Kawasaki

KZ650



Motorcycle Service Manual

Quick Reference Guide

To use, bend the manual back and match the desired chapter below against the black spot showing at the edge of these pages.



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Kawasaki

KZ650



Motorcycle Service Manual

All information contained in this manual is based on the latest product information available at the time of publication. 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 manual was issued. Published by Motorcycle Division, KHI.

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First issue: Jan. 16, 1981 (Y)

Foreword

This manual is designed primarily for use by motorcycle mechanics in a properly equipped shop, although it contains enough detail and basic information to make it useful to the motorcycle user who desires to carry out his own basic maintenance and repair work. Since a certain basic knowledge of mechanics, the proper use of tools, and workshop procedures must be understood in order to carry out maintenance and repair satisfactorily; the adjustments, maintenance, and repair should be carried out only by qualified mechanics whenever the owner has insufficient experience, or has doubts as to his ability to do the work, so that the motorcycle can be operated safely.

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

This manual consists of the following major chapters:

1. "General Information" contains general information which will be useful when servicing the motorcycle.
2. "Scheduled Maintenance" gives the procedures for all maintenance which must be done periodically.
3. "Non-Scheduled Maintenance" describes the procedures for inspection, adjustment, and repair which may become necessary unexpectedly or irregularly.
4. "Disassembly" gives teardown sequences required to service most major components. Unless specific instructions are given for assembly and installation, they are performed by reversing the removal/disassembly sequences.
5. "Appendix" in the back of this manual contains miscellaneous information, including an additional considerations for racing, troubleshooting guide, and unit coversion table.

NOTE: Explanation on major changes and additions, that are unique to later year units since the publication of the Service Manual, will be added in the end of the text.

For the duration of your warranty period, especially, we recommend that all repairs and scheduled maintenance be performed in accordance with this service manual. Any owner maintenance or repair procedure not performed in accordance with this manual may void the warranty.

To get the longest life out of your Motorcycle:

- Follow the Periodic Maintenance Chart in the Service Manual.
- Be alert for problems and non-scheduled maintenance.
- Use proper tools and genuine Kawasaki Motorcycle parts.
- 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.

General Information

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BEFORE SERVICING

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

Especially note the following:

(1) 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.

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

(3) Tightening Sequence
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. When installing a part with several bolts, nuts, or screws, they should all be started in their holes and tightened to a snug fit. Then tighten them evenly, according to the tightening sequence, to the specified torque. This is to avoid distortion of the part and/or causing gas or oil leakage. Conversely when loosening the bolts, nuts, or screws, loosen all of them about a quater of trun and then remove them.

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

(5) Force
Common sense should dictate how much force is necessary in assembly and disassembly. If a part seems especially difficult to remove or install, stop and examine what may be causing the problem. Whenever tapping is necessary, tap lightely 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) Lubricant
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.

(7) Battery Ground
Before performing any disassembly operations on the motorcycle, remove the ground (–) lead from the battery to prevent the possibility of accidentally turning the engine over while partially disassembled.

(8) Engine Rotation
When turning the crankshaft by hand, always turn it in the direction of normal rotation; which is clockwise, viewed from the right side of the engine. This will ensure proper adjustments.

(9) 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.

(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) Oil seal, Grease Seal
Replace any oil or grease seals that were removed with new ones, as removal generally damages seals. 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.

(12) Gasket, O Ring

When in doubt as to the condition of a gasket or O ring, replace it with a new one. The mating surfaces around the gasket should be free of foreign matter and perfectly smooth to avoid oil or compression leaks.

(13) 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 examine of a non-permanent locking agent commonly available in North America is Loctite Lock'n Seal (Blue).

(14) Ball Bearing, Oil Seal, Grease Seal Installation

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. Seals should be pressed into place using a suitable driver, which contacts evenly with the side of the seal until the face of the seal is even with the end of the hole.

(15) Circlip, Retaining Ring

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

(16) 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.

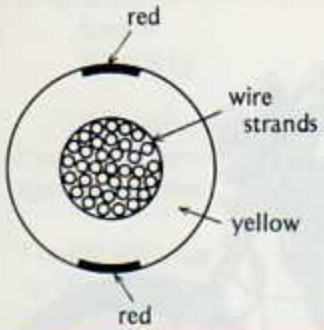
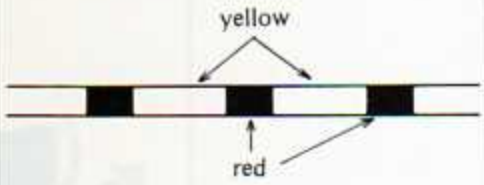
(17) Molybdenum Disulfide (MoS_2) Grease

This manual makes reference to molybdenum disulfide grease in the assembly of certain engine and chassis parts. Always check manufacturer recommendations before using such special lubricants.

(18) Electrical Leads

All the electrical leads are either single-color or two-color and, with only a few exceptions, must be connected to leads of the same color. On any of the two-color leads there is a greater amount of one color and a lesser amount of a second color, so a two-color lead 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.

Table 1-1 Two-color Lead Identification

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

MODEL IDENTIFICATIONS

KZ650-D4



KZ650-F2



KZ650-H1



SPECIFICATIONS

Specifications for 1981 KZ650:

Items		KZ650-D4	KZ650-F2	KZ650-H1
Dimensions:				
Overall length		2,185 mm, ⓞ 2,145 mm	2,220 mm, ⓞ 2,170 mm	2,190 mm
Overall width		830 mm	775 mm, ⓞ 850 mm	820 mm
Overall height		1,160 mm	1,115 mm, ⓞ 1,145 mm	1,245 mm
Wheelbase		1,440 mm	*	1,445 mm
Road clearance		155 mm	152 mm	*
Seat height		795 mm	820 mm	775 mm
Dry weight		214.3 kg	209 kg	210 kg
Fuel tank capacity		14 liters	16.8 liters	12.4 liters
Performance:				
Climbing ability		30°	*	*
Braking distance		12.5 m from 50 kph	*	*
Minimum turning radius		2.4 m	*	2.5 m
Enigne:				
Type		4-stroke, DOHC, 4-cylinder	*	*
Cooling system		Air-cooled	*	*
Bore and stroke		62.0 x 54.0 mm	*	*
Displacement		652 cc	*	*
Compression ratio		9.5	*	*
Valve timing:				
Inlet	Open	22° BTDC	*	*
	Close	52° ABDC	*	*
	Duration	254°	*	*
Exhaust	Open	60° BBDC	*	*
	Close	20° ATDC	22° ATDC	*
	Duration	260°	262°	*
Carburetion system		Mikuni Carburetors, VM24SS x 4	*	*
Cylinder numbering method		Left to right, 1-2-3-4	*	*
Firing order		1-2-4-3	*	*
Lubrication system		Forced lubrication (wet sump)	*	*
Engine oil:				
Grade		SE class	*	*
Viscosity		SAE 10W40, 10W50, 20W40, or 20W50	*	*
Capacity		3.5 liters	*	*
Starting system		Electric starter	*	*
Ignition system		Battery and coil (transistorized)	*	*
Timing advance		Mechanical advanced	*	*
Ignition timing		From 10° BTDC @1,000 rpm to 35° BTDC @3,200 rpm	*	*
Spark plugs		NGK B7ES or ND W22ES-U	*	*

* : Identical to KZ650-D4
ⓞ : Other than European and Australian models

(Continued on next page.)

Specifications for 1981 KZ650(Cont.):

Items	KZ650-D4	KZ650-F2	KZ650-H1
Drive Train:			
Primary reduction system:			
Type	Chain and gear	*	*
Reduction ratio	2.550 (27/23 x 63/29)	*	*
Clutch type	Wet malti disc	*	*
Transmission:			
Type	5-speed, constant mesh, return shift	*	*
Gear ratios 1st	2.333 (35/15)	*	*
2nd	1.631 (31/19)	*	*
3rd	1.272 (28/22)	*	*
4th	1.040 (26/25)	*	*
5th	0.888 (24/27)	*	*
Final drive system:			
Type	Chain drive	*	*
Reduction ratio	2.538 (33/13)	2.615 (34/13)	*
Overall drive ratio	5.754 @top gear	5.928 @top gear	*
Frame:			
Type	Tubular, double cradle	*	*
Castor (rake angle)	27.5°	27°	29°
Trail	113 mm	108 mm	115 mm
Front tire:			
Type	Tubeless	*	Tube type
Size	3.25H-19 4PR	*	*
Rear tire:			
Type	Tubeless	*	Tube type
Size	130/90-16 67H 4PR	4.00H-18 4PR	*
Front Suspension:			
Type	Telescopic fork (pneumatic)	*	*
Wheel travel	160 mm	*	180 mm
Rear suspension:			
Type	Swing arm	*	*
Wheel travel	95 mm	*	*
Brake type:			
Front	Dual disc brake	*	Single disc brake
Rear	Single disc brake	Drum brake	Drum brake
Electrical Equipment:			
Alternator:			
Type	Three-phase AC	*	*
Rated output	17 amp. @10,000 rpm, 14V	*	*
Voltage regulator	Short-circuit type	*	*
Battery	12V 10AH	*	12V 12AH
Headlight:			
Type	Semi-sealed	*	Sealed
Bulb	12V 60/55W (Quartz-halogen) ⓞ 12V 50/40W	*	12V 60/50W
Tail/brake light	12V 5/21W, ⓞ 12V 8/27W	*	12V 8/27W

* : Identical to KZ650-D4
ⓞ : Other than European and Australian models

SERVICE DATA

The following tables list the service data which show criteria for servicing major parts. Although reliable measurements can only be obtained by using the proper instruments and following the procedures explained in this text, detail has not been explained in this section. See each section for a detailed account.

Engine:

Items	Standard	Service Limit	Table No. in Text
Fuel Tap:			See Pg.3-2
Fuel tap opening vacuum:			
KZ650-D, F	More than 18 cmHg	– – –	
KZ650-H	More than 17 cmHg	– – –	
Carburetors:			
Idling speed	1,000 ± 50 rpm	– – –	2-5
Synclronization	Under 2 cmHg difference	– – –	2-6
Service fuel level	2 – 4 mm	– – –	3-2
Jet needle clip groove number:			3-2
US	No groove	– – –	
Other than US	4 from the top most groove	– – –	
Throttle Grip:			See Pg.2-8
Throttle grip play	2 – 3 mm	– – –	
Vacuum Switch Valve:			See Pg.3-5
Valve Switching vacuum:			
When closing	43 ± 2 cmHg	– – –	
When opening	37 cmHg	– – –	
Camshafts:			
Cam height	35.73 – 35.87 mm	35.65 mm	3-5
Camshaft journal/camshaft cap clearance	0.090 – 0.132 mm	0.19 mm	3-6
Camshaft journal diameter	21.949 – 21.970 mm	21.93 mm	3-7
Camshaft bearing inside diameter	22.060 – 22.081 mm	22.12 mm	3-8
Camshaft runout	Under 0.02 mm	0.1 mm	3-9
Camshaft Chain, Guides, Tensioner:			
Camshaft chain length (20-link length)	127.00 – 127.12 mm	128.9 mm	3-10
Chain guide groove depth:			3-11
Upper	0 mm	3.5 mm	
Front	1.0 – 1.5 mm	2.5 mm	
Rear	1.5 mm	3.5 mm	
Tensioner spring free length:			3-12
Ball-lock type	45.4 mm	43 mm	
Cross-wedge type:			
at push rod	38 mm	36 mm	
at push rod stop	46.2 mm	44 mm	

(Continued on next page.)

Service Data (Cont.)

Item	Standard	Service Limit	Table No. in Text
Cylinder Head, Values:			
Cylinder compression	12.7 kg/cm² Usable Range: 9.6 – 14.7 kg/cm²	– – –	3-13
Valve clearance	0.08 – 0.18 mm	– – –	2-4
Cylinder head warp	– – –	0.05 mm	3-14
Combustion chamber volume	23.3 – 24.1 cc	– – –	3-15
Valve head thickness:			3-16
Inlet	1 mm	0.5 mm	
Exhaust	1 mm	0.7 mm	
Valve stem bend	Under 0.01mm	0.05 mm	3-17
Valve stem diameter:			3-18
Inlet	6.965 – 6.980 mm	6.95 mm	
Exhaust	6.950 – 6.970 mm	6.94 mm	
Valve guide inside diameter	7.000 – 7.015 mm	7.08 mm	3-19
Valve/valve guide clearance: (Wobble method)			3-20
Inlet	0.049 – 0.085 mm	0.24 mm	
Exhaust	0.057 – 0.124 mm	0.19 mm	
Valve seating area:			3-21
Outside diameter:			
Inlet	32 mm	– – –	
Exhaust	27 mm	– – –	
Width	0.5 – 1.0 mm	– – –	
Valve installed height	See Table in the text.	– – –	3-22
Valve spring tension:			3-23
Inner/23.6 mm	25.75 – 18.45 kg	24.2 kg	
Outer/25.6 mm	47.0 – 51.8 kg	44.0 kg	
Valve spring Squarence:			3-24
Inner	– – –	1.3 mm	
Outer	– – –	1.5 mm	
Cylinder:			
Cylinder inside diameter	61.993 – 62.005 mm	62.10mm	3-25
Piston:			
Piston diameter	61.948 – 61.963 mm	61.80 mm	3-26
Piston/cylinder clearance	0.030 – 0.057 mm	– – –	3-27
Piston ring/groove clearance:			3-28
Top	0.04 – 0.08 mm	0.18 mm	
Second	0.03 – 0.07 mm	0.17 mm	
Piston ring thickness:			3-29
Top and second	1.17 – 1.19 mm	1.10 mm	
Piston ring groove width:			3-30
Top	1.23 – 1.25 mm	1.33 mm	
Second	1.22 – 1.24 mm	1.32 mm	
Oil	2.51 – 2.53 mm	2.61 mm	
Piston ring end gap:			3-31
Top and Second	0.15 – 0.35 mm	0.7 mm	

(Continued on next page.)

Service Data (Cont.)

Items	Standard	Service Limit	Table No. in Text
Piston pin diameter	14.994 – 14.998 mm	14.96 mm	3-32
Piston pin hole diameter	15.004 – 15.009 mm	15.07 mm	3-32
Connecting rod small end inside diameter	15.003 – 15.014 mm	15.05 mm	3-32
Crankshaft, Connecting Rods:			
Connecting rod bend	Under 0.1/100 mm	0.2/100 mm	3-33
Connecting rod twist	Under 0.15/100 mm	0.2/100 mm	3-34
Connecting rod Bearing insert/ journal clearance	0.034 – 0.064 mm	0.10 mm	3-35
Connecting rod journal diameter:			3-36
No mark	34.984 – 34.994 mm	34.97 mm	
○	34.995 – 35.000 mm	34.97 mm	
Connecting rod big end inside diameter:			3-37
No mark	38.000 – 38.008 mm	– – –	
○	38.009 – 38.016 mm	– – –	
Connecting rod big end bearing insert thickness:			3-39
Brown	1.475 – 1.480 mm	– – –	
Black	1.480 – 1.485 mm	– – –	
Green	1.485 – 1.490 mm	– – –	
Connecting rod big end side clearance	0.15 – 0.25 mm	0.45 mm	3-40
Crankshaft runout	Under 0.02 mm	0.05 mm	3-41
Crankshaft bearing insert/journal clearance	0.012 – 0.036 mm	0.08 mm	3-42
Crankshaft journal diameter:			3-43
No mark	35.984 – 35.992 mm	35.96 mm	
1	35.993 – 36.000 mm	35.96 mm	
Crankshaft bearing inside diameter			3-44
0	39.000 – 39.008 mm	– – –	
No mark	39.009 – 39.016 mm	– – –	
Crankshaft bearing insert thickness:			3-46
Brown	1.490 – 1.494 mm	– – –	
Black	1.494 – 1.498 mm	– – –	
Blue	1.498 – 1.502 mm	– – –	
Crankshaft side clearance	0.05 – 0.15 mm	0.40 mm	3-47
Primary Chain, Sprockets:			
Primary chain slack	– – –	27 mm	3-48
Clutch:			See Pg.2-11
Clutch lever play	2 – 3 mm	– – –	3-49
Clutch spring tension/23.5 mm	23.5 – 26.5 kg	22.5 kg	

(Continued on next page.)

Service Data (Cont.)

Items	Standard	Service Limit	Table No. in Text
Friction plate thickness	3.7 – 3.9 mm	3.5 mm	3-50
Clutch plate warp:			3-51
Friction	Under 0.15 mm	0.3 mm	
Steel	Under 0.2 mm	0.3 mm	
Friction plate/clutch housing clearance	0.34 – 0.75 mm	1.0 mm	3-52
Clutch housing gear/secondary shaft gear backlash	Under 0.10 mm	0.14 mm	3-53
Clutch housing inside diameter	37.000 – 37.016 mm	37.03 mm	3-54
Drive shaft sleeve diameter	31.980 – 31.995 mm	31.96 mm	3-54
Transmission:			
Shift drum positioning pin spring free length	32.3 mm	30.7 mm	3-55
Transmission gear backlash	Under 0.17 mm	0.25 mm	3-56
Shift fork ear thickness	4.9 – 5.0 mm	4.7 mm	3-57
Gear shift fork groove width	5.05 – 5.15 mm	5.25 mm	3-58
Shift fork guide pin diameter:			3-59
1st and 2nd/3rd	7.9 – 8.0 mm	7.85 mm	
4th/5th	7.985 – 8.000 mm	7.93 mm	
Shift drum groove width	8.05 – 8.20 mm	8.25 mm	3-60
Gear/shaft, Gear/bush clearance:			3-61
Drive 4th, 5th, Output 2nd, 3rd	0.020 – 0.062 mm	0.16 mm	
Output 1st	0.027 – 0.069 mm	0.17 mm	
Shaft bearing diameter	19.980 – 19.993 mm	19.96 mm	3-62
Needle bearing outer race inside diameter	26.005 – 26.022 mm	26.04 mm	3-62
Engine Lubrication:			
Relief valve opening pressure	5.2 ± 0.8 kg/cm²	– – –	3-64
Oil pressure/4,000rpm, 90°C	2.0 – 2.5 kg/cm²	– – –	3-65
Oil pump:			
Outer rotor/inner rotor clearance	0.05 – 0.23 mm	0.30 mm	3-66
Outer rotor/pump body clearance	0.15 – 0.21 mm	0.30 mm	3-67
Rotor side clearance	0.02 – 0.07 mm	0.12 mm	3-68
Engine oil:			2-1
Grade	SE class	– – –	
Visconsity	SAE 10W40, 10W50, 20W40 20W50	– – –	
Capacity:			
When filter is not changed	3.0 liters	– – –	
When filter is changed	3.5 liters	– – –	

(Continued on next page.)

Service Data (Cont.):

Chassis:

Items	Standard	Service Limit	Table No. in Text
Wheels:			
Tire tread depth:			2-13
Front:			
KZ650-D, H	3.8 mm	1 mm	
KZ650-F	3.5 mm	1 mm	
Rear:			
KZ650-D, H	8.2 mm	2 mm: Under 130kph 3 mm: Over 130kph	
KZ650-F	7.3 mm	2 mm: Under 130kph 3 mm: Over 130kph	
Tire air pressure	See Table in the text.		4-1
Rim runout:			
Wire-spoke rim:			2-15
Axial	Under 0.8 mm	2 mm	
Radial	Under 1.0 mm	2 mm	
Cast rim:			
Axial	– – –	0.5 mm	4-2
Radial	– – –	0.8 mm	
Axle runout	Under 0.05/100mm Usable range: 0.2/100 mm	0.7/100 mm	4-3
Drive Train:			
Drive chain slack	20 – 30 mm	Less than 20 mm More than 35 mm	2-7
Drive chain length	381.0 – 381.8 mm	389 mm	2-9
Sprocket diameter:			4-4
Engine	67.36 – 67.56 mm	66.7 mm	
Rear:			
KZ650-D, H	188.22 – 188.72 mm	187.9 mm	
KZ650-F	194.60 – 195.10 mm	194.3 mm	
Rear sprocket warp	Under 0.4 mm	0.5 mm	4-5
Brakes:			
Brake pedal play:			
Drum	20 – 30 mm	– – –	2-14
Disc	8 – 10 mm	– – –	2-15
Brake pedal position	0 – 30 mm	– – –	4-8
Brake cam lever angle	80° – 90°	– – –	2-15
Brake light switch:			2-19
Front	Non-adjustable type	– – –	
Rear	Light on after 15 mm pedal travel	– – –	

(Continued on next page.)

Service Data (Cont.):

Items	Standard	Service Limit	Table No. in Text
Pad lining thickness:			2-10
Front:			
KZ650-D, F	3.35 mm	1 mm	
KZ650-H	4.85 mm	1 mm	
Rear	4.85 mm	1 mm	
Brake fluid type	D.O.T.3	– – –	2-11
Master cylinder parts:			4-6
Cylinder inside diameter:			
Front:			
KZ650-D, F	15.870 – 15.933 mm	15.95 mm	
KZ650-H	12.700 – 12.763 mm	12.78 mm	
Rear	14.000 – 14.063 mm	14.08 mm	
Piston diameter			
Front:			
KZ650-D, F	15.693 – 15.720 mm	15.67 mm	
KZ650-H	12.523 – 12.550 mm	12.50 mm	
Rear	13.823 – 13.850 mm	13.80 mm	
Primary cup diameter			
Front:			
KZ650-D, F	16.15 – 16.65 mm	16.0 mm	
KZ650-H	12.9 – 13.3 mm	12.8 mm	
Rear	14.15 – 14.65 mm	14.0 mm	
Secondary cup diameter			
Front:			
KZ650-D, F	16.55 – 17.05 mm	16.4 mm	
KZ650-H	13.25 – 13.75 mm	13.1 mm	
Rear	14.75 – 15.25 mm	14.6 mm	
Return spring free length			
Front:			
KZ650-D, F	36.6 – 40.6 mm	34.8 mm	
KZ650-H	49.65 – 53.65 mm	47.2 mm	
Rear	34.15 – 38.15 mm	32.4 mm	
Caliper parts:			4-7
Cylinder inside diameter	42.85 – 42.90 mm	42.92 mm	
Piston diameter	42.77 – 42.82 mm	42.75 mm	
Disc warp	Under 0.15 mm	0.3 mm	4-8
Disc thickness:			4-9
Front	4.8 – 5.1 mm	4.5 mm	
Rear	6.8 – 7.1 mm	6.0 mm	
Drum inside diameter	180.000 – 180.160 mm	180.75 mm	4-10
Shoe lining thickness	4.85 – 5.80 mm	2.5 mm	4-11
Shoe spring free length	66.0 – 67.0 mm	69.0 mm	4-12
Brake camshaft diameter	16.957 – 16.984 mm	16.88 mm	4-13
Camshaft hole diameter	17.000 – 17.070 mm	17.15 mm	4-14

(Continued on next page.)

Service Data (Cont.):

Items	Standard	Service Limit	Table No. in Text
Suspensions:			
Front fork:			
Oil type	SAE10W	– – –	2-12
Oil capacity:			2-12
KZ650-D, F	245 ± 4 cc	– – –	
KZ650-H	291 ± 4cc	– – –	
Oil level (without spring):			2-12
KZ650-D	375 ± 4 mm	– – –	
KZ650-F	376 ± 4 mm	– – –	
KZ650-H	433 ± 4 mm	– – –	
Air pressure:			4-16
KZ650-D, F	0.7 kg/cm²	– – –	
	Usable range: 0.6–0.9 kg/cm²		
KZ650-H	0.6 kg/cm²	– – –	
	Usable range: 0.5–1.0 kg/cm²		
Spring free length:			4-19
KZ650-D,F	501 mm	491 mm	
KZ650-H	507 mm	497 mm	
Swing arm:			
Sleeve outside diameter	21.987 – 22.000 mm	21.96 mm	4-20
Pivot shaft runout	Under 0.10 mm	0.7 mm	4-21
	Usable range: 0.14 mm		

Electrical Equipment:

Items	Standard	Service Limit	Table No. in Text
Charging System:			
Charging voltage (4,000 rpm)	14.5 V	– – –	5-2
Alternator output voltage (4,000 rpm)	About 50V	– – –	5-3
Stator coil resistance	0.48 – 0.72 Ω	– – –	5-4
Ignition System:			
Ignition coil:			
Arcing distance (3-point)	7 mm or more	– – –	5-6
Primary winding resistance	1.8 – 2.7 Ω	– – –	5-7
Secondary winding resistance	12 – 18 kΩ	– – –	5-7
Pickup coil resistance	360 – 540 Ω	– – –	5-8
IC Igniter resistance	See Table in the text.	– – –	5-10
Spark plug:			2-2
Type	NGK B7ES or ND W22ES-U	– – –	
Gap	0.7 – 0.8 mm	– – –	
Starter System:			
Starter motor:			
Carbon brush length	12.0 – 13.0 mm	6 mm	5-12
Brush spring tension	560 – 680 grams	– – –	5-13
Commutator groove depth	0.5 – 0.8 mm	0.2 mm	5-13

TORQUE AND LOCKING AGENT

The following table lists the tightening torque for the major bolts and nuts, and parts requiring use of a non-permanent locking agent or liquid gasket.

NOTE: Marks used in "Remark"

A : Apply a non-permanent locking agent to the threads.
G : Apply a liquied gasket to the threads or washer.
S : Tighten the bolts, nuts, or screws according to the tightening sequence.

Engine Parts	Threads		Quantity	Torque		Remark	See Pg.
	Dia (mm)	Pitch (mm)		kg-m	ft-lbs		
Air suction valve cover bolts	6	1.0	8	0.80	69 in-lbs	–	6-26
Alternator rotor bolt	10	1.25	1	7.0	51	–	6-32
Alternator stator Allen bolts	6	1.0	3	0.80	69 in-lbs	A	6-32
Breather cover bolt	8	1.25	1	0.60	52 in-lbs	–	6-29
Camshaft cap bolts	6	1.0	16	1.2	104 in-lbs	S	6-24
Camshaft chain tensioner cap	18	1.5	1	2.5	18 0	–	6-25
Camshaft sprocket bolts	6	1.0	4	1.5	11.0	A	6-26
Carburetor holder screws	6	1.0	8	–	–	A	6-28
Clutch hub locknut	20	1.5	1	13.5	98	–	6-38
Clutch release mounting screws	6	1.0	2	–	–	A	6-14
Clutch spring bolts	6	1.0	5	0.90	78 in-lbs	–	6-38
Connecting rod big end cap nuts	8	0.75	8	3.7	27	–	6-51
Crankcase bolts							
(upper)	6	1.0	13	1.0	87 in-lbs	–	6-52
(lower)	6	1.0	7	1.0	87 in-lbs	–	6-52
(lower)	8	1.25	10	2.5	18.0	S	6-52
Cylinder head							
bolts	8	1.25	2	3.0	22	S	6-23
nuts	10	1.25	12	4.0	29	S	6-23
Cylinder head cover bolts	6	1.0	24	0.80	69 in-lbs	–	6-25
Drive chain guard bolts	6	1.0	3	–	–	A	6-34
Engine drain plug	12	1.5	1	3.8	27	–	2-4
Engine mounting bolts	10	1.25	6	4.0	29	–	6-16
Engine mounting bracket bolts	8	1.25	6	2.4	17.5	–	6-16
Engine sprocket nut	20	1.5	1	8.0	58	–	6-14
Neutral switch	12	1.5	1	1.5	11.0	–	6-34
Oil filter mounting bolt	20	1.5	1	2.0	14.5	–	6-15

(Continued on next page.)

Torque and Locking Agent (Cont.):

Engine Parts	Threads		Quantity	Torque		Remark	See Pg.
	Dia (mm)	Pitch (mm)		kg-m	ft-lbs		
Oil pan bolts	6	1.0	15	1.0	87 in-lbs	–	6-44
Oil pressure switch	PT1/8		1	1.5	11.0	–	6-36
Oil pressure relief valve	12	1.25	1	1.5	11.0	A	6-44
Return spring pin (bolt)	8	1.5	1	2.5	18.0	A	6-33
Secondary shaft nut	18	1.5	1	6.0	43	–	6-43
Shift drum pin plate screw	6	1.0	1	–	–	A	6-53
Spark plugs	14	1.25	4	2.8	20	–	2-5
Starter motor clutch Allen bolts	8	1.25	3	3.5	25	A	6-45
Studs							
(cylinder head)	6	1.0	8	–	–	A	6-18
(crankcase)	10	1.25	12	–	–	A	6-19
Timing advancer mounting bolt	8	1.25	1	2.5	18.0	–	6-36

Chassis Parts	Threads		Quantity	Torque		Remark	See Pg.
	Dia (mm)	Pitch (mm)		kg-m	ft-lbs		
Brake parts	See Table for Brake Parts.						1-16
Front axle							
nut (leading axle)	14	1.5	1	8.0	58	–	7-3
nuts (center axle)	16	1.5	2	8.0	58	–	7-4
Front axle clamp							
nut (leading axle)	8	1.25	1	1.8	13.0	–	7-4
nuts (center axle)	8	1.25	4	1.8	13.0	S	7-4
Front fork air valves	10	1.25	2	1.2	104 in-lbs	A	7-29
Front fork bottom Allen bolts	8	1.25	2	2.3	16.5	A, G	7-29
Front fork clamp bolts							
(upper)	8	1.25	2	2.0	14.5	–	2-20
(lower)	10	1.25	2	3.8	27	–	7-26
Front fork drain screws	4	0.7	2	–	–	G	7-29
Front fork top plugs	28	1.0	2	2.3	16.5	–	7-29
Handlebar clamp bolts	8	1.25	4	1.8	13.0	–	7-27

(Continued on next page.)

Torque and Locking Agent (Cont.):

Chassis Parts	Threads		Quantity	Torque		Remark	See Pg.
	Dia (mm)	Pitch (mm)		kg-m	ft-lbs		
Rear axle nut	16	1.5	1	12.0	87	–	2-12
Rear shock absorber mounting							
nuts	10	1.25	2	3.0	22	–	7-31
bolts	10	1.25	2	3.0	22	–	7-31
Rear sprocket nuts	10	1.25	6	4.0	29	–	7-13
Spokes	–	–	80	0.30	26 in-lbs	–	2-23
Steering stem head bolt	16	1.5	1	4.5	33	–	2-20
Steering stem head clamp nut	8	1.25	1	1.8	13.0	–	2-20
Steering stem locknut	30	1.0	1	3.0	22	–	2-20
Swing arm pivot shaft nut	16	1.5	1	10.0	72	–	7-31
Tire air valve nuts							
(for tubeless tire)	8	0.8	2	0.15	13 in-lbs	–	7-10
Torque link bolt nuts	10	1.25	2	3.0	22	–	2-13

Brake Parts	Threads		Quantity	Torque		Remark	See Pg.
	Dia (mm)	Pitch (mm)		kg-m	ft-lbs		
Bleed valves	7	1.0	max. 3	0.80	69 in-lbs	–	2-18
Brake hose							
banjo bolts	10	1.25	max. 7	3.0	22	–	7-17
clamp screws (built in the clamp)			2	0.10	9 in-lbs	–	7-20
Brake lever pivot							
bolt	6	1.0	1	0.30	26 in-lbs	–	7-20
locknut	6	1.0	1	0.60	52 in-lbs	–	7-20
Brake pedal pivot cap nut	8	1.25	1	2.0	14.5	–	2-28
Caliper holder shaft bolts	8	1.25	max. 6	1.8	13.0	–	7-17
Disc mounting Allen bolts	8	1.25	max. 21	2.3	16.5	–	7-15
Disc mounting bolts	8	1.25	4	4.0	29	–	7-15
Front caliper mounting bolts	10	1.25	4	4.0	29	–	7-17
Front master cylinder clamp bolts	6	1.0	2	0.90	78 in-lbs	S	7-18

(Continued on next page.)

Torque and Locking Agnet (Cont.):

The table below, relating tightening torque to thread diameter and pitch, lists the basic torque for the bolts and nuts used on Kawasaki Motorcycles. However, the actual torque that is necessary may vary amount bolts and nuts with the same thread diameter and pitch. The bolts and nuts liested on Pg. 1-14 – 1-16 vary to a greater or lesser extent from what is given in this table. Refer to this table for only the bolts and nuts not included in the table on Pg. 1-14 – 1-16. All of the values are for use with dry solvent-cleaned threads.

Coarse threads

Threads		Torque	
dia. (mm)	pitch (mm)	kg-m	ft-lbs
5	0.80	0.35 – 0.50	30 – 43 in-lbs
6	1.00	0.60 – 0.90	52 – 78 in-lbs
8	1.25	1.6 – 2.2	11.5 – 16.0
10	1.50	3.1 – 4.2	22 – 30
12	1.75	5.4 – 7.5	39 – 54
14	2.00	8.3 – 11.5	60 – 83
16	2.00	13.0 – 18.0	94 –130
18	2.50	18.0 – 25	130 – 181
20	2.50	26 – 35	188 – 253

Fine threads

Threads		Torque	
dia. (mm)	pitch (mm)	kg-m	ft-lbs
5	0.50	0.35 – 0.50	30 – 43 in-lbs
6	0.75	0.60 – 0.80	52 – 69 in-lbs
8	1.00	1.4 – 1.9	10.0 – 13.5
10	1.25	2.6 – 3.5	19.0 – 25
12	1.50	4.5 – 6.2	33 – 45
14	1.50	7.4 – 10.2	54 – 74
16	1.50	11.5 – 16.0	83 – 116
18	1.50	17.0 – 23	123 – 166
20	1.50	23 – 33	166 – 239

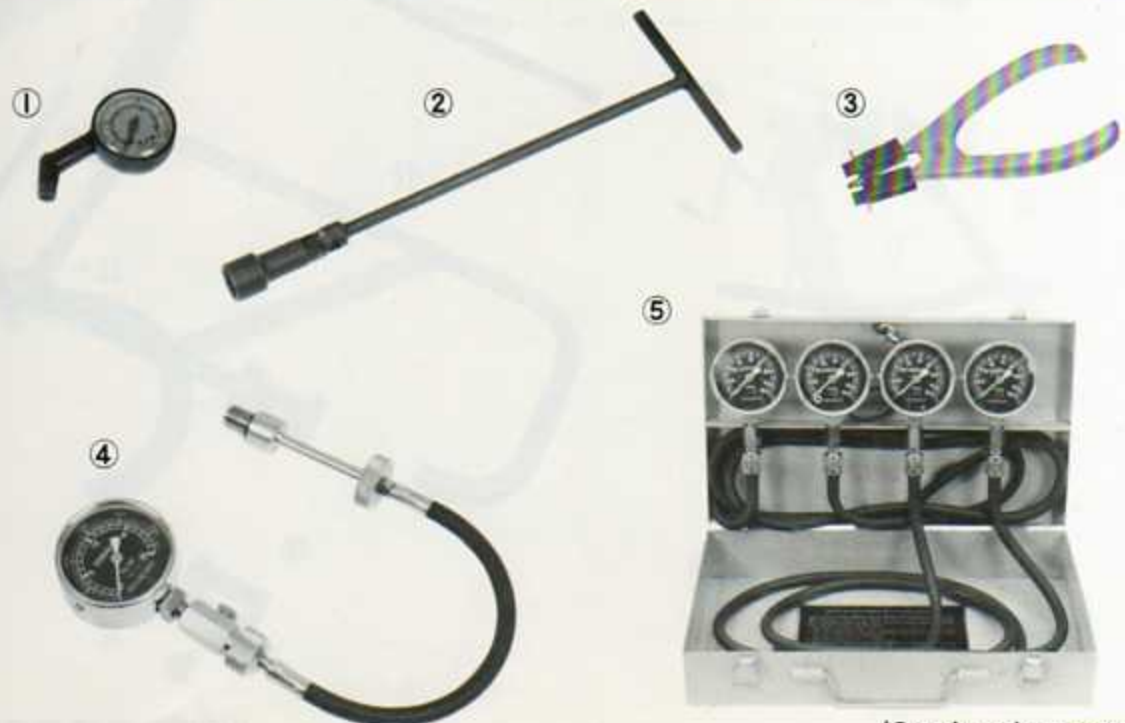
SPECIAL TOOLS

Ref. No.	Part No.	Description	Quantity
1	52005-1003	Air Pressure Gauge	1
2	57001-110	Spark Plug Wrench	1
3	57001-115	Piston Ring Pliers	1
4	57001-123	Compression Gauge Assy	1
5	57001-127	Vacuum Gauge Set	1 set
6	57001-135	Bearing Puller	1
7	57001-136	Bearing Puller Adapter (included in 57001-135)	1
8	57001-137	Stem Bearing Driver	1
9	57001-141	Front Fork Oil Seal Driver	1
		(or Driver: 57001-1091)	(1)
10	57001-143	Inside Circlip Pliers	1
11	57001-144	Outside Circlip Pliers	1
12	57001-149	Piston Bases (included in 57001-531)	—
13	57001-162	Valve Guide Reamer	1
14	57001-163	Valve Guide Arbor	1
15	57001-164	Oil Pressure Gauge Assy	1
16	57001-183	Front Frok Cylinder Holder Handle	1
17	57001-241	Valve Spring Compressor Assy	1
18	57001-243	Valve Spring Compressor Adapter	1
19	57001-254	Rotor Puller	1
		(or Rotor Puller: 57001-1099)	(1)
20	57001-264	Oil Seal Guide	1
21	57001-297	Bearing Driver	1
22	57001-305	Clutch Holder	1
23	57001-308	Rotor Holder	1
24	57001-317	Bearing Puller Adapter	1
25	57001-319	Gear Puller & Pusher	1
26	57001-382	Driver	1
27	57001-403	Oil Pressure Gauge Adapter	1
28	57001-531	Piston Ring Compressor Assy	1
29	57001-900	Engine Stand	1
30	57001-910	Piston Pin Puller Assy	1
31	57001-913	Piston Pin Puller Adapter (included in 57001-910)	—
32	57001-980	Electrotester	1
33	57001-983	Hand Tester	1
34	57001-1011	Front Fork Cylinder Holder Adapter	1
35	57001-1017	Fuel Level Gauge	1
36	57001-1063	Rim Protectors	1 set
37	57001-1065	Tire Changer	1
38	57001-1072	Tire Bead Breaker	1

(Continued on next page.)

Special Tools (Cont.):

Ref. No.	Part No.	Description	Quantity
39	57001-1073	Tire Irons (included in 57001-1072)	–
40	57001-1100	Stem Nut Wrench	1
41	57001-1111	Valve Seat Cutter Case	1
42	57001-1112	Separate Case	1
43	57001-1115	Seat Cutter 45° (EX)	1
44	57001-1116	Seat Cutter 45° (IN)	1
45	57001-1121	Outside Cutter 32° (EX and IN)	1
46	57001-1123	Inside Cutter 60° (EX)	1
47	57001-1124	Inside Cutter 60° (IN)	1
48	57001-1126	Cutter Holder 7 mm	1
49	57001-1128	Cutter Holder Bar	1
50	57001-1129	Bearing Driver Set	1 set
51	57001-1132	Bearing Driver Holder (included in 57001-1129)	–
52	57001-1135	Bearing Driver (included in 57001-1129)	–
53	57001-1136	Bearing Driver (included in 57001-1129)	–
54	57001-1138	Bearing Driver (included in 57001-1129)	–
55	57001-1139	Bearing Driver (included in 57001-1129)	–
56	57001-1140	Bearing Driver (included in 57001-1129)	–
57	57001-1142	Bearing Driver (included in 57001-1129)	–
58	57001-1145	Bearing Driver (included in 57001-1129)	–
59	57001-1146	Bearing Driver (included in 57001-1129)	–
60	57001-1147	Bearing Driver (included in 57001-1129)	–
61	57001-1148	Bearing Driver (included in 57001-1129)	–



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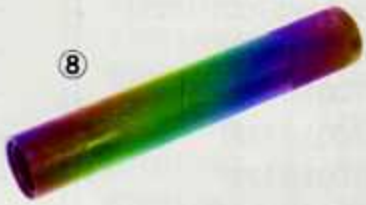
Special Tools (Cont.):

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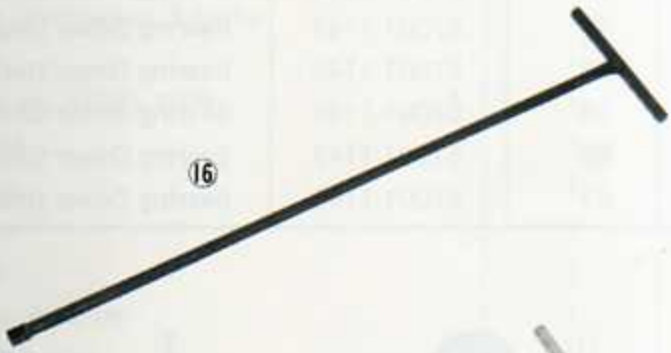
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Special Tools (Cont.):

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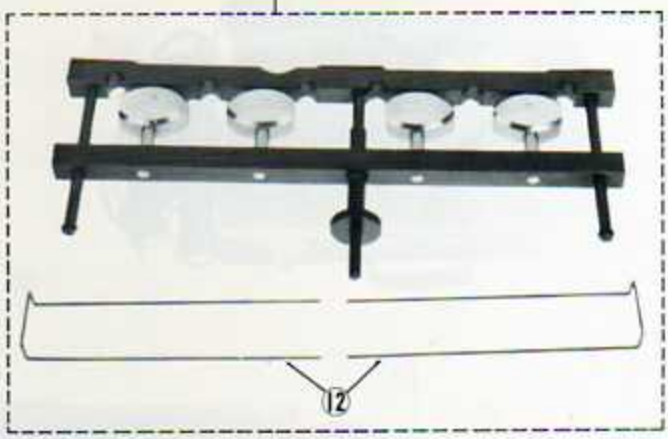
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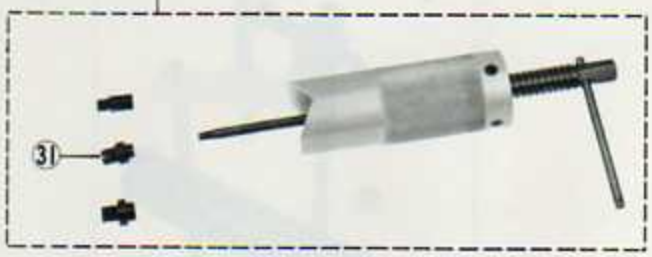
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Special Tools (Cont.):

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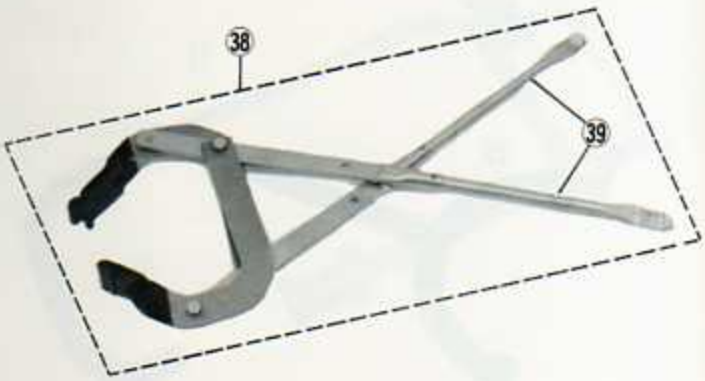
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Special Tools (Cont.):

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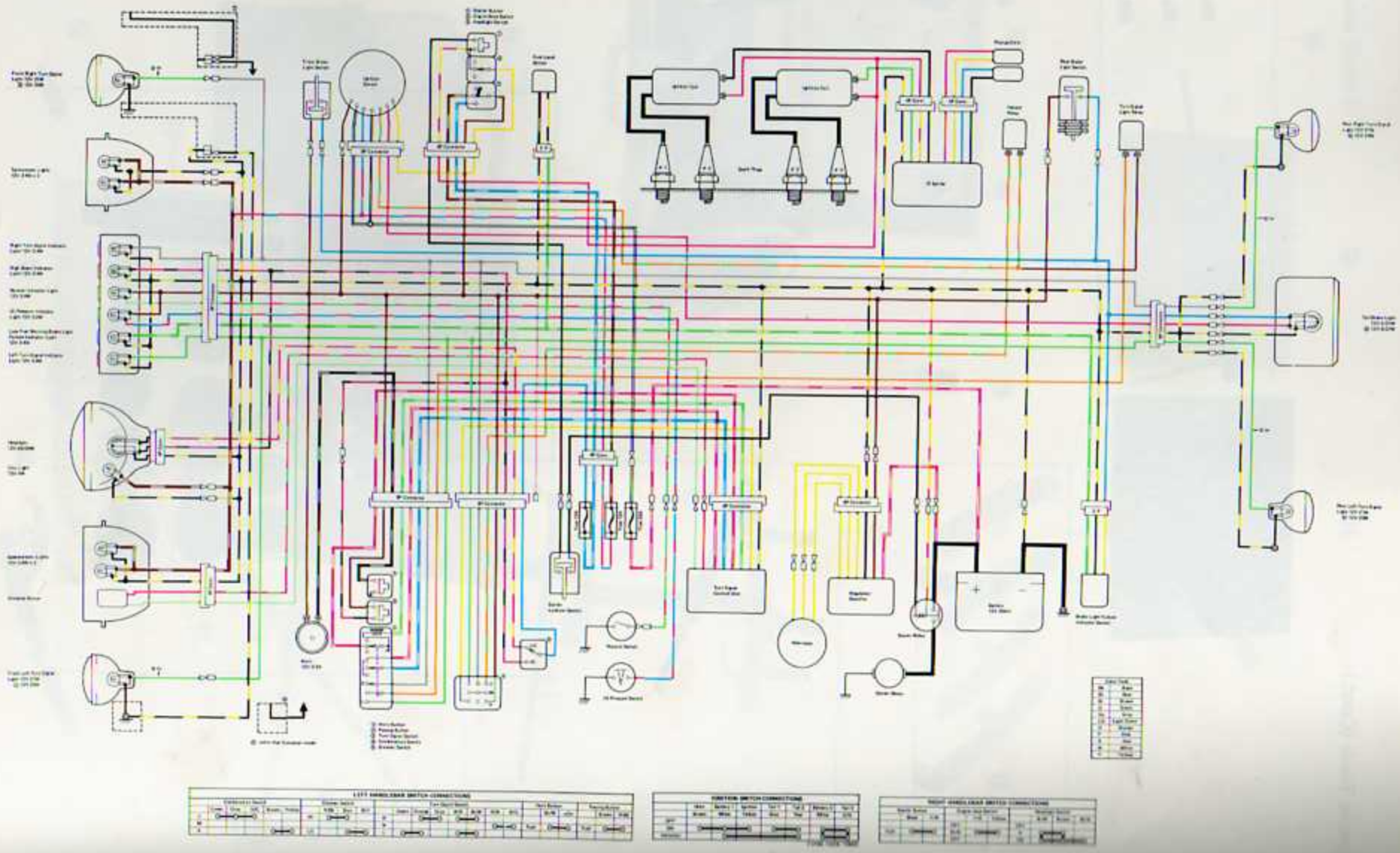
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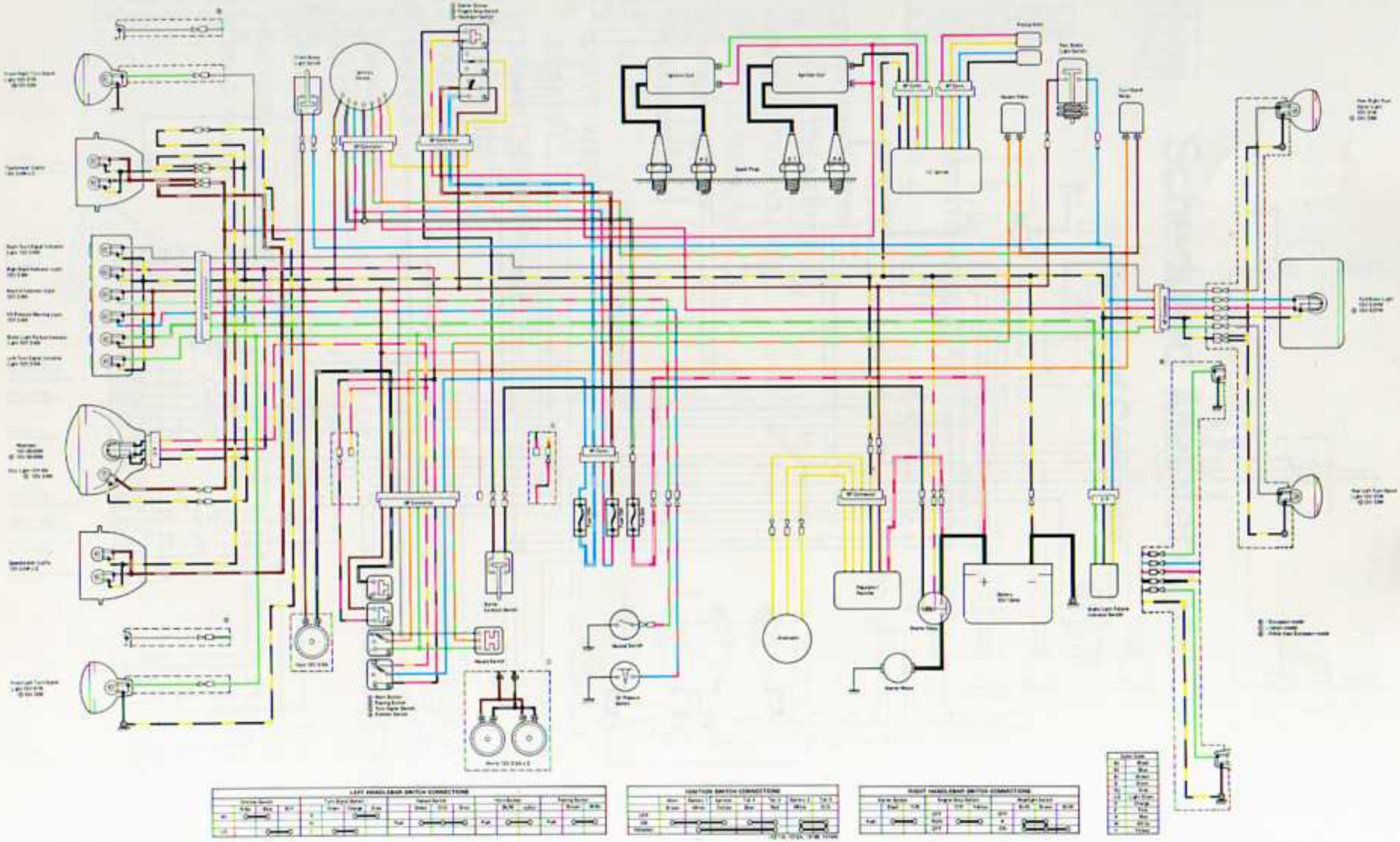
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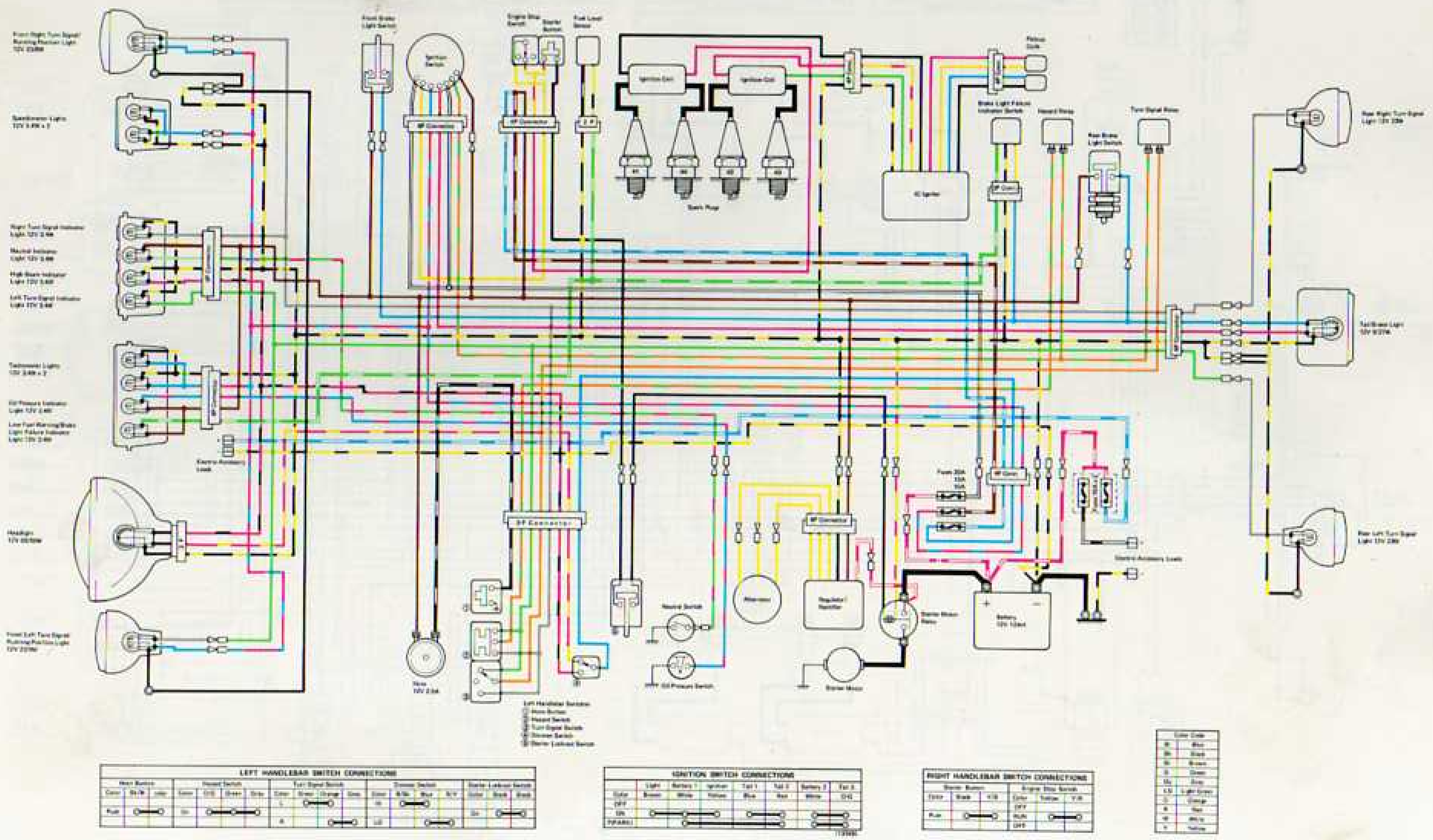
KZ650-D4 Wiring Diagram:



KZ650-F2 Wiring Diagram:



KZ650-H1 Wiring Diagram:



Scheduled Maintenance

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PERIODIC MAINTENANCE CHART

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

OPERATION \ FREQUENCY	Whichever comes first ↓ Every	*ODOMETER READING 800 km	5,000 km	10,000 km	15,000 km	20,000 km	25,000 km	30,000 km	See Page
Battery electrolyte level – check †	month	•	•	•	•	•	•	•	2-14
Brake play – check †		•	•	•	•	•	•	•	2-14
Brake light switch – check †		•	•	•	•	•	•	•	2-19
Brake wear – check †			•	•	•	•	•	•	2-16
Brake fluid level – check †	month	•	•	•	•	•	•	•	2-16
Brale fluid – change	year			•		•		•	2-17
Clutch – adjust		•	•	•	•	•	•	•	2-11
Carburetor operation – check †		•	•	•	•	•	•	•	2-9
Throttle grip – check †		•	•	•	•	•	•	•	2-8
Steering play – check †		•	•	•	•	•	•	•	2-19
Spoke tightness and rim runout – check † (If applicable)		•	•	•	•	•	•	•	2-23
Drive chain wear – check †			•	•	•	•	•	•	2-13
Front fork – clean			•	•	•	•	•	•	2-21
Nuts, bolts, fasteners – check †		•		•		•		•	2-27
Spark plug – clean and gap †		•	•	•	•	•	•	•	2-4
Valve celarance – check †		•	•	•	•	•	•	•	2-5
Air suction valve – check † (If applicable)			•	•	•	•	•	•	2-7
Air cleaner element – clean			•		•		•		2-8
Air cleaner element – replace	5 cleanings			•		•		•	2-8
Fuel system – clean				•		•		•	2-24
Tire tread wear – check †			•	•	•	•	•	•	2-22
Engine oil – change	year	•	•	•	•	•	•	•	2-4
Oil filter – replace		•		•		•		•	2-4
General lubrication – perform			•	•	•	•	•	•	2-25
Front fork oil – change				•		•		•	2-21
Timing advancer – lubricate				•		•		•	2-5
Swing arm – lubricate				•		•		•	2-24

Periodic Maintenance Chart (Cont.):

OPERATION \ FREQUENCY	Whichever comes first ➡ Every ⬇	*ODOMETER READING 800 km	5,000 km	10,000 km	15,000 km	20,000 km	25,000 km	30,000 km	See Page
Wheel bearing – lubricate	2 years					•			2-22
Speedometer gear–lubricate	2 years					•			2-22
Brake camshaft – lubricate (If applicable)	2 years					•			2-18
Steering stem bearing – lubricate	2 years					•			2-20
Master cylinder cup and dust seal – replace	2 years								2-19
Caliper piston seal and dust seal – replace	2 years								2-19
Brake hose – replace	4 years								2-19
Fuel hose – replace	4 years								2-25
Drive chain – lubrciate	Every 300 km								2-14
Drive chain slack – check †	Every 800 km								2-12

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

ENGINE OIL

In order for the engine, transmission, and clutch to function properly, maintain the engine oil at the proper level, and change the oil and oil filter in accordance with the Periodic Maintenance Chart. Not only do dirt and metal particles collect in the oil, but the oil itself loses its lubricative quality if used too long.

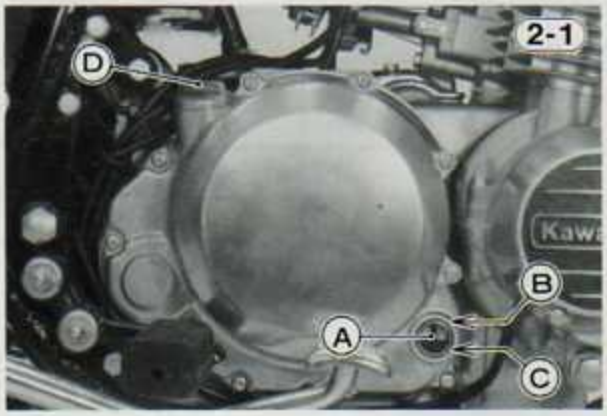
WARNING **Motorcycle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine or transmission seizure, accident, and injury.**

Oil Level Inspection

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

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

- If the motorcycle has just been used, wait several minutes for all the oil to drain down.
- Check the engine oil level through the oil level gauge. With the motorcycle held level, the oil level should come up between the lines next to the gauge.



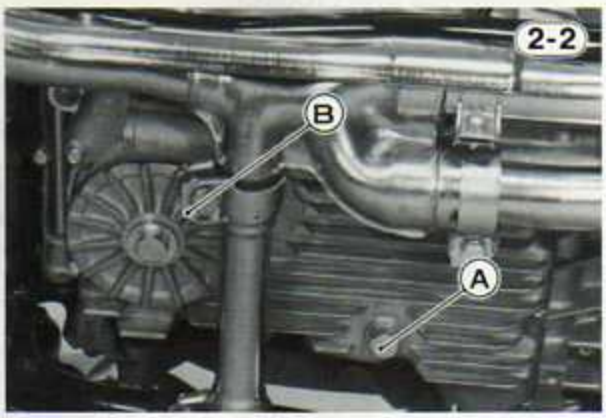
A. Oil Level Gauge **C. Lower Level Line**
B. Upper Level Line **D. Oil Filler Opening**

- ★If the oil level is too high, remove the excess oil, using a syringe or some other suitable device.
- ★If the oil level is too low, add the correct amount of oil through the oil filler opening. Use the same type and make of oil that is already in the engine.

CAUTION **If the engine oil gets extremely low or if the oil pump or oil passages clog up or otherwise do not function properly, the oil pressure warning light will light. If this light stays on when the engine speed is above 1,100 rpm, stop the engine immediately and find the cause.**

Oil and/or Oil Filter Change

- Warm up the engine thoroughly, and then stop the engine.
- Place an oil pan beneath the engine.
- Remove the engine drain plug.



A. Drain Plug **B. Oil Filter**

- With the motorcycle perpendicular to the ground, let the oil completely drain.
- If the oil filter is to be changed, replace the oil filter with a new one.
- After the oil has completely drained out, install the engine drain plug. Proper torque for the drain plug is 3.8 kg-m (27 ft-lbs).

NOTE: 1. Replace the damaged gasket with a new one.

- Fill the engine up to the upper level with a good quality motor oil specified in the table.
- Check the oil level.

Table 2-1 Engine Oil

Grade	Viscosity	Filling Engine Oil Capacity	
SE class	SAE 10W40 10W50 20W40 20W50	When filter is not changed	When filter is changed
		3.0 liters	3.5 liters

SPARK PLUGS

Neglecting the spark plug eventually leads to difficult starting and poor performance. If the spark plug is used for a long period, the electrodes gradually burn away and carbon builds up along the insulator. In accordance with the Periodic Maintenance Chart, the plug should be removed for inspection, cleaning and to reset the gap.

Cleaning and Gapping

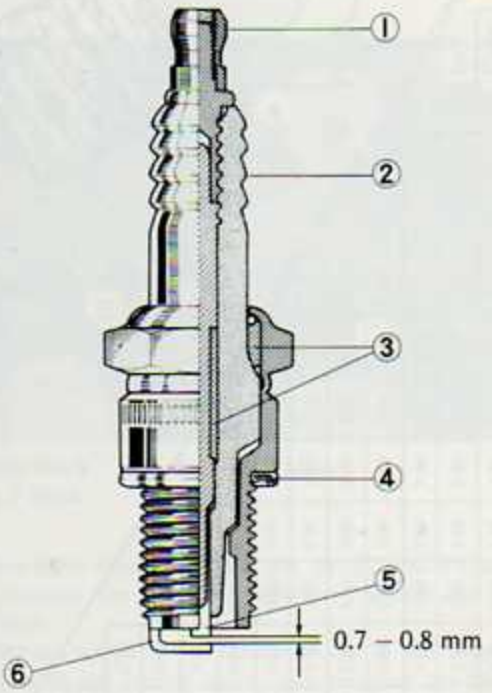
- Remove the spark plugs.
- Clean the spark plug preferably in a sand-blasting device, and then clean off any abrasive particles. The plug may also be cleaned using a high flash-point solvent and a wire brush or other suitable tool.

★If the spark plug electrodes are corroded or damaged, or if the insulator is cracked, replace the plug. Use the standard plug or its equivalent.
•Measure the gap with a wire-type thickness gauge.
★If the gap is incorrect carefully bend the outer electrode, with a suitable tool to obtain the correct gap.
•Tighten the spark plugs in the cylinder head to specified torque.

Table 2-2 Spark Plug

Standard Plug	NGK B7ES ND W22ES-U
Plug Gap	0.7 – 0.8 mm
Tightening Torque	2.8 kg-m (20 ft-lbs)

Spark Plug (2-3)



1. Terminal
2. Insulator
3. Cement
4. Gasket
5. Center Electrode
6. Side Electrode

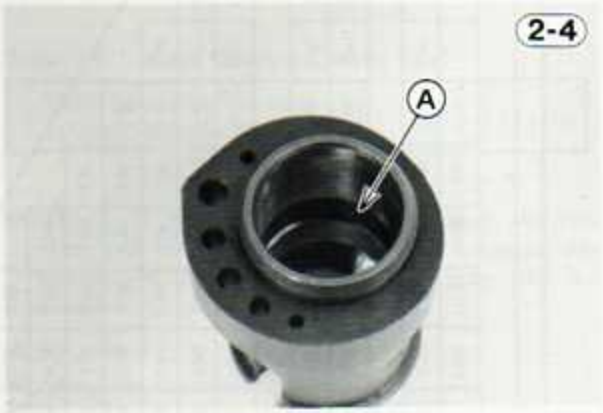
IGNITION SYSTEM

This motorcycle has a transistorized ignition system which has no moving parts in the electrical circuit. Consequently, there are no parts except an automatic timing advancer to require periodic maintenance. In accordance with the Periodic Maintenance Chart, the timing advancer should be lubricated.

Lubrication

•Remove and disassemble the timing advancer.
•Wipe the advancer clean, apply grease to it, and fill the groove in the rotor sleeve with grease.

(2-4)



A. Grease.

•Assemble and install the advancer.

VALVE CLEARANCE

Valve and valve seat wear decreases valve clearance, upsetting valve timing.

CAUTION **If valve clearance is left unadjusted, the wear will eventually cause the valves to remain partly open; which lowers performance, burns the valves and valve seats, and may cause serious engine damage.**

Valve clearance for each valve should be checked and, if incorrect, adjusted in accordance with the Periodic Maintenance Chart.

When carrying out adjustment, be careful to adjust within the specified clearance. Adjusting to a larger value will both disturb valve timing and cause engine noise.

NOTE: 1. Valve clearance must be checked when the engine is cold (room or atmospheric temperature).

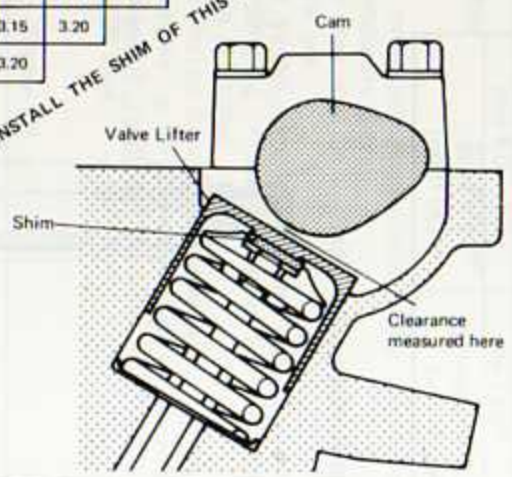
Inspection

•Remove the fuel tank.
•Remove the ignition coils.
•Remove the cylinder head cover (See the Camshaft Removal).
•Check the tightening torque of the camshaft cap bolts [1.2 kg-m (104 in-lbs)].

Table 2-3 Valve Clearance Adjustment Chart

	PRESENT SHIM SIZE																								
PART NUMBER (92025-)	1090	1091	1092	1093	1094	1095	1096	1097	1098	1099	1100	1101	1102	1103	1104	1105	1106	1107	1108	1109	1110	1111	1112	1113	1114
THICKNESS (mm)	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20

VALVE CLEARANCE (mm)	INSTALL THE SHIM OF THIS THICKNESS (mm)																								
0.00 ~ 0.03			2.00	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05
0.04 ~ 0.07		2.00	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10
0.08 ~ 0.18	SPECIFIED CLEARANCE / NO CHANGE REQUIRED																								
0.19 ~ 0.22	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	
0.23 ~ 0.27	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20		
0.28 ~ 0.32	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20			
0.33 ~ 0.37	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20				
0.38 ~ 0.42	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20					
0.43 ~ 0.47	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20						
0.48 ~ 0.52	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20							
0.53 ~ 0.57	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20								
0.58 ~ 0.62	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20									
0.63 ~ 0.67	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20										
0.68 ~ 0.72	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20											
0.73 ~ 0.77	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20												
0.78 ~ 0.82	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20													
0.83 ~ 0.87	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20														
0.88 ~ 0.92	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20															
0.93 ~ 0.97	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20																
0.98 ~ 1.02	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20																	
1.03 ~ 1.07	2.90	2.95	3.00	3.05	3.10	3.15	3.20																		
1.08 ~ 1.12	2.95	3.00	3.05	3.10	3.15	3.20																			
1.13 ~ 1.17	3.00	3.05	3.10	3.15	3.20																				
1.18 ~ 1.22	3.05	3.10	3.15	3.20																					
1.23 ~ 1.27	3.10	3.15	3.20																						
1.28 ~ 1.32	3.15	3.20																							
1.33 ~ 1.38	3.20																								



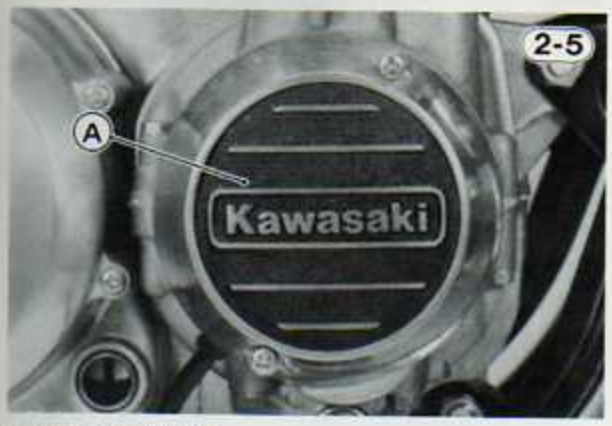
1. Measure the clearance (when cold).
2. Check present shim size.
3. Match clearance in vertical column with present shim size in horizontal column.
4. The shim specified where the lines intersect is the one that will give you the proper clearance.

NOTE: If there is no clearance, select a shim which is several sizes smaller and then measure the clearance.

CAUTION

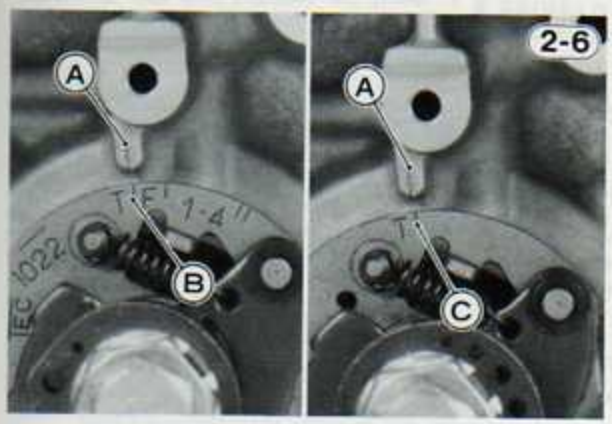
1. **Do not put shim stock under the shim. This may cause the shim to pop out at high rpm causing extensive engine damage.**
2. **Do not grind the shim. This may cause it to fracture, causing extensive engine damage.**
3. **Check the valve clearance with the proper method in the text. Checking the clearance at any other cam position may result in improper valve clearance.**

•Remove the pickup coil cover.



A. Pickup Coil Cover

•Using a 17 mm wrench on the crankshaft, turn the crankshaft so that the 1 · 4 T mark on the timing advancer is aligned with the timing mark.

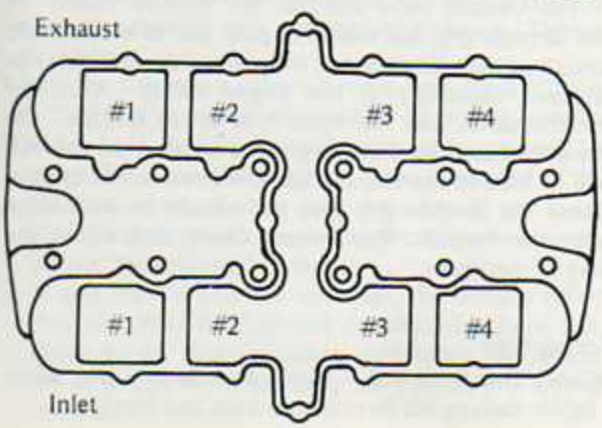


A. Timing Mark
B. 1 · 4 T Mark
C. 2 · 3 T Mark

•For two inlet valves (#1 and #3, or #2 and #4) at a time, measure the clearance between the cam and the valve lifter.

•Turn the crankshaft a half turn until the 2 · 3 T mark is aligned with the timing mark, and measure the clearance of two exhaust valves (#1 and #3, or #2 and #4).

Valve Location (2-7)



•Turning the crankshaft another a half turn and then another a half turn to measure the clearance for the remaining valves.

★If the valve clearance is incorrect, continue the following procedures to replace the present shim with a new shim, which will give the proper clearance.

Table 2-4 Valve Clearance (when cold)

Valve Clearance (for both inlet and exhaust)	0.08 – 0.18 mm

NOTE: 1. If there is no clearance between the valve lifter and cam, select a shim which is several sizes smaller and then remeasure the clearance once it is installed.

Adjustment

•Remove the camshaft.

•Being careful not to damage the valve lifter, pull off the valve lifter with a suitable tool.

•Check the present shim thickness (shim size) which is printed on the shim surface, and referring to the Valve Clearance Adjustment Chart, select a new shim which brings valve clearance within the specified limits. Shims are available in sizes from 2.0 – 3.2 mm, in increments of 0.05 mm.

•Insert the new shim on the valve spring retainer.

CAUTION **1. Do not put shim stock under the shim. This may cause the shim to pop out at high rpm, causing extensive engine damage.**

2. Do not grind the shim. This may cause it to fracture, causing extension engine damage.

NOTE: 1. If the smallest shim does not sufficiently increase clearance, the valve seat is probably worn. In this case, repair the valve seat, and check the valve stem installed height.

•Install the camshaft, remeasure the valve clearance that was adjusted, and readjust if necessary.

AIR SUCTION VALVES

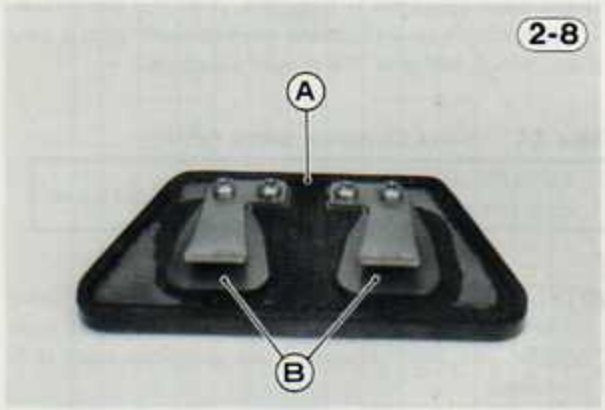
The air suction valve is essentially a check valve which allows fresh air to flow only from the air cleaner into the exhaust port. Any air that has passed the air suction valve is prevented from returning. Inspect the air suction valves in accordance with the Periodic Maintenance Chart.

Inspection

•Remove the air suction valves.

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

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

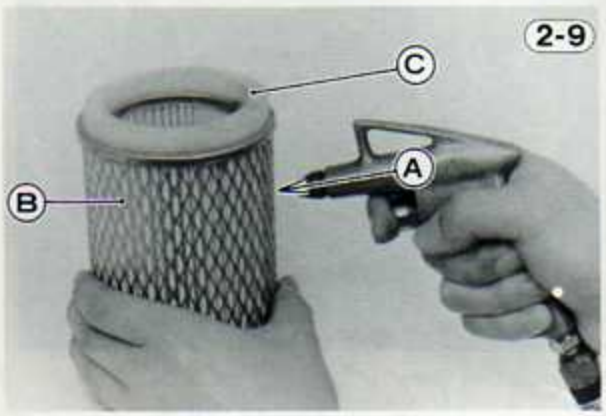


A. Valve Holder **B. Reeds**

●Check the reed contact areas of the valve holder for grooves, scratches, any signs of separation from the holder, or heat damage.
●Check the sealing lip located around the valve holder for the same items.
★If there is any doubt as to the condition of the reed contact areas or the sealing lip, replace the air suction valve as an assembly.
★If any carbon or other foreign particles have accumulated between the reed and the reed contact area, wash the valve assembly clean with a high flash-point solvent.

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

●Clean the element in a bath of a high flash-point solvent, and then dry it from the outside with compressed air.



A. Compressed Air **C. Spongy Gasket**
B. Element

WARNING
1. Clean the element in a well-ventilated area, and take ample care that there are no sparks or flame anywhere near the working area.
2. Because of the danger of highly flammable liquids, do not use gasoline or a low flash-point solvent to clean the element.

CAUTION **Since this is a dry-type element, do not use kerosene or any fluid which would leave the element oily.**

●Install the element.

Replacement

●Replace the air cleaner element with a new one in accordance with the Periodic Maintenance Chart.

AIR CLEANER

A clogged air cleaner restricts the engine's air intake, increasing fuel consumption, reducing engine power, and causing spark plug fouling.

The air cleaner element must be cleaned and replaced in accordance with the Periodic Maintenance Chart. In dusty areas, the element should be cleaned more frequently than the recommended interval. After riding through rain or on muddy roads, the element should be cleaned immediately. The element should be replaced if it is damaged.

Cleaning

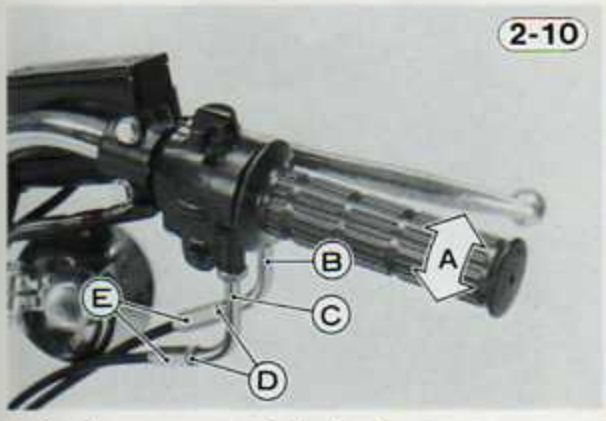
●Remove the air cleaner element.
●Check the filter and sponge gaskets on both sides of the element for damage.
★If the sponge gaskets come loose, stick them back on with an adhesive sealant.
★If the sponge or the filter is damaged, replace the element with a new one.

THROTTLE GRIP

The throttle cable controls the throttle valves. If the throttle grip has excessive play due to either cable stretch or maladjustment, it will cause a delay in throttle response, especially at low engine speed. Also, the throttle valves may not open fully at full throttle. On the other hand, the throttle grip has no play, the throttle will be hard to control, and the idle speed will be erratic. Check the throttle grip play periodically in accordance with the Periodic Maintennace Chart, and adjust the play if necessary.

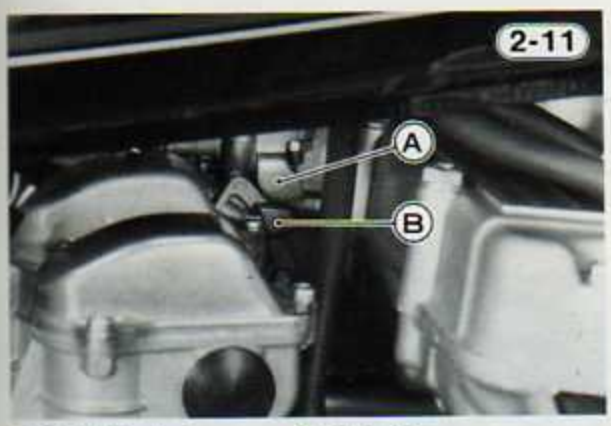
Inspection

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



A. 2 – 3 mm
B. Accelerator Cable
C. Decelerator Cable
D. Locknuts
E. Adjusting Nuts

•Push the throttle grip completely closed. At this time there should be no clearance between the cable bracket and the cable stop.



A. Cable Bracket
B. Cable Stop

★If any one of the above checks shows improper adjustment, adjust the throttle cable as follows:

Adjustment

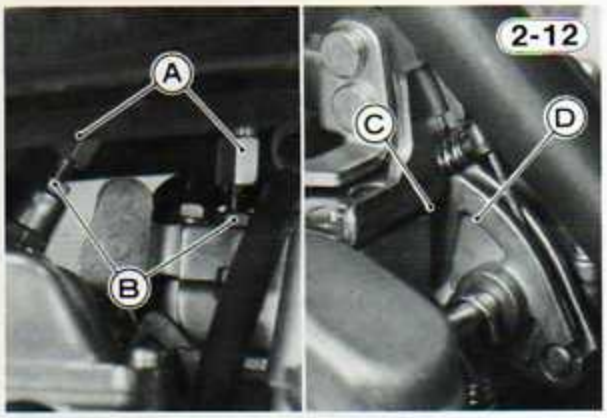
•Loosen the locknuts, and screw both throttle cable adjusting nut in completely at the upper end of the throttle cables so as to give the throttle grip plenty of play.

•Turn out the decelerator cable adjusting nut until there is no clearance between the cable bracket and the stop when the throttle grip is completely closed. Tighten the locknut.

•Turn the accelerator cable adjusting nut until 2 – 3 mm of throttle grip play is obtained. Tighten the locknut.

NOTE: 1. If the throttle cables cannot be adjusted by using the cable adjusting nuts at the upper end of the throttle cables, use the cable adjusters at the lower end of the throttle cables. Do not forget to securely tighten the adjuster locknuts.

2. If grip play is adjusted too large, the throttle valves may not open fully at full throttle. To check this, check to see that the pulley stop screw hits against the stop on the bracket when the throttle grip is fully opened.



A. Cable Adjusters
B. Locknuts
C. Stop Screw
D. Pulley

CARBURETORS

The following procedure covers the carburetor adjustment, which should be performed in accordance with the Periodic Maintenance Chart.

When the idle speed is too low, the engine may stall; when the idle speed is too high, the fuel consumption becomes excessive, and the resulting lack of engine braking may make the motorcycle difficult to control. Poor carburetor synchronization will cause unstable idling, sluggish throttle response, the reduced engine power and performance.

The following procedure consists of two parts: idle speed and synchronization.

Idle Speed:

Inspection

•Thoroughly warm up the engine.

•Check that the idle speed is within the specified range.

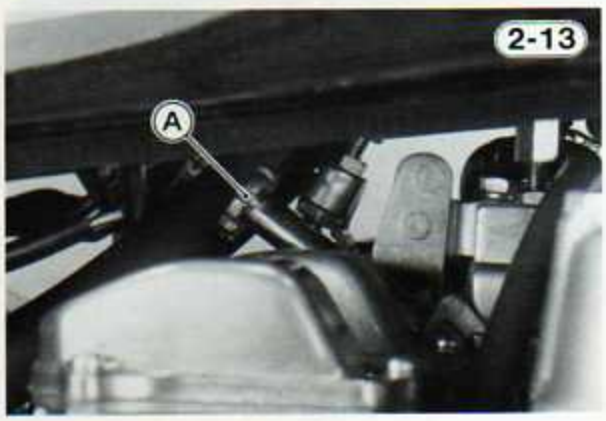
Table 2-5 Idle Speed

1,000 ± 50 rpm

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

Adjustment

•Turn the idle adjusting screw to adjust the idle speed.



A. Idle Adjusting Screw

•Open and close the throttle a few times to make sure that the idle speed is within the specified range. Readjust if necessary.
•With the engine idling, turn the handlebar to both sides.
★If handlebar movement changes the idle speed; the throttle cable may be improperly adjusted or incorrectly routed, or it may be damaged.

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

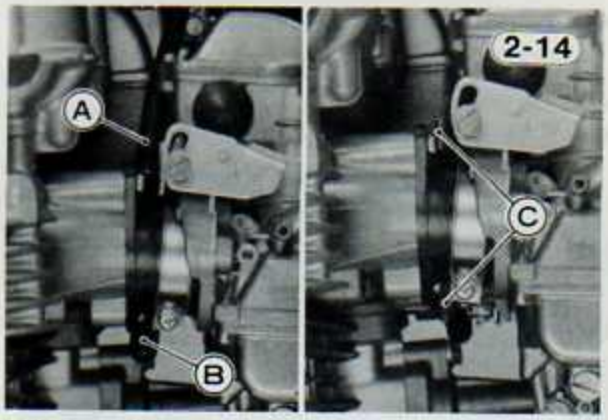
Synchronization:

NOTE: 1. During carburetor synchronization, the fuel tank will be removed. In most cases, it will be necessary to temporarily replace the standard fuel lines with lines long enough to reach the fuel tank while it is located on your workbench.
2. If fuel is supplied to the carburetors from another optional tank, the vacuum hose for the automatic fuel tap will be open and extra air drawn into the carburetor bore through the vacuum hose. This results in improper carburetor synchronization. To prevent this, plug the open end of the vacuum hose during carburetor synchronization so that no extra air can be drawn into the carburetor.

WARNING **Use extreme caution when working with gasoline, open fuel lines, etc. to avoid a fire or explosion.**

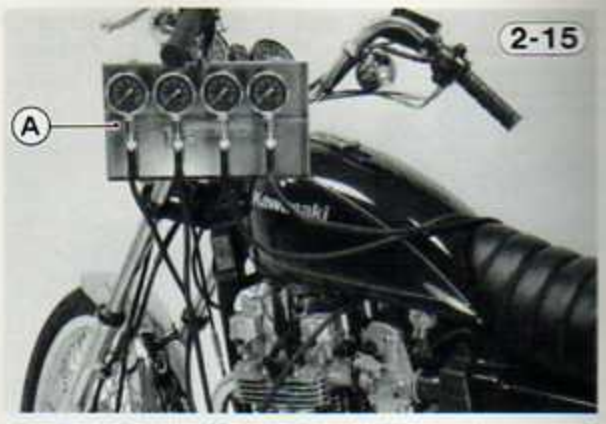
Inspection

•Start the engine, and warm it up thoroughly.
•Perform idling adjustment.
•Stop the engine.
•Remove the rubber caps and rubber hose(s) from the vacuum gauge attachments.



A. Vacuum Hose **C. Vacuum Gauge Attachements**
B. Rubber Cap

•Attach the vacuum gauge set (special tool) fitting the gauge hoses to the vacuum gauge attachments.

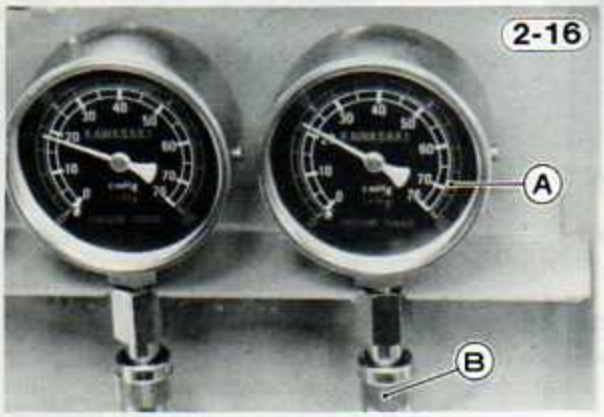


A. Vacuum Gauge Set: 57001-127

•With the engine running at idle speed, close the vacuum gauge damper valves until gauge needle flutter is less than 3 cmHg. Note the gauge reading.

Table 2-6 Engine Vacuum

Difference between any two cylinders	less than 2 cmHg

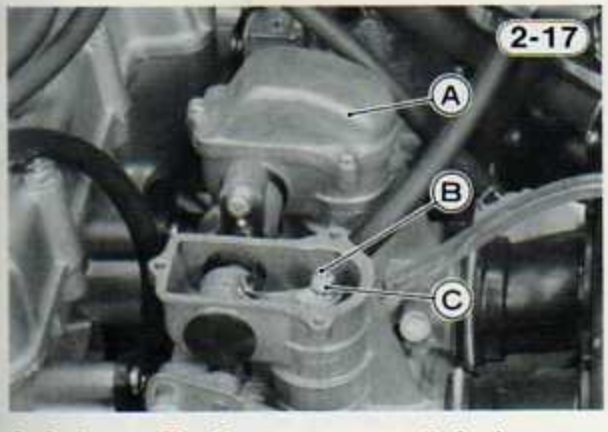


A. Vacuum Gauge **B. Damper Valve**

★If the difference in vacuum readings between any two cylinders is greater than the specified value, synchronize the carburetors according to the following procedure.

Adjustment

•Remove the fuel tank, and supply fuel for carburetors by some means during adjustment.
•Remove the carburetor top covers (4) and loosen the locknuts.



A. Carburetor Top Cover **C. Locknut**
B. Throttle Adjusting Screw

- With the engine running at idle speed, readjust the individual throttle adjusting screws to set all the carburetors to within 2 cmHg of each other. Backing the screw out decreases vacuum and turning it in increases it.
- ★If any gauge reads less than 14 cmHg after synchronizing the carburetors; check the points listed below and check and clean carburetor starter system.

Engine Oil
Spark Plugs
Throttle Grip
Cylinder Compression
Air Cleaner Element
Air Cleaner Duct and Carburetor Holder Leakage
Camshaft Chain
Valve Clearance
Air Suction Valve and Vacuum Switch Valve
Carburetor Function Checks

CAUTION **Take care that no dirt or other foreign matter enters the tops of the carburetors during this operation, or else the throttle valves may stick.**

- Check the idle speed again.
- Open the throttle grip and let it snap shut a few times. Make sure the vacuum readings stay within the specified vacuum reading.
- ★If they do not, repeat the last two steps.
- After the carburetors are properly synchronized, tighten the locknuts without changing the positions of the screws. Install the top covers.
- Detach the vacuum gauge and install the rubber caps on the vacuum gauge attachments.
- Install the fuel tank.

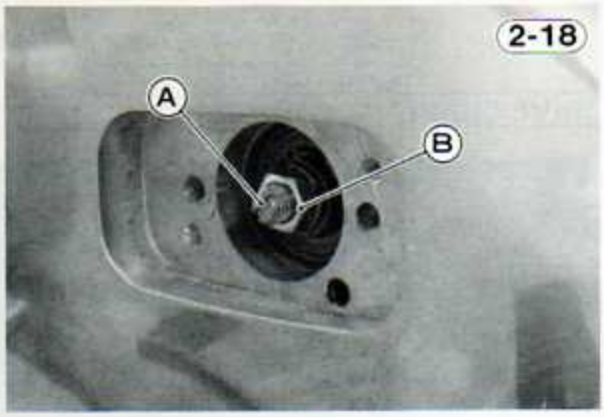
CLUTCH

Due to the friction plate wear and the clutch cable stretch over a long period of use, the clutch must be adjusted in accordance with the Periodic Maintenance Chart.

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

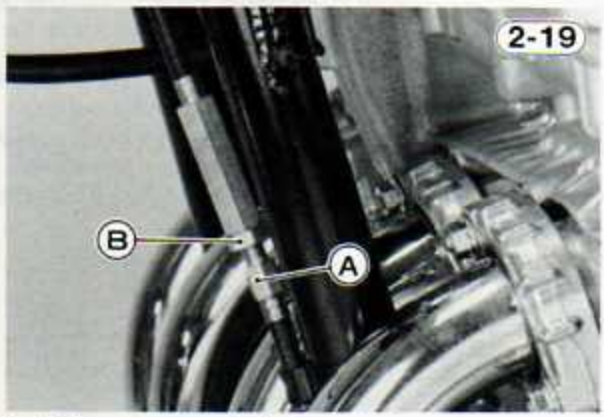
Adjustment

- Remove the clutch release adjusting cover.
- Loosen the locknuts, and turn in fully the clutch cable adjusters to give the cable plenty of play.
- Loosen the locknut, and turn the clutch release adjusting screw counterclockwise until it becomes hard to turn.
- Turn the release adjusting screw clockwise ¼ turn from that point, and tighten the locknut.

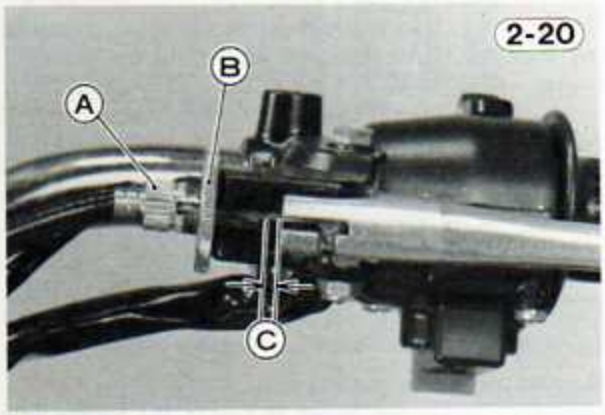


A. Adjusting Screw **B. Locknut**

- Turn the clutch cable adjusters so that the clutch lever will have 2 – 3 mm of play as shown in the figure.



A. Adjuster **B. Locknut**



A. Adjuster **B. Locknut** **C. 2 – 3 mm**

WARNING **Be sure each end of the clutch outer cable is fully seated in its fitting, or it could slip into place later, creating enough cable play to prevent clutch disengagement, resulting in a hazardous riding condition.**

- Tighten the locknuts, and install the removed parts.
- After the adjustment is made, start the engine and check that the clutch does not slip and that it releases properly.

DRIVE CHAIN

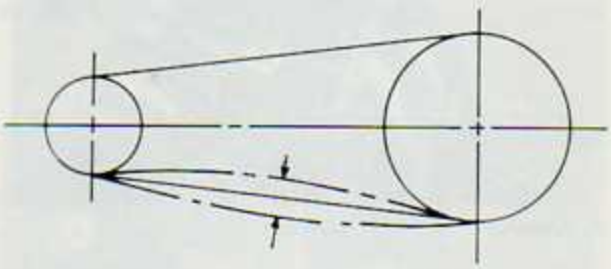
The drive chain must be checked, adjusted, and lubricated in accordance with the Periodic Maintenance Chart for safety and to prevent excessive wear. Lubrication is also necessary after riding through rain or on wet roads, or any time that the chain appears dry. If the chain becomes badly worn or maladjusted – either too loose or too tight – the chain could jump off the sprockets or break.

WARNING **A chain that breaks or jumps off the sprockets could snag on the engine sprocket or lock the rear wheel, severely damaging the motorcycle and causing it to go out of control.**

Slack Inspection

- Set the motorcycle up on its center stand.
- Rotate the rear wheel to find the position where the chain is tightest, and measure the vertical movement midway between the sprockets.

Chain Slack (2-21)



★If the drive chain is too tight or too loose, adjust it so that the chain slack will be within the standard valve.

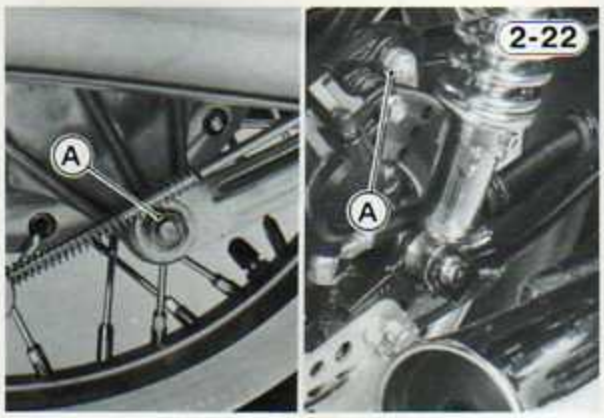
Table 2-7 Drive Chain Slack

Standard	20 – 30 mm
Too tight or too loose	less than 20 mm more than 35 mm

Slack Adjustment

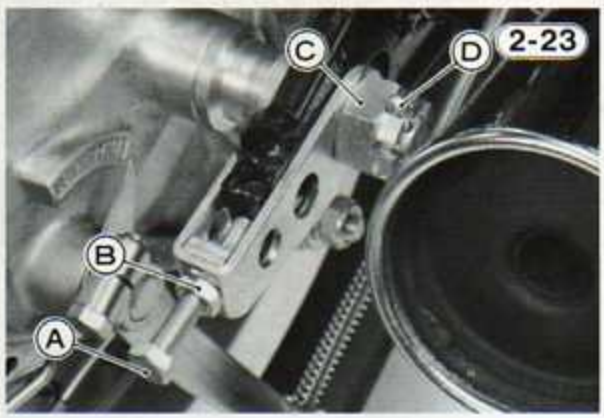
- Loosen the rear torque link nut.

CAUTION **Do not forget to loosen the torque link nut.**



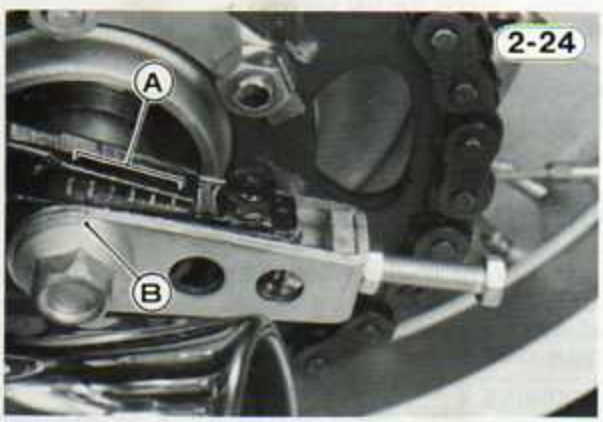
A. Torque Link Nut

- Loosen the left and right chain adjuster locknuts.
- Remove the cotter pin, and loosen the axle nut.



A. Adjusting Bolt **C. Axle Nut**
B. Locknut **D. Cotter Pin**

- If the chain is too tight, back out the left and right chain adjusting bolts evenly, and kick the wheel forward until the chain is too loose.
- Turn both chain adjusting bolts evenly until the drive chain has the correct amount of slack. To keep the chain and wheel properly aligned, the notch on the left chain adjuster should align with the same swing arm mark that the right chain adjuster notch aligns with.



A. Alignment Mark **B. Notch**

NOTE: 1. Wheel alignment can also be checked using the straightedge or string method.

WARNING **Misalignment of the wheel will result in abnormal wear, and may result in an unsafe riding condition.**

- Tighten both chain adjuster locknuts.
- For the drum brake type, center the brake panel assembly in the brake drum. This is done by tightening the axle nut lightly, spinning the wheel, and depress the brake pedal forcefully. The partially tightened axle nut allows the brake panel assembly to center itself within the brake drum.

NOTE: 1. This procedure can prevent a soft, or "spongy feeling" brake.

- Tighten the axle nut to the specified torque.

Table 2-8 Tightening Torque

Axle Nut	12.0 kg-m (87 ft-lbs)
Torque Link Nut	3.0 kg-m (22 ft-lbs)

- Rotate the wheel, measure the chain slack again at the tightest position, and readjust if necessary.
- Insert a new cotter pin through the axle nut and axle, and spread its ends.
- Tighten the rear torque link nut to the specified torque.

WARNING **If the axle and torque link nuts are not securely tightened and the cotter pin and safety clip are not installed, an unsafe riding condition may result.**

- Check the rear brake. (See the Brakes section.)

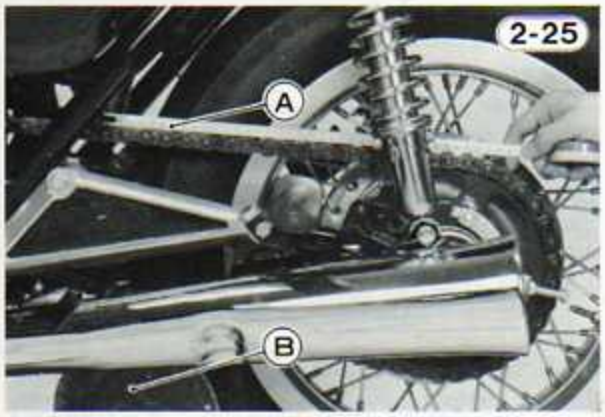
Wear Inspection

- Stretch the chain taut either by using the chain adjusters, or by hanging a 10 kg weight on the chain.
- Measure the length of 20 links on a straight part of the chain from pin center of the 1st pin to pin center of the 21st pin. Since the drive chain may wear unevenly, take measurements at several places.
- ★If any measurement exceeds the service limit, replace the chain. Also, replace the engine and rear sprockets when the drive chain is replaced.

WARNING **For safety, use only the standard chain. It is an endless type and should not be cut for installation.**

Table 2-9 Drive Chain 20-link Length

Service Limit	389 mm

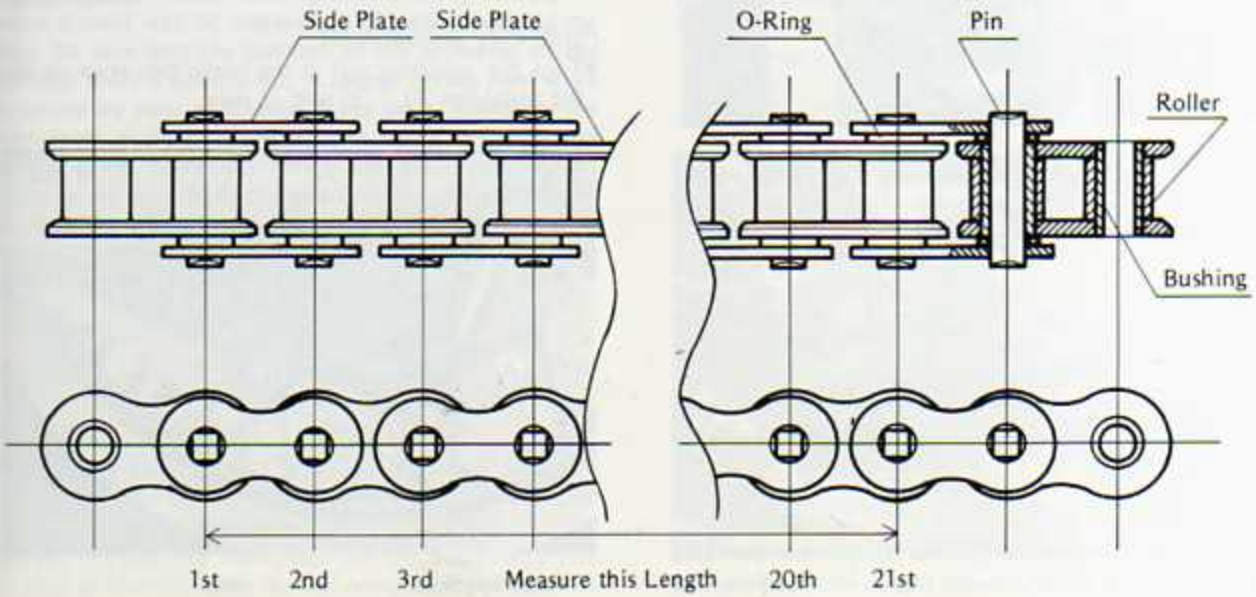


A. Measure **B. Weight**

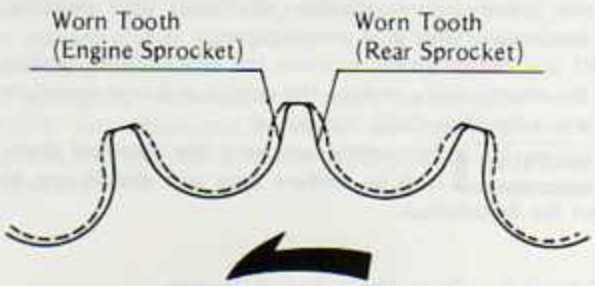
- Rotate the rear wheel to inspect the drive chain for damaged rollers, and loosen pins and links.
- Also, inspect the sprockets for unevenly or excessively worn teeth, and damaged teeth.

NOTE: 1. Sprocket wear is exaggerated for installation.

Drive Chain 2-26



Sprocket Teeth (2-27)

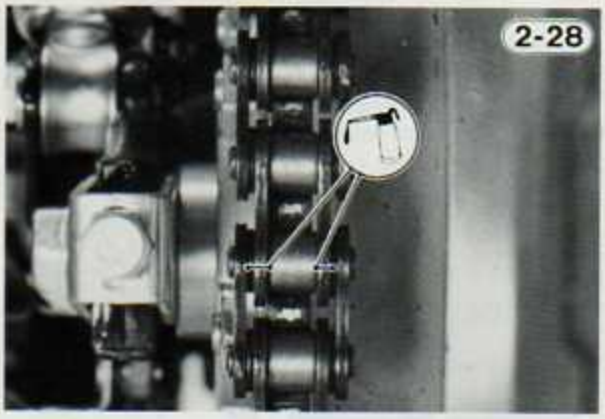


★If there is any irregularity, replace the drive chain and both sprockets.

Lubrication

The chain should be lubricated with a lubricant which will both prevent the exterior from rusting and also absorb shock and reduce friction in the interior of the chain. An effective, good quality lubricant specially formulated for chains is best for regular chain lubrication. If a special lubricant is not available, a heavy oil such as SAE 90 is preferred to a lighter oil because it will stay on the chain longer and provide better lubrication.

- Apply the oil to the sides of the rollers and between the side plates of the links so that oil will penetrate to the rollers and bushings where most wear takes place. Wipe off any excess oil.



NOTE: 1. If the chain is especially dirty, it should be cleaned (Pg. 4-7).

BRAKES

Brake Play:

Front Brake:

Disc and disc pad wear is automatically compensated for and has no effect on the brake lever action. So there are no parts that require periodic adjustment on the front brake.

WARNING **If the brake lever 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 motorcycle under such conditions, bleed the air from the brake line immediately.**

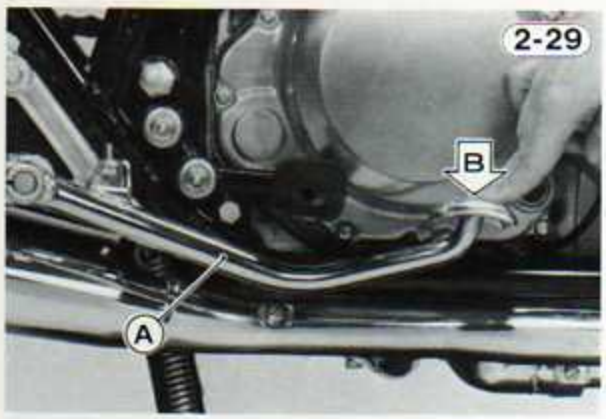
Rear Brake:

In accordance with the Periodic Maintenance Chart, inspect the brake pedal play.

– For Drum Brake –

Pedal Play Inspection

- The brake pedal should have 20 – 30 mm of play when the pedal is pushed down lightly by hand.

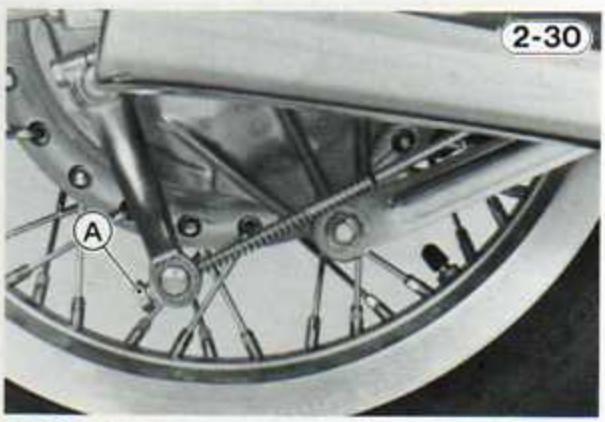


A. Rear Brake Pedal **B. 20 – 30 mm**

- Rotate the wheel to check for brake drag.
- Check the brake cam lever angle.
- Operate the pedal a few times to see that it returns to its rest position immediately upon release.
- Check braking effectiveness.
- If the pedal has improper play, adjust it.

Pedal Play Adjustment

- Turn the adjusting nut at the brake cam lever so that the pedal has 20 – 30 mm of play.

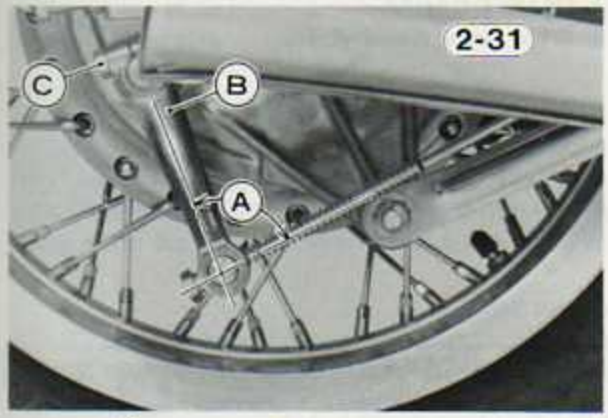


A. Adjusting Nut

WARNING **If brake drag is detected during brake adjustment, disassemble the brake, and inspect for wear or damage. Also, if the brake pedal does not return to its rest position quickly upon release, inspect the brake for wear or damage. If the brake has a soft, or "spongy feeling", make sure the brake panel is properly centered (See the Drive Chain Adjustment section).**

Cam Lever Angle Inspection

•The brake cam lever should come to an 80 – 90° angle with the brake rod when the brake is fully applied.



A. 80 – 90° **C. Bolt**
B. Cam Lever

★If it does not, adjust the brake cam lever angle.

Cam Lever Angle Adjustment

•Remove the bolt and take off the cam lever.
•Mount the cam lever at a new position, so that the cam lever comes to an 80 – 90° angle with the brake rod when the brake is fully applied.

WARNING **Since a cam lever angle greater than 90° reduces braking effectiveness, this adjustment should not be neglected. When remounting the cam, be sure that the position of the indicator on the serrated shaft is not altered. A change in cam lever angle is caused by wear of internal brake parts. Whenever the cam lever angle is adjusted, also check for drag and proper pedal operation, taking particular note of the brake lining wear indicator position. In case of doubt as to braking effectiveness, disassemble and inspect all internal brake parts. Worn parts could cause the brake to lock or fail.**

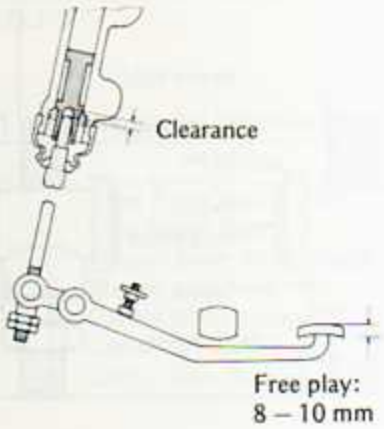
– For Disc Brake –

Pedal Play Inspection

•The brake pedal should have 8 – 10 mm of free play from the rest position before the push rod contacts the master cylinder piston.

NOTE: 1. Feel for restriction of the push rod's side play to identify when the rod contacts the piston.

Brake Pedal Free Play **2-32**



WARNING **Lack of free play may cause the brake pads to drag on the disc causing heat build-up, possible brake lock-up and loss of control.**

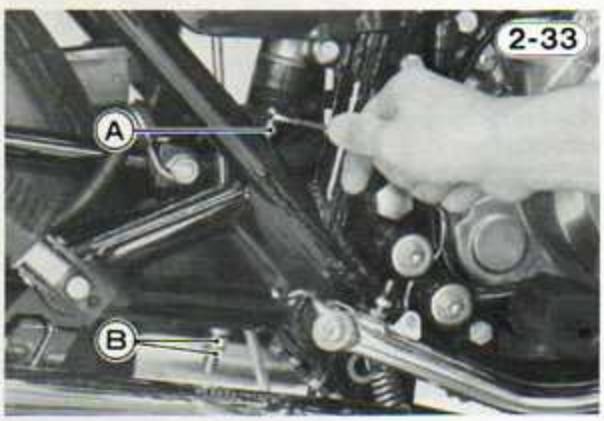
•Rotate the wheel to check for brake drag.
•Operate the pedal a few times to see that it returns to its rest position immediately upon release.
•Check braking effectiveness.
★If the pedal has improper play, adjust it.

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 motorcycle under such conditions, bleed the air from the brake line immediately.**

Pedal Play Adjustment

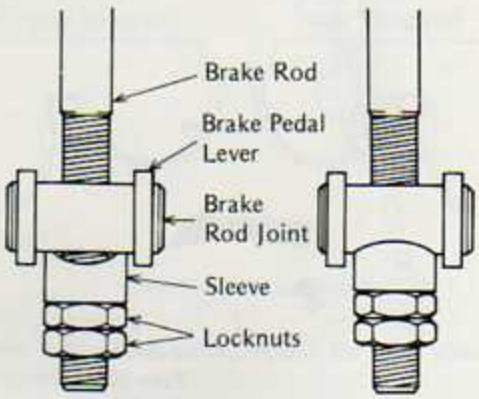
•Loosen the locknuts, and turn the push rod so that the pedal has 8 – 10 mm of free play.
•Tighten the locknuts.
•Check for brake drag, and check braking effectiveness.

NOTE: 1. When tightening the locknuts, make certain the sleeve is properly fitted on the joint.



A. Push Rod **B. Locknuts**

Locknut Tightening (2-34)



Brake Wear:

In accordance with the Periodic Maintenance Chart, inspect the brakes for wear.

Disc Brake:

Inspection

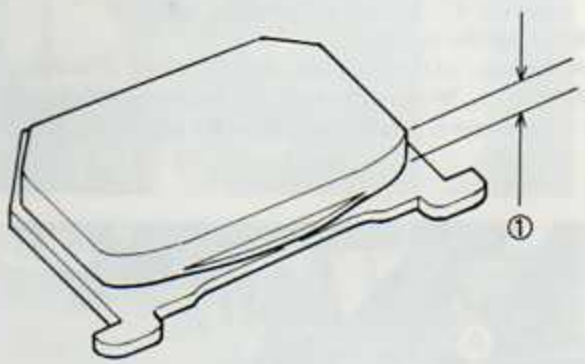
•Check the lining thickness of the pads in each caliper.

★If the lining thickness of either pads is less than the service limit, replace both pads in the caliper as a set.

Table 2-10 Pad Lining Thickness

Service Limit	1 mm

Brake Pad (2-35)



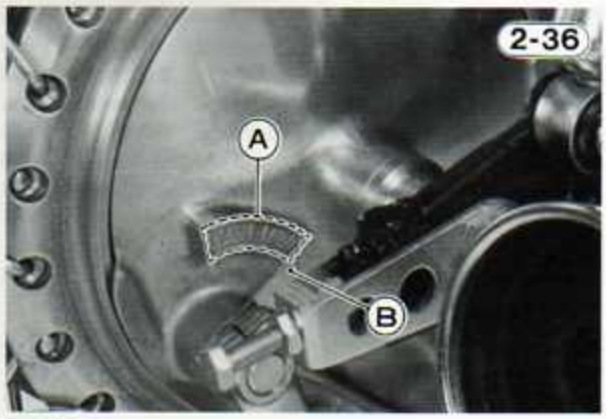
1. Lining Thickness

Drum Brake:

Inspection

•Check the brake lining wear indicator points within the USABLE RANGE when the brake is fully applied.

★If does not, the brake shoes must be immediately replaced and the other brake parts examined.



A. USABLE RANGE
B. Brake Lining Wear Indicator

Brake fluid:

Brake Fluid Level:

In accordance with the Periodic Maintenance Chart, inspect the brake fluid level in the brake fluid reservoir(s).

Inspection

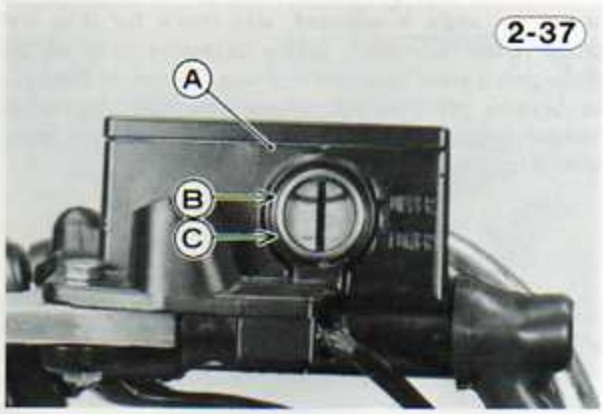
•Check the brake fluid level in the reservoir.

NOTE: 1. Hold the reservoir horizontal when checking brake fluid level.

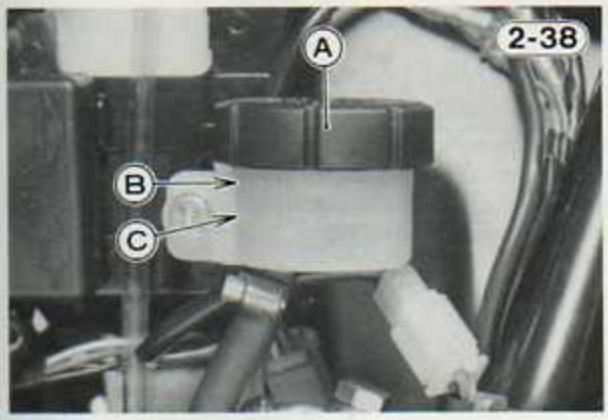
★The fluid level should be between the upper and lower level lines. If the fluid level is lower than the lower level line, fill the reservoir to the upper level line with the same type and brand of fluid that already is in the reservoir.

NOTE: 1. See the next paragraph for brake fluid requirement.

WARNING **Change the brake fluid in the brake line completely if the brake fluid must be refilled but the type and brand of the brake fluid that already is in the reservoir are unidentified. After changing the fluid, use only the same type and brand of fluid thereafter. Mixing different types and brands of brake fluid lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause the rubber brake parts to deteriorate.**



A. Front Brake Fluid Reservoir
B. Upper Level Line
C. Lower Level Line



A. Rear Brake Fluid Reservoir
B. Upper Level Line
C. Lower Level Line

Brake Fluid Change:

In accordance with the Periodic Maintenance Chart, change the brake fluid. The brake fluid should also be changed if it becomes contaminated with dirt or water.

WARNING **When working with the disc brake, observe the precautions listed below.**

1. Never reuse old brake fluid.
2. Do not use fluid from a container that has been left unsealed or that has been open for a long time.
3. Do not mix two types and brands of fluid for use in the brake. This lowers the brake fluid boiling point and could cause the brake to be ineffective. It may also cause the rubber brake parts to deteriorate.
4. Don't leave the reservoir cap off for any length of time to avoid moisture contamination of the fluid.
5. Don't change the fluid in the rain or when a strong wind is blowing.
6. Except for the disc pads and discs, use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning brake parts. Do not use any other fluid for cleaning these parts. Gasoline, motor oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely and will eventually reach and break down the rubber used in the disc brake.
7. When handling the disc pads or disc, be careful that no disc brake fluid or any oil gets on them. Clean off any fluid or oil that inadvertently gets on the pads or disc with a high flash-point solvent. Do not use one which will leave an oily residue. Replace the pads with new ones if they cannot be cleaned satisfactorily.
8. Brake fluid quickly ruins painted surfaces; any spilled fluid should be completely wiped up immediately.
9. If any of the brake line fittings or the bleed valve is opened at any time, the **AIR MUST BE BLED FROM THE BRAKE.**

Recommended fluids are given in the table below. If none of the recommended brake fluids are available, use extra heavy-duty brake fluid only from a container marked D.O.T.3.

Table 2-11 Recommended Disc 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-Green Castrol GT (LMA) Castrol Disc Brake Fluid

Changing Brake Fluid

- Remove the reservoir cap, and remove the rubber cap on the bleed valve.
- Attach a clear plastic hose to the bleed valve on the caliper, and run the other end of the hose into a container.
- Open the bleed valve (counterclockwise to open), and pump the brake lever or pedal until all the fluid is drained from the line.
- Close the bleed valve.
- If a dual disc brake is used, repeat the above 4 steps one more time for the other side.
- Fill the reservoir with fresh brake fluid.
- Open the bleed valve, apply the brake by the brake lever or pedal, close the valve with the brake held applied, and then quickly release the lever or pedal. Repeat this operation until the brake line is filled and fluid starts coming out of the plastic hose.

NOTE: 1. Replenish the fluid in the reservoir as often as necessary to keep it from running completely out.

- Bleed the air from the lines.

Air Bleeding:

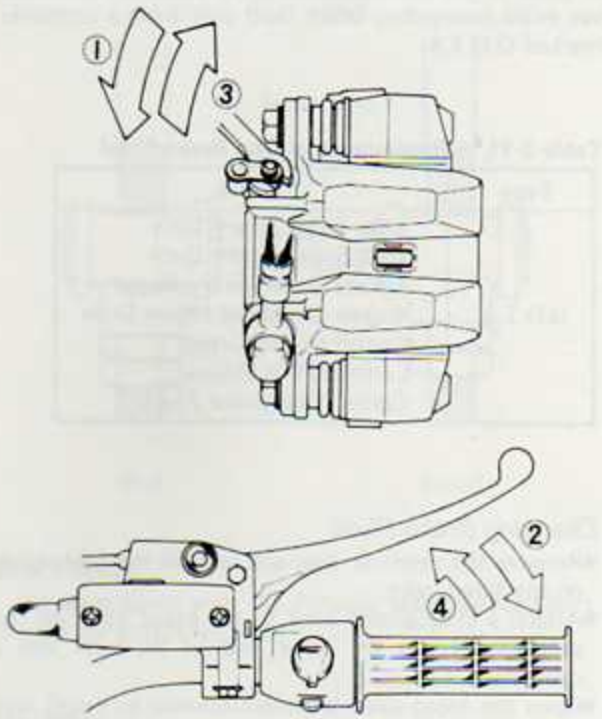
The brake fluid has a very low compression coefficient so that almost all the movement of the brake lever or pedal is transmitted directly to the caliper for braking action. Air, however, is easily compressed. When air enters the brake lines, brake lever or pedal movement will be partially used in compressing the air. This will make the lever or pedal feel spongy, and there will be a loss in braking power.

Bleed the air from the brake whenever brake lever or pedal action feels soft or spongy, after the brake fluid is changed, or whenever a brake line fitting has been loosened for any reason.

Bleeding Brake Line

- Remove the reservoir cap, and check that there is plenty of fluid in the reservoir.
- With the reservoir cap off, slowly pump the brake lever or pedal several times until no air bubbles can be seen rising up through the fluid from the holes at the bottom of the reservoir. This bleeds the air from the master cylinder end of the line.

Filling up the Brake Line (2-39)



1. Open the bleed valve.
2. Apply the brake, keeping the brake applied.
3. Close the bleed valve.
4. Then quickly release the brake.

- Install the reservoir cap, and connect a clear plastic hose to the bleed valve at the caliper, running the other end of the hose into a container. Pump the brake lever or pedal a few times until it becomes hard and then, holding the lever squeezed or the pedal pushed down, quickly open (turn counterclockwise) and close the bleed valve. Then release the lever or pedal. Repeat this operation until no more air can be seen coming out into the plastic hose.

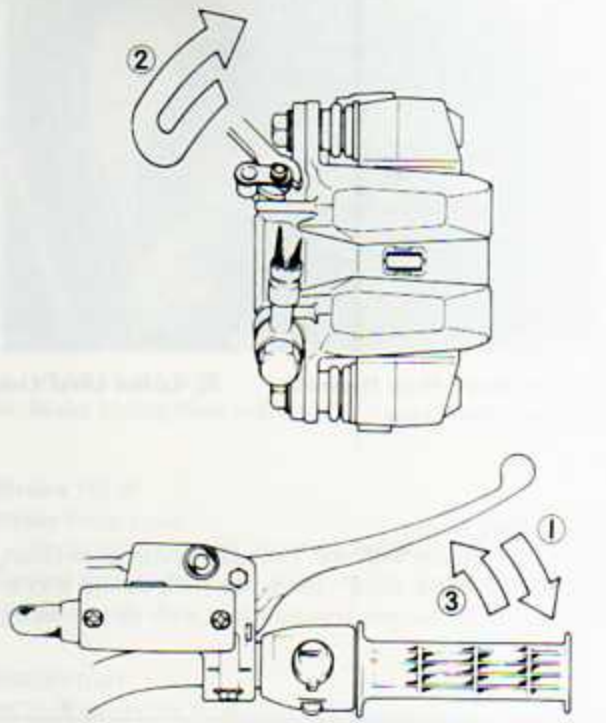
NOTE: 1. The fluid level must be checked several times during the bleeding operation and replenished as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.

- If a dual disc brake is used, repeat the previous step one more time for the other side.
- When air bleeding is finished, install the rubber cap(s) on the bleed valve, and check that the brake fluid is filled to the upper level line marked in the reservoir (handlebar turned so that the reservoir is level).
- Tighten the bleed valve to 0.80 kg-m (69 in-lbs) of torque.
- Apply the brake forcefully for a few seconds, and check for fluid leakage around the fittings.

Brake Camshaft:

In accordance with the Periodic Maintenance Chart, the brake camshaft should be lubricated.

Bleeding the Brake Line (2-40)

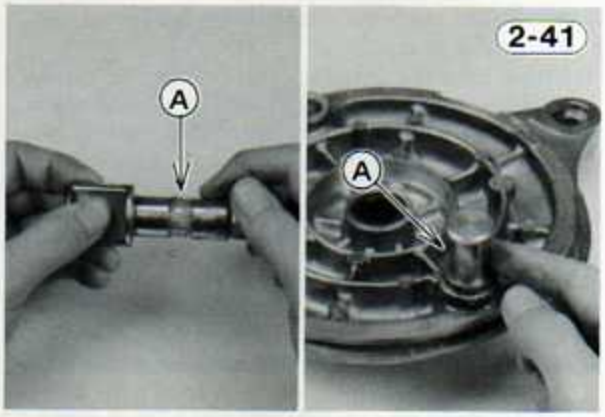


1. Hold the brake applied.
2. Quickly open and close the valve.
3. Release the brake.

Lubrication

- Disassemble the drum brake.
- Using a high flash-point solvent, clean the old grease off the brake camshaft and other pivot points.
- ★Replace the drum brake parts if they show wear or damage.
- Apply grease to the brake pivot points (brake shoe anchor pin, spring ends, and cam surface of the camshaft) and fill the camshaft groove with grease. Do not get any grease on the brake shoe linings, and wipe off any excess grease so that it will not get on the linings or drum after brake assembly.

(2-41)



A. Grease.

•Assemble the drum brake.

Rubber Disc Brake Parts:

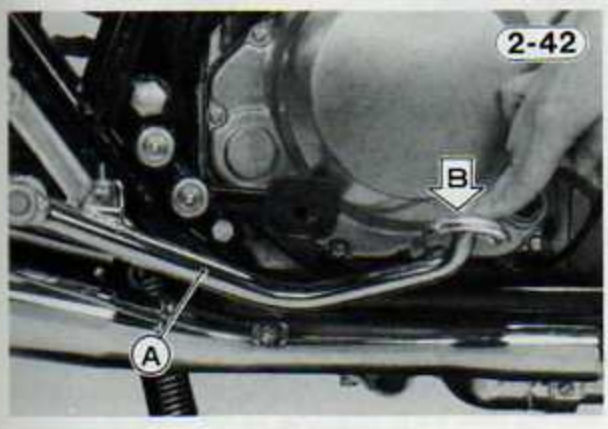
In accordance with the Periodic Maintenance Chart, replace the brake hoses, caliper and master cylinder rubber parts. The removal and installation, disassembly and assembly sequences which need a special care is explained in the "Disassembly" chapter.

BRAKE LIGHT SWITCHES

When either the front or rear brake is applied, the brake light goes on. The front brake light switch requires no adjustment, but the rear brake light switch should be adjusted in accordance with the Periodic Maintenance Chart.

Inspection

•Turn on the ignition switch.
•The brake light should go on when the front brake is applied.
★If it does not, inspect the front brake light circuit.
•Check the operation of the rear brake light switch by depressing the brake pedal. The brake light should go on after about 15 mm of pedal travel.



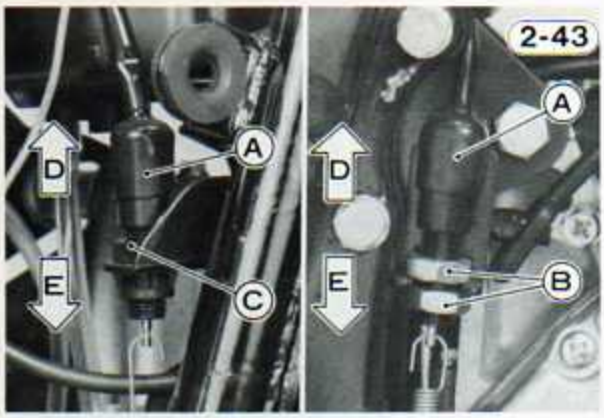
A. Rear Brake Pedal **B. 15 mm**

★If it does not, adjust the rear brake light switch.

Adjustment

•Adjust the rear brake light switch by moving the switch up or down. To change the switch position, alter the position of the adjusting nut or mounting nuts. Tighten the mounting nuts when the switch is properly positioned.

CAUTION **To avoid damaging the electrical connections inside the switch, be sure that the switch body does not turn during adjustment.**



A. Rear Brake Light Switch
B. Mounting Nuts
C. Adjusting Nut
D. Light sooner
E. Light later

STEERING

For safety, the steering should always be kept adjusted so that the handlebar will turn freely but have no play.

If the steering is too tight, it will be difficult to turn the handlebar quickly, the motorcycle may pull to one side, and the steering stem bearings may become damaged. If the steering is too loose, the handlebar will vibrate and the motorcycle will be unstable and difficult to steer in a straight line.

Inspection

The steering should be checked in accordance with the Periodic Maintenance Chart.

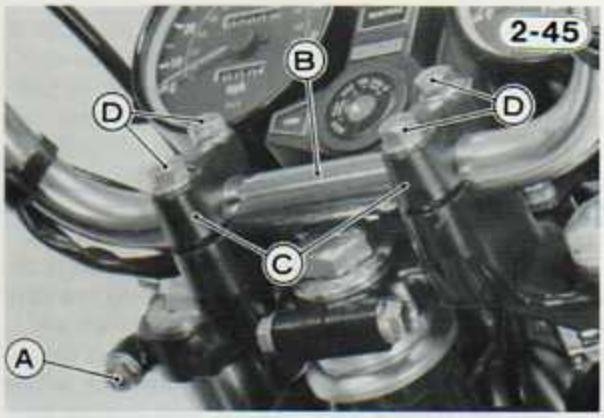
•Put the motorcycle up on its center stand, and jack or prop up the engine so that the front wheel will be off the ground.
•Push the handlebar lightly to either side.
★If it continues moving under its own momentum, the steering is not too tight.
★If the handlebar jerks or catches when turned, the steering is too tight, necessitating adjustment.

•Squatting in front of the motorcycle, grasp the lower ends of the front fork at the axle, and push and pull the front fork end back and forth.
★If play is felt, the steering is too loose, necessitating adjustment.



Adjustment

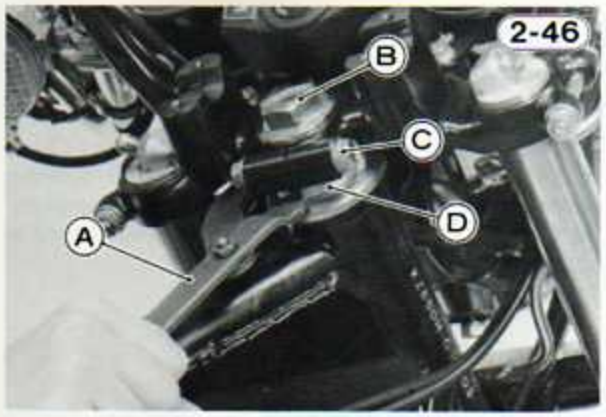
•Put the motorcycle up on its center stand, and jack or prop up the engine so that the front wheel will be off the ground.
•Remove the fuel tank.
•Loosen the front fork upper clamp bolts (2) to free the fork tubes from the steering stem during adjustment.



A. Upper Clamp Bolt **C. Clamps**
B. Handlebar **D. Clamp Bolts**

•Remove the handlebar clamp bolts and lockwashers (4 ea), and take off the clamps.
•Loosen the steering stem head bolt and head clamp bolt, and back out the steering stem locknut using the stem nut wrench (special tool) 1 or 2 turns until it turns without drag.

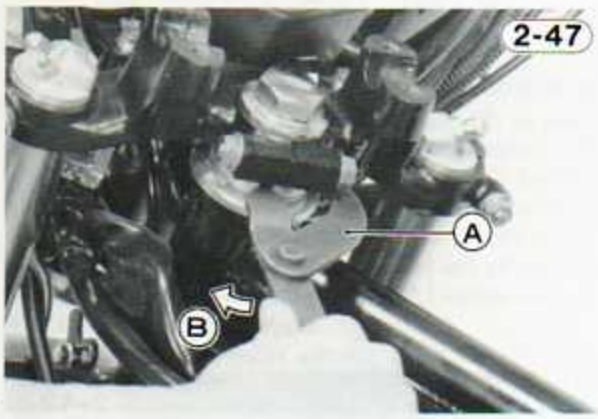
NOTE: 1. Do not back out the steering stem locknut more than a couple of turns. If the locknut is backed off too far, the bearing balls in the steering stem may fall out of place. This will necessitate steering stem removal and installation.



A. Stem Nut Wrench: 57001-1100 **C. Head Clamp Bolt**
B. Stem Head Bolt **D. Steam Locknut**

•Tighten the stem locknut to 3.0 kg-m (22 ft-lbs) of torque.

NOTE: 1. If a suitable torque wrench is not available, tighten the steering stem locknut lightly (unit it just becomes hard to turn), and then cotinue for another 1/16 turn (about 20° travel) from that point.



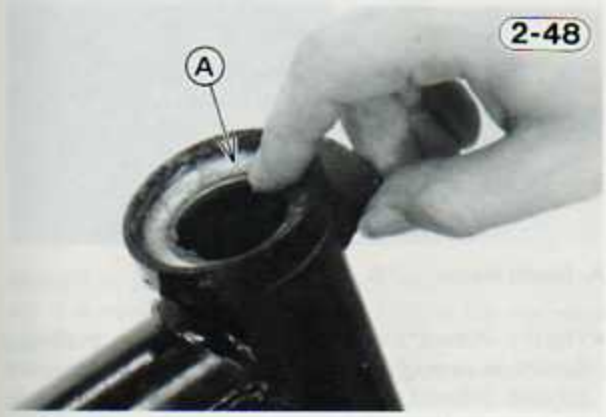
A. Stem Nut Wrench: 57001-1100
B. Another 1/16 Turn

•Tighten the steering stem head bolt to 4.5 kg-m (33 ft-lbs) of torque.
•Tighten the steering stem head clamp bolt nut to 1.8 kg-m (13.0 ft-lbs) of torque.
•Tighten the front fork upper clamp bolts (2) to 2.0 kg-m (14.5 ft-lbs) of torque.
•Check the steering again. If the steering is too tight or too loose in spite of correct adjustment, inspect the steering stem parts according to the maintenance section.
•Install the handlebar referring to the handlebar installation.
•Remount the fuel tank.

Lubrication

In accordance with the Periodic Maintenance Chart, the steering stem bearing should be lubricated.
•Disassemble the steering stem.
•Wipe the old grease off the races and balls, washing them in a high flash-point solvent if necessary.

★Replace the bearing parts if they show wear or damage.
•Apply grease liberally to the upper and lower races, and stick the bearing balls in place with grease.
•Assemble the steering stem.



A. Grease.

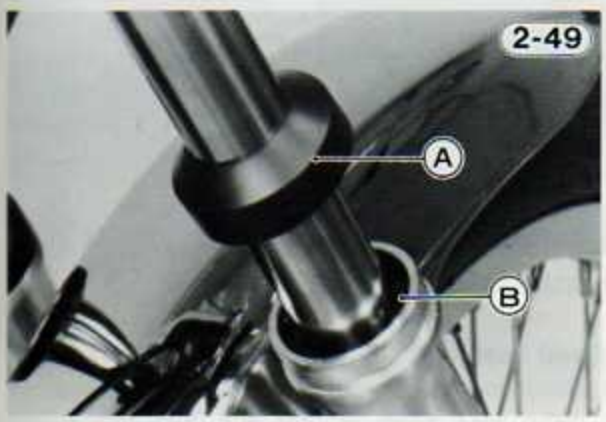
FRONT FORK

Cleaning

Dirt or sand that has worked its way past a dust seal will eventually damage the oil seal, causing oil leakage. In accordance with the Periodic Maintenance Chart.

Clean out the dirt or sand that has accumulated in the dust seals.

•Slide up the dust seals and clean out any dirt or sand. Be careful not to damage either the oil seal or the inner tube surface.



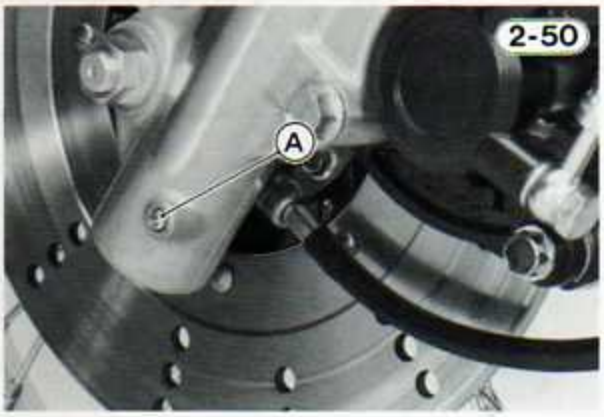
A. Dust Seal B. Oil Seal

Oil Change

Either too much or too little oil in the fork legs will adversely affect shock damping. Too much oil or too heavy an oil makes the action too stiff; too little oil or too light an oil makes the action soft, decreases damping potential, and may cause noise during fork movement.

Contaminated or deteriorated oil will also affect shock damping and, in addition, will accelerate internal wear. The fork oil should be changed periodically or sooner if the oil appears dirty.

•Put a motorcycle up on its center stand.
•Release air through the air valve at the top end of the front fork.
•Remove the handlebar off the stem head.
•Remove the drain screw from the lower end of the outer tube.



A. Drain Screw

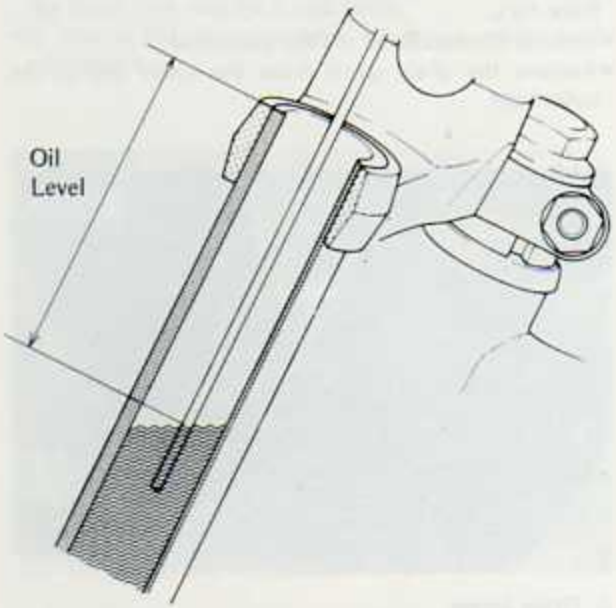
•Pump out the oil by repeatedly compressing and extending the front fork.
•Wash the drain screw threads clean of oil, and blow them dry.
•Apply a liquid gasket to the thread of drain screw, and tighten the screw with its gasket.
•Remove the top plug, and remove the spring from the inner tube, and pour in the type and amount of oil specified in the table.

Table 2-12 Fork Oil (each fork leg)

Type		Filling fork oil capacity		Oil level (without spring)
		When changing oil	After disassembly and completely dry	
KZ650-D	SAE 10W	about 225 cc	245 ± 4 cc	375 ± 4 mm from the top of the inner tube
KZ650-F	SAE 10W	about 225 cc	245 ± 4 cc	376 ± 4 mm from the top of the inner tube
KZ650-H	SAE 10W	about 270 cc	291 ± 4 cc	433 ± 4 mm from the top of the inner tube

•Pump the fork by several times to expel the air from the upper and lower chambers.
•Place a jack or stand under the engine so that the front wheel is raised off the ground.
•Insert a rod down into the tube, and measure the distance from the top of the inner tube to the oil level.
★If the oil is below the correct level, add enough oil to bring it up to the proper level, taking care not to overfill.

Fork Oil Level Measurement (2-51)



CAUTION **The operation of air front forks is especially dependent upon correct oil level. Higher level than specified may cause oil leakage and seal breakage. So be sure to maintain the specified level.**

- Inspect the O-ring on the top plug, and replace it with a new one if it is damaged.
- Assemble the fork leg.
- Change the oil of the other fork leg in the same manner.
- Install the handlebar.
- Adjust the front fork air pressure.

WHEELS

Tires:

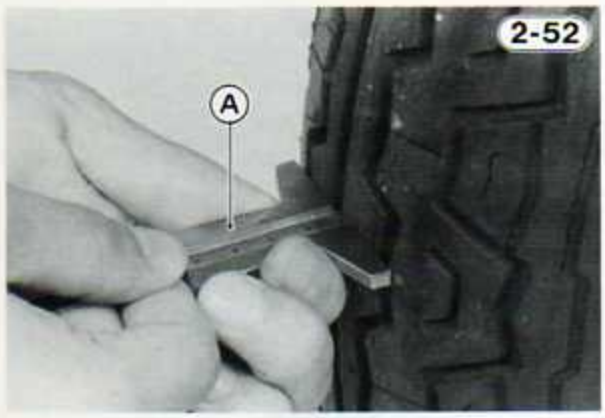
Tire Wear, Damage

As the tire tread wears down, the tire becomes more susceptible the puncture and failure. An accepted estimate is that 90% of all tire failures occur during the last 10% of tread life (90% worn). So it is false economy and unsafe to use the tires until they are bald. In accordance with the Periodic Maintenance Chart, check the tire for wear.

- Measure the depth 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.

Table 2-13 Tire Tread Depth

Tire	Service Limit	
	Under 130 kph	Over 130 kph
Front	1 mm	1 mm
Rear	2 mm	3 mm



(2-52)

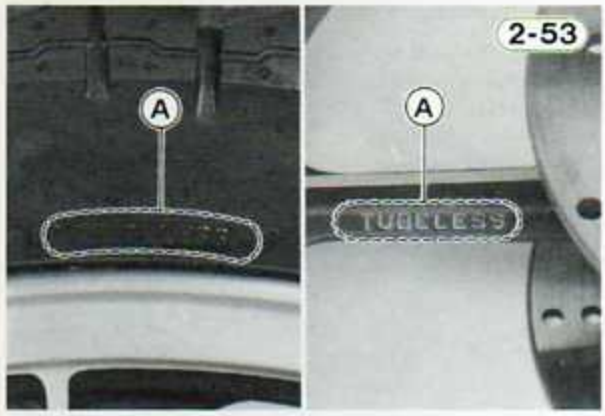
A. Depth Gauge B. Tread

- Visually inspect the tire for cracks and cuts, replacing the tire in case of bad damage. Swelling or high spots indicate internal damage, requiring tire replacement.
- Remove any imbedded stones or other foreign particles from the tread.

NOTE: 1. Check and balance the wheels when required, or when a tire is replaced with a new one.

2. Tires and rims specially designed for tubeless use have the indications of "TUBELESS" on the tire side wall and the rim spoke.

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



(2-53)

A. TUBELESS

Wheel Bearings and Speedometer Gear:

Lubrication and Inspection

Since worn wheel bearings will cause play in the wheel, vibration, and instability, they should be cleaned, inspected, and greased in accordance with the Periodic Maintenance Chart. Also, the speedometer gear housing should be cleaned and greased in periodically.

- Remove the front wheel and the rear wheel coupling, and remove the two front wheel bearings and one rear wheel coupling bearing.

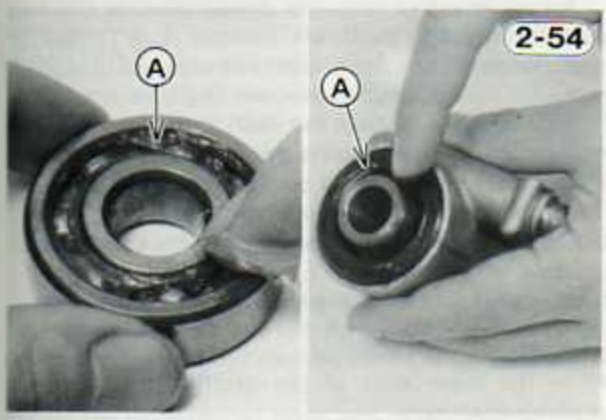
NOTE: 1. The two rear wheel bearings are packed with grease and shielded. Bearing removal is not required for lubrication.

- Wash the bearing with a high flash-point solvent, dry it (do not spin it while it is dry), and oil it.

Table 2-14 Standard Tire

	KZ650-D	KZ650-F	KZ650-H
Front	3-25H-19 4PR, DUNLOP F8 or BRIDGESTONE L303A, Tubeless	3.25H-19 4PR, DUNLOP F8, Tubeless	3.25H-19 4PR, BRIDGESTONE S703, Tube Type
Rear	130/90-16 67H 4PR, DUNLOP K200 or BRIDGESTONE S708A, Tubeless	4.00H-18 4PR, DUNLOP K127, Tubeless	130/90-16 67H 4PR, BRIDGESTONE S708, Tube Type

•Spin it by hand to check its condition.
★If it is noisy, does not spin smoothly, or has any rough spots, it must be replaced.
•If the same bearing is to be used again, re-wash it with a high flash-point solvent, and dry it.
•Pack it with good quality bearing grease before installation. Turn the bearing around by hand a few times to make sure the grease is distributed uniformly inside the bearing, and wipe the old grease out of the hub before bearing installation.



A. Grease.

•Clean and grease the speedometer gear housing.
•Replace the grease seals, which are removed for bearing removal, with new ones. The seals are generally damaged upon removal.

Spoke and Rim (wire-spoke wheels):

The spokes and rims of the wire-spoke wheels must be inspected as follows in accordance with the Periodic Maintenance Chart.

Since the spokes must withstand repeated stress, it is important to take sufficient care that the spokes are not allowed to loosen and that they are tightened evenly. Loose or unevenly tightened spokes cause the rim to warp, increase the possibility of spoke breakage, and hasten nipple and spoke metal fatigue.

Spoke Tighteness

•Check that all the spokes are tightened evenly since they stretch a certain amount during use.
★Standard spoke tightening torque is 0.30 kg-m (26 in-lbs). Over- or under-tightening may cause breakage.

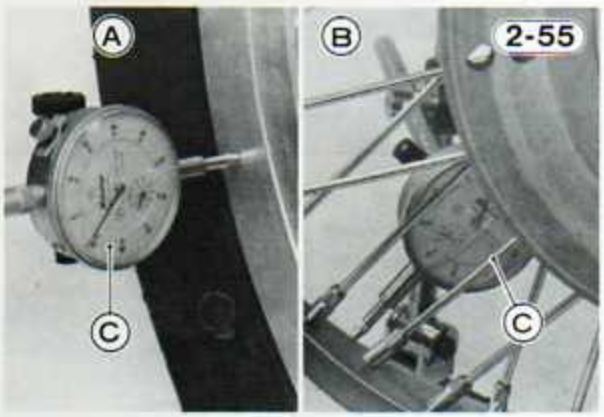
WARNING **If any spoke breaks, it should be replaced immediately. A missing spoke places an additional load on the other spokes, which will eventually cause other spokes to break.**

Rim runout

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

Table 2-15 Rim Runout (with tire installed)

	Service Limit
Axial and Radial	2 mm



A. Axial Runout B. Radial Runout C. Dial Gauge

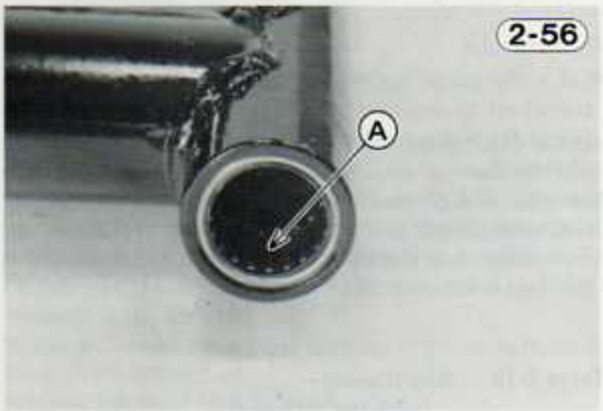
★If rim runout exceeds the service limit, correct the rim warp (runout). A certain amount of rim warp can be corrected by recentering the rim. Loosen some spokes and tighten others to change the position of different parts of the rim. If the rim is badly bent, however, it should be replaced.

SWING ARM

In order for the swing arm to function safely and wear slowly, it should be lubricated in accordance with the Periodic Maintenance Chart.

Lubrication

- Remove the swing arm, and pull the swing arm sleeve out of the pivot.
- Using a high flash-point solvent, wash the sleeve and the needle bearings clean of grease, and dry them.
- Inspect the needle bearings, sleeve, and grease seals for abrasion, color change, or other damage.
- ★If there is any doubt as to the condition of any needle bearing or sleeve, replace all the needle bearings and sleeve, replace the damaged grease seal with a new one.
- Pack the needle bearings with grease, and apply grease to the outer circumferance of the sleeve.



A. Grease.

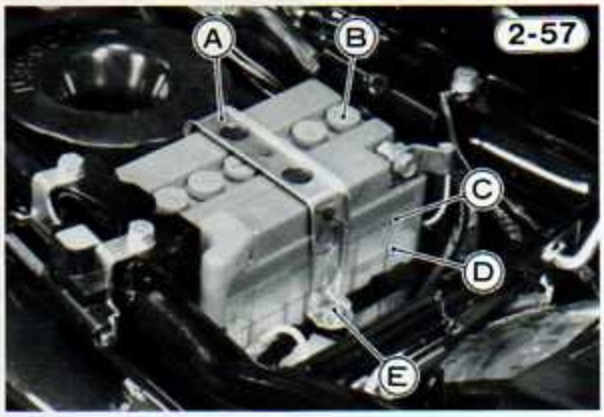
- Install the swing arm.

BATTERY

Battery Electrolyte Level Inspection

The battery electrolyte level must be kept between the upper and lower level lines. Check the electrolyte level in each cell in accordance with the Periodic Maintenance Chart.

- Unlock the seat, swing it open, and unhook the battery band.
- Remove the tool kit.
- Check that the electrolyte level in each cell is between the upper and lower level lines.
- ★If the electrolyte level is low in any cell, fill with distilled water as follows.
- For the battery holded with the battery holder, remove the screw and take off the holder.
- Remove the battery filler caps and fill with distilled water until the electrolyte level in each cell reaches the upper level line.



A. Battery Holder
B. Filler Cap
C. Upper Level
D. Lower Level
E. Screw

CAUTION **Add only distilled water is not a substitute for distilled water and will shorten the life of the battery.**

FUEL SYSTEM

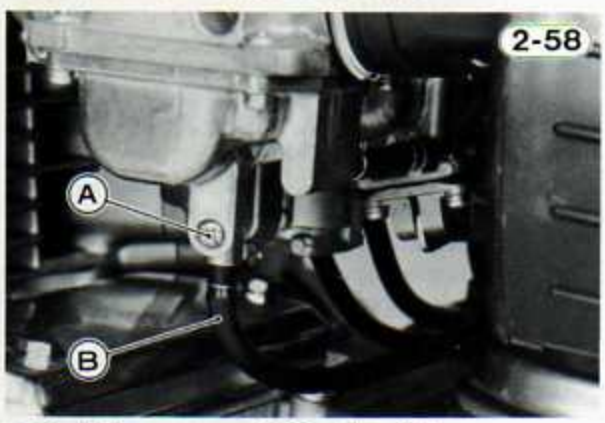
Accumulation of moisture or sediment in the fuel system will restrict the flow of fuel and cause carburetor malfunction. The system should be checked in accordance with the Periodic Maintenance Chart.

WARNING

1. **Inspect the fuel system in a well-ventilated area, and take ample care that there are no sparks or flame anywhere near the working area.**
2. **Never inspect the fuel system when the engine is still warm.**
3. **Wipe any fuel off the engine before starting it.**

Inspection and Cleaning

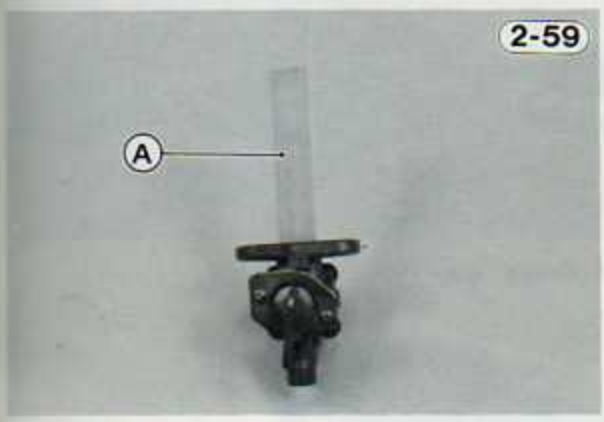
- Run the lower ends of the overflow tubes into a suitable container.
- Turn the fuel tap lever to the PRI position.
- Turn out each drain plug a few turns to drain the carburetors, and check to see if water or dirt has accumulated in the carburetors. Continue draining each carburetor for about 10 seconds.



A. Drain Plug **B. Overflow Tube**

- Tighten the drain plugs, and turn the fuel tap lever to the ON position.

*If any water or dirt appeared during the above inspection, clean the fuel system as follows.
•Remove the fuel tank, and remove the fuel tap from the tank.
•Flash out the fuel tank with a high flash-point solvent.
•Wash the fuel filter on the fuel tap clean of dirt with a high flash-point solvnet.



A. Fuel Filter

•Remove the carburetors, and disassemble them to clean the fuel and air passages.

CAUTION **1. Remove the float and/or diaphragm before cleaning the carburetor with compressed air, or they will be damaged.**

2. **Remove as many rubber or plastic parts from the carburetors as possible before cleaning the carburetors with a cleaning solution. This will prevent damage or deterioration of the parts.**
3. **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 cleaning solution safe for plastic parts.**
4. **Do not use wire for cleaning as this could damage the jets.**

•Wash the disassembled parts, and air and fuel passages with a high flash-point solvent then blow them clean with compressed air. If necessary, use a bath of automotive type carburetor cleaner.
•Assemble and install the carburetors.
•Install the fuel tap on the fuel tank, and install the fuel tank.

Fuel Hose Replacement

In accordance with the Periodic Maintenance Chart, replace the fuel hose with a new one.
•Remove the fuel tank.
•Replace the fuel hose which connect the fuel tap with the carburetors. Also replace the hose clamps with new ones.
•Install the fuel tank, and check for fuel leakage.

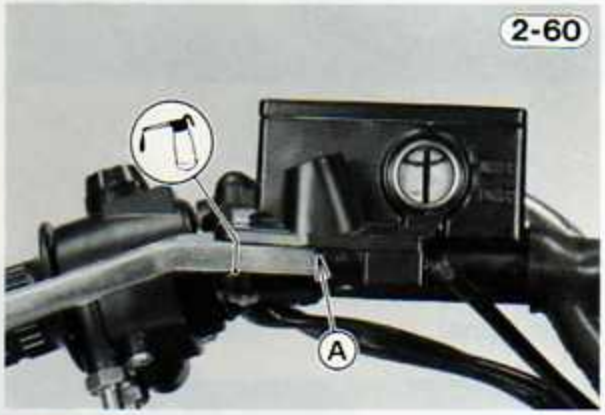
GENERAL LUBRICATION

Lubricate the points shown here, with either motor oil or regular grease, in accordance with the Periodic Maintenance Chart or whenever the vehicle has been operated under wet or rainy conditions, and especially after using a highpressure spray washer.

Before lubricating each part, clean off any rusty spots with rust remover and wipe off any grease, oil, dirt, or grime.

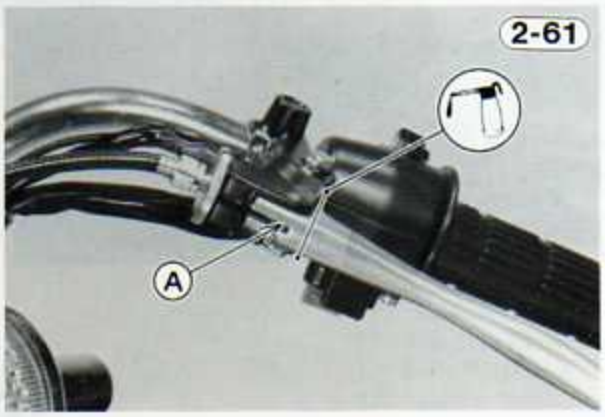
NOTE: 1. A few drops of oil are effective to keep bolts and nuts from rusting and sticking. This makes removal easier. Badly rusted nuts, bolts, etc., should be replaced with new ones.

Brake Lever:



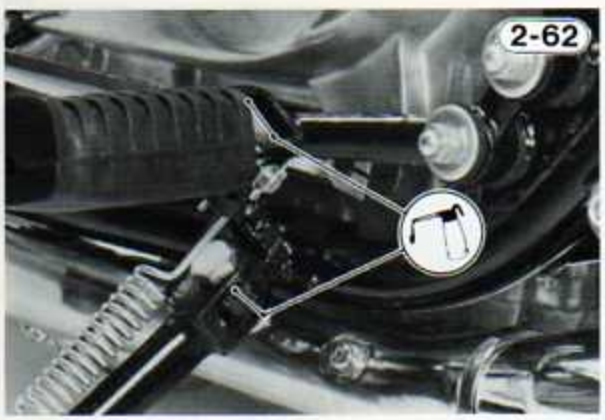
A. Grease.

Clutch Lever:

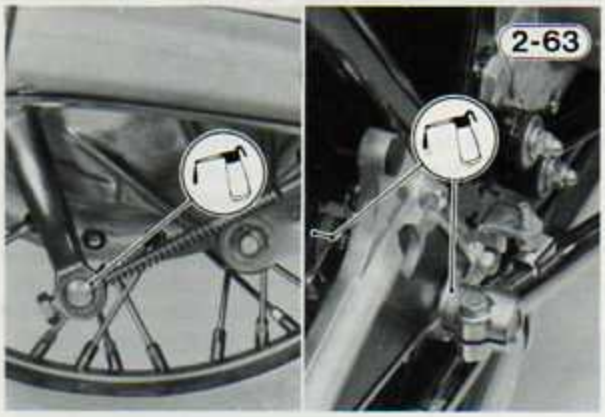


A. Grease.

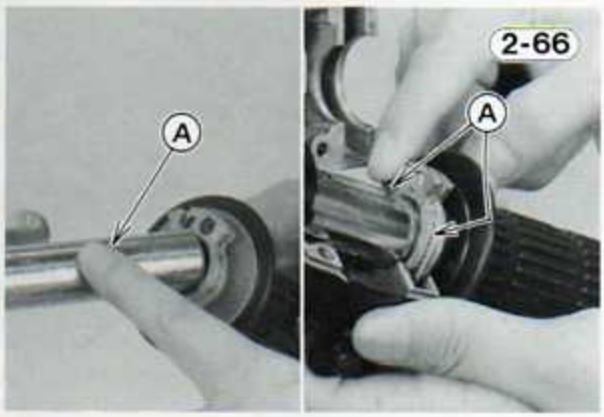
Footpeg, Side Stand:



Brake Pedal, Brake Rod Joints:

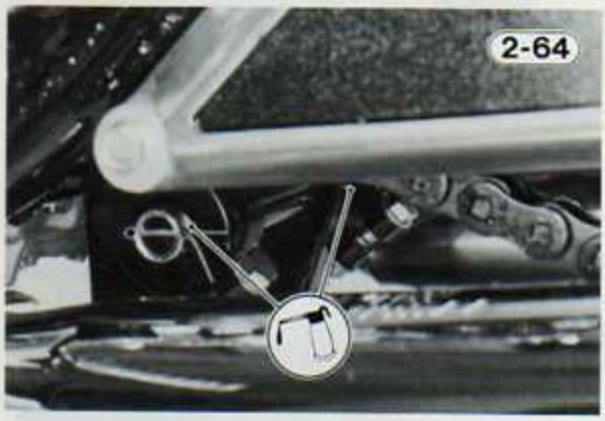


Throttle Grip:



A. Grease.

Center Stand:



Clutch and Throttle Cables:

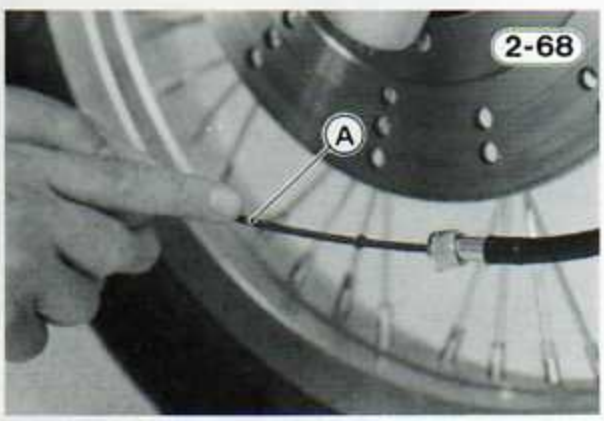
Cable Lubrication 2-67



Carburetor Choke Link Mechanism:



Speedometer and Tachometer Cables:

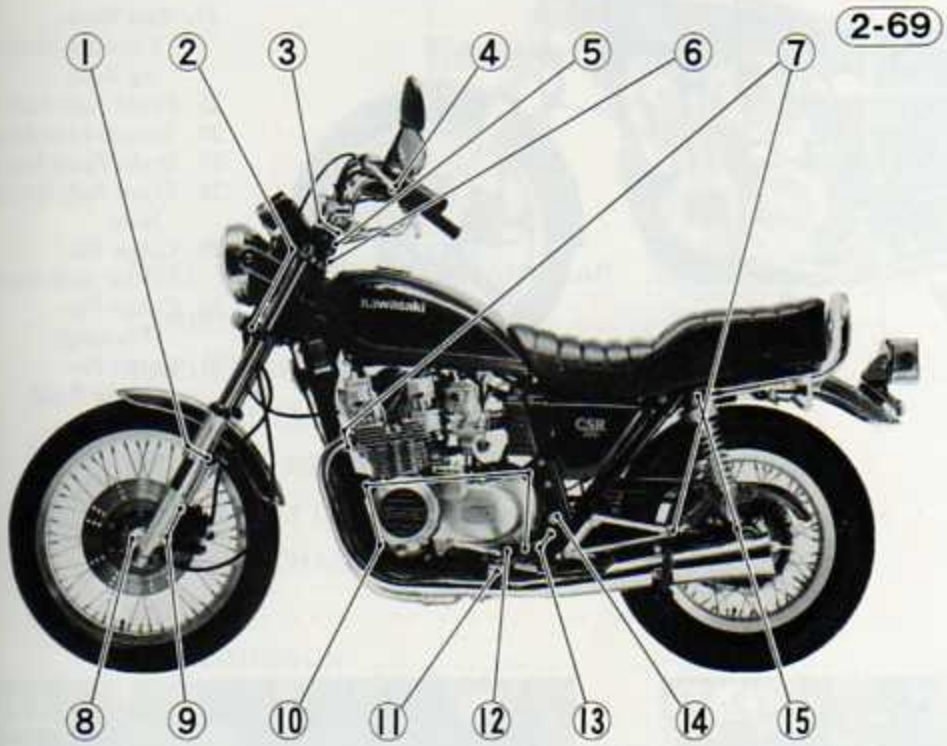


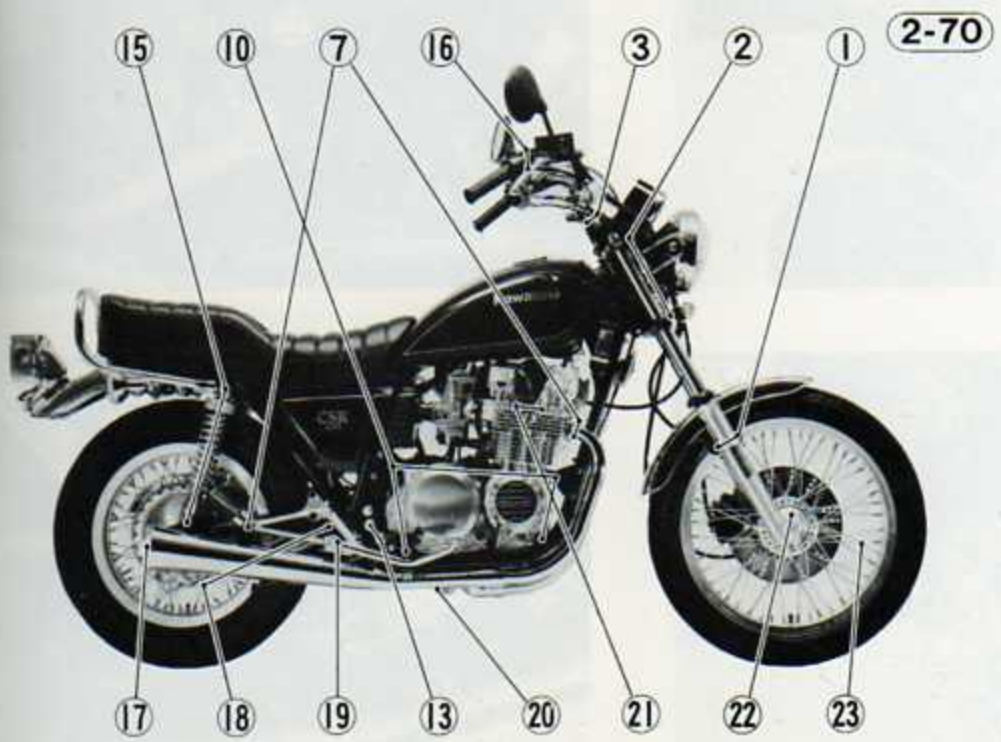
A. Grease Sparingly.

BOLT AND NUT TIGHTENING

In accordance with the Periodic Maintenance Chart, it is very important to 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.

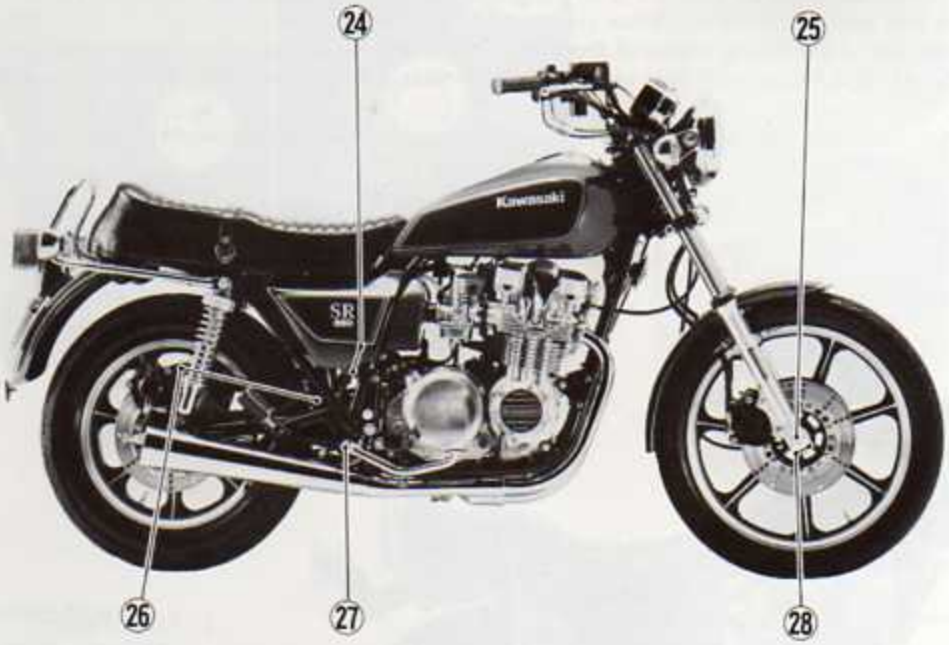
NOTE: 1. For the engine fasteners, check the tighteness of them when the enigne is cold (at room temperature).
2. When retorquing the fasteners, first loosen each bolt or nut ½ turn, one at a time then tighten it to the specified torque.
3. When retorquing the cylinder head nuts, follow the tightening sequence specified in the "Disassembly" chapter.





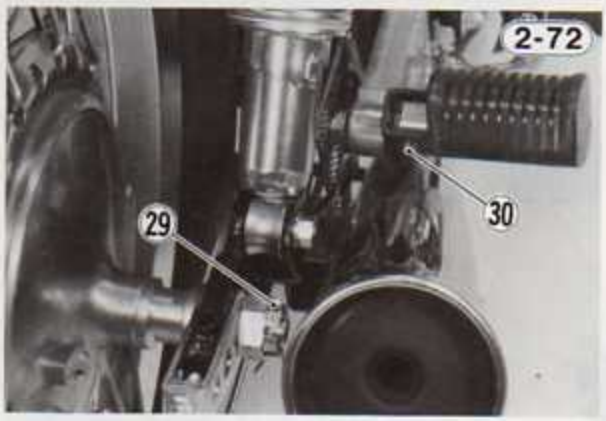
1. Front Fender Mounting Bolts
2. Front Fork Clamp Bolts
3. Handlebar Clamp Bolts
4. Clutch Lever Holder Bolt
5. Stem Head Bolt
6. Stem Head Clamp Bolt
7. Muffler Mounting Nuts
8. Front Axle Nut
9. Caliper Mounting Bolts
10. Engine Mounting Bolts and Nuts
11. Side Stand Bolt
12. Shift Pedal Bolt
13. Footpeg Mounting Nuts
14. Pivot Shaft Nut
15. Rear Shock Absorber Bolts and Nuts
16. Master Cylinder Clamp Bolts
17. Brake Cam Lever Bolt
18. Torque Link Nuts
19. Brake Pedal Bolt
20. Muffler Connecting Pipe Clamp Bolts
21. Cylinder Head Nuts
22. Front Axle Clamp Bolt
23. Spokes

2-71



24. Rear Master Cylinder Mounting Bolts
25. Front Axle Nut
26. Torque Link Nuts
27. Brake Pedal Nut
28. Front Axle Clamp Nuts
29. Cotter Pin (Rear Axle Nut)
30. Cotter Pin (Footpeg)
31. Cotter Pin (Brake Rod)
32. Cotter Pin (Spring Rod)
33. Cotter Pin (Center Stand)

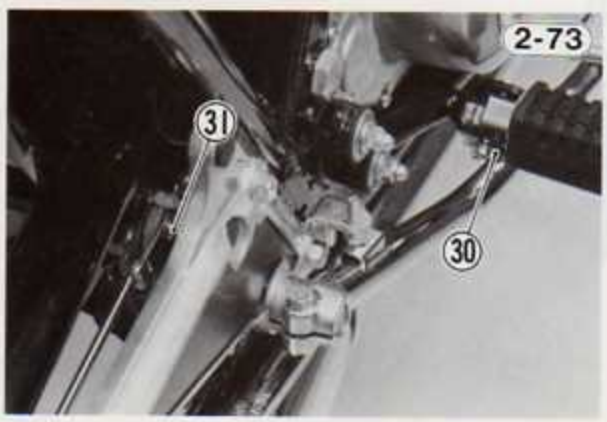
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Non-scheduled Maintenance – Engine

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FUEL TANK, FUEL TAP, TANK CAP

WARNING **Inspect the fuel tank, fuel tap, and tank cap in a well-ventilated area, and take ample care that there are no sparks and flame anywhere near the working area.**

Inspection

If fuel leaks from the tank cap or from around the fuel tap –

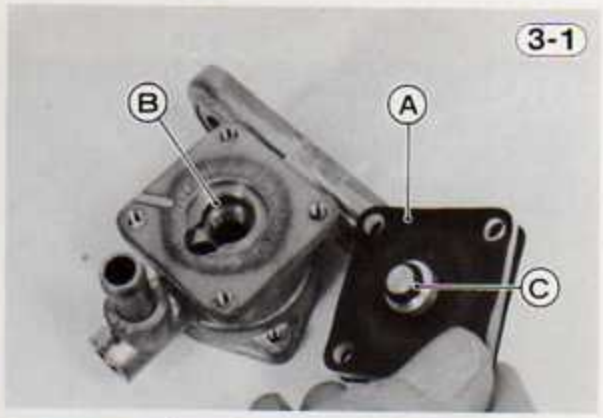
- Remove the tank cap, or remove and disassemble the fuel tap, inspect the O-rings and/or cap gasket.
- ★If there is any damage, replace it with a new one.

If the air vent in the tank cap is obstructed –

- Use compressed air to clear an obstructed vent.

If there is any doubt about the condition of the fuel tap –

- Remove and disassemble the fuel tap, and inspect the parts.
- ★If there is any damage, replace the part with a new one. Make sure the O-ring and its seat are clean and undamaged; if the O-ring is prevented from seating properly or if it is damaged, fuel flow will not stop when the engine is stopped, and may overflow from the carburetors.
- Visually inspect the diaphragm assembly.
- ★If there is any tear or other damage, the diaphragm assembly should be replaced.



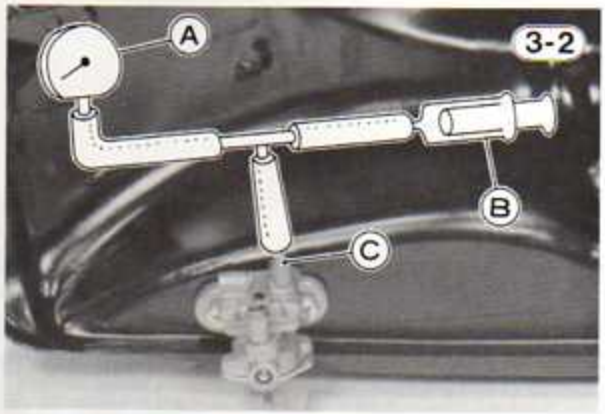
A. Diaphragm Assembly
B. O-Ring Seat
C. O-Ring

- Clean the air and fuel passages by lightly applying compressed air to the passage openings.

CAUTION **Do not use wire for cleaning as this could damage the check valve, O-ring seat, and diaphragm mating surfaces.**

Using the vacuum gauge (special tool) and a syringe, insepct the fuel tap operation as follows:

- Remove the fuel tank.
- Turn the fuel tap lever to the ON or RES position.
- Using the rubber hoses (3) and 3-way joint, connect the vacuum gauge (special tool) and a syringe to the vacuum hose fitting on the fuel tap.



A. Vacuum Gauge: 57001-127
B. Syringe
C. Vacuum Hose Fitting

- Gradually raise the vacuum (lower the pressure) applied to the fuel tap, and check the fuel tap operation. When the vacuum is low enough, the fuel tap should stop fuel flow. When the vacuum reaches a certain level above 17 or 18 cmHg, it should permit fuel to stop. When the vacuum is high enough, the fuel can also flow through the fuel tap.
- ★If the fuel tap does not operate as this, replace it with a new one. Adjustment is not permitted.

CAUTION **Do not apply a vacuum more than 40 cmHg to the fuel tap as this could damage the diaphragm in the tap.**

- Conversely, gradually lower the vacuum (raise the pressure) applied from the high vacuum, and check the fuel tap operation. The fuel tap will return to its original state just the reverse way as it came, but the transition should occur when the vacuum comes to a level below 17 or 18 cmHg.
- ★If the fuel tap does not work as specified, replace it with a new one.

CARBURETORS

Carburetor trouble can be caused by dirt, wear, maladjustment, or improper fuel level in the float chamber.

Table 3-1 Mixture Trouble Symptoms

Poor running
Overheating
Exhaust smokes excessively
Frequent backfiring in the exhaust system during engine braking

Table 3-2 Carburetor Specifications

Type	Main Jet	Needle Jet	Jet Needle	Pilot Jet	Starter Jet	Throttle Valve Cutaway	Float Height	Service Fuel Level
VM24SS	102.5 Ⓤ 92.5	#O-4 Ⓤ #O-5	5CN15-4† Ⓤ 5CL30	15	40 Ⓤ 35	1.5 Ⓤ 1.75	23 ± 1 mm	3.0 ± 1 mm

† The "4" of "5CN15-4" shows the groove number for the clip, and not stamped on the needle. The groove numbers are counted from the topmost groove, 5 being the lowest groove.
Ⓤ US model

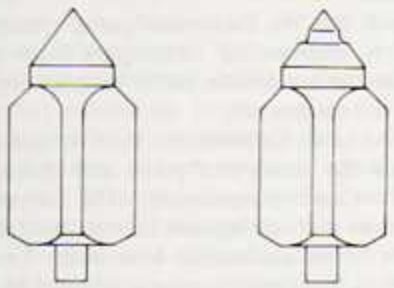
The following explanation covers the inspection of the carburetor.

WARNING **Inspect the carburetors in a well-ventilated area, and take ample care that there are no sparks and flame anywhere near the working area.**

Wear Inspection

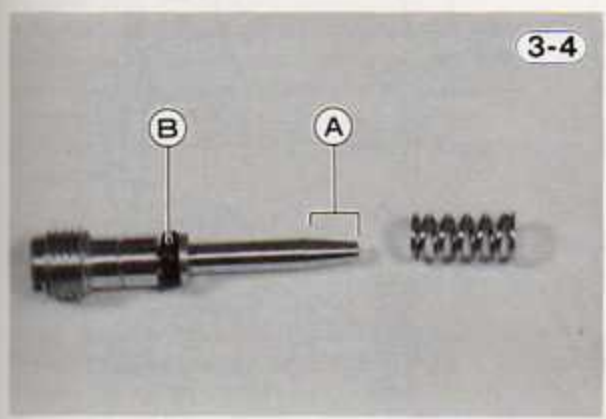
- Remove and disassemble the carburetors.
- ★Examine the float, and replace if damaged.
- ★If the needle is worn as shown in the diagram, replace the valve needle and valve seat as a set.

Valve Needle 3-3



Good Bad

- Remove the air screw, and check that the tapered portion is not worn or otherwise deformed.
- ★If it is, replace the air screw.
- ★If the screw O-ring is damaged, replace the O-ring.



A. Tapered Portion B. O-Ring

- Check the jet needle and needle jet.
- ★If they are worn, replace them.

Service Fuel Level Measurement

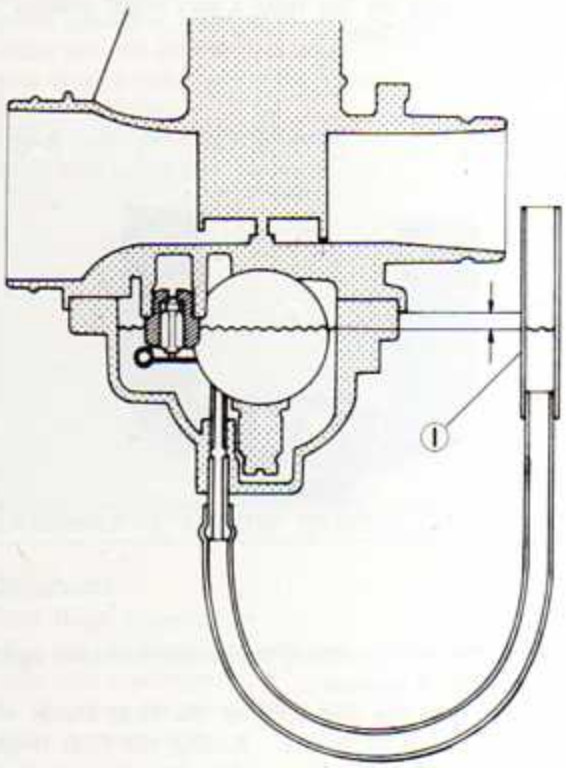
If the motorcycle exhibits symptoms of improper fuel mixture, measure the service fuel level.

- Secure the motorcycle in a true vertical position.

WARNING **Check the fuel level in a well-ventilated area, and take ample care that there are no sparks or flame anywhere near the working area.**

- Attach the fuel level gauge (special tool) to the open end of the overflow tube, and turn out the drain plug 1 – 2 turns.

Service Fuel Level Measurement 3-5



1. Fuel Level Gauge: 57001-1017

- Keeping the calibrated plastic pipe of the gauge higher than the float bowl, turn the fuel tap to the PRI position. Wait until the fuel level in the tube settles, and wait until no air bubbles can be seen rising up through the fuel.
- Keeping the calibrated plastic tube vertical, slowly lower the calibrated plastic tube until the "0" line is even with the bottom edge of the carburetor body.

NOTE: 1. Do not lower the "0" line below the bottom edge of the carburetor body. If the calibrated plastic tube is moved upward, the fuel level measurement must be repeated from the beginning.

- Read the service fuel level in the plastic pipe.
- Measure the service fuel level for the remaining carburetors.

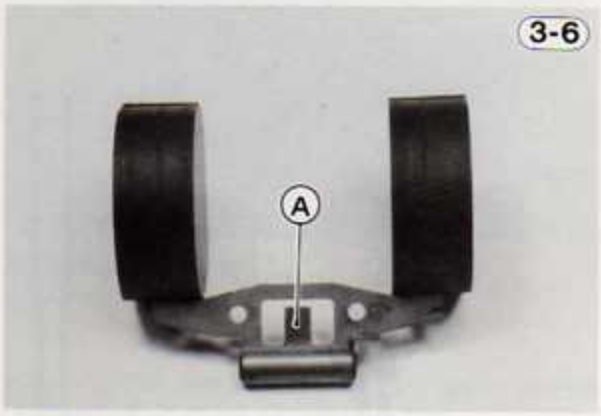
Table 3-3 Service Fuel Level

Standard
3.0 ± 1 mm below from the bottom edge of the carburetor body to the fuel level

★If any fuel level is incorrect, adjust the fuel level.

Service Fuel Level Adjustment

- Remove the carburetors, and remove the float bowl and float.
- Bend the tang on the float a very slight amount to change the fuel level.



A. Tang

- After adjustment, measure the service fuel level again, and readjust if necessary.

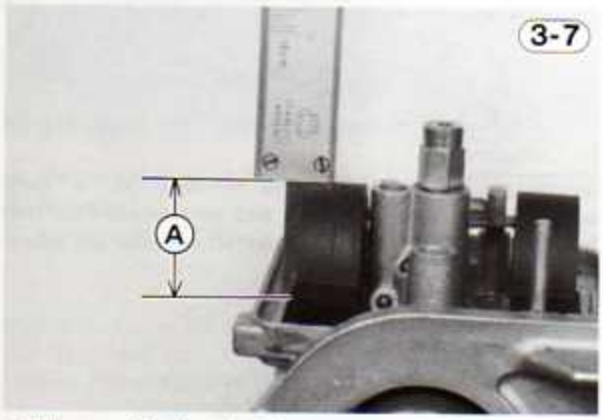
NOTE: 1. Bending the tang on the float makes the altering the float height. Raising the float height closes the valve sooner and lowers the fuel level; lowering the float height raises the level.

2. The float height for the proper service fuel level is shown in the table.

Table 3-4 Float Height†

Standard
23 ± 1 mm above from the mating surface of the carburetor body to the top of the float

†Carburetors are holded upside-down and float bowl gaskets are removed.



A. Measure the float height.

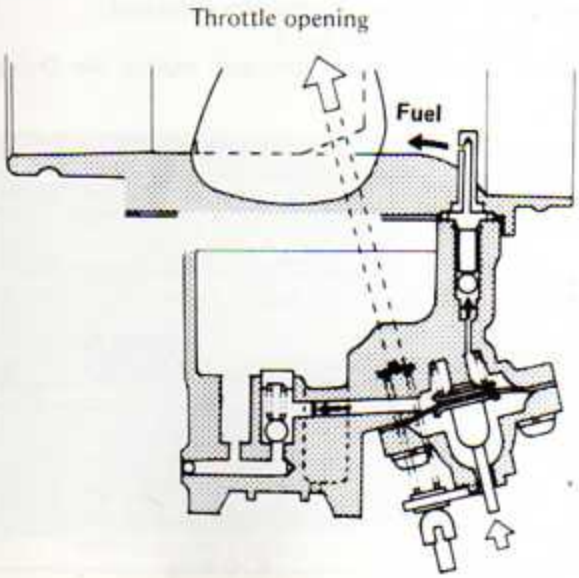
Accelerator Pump System Inspection

The accelerator pump should eject fuel from the pump nozzle.

To check that the accelerator pump system is working properly, remove the carburetors from the engine and operate the accelerator pump as following:

- Remove the carburetors.
- Supply fuel to the carburetors. Turn the pulley quickly to operate the accelerator pump and check that fuel squirts from each pump nozzle. The fuel must squirt directly into each carburetor bore without hitting the jet needle or the carburetor bore wall. The quantity of fuel eject from each pump nozzle must be the same.

Accelerator Pump 3-8



★If no fuel is ejected at all, the accelerator pump is defective.
★If any one of the pump nozzles ejects less fuel than the others or none at all, the nozzle or passage is clogged and must be cleaned.

Accelerator Pump System
Cleaning and Replacement

- Disassemble the carburetors, and blow the passages clean with compressed air.
- Check that the diaphragm and return spring are not damaged or otherwise deformed.

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

CAUTION **Never blow out the passages with compressed air while the diaphragm assembled, or the diaphragm will be damaged and require replacement.**

VACUUM SWITCH VALVE

Although the vacuum switch valve usually permits secondary air flow, it shuts off the air flow when a high vacuum (low pressure) is developed at the engine side of the carburetor bores during engine braking. This is to prevent explosions in the exhaust ports which might be caused by extra unburned fuel in the exhaust during deceleration, if fresh air were injected into the exhaust ports. These explosions or "backfiring" in the exhaust system could damage the air suction valves.

Regular inspection of the vacuum switch valve is not needed. If backfiring occurs frequently in the exhaust system during engine braking or if there are abnormal engine noises, check the vacuum switch valve as follows:

CAUTION **Do not attempt to turn the paint-locked screw on the vacuum switch valve. This screw position is preset to determine spring preload. Turning the screw will cause valve malfunction.**

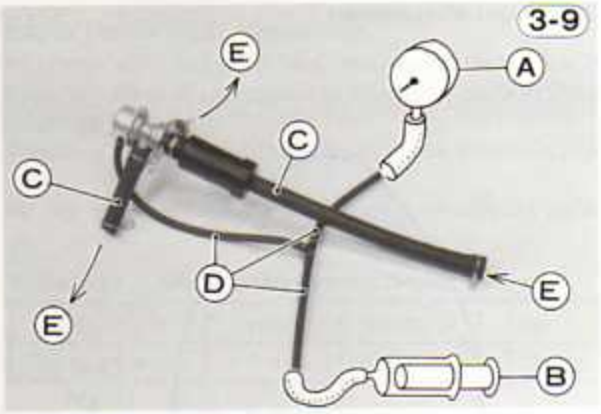
Inspection

- Be certain that all the hoses are routed without being flattened or kinked, and are connected correctly to the air cleaner housing, vacuum switch valve, #2 and #3 carburetor holders, and air suction covers.

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

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

- Remove the fuel tank.
- Pull the air hose out of the air cleaner housing.
- Slide the hose clamps out of place, and pull the vacuum hoses (2) off the carburetor holders.
- Connect the vacuum gauge and a syringe to the vacuum hoses.



A. Vacuum Gauge : 57001-127
B. Syringe C. Air Hose D. Vacuum Hoses E. Air

- Gradually raise the vacuum (lower the pressure) applied to the vacuum switch valve, and check the valve operation. When the vacuum is low enough, the vacuum switch valve should permit air to flow. When the vacuum reaches a certain level between 41 and 45 cmHg, it should stop air flow. When the vacuum is high enough, the air cannot also flow through the valve. If the vacuum switch valve does not operate as this, replace it with a new one. Adjustment is not permitted.

NOTE: 1. Whether the valve permits the air to flow or not is confirmed by blowing the air hose with breath.

CAUTION **Do not apply a vacuum more than 50 cmHg to the vacuum switch valve as this could damage the diaphragm in the valve.**

- Conversely, gradually lower the vacuum (raise the pressure) applied from the high vacuum, and check the valve operation. The valve will return to its original state just the reverse way as it came, but the transition should occur when the vacuum comes to a level below 37 cmHg.

★If the valve does not work as specified, replace the valve with a new one.

CAMSHAFTS, CHAIN, GUIDES, TENSIONER

Camshafts:

Cam Wear Inspection

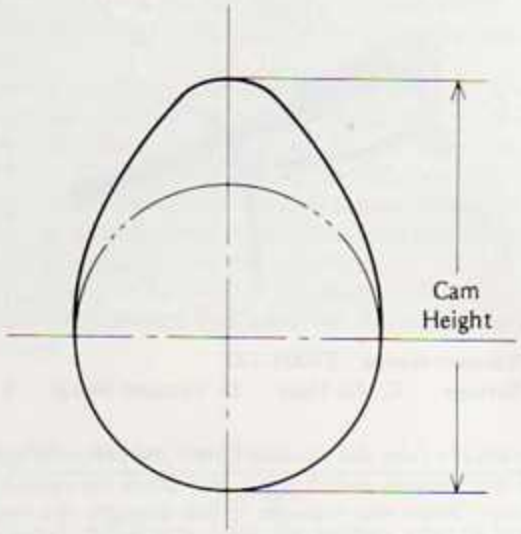
- Remove the camshafts, and measure the height of each cam with a micrometer.

★If the cams are worn down past the service limit, replace the camshafts.

Table 3-5 Cam Height

Service Limit	35.65 mm

Cam Height Measurement (3-10)



Journal, Bearing Wear Inspection

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

- Remove the camshaft, and wipe each journal and camshaft cap surface clean of oil.
- Cut strips of plastigauge to journal width. Place a strip on each journal parallel to the camshaft and so that the plastigauge will be compressed between the journal and camshaft cap.

CAUTION **While installing the camshaft, be sure to reset it correctly. If it is installed incorrectly, valves may be bent.**

- Tighten the camshaft cap bolts to the specified torque.
- Remove the camshaft cap again, and measure the plastigauge width to determine the clearance between each journal and the camshaft cap.



A. Plastigauge

★If any clearance exceeds the service limit, measure the diameter of the camshaft journal. If camshaft replacement does not bring the journal clearance within the service limit, replace the cylinder head and camshaft caps.

Table 3-6 Camshaft Journal/Camshaft Cap Clearance

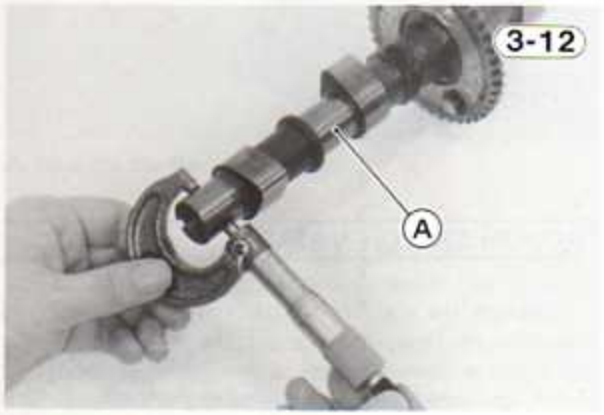
Service Limit	0.19 mm

- Measure the diameter of each camshaft journal with a micrometer.

★If the diameter of any journal is less than the service limit, replace the camshaft.

Table 3-7 Camshaft Journal Diameter

Service Limit	21.93 mm



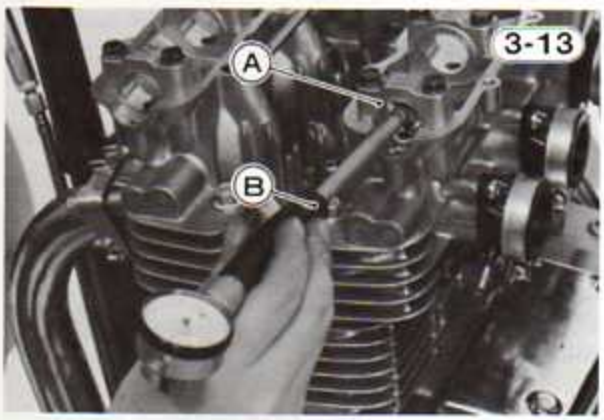
A. Camshaft

- Remove the camshafts, and tighten the camshaft caps with the specified torque.
- Measure the vertical inside diameter of each bearing with a cylinder gauge.

★If it exceeds the service limit, replace the cylinder head and camshaft caps as a set since the camshaft caps are machined together with the cylinder head.

Table 3-8 Camshaft Bearing Inside Diameter

Service Limit	22.12 mm



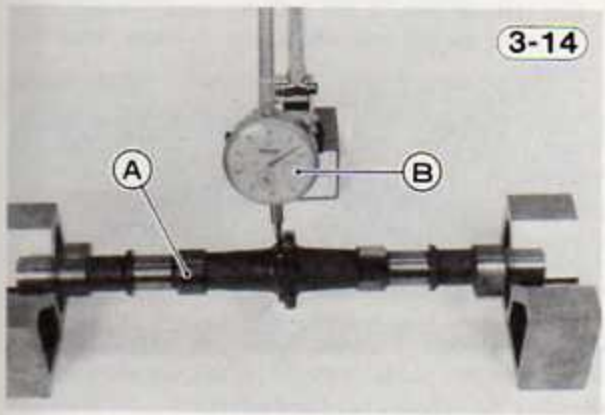
A. Camshaft Cap **B. Cylinder Gauge**

Camshaft Runout Measurement

- Remove the camshaft and take the sprocket off the shaft.
- Set the shaft on V blocks at the outside journals as shown in the figure.
- Measure runout with a dial gauge at the sprocket mounting location.
- ★If the runout exceeds the service limit, replace the shaft.

Table 3-9 Camshaft Runout

Service Limit	0.1 mm



A. Camshaft **B. Dial Gauge**

Camshaft Chain, Guides, Tensioner:

When the chain can no longer be adjusted enough to stop it from making noise, remove the chain, guides, and tensioner for inspection.

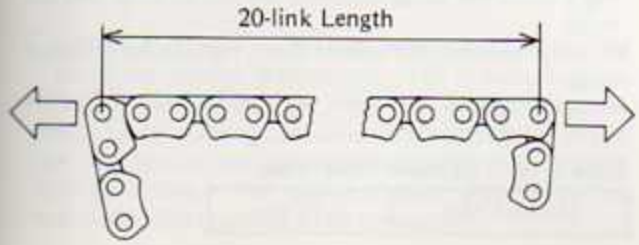
Camshaft Chain Wear Inspection

- Hold the chain taut with a force of about 5 kg in some manner, and measure a 20-link length. Since the camshaft chain may wear unevenly, take measurements at several places.
- ★If any measurement exceeds the service limit, replace the chain.

Table 3-10 Camshaft Chain Length

Service Limit	128.9 mm

Chain Length Measurement 3-15



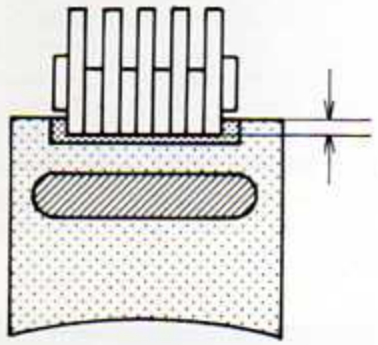
Chain Guide Wear Inspection

- Remove all the chain guides, and inspect them visually.
- ★Replace them if the rubber or any other portion shows damage.
- Measure the depth of the grooves where the chain links run.
- ★If the wear exceeds the service limit, replace the guide.

Table 3-11 Chain Guide Groove Depth

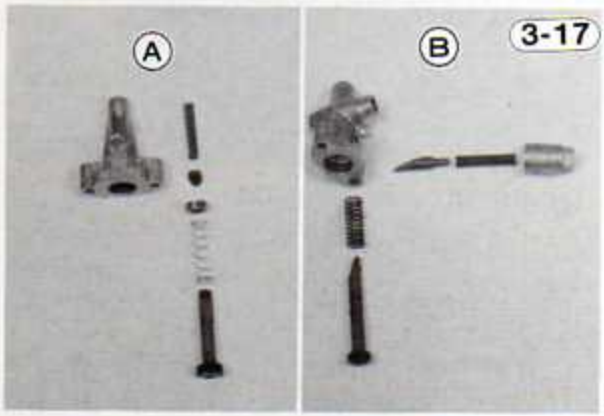
Guide	Upper	Front	Rear
Service Limit	3.5 mm	2.5 mm	3.5 mm

Chain Guide Rubber Wear 3-16



Chain Tensioner Inspection

- Remove the chain tensioner, and visually inspect the tensioner parts.
- ★If there is any damage or dent, replace the part with a new one.



A. Ball-lock Type **B. Cross-wedge Type**

- Measure the free length of the chain tensioner spring.
- ★If it is shorter than the service limit, replace it with a new one.

Table 3-12 Tensioner Spring Free Length

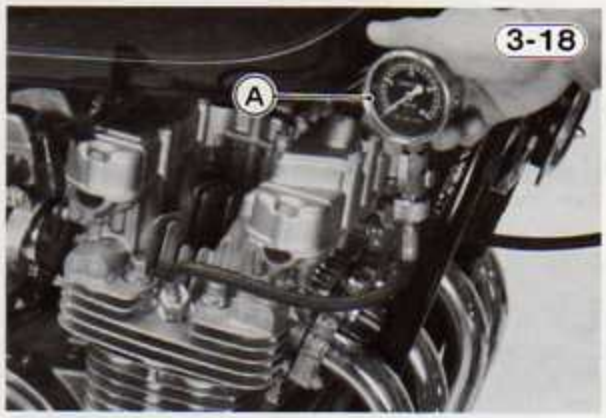
Spring		Service Limit
Ball-lock Type		43 mm
Cross-wedge Type	at push rod	36 mm
	at push rod stop	44 mm

CYLINDER HEAD, CYLINDER BLOCK, PISTONS

Compression Measurement

A compression test is useful in determining the condition of the engine. Low compression may be due to cylinder wear; worn piston ring grooves; worn, broken, or sticking piston rings; poor valve seating; cylinder head leaks; or damage to the engine such as piston seizure. Too high compression may be due to carbon build-up on the piston heads and cylinder head. Difference in compression between the cylinders may cause poor running.

- Before measuring compression, check that the cylinder head is tightened down with the specified torque and that the battery is fully charged and thoroughly warm up the engine so that engine oil between the pistons and cylinder walls will help seal compression as it does during normal running. While the engine is running, check that there is no gas leakage from around the cylinder head gasket and from the spark plugs.
- Stop the engine, remove all spark plugs, and screw the compression gauge (special tool) firmly into one spark plug hole.



A. Compression Gauge: 57001-123

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

Table 3-13 Cylinder Compression†

Usable Range	9.6 – 14.7 kg/cm² (137 – 209 psi, 941 – 1,442 kPa), or less than 1 kg/cm² (14 psi, 100 kPa) difference between any two sylinders

†Engine hot, spark plugs removed, throttle fully opened, cranking the engine with the starter motor.

★If cylinder compression is higher than the usable range, check the following:

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

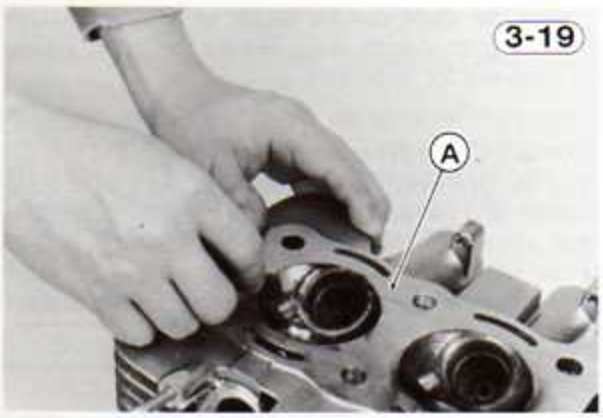
★If cylinder compression is lower than the service limit, check the following:

1. Gas leakage around the cylinder head – replace the damaged gasket and check the cylinder head for warp.
2. Condition of the valve seating.
3. Valve clearance – if a valve requires an unusually thick shim to obtain proper clearance, the valve may be bent, and not seating completely.
4. Piston/cylinder clearance, piston seizure.
5. Piston ring, piston ring groove.

Cylinder Head:

Cleaning

- Remove the cylinder head and valves.
- Scrape out any carbon, and wash the head with a high flash-point solvent.



A. Cylinder Head

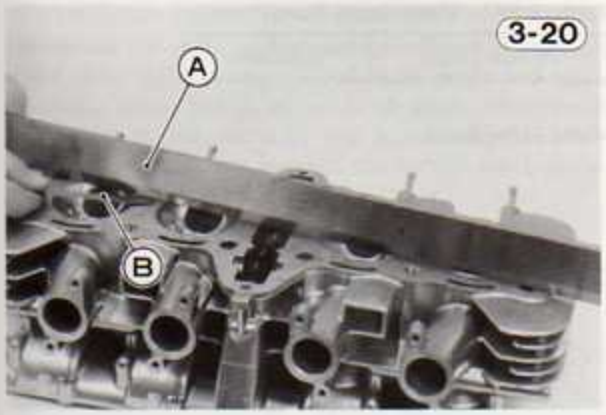
Cylinder Head Warp Inspection

- Lay a straightedge across the lower surface of the head at several different points, and measure warp by inserting a thickness gauge between the straightedge and the head.

★If warp exceeds the service limit, replace the cylinder head.

Table 3-14 Cylinder Head Warp

Service Limit	0.05 mm



A. Straightedge B. Thickness Gauge

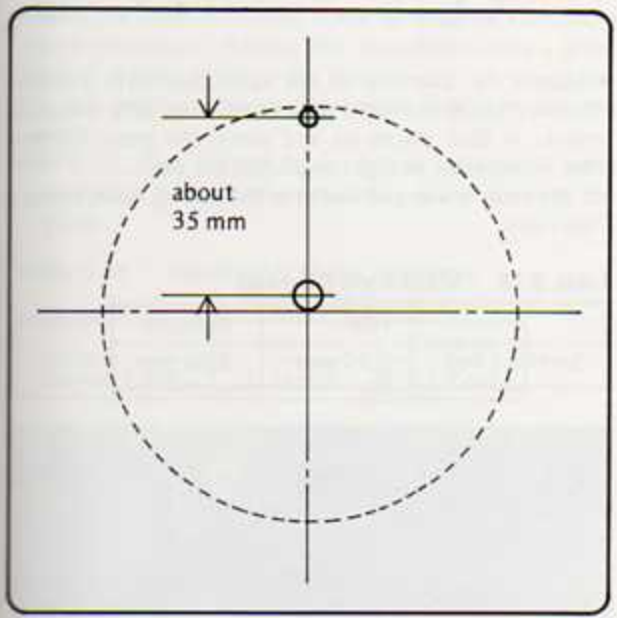
Combustion Chamber Volume Measurement

The combustion chamber volume should be measured any time that compression measurement results in compression pressures well below or above the standard.

NOTE: 1. Another person will be needed to help expel air bubbles out of the combustion chamber.

2. Prepare a piece of transparent plastic plate which has a flat surface and two holes about 35 mm apart in its center portion. One hole should be about 6 mm in diameter, the other about 3 mm in diameter. The plate must be oil resistant, about 120 mm square, and at least 3 mm thick.

Measuring Plastic Plate 3-21

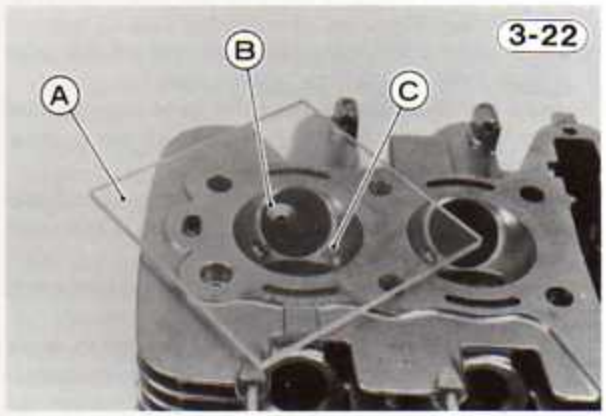


3. Obtain a burette or syringe which is calibrated at one-cc or smaller graduations. Fill it with thin oil.

•Prior to the combustion chamber volume measurement, clean off any carbon on the combustion chamber, and remove any gasket flakes on the cylinder head mating surface. The standard spark plug should be installed in the chamber to be measured.

NOTE: 1. The valves must seal well to prevent the oil from leaking out.

•Apply a thin coat of grease to the cylinder head mating surface and place the plastic plate over the cylinder head combustion chamber, fitting its small hole near the edge of the combustion chamber.



A. Plastic Plate C. Small Hole
B. Large Hole

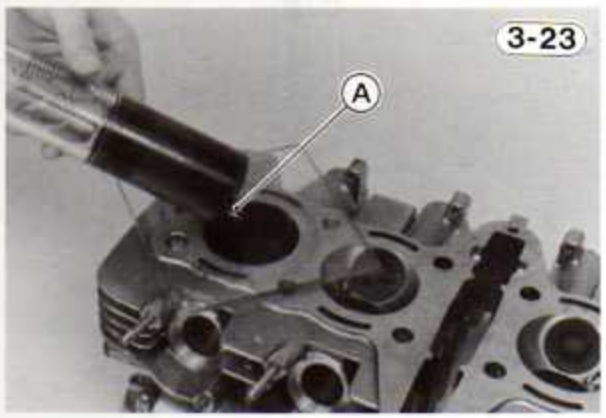
•Place the cylinder head on a level surface.

•Through the large hole, fill the combustion chamber with light oil such as 2-stroke oil or missing oil until the chamber is completely filled but not overly. Tilt the cylinder head slightly so that air bubbles come out through the small hole. The oil should just rise to the bottom edge of the holes in the plate.

The amount of oil used to fill the chamber is the combustion chamber volume.

Table 3-15 Combustion Chamber Volume

Standard	23.3 – 24.1 cc



A. Oil

★If the combustion chamber volume is too small, it is possible that the cylinder head was modified for higher compression. Make sure that all carbon deposits have been cleaned out of the chamber.

★If the combustion chamber volume is too large, it is possible that the valves and valve seats have been resurfaced so much that the volume is increased. Make sure that the spark plug is the standard type and that it is fully tightened.

Valves, Valve Guides, Valve Seats:

Valve Inspection

●Visually inspect the valve face, and replace the valve if it shows deformation or uneven wear.

●Measure the thickness of the valve head using vernier calipers, and replace the valve if the thickness is under the service limit.

★If the seating surface of the valve is damaged or badly worn, repair the valve with a valve refacer. The angle of the seating surface is 45°.

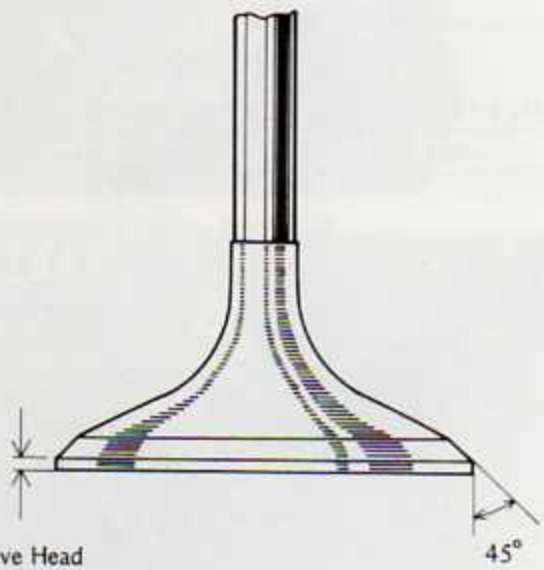
★If the end of the valve stem is damaged or badly worn, replace the valve with a new one.

CAUTION **Do not grind the valve stem end to repair it or to permit additional valve clearance. If the valve end is ground, the shim may contact the spring retainer and/or split keepers during operation, allowing the keeper to loosen. Consequently, the valve may drop into the engine, causing serious damage.**

Table 3-16 Valve Head Thickness

	Inlet	Exhaust
Service Limit	0.5 mm	0.7 mm

Valve Shape (3-24)



Valve Head Thickness

●Position the valve in **V** blocks at each end of the straight portion of the stem, and set a dial gauge against the center of the stem.

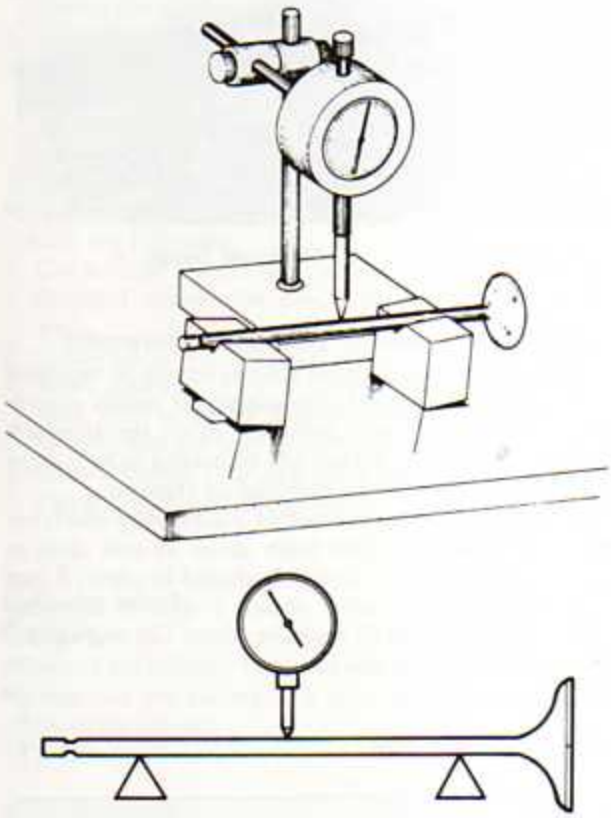
●Turning the valve, read the variation in the dial gauge.

★If the stem is bent more than the service limit, replace the valve.

Table 3-17 Valve Stem Bend

Service Limit	0.05 mm

Valve Stem Bend (3-25)



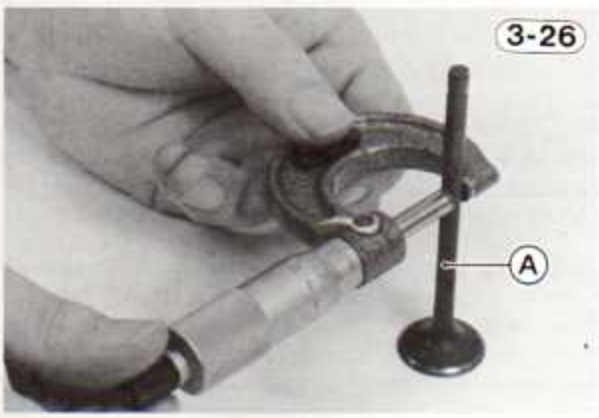
●Measure the diameter of the valve stem with a micrometer. Since the stem wears unevenly, take measurements at four places up and down the stem, keeping the micrometer at right angles to the stem.

★If the stem is worn to less than the service limit, replace the valve.

Table 3-18 Valve Stem Diameter

	Inlet	Exhaust
Service Limit	6.95 mm	6.94 mm

(3-26)



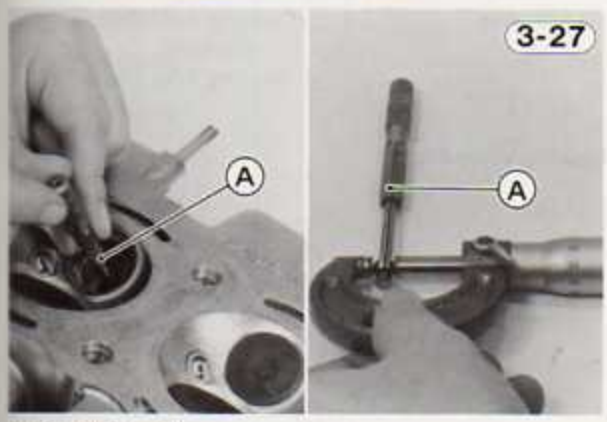
A. Valve Stem

Valve Guide Inspection

- Remove the valve, and measure the inside diameter of the valve guide using a small bore gauge and micrometer. Since the guide wears unevenly, measure the diameter at four places up and down the guide.
- ★If any measurement exceeds the service limit, replace the guide.

Table 3-19 Valve Guide Inside Diameter

Service Limit	7.08 mm



A. Samll Bore Gauge

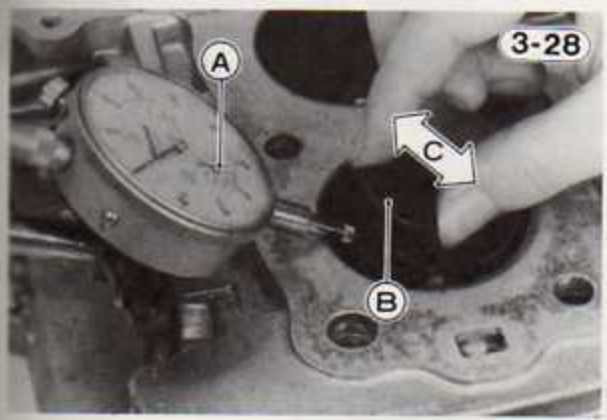
If a small bore gauge is not available, inspect the valve guide wear by measuring the valve to valve guide clearance with the wobble method, as indicated below.

- Insert a new valve into the guide and set a dial gauge against the stem perpendicular to its as close as possible to the cylinder head mating surface.
- Move the stem back and force 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: 1. The reading is not actual valve/valve guide clearance because the measuring point is above the guide.

Table 3-20 Valve/Valve Guide Clearance (Wobble Method)

	Inlet	Exhaust
Service Limit	0.24 mm	0.19 mm



A. Dial Gauge **B. New Valve** **C. Move.**

Valve Seat Inspection

The valve must seat in the valve seat evenly around the circumference over the specified area. If the seating area is too wide, the seating pressure per unit of area is reduced, which may result in compression leakage and carbon accumulation on the seating surface. If the seating area is too narrow, heat transfer from the valve is reduced and the valve will overheat and warp. Uneven seating or seat damage will cause compression leakage.

- Remove the valve, and check to see if the valve and valve guide are in good condition before valve seat inspection.
- Apply machinist's dye to the valve seat, and then use a lapper to tap the valve lightly into place.
- Remove the valve, and note where the dye adheres to the valve seating surface. The distribution of the dye on the seating surface gives an indication of seat condition (Fig. 3-30).
- ★If the distribution of the dye shows uneven seating or seat damage, or if the seating area is out of the specified range repair the valve seat.

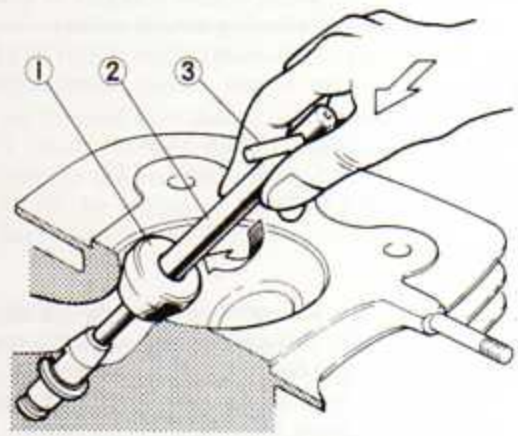
Table 3-21 Valve Seating Area

	Inlet	Exhaust
Outside Diameter	32 mm	27 mm
Width	0.5 – 1.0 mm	

Valve Seat Repair

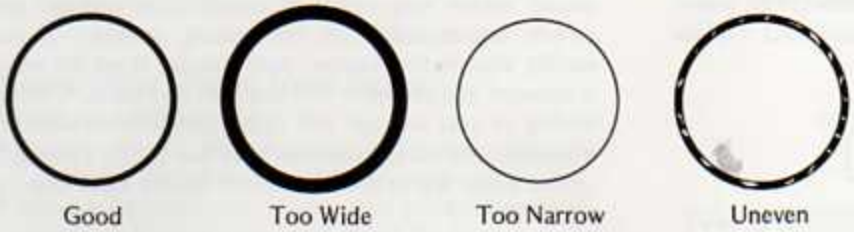
- First, cut the seating surface of the valve seat with the 45° seat cutter, cutter holder, and bar (special tools). Cut only the amount necessary to make a good surface; overcutting will reduce the valve clearance, possibly making it no longer adjustable.
- Next, cut the outermost surface with the outside cutter (special tool) so that the valve seating surface will have the specified outside outside **diameter.**
- Then, cut the surface inside the seating surface with the inside cutter (special tool) so that the seating surface will have the specified **width.**

Valve Seat Cutter 3-29

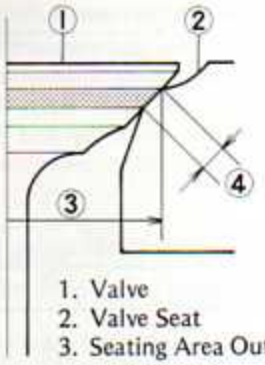


1. Cutter
2. Cutter Holder 7 mm: 57001-1126
3. Bar: 57001-1128

Valve and Valve Seat



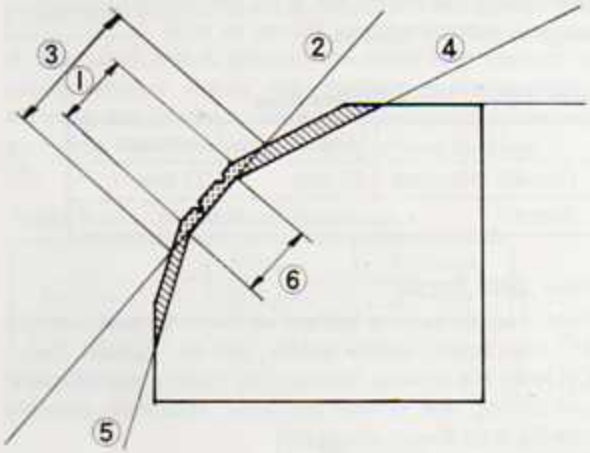
3-30



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

Cutting Valve Seat

3-31



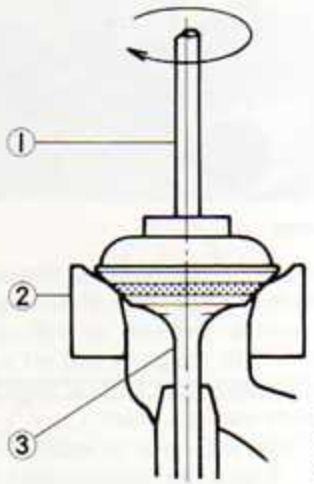
1. Original Seating Surface
2. Cut seating surface with following seat cutters to obtain new seating surface:
   Inlet: Seat Cutter: 57001-1116
   Exhaust: Seat Cutter: 57001-1115
3. New Seating Surface
4. Cut this surface to adjust outside diameter of new seating surface with following outside cutter:
   Inlet and Exhaust: Outside Cutter: 57001-1121
5. Cut this surface to obtain correct width with following inside cutter:
   Inlet: Inside Cutter: 57001-1124
   Exhaust: Inside Cutter: 57001-1123
6. Corrective Seating Surface

After cutting, lap the valve to properly match the valve and valve seat surfaces. Start off with coarse lapping compound, and finish with fine compound.

- Apply compound to the valve seat, and tap the valve lightly into place while rotating it with a lapper. Repeat this until a smooth, matched surface is obtained.
- When lapping is completed, check the valve installed height and adjust if necessary.

Lapping Valve Seat

3-32



1. Lapper
2. Valve Seat
3. Valve

Valve Installed Height Inspection

- Measure the installed valve height from the bottom of the cylinder head lifter hole to the end of the valve stem with a vernier caliper. Refer to the table for the recommended repair.

Valve Installed Height

3-33

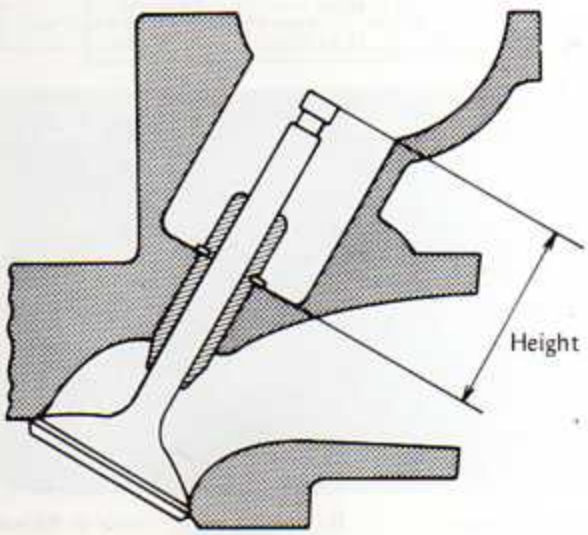


Table 3-22 Valve Stem Installed Height Procedure

Measurement	Probable Cause	Recommendation	
		Assemble with this shim:	After checking valve clearance, final shim may be in this range:
36.30 – 36.64 mm	Normal/acceptable	2.85 mm	2.85 – 3.20 mm
36.65 – 36.69		2.80	2.80 – 3.20
36.70 – 36.74		2.75	2.75 – 3.15
36.75 – 36.79		2.70	2.70 – 3.10
36.80 – 36.84		2.65	2.65 – 3.05
36.85 – 36.89		2.60	2.60 – 3.00
36.90 – 36.94		2.55	2.55 – 2.95
36.95 – 36.99		2.50	2.50 – 2.90
37.00 – 37.04		2.45	2.45 – 2.85
37.05 – 37.09		2.40	2.40 – 2.80
37.10 – 37.14		2.35	2.35 – 2.75
37.15 – 37.19		2.30	2.30 – 2.70
37.20 – 37.24		2.25	2.25 – 2.65
37.25 – 37.29		2.20	2.20 – 2.60
37.30 – 37.34		2.15	2.15 – 2.55
37.35 – 37.39		2.10	2.10 – 2.50
37.40 – 37.44		2.05	2.05 – 2.45
37.45 – 37.49		2.00	2.00 – 2.40
37.50 – 37.54		2.00	2.00 – 2.35
More than 37.54 mm	Valve face and valve seat worn out.	1. Replace valve. Remeasure. 2. Replace cylinder head. Remeasure.	

NOTE: 1. Be sure to mark each valve so it may be properly matched to its corresponding valve seat during assembly.

2. A selection of various thickness valve shims are available for adjusting the valve clearance. There is however, a limit to the amount of adjustment possible using the shims. Resurfacing of the valve face and valve seat inevitably drops the valve deeper into the valve seat, allowing the valve stem end to come closer to the camshaft. Consequently, a thinner shim must be used to compensate for the reduced valve clearance.

3. Over a period of long use and repeated resurfacing, the valve may drop so far into the valve seat. In this case, the installed height becomes so large that even the thinnest shim cannot give adequate clearance, and it should be necessary to replace the valve and remeasure the installed height. If this is not successful, it will be necessary to replace the cylinder head. Replacement valve seats are not available.

Valve Springs:

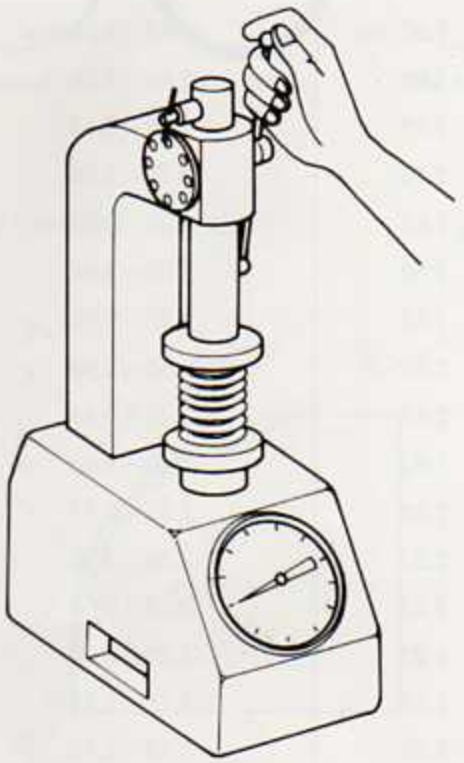
Spring Tension Inspection

- Remove the springs, and set them one at a time, on a spring tension testing device.
- Compress the spring, and read the tension at the test length.
- ★If the spring tension at the specified length is weaker than the service limit, replace the spring.

Table 3-23 Valve Spring Tension

Springs	Test Length	Service Limit
Inner	23.6 mm	24.2 kg
Outer	25.6 mm	44.0 kg

Valve Spring Tension Measurement (3-34)



Spring Squareness Inspection

•Measure the squareness of each spring by standing each end on a surface plate and setting a square against it.

★If the distance between the top of the spring and the square is greater than the service limit, replace the spring.

Valve Spring Squareness (3-35)

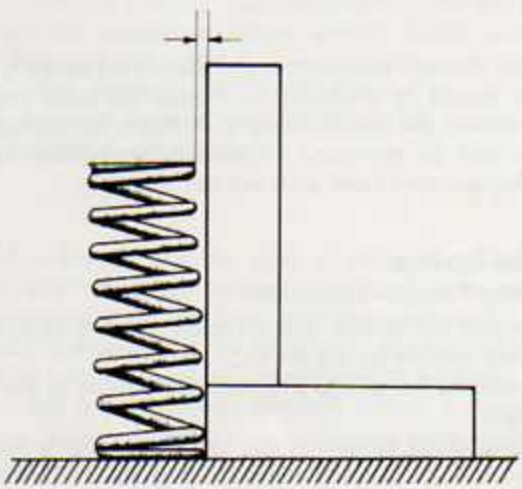


Table 3-24 Valve Spring Squareness

	Inner	Outer
Service Limit	1.3 mm	1.5 mm

Oil Seals:

Oil Seal Inspection

★If an oil seal appears damaged or deteriorated or if there is any doubt as to its condition, replace it with a new one.

Cylinder, Pistons, Piston Rings:

Piston Cleaning

Built-up carbon on the piston head reduces the cooling capability of the piston and raises compression, leading to overheating which could possibly even melt the top of the piston.

•To decarbonize the piston head, remove the piston, scrape off the carbon, and then lightly polish the piston with fine emery cloth.



Carbon accumulated in the piston ring grooves can cause the rings to stick.

•Remove the rings, and clean out any carbon deposits using the end of a broken piston ring or some other suitable tool.

CAUTION

1. When removing carbon, take care not to scratch the side of the piston, or the piston ring grooves.

2. Never clean the piston heads with the engine assembled. If the carbon is scraped from the piston heads with the cylinder left in place, carbon particles will unavoidably drop between the pistons and cylinder walls onto the rings and eventually find their way into the crank chamber. Carbon particles, which are very abrasive, drastically shorten the life of the rings, pistons, cylinders, crankshaft bearings, and oil seals.

Cylinder, Piston Wear Inspection

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

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

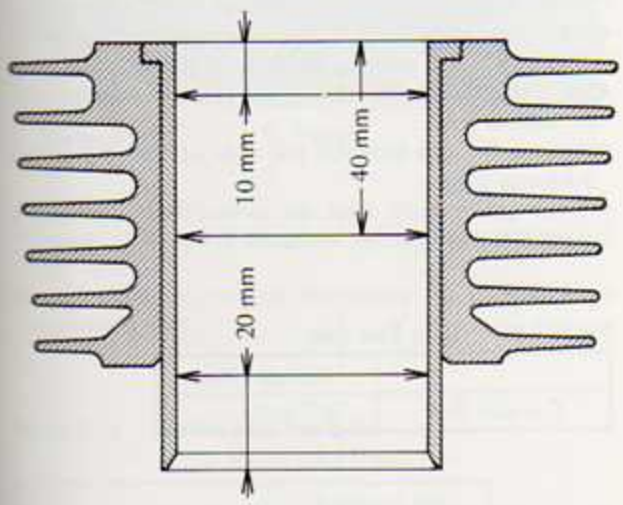
*However, if the amount of boring necessary would make the inside diameter greater than the repair limit, the cylinder block must be replaced.

Table 3-25 Cylinder Inside Diameter†

Service Limit	Repair Limit
62.10 mm, or more than 0.05 mm difference between any two measurements	63.0 mm

†This service limit applies only to cylinder that has not been bored oversize.

Cylinder Inside Diameter Measurement (3-37)



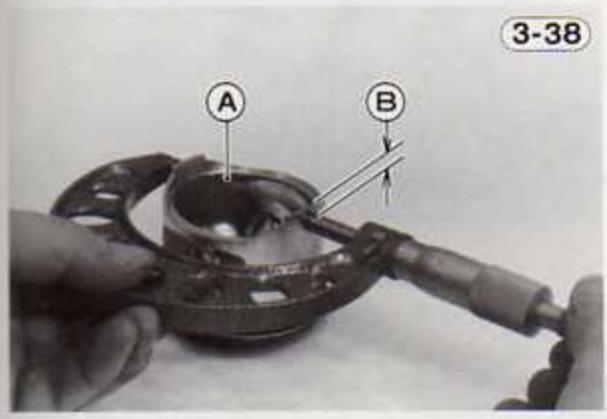
•Measure the outside diameter of each piston 5 mm up from the bottom of the piston at a right angle to the direction of the piston pin.
*If the measurement is under the service limit, replace the piston.

Table 3-26 Piston Diameter†

Service Limit	61.80 mm

†This table applies only to the standard size piston.

(3-38)



A. Piston B. 5 mm

NOTE: 1. Abnormal wear such as a marked diagonal pattern across the piston skirt may mean a bent connecting rod or crankshaft.
2. Whenever the piston or cylinder block has been replaced with a new one, the motorcycle must be broken in the same as with a new machine.

Piston/Cylinder Clearance

The piston-to-cylinder clearance is measured whenever a piston or the cylinder block is replaced with a new one, or whenever a cylinder is rebored and an oversize piston installed. The standard piston-to-cylinder clearance must be adhered to whenever the cylinder block is replaced or a cylinder rebored. If only a piston is replaced, the clearance may exceed the standard slightly. But it must not be less than the minimum, in order to avoid piston seizure.

The most accurate way to find the piston clearance is by making separate piston and cylinder diameter measurements and then computing the difference between the two values. Measure the piston diameter as just described, and measure the cylinder diameter at the very bottom of the cylinder.

Table 3-27 Piston/Cylinder Clearance

Standard	0.030 – 0.057 mm

Boring, Honing

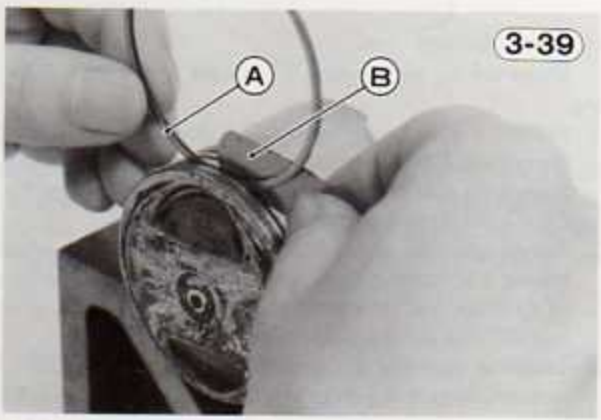
When boring and honing a cylinder, note the following:
1. Before boring a cylinder, first measure the exact diameter of the oversize piston, and then in accordance with the standard clearance given in the table, determine the diameter of the rebore.
2. Never separate the liners from the cylinder when boring and honing the liners; because the top surface of cylinder and liners is machined at the factory as an assembly to get the proper surface.
3. To avoid cylinder distortion due to unbalanced metal temperatures, bore the cylinders in 2-4-1-3 or 3-1-4-2 order.
4. Cylinder inside diameter must not vary more than 0.01 mm at any point.
5. Be wary of measurements taken immediately after boring since the heat affects cylinder diameter.
6. There are two sizes of oversize pistons available: 0.5 mm and 1.0 mm. Oversize pistons require oversize rings.
7. In the case of a rebored cylinder and oversize piston, the service limit for the cylinder is the diameter to which the cylinder was bored plus 0.1 mm, the service limit for the piston is the oversize piston original diameter minus 0.15 mm. If the exact figure for the rebored diameter is unknown, it can be roughly determined by measuring the diameter at the base of the cylinder.

Piston/Cylinder Seizure

- Remove the cylinder block and pistons to check the damage.
- ★If there is only slight damage, the piston may be smoothed with #400 emery cloth, and any aluminum deposits removed from the cylinder with either #400 emery cloth or light honing. However, in most cases, the cylinder will have to be bored oversize and honed, and an oversize piston installed.

Piston Ring, Piston Ring Groove Wear Inspection

- Visually inspect the piston rings and the piston ring grooves.
- ★If the rings are worn unevenly or damaged, they must be replaced.
- ★If the piston ring grooves are worn unevenly or damaged, the piston must be replaced and fitted with new rings. The two rails and the expander of the oil ring must be replaced as a set.
- With the top and second rings in their grooves, make several measurements with a thickness gauge to determine piston ring/groove clearance.
- ★If the clearance exceeds the service limit, measure the thickness of the piston rings and the width of the ring grooves.
- ★If the ring has worn down to less than the service limit, replace the ring; if the groove width exceeds the service limit, replace the piston.



A. Piston Ring **B. Thickness Gauge**

Table 3-28 Piston Ring/Groove Clearance

	Top	2nd
Service Limit	0.18 mm	0.17 mm

Table 3-29 Piston Ring Thickness

	Service Limit
Top and 2nd	1.10 mm

Table 3-30 Piston Ring Groove Width

	Service Limit
Top	1.33 mm
2nd	1.32 mm
Oil	2.61 mm

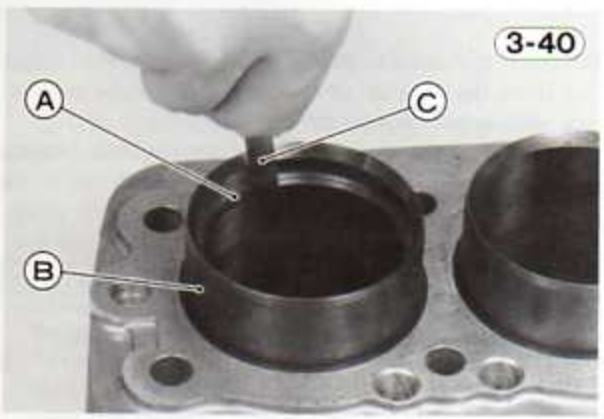
- When new rings are being fitted into a used piston, check for uneven groove wear by inspecting the ring seating. The rings should fit perfectly parallel to the groove surfaces.
- ★If not, the piston must be replaced.

Piston Ring End Gap Inspection (Top, Second)

- Place the piston ring inside the cylinder, using the piston to locate the ring squarely in place.
- Set it close to the bottom of the cylinder, where cylinder wear is low.
- Measure the gap between the ends of the ring with a thickness gauge.
- ★If the gap is wider than the service limit, the ring is overworn and must be replaced.

Table 3-31 Ring End Gap

	Service Limit
Top and 2nd	0.7 mm



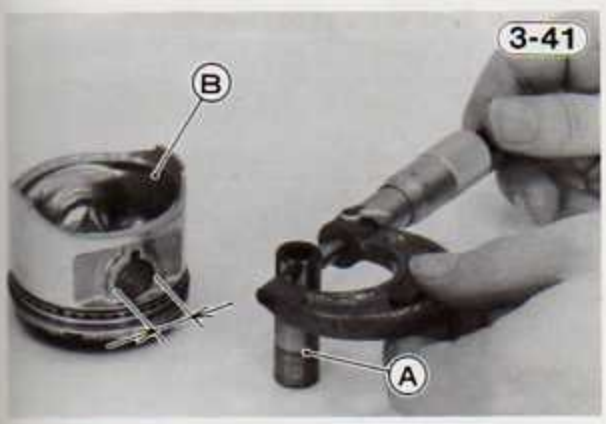
A. Piston Ring **C. Thickness Gauge**
B. Cylinder Block

NOTE: 1. The service limit is effective also for the bored cylinder, oversize piston, and piston rings.

Piston, Piston Pin, Connecting Rod Wear Inspection

- Measure the diameter of the piston pin with a micrometer, and measure the inside diameter of both piston pin holes in the piston.

★If the piston pin diameter is less than the service limit at any point, replace the piston pin.
★If either piston pin hole diameter exceeds the service limit, replace the piston.

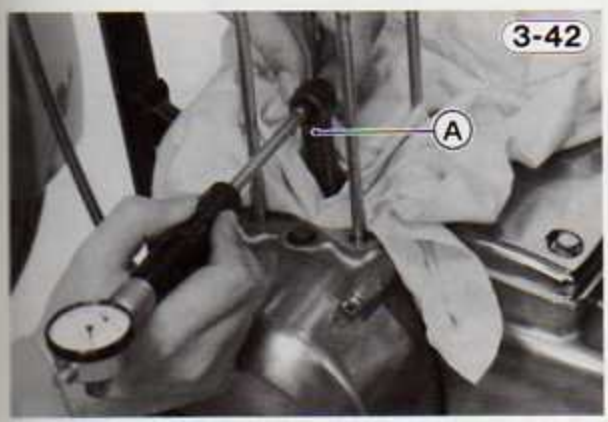


A. Piston Pin B. Piston

•Measure the inside diameter of the connecting rod small end.
★If the diameter exceeds the service limit, replace the connecting rod.

Table 3-32 Piston Pin, Pin Hole, Small End Diameter

	Service Limit
Piston Pin	14.96 mm
Piston Pin Hole	15.07 mm
Small End	15.05 mm



A. Connecting Rod Small End

NOTE: 1. When a new piston or pin is used, also check that piston-to-pin clearance is 0.006 – 0.015 mm, and that pin to small end clearance is within 0.005 – 0.020 mm.

CRANKSHAFT, CONNECTING RODS

The following explanation concerns the most common crankshaft and connecting rod problems, giving the procedure for detecting damage and measuring wear and runout.

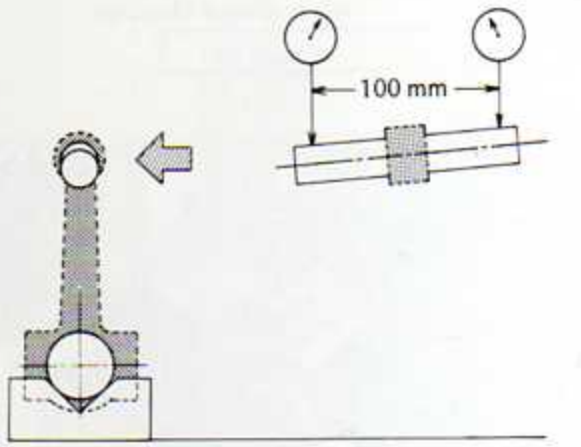
Connecting Rod Bend, Twist Inspection

•Remove the connecting rod big end bearing inserts and replace the connecting rod big end cap.
•Select an arbor of the same diameter as the connecting rod big end and of optional length, and insert it through the big end of the connecting rod.
•Select an arbor of the same diameter as the piston pin and of optional length, and insert it through the small end of the connecting rod.
•On a surface plate, set the big-end arbor on V blocks so that the connecting rod is perpendicular to the surface plate.
•Using a height gauge or dial gauge, measure the difference in the height of the small-end arbor above the surface plate over a 100 mm length to determine the armount the connecting rod is bent.
★If the measurement exceeds the service limit, replace the connecting rod.

Table 3-33 Connecting Rod Bend/100 mm

Service Limit	0.2 mm

Connecting Rod Bend Measurement 3-43

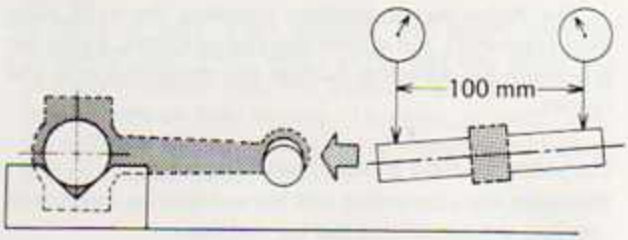


•Swing the connecting rod 90° to one side and support it parallel to the surface plate.
•Measure the difference in the height of the small-end arbor above the surface plate over a 100 mm length to determine the amount the connecting rod is twisted.
★If the measurement exceeds the service limit, replace the connecting rod.

Table 3-34 Connecting Rod Twist/100 mm

Service Limit	0.2 mm

Connecting Rod Twist Measurement (3-44)



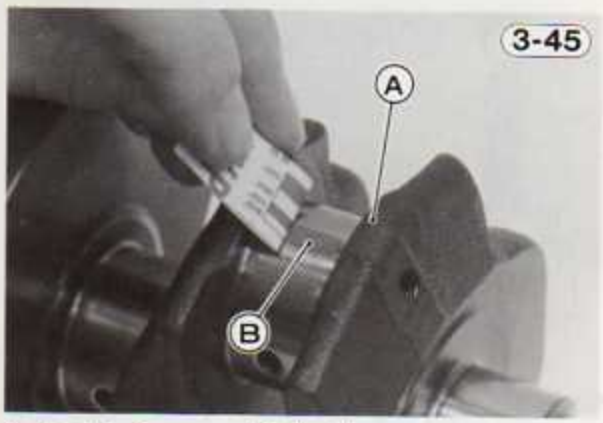
Connecting Rod Bearing Insert/Journal Wear Inspection

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

- Remove the connecting rods, and wipe each journal and connecting rod bearing surface clean of oil. Cut strips of plastigauge to bearing insert width. Place a strip on the connecting rod bearing insert on each connecting rod parallel to the crankshaft so the plastigauge will be compressed between the bearing insert and the connecting rod journal. Install the connecting rods, tightening the nuts with the specified torque.
- Remove the connecting rods, and measure the plastigauge width to determine the bearing insert/journal wear.

Table 3-35 Connecting Rod Bearing Insert/Journal Clearance

Service Limit	0.10 mm



A. Crankshaft **B. Plastigauge**

★If the clearance exceeds the service limit, replace the bearing inserts.

Connecting Rod Bearing Insert Replacement

- With a micrometer, measure the diameter of the crankshaft journals on which the connecting rods fit.
- Mark each flywheel in accordance with the journal diameter.

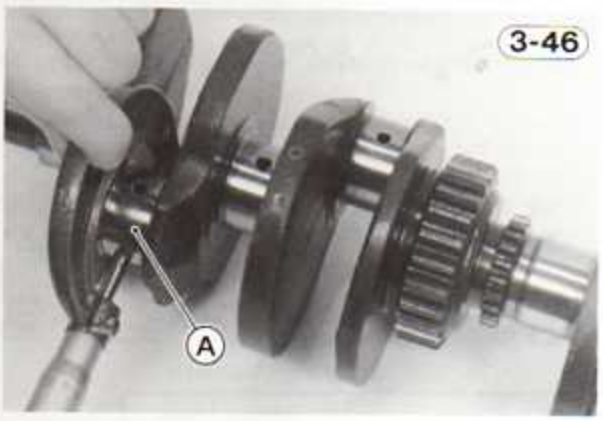
Table 3-36 Connecting Rod Journal Diameter

Marking	Standard	Service Limit
No mark	34.984 – 34.994 mm	34.97 mm
○	34.995 – 35.000 mm	

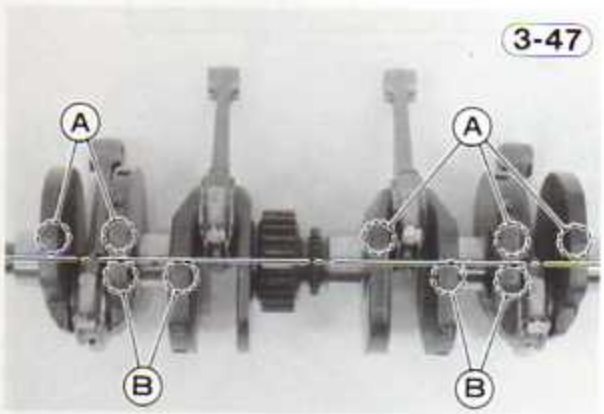
★If the measurements is less than the service limit, replace the crankshaft.

★If the measurements is less than the standard value, but is not under the service limit; use bearing inserts painted green.

NOTE: 1. Any mark already on the flywheel should not be referred to during servicing.



A. Connecting Rod Journal



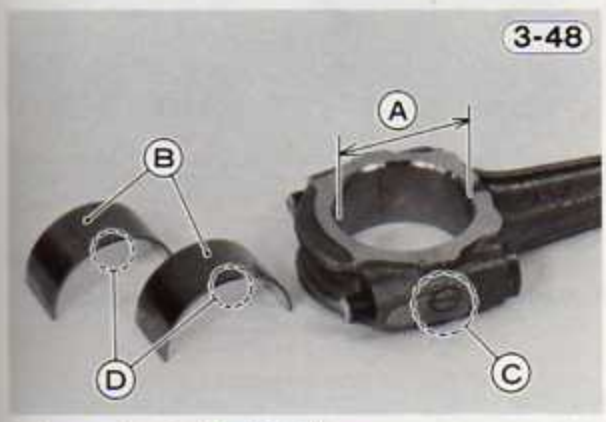
A. Marking for Crankshaft Journal Diameter
B. Marking for Connecting Rod Journal Diameter ("○" or No Mark)

- Put the connecting rod big end caps on the rods and tighten the nuts with the specified torque.
- Measure the inside diameter, and mark each connecting rod big end in accordance with the inside diameter.

NOTE: 1. The mark already on the big end should almost coincide with the measurement.

Table 3-37 Connecting Rod Big End Diameter

Marking	Standard
○	38.009 – 38.016 mm
No mark	38.000 – 38.008 mm



A. Connecting Rod Inside Diameter
B. Bearing Inserts
C. Marking ("○" or No Mark)
D. Painted Mark (Green, Black, or Brown)

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

Table 3-38 Bearing Insert Selection

Con-Rod Marking / Crankshaft Marking	○	No mark
○	Black P/N: 13034-051	Brown P/N: 13034-052
No mark	Green P/N: 13034-050	Black P/N: 13034-051

Table 3-39 Bearing Insert Thickness

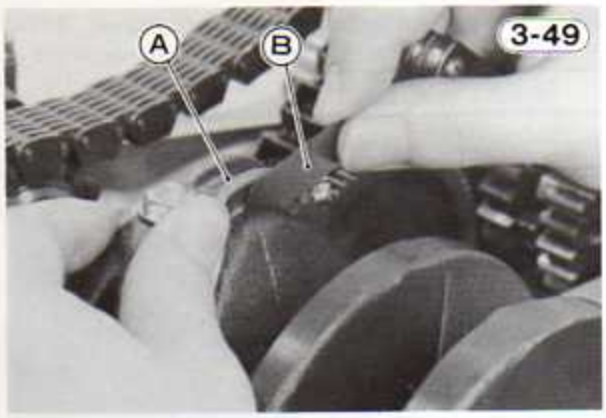
Color	Thickness
Green	1.485 – 1.490 mm
Black	1.480 – 1.485 mm
Brown	1.475 – 1.480 mm

Connecting Rod Side Clearance Inspection

•Measure the side clearance of the connecting rod with a thickness gauge.
*If the clearance exceeds the service limit, replace the crankshaft and the connecting rod.

Table 3-40 Connecting Rod Big End Side Clearance

Service Limit	0.45 mm



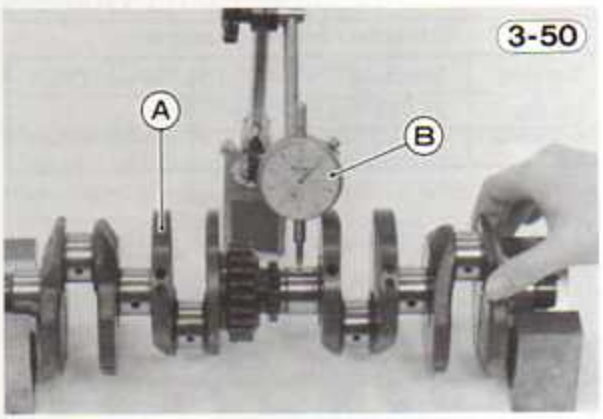
A. Connecting Rod B. Thickness Gauge

Crankshaft Runout Inspection

•Set the crankshaft in a flywheel alignment jig or on V blocks, and place a dial gauge against the points indicated.
•Turn the crankshaft slowly. The maximum difference in gauge readings is the crankshaft runout.
*If the measurement exceeds the service limit, replace the connecting rod.

Table 3-41 Crankshaft Runout

Service Limit	0.05 mm



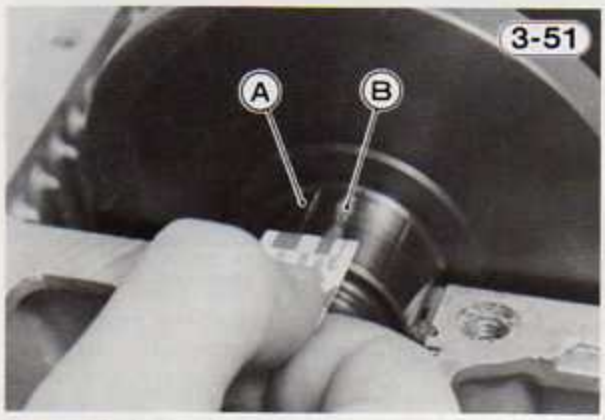
A. Crankshaft B. Dial Gauge

Crankshaft Bearing Insert/Journal Wear Inspection

•Remove the crankshaft. Clean off the oil, and install the crankshaft. Cut strips of plastigauge to bearing insert width. Place a strip on each journal parallel to the crankshaft so the plastigauge will be compressed between the insert and the crankshaft journal. Install the lower crankcase half without turning the crankshaft, and tighten the bolts in the correct sequence with the specified amount of torque.
•Remove the lower crankcase half (making sure that the crankshaft does not turn at any time), and measure the plastigauge width to determine the bearing insert/journal wear.

Table 3-42 Crankshaft Bearing Insert/Journal Clearance

Service Limit	0.08 mm



A. Crankshaft Journal B. Plastigauge

★If any clearance exceeds the service limit, replace all bearing inserts (10).

Crankshaft Bearing Insert Replacement

•Measure the diameter of the crankshaft journals which wear on these bearing inserts. Mark each flywheel in accordance with the journal diameter.

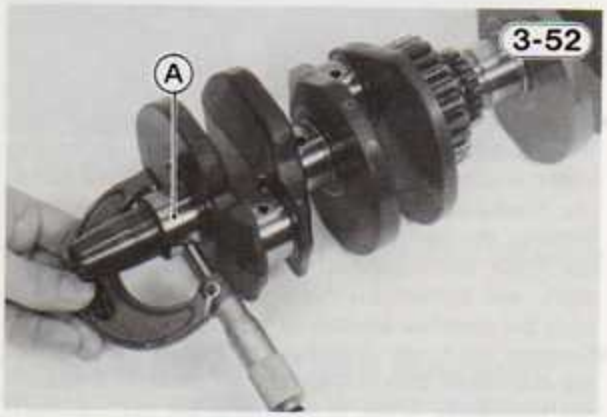
Table 3-43 Crankshaft Journal Diameter

Marking	Standard	Service Limit
No mark	35.984 – 35.992 mm	35.96 mm
1	35.993 – 36.000 mm	

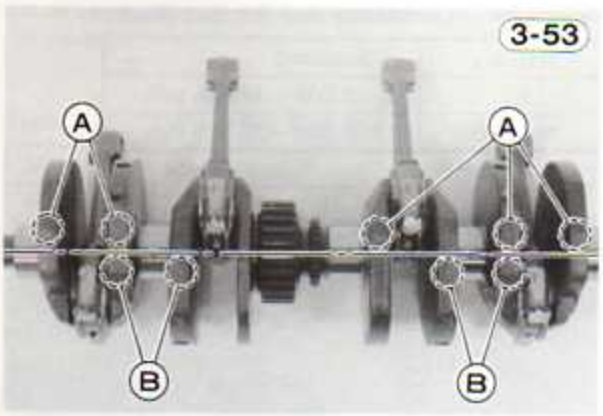
★If the measurements is less than the service limit, replace the crankshaft.

★If the measurements is less than the standard value, but is not under the service limit; use bearing inserts painted green.

NOTE: 1. Any mark already on the flywheel should not be referred to during servicing.



A. Crankshaft Journal



A. Marking for Crankshaft Journal Diameter ("1" or No Mark)
B. Marking for Connecting Rod Journal Diameter

•Put the lower crankcase half on the upper crankcase half without the bearing inserts, and tighten the bolts to the specified torque.

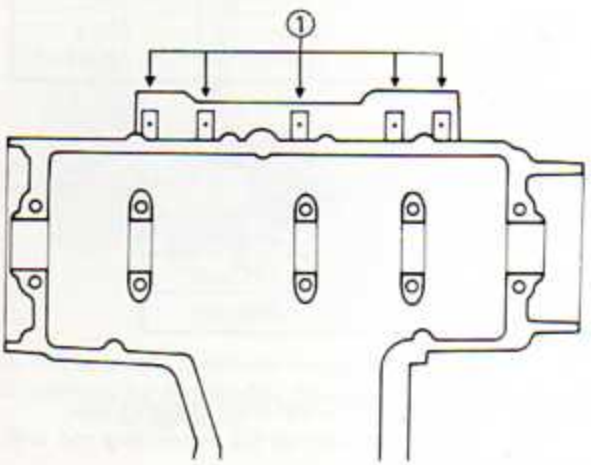
•Measure the inside diameter, and mark the upper crankcase half in accordance with the inside diameter.

NOTE: 1. The mark already on the upper crankcase half should almost coincide with the measurement.

Table 3-44 Crankshaft Bearing Insert Diameter

Marking	Standard
○	39.000 – 39.008 mm
No mark	39.009 – 39.016 mm

Upper Crankcase Marking 3-54



1. Marking ("○" or No mark)

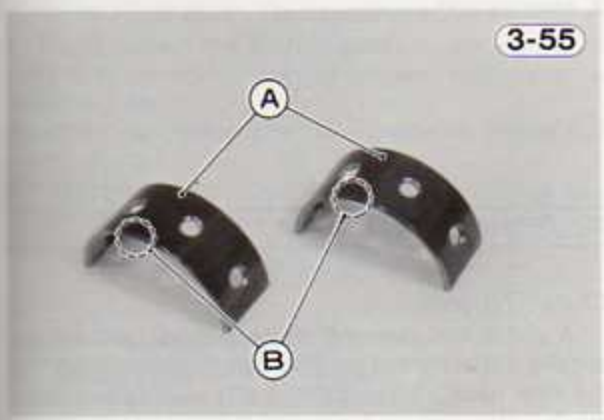
•Select the proper bearing inserts in accordance with the combination of the crankcase and the crankshaft marks.

Table 3-45 Crankshaft Bearing Insert Selection

Crankshaft Marking \ Crankcase Marking	○	No mark
1	Brown P/N: 92028-1102	Black P/N: 92028-1101
No mark	Black P/N: 92028-1101	Blue P/N: 92028-1100

Table 3-46 Crankshaft Bearing Insert Thickness

Color	Thickness
Brown	1.490 – 1.494 mm
Black	1.494 – 1.498 mm
Blue	1.498 – 1.502 mm



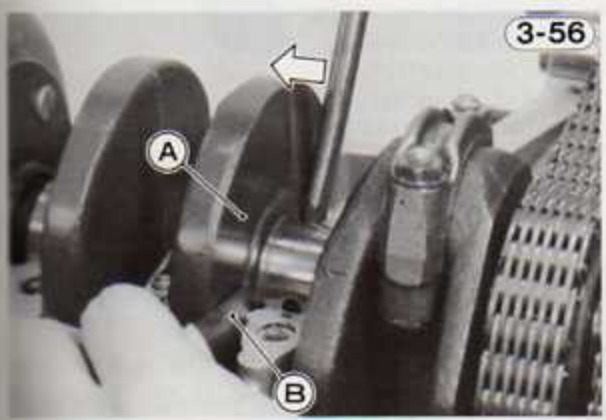
A. Bearing Inserts
B. Painted Mark (Brown, Black or Blue)

Crankshaft Side Clearance Inspection

- Measure the crankshaft side clearance with a thickness gauge at the second main journal from the left.
- ★If the clearance exceeds the service limit, replace the crankcase halves as a set.

Table 3-47 Crankshaft Side Clearance

Service Limit	0.40 mm

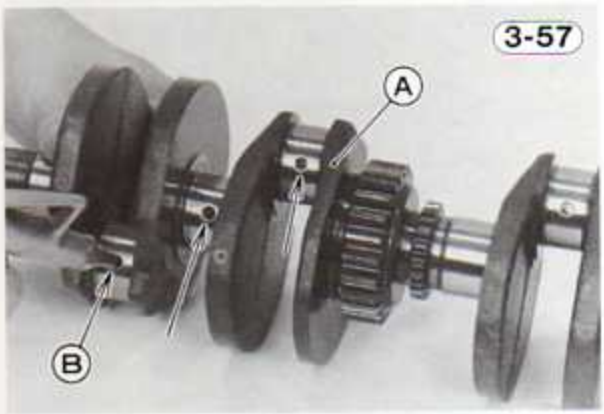


A. Crankshaft B. Thickness Gauge

NOTE: 1. The upper crankcase half and the lower crankcase half are machined at the factory in the assembled state, so the crankcase halves must be replaced as a set.

Oil Passage Cleaning

- Use compressed air to remove any foreign particles or residue that may have accumulated in the crankshaft oil.

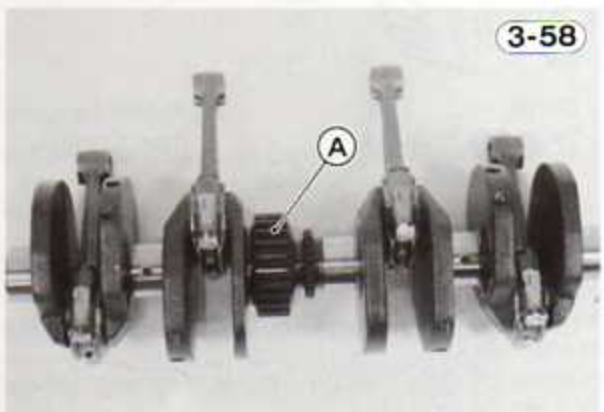


A. Crankshaft B. Compressed Air

PRIMARY CHAIN, SPROCKETS

Primary Chain Drive Sprocket Damage Inspection

- Inspect the teeth on the primary chain drive sprocket (located at the center of the crankshaft).
- ★Any light damage can be corrected with an oilstone, but the crankshaft must be replaced if the teeth are badly damaged. Damaged teeth on the primary chain drive sprocket indicate that the primary chain, by which it is driven, may also be damaged. At the same time that the primary chain drive sprocket is repaired or replaced, the primary chain and the primary chain driven sprocket (located on the secondary shaft) should be inspected, and then replaced if necessary.



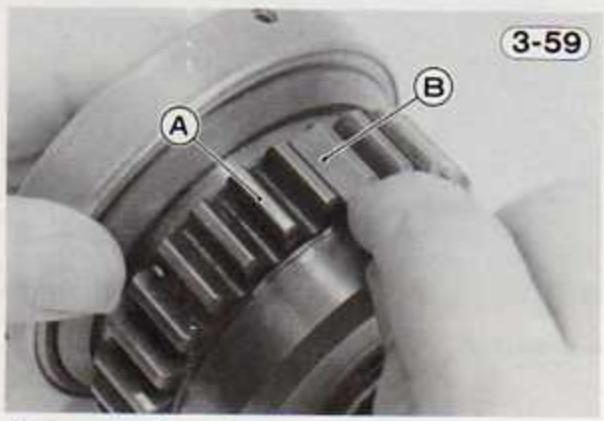
A. Primary Chain Drive Sprocket

Secondary Sprocket Damage Inspection

•Inspect the teeth on the secondary sprocket.

★If the teeth of the sprocket are light damaged, correct them with an oilstone, but the secondary sprocket must be replaced if the teeth are badly damaged.

NOTE: 1. Damaged teeth on the secondary sprocket indicate that the primary chain, by which it is driven, may also be damaged. At the same time that the secondary sprocket is repaired or replaced, the primary chain should be inspected, and then replaced if necessary.



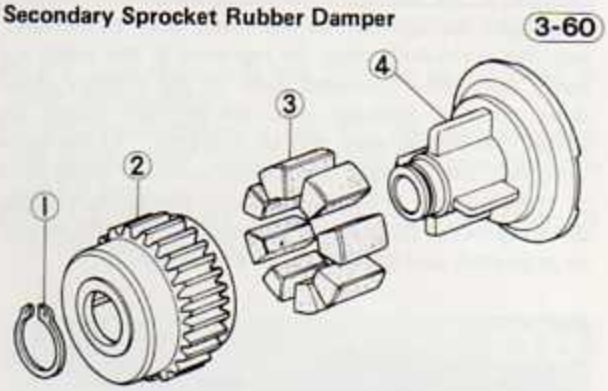
A. Secondary Sprocket **B. Oilstone**

Damper Inspection

•Disassemble the secondary sprocket coupling, and inspect the rubber dampers.

★If they appear damaged or deteriorated, replace them.

Secondary Sprocket Rubber Damper



1. Circlip
2. Secondary Sprocket
3. Rubber Dampers
4. Inner Coupling

Primary Chain Wear Inspection

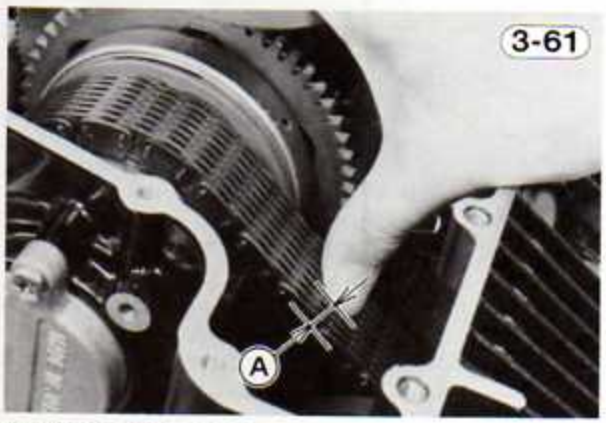
A primary chain which has worn so that it is 1.4% or more longer than when new is no longer safe for use and should be replaced. Inspect the chain wear by measuring the chain slack.

•Measure the chain slack (the vertical movement midway between the sprockets).

★If it has worn past the service limit, replace the chain.

Table 3-48 Primary Chain Slack

Service Limit	27 mm



A. Measure at the center.

CLUTCH

Clutch Trouble

A clutch that does not properly disengage will cause shifting difficulty and possible transmission damage. On the other hand, a slipping clutch will reduce power transmission efficiency and may overheat and burn out. A clutch that does not properly disengage may be caused by:

1. Excessive clutch lever play.
2. Clutch plates that are warped or too rough.
3. Uneven clutch spring tension.
4. Deteriorated engine oil.
5. Engine oil viscosity too high.
6. Engine oil level too high.
7. The clutch housing frozen or the drive shaft.
8. A defective clutch release mechanism.
9. An unevenly worn clutch hub or housing.
10. Missing parts.

A slipping clutch may be caused by:

1. No clutch lever play.
2. Worn friction plates.
3. Weak clutch springs.
4. The clutch cable not sliding smoothly.
5. A defective clutch release mechanism.
6. An unevenly worn clutch hub or housing.

Clutch noise may be caused by:

1. Too much backlash between the secondary shaft gear and the clutch gear.
2. Damaged gear teeth.
3. Too much clearance between the friction plate tangs and the clutch housing.
4. Needle bearing worn or damaged.
5. Weak or damaged damper rubber(s).

6. Metal chips jammed into the clutch housing gear teeth.

Spring Tension Inspection

- Remove the clutch springs, and set them, one at a time, on a spring tension testing device.
- Compress the spring, and read the tension at the test length.
- ★If the spring tension at the specified length is weaker than the service limit, replace the spring.

Table 3-49 Clutch Spring Tension

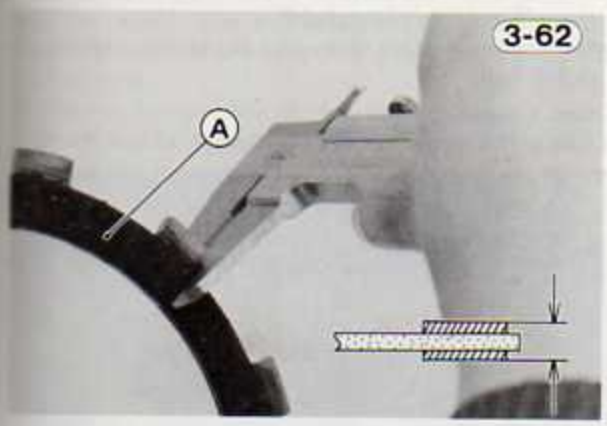
Test Length	Service Limit
23.5 mm	22.5 kg

Friction Plate Wear, Damage Inspection

- Visually inspect the friction plates to see whether or not they show any signs of seizure, overheating, or uneven wear.
- Measure the thickness of the plates with vernier caliper.
- ★If any plates show signs of damage, or if they have worn past the service limit, replace them with new ones.

Table 3-50 Friction Plate Thickness

Service Limit	3.5 mm



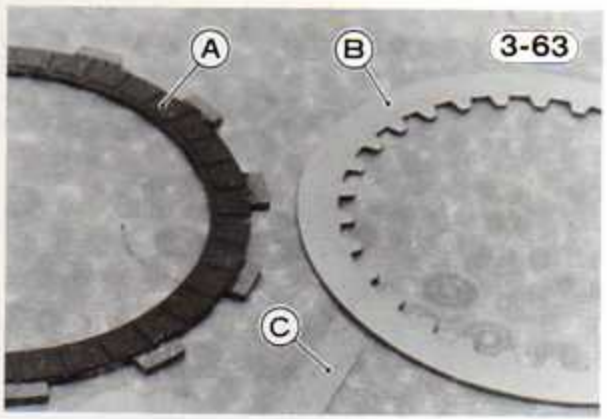
A. Friction Plate

Clutch Plate Warp Inspection

- Place each clutch plate on a surface plate, and measure the gap between each clutch plate and the surface plate. This gap is the amount of clutch plate warp.
- ★If any plates warped over the service limit, replace the clutch plate.

Table 3-51 Clutch Plate Warp

Service Limit	0.3 mm



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

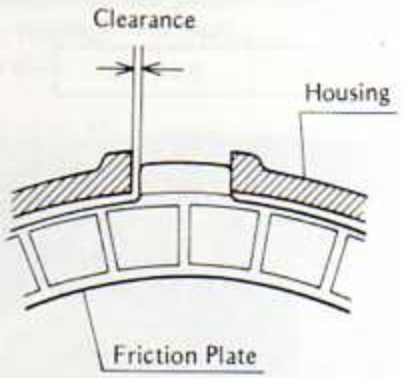
Friction Plate/Clutch Housing Clearance Inspection

- Measure the clearance between the tangs on the friction plates and the fingers of the clutch housing. If this clearance is excessive, the clutch will no noisy.
- ★If the clearance exceeds the service limit, replace the friction plates. Also, replace the clutch housing if it is unevenly or badly worn where the friction plates wear against it.

Table 3-52 Friction Plate/Clutch Housing Clearance

Service Limit	1.0 mm

Friction Plate/Clutch Housing Clearance 3-64

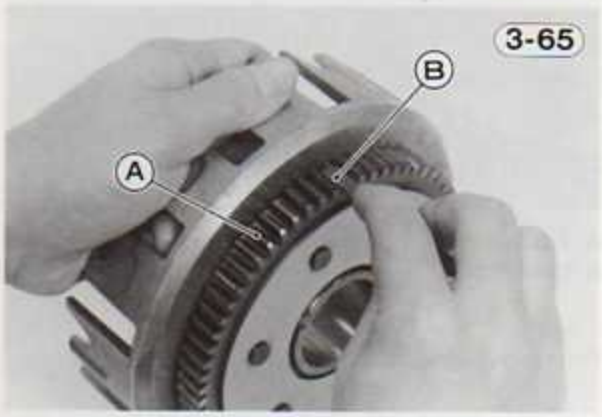


- Inspect the fingers of the housing where the tangs of the friction plates hit them.
- ★If they are badly worn or if there are grooves cut where the tangs hit, replace the clutch housing.

Clutch Housing Gear Damage Inspection

- Inspect the teeth on the clutch housing gear.
- ★If the teeth of the gear are light damaged, correct them with an oilstone, but the clutch housing must be replaced if the teeth are badly damaged.

NOTE: 1. Damaged teeth on the clutch housing gear indicate that the secondary shaft gear, by which it is driven, may also be damaged. Whenever the clutch housing gear is repaired or replaced, the secondary shaft gear should be inspected, and then replaced if necessary.



A. Clutch Housing Gear **B. Oilstone**

Clutch Housing Gear/Secondary Shaft Gear Backlash Inspection

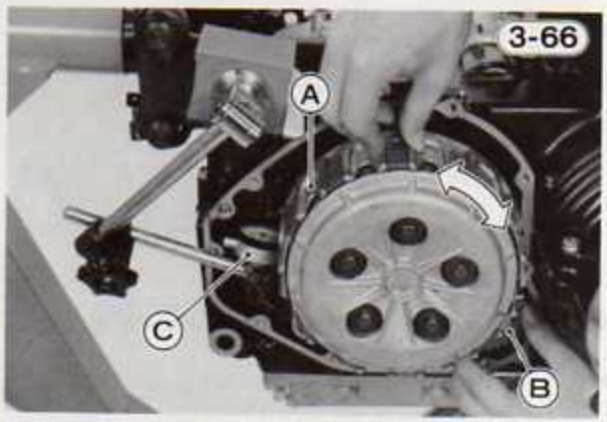
Measure the backlash between the clutch housing gear and secondary shaft gear.

- To measure the backlash, set a dial gauge against the teeth of one gear. Then move the gear back and forth while holding the other gear steady. The difference between the highest and the lowest gauge reading is the amount of backlash.

★If the amount of backlash exceeds the service limit, replace both the clutch housing and the secondary shaft gear.

Table 3-53 Clutch Housing Gear/Secondary Shaft Gear Backlash

Service Limit	0.14 mm



A. Clutch Housing **C. Dial Gauge**
B. Secondary Shaft Gear

Clutch Housing/Drive Shaft Sleeve Wear Inspection

- Measure the diameter of the drive shaft sleeve with a micrometer.

★If the diameter is less than the service limit, replace the drive shaft sleeve.

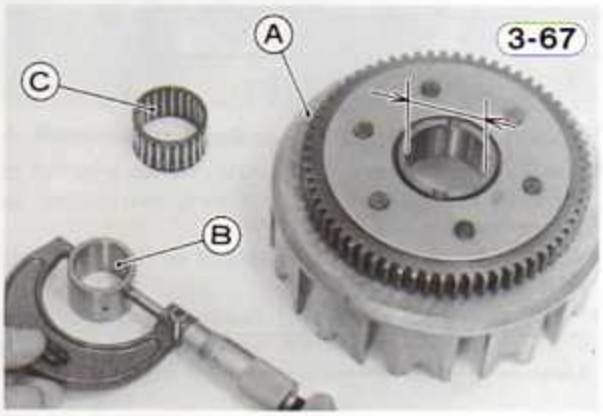
- Measure the inside diameter of the clutch housing with a cylinder gauge.

★If the diameter exceeds the service limit, replace the clutch housing.

NOTE: 1. When replacing the clutch housing and/or drive shaft sleeve, replace the clutch housing needle bearing also.

Table 3-54 Clutch Housing, Sleeve Diameter

	Clutch Housing	Sleeve
Service Limit	37.03 mm	31.96 mm



A. Clutch Housing **C. Needle Bearing**
B. Drive Shaft Sleeve

Clutch Hub Damage Inspection

- Inspect where the teeth on the steel plates wear against the splines of the clutch hub.

★If there are notches worn into the splines, replace the clutch hub.

Clutch Release Gear Wear Inspection

- With the clutch release assembled, push the inner release gear back and forth in the direction of the shaft without turning it.

★If there is excessive play, replace the clutch release assembly.

Lubrication

- Lubricate the clutch release gear with grease.

TRANSMISSION

Transmission Trouble

Transmission or external shift mechanism damage, causing the transmission to misshift, overshift, and/or jump out of gear, can cause further damage to the transmission and overrev damage to the engine itself. An improperly functioning transmission or external shift mechanism may be caused by the following:

1. Loose return spring pin
2. Broken or weakened return spring or shift drum positioning pin spring.
3. Broken or weakened shift pawl spring
4. Damaged shift arm and/or overshift limiter
5. Loose shift drum guide bolt
6. Bent or worn shift fork(s)
7. Worn shift fork grooves on gears D3, O4 and/or O5
8. Worn shift fork guide pin(s)
9. Worn shift drum groove(s)
10. Binding of shift drum positioning pin in the positioning bolt
11. Worn or damaged gear dogs, gear dog holes, and/or gear dog recesses
12. Improperly functioning clutch or clutch release
13. Improper assembly or missing parts

Transmission noise results from worn or damaged shafts, bearings, gear hubs or teeth, etc.

Neutral Switch Inspection

If the neutral indicator light does not go on in the neutral position, or if it goes on in other positions –

•Check that the shift drum pin plate is installed in the correct position.

★If it is not, reinstall it in the correct position.

If the neutral indicator light does not go on in all positions, or if it goes on in all positions –

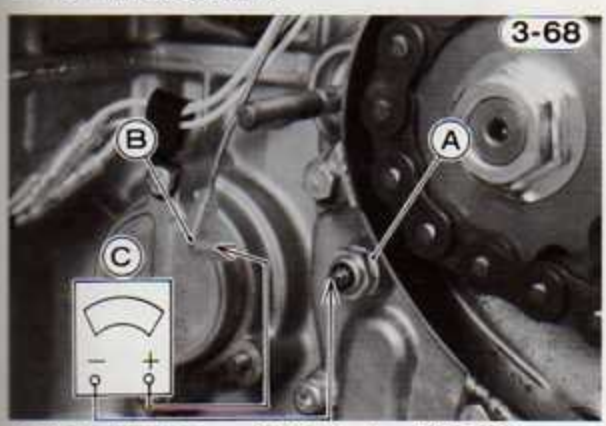
•Remove the engine sprocket cover, and disconnect the neutral switch lead.

•To check for the voltage, first turn the meter to 25V DC, connect the (+) meter lead to the switch lead, and connect the (–) meter lead to chassis ground.

•Turn the ignition switch on, and see if the meter reads battery voltage.

★If the meter does not indicate battery voltage, the trouble is either defective wiring or a burned-out indicator bulb.

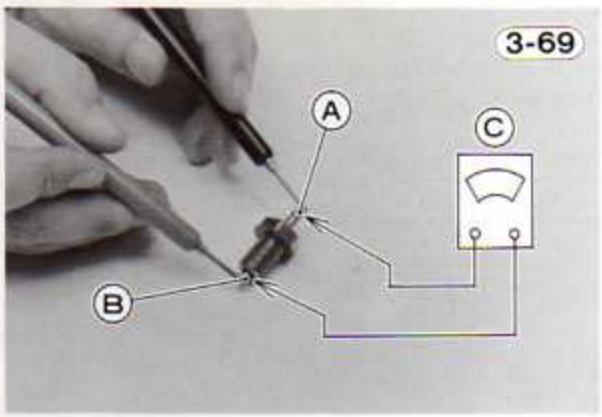
★If the voltmeter reads battery voltage, then the neutral switch may be defective.



A. Neutral Switch **C. Voltmeter (25V DC)**
B. Switch Lead

•To check the neutral switch, first remove the switch, turn the meter to the x 1 Ω range, and measure the resistance between the switch terminal and the spring loaded pin.

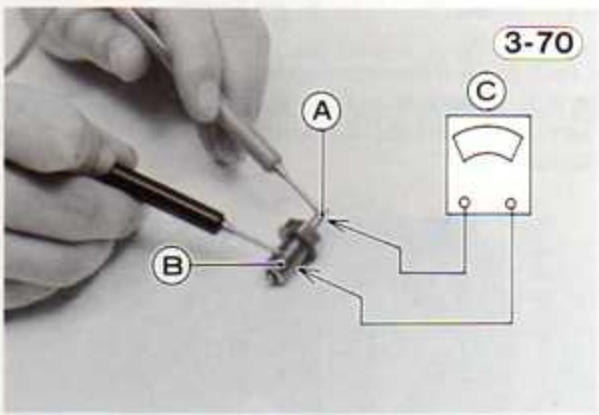
★If the resistance is not close to zero ohms, the switch is defective, and must be replaced.



A. Switch Terminal **C. Ohmmeter (x 1 Ω)**
B. Spring Loaded Pin

•If the resistance is close to zero ohms, measure the resistance between the switch terminal or spring loaded pin and the switch body.

★If there is any meter reading, the neutral switch is defective and must be replaced.

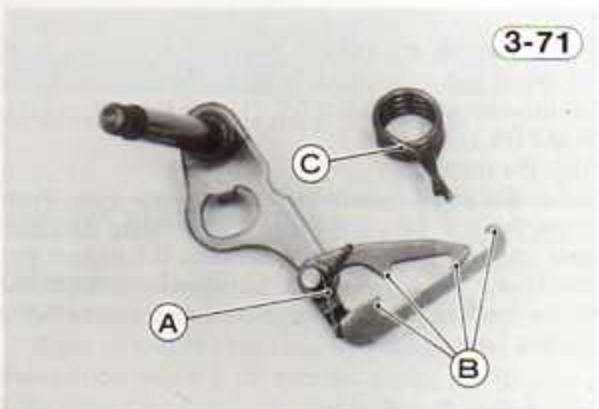


A. Switch Terminal **C. Ohmmeter (x 1 Ω)**
B. Switch Body

External Shift Mechanism Inspection

•Inspect the shift pawl spring, shift pawls, and return spring.

★If they are broken or otherwise damaged, replace them.

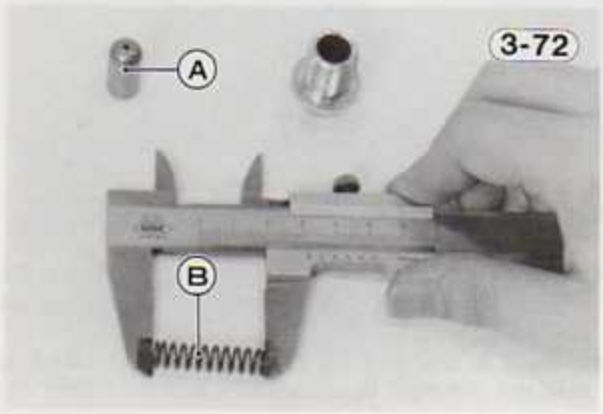


A. Pawl Spring **C. Return Spring**
B. Shift Pawls

•Measure the free length of the shift drum positioning pin spring.
★If it is shorter than the service limit, replace it with a new one.

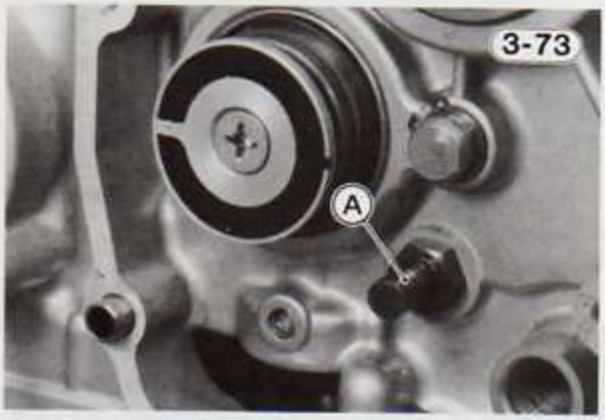
Table 3-55 Positioning Pin Spring Free Length

Service Limit	30.7 mm



A. Positioning Pin **B. Pin Spring**

•Check to see if the return spring pin is loose.
★If it is, remove it and apply a non-permanent locking agent to the threads, and then tighten it to the specified torque.



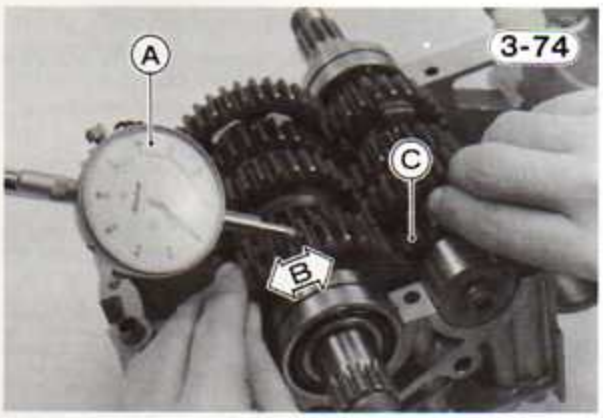
A. Return Spring Pin

Gear Backlash Inspection

Leaving the transmission in place, measure the backlash between gears O1 and D1, O2 and D2, O3 and D3, O4 and D4, O5 and D5.
•Split the crankcase.
•Set a dial gauge against the teeth on one gear. Then move the gear back and forth while holding the other gear steady. The difference between the highest and the lowest gauge reading is the amount of backlash.
★If the amount of backlash exceeds the service limit, replace both gears.

Table 3-56 Gear Backlash

Service Limit	0.25 mm



A. Dial Gauge **B. Move** **C. Hold**

Shift Fork Bending Inspection

A bent fork could cause difficulty in shifting or allow the transmission to jump out of gear when under power.
•Visually inspect the shift forks.
★If the shift fork is bent, replace it.

Shift Fork/Gear Groove Wear Inspection

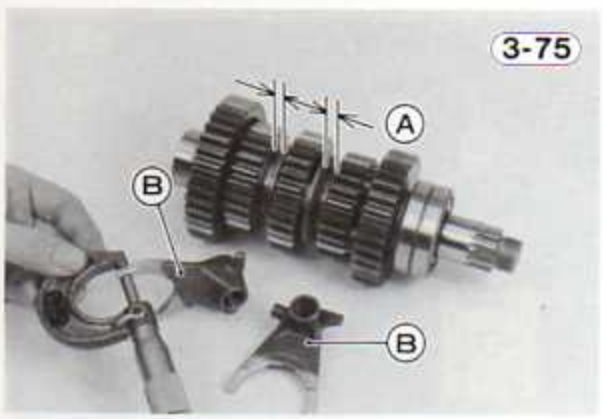
•Measure the thickness of the ears of each shift fork, and measure the width of the shift fork grooves on gears D3, O4, and O5.
★If the thickness of a shift fork ear is under the service limit, the shift fork must be replaced.
★If a gear shift fork groove is worn over the service limit, the gear must be replaced.

Table 3-57 Shift Fork Thickness

Service Limit	4.7 mm

Table 3-58 Gear Shift Fork Groove Width

Service Limit	5.25 mm



A. Gear Shift Fork Grooves **B. Shift Fork**

Shift Fork Guide Pin/Shift Drum Groove Wear Inspection

•Measure the diameter of each shift fork guide pin, and measure the width of each shift drum groove.
★If the shift fork guide pin has worn past the service limit, replace the shift fork.

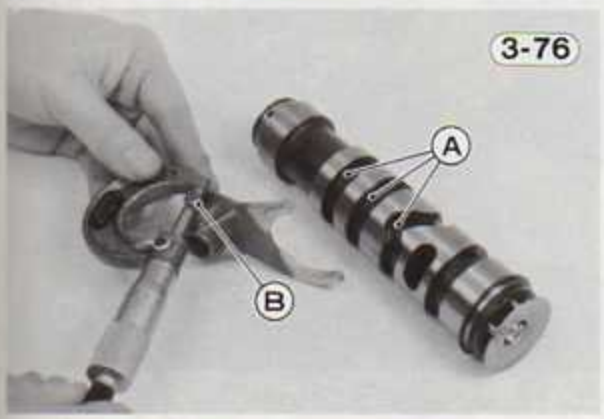
★If a shift drum groove is worn past the service limit, replace the shift drum.

Table 3-59 Shift Fork Guide Pin Diameter

	on Shift Rod	on Shift Drum
Service Limit	7.85 mm	7.93 mm

Table 3-60 Shift Drum Groove Width

Service Limit	8.25 mm



A. Shift Drum Grooves **B. Shift Fork Guide Pin**

Gear Dog, Gear Dog Hole, Gear Dog Recess Damage Inspection

- Visually inspect the gear dogs, gear dog holes, and gear dog recesses.
- ★If the gears have damaged, or unevenly or excessively worn dogs, dog holes, or dog recesses, replace them.



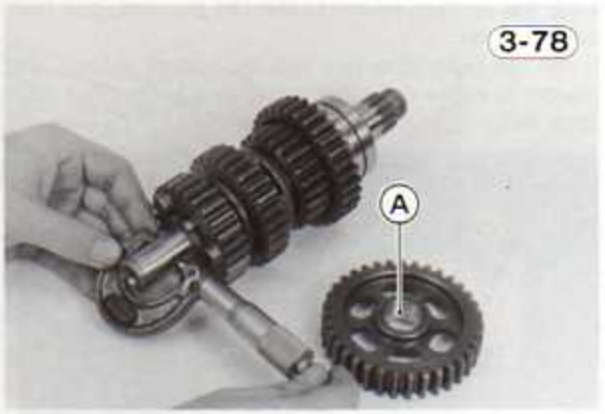
A. Gear Dog **B. Dog Hole** **C. Dog Recess**

Gear/Shaft Clearance Inspection

- Measure the diameter of each shaft and bush with a micrometer, and measure the inside diameter of each gear listed below.
- ★If the difference between the two readings to figure clearance exceeds the service limit, replace the gear.

Table 3-61 Gear/Shaft, Gear/Bush Clearance

	O2, O3, D4, D5	O1
Service Limit	0.16 mm	0.17 mm



A. Bush

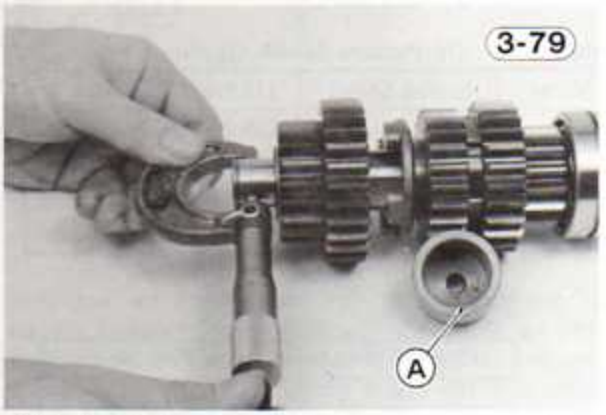
Shaft/Needle Bearing Outer Race Wear Inspection

- Measure the diameter of the drive and output shafts where it passes through the needle bearing.
- ★If the diameter is less than the service limit, replace the shaft.
- Measure the inside diameter of the needle bearing outer race with a cylinder gauge.
- ★If the diameter exceeds the service limit, replace the outer race.

NOTE: 1. When replacing the shaft and/or outer race, replace the needle bearing also.

Table 3-62 Shaft, Needle Bearing Outer Race Diameter

	Shaft	Outer Race
Service Limit	19.96 mm	26.04 mm



A. Needle Bearing Outer Race

ENGINE LUBRICATION

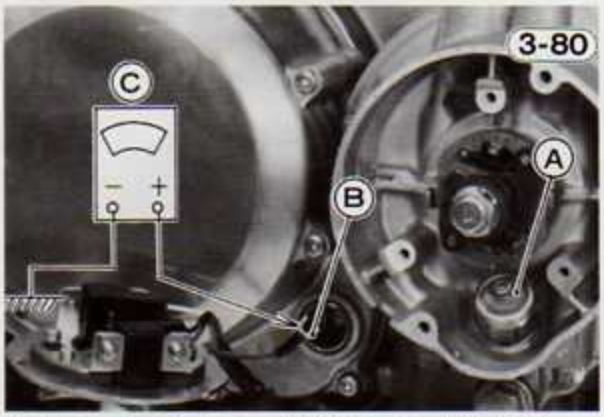
Oil Pressure Switch:

Oil Pressure Switch Inspection

If the oil pressure indicator light does not go on when the ignition switch is on with the engine not running –

- Disconnect the switch lead.
- Connect the 25V DC voltmeter (+) lead to the switch lead, and ground the voltmeter (–) lead to the engine.

•Turn the ignition switch to the ON position, and read the voltmeter.
★If the voltmeter does not indicate battery voltage, the trouble is either defective wiring or a burned-out indicator bulb.



A. Oil Pressure Switch **C. Voltmeter (25V DC)**
B. Switch Lead

★If the voltmeter does indicate battery voltage, the oil pressure switch may be defective.
•Use an ohmmeter to check for continuity between the switch terminal and the switch body.
★If the resistance is not close to zero ohms with the switch lead disconnected and the engine stopped, the switch is at fault, and must be replaced.

If the oil pressure indicator light stays on when the engine is running faster than the idle speed –
•Stop the engine.
•Disconnect the switch lead.
•Connect the ohmmeter between the switch terminal and the engine (chassis ground), and inspect the oil pressure switch operation.

Table 3-63 Oil Pressure Switch Operation

Meter	Engine Speed	Oil Pressure Switch
x 1 Ω	Stopped	ON (Ohmmeter reads zero ohms)
	More than idle speed	OFF (Ohmmeter reads infinity)

★If the meter reads zero ohms when the engine is running above the specified speed, measure the oil pressure. If the oil pressure is more than the specified value with the engine running at the specified speed, the oil pressure switch is defective, and must be replaced.

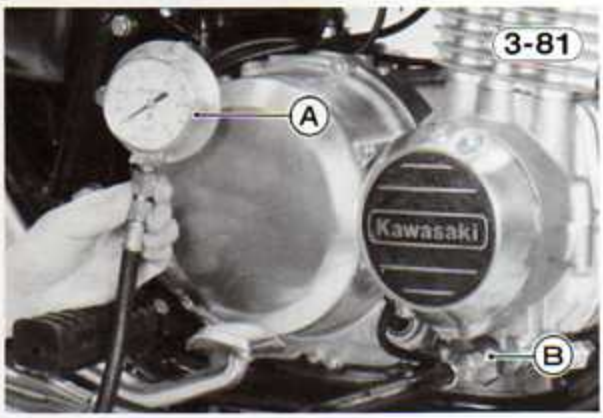
Oil Pressure Measurement

Measuring the oil pressure when the engine is cold (about room temperature) means the inspection of the relief valve operation. First inspect the relief valve operation with the engine cold, and then warm up the engine to measure the oil pressure at the normal operating temperature.

NOTE: 1. If the engine is warmed up already, begin by measuring the oil pressure at the normal operating temperature.

– When the engine is cold –
•Check the engine is cold.
•With the motorcycle on its side stand, remove the oil passage plug from the right side of the crankcase, and connect the oil pressure gauge and adapter (special tools) in its place to measure oil pressure.

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



A. Oil Pressure Gauge: 57001-164
B. Adapter: 57001-403

•Start the engine, and note the oil pressure while running the engine at various speeds. A normal relief valve keeps the maximum oil pressure between the values in the table.

Table 3-64 Relief Valve Opening Pressure

Standard
5.2 ± 0.8 kg/cm² (74 ± 11 psi, 510 ± 78 kPa)

★If the oil pressure exceeds the standard pressure by very much, the relief valve is stuck at its close position.
★If the oil pressure is much lower than the standard pressure at more than 5,000 rpm, the relief valve may be stuck open, or there may be other damage in the lubrication system.

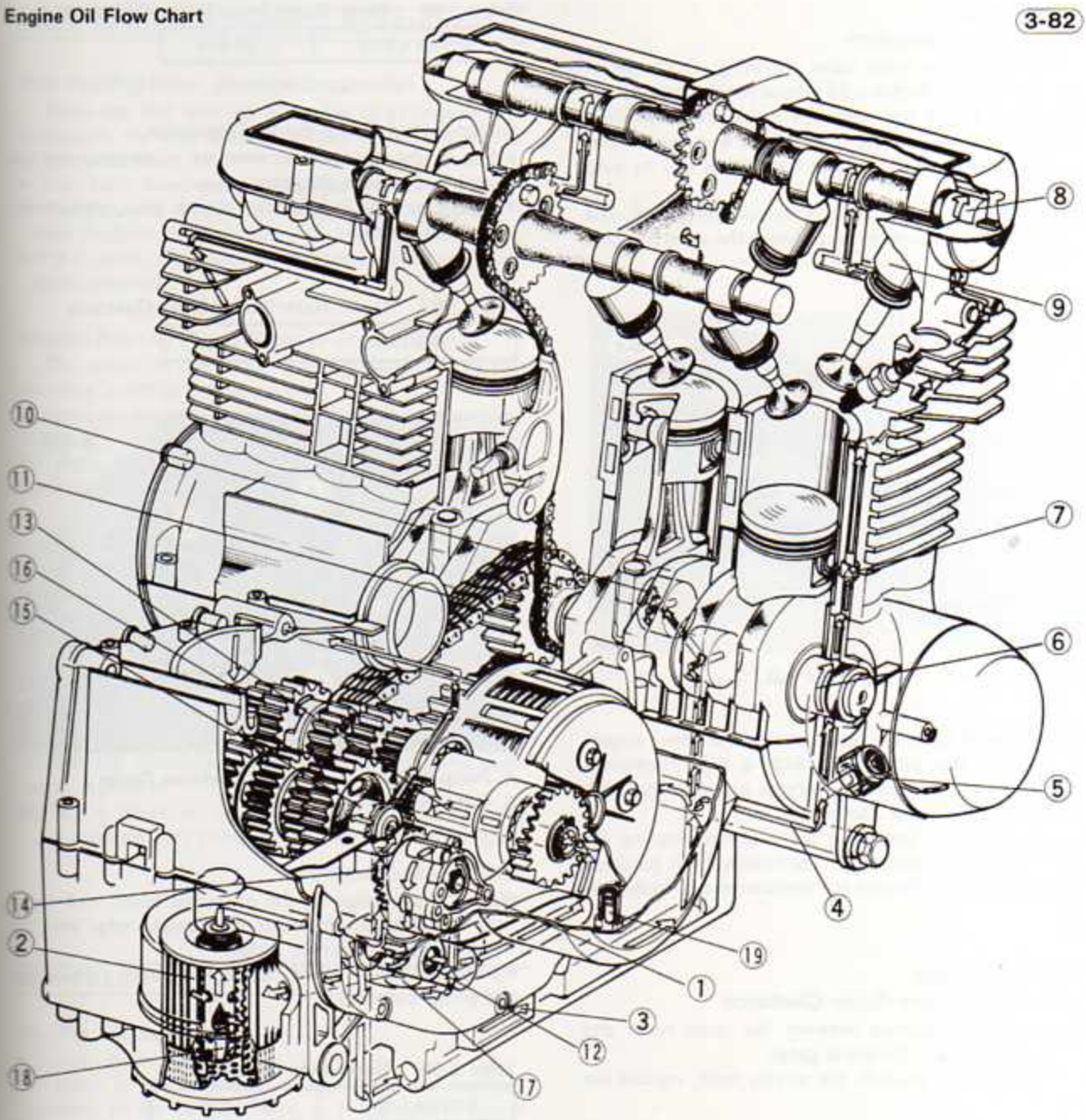
– When the engine is warmed up –
•Warm up the engine, and measure the oil pressure at the normal operating temperature.
•Run the engine at the specified speed, and read the oil pressure gauge.

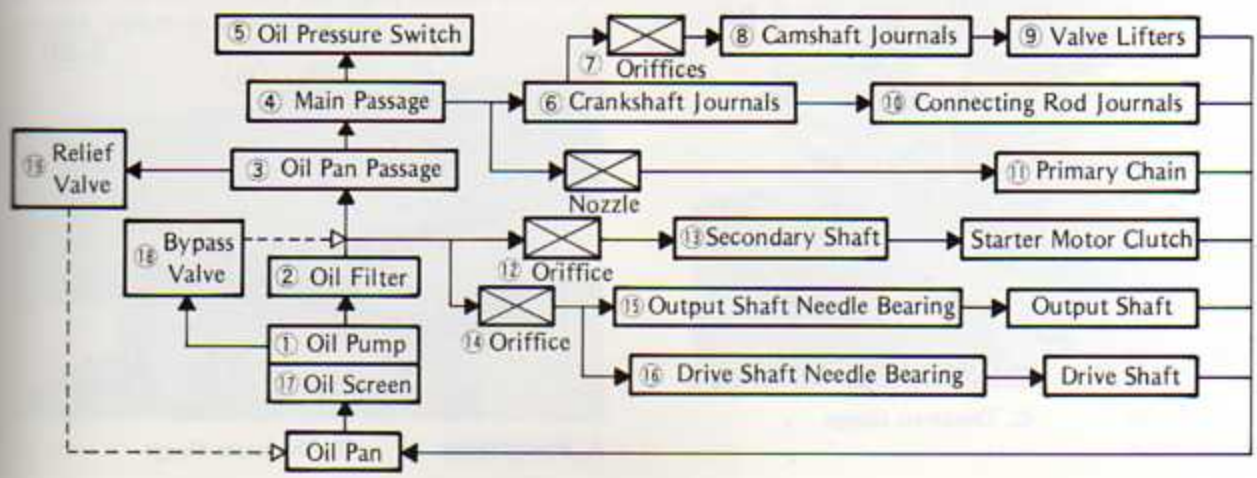
Table 3-65 Oil Pressure

Oil Pressure @4,000 rpm, 90°C (194°F)
2.0 – 2.5 kg/cm² (28 – 36 psi, 196 – 245 kPa)

★If the oil pressure is significantly below the standard pressure, inspect the engine oil pump and relief valve.
★If the pump and relief valve are not at fault, inspect the rest of the lubrication system.

Engine Oil Flow Chart (3-82)





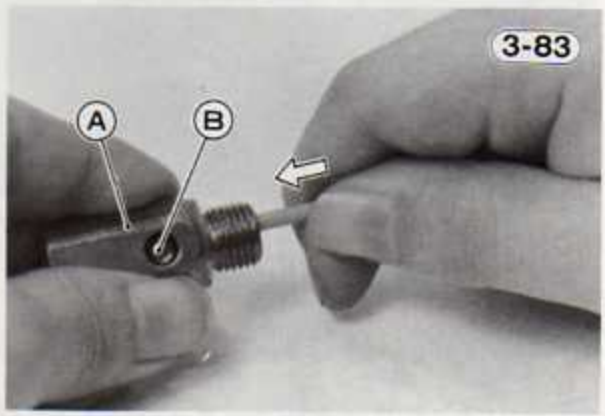
Relief Valve:

Relief Valve Inspection

To inspect the relief valve operating, check the oil pressure with the engine cold (about room temperature).

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

NOTE: 1. Inspect the valve in its assembled state. Disassembly and assembly may change the vlave performance.



A. Relief Valve **B. Steel Ball**

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

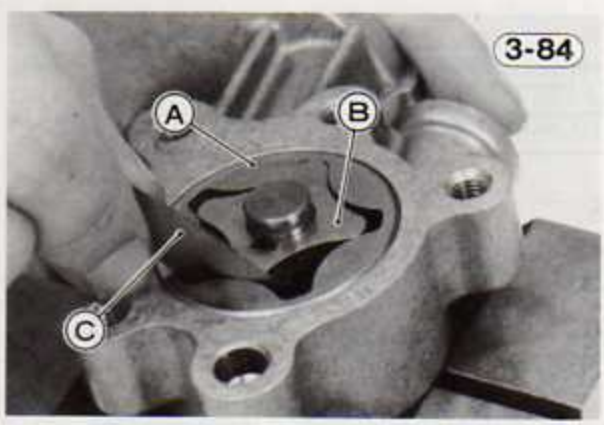
★If cleaning does not solve the problem, replace the relief valve as an assembly. The relief valve is precision made with no allowance for replacement of individual parts.

Engine Oil Pump:

Outer Rotor/Inner Rotor Clearance

- Measure the clearance between the outer rotor and inner rotor with a thickness gauge.

★If the clearance exceeds the service limit, replace the rotors.



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

Table 3-66 Outer Rotor/Inner Rotor Clearance

Service Limit	0.30 mm

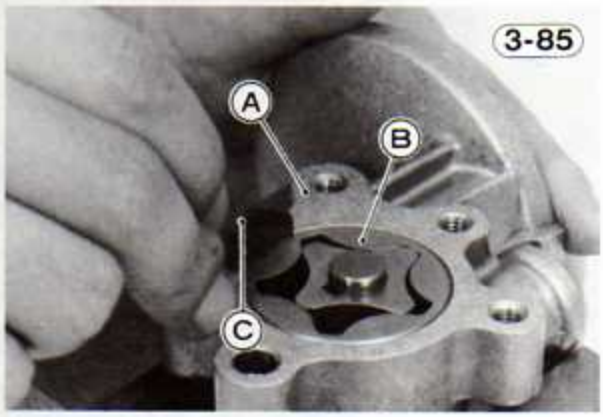
Outer Rotor/Pump Body Clearance

- Measure the clearance between the outer rotor and the pump body with a thickness gauge.

★If the clearance exceeds the service limit, replace the oil pump assembly.

Table 3-67 Outer Rotor/Pump Body Clearance

Service Limit	0.30 mm



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

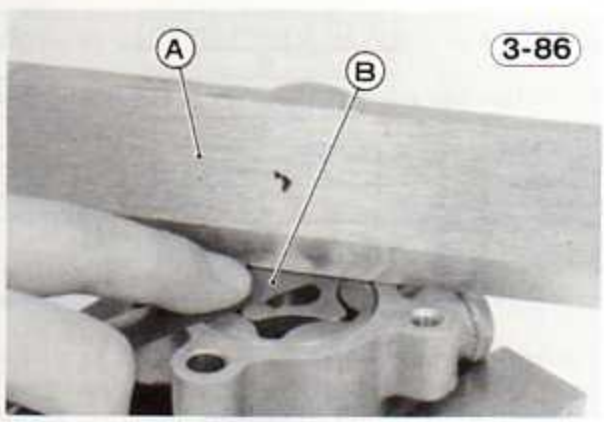
Rotor Side Clearance

- Lay a straightedge on the oil pump body, and measure the clearance between the straight edge and the rotors with a thickness gauge.

★If the clearance exceeds the service limit, replace the oil pump assembly.

Table 3-68 Rotor Side Clearance

Service Limit	0.12 mm



A. Straightedge **B. Thickness Gauge**

BALL BEARINGS, NEEDLE BEARINGS

Ball Bearing Wear, Damage Inspection

Since the ball bearings are made to extremely close tolerances, the wear must be judged by feel rather than by measurement.

•Clean each bearing in a high flash-point solvent, dry it (do not spin it while it is dry), and oil it. Spin it by hand to check its condition.

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

Needle Bearing Wear, Damage Inspection

The rollers in the needle bearings wear so little that the wear is difficult to measure.

•Inspect the bearings for abrasion, color change, or other damage.

*If there is any doubt as to the condition of either bearing, replace it.

OIL SEALS

Oil Seal Damage Inspection

•Inspect the oil seals.

*If the lips are misshapen, discolored (indicating the rubber has deteriorated), hardened, or otherwise damaged, replace it.

NOTE: 1. Since an oil seal is nearly always damaged on removal, any removed oil seals must be replaced.

MUFFLERS

Muffler Inspection

•Visually inspect the mufflers.

*If there is any exhaust leakage where the mufflers connect to the cylinder head, or if the gaskets appear damaged, replace the gaskets.

*If either muffler is badly damaged, dented, cracked or rusted, replace it with a new one.

Non-scheduled Maintenance – Chassis

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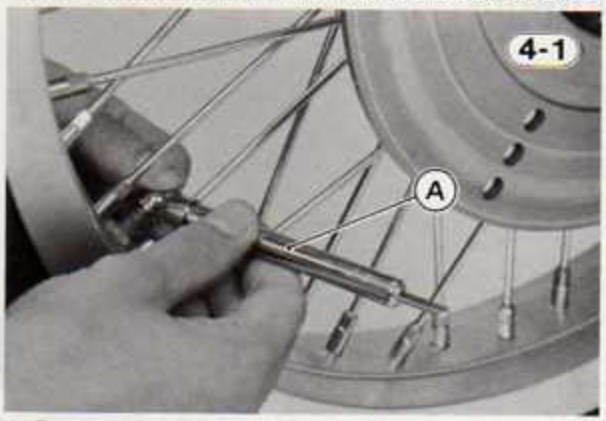
WHEELS

Payload and Tire Pressure:

Failure to maintain proper inflation pressures or observe payload limits for your tires may adversely affect handling and performance of your motorcycle and can result in loss of control. The maximum recommended load in addition to vehicle weight is 165 kg, including rider, passenger, baggage, and accessories.

Tire Pressure Adjustment

•Check the tire pressure often, using an accurate gauge.



A. Pressure Gauge

★If the tire pressure is not correct, adjust it.

NOTE: 1. Mesaure the tire pressure when the tires are cold (that is, when the motorcycle has not been ridden more than a mile during the past 3 hours).

2. Tire pressure is affected by changes in ambient temperature and altitude, and so the tire pressure should be checked and adjusted when your riding involves wide variations in temperature or altitude.

Wheel Balance:

To improve stability and decrease vibration at high speed, the front and rear wheels must be kept balanced.

Check and balance the wheels when required, or when a tire and/or rim is replaced with a new one.

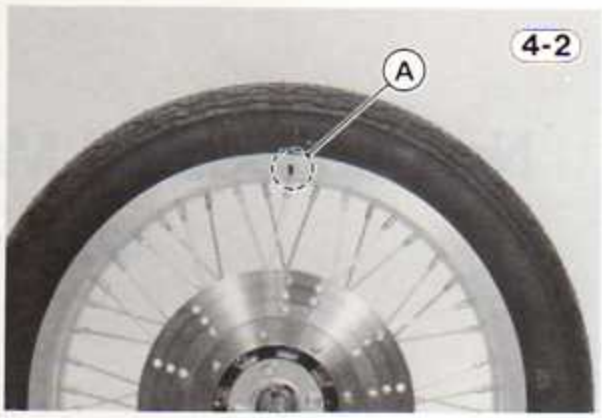
Inspection

•Remove the wheel.

•For a wire spoke wheel, check that all the spokes are tightened evenly and the rim runout is within the service limit.

•Suspend the wheel so that it can be spun freely.

•Spin the wheel lightly, and mark the wheel at the top when the wheel stops.



A. Mark at the top.

•Repeat this procedure several times.

★If the wheel stops of its own accord in various positions, it is well balanced.

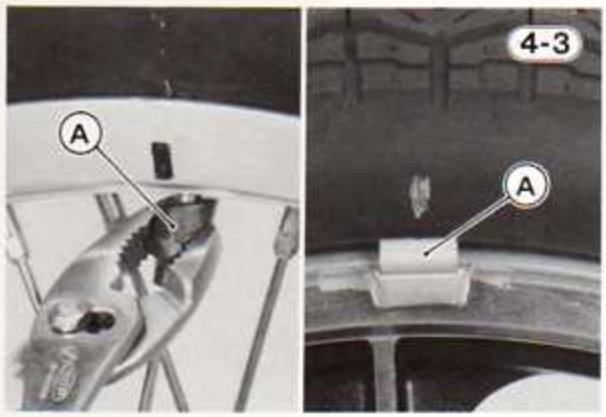
★If the wheel always stops in one position, balance the wheel.

Balancing

•Temporarily attach a balance weight on the wheel.

○For the case wheel: Attach a balance weight on the rim at the marking with tape.

○For the wire spoke wheel: Attach a balance weight loosely to the spoke under the marking.

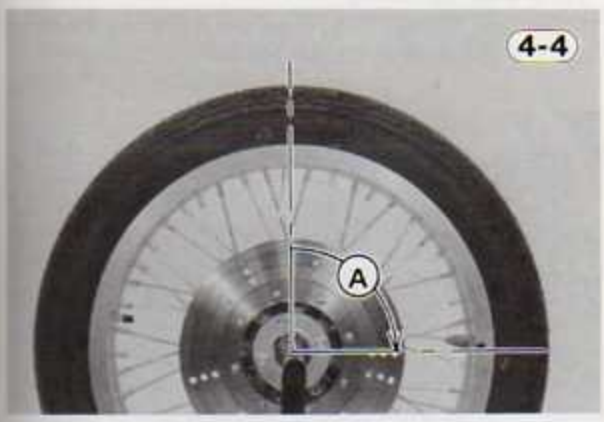


A. Balance Weight

Table 4-1 Tire Air Pressure

	KZ650-F		KZ650-H		KZ650-D		
Front	2.00 kg/cm² (28 psi, 200 kPa)		1.75 kg/cm² (25 psi, 175 kPa)			Up to 180 kph (110 mph)	Over 180 kph (110 mph)
						1.75 kg/cm² (25 psi, 175 kPa)	2.00 kg/cm² (28 psi, 200 kPa)
Rear	Up to 97.5 kg load	2.25 kg/cm² (32 psi, 225 kPa)	Up to 97.5 kg load	1.5 kg/cm² (22 psi, 150 kPa)	Up to 97.5 kg load	1.75 kg/cm² (25 psi, 175 kPa)	2.00 kg/cm² (28 psi, 200 kPa)
	97.5 – 165 kg load	2.50 kg/cm² (36 psi, 250 kPa)	97.5 – 165 kg load	1.75 kg/cm² (25 psi, 175 kPa)	97.5 – 165 kg load	2.00 kg/cm² (28 psi, 200 kPa)	2.25 kg/cm² (32 psi, 225 kPa)

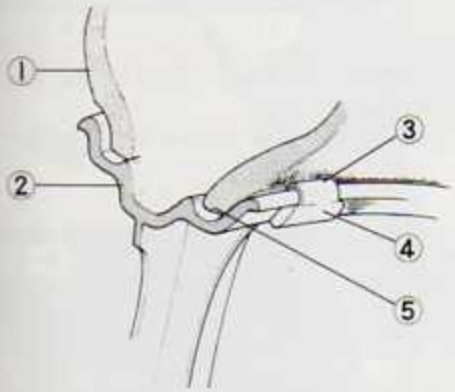
•Rotate the wheel ¼ turn, and see whether or not the wheel stays in this position.
*If it does, the correct balance weight is being used.



A. ¼ turn.

*If the wheel rotates and the weight goes up, replace the weight with the next heavier size.
*If the wheel rotates and the weight goes down, replace the weight with the next lighter size.
•Repeat these steps until the wheel remains at rest after being rotated ¼ turn.
•Rotate the wheel another ¼ turn and then another ¼ turn to see if the wheel is correctly balanced.
•Repeat the entire procedure as many times as necessary to achieve correct wheel balance.
•Install the balance weight firmly on the wheel.
○For the cast wheel: First reduce the tire pressure, pry the tire bead from the rim, and then insert the blade part of the balance weight between the rim and the tire bead until the stepped portions of the rim and the weight is hooked over the overhang portion of the rim.

Balance Weight Installation (4-5)



1. Tire
2. Rim
3. Blade
4. Weight
5. Tire Bead

○For the wire spoke wheel: Clamp on the balance weight firmly using pliers.

•For the cast wheel, inflate the tire to standard pressure.
•Mount the wheel back onto the mtorcycle.

NOTE: 1. Balance weights are available from Kawasaki Dealers in 5, 10, 20, and 30 gram sizes. An imbalance of less than 10 grams will not usually after running stability.

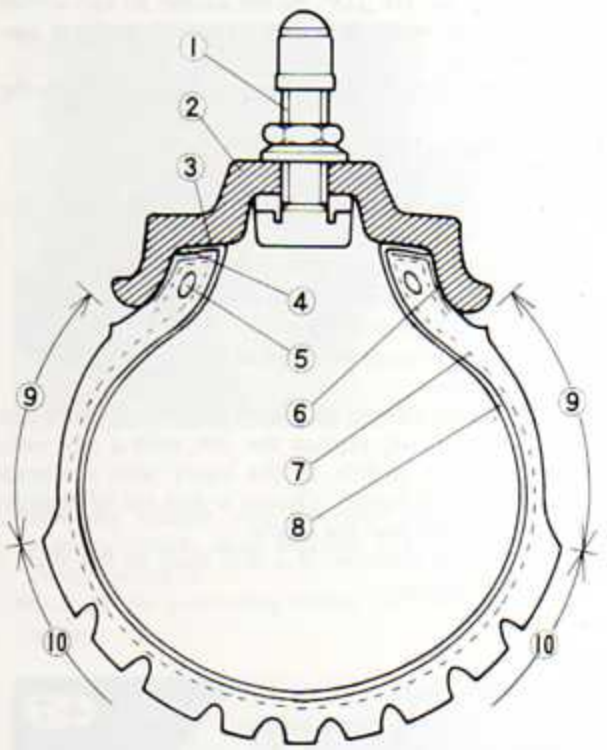
Tubeless Tires:

Structure of the tubeless tire is characterized by an inner liner and chafers.

The inner liner is a layer of thicker rubber which covers the inside wall of the tire. The inner liner is made from special quality of rubber which is hard to admit the air. Generally chafers reinforce tire beads which are likely damaged by friction with the rim. The chafers of tubeless tires have a characteristic of airtightness as well.

Since airtightness of tubeless tires is accomplished by closely seating the chafers in good condition on the rim, be careful not to damage the chafers when handling tubeless tires.

Tubeless Tire (4-6)



1. Air Valve
2. Rim
3. Rim Sealing Area
4. Bead Sealing Area
5. Bead Wires
6. Chafers
7. Plies
8. Inner Liner
9. Side Wall
10. Tread

WARNING **The tires, rims, and air valves on this motorcycle is designed only for tubeless type wheels. The recommended standard tires, rims, and air valves must be used for replacement. For correct performance, do not install a tube in a tubeless tire.**

Tire Repair

Currently two types of repair for tubeless tires have come into wide use. One type is called temporary (external) repairs which can be carried out without removing the tire from the rim, and another type is called permanent (internal) repairs which require tire removal. It is generally understood that higher running durability is obtained by permanent (internal) repairs than by temporary (external) ones. Also, permanent (internal) repairs also have the advantage of permitting a thorough examination for secondary damage not visible from external inspection of the tire. For these reasons, Kawasaki does not recommend temporary (external) repair. Only appropriate permanent (internal) repairs are recommended.

The tubeless tire repair methods described here describe the internal repair methods for COMBI UNITS made by TIP TOP (trade names). Repair methods may very slightly from make to make. Follow the repair methods indicated by the manufacutrer of the repair tools and materials so that safe results can be obtianed.

WARNING **Tires that have been punctured and replaced do not have the same capabilities as unchanged itres. When being repaired with COMBI UNITS made by TIP TOP, do not exceed 80 kph within 24 hours after repair, and 180 kph (113 mph) at any time after that.**

- Locate and mark the puncture and remove the injuring object.
- Remove the tire from rim.
- Insepct the tire carefully.

★If any damage mentioned below is found, replace the tire with a new one:

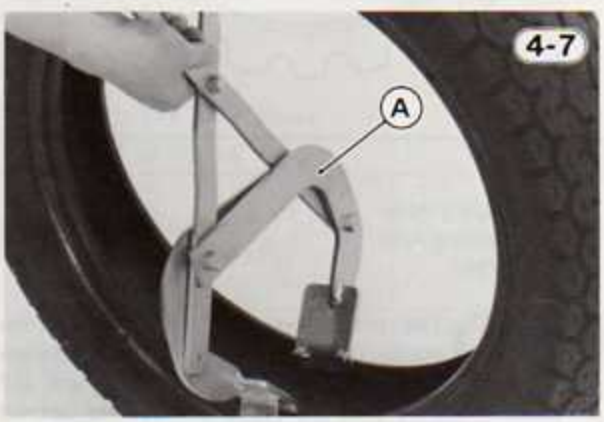
1. Puncture or tear larger than 3 mm diameter.
2. Two punctures within 40 cm distance.
3. Three punctures or more in one tire.
4. Puncture or damage on sidewall.

- Inspect the rim.

★If there is any damage such as is mentioned in the rim damage inspection, replace the rim with a new one.

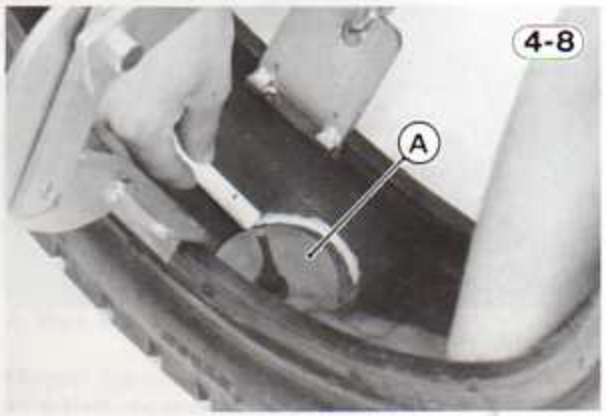
- Spread the tire slightly at the injury with the bead breaker (special tool). Choose a drill bit of slightly greater diameter than the injury.

NOTE: 1. The diameter of a drill must be less than 3 mm at maximum.



A. Bead Breaker: 57001-1072

- Before buffing the tires, thoroughly clean the area around the puncture with a suitable solvent and scrape out all mold lubricants (i.e. silicon, gaphite, etc.). Let dry before buffing.
- Center the COMBI UNIT on the puncture inside of the tire and draw an outline (do not use crayon).



A. COMBI UNIT

- Buff the area slightly larger than the COMBI UNIT, remove the buffing dust.



- Center the drill in the break inside of the tire and screw into the puncture.

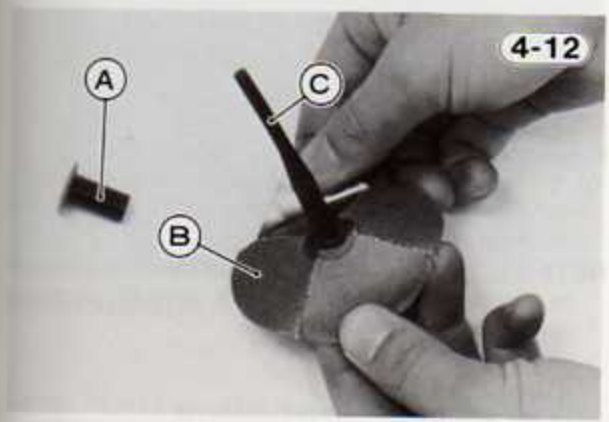
NOTE: 1. Be careful not to expand the injury with the drill.



- Clean the buffed area thoroughly.
- Coat the puncture channel with a heavy larger of Rema Special Tire Cement. Using clean fingers or a brush, spread a thin, even coat of the same Cement to the buffed surface. Keep the repair area up to permit faster evaporation of solvent. Allow approximately 10 minutes for drying.

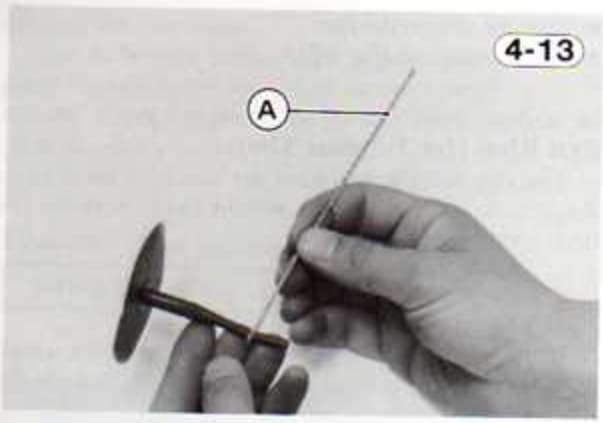


- Use the COMBI UNIT for motorcycle tires. Remove the protective sleeve from the stem of the COMBI UNIT. Break the metal foil across the center and peel the foil toward the edge. Coat the surface with a thin layer of Special Tire Cement. Do not touch the patch area.



A. Protective Sleeve **C. COMBI UNIT**
B. Metal Foil

- Run the stem of the COMBI UNIT patch through the inserting wire.



A. Inserting Wire

- Apply Special Tire Cement to the upper end of the stem (30 mm above the patch) so that the stem of COMBI UNIT patch slips smoothly.
- Pull the end of the stem through the puncture without turning until the base presses against inside of the tire.



- Roll the stitcher over the patch as hard as possible, keeping strokes close together and working from the center outwards.
- Cut off the protruding rubber tail flush with the tire surface.



•Install the tire on the rim.
•Balance the wheel (Pg. 4-2).

Cast Rims (for Tubeless Tire):

The rim for tubeless tires are specially designed in shape, size, and finish to be airtight and to keep the tire from coming off the rim.

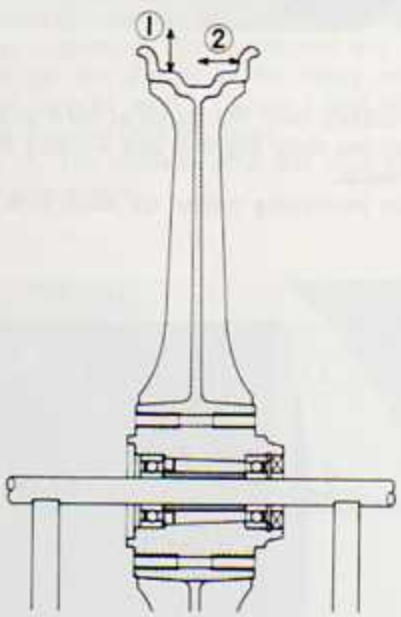
Rim runout measurement

If there is any doubt as to the condition of the wheel, or if the wheel has received a heavy impact, check the rim runout as follows:
•Remove the tire and suspend the wheel by the axle.
•Set a dial gauge against the side of the rim, and rotate the wheel to measure the axial runout. The difference between the highest and lowest dial readings is the amount of runout.
•Set the dial gauge against the outer circumference of the rim, and rotate the wheel to measure radial runout. The difference between the highest and lowest dial readings is the amount of runout.
★If rim runout exceeds the service limit, check the wheel bearings first.
★If they are damaged, replace them. If the problem is not due to the bearings, the wheel must be replaced. Do not attempt to repair a damaged wheel.

Table 4-2 Rim Runout

	Axial	Radial
Service Limit	0.5 mm	0.8 mm

Rim Runout (4-16)



1. Radial Runout
2. Axial Runout

Rim damage inspection

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

WARNING **Never attempt to repair a damaged wheel. If there is any damage besides wheel bearings, the wheel must be replaced to insure safe operational condition.**

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

Axles:

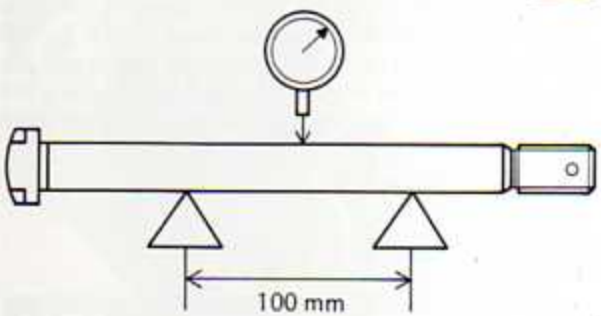
Axle runout measurement

•Remove the axle, place it in **V** blocks that are 100 mm part, and set a dial gauge to the axle at a point halfway between the blocks.
•Turn the axle to measure the runout. The amount of runout is the amount of dial variation.
★If runout exceeds the service limit, straighten the axle or replace it.
★If the axle cannot be straightened to within tolerance, or if runout exceeds repair limit, replace the axle.

Table 4-3 Axle Runout/100 mm

Usable Range	Service Limit
0.2 mm	0.7 mm

Axle Runout (4-17)



Grease Seals:

Inspection

•Inspect the grease seals.
★If the seal or internal ribbing is discolored (indicating the rubber has deteriorated), hardened, or other wise damaged, replace it.

NOTE: 1. Whenever the grease seal is removed, it should be replaced. The grease seal is generally damaged upon removal.

DRIVE TRAIN

Rear Wheel Coupling:

Damper inspection

•Remove the rear wheel coupling, and inspect the damper.
★If it appears damaged or deteriorated, replace it.



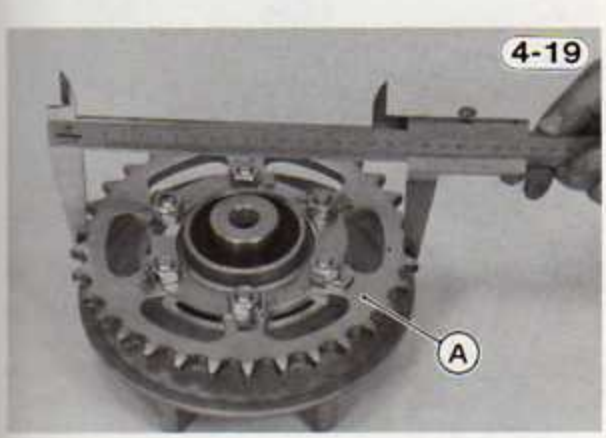
A. Rubber Damper

Sprockets:

- Measure the diameter of the sprocket at the base of the teeth.
- ★If the sprocket is worn down to less than the service limit, replace the sprocket.

Table 4-4 Sprocket Diameter

		Service Limit
Engine		66.7 mm
Rear	KZ650-D, H	187.9 mm
	KZ650-F	194.3 mm



A. Rear Sprocket

NOTE: 1. If a sprocket requires replacement, the chain is probably worn also. Upon replacing a sprocket, inspect the chain.

Rear sprocket warp inspection

- Elevate the rear wheel so that it will turn freely, and set a dial gauge against the rear sprocket near the teeth.
- Rotate the rear wheel.

The difference between the highest and lowest dial gauge readings is the amount of runout (warp).

- ★If the runout exceeds the service limit, replace the rear sprocket.

Table 4-5 Rear Sprocket Warp

Service Limit	0.5 mm



A. Rear Sprocket B. Dial Gauge C. Turn

Drive Chain:

Cleaning

Dirt will cling to the oil and act as an abrasive, accelerating chain wear. Whenever the chain becomes particularly dirty, it must be cleaned.

CAUTION **The O-rings between the side plates seal in the lubricant between the pin and the bushing. To avoid damaging the O-rings and resultant loss of lubricant, observe the following rules.**

1. **Use only kerosene or diesel oil for cleaning an O-ring drive chain. Any other cleaning solution such as gasoline or trichloroethylene will cause deterioration and swell of the O-rings.**
2. **Immediately blow the chain dry with compressed air after cleaning.**
3. **Complete cleaning and drying the chain within 10 minutes.**
4. **Lubricate the chain after cleaning and drying.**

BRAKES

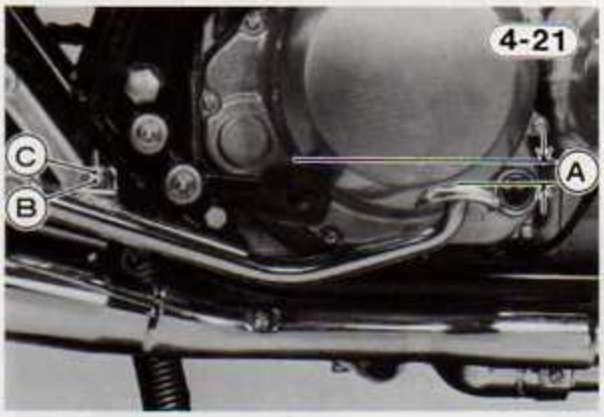
Brake Pedal Position:

Brake pedal position can be adjusted within the usable range to suit you.

Pedal Position Inspection

•When the brake pedal is in its rest position, it should be 0 – 30 mm lower than the top of the footpeg.

★If it is not, adjust the pedal position.



A. 0 – 30 mm **C. Locknut**
B. Adjusting Bolt

Pedal Position Adjustment

•Loosen the locknut, and turn the adjusting bolt to adjusting bolt to adjust the pedal position.

•Tighten the locknut.

•Check the brake pedal play and operation of the rear brake light switch.

Disc Brakes:

Master Cylinder Part Wear Inspection

When master cylinder parts are worn or damaged, proper brake fluid pressure cannot be obtained in the line and the brake will not hold.

If the small relief port becomes plugged, especially with a swollen or damaged primary cup, the brake pads will drag on the disc.

•Inspect the inside of the master cylinder and piston, and measure the cylinder inside diameter and piston diameter.

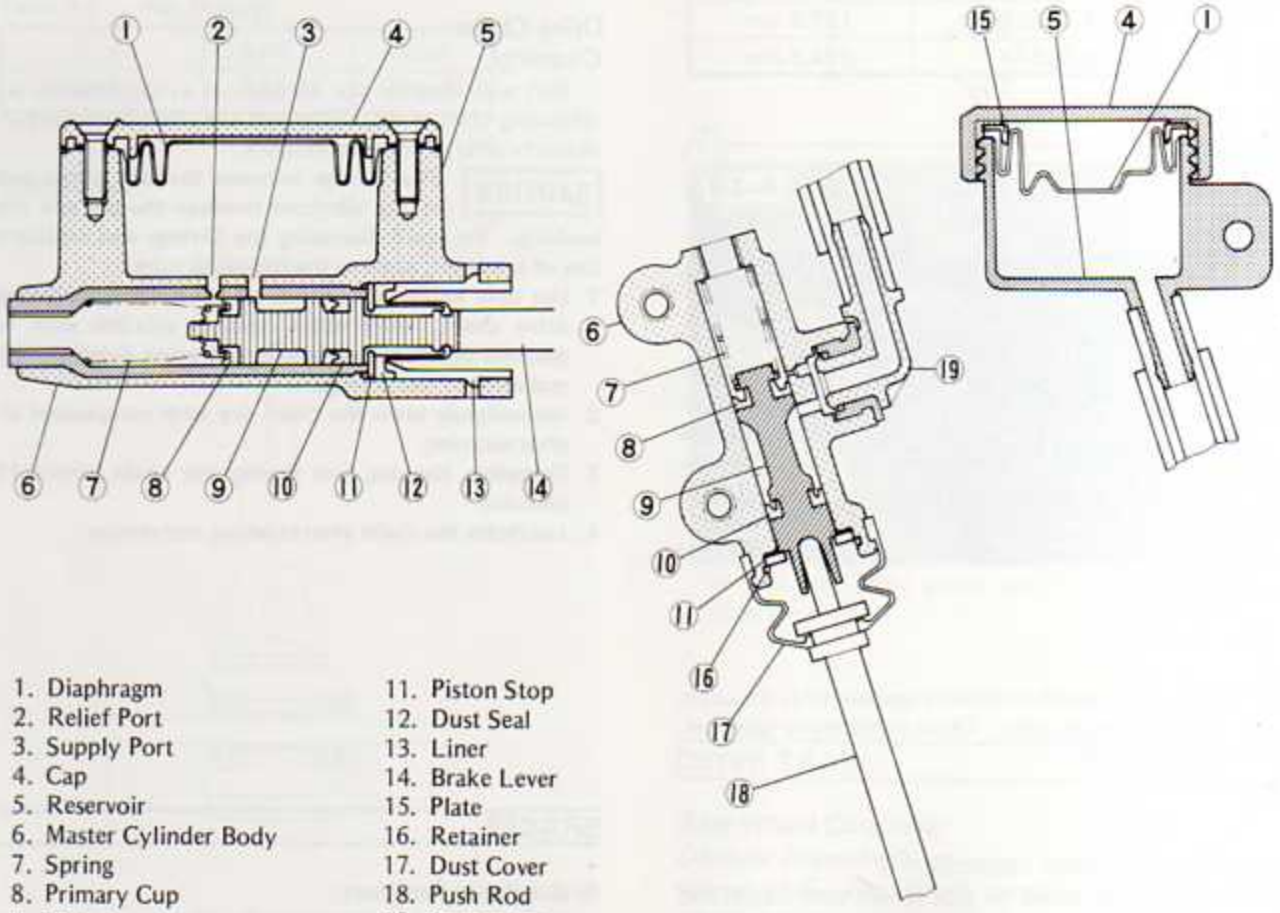
★If there are scratches, rust, or pitting on the piston and the inside of the cylinder, replace them.

★If they are worn out of tolerance, replace them.

NOTE: 1. The cups and spring are part of the piston assembly. Replace the piston assembly if any one of the cups or the spring requires replacement.

Front and Rear Master Cylinders

4-22

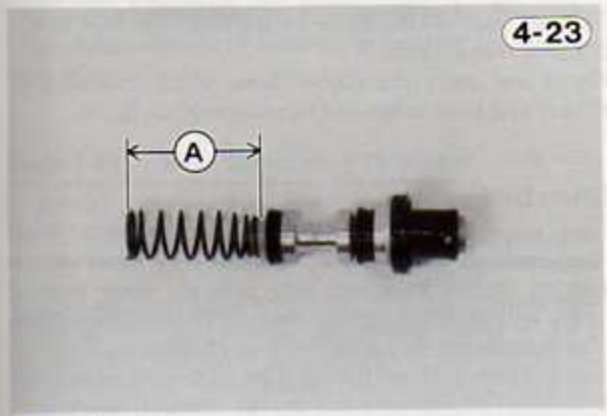


1. Diaphragm
2. Relief Port
3. Supply Port
4. Cap
5. Reservoir
6. Master Cylinder Body
7. Spring
8. Primary Cup
9. Piston
10. Secondary Cup
11. Piston Stop
12. Dust Seal
13. Liner
14. Brake Lever
15. Plate
16. Retainer
17. Dust Cover
18. Push Rod
19. Connector

Table 4-6 Master Cylinder Parts

	Measurment	Service Limit		
		KZ650-D	KZ650-F	KZ650-H
Front	Cylinder Inside Diameter	15.95 mm	15.95 mm	12.78 mm
	Piston Outside Diameter	15.67 mm	15.67 mm	12.50 mm
	Primary Cup Diameter	16.0 mm	16.0 mm	12.8 mm
	Secondary Cup Diameter	16.4 mm	16.4 mm	13.1mm
	Spring Free Length	34.8 mm	34.8 mm	47.2 mm
Rear	Cylinder Inside Diameter	14.08 mm	–	–
	Piston Outside Diameter	13.80 mm	–	–
	Primary Cup Diameter	14.0 mm	–	–
	Secondary Cup Diameter	14.6 mm	–	–
	Spring Free Length	32.4 mm	–	–

•Inspect the primary and secondary cups. When inserting the cup into the cylinder, see that it is slightly larger than the cylinder.
★If a cup is worn, damaged, softened (rotted), or swollen, replace it.
★If fluid leakage is noted at the brake lever, the cups should be replaced.
•Check that the spring is not damaged and the spring free length is not shorter than the service limit.
★If it is damaged and/or it is shorter than the service limit, replace it.



A. Free Length

•Inspect the dust seal at the piston and diaphragm at the reservoir cap.
★If they are teared or other damaged, replace them.

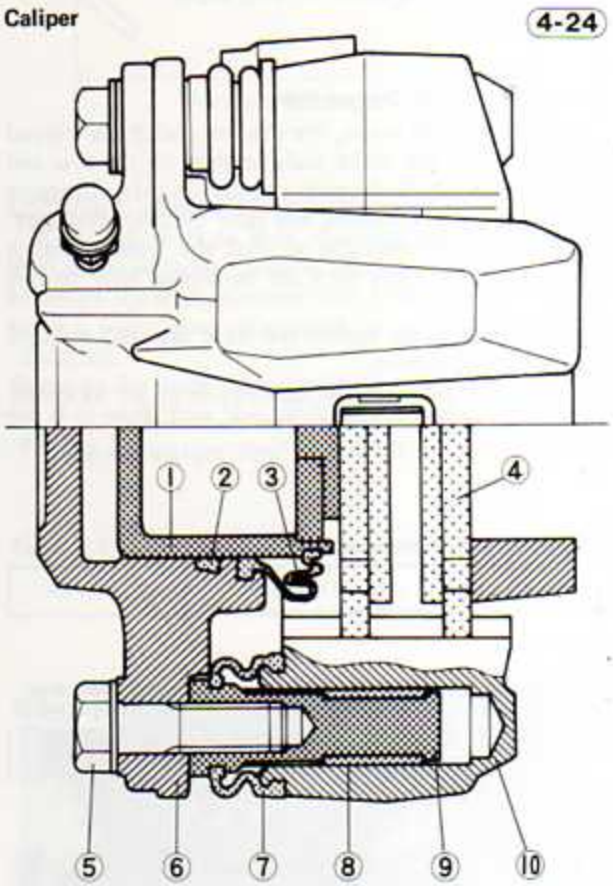
Caliper Part Inspection

The fluid seal around the piston maintains the proper pad/disc clearance. If this seal is not satisfactory, pad wear will increase, and constant pad drag on the disc will raise brake and brake fluid temperature.

•Replace the fluid seals under any of the following conditions: (a) fluid leakage around the pad; (b) brakes overheat; (c) there is a large difference in left and right pad wear; (d) the seal is stuck to the piston.

NOTE: 1. If the fluid seal is replaced, replace the dust seal as well. Also, replace all seals every other time the pads are changed.

Caliper



1. Piston
2. Fluid Seal
3. Dust Seal
4. Pad
5. Holder Shaft Bolt
6. Caliper
7. Dust Cover
8. Friction Boot
9. Holder Shaft
10. Caliper Holder

•Check the dust seals.
★If they are cracked, worn, swollen, or otherwise damaged, replace them.
•Check the cylinder and piston, and measure the cylinder inside diameter and piston outside diameter.
★If they are worn out of tolerance, badly scored, or rusty.

Table 4-7 Caliper Parts

Measurement	Service Limit
Cylinder Inside Diameter	42.92 mm
Piston Outside Diameter	42.75 mm

Caliper holder shafts must slide smoothly in the caliper holder. If the shafts do not slide smoothly, one pad will wear more than the other, pad wear will increase, and constant drag on the disc will raise brake and brake fluid temperature.

•Check to see if the caliper holder shafts are nor badly worn or stepped, or rubber friction boot are not damaged.

★If the shafts or rubber friction boot are damaged, replace the shafts, rubber friction boot, and the caliper holder.

Disc Warp, Wear Inspection

Besides wearing down, the disc may warp. A warped disc will cause the brake pads to drag on the disc and will wear down both the pads and disc quickly. Dragging will also cause overheating and poor braking efficiency.

•Jack up the motorcycle so that the front wheel is off the ground, and turn the handlebar fully to one side.

•Set up a dial gauge against the front disc and measure the front disc runout.

•Remove the jack, set the motorcycle up on its center stand, and then measure the rear disc runout.

★If runout exceeds the service limit, replace the disc.

Table 4-8 Disc Runout

Service Limit	0.3 mm



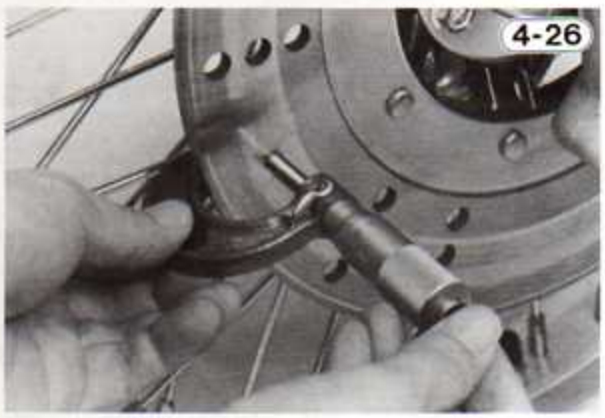
A. Turn

•Measure the thickness of each disc at the point where it has worn the most.

★If it has worn past the service limit, replace it.

Table 4-9 Disc Thickness

	Front	Rear
Service Limit	4.5 mm	6.0 mm



Disc Cleaning

Poor braking can also be caused by oil on the disc.

•Oil on the disc must be cleaned off with trichloroethylene or a high flash-point solvent. Do not use one which will leave an oily residue.

Brake Line Damage 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.

★If any cracks or bulges are noticed, replace it.

Drum Brake:

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 linings dust with compressed iar.
2. If any components are to be cleaned, wash 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 Drum Wear Inspection

•Measure the inside diameter of the brake drum with calipers to determine wear. Since uneven drum wear will decrease braking effectiveness, take measurement at a minimum of two places.

★If the drum is worn unevenly or if it is scored, turn the drum down on a brake drum lathe or replace the hub with a new one. (Do not turn it down to the service limit, and do not turn it down if any diameter measurement exceeds the service limit).

★If any diameter measurement exceeds the service limit, replace the hub with a new one.

Table 4-10 Brake Drum Inside Diameter

Service Limit	180.75 mm



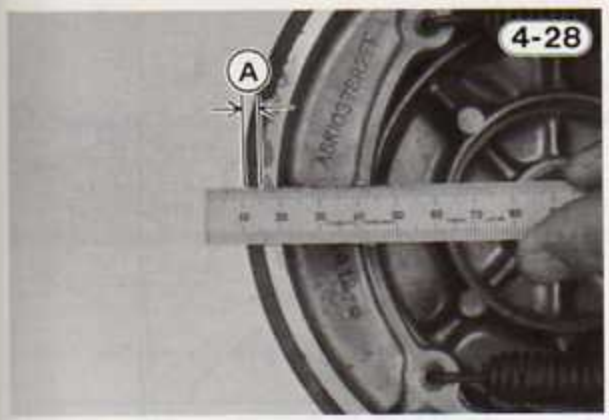
Brake Shoe Lining Wear Inspection

•Check the thickness of the brake linings.

★If the thickness at any point is less than the service limit, replace both shoes as a set. If the thickness of the brake linings is sufficient, check the linings for uneven wear, and file or sand down any high spots. With a wire brush, remove any foreign particles imbedded in the lining surface. Wash off any oil or grease with a high flash-point solvent. Do not use one which will leave an oily residue. In case the lings are damaged or the surface cannot be restored by sanding and cleaning, the shoes must be replaced.

Table 4-11 Brake Shoe Lining Thickness

Service Limit	2.5 mm



A. Lining Thickness

Brake Shoe Spring Tension Inspection

If the brake springs have stretched, they will not pull the shoes back away from the durm after the brake pedal or lever is released, and the shoes will drag on the drum.

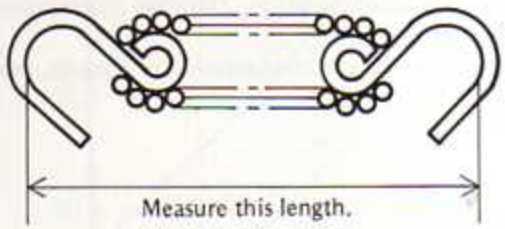
•Remove the springs, and check their free lenfth with vernier calipers.

★If either is stretched beyond the service limit, replace both springs.

Table 4-12 Brake Spring Free Length

Service Limit	69.0 mm

Brake Spring Free Length 4-29



Camshaft, Shaft Hole Wear Inspection

Excessive shaft to hole clearance will increase camshaft play and reduce braking efficiency.

•Measure the shaft diameter with a micrometer.

★If it is worn down to less than the service limit, replace the shaft.

•Measure the inside diameter of the camshaft hole.

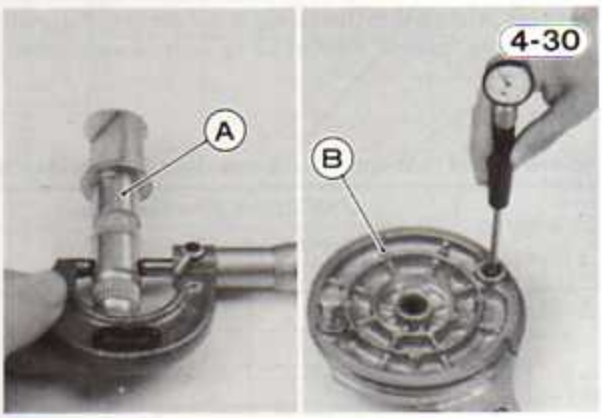
★If it is worn past the service limit, replace the brake panel.

Table 4-13 Brake Camshaft Diameter

Service Limit	16.88 mm

Table 4-14 Camshaft Hole Diameter

Service Limit	17.15 mm



A. Camshaft **B. Brake Panel**

STEERING

Steering Stem Warp Inspection

•Examine the steering stem.

★If it is bend, replace it.

Bearing Wear, Damage Inspection

•Wipe the bearings clean of grease and dirt, and examine the races and balls.

★If the balls or races are worn, or if either race is dented, replace both races and all the balls for that bearing as a set.

Grease Seal Deterioration, Damage Inspection

•Check the grease seal.

★If it has any signs of deterioration or damage, replace it.

SUSPENSIONS

Suspension Setting:

The fornt and rear suspension setting is necessary to obtain the stable handling or suitable riding condition. Ordinarily, the heavier the total load becomes, the harder the suspension should be set.

Adjustment

•Adjust the air pressure, spring force, or damping force for different road and loading conditions if necessary.

NOTE: 1. The following table shows an example of setting for the front and rear suspension. For instance, setting **A** shown in the table is softest and designed for an average-built rider of 68 kg with no accessories.

Front Fork Air Pressure:

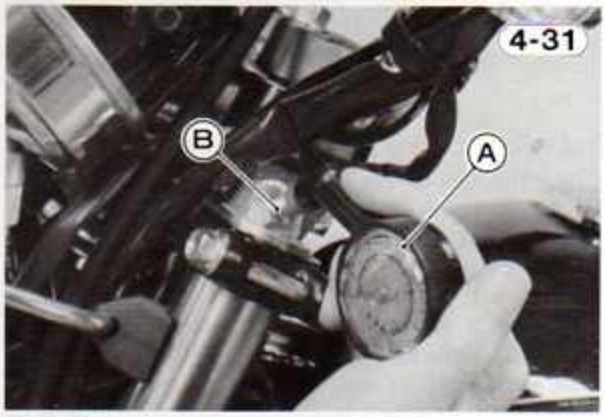
The front fork can be adjusted to any air pressure within the usable range to suit various riding and load conditions. They can be adjusted to lower air pressure for cruising on smooth roads, but should be adjusted to higher pressure to high speed riding, or riding on bad roads.

Inspection

•Put the motorcycle up on its center stand.

•Raise the front wheel off the ground by using a jack under the engine. All weight must be off the front wheel.

•Remove the air valve cap, and check the air pressure with the air pressure gauge (special tool).



A. Air Pressure Gauge: 52005-1003
B. Air Valve

NOTE: 1. Check the air pressure when the fork legs are cold.

2. Do not use tire gauges for checking air pressure. They may not indicate the correct air pressure because of air leaks that occur when the gauge is applied to the valve.

Adjustment

•Inject air through the valve with a pump to adjust the pressure, but do not exceed 2.5 kg/cm² (36 psi, 250 kPa).

NOTE: 1. A normal tire pump can be used.

2. Adjust the air pressure to suit various riding conditions within the usable range.

Table 4-15 Front and Rear Suspension Setting (example)

Suspension Setting		Rear Shock Absorber		Front Fork Air Pressure	
		Spring Force (Sleeve Position)	Damping Force (Adjuster Position)	KZ650-D, F	KZ650-H
Soft	A	1 or 2	1 or 2	0.6 kg/cm² (8.5 psi, 60 kPa) ∫ 0.9 kg/cm² (13 psi, 90 kPa)	0.5 kg/cm² (7.1 psi, 50 kPa) ∫ 1.0 kg/cm² (14 psi, 100 kPa)
↑ ↓	B	2 or 3	2 or 3		
	C	3 or 4	3 or 4		
Hard	D	4 or 5	3 or 4		

Table 4-16 Front Fork Air Pressure

	Standard kg/cm² (psi, kPa)	Usable Range kg/cm² (psi, kPa)
KZ650-D, F	0.7 (10, 70)	0.6 – 0.9 (8.5 – 13, 60 – 90)
KZ650-H	0.6 (8.5, 60)	0.5 – 1.0 (7.1 – 14, 50 – 100)

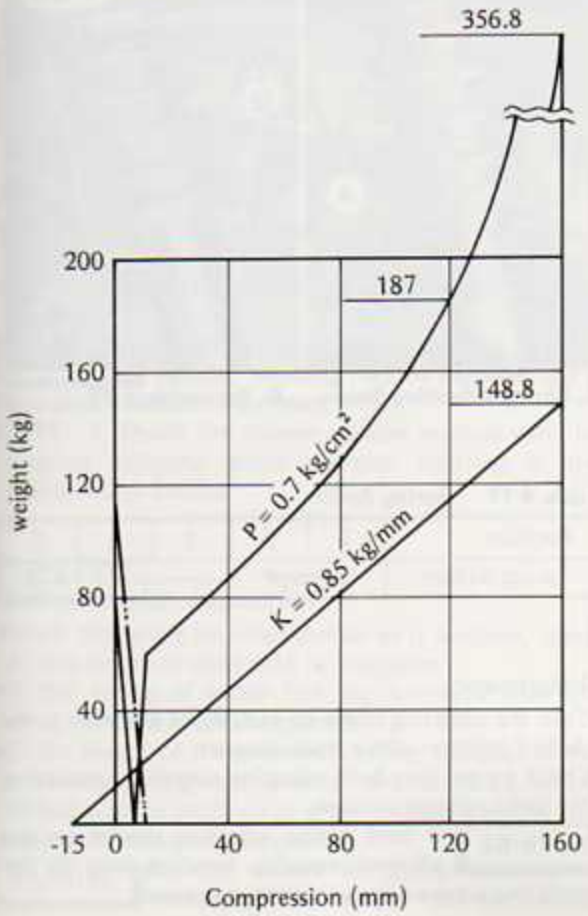
CAUTION

1. Try to set the air pressure of the right and left fork legs as equally as possible. The difference in air pressure between the right and left fork legs must be within 0.1 kg/cm² (1.4 psi, 10 kPa).
2. Inject air little by little so that air pressure does not rise rapidly. Air pressure exceeding 2.5 kg/cm² (36 psi, 250 kPa) may damage the oil seals.

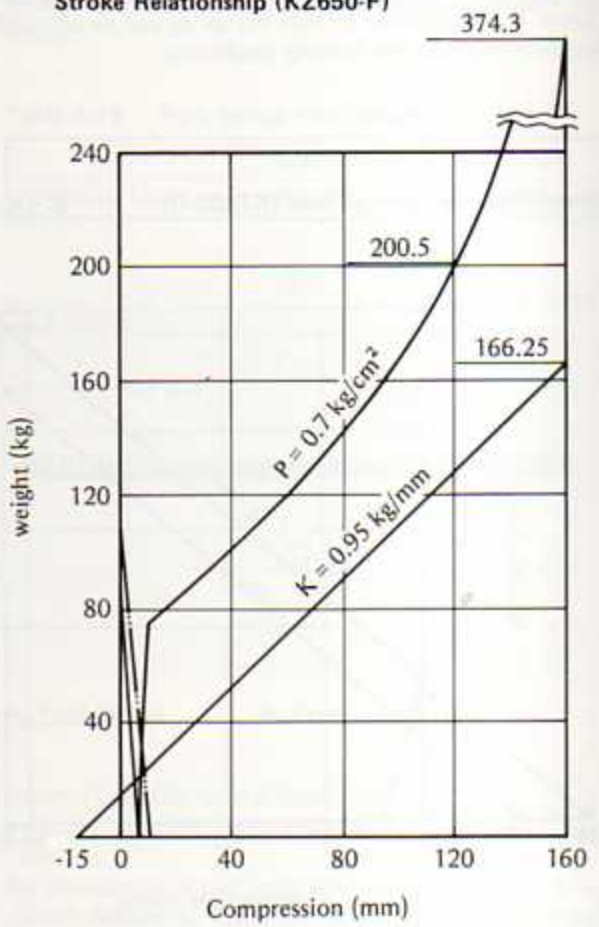
WARNING

1. Be sure to adjust the air pressure within the usable range. Front fork adjusted too low or too high adversely affect handling and stability and could lead to accident and injury.
2. Only air or nitrogen gas can be used. Never inject oxygen or any ohter kind of gas. Other gases could produce an explosion.
3. Do not incinerate the front fork.

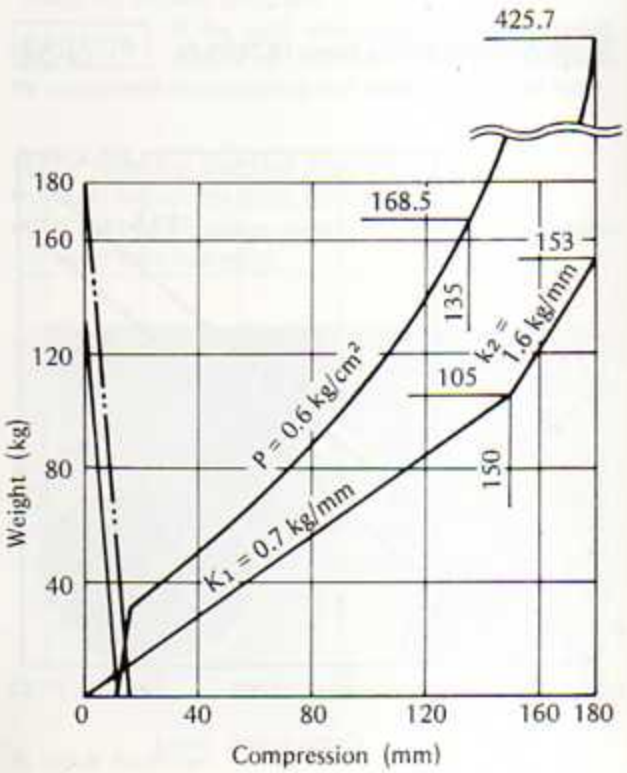
Front Fork Load/Compression Stroke Relationship (KZ650-D) (4-32)



Front Fork Load/Compression Stroke Relationship (KZ650-F) (4-33)



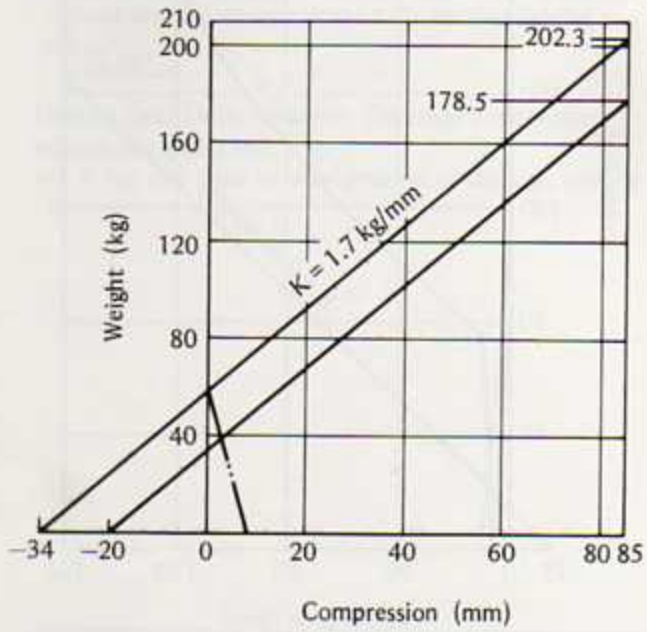
Front Fork Load/Compression Stroke Relationship (KZ650-H) (4-34)



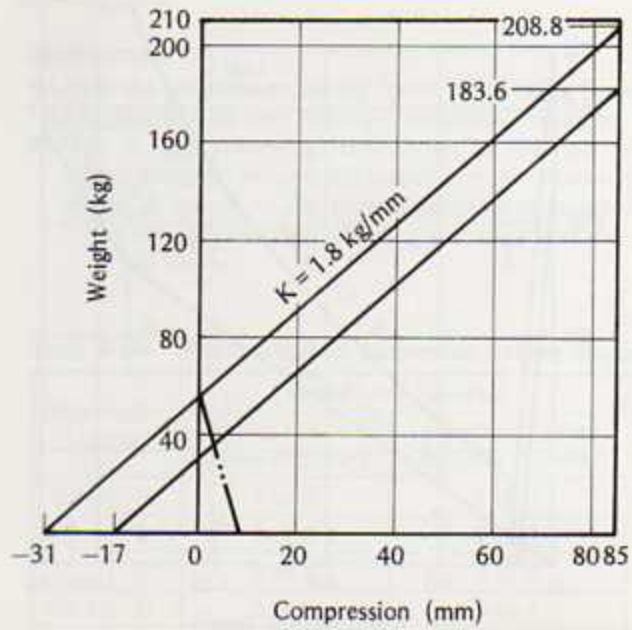
Rear Shock Absorber Spring Force:

The spring adjusting sleeve on each rear shock absorber has 5 positions so that the spring can be adjusted for different road and loading conditions.

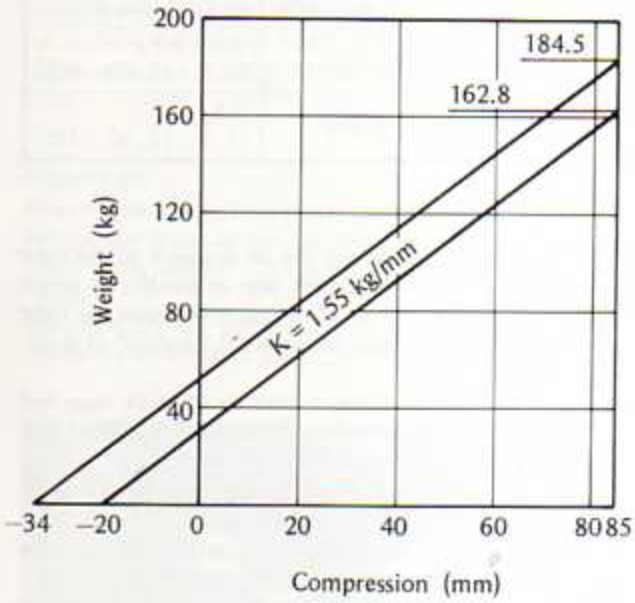
Shock Absorber Spring Force (KZ650-D) (4-35)



Shock Absorber Spring Force (KZ650-F) (4-36)

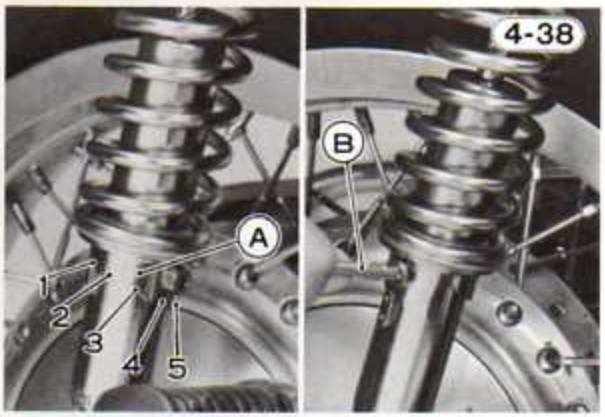


Shock Absorber Spring Force (KZ650-H) (4-37)



Inspection

★If the spring action feels too soft or too stiff, adjust it in accordance with the following table:



A. Spring Adjusting Sleeve **B. Screwdriver Bit**

Table 4-17 Spring Action

Position	1	2	3	4	5
Spring Action	Stronger →				

Adjustment

- Turn the adjusting sleeve on each shock absorber to the desired position with a hook spanner.
- Check to see that both adjusting sleeves are turned to the same relative position.

WARNING **If both spring adjusting sleeves are not adjusted equally, handling may be impaired and a hazardous condition may result.**

NOTE: 1. Match the spring adjusting sleeve position with the damper adjuster position refering to the Suspension Setting.

Rear Shock Absorber Damping Force:

The damper adjuster on each rear shock absorber has 4 positions so that the damping force can be adjusted for different road and loading conditions. The numbers on the adjuster show the setting position of the damper.



A. Damper Adjuster

Inspection

*If the damper setting feels too soft or too stiff, adjust it in accordance with the following table:

Table 4-18 Damping Force

Position	1	2	3	4	5
Damping Force	Larger →				

Adjustment

•Turn the adjuster to the desired number untill you feel a click.

•Check to see that both adjuster are turned to the same relative position.

WARNING **If both damper adjuster are not adjusted equally, handling may be impaired and a hazardous condition may result.**

NOTE: 1. Match the damper adjuster position with the spring adjusting sleeve position referring to the Suspension Setting.

Front Fork:

Spring Tension Inspection

•Since the spring becomes shorter as it weakens, check its free length to determine its condition.

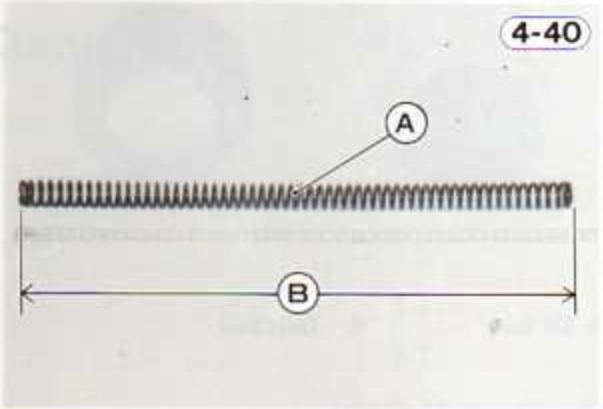
*If the spring of either fork leg is shorter than the service limit, it must be replaced.

*If the length of a replacement spring and that of the remaining spring vary greatly, the remaining spring should also be replaced in order to keep the fork legs balanced for motorcycle stability.

WARNING **Do not remove the springs and rely on compressed air only. Correct springs must be used in this suspension system. Use without springs can lead to a condition causing accident and injury.**

Table 4-19 Fork Spring Free Length

	KZ650-D, F	KZ650-H
Service Limit	491 mm	497 mm



A. Fork Spring **B. Free Length**

Inner Tube Damage Inspection

•Visually inspect the inner tube, and repair any damage.

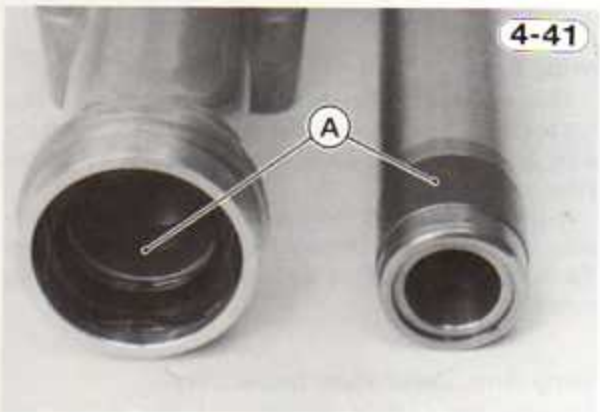
*If the damage is not repairable, replace the inner tube. Since damage to the inner tube damages the oil seal, replace the oil seal whenever the inner tube is repaired or replaced. Temporarily assemble the inner and outer tubes, and pump them back and forth manually to check for smooth operation.

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

Guide Bushing Damage Inspection

•Visually inspect the guide bushings.

*If it has badly damage, replace the inner tube assembly or outer tube assembly.



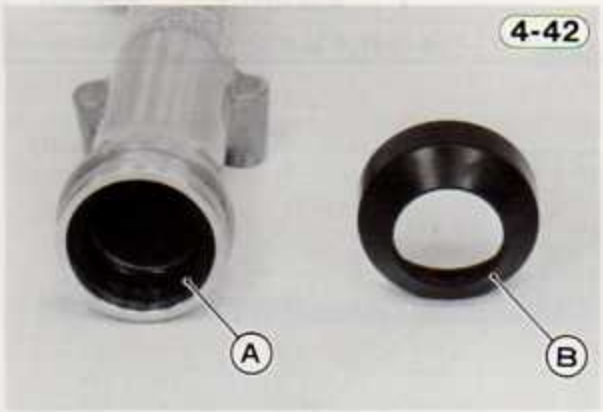
A. Guide Bushings

Oil Seal, Dust Seal Inspection

•Check the oil seal and dust seal.

★If any signs of deterioration or damage, replace them.

NOTE: 1. Replace the oil seal with a new one whenever it has been removed.



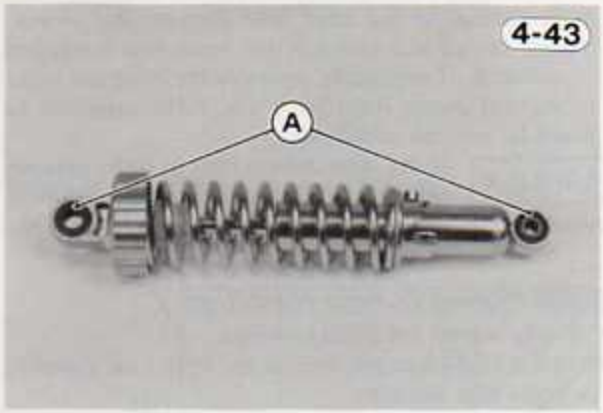
A. Oil Seal **B. Dust Seal**

Rear Shock Absorbers:

Inspection

•Check the rubber bushings in both the upper and lower shock absorber mountings.

★If they are worn, cracked, hardened, or otherwise damaged, replace them with new ones.



A. Rubber Bushings

Swing Arm:

This motorcycle has needle bearings at the swing arm pivot. If bearing wear has progressed such that the swing arm has become loose, the motorcycle will be unstable.

A bent pivot shaft or twisted swing arm will also cause instability by throwing the rear wheel out of alignment. A bent pivot shaft may also cause bearing seizure.

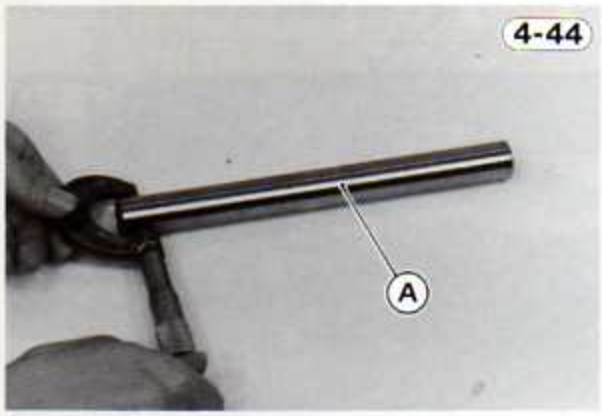
Swing Arm Sleeve Wear Inspection

•Measure the outside diameter of the swing arm sleeve at both ends with a micrometer.

★If the diameter is less than the service limit or if it shows visible damage, replace the swing arm sleeve.

Table 4-20 Swing Arm Sleeve

Service Limit	21.96 mm



A. Swing Arm Sleeve

Needle Bearing Inspection

•Inspect the needle bearings for abrasions, color change, or other damage.

★If there is any doubt as to its the condition of either needle bearing, replace both needle bearings.

NOTE: 1. Whenever the swing arm sleeve is replaced, also replace the needle bearings.

Pivot Shaft Runout Measurement

•To measure the pivot shaft runout, set the pivot shaft on V blocks at the end of the pivot shaft, and set a dial gauge to the shaft halfway between the blocks.

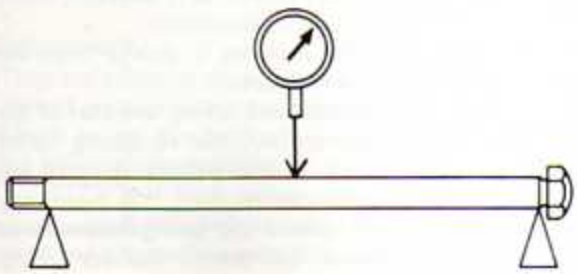
•Turn the shaft to measure the runout. The amount of runout is the one of dial variation.

★If the shaft runout exceeds the service limit, straighten it.

Table 4-21 Pivot Shaft Runout

Usable Range	Service Limit
0.14 mm	0.7 mm

Pivot Shaft Runout 4-45



Non-scheduled Maintenance – Electrical

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LIGHTING SYSTEM 5-15
HORN 5-23
LOW FUEL WARNING SYSTEM 5-23

BATTERY

With proper care, the battery can be expected to last several years, but it may be completely ruined long before that if it is mistreated. Following a few simple rules will greatly extent the life of the battery.

1. **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.**
2. **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.**
3. **Avoid quick-charging the battery. A quick-charge will damage the battery plates.**
4. **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.**
5. **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.**
6. **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.**
7. **DON'T INSTALL THE BATTERY BACKWARDS. The negative side is grounded.**

Electrolyte:

The electrolyte is dilute sulphuric acid. The standard specific gravity of the electrolyte is 1.280 at 20°C (68°F). The water in this solution changes to a gaseous mixture due to chemical action in the battery and escapes, which concentrates the acid in a charged battery. Consequently, when the level of the electrolyte becomes low, only distilled water should be added. If sulphuric acid is added, the solution will become too strong for proper chemical action and will damage the plates. Metal from the damaged plates collects in the bottom of the battery. This sediment will eventually cause an internal short circuit.

The specific gravity of the electrolyte is measured with a hydrometer and is the most accurate indication of the condition of the battery. Fig. 5-1 shows the relationship between the specific gravity of battery charge. Since specific gravity varies with temperature, and since the temperature of the solution being checked is likely to be other than 20°C (68°F) and the percentage of battery charge. Since specific gravity varies with temperature, and since the temperature of the solution being checked is likely to be other than 20°C (68°F); the formula given below should be used to compute the equivalent specific gravity for any temperature. When the temperature goes up, the specific gravity goes down, and vice versa.

○Celsius

$$S_{20} = S_t + [0.0007\ (t - 20)]$$

○Fahrenheit

$$S_{68} = S_t + [0.0004\ (t - 68)]$$

S_t = specific gravity at the present temperature

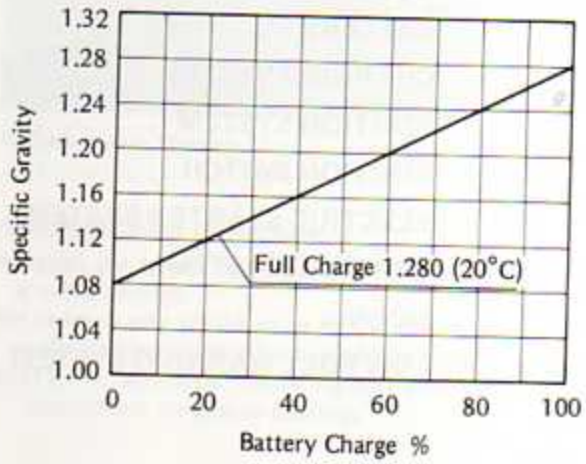
S_{20} = specific gravity at 20°C

S_{68} = specific gravity at 68°F

t = present temperature of solution

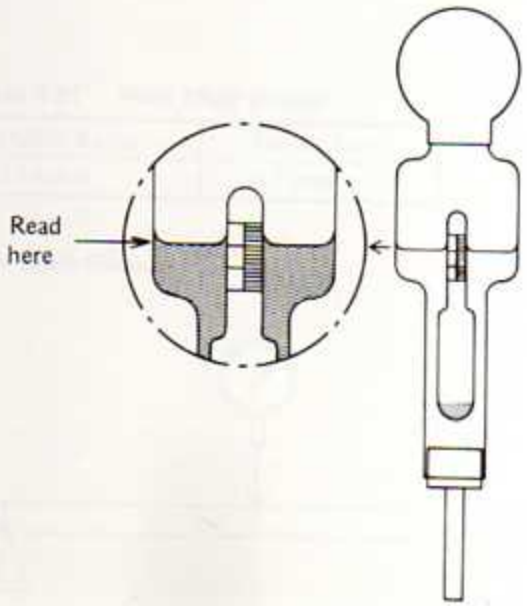
Generally speaking, a battery should be charged if a specific gravity reading shows it to be discharged to 50% or less of full charge.

Specific Gravity/Battery Charge Relationship (5-1)



NOTE: 1. When using the hydrometer, read the electrolyte level at the bottom of the meniscus (curved surface of the fluid).

Hydrometer (5-2)



Battery Charge:

Initial Charging

New batteries for Kawasaki motorcycles are dry charged and can be used directly after adding the electrolyte. However, the effect of the dry charge deteriorates somewhat during storage, especially if any air has entered the battery from imperfect sealing. Therefore, it is best to give the battery an initial charge before using it in order to ensure long battery life.

WARNING **Because the battery gives off an explosive gas mixture of hydrogen and oxygen, keep any sparks or open flame away from the battery during charging.**

- Pour a 1.280 (specific gravity at 20°C or 68°F) sulphuric acid solution into each cell of the battery up to the upper level line.
- Let the battery stand for 30 minutes, adding more acid if the level drops during this time.

NOTE: 1. If the temperature of the solution is over 30°C (85°F), cool the solution before pouring it into the battery.

2. After pouring the acid into the battery, start charging the battery within 12 hours.

- 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 12AH, the charging rate would be 1.2 ampere. If a constant voltage charger is used, the voltage must be adjusted periodically to keep the current at a constant value.

CAUTION **If the temperature of the electrolyte rises above 45°C (115°F) during charging, reduce the charging rate to bring down the temperature, and increase the charging time proportionately.**

- After charging, check the electrolyte level in each cell.
- ★If the level has dropped, add distilled water to bring it back up to the upper level line.
- Check the results of charging by measuring the specific gravity of each cell and by measuring battery voltage. Battery voltage of a 12 volt battery directly after the completion of charging should be 15 to 16 volts.

Ordinary Charging

WARNING **Because the battery gives off an explosive gas mixture of hydrogen and oxygen, keep any sparks or open flame away from the battery during charging.**

- Clean off the battery using a solution of baking soda and water. Make especially sure that the terminals are clean.
- If the electrolyte level is low in any cell, fill to over the lower level line but not up to the upper level line since the level rises during charging. Figure the charging rate to be between 1/10 and 3/10 of battery capacity. For example, the maximum charging rate for a 12AH battery would be 12 x 3/10 which equals 3.6 amperes.

CAUTION **Charging the battery at a rate higher than specified above could ruin the battery. Charging at a higher 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 meterial. Deposits will accumulate, and can cause internal shorting.**

- Measure the specific gravity of the electrolyte, and use the graph, Fig. 5-1, to determine the percentage of discharge. Multiply the capacity of the battery by the percentage of discharge to find the amount of discharge in ampere-hours. Use this figure in the formula below to compute charging time.

$$\text{Charging time (hours)} = \frac{\text{Amount of discharge (AH)}}{\text{charging current (A)}} \times 1.2 \sim 1.5$$

- Remove the caps from all the cells, and begin charging the battery at the rate just caluculated. If a constant voltage charger is used, the voltage will have to be adjusted periodically to maintain charging current at a constant value.

CAUTION **If the temperature of the electrolyte rises above 45°C (115°F) during charging, reduce the charging rate to bring down the temperature, and increase charging time proportionately.**

- After charging, check the electrolyte level in each cell.
- ★If the level has dropped, add distilled water to bring it back up to the upper level line.
- Check charging results by measuring the specific gravity of each cell and by measuring battery voltage. Battery voltage of a 12 volt battery directly after the completion of charging should be 15 to 16 volts and the specific gravity of the electrolyte should be more than 1.250.
- ★If the voltage is lower than this, the battery is not completely charged or can no longer take a full charge.
- ★If the specific gravity of any one cell is lower than 1.250, there may be damage in the cell.

Table 5-1 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 volts	below 12 volts	Test charge
Electrolyte Level	above plates	below top of plates	Fill and test charge
Specific Gravity	above 1.200 in all cells; no two cells more than 0.020 different	below 1.100, or difference of more than 0.020 between two cells	Test charge

Battery Test:

When the battery is suspected of being defective, check the battery as following:

Inspection

- Inspect the points noted in Table 5-1.
- Charge the battery with the ordinary charge following the table.
- ★If the battery will take a charge so that the voltage and specific gravity come up to normal, it may be considered good except in the following case:
- ☆If the voltage suddenly jumps to over 13 volts just after the start of charging, the plates are probably sulphated. A good battery will rise to 12 volts immediately and then gradually go up to 12.5 – 13 volts in about 30 to 60 minutes after charging is started.
- ☆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 to short the plates, but one cell has a low specific gravity after the battery is fully charged, the trouble may be instance only, sulphuric acid solution may be added to correct the specific gravity.
- ☆If a fully charged battery not in use loses its charge after 2 to 7 days, or if the psecific gravity drops markedly, the battery is defective. The self-discharge rate of a good battery is only about 1% per day.

CHARGING SYSTEM

The charging system consists of an alternator and regulator/rectifier.

The alternator generates the current required by the electrical circuits. The generated current is a three phase alternating current (AC), which is changed to direct current (DC) and controlled by a solid-state regulator/rectifier to supply an even voltage to the circuit components.

There are a number of important precautions that are musts even servicing the charging system. Cautions that are applied to the individual sections are mentioned in each section. Failure to observe these rules can result in serious system damage. Learn and observe all the rules below.

CAUTION When handling the regulator/rectifier, observe the following to avoid damage to the regulator/rectifier.

1. **Do not reverse the battery lead connections. This will burn out the zener diode.**
2. **For the regulator/rectifier to function properly, the battery must be charged to near capacity. If the battery is badly discharged, charge it before installing it in the motorcycle.**

When handling the alternator rotor:

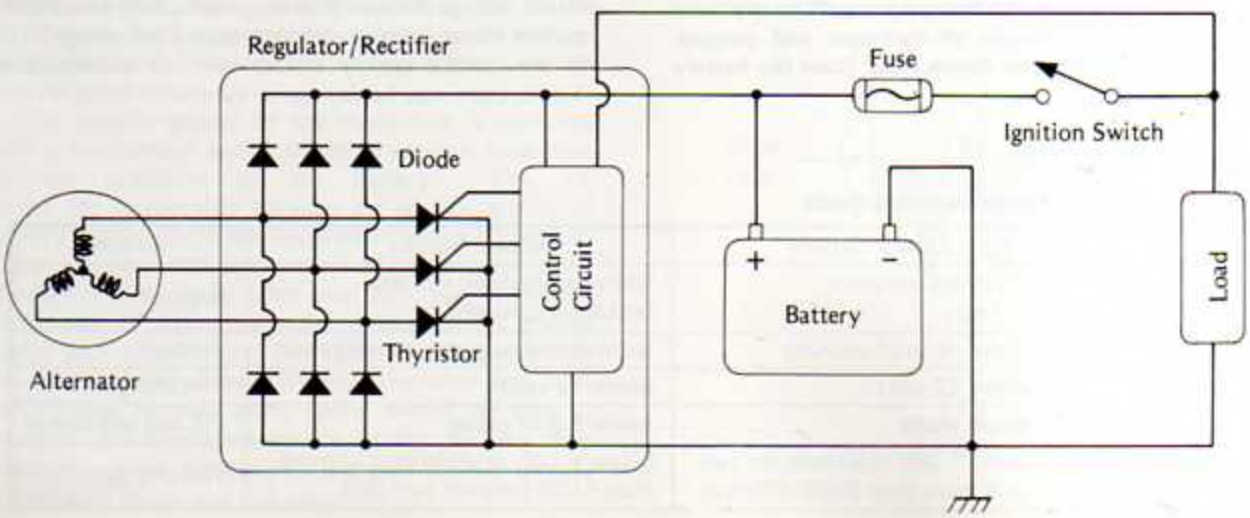
3. **Do not allow the rotor to suffer sharp impacts such as striking it with a hammer or letting it fall on a hard surface. Such a shock to the rotor can cause the magnets to loss their magnetism.**

Initial Inspection

When there are any problem indications in the charging system, give the system a quick initial inspection or check before starting a series of time consuming tests, or worse yet, removing parts for repair or replacement. Such a check will often turn up the source of the trouble.

- 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.
- Check the regulator/rectifier and alternator for evidence of physical damage.

Charging Circuit 5-3

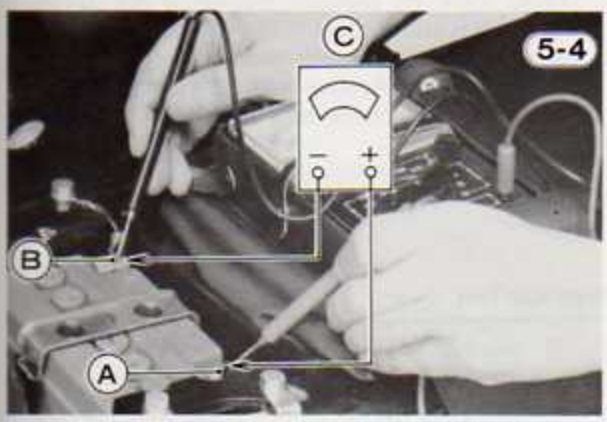


A worn out or badly sulphated battery will produce numerous problems that cannot be corrected until the battery is replaced. **ALWAYS CHECK BATTERY CONDITION BEFORE CONDEMNING OTHER PARTS OF THE SYSTEM. A FULLY CHARGED BATTERY IS A MUST FOR CONDUCTING ACCURATE SYSTEMS TESTS.**

Charging system mulfunctions can be traced to either the battery, alternator, regulator/rectifier, or the wiring. Troubles may involve one unit or in some cases, all units. Never replace a defective unit without determining what **CAUSED** the failure. If the failure was brought on by some other unit or units, they too must be repaired or replaced, or the new replacement will soon fail.

Operational Inspection of Charging System

- Before making this test, check the condition of the battery.
- ★If the battery voltage is less than 12 volts, charge the battery.
- Before starting the charging voltage test, warm up the engine to obtain actual alternator operating conditions.
- Unlock the seat and swing it open.
- Set the multimeter to the 25V DC range, and connect the meter (+) lead to the battery (+) terminal and the meter (–) lead to the battery (–) terminal.



A. Battery (+) Terminal **C. Voltmeter (25V DC)**
B. Battery (–) Terminal

- Start the engine, run it at the rpm in the table, and note the voltage reading.

Table 5-2 Charging Voltage

Meter	Connections	Reading @4,000 rpm
25V DC	Meter (+) ↔ Battery (+) Meter (–) ↔ Battery (–)	about 14.5 V

- ★If the reading is much higher than the values specified in the table, the regulator/rectifier is defective or its leads are loose or open.
- ★If the reading does not rise as the engine speed increases, check the alternator and regulator/rectifier to determine which part is defective.

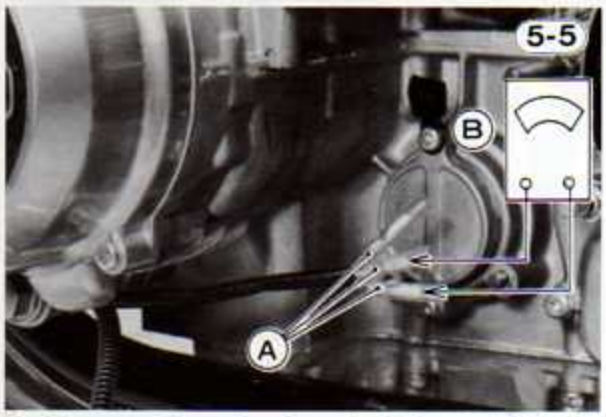
Alternator inspection

There are three types of alternator failures: short, open (wire burned out), or loss in rotor magnetism. A short or open in one of the coil wires will result in either a low output, or no output at all. A loss in rotor magnetism, which may be caused by dropping or hitting the rotor, by leaving it near an electromagnetic field, or just by aging, will result in low output.

- Remove the engine sprocket cover, and disconnect the three yellow leads from the alternator.
- Connect the multimeter as shown in the table to check the alternator output voltage of each pair of the three alternator output leads with no electrical loads.

Table 5-3 Alternator Output Voltage

Meter Range	Connections	Reading @4,000 rpm
250V AC	One meter lead → One yellow lead	about 50V
	The other meter lead → Another yellow lead (Total of 3 measurements)	



A. Alternator Output Leads **B. Voltmeter (250V AC)**

- Start the engine, run it at the rpm given in the table, and note the voltage reading.
- ★If the output voltage shows the value in the table, the alternator operates properly and the regulator/rectifier is damaged. A much lower reading than that given in the table indicates that the alternator is defective.
- Check the stator coil resistance as follows:
- Stop the engine, set the multimeter to the x 1 Ω range, and measure for continuity between each pair of the three alternator output leads.

Table 5-4 Stator Coil Resistance

Meter Range	Connections	Reading
x 1 Ω	One meter lead → One yellow lead	0.48 – 0.72 Ω
	The other meter lead → Another yellow lead (Total of 3 measurements)	

★If there is more resistance than shown in the table, or no meter reading (infinity) for any two stator coil leads, the coil has an open lead and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.

•Using the highest resistance range of the multimeter, measure the resistance between each of the yellow leads and chassis ground.

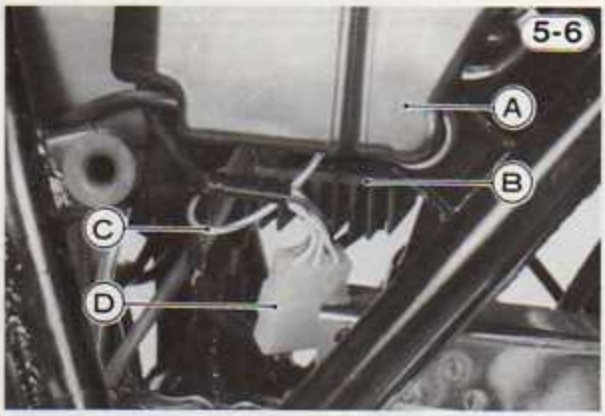
★If any meter reading is less than infinity (∞), the stator is shorted and must be replaced.

★If the stator coil windings have normal resistance, but the voltage check showed the alternator to be defective; then the rotor magnets have probably weakened, and the rotor must be replaced.

Regulator/Rectifier Inspection

Rectifier Inspection:

•With the ignition switch turned off, pull off the left side cover, and remove the electrical cover.



A. Electric Cover **C. White/Red Lead**
B. Regulator/Rectifier **D. 6-Pin Connector**

•Disconnect the regulator/rectifier white/red lead and 6-pin connector.

•Using the x 10 or x 100 Ω range, check the resistance in both directions between the white/red lead and each yellow lead, and between the black lead and each yellow lead. There is a total of 12 measurements. 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: 1. The actual meter reading varies with the meter used and the individual rectifier, but, generally speaking the lower reading should be within 1/3 scale of zero ohms.

Regulator test:

To test the regulator out of circuit, use three 12V batteries and a test light made from a 12V 3 – 6W bulb in a socket with leads.

•Remove the regulator/rectifier from the bottom of the battery case.

•Using auxiliary leads, connect one of the yellow leads to the battery (+) terminal, and connect the test light between the black lead and the battery (–) terminal. At this time the bulb should not be lit.

CAUTION **The test light works as an indicator and also as a current limiter to protect the regulator/rectifier from excessive current. Do not use an ammeter instead of a test light.**

•Connect the brown lead to the other battery (+) terminal and connect the black lead to the battery (–) terminal momentarily. At this time the bulb should not be lit.

•To apply 24V to the regulator/rectifier, connect two 12V batteries in series, and connect the brown lead to the battery (+) terminal and the balck lead to the battery (–) terminal momentarily. The bulb should now light and stay on until the bulb circuit is opened.

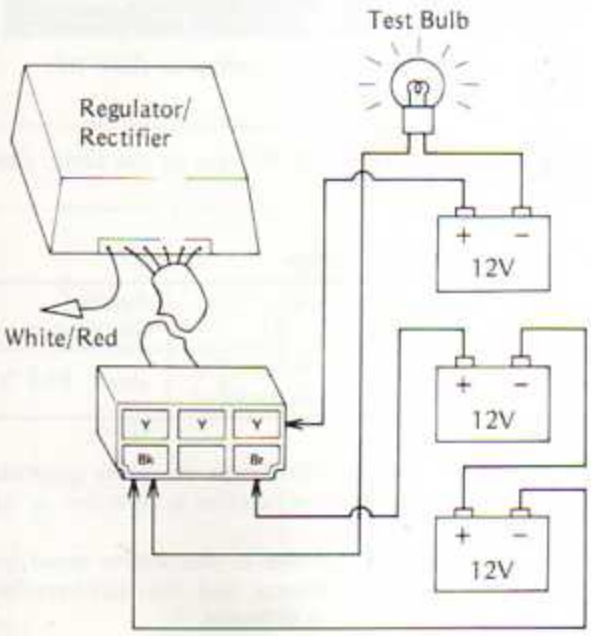
CAUTION **Do not apply more than 24 volts. If more than 24 volts is applied, the regulator/rectifier may be damaged. Do not apply 24 V more than a few seconds. If 24 volts is applied for more than a few seconds, the regulator/rectifier may be damaged.**

•Repeat the above three steps for other two yellow leads.

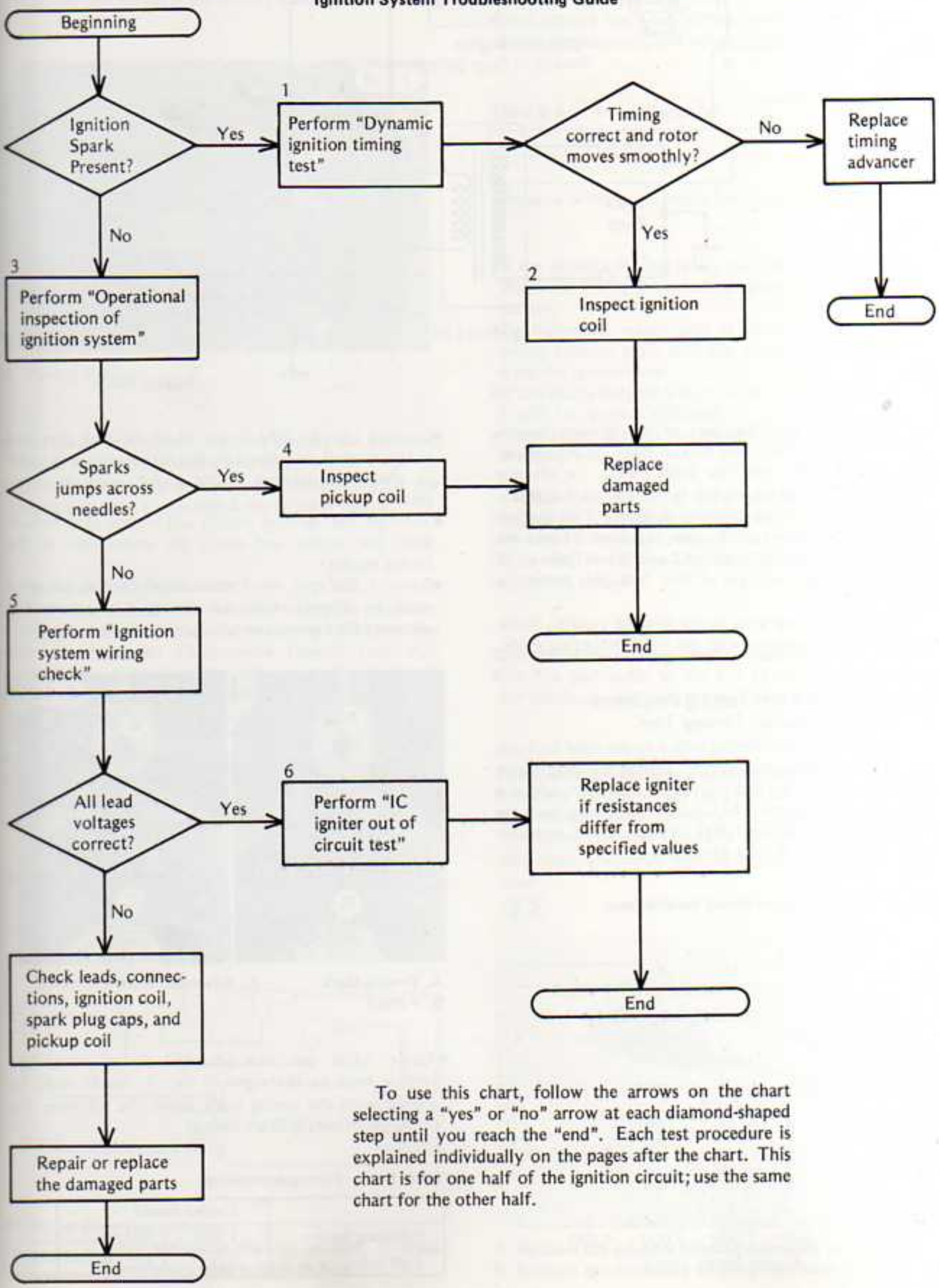
★If the bulb does not light as described above, replace the regulator/rectifier.

NOTE: 1. The above test is not foolproof. If the above checks show the regulator/rectifier is not damaged, but there is still trouble in the charging system, first carefully inspect the alternator, battery, wiring, and all connections. Replace the regulator/rectifier if all these other components turn out good.

Regulator Test **5-7**

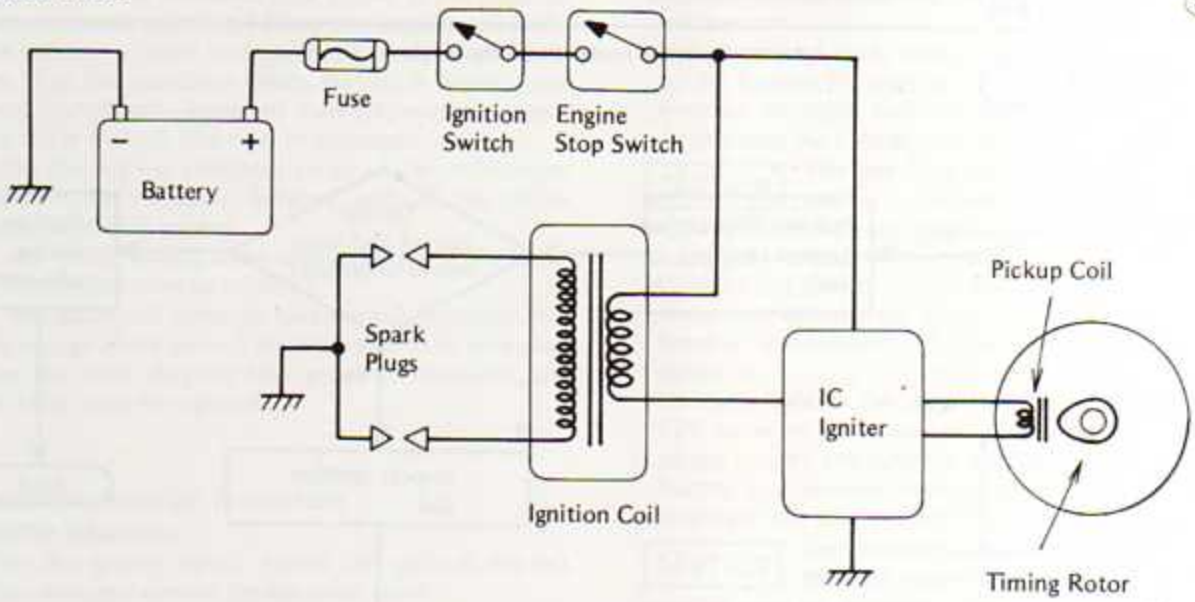


Ignition System Troubleshooting Guide



To use this chart, follow the arrows on the chart selecting a "yes" or "no" arrow at each diamond-shaped step until you reach the "end". Each test procedure is explained individually on the pages after the chart. This chart is for one half of the ignition circuit; use the same chart for the other half.

Ignition Circuit 5-8



The working electrical part of the ignition system consists of a battery, two pickup coils, an IC igniter, two ignition coils, and four spark plugs. To advance the ignition timing as engine rpm rises, an automatic centrifugal-type timing advancer is used. The ignition system comprises two parts; one part fires #1 and #4 cylinders, and the other part #2 and #3 cylinders. A schematic wiring diagram of one half the system is in the figure.

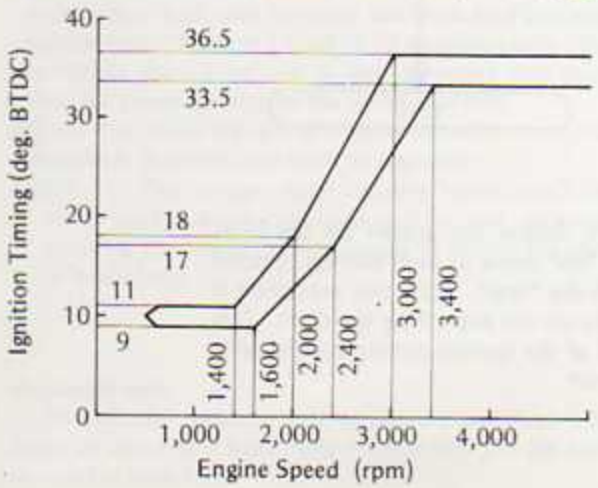
If trouble is suspected in the ignition system, check the system in accordance with the troubleshooting guide.

Description of Each Testing Procedure:

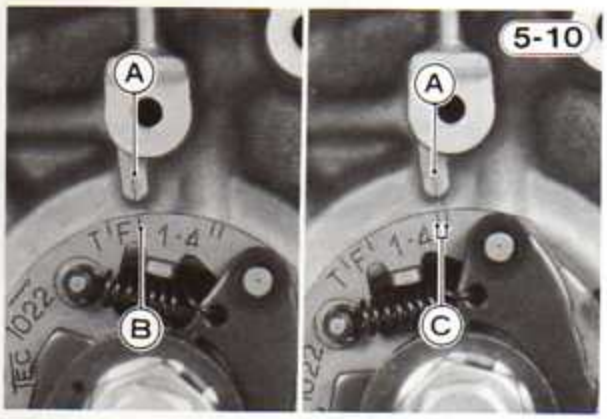
1. Dynamic Ignition Timing Test

Check the ignition timing with a strobe light for both low and high speed operation. Timing advance begins at 1,400 – 1,600 rpm and reaches the maximum advance at 3,000 – 3,400 rpm. As a result, the timing must be checked at idle (below 1,400 rpm) and then at above 3,400 rpm when it is fully advanced.

Ignition Timing/Engine Speed Relationship 5-9



- Connect a strobe light to the #1 or #4 spark plug lead in the manner prescribed by the manufacturer in order to check the ignition timing under operating conditions.
- Turn on the ignition switch and engine stop switch. Start the engine, and direct the strobe light at the timing marks.
- Below 1,400 rpm, the F mark on the timing advancer must be aligned with the timing mark above the advancer for correct low rpm ignition timing.



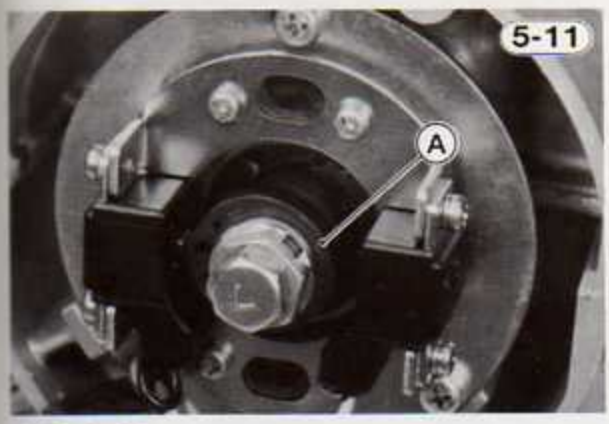
A. Timing Mark **C. Advanced Mark**
B. F Mark

- Above 3,400 rpm, the advanced timing mark (the vertical lines to the right of the 4 mark) must be aligned with the timing mark above the advancer for correct high rpm ignition timing.

Table 5-5 Timing Advancing

	Engine Speed
Advance Begins	1,400 – 1,600 rpm
Full Advance	3,000 – 3,400 rpm

★If the timing is not correct, check that the rotor on the timing advancer turns smoothly on the shaft by hand and that no parts are visually damaged.



A. Timing Rotor

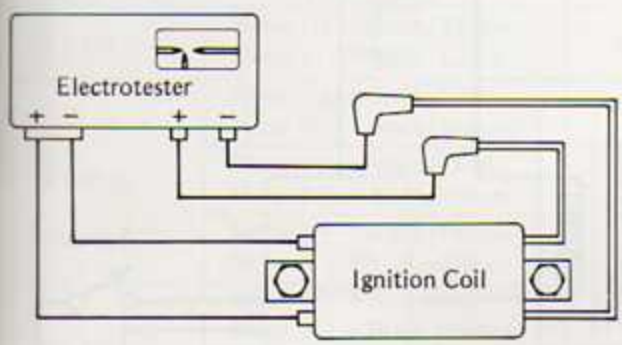
★If advancer lubrication does not remedy the problem, replace the advancer with a new one.
★If the timing rotor binds on the shaft, lubricate the timing advancer, and re-check the ignition timing.

2. Ignition Coil Inspection

The most accurate test for determining the condition of the ignition coils is made by measuring arcing distance with the Kawasaki Electrotester (special tool: P/N 57001-980). Since a tester other than the Kawasaki Electrotester may produce a different arcing distance, the Kawasaki Electrotester is recommended for reliable results.

- Remove the ignition coil.
- Connect the ignition coil to the Kawasaki Electrotester as shown in the figure.

Ignition Coil Test (5-12)



- Turn on the tester switches.

WARNING **Do not touch the coil or leads to avoid extremely high voltage shocks.**

- Gradually slide the arcing distance adjusting knob from left to right (small distacne to large distance) carefully watcheing the arcing.
- Stop moving the knob at the point where the arcing begins to fluctuate, and note the knob position in mm.

Table 5-6 Arcing Distance*

Standard
7 mm or more

*Measure with the Kawasaki Electrotester.

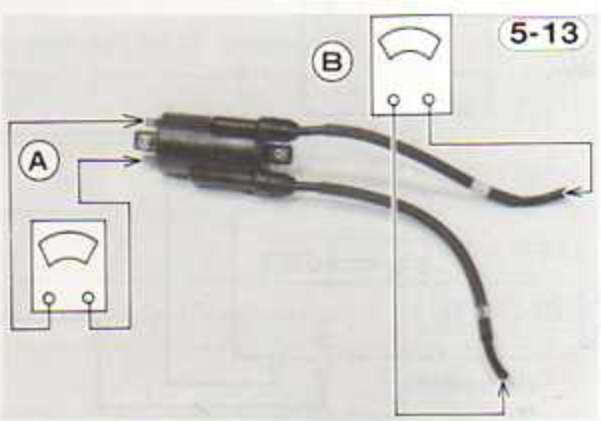
★If the distance reading is less than the value shown in the table, the ignition coil or spark plug caps are defective.
- To determine which part is defective, measure the arcing distance again with the spark plug caps removed from the ignition coil.

★If the arcing distance is subnormal as before, the trouble is with the ignition coil itself.
★If the arcing distance is now normal, the trouble is with the spark plug caps.

If an Electrotester is not available, the coil can be checked for a broken or dadly shorted winding with an ohmmeter. However, an ohmmeter cannot detect layer shorts and shorts resulting from insulation breakdown under high voltage.

To measure the primary winding resistance:
- Set the ohmmeter to the x 1 Ω range, and measure for continuity between the primary lead terminals.

To measure the secondary winding resistance:
- Unscrew the spark plug caps from the spark plug leads.
- Set the ohmmeter to the x 1 kΩ range, and connect one ohmmeter lead to one of the spark plug leads and the other ohmmeter lead to the remaining spark plug lead.



A. Measure the primary winding resistance (x 1 Ω)
B. Measure the secondary winding resistance (x 1 kΩ)

Table 5-7 Ignition Coil Resistance

	Meter Range	Reading
Primary Winding	x 1 Ω	1.8 – 2.7 Ω
Secondary Winding	x 1 kΩ	12 – 18 kΩ

★If the coil does not produce an adequate spark, or if either the primary or secondary winding does not have the correct resistance, replace the ignition coil.
- With the highest ohmmeter range, check for continuity between each ignition coil pink lead, and one spark plug lead and the coil core (two tests on each coil).

★If there is any reading, the coil is shorted and must be replaced.
★If either spark plug lead shows visible damage, replace the ignition coil.

3. Operational Inspection of the Ignition System

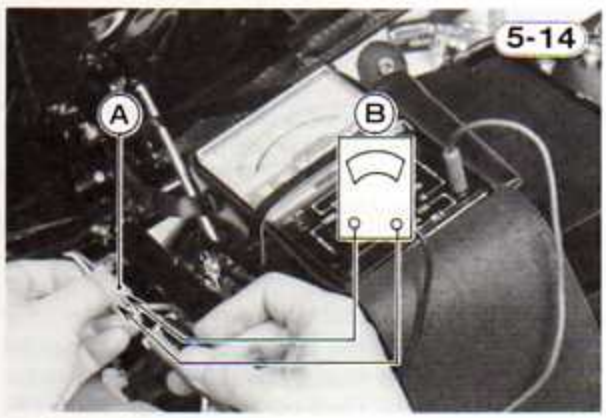
- Have a DC voltage source of 6 – 12 volts output such as a motorcycle battery.
- Open the seat, and disconnect the 4-pin connector which connects the IC igniter and the pick-up coils.
- Remove the fuel tank, and pull the spark plug caps off the spark plugs.
- Connect the spark plug leads to the Electrotester in the same way as for measuring the arcing distance. For this test, the Electrotester need not be supplied with electric power.
- Slide the adjusting knob to set the arcing distance to 5 – 8 mm.
- In the 4-pin connector from the IC igniter, connect the DC voltage source positive (+) lead to the black lead and the negative (–) lead to the blue lead for the #1 and #4 ignition coil (voltage source positive (+) lead to the yellow lead and the negative (–) lead to the red lead for the #2 and #3 ignition coil).
- Turn the ignition switch to the ON position, and switch the DC voltage source on and off.
- As the DC voltage source is switched, sparks should jump across the needles in the Electrotester.

4. Pickup Coil Inspection

- Connect the multimeter to the pickup coil leads to measure the coil resistance as shown in the table.

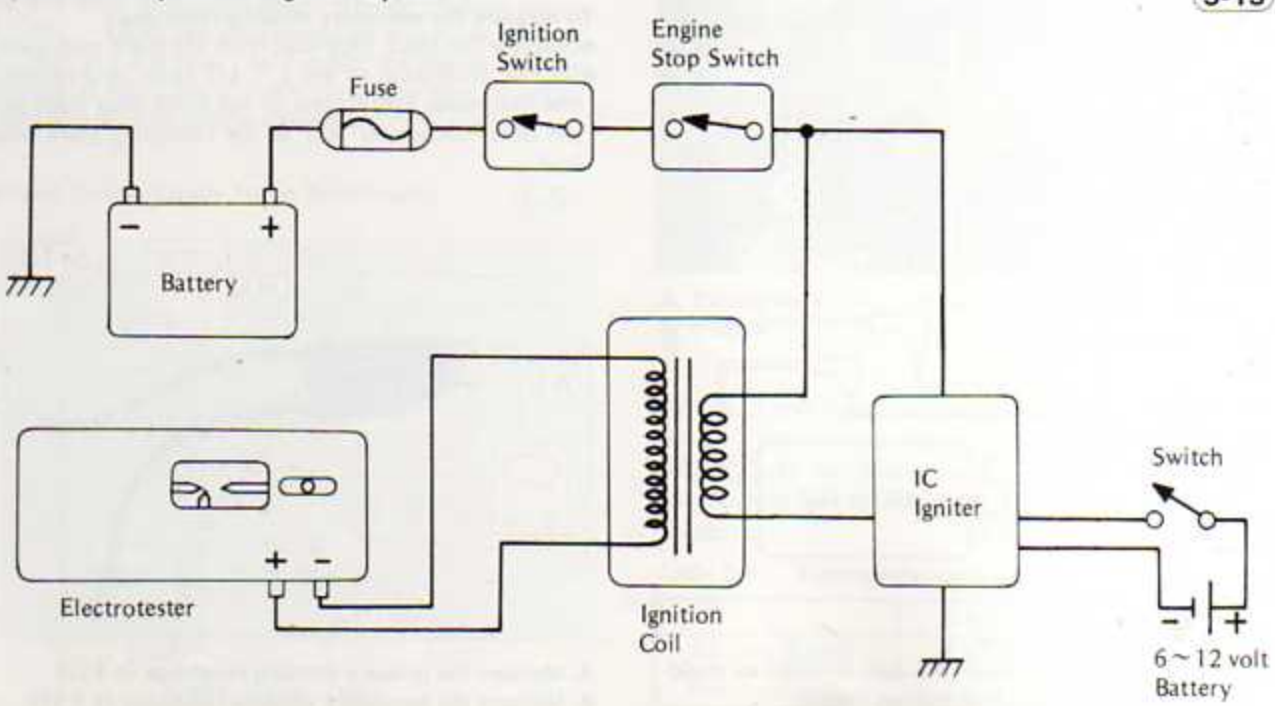
Table 5-8 Pickup Coil Resistance

Meter Range	Connections	Reading
x 100 Ω	One meter lead → Black or Yellow Lead	360 – 540 Ω
	The other meter Lead → Blue or Red Lead	



A. Pickup Coil 4-pin Connector
B. Ohmmeter (x 100 Ω)

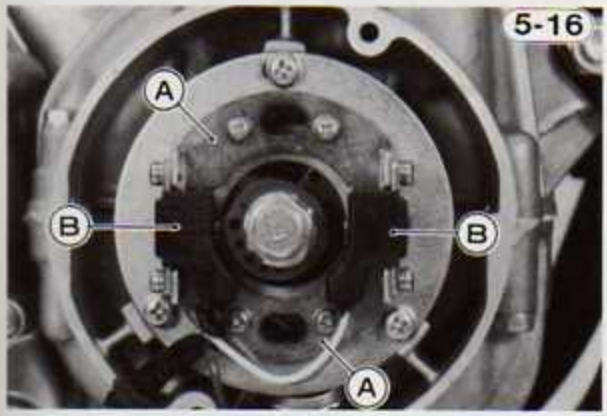
Operational Inspection of Ignition System



★If there is more resistance than shown in the table, the coil has an open lead and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.
- Using the highest resistance range of the multimeter, measure the resistance between the pickup coil leads and chassis ground.

★If any meter reading is less than infinity (∞), the pickup coil assembly is shorted and must be replaced.
- Visually inspect the pickup coil assembly.

★If the permanent magnets and coils are damaged, replace the pickup coil assembly.



A. Magnet B. Pickup Coil

5. Ignition System Wiring Check

- Reconnect all leads and connectors which were disconnected.
- Connect the multimeter to the IC igniter leads as shown in the table, turn on the ignition switch, and note the meter readings. Measure the lead voltages with the engine stopped.

6. IC Igniter Out of Circuit Test

- Turn off the ignition switch, and disconnect all the IC igniter leads and connector.
- Connect the multimeter as shown in the table to check the internal resistance of the igniter.

IGNITION SWITCH

Switch Test

- Remove the headlight unit, and disconnect the 6-pin connector and brown lead from the switch.
- Use an ohmmeter to verify that all the connections listed in the table are making contact (zoro ohms between those wires), and that no other wires are connected.

★If there are any opens or shorts in the switch, replace it with a new one.

Table 5-9 Wiring Inspection

Meter Range	Connections*	Location	Reading
25V DC	Meter (+) → Black or Green	At 4-pin connector for the ignition coils	Battery voltage
	Meter (+) → Black, Blue, Yellow, or Red	At 4-pin connector for the pickup coils	0.5 — 1.0 V

*Connect the meter (—) lead to ground.

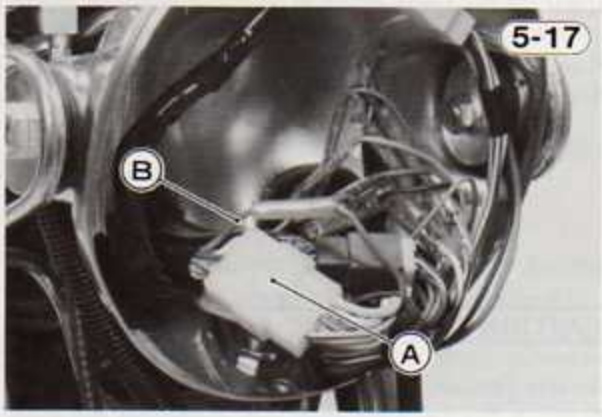
Table 5-10 IC Igniter Resistance

Meter Range	Connections	Location	Reading*
x 1 kΩ	Meter (+) → Black/Yellow Meter (—) → Black, Green	At 4-pin connector for the ignition coils	∞
x 100 Ω	Meter (+) → Black, Green Meter (—) → Black/Yellow	"	200 — 500 Ω
	Meter (+) → Yellow/Red Meter (—) → Black/Yellow	"	200 — 600 Ω
	Meter (+) → Black/Yellow Meter (—) → Yellow/Red	"	300 — 700 Ω
x 1 kΩ	Meter (+) → Blue (Red) Meter (—) → Black (Yellow)	At 4-pin connector for the pickup coils	25 — 45 kΩ
	Meter (+) → Black (Yellow) Meter (—) → Blue (Red)	"	20 — 40 Ω

*Measured with the Kawasaki Hand Tester (57001-983)
A tester other than the Kawasaki Hand Tester may show slightly different readings.

Table 5-11 Ignition Switch Internal Connections for each Switch Position

	Horn	Battery 1	Ignition	Tail 1	Tail 2	Battery 2	Tail 3
	Brown	White	Yellow	Blue	Red	White	Orange/Green
OFF							
ON	●	●	●	●	●	●	●
P (Park)		●			●	●	



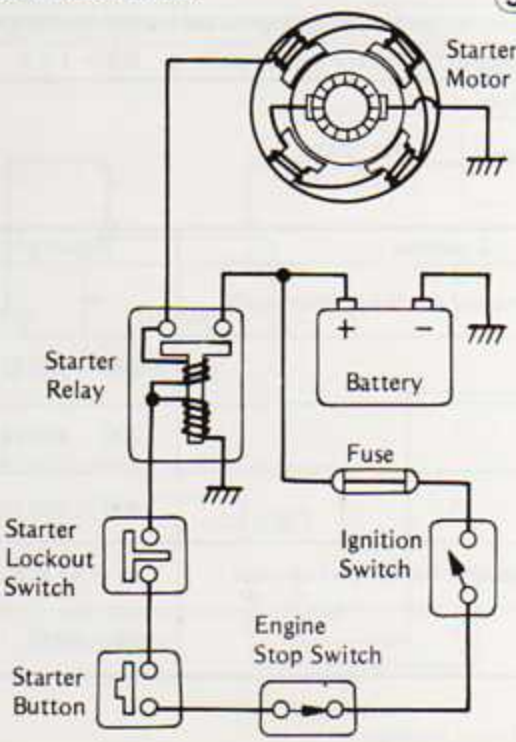
A. 6-pin Connector **B. Brown Lead**

ELECTRIC STARTER SYSTEM

Starter Motor Circuit:

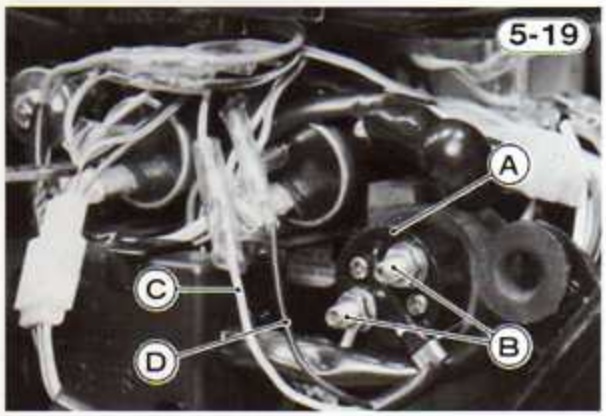
CAUTION **Because of the large amount of current, never keep the starter button pushed any time that the starter motor will not turn over, or the current may burn out the starter motor windings.**

Starter Motor Circuit 5-18



Starter Relay Test

- Disconnect the starter motor lead from the starter motor in the electrical cover, and connect an ohmmeter set to the x 1 Ω range across the relay terminals.
- Pulling the clutch lever, push the starter button, and see if the meter reads zero ohms.
- ★If the relay makes a single clicking sound and the meter reads zoro, the relay is good.
- ★If the relay clicks but the meter does not read zoro, the relay is defective and must be replaced.

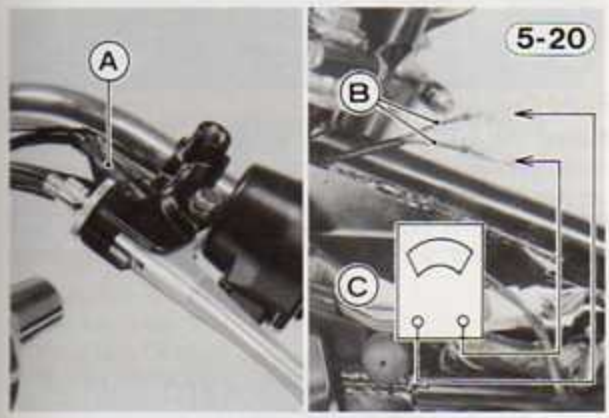


A. Starter Relay **C. Yellow/Red Lead**
B. Relay Terminals **D. Black Lead**

- If the relay does not click at all, disconnect the other two leads (black and yellow/red), and measure the resistance across them.
- ★If the resistance is not close to zoro ohms, the relay is defective.
- ★However, if there is about zoro ohms resistance, the relay may be good; check that there is actually voltage to the relay before deciding that the relay is defective.
- To check for the voltage, first turn the meter to 25V DC, connect the (−) meter lead to the yellow/red lead which was disconnected form the relay lead, and connect the (+) meter lead to the black lead.
- Pulling the clutch lever, push the starter button, and see if the meter reads battery voltage.
- ★If the meter does not, there is wiring, starter lockout switch, or starter switch trouble.
- ★If the meter reads battery voltage but the relay does not click, the relay is defective.

Starter Lockout Switch Test

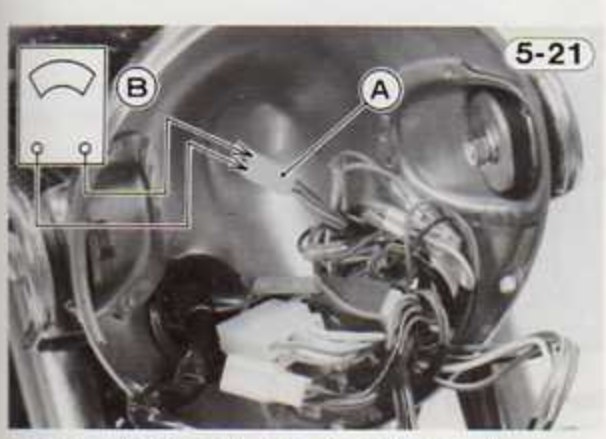
- Remove the fuel tank, and disconeect the two starter lockout switch black leads.
- Connect an ohmmeter set to the x 1 Ω range across the two black leads.
- Pull the cluth lever, and see if the meter reads zoro ohms.
- ★If the meter does not, the starter lockout switch is defective and must be replaced.



A. Starter Lockout Switch **C. Ohmmeter (x 1 Ω)**
B. Switch Leads

Starter Button Test

- Remove the headlight unit, and disconnect the 6-pin connector from the right switch housing.
- Connect an ohmmeter set to the x 1 Ω range across the yellow/red and the black leads.
- Push the starter button, and see if the meter reads zoro ohms.
- ★If the meter does not, the starter button is defective and the entire right switch housing assembly must be replaced.



A. Yellow/Red and Black Leads (6-pin Conn.)
B. Ohmmeter (x 1 Ω)

Starter Motor:

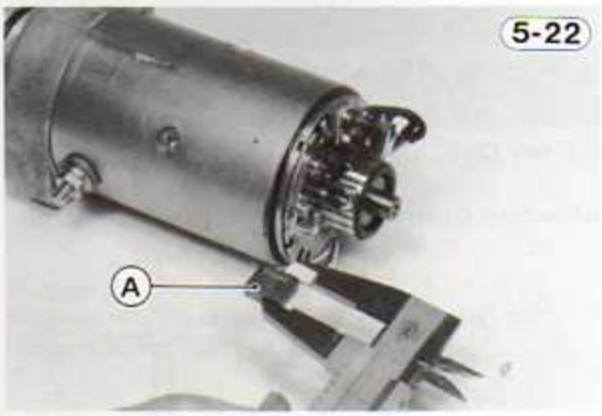
Carbon Brush Wear Inspection

Worn brushes or weak springs will cause poor brush contact.

- Measure the length of the brushes.
- ★Replace both if either one is worn down to less than the service limit.

Table 5-12 Carbon Brush Length

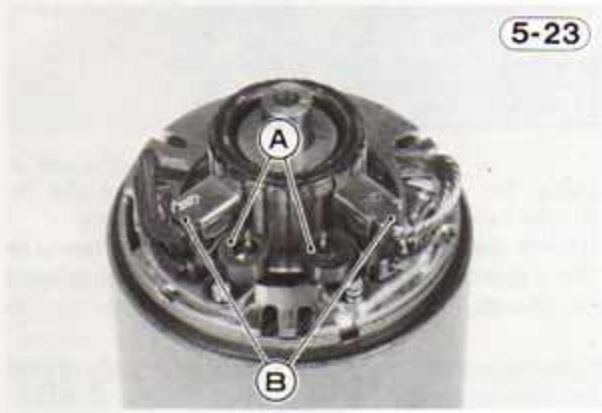
Service Limit	6 mm



A. Carbon Brush

Brush Spring Inspection

- Spring tension should be 560 – 680 grams but a spring can be considered serviceable if it will snap the brush firmly into place.

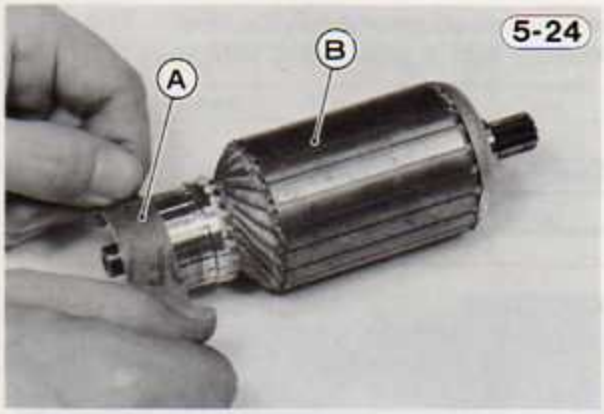


A. Springs **B. Brushes**

Commutator Inspection

A dirty or damaged commutator will result in poor brush contact and cause the brushes to wear down quickly. In addition, particles from brush wear accumulating between commutator segments may cause partial shorts.

- Smooth the commutator surface if necessary with fine emery cloth, and clean out the grooves as illustrated.
- Determine as accurately as possible the depth of the grooves between commutator segments.
- ★If the groove depth is less than the service limit, replace the armature with a new one.



A. Emery Cloth B. Armature

Commutator Groove

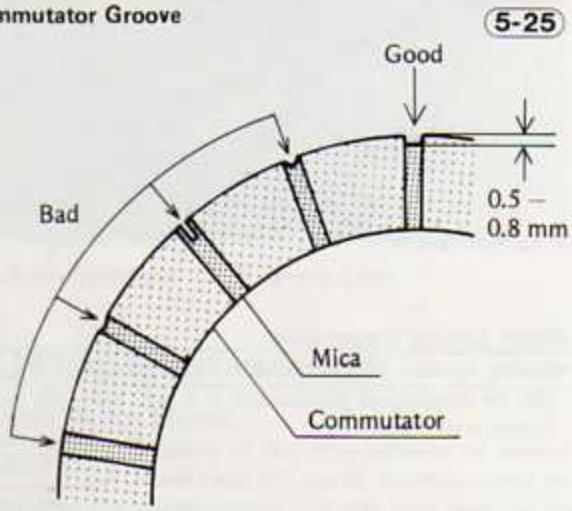
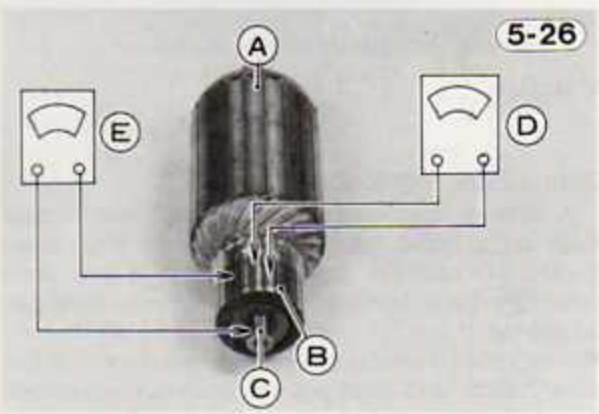


Table 5-13 Commutator Groove Depth

Service Limit	0.2 mm

•Using the x 1 Ω ohmmeter range, measure the resistance between any two commutator segments.

★If there is a high resistance or no reading between any two segments, a winding is open and the armature must be replaced.



A. Armature D. Ohmmeter (x 1 Ω)
B. Commutator Segments E. Ohmmeter (x 1 kΩ)
C. Shaft

•Using the highest ohmmeter range, measure the resistance between the commutator and the shaft.

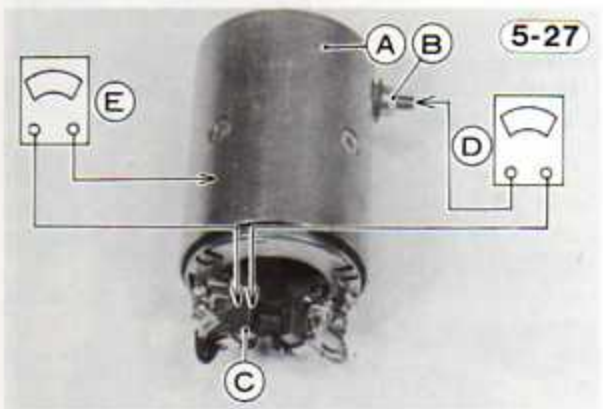
★If there is any reading, the armature has a short and must be replaced.

NOTE: 1. Even if the foregoing checks shown the armature to be good, it may be defective in some manner not readily detectable with an ohmmeter. If all other starter motor and starter motor circuit components check good, but the starter motor still does not turn over or only turns over weakly, replace the starter motor with a new one.

Field Coil Inspection

•Using the x 1 Ω ohmmeter range, measure the resistance between the (+) side carbon brush and the starter motor terminal.

★If there is not close to zero ohms, the field coils have an open and the yoke assembly must be replaced.



A. Yoke D. Ohmmeter (x 1 Ω)
B. Terminal E. Ohmmeter (x 1 kΩ)
C. (+) Side Carbon Brush

•Using the highest ohmmeter range, measure the resistance between the (+) side carbon brush and the yoke (housing).

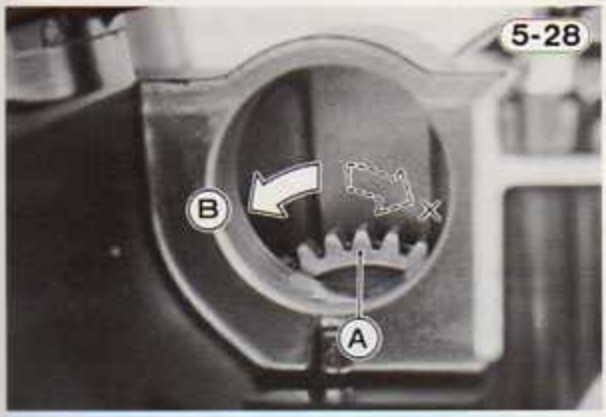
★If there is any meter reading, the coils are shorted to ground and the yoke assembly must be replaced.

Starter Motor Clutch:

Inspection

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

★If the clutch does not operate as it should or if it makes noise, disassemble the starter clutch, examine each part visually, and replace any worn or damaged parts.



A. Starter Motor Idle Gear B. Turn freely.

LIGHTING SYSTEM

This section is divided as follows:
- Headlight Beam:
- Headlight Circuit:
- Brake Light Circuit:
- Turn Signal Circuit:
- Automatic Turn Signal Cancelling System:
- Hazard Circuit:

Headlight Beam:

Horizontal Adjustment

The headlight beam is adjustable horizontally. If not properly adjusted horizontally, the beam will point to one side rather than straight ahead.

- Turn the adjusting screw on the headlight rim in or out until the beam points straight ahead. Turning the adjusting screw clockwise makes the headlight beam point to the left.

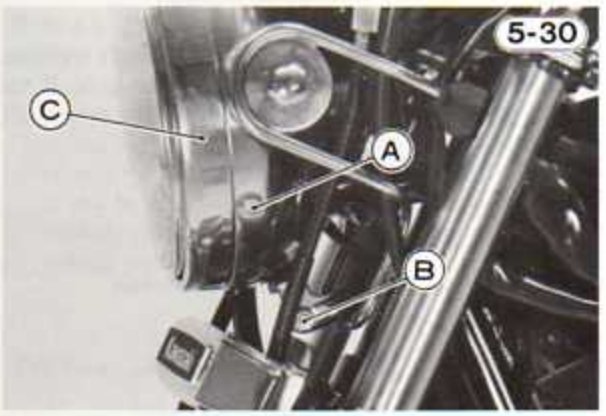


A. Adjusting Screw

Vertical Adjustment

The headlight beam is adjustable vertically. If adjusted too low, neither low nor high beam will illuminate the road far enough ahead. If adjusted too high, the high beam will fail to illuminate the road close ahead, and the low beam will dazzle oncoming drivers.

- Remove the mounting screws, and drop out the headlight unit.



A. Mounting Screw C. Headlight Unit
B. Headlight Bolt

- Loosen the lower headlight bolt.
- Loosen the headlight housing mounting nuts, and adjust the headlight vertically.

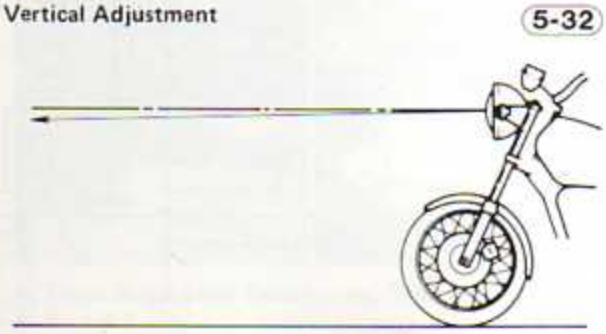


A. Mounting Nut

- Tighten the headlight housing mounting nuts.
- Tighten the lower headlight bolt.
- Install the headlight unit, and tighten the mounting screws.

NOTE: 1. On high beam, the brightest point should be slightly below horizoned with the motorcycle on its wheels and the rider seated. Adjust the headlight to the proper angle according to local regulations.

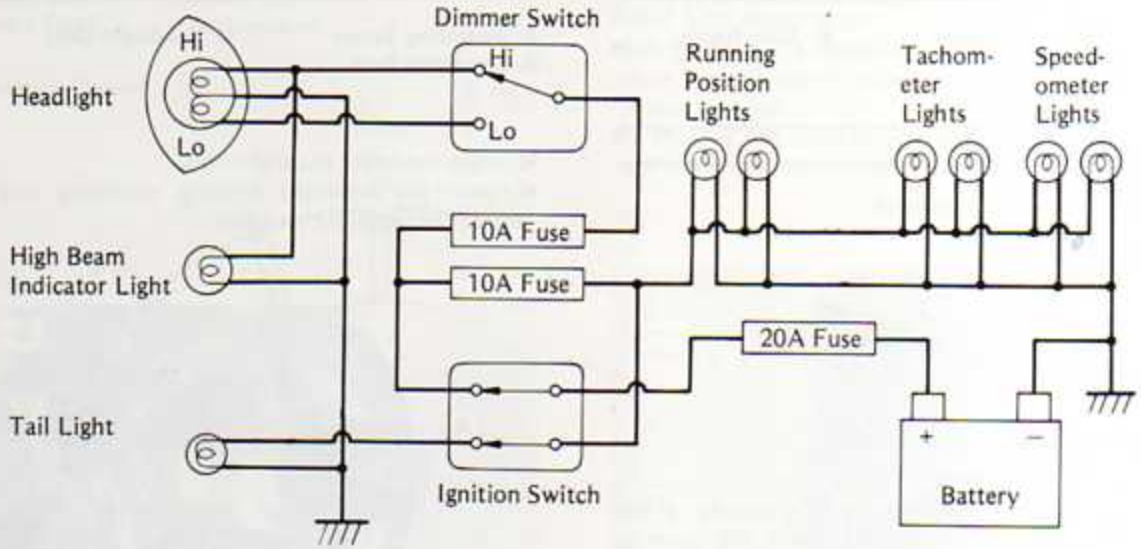
Vertical Adjustment



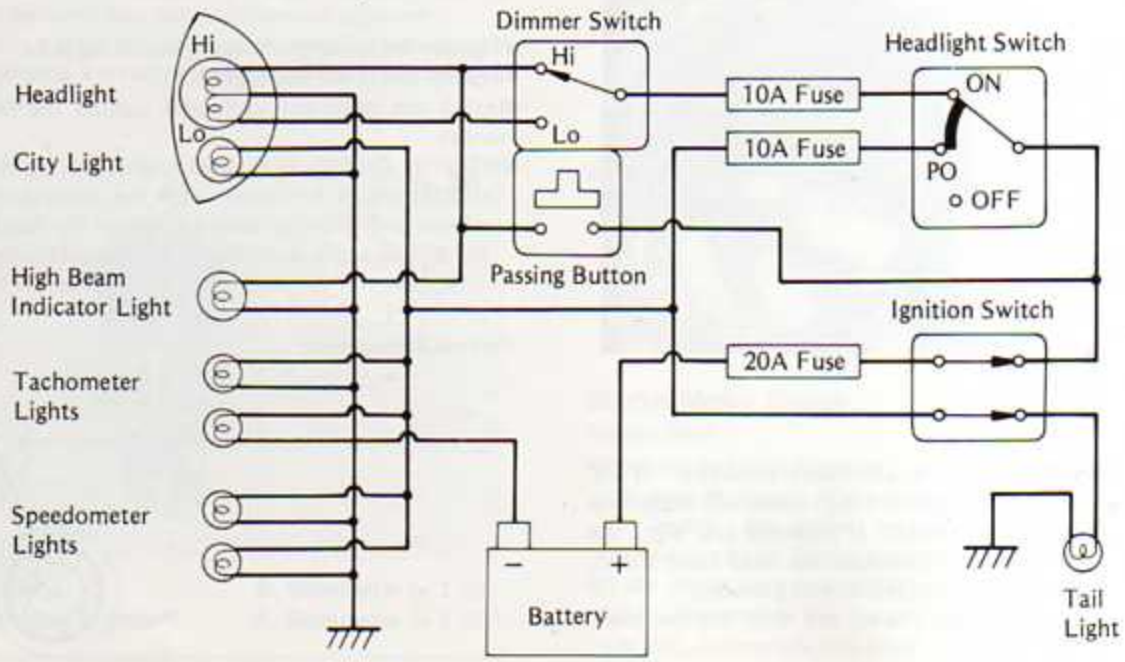
Headlight Circuit:

If the bulb does not go on when the circuit is closed, the filament is probably burned out. However, if the bulb is good, check the battery, fuses, ignition switch, headlight switch, dimmer switch, and wiring.

Headlight Circuit for US and Canadian models (5-33)

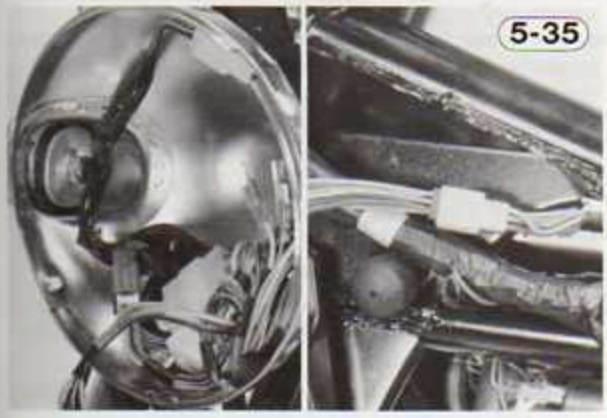


Headlight Circuit for Other than US and Canadian models (5-34)



Headlight Switch, Dimmer Switch, Passing Button Inspection

•Remove the fuel tank and/or headlight unit, and disconnect the leads or connectors to the left or right switch housing.



•Use an ohmmeter to see that only the connections shown in the tables have continuity (zero ohms).

★If the switch has open or a short, it can be disassembled for repair. The contact surfaces may be cleaned, but no internal parts are available for replacement. If any parts are not repairable, the switch must be replaced as a unit.

Table 5-14 Headlight Switch Connections

	Brown/White	Brown	Bl/W
OFF			
• (City Light)	●	●	
ON	●	●	●

Table 5-15 Dimmer Switch Connections

	Red/Black	Blue	Red/Yellow
Hi	●	●	
Lo		●	●

Table 5-16 Passing Button Connections

	Red/Black	Brown
Push	●	●

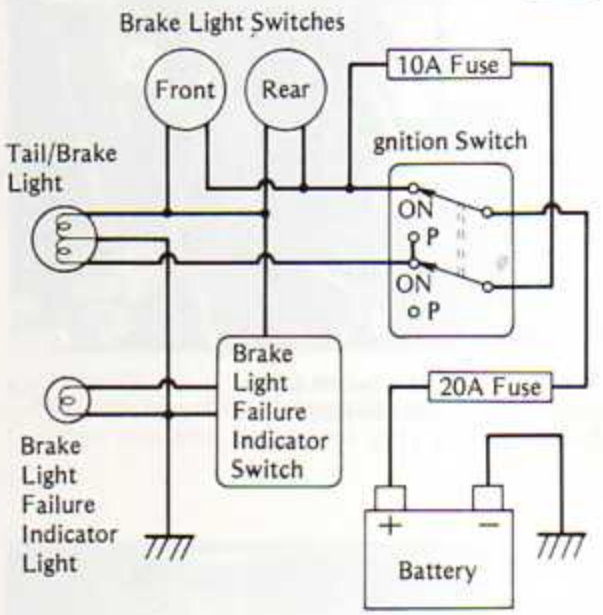
★If the headlight lights but does not light brightly, the trouble may be that the headlight is of improper wattage or the battery or the alternator is not supplying sufficient current. However, the trouble may also be caused by a short or a component drawing too much current in some other part of the electrical system.

Brake Light Circuit:

NOTE: 1. The same bulb is used for both the brake and tail lights.

2. See the Headlight circuit fot the tail light trouble. If the brake light does not go on when the circuit is closed, the filament is probably burned out. However if the bulb is good, check the fuses, ignition switch, battery, front brake light switch, rear brake light switch, and wiring.

Tail/Brake Light Circuit 5-36



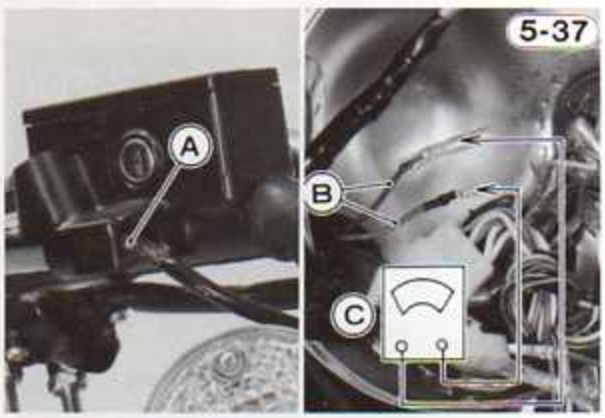
Front Brake Light Switch Inspection

•Remove the headlight unit.

•Disconnect the front brake light switch leads (brown and blue).

•Set an ohmmeter to the x 1 Ω range, connect the meter between the switch leads, and determine whether or not there is continuity whenever the front brake lever is squeezed.

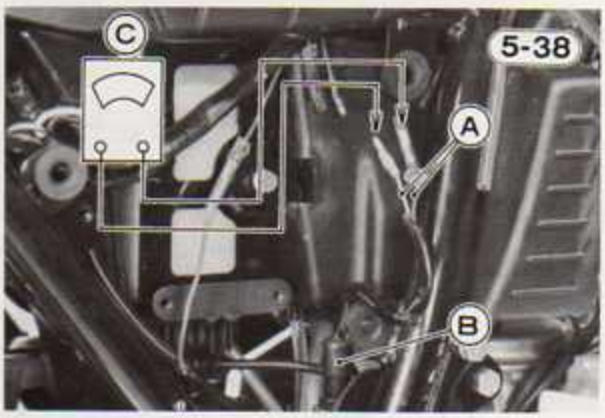
★If there is no continuity, replace the switch.



A. Front Brake Light Switch
B. Switch Leads
C. Ohmmeter (x 1 Ω)

Rear Brake Light Switch Inspection

•Disconnect the rear brake light switch leads (blue and brown) in the right side cover.
•Set an ohmmeter to the x 1 Ω range, connect the meter between the switch leads, and determine whether or not there is continuity whenever the rear brake pedal is depressed.
★If there is no continuity, replace the switch.



A. Rear Brake Light Switch Leads
B. Rear Brake Light Switch
C. Ohmmeter (x 1 Ω)

Brake Light Failure Indicator Switch Inspection

•Turn on the ignition switch. Watching the indicator light (stop lamp), apply and then release either brake.
•Next, with the tail/brake light bulb removed, do the same above.
★If the indicator light operates as shown in the table, the brake light failure indicator switch and brake light circuit are functioning properly.



A. Indicator Light

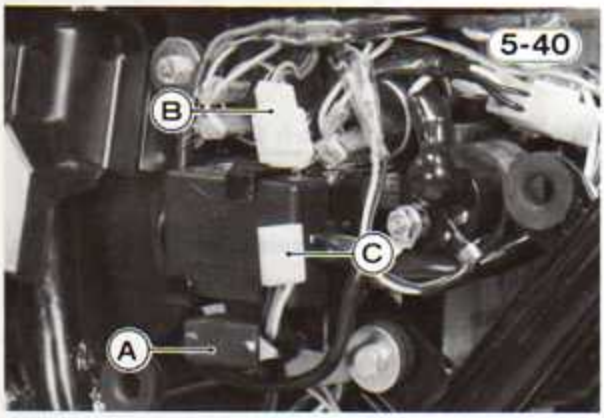
Table 5-17 Brake Light Failure Indicator Switch Test

		Brake Lever or Pedal	
		Applied	Released
Tail/Brake Light Bulb	In place	Goes On	Goes Off
	Out of place	Goes On	Flashes

•If the brake light failure indicator does not function properly, find out whether the brake light wiring is defective or the failure indicator switch is defective. The easiest way to test the failure indicator switch is to install and check the suspect switch on a motorcycle with a known good brake light circuit. When this method is impossible, check the circuit as follows (the battery must be charged).

(1)Brake light wiring inspection:
•Check brake light operation and replace any defective parts. The brake light must go on only when the brake is applied.
•Remove the left side cover, open the electrical cover, and disconnect the indicator switch 3-pin plug.
•Set an ohmmeter to the x 1 Ω range and voltmeter to the 25V DC range. Check the wiring as shown in the table.

CAUTION **To prevent a meter burning, turn off the ignition switch while using an ohmmeter.**



A. Brake Light Failure Indicator Switch
B. 3-pin Socket (from main harness)
C. 3-pin Plug (from indicator switch)

★If the meter does not read according to this table, there may be an open or short.
★In case the voltage of the green/white lead shows 0 V, the indicator bulb may be burned out.

(2)Brake light failure indicator switch inspection:
•Make sure that the brake light operates properly, and that the brake light wiring is not damaged.
•Connect the indicator switch 3-pin connector.
•Measure the voltage at the 3-pin connector as shown in the table.
★If any one of the meter readings shows an improper value, the brake light failure indicator switch is defective.

Table 5-18 Brake Light Wiring Inspection

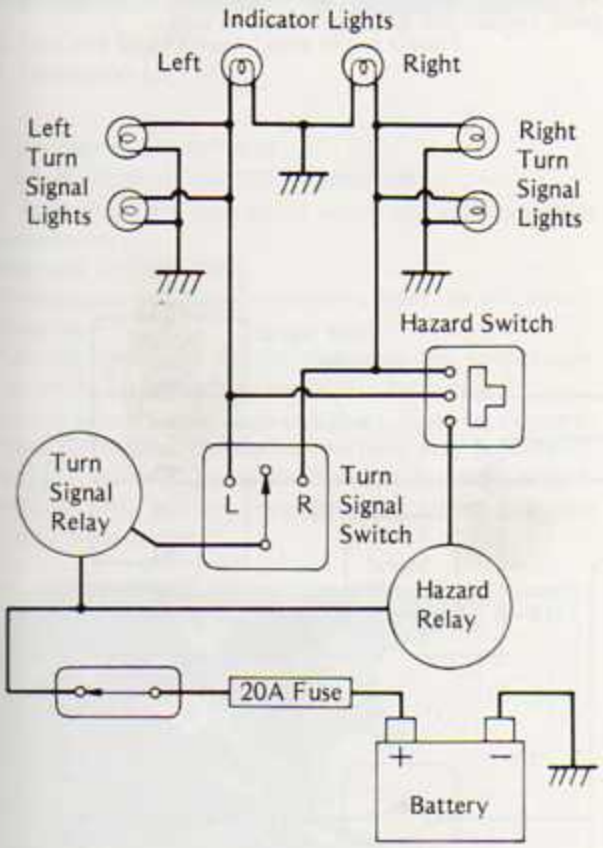
Meter Range	Connections	Brake	Reading
25V DC	Meter (+) Lead → Blue Lead Meter (–) Lead → Chassis Ground	Apply	Battery Voltage
		Release	0 V
	Meter (+) Lead → Green/White Lead Meter (–) Lead → Chassis Ground	———	Battery Voltage
x 1 Ω	Black/Yellow Lead ↔ Chassis Ground	———	0 Ω

Table 5-19 Indicator Switch Inspection

Meter Range	Connections	Brake	Reading
25V DC	Meter (+) Lead → Yellow Lead Meter (–) Lead → Chassis Ground	Apply	Battery Voltage
		Release	0 V
	Meter (+) Lead → Green/White Lead Meter (–) Lead → Chassis Ground	Apply	0 V
		Release	Battery Voltage

Turn Signal Circuit: (5-41)

Turn Signal and Hazard Circuit

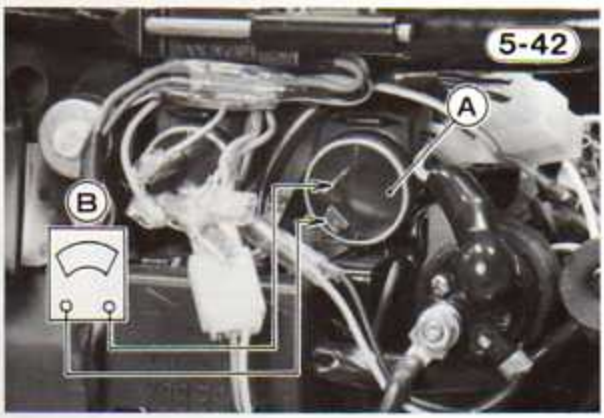


Turn Signal Trouble

(1)Neither right nor left turn signals come on at all:

- Check that battery voltage is normal.
- Remove the left side cover, and open the electrical cover.
- Unplug the orange lead and orange/green lead from the relay, and use an ohmmeter to check that there is continuity (close to zero ohms) between the relay terminals.

★If there is no ohmmeter reading, or if there is several ohms resistance, replace the relay with a new one.

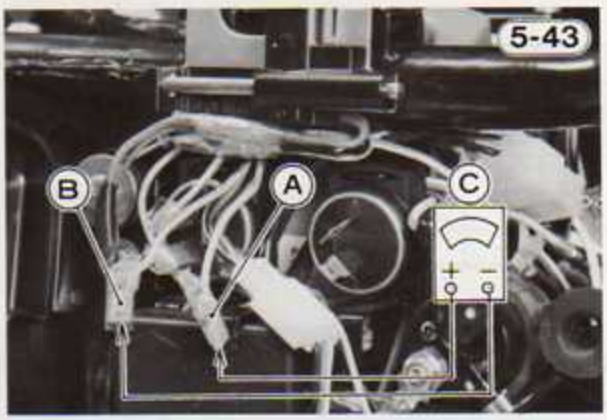


A. Turn Signal Relay B. Ohmmeter (x 1 Ω)

- If the relay checks good, turn the meter to the 25V DC range, connect the (+) meter lead to the orange lead that was disconnected from the relay, and connect the (–) meter lead to the orange/green lead. With the ignition switch on, first switch the turn signal switch to the R and then to the L position. The meter should resister battery voltage at either position.

★If it does not, the fuse, ignition switch, or wiring is at fault.

★If battery voltage is read on the meter but the turn signals still will not work when the relay is reconnected, then recheck all wiring connections.



A. Orange Lead
B. Orange/Green Lead
C. Voltmeter (25V DC)

(2)Both right or both left turn signal come on and stay on or flash too slowly:
- •Check that battery voltage is normal.
- •Check that all wiring connections are good.
- •Check that the turn signal bulbs and indicator bulbs are of the correct wattage.
- ★If all of the above check good, replace the relay.

(3)A signal light on one side comes on and stays on:
- •Either the light that does not come on is burned out or of the incorrect wattage, or the wiring is broken or improperly connected.

(4)Neither light on one side comes on:
- •Unless both lights for that side are burned out, the trouble is with the turn signal switch.

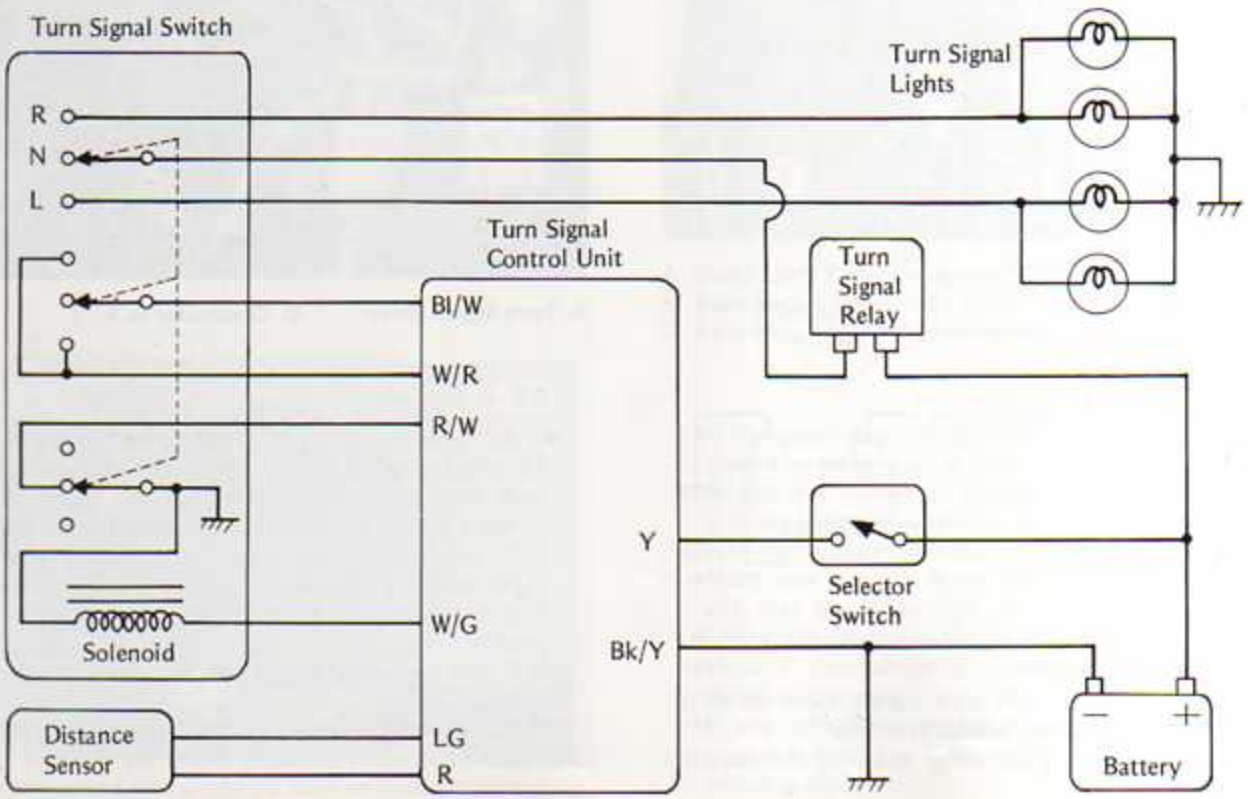
(5)Flashing rate is too fast:
- •If this occurs on both the right and left sides, check that the battery is not being overcharged (indicating a defective regulator).
- ★If the alternator and the battery voltage are normal, replace the turn signal relay.
- ★If this occurs on only one side, one or both of the turn signal bulbs are of too high a wattage.

Automatic Turn Signal Cancelling System:

If the automatic turn signal cancelling system does not function properly, first check all the wiring connections carefully, and then inspect the distance sensor and turn signal switch/solenoid assembly. If all these are good, replace the turn signal control unit.

Turn Signal Cancelling System

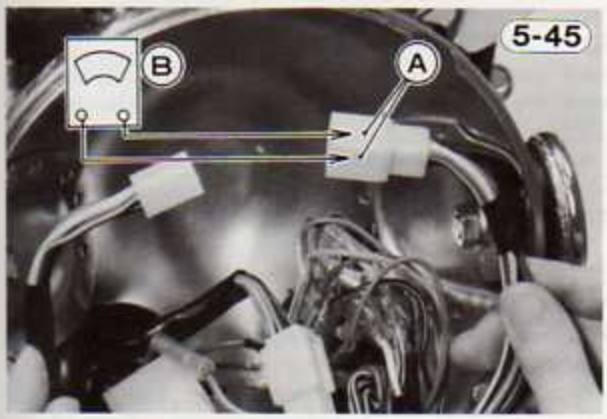
5-44



Distance Sensor Inspection

- Remove the headlight unit, disconnect the 4-pin connector from the speedometer, and remove the speedometer cable lower end from the speedometer gear housing using pliers.
- Connect an ohmmeter across to the sensor leads, and check continuity as follows. Turning the speedometer inner cable slowly count how many times the sensor shows continuity. The ohmmeter should show continuity and then open four times per revolution.

★If it does not, replace the sensor.



A. Red and Light Green Leads (4-pin Conn.)
B. Ohmmeter (x 1 Ω)

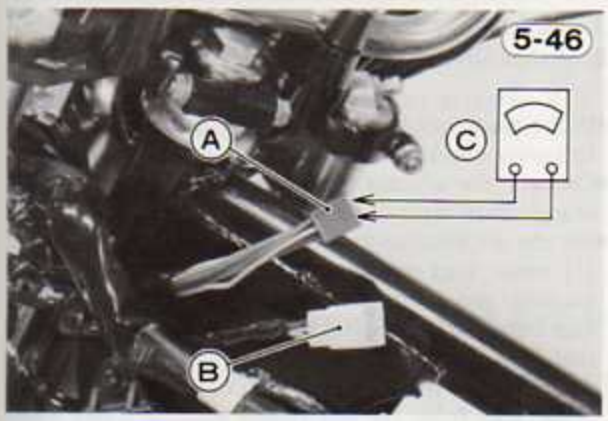
Turn Signal Switch and Selector Switch Inspection

First check the turn signal switch and selector switch connections.

- Remove the fuel tank.
- Disconnect two 9-pin connectors from the left switch housing.
- Use an ohmmeter to see that only the connections shown in the tables have continuity (zero ohms).

★If the switch has an open or a short, it can be disassembled for repair. The contact surfaces may be cleaned, but no internal parts are available for replacement.

★If any parts are not repairable, the switch must be replaced as a unit.



A. 9-pin Plug from the Selector Switch
B. 9-pin Socket from the Turn Signal Switch
C. Ohmmeter (x 1 Ω)

Table 5-20 Selector Switch Internal Connections

	Gray	Orange/ Green	Green	Brown	Yellow
Δ	●	●	●		
M					
A				●	●

Next check that the solenoid operates properly when it receives a pulse from the control unit.

- Prepare an auxiliary lead which has enough length to reach the 9-pin connector of the selector switch from the battery.
- Connect the one end of the lead to the positive (+) side of the battery.

CAUTION **Take care not to short the lead to the chassis ground during this inspection.**

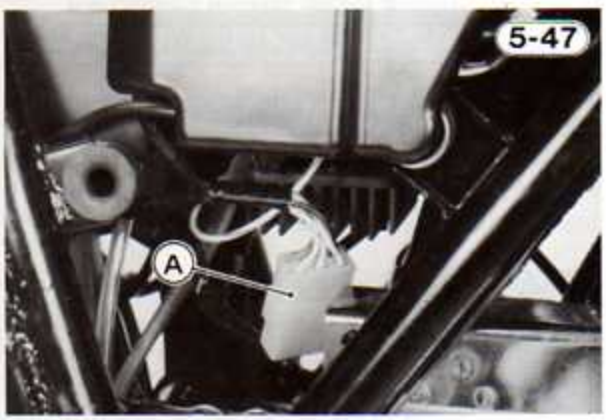
- Switch the turn signal switch to either side, connect the other end of the lead to the white/green lead in the 9-pin connector momentarily. At this time the solenoid should return the turn signal switch to the off position.

★If it does not do this for both right and left positions, replace the switch assembly.

CAUTION **Do not connect the battery lead to the white/green wire for more than a few seconds, as it could burn out the solenoid.**

Wiring Inspection

- Connect all the leads and connectors.
- Measure the voltage at the 6-pin connector from the turn signal control as shown in the table.



A. 6-pin Connector

★If any one of the meter reading shows an improper value, check the wiring and connections among the turn signal switch, distance sensor, and turn signal control unit.

★If all of them turn out good, replace the turn signal control unit.

Table 5-21 Turn Signal Switch Internal Connections

	Gray	Orange	Green	Red/ White	Ground	White/ Red	Blue/ White
R	●	●				●	●
Neutral				●	●		
L		●	●			●	●

Table 5-22 Wiring Inspection

Meter Range	Connections*	Ignition Switch	Selector Switch Position	Turn Signal Switch Position	Reading
25V DC	Meter (+) → Yellow, Blue/White	on	A	Any (R, L, Neu.)	Battery voltage
		off	M or Δ	Any	0 V
	Meter (+) → White/Red	on	A	R or L	Battery voltage
		off	M or Δ	Neutral	0 V

*Connect the meter negative (–) lead to ground.

Hazard Circuit:

Before testing the hazard circuit, check the ignition switch connections and turn signal operation.

Hazard Circuit Test

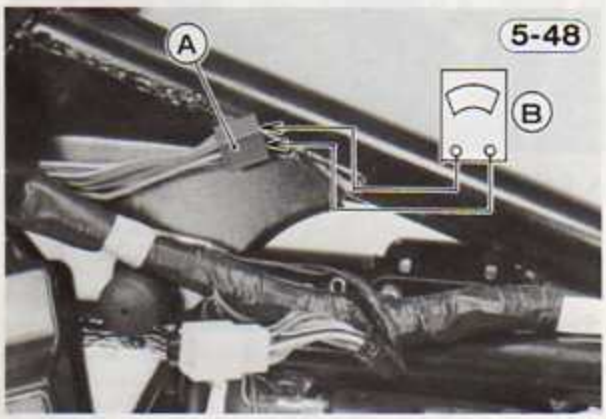
- Remove the fuel tank.
- Disconnect the 9-pin connector from the left switch housing and use an ohmmeter to verify that there is continuity between all the connections that are listed in the table.

★If the switch has an open or short, the switch must be replaced.

Table 5-23 Hazard Switch Internal Connections

Color	Green	Orange/Green	Gray
Off			
On	●	●	●

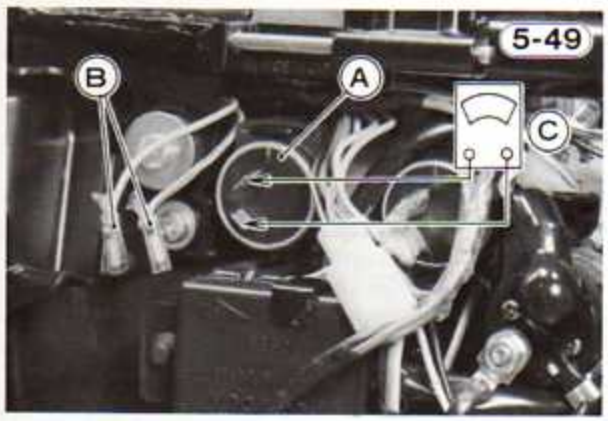
NOTE: 1. See Table 5-20 for the motorcycle with the automatic turn signal cancelling system.



A. 9-pin Connector **B. Ohmmeter (x 1 Ω)**

- Remove the left side cover, and open the electrical cover.
- Disconnect the hazard relay leads, and check the resistance between the relay terminals. There should be 60 Ω.

★If there is no ohmmeter reading, or if there is zero ohms resistance, replace the relay with a new one.



A. Hazard Relay **C. Ohmmeter (x 1 Ω)**
B. Orange/Green Leads

★If the relay and hazard switch are good, go on to the following check.

- Connect the suitable lead between the hazard switch orange/green leads of the connector.
- Set the multimeter to the 25V DC range, connect the (+) meter lead to the gray lead from the left switch housing, and connect the (–) meter lead to the gray lead from the main harness. With the hazard switch on, first turn the ignition switch to the ON position and then to the P(Park) position. Do the same with the green lead from the left switch housing. The meter should register battery voltage at both positions.

★If it does not, the fuse, hazard switch, or wiring is at fault.

HORN

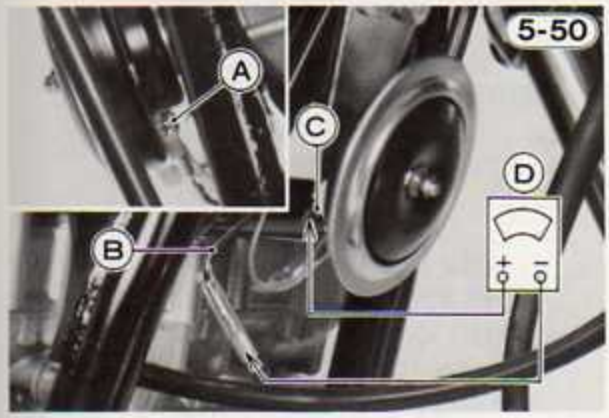
Horn Adjustment

The horn contacts wear down after long use and may need to be adjusted from time to time. Turning in the adjusting screw compensates for contact wear. If satisfactory horn performance cannot be obtained by this adjustment when the rest of the electrical system is functioning properly, the horn must be replaced. It cannot be disassembled.

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

CAUTION **Do not turn the adjusting screw in too far, since doing so will increase horn current with the possibility of burning out the horn coil.**

- Disconnect the black/white lead; and connect an ammeter in series to the horn circuit. The (+) ammeter lead goes to the horn terminal and the (–) ammeter lead to the black/white lead.
- Fully loosen the adjusting screw locknut.
- Turn on the ignition switch, and keep the horn button pressed while turning the horn adjusting screw. Adjust for the best horn sound while keeping the current between 2.0 – 3.0 amperes.



A. Horn Adjusting Screw
B. Black/White Lead
C. Horn Terminal
D. Ammeter (20A DC)

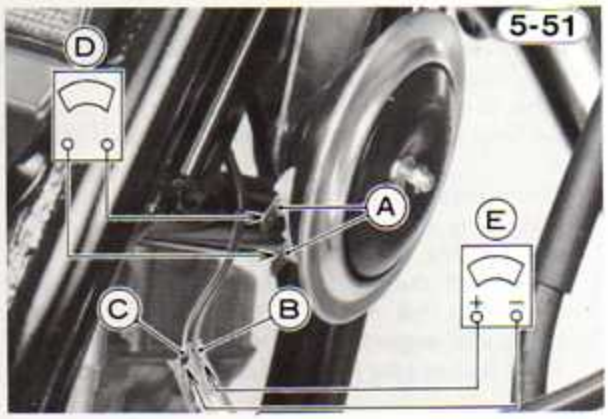
- Tighten the adjusting screw locknut.

NOTE: 1. The horn will not sound properly if it is mounted incorrectly or if any cable or other part is touching it.

Horn Trouble

- Check that battery voltage is normal.
- Check that the adjusting screw is turned in or out too far.
- Disconnect the leads to the horn, and connect to the horn terminals a multimeter set to the x 1 Ω range to check for continuity (close to zero ohms).

*If the reading is several ohms or if there is no reading at all, replace the horn.



A. Horn Terminals
B. Brown Lead
C. Black/White Lead
D. Ohmmeter (x 1 Ω)
E. Voltmeter (25V DC)

- If the reading is very close to zero, set the multimeter to the 25V DC range, and connect the meter to the leads that were disconnected from the horn. The (+) meter lead goes to the brown lead, and the (–) meter lead goes to the black lead. With the ignition switch on, press the horn button. The meter should register battery voltage.

*If it does not, the fuse, ignition switch, or the wiring is at fault.

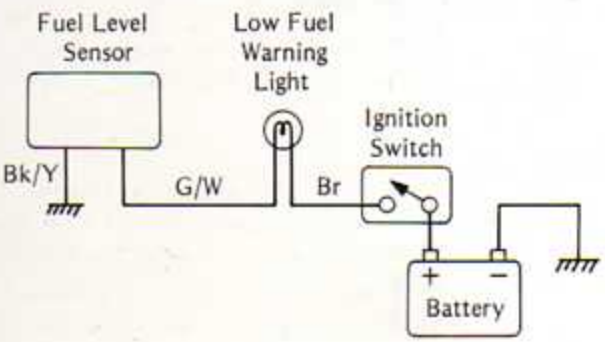
*If the meter does show battery voltage, indicating that the horn trouble lies within the horn itself, and adjustment fails to correct the trouble, replace the horn.

NOTE: 1. Do not loosen the armature mounting since doing so would alter the armature position such that the horn would probably have to be replaced.

LOW FUEL WARNING SYSTEM

This is a system that warns the rider when there is only about 1/4 tank (KZ650-D) or 1/5 tank (KZ650-H) of fuel remaining. It consists of a fuel level sensor inside the tank and a warning light. The same bulb is used for both the low fuel warning light and brake light failure indicator light.

Low Fuel Warning Circuit 5-52

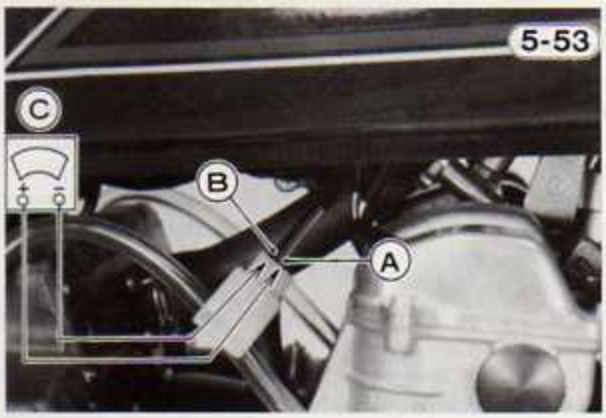


Warning System Trouble

Before starting to troubleshoot the fuel warning system, first check that the battery is good and make sure that all connectors in the system are clean and tight.

(1) Fuel level is low but the warning light does not come on.

- •Check that the warning light comes on when the brake lever on pedal is applied.
- ★If it does not, check the brake light circuit.
- •Disconnect the 2-pin connector to the fuel level sensor, set the meter to the 25V DC or higher range, and connect the (+) meter lead to the green/White lead and the (–) lead to the black/yellow lead.



A. Green/White Lead
B. Black/Yellow Lead
C. Voltmeter (25V DC)

- •Turn on the ignition switch and read the meter.
- ★If it does not read battery voltage, the wiring is at fault.
- ★If the meter does read battery voltage, the sensor is defective and must be replaced.

(2) Fuel level is not low but the warning light stays on continuously.

- •Check that the brake light circuit is good.
- ★If it is good, the sensor is bad and must be replaced.

(3) Warning light goes on and off irregularly.

- •Check that the fuel is well above the low level.
- •Check that the wiring is not shorting out against other parts.
- •Check that the battery charging voltage is normal.
- •If all the above checks are good, check that the sensor is not internally shorting intermittenly.
- ★If it is, replace the sensor.

Disassembly – Engine

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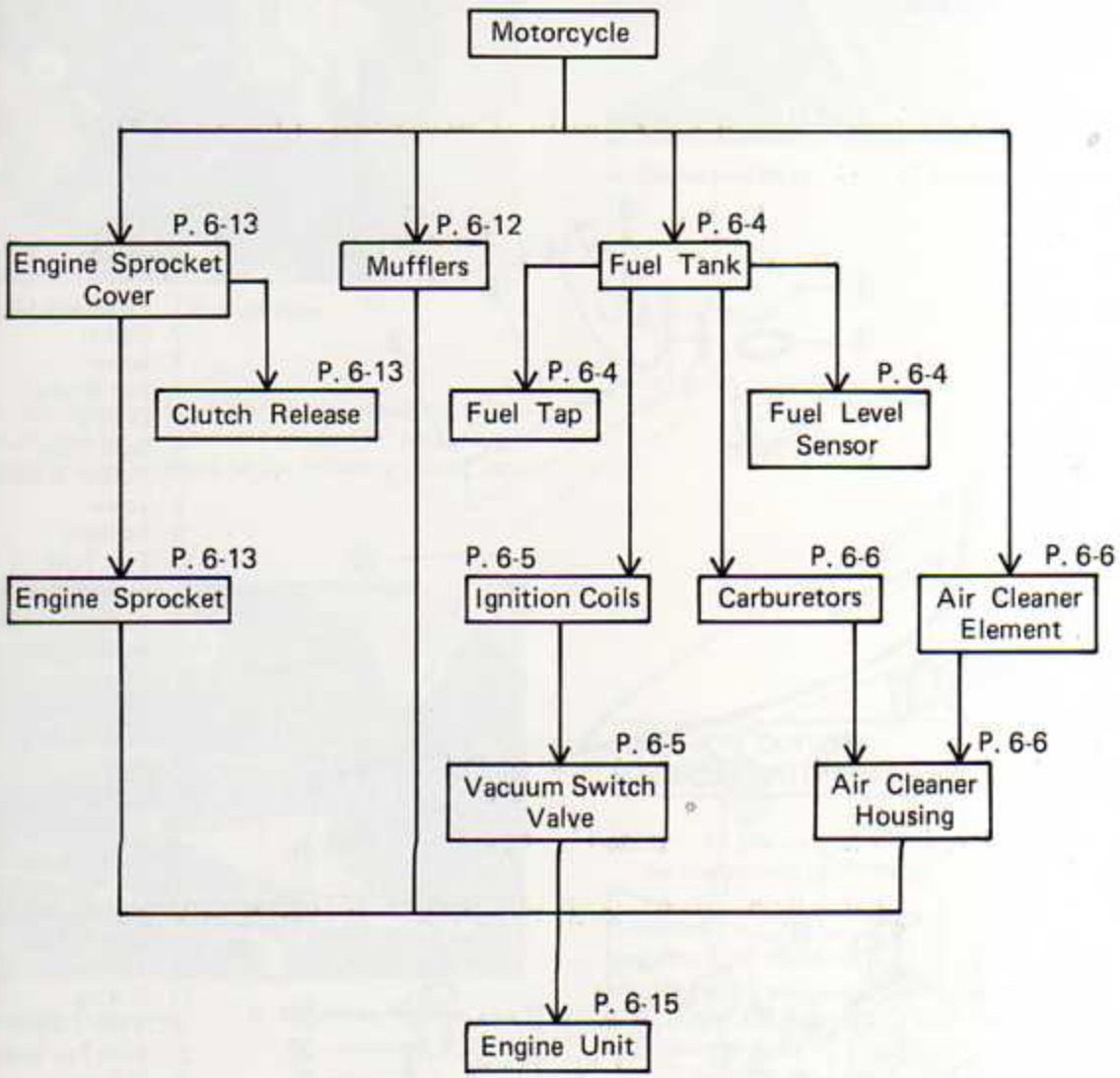
Engine Split

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FLOW CHART

This chart is designed to aid in determining proper removal sequence. Select the component you wish to remove and follow the arrows to that point on the chart. Explanation on the pages after the chart is shown the best method for removal, installation, disassembly, and assembly of each component.

Disassembly-Engine (Engine Removal)



*: Only on US model

FUEL TANK
FUEL TAP
FUEL LEVEL SENSOR

NOTE: 1. There is the model of the motorcycle which has not the fuel level sensor.

Removal:

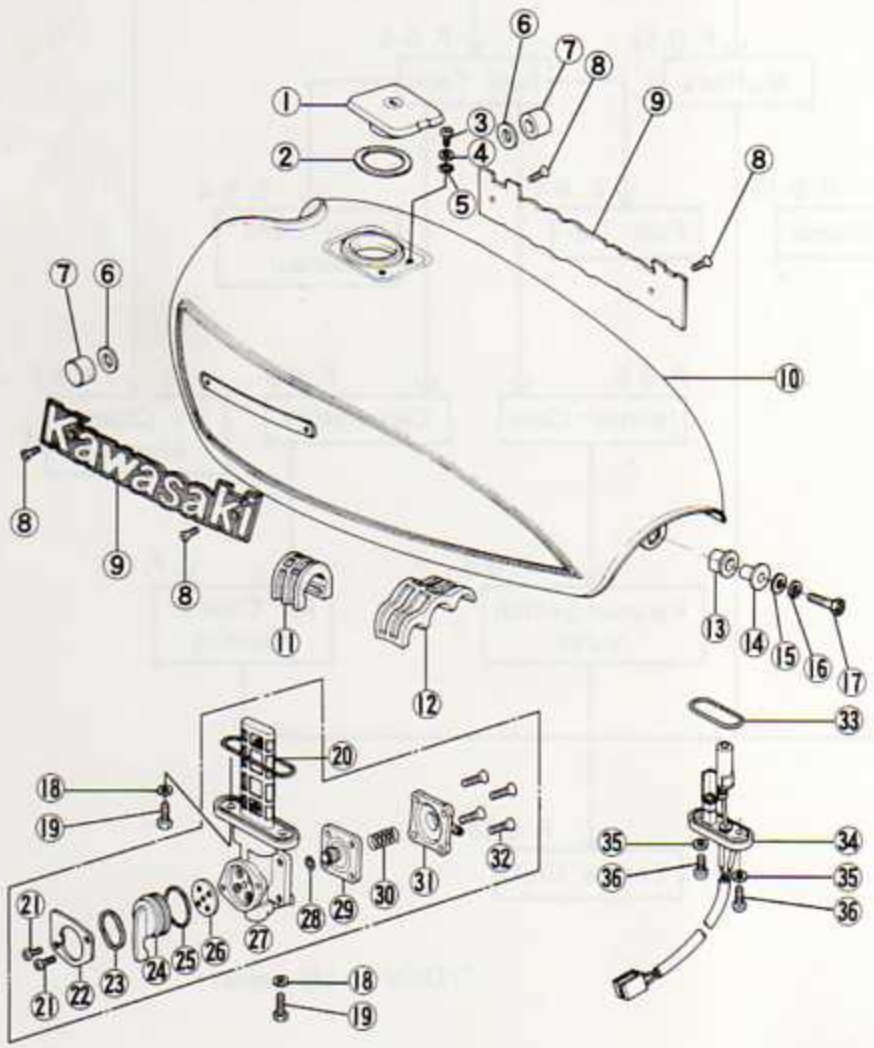
Fuel Tank Removal

- Unlock the seat and swing it open.
- Turn the fuel tap to the ON or RES position, slide the hose clamps down, and pull the fuel hose and vaccum hose off the tap.
- For the motorcycle which has the fuel level sensor, disconnect the 2-pin connector from the fuel level sensor under the fuel tank.
- For the motorcycle which has the fuel tank retaining bolt, remove the bolt, lockwasher, flat washer, and collar.
- Lift the rear end of the fuel tank up about 30 mm and then pull the fuel tank off toward the rear.

Fuel Tap, Fuel Level Sensor Removal

- Holding a container under the fuel tap, turn the tap to the PRI position to drain the tank.
- Remove the bolts and gaskets, and pull the fuel tap off the fuel tank. Be careful not to damage the filter.
- For the motorcycle which has a fuel level sensor, remove the screws and gaskets, and pull the fuel level sensor off the fuel tank. Be careful not to damage the sensor.

Fuel Tank, Fuel Tap, Fuel Level Sensor (6-1)



1. Fuel Tank Cap
2. Gasket
3. Screw
4. Flat Washer
5. O-Ring
6. Steel Plate
7. Rubber Damper
8. Screw
9. Emblem
10. Fuel Tank
11. Rubber Damper
12. Rubber Damper
13. Rubber Damper
14. Collar
15. Flat Washer
16. Lockwasher
17. Bolt
18. Gasket
19. Bolt
20. O-Ring
21. Screw
22. Holding Plate
23. Wave Washer
24. Tap Lever
25. O-Ring
26. Valve Gasket
27. Fuel Tap Body
28. O-Ring
29. Diaphragm Assembly
30. Spring
31. Diaphragm Cover
32. Screw
33. O-Ring
34. Fuel Level Sensor
35. Gasket
36. Screw

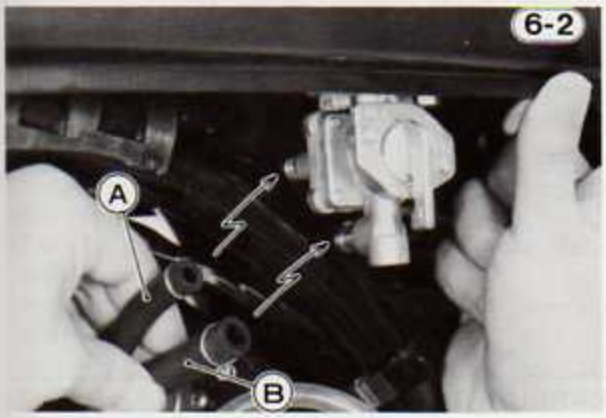
Installation Note:

Fuel Tap, Fuel Level Sensor Installation

1. Check the O-rings, and replace them with new ones if they are damaged or deteriorated.

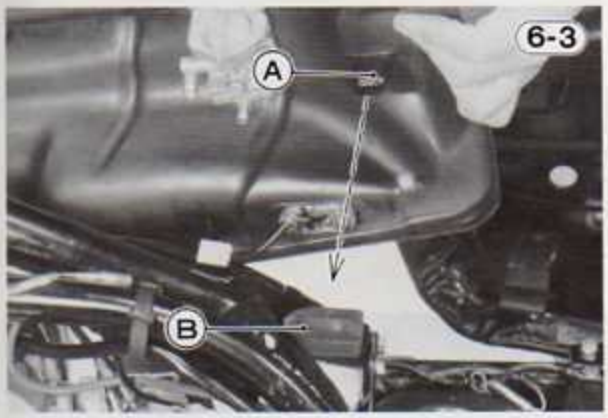
Fuel Tank Installation

2. The vacuum hose is the small diameter hose; the fuel hose is larger.



A. Vacuum Hose **B. Fuel Hose**

3. For the motorcycle which has the retaining projection at the rear bottom end of the fuel tank, be sure the projection is seated in the retaining rubber hole.



A. Retaining Projection **B. Retaining Rubber**

Fuel Tap Disassembly:

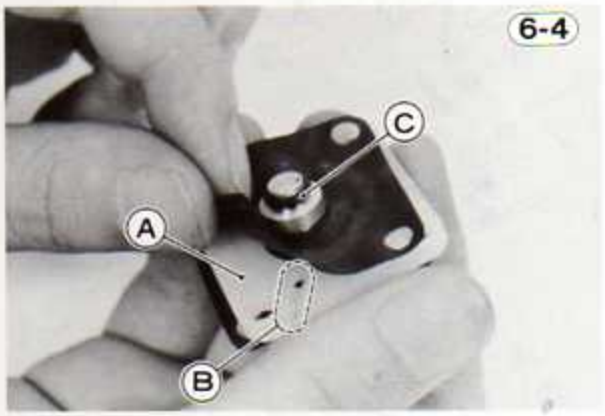
Fuel Tap Disassembly

- Remove the holding plate screws, and remove the tap lever, O-ring, wave washer, and holding plate.
- Take out the valve gasket.
- Remove the diaphragm cover screws, and remove the diaphragm cover and spring.
- Remove the diaphragm assembly from the fuel tap.

Fuel Tap Assembly

NOTE: 1. Check and clean all the parts (Pg. 3-2). Replace damaged parts with new ones.

2. Install the diaphragm plate so that the groove in the plate faces to the O-ring side.



A. Diaphragm Plate **B. Groove** **C. O-Ring**

IGNITION COILS VACUUM SWITCH VALVE

NOTE: 1. The vacuum switch valve is only attached to the motorcycle to US model.

Removal:

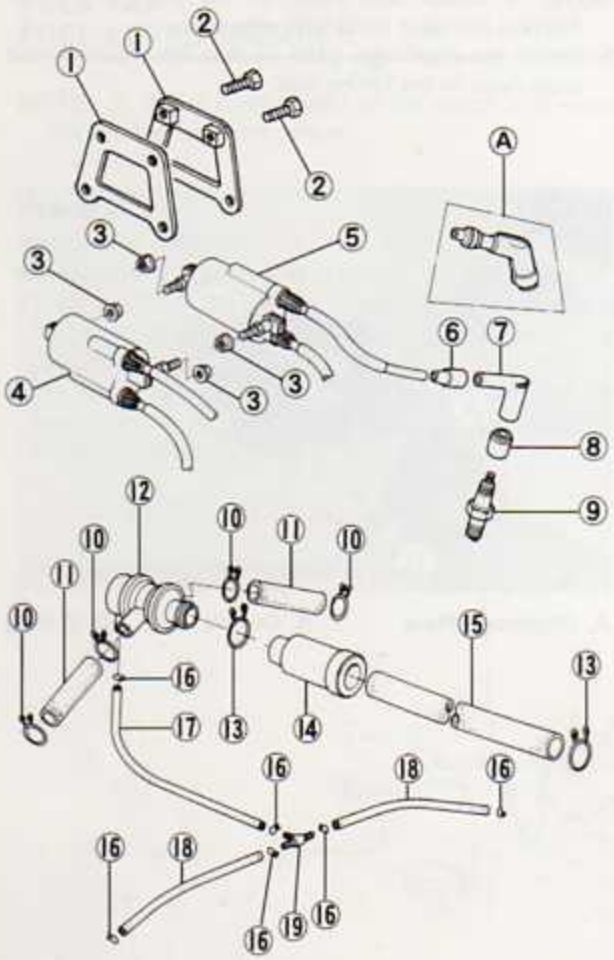
Ignition Coil Removal

- Pull the spark plug lead from each spark plug.
- Disconnect the ignition coil leads from the coils.
- Remove the bolts or nuts to take off the ignition coils and/or brackets.

Vacuum Switch Valve Removal

- Slide the clamp out of place, and pull the air hose off each fitting.
- Slide the clamp out of place, and pull the vacuum hose off #1 and #4 carburetor holders.
- Pull the vacuum switch valve with the hoses attached free off the motorcycle.

Ignition Coils, Vacuum Switch Valve (6-5)



Ⓐ : European and Canadian Models

1. Bracket
2. Mounting Bolt
3. Mounting Nut
4. Ignition Coil (#2, #3)
5. Ignition Coil (#1, #4)
6. Grommet
7. Plug Cap
8. Cap Cover
9. Spark Plug
10. Clamp
11. Air Hose
12. Vacuum Switch Valve
13. Clamp
14. Silenser
15. Air Hose
16. Clamp
17. Vacuum Hose
18. Vacuum Hose
19. 3-way Joint

Installation Note:

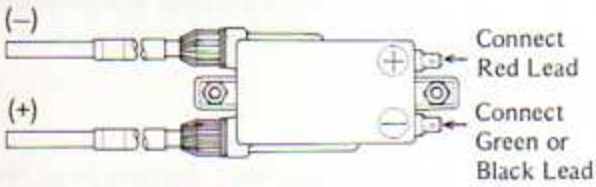
Vacuum Switch Valve Installation

1. Check that all hoses fit in place, and that all clamps are installed.

Ignition Coil Installation

2. Install the ignition coil (#1, 4) under the right bracket and the ignition coil (#2, 3) under the left bracket so that the spark plug leads point to the rear.
3. The polarity of the two spark plug leads are as shown in the figure when the primary leads are connected as indicated on the ignition coil body.

Polarity of Ignition Coil (6-6)



4. Connect the green and black leads as following:
   Green Lead ↔ Ignition Coil (#2, 3)
   Black Lead ↔ Ignition Coil (#1, 4)

CARBURETORS
AIR CLEANER ELEMENT
AIR CLEANER HOUSING

NOTE: 1. The carburetors on US model have an accelerater pump.

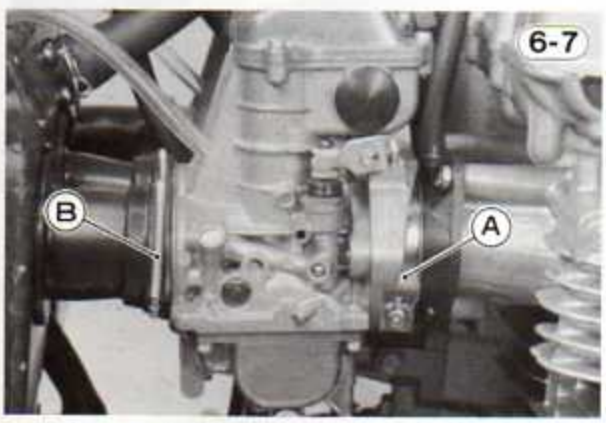
Removal:

Carburetor Removal

- Screw in fully the locknuts and adjusting nuts at the upper end of the throttle cables so as to give the cables plenty of play.

CAUTION **Removing the throttle cables from the carburetors without enough cable play, may cause throttle cable damage.**

- Loosen the carburetor holder clamps.
- Slide the spring bands of the air cleaner ducts out of place.



A. Carburetor Holder Clamp **B. Spring Band**

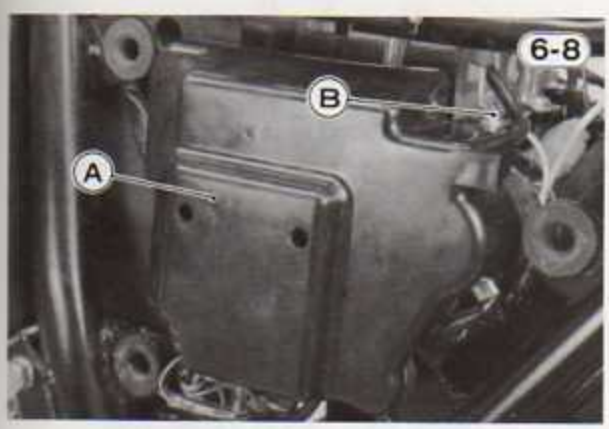
•Slip the carburetors up and out of them to the right side.
•Loosen the throttle cable adjuster mounting nuts fully remove the decelerator throttle cable adjuster from its bracket, and slip the tip of its inner cable out of the pulley. Then do the same with the accelerator throttle cable to complete carburetor removal.

Air Cleaner Element Removal

•Unlock the seat and swing it open.
•Unscrew the air cleaner cap, and remove the cap and air cleaner element.

Air Cleaner Housing Removal

•For the motorcycle which has the baffle plate, remove the bolts and flat washers, and take off the baffle plate.
•Remove the left and right side cover.
•For the motorcycle which has the electrical panel cover, it is necessary to do next two steps.
○Remove the screw and flat washer, and open the electrical panel cover.
○Remove the electrical panel mounting bolts. Each bolt has a large flat washer.



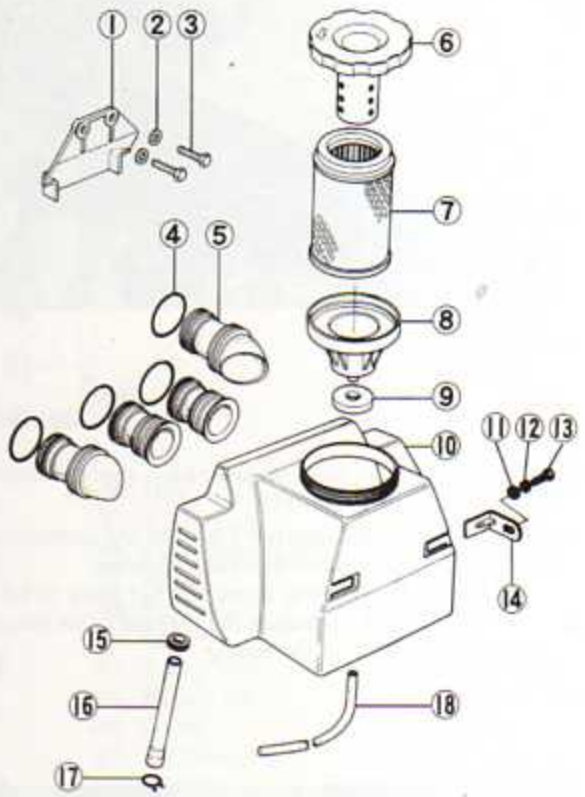
A. Electrical Panel Cover **B. Screw**



A. Electrical Panel Mounting Bolts

•Remove the air cleaner housing mounting bracket bolts, lockwashers, and flat washers from both sides of the battery housing. Remove the mounting brackets.
•Slide the clip out of place, and remove the breather hose from the breather cover.
•Remove the air cleaner housing from the motorcycle.

Air Cleaner Element, Housing **6-10**



1. Baffle Plate
2. Flat Washer
3. Bolt
4. Spring Band
5. Air Cleaner Duct
6. Air Cleaner Cap
7. Air Cleaner Element
8. Element Holder
9. Gasket
10. Air Cleaner Housing
11. Flat Washer
12. Lockwasher
13. Bolt
14. Bracket
15. Grommet
16. Breather Hose
17. Clamp
18. Hose

Installation Note:

Air Cleaner Housing Installation

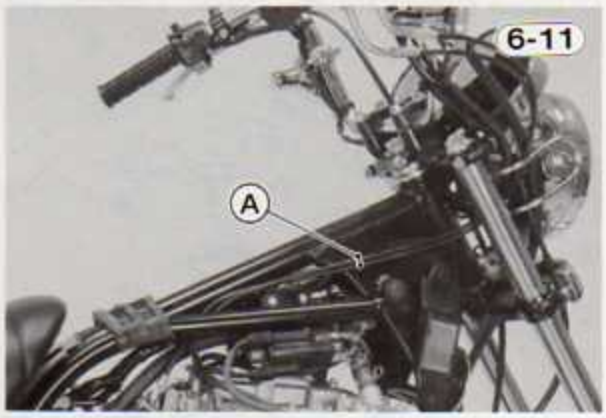
1. The air cleaner housing bracket bolts are tightened after carburetor installation.

Air Cleaner Element Installation

2. Check that the air cleaner element is fitted in the correct position, and screw the air cleaner cap on until you feel a click.

Carburetor Installation

3. Be sure that both throttle cables run between the frame top tube and the right side cradle tube without kinks or sharp bends, and that they do not twist around each other.



A. Throttle Cables

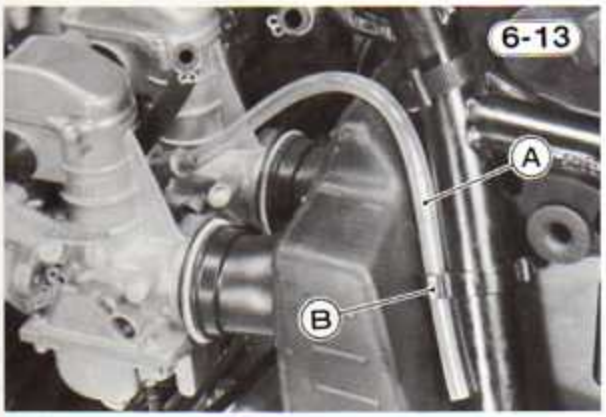
4. If the carburetors were disassembled, perform Initial Synchronization (Pg. 6-11).
5. After installing the throttle cables to the carburetors, check the throttle cable bracket as follows:
   - ○Turn the idle adjusting screw so that there is 1.6 – 2.0 mm clearance between the throttle cable bracket end and the stop on the pulley



A. 1.6 – 2.0 mm

   - ○Push the throttle grip completely closed. At this time there should be no clearance between the cable bracket and the stop. When the throttle grip is released, there should be 1.6 – 2.0 mm clearance between the cable bracket and the stop. Replace the cable bracket if it does not work as above.

6. Route the carburetor air vent hoses between the air cleaner housing and the frame pipe, and clamp the left air vent hose to the frame.



A. Air Vent Hose **B. Clamp**

7. Check and adjust the following items, if necessary:
   - ○Throttle Grip (Pg. 2-8)
   - ○Carburetors (Pg. 2-9)

Carburetor Disassembly:

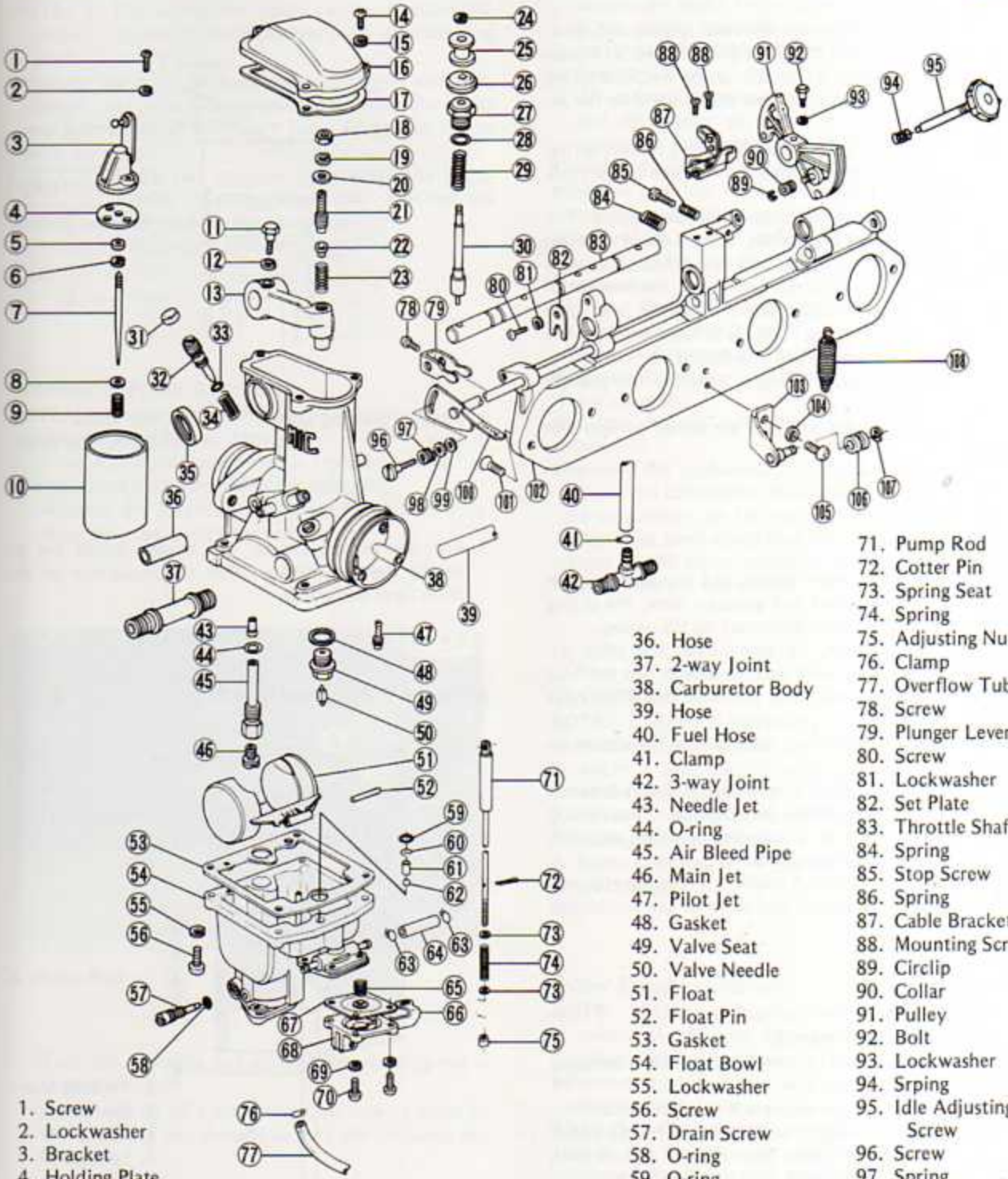
Carburetor Body Disassembly (each carburetor)

NOTE: 1. The following procedure explains removal of the carburetor parts listed below, and these parts except for the #1, #2, and #3 starter plungers can be removed without separating the carburetors from the mounting plate.

Throttle Valve	Needle Jet
Jet Needle	Pilot Jet
Air Screw	Float
Starter Plunger #4	Float Valve Needle
Main Jet	Float Valve Seat
Air Bleed Pipe	Accelerator Pump Outlet Valve (on US model)

Top End:

- ●Remove the idle adjusting screw and spring.
- ●Remove the top cover screws and lockwashers, and remove the top covers and gaskets.
- ●Remove the throttle arm mounting bolts and lockwashers from each throttle arm.
- ●Remove the pulley mounting bolt and lockwasher.
- ●Remove the throttle return spring.
- ●Remove the throttle shaft set plate screw and lockwasher, and remove the throttle shaft set plate.
- ●Remove the rubber caps from both sides of the carburetor assembly.
- ●Pull the throttle shaft off by pushing the other end.



1. Screw
2. Lockwasher
3. Bracket
4. Holding Plate
5. Spacer
6. Circlip
7. Jet Needle
8. Spring Seat
9. Spring
10. Throttle Valve
11. Mounting Bolt
12. Lockwasher
13. Throttle Arm
14. Screw
15. Lockwasher
16. Top Cover
17. Gasket
18. Locknut
19. Lockwasher
20. Flat Washer
21. Adjusting Screw
22. Joint Ball Seat
23. Spring
24. Circlip
25. Bush
26. Dust Seal
27. Plunger Cap
28. O-ring
29. Spring
30. Starter Plunger
31. Plug
32. Air Screw
33. O-ring
34. Spring
35. Dust Seat
36. Hose
37. 2-way Joint
38. Carburetor Body
39. Hose
40. Fuel Hose
41. Clamp
42. 3-way Joint
43. Needle Jet
44. O-ring
45. Air Bleed Pipe
46. Main Jet
47. Pilot Jet
48. Gasket
49. Valve Seat
50. Valve Needle
51. Float
52. Float Pin
53. Gasket
54. Float Bowl
55. Lockwasher
56. Screw
57. Drain Screw
58. O-ring
59. O-ring
60. Clip
61. Valve Weight
62. Check Valve
63. Clamp
64. Hose
65. Spring
66. Pump Lever
67. Diaphragm
68. Pump Cover
69. Lockwasher
70. Screw
71. Pump Rod
72. Cotter Pin
73. Spring Seat
74. Spring
75. Adjusting Nut
76. Clamp
77. Overflow Tube
78. Screw
79. Plunger Lever
80. Screw
81. Lockwasher
82. Set Plate
83. Throttle Shaft
84. Spring
85. Stop Screw
86. Spring
87. Cable Bracket
88. Mounting Screw
89. Circlip
90. Collar
91. Pulley
92. Bolt
93. Lockwasher
94. Srping
95. Idle Adjusting Screw
96. Screw
97. Spring
98. Flat Washer
99. Plastic Washer
100. Linkage Shaft
101. Screw
102. Mounting Plate
103. Bracket
104. Lockwasher
105. Screw
106. Collar
107. Circlip
108. Return Spring

- Lift up the throttle arm, and pull out the throttle valve and jet needle.
- Remove the throttle valve bracket screws and lockwashers, and take the throttle valve bracket, jet needle holding plate, spacer, jet needle, spring seat, and spring out of the throttle valve. The clip is fixed to the jet needle groove.

NOTE: 1. The jet needle holding plate, spacer, spring seat, and spring are installed only on the carburetors for US model.

- Remove the air screw with the O-ring and spring. For the carburetors on US model, using an awl or some other suitable tools, punch and pry off the air screw plug. Turn in the air screw and count the number of turns until it seats fully but not tightly, and then remove it with its spring. This is to set the pilot screw on its original position when assembling.
- To remove the starter plunger, unscrew the plunger cap, and pull out the unit.
- Remove the clip and pull out the starter plunger and spring.

Bottom End:

- Remove the float bowl screws and lockwashers, and take off the float bowl and gasket. Now, the O-ring can be removed for the carburetors on US model.
- Remove the main jet, air bleed pipe, and pilot jet.
- To remove the float valve seat, first push out the float pin, remove the float, and pull out the float valve needle.
- To remove the needle jet, remove the throttle valve and air bleed pipe.
- Make sure that the float is removed so that it does not get damaged during needle jet removal. Push on top of the needle jet with a wooden or other soft rod; it will fall out the bottom of the carburetor.
- For the carburetors on US model, remove the clip, and take out the valve weight and valve of the accelerator pump outlet.

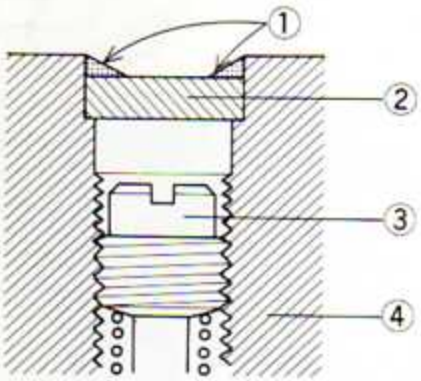
Carburetor Body Assembly

NOTE: 1. Replace any of O-rings and gaskets if damaged or deteriorated.

2. Install the drain screw securely if it was removed.
3. If the clip, valve weight, and accelerator pump outlet valve are removed, check the clip and replace with a new one if it is damaged.
4. For the carburetors on US model, install the air screw and plug as the following:
   - ○Turn in the air screw fully but not tightly, and the back it out the same number of turns counted during disassembly.
   - ○Install a new plug in the air screw hole, and apply a small amount of a bonding agent to the circumference of the plug to fix the plug.

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

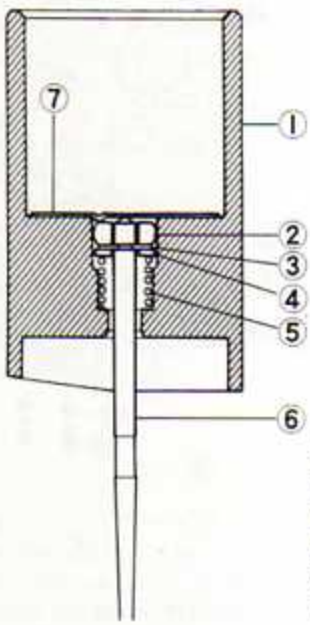
Plug Installation **6-15**



1. Apply a bonding agent.
2. Plug
3. Air Screw
4. Carburetor Body

5. For the motorcycle on US model, install the jet needle holding plate so that the projection on the plate faces the spacer.

Jet Needle Holding Plate Installation **6-16**



1. Throttle Valve
2. Spacer
3. Clip
4. Spring Seat
5. Spring
6. Jet Needle
7. Holding Plate

7. Apply a thin coat of grease on the throttle shaft before inserting the shaft through the carburetors.
8. Perform Initial Synchronization (Pg. 6-11) before installing the top covers.
9. Replace the top cover gasket with a new one, if it is damaged.

Accelerator Pump Disassembly

NOTE: 1. The accelerator pump can be disassembled without separating the carburetor from the mounting plate.

- Remove the accelerator pump cover screws and lockwashers, and remove the pump cover with the pump lever connected to the pump rod. Be careful not to bend the rod.

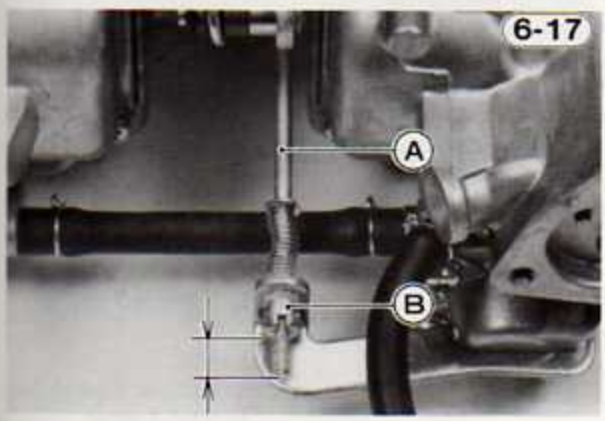
CAUTION **Do not attempt to separate the pump lever from the pump rod. This can not be done without breaking the pump rod.**

- Remove the diaphragm and the spring.

Accelerator Pump Assembly

NOTE: 1. Check the diaphragm, and repalce it with a new one if it shows an damage.

2. If the accelerator pump rod is replaced with a new one, adjust the pump rod as the following:
   - Measure the length shown in the figure before disassembly, and replace the rod.



A. Pump Rod **B. Adjusting Nut**

   - Turn the adjusting nut so that the adjusting nut is original position.
   - Apply a drop of a non-permanent locking agent to the adjusting nut threads to lock the adjusting nut in place.

Carburetor Separation

NOTE: 1. The four carburetors look the same, but they are slightly different from each other. Note the following prior to removal:
   - Position of the air passage plug for the air screw and drain plug
   - Presence of the fuel hose 3-way joint and connecting pipe

2. The #2 carburetor can be separated together with the accelerator pump rod and the pulley. If accelerator pump related parts are replaced, adjust the accelerator pump as explained in the Accelerator Pump Assembly Note.
3. All carburetor parts except the linkage mechanism and the starter plungers can be removed without separating the carburetors from the mounting plate.

- Remove the idle adjusting screw and spring.
- Remove the top cover screws and lockwashers, and remove the top covers and gaskets.
- Unscrew the throttle arm mounting bolts at each throttle arm and pulley mounting bolt. Each bolt has a lockwasher.
- Remove the throttle return spring.
- Remove the throttle shaft set plate screw and lockwasher, and remove the throttle shaft set plate.
- Remove the rubber caps from both sides of the carburetor assembly.
- Pull the throttle shaft off to the left by pushing the other end.
- Remove the carburetor mounting plate screws, and remove the carburetors from the mounting plate. For the carburetors on US model, there are rubber hoses at the float bowl which lead from the accelerator pump outlet to the pump nozzle in each carburetor. Each rubber hose has two clamps.

Carburetor Assembly

NOTE: 1. Apply a non-permanent locking agent to the mounting screw threads.

2. Apply a thin coat of grease on the throttle shaft before inserting the shaft through carburetors.
3. Perform Initial Synchronization (Pg. 6-11) before installing the top covers.
4. Replace the top cover gaskets with new ones, if they are damaged.

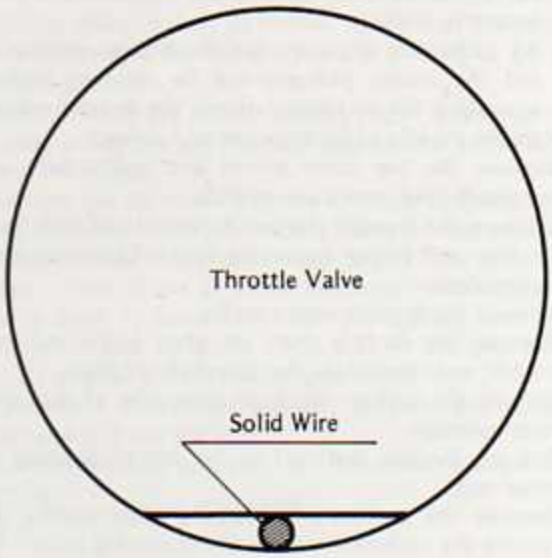
Initial Synchronization:

NOTE: 1. If the carburetors were disassembled, mechanically synchronize the throttle valves before installation of the carburetors.

- Remove the top covers, and loosen the throttle valve adjusting screw locknuts.
- Turn the adjusting screw to make a slight clearance between the throttle valve and the bottom of the carburetor bore. Turn each adjusting screw until the four clearances are the same. This is a very fine adjustment, so make it carefully.

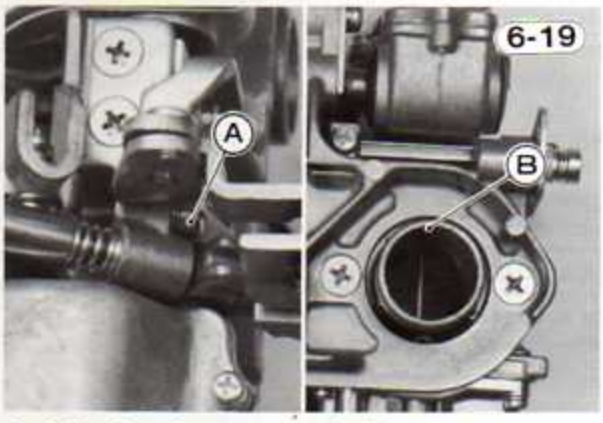
NOTE: 1. An easy method of performing this adjustment is to carefully insert a piece of 0.5 – 1.0 mm solid wire in the space between the bottom of the carburetor bore and the throttle valve, lifting the valve and slowly letting it seat on the wire. Then, with the carburetor throat facing downward, slowly turn the adjusting screw out until the wires fall out. Repeat the procedure above for each carburetor. This will insure a correct and uniform setting for each valve.

Throttle Valve Clearance (Initial Synchronization) (6-18)



Bottom of Carburetor Bore

- Tighten the locknuts without changing the position of the screws. Install the top covers.
- Open the throttle so that the bottom edge of the lowest of the four carburetor throttle valves is even with the top of the carburetor bore. Turn the pulley stop screw so the pulley is stopped at that point.



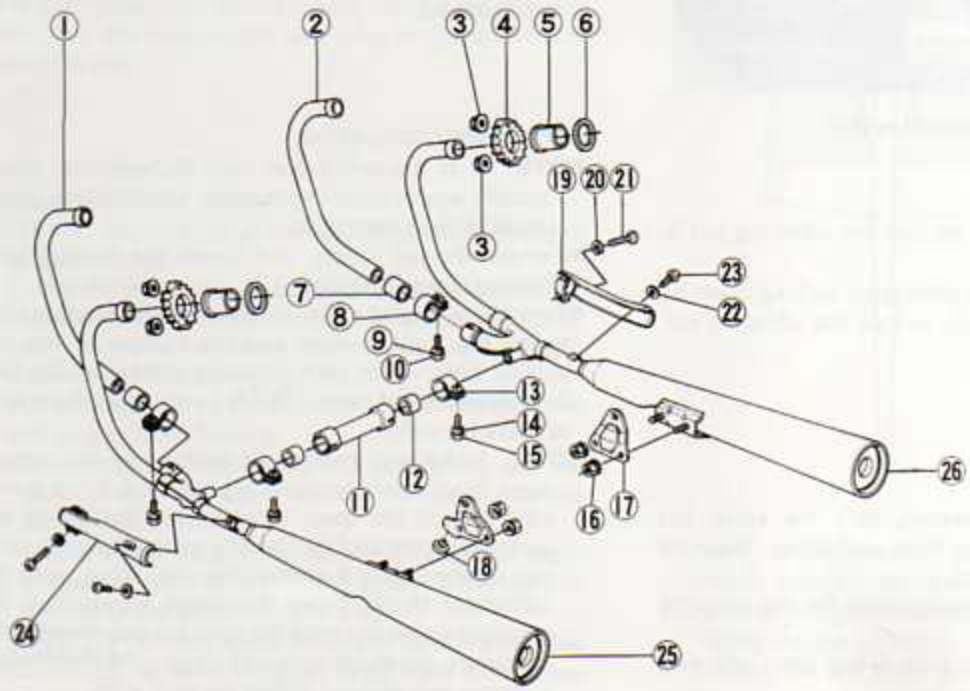
A. Pulley Stop Screw B. Throttle Valve

MUFFLERS

Removal (each muffler):

- Loosen both clamps securing the muffler connecting pipe to the mufflers, and loosen the clamp securing the exhaust pipe to the muffler.
- Remove the inner exhaust pipe holder nuts, and slide the holder off its cylinder head studs.
- Remove the split keepers, and pull the inner exhaust pipe off the muffler.
- Remove the outer exhaust pipe holder nuts, and slide the holder off its cylinder head studs.
- Remove the split keepers.
- Remove the rear footpeg mounting bolt to complete muffler removal. Also, remove the exhaust pipe holders and gaskets.

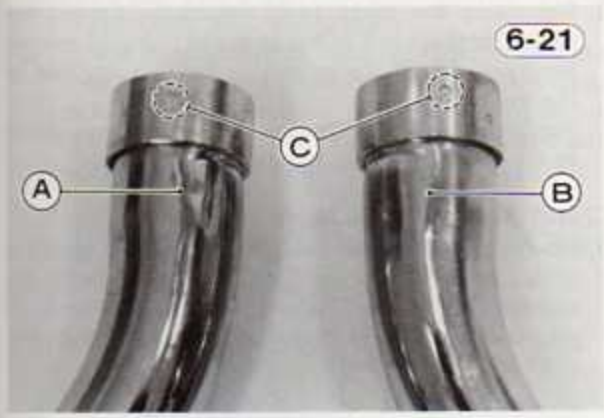
Mufflers (6-20)



1. Exhaust Pipe (#2)
2. Exhaust Pipe (#3)
3. Nut
4. Exhaust Pipe Holder
5. Split Keeper
6. Gasket
7. Gasket
8. Clamp
9. Lockwasher
10. Bolt
11. Connecting Pipe
12. Gasket
13. Clamp
14. Lockwasher
15. Bolt
16. Nut
17. Bracket
18. Rubber Damper
19. Muffler Cover
20. Lockwasher
21. Screw
22. Flat Washer
23. Screw
24. Muffler Cover
25. Muffler
26. Muffler

Installation Note:

1. Check the gaskets at each muffler or exhaust pipe connection, and replace them if damaged.
2. There is an identification mark on the exhaust pipes to show the cylinder number to be installed on. Fit these exhaust pipes to the correct position.



A. #2 Cylinder Exhaust Pipe
B. #3 Cylinder Exhaust Pipe
C. Marks

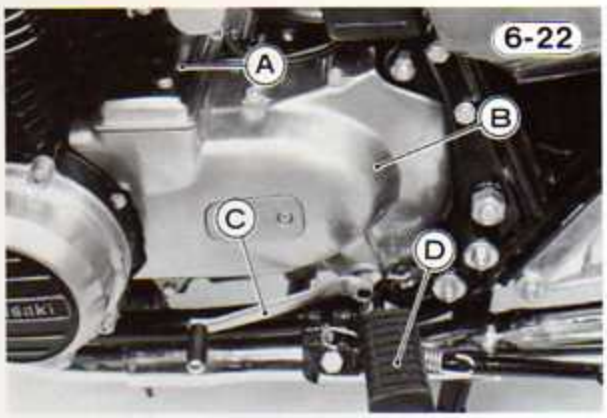
3. After finger-tightening the mounting bolts and clamp bolts, first tighten the nuts of the exhaust pipe holders evenly to avoid exhaust leaks, and then tighten the mounting bolts and clamp bolts.
4. Thoroughly warm up the engine, and after completely cooling down, retighten all clamp bolts.

ENGINE SPROCKET COVER
CLUTCH RELEASE
ENGINE SPROCKET

Removal:

Engine Sprocket Cover Removal

- Set the motorcycle up on its center stand.
- Remove the left footpeg mounting nuts and left footpeg.



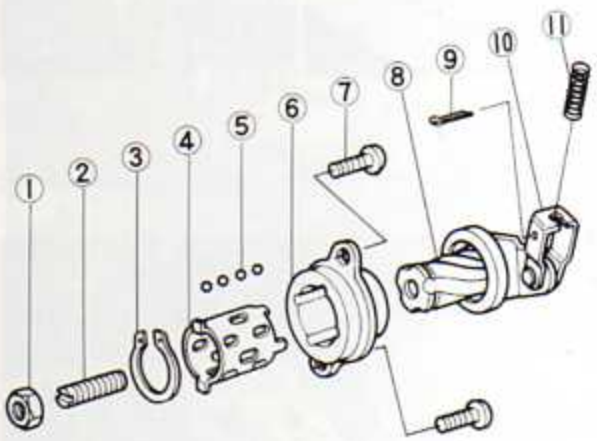
A. Starter Motor Cover
B. Engine Sprocket Cover
C. Shift Pedal
D. Left Footpeg

- Check that the transmission is in neutral.
- Take out the shift pedal bolt, and remove the shift pedal.
- Remove the starter motor cover bolts and cover.
- Remove the engine sprocket cover bolts, and pull the cover free from the crankcase.
- Remove the cotter pin from the clutch release lever, and free the clutch inner cable tip from the lever and engine sprocket cover.

Clutch Release Removal

- Remove the clutch release mounting screws, and remove the release.

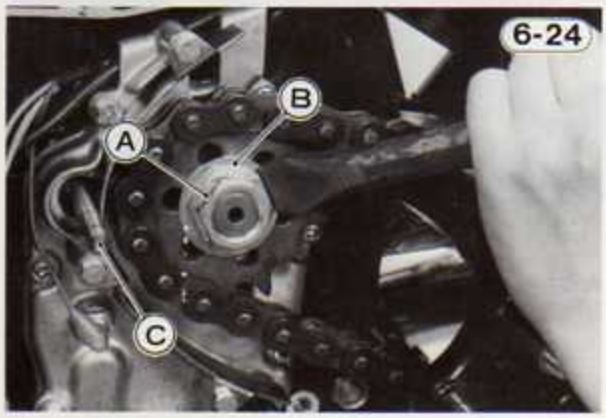
Clutch Release 6-23



1. Locknut
2. Adjusting Screw
3. Circlip
4. Ball Retainer
5. Steel Ball
6. Outer Release Gear
7. Screw
8. Inner Release Gear
9. Cotter Pin
10. Release Lever
11. Spring

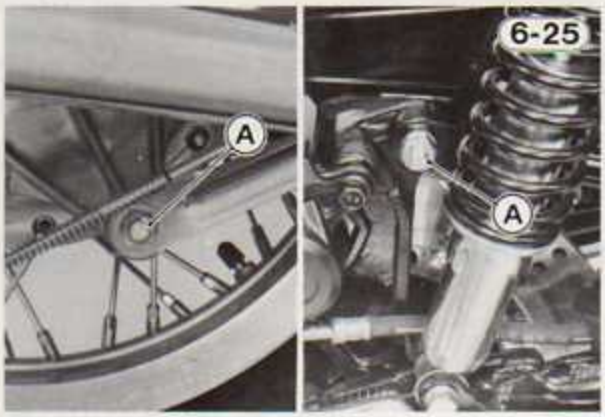
Engine Sprocket Removal

- Remove the clutch push rod to avoid damaging the rod.
- Straighten the side of the splined washer that is bent over the side of the engine sprocket nut.



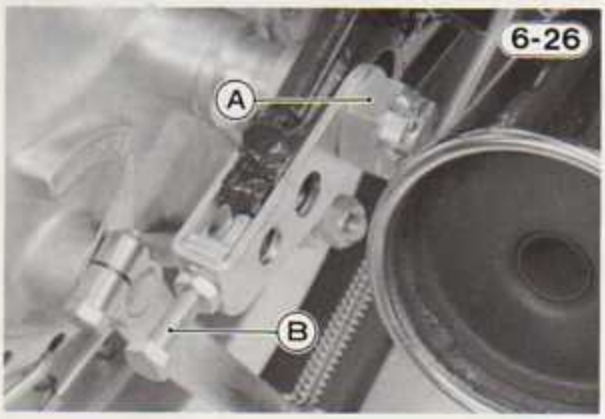
A. Engine Sprocket Nut **C. Clutch Push Rod**
B. Washer

- Depressing the brake pedal forcefully, remove the engine sprocket nut and splined washer.
- Loosen the nut at the rear end of the torque link.



A. Torque Link Nut

- Remove the cotter pin, and loosen the rear axle nut.



A. Axle Nut **B. Chain Adjusting Bolt**

- Loosen the left and right chain adjusting bolt locknuts, and then back out the chain adjusting bolts. Kick the wheel forward to give the chain plenty of play.
- Remove the engine sprocket.

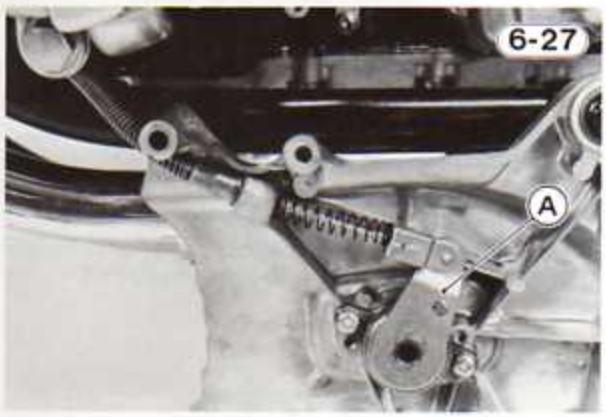
Installation Note:

Engine Sprocket Installation

1. Depressing the brake pedal forcefully, tighten the engine sprocket nut to 8.0 kg-m (58 ft-lbs) of torque. Bend one side of the splined washer over the side of the nut.
2. Apply molybdenum disulfide engine assembly grease to the clutch push rod, and install the push rod.

Clutch Release Installation

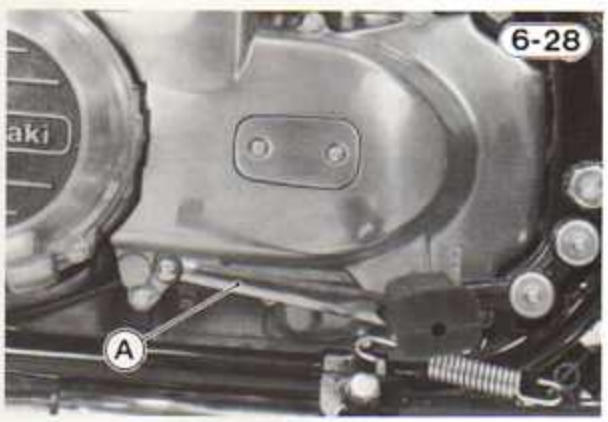
3. Fit the clutch release back into the engine sprocket cover, apply a non-permanent locking agent to the mounting screws, and tighten the screws. The clutch release lever must be positioned as shown, when the gears are fully meshed.



A. Clutch Release Lever

Engine Sprocket Cover Installation

4. Mount the shift pedal so that its end matches the level of the left footpeg.



A. Shift Pedal

Clutch Release Disassembly:

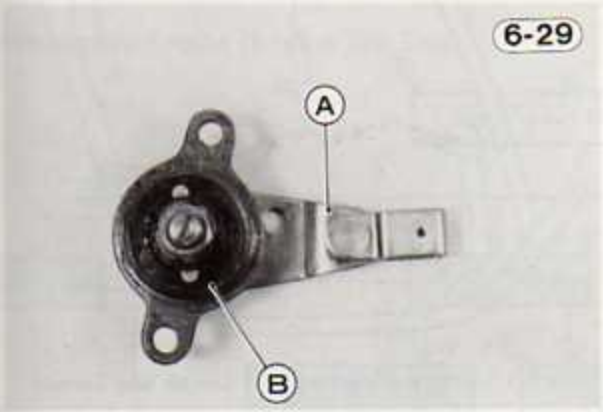
Clutch Release Disassembly

•Take out the circlip, and separate the outer release gear and the inner release gear.

Clutch Release Assembly

NOTE: 1. Wash and clean the release balls and inner release gear with a high flash-point solvent. Dry and then lubricate them with grease.

2. Fit the inner gear back into the outer release gear. When the two gears are fully meshed, the clutch release lever and the outer release gear must be positioned as shown. The machined side of the outer release gear must face upward.



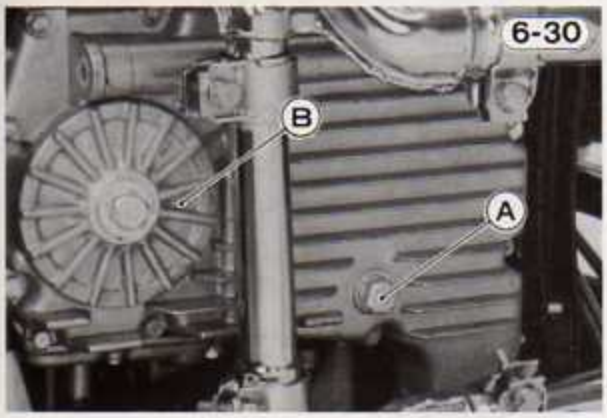
A. Release Lever **B. Outer Release Gear**

ENGINE UNIT

Removal:

•Set the motorcycle up on its center stand.

•Place an oil pan beneath the engine, and remove the engine drain plug and oil filter to drain out the oil.

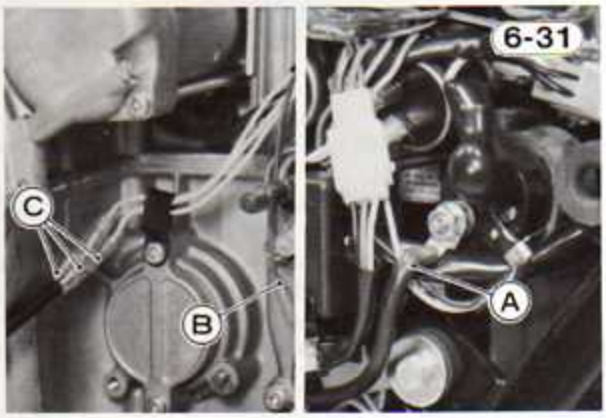


A. Engine Drain Plug **B. Oil Filter**

•After draining the oil, replace the drain plug with its aluminum gasket, tighten the plug to 3.8 kg-m (27 ft-lbs) of torque, and install the oil filter tightening its bolt to 2.0 kg-m (14.5 ft-lbs) of torque.

•Free all cables and leads as following, and take them properly positioned on the engine and frame so that they will not get damaged during engine unit removal.

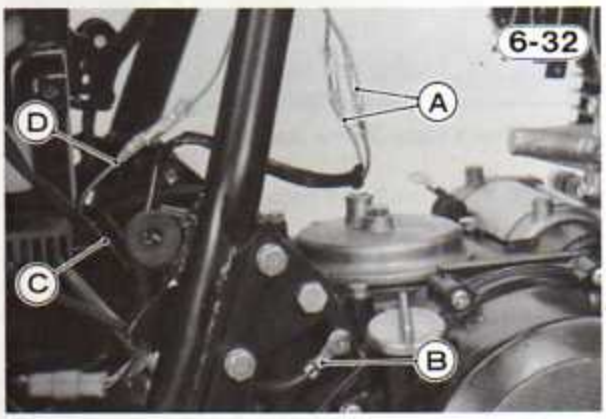
○Slide the rubber cap out of place, remove the nut and lockwasher, and free the starter motor lead from the starter motor terminal.



A. Starter Motor Lead **C. Alternator Leads**
B. Neutral Switch Lead

○Disconnect the neutral switch lead from the switch, and disconnect the alternator leads. Free the lead from the engine.

○Disconnect the rear brake light switch leads.

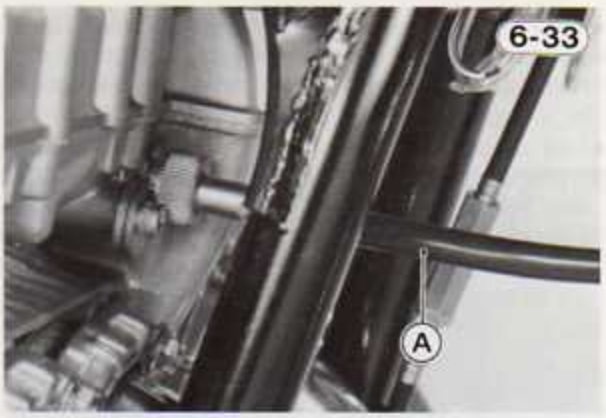


A. Rear Brake Light Switch Leads
B. Battery Negative Ground Lead
C. Pickup Coil Leads
D. Oil Pressure Switch Lead

○Remove the bolt and lockwasher, and remove the battery negative ground lead from the engine.

○Disconnect the pickup coil 4-pin connector, and oil pressure switch lead, and free the leads from the frame.

○Unscrew the tachometer cable nut from the cylinder head and pull off the cable from the cylinder head.



A. Tachometer Cable

○Check that the clutch cable and throttle cables are free from the engine unit.

•Pull out the engine sprocket cover knock pins and clutch push rod, if they are still in the engine.

NOTE: 1. This prevents the knock pins and/or clutch push rod from catching the engine mounting bracket when the engine is lifted up.

•Remove the nuts and flatwashers, and remove the right footpeg.



A. Rear Brake Light Switch Spring

•To hold down the brake pedal out of the way, do the following procedures.

○Remove the rear brake light switch spring.

○For the motorcycle with the rear drum brake, back the rear brake adjusting nut off to the end of the brake rod.

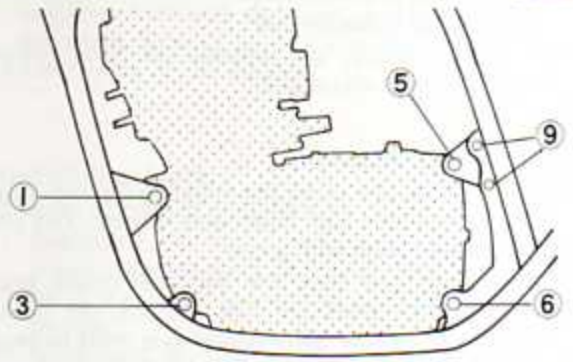
○For the motorcycle with the rear disc brake, remove the master cylinder mounting bolts, lockwashers, and flat washers. Loosen the brake pedal adjusting bolt locknut, and back out the adjusting bolt until the pedal is held down out of the way.

•Jack or lever the engine up slightly to take the weight off the mounting bolts.

•Remove the engine mounting bolts and engine mounting bracket bolts. Be careful not to damage the threads upon removal. The rear upper mounting bolt has a spacer.

•Left the engine straight up keeping it level, then move it to the right slightly so the rear and front of the engine slips over the lower engine mounts, and pull the engine out to the right side.

Engine Mount (Left) 6-35



Engine Mount (Right) 6-36

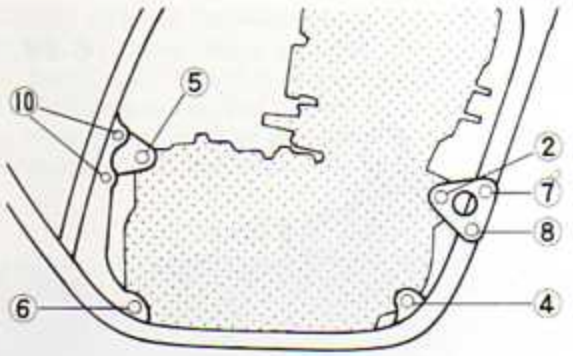


Table 6-1 Engine Mounting Bolt Length and Torque

Bolt		Length	Torque
Front Upper Mounting Bolts	Left (1)	72 mm	4.0 kg-m (29 ft-lbs)
	Right (2)	46 mm	
Front Lower Mounting Bolts	Left (3)	84 mm	
	Right (4)		
Rear Upper Mounting Bolt (5)		250 mm	
Rear Lower Mounting Bolt (6)		225 mm	
Front Upper Right Bracket Bolts	Upper (7)	63 mm	2.4 kg-m (17.5 ft-lbs)
	Lower (8)	60 mm	
Rear Upper Bracket Bolts	Left (9)	40 mm	
	Right (10)		

Installation Note:

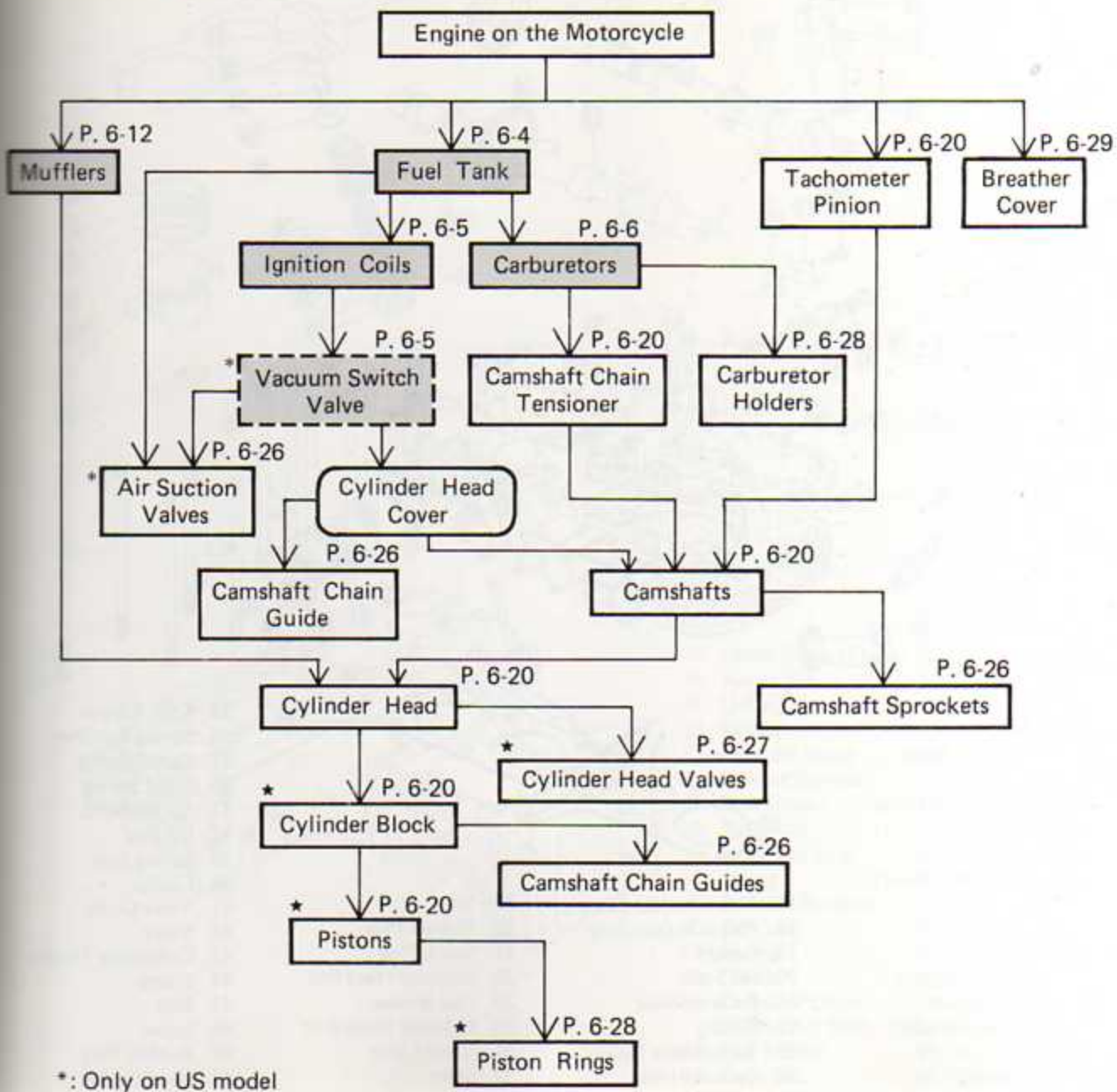
1. Make sure that the following cables and leads are free, and properly positioned on the engine and frame so that they will not get damaged during engine installation: starter motor lead, clutch cable, tachometer cable, pickup coil leads, battery negative ground lead, alternator leads, neutral switch lead, and throttle cables.
2. Place the engine into the frame the reverse of how it was removed, seeing the following table for the bolt location and torque.
3. Check and adjust the following items:
   - ○Clutch (Pg. 2-11)
   - ○Throttle Grip (Pg. 2-8)
   - ○Rear Brake (Pg. 2-14)
   - ○Rear Brake Light Switch (Pg. 2-19)
   - ○Drive Chain (Pg. 2-12)
   - ○Engine Oil (Pg. 2-4)

FLOW CHART

This chart is designed to aid in determining proper removal sequence. Select the component you wish to remove and follow the arrows to that point on the chart. Explanation on the pages after the chart is shown the best method for removal, installation, disassembly, and assembly of each component.

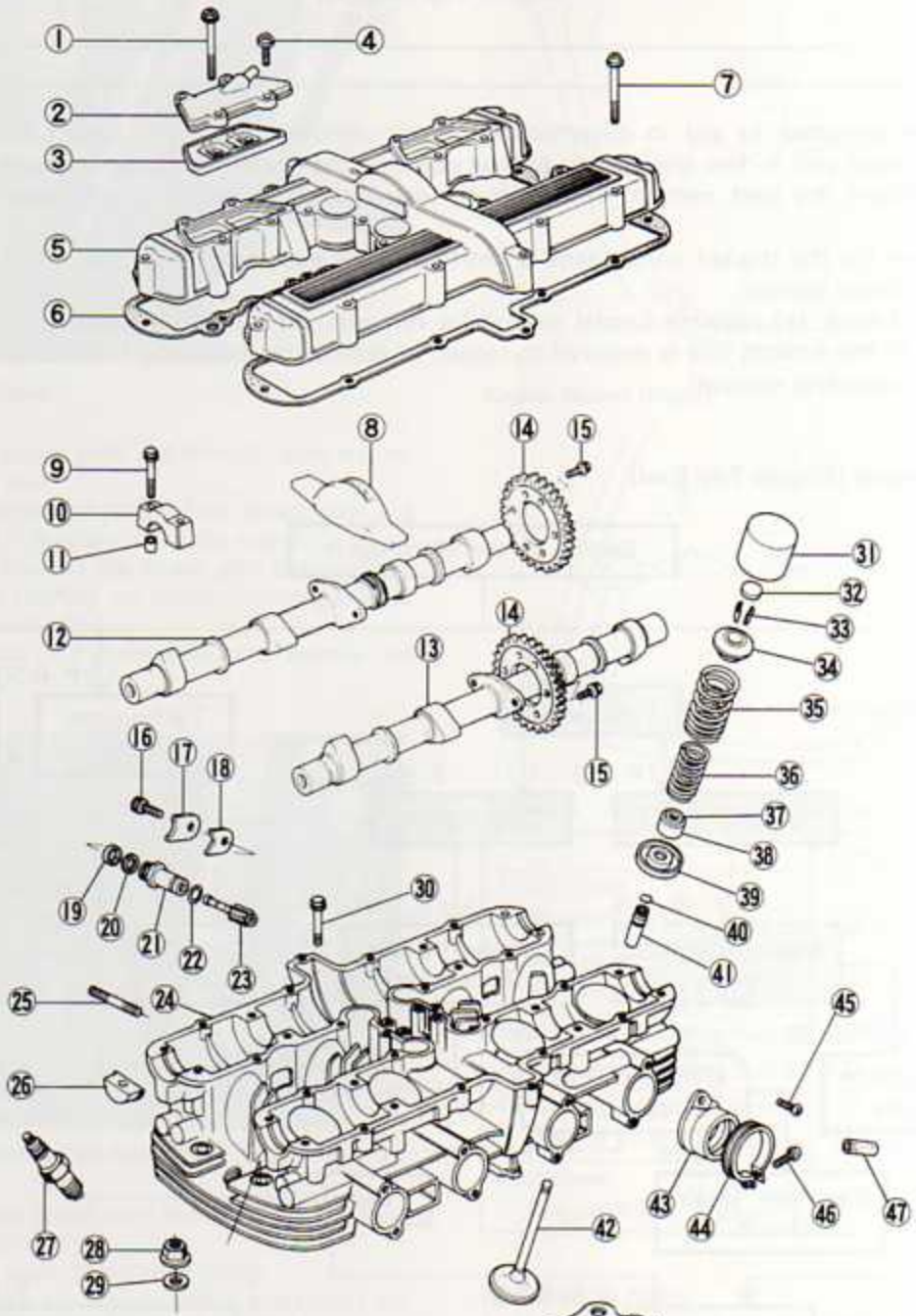
NOTE: 1. Action for the shaded component is omitted in the explanation because it has been already spared in the other section.
2. Action with a mark (★) requires special tool(s) for removal, installation, disassembly, or assembly.
3. Component in the broken line is required to loosen or remove its mounting bolts or screws, but not necessary its complete removal.

Disassembly-Engine (Engine Top End)

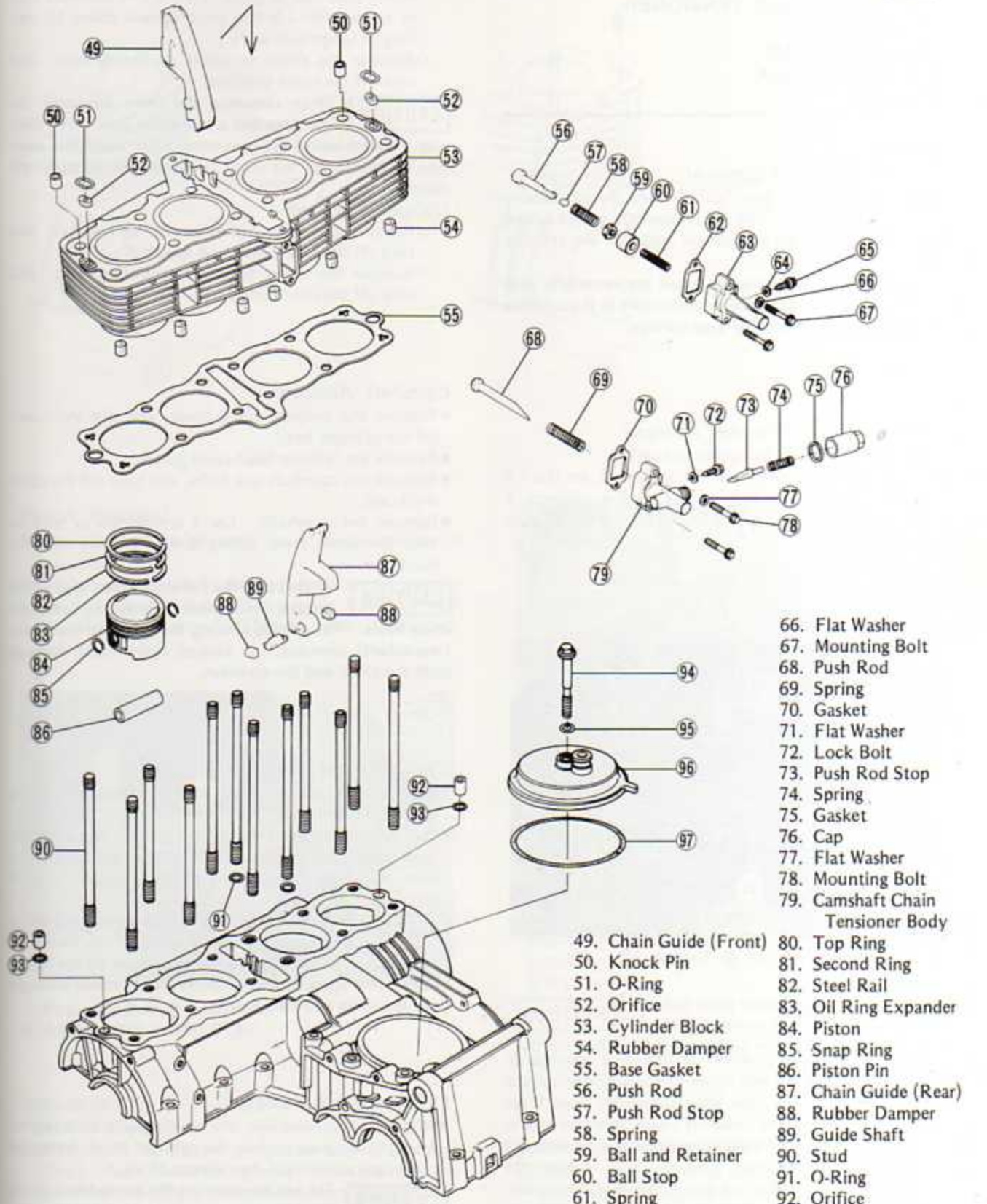


*: Only on US model

Engine Top End



1. Bolt
2. Cover
3. Air Suction Valve
4. Bolt
5. Cylinder Head Cover
6. Cover Gasket
7. Bolt
8. Chain Guide (Upper)
9. Bolt
10. Camshaft Cap
11. Knock Pin
12. Exhaust Camshaft
13. Inlet Camshaft
14. Camshaft Sprocket
15. Bolt
16. Allen Bolt
17. Pinion Holder Stop
18. Pinion Holder Stop
19. Gasket
20. Oil Seal
21. Pinion Holder
22. O-Ring
23. Tachometer Pinion
24. Cylinder Head
25. Stud
26. Rubber Plug
27. Spark Plug
28. Cylinder Head Nut
29. Flat Washer
30. Cylinder Head Bolt
31. Valve Lifter
32. Shim
33. Split Keeper
34. Spring Retainer
35. Outer Spring
36. Inner Spring
37. Spring Band
38. Oil Seal
39. Spring Seat
40. Circlip
41. Valve Guide
42. Valve
43. Carburetor Holder
44. Clamp
45. Bolt
46. Screw
47. Rubber Plug
48. Head Gasket



49. Chain Guide (Front)
50. Knock Pin
51. O-Ring
52. Orifice
53. Cylinder Block
54. Rubber Damper
55. Base Gasket
56. Push Rod
57. Push Rod Stop
58. Spring
59. Ball and Retainer
60. Ball Stop
61. Spring
62. Gasket
63. Camshaft Chain Tensioner Body
64. Flat Washer
65. Lock Bolt
66. Flat Washer
67. Mounting Bolt
68. Push Rod
69. Spring
70. Gasket
71. Flat Washer
72. Lock Bolt
73. Push Rod Stop
74. Spring
75. Gasket
76. Cap
77. Flat Washer
78. Mounting Bolt
79. Camshaft Chain Tensioner Body
80. Top Ring
81. Second Ring
82. Steel Rail
83. Oil Ring Expander
84. Piston
85. Snap Ring
86. Piston Pin
87. Chain Guide (Rear)
88. Rubber Damper
89. Guide Shaft
90. Stud
91. O-Ring
92. Orifice
93. O-Ring
94. Bolt
95. O-Ring
96. Breather Cover
97. O-Ring

TACHOMETER PINION
CAMSHAFT CHAIN TENSIONER
CAMSHAFTS
CYLINDER HEAD
CYLINDER BLOCK
PISTONS

Removal:

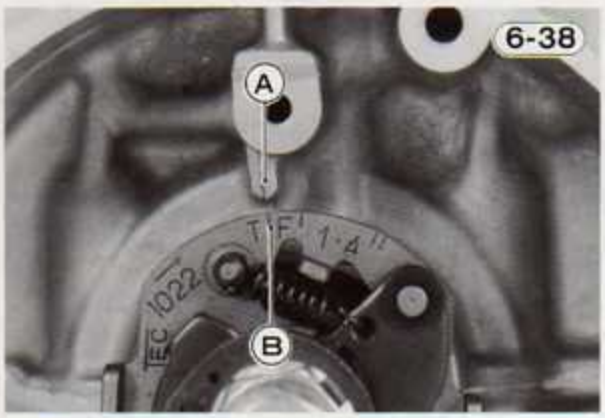
Tachometer Pinion Removal

- Remove the Allen bolt, and remove the tachometer pinion holder stops. Pull the tachometer pinion holder and pinion with the tachometer cable off the cylinder head.

CAUTION **Attempting to install the camshafts with the tachometer pinion left in the cylinder head may cause tachometer gear damage.**

Camshaft Chain Tensioner Removal

- Remove the pick-up coil cover and gasket.
- Using a 17 mm wrench on the crankshaft, set the 1,4 pistons at TDC by aligning the timing advancer T mark on the 1, 4 side (the line adjoining the T) with the timing mark.



A. Timing Mark **B. T Mark**

- Remove the chain tensioner as following procedures.

NOTE: 1. There are two types of the automatic chain tensioner, ball-lock type and cross-wedge type. Once the push rod in the camshaft chain tensioner moves out to take up chain slack automatically, it does not return to its original position. So, remove the tensioner before starting any disassembly operation that slackens the chain: cylinder head cover removal, camshaft removal, etc..

(1)Ball-lock Type

- Remove the lock bolt and washer originally installed on the tensioner, and then turn in and tighten securely a longer 110B0616 bolt to hold the tensioner push rod in place. (Any 6 mm diameter bolt or screw with 1.0 mm pitch threads about 16 mm long or longer will work.)
- Remove the chain tensioner mounting bolts, and take off the chain tensioner.

CAUTION **When removing the chain tensioner, do not take out a mounting bolt only halfway. Retightening the mounting bolts from this position could damage the chain tensioner and the camshaft chain.**

(2)Cross-wedge Type

- Remove the chain tensioner cap and gasket, and take off the spring and push rod stop.
- Remove the chain tensioner mounting bolts, and take off the chain tension.

Camshaft Removal

- Remove the cylinder head cover, and slip the cover off the cylinder head.
- Remove the cylinder head cover gasket.
- Remove the camshaft cap bolts, and take off the camshaft caps.
- Remove the camshafts. Use a screwdriver or wire to keep the chain from falling down into the cylinder block.

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

Cylinder Head Removal

- Remove the cylinder head bolts and nuts from the upper cylinder head.
- Pull off the cylinder head, and remove the cylinder head gasket and O-rings. Use a screwdriver or wire to keep the chain from falling down into the cylinder block.

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

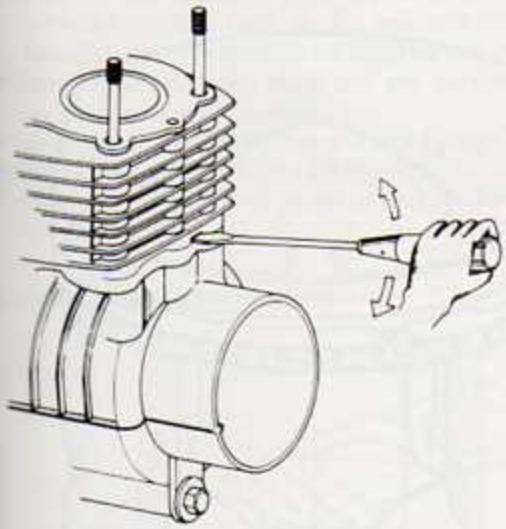
Cylinder Block Removal

- With a large screwdriver, pry at the gap in each side of the cylinder base to free the cylinder block from the crankcase, and lift off the cylinder block.

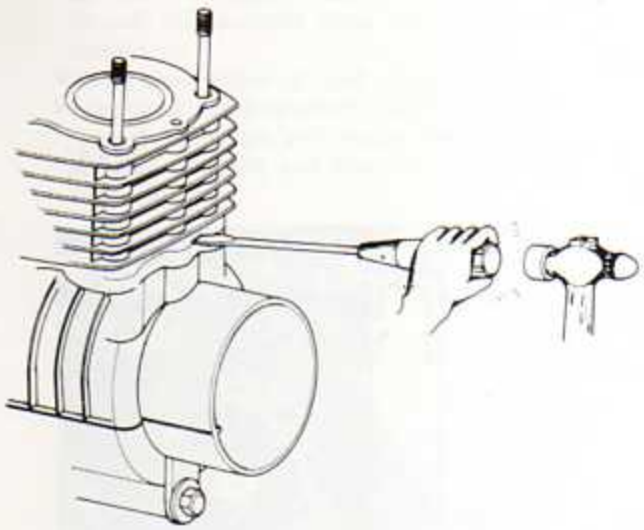
CAUTION **Do not hammer on the screwdriver while it is in the pry point as engine damage could result.**

- Remove the cylinder base gasket.
- Wrap a clean cloth around the base of each piston so that no parts or dirt will into the crankcase.

Cylinder Block Pry Point (6-39)



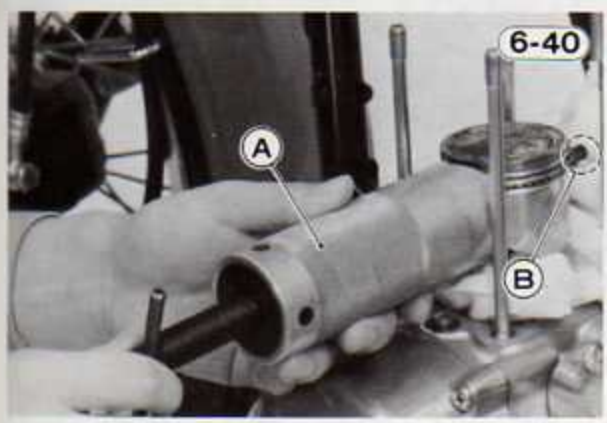
Good



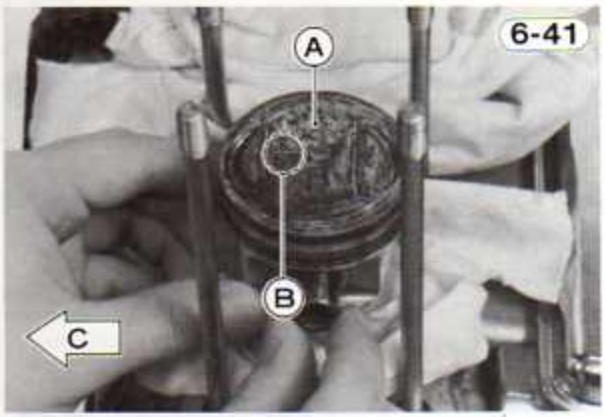
Bad

Piston Removal

- Remove the piston pin snap rings from the outside of each piston.
- Remove each piston by pushing its piston pin out the side that the snap ring was removed. Use the piston pin puller and adapter "B" (special tools) if necessary.



A. Piston Pin Puller: 57001-910
B. Adapter "B": 57001-913



A. Piston **B. Arrow Mark** **C. Front**

- Fit a new piston pin snap ring into the side of each piston, taking care to compress it only enough to install it and no more. Check that the other snap ring is in place.

CAUTION **Do not reuse snap rings, as removal weakens and deforms the snap ring. It could fall out and score the cylinder wall.**

Installation:

Piston Installation

NOTE: 1. If the piston is replaced with a new one, check that piston-to cylinder clearance has the specified value (Pg. 3-15). Also, when a new piston or piston pin is installed, check that the piston-to-pin clearance has the specified value (Pg. 3-17).

- Apply a little engine oil to the piston pins, and install the pistons and piston pins. The arrow on the top of each piston must point towards the front.

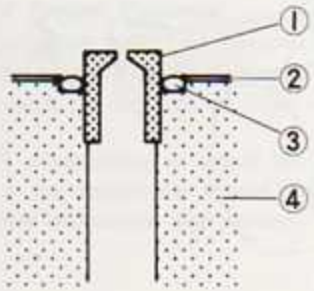
Cylinder Block Installation

NOTE: 1. If the cylinder block is replaced with a new one, piston to cylinder clearance must be checked against the specified value (Pg. 3-15).

- With compressed air, blow out the oil passages and orifices to remove dirt or particles which may obstruct oil flow.
- Remove the cloth from under each piston.

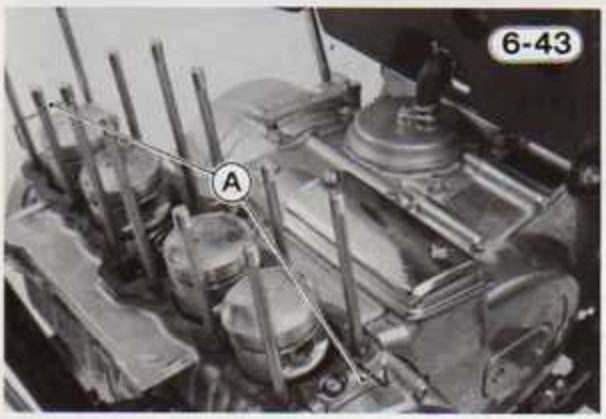
- Install the oil passage orifices so that the small hole in each orifice faces up. Install the new orifice O-rings.

Orifice Installation 6-42



1. Orifice
2. Gasket
3. O-Ring
4. Cylinder Block

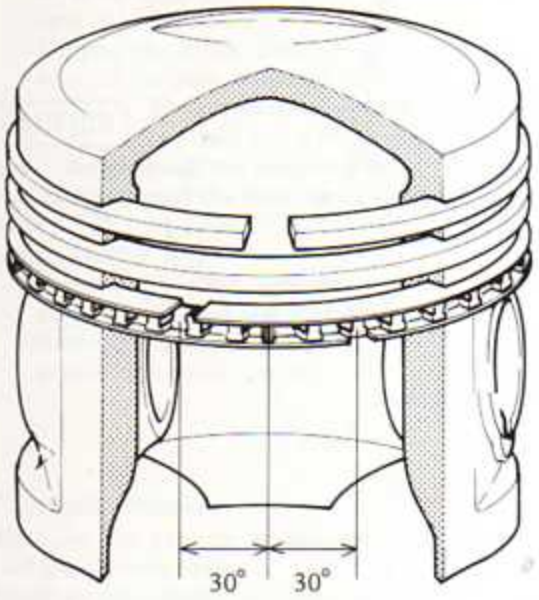
- Check that the rear chain guide is in place.
- Pull the chain taut to avoid kinking the chain, and using a 17 mm wrench on the crankshaft, turn the crankshaft so that all the pistons are at about the same height.
- Slip the piston bases (special tools) under the pistons to hold them level.
- Install the cylinder base gasket.



A. Piston Bases: 57001-149

- Position each piston ring so that the opening in the top and oil rings are facing forwards, and the second ring opening faces the rear. The openings of the oil rings steel rails must be slipped to both directions about 30° from the opening of the expander.

Piston Ring Openings (Front Side View) 6-44



- Apply engine oil to the piston rings and the inside cylinder surfaces.
- Compress the piston rings using the piston ring compressor (special tool) on each piston.



A. Piston Ring Compressor: 57001-531

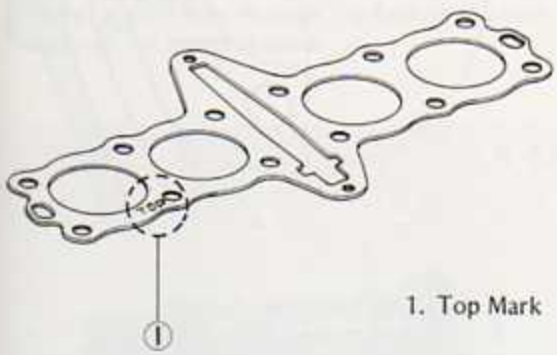
- Check to see that the front chain guide is properly fitted in the cylinder block.
- Fit the cylinder block on the crankcase studs, inserting the rear chain guide into the cylinder block, and rest the bottom of the cylinders on the piston ring compressor.
- Pull the camshaft chain up through the cylinder block and insert a screwdriver through it to prevent the chain from falling into the crankcase.
- Work the bottom of each cylinder past the rings, and set the cylinder block in place while removing the special tools. If the cylinder block does not seat on the crankcase, lift it up slightly; pull out the camshaft chain, and press the cylinder block down.

Cylinder Head Installation

NOTE: 1. The camshaft caps are machined together with the cylinder head, so, if a new cylinder head is installed, use the caps that are supplied with new head.

- Using compressed air, blow out any particles which may obstruct the oil passages.
- Install the oil passage orifices and new O-rings.
- Be sure that the knock pins are in place.
- Install the cylinder head gasket so that the side marked TOP faces up.

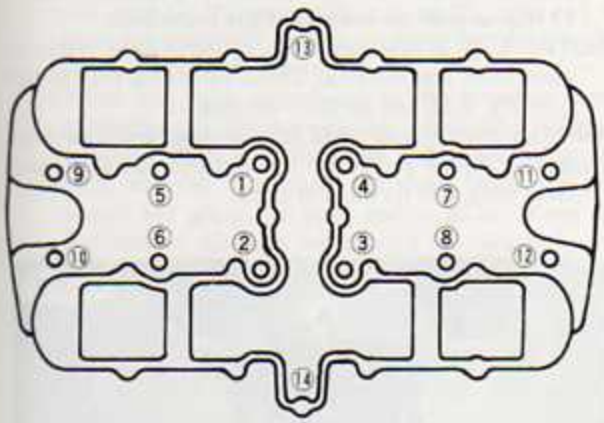
Cylinder Head Gasket Installation (6-46)



1. Top Mark

- Install the cylinder head.
- Lift up the camshaft chain, and use a screwdriver to keep the chain from falling down into the cylinder block.
- Tighten the cylinder head nuts first to about 2.5 kg-m (18.0 ft-lbs) and finally to 4.0 kg-m (29 ft-lbs) of torque, following the tightening sequence as shown. Each nut has a flat washer.

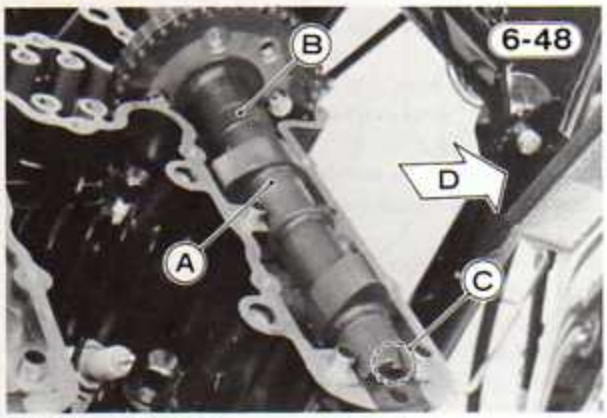
Cylinder Head Bolt and Nut Tightening Order (6-47)



- Tighten the cylinder head bolts to 3.0 kg-m (22 ft-lbs) of torque.

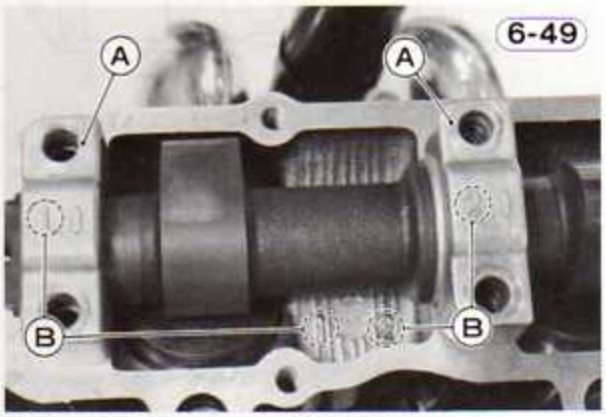
Camshaft Installation

- Check that the tachometer pinion is removed from the cylinder head, and all camshaft cap knock pins are fitted.
- Check crankshaft position to see that the 1,4 pistons are still at TDC, and readjust if necessary. Remember to pull the camshaft chain taut before rotating the crankshaft.
- Apply clean engine oil to all cam parts.
- Feed the exhaust camshaft (tachometer gear is affixed) through the chain and remove the screwdriver. The notched camshaft end must be on the right side of the engine.



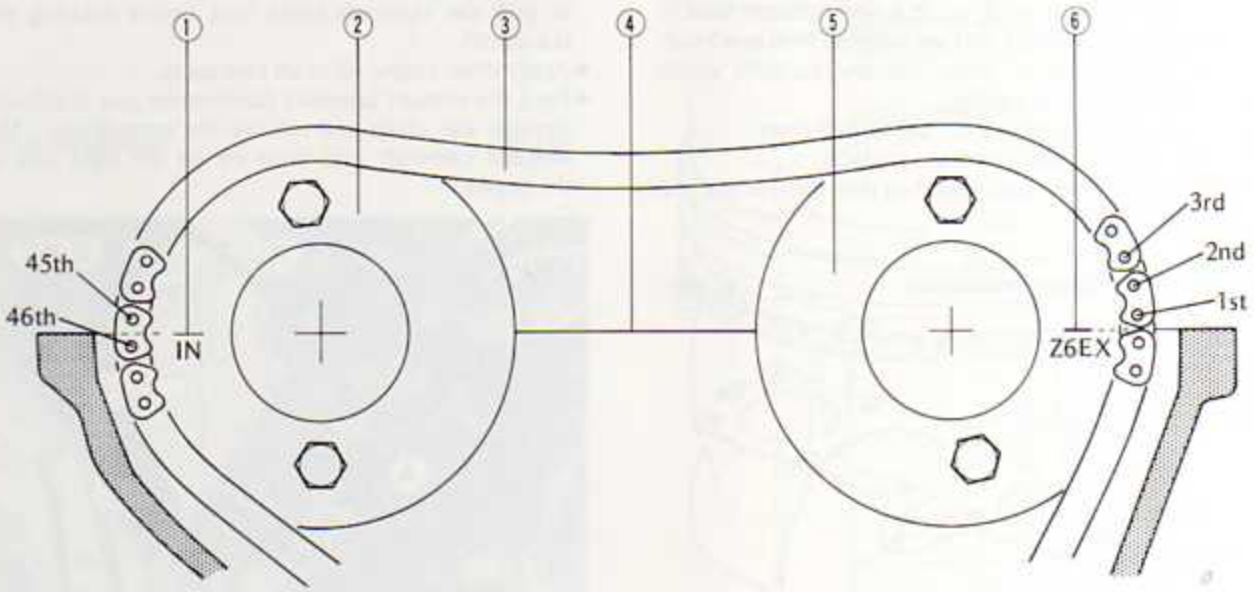
A. Exhaust Camshaft **C. Notch**
B. Tachometer Gear **D. Front**

- Turn the exhaust camshaft so that the line adjoining the Z6EX mark on the sprocket is pointing to the front aligned with the cylinder head surface.
- Pull the chain taut and fit it onto the exhaust camshaft sprocket.
- Feed the inlet camshaft through the chain, and align the line adjoining the IN mark on the sprocket with the cylinder head surface and pointing to the rear. Find the pin on the link pointed at by the exhaust camshaft sprocket line adjoining the Z6EX mark, starting with this pin as zero (0), count to the 45th pin. Check to see that the inlet camshaft sprocket line adjoining the IN mark points between that 45th and 46th pins. If not, the camshafts are installed incorrectly.
- Check that the camshaft chain seats in the groove of the front and rear chain guides.
- The camshaft caps are machined together with the cylinder head, so match the number on the camshaft caps with the number on the cylinder head. The arrow on the cap points forward (toward the exhaust).



A. Camshaft Cap **B. Match the number.**

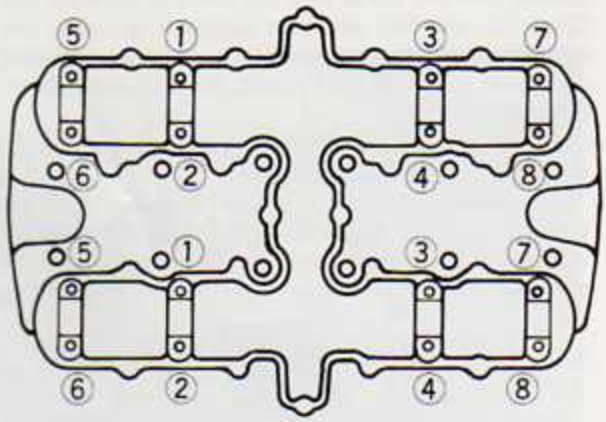
Camshaft Chain Timing (6-50)



1. IN Mark
2. Inlet Camshaft Sprocket
3. Camshaft Chain
4. Cylinder Head Upper Surface
5. Exhaust Camshaft Sprocket
6. Z6EX Mark

- Partially tighten the left inside camshaft cap bolts first, to seat the camshaft in place. Fully tighten all the bolts to 1.2 kg-m (104 in-lbs) of torque, following the tightening sequences shown in the figure.

Camshaft Cap Bolt Tightening Order (6-51)



- Install the chain tension. See the *Chain Tensioner Installation*.
- Before rotating the crankshaft, check that, with the crankshaft positioned so #1 and #4 pistons are at TDC, the timing marks on the exhaust and inlet camshaft sprockets are aligned with the cylinder head surface.

CAUTION **Rotation of the crankshaft with improper camshaft timing could cause the valves to contact each other or the piston, and bend.**

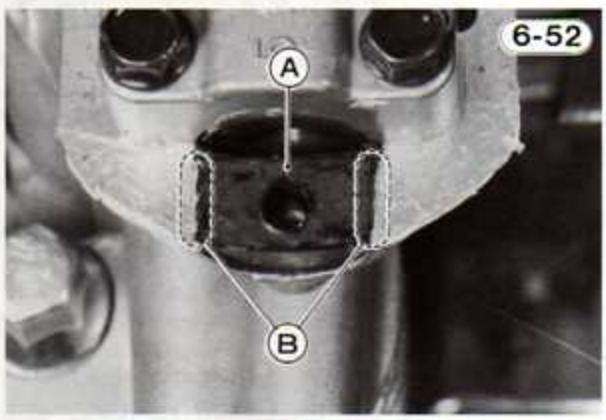
- Turn the crankshaft over clockwise until pistons #1 and #4 are at TDC, and re-check the camshaft timing. If the three timing mark pairs are aligned, the cam timing is correct.

CAUTION **1. If any resistance is felt when turning over the crankshaft, stop immediately, and check the camshaft chain timing. Valves may be bent, is the timing was not properly set.**

2. Do not try to turn the crankshaft and camshafts with a wrench on the camshaft sprocket. Use a 17 mm wrench on the end of the crankshaft.

NOTE: 1. If a new camshaft, cylinder head, valve or valve lifter was installed, check valve clearance at this time (Pg. 2-5), and adjust if necessary.

- Replace the cylinder head rubber plugs with new ones, apply a liquid gasket to the circumference of each rubber plug, and fit them in place.



(6-52)

A. Rubber Plug **B. Apply a liquid gasket.**

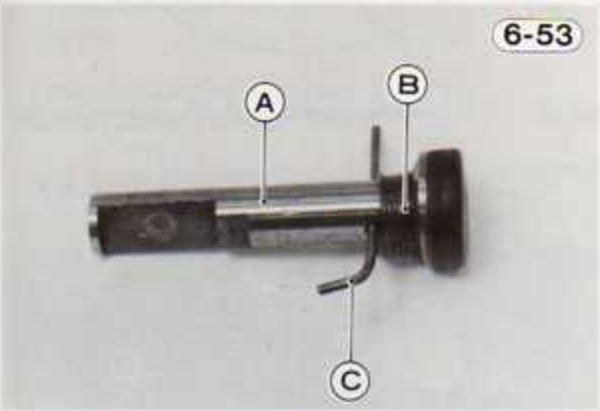
- Check that the upper chain guide is fixed to the cylinder head cover.
- Install the cylinder head cover with a new cylinder head cover gasket. The arrow on the cover must point toward the front. Tighten the cover bolts to 0.80 kg-m (69 in-lbs) of torque.

Chein Tension Installation

- Install the chain tensioner as following procedures.

(1)Ball-lock Type

- Remove the lock bolt, and take out the push rod, push rod stop, and soft spring.
- Compressing the spring against the push rod head, insert a thin wire through the hole in the push rod to keep the spring in place.



A. Push Rod **B. Spring** **C. Wire**

- Check to see that the stiff spring is in the tensioner body.
- Apply a thin coat of grease on the end of the push rod, and fit the push rod stop on the push rod so that the push rod stop is properly installed in the tensioner body as shown.
- Insert the push rod stop into the tensioner body going through the ball retainer. And then hold the tensioner body with the open end down so that the balls will fall away from the ramp inside the tensioner and allow the push rod to go in. Keep the flat side of the push rod toward the lock bolt, and push in the rod by hand until the wire rests against the tensioner mating surface.
- Holding the push rod in position and facing the flat side toward the bolt, tighten the original lock bolt securely to prevent the push rod from sticking out, and then pull out the wire.
- Check the gasket, and replace it if it is damaged.
- Install the chain tensioner on the cylinder block, and tighten the mounting bolts. The upper mounting bolt is longer then the lower, and has an aluminum washer.
- Be certain that either the #1 and #4, or the #2 and #3 pistons are at TDC. If it is not, turn the crankshaft clockwise, and align one of the T marks on the timing advancer with the timing mark.
- Loosen the lock bolt and then tighten it. With the bolt loose, the stiff spring inside takes up any slack automatically.

(2)Cross-wedge Type

- Remove the bolt and washers, and remove the push rod and spring from the tension body.
- Clean the push and push rod slop, and apply a molybdenum disulfide engine assembly grease to them.

CAUTION **The dirt or grime of the push rod and push rod stop can cause the chain tensioner drag.**

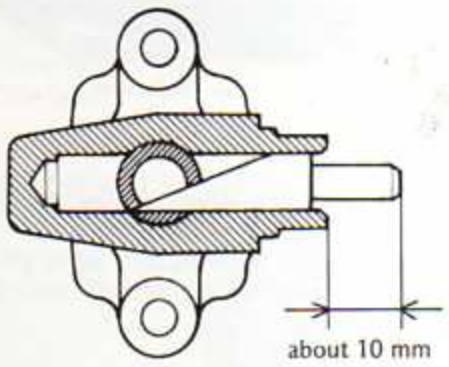
- Assemble the tensioner body, push rod, and spring, and tighten the bolt with its washer so that the top of bolt inserts the groove on the push rod.

CAUTION **Installation of the chain tensioner without the bolt can cause the push rod to fall into the cylinder.**

- Install the chain tensioner body and gasket, and tighten the bolts evenly. The upper bolt is longer than the lower, and has an aluminum washer.
- Check that either the #1 and #4, or the #2 and #3 pistons are at TDC. If not, turn the crankshaft clockwise, and align one of the T marks on the timing advancer with the timing mark.
- Install the chain tensioner push rod stop and spring so that the taperd surface of the push and stop fits on the taperd surface of the push rod.

NOTE: 1. When the push rod stop was properly installed, the push rod stop end sticks out about 10 mm. If it sticks out over the correct value, push it in until it is properly installed turning the crankshaft in the direction of normal rotation.

Push Rod Stop Installation 6-54



- Tighten the tensioner cap with its gasket to 2.5 kg-m (18.0 ft-lbs) of torque.
- Install the pick-up coil cover and gasket.

Tachometer Pinion Installation

- Apply a small amount of molybdenum disulfide engine assembly grease to the tachometer pinion shaft, insert the pinion and pinion holder into the cylinder head.
- Install the pinion holder stops, and tighten the holder stop Allen bolt.

- Check and adjust the following items as if necessary:
  - Throttle Grip (Pg. 2-8)
  - Carburetors (Pg. 2-9)
  - Valve Clearance (Pg. 2-5)
- If the cylinder head bolts and nuts were removed, thoroughly warm up the engine, wait until the engine grows cold, and retighten the cylinder head nuts to 4.0 kg-m (29 ft-lbs) of torque following the tightening sequence.

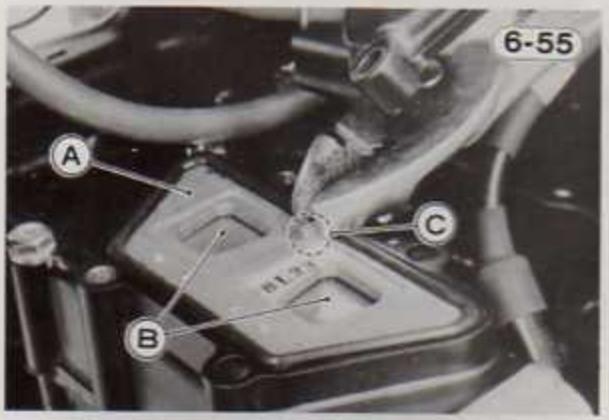
WARNING **To avoid serious burn, never touch the engine or exhaust pipes while they are hot.**

AIR SUCTION VALVES

NOTE: 1. The air suction valves are only attached to the motorcycle for US model.

Removal:

- Remove the air suction valve cover bolts, and lift the cover off the air suction valve assembly.
- Remove the valve assembly taking care not to damage the valve reeds and reed contact areas. If the valve assembly sticks in the cylinder head cover, pull it up by grasping the projection with pliers.



A. Valve Assembly **C. Projection**
B. Valve Reeds

Installation Note:

1. Check the air suction valve assembly, and replace it with a new one if it is damaged (Pg. 2-7).
2. Tighten the cover bolts to 0.80 kg-m (69 in-lbs) of torque with a flat washer installed under each bolt head.

CAMSHAFT SPROCKETS

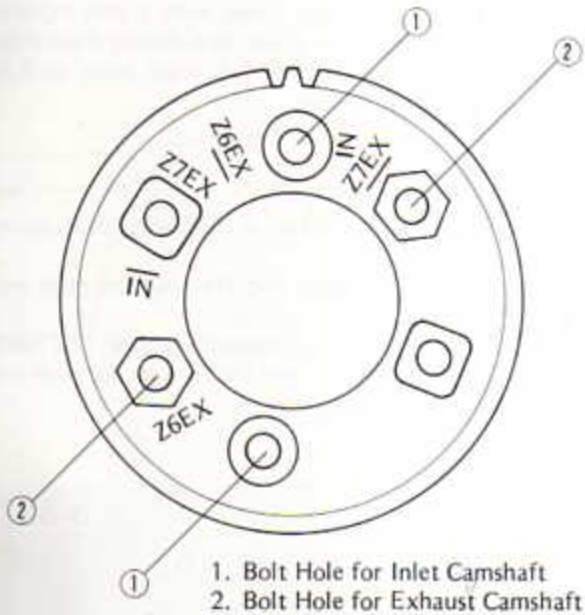
Removal:

- Remove the camshaft sprocket bolts, and slide the sprocket off the camshaft.

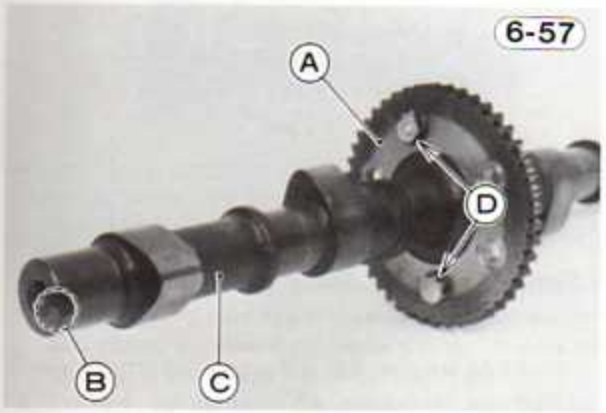
Installation Note:

1. Set the sprocket on the camshaft, aligning the bolt holes. Use the two of six sprocket bolt holes for installation as shown. The marked side of the camshaft sprocket must face the notch on the shaft end.

Camshaft Sprocket Installation 6-56



1. Bolt Hole for Inlet Camshaft
2. Bolt Hole for Exhaust Camshaft



A. Sprocket **B. Notch** **C. Camshaft**
D. Apply a non-permanent locking agent.

2. Apply a non-permanent locking agent to the sprocket bolts and install the bolts, tightening them to 1.5 kg-m (11.0 ft-lbs) of torque.

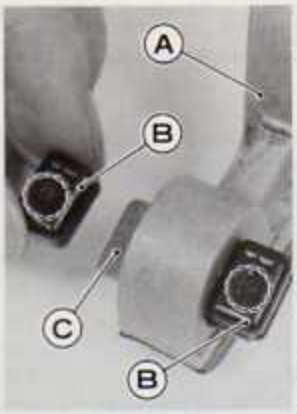
CAMSHAFT CHAIN GUIDES

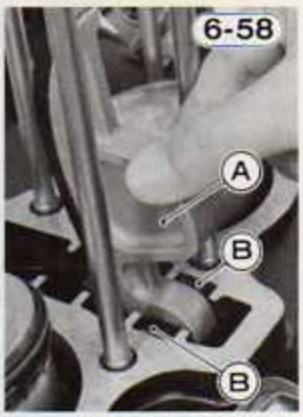
Removal:

- Remove the upper camshaft chain guide from inside of the cylinder head cover.
- Pushing the front camshaft chain guide up, remove the guide from the cylinder block with a twisting motion.
- Remove the rear camshaft chain guide from the upper crankcase.

Installation Note:

1. Install the rubber dampers on the guide shaft ends using an adhesive agent with the side marked UP facing upwards.

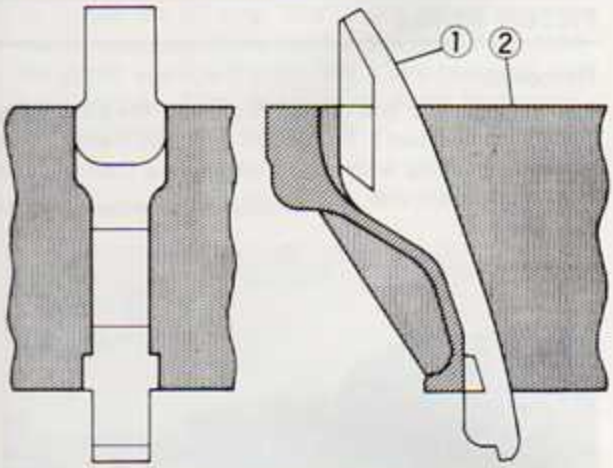




A. Rear Chain Guide **C. Guide Shaft**
B. Rubber Damper

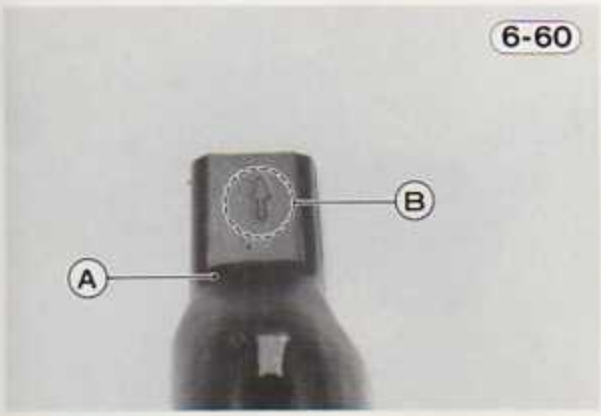
2. Install the front chain guide in the cylinder block as shown.

Front Camshaft Chain Guide Installation 6-59



1. Front Camshaft Chain Guide
2. Cylinder

3. Install the upper camshaft chain guide to the cylinder head cover with the arrow mark on the guide pointing forwards.



A. Upper Camshaft Chain Guide **B. Arrow**

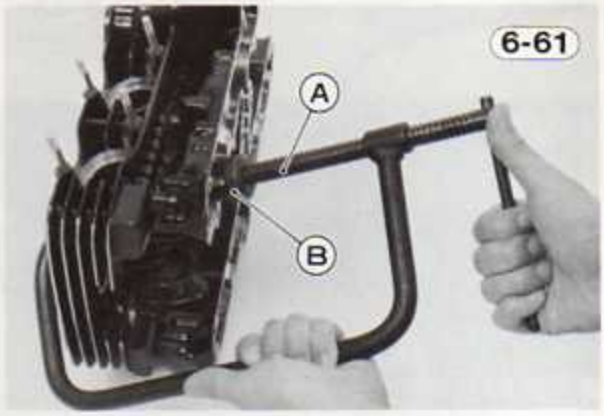
CYLINDER HEAD VALVES

Removal:

- Pull out the valve lifters and shims with a suitable tool, marking them as to location.

NOTE: 1. If more than one valve is to be removed, mark them as to location so they can be reinstalled in the proper place.

- Using the valve spring compressor assembly and adapter (special tools) to press down the valve spring retainer, remove the split keeper.



A. Valve Spring Compressor Assembly: 57001-241
B. Adapter: 57001-243

- Remove the tool, and then remove the spring retainer, outer spring, and inner spring.
- Push out the valve.
- Remove the oil seal and spring band.
- Remove the spring seat.
- Heat the area around the valve guide to about 120 – 150°C (248 – 302°F), and hammer lightly on the valve guide arbor (special tool) to remove the guide from the top of the head.

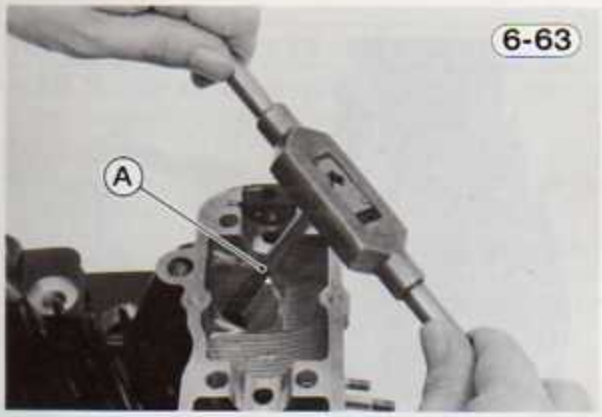


A. Valve Guide Arbor: 57001-163

Installation Note:

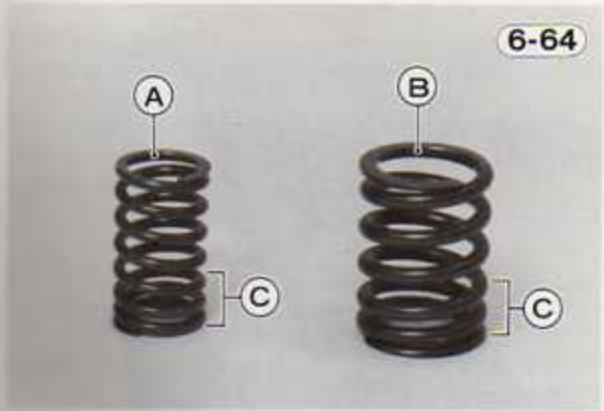
1. If a new valve or valve guide are installed, check the valve/valve guide clearance (Pg. 3-11).

2. Apply oil to the valve guide, and snap the circlip into the groove on the valve guide.
3. Heat the area around the valve hole to about 120 – 150°C (248 – 302°F), and drive the valve guide in from the top of the head using the valve guide arbor (special tool). The circlip stops the guide from going in too far.
4. Ream the valve guide with the valve guide reamer (special tool) even if the old guide is re-used.



A. Valve Guide Reamer: 57001-162

5. Lap the valve to check that it is seating properly. If it is uneven, refer to the Non-scheduled Maintenance Chapter (Pg. 3-10).
6. Apply a thin coat of a molybdenum disulfide engine assembly grease to the valve stem, insert the valve, and install the outer and inner springs with the concentrated portion of each spring down as shown.



A. Inner Spring
B. Outer Spring
C. Concentrated Portion

7. Mount the shims and valve lifters in their original locations.

CARBURETOR HOLDERS

Removal (each holder):

- Removal the screw, and take the carburetor holder off the cylinder head.

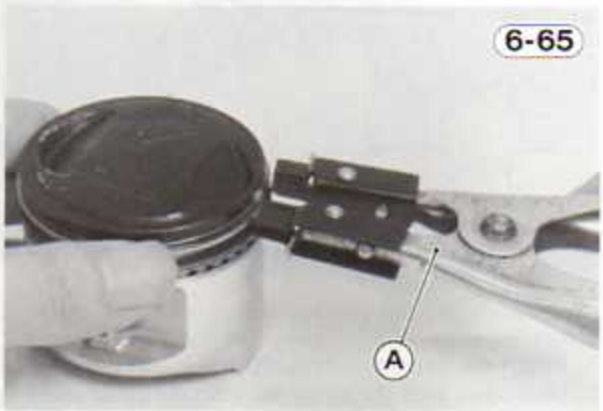
Installation Note:

1. When installing the carburetor holders, the vacuum hose attachment on each holder must point to the correct side.
   - For US model, attachment on the #1 or #4 carburetor holder must point upward and to the inside, and attachment on the #2 or #3 carburetor holder must point downward and to the outside.
   - For the other than US model, attachment on each carburetor holder must point downward and to the outside.
2. Apply a non-permanent locking agent to the threads of the mounting screws.

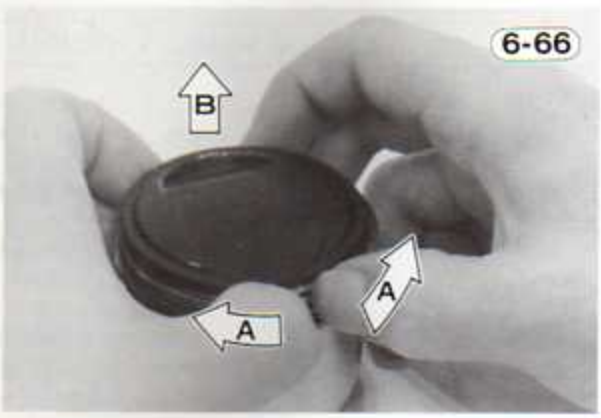
PISTON RINGS

Removal:

- Remove the top and second rings with the piston ring pliers (special tool). To remove a ring by hand, spread the ring opening with both thumbs, and then push up on the opposite side.



A. Piston Ring Pliers: 57001-115



A. Spread. **B. Push up.**

- Remove the upper and lower oil ring steel rails, and then remove the oil ring expander.

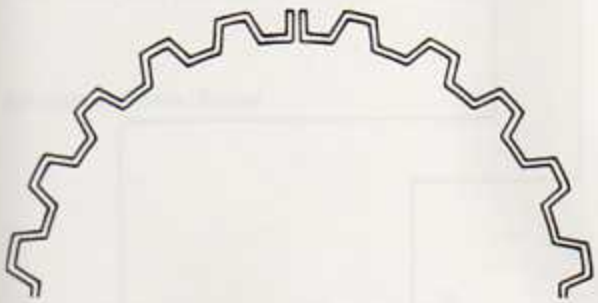


A. Oil Ring Expander
B. Upper Steel Rail
C. Lower Steel Rail

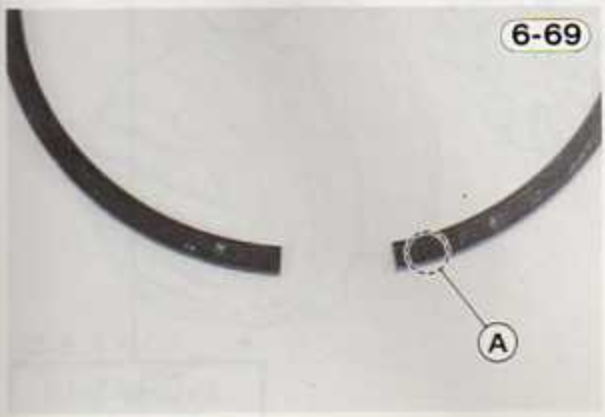
Installation Note:

1. To install the oil ring, first install the expander so that the expander ends but together, and then install the upper and lower steel rails. The two steel rails are identical. There is no up or down to the rails; they can be installed either way.

Oil Ring Expander Installation 6-68



2. If there is the side marked R on the top or second ring, the ring must be installed so that the marked side faces up. The top and second rings are idential.



A. R Mark

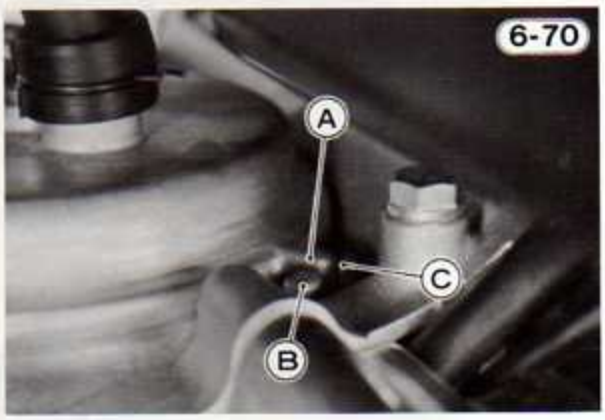
BREATHER COVER

Removal:

- Slide the clip out of place, and remove the breather hose from the breather cover.
- Remove the breather cover bolt and cover.

Installation Note:

1. Replace the breather cover O-ring and cover bolt O-ring with new ones if deteriorated or damaged.
2. The projection of the breather cover must be installed between the positioning pin and mount on the crankcase.



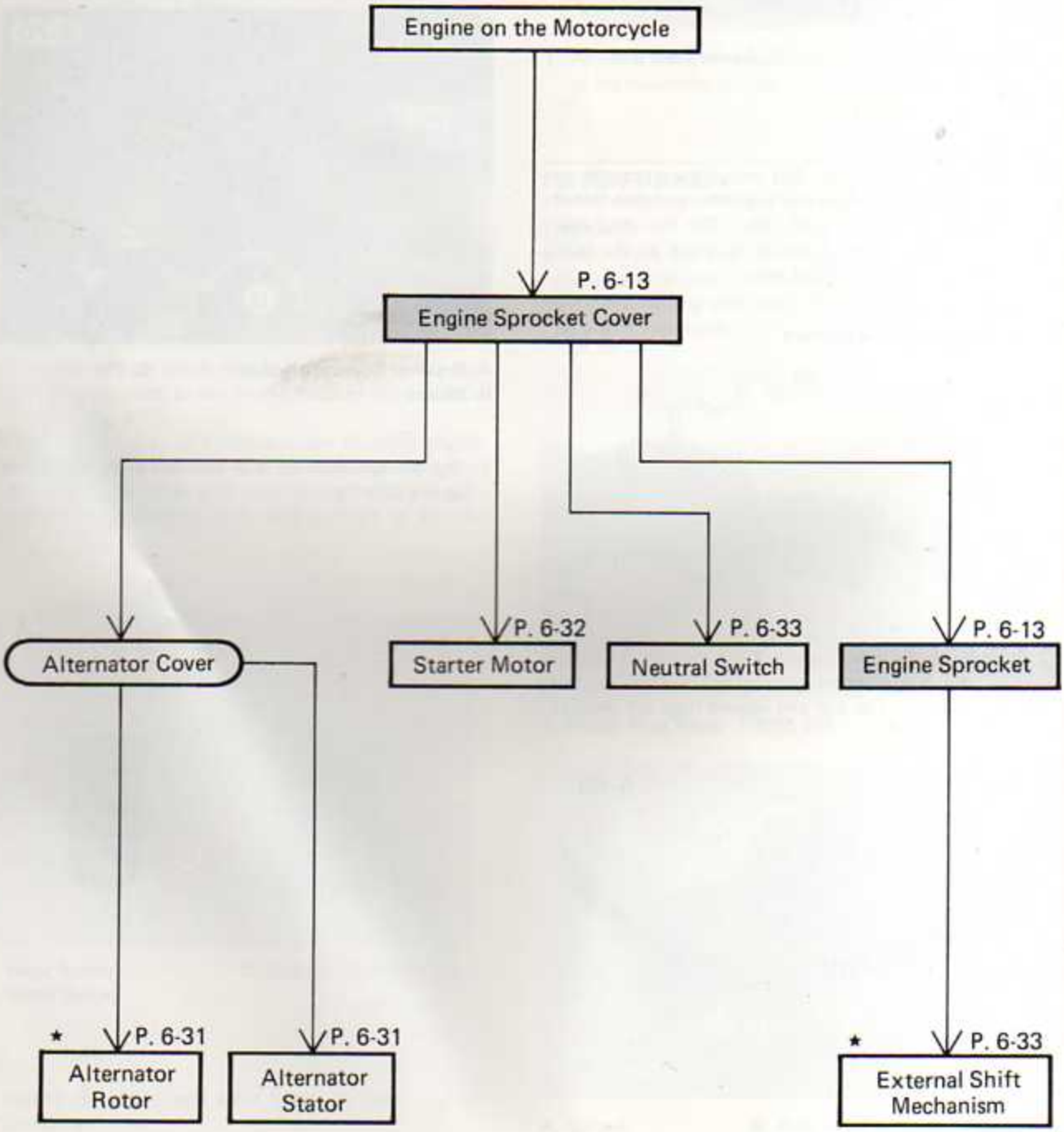
A. Breather Cover Projection
B. Mount
C. Pin

3. Tightening torque for the breather cover bolt is 0.60 kg-m (52 in-lbs).

FLOW CHART

This chart is designed to aid in determining proper removal sequence. Select the component you wish to remove and follow the arrows to that point on the chart. Explanation on the pages after the chart is shown the best method for removal, installation, disassembly, and assembly of each component.
NOTE: 1. Action for the shaded component is omitted in the explanation because it has been already spared in the other section.
2. Action with a mark (★) requires special tool(s) for removal, installation, disassembly, or assembly.

Disassembly-Engine (Engine Left Side)

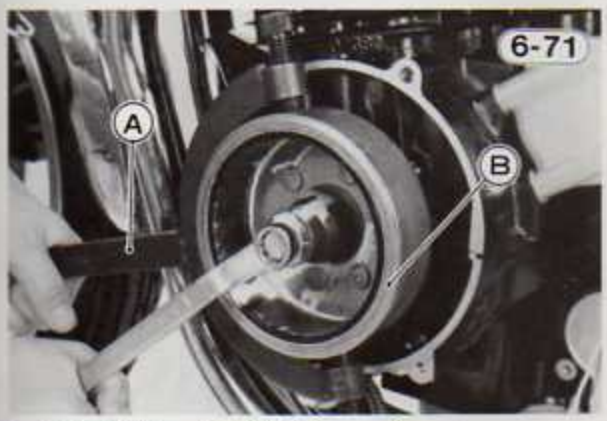


ALTERNATOR ROTOR
ALTERNATOR STATOR

Removal:

Alternator Rotor Removal

- Disconnect the alternator leads.
- Remove the alternator cover screws, and pull off the alternator cover and gasket.
- Hold the alternator rotor steady with the rotor holder (special tool), and remove the rotor bolt.



A. Rotor Holder: 57001-308 **B. Rotor**

- Using the special tool to hold the rotor steady, remove the rotor with the rotor puller (special tool).

CAUTION **If the rotor is difficult to remove and a hammer is used, turn the bar with hand tapping the head of the puller shaft with a hammer. Do not attempt to strike the bar of the alternator rotor itself. Striking the bar or the rotor can cause the bending or the magnets to lose their magnetism.**



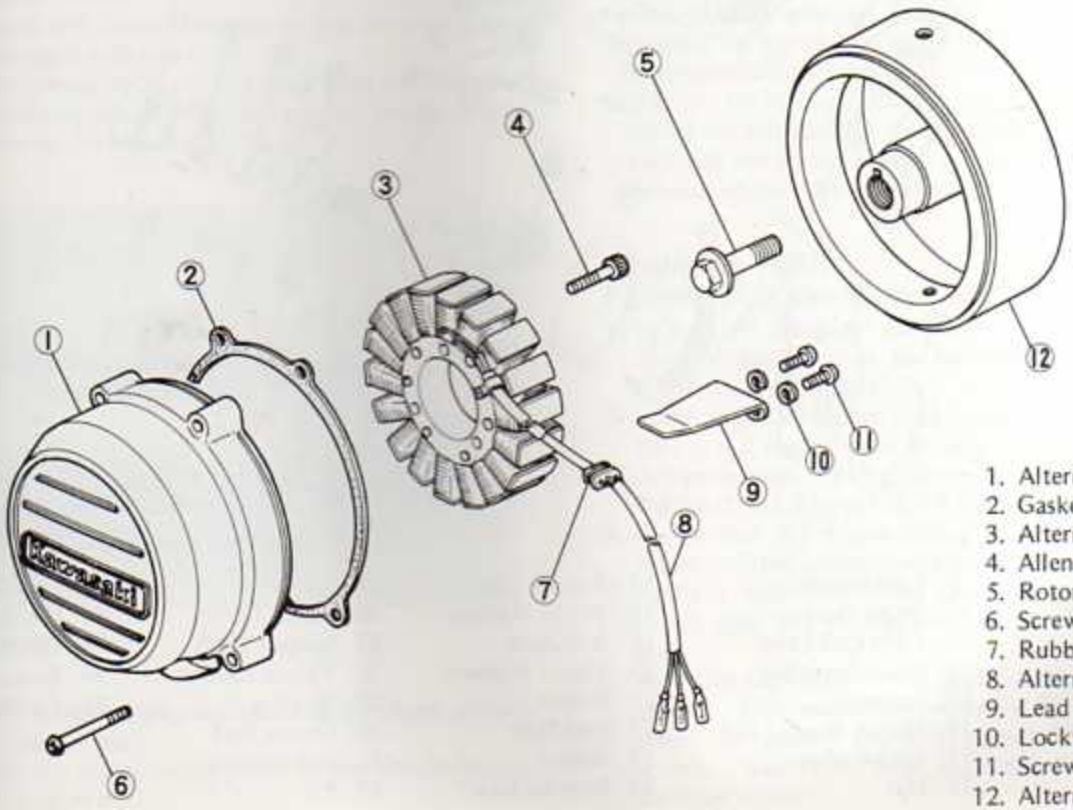
A. Rotor Puller: 57001-254

Alternator Stator Removal

- Remove the wiring clamp screws and wiring clamp.
- Remover the alternator stator Allen bolts, and pull out the alternator stator.

Alternator Rotor, Stator

6-73



1. Alternator Cover
2. Gasket
3. Alternator Stator
4. Allen Bolt
5. Rotor Bolt
6. Screw
7. Rubber Grommet
8. Alternator Leads
9. Lead Clamp
10. Lockwasher
11. Screw
12. Alternator Rotor

Installation Note:

Alternator Stator Installation

1. Install the grommet, and fir the stator into place. Use a non-permanent locking agent on each Allen bolt, and tighten the bolts to 0.80 kg-m (69 in-lbs) of torque.

Alternator Rotor Installation

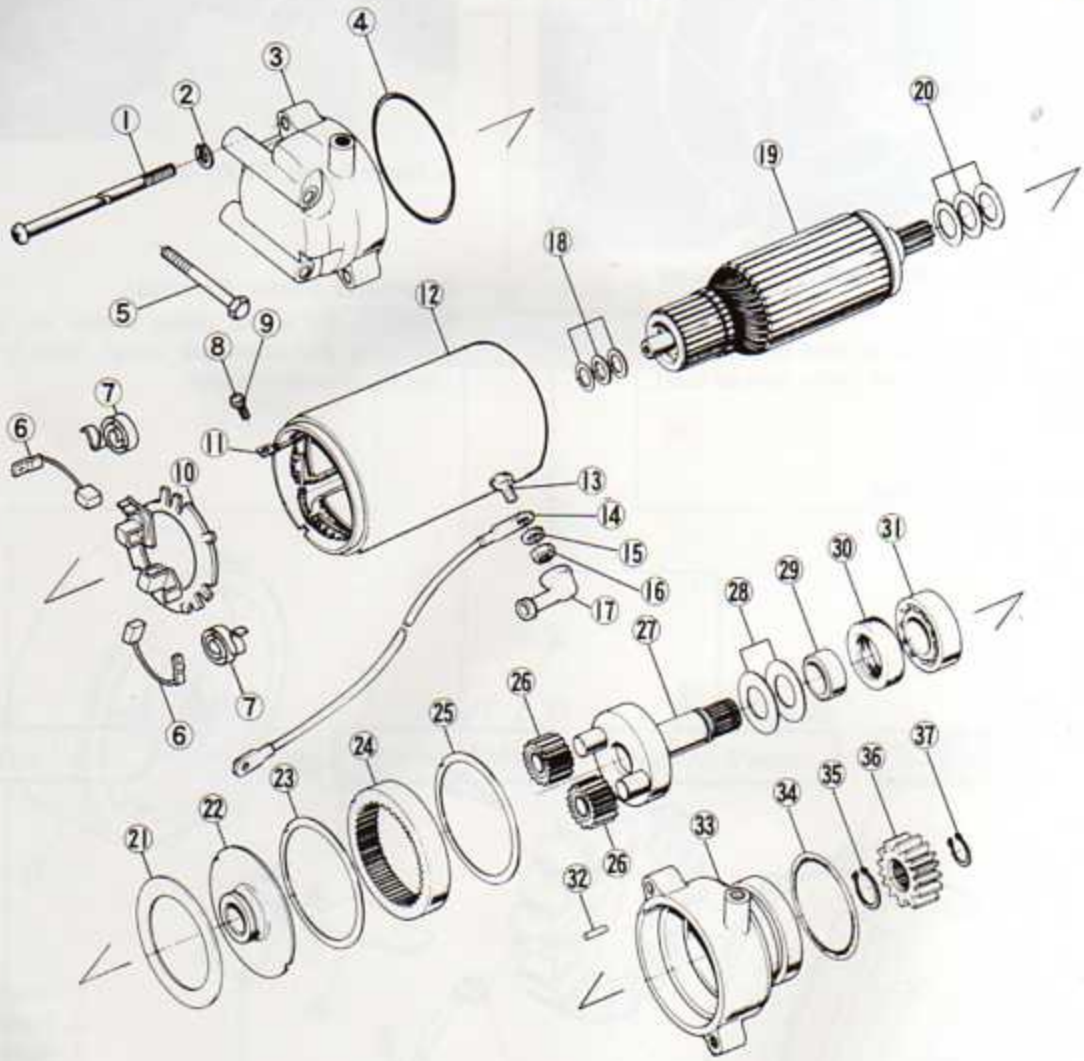
2. Using a high flash-point solvent, clean off any oil or dirt that may be on the crankshaft taper or rotor hub, and place the rotor back on the crankshaft.
3. Tighten the rotor bolt to 7.0 kg-m (51 ft-lbs) of torque while holding the alternator rotor steady with the rotor holder (special tool).
4. Check that the knock pins are in place, install the alternator cover using a new gasket, and tighten its screws.

STARTER MOTOR

Removal:

- Remove the starter motor retaining bolts.
- Pull off the starter motor.
- Remove the starter motor terminal nut and lockwasher, and take the lead off the starter motor.

Starter Motor 6-74



1. Screw
2. Lockwasher
3. End Cover
4. O-ring
5. Mounting Bolt
6. Carbon Brush
7. Brush Spring
8. Screw
9. Lockwasher
10. Brush Plate
11. Field Coil Lead
12. Yoke Assembly
13. Terminal
14. Starter Motor Lead
15. Lockwasher
16. Nut
17. Rubber Cap
18. Thrust Washers
19. Armature
20. Thrust Washers
21. Gasket
22. End Plate
23. Gasket
24. Internal Gear
25. Gasket
26. Planet Pinion
27. Output Shaft
28. Thrust Washers
29. Bushing
30. Grease Seal
31. Ball Bearing
32. Pin
33. End Cover
34. O-ring
35. Circlip
36. Pinion
37. Circlip

Installation Note:

1. Replace the O-ring with a new one, if it is deteriorated or damaged, and apply a little oil to it before installation.
2. Clean the starter motor lugs and crankcase where the starter motor is grounded.



A. Clean

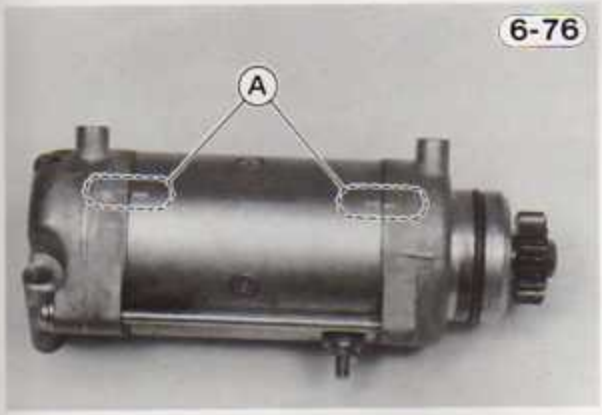
Disassembly:

- Remove the screws (1) and lockwashers (2).
- Remove the end cover (3) and O-ring (4).
- Remove the screw (8) which connects the brush lead to the filed coil lead, and remove the brush plate (10). The screw has a lockwasher (9).

NOTE: 1. The yoke assembly is not meant to be disassembled.

Assembly Note:

1. Replace any O-rings and gaskets that are deteriorated or damaged with new ones.
2. Align the notch on the end plate with the tongue on the housing, and align the line on each end cover with its line on the housing.



A. Align the lines.

3. Apply a high temperature grease to the planet pinions and internal gear.
4. Install the starter motor pinion so that the chamfered surface faces out.



NEUTRAL SWITCH EXTERNAL SHIFT MECHANISM

Removal:

Neutral Switch Removal

- Place an oil pan beneath the engine left side.
- Disconnect the neutral switch lead. Now, the neutral switch can be removed.

External Shift Mechanism Removal

- Remove the bolts and the chain guard.
- Remove the external shift mechanism cover bolts and screws, and pull off the external shift mechanism cover and gasket.

NOTE: 1. Engine oil will drain through the bolt hole of the cover.

- Remove the output shaft collar and O-ring.
- Move the shift arm and overshift limiter out of their positions on the end of the shift drum, and pull out the external shift mechanism.

NOTE: 1. Do not pull the shift rod more than 40 mm out of the crankcase, or the shift forks inside the crankcase will fall to the bottom of the oil pan, requiring removal of the crankcase to install them.

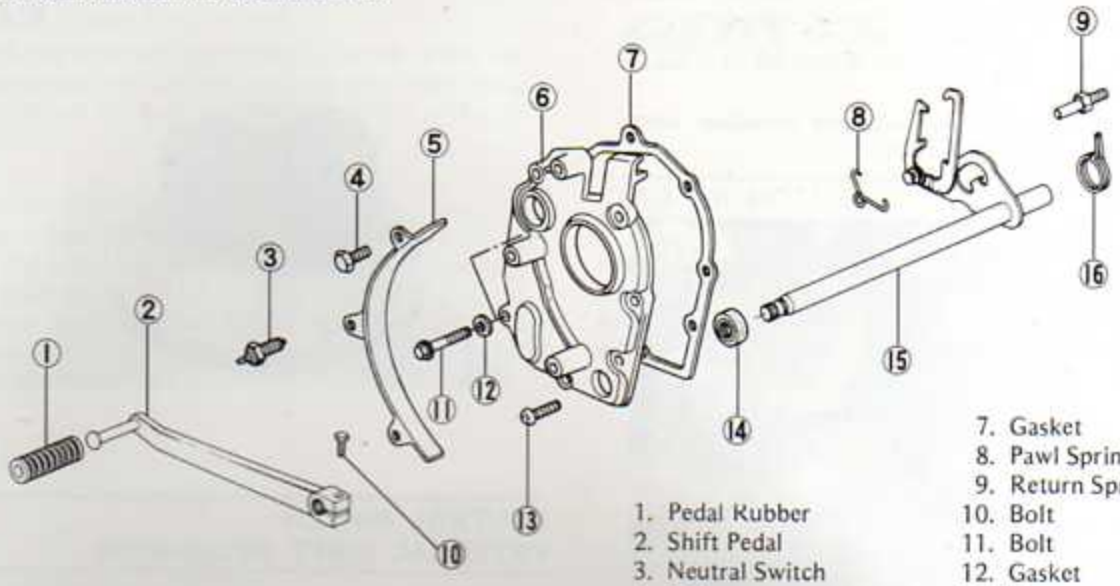
Installation Note:

External Shift Mechanism Installation

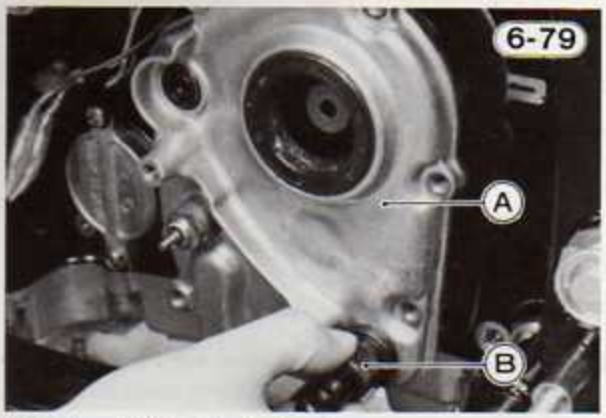
1. If the shift drum pin plate and pins were removed, install them referring to the shift mechanism assembly note (Pg. 6-53).
2. Check that the external shift mechanism return spring bolt is not loose. If it is loose, remove it, apply a non-permanent locking agent to the threads, and tighten it to 2.5 kg-m (18.0 ft-lbs) of torque.
3. Check that the return spring and pawl spring are properly fitted on the mechanism.
4. Apply a high temperature grease to the lips of the clutch push rod oil seal and output shaft collar oil seal.
5. Insert the shift shaft oil seal guide (special tool) in the external shift mechanism cover oil seal, install the cover and gasket, and then tighten the bolts and screws. Each bolt must be installed with a new alminum washer.

External Shift Mechanism, Neutral Switch

6-78

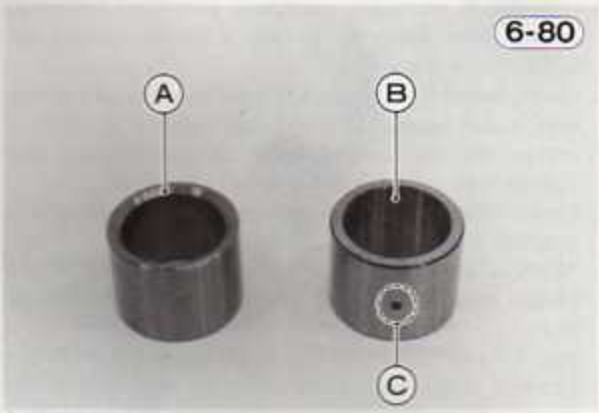


1. Pedal Rubber
2. Shift Pedal
3. Neutral Switch
4. Bolt
5. Drive Chain Guard
6. External Shift Mechanism Cover
7. Gasket
8. Pawl Spring
9. Return Spring Pin
10. Bolt
11. Bolt
12. Gasket
13. Screw
14. Oil Seal
15. Shift Shaft
16. Return Spring



A. External Shift Mechanism Cover
B. Shift Shaft Oil Seal Guide: 57001-264

6. The output shaft collar and drive shaft sleeve look the same, but the drive shaft sleeve has a small hole.



A. Output Shaft Collar
B. Drive Shaft Sleeve
C. Small Hole

7. Apply a non-permanent locking agent to the bolts, and install the chain guard.

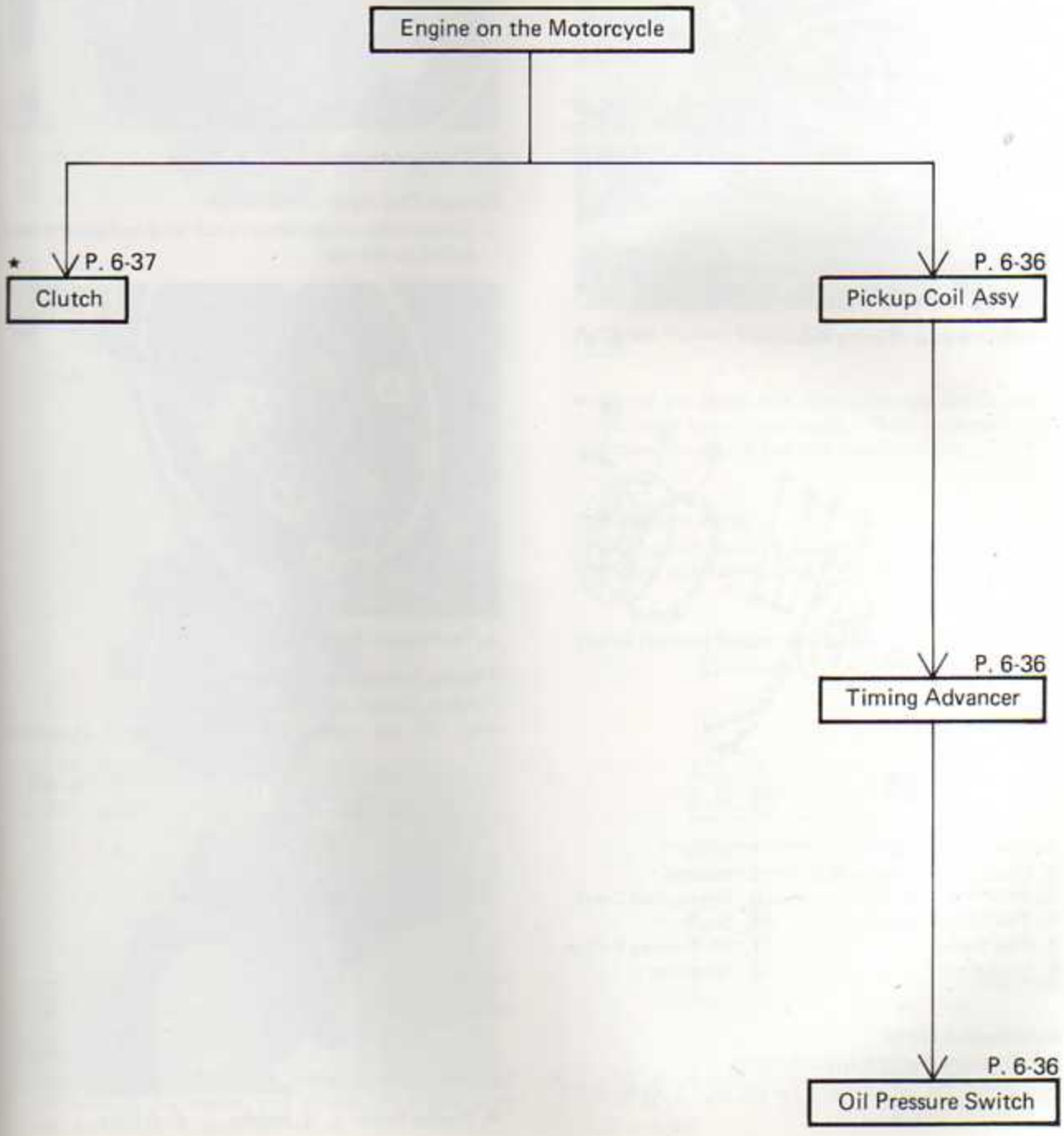
Neutral Switch Installation

8. Install the neutral switch and gasket tightening it to 1.5 kg-m (11.0 ft-lbs) of torque.
9. Check and adjust the following items as if necessary:
   - Engine Oil (Pg. 2-4).
   - Drive Chain (Pg. 2-12).

FLOW CHART

This chart is designed to aid in determining proper removal sequence. Select the component you wish to remove and follow the arrows to that point on the chart. Explanation on the pages after the chart is shown the best method for removal, installation, disassembly, and assembly of each component.
NOTE: 1. Action with a mark (★) requires special tool(s) for removal, installation, disassembly, or assembly.

Disassembly-Engine (Engine Right Side)



PICKUP COIL ASSY
TIMING ADVANCER
OIL PRESSURE SWITCH

Removal:

Pickup Coil Assy Removal

- Unlock the seat and swing it open.
- Remove the tool kit box.
- Disconnect the 4-pin connector that joints the pickup coil leads to the IC igniter, and disconnect the oil pressure switch and slide the leads free from the clamps under the clutch cover.
- Remove the pickup coil cover and gasket.
- Remove the pickup coil assy mounting screws, disconnect the oil pressure switch lead, and take off the assy.

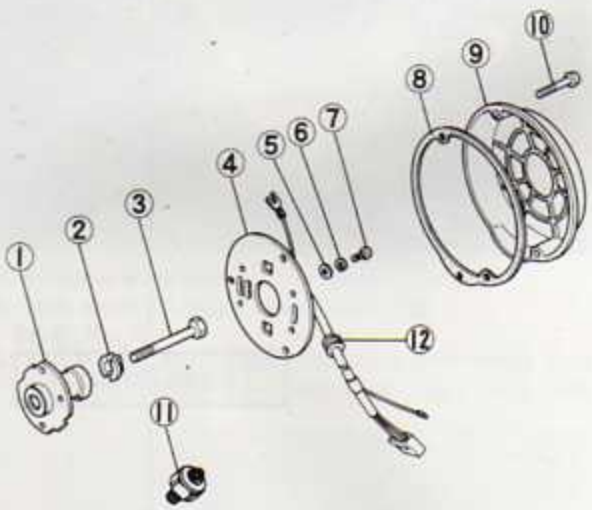
Timing Advancer Removal

- With a 17 mm wrench on the crankshaft rotation nut to keep the shaft from turning, remove the advancer mounting bolt, and take off the rotation nut and the timing advancer.

Oil Pressure Switch Removal

- Now, the oil pressure switch can be removed.

Pickup Coil Assy, Timing Advancer (6-81)



1. Timing Advancer
2. Crankshaft Rotation Nut
3. Mounting Bolt
4. Pickup Coil Assy
5. Flat Washer
6. Lockwasher
7. Screw
8. Gasket
9. Pickup Coil Cover
10. Screw
11. Oil Pressure Switch
12. Grommet

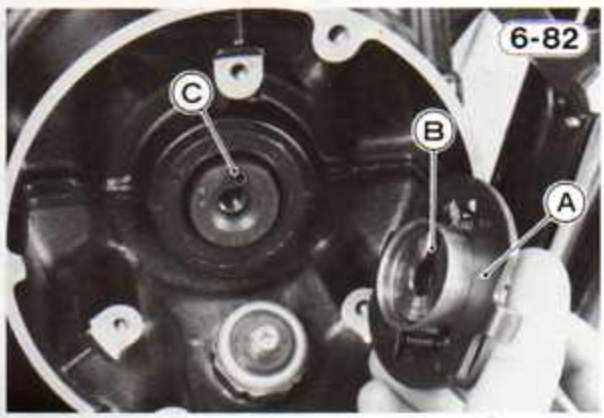
Installation Note:

Oil Pressure Switch Installation

1. Tighten the oil pressure switch to 1.5 kg-m (11.0 ft-lbs) of torque.

Timing Advancer Installation

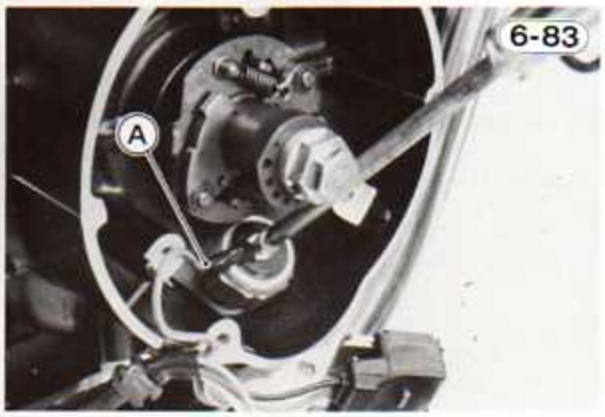
2. Fit the timing advancer onto the crankshaft, matching its notch with the pin in the end of the crankshaft, and install the crankshaft rotation nut and advancer mounting bolt. The notches in the nut fit the projections on the timing advancer. Tighten the bolt to 2.5 kg-m (18.0 ft-lbs) of torque.



A. Timing Advancer **B. Notch** **C. Pin**

Pickup Coil Assy Installation

3. Connect the oil pressure switch lead so that the lead points to the rear.

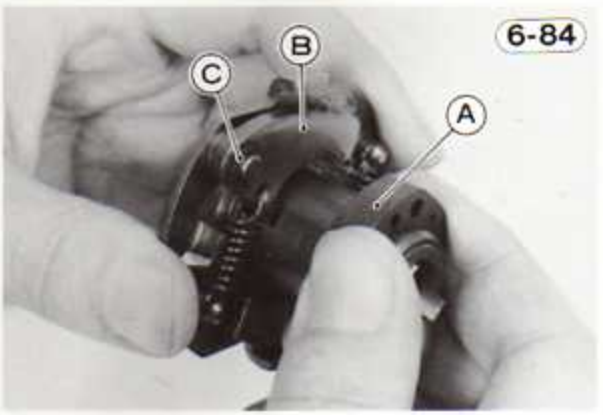


A. Oil Pressure Switch Lead

Timing Advancer Disassembly:

Timing Advancer Disassembly

- Pull off the timing rotor by turning it clockwise.

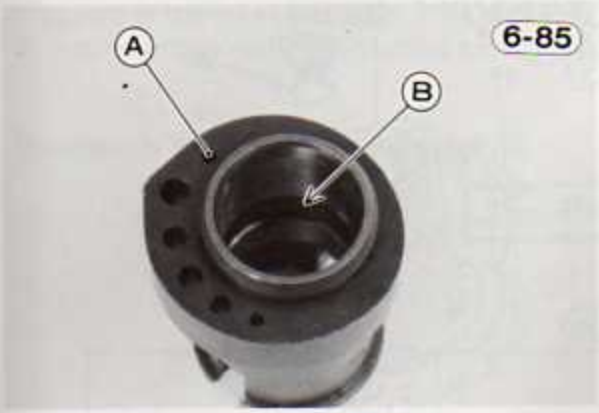


A. Timing Rotor **B. Weight** **C. C-Ring**

- Remove the C-ring, washers, and weights.
- Remove the thrust washer from each weight shaft.

Timing Advancer Assembly

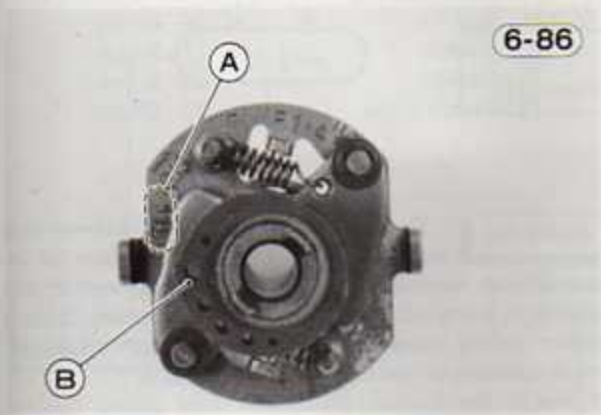
NOTE: 1. Wipe the advancer clean, and fill the groove in the timing rotor sleeve with grease.



6-85

A. Timing Rotor **B. Grease**

2. When installing the timing rotor, align the projection on the rotor with the TEC mark on the advancer body.



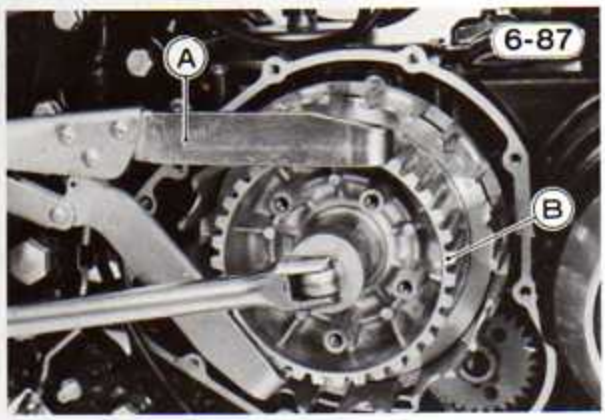
6-86

A. TEC Mark **B. Projection**

CLUTCH

Removal:

- With the motorcycle on its center stand, place an oil pan beneath the engine, and remove the engine drain plug and washer to drain out the oil.
- After the oil has drained, tighten the drain plug to 3.8 kg-m (27 ft-lbs) of torque.
- Remove the mounting nuts and right footpeg.
- Remove the screws, and pull off the clutch cover and gasket. There are two knock pins.
- Remove the clutch spring bolts, washers and springs.
- Pull off the spring plate, pull out the spring plate pusher, and tilt the motorcycle so that the steel ball will fall out.
- Remove the friction plates and steel plates.
- Hold the clutch hub from turning using the clutch holder (special tool), and remove the clutch hub locknut and lockwasher.



6-87

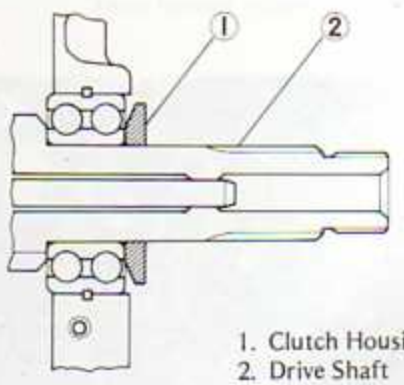
A. Clutch Holder: 57001-305 **B. Clutch Hub**

- Pull off the clutch hub, clutch housing, needle bearing, drive shaft sleeve, and spacer. There is a thrust washer between the clutch hub and clutch housing.

Installation Note:

1. The clutch housing spacer must be installed with its flat side facing toward the end of the drive shaft.

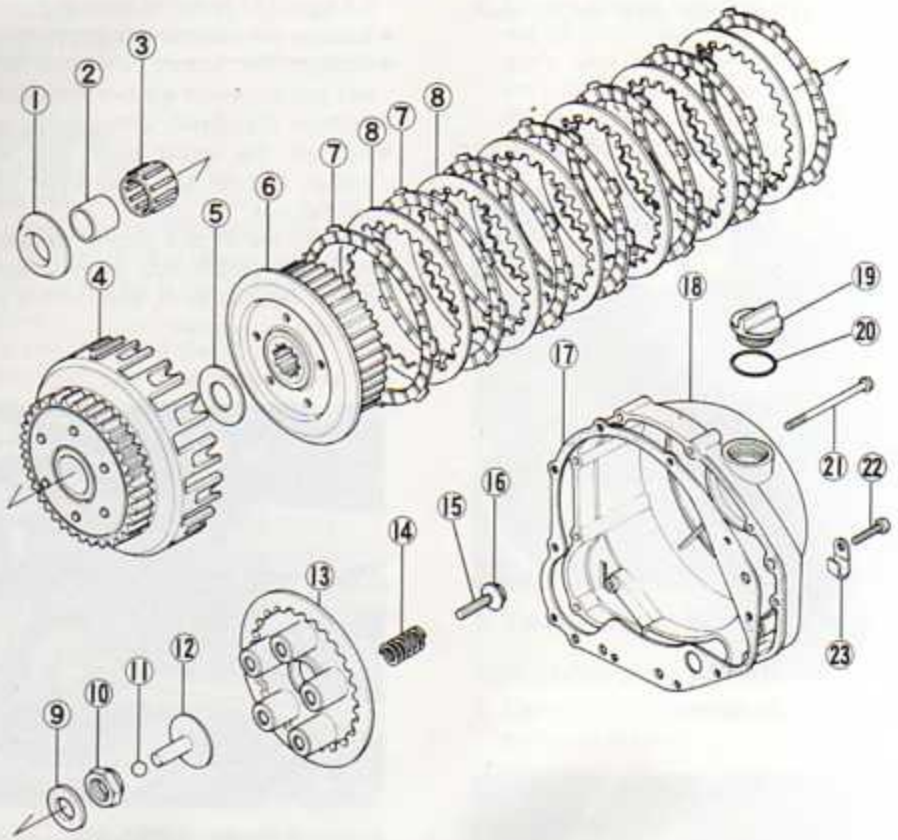
Clutch Housing Spacer Installation 6-88



1. Clutch Housing Spacer
2. Drive Shaft

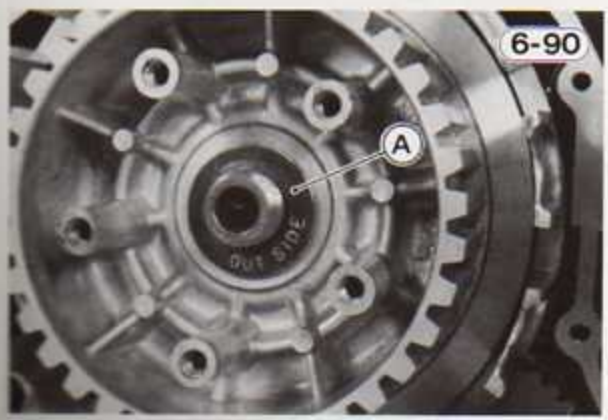
2. The drive shaft sleeve and output shaft collar look the same, but the drive shaft sleeve has a small hole (Fig. 6-80).

6-89



1. Spacer
2. Sleeve
3. Needle Bearing
4. Clutch Housing
5. Thrust Washer
6. Clutch Hub
7. Friction Plate
8. Steel Plate
9. Lockwasher
10. Locknut
11. Steel Ball
12. Spring Plate Pusher
13. Spring Plate
14. Clutch Spring
15. Bolt
16. Washer
17. Gasket
18. Clutch Cover
19. Oil Filler Opening Cap
20. O-ring
21. Screw
22. Screw
23. Clamp

3. Replace the clutch hub locknut with a new one, screw on the locknut and tighten it to 13.5 kg-m (98 ft-lbs) of torque, while holding the hub stationary with the clutch holder (special tool).



A. Lockwasher

WARNING **The lockwasher between the clutch hub and the clutch hub locknut must be installed with marked side, OUTSIDE, facing out. If this washer is installed backwards, the hub locknut might loosen during operation. This causes clutch disengagement resulting in loss of motorcycle control.**

4. Install the friction plates and steel plates, starting with a friction plate and alternating them.

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

5. Insert the clutch steel, ball, and spring plate pusher, applying a thin coat of a molybdenum disulfide engine assembly grease to their surfaces.
6. Cross tighten the clutch spring bolts evently to 1.0 kg-m (87 in-lbs) of torque.
7. Be sure to include the pick-up coil leads clamps with their clutch cover screws.
8. Check and adjust the following items:
   - Engine Oil (Pg. 2-4).
   - Clutch (Pg. 2-11).

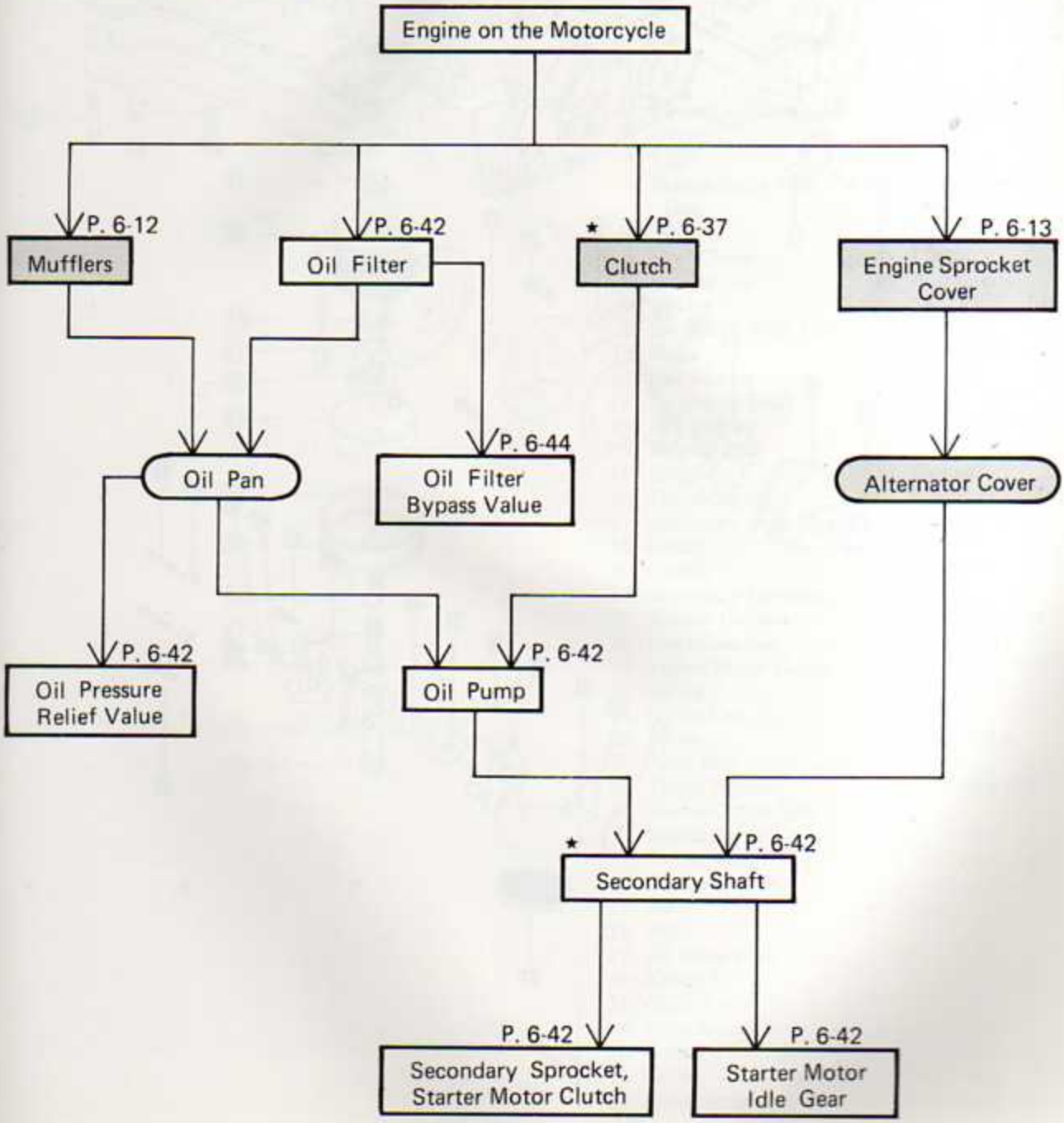
FLOW CHART

This chart is designed to aid in determining proper removal sequence. Select the component you wish to remove and follow the arrows to that point on the chart. Explanation on the pages after the chart is shown the best method for removal, installation, disassembly, and assembly of each component.

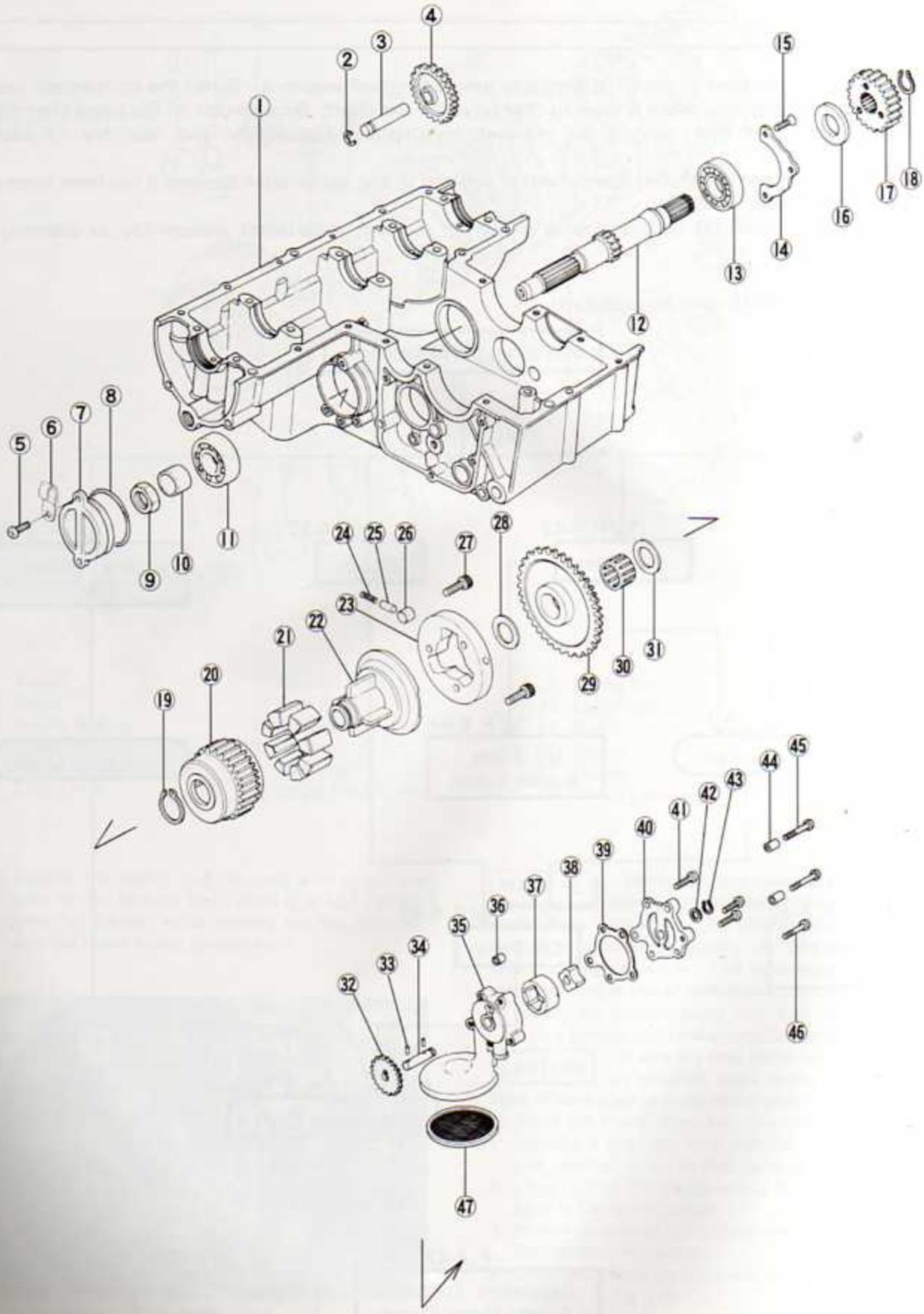
NOTE: 1. Action for the shaded component is omitted in the explanation because it has been alreary spared in the other section.

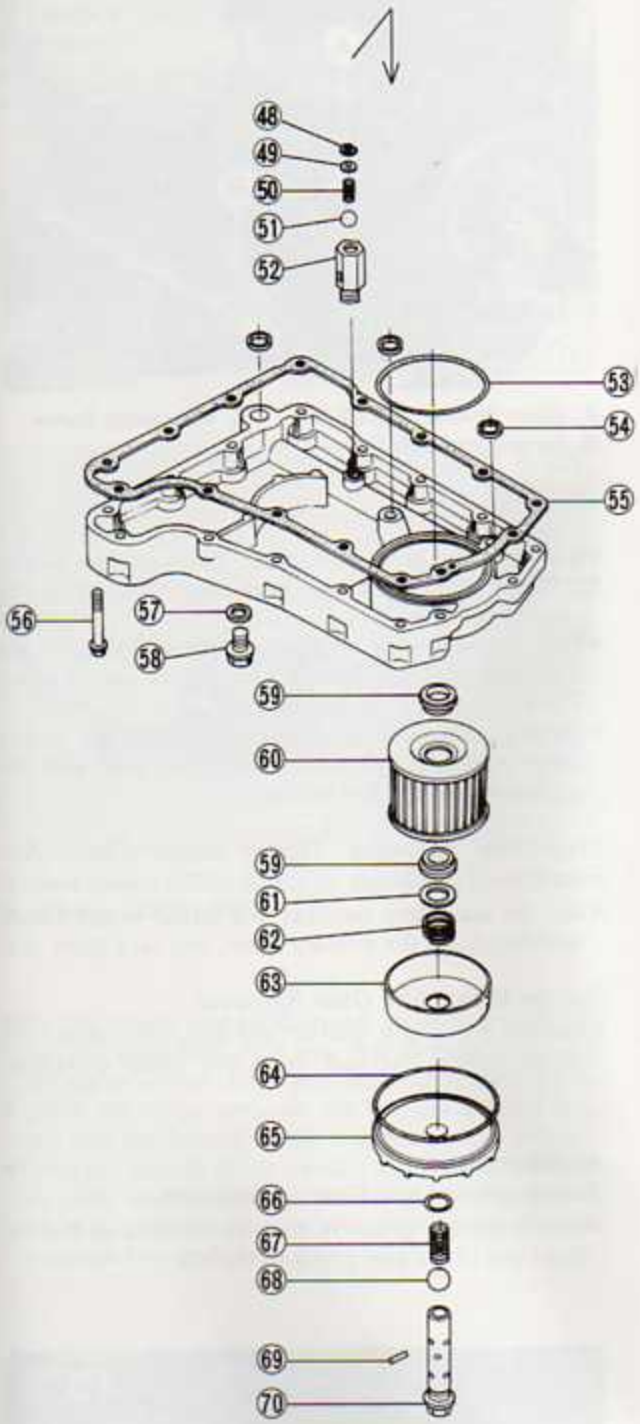
2. Action with a mark (★) requires special tool(s) for removal, installation, disassembly, or assembly.

Disassembly-Engine (Engine Bottom End)



Enigne Bottom End





1. Lower Crankcase Half
2. Circlip
3. Shaft
4. Starter Motor Idle Gear
5. Screw
6. Lead Clamp
7. Bearing Cap
8. O-Ring
9. Secondary Shaft Nut
10. Collar
11. Ball Bearing
12. Secondary Shaft
13. Ball Bearing
14. Bearing Stop
15. Screw
16. Thrust Washer
17. Secondary Shaft Gear
18. Circlip
19. Circlip
20. Secondary Sprocket
21. Rubber Damper
22. Inner Coupling
23. Starter Motor Clutch
24. Spring
25. Spring Cap
26. Roller
27. Allen Bolt
28. Thrust Washer
29. Starter Clutch Gear
30. Needle Bearing
31. Thrust Washer
32. Oil Pump Gear
33. Pin
34. Shaft
35. Oil Pump Body
36. Knock Pin
37. Outer Rotor
38. Inner Rotor
39. Gasket
40. Cover
41. Cover Screw
42. Flat Washer
43. Circlip
44. Knock Pin
45. Mounting Bolt
46. Mounting Bolt
47. Screw
48. Circlip
49. Flat Washer
50. Spring
51. Steel Ball
52. Relief Valve
53. O-Ring
54. O-Ring
55. Gasket
56. Screw
57. Gasket
58. Engine Drain Plug
59. Grommet
60. Oil Filter
61. Flat Washer
62. Spring
63. Element Fence
64. O-Ring
65. Oil Filter Cover
66. O-Ring
67. Spring
68. Steel Ball
69. Pin
70. Mounting Bolt

OIL FILTER
OIL PRESSURE RELIEF VALVE
OIL PUMP
SECONDARY SHAFT
SECONDARY SPROCKET
STARTER MOTOR CLUTCH
STARTER MOTOR IDLE GEAR

Removal:

Oil Filter Removal

- With the motorcycle on its center stand, place an oil pan beneath the engine, and remove the engine oil drain plug, oil filter mounting bolt and oil filter to drain out the oil.
- After the oil has drained out, install the drain plug and tighten it to 3.8 kg-m (27 ft-lbs) of torque.

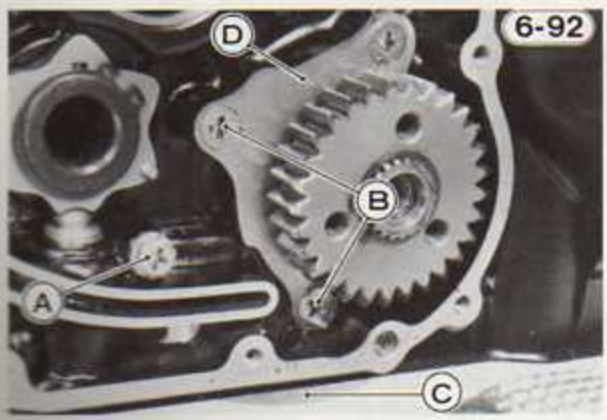
Oil Pressure Relief Valve Removal

- Remove the oil pan bolts, and remove the oil pan, gasket, and oil passage O-rings.
- Now, the oil pressure relief valve can be removed from the oil pan.

Oil Pump Removal

- Remove the mounting bolt and screws, and pull off the oil pump.

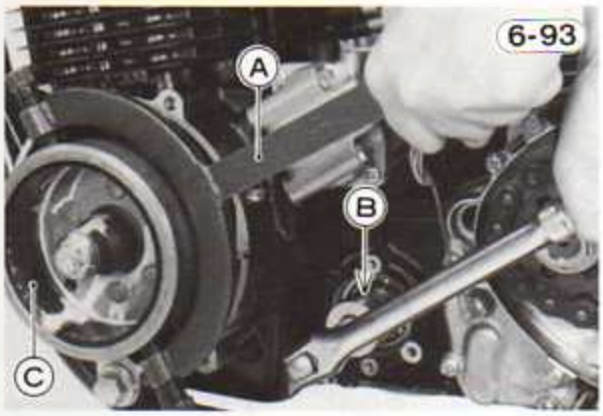
NOTE: 1. The oil pump mounting screws are also used as two of the secondary shaft bearing stop screws (3). If the secondary shaft is to be removed, remove the remaining one.



A. Mounting Bolt
B. Mounting Screws
C. Oil Pump
D. Secondary Shaft Bearing Stop

Secondary Shaft Removal

- Remove the screws, and pull off the secondary shaft bearing cap.
- Using the rotor holder (special tool) to hold the alternator rotor, remove the secondary shaft nut.



A. Rotor Holder: 57001-308
B. Secondary Shaft Nut
C. Alternator Rotor

- Remove the secondary shaft bearing stop screw.

NOTE: 1. This screw may have been removed just at the oil pump removal (Fig. 6-92).

- Tap the secondary shaft from the left side of the crankcase until the right bearing comes out of place. There is a collar in the left bearing.
- Holding the secondary sprocket and starter motor clutch assembly, pull out the secondary shaft with the secondary gear and ball bearing.

Secondary Sprocket, Starter Motor Clutch Removal

- Slip the secondary sprocket and starter motor clutch assembly from the primary chain, and take them out.

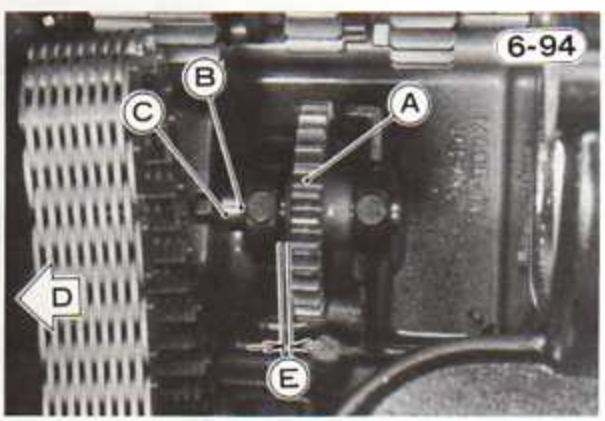
Starter Motor Idle Gear Removal

- Remove the circlip, pull off the shat, and remove the starter motor idle gear from the upper crankcase.

Installation:

Starter Motor Idle Gear Installation

- Install the idle gear. It must be installed so that the short end of the gear points to the left.



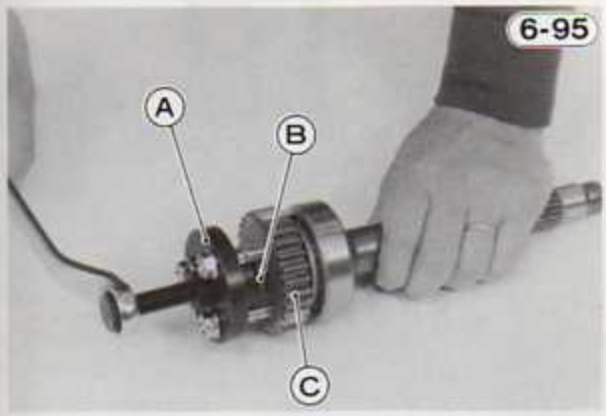
A. Idle Gear
B. Circlip
C. Shaft
D. Left Side
E. Short End

Secondary Sprocket, Starter Motor Clutch Installation

- Check that the starter clutch rollers 26 are in place.
- Put the thrust washer 28, starter clutch gear 29, and needle bearing 30 into the secondary sprocket and starter motor clutch assembly.
- Fit the primary chain on the secondary sprocket.

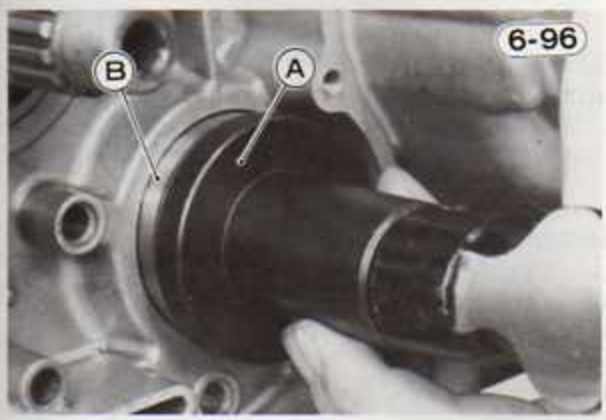
Secondary Shaft Installation

- Remove the secondary shaft gear circlip. Using the gear puller and adapter (special tools), pull the secondary shaft gear off the shaft.



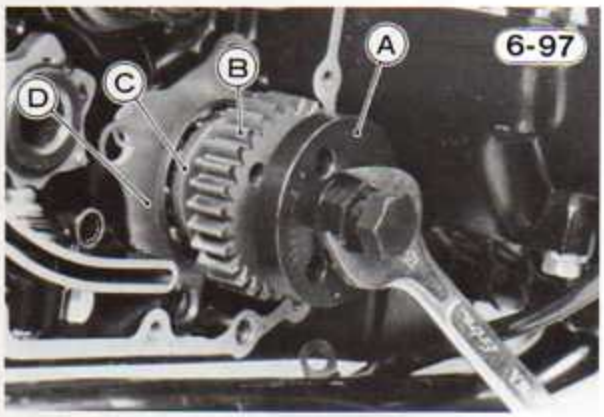
A. Gear Puller: 57001-319
B. Adapter: 57001-317
C. Secondary Shaft Gear

- Put the thrust washer 31 on the secondary shaft, and put the secondary shaft into the secondary sprocket and starter motor clutch assembly, fitting their splines.
- Install the collar between the left ball bearing inner race and the journal of the secondary shaft left end.
- Using the bearing driver (special tool), tap the secondary shaft bearing into the crankcase with the secondary shaft until the bearing stops at the bottom of the crankcase bearing hole.



A. Bearing Driver: 57001-297
B. Secondary Shaft Bearing

- Put the large flat washer on the secondary shaft.
- Put the secondary shaft bearing stop, and tighten one of the stop screws loosely.
- Apply a little oil on the secondary shaft and between the secondary shaft gear and gear pusher (special tool). If necessary, using the rotor holder (special tool) to keep the crankshaft and secondary shaft from turning, push the secondary shaft gear on the shaft by rotating the gear pusher (special tool).



A. Gear Puller: 57001-319
B. Secondary Shaft Gear
C. Flat Washer
D. Bearing Stop

- Install the circlip on the secondary shaft.
- Check that the felt bearing collar is in place, and tighten the secondary shaft nut to 6.0 kg-m (43 ft-lbs) of torque by holding the alternator rotor with the rotor holder (special tool).
- Install the secondary shaft bearing cap, and tighten its screws. The upper screw has a wiring clamp.

Oil Pump Installation

- Fill the oil pump with engine oil for initial lubrication.
- Check to see that the knock pins are in place.

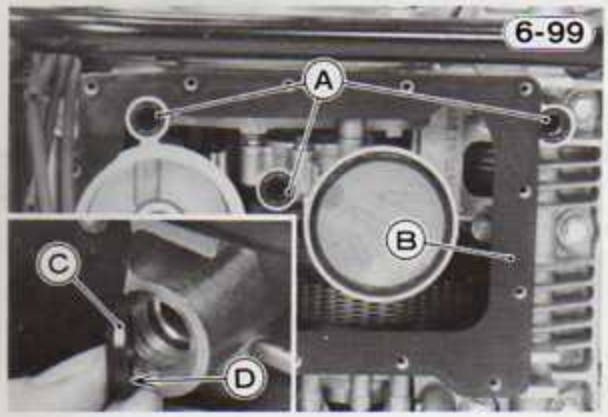


A. Knock Pins

- Install the oil pump, making sure the oil pump gear and pump drive gear at the secondary shaft mesh properly. Tighten the oil pump bolt and screws.
- Stake each head of the bearing stop screw with a punch to prevent loosening.

Oil Pressure Relief Valve Installation

- Fit the oil passage O-rings on the lower crankcase. Replace the O-rings with new ones, if deteriorated or damaged. The flat side of the O-ring must face toward the crankcase.



A. Oil Passage O-Rings **C. Oil Passage O-Ring**
B. Oil Pan Gasket **D. Flat Side**

- Check that the large O-ring and oil pressure relief valve are in place. If the relief valve is removed, use a non-permanent locking agent on the valve thread, and tighten the valve to 1.5 kg-m (11.0 ft-lbs) of torque.
- Install a new oil pan gasket, and the oil pan with its mounting bolts. Tighten the bolts to 1.0 kg-m (87 in-lbs) of torque.

Oil Filter Installation

- Check that the large O-ring is in place, and install the oil filter, tightening its bolt to 2.0 kg-m (14.5 ft-lbs) of torque.
- Check and adjust the following items as if necessary:
  - Engine Oil (Pg. 2-4).
  - Clutch (Pg. 2-11).

Oil Filter, Bypass Valve Disassembly:

Oil Filter Disassembly

- Holding the element steady, turn the mounting bolt to work the element free.
- Remove the flat washer, spring, and element fence, and pull the filter cover off the bolt.

Bypass Valve Disassembly

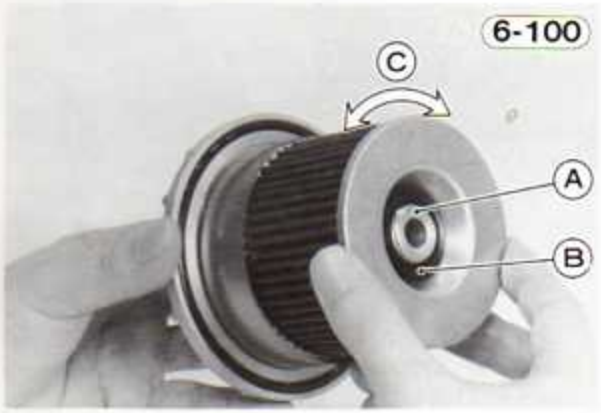
- To remove the bypass valve steel ball, drive the pin and drop out the spring and steel ball from mounting bolt.

Oil Filter, Bypass Valve Assembly

NOTE: 1. Make sure that the O-rings are all properly in place. Replace the O-ring with a new one if deteriorated or damaged.

CAUTION **Using damaged or deteriorated O-rings instead of replacing them with new ones will cause oil leaks and eventually result in little or no oil left in the engine. This will cause serious engine damage. The oil in the oil filter housing is pressurized by the engine oil pump, so these O-rings must be inspected with special care. Look for discoloration (indicating the rubber has deteriorated), hardening (the sides which face the mating surfaces are flattened), scoring, or other damage.**

2. When installing the element, apply a little engine oil to the oil filter grommets on the both sides of the element, and holding the filter steady, turn the filter mounting bolt to work the element into place. Be careful that the element grommets do not slip out of place.



A. Mounting Bolt **B. Grommet** **C. Turn**

Oil Pump Disassembly:

Oil Pump Disassembly

- Remove the circlip and washer on the pump shaft end.
- Remove the oil pump cover screws, and take off the oil pump cover and gasket.
- Take out the rotors.
- Take out the pin, and pull off the oil pump gear and shaft.
- Slide off the pump gear, and take out the pin from the shaft.

Oil Pump Assembly

NOTE: 1. Replace the gasket with a new one.
2. After completing the oil pump assembly, check that the rotor shaft and rotor turn smoothly.

Secondary Shaft, Starter Motor Clutch Disassembly:

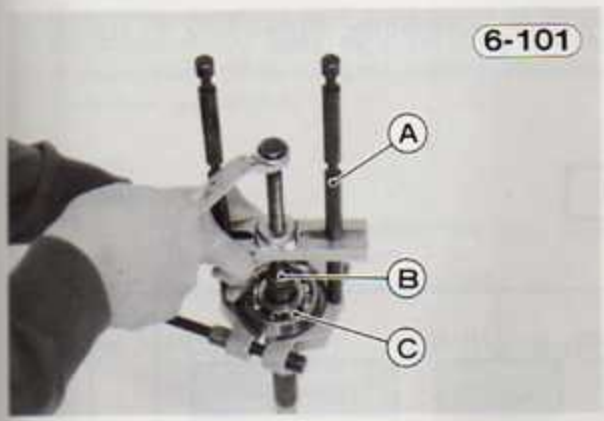
Starter Motor Clutch Disassembly

- Pull off the starter clutch gear, needle bearing, and flat washer.
- Remove the rollers, springs, and spring caps from the starter motor clutch.
- Remove the circlip, and pull off the secondary sprocket. There are rubber dampers.

•Holding the secondary shaft coupling steady, remove the Allen bolts to separate the coupling and starter motor clutch.

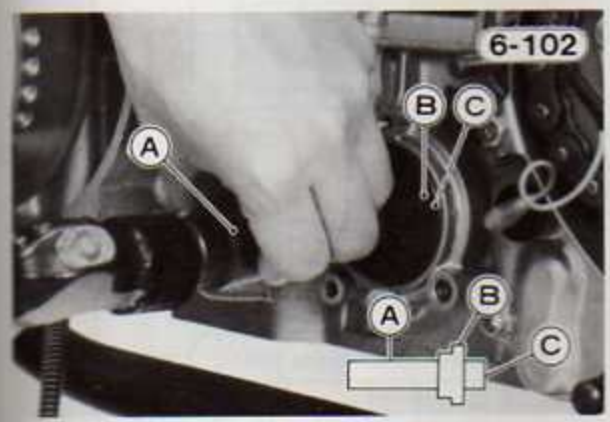
Secondary Shaft Disassembly

•Remove the ball bearing on the secondary shaft using the bearing puller and adapter (special tools).



A. Bearing Puller: 57001-135
B. Adapter: 57001-317
C. Ball Bearing

•Using the bearing drivers and bearing dirver holder (special tools), tap the ball bearing off the crankcase.



A. Bearing Driver Holder: 57001-1132
B. Bearing Driver: 57001-1146
C. Bearing Driver: 57001-1139

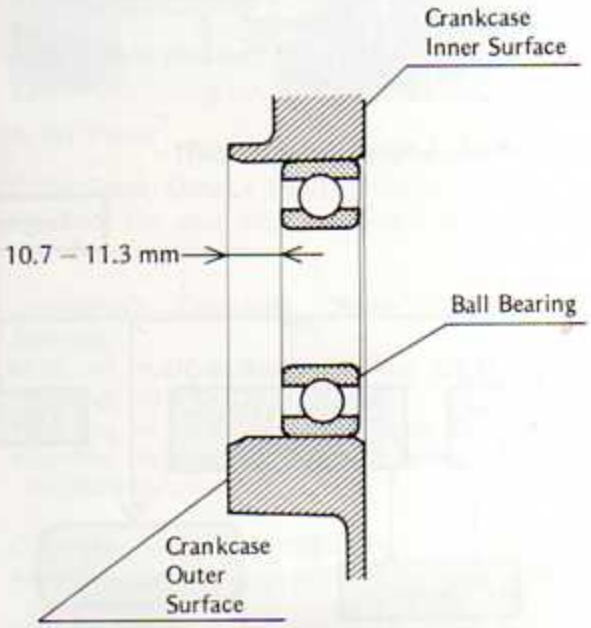
Starter Motor Clutch Assembly

NOTE: 1. Check the rubber dampers, and replace them with new ones if damaged.
2. Apply a little oil on the rubber dampers to assemble the secondary sprocket and coupling.
3. Apply a non-permanent locking agent to the starter clutch Allen bolts, and tighten the bolts to 3.5 kg-m (25 ft-lbs) of torque.

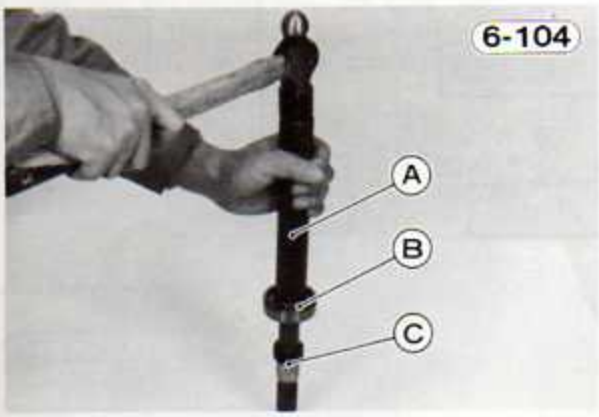
Secondary Shaft Assembly

NOTE: 1. Install the ball bearing to the crankcase using the bearing drivers and bearing driver holder (special tools: 57001-1132, 1139, 1146) until it is 10.7 – 11.3 mm deeper than the crankcase surface.

Ball Bearing Installation 6-103



2. Install the ball bearing to the secondary shaft using the driver (special tool).



A. Driver: 57001-382
B. Ball Bearing
C. Secondary Shaft

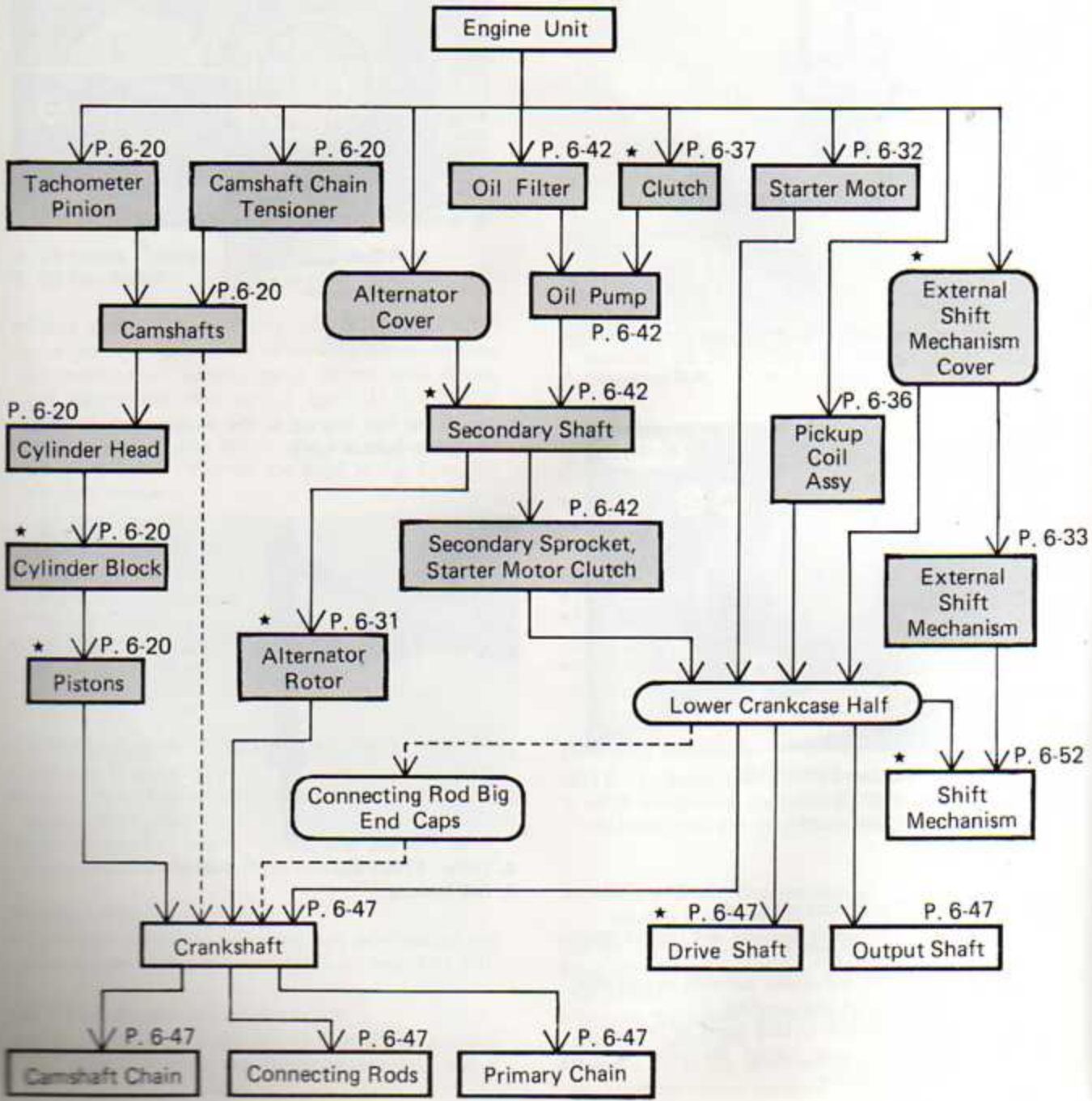
FLOW CHART

This chart is designed to aid in determining proper removal sequence. Select the component you wish to remove and follow the arrows to that point on the chart. Explanation on the pages after the chart is shown the best method for removal, installation, disassembly, and assembly of each component.

NOTE: 1. Action for the shaded component is omitted in the explanation because it has been alreary spared in the other section.

2. Action with a mark (★) requires special tool(s) for removal, installation, disassembly, or assembly.

Disassembly-Engine (Engine Split)



DRIVE SHAFT
OUTPUT SHAFT
CRANKSHAFT
CAMSHAFT CHAIN
PRIMARY CHAIN
CONNECTING RODS
SHIFT MECHANISM

NOTE: 1. For these removal, it is necessary to set the engine on a clean surface or, preferably, into a disassembly apparatus with some means of holding the engine steady while parts are being removed.
2. A engine stand for servicing the engine is available as a kawasaki special tool.

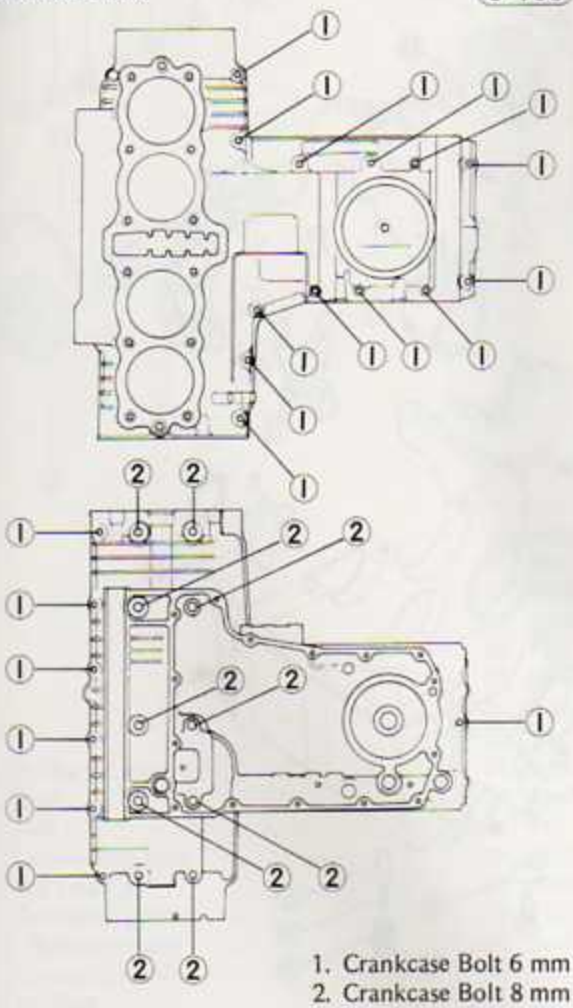
Removal:

Crankcase Splitting

NOTE: 1. Crankcase splitting contains the lower crankcase and shift mechanism removal.

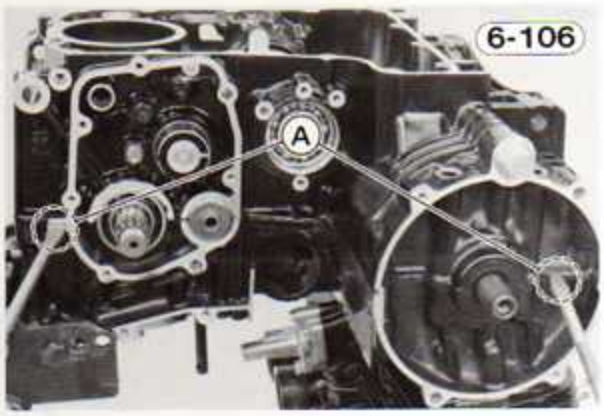
- Remove the upper and lower crankcase bolts.

Crankcase Bolts (6-105)



1. Crankcase Bolt 6 mm
2. Crankcase Bolt 8 mm

- Pry the four points to split the two crankcase halves apart, and lift off the lower crankcase half. The shift mechanism built in the lower crankcase half can now be disassembled.



A. Pry Points

Drive Shaft, Output Shaft Removal

- Remove the drive shaft and output shaft assemblies off the upper crankcase.

Crankshaft, Camshaft Chain, Primary Chain Removal

- Lift off the crankshaft with the connecting rods, camshaft chain, and primary chain.
- Pull the oil seals off both ends of the crankshaft.
- Remove the camshaft chain and primary chain from the crankshaft.

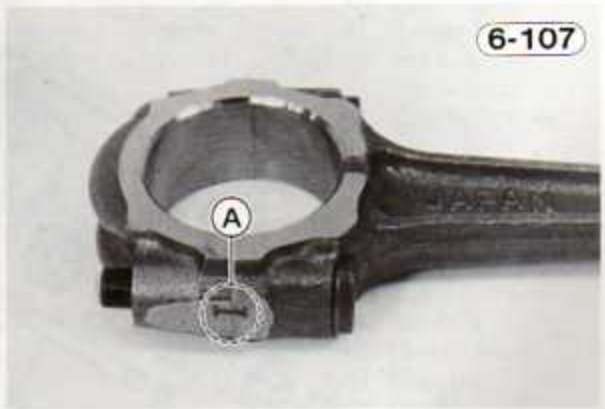
Connecting Rod Removal

- Remove the nuts and pull off the connecting rod big end caps.

CAUTION **To prevent damage to the crankshaft journals, do not allow the big end cap bolts to bump against them.**

Installation:

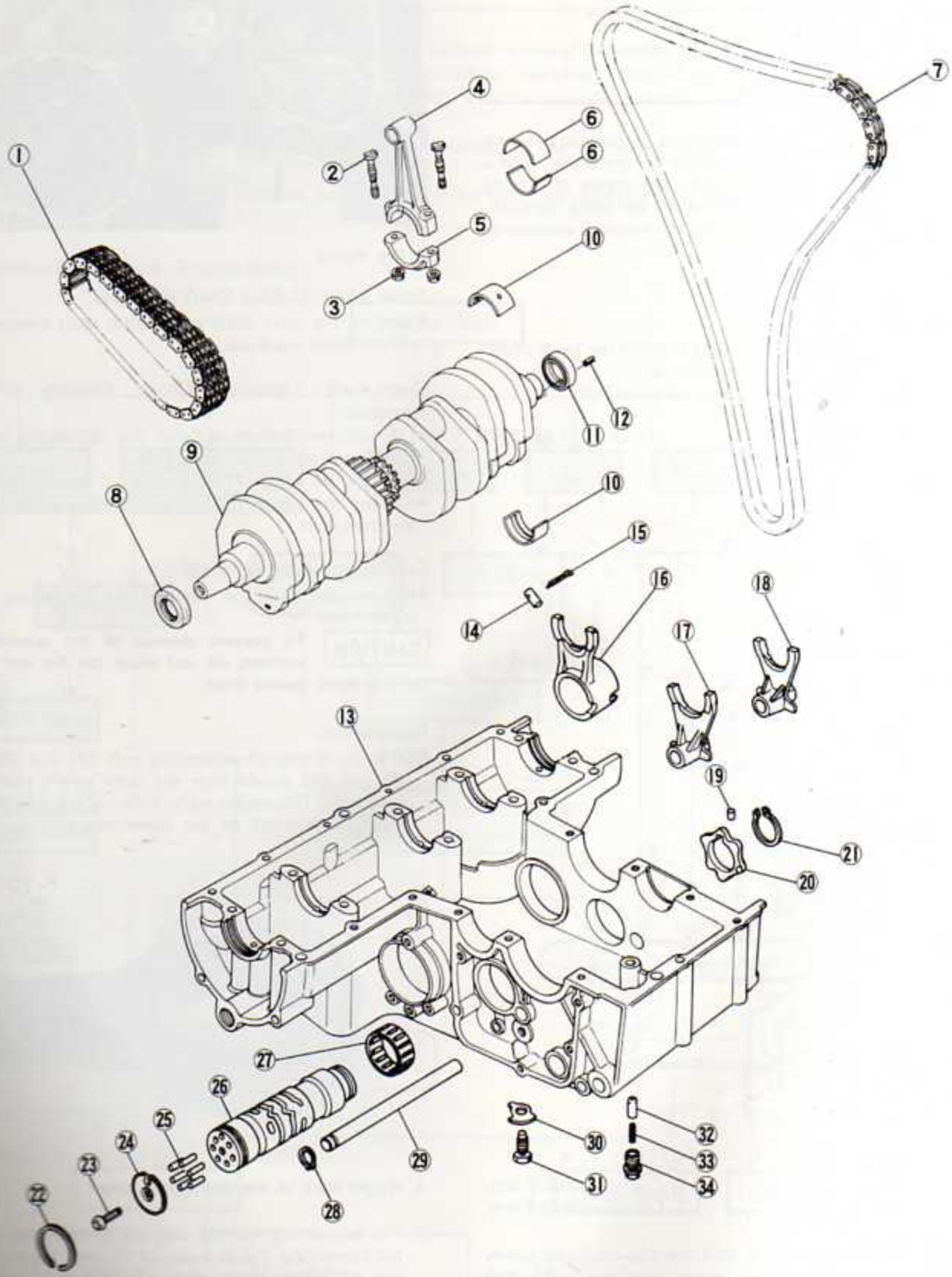
NOTE: 1. A pair of connecting rods (#1 and #2, or #3 and #4) should have the same weight mark in each pair. This weight mark, indicated using a capital letter, is stamped on the connecting rod big end.

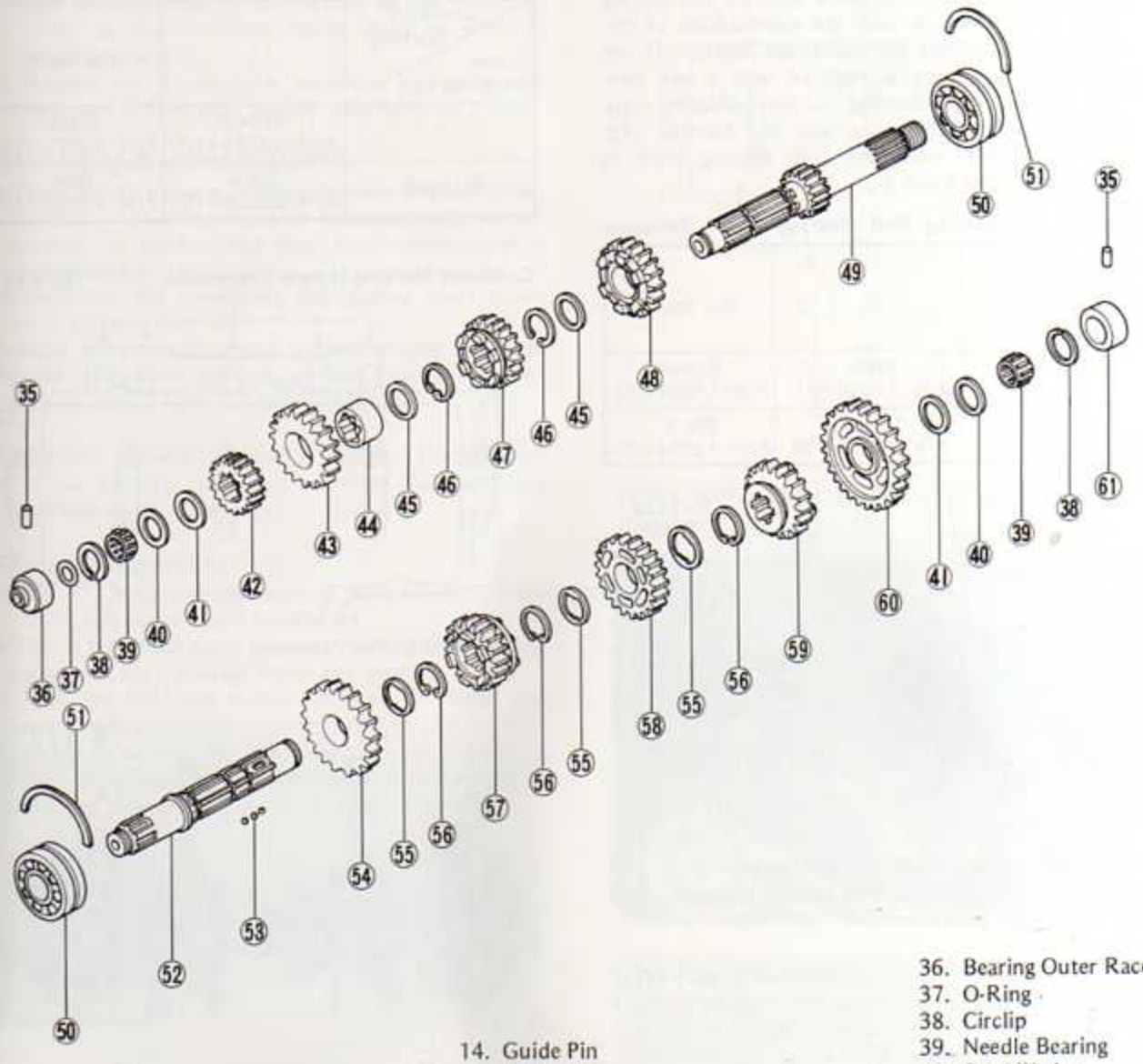


A. Weight Mark (A stamped capital letter)

2. The connecting rod big end cap is machined with the connecting rod as a set, so fit them together so that the weight marks align. The big end cap must be replaced together with the connecting rod as a set.

Engine Split



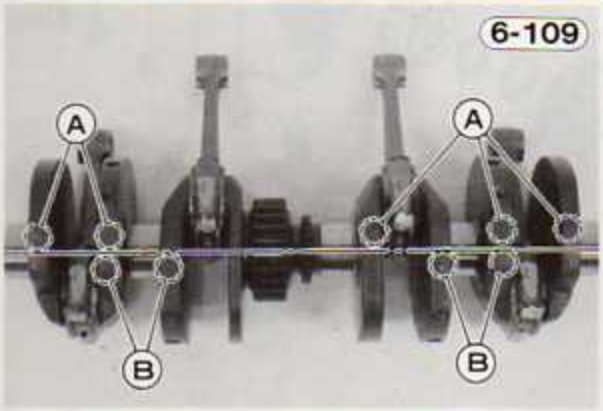


1. Primary Chain
2. Bolt
3. Nut
4. Connecting Rod
5. Big End Cap
6. Connecting Rod Bearing Insert
7. Camshaft Chain
8. Oil Seal
9. Crankshaft
10. Main Bearing Insert
11. Oil Seal
12. Pin
13. Lower Crankcase Half
14. Guide Pin
15. Cotter Pin
16. Shift Fork (4th/5th)
17. Shift Fork (2nd/3rd)
18. Shift Fork (1st)
19. Pin
20. Operating Plate
21. Circlip
22. Circlip
23. Screw
24. Pin Plate
25. Pin
26. Shift Drum
27. Needle Bearing
28. Circlip
29. Shift Rod
30. Lockwasher
31. Shift Drum Guide Bolt
32. Positioning Pin
33. Spring
34. Positioning Bolt
35. Set Pin
36. Bearing Outer Race
37. O-Ring
38. Circlip
39. Needle Bearing
40. Steel Washer
41. Copper Washer
42. 2nd Gear (D)
43. 5th Gear (D)
44. Copper Bushing
45. Flat Washer
46. Circlip
47. 3rd Gear (D)
48. 4th Gear (D)
49. Drive Shaft
50. Ball Bearing
51. Set Ring
52. Output Shaft
53. Steel Ball
54. 2nd Gear (O)
55. Splined Washer
56. Circlip
57. 5th Gear (O)
58. 3rd Gear (O)
59. 4th Gear (O)
60. 1st Gear (O)
61. Bearing Outer Race

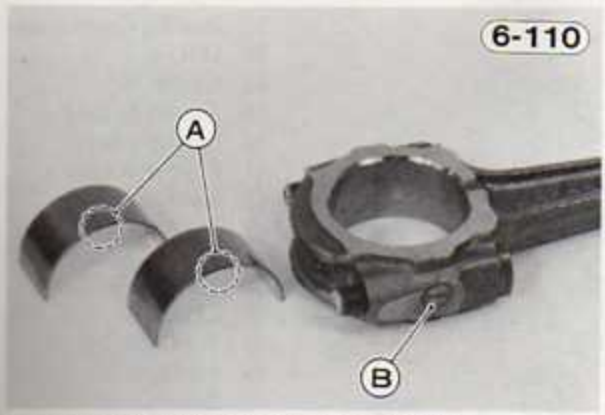
3. If a new crankshaft, connecting rod, and /or main bearing inserts are used, select the right rod bearing insert in accordance with the combination of the connecting rod and the crankshaft marks. If the connecting rod only is replaced with a new one, first measure the diameter of the crankpin, mark its flywheel in accordance with the diameter (Pg. 3-18), and then select the right bearing insert in accordance with Table 6-2.

Table 6-2 Connecting Rod Bearing Insert Selection

Crank-shaft Marking \ Con-Rod Marking	○	No mark
○	Black P/N: 13034-051	Brown P/N: 13034-052
No mark	Green P/N: 13034-050	Black P/N: 13034-051



A. Markings for Crankshaft Journal Diameter
B. Markings for Connecting Rod Journal Diameter ("○" or No mark)



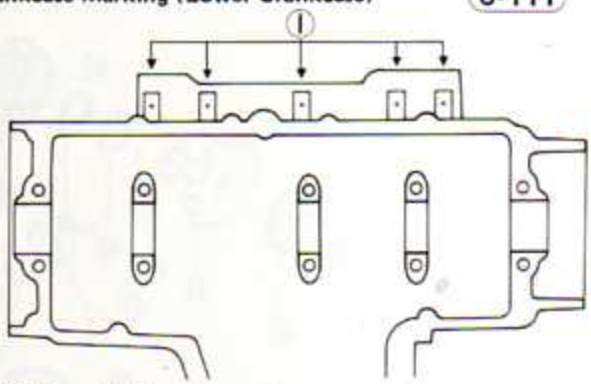
A. Painted Marks (Green, Black, or Brown)
B. Marking for Connecting Rod Inside Diameter ("○" or No mark)

4. If a new crankshaft, crankcase halves, and/or main bearing inserts are used, select the proper bearing insert in accordance with the combination of crankcase and the crankshaft marks. If the crankcase only is replaced with a new one, first measure the diameter of the crankshaft journal, mark its flywheel in accordance with the diameter (Pg. 3-20), and then select the right bearing inserts in accordance with Table 6-3.

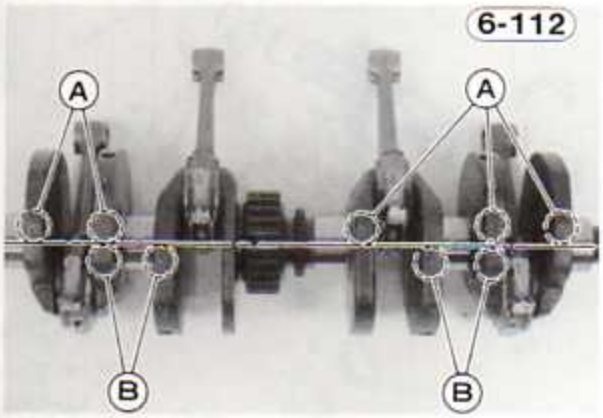
Table 6-3 Main Bearing Insert Selection

Crank-shaft Marking \ Con-Rod Marking	○	No mark
1	Brown P/N: 92028-1102	Black P/N: 92028-1101
No mark	Black P/N: 92028-1101	Blue P/N: 92028-1100

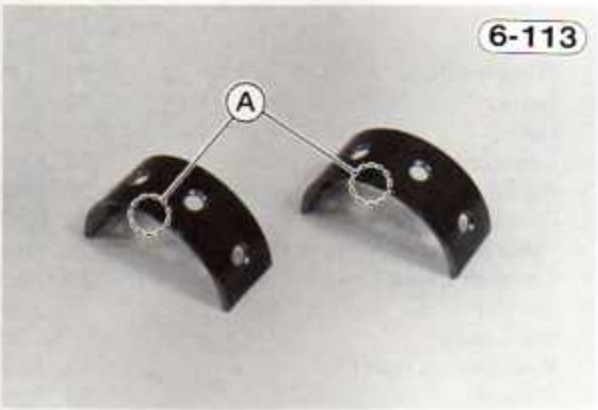
Crankcase Marking (Lower Crankcase)



1. Markings ("○" or No mark)



A. Markings for Crankshaft Journal Diameter ("1" or No mark)
B. Marking for Connecting Rod Journal Diameter



A. Painted Marks (Blue, Black, or Brown)

5. The upper crankcase half and the lower crankcase half are machined at the factory in the assembled state, so the crankcase halves must be replaced together as a set.
6. Replace the 8 mm lower crankcase half bolts with new ones if they have already been removed 5 times.

Connecting Rod Installation

- There are oil passages running between the crankshaft journals. Use compressed air to remove any foreign particles or residue that may have accumulated in these passages.
- Check that the connecting rod bearing insert halves are in place.
- Install the connecting rods to their original positions.
- Hand tighten the big end cap nuts first, and tighten each nut to 3.7 kg-m (27 ft-lbs) of torque.

Camshaft Chain, Primary Chain Installation

- Fit the primary chain and camshaft chain on their sprockets of the crankshaft.

Crankcase Assembly

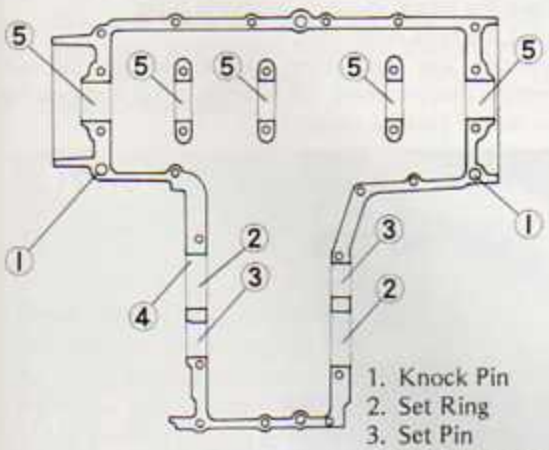
NOTE: 1. This assembly contains the crankshaft, drive shaft, and output shaft installation.

- With a high flash-point solvent, clean off the mating surfaces of the crankcase halves and wipe dry.
- Check the following matters on both the upper and lower crankcase halves.

1. Check to see that the following parts are in place on both the upper and lower crankcase halves, and blow the oil passage nozzles clean with compressed air.

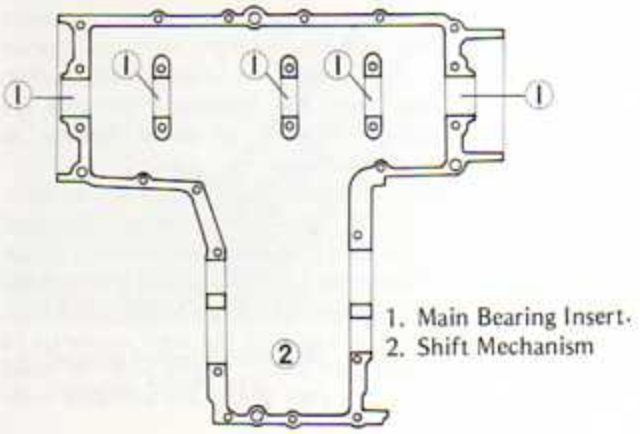
Upper crankcase half:
Knock pins, drive shaft and output shafts set rings, and set pins, oil passage plug (rubber ball), and crankshaft main bearing inserts.

Upper Crankcase (6-114)

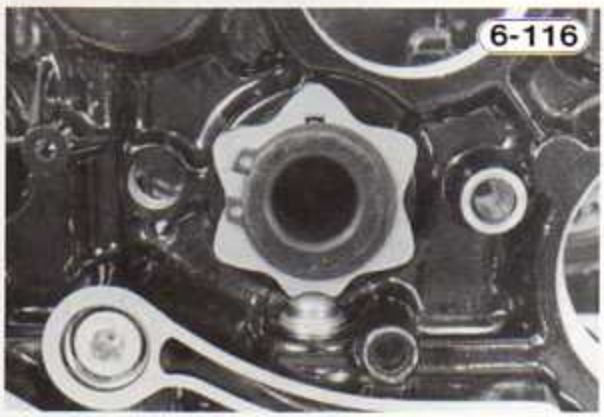


Lower crankcase half:
Crankshaft main bearing inserts and shift mechanism.

Lower Crankcase (6-115)

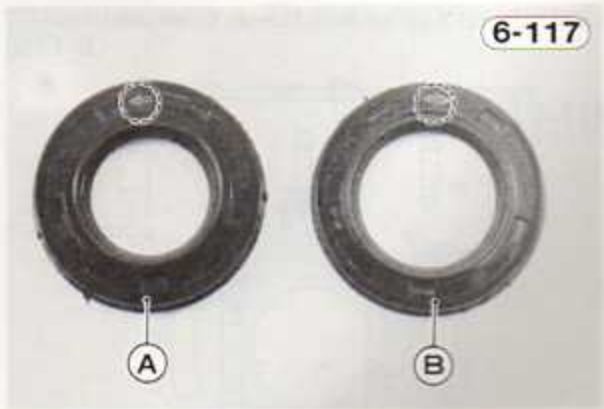


2. The shift drum must be in the neutral position as shown.



(Crankshaft Installation)

- Apply a high temperature grease to the lip of the oil seals, and fit the oil seals onto both sides of the crankshaft with the arrow mark on the oil seal facing out. The arrow mark should shown the same direction of the crankshaft rotation (clockwise, watching from the pick-up coil side).



A. Oil Seal for Left End **B. Oil Seal for Right End**

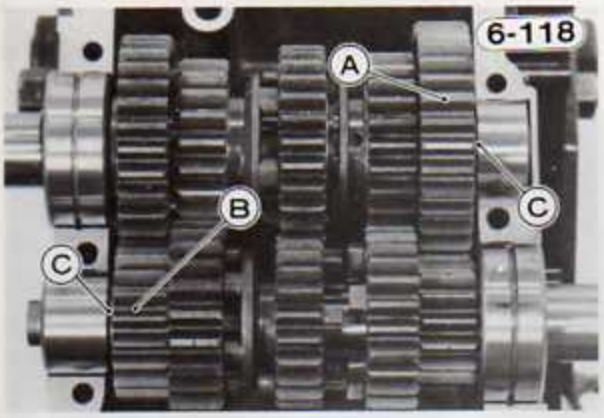
- Install the crankshaft to the upper crankcase half.

(Drive Shaft, Output Shaft Installation)

- Fit the output and drive shaft assemblies on the upper crankcase half. When installing the output and drive shafts, the crankcase set pins must go into the holes in the respective needle bearing outer races, and the set rings must fit into the grooves in each ball bearing.

CAUTION **Make sure the crankcase set pins are properly aligned to avoid damage to the crankcases upon installation.**

- Check to see that the output shaft 1st gear turns freely. If the gear does not turn freely, replace the steel washer with the thinner (0.5 mm) steel washer. Check the clearance between the drive shaft 2nd gear and the copper washer. The clearance should be 0.1 – 0.3 mm. If it is not, change and/or add the steel washer(s) to obtain the proper clearance. Three sizes of steel washers (1.0, 0.7, 0.5 mm thick) are available from Kawasaki Dealers.

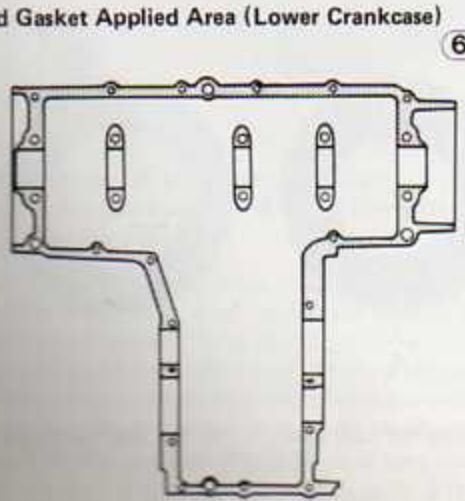


A. Output Shaft 1st Gear **C. Steel Washer**
B. Drive Shaft 2nd Gear

- Apply a little engine oil to the transmission gears, ball bearings, shift drum, and crankshaft main bearing inserts.
- Apply liquid gasket to the mating surface of the lower crankcase half in the areas shown in the figure.

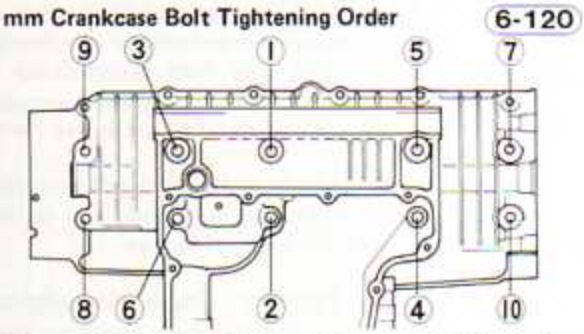
CAUTION **If liquid gasket adheres to any areas not indicated, the engine oil passages may be obstructed, causing engine seizure.**

Liquid Gasket Applied Area (Lower Crankcase)



- Fit the lower crankcase half on the upper crankcase half. Each shift fork must fit in its gear groove.
- Install and lightly tighten the crankcase 8 mm bolts and 6 mm bolts.
- Following the tightening sequence numbers on the lower crankcase half, tightening the 8 mm bolts first to about 1.5 kg-m (11.0 ft-lbs) and finally to 2.5 kg-m (18.0 ft-lbs) of torque.

8 mm Crankcase Bolt Tightening Order

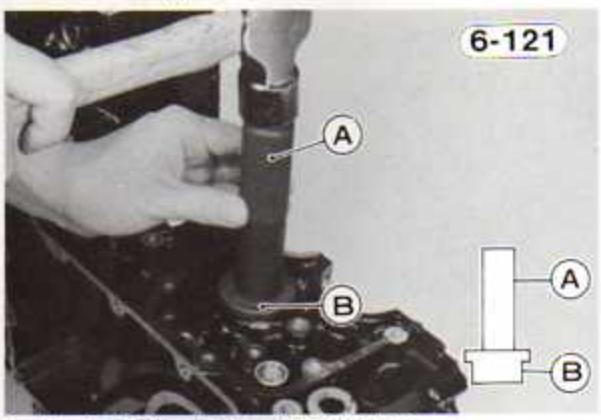


- Tighten the 6 mm bolts to 1.0 kg-m (87 in-lbs) of torque.
- Check to see that the drive shaft and output shaft turn freely.

Shift Mechanism Disassembly:

Shift Mechanism Disassembly

- Pull out the shift rod, and remove the output shaft 1st and 2nd/3rd shift forkd in the lower crankcase half.
- Remove the shift drum positioning bolt, springs, and pin.
- Straighten the side of the lockwasher that is bent over the side of the shift drum guide bolt, and remove the bolt.
- Remove the cotter pin, and pull out the drive shaft 4th/5th shift fork guide pin.
- Remove the operating plate circlip and operating plate.
- Pull out the shift drum slightly, and remove the drive shaft 4th/5th shift fork. Pull the shift drum free from the crankcase.
- Drop out the operating plate pin.
- Remove the screw and shift drum pin plate.
- Pull out the shift drum pins.
- To remove the shift drum needle bearing, tap out the needle bearing using the bearing driver and bearing driver holder (special tools).



A. Bearing Driver Holder: 57001-1132
B. Bearing Driver: 57001-1145

Shift Mechanism Assembly

NOTE: 1. The long shift drum pin must be in the position. If the pin is assembled in the wrong position, the neutral indicator light will not light when the gears are in neutral.



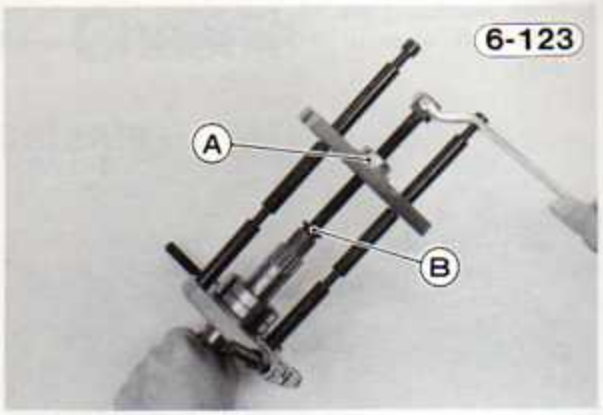
A. Long Shift Drum Pin **B. Hole**

2. Apply a non-permanent locking agent to the pin plate screw, and tighten it.
3. Install the shift drum needle bearing using a suitable driver. Press it so that the end of the bearing is even with the outside end of the crankcase bearing hole.
4. Install the drive shaft 4th/5th shift fork with the short end facing the shift drum pin plate, the short end goes onto the drum first.
5. Put the drive shaft 4th/5th shift fork guide pin into the 4th/5th shift fork. The guide pin rides in the middle groove of the three guide pin grooves on the shift drum.
6. Insert a new cotter pin through the 4th/5th shift fork and guide pin from the long end side of the shift fork, and spread the cotter pin long end inward.
7. The output shaft 2nd/3rd shift fork and 1st shift fork are identical.

Drive Shaft Disassembly:

Drive Shaft Disassembly

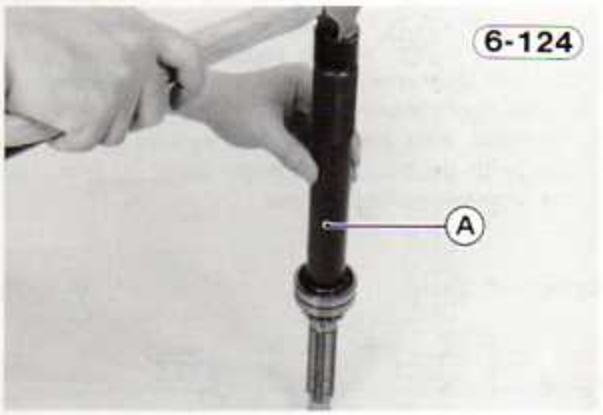
- Remove the needle bearing outer race.
- Remove the circlip and pull off the needle bearing, steel washer, and copper washer.
- Pull off 2nd gear, the copper bushing, and washer.
- Remove the circlip, and pull off 3rd gear.
- Remove the circlip, and pull off the washer and 4th gear.
- Remove the ball bearing from the drive shaft using the bearing puller and adapter (special tools).



A. Bearing Puller: 57001-135
B. Adapter: 57001-317

Drive Shaft Assembly

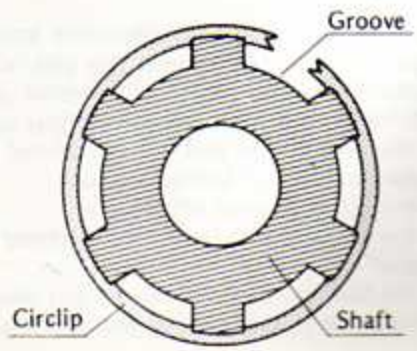
NOTE: 1. Install the drive shaft ball bearing using the driver (special tool).



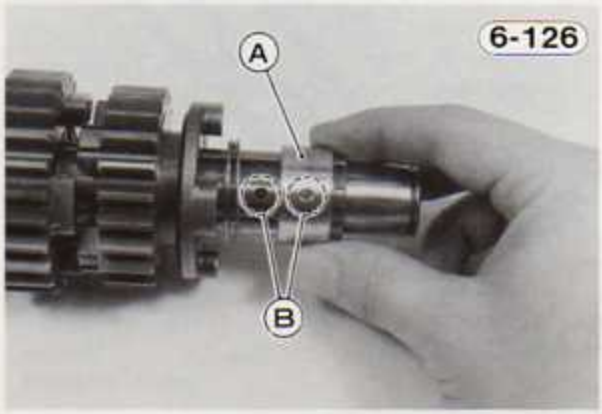
A. Driver: 57001-382

2. Replace any circlips that were disassembled with new ones, and install the circlip so that the opening coincides with one of the splined grooves in the drive shaft.

Circlip Installation 6-125



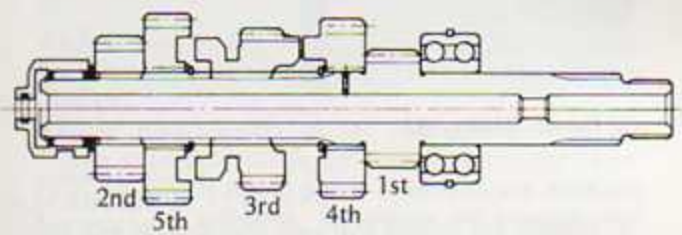
3. When assembling the 5th gear copper busing to the drive shaft, align its oil holes with the holes in the shaft.



A. Copper Bushing **B. Align the oil holes.**

4. Be sure that all parts are put back in the correct sequence and all circlips and flat washers are properly in place. Proper sequnce starting with 1st gear (part of drive shaft) is 1st gear, 4th gear, washer, circlip, 3rd gear, circlip, washer, copper bushing, 5th gear, 2nd gear, copper washer, steel washer, needle bearing, circlip, needle bearing race.
5. The drive shaft gears can be recognized by size, the gear with the smallest diameter being 1st gear, and the largest one being 5th gear.

Drive Shaft Gears **6-127**



Output Shaft Disassembly:

Output Shaft Disassembly

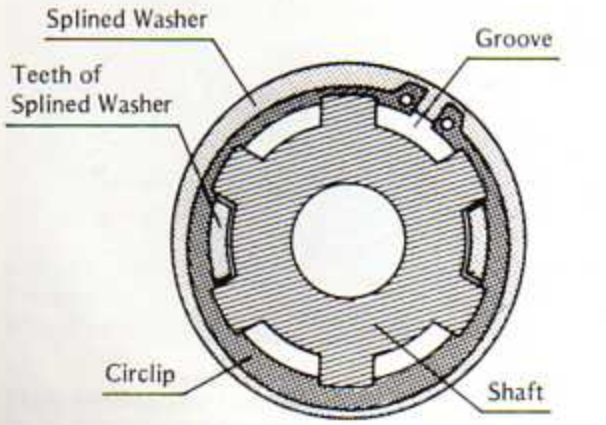
- Pull off the needle bearing outer race.
- Remove the circlip, and pull off the needle bearing steel washer, and copper washer.
- Pull off 1st gear.
- 4th gear has three steel balls assembled into it for neutral positioning. To remove this gear with the balls, quickly spin the shift in a vertical position while holding 3rd gear, and pull off 4th gear upwards.
- Remove the circlip, and pull off the splined washer and 3rd gear, and another splined washer.
- Remove the circlip, and pull off 5th gear.
- Remove the circlip, and pull off the the splined washer and 2nd gear.
- Remove the ball bearing from the output shaft using the bearing puller (special tool) as shown in Fig. 6-123.

Output Shaft Assembly

NOTE: 1. Install the output shaft ball bearing using the driver (special tool: 57001-382) as shown in Fig. 6-124.

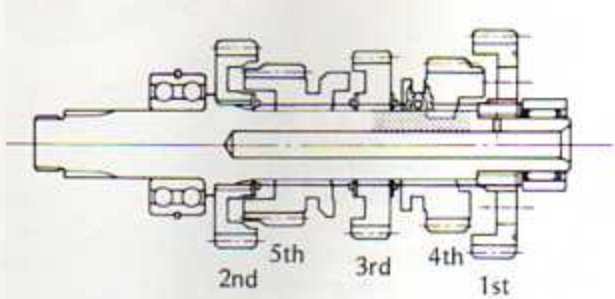
2. Replace any circlips that were removed with new ones. Install the circlip so that is opening coincides withsone of the splined grooves in the output shaft.

Circlip, Splined Washer Installation **6-128**



3. Install the splined washer so that its teeth do not coincide with the circlip opening.
4. Do not use grease on the three balls during assembly; these balls nust be able to move freely.
5. Be sure that all parts are put back in the correct sequence and all circlips and alinedswashers are properly in place. Proper sequence starting with the engine sprocket side is 2nd gear, splined washer, circlip, 5th gear; circlip, splined washer, 3rd gear, splined washer circlip, 4th gear, 1st gear, copper washer, steel washer, needle bearing, circlip, and needle bearing outer race.
6. The output shaft gear sizes are opposite from those of the drive shaft gears, the largest being 1st gear and the smallest, 5th gear.

Output Shaft Gears **6-129**



Disassembly – Chassis

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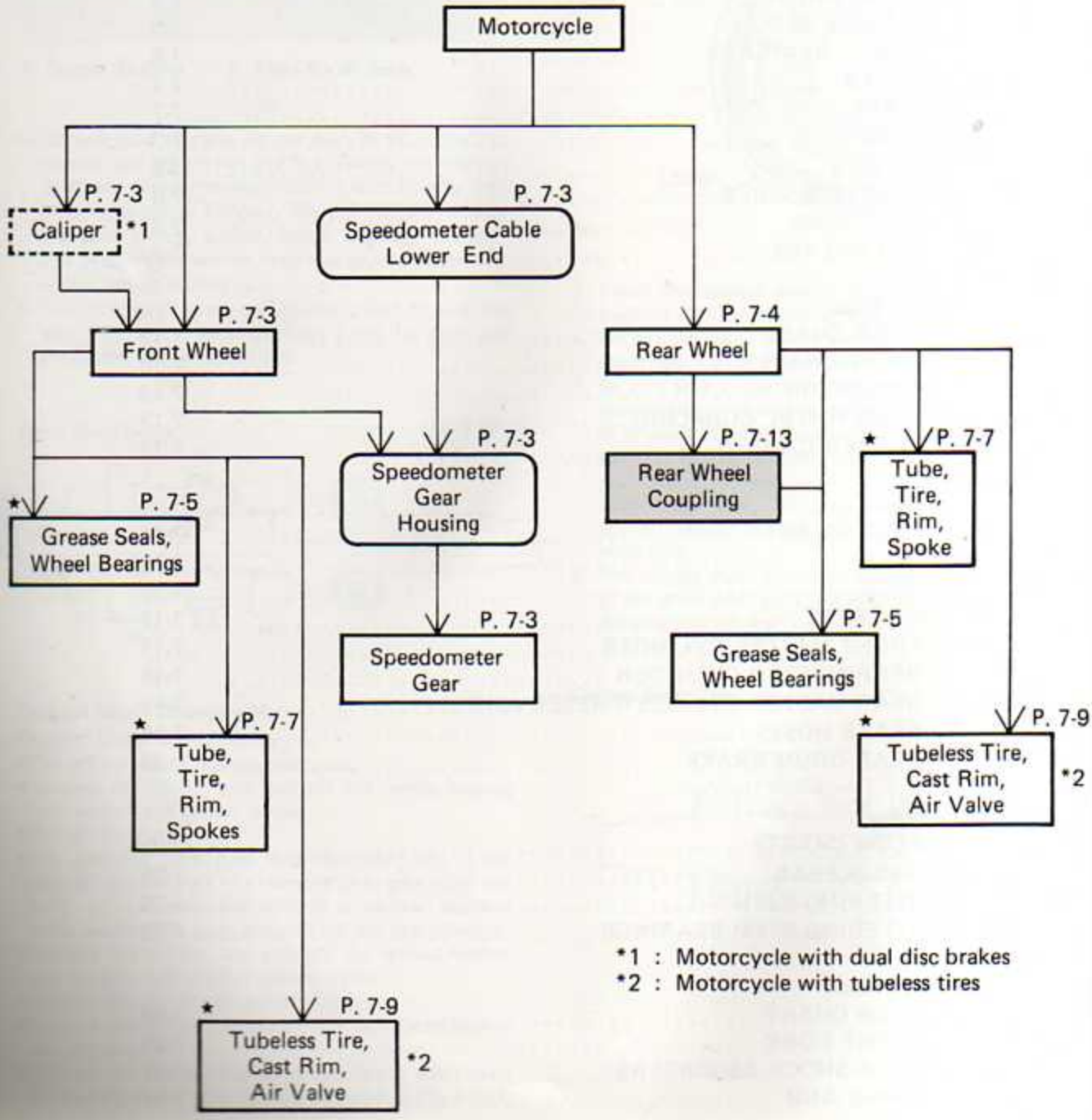
FLOW CHART

This chart is designed to aid in determining proper removal sequence. Select the component you wish to remove and follow the arrows to that point on the chart. Explanation on the pages after the chart is shown the best method for removal, installation, disassembly, and assembly of each component.

NOTE: 1. Action for the shaded component is omitted in the explanation because it has been alreary spared in the other section.

2. Component in the broken line is required to loosen or remove its mounting bolts or screws, but not necessary its complete removal.

Disassembly-Chassis (Wheels)



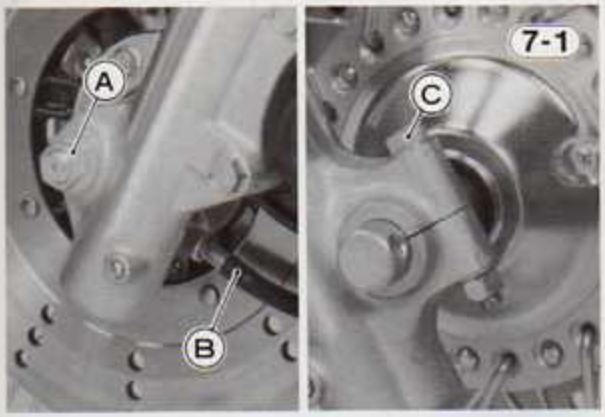
*1 : Motorcycle with dual disc brakes
*2 : Motorcycle with tubeless tires

FRONT WHEEL SPEEDOMETER GEAR

Removal:

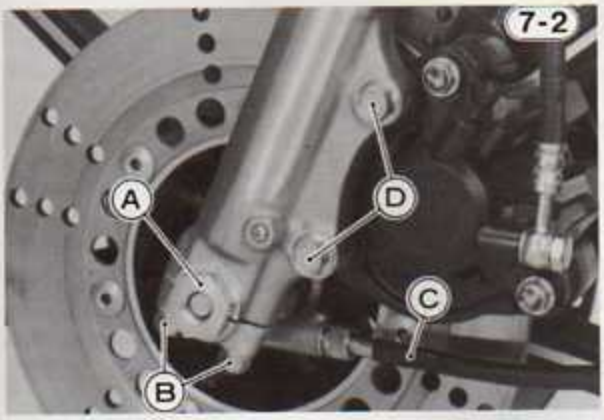
Front Wheel Removal

- Unbolt one of the brake calipers, and move it free of the fork leg. Avoid straining the brake lines and fittings.
- Insert a wood wedge (4 – 5 mm thick) between the disc brake pads. This prevents the pads from being moved out of their proper position, should the brake lever be squeezed accidentally.
- For the motorcycle with the leading axle front fork, remove the axle nut, and loosen the axle clamp bolt nut. Holding the wheel to facilitate the wheel removal, pull the axle, and then remove the wheel from the motorcycle.



A. Axle Nut **C. Axle Clamp Bolt**
B. Speedometer Cable

- For the motorcycle with the center axle front fork, loosen the axle clamp nuts but do not remove them, and loosen the axle nuts. Remove the axle clamp nuts, lockwashers, and clamps. Using a jack under the engine or other suitable means to lift the front of the motorcycle, drop the front wheel out of the forks, and remove it.



A. Axle Nut **C. Speedometer Cable**
B. Axle Clamp Nuts **D. Caliper Mounting Bolts**

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

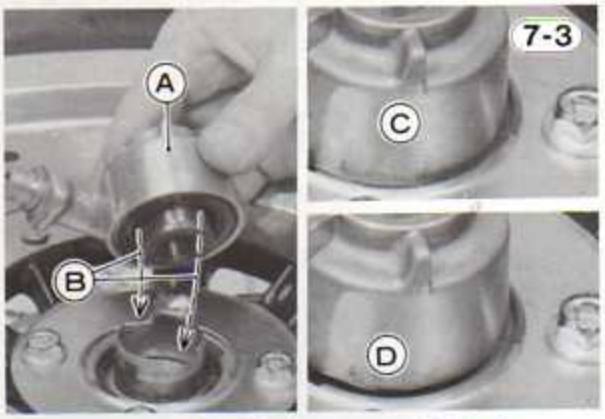
Speedometer Gear Removal

- Pull the speedometer gear housing off the wheel.
- Disconnect the lower end of the speedometer cable with pliers.

Installation Note:

Speedometer Gear Installation

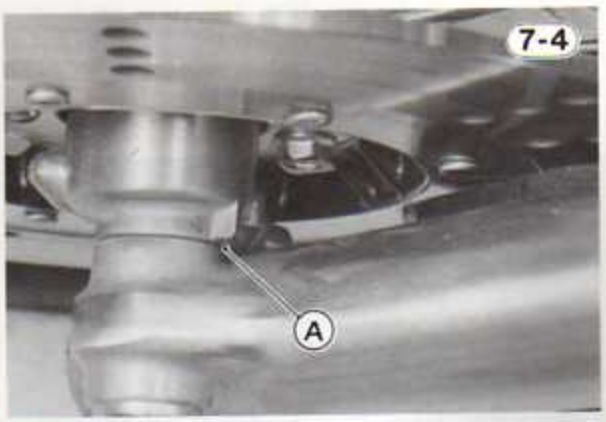
1. Install the speedometer gear housing so that it fits in the speedometer gear drive notches.



A. Speedometer Gear Housing **C. Good**
B. Fit in the gear drive notches. **D. Bad**

Front Wheel Installation

2. Before installing the wheel, use a high flash-point solvent to completely clean off any grease that may have gotten on either side of the disc(s). Do not use a solvent which will leave an oily residue.
3. Turn the speedometer gear housing counterclockwise until it comes to rest against the stop on the fork leg.

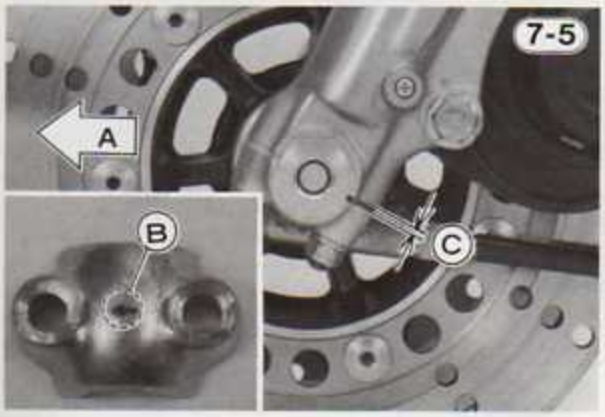


A. Stop

4. For the motorcycle with the leading axle front fork, tighten the axle nut and clamp nuts as the following:
   - Tighten the axle nut and clamp nuts to a snug fit.
   - Tighten the axle nut to 8.0 kg-m (58 ft-lbs) of torque. Prevent the axle from turning by inserting a metal rod through the axle.

- Loosen the axle clamp nuts on the right fork leg, and pump the front fork several times. This operation aligns both front fork legs so that they are parallel to each other.
- Tighten the axle clamp nut on the right fork leg to 1.8 kg-m (13.0 ft-lbs) of torque.

5. For the motorcycle with the center axle front fork, tighten the axle nuts and clamp nuts as the following:
   - Center the axle so that the gap between the axle nut surface and the end of the axle is the same on each side.
   - Position the front wheel in its place between the front fork tubes, and slowly lower the front fork tube bottom ends onto the front axle.
   - Mount the front axle clamps, and tighten the nuts loosely with the lockwashers. The arrow at the bottom of the clamp must point to the front.
   - Tighten the axle nuts to 8.0 kg-m (58 ft-lbs) of torque.
   - Tighten first the front axle clamp nut and then the rear nut to 1.8 kg-m (13.0 ft-lbs) of torque. There will be a gap at the rear of the clamp after tightening.



A. Front B. Arrow Mark C. Gap

6. Insert the speedometer inner cable into the housing while turning the wheel so that the slot in the end of the cable will mesh with the tongue of the speedometer pinion.



A. Slot B. Turn the wheel.

7. Check and adjust the front brake (Pg. 2-14).

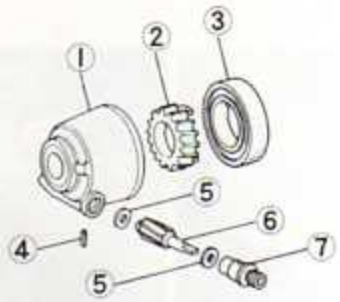
Speedometer Gear Disassembly:

Speedometer Gear Disassembly

- Pull the grease seal out of the gear housing using a hook.
- Pull out the speedometer gear.
- If the speedometer cable bushing or speedometer pinion needs to be removed, first drill the housing through the pin using a 1 mm drill bit. Drill the housing from the gear side using a 2 mm drill bit. Using a suitable tool, tap out the pin, and then pull out the speedometer cable bushing, pinion, and washers.

NOTE: 1. It is recommended that the assembly be replaced rather than attempting to repair the components.

Speedometer Gear 7-7



1. Speedometer Gear Housing
2. Speedometer Gear
3. Grease Seal
4. Pin
5. Washer
6. Speedometer Pinion
7. Bushing

Speedometer Gear Assembly

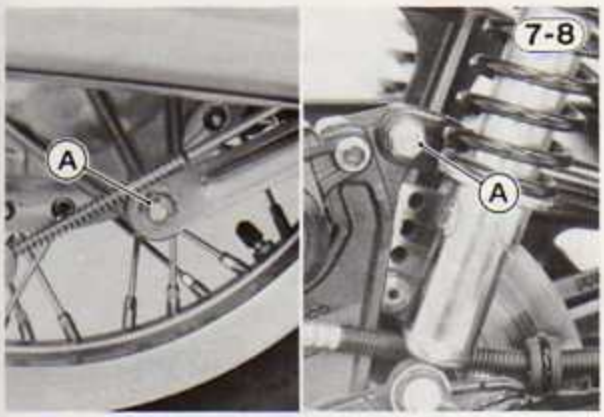
NOTE: 1. After inserting a new pin, stake the housing hole to secure the pin in place.

2. Replace the grease seal with a new one. Apply a little grease to the seal. Install it using a press or a suitable driver so that the face of the seal is level with the surface of the housing.
3. Regrease the speedometer gear.

REAR WHEEL

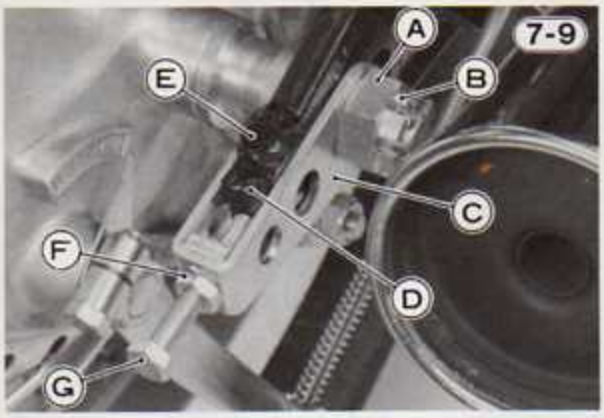
Removal:

- Put the motorcycle up on its center stand.
- Loosen the nut at the rear end of the torque link.



A. Torque Link Nut

- For the motorcycle with the rear drum brake, remove the nut at the rear end of the brake rod.
- Loosen the left and right chain adjuster locknuts, and fully loosen both chain adjuster bolts.



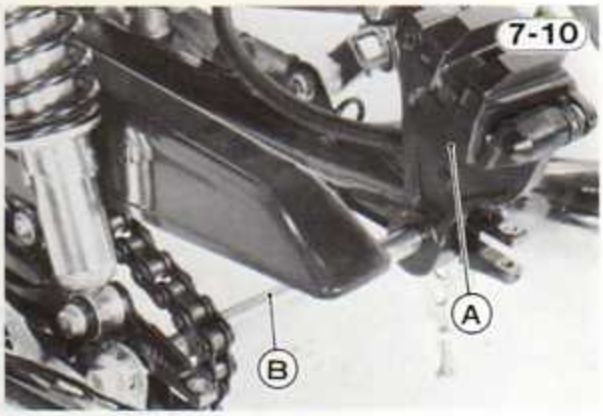
A. Axle Nut
B. Cotter Pin
C. Chain Adjuster
D. Chain Adjuster Stop
E. Stop Bolt
F. Locknut
G. Adjusting Bolt

- Remove the cotter pin, loosen the axle nut, and then push the wheel forward so that the chain can be easily removed from the rear sprocket.
- Remove the bolts and lockwashers and take out the chain adjuster stops.
- Remove the drive chain from the rear sprocket, and hang it to the left side of the swing arm.
- Pull the rear wheel together with the rear caliper toward the rear.
- Remove the axle nut and left chain adjuster. Then pull off the axle with the right chain adjuster.
- Remove the rear wheel.

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

- For the motorcycle with the rear disc brake, do the next two steps.

○Run the axle through the swing arm and the caliper to prevent the caliper from dangling.



A. Rear Caliper B. Axle

○Insert a wood wedge (7 – 8 mm thick) between the disc brake pads. This prevents them from being moved out of their proper position, should the brake pedal be pushed accidentally.

Installation Note:

1. When installing the rear wheel coupling, inspect the O-ring on the rear hub, replace it with a new one if it has deteriorated, and apply a little grease to the O-ring (Fig. 7-26).
2. Before installing the wheel which has the brake disc, use a high flash-point solvent to completely clean off any grease that may have gotten on either side of the disc. Do not use a solvent which will leave an oily residue.
3. When installing the drive chain adjusters, they must be installed facing the alignment mark side out.
4. Check and adjust the following items:
   ○Drive Chain (Pg. 2-12)
   ○Rear Brake (Pg. 2-14)

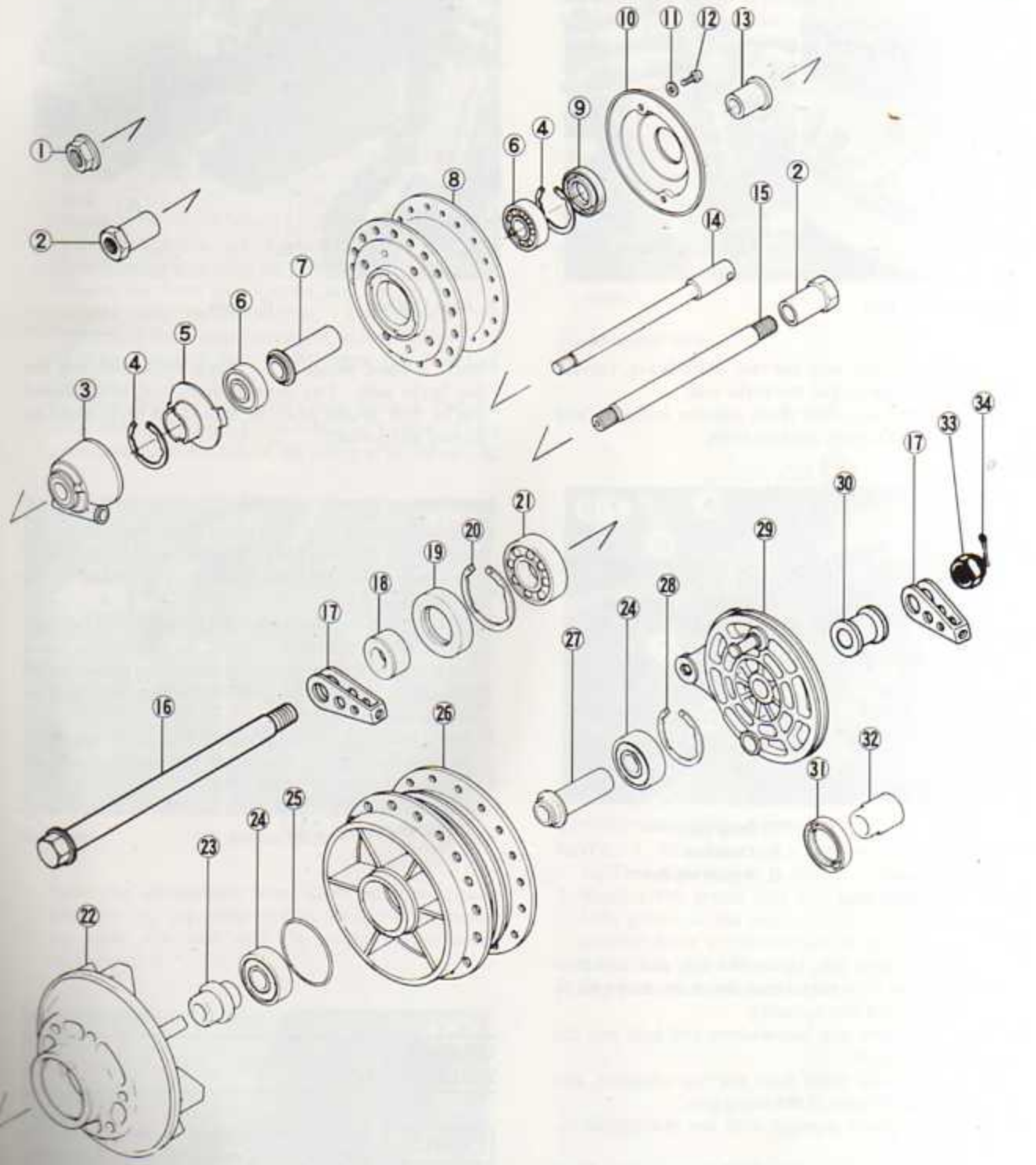
GREASE SEALS WHEEL BEARINGS

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

Removal:

Grease Seal Removal

- For the wire-spoke front wheel, remove wheel cap screws and washers, and take off the cap.
- Remove the grease seals at the wheel hub and wheel coupling using a hook.

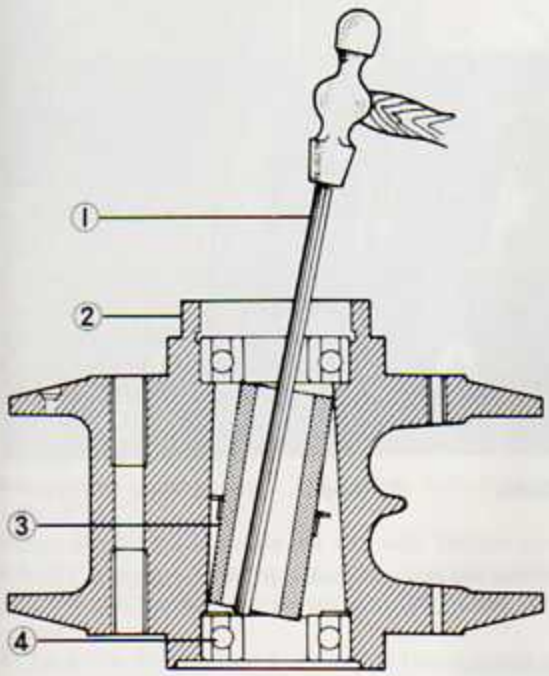


1. Front Axle Nut
2. Front Axle Nut
3. Speedometer Gear Housing
4. Circlip
5. Speedometer Gear Drive
6. Ball Bearing
7. Distance Collar
8. Front Hub
9. Grease Seal
10. Cap
11. Flat Washer
12. Screw
13. Collar
14. Front Axle
15. Front Axle
16. Rear Axle
17. Drive Chain Adjuster
18. Coupling Collar
19. Grease Seal
20. Circlip
21. Ball Bearing
22. Rear Wheel Coupling
23. Coupling Sleeve
24. Ball Bearing
25. O-ring
26. Rear Hub
27. Distance Collar
28. Circlip
29. Rear Brake Panel
30. Collar
31. Grease Seal
32. Collar
33. Rear Axle Nut
34. Cotter Pin

Wheel Bearing Removal

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

Wheel Bearing Removal (7-12)



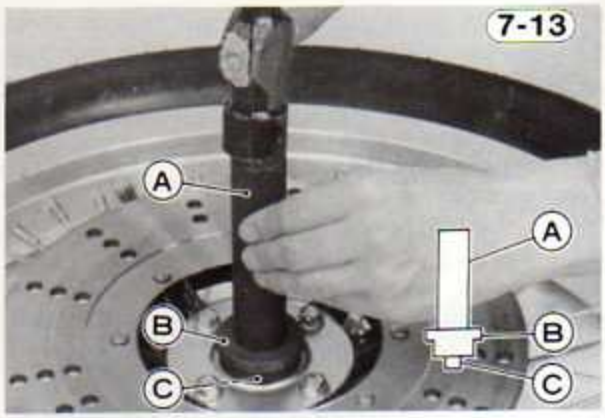
1. Metal Rod
2. Front Hub
3. Distance Collar
4. Ball Bearing

- Remove the grease seal and ball bearing on the rear wheel coupling as following:
  - Pull out the coupling collar and coupling sleeve from the coupling.
  - Remove the circlip.
  - Using the suitable tool, remove the bearing by tapping from the wheel side.

Installation Note:

Wheel Bearing Installation

1. Before installing the wheel bearing, blow any dirt or foreign particles out of the hub with compressed air to prevent contamination of the bearings.
2. Inspect the bearings and replace them if necessary (Pg. 2-23). Lubricate them and install them using the bearing driver and the bearing driver holder (special tools) so that the marked sides face out.



A. Bearing Driver Holder: 57001-1132
B. Bearing Driver: 57001-1145, -1148
C. Bearing Driver: 57001-1135, -1136, -1140

Table 7-1 Bearing Drivers for Wheel Bearings

Bearings	Bearing Drivers	
	Ⓑ in Fig. 7-13	Ⓒ in Fig. 7-13
Front Wheel	57001-1145	57001-1135
Rear Wheel		57001-1136
Rear Wheel Coupling	57001-1148	57001-1140

Grease Seal Installation

3. Inspect the grease seal and replace if necessary (Pg. 4-6). Press it in until it stops at the circlip in the hole using the same special tools used for bearing installation. For the grease seal on the rear wheel coupling, press it in until the face of the seal is level with the end of the grease seal hole.

TUBES
TIRES
RIMS
SPOKES

Removal:

Tube, Tire Removal

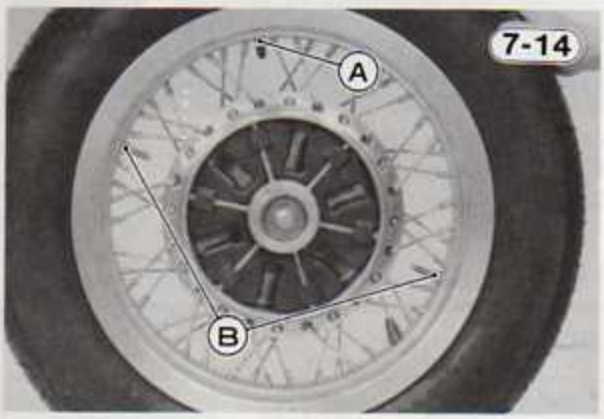
The following explanation covers tube and tire removal and installation using rim protectors (special tools). If tires are to be removed and installed using a tire changer, operate it in the manner prescribed by the manufacturer.

NOTE: 1. A tire changer suitable for tubeless and tube-type tires is available as a Kawasaki special tool.

WARNING **To ensure safe handling and stability, use only tires recommended may result in an unsafe condition, leading to accident and injury.**

- If the brake disc is installed, remove it from the wheel.
- To maintain wheel balance, mark the valve stem position on the tire with chalk so that the tire will be reinstalled in the same position.
- Take out the valve core to let out the air.
- Remove the valve stem nut, and fully loosen the two bead protector nuts.

NOTE: 1. Front tire has not bead protectors.



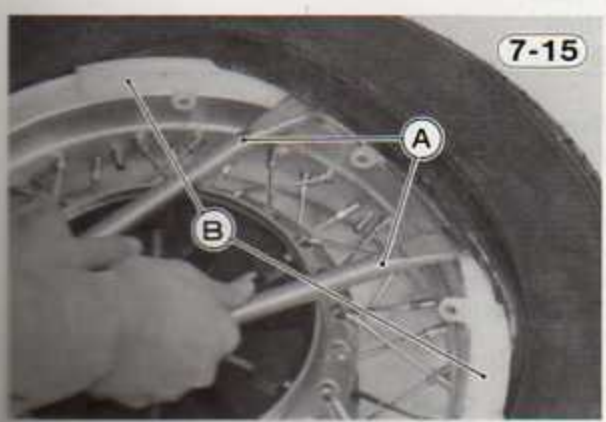
A. Valve Stem Nut **B. Bead Protector Nuts**

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

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

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

NOTE: 1. For easier removal, always position the tire bead opposite the valve stem in the rim well, and pry the tire bead a little at a time.



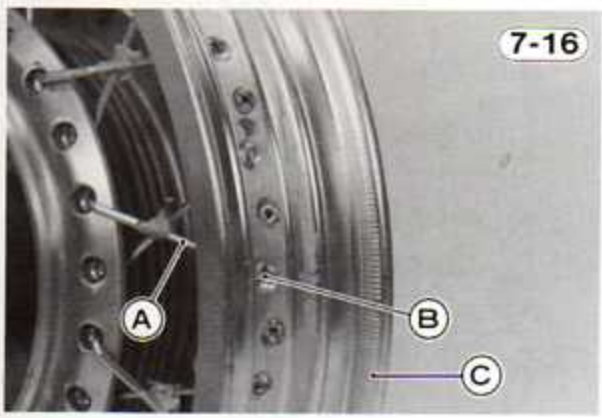
A. Tire Irons B. Rim Protectors: 57001-1063

CAUTION **Take care not to insert the tire irons so deeply that the tube gets damaged.**

- Remove the tube when one side of the tire is pried off.
- Pry the other side of the tire off the rim, and remove the rim from the tire.

Rim, Spoke Removal

- Remove the bead protectors (only on the rear wheel) and rubber band.
- Tape or wire all the spoke intersections so that the spokes don't get mixed up, and unscrew the nipples from all the spokes with a screwdriver.



A. Spoke **B. Nipple** **C. Rim**

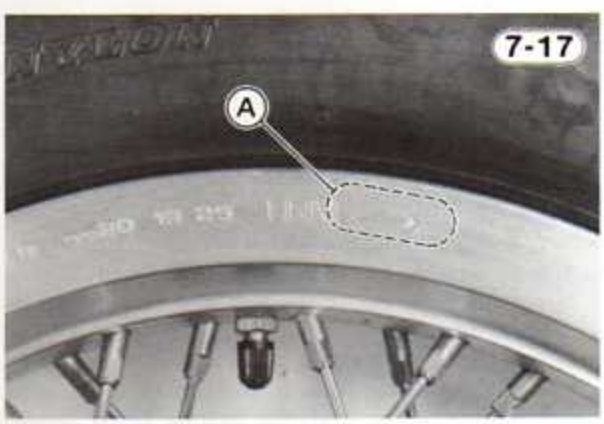
- Remove the rim and spokes from the hub.

Installation:

Spoke, Rim Installation

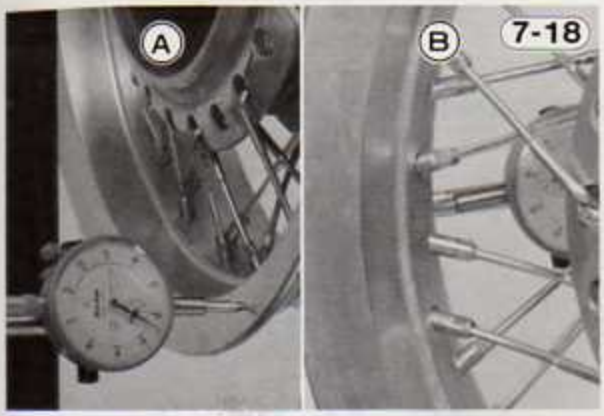
- Fit all the spokes through the holes, and screw all the nipples onto the spokes tightening them partially.

NOTE: 1. Be sure that the rim does not go on backwards; the rim for the rear wheel has an arrow mark on the outside of the rim flange to show the direction of tire rotation.



A. Rotation Mark (Arrow)

- Suspend the wheel by the axle, and set up a dial gauge to measure rim runout. Fix the axle in place if necessary to prevent horizontal movement.
- Tighten the spokes evenly so that the radial (out from the axle) runout is less than 0.8 mm and the axial (side to side) runout is less than 0.5 mm.



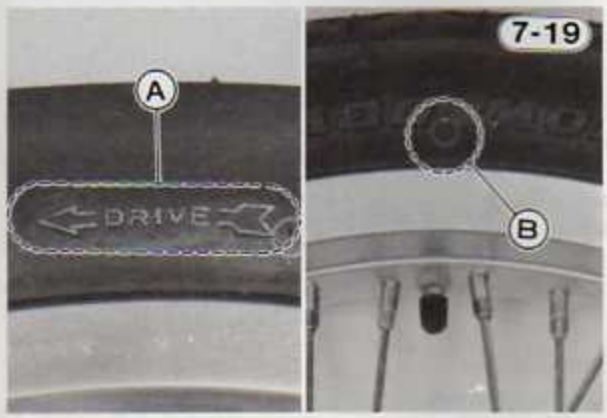
A. Radial Runout **B. Axial Runout**

- Make sure that the spokes are tightened evenly. Standard torque is 0.30 kg-m (26 in-lbs).
- Install the bead protectors to the rim.
- Install the rubber band fitting its hole with the hole for the valve stem in the rim.

Tube, Tire Installation

- Inspect the tube and tire, and replace them if necessary (Pg. 2-22).
- Dust the tube and inside the tire with talcum powder.
- Apply a soap and water solution, or rubber lubricant to the rim flanges, rim protectors, tire beads, and tire irons.
- Check the tire rotation mark on the rear tire and install it on the rim accordingly.

NOTE: 1. The direction of the tire rotation is shown by an arrow on the tire side wall.



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

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

NOTE: 1. To prevent rim damage, be sure to place the rim protectors at any place the tire irons are applied.

- Insert the tube into the tire, and insert the valve stem into the rim, and screw the nut on loosely.
- Install the valve core.
- Put just enough air in the tube to keep it from getting caught between the tire and rim. Too much air makes fitting difficult, and too little will make the tube more liable to be pinched by the irons.
- Pry the other side of the tire onto the rim, starting at the side opposite the valve.

CAUTION **Take care not to insert the tire irons so deeply that the tube gets damaged.**

- Check that the tube is not pinched between the tire and rim.
- Lubricate the tire beads and rim flanges with a soap and water solution to help seat the tire beads in the rim flanges of the rim while inflating the tire.
- Center the rim in the tire beads, and inflate the tire with compressed air until the tire beads seat in the rim flanges.
- Tighten the bead protector and valve stem nuts, and put on the valve cap.
- Check and adjust the following items:
  - Tire Air Pressure (Pg. 4-2).
  - Wheel Balance (Pg. 4-2).

TUBELESS TIRES
CAST RIMS
AIR VALVES

Damage to the rim flanges and tire beads spoil the airtightness of tubeless tires and rims. When handling tubeless tires and rims, be careful not to damage the air-sealing surfaces.

The following explanation covers tire removal and installation using bead breaker, rim protectors, and tire irons (special tools). If tires are to be removed and installed using a tire changer, operate it in the manner prescribed by the manufacturer.

NOTE: 1. A tire changer suitable for tubeless and tube-type tires is available as a Kawasaki special tool.

WARNING **1. To ensure safe handling and stability, use only wheels, valves, and tires recommended may result in an unsafe condition, leading to accident and injury.**

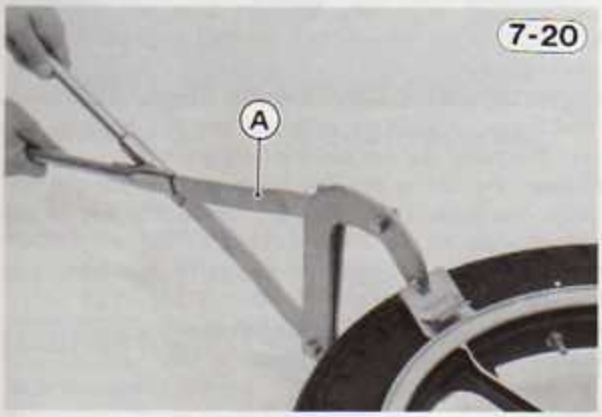
2. Never install a tube on the rims on this motorcycle. They are designed for tubeless tires only.

Removal:

- If the brake disc is installed, remove it from the wheel.
- To maintain wheel balance, mark the valve stem position on the tire with chalk so that the tire will be reinstalled in the same position.
- Take out the valve core to let out the air.
- Lubricate the tire beads and rim flanges on both sides with a soap and water solution or rubber lubricant. This helps the tire beads slip off the rim flanges.

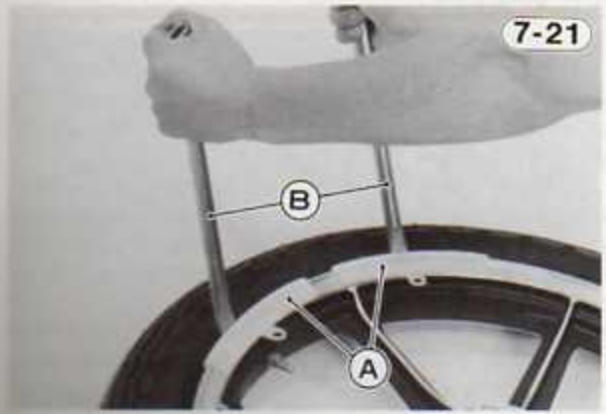
CAUTION **Never lubricate with mineral oil (engine oil) or gasoline because they will cause deterioration of the tire.**

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



A. Bead Breaker: 57001-1072

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

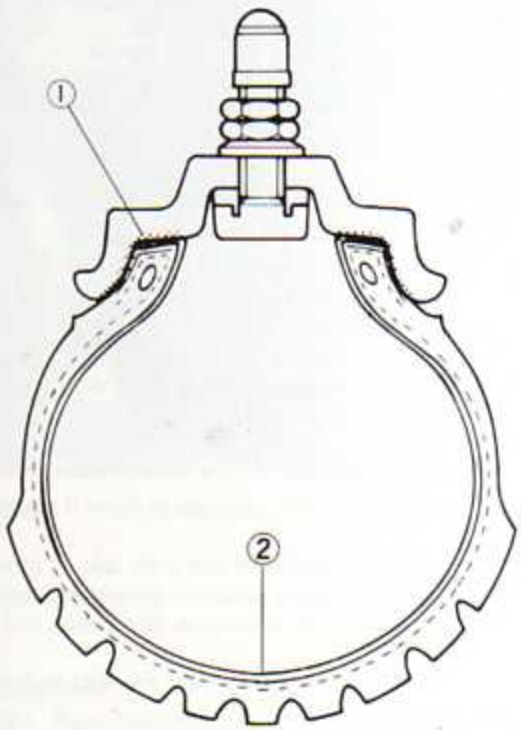


A. Rim Protectors: 57001-1063
B. Tire Irons: 57001-1073

NOTE: 1. For easier removal, always position the tire bead opposite the valve stem in the rim well, and pry the tire bead a little at a time.

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

Air Sealing Surfaces 7-22



1. Air Sealing Surfaces
2. Inner Liner

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

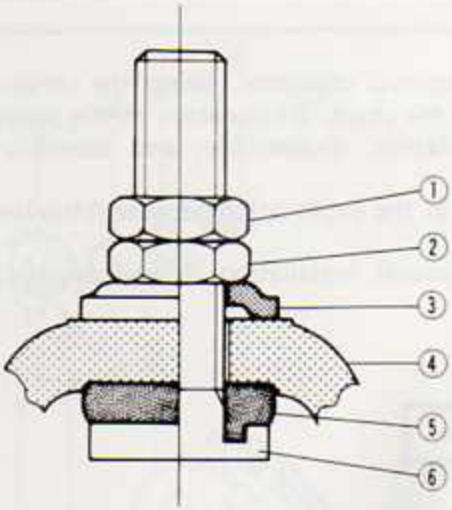
Installation:

- Inspect the rim and tire, and replace them if necessary (Pg. 4-3, 4-6).

NOTE: 1. Refer to Pg. 2-4 for tire repair.

- Clean the sealing surfaces of the rim and tire, and smooth the sealing surfaces of the rim with a fine emery cloth if necessary.
- Replace the valve with a new one. Tighten the mounting nut and locknut to 0.15 kg-m (13 in-lbs) of torque.

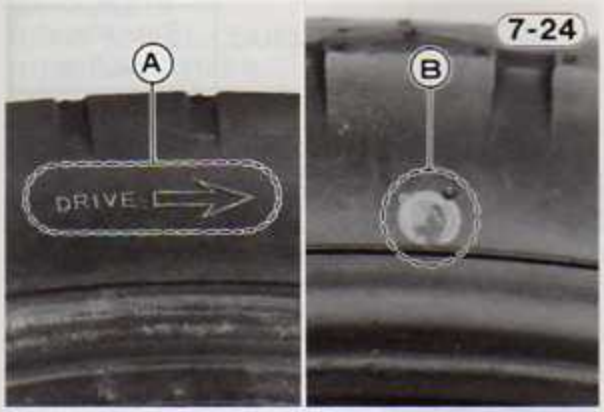
Air Valve (7-23)



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

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

NOTE: 1. The direction of the tire rotation is shown by an arrow on the tire sidewall.



(7-24)

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

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

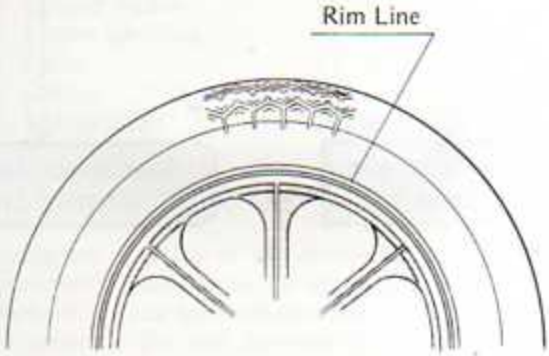
NOTE: 1. To prevent rim damage, be sure to place the rim protectors at any place the tire irons are applied.

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

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

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

Rim Line (7-25)



- If the rim lines and tire sidewall lines are not parallel, remove the valve core. Lubricate the rim flanges and tire beads. Install the valve core and inflate the tire again.
- After the tire beads seat in the rim flanges, check for air leaks. Inflate the tire slightly above standard inflation. Use a soap and water solution or submerge it, and check for bubbles that would indicate leakage.
- Check and adjust the following items:
  - Tire Air Pressure (Pg. 4-2).
  - Wheel Balance (Pg. 4-2).

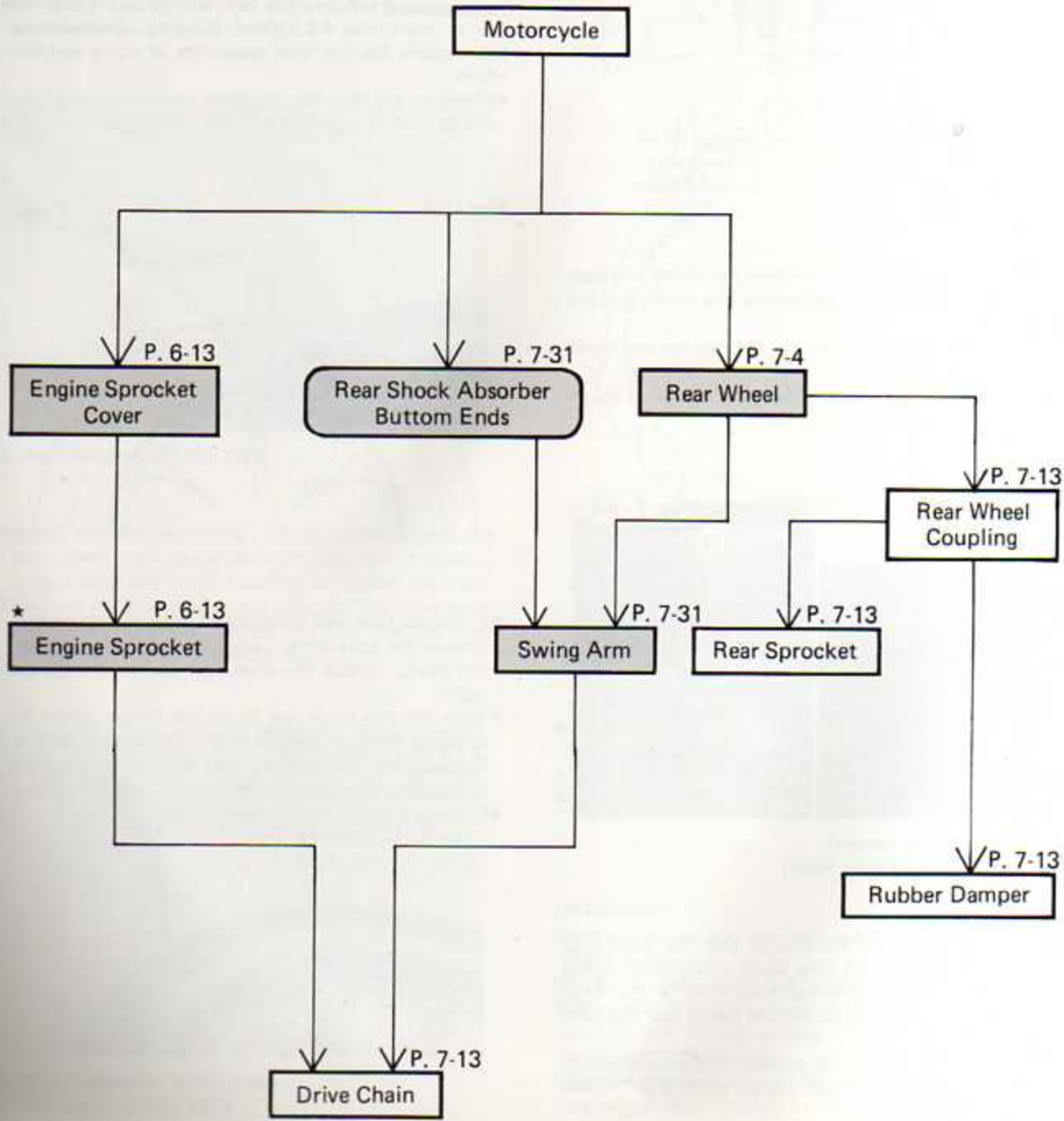
FLOW CHART

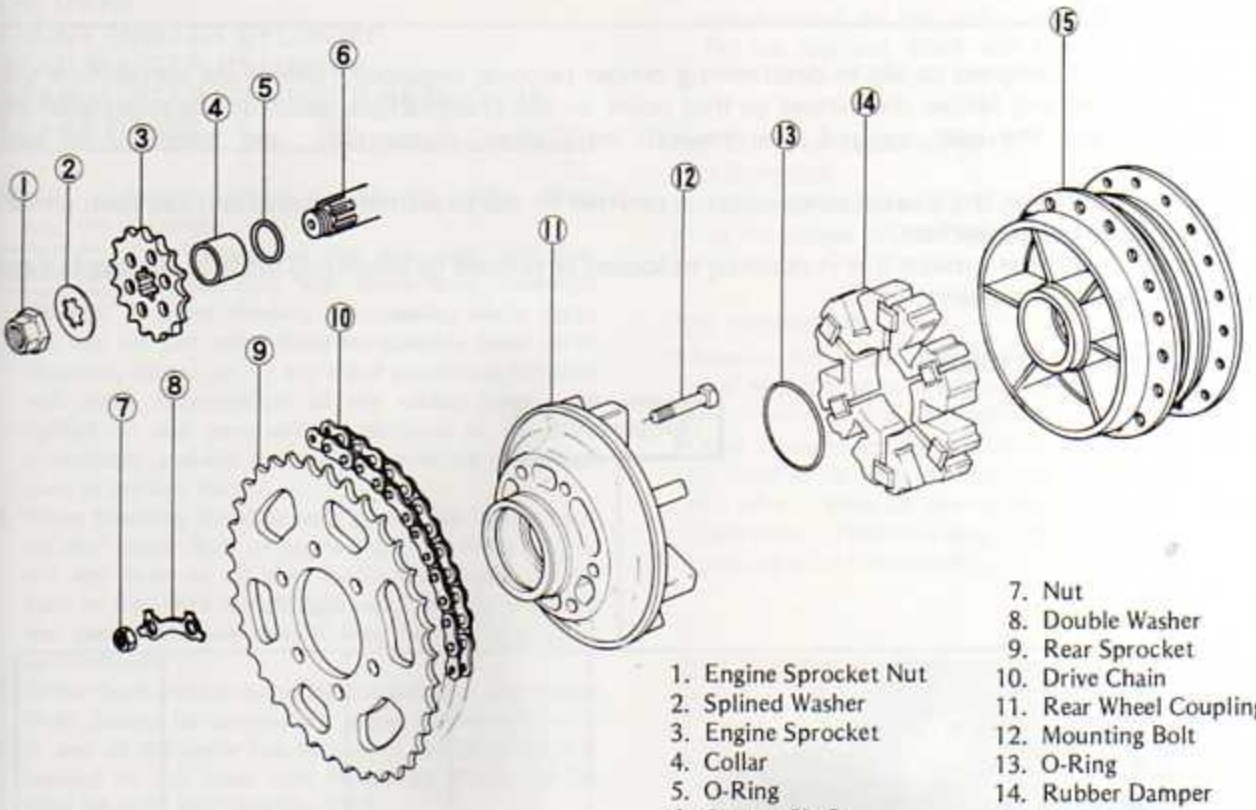
This chart is designed to aid in determining proper removal sequence. Select the component you wish to remove and follow the arrows to that point on the chart. Explanation on the pages after the chart is shown the best method for removal, installation, disassembly, and assembly of each component.

NOTE: 1. Action for the shaded component is omitted in the explanation because it has been alreary spared in the other section.

2. Action with a mark (★) requires special tool(s) for removal, installation, disassembly, or assembly.

Disassembly-Chassis (Drive Train)





1. Engine Sprocket Nut
2. Splined Washer
3. Engine Sprocket
4. Collar
5. O-Ring
6. Output Shaft
7. Nut
8. Double Washer
9. Rear Sprocket
10. Drive Chain
11. Rear Wheel Coupling
12. Mounting Bolt
13. O-Ring
14. Rubber Damper
15. Rear Hub

DRIVE CHAIN
SPROCKETS
REAR WHEEL COUPLING
RUBBER DAMPER

NOTE: 1. When removing and installing the drive chain refer to the flow chart noting the following.

WARNING **The chain must not be cut for installation as this may result in subsequent chain failure and loss of control.**

2. When removing and installing the engine sprocket, refer to the Disassembly-Engine chapter.

Rear Wheel Coupling, Rubber Damper Removal:

Rear Wheel Coupling, Rubber Damper Removal

- Pull off the rear wheel coupling and rubber damper.

Rear Wheel Coupling,
Rubber Damper Installation

NOTE: 1. When installing the rear coupling, inspect the O-ring on the rear hub, replace it with a new one if it has deteriorated, and apply a little grease to the O-ring.

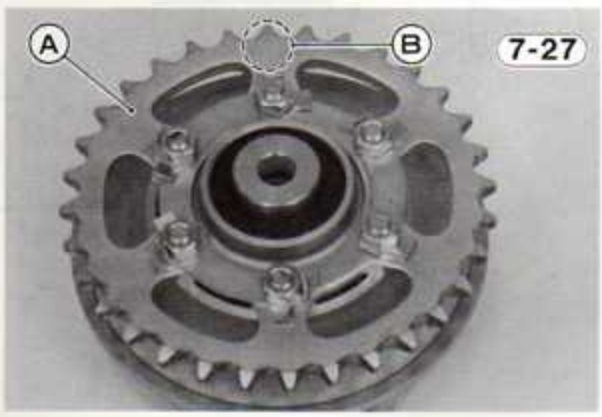
Rear Sprocket Removal:

Rear Sprocket Removal

- Install the rubber damper and wheel coupling temporarily on the rear hub to aid in rear sprocket removal.
- Straighten the side of the double lockwasher that is bent over the side of the rear sprocket nut.
- Remove the rear sprocket nuts and double lockwashers to separate the rear sprocket and wheel coupling.

Rear Sprocket Installation

NOTE: 1. Install the rear sprocket with the numbered side facing out. Tighten the sprocket nuts to 4.0 kg-m (29-ft lbs) of torque, and bend the side of the lockwasher over the side of the nut.



A. Rear Sprocket **B. Tooth Number**

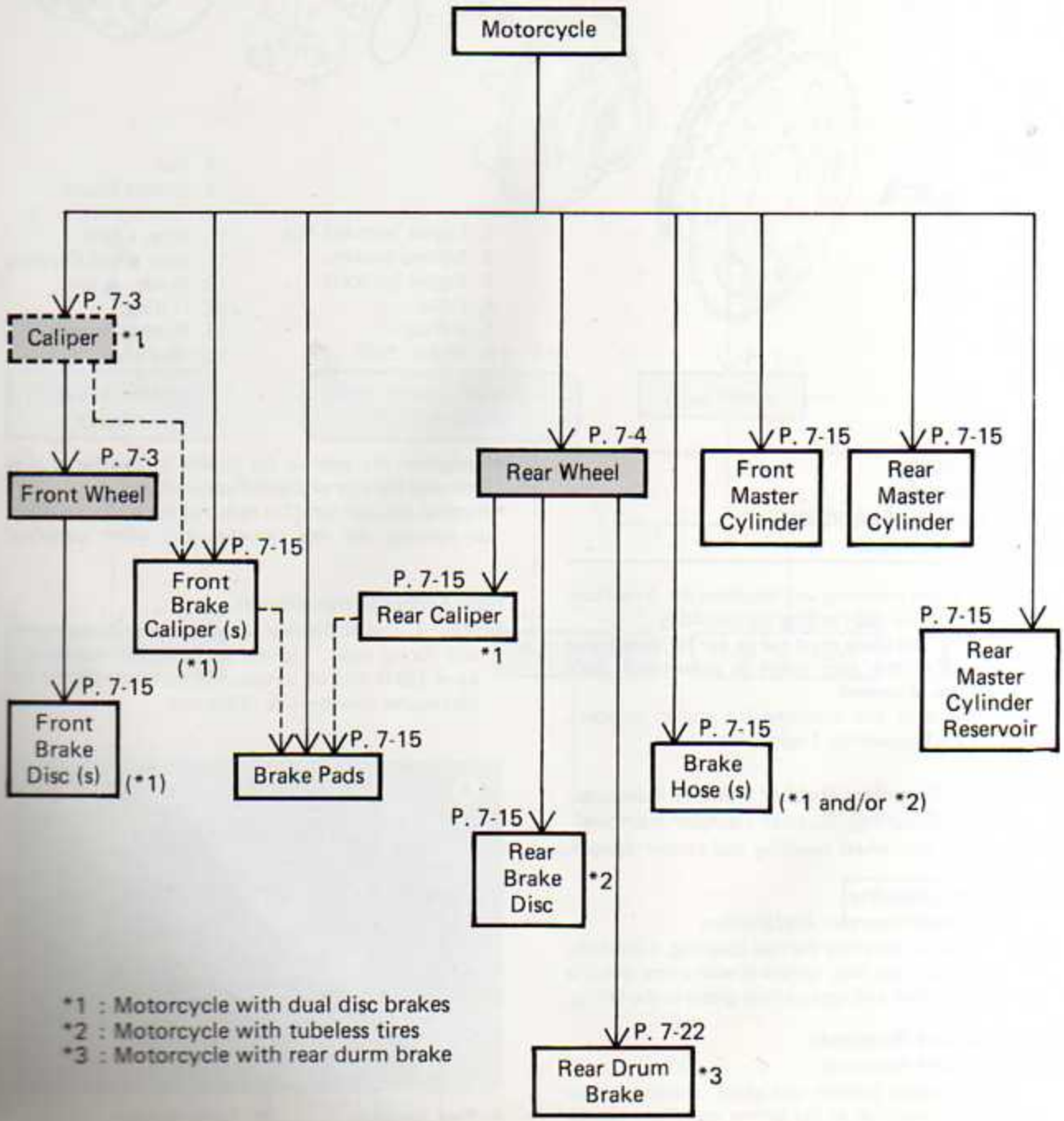
FLOW CHART

This chart is designed to aid in determining proper removal sequence. Select the component you wish to remove and follow the arrows to that point on the chart. Explanation on the pages after the chart is shown the best method for removal, installation, disassembly, and assembly of each component.

NOTE: 1. Action for the shaded component is omitted in the explanation because it has been alreary spared in the other section.

2. Component in the broken line is required to loosen or remove its mounting bolts or screws, but not necessary its complete removal.

Disassembly-Chassis (Brakes)



DISCS
PADS
CALIPERS
FRONT MASTER CYLINDER
REAR MASTER CYLINDER
REAR MASTER CYLINDER RESERVOIR
BRAKE HOSES

NOTE: 1. Before working on the disc brake, please read the following:

CAUTION **1. Except for the disc pads and disc; use only disc brake fluid, isoproply alcohol, or ethyl alcohol, for cleaning brake parts. Do not use any other fluid for cleaning these parts. Gasoline, motor oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off completely, and will eventually deteriorate the rubber used in the disc brake.**

2. When handling the disc pads or disc, be careful that no disc brake fluid or any oil gets on them. Clean off any fluid or oil that inadvertently gets on the pads or disc with a high flash-point solvent. Replace the pads with new ones if they cannot be cleaned satisfactorily.

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

4. If any of the brake line fittings or the bleed valve is opened at any time, AIR MUST BE BLED FROM THE BRAKE SYSTEM (Pg. 2-17).

Disc Removal (each disc):

Disc Removal

- Remove the disc mounting bolts, and take off the disc and/or plate.

Disc Installation

NOTE: 1. The plate must be installed with the plain side facing in.



A. Plate

2. Tighten the disc mounting bolts to 4.0 kg-m (29 ft-lbs) of torque. The disc must be installed with the chamfered hole side facing toward the wheel. Tightening torque for the disc mounting Allen bolts is 2.3 kg-m (16.5 ft-lbs).
3. After installing the disc, check the disc runout (Pg. 4-10).
4. Completely clean off any grease that has gotton on either side of the disc with a high flash-point solvent. Do not use one which will leave an oily residue.

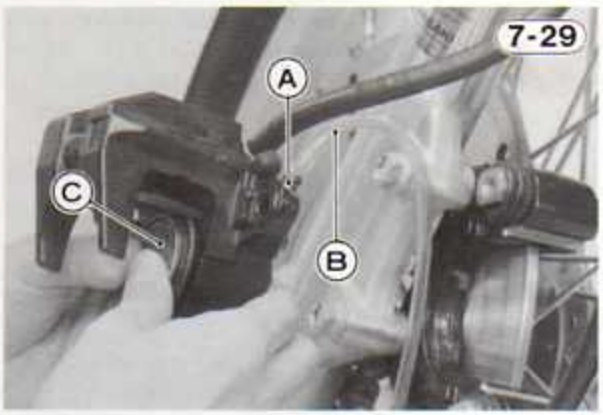
Pad Removal (each caliper):

Pad Removal

- Remove the caliper holder shaft bolts.
- Lift the caliper off the holder, and remove the pads.

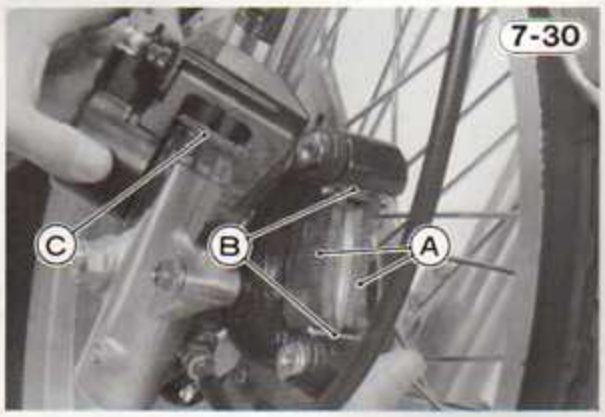
Pad Installation

- Remove the bleed valve cap on the caliper, attach a clear plastic hose to the bleed valve, and run the other end of the hose into a container.
- Open (loosen) the valve slightly, push the piston in by hand as far as it will go, and then close (tighten) the valve. Wipe up any spilled fluid, and recap the bleed valve. The bleed valve must be tightened to 0.80 kg-m (69 in-lbs) of torque.

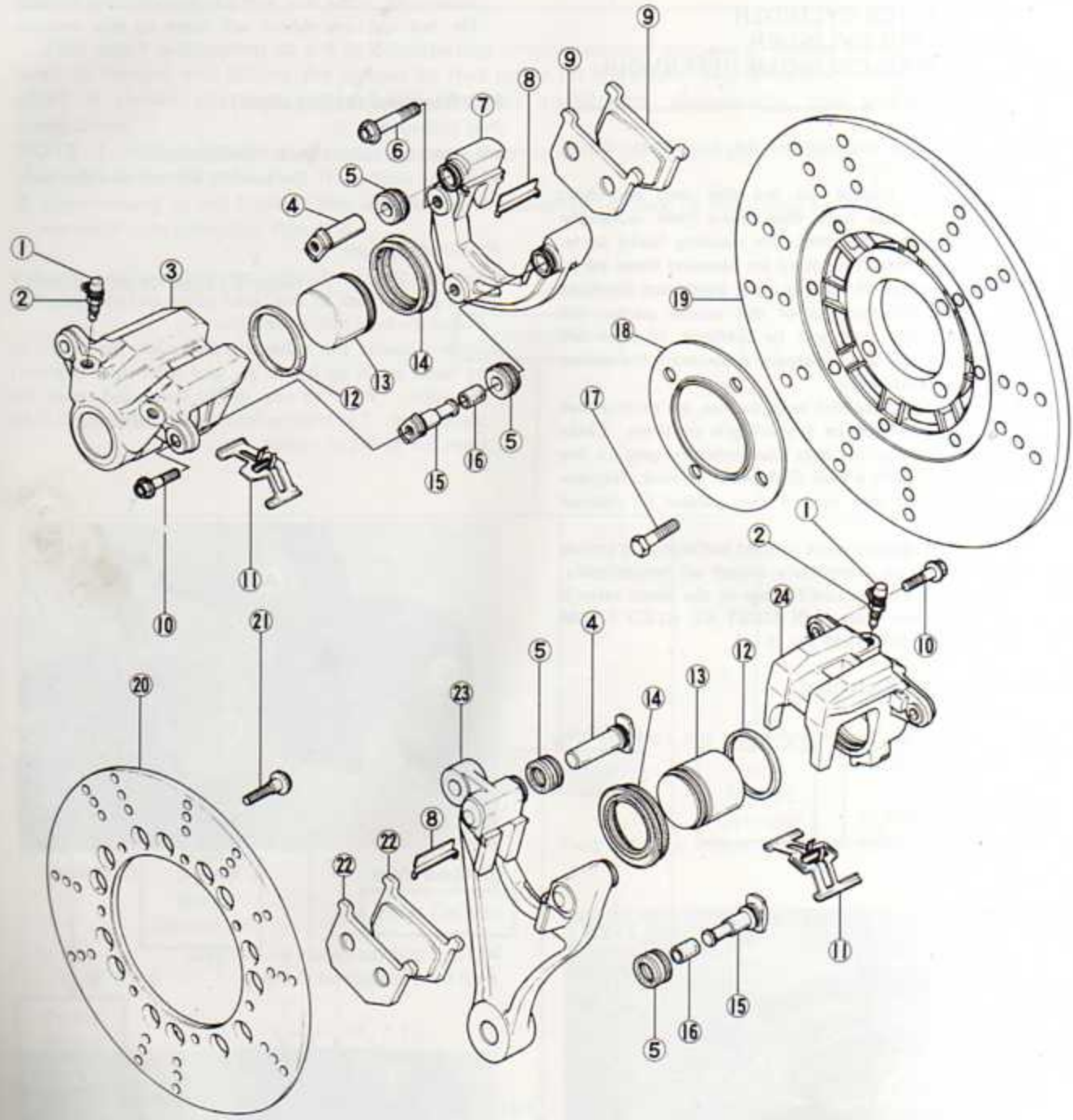


A. Bleed Valve **B. Hose** **C. Piston**

- Check that the sliders are in place.
- Fit the pads against the disc.



A. Pads **B. Sliders** **C. Anti-Rattle Spring**



1. Bleed Valve Cap
2. Bleed Valve
3. Caliper Cylinder
4. Caliper Holder Shaft
5. Dust Cover
6. Caliper Mounting Bolt
7. Caliper Holder
8. Slider
9. Pad
10. Caliper Holder Shaft Bolt
11. Anti-rattle Spring
12. Fluid Seal
13. Piston
14. Dust Seal
15. Caliper Holder Shaft
16. Friction Boot
17. Disc Mounting Bolt
18. Plate
19. Disc
20. Disc
21. Disc Mounting Allen Bolt
22. Pad
23. Caliper Holder
24. Caliper Cylinder

- Check that the anti-rattle spring is in place. If it was removed, install it to the caliper as shown in Fig. 7-35.
- Install the caliper, and tighten the caliper holder shaft bolts to 1.8 kg-m (13.0 ft-lbs) of torque.
- Since some brake fluid was lost when the bleed valve was opened, check the fluid level in the master cylinder and bleed the air from the brake system (Pg. 2-17).
- Check the brake (Pg. 2-14).

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

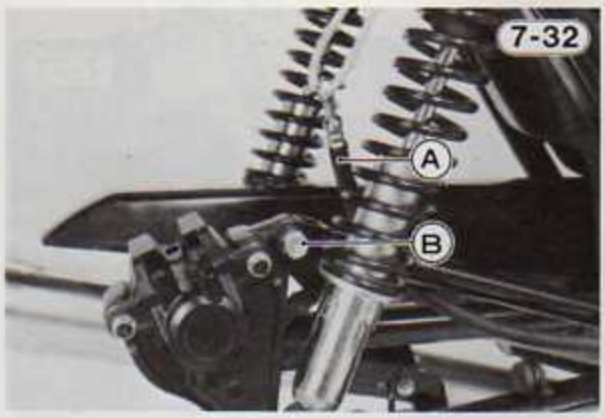
Caliper Removal (each caliper):

Caliper Removal

- If the caliper is to be disassembled, loosen the caliper holder shaft bolts.

NOTE: 1. If the caliper is to be disassembled after caliper removal and compressed air is not available, remove the piston using the following two steps before disconnecting the brake hose fitting from the caliper.
   - ○Remove the pads.
   - ○Pump the piston out with the brake lever or pedal.

- Remove the banjo bolt at the caliper, and temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum. There is a flat washer on each side of the hose fitting.
- For the front brake caliper, remove the mounting bolts, and take off the caliper.
- For the rear brake caliper, remove the rear torque link nut, lockwasher, and bolt. Then, pull the axle and take off the rear caliper.



A. Brake Hose **B. Torque Link Nut**

Caliper Installation

NOTE: 1. Tighten the front caliper mounting bolts to 4.0 kg-m (29 ft-lbs) of torque.
2. Tighten the caliper holder shaft nuts to 1.8 kg-m (13.0 ft-lbs) of torque.
3. Connect the brake hose to the caliper putting a new flat washer on each side of the brake hose fitting. Tighten the banjo bolt to 3.0 kg-m (22 ft-lbs) of torque.
4. Check the fluid level in the master cylinder, and bleed the brake line (Pg.2-17).

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

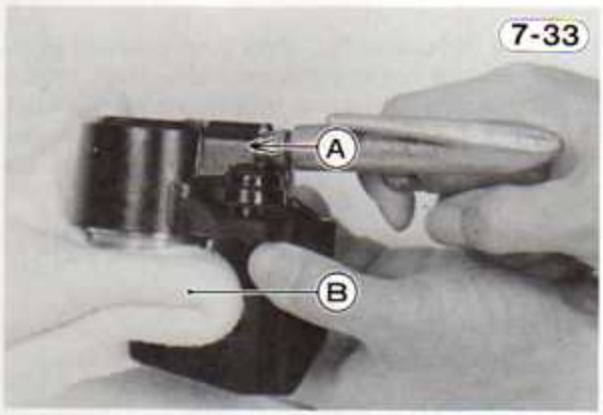
Caliper Disassembly (each caliper):

Caliper Disassembly

- Remove the caliper holder shaft bolts, and pull out the caliper holder and the pads.
- Remove the holder shafts with the dust covers. There is the friction boot on the shaft that is smaller diameter.
- Remove the anti-rattle spring.
- Remove the dust seal around the piston.
- Cover the caliper opening with a clean, heavy cloth, and remove the piston by lightly applying compressed air to where the brake line fits into the caliper.

WARNING **To avoid serious injuy, never place your fingers or palm inside the caliper opening. If you apply compressed air into the caliper, the piston may crush your hand or fingers.**

NOTE: 1. If compressed air is not available, reconnect the brake line and pump the piston out with the brake lever.



A. Compressed Air **B. Heavy Cloth**

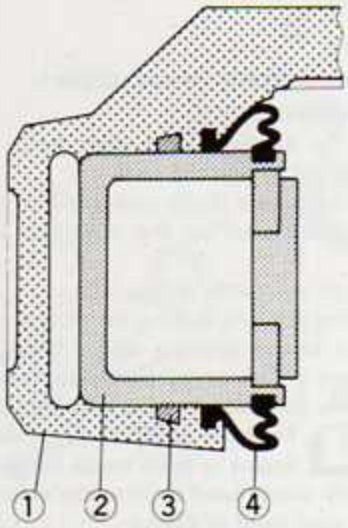
- Taking care not to damage the cylinder surface, remove the fluid seal with a hook.

Caliper Assembly

NOTE: 1. Clean the caliper parts with brake fluid or alcohol.
2. It is recommended that the fluid seal, which is removed, be replaced with a new one.
3. Replace the dust covers and friction boot if they were damaged.
4. Apply brake fluid to the outside of the piston and the fluid seal, and push the piston into the cylinder by hand. Take care that neither the cylinder nor the piston skirt get scratched.

5. Install the dust seal around the piston. Check that the dust seal is properly fitted into the grooves in the piston and caliper.

Caliper Dust Seal, Fluid Seal (7-34)



1. Caliper
2. Piston
3. Fluid Seal
4. Dust Seal

6. Apply a thin coat of PBC (Poly Butyl Cuprysil) grease to the caliper holder shafts and holder holes. (PBC is a special high temperature, water-resistant grease).
7. Install the anti-rattle spring to the caliper as shown.

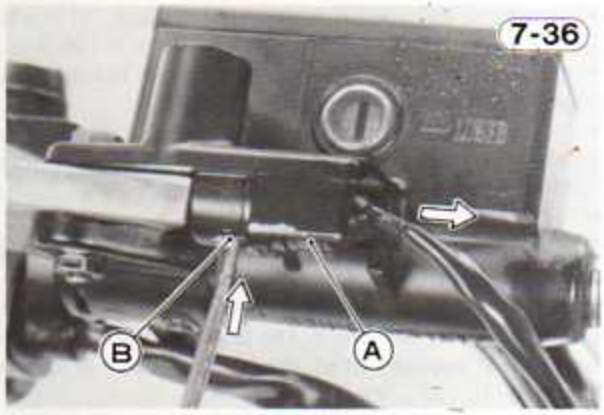


A. Anti-rattle Spring

Front Master Cylinder Removal:

Front Master Cylinder Removal

- Take off the right rear view mirror.
- Using a thin-bladed screwdriver or some other suitable tool, press in the front brake light switch tab which catches in the hole in the underside of the master cylinder, and then remove the switch.

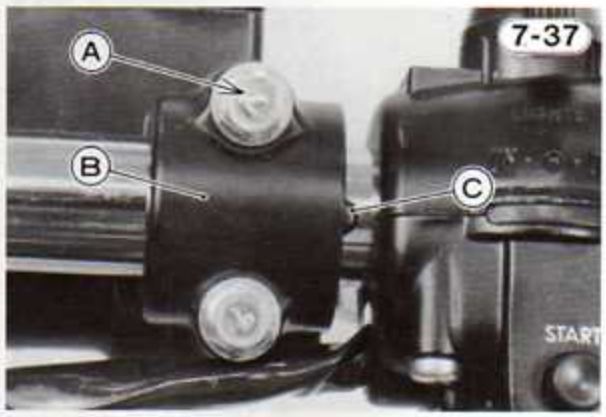


A. Front Brake Light Switch **B. Switch Tab**

- Pull back the dust cover, and remove the banjo bolt. There is a flat washer on each side of the hose fitting.
- Remove the clamp bolts, and take off the master cylinder. There is a flat washer for each master cylinder clamp bolt. Immediately wipe up any brake fluid that spills.

Front Master Cylinder Installation

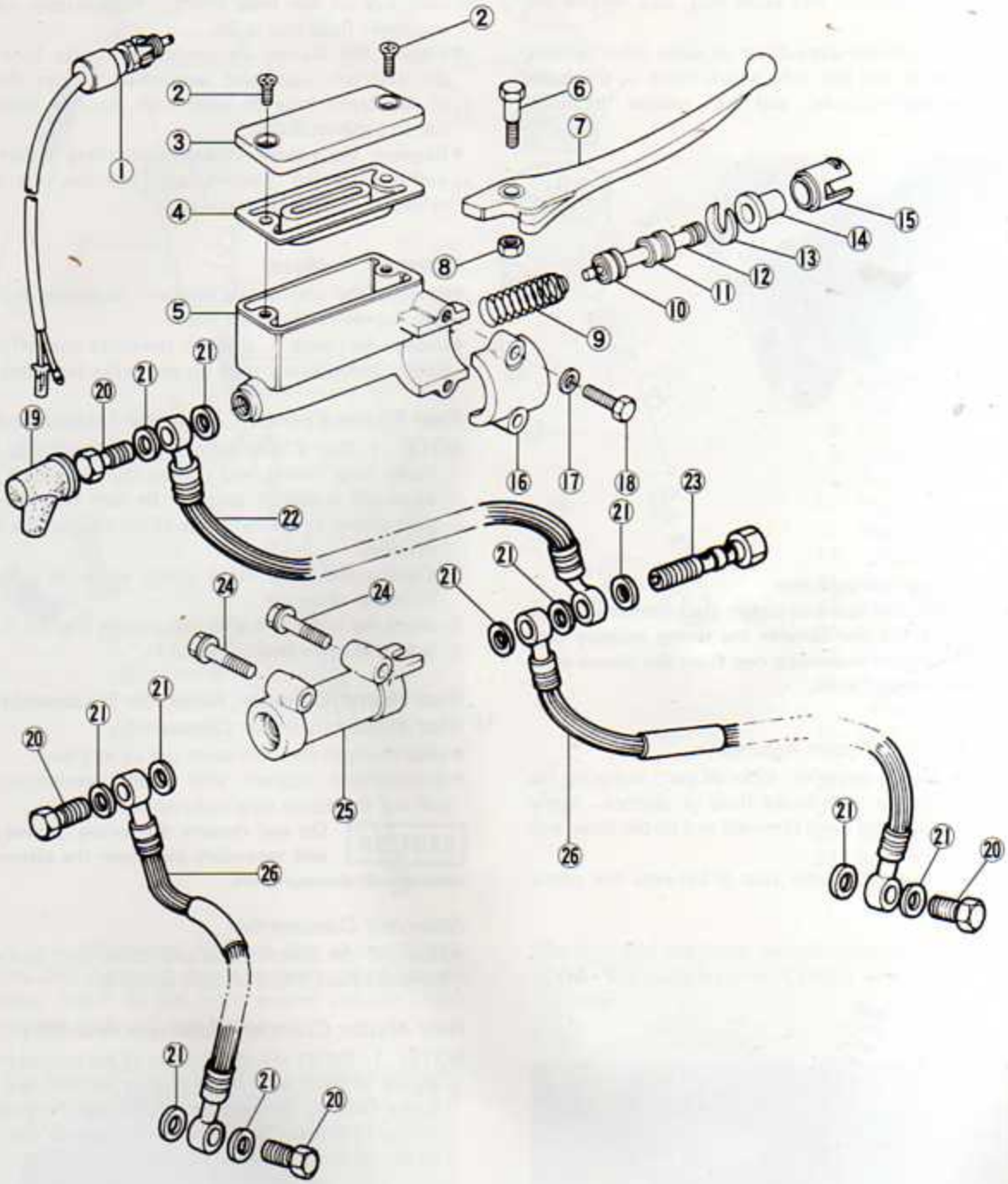
NOTE: 1. The master cylinder clamp is installed with the small projection towards the throttle grip. Tighten the upper clamp bolt first, and then the lower clamp bolt both to 0.90 kg-m (78 in-lbs) of torque.



A. Tighten the upper clamp bolt first.
B. Clamp **C. Projection**

2. Use a new flat washer on each side of the brake hose fitting. Tighten the banjo bolt to 3.0 kg-m (22 ft-lbs) of torque.
3. Bleed the brake line after master cylinder installation (Pg. 2-17).

7-38

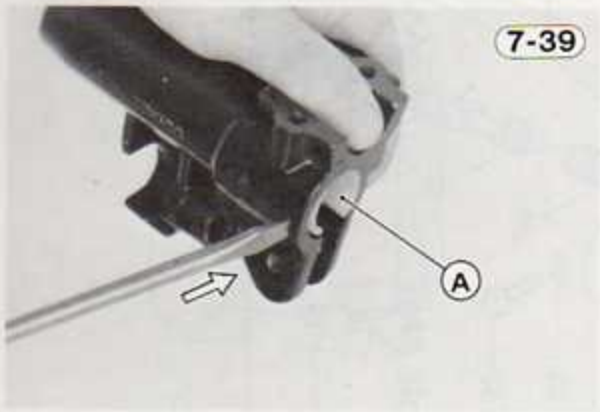


1. Front Brake Light Switch
2. Screw
3. Master Cylinder Cap
4. Diaphragm
5. Master Cylinder
6. Brake Lever Pivot Bolt
7. Brake Lever
8. Locknut
9. Return Spring
10. Primary Cup
11. Secondary Cup
12. Piston
13. Piston Stop
14. Dust Seal
15. Liner
16. Master Cylinder Clamp
17. Flat Washer
18. Clamp Bolt
19. Dust Cover
20. Banjo Bolt
21. Flat Washer
22. Brake Hose
23. Banjo Bolt
24. 2-way Joint Mounting Bolt
25. 2-way Joint
26. Brake Hose

Front Master Cylinder Disassembly:

Front Master Cylinder Disassembly

- Remove the master cylinder cap screws, take off the master cylinder cap and diaphragm, and empty out the brake fluid.
- Remove the locknut and pivot bolt, and remove the brake lever.
- Using a thin-bladed screwdriver or some other suitable tool, press in the line tabs which catch in the holes in the master cylinder, and then remove the liner.



A. Liner

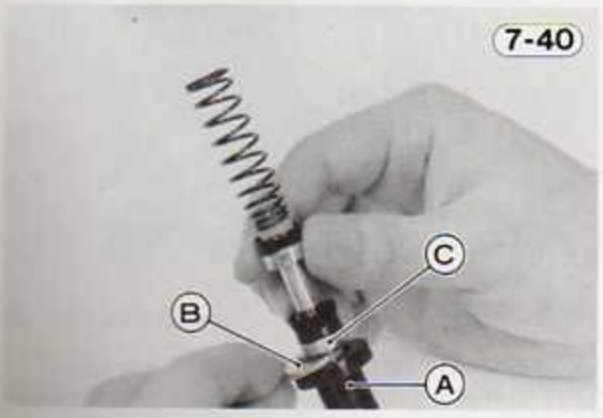
- Pull out the piston assembly.
- Remove the dust seal and piston stop from the piston.

CAUTION **Do not remove the spring primary cup, and secondary cup from the piston since remove will damage them.**

Front Master Cylinder Assembly

NOTE: 1. Before assembly, clean all parts including the master cylinder with brake fluid or alcohol. Apply brake fluid to the parts removed and to the inner wall of the cylinder.

2. Be sure that the piston stop is between the piston and dust seal.



A. Dust Seal **B. Piston Stop** **C. Piston**

3. Tighten the brake lever pivot bolt to 0.30 kg-m (26 in-lbs) of torque, and tighten the locknut to 0.60 kg-m (52 in-lbs) of torque.

Rear Master Cylinder, Reservoir Removal:

Rear Master Cylinder Removal

- Pull off the right side cover.
- Remove the banjo bolt to disconnect the brake hose from the master cylinder. There is a flat washer on each side of the hose fitting. Immediately wipe up any brake fluid that spills.
- Loosen the clamp, disconnect the brake hose from the reservoir cup, and temporarily secure the end of the brake hose to some high place to keep fluid loss to a minimum.
- Remove the master cylinder mounting bolts, lock-washer, and flat washers, and free the rear master cylinder from the motorcycle.

Reservoir Removal

- Remove the rear brake reservoir mounting bolt, and take the reservoir off the frame.
- Loosen the clamp , and pull the brake hose off the reservoir. Immediately wipe up any brake fluid that spills.

Rear Master Cylinder, Reservoir Installation

NOTE: 1. Use a new flat washer on each side of the brake hose fitting, and tighten the banjo bolt to 3.0 kg-m (22 ft-lbs) of torque. Be sure that the metal pipe comes to the right side of the stop on the master cylinder.

2. Tighten the brake hose clamp screw to 0.10 kg-m (9 in-lbs) of torque.
3. Bleed the brake line after installation (Pg. 2-17).
4. Adjust the rear brake (Pg. 2-14).

Rear Master Cylinder, Reservoir Disassembly:

Rear Master Cylinder Disassembly

- Slide the push rod dust cover out of its place.
- Remove the ratainer with a thin screwdriver, and pull out the piston stop and piston assembly.

CAUTION **Do not remove the spring, primary cup, and secondary cup from the piston since remove will damage them.**

Reservoir Disassembly

- Take off the reservior cap and diaphragm, and empty the brake fluid into a suitable container.

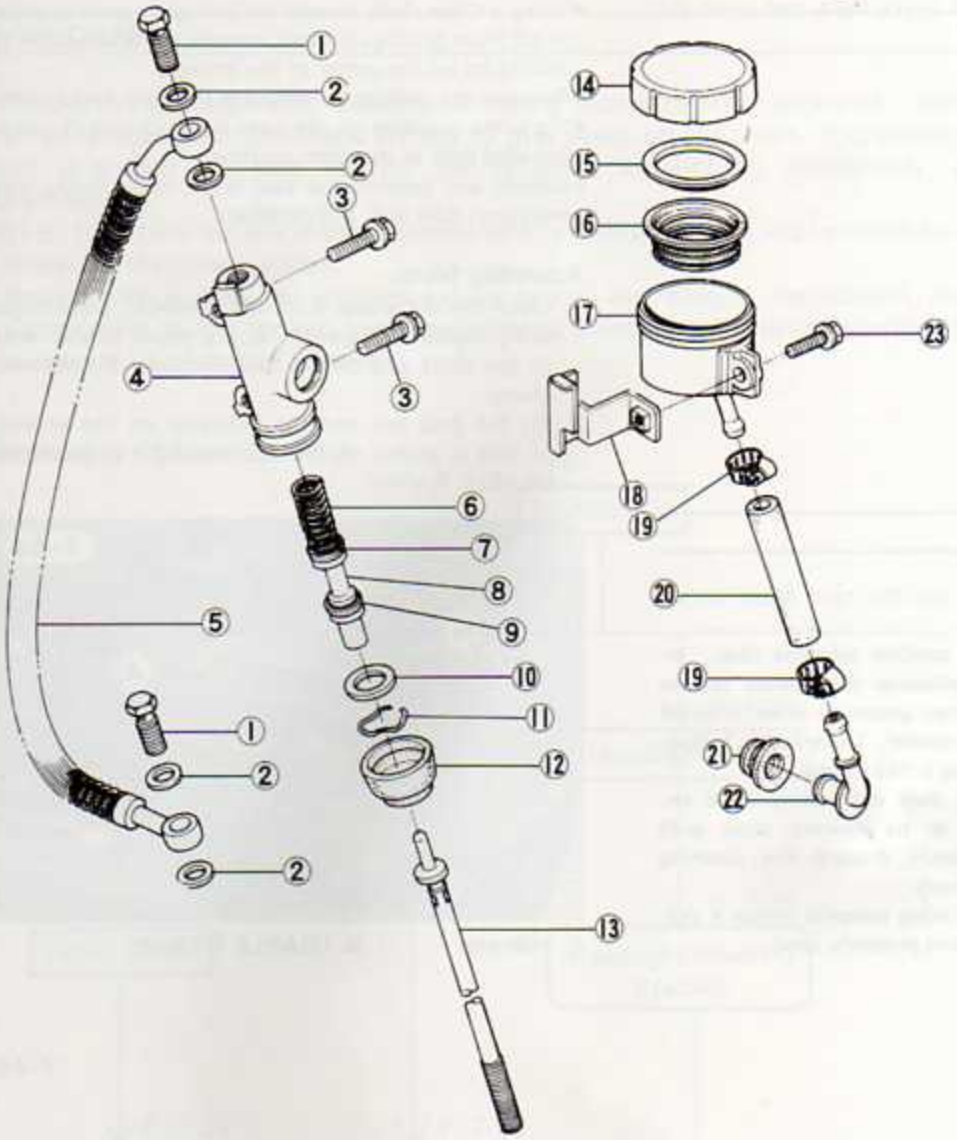
Rear Master Cylinder, Reservoir Assembly

NOTE: 1. 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. Take care not to scratch the piston or the inner wall of the cylinder.

Brake Hose Replacement:

- Pump the brake fluid out of the line
- Remove the banjo bolts at both end of the brake hose, and pull the hose off the motorcycle. Especially, for the brake hose between the rear muster cylinder and the reservoir, loosen the clamps at both end of the hose, and take off the hose.
- Install the new brake hose in its place, and tighten the banjo bolts to 3.0 kg-m (22 ft-lbs) of torque, noting the following:

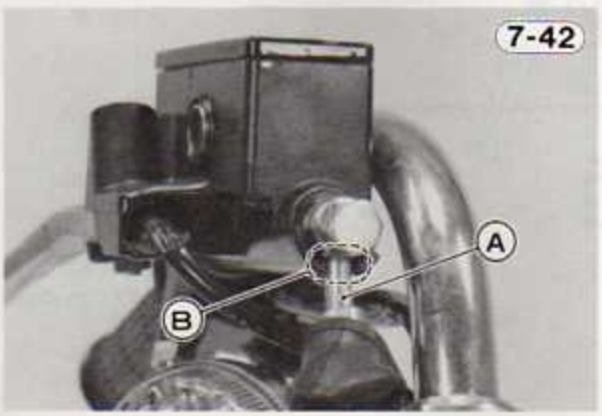
Rear Master Cylinder, Reservior (7-41)



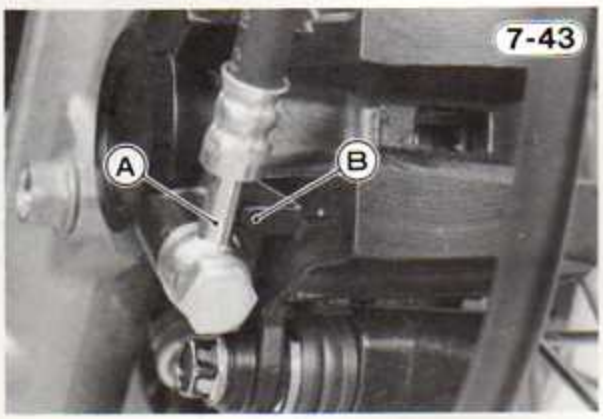
1. Banjo Bolt
2. Flat Washer
3. Master Cylinder Mounting Bolt
4. Master Cylinder
5. Brake Hose
6. Return Spring
7. Primary Cup
8. Piston
9. Secondary Cup
10. Piston Stop
11. Retainer
12. Dust Cover
13. Push Rod
14. Cap
15. Ring Plate
16. Diaphragm
17. Reservoir
18. Reservoir Mounting Bracket
19. Hose Clamp Mounting Bolt
20. Brake Hose
21. Grommet
22. Connector
23. Reservoir Mounting Bolt

○Use a new flat washer for each side of the fittings.
○Be sure that the metal pipe is properly fitted into the U-shaped notch in the front master cylinder, front right caliper, and/or 2-way joint.

○Be sure that the metal pipe is fitted to the stop on the front left caliper, rear caliper, and/or rear master cylinder.



A. Metal Pipe B. U-shaped Notch



A. Metal Pipe B. Stop

- For the hose between the rear master cylinder and the reservoir, tighten the hose clamps firmly.
- Fill the reservoir with fresh brake fluid, and bleed the brake line (Pg. 2-17).

REAR DRUM BRAKE

NOTE: 1. Before working on the rear drum brake, please read the following:

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:**

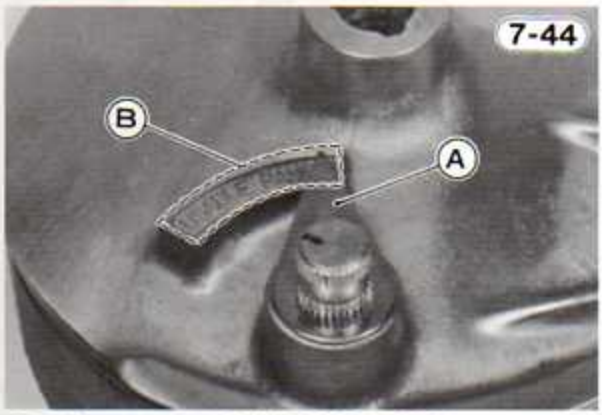
1. **Never blow brake lining dust with compressed air.**
2. **If any components are to be cleaned, wash with detergent, then immediately discard the cleaning solution and wash your hands.**
3. **Do not grind any brake lining material unless a ventilation hood is available and properly used.**

Disassembly:

- Remove the brake panel from the wheel.
- Using a clean cloth around the linings to prevent grease or oil from getting on them, remove the brake shoes by pulling up on the center of the linings.
- Remove the springs to separate the two brake shoes.
- Mark the position of the cam lever so that it can be installed later in the same position.
- Unbolt and remove the cam lever, brake lining wear indicator, dust seal, and camshaft.

Assembly Note:

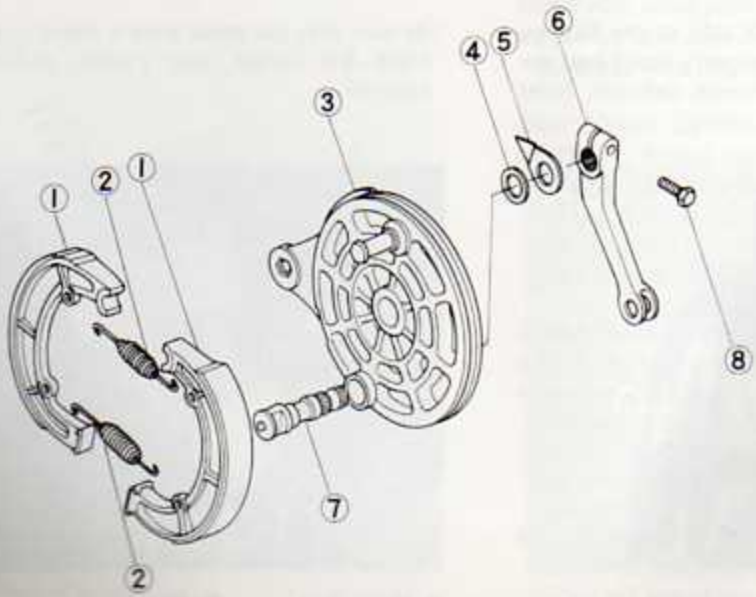
1. Clean the old grease from the camshaft, and regrease using regular cup grease. Apply grease to the center of the shaft and on the cam surfaces. Do not overgrease.
2. Fit the dust seal and the indicator on the serration so that it points to the extreme right of the letters USABLE RANGE.



A. Indicator B. USABLE RANGE

Rear Drum Brake

7-45



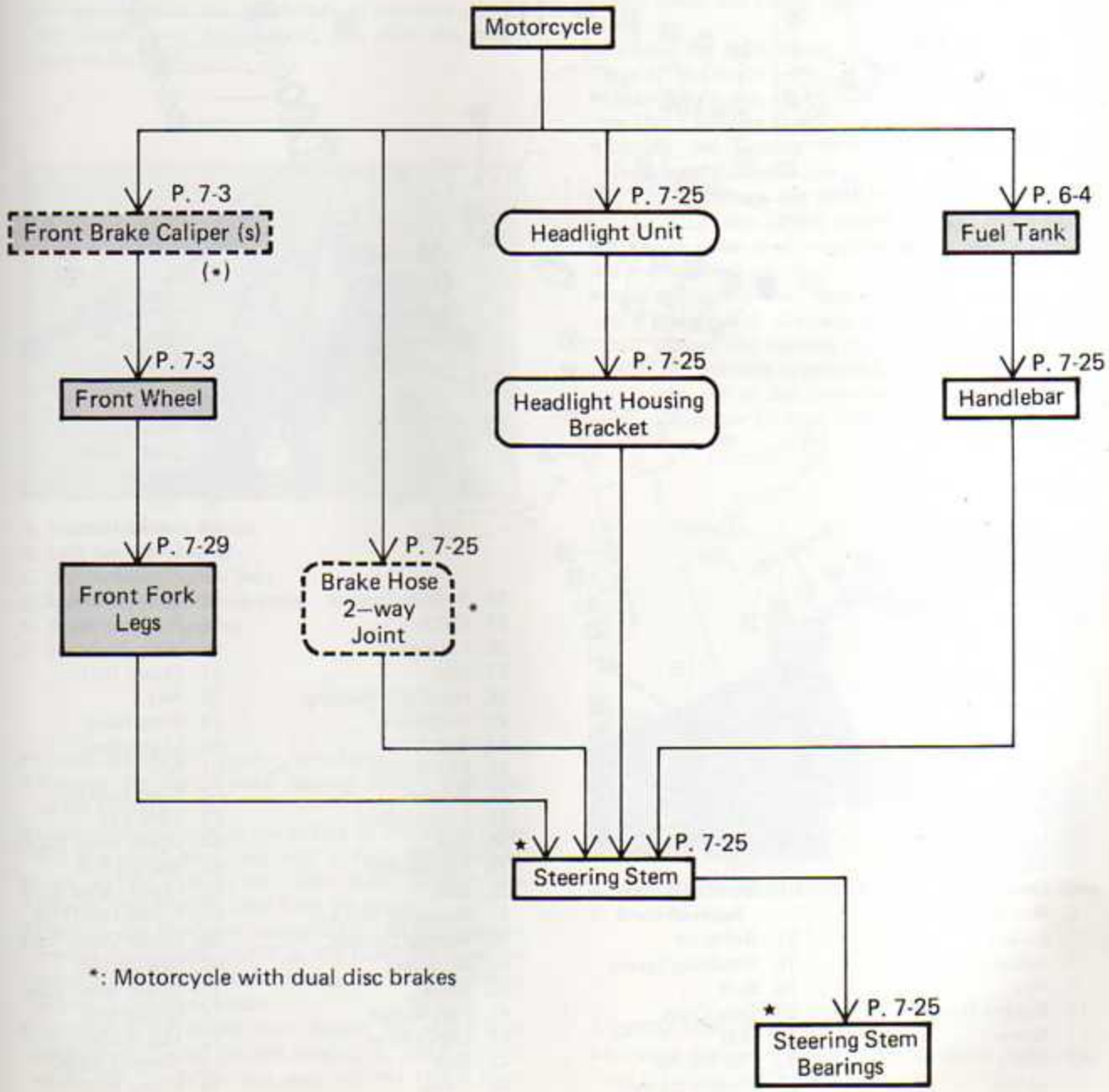
1. Brake Shoe
2. Spring
3. Brake Panel
4. Dust Seal
5. Wear Indicator
6. Brake Cam
7. Brake Camshaft
8. Bolt

FLOW CHART

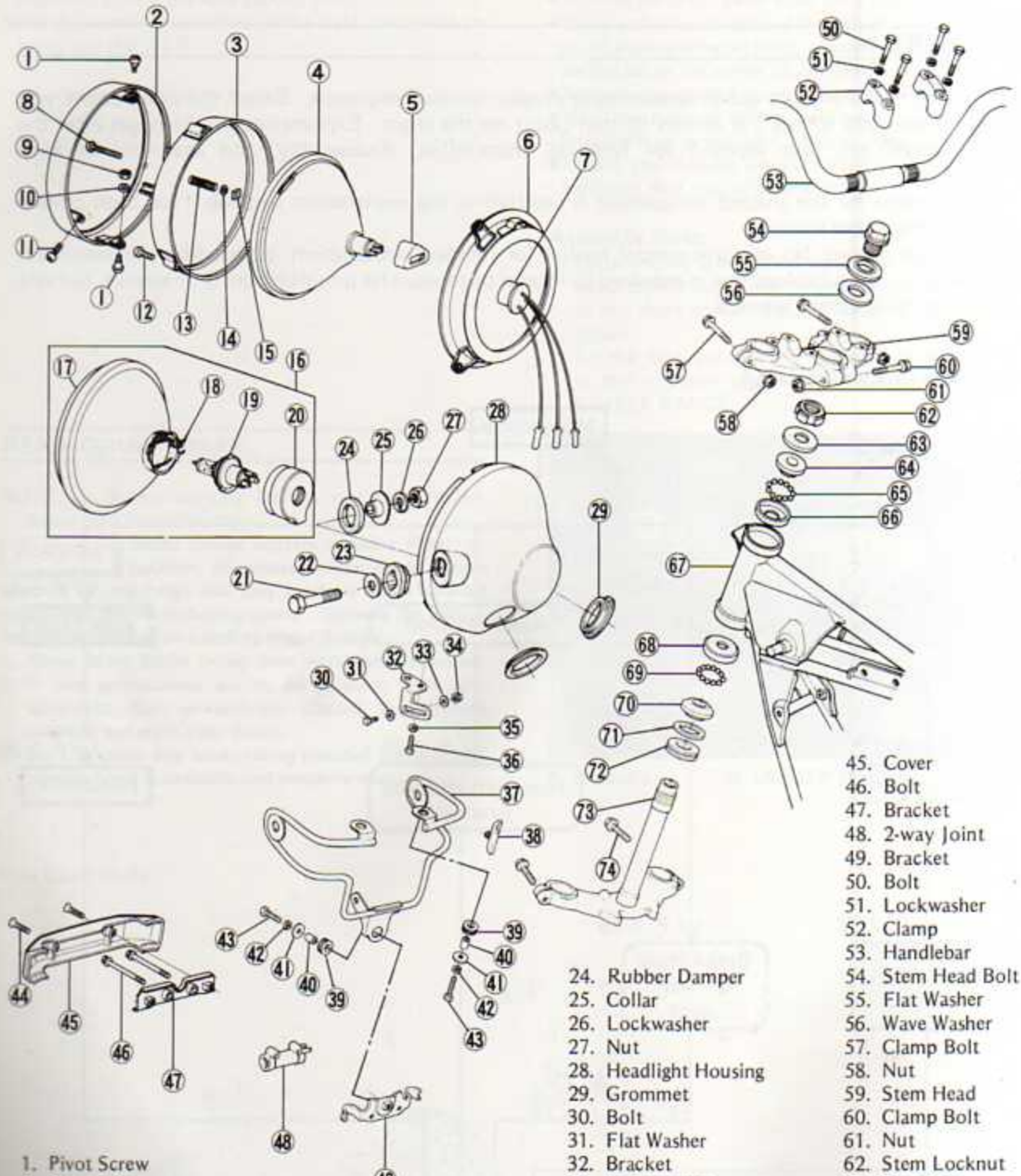
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NOTE: 1. Action for the shaded component is omitted in the explanation because it has been alreary spared in the other section.
2. Action with a mark (★) requires special tool(s) for removal, installation, disassembly, or assembly.
3. Component in the broken line is required to loosen or remove its mounting bolts or screws, but not necessary its complete removal.

Disassembly-Chassis (Steering)



*: Motorcycle with dual disc brakes



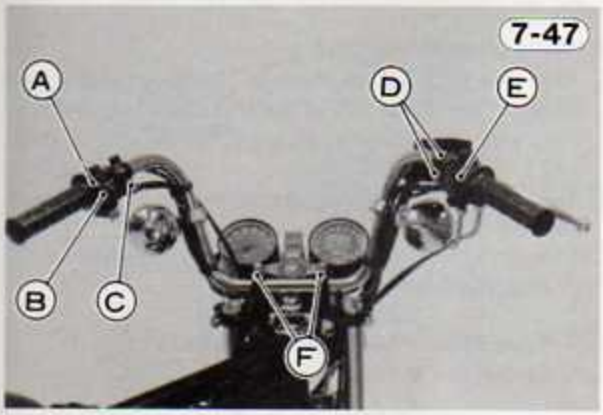
1. Pivot Screw
2. Outer Rim
3. Inner Rim
4. Sealed Beam Unit
5. Dust Cover
6. Mounting Rim
7. Socket
8. Adjusting Screw
9. Nut
10. Rubber Damper
11. Screw
12. Screw
13. Spring
14. Spring Seat
15. Nut
16. Quartz Halogen Beam Unit
17. Reflector
18. Retaining Spring
19. Bulb
20. Dust Cover
21. Bolt
22. Flat Washer
23. Rubber Damper
24. Rubber Damper
25. Collar
26. Lockwasher
27. Nut
28. Headlight Housing
29. Grommet
30. Bolt
31. Flat Washer
32. Bracket
33. Lockwasher
34. Nut
35. Lockwasher
36. Bolt
37. Mounting Bracket
38. Rubber Damper
39. Grommet
40. Collar
41. Flat Washer
42. Lockwasher
43. Bolt
44. Screw
45. Cover
46. Bolt
47. Bracket
48. 2-way Joint
49. Bracket
50. Bolt
51. Lockwasher
52. Clamp
53. Handlebar
54. Stem Head Bolt
55. Flat Washer
56. Wave Washer
57. Clamp Bolt
58. Nut
59. Stem Head
60. Clamp Bolt
61. Nut
62. Stem Locknut
63. Stem Cap
64. Upper Inner Race
65. Bearing Ball
66. Upper Outer Race
67. Frame Head Pipe
68. Lower Outer Race
69. Bearing Ball
70. Lower Inner Race
71. Grease Seal
72. Flat Washer
73. Steering Stem
74. Clamp Bolt

HANDLEBAR
STEERING STEM
STEERING STEM BEARINGS

Removal:

Handlebar Removal

- Remove the rear view mirrors.
- Remove the straps which hold the left switch wiring harness and right switch wiring harness to the handlebar.
- Take the starter lockout switch off the clutch holder.
- For the motorcycle which has the front turn signal assemblies on the handlebar, remove the bolts, lockwashers, and flat washers, and take the assembly clamps, rubber dampers, and assemblies off the handlebar.
- Take out the left switch housing screws, and remove the housing from the handlebar. If necessary, loosen the clutch lever holder bolt, and slide the clutch lever to the right.



A. Starter Lockout Switch
B. Left Switch Housing
C. Clutch Lever Holder Bolt
D. Master Cylinder Clamp Bolts
E. Right Switch Housing
F. Handlebar Clamps

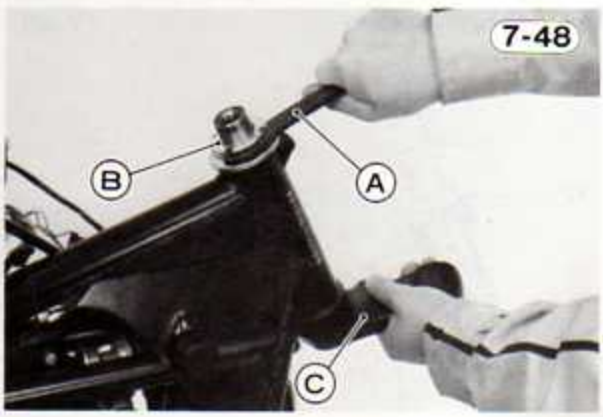
- Loosen the master cylinder clamp bolts.
- Remove the right switch housing screws, and open up the housing.
- Loosen the locknuts at the middle of the clutch calbe and the clutch lever, and turn in fully the adjusters.
- Line up the slots in the clutch lever, locknut, and adjuster, and free the cable from the lever.
- Remove the handlebar clamp bolts and lockwashers, remove the clamps, and slide the handlebar from the throttle grip, right switch housing, and master cylinder or front brake lever holder.
- To remove the clutch lever, loosen the clutch lever holder bolt, cut off the left handlegrip, which is bonded to the handlebar, and slide off the clutch lever.

Steering Stem Removal

- Take out the retaining screws, and swing the unit from the housing.
- Disconnect all the leads and plugs in the headlight housing.
- Disconnect the tachometer cable and speedometer cable at the meters.
- Remove the screws, and take off the stem base cover.
- Remove the mounting bolts, stem base cover bracket, and/or mounting bolt collars.
- Remove the headlight mounting bracket bolts, and remove the bracket with the headlight housing. Each bolt has a lockwasher and flat washer.
- Remove the caliper(s) together with the mastercylinder, brake hoses, and/or 2-way joint.
- Loosen the stem head clamp bolt, and then remove the stem head bolt, flat washer, and lockwasher.
- Remove the right front fork upper clamp bolt and cable guide, and loosen the left front fork upper clamp bolt.
- Remove the front fender bolts and lockwashers, and take off the fender.
- Loosen the lower clamp bolts, and pull out each fork leg with a twisting motion.
- Remove the steering stem head together with the meters and ignition switch.

CAUTION **Place the stem head so that the correct side of the meters are up. If a meter is left upside down or sideways for any length of time, it will malfunction.**

- Push up on the stem base, and remove the steering stem locknut with the stem nut wrench (special tool); then remove the steering stem and stem base (single unit). As the stem is removed, some of the steel balls will drop out of the lower outer race. Remove the rest. There are 20 steel balls in the lower outer race.

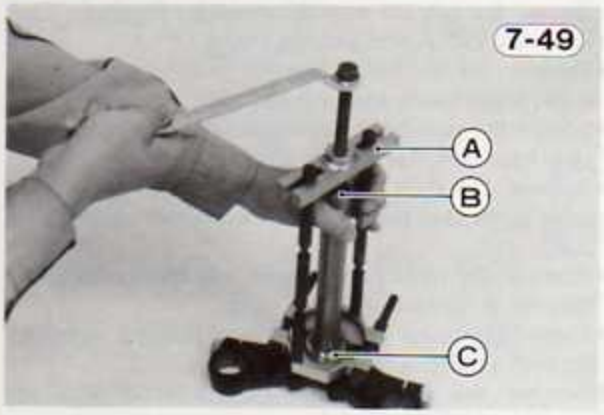


A. Stem Nut Wrench: 57001-1100
B. Stem Locknut
C. Stem Base

Steering Stem Bearing Removal

- Removal the steering stem cap, the upper inner race, and the upper steel balls (19).

- To remove the outer races pressed into the head pipe, insert a bar into the head pipe, and hammer evenly around the circumference of the opposite race to drive it out.
- Remove the grease seal under the lower inner race. Be careful not to damage the grease seal during removal.
- Removal the lower inner race, which is presses onto the steering stem, with the stem bearing puller and adapter (special tools).



A. Bearing Puller: 57001-135 **C. Lower Inner Race**
B. Adapter: 57001-136

- Remove the washer from the steering stem.

Installation Note:

Steering Stem Bearing Installation

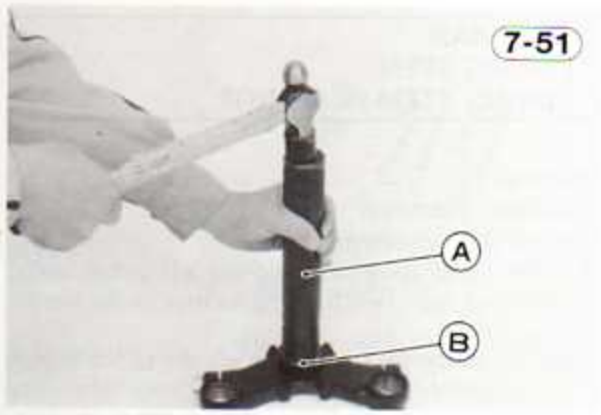
1. Apply oil to the outer races, and then drive them into the head pipe using the bearing drivers and bearing driver holder (special tools). Be sure to press them until they stop at the stepped portion in the head pipe.

Stem Bearing Installation 7-50



1. Bearing Driver Holder: 57001-1132
2. Bearing Driver: 57001-1145
3. Bearing Driver: 57001-1147

2. Apply oil to the lower inner race, and then drive it onto the steering stem using the stem bearing driver (special tool). Be sure to press it until it stops at the stem base.

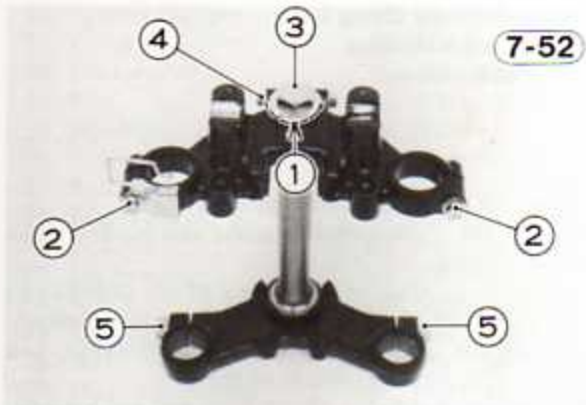


A. Stem Bearing Driver: 57001-137
B. Inner Race

3. Apply grease to the upper and lower outer races in the head pipe so that the steel balls will stick in place during stem insertion. Install the upper steel balls (19) and lower steel balls (20). All upper and lower steel balls are one size.

Steering Stem Installation

4. Slide the fork leg up through the lower and upper clamps. The upper end of the front fork inner tube is even with the upper surface of the stem head (Fig. 7-61).
5. Tightening order and tightening torque for each bolt and nut are shown as follows:
   1. Steering stem locknut: 3.0 kg-m (22 ft-lbs)
   2. Front fork upper clamp bolts:
      2.0 kg-m (14.5 ft-lbs)
   3. Steering stem head bolt: 4.5 kg-m (33 ft-lbs)
   4. Steering stem head clamp nut:
      1.8 kg-m (13.0 ft-lbs)
   5. Front fork lower clamp bolts: 3.8 kg-m (27 ft-lbs)

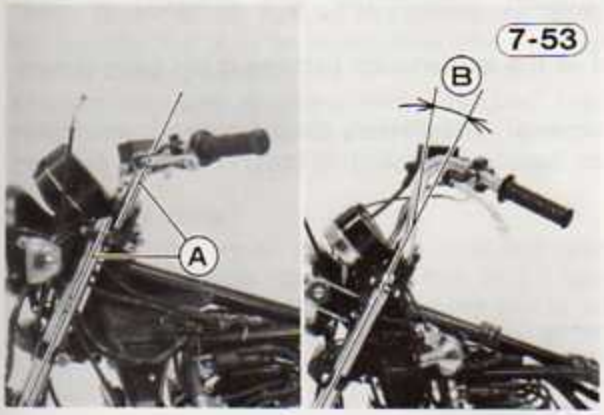


Handlebar Installation

6. If the clutch lever and left handligrip were removed; slide the clutch lever back on, hand tighten its bolt, and bond as new left handlegrip to the handlebar.

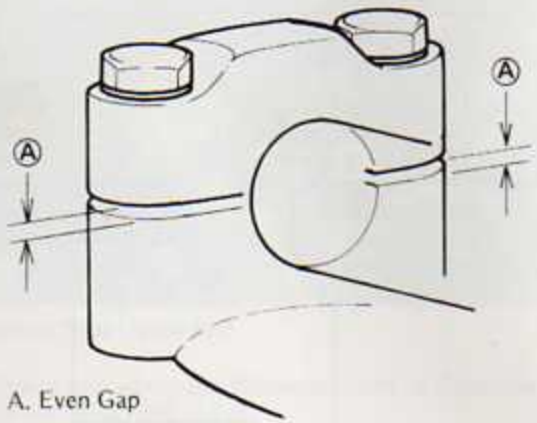
7. Mount the handlebar so that the angle of the handlebar matches the angle of the front fork as shown, and tighten the clamp bolts evenly to 1.8 kg-m (13.0 ft-lbs) of torque. If the handlebar clamps are correctly installed, the front and rear gaps will be equal.

Standard **Pullback**



A. Parallel **B. 10°**

Handlebar Clamp Installation **7-54**



A. Even Gap

8. The upper half of the right switch housing has a small projection which fits into a small hole in the handlebar. The front switch housing screw is longer than the rear screw.



A. Projection **B. Hole**

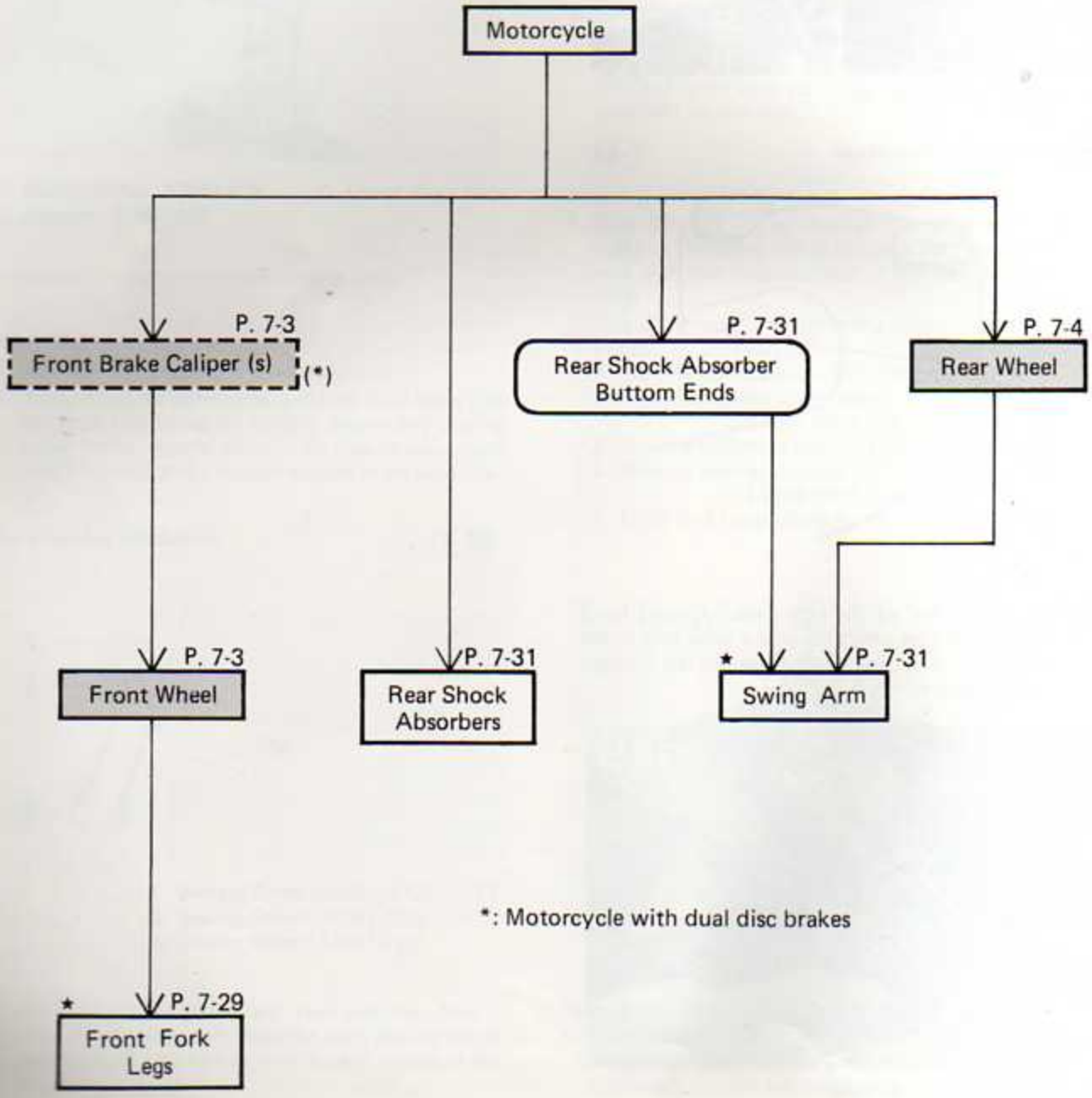
9. With the brake lever mounted at the proper angle, tighten first the upper and then the lower master cylinder clamp bolt to 0.90 kg-m (78 in-lbs) of torque (Fig. 7-37).
10. Check and adjust the following items as if necessary:
    - Steering (Pg. 2-19).
    - Clutch (Pg. 2-11).
    - Throttle Grip (Pg. 2-11).
    - Rear View Mirrors

FLOW CHART

This chart is designed to aid in determining proper removal sequence. Select the component you wish to remove and follow the arrows to that point on the chart. Explanation on the pages after the chart is shown the best method for removal, installation, disassembly, and assembly of each component.

NOTE: 1. Action for the shaded component is omitted in the explanation because it has been alreary spared in the other section.
2. Action with a mark (★) requires special tool(s) for removal, installation, disassembly, or assembly.
3. Component in the broken line is required to loosen or remove its mounting bolts or screws, but not necessary its complete removal.

Disassembly-Chassis (Suspensions)



*: Motorcycle with dual disc brakes

FRONT FORK

Removal (each fork leg):

- Remove the mounting bolts, take off the only caliper on the fork leg to be removed, and rest the caliper on some kind of stand so that it does not dangle.
- Remove the bolts and lockwashers that hold the front fender to the fork leg and remove the fender.
- If the fork leg is to be disassembled after removed, loosen the top plug now.
- Loosen the upper and lower front fork clamp bolts.
- With a twisting motion, work the fork legs down and out.

Installation Note:

1. Slide the fork leg up through the lower and upper clamps, tighten the upper clamp bolt to 2.0 kg-m (14.5 ft-lbs) of torque, and lower clamp bolt to 3.8 kg-m (27 ft-lbs) of torque. The upper end of the inner tube is even with the upper surface of the stem head.

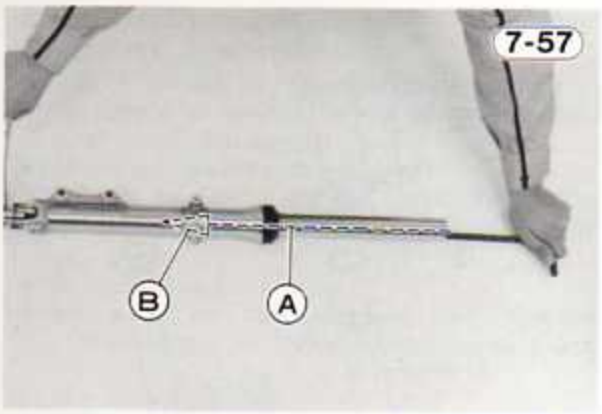


A. Inner Tube Upper End

2. Check and adjust the following items as if necessary:
   - ○Front Brake (Pg. 2-14).
   - ○Fork Oil Level (Pg. 2-21).
   - ○Fork Air Pressure (Pg. 4-12).

Disassembly:

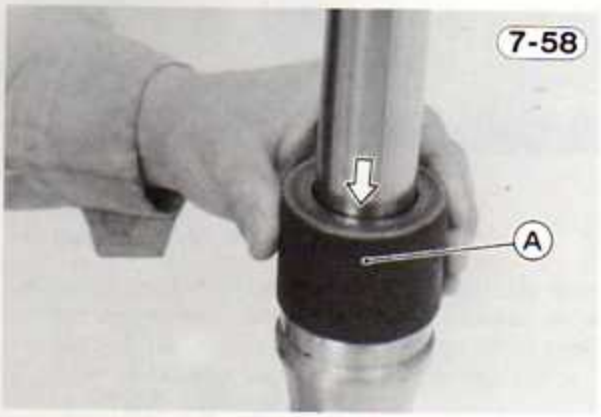
- Release air through the air valve.
- Remove the air valve and its O-ring if necessary.
- Remove the top plug, O-ring, and spring.
- Pour the oil into a suitable container, pumping as necessary to empty out all the oil.
- Stop the cylinder from turning by using the front fork cylinder holder handle and adapter (special tools). Unscrew the Allen bolt and gasket from the bottom of the outer tube, and then separate the inner tube from the outer tube by pulling it out.
- Slide or push the cylinder and its spring out the top of the inner tube.
- Remove the dust seal off the outer tube.
- Remove the cylinder base.
- Remove the retainer from the outer tube with a sharp hook, and pull out the oil seal. It may be necessary to heat the outer tube around the oil seal before pulling it out.



A. Front Fork Cylinder Holder Handle: 57001-183
B. Adapter: 57001-1011

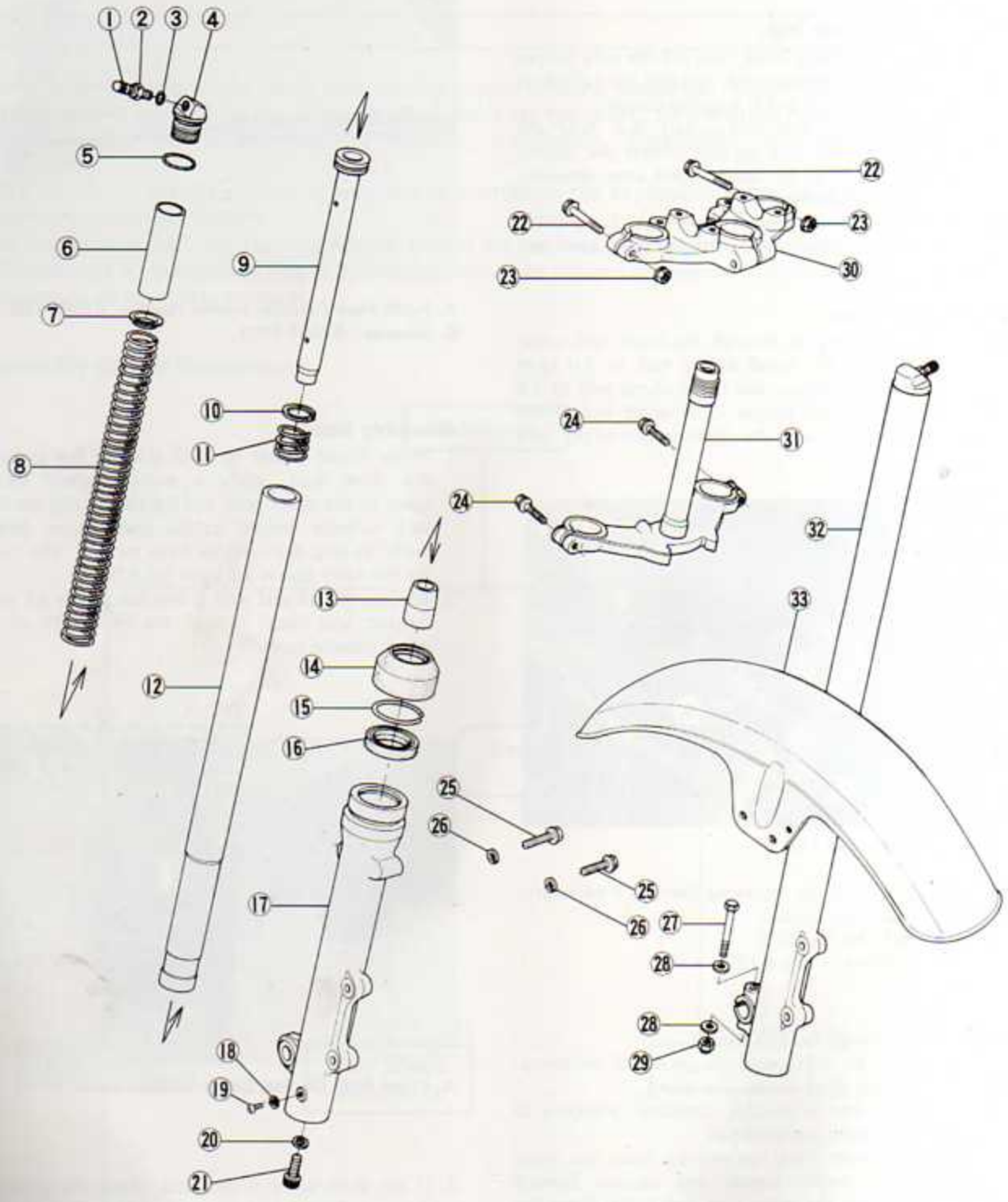
Assembly Note:

1. Apply liquid gasket to both sides of the gasket of the Allen bolt, apply a non-permanent locking agent to the Allen bolt, and tighten it using the front fork cylinder holder handle and adapter (special tools) to stop the cylinder from turning. The torque for the Allen bolt is 2.3 kg-m (16.5 ft-lbs).
2. Replace the oil seal with a new one, apply oil to the outside, and install it with the front fork oil seal driver (special tool).



A. Front Fork Oil Seal Driver: 57001-141

3. If the drain screw is removed, check the gasket for damage. Replace the damaged gasket with a new one. Before installing the drain screw, apply a liquid gasket to the threads of the screw, and tighten the screw securely.
4. Check the O-rings for damage. Replace them with new ones if damaged.
5. Apply a non-permanent locking agent to the threads of the air valve, and tighten the valve to 1.2 kg-m (104 in-lbs) of torque.
6. Tighten the top plug to 2.3 kg-m (16.5 ft-lbs) of torque.



*: KZ650-H only

1. Air Valve Cap
2. Air Valve
3. O-ring
4. Top Plug
5. O-ring
* 6. Collar
7. Spring Seat
8. Spring
9. Piston and Cylinder Unit
10. Piston Ring
11. Spring
12. Inner Tube
13. Cylinder Base
14. Dust Seal
15. Retainer
16. Oil Seal
17. Outer Tube
18. Gasket
19. Drain Screw
20. Gasket
21. Buttom Allen Bolt
22. Upper Clamp Bolt
*23. Nut
24. Lower Clamp Bolt
25. Front Fender Mounting Bolt
26. Lockwasher
*27. Front Axle Clamp Bolt
*28. Flat Washer
*29. Nut
30. Steering Stem Head
31. Steering Stem
32. Right Fork Leg
33. Front Fender

REAR SHOCK ABSORBERS
SWING ARM

Removal:

Rear Shock Absorber Removal

- Remove the grab rail mounting bolts and lockwashers, and remove the rear shock absorber upper mounting cap nuts, lockwashers, and flat washers.
- Pull the grab rail toward the rear.
- Remove the cap nuts, lockwashers and flat washers.
- Lift up on the rear end of the swing arm as necessary to avoid damaging the shock absorber bolt threads, and remove the shock absorber bolts and lockwashers.
- Pull off the rear shock absorbers.

Swing Arm Removal

- For the motorcycle with the rear disc brake, pull the rear brake hose out of the guides on the swing arm.
- Remove the torque link rear bolt, and rest the rear caliper on some kind of stand.
- Remove the drive chain cover mounting screws or bolts, and take off the cover.
- Remove the pivot shaft nut and pull out the pivot shaft.
- Pull back the swing arm. A cap on each side of the pivot will also drop off.

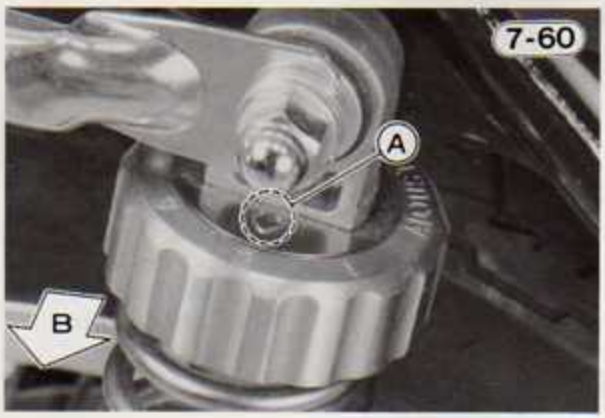
Installation Note:

Swing Arm Installation

1. Put the left side of the swing arm through the drive chain loop.
2. Install the pivot shaft nut, and tighten the nut to 10.0 kg-m (72 ft-lbs) of torque.
3. Move the swing arm up and down to check for abnormal friction.

Rear Shock Absorber Installation

4. Tighten the shock absorber bolts and nuts to 3.0 kg-m (22 ft-lbs) of torque. The arrow on the upper bracket of each absorber must point toward the out side.



A. Arrow B. Outside

Swing Arm Disassembly:

Swing Arm Disassembly

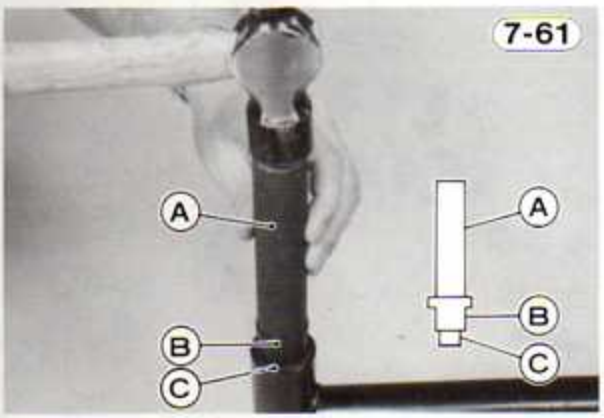
NOTE: 1. As the swing arm needle bearings will be damaged upon removal, be sure to have new ones on hand prior to disassembly.

- Remove the caps off both end.
- Take out the torque link nut, lockwasher, and bolt, and then remove the torque link from the swing arm.
- Pull out the swing arm sleeve.
- Insert a bar into the swing arm pivot, hammering on them lightly to knock out the needle bearings.

Swing Arm Assembly

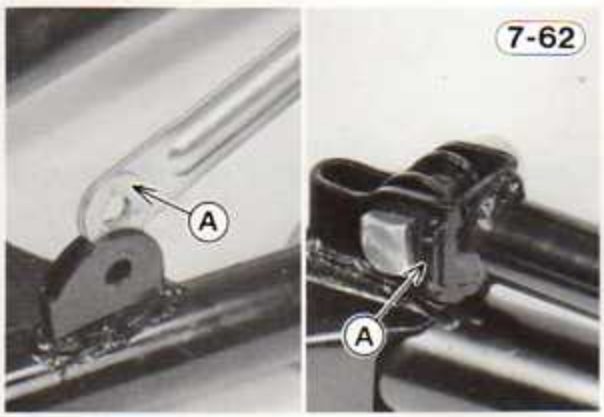
NOTE: 1. Inspect the swing arm sleeve (Pg. 2-16), and replace it with a new one if it has worn past the service limit or is damaged. Also, replace all needle bearings whenever the sleeve is replaced.

2. Replace the needle bearings with new ones if any one has been damaged or removed (Pg. 2-16).
3. Apply oil to the outside surface of the bearings, and install them into the swing arm using the bearing drivers and holder (special tools).

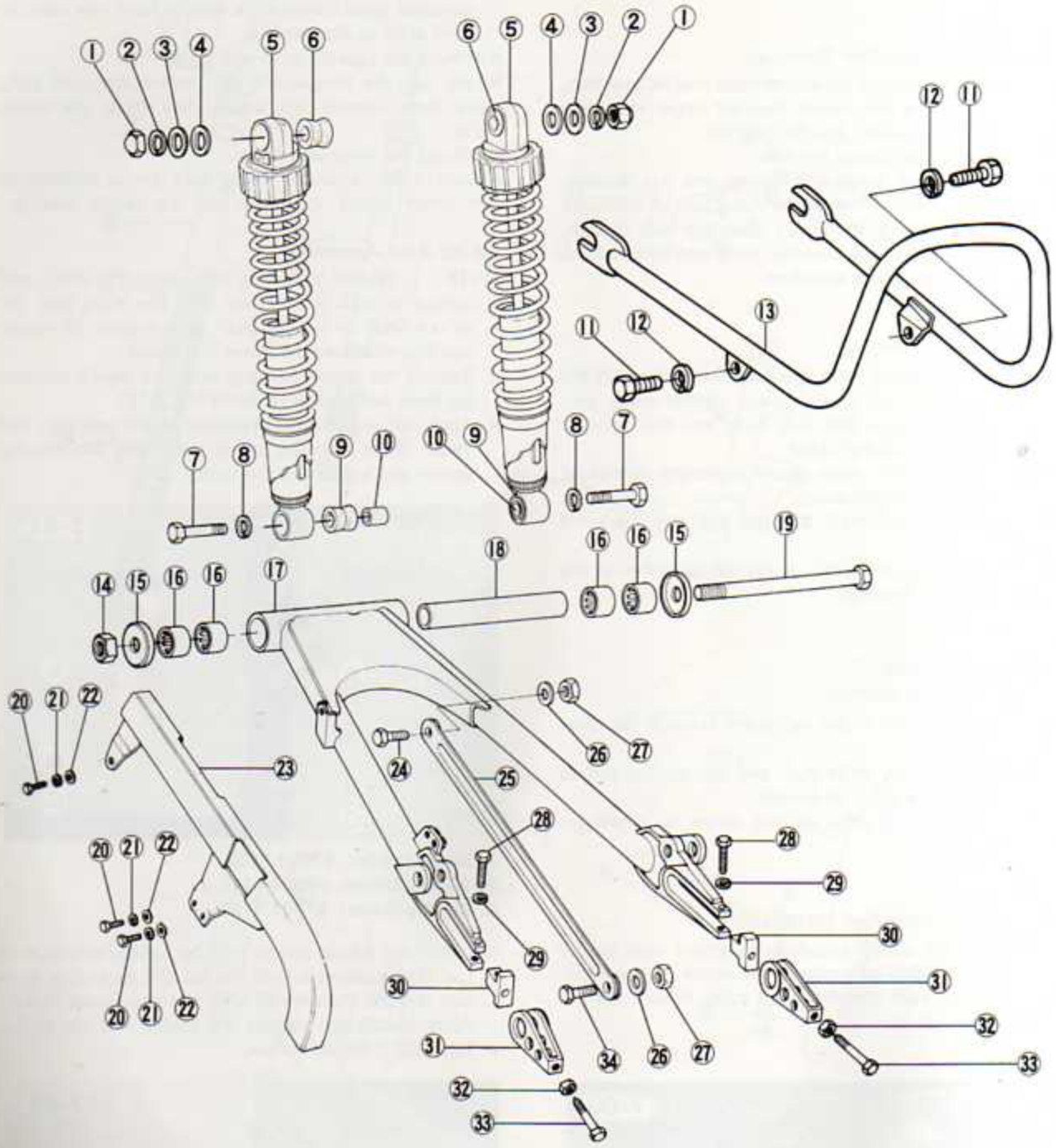


A. Driver Holder: 57001-1132
B. Bearing Driver: 57001-1142
C. Bearing Driver: 57001-1138

4. Install the torque link so that the welded side faces in (on the motorcycle with the rear disc brake), or faces out (on the motorcycle with the rear drum brake). After installation tighten the torque link nut to 3.0 kg-m (22 ft-lbs) of torque.



A. Welded Side



1. Shock Absorber Mounting Cap Nut
2. Lockwasher
3. Flat Washer
4. Flat Washer
5. Shock Absorber
6. Rubber Bushing
7. Shock Absorber Mounting Bolt
8. Lockwasher
9. Rubber Bushing
10. Collar
11. Grab Rail Mounting Bolt
12. Lockwasher
13. Grab Rail
14. Pivot Shaft Nut
15. Cap
16. Needle Bearing
17. Swing Arm
18. Sleeve
19. Swing Arm Pivot Shaft
20. Chain Cover Mounting Bolt
21. Lockwasher
22. Flat Washer
23. Drive Chain Cover
24. Torque Link Bolt
25. Torque Link
26. Lockwahser
27. Nut
28. Chain Adjuster Stop Bolt
29. Lockwasher
30. Chain Adjuster Stop
31. Chain Adjuster
32. Locknut
33. Chain Adjusting Bolt

Appendix

Table of Contents

TROUBLESHOOTING GUIDE 8-2
ADDITIONAL CONSIDERATIONS FOR RACING 8-6
UNIT CONVERSION TABLE 8-8

TROUBLESHOOTING GUIDE

NOTE: 1. 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. Electrical troubleshooting is not covered here due to its complexity. For electrical problems, refer to the appropriate heading in the Maintenance Section (Pg. 5-1).

Engine Doesn't Start, Starting Difficulty

Starter motor not rotating
- Clutch lever not pulled
- Starter lockout switch trouble
- Starter motor trouble
- Battery voltage low
- Relay not contacting or operating
- Starter button not contacting
- Wiring open or shorted
- Ignition switch trouble
- Engine stop switch trouble
- Engine stop switch off
- Fuse blown

Starter motor rotating but engine doesn't turn over
- Starter motor clutch trouble

Engine won't turn over
- Valve seizure
- Valve lifter seizure
- Cylinder, piston seizure
- Crankshaft seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or bearing seizure
- Camshaft seizure
- Secondary shaft bearing seizure
- Primary chain broken

No fuel flow
- No fuel in tank
- Sticking of the valve in the automatic fuel tap
- Fuel tap vacuum hose clogged
- Tank cap air vent obstructed
- Fuel tap clogged
- Fuel line clogged
- Float valve clogged

Engine flooded
- Fuel level too high
- Float valve worn or stuck open
- Starting technique faulty
- (When flooded, push the starter button with the throttle fully open to allow more air to reach the engine.)

No spark; spark weak
- Battery voltage low
- Ignition switch not on
- Engine stop switch turned off
- 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 or engine stop switch shorted
- Wiring shorted or open

Compression low
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston 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
- Air 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 too high or too low
- Fuel tank air vent obstructed
- Carburetor holder loose
- Air cleaner duct loose

Compression low
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston ring bad (worn, weak, broken, or sticking)
- Piston ring/land clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve spring broken or weak
- Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)
- Acceleration poor
- Accelerator pump trouble

Other
- Timing not advancing (spring broken or stretched)
- Carburetors not synchronizing
- Throttle valve doesn't slide smoothly
- Engine oil viscosity too high
- Brake dragging
- Air suction valve trouble
- Vacuum switch valve trouble

Poor Running or No Power at High Speed

Firing incorrect
- Spark plug dirty, broken, or maladjusted

Spark plug cap 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
Timing not advancing

Fuel/air mixture incorrect
Starter plunger stuck open
Main jet clogged or wrong size
Jet needle or needle jet worn
Jet needle clip in wrong position
Air jet clogged
Fuel level too high or too low
Bleed holes of air bleed pipe or needle jet clogged
Air cleaner clogged, poorly sealed, or missing
Air cleaner duct poorly sealed
Water or foreign matter in fuel
Carburetor holder loose
Air cleaner duct loose
Fuel tank air vent obstructed
Fuel tap clogged
Fuel line clogged

Compression low
Spark plug loose
Cylinder head not sufficiently tightened down
No valve clearance
Cylinder, piston worn
Piston ring bad (worn, weak, broken, or sticking)
Piston ring/land clearance excessive
Cylinder head gasket damaged
Cylinder head warped
Valve spring broken or weak
Valve not seating properly (valve bent, worn or carbon accumulation on the seating surface.)

Knocking
Carbon built up in combustion chamber
Fuel poor quality or incorrect
Spark plug incorrect

Miscellaneous
Throttle valve won't fully open
Throttle valve doesn't slide smoothly
Timing not advancing
Brake dragging
Clutch slipping
Overheating
Engine oil level too high
Engine oil viscosity too high
Air suction valve trouble
Vacuum switch valve trouble

Overheating

Firing incorrect
Spark plug dirty, broken, or maladjusted
Spark plug incorrect

Fuel/air mixture incorrect
Main jet clogged or wrong size
Fuel level too low
Carburetor holder loose
Air cleaner poorly sealed, or missing
Air cleaner duct poorly sealed
Air cleaner clogged

Compression high
Carbon built up in combustion chamber

Engine load faulty
Clutch slipping
Engine oil level too high
Engine oil viscosity too high
Brake dragging

Lubrication inadequate
Engine oil level too low
Engine oil poor quality or incorrect

Clutch Operation Faulty

Clutch slipping
No clutch lever play
Friction plate worn or warped
Steel plate worn or warped
Clutch spring broken or weak
Clutch release maladjusted
Clutch cable maladjusted
Clutch inner cable catching
Clutch release mechanism trouble
Clutch hub or housing unevenly worn

Clutch not disengaging properly
Clutch lever play excessive
Clutch plate warped or too rough
Clutch spring tension uneven
Engine oil deteriorated
Engine oil viscosity too high
Engine oil level too high
Clutch housing frozen on drive shaft
Clutch release mechanism trouble
Loosen clutch hub locknut

Gear Shifting Faulty

Doesn't go into gear; shift pedal doesn't return
Clutch not disengaging
Shift fork bent or seized
Gear stuck on the shaft
Shift drum positioning pin binding
Shift return spring weak or broken
Shift return spring pin loose
Shift mechanism arm spring broken
Shift lever broken
Shift mechanism arm broken
Shift pawl broken

Jumps out of gear
Shift fork worn
Gear groove worn
Gear dogs, dog holes, and/or dog recesses worn
Shift drum groove worn
Shift drum positioning pin spring weak or broken
Shift fork pin worn
Drive shaft, output shaft, and/or gear splines worn

Overshifts
Shift drum positioning pin spring weak or broken
Overshift limiter pawl broken
Shift mechanism arm spring broken

Abnormal Engine Noise

Knocking
- 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
- Valve lifter worn

Other noise
- Connecting rod small end clearance excessive
- Connecting rod big end clearance excessive
- Piston ring worn, broken or stuck
- Piston seizure, damage
- Cylinder head gasket leaking
- Exhaust pipe leaking at cylinder head connection
- Crankshaft runout excessive
- Engine mounts loose
- Crankshaft bearing worn
- Primary chain worn
- Camshaft chain tensioner trouble
- Camshaft chain, sprocket, guide worn
- Loose alternator rotor
- Air suction valve damaged
- Vacuum switch valve damaged

Abnormal Drive Train Noise

Clutch noise
- Weak or damaged shock rubber damper
- Clutch housing/friction plate clearance excessive

Transmission noise
- Bearing worn
- Transmission gear worn or chipped
- Metal chip jummed in gear teeth
- Engine oil insufficient

Drive chain noise
- Drive chain adjusted improperly
- Chain worn
- Rear, engine sprocket worn
- Chain lubrication insufficient
- Rear wheel misaligned

Abnormal Frame Noise

Front fork noise
- Oil insufficient or too thin
- Spring weak or broken

Rear shock absorber noise
- Shock absorber defective

Disc brake noise
- Pad installed incorrectly
- Pad surface glazed
- Disc warped
- Caliper trouble
- Cylinder damaged

Other noise
- Bracket, nut, bolt, etc. not properly mounted or tightened

Exhaust Smokes Excessively

White smoke
- Piston oil ring worn
- Cylinder worn
- Valve oil seal damaged
- Valve guide worn
- O-ring at the cylinder oil passage orifices are damaged
- Engine oil level too high

Black smoke
- Air cleaner clogged
- Main jet too large or fallen off
- Starter plunger stuck open
- Fuel level too high

Brown smoke
- Main jet too small
- Fuel level too low
- Air cleaner duct loose
- Air cleaner poorly sealed or missing

Handling and/or Stability Unsatisfactory

Handlebar hard to turn
- Steering stem locknut too tight
- Bearing ball damaged
- Race dented or worn
- Steering stem lubrication inadequate
- Steering stem bent
- Tire air pressure too low

Handlebar shakes or excessively vibrates
- Tire worn
- Swing arm needle bearing worn
- Rim warped, or not balanced
- Spokes loose
- Front, rear axle runout excessive
- Wheel bearing worn
- Handlebar clamp loose
- Steering stem head bolt and/or clamp bolt loose

Handlebar pulls to one side
- Frame bent
- Wheel misalignment
- Swing arm bent or twisted
- Steering stem bent
- Front fork bent
- Right/left fork legs oil level uneven
- Right/left fork legs air pressure uneven
- Right/left rear shock absorbers unbalanced

Shock absorption unsatisfactory
- Too hard:
- Front fork oil excessive
- Front fork oil viscosity too high
- Front fork air pressure too high
- Tire air pressure too high

Rear shock absorber maladjusted
Front fork bent
Too soft:
Front fork oil insufficient and/or leaking
Front fork oil viscosity too low
Front fork air pressure too low
Front fork, rear shock absorber spring weak
Rear shock absorber oil leaking

Brakes Don't Hold

Disc brake

Air in the brake line
Pad or disc worn
Brake fluid leak
Disc warped
Contaminated pad
Brake fluid deteriorated
Primary or secondary cup trouble
Master cylinder scratched inside

Drum brake

Brake maladjusted
Brake lining or drum worn
Overheated
Water in brake drum
Brake cam, camshaft worn
Oil on brake linings

Oil Pressure Indicator Light Goes On

Engine oil pump defective
Engine oil pump screen clogged
Engine oil level too low
Engine oil viscosity too low
Camshaft bearings worn
Crankshaft bearings worn
Oil pressure switch trouble
Wiring trouble
Relief valve stuck open

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)
Regulator/rectifier trouble
Ignition switch trouble
Alternator trouble
Wiring faulty

ADDITIONAL CONSIDERATIONS FOR RADING

This motorcycle has been manufactured for use in a reasonable and prudent manner and as a vehicle only. However, some may wish to subject this motorcycle to abnormal operation, such as would be experienced under racing conditions. KAWASAKI STRONGLY RECOMMENDS THAT ALL RIDERS RIDE SAFELY AND OBEY ALL LAWS AND REGULATIONS CONCERNING THEIR MOTORCYCLE AND ITS OPERATION.

Racing should be done under supervised conditions, and recognized sanctioning bodies should be contacted for further details. For those who desire to participate in competitive racing or related use, the following technical information may prove useful. However, please note the following important points.

- You are entirely responsible for the use of your motorcycle under abnormal conditions such as racing, and Kawasaki shall not be liable for any damages which might arise from such use.
- Kawasaki's Limited Motorcycle Warranty and Limited Emission Control System Warranty specifically exclude motorcycles which are used in competitive or related uses. Please read the warranty carefully.
- Motorcycle racing is a very sophisticated sport, subject to many variables. The following information is theoretical only, and Kawasaki shall not be liable for any damages which might arise from alterations utilizing this information.
- When the motorcycle is operated on public roads, it **must** be in its original state in order to ensure safety and compliance with applicable emission regulations.

Carburetors:

Sometimes an alteration may be desirable for improved performance under special conditions when proper mixture is not obtained after the carburetor has been properly adjusted, and all parts cleaned and found to be functioning properly.

A certain amount of adjustment can be made by changing the position of the needle. There are five grooves at the top of the needle. Changing the position of the clip to a groove closer to the bottom raises the needle, which makes the mixture richer at a given position of the throttle valve.

Jet Needle (8-1)



NOTE: 1. The last digit of the jet needle number (Example: "4" of "5CN15-4") is not stamped on the needle, but is the number of the standard groove in which the clip is set. The groove numbers are counted from the top of the needle, 1 being the topmost groove, and 5 being the lowest groove.

If the engine still exhibits symptoms of overly lean carburetion after all maintenance and adjustments are correctly performed, the main jet can be replaced with a larger one. A larger numbered jet gives a richer mixture.

Spark Plugs:

The spark plugs ignite the fuel/air mixture in the combustion chamber. To do this effectively and at the proper time, the correct spark plugs must be used, and the spark plugs must be kept clean and adjusted.

Test have shown the NGK B7ES or ND W22ES-U set to a 0.7 – 0.8 mm gap to be the best plug for general use.

Since spark plug requirements change with the ignition and carburetion adjustments and with riding conditions, whether or not spark plugs of a correct heat range are used should be determined by removing and inspecting the plugs.

When a plug of the correct heat range is being used, the electrodes will stay hot enough to keep all the carbon burned off, but cool enough to keep from damaging the engine and the plug itself. This temperature is about 400 – 800°C (750 – 1,450°F) and can be judged by noting the condition and color of the ceramic insulator around the center electrode. If the ceramic is clean and of a light brown color, the plug is operating at the right temperature.

A spark plug for higher operating temperatures is used for racing. Such a plug is designed for better cooling efficiency so that it will not overheat and thus is often called a "colder" plug. If a spark plug with too high a heat range is used – that is, a "cold" plug that cools itself too well – the plug will stay too cool to burn off the carbon, and the carbon will collect on the electrodes and the ceramic insulator. This carbon conducts electricity, and can short the center electrode to ground by either coating the ceramic insulator or bridging across the gap. Such a short will prevent an effective spark. Carbon build-up on the plug can also cause other troubles. It can heat up red-hot and cause preignition and knocking, which may eventually burn a hole in the top of the piston.

To check the spark plugs:

Remove each plug and inspect the ceramic insulator. Whether or not the right temperature plug is being used can be ascertained by noting the condition of the ceramic insulator around the electrode. A light brown color indicates the correct plug is being used. If the ceramic is white, the plug is operating at too high a temperature and it should be replaced with the next colder type (NGK B8ES).

Spark Plug Condition (8-2)



Carbon Fouling | Oil Fouling | Normal Operation | Overheating

The heat range of the spark plug functions like a thermostat for the engine. Using the wrong type of spark plug can make the engine run too hot (resulting in engine damage) or too cold (with poor performance, misfiring, and stalling). The standard plug has been selected to match the normal usage of this motorcycle in combined street and highway riding. Unusual riding conditions may require a different spark plug heat range. For racing, install the NGK B8ES plug (colder).

CAUTION **If the spark plugs are replaced with a type other than those mentioned below, make certain the replacement plugs have the same thread pitch and reach (length of threaded portion) as the standard plugs.**

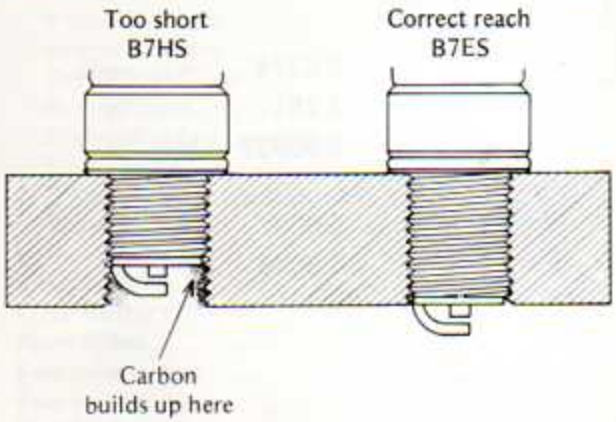
Table 8-1 Spark Plug

Required Plug Threads	Riding Condition	Heat Range	NGK ND
Diameter: 14 mm Pitch: 1.25 mm Reach: 19.0 mm	Normal	Normal	B7ES W22ES-U
	Racing	High (Colder)	B8ES W24ES

If the plug reach is too short, carbon will build up on the plug hole threads in the cylinder head, causing overheating and making it very difficult to insert the correct spark plug later.

If the reach is too long, carbon will build up on the exposed spark plug threads causing overheating, preignition, and possibly burning a hole in the piston top. In addition, it may be impossible to remove the plug without damaging the cylinder head.

Spark Plug Reach (8-3)



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 Length

km	x	0.6214	=	mile
m	x	3.281	=	ft
mm	x	0.03937	=	in
mile	x	1.609	=	km
ft	x	0.3048	=	m
in	x	25.4	=	mm

Units of Mass

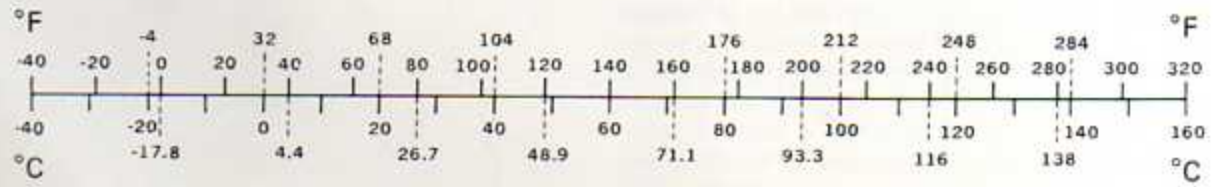
kg	x	2.205	=	lbs
g	x	0.03527	=	oz
lb	x	0.4536	=	kg
oz	x	28.35	=	g

Units of Torque

kg-m	x	7.233	=	ft-lbs
kg-m	x	86.80	=	in-lbs
ft-lbs	x	0.1383	=	kg-m
in-lbs	x	0.01152	=	kg-m

Units of Temperature

$$\frac{9\,(°C + 40)}{5} - 40 = °F \qquad \frac{5\,(°F + 40)}{9} - 40 = °C$$



Units of Volume

liter	x	0.2642	=	gal (US)
liter	x	0.2200	=	gal (imp)
liter	x	1.057	=	qt (US)
liter	x	0.8799	=	qt (imp)
liter	x	2.113	=	pint (US)
liter	x	1.816	=	pint (imp)
cc	x	0.03381	=	oz (US)
cc	x	0.02816	=	oz (imp)
cc	x	0.06102	=	cu in
gal (US)	x	3.785	=	liter
gal (imp)	x	4.546	=	liter
qt (US)	x	0.9464	=	liter
qt (imp)	x	1.137	=	liter
pint (US)	x	0.4732	=	liter
pint (imp)	x	0.5506	=	liter
oz (US)	x	29.57	=	cc
oz (imp)	x	35.51	=	cc
cu in	x	16.39	=	cc

Units of Power

kW	x	1.341	=	hp
hp	x	0.7457	=	kW

Units of Pressure

kg/cm^2	x	98.07	=	kPa
kg/cm^2	x	14.22	=	psi
kPa	x	0.01020	=	kg/cm^2
kPa	x	0.1450	=	psi
psi	x	0.07031	=	kg/cm^2
psi	x	6.895	=	kPa

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