Kawasaki

KZ750 Twin

Motorcycle Service Manual

Second Edition ① : June 1, 1981 Ⓜ

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 machanics, 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.

Whenever you see the symbols shown below, heed their instructions! Always follow safe operating and maintenance practices.

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

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

"NOTE" indicates points of particular interest for more efficient and convenient operation.

This manual is divided into the following sections:

(1) Adjustment

The adjustment section gives the procedure for all adjustments which may become necessary periodically and which do not involve major disassembly.

(2) Disassembly

This section shows the best method for the removal,disassembly, assembly, and installation which are necessary for maintenance and repair. Since assembly and installation are usually the reverse of disassembly and removal, assembly and installation are not explained in detail in some cases. Instead, assembly notes and installation notes are provided to explain special points.

In cases the removal procedures are apparent without explanation such as for the seat or side stand, no information is given.

(3) Maintenance

The procedures for inspection and repair are described in detail in this section. An explanation on the structure and functioning of each of the major parts and assemblies is given to enable the mechanic to better understand what he is doing.

(4) Appendix

The appendix in the back of this manual contains miscellaneous information, including a special tool list and wiring diagrams.

(5) Supplement

The maintenance and repair procedures, that are unique to the variation models since the first publication of the Service Manual, are explained in this section per each variation model.

Since this Service Manual is based on first production units of the KZ750-B4, there may be minor discrepancies between some vehicles and the illustrations and text in this manual. Explanation on major changes and additions pertaining to later year units will be added in the end of the supplement by a new edition, as required.

EMISSION CONTROL INFORMATION

To protect the environment in which we all live, Kawasaki has incorporated two emission control systems in compliance with the applicable regulations of the United States Environmental Protection Agency.

1. Crankcase Emission Control System

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

2. Exhaust Emission Control System

   This system reduces the amount of pollutants discharged into the atmosphere by the exhaust of this motorcycle. The fuel and ignition systems of this motorcycle have been carefully designed and constructed to ensure an efficient engine with low exhaust pollutant levels.

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

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

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

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

Note: The phrase "remove or render inoperative any device or element of design" has been generally interpreted as follows:

1. Tampering does not include the temporary removal or rendering inoperative of devices or elements of design in order to perform maintenance.

EMISSION CONTROL INFORMATION (CONT.)

2. Tampering could include:
   a. Maladjustment of vehicle components such that the emission standards are exceeded.
   b. Use of replacement parts or accessories which adversely affect the performance or durability of the motorcycle.
   c. Addition of components or accessories that result in the vehicle exceeding the standards.
   d. Permanently removing, disconnecting, or rendering inoperative any component or element of design of the emission control systems.

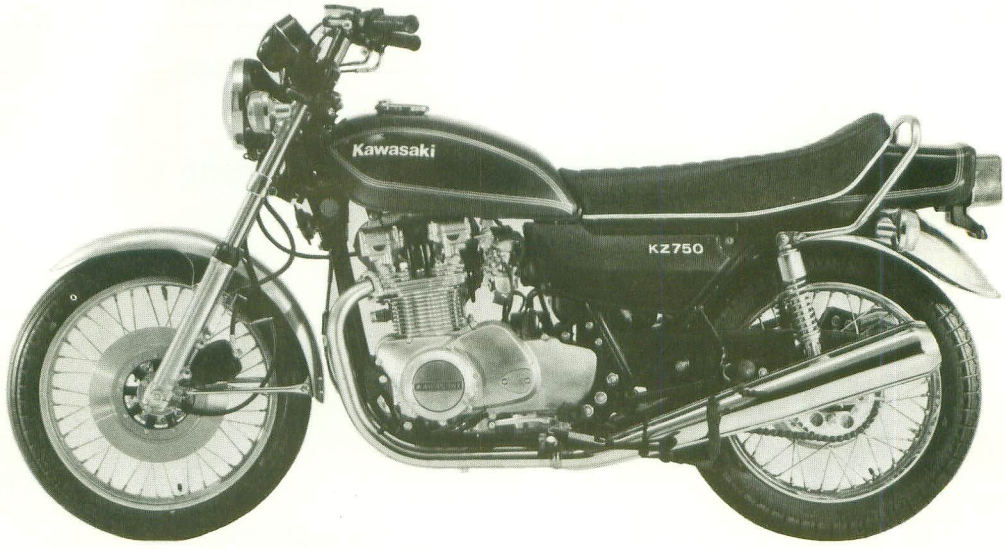
WE RECOMMEND THAT ALL DEALERS OBSERVE THESE PROVISIONS OF FEDERAL LAW, THE VIOLATION OF WHICH IS PUNISHABLE BY CIVIL PENALTIES NOT EXCEEDING $10,000 PER VIOLATION.

QUICK REFERENCE GUIDE

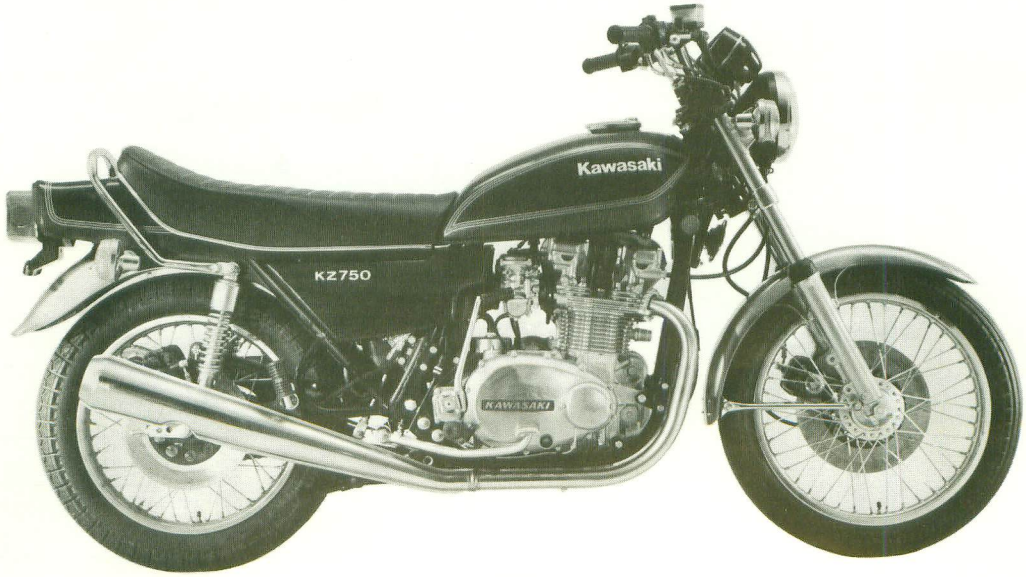
To use, bend the manual back and match the desired section below against the black spot showing at the edge of these pages.

Model Identification

KZ750-B4 Left Side View



KZ750-B4 Right Side View



A

Specifications

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SPECIFICATIONS

		KZ750-B4
Dimensions		
Overall length		2,150 mm
Overall width		855 mm
Overall height		1,195 mm
Wheelbase		1,450 mm
Road clearance		145 mm
Dry weight		218 kg
Fuel tank capacity		14.5 ℓ
Performance		
Climbing ability		26°
Braking distance		12 m @50 kph
Minimum turning radius		2.5 m
Engine		
Type		DOHC 2 cylinder, 4 stroke, air cooled
Bore and stroke		78 x 78 mm
Displacement		745 cc
Compression ratio		8.5
Maximum horsepower		55 HP @7,000 rpm
Maximum torque		6.0 kg-m @3,000 rpm
Valve timing		
Inlet	Open	30° BTDC
	Close	50° ABDC
	Duration	260°
Exhaust	Open	70° BBDC
	Close	30° ATDC
	Duration	280°
Carburetors		Mikuni BS38 x 2
Lubrication system		Forced lubrication (wet sump)
Engine oil		SE class SAE 10W40, 10W50, 20W40 or 20W50
Engine oil capacity		4.0 ℓ
Starting system		Electric and kick
Ignition system		Battery and coil
Ignition timing		From 5° BTDC @1,000 rpm to 30° BTDC @3,750 rpm
Spark plugs		NGK B6ES or ND W20ES-U
Transmission		
Type		5-speed, constant mesh, return shift
Clutch		Wet, multi disc
Gear ratio:	1st	2.33 (35/15)
	2nd	1.63 (31/19)
	3rd	1.27 (28/22)
	4th	1.04 (26/25)
	5th	0.89 (24/27)
Primary reduction ratio		2.48 (57/23)

Final reduction ratio		2.38 (38/16)
Overall drive ratio		5.23 (@Top gear)

Electrical Equipment

Generator (Dynamo)	Nippon Denso 037000-1330
Regulator	Shindengen SH221-12
Ignition coil	Nippon Denso AJPG36
Battery	Nippon Denchi GM14Z-3A (12V 14AH)
Starter	Mitsuba SM-224
Headlight type	Sealed Beam
Headlight	12V 50/35W
Tail/Brake light	12V 8/27W (3/32 CP)
Turn signal/Running position lights	12V 23/8W
Turn signal lights	12V 23W
Meter lights	12V 3.4W
Indicator lights	12V 3.4W
Horn	12V 2.5A

Frame

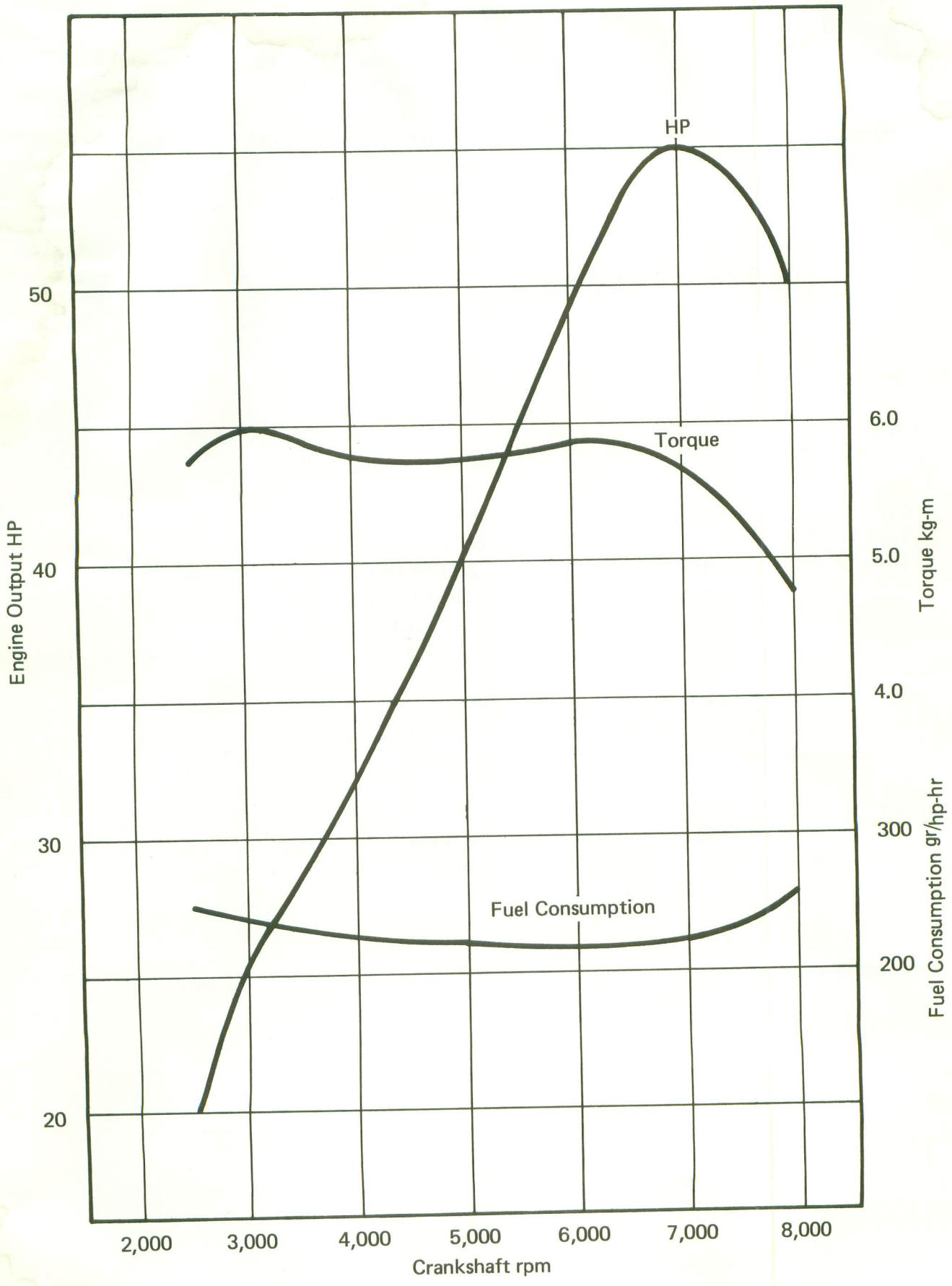
Type		Tubular, double cradle
Steering angle		39° to either side
Castor		26.5°
Trail		105 mm
Tire size	Front	3.25H-19 4PR
	Rear	4.00H-18 4PR
Suspension	Front	Telescopic fork
	Rear	Swing arm
Suspension stroke	Front	140 mm
	Rear	80 mm
Front fork oil capacity (each fork)		176 ~ 184 cc
Front fork oil type		SAE 15W

Brakes

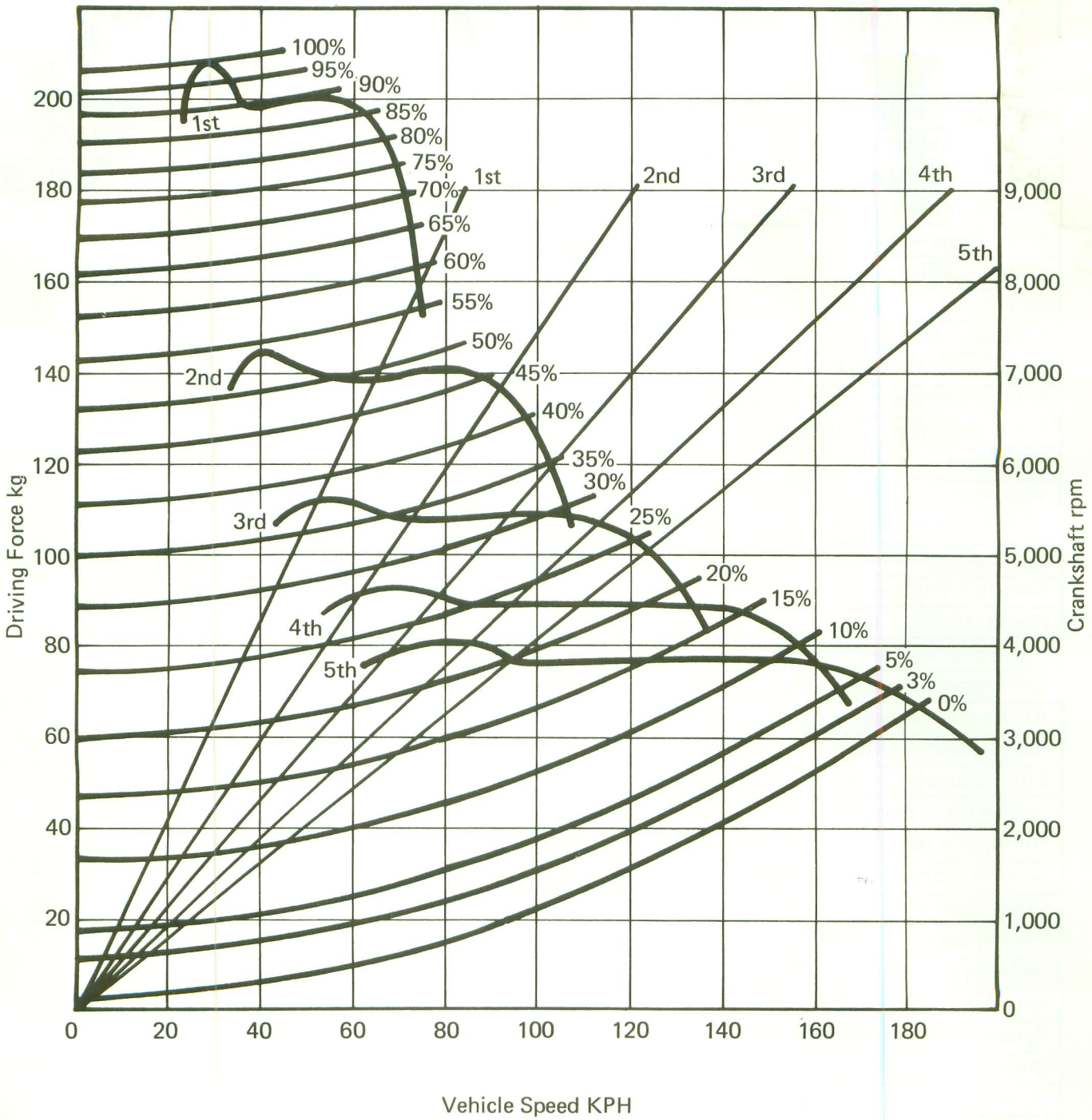
Type	Front and Rear	Disc brake
Effective disc diameter	Front	250 mm
	Rear	230 mm

Specifications subject to change without notice.

ENGINE PERFORMANCE CURVES (KZ750-B4)



RUNNING PERFORMANCE CURVES (KZ750-B4)



10 SPECIFICATIONS

PERIODIC MAINTENANCE CHART

The maintenance and adjustments 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	•	•	•	•	•	•	•	190
Brake adjustment — check †		•	•	•	•	•	•	•	25
Brake wear — check †			•	•	•	•	•	•	181,182
Brake fluid level — check †	month	•	•	•	•	•	•	•	181
Brake fluid — change	year			•		•		•	179
Clutch — adjust		•	•	•	•	•	•	•	20
Carburetors — adjust		•	•	•	•	•	•	•	18
Throttle cables — adjust		•	•	•	•	•	•	•	16
Steering play — check †		•	•	•	•	•	•	•	26
Spoke tightness and rim runout — check †		•	•	•	•	•	•	•	172
Drive chain wear — check †			•	•	•	•	•	•	175
Front fork — inspect/clean		•	•	•	•	•	•	•	185
Rear shock absorbers — inspect		•	•	•	•	•	•	•	187
Nuts, Bolts, Fasteners — check and torque		•		•		•		•	33 ~ 36
Spark plugs — clean and gap †		•	•	•	•	•	•	•	12
Camshaft chain — adjust		•	•	•	•	•	•	•	14
Points, timing — check †		•	•	•	•	•	•	•	12
Valve clearance — check †		•	•	•	•	•	•	•	15
Air cleaner element — clean			•		•		•		130
Air cleaner element — replace	5 cleanings		•		•		•		130
Fuel system — clean		•	•	•	•	•	•	•	21,170
Tire tread wear — check †			•	•	•	•	•	•	170
Engine oil — change	year	•	•	•	•	•	•	•	21
Oil filter — replace		•		•		•		•	21
General lubrication — perform			•	•	•	•	•	•	28
Front fork oil — change				•		•		•	185
Timing advancer — lubricate				•		•		•	197
Swing arm — lubricate				•		•		•	188
Wheel bearings — grease	2 years					•			174
Speedometer gear housing — grease	2 years					•			174
Steering stem bearings — grease	2 years					•			183
Drive chain — lubricate	Every 300 km								175
Drive chain — adjust	Every 800 km								24

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

Adjustment–Engine

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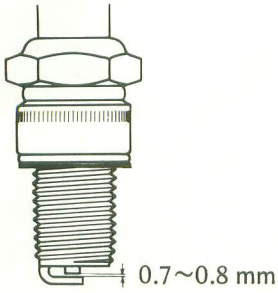
SPARK PLUGS

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 inside part. In accordance with the Periodic Maintenance Chart (Pg. 10), the plug should be removed for inspection, cleaning and to reset the gap.

- Remove the spark plugs using a spark plug wrench.
- 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.

Spark Plug (B1)



- Tighten the spark plugs in the cylinder head with 2.5~3.0 kg-m (18.5~22.0 ft-lbs) of torque.

NOTE: Refer to electrical maintenance section, page 197, for detailed spark plug information.

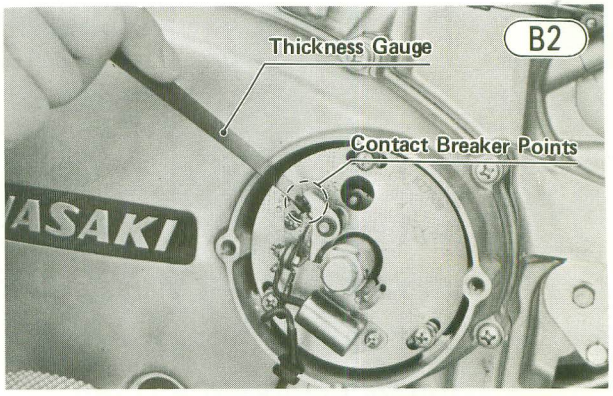
IGNITION TIMING

Incorrect ignition timing can cause poor performance, knocking, overheating, and serious engine damage. Periodic adjustment will be necessary to compensate for wear of parts, and the ignition timing must be checked whenever ignition related parts have been disassembled or replaced.

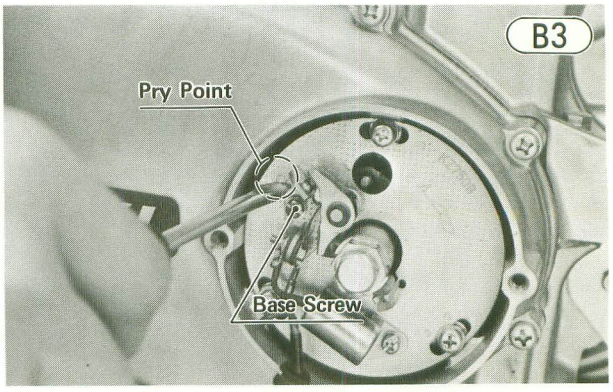
Correct ignition timing is achieved by first obtaining the correct contact breaker point gap (this can also be achieved by adjusting the dwell angle to the specified amount) and then changing the position of the contact breaker mounting plate. Often the first step returns the timing very close to the correct original setting. Once the timing has been adjusted, it may be checked for accuracy by the use of a strobe light.

Point Gap Adjustment (using a thickness gauge):

- Remove the contact breaker cover.
- Clean the points with clean paper or cloth or using an oil-free solvent. A business card soaked in trichloroethylene can be used to remove traces of oil. To repair light damage, use emery cloth or an oilstone. If the points are badly worn down or damaged, or if the spring is weak, replace the contact breaker.
- Lubricate point cam felt sparingly with suitable point cam lubricant. Do not over lubricate. Replace the felt if it is worn.
- Using a 17 mm wrench on the crankshaft, turn the engine counterclockwise until the contact breaker points are at their widest opening.
- Measure the size of the point gap with a thickness gauge. The proper gap is 0.3 ~ 0.4 mm.



- If the gap is incorrect, loosen the contact breaker base screw just enough to allow the base to move. Open the points using a slot screwdriver on the contact breaker base pry point, and insert a thickness gauge of 0.35 mm between the points. Tighten the contact breaker base screw, and remove the thickness gauge. Again turn the crankshaft, and recheck the point gap.



- Perform the timing adjustment.

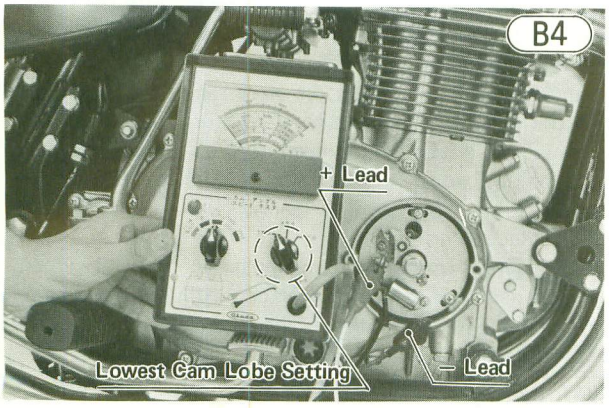
Point Gap Adjustment (using a dwell angle tester):

The most precise means to set the point gap is to use a dwell angle tester instead of a thickness gauge. If a dwell angle tester is available, adjust the dwell angle (point gap) in the following manner.

NOTE: The dwell angle is the angular range for which the contact breaker heel is off the cam lobe. This allows the current to flow in the ignition coil primary winding.

- Remove the contact breaker cover.
- Clean the points with clean paper or cloth, using an oil-free solvent. A business card soaked in trichloroethylene can be used to remove traces of oil. To repair light damage, use emery cloth or an oilstone. If the

points are badly worn down or damaged, or if the spring is weak, replace the contact breaker.
- Lubricate point cam oil felt sparingly with suitable point cam lubricant. Do not over lubricate. Replace oil felt if it is worn.
- Connect the dwell angle tester (–) lead to chassis ground (such as the frame or crankcase) and the (+) lead to the contact breaker terminal.
- If the dwell angle tester is calibrated in degrees, turn the selector knob to the lowest cam lobe setting.



- Start the engine, and let it idle (below 1,050 rpm).

WARNING **Make sure that no tools, clothes, or meter leads ever touch the spinning crankshaft. Touching the crankshaft of a running engine could inflict an injury.**

- Note the reading on the tester. The dwell angle specification is 185~200° for a tester calibrated in degrees and 51.4~55.6% for one calibrated in percentage. If the tester setting is for more than one cam lobe, the reading on the tester must be multiplied by the cam lobe number to obtain the true dwell angle.

Table 1 Relation between Selector Knob Setting and Meter Reading†

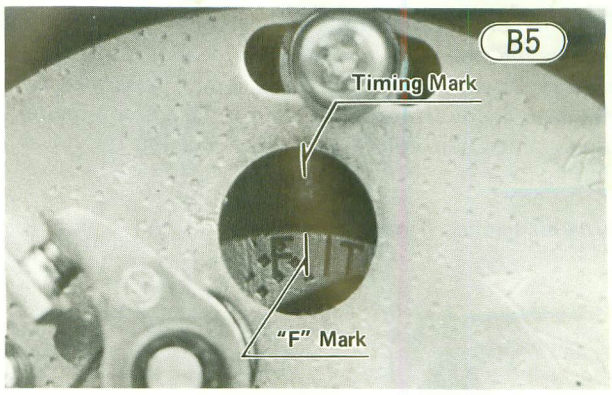
Selector Knob Setting	Dwell Angle Tester Reading
1 cyl.	185.0~200.0°
2 cyls.	92.5~100.0°
3 cyls.	61.5~66.5°
4 cyls.	46.5~50.0°

† Running the engine at idling speed.

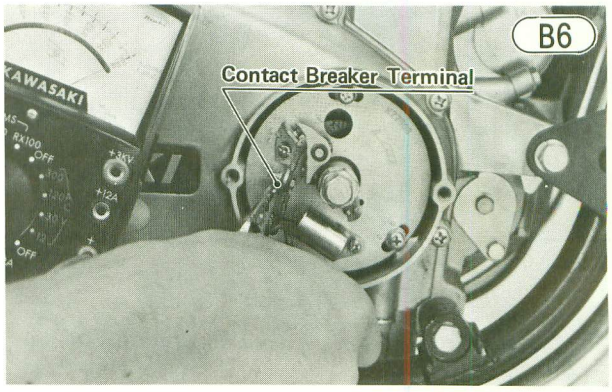
- If the dwell angle is not the same as the specification, loosen the contact breaker base screw just enough so that a slot screwdriver at the contact breaker pry point will be able to change the gap (Fig. B3). Adjust the gap until the dwell angle specification is obtained. Tighten the screw.
- Stop the engine, disconnect the tester.

Timing Test (Static):

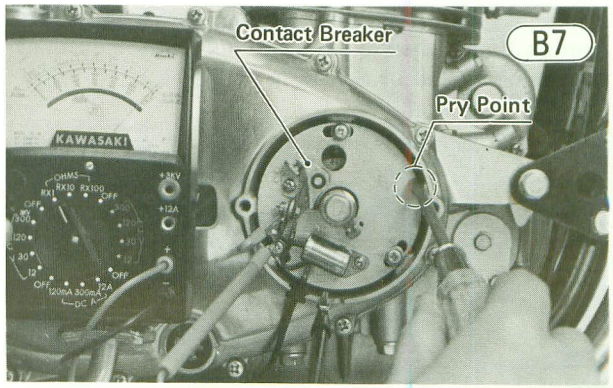
- Check the point gap, and adjust if necessary (Pg. 12).
- With the ignition switch turned off, turn the engine stop switch to one of the "OFF" positions to make the ohmmeter flicker easier to read.
- Turn the crankshaft so that the "F" mark on the timing advancer is aligned with the timing mark as shown in Fig. B5.



- Connect an ohmmeter set to the R x 1 range across the contact breaker points by securing one lead to chassis ground (such as the crankcase), and attaching the other lead firmly on the contact breaker terminal.



- Loosen the contact breaker mounting plate screws (3) just enough to allow the plate to move.
- Using a screwdriver on the contact breaker mounting plate pry point, turn the plate until the contact breaker points are just at the starting to open. The ohmmeter needle starts to rise when the points just begin to open. At this point, tighten the contact breaker mounting plate screws (3).



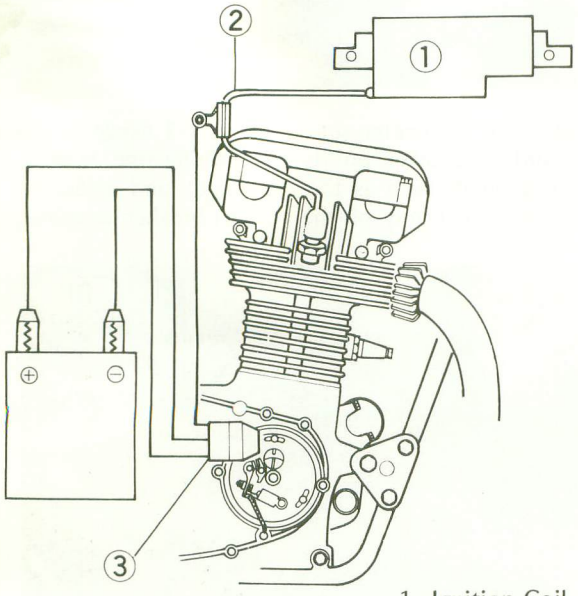
- Turning the crankshaft counterclockwise, check to see if the "F" mark is aligned with the timing mark when the needle jumps. If not, readjust.

- Disconnect the ohmmeter leads, and turn the engine stop switch back to the "RUN" position.
- Check the contact breaker point gap.

Timing Test (Dynamic)

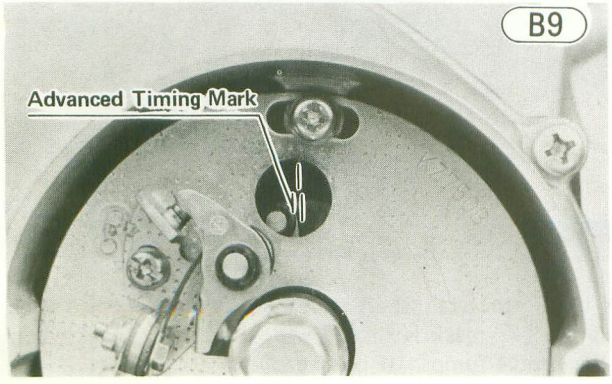
- Check the point gap, and adjust if necessary (Pg. 12).
- Connect a strobe light in the manner prescribed by the manufacturer in order to check the ignition timing under operation conditions. One example is shown in Fig. B8.

Dynamic Ignition Timing Test B8



1. Ignition Coil
2. Spark Plug Lead
3. Strobe Light

- Start the engine, and direct the light at the timing mark. At idle speed the timing mark and the "F" mark on the timing advancer must be aligned for correct low rpm ignition timing. At 3,900 rpm or higher the timing mark and the pair of lines on the timing advancer as shown in Fig. B9 must be aligned for correct high rpm ignition timing. If both low and high rpm ignition timing are incorrect, adjust the timing as just explained. If either low or high rpm ignition timing is correct but the other is not, examine the timing advancer mechanism (Pg. 197).



- Check the contact breaker point gap.
- Install the contact breaker cover.

CAMSHAFT CHAIN

Camshaft chain and chain guide wear cause the chain to develop slack, which will cause noise and may result in engine damage. To keep the chain from making noise, periodic adjustment is necessary in accordance with the Periodic Maintenance Chart (Pg. 10).

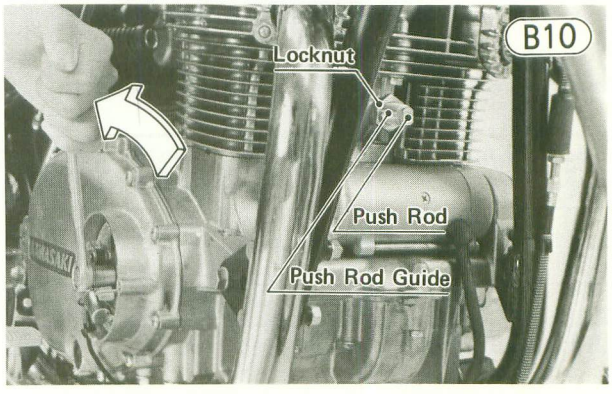
However, if the adjustment fails to keep the chain from making noise, the camshaft chain or chain guides have probably worn past the service limit and will need to be replaced.

NOTE: The camshaft chain must be adjusted when the cylinder head cover is in place. Adjusting the camshaft chain with the cylinder head cover removed will result in improper adjustment.

WARNING **During camshaft chain adjustment, never touch the engine and exhaust pipes or you may suffer burns.**

To adjust the camshaft chain:

- Remove the contact breaker cover.
- Remove the chain tensioner cap and **O** ring.
- Turn the crankshaft counterclockwise while watching the push rod (in the center of the push rod guide) move in and out. Continue turning the crankshaft counterclockwise until the push rod again reaches the innermost position, and then stop.



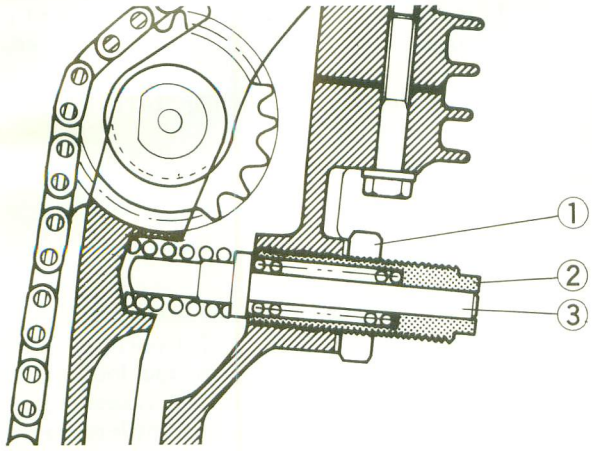
NOTE: Do not turn the crankshaft backwards (clockwise). Turning the crankshaft backwards may cause improper adjustment.

- Loosen the locknut, and turn in the push rod guide until the ends of the push rod guide and push rod are flush.

CAUTION **Be sure that the ends are flush. Never overtighten the push rod guide after the ends are just flush, or the tensioner or chain becomes damaged.**

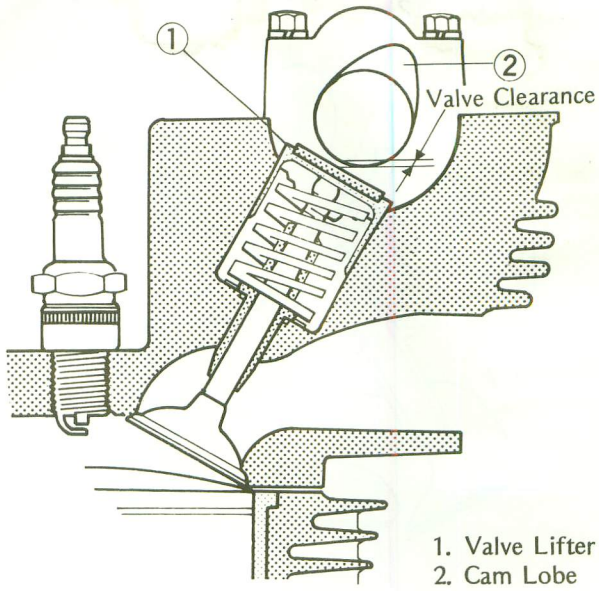
- Tighten the locknut, and install the chain tensioner cap and **O** ring.
- Install the contact breaker cover.

Cam Chain Tensioner Adjustment B11



1. Locknut
2. Push Rod Guide
3. Push Rod

Valve Clearance Measurement B12



1. Valve Lifter
2. Cam Lobe

VALVE CLEARANCE

Valve and valve seat wear decreases valve clearance, upsetting valve timing. 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 (Pg. 10) and any time that clearance may have been affected by disassembly.

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: Valve clearance must be checked when the engine is cold.

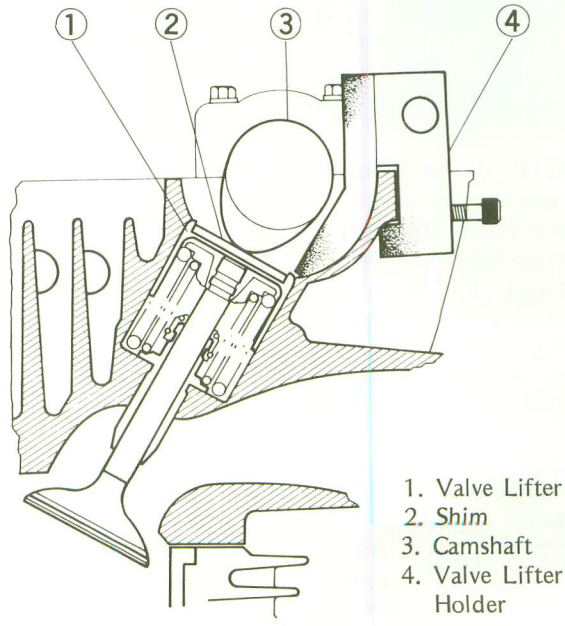
To check and adjust the valve clearance:

- Remove the fuel tank (Pg. 39).
- Remove the spark plug cap from both plugs.
- Disconnect the ignition coil blue lead and yellow/red lead (Fig. E21).
- Take out the bolts, nuts, flat washers, and lock washers, and remove the brackets connecting the cylinder head cover to the frame (Fig. E22).
- Remove the cylinder head cover bolts (14), and lift the cover off the cylinder head and out of the way (Fig. E34).
- Remove the contact breaker cover.
- Using a 17 mm wrench on the crankshaft and checking one valve at a time, turn the crankshaft so that the cam lobe (highest part of the cam) is pointing directly away from the valve lifter.
- Measure the clearance between the cam and the shim in the top of the valve lifter. The correct clearance is 0.05 ~ 0.10 mm.
- 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.

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

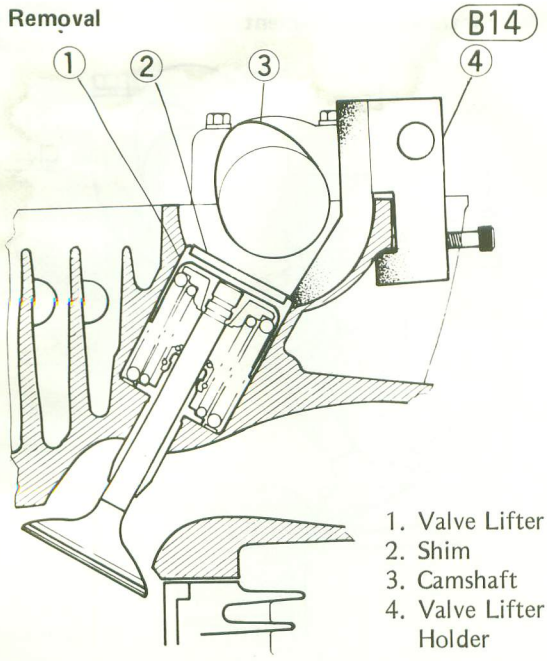
- Use the valve lifter holder (special tool), according to the following instructions, to hold the valve lifter down; and then remove the shim.
  - ○Turn the crankshaft so that the cam points away from the lifter. Position the notch in the lifter so it points toward the opposite camshaft. This will allow the shim to be lifted and grasped later.
  - ○Turn the crankshaft so that the cam is pushing the lifter down.
  - ○Fit the tool in place.

Valve Lifter Holder B13



1. Valve Lifter
2. Shim
3. Camshaft
4. Valve Lifter Holder

Shim Removal

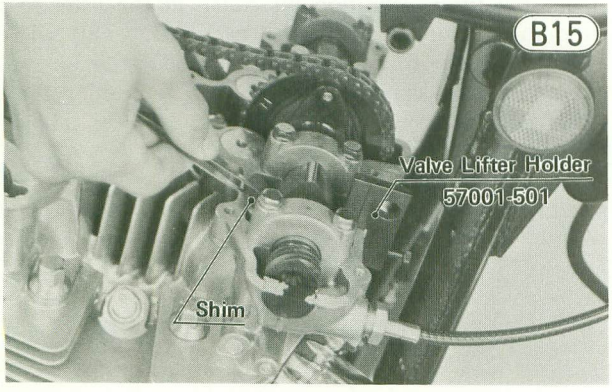


1. Valve Lifter
2. Shim
3. Camshaft
4. Valve Lifter Holder

○Turn the crankshaft in the proper direction so that the cam points away from the lifter, and remove the shim.

NOTE: The camshaft rotates in the same direction as the crankshaft.

CAUTION **When the valve lifter holder is fitted to a valve assembly, and the crankshaft is turned to rotate the camshaft, it MUST be turned so the cam lobe turns away from the tool. If it is turned toward the tool, serious engine damage can result.**



NOTE: If the camshafts are unbolted instead of using a special tool to remove the shims, see information on valve timing (Pg. 137) and camshaft installation (Pg. 46) before tightening the shafts in place.

●Check the present shim thickness (shim size) which is printed on the shim surface, and referring to the Valve Adjustment Chart (Pg. 17), select a new shim which brings valve clearance within the specified limits. Shims are available in sizes from 2.2 ~ 3.4 mm, in increments of 0.05 mm.

●Insert the new shim on the valve lifter with the numbered side facing downwards so the number won't be polished off by the action of the cam.

CAUTION **1. Do not put the 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.

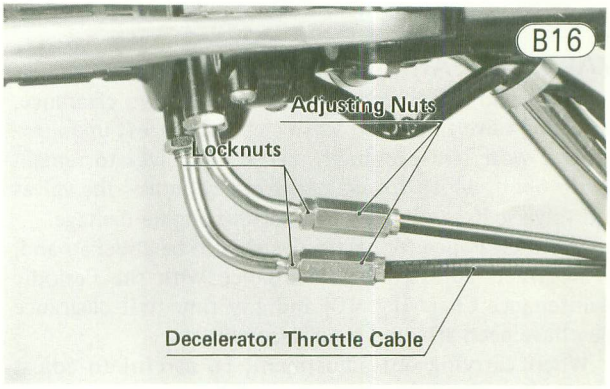
NOTE: If the smallest shim does not sufficiently increase clearance, the valve seat is probably worn. In this case, (a) repair the valve seat (Pg. 143), (b) grind down the stem lightly (Pg. 141), (c) then recheck the clearance.

THROTTLE CABLES

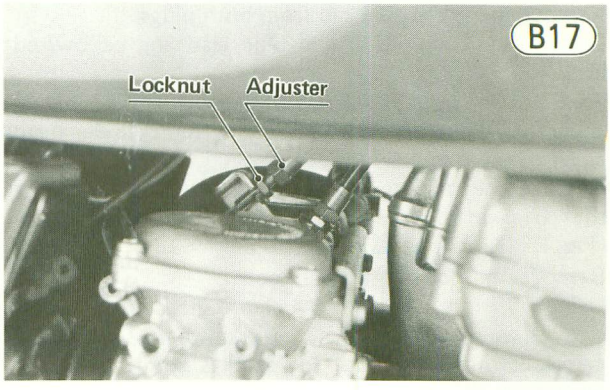
There are two throttle cables, the accelerator cable for opening the butterfly valves and decelerator cable for closing them. If the cables are too loose from either cable stretch or maladjustment, the excessive play in the throttle grip will cause a delay in throttle response, especially at low rpm. Also, the butterfly valves may not open fully at full throttle. On the other hand, if the cables are too tight, the throttle will be hard to control, and the idle speed will be erratic.

To adjust the throttle cable play:

●Loosen the locknuts and screw the adjusting nuts in fully at the upper end of the throttle cables so as to give the throttle grip plenty of play.



●Turn out the decelerator throttle cable adjusting nut 3 turns. There must still be play in the throttle grip; if there is not, loosen the locknut at the lower end of the decelerator cable, turn in the adjuster to create a small amount of play, and tighten the locknut.



●Turn out the accelerator throttle cable adjusting nut until the throttle grip play is just eliminated and then tighten the locknut.

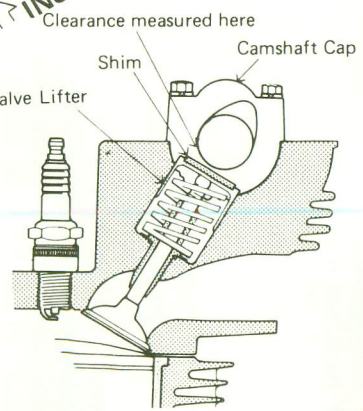
VALVE ADJUSTMENT CHART

PART NUMBER	-051	-052	-053	-054	-055	-056	-057	-058	-059	-060	-061	-062	-063	-064	-065	-066	-067	-068	-069	-070	-071	-072	-073	-074	-075
	PRESENT SHIM SIZE																								
MILLIMETERS	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	3.25	3.30	3.35	3.40

VALVE CLEARANCE

MILLIMETERS																									
0.00-0.04		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	3.25	3.30	3.35
0.05-0.10	SPECIFIED CLEARANCE/NO CHANGE REQUIRED																								
0.10-0.14	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	3.25	3.30	3.35	3.40	
0.15-0.19	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	3.25	3.30	3.35	3.40		
0.20-0.24	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	3.25	3.30	3.35	3.40			
0.25-0.29	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	3.25	3.30	3.35	3.40				
0.30-0.34	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	3.25	3.30	3.35	3.40					
0.35-0.39	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	3.25	3.30	3.35	3.40						
0.40-0.44	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	3.25	3.30	3.35	3.40							
0.45-0.49	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	3.25	3.30	3.35	3.40								
0.50-0.54	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40									
0.55-0.59	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40										
0.60-0.64	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40											
0.65-0.69	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40												
0.70-0.74	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40													
0.75-0.79	2.90	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40														
0.80-0.84	2.95	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40															
0.85-0.89	3.00	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40																
0.90-0.94	3.05	3.10	3.15	3.20	3.25	3.30	3.35	3.40																	
0.95-0.99	3.10	3.15	3.20	3.25	3.30	3.35	3.40																		
1.00-1.04	3.15	3.20	3.25	3.30	3.35	3.40																			
1.05-1.09	3.20	3.25	3.30	3.35	3.40																				
1.10-1.14	3.25	3.30	3.35	3.40																					
1.15-1.19	3.30	3.35	3.40																						
1.20-1.24	3.35	3.40																							
1.25-1.30	3.40																								

INSTALL THIS SHIM



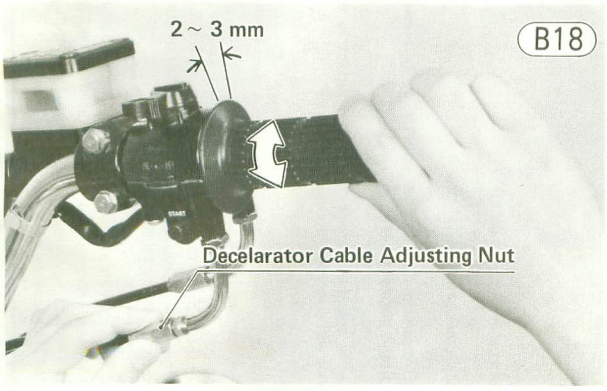
1. Measure valve clearance (cold).
2. Check present shim size.
3. Match clearance in vertical column with present shim size in horizontal column.
4. The shim specified where the lines intersect is the one that will give you the proper clearance.

NOTE: If there is no clearance between the shim and the cam, select a shim which is several sizes smaller and then remeasure the gap.

Do not put shim stock under the shim. This may cause the shim to pop out at high rpm. Do not grind the shim. This may cause it to fracture.

Check the valve clearance with the cam lobe pointing directly away from the valve, as pictured. Checking the clearance at any other cam position may result in improper valve clearance.

●Turn in the decelerator cable adjusting nut until 2 ~ 3 mm of throttle grip play is obtained. Tighten the locknut.



CARBURETORS

For internal carburetor maintenance and replacement of parts, see the maintenance section (Pg. 130) of this manual. The following procedure covers the idling adjustment, which should be inspected during periodic maintenance or whenever the idling setting has been disturbed. This procedure also includes the necessary step for obtaining proper carburetor synchronization.

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 three parts: preliminary adjustment (sometimes necessary), idling adjustment, and carburetor synchronization.

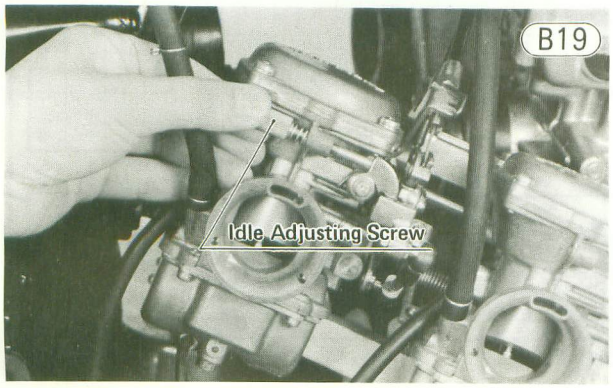
Preliminary Adjustment:

If the engine idling is especially rough, it may be necessary to synchronize the butterfly valves before making the idling adjustment:

●Remove the carburetors from the engine (Pg. 39) leaving the accelerator and decelerator cables connected.

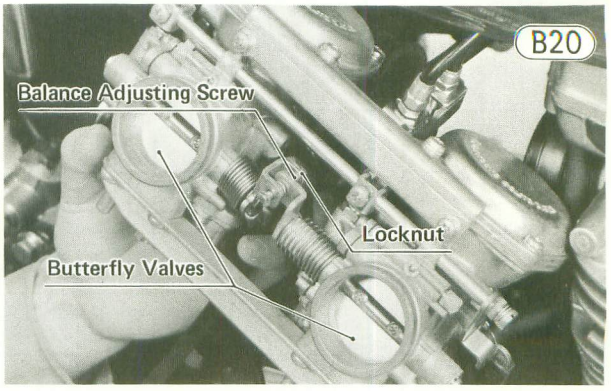
●If the butterfly valves do not close at the same time by visual inspection, synchronize them using the following procedure:

○Back off the idle adjusting screw so there is enough clearance to allow the butterfly valves to seat in their bores.



○Turn the idle adjusting screw until the butterfly valves just begin to open and there is a slight gap between the valve and bore.

○Loosen the locknut and turn the balance adjusting screw to obtain the same gap between the butterfly valve and the bore in each carburetor.

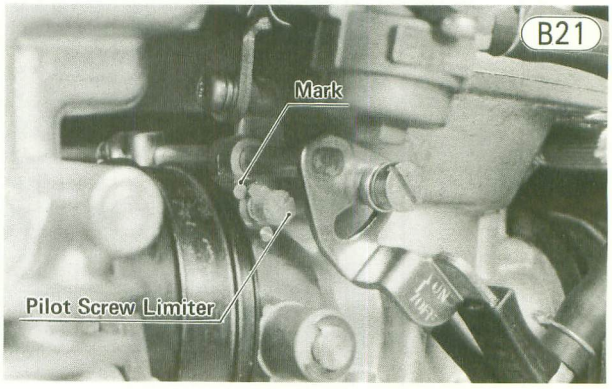


○Tighten the locknut.

●Install the carburetor (Pg. 40), and check the play in the cables (Pg. 16).

Idling Adjustment:

●Turn the pilot screw limiter of each carburetor until the pilot screw limiter is aligned with the mark on the carburetor body.



●Start the engine, and warm it up for 5 minutes.

●Adjust idle speed to 950 ~ 1,050 rpm by turning the idle adjusting screw.

●Open and close the throttle a few times to make sure that the idle speed does not change. Readjust if necessary.

NOTE: With the engine idling, turn the handlebar to either side. If handlebar movement changes idle speed, the throttle cables may be improperly adjusted or incorrectly routed, or they may be damaged.

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

NOTE: If idling adjustment has resulted in failure, check the following and correct if necessary:

Engine Oil (Pg. 21)
Spark Plugs (Pg. 12)
Ignition Timing (Pg. 12)
Throttle Cables (Pg. 16)
Cylinder Compression (Pg. 146)
Air Cleaner Element (Pg. 130)
Camshaft Chain (Pg. 14)
Valve Clearance (Pg. 15)

Carburetor Synchronization:

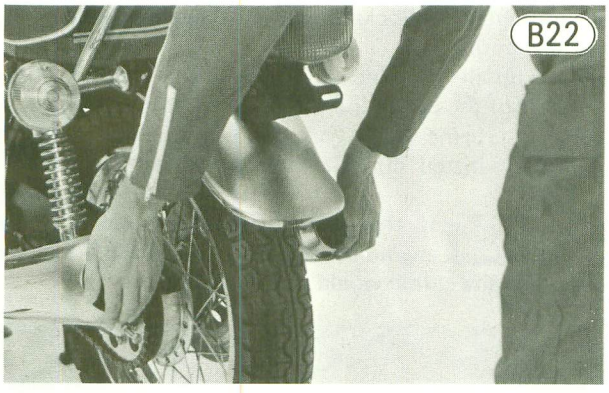
Adjustment of carburetor synchronization, necessary for smooth engine operation, can be obtained through the use of either of the following two procedures, depending on whether or not vacuum gauges are available.

NOTE: During carburetor synchronization, the fuel tank will be removed. In most cases, it will be necessary to temporarily replace the standard fuel and vacuum hoses with hoses long enough to reach the fuel tank while it is located on your workbench.

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

Without Vacuum Gauges:

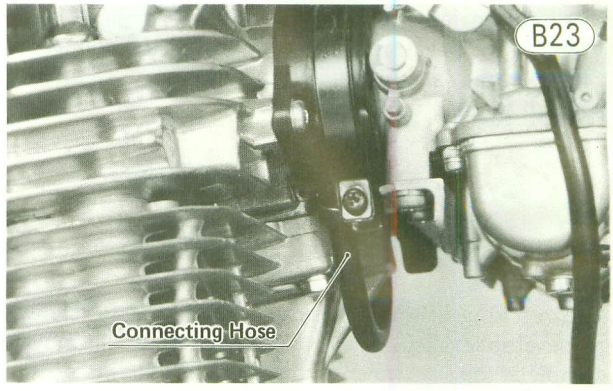
- Start the engine, and warm it up for 5 minutes.
- Perform idling adjustment (Pg. 18).
- Listen to exhaust noise, and place your hands at the rear of the mufflers to feel exhaust pressure.



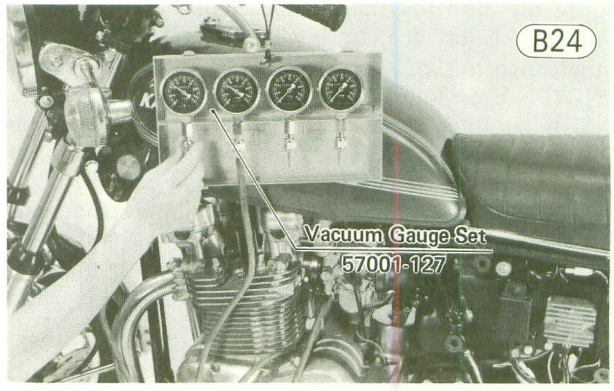
- If there is a difference in noise or exhaust pressure between the cylinders, stop the engine and remove the fuel tank (Pg. 39). With the engine running, alter the balance adjusting screw position with the balance adjuster (special tool) to minimize the difference in noise or exhaust pressure (Fig. B25).
- Adjust the idle speed to 950 ~ 1,050 rpm with the idle adjusting screw, if necessary.
- Re-check the exhaust noise and pressure, and if there is a difference between the cylinders, repeat the last 2 steps.
- When the balance adjusting screw is properly positioned, tighten the locknut, stop the engine, and install the fuel tank (Pg. 39).

With Vacuum Gauges:

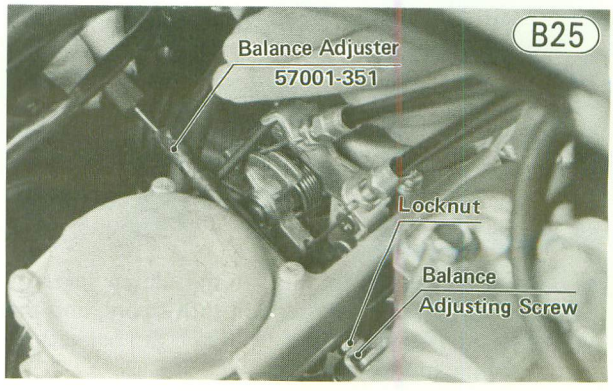
- Start the engine, and warm it up for 5 minutes.
- Perform idling adjustment (Pg. 18).
- Remove the connecting hose from the vacuum gauge attachments on the carburetor holder, and attach the vacuum gauges.



- With the engine running at idle speed, close the vacuum gauge damper valves until gauge needle flutter is less than 3 cm Hg. Normal vacuum gauge reading is 17 ~ 23 cm Hg, and the difference between the two cylinders should be less than 2 cm Hg.



- If there is a difference of more than 2 cm Hg between the two gauges, stop the engine, remove the fuel tank (Pg. 39).
- With the engine running, alter the balance adjusting screw position with the balance adjuster (special tool) to obtain a difference in readings which is less than 2 cm Hg.



- Adjust the idle speed to 950 ~ 1,050 rpm with the idling screw, if necessary.
- Recheck the difference in vacuum gauge readings, and if there is a difference of more than 2 cm Hg, repeat the last 2 steps.
- When the balance adjusting screw is properly positioned, tighten the balance adjusting screw locknut and stop the engine.
- Detach the vacuum gauges, and install the connecting hose on the vacuum gauge attachments.
- Install the fuel tank (Pg. 39).

CLUTCH

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

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

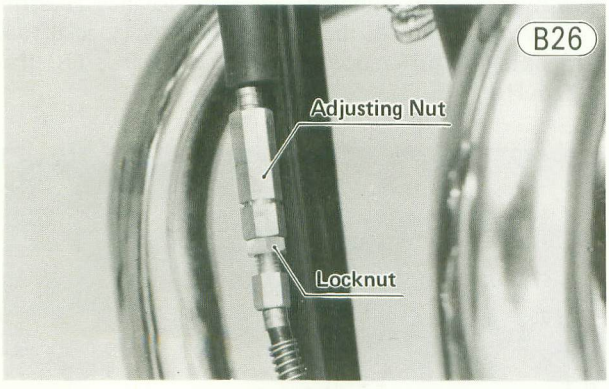
NOTE: Even though the proper amount of play exists at the clutch lever, clutch lever play alone cannot be used to determine whether or not the clutch requires adjustment.

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

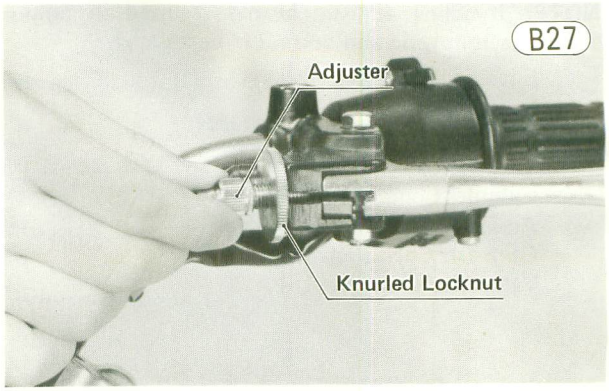
WARNING **To avoid a serious burn, never touch the engine or exhaust pipes during clutch adjustment.**

To adjust the clutch:

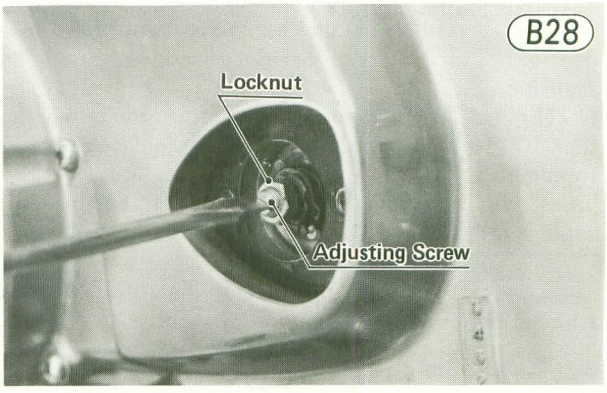
- Turn in fully the locknut and adjusting nut at the center of the clutch cable to give the cable plenty of play.



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

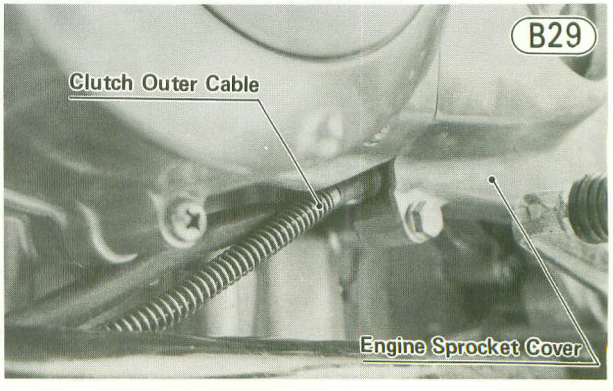


- Remove the clutch adjusting cover.
- Loosen the locknut, and back out the clutch adjusting screw 3 or 4 turns until the screw turns without drag.

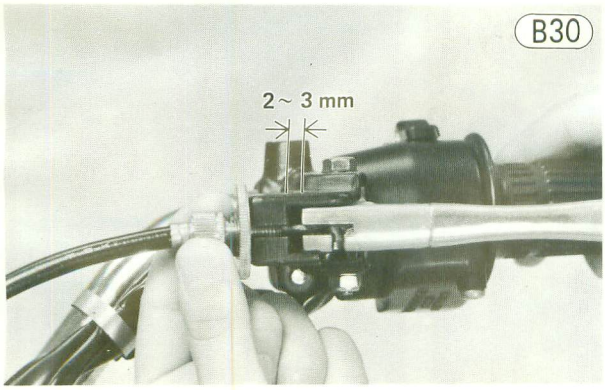


- Turn the adjusting screw in until it becomes hard to turn. This is the point where the clutch is just starting to release.
- Back out the adjusting screw ½ turn from that point, and tighten the locknut without changing the adjusting screw position.
- Take up all the cable play with the adjusting nut at the center of the cable, and then tighten the locknut.
- Make sure the lower end of the clutch outer cable is properly fitted into the hole in the engine sprocket cover.

WARNING **If the cable is not fully seated in the engine cover hole, it could slip into place later and the clutch would not disengage.**



- Turn the adjuster at the clutch lever so that the clutch lever will have 2~3 mm of play as shown in Fig. B30, and tighten the locknut.



●Install the clutch adjusting cover.

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 in accordance with the Periodic Maintenance Chart (Pg. 10). Motorcycle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine or transmission seizure.

Oil Level

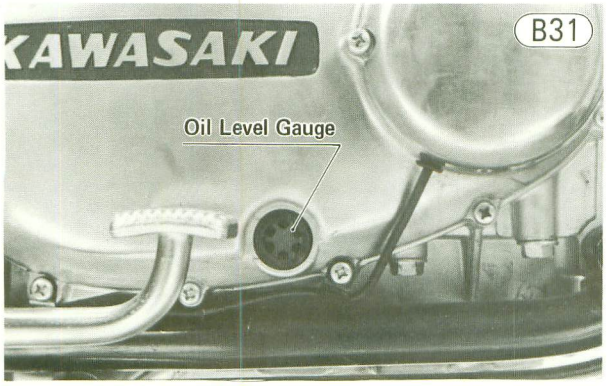
●Situate the motorcycle so that it is perpendicular to the ground (on its center stand).

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

CAUTION **Run the engine at idling speed at least until the oil pressure light turns off. 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 in the lower right side of the engine. With the motorcycle held level or on the center stand, the oil level should come up between the lines next to the gauge.



●If the oil level is too high, remove the excess oil, using syringe or some other suitable device.

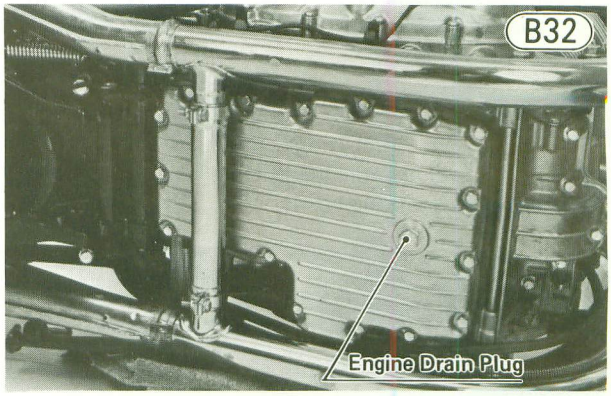
●If the amount of oil is insufficient, add the correct amount of oil through the oil filler opening. Fill, using the same type and make of oil that already is in the engine.

WARNING **If the engine is run without oil, it will be severely damaged. In addition, the engine may suddenly seize, locking the rear wheel and causing an accident if the clutch lever is not pulled in fast enough.**

Oil and Oil Filter Change

●Warm up the engine thoroughly, and stop it.

●Situate the motorcycle so that it is perpendicular to the ground (on its center stand), place an oil pan beneath the engine, and remove the engine drain plug.



●If the oil filter is to be changed, remove the filter and replace the oil filter with a new one. Check that it is properly assembled (Pg. 59).

NOTE: Check for O ring damage. If necessary, replace it with a new one.

●Install the oil filter, tightening its bolt with 1.8 ~ 2.2 kg-m (13 ~ 16 ft-lbs) of torque; and filter drain plug with 1.6 ~ 2.0 kg-m (11.5 ~ 14.5 ft-lbs) of torque.

●After the oil has completely drained out, install the drain plug and gasket, using a new gasket if the old one is deteriorated or damaged. Proper torque for the drain plug is 2.7 ~ 3.3 kg-m (19.5 ~ 24 ft-lbs).

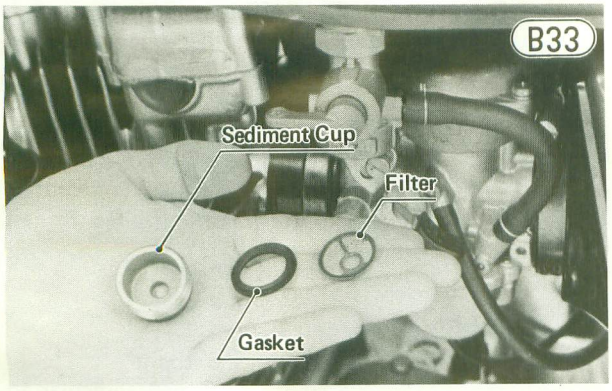
●Fill the engine up to the upper level with SE class SAE 10W40, 10W50, 20W40 or 20W50 motor oil. It will take about 4.0 liters when the filter is changed. When the filter is not changed, a refill takes about 3.6 liters.

NOTE: After the engine has been run and then stopped for a few munutes, the oil level should come to between the upper and lower marks.

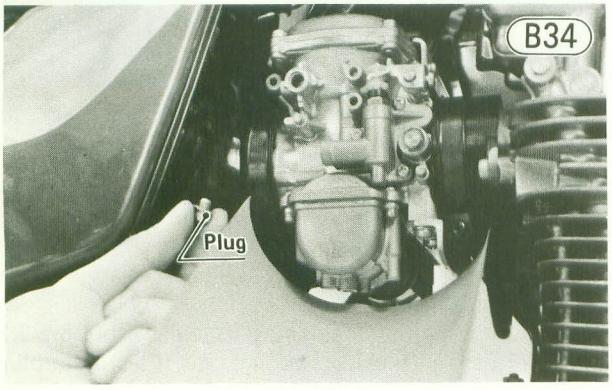
FUEL SYSTEM

Water or dirt anywhere in the fuel system can cause starting difficulty, poor running, and lack of power. Clean out the fuel system as follows:

●Turn the fuel tap to the off position. Unscrew the sediment cup at the bottom of the tap, and clean out the water and dirt from it. Clean any dirt out of the fuel tap filter.



- If there was water inside the sediment cup, there may also be some in the fuel tank. Holding a container under the fuel tap, turn the tap to the reserve position to drain the tank until gasoline only comes out, and then close the tap.
- Install the gasket and the sediment cup. Make sure that the gasket is in the tap and that the filter is not damaged during installation.
- Remove the plug from the bottom of each carburetor float bowl to drain the bowls.



Adjustment–Chassis

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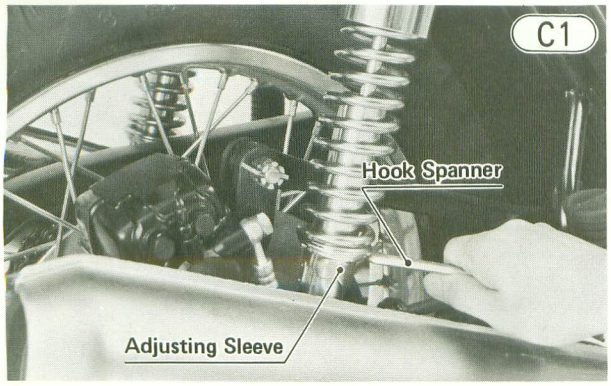
REAR SHOCK ABSORBERS

The rear shock absorbers can be adjusted to one of three positions to suit riding conditions. They can be left soft for average riding but should be adjusted harder for high speed riding, riding on bad roads, or riding with a passenger. Shock absorbers adjusted either too soft or too hard adversely affect riding comfort and stability. To adjust the rear shock absorbers:

- Turn the adjusting sleeve on each shock absorber to the desired position with a hook spanner. The higher the adjusting sleeve is positioned, the stronger the spring tension, and the harder the ride.



- Check to see that both adjusting sleeves are turned to the same relative position.

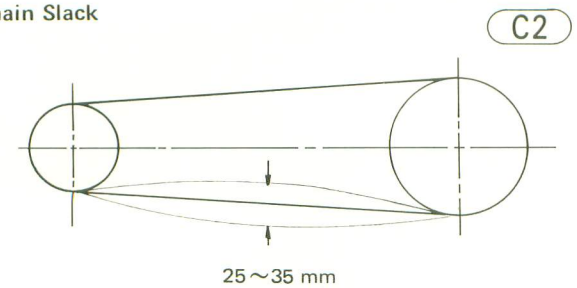
WARNING **If they are not adjusted to the same position, an unsafe riding condition may result.**

DRIVE CHAIN

Chain and sprocket wear causes the chain to stretch, which results in power loss, accelerated chain and sprocket wear, and increased noise. A chain that has been adjusted too loose may be thrown off the sprockets. A chain that has been adjusted too tight will wear excessively and possibly break.

- To determine whether or not the chain requires adjustment, first 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. If it is less than 25 mm or more than 40 mm, adjust the chain so that the vertical movement will be about 25~35 mm.

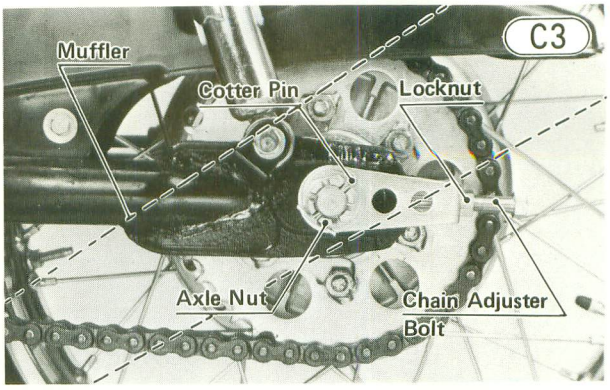
Chain Slack



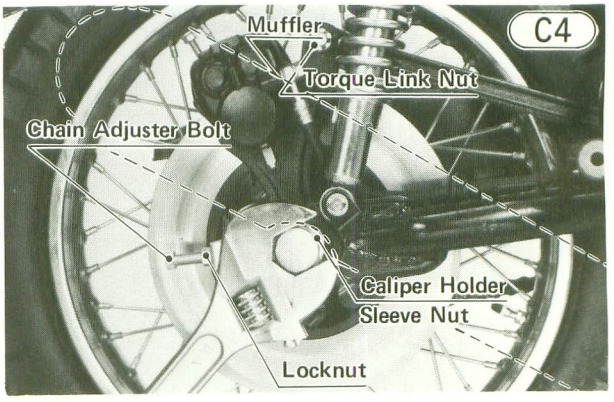
CAUTION **1. A chain worn past the service limit (Pg. 175) must be replaced. Such wear cannot be adequately compensated for by adjustment.**

2. Take care not to damage the brake hose. Damaging the brake line greatly reduces the brake line strength and causes brake fluid leakage, resulting in loss of brake control.

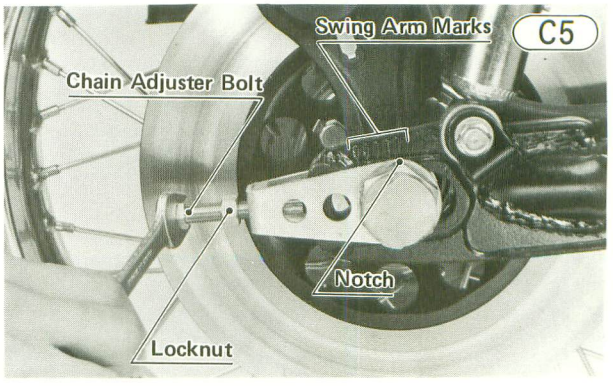
- Remove the axle cotter pin, and loosen the axle nut.



- Remove the cotter pin, and loosen the nut at the rear end of the torque link.



- Loosen the 36 mm caliper holder sleeve nut.
- Loosen the left and right chain adjuster locknuts.
- If the chain is too tight, back out the left and right chain adjuster bolts, and kick the wheel forward until the chain is too loose.
- Turn in the left and right chain adjuster bolts evenly until the drive chain has the correct amount of slack. To keep the chain and wheel aligned, the notch on the left chain adjuster should align with the same swing arm mark that the right chain adjuster notch aligns with.



- Tighten both chain adjuster locknuts, and then tighten the caliper holder sleeve nut securely.

WARNING **Tighten the caliper sleeve nut prior to tightening the axle nut. If the nut tightening order is reversed, the rear axle will not be securely mounted on the swing arm. This may cause misalignment of wheels, and result in loss of control.**

- Tighten the axle nut with 10 ~ 14 kg-m (72 ~ 101 ft-lbs) of torque.
- Rotate the wheel, measure the vertical movement 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 torque link rear nut with 2.6 ~ 3.5 kg-m (19.0 ~ 25 ft-lbs) of torque, insert a new cotter pin, and spread its ends.

BRAKES

Front Brake

Disc and disc pad wear is automatically compensated for and has no effect on brake lever action. So there are no parts that require adjustment on the front brake. However if the brake lever has a soft, or "spongy feeling", check the brake fluid level in the line (Pg. 181).

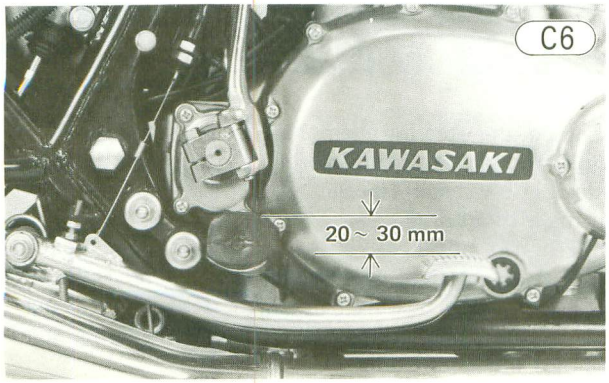
Rear Brake

Disc and disc pad wear is automatically compensated for and has no effect on brake pedal action. However, the brake pedal may occasionally require adjustment due to wear of the brake pedal pivot, or in case of disassembly. Excessive play must be taken up to keep the braking action lag time to a minimum, but enough play must be left to ensure a full braking stroke.

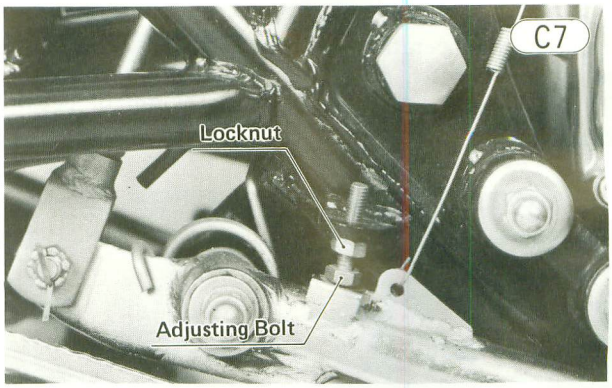
NOTE: Check the brake fluid level in accordance with the Periodic Maintenance Chart (Pg. 10). Before adjusting the brake, be sure that all air is bled from the brake line (Pg. 180).

Brake Pedal Position:

- When the brake pedal is in its rest position, it should be 20 ~ 30 mm lower than the top of the footpeg.



- If it is too high, loosen the locknut and shorten the brake push rod to give the brake pedal plenty of play. If it is too low, go to the next step.
- Loosen the locknut and then turn the brake pedal adjusting bolt to obtain the correct pedal position. Tighten the locknut.

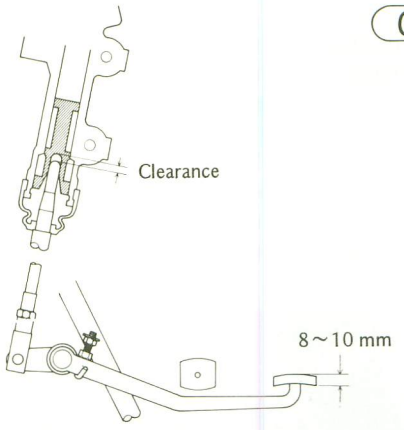


Rear Brake Pedal Play

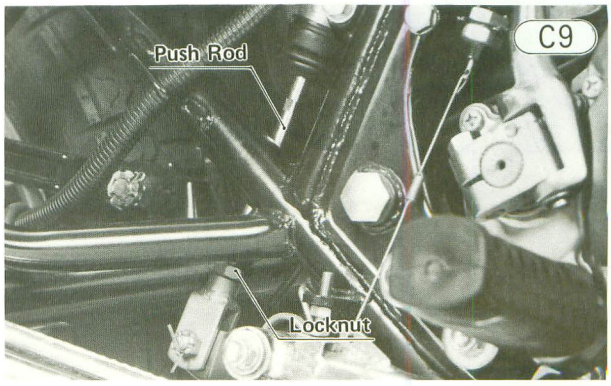
- The brake pedal should have 8 ~ 10 mm of free play from the rest position before the push rod contacts the master cylinder piston.

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.**

Pedal Play



- To adjust play, loosen the push rod locknuts and turn the push rod. Tighten the locknuts.

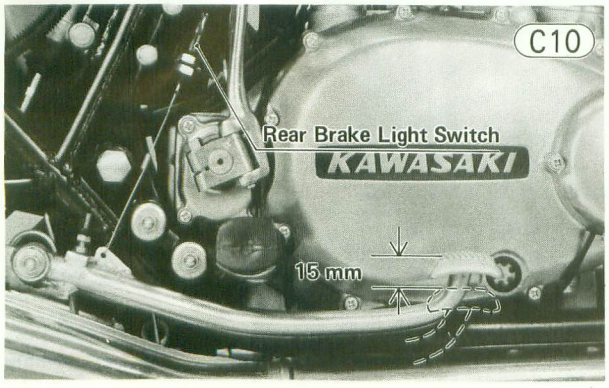


- Check the rear brake light switch (Pg. 26).
- Check for brake drag.
- Check braking effectiveness.

BRAKE LIGHT SWITCHES

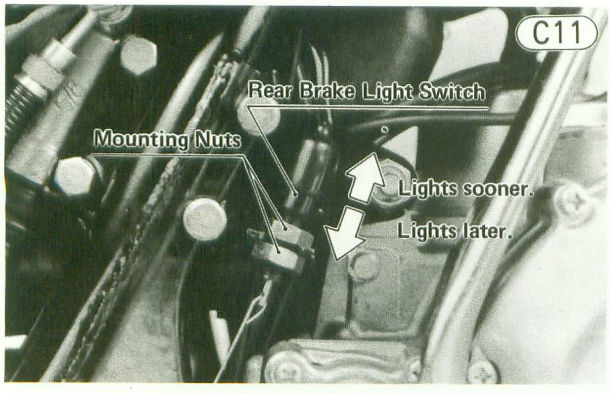
The front brake light switch, mounted on the steering stem base, operates hydraulically and is non-adjustable. However, the rear brake light switch, activated by a spring attached to the brake pedal, requires periodic adjustment to compensate for any change in spring shape or tension.

Check the operation of the switch by turning on the ignition switch and depressing the brake pedal. The brake light should go on after 15 mm of pedal travel.



- Adjust the switch so that the brake light will go on after the proper amount of brake pedal travel. Raising the switch will make the light go on after less travel; lowering it will require more travel. Adjustment is made by altering the position of the mounting nuts on the brake switch body.

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

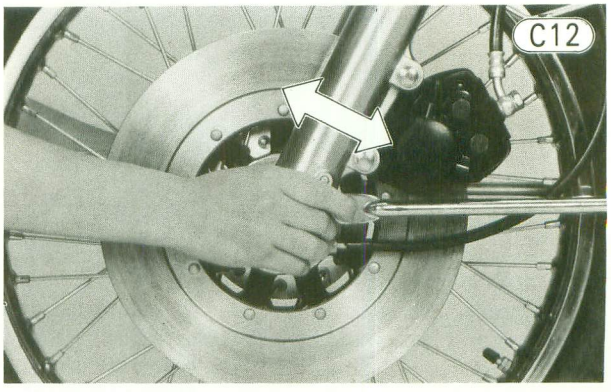


STEERING

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

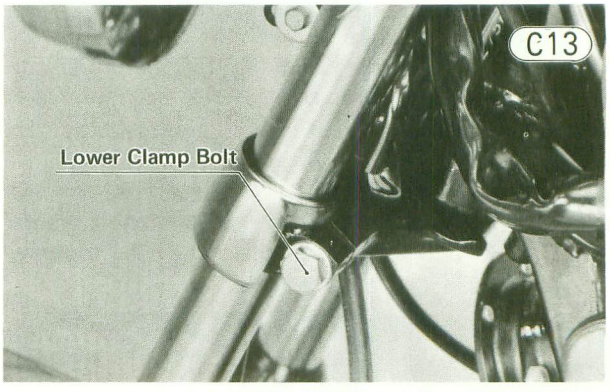
If the steering is too tight, it will be difficult to turn the handlebar quickly, the motorcycle may pull to one side, and the steering stem bearings may become damaged. If the steering is too loose, the handlebar will vibrate and the motorcycle will be unstable and difficult to steer in a straight line.

To check the steering adjustment, first place a stand or block under the engine so that the front wheel is raised off the ground. Push the handlebar lightly to either side; if it continues moving under its own momentum, the steering is not too tight. Squatting in front of the motorcycle, grasp the lower ends of the front fork at the axle, and push and pull the fork end back and forth; if play is felt, the steering is too loose.



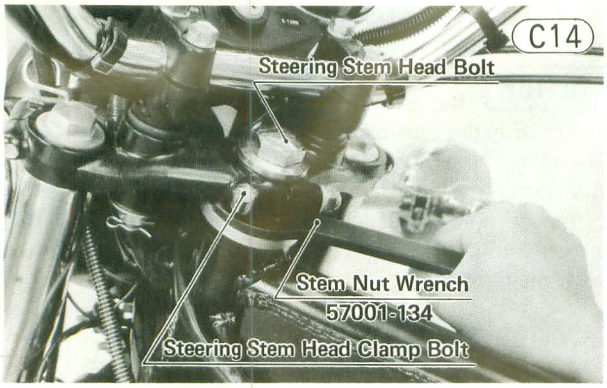
To adjust the steering:

- 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 (Pg. 39) to avoid damaging the painted surface.
- Loosen the front fork lower clamp bolts (2) to free the fork tubes from the steering stem during adjustment.



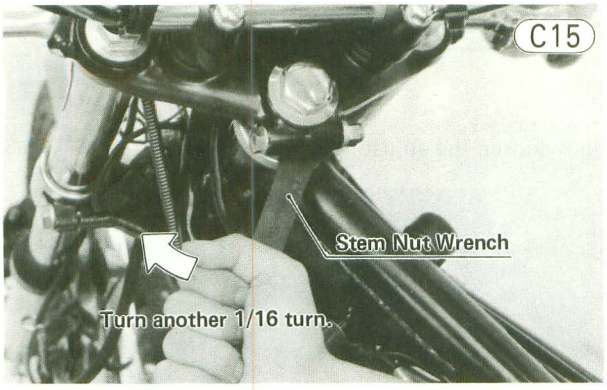
- Loosen the steering stem head bolt and head clamp bolt, and back out the steering stem locknut using the stem nut wrench (special tool) 1 or 2 turns until it turns without drag.

NOTE: 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.



- Tighten the stem locknut with 2.7~3.3 kg-m (19.5~24 ft-lbs) of torque.

NOTE: If a suitable torque wrench is not available, turn the stem locknut until it just becomes hard to turn, and then continue turning for another 1/16 turn (about 20°).



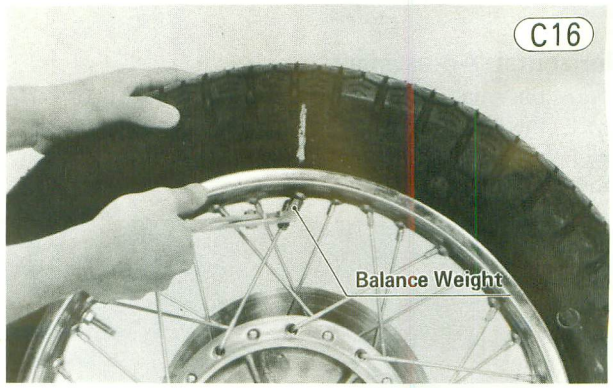
- Tighten the steering stem head bolt with 4~5 kg-m (29~36 ft-lbs) of torque.
- Tighten the steering stem head clamp bolt with 1.6~2.2 kg-m (11.5~16 ft-lbs) of torque.
- Tighten the front fork lower clamp bolts (2) with 3.4~4.6 kg-m (25~33 ft-lbs) of torque.
- Check the steering again. If the steering is too tight or too loose in spite of correct adjustment, inspect the steering stem parts according to the maintenance section (Pg. 182).
- Remount the fuel tank (Pg. 39).

WHEEL BALANCE

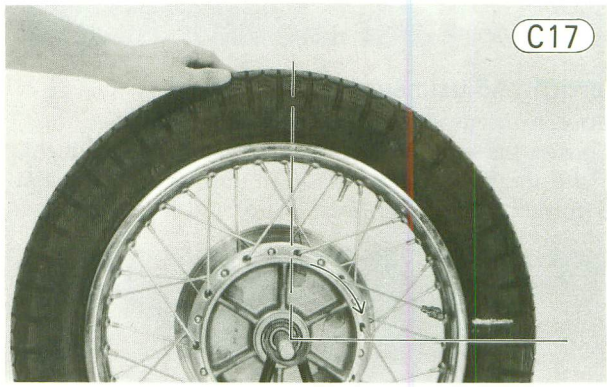
To improve stability and decrease vibration at high speed, the front and rear wheels must be kept balanced.

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

- Remove the wheel (Pg. 97 or 104).
- Check that all the spokes are tightened evenly and the rim runout is within the service limit (Pg. 173).
- Suspend the wheel so that it can be spun freely.
- Spin the wheel lightly, and mark the spoke at the top when the wheel stops.
- Repeat this procedure several times. If the wheel stops of its own accord in various positions, it is well balanced.
- However, if the wheel always stops in one position, attach a balance weight loosely to the marked spoke.



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



- If the wheel rotates and the weight goes up, replace the weight with the next heavier size. If the wheel rotates and the weight goes down, replace the weight with the next lighter size. Repeat these steps until the wheel remains at rest after being rotated ¼ turn.
- Rotate the wheel another ¼ turn and then another ¼ turn to see if the wheel is correctly balanced.
- Repeat the entire procedure as many times as necessary to achieve correct wheel balance, and then clamp on the balance weights firmly using pliers.
- Mount the wheel back onto the motorcycle (Pg. 97 or 104).

NOTES: 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 affect running stability.

2. When removing a tire from a rim, mark the valve stem location on the tire so that it can be replaced in the same position.

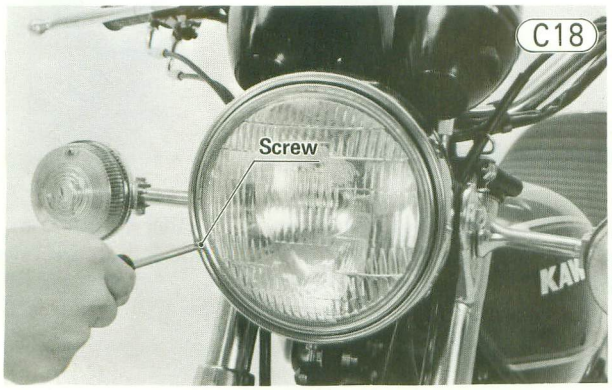
3. When installing a new tire, be sure to go through the balancing procedure.

HEADLIGHT

The headlight beam is adjustable both horizontally and vertically. If not properly adjusted horizontally, the beam will point to one side rather than straight ahead. 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 blind oncoming drivers.

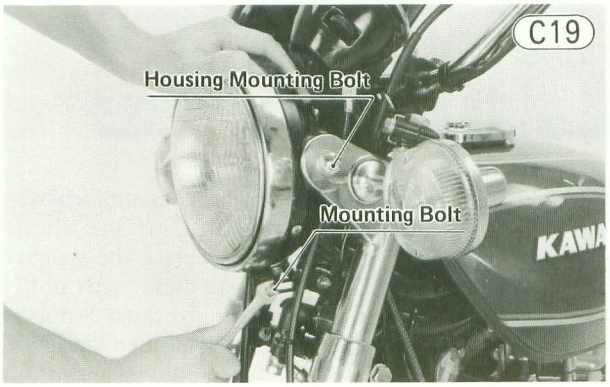
Horizontal Adjustment:

- Turn the small 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.



Vertical Adjustment:

- Loosen the headlight housing mounting bolts.
- Loosen the mounting bolts underneath the headlight. Move the headlight up or down until the vertical aim is correct, and tighten the bolt to hold it there.



- Tighten the headlight housing mounting bolts.

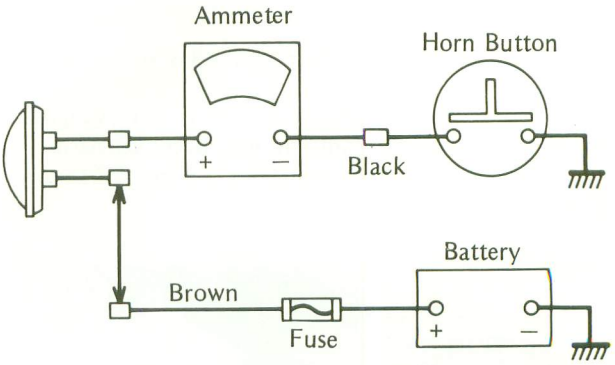
HORN

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.

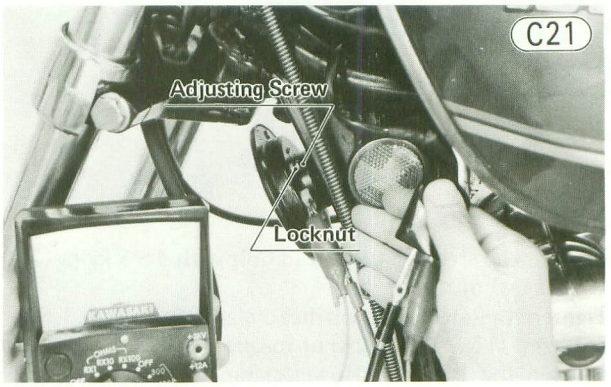
CAUTION **Do not turn the adjusting *screw in too* far, since doing so will increase horn current with the possibility of burning out the horn coil.**

- Disconnect the horn leads, and connect an ammeter in series to the horn circuit. The + ammeter lead goes to the horn terminal lead and the – ammeter lead to the remaining black lead. Connect the brown lead and the remaining horn terminal together.

Horn Current Measurement C20



- Fully loosen the adjusting screw locknut.



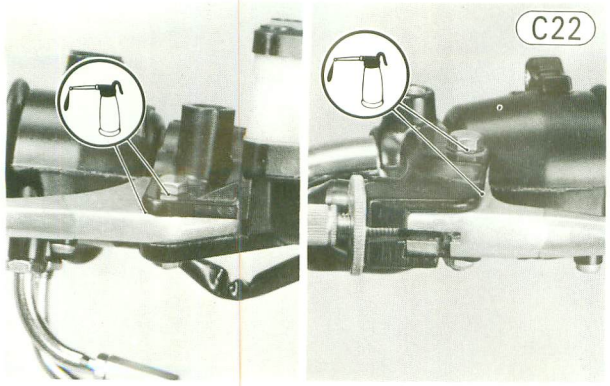
- Turn on the ignition key, and keep the horn button pressed while turning the horn adjusting screw. Adjust for the best horn sound while keeping the current between 2.0 ~ 3.0 amperes.
- Tighten the adjusting screw locknut.

NOTE: The horn will not sound properly if it is mounted incorrectly or if any cable or other part is touching it.

LUBRICATION

Lubrication of exposed parts subject to rust with either motor oil or regular grease should be carried out periodically and whenever the vehicle has been operated under wet or rainy conditions. Before lubricating each part, clean off any rusty spots with rust remover and wipe off old grease, old oil, and any dirt or grime.

Clutch and Brake Levers

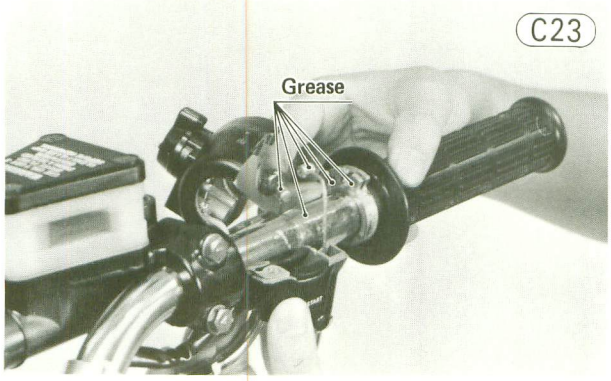


Throttle Grip

Apply grease to the handlebar where the throttle grip turns.

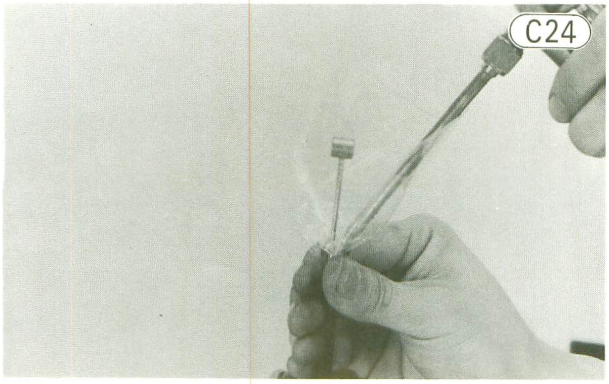
Apply a light coat of grease to the exposed portion of the throttle grip inner cables and their catches in the throttle grip.

Fit the throttle cables into the throttle grip. Refer to throttle cable installation (Pg. 112).



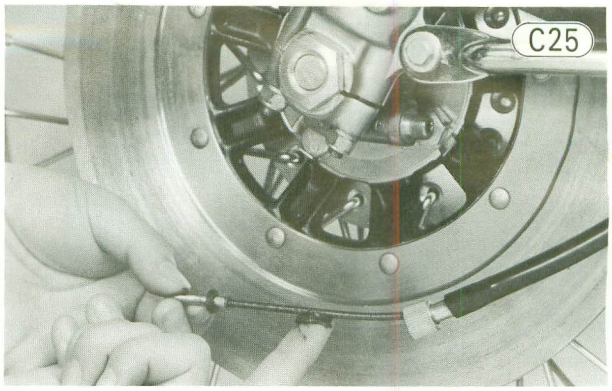
Clutch and Throttle Cables

Lubricate the clutch cable and throttle cables, as shown in the figure. Refer to Pgs. 111 and 112 for cable removal and installation.



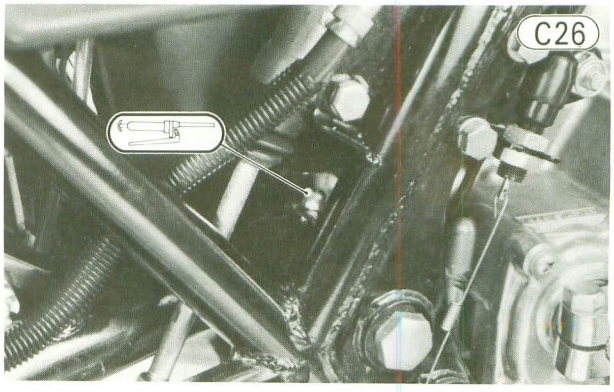
Speedometer and Tachometer Cables

Apply grease sparingly to these inner cables.

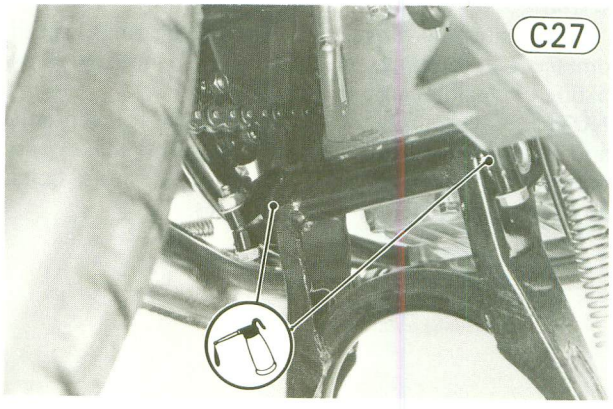


Swing Arm Pivot

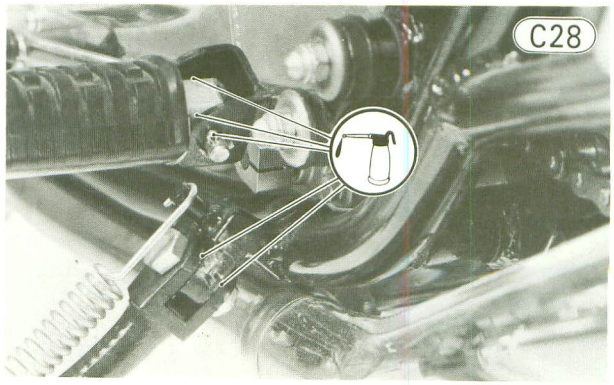
Force grease into the nipple until it comes out at both sides of the swing arm, and wipe off any excess.



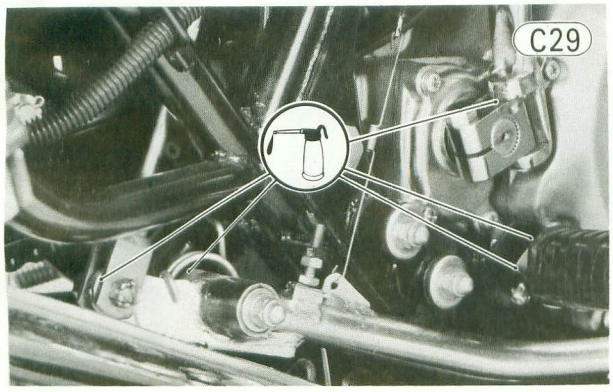
Center Stand



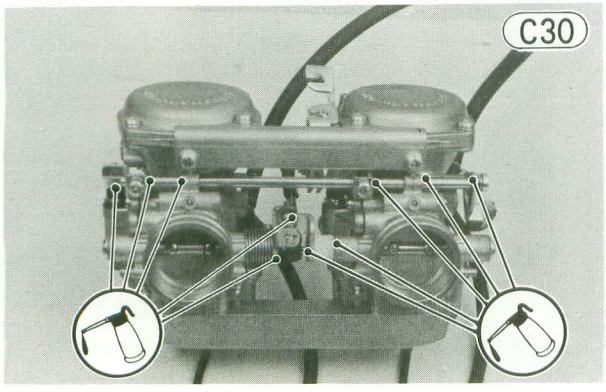
Left Footpeg, Side Stand



Kickstarter Pedal, Right Footpeg, Brake Pedal, Brake Rod Joint



Carburetor Choke Link Mechanism



Others

Lubricate the drive chain, wheel bearings, speedometer gear housing, and steering stem bearing as explained in Maintenance Section.

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

Disassembly–Introduction

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D

INTRODUCTION TO DISASSEMBLY

Detail has not been spared in this section in order that the motorcycle can not only be taken apart but also put back together properly as well. Photographs, diagrams, notes, cautions, warnings, and detailed descriptions have been included wherever necessary. Nevertheless, even a detailed account has limitations; a certain amount of basic knowledge is also required for successful work.

Especially note the following:

(1) 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 quarter of turn 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 lightly using a wooden or plastic-faced mallet. Use an impact driver for screws (particularly for the removal of screws held by a locking agent) in order to avoid damaging the screw heads.

(6) 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 counterclockwise, 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

An oil seal guide is required for certain oil seals during installation to avoid damage to the oil seal lips. Before a shaft passes through an oil 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

Before using liquid gasket or non-permanent locking agent, wash or wipe the surfaces where liquid gasket or non-permanent locking agent are applied. Do not apply them excessively, because excessive amounts could block the engine oil passages and cause serious engine damage.

(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 circlips and retaining rings, take care to compress or expand them only enough to install them and no more.

TORQUE AND LOCKING AGENT

Tighten all bolts and nuts to the proper torque using an accurate torque wrench. If insufficiently tightened, a bolt or nut may become damaged or fall off, possibly resulting in damage to the motorcycle and injury to the rider. A bolt or nut which is overtightened may become damaged, strip an internal thread, or break and then fall out. The following table lists the tightening torque for the major bolts and nuts, and the parts requring use of a non-permanent locking agent.

Parts marked with an asterisk (*) must be retorqued according to the Periodic Maintenance Chart (Pg. 10). One at a time, loosen each bolt or nut ½ turn, then tighten it to the specified torque. Follow the sequence if specified. For engine fasteners, retorque them when the engine is cold (at room temperature).

Engine Part	Locking Agent (•), Required	Quantity	Metric (kg-m)	English (ft-lbs)	See Pg.
Balancer chain tensioner mounting bolts φ6 P1.0	•	2	0.9~1.1	78~95 in-lbs	91
Breather baffle plate bolts φ6 P1.0	•	2	0.45~0.55	39~48 in-lbs	80
Breather cover bolt φ8 P1.25	–	1	1.3~1.7	9.5~12.0	53
Camshaft cap bolts φ6 P1.0	–	16	1.1~1.3	95~113 in-lbs	47,138
Camshaft chain guide holder bolts φ6 P1.0	•	2	1.1~1.3	95~113 in-lbs	94
Camshaft sprocket bolts φ6 P1.0	•	6	1.4~1.6	10.0~11.5	48
Clutch hub nut φ20 P1.5	–	1	12~15	87~108	64,83
Clutch release mounting screws φ6 P1.0	•	2	–	–	59
Clutch spring bolts φ6 P1.0	–	5	0.8~1.0	69~87 in-lbs	65,83
Connecting rod big end cap nuts φ8 P0.75	–	4	3.6~4.0	26~29	93
Crankcase bolts					
upper φ6 P1.0	–	3	0.9~1.1	78~95 in-lbs	83,84
lower φ6 P1.0	–	17	0.9~1.1	78~95 in-lbs	82
lower φ10 P1.5	–	6	3.7~4.3	27~31	82
Cylinder head bolts φ6 P1.0	–	3	1.1~1.3	95~113 in-lbs	49

Engine Part	Locking Agent (•), Required	Quantity	Metric (kg-m)	English (ft-lbs)	See Pg.
Cylinder head cover bolts φ6 P1.0	–	14	1.1~1.3	95~113 in-lbs	47
Cylinder head cover bracket bolts φ8 P1.25					
upper	–	4	2.0~2.8	14.5~20.0	47,75
lower	–	2	1.6~2.2	11.5~16.0	47,75
*Cylinder head nuts φ10 P1.25	–	8	3.8~4.2	27~30	48
Dynamo armature Allen bolts φ6 P1.0	•	3	0.9~1.1	78~95 in-lbs	55
Dynamo flywheel bolt φ12 P1.25	–	1	12~14	87~101	56,84
Engine drain plug φ12 P1.5	–	1	2.7~3.3	19.5~24.0	21,64,66
*Engine mounting bolts φ10 P1.5	–	5	3.4~4.6	25~33	75
*Engine mounting bracket bolts φ8 P1.25	–	6	2.0~2.8	14.5~20.0	75
Engine sprocket nut φ20 P1.5	–	1	7.5~8.5	54~61	60
*Exhaust pipe mounting nuts φ6 P1.0	–	4	–	–	43
*Muffler clamp bolts φ10 P1.25	–	2	–	–	43
Neutral switch φ12 P1.5	–	1	1.3~1.7	9.5~12.0	59
Oil filter drain plug φ8 P1.25	–	1	1.6~2.0	11.5~14.5	21,59
Oil filter mounting bolt φ20 P1.5	–	1	1.8~2.2	13.0~16.0	21,59
Oil pan bolts φ6 P1.0	–	17	0.9~1.1	78~95 in-lbs	67,83
Oil pressure switch PT1/8	–	1	1.3~1.7	9.5~12.0	54
Oil pressure relief valve φ12 P1.25	•	1	1.3~1.7	9.5~12.0	89
Oil pump mounting bolts φ6 P1.0	•	3	0.9~1.1	78~95 in-lbs	67,83
Primary chain guide mounting bolts φ8 P1.25	•	4	–	–	–
Ratchet gear arm stop bolts	•	2	0.9~1.1	78~95 in-lbs	89
Return spring pin φ8 P1.25	•	1	–	–	160
Shift drum positioning pin bolt φ16 P1.0	–	1	3.2~3.8	23~27	85
*Shift pedal bolt φ6 P1.0	–	1	–	–	54
Spark plugs φ14 P1.25	–	2	2.5~3.0	18.0~22.0	12
Starter motor clutch mounting Allen bolts φ8 P1.25	•	3	3.3~3.7	24~27	56
Starter motor lead terminal nuts φ6 P1.0	–	2	0.4~0.6	35~52 in-lbs	57
Starter motor mounting bolts φ6 P1.0	•	2	0.9~1.1	78~95 in-lbs	57
Timing advancer mounting bolt φ8 P1.25	–	1	2.3~2.7	16.5~19.5	63,83

Frame Part	Locking Agent (●), Liquid Gasket (★) Required	Quantity	Metric (kg-m)	English (ft-lbs)	See Pg.
*Brake pedal pivot cap nut φ8 P1.25	–	1	1.6~2.2	11.5~16.0	–
Disc brake parts	See Table G1 on Pg. 100.				
*Clutch lever holder bolt φ6 P1.0	–	1	–	–	117
*Footpeg mounting nuts φ12 P1.25	–	4	–	–	54
Front axle clamp nuts φ8 P1.25	–	4	1.6~2.2	11.5~16.0	97
*Front axle nuts φ16 P1.5	–	2	7.0~9.0	51~65	97
Front brake lever holder bolt φ6 P1.0	–	1	–	–	102
Front brake light switch PT1/8	●	1	2.6~3.0	19~26	117
*Front fender mounting bolts φ8 P1.25	–	4	–	–	123
Front fork bottom Allen bolts φ10 P1.0	●,★	2	2.0~2.6	14.5~19.0	125
Front fork clamp bolts					
* upper φ8 P1.25	–	2	1.6~2.2	11.5~16.0	121,123
* lower φ10 P1.5	–	2	3.4~4.6	25~33	27,122,123
Front fork top bolts φ28 P1.0	–	2	2.5~3.0	18~22	123
*Handlebar clamp bolts φ8 P1.25	–	4	1.6~2.2	11.5~16.0	119
*Kick pedal mounting bolt φ10 P1.25	–	1	–	–	–
Pad mounting screw φ6 P1.0	●	2	–	–	101
Rear axle nut φ18 P1.5	–	1	10~14	72~101	25
Rear shock absorber mounting					
* upper cap nuts φ12 P1.25	–	2	2.6~3.5	19~25	126
* lower bolts φ10 P1.25	–	2	2.6~3.5	19~25	126
Rear sprocket nuts φ10 P1.25	–	6	3.6~4.4	26~32	105
*Spokes	–	80	0.2~0.4	17~35 in-lbs	111
*Steering stem head bolt φ16 P1.5	–	1	4.0~5.0	29~36	27,122
Steering stem head rear clamp bolt φ8 P1.25	–	1	1.6~2.2	11.5~16.0	27,122
Steering stem locknut φ30 P1.0	–	1	2.7~3.3	19.5~24	27,121
*Swing arm pivot shaft nut φ16 P1.5	–	1	8~12	58~87	126
*Torque link nuts φ12 P1.25	–	2	2.6~3.5	19~25	25

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 among bolts and nuts with the same thread diameter and pitch. The bolts and nuts listed on Pgs. 33 ~ 35 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 Pgs. 33 ~ 35. All of these values are for use with dry solvent-cleaned threads.

Coarse threads

dia (mm)	pitch (mm)	kg-m	ft-lbs
5	0.90	0.35~0.50	2.5~3.5
6	1.00	0.6~0.9	4.5~6.5
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	13~18	94~130
18	2.50	18~25	130~181
20	2.50	26~35	188~253

Fine threads

dia (mm)	pitch (mm)	kg-m	ft-lbs
5	0.50	0.35~0.50	2.5~3.5
6	0.75	0.6~0.8	4.5~5.5
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	83~116
18	1.50	17~23	123~166
20	1.50	23~33	166~239

Disassembly–Engine Installed

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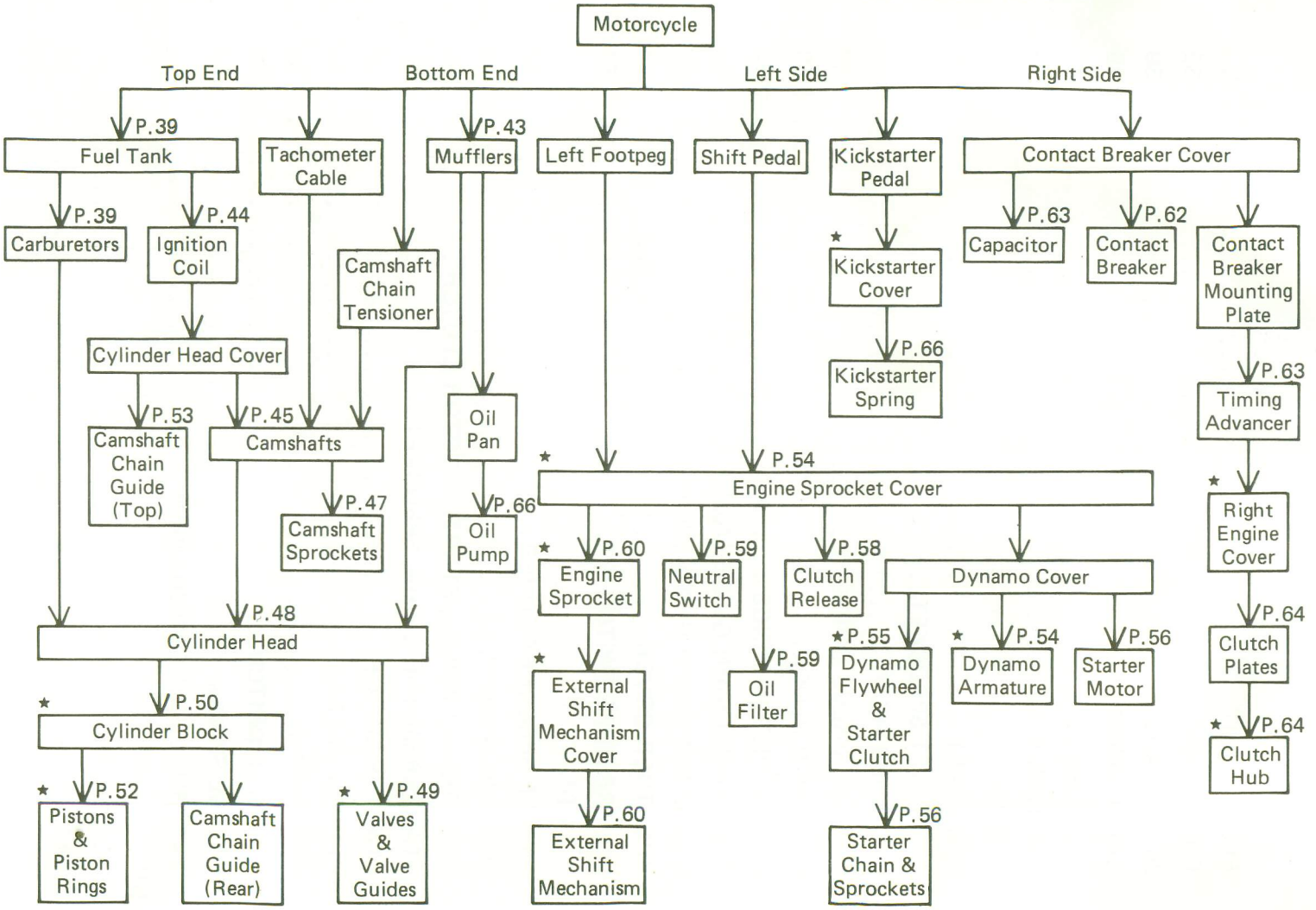
E

FLOW CHART
Disassembly – Engine Installed

The following chart is intended to be aids to proper removal. Select the component you wish to remove and follow the arrows to that point on the chart.

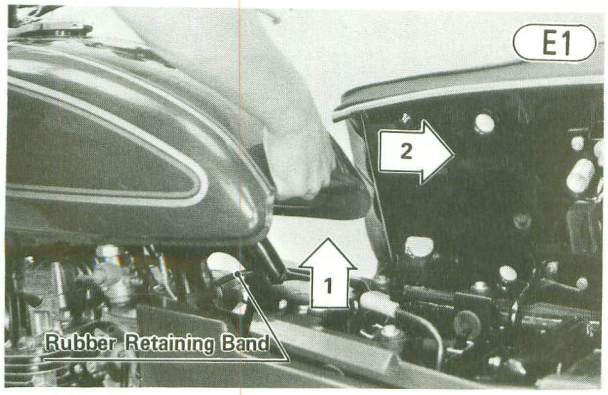


NOTES: 1. Before performing any disassembly operations, remove the ground (–) lead from the battery to prevent the possibility of accidentally turning the engine over.
2. Action with a mark (★) requires special tool(s) for removal, installation, disassembly, or assembly.

FUEL TANK

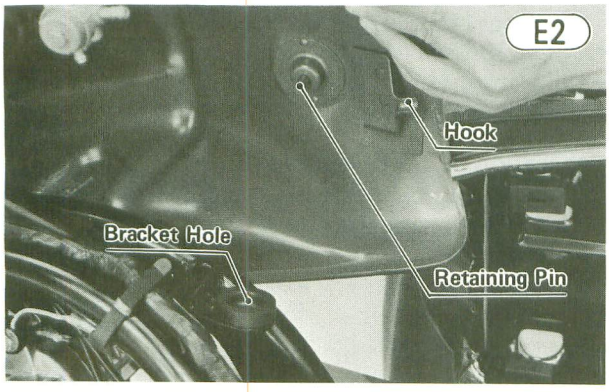
Removal:

- Turn the fuel tap to the "OFF" position, slide down the hose clamps, and pull the fuel hoses (2) off the tap.
- Unlock the seat, and swing it open.
- Unhook the rubber retaining band, first lift up the rear end of the tank about 30 mm, and then pull the fuel tank off towards the rear.



Installation:

- Put on the fuel tank, and fit the fuel hoses back onto the fuel tap, and slide the clamps back into place.
- Hook the fuel tank retaining band. Be sure that the retaining pin is seated in the bracket hole.

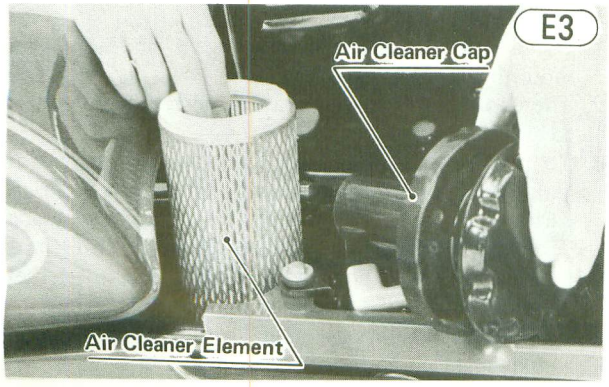


- Push the seat back down.

AIR CLEANER ELEMENT

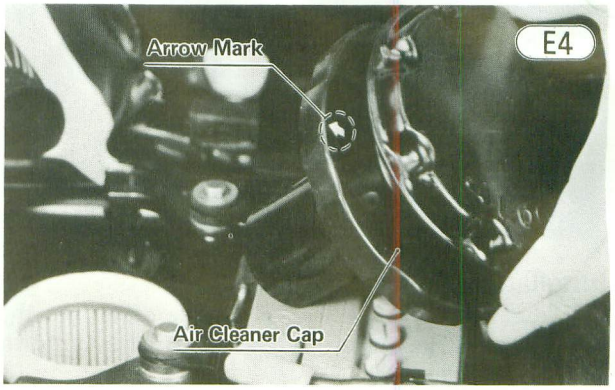
Removal:

- Unlock the seat, and swing it open.
- Screw off the air cleaner cap.
- Pull out the element.



Installation:

NOTE: When installing the air cleaner cap, screw the cap until a click is felt on your hand. The arrow mark on the cap must point to the front.



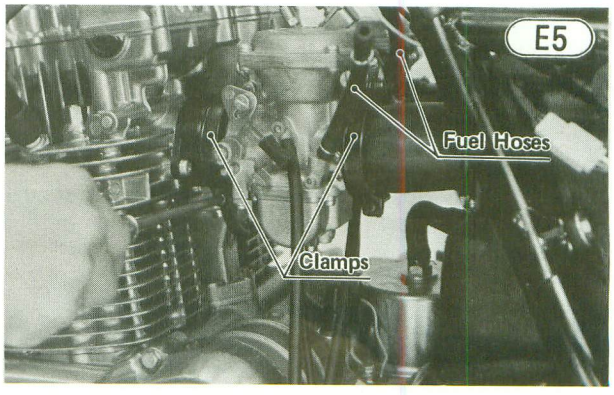
CARBURETORS

Removal:

- Take off the right and left side covers.
- Turn the fuel tap lever to the "OFF" position, slide down the hose clamps (2), and pull the fuel hoses (2) off the tap.
- 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.

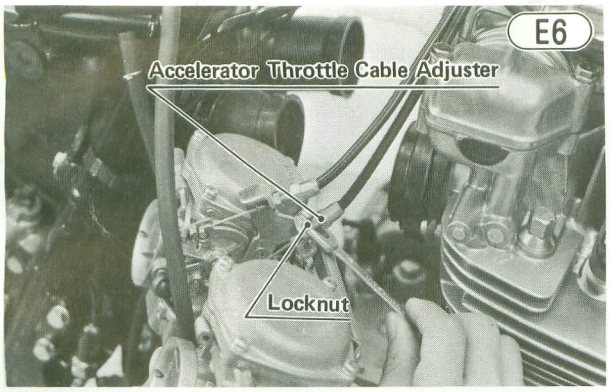
CAUTION **Removing the throttle cables from the carburetors without enough cable play, may cause throttle cable damage.**

- Free the air vent and overflow tubes from the rubber guide.
- Loosen the carburetor holder clamp and the air cleaner duct clamp for each carburetor, and slip it out of place.



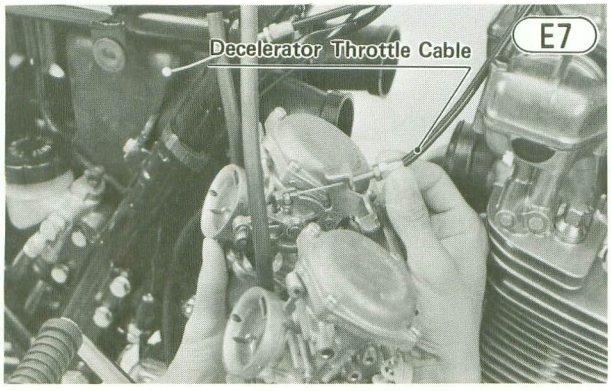
- Loosen the throttle cable adjuster locknuts, screw the accelerator throttle cable adjusters out of its bracket, and slip the tip of its inner cable out of the pulley. Then do the same with the decelerator throttle cable.

CAUTION **If, when screwing out the accelerator throttle cable adjuster there becomes no cable play, screw in fully the decelerator throttle cable adjuster and continue the accelerator throttle cable removal. This is to prevent inner cable breakage.**



Installation:

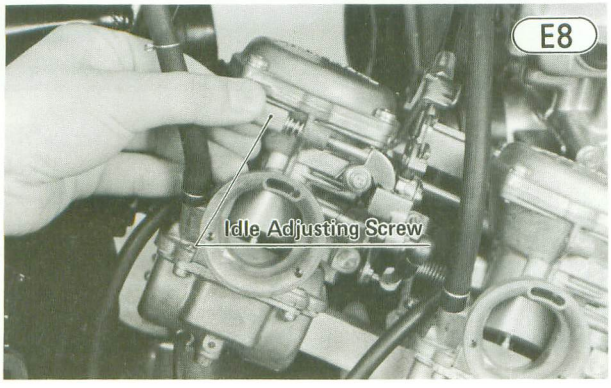
- Fit the tip of the decelerator throttle cable into the rear catch in the pulley, and screw its adjuster down into the bracket all the way.



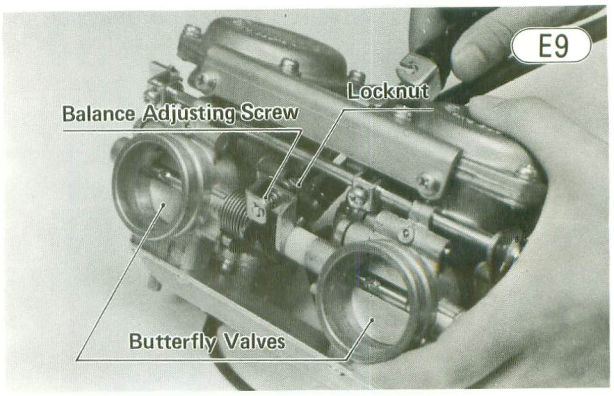
- Fit the tip of the other cable into the other catch, and lift its adjuster onto the bracket while turning the throttle grip at the same time, if necessary.
- Center each adjuster in its place in the bracket, and tighten the locknuts.

NOTE: If carburetors were separated from each other, or if only one of the carburetor mounting plates was removed, check the following; if necessary, adjust the carburetor before slipping the carburetors back into the carburetor holders.

- If the butterfly valves do not close at the same time by visual inspection, synchronize them using the following procedure:
  - Back off the idle adjusting screw so there is enough clearance to allow the butterfly valves to seat in their bores.



  - Turn the idle adjusting screw in until the butterfly valves just begin to open and there is a slight gap between the valve and bore.
  - Loosen the locknut and turn the balance adjusting screw to obtain the same gap between the butterfly valve and the bore in each carburetor.



  - Tighten the locknut.
- Slip the carburetors back into place the reverse of how they were removed.
- Once the ducts and carburetor are all properly fitted on the carburetors, tighten all four clamps.
- Route the carburetor tubes (4) to the rear right through the rubber guide.
- Fit the fuel hoses (2) back onto the fuel tap, and slide the clamps (2) back into place.
- Fit the right and left side covers.
- Adjust the throttle cables (Pg. 16).
- Adjust the carburetors (Pg. 18).

Separation of Carburetors:

NOTE: The carburetor parts listed below can be removed without separating the left and right carburetors from each other.

Main Jet	Jet Needle
Float Bowl	Pilot Jet
Starter Plunger (on right carb).	Pilot Screw
	Valve Seat, Valve Needle

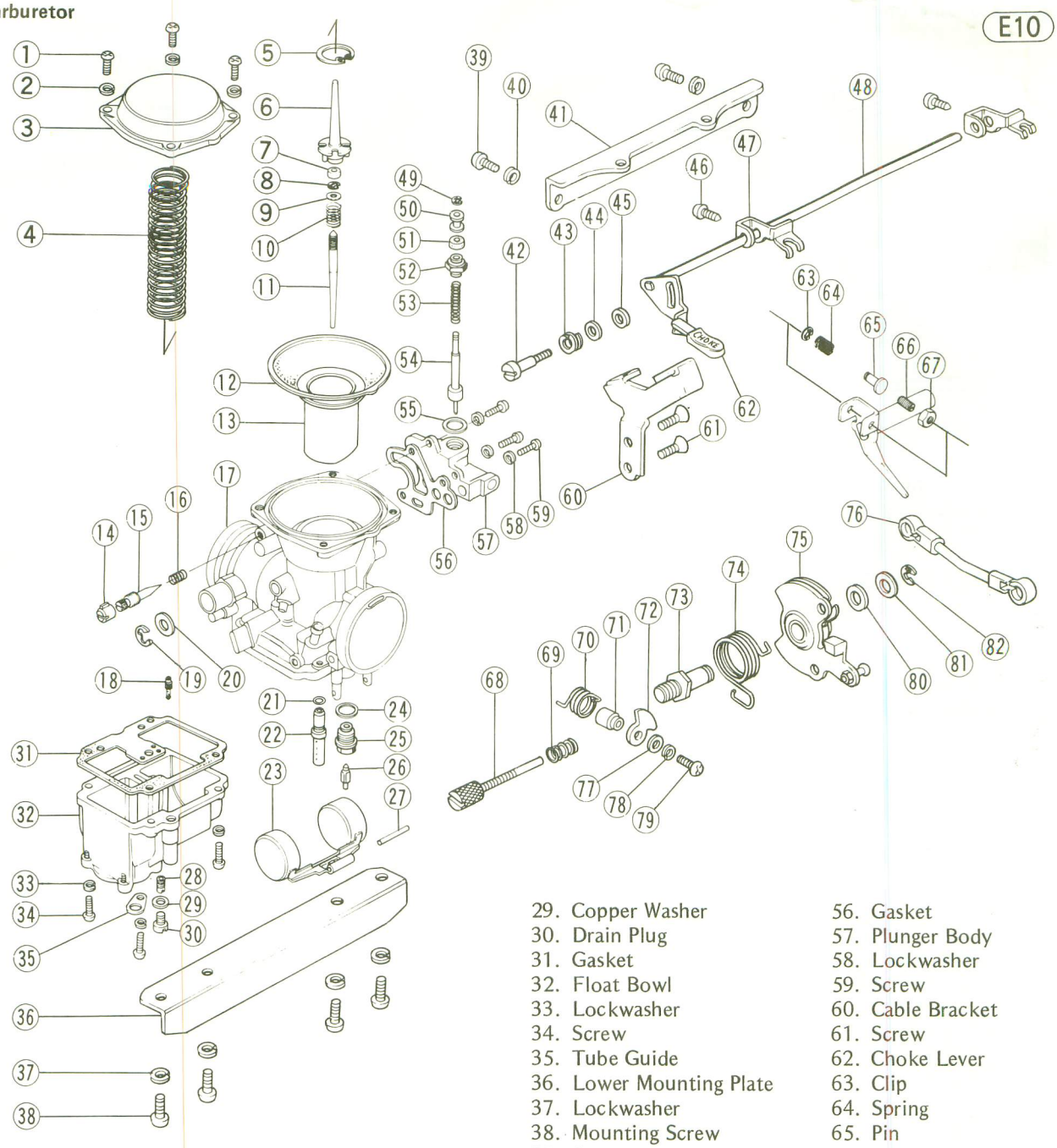
- Unscrew the plunger lever screws ㊻ (2), remove the screw ㊷, spring ㊸, flat washer ㊹, and plastic washer ㊺, and then pull off the choke lever linkage shaft ㊽.
- Remove the screws and lockwashers (4 ea) to take off the upper mounting plate ㊶.
- Remove the screws and lockwashers (4 ea) to take off the lower mounting plate ㊱ and separate the left and right carburetors.

Assembly Notes:

1. Use a non-permanent locking agent on each lower mounting screws.
2. The choke lever linkage shaft should be installed last, to avoid bending the shaft.
3. To prevent binding of the throttle linkage and air leaks from carburetor holders, both the left and right carburetor bore openings must be on the same plane. That is, the centerlines of the carburetor bores must be parallel both horizontally and vertically. If they are not, loosen the mounting screws just enough so that the carburetors are able to move, align them on a flat surface, and retighten the mounting screws.

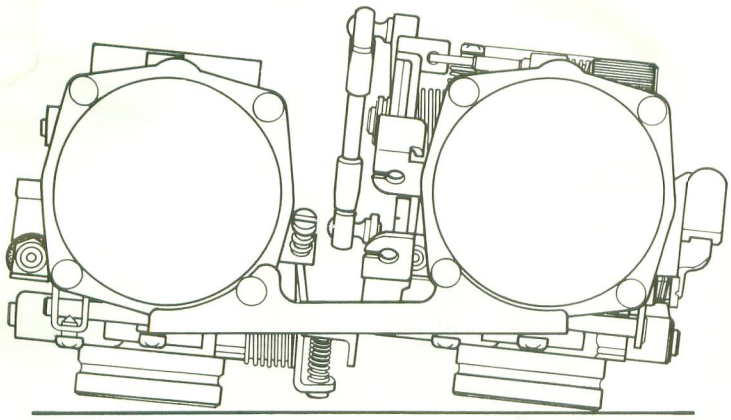
Carburetor

E10

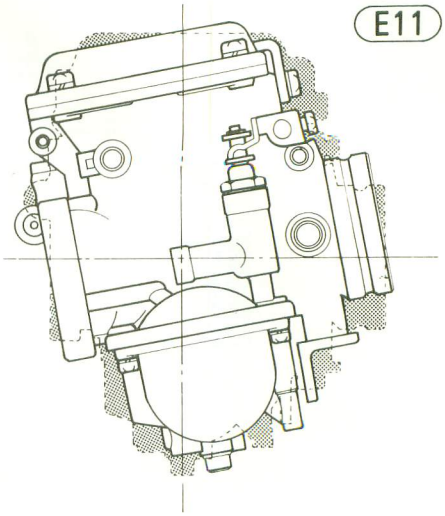


1. Screw
2. Lockwasher
3. Upper Chamber Cover
4. Spring
5. Circlip
6. Jet Needle Holder
7. Spacer
8. Clip
9. Spring Seat
10. Spring
11. Jet Needle
12. Diaphragm
13. Vacuum Piston
14. Pilot Screw Limiter
15. Pilot Screw
16. Spring
17. Carburetor Body
18. Pilot Jet
19. Clip
20. Washer
21. O Ring
22. Needle Jet
23. Float
24. Gasket
25. Valve Seat
26. Valve Needle
27. Float Pin
28. Main Jet
29. Copper Washer
30. Drain Plug
31. Gasket
32. Float Bowl
33. Lockwasher
34. Screw
35. Tube Guide
36. Lower Mounting Plate
37. Lockwasher
38. Mounting Screw
39. Screw
40. Lockwasher
41. Upper Mounting Plate
42. Screw
43. Spring
44. Flat Washer
45. Plastic Washer
46. Screw
47. Plunger Lever
48. Linkage Shaft
49. Clip
50. Bush
51. Dust Seal
52. Plunger Cap
53. Spring
54. Starter Plunger
55. Gasket
56. Gasket
57. Plunger Body
58. Lockwasher
59. Screw
60. Cable Bracket
61. Screw
62. Choke Lever
63. Clip
64. Spring
65. Pin
66. Adjusting Screw
67. Locknut
68. Idle Adjusting Screw
69. Spring
70. Spring
71. Collar
72. Cam
73. Pulley Pivot Shaft
74. Spring
75. Pulley
76. Ball Joint
77. Flat Washer
78. Lockwasher
79. Screw
80. Plastic Washer
81. Flat Washer
82. Clip

Carburetor Alignment



E11



Check for smooth operation of the throttle linkage, and proper alignment at the balance adjuster mechanism.

Carburetor Body Disassembly (per carburetor):

- Carefully mark the position of the pilot screw limiter ⑭ on the carburetor body so that it can be installed and set to its original position later. Without turning the pilot screw, remove the pilot screw limiter.
- Turn in the pilot screw and count the number of turns until it seats fully but not tightly, and then remove the pilot screw.
- Remove the drain plug ㉚ and copper washer ㉙, and remove the main jet ㉘.
- Remove the upper chamber cover screws (3) and lockwashers (3), and take off the upper chamber cover ③ and spring ④.
- Pull out the vacuum piston ⑬ with the diaphragm ⑫.

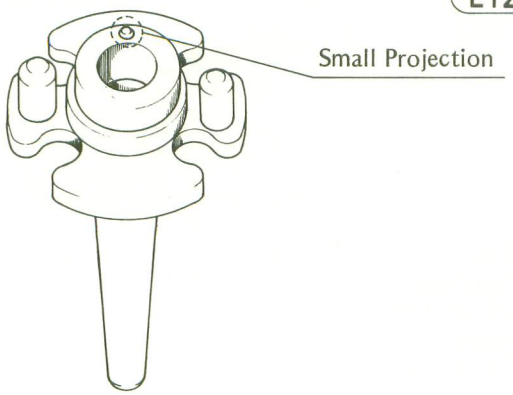
CAUTION **During carburetor disassembly, be careful not to damage the diaphragm. Never use a sharp edge to remove the diaphragm.**

- Remove the circlip ⑤ with a circlip pliers, and take the jet needle holder ⑥, spacer ⑦, jet needle ⑪, spring seat ⑨, and spring ⑩ out of the vacuum piston.

NOTE: There is a small projection of about 0.5 mm height on the bottom of the jet needle holder, which works to set the jet needle. Be careful not to chip it off.

Jet Needle Holder

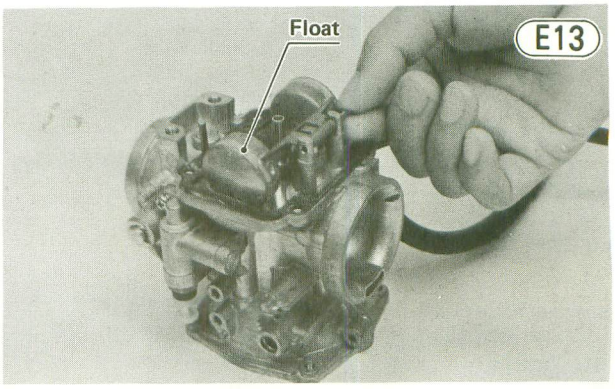
E12



- Remove the float bowl screws (4), and take off the float bowl ㉜, and gasket ㉛.
- Remove the pilot jet ⑱ from the float bowl.
- Push out the float pin ㉗, remove the float ㉓, and pull out the float valve needle ㉖.
- Remove the float valve seat ㉕ and gasket ㉔.
- Pull out the needle jet ㉒.
- Remove the screws (3), and remove the starter plunger body ㊼, and gasket ㊻.
- Unscrew the starter plunger cap ㊷, and remove the gasket ㊺, plunger ㊹, and spring ㊸.

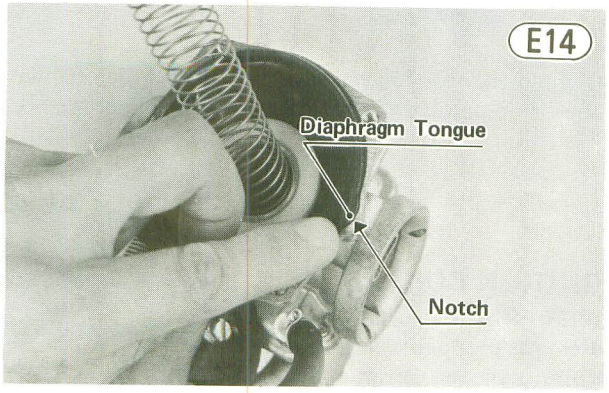
Assembly Notes:

1. Turn in the pilot screw fully but not tightly, and then back it out the number of turns counted during disassembly. Without turning the pilot screw, push the pilot screw limiter on so that it coincides with the marking on the carburetor body.
2. Replace any **O** rings and gaskets if damaged or deteriorated.
3. The standard vacuum piston spring must be installed. The spring tension greatly affects the engine performance, so a damaged spring must be replaced. The standard free length of the spring is about 100 mm.
4. The float must be installed in the direction shown in Fig. E13.



5. Assemble the upper chamber as follows:
   - Make sure that the jet needle clip is in the groove specified in the maintenance section (Pg. 135).

○Install the spring, spring seat, jet needle, and spacer into the vacuum piston.
○Put on the jet needle holder in the vacuum piston so that the projections of the holder fit into the holes in the vacuum piston, and install the circlip.
○Fit the vacuum piston into the carburetor body, and check that the piston slides up and down without drag.
○Insert the spring into the vacuum piston.
○Align the diaphragm tongue with the notch in the upper chamber cover mating surface, and fit the diaphragm sealing lip into its groove.



○With a finger, lift the vacuum piston just enough so that there is no crease on the diaphragm, and taking care not pinch the diaphragm lip, replace the upper chamber cover. While holding the cover to keep it from being lifted by the spring, tighten the three screws. The upper chamber cover must be installed fitting its tongue with the tongue of the carburetor body.

6. To verify correct diaphragm installation, check the vacuum piston operation in the following manner. Stand the carburetor upright, and set the vacuum piston at its highest position with your finger. While holding another finger on the incoming air passage hole to block any air leak, release your finger from the vacuum piston. In correct operation, the vacuum piston drops very slowly (taking more than 10 seconds to reach the bottom). If not, the diaphragm or vacuum piston is probably damaged and should be replaced.

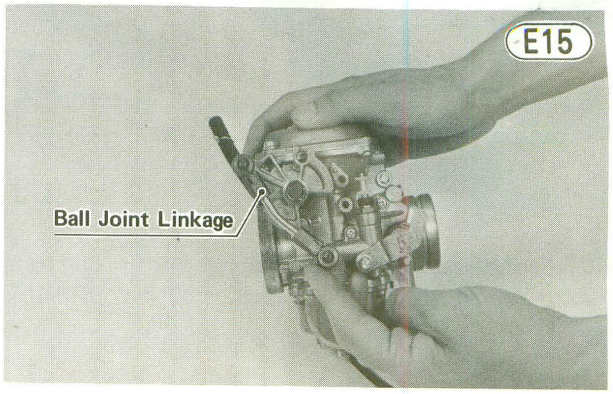
CAUTION **If the diaphragm is pinched, not only does the diaphragm become damaged, but the vacuum piston will not slide down to the reset position (there is a 5.5 mm space normally left between the piston lower end and the carburetor venturi). This causes idling unstability and reduces engine performance.**

Linkage Mechanism Disassembly:

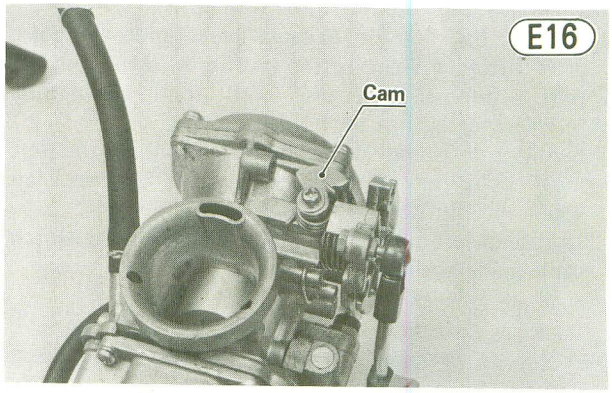
●Separate the carburetors (Pg. 40).
●Remove the cable bracket screws (2), and take off the cable bracket ⑥⓪.
●Remove the ball joint linkage ⑦⑥.
●Unscrew the idle adjusting screw ⑥⑧ and remove its spring ⑥⑨ to facilitate pulley ⑦⑤ removal.
●Remove the screw ⑦⑨ and remove the lockwasher ⑦⑧, flat washer ⑦⑦, cam ⑦②, collar ⑦①, and spring ⑦⓪.
●Take off the clip ⑧②, and pull off the flat washer ⑧①, plastic washer ⑧⓪, pulley ⑦⑤, and return spring ⑦④.

Linkage Mechanism Assembly Notes:

1. Apply a non-permanent locking agent to the cable bracket screws.
2. Install the ball joint linkage so that it bends downwards (Fig. E15). This is because to avoid the interference of linkage against the balance adjusting screw when the pulley is fully turned open.



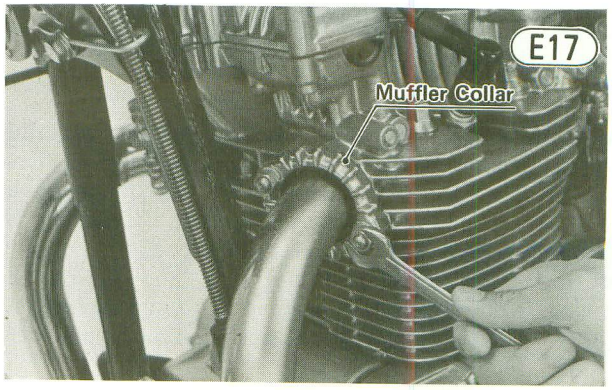
3. Install the cam and spring as shown in Fig. E16.



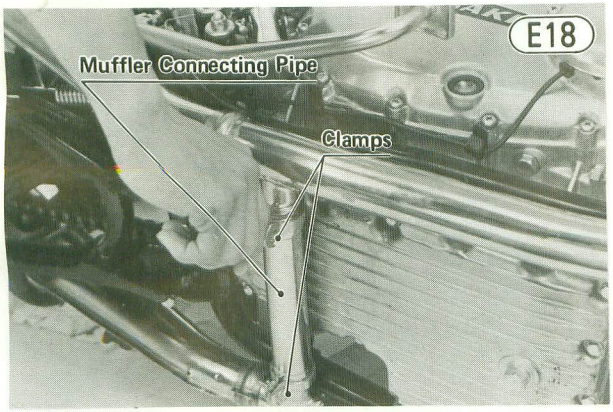
MUFFLER

Removal (each muffler):

●Remove the exhaust pipe holder nuts (2), and slide the holder off its cylinder head studs.



•Loosen the clamps that secures the mufflers to the muffler connecting pipe.

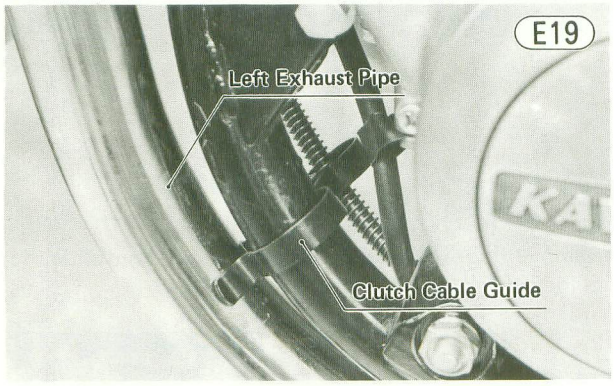


•Remove the rear footpeg to complete muffler removal. Also, remove the muffler gasket from each exhaust port.

Installation (each muffler):

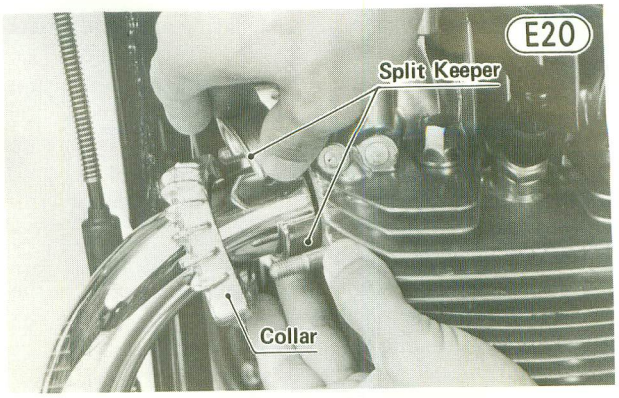
•Fit the muffler gasket into the exhaust port and place the exhaust pipe holder on the stud bolts.

NOTES: 1. Backing the exhaust pipe holder in place after fitting the end of the muffler into the exhaust port is impossible because of the frame down tube interference against the holder.
2. Swing side stand down before installing the left muffler to prevent interference with its operation when the muffler is in place.
3. In case of left muffler installation, position the clutch cable guide as shown.



•Fit the end of the muffler into the exhaust port, and attach the muffler to the frame connecting both mufflers with the connecting pipe under the engine. Tighten the rear footpeg nut loosely. Be sure a flat washer is between the muffler bracket and the nut.

•Fit the split keeper back into place, and tighten the exhaust pipe holder nuts (2) evenly to avoid an exhaust leak. The lockwasher on the nut must face the holder side.

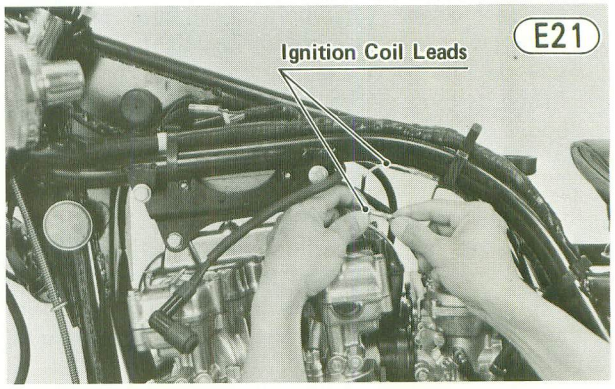


•Tighten the rear footpeg nut securely, and then tighten the clamp bolts of the muffler connecting pipe.

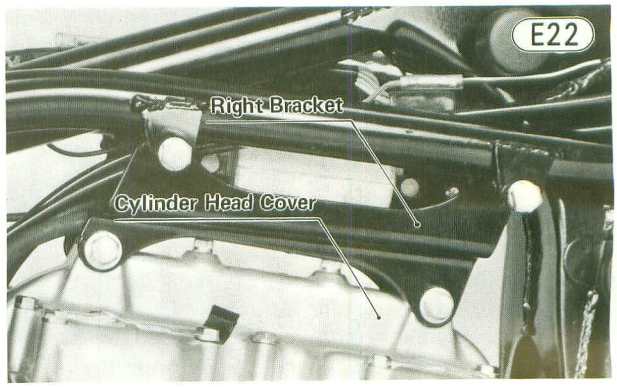
IGNITION COIL

Removal:

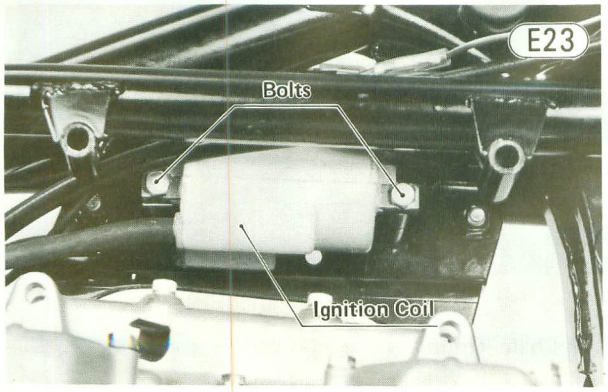
•Remove the fuel tank (Pg. 39).
•Pull off the lead from each spark plug.
•Disconnect the blue and the yellow/red ignition coil leads.



•Remove the bolts (4) from the right bracket that connecting the cylinder head cover to the frame, and remove the right bracket.



●Remove the bolts (2) that connect the ignition coil to the brackets, and remove the ignition coil.



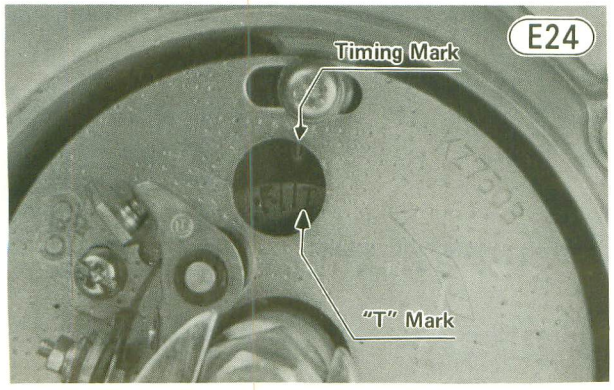
Installation Notes:

1. Use only the Kawasaki ignition coil bolts to mount the ignition coil. Bolts of a different composition may adversely affect ignition coil performance.
2. Each ignition coil mounting bolt has a collar between the ignition coil and left bracket.

CAMSHAFT

Removal:

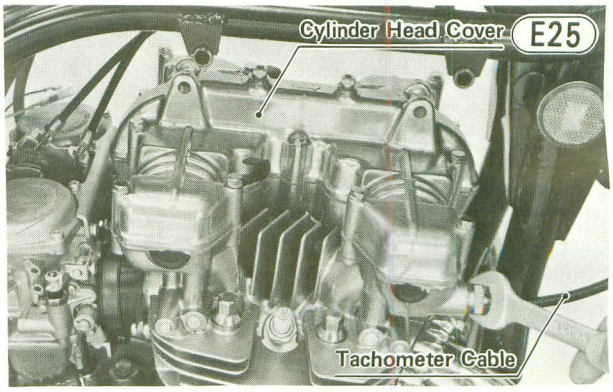
●Remove the fuel tank (Pg. 39).
●Remove the battery ground lead.
●Pull off the spark plug lead from each spark plug.
●Disconnect the blue contact breaker lead and yellow/red lead from the ignition coil lead (Fig. E21).
●Remove the contact breaker cover and gasket to turn the crankshaft.
●Using a 17 mm wrench on the crankshaft, set the engine at TDC by aligning the timing advancer "T" mark (the line adjoining the "T") with the timing mark.



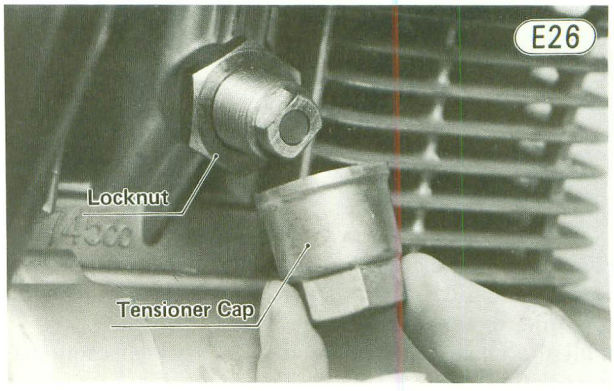
●Remove the bolts (6), and take off the cylinder head cover brackets (2). The left bracket has the ignition coil on it, and each bolt has a lockwasher. Each lower bolt has flat washers (2).

●Unscrew the tachometer cable from the cylinder head, and take out the tachometer pinion.

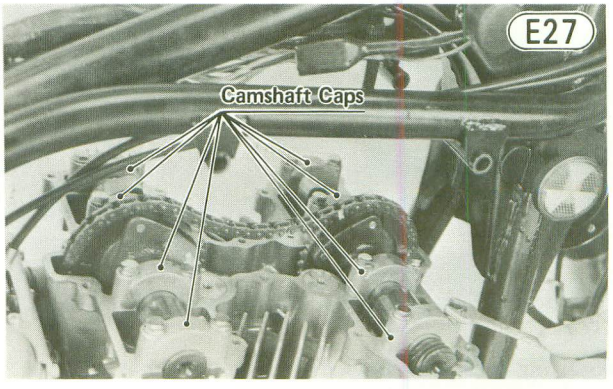
CAUTION **When installing the camshafts attempting to install the camshafts with the tachometer pinion left in the cylinder head may cause tachometer gear damage.**



●Remove the cylinder head cover bolts (14), and slip the cover off the cylinder head.
●Remove the gasket.
●Remove the chain tensioner cap and O ring, loosen the locknut, and then screw the chain tensioner assembly off the cylinder block.



●Remove the camshaft cap bolts (16), and take off the camshaft caps (8).



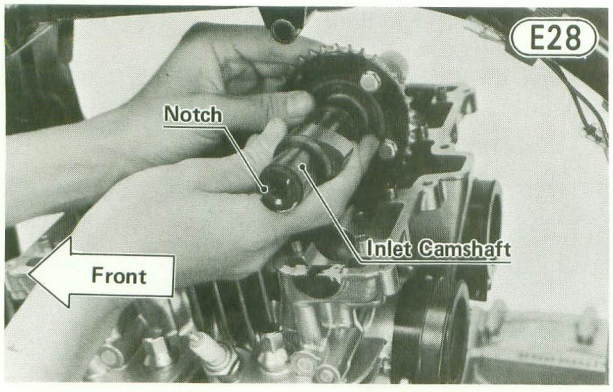
●Remove the camshafts. Use a screwdriver or wire to keep the chain from falling down into the cylinder block.

CAUTION **Always pull the camshaft chain taut during the turning of the crankshaft while the camshaft chain is loose, to avoid kinking the chain on the lower (crankshaft) sprocket. A kinked chain could damage both the chain and the sprocket.**

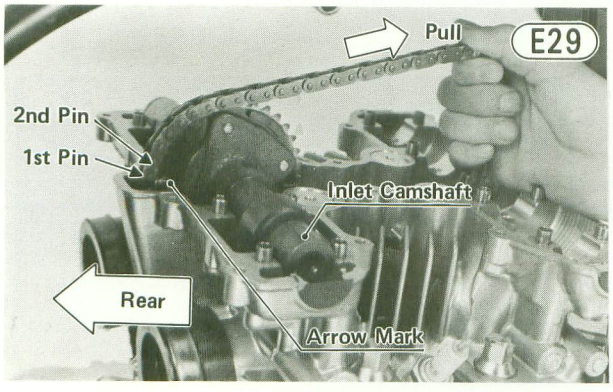
Installation:

NOTE: If a new camshaft, cylinder head, valve, or valve lifter were installed, check valve clearance (Pg. 15).

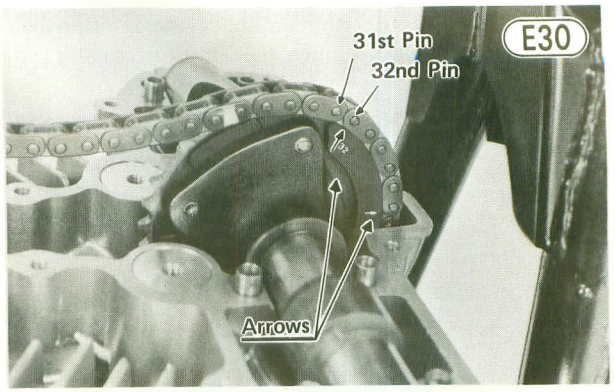
- Check that the tachometer pinion is removed from the cylinder head, and all camshaft cap knock pins (16) are fitted.
- Check crankshaft position to see that the engine is still at TDC, and readjust if necessary. Remember to pull the camshaft chain taut before rotating the crankshaft.
- Apply clean engine oil to all cam parts.
- Feed the inlet camshaft (no tachometer gear) through the chain and remove the screwdriver. The notched camshaft end must be on the left side of the engine.



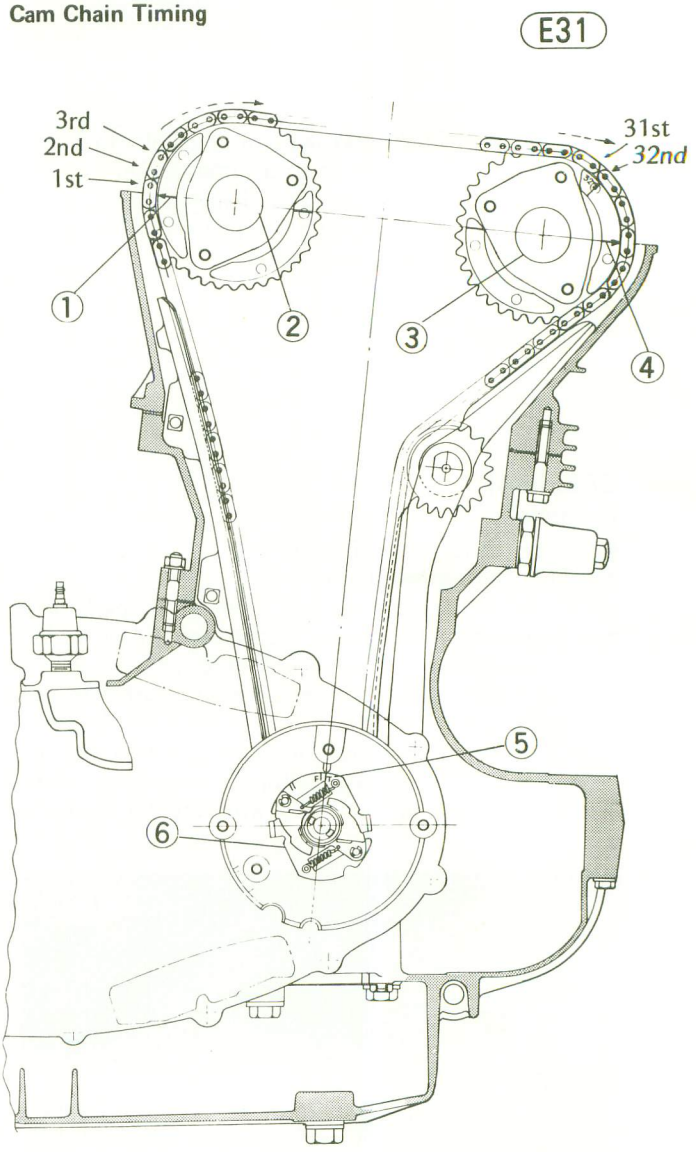
- Turn the inlet camshaft so that the arrow mark on the sprocket is aligned with the cylinder head surface and pointing to the rear.
- Pull the chain taut and fit it onto the inlet camshaft sprocket.



- Starting with the upper pin on the link that coincides with the inlet camshaft sprocket arrow mark, count to the 32nd pin. Feed the exhaust camshaft through the chain and align that 32nd pin with the raised arrow mark. The notch on the camshaft end must face left.



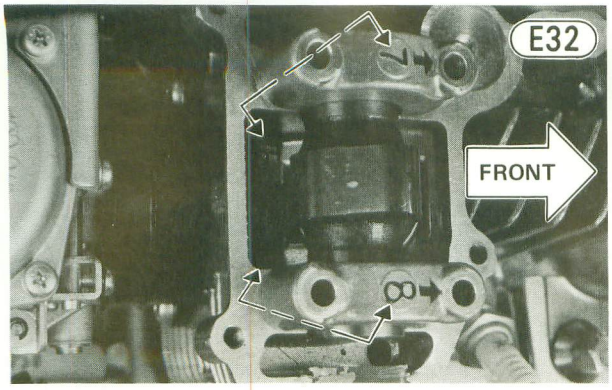
Cam Chain Timing



1. Arrow Mark
2. Inlet Camshaft
3. Exhaust Camshaft
4. Arrow Mark
5. TDC Mark
6. Timing Advancer

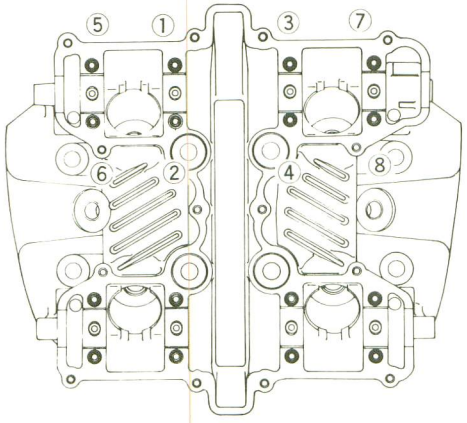
- The camshaft caps are machined together with the cylinder head, so set the camshaft caps into place with the number on the camshaft caps matching the number

on the cylinder head, and with the arrow on the cap pointing forward (toward the exhaust side).



- Partially tighten the left inside camshaft cap bolts first, to seat the camshaft in place. Fully tighten all the bolts with 1.1 ~ 1.3 kg-m (95 ~ 113 in-lbs) of torque, following the tightening sequence shown in the diagram.

Camshaft Cap Tightening Order E33



- Install the chain tensioner assembly. The sequence is push rod, spring (long), washer, spring (short), push rod guide, aluminum washer, and locknut.

CAUTION **Do not adjust cam chain tension prior to installation of the cylinder head cover.**

- Turn the crankshaft over to align the "T" mark with the timing mark (TDC) (See Fig. E24), and check that the arrow mark on the inlet camshaft sprocket and the unnumbered arrow mark on the exhaust camshaft sprocket are aligned with the cylinder head surface, indicating that cam timing is correct.

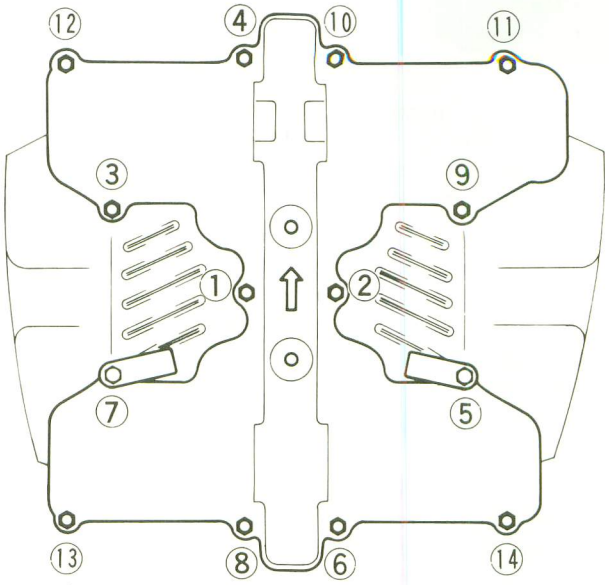
CAUTION **1. If any resistance is felt when turning over the crankshaft, stop immediately, and check the camshaft chain timing. Valves may be bent, if the timing was not properly set.**

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: If a new camshaft, cylinder head, valve, or valve lifter were installed, check valve clearance at this time (Pg. 15), and adjust if necessary.

- Apply a small amount of molybdenum disulfide grease for engine assembly to the tachometer pinion shaft, insert the pinion, and reconnect the cable to the cylinder head.
- Apply a liquid gasket to the circumference of each cylinder head rubber plug, and fit them in place.
- Install the cylinder head cover with a new cylinder head cover gasket. The arrow on the cover must point towards the front. Tighten the cover bolts (14) with 1.1 ~ 1.3 kg-m (95 ~ 113 in-lbs) of torque, following the tightening sequence shown in Fig. E34. Do not forget to install the spark plug lead clamps (2) when the cylinder head cover is installed.

Cylinder Head Cover Bolt Tightening Order E34



- Install the brackets connecting the cylinder head cover to the frame. Tighten the upper bracket bolts (4) with 2.0 ~ 2.8 kg-m (14.5 ~ 20.0 ft-lbs) of torque. Each upper bracket bolt has a lockwasher. Tighten the lower bracket bolt nuts (2) with 1.6 ~ 2.2 kg-m (11.5 ~ 16.0 ft-lbs) of torque. Each lower bracket bolt has a lockwasher and two flat washers.
- Connect the blue and yellow/red contact breaker leads to the same color leads which were disconnected.
- Connect the spark plug lead on each spark plug.
- Install the fuel tank (Pg. 39).
- Adjust the camshaft chain (Pg. 14) and install the cap and O ring.
- Install the contact breaker cover gasket and cover.

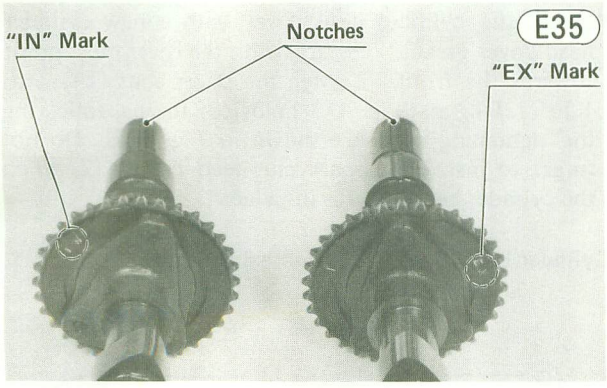
CAMSHAFT SPROCKET

Removal (on each camshaft):

- Remove the camshaft (Pg. 45).
- Remove the camshaft sprocket nuts (3), and slide the sprocket off the camshaft.

Installation:

- Set the sprocket on the camshaft aligning the bolt holes. The side marked "IN" on the inlet camshaft sprocket or "EX" on the exhaust camshaft sprocket must be opposite to the notch on the shaft end.

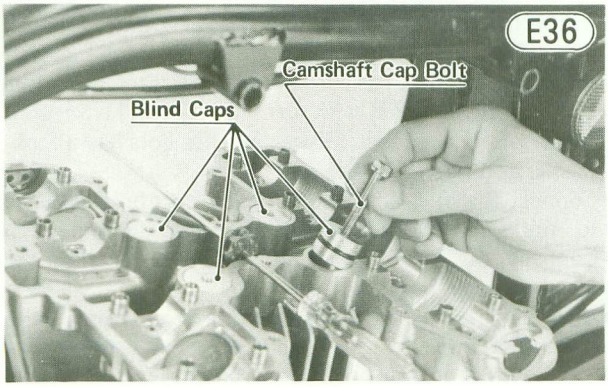


- Apply a non-permanent locking agent to sprocket bolts (3), and install bolts tightening them with 1.4 ~ 1.6 kg-m (10~11.5 ft-lbs) of torque.
- Install the camshaft (Pg. 46).

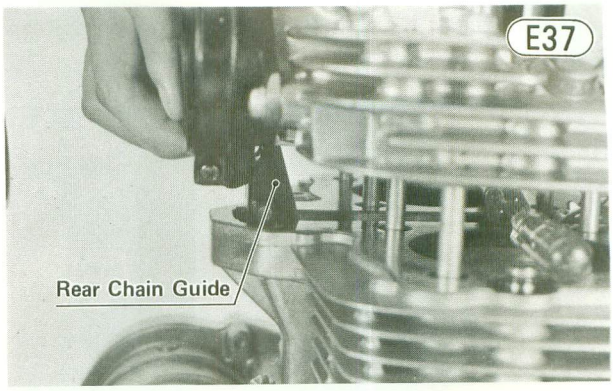
CYLINDER HEAD

Removal:

- Remove the mufflers (Pg. 43).
- Remove the carburetors (Pg. 39).
- Remove the camshafts (Pg. 45).
- Using the camshaft cap bolt, pull out the blind caps (4).



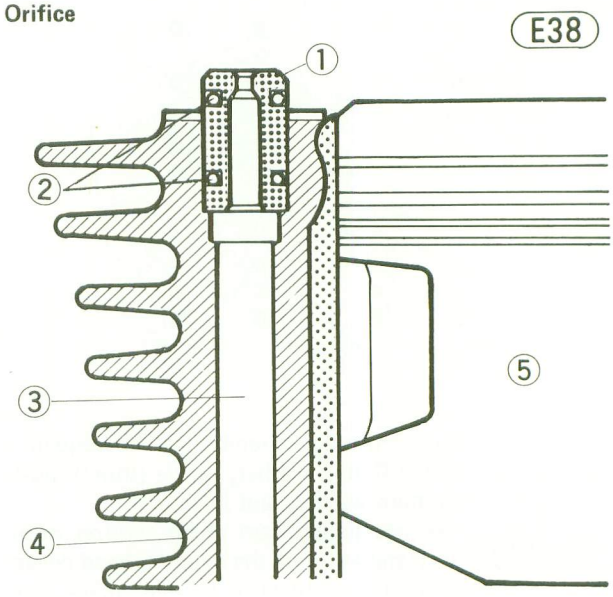
- Remove the cylinder head nuts (8) from the upper cylinder head, and bolts (3) from the bottom of the cylinder head (rear 2, front 1).
- Pull off the cylinder head, and remove the cylinder head gasket. To avoid chain guide interference with the cylinder head, lift the cylinder head up approximately 30 mm, pull the rear chain guide up slightly and slide forward, and pull the head out toward the rear taking care not to damage the camshaft chain guides.



Installation:

NOTE: 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 the new head.

- Using compressed air, blow out any particles which may obstruct the oil passages and orifices. Check the O rings on each orifices, and replace them if deteriorated or damaged.
- Install a new cylinder head gasket. Check to see that oil passage orifices (2) are in place, that the small hole in each orifice faces up, and the head gasket face marked "TOP" is facing up.

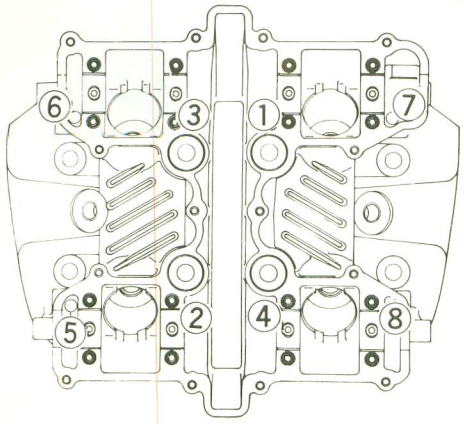


1. Orifice
2. O Rings
3. Oil Passage
4. Cylinder Block
5. Piston

- Slide the rear chain guide foward slightly to facilitate the cylinder head installation.
- Fit the cylinder head on part way, install the rear chain guide, and then install the cylinder head completely.
- Tighten the cylinder head nuts (8) with 3.8~4.2 kg-m (27 ~ 30 ft-lbs) of torque, following the tightening sequence indicated on the cylinder head. First hand tighten the nuts, then tighten them to the specified torque.

Cylinder Head Nut Tightening Order

E39



- Tighten the cylinder head bolts (3) with 1.1~1.3 kg-m (95~113 in-lbs) of torque.
- Apply a little oil on the **O** rings, and fit the blind caps (4).

NOTE: Blind caps must face up towards the screw hole to facilitate later removal.

- Lift up the camshaft chain, and use a screwdriver to keep the chain from falling down into the cylinder block.
- Install the camshafts (Pg. 46).

NOTE: If a new camshaft, cylinder head, valve, or valve lifter were installed, check valve clearance (Pg. 15), and adjust if necessary.

- Install the carburetors (Pg. 40).
- Install the mufflers (Pg. 44).
- Adjust the camshaft chain (Pg. 14).
- Adjust the throttle cable play (Pg. 16).
- Check the idling and adjust the carburetors if necessary (Pg. 18).

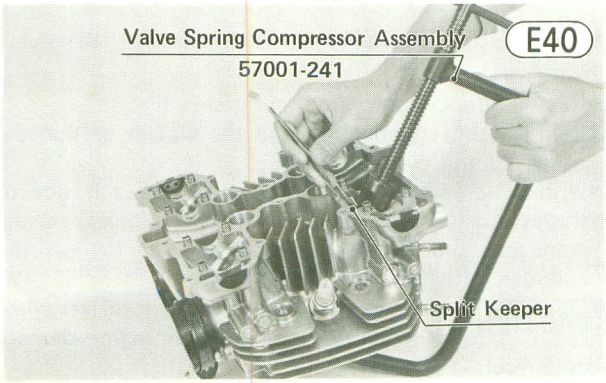
VALVES, VALVE GUIDES

Removal (each valve and valve guide):

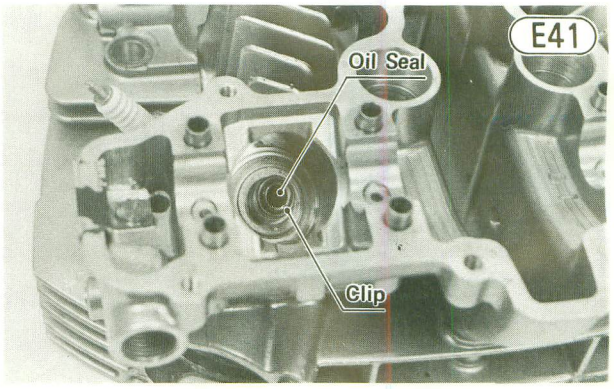
- Remove the cylinder head (Pg. 48).
- Pull out the valve lifters (4) and shims (4), marking them as to location.

NOTE: If more than one valve is to be removed, mark them as to location so they can be reinstalled in the proper place.

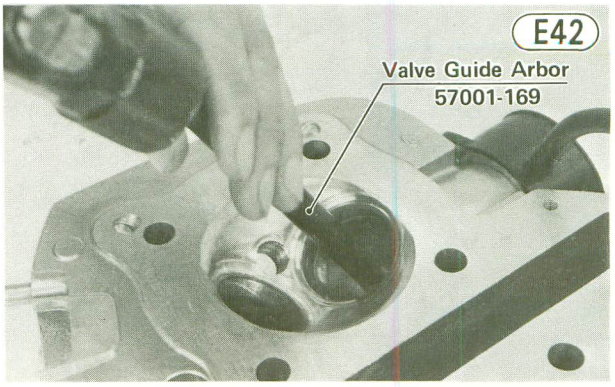
- Using the valve spring compressor assembly (special tool) to press down the valve spring retainer ④, remove the split keeper ③.



- Remove the tool, and then remove the spring retainer, outer spring ⑥, inner spring ⑤, and spring seat ⑩.
- Push out the valve ⑫ or ⑬.
- Remove the clip ⑧ and pull off the oil seal ⑦.



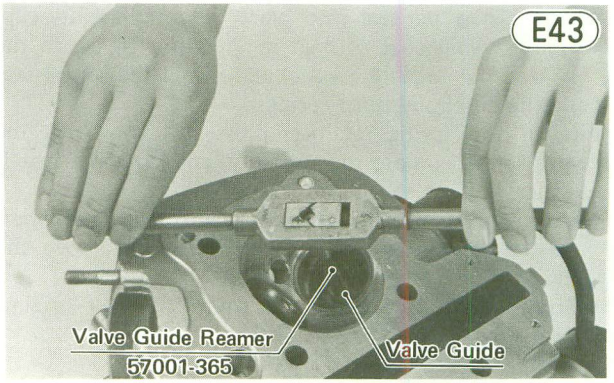
- Heat the area around the guide to about 120~150°C (248~302°F), and hammer lightly on valve guide arbor (special tool) to remove the guide from the top of the head.



Installation (each valve and valve guide):

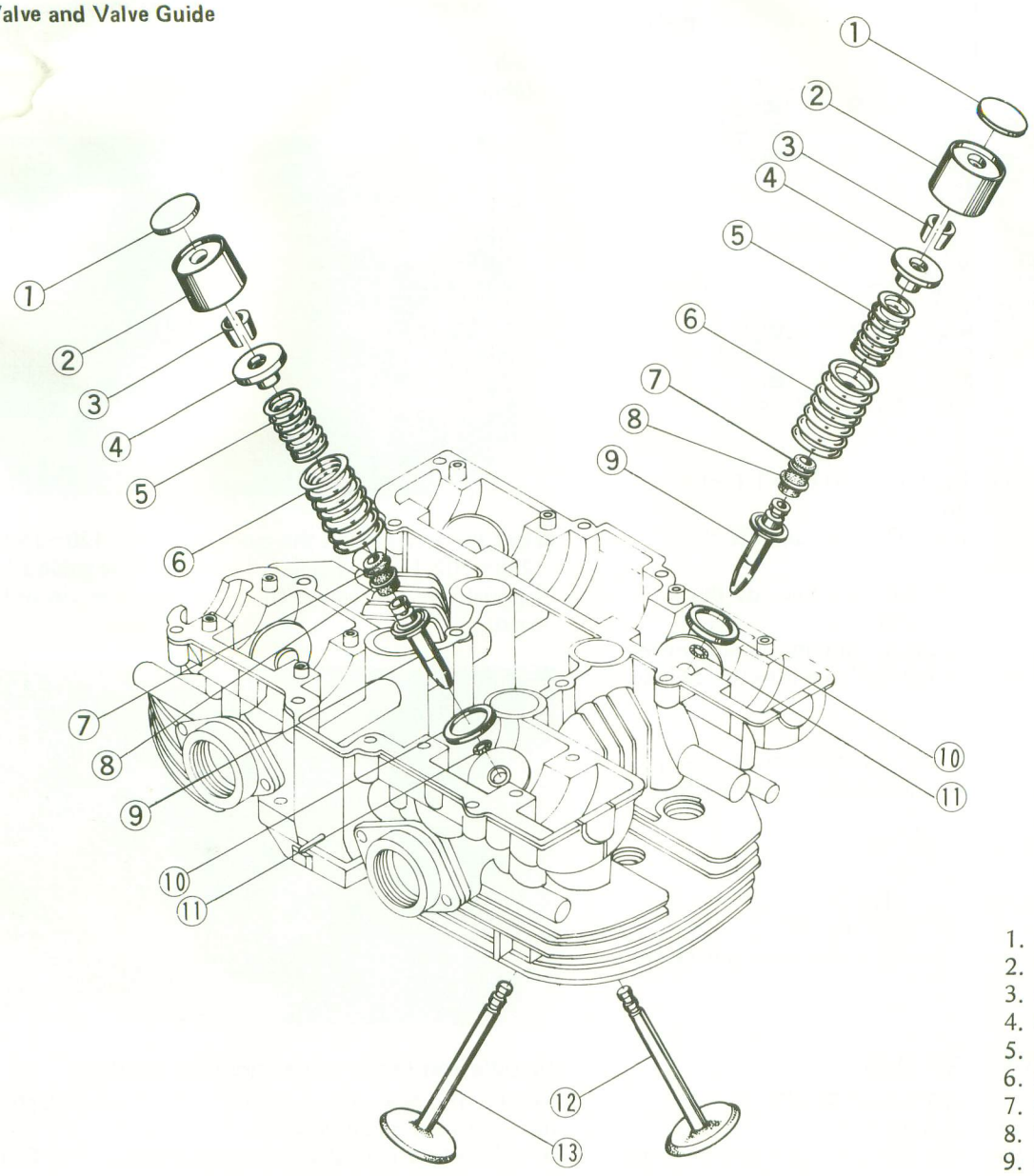
NOTE: If a new valve or valve guide are installed, check the valve/valve guide clearance.

- Apply oil to the valve guide, and install a new **O** ring ⑪ onto the valve guide.
- Heat the area around the valve guide 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).
- Ream the valve guide with the valve guide reamer (special tool) even if the old guide is re-used.



Valve and Valve Guide

E44



1. Shim
2. Valve Lifter
3. Split Keeper
4. Spring Retainer
5. Inner Spring
6. Outer Spring
7. Clip
8. Oil Seal
9. Clip
10. Valve Guide
11. O Ring
12. Inlet Valve
13. Exhaust Valve

- Lap the valve to check that it is seating properly. If it is uneven, refer to the Maintenance Section (Pg. 142).
- Push a new oil seal into place, and replace its clip.
- Apply a thin coat of high temperature grease to the valve stem, insert the valve, and install the spring seat and the outer and inner springs.
- Install the spring retainer, press it down with the valve spring compressor assembly, and put on the split keeper.
- After making sure that the split keeper, spring retainer, and valve stem are all properly fitted, remove the valve spring compressor assembly.
- Mount the valve lifters and shims in their original locations.
- Install the cylinder head (Pg. 48).
- Check valve clearance (Pg. 15), and adjust if necessary.

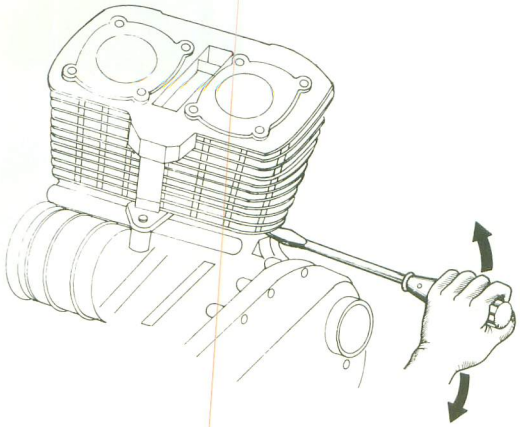
CYLINDER BLOCK

Removal:

- Remove the cylinder head and gasket (Pg. 48).
- Remove the cylinder nut and the washer at the rear center of the cylinder block.
- With a screwdriver, pry at the gap in each side of the cylinder base to free the cylinder block from the crankcase and lift it slightly, and then lift off the cylinder with the rear chain guide.

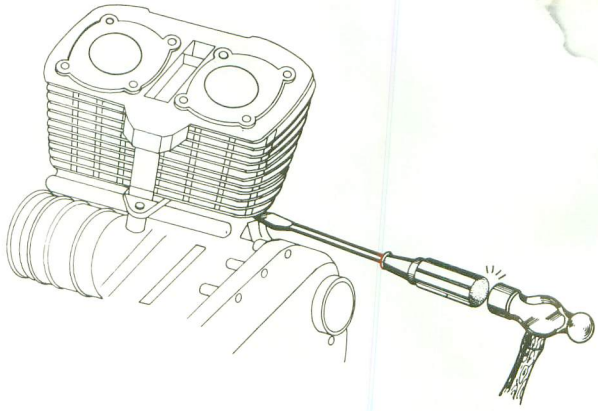
CAUTION **Do not hammer on the screwdriver while it is in the pry point as engine damage could result (Fig. E45).**

Cylinder Block Pry Point



Good

E45



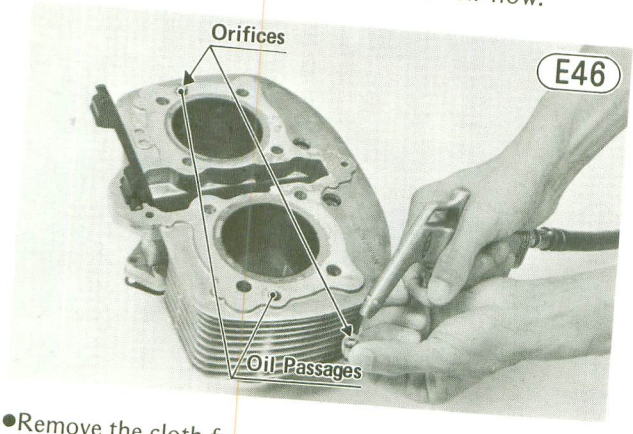
Bad

•Wrap a clean cloth around the base of each piston so that no parts or dirt will fall into the crankcase.

Installation:

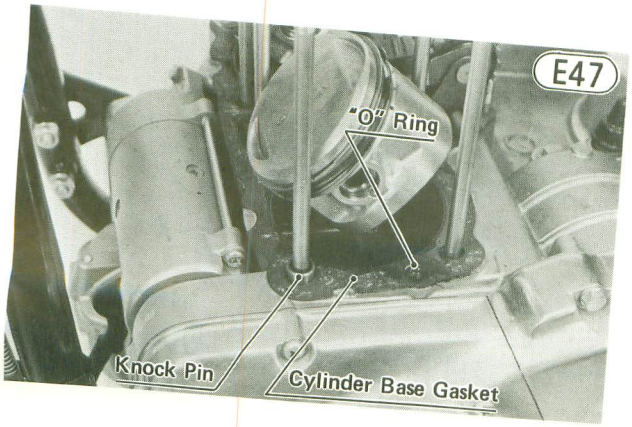
NOTE: If the cylinder block is replaced with a new one, piston to cylinder clearance must be checked against the specified value (Pg. 147).

•With compressed air, blow the oil passages to remove dirt or particles which may obstruct oil flow.



•Remove the cloth from under each piston.

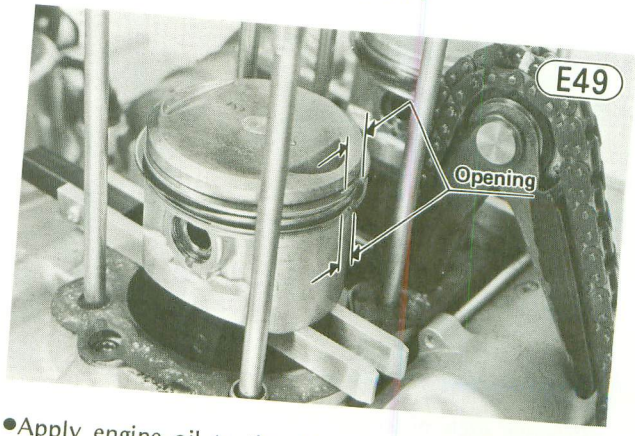
•Put on the cylinder block **O** rings (2), oil passage **O** rings (2), and cylinder base gasket with new ones, and be sure that knock pins (2) are properly fitted on the crankcase.



•Pull the chain taut to avoid kinking the chain, and using a 17 mm wrench on the crankshaft, turn the crankshaft to where the timing advancer "T" mark (the line adjointed the "T") aligns with the timing mark.

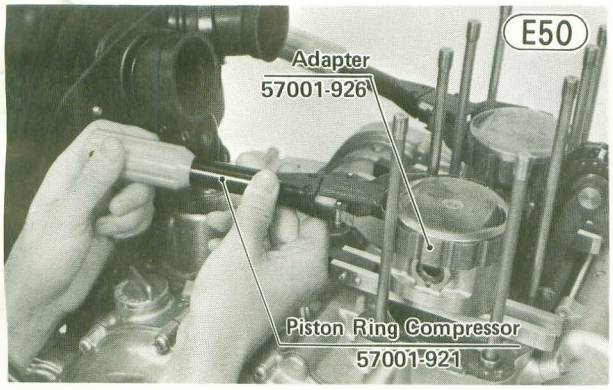
•Fit the piston base (special tool) into place at the crankcase opening for each piston, and gently turn the crankshaft with a 17 mm wrench until each piston is situated squarely on its piston base.

•Position each piston ring so that the opening in the top and oil ring of each piston is facing forward, and the second ring opening faces the rear.



•Apply engine oil to the piston rings and the cylinder inside surfaces.

•Compress the piston rings using a piston ring compressor and adapter (special tools) on each piston.

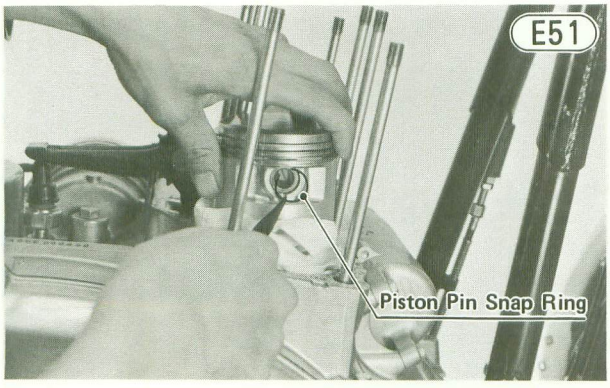


•Check that the rear camshaft chain guide is in place.
•Fit the cylinder block on the crankcase studs, guide the front camshaft chain guide inside the block, and rest the bottom of the cylinders on the piston ring compressors.
•Pull the camshaft chain up through the cylinders and insert a screwdriver through it to avoid the chain 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.
•Install the flat washer and nut, and after hand tightening the cylinder cap nuts (8), tighten the cylinder base nut.
•Install the cylinder head (Pg. 48).
•Adjust camshaft chain (Pg. 14).

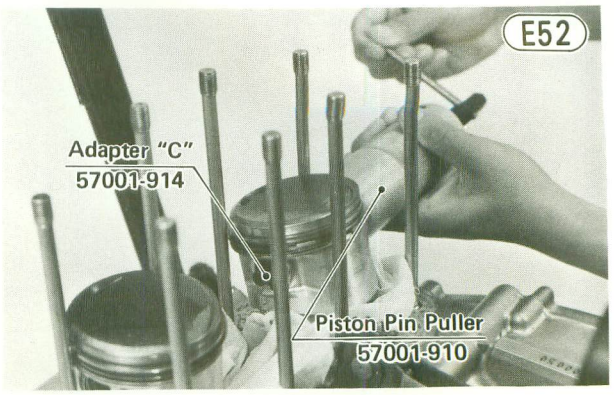
PISTON, PISTON RINGS

Removal:

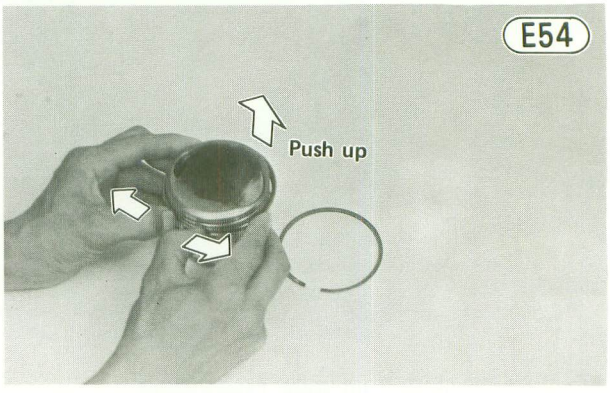
•Remove the cylinder block (Pg. 50).
•Wrap a clean cloth around the base of each piston to secure it in position for removal and so that no parts and dirt will fall into the crankcase.
•Remove the piston pin snap rings from the outside of each piston.



•Remove each piston by pushing its piston pin out the side that the snap ring was removed. Use the piston pin puller and adapter "C" (special tools) if necessary.



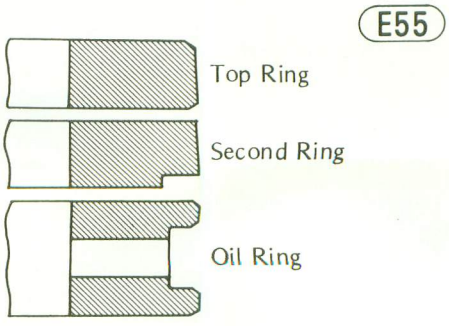
•Remove the piston rings with the piston ring pliers (special tool). To remove a ring by hand, spread the ring open with both thumbs, and then push up on the opposite side.

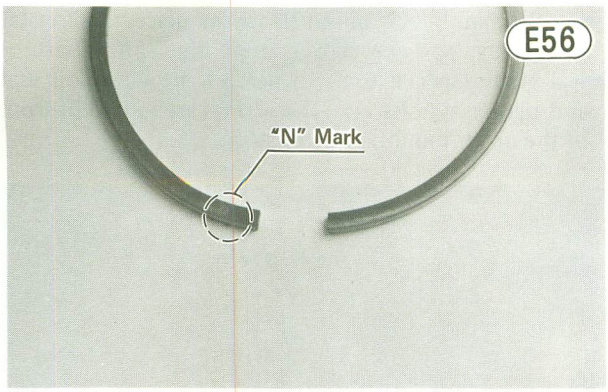


Installation:

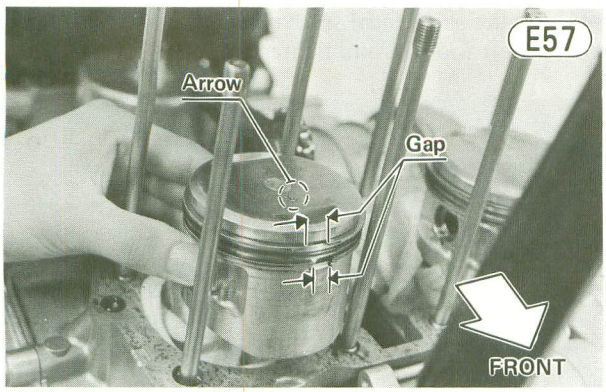
•Install the piston rings so that the correct side (marked "N") faces up (Fig. E56). Do not mix up the top and second rings. The outer edges of the top ring are chamfered; the lower outer edge of the second ring is notched.

Piston Rings





- Turn the rings so that the gap in the top ring and oil ring of each piston faces forward and the gap in the second ring faces the rear.
- Apply a little engine oil to the piston pins, and install the piston and piston pins. The arrow on the top of each piston must point towards the front.

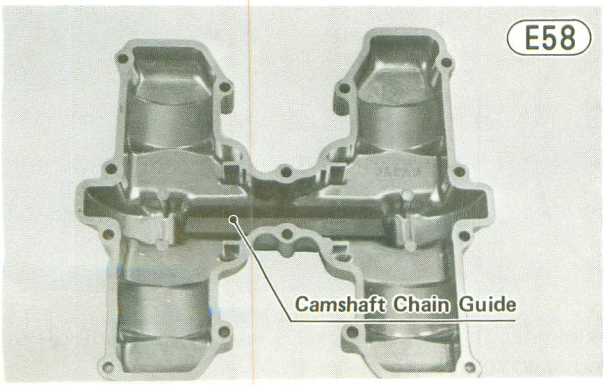


- Fit a new piston pin snap ring into the side of each piston, as removal weakens and deforms the snap ring.
- Install the cylinder block (Pg. 51).
- Adjust camshaft chain (Pg. 14).

CAMSHAFT CHAIN GUIDE (Top)

Removal:

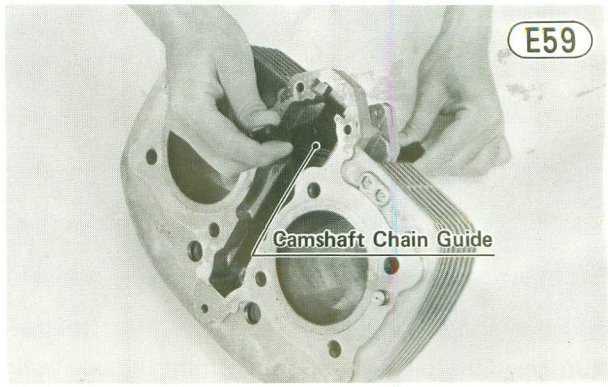
- Remove the cylinder head cover as explained in camshaft removal (Pg. 45).
- Remove the Allen bolts and copper washers (2 ea), and remove the camshaft chain guide.



CAMSHAFT CHAIN GUIDE (Rear)

Removal:

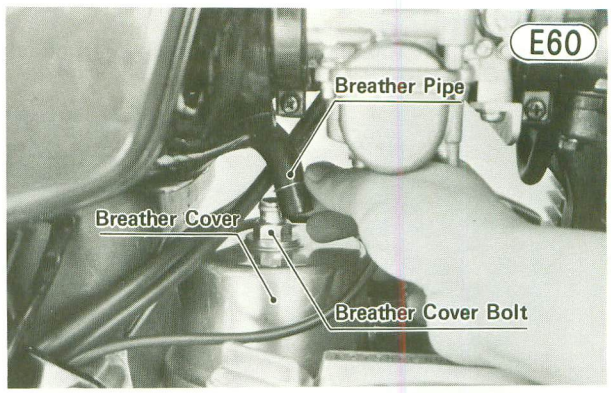
- Remove the cylinder block (Pg. 50).
- Remove the chain guide.



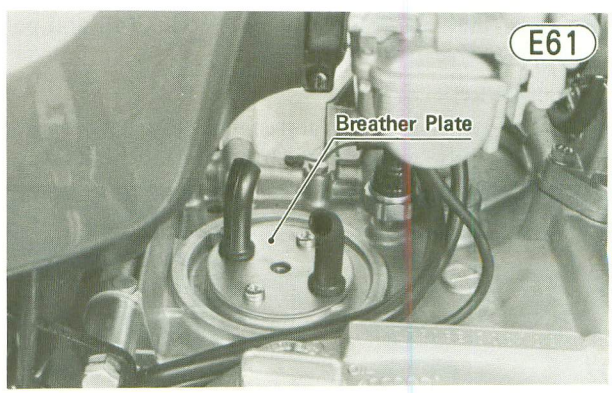
BREATHER COVER

Removal:

- Remove the breather pipe from the breather cover bolt.



- Remove the breather cover bolt and **O** ring, and take off the breather cover and **O** ring.
- Remove the breather plate screws (2), and remove the breather plate with the breather tubes.



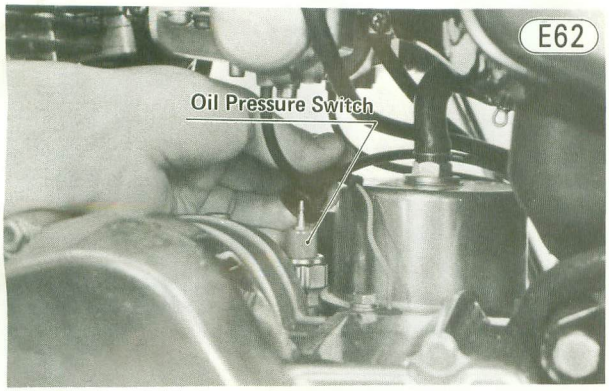
Installation Notes:

1. Replace the breather cover **O** ring, or breather cover bolt **O** ring with a new one if deteriorated or damaged.
2. Tighten the breather cover bolt with 1.3 ~ 1.7 kg-m (9.5 ~ 12.0 ft-lbs) of torque.

OIL PRESSURE SWITCH

Removal:

•Pull off the oil pressure switch lead from the switch.



•Unscrew the oil pressure switch from the crankcase.

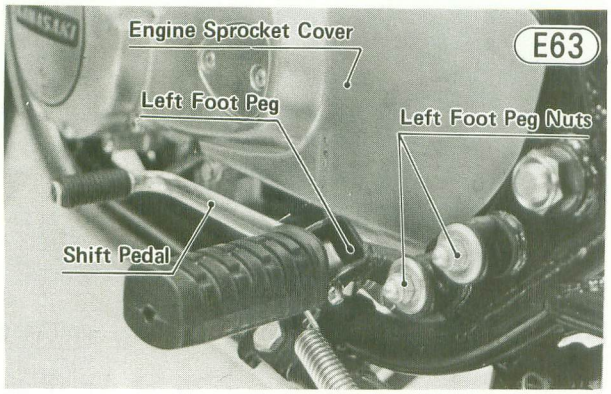
Installation Note:

•Tighten the switch with 1.3~1.7 kg-m (9.5~12 ft-lbs) of torque.

ENGINE SPROCKET COVER

Removal:

•Remove the left footpeg nuts (2), washers (2), and left footpeg.

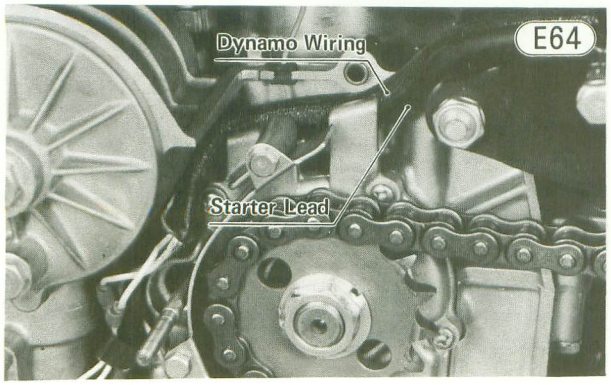


•Take out the shift pedal bolt, and remove the shift pedal.

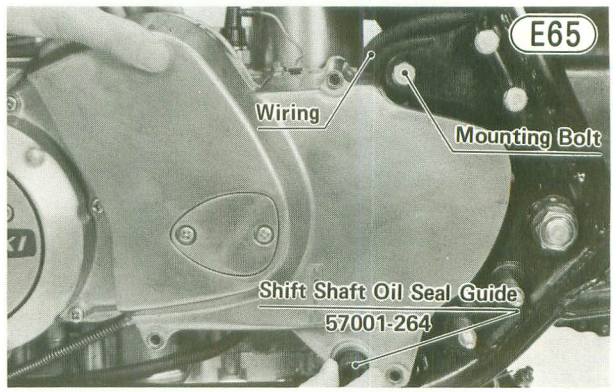
•Remove the engine sprocket cover bolts (4), and pull the cover free from the crankcase.

Installation:

•Fit the dynamo wiring and starter lead between the external shift mechanism cover and the crankcase.

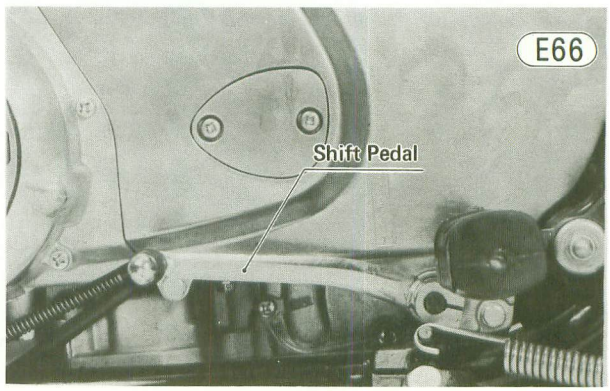


•Check that knock pins (2) are in place, and install the engine sprocket cover using the shift shaft oil seal guide (special tool) to protect the cover oil seal, and tighten it bolts (4). The wirings are routed in front of the upper mounting bolt spacer.



•Mount the left footpeg with its nuts and washers (2 ea).

•Mount the shift pedal so that its end matches the level of the left footpeg, and tighten its bolt.

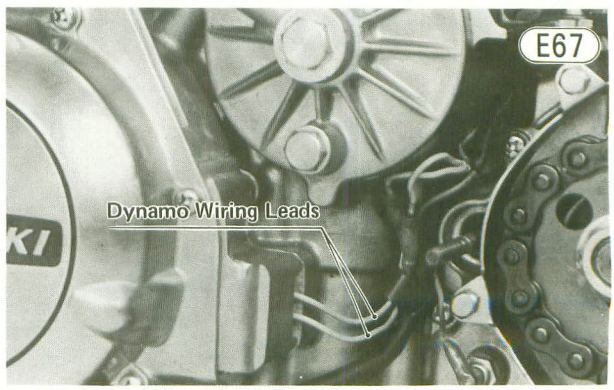


DYNAMO ARMATURE

Removal:

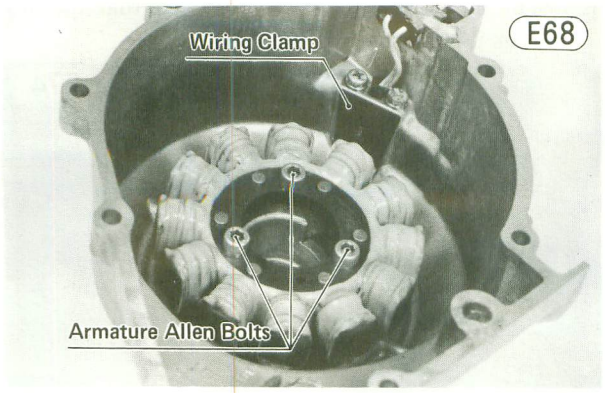
•Remove the engine sprocket cover (Pg. 54).

•Disconnect the dynamo wiring yellow leads.



•Remove the dynamo cover screws (8), and pull off the dynamo cover and gasket.

●Remove the wiring clamp screws (2) and wiring clamp.



●Remove the armature Allen bolts (3), and pull out the armature.

Installation:

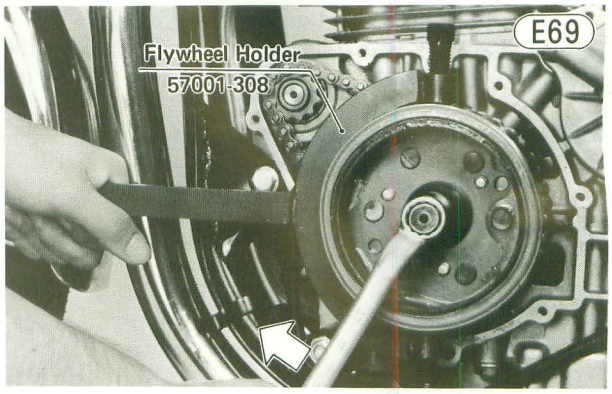
●Install the grommet, and fit the armature into place. Use a non-permanent locking agent on each Allen bolt, and tighten the bolts with 0.9 ~ 1.1 kg-m (78 ~ 95 in-lbs) of torque.
●Install the wiring clamp with its screws (2) and lock-washers (2).
●Check that the knock pins (2) are in place, install the dynamo cover and a new gasket, and tighten its screws (8).
●Connect the dynamo wiring yellow leads.
●Install the engine sprocket cover (Pg. 54).

DYNAMO FLYWHEEL, STARTER MOTOR CLUTCH

Removal:

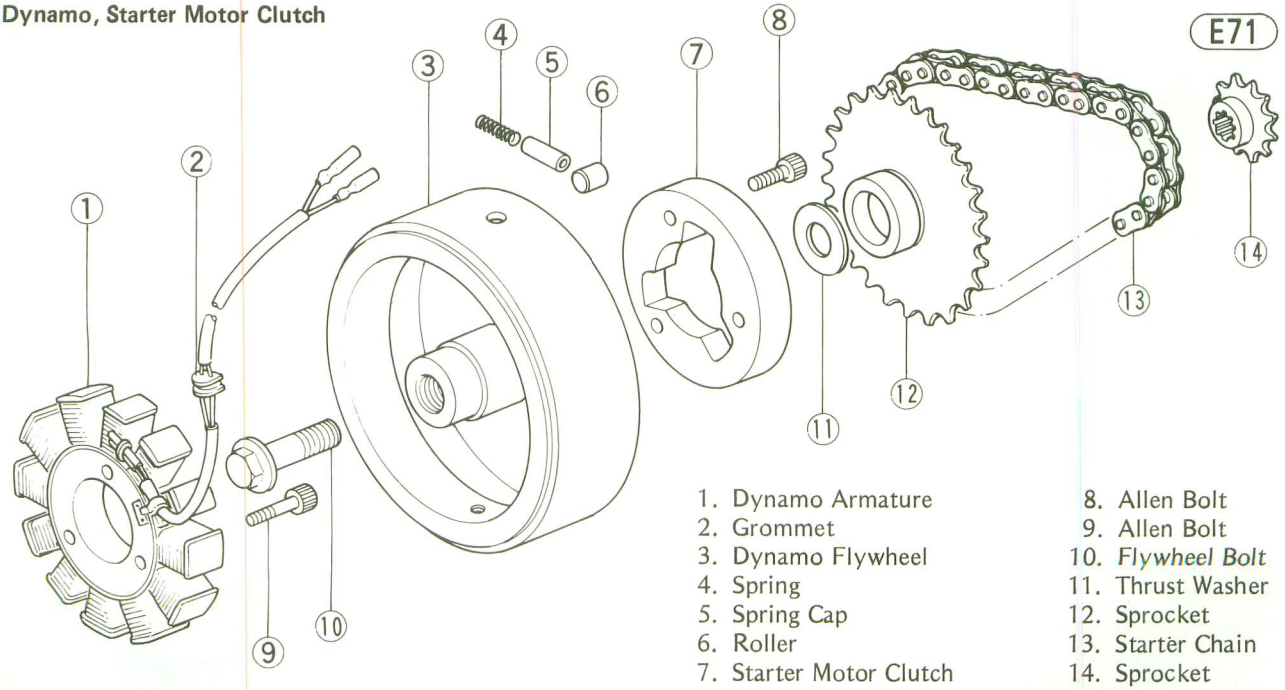
●Remove the engine sprocket cover (Pg. 54).
●Disconnect the dynamo wiring yellow leads (Fig. E67).

●Remove the dynamo cover screws (8), and pull off the dynamo cover and gasket.
●Hold the dynamo flywheel steady with the flywheel holder (special tool), and remove the flywheel bolt. The bolt is a left hand thread and must be turned clockwise for removal.



●Using the special tool to hold the flywheel steady, remove the flywheel and starter motor clutch assembly with the rotor puller (special tool).

Dynamo, Starter Motor Clutch



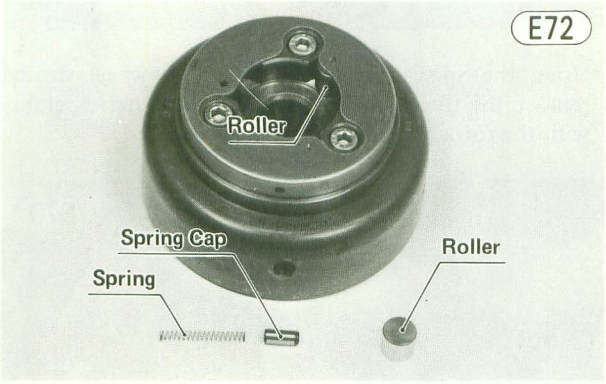
1. Dynamo Armature
2. Grommet
3. Dynamo Flywheel
4. Spring
5. Spring Cap
6. Roller
7. Starter Motor Clutch
8. Allen Bolt
9. Allen Bolt
10. *Flywheel Bolt*
11. Thrust Washer
12. Sprocket
13. Starter Chain
14. Sprocket

Installation:

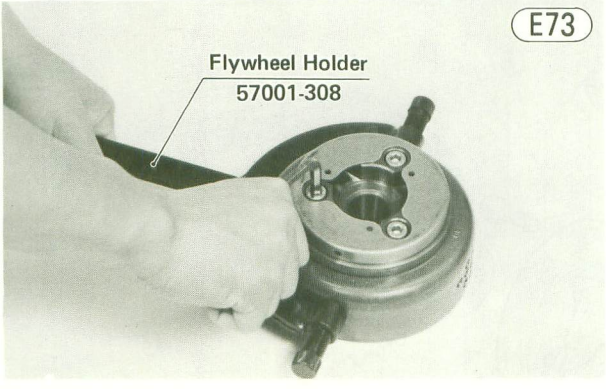
- Using a high flash-point solvent, clean off any oil or dirt that may be on the crankshaft taper or flywheel hub, and place the flywheel and starter motor clutch assembly back on the crankshaft.
- Tighten the flywheel bolt with 12~14 kg-m (87~101 ft-lbs) of torque while holding the dynamo flywheel steady with the flywheel holder (special tool).
- Check that the knock pins (2) are in place, install the dynamo cover using a new gasket, and tighten its screws (8).
- Connect the dynamo wiring yellow leads.
- Install the engine sprocket cover (Pg. 54).

Disassembly:

- Remove the thrust washer
- Remove the rollers ⑥, springs ④, and spring caps ⑤ (3 ea) from the starter motor clutch.



- Place the flywheel face down on the workbench. Holding the flywheel steady with the flywheel holder (special tool), remove the Allen bolts (3) to separate the flywheel and starter motor clutch.



Assembly Note:

- Apply a non-permanent locking agent to the Allen bolts (3), and tighten the bolts with 3.3 ~ 3.7 kg-m (24 ~ 27 ft-lbs) of torque.

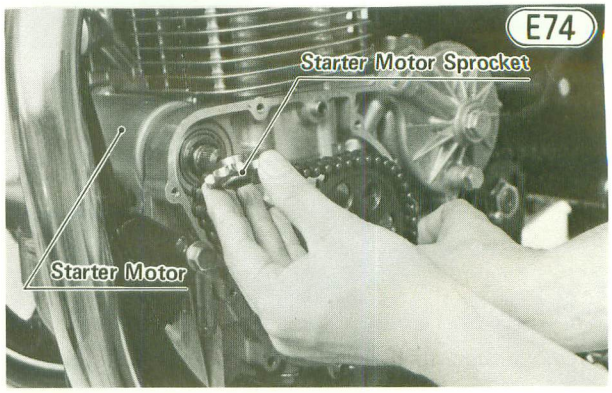
STARTER MOTOR CHAIN, SPROCKETS

Removal:

- Remove the dynamo flywheel and starter motor clutch assembly (Pg. 55).
- Pull off the starter motor chain ⑬ and sprockets ⑫, ⑭.

Installation Notes:

1. Install the starter motor sprocket so that the protruding side of the sprocket faces in.

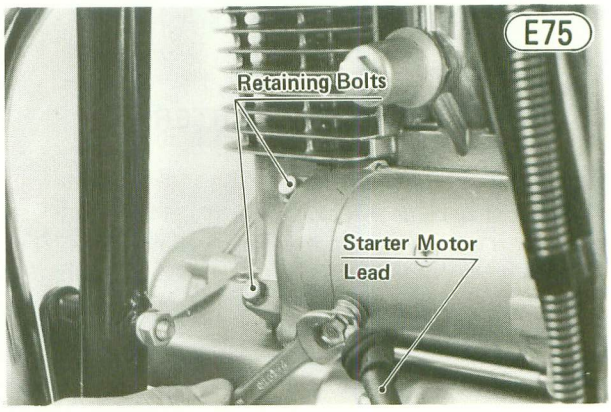


2. Install the thrust washer before installing the flywheel.

STARTER MOTOR

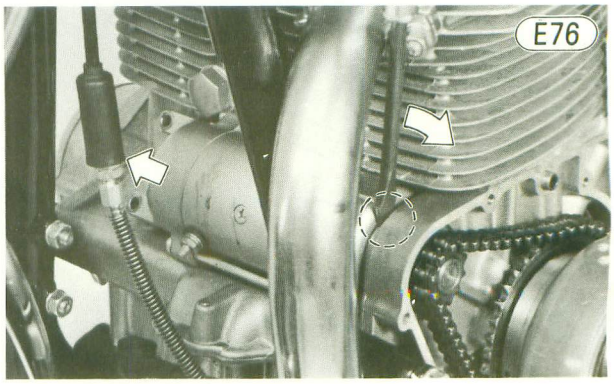
Removal:

- Remove the engine sprocket cover (Pg. 54).
- Remove the dynamo cover screws (8), and pull off the dynamo cover and gasket.
- Slide out the rubber cap, remove the starter motor terminal nut and lock washer, and take the lead off of the motor.



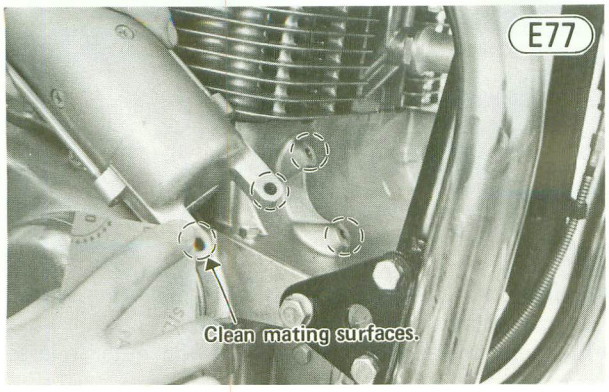
- Remove the starter motor retaining bolts (2).
- Pry the starter motor loose from the crankcase with a screwdriver and pull the starter motor off towards the right side of the engine.

CAUTION **Do not tap on the starter motor shaft. Tapping on the shaft may damage the motor.**



Installation:

- Replace the O ring with a new one, if it is deteriorated or damaged, and apply a little oil to it.
- Clean the starter motor lugs and crankcase where the starter motor is grounded.

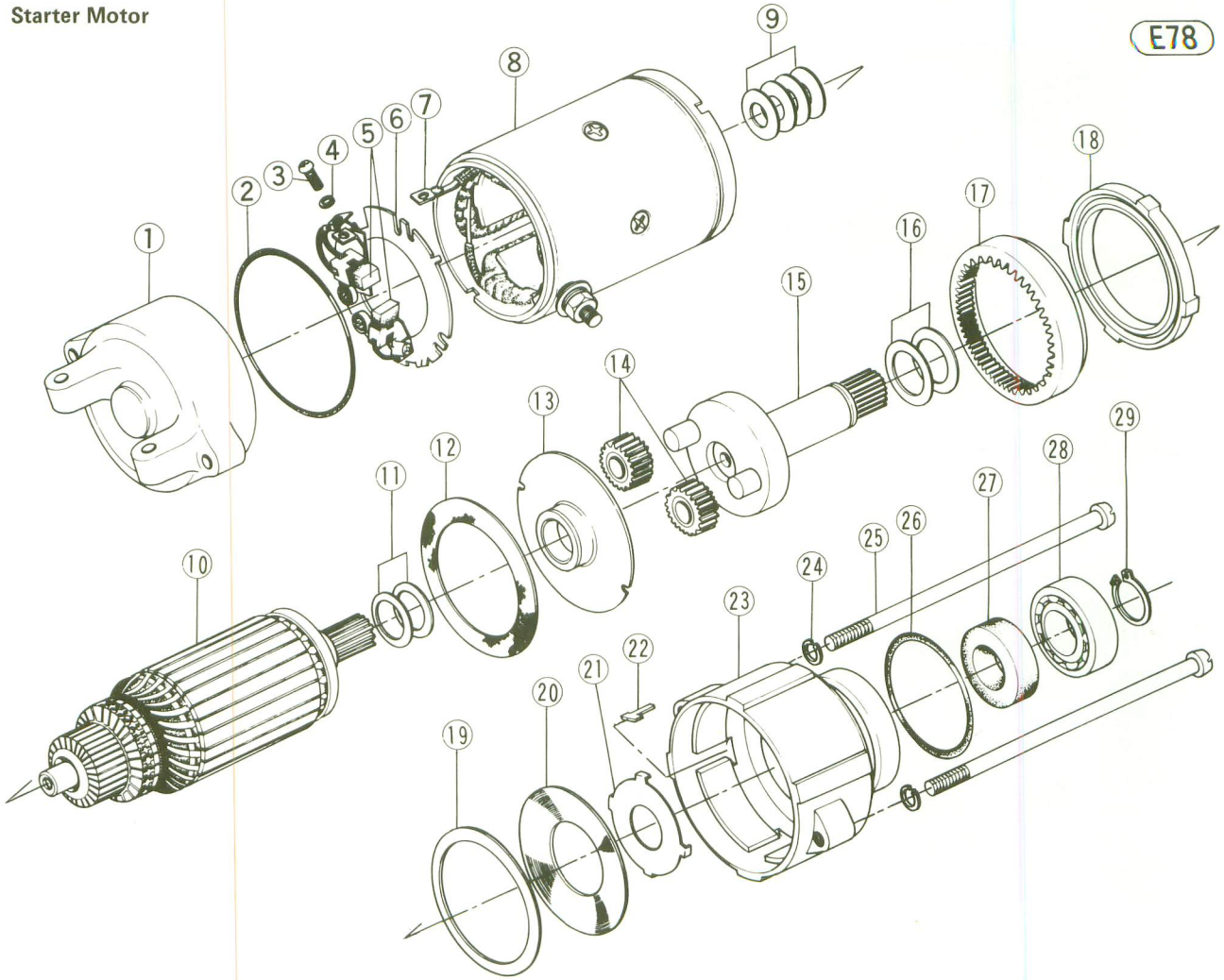


- Place the starter motor back into position fitting the shaft through the sprocket, the protruding side of the sprocket must face in (Fig. E74).
- Apply a non-permanent locking agent to the starter motor retaining bolts, and tighten the bolts with 0.9~1.1 kg-m (78~95 in-lbs) of torque.
- Reconnect the motor lead onto the terminal with its nut and lockwasher. Tighten the nut with 0.4 ~ 0.6 kg-m (35~52 in-lbs) of torque.
- Reinstall the rubber cap.
- Check to see that the knock pins (2) are in place and install the dynamo cover, gasket, and screws (8).
- Install the engine sprocket cover (Pg. 54).

Disassembly:

- Remove the screws ㉕ (2), lockwashers ㉔ (2), and remove the end covers ①, ㉓.
- Remove the end plate ⑬, gasket ⑫, thrust washers ⑪ and armature ⑩ from the shaft side.

Starter Motor



1. End Cover
2. O Ring
3. Screw
4. Lockwasher
5. *Carbon Brushes*
6. Brush Plate
7. Field Coil Lead
8. Yoke Assembly
9. Thrust Washers
10. Armature
11. Thrust Washers
12. Gasket
13. End Plate
14. Planet Pinions
15. Output Shaft
16. Thrust Washers
17. Internal Gear
18. Internal Gear Holder
19. Large Thrust Washer
20. Spring
21. Toothed Washer
22. Key
23. End Cover
24. Lockwasher
25. Screw
26. O Ring
27. Grease Seal
28. Ball Bearing
29. Circlip

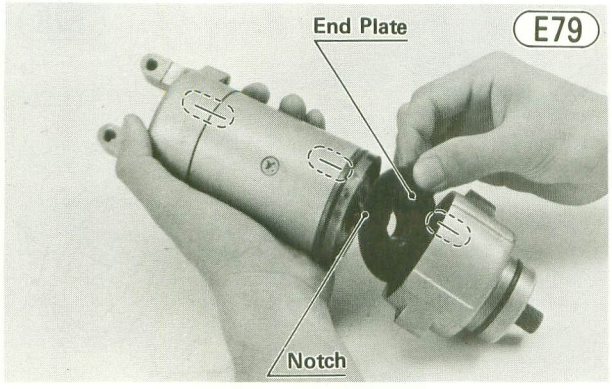
- Remove the screw which connects the brush lead ⑤ to the field coil lead ⑦, and remove the brush plate ⑥. The screw has a lock washer. There is a O ring ② at the brush side of the housing.

NOTE: The yoke assembly ⑧ is not meant to be disassembled.

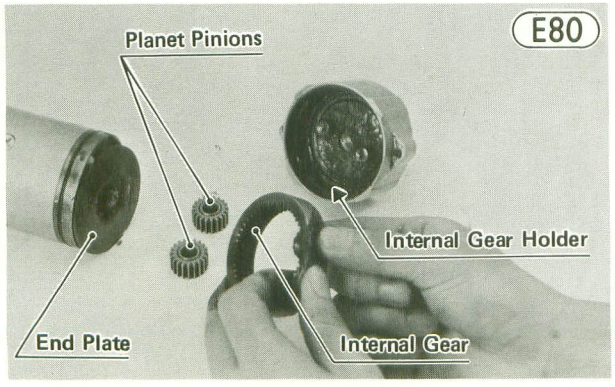
- Remove the planet pinions ⑭ and internal gear ⑰.
- Remove the key ㉒, and pull off the internal gear holder ⑱.
- Remove the large thrust washer ⑲.

Assembly Notes:

1. Replace any O rings 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.



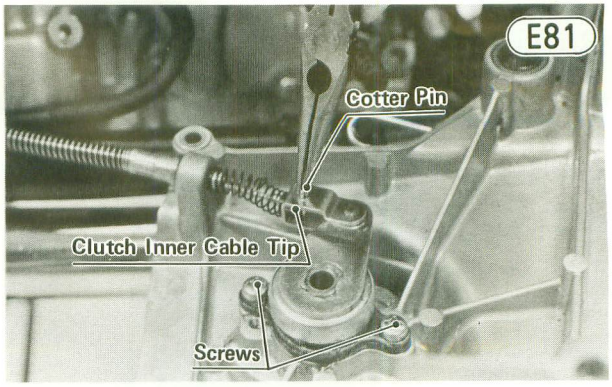
3. Apply a high temperature grease to the planet pinions ⑭, internal gear ⑰, and internal gear holder ⑱.



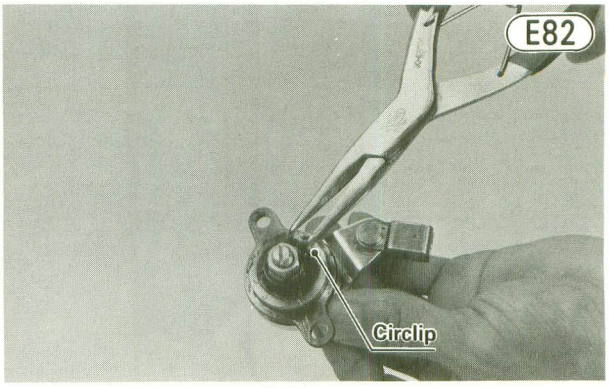
CLUTCH RELEASE

Removal:

- Remove the engine sprocket cover (Pg. 54).
- Remove the cotter pin from the clutch release lever, and free the clutch inner cable tip from the lever and engine sprocket cover.

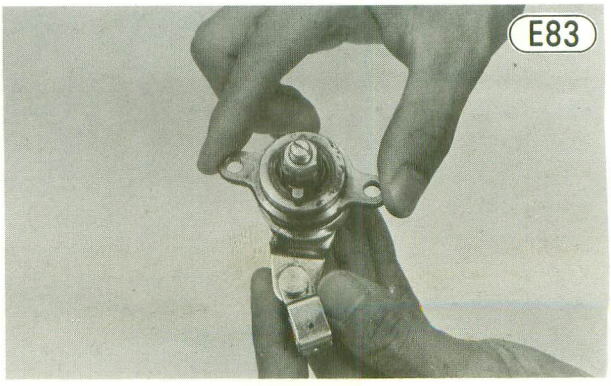


- Remove the clutch release assembly mounting screws (2), and remove the release assembly.
- Take out the circlip, and separate the outer release gear and the inner release gear.



Installation:

- Wash and clean the release balls and inner release gear with a high flash-point solvent. Dry and lubricate them with grease.
- 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 in Fig. E83. The machined side of the outer release gear must face upward.



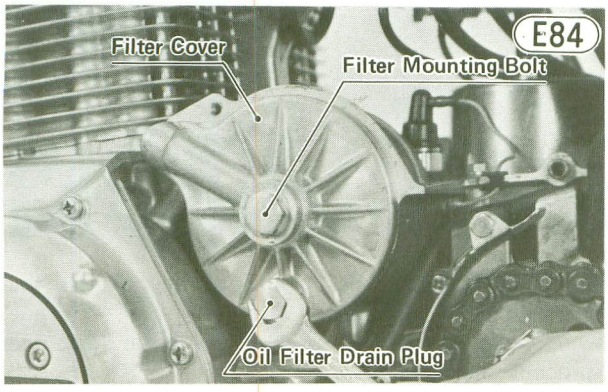
- Install the circlip on the inner release gear.

- Fit the clutch release lever assembly back into the engine sprocket cover, apply a non-permanent locking agent to the screws, and tighten the screws. The clutch release lever must be positioned as shown in Fig. E81, when the gears are fully meshed.
- Run the clutch cable into the engine sprocket cover and spring, and fit the tip of the inner cable into the clutch release lever.
- Using a new cotter pin, secure the cable tip to the release lever.
- Install the engine sprocket cover (Pg. 54).
- Adjust the clutch (Pg. 20).

OIL FILTER

Removal:

- Remove the engine sprocket cover (Pg. 54).
- Remove the oil filter drain plug and **O** ring, and drain the oil from the filter.



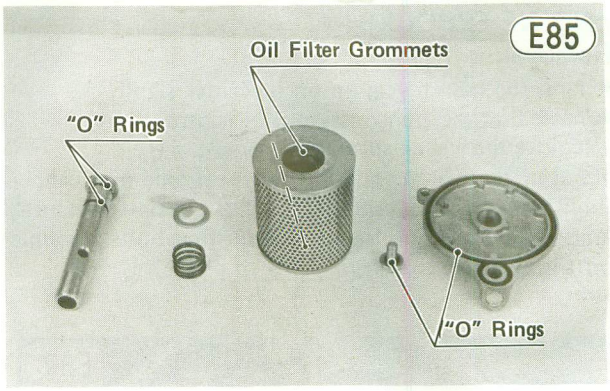
- Remove the filter mounting bolt, and pull out the filter. There is a spring seat and spring between the oil filter and the filter cover.

CAUTION **Hold the filter cover so it doesn't turn while unscrewing the filter mounting bolt. If the filter cover turns, the large O ring in the filter cover may be damaged.**

Installation:

- Remove the filter mounting bolt from the filter cover, and make sure that the **O** rings on the filter mounting bolt, drain plug, and filter cover 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 then with new ones will cause oil leaks and eventually result in little or no oil left in the engine. This will cause in 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), score, or other damage.**

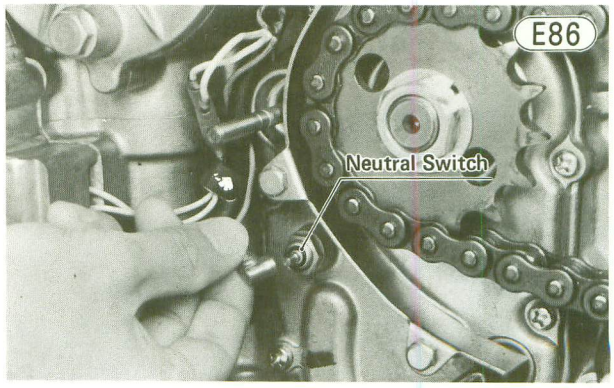


- Apply a little engine oil to the **O** rings on the filter mounting bolt, fit the filter cover on the bolt, and install the spring, spring seat.
- Apply a little engine oil on the oil filter grommets, and turn the filter mounting bolt to work the new filter into place while holding the filter steady. Be careful that the filter grommets do not slip out of place.
- Make sure the knock pin is in place, and install the oil filter tightening its bolt with 1.8 ~ 2.2 kg-m (13.0 ~ 16.0 ft-lbs) of torque.
- Install the oil filter drain plug and tighten it with 1.6 ~ 2.0 kg-m (11.5 ~ 14.5 ft-lbs) of torque.
- Install the engine sprocket cover (Pg. 54).
- Check the oil level and add oil (Pg. 21).

NEUTRAL SWITCH

Removal:

- Remove the engine sprocket cover (Pg. 54).
- Pull the neutral switch lead off the switch.



- Unscrew the neutral switch and gasket.

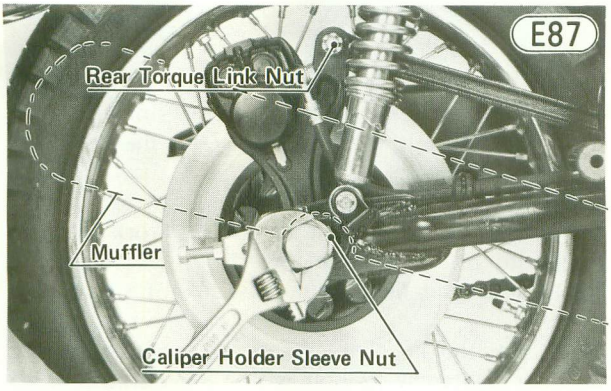
Installation:

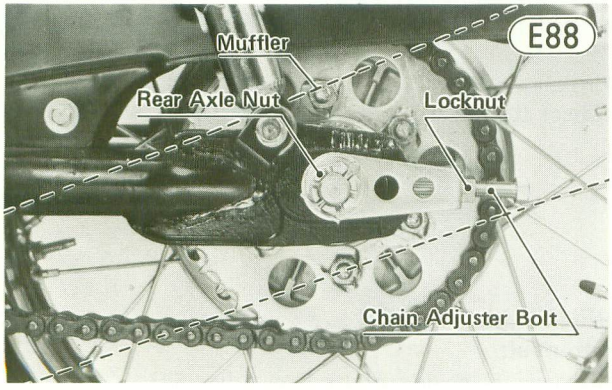
- Install the neutral switch and gasket tightening it with 1.3 ~ 1.7 kg-m (9.5 ~ 12.0 ft-lbs) of torque.
- Fit the lead back on the switch.
- Install the engine sprocket cover (Pg. 54).

ENGINE SPROCKET

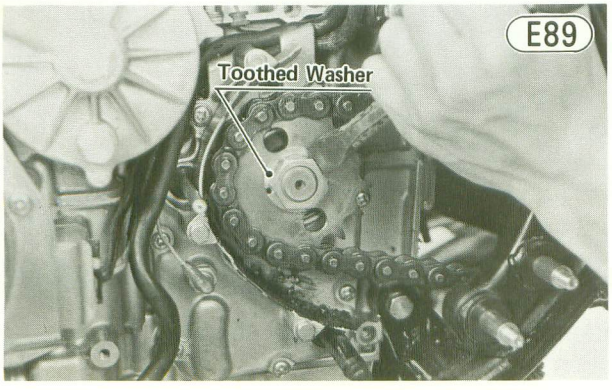
Removal:

- Stand the motorcycle up on its center stand.
- Check that the transmission is in neutral.
- Remove the engine sprocket cover (Pg. 54).
- Loosen the rear torque link nut, rear axle nut, caliper holder sleeve nut, and chain adjusting bolt locknuts, and then back out the chain adjusting bolts a couple of turns to give the chain plenty of play.

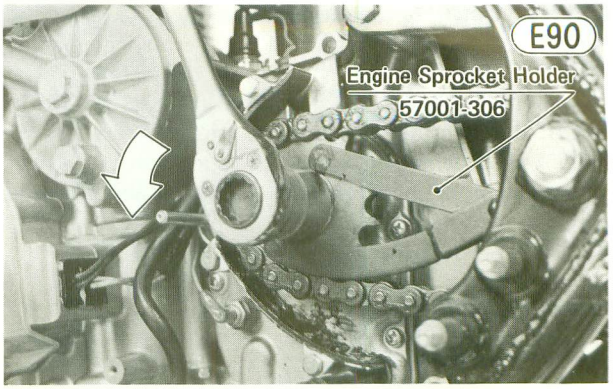




- Straighten the side of the toothed washer that is bent over the side of the engine sprocket nut.

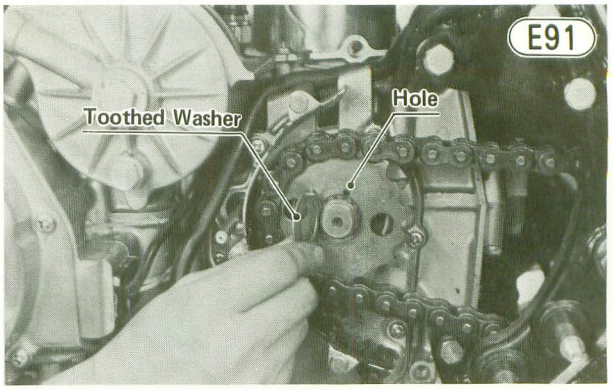


- Hold the engine sprocket steady using the engine sprocket holder (special tool), and remove the engine sprocket nut and toothed washer. Pull the engine sprocket off along with the drive chain.



Installation:

- Mount the engine sprocket while meshed with the drive chain. Install the toothed washer engaging it with a hole in the sprockets.

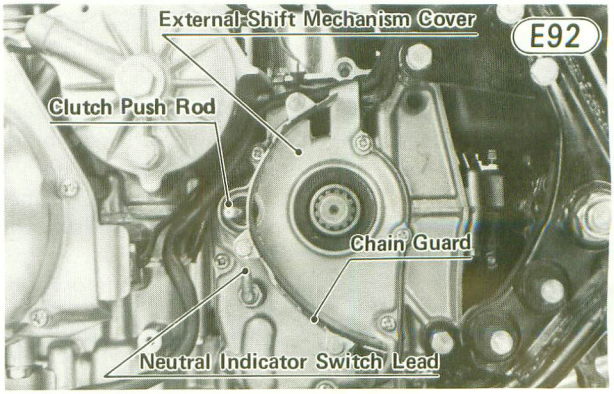


- Install the engine sprocket nut, and then tighten the nut with 7.5 ~ 8.5 kg-m (54 ~ 61 ft-lbs) of torque while using the engine sprocket holder to keep the sprocket steady.
- Bend back one side of the toothed washer over the side of the nut.
- Install the engine sprocket cover (Pg. 54).
- Adjust the drive chain (Pg. 24).

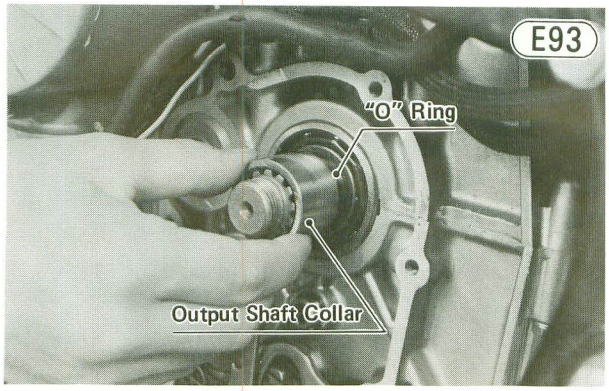
EXTERNAL SHIFT MECHANISM

Removal:

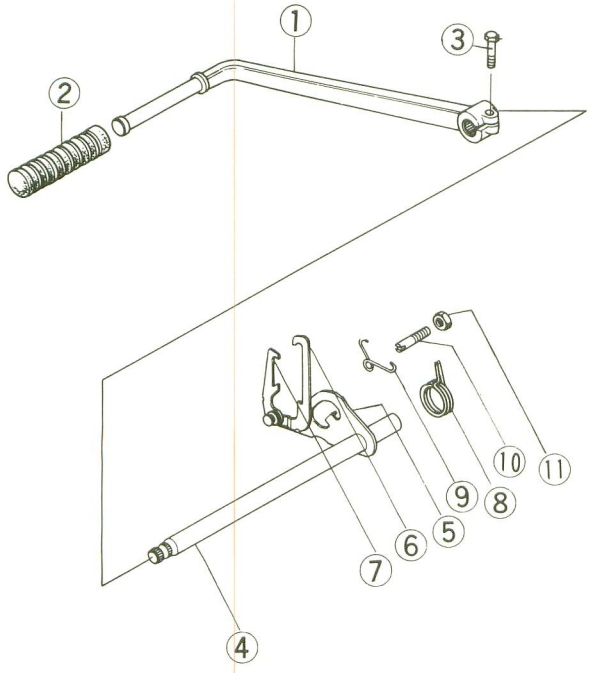
- Remove the engine sprocket (Pg. 60).
- Disconnect the neutral indicator switch lead and pull out the clutch push rod.



- Remove the engine sprocket chain guard.
- Remove the external shift mechanism cover screws (7), and pull off the external shift mechanism cover and gasket.
- Remove the output shaft collar, using a bearing puller if it is difficult to remove, and take off the **O** ring.



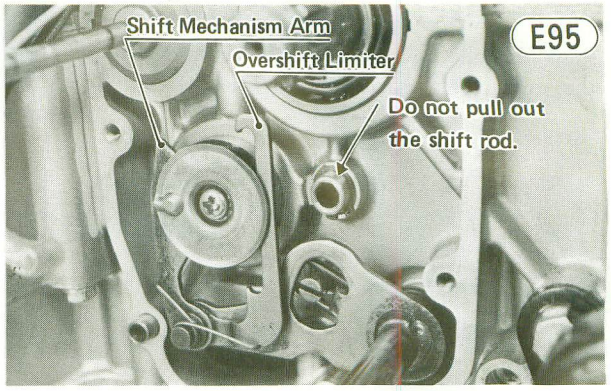
External Shift Mechanism



1. Shift Pedal
2. Pedal Rubber
3. Bolt
4. Shift Shaft
5. Shift Lever
6. Overshift Limiter
7. Shift Mechanism Arm
8. Return Spring
9. Pawl Spring
10. Return Spring Pin
11. Locknut

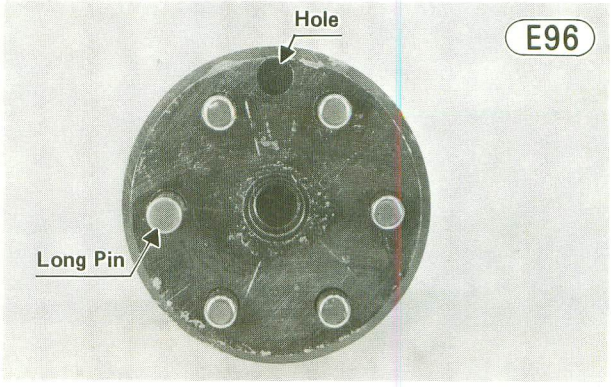
- Move the shift mechanism arm and overshift limiter out of their positions on the end of the shift drum, and pull out the external shift mechanism.

NOTE: 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 oil pan to install them.



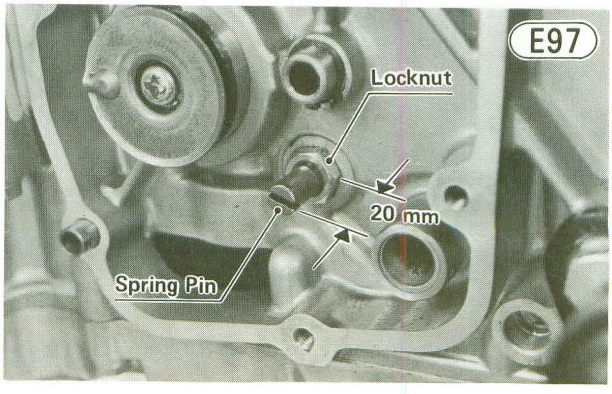
Installation:

- If the shift drum pins were removed, make sure the one long pin is assembled in the position shown. If this pin is assembled in the wrong position, the neutral indicator light will not light when the gears are in neutral.



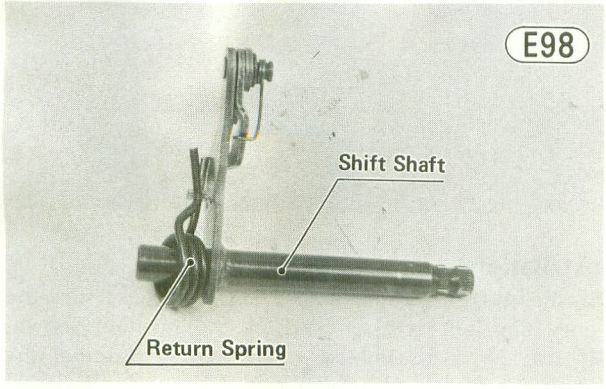
- Check that the external shift mechanism return spring pin is not loose. If it is loose, remove it, apply a non-permanent locking agent to the threads, re-install it, and tighten the locknut.

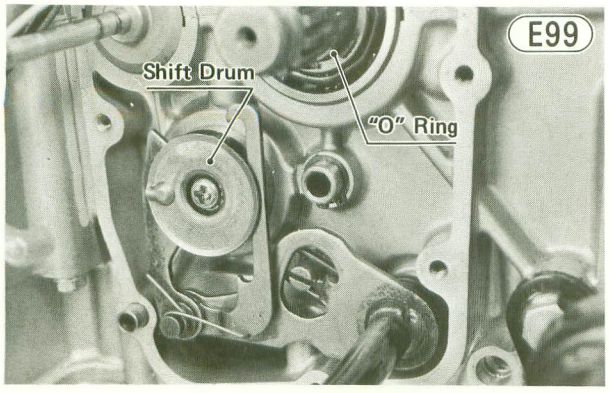
NOTE: The return spring pin must be screwed in until it protrudes approximately 20 mm from the crankcase, so that it can work satisfactorily as an external shift mechanism lever stopper.



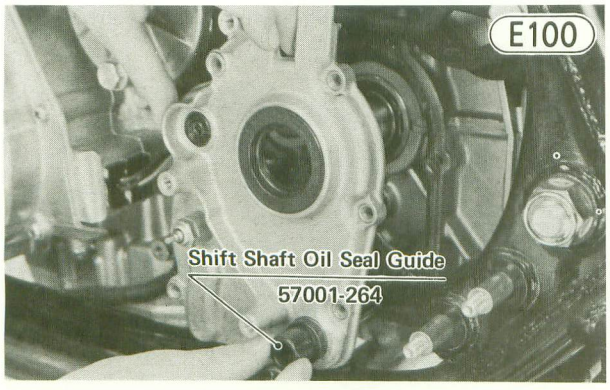
- Check that two knock pins are in place.
- Replace the output shaft **O** ring with a new one if it is damaged, and install it next to the ball bearing inner race.

•Check that the return spring is properly fitted on the shaft, install the external shift mechanism, and place the shift mechanism arm and overshift limiter on the shift drum pins.





•Apply a high temperature grease to the lips of the clutch push rod oil seal and the output shaft collar oil seal.
•Insert the shift shaft oil seal guide (special tool) in the external shift mechanism cover oil seal, and install the cover and then tighten the screws (7).

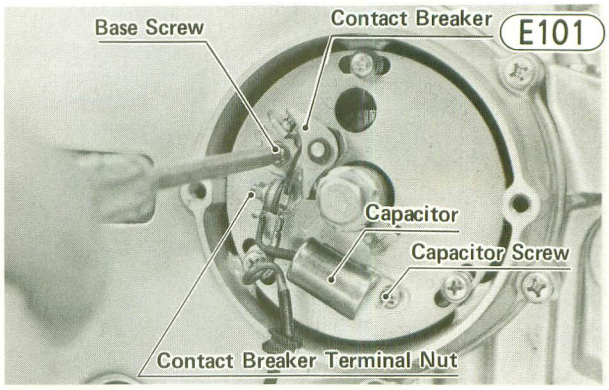


•Install the output shaft collar on the output shaft.
•Install the engine sprocket chain guard.
•Fit the neutral indicator switch lead back on the switch and install the clutch push rod.
•Install the engine sprocket (Pg. 60).
•Adjust the drive chain (Pg. 24).
•Check the oil level and add oil (Pg. 21).

CONTACT BREAKER

Removal:

•Remove the contact breaker cover and gasket.
•Remove the contact breaker base screw. The screw has a flat washer and lockwasher.

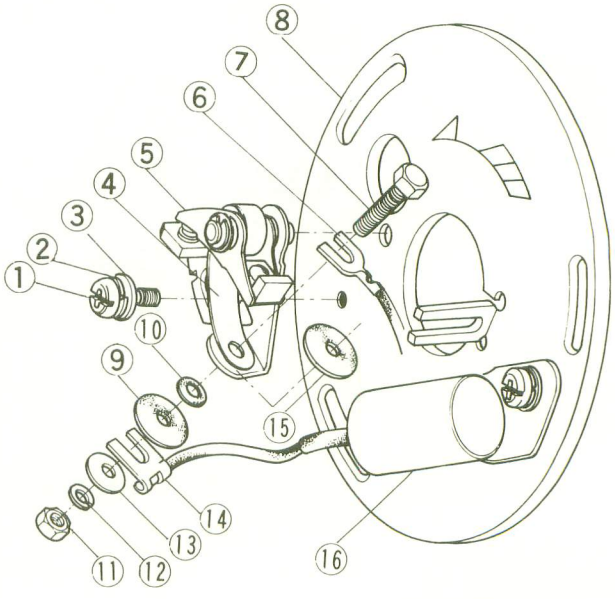


•Loosen the contact breaker terminal nut, and remove the two leads.

Installation Notes:

1. The sequence of installation on the contact breaker bolt is bolt ⑦, contact breaker lead ⑥, spring ④, large insulator ⑮, small insulator ⑩ (in contact breaker hole), large insulator ⑨, capacitor lead ⑭, flat washer ⑬, lockwasher ⑫, and nut ⑪.

Contact Breaker Lead Installation E102



1. Screw
2. Lockwasher
3. Flat Washer
4. Spring
5. Contact Breaker
6. Contact Breaker Lead
7. Bolt
8. Contact Breaker Plate
9. Large Insulator
10. Small Insulator
11. Nut
12. Lockwasher
13. Flat Washer
14. Capacitor Lead
15. Large Insulator
16. Capacitor

2. After installation, adjust the ignition timing (Pg. 12).

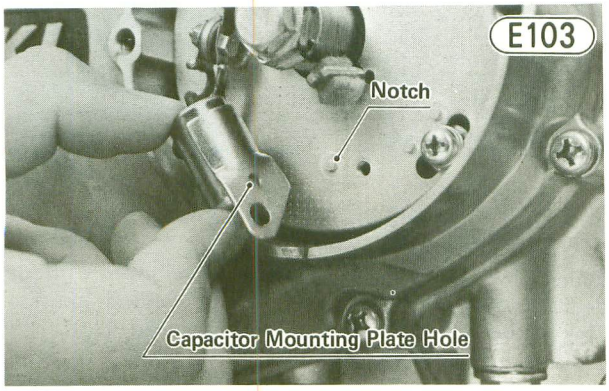
CAPACITOR

Removal:

- Remove the contact breaker cover and gasket.
- Remove the capacitor screw (Fig. E101). The screw has a flat and lockwasher.
- Loosen the contact breaker nut, and remove the capacitor lead to complete capacitor removal.

Installation Notes:

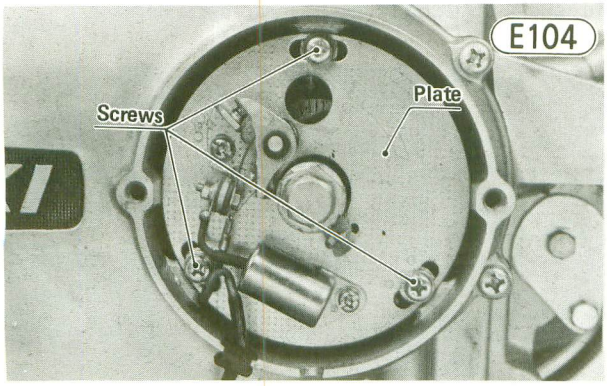
1. The sequence of installation on the contact breaker bolt is bolt, contact breaker lead, spring, large insulator, small insulator (in contact breaker hole), large insulator, capacitor lead, flat washer, lockwasher, and nut (Fig. E102).
2. Match the capacitor mounting plate hole with the notch on the contact breaker plate.



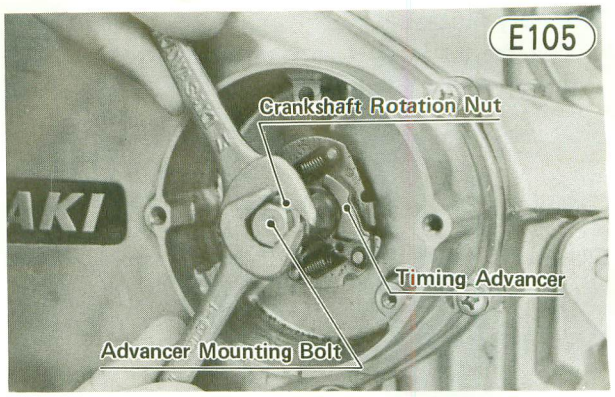
TIMING ADVANCER

Removal:

- Remove the contact breaker cover and gasket.
- Take out the contact breaker mounting plate screws, lockwashers, and flat washers (3 ea), and remove the plate.

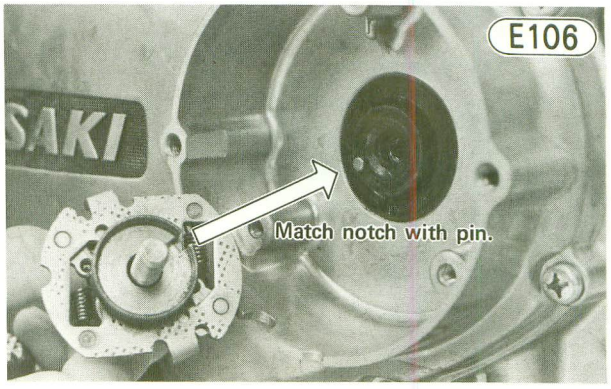


- With a 17 mm wrench on the crankshaft rotation nut to keep the shaft from turning, remove the advancer mounting bolt, and take off the rotation nut and the timing advancer.



Installation:

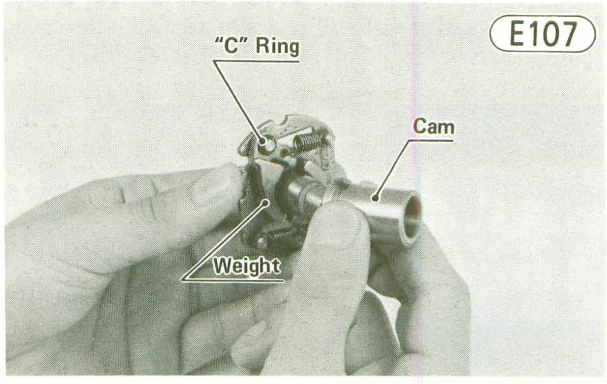
- Fit the timing advancer onto the crankshaft matching its notch with the pin in the end of the crankshaft, and install the crankshaft rotation nut and the advancer mounting bolt. The notches in the nut fit the projections on the timing advancer. Tighten the bolt with 2.3~2.7 kg-m (16.5~19.5 ft-lbs) of torque.



- Mount the contact breaker mounting plate, and tighten its screws (3) loosely. Each screw has a lockwasher and flat washer.
- Adjust the ignition timing (Pg. 12).

Disassembly:

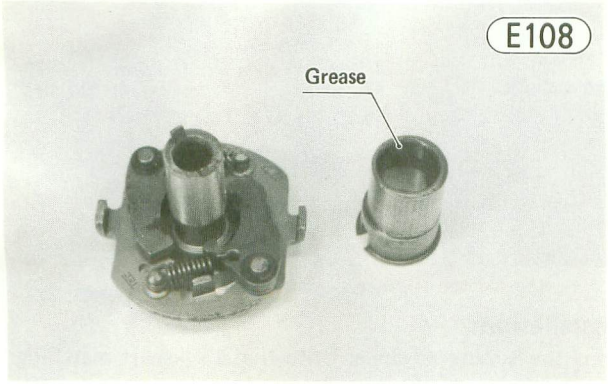
- Pull off the cam.



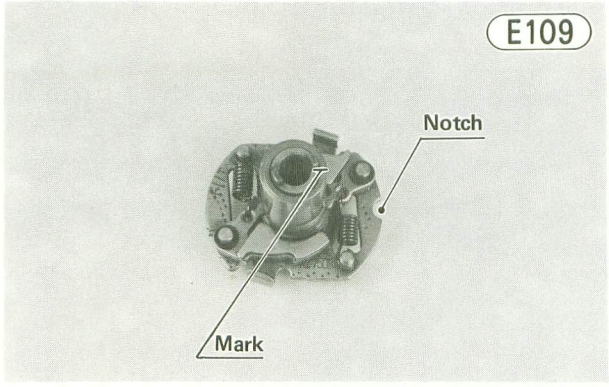
- Remove the **C** rings (2), washers (4), and weights (2).
- Remove the thrust washer from each weight shaft.

Assembly Notes:

1. Wipe the advancer clean, and fill the groove inside the cam with grease.



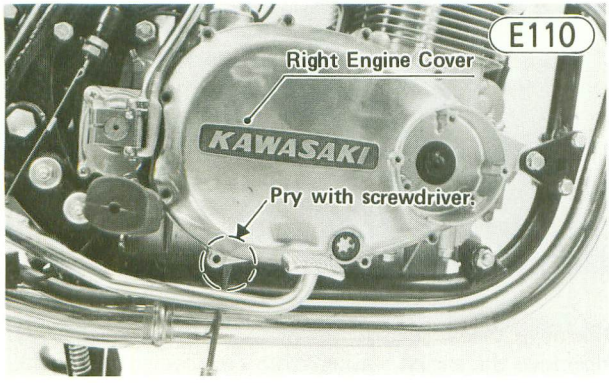
2. When installing the cam, align the mark on the cam with the notch on the advancer body.



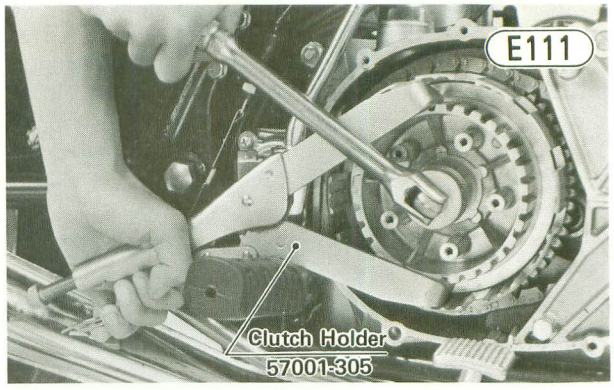
CLUTCH HUB, CLUTCH PLATES

Removal:

- With the motorcycle on its center stand, place an oil pan beneath the engine, and remove the engine oil drain plug and washer to drain out the oil.
- After the oil has drained, tighten the drain plug with 2.7~3.3 kg-m (19.5~24.0 ft-lbs) of torque.
- Remove the timing advancer (Pg. 63).
- Remove the screws (12), and pull off the right engine cover and gasket. There is a slot to facilitate cover removal. Pry this point with a slot screwdriver.



- Remove the clutch spring bolts ⑯ (5), washers ⑮ (5), and springs ⑭ (5).
- Pull off the spring plate ⑬, pull out the spring plate pusher ⑫, and tilt the motorcycle so that the steel ball ⑪ will fall out.
- Remove the friction plates ⑦ (8) and steel plates ⑧ (7).
- Hold the clutch hub from turning using a clutch holder (special tool), and remove the clutch hub nut ⑩ and washer ⑨



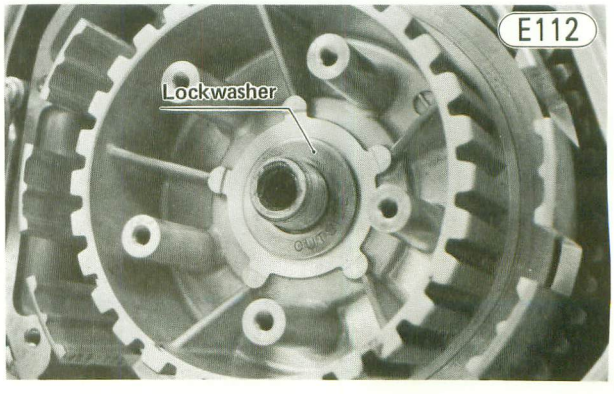
- Pull off the clutch hub ⑥. There is a thrust washer ④ at the rear of the clutch hub.

NOTE: The clutch housing cannot be removed without major disassembly work. To remove the clutch housing refer to the transmission removal section (Pg. 84).

Installation:

- Install the thrust washer, clutch hub, and flat washer. Replace the clutch hub nut with a new one, screw on the nut, and tighten it with 12 ~ 15 kg-m (87 ~ 108 ft-lbs) of torque, while holding the hub stationary with the clutch holder (special tool).

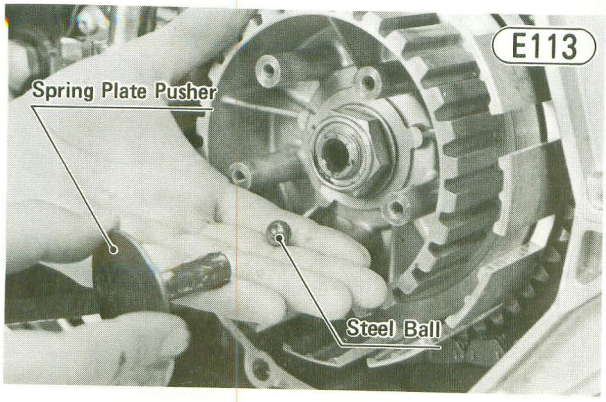
WARNING **The lockwasher between the clutch hub and the clutch hub nut must be installed with the marked side, "OUTSIDE", facing out. If the lockwasher is installed backwards, the hub nut might loosen during operation. This causes clutch disengagement and might cause primary chain breakage by the misalignment of the primary and the clutch housing sprockets, resulting in loss of motorcycle control.**



- Install the friction plates (8) and steel plates (7), 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.**

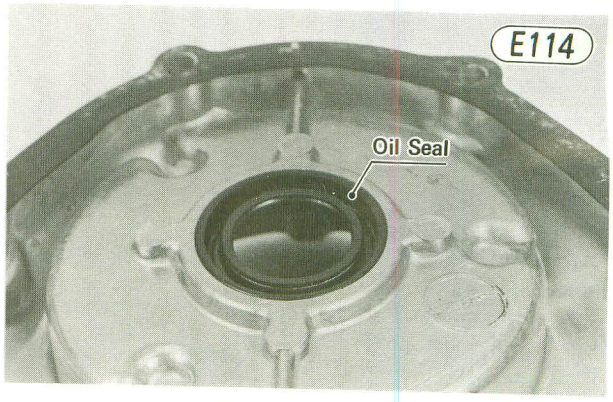
- Insert the steel ball and spring plate pusher, applying a high temperature grease to their surfaces.



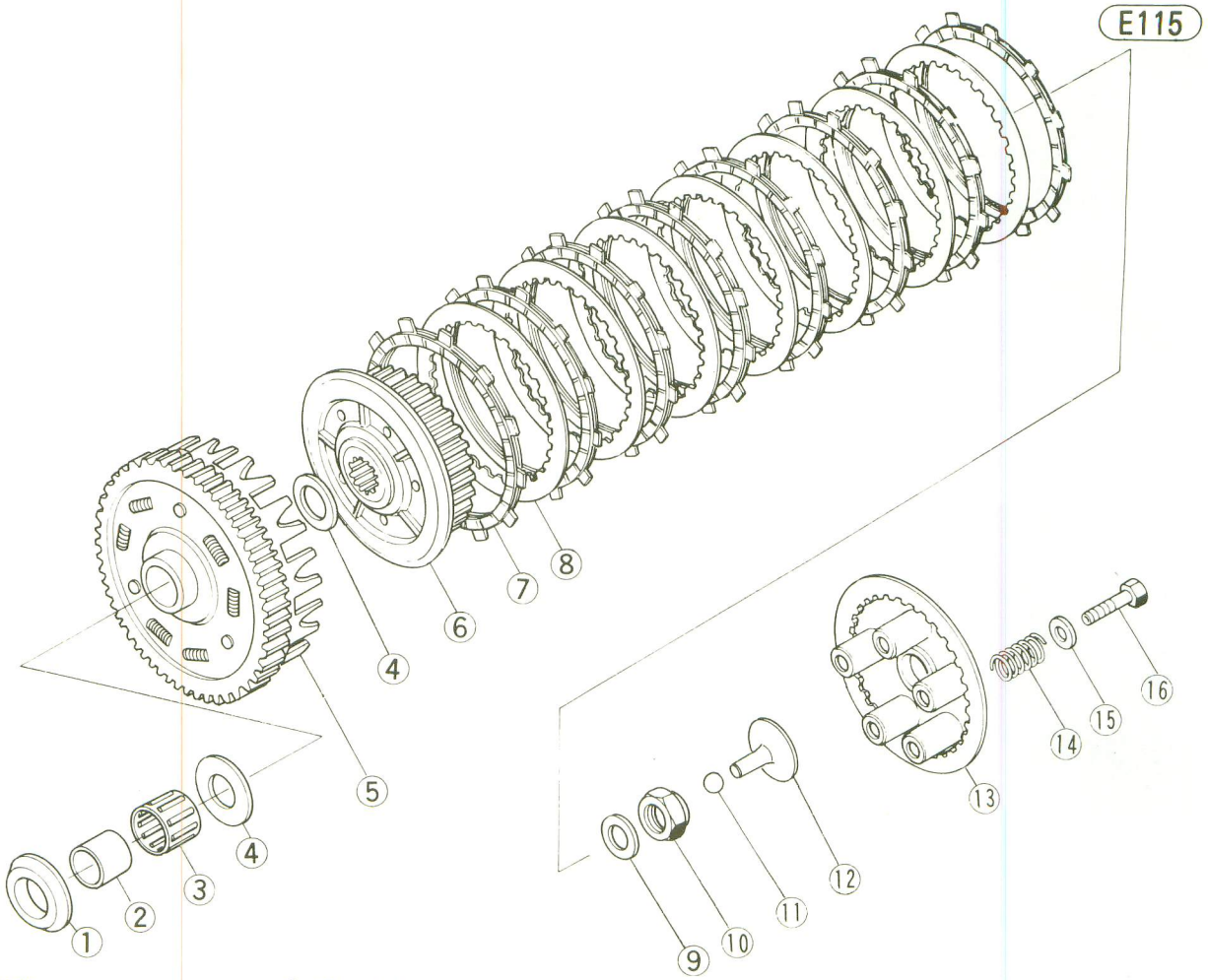
- Install the spring plate, springs, washers, and spring bolts (5 ea). Cross tighten the bolts evenly with 0.8 ~ 1.0 kg-m (69 ~ 87 in-lbs) of torque by hand.

NOTE: The spring plate can be installed on the clutch hub in any position, so there is no mark on either the spring plate or the clutch hub.

- Check that the spring in the engine cover crankshaft oil seal has not slipped out of its proper position and apply a high temperature grease to the oil seal lip. If the oil seal is damaged, replace it with a new one.



Clutch



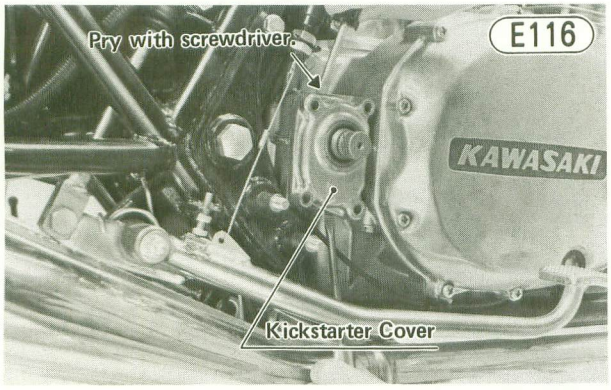
1. Spacer
2. Drive Shaft Sleeve
3. Needle Bearing
4. Thrust Washer
5. Clutch Housing
6. Clutch Hub
7. Friction Plate
8. Steel Plate
9. Lockwasher
10. Clutch Hub Nut
11. Steel Ball
12. Spring Plate Pusher
13. Spring Plate
14. Clutch Spring
15. Washer
16. Bolt

- Check that the two knock pins are in place, and using a new right engine cover gasket, fit the right engine cover onto the crankcase. Tighten the screws (12) firmly. Be sure to include the contact breaker lead clamps with their right engine cover screws.
- Fill the engine with oil, check the oil (Pg. 21), and add more if necessary.
- Install the timing advancer (Pg. 63).
- Adjust the ignition timing (Pg. 12).
- Adjust the clutch (Pg. 20).

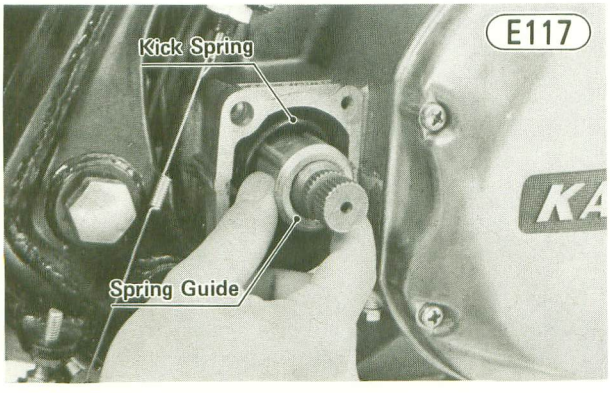
KICKSTARTER SPRING

Removal:

- Remove the right foot peg.
- Mark the position of the kickstarter pedal so that it can later be installed on the kick shaft in the same position.
- Take out the kickstarter pedal bolt, slightly widen the gap in the kickstarter pedal with a screwdriver, and then pull off the kickstarter pedal.
- Remove the kickstarter cover screws (4), and pull off the kickstarter cover and gasket, prying the points shown in Fig. E116 with a screwdriver.

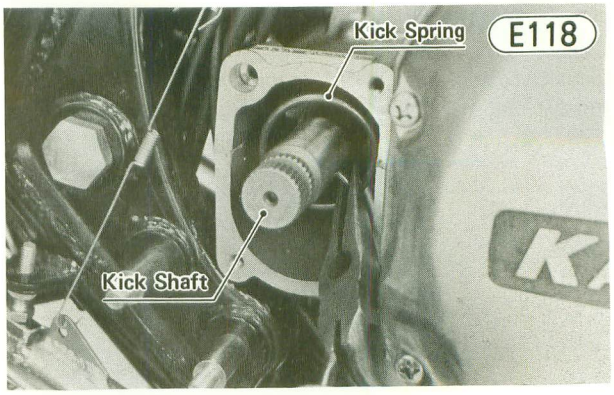


- Pull out the spring guide, and remove the kick spring.



Installation Notes:

1. To install the kick spring, turn the kick shaft all the way clockwise, insert one end of the spring into the crankcase hole, insert the other end into the kick shaft using needle nose pliers, and, while holding the spring in place if necessary, insert the kick spring guide.

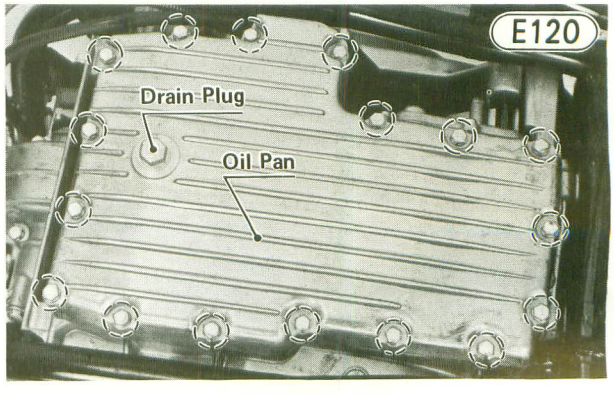


2. Using a new kickstarter cover gasket, fit the kickstarter cover onto the crankcase. Use the kick shaft oil seal guide (special tool) to protect the kick shaft oil seal. Tighten the screws (4) firmly.

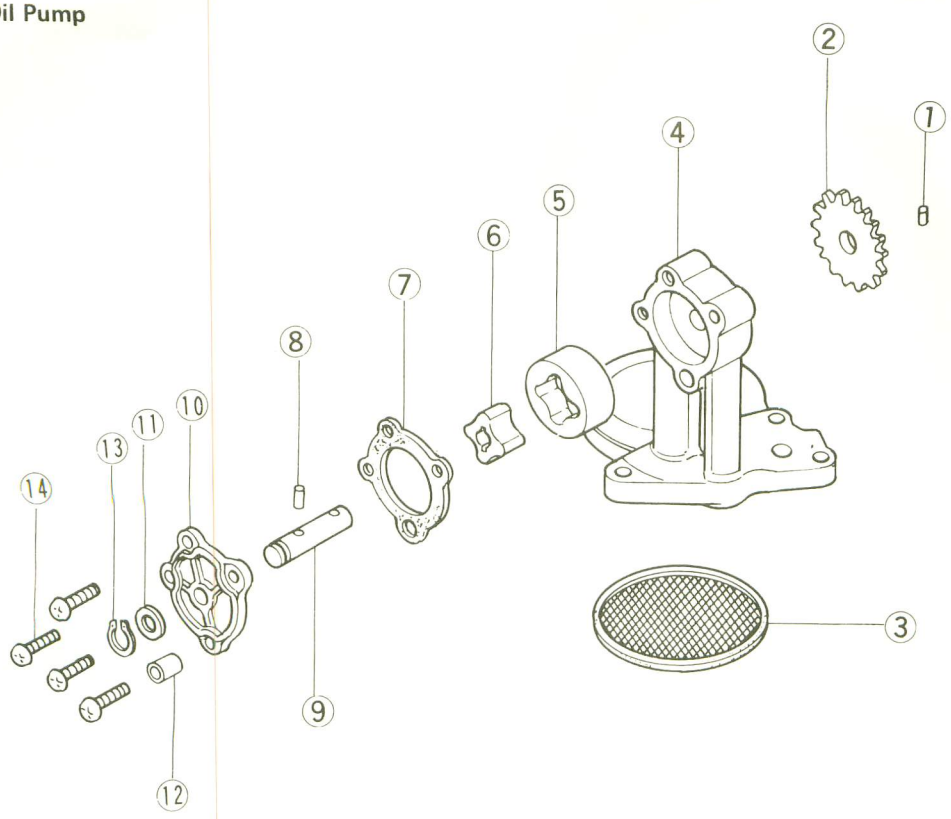
ENGINE OIL PUMP

Removal:

- With the motorcycle on its center stand, place an oil pan beneath the engine, and remove the engine oil drain plug to drain out the oil.
- After the oil has drained out, install the drain plug and tighten it with 2.7 ~ 3.3 kg-m (19.5 ~ 24.0 ft-lbs) of torque.
- Remove the mufflers (Pg. 43).
- Remove the oil pan bolts (17), and take off the oil pan and gasket.

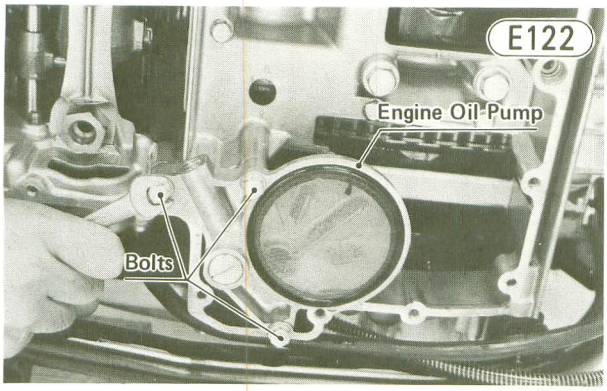


Oil Pump



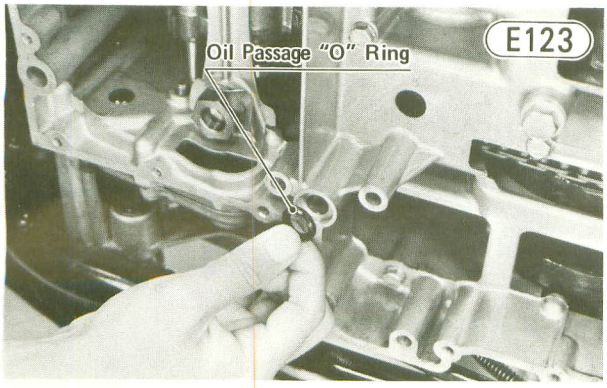
1. Pin
2. Pump Gear
3. Screen
4. Pump Body
5. Outer Rotor
6. Inner Rotor
7. Gasket
8. Pin
9. Pump Shaft
10. Pump Cover
11. Washer
12. Knock Pin
13. Circlip
14. Pump Cover Screw

●Remove the engine oil pump bolts (3), and take off the engine oil pump.



Installation Notes:

1. Replace the oil passage O ring and oil pan gasket with new ones.



2. Fill the oil pump with engine oil for initial lubrication.
3. Check to see that knock pins (2) are in place.
4. Be sure the oil pump gear and pump drive gear at the end of the balancer shaft mesh properly.
5. Apply non-permanent locking agent to the engine oil pump bolts (3), and tighten them with 0.9 ~ 1.1 kg-m (78 ~ 95 in-lbs) of torque.
6. Tighten the oil pan bolts (17) with 0.9 ~ 1.1 kg-m (78 ~ 95 in-lbs) of torque.

Disassembly:

●Remove the circlip ⑬ and washer ⑪ on the pump shaft end.
●Remove the oil pump cover screws ⑭ (4), and take off the oil pump cover ⑩ and gasket ⑦.
●Take out the rotors ⑤, ⑥.
●Take out the pin ⑧, and pull off the oil pump gear ② and shaft ⑨.
●Slide off the pump gear, and take out the pin ① from the shaft.

Assembly Notes:

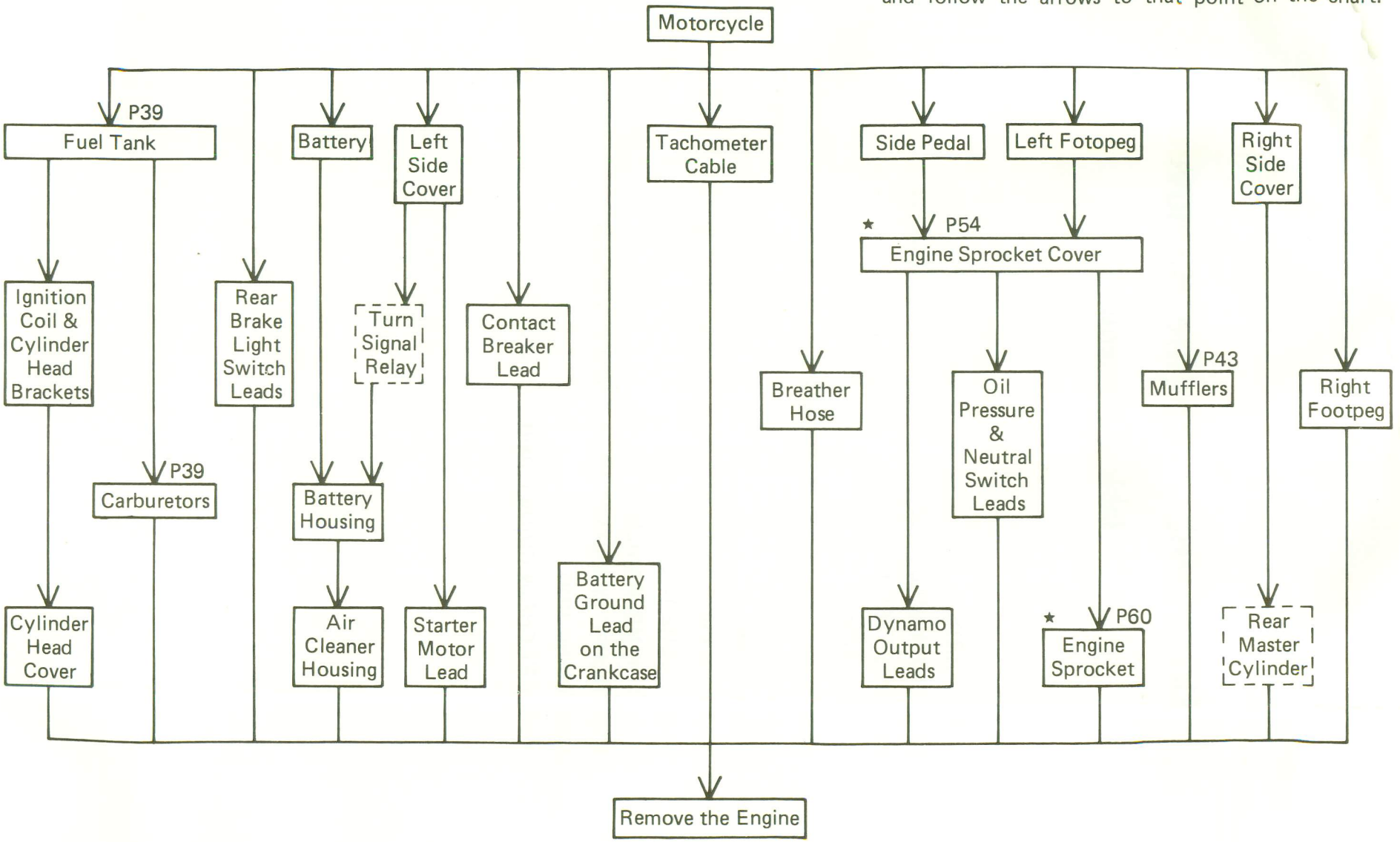
1. Replace the gasket with a new one.
2. After completing the oil pump assembly, check that the rotor shaft and rotor turn smoothly.

Disassembly–Engine Removed

Table of Contents

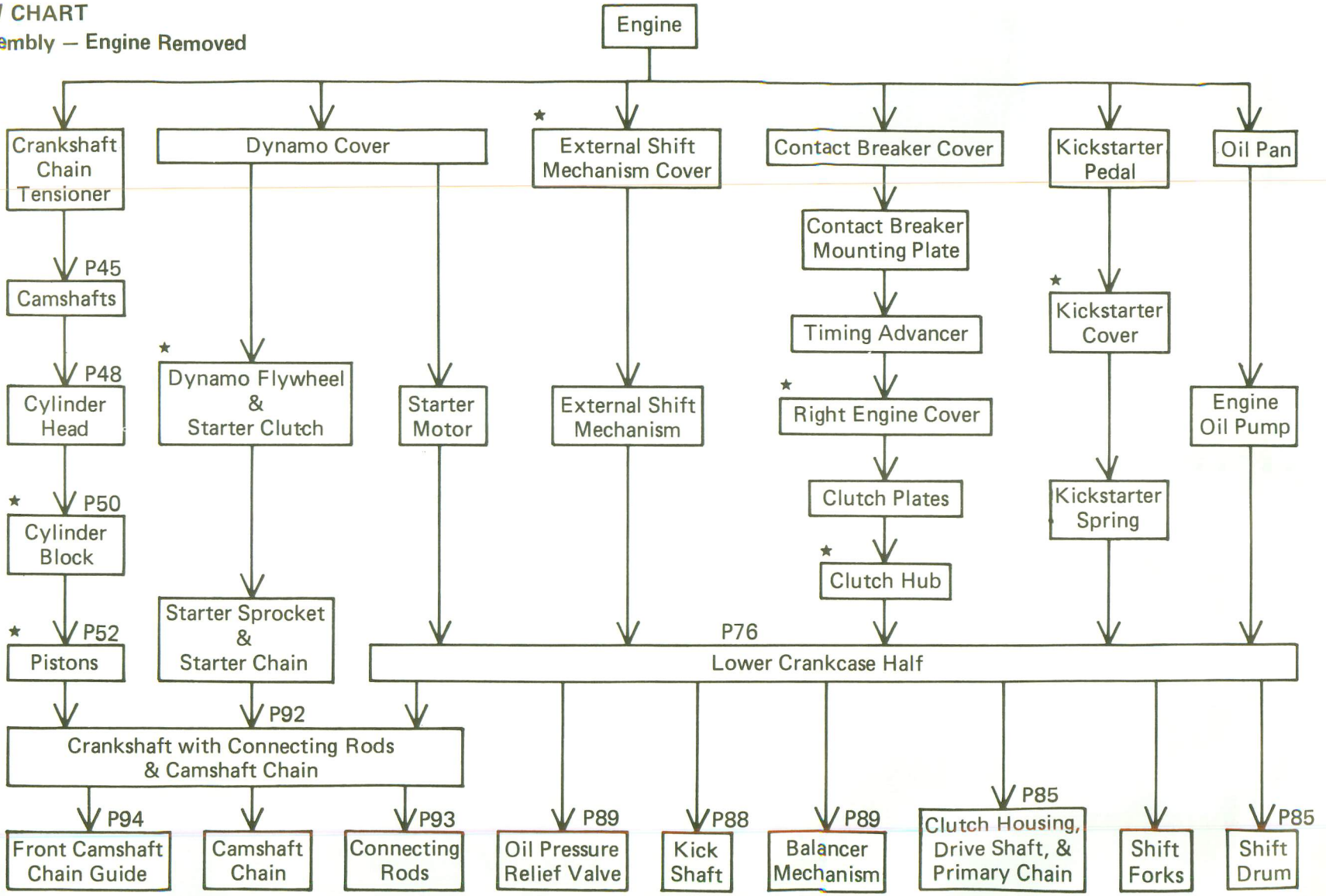
FLOW CHART
Engine Removal

The following charts are intended to be aids to proper removal. Select the component you wish to remove and follow the arrows to that point on the chart.



NOTE: Action with a mark (★) requires special tool(s) for removal, installation, disassembly, or assembly.

FLOW CHART
Disassembly — Engine Removed

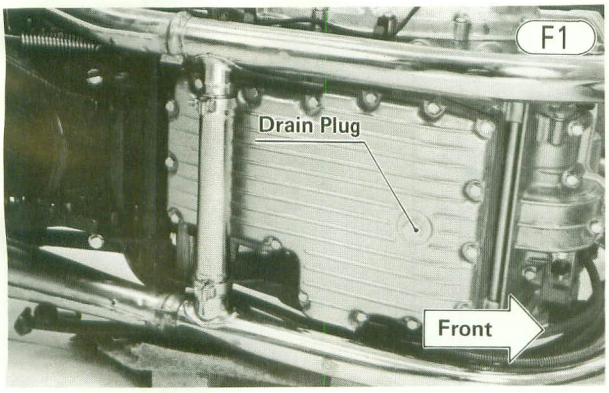


NOTES: 1. Action that has been already done in the engine removal procedure is omitted. Action that is not necessarily required for engine disassembly off the motorcycle is also omitted.
2. Action with a mark (★) requires special tool(s) for removal, installation disassembly, or assembly.

ENGINE REMOVAL

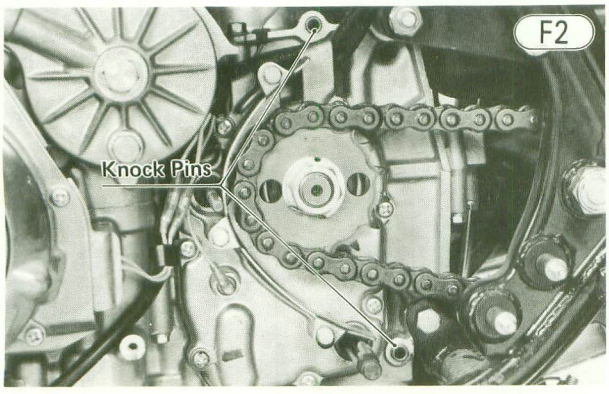
Removal:

- With the motorcycle up on its center stand, place an oil pan beneath the engine, and remove the engine drain plug to drain out the oil.

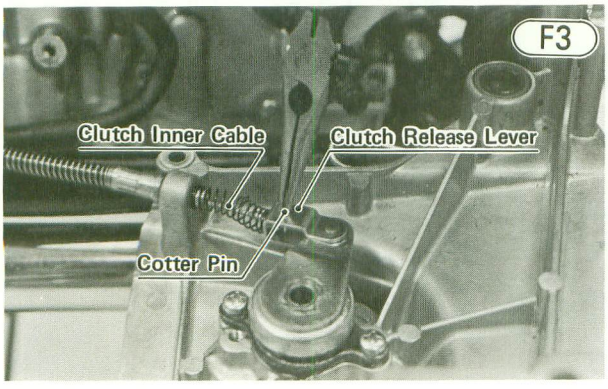


- After draining the oil, replace the drain plug with its aluminum gasket and tighten the plug with 2.7 ~ 3.3 kg-m (19.5 ~ 24.0 ft-lbs) of torque.
- Pull off the right and left side covers.
- Remove the fuel tank (Pg. 39).
- Pull off the spark plug lead from each spark plug and free the lead from its clamp on the cylinder head cover.
- Remove the engine sprocket cover (Pg. 54).
- Pull out the engine sprocket cover knock pins (2), if they are left on the engine side.

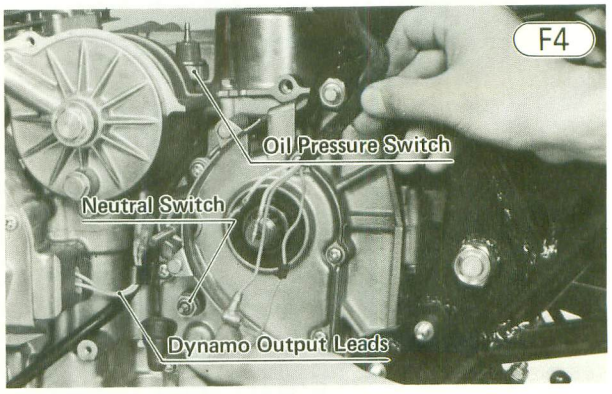
NOTE: This procedure prevents the knock pins from catching the engine mounting bracket when the engine is lifted up.



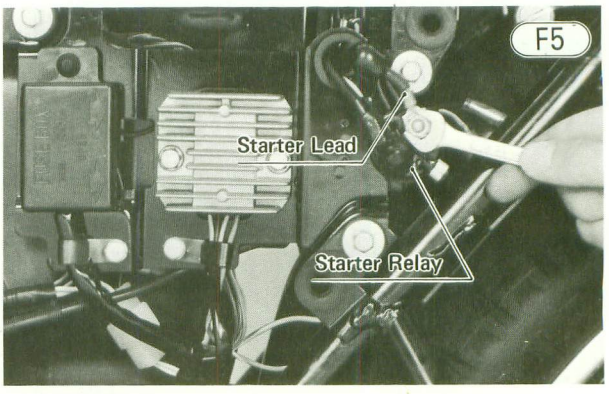
- Remove the cotter pin from the clutch release lever and free the clutch inner cable tip from the lever and engine sprocket cover.



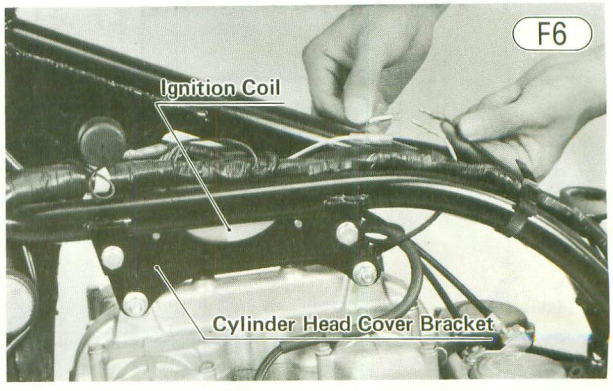
- Pull out the clutch cable through the engine and the frame, and situate the cable so that it will not get damaged during engine removal.
- Remove the left and right mufflers (Pg. 43).
- Unscrew the tachometer cable from the cylinder head, and pull off the cable from the cylinder head.
- Remove the engine sprocket (Pg. 60).
- Disconnect the neutral switch red lead, oil pressure switch gray lead, and dynamo output yellow leads.



- Slide the rubber cap out of place, remove the nut, lockwasher, and starter lead from the starter relay terminal, and free the starter lead from the frame.



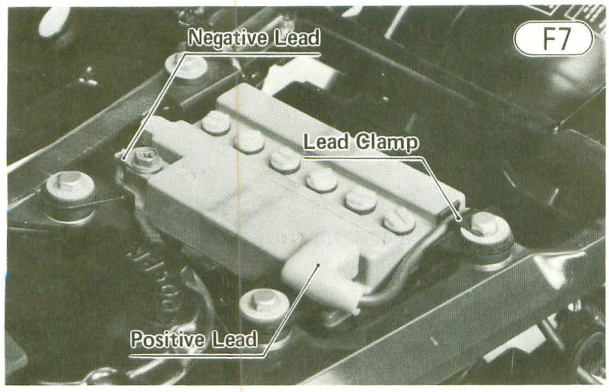
- Disconnect the blue and the red/yellow ignition coil leads.



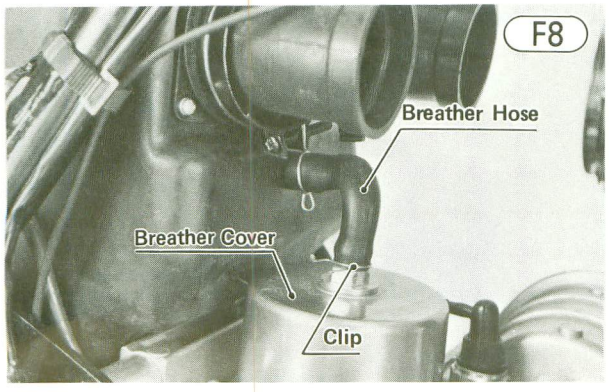
- Loosen slightly the straps which hold the blue contact breaker lead to free it from the frame.

- Remove the bolts (6), and take off the cylinder head cover brackets (2). The left bracket has the ignition coil unit. Each bolt has a lockwasher, and each lower bolt has flat washers (2).
- Remove the battery band, and first disconnect the ground negarive (–) lead terminal and then the positive (+) lead terminal from the battery.

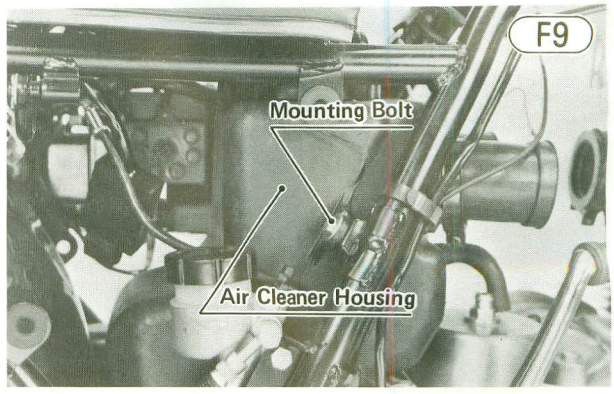
CAUTION **If the battery leads are removed in the reverse order given here and the positive (+) lead touches the frame or other ground parts while the negative (–) battery lead is still on the battery terminal, the cable could burn out and may cause fire. The battery lead removal must be begun with the negative (–) lead and it must be kept away from the battery terminal once it has been disconnected.**



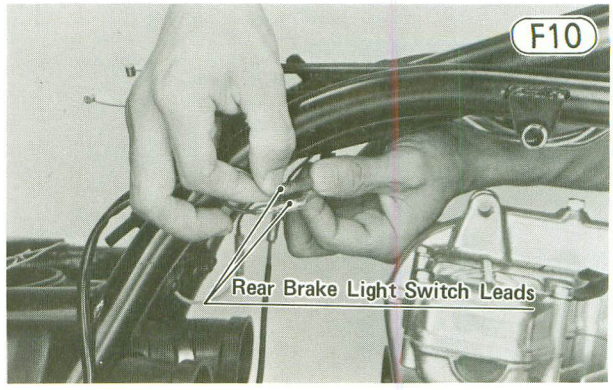
- Remove the battery from the motorcycle.
- Unbolt the battery housing mounting bolts (4). Each bolt has a lockwasher and a flat washer. The rear bolt has a lead clamp.
- Disconnect the black/yellow leads from the battery negative lead.
- Remove the turn signal relay from the battery housing and complete the battery housing and the frame cover removal.
- Remove the carburetors (Pg. 39).
- Slide the clip out of place and remove the breather hose from the breather cover.



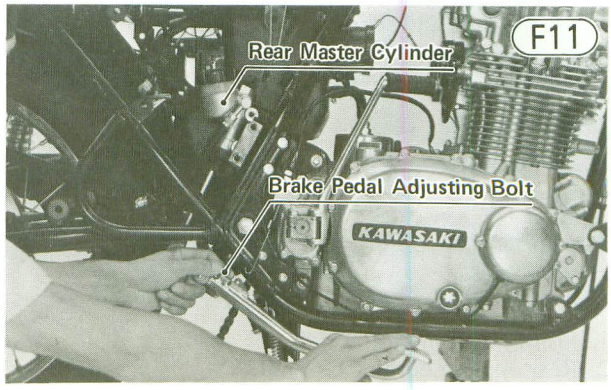
- Screw off the air cleaner cap.
- Remove the air cleaner housing mounting bolts and washers, and with some sort of cord, secure the air cleaner housing up into a position which will not hinder removal of the engine.



- Disconnect the rear brake light switch leads (blue and brown) and slide its leads free from the frame through the straps.

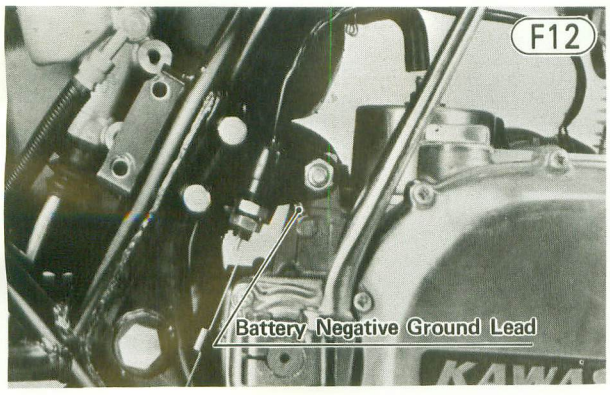


- Remove the rear brake light switch spring.
- Remove the rear master cylinder mounting bolts, lockwashers, and flat washers, loosen the brake pedal adjusting bolt locknut, and back out the adjusting bolt until the pedal is held down out of the way.

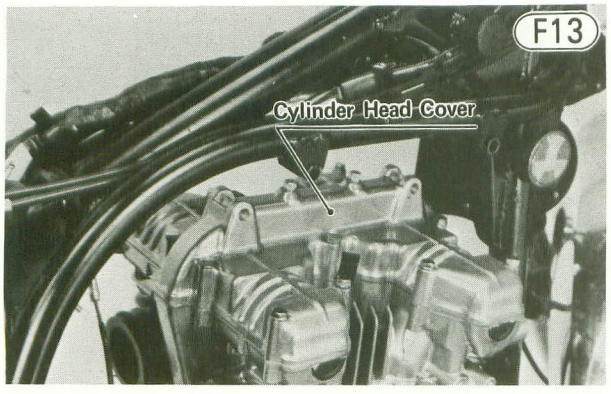


- Remove the right footpeg nuts and washers (2 ea), and remove the footpeg.

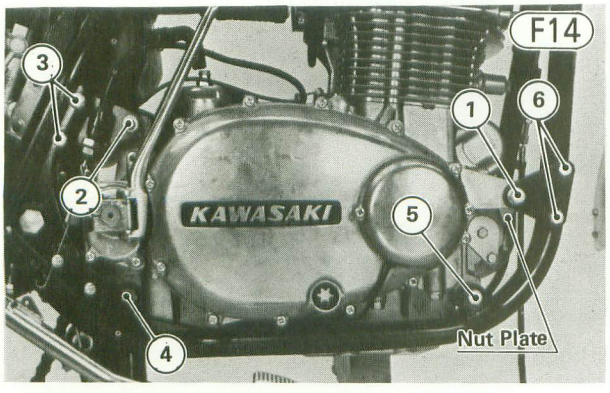
●Remove the bolt and lockwasher, and remove the battery negative ground lead from the engine.



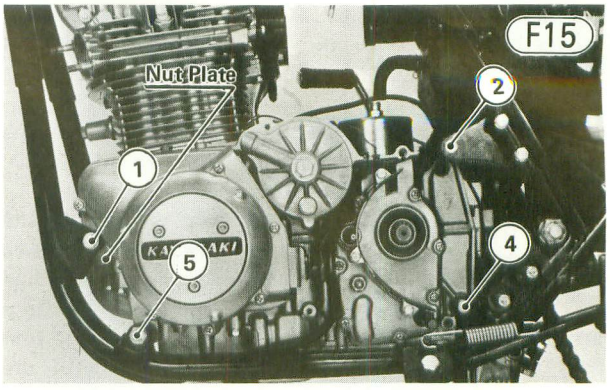
●Remove the cylinder head cover bolts (14), and take off the cylinder head cover. Two spark plug lead clamps are held in place with two cylinder head cover bolts.



●Jack or lever the engine up slightly to take the weight off the mounting bolts.
●Remove the upper front mounting bolt ① and lock washer on each side. Each bolt has a nut plate.

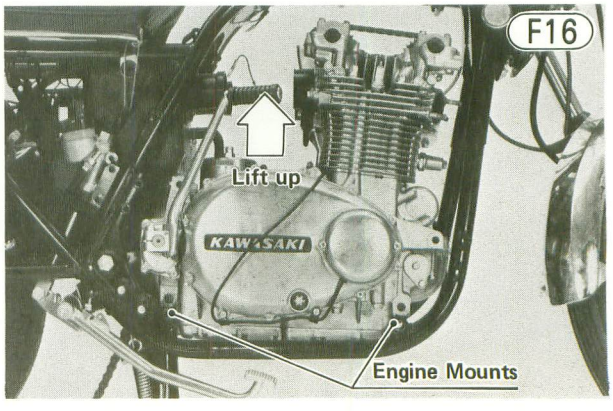


1. Front upper mounting bolt
2. Rear upper mounting bolt nut
3. Rear upper mounting bracket bolts
4. Rear lower mounting bolt nut
5. Front lower mounting bolt
6. Front upper mounting bracket bolts

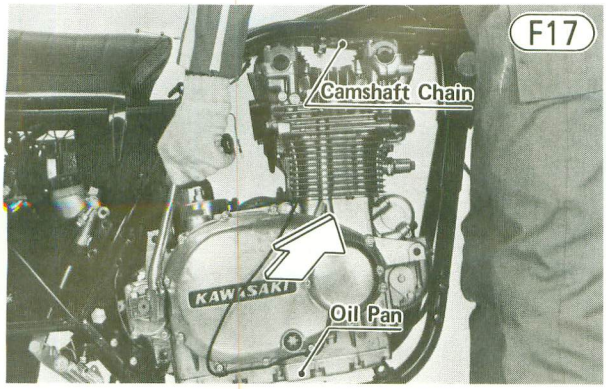


1. Front upper mounting bolt
2. Rear upper mounting bolt
4. Rear lower mounting bolt
5. Front lower mounting bolt

●Remove the rear upper mounting bolt nut ② and lock washer.
●Remove the bolts ③, ⑥ (4) and lock washers (4), and remove the rear upper and front upper mounting brackets on the right side.
●Remove the rear lower and front lower mounting bolt nuts ④, ⑤ and lock washers.
●Pull out the long engine mounting bolts ②, ④, ⑤. Be careful not to damage the threads upon removal.
●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 removal: starter lead, clutch cable, tachometer cable, contact breaker point lead, dynamo output leads, crankcase ground lead, throttle cables.
●Lift the engine straight up about 30 mm keeping it level, then move it to the right slightly so the rear and front of the engine slips over the lower right rear and the lower right front engine mounts.



●Lift up the right side so that the oil pan at the bottom of the engine clears the frame, and pull the engine out diagonally upward to the right, taking ample care not to damage the camshaft chain and the camshaft sprocket.



Installation:

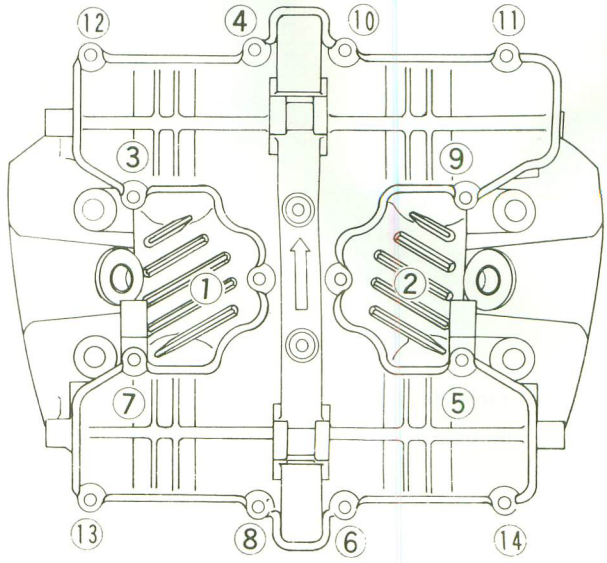
- Place the engine into the frame the reverse of how it was removed.
- Install the rear upper and the front upper mounting brackets, and tighten four bracket bolts ③, ⑥ loosely. The rear two bolts and front two nuts have lock washers.
- Lifting the engine as necessary so that the mounting bolt threads do not get damaged, insert the five engine mounting bolts and tighten them loosely. The front upper mounting bolts ① and the other three nuts have lock washers. The rear upper engine mounting bolt ② runs through the engine mount, the long spacer, engine, short spacer, and finally through the rear upper engine mounting bracket.

Table F1 Engine Mounting Bolt Length

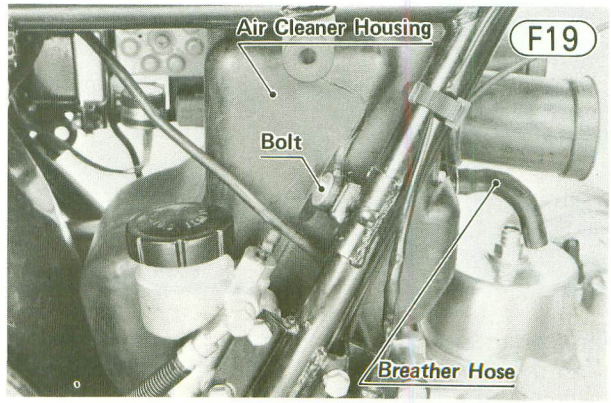
Mounting Bolt		Length
Front Upper	Left	70 mm
	Right	50 mm
Front Lower		326 mm
Rear Upper		240 mm
Rear Lower		160 mm

- Tighten four bracket bolts with 2.0 ~ 2.8 kg-m (14.5 ~ 20.0 ft-lbs) of torque, and then tighten five engine mounting bolts with 3.4 ~ 4.6 kg-m (25 ~ 33 ft-lbs) of torque.
- Apply a liquid gasket to the circumference of each cylinder head rubber plug, and fit them in place.
- Install the cylinder head cover with a new cylinder head cover gasket. The arrow on the cover must point towards the front. Tighten the cover bolts (14) with 1.1 ~ 1.3 kg-m (95 ~ 113 in-lbs) of torque, following the tightening sequence shown in Fig. F18. Do not forget to install the spark plug lead clamps (2) when the cylinder head cover is installed.
- Screw in the brake pedal adjusting bolt and install the rear brake master cylinder. Each master cylinder mounting bolt has a lockwasher and a flat washer.
- Mount the rear brake light switch spring.
- Run the rear brake light switch leads through the straps on the frame, and connect the blue lead and the brown lead to the same color leads on the main harness side.

Cylinder Head Cover Bolt Tightening Order F18

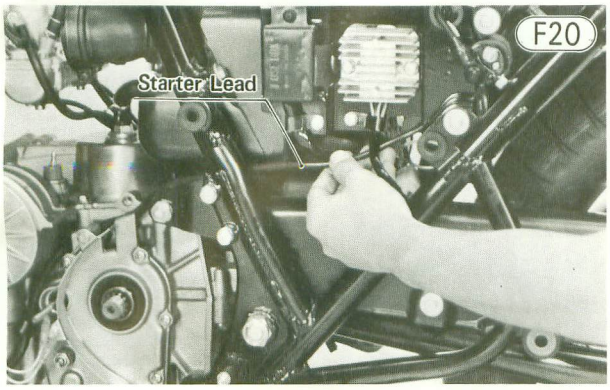


- Install the brackets (with the ignition coil) connecting the cylinder head cover to the frame. Tighten the upper bracket bolts (4) with 2.0 ~ 2.8 kg-m (14.5 ~ 20.0 ft-lbs) of torque. Each upper bracket bolt has a lockwasher. Tighten the lower bracket bolt nuts with 1.6 ~ 2.2 kg-m (11.5 ~ 16 ft-lbs) of torque. Each lower bracket bolt has a lockwasher and two flat washers.
- Connect the spark plug lead on each spark plug and insert each lead into its clamp.
- Install the battery negative ground lead on the engine right side and tighten its bolt. The bolt has a lock washer. Run the lead over the rear master cylinder.
- Run the contact breaker lead through its straps, and connect the blue contact breaker lead to the blue ignition coil lead, and connect the red/yellow ignition coil lead to the red/yellow lead.
- Install the air cleaner housing and tighten the bolts (2). Each bolt has a flat washer.

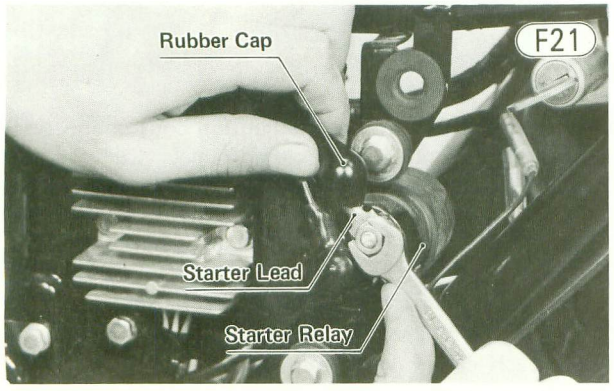


- Install the air cleaner element and cap (Pg. 39).

- Fit the breather hose onto the breather cover, and slide back the clip.
- Run the starter lead above the upper engine mounting bolt spacer to the starter relay.

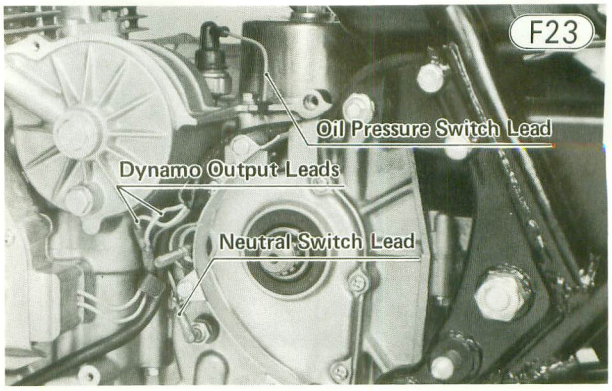


- Fit the starter lead to the starter relay terminal. After tightening the nut, slide the rubber cap back onto the relay terminal.



- Install the battery housing and frame covers. Before tightening the battery housing mounting bolts (4), lift up the battery negative lead into the housing, and connect the black/yellow leads to the negative leads. Tighten the battery housing mounting bolts. Each bolt has a flat washer. The rear left bolt has a lead clamp.

- Fit the turn signal relay to the battery housing.
- Run the dynamo output leads, and connect the output yellow leads. Connect the gray oil pressure switch lead to the switch and the red neutral switch lead to the switch.



- Clamp all leads, and fit the leads between the external shift mechanism cover and crankcase.
- Install the battery and route the battery vent hose to the rear fender right side.

CAUTION

1. **Route the battery vent hose as shown in the caution label. If battery gases cannot escape from this hose, the battery may explode.**
2. **Make sure the battery vent hose end is kept away from the chain. Electrolyte from the battery vent hose will corrode and dangerously weaken the chain.**
3. **Do not let the battery vent hose get folded or pinched, and route it away from the exhaust system.**

- Connect first the battery positive (+) lead and then the negative (–) lead to battery terminals.

NOTE: The battery positive lead has a red insulation boot on its end.

- Install the battery band.
- Install the engine sprocket (Pg. 60).
- Run the clutch cable into the engine sprocket cover and spring, and fit the tip of the inner cable into the clutch release lever (Fig. F3).
- Using a new cotter pin, secure the cable tip to the release lever.
- Install the engine sprocket cover (Pg. 54).
- Install the mufflers (Pg. 44).
- Fit the gasket into the cylinder head, and fit the tachometer cable to the cylinder head.
- Install the right footpeg, and tighten the cap nuts securely. Each nut has a flat washer.
- Install the fuel tank (Pg. 39).
- Fit the right and left side covers.
- Fill the engine with oil, check the lever (Pg. 21), and add more if necessary.
- Adjust the drive chain (Pg. 24).
- Adjust the clutch (Pg. 20).
- Adjust the throttle cable (Pg. 16).
- Adjust the rear brake (Pg. 25).
- Adjust the rear brake light switch (Pg. 26).
- Adjust the camshaft chain (Pg. 14).
- Adjust the ignition timing (Pg. 12).
- Adjust the idle speed (Pg. 18).

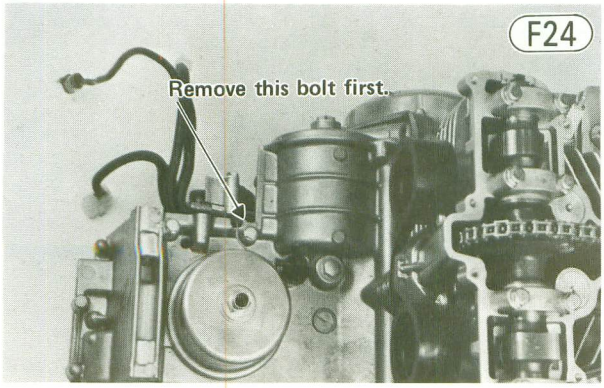
CRANKCASE SPLIT

Disassembly:

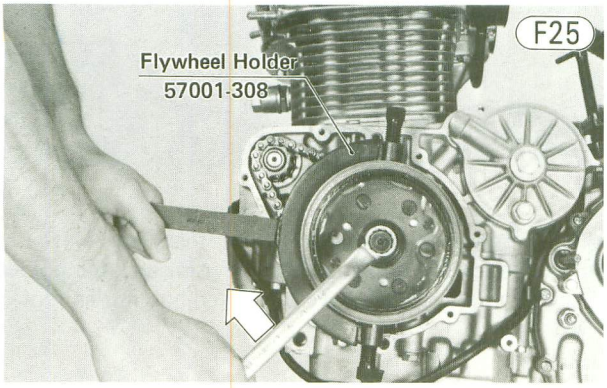
- Remove the engine (Pg. 72).
- Remove the spark plugs.

●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.

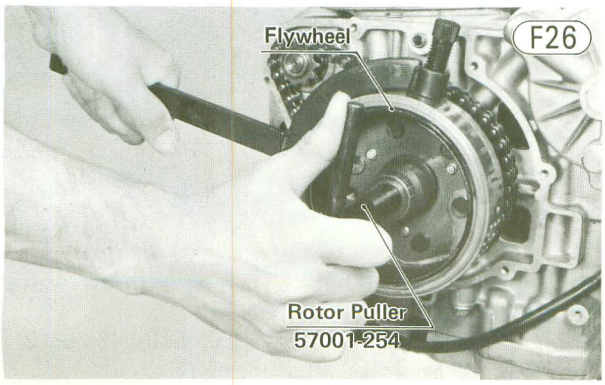
NOTE: If the engine is to be set onto the Kawasaki engine disassembly apparatus, one of the upper crankcase half bolts (3) shown in Fig. F24 must be removed before positioning the engine.



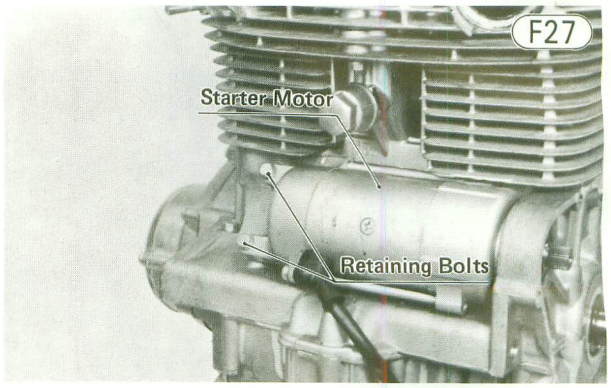
●Free the dynamo output leads from the clamp.
●Remove the dynamo cover screws (8), and pull off the dynamo cover, gasket, and knock pins (2).
●Remove the dynamo flywheel using the following 3 steps only if the crankshaft is to be removed.
○Hold the dynamo flywheel steady with the flywheel holder (special tool), and remove the left hand thread bolt. The bolt must be turned clockwise for removal.



○Using the special tool to hold the flywheel steady, remove the flywheel and starter clutch assembly with the rotor puller (special tool). There is a thrust washer at the rear of the flywheel and starter clutch assembly.



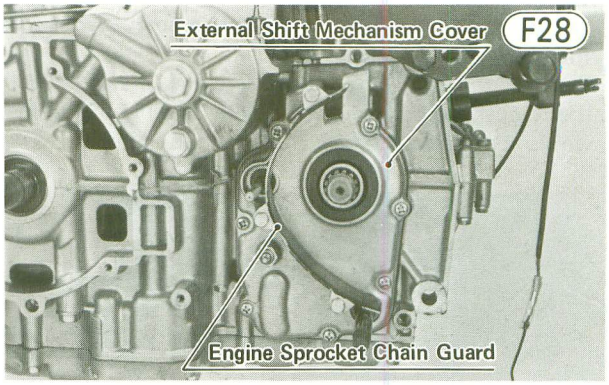
○Pull off the starter motor sprockets and chain.
●Remove the starter motor retaining bolts (2).



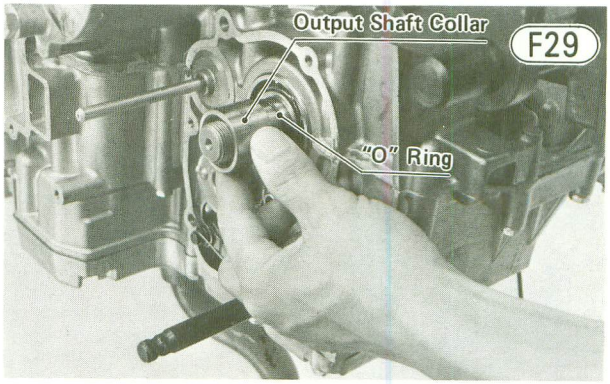
●Pry the starter motor loose from the crankcase with a screwdriver and pull the starter motor off towards the right side of the engine (Fig. E76 on Pg. 56).

CAUTION **Do not tap on the starter motor shaft. Tapping on the shaft may damage the motor.**

●Remove the engine sprocket chain guard.

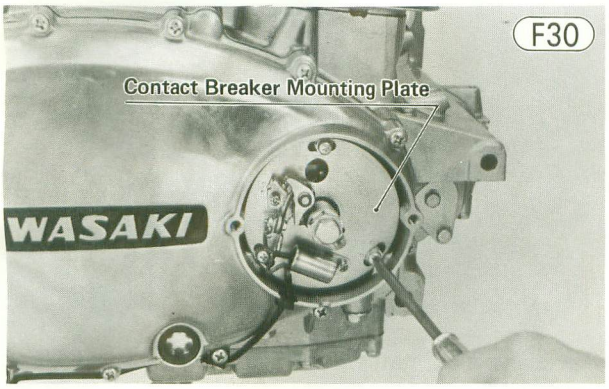


●Pull off the clutch push rod.
●Remove the external shift mechanism cover screws (7), and pull off the external shift mechanism cover and gasket.
●Take off the output shaft collar, using a bearing puller if it is difficult to remove, and take off the **O** ring.

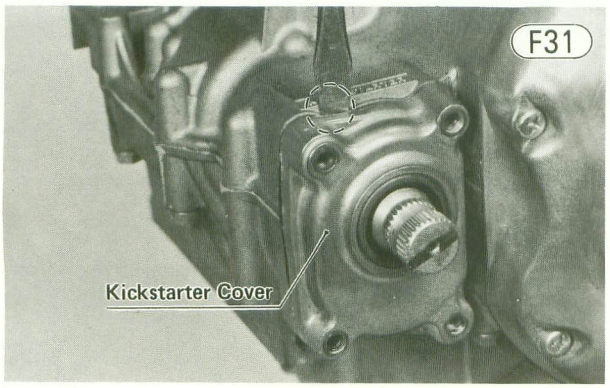


●Move the external shift mechanism lever arms out of their positions on the end of the shift drum, and pull out the external shift mechanism.

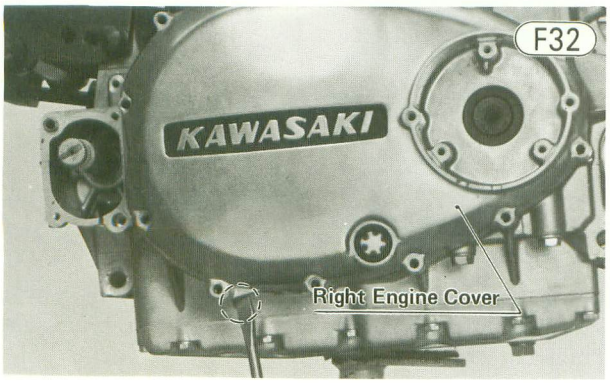
- Remove the contact breaker cover and gasket.
- Take out the contact breaker mounting plate screws, lockwashers, and flat wahsers (3 ea), and remove the mounting plate.



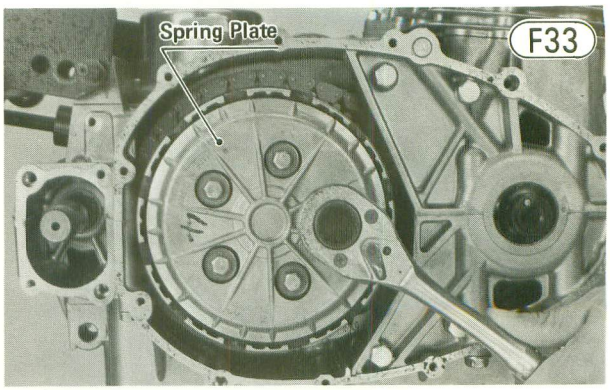
- With a 17 mm wrench on the crankshaft rotation nut to keep the shaft from turning, remove the advancer mounting bolt, and take off the timing advancer.
- Mark the position of the kickstarter pedal so that it can later be replaced on the kick shaft in the same position.
- Take out the kickstarter pedal bolt, slightly widen the gap in the kickstarter pedal with a screwdriver, and then pull off the kickstarter pedal.
- Remove the kickstarter cover screws (4), and pull off the kickstarter cover and gasket, prying the points with a screwdriver. There are two knock pins.



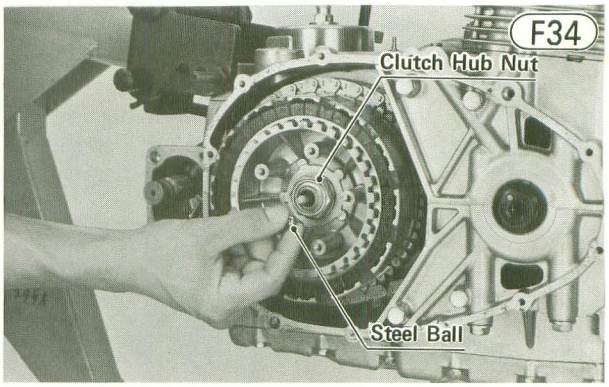
- Pull out the spring guide, and remove the kick spring.
- Remove the screws (12), and pull off the right engine cover and gasket. There is a slot to facilitate cover removal. Pry this point with a screwdriver.



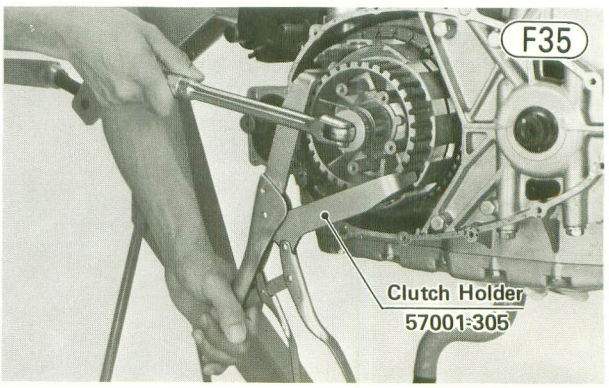
- Remove the clutch spring bolts (5), washers (5), and springs (5).



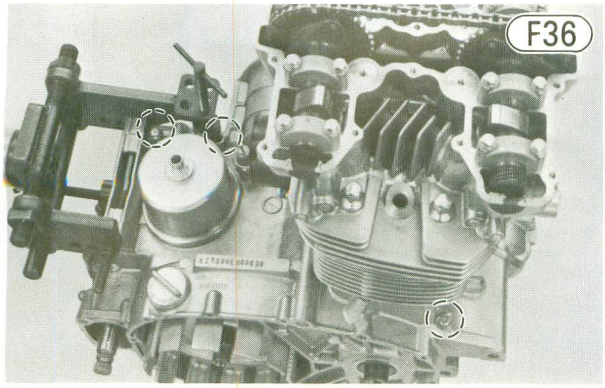
- Pull off the spring plate and spring plate pusher.
- Push in on the push rod to remove the steel ball, and pull out the push rod.



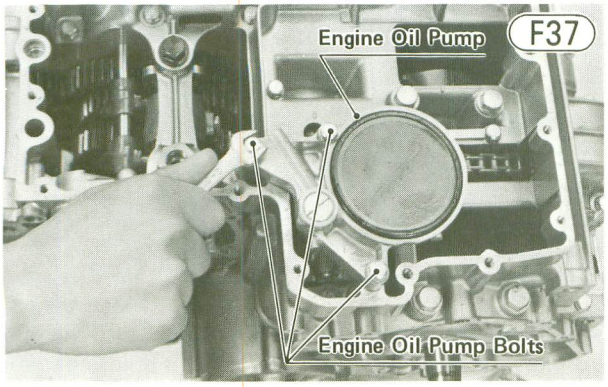
- Remove the friction plates (8) and steel plates (7).
- Hold the clutch hub from turning using a clutch holder (special tool), and remove the clutch hub nut and lockwasher.



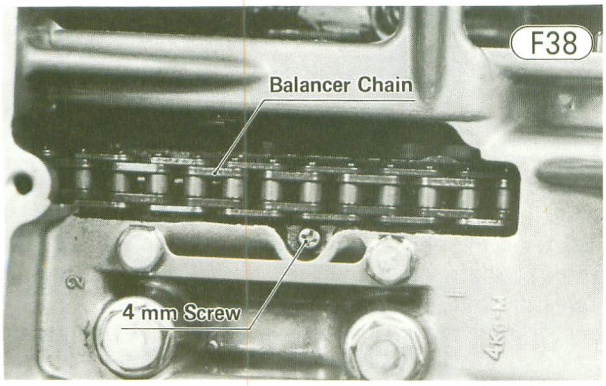
- Pull off the clutch hub. There is a thrust washer at the rear of the clutch hub.
- Remove the upper crankcase half bolts (3, or 2 if one was removed just after engine removal).



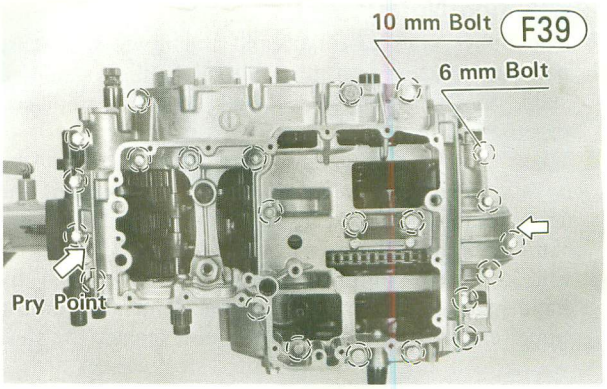
•Turn the engine upside down, remove the oil pan bolts (17), and remove the oil pan and gasket.
•Remove the engine oil pump bolts (3), and take off the engine oil pump. There are two knock pins and an O ring.



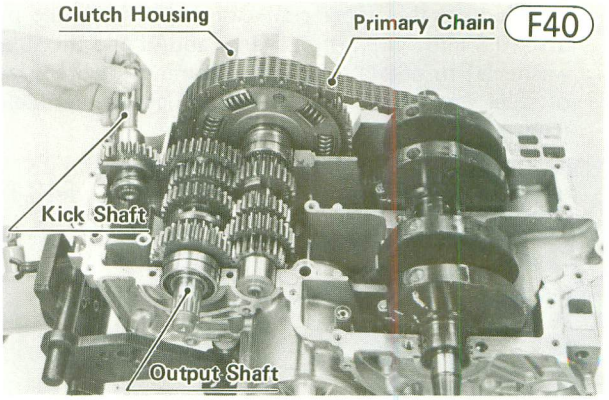
•To hold the balancer chain guide in original position after separating the crankcase halves, turn a 4 mm screw into the chain tensioner body. Use a screw which has a 0.7 mm thread pitch and about 15 mm length.



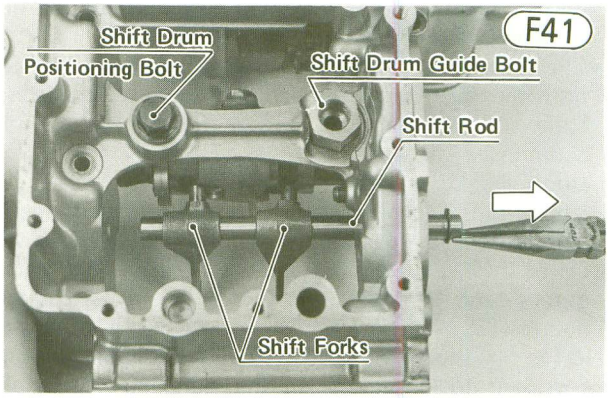
•Remove the 6 mm lower crankcase half bolts (17) and 10 mm bolts (6), pry the two points shown in Fig. F39 to split the two crankcase halves apart, and lift off the lower crankcase half.



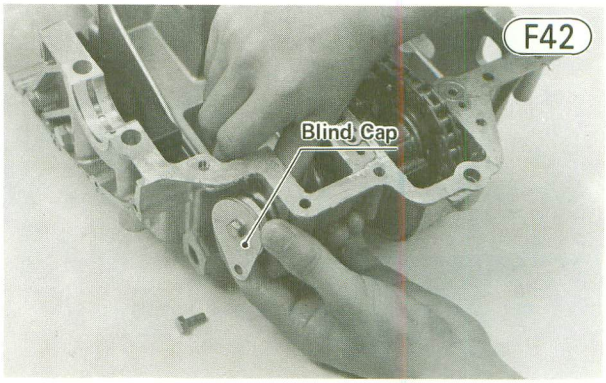
•Take out the kick shaft and output shaft assemblies.



•Slip out the clutch housing from the primary chain, and take out the clutch housing with the drive shaft assembly.
•Pull out the shift rod, and remove the two shift forks in the lower crankcase half.

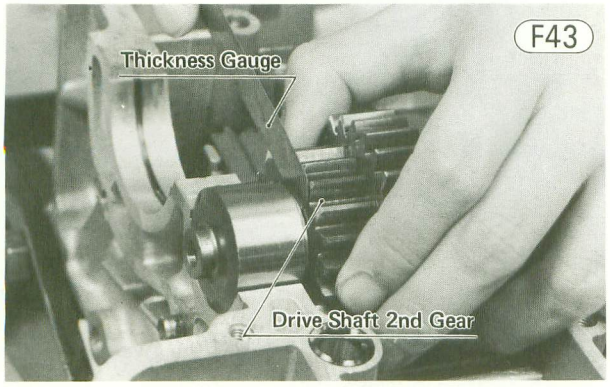


•Remove the blind cap stop bolt and washer, and pull the blind cap.



Installation Notes:

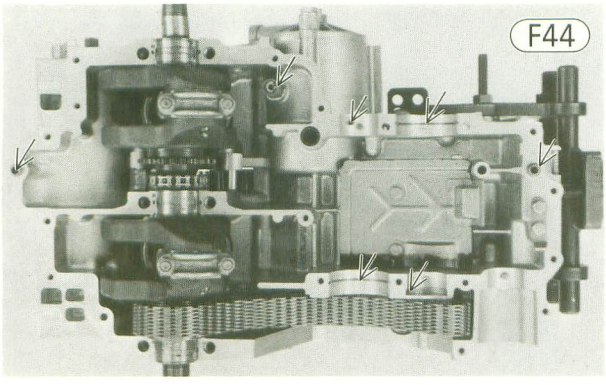
1. The upper crankcase half and the lower crankcase half are machined at the factory in the assembled state, so the crankcase halves must be replaced together as a set.
2. When replacing new crankcase halves, to seat the bypass valve steel ball evenly in the bottom of the upper crankcase half, insert the soft steel rod and hammer lightly the rod.
3. Check that the output shaft 1st gear turns freely by hand with the output shaft assembly installed on the upper crankcase half. If it does not, replace the steel washer with the thinner (0.5 mm) steel washer.
4. Check the clearance between the drive shaft 2nd gear and the copper washer with the drive shaft assembly installed on the upper crankcase half. It should be 0.1 ~ 0.5 mm. If it is not, change and/or add the steel washer(s) to obtain the proper clearance. Three size of steel washers (1.0, 0.7, 0.5 mm thick) are available from Kawasaki dealer.

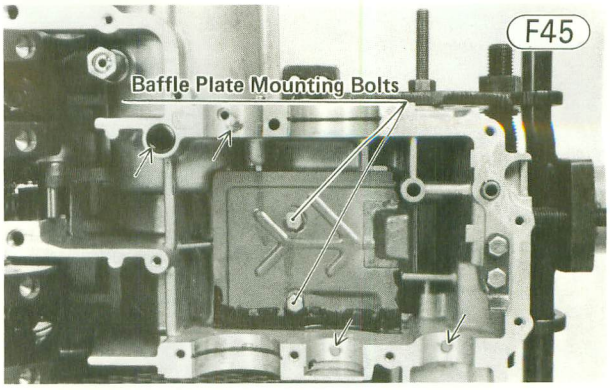


- With a high flash-point solvent, clean off the mating surfaces of the crankcase halves and wipe dry.
- Check to see that the following parts are in place on both the upper crankcase half and the lower crankcase half, and blow the oil passage nozzles clean with compressed air.

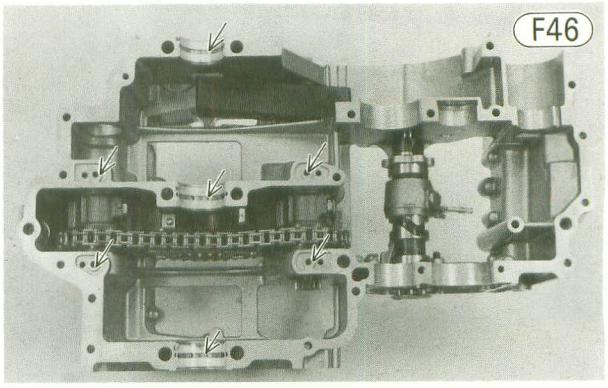
  Upper crankcase half:
  Knock pins (2); oil passage **O** ring (use a new one if deteriorated or damaged); oil pressure relief valve; drive shaft and output shaft set rings (2); drive, output, and kick shaft set pins (3); and oil passage nozzles (2).

NOTE: If the baffle plate is removed, apply a non-permanent locking agent on the plate mounting bolt threads, and tighten them with 0.45 ~ 0.55 kg-m (39 ~ 48 in-lbs) of torque.

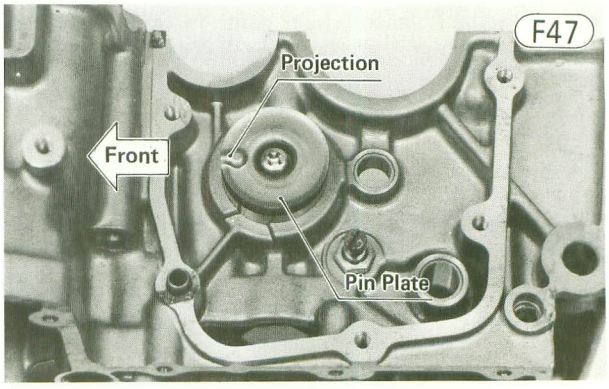




Lower crankcase half:
Crankshaft main bearing inserts (3); and balancer shaft needle bearing Allen screws (4), see CAUTION 2. on Pg. 90.



- To set the shift drum in neutral position, turn the shift drum so that the pin plate projection is pointing to the front.

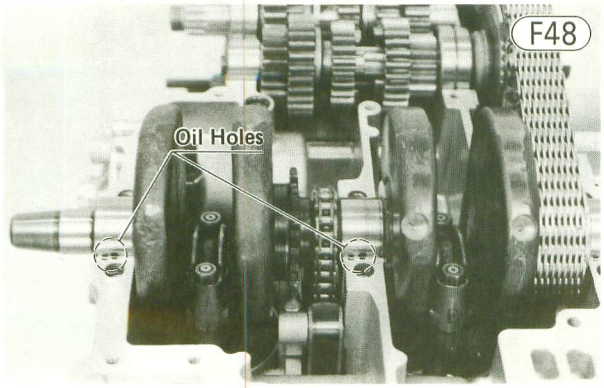


- Fit the output and drive shaft assemblies, and kick shaft on the upper crankcase half. When installing the output shaft, drive and kick shafts, the crankcase set pins must go into the holes in the respective bushings or bearing races, and the set rings must fit into the grooves in each ball bearing.

CAUTION **Make sure the crankcase set pins are properly aligned to avoid damage to the crankcases upon installation.**

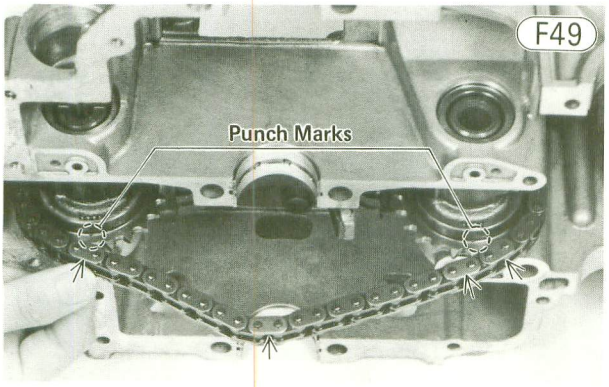
- Apply a little engine oil to the transmission gears, ball bearings, shift drum, and crankshaft main bearing inserts.

•Temporarily install the timing advancer, and, with a 17 mm wrench, turn the crankshaft so that the crankshaft oil holes are even with the upper crankcase half surface, with flywheels positioned up.



•Check to see that the balancer chain and balancer sprockets are properly fitted. For the front sprocket, the chrome plated link must fit on the sprocket tooth with the punch mark. For the rear sprocket, the link between two chrome plated links must fit on the sprocket tooth with the punch mark.

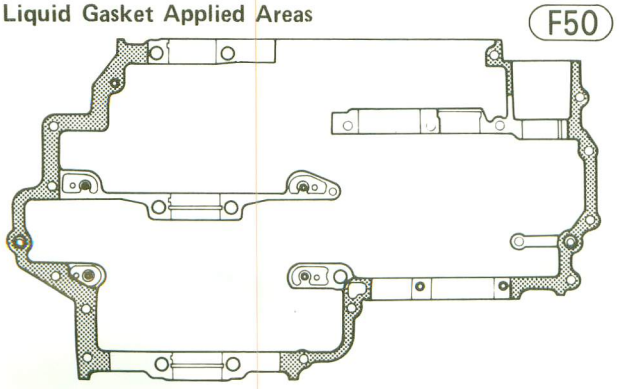
NOTE: There are four plated links, and, with the chain in the position mentioned above, the 2nd plated link counted from the front will be located on the crankshaft side.



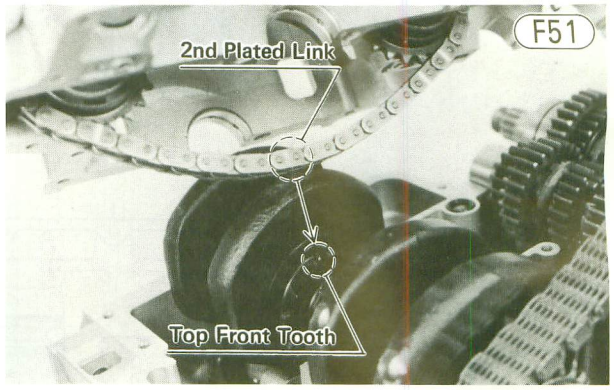
•Apply a liquid gasket to the fitting surface of the lower crankcase half in the areas as shown.

CAUTION **If liquid gasket adheres to any areas not inidcated, the engine oil passages may be obstructed, causing engine seizure.**

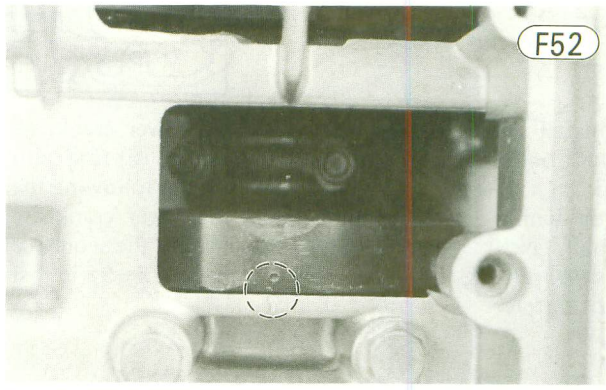
Liquid Gasket Applied Areas



•Fit the lower crankcase half on the upper crankcase half, engaging the 2nd plated link with the top front tooth of the sprocket on the crankshaft. The 3rd gear shift fork must fit in the drive shaft 3rd gear groove.

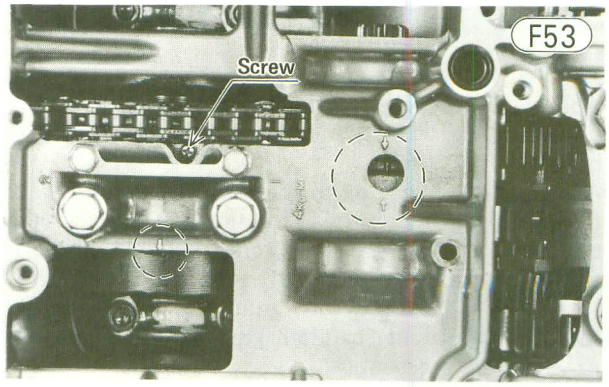


•Install and tighten lightly the 10 mm lower crankcase half bolts (6) and check that the arrow on the lower crankcase points to the mark on the flywheel as shown.



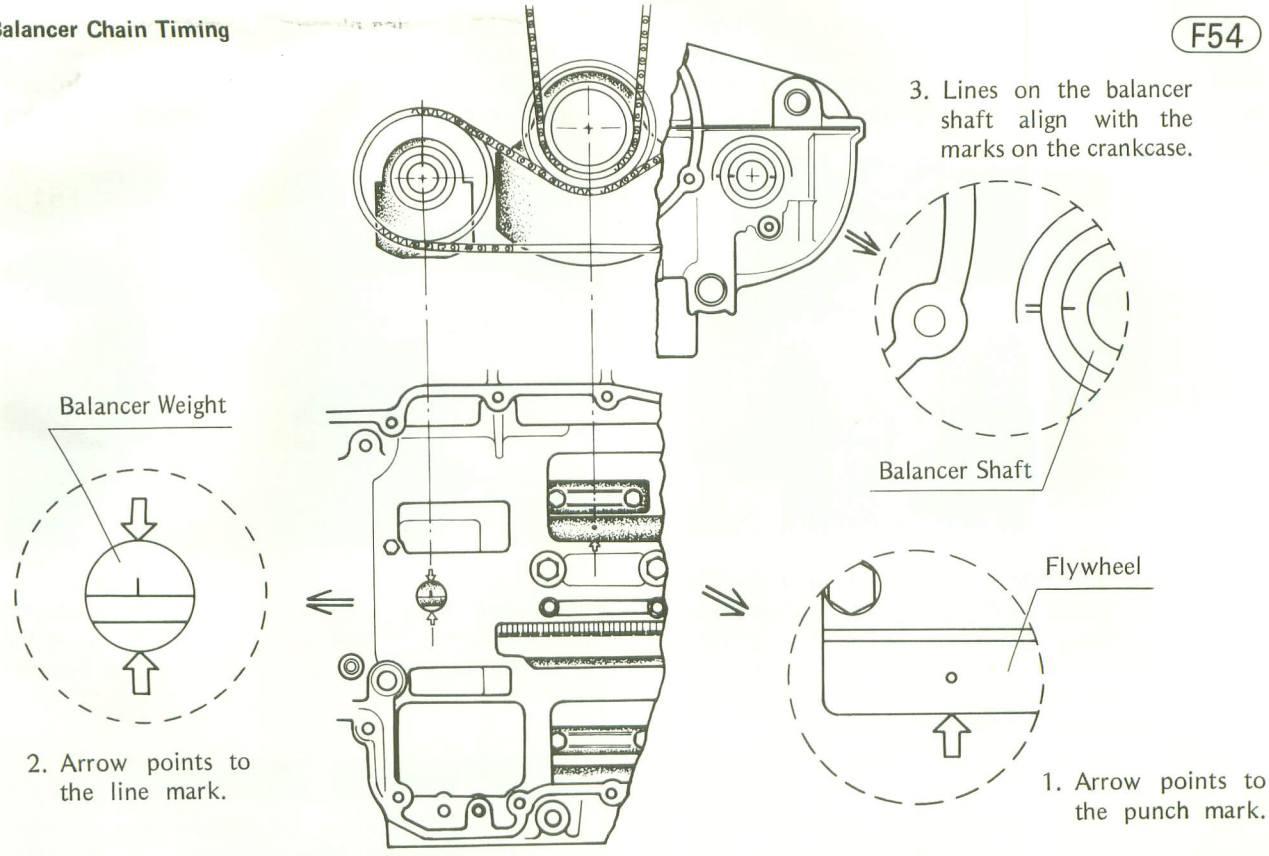
•Check that the arrow beside the timing inspection hole points to the mark on the rear balancer weight, and that the marks on the front balancer weight shaft align with the mark on the lower crankcase (Fig. F54). If the three timing mark pairs are not aligned at the same time, lift off the lower crankcase half and correct the timing.

•Remove the screw that holds the balancer chain tensioner body.

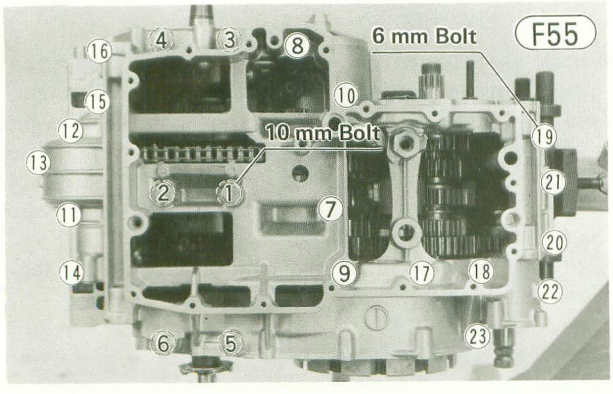


Balancer Chain Timing

F54

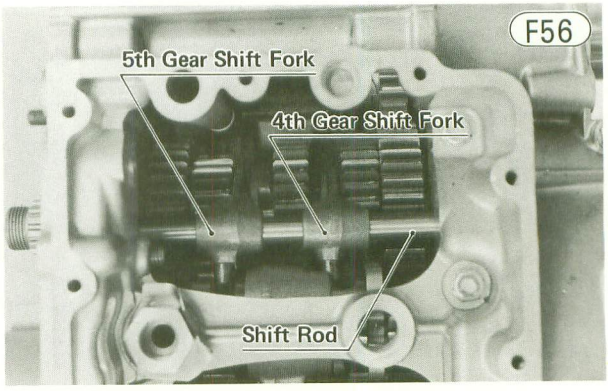


- Install and tighten lightly the 6 mm lower crankcase half bolts (17). Tighten the 10 mm bolts (6) first with 3.7~4.3 kg-m (27~31 ft-lbs) of torque, following the tightening sequence numbers on the lower crankcase half. Next tighten the 6 mm bolts (17) in the sequence shown in Fig. F55 with 0.9~1.1 kg-m (78~95 in-lbs) of torque.

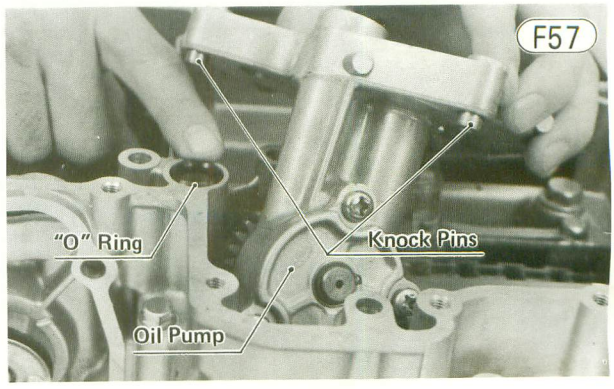


- Apply a little engine oil on the **O** ring and install the blind cap and washer, and tighten the blind cap stop bolt.
- Apply a little engine oil to the shift rod and shift fork fingers, insert the shift rod running it through the output shaft 5th gear shift fork, and then through the output shaft 4th gear shift fork, fitting each shift fork guide pin into the shift drum groove.

NOTE: The output shaft 5th gear shift fork and 4th gear shift fork are identical.

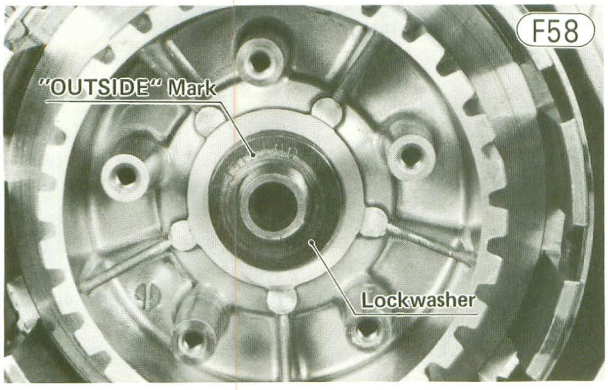


- Check to see that the drive shaft and output shaft turn freely, and, spinning the drive shaft, shift the transmission through all gears to make certain there is no binding and that all gears shift properly.
- Check to see that the oil pump knock pins (2) and the oil passage **O** ring are in place. Replace the **O** ring with a new one, if deteriorated or damaged.

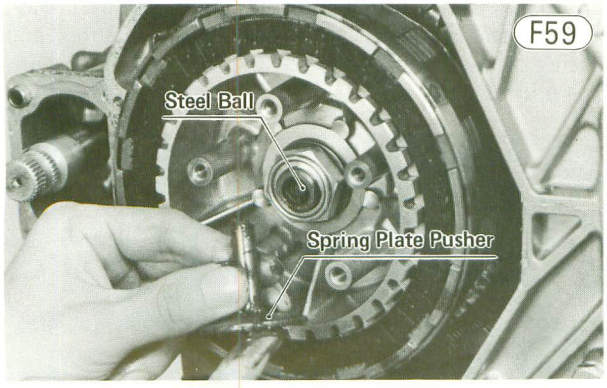


- Install the oil pump, making sure the oil pump gear and pump drive gear at the end of the balancer shaft mesh properly. Apply non-permanent locking agent to the engine oil pump bolts (3), and tighten them with 0.9 ~ 1.1 kg-m (78 ~ 95 in-lbs) of torque.
- Install a *new oil pan* gasket, and the oil pan with its mounting bolts (17). Tighten the bolts with 0.9 ~ 1.1 kg-m (78 ~ 95 in-lbs) of torque.
- Install the upper crankcase bolts (3, or 2 if the engine is set on the Kawasaki engine disassembly apparatus), and tighten them with 0.9 ~ 1.1 kg-m (78 ~ 95 in-lbs).
- Remove the timing advancer.
- Install the thrust washer, clutch hub, and flat wahser. Replace the clutch hub nut with a new one, screw on the nut, and tighten it with 12 ~ 15 kg-m (87 ~ 108 ft-lbs) of torque, while holding the hub stationary with the clutch holder (special tool).

WARNING **The lockwasher between the clutch hub and the clutch hub nut must be installed with the marked side, "OUTSIDE", facing out. If this lockwasher is installed backwards, the hub nut might loosen during operation. This causes clutch disengagement and might cause primary chain breakage by the misalignment of the primary and the clutch housing sprockets, resulting in loss of motorcycle control.**



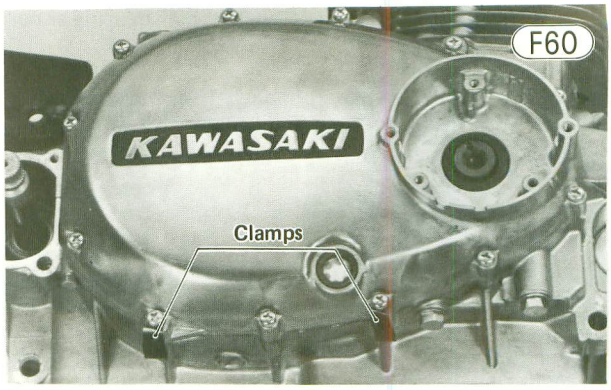
- Install the friction plates (8) and steel plates (7), starting with a friction plate and alternating them.
- Insert the steel ball and spring plate pusher, applying a thin coat of a high temperature grease to their surfaces.



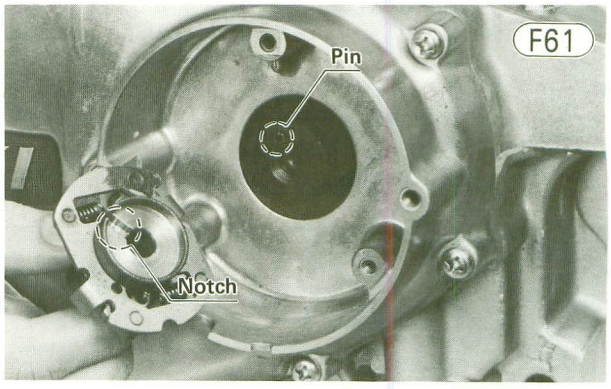
- Install the spring plate, springs washers, and spring bolts (5 ea). Cross tighten the bolts evenly with 0.8~ 1.0 kg-m (69 ~ 87 in-lbs) of torque by hand.

NOTE: The spring plate can be installed on the clutch hub in any position, so there is no mark on either the spring plate or the clutch hub.

- Check that the wire band in the right engine cover crankshaft oil seal has not slipped out of its proper position and apply a high temperature grease to the oil seal lip (Fig. E114). If the oil seal is damaged, replace it with a new one.
- Check that the two knock pins are in place, and using a new right engine cover gasket, fit the right engine cover onto the crankcase. Tighten the screws (12) firmly. Be sure to include the contact breaker lead clamps with their right engine cover screws.



- 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 the advancer mounting bolt. The notches in the nut fit the projections on the timing advancer. Tighten the bolt with 2.3 ~ 2.7 kg-m (16.5 ~ 19.5 ft-lbs) of torque.



- Mount the contact breaker mounting plate, and tighten its screws (3) loosely. Each screw has a lockwasher and flat washer.

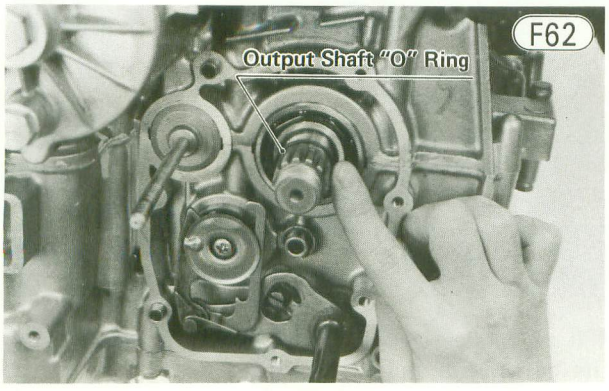
NOTE: These screws will be tightened securely during ignition timing adjustment.

- Turn the kick shaft clockwise until it stops, and insert one end of the spring into the crankcase hole.
- Using needle nose pliers, insert the other end into the kick shaft, and while holding the spring in place, insert the kick spring guide.
- Check to see that knock pins (2) are in place, and using a new kick shaft cover *gasket, fit* the cover onto the crankcase. Use the kick shaft oil seal guide (special tool) to protect the kick shaft oil seal (Fig. E119). Tighten the cover screws (4).

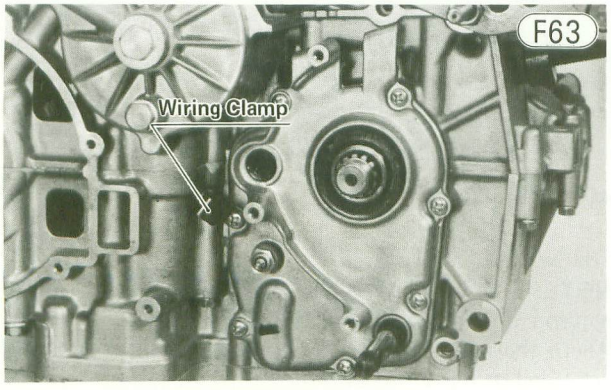
- Install the kick pedal in the position marked during disassembly, and then tighten the bolt.
- Check that the external shift mechanism return spring pin is not loose. If it is loose, remove it, apply non-permanent locking agent to the threads, re-install it, and tighten the locknut.

NOTE: The return spring pin must be screwed in until it protrudes approximately 20 mm from the crankcase, so that it can work satisfactorily as an external shift mechanism lever stop (Fig. H89 on Pg. 160).

- Check that the external shift mechanism cover knock pins (2) are in place.
- Replace the output shaft **O** ring with a new one if it is damaged, and install it next to the ball bearing inner race.



- Check that the return spring is properly fitted on the shaft (Fig. E99), mount the external shift mechanism, and place its arms on the shift drum pins.
- Apply a high temperature grease to the lips of the clutch push rod oil seal and the output shaft collar oil seal.
- Insert the shift shaft oil seal guide (special tool) in external shift mechanism cover oil seal (Fig. E100), and install the cover, and then tighten the screws (7). The left center screw has a wiring clamp.



- Install the output shaft collar.
- Insert the clutch push rod.
- Install the engine sprocket chain guard.
- Clean the starter motor lugs and crankcase where the starter motor is grounded.
- Apply a little oil to the **O** ring and install the starter motor. If the dynamo flywheel is not removed, place the starter motor back into place fitting the shaft through the sprocket. The protruding side of the sprocket must face in (Fig. E74).
- Apply a non-permanent locking agent to the starter motor retaining bolts (2), and tighten the bolts.
- Install the starter motor sprockets and chain. The protruding side of the starter motor sprocket faces in (Fig. E74).
- Check to see that the thrust washer is at the rear of the dynamo flywheel, using a high flash-point solvent clean off an any oil or dirt that may be on the crankshaft taper or flywheel hub, and install the dynamo rotor and starter motor clutch assembly.
- Tighten the dynamo flywheel bolt with 12~14 kg-m (87 ~ 101 ft-lbs) of torque while holding the dynamo flywheel steady with the flywheel holder (special tool).
- Check the see that the knock pins (2) are in place, and install the dynamo cover, gasket, and then tighten the screws (8).
- Install the engine (Pg. 75).

NOTE: Before installing the engine, tighten the remaining upper crankcase bolt if not already tightened. Tightening torque of the bolt is 0.9 ~ 1.1 kg-m (78 ~ 95 in-lbs).

- Fill the engine with oil, check the oil level (Pg. 21), and add more if necessary.
- Carry out the adjustment procedures listed at the end of the engine installation section (Pg. 76).

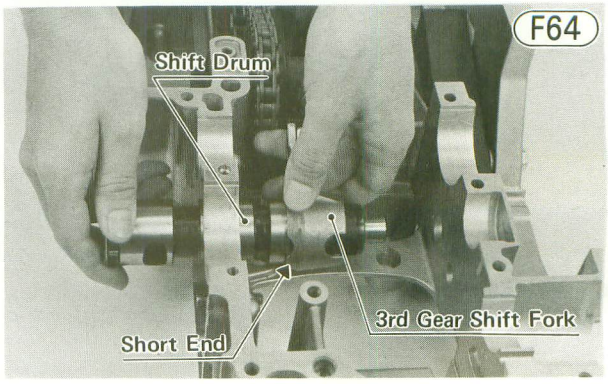
TRANSMISSION

Removal:

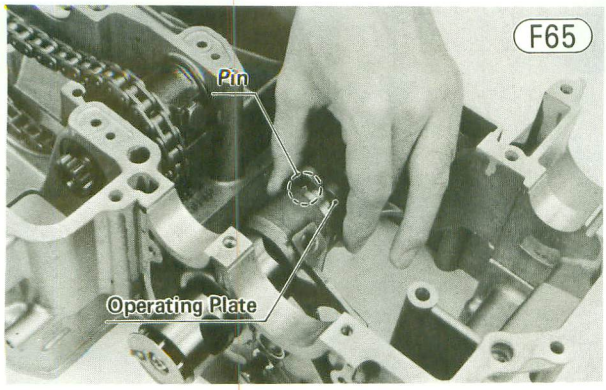
- Remove the engine (Pg. 72).
- Split the crankcase (Pg. 76).
- Remove the shift drum positioning bolt, spring, and pin.
- Straighten the side of the lockwasher that is bent over the side of the shift drum guide bolt, and remove the bolt.
- Remove the cotter pin, and pull out the drive shaft 3rd gear shift fork guide pin.
- Pull out the shift drum slightly, remove the operating plate circlip, the operating plate, and drive shaft 3rd gear shift fork. Pull the shift drum free from the crankcase.

Installation:

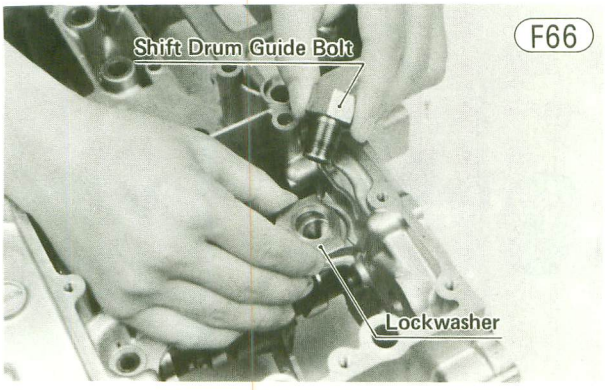
- Insert the shift drum into the crankcase part way, replace the 3rd gear shift fork with the short end facing the neutral switch, i.e., the short end goes onto the drum first.



●Check to see that the operating plate pin is in place, fit the operating plate onto the end of the shift drum, and install the circlip.



●Push the shift drum in the rest of the way, put the 3rd gear shift fork guide pin into the 3rd gear shift fork. The guide pin rides in the middle groove of the three guide pin grooves.
●Insert a new cotter pin through the 3rd gear shift fork and guide pin from the long end side of the shift fork, and spread the cotter pin long end inward.
●Tighten the shift drum guide bolt, and bend the side of the lockwasher over the side of the bolt. The lockwasher must seat in the crankcase.



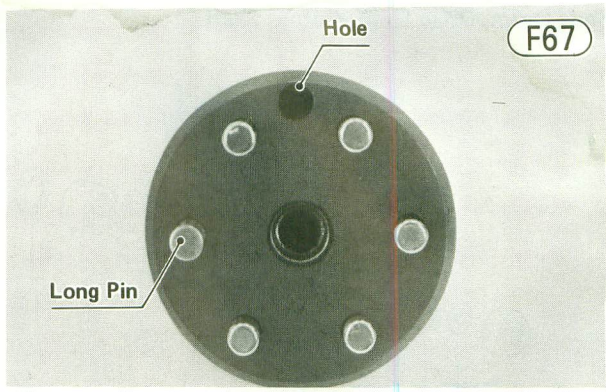
●Install the shift drum positioning pin, spring, and bolt. Tighten the bolt securely with 3.2 ~ 3.8 kg-m (23~27 ft-lbs) of torque.

Shift Drum Disassembly:

●Drop out the operating plate pin ㉗.
●Remove the shift drum pin plate ⑳. The screw ⑱ has a lock washer ⑲.
●Pull out the pins ㉑ (6).

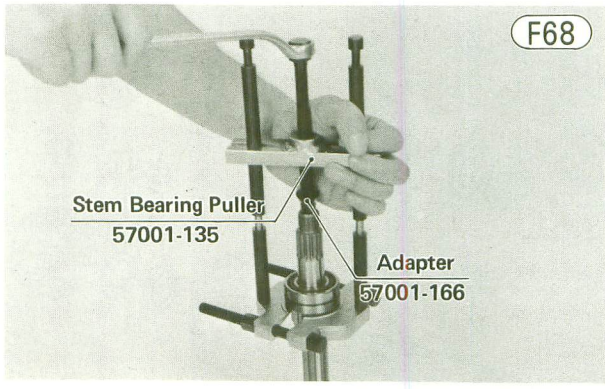
Shift Drum Assembly Notes:

1. Use a new lock washer, and be sure that the screw is firmly tightened.
2. The long shift drum pin must be in the position shown in Fig. F67. If the pin is assembled in the wrong position, the neutral indicator light will not light when the gears are in neutral.



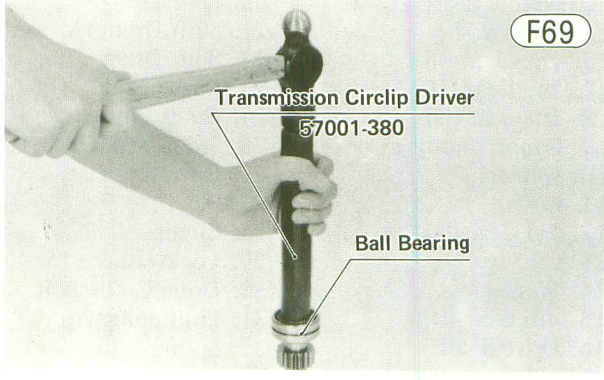
Drive Shaft Disassembly:

●Pull off the clutch housing and the needle bearing from the drive shaft assembly.
●Pull off the drive shaft sleeve and spacer.
●Remove the needle bearing outer race ①.
●Remove the circlip ③ and pull off the needle bearing ④, steel washer ⑤, and copper washer ⑥.
●Pull off 2nd gear ⑦, 5th gear ⑧, the copper bushing ⑨, and washer ⑩.
●Remove the circlip ⑪, and pull off 3rd gear ⑫.
●Remove the circlip ⑬, and pull off the washer ⑭ and 4th gear ⑮.
●Remove the ball bearing ⑰ using the stem bearing puller and adapter (special tools).



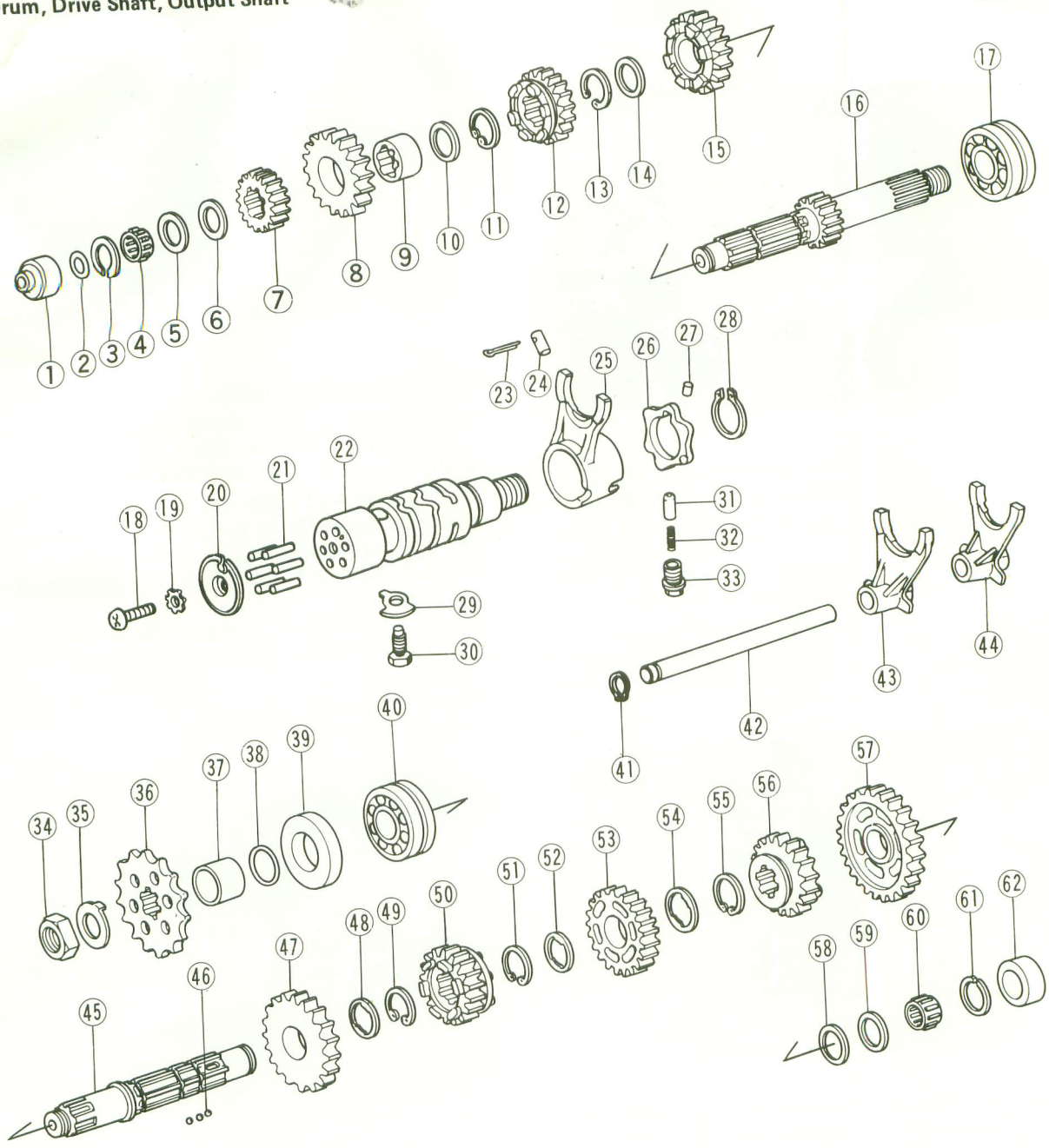
Drive Shaft Assembly Notes:

1. Install the drive shaft ball bearing using the transmission circlip driver (KZ400 special tool).



F70

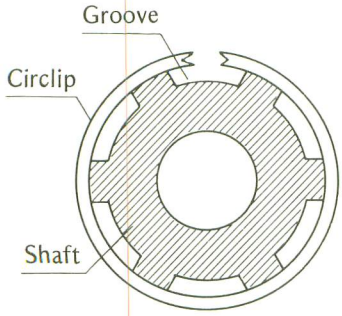
Shift Drum, Drive Shaft, Output Shaft



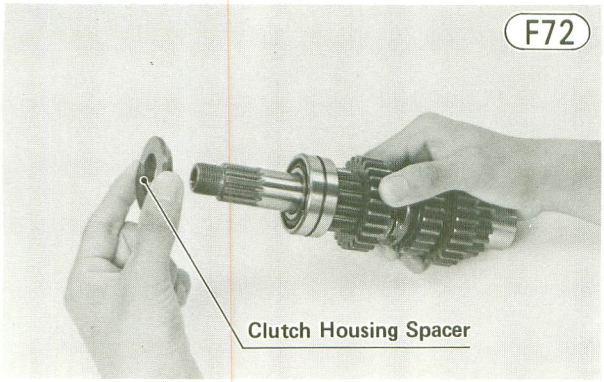
1. Bearing Outer Race
2. O Ring
3. Circlip
4. Needle Bearing
5. Steel Washer
6. Copper Washer
7. 2nd Gear (D)
8. 5th Gear (D)
9. Copper Bushing
10. Washer
11. Circlip
12. 3rd Gear (D)
13. Circlip
14. Washer
15. 4th Gear (D)
16. Drive Shaft
17. Ball Bearing
18. Screw
19. Lockwasher
20. Pin Plate
21. Shift Drum Pin
22. Shift Drum
23. Cotter Pin
24. Guide Pin
25. 3rd Gear Shift Fork
26. Operating Plate
27. Pin
28. Circlip
29. Lockwasher
30. Drum Guide Bolt
31. Positioning Pin
32. Spring
33. Positioning Bolt
34. Nut
35. Toothed Washer
36. Engine Sprocket
37. Collar
38. O Ring
39. Oil Seal
40. Ball Bearing
41. Clip
42. Shift Rod
43. 5th Gear Shift Fork
44. 4th Gear Shift Fork
45. Output Shaft
46. Steel Ball
47. 2nd Gear (O)
48. Sprined Washer
49. Circlip
50. 5th Gear
51. Circlip
52. Splined Washer
53. 3rd Gear
54. Splined Washer
55. Circlip
56. 4th Gear (O)
57. 1st Gear (O)
58. Copper Washer
59. Steel Washer
60. Needle Bearing
61. Circlip
62. Bearing Outer Race

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 onto Drive Shaft F71

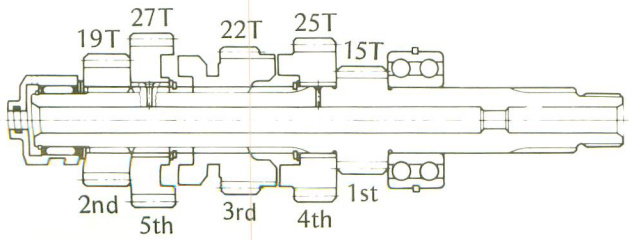


3. When assembling the 5th gear copper bushing to the drive shaft, align its oil holes with the holes in the shaft.
4. The clutch housing spacer must be installed with its flat side facing toward the end of the shaft.



5. Be sure that all parts are put back in the correct sequence and all circlips and flat washers are properly in place. Proper sequence 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. At the other end of the shaft, install the spacer, drive shaft sleeve, needle bearing, and clutch housing.
6. 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.

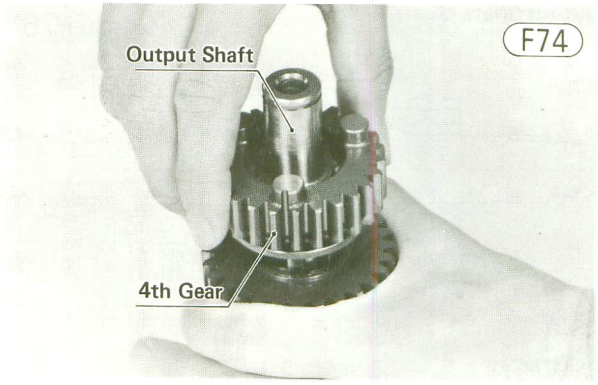
Drive Shaft Gears F73



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 (57).
- 4th gear (56) has three steel balls (46) 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.

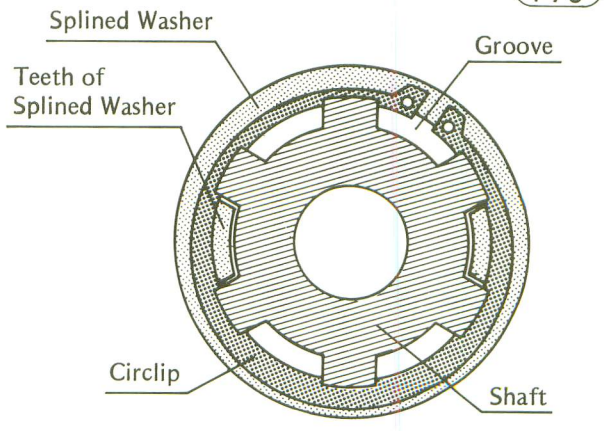


- Remove the circlip (55), and pull off the splined washer (54), 3rd gear (53), and another splined washer (52).
- Remove the circlip (51), and pull off 5th gear (50).
- Remove the circlip (49), and pull off the splined washer (48) and 2nd gear (47).
- Remove the output shaft ball bearing (40) using the stem bearing puller (special tool).

Assembly Notes:

1. Install the output shaft ball bearing using the steering stem bearing driver (special tool).
2. Replace any circlips that were removed with new ones. Install the circlip so that is opening coincides with one of the splined grooves in the output shaft (Fig. F75).
3. Install the splined washer so that its teeth do not coincide with the circlip opening.

Circlip, Splined Washer Installation F75

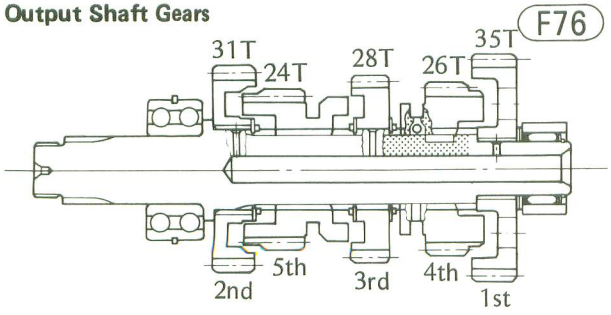


4. Do not use grease on the three balls during assembly; these balls must be able to move freely.

5. Be sure that all parts are put back in the correct sequence and all circlips and splined washers 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

F76

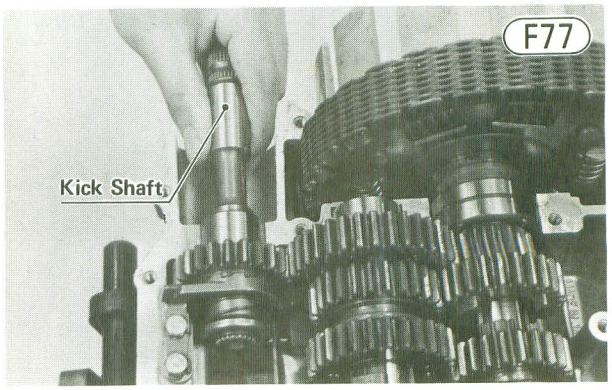


KICKSTARTER

Removal:

- Remove the engine (Pg. 72).
- Split the crankcase (Pg. 76).
- Remove the kick shaft from the upper crankcase half.

F77

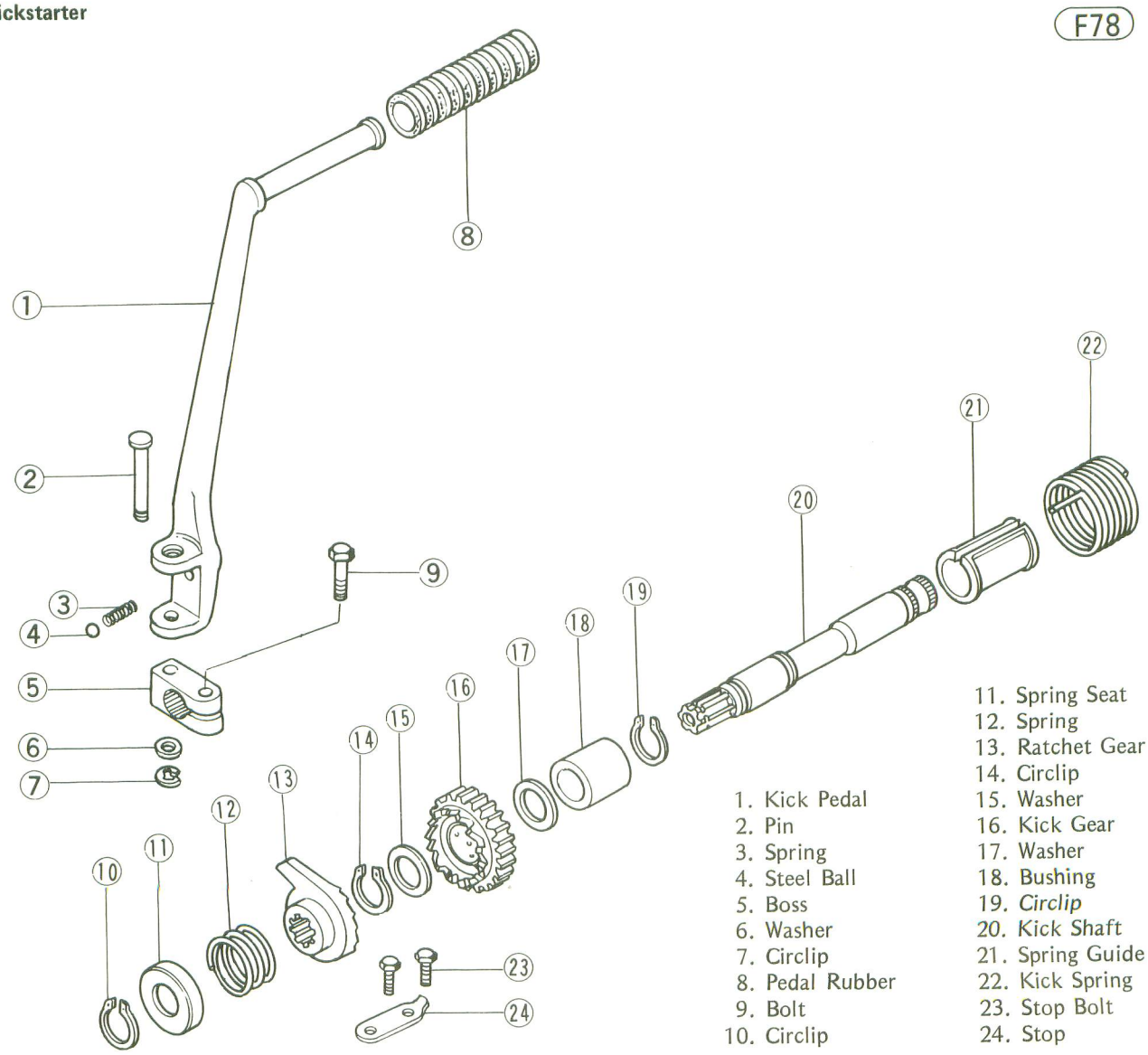


Installation Note:

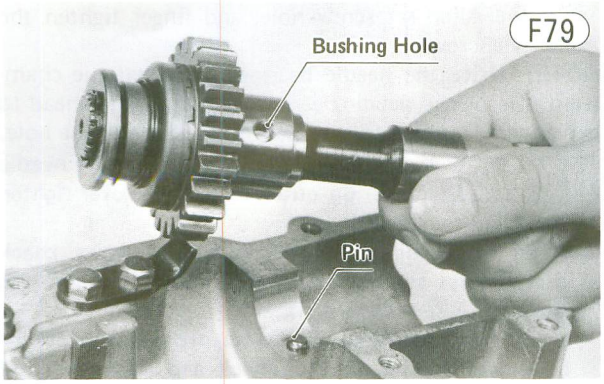
- Fit the kick shaft bushing hole with the pin on the upper crankcase.

Kickstarter

F78



1. Kick Pedal
2. Pin
3. Spring
4. Steel Ball
5. Boss
6. Washer
7. Circlip
8. Pedal Rubber
9. Bolt
10. Circlip
11. Spring Seat
12. Spring
13. Ratchet Gear
14. Circlip
15. Washer
16. Kick Gear
17. Washer
18. Bushing
19. *Circlip*
20. Kick Shaft
21. Spring Guide
22. Kick Spring
23. Stop Bolt
24. Stop

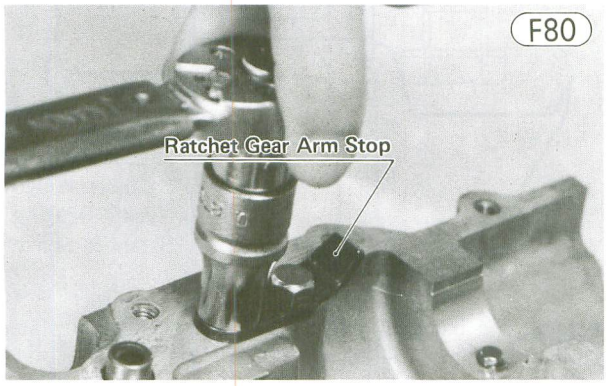


Kickstarter Disassembly:

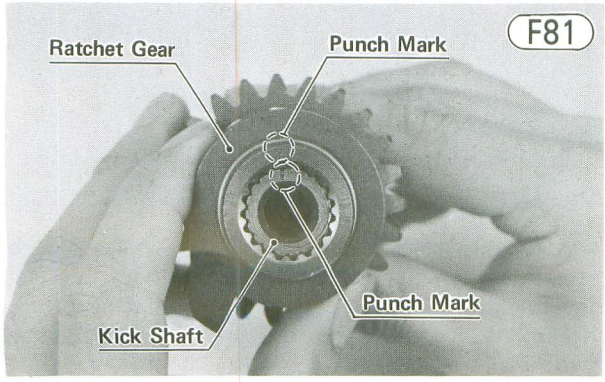
- Remove the ratchet gear arm stop bolts ㉓ (2) and stop ㉔.
- Remove the circlip ⑩ on the kick shaft end, and take off the spring seat ⑪, spring ⑫, and ratchet gear ⑬.
- Remove the circlip ⑭, and pull off the washer ⑮, kick gear ⑯, washer ⑰, and kick shaft bushing ⑱. Remove the circlip ⑲.

Kickstarter Assembly Notes:

1. Install the ratchet gear arm stop in the direction shown in Fig. F80. Apply a non-permanent locking agent to the stop bolts (2), and tighten the bolts with 0.9 ~ 1.1 kg-m (78 ~ 95 in-lbs) of torque.



2. Apply a little engine oil to the inside of the bushing, kick gear, and ratchet gear before installation.
3. When installing the ratchet gear, align the ratchet gear punch mark with the punch mark on the kick shaft.

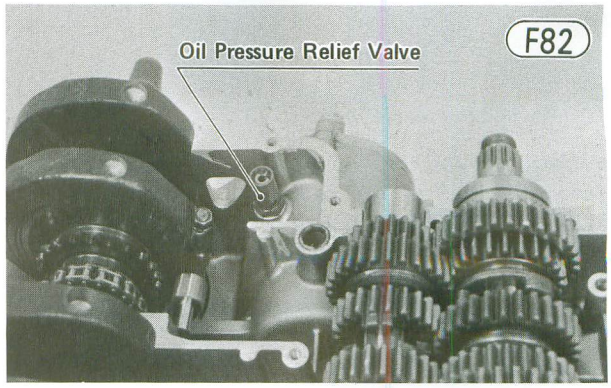


OIL PRESSURE RELIEF VALVE

Removal:

- Remove the engine (Pg. 72).
- Split the crankcase (Pg. 76).
- Unscrew the valve from the upper crankcase half.

NOTE: Do not disassemble the relief valve for inspection. Replacement parts are not available.



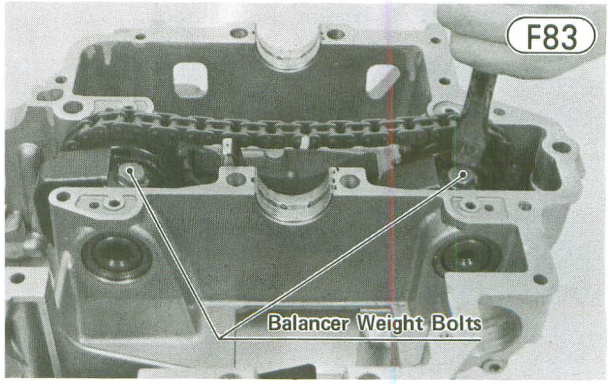
Installation Note:

- Use a non-permanent locking agent on the valve threads.

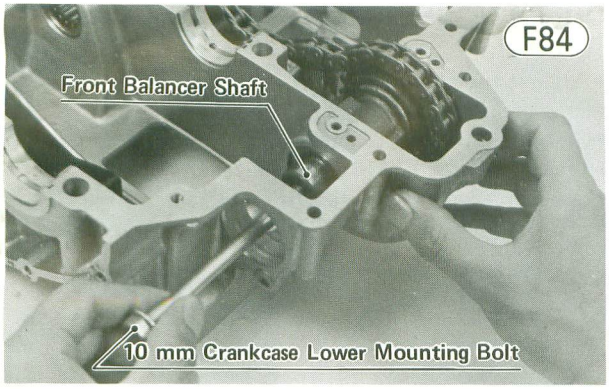
BALANCER MECHANISM

Removal:

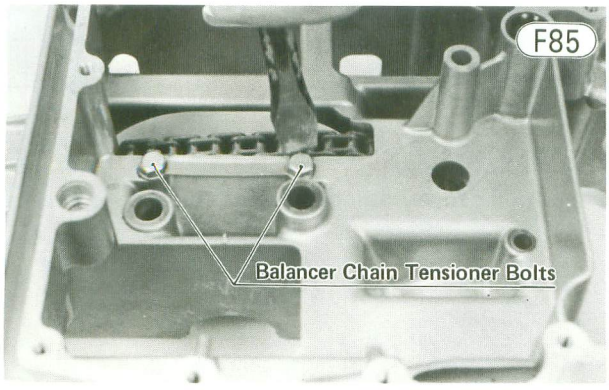
- Remove the engine (Pg. 72).
- Split the crankcase (Pg. 76).
- Straighten out the lockwasher ends which are bent over the side of the balancer weight bolts (2), and remove the bolts and lockwashers (2).



- Push out the rear balancer shaft toward the engine right side, and remove the rear balancer weight with the washers (3).
- Pull out the front balancer shaft using the 10 mm crankcase lower mounting bolt, and remove the front balancer weight with the washers (3) as shown in Fig. F84.

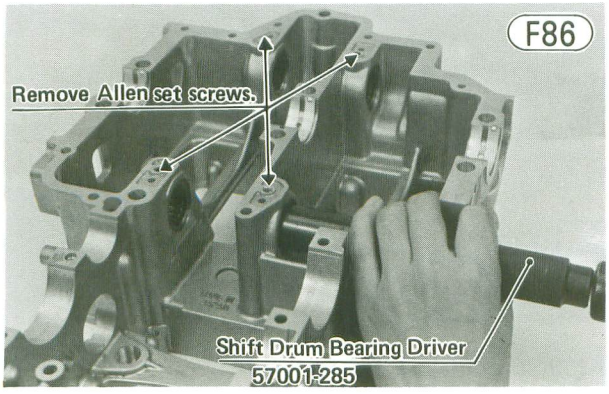


•Straighten out the lockwasher ends which are bent over the side of the balancer chain tensioner bolts (2), and remove the bolts, lockwasher, balancer chain tensioner assembly, and balancer chain.



•To remove the balancer shaft needle bearings (4), first screw out the Allen set screws (4), and then drive out the needle bearings using the shift drum bearing driver (special tool). For the front left needle bearing, pull it out using a suitable tool.

NOTE: In the absense of the above mentioned special tool and a suitable tool, satisfactory results may be obtained by heating the case (in the area immediately surrounding the needle bearing) to 120~150°C (248~302°F), pull out the bearing using a hook.



Installation:

•If the balancer shaft needle bearings were removed, install a new needle bearing using the shift drum bearing driver (special tool) to drive it in. Be sure that the groove on the bearing outer race matches with the Allen set screw hole, and finger tighten the Allen set screw.

NOTE: Drive the needle bearing in, so that the chamfered side of the needle bearing outer race goes ahead to prevent the outer race from eating in the crankcase hole.

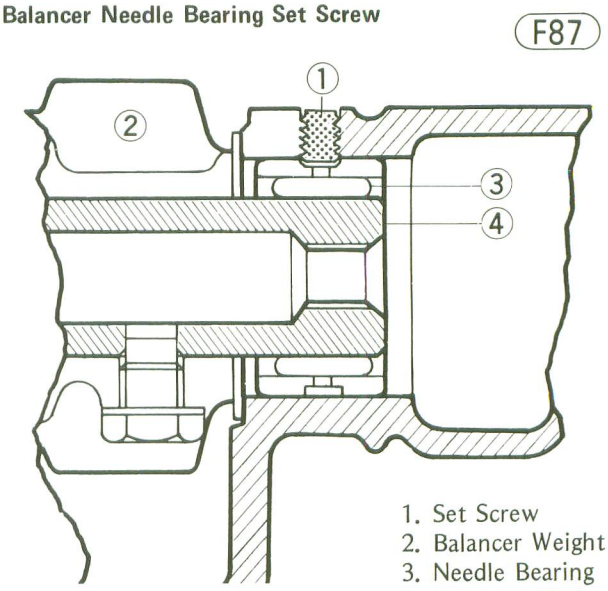
CAUTION

1. To prevent the distortion of the needle bearing outer race, never over tighten the Allen set screws.

2. After finger tightening the Allen set screws, check that the set screws sink approximately 0.2 mm into the crankcase mating surface.

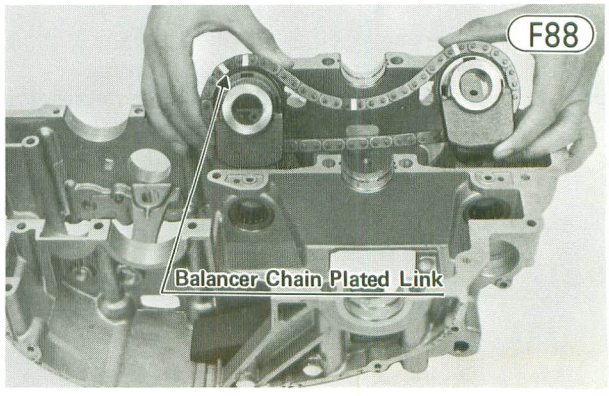
In case an Allen set screw protrudes from the crankcase mating surface, check and align the outer race groove with the Allen set screw hole, otherwise the protruding set screw will prevent the crankcase halves from contacting perfectly.

Balancer Needle Bearing Set Screw



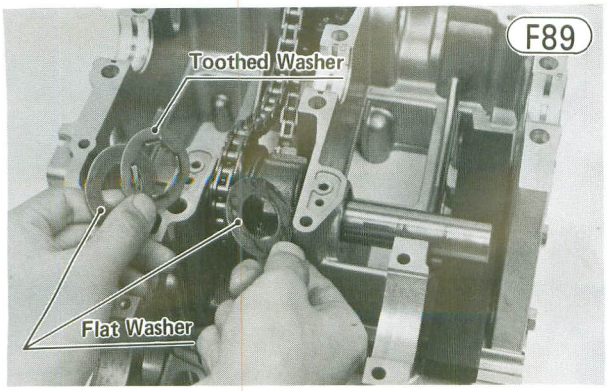
1. Set Screw
2. Balancer Weight
3. Needle Bearing
4. Balancer Shaft

•Install the balancer chain. The balancer chain plated links must face the engine clutch side.

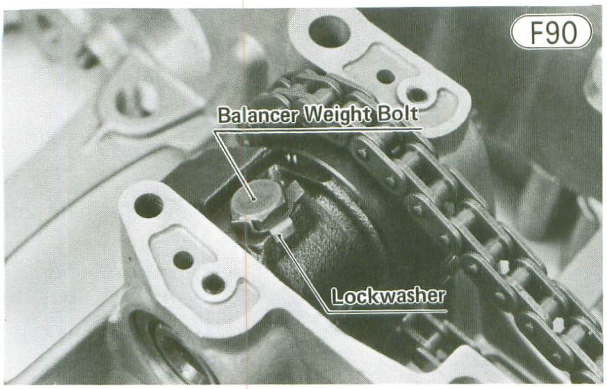


•At each balancer weight, install the washers (3) on the balancer weight sides. The washer with four teeth goes next to the sprocket, with its teeth facing in.

NOTE: Both front and rear balancer weights and sprockets are identical.

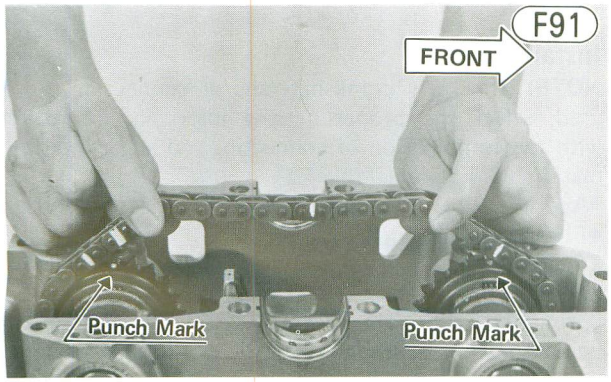


- Apply oil to each shaft, and insert them keeping the chain on the sprockets. Match the shaft hole with the hole in the balancer weight. The rear balancer weight shaft has the engine oil pump driver gear on its left end. Be sure that all washers are in place and that the sprockets are on the left side of the weights.
- At each balancer weight, using a new lockwasher, tighten the balancer weight bolt securely.
- Bend one side of the lockwasher over the side of the bolt, and the other side of the lockwasher over the side of the balancer weight.

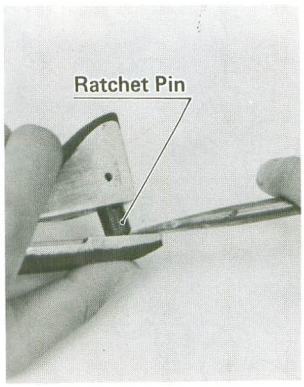


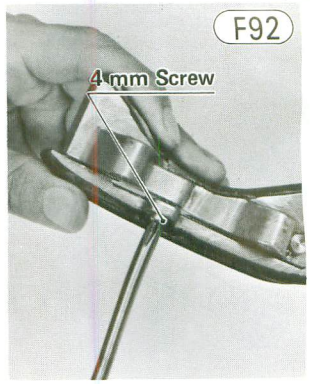
- Fit the chain on the sprockets properly. For the front sprocket, the chrome plated link must fit on the sprocket tooth with the punch mark. For the rear sprocket, the link between two chrome plated links must fit on the sprocket tooth with the punch mark.

NOTE: There are four plated links, and, with the chain in the position mentioned above, the 2nd plated link counted from the front will be located on the crankshaft side.



- Push the ratchet pin all the way into the tensioner body by working the pin back and forth. Turn in a 4 mm screw into the chain tensioner body to hold the chain guide in position. Use a screw which has a 0.7 mm thread pitch and about 15 mm length.





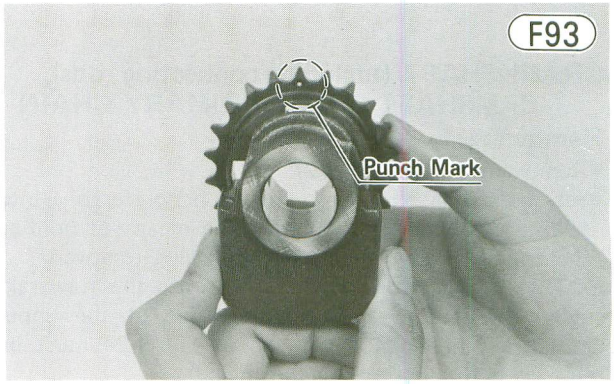
- Install the balancer chain tensioner assembly. Use a new lockwasher, apply a non-permanent locking agent to the threads of the mounting bolts. The tightening torque of the mounting bolts is 0.9 ~ 1.1 kg-m (78 ~ 95 in-lbs).
- Assemble the crankcase (Pg. 80).
- Install the engine (Pg. 75).

Balancer Weight Disassembly (each balancer unit):

- Remove the circlip ⑤, and take off the washer ⑥.
- Tapping lightly with a mallet, separate the sprocket ⑦ and balancer weight ⑩. The springs ⑨ and pins ⑧ (4 ea) may be removed.

Balancer Weight Assembly (each balancer unit):

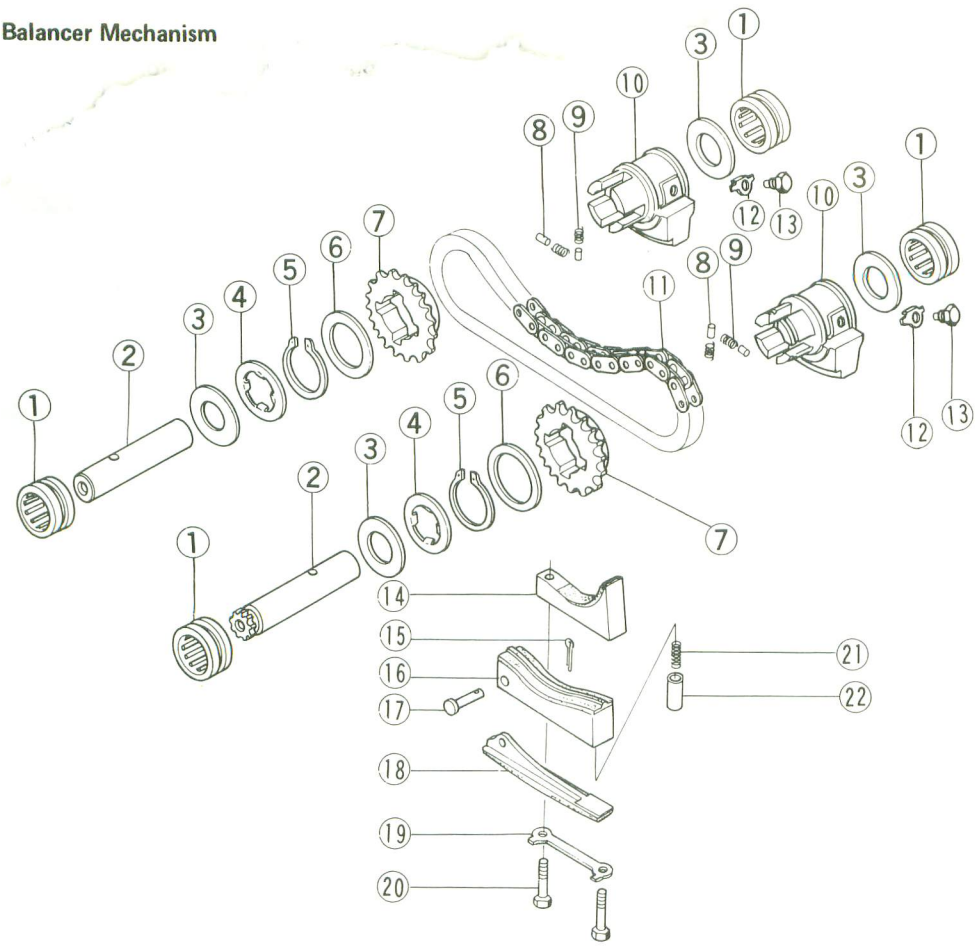
- With the springs and pins (4 ea) all in place in the inner circumference of the balancer weight, install the sprocket. The punch mark on the sprocket must face in (balancer weight side), with the sprocket positioned as depicted in Fig. F93. Only one of the four positions is correct, and that is with the punch mark opposite the weight.



- Put on the washer and circlip. Use a new circlip if it is deformed or otherwise damaged during removal.
- Move each spring to the furthest point outward in its space so that the springs will not hinder insertion of the balancer shaft through the weight.

Balancer Mechanism

F94



1. Needle Bearing
2. Balancer Shaft
3. Washer
4. Splined Washer
5. Circlip
6. Washer
7. Sprocket
8. Pin
9. Spring
10. Balancer Weight
11. Balancer Chain
12. Lockwasher
13. Bolt
14. Chain Guide
15. Cotter Pin
16. Tensioner Body
17. Pin
18. Chain Guide
19. Lockwasher
20. Bolt
21. Spring
22. Tensioner Pin

Balancer Chain Tensioner Disassembly:

- Remove the cotter pin ⑮, pull out the pin ⑰, and remove the chain guide ⑱.
- Pull out the tensioner pin ㉒, spring ㉑.

Balancer Chain Tensioner Assembly Note:

- Insert a new cotter pin through the pin after assembling the chain tensioner assembly, and spread out its ends.

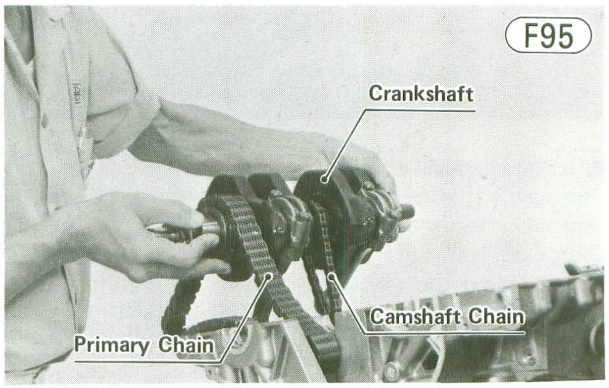
CRANKSHAFT (Including connecting rods), CAMSHAFT CHAIN, PRIMARY CHAIN

Removal:

- Remove the engine (Pg. 72).
- 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.

NOTE: If the engine is to be set onto the Kawasaki engine disassembly apparatus, the one of the upper crankcase half bolts (3) shown in Fig. F24 must be removed before positioning the engine.

- Remove the camshafts as explained camshaft removal (Pg. 45).
- Remove the cylinder block (Pg. 50).
- Remove the pistons (Pg. 52).
- Split the crankcase (Pg. 76).
- Lift off the crankshaft with the camshaft chain and primary chain.

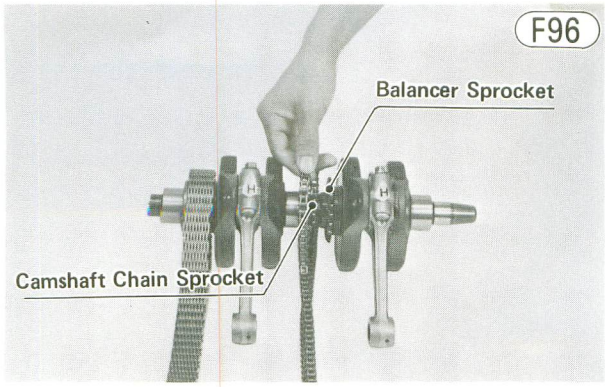


- Remove the camshaft chain from the crankshaft.
- Remove the primary chain.

Installation:

NOTE: If a new crankshaft and/or connecting rod is used, select the proper bearing insert in accordance with the combination of connecting rod and crankshaft marks (Fig. F99 and Table F2).

- Apply engine oil to the crankshaft bearing inserts.
- Fit the camshaft chain and primary chain back onto their sprockets and set the crankshaft back in its place on the upper crankcase half while engaging it with the primary chain. The camshaft chain sprocket on the crankshaft is smaller than the balancer sprocket.



- Assemble the crankcase (Pg. 80).
- Install the pistons (Pg. 52).
- Install the cylinder block (Pg. 51).
- Install the camshafts (Pg. 46).

NOTE: The cylinder head cover must be installed after engine installation on the motorcycle.

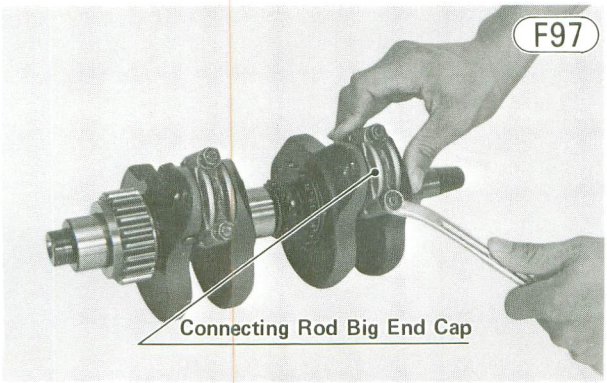
- Install the engine (Pg. 75).
- Fill the engine with oil, check the oil level (Pg. 21), and add more if necessary.
- Carry out the adjustment procedures listed at the end of the engine installation section (Pg. 76).

CONNECTING ROD

Removal (each side):

- Remove the crankshaft (Pg. 92).
- Remove the nuts (2) and pull off the connecting rod big end cap.

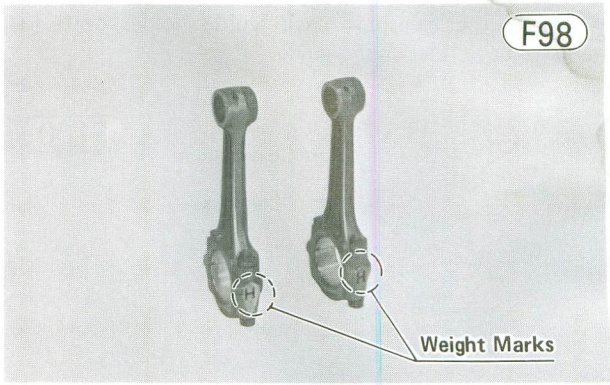
CAUTION **Do not allow the big end cap bolts to bump against the crankshaft journals to prevent damage.**



- Remove the rod bearing insert halves from the connecting rod big end and the big end cap.

Installation Notes:

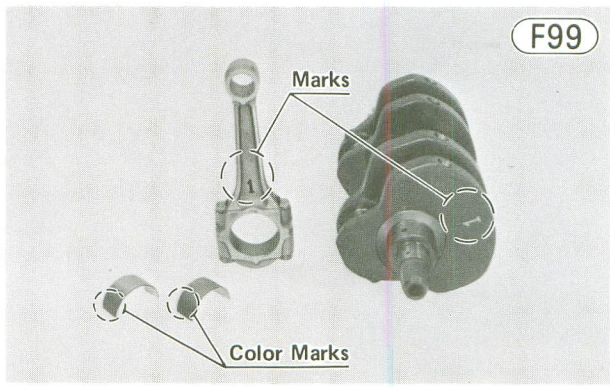
1. Apply engine oil to the rod bearing inserts.
2. When installing new connecting rods, use connecting rods having the same weight mark. This weight mark, indicated using a capital letter, is stamped on the connecting rod big end.



3. 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 (Fig. F98). The big end cap must be replaced together with the connecting rod as a set.
4. If a new crankshaft and/or connecting rod is used, select the right rod bearing insert in accordance with the combination of the connecting rod and the crankshaft marks (Fig. F99). If the connecting rod only is replaced with a new one, first measure the diameter of the crank pin, mark its flywheel in accordance with the diameter (Pg. 151), and then select the right bearing insert in accordance with Table F2.

Table F2 Bearing Insert Selection

Crankshaft marking \ Con-Rod marking	1	Unmarked
1	Black PN 13034-043	Brown PN 13034-046
Unmarked	Blue PN 13034-045	Black PN 13034-043



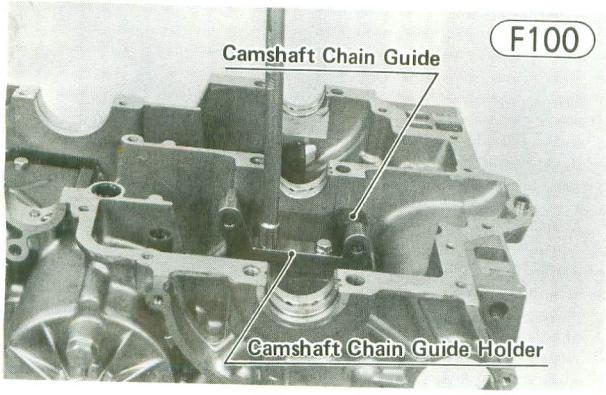
5. Apply a little molybdenum disulfide grease for engine assembly to the big end bolt threads. Hand tighten both nuts first, and then tighten each nut with 3.6 ~ 4.0 kg-m (26 ~ 29 ft-lbs) of torque.

CAUTION **Replace the big end bolts and nuts with new ones, whenever they are removed or just loosened. Use only Kawasaki big end bolts and nuts, as these are very important parts.**

CAMSHAFT CHAIN GUIDE (Front)

Removal:

- Remove the crankshaft (Pg. 92).
- Remove the camshaft chain guide holder bolts (2), and remove the chain guide.



Assembly Note:

- Apply a non-permanent locking agent to the holder bolt threads, and tighten the holder bolts with 1.1 ~ 1.3 kg-m (95 ~ 113 in-lbs) of torque.

Disassembly–Chassis

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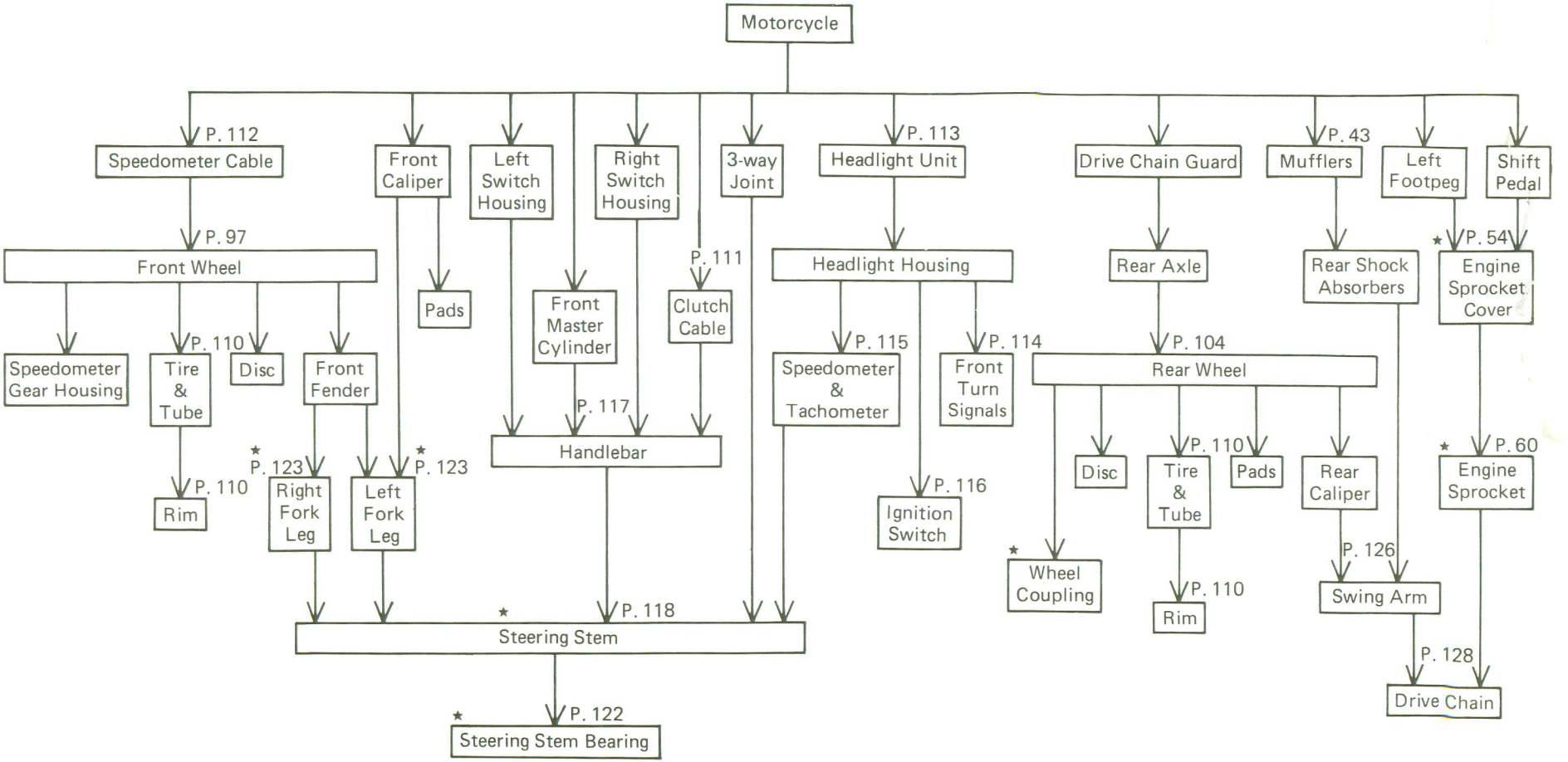
FLOW CHART
Disassembly – Chassis

The following chart is intended to be aids to proper removal. Select the component you wish to remove and follow the arrows to that point on the chart.

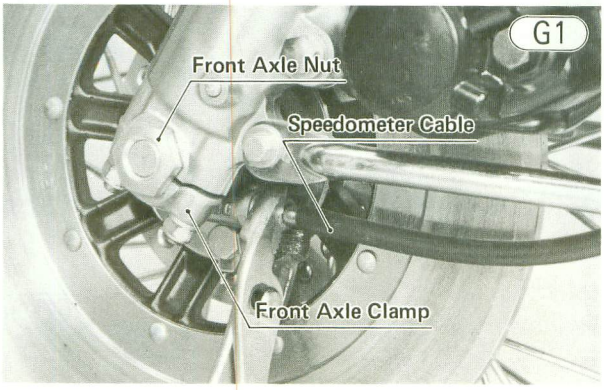


NOTE: Action with a mark (★) requires special tool(s) for removal, installation, disassembly, or assembly.

FRONT WHEEL

Removal:

●Disconnect the lower end of the speedometer cable with pliers.

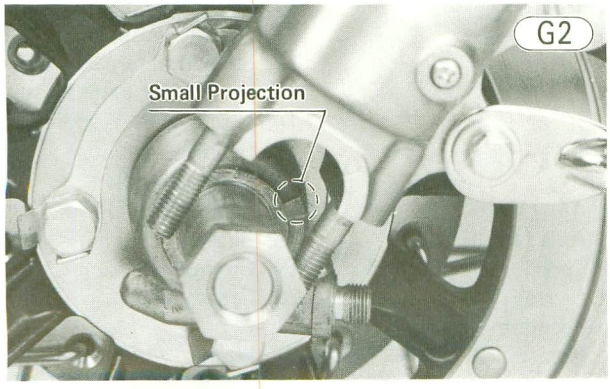


●Loosen the front axle clamp nuts (4) but do not remove them. Then loosen the front axle nuts (2).
●Remove the front axle clamp nuts, lockwashers, and clamps.
●Use a jack under the engine or other suitable means to lift the front of the motorcycle. Drop the front wheel out of the forks, and remove it.
●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 lever be squeezed accidentally.

CAUTION **Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc.**

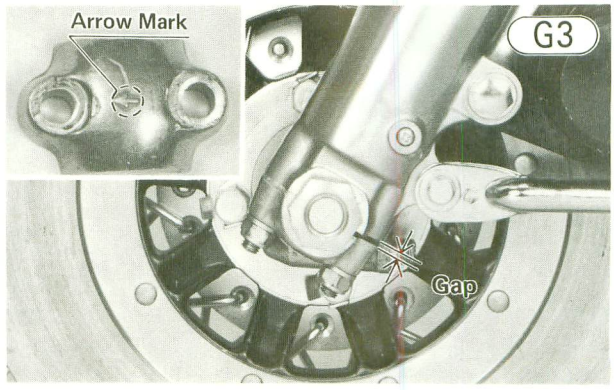
Installation:

●Remove the wedge from between the disc brake pads.
●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.
●Turn the speedometer gear housing so that it points to the rear. Be sure that the small projection on the gear housing does not catch on the lower part of the left tube.

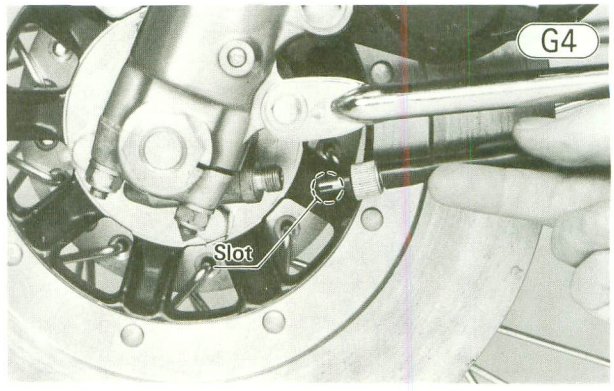


●Mount the left and right front axle clamps, and tighten the axle clamp nuts loosely. The arrow at the bottom of the axle clamp must point to the front as shown in Fig. G3.
●Tighten the axle nuts with 7 ~ 9 kg-m (51 ~ 65 ft-lbs) torque, and position the speedometer housing by turning it counterclockwise until it stops.
●Tighten first the front axle clamp nut and then the rear nut with 1.6 ~ 2.2 kg-m (11.5 ~ 16 ft-lbs) of torque. There will be a gap at the rear of the clamp after tightening.

WARNING **If the clamps are installed incorrectly or improperly tightened, the clamps or the studs could fail, resulting in loss of control.**



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



Speedometer Gear Housing Disassembly:

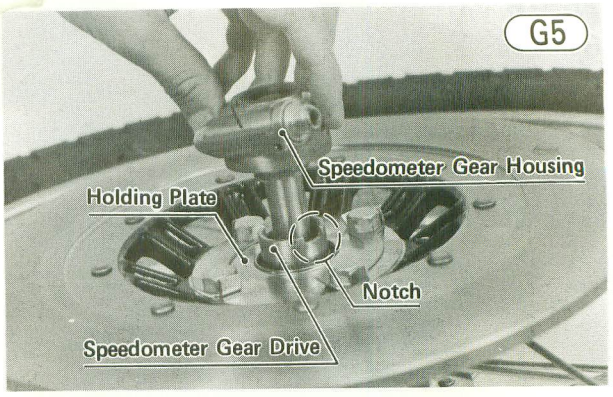
●Remove the left axle nut ①, and pull the speedometer gear housing ② off the hub ⑰.
●Pull out the grease seal ④ using a hook.
●Pull out the speedometer gear ③.
●If the speedometer cable bushing ⑩ or speedometer pinion ⑧ needs to be removed, first drill the housing through the pin ⑥ using a 1 mm drill 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 and pinion.

WARNING **An improperly installed pin could fall out, and this could lead to front wheel lockup from the speedometer gears jamming.**

Speedometer Gear Housing Assembly Notes:

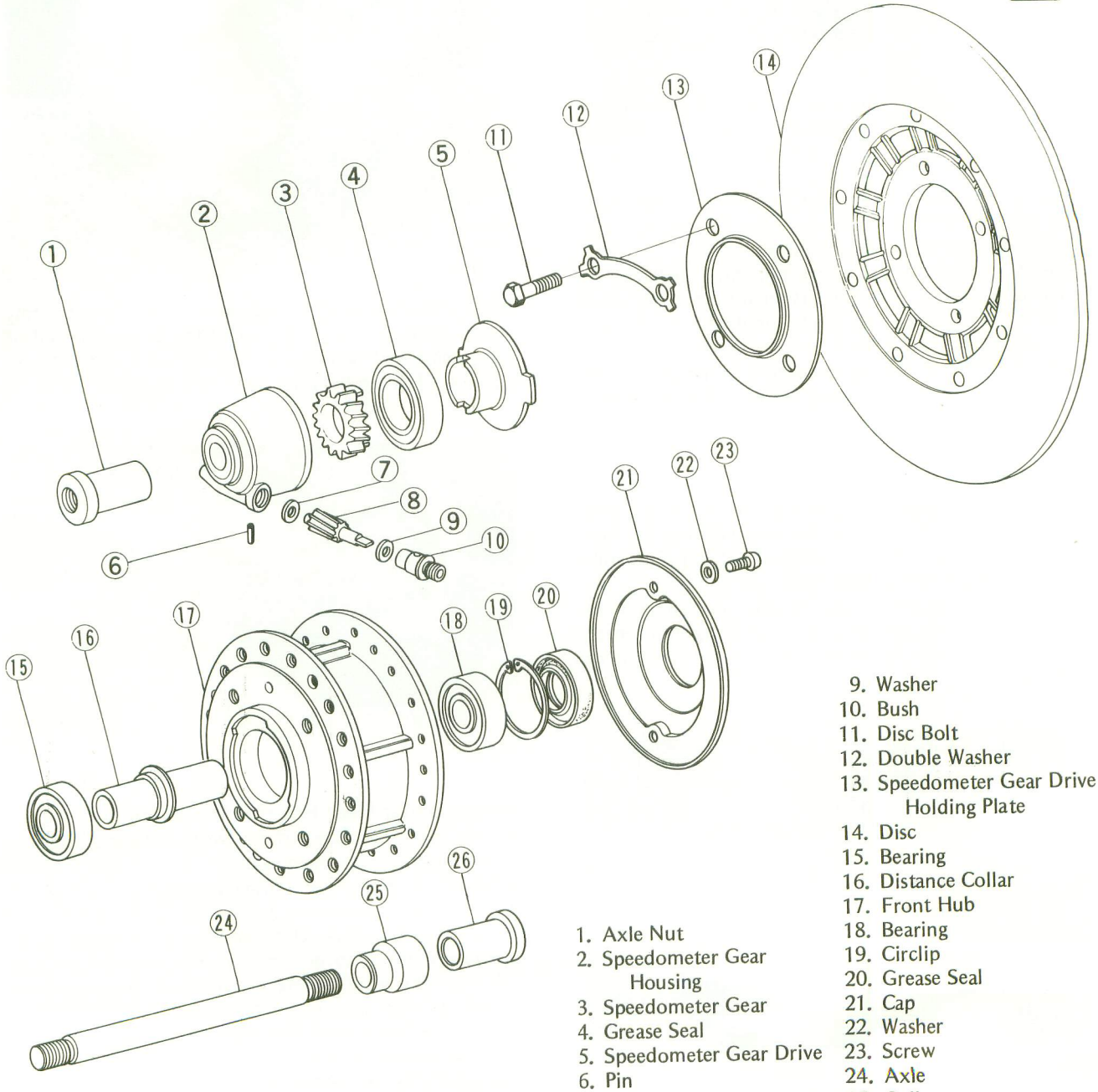
1. Replace the grease seal with a new one. Apply a little grease to the seal. Install it using a press or a suitable driver so that the face of the seal is level with the surface of the housing.
2. After inserting a new pin, punch the housing hole to secure the pin in place.
3. Regrease the speedometer gear.
4. Install the speedometer gear housing so that it fits in the speedometer gear drive notches (Fig. G5). When properly fitted, the clearance between the speedometer gear housing and the gear drive holding plate is a little less than 3 mm.

G5



Front Hub

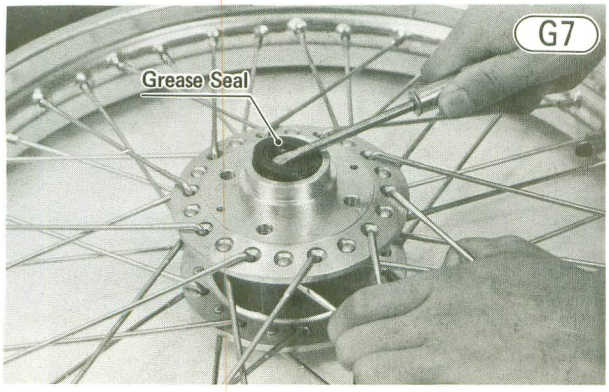
G6



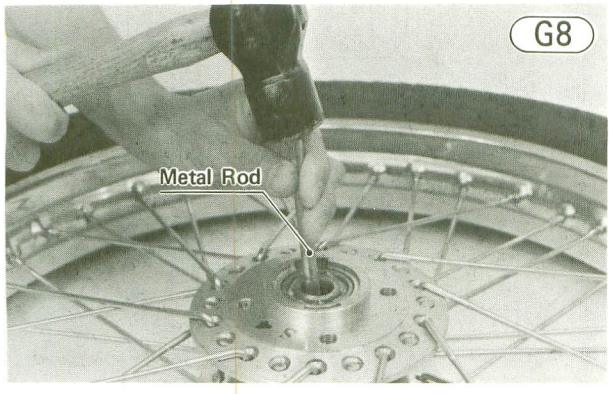
1. Axle Nut
2. Speedometer Gear Housing
3. Speedometer Gear
4. Grease Seal
5. Speedometer Gear Drive
6. Pin
7. Washer
8. Speedometer Pinion
9. Washer
10. Bush
11. Disc Bolt
12. Double Washer
13. Speedometer Gear Drive Holding Plate
14. Disc
15. Bearing
16. Distance Collar
17. Front Hub
18. Bearing
19. Circlip
20. Grease Seal
21. Cap
22. Washer
23. Screw
24. Axle
25. Collar
26. Axle Nut

Front Hub Disassembly (including disc removal):

- Remove the disc side axle nut ①, and pull off the speedometer gear housing ②.
- Straighten the part of the disc double washers ⑫ that are bent over the disc bolts ⑪ (4). Remove the bolts, double washers (2), speedometer gear drive holding plate ⑬, speedometer gear drive ⑤, and disc ⑭.
- Pull out the axle ㉔ along with the right axle nut ㉖, and remove the collar ㉕.
- Remove the screws ㉓ (2) and washers ㉒ (2), and take the cap ㉑ off the right side of the hub.
- Using a hook, pull out the grease seal ⑳ and remove the circlip ⑲



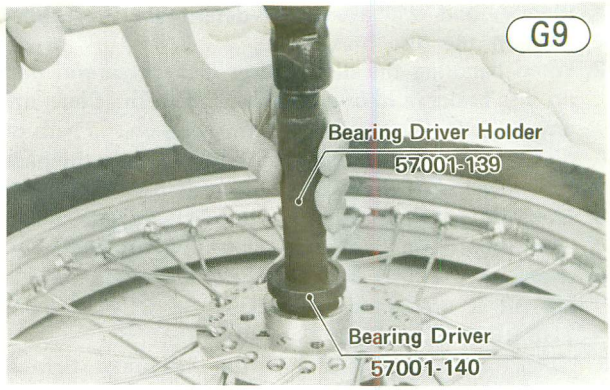
- Insert a metal rod into the hub from the speedometer gear side, and remove the ball bearing ⑳ on the right side by tapping evenly around the bearing inner race. The distance collar ⑯ will come out with the ball bearing.



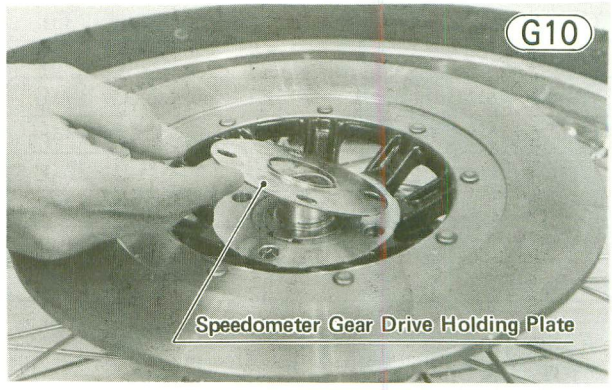
- Insert the metal rod into the hub from the right side, and remove the other bearing ⑮ by tapping evenly around the bearing inner race.

Front Hub Assembly Notes:

1. Inspect the bearings and replace if necessary (Pg. 174). Install them using the wheel bearing driver and the bearing driver holder (special tools). Press the bearing until it stops at the bottom of the hole.



2. Replace the grease seal with a new one using a wheel bearing driver and bearing driver holder (special tools: P/N 57001-296 and 57001-139). Press the seal so that the face of the seal is level with the surface of the front hub.
3. When installing the speedometer gear drive, fit it in the hub notches. The speedometer gear drive holding plate must be installed with the plain side facing in.



4. After tightening the disc mounting bolts (4) with 3.4 ~ 4.6 kg-m (25 ~ 33 ft-lbs) of torque, bend the washer tabs back over the bolts.
5. Install the speedometer gear housing so that it fits in the speedometer gear drive notches (Fig. G5).
6. Completely clean off any grease that has gotten on either side of the disc with a high flash-point solvent. Do not use one which will leave an oily residue.

FRONT DISC BRAKE

The front disc brake section is divided as follows:

- Pad removal and Installation
- Caliper Removal and Installation Notes
- Caliper Disassembly and Assembly
- Master Cylinder Removal and Installation
- Master Cylinder Disassembly and Assembly Notes
- Brake Hose Replacement

NOTE: Disc removal and installation are covered in front hub disassembly and assembly section (Pg. 99).

Before working on the disc brake, note the following precautions:

CAUTION

1. Except for the disc pads and disc; use only disc brake fluid, isopropyl alcohol, or ethyl alcohol for cleaning brake parts. Do not use any other fluid for cleaning these parts. Gasoline, motor oil, or any other petroleum distillate will cause deterioration of the rubber parts. Oil spilled on any part will be difficult to wash off com-

pletely, 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. 180).
5. When installing or assembling the disc brake, tighten the disc brake fittings to the values given in Table G1. Improper torque may cause the brake to malfunction.

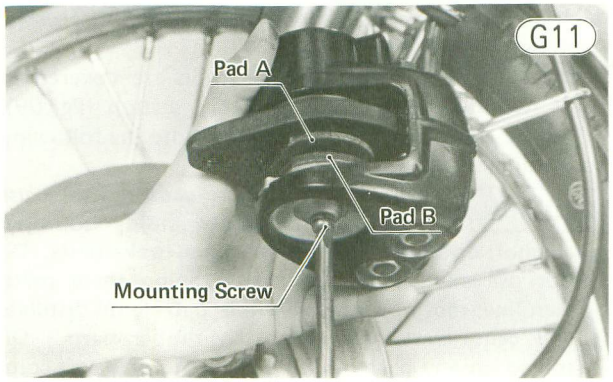
Table G1 Disc Brake Torque

	kg-m	ft-lbs
Bleed valve	0.7~1.0	61~87 in-lbs
Brake lever pivot bolt	0.5~0.7	43~61 in-lbs
Caliper Allen bolt	2.8~3.2	20.0~23.0
Caliper holder shaft nut	2.4~2.8	17.5~20.0
Caliper mounting bolts	3.4~4.6	25.0~33.0
Disc mounting bolts	3.4~4.6	25.0~33.0
Fitting (banjo) bolts	2.9~3.1	21.0~22.0
Front brake light switch	2.6~3.0	19.0~22.0
Master cylinder clamp bolts	0.6~0.9	52~78 in-lbs
3-way joint	0.7~0.9	61~78 in-lbs

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.

Pad Removal:

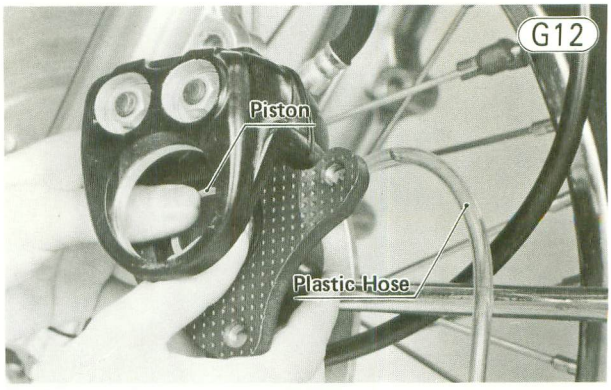
- Remove the caliper mounting bolts, lockwashers, and flat washers (2 ea).
- Take out the mounting screw for pad B, and remove the pad. A lockwasher and metal plate also come off.



- After pad B is removed, slide the caliper holder to the piston side and remove pad A.

Pad Installation:

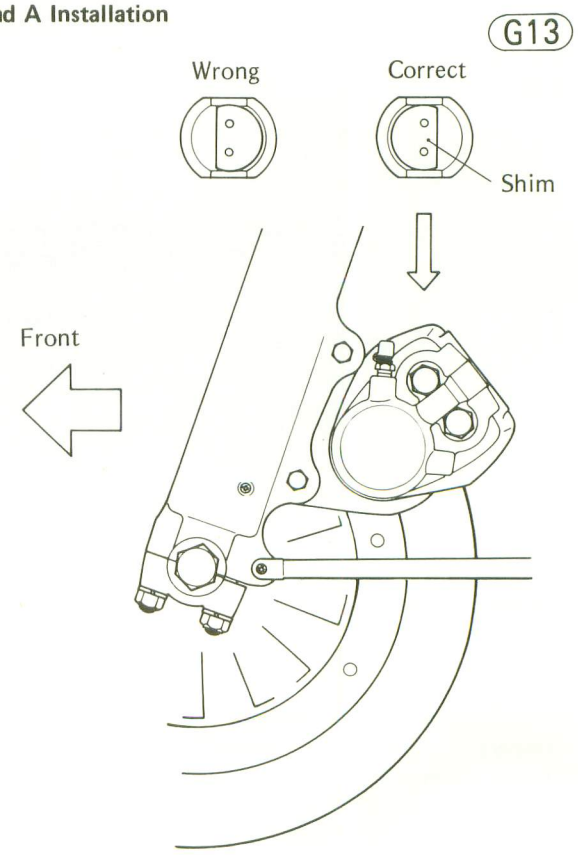
- Remove the bleed valve cap on the caliper, attach a clear plastic hose to the bleed valve, and run the other end of the hose into a container.
- Open (loosen) the valve slightly, push the piston in by hand as far as it will go, and then close (tighten) the valve. Wipe up any spilled fluid, and recap the bleed valve.



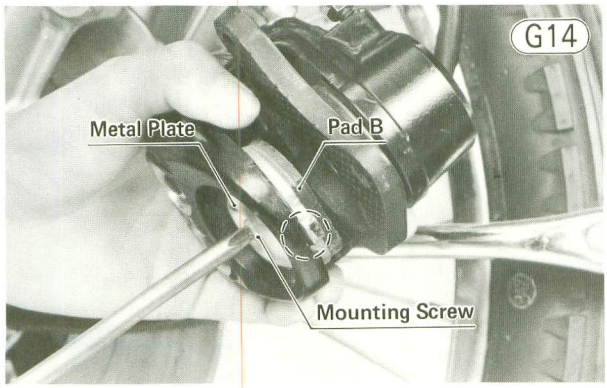
- Install pad A in the caliper holder.

NOTE: Fit pad A into the caliper holder so that the shim on pad A is toward the front of the motorcycle.

Pad A Installation



●Fit pad B, aligning the tongue on the pad with the groove in the caliper. Install the metal plate, lockwasher and mounting screw; using a non-permanent locking agent on the screw.

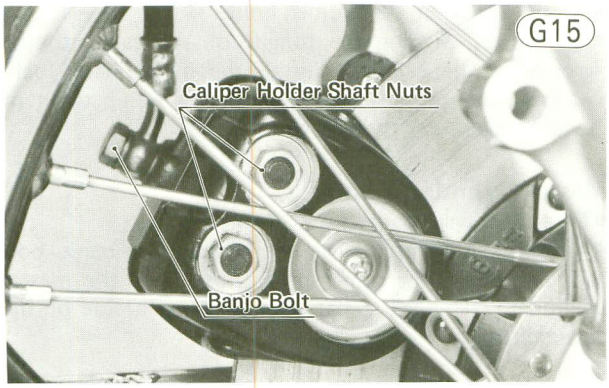


●Install the caliper, tightening the caliper mounting bolts with 3.4 ~ 4.6 kg-m (25 ~ 33 ft-lbs) of torque. Each mounting bolt has a flat washer and lockwasher.
●Since brake fluid was spilled when the bleed valve was opened, check the fluid level in the master cylinder and bleed the air from the brake system (Pg. 180).
●Check the front brake.

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

Caliper Removal:

●If the caliper is to be disassembled, loosen the caliper holder shaft nuts (2).



●Remove the banjo bolt at the caliper, and temporarily secure the end of the brake hose to some high place to prevent fluid loss minimum. There is a flat washer on each side of the hose fitting.
●Remove the mounting bolts (2), each with a flat washer and lockwasher, and take off the caliper.

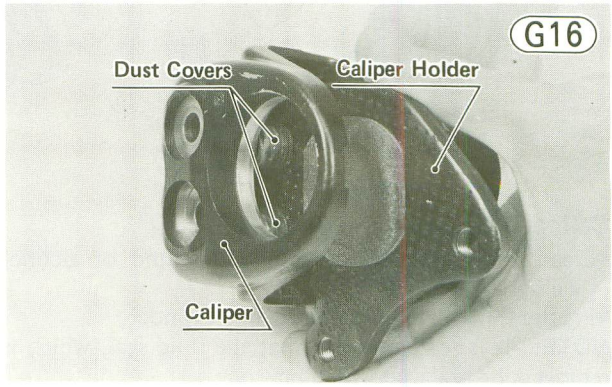
Caliper Installation Notes:

1. Tighten the mounting bolts with 3.4 ~ 4.6 kg-m (25 ~ 33 ft-lbs) of torque.
2. Tighten the caliper holder shaft nuts with 2.4 ~ 2.8 kg-m (17.5 ~ 20 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 with 2.9 ~ 3.1 kg-m (21 ~ 22 ft-lbs) of torque.
4. Check the fluid level in the master cylinder, and bleed the brake line (Pg. 180).

Caliper Disassembly:

●Take out the mounting screw ⑯ for pad B ⑲, and remove the pad. A lockwasher ⑰ and metal plate ⑱ also come off.
●Remove the caliper holder shaft nuts ① (2), and pull out the caliper holder shafts ⑥ (2) and the spacers ② (2) taking care not to damage the dust covers ⑦ (4). Remove the caliper holder ⑳, and push out pad A ⑨.

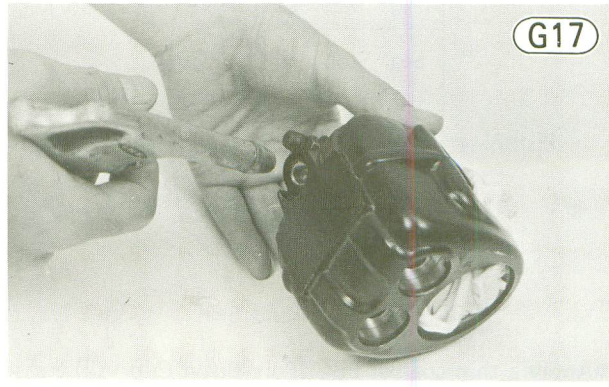
CAUTION **To avoid damage to the dust covers and O rings, unscrew each shaft a little at a time.**



●Remove the dust seal ⑩ around the piston ⑪.
●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 injury, never place your fingers or palm inside the caliper opening. If you apply compressed air into the caliper, the piston may crush your hand or fingers.**

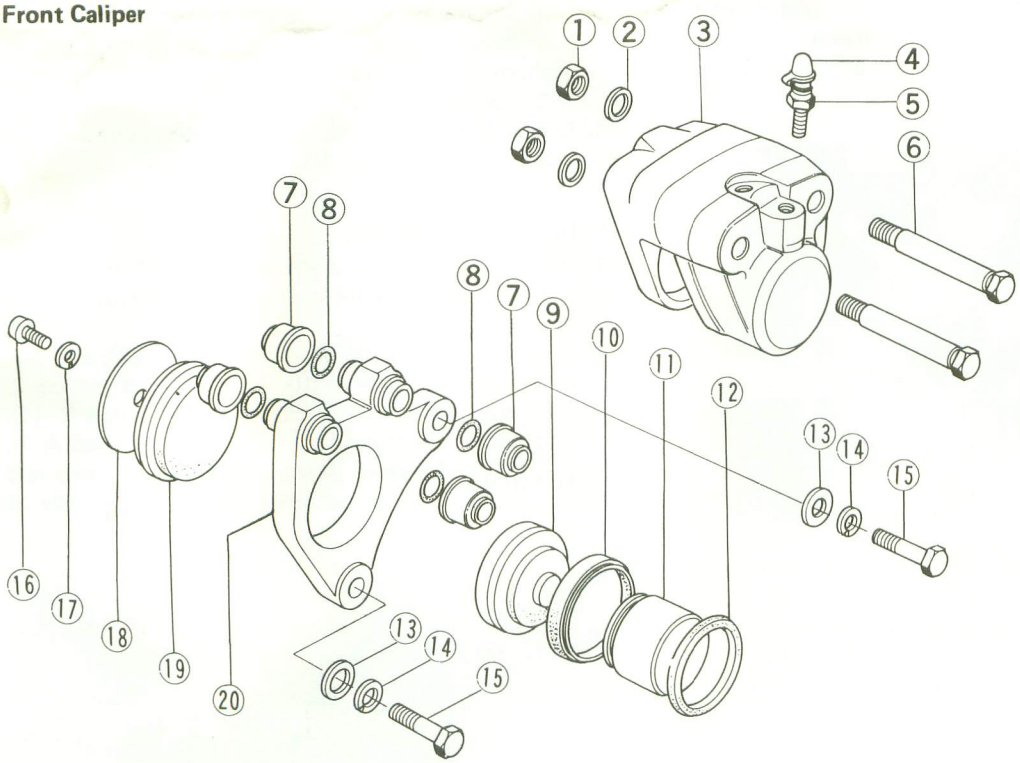
NOTE: If compressed air is not available, reconnect the brake line and pump the piston out with the brake lever.



●Taking care not to damage the cylinder surface, remove the fluid seal ⑫ with a hook.

Front Caliper

G18



1. Nut
2. Spacer
3. Caliper
4. Bleed Valve Cap
5. Bleed Valve
6. Caliper Holder Shaft
7. Dust Cover
8. O Ring
9. Pad A
10. Dust Seal
11. Piston
12. Fluid Seal
13. Flat Washer
14. Lockwasher
15. Caliper Mounting Bolt
16. Mounting Screw
17. Lockwasher
18. Metal Plate
19. Pad B
20. Caliper Holder

Caliper Assembly:

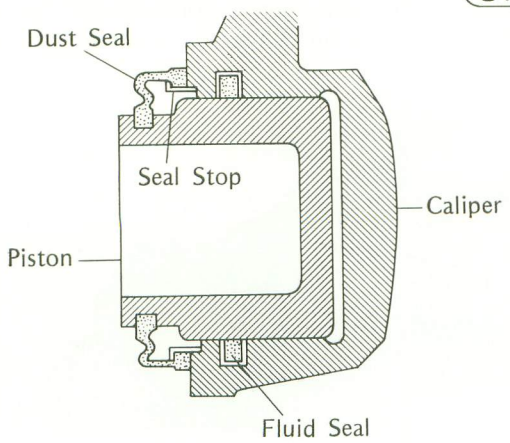
- Clean the caliper parts with brake fluid or alcohol (See CAUTION–Pg. 100).
- Fit the fluid seal in place inside the cylinder.

NOTE: It is recommended that the fluid seal, which is removed, be replaced with a new one.

- 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.
- Install the dust seal around the dust seal stop. Check that the dust seal is properly fitted into the groove in the piston and on the dust seal stop.

Caliper Dust Seal

G19



- Apply a thin coat of PBC (Poly Butyl Cuprysil) grease to the caliper holder shafts and the holder holes. (PBC grease is a special high-temperature, water-resistant grease.)

NOTE: Replace the dust covers and O rings if they were damaged.

- With the caliper holder properly positioned, insert the caliper holder shafts while carefully turning the shafts to prevent damage to the dust covers.
- Install the spacers and the nuts, and tighten the nuts loosely.

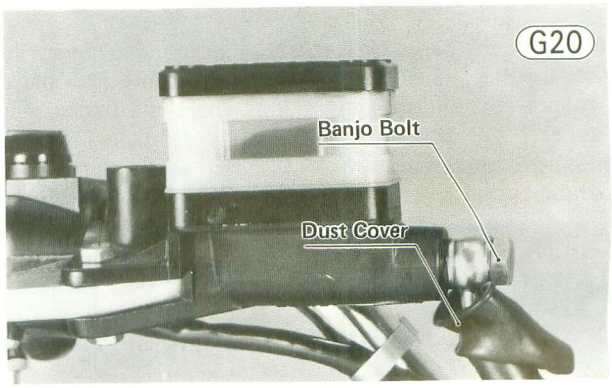
NOTE: Do not forget to tighten the caliper holder shaft nuts after installing the caliper on the motorcycle (Table G1).

- Install pad A in the caliper holder.
- Fit pad B, aligning the tongue on the pad with the groove in the caliper. Install the metal plate, lockwasher, and mounting screw; using a non-permanent locking agent on the screw.

Master Cylinder Removal:

- Take off the right rear view mirror.
- Pull back the dust cover, and remove the banjo bolt to disconnect the upper brake hose from the master cylinder. There is a flat washer on each side of the hose fitting.

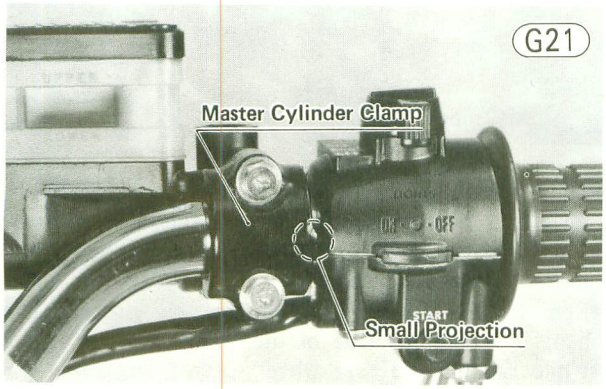
G20



●Remove the clamp bolts (2), 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.

Master Cylinder Installation Notes:

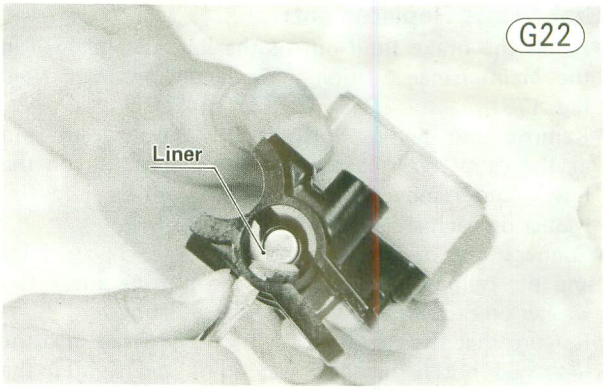
1. The master cylinder clamp is installed with the small projection towards the throttle grip. Tighten the upper clamp bolt first, and then the lower clamp bolt, both with the specified torque (Table G1).



2. Bleed the brake line after master cylinder installation (Pg. 180).

Master Cylinder Disassembly:

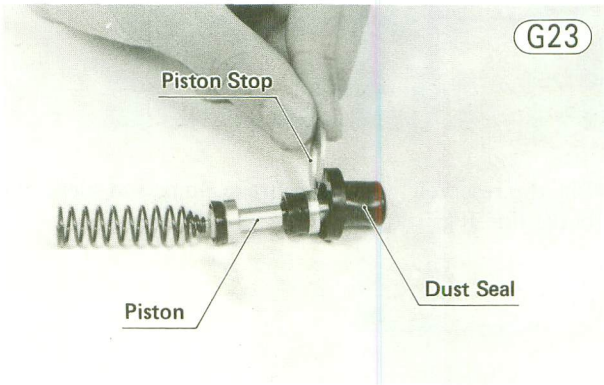
●Remove the screws (4), take off the master cylinder cap ② and diaphragm ④, and empty out the brake fluid.
●Remove the locknut ⑧ and pivot bolt ⑥, and remove the brake lever ⑦.
●Using a thin-bladed screwdriver or some other suitable tool, press in the liner tabs which catch in the holes in the master cylinder, and then remove the liner ⑮.



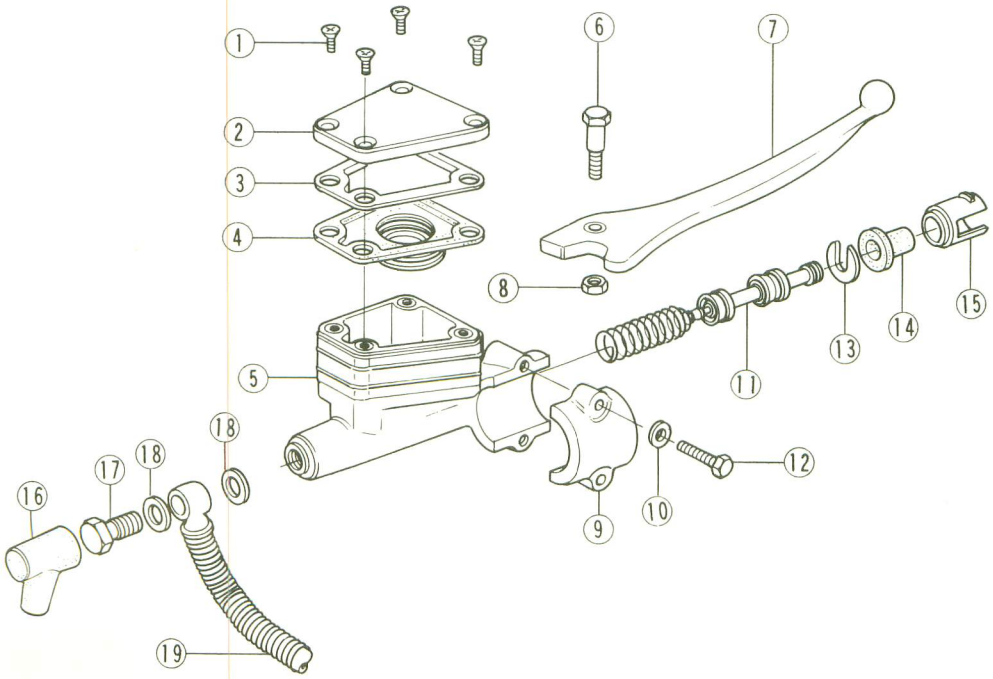
●Pull out the piston and spring unit.

Master Cylinder Assembly Notes:

1. Before assembly, clean all parts including the master cylinder with brake fluid or alcohol (See CAUTION –Pg. 100). Apply brake fluid to the parts removed and to the inner wall of the cylinder.
2. Be sure that the piston stop ⑬ is between the piston and dust seal ⑭.



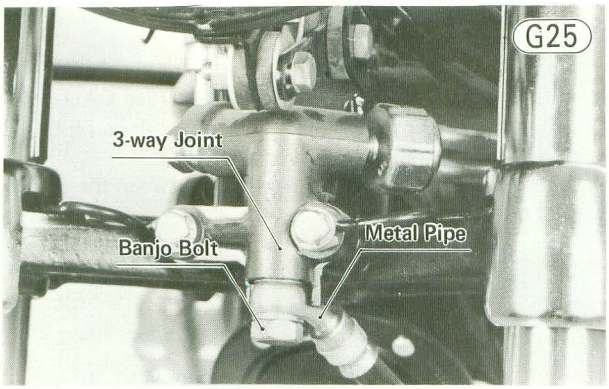
Front Master Cylinder



1. Screw
2. Cap
3. Plate
4. Diahragm
5. Master Cylinder Body
6. Pivot Bolt
7. Brake Lever
8. Locknut
9. Clamp
10. Flat Washer
11. Piston Unit
12. Bolt
13. Piston Stop
14. Dust Seal
15. Liner
16. Dust Cover
17. Banjo Bolt
18. Flat Washer
19. Upper Brake Hose

Brake Hose Replacement:

- Pump the brake fluid out of the line as explained in the Maintenance Section – *Changing the brake fluid* (Pg. 179).
- Remove the banjo bolts at the 3-way joint and at the caliper or master cylinder (depending on the hose), and remove the brake hose. There is a flat washer on each side of the hose fitting.
- Connect the new brake hose to the 3-way joint and the caliper or master cylinder, putting a new flat washer on each side of the brake hose fittings.
- Be sure that the metal pipe is properly fitted into the U-shaped notch in the 3-way joint and tighten the banjo bolts to 2.9~3.1 kg-m (21~22 ft-lbs) of torque.

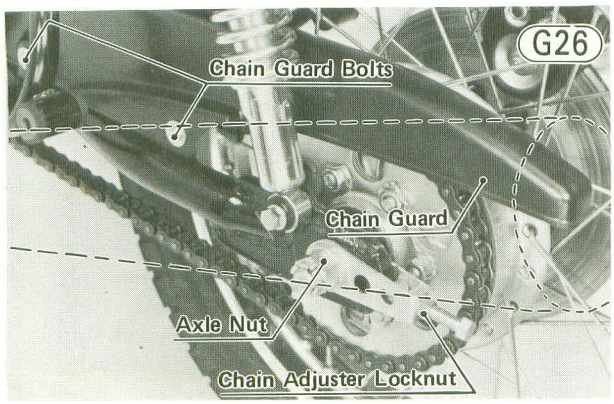


- Fill the reservoir with fresh brake fluid, and bleed the brake line (Pg. 180).

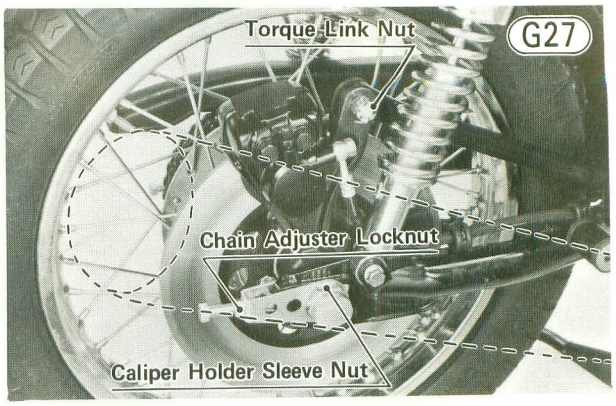
REAR WHEEL

Removal:

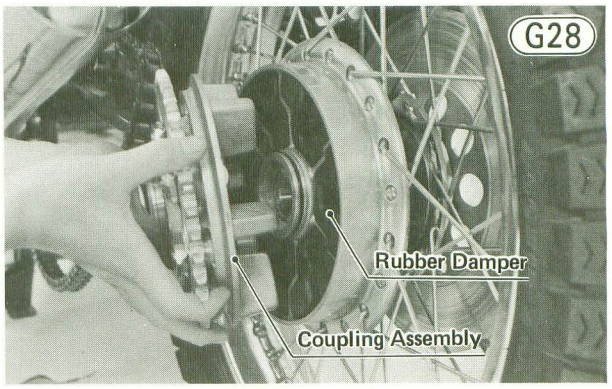
- Put the motorcycle up on its center stand.
- Remove the chain guard bolts (2) and washers (2), and take off the chain guard.



- Remove the axle cotter pin, and take out the axle nut and washer.
- Remove the cotter pin, and loosen the nut at the rear end of the torque link.
- Loosen the 36 mm caliper holder sleeve nut.



- Loosen the left and right chain adjuster locknuts, fully loosen both chain adjusting bolts, and kick the wheel forward so that the chain can be easily removed from the rear sprocket.
- Remove the drive chain from the rear sprocket, and hang it to the left side of the swing arm.
- While holding the rear wheel so that the grease seal in the right side of the rear hub does not get damaged, pull out the axle. The left chain adjuster comes off with the rear wheel.
- Pull the rear wheel toward the rear until it is stopped by the rear fender, and remove the coupling assembly and rubber damper from the left side of the rear hub.



- Clear the disc from the caliper, lean the wheel to the left, and pull it out under the left side of the rear fender.
- 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 down accidentally.

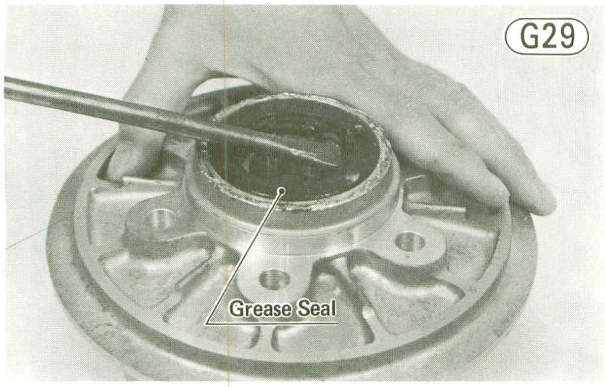
Installation:

- Remove the wedge spacer from between the disc brake pads.
- Slip the rear wheel back from the left rear and install the rubber damper and the coupling assembly in the rear hub. Be sure the disc side collar and coupling collar are in place.

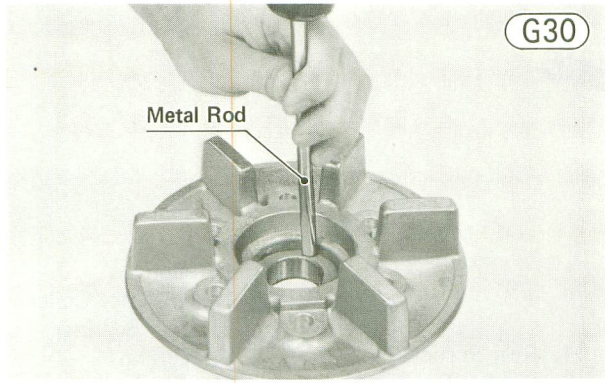
- Slip the disc into the caliper.
- Fit the drive chain onto the rear sprocket.
- Install the left chain adjuster, and insert the axle through the hub from the right to left, while holding the rear wheel in place.
- Install the axle washer and nut, and tighten the axle and caliper holder nuts loosely.
- Install the chain guard.
- Adjust the drive chain (Pg. 24).

Wheel Coupling Disassembly:

- Pull out the coupling collar ⑩ from the left, and the coupling sleeve ⑥ from the right.
- Install the rubber damper ⑫ and wheel coupling assembly temporarily to aid in rear sprocket ⑪ removal.
- Straighten the bent portions of the double washers ⑰ (3).
- Remove the rear sprocket nuts ⑯ (6), the double washers, and the sprocket bolts ⑱ (6) to separate the rear sprocket ⑪ and wheel coupling ⑤.
- Remove the coupling from the rear wheel.
- Using a hook, pull out the grease seal ② and remove the circlip ③.



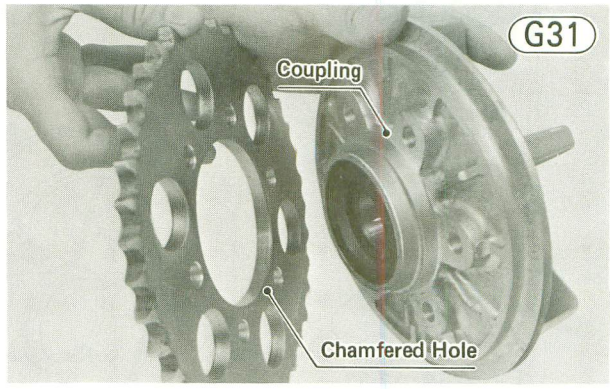
- Remove the bearing ④ by tapping from the wheel side evenly around the bearing inner race.



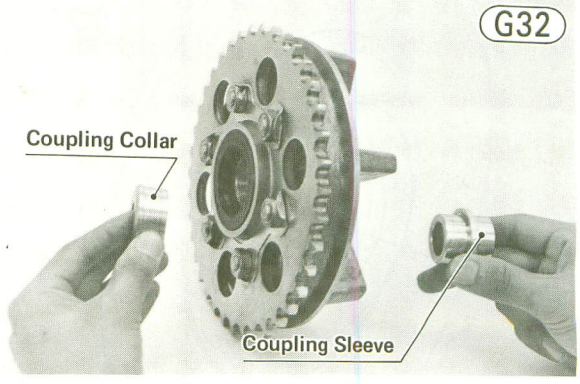
Wheel Coupling Assembly:

- Inspect the bearing, and replace if necessary (Pg. 174). Lubricate it (Pg. 174), and install it using the wheel bearing driver and the bearing driver holder (special tools PN 57001-139 and 57001-296). Press the bearing until it stops at the bottom of the hole.
- Install the circlip.
- Replace the grease seal with a new one using the same special tools used for the bearing installation. Press the seal so that the face of the seal is level with the end of the grease seal hole.
- Install the rear sprocket, bolts (6), double washers (3), and nuts (6), and tighten the nuts loosely.

WARNING **The rear sprocket must be installed with the chamfered hole side facing toward the coupling. If not, the sprocket will not seat on the coupling evenly, causing the drive chain to be thrown off by excessive sprocket runout during operation. This can result in rear wheel lockup and loss of control.**



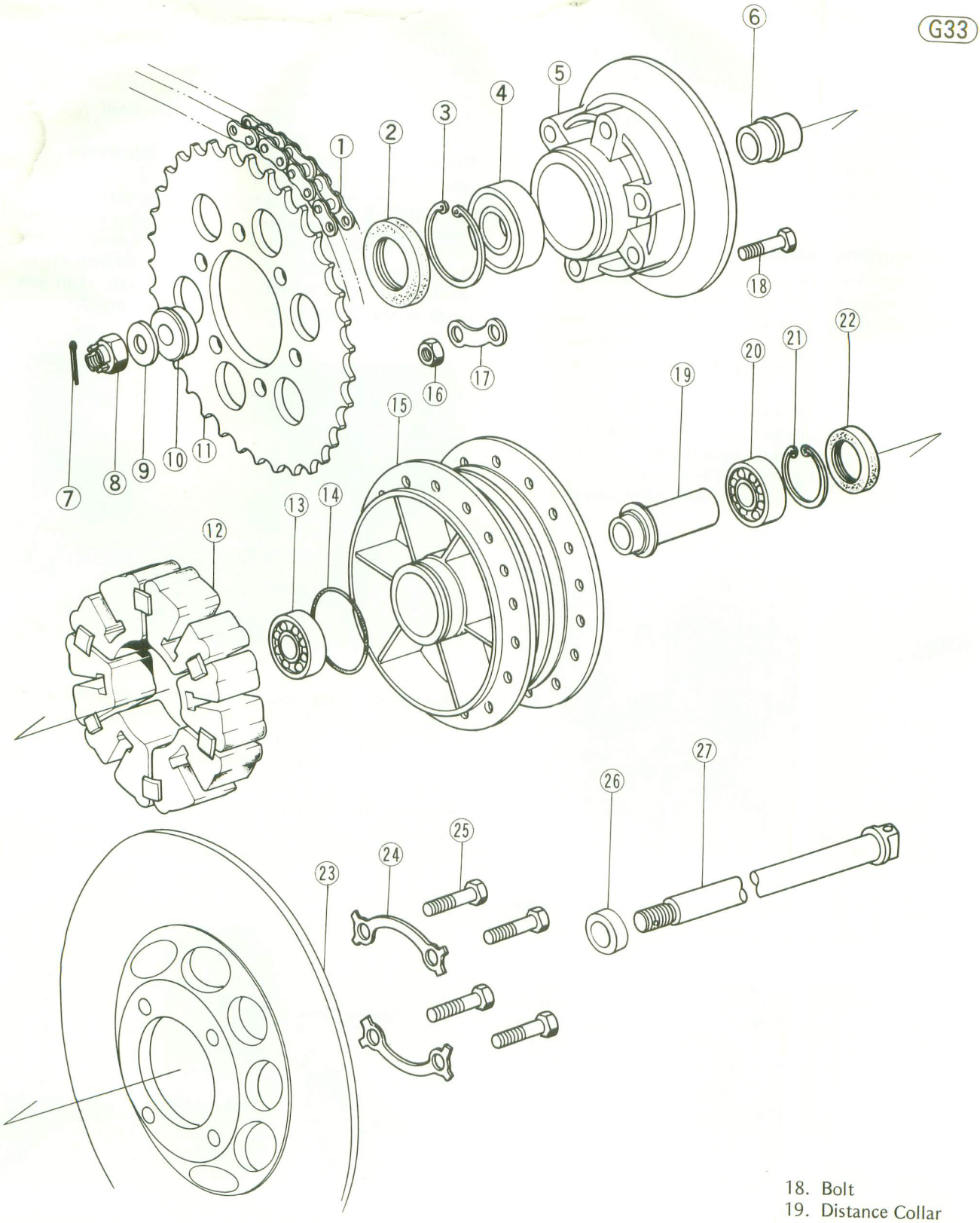
- Install the rubber dampers and wheel coupling on the rear hub, and then tighten the sprocket nuts with 3.6~4.4 kg-m (26~32 ft-lbs) of torque.
- Bend the tab portions of the double washers over the nuts.
- Remove the coupling from the rear hub.
- Install the coupling sleeve on the right side and the coupling collar on the left side of the coupling.



Rear Hub Disassembly (including disc removal):

- Pull out the collar ㉖ from the disc side.
- Straighten the bent portions of the double washers ㉔ (2), and remove the bolts ㉕ (4), double washers (2), and rear disc ㉓.
- Remove the grease seal ㉒ using a hook, and remove the circlip ㉑.

Rear Hub

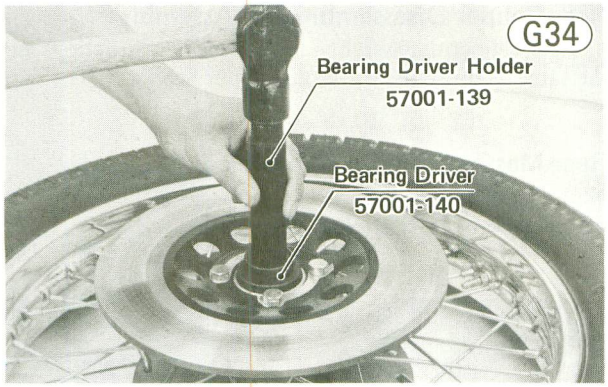


1. Drive Chain
2. Grease Seal
3. Circlip
4. Ball Bearing
5. Wheel Coupling
6. Coupling Sleeve
7. Cotter Pin
8. Axle Nut
9. Washer
10. Coupling Collar
11. Rear Sprocket
12. Rubber Damper
13. Ball Bearing
14. O Ring
15. Rear Hub
16. Sprocket Nut
17. Double Washer
18. Bolt
19. Distance Collar
20. Ball Bearing
21. Circlip
22. Grease Seal
23. Disc
24. Double Washer
25. Bolt
26. Collar
27. Rear Axle

- Insert a metal rod into the hub from the disc side, and remove the left side bearing ⑬ by tapping evenly around the bearing inner race. The distance collar ⑲ will come out with the bearing.
- Insert the metal rod into the hub from the other side, and tap out the remaining bearing ⑳.

Rear Hub Assembly Notes:

1. Inspect the bearings and replace if necessary (Pg. 174). Install them using the wheel bearing driver and the bearing driver holder (special tools).



2. Inspect the grease seal and replace if necessary (Pg. 174). Press it in until it stops at the bottom of the hole using the wheel bearing driver and the bearing driver holder (special tools PN 57001-139 and 57001-140).
3. Inspect the O ring and replace if necessary.

REAR DISC BRAKE

Removal, installation, disassembly, and assembly of the rear disc brake is divided as follows:

Pad Removal and Installation
Caliper Removal and Installation
Caliper Disassembly and Assembly
Master Cylinder Removal and Installation Notes
Master Cylinder Disassembly and Assembly

NOTES:

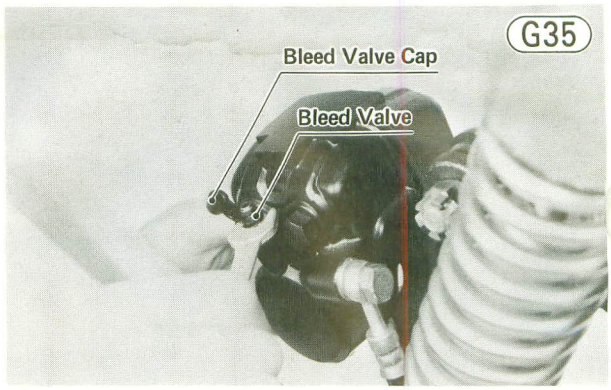
1. Disc removal and disc installation are covered in rear hub disassembly and rear hub assembly sections (Pg. 105).
2. Refer to CAUTION and WARNING (Pg. 100) for general disc brake information.

Pad Removal:

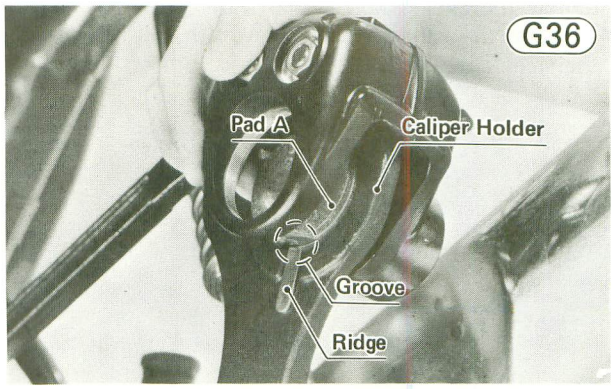
- Remove the rear wheel (Pg. 104).
- Remove pads A and B using the same method covered in front disc brake pads removal (Pg. 100).

Pad Installation:

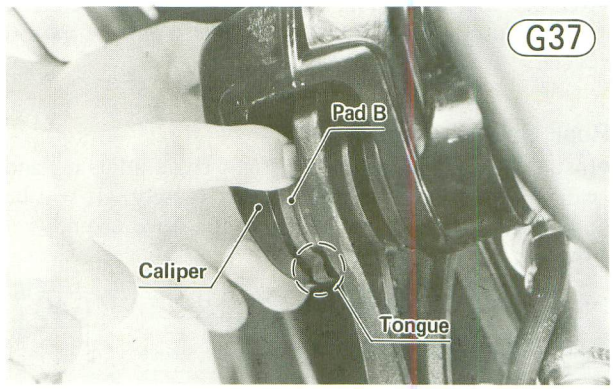
- Remove the bleed valve cap, open (loosen) the valve slightly, push the piston in by hand as far as it will go, and then close (tighten) the valve. Wipe up any spilled fluid, and recap the bleed valve.



- Install pad A in the caliper holder, aligning the groove of pad A with the ridge in the caliper holder.



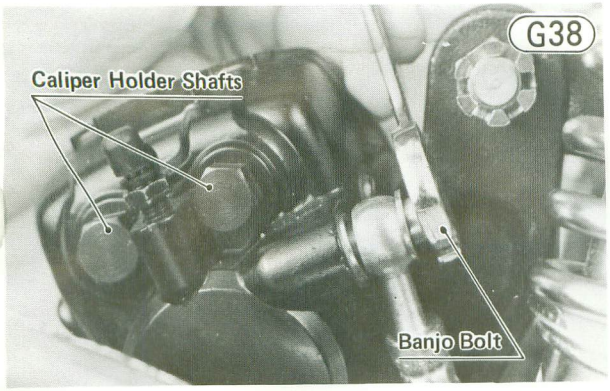
- Fit pad B, aligning the tongue on the pad with the groove in the caliper, and install the metal plate, lock washer, and mounting screw using a non-permanent locking agent on the screw.



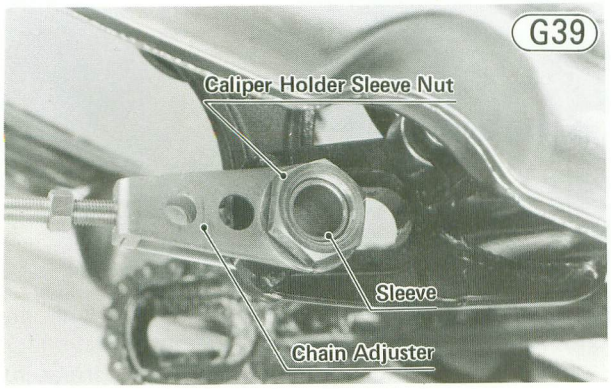
- Since brake fluid was spilled when the bleed valve was opened, check the fluid level in the master cylinder and bleed the air from the brake system (Pg. 180).
- Install the rear wheel (Pg. 104).
- Adjust the drive chain (Pg. 24).

Rear Caliper Removal:

- Remove the rear wheel (Pg. 104).
- Remove the banjo bolt at the caliper, and temporarily secure the end of the brake hose to some place high than the rear brake reservoir to prevent fluid from flowing out. There is a flat washer on each side of the hose fitting (Fig. G38).



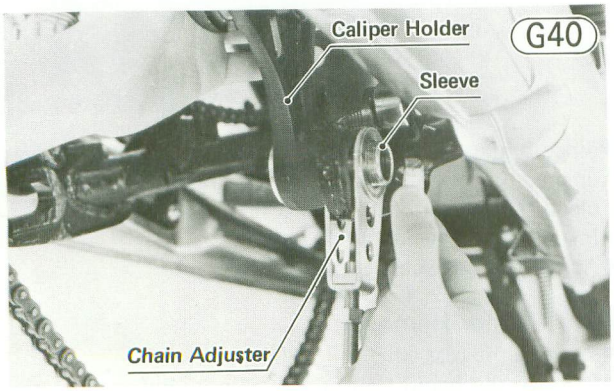
- Immediately wipe up any brake fluid that spills.
- If the piston or the caliper holder is to be removed, loosen the caliper holder shaft nuts (2).
- Remove the caliper holder sleeve nut, the sleeve, and the right chain adjuster.



- Remove the torque link nut and bolt from the rear end of the torque link. Free the caliper from the motorcycle.

Rear Caliper Installation:

- Install the sleeve, sleeve nut, right chain adjuster, and caliper, and tighten the sleeve nut loosely. It will be tightened securely after adjusting the drive chain.



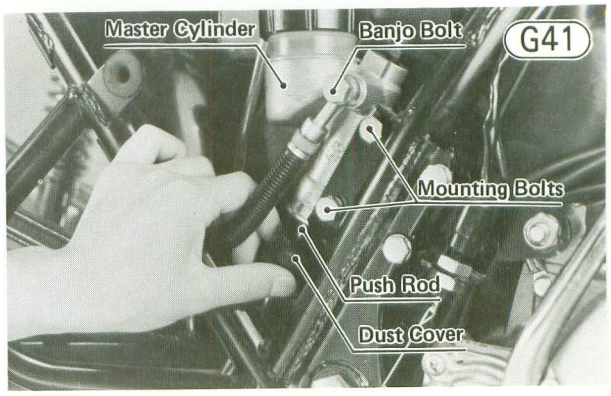
- Fit the torque link bolt through the torque link and the caliper from the left side and tighten the nut loosly.
- Install the rear wheel (Pg. 104).
- Tighten the caliper holder shaft nuts with 2.4 ~ 2.8 kg-m (17.5~20 ft-lbs) of torque.
- Connect the brake hose to the caliper, tightening its banjo bolt with 2.9 ~ 3.1 kg-m (21 ~ 22 ft-lbs) of torque. There is a flat washer for each side of the brake hose fitting.
- Adjust the drive chain (Pg. 24).
- Check the fluid level in the master cylinder, and bleed the brake line (Pg. 180).

Rear Caliper Disassembly and Assembly:

Rear caliper diasssembly and assembly instructions are the same as those for the front caliper See Pg. 101.

Rear Master Cylinder Removal:

- Pull off the right side cover.
- Slide down the push rod dust 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.
- Remove the master cylinder mounting bolts (2), lock washers (2), and flat washers (2), and free the rear master cylinder from the motorcycle.

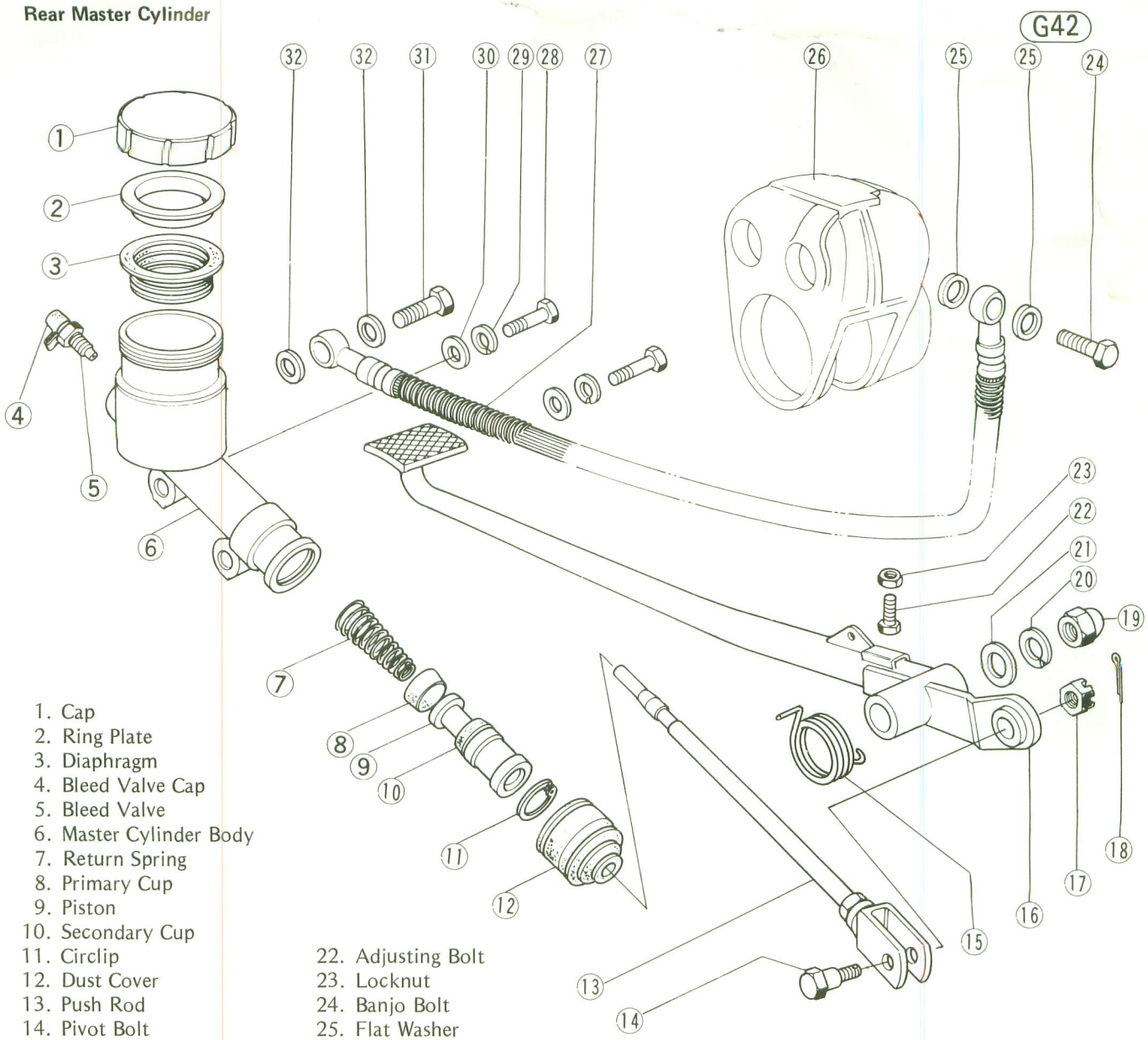
Rear Master Cylinder Installation Notes:

1. Tighten the master cylinder mounting bolts securely.
2. Bleed the brake line after master cylinder installation (Pg. 180).
3. Adjust the rear brake (Pg. 25).

Rear Master Cylinder Disassembly:

- Take off the master cylinder cap ① and diaphragm ③, and empty the brake fluid into a suitable container.
- Remove the circlip ⑪ with circlip pliers, and pull out the piston ⑨ and secondary cup ⑩. Do not remove the secondary cup from the piston since removal will damage the cup.
- Remove the bleed valve ⑤ and remove the return spring ⑦ and primary cup ⑧ by lightly applying compressed air into the bleed valve hole.

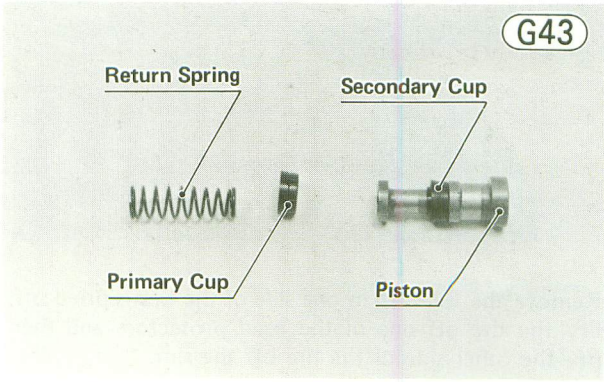
Rear Master Cylinder



1. Cap
2. Ring Plate
3. Diaphragm
4. Bleed Valve Cap
5. Bleed Valve
6. Master Cylinder Body
7. Return Spring
8. Primary Cup
9. Piston
10. Secondary Cup
11. Circlip
12. Dust Cover
13. Push Rod
14. Pivot Bolt
15. Return Spring
16. Brake Pedal
17. Nut
18. Cotter Pin
19. Cap Nut
20. Lockwasher
21. Flat Washer
22. Adjusting Bolt
23. Locknut
24. Banjo Bolt
25. Flat Washer
26. Caliper Body
27. Brake Hose
28. Mounting Bolt
29. Lockwasher
30. Flat Washer
31. Banjo Bolt
32. Flat Washer

Rear Master Cylinder Assembly:

- Before assembly, clean all parts including the rear master cylinder with brake fluid or alcohol (See CAUTION–Pg. 100), and apply brake fluid to the removed parts and the inner wall of the master cylinder. Take care not to scratch the piston or the inner wall of the cylinder.
- Install the bleed valve.
- Put the return spring into the cylinder. The spring seat side must face out.
- Install the primary cup. Be sure that the primary cup is not installed backward or turned sideways after insertion.



- Install the piston, and with a suitable rod, install the circlip to hold the piston in as far as it will go.
- Fit the diaphragm and the master cylinder cap.

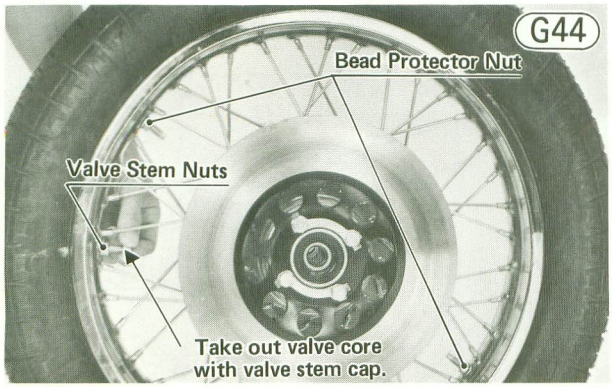
TIRE, TUBE

Removal:

- Remove the wheel from the motorcycle (Pg. 97 or 104).

CAUTION **Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc.**

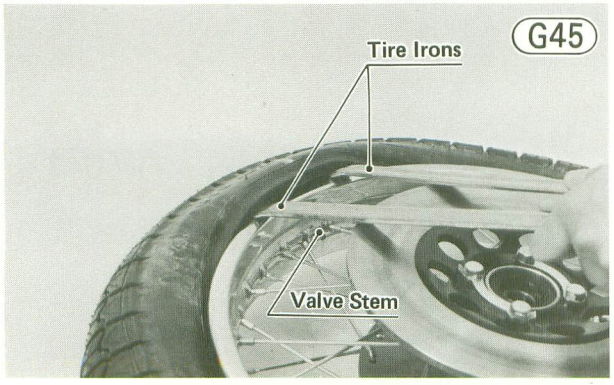
- Mark the valve stem position on the tire with chalk so that the tire will be reinstalled in the same position to maintain wheel balance.
- Take out the valve core to let out the air.



- Remove the valve stem nut, and fully loosen the two bead protector nuts.
- Use a rubber mallet to break the tire beads away from both sides of the rim.

NOTE: Front tire has no tire bead protectors.

- 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. Take care not to insert the tire irons so deeply that the tube gets damaged.

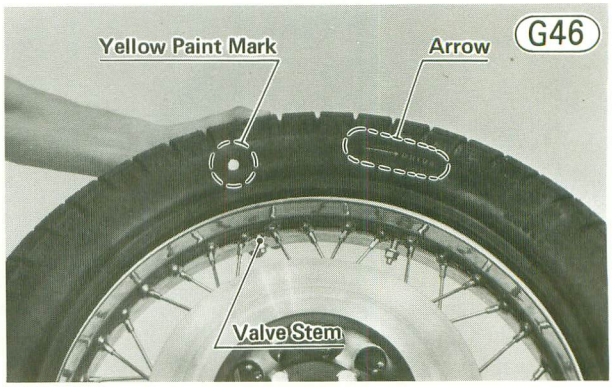


- Remove the tube when one side of the tire is pried off.
- Pry the tire off one of the bead protectors and then pry the other side of the tire off the rim.

Installation:

- 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. Dust the tube and inside the tire with talcum powder, and insert the tube into the tire now, even if the tire was completely removed from the rim. Insert the valve stem into the rim, and screw the nut on loosely.
- Lubricate the tire beads and rim flanges with a soap and water solution or liquid soap to help seat the tire beads in the rim while inflating the tire.
- If the tire was completely removed, pry one side back onto the rim and fit the bead protectors into the tire. Be sure that the tire does not go on backwards; the rear tire has an arrow molded into the sidewall to show the direction of tire rotation. Align the chalk mark on the tire with the valve stem.

NOTE: If a new tire is installed, the yellow paint mark on the tire should be aligned with the valve stem for best balancing results.



- Pry the other side of the tire onto the rim, starting at the side opposite the valve. 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, and then inflate to the specified pressure (Pg. 170).
- Tighten the bead protector and valve stem nuts, and put on the valve cap.
- Balance the wheel (Pg. 27).
- Mount the wheel on the motorcycle (Pg. 97 or 104).
- Adjust the drive chain (Pg. 24), if the rear wheel was removed.

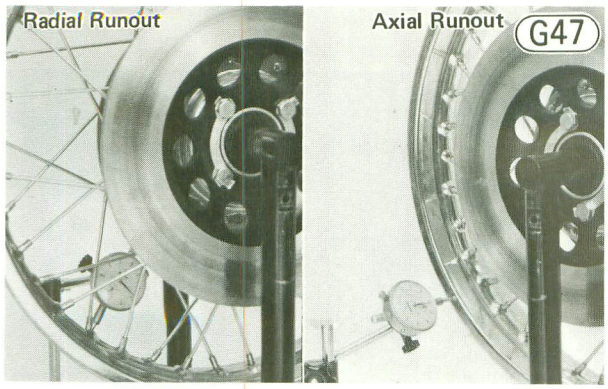
RIM

Removal:

- Remove the wheel from the motorcycle (Pg. 97 or 104).
- Take the tire and tube off the rim (Pg. 110).
- Remove the bead protectors (only on the rear wheel) and the 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.

Installation:

- Fit all the spokes through the holes, and screw all the nipples onto the spokes tightening them partially.
- 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.
- Make sure that the spokes are tightened evenly. Standard torque is 0.20 ~ 0.40 kg-m (17 ~ 35 in-lbs).
- Mount the tube and tire (Pg. 110).
- Balance the wheel (Pg. 27).
- Mount the wheel on the motorcycle (Pg. 97 or 104).
- Adjust the drive chain (Pg. 24), if the rear wheel was removed.

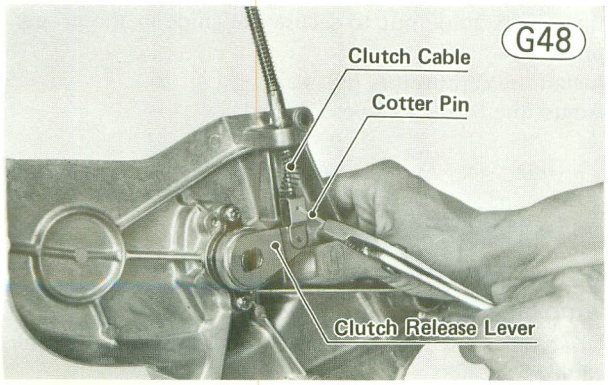
SPOKE (breakage replacement)

- Reduce the tire air pressure by a small amount.
- Insert the new spoke through the hub, and bend it to meet the nipple.
- Tighten with a spoke wrench. Standard torque is 0.20 ~ 0.40 kg-m (17 ~ 35 in-lbs).
- Inflate the tire to standard pressure (Pg. 170).

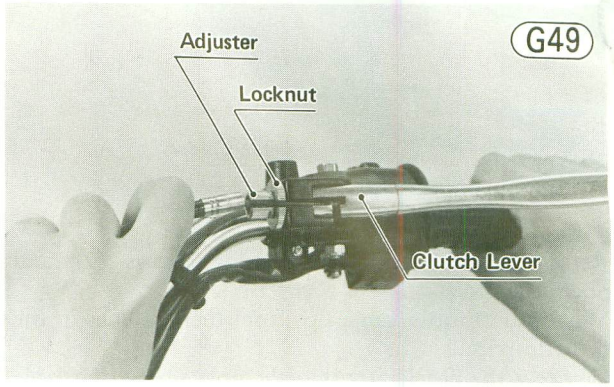
CLUTCH CABLE

Removal:

- Remove the engine sprocket cover (Pg. 54).
- Remove the cotter pin, and disconnect the tip of the clutch cable from the clutch release lever.



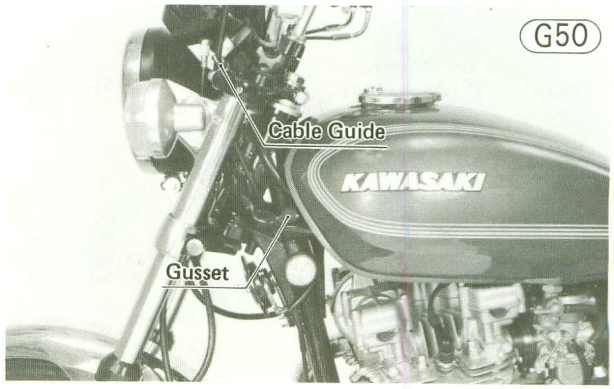
- Loosen the locknut on the clutch lever, and screw in the adjuster.
- Line up the slots in the clutch lever, locknut, and adjuster and free the cable from the lever.
- Pull the cable free from the motorcycle.



Installation:

NOTE: Before installing the clutch cable, lubricate it.

- Run the upper end of the cable through the gusset and the guide at the left of the stem head, and to the clutch lever.

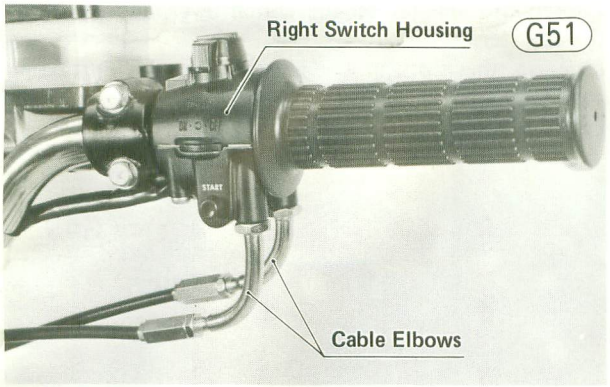


- Fit the tip of the cable back into the clutch lever.
- Run the lower end of the clutch cable between the left down tube and the lower part of the engine, and spring. Fit the tip of the inner cable into the clutch release lever.
- Using a new cotter pin, secure the cable tip to the release lever.
- Install the engine sprocket cover (Pg. 54).
- Adjust the clutch (Pg. 20).

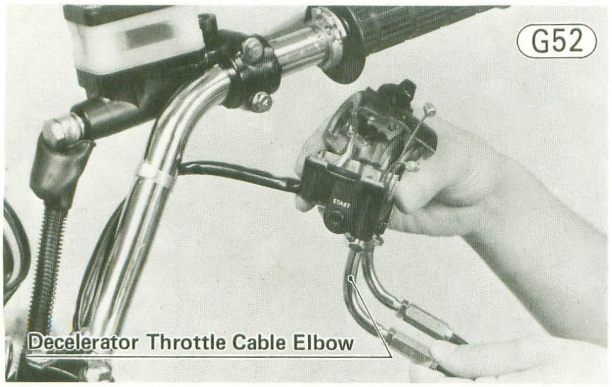
THROTTLE CABLES

Removal:

- Remove the carburetors (Pg. 39).
- Loosen both cable elbow nuts, and pull out the cables through the right cable guide on the stem head (Fig. G51).



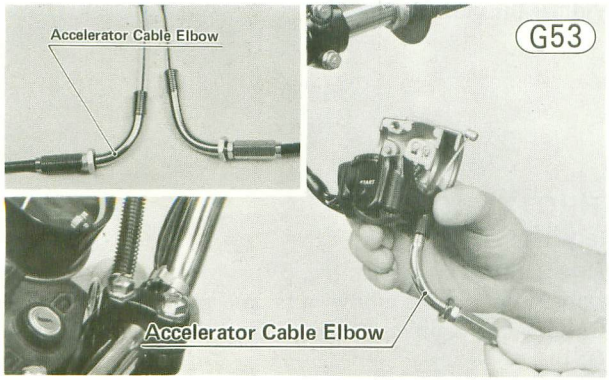
- Remove the right switch housing screws (2), and open the housing.
- Slip both throttle cable tips from their catches in the throttle grip.
- Unscrew the decelerator throttle cable elbow (the cable elbow next to the starter button), and pull the cable out of the engine stop switch housing. Then do the same with the accelerator throttle cable elbow to free the throttle cables from the motorcycle.



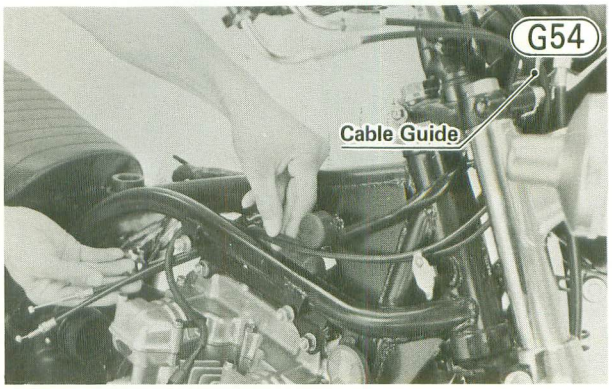
Installation:

NOTE: Before installing the throttle cables, lubricate them.

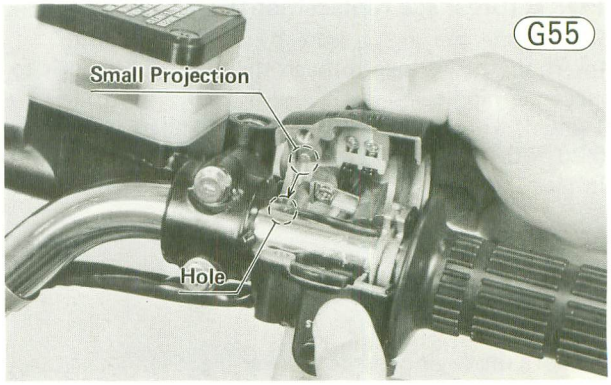
- Screw the accelerator throttle cable elbow (shorter than the decelerator throttle cable elbow) into the side of the engine stop switch opposite the starter button. Screw it in almost all the way, and then lightly tighten the elbow nut.



- Screw in the decelerator cable elbow almost all the way, and then lightly tighten the elbow nut.
- Run both cables through the cable guide on the right stem head, between the right front shock absorber and the head pipe, and between the right top tube and upper tube to the carburetors. The cables should be natually routed, neither one twisted about the other.



- Turn the throttle grip so that the cable catches are facing up, fit the accelerator throttle cable tip in the front catch and the other cable tip in the rear catch.
- Put together the right switch housing, and tighten its screws. The upper half of the housing has a small projection which fits into a hole in the handlebar. The front switch housing screw is longer than the rear screw.

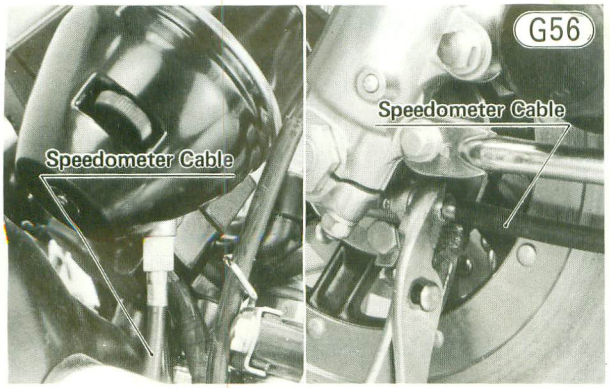


- Turn each guide in the direction of its cable, and tighten its guide nut to secure the guide in the proper position.
- Install the carburetors (Pg. 40).
- Adjust the throttle cables (Pg. 16).

SPEEDOMETER CABLE

Removal:

- Disconnect the upper and lower ends of the speedometer cable with pliers.

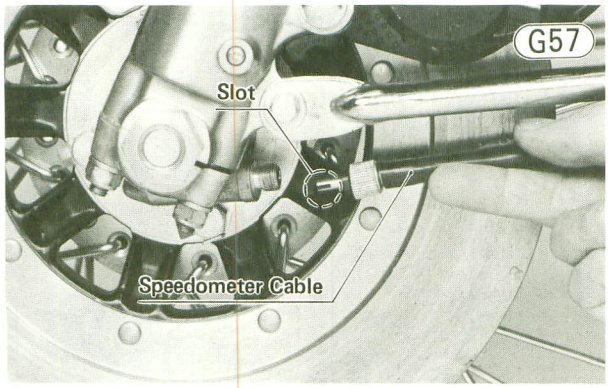


●Pull the cable free.

Installation:

●Run the speedometer cable through its guides at the 3-way joint and the front fender left side, and secure the upper end of the cable to the speedometer with pliers.

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



TACHOMETER CABLE

Removal:

●Disconnect the upper end of the tachometer cable with pliers and the lower end of the cable with a wrench.

●Free the cable from the motorcycle.

Installation:

●Run the tachometer cable through its guide at the 3-way joint, fit the inner cable into the tachometer, and tighten the cable nut with pliers.

●Fit the bottom end of the cable into its place in the cylinder head. Turn it if necessary so that it fits all the way into place, and tighten its nut with a wrench.

HEADLIGHT UNIT

Removal:

●Take out the retaining screws ⑧ (2), and swing the unit ⑦ from the housing ⑳.

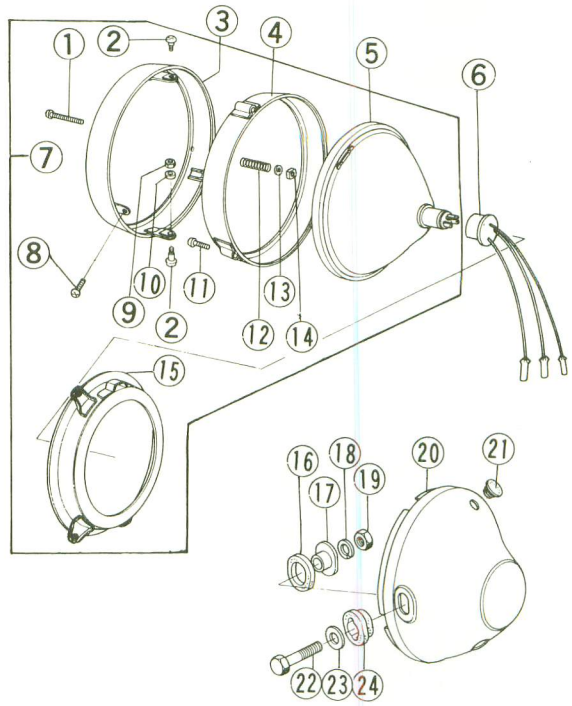
●Disconnect the headlight socket ⑥ from the rear of the unit. For semi-sealed beam units, the bulb can now be removed.

●Remove the pivot screws ②, nuts ⑨, washers ⑩, and rubber dampers (2 ea), and the beam horizontal adjusting screw ①. A nut ⑭, spring seat ⑬, and spring ⑫ come off with the adjusting screw.

●Separate the outer rim ③ from the inner rim ④.

●Remove the screws ⑪ (2), and separate the sealed beam unit from the inner rim and mounting rim ⑮.

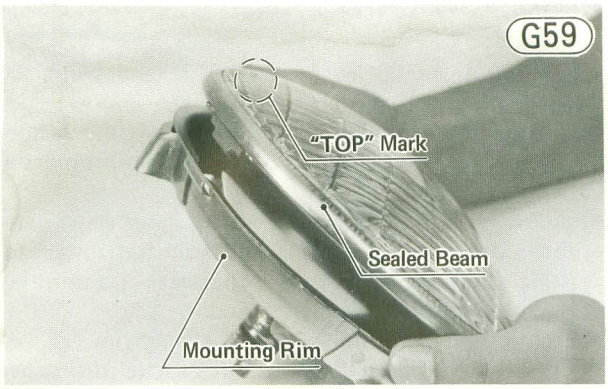
Headlight Unit



1. Adjusting Screw
2. Pivot Screw
3. Outer Rim
4. Inner Rim
5. Sealed Beam Unit
6. Socket
7. Headlight Unit
8. Retaining Screw
9. Nut
10. Washer
11. Screw
12. Spring
13. Spring Seat
14. Nut
15. Mounting Rim
16. Damper
17. Collar
18. Lockwasher
19. Nut
20. Housing
21. Plug
22. Mounting Bolt
23. Flat Washer
24. Damper

Installation Notes:

1. Place the sealed beam unit into the mounting rim, fitting the raised portion into its holders on the mounting rim. This ensures that the part of the sealed beam unit marked "TOP" will be to the top after the headlight unit is mounted back into the headlight housing (Fig. G59).

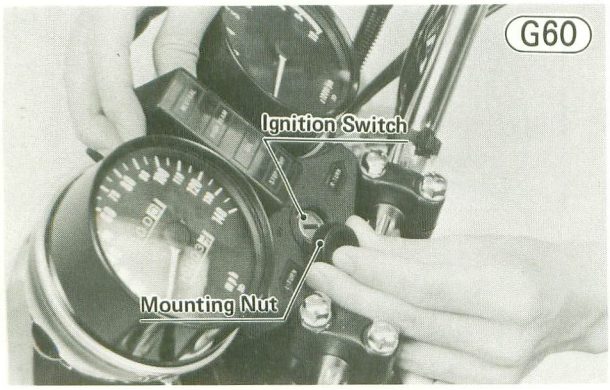


2. The washer on the adjusting screw goes between the spring and the bracket.
3. Carry out the horizontal beam adjustment after installation (Pg. 28).

INDICATOR LIGHTS (Neutral, High Beam, Oil, Stop Lamp, Left and Right Turn)

Removal:

- Remove the ignition switch mounting nut and take off the upper cover.



- Remove the indicator lights (6) the same way as meter light removal (Fig. G67).

Installation Note:

- Use the bulbs shown in Table G2 for indicator light replacement. Also, refer to the table for light location by lead color. Example: The right turn signal socket takes the bulb with Black/Yellow and gray leads.

Table G2 Indicator Lights

Bulb Wattage	Indicator Lights	Lead Color
12V 3.4W	Neutral	Green/Red, Brown
	High Beam	Black/Yellow, Red/Black
	Oil	Blue/Red, Brown
	Stop Lamp	Green/White, Brown
	Left Turn Signal	Black/Yellow, Green
	Right Turn Signal	Black/Yellow, Gray

TURN SIGNAL LIGHT (Burn out Replacement)

- Remove the lens mounting screws, and take off the lens.
- Press the bulb inwards, and holding the bulb in this position, twist it to the left and pull it out.
- Install a new 12 volt bulb of the correct wattage (see the wiring diagram).
- Fit the rubber gasket in place, if removed, and install the lens. Be careful not to overtighten the mounting screws.

TURN SIGNAL ASSEMBLY

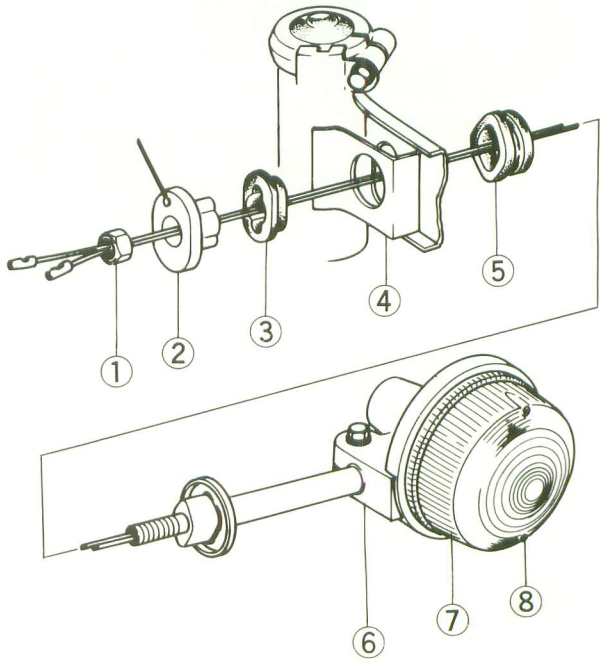
Removal (front, either side):

- Take out the retaining screws (2), pull the bottom of the headlight unit out of its housing, and swing the unit out from the housing.
- Disconnect the headlight socket from the rear of the unit.
- Disconnect the turn signal gray or green lead and blue lead in the headlight housing.
- Loosen the mounting bolts (2) underneath the headlight housing.
- Take out the headlight housing mounting bolts (2) and move the housing down slightly.
- Remove the nut and pull the front turn signal from the front fork cover stay.

Installation Notes (front, either side):

1. If the front turn signal dampers have been removed, install them as shown in Fig. G61.

Front Turn Signal Installation G61

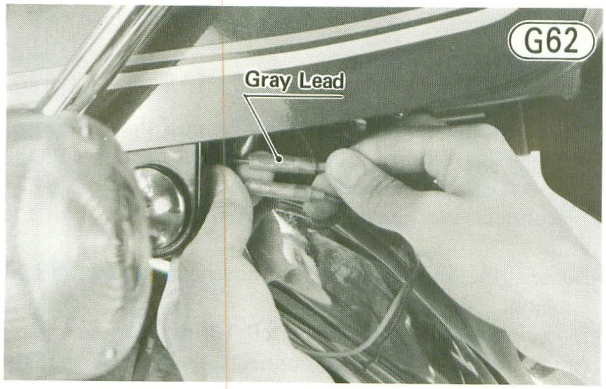


1. Nut
2. Collar
3. Rubber Damper
4. Fork Cover
5. Rubber Damper
6. Front Turn Signal
7. Lens
8. Mounting Screw

2. Adjust the headlight vertically.

Removal (rear, either side):

- Unlock the seat and swing it open.
- Disconnect the turn signal gray lead.

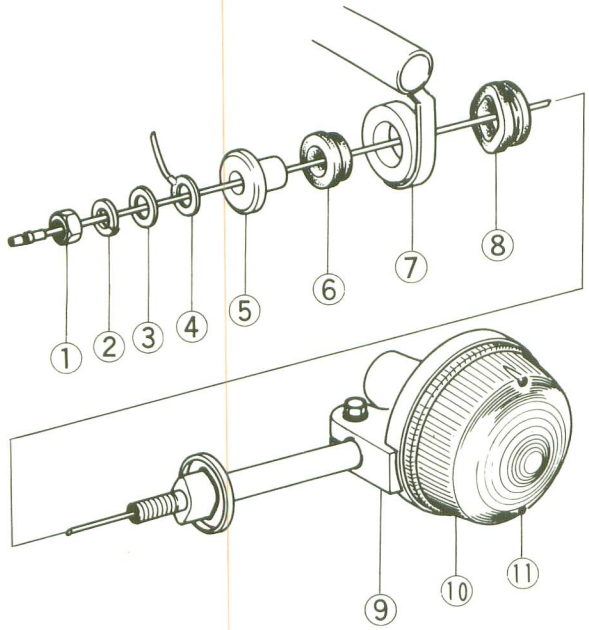


- Remove the nut and lockwasher, and pull the rear turn signal from the frame.

Installation Notes (rear, either side):

1. If the rear turn signal dampers have been removed, install them as illustrated.

Rear Turn Signal Installation G63



1. Nut
2. Lockwasher
3. *Flat Washer*
4. Lead Terminal
5. Collar
6. Rubber Damper
7. Frame
8. Rubber Damper
9. Rear Turn Signal
10. Lens
11. Mounting Screw

2. Connect the turn signal leads according to Table G3.

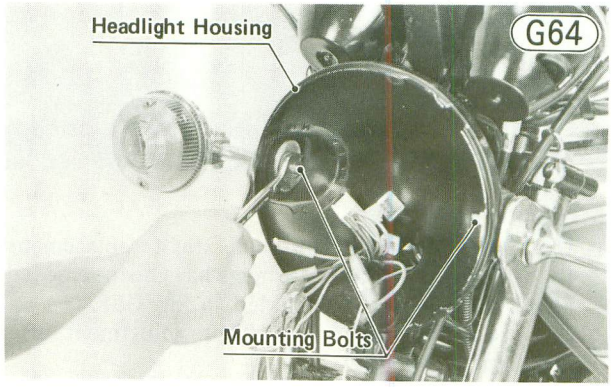
Table G3 Turn Signal Lead Color

	Turn Signal Lead	↔	Main Wiring Harness Lead
Right	Gray	↔	Gray
	Black/Yellow	↔	Black/Yellow
Left	Gray	↔	Green
	Black/Yellow	↔	Black/Yellow

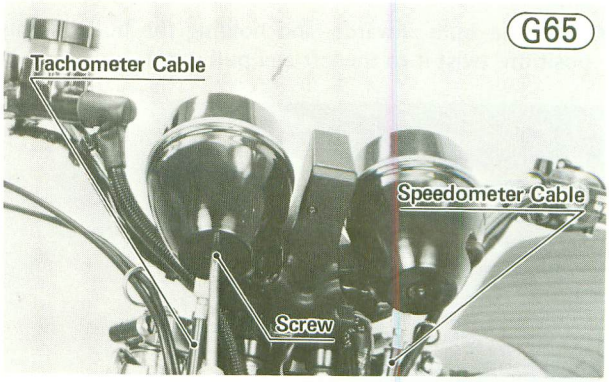
SPEEDOMETER, TACHOMETER, METER LIGHTS

Removal:

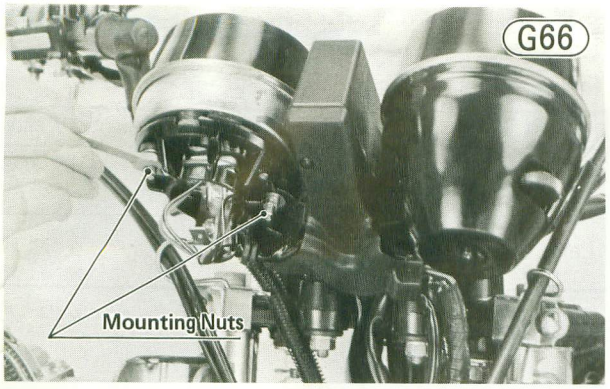
- Take out the retaining screws (2), pull the bottom of the headlight unit out of its housing, and swing the unit out from the housing.
- Disconnect the headlight socket from the rear of the unit.
- Loosen the mounting bolts underneath the headlight housing.
- Take out the headlight housing mounting bolts (2), and move the housing down slightly. A nut, lockwasher, and flat washer come off with each mounting bolt.



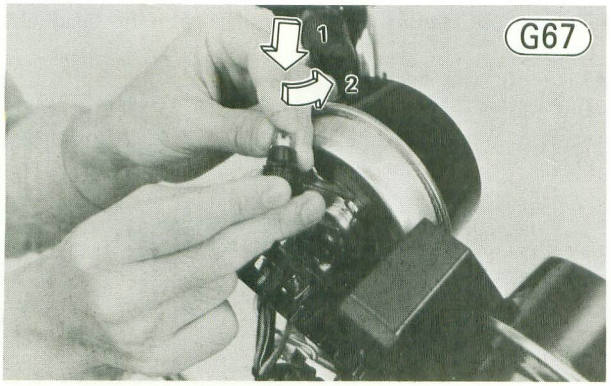
- Disconnect the upper end of the speedometer cable and tachometer cable with pliers.
- Remove the screw and lockwasher, and wiring grommet from the meter cover, and pull off the cover.



- Remove the mounting nuts, lockwashers, flat washers, dampers, and collars (2 ea) from the bottom of the meter holder as shown in Fig. G66.



- Pull up on the front of the meter, and pull out the illuminator lights (2) from their base to complete meter removal.
- To remove the illuminator bulb, first press the bulb inwards, then holding the bulb in this position, twist it to the left and pull it out.

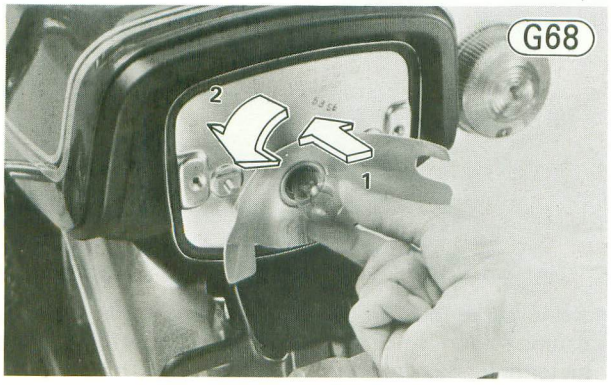


Installation Notes:

1. Use 12V 3.4W bulbs for meter light replacement.
2. If the headlight housing dampers have been removed, install the dampers as illustrated in Fig. G58.
3. Carry out the vertical headlight adjustment after installation (Pg. 28).

TAIL/BRAKE LIGHT (Burn out Replacement)

- Remove the lens mounting screws, and take off the lens.
- Press the bulb inwards, and holding the bulb in this position, twist it to the left and pull it out.

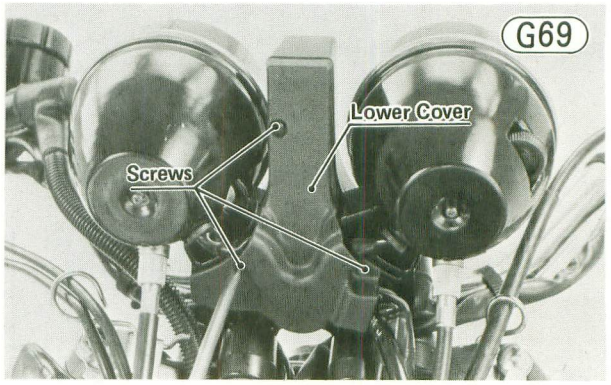


- Replace a burned out bulb with a new 12 volt bulb of the correct wattage (see the wiring diagram).
- Fit the rubber gasket in place, if removed, and install the lens. Be careful not to overtighten the mounting screws.

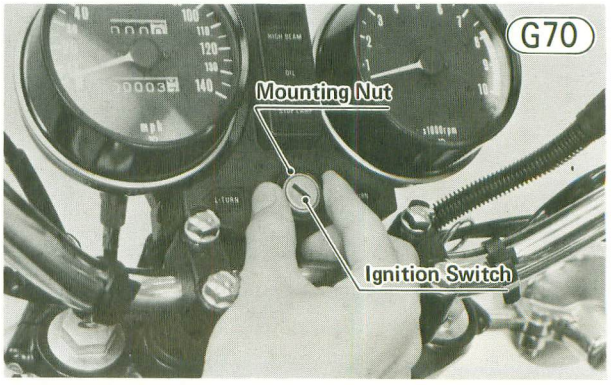
IGNITION SWITCH

Removal:

- Take out the retaining screws (2), pull the bottom of the headlight unit out of its housing, and swing the unit out from the housing.
- Disconnect the headlight socket from the rear of the unit.
- Loosen the mounting bolts underneath the headlight housing.
- Disconnect the ignition switch wiring harness socket from the plug (4-pin) it connects to in the headlight housing, and push the socket out of the housing.
- Take out the headlight housing mounting bolts (2) and move the housing down slightly. Each bolt has a nut, lockwasher, and flat washer.
- Take out the screws and lockwashers (3 ea) from the bottom of the indicator light panel, and remove the lower cover.



- Unscrew the ignition switch mounting nut, and pull out the ignition switch holder and ignition switch.



Installation:

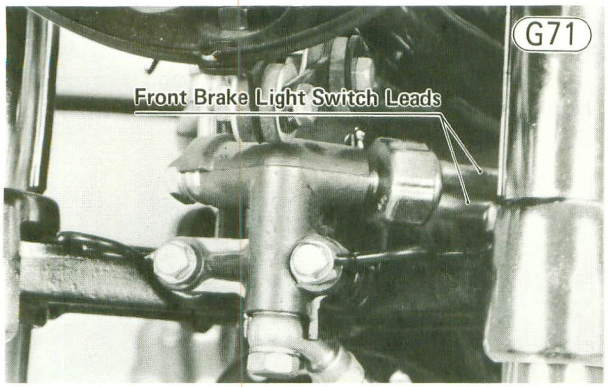
- Fit the ignition switch and its holder in place, and screw the ignition switch mounting nut onto the switch.

- Install the lower cover and tighten the screws (3). Each screw has a lockwasher.
- Connect the ignition switch wiring harness socket to its plug in the headlight housing.
- Mount the headlight housing in place and tighten its mounting bolts. The sequence is: mounting bolt, flat washer, fork cover, rubber damper, headlight housing, rubber damper, housing insert, lockwasher and nut (Fig. G58).
- Connect the headlight plug to the headlight, fit the headlight into the housing, and tighten its retaining screws.
- Adjust the headlight vertically (Pg. 28).

FRONT BRAKE LIGHT SWITCH

Removal:

- Disconnect the front brake light switch leads from the switch.



- Unscrew the front brake light switch from the 3-way (or 4-way) joint.

CAUTION **If brake fluid spills when the switch is removed, painted surfaces may be damaged. Wipe up any spilled fluid immediately.**

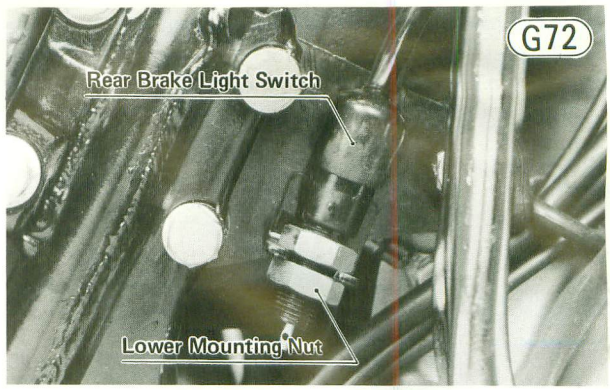
Installation Notes:

1. Apply a small amount of a non-permanent locking agent to the switch threads before mounting the switch. So that no locking agent will get mixed in with the brake fluid, do not apply any on the lower one-fourth of the threads.
2. Tighten the front brake light switch with 2.6 ~ 3.0 kg-m (19~22 ft-lbs) of torque.
3. After the switch has been installed, bleed the front brake lines.

REAR BRAKE LIGHT SWITCH

Removal:

- Remove the rear brake light switch spring.
- Remove the right side cover, and disconnect the blue and brown leads from the rear brake light switch.
- Loosen the lower mounting nut fully, and remove the rear brake light switch.



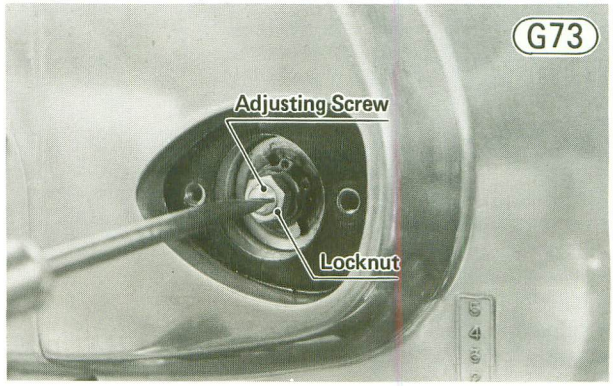
Installation Note:

- Adjust the switch after installation (Pg. 26).

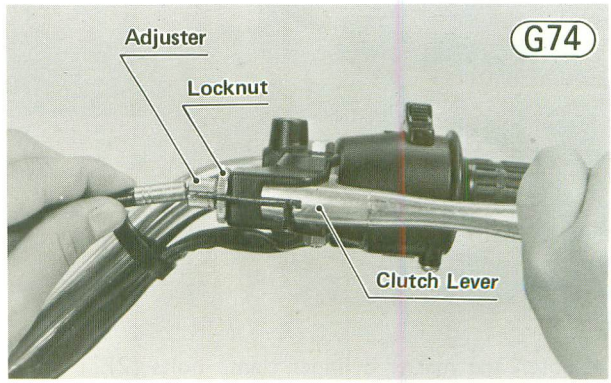
HANDLEBAR

Removal:

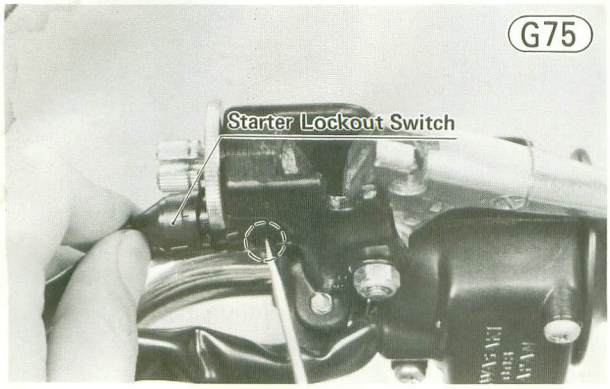
- Take off the rear view mirrors.
- Remove the fuel tank (Pg. 39) or cover the tank with thick cloth to avoid damaging the painted surface.
- Remove the clutch adjusting cover.
- Loosen the locknut, and back out the clutch adjusting screw a couple of turns to give the clutch cable plenty of play.



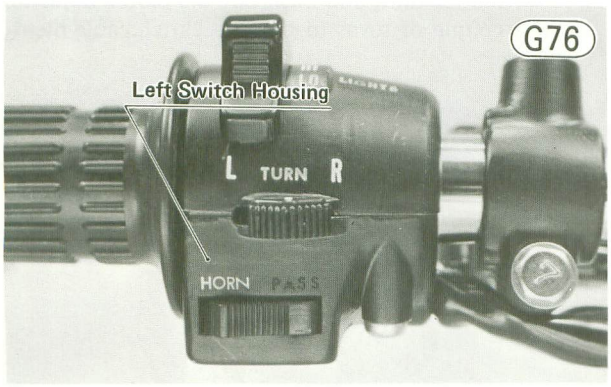
- Loosen the locknut on the clutch lever, and screw in the adjuster and line up the slots in the clutch lever, locknut, and adjuster. Free the inner cable from the lever.



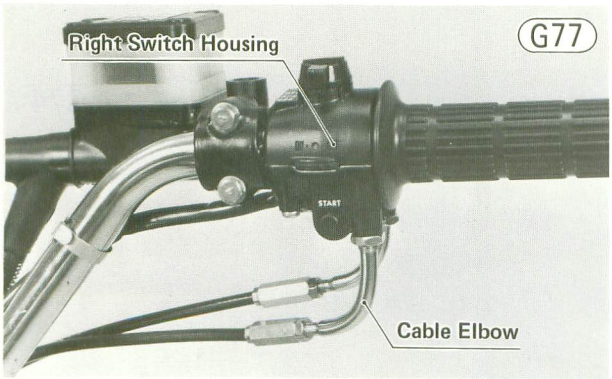
•Using a thin-bladed screwdriver or some other suitable tool, press in the starter lockout switch tab which catches in the hole in the underside of the clutch lever holder, and then remove the switch.



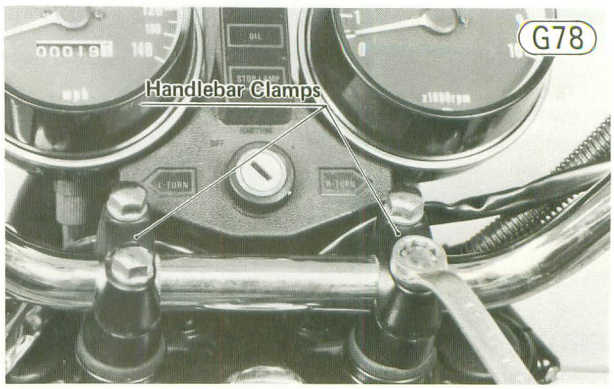
•Remove the straps which hold the left switch wiring harness and right switch wiring harness to the handlebar.
•Take out the left switch housing screws (2), and remove the left switch housing from the handlebar. If necessary, loosen the clutch lever bolt, and slid the clutch lever to the right.



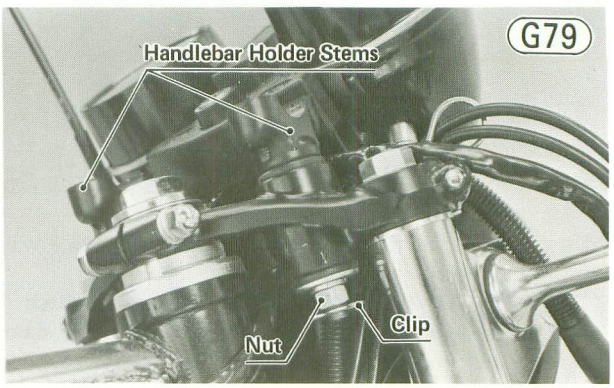
•Remove the helmet holder.
•Remove the right switch housing screws (2), and open the housing. If the screw driver can not seat properly on the screw head, loosen the cable elbow nut and turn the elbow.



•Loosen the master cylinder clamp bolts (2).
•Remove the handlebar clamp bolts and lock washers (4 ea), remove the clamps (2), and slide the handlebar from the master cylinder and the engine stop switch and throttle grip assembly.

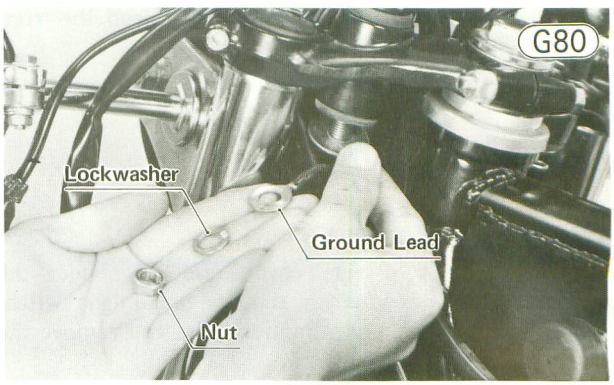


•To remove the clutch lever, loosen the clutch lever bolt, cut off the left handlegrip, which is bonded to the handlebar, and slide off the clutch lever.
•Remove the clip, nut, lockwasher, and flat washer from each handlebar holder stem, and remove the handlebar holder and rubber dampers (2) from each side of the stem head.

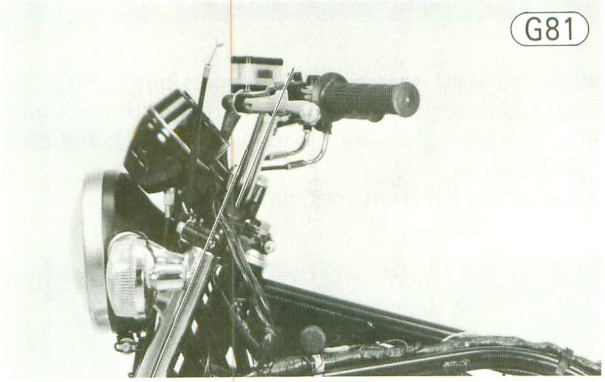


Installation:

•For each handlebar holder, install the rubber dampers (2) and insert the holder. Install the flat washer, lockwasher, and nut in this order; and hand-tighten the nut. Install the ground lead from the headlight housing onto the left holder.



- If the clutch lever and left handlegrip were removed; slide the clutch lever back on, tighten its bolt loosely, and bond a new left handlegrip onto the handlebar.
- Slide the right side of the handlebar through the master cylinder holder into the right switch housing and throttle grip assembly. Mount it in its clamps so that the angle of the handlebar matches the angle of the front fork as shown. Torque for the handlebar clamp bolts is 1.6 ~ 2.2 kg-m (11.5 ~ 16.0 ft-lbs). Each bolt has a lockwasher.



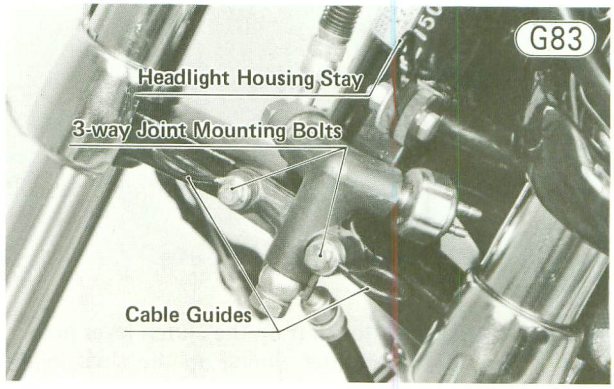
- Position the right switch housing in place with its projection in the hole in the handlebar (Fig. G55), and tighten its screws. The front screw is longer than the rear screw.
- With the brake lever mounted at the proper angle, tighten first the upper and then the lower master cylinder clamp bolt with 0.6 ~ 0.9 kg-m (52 ~ 78 in-lbs) of torque.
- Install the left switch housing.
- Push the starter lockout switch into the clutch lever holder.
- Install the helmet holder.
- Strap both the left and right switch wiring harness back onto the handlebar.
- Install the fuel tank (Pg. 39).
- Fit the tip of the clutch cable back into the clutch lever.
- Adjust the clutch (Pg. 20).
- Install the rear view mirrors.
- Adjust the rear view mirrors.

STEERING STEM

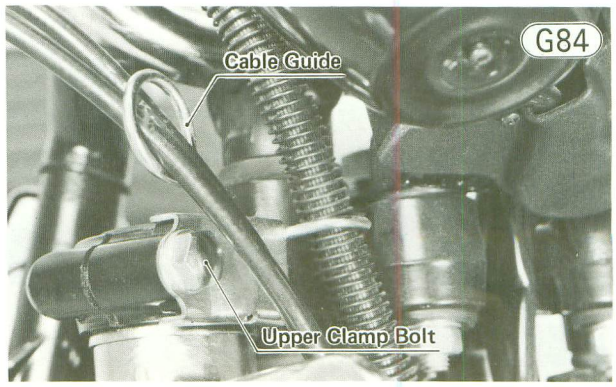
Removal:

- Remove the fuel tank (Pg. 39).
- Remove the speedometer cable (Pg. 112).
- Disconnect the tachometer cable at the tachometer with pliers.
- Remove the front wheel (Pg. 97).
- Remove the headlight unit (Pg. 113).
- Disconnect all the leads and plugs in the headlight housing.
- Disconnect the front brake light switch leads from the switch.
- Remove the headlight housing mounting bolts (2) and remove the headlight housing. Each bolt has a flat washer, lockwasher, and nut.

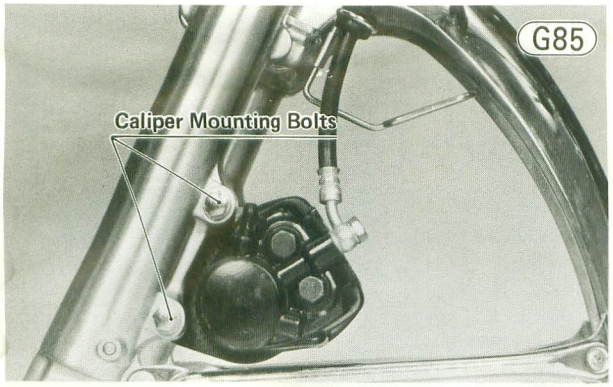
- Remove the clamp bolts (2), and take off the master cylinder. There is a flat washer for each master cylinder clamp bolt.
- Remove the 3-way joint mounting bolts, lockwashers, and flat washers (2 ea) with the two cable guides and the headlight housing stay.



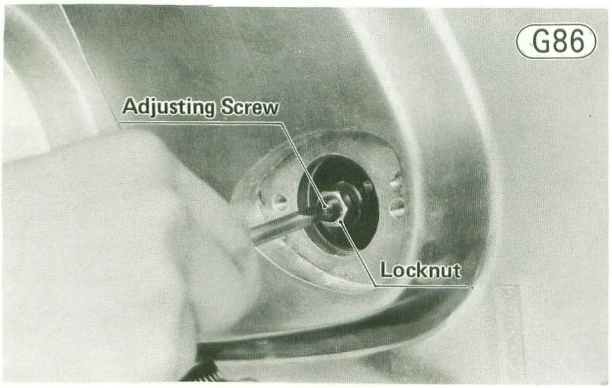
- Remove the right fork leg upper clamp bolt and cable guide.



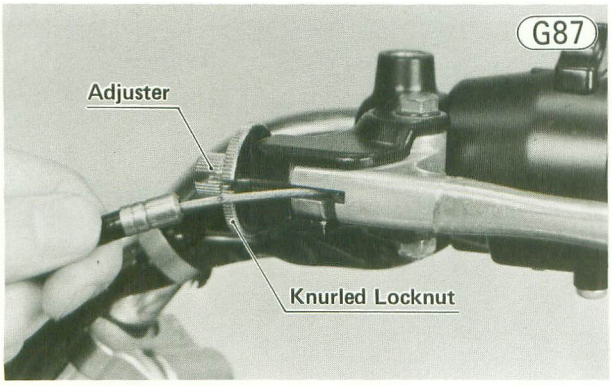
- Remove the caliper mounting bolts, lockwashers, and flat washers (2 ea), and remove the caliper together with the master cylinder, upper brake hose, 3-way joint, and lower brake hose (Fig. G85).



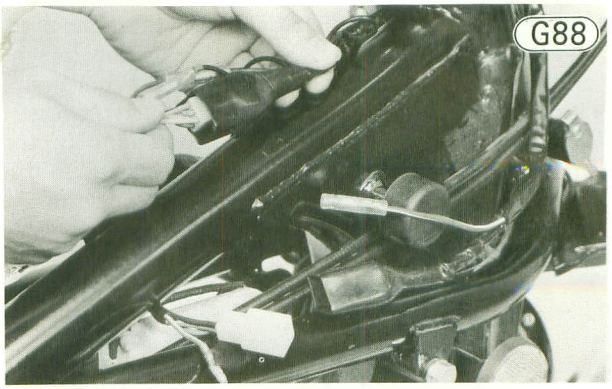
- Loosen the locknut, and turn out fully the adjuster at the center of the clutch cable to give the cable plenty of play.
- Remove the clutch adjusting cover.
- Loosen the locknut, and turn in the clutch adjusting screw a couple of turns to give the clutch cable plenty of play.



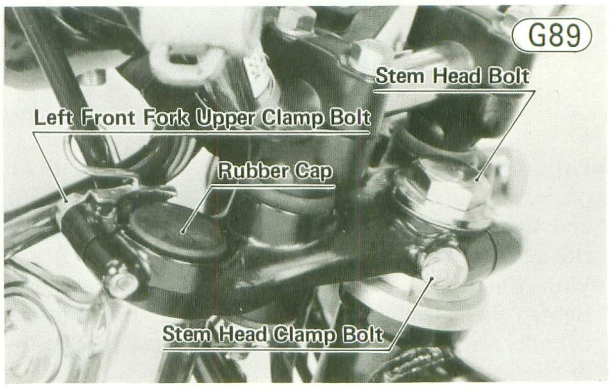
- Loosen the knurled locknut on the clutch lever holder, and screw in the adjuster, lining up the slots in the clutch lever, knurled locknut, and adjuster. Free the inner cable from the lever.



- Remove the straps which hold the right switch wiring harness to the handlebar.
- Disconnect all the leads and plugs from the left and right switch housings under the frame top tube.

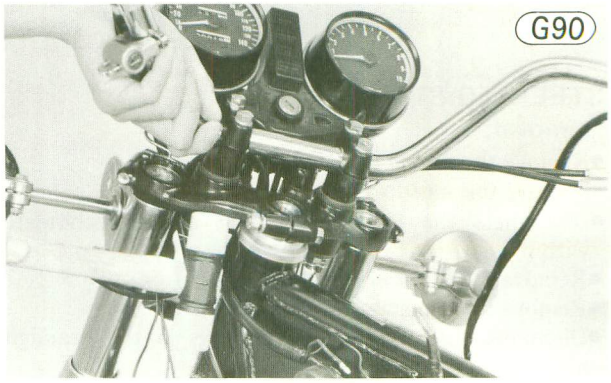


- Pull the right switch wiring harness out through the space between the stem head and the instrument unit.
- Remove the right switch housing screws (2), and open the housing.
- Loosen the left front fork upper clamp bolt.

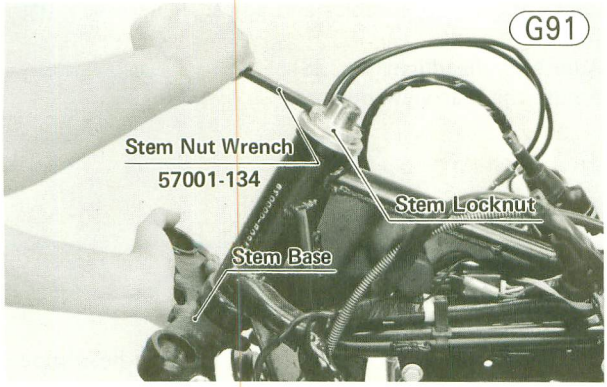


- Remove the rubber caps from the top of the inner tubes.
- Loosen the stem head clamp bolt, and then remove the stem head bolt, lockwasher, and flat washer.
- Tap lightly on the bottom of the stem head with a mallet, and then remove the steering stem head together with the handlebar, meters, and ignition switch. Slide the handlebar from the throttle grip and the right switch housing.

CAUTION **Place the stem head so that the correct side of the meter(s) is up. If a meter is left upside down or sideways for any length of time, it will malfunction.**



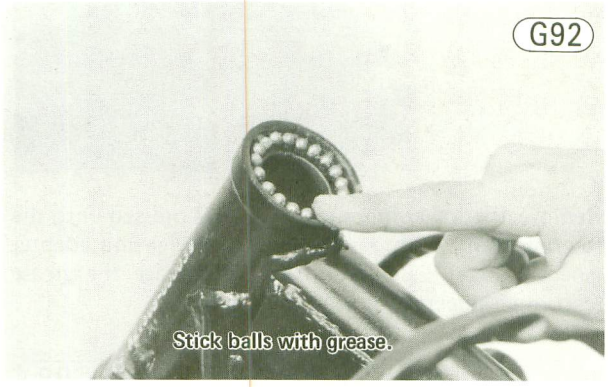
- Remove the fork covers with the turn signals. Each fork cover has a ring cap at the top; and stem base cover, damper ring, and rubber damper at the bottom.
- Remove the fender bolts and lockwashers (6 ea), and take off the fender.
- Loosen the lower clamp bolts, and pull out each fork leg with a twisting motion.
- 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.



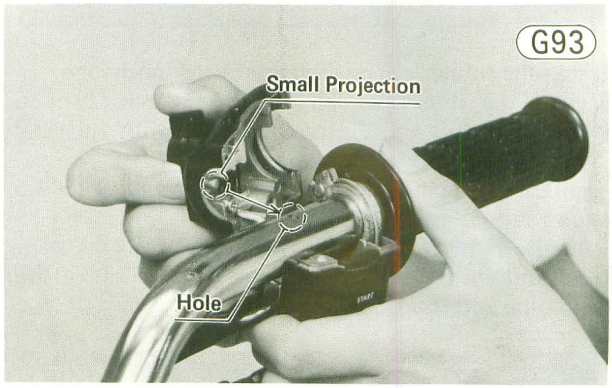
- Remove the steering stem cap, the upper inner race, and the upper steel balls (19).

Installation:

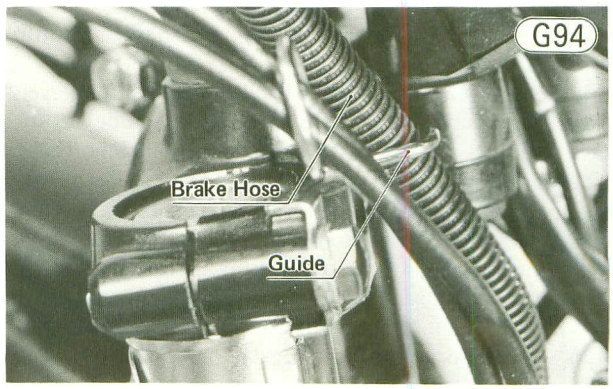
- Apply grease to the upper and lower outer races in the head pipe so that the steel balls will stick in place during stem insertion. Install the upper steel balls (19) and lower steel balls (20). All upper and lower steel balls are one size.



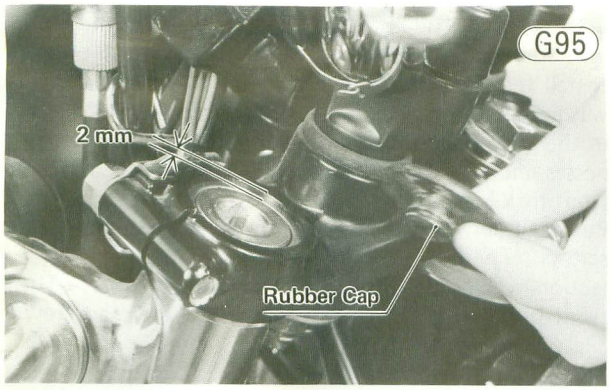
- Put on the upper inner race and steering stem cap. Insert the steering stem into the head pipe, and tighten the steering stem locknut with 2.7 ~ 3.3 kg-m (19.5 ~ 24 ft-lbs) of torque.
- Run the inner tube of each front fork leg up through its clamp in the stem base. Temporarily tighten the lower clamp bolt on each side to hold each fork leg in place with its inner tube protruding about 200 mm above the steering stem base.
- Install the rubber damper, damper ring, base cover, fork cover, and ring cap on each tube in this order.
- Slide the right side of the handlebar through the right switch housing, and into the throttle grip assembly.
- Install the stem head assembly and the stem head lockwasher and flat washer (flat side facing down). Screw in the stem head bolt loosely. Be sure the wiring harnesses and all cables go between the stem head and the front fork legs.
- Put together the right switch housing, and tighten its screws. The upper half of the housing has a small projection which fits into a hole in the handlebar. The front switch housing screw is longer than the rear screw.



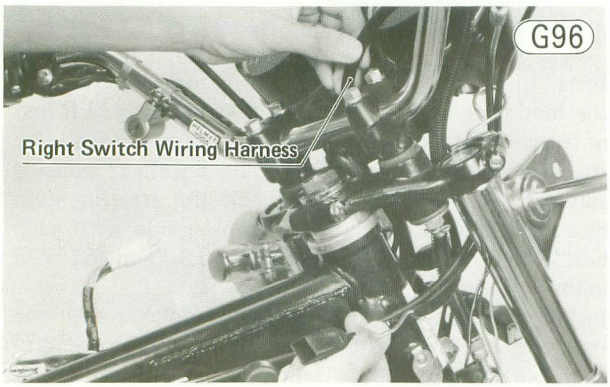
- Install the caliper on the left front fork leg. Tighten the mounting bolts with 3.4 ~ 4.6 kg-m (25 ~ 33 ft-lbs) of torque. Each bolt has a lockwasher and flat washer.
- Install the 3-way joint, placing the headlight housing stay between the 3-way joint and the steering stem base. Be sure to include the cable guide with each bolt. Tighten the bolts with 0.7 ~ 0.9 kg-m (61 ~ 78 in-lbs) of torque.
- Install the master cylinder on the handlebar with the small projection on the clamp facing the throttle grip (Fig. G21 on Pg. 103). Tighten first the upper clamp bolt and then the lower bolt, both with 0.6 ~ 0.9 kg-m (52 ~ 78 in-lbs) of torque. Each clamp bolt has a flat washer.
- Install the right fork leg upper clamp bolt with the cable guide. The front brake hose goes through the guide as shown.



- For each fork leg, loosen the lower clamp, and slide the fork leg up through the upper clamp until the upper end of the inner tube is 2 mm lower than the upper surface of the stem head as shown in Fig. G95. Tighten the upper clamp bolts with 1.6 ~ 2.2 kg-m (11.5 ~ 16.0 ft-lbs) of torque.



- Install the rubber cap on each top of the inner tube.
- Tighten the stem head bolt with 4 ~ 5 kg-m (29 ~ 36 ft-lbs) of torque and the rear clamp bolt with 1.6 ~ 2.2 kg-m (11.5 ~ 16.0 ft-lbs) of toque.
- Tighten the front fork lower clamp bolts with 3.4 ~ 4.6 kg-m (25 ~ 33 ft-lbs) of torque.
- Run the right switch wiring harness between the stem head and the instrument unit, going to the left of the head pipe and along the frame top tube.

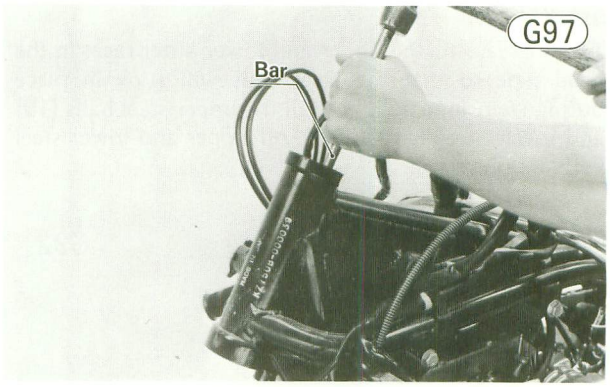


- Run the left switch wiring harness to the right of the head pipe and along the frame top tube.
- Connect the right and left switch leads and plugs to the same color leads of the main wiring harness.
- Run the front brake light switch lead between the stem head and the instrument unit.
- Strap the right switch housing wiring harness back onto the handlebar.
- Fit the tip of the clutch cable back into the clutch lever.
- Run the tachometer cable through its guide at the 3-way joint, fit the inner cable into the tachometer, and tighten the cable nut with pliers.
- Connect the front brake light switch leads to the switch. The leads may connect to either terminal.
- Run the plugs, sockets, and wiring into the headlight housing, and mount the headlight housing, tightening its mounting bolts. The sequence is mounting bolt, flat washer, fork cover, rubber damper, headlight housing, rubber damper, housing insert, and nut (Fig. G58).
- Insert the mounting bolt underneath the headlight housing.
- Connect the plugs, sockets, and leads in the headlight housing. Connect the same color leads to the same color leads.
- Install the headlight unit (Pg. 113).
- Install the front fender between the fork legs. First screw in the right side 3 mounting bolts, insert the guide holder plate between the left fork leg and the fender, then install the left side 3 mounting bolts. Tighten the bolts securely. Each bolt has a lockwasher.
- Secure the lower brake hose in its guide. Be sure the rubber grommet is in place.
- Install the front wheel (Pg. 97).
- Install the speedometer cable (Pg. 113).
- Check the steering and adjust it, if necessary (Pg. 26).
- Install the fuel tank (Pg. 39).
- Check the front brake and bleed the system, if necessary (Pg. 180).
- Adjust the clutch (Pg. 20).
- Check the throttle cables and adjust, if necessary (Pg. 16).
- Adjust the headlight (Pg. 28).
- Adjust the rear view mirrors.

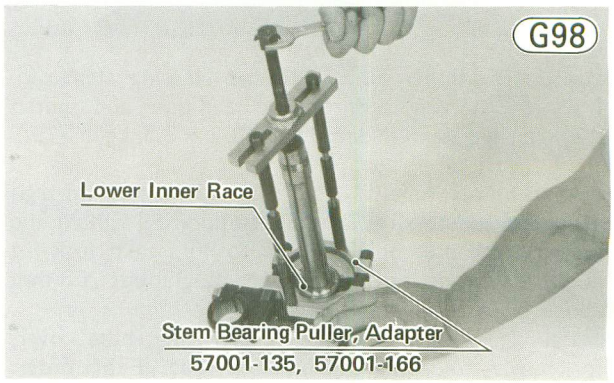
STEERING STEM BEARING

Removal:

- Remove the steering stem (Pg. 119).
- 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.

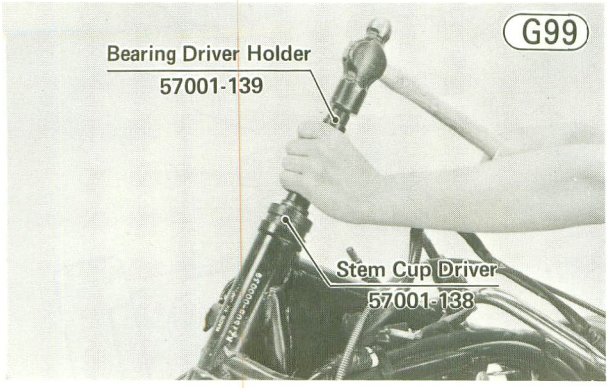


- Remove the lower inner race, which is pressed onto the steering stem, with a stem bearing puller and adapter (special tools). Be careful not to damage the grease seal under the race during race removal.



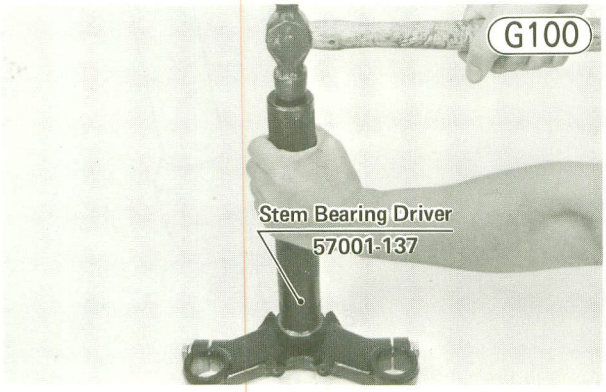
Installation:

•Apply oil to the outer races, and drive them into the head pipe using the stem cup driver and the bearing driver holder (special tools).



•Apply oil to the lower inner race, and drive it onto the steering stem using the stem bearing driver (special tool).

NOTE: Replace the grease seal with a new one, if damaged.

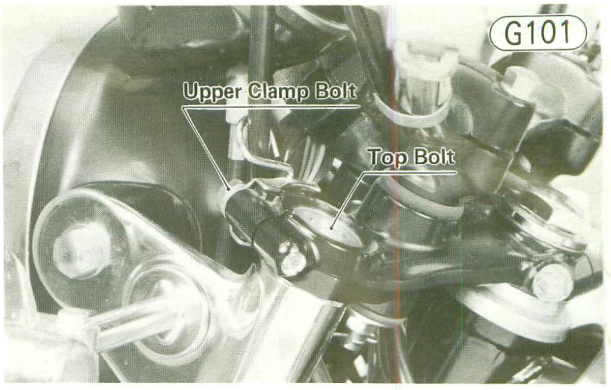


•Install the steering stem (Pg. 121).

FRONT FORK

Removal (left fork leg):

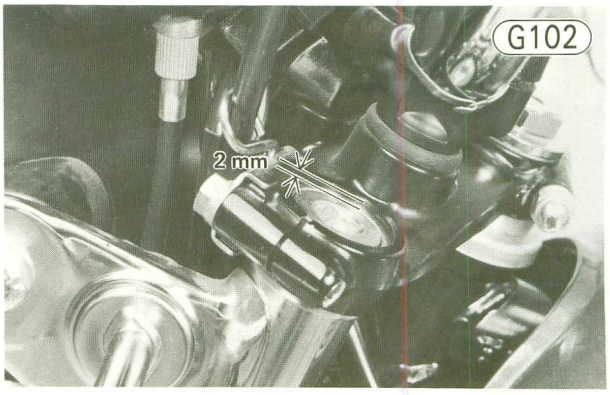
•Remove the caliper mounting bolts (2), and rest the caliper on some kind of stand.
•Remove the front wheel (Pg. 97).
•Remove the bolts (3) that hold the front fender to the left fork leg.
•Remove the rubber cap from the top of the inner tube.
•If the fork leg is to be disassembled after removal, loosen the top bolt first.



•Loosen the upper and lower clamp bolts.
•With a twisting motion, work the fork leg down and out.

Installation (left fork leg):

•Slide the fork leg up through the lower and upper clamps until the upper end of the inner tube is 2 mm lower than the upper surface of the stem head. Tighten the upper clamp bolt with 1.6 ~ 2.2 kg-m (11.5 ~ 16.0 ft-lbs) of torque and lower clamp bolt with 3.4 ~ 4.6 kg-m (25 ~ 33 ft-lbs) of torque.



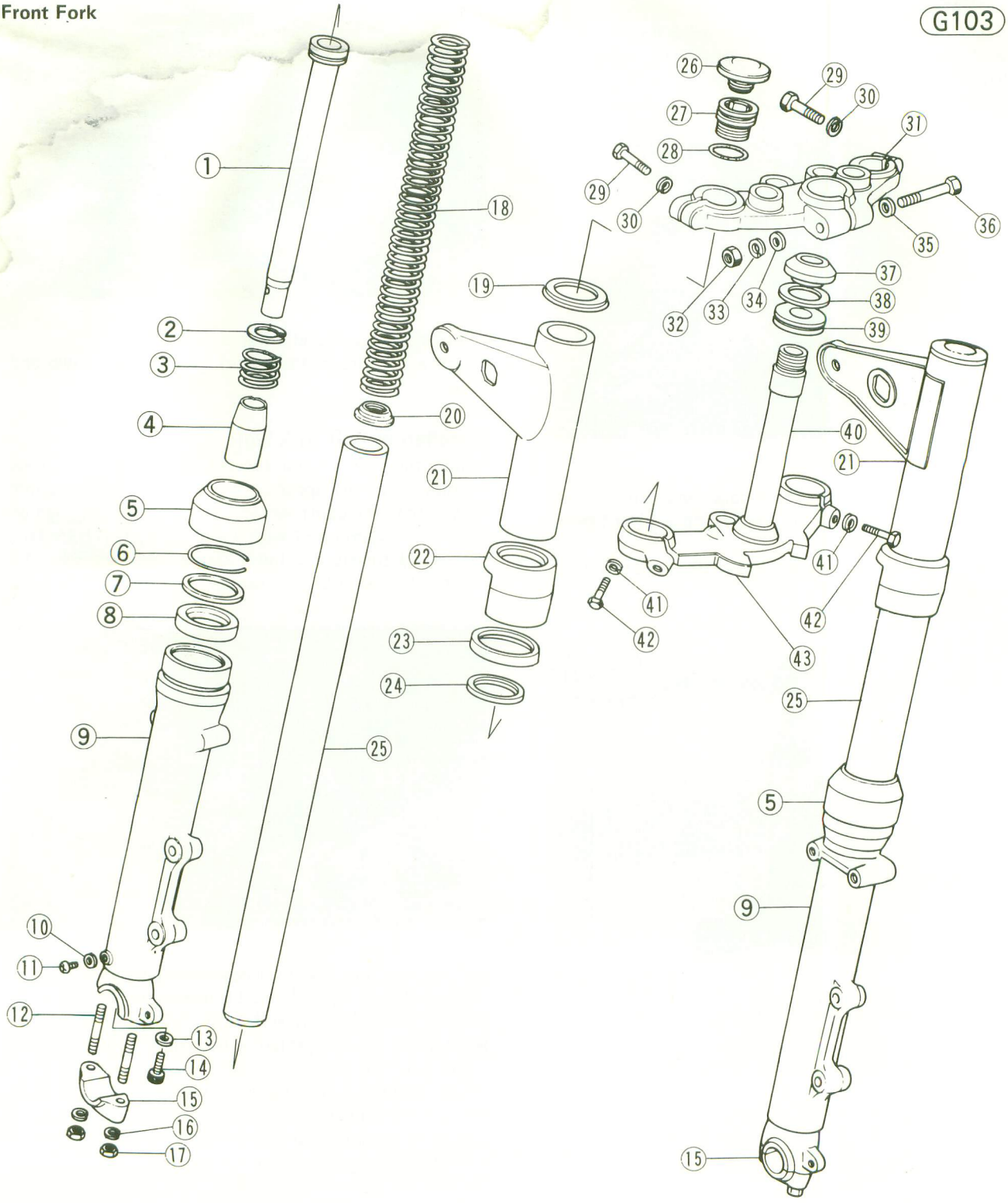
•If the top bolt was loosened during removal, tighten it with 2.5~3 kg-m (18~22 ft-lbs) of torque.
•Install the rubber cap to the top of the inner tube.
•Install the caliper, tightening the caliper mounting bolts with 3.4~4.6 kg-m (25~33 ft-lbs) of torque.
Each mounting bolt has a flat washer and lockwasher.
•Install the fender bolts (with lockwashers) through the guide holder plate, and position the plate between the front fender and the left front fork leg.
•Install the front wheel (Pg. 97).

Removal (right fork leg):

•Remove the front wheel (Pg. 97).
•Remove the bolts (3) that hold the front fender to the right fork leg.
•Remove the rubber cap from the top of the inner tube.
•If the fork leg is to be disassembled after removal, loosen the top bolt first.
•Loosen the upper and lower clamp bolts.
•With a twisting motion, work the fork leg down and out.

Front Fork

G103



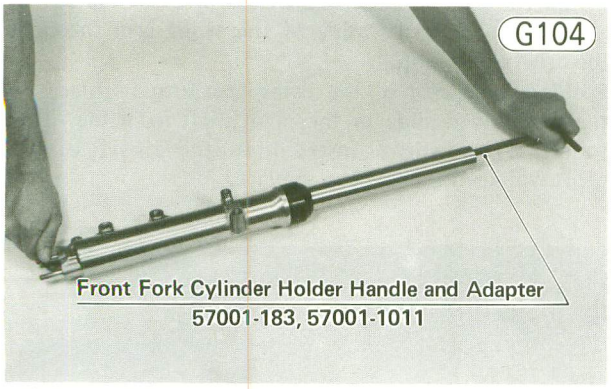
1. Piston and Cylinder Unit
2. Piston Ring
3. Spring
4. Cylinder Base
5. Dust Seal
6. Retainer
7. Washer
8. Oil Seal
9. Outer Tube
10. Gasket
11. Drain Screw
12. Stud
13. Gasket
14. Allen Bolt
15. Axle Clamp
16. Lockwasher
17. Clamp Nut
18. Spring
19. Ring Cap
20. Spring Seat
21. Fork Cover
22. Stem Base Cover
23. Damper Ring
24. Rubber Damper
25. Inner Tube
26. Rubber Cap
27. Top Bolt
28. O Ring
29. Upper Clamp Bolt
30. Lockwasher
31. Steering Stem Head
32. Nut
33. Lockwasher
34. Flat Washer
35. Flat Washer
36. Clamp Bolt
37. Lower Inner Race
38. Washer
39. Grease Seal
40. Steering Stem
41. Lockwasher
42. Lower Clamp Bolt
43. Steering Stem Base

Installation (right fork leg):

- Slide the fork leg through the lower and upper clamps until the upper end of the inner tube is 2 mm lower than the upper surface of the stem head. Tighten the upper clamp bolt with 1.6 ~ 2.2 kg-m (11.5 ~ 16.0 ft-lbs) of torque and lower clamp bolt with 3.4 ~ 4.6 kg-m (25 ~ 33 ft-lbs) of torque.
- If the top bolt was loosened during removal, tighten it with 2.5~3 kg-m (18~22 ft-lbs) of torque.
- Install the rubber cap to the upper end of the inner tube.
- Install the fender bolts (with lockwashers). Be sure to position the spacer plate between the right fork leg and the front fender.
- Install the front wheel (Pg. 97).

Disassembly:

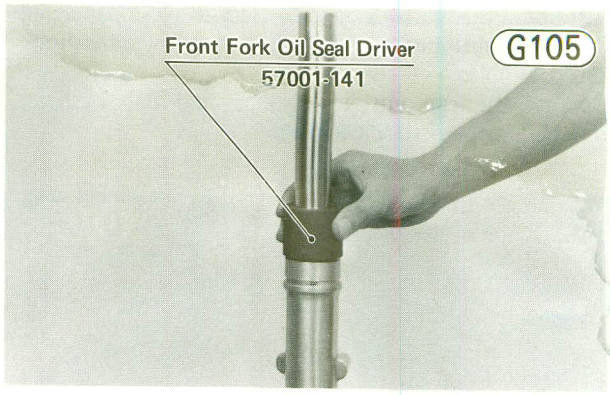
- Remove the top bolt ㉗, and pull out the spring ⑱, and spring seat ⑳.
- Pour the oil into a suitable container, pumping as necessary to empty out all the oil.
- Stop the cylinder ① from turning by using the front fork cylinder holder handle and adapter (special tools). Unscrew the Allen bolt ⑭ and gasket ⑬ from the bottom of the outer tube ⑨ and then separate the inner tube from the outer tube by pulling it out.



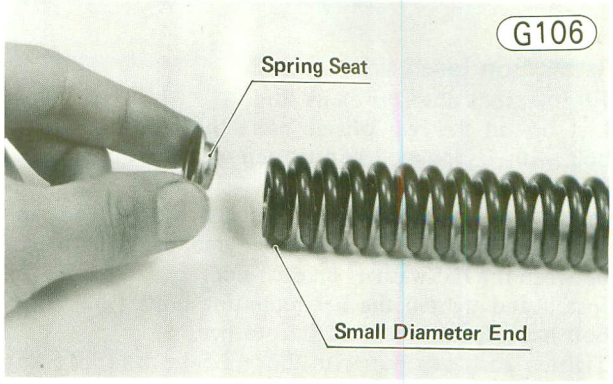
- Remove the cylinder base ④.
- Slide or push the cylinder and piston unit ① and its spring ③ out the top of the inner tube.
- Slide the dust seal ⑤ off the inner tube ㉕.
- Remove the retainer ⑥ from the outer tube with a sharp hook. Remove the washer ⑦, and then pull out the oil seal ⑧. Be careful not to damage the outer tube. It may be necessary to heat the outer tube around the oil seal before pulling it out.

Assembly Notes:

1. Apply liquid gasket to both sides of the gasket, apply a non-permanent locking agent to the Allen bolt, and tighten it using the front fork cylinder holder and holder adapter (special tools) to stop the cylinder from turning. The torque for the Allen bolt is 2.0~2.6 kg-m (14.5~19.0 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).



3. Install the spring seat ⑳ to the smaller diameter end of the spring ⑱, and install the spring with the smaller diameter end facing down.

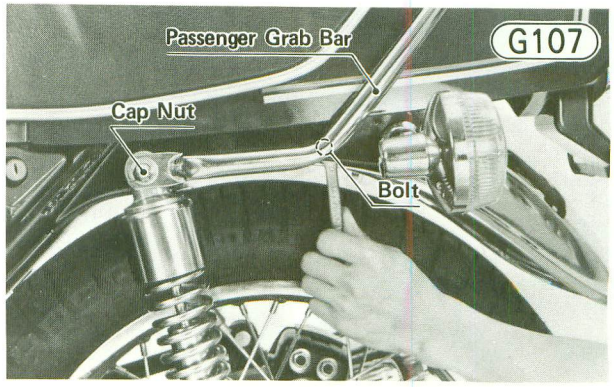


4. Refill with 182 ~ 191 cc of fresh SAE 15W oil.
5. After installing the front fork leg, tighten the top bolt to 2.5~3.0 kg-m (18~22 ft-lbs) of torque.

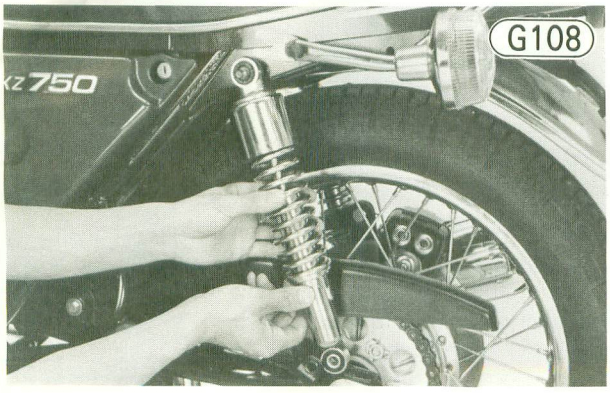
REAR SHOCK ABSORBERS

Removal (each side):

- Set the motorcycle up on its center stand.
- Remove the muffler (Pg. 43).
- Remove the passenger grab bar mounting bolts (2), loosen the shock absorber cap nuts (2), and take off the bar.



- Lift up on the rear wheel as necessary to avoid damaging the shock absorber bolt threads, and remove the shock absorber bolt.
- Remove the cap nut, lockwasher, and flat washers, and pull off the shock absorber.



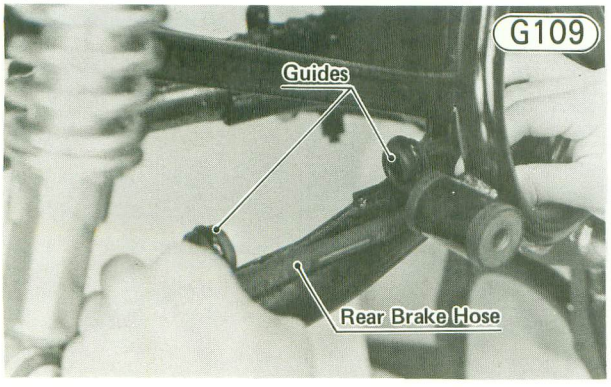
Installation (each side):

- Fit the shock absorber on its stud.
- Lift up on the rear wheel, insert the shock absorber bolt with its locknut, and tighten with 2.6 ~ 3.5 kg-m (19.0 ~ 25 ft-lbs) of torque.
- Install the large flat washer, small flat washer, and cap nut, and then fit the passenger grab bar into place between the flat washers on each side.
- Install and tighten the bar mounting bolts (2). Each bolt has a lockwasher and flat washer.
- Tighten each cap nut with 2.6 ~ 3.5 kg-m (19.0 ~ 25 ft-lbs) of torque.
- Mount the muffler (Pg. 44).

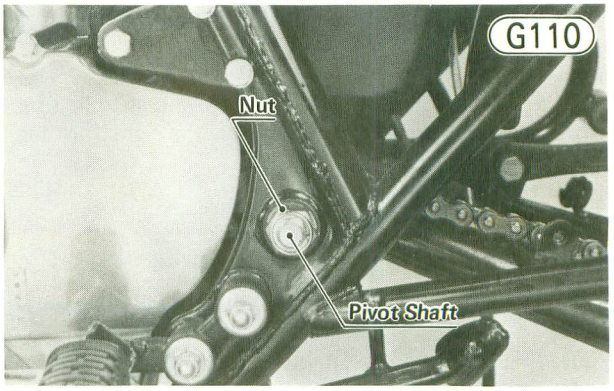
SWING ARM

Removal:

- Set the motorcycle up on its center stand.
- Remove the mufflers (Pg. 43).
- Remove the rear wheel (Pg. 104).
- Remove the rear caliper (Pg. 107).
- Pull off the rear brake hose from the guides on the swing arm, and secure the brake hose to some place higher than the rear brake reservoir to prevent fluid from flowing out.



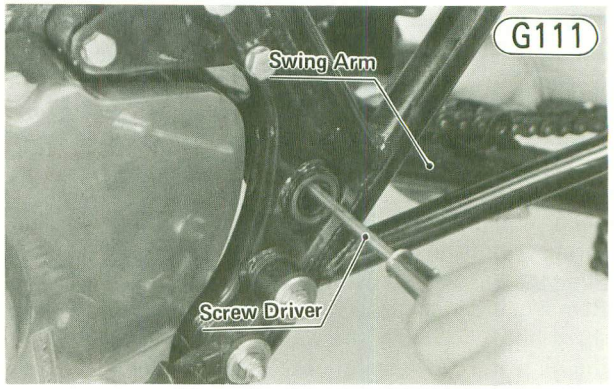
- Remove the mounting bolt from each shock absorber bottom. A lockwasher comes off with the bolt.
- Move the swing arm up and down to check for abnormal friction. If abnormal friction is felt, inspect swing arm (Pg. 187).
- Remove the pivot shaft nut and pull out the pivot shaft.



- Pull back the swing arm. A cap and an **O** ring on each side of the pivot will also drop off.

Installation:

- Install the cap on each end of the pivot of the swing arm, and put the left side of the swing arm through the drive chain loop.
- Position the pivot of the swing arm into its place in the frame, and slide in the pivot shaft from the right to left. A screwdriver inserted into the left side of the pivot will keep the left cap in place.



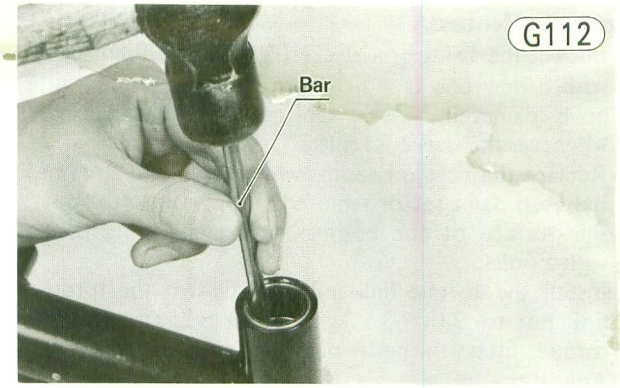
- Install the pivot shaft nut and tighten the nut with 8 ~ 12 kg-m (58 ~ 87 ft-lbs) of torque.
- Install the rear shock absorber bolts and lock washers, tightening each bolt with 2.6 ~ 3.5 kg-m (19.0 ~ 25 ft-lbs) of torque.
- Install the rear caliper (Pg. 108).
- Secure the brake hose in its guides with its rubber grommets, and install the brake hose fitting to the caliper tightening its banjo bolt with 2.9 ~ 3.1 kg-m (21 ~ 22 ft-lbs) of torque. There is a flat washer for each side of the fitting.
- Install the rear wheel (Pg. 104).

- Adjust the drive chain (Pg. 24).
- Install the mufflers (Pg. 44).
- Refill the brake lines and bleed air from the lines (Pg. 180).

Disassembly:

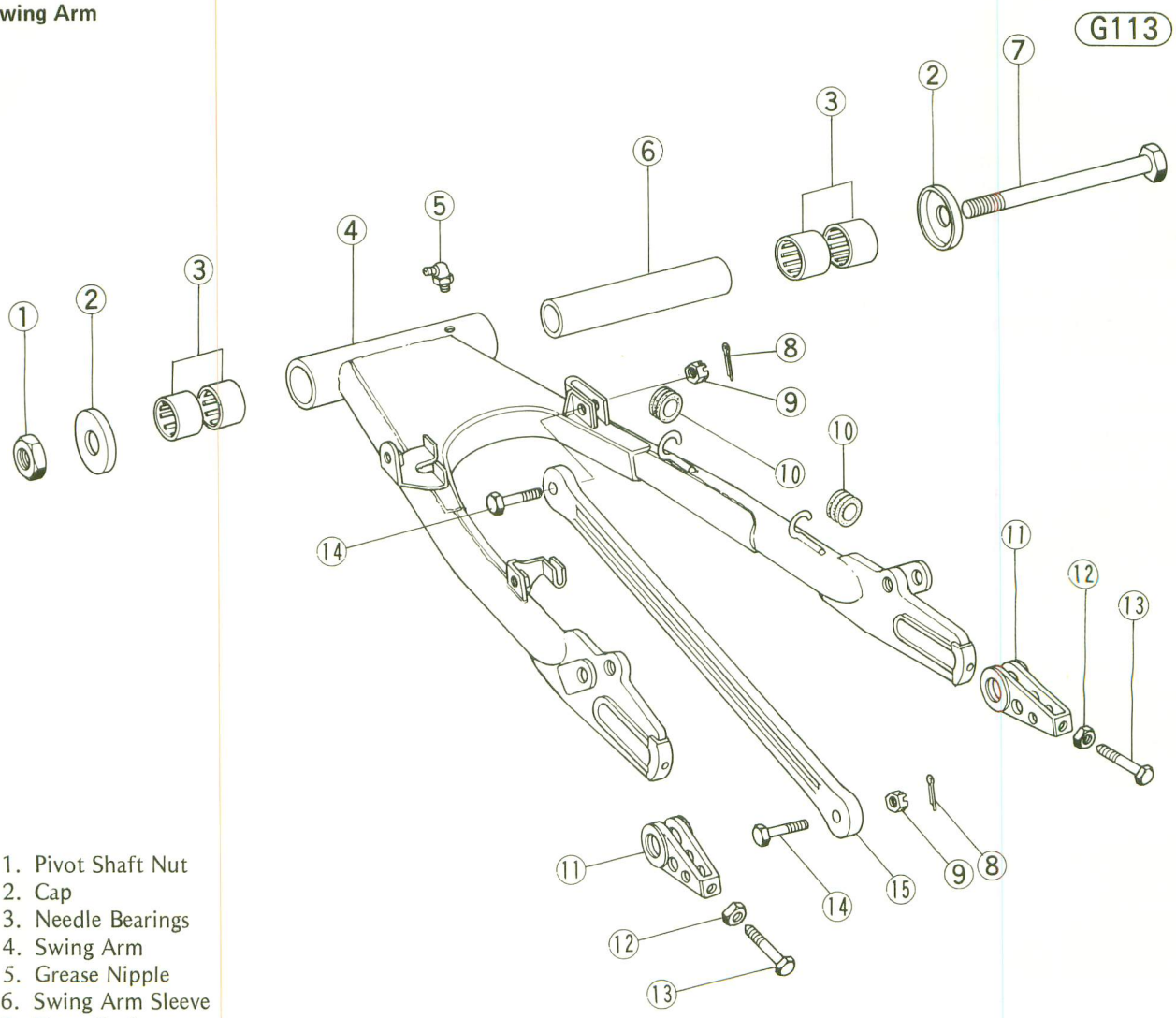
NOTE: As the swing arm needle bearings will be damaged upon removal, be sure to have new ones on hand prior to disassembly.

- Remove the clip ⑧ from the torque link bolt ⑭. Take out the nut ⑨ and bolt, and then remove the torque link ⑮ from the swing arm ④.
- Pull out the swing arm sleeve ⑥.
- Insert a bar into one side, hammering on them lightly to knock out the needle bearings ③ on the opposite side.



- Use the bar again to knock out the other bearings.

Swing Arm



1. Pivot Shaft Nut
2. Cap
3. Needle Bearings
4. Swing Arm
5. Grease Nipple
6. Swing Arm Sleeve
7. Pivot Shaft
8. Cotter Pin
9. Torque Link Nut
10. Rubber Grommet
11. Chain Adjuster
12. Locknut
13. Adjusting Bolt
14. Bolt
15. Torque Link

Assembly Notes:

1. Inspect the swing arm sleeve (Pg. 187), 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. Apply oil to the outside surface of the bearings before installing them with a press.
3. Install the torque link and then tighten the torque link nut to 2.6 ~ 3.5 kg-m (19.0 ~ 25.0 ft-lbs) of torque. Insert the cotter pin through the bolt.
4. Adjust the drive chain (Pg. 24) after installing the swing arm.

DRIVE CHAIN

Removal:

WARNING **The chain must not be cut for installation, as this may result in subsequent chain failure and loss of control.**

- Remove the mufflers (Pg. 43).
- Remove the rear wheel (Pg. 104).
- Remove the swing arm (Pg. 126).
- Remove the engine sprocket (Pg. 60) and take off the chain.

Installation:

- Install the engine sprocket (Pg. 60).
- Install the swing arm (Pg. 126).
- Install the rear wheel (Pg. 104).
- Install the muffler (Pg. 44).
- Adjust the drive chain (Pg. 24).

Maintenance–Engine

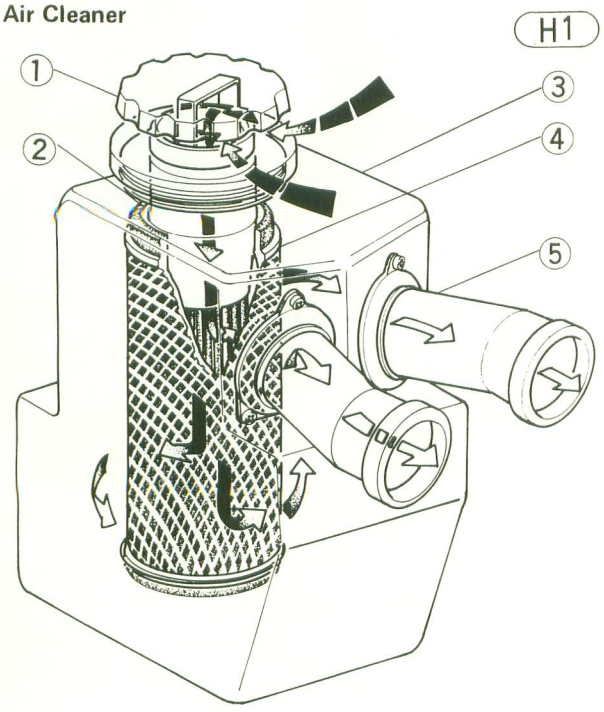
Table of Contents

AIR CLEANER

A properly maintained air cleaner ensures that only clean, filtered air is supplied through the carburetor into the engine. If the air is supplied directly without filtering, dirt and dust from the air will clog carburetor passages causing the engine to run poorly. The dust that enters the engine will also act like grinding compound, wearing down the cylinders, pistons, and rings. If the air cleaner element is damaged, the result will be the same as if no element were used.

An air cleaner element clogged with dirt chokes the air supply to the engine, resulting in an overly rich fuel/air mixture and inefficient combustion. This in turn causes overheating from carbon build-up, and reduced engine power.

Air Cleaner



1. Air Cleaner Cap
2. Element
3. Air Cleaner Housing
4. Element Frame
5. Intake Duct

Cleaning and replacement

The air cleaner element must be cleaned periodically (Pg. 10). In extremely dry, dusty areas, the element will need to be cleaned more often. After riding through rain or on muddy roads, the element should be cleaned immediately.

Remove the air cleaner element (Pg. 39). Clean it in a bath of a high flash-point solvent, and then dry it from the inside using compressed air. Since this is a dry-type element, do not use kerosene or any fluid which would leave the element oily.

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

Since repeated cleaning opens the pores of the element, replace it with a new one in accordance with the periodic maintenance chart (Pg. 10). Also, if there is a break in the element material or any other damage to the element, replace the element with a new one.

CARBURETORS

The carburetors perform the function of mixing the fuel and air in the proportions necessary for good engine performance at varying speeds and loads. In order for them to function satisfactorily, they must be properly adjusted and maintained. The throttle cable adjustment, idling adjustment, and synchronizing adjustment are covered in the Adjustment Section. The discussion here concerns the fundamentals of carburetor operation, fuel level adjustment, and the cleaning and replacement of carburetor parts.

A linkage mechanism turns each carburetor butterfly valve the same amount in response to throttle grip movement so that the carburetors operate in unison. As the throttle grip is turned counterclockwise, the throttle accelerator cable turns the carburetor pulley. Through the linkage mechanism the pulley opens the butterfly valves. As the throttle grip is turned clockwise or is released, the linkage mechanism return spring, together with the throttle decelerator cable, closes the butterfly valves.

One of the basic principles in carburetor operation is that the pressure exerted by a moving body of air is less than atmospheric pressure. As the engine draws air in through the carburetor bore, the air pressure in the carburetor bore is less than the air pressure in the float chamber, which is vented to the atmosphere. This difference in air pressure forces fuel up through passages into the carburetor bore, where it is atomized by the high-speed air flowing into the engine.

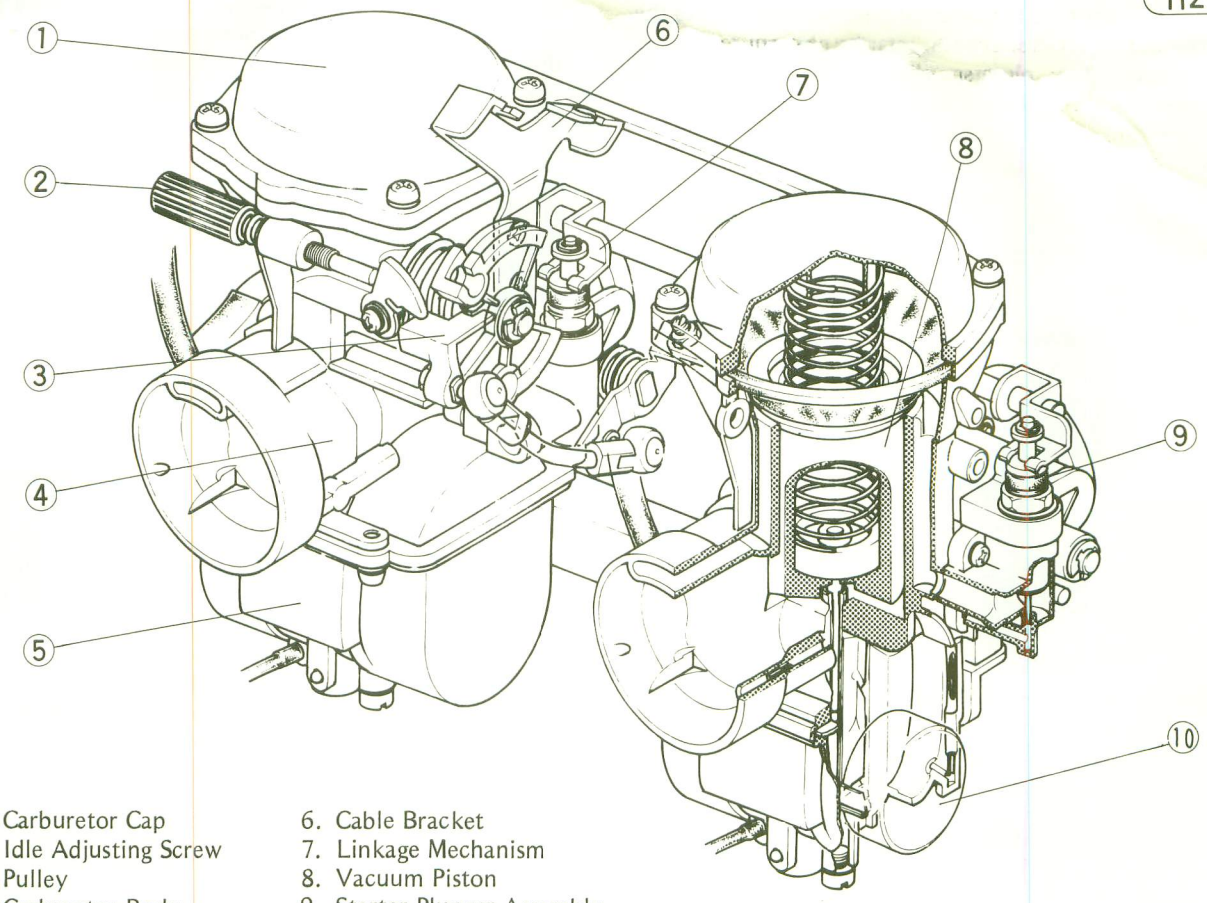
Another important principle is the Venturi Principle, which states that when an air passage narrows, moving air flows faster, exerting even less pressure. For example, at low speeds (0 ~ ¼ throttle) the vacuum piston is at its lowest position, forming what is called the "primary venturi". In this position, the vacuum piston constricts the air passage to increase air flow speed over the jets. Thus, even at low engine speeds, there is enough pressure differential to force the necessary amount of fuel into the air stream.

Table H1 Carburetor Specifications

Type	Main Jet	Needle Jet Badge #	Jet Needle	Pilot Jet	Starter Jet	Design Fuel Level	Service Fuel Level
BS38	125	Z-2	4HL12-3	40	50	30 ± 1 mm	5.5 ± 1 mm

Carburetors

H2



1. Carburetor Cap
2. Idle Adjusting Screw
3. Pulley
4. Carburetor Body
5. Float Bowl
6. Cable Bracket
7. Linkage Mechanism
8. Vacuum Piston
9. Starter Plunger Assembly
10. Float

The amount of fuel passing through a jet depends both on the size of the jet and on the speed of the air flow over the jet. The speed of this air flow is in turn determined both by the engine rpm and by the dimensions of the passage (varies by the vacuum piston) just above the jet. The size of the jet openings, the various dimensions of the air passages, and the engine rpm are correlated through carburetor design so that, when properly adjusted, the carburetor meters the fuel and air in the correct proportions at different throttle openings.

The ratio of fuel-to-air at different throttle openings is set through carburetor design by a number of interrelating factors.

0 ~ ¼ throttle	pilot screw
¼ ~ ¾ throttle	jet needle position
¾ ~ 1 throttle	main jet size

The carburetor specifications (Table H1) have been chosen for best all around performance, and ordinarily will not require any change. Carburetor trouble can be caused by dirt, wear, maladjustment, or improper fuel level in the float chamber. A dirty or damaged air cleaner can also alter the fuel-to-air ratio.

Table H2 Mixture Trouble Symptoms

Poor running
Overheating
Exhaust smokes excessively

The following explanation of the functioning and maintenance of the carburetors covers the four main systems for fuel regulation and supply.

Table H3 Carburetor Systems

System	Function
Starter System	Supplies the necessary rich mixture for starting a cold engine.
Pilot System	Supplies fuel at idling and low speeds.
Main System	Supplies fuel at medium and high speeds.
Float System	Maintains the fuel at a constant level in the float chamber.

CAUTION

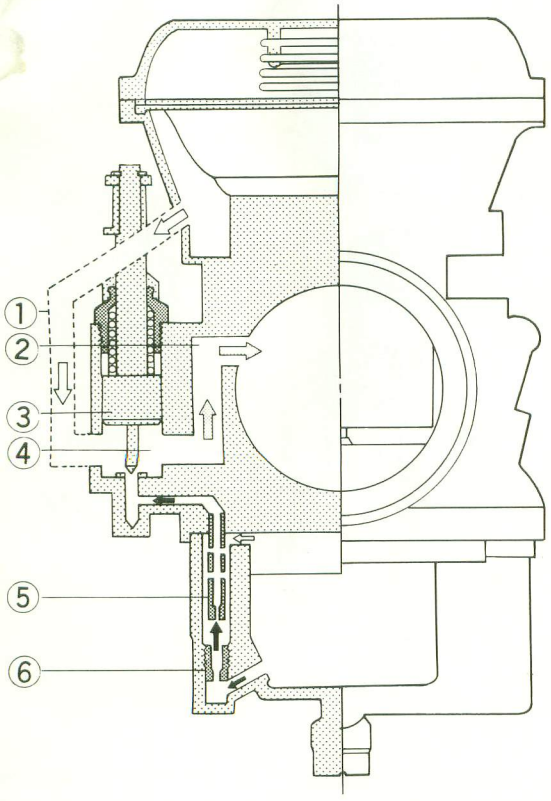
1. **Remove the diaphragm before cleaning the carburetor with compressed air, or it will be damaged.**
2. **The carburetor body has plastic parts that cannot be removed. DO NOT use a strong carburetor cleaning solution which could attack these parts; instead, use a mild cleaning solution safe for plastic parts.**
3. **Do not use wire for cleaning as this could damage the jets.**

Starter System

Fig. H3 shows the starter system, which includes the starter jet ⑥, starter pipe ⑤, starter plunger ③, starter air passage ①, plunger chamber ④, and mixture passage ②.

Starter System

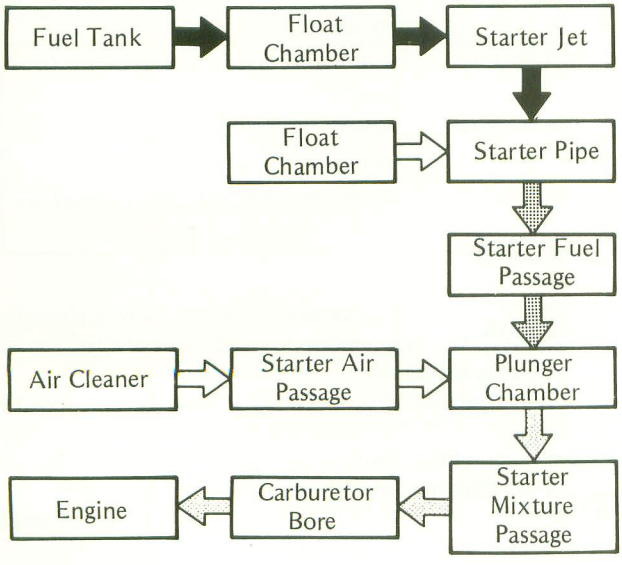
H3



1. Air Passage
2. Mixture Passage
3. Starter Plunger
4. Plunger Chamber
5. Starter Pipe
6. Starter Jet

Starter System Fuel and Air Supply

H4



The starter system provides the exceptionally rich fuel/air ratio that is necessary to enable easy starting when the engine is cold. When starting the engine, the throttle is left closed, and the starter plunger is pulled fully open by pulling up the choke lever. Since the butterfly valve is closed, a high intake vacuum (suction or low pressure) is developed at the engine side of the carburetor bore. The starter plunger, when raised, opens up the starter fuel passage and an air passage so that they connect to the engine side of the carburetor bore. As the engine is cranked over, it draws in air through this air passage and fuel from the float chamber through the starter fuel passage. Fuel metered by the starter jet mixes with a small amount of air drawn in through air bleed holes in the starter pipe as it rises in the starter fuel passage. This small amount of air prepares the fuel for better atomization once it reaches the plunger chamber (the area just below the raised plunger) where the fuel mixes with the air drawn in through the air passage. Through the mixture passage, this mixture is then drawn into the carburetor bore where it, together with a small amount of mixture supplied by the pilot system, is drawn into the engine.

In order for the starter system to work properly, the throttle must be kept closed so that sufficient vacuum can be built up at the starter outlet. Also, the choke lever must be pulled up fully so that the starter plunger will fully open the air passage and starter fuel passage to the carburetor bore. Clogged starter pipe air bleed holes will cause insufficient atomization, thus impairing starter system efficiency. Fuel mixture trouble results if the plunger does not seat properly in its rest position after the choke lever is returned. This may be caused by dirt, gum, a defective spring, deformed plunger chamber bore, or damaged plunger seat rubber.

Cleaning (See caution Pg. 131)

Remove the diaphragm and float bowl. Blow the starter pipe, starter air passage, mixture passage, and starter jet clean with compressed air.

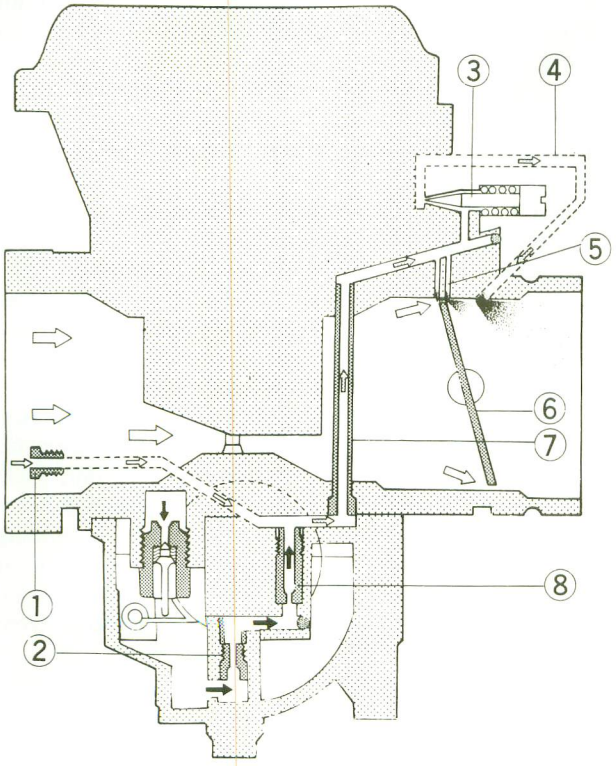
Remove the starter plunger, and clean it with a high flash-point solvent.

Pilot System

Fig. H5 shows the pilot system, which includes the pilot jet ⑧, pilot air jet ①, pilot passage pipe ⑦, pilot bypass ⑤, pilot screw ③, and pilot screw passage ④.

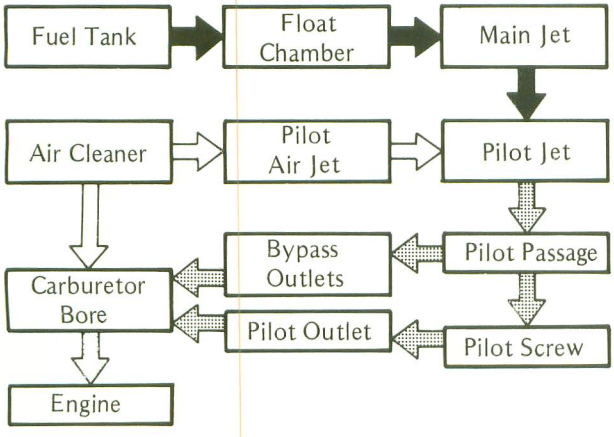
The pilot system determines the operation of the carburetor from 0 to ¼ throttle opening. At small throttle openings, almost no fuel is drawn through the main system due to insufficient air flow. Instead, the fuel is drawn through the main and pilot jets as a result of the low pressure (suction) brought about by the demand for air by the engine, and the limited but relatively fast flow of air past the pilot outlets. The almost closed position of the butterfly valve restricts the carburetor bore air flow, preventing it from relieving the low pressure created by the engine around the pilot outlets. The venturi effect (the narrower the air passage, the faster the flow of air) at the engine side of the butterfly valve further reduces the low pressure.

Pilot System H5



1. Pilot Air Jet
2. Main Jet
3. Pilot Screw
4. Pilot Screw Passage
5. Pilot Bypass
6. Butterfly Valve
7. Pilot Passage Pipe
8. Pilot Jet

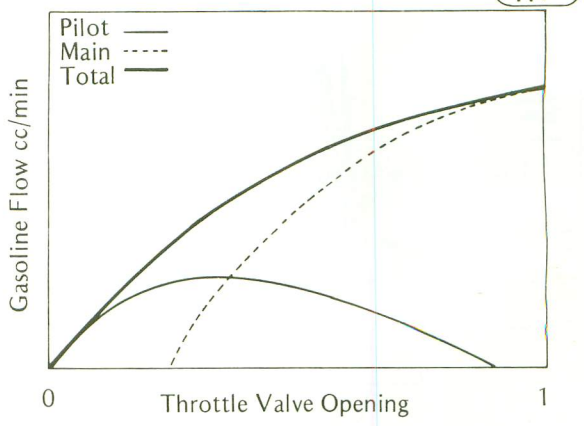
Pilot System Fuel and Air Supply H6



The supply of the fuel and air in the pilot system is shown in Fig. H6. At idling, fuel passes through the main jet and is metered by the pilot jet. It mixes with air metered by the pilot air jet, and flows through the pilot passage. The pilot screw controls flow to the pilot outlet, where the mixture enters the carburetor bore, and is drawn into the engine. As the butterfly valve begins to open, its position extends the low pressure area to the pilot bypass outlets, allowing fuel to "bypass" part of the pilot passage and go directly to the carburetor bore. In this way, the supply of fuel increases sufficiently with engine need.

Fig. H7 shows through opening versus fuel flow for the main and pilot systems. If there is trouble in the pilot system, starting and low speed running are affected. The transition from pilot to main system is not smooth as the throttle is opened, causing a drop in engine efficiency. Pilot system trouble might be due to maladjustment; a dirty or loose pilot jet or pilot air jet; or clogging of the main jet, pilot passage, pilot outlet, or pilot bypass outlets.

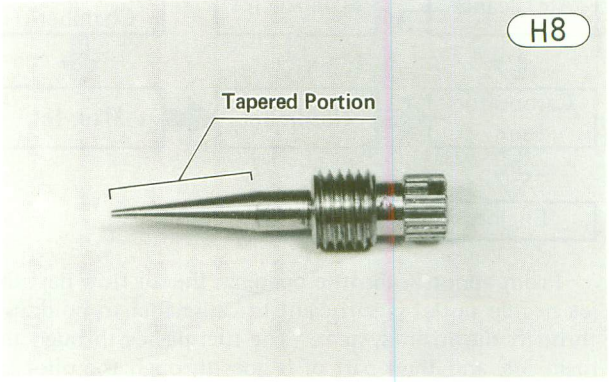
Flow Characteristic H7



Cleaning and replacement (See cautions Pg. 131)

Remove the diaphragm and pilot screw. Wash the main jet, pilot jet, and pilot air jet with a high flash-point solvent; and blow them clean with compressed air. Use compressed air to clean the pilot passage and pilot air jet passage.

Check that the pilot screw tapered portion is not worn or otherwise deformed. If it is, replace the screw.

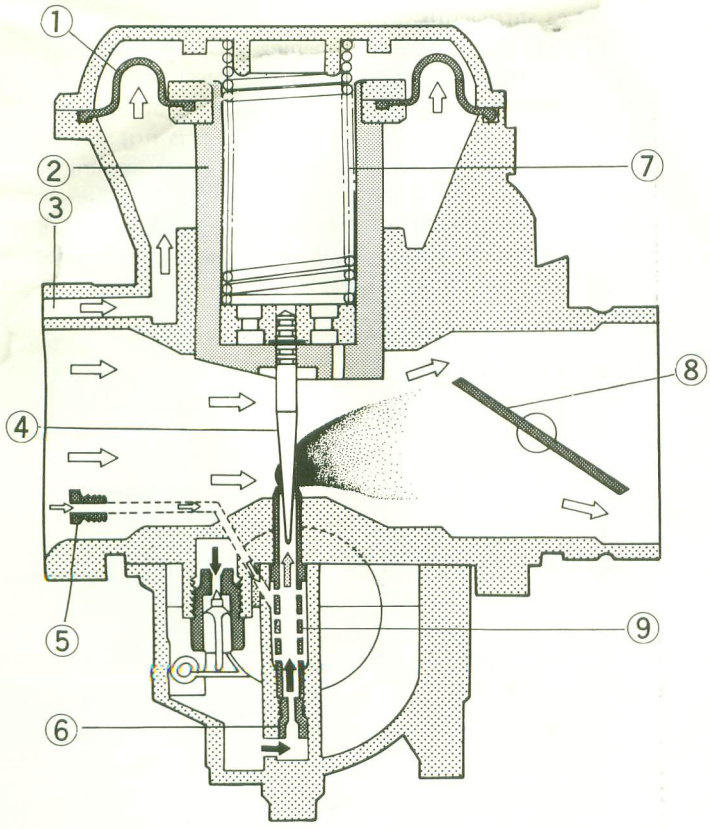


Main System

Fig. H9 shows the main system, which consists of the main jet ⑥, needle jet ⑨, jet needle ④, vacuum piston ②, main air jet ⑤, diaphragm ①, spring ⑦, and air vent ③. Fig. H10 shows the supply of fuel and air in the main system.

Main System

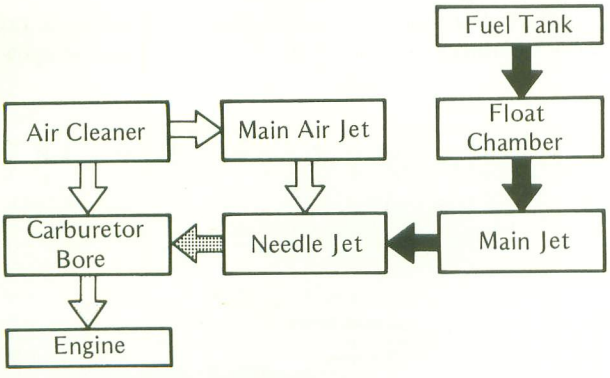
H9



1. Diaphragm
2. Vacuum Piston
3. Air Vent
4. Jet Needle
5. Main Air Jet
6. Main Jet
7. Spring
8. Butterfly Valve
9. Needle Jet

Main System Fuel and Air Supply

H10



From about ¼ throttle opening, the air flow past the jet needle outlet is sufficient to cause fuel to be drawn through the main system. The fuel passes through the main jet, and then part of it goes through the pilot jet as in the pilot system. The rest of the fuel passes straight up through the needle jet and into the carburetor bore, where it is atomized by the air flow to the engine.

The needle jet has holes to admit the air metered by the main air jet. This air mixes with the fuel in the needle jet to prepare the fuel for better atomization in the carburetor bore.

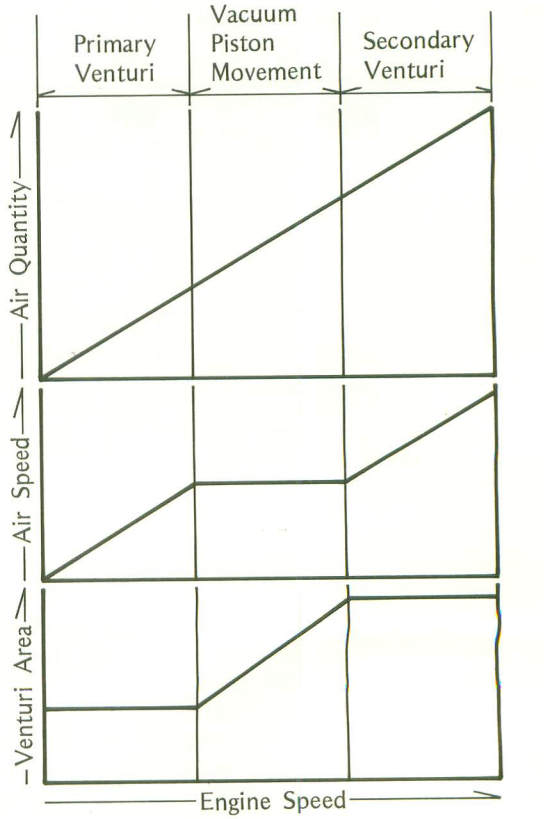
The lower part of the jet needle is tapered and extends down into the needle jet. It is fixed to the vacuum piston, and thus rises up in the needle jet as the vacuum piston rises. From the time the vacuum piston starts rising, about ¼ throttle, until it reaches most of the way up in the carburetor bore, the fuel is metered primarily by the jet needle taper. As the jet needle rises, the needle-to-jet clearance increases, thereby increasing the amount of fuel that can pass up through the jet.

The vacuum piston is attached to the diaphragm and rises only between ¼ and ¾ throttle. Through the hole in the bottom of the piston, the air pressure in the bottom of the piston, the air pressure in the chamber above the diaphragm is reduced by engine intake vacuum. The air vent maintains atmospheric pressure in the chamber under the diaphragm. As engine speed increases, air pressure in the upper chamber decreases. The difference between this pressure and atmospheric pressure in the lower chamber becomes greater. The force of the spring and the weight of the piston are overcome, and the piston rises to an extent corresponding to this pressure difference. The diaphragm is made of rubber and absorbs the vibration caused by engine intake pulsing to prevent the vacuum piston from wearing.

As shown in Fig. H11 the quantity of air drawn in by engine intake is in direct proportion to engine rpm, and the speed of the air flow is almost constant while the vacuum piston rises from ¼ to ¾ throttle. In a conventional slide-type carburetor, the size of the air passage above the needle jet changes with throttle movement rather than with engine intake (demand).

Vacuum Piston Movement

H11



The venturi effect creates a momentary drop in air flow speed when the throttle is opened suddenly. This often causes a slight stall in acceleration. However, the vacuum piston-butterfly valve arrangement controls both the air and fuel supplies during sudden throttle movements for smooth and immediate engine response.

At ¾ throttle the vacuum piston reaches its highest position, forming the "secondary venturi" to permit maximum engine output. At near full throttle openings, the cross-sectional area of the needle-to-jet clearance becomes greater than the main jet. At these openings, the fuel drawn up into the carburetor bore is limited by the size of the main jet rather than the needle-to-jet clearance.

Trouble in the main system is usually indicated by poor running, or lack of power at high speeds. A dirty or clogged main jet will cause the mixture to become too lean. An overly rich mixture could be caused by clogging of the main air jet, its air passage, or the air holes in the needle jet; by needle jet or needle wear (increasing clearance); by a loose main jet; or by a loose needle jet.

Cleaning (See caution on Pg. 131)

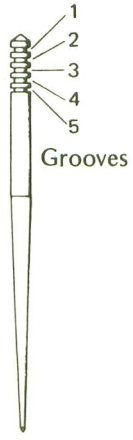
Disassemble the carburetor and wash the main jet, bleed pipe, needle jet, jet needle, air jet, and air passage with a high flash-point solvent, blowing them clean with compressed air. If necessary, use a bath of automotive type carburetor cleaner. A worn needle jet or jet needle should be replaced.

NOTE: The last number of the jet needle number ("3" of 5CL10-3) is not stamped on the needle, but is the number of the groove in which the clip **must** be installed. The groove numbers are counted from the top of the needle, 1 being the topmost groove, and 5 being the lowest groove.

CAUTION **If the clip is put in any but the specified groove, exhaust emission will be increased, and the engine may suffer serious damage which could result in a crash.**

Jet Needle

H12

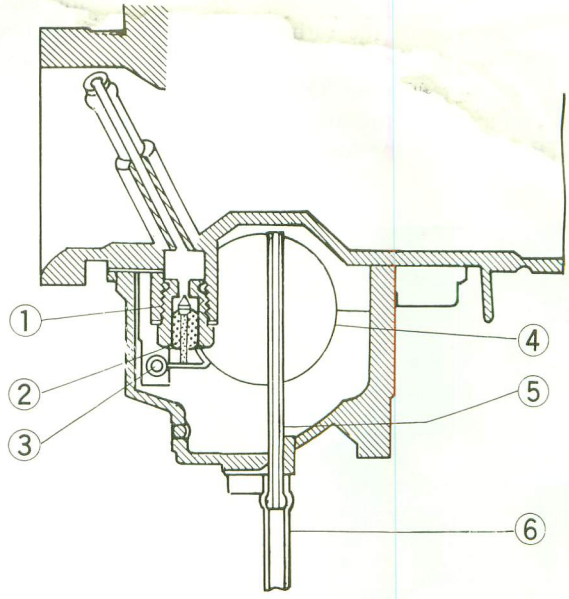


Float System

Fig. H13 shows the float system, which consists of the float ④, float valve needle ②, float valve seat ①, and overflow pipe ⑤.

Float System

H13



1. Float Valve Seat
2. Float Valve Needle
3. Float Pin
4. Float
5. Overflow Pipe
6. Overflow Tube

The float system serves to keep a relatively constant level of fuel in the carburetor float chamber at all times so that the fuel supply to the engine will be stable. If the fuel level in the float chamber is set too low, it will be more difficult for fuel to be drawn up into the carburetor bore, resulting in too lean a mixture. If the level is set too high, the fuel can be drawn up too easily, resulting in too rich a mixture.

The design fuel level is defined as the vertical distance from the center of the carburetor bore to the surface of the fuel in the float chamber. The fuel level is maintained at a constant value by the action of the float valve, which opens and closes according to the fuel level. As fuel flows through the float valve into the chamber, the fuel level rises. Thr float, rising with the fuel level, pushes up on the needle. When the fuel reaches a certain level, the needle is pushed completely into the valve seat, which closes the valve so that no more fuel may enter the chamber. As the fuel is drawn up out of the float chamber, the fuel level drops, lowering the float. The needle no longer blocks the float valve, and fuel once again flows through the float valve into the chamber.

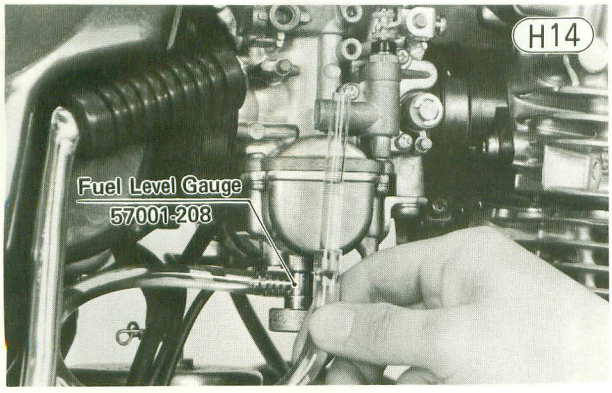
NOTE: It is impractical to measure the actual design fuel level. Service fuel level is defined as the vertical distance from the bottom edge of the carburetor body to the surface of the fuel in the float chamber. Measuring the service fuel level is an indirect method of inspecting for correct design fuel level.

Service fuel level/measurement and adjustment

If the motorcycle exhibits symptoms of improper fuel mixture, measure the service fuel level. Secure the motorcycle in a true vertical position. Turn the

fuel tap to the "OFF" position, and remove the drain plug from the bottom of the float bowl. Install the fuel level gauge (special tool). Hold the plastic tube against the side of the carburetor so that the "0" line is even with the bottom edge of the carburetor body. Turn the fuel tap to the "ON" position. Read the service fuel level in the plastic tube.

NOTE: Measure the fuel level at the center of the carburetor.



Fuel Level Measurement H15

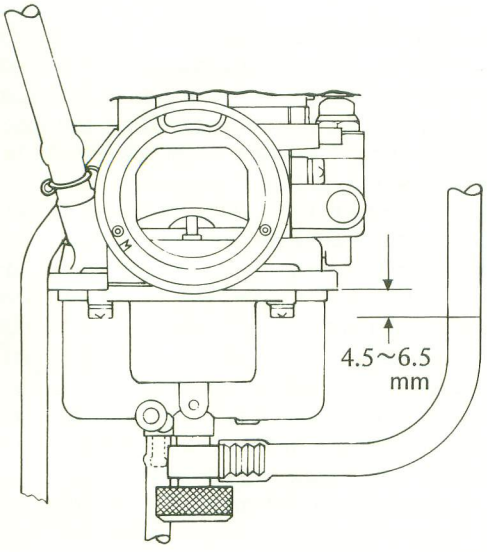
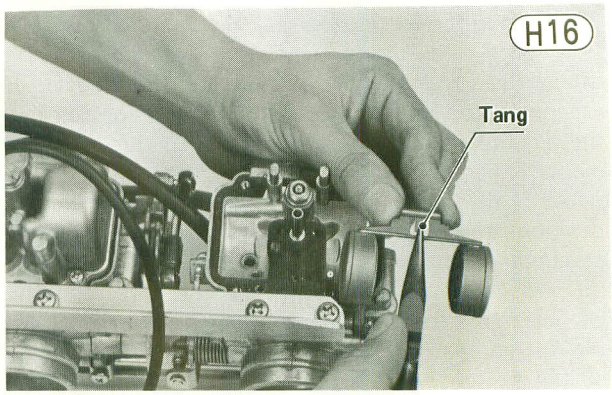


Table H4 Service Fuel Level

Standard
4.5~6.5 mm below from the bottom edge of the carburetor body to the fuel level

If the fuel level is incorrect, remove the carburetor (Pg. 39), and then remove the float bowl and float. Bend the tang on the float a very slight amount to change the fuel level. Bending it down closes the valve sooner and lowers the fuel level; bending it up raises the level.

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



Cleaning and replacement (See caution Pg. 131)

If dirt gets between the needle and seat, the float valve will not close and fuel will overflow. Overflow can also result if the needle and seat become worn. If the needle sticks closed, no fuel will flow into the carburetor.

Remove the carburetor, and take off the float bowl and float. Wash the bowl and float parts in a high flash-point solvent. Use carburetor cleaner if necessary on the float bowl and metal parts. Blow out the fuel overflow pipe with compressed air.

Examine the float, and replace if damaged. If the needle is worn as shown in the diagram, replace the needle and seat as a set.

Vlave Needle H17

Good Bad

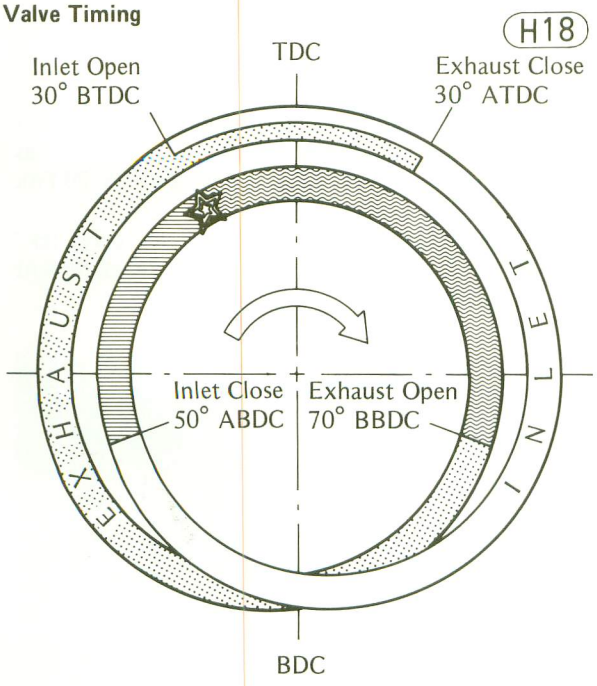
CAMSHAFTS

Since this engine is the DOHC (Double Over Head Camshaft) type, there are two camshafts mounted in the top of the cylinder head. One is the inlet camshaft, and is manufactured with two cam lobes, one to open the inlet valve for each cylinder. The other is the exhaust camshaft, and has two cam lobes to open the exhaust valves. There is a sprocket at the center of the crankshaft and at the center of each camshaft. A chain placed over these sprockets enables the crankshaft to turn both camshafts so that the valves will be opened and closed at the proper times during each rotation of the engine.

Each sprocket has marks so that valve timing (the time that each valve is opened) can be reset correctly any time the camshafts are removed for inspection or repairs (See Pg. 45).

However, since the time, amount, and duration that each valve is opened (valve timing) changes with cam wear, journal wear, and camshaft runout (bend); the camshafts should be inspected periodically and whenever timing trouble is suspected. If the valves do not open at the right times or if they do not open the correct amount or duration, there will be a decrease in combustion efficiency, causing a loss of engine power and leading to serious engine trouble.

Valve Timing



Cam wear

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.

Cam Height Measurement

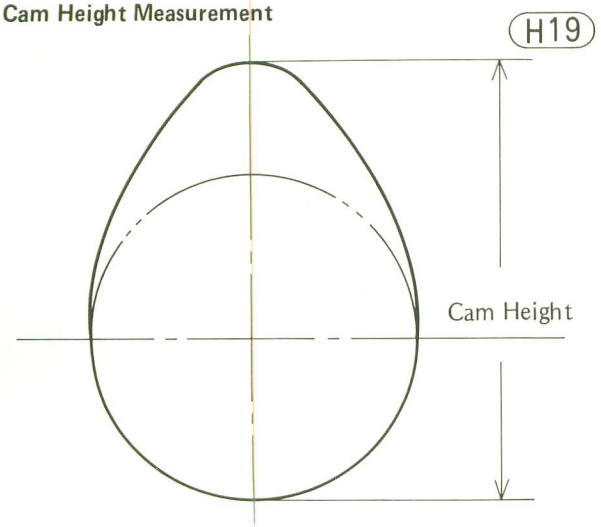


Table H5 Cam Height

	Standard	Service Limit
Inlet	41.21 ~ 41.39 mm	41.15 mm
Exhaust	42.26 ~ 42.44 mm	42.20 mm

Journal, bearing wear

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 camshafts, and wipe each journal, camshaft cap, and cylinder head bearing surface clean of dirt and oil. Install the camshafts so that no cam lobe is pushing down a valve. This is to prevent the camshafts from turning during clearance measurement. 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 the camshaft cap. Install the camshaft caps, tightening the bolts in the correct sequence with the correct amount of torque (Pg. 47).

Remove the camshaft caps, and measure the plastigauge width to determine the clearance between each journal and the cylinder head cover. If a clearance exceeds the service limit, measure the diameter of the camshaft journal and the bearing inside diameter.

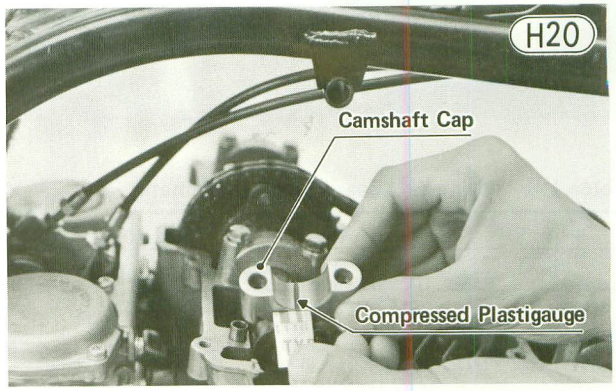


Table H6 Camshaft Journal/Camshaft Cap Clearance

Standard	Service Limit
0.030 ~ 0.072 mm	0.16 mm

Measure the diameter of each camshaft journal with a micrometer. If a diameter is less than the service limit, replace the camshaft.

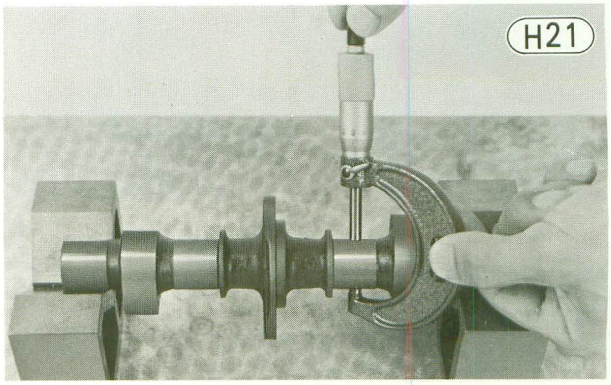


Table H7 Camshaft Journal Diameter

Standard	Service Limit
24.949 ~ 24.) mm	24.93 mm

Remove the camshafts, and tighten the camshaft caps with 1.1 ~ 1.3 kg-m (95 ~ 113 in-lbs) of 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.

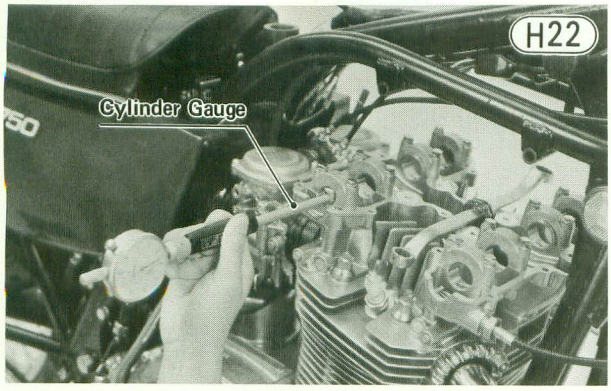


Table H8 Camshaft Bearing Inside Diameter

Standard	Service Limit
25.000~25.021 mm	25.06 mm

Camshaft runout

Remove the camshafts, and set each shaft in V blocks at the outside journals as shown in the figure. Measure the runout with a dial gauge set against the inside journal. If the runout exceeds the service limit, replace the camshaft.

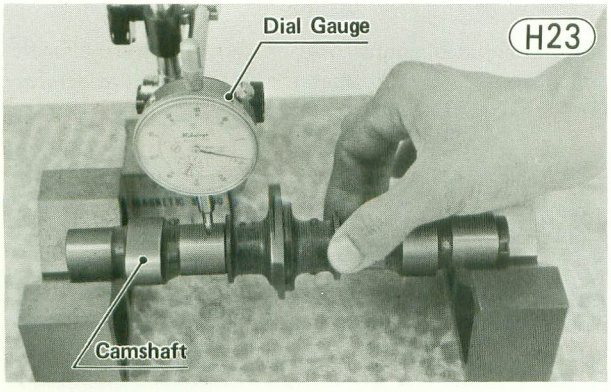


Table H9 Camshaft Runout

Standard	Service Limit
under 0.02 mm	0.1 mm

CAMSHAFT CHAIN, GUIDES, TENSIONER

The camshaft chain, which is driven by the crankshaft sprocket, drives the two camshafts at one-half crankshaft speed. For maximum durability, it is an endless-type chain with no master link.

Camshaft chain, sprocket, and chain guide wear cause noise, accelerate wear, and could possibly lead to serious damage to the engine. If the chain tension can no longer be adjusted by the chain tensioner, either the camshaft chain or the chain guides must be replaced.

Camshaft chain wear

Remove the camshaft chain, hold the chain taut with a force of about 5 kg in some manner such as the one shown in Fig. H24, 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.

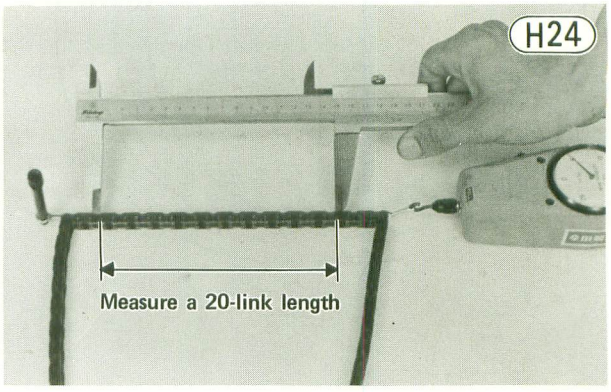


Table H10 Camshaft Chain Length

Standard	Service Limit
160.0 ~ 160.3 mm	162.4 mm

Chain guide wear

Remove the chain guides and sprocket, and inspect them visually. Replace a guide if the rubber or any other portion is damaged.

Measure the depth of the grooves where the chain links run. Replace a guide if the wear exceeds the service limit.

Chain Guide Rubber Wear

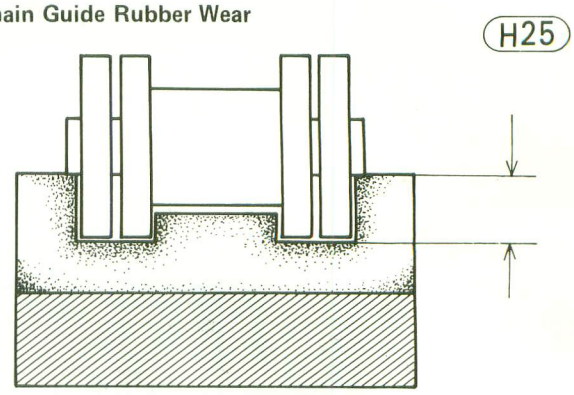


Table H11 Camshaft Chain Guide Wear

	Service Limit
Upper	2 mm
Front Upper	2 mm
Front Lower	2 mm
Rear	4 mm

Chain tensioner wear

Remove the camshaft chain tensioner. Visually inspect the push rod, and check that it moves smoothly in the guide, with the springs removed. If there is any damage or abnormal operation, replace the tensioner with a new one.

Measure the spring free length. Replace the spring if the free length exceeds the service limit.

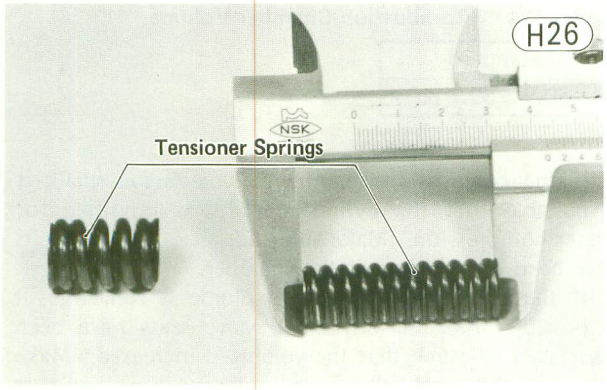


Table H12 Chain Tensioner Spring Free Length

	Standard	Service Limit
Long	43.7 mm	41.5 mm
Short	24.32 ~ 24.92 mm	23.1 mm

CYLINDER HEAD, VALVES

The valves are mounted in the head; they are pushed open by the cams, and closed by the valve springs.

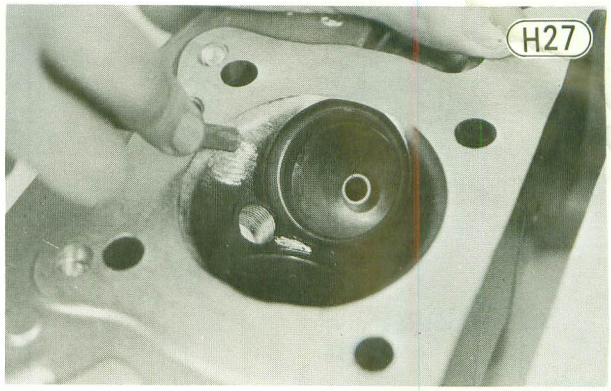
The valve guides and valve seats are pressed into the cylinder head. The valve seat, which is cut to the angles shown in Fig. H43, prevents compression leakage by fitting snugly against the valve. It also prevents the valve from overheating by allowing efficient heat transfer.

Cylinder Head

The cylinder head is made of aluminum alloy, used for its high heat conductivity, and is finned on the outside to aid dissipation of the heat generated in the combustion chambers. Carbon built up inside the combustion chambers interferes with heat dissipation and increases the compression ratio; which may result in preignition, detonation, and overheating. Trouble can also arise from improper head mounting or mounting torque, which may cause compression leakage.

Cleaning and inspection

Remove the cylinder head (Pg. 48) and valves (Pg. 49). Scrape out any carbon, and wash the head with a high flash-point solvent.



Cylinder head warp

Lay a straightedge across the lower surface of the head at several different points, and measure warp by inserting a thickness gauge between the straightedge and the head. If warp exceeds the service limit, replace the cylinder head.

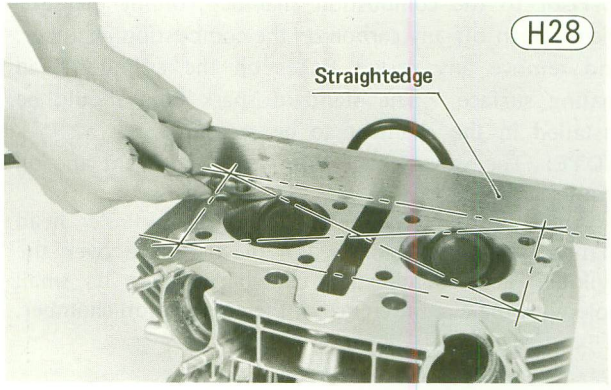


Table H13 Cylinder Head Warp

Service Limit
under 0.05 mm

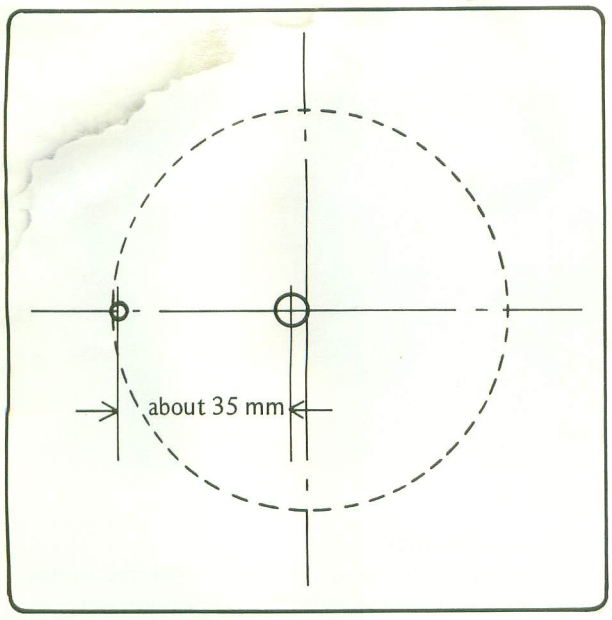
Combustion chamber volume measurement

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

NOTES:

1. One more person will be needed to help expel air bubbles out of the cylinder head combustion chamber.
2. Prepare a piece of transparent plastic plate which has a flat surface and has two holes about 35 mm apart in its center portion. One is a large hole (about 6 mm in diameter), the other is small hole (about 3 mm in diameter). This plate must be *oil resistant, about* 120 mm square, and at least 3 mm thick.

Plastic Plate used for Cylinder Head Volume Measurement (H29)

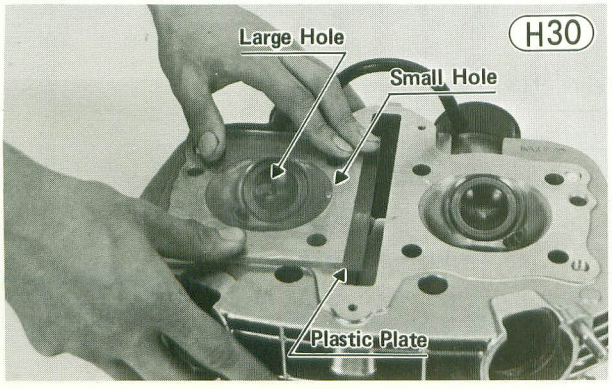


3. Obtain a burette or syringe which is calibrated at one-cc or smaller graduations. Fill it with thin oil.

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: The valves must seat 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 with the circumference of the combustion chamber.



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 mission 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.

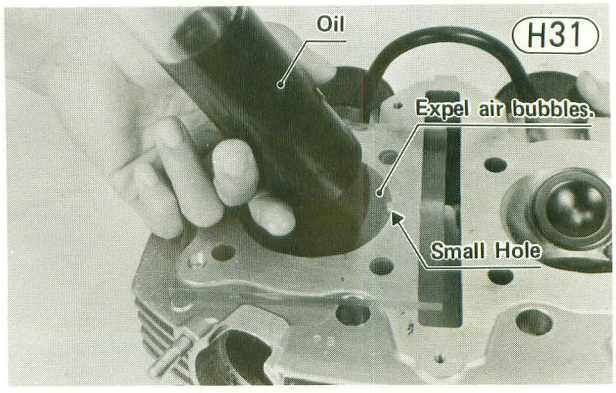


Table H14 Combustion Chamber Volume

Standard
50.9~52.1 cc

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.

Valve, Valve Guide, Valve Seat

Valve face deformation or wear, stem bending or wear, and valve guide wear can cause poor valve seating. Poor seating can also be caused by the valve seat itself, if there is heat damage or carbon build-up. The result of poor valve seating is compression leakage and a loss of engine power.

In addition, valve and valve seat wear causes deeper valve seating and a decrease in valve clearance. Insufficient clearance upsets valve timing and may eventually prevent the valve from seating fully. So that wear never progresses this far, adjust the valve clearance in accordance with the Periodic Maintenance Chart (Pg. 10).

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 together with its valve guide if the thickness is under the service limit.

If the seating surface of the valve or the end of the valve stem is damaged or badly worn, repair the valve with a valve refacer. The angle of the seating surface is 45.0~45.5°.

The valve stem end may be ground to permit additional valve clearance, use a refacing grinder to assure a flat, square surface.

CAUTION **If the valve's Dimension "A" is less than specified, the valve lifter may contact the valve spring retainer during operation, allowing the keepers to loosen. Consequently, the valve may drop into the engine, causing serious damage.**

Valve Shape

H32

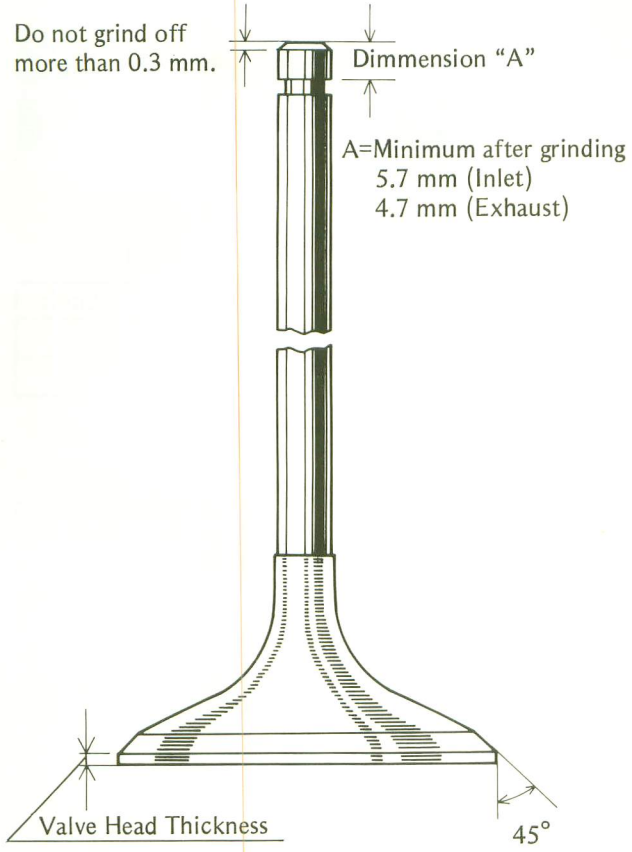
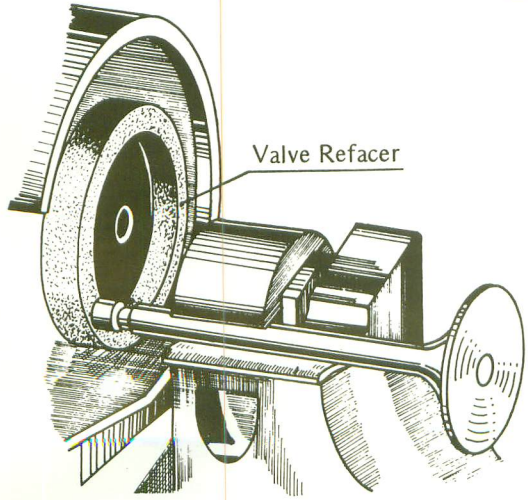


Table H15 Valve Head Thickness

Standard	Service Limit
0.85~1.15 mm	0.5 mm

Valve Stem Grinding

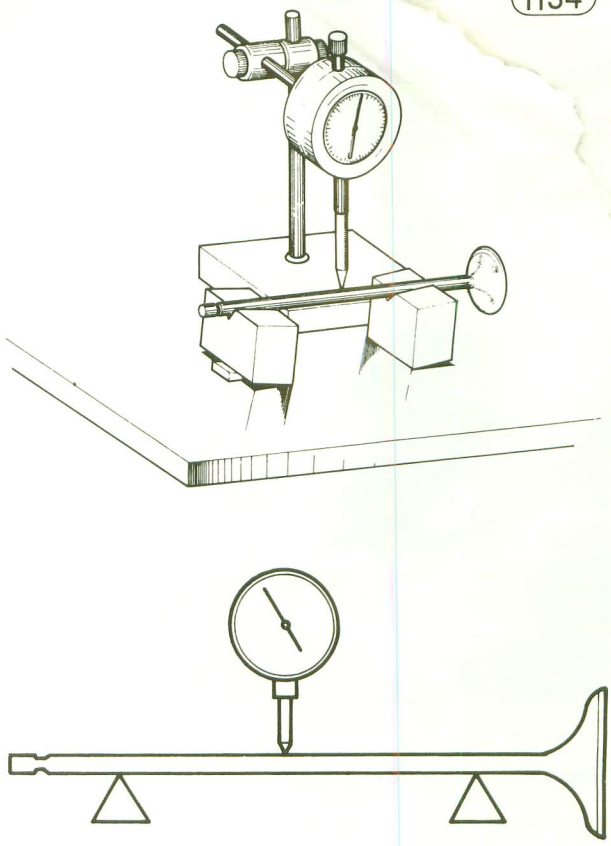
H33



Hold the valve at both ends of the stem straight portion, and set a dial gauge against the center of the stem. One example is shown in H34.

Valve Stem Bend

H34



Turning the valve, read a variation in the dial gauge. Replace the valve if it is bent over the service limit.

Table H16 Valve Stem Bend

Standard	Service Limit
under 0.01 mm	0.05 mm

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.

Replace the valve if the stem is worn to less than the service limit.

H35

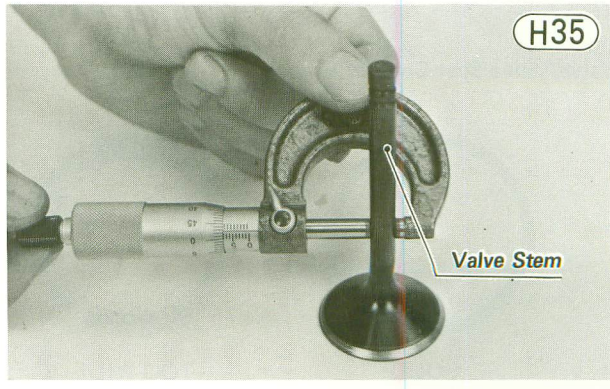


Table H17 Valve Stem Diameter

	Standard	Service Limit
Inlet	7.965 ~ 7.980 mm	7.90 mm
Exhaust	7.955 ~ 7.970 mm	7.90 mm

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.

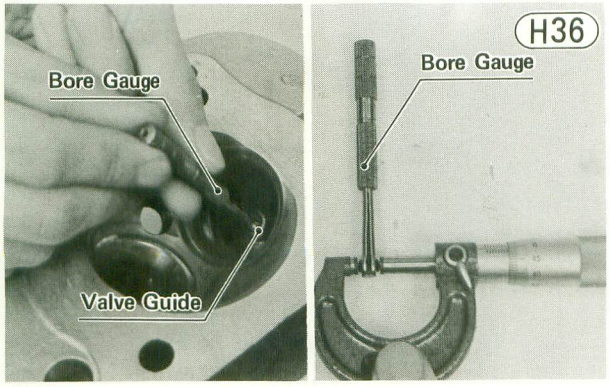


Table H18 Valve Guide Inside Diameter

Standard	Service Limit
8.000 ~ 8.015 mm	8.08 mm

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

Insert a new valve into the guide and set a dial gauge against the stem perpendicular to it as close as possible to the cylinder head mating surface. Move the stem back and forth to measure valve/valve guide clearance. Repeat the measurement in a direction at a right angle to the first.

If the reading exceeds the service limit, replace the guide.

NOTE: The reading is not actual valve/valve guide clearance because the measuring point is above the guide.

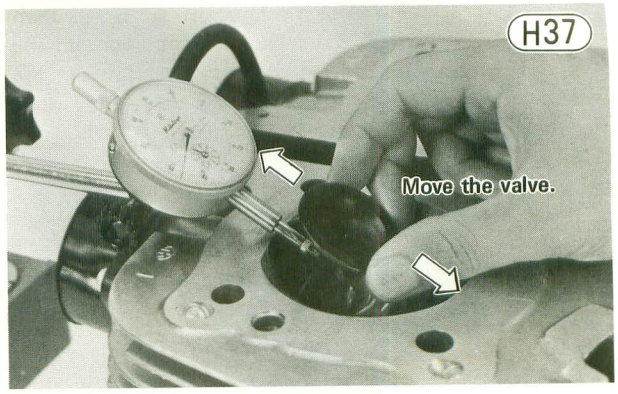


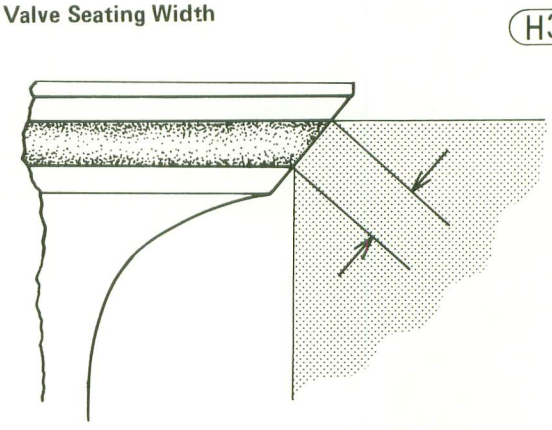
Table H19 Valve/Valve Guide Clearance (Wobble Method)

	Standard	Service Limit
Inlet	0.047 ~ 0.117 mm	0.23 mm
Exhaust	0.069 ~ 0.139 mm	0.23 mm

Valve seat repair

The valve must seat in the valve seat evenly around the circumference over the specified area. If the seat 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.

Valve Seating Width



Valve/Valve Seat Contact Area

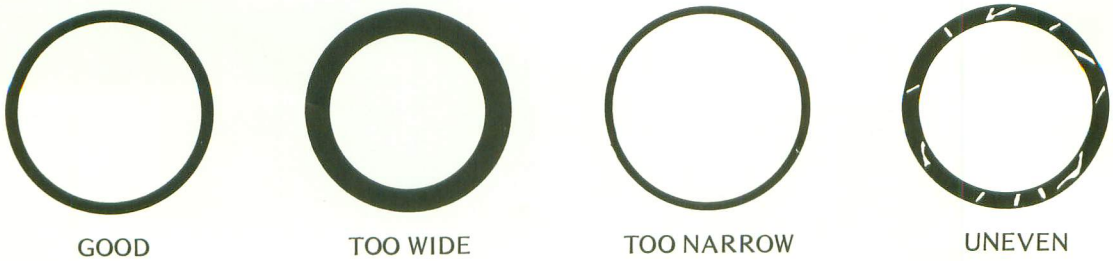
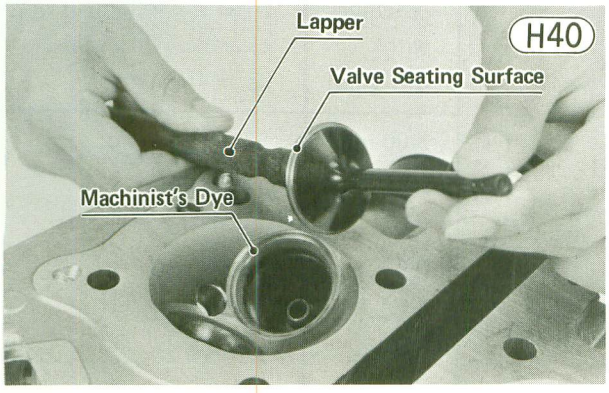


Table H20 Valve Seating Width

Standard
0.7~1.0 mm

To determine whether or not the valve seat requires repair, first remove the valve, 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 valve seating surface should be in the middle of the valve face (Fig. H38). The distribution of the dye on the seating surface gives an indicaiton of seat condition (Fig. H39).

NOTE: The valve and valve guide must be in good condition before this check will give an accurate indication of valve seat condition.



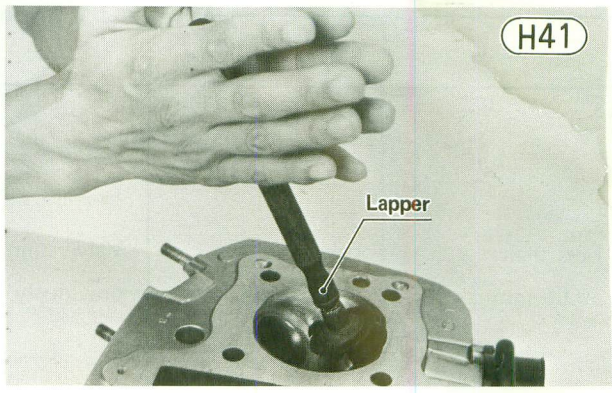
A valve seat which requires repair is cut with a set of valve seat cutters. Four cutters are required for complete repair; one 30° (inlet valve seat only); one 45°; and two 75° cutters, one for the inlet and the other for the exhaust.

First, cut the seating surface of the valve seat with the 45° cutter. Cut only the amount necessary to make a good surface; overcutting will reduce the valve clearance, possibly making it no longer adjustable.

Next, use the 30° cutter (inlet valve seat only) to cut the surface inside the seating surface, and then use the 75° cutter to cut the outermost surface. Cut these two surfaces so that the seating surface will have a specified width.

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.

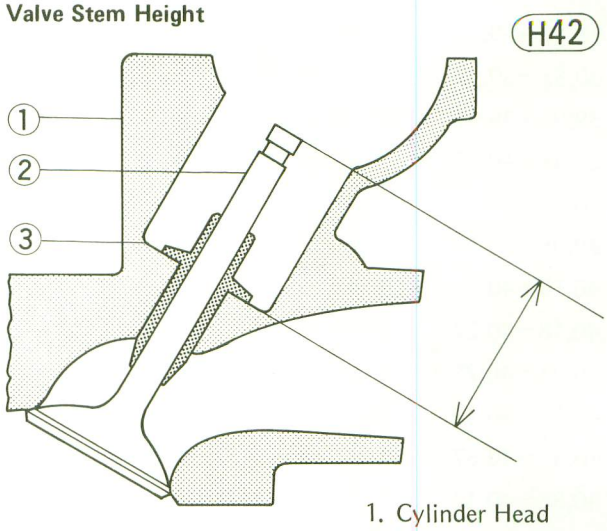
Apply compound to the valve seat, and tap the valve lightly into place while rotating it with a lapper, repeating this until a smooth, matched surface is obtained.



When lapping is completed, check the valve stem height and adjust if necessary.

After grinding the valves or valve seats and before assembling the cylinder head, 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 Page 144 for the recommended repair.

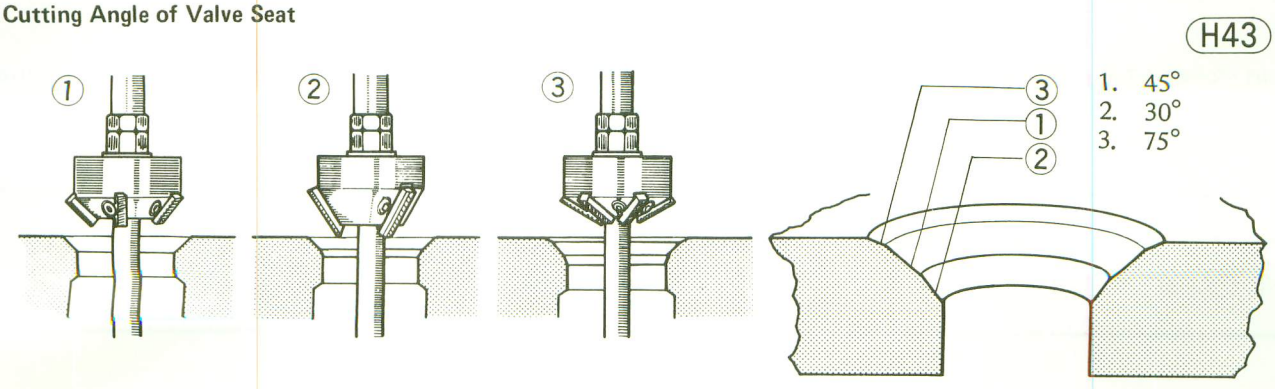
Valve Stem Height



1. Cylinder Head
2. Valve Stem
3. Lifter Hole Bottom

Be sure to mark each valve so it will be properly matched to its corresponding valve seat during assembly.

Cutting Angle of Valve Seat



VALVE INSTALLED HEIGHT PROCEDURE TABLE

<table>
<tr><th colspan="2">Measurement</th><th rowspan="2">Probable Cause</th><th colspan="2" rowspan="2">Recommendation</th></tr>
<tr><th>Inlet</th><th>Exhaust</th></tr>
<tr><td>Less than
39.68 mm</td><td>Less than
40.68 mm</td><td>Valve stem ground previously</td><td colspan="2">1. Check to be sure Dimension "A" is at least 4.7 mm. See CAUTION, Pg. 141.
2. Interchange valve to deeper cut valve seat. Remeasure.
3. Grind valve face to drop it further into valve seat. Remeasure.
4. Replace valve. Remeasure.</td></tr>
<tr><td rowspan="19">39.68~39.72 mm
39.73~39.77
39.78~39.82
39.83~39.87
39.88~39.92
39.93~39.97
39.98~40.02
40.03~40.07
40.08~40.12
40.13~40.17
40.18~40.22
40.23~40.27
40.28~40.32
40.33~40.37
40.38~40.42
40.43~40.47
40.48~40.52
40.53~40.57</td><td rowspan="19">40.68~40.72 mm
40.73~40.77
40.78~40.82
40.83~ 40.87
40.88~40.92
40.93~40.97
40.98~41.02
41.03~41.07
41.08~41.12
41.13~41.17
41.18~41.22
41.23~41.27
41.28~41.32
41.33~40.37
41.38~41.42
41.43~41.47
41.48~41.52
41.53~41.57</td><td rowspan="19">Normal/acceptable</td><td>Assemble with this shim:</td><td>After checking valve clearance, final shim may be in this range:</td></tr>
<tr><td>3.00 mm</td><td>3.00~3.40 mm</td></tr>
<tr><td>2.95</td><td>2.95~3.40</td></tr>
<tr><td>2.90</td><td>2.90~3.35</td></tr>
<tr><td>2.85</td><td>2.85~3.30</td></tr>
<tr><td>2.80</td><td>2.80~3.25</td></tr>
<tr><td>2.75</td><td>2.75~3.20</td></tr>
<tr><td>2.70</td><td>2.70~3.15</td></tr>
<tr><td>2.65</td><td>2.65~3.10</td></tr>
<tr><td>2.60</td><td>2.60~3.05</td></tr>
<tr><td>2.55</td><td>2.55~3.00</td></tr>
<tr><td>2.50</td><td>2.50~2.95</td></tr>
<tr><td>2.45</td><td>2.45~2.90</td></tr>
<tr><td>2.40</td><td>2.40~2.85</td></tr>
<tr><td>2.35</td><td>2.35~2.80</td></tr>
<tr><td>2.30</td><td>2.30~2.75</td></tr>
<tr><td>2.25</td><td>2.25~2.70</td></tr>
<tr><td>2.20</td><td>2.20~2.65</td></tr>
<tr><td>2.20</td><td>2.20~2.60</td></tr>
<tr><td>40.58~41.07 mm</td><td>41.58~42.07 mm</td><td>Wear or grinding of valve face and valve seat allowed valve to drop too far into valve seat.</td><td colspan="2">1. Interchange valve to shallowest cut valve seat. Remeasure.
2. Grind 0.5 mm maximum off valve stem. See CAUTION, Pg. 141. Remeasure.</td></tr>
<tr><td>More than
41.07 mm</td><td>More than
42.07 mm</td><td>Valve face and valve seat worn out or excessively ground.</td><td colspan="2">1. Replace valve. Remeasure.
2. Replace cylinder head. Remeasure.</td></tr>
</table>

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.

Over a period of long use and repeated resurfacing, the valve may drop so far into the valve seat that even the thinnest shim cannot give adequate clearance. In this case, it is possible to grind the end of the valve stem to reduce the valve installed height and so gain the needed clearance (See Caution in Pg. 141).

If the valve drops so far into the valve seat that the installed height becomes quite large, either by a resurfacing error or heavy wear, it may 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

When the valve is not being pushed open by the cam, valve springs press the valve against the seat to prevent compression leakage. An inner spring is used with each outer spring to prevent spring surge, which may cause valve float at high rpm. If the springs weaken or break, compression leakage and valve noise will result, dropping engine power.

Spring Tension

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.

Valve Spring Tension Measurement (H44)

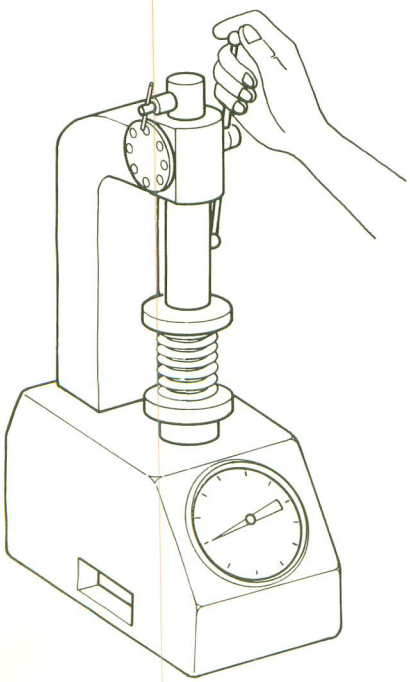


Table H22 Valve Spring Tension

	Length	Standard	Service Limit
Inner	23.15 mm	27.55~30.45 kg	26.44 kg
Outer	26.15 mm	59.85~66.15 kg	57.60 kg

Squareness

Measure the squareness of each spring by standing each end on a surface plate and setting a square against it. Replace any spring for which the distance between the top of the spring and the square is greater than the service limit.

Valve Spring Squareness (H45)

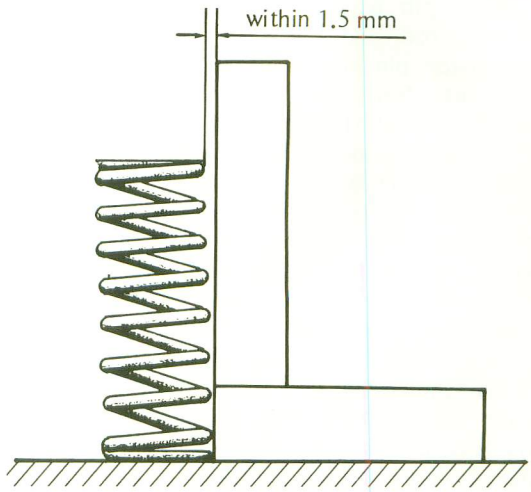


Table H23 Valve Spring Squareness

Standard	Service Limit
under 1.1 mm	1.5 mm

Oil Seals

The oil seal around each valve stem prevents oil from leaking down into the combustion chamber. If an oil seal is damaged or deteriorated, oil consumption will increase, and carbon may build up in the combustion chambers. This may be indicated by white exhaust smoke.

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 BLOCK, PISTONS

The cylinder block is subjected to extremely high temperatures. Since excessive heat can seriously distort the shape of a cylinder or cause piston seizure, the cylinder block is made of aluminum alloy for good heat conduction and the outside is finned to increase the heat-radiating surface for better cooling efficiency. To minimize distortion from heat and to maximize durability, a wear resistant iron sleeve is cold-pressed into each cylinder.

Each piston is made from an aluminum alloy, which expands and distorts slightly from heat during engine operation. So that the piston will become cylindrical after heat expansion, it is designed such that, when cold, it is tapered in towards the head and is elliptical rather than perfectly round. The piston diameter is made so that there is enough clearance between the piston and cylinder to allow for expansion.

Three rings are fitted into grooves near the top of each piston to prevent compression leakage into the crankcase and to stop oil from getting up into the combustion chambers. The top two rings are compression rings, and the bottom ring is an oil ring.

The full floating type of piston pin is used to connect each piston to its connecting rod. The middle part of the piston pin passes through the small end of the connecting rod, and a snap ring is fitted at each end of the piston pin in a groove to prevent the pin from coming out. Since the pin is the full floating type, a small amount of clearance exists between the piston pin and the piston when the engine is at normal operating temperatures.

Proper inspection and maintenance of the cylinder block and the pistons include checking the compression; removing carbon from the piston heads, piston ring grooves, and cylinder head exhaust ports; and checking for wear and proper clearance during top end overhaul. A worn cylinder, worn piston, or worn or stuck piston rings may cause a loss of compression from gas blowby past the rings. Blowby may result in difficult starting, power loss, excessive fuel consumption, contaminated engine oil, and possibly engine destruction. Oil leakage into the combustion chambers causes carbon to build up on top of the pistons; which may result in preignition, overheating, and detonation. A worn piston pin causes piston slap, which may cause accelerated piston and cylinder wear. It is evidenced by a knocking sound in the engine.

Engine problems may be caused not only by carbon deposits and wear or damage to the engine itself; but also by poor quality fuel or oil, improper oil, improper fuel/air mixture, improper supply of oil, or incorrect ignition timing. Whenever knocking, pinging, piston slap, or other abnormal engine noise is heard; the cause should be determined as soon as possible. Neglect of proper maintenance will result in reduced engine power and may lead to accelerated wear, overheating, detonation, piston seizure, and engine destruction.

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 (Pg. 33) and that the battery is fully charged (Pg. 190), 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 the spark plugs, and attach the compression gauge (special tool) firmly into one spark plug hole. 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.

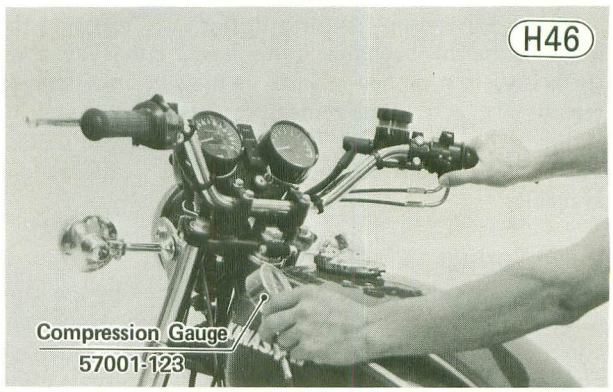


Table H24 Cylinder Compression†

Standard	Service Limit
11 kg/cm² (156 psi)	8 kg/cm² (114 psi) and less than 1 kg/cm² (14 psi) difference between the cylinders

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

If cylinder compression is higher than the standard value, check the following:

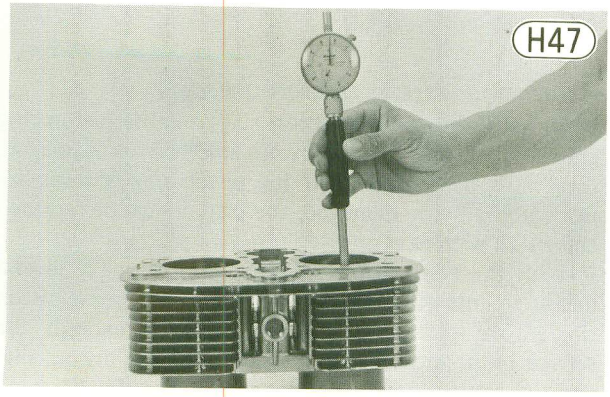
1. Carbon build-up on the piston head and cylinder head – clean off any carbon on the piston head and cylinder head.
2. Cylinder head gasket, cylinder base gasket – use only the proper gasket for the cylinder head. The use of a gasket of incorrect thickness will change the compression.
3. Valve stem 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. Combustion chamber valume (Pg. 139).

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 warp (Pg. 139)
2. Condition of the valve seating (Pg. 142)
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, piston wear

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 Fig. H48. If any of the cylinder inside diameter measurements exceeds the service limit, the cylinder will have to be bored to oversize and then honed. However, if the amount of boring necessary would make the inside diameter greater than 79.0 mm, the cylinder block must be replaced.



Cylinder Inside Diameter Measurement

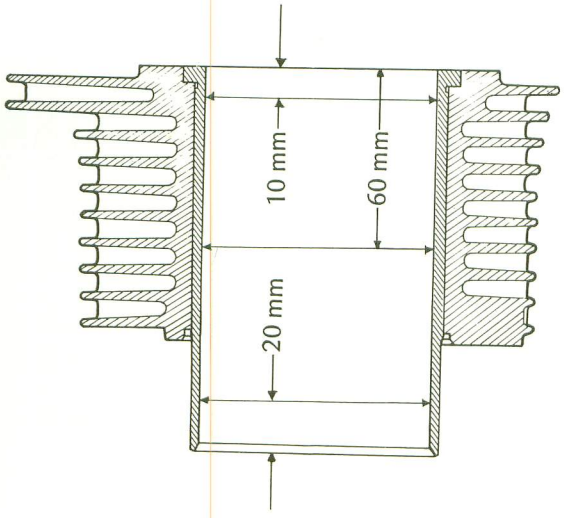


Table H25 Cylinder Inside Diameter

Standard	Service Limit
78.000 ~ 78.019 mm, and less than 0.01 mm difference between any two measurements	78.10 mm, and more than 0.05 mm difference between any two measurements

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.

NOTE: Abnormal wear such as a marked diagonal pattern across the piston skirt may mean a bent connecting rod or crankshaft.

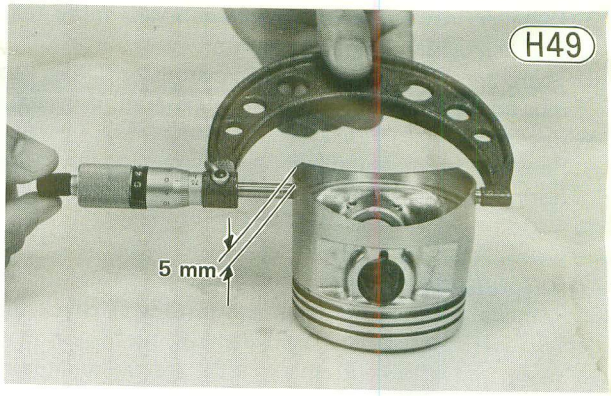


Table H26 Piston Diameter

Standard	Service Limit
77.94 ~ 77.96 mm	77.8 mm

Table H25 applies only to a cylinder that has not been bored to oversize, and Table H26 applies only to the standard size piston. In the case of a rebored cylinder and oversize piston, the service limit for the cylinder is the diameter that the cylinder was bored to plus 0.1 mm and the service limit for the piston is the oversize piston original diameter minus 0.15 mm. If the exact figure for the rebored diameter is unknown, it can be roughly determined by measuring the diameter at the base of the cylinder.

NOTE: Whenever a 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 H27 Piston Cylinder Clearance

Standard
0.043 ~ 0.070 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 Table H27, determine the diameter of the rebore.

2. Cylinder inside diameter must not vary more than 0.01 mm at any point.
3. There are two sizes of oversize pistons available: 0.5 mm and 1.0 mm. Oversize pistons require oversize rings.
4. Be wary of measurements taken immediately after boring since the heat affects cylinder diameter.

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 to oversize and honed, and an oversize piston installed.

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 (Pg. 52), 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 an end of a broken piston ring or some other suitable tool.

CAUTION

1. **When removing carbon, take ample 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.**

Pisotn ring, piston ring groove wear

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.

With the piston 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.

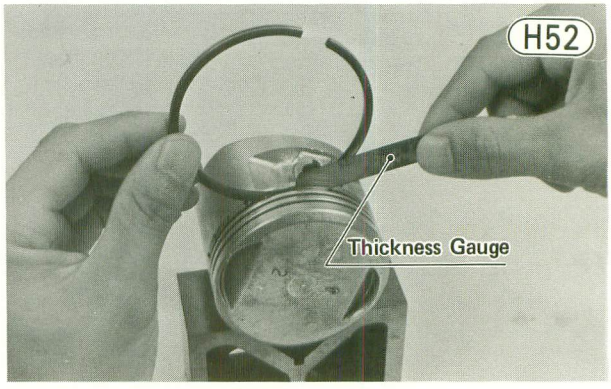


Table H28 Piston Ring/Groove Clearance

Standard	Service Limit
0.01~0.05 mm	0.15 mm

Table H29 Piston Ring Thickness

	Standard	Service Limit
Top and 2nd Rings	1.47~1.49 mm	1.40 mm
Oil Ring	2.77~2.79 mm	2.70 mm

Table H30 Piston Ring Groove Width

	Standard	Service Limit
Top and 2nd Rings	1.50~1.52 mm	1.60 mm
Oil Ring	2.80~2.82 mm	2.90 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

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.

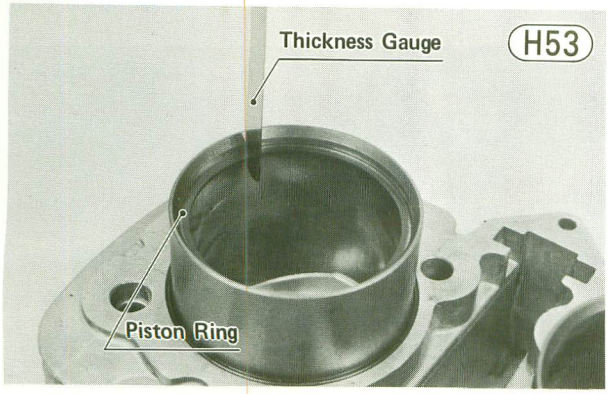


Table H31 Ring End Cap

Standard	Service Limit
0.2~0.4 mm	0.7 mm

Piston ring tension

Piston ring tension can be evaluated by measuring the gap between the ends of the ring with the ring free of any restraint. Measure the gap before removing the piston rings from the piston. If the measured gap is less than the service limit, the ring is weak and must be replaced.

Ring Free Gap

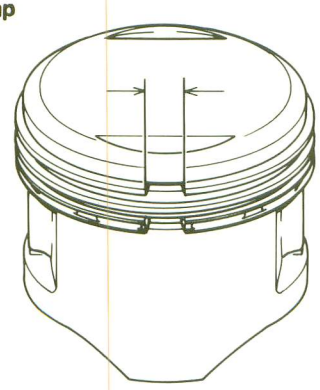


Table H32 Ring Free Gap

	Standard	Service Limit
Top Ring	about 11.0 mm	9.9 mm
2nd Ring	about 11.5 mm	10.4 mm
Oil Ring	about 10.0 mm	9.0 mm

Piston, piston pin, connecting rod wear

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.

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

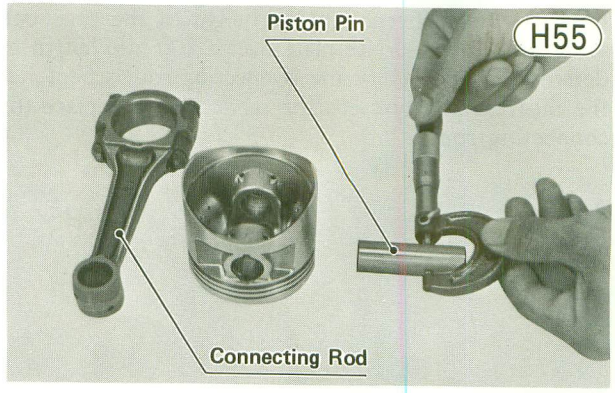


Table H33 Piston Pin, Piston Pin Hole, Small End Diameter

	Standard	Service Limit
Piston Pin	18.995~19.004 mm	18.96 mm
Piston Pin Hole	19.005~19.015 mm	19.08 mm
Small End	19.007~19.023 mm	19.06 mm

NOTE: When a new piston or pin is used, also check that piston-to-pin clearance is 0.005 ~ 0.016 mm, and that pin to small end clearance is within 0.003 ~ 0.025 mm.

CRANKSHAFT, CONNECTING RODS

The crankshaft changes the reciprocating motion of the pistons into rotating motion, which is transmitted to the rear wheel when the clutch is engaged. The connecting rods connect the pistons to the crankshaft. Crankshaft or connecting rod trouble, such as worn crankshaft journals or a bent connecting rod, will multiply the stress caused by the intermittent force on the pistons. This results in not only rapid crankshaft bearing wear; but also noise, power loss, vibration, and shortened engine life. A defective crankshaft or connecting rod should always be detected at an early stage and then replaced immediately.

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

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 amount the connecting rod is bent. If the measurement exceeds the service limit, replace the connecting rod.

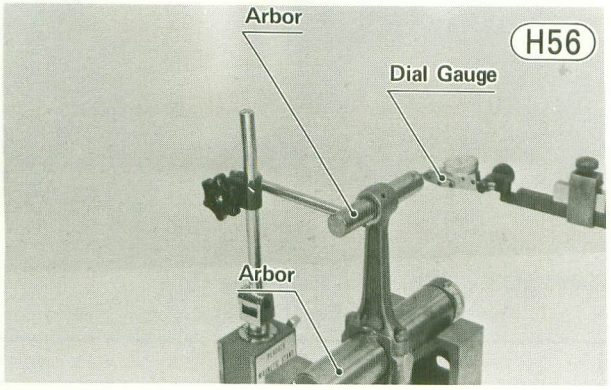


Table H34 Connecting Rod Bend

Standard	Service Limit
under 0.10/100 mm	0.2 mm

Swing the connecting rod 90° to one side and support it parallel to the surface plate as shown in Fig. H57. 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.

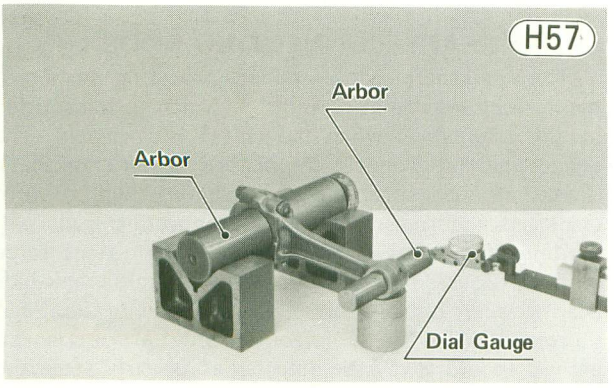


Table H35 Connecting Rod Twist

Standard	Service Limit
under 0.15/100 mm	0.2 mm

Connecting rod bearing insert/journal wear

Bearing insert 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 connecting rods. 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 (Pg. 33).

Remove the connecting rods, and measure the plastigauge width to determine the bearing insert/journal wear.

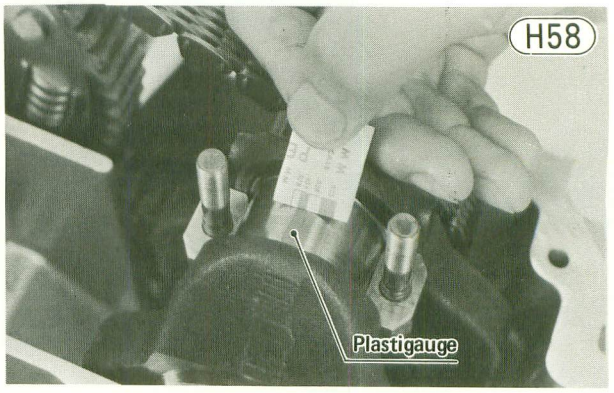


Table H36 Connecting Rod Bearing Insert/Journal Clearance

Standard	Service Limit
0.041~0.071 mm	0.1 mm

If the clearance exceeds the service limit, replace the bearing inserts as follows:

1. 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 H37).

If the measurement is less than the service limit, replace the crankshaft.

If the measurement is less than the standard value, but is not under the service limit; use bearing inserts painted blue.

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

Table H37 Connecting Rod Journal Diameter

Marking	Diameter	Service Limit
No mark	37.984~37.994 mm	37.97 mm
1	37.995~38.000 mm	

2. Put the connecting rod big end caps on the rods and tighten the nuts with the specified torque (Pg. 33). Measure the inside diameter, and mark each connecting rod big end in accordance with the inside diameter (Table H38).

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

Table H38 Connecting Rod Big End Inside Diameter

Marking	Diameter
No mark	41.000~41.010 mm
1	41.011~41.020 mm

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

Table H39 Bearing Insert Selection

Crank-shaft marking \ Con-Rod marking	1	Unmarked
1	Black PN 13034-043	Brown PN 13034-046
Unmarked	Blue PN 13034-045	Black PN 13034-043

Table H40 Bearing Insert Thickness

Blue	1.485~1.490 mm
Black	1.480~1.485 mm
Brown	1.475~1.480 mm

Connecting rod side clearance

Measure the side clearance of the connecting rod with a thickness gauge as shown. Replace the crankshaft and the connecting rod if the clearance exceeds the service limit.

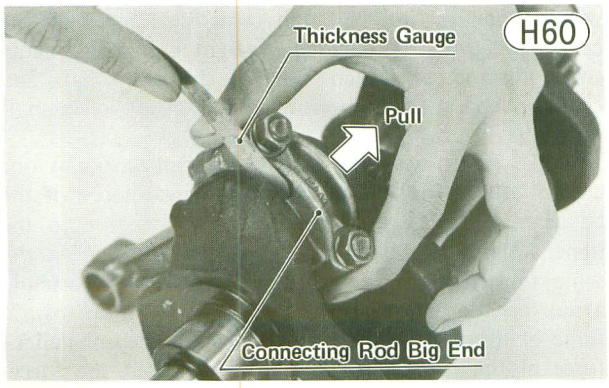


Table H41 Connecting Rod Big End Side Clearance

Standard	Service Limit
0.15~0.25 mm	0.45 mm

Crankshaft runout

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.

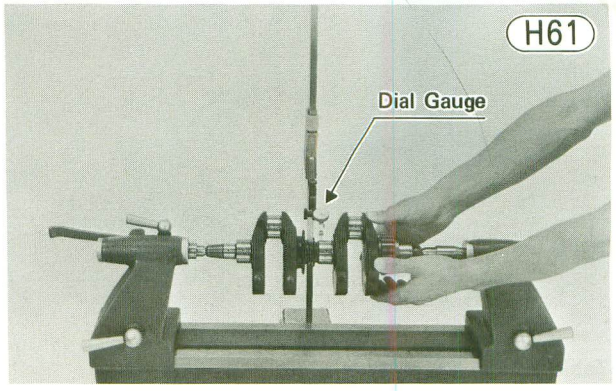


Table H42 Crankshaft Runout

Standard	Service Limit
under 0.02 mm	0.05 mm

Crankshaft bearing insert/journal wear

Remove the crankshaft. Cut strips of plastigauge to bearing insert width. Place a strip on each bearing insert parallel to the crankshaft so the plastigauge will be compressed between the insert and the crankshaft journal. Install the crankshaft and the lower crankcase half without turning the crankshaft, and tighten the bolts in the correct sequence with the specified amount of torque (Pg. 33).

Remove the crankshaft (making sure that the crankshaft does not turn at any time), and measure the plastigauge width to determine the bearing insert/journal wear. If either clearance exceeds the service limit, replace all six bearing inserts, and check the crankshaft journals.

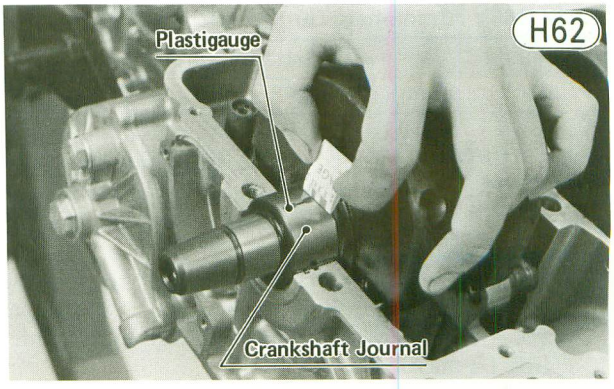


Table H43 Crankshaft Bearing Insert/Journal Clearance

Standard	Service Limit
0.040~0.082 mm	0.11 mm

Measure the journals which wear on these bearing inserts. If the micrometer reading is less than the service limit, replace the crankshaft.

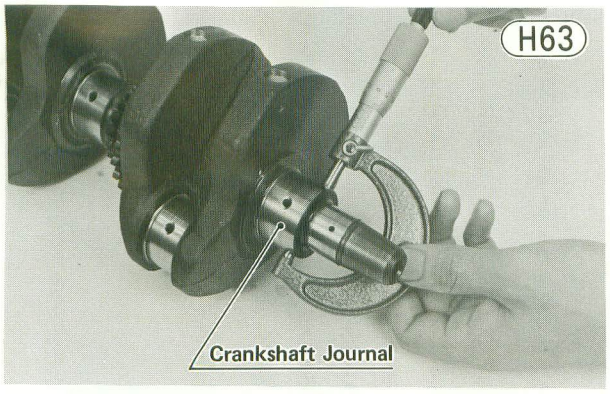


Table H44 Crankshaft Journal Diameter (Not Connecting Rod)

Standard	Service Limit
37.984~38.000 mm	37.964 mm

Measure the crankshaft thrust clearance with a thickness gauge as shown. Replace the crankcase halves as a set, if the clearance exceeds the service limit.

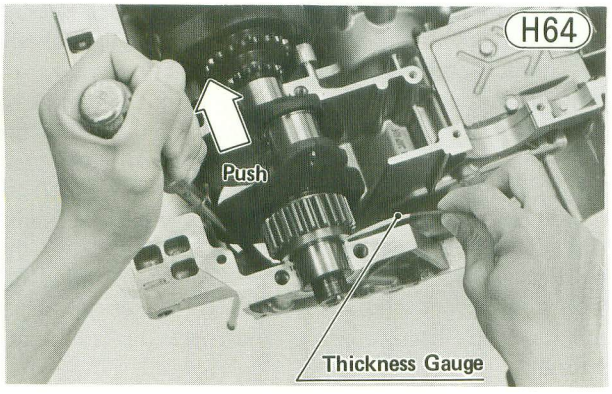


Table H45 Crankshaft Thrust Clearance

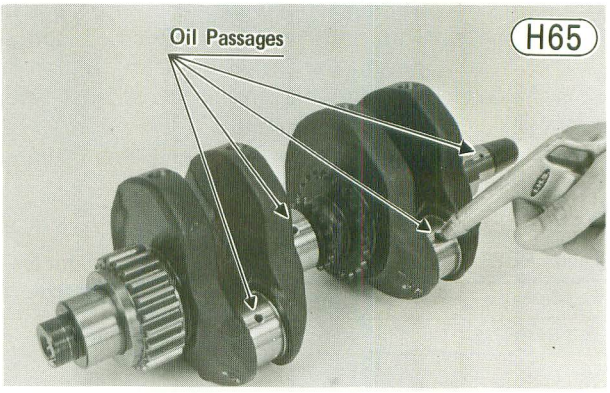
Standard	Service Limit
0.05~0.23 mm	0.45 mm

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.

2. When replacing new crankcase halves, to seat the bypass valve steel ball in the bottom of the upper crankcase half, insert a mild steel rod and hammer lightly on the rod.

Oil passage cleaning

There is an oil passage running between the crankshaft journals on each side. Use compressed air to remove any foreign particles or residue that may have accummulated in these passages.



BALANCER MECHANISM

The balancer mechanism basically consists of two weights, which are chain-driven by the crankshaft. The following explanation covers how this mechanism reduces vibration.

The vibration of a 4-stroke, 2-cylinder engine is generally greater with larger engine displacement. This up-and-down vibration is natural due to the mechanics of a reciprocating engine, but the proper addition of counterweights on the crankshaft can reduce this vibration. However, troublesome revolving vibration remains unless some additional measure is taken.

Fig. H66 shows the internal engine forces when the centrifugal force of the counterweights in one half the intertial force of the pistons. The arrows show the amount and direction of these forces.

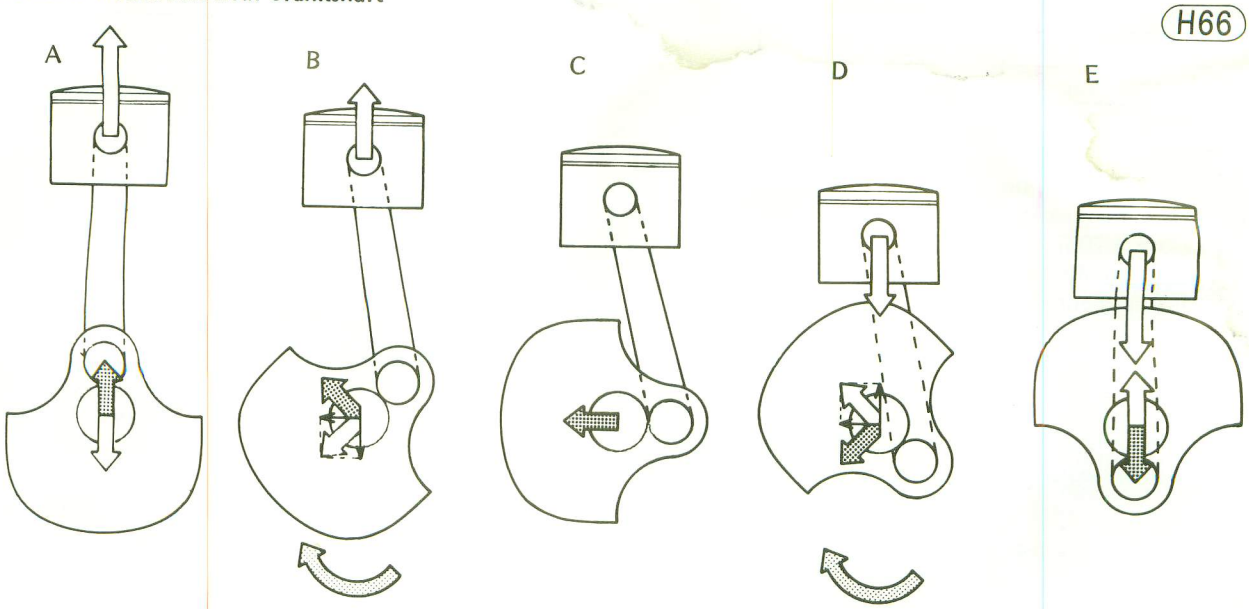
As the crankshaft rotates clockwise, A~E in Fig. H66, one half of the inertial force of the pistons is negated by the vertical component of the centrifugal force of the counterweights. However, the horizontal component of the centrifugal force of the counterweights (brought about by having counterweights) is not negated by anything. The thick arrows indicate the resulting unbalanced force, which is the main cause of engine revolving vibration.

The balancer mechanism includes two balancing weights having one half the centrifugal force of the counterweights. A balancing weight is installed at an equal distance on each side of the crankshaft and chain-driven in the opposite direction of crankshaft rotation.

Fig. H68 shows how this mechanism works at one crankshaft position (D). The centrifugal force of the balancer weights exerts a pull on the engine to the upper right as the arrows in the figure show. At the same time the crankshaft counterweights are exerting a pull on the engine to the lower left. The centrifugal force of the two balancer weights equals the unbalanced force of the crankshaft counterweights, but the forces

Vibration Reduction with Crankshaft

H66



cancel each other since the directions of these forces are opposite. With the forces cancelled, engine vibration is greatly reduced. At other crankshaft positions, these two forces are also equal and opposing such that they cancel each other, keeping the system always in balance.

The balancer weights, turning at the same rpm as the crankshaft, are chain-driven by a sprocket on the crankshaft. The balancer chain is an endless type for maximum durability and wears very slowly due to its ample lubrication. The chain drives the weights through a sprocket on each balancer shaft. Each sprocket has four springs wedged between the sprocket and the weights to protect the sprocket and chain from the shock of power impulses. In the center of each spring is a pin, which prevents damage to the spring from excessive compression.

If balancer mechanism trouble develops, such as excessive shaft or chain wear, not only are the bearings and crankcase parts affected but the resulting power loss and engine vibration may adversely affect performance and overall engine life.

Balancer shaft wear

Measure with a micrometer the diameter of each shaft where it wears on the needle bearings. Replace a shaft and its needle bearings if it has worn down on either side to less than the service limit.

Balancer Mechanism

H68

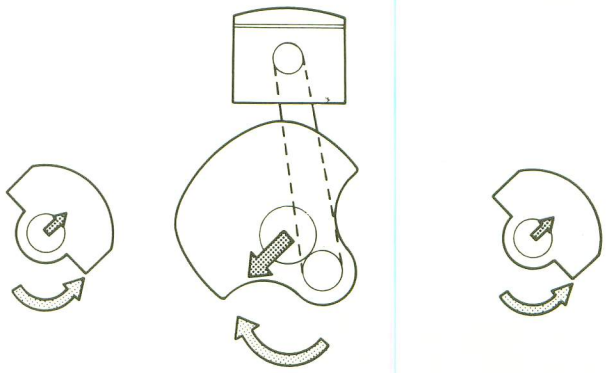


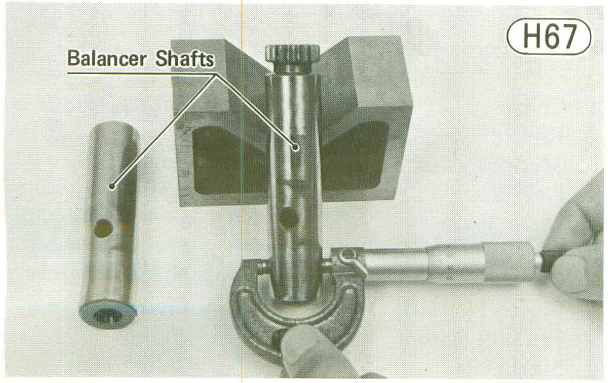
Table H46 Balancer Shaft Diameter

Standard	Service Limit
23.987~24.000 mm	23.95 mm

Spring free length

Measure the free length of each spring with vernier calipers. Replace any spring which is shorter than the service limit.

H67



H69

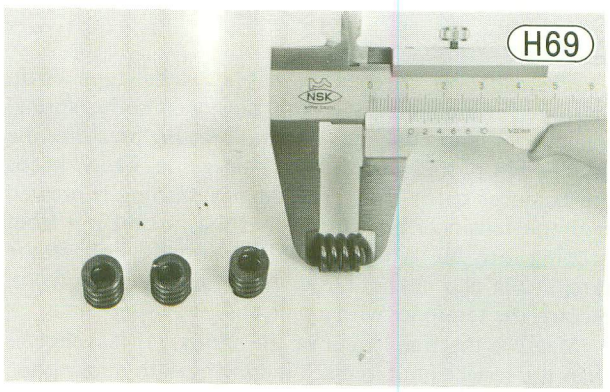
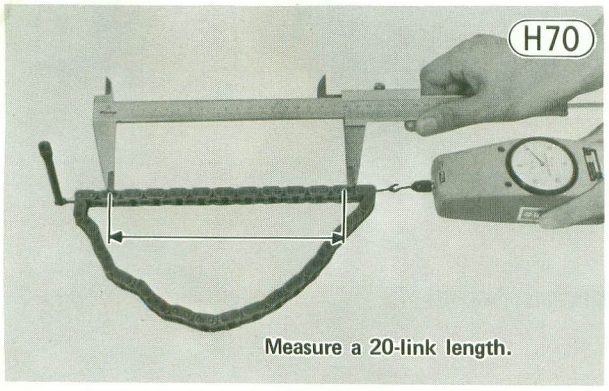


Table H47 Balancer Spring Free Length

Standard	Service Limit
10.8~11.2 mm	10.4 mm

Chain wear

Remove the chain, hold it taut with a force of about 5 kg in some manner such as the one shown in Fig. H70, and measure a 20-link length. Since the balancer chain may wear unevenly, take measurements at several places. If any measurement exceeds the service limit, replace the chain.



Measure a 20-link length.

Table H48 Balancer Chain Length

Standard	Service Limit
190.5~190.9 mm	193.4 mm

When replacing a chain with a new one, inspect all the sprockets. If either of the balancer mechanism sprockets is damaged or overly worn, replace it. If the crankshaft sprocket is damaged or overly worn, replace the crankshaft.

NOTE: If the crankshaft is replaced, select the right bearing insert in accordance with the combination of the connecting rod and the crankshaft marks (Pg. 151).

Chain guide wear

Visually inspect the rubber part of each chain guide. If it is worn down or damaged, replace the guide.

Measure the depth of the grooves where the chain links run (Fig. H25). If wear exceeds the service limit, replace the guide.

Table H49 Balancer Chain Guide Wear

Service Limit
1.5 mm

Chain tensioner inspection

This balancer mechanism has a ratchet-type chain tensioner, which consists of a tensioner body, spring, ratchet pin, and chain guide. Under spring pressure, the ratchet pin pushes against the chain guide, which keeps the balancer chain taut. The ratchet bushing is pressed into the tensioner hole to prevent the ratchet pin from backing into the tensioner body. Visually inspect the ratchet pin and ratchet bushing. If they are badly worn, replace the tensioner with a new one.

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

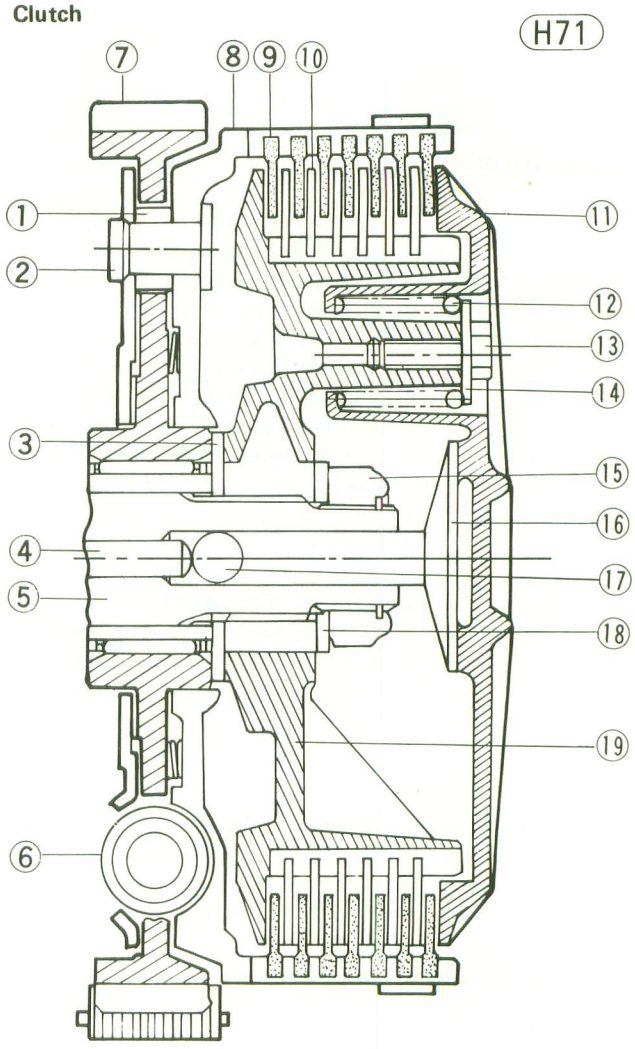
Table H50 Spring Free Length

Standard	Service Limit
45.4 mm	43.0 mm

CLUTCH

Fig. H71 shows the construction of the clutch, which is a wet, multi-plate type with 8 friction plates ⑨ and 7 steel plates ⑩. The friction plates are made of cork, used for its high coefficient of friction, bonded on a steel core, which provides durability and warp resistance. The clutch housing ⑧ has a reduction sprocket on one side and contains springs to absorb shock from the drive train.

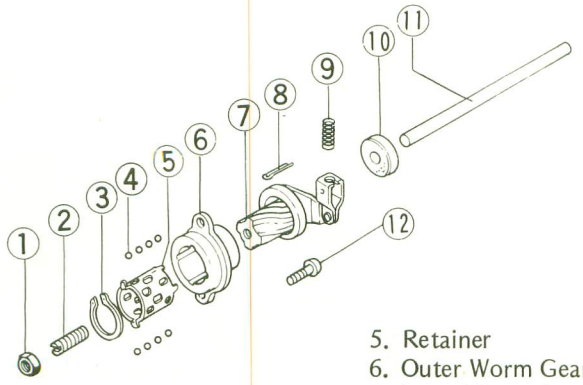
Clutch



1. Collar
2. Rivet
3. Thrust Washer
4. Push Rod
5. Drive Shaft
6. Shock Damper Spring
7. Clutch Housing Sprocket
8. Clutch Housing
9. Friction Plate
10. Steel Plate
11. Spring Plate
12. Spring
13. Bolt
14. Washer
15. Clutch Hub Nut
16. Spring Plate Pusher
17. Steel Ball
18. Washer
19. Clutch Hub

The clutch release mechanism is shown in Fig. H72. The clutch release outer worm gear ⑥ and the inner worm gear ⑦ are made of steel. Balls ④ are installed between the outer and inner worm gears to reduce the friction between them. Assembled into the center of the release inner gear is the clutch adjusting screw ②, which pushes on the push rod ⑪ and steel ball inside the drive shaft to release the clutch.

Clutch Release Mechanism (H72)



1. Locknut
2. Adjusting Screw
3. Circlip
4. Steel Ball
5. Retainer
6. Outer Worm Gear
7. Inner Worm Gear
8. Cotter Pin
9. Spring
10. Grease Seal
11. Push Rod
12. Screw

The friction plates are keyed to the clutch housing by tangs on the outer circumference of each plate. Since the clutch housing is chain driven directly from the crankshaft, these plates are always turning any time the engine is running. The steel plates have a toothed inner circumference and mesh with the splines in the clutch hub. The hub is mounted on the drive shaft, so that the drive shaft and steel plates always turn together.

One end of each clutch spring forces against its washer and bolt, which is threaded into the clutch hub. The other end forces against the spring plate. When the clutch is left engaged, the springs force the spring plate, friction plates, steel plates, and clutch hub tightly together so that the friction plates will drive the steel plates and transmit power to the transmission drive shaft.

When the clutch lever is pulled to release (disengage) the clutch, the clutch cable turns the clutch release inner worm gear in towards the clutch. The clutch adjusting screw, assembled inside the clutch release inner worm gear, then pushes the push rod, which through the steel ball and spring plate pusher pushes the spring plate. Since the spring plate moves the same distance that the inner worm gear moves and the clutch hub remains stationary, the springs are compressed and pressure is taken off the clutch plates. Because the plates are no longer pressed together, power transmission from the crankshaft to the transmission drive shaft is interrupted. As the clutch lever is released, the clutch springs return the spring plate and once again force the spring plate, plate assembly, and clutch hub tightly together.

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 on 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. Excessively worn primary chain and sprockets.
2. Damaged sprocket teeth.
3. Too much clearance between the friction plate tangs and the clutch housing.
4. Weak or damaged damper spring(s).

Spring Tension

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 H51 Clutch Spring Tension

Length	Standard	Service Limit
23.5 mm	23.5 ~ 26.5 kg	21.5 kg

Friction plate wear, damage

Visually inspect the friction plates to see whether or not they show any signs of seizure, overheating, or unevenly worn. Measure the thickness of the plates with vernier calipers.

If any plates show signs of damage, or if they have worn past the service limit, replace them with new ones.

Friction Plate Measurement (H73)

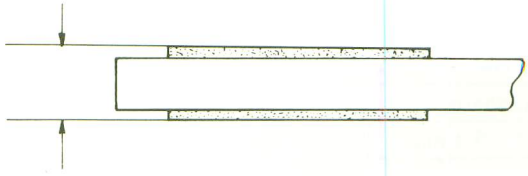


Table H52 Friction Plate Thickness

Standard	Service Limit
2.9~3.1 mm	2.7 mm

Clutch plate warp

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.

Replace any plates warped over the service limit.

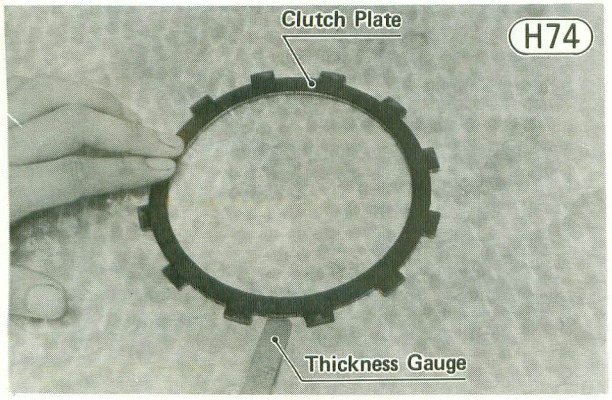


Table H53 Clutch Plate Warp

Standard	Service Limit
under 0.2 mm	0.4 mm

Friction plate/clutch housing clearance

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 be 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.

Friction Plate/Clutch Housing Clearance H75

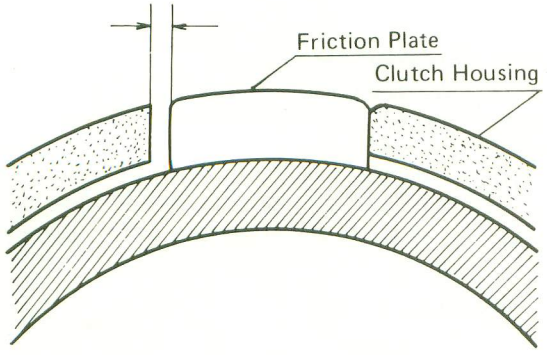
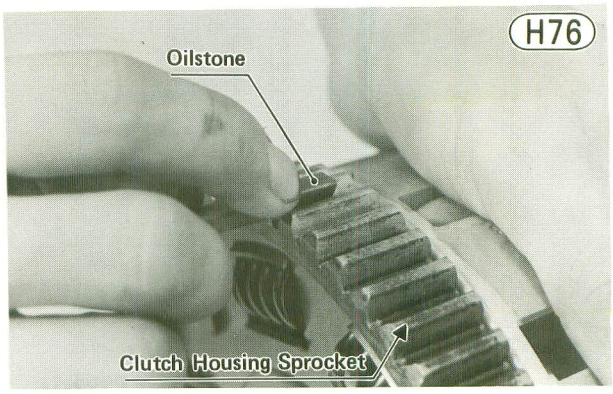


Table H54 Friction Plate/Clutch Housing Clearance

Standard	Service Limit
0.1~0.3 mm	0.5 mm

Clutch housing sprocket damage

Inspect the teeth on the clutch sprocket. Any light damage can be corrected with an oilstones, but the clutch housing must be replaced if the teeth are badly damaged. Damaged teeth on the clutch housing sprocket indicate that the primary chain, by which it is driven, may also be damaged. At the same time that the clutch housing sprocket is repaired or replaced, the primary chain should be inspected, and then replaced if necessary.



Clutch housing/drive shaft sleeve wear

Measure the diameter of the drive shaft sleeve with a micrometer. Replace the drive shaft sleeve if the diameter is less than the service limit. Measure the inside diameter of the clutch housing with a cylinder gauge. Replace the clutch housing if the diameter exceeds the service limit. When replacing the clutch housing and/or drive shaft sleeve, replace the clutch housing needle bearing also.

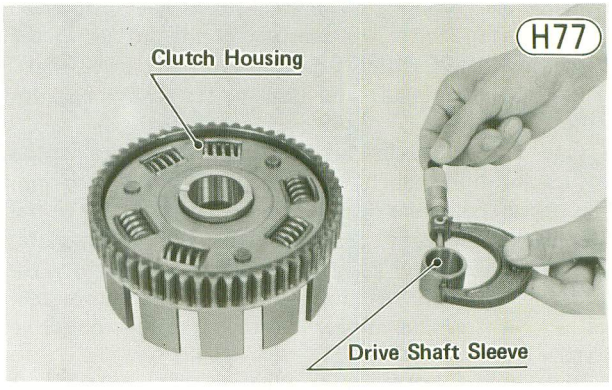


Table H55 Clutch Housing, Drive Shaft Sleeve Diameter

	Standard	Service Limit
Housing I.D.	37.000~37.016 mm	37.04 mm
Sleeve O.D.	31.995~31.998 mm	31.97 mm

Needle bearing wear

The rollers in the needle bearing wear so little that the wear is difficult to measure. Instead, inspect the needle bearing for abrasion, color change, or other damage. If there is any doubt as to its condition, replace the needle bearing.

Clutch hub damage

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

With the clutch release assembled, push the inner worm 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 worm gears with grease.

PRIMARY CHAIN

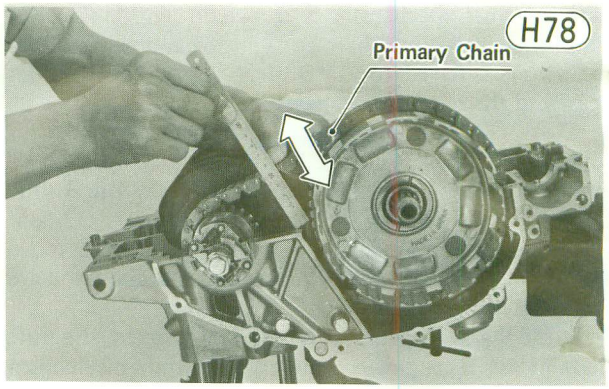
The power transmission from the crankshaft to the drive shaft is chain-drive, utilizing a Hy-Vo (high velocity) chain. The Hy-Vo chain is a rocker-joint type with a pin and rocker construction. Some of the special features of the Hy-Vo chain are its capacity to transmit much power at high speed, its resistance to heat seizure due to a construction which employs rolling rather than sliding friction, quiet operation even at high rpm, and low power loss.

Wear

A primary chain which has worn such that it is 1.4 % or more longer than when new is no longer safe for use and should be replaced. Split the crankcase. Leaving the transmission and crankshaft in place, inspect the wear by measuring the chain slack, and replace the chain if it has worn past the service limit. The replacement chain must be the Tsubakimoto Hy-Vo 3/8P-1W, 76-link chain.

Table H56 Primary Chain Play

Service Limit
32 mm



When a new chain is installed, check the chain guides, and replace them with new ones if necessary.

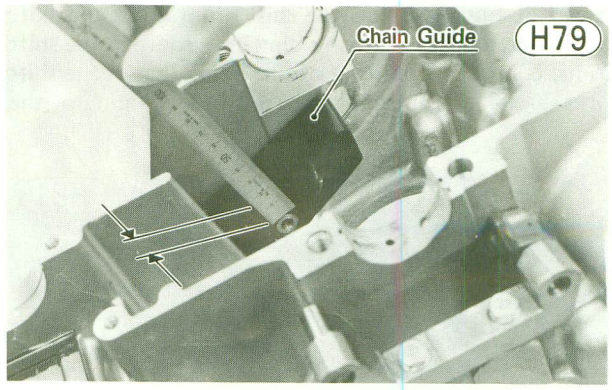


Table H57 Primary Chain Guide Thickness (Upper, Lower)

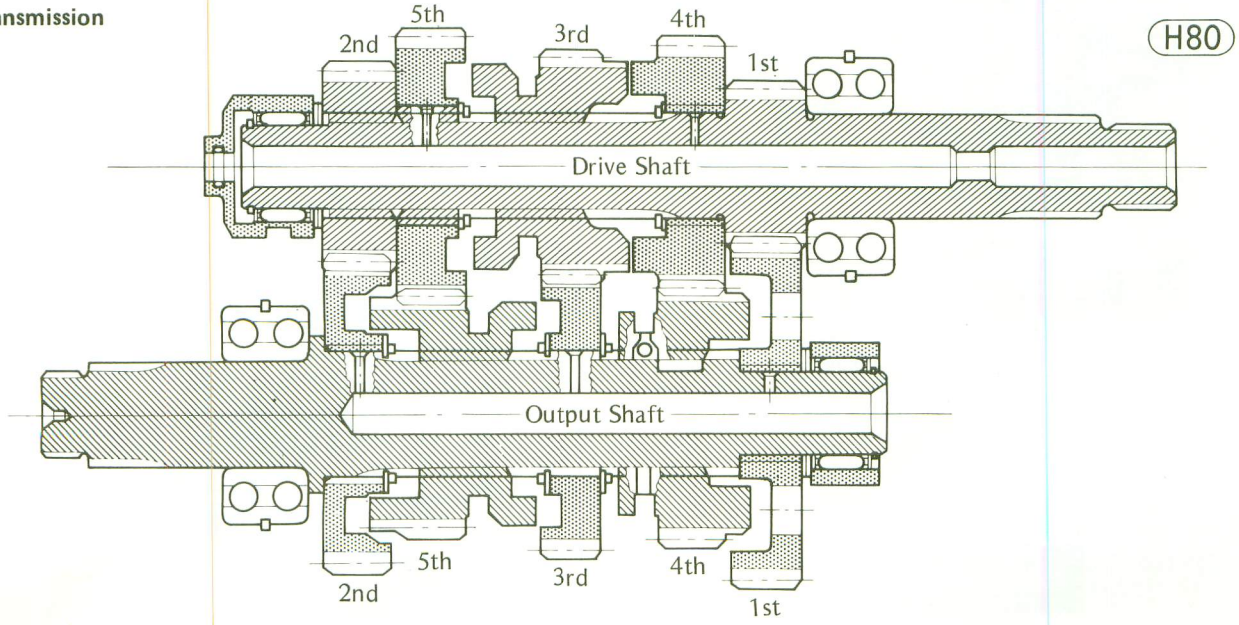
Standard	Service Limit
6.0 mm	3.0 mm

NOTE: When installing new chain guides, apply a non-permanent locking agent to the chain guide screws.

TRANSMISSION

The transmission is a 5-speed, constant mesh, return shift type. Its cross section is shown in Fig. H80, and the

Transmission

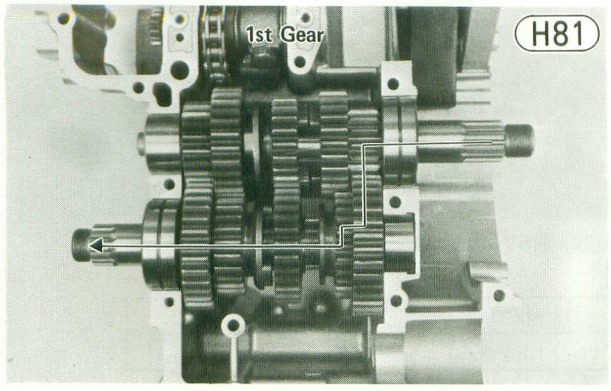


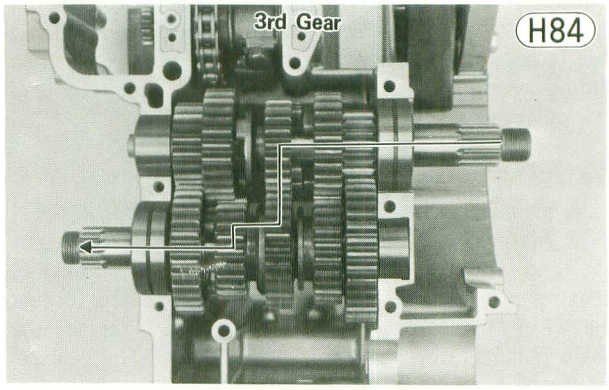
external shift mechanism is shown in Fig. H87. For simplicity, the drive shaft gears in the following explanation are referred to as "D" (e.g., D1=drive shaft 1st gear) and the output shaft gears as "O".

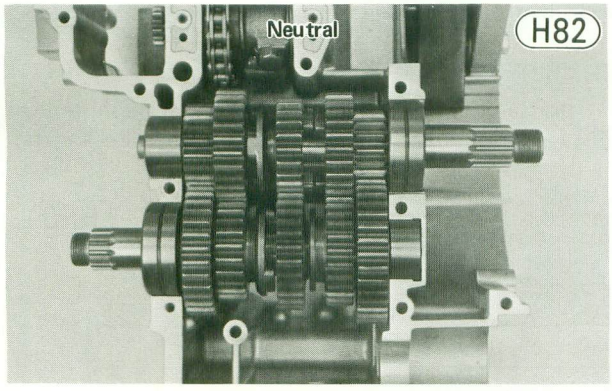
Gears D3, O4, and O5 are all splined to, and thus rotate with their shafts. During gear changes, these gears are moved sideways on their shafts by the 3 shift forks, one for each gear. Gears D4, D5, O1, O2, and O3 rotate free of shaft rotation, but cannot move sideways Gears. D1 and D2 rotate with the shaft and are unable to move sideways.

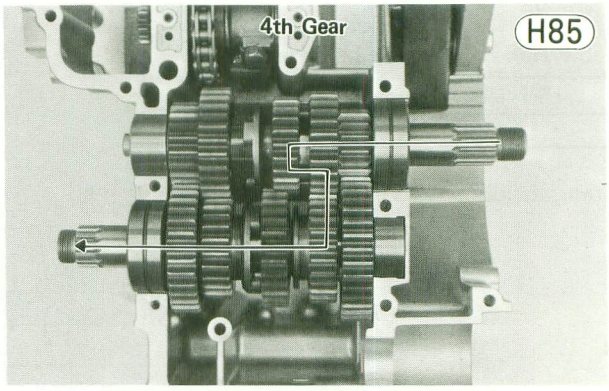
When the shift pedal ④ is raised or lowered, the shift shaft ⑰ turns, a pawl on the external shift mechanism arm ⑭ catches on one of the shift drum pins ⑥, and the shift drum ⑨ turns. At the same time, the overshift limiter ⑥ on the shift lever ⑲ catches another pin as shown in Fig. H88. As the shift drum turns, the shift fork guide pins (3), each riding in a groove in the shift drum, change the position of one or another of the shift forks ⑧, ㉑, ㉓, in accordance with the winding of the grooves. The shift fork ears then determine the position of gears D3 ③, O4 ⑩; and/or O5 ⑫. Refer to Fig. H81 to H86 for the gear position and drive path for neutral and each of the 5 gears.

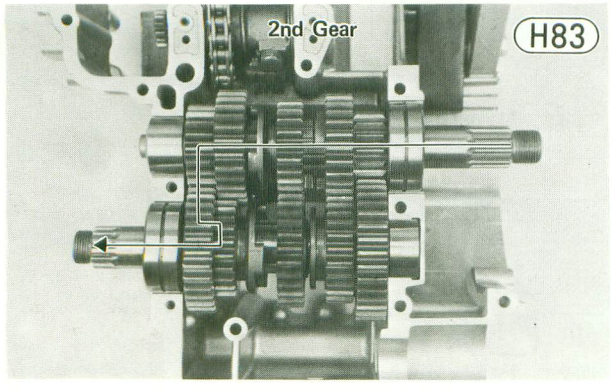
A pawl spring ⑮ is fitted on the external shift mechanism to keep the shift arm and overshift limiter pressed against the shift drum pins to ensure proper pawl and pin contact. When the shift pedal is released after shifting, the return spring ⑳, returns the shift lever and shift pedal back to their original positions. So that the transmission will remain where it was shifted, the shift drum positioning pin spring pushes the shift drum positioning pin ㉔ into one of six notches on the shift drum operating plate ⑪. Five of these notches are equally spaced and correspond to the 5 gears. The other notch is halfway between the notches for 1st and 2nd gears, and corresponds to the half-stroke shift pedal movement from 1st or 2nd gear required to shift into neutral.

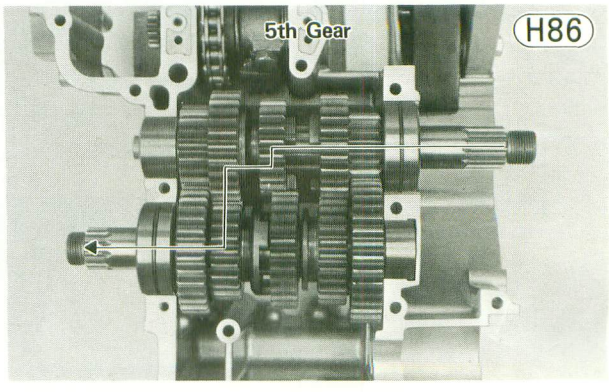






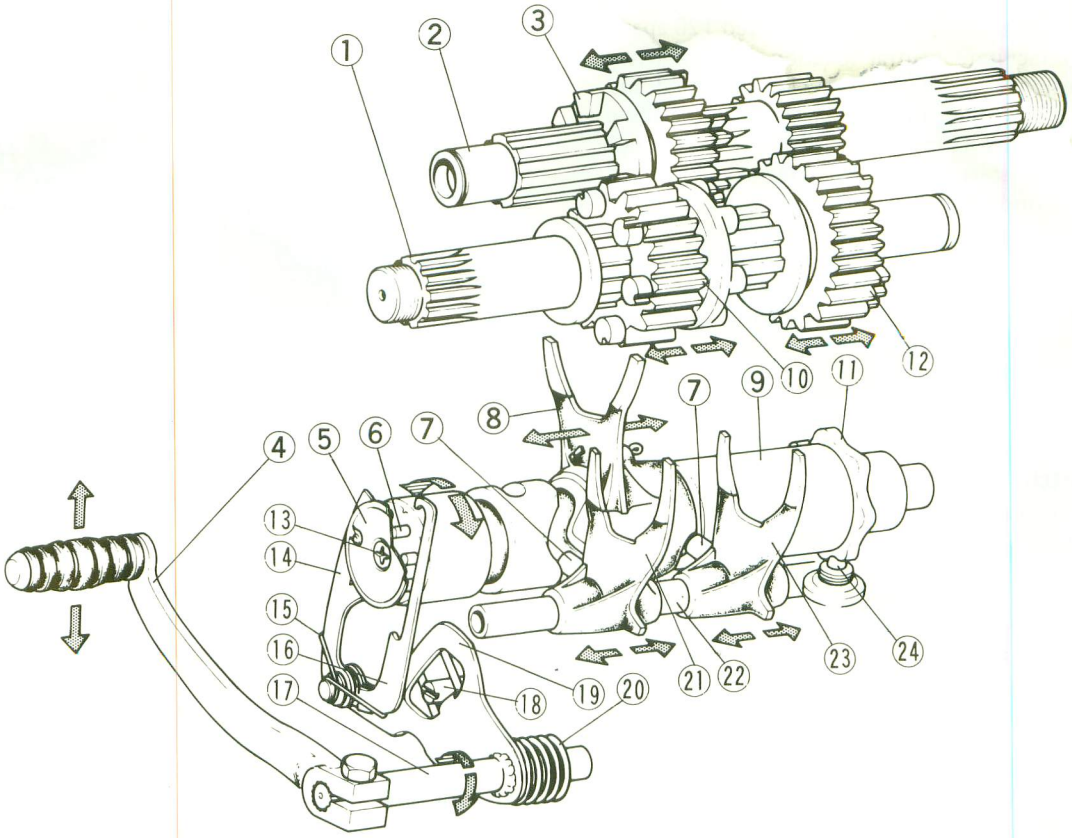






Shift Mechanism

H87

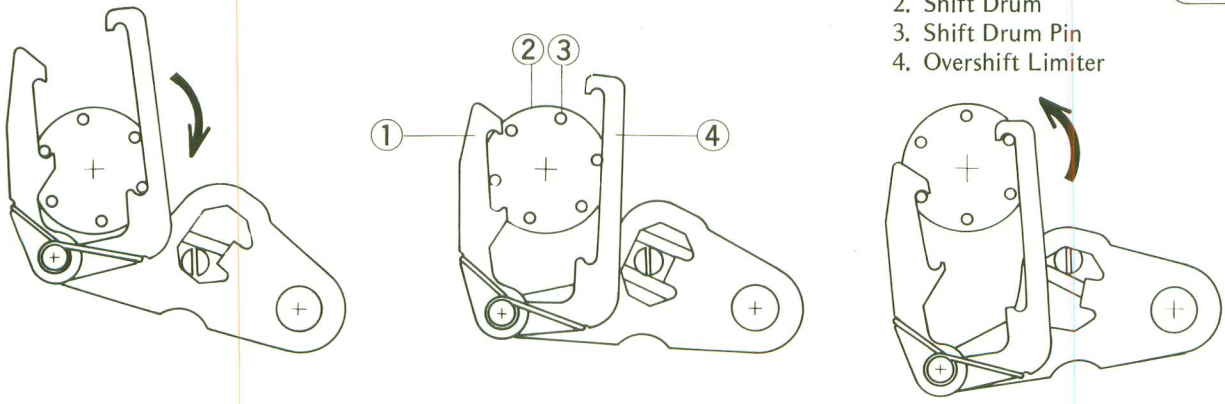


1. Output Shaft
2. Drive Shaft
3. Drive 3rd Gear
4. Shift Pedal
5. Shift Drum Pin Plate
6. Shift Drum Pin
7. Shift Fork Guide Pin
8. Shift Fork (D3)
9. Shift Drum
10. Output 5th Gear
11. Operating Plate
12. Output 4th Gear
13. Screw
14. Shift Mechanism Arm
15. Pawl Spring
16. Overshift Limiter
17. Shift Shaft
18. Return Spring Pin
19. Shift Lever
20. Return Spring
21. Shift Fork (O5)
22. Shift Rod
23. Shift Fork (O4)
24. Positioning Pin

Shift Mechanism Arm and Over Shift Limiter Operation

H88

1. Shift Mechanism Arm
2. Shift Drum
3. Shift Drum Pin
4. Overshift Limiter



The return spring pin ⑱ on the side of the crankcase passes through a cutout on the shift mechanism lever. This pin engages between the two ends of the shift mechanism return spring. At the end of a full upshift or downshift stroke, the return spring pin makes contact with the cutout on the shift lever to limit the shift lever's range of movement.

Overshift Limiter

Each time that the shift pedal is operated, the overshift limiter interlocks with the shift drum pins to prevent overshifting. On a full upshift or downshift stroke, the limiter "hooks" catch the shift drum pins to keep the inertia of the heavy shift drum from allowing it to rotate beyond the intended gear position, particularly on a fast shift.

Neutral Locator

Inside gear O4 three steel balls are located 120 apart, and serve to facilitate neutral location when shifting from first gear. When the motorcycle is stopped and the output shaft is not turning, one or two of these balls falls down into its respective groove in the output shaft. When the shift pedal is operated to shift from first toward second, gear O4 starts moving, but halfway toward its second gear position, the steel ball(s) hits the end of the groove(s) in the output shaft, stopping gear O4 from moving, stopping the shift drum from turning, and leaving the transmission gears in the neutral position.

Neutral Switch

A neutral indicator light is provided so that the rider can readily determine whether or not the transmission is in neutral. The neutral switch, installed in the external shift mechanism cover, consists of a spring loaded pin which contacts a nub on the shift drum pin holder when the transmission is in neutral. This completes the neutral indicator light circuit, which turns the neutral indicator light on.

Transmission or external shift mechanism damage, causing the transmission to misshift, overshift, and/or jump out of gear, brings about more damage to the transmission and also 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 mechanism arm
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.

External shift mechanism inspection

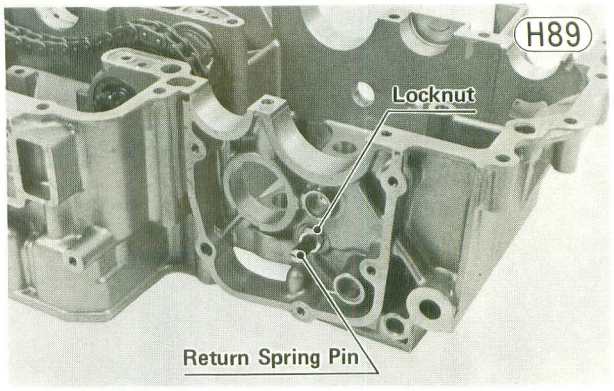
Inspect the shift pawl spring, shift pawls, and return spring. Replace any broken or otherwise damaged parts.

Measure the free length of the shift drum positioning pin spring. If it exceeds the service limit, replace it with a new one.

Table H58 Shift Drum Positioning Pin Spring Length

Standard	Service Limit
32.3 mm	30.7 mm

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. Then screw it back in, tightening its locknut.



Gear backlash

Split the crankcase. 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. To measure the backlash, set a dial gauge against the teeth on one gear, and move the gear back and forth while holding the other gear steady. The difference between the highest and the lowest gauge reading is the amount of backlash. Replace both gears if the amount of backlash exceeds the service limit.

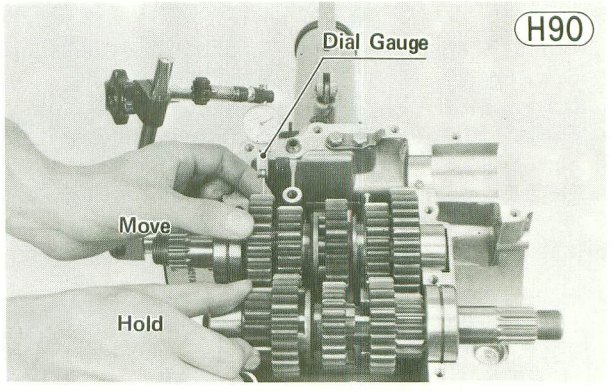


Table H59 Gear Backlash

Standard	Service Limit
under 0.17 mm	0.25 mm

Shift fork bending

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

Shift fork/gear groove wear

Measure the thickness of the 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.

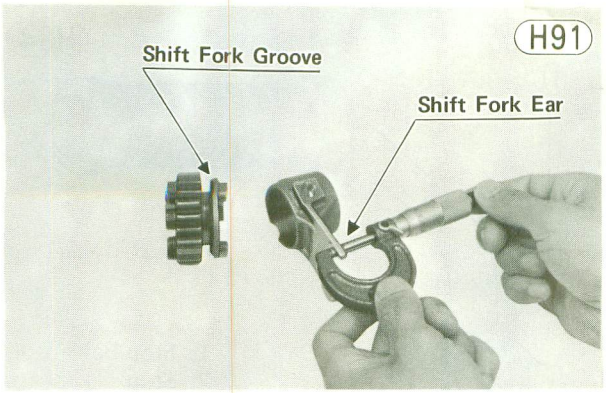


Table H60 Shift Fork Thickness

Standard	Service Limit
4.9~5.0 mm	4.7 mm

Table H61 Gear Shift Fork Groove Width

Standard	Service Limit
5.05~5.15 mm	5.25 mm

Shift fork guide pin/shift drum groove wear

Measure the diameter of each shift fork guide pin, and measure the width of each shift drum groove. Replace any shift fork on which the guide pin has worn past the service limit. If a shift drum groove is worn past the service limit, replace the shift drum.

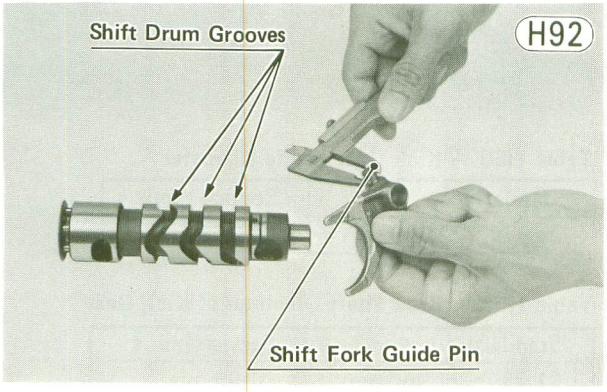


Table H62 Shift Fork Guide Pin Diameter

	Standard	Service Limit
4th, 5th	7.9~8.0 mm	7.85 mm
3rd	7.978~8.000 mm	7.92 mm

Table H63 Shift Drum Groove Width

Standard	Service Limit
8.05~8.20 mm	8.25 mm

Gear dog, gear dog hole, gear dog recess damage

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

Gear/shaft wear

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

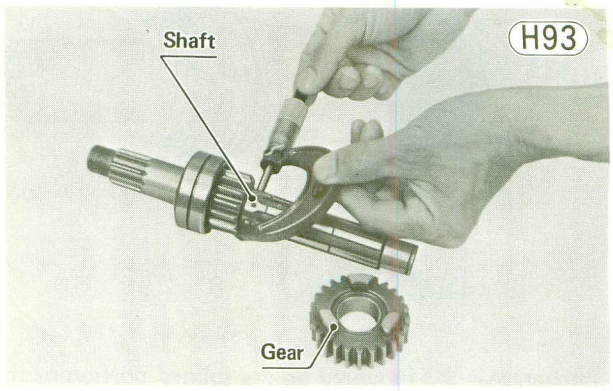


Table H64 Gear/Shaft, Gear/Bush Clearance

Gear	Standard	Service Limit
D4, O2, O3, D5	0.020~0.062 mm	0.16 mm
O1	0.014~0.048 mm	0.15 mm

Ball bearing wear, damage

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

The rollers in the needle bearings wear so little that the wear is difficult to measure. Instead, inspect the bearings for abrasions, color change, or other damage. If there is any doubt as to the condition of either bearing, replace it.

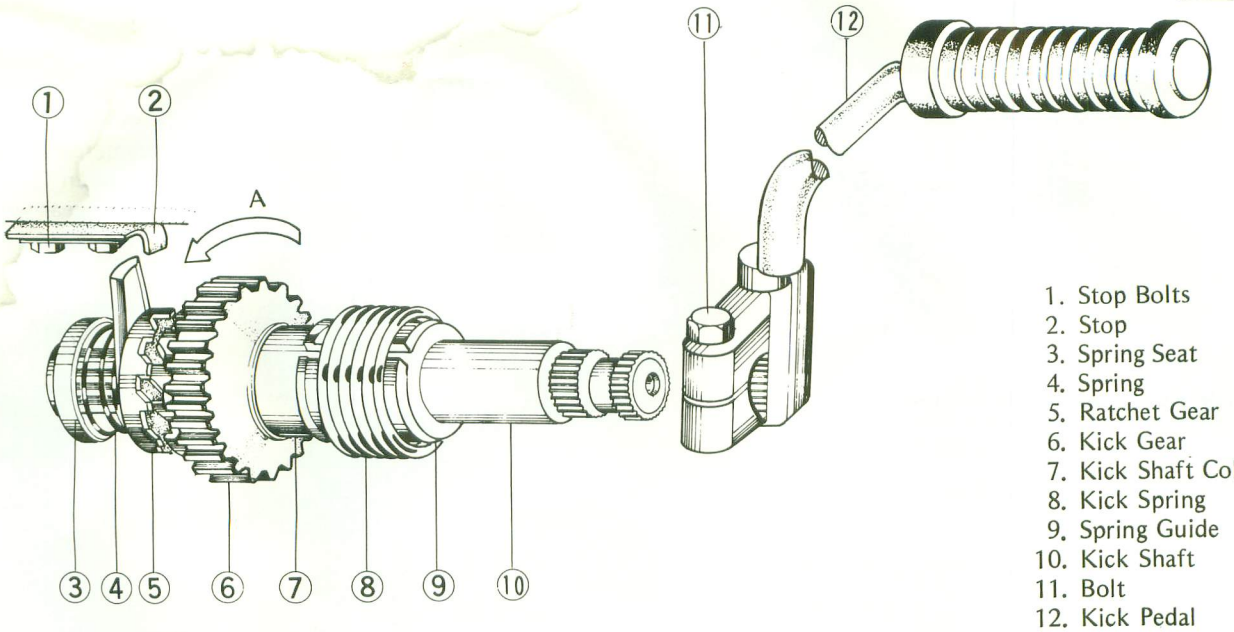
KICKSTARTER

Kickstarter construction is shown in Fig. H94. The kick gear is connected to the primary sprocket on the crankshaft through the output shaft 1st gear, drive shaft 1st gear, clutch housing sprocket, and primary chain.

The kick gear ⑥, constructed with a ratchet on one side, is always meshed with the output shaft 1st gear and turns freely anytime the output shaft is turning. The

Kickstarter

H94



1. Stop Bolts
2. Stop
3. Spring Seat
4. Spring
5. Ratchet Gear
6. Kick Gear
7. Kick Shaft Collar
8. Kick Spring
9. Spring Guide
10. Kick Shaft
11. Bolt
12. Kick Pedal

ratchet gear ⑤, mounted on the splined portion of the kick shaft ⑩, turns with the kick shaft and can be moved sideways on the shaft. A spring ④ presses on the ratchet gear in the direction of the kick gear. But when the kick pedal ⑫ is not being operated, an arm on the ratchet gear is caught on the stop ②, which prevents the ratchet gear from meshing with the ratchet on the kick gear.

When the kick pedal is operated, the ratchet gear arm is freed from the stop and the ratchet gear then meshes with the kick gear ratchet, rotating the kick gear. The gear train of the kickstarter system then cranks the engine. As the engine starts, the primary sprocket through the gear train turns the kick gear. But, since the kick gear rotates in the direction of arrow "A" as shown in Fig. H94, the kick gear ratchet doesn't catch on the ratchet gear.

When the kick pedal is released, the kick shaft is turned by the return spring, bringing the kick pedal to its original position. At the same time, the ratchet gear arm rides up the stop, breaking away from the kick gear. The kick gear now turns freely.

If the kick pedal return spring weakens or breaks, the kick pedal will not return completely or at all, and the kick gear and ratchet gear will stay partially meshed, making noise while the engine is running. Kick mechanism noise may also result when the kick gear, collar, or kick shaft becomes worn.

If the ratchet gear or ratchet on the kick gear is worn or damaged, the kick gear will slip, and it will not be possible to kickstart the engine.

Kick gear, shaft wear

Measure the inside diameter of the kick gear, and replace the gear if the diameter is over the service limit. Visually inspect the ratchet portion of the kick gear. If there is any kind of damage, replace the kick gear.

Measure the kick shaft diameter at the kick gear, and replace it if it is under the service limit.

H95

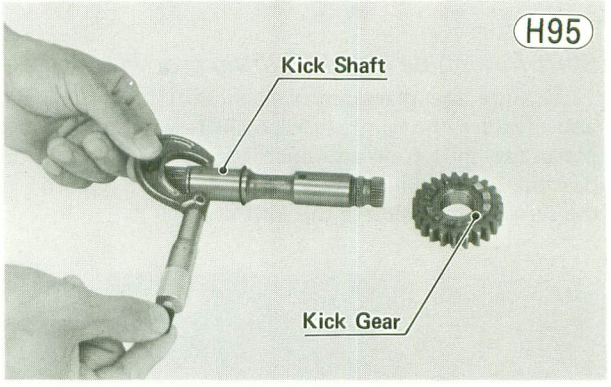


Table H65 Kick Gear Inside Diameter

Standard	Service Limit
21.979~22.000 mm	22.05 mm

Table H66 Kick Shaft Diameter at Kick Gear

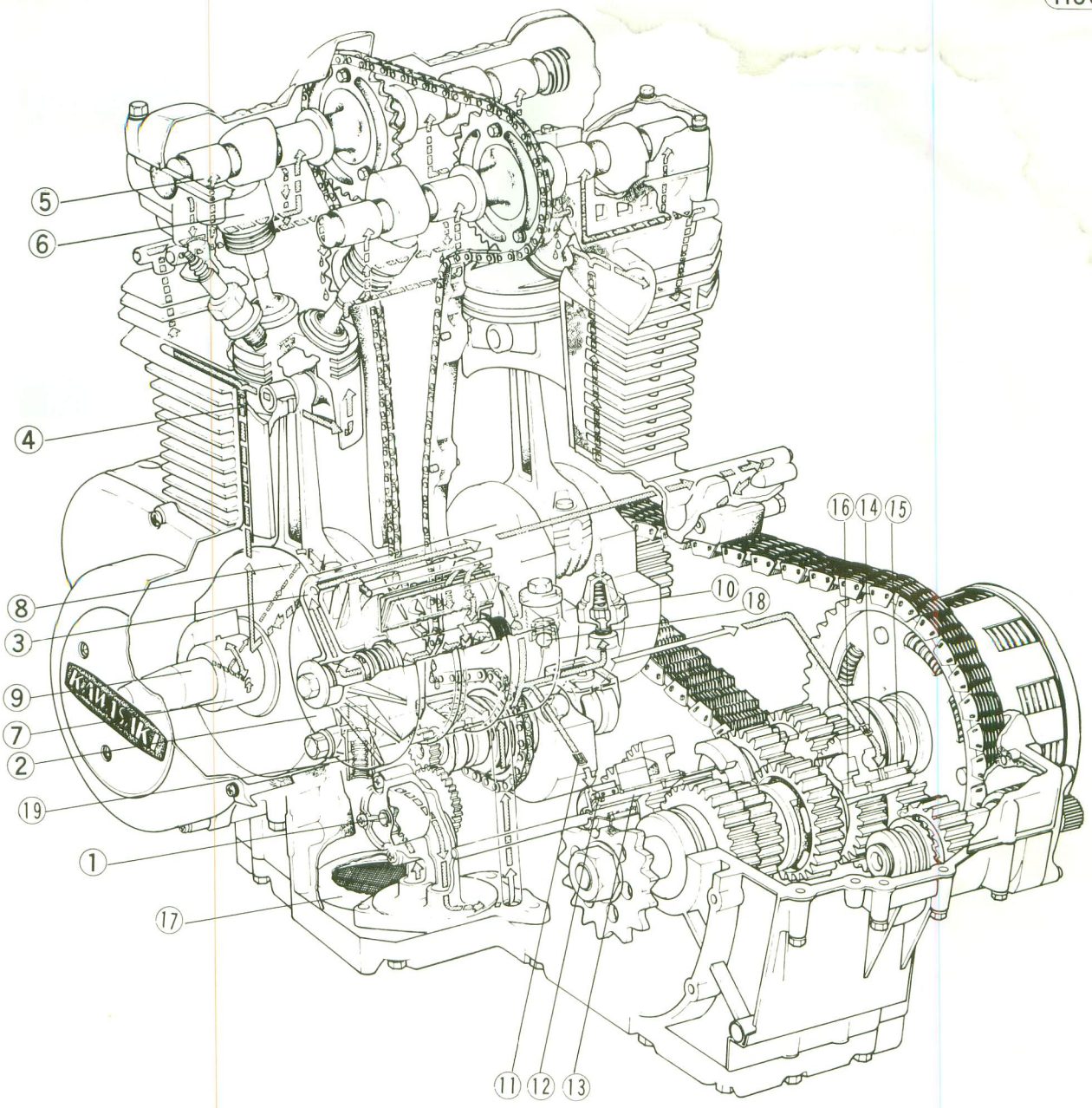
Standard	Service Limit
21.939~21.960 mm	21.92 mm

ENGINE LUBRICATION

The engine lubrication system includes the oil screen, engine oil pump, oil filter, oil pressure relief valve, and oil passages. An oil pressure indicator switch is provided to warn in case of insufficient oil pressure. An oil breather keeps crankcase pressure variations to a minimum and reduces emmissions by recirculating blowby gas. The discussion here concerns how these parts work together, how the oil reaches the various parts of the engine, and how to check the oil pressure. Details on the engine oil pump, oil filter, and oil breather are given in the sections (Pg. 165 ~ 166) following engine lubrication.

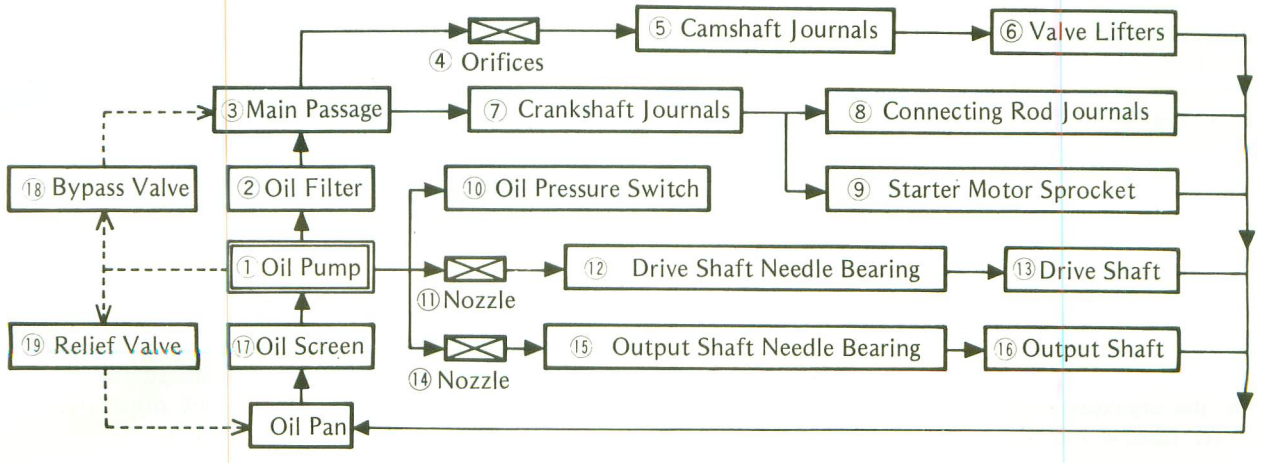
Engine Lubrication System

H96



Engine Oil Flow Chart

H97



Since the engine lubrication system is the wet sump type, there is always a supply of oil in the crankcase at the bottom of the engine. The oil is drawn through the wire screen into the oil pump as the pump rotors turn. The pump is driven by a gear attached on the left end of the rear balancer shaft. The screen removes any metal particles and other foreign matter which could damage the oil pump. From the pump the oil passes through the oil filter element for filtration. If the element is badly clogged, slowing the flow of oil through it, oil bypasses the element through a bypass valve in the upper crankcase half. After passing through the filter, the oil flows through the crankcase main oil passage to where it branches into two lubrication routes.

One of these routes is to the crankshaft main bearings, then to the connecting rod journals and to the starter motor crankshaft sprocket. The cylinder walls, pistons, and piston pins are lubricated by splash from the spinning crankshaft. The oil then drops and collects at the bottom of the crankcase to be used again.

The other route for filtered oil is through the oil passage at each side of the cylinder block, up to the top of the cylinder head. After lubricating the camshaft journals, the oil flows out over the cams and down around the valve lifters to lubricate these areas. This oil returns to the sump via the oil return holes at the base of the valve lifters, and via the cam chain opening in the center of the head and cylinder.

After lubricating the camshaft journals, the oil flows out over the cams and down around the valve lifters to lubricate these areas. This oil returns to the sump via the oil return holes at the base of the valve lifters, and via the cam chain opening in the center of the head and cylinder.

The oil pump feeds unfiltered oil directly to the transmission. It exits from the oil passage nozzles at the needle bearings of the drive and output shafts, and drops down into the crankcase after lubricating the bearings and gears.

The balancer mechanism shaft needle bearings are lubricated by spraying oil which lands on the oil receiver recess in the lower crankcase half mating surface. After bearing lubrication the oil drops and collects at the bottom of the crankcase for recirculation.

Both the oil pressure switch and the oil pressure relief valve are important for maintaining a constant oil pressure. The oil pressure switch, mounted on the upper part of the crankcase, checks on the oil pressure in the main oil passage and lights the oil pressure warning light if the pressure falls below a safe level. If the oil pressure is insufficient, the oil pump is overworn or malfunctioning or there is insufficient oil supply to the pump. On the other hand, if the oil pressure becomes excessive, such as when the engine is started (especially in cold weather), the relief valve reduces the oil pressure. The relief valve opens whenever a pressure of 5.2 kg/cm^2 (74 psi) is exerted on the valve spring.

Oil pressure measurement

Warm up the engine. Remove the oil pressure switch from the crankcase, and connect the oil pressure gauge adapter (special tool) in its place. Fit the oil pressure switch and the oil pressure gauge on the adapter, and start the engine. Run the engine at the specified speed (Table H67), and read the oil pressure gauge.

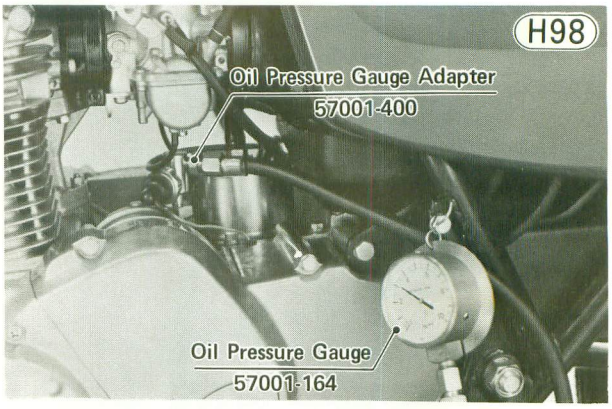


Table H67 Oil Pressure

Oil Pressure @4,000 rpm, 90°C (194°F)
More than 3.4 kg/cm^2 (48 psi)

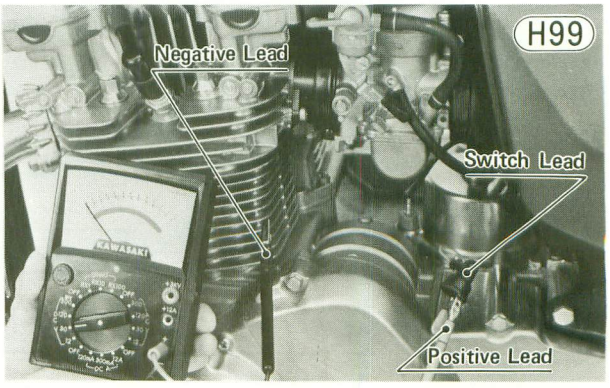
If the oil pressure is significantly below the standard pressure, inspect the engine oil pump (Pg. 165). If the pump is not at fault, inspect the rest of the lubrication system.

NOTE: Tighten the oil pressure switch with 1.3~1.7 kg-m (9.5~12.0 ft-lbs) of torque.

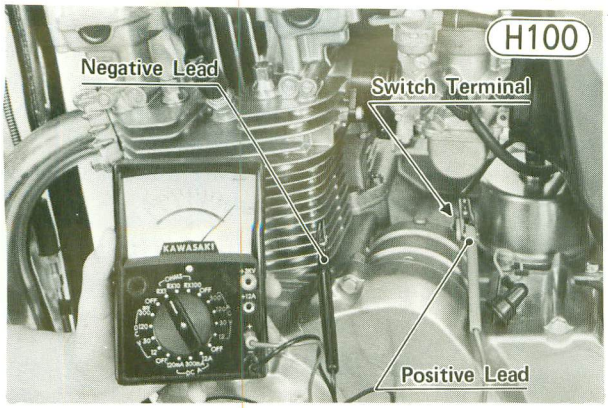
Oil pressure switch inspection

The switch should turn on the warning light whenever the ignition switch is on with the engine not running.

If the light does not go on, disconnect the switch lead. Connect the positive lead of a 30 VDC range voltmeter to the switch lead and ground the voltmeter negative 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.



If the voltmeter does indicate battery voltage, then the oil pressure switch may defective. Use an ohmmeter to check for continuity between the switch terminal and the switch body. With the switch lead disconnected, and the engine stopped, any reading other than zero ohms indicates that the switch is at fault.



The switch should turn off the warning light whenever the engine is running faster than the specified speed. If the light stays on, stop the engine immediately, disconnect the lead from the switch, and connect the ohmmeter between the switch terminal and the engine (chassis ground). The meter should read zero ohms when the engine is off and infinity when the engine is running above the specified speed (Table H68). If the meter reads zero ohms when the engine is running at the specified speed, stop the engine and measure the oil pressure (Pg. 164). If the oil pressure is more than 0.2 ~ 0.4 kg/cm^2 (2.8 ~ 5.7 psi) with the engine running at the specified speed, the oil pressure switch is defective, and must be replaced.

NOTE: When installing a new switch, tighten it with 1.3 ~ 1.7 kg-m (9.5 ~ 12.0 ft-lbs) of torque.

Table H68 Oil Pressure switch Inspection

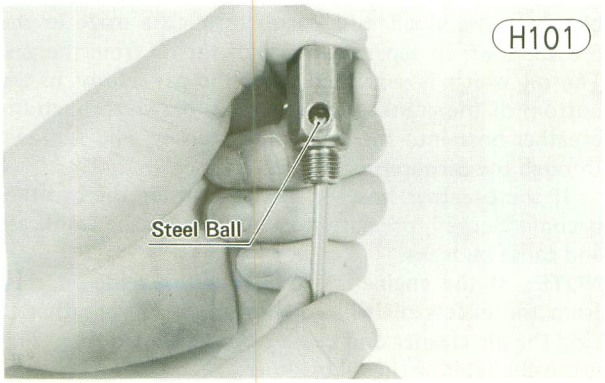
Meter	Engine Speed	Oil Pressure Switch
R x 1	Stopped	ON (Ohmmeter reads zero ohms)
	More than idle speed	OFF (Ohmmeter reads infinity)

Relief Valve

Relief valve inspection

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

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



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

The oil pump, installed in the left side of the lower crankcase half, is a simple trochoid type with an outer and an inner rotor. The gear on the pump is driven in direct proportion to engine rpm by a gear attached to the left end of the rear balancer shaft.

If the oil pump becomes worn, it may no longer be able to supply oil to lubricate the engine adequately.

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.

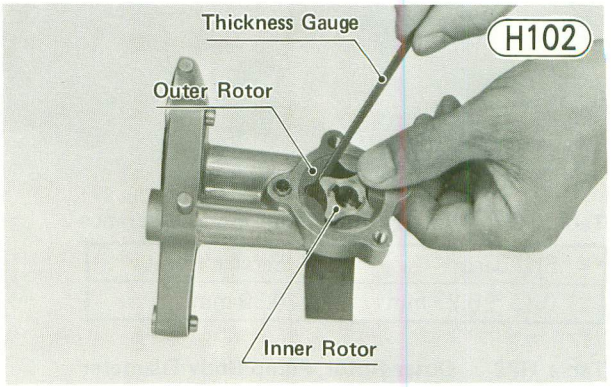


Table H69 Outer Rotor/Inner Rotor Clearance

Standard	Service Limit
0.05 ~ 0.23 mm	0.30 mm

Rotor side clearance

Lay a straightedge on the oil pump body, and measure the clearance between the straightedge and the rotors with a thickness gauge. If the clearance exceeds the service limit, replace either the pump body or the rotors depending on which is excessively worn.

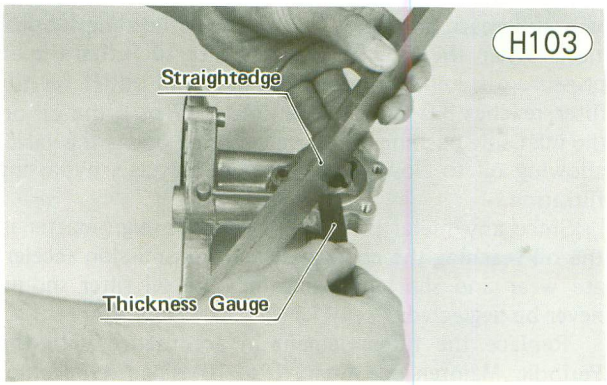


Table H70 Rotor Side Clearance (with cover gasket fitted)

Standard	Service Limit
0.02~0.07 mm	0.12 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, measure the outer rotor outside diameter and pump body inside diameter. If the outer rotor outside diameter is less than the service limit, replace the rotors. If the pump body inside diameter exceeds the service limit, replace the oil pump assembly.

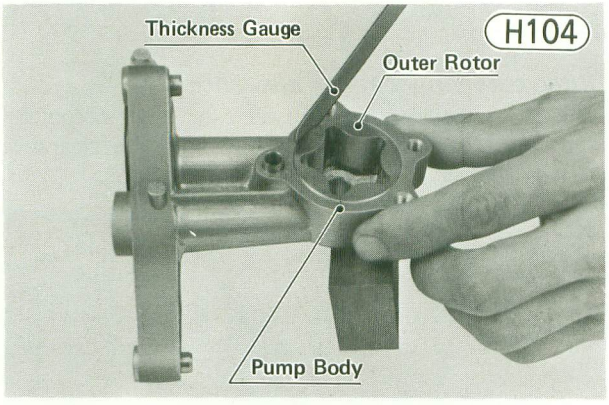


Table H71 Outer Rotor/Pump Body Clearance

Standard	Service Limit
0.15~0.23 mm	0.30 mm

Table H72 Outer Rotor, Pump Body Diameter

	Standard	Service Limit
Outer Rotor	40.51~40.56 mm	40.45 mm
Pump Body	40.71~40.74 mm	40.80 mm

Oil Filter

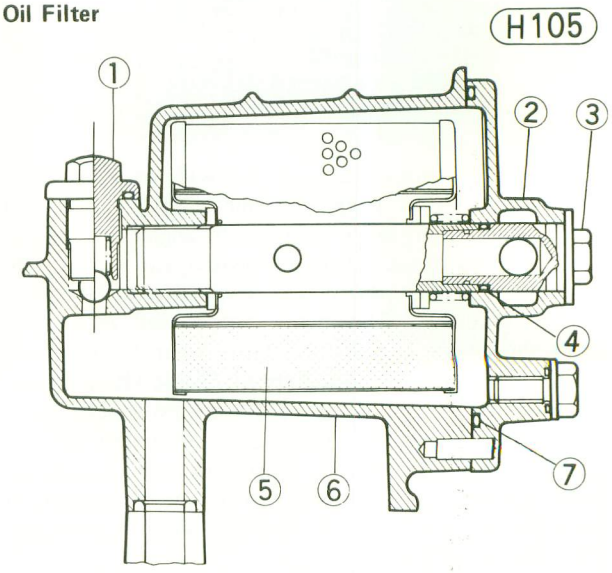
The oil filter, located in the upper left part of the crankcase, remove impurities from the oil.

As the filter element becomes dirty and clogged, its filtering efficiency is impaired. If it becomes so clogged that it seriously impedes oil flow, a pressure-activated bypass valve in the crankcase opens so that sufficient oil will still reach the parts of the engine needing lubrication. When the filter becomes clogged such that the oil pressure difference between the inlet and outlet for the filter reaches 3.0~4.0 kg/cm^2 (43~57 psi), the oil on the inlet side pushing on the valve spring opens the valve, allowing oil to flow to the main oil passage, bypassing filtration.

Since any metal particles or other foreign matter in the oil reaching the crankshaft and transmission accelerate wear and shorten engine life, the oil filter should never be neglected.

Replace the filter element in accordance with the Periodic Maintenance Chart (Pg. 10) since it becomes clogged with metal filings from the engine and transmission especially during break in. After break-in, replace the element at every other oil change. When the filter is removed for element replacement, wash the rest of the filter parts in a high flash-point solvent and check the condition of the **O** rings. If they are worn or deteriorated, replace them to avoid oil leakage.

Oil Filter



1. Bypass Valve
2. Filter Cover
3. Filter Bolt
4. O Ring
5. Filter Element
6. Filter Body
7. O Ring

Oil Breather

The oil breather is located on the top of the crankcase. The underside of the breather opens to the crankcase, while the upper part connects through the breather hose to the air cleaner. Its function is to minimize crankcase pressure variations caused by crankshaft and piston movement and to recycle blowby gas.

Gas blowby is the combustion chamber gas escaping past the rings into the crankcase. A small amount is unavoidable, but gas blowby increases as cylinder wall and piston ring wear progresses. If not efficiently removed, blowby gas will seriously contaminate the engine oil.

Recycling blowby gas means more efficient combustion, but the oil mist resulting from transmission gear movement must first be removed. The mixture of blowby gas and oil mist passes through a maze in the breather, which separates most of the oil from the gas. The oil which is separated from the gas returns to the bottom of the crankcase. The gas is drawn through the breather hose into the air cleaner housing, and is drawn through the carburetors into the engine.

If the breather hose or the parts inside the breather become clogged, pressure may build up in the crankcase and cause oil leaks.

NOTE: If the engine is overfilled with engine oil, mist from the excess oil will go through the oil breather to clog the air cleaner and cause carburetion trouble. This is not the fault of the oil breather.

Table H73 Engine Oil Seal

Crankshaft	Clutch Push Rod	Output Shaft	Shift Shaft	Kick Shaft
AJ254007	AK071807	AJ325211	AJ13225.5	AJ22325.5

ENGINE OIL SEALS

The engine oil seals are listed in Table H73. The crankshaft oil seal in the right engine cover forms a seal between the crank chamber and the contact breaker points cavity. If this seal is damaged, oil will leak into the contact breaker point cavity, and foul the contact breaker points. Any damaged, hardened, or otherwise defective oil seal will allow oil to leak.

Oil seal damage

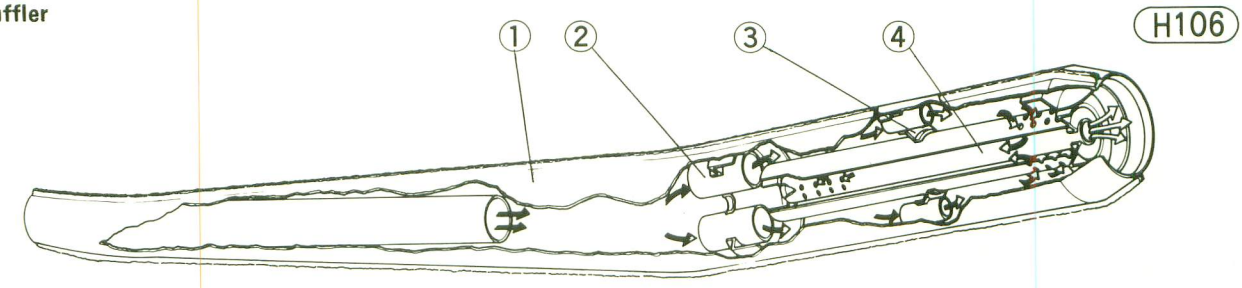
Inspect the oil seals, and replace any if the lips are misshapen, discolored (indicating the rubber has deteriorated), hardened, or otherwise damaged. Since an oil seal is nearly always damaged on removal, any removed oil seals must be replaced. When pressing in an oil seal which is marked, press it in with the mark facing out. Press the seal in so that the face of the seal is level with the surface of its hole.

MUFFLERS

The mufflers reduce exhaust noise and conduct the exhaust gases back away from the rider while keeping power loss to a minimum. If much carbon is built up inside the mufflers, exhaust efficiency is reduced, which lowers the engine power output.

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.

Muffler



1. Muffler
2. Connecting Pipe
3. Partition Wall
4. Baffle Tube

Maintenance—Chassis

Table of Contents

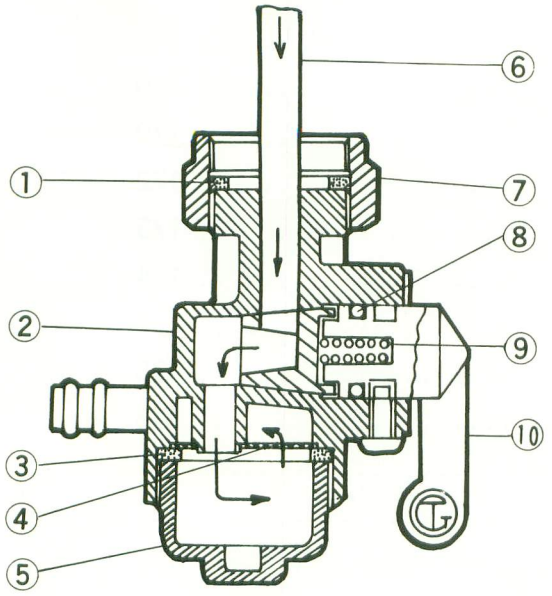
FUEL TANK, FUEL TAP

The fuel tank capacity is 14.5 liters, 2 liters of which form the reserve supply. A cap is attached to the top of the tank, and a fuel tap to the bottom. An air vent is provided in the cap to prevent an air lock, which would hinder fuel flow to the carburetors.

Fuel tap construction is shown in Fig. J1. The fuel tap has three positions: off, on, and reserve. With the tap in the "off" position, no fuel will flow through the tap; with the tap in the "on" position, fuel flows through the tap by way of the main pipe until only the reserve supply is left in the tank; with the tap in the "reserve" position, fuel flows through the tap from the bottom of the tank. The fuel tap contains a filter and a sediment cup to filter out dirt and collect water.

Fuel Tap

J1



1. Gasket
2. Body
3. Gasket
4. Filter
5. Sediment Cup
6. Main Pipe
7. Fuel Tap Nut
8. O Ring
9. Spring
10. Lever

Inspection and cleaning

If fuel leaks from the cap or from around the fuel tap, the gasket or O ring may be damaged. Visually inspect these parts, and replace them if necessary.

Examine the air vent in the cap to see if it is obstructed. Use compressed air to clear an obstructed vent.

Periodically inspect and clean the fuel tap filter and the sediment cup, using a high flash-point solvent and a fine brush. If the filter is damaged, it must be replaced. If the sediment cup contains much water or dirt, the fuel tank and the carburetor may also need to be cleaned.

To clean out the fuel tank, disconnect the fuel hoses, remove the fuel tap, and flush out the tank with a high flash-point solvent.

To drain the carburetor flow bowls, remove the plug at the bottom of each carburetor. For thorough cleaning, remove and disassemble the carburetors (Pg. 39).

WHEELS

Wheel construction is shown in Fig. J2 and J3. The following sections, Pgs. 170~175, cover the tires, rims and spokes, axles, grease seals, and wheel bearings. For the brakes, see Pgs. 177~182.

Tires

The tires are designed to provide good traction and power transmission during acceleration and braking even on bad surfaces. To do this, they must be inflated to the correct pressure and not overloaded. The maximum recommended load, in addition to vehicle weight, is 165 kg.

If the tires are inflated to too high a pressure, riding becomes rough, the center portion of the tread wears quickly, and the tires are easily damaged.

If inflation pressure is too low, the shoulder portions wear quickly, the cord suffers damage, fuel consumption is high, and handling is poor. In addition, heat builds up at high speeds, and tire life is greatly shortened.

To ensure safe handling and stability, use only the recommended standard tires for replacement, inflating them to the standard pressure. Also, a certain variation from the standard pressure may be desired depending on road surface conditions (rain, ice, rough surface, etc.).

Table J1 Tires, Air Pressure (measured when cold)

	Air pressure		Size	Make, Type
Front	2.00 kg/cm² (28 psi)		3.25H19 4PR	BRIDGESTONE SUPER SPEED-21F2
Rear	up to 97.5 kg	2.25 kg/cm² (32 psi)	4.00H18 4PR	BRIDGESTONE SUPER SPEED-21R2
	97.5~165 kg	2.50 kg/cm² (36 psi)		

Bead protectors are provided on the rear wheel to keep the tire from slipping on the rim and damaging the tube when extreme braking or driving forces are applied.

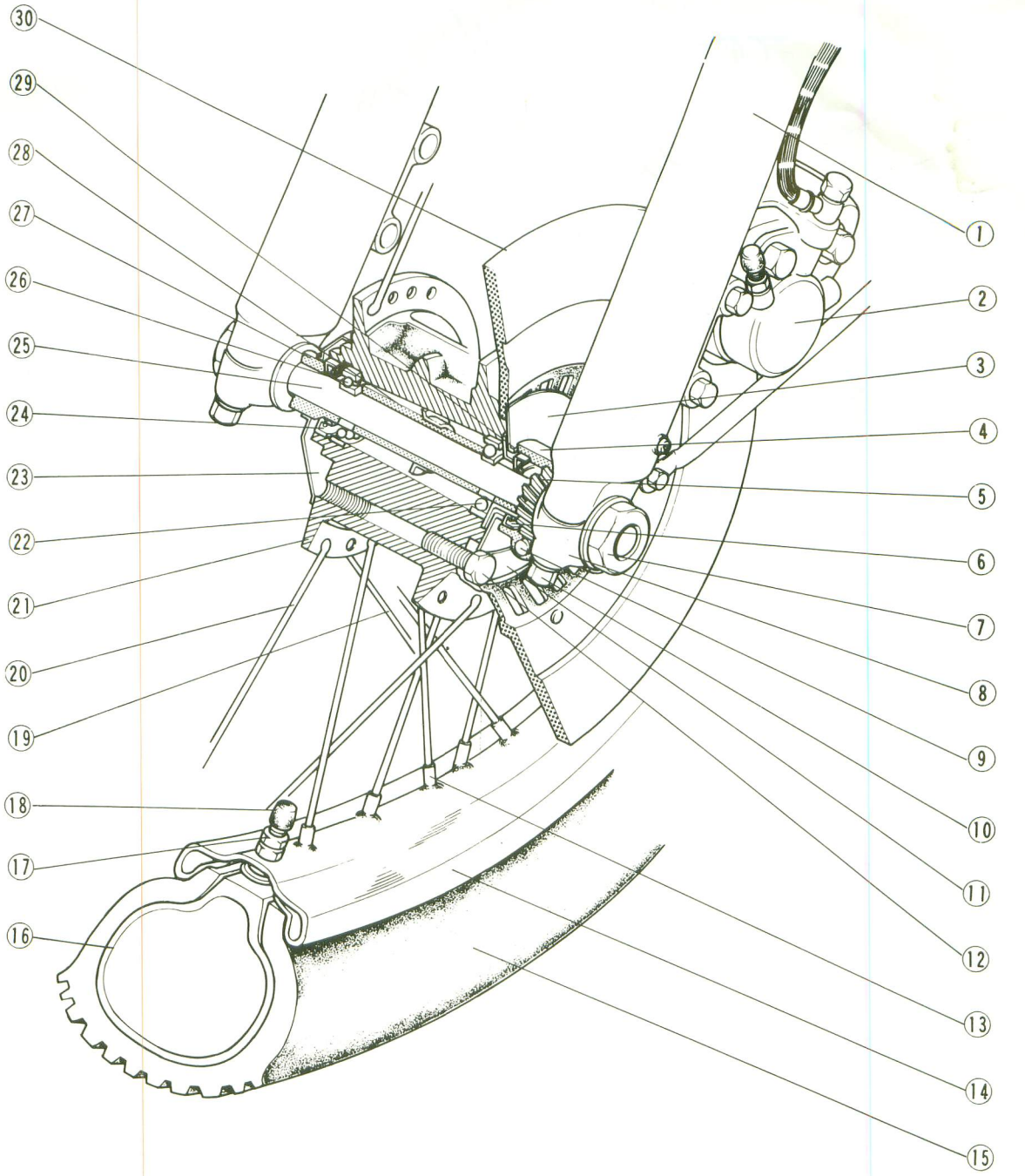
Tire wear, damage

Tires must not be used if they are getting bald, or if they are cut or otherwise damaged. As the tire tread wears down, the tire becomes more susceptible to puncture and failure. 90% of tire failures occur during the last 10% of tire life.

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

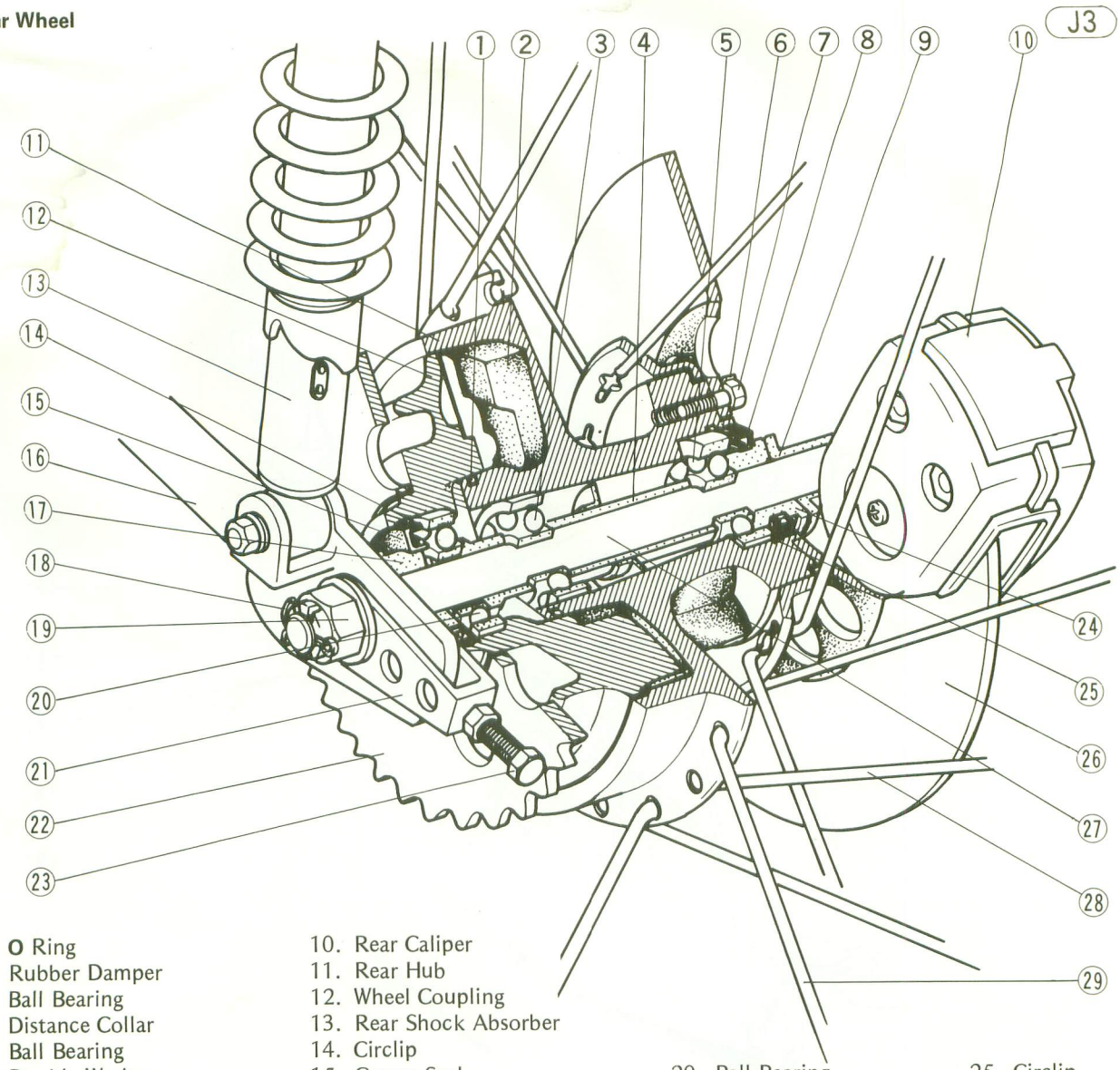
Front Wheel

J2



1. Fork Leg
2. Caliper
3. Speedometer Gear Drive Holding Plate
4. Speedometer Gear Housing
5. Speedometer Gear
6. Grease Seal
7. Axle Nut
8. Axle Clamp
9. Speedometer Pinion
10. Clamp Nut
11. Double Washer
12. Disc Mounting Bolt
13. Spoke Nipple
14. Rim
15. Tire
16. Tube
17. Locknut
18. Valve Stem Cap
19. Outer Spoke
20. Inner Spoke
21. Front Hub
22. Wheel Bearing
23. Cap
24. Grease Seal
25. Front Axle
26. Wheel Bearing
27. Collar
28. Distance Collar
29. Speedometer Gear Drive
30. Disc

Rear Wheel



1. O Ring
2. Rubber Damper
3. Ball Bearing
4. Distance Collar
5. Ball Bearing
6. Double Washer
7. Disc Mounting Bolt
8. Grease Seal
9. Rear Caliper Holder Sleeve
10. Rear Caliper
11. Rear Hub
12. Wheel Coupling
13. Rear Shock Absorber
14. Circlip
15. Grease Seal
16. Swing Arm
17. Coupling Collar
18. Cotter Pin
19. Axle Nut
20. Ball Bearing
21. Chain Adjuster
22. Rear Sprocket
23. Adjusting Bolt
24. Collar
25. Circlip
26. Rear Disc
27. Rear Axle
28. Inner Spoke
29. Outer Spoke

Measure the depth of the tread with a depth gauge, and replace the tire if tread depth is less than the service limit.

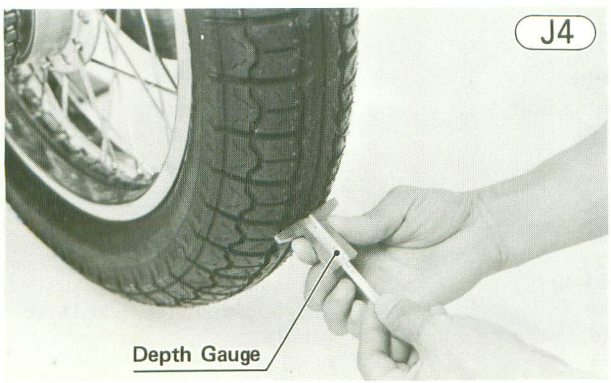


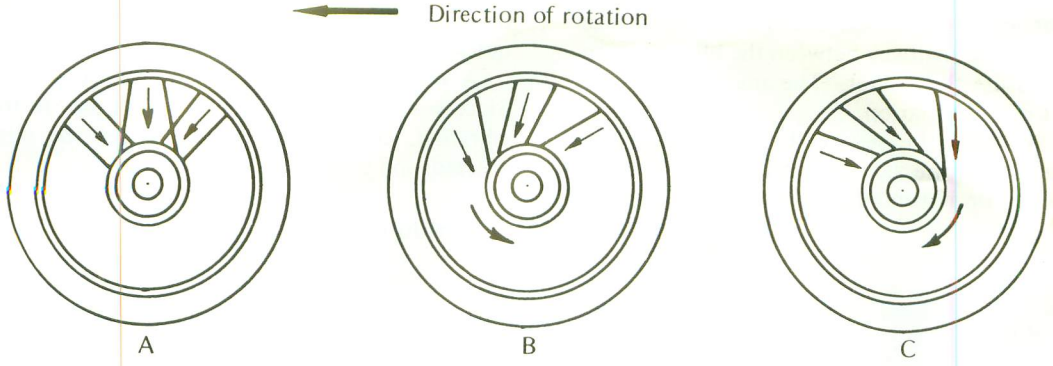
Table J2 Tire Tread Depth

Tire	Standard	Service Limit	
		Normal Speed	over 130 kph
Front	3.4 mm	1 mm	1 mm
Rear	6.7 mm	2 mm	3 mm

Rim, Spokes

The rim of each wheel is made of steel and is connected to the hub by the spokes. A rim band around the outside center of the rim keeps the tube from coming into direct contact with the rim and the spoke nipples.

Spoke Force



J5

The spokes are connected to the hub at tangents and in different directions so that different spokes bear the brunt of the load under different conditions. With the spokes doing specialized work, the strength of the spokes can be used more effectively.

When the motorcycle is at rest (Fig. J5A), the spokes above the axle are stretched and tense, while the spokes below the axle are slightly loose and do not provide support. During acceleration (B), the spokes running to the hub in the direction of rotation are stretched, while during deceleration or braking (C), the spokes running to the hub opposite to the direction of rotation are the ones that are stretched. In both cases B and C, the spokes that are not stretched (omitted from the diagram) are slightly loose and do not provide support. A damping of road shock is achieved by flexing of the spokes since they are arranged in this cross pattern instead of running straight from the hub to the rim.

Since the spokes must withstand this 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.

NOTE: The rim size shown in Table J3 is the outer width and diameter, both in inches. The spoke size is diameter number by length in milimeters. The two numbers for diameter size mean that each spoke has two diameters. To make the spoke more resistant to breakage the diameter is greater near the hub.

Table J3 Rim Size

Front	1.85 x 19
Rear	2.158 x 18

Spoke breakage

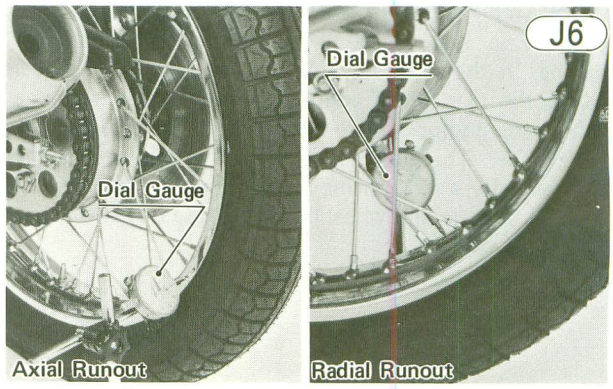
If any spoke breaks, it should be replaced immediately. A missing spoke places an additional load on the other spokes, which will eventually cause other spokes to break.

Periodically check that all the spokes are tightened evenly since they stretch a certain amount during use. Standard spoke tightening torque is 0.20 ~ 0.40 kg-m (17 ~ 35 in-lbs). Over-or under-tightening may cause breakage.

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.



J6

Table J4 Rim Runout

	Standard	Service Limit
Axial	under 0.8 mm	2 mm
Radial	under 1 mm	2 mm

A certain amount of rim warp (runout) 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.

Axle

A bent axle causes vibration, poor handling, and instability.

To measure axle runout, remove the axle, place it in V blocks that are 100 mm apart, 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 0.7 mm, replace the axle.

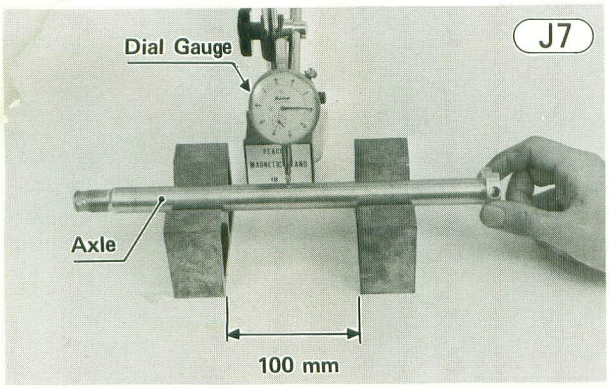


Table J5 Axle Runout/100 mm

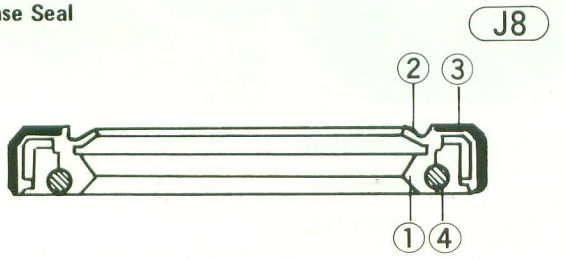
	Standard	Service Limit
Front	under 0.1 mm	0.2 mm
Rear	under 0.05 mm	0.2 mm

Grease Seals, Wheel Bearings

A grease seal is fitted in the speedometer gear housing, in the right sides of the front and rear hubs, and in the rear wheel coupling. Each grease seal is a rubber ring equipped with a steel band on its outer circumference. The grease seal inner lip is held against the axle collar by a wire spring band. Since the grease seal not only seals in the wheel bearing grease but also keeps dirt and moisture from entering the hub, the use of a damaged grease seal will cause the wheel bearing to wear quickly.

A wheel bearing is fitted in both sides of each hub. Since worn wheel bearings will cause play in the wheel, vibration, and instability, they should be cleaned, inspected, and greased periodically.

Grease Seal



1. Primary Lip
2. Secondary Lip
3. Metal Band
4. Wire Spring Band

Inspection and lubrication

If the grease seals are examined without removing the seals themselves, look for discoloration (indicating the rubber has deteriorated), hardening, damage to the internal ribbing, or other damage. If the seal or internal ribbing has hardened, the clearance between the seal and the axle sleeve will not be taken up, which will allow dirt and moisture to enter and reach the bearing. If in doubt as to its condition and whenever the seal is removed for greasing the bearing, the seal should be replaced. The seals are generally damaged upon removal.

Since the wheel bearings are made to extremely close tolerances, the clearance cannot normally be measured. Wash the bearing with 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, it must be replaced. If the same bearing is to be used again, re-wash it with a high flash-point solvent, dry it, and 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. Clean and grease the wheel bearings and the speedometer gear housing in accordance with the Periodic Maintenance Chart (Pg. 10).

Rear Wheel Coupling

The rear wheel coupling connects the rear sprocket to the wheel. Rubber shock damper in the coupling absorbs some of the shock resulting from sudden changes in torque due to acceleration or braking.

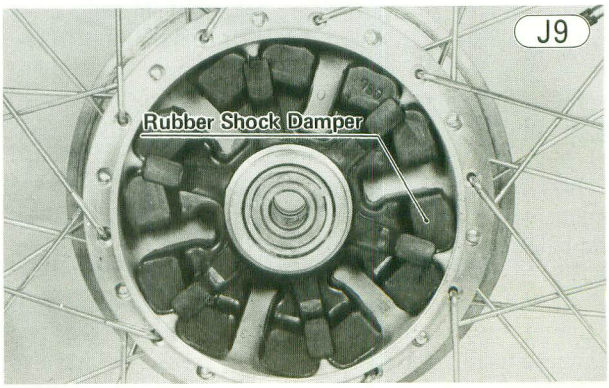


Table J6 Grease Seals, Wheel Bearings

	Front Wheel			Rear Wheel		
	Hub Left	Hub Right	Speedometer Gear Housing	Coupling	Hub Left	Hub Right
Grease Seal	———	PJA254008	PJA304208	AJ406207	———	PJA355207
Bearing	#6203	#6203	———	#6206	#6304	#6304

Damper inspection

Remove the rear wheel coupling (Pg. 104), and inspect the rubber damper.

Replace the damper if any appear damaged or deteriorated.

DRIVE CHAIN

The drive chain is an "endless" type in which the weakest link, the master link has been eliminated by constructing the chain in a closed loop. To preserve chain strength and reliability, never cut the chain to install it; follow the replacement procedure given in the "Disassembly" section of this manual. When chain replacement is necessary, use only the standard chain (Table 89) for replacement, since only this chain has been especially designed to withstand the extremely high torque developed by the engine.

Table J7 Standard Chain

Make	Type	Link
Enuma	EK530SH-T2G	106 link

Chain construction is shown in Fig. J11. Most chain wear occurs between the pins and bushings, and between the bushings and rollers, rather than on the outside of the rollers. This wear causes the chain to lengthen. If the chain is left unadjusted, the lengthening will lead to noise, excessive wear, breakage, and disengagement from the sprockets. If the chain is allowed to wear too much, the distance from roller to roller is so much greater than the distance between each tooth of the sprocket that the wear to the chain and the sprocket rapidly accelerates.

The rate of wear can be greatly reduced, however, by frequent and adequate lubrication, especially between the side plates of the links so that oil can reach the pins and bushings inside the rollers.

Wear

When the chain has worn so much that it is more than 2% longer than when new, it is no longer safe for use and should be replaced. Whenever the chain is replaced, inspect both the engine and rear sprockets, and replace them if necessary. Overworn sprockets will cause a new chain to wear quickly. See Pg. 176 ("sprockets" section).

Since it is impractical to measure the entire length of the chain, determine the degree of wear by measuring a 20-link length of the chain. Stretch the chain taut either by using the chain adjuster, 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.

NOTE: The drive system was designed for use with the standard chain. For maximum strength and safety, the standard chain must be used for replacement.

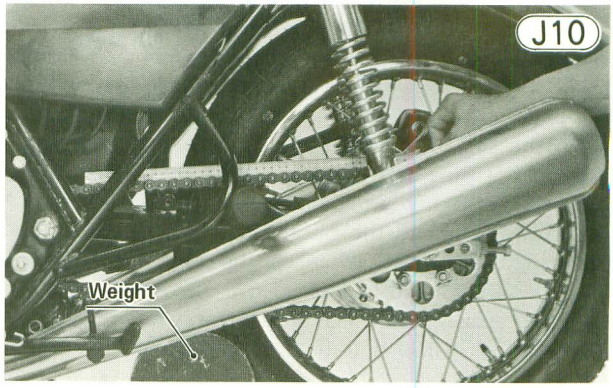


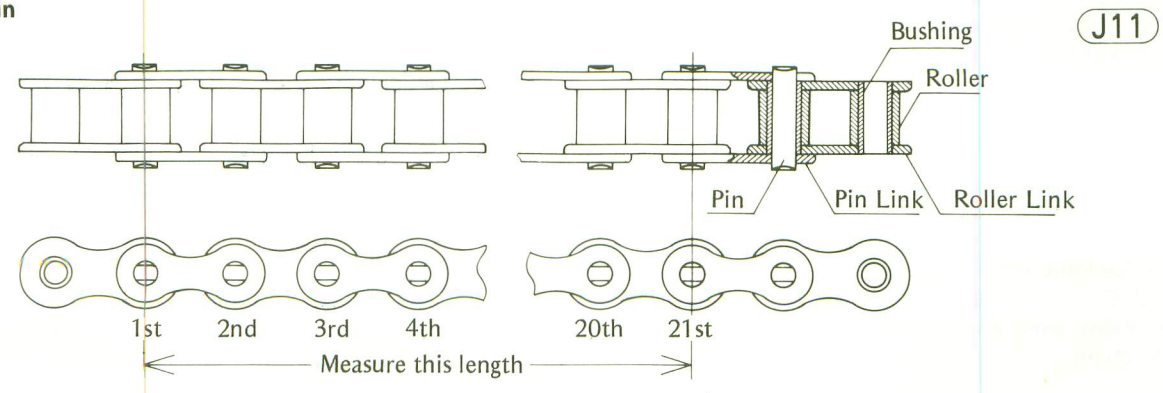
Table J8 Drive Chain 20-link Length

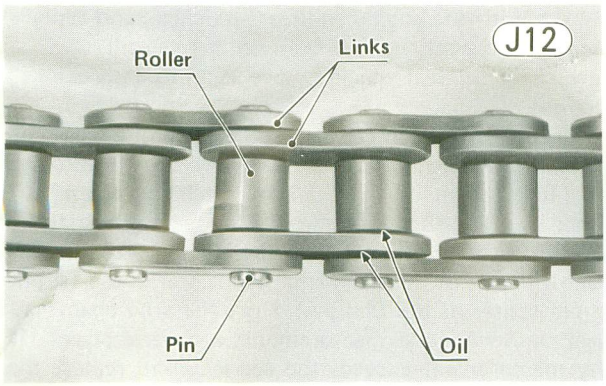
Standard	Service Limit
317.5~318.1 mm	323 mm

Lubrication

In order for the chain to function safely and wear slowly, it should be properly lubricated in accordance with the Periodic Maintenance Chart (Pg. 10). Lubrication is also necessary after riding through rain or on wet roads, or any time that the chain appears dry. Anytime that the motorcycle has been washed, the chain should be adequately lubricated on the spot in order to avoid rust (Fig. J12).

Drive Chain





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 pins and bushings where most wear takes place. Wipe off any excess oil.

Dirt will cling to the oil and act as an abrasive, accelerating chain wear. Whenever the chain becomes particularly dirty, it must be cleaned in kerosene and then soaked in a heavy oil. Shake the chain while it is in the oil so that oil will penetrate to the inside of the rollers.

SPROCKETS

There are two sprockets for the drive chain. A forward sprocket, or engine sprocket, is mounted on the end of the output shaft and is used to drive the chain. A rear sprocket is connected to the rear wheel hub through the rear wheel coupling and is driven by the chain to turn the rear wheel.

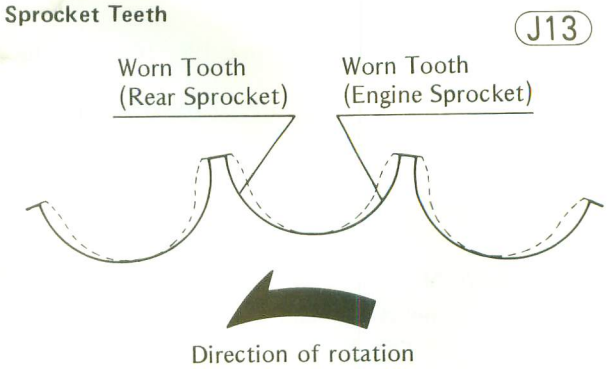
Sprockets that have become excessively worn cause chain noise and greatly accelerate chain and sprocket wear. The sprockets should be checked for wear any time that the chain is replaced. A warped rear sprocket destroys chain alignment such that the chain may break or jump from the sprockets when traveling at high speed. The sprockets should be checked for wear and the rear sprocket for warp any time the chain is replaced.

Sprocket wear

Visually inspect the sprocket teeth. If they are worn as illustrated, replace the sprocket.

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.

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



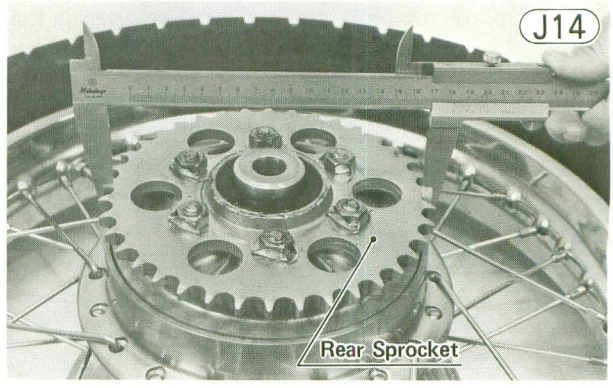


Table J9 Sprocket Diameter

	Standard	Service Limit
Engine	71.01 ~ 71.21 mm	70.2 mm
Rear	182.08 mm	181.5 mm

Rear sprocket warp

Elevate the rear wheel so that it will turn freely, and set a dial gauge against the rear sprocket near the teeth as shown in Fig. J15. 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.

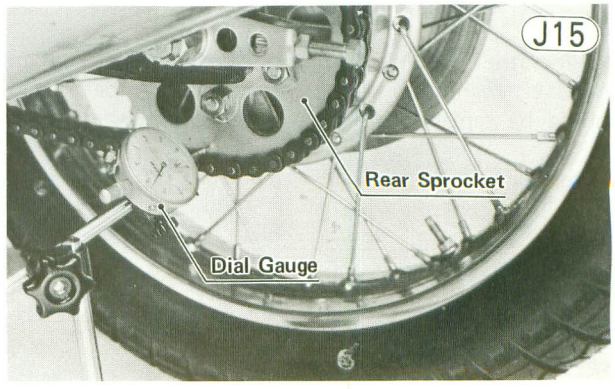


Table J10 Rear Sprocket Warp

Standard	Service Limit
under 0.3 mm	0.5 mm

DISC BRAKES

A hydraulic disc brake is used on each wheel for superior braking performance and high reliability. The major components of each disc brake are the brake lever (front) or the brake pedal (rear), master cylinder, brake line, caliper assembly, and disc. The brake lever is pulled or the brake pedal is pushed to move a piston in the master cylinder and pressurize the brake fluid. Fluid pressure is transmitted through the brake line to operate the caliper. The caliper grips the disc attached to the wheel, slowing wheel rotation. Front fluid pressure operates the front brake light switch, and the rear brake pedal pulls the rear brake light switch. Each switch turns on the brake light.

The brake fluid is an extra heavy duty type with a high boiling point to withstand the heat produced by friction of the caliper pads on the disc. Since the boiling point and thus the performance of the fluid would be reduced by contamination with water vapor or dirt from the air, the reservoir is sealed with a rubber diaphragm under the cap. This cap seal also prevents fluid evaporation and spillage should the motorcycle fall over. The fluid is further protected by rubber seals in the caliper assembly and at the master cylinder brake line fitting.

Each master cylinder assembly includes the reservoir, piston, primary and secondary cups, non-return valve, and spring. The reservoir has two holes at the bottom: a relatively large supply port to supply fluid to the lines and a small relief port to admit excess fluid from the line. The primary and secondary cups stop the fluid from leaking back around the piston while the piston is moving forward to pressurize the line. The non-return valve is in the head of the piston; it stops backward fluid flow when the brake is applied. When the brake lever or pedal is released, the valve allows flow around the cup to fill the vacuum in front of the piston so that the piston can return easily.

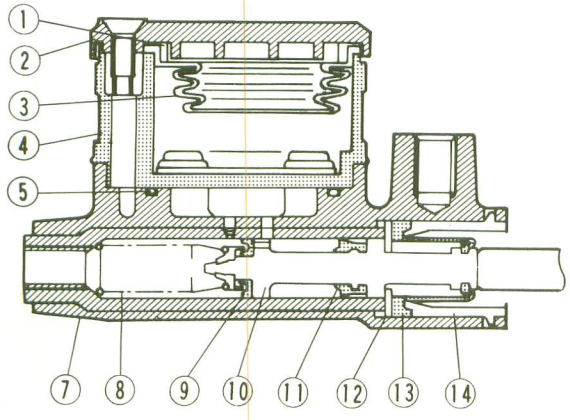
Each caliper assembly includes pad A, pad B, and the piston, which is inside the caliper cylinder. Through each caliper run two shafts, which also pass through the caliper holder to mount the assembly to the left front fork or the rear axle. When the piston forces pad A against the disc, the shaft portion of the caliper assembly slides through the holder such that pad B is also forced against the disc, both brake pads being kept paralled to the disc.

Unlike a drum-type brake, the components of the disc brake which perform the actual braking action, i.e., the disc and pads, are open to direct contact with the air flow past the motorcycle. This provides for excellent dissipation of the heat from brake friction, and minimizes the possibility of brake fade common to drum brakes.

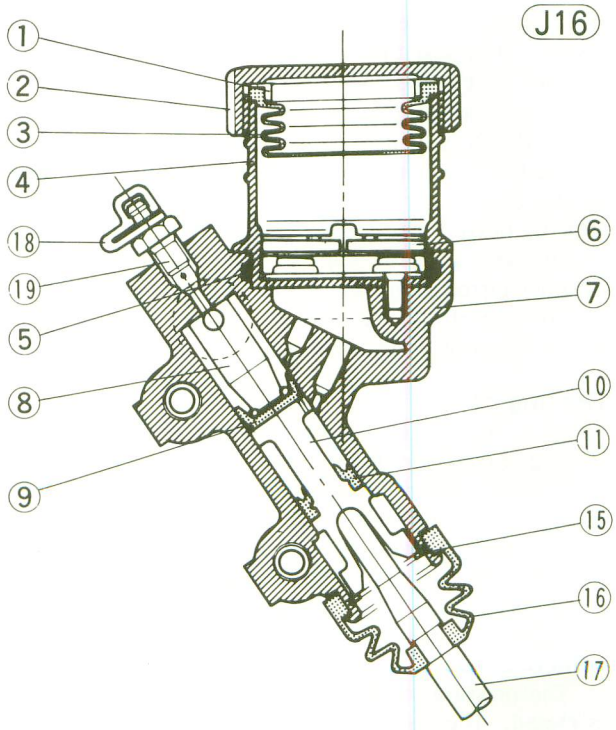
Automatic Wear Adjustment

When fluid pressure develops in the cylinder, the piston is pushed exerting pressure against the brake pad, which in turn presses against the brake disc. The pressurized fluid is prevented from leaking by a fluid seal fitted into the cylinder wall. The seal is pressed, against the piston, and instead of sliding when the piston moves, the seal is only distorted, allowing no fluid leakage at all. When the brake lever or pedal is released and fluid pressure lowers, the elasticity of the seal returns the piston to its original position. After the brakes are used for a while and the pads wear slightly, the rubber seal will no longer be able to distort the additional amount that the piston travels. Instead, when piston

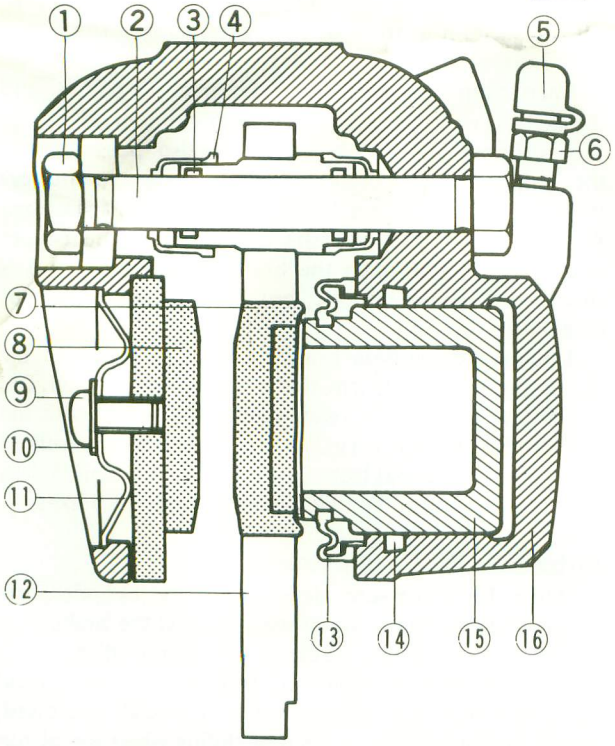
Master Cylinders



1. Ring Plate
2. Cap
3. Diaphram
4. Reservoir
5. O Ring
6. Plate
7. Master Cylinder Body
8. Spring
9. Primary Cup
10. Piston
11. Secondary Cup
12. Piston Stop
13. Dust Seal
14. Liner
15. Retainer
16. Dust Cover
17. Push Rod
18. Rubber Cap
19. Bleed Valve



Caliper J17



1. Nut
2. Caliper Holder Shaft
3. O Ring
4. Dust Cover
5. Bleed Valve Cap
6. Bleed Valve
7. Pad A
8. Pad B
9. Screw
10. Lockwasher
11. Metal Plate
12. Caliper Holder
13. Dust Seal
14. Fluid Seal
15. Piston
16. Caliper

travel forces the seal past its limit, the seal slips on the piston. The seal then returns the piston to a new rest position that is closer to the disc.

A small amount of fluid from the reservoir supplements the fluid in the brake line to compensate for the difference in piston position. Consequently, the length of the brake lever or pedal stroke remains unchanged, and the brake never needs adjustment.

The seal and the cup at the head of the master cylinder piston are made of special heat resistant rubber for best performance and to prevent deterioration. For this reason, only standard parts should be used.

Braking Stroke

When the brake lever is pulled or the pedal is pushed, the piston ⑨ in the master cylinder is pushed and moves forward against the force of the return spring ⑥. At this time, the primary cup ⑦ at the head of the piston closes the small relief port ③, which connects the pressure chamber and the reservoir ⑤. Until this port is fully closed, the brake fluid does not start being pressurized, in spite of the forward movement of the piston.

The pressure stroke starts as soon as the relief port is closed. The piston compresses the brake fluid, which is being used as the pressure medium, forcing it out into the brake line. The pressure is transmitted through the line to the cylinder portion of the caliper assembly, where it forces the piston towards the disc. The piston presses pad A against the disc, but since the disc is immovable, further pressure cannot move the pad any farther. Instead, the entire caliper assembly moves in the opposite direction such that pad B is also forced against the disc. In this manner, the disc is gripped between the two pads, and the resulting friction slows wheel rotation.

Braking Release Stroke

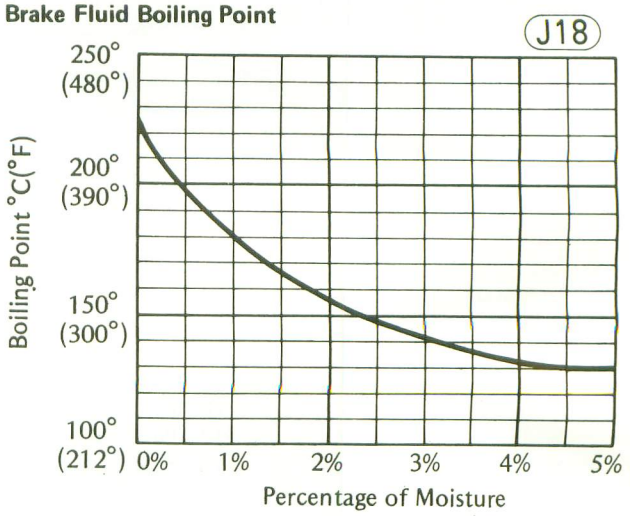
When the brake lever or pedal is released, the piston in the master cylinder is quickly returned toward its rest position by the spring ⑥, and brake fluid pressure drops in the line and in the caliper cylinder. The elasticity of the fluid seal ② in the cylinder then returns the piston. This leaves no pressure against either pad A or B so that slight friction against the disc pushes them both slightly away from the disc.

As the master cylinder piston moves back further, the brake fluid in the line rushes to fill the low pressure area in front of the primary cup at the piston head. At this time, fluid from the reservoir flows *through the* large supply port ④ into the space between the primary and secondary cups, through the non-return valve, and passes around the edges of the primary cup to fill the vacuum. When the piston has returned to its rest position against the stop, the small relief port is uncovered. As the brake fluid returns from the line, excess fluid passes through the relief port into the reservoir until the brake line pressure returns to zero.

Brake Fluid

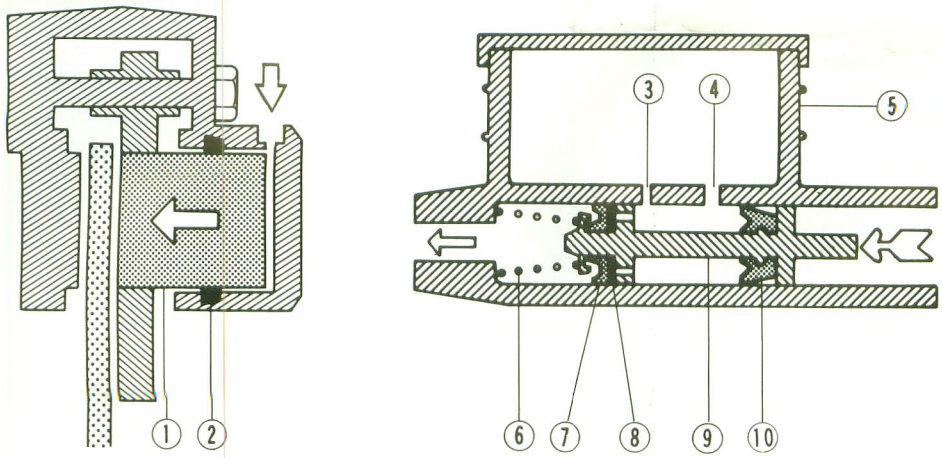
When the brake is applied, heat is generated by the friction between the disc and the brake pads. While much of this heat is immediately dissipated, some of it is transmitted to the brake fluid and may raise fluid temperature to as high as 150°C (300°F) during brake operation. This temperature could boil the brake fluid and cause a vapor lock in the lines unless fluid with a high boiling point is used and has been kept from being contaminated with dirt, moisture, or a different type of fluid. Poor quality or contaminated fluid can also deteriorate from contact with the recommended brake fluids.

Brake Fluid Boiling Point J18



Braking Stroke

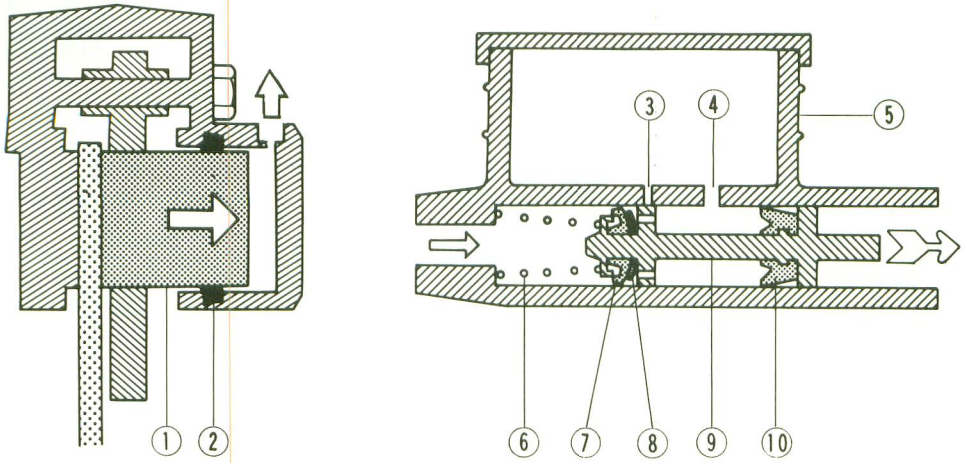
J19



1. Piston
2. Fluid Seal
3. Relief Port
4. Supply Port
5. Reservoir
6. Spring
7. Primary Cup
8. Non-return Valve
9. Piston
10. Secondary Cup

Braking Release Stroke

J20



1. Piston
2. Fluid Seal
3. Relief Port
4. Supply Port
5. Reservoir
6. Spring
7. Primary Cup
8. Non-return Valve
9. Piston
10. Secondary Cup

The graph of Fig. J18 shows how brake fluid contamination with moisture lowers the fluid boiling point. Although not shown in the graph, the boiling point also lowers as the fluid gets old, is contaminated with dirt, or if two different types of brake fluid are mixed.

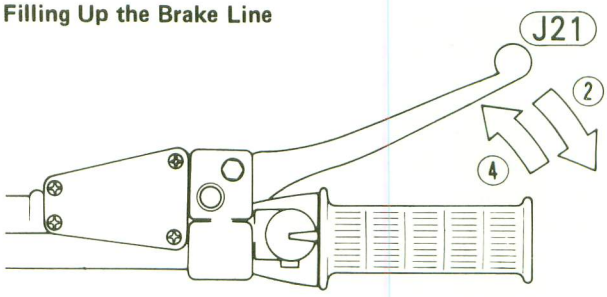
Changing the brake fluid

The brake fluid should be changed in accordance with the Periodic Maintenance Chart (Pg. 10) and whenever it becomes contaminated with dirt or water.

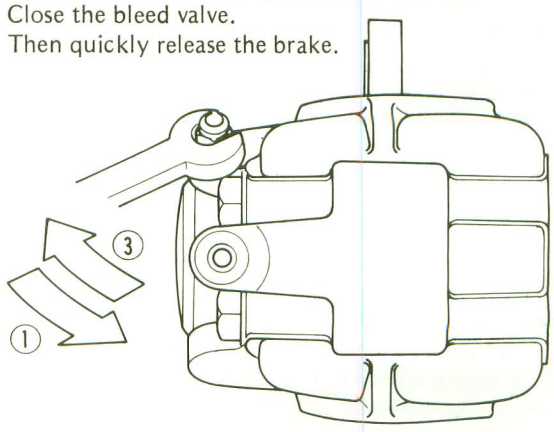
- Attach a clear plastic hose to the bleed valve on the caliper, and run the other end of the hose into a container.
- Open the bleed valve (counterclockwise to open), and pump the brake lever until all the fluid is drained from the line.
- Close the bleed valve, and fill the reservoir with fresh brake 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. Replenish the fluid in the reservoir as often as necessary to keep it from running completely out.
- Bleed the air from the lines.

Filling Up the Brake Line

J21



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



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 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. Recommended fluids are given in the table. **NOTE:** The type of fluid originally used in the disc brake is not available in most areas, but it should be necessary to add very little fluid before the first brake fluid change. After changing the fluid, use only the same type thereafter.

Table J11 Recommended Disc Brake Fluid

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

The correct fluid will come in a can labeled D.O.T.3. Do not use fluid that does not have this marking.

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.**
10. Brake linings contain asbestos fiber. Inhalation of asbestos may cause serious scarring of the lungs and may promote other internal injury and illness, including cancer. Observe the following precautions when handling brake linings:
    - ○Never blow brake lining dust with compressed air.
    - ○If any components are to be cleaned, wash with detergent, then immediately discard the cleaning solution and wash your hands.
    - ○Do not grind any brake lining material unless a ventilation hood is available and properly used.

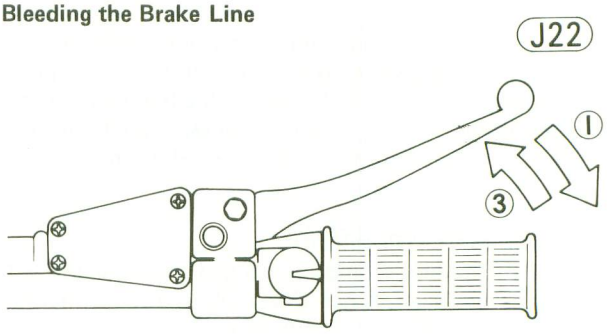
Bleeding the brake

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.

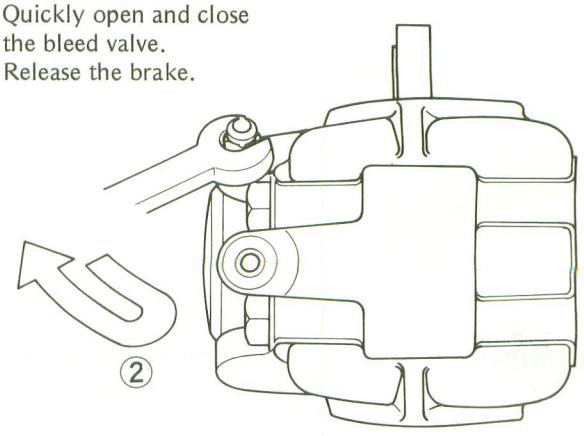
Bleed the air from the brake whenever brake lever or pedal action feels soft or spongy, after the brake fluid is changed, or whenever a brake line fitting has been loosened for any reason.

- ●Remove the reservoir cap, and check that there is plenty of fluid in the reservoir. The fluid level must be checked several times during the bleeding operation and replenished as necessary. If the fluid in the reservoir runs completely out any time during bleeding, the bleeding operation must be done over again from the beginning since air will have entered the line.
- ●With the reservoir cap off, slowly pump the brake lever 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.
- ●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

Bleeding the Brake Line

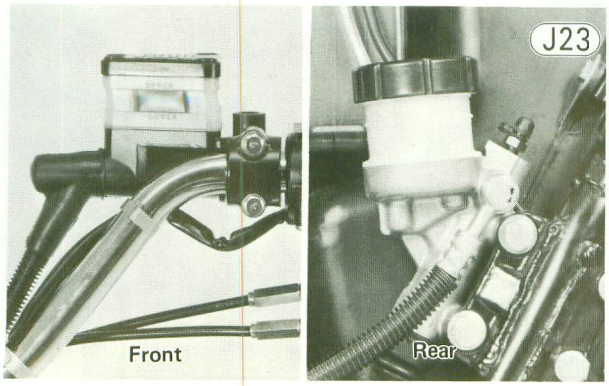


1. Hold the brake applied.
2. Quickly open and close the bleed valve.
3. Release the brake.



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. Check the fluid level in the reservoir every so often, replenishing it as necessary.

- When air bleeding is finished, install the rubber cap on the bleed valve, and check that the front or rear brake fluid is filled to the line marked in the reservoir (handlebar turned so that the reservoir is level).

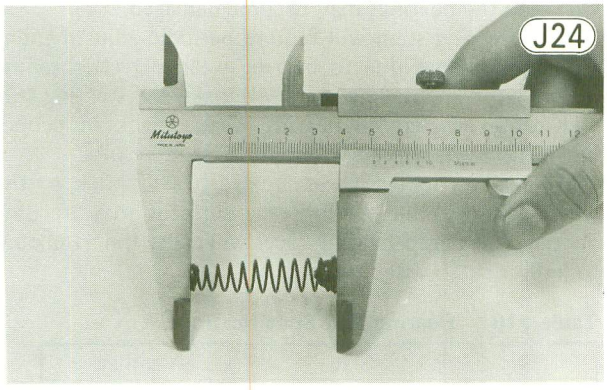


Master cylinder parts wear

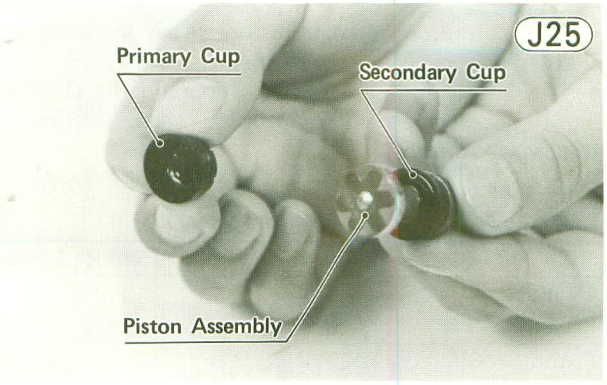
When master cylinder parts are worn or damaged, proper brake fluid pressure cannot be obtained in the line, and the brake will not hold.

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

- Check that there are no scratches, rust or pitting on the inside of the master cylinder, and that it is not worn past the service limit.
- Check the piston for these same faults.
- Check that the spring is not damaged and is not shorter than the service limit.



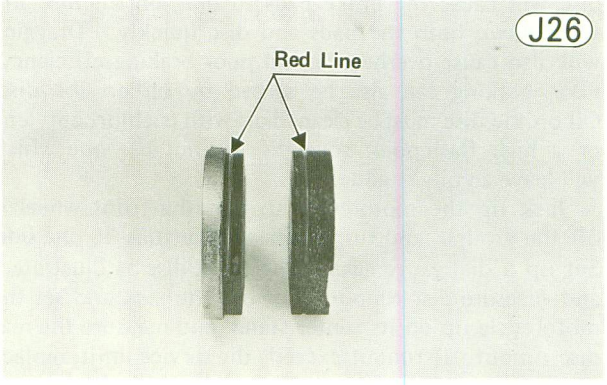
- Inspect the primary and secondary cups. If a cup is worn, damaged, softened (rotted), or swollen, replace it. When inserting the cup into the cylinder, see that it is slightly larger than the cylinder (standard values given in the table). If fluid leakage is noted at the brake lever or pedal, the cups should be replaced. (The secondary cup is part to the piston assembly. Replace the piston if the secondary cup requires replacement).



- Replace the dust seal if damaged.

Caliper parts wear

Inspect the pads for wear. If either pad is worn down through the red line, replace both pads as a set. If any grease or oil spills on the pads, wash it off with trichloroethylene or a high flash-point solvent. Do not use one which will leave an oily residue. If the oil cannot be thoroughly cleaned off, replace the pads.



The fluid seal around the piston maintains the proper pad/disc clearance. If this seal is not satisfactory,

Table J12 Master Cylinder Parts

	Front		Rear	
	Standard	Service Limit	Standard	Service Limit
Cylinder Inside Diameter	14.000~14.063 mm	14.10 mm	15.870~15.913 mm	15.95 mm
Piston Outside Diameter	13.957~13.984 mm	13.90 mm	15.827~15.854 mm	15.77 mm
Prmiary Cup Diameter	14.2~14.6 mm	14.05 mm	16.45~16.95 mm	16.30 mm
Secondary Cup Diameter	14.65~15.15 mm	14.50 mm	16.45~16.95 mm	16.30 mm
Spring Free Length	———	———	39.2~43.2 mm	37.2 mm

pad wear will increase, and constant pad drag on the disc will raise brake and brake fluid temperature.

Replace the fluid seal under any of the following conditions: (a) fluid leakage around pad A; (b) brakes overheat; (c) there is a large difference in A and B pad wear; (d) the seal is stuck to the piston. If the fluid seal is replaced, replace the dust seal as well. Also replace both seals every other time the pads are changed.

Measure the cylinder inside diameter and piston outside diameter.

Replace the cylinder and piston if they are worn out of tolerance, badly scored, or rusty.

Check the dust seals, dust covers, and the **O** rings, and replace any that are cracked, worn, swollen or otherwise damaged.

Table J13 Caliper Parts (Front, Rear)

	Standard	Service Limit
Cylinder inside diameter	42.850~42.900 mm	42.92 mm
Piston outside diameter	42.788~42.820 mm	42.75 mm

Brake line damage

The high pressure inside the brake line can cause fluid to leak or the hose to burst if the line is not properly maintained.

Bend and twist the rubber hose while examining it. Replace it if any cracks or bulges are noticed.

Disc wear, warp

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

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 as illustrated, and measure disc runout. Remove the jack and set the motorcycle up on its center stand, and measure the rear disc runout. If runout exceeds the service limit, replace the disc.

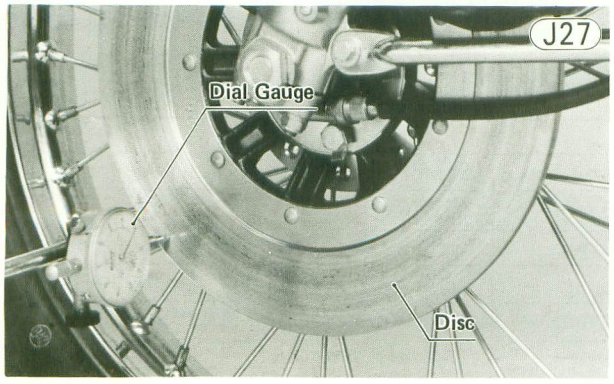


Table J14 Disc Runout

Standard	Service Limit
under 0.15 mm	0.3 mm

Measure the thickness of each disc at the point where it is has worn the most. Replace the disc if it has worn past the service limit.

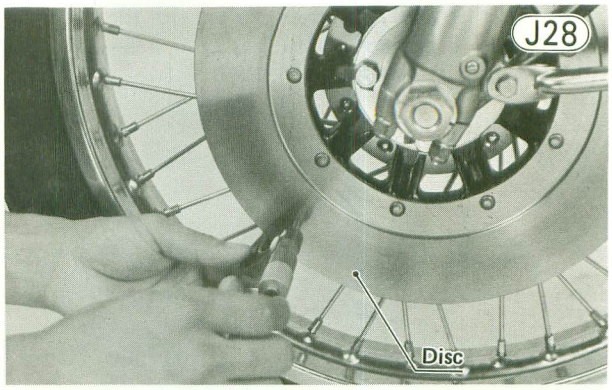


Table J15 Disc Thickness

Standard	Service Limit
6.9~7.1 mm	6 mm

STEERING STEM

The steering stem supports the handlebar and front fork shock absorbers, and turns inside the frame head pipe. Ball bearings in the upper and lower ends of the head pipe enable the steering stem to turn smoothly and easily.

The steering stem itself does not wear, but it may become bent. If it becomes bent, the steering will be stiff, and the bearings may become damaged.

The steering stem will require periodic adjustment as it becomes loose due to bearing wear. Overtightening during adjustment, however, will make the steering stiff and cause accelerated bearing wear. Lack of proper lubrication will also bring about the same results.

From overtightening or from a heavy shock to the steering stem, the bearing race surfaces may become dented. Damaged bearing races will cause the handlebar to jerk or catch when turned.

Table J16 Bearing Ball Specifications

	Size	Number
Upper	1/4"	19
Lower	1/4"	20

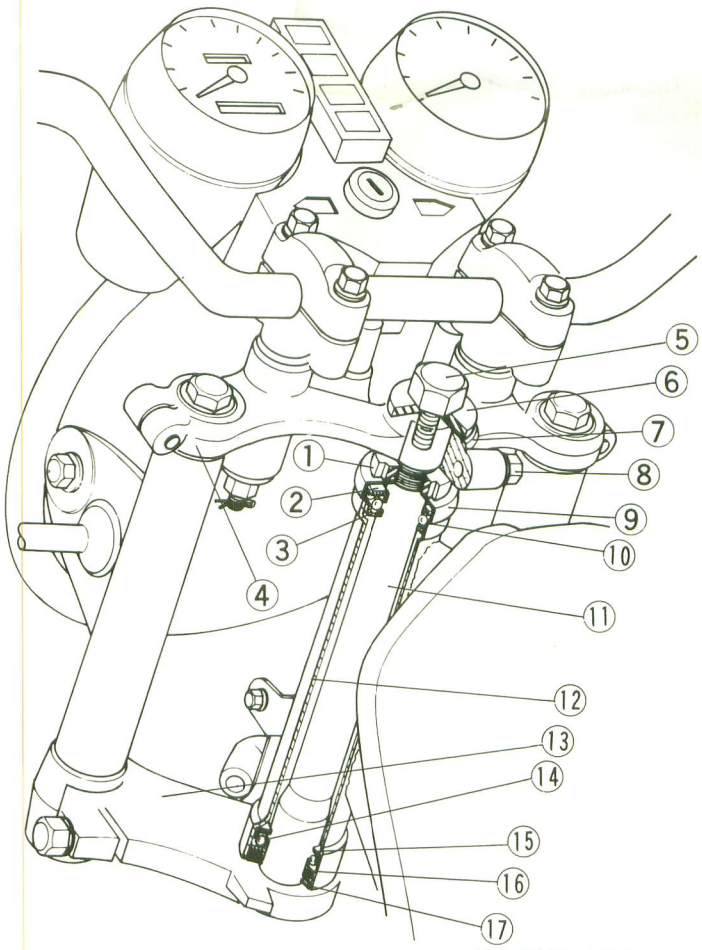
Steering stem warp

Examine the steering stem, and replace it if it is bent.

Bearing wear, damage

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.

Steering Stem

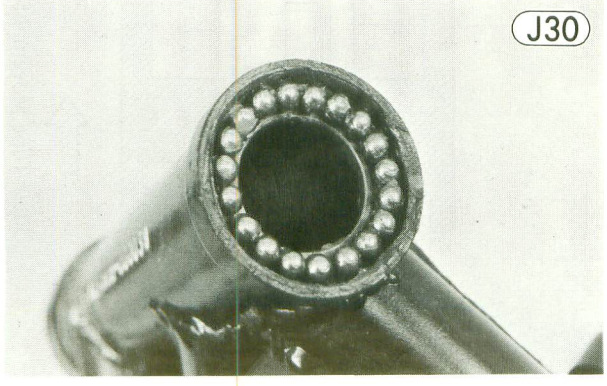


1. Stem Locknut
2. Upper Inner Race
3. Upper Outer Race
4. Stem Head
5. Stem Head Bolt
6. Lockwasher
7. Flat Washer
8. Stem Head Clamp Bolt
9. Stem Cap
10. Steel Ball
11. Steering Stem
12. Frame Head Pipe
13. Stem Base
14. Steel Ball
15. Lower Outer Race
16. Lower Inner Race
17. Grease Seal

Bearing lubrication

In accordance with the Periodic Maintenance Chart (Pg. 10), and whenever the steering stem is disassembled, the steering stem bearings should be relubricated.

Wipe all 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.



Grease seal deterioration, damage

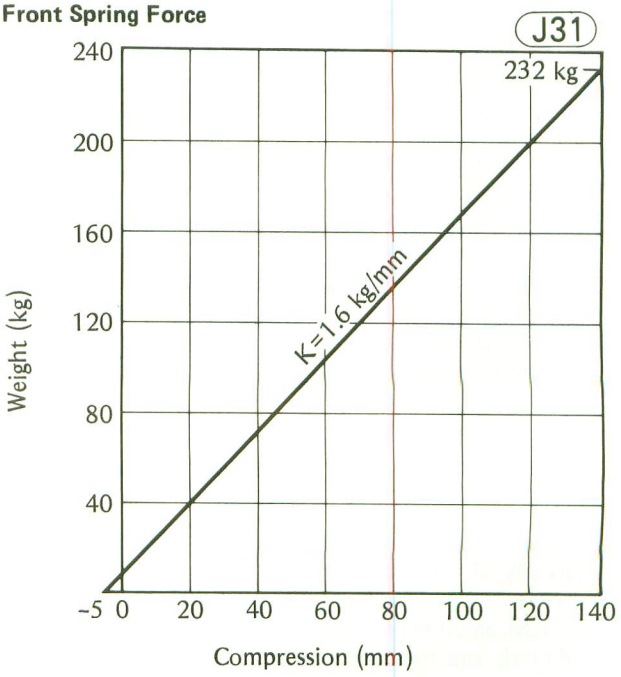
Inspect the grease seal for any signs of deterioration or damage, and replace it if necessary.

Replace the grease seal with a new one whenever it has been removed. The grease seal comes off whenever the lower bearing inner race is removed.

FRONT FORK

Front fork construction is shown in Fig. J32 and J33. It consists of two fork legs connected to the frame head pipe by the stem base and stem head. It accomplishes shock absorption through spring action, air compression in the inner tube, and resistance to the flow of the oil forced into the cylinder by tube movement.

Front Spring Force



Each fork leg is a telescopic tube including an inner tube ⑥, outer tube ⑦, piston and cylinder unit ⑤, collar ⑬, and cylinder base ⑮. The inner tube fits into the outer tube, altering its position in the outer tube as the tube arrangement absorbs shocks. The cylinder is fixed to the bottom of the outer tube and the top of the cylinder is a piston (equipped with a piston ring ④). A valve ⑫ (with a valve seat ⑪), fixed in the lower end of the inner tube, forms the upper part of the lower chamber ⑭ and, together with the piston helps seal the upper chamber. The collar and cylinder base configuration function to form an oil lock at the end of the compression stroke to prevent the inner tube from striking the bottom. The spring ⑩ under the piston prevents the inner tube from striking the piston at the end of the extension stroke to prevent the inner tube from striking the piston.

Oil is prevented from leaking out by the oil seal ②, which is fitted at the upper end of the outer tube. A dust seal ③ on the outside of the tube keeps dirt and water from entering and damaging the oil seal and the tube surface.

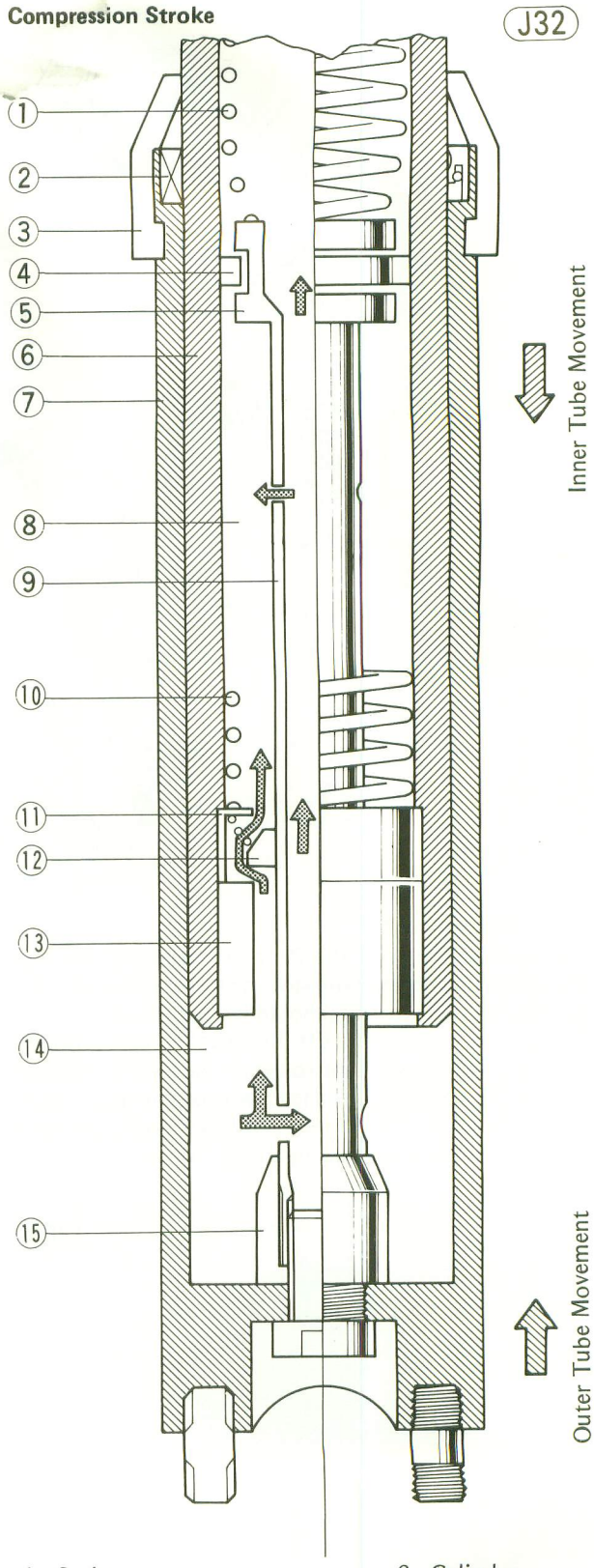
Compression Stroke

Whenever a load is placed on the front fork, the inner tube ⑥ moves down inside the outer tube ⑦, compressing both the spring ① and the air in the inner tube. At the same time, low pressure (suction) is created in an enlarging chamber (upper chamber ⑧) formed between the inner tube and the cylinder ⑨, and oil is drawn in from a diminishing chamber (lower chamber ⑭) formed between the outer tube and the cylinder. As the lower chamber shrinks in size with oil passing freely through the valve ⑫ into the upper chamber, oil passes through the cylinder's lower orifices into the cylinder as the inner tube approaches the cylinder base ⑮. These orifices restrict the oil flow into the cylinder, damping fork compression slightly. Near the end of the compression stroke, the clearance between the tapered-out cylinder-base and the collar at the lower end of the inner tube approaches zero. The resulting resistance to the flow of oil through this small space slows the downward movement, finally forming an oil lock to finish the compression stroke.

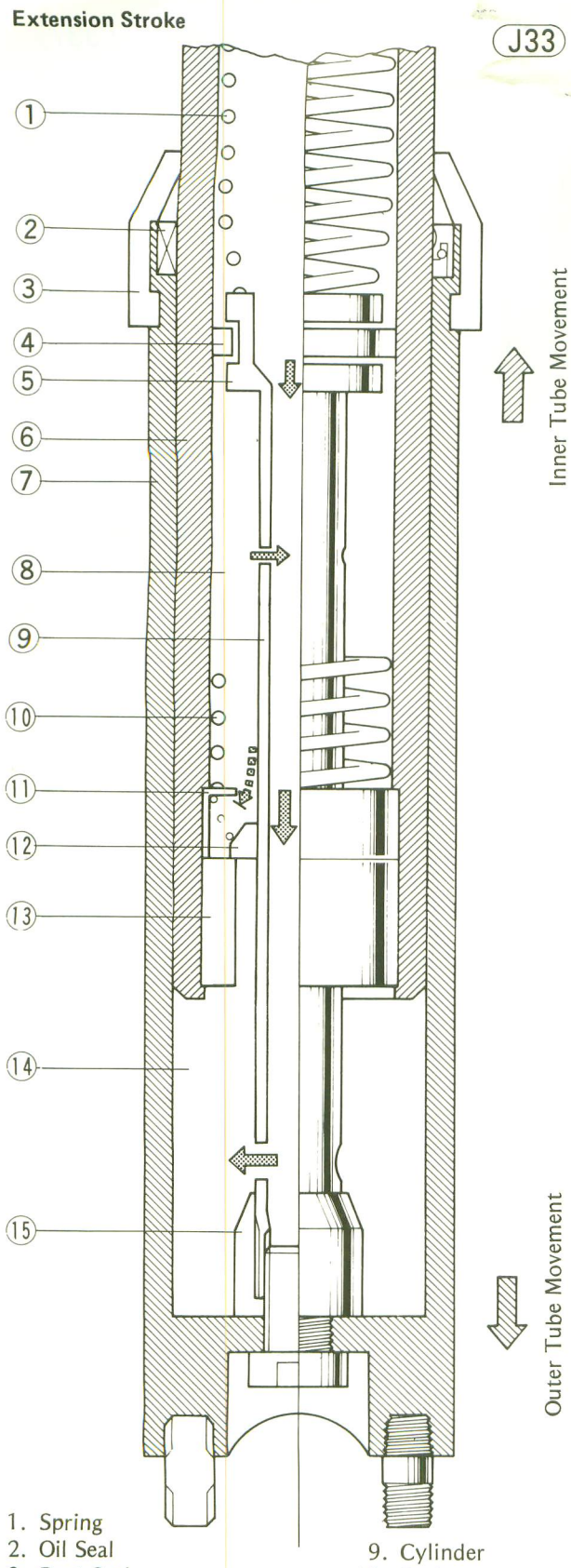
Extension Stroke

Following the compression stroke is the extension stroke, in which the inner tube is pushed back out by spring action and the compressed air in the inner tube. As the tubes move apart, the upper chamber grows smaller, forcing the oil through the cylinder upper orifice and through the valve ⑫. This small hole and the clearance between the valve and the cylinder restrict the oil flow into the inner tube and into the lower chamber, damping fork extension. Near the end of the extension stroke the spring is compressed between the valve seat and the piston, finishing the extension stroke.

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.



1. Spring
2. Oil Seal
3. Dust Seal
4. Piston Ring
5. Piston
6. Inner Tube
7. Outer Tube
8. Upper Chamber
9. Cylinder
10. Spring
11. Valve Seat
12. Valve
13. Collar
14. Lower Chamber
15. Cylinder Base



1. Spring
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7. Outer Tube
8. Upper Chamber
9. Cylinder
10. Spring
11. Valve Seat
12. Valve
13. Collar
14. Lower Chamber
15. Cylinder Base

Contaminated or deteriorated oil will also affect shock damping and, in addition, will accelerate internal wear. The fork oil should be changed periodically (*Pg.* 10) or sooner if the oil appears dirty.

A bent, dented, scored, or otherwise damaged inner tube will damage the oil seal, causing oil leakage. A badly bent inner tube may cause poor handling.

Spring tension

Since the springs becomes shorter as they weaken, check their free length to determine their 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 leg balanced for motorcycle stability.

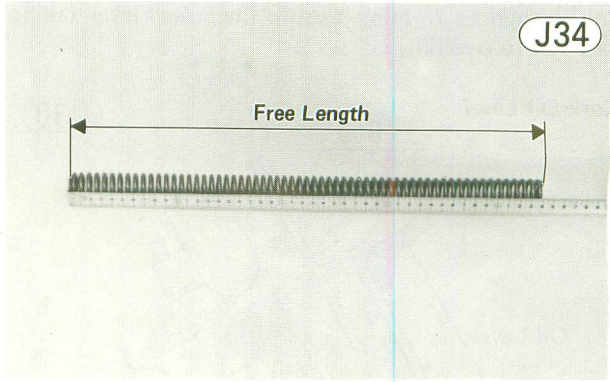


Table J17 Fork Spring Free Length

Standard	Service Limit
496 mm	485 mm

Fork oil

To drain out the old oil, remove the drain screw from the lower end of the outer tube. With the front wheel on the ground and the front brake fully applied push down on the handlebar a few times to pump out the oil. Install the drain screw, remove the rubber cap and top bolt from the inner tube, and pour in the type and amount of oil sepcified in Table J18. Check the oil level and install the top bolt and rubber cap. If the oil is below the specified level, add oil and recheck the oil level.

NOTE: After the front fork oil is changed, before checking the oil level, pump the forks several times to expel air from the upper and lower chambers.

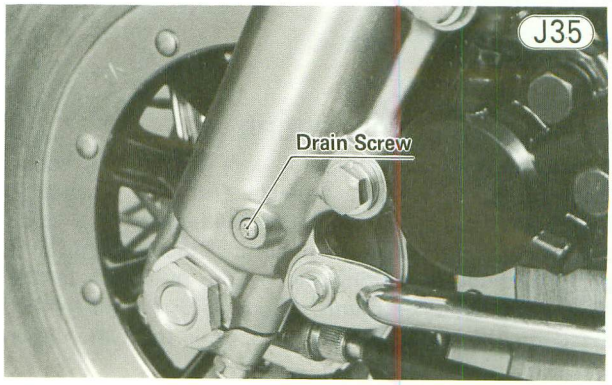
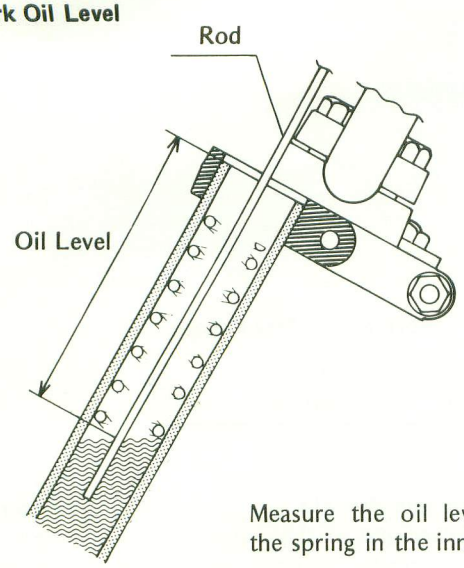


Table J18 Fork Oil

Filling fork oil capacity			
Type	When changing oil	After disassembly and completely dry	Oil Level
SAE 15W	about 150 cc	176 ~ 184 cc	411 mm from top of inner tube

To check the fork oil level, first place a jack or stand under the engine so that the front wheel is raised off the ground. Remove the rubber cap and top bolt from the inner tube. 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 J36



Measure the oil level with the spring in the inner tube.

Inner tube damage

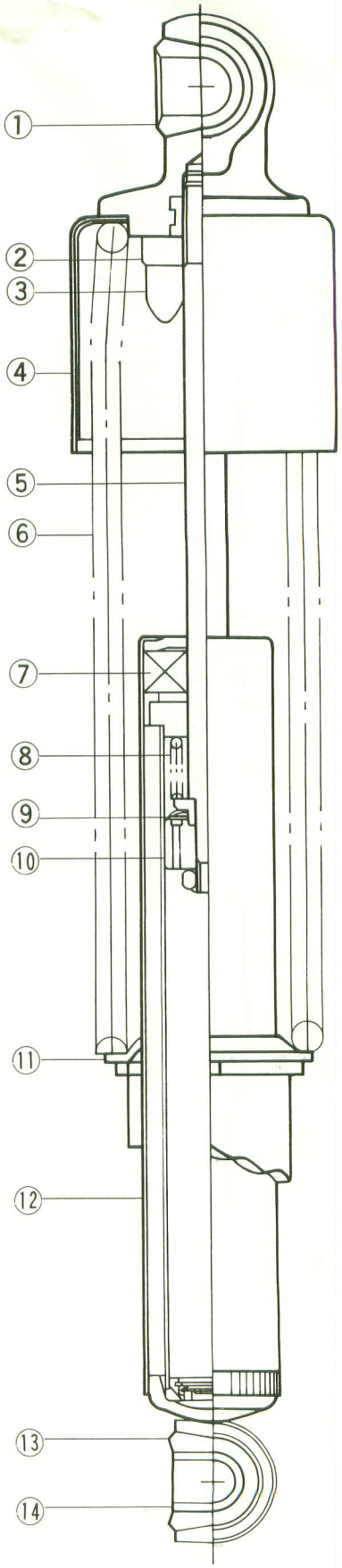
Visually inspect the inner tube. If it is damaged, replace the inner tube. Since damage to the inner tube damages the oil seal, replace the oil seal with new one whenever the inner tube is replaced. Temporarily assemble the inner and outer tubes, and pump them back and forth manually to check for smooth operation.

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

REAR SHOCK ABSORBERS

The rear shock absorbers serve to dampen shock transmitted to the frame and rider from the rear wheel. For this purpose, they are connected between the frame and the rear end of the swing arm. Shock absorption is performed by the spring and by the resistance to the flow of oil inside each unit. Shock absorption is further aided by the use of rubber bushings in both the upper and lower shock absorber mountings.

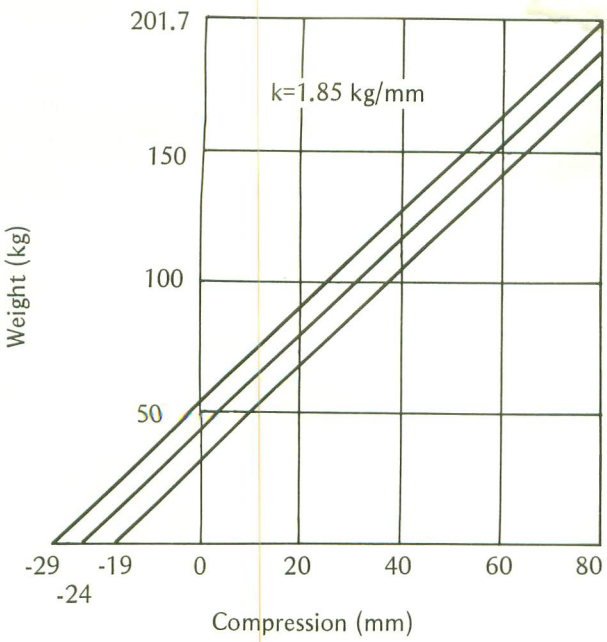
Rear Shock Absorber J37



1. Rubber Bushing
2. Nut
3. Stopper Rubber
4. Cover
5. Piston Rod
6. Outer Spring
7. Oil Seal
8. Inner Spring
9. Check Valve
10. Piston
11. Spring Seat
12. Outer Shell
13. Rubber Bushing
14. Collar

Rear Spring Force

J38



Since the rear shock absorbers are sealed units which cannot be disassembled, only external checks of operation are necessary. With the shocks removed, compress each one and see that the compression stroke is smooth and that there is damping in addition to spring resistance to compression. When the unit is released, the spring should not suddenly snap in to full length. It should extend smoothly with notable damping. When the shock absorber is operated, there should be no oil leakage. If either shock absorber does not perform all of these operations satisfactorily, or if one unit feels weaker than the other, replace both shock absorbers as a set. If only one unit is replaced and the two are not balanced, motorcycle instability at high speeds may result.

Shock absorber spring force for the 3 different settings is shown in the graph.

Bushings

Check the rubber bushings, and replace any that are worn, cracked, hardened, or otherwise damaged.

SWING ARM

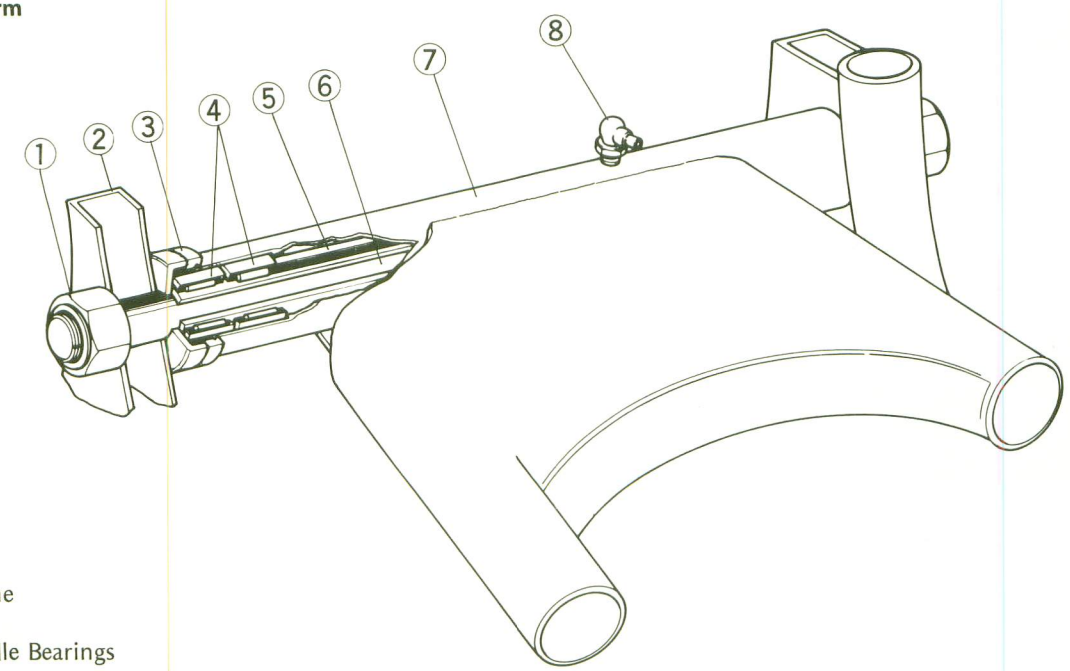
The swing arm is designed to work with the shock absorbers to dampen the shock to the frame from the rear wheel. The rear of the swing arm is connected to the frame by the rear shock absorbers, while the front end pivots on a shaft connected to the frame. When the rear wheel receives a shock, the swing arm, pivoting on its shaft, allows the wheel to move up and down in relation to the frame within the limits of the shock absorbers.

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. To minimize wear, the swing arm should be kept properly lubricated.

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

J39



1. Nut
2. Frame
3. Cap
4. Needle Bearings
5. Sleeve
6. Pivot Shaft
7. Swing Arm
8. Grease Nipple

Swing arm bearing wear

Measure the outside diameter of the swing arm sleeve at both ends with a micrometer. Replace the swing arm sleeve if the diameter is less than the service limit or if it shows visible damage.

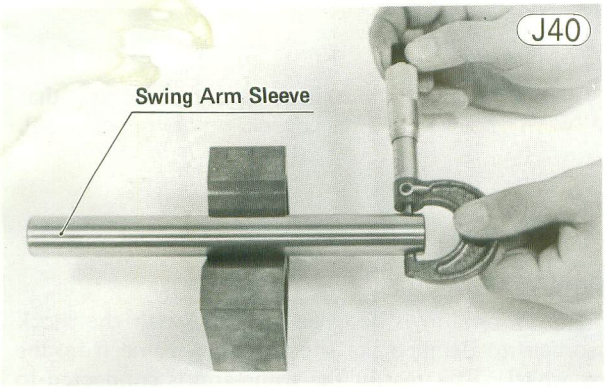


Table J19 Swing Arm Sleeve Diameter

Standard	Service Limit
21.987~22.000 mm	22.96 mm

The rollers in the needle bearings wear so little that the wear is difficult to measure. Instead, 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. Whenever the swing arm sleeve is replaced, also replace the needle bearings.

Pivot shaft

Check whether or not the pivot shaft is bent by placing it in two V blocks set 100 mm apart, setting a dial gauge to the shaft to get a variation in the dial gauge reading. If the shaft runout exceeds the service limit, straighten it. If it cannot be straightened, or if the runout exceeds 0.7 mm, replace the shaft.

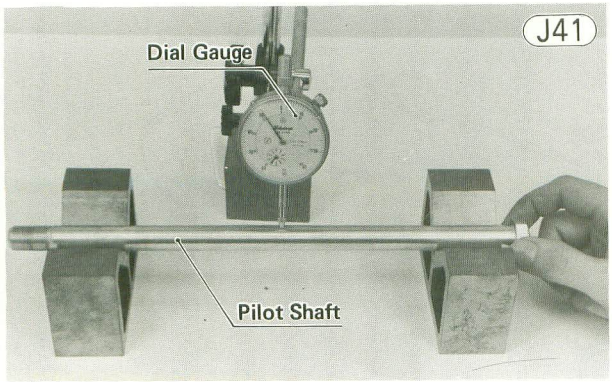
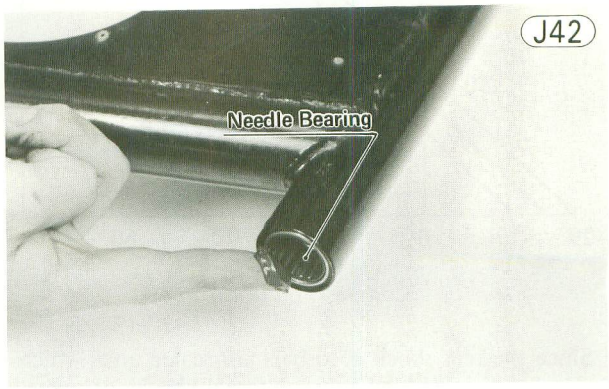


Table J20 Pivot Shaft Runout/100 mm

Standard	Service Limit
under 0.1 mm	0.14 mm

Swing arm lubrication

There is a grease fitting on the swing arm for lubrication. Grease the swing arm with regular cup grease as a part of general lubrication (Pg. 28) with the frequency given in the Periodic Maintenance Chart (Pg. 10). Force the grease into the fitting until it comes out at both sides of the swing arm, and wipe off any excess. If the grease does not come out, first check that the fitting is not clogged with dirt or old grease. If the fitting it clear but still will not take grease; remove the swing arm (Pg. 126), pull out the sleeve, clean out the old grease, and apply grease to the needle bearings.



Maintenance–Electrical

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BATTERY

The battery supplies the current to the starter motor and serves as a back-up source of power to operate the electrical equipment whenever the engine is turning over too slowly for the dynamo to supply sufficient power.

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 extend the life of the battery.

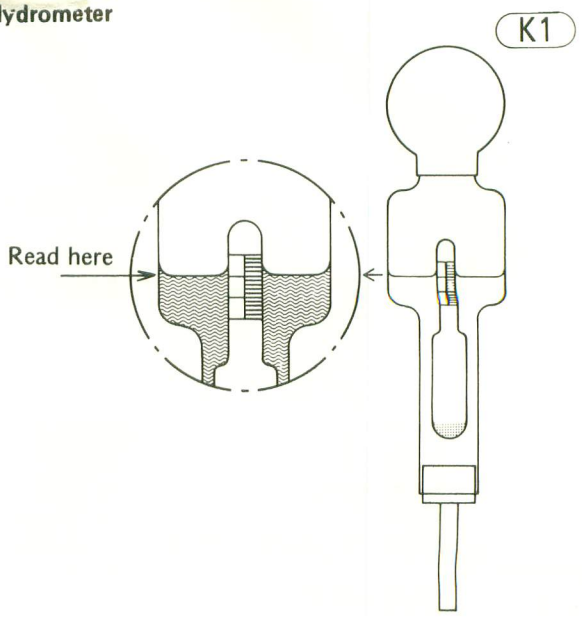
1. **When the level of the electrolyte in the battery is low, add only distilled water to each cell, until the level is at the upper level line marked on the outside of the battery. Ordinary tap water is not a substitute for distilled water and will shorten the life of the battery.**
2. **Never *add* 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. When using the hydrometer, read the electrolyte level at the bottom of the meniscus (curved surface of the fluid). Fig. K2 shows the relationship between the specific gravity of the solution at 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.

Hydrometer (K1)



○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

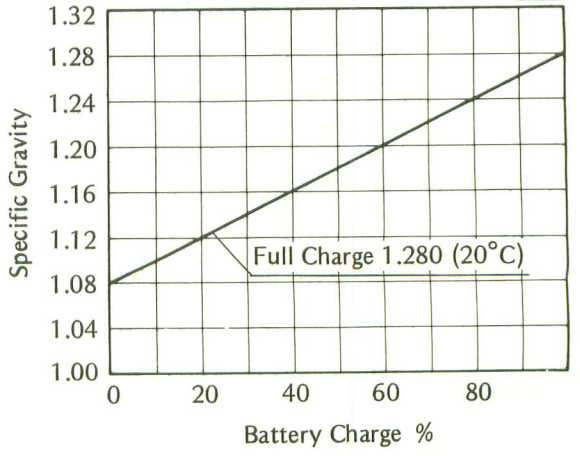
S_{20}=specific gravity at 20°C

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 (K2)



Initial charge

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 smoewhat 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.

NOTES: 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 14AH, the charging rate would be 1.4 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 15~16 volts.

Ordinary charge

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 14AH battery would 14 x 3/10 which equals 4.2 amperes.

CAUTION **Charging the battery at a rate higher that 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 material. Deposits will accumulate, and can cause internal shorting.**

- Measure the specific gravity of the electrolyte, and use the graph, Fig. K2, 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.

$$\text{Charging (hours)} = \frac{\text{Amount of discharge (AH)}}{\text{charging current (A)}} \times 1.2 \sim 1.5$$

- Remove the caps from all the cells, and begin charging the battery at the rate just calculated. 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 15~16 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.

Test charging

When the battery is suspected of being defective, first inspect the points noted in the Table below. The battery can be restored by charging it with the ordinary charge. If it 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 wise to 12 volts immediately and then gradually go up to 12.5~13 volts in about 30 to 60 minutes after charging is started.

Table K1 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

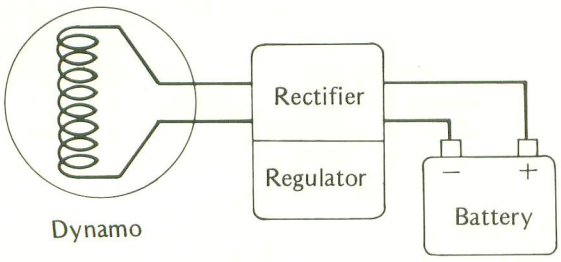
★ If one cell produces no gas bubbles, or has a very low specific gravity, it is probably shorted.
★ If there does not appear to be enough sediment to short the plates, but one cell has a low specific gravity after the battery is fully charged, the trouble may be just that there is insufficient acid in that cell. In this 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 specific 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 a dynamo (an alternator) and regulator/rectifier.

The dynamo generates the current required by the electrical circuits. The generated current is a single phase alternating current (AC), which is changed to direct current (DC) and controlled by a solid state regulator/rectifier unit to supply an even voltage to the circuit components.

Charging System (K3)



There are a number of important precautions that are musts when servicing the charging system. Cautions that are applied to the individual sections are mentioned each section. Failure to observe these rules can result in serious system damage. Learn and observe all the rules in each section.

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. Examine wires for signs of burning, fraying, etc. Poor wires and bad connections will affect electrical system operation. Check the dynamo and regulator/rectifier for evidence of physical damage.

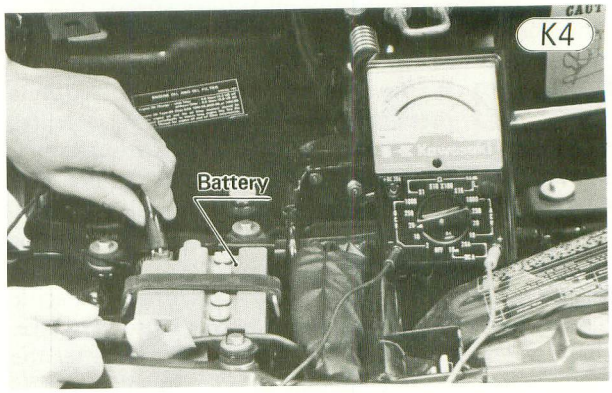
A worn out or badly sulphated battery will produce numerous problems that cannot be corrected until the battery is replaced. **ALWAYS CHECK BATTERY CONDITION BEFORE CONDEMNING OTHER PARTS OF THE SYSTEM. A FULLY CHARGED BATTERY IS A MUST FOR CONDUCTING ACCURATE SYSTEMS TESTS.**

Charging system malfunctions can be traced to either the battery, dynamo, 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.

Initial inspection

Before making this test, check the condition of the battery (Pg. 191). 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 dynamo operating conditions.

- Unlock the seat and swing it open.
- Set the multimeter to the 20V DC range, and connect the meter + lead to the battery + terminal and the meter – lead to the battery – terminal.



- Start the engine, and run the engine at the rpm in Table K2. Note the voltage reading.

Table K2 Charging Voltage

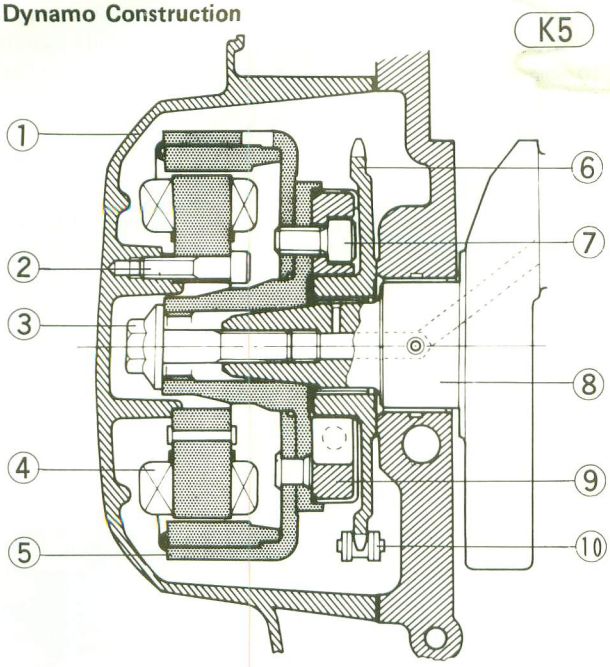
Meter	Connections	Reading @4,000 rpm
20V DC	Meter (+) ↔ Battery (+) Meter (–) ↔ Battery (–)	about 14.5V

- If the reading is more than 16V, the regulator/rectifier is defective, and should be replaced with a new one. If the reading is less than 14V, check the dynamo output and regulator/rectifier (Pg. 193) to determine which part is defective.

Dynamo

The dynamo, fundamentally a single phase A.C. generator, can be divided up into a moving part called the flywheel ⑤, which is taper fitted to one end of the crankshaft ⑧, and a stationary part called the armature ④, which is located inside the flywheel and fixed to the inside of the dynamo cover ①. The flywheel has 6 permanent magnets evenly spaced in its circumference to generate an alternating current with 6 cycles per flywheel revolution.

Dynamo Construction



1. Dynamo Cover
2. Allen Bolt
3. Flywheel Bolt
4. Dynamo Armature
5. Dynamo Flywheel
6. Starter Sprocket
7. Allen Bolt
8. Crankshaft
9. Starter Clutch
10. Starter Chain

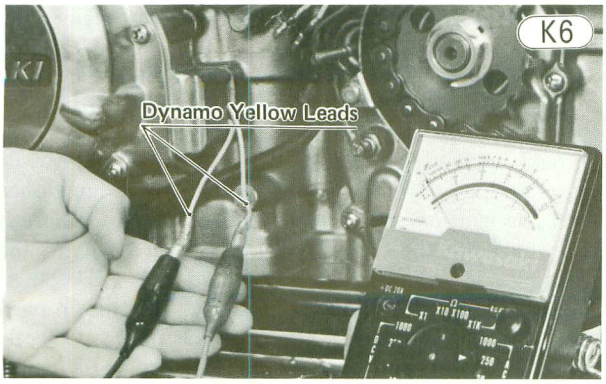
Dynamo failure

If the battery, regulator/rectifier, leads, and connectors are all good, but there is still low voltage or insufficient charging current, the dynamo may be defective. There are three types of dynamo failures: short, open (wire burned out), or loss in flywheel magnetism. A short or open in the armature coil will result in either a low output, or no output at all. A loss in flywheel magnetism, which may be caused by dropping or hitting the flywheel, leaving it near an electromagnetic field, or just by aging, will result in low output.

Dynamo output test

Before starting dynamo output test warm up the engine to obtain actual dynamo operating condition.

- Remove the engine sprocket cover (Pg. 54), and disconnect the yellow leads from the dynamo. Set the multimeter to the 250V AC scale, and connect each meter lead to yellow leads from the dynamo.



- Start the engine, run it at the rpm given in Table K3, and note the voltage reading. A much lower reading than that given in the table indicates that the dynamo is defective.

Table K3 Dynamo Output

Meter	Reading @4,000 rpm
250V AC	about 75V

Armature resistance check

- Disconnect the meter leads from the dynamo leads.
- Set the multimeter to the x 1Ω range, and measure the resistance for continuity between the yellow leads. If there is more resistance than shown in Table K4, or not meter reading, the armature has an open and must be replaced.

Table K4 Armature Resistance

Meter	Reading
x 1 Ω	about 0.32 Ω

- Using the highest resistance range of the multimeter, measure the resistance between each of the yellow leads and chassis ground. Any meter reading less than infinity (∞) indicates a short, necessitating armature replacement.

If the armature windings have normal resistance, but the voltage check showed the dynamo to be defective, then the flywheel megnets have probably weakened, and the flywheel must be replaced.

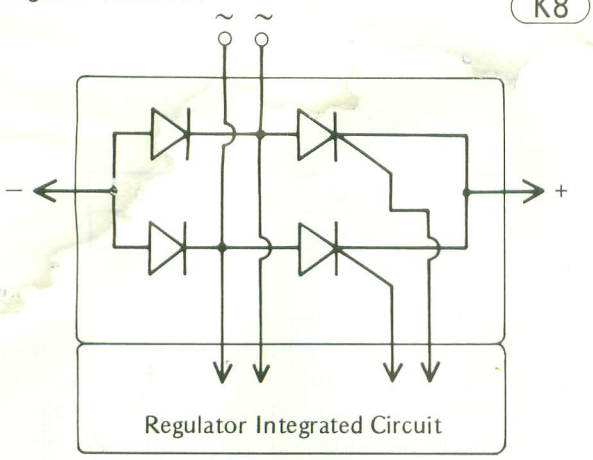
Regulator/Rectifier

This motorcycle has a regulator and rectifier as a unit. The regulator/rectifier functions cannot be checked separately because it is a solid-state type, and must be replaced as a unit should it become defective.

CAUTION When inspecting the regulator/rectifier, observe the following to avoid damage to the regulator/rectifier.

1. **Do not disconnect the regulator/rectifier with the ignition switch on. This may damage the regulator/rectifier.**
2. **Do not disconnect the battery leads while the engine is running. This may damage the regulator/rectifier.**

Regulator/Rectifier K8

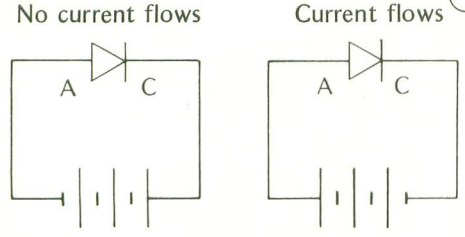


The rectifier is used to change the alternating current (AC) from the dynamo to direct current (DC) for the battery charging, ignition, lighting, and other circuits. It contains two silicon diodes and thyristors. The diodes and thyristors are connected in a bridge circuit arrangement for efficient, full-wave rectification.

1. Diode

The current of electrons flows only from the – to the + side of the diode. However, a defective diode will conduct in both directions (a short) or not conduct at all (an open). If any of the diodes is shorted or open, the voltage from the rectifier will be below normal, and the battery may not be charged adequately.

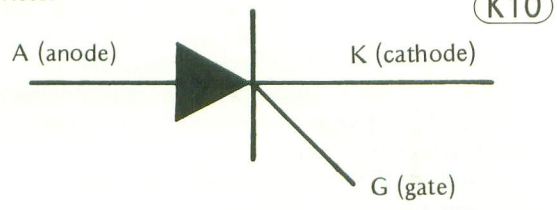
Diode Current Flow K9



2. Thyristor

The current of electrons will flow from the cathode to the anode but will not flow in the reverse direction. The thyristor differs from a diode in two respects: (a) even though a voltage of the correct polarity (negative to cathode) may be applied, the thyristor will not conduct until a signal is received at the gate input lead; (b) once started, it will not stop conducting (even if the gate lead signal voltage stops) until the anode to cathode voltage is removed or reversed.

Thyristor K10



The solid-state regulator limits dynamo output voltage to a maximum of 14.0 ~ 15.0 volts. Since it contains no contacts or other moving parts, it does not wear out and never needs to be adjusted. According to the dynamo output, the regulator circuit sends signals to the rectifier thyristors to keep the output voltage at specified value.

Inspection

Before testing the regulator/rectifier out of circuit, check the charging voltage (Pg. 192) and the dynamo output (Pg. 193).

- Remove the left side cover.
- With the ignition switch turned off, disconnect the regulator/rectifier 3-pin connector.
- Using an ohmmeter, check the resistance between the black lead and each yellow lead as shown in Table K5. The resistance should be as shown in the table. If any two leads are low or high in both directions, the regulator/rectifier is defective and must be replaced.

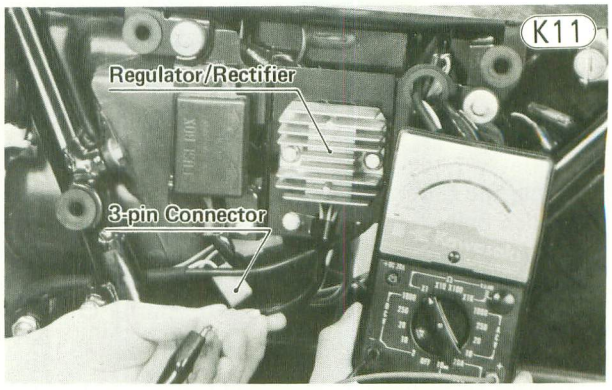


Table K5 Regulator/Rectifier Resistance

Meter	Connections	Reading
x 1 Ω	Meter (+) ↔ Yellow Lead Meter (–) ↔ Black Lead	less than 20Ω
x 1 kΩ	Meter (+) ↔ Black Lead Meter (–) ↔ Yellow Lead	more than 100 kΩ

NOTE: If the regulator/rectifier check is good with the above procedure but still does not appear to be operating correctly in the circuit, check it by trial replacement with a good unit.

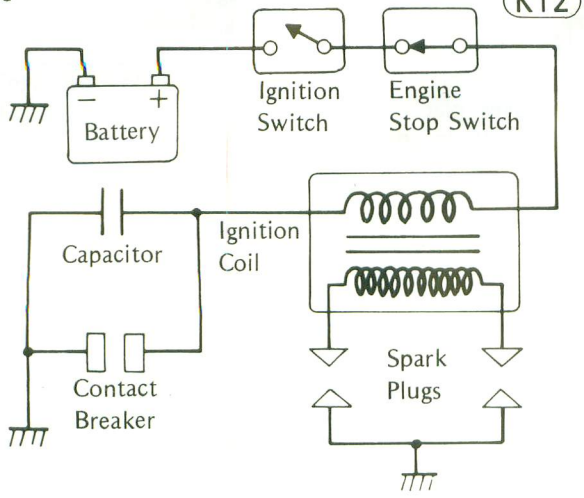
IGNITION SYSTEM

The working electrical part of the ignition system consists of the battery, contact breaker points, capacitor, ignition coil, and spark plugs. A timing advancer is attached to advance the ignition timing as engine rpm rises.

A wiring diagram of the ignition system is shown in Fig. K12, and works as follows. The battery supplies the current for the primary circuit, which includes the contact breaker points, capacitor, and the primary winding of the ignition coil. When the points suddenly open with the ignition switch turned on, a surge of electrons is produced in the secondary circuit, which includes the ignition coil secondary winding and the spark plugs. For this system to function properly, all ignition parts must be in good order, the ignition timing correctly set, the ignition and engine stop switches not shorted,

and all wiring in good condition (no shorts or breaks, and no loose or corroded connections).

Ignition Circuit (K12)



Ordinarily in a 4-stroke engine, a spark jumps across the spark plug electrodes only every other time that the piston for that spark plug rises (once every 720° of crankshaft rotation). This is because between each compression stroke, in which a fuel/air mixture ready for combustion is in the cylinder, there is an exhaust stroke, in which the piston rises only to push out the burned gases. However, even if a spark does jump across the electrodes during the exhaust stroke, there is no effect since there is no compression and no fuel to burn. Therefore, to eliminate any need for a distributor (thus simplifying the system and making it more reliable), the system is constructed so that both spark plugs fire every time both pistons rise (once every 360° of crankshaft rotation) although one piston is on the compression stroke and the other on the exhaust stroke.

Because the two spark plugs are connected in series, the current through one spark plug also must go through the other. Consequently, if a spark will not jump across the electrodes of one spark plug (due to dirty electrodes, faulty plug lead, etc.), no spark will jump across the electrodes of the other plug as well.

Ignition Coil

With the ignition switch on and the points closed, current flows in the primary circuit, including the ignition coil primary winding where the magnetic field (which accompanies electron flow) is concentrated (due to the winding). When the points open, this circuit is broken stopping the electron flow and collapsing the magnetic filed. As this field collapses, magnetic flux cuts through the secondary winding inducing voltage in the winding. The induced voltage, depending on the number of turns in the secondary winding and the speed of the drop in the primary winding current, is much greater than the voltage in the primary winding. It is this high voltage that causes a spark to jump across the spark plug electrodes. A greater ratio of secondary winding turns over primary winding turns and a sharper drop of primary winding current increase the secondary winding voltage that is produced. For this reason, a certain ratio of turns in the ignition coil has been chosen and a certain current drop shaprness (determined by capacitor and breaker point performance) has been designed into the ignition system so that a spark of sufficient but not excessive strength will be produced.

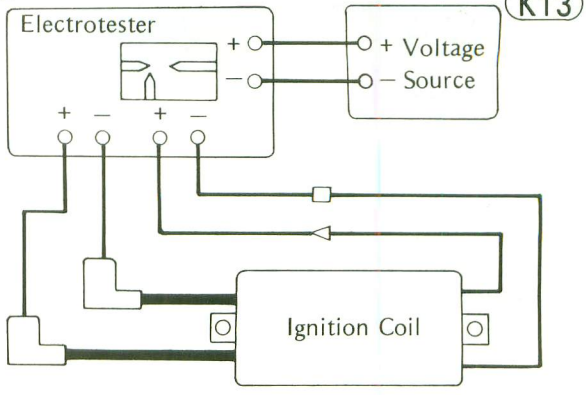
Ignition coil inspection

To check the coil:

The most accurate test for determining the condition of the ignition coil is made by measuring arcing distance with the Kawasaki Electrotester. 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 (K13)



- Turn on the tester switches.

WARNING **To avoid extremely high voltage shocks, do not touch the coil or leads.**

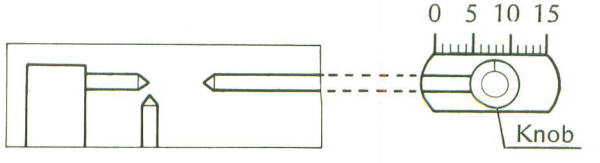
- Gradually slide the arcing distance adjusting knob from left to right (small distance to large distance) carefully checking the arcing.
- Stop moving the knob at the point where the arcing begins to fluctuate, and note the knob position in mm. The reading should show the value in the table.

Table K6 Arcing Distance*

Standard	5 mm or more

*1. Measure with the Kawasaki Electrotester.

Arcing Distance Measurement (K14)

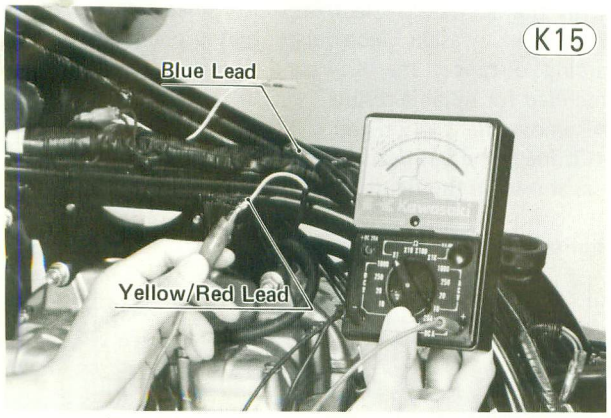


If the distance reading is less than the value shown in the table, the ignition coil or spark plug caps are defective. To determine which part is defective, measure the arcing distance again with the spark plug caps removed from the ignition coil. If the arcing distance is subnormal as before, the trouble is with the ignition coil itself. It the arcing distance is now normal, the trouble is with the spark plug caps.

To measure the primary winding resistance:

If an Electrotester is not available, the coil can be checked for a broken or badly shorted winding with an ohmmeter. However, an ohmmeter cannot detect layer shorts and shorts resulting from insulation breakdown under high voltage.

- Set the ohmmeter to the x 1 Ω range, and connect one ohmmeter lead to the yellow/red lead and the other to the blue lead from the ignition coils.



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.

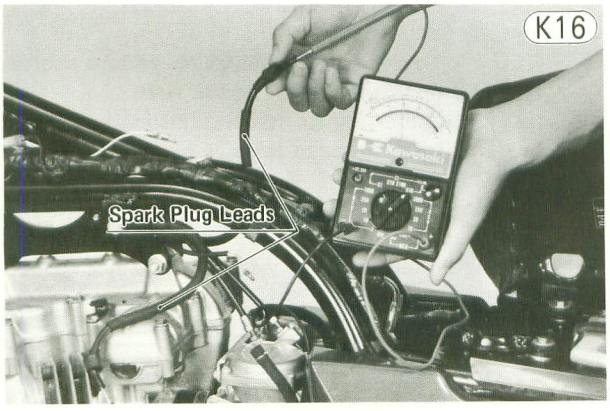


Table K7 Ignition Coil Resistance

	Meter	Reading
Primary Winding	x 1 Ω	3.2~4.8 Ω
Secondary Winding	x 1 kΩ	10.4~15.6 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 the yellow/red lead and the coil core and between each plug lead and the coil core. If there is any reading, the coil is shorted and must be replaced. Also, replace the ignition coil if the spark plug lead shows visible damage.

Contact Breaker

The contact breaker consists of one fixed and one movable contact point. The movable point is pivoted, and the heel on one end is held against the cam surface on the timing advancer by a single leaf spring. As the crankshaft rotates, the heel rides on the cam surface, and, as the crankshaft reaches the position where ignition takes place, the high spot on the cam surface pushes out on the heel, which opens the points. As the heel wears down, the point gap narrows, affecting ignition timing. Consequently, the ignition timing and point gap must be periodically adjusted to compensate for heel wear.

Contact breaker inspection

When the points become dirty, pitted, or burned, or if the spring weakens, the points will not make the contact necessary to produce a good spark, resulting in unstable idling, misfiring, or the engine not running at all. Inspect the contact breaker in accordance with the Periodic Maintenance Chart (Pg. 10), and repair or replace if necessary.

Clean the points with clean paper or cloth using an oil-free solvent. A business card soaked in trichloroethylene can be used to remove traces of oil. To repair light damage, use fine emery cloth or an oilstone. If the points are badly worn down or damaged, or if the spring is weak, replace the contact breaker.

Whenever the contact breaker is inspected or replaced, apply a small amount of point cam grease to the felt to lubricate the cam. This will minimize wear of the contact breaker heel. Be careful not to apply so much grease that it can drop off or be thrown onto the points, which will cause the points to foul and burn.

Capacitor

A capacitor is connected in parallel across the contact breaker points and serves to prevent current from arcing across the points as they open. Arcing across the points would reduce the sharpness of the voltage drop in the primary winding, thus weakening the spark plug spark, and also damaging the surface of the points. When the points are first opening, the capacitor absorbs a certain amount of current, giving the points time to open far enough apart to where current will not arc across. However, if the capacitor shorts, the current will simply flow through the capacitor whenever the points open. When the capacitor is otherwise defective, the current will not be prevented from arcing across the points at the time of ignition resulting in poor spark plug performance and burned and pitted points.

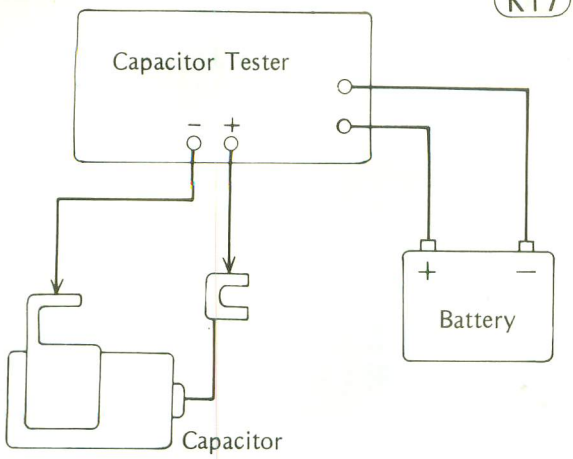
Capacitor inspection

The capacitor can usually be considered to be defective if a long spark is seen arcing across the points as they open or if the points are burned or pitted for no apparent reason. Replace the capacitor any time it appears defective and whenever the contact breaker is replaced.

NOTE: For checking with a capacitor tester, capacitor specifications are: 0.24 ± 0.02 μfd, 1,000W VDC.

Capacitor Test

K17



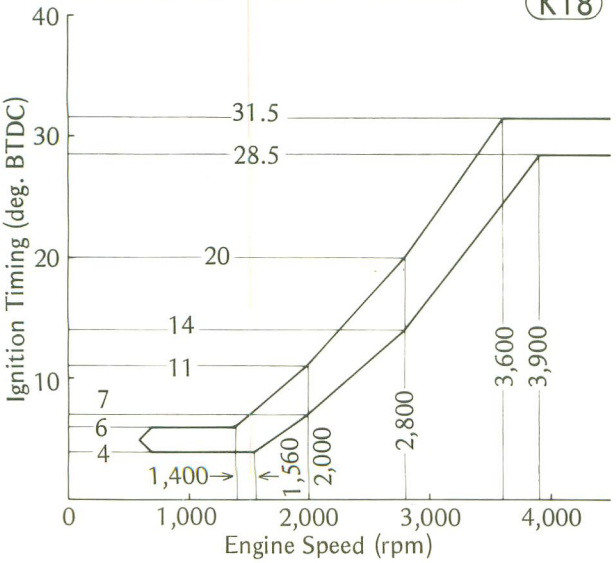
Timing Advancer

The timing advancer is a device that advances the ignition timing (makes the spark plugs fire sooner) as engine rpm rises. It consists of two weights and two springs connected to the timing cam that opens the contact breaker points. The more the engine speed rises, the further the weights are thrown out against spring tension, turning the cam in the direction of crankshaft rotation and causing the points to open sooner.

If the mechanism is damaged, has a weak or broken spring(s), or does not move smoothly, the ignition timing will not advance smoothly or it may stick in one position. This will result in incorrect timing at certain engine speeds, causing poor engine performance. Failure to advance at all will cause poor high speed performance, and excessive advance will cause knocking and poor low speed performance.

Ignition Timing/Engine Speed Relationship

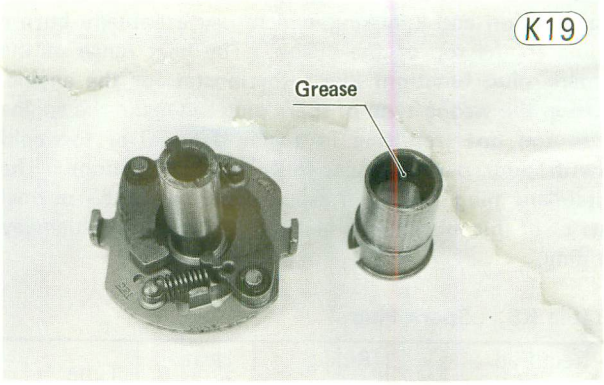
K18



Inspection and lubrication

Remove the timing advancer (Pg. 63), and check that the mechanism moves smoothly by hand and that no parts are visually worn or damaged. Periodically wipe the advancer clean, apply oil to it, and fill the groove inside the cam with grease.

K19



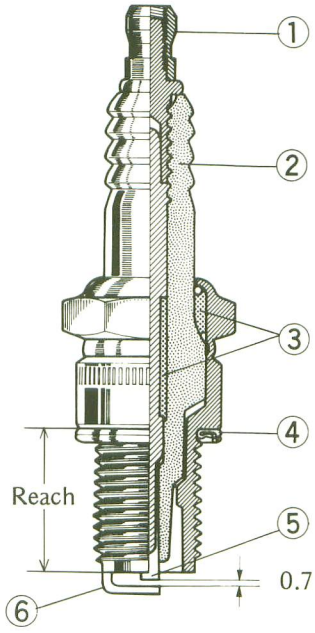
Install the advancer (Pg. 63), adjust the timing (Pg. 12), and check it with a strobe light for both low and high speed operation (Pg. 12). If the timing differs from that which is shown in the graph (Fig. K18), replace the timing advancer with a new one.

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.

Spark Plug

K20



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

Tests have shown the NGK B6ES or ND W20ES-U, set to a 0.7 ~ 0.8 mm gap to be the best plug for general use.

If a plug of the wrong heat range is used, the electrodes may not hot enough to keep all the carbon burned off, but cool enough to keep from damaging the engine and the plug itself. The proper spark plug temperature is about 400 ~ 800°C (750 ~ 1,450°F).

CAUTION **The carbon on the electrodes conducts electricity, and can short the center electrode to ground by either coating the ceramic insulator or bridging across the gap. Such a short will prevent an effective spark. Carbon build-up on the plug can also cause other troubles. It can heat up red-hot and cause**

preignition and knocking, which may eventually burn a hole in the top of the piston. 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.

Table K8 Spark Plug

Required Plug Thread	Riding Condition	Heat Range	Type
Diameter: 14 mm Pitch: 1.25 mm Reach: 19.0 mm	Normal	Normal	NGK B6ES ND W20ES-U

ELECTRIC STARTER SYSTEM

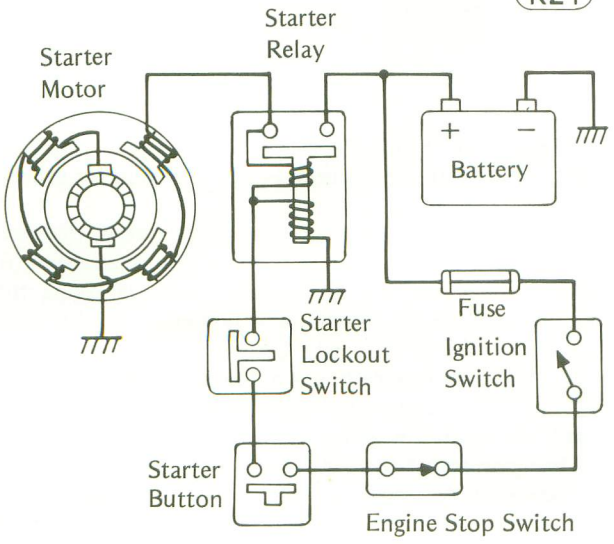
Starter Motor Circuit

The starter motor circuit includes the starter button (switch), starter relay, battery, and starter motor. When the ignition switch is on and the starter button is pushed, a small amount of current flows through the switch and the relay coil. This current magnetizes the relay core, which then pulls the armature to it, closing the relay contacts. The closed contacts complete a circuit for the starter motor, and the motor turns. The reason for using a relay instead of using the switch to turn on the starter motor directly is that the starter motor requires much current – enough that relatively thick wire is necessary to carry the current to the starter motor. Because it is not practical to put a heavy switch on the handlebar and have large wires running to it, the starter switch is made to carry just the light relay coil current, and heavy contacts inside the relay carry the starter motor current.

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

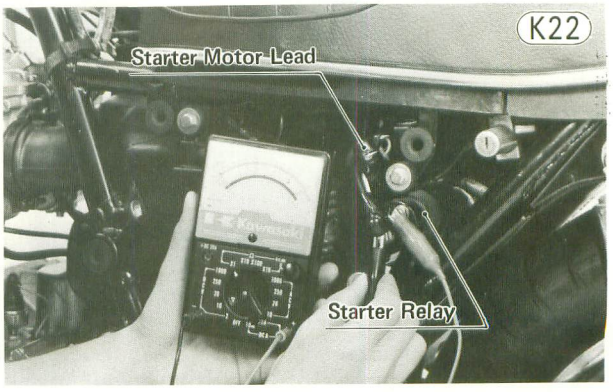
K21



Starter relay test

- Remove the left side cover.
- Disconnect the starter motor lead from the starter relay, and connect an ohmmeter set to the x 1 Ω range across the relay terminals.
- Turn on the ignition switch, pull 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 does not read zero, the relay is defective, and must be replaced.

K22



- If the relay does not click at all, disconnect the other two leads (black and yellow/red) in the left side cover, and measure the resistance across them. If the resistance is not close to zero ohms, the relay is defective.

K23

However, if there is zero ohms resistance, the relay may be good; check that there is actually voltage to the relay before deciding that the relay is defective.

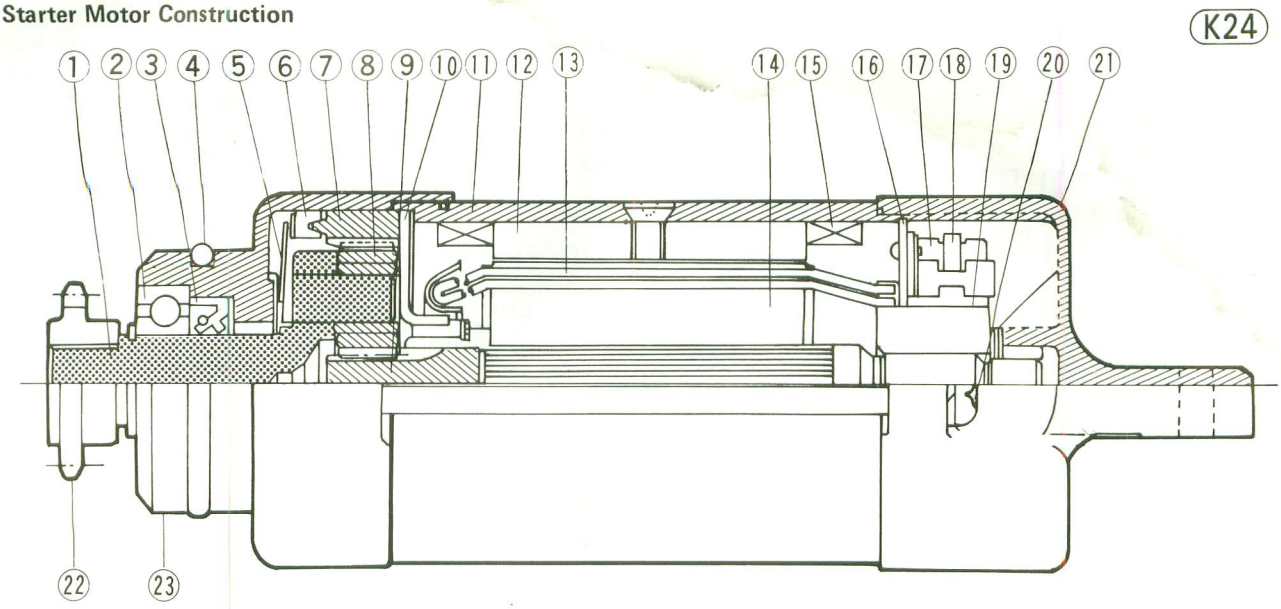
- To check for the voltage, first turn the meter to 20V DC, connect the – meter lead to the yellow/red lead which was disconnected from the relay, and connect the + meter lead to the balck lead. Push the starter button, and see if the meter reads battery voltage. If it does not, there is wiring trouble. If the meter reads battery voltage but the relay does not click, the relay is defective.

Starter Motor

The starter motor is installed with a sprocket and chain arrangement to transmit starter motor rotation to the crankshaft. A starter motor clutch (Pg. 200) disengages the starter motor once the engine starts.

Fig. K24 shows starter motor construction. The field coils ⑮ are wound around four cores ⑫, forming the

Starter Motor Construction



1. Output Shaft
2. Ball Bearing
3. Grease Seal
4. O Ring
5. Plate Spring
6. Internal Gear Holder
7. Internal Gear
8. Planet Pinion
9. Sun Gear
10. End Plate
11. Yoke Assembly
12. Cores
13. Armature Winding
14. Armature
15. Field Coil
16. Brush Plate
17. Carbon Brush
18. Spring
19. Commutator
20. Screw
21. End Cover
22. Starter Motor Sprocket
23. End Cover

yoke ⑩, and the armature windings ⑪ are connected to the commutator ⑱ and receive their current through the brushes ⑯. If the brushes are not making good contact, no starter motor current will flow at all since the field coils and armature windings are connected in series, and the motor will not turn over. A short or open in a coil or winding may also cause the motor to be inoperative. Particles from brush wear may be another cause of starter motor failure; these particles may get onto the bearing at the rear of the motor, causing heat seizure.

A planetary gear train is provided at the output side of the starter motor. The planetary gear train consists of an internal gear ⑦, two planet pinions ⑥, and a sun gear ⑨. These gears reduce the rotational speed of the armature to give more power to the output shaft. The internal gear is fixed to the end cover ⑤.

Carbon brushes

Worn brushes or weak springs will cause poor brush contact.

Measure the length of the brushes, and replace both if either one is worn down to less than the service limit.

Table K9 Carbon Brush Length

Standard	Service Limit
11.0 ~ 12.5 mm	6 mm

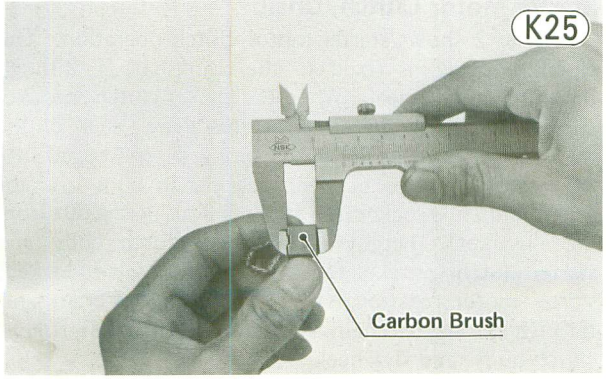
Brush spring

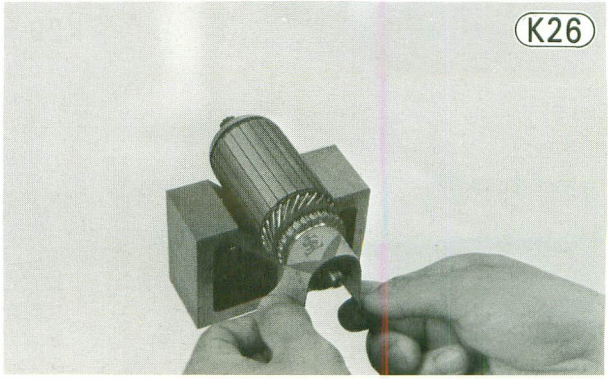
Spring tension should be 495 ~ 605 grams but a spring can be considered serviceable if it will snap the brush firmly into place.

Commutator

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.

- Correct 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. Replace the armature with a new one if the groove depth is less than the service limit.





Commutator

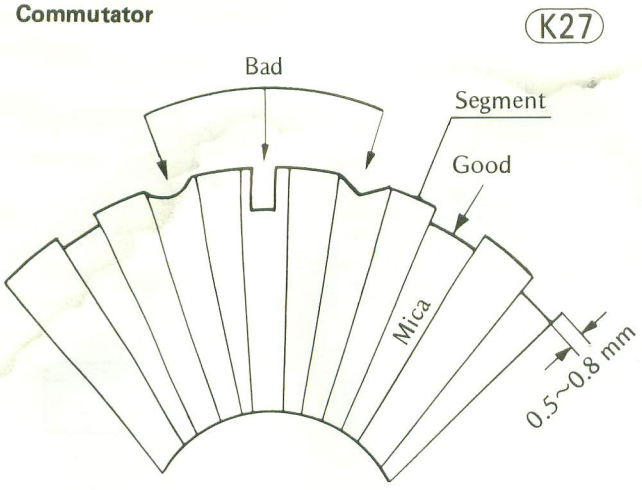
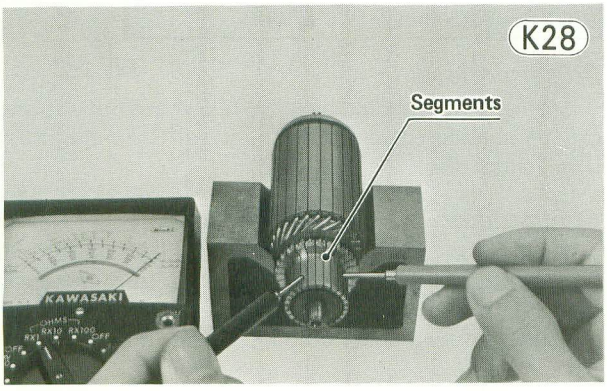


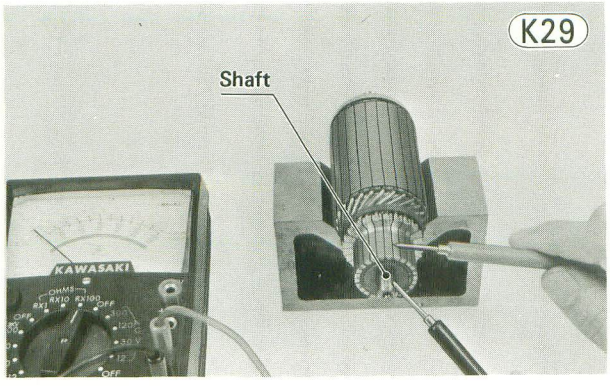
Table K10 Commutator Groove Depth

Standard	Service Limit
0.5 ~ 0.8 mm	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.



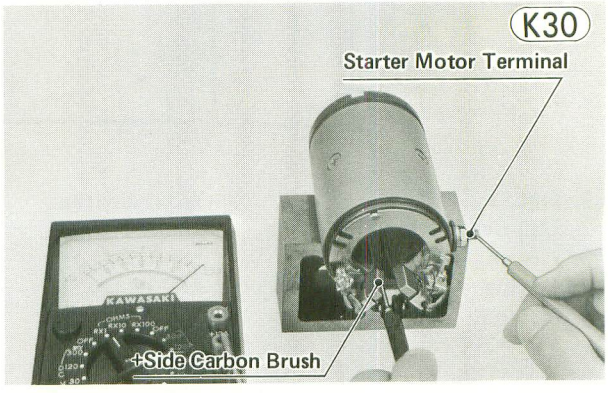
- Using the highest ohmmeter range, measure the resistance between the commutator and the shaft. If there is any reading at all, the armature has a short and must be replaced.



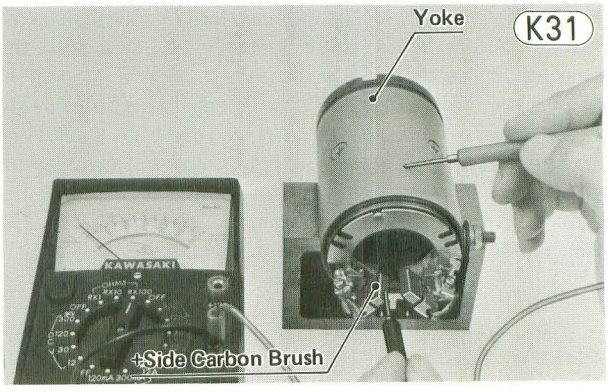
NOTE: Even if the foregoing checks show the armature to be good, it may be defective in some manner not readily detectable with an ohmmeter. If all other starter motor and starter motor circuit components check good, but the starter motor still does not turn over or only turns over weakly, replace the armature with a new one.

Field coils

- 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.



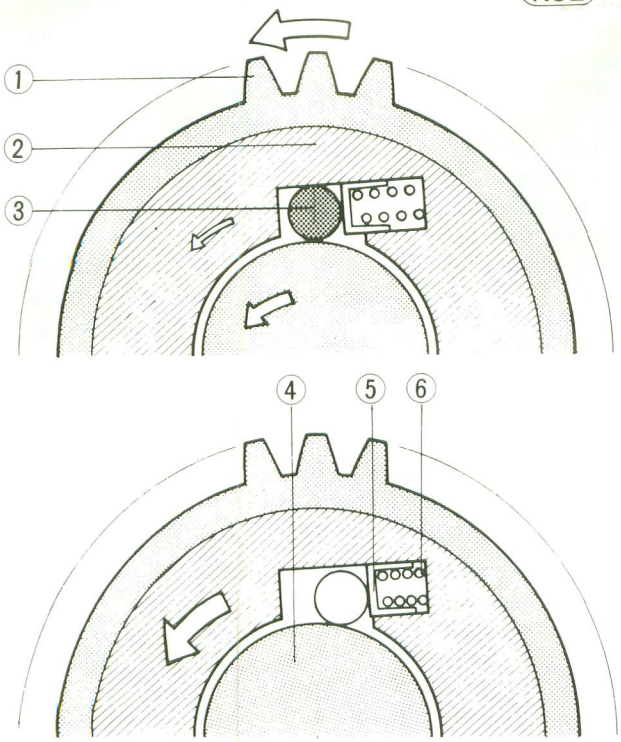
- Using the highest ohmmeter range, measure the resistance between the + side carbon brush and the yoke (housing). If there is any meter reading, the coils are shorted to ground and the yoke assembly must be replaced.



Starter Motor Clutch, Chain

Fig. K32 shows starter motor clutch operation. The clutch body ② is fixed to the crankshaft ④ through the dynamo flywheel. When the starter clutch sprocket ① rotates in the direction of the arrow, each of the three rollers ③, pushed by its spring ⑥, is wedged into the narrower space between the clutch body and the starter clutch sprocket hub (the portion jutting out from the sprocket), thereby locking the clutch body and starter clutch sprocket together. With these two locked, starter motor rotation is transmitted to the cranksahft through the starter chain, starter clutch sprocket, rollers, clutch body, and flywheel.

Starter Motor Clutch Operation K32



1. Clutch Sprocket
2. Clutch Body
3. Roller
4. Crankshaft
5. Spring Cap
6. Spring

When the engine starts, friction with the starter clutch sprocket (and at higher speeds, inertia) moves the rollers back against the tension of their springs so that they no longer serve as wedges locking the clutch body and starter clutch sprocket together. In this manner, the engine rotates freely without forcing the starter motor to turn with it.

If the rollers or the starter clutch sprocket hub become damaged or worn, the rollers may lock in place so that the starter motor will not disengage when the engine starts. On the other hand, roller or sprocket hub damage could prevent the clutch from engaging properly, causing the starter motor to run freely without transmitting rotation.

Clutch inspection

- Turn off the ignition switch and disconnect the battery negative lead from the battery.
- Remove the dynamo cover.

NOTE: Some engine oil will be spilled by dynamo cover removal. After installing the cover, check the engine oil level and add engine oil as necessary (Pg. 21).

- Turn the dynamo flywheel using the flywheel holder (special tool), and check the starter motor clutch operation. When turning the flywheel clockwise, the starter clutch sprocket should not turn with the flywheel, but, when turning the flywheel counterclockwise, the sprocket should turn. If the clutch does not operate as it should or if it makes noise, disassemble the starter motor clutch (Pg. 56), examine each part visually, and replace any worn or damaged parts.

Starter chain inspection

- Remove the starter chain (Pg. 56), hold the chain taut with a force of about 5 kg in some manner such as the one shown in Fig. K34, and measure a 20-link length. Since the starter chain may wear unenvely, take measurements at several places. If any measurement exceeds the service limit, replace the chain.

Starter Chain Measurement K34

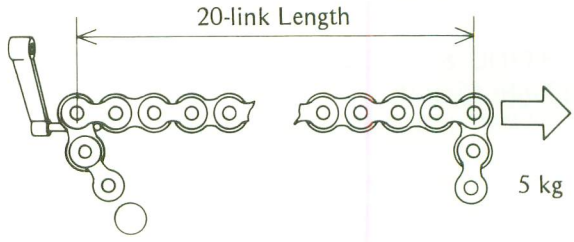


Table K11 Starter Chain 20-link Length

Standard	Service Limit
190.5~190.9 mm	193.4 mm

IGNITION SWITCH

The ignition switch has three positions: off, on and park. In the off position all circuits are turned off and the key can be removed from the switch. In the on position the motorcycle can be started and all electrical equipment can be used. The key cannot be removed from the switch when it is in this position. In the park position the tail light is on, but all other circuits are cut off and the key can be removed from the switch. This provides added visibility when the motorcycle is parked.

Testing the switch

Table K12 shows the internal connections of the ignition switch for each switch position. To check the switch, disconnect the plug (4-pin) from the switch, and use an ohmmeter to verify that all the connection listed in the table are making contact (zero 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 (Fig. K35).

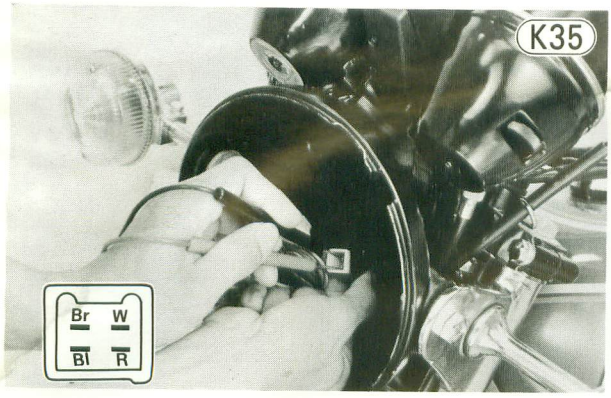


Table K12 Ignition Switch Connection

Color	White	Brown	Blue	Red
OFF				
ON	●	●	●	●
PK	●	●		●
Lead	BAT	IG	TL1	TL2

A blown fuse should be replaced. If the bulb and fuses are good, check the dimmer switch. Table K13 shows the connections in the dimmer switch for both high and low beam. Remove the fuel tank, and disconnect the 4-pin connector and blue lead to the dimmer switch. Use an ohmmeter to see that only the connections shown in the table 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. If the procedure above does not remedy the problem, check the ignition switch and the wiring.

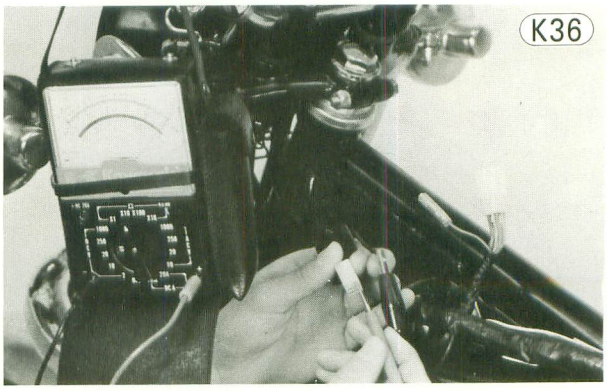


Table K13 Dimmer Switch Connections

	Red/Black	Blue	Red/Yellow
Hi	●	●	
Lo		●	●

LIGHTING SYSTEM

Headlight Circuit

Fig. K37 is the wiring diagram of the headlight circuit.

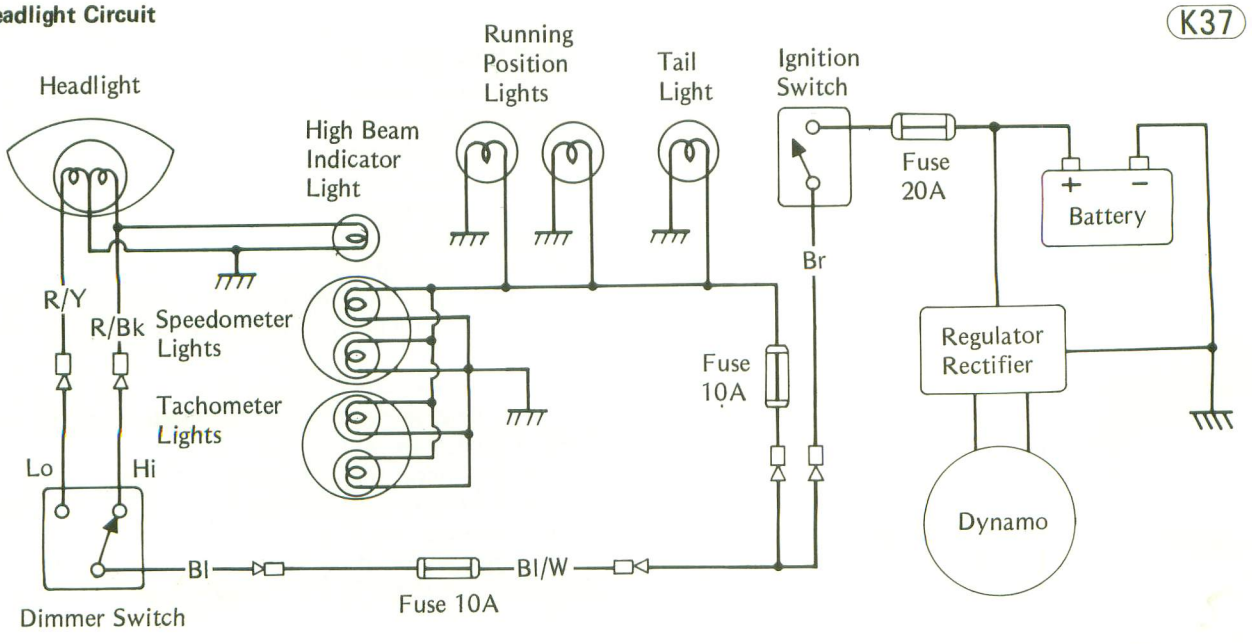
There is no headlight switch, so the headlight circuit is completed when the ignition switch is turned on. High and low beam can be selected by the dimmer switch.

Headlight trouble

If the headlight does not light, check to see if the bulb has burned out or fuses have blown. If the bulb has burned out, the sealed beam unit must be replaced.

If the headlight lights but does not light brightly, the trouble may be that the headlight is of improper wattage or the dynamo 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.

Headlight Circuit



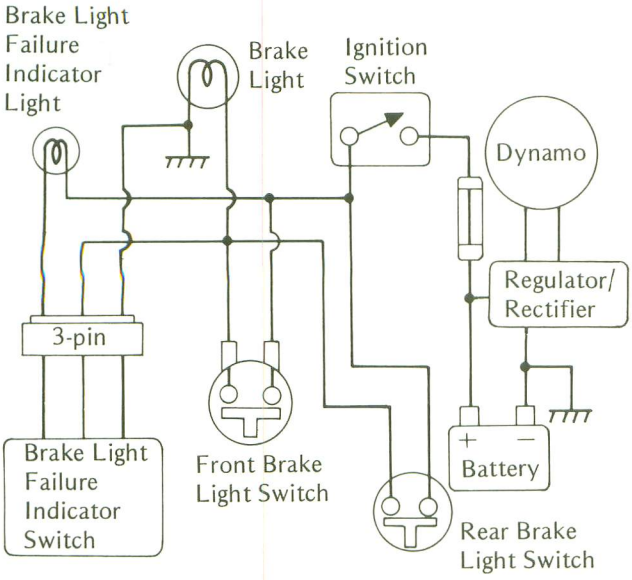
Tail light trouble

If the tail light does not go on when the circuit is closed, the filament is probable burned out. However, if the bulb is good, check the fuses, wiring, ignition switch, headlight switch fuse and battery.

Brake Light Circuit

The brake light circuit is shown in Fig. K38. When the ignition switch is turned on, the brake light goes on whenever the circuit is closed by either the front or rear brake light switch. The same bulb is used for both the brake and tail lights as explained in the preceding section.

Brake Light Circuit K38



The front brake light switch is a pressure switch installed in the brake fluid line, and is operated by fluid pressure when the brake lever is pulled. The front brake light switch never requires adjustment and so is not designed to be adjusted. It can not be disassembled for repair and must be replaced when defective.

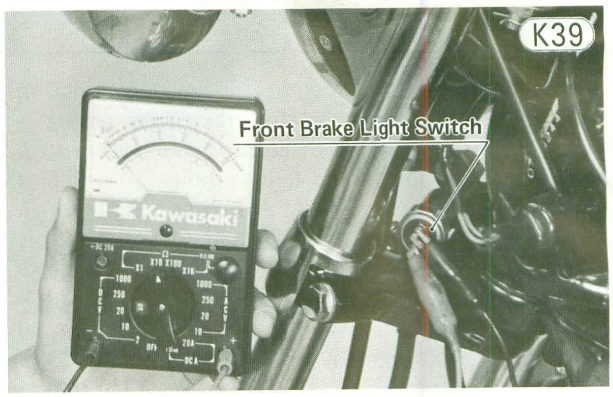
The rear brake light switch is a plunger type switch actuated by a spring attached to the rear brake pedal. It can be adjusted by changing its position higher or lower in the mounting bracket (See Pg. 26).

The brake light failure indicator switch is in the brake light circuit as a warning device to indicate during vehicle operation whether or not the brake light is functioning properly. Brake light failure may be due to a burned out bulb or some other failure in the brake light circuit.

Brake light circuit inspection involves the front brake light switch, rear brake light switch, brake light, brake light failure indicator switch, brake light failure indicator light, and wiring.

Front brake light switch inspection

- Disconnect the front brake light switch leads from the switch.
- Set an ohmmeter to the R x 1 range, connect the meter to the switch terminals, and determine whether or not there is continuity whenever the front brake lever is squeezed. If there is no continuity, replace the switch.



Rear brake light switch inspection

- Unlock the seat, and swing it open.
- Disconnect the rear brake light switch blue and brown leads.
- Inspect in the same way that the front brake light switch was inspected. If there is no continuity whenever the rear brake pedal is depressed, replace the switch.

Brake light failure indicator switch inspection

Turn on the ignition switch. Watching the indicator light, apply and then release either brake. Next, with the tail/brake light bulb removed, do the same above. If the indicator lights as shown in Table K14, the brake light failure indicator switch and brake light circuit are functioning properly.

Table K14 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	Flash

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 brakes are applied.
- Remove the left side cover, and disconnect the indicator switch 3-pin plug. The brake light failure indicator switch is behind the electrical panel.
- Set an ohmmeter to the R x 1 range and voltmeter to the 20V DC range. Check the wiring as shown in Table K15.

CAUTION **To prevent a meter burning, turn off the ignition switch while using an ohmmeter.**

Table K15 Brake Light Wiring Inspection

Meter	Connections†	Brake	Standard
Voltmeter 20V DC	Meter (+) ⟷ Blue	Apply	Battery Voltage
		Release	0V
	Meter (+) ⟷ Green/White	—	Battery Voltage
Ohmmeter R x 1	Meter (+) ⟷ Black/Yellow	—	0 Ω

†1. Negative (–) meter lead connected to the ground.
2. Positive (+) meter lead a 3-pin socket with indicator switch disconnected.

If 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 volts, the indicator bulb may be burned out.

(2) Brake light failure indicator switch inspection:

- Make sure that the brake light oprates properly, and that the brake light wiring is not damaged.
- Connect the indicator switch 3-pin plug.
- Measure the voltage at the 3-pin plug as shown in Table K16.

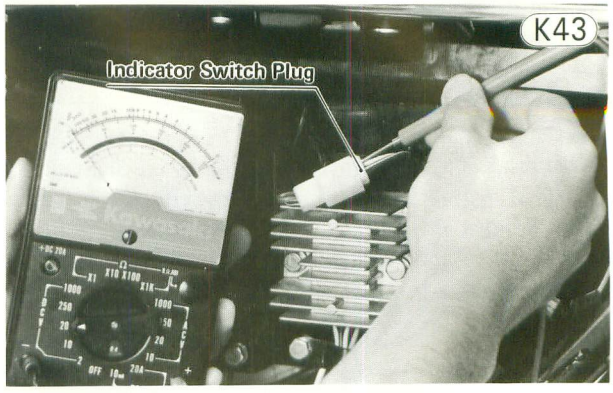


Table K16 Indicator Switch Inspection

Meter	Connections†	Brake	Standard
20V DC	Meter (+) ⟷ Yellow	Apply	Battery Voltage
		Release	0V
	Meter (+) ⟷ Green/White	Apply	0V
		Release	Battery Voltage

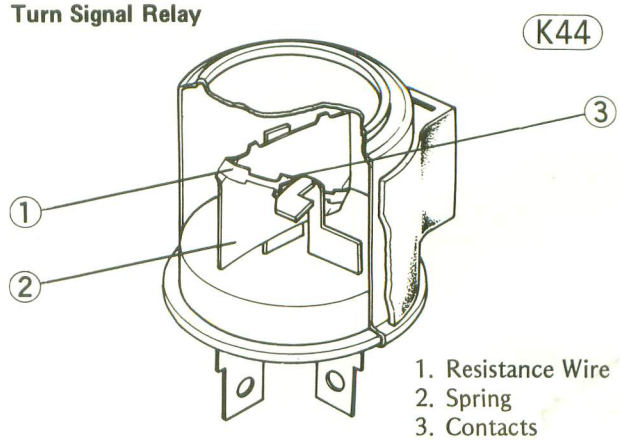
†1. Negative (–) meter lead connected to the ground.
2. Positive (+) meter lead at 3-pin plug with indicator switch connected.

If any one of the meter readings shows an improper value, the brake light failure indicator switch is defective.

Turn Signal Circuit

A wiring diagram of the turn signal circuit is shown in Fig. K45. When the igntion switch is on and the turn signal switch is turned to R or L, a ground is provided for the circuit so current can flow. Current to the right or left turn signals flows through the closed contacts and the resistance wire inside the turn signal relay, and the turn signals go on. The resistance wire quickly heats up, expands, and allows a spring to pull the contacts open. When the contacts have opened, the circuit is broken, the turn signals go off, and the resistance wire cools and contracts, closing the contacts so that the cycle can begin again. The indicator light in the turn signal circuit flashes on and off with the turn signals to indicate that they are working properly.

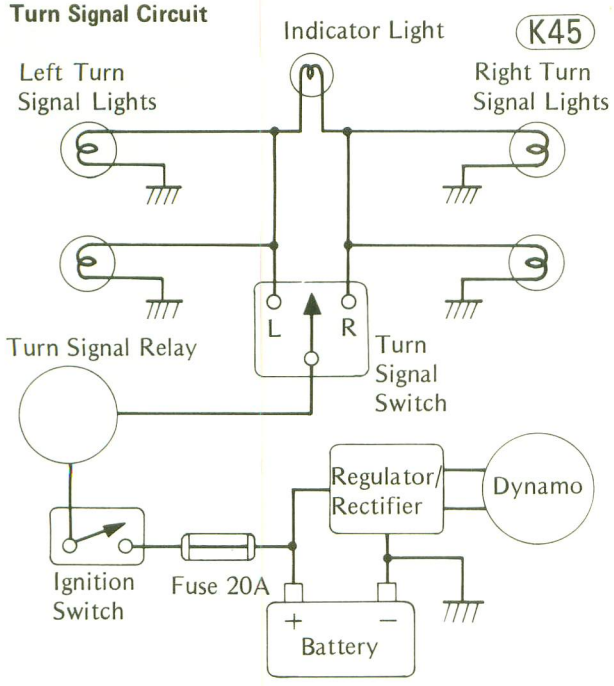
Turn Signal Relay



1. Resistance Wire
2. Spring
3. Contacts

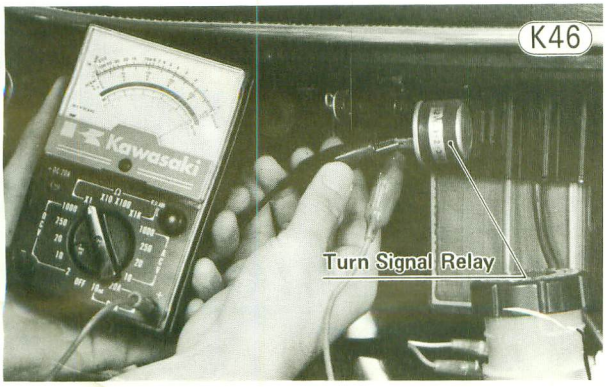
Since the turn signal relay is designed to operate correctly only when two turn signals (one front and one rear) and the turn signal indicator light are properly connected in the circuit, trouble may result from a burned out bulb, a bulb of incorrect wattage, loose wiring, as well as from a defect in the relay itself. In general, if the trouble with the circuit is common to both right and left turn signals, it is probably caused by a defective turn signal relay, although it may be due to a bad switch, wiring, or battery. If the trouble is with only one side – either right or left – then the relay is not at fault since the same relay is used for both sides.

Turn Signal Circuit

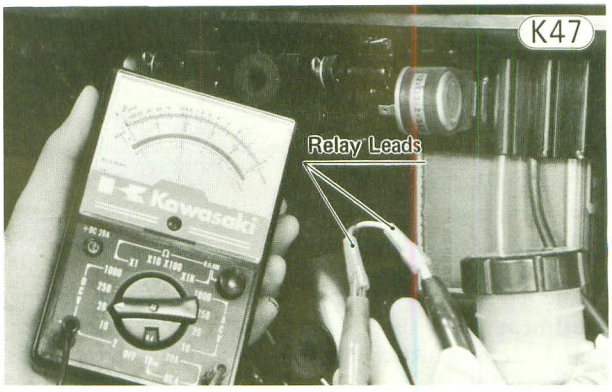


Turn signal trouble

(1)Neither right nor left turn signals come on at all:
- Check that battery voltage is normal.
- Remove the right side cover.
- Unplug the relay leads 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.



- If the relay checks good, turn the meter to the 20V DC range, connect the + meter lead to the brown lead that was disconnected from the relay, and connect the – meter lead to the orange lead. With the ignition switch on, first switch the turn signal switch to the R and then to the L position. The meter should register 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 will still not work when the relay is reconnected, then recheck all wiring connections.



(2)Both right or both left turn signals come on and stay on or flash too slowly:
- Check that battery voltage is not low.
- Check that all wiring connections are good.
- Check that the turn signal bulbs and indicator bulb are of the correct wattage.
- If all of the above check good, replace the relay.

(3)A single 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.

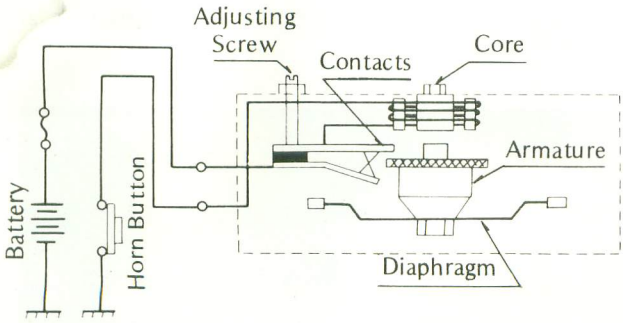
(5)Flashing rate is too fast:
- If this occurs on both the right and left sides, check that the battery is not being overcharged (*indicating* a defective regulator). If the dynamo and the battery voltage are normal, replace the turn signal relay.
- If this occurs on only one side, one or both of the turn signal bulbs are of too high a wattage.

HORN

The horn circuit and construction are shown in Fig. K48. When the horn button is pressed with the ignition switch on, the horn is grounded to complete the horn circuit. Current then flows through the horn contacts and horn coil, magnetizing the iron core. The magnetized iron core pulls on the armature and diaphragm assembly, the movement of which pushes open the contacts, interrupting the current flow. Since the

core now loses its magnetism, the armature and diaphragm assembly springs back to its original position, closing the contacts. This cycle repeats until the horn button is release. Since each cycle takes only a fraction of a second, the diaphragm moves fast enough to produce sound.

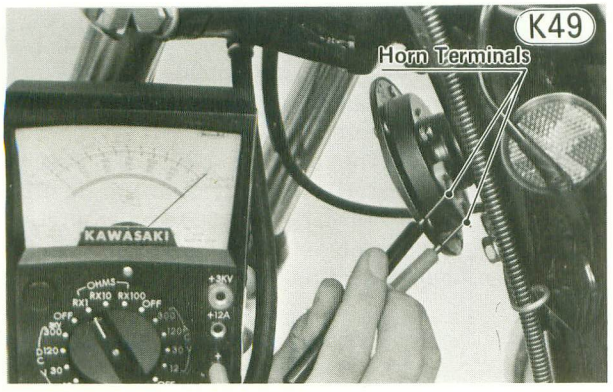
Horn Construction (K48)



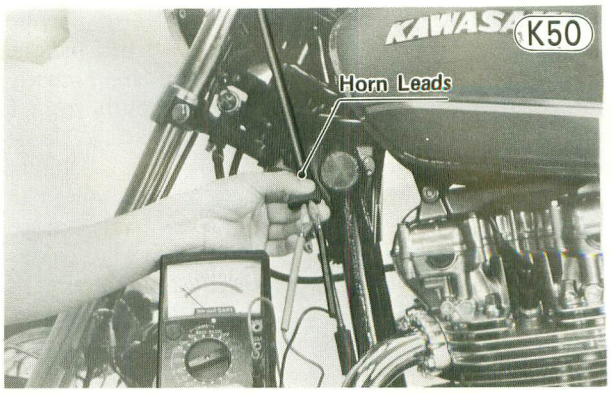
The contacts wear down after long use, requiring adjustment from time to time (Pg. 28). If the horn itself is determined to be at fault and adjustment fails to correct the trouble, the contacts or some other component in the horn is defective. The horn cannot be disassembled and must be replaced if defective.

Horn trouble

- Check that battery voltage is normal.
- Disconnect the leads to the horn, and connect to the horn terminals a multimeter set to the R x 1 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.

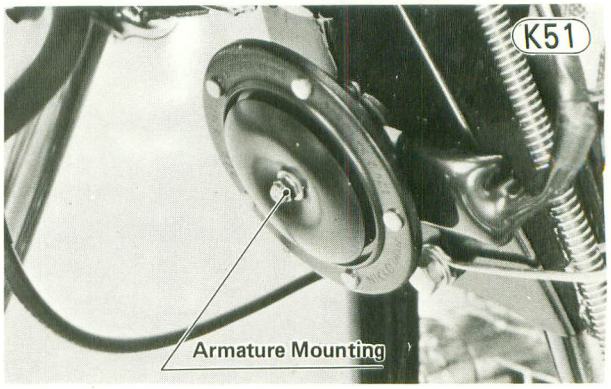


- If the reading is very close to zero, set the multimeter to the 30V DC range, and connect the meter to the leads that were disconnected from the horn. The + meter lead goes to the brown lead, and the – meter lead goes to the black lead. With the ignition switch on, press the horn button. The meter should register battery voltage. If it does not, the fuse, ignition switch, horn button, or the wiring is at fault. Also check that the black/yellow lead is grounded to the handlebar holder stem.



- 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: Do not loosen the armature mounting since doing so would alter the armature position such that the horn would probably have to be replaced.



SPEEDOMETER, TACHOMETER

The speedometer and the tachometer are sealed units which cannot be disassembled. If either fails to work satisfactorily, it must be replaced as a complete unit.

The speedometer and tachometer illumination lights and the indicator lights are independent and can be removed for replacement if necessary.

There is damping oil around the meter needle shaft which damps needle flutter and makes the needle move smoothly. If the meters are left upside down or sideways for any length of time, the damping oil will spill out of the reservoir, and the meters will malfunction.

Troubleshooting—Guide

Engine Doesn't Start; Starting Difficulty

Starter motor not rotating
- Clutch lever not pulled
- Starter motor defective
- Battery voltage low
- Relay not contacting or operating
- Starter button not contacting
- Wiring open or shorted
- Ignition switch defective
- Engine stop switch off
- Engine stop switch defective
- Fuse blown

Starter motor rotating but engine doesn't start
- Starter motor clutch defective

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
- Kickstarter return spring broken
- Kick ratchet gear not engaging
- Primary chain broken

No fuel flow
- No fuel in tank
- Fuel tap turned off
- 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, kick with the throttle fully open to allow more air to reach the engine.)

No spark; spark weak
- Ignition switch not on
- Engine stop switch turned off
- Battery voltage low
- Spark plug dirty, defective, or maladjusted
- Spark plug cap or high tension wiring defective
- Spark plug cap shorted or not in good contact
- Contact breaker points dirty or damaged
- Contact breaker point gap maladjusted
- Capacitor defective
- Ignition coil defective
- Ignition or engine stop switch shorted
- Wiring shorted or open

Compression low
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston rings bad (worn, weak, broken, or sticking)
- Piston ring/land clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve lifter seizure
- Valve sticking
- Valve not closing
- Valve spring broken or weak
- Valve not seating properly (vlave bent, warped, or worn)

Poor Running at Low Speed

Spark weak
- Battery voltage low
- Spark plug dirty, defective, or maladjusted
- Spark plug cap or high tension wiring defective
- Spark plug cap shorted or not in good contact
- Spark plug incorrect
- Contact breaker points dirty or damaged
- Contact breaker point gap maladjusted
- Capacitor defective
- Ignition coil defective

Fuel/air mixture incorrect
- Pilot screw(s) maladjusted
- Pilot jet, or air passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Air cleaner duct poorly sealed
- Starter plunger stuck open
- Fuel level too high or too low
- Fuel tank air vent obstucted
- Carburetor holders loose

Compression low
- Spark plug loose
- Cylinder head not sufficiently tightened down
- No valve clearance
- Cylinder, piston worn
- Piston rings bad (worn, weak, broken or sticking)
- Piston ring/land clearance excessive
- Cylinder head gasket damaged
- Cylinder head warped
- Valve lifter seizure
- Valve sticking
- Valve not closing
- Valve spring broken or weak
- Valve not seating properly (valve bent, warped, or worn)

Other
- Ignition timing maladjusted
- Timing not advancing (spring broken or stretched)
- Carburetors not synchronizing
- Engine oil viscosity too high
- Brakes dragging

Poor Running or No Power at High Speed

Firing incorrect
- Battery voltage low
- Spark plug dirty, defective, or maladjusted
- Spark plug cap or high tension wiring defective
- Spark plug cap shorted or not in good contact
- Spark plug incorrect

Contact breaker points dirty or damaged
Contact breaker point gap maladjusted
Capacitor defective
Ignition coil defective
Ignition timing maladjusted and/or timing not advancing
Contact breaker spring weak

Fuel/air mixture incorrect
Main jet clogged or wrong size
Jet needle or needle jet worn
Jet needle clip in wrong position
Fuel level too high or too low
Needle jet bleed hole clogged
Air cleaner clogged, poorly sealed, or missing
Starter plunger stuck open
Water or foreign matter in fuel
Carburetor holders 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 rings bad (worn, weak, broken, or sticking)
Piston ring/land clearance excessive
Cylinder head gasket damaged
Cylinder head warped
Valve lifter seizure
Valve sticking
Valve not closing
Valve spring broken or weak
Valve not seating properly (valve bent, warped, or worn)

Knocking
Ignition timing maladjusted
Carbon built up in combustion chamber
Fuel poor quality or incorrect
Overheating
Spark plug incorrect

Miscellaneous
Throttle valve won't fully open
Vacuum pistons don't slide smoothly
Damaged diaphragm
Ignition timing maladjusted
Timing not advancing
Balancer mechanism malfunctioning
Brakes dragging
Clutch slipping
Overheating
Engine oil level too high
Engine oil viscosity too high

Overheating

Firing incorrect
Spark plug dirty, damaged, or maladjusted
Ignition timing maladjusted
Spark plug incorrect

Fuel/air mixture incorrect
Main jet clogged
Fuel level too low
Carburetor holders loose
Air cleaner clogged, poorly sealed, or missing

Compression high
Carbon built up in combustion chamber

Engine load faulty
Clutch slipping
Engine oil level too high
Engine oil viscosity too high
Brakes dragging

Lubrication inadequate
Engine oil level too low
Engine oil poor quality or incorrect

Clutch Operation Faulty

Clutch slipping
No clutch lever play
Friction plates worn or warped
Steel plates worn or warped
Clutch springs weak
Clutch release maladjusted
Clutch inner cable catching
Clutch release mechanism defective
Clutch hub or housing unevenly worn

Clutch not disengaging properly
Clutch lever play excessive
Clutch plates warped or too rough
Clutch spring tension uneven
Engine oil deteriorated
Engine oil of too high a viscosity
Engine oil level too high
Clutch housing frozen on drive shaft
Clutch release mechanism defective
Loose clutch hub nut

Gear Shifting Faulty

Doesn't go into gear; shift pedal doesn't return
Clutch not disengaging
Shift fork(s) bent or seized
Gear(s) stuck on the shaft
Shift drum positioning pin binding
Shift return spring weak or broken
Shift lever broken
External shift mechanism pawl broken
Shift return spring pin loose
External shift mechanism arm spring broken

Jumps out of gear
Shift fork(s) worn
Gear groove(s) worn
Gear dogs, dog holes, and/or dog recesses worn
Shift drum groove(s) worn
Shift drum positioning pin spring weak or broken
Shift fork pin(s) worn
Drive shaft, output shaft, and/or gear splines worn

Overshifts
Shift return spring pin loose
Shift drum positioning pin spring weak or broken
External shift mechanism arm spring weak or broken

Abnormal Engine Noise

Knocking
Ignition timing maladjusted
Carbon built up in combustion chamber
Fuel poor quality or incorrect

Overheating
Spark plug incorrect

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 bearings worn
Valve lifter worn

Other noise
Connecting rod small end clearance excessive
Connecting rod big end clearance excessive
Piston ring(s) worn, broken, or stuck
Piston seizure damage
Cylinder head gasket leaking
Exhaust pipe leaking at cylinder head connection
Crankshaft runout excessive
Engine mounts loose
Crankshaft bearings worn
Primary chain, chain guides worn
Starter motor chain worn
Balancer chain, chain tensioner worn
Camshaft chain tensioner defective
Camshaft chain, sprocket, guides worn
Camshaft chain requires adjustment
Balancer mechanism springs weak or broken

Abnormal Drive Train Noise

Clutch noise
Clutch housing/friction plate clearance excessive
Weak or damaged shock absorber spring(s)

Transmission noise
Bearings worn
Transmission gears worn or chipped
Metal chips jammed in gear teeth
Engine oil insufficient or too thin
Kick ratchet gear not properly disengaging from kick gear

Drive chain noise
Drive chain adjusted improperly
Chain worn
Rear and/or engine sprocket(s) worn
Chain lubrication insufficient
Rear wheel misaligned

Abnormal Frame Noise

Front fork shock absorber noise
Oil insufficient or too thin
Spring weak or broken

Rear shock absorber noise
Shock absorber defective

Disc brake noise
Pad B loose
Pad surface glazed
Disc warped
Caliper seal defective
Cylinder damaged

Other noise
Brackets, nuts, bolts, etc. nor properly mounted or tightened

Oil Pressure Indicator Light Goes On

Engine oil pump defective
Engine oil screen clogged
Engine oil level too low
Engine oil viscosity too low
Camshaft bearings worn
Crankshaft bearings worn
Oil pressure indicator light switch defective
Wiring defective
Relief valve stuck open

Exhaust Smokes Excessively

White smoke
Piston oil ring worn
Cylinder worn
Valve oil seal damaged
Valve guide worn
O rings at the cylinder oil passage orifice 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
Carburetor intake ducts loose
Air cleaner poorly sealed or missing

Handling and/or Stability Unsatisfactory

Handlebar hard to turn
Steering stem locknut too tight
Bearing balls damaged
Race(s) dented or worn
Steering stem lubrication inadequate
Steering stem bent
Tire air pressure too low

Handlebar shakes or excessively vibrates
Tire(s) worn
Swing arm bush and sleeve worn
Rim(s) warped, or not balanced
Spokes loose
Wheel bearing(s) worn
Handlebar clamps 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 shock absorber(s) bent
Right/left front fork shock absorber oil level uneven
Right/left rear shock absorbers unbalanced

Shock absorption unsatisfactory
Too hard:
Front fork oil excessive
Front fork oil viscosity too high
Tire air pressure too high
Shock absorber maladjusted
Front fork shock absorber(s) bent

Too soft:
Front fork oil insufficient and/or leaking
Front fork oil viscosity too low
Front fork, rear shock absorber spring(s) weak
Rear shock absorber oil leaking

Brakes Don't Hold

Disc Brake

Air in the brake line
Pad or disc worn
Brake fluid leak
Contaminated pads
Brake fluid deteriorated
Primary or secondary cup defective
Master cylinder scratched inside

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 defective
Ignition switch defective
Armature coil open or short
Field coil open
Wiring faulty

Battery Overcharged

Regulator/rectifier defective
Battery defective

NOTE: This is not an exhaustive list, giving every possible cause for each problem listed. It is meant simply as a rough guide to assist the troubleshooting for some of the more common difficulties. Electircal troubleshooting is not covered here due to its complexity. For electrical problems, refer to the appropriate heading in the Maintenance Section.

Appendix

ADDITIONAL CONSIDERATIONS FOR RACING

This motorcycle has been manufactured for use in a reasonable and prudent manner and as a vehicle only. However, some may wish to subject this motorcycle to abnormal operation, such as would be experienced under racing conditions. KAWASAKI STRONGLY RECOMMENDS THAT ALL RIDERS RIDE SAFELY AND OBEY ALL LAWS AND REGULATIONS CONCERNING THEIR MOTORCYCLE AND ITS OPERATION.

Racing should be done under supervised conditions, and recognized sanctioning bodies should be contacted for further details. For those who desire to participate in competitive racing or related use, the following technical information may prove useful. However, please note the following important points.

- You are entirely responsible for the use of your motorcycle under abnormal conditions such as racing, and Kawasaki shall not be liable for any damages which might arise from such use.
- Kawasaki's Limited Motorcycle Warranty and Limited Emission Control Systems Warranty specifically exclude motorcycles which are used in competitive or related uses. Please read the warranty carefully.
- Motorcycle racing is a very sophisticated sport, subject to many variables. The following information is theoretical only, and Kawasaki shall not be liable for any damages which might arise from alterations utilizing this information.
- When the motorcycle is operated on public roads, it **must** be in its original state in order to ensure safety and compliance with applicable emission regulations.

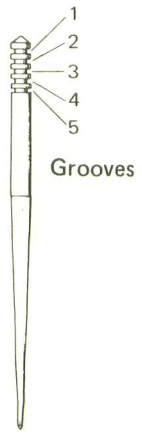
Carburetors

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

M1



NOTE: The last digit of the jet needle number ("3" of 5CL10-3) 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.

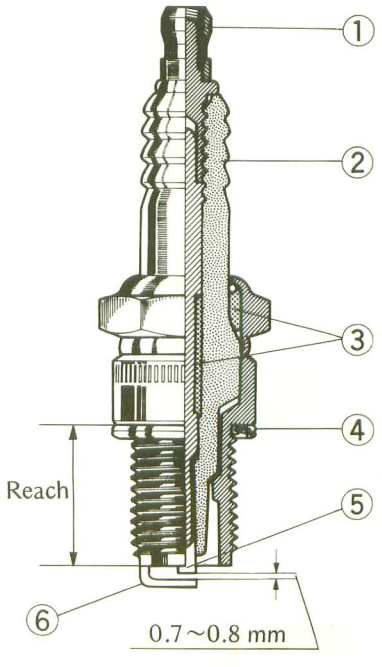
Test have shown the NGK B6ES or ND W20ES-U set to a 0.7 ~ 0.8 mm gap to be the best plug for general use.

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.

Spark Plug

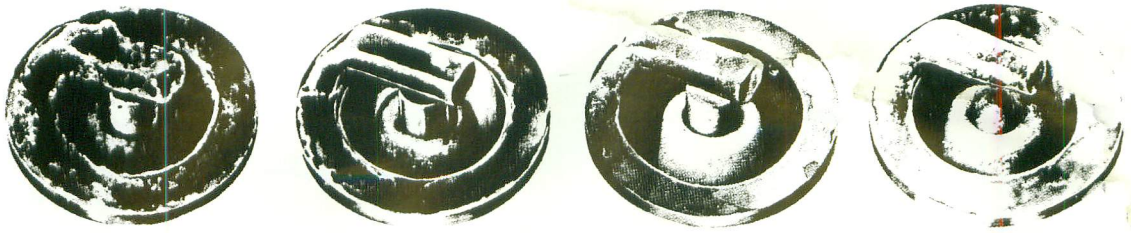
M2



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

Spark Plug Condition

M3



Carbon Fouling | Oil Fouling | Normal Operation | Overheating

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 B7ES).

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 B7ES 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 M1 Spark Plug

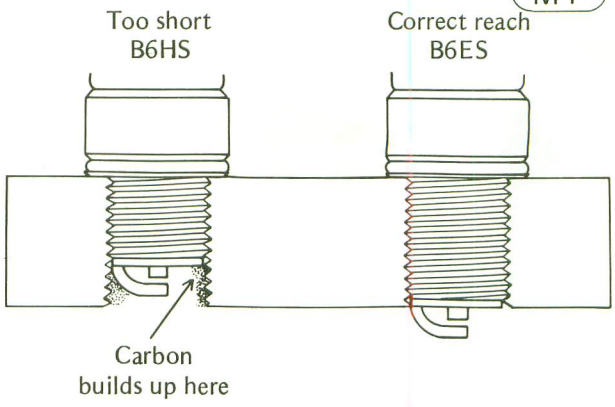
Required Plug Thread	Riding Condition	Heat Range	Type
Diameter: 14 mm Pitch: 1.25 mm Reach: 19.0 mm	Normal	Normal	NGK B6ES ND W20ES-U
	Racing	High (Colder)	NGK B7ES ND W22ES-U

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.

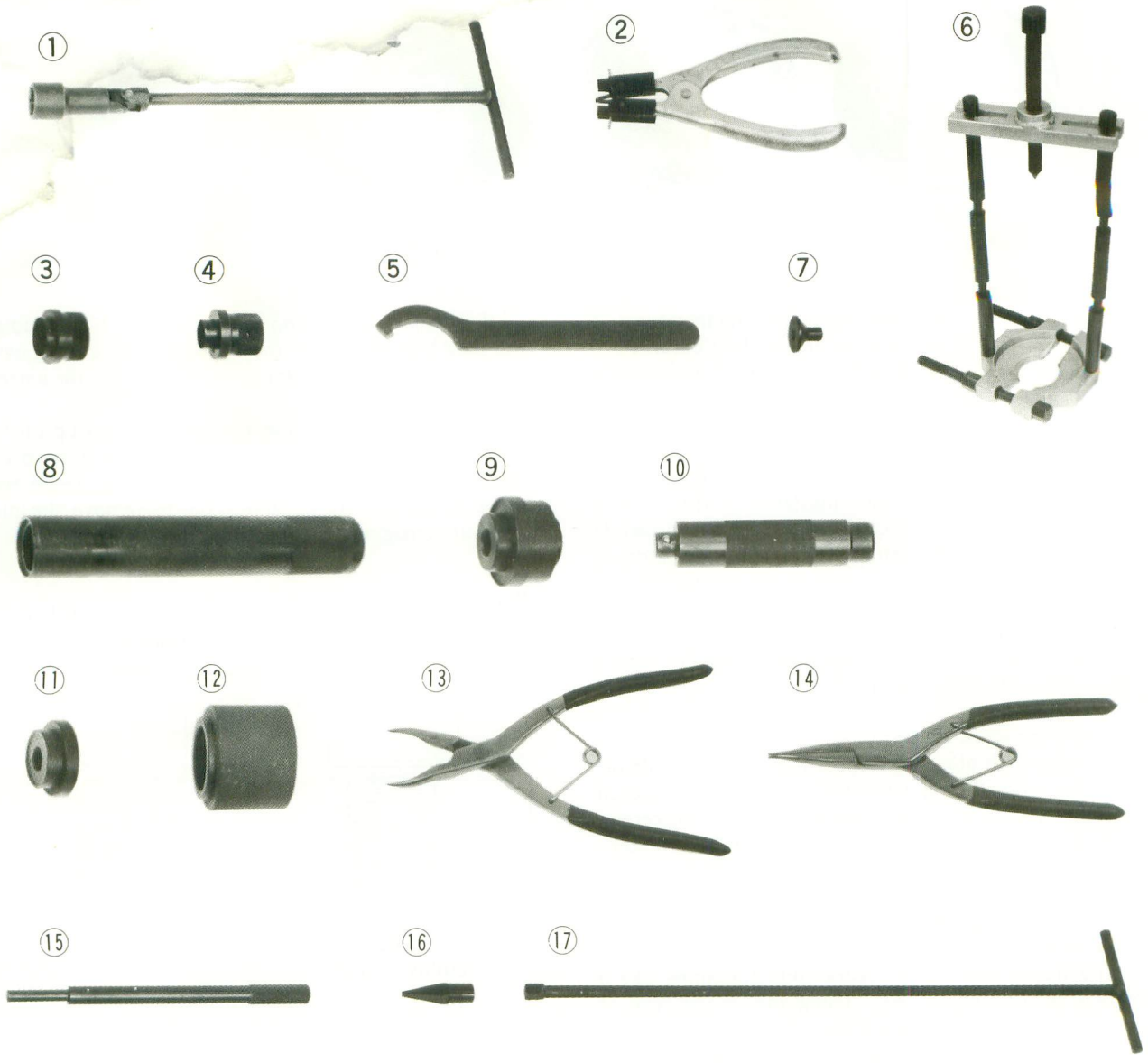
If the reach is too long, carbon will build up on the exposed spark plug threads causing overheating, preignition, and possibly burning a hole in the piston top. In addition, it may be impossible to remove the plug without damaging the cylinder head.

Plug Reach

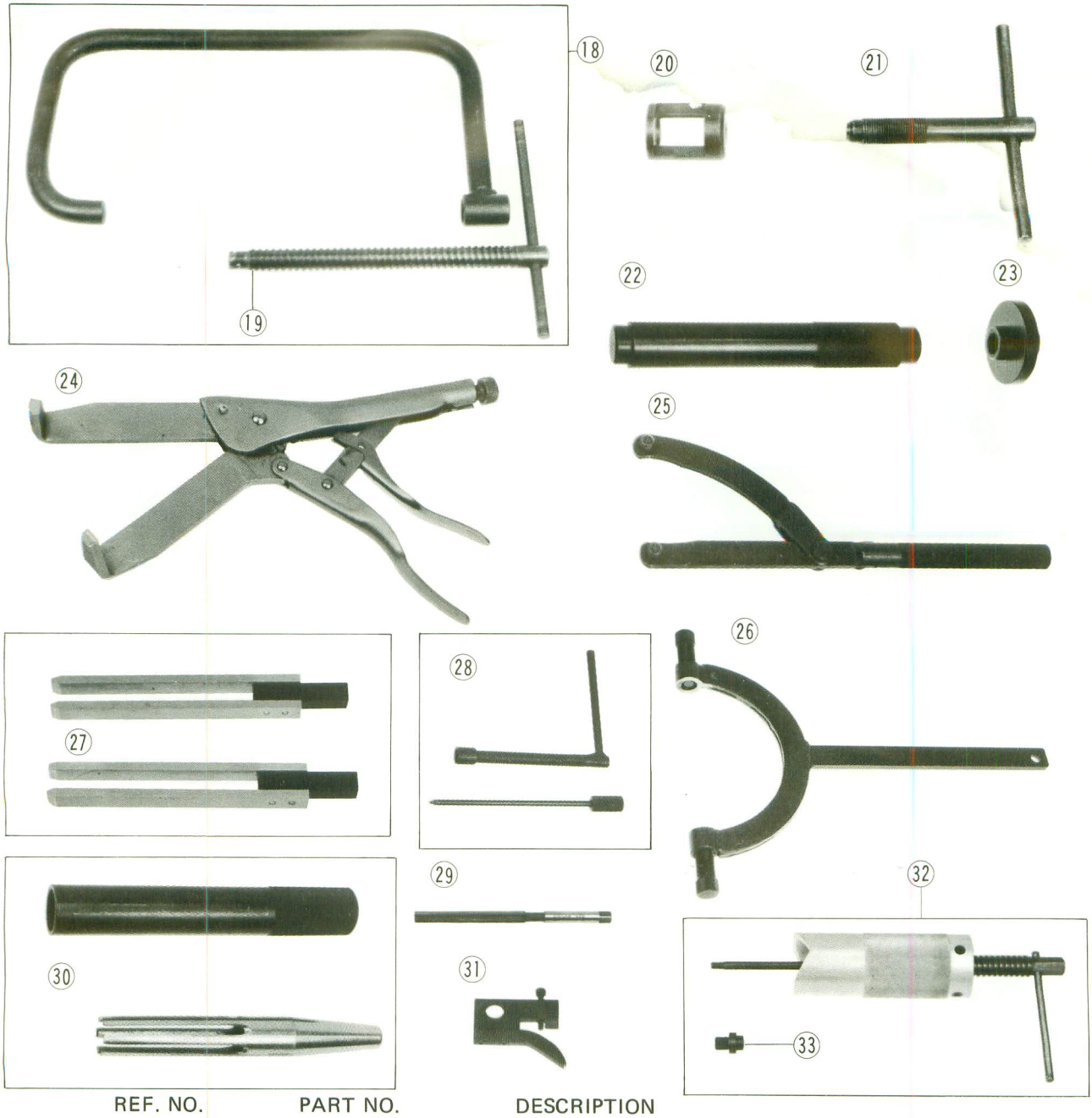
M4



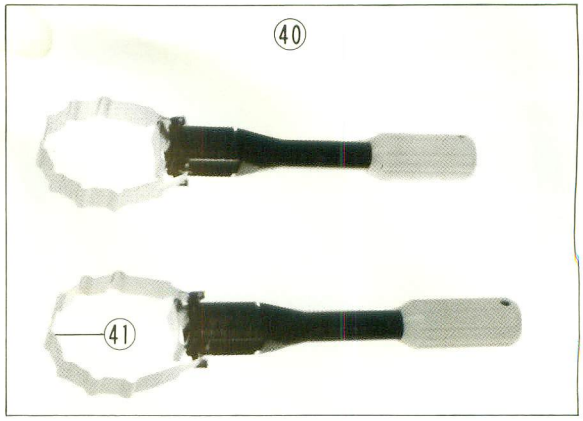
SPECIAL TOOLS

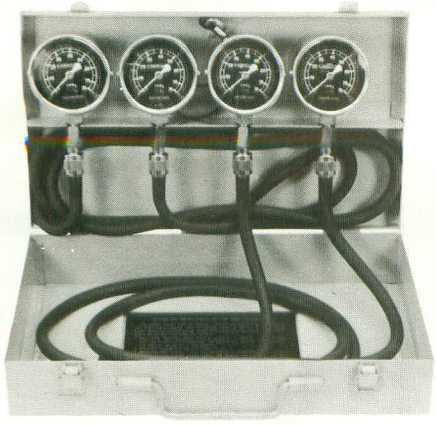


REF. NO.	PART NO.	DESCRIPTION
1	57001-110	SPARK PLUG WRENCH
2	57001-115	PISTON RING PLIERS
3	57001-131	KICK SHAFT OIL SEAL GUIDE
4	57001-264	SHIFT SHAFT OIL SEAL GUIDE
5	57001-134	STEM NUT WRENCH
6	57001-135	BEARING PULLER
7	57001-166	BEARING PULLER ADAPTER
8	57001-137	STEM BEARING DRIVER
9	57001-138	STEM CUP DRIVER
10	57001-139	BEARING DRIVER HOLDER
11	57001-140	BEARING DRIVER
12	57001-141	FRONT FORK OIL SEAL DRIVER
13	57001-143	CIRCLIP PLIERS, INSIDE
14	57001-144	CIRCLIP PLIERS, OUTSIDE
15	57001-169	VALVE GUIDE ARBOR
16	57001-1011	FRONT FORK CYLINDER HOLDER ADAPTER
17	57001-183	FRONT FORK CYLINDER HOLDER HANDLE



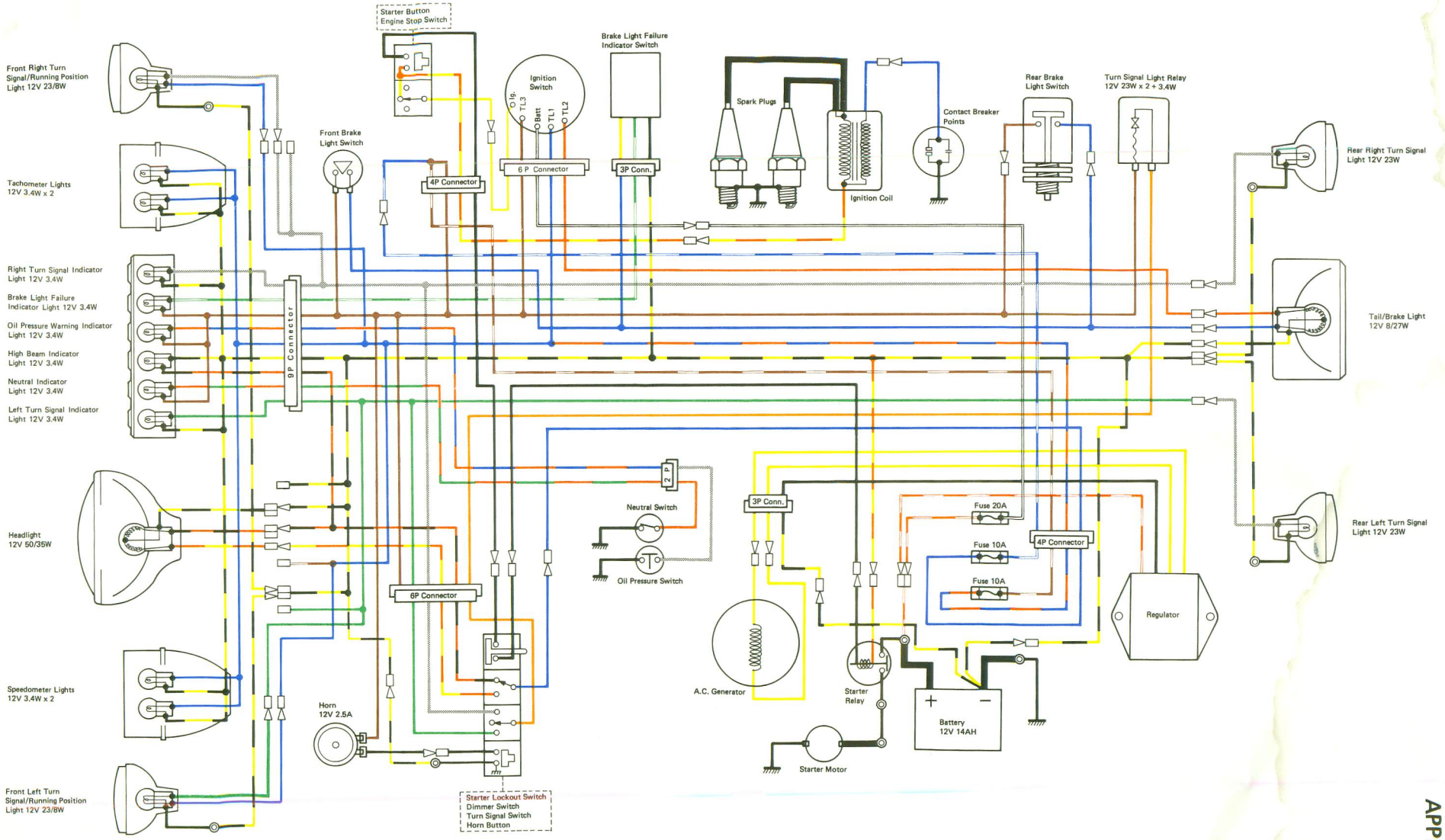
REF. NO.	PART NO.	DESCRIPTION
18	57001-241	VALVE SPRING COMPRESSOR ASSEMBLY
19	57001-244	VALVE SPRING COMPRESSOR CENTER SHAFT
20	57001-246	VALVE SPRING COMPRESSOR ADAPTER
21	57001-254	ROTOR PULLER
22	57001-285	SHIFT DRUM BEARING DRIVER (Used to install the balancer needle bearing)
23	57001-296	BEARING DRIVER
24	57001-305	CLUTCH HOLDER
25	57001-306	ENGINE SPROCKET HOLDER
26	57001-308	FLYWHEEL HOLDER
27	57001-341	PISTON BASE
28	57001-351	BALANCE ADJUSTER
29	57001-365	VALVE GUIDE REAMER
30	57001-380	TRANSMISSION CIRCLIP DRIVER (Used to install the transmission ball bearing)
31	57001-501	VALVE LIFTER HOLDER
32	57001-910	PISTON PIN PULLER ASSEMBLY
33	57001-914	PISTON PIN PULLER ADAPTER "C"





REF. NO.	PART NO.	DESCRIPTION
34	57001-123	COMPRESSION GAUGE ASSEMBLY
35	57001-127	VACUUM GAUGE SET
36	57001-226	VACUUM GAUGE
37	57001-164	OIL PRESSURE GAUGE ASSEMBLY
38	57001-400	OIL PRESSURE GAUGE ADAPTER
39	57001-208	FUEL LEVEL GAUGE
40	57001-921	PISTON RING COMPRESSOR ASSEMBLY
41	57001-926	PISTON RING COMPRESSOR ADAPTER
42	57001-980	ELECTRO TESTER
43	57001-983	HAND TESTER

KZ750-B4 Wiring Diagram



LEFT HANDLEBAR SWITCH CONNECTIONS

Starter Lockout Switch			Hron Button			Dimmer Switch				Turn Signal Switch			
Color	Black	Black	Color	Black	//////	Color	R/Bk	Blue	R/Y	Color	Green	Orange	Gray
			OFF			HI	●			Left	●		
ON	●		ON	●		LO		●					
										Right		●	

Ignition Switch Connections

	Tail 3	Battery	Ignition	Tail 1	Tail 2
Color	Brown	White	Yellow	Blue	Red
OFF					
ON		●	●	●	
PARK		●			

(1116A)

RIGHT HANDLEBAR SWITCH CONNECTIONS

Starter Button			Engine Stop Switch		
Color	Black	Y/R	Color	Y/R	Brown
			OFF		
OFF			RUN	●	
ON	●		OFF		

Supplement

This Supplement is designed to be used in conjunction with the front part of this manual (up to Pg. 217). The maintenance and repair procedures described in this Supplement are only those that are unique to the variation models (KZ750G and KZ750M) since the first pubrication of this Service Manual. Complete and proper servicing of the variation models therefore requires mechanics to read this Supplement and the text in front of the Supplement. Unless otherwise noted, procedures for the variation models are the same as for the standard KZ750-B4.

This supplement is divided into a few sections. Each section explains procedures per each variation models that are unique to each one. Complete and proper servicing of the variation models therefore requires mechanics to read (1) the section corresponding to the variation model they work at, (2) the previous section(s), and (3) the text in front of this supplement.

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Supplement for 1980 KZ750-G1

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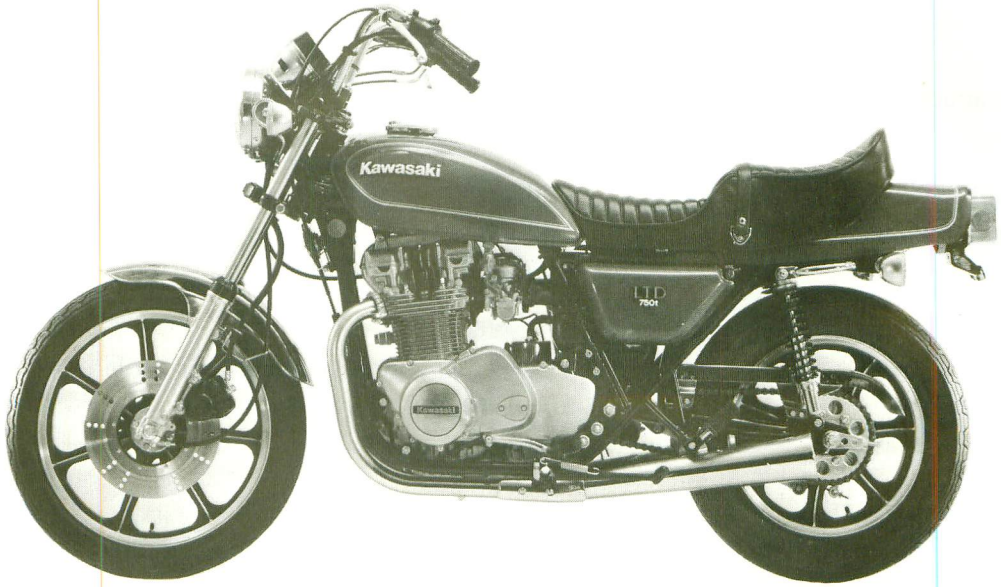
Model Identification

KZ750-G1 Left Side View



KZ750-G1 Right Side View

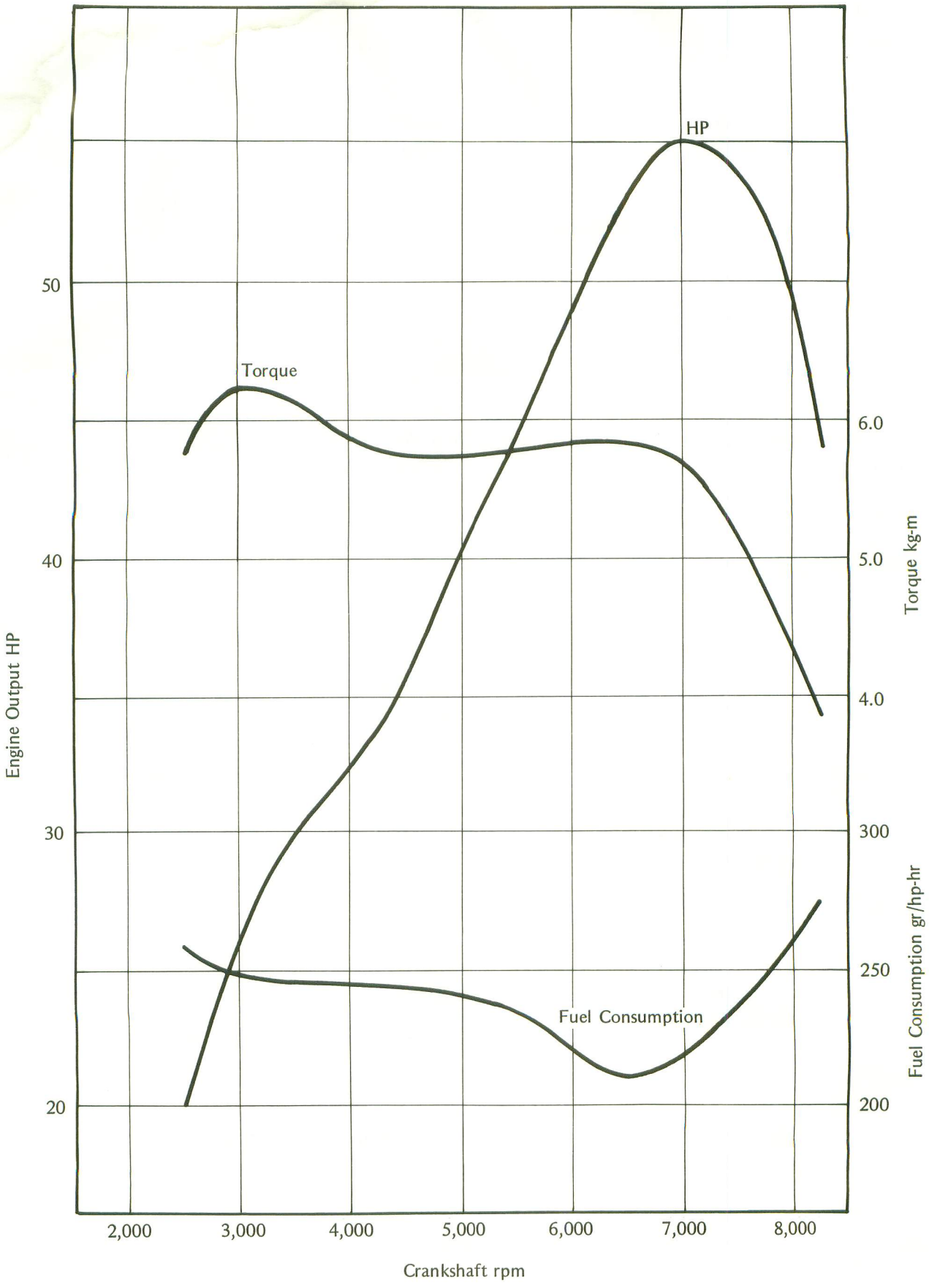
SPECIFICATIONS

		KZ750-G1
Dimensions		
Overall length		2,170 mm
Overall width		835 mm
Overall height		1,235 mm
Wheelbase		1,460 mm
Road clearance		160 mm
Dry weight		206 kg
Fuel tank capacity		14.5 ℓ
Performance		
Climbing ability		26°
Braking distance		12 m @50 kph
Minimum turning radius		2.5 m
Engine		
Type		DOHC 2 cylinder, 4 stroke, air-cooled
Bore and stroke		78 x 78 mm
Displacement		745 cc
Compression ratio		8.5
Maximum horsepower		55 HP @7,000 rpm
Maximum torque		6.2 kg-m @3,000 rpm
Valve timing		
Inlet	Open	30° BTDC
	Close	50° ABDC
	Duration	260°
Exhaust	Open	70° BBDC
	Close	30° ATDC
	Duration	280°
Carburetors		Mikuni BS38 x 2
Lubrication system		Forced lubrication (wet sump)
Engine oil		SE class SAE 10W40, 10W50, 20W40, or 20W50
Engine oil capacity		4.0 ℓ
Starting system		Electric and kick
Ignition system		Battery and coil
Ignition timing		From 5° BTDC @1,000 rpm to 30° BTDC @3,750 rpm
Spark plugs		NGK B6ES or ND W20ES-U
Transmission		
Type		5-speed, constant mesh, return shift
Clutch		Wet, multi disc
Gear ratio:	1st	2.33 (35/15)
	2nd	1.63 (31/19)
	3rd	1.27 (28/22)
	4th	1.04 (26/25)
	5th	0.89 (24/27)

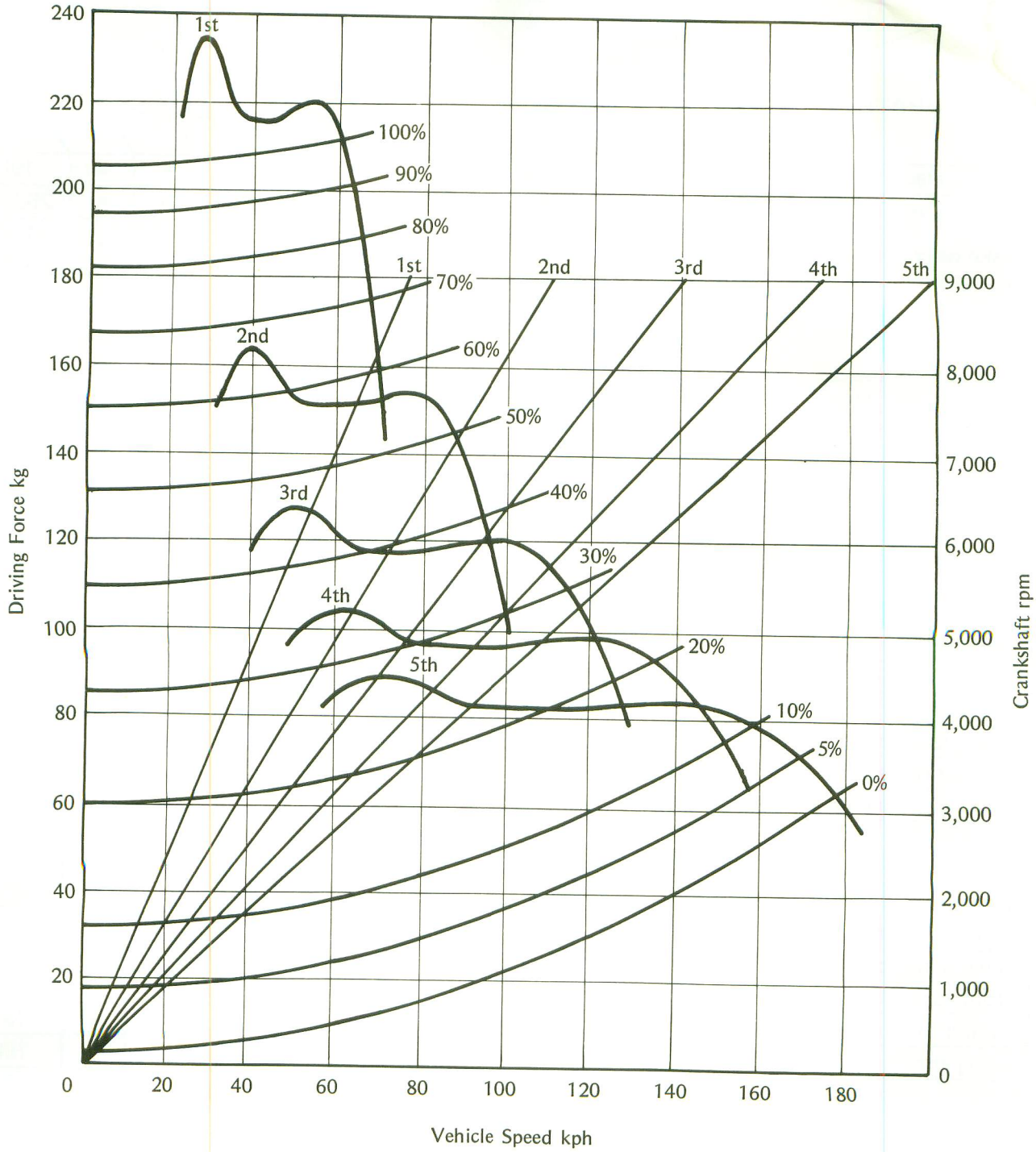
		KZ750-G1
Primary reduction ratio		2.48 (57/23)
Final reduction ratio		2.38 (38/16)
Overall drive ratio		5.23 (@Top gear)
Electrical Equipment		
Generator (Dynamo)		Nippon Denso 037000-1330
Regulator/Rectifier		Shindengen SH222-12
Ignition coil		Nippon Denso AJPG36
Battery		Nippon Denchi GM14Z-3A (12V 14AH)
Starter		Mitsuba SM-224
Headlight type		Sealed Beam
Headlight		12V 50/35W
Tail/Brake light		12V 8/27W (3/32 CP)
Turn signal/Running position lights		12V 23/8W
Turn signal lights		12V 23W
Meter lights		12V 3.4W
Indicator lights		12V 3.4W
Horn		12V 2.5A
Frame		
Type		Tubular, double cradle
Steering angle		39° to either side
Castor		27.5°
Trail		110 mm
Tire size	Front	3.25H-19 4PR
	Rear	130/90-16 67H
Suspension	Front	Telescopic fork
	Rear	Swing arm
Suspension stroke	Front	140 mm
	Rear	95 mm
Front fork oil capacity (each fork)		180 ~ 188 cc
Front fork oil type		SAE 10W20
Brakes		
Type	Front	Disc brake
	Rear	Drum brake
Effective disc diameter		250 mm
Brake drum inside diameter and effective width		180 x 40 mm

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

KZ750-G1 ENGINE PERFORMANCE CURVES



KZ750-G1 RUNNING PERFORMANCE CURVES



PERIODIC MAINTENANCE CHART

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

FREQUENCY / OPERATION	Whichever comes first ➡ Every ⬇	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	•	•	•	•	•	•	•	190
Brake adjustment – check †		•	•	•	•	•	•	•	25,228
Brake wear – check †			•	•	•	•	•	•	181,182, 239
Brake fluid level – check †	month	•	•	•	•	•	•	•	181
Brake fluid – change	year			•		•		•	179
Clutch – adjust		•	•	•	•	•	•	•	20
Carburetors – adjust		•	•	•	•	•	•	•	18,227
Throttle cables – adjust		•	•	•	•	•	•	•	16
Steering play – check †		•	•	•	•	•	•	•	26
Drive chain wear – check †			•	•	•	•	•	•	175
Front fork – inspect/clean		•	•	•	•	•	•	•	185
Rear shock absorbers – inspect		•	•	•	•	•	•	•	187
Nuts, Bolts, Fasteners – check and torque		•		•		•		•	33~36, 231
Spark plugs – clean and gap †		•	•	•	•	•	•	•	12
Camshaft chain – adjust		•	•	•	•	•	•	•	14
Points, timing – check †		•	•	•	•	•	•	•	12
Valve clearance – check †		•	•	•	•	•	•	•	15
Air cleaner element – clean			•		•		•		130
Air cleaner element – replace	5 cleanings		•		•		•		130
Fuel system – clean		•	•	•	•	•	•	•	21,170
Tire tread wear – check †			•	•	•	•	•	•	170
Engine oil – change	year	•	•	•	•	•	•	•	21
Oil filter – replace		•		•		•		•	21
General lubrication – perform			•	•	•	•	•	•	28,230
Front fork oil – change				•		•		•	185,241
Timing advancer – lubricate				•		•		•	197
Swing arm – lubricate				•		•		•	188
Wheel bearings – grease	2 years					•			174
Speedometer gear housing – grease	2 years					•			174
Steering stem bearings – grease	2 years					•			183
Drive chain – lubricate	Every 300 km								241
Drive chain – adjust	Every 800 km								227

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

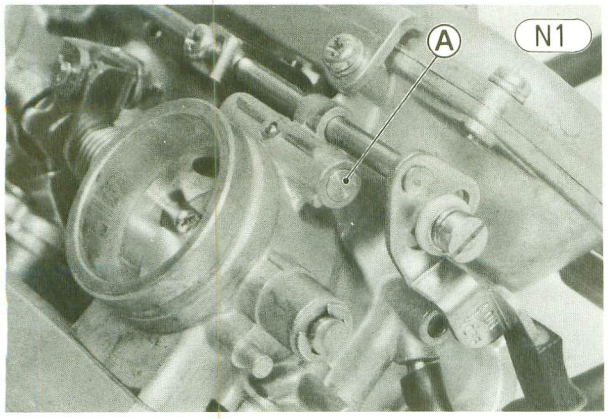
Adjustment

CARBURETORS

Idling Adjustment:

Refer to Pgs. 18 ~ 19, noting the following:

1. For US model, the pilot screw limiter has been eliminated.
2. Except for US model, turn in the pilot screw of each carburetor until it seats fully but not tightly, and then back it out 1½ turns first.



A. Pilot Screw

REAR SHOCK ABSORBERS

Refer to Pg. 24, noting the following.

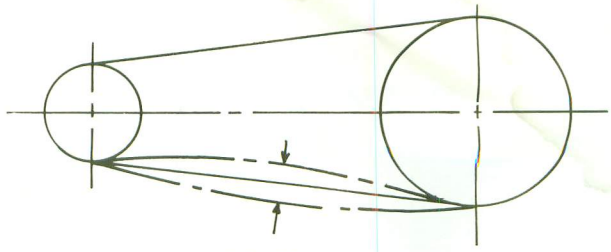
1. The rear shock absorbers can be adjusted to one of five positions to suit riding conditions.

DRIVE CHAIN

Chain and sprocket wear causes the chain to stretch, which results in power loss, accelerated chain and sprocket wear, and increased noise. A chain that has been adjusted too loose may be thrown off the sprockets. A chain that has been adjusted too tight will wear excessively and possibly break.

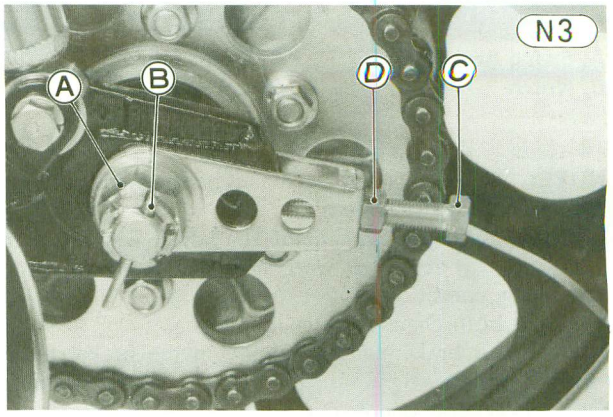
- To determine whether or not the chain requires adjustment, first stand the motorcycle with its side stand. Rotate the rear wheel to find the position where the chain is tightest, and measure the vertical movement midway between the sprockets. If it is less than 25 mm or more than 35 mm, adjust the chain so that the vertical movement will be about 25 ~ 30 mm.

Chain Slack N2



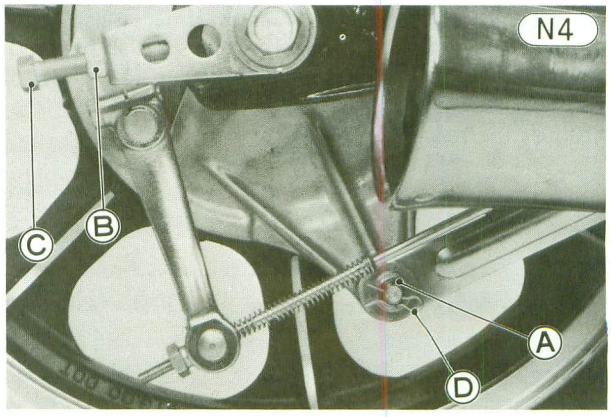
CAUTION **A chain worn past the service limit (Pg. 175) must be replaced. Such wear cannot be adequately compensated for by adjustment.**

- Remove the cotter pin and loosen the rear axle nut.



A. Axle Nut
B. Cotter Pin
C. Chain Adjuster Bolt
D. Locknut

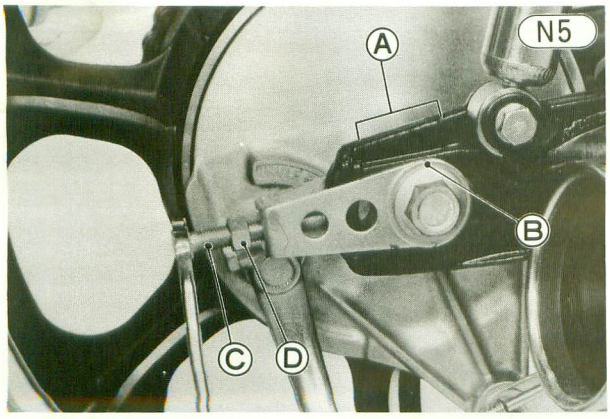
- Remove the safety clip, and loosen the torque link nut at the rear end.



A. Torque Link Nut
B. Locknut
C. Chain Adjuster Bolt
D. Safety Clip

- Loosen the left and right chain adjuster locknuts.
- If the chain is too tight, back out the left and right chain adjuster bolts, and kick the wheel forward until the chain is too loose.

•Turn in the left and right chain adjuster bolts evenly until the drive chain has the correct amount of slack. To keep the chain and wheel 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. Swing Arm Marks
B. Notch
C. Chain Adjuster Bolt
D. Locknut

NOTE: 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.
•Center the brake panel assembly in the brake drum. This is done by tightening the axle nut lightly, spinning the wheel, and depressing the brake pedal forcefully. The partially tightened axle allows the brake panel assembly to center itself within the brake drum.

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

•Tighten the axle nut to 12.0 kg-m (87 ft-lbs) of torque.
•Rotate the wheel, measure the vertical movement again at the tightest position, and readjust if necessary.
•Insert a new cotter pin into the axle shaft and bend it.
•Tighten the torque link nut to 3.1 kg-m (22 ft-lbs) of torque, and insert a safety clip.
•Adjust the rear brake (Pg. 228).

BRAKES

Rear Brake

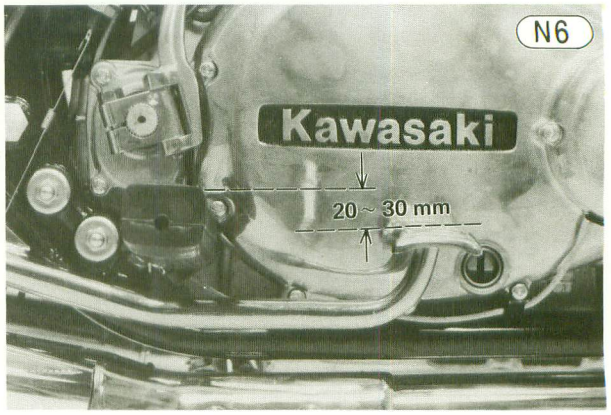
Brake lining and drum wear causes the rear brake to go out of adjustment, increasing pedal play and decreasing braking effectiveness. Rear brake adjustment to compensate for this actually consists of three successive adjustments: brake pedal position, cam lever angle, and brake pedal travel.

If brake drag is detected during brake adjustment, disassemble the brake (Pg. 234), and inspect for wear or damage (Pg. 239). 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. This procedure can prevent a soft or "spongy feeling" brake.

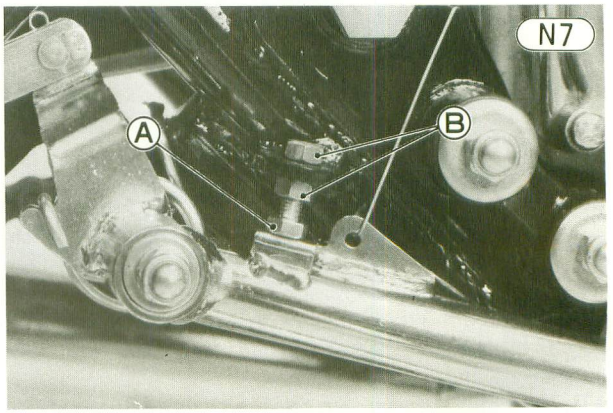
On the outside of the rear brake panel there is a brake lining wear indicator. Whenever the indicator has gone past USABLE RANGE, the brake shoes must be immediately replaced and the other brake parts examined. Adjustment alone cannot compensate for the wear of a brake worn past USABLE RANGE.

Brake Pedal Position

•When the brake pedal is in its rest position, it should be 20 ~ 30 mm lower than the top of the footpeg.



•If the brake pedal position is too high or too low, loosen the locknuts and then turn the brake pedal adjusting bolt to obtain the correct pedal position. Tighten the locknuts.

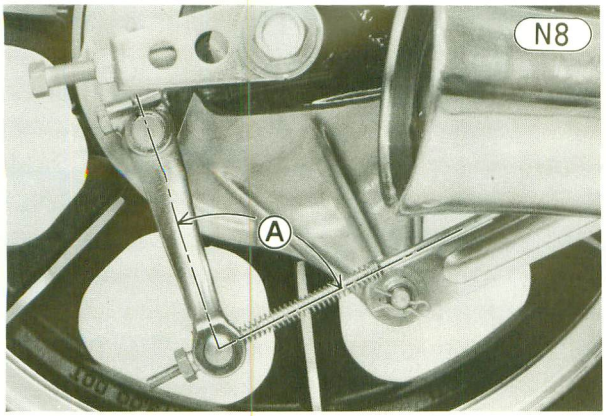


A. Adjusting Bolt
B. Locknuts

•Check the cam lever angle, brake pedal play, and brake light switch operation (Pgs. 229 and 26), and adjust them if necessary.

Cam Lever Angle

●When the brake is fully applied, the brake cam lever should come to an 80~90° angle with the brake rod.



A. 80~90°

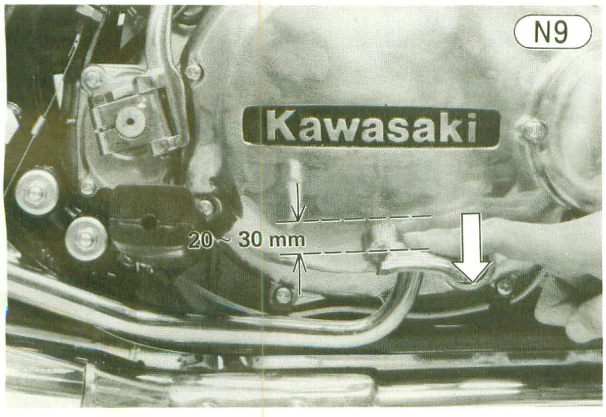
●If it does not, remove the cam lever, and then remount it at a new position on the shaft for the proper angle.

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. See Pg. 236 for detailed information on the position of the wear indicator when the cam lever is not on the shaft. 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.**

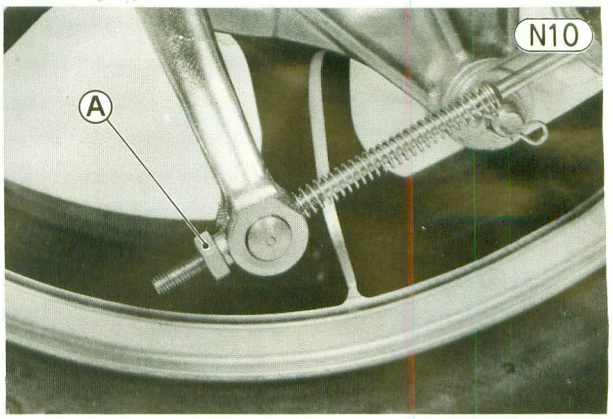
●Rotate the rear wheel to check for brake drag.
●Operate the pedal a few times to see that it returns to its rest position immediately upon release.
●Adjust the brake pedal travel.

Brake Pedal Travel

●Check to see that the brake pedal has 20~30 mm of travel from the rest position to the fully applied position when the brake pedal is pushed down lightly by hand.



●If it does not, turn the adjusting nut on the end of the brake rod so that the brake pedal has the proper travel.



A. Adjusting Nut

●Rotate the rear 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 the rear brake light switch operation (Pg. 26).

STEERING

Refer to Pgs. 26~27, noting the following:

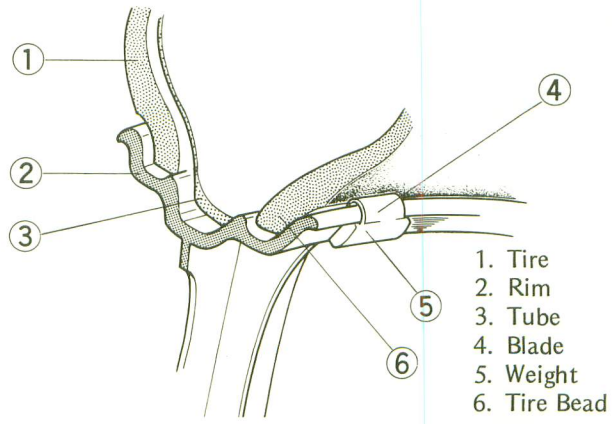
1. Tighten the steering stem head clamp bolt to 1.4 kg-m (10.0 ft-lbs) of torque.

WHEEL BALANCE

Refer to Pg. 27, noting the following:

1. See Pgs. 97 and 232 for the front wheel removal, and Pg. 234 for the rear wheel removal.
2. To install the balance weights on the rim of cast wheels:
   ●First reduce the tire pressure, pry the tire bead from the rim, and insert the blade part of the balance weight between the rim and the tire bead until the weight is hooked over the overhung portion of the rim.

Balance Weight Installation N11



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

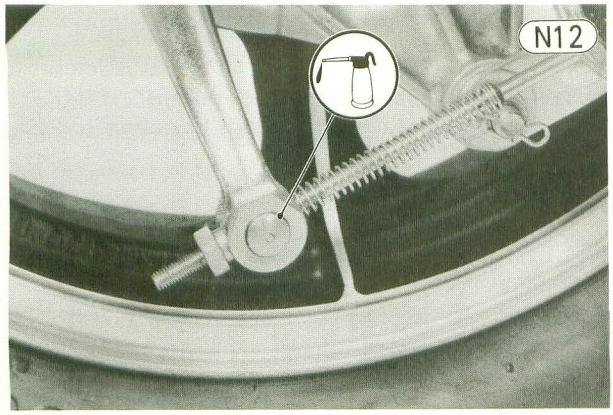
●Inflate the tire to standard pressure (Pg. 238).

3. Balance weights are available from Kawasaki Dealers in 10, 20, and 30 gram sizes. An imbalance of less than 10 grams will not usually affect running stability.

LUBRICATION

Lubricate the following portion besides the portions written on Pgs. 31 ~ 33.

Brake Rod Joint



Disassembly–Introduction

TORQUE AND LOCKING AGENT

The table below shows the tightening torque for the parts which has been changed from the previous model. Tighten the other parts to the same torque listed on Pgs. 33 ~ 36.

Engine Part Name	Locking Agent (●), Liquid Gasket (★) Required	Quantity	Metric (kg-m)	English (ft-lbs)	See Pg.
Clutch hub nut ϕ12 P1.25	–	1	11 ~ 13	80 ~ 94	232

Frame Part Name	Locking Agent (●), Liquid Gasket (★) Required	Quantity	Metric (kg-m)	English (ft-lbs)	See Pg.
Disc mounting bolts ϕ10 P1.25	–	4	2.0 ~ 2.5	14.5 ~ 18.0	232
Front axle clamp nuts ϕ8 P1.25	–	4	1.1 ~ 1.6	8.0 ~ 11.5	232
Front fork clamp bolts					
* upper ϕ8 P1.25	–	2	1.1 ~ 1.6	8.0 ~ 11.5	237
* lower ϕ12 P1.25	–	2	3.1 ~ 4.5	22 ~ 33	237
Steering stem head rear clamp bolt ϕ8 P1.25	–	1	1.1 ~ 1.6	8.0 ~ 11.5	229,237

Disassembly–Engine

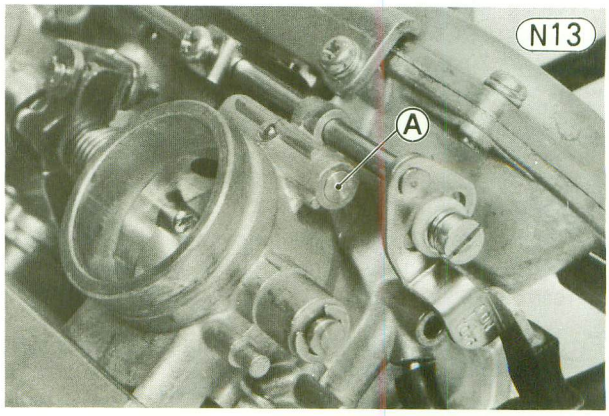
CARBURETORS

Carburetor Body Disassembly (per carburetor):

Refer to Pg. 42, noting the following:

1. For US model, the pilot screw limiter has been eliminated and the pilot screw plug has newly added on the pilot screw (Fig. N13). To remove the pilot screw, punch and pry off the plug with an awl or other suitable tools, turn in the pilot screw and count the number of turns until it seats fully but not tightly, and then remove the pilot screw. This is to set a pilot screw on its original position when assembling.

2. Except for US model, neither the pilot screw limiter nor the pilot screw plug is installed.



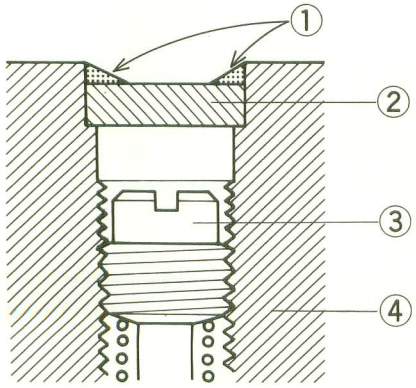
A. Pilot Screw Plug

Assembly Notes:

Refer to Pgs. 42~43, noting the following:

1. Pilot screw installation of US model:
   - Turn in the pilot screw fully but not tightly, and then back it out the same number of turns counted during disassembly.
   - Install a new plug in the pilot screw hole, and apply a small amount of a bonding agent to the circumference of the plug to fix the plug.

Plug Installation (N14)



1. Apply a bonding agent.
2. Pilot Screw Plug
3. Pilot Screw
4. Carburetor Body

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

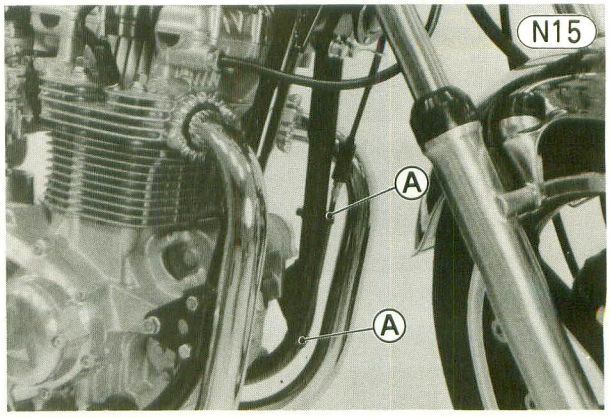
MUFFLERS

Removal:

- Remove the exhaust pipe holder nuts (4), and slide the both holders (2) off their cylinder head studs.
- Loosen the clamps that secure the mufflers to the muffler connecting pipe.
- Remove the rear footpegs, take out the mufflers, and separate them.

Installation Notes:

1. Check that the muffler gaskets are put in the exhaust ports.
2. Backing the exhaust pipe holder in place after fitting the end of the muffler into the exhaust port is impossible because of the frame down tube interference against the holder.
3. Position the clutch cable guide as shown.



A. Cable Guide

CYLINDER HEAD

Refer to Pgs. 48~49, noting the following:

1. Each cylinder head nut has a flat washer.

CLUTCH HUB, CLUTCH PLATES

Refer to Pgs. 64~66, noting the following:

1. Tighten the clutch hub nut to 12.0 kg-m (87 ft-lbs) of torque.

Disassembly–Chassis

FRONT WHEEL

Removal:

Refer to Pg. 97, noting the following:

1. As the center stand has been eliminated, use a chain hoist or other suitable means to lift the front of the motorcycle.

Installation:

Refer to Pg. 97, noting the following:

1. Tighten first the front axle clamp nut and then the rear nut to 1.4 kg-m (10 ft-lbs) of torque.

Front Hub Disassembly (including disc removal):

Refer to Pg. 99, noting the following.

1. Double washers (2) (⑫ on Fig. G6) have been eliminated.

Front Hub Assembly Notes:

Refer to Pg. 99, noting the following:

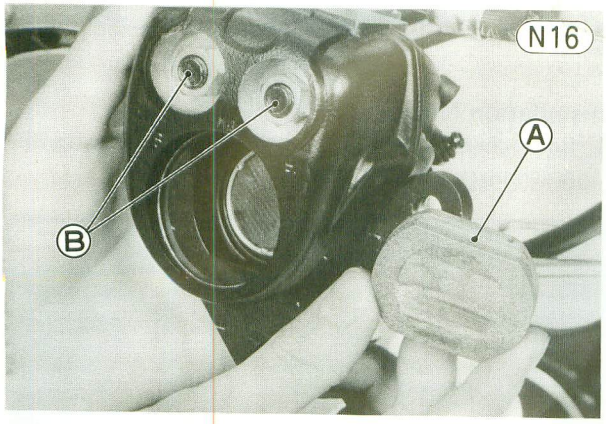
1. Tighten the disc mounting bolts (4) (⑪ on Fig. G6) to 2.3 kg-m (16.5 ft-lbs) of torque.

FRONT DISC BRAKE

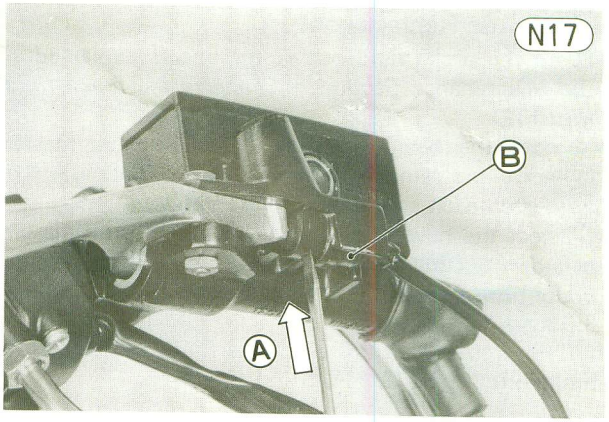
Pad Installation:

Refer to Pgs. 100~101, noting the following:

1. Install the pad A in the caliper holder so that the pad lining is toward the disc and stepped portion of the lining is toward the caliper holder shafts.



A. Stepped Portion B. Caliper Holder Shafts



A. Push the tab. B. Front Brake Light Switch

Master Cylinder Removal:

Refer to Pgs. 102 ~ 103, noting the following:

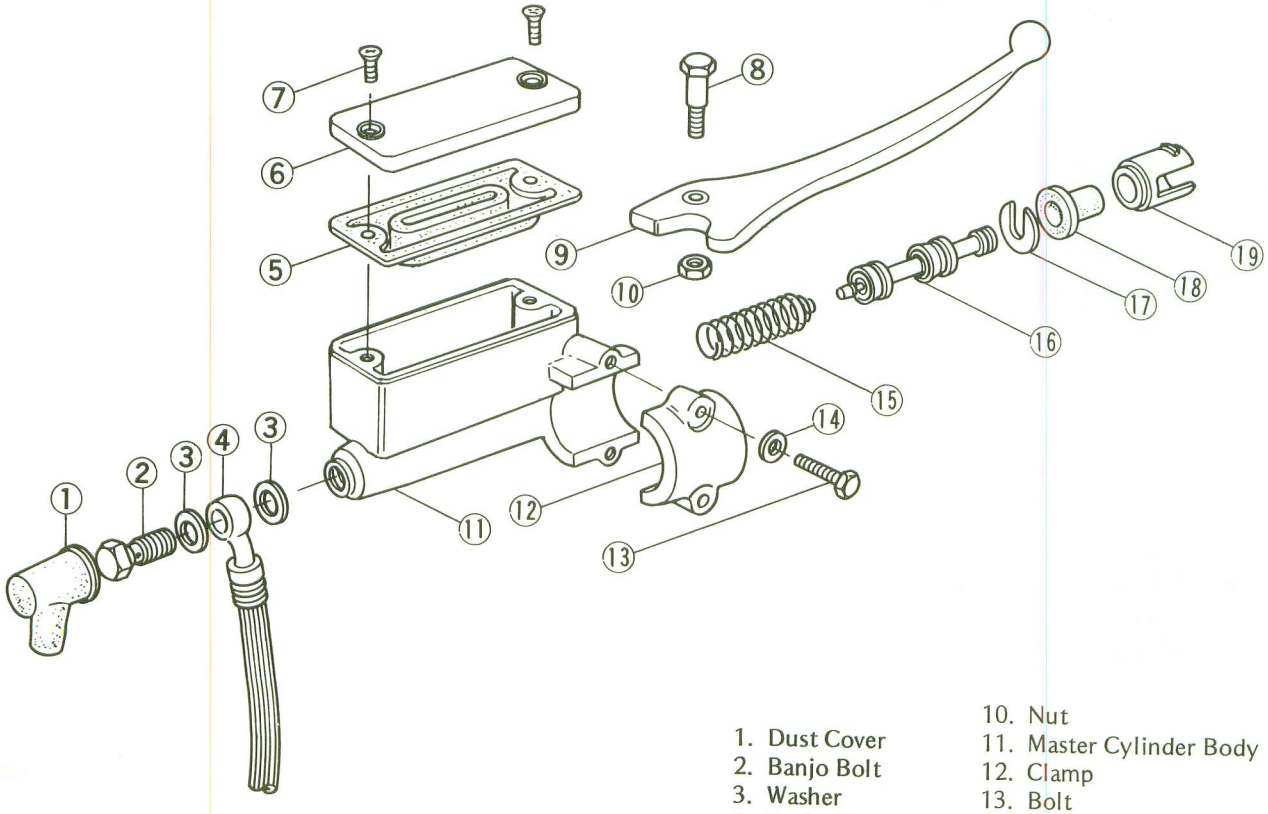
1. At first, using a thin-bladed screw driver or some other suitable tools, press in the tab of front brake switch which catches in the hole on the master cylinder, and then remove the switch.

Master Cylinder Disassembly:

Refer to Pg. 103, noting the following:

1. Master cylinder parts have been changed.

Front Master Cylinder



1. Dust Cover
2. Banjo Bolt
3. Washer
4. Brake Hose
5. Diaphragm
6. Cap
7. Screw
8. Pivot Bolt
9. Brake Lever
10. Nut
11. Master Cylinder Body
12. Clamp
13. Bolt
14. Washer
15. Spring
16. Piston
17. Piston Stop
18. Dust Seal
19. Liner

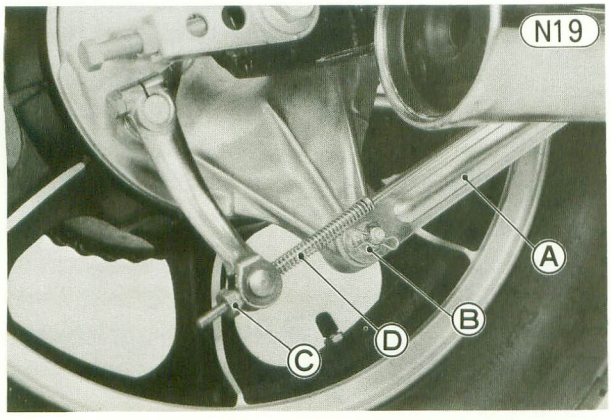
Brake Hose Replacement

- Pump the brake fluid out of the line as explained in the Maintenance Section – *Changing the brake fluid* (Pg. 179).
- Remove the banjo bolts at the caliper and master cylinder, and remove the brake hose. There is a flat washer on each side of the hose fitting.
- Connect the new brake hose to the caliper and master cylinder, putting a new flat washer on each side of the brake hose fittings. Tightening torque of banjo bolts is 3.0 kg-m (22 ft-lbs) of torque.
- Fill the reservoir with fresh brake fluid, and bleed the brake line (Pgs. 179 ~ 181).

REAR WHEEL

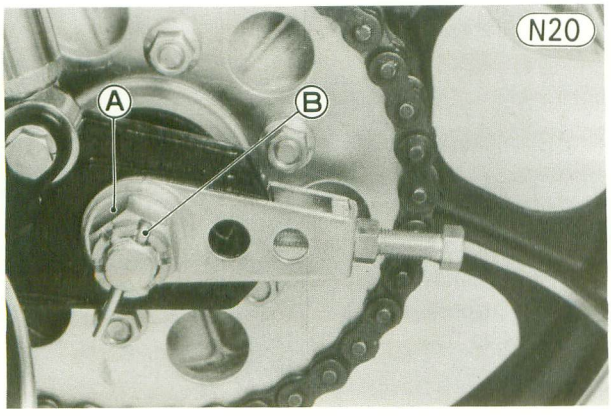
Removal:

- Lift the rear wheel with a chain hoist or other suitable means.
- Remove the chain guard mounting bolts (3) with washers (3), and take off the chain guard.
- Pull off the safety clip and remove the rear nut of torque link.



A. Torque Link **C. Rear Brake Adjusting Nut**
B. Rear Nut **D. Rear Brake Spring**

- Remove the rear brake adjusting nut.
- Straighten the cotter pin, pull off the pin, remove the axle nut, and then pull off the rear axle to right side.

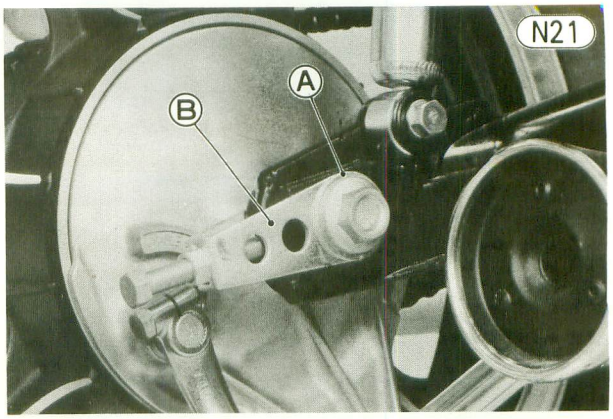


A. Axle Nut **B. Cotter Pin**

- Take off the drive chain and remove the rear wheel.

Installation Notes:

1. Both chain adjusters should be installed with the notch mark sides facing out.



A. Notch Mark **B. Chain Adjuster**

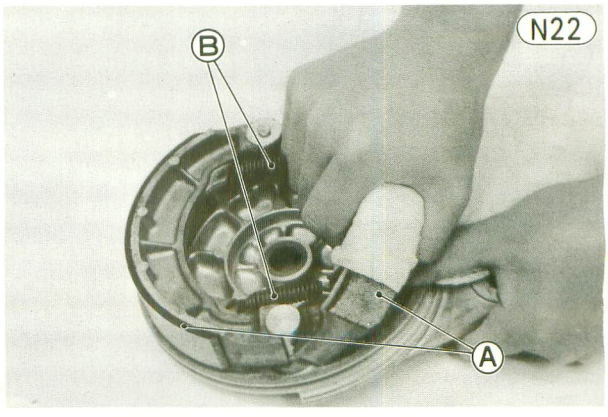
2. Adjust the drive chain (Pg. 227), rear brake (Pg. 228), and rear brake light switch (Pg. 26).
3. Tighten the torque link nut to 3.1 kg-m (22 ft-lbs) of torque, and the rear axle nut to 12.0 kg-m (87 ft-lbs) of torque.

Rear Brake Disassembly:

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.**

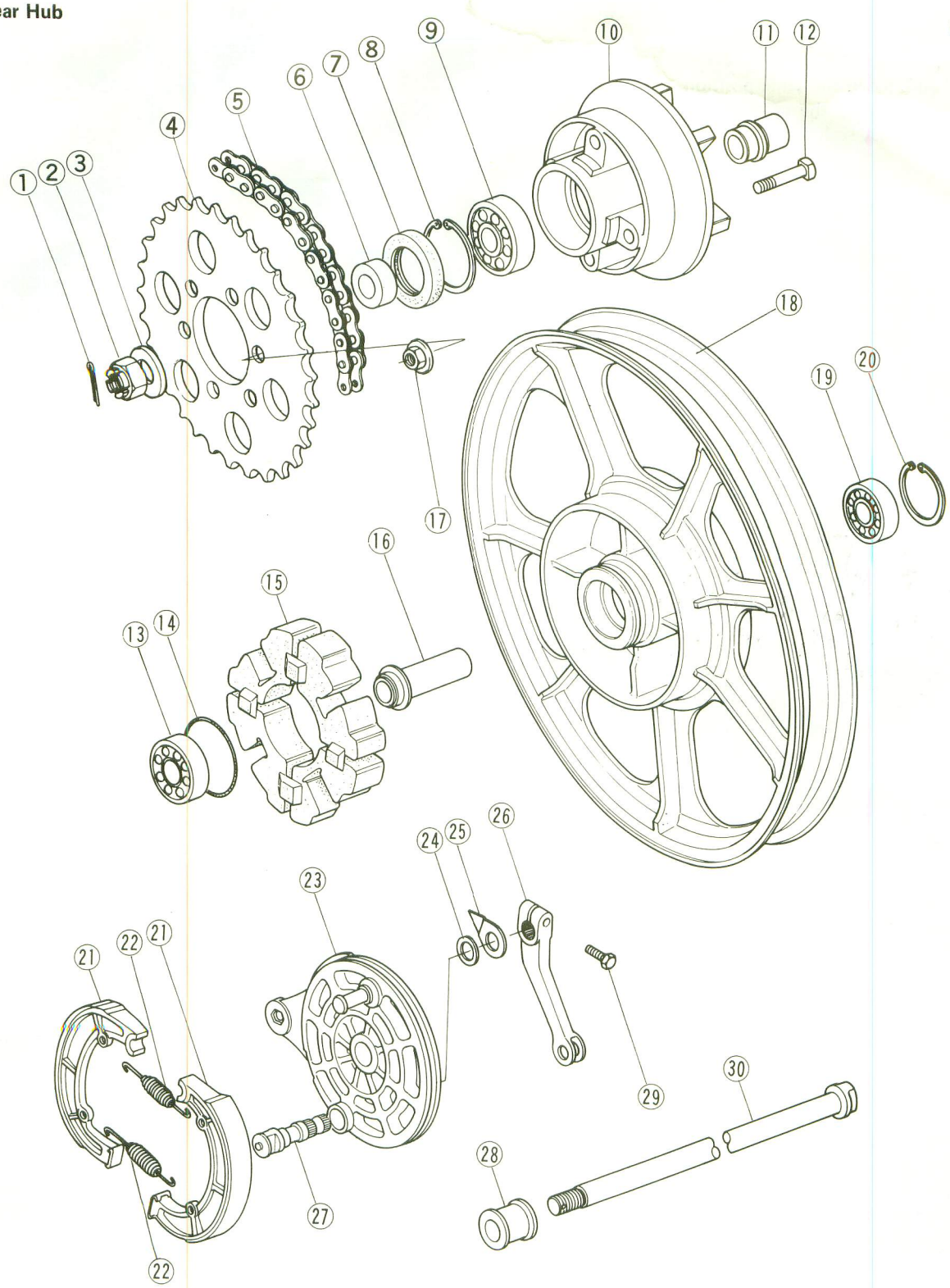
- Remove the brake panel from the wheel.
- Using a clean cloth around the linings to prevent grease or oil from getting on them, remove the brake shoes (21), by pulling on the center of the lining.



A. Brake Shoes **B. Springs**

Rear Hub

N23

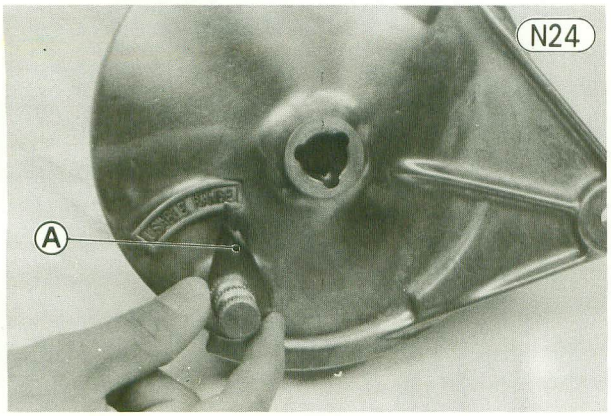


1. Cotter Pin
2. Nut
3. Flat Washer
4. Rear Sprocket
5. Drive Chain
6. Collar
7. Grease Seal
8. Circlip
9. Ball Bearing
10. Coupling
11. Sleeve
12. Sprocket Mounting Bolt
13. Ball Bearing
14. O Ring
15. Rubber Damper
16. Distance Collar
17. Nut
18. Cast Wheel
19. Ball Bearing
20. Circlip
21. Brake Shoe
22. Spring
23. Brake Panel
24. Dust Seal
25. Indicator
26. Cam Lever
27. Brake Camshaft
28. Spacer
29. Bolt
30. Rear Axle

- Remove the springs ㉒ (2) to separate the two brake shoes.
- Mark the position of the cam lever ㉖ so that it can be installed later in the same position.
- Unbolt and remove the cam lever, brake lining wear indicator ㉕, dust seal, and camshaft ㉗.

Rear Brake Assembly:

- Lubricate the brake parts (Pg. 240).
- Put the camshaft back into the panel.
- Fit the springs onto the brake shoes, and wrapping a clean cloth around the linings to prevent grease or oil from getting on them, install the shoes on the brake panel.
- Fit the dust seal and the indicator on the serration so that it points to the extreme right of the USABLE RANGE.



A. Indicator

- Install the cam lever in its original position on the camshaft, and tighten its bolt.

Wheel Coupling Disassembly:

Refer to Pg. 105, noting the following:

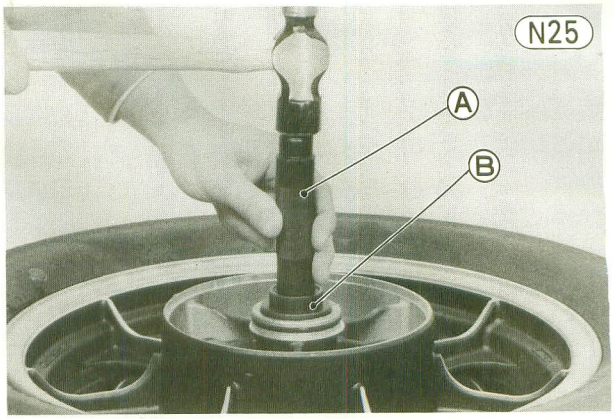
1. Double washers (3) (⑰ on Fig. G33) have been eliminated.

Rear Hub Disassembly:

- Remove the wheel coupling assembly, rubber damper, and rear brake assembly from the rear hub assembly.
- Remove the circlip from the right side, insert a metal rod into the hub from the left side, and remove the right side bearing ⑲ by tapping evenly around the bearing inner race. The distance collar ⑯ will come out with the bearing ⑲.
- Insert the metal rod into the hub from the other side, and tap out the remaining bearing ⑬.

Rear Hub Assembly Notes:

1. Inspect the bearings and replace if necessary (Pg. 174). Install them using the wheel bearing driver and the bearing driver holder (special tools).



A. Bearing Driver Holder (57001-139)
B. Bearing Driver (57001-140)

2. Inspect the **O** ring ⑭ and replace if necessary.

FRONT BRAKE LIGHT SWITCH

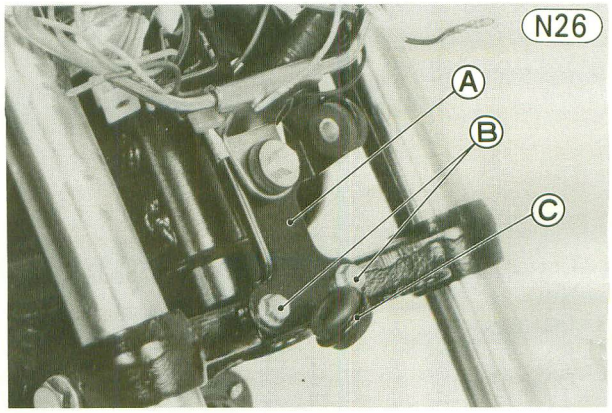
Removal:

- Remove the headlight unit (Pg. 113), and disconnect the brown and blue switch leads in the headlight housing.
- Using a thin-bladed screwdriver or some other suitable tools, press in the tab of front brake switch which catches in the hole on the master cylinder, and then remove the switch (Fig. N17).

STEERING STEM

Refer to Pgs. 119 ~ 122, noting the following:

1. At the center stand has been eliminated, lift the front of motorcycle with a chain hoist or other suitable means to remove the front wheel.
2. Headlight housing has been mounted with three bolts (right, left, and lower). Each right and left bolt has a lockwasher. Lower bolt has a lockwasher and two flat washers.
3. The 3-way joint has been eliminated. Remove the headlight stay mounting bolts (2) with the cable guide.



A. Headlight Stay
B. Headlight Stay Mounting Bolts
C. Cable Guide

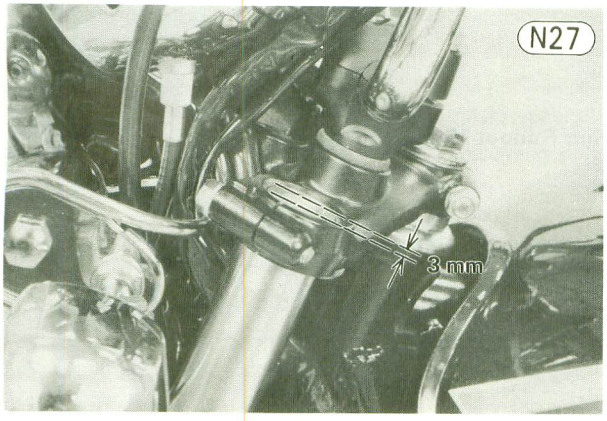
4. Take out the throttle cables from the carburetor pulley, remove the right switch housing screws (2), and remove the housing and cables.
5. When assembling, tighten the steering stem head rear clamp bolt to 1.4 kg-m (10.0 ft-lbs) of torque.

FRONT FORK

Installation:

Refer to Pgs. 123~125, noting the following.

1. Slide the fork leg up through the lower and upper clamps until the upper end of the inner tube is 3 mm lower than the upper surface of the stem head.

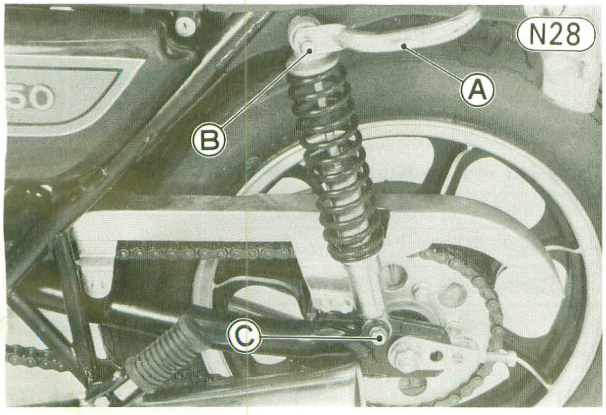


2. Tighten the lower clamp bolts to 3.8 kg-m (27 ft-lbs) of torque, and the upper clamp bolts to 1.4 kg-m (10 ft-lbs) of torque.

REAR SHOCK ABSORBERS

Removal:

- As the center stand has been eliminated, lift the rear of motorcycle with a chain hoist or other suitable means.
- Remove the grab bar mounting bolt and cap nut, and take off the grab bar.



A. Grab Bar **B. Cap Nut** **C. Clamp Bolt**

- Remove the lower clamp bolt, and take off the left rear shock absorber.
- Remove the cap nut and clamp bolt, and take off the right shock absorber.

Installation Notes:

- Each cap nut has a flat washer and spring washer.
- Tighten the cap nuts and lower clamp bolts to 3.1 kg-m (22 ft-lbs) of torque.

SWING ARM

Removal:

- Lift the rear wheel with a chain hoist or other suitable means.
- Remove the rear wheel (Pg. 234).
- Remove the both lower rear shock absorber mounting bolts with lockwashers.
- Move the swing arm up and down to check for abnormal friction. If abnormal friction is left, inspect the swing arm (Pg. 187).
- Remove the pivot shaft nut and pull out the pivot shaft, holding the swing arm to prevent it from hitting the ground (Fig. G110).

Installation Notes:

1. Install the cap on each end of the pivot of the swing arm, and put the swing arm through the drive chain loop.
2. Tighten the pivot shaft nut to 10 kg-m (72 ft-lbs) of torque.
3. Tighten the lower rear shock absorber mounting bolts to 3.1 kg-m (22 ft-lbs) of torque.
4. After installing the rear wheel, adjust the drive chain (Pg. 227), rear brake (Pg. 228), and rear brake light switch operation (Pg. 26).

Maintenance

CARBURETORS

Refer to Pgs. 130~136, noting the following:

1. Carburetor Specification are as follow.

Table N1 Carburetor Specifications

Model	Type	Main Jet	Needle Jet Badge #	Jet Needle	Pilot Jet	Starter Jet	Design Fuel Level	Service Fuel Level	Pilot Screw	Main Air Jet
US Model	BS38	125	Y-3	†4HL14	40	45	31±1 mm	5.5±1 mm	–	1.0
Other than US Model	BS38	125	Z-4	†4JN19-4	45	55	31±1 mm	5.5±1 mm	1½±½	1.0

† The latter "4" of "4JN19-4" is the groove number for clip.

WHEELS

Tires

Refer to Pgs. 170~172, noting the following:

Table N2 Tires, Air Pressure (measured when cold)

	Air Pressure		Size	Make, Type
Front	2.00 kg/cm² (28 psi)		3.25H-19 4PR	Bridgestone Mag Mopus S703
Rear	Up to 97.5 kg load	1.50 kg/cm² (21 psi)	130/90-16 67H	Bridgestone Mag Mopus S708
	97.5~165 kg load	2.00 kg/cm² (28 psi)		

Wheels (Cast Wheels)

Inspection and rim runout

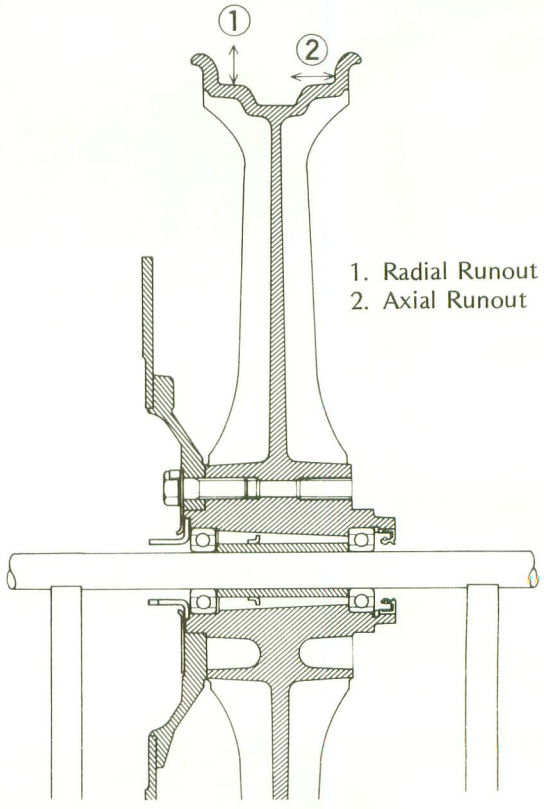
Carefully inspect the wheel for small cracks, dents, bends, or warp. If there is any damage to the wheel, it must be replaced.

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

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. 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 to 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.

Rim Runout Measurement (N29)



1. Radial Runout
2. Axial Runout

Table N3 Rim Runout (with tire removed)

	Service Limit
Axial	0.5 mm
Radial	0.8 mm

If rim runout exceeds the service limit, check the wheel bearings first. Replace them if they are damaged.

If the problem is not due to the bearings, the wheel must be replaced. Do not attempt to repair a damaged wheel.

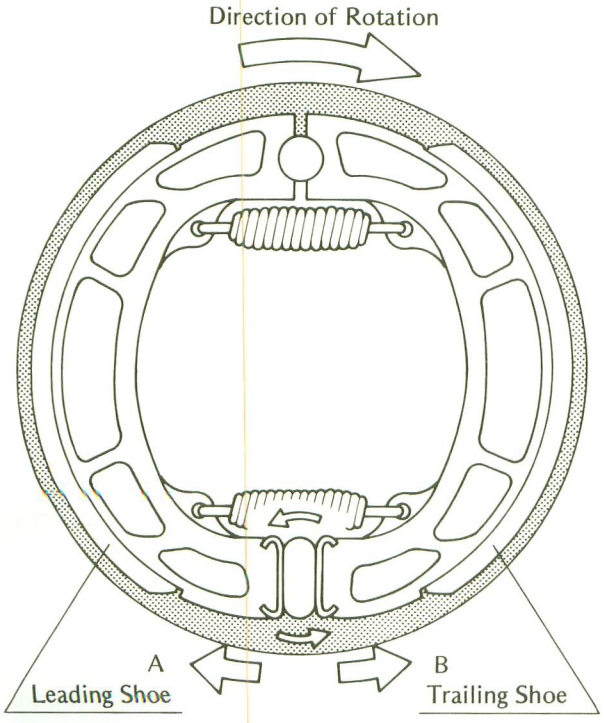
Table N4 Rim Size

	Size
Front	19 x MT1.85
Rear	16 x MT3.00

DRUM BRAKE

The rear wheel of KZ750-G has been equipped with a leading-trailing type of drum brake. "Leading-trailing" means that one of the two brake shoes leads, expanding against the drum in the direction of drum rotation, and the other shoe trails, expanding in the direction opposite drum rotation.

Drum Brake (N30)



The force applied by the rider upon braking is transmitted to the interior of the brake by a camshaft. The force applied at the brake pedal is transmitted by a rod to the cam lever which then turns the camshaft. When the camshaft rotates, the large portion of the cam is forced between the two brake shoes. Since the shoes are only held together away from the drum by springs, the cam, overcoming spring tension, pushes the shoes outward against the drum. The leading shoe rotates in direction "A", and the trailing shoe in direction "B" as shown in the Fig. N30.

The friction between the linings and the drum, which decelerates the motorcycle, gradually wears down the brake shoe linings. On the outside of the brake panel is a brake lining wear indicator, which, as the brake is applied, moves in direct proportion to the distance that the brake shoe linings move to reach the brake drum. As the linings wear down, the lining surface has farther to travel before reaching the drum. The indicator accordingly travels farther until it finally points just to the left of the "U" in USABLE when the lining wear has reached the service limit.

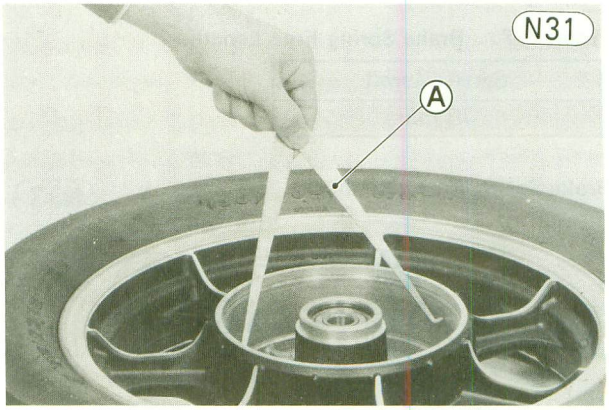
Due to wear of the brake drum, shoe linings, and cam, periodic brake adjustment is required. However, if the brake parts become overworn, adjustment will not be sufficient to ensure safe brake operation. Not only can overworn parts crack (drum) and otherwise suffer damage as they lose their braking effectiveness, but, if the cam wears to the point where it turns nearly horizontal when the brake is fully applied, the brake may lock in the applied position, or brake pedal return may be very sluggish. All brake parts should be checked for wear in accordance with the Periodic Maintenance Chart (Pg. 10).

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.**

Brake drum wear

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.



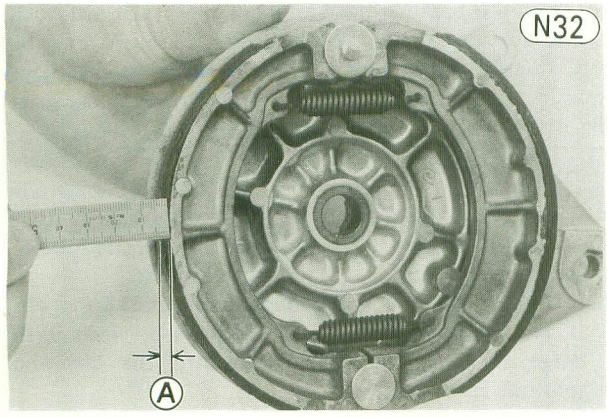
A. Calipers

Table N5 Rear Brake Drum Inside Diameter

Service Limit
180.75 mm

Brake shoe lining wear

Check the thickness of the brake linings, and replace both shoes as a set if the thickness at any point is less than the service limit. 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 linings are damaged or the surface cannot be restored by sanding and cleaning, the shoes must be replaced.



A. Lining Thickness

Table N6 Rear Brake Lining Thickness

Service Limit
2.5 mm

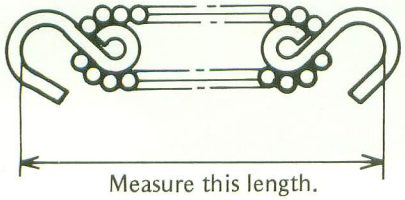
Brake shoe spring tension

If the brake springs have stretched, they will not pull the shoes back away from the drum after the brake pedal is released, and the shoes will drag on the drum. Remove the springs, and check their free length with vernier calipers. If either is stretched beyond the service limit, replace both springs.

Table N7 Brake Spring Free Length

Service Limit
70 mm

Brake Spring Free Length N33



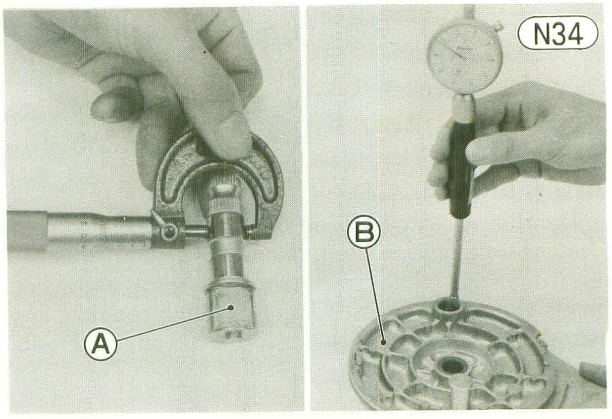
Measure this length.

Camshaft, shaft hole wear

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

Measure the shaft diameter with a micrometer, and replace it if it is worn down to less than the service limit.

Measure the inside diameter of the camshaft hole, and replace the brake panel if the hole is worn past the service limit.



A. Camshaft **B. Brake Panel**

Table N8 Brake Camshaft Diameter

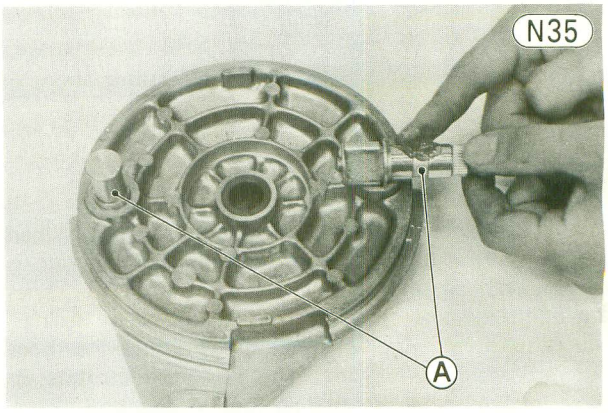
Service Limit
16.88 mm

Table N9 Camshaft Hole Diameter

Service Limit
17.15 mm

Lubrication

Every time that the brake is disassembled, and in accordance with the Periodic Maintenance Chart (Pg. 10), wipe out the old grease, and re-grease the brake pivot points. Apply grease to the 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.



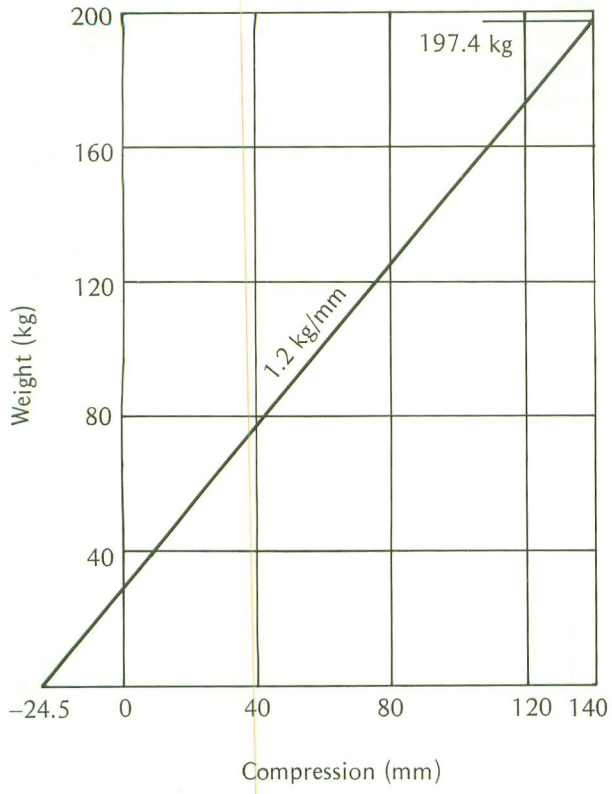
A. Grease

FRONT FORK

Refer to Pgs. 183 ~ 186, noting the following:

1. The spring force is as follows.

Front Fork Spring Force (N36)



2. The front fork spring free length and its service limit have been changed.

Table N10 Fork Spring Free Length

Service Limit
527 mm

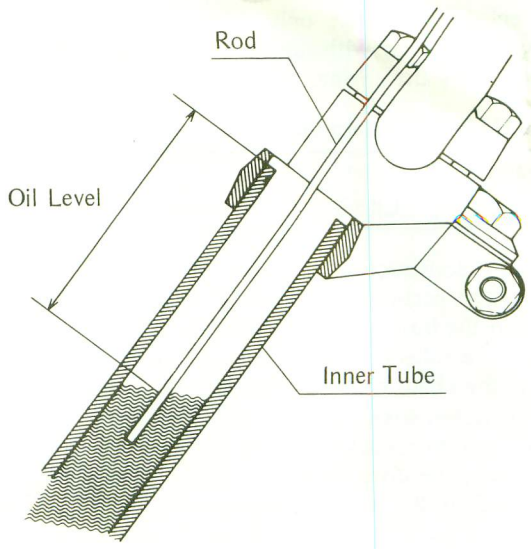
3. The type and capacity of front fork oil have been changed.

Table N11 Front Fork Oil

Type	Filling fork oil capacity		Oil level *
	When changing oil	After disassembly and completely dry	
SAE 10W20	about 154 cc	180 ~ 188 cc	441 mm from top of inner tube

* Measure the oil level with the spring being removed.

Fork Oil Level (N37)

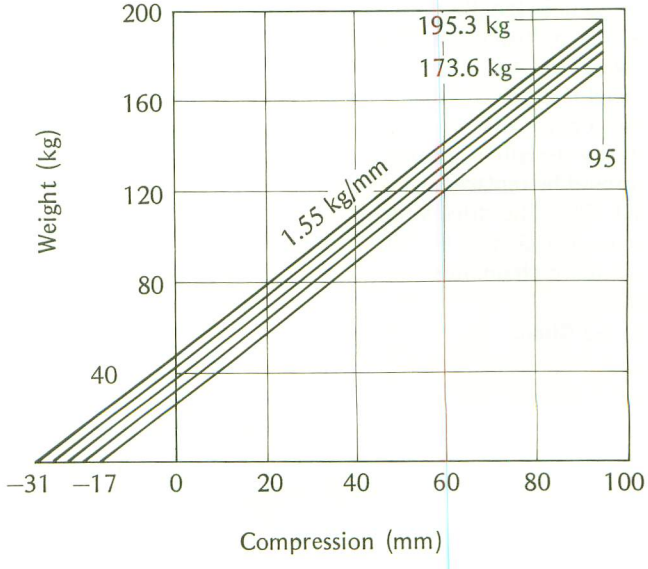


REAR SHOCK ABSORBERS

Refer to Pgs. 186 ~ 187, noting the following:

1. The spring force has been changed, and its 5 different setting is shown in the graph.

Spring Force (each shock absorber) (N38)



DRIVE CHAIN

The drive chain is an "endless" type in which the weakest link, the master link has been eliminated by constructing the chain in a close loop. To preserve

chain strength and reliability, never cut the chain to install it; follow the replacement procedure given in the "Disassembly" section of this manual. When chain replacement is necessary, use only the standard chain for replacement, since only this chain has been especially designed to withstand the extremely high torque developed by the engine.

Table N12 Standard Chain

Make	Type	Link
Enuma	EK530SH-O	106-link

Chain construction is shown in Fig. N40. Most chain wear occurs between the pins and bushings, and between the bushings and rollers, rather than on the outside of the rollers. This wear causes the chain to lengthen. If the chain is left unadjusted, the lengthening will lead to noise, excessive wear, breakage, and disengagement from the sprockets. If the chain is allowed to wear too much, the distance from roller to roller is so much greater than the distance between each tooth of the sprocket that the wear to the chain and the sprocket rapidly accelerates.

The wear between the pin and bushing is greatly reduced by providing O rings to seal in the lubricant between the pin and bushing. The wear between bushing and roller can be minimized by frequent and sufficient lubrication.

Wear

When the chain has worn so much that it is more than 2% longer than when new, it is no longer safe for use and should be replaced. Whenever the chain is replaced, inspect both the engine and rear sprockets, and replace them if necessary. Overworn sprockets will cause a new chain to wear quickly. See Pg. 176 ("sprockets" section).

Since it is impractical to measure the entire length of the chain, determine the degree of wear by measuring a 20-link length of the chain. Stretch the chain taut either by using the chain adjuster, or by hanging a 10 kg weight on the chain (Fig. J10 on Pg. 175). 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. If the length is greater than the service limit, the chain should be replaced.

NOTE: The drive system was designed for use with the standard chain. For maximum strength and safety, the standard chain must be used for replacement.

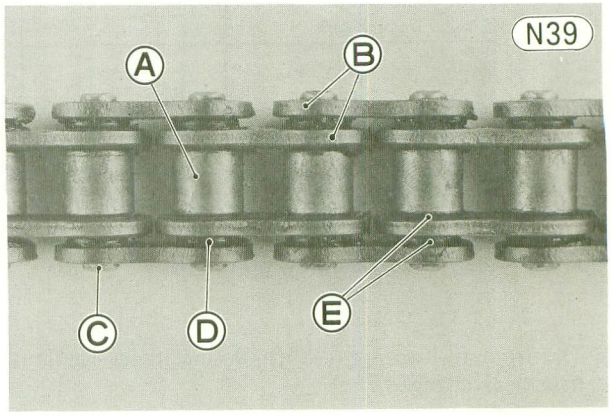
Table N13 Drive Chain 20-link Length

Standard	Service Limit
317.5 ~ 318.1 mm	323 mm

Lubrication

In order for the chain to function safely and wear slowly, it should be properly lubricated in accordance with the Periodic Maintenance Chart (Pg. 226). Lubrication is also necessary after riding through rain or on wet roads, or any time that the chain appears dry. Anytime that the motorcycle has been washed, the chain should be adequately lubricated on the spot in order to avoid rust.

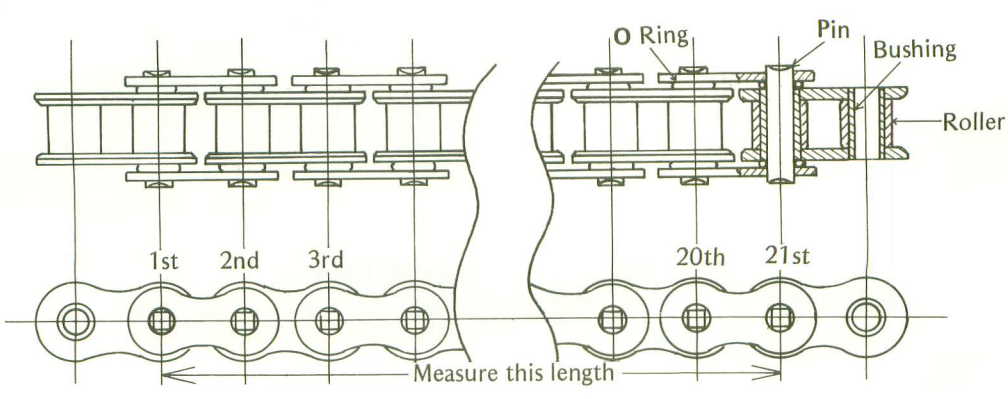
The chain should be lubricated with a lubricant which will both prevent the exterior from rusting and also absorb shock and reduce friction in the interior of the chain. An effective, good quality lubricant specially formulated for chains is best for regular chain lubrication. If a special lubricant 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.



A. Roller **C. Pin** **E. Apply oil.**
B. Side Plates **D. "O" Ring**

Dirt will cling to the oil and act as an abrasive, accelerating chain wear. Whenever the chain becomes particularly dirty, it must be cleaned in kerosene and then soaked in a heavy oil. Shake the chain while it is in the oil so that oil will penetrate to the inside of the rollers.

Drive Chain



CHARGING SYSTEM

The charging system consists of a dynamo and an integrated regulator/rectifier.

The dynamo generates the current required by the electrical circuits. The generated current is a single-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.

Dynamo

The dynamo of this model is the same as the one of the previous model. As to the constructions of the dynamo, refer to Pgs. 192~193.

Regulator/Rectifier

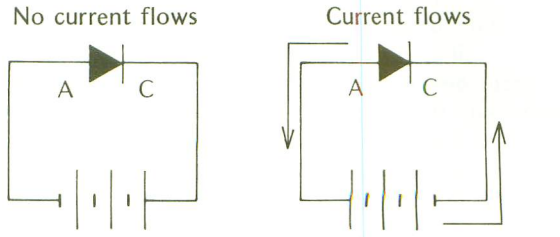
The regulator and rectifier are solid-state type, and integrated into one unit. Since it contains no contacts or other moving parts, it does not wear out and never needs to be adjusted. It is therefore manufactured as a sealed unit, and must be replaced as a unit should it become defective. The rectifier in the unit rectifies (changes to direct current, DC) the single-phase alternating current (AC) from the dynamo. It contains four silicon diodes which are connected in a bridge circuit arrangement for efficient, full-wave rectification. The regulator in the unit keeps the battery + terminal voltage level to a maximum of the specified range. The control unit in the regulator/rectifier unit checks on the voltage level, and triggers the thyristors.

The main components of the regulator/rectifier circuit are one zener diode in the control unit, two thyristors or Silicon Controlled Rectifiers as they are called, four diodes. The diode, thyristor (Th) or Silicon Controlled Rectifier (SCR), and zener diode (ZD) function as follows.

1. Diode

A current of electrons can flow only from the cathode to the anode of the diode. However, a defective diode will either conduct in both directions (a short) or not conduct at all (an open circuit). If any of the diodes is shorted or open, the voltage from the regulator/rectifier will be below normal, and the battery may not be charged adequately.

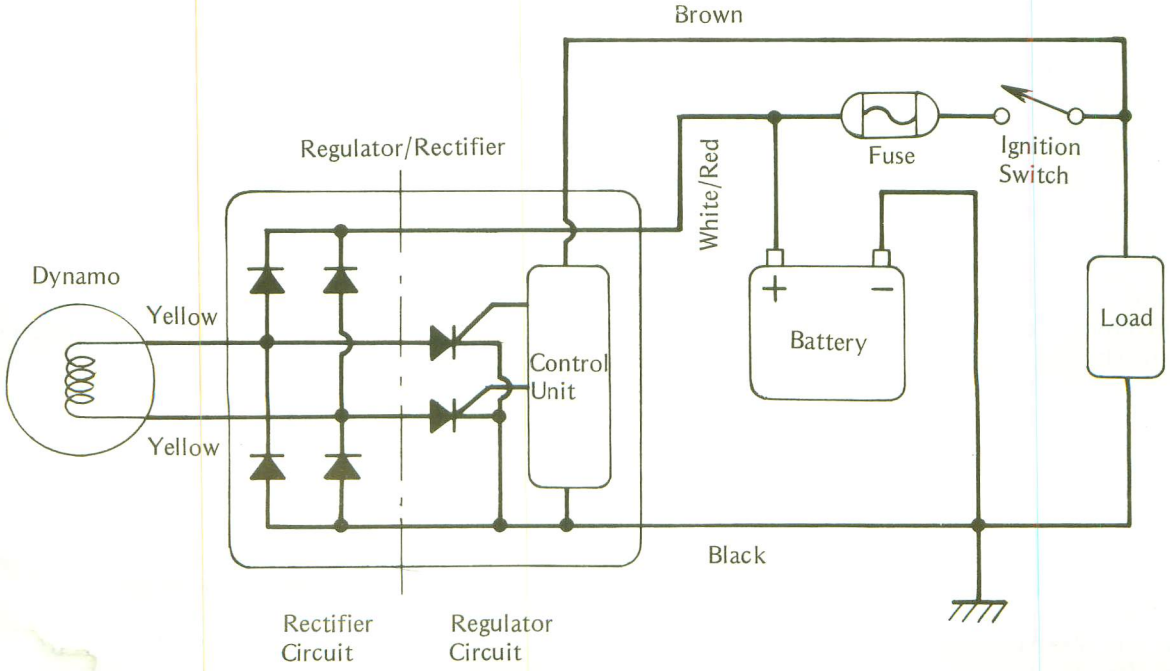
Diode Current Flow (N41)



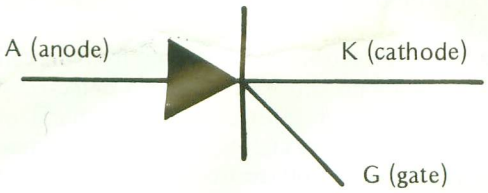
2. Thyristor (Th) or Silicon Controlled Rectifier (SCR)

The current of electrons will flow from the cathode to the anode but will not flow in the reverse direction. The thyristor differs from a diode in two respects: (a) even through a voltage of the correct polarity (negative to cathode) may be applied, the thyristor will not conduct until a signal is received at the gate input lead; (b) once started, it will not stop conducting (even if the gate lead signal voltage stops) until the anode to cathode voltage is removed or reversed.

Charging System (N42)



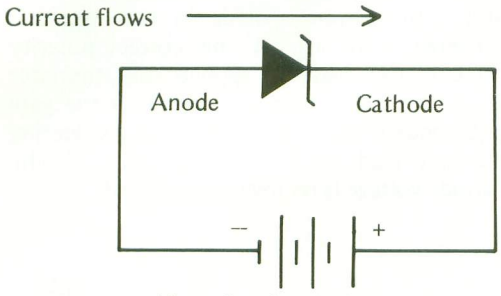
Thyristor (N43)



3. Zener diode

As in a normal diode, current will flow easily from the cathode to anode, and will not usually flow in the opposite direction. Unlike a normal diode, however, the zener diode will "break down", or conduct in the reverse direction, if enough voltage is applied in the reverse direction. When this voltage is lowered or removed, the diode will stop conducting and return to its normal state. The voltage at which the diode begins reverse conduction, is called the break down voltage, and is set at the desired level when the diode is manufactured. This property of the zener diode makes it very useful in voltage regulator circuits.

Zener Diode (N44)



Though the actual regulator/rectifier circuit performs full-wave rectification, a simplified half-wave rectification is explained here to aid the technician in troubleshooting and in understanding test procedures. Fig. N43 shows the basic circuit of the regulator/rectifier.

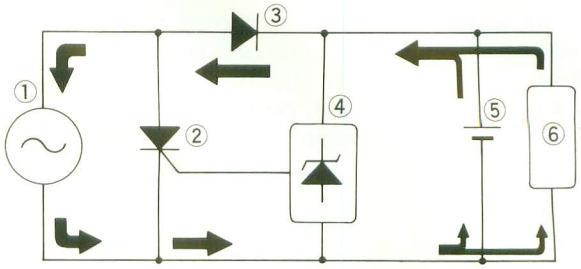
When the battery voltage is lower than the specified value, the zener diode does not conduct and the control unit does not trigger the thyristor. At this time, the thyristor does not conduct, and all dynamo output current flows through the battery and loads to supply adequate charging current.

When the battery voltage is equal to or higher than the predetermined voltage, the zener diode conducts and the control unit signals the thyristor to start conducting. Then, instead of current going through the battery and overcharging it, it flows through the thyristor and then directly back to the dynamo.

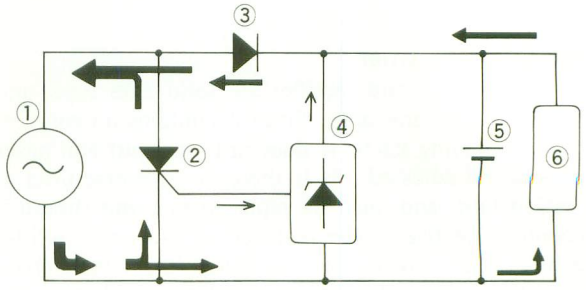
There are a number of important precautions that are musts when servicing the charging system. Cautions that apply to the individual parts are listed below. Failure to observe these rules can result in serious system damage. Learn and observe all the rules below.

Basic Regulator/Rectifier Circuit (N45)

1. When battery voltage is low (Thyristor is off).



2. When battery voltage is high (Thyristor is on to provide bypass).



1. Dynamo
2. Thyristor
3. Diode
4. Control Unit
5. Battery
6. Load

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 dynamo flywheel:

3. **The dynamo flywheel should never be struck sharply, as with a hammer, or allowed to fall on a hard surface. Such a shock to the flywheel can cause the magnets to lose their magnetism.**

Charging System Inspection

Initial inspection:

If 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. Examine wires for signs of burning, fraying, etc. Poor wires and bad connections will affect electrical system operation. Check the dynamo flywheel and regulator/rectifier for evidence of physical damage.

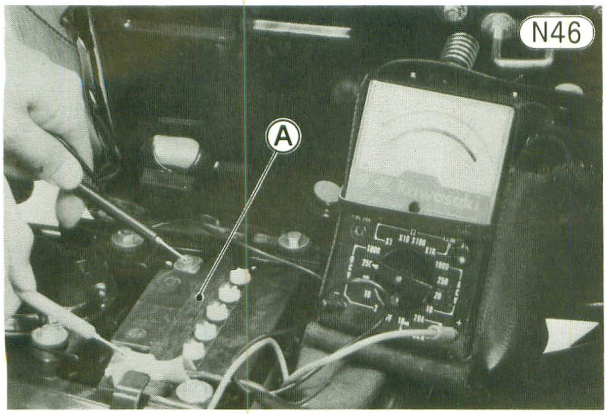
A worn out or badly sulphated battery will produce numerous problems that cannot be corrected until the battery is replaced. **ALWAYS CHECK BATTERY CONDITION BEFORE CONDEMNING OTHER PARTS**

OF THE SYSTEM. A FULLY CHARGED BATTERY IS A MUST FOR CONDUCTING ACCURATE CHARGING SYSTEM TESTS.

Charging system malfunctions can be traced to either the battery, dynamo, regulator/rectifier, or the wiring. Troubles may involve one item or in some cases all items. Never replace a defective part without determining what **CAUSED** the failure. If the failure was brought on by some other item or items, they too must be repaired or replaced, or the new replacement will soon fail again.

Operational inspection of charging system:

- Warm up the engine to obtain actual dynamo 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

- Start the engine, and note the voltage readings at various engine speeds with the headlight turned on and then turned off. (To turn off the headlight, disconnect the black/yellow lead from the headlight unit in the headlight housing.) The readings should show nearly battery voltage when the engine speed is low, and, as the engine speed rises, the readings should also rise. But they must be kept within the specified range.
- **If the regulator/rectifier output voltage is kept between the values given in Table N14, the charging system is considered to be working normally.**

If the output voltage is much higher than the values specified in the table, the regulator/rectifier is defective or the regulator/rectifier leads are loose or open.

If the battery voltage does not rise as the engine speed increases, then the regulator/rectifier is defective or the dynamo output is insufficient for the loads. Check the dynamo and regulator/rectifier to determine which part is defective.

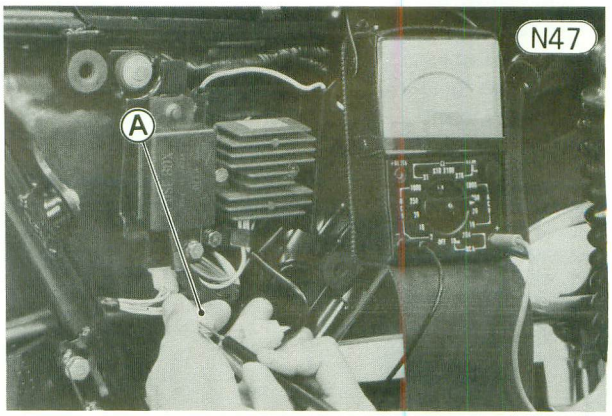
Table N14 Charging Voltage

Meter	Connections	Reading
25V DC	Meter (+) ↔ Battery (+) Meter (–) ↔ Battery (–)	Battery Voltage~15V

Dynamo inspection

There are three types of dynamo failures: short, open (wire burned out), or loss in flywheel magnetism. A short or open in the coil wire will result in either a low output, or no output at all. A loss in flywheel magnetism, which may be caused by dropping or hitting the dynamo, by leaving it near an electromagnetic filed, or just by aging, will result in low output.

- Remove the left side cover, pull out the 3-pin connector which connects the regulator/rectifier and the dynamo, and disconnect the 3-pin connector.
- Set the multimeter to the 250V AC scale, and connect each meter lead to each yellow lead of 3-pin connector from the dynamo to check the dynamo output voltage with no electrical loads.



A. 3-pin Connector

- Start the engine, run it at the rpm given in Table N15, and note the voltage reading. If the output voltage shows the value in Table N15, the dynamo operates properly and the regulator/rectifier is damaged. A much lower reading than that given in the table indicates that the dynamo is defective. Check the starter coil resistance as follows:

Table N15 Dynamo Output Voltage

Meter	Reading @4,000 rpm
x 250V AC	about 75 V

- Stop the engine, set the multimeter to the x 1 Ω range, and measure for continuity between the dynamo output yellow leads of 3-pin connector. If there is more resistance than shown in Table N16, or no meter reading (infinity), the stator has an open lead and must be replaced. Much less than this resistance means the stator is shorted, and must be replaced.

Table N16 Armature Resistance

Meter	Reading
x 1 Ω	about 0.32 Ω

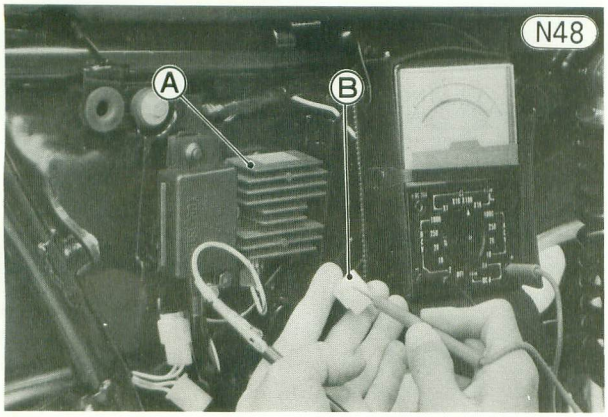
- Using the highest resistance range of the *multimeter*, measure the resistance between each of the yellow leads and chassis ground. Any meter reading less than infinity (∞) indicates a short, necessitating armature replacement.

If the armature coil have normal resistance, but the voltage check showed the dynamo to be defective; then the flywheel magnets have probably weakened, and the flywheel must be replaced.

Regulator/Rectifier

Rectifier inspection

- With the ignition switch turned off, remove the left side cover, and disconnect the 3-pin connector and brown lead from the regulator/rectifier.
- Using the x 10 or x 100 Ω range, check the resistance in both directions between each yellow lead in the 3-pin connector which leads to the regulator/rectifier and the white/red lead, and between the black lead and each yellow lead. There is a total of 8 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 circuit is defective and the regulator/rectifier must be replaced as a unit.



A. Regulator/Rectifier **B. 3-pin Connector**

NOTE: The actual meter reading varies with meter used and the individual rectifier, but, generally speaking, the lower reading should be from zero to the first 1/3 of the scale.

Regulator test

To test the regulator out of circuit, use three 12 volt batteries and a test light made from a 12V 3~6W bulb in a socket with leads.

- Remove the regulator/rectifier from the frame.
- 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.

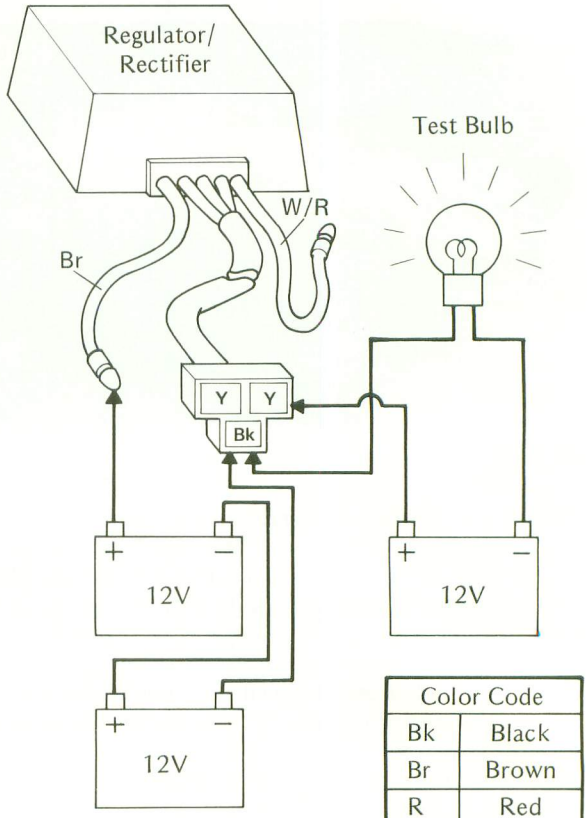
CAUTION **The test light works as an indicator and also as a current limiter to protect the regulator/rectifier from excessive current. Do not use an ammeter instead of a test light.**

- 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 24 volts to the regulator/rectifier, connect two 12 volt batteries in series, and connect the brown lead to the battery (+) terminal and the black 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 volts 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 another yellow lead (in the 3-pin connector which leads to the regulator/rectifier).
- Replace the regulator/rectifier if the bulb does not light as described above.

Regulator Circuit Test N49



Color Code	
Bk	Black
Br	Brown
R	Red
W	White
Y	Yellow

Troubleshooting—Guide

Abnormal Frame Noise

Drum brake noise

Brake linings overworn or worn unevenly
Drum worn unevenly or scored
Brake springs weak or broken
Foreign matter in hub
Brake not properly adjusted

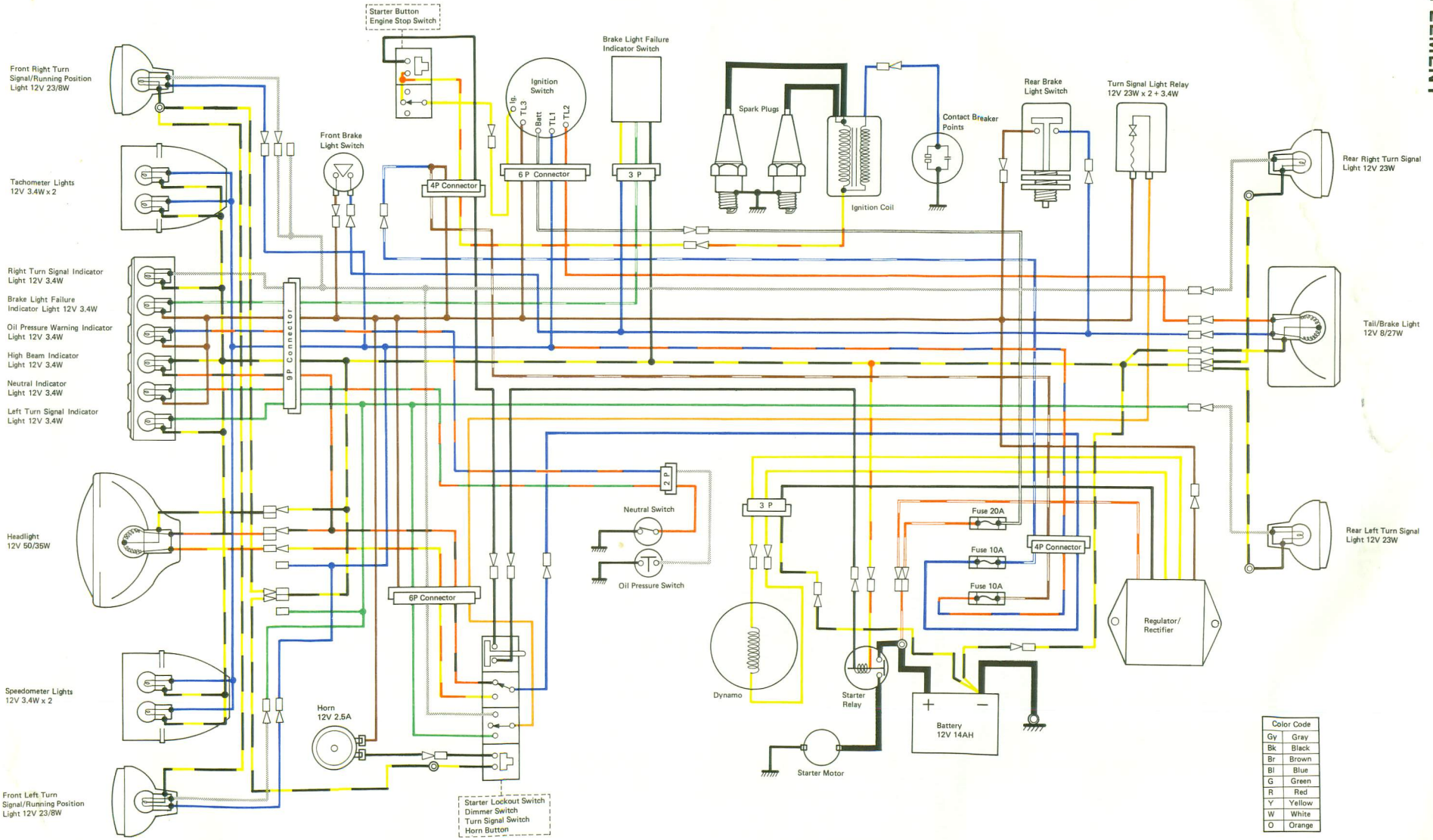
Brakes Don't Hold

Drum brake

Brake not properly adjusted
Linings overworn or worn unevenly
Drum worn unevenly or scored
Cam, camshaft, shaft hole worn
Oil, grease on lining and drum
Dirt, water between lining and drum
Overheated

NOTE: This is not an exhaustive list, giving every possible cause for each problem listed. It is meant simply as a rough guide to assist the troubleshooting for some of the more common difficulties. Electrical troubleshooting is not covered here due to its complexity. For electrical problems, refer to the appropriate heading in the Maintenance Section.

KZ750-G1 Wiring Diagram



Color Code	
Gy	Gray
Bk	Black
Br	Brown
Bl	Blue
G	Green
R	Red
Y	Yellow
W	White
O	Orange

LEFT HANDLEBAR SWITCH CONNECTIONS

Starter Lockout Switch			Hron Button			Dimmer Switch					Turn Signal Switch			
Color	Black	Black	Color	Black	⏦	Color	R/Bk	Blue	R/Y		Color	Green	Orange	Gray
			OFF			HI	●	●			Left	●	●	
ON	●	●	ON	●	●	LO		●	●					
											Right		●	●

Ignition Switch Connections

	Tail 3	Battery	Ignition	Tail 1	Tail 2
Color	Brown	White	Yellow	Blue	Red
OFF					
ON	●	●	●	●	
PARK		●			●

(1172A)

RIGHT HANDLEBAR SWITCH CONNECTIONS

Starter Button			Engine Stop Switch		
Color	Black	Y/R	Color	Y/R	Yellow
			OFF		
OFF			RUN	●	●
ON	●	●	OFF		

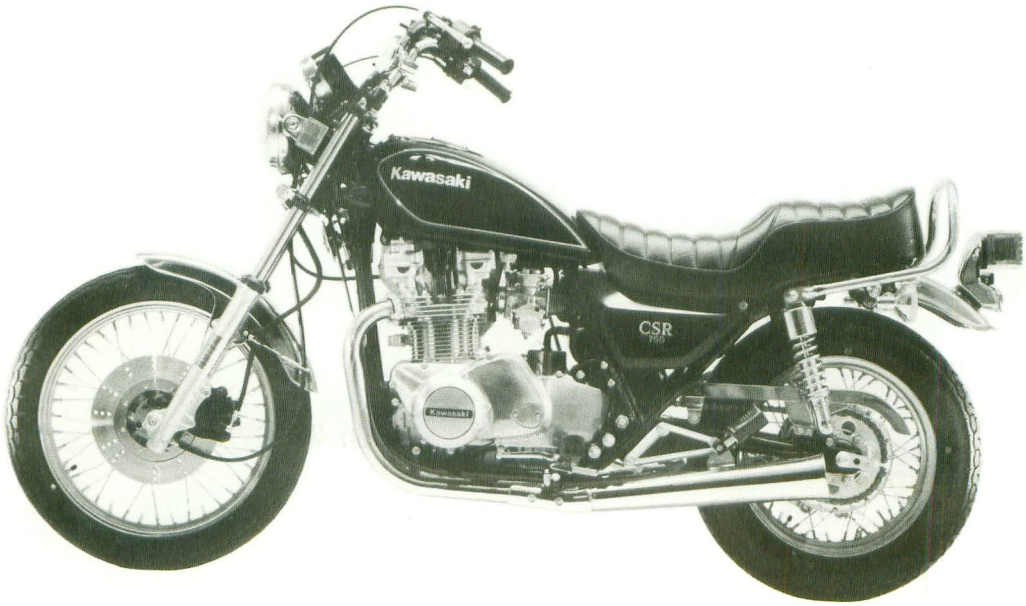
Supplement for 1981 KZ750-M1

Table of Contents

Model Identification

KZ750-M1 Right Side View

KZ750-M1 Left Side View



Specifications

SPECIFICATIONS

Items		KZ750-M1
Dimensions:		
Overall length		2,190 mm
Overall width		840 mm
Overall height		1,215 mm
Wheelbase		1,475 mm
Road clearance		170 mm
Seat height		770 mm
Dry weight		205 kg
Fuel tank capacity		10.6 ℓ
Performance:		
Climbing ability		26°
Braking distance		12.5 m from 50 kph
Minimum turning radius		2.5 m
Engine		
Type		4-stroke, DOHC, 2 cylinder
Cooling system		Air-cooled
Bore and stroke		78.0 x 78.0 mm
Displacement		745 cc
Compression ratio		8.5
Maximam hosepower		55 HP @7,000 rpm
Maximam torque		6.2 kg-m @3,000 rpm
Valve timing:		
Inlet	Open	30° BTDC
	Close	50° ABDC
	Duration	260°
Exhaust	Open	70° BBDC
	Close	30° ATDC
	Duration	280°
Carburetion system		Carburetors, Mikuni BS34 x 2
Lubrication system		Forced lubrication, wet sump
Engine oil:		
Grade		SE class
Viscosity		SAE 10W40, 10W50, 20W40, or 20W50
Capacity		4.0 ℓ
Starting system		Electric starter and kick
Ignition system		Battery and coil (Transistorized)
Timing advance		Mechanical advanced
Ignition timing		From 5° BTDC @1,000 rpm to 30° BTDC @3,750 rpm
Spark plugs		B6ES or W20ES-U © BR6ES or W20ESR-U

Items	KZ750-M1
Drive Train:	
Primary reduction system:	
Type	Chain
Reduction ratio	2.48 (57/23)
Clutch type	Wet, multi disc
Transmission:	5-speed, constant mesh, return shift
Type	
Gear ratios 1st	2.33 (35/15)
2nd	1.63 (31/19)
3rd	1.27 (28/22)
4th	1.04 (26/25)
5th	0.88 (21/24)
Final drive system:	
Type	Chain
Reduction ratio	2.38 (38/16)
Overall drive ratio	5.15 @5th Gear
Frame:	
Type	Tubular, double cradle
Castor (rake angle)	28.5°
Trail	112 mm
Front tire:	
Type	Tube
Size	3.25H-19 4PR
Rear tire:	
Type	Tube
Size	130/90-16 67H
Front suspension:	
Type	Telescopic fork (Pneumatic)
Wheel travel	180 mm
Rear suspension:	
Type	Swing arm
Wheel travel	96 mm
Brake type:	
Front	Single disc brake
Rear	Drum brake
Electrical Equipment:	
Alternator:	
Type	Three-phase AC
Rated output	13 amp. @8,000 rpm, 14V
Voltage regulator	Short-circuit type
Battery	12V 14AH
Headlight:	
Type	Sealed Beam
Bulb	12V 60/50W
Tail/brake light	12V 8/27W

Ⓒ: Canadian model

PERIODIC MAINTENANCE CHART

The maintenance and adjustment 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.**

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

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
Engine oil – change	year	•	•	•	•	•	•	•	21
Spark plug – clean and gap †		•	•	•	•	•	•	•	12
Camshaft chain tension – adjust		•	•	•	•	•	•	•	14
Valve clearance – check †		•	•	•	•	•	•	•	15
Throttle grip play – check †		•	•	•	•	•	•	•	254
Idle speed – check †		•	•	•	•	•	•	•	254
Carburetor synchronization – check †		•	•	•	•	•	•	•	255
Clutch – adjust		•	•	•	•	•	•	•	20
Brake fluid level – check †	month	•	•	•	•	•	•	•	181
Brake play – check †		•	•	•	•	•	•	•	229
Brake light switch – check †		•	•	•	•	•	•	•	26
Steering play – check †		•	•	•	•	•	•	•	26
Spoke tightness and rim runout – check †		•	•	•	•	•	•	•	172
Battery electrolyte level – check †	month	•	•	•	•	•	•	•	190
Oil filter – replace		•		•		•		•	21
Nut, bolt, and fastner tightness – check †		•		•		•		•	258
Air suction valve – check †			•	•	•	•	•	•	276
Drive chain wear – check †			•	•	•	•	•	•	276
Brake lining wear – check †			•	•	•	•	•	•	242,277
Front fork oil seal – clean			•	•	•	•	•	•	185
Tire wear – check †			•	•	•	•	•	•	170,276
General lubrication – perform			•	•	•	•	•	•	28,230
Air cleaner element – clean			•		•		•		130
Air cleaner element – replace	5 cleanings			•		•		•	130
Fuel system – clean				•		•		•	21,273
Timing advancer – lubricate				•		•		•	197
Brake fluid – change	year			•		•		•	179
Front fork oil – change				•		•		•	278
Swing arm pivot – lubricate				•		•		•	279
Brake camshaft – lubricate	2 years					•			240
Steering stem bearing – lubricate	2 years					•			183
Wheel bearing – lubricate	2 years					•			174
Speedometer gear – lubricate	2 years					•			174
Drive chain – lubricate	Every 300 km								241
Drive chain slack – check †	Every 800 km								227
Master cylinder cup and dust seal – replace	Every 2 years								–
Caliper piston seal and dust seal – replace	Every 2 years								–
Fuel hose – replace	Every 4 years								–
Brake hose – replace	Every 4 years								–

Adjustment

IGNITION TIMING

The ignition system for this model is transistorized and controls the current for the primary circuit by use of a solid-state electronic switching unit called a Darlington power transistor. The power transistor is triggered by pickup coil and there are no mechanical breaker points, so the only periodic maintenance needed is automatic timing advancer lubrication (Pg. 197). Since contact breaker heel wear and breaker point pitting or burning are eliminated, periodic inspection and adjustment of the ignition timing are not required.

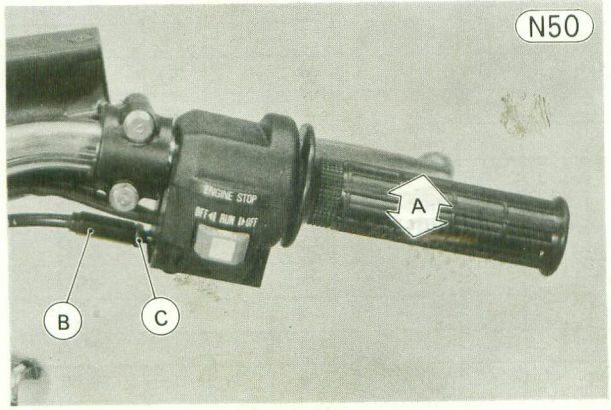
See the "Ignition System" section (Pg. 280) for the inspection of the ignition system.

THROTTLE CABLE

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

Inspection

- Turn the throttle grip back and forth to check the throttle grip play.



A. 2 – 3 mm
B. Adjusting Nut
C. Locknut

★There should be 2 – 3 mm play measured at the grip. If the cable does not have the proper play, adjust it as follows.

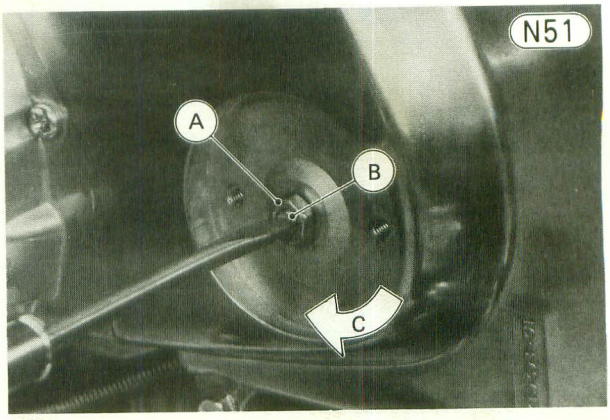
Adjustment

- Loosen the locknut at the upper end of the throttle cable, and turn the adjusting nut to adjust the play.
- Tighten the locknut.

CLUTCH

Refer to Pgs. 20 – 21, noting the following:

- Turn **out** the adjusting screw until it becomes hard to turn. This is the point where the clutch is just starting the release.
- Turn **in** the adjusting screw ¼ turn from that point, and tighten the locknut.



A. Locknut **B. Adjusting Screw** **C. ¼ Turn**

CARBURETORS

The following procedure covers the carburetor adjustment, which should be performed in accordance with the periodic Maintenance Chart or whenever the idle speed is disturbed.

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, and reduced engine power and performance.

Idle Speed:

Inspection

- Thoroughly warm up the engine.
- Check that the idle speed is within the specified range.

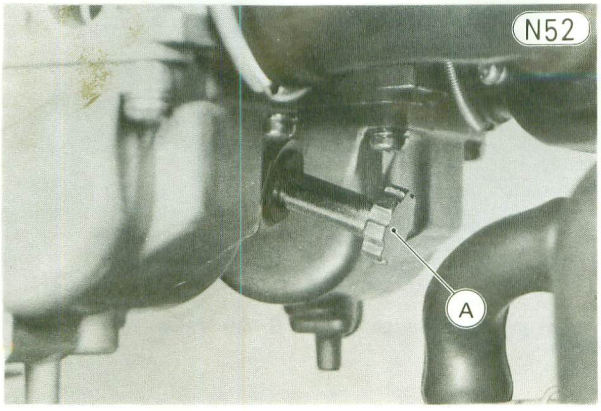
Table N17 Idle Speed

1,000 ± 50 rpm

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

Adjustment

●Turn the adjusting screw to adjust the idle speed.



A. Adjusting Screw

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

●With the engine idling, turn the handlebar to both sides. If handlebar movement changes the idle speed; the throttle cable may be improperly ajdusted or incorrectly routed, or it may be damged.

WARNING

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

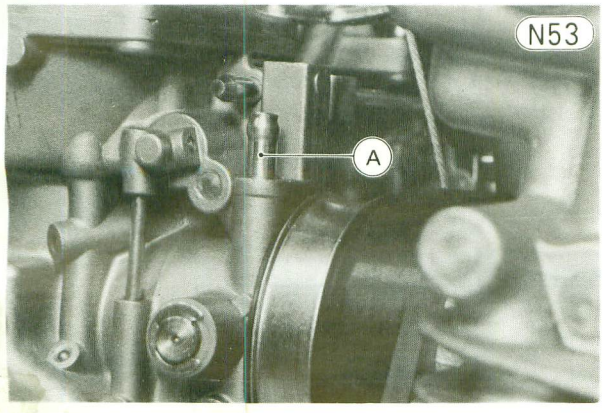
Synchronization:

Inspection

●Warm up the engine throughly.

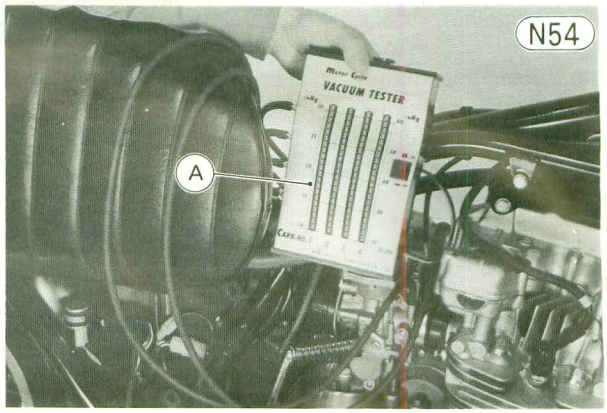
●Remove the fuel tank, and put it on the work bench near the motorcycle on the same level as the original position.

●Pull off the vacuum hoses from the fittings on the carburetors.



A. Hose Fitting

●Attach the vacuum gage (special tool) hoses to the hose fittings.



A. Vacuum Gage: 57001-1152

●Connect the gage leads to the battery terminals.

●Using a suitable hose, connect the fuel tank with the carburetors.

●Turn the fuel tap lever to the "PRI" position.

●Start the engine, and let it idle.

●Adjust the idle speed.

●Note the gauge readings.

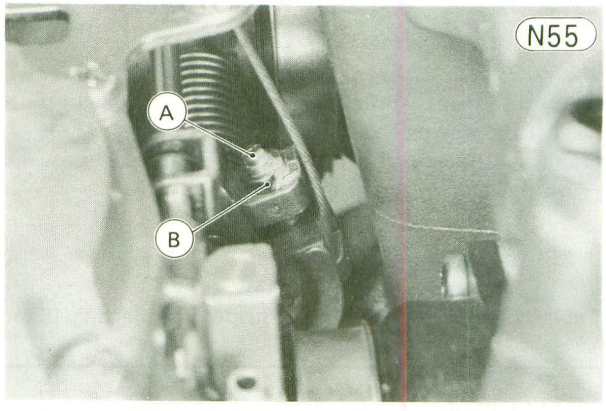
Table N18 Engine Vacuum

Difference between two cylinders	Less than 2 cm Hg

★If the gauge shows more vacuum difference than specified in the table, synchronize the carburetors.

Adjustment

●To change the vacuum, loosen the locknut, and turn the balance adjusting screw.

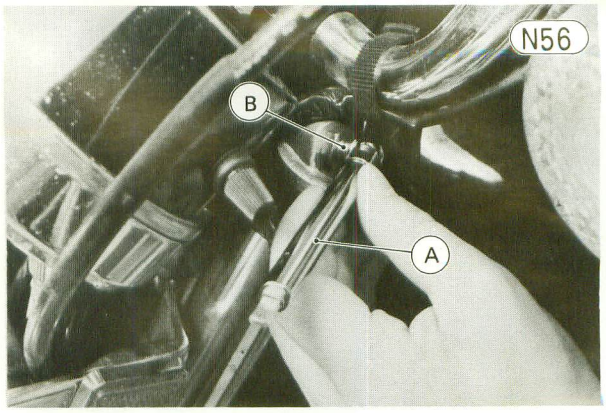


A. Balance Adjusting Screw **B. Locknut**

●If the idle speed has been changed during synchronization, adjust 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 three steps.
- After the carburetors are properly synchronized, tighten the locknut without changing the position of the screw.
- Detach the vacuum gauges, and install the vacuum hose on the fittings on the carburetors.
- Install the fuel tank.



A. Air pressure Gauge **B. Air Valve**

SUSPENSIONS

Suspension Setting:

The front 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, sping force, or damping force for different road and loading conditions if necessary.

NOTE: 1. Table N20 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

- Raise the front wheel off the ground. All weight must be off the front wheel.
- Remove the air valve cap, and check the air pressure with the air pressure gauge.

NOTES: 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/cm^2 (36 psi, 250 kPa).

NOTES: 1. A normal tire pump can be used.
2. Adjust the air pressure to suit various riding conditions within the usable range.

Table N19 Front Fork Air Pressure

Standard	Usable Range
0.6 kg/cm^2 (8.5 psi) (60 kPa)	0.5 – 0.7 kg/cm^2 (7.1 – 10.0 psi) (50 – 70 kPa)

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/cm^2 (1.4 psi, 10 kPa).**

Table N20 Front and Rear Suspension Setting (Example)

Suspension Setting		Rear Shock Absorber		Front Fork Air Pressure
		Spring Force (Sleeve Position)	Damping Force (Adjuster Position)	
Soft	A	1 or 2	1 or 2	0.5 kg/cm^2 (7.1 psi, 50 kPa)
↑	B	2 or 3	2 or 3	)
↓	C	3 or 4	3 or 4	)
Hard	D	4 or 5	4 or 5	0.7 kg/cm^2 (10.0 psi, 70 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.

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.

Inspection

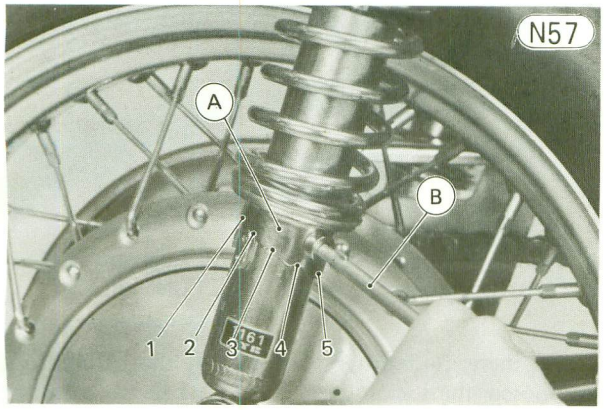
★If the spring action feels too soft or too stiff, adjust it in accordance with the following table and Fig. N57.

Table N21 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 screwdriver bit.



A. Spring Adjusting Sleeve B. Screwdriver Bit

●Check to see that both adjusting sleeves are turned to the same relative position.

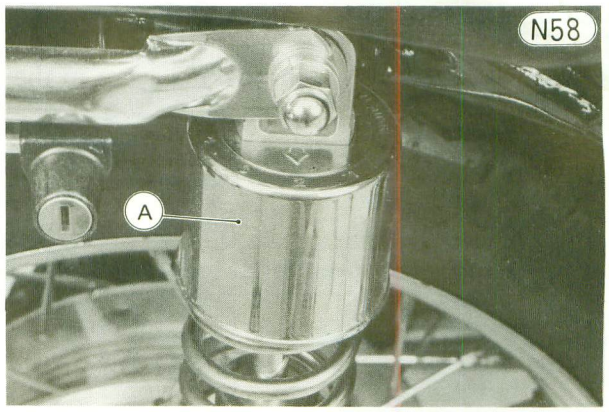
WARNING

1. 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 5 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 N22 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

1. If both damper adjusters 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.

DRIVE CHAIN

The procedures are the same as those for KZ750-G1. See Pgs. 227 – 228.

BRAKES

Rear Brake

The procedures are the same as those for KZ750-G1. See Pgs. 228 – 229.

LUBRICATION

Refer to Pgs. 28 – 30 and Pg. 230.

Disassembly

TORQUE AND LOCKING AGENT

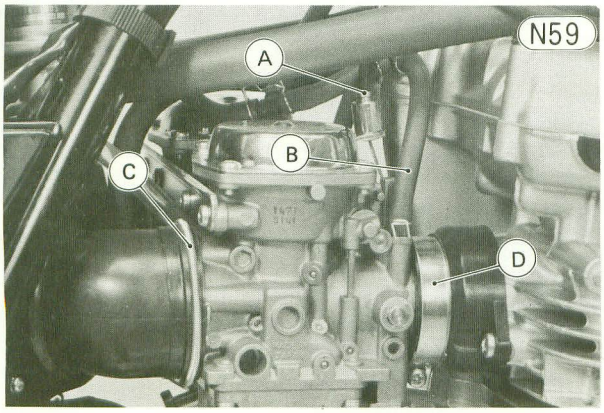
The table *below* shows the tightening torque for the parts which has been changed from the previous model. *Tighten* the other parts to the same torque listed on Pgs. 33 – 36 and Pg. 231.
NOTE: Mark used in "Remark"
★ : Apply a non-permanent locking agent to the threads

Parts	Threads		Quantity	Torque		Remark	See Page
	Dia. (mm)	Pitch (mm)		kg-m	ft-lbs		
Air suction valve cover bolts	6	1.0	4	1.2	104 in-lbs	–	262
Disc brake parts	See Table N23 on Page 265.						
Front axle clamp bolt	8	1.25	1	1.8	13.0	–	265
Front fork air valves	8	1.0	2	0.80	69 in-lbs	8	270
Front fork top plugs	28	1.0	2	2.3	16.5	–	270

CARBURETORS

Removal:

- Remove the fuel tank.
- Loosen the carburetor holder clamps (2), and slide the spring bands (2) on the air cleaner ducts out of place.

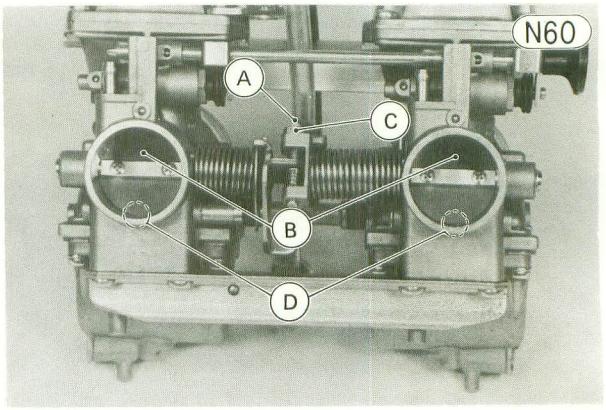


A. Throttle Cable
B. Vacuum Hose
C. Spring Band
D. Holder Clamp

- Disconnect the throttle cable lower end from the carburetor.
- Disconnect the vacuum hoses from the carburetor.
- Remove the carburetor.

Installation Notes:

1. Check the carburetor holders for crack or other damage, replace the damaged holders with new ones. Apply a non-permanent locking agent to the carburetor holder mounting screw threads.
2. If the carburetors were disassembled, visually synchronize the throttle (butterfly) valves as follows:
   - Check to see that butterfly valves open and close smoothly without no binding when turning the pulley.
   - Visually check the clearance between the butterfly valve and the carburetor bore in each carburetor.

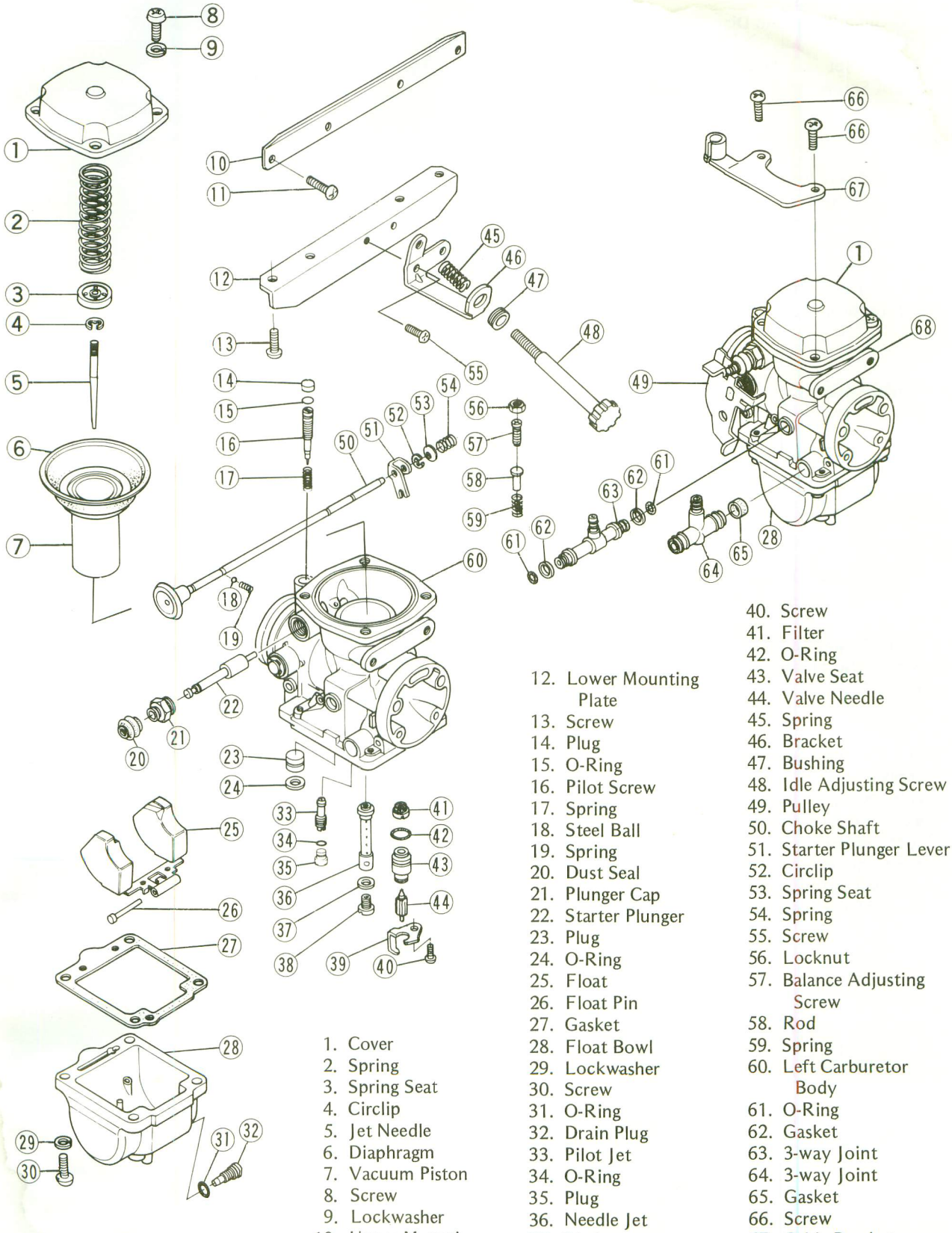


A. Balance Adjusting Screw
B. Throttle Valves
C. Locknut
D. Clearance

   - If there is a difference between the carburetors, loosen the locknut and turn the balance adjusting screw to obtain the same clearance.
   - Tighten the locknut.
3. Run the throttle cable between the right fork leg and the head pipe, and right side of the frame top tube.
4. Connect the vacuum hose from the fuel tap to the right carburetor and connect the hose from the air cleaner to the left carburetor.
5. Run the air vent tube through the right side of the battery and behind of the battery.
6. After completing installation, adjust the throttle grip (Pg. 254) and the caburetors (Pg. 254).

N61

Carburetor



1. Cover
2. Spring
3. Spring Seat
4. Circlip
5. Jet Needle
6. Diaphragm
7. Vacuum Piston
8. Screw
9. Lockwasher
10. Upper Mounting Plate
11. Screw
12. Lower Mounting Plate
13. Screw
14. Plug
15. O-Ring
16. Pilot Screw
17. Spring
18. Steel Ball
19. Spring
20. Dust Seal
21. Plunger Cap
22. Starter Plunger
23. Plug
24. O-Ring
25. Float
26. Float Pin
27. Gasket
28. Float Bowl
29. Lockwasher
30. Screw
31. O-Ring
32. Drain Plug
33. Pilot Jet
34. O-Ring
35. Plug
36. Needle Jet
37. Washer
38. Main Jet
39. Holding Plate
40. Screw
41. Filter
42. O-Ring
43. Valve Seat
44. Valve Needle
45. Spring
46. Bracket
47. Bushing
48. Idle Adjusting Screw
49. Pulley
50. Choke Shaft
51. Starter Plunger Lever
52. Circlip
53. Spring Seat
54. Spring
55. Screw
56. Locknut
57. Balance Adjusting Screw
58. Rod
59. Spring
60. Left Carburetor Body
61. O-Ring
62. Gasket
63. 3-way Joint
64. 3-way Joint
65. Gasket
66. Screw
67. Cable Bracket
68. Right Carburetor Body

Separation of Carburetors:

NOTES: 1. The carburetor parts listed below can be removed without separating the carburetors from the mounting plates.
- ○Vacuum Piston and Diaphragm Assembly
- ○Jet Needle
- ○Needle Jet
- ○Pilot Screw
- ○Pilot Jet
- ○Main Jet
- ○Float
- ○Float Valve Needle
- ○Float Valve Seat
- ○Starter Plunger

- ●Remove the choke plungers.
- ●Remove the mounting screws (8), and remove the upper and lower mounting plates ⑩, ⑫.
- ●Separate the carburetors.

Assembly after Carburetor Separation:

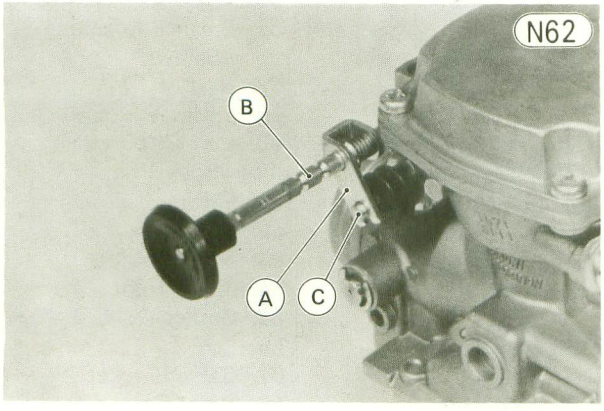
NOTE: 1. The centerlines of the carburetor bores must be parallel both horizontally and vertically. If they are not, loosen the mounting screws just enough so that the carburetors are able to move, align them on a flat surface, and retighten the mounting screws.

Starter Plunger Disassembly:

- ●Remove the circlips ⑫ (2) off the choke shaft ⑩ , and pull out the shaft. Two steel balls ⑱ and springs ⑲ will fall off the carburetors.
- ●Unscrew the plunger cap ㉑ and remove the starter plunger ㉒.

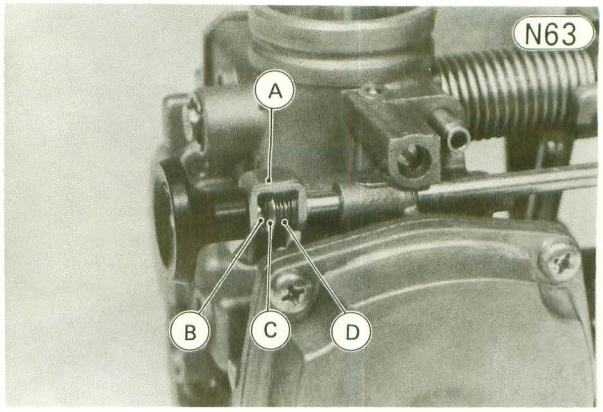
Starter Plunger Assembly Notes:

1. Apply grease to the shaft positioning springs ⑲ and balls ⑱ (2 ea), and put the spring and ball in this order into each carburetor.
2. Apply grease to the shaft hole in the carburetors.
3. Insert the shaft through each plunger lever, spring seat, and spring while engaging the lever with the starter plunger groove.



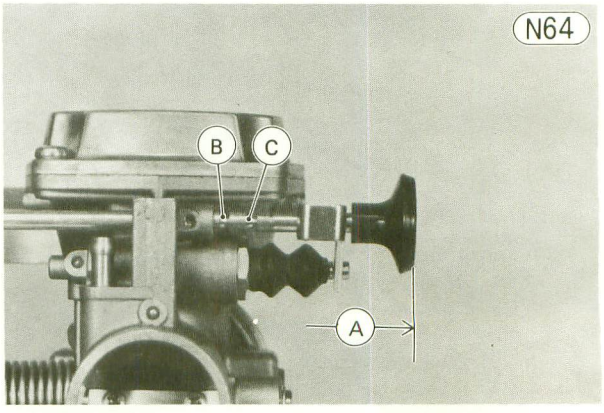
A. Plunger Lever B. Choke Shaft C. Starter Plunger

4. Install the circlips (2) on the choke shaft. The circlips must be on the left side of the spring seat.

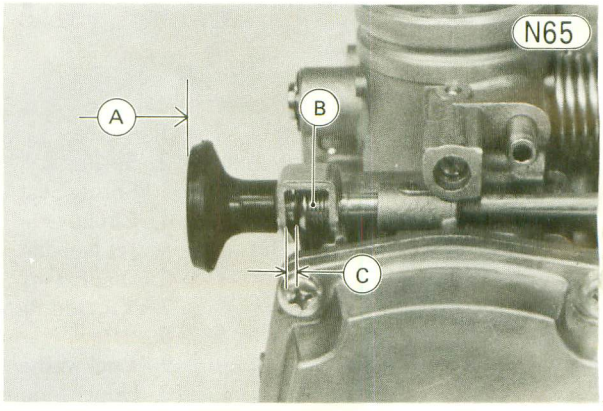


A. Plunger Lever B. Circlip C. Spring Seat D. Spring

5. Check to see that the choke shaft slides left to right smoothly without abnormal friction.
6. The choke shaft has three stop positions:
   (1)On position – the fully-pulled-out position.
   (2)Halfway position – the first click position in the choke return way.
   (3)Off position – the second click position in the choke return way, the plunger lever springs must be compressed a little to press securely the starter plungers against their seats in the carburetor bodies.



A. On Position C. Off-Position Groove
B. Halfway-Position Groove



A. Off Position C. Clearance
B. Spring is compressed.

CAUTION **1. Fuel mixture trouble could result if the plunger does not seat properly in its rest position after the choke knob is returned.**

Top End Disassembly

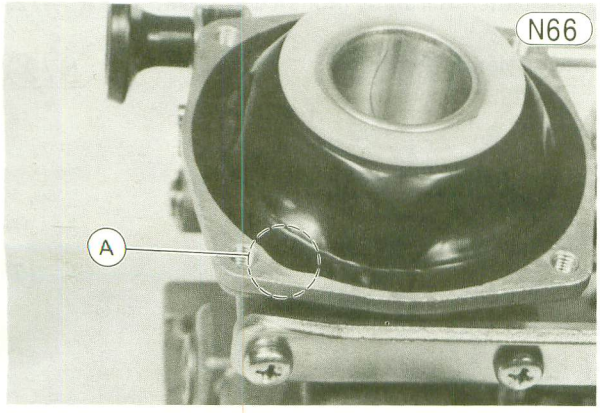
- Remove the upper chamber cover screws ⑧ (4), and take off the cover ① and spring ②.
- Pull off the vacuum piston and diaphragm assembly with the jet needle ⑤.

CAUTION **1. During carburetor disassembly, be careful not to damage the diaphragm. Never use a sharp edge to remove the diaphragm.**

- Take out the spring seat ③ and jet needle.
- To remove the pilot screw ⑯, punch and pry off the plug ⑭ with an owl or other suitable tools, turn in the pilot screw and count the number of turns until it seated fully but not tightly, and then remove the pilot screw, spring ⑰ and O-ring ⑮. This is to set the pilot screw on its original position when assembling.

Top End Assembly Notes:

1. Replace any O-ring, diaphragms, plastic plug, and gasket if damaged or deteriorated.
2. When installing the vacuum piston and diaphragm assembly, align the diaphragm tongue with the notch in the upper chamber cover mating surface, and fit the diaphragm sealing lip into its groove.

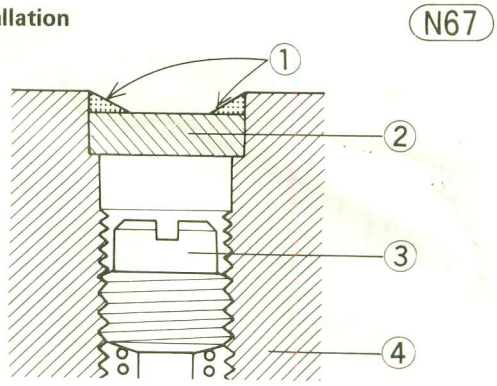


A. Align tongue with notch.

3. After installing the upper chamber cover, check that the vacuum pistons slide up and down smoothly without binding in the carburetor bores.
4. Turn in the pilot screw fully but not tightly, and then back it out the same number of turns counted during disassembly.
5. Install a new plug in the pilot screw hole, and apply a small amount of a bonding agent to the circumference of the plug to fix the plug.

CAUTION **1. Do not apply too much bond on the plug to keep the pilot screw itself from being fixed.**

Plug Installation



1. Apply a bonding agent.
2. Plug
3. Pilot Screw
4. Carburetor Body

Bottom End Disassembly:

- Remove the float bowl screws (4), and take off the float bowl ㉘, gasket ㉗, O-ring ㉔, and aluminum plug ㉓.
- Pull off the plastic plug ㉟, and unscrew the pilot jet ㉝.
- Remove the main jet ㊳ and washer, and push on the top of the needle jet with a wooden or other soft rod, and it will fall out the bottom of the carburetor.
- Using a starting punch, start the float pin ㉖, pull off the pin, and remove the float ㉕.

CAUTION **1. Be careful not to damage the float pin holder by hitting the holder instead of the pin.**

- Remove the screw ㊵ and holding plate ㊴, and pull out the float valve assembly (valve needle ㊹, valve seat ㊸, O-ring ㊷, and filter ㊶).

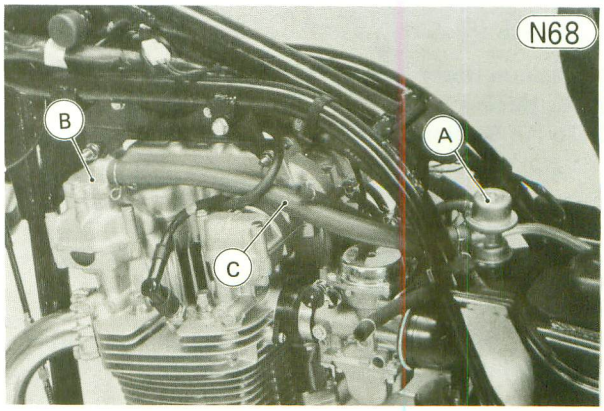
MUFFLERS

The procedures are the same as those for KZ750-G1. See Pg. 232.

VACUUM SWITCH VALVE (US Model)

Removal:

- Remove the fuel tank.
- Slide the clamps out of place, and pull the air hose off each air suction valve cover.

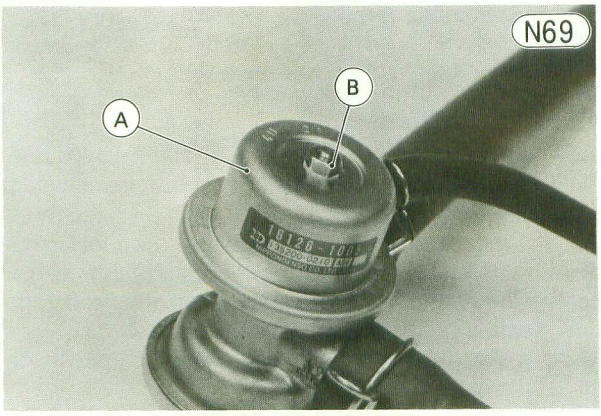


A. Vacuum Switch Valve
B. Air Suction Valve Cover
C. Air Hose

- Slide the clamps out of place, and pull the vacuum hoses off the carburetors.
- Pull the vacuum switch valve and the hoses free of the motorcycle.

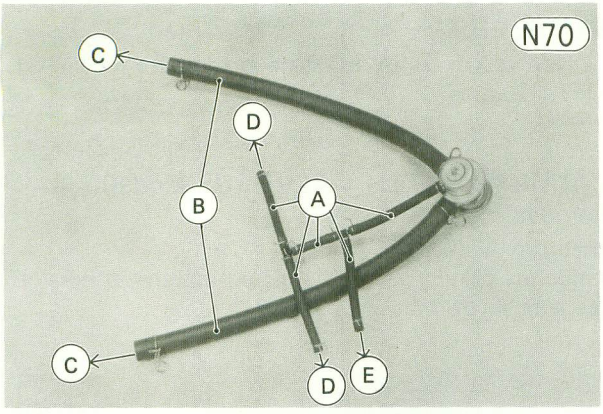
Installation:

CAUTION **1. Do not turn the paint-locked screw on the vacuum switch valve. Changing the position of the screw upsets the pre-load of the diaphragm spring inside the valve, and could cause malfunctioning of the exhaust emission control system.**



A. Valve **B. Do not turn this screw.**

NOTE: 1. Secure each hose end of the fitting with a clamp. Be sure that all hoses are routed without being flattened or kinked.

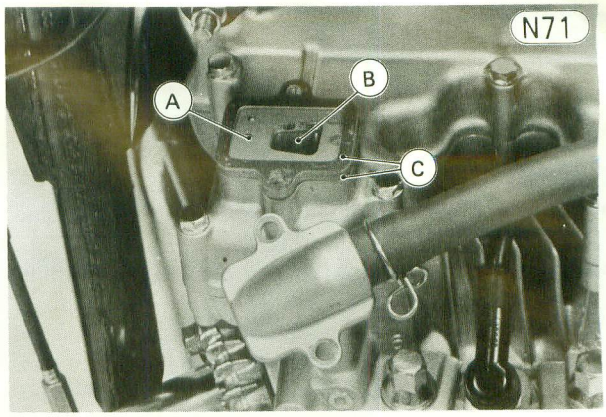


A. Vacuum Hoses
B. Air Hoses
C. To Air Suction Valve
D. To Carburetor
E. To Fuel Tap

AIR SUCTION VALVES (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. There are gaskets on both sides of the valve assembly.



A. Valve Assembly **C. Gaskets**
B. Valve Reed

Installation Notes:

1. Check the air suction valve assembly, and replace it with a new one if it is damaged (Pg. 276).
2. Tighten the cover bolts to 1.2 kg-m (104 in-lbs) of torque with a flat washer installed under each bolt head.

CYLINDER HEAD

Refer to Pgs. 48 – 49, noting the following:

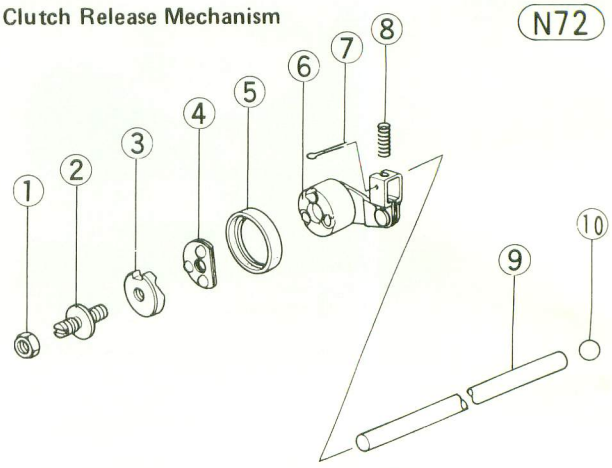
1. Each cylinder head nut has a flat washer.

CLUTCH, CLUTCH RELEASE

Refer to Pgs. 58~59 and 64~66, noting the following:

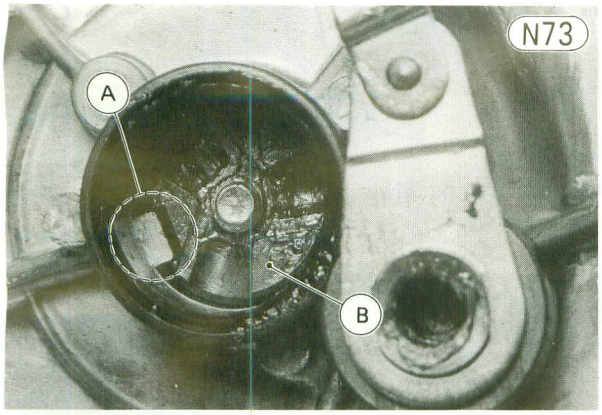
1. Tighten the clutch hub nut to 12.0 kg-m (87 ft-lbs) of torque.
2. The clutch release is modified as shown in Fig. N72.

Clutch Release Mechanism



1. Locknut
2. Adjusting Screw
3. Ball Ramp Plate
4. Ball Assembly
5. Grease Seal
6. Release Lever
7. Cotter Pin
8. Spring
9. Push Rod
10. Steel Ball

3. Wash and clean the clutch release lever, steel ball assembly, and ball ramp plate with a high flash-point solvent. Dry and lubricate them with grease.
4. Install the adjusting screw and ball ramp plate, aligning the ridge on the engine sprocket cover with the groove in the ball ramp plate.



A. Fit the ridge and the groove. B. Ramp Plate

CAMSHAFT

Refer to Pgs. 45 – 47, noting the foolowing:

1. The spark plug lead clams (2) on the cylinder head cover are eliminated.

PISTON, PISTON RINGS

Removal and Installation:

Piston ring installation procedures are changed. See Pgs. 66 – 68 with the following exception.

1. If the top ring or oil ring has an "N" mark near the ring end, install the ring so that the "N" mark side faces up. If there is no marks on the ring, the ring can be installed with either side facing up.

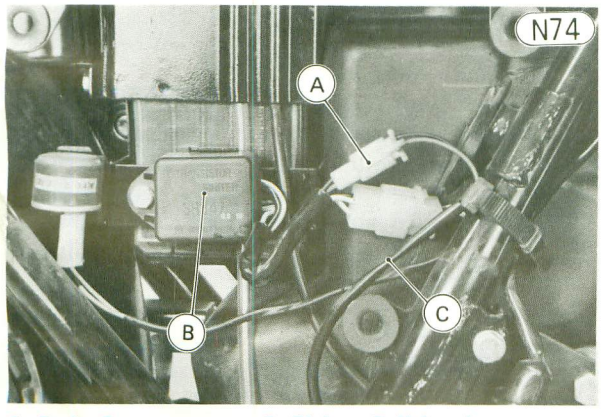
CONTACT BREAKER, CAPACITOR

The ignition system for this model is transistorized and controls the current for the primary circuit by use of a solid-state electronic switching unit called a Darlington power transistor. So there are no mechanical contact breaker points and capacitor.

PICKUP COIL

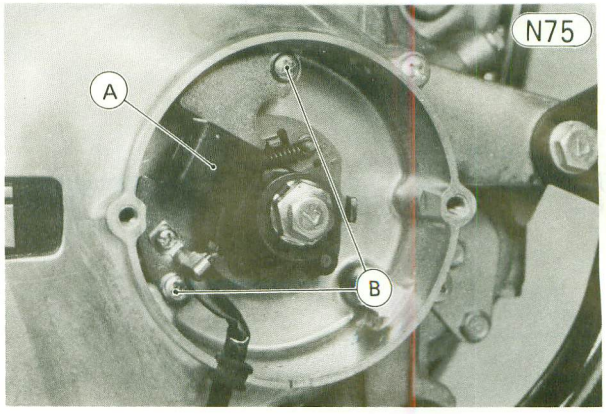
Removal:

- Remove the pickup coil cover screws (2), and take off the cover and gasket.
- Remove the right side cover.
- Disconnect the 2-pin connector that joins the pickup coil leads to the IC igniter, and slide the leads free from the clamps.



A. 2-pin Connector C. Pickup Coil Leads
B. IC Igniter

- Remove the mounting screws (2), and take off the pickup coil assembly.

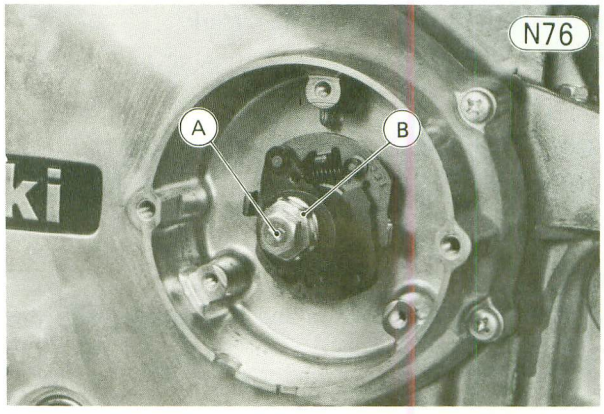


A. Pickup Coil Assembly B. Screws

TIMING ADVANCER

Removal:

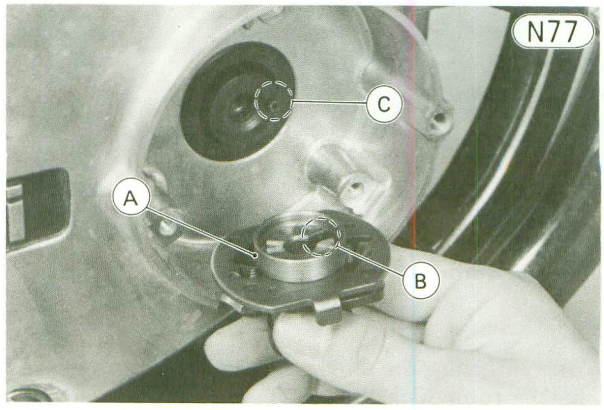
- Remove the pickup coil assembly.
- With a 17 mm wrench on the crankshaft rotation nut to keep the shaft from turning, remove the mounting bolt, and take off the rotation nut and the timing advancer.



A. Mounting Bolt B. Rotation Nut

Installation:

- Fit the timing advancer onto the crankshaft, matching its notch with the pin in the end of the crankshaft.

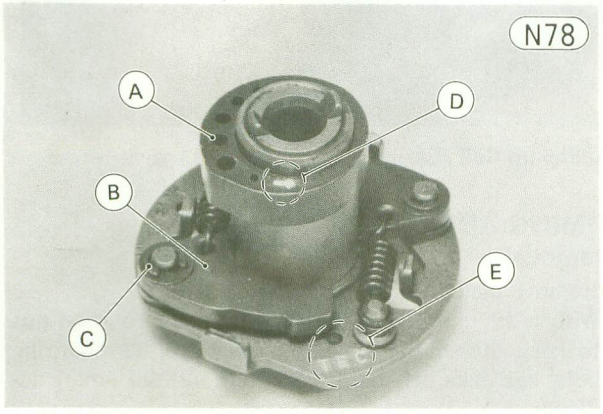


A. Timing Advancer B. Notch C. Pin

- 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.
- Install the pickup coil assembly.

Disassembly:

- Pull off the timing rotor by turning it counterclockwise.

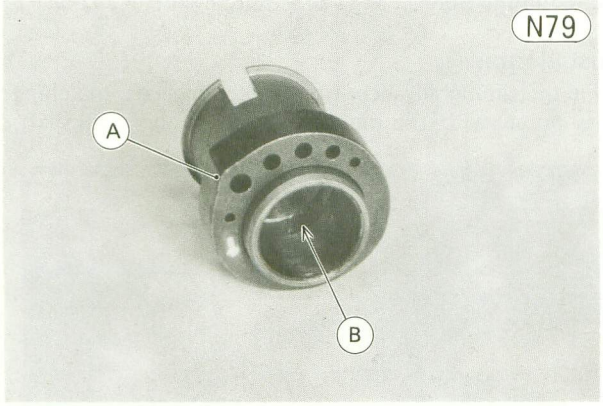


A. Timing Rotor
B. Weight
C. Clip
D. Arrow Mark
E. TEC Mark

- Remove the clips (2), washer (2), and weights (2).
- Remove the thrust washer(s) from each weight shaft.

Assembly Notes:

1. Wipe the advancer clean, and fill the groove in the timing rotor with grease.



A. Timing Rotor **B. Grease**

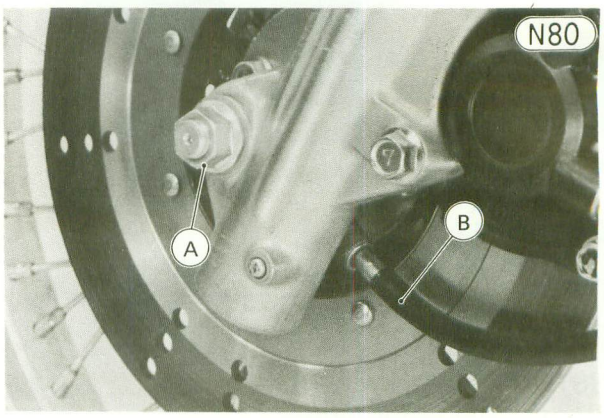
2. When installing the timing rotor, align the arrow mark on the rotor with the "TEC" mark on the advancer body (Fig. N78).

FRONT WHEEL

Refer to Pgs. 97 – 99 and Pg. 232, noting the following:

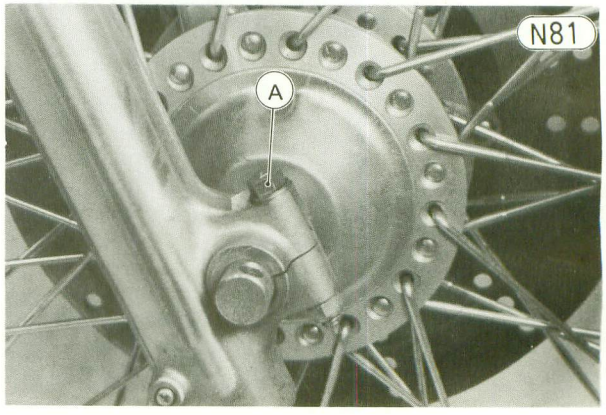
Removal:

- Disconnect the lower end of the speedometer cable with pliers.



A. Front Axle Nut **B. Speedometer Cable**

- Loosen the axle clamp bolt.



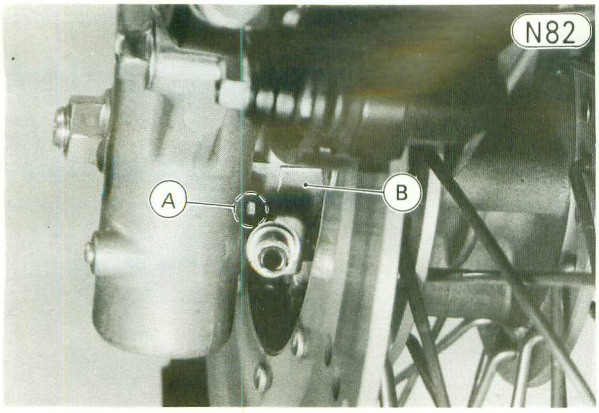
A. Axle Clamp Bolt

- Remove the front axle nut.
- Use a jack under the engine or other suitable means to light the front of the motorcycle.
- Remove the front axle and drop the front wheel out of the forks, and remove it.
- Insert a wood wedge (7 – 8 mm thick) between the disc brake pads. This prevent them from being moved out of their proper position, should the brake lever be squeezed accidentally.

CAUTION **1. Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc.**

Installation Notes:

1. Install the speedometer gear housing as shown. Be sure that the small projection on the front fork does not catch on the speedometer gear housing.



A. Small Projection **B. Speedometer Gear Housing**

2. Tighten the front axle nut to 8.0 kg-m (58 ft-lbs) of torque.
3. Tighten the front axle clamp bolt to 1.8 kg-m (13.0 ft-lbs) of torque.

FRONT DISC BRAKE

Refer to Pgs. 99 – 104 and Pgs. 232 – 234, noting the following:

NOTE: 1. Tightening torque for the parts related to disc brake is changed as shown in Table N23.

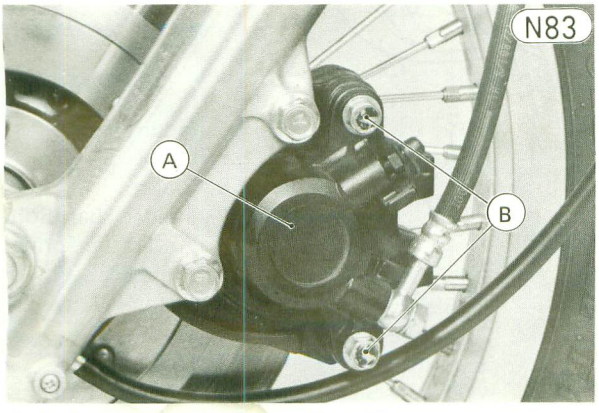
Table N23 Disc Brake Torque

Bleed valve	0.80 kg-m	69 in-lbs
Brake Lever pivot bolt	0.30 kg-m	26 in-lbs
Brake lever pivot bolt locknut	0.60 kg-m	52 in-lbs
Caliper holder shaft bolts	1.8 kg-m	13.0 ft-lbs
*Caliper mounting bolts	4.0 kg-m	29 ft-lbs
Disc mounting Allen bolts	2.3 kg-m	16.5 ft-lbs
Fitting (banjo) bolts	3.0 kg-m	22 ft-lbs
*Master cylinder clamp bolts	0.90 kg-m	78 in-lbs

* : Retorque these parts according to Periodic Maintenance Chart (Pg. 253).

Pad Removal:

- Remove the caliper holder shaft bolts (2).

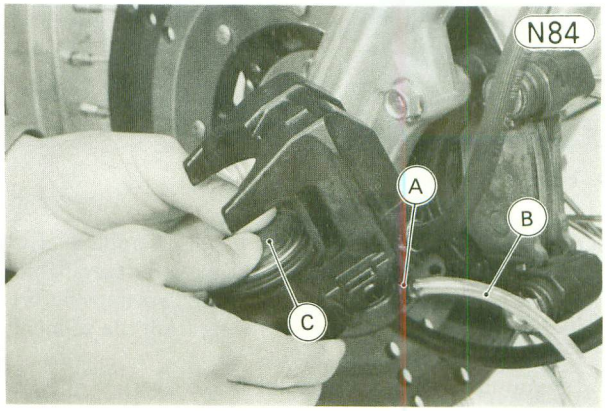


A. Caliper **B. Holder Shaft Bolts**

- Lift the caliper off the holder, and remove the pads.

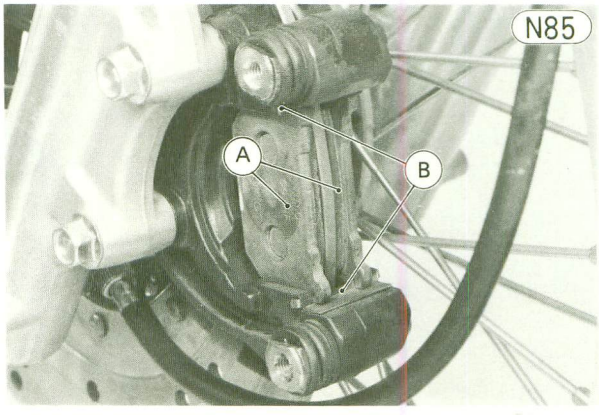
Pad Installation:

- 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 (2) are in place.
- Fit the pads against the disc.



A. Pads **B. Sliders**

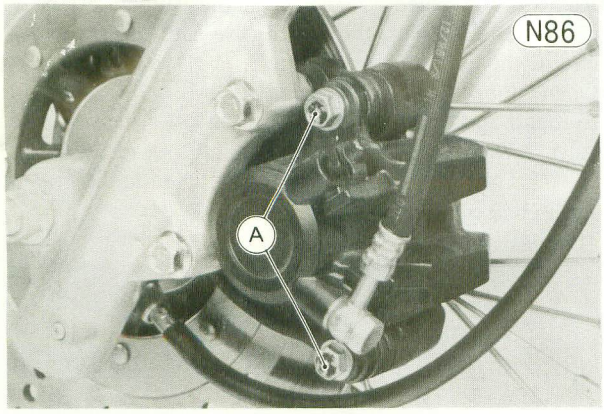
- Check that the anti-rattle spring is in place. If it was removed, install it to the caliper as shown in Fig. N91.
- Install the caliper, and tighten the caliper holder shaft bolts to 1.8 kg-m (13.0 ft-lbs) of torque.
- Since some brake fluid was lost when the bleed valve was opened, check the fluid level in the master cylinder and bleed the air from the brake system (Pg. 180).
- Check the brake.

WARNING

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

Caliper Removal:

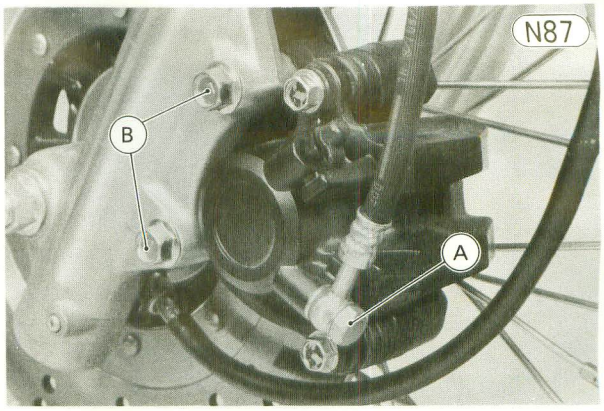
●If the caliper is to be disassembled, loosen the caliper holder shaft bolts (2).



A. 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 (Pg. 265).
○Pump the piston out with the brake lever.

●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.



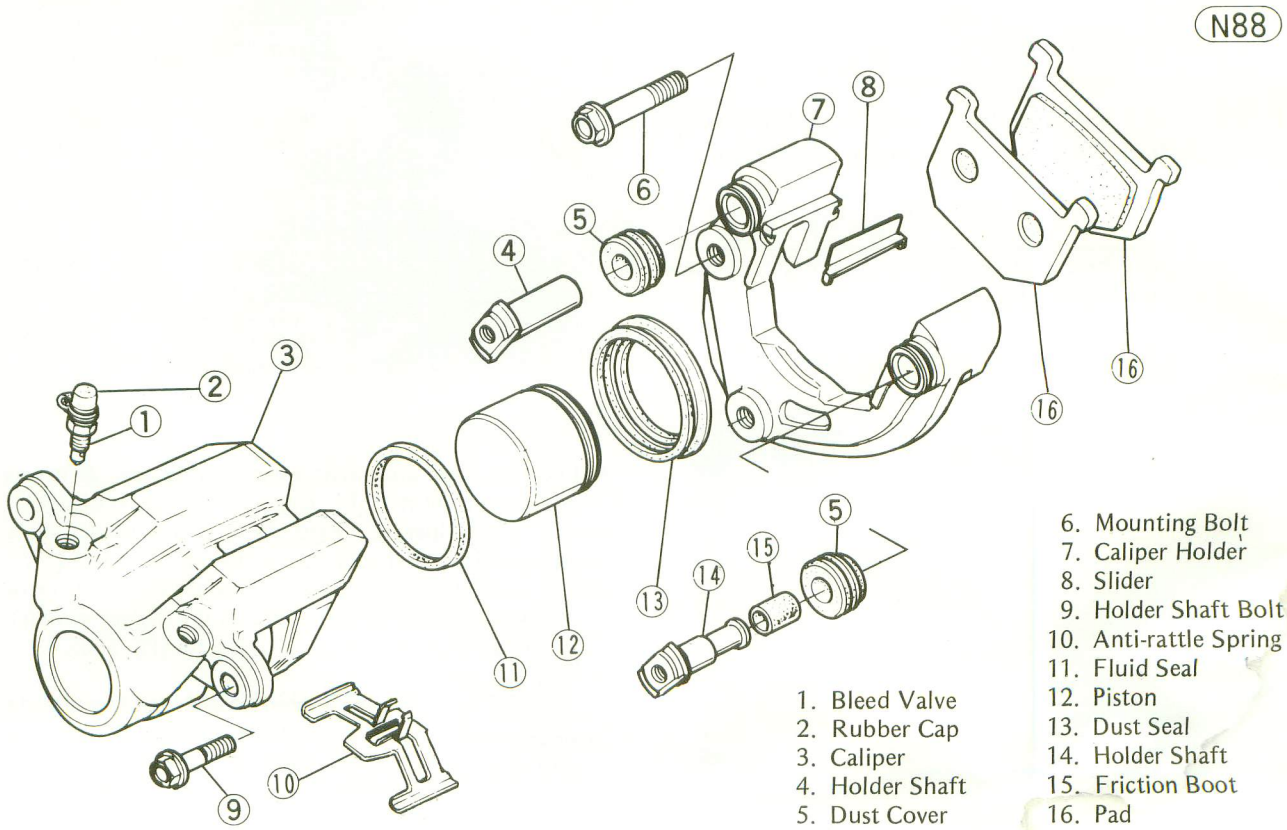
A. Banjo Bolt **B. Mounting Bolts**

●Remove the mounting bolts (2), and take off the caliper.

Caliper Installation Notes:

1. Tighten the front caliper mounting bolts to 4.0 kg-m (29 ft-lbs) of torque.
2. Tighten the caliper holder shaft bolts 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. 180).

Front Caliper



1. Bleed Valve
2. Rubber Cap
3. Caliper
4. Holder Shaft
5. Dust Cover
6. Mounting Bolt
7. Caliper Holder
8. Slider
9. Holder Shaft Bolt
10. Anti-rattle Spring
11. Fluid Seal
12. Piston
13. Dust Seal
14. Holder Shaft
15. Friction Boot
16. Pad

WARNING

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

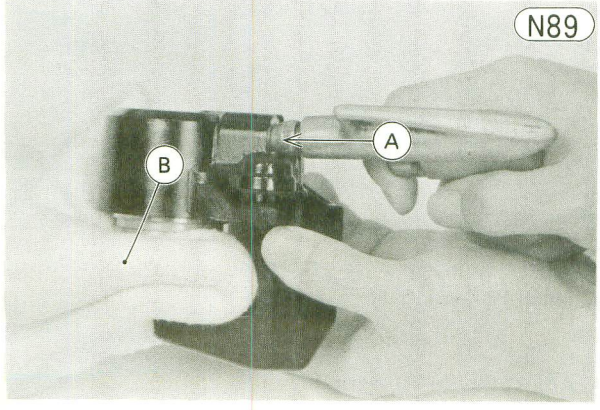
Caliper Disassembly:

- Remove the caliper holder shaft bolts ⑥ (2). amd pull out the caliper holder ⑦ and the pads ⑯ (2).
- Remove the holder shafts ④ and ⑭ with the dust covers ⑤ . There is the friction boot ⑮ on the shaft that diameter is smaller than the other.
- Remove the anti-rattle spring ⑩.
- Remove the dust seal ⑬ around the piston ⑫.
- 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

1. To avoid serious injury, never place your fingers or palm inside the caliper opening. If you apply compressed air into the caliper, the piston may crush your hand or fingers.

NOTE: 1. If compressed air is not available, reconnect the brake line and pump the piston out with the brake lever.



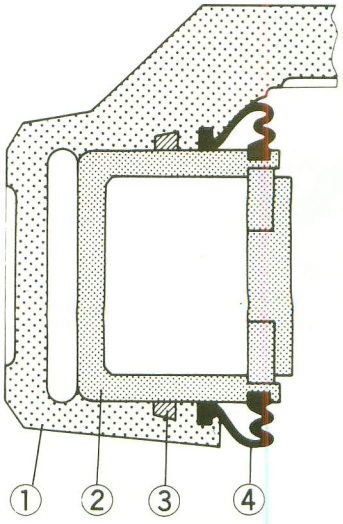
A. Compressed Air **B. Heavy Cloth**

- Taking care not to damage the cylinder surface, remove the fluid seal ⑪ with a hook.

Caliper Assembly Notes:

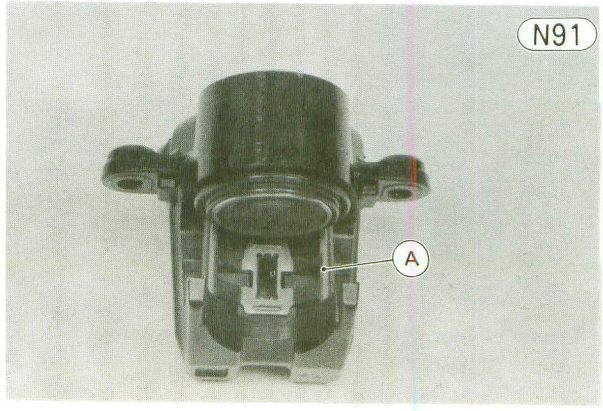
1. Clean the caliper parts with brake fluid or alcohol (See CAUTION – Pg. 99).
2. It is recommended that the fluid seal, which is removed, be replaced with a new one.
3. Replace the dust covers and friction boot if they were damaged.
4. Apply brake fluid to the outside of the piston and the fluid seal, 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 N90



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 grease is a special high temperature, water-resistance grease).
7. Install the anti-rattle spring to the caliper as shown.



A. Anti-rattle Spring

8. Do not forget to tighten the holder shaft bolts after installing the caliper on the motorcycle (Pg. 266).

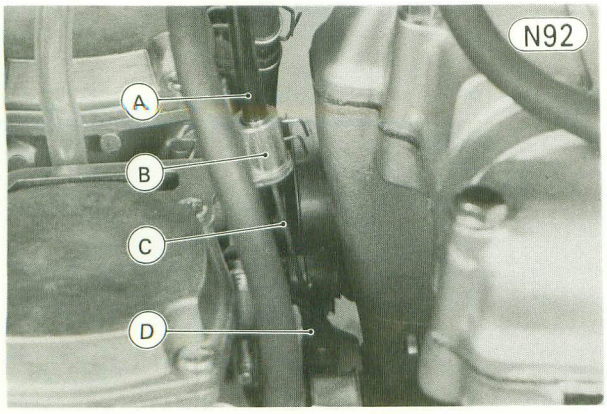
REAR WHEEL

The procedures are the same as those for KZ750-G1. See Pgs. 234 – 236.

THROTTLE CABLE

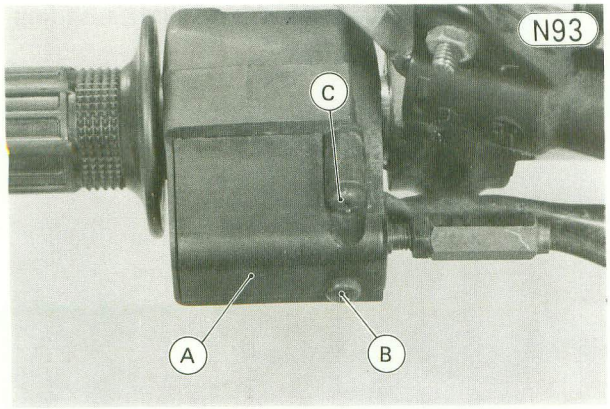
Removal:

- Lift the lower end of the outer throttle cable off the cable bracket on the carburetor, slip the inner cable tip out of the pulley, and free the lower end of the throttle cable from the carburetors.



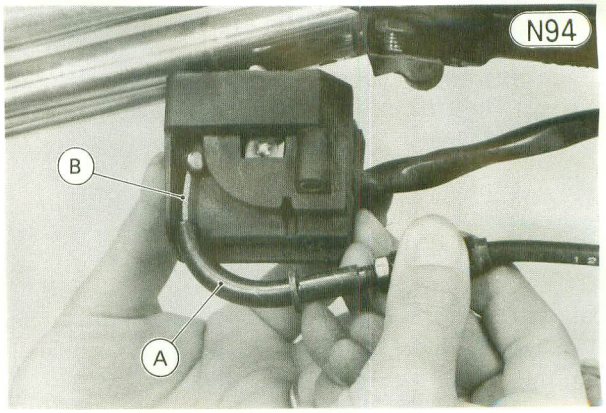
A. Outer Throttle Cable
B. Cable Bracket
C. Inner Throttle Cable
D. Pulley

- Remove the cable elbow holder screw, and remove the elbow holder from the lower half of the right switch housing.



A. Elbow Holder
B. Holder Screw
C. Switch Housing Screw

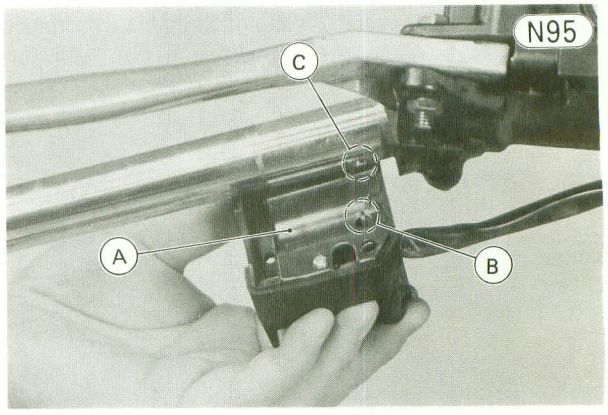
- Remove the right switch housing screws (2), and open the housing.
- Slip the throttle cable tip form its catch in the throttle grip, and pull out the cable through the right cable guide of the steering stem head.



A. Cable Elbow
B. Throttle Cable

Installation Notes:

1. Before installing the throttle cable, lubricate it.
2. The cable should be naturally routed.
3. The lower half of the housing has a small projection which fits into a hole in the handlebar.



A. Switch Housing
B. Small Projection
C. Hole

4. Adjust the throttle grip play (Pg. 254).

FRONT BRAKE LIGHT SWITCH

The procedures are the same as those for KZ750-G1. See Pg. 236.

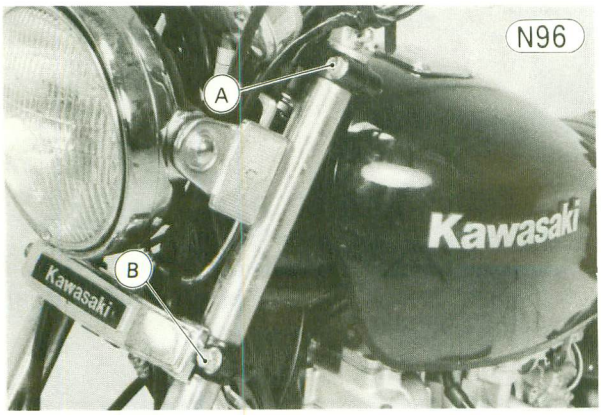
STEERING STEM

See pgs. 119 – 122 and Pgs. 236 – 237.

FRONT FORK

Removal:

- To remove the left fork leg, remove the caliper mounting bolt and caliper, and rest the caliper on some kind of stand so that it does not dangle.
- Remove the front wheel (Pg. 264).
- 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.

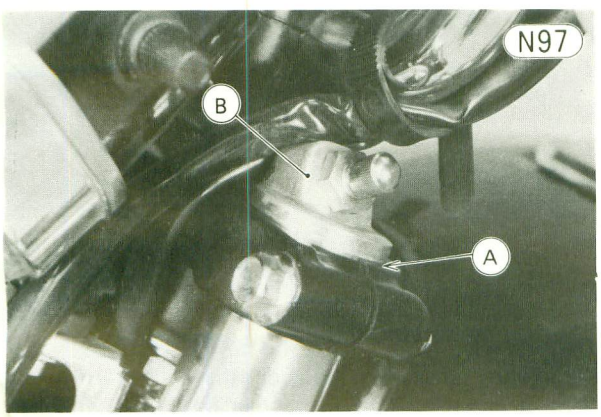


A. Upper Clamp Bolt **B. Lower Clamp Bolt**

- With a twisting motion, work the fork legs down and out.

Installation Notes:

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, and the air valve points to the outside.

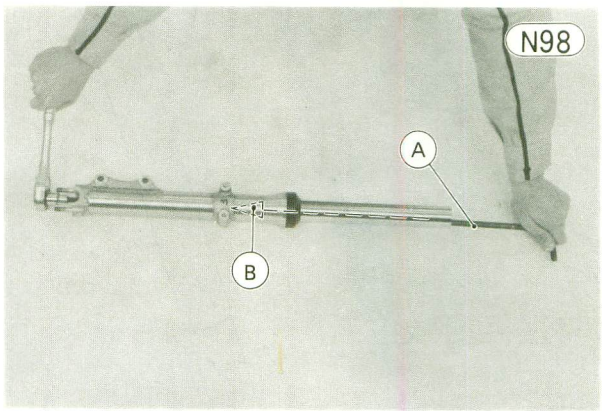


A. Inner Tube Upper End **B. Air Valve**

2. Check and adjust the following items as if necessary:
   - ○*Front* Brake (Pg. 177)
   - ○Fork Oil Level (Pg. 278)
   - ○Fork Air Pressure (Pg. 256)

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 innner tube from the outer tube by pulling it out.

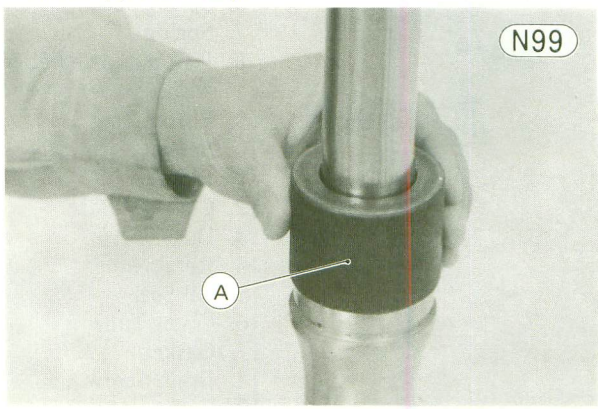


A. Front Fork Cylinder Holder Handle: 57001-183
B. Adapter: 57001-1011

- 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.

Assembly Notes:

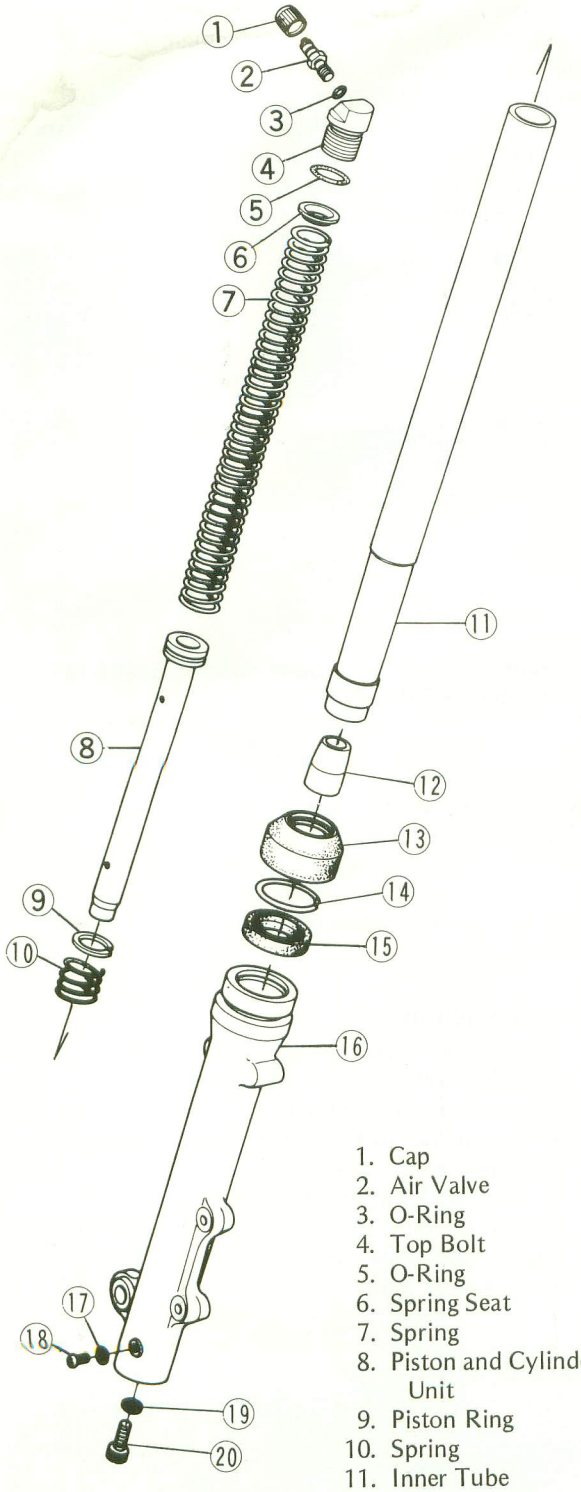
1. Apply liquid gasket to both sides of the gasket of the Allen bolt, apply a non-permanent locking agent to the Allen bolt, and tighten it using the front fork cylinder holder handle and adapter (special tools) to stop the cylinder from turning. The torque for the Allen bolt is 2.3 kg-m (16.5 ft-lbs).
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

Front Fork

N100



1. Cap
2. Air Valve
3. O-Ring
4. Top Bolt
5. O-Ring
6. Spring Seat
7. Spring
8. Piston and Cylinder Unit
9. Piston Ring
10. Spring
11. Inner Tube
12. Cylinder Base
13. Dust Seal
14. Retainer
15. Oil Seal
16. Outer Tube
17. Gasket
18. Drain Screw
19. Gasket
20. Allen Bolt

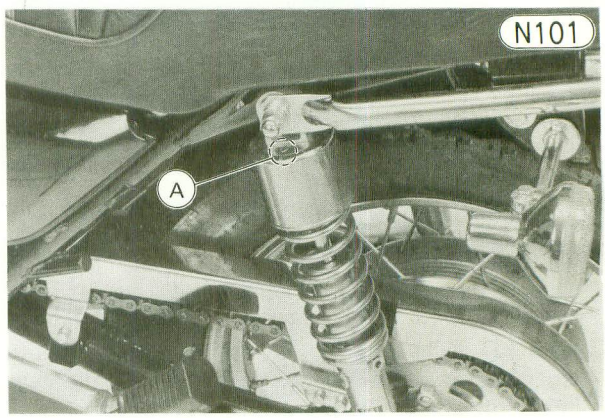
3. If the drain screw is removed, check the gasket for damage. Replace the damaged gasket with a new one. Before installing the drain screw, apply a liquid gasket to the threads of the screw, and tighten the screw securely.
4. Check the O-rings for damage. Replace them with new ones if damaged.
5. Apply a non-permanent locking agent to the threads of the air valve, and tighten the valve to 0.80 kg-m (69 in-lbs) of torque.
6. Tighten the top plug to 2.3 kg-m (16.5 ft-lbs) of torque.

REAR SHOCK ABSORBERS

Refer to Pg. 237, noting the following:

1. Install the rear shock absorber so that the arrow on the upper bracket of each absorber must point toward the out side.

N101



A. Arrow

SWING ARM

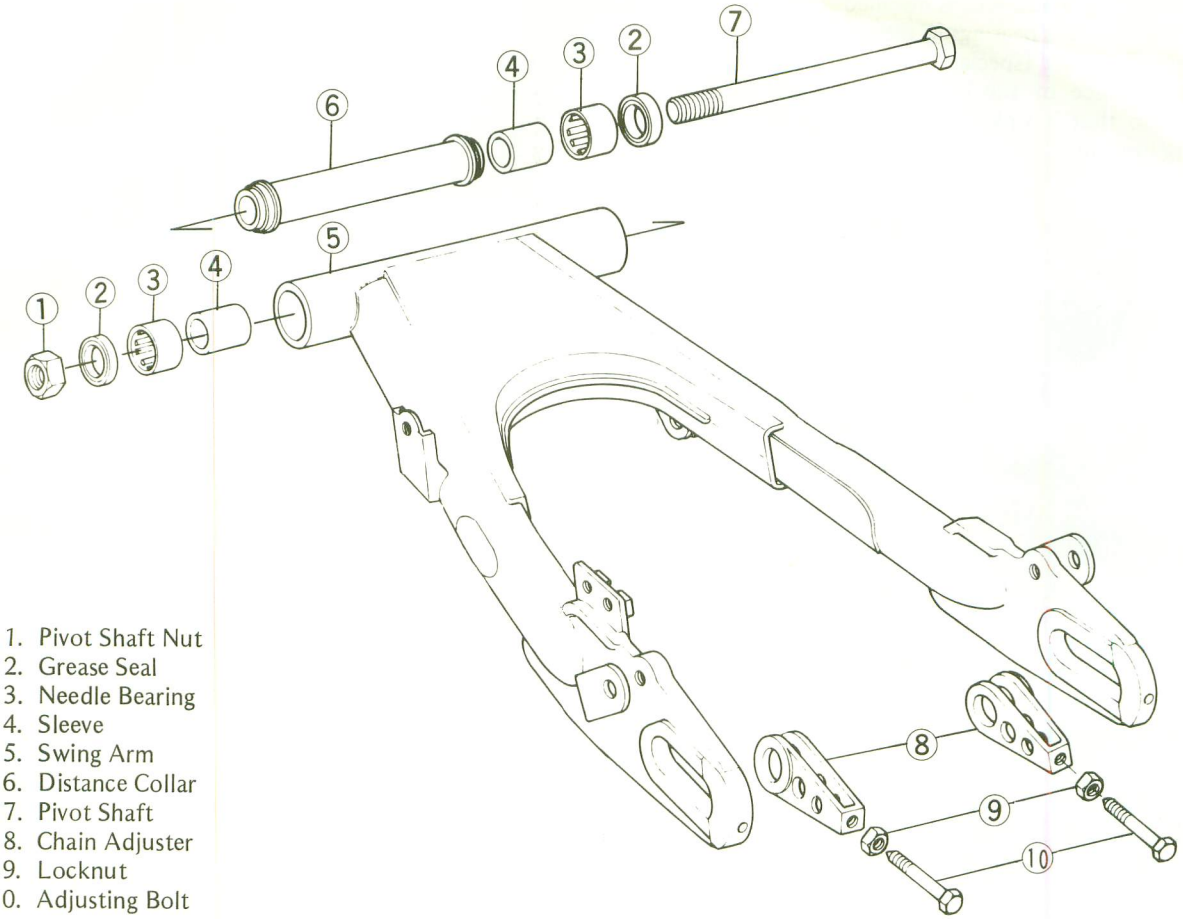
Refer to Pg. 237, noting the following:

Installation Notes:

1. Inspect the grease seals on the swing arm pivot for damage. Replace the damaged seals with new ones.
2. Lubricate the swing arm needle bearings (Pg. 279).
3. Tightening torque for the pivot shaft nut is 10.0 kg-m (72 ft-lbs).
4. Move the swing arm up and down to check for abnormal friction.
5. Adjust the drive chain (Pg. 257) after installation.

Swing Arm

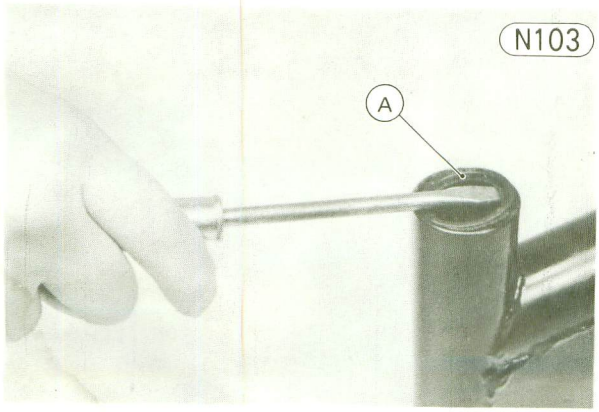
N102



1. Pivot Shaft Nut
2. Grease Seal
3. Needle Bearing
4. Sleeve
5. Swing Arm
6. Distance Collar
7. Pivot Shaft
8. Chain Adjuster
9. Locknut
10. Adjusting Bolt

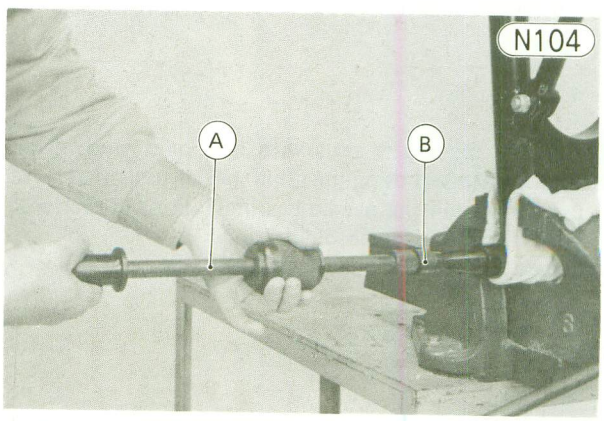
Disassembly:

●Pull the sleeve ④ out of each side of the swing arm.
●Pry the grease seals ② off the swing arm.



A. Grease Seal

●Pull out the needle roller bearings ③ using the oil seal and bearing remover and adapter (special tools).



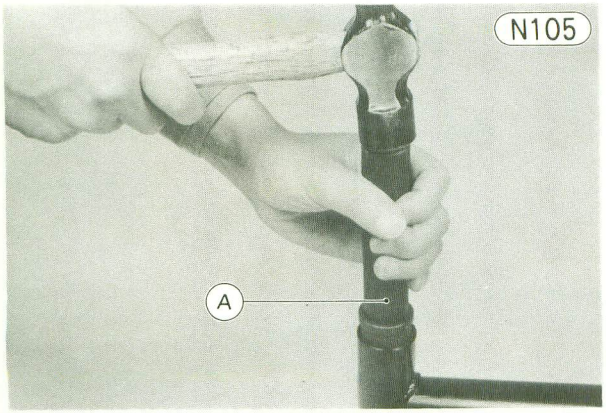
A. Remover: 57001-1058 B. Adapter: 57001-1061

●Pull the distance collar ⑥ out of the swing arm.

Assembly:

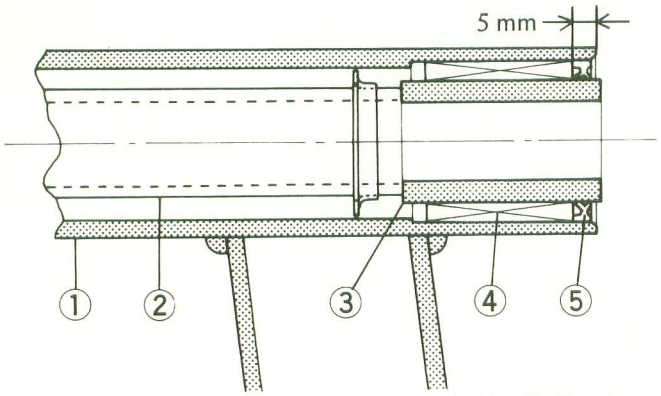
Swing Arm Assembly

1. Put the distance collar into the swing arm after the needle bearing on one side is installed.
2. Install new needle bearings in the swing arm using the bearing driver set (special tools). Apply oil to the outside surface of the bearings, and press in each bearing so that it sinks 5 mm from the end of the bearing housing.



A. Bearing Driver Set: 57001-1129

Swing Arm Bearing Installation N106



1. Swing Arm
2. Distance Collar
3. Sleeve
4. Needle Bearing
5. Grease Seal

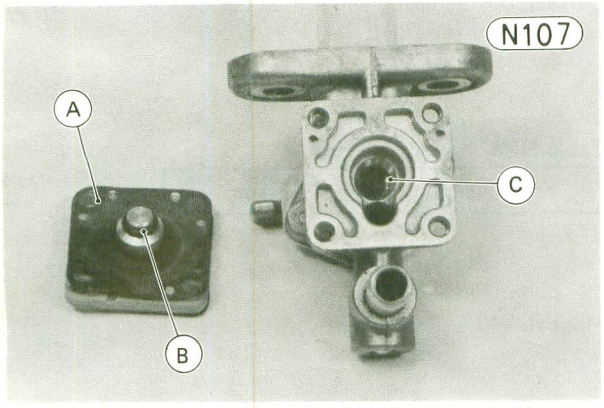
3. Replace the grease seals with new ones, and install each grease seal using the same special tools that were used to install the needle bearings. Press in each seal until it stops at the needle bearing.
4. Grease the swing arm bearings (Pg. 279).

Maintenance

FUEL TANK, FUEL TAP

If fuel leaks from the tank cap or from around the fuel tap or if there is any doubt as to the operation of the fuel tap, inspect the fuel tap and tank cap as follows:

- Drain the fuel tank.
- Remove the fuel tank, and remove the fuel tap from the tank.
- Disassemble the fuel tap, and inspect the parts and surfaces listed below for deterioration, swelling, scratch, or other damage.
  - O-rings: one on the fuel tap body and another on the diaphragm assembly
  - Valve O-ring seating surface
  - Diaphragm
  - Rubber tank cap gasket
  - Mating surfaces: diaphragm cover, tap body, tap lever, and fuel tank
  - Valve gasket



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

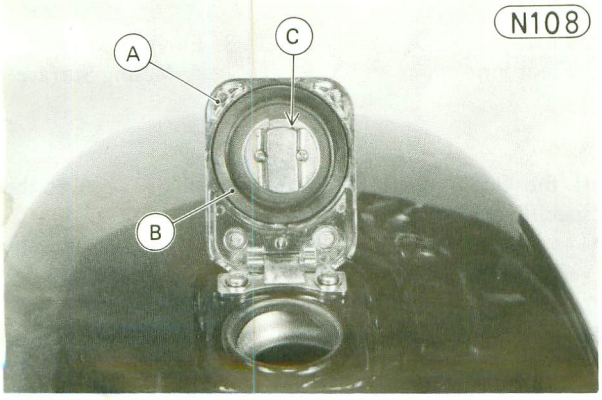
★Replace the damaged parts.

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

CAUTION **1. Do not use wire for cleaning as this could damage the check valve, O-ring seat, and diaphragm mating surfaces.**

If sufficient fuel does not reach the carburetors, the air vent in the tank cap may be obstructed.

- Disassemble the tank cap.
- Use compressed air to clear an obstructed vent.



A. Tank Cap B. Gasket C. Air Vent

CARBURETORS

Carburetor trouble can be caused by dirt, wear, maladjustment, or improper fuel level in the float chamber. A dirty or damaged air cleaner can also alter the fuel-to air ratio. Refer to Pgs. 130 – 136, noting the following:

Table N24 Mixture Trouble Symptoms

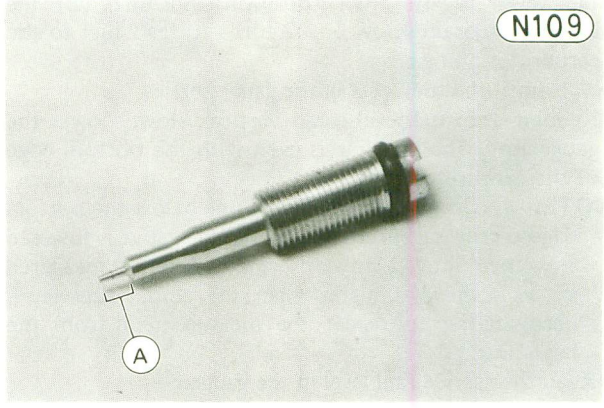
Poor running
Overheating
Exhaust smokes excessively
Frequent backfiring in the exhaust system during engine braking

Pilot System

Cleaning and replacement

- Remove the pilot screw, and check that the tapered portion of the pilot screw is not worn or otherwise deformed.

★If it is, replace the screw.



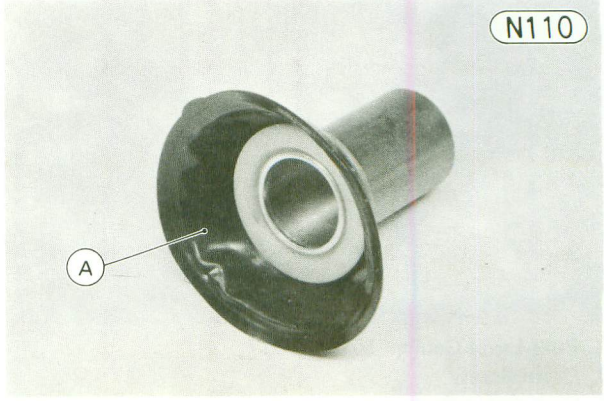
A. Tapered Portion

Main System

Cleaning and replacement

- Visually inspect the diaphragms of the vacuum pistons.

★If there is any damage, the diaphragm should be replaced.



A. Vacuum Piston Diaphragm

Table N25 Carburetor Specifications

Type	Main Jet	Needle Jet	Jet Needle	Pilot Jet	Starter Jet
BS34	115	Y-9	5C50	45	70

Float System

Service fuel level measurement and adjustment

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

WARNING

1. 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.

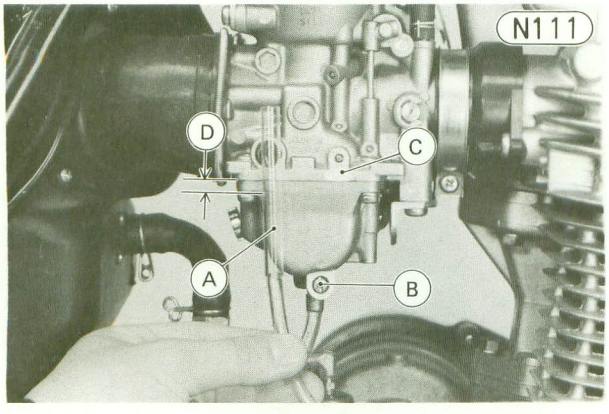
- Hold the carburetor in a true vertical position.
- Prepare a rubber hose (6 mm in diameter and about 300 mm long).
- Connect one end of the rubber hose with the carburetor float bowl, and insert the other end into the fule level gauge (special tool).
- Holding the gauge against the side of the carburetor body so that "0" line is several millimeters higher than the bottom edge of the carburetor body, turn the fuel tap lever to the "PRI" position and turn out the carburetor drain screw 1 – 2 turns to feed fuel to the carburetor and gauge.
- Wait until the fuel level in the gauge settles.
- Keeping the fuel level gauge vertical, slowly lower the gauge 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 gauge is lowered and then moved upwards, the fuel level measured shows somewhat higher than the actual fuel level, necessitating to repeat the measurement from the beginning.

- Read the service fuel level in the gauge.

Table N26 Service Fuel Level

Standard	3 ± 1 mm below from bottom edge of carburetor body to fuel level



A. Fuel Level Gauge: 57001-1017
B. Drain Screw
C. Carburetor Body
D. Service Fuel Level

- Tighten the drain screw, and remove the gauge and rubber hose.
- Measure the fuel level in the other carburetor in the same manner.
- Turn the fuel tap lever to the "ON" position to shut off the tap.

★If the fuel level is incorrect, adjust it as follows.

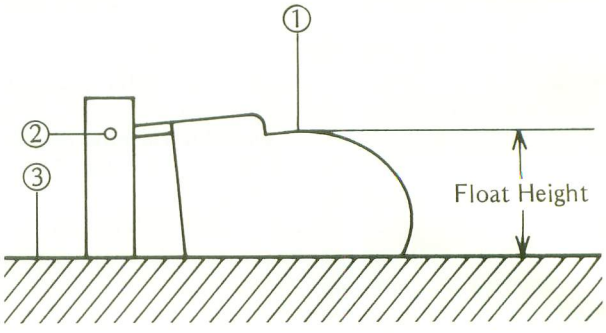
- Drain the carburetors, and remove the carburetors (Pg. 258).
- Remove the float bowls and gaskets.
- Put the carburetors upside down on the working bench, and measure the float height of each carburetor. Take measurements for both floats in each carburetor.

NOTE: 1. Float height is the vertical distance from the float bowl mating surface of the carburetor body to the top of the float.

Table N27 Float Height

Float Height	18.6 mm

Float Height Measurement N112



1. Float
2. Float Pin
3. Float Bowl Mating Surface

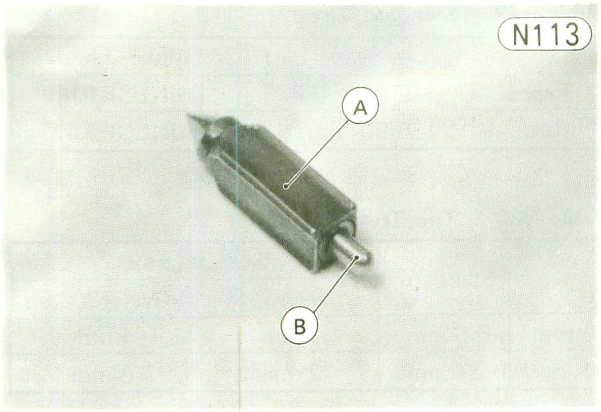
★If the float height is significantly below or over the specified value, adjust it as follows.

- Tap out the float pin, and remove the float and the valve needle.
- Check the valve needle and the valve seat for wear.

★If they are worn, replace them as an assembly.

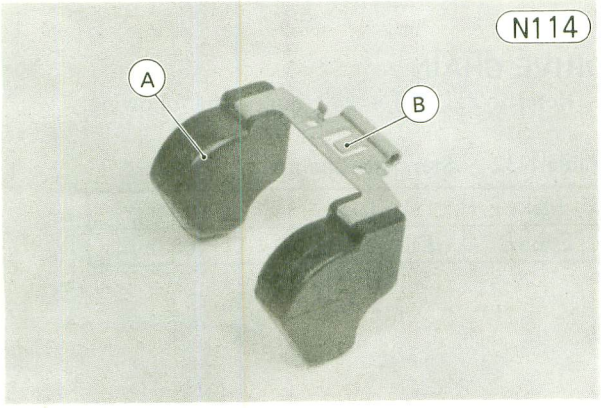
- Push the rod in the valve needle, then release it.

★If the rod does *not come out* fully by spring tension, replace the valve needle and valve seat as assembly.



A. Valve Needle **B. Rod**

●Bend the tang on the float a very slight amount to change the float height. Increasing the float height lowers the fuel level, and decreasing the float height raise the fuel level.



A. Float **B. Tang**

●After adjustment, assemble the carburetors, and measure the service fuel level again. Readjust if necessary.
★If the service fuel level cannot be corrected by adjusting the float height within the specified range, the float may be damaged necessitating float 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.

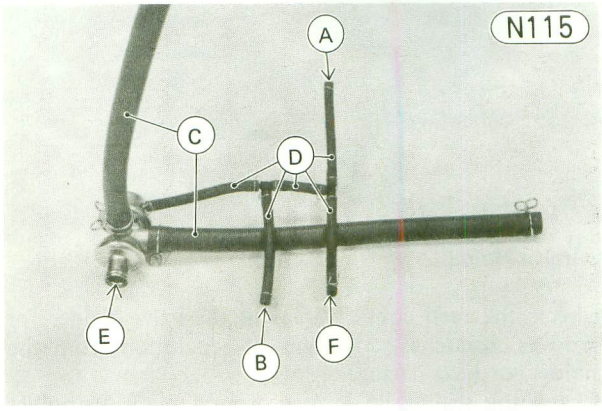
Regular inspection of the vacuum switch valve is not needed. If backfiring occurs frequently in the exhaust system during engine braking or if there are abnormal engine noises, check the vacuum switch valve as follows:

CAUTION **1. 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 flattered or kinked, and are connected correctly to the air cleaner housing, vacuum switch valve, 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.
●Remove the vacuum switch valve (Pg. 261).
●Connect the vacuum gauge and a syringe to the vacuum hoses, and plug the other vacuum hose.



A. Vacuum Gauge: 57001-1152 **D. Vacuum Hoses**
B. Syringe **E. Air**
C. Air Hoses **F. Plug**

●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. Adjsutment 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 **1. Do not apply a vacuum more than 50 cmHg to the vacuum switch valve as this could damage the diaphragm in the valve.**

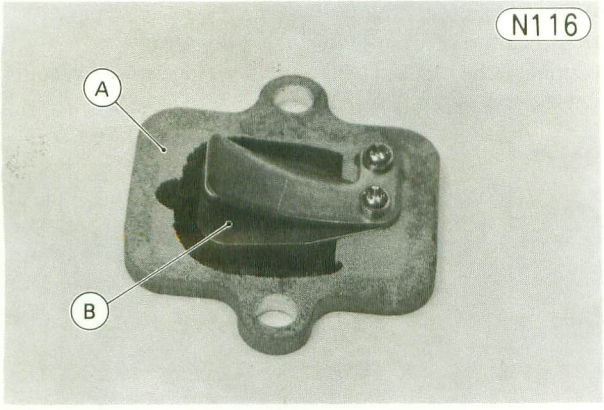
●Conversely, gradually lower the vacuum (raise the pressure) applied from the high vacuum, and check the valve operation. The valve will return to its original state just the reverse way as it came, but the transition should occur when the vacuum comes to a level below 37 cmHg.
★If the valve does not work as specified, replace the valve with a new one.

AIR SUCTION VALVE

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. Reed**

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

WHEELS

Refer to Pgs. 170 – 172, noting the following:

Table N28 Tire Air Pressure (when cold)

Front	1.75 kg/cm² (25 psi, 175 kPa)	
Rear	Up to 97.5 kg (215 lbs) load	1.75 kg/cm² (25 psi, 175 kPa)
	97.5 – 180 kg (215 – 397 lbs) load	2.00 kg/cm² (28 psi, 200 kPa)

Table N29 Standard Tire

	Size	Make, Type
Front	3.25H-19 4PR	DUNLOP F14
Rear	130/90-16 67H	DUNLOP K427

Table N30 Tire Tread Depth

	Standard	Service Limit	
		Under 130 kph	Over 130 kph
Front	3.5 mm	1 mm	1 mm
Rear	7.4 mm	2 mm	3 mm

Table N31 Rim Size

Front	MT 1.85 x 19
Rear	MT3.00 x 16

DRIVE CHAIN

Refer to Pgs. 241 – 242, noting the following:

Table N32 Standard Chain

Make	Type	Link
Enuma	EK530SH-T3O	106 link

SPROCKETS

Refer to Pg. 176, noting the following:

Table N33 Sprocket Diameter

	Standard	Service Limit
Rear	176.20 – 176.60 mm	175.9 mm

FRONT DISC BRAKE

Refer to Pgs. 177 – 182 for other service information not specifically mentioned here.

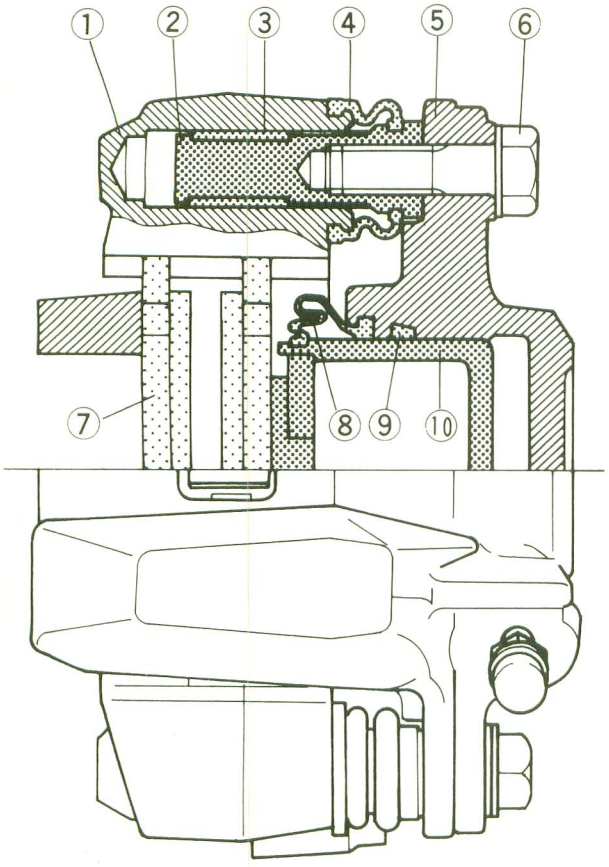
Caliper

The front wheel has a floating-type caliper. The caliper assembly includes two pads ⑦, and the piston ⑩, which is inside the caliper cylinder. Through the caliper run two shafts ②, which also pass through the caliper holder ① to mount the assembly to the fork leg.

When the piston forces the piston side pad against the disc, the shaft portion of the caliper assembly slides through the holder such that the another pad is also forced against the disc, both brake pads being kept parallel to the disc.

Front Caliper

N117



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

Pad wear

Inspect the pads for wear. Check the thickness of the pad linings, and replace both pads as a set if the thickness of either pad is less than 1 mm.

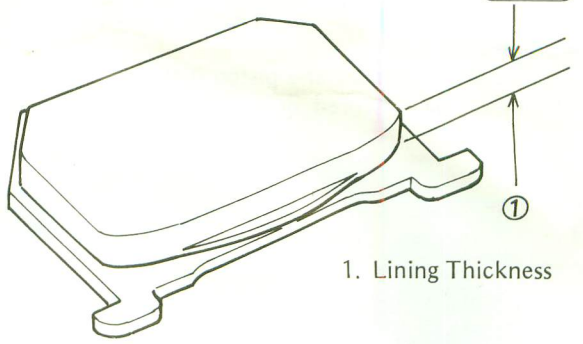
If any grease or oil spills on the pads, wash it off with trichloroethylene or a high flash-point solvent. Do not use one which will leave an oily residue. If the oil cannot be thoroughly clean off, replace the pads.

Table N34 Pad Lining Thickness

Standard	Service Limit
4.85 mm	1 mm

Brake Pad

N118



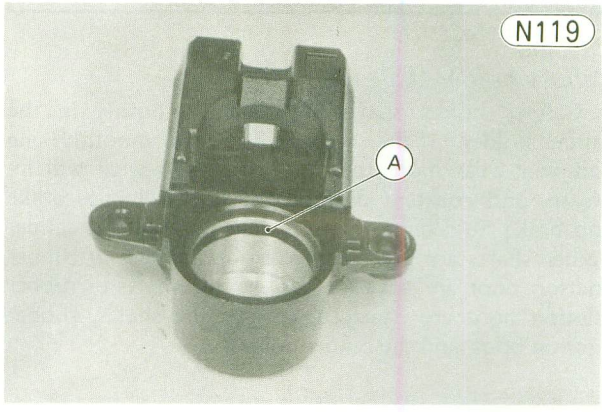
1. Lining Thickness

Fluid seal damage

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

Replace the fluid seal under any of the following conditions: (a) fluid leakage around the pad; (b) brakes overheat; (c) there is a large difference in left and right pad wear; (d) the seal is stuck to the piston. If the fluid seal is replaced, replace the dust seal as well. Also, replace both the dust seal and fluid seal every other time the pads are changed.

N119

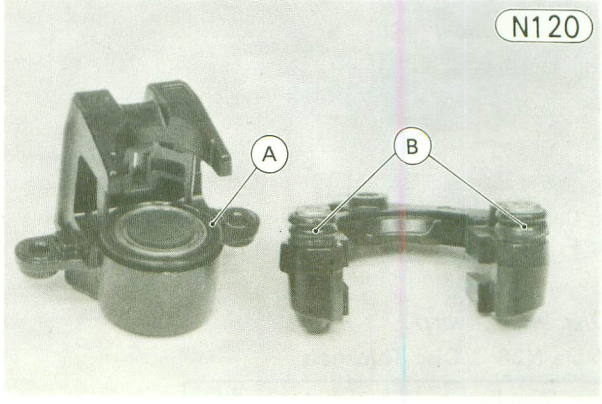


A. Fluid Seal

Dust seal, dust cover damage

Check the dust seal and dust covers, and replace any that are cracked, worn, swollen, or otherwise damaged.

N120

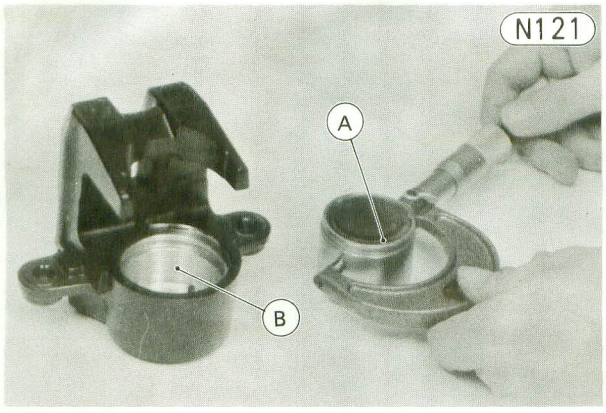


A. Dust Seal **B. Dust Covers**

Piston, cylinder wear

Measure the cylinder inside diameter and piston outside diameter.

Replace the cylinder and piston if they are worn out of tolerance, badly scored, or rusty.



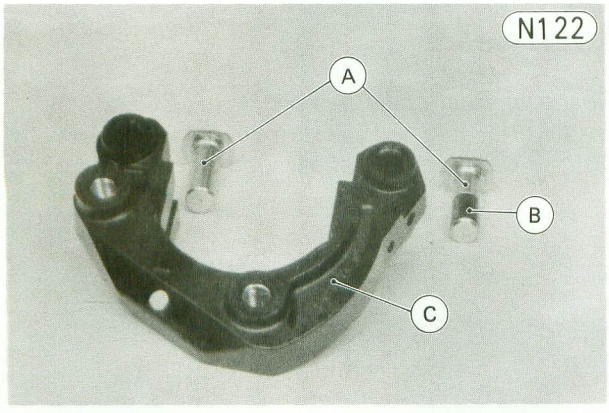
A. Piston **B. Cylinder**

Table N35 Caliper Parts

Measurement	Standard	Service Limit
Cylinder Dia.	42.85 mm	42.92 mm
Piston Dia.	42.77 – 42.82 mm	42.75 mm

Caliper holder shaft wear

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 not 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.



A. Caliper Holder Shafts **C. Caliper Holder**
B. Friction Boot

Disc wear, warp

Table N36 Disc Thickness

Standard	Service Limit
5.8 – 6.1 mm	5.5 mm

REAR DRUM BRAKE

The procedures and data are the same as those of KZ750-G1. See Pgs. 239 – 240.

FRONT FORK

Refer to Pg. 185, noting the following:

Spring tension

Table N37 Fork Spring Free Length

Standard	Service Limit
527 mm	516 mm

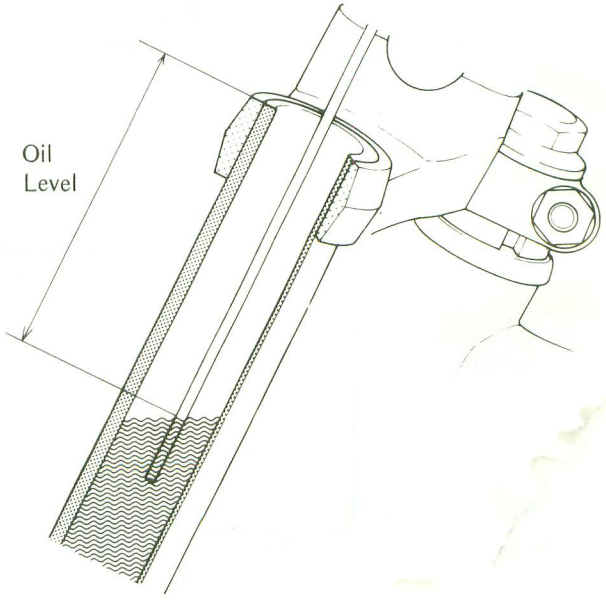
Fork oil

Table N38 Fork Oil (each fork leg)

Oil Type	Filling Fork Oil Capacity		Oil Level*
	when changing oil	After disassembly and completely dry	
SAE 10W20	about 300 cc	331 ± 4 cc	433 ± 2mm

*Distance from the top of the inner tube, measure with the main spring removed.

Oil Level Measurement

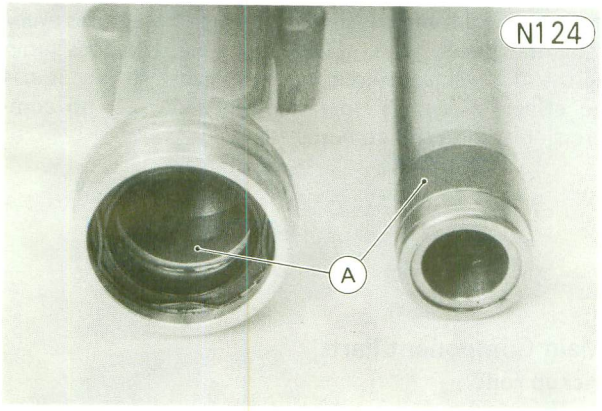


CAUTION **1. The operation of air front forks is especially dependent upon correct oil level. Higher level than specified may cause oil leakage and seal breakage. So be sure to maintain the specified level.**

NOTES: 1. Inspect the O-ring on the top plug, and replace it with a new one if it is damaged.
2. Adjust the front fork air pressure.

Guide bushing damage inspection

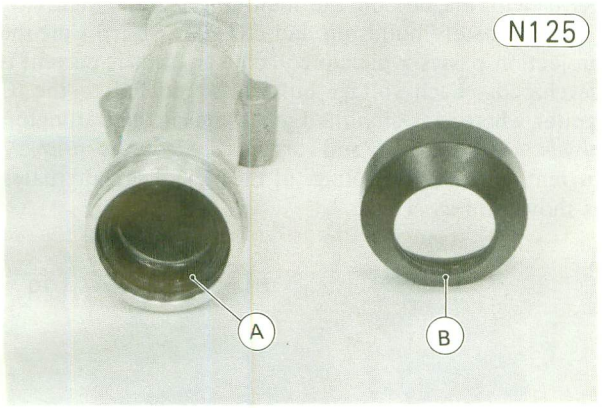
●Visually inspect the guide bushings.
★If it has badly damage, replace the inner tube assembly or outer tube assembly.



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**

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. To minimize wear, the swing arm should be kept properly lubricated.

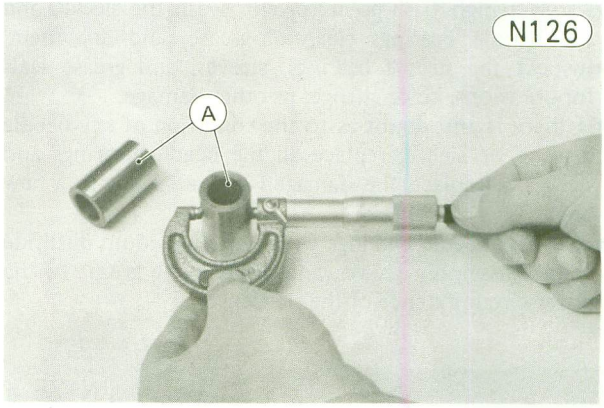
A bent pivot shaft or twisted swing arm will also cause instability by throwing the rear wheel out of alignment. A bent pivot shaft may also cause bearing seizure.

Swing arm sleeve wear

●Remove the swing arm, and pull the swing arm sleeves out of the pivot.
●Measure the outside diameter of the swing arm sleeves with a micrometer.
★Replace all the sleeves and need bearings, if the diameter of any sleeve is less than the service limit or if it shows visible damage.

Table N39 Sleeve Outside Diameter

Standard	Service Limit
24.987 – 25.000 mm	24.96 mm



A. Swing Arm Sleeves

Swing arm bearing damage

●The rollers in the needle bearings wear so little that the wear is difficult to measure. Instead, 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 all the needle bearings and swing arm sleeves.

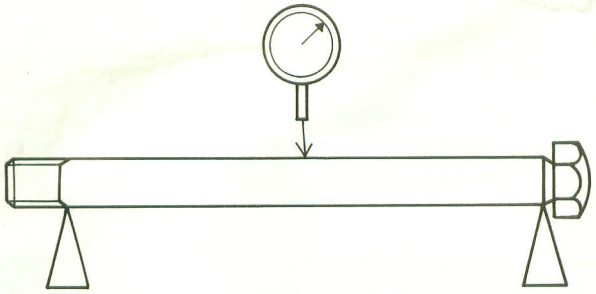
Pivot shaft runout

●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 amount of dial variation.
★If the shaft runout exceeds the usable range, straighten it. If it cannot be straightened, or if the runout exceeds the service limit, replace the shaft.

Table N40 Pivot Shaft Runout

Standard	Usable Range	Service Limit
under 0.10 mm	under 0.14 mm	0.7 mm

Pivot Shaft Runout N127



Lubrication

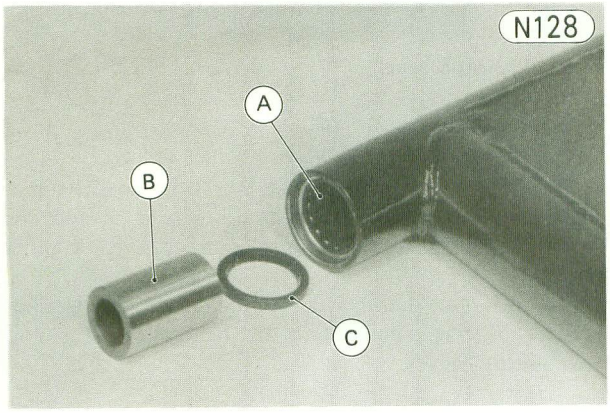
- Remove the swing arm, and pull the swing arm sleeves out of the pivot.

NOTE: 1. The distance collar can be left in the swing arm pivot for swing arm lubrication.

- Using a high flash-point solvent, wash the sleeves and the needle bearings clean of grease, and dry them.
- Inspect the needle bearings, sleeves, and grease seals for abrasions, 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 sleeves. Replace the damaged grease seal with a new one.

- Pack the needle bearings with a molybdenum disulfide chassis assembly grease, and apply same grease to the outer circumference of the sleeves.



A. Needle Bearing **C. Grease Seal**
B. Sleeve

- Install the swing arm.

IGNITION SYSTEM

Introduction

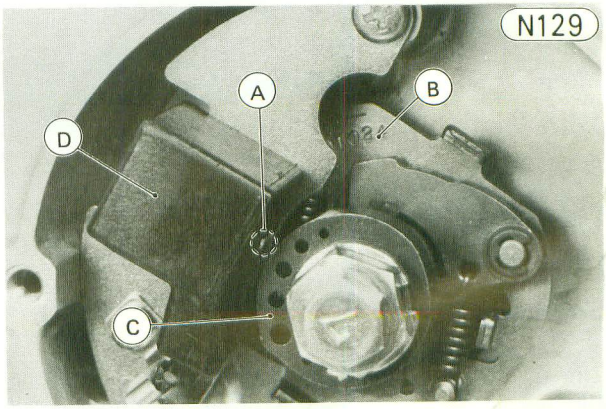
The ignition system for this model is essentially a battery and coil ignition system where the battery supplies the current for the primary circuit in the ignition system. However, this ignition system is transistorized and controls the current for the primary circuit by use of a solid-state electronic switching unit called a Darlington power transistor. The power transistors are triggered by pickup coil and there are no mechanical breaker points, so the only periodic maintenance needed is automatic timing advancer lubrication (Pg. 197). Since contact breaker heel wear (with resultant retarded ignition timing) and breaker point pitting or burning are eliminated, periodic inspection and adjustment of the ignition timing are not required.

The working electrical part of the ignition system consists of a battery, a pickup coil, an IC igniter, an ignition coil, and two spark plugs. To advance the ignition timing as engine rpm rises, an automatic centrifugal-type timing advancer is used. Each spark plug fires every time the piston rises. However, if a spark does jump across the electrodes during the exhaust stroke, it has no effect on engine operation since there is no compression and no fuel to burn.

Main Component Parts

Pickup coil:

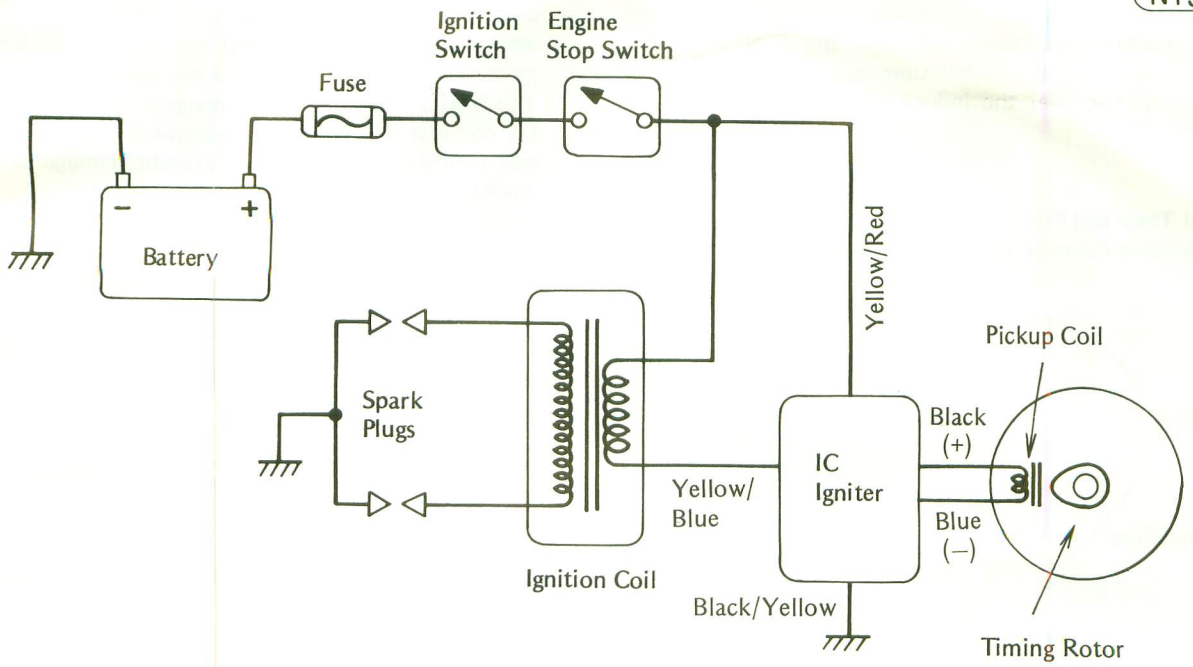
The pickup coil assembly (inductor type) resembles the standard contact breaker assembly in most respect that the set of breaker points has been eliminated. In its place is an iron timing rotor and a magnetic pickup coil. The pickup coil assembly consists of a permanent magnet and a pickup coil on a mounting plate. The timing rotor which is attached to the timing advancer has one projection. As the projection on the timing rotor passes through the magnetic field created by the permanent magnet on the mounting plate, a magnetic field alternately builds up and collapses. Each time the projection passes a pickup coil core an electric current is developed. Each voltage pulse is conducted to the IC igniter where it is amplified and switches the Darlington power transistor on and off to control the primary current. The output voltage of the pickup coil alternates as shown in Fig. N131.



A. Permanent Magnet **C. Timing Rotor**
B. Timing Advancer **D. Pickup Coil**

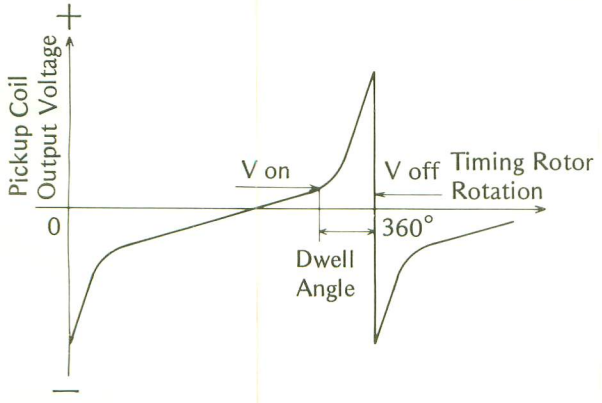
Ignition Circuit

N130



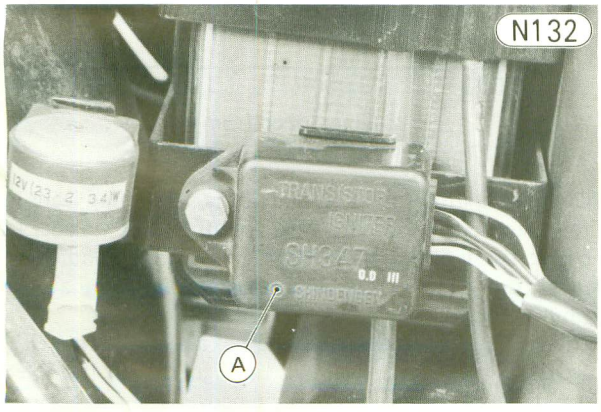
Output Voltage of Pickup Coil

N131



IC igniter:

The IC igniter utilizes the voltage pulse sent from the pickup coil as follow to obtain stable induced high tension voltage from low to high engine speeds.

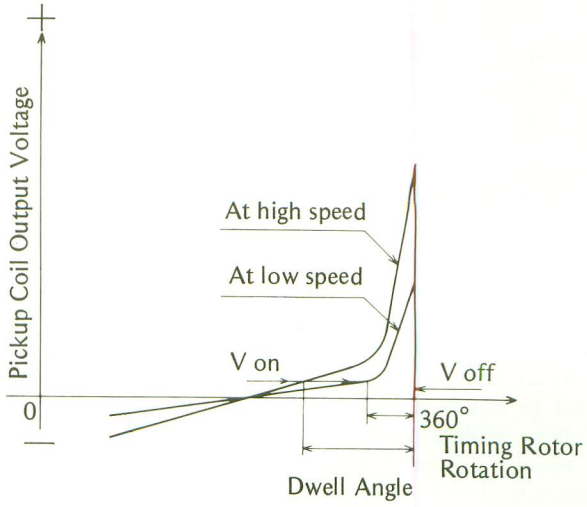


A. IC Igniter

With rotation of the timing rotor the pickup coil output voltage rises, and the power transistor conducts and permits primary current to flow when the pickup coil output reaches the preset voltage (**V** on). When the output voltage drops to the other preset voltage (**V** off) after passing the voltage peak, the power transistor no longer conducts, stopping the current flow in the ignition coil primary winding and inducing a high tension voltage that jumps across the spark plug electrodes. In the case of a standard breaker point ignition system the dwell time (the time during which current can flow in the primary circuit) decreases as the engine speed increases. This results in less current flow through the ignition coil primary winding and decreased induced voltage at high rpm. Conversely the dwell time in this transistorized ignition system is kept relatively constant by virtue of the pickup coil output voltage. This is

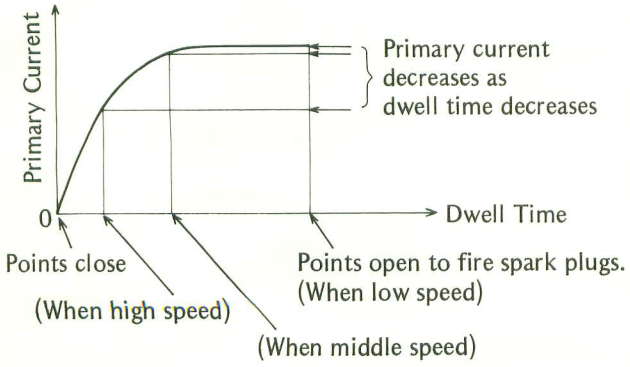
Pickup Coil Output Voltage at Low and High Speeds

N133



because the faster the engine runs, the higher the output voltage of the pickup coil becomes and the sooner the **V** on voltage is reached. Therefore the dwell **angle** increases to keep the dwell **time** long enough at high engine rpm so that the induced high voltage does not decrease.

Dwell Time and Primary Current (Breaker Point System) (N134)

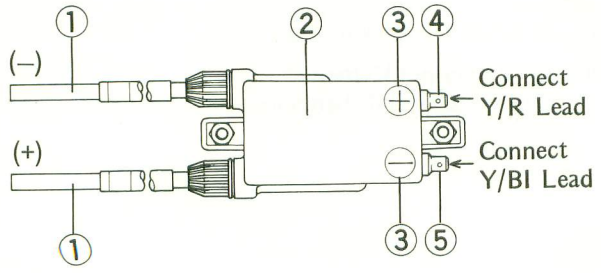


If the pickup coil stops sending signals, the primary current will be cut off preventing ignition coil and ignition unit damage by overheating.

Ignition coil:

Every time both pistons rise, the ignition coil fires both spark plugs simultaneously which are connected series. 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 (N135)



1. Spark Plug Lead
2. Ignition Coil
3. Marking
4. Primary + Terminal
5. Primary – Terminal

Safety Instructions

There are a number of important precautions that must be observed when servicing the transistor ignition system. Failure to observe these precautions can result in serious system damage. Learn and observe all the rules listed below.

1. **Because of limited capacity of the voltage regulate circuit in the IC igniter, do not disconnect the battery leads or any other electrical connections when the ignition switch is on, or when the engine is running. This is to prevent IC igniter damage.**
2. **Do not install the battery backwards. The negative side is grounded. This is to prevent damage to the diodes.**

Ignition System Troubleshooting Guide

If trouble is suspected in the ignition system, check the system by the following procedure.

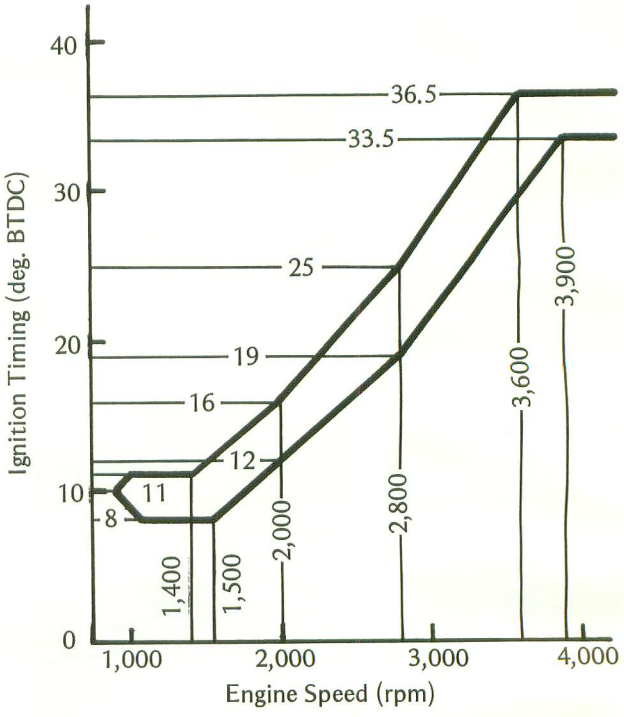
An example of troubleshooting is shown in Fig. N137. To use this chart, follow the arrows on the chart selecting a "yes" or "no" arrow at each diamond-shaped step until you reach the "end". Each test procedure is explained individually.

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.

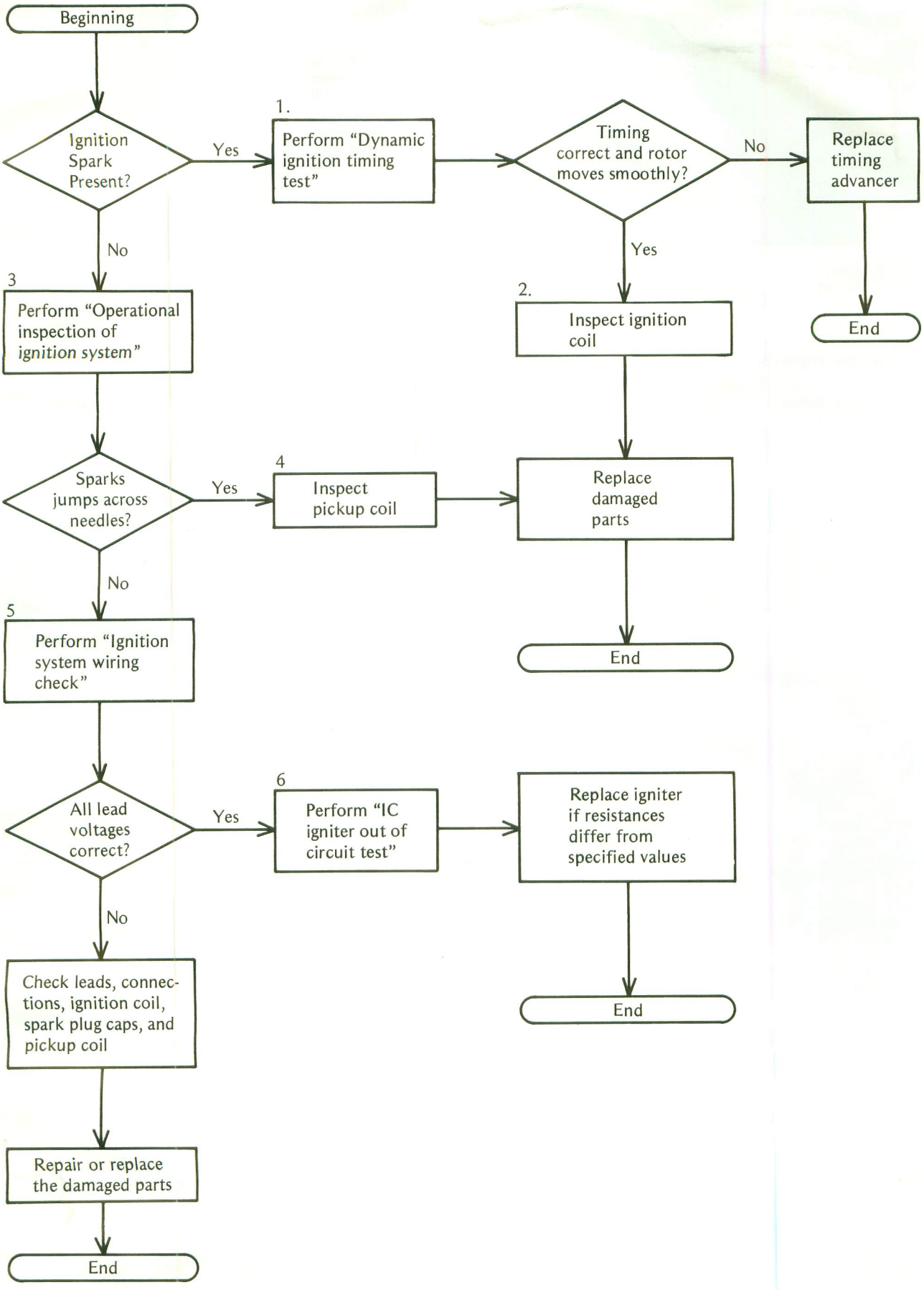
Ignition Timing/Engine Speed Relationship (N136)

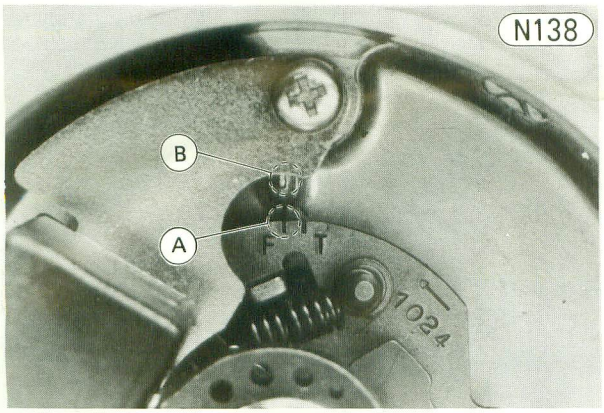


- Connect a strobe light to one of the spark plug leads in the manner prescribed by the manufacturer in order to check the ignition timing under operating conditions.
- Start the engine, and direct the strobe light at the timing marks.
- At idle, the "F" mark (the line next to the letter "F") on the timing advancer must be aligned with the fixed timing mark on the right engine cover for correct low speed ignition timing.

Ignition System Troubleshooting Guide

N137



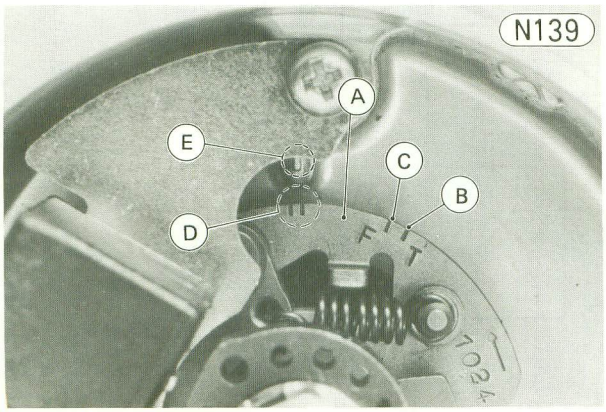


A. "F" Mark
B. Timing Mark on Right Engine Cover

●Raise the engine speed to 4,000 rpm, and check the ignition timing. At this time, the fixed timing mark should be between the advanced timing marks (a pair of the parallel lines) on the timing advancer for correct high speed ignition timing.

Table N41 Timing Advancing

	Engine Speed
Advance Begins	1,400 – 1,600 rpm
Full Advance	3,000 – 3,400 rpm



A. Timing Advancer
B. "T" Mark (not used for ignition timing test)
C. "F" Mark
D. Advanced Timing Marks
E. Timing Mark on Right Engine Cover

★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 damaged timing advancer must be replaced with a new one.
★If the timing advancer binds on the shaft, lubricate it and re-check the ignition timing.
★If advancer lubrication does not remedy the problem, replace the advancer with a new one.

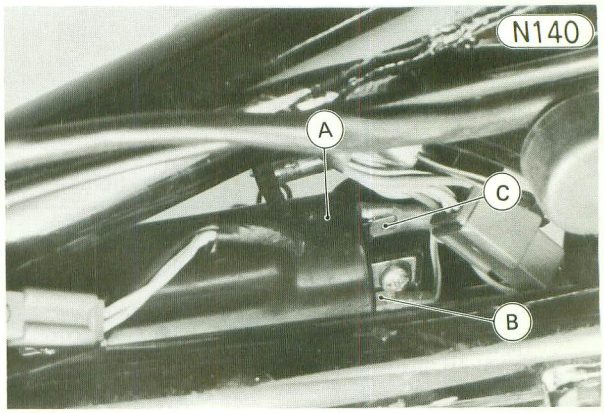
2. Ignition coil inspection
To check the coil:
Refer to Pg. 195, noting the following:

Table N42 Arcing Distance*

Standard
7 mm or more

*Measured with the Kawasaki Electrotester.

To measure the primary and secondary windings resistance:
Refer to Pg. 196, noting the following:
●Remove the fuel tank.
●Pull out the yellow/blue and yellow/red leads from the ignition coil terminals.
●Set the ohmmeter to the x 1 Ω range, and measure the resistance across the primary winding terminals.



A. Ignition Coil
B. (+) Terminal
C. (–) Terminal

Table N43 Ignition Coil Resistance

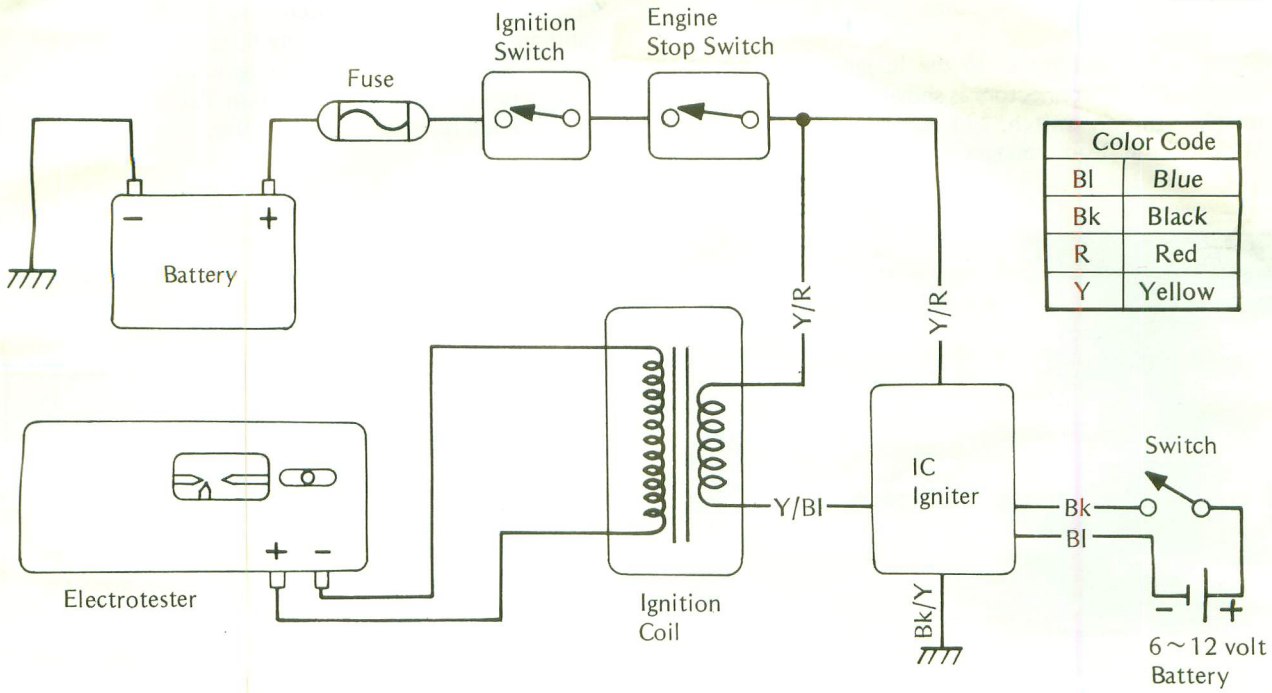
	Meter Range	Reading*
Primary Winding	x 1 Ω	1.8 – 2.8 Ω
Secondary Winding	x 1 kΩ	10.4 – 15.6 kΩ

*Measured when the coil is cold (room or atmospheric temperature).

3. Operational inspection of ignition system
●Have a DC voltage source of 6 – 12 volts output such as a motorcycle battery.
●Remove the right side cover, and disconnect the 2-pin connector which connects the IC igniter and the pickup coil.
●Pull the spark plug caps off the spark plugs, and 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 (See Fig. N141).
●Slide the adjusting knob to set the arcing distance to 7 mm.
●In the 2-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.

Operational Inspection of Ignition System

N141



- Turn the ignition switch to the ON position, and switch the DC voltage source repeatedly on and off.

CAUTION **1. Do not apply DC voltage to the IC igniter blue and black leads continuously more than 30 seconds. The primary coil current will flow during the DC voltage is applied. This overheats the ignition coil and the igniter, and could damage them.**

- When the DC voltage source is switched off, a spark should jump across the needles in the Electrotester.

4. Pickup coil inspection

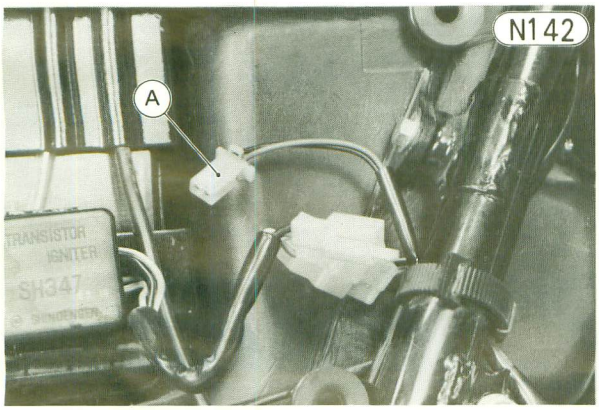
- Remove the right side cover, and disconnect the 2-pin connector which connects the pickup coil with the igniter.
- Connect the multimeter to the pickup coil leads to measure the coil resistance as shown in Table N44.
- ★If there is more resistance than shown in the Table N44, the coil has an open lead and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.

Table N44 Pickup Coil Resistance

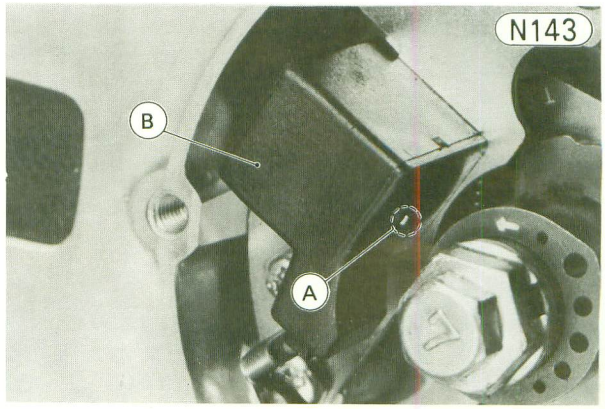
Meter Range	Connections	Reading*
x 100 Ω	One meter lead → Black lead The other meter lead → Blue lead	360 – 540 Ω

*Measured when the coil is cold (room or atmospheric temperature).

- Using the highest resistance range of the multimeter, measure the resistance between the pickup coil leads and chassis ground. Any meter reading less than infinity (∞) indicates a short, necessitating replacement of the pickup coil assembly.
- Visually inspect the pickup coil assembly. If the permanent magnet and coil are damaged, replace the pickup coil assembly.



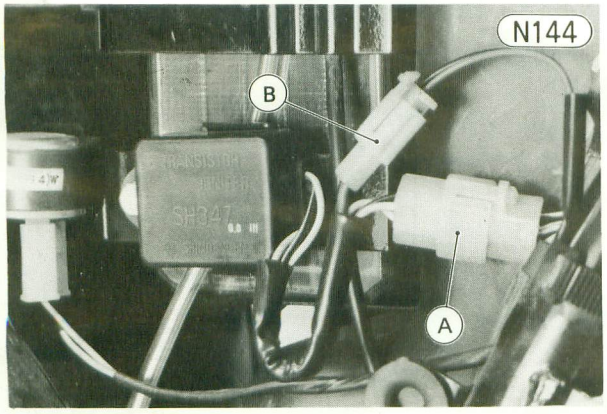
A. Pickup Coil 2-pin Connector



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 in the 2-pin and 3-pin connectors as shown in Table N46, turn on the ignition switch, and note the meter readings. Measure the lead voltages with the engine stopped.



A. Igniter 3-pin Connector
B. Igniter 2-pin Connector

6. IC igniter out of circuit test

- Turn off the ignition switch, and disconnect the 2-pin and 3-pin connectors from the IC igniter.
- Connect the multimeter to the igniter leads in the 2-pin and 3-pin connectors as shown in Table N45 to check the internal resistance of the igniter.

Table N45 Resistance of IC Igniter

Meter Range	Connections	Reading*
x 100 Ω	Meter (+) → Yellow/Red Meter (–) → Black/Yellow	0.3 – 1.2 kΩ
	Meter (+) → Black/Yellow Meter (–) → Yellow/Red	1 – 3 kΩ
	Meter (+) → Yellow/Blue Meter (–) → Black/Yellow	200 – 700 Ω
x 1 kΩ	Meter (+) → Black/Yellow Meter (–) → Yellow/Blue	∞
	Meter (+) → Blue Meter (–) → Black	30 – 130 kΩ
	Meter (+) → Black Meter (–) → Blue	20 – 70 kΩ

*: Measured with the Kawasaki Hand Tester (P/N: 57001-983). A tester other than the Kawasaki Hand Tester may show slightly different readings.

Table N46 Wiring Inspection

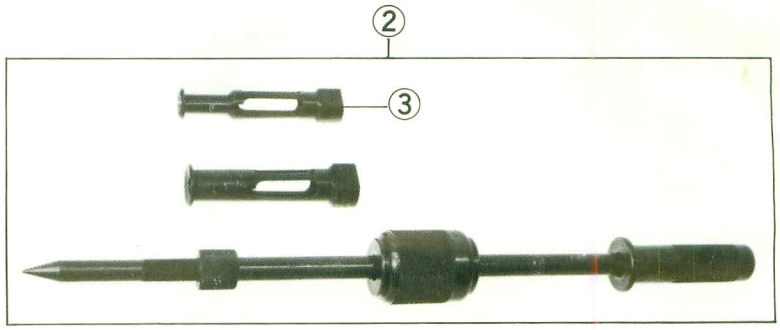
Meter Range	Connections*	Reading
25V DC	Meter (+) → Yellow/Red or Yellow/Blue	Battery voltage
10V DC	Meter (+) → Black	0.5 – 1.0 V
	Meter (+) → Blue	0.8 – 3.0 V

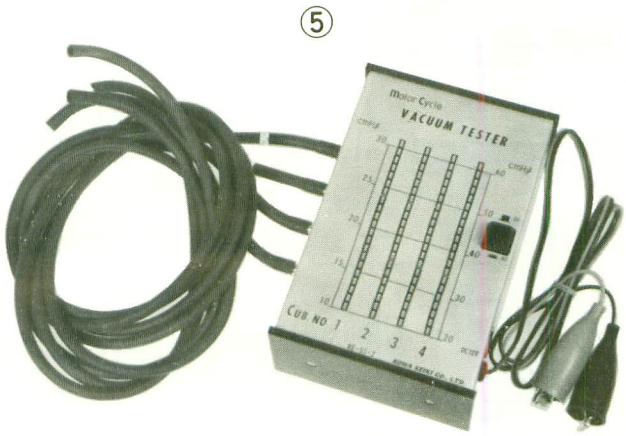
*: Connect the meter (–) lead to ground.

Appendix

SPECIAL TOOLS

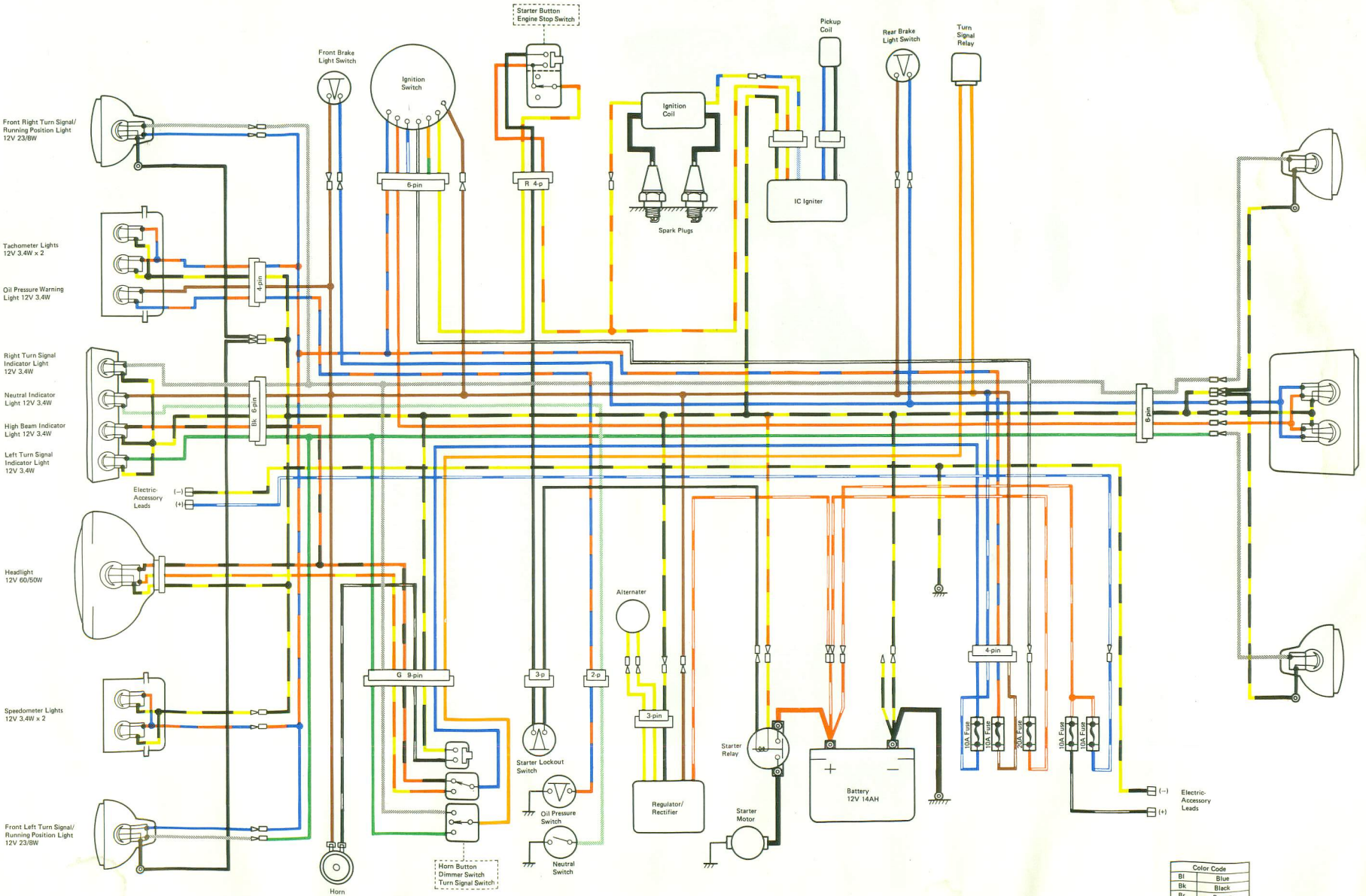
Refer to Pgs. 214 – 216, noting the following:





REF. NO.	PART NO.	DESCRIPTION	Q'TY
1	57001-1017	FUEL LEVEL GAUGE	1
2	57001-1058	BEARING REMOVER	1 set
3	57001-1061	ADAPTER (included in 57001-1058)	(1)
4	57001-1129	BEARING DRIVER SET	1 set
5	57001-1152	VACUUM GAUGE	1

KZ750-M1 Wiring Diagram



LEFT HANDLEBAR SWITCH CONNECTIONS

Starter Lockout Switch			Dimmer Switch				Turn Signal Switch				Horn Button		
Color	Black	Black	Color	R/Y	Blue	R/Bk	Color	Green	Orange	Gray	Color	Bk/W	Bk/Y
Push	○	○	HI		○		L	○			Push	○	
			LO		○		R		○				

IGNITION SWITCH CONNECTIONS

	Lights	Battery	Ignition	Tail 1	Tail 2
Color	Brown	White	Yellow	Blue	Red
OFF					
ON	○	○	○	○	
P (Park)		○	○		

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RIGHT HANDLEBAR SWITCH CONNECTIONS

Starter Button			Engine Step Switch		
Color	Black	Y/R	Color	Red	Y/R
Push	○	○	OFF		
			RUN	○	
			OFF		

Color Code	
Bl	Blue
Bk	Black
Br	Brown
G	Green
Gy	Gray
LG	Light Green
LB	Light Blue
O	Orange
R	Red
W	White
Y	Yellow

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