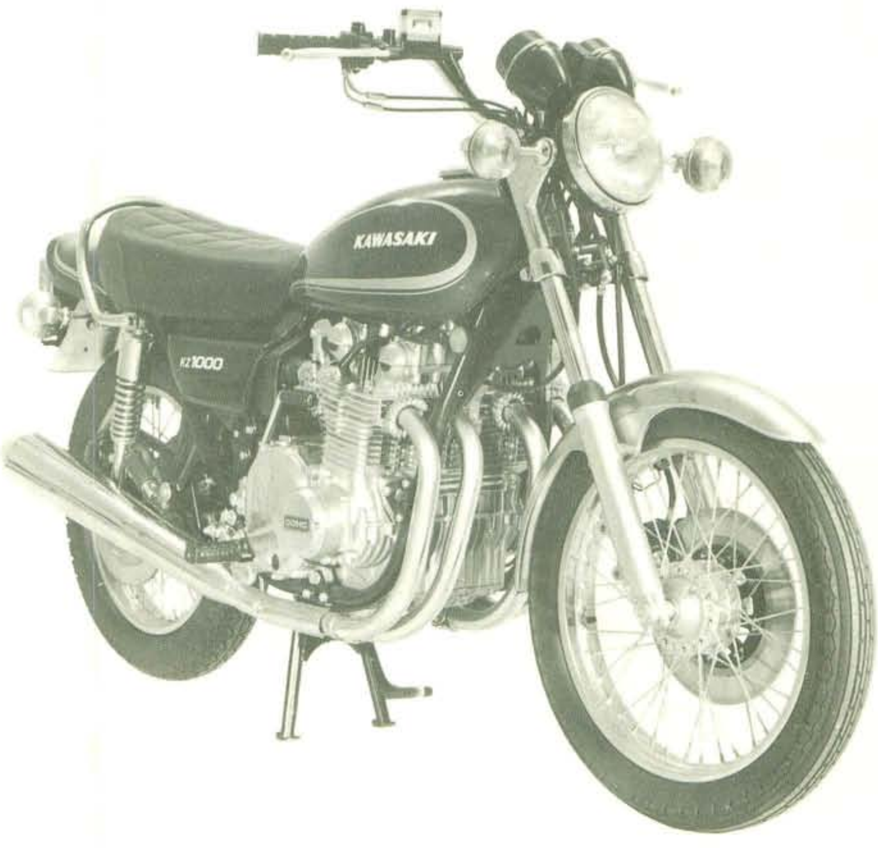
Kawasaki

KZ1000



Motorcycle Service Manual

Revised 5 : Nov. 9, 1979 (M)

Foreword

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

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

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 chapters:

(1) Adjustment

The adjustment chapter gives the procedure for all adjustments which may becomes necessary periodically and which do not involves major disassembly.

(2) Disassembly

This chapter 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.

(3) Maintenance and Theory of Operation

The procedures for inspection and repair are described in detail in this chapter. 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 a wiring diagram.

(5) Supplement

The maintenance and repair procedures, that are unique to later year units since the first publication of the Service Manual, are explained in this chapter per one year unit.

Since the Service Manual is based on the first production units of the late 1978 KZ1000-A2A, there may be minor discrepancies between some vehicles and the illustrations and text in this manual. Explanations 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.

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

KZ1000-A2A Left Side View

KZ1000-A2A Right Side View

A

Specifications

Table of Contents

6 SPECIFICATIONS

SPECIFICATIONS

			KZ1000-A2A
Dimensions			
Overall length			2,210 mm
Overall width			880 mm
Overall height			1,200 mm
Wheelbase			1,505 mm
Road clearance			160 mm
Dry weight			240 kg
Fuel tank capacity			16.7 ℓ
Performance			
Climbing ability			30°
Braking distance			11.0 m from 50 kph
Minimum turning radius			2.4 m
Engine			
Type			DOHC 4 cylinder, 4 stroke, air-cooled
Bore and stroke			70 x 66 mm
Displacement			1,015 cc
Compression ratio			8.7
Maximum horsepower			83 HP @8,000 rpm
Maximum torque			8.1 kg-m @6,500 rpm
Valve timing			
	Inlet	Open	30° BTDC
		Close	70° ABDC
		Duration	280°
	Exhaust	Open	70° BBDC
		Close	30° ATDC
		Duration	280°
Carburetors			Mikuni VM26SS x 4
Lubrication system			Forced lubrication (wet sump)
Engine oil			SE class SAE 10W40, 10W50, 20W40, or 20W50
Engine oil capacity			3.7 ℓ
Starting system			Electric and kick
Ignition system			Battery and coil
Cylinder numbering method			Left to right, 1–2–3–4
Firing order			1–2–4–3
Ignition timing			From 10° BTDC @1,000 rpm to 40° BTDC @2,350 rpm
Spark plugs			NGK B8ES or ND W24ES-U
Transmission			
Type			5-speed, constant mesh, return shift
Clutch			Wet multi disc
Gear ratio:		1st	3.17 (38/12)
		2nd	2.19 (35/16)
		3rd	1.67 (35/21)
		4th	1.38 (29/21)
		5th	1.22 (28/23)

Primary reduction ratio		1.73 (97/56)
Final reduction ratio		2.20 (33/15)
Overall drive ratio		4.64 (Top gear)

Electrical Equipment

Generator (Dynamo)		Kokusan AR3703
Regulator		Kokusan RS2127
Ignition coil		Toyo Denso ZC001-14, ZC001-23
Battery		Yuasa YB14L-A2 (12V 14AH)
Starter		Mitsuba SM-226-K
Headlight type		Sealed beam
Headlight		12V 60/50W
Tail/Brake light		12V 8/27W
Meter lights		12V 3.4W
Indicator lights		12V 3.4W
Turn signal/running position lights (Front)		12V 23/8W
Turn signal lights (Rear)		12V 23W
Horn		12V 2.5A

Frame

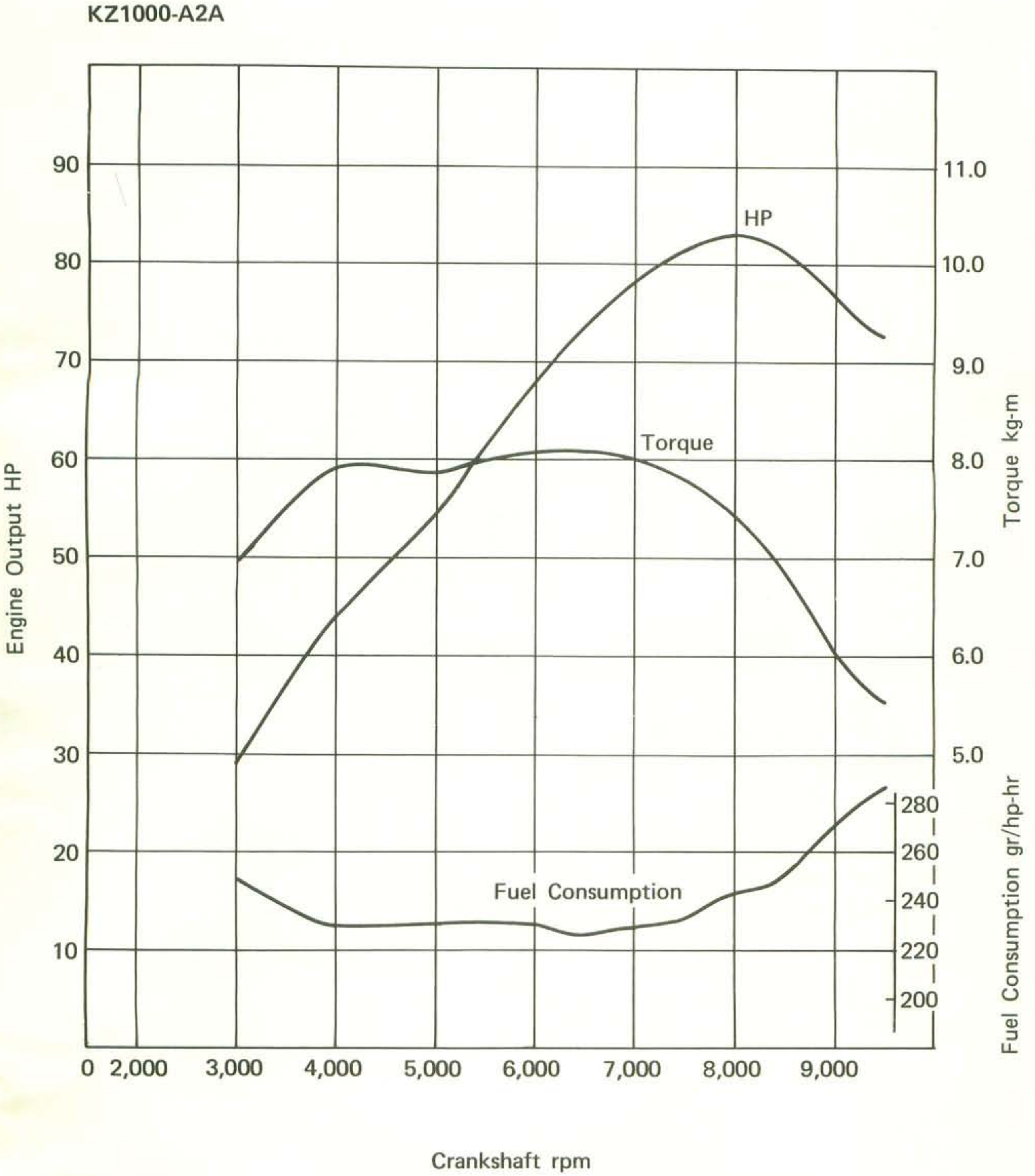
Type		Tubular, double cradle
Steering angle		41° to either side
Castor		26°
Trail		90 mm
Tire size	Front	3.25H-19 4PR
	Rear	4.00H-18 4PR
Suspension	Front	Telescopic fork
	Rear	Swing arm
Suspension stroke	Front	140 mm
	Rear	80 mm
Front fork oil capacity (each fork)		180 ~ 188 cc
Front fork oil type		SAE 10W20

Brakes

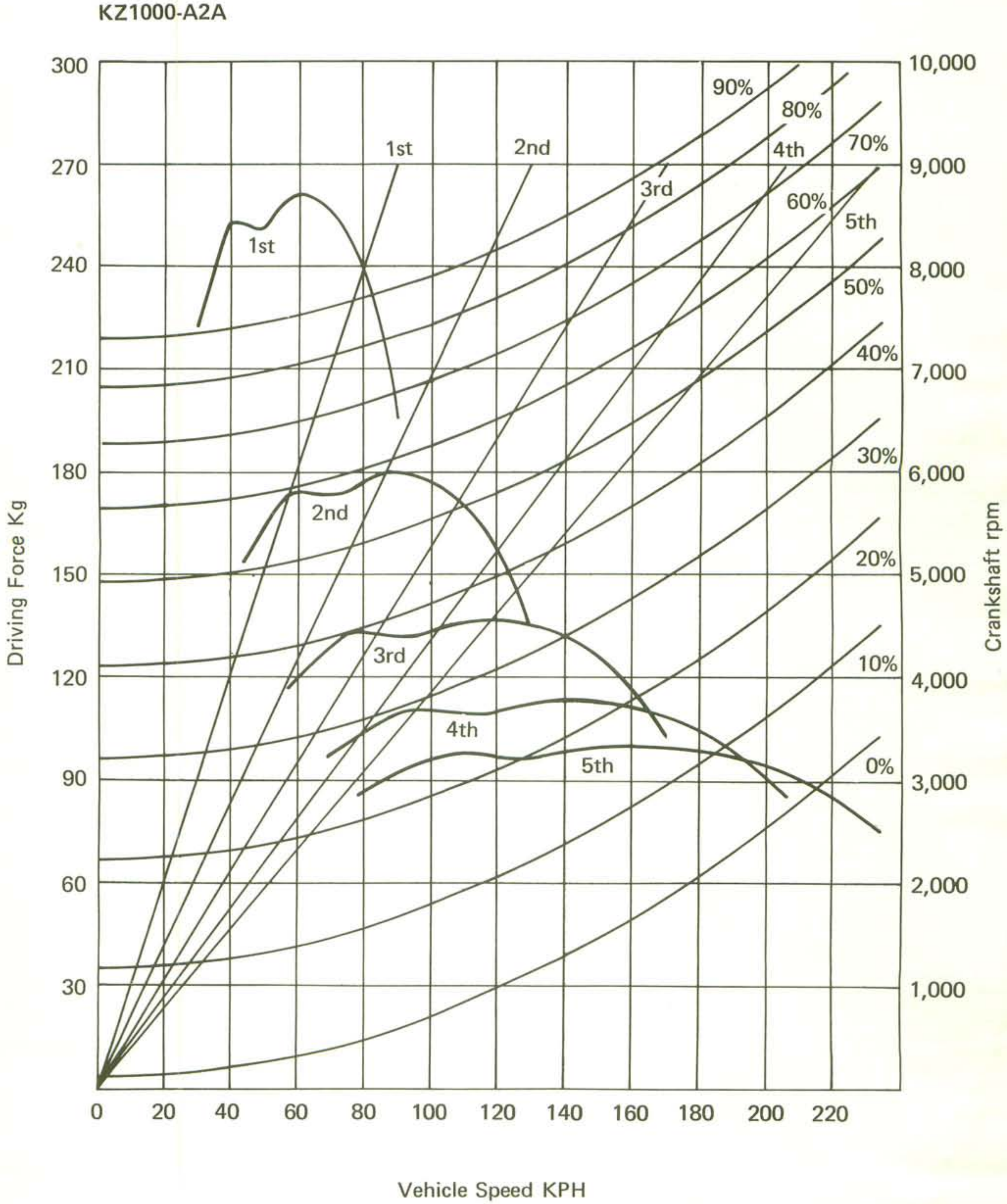
Type	Front and Rear	Disc brake
Effective disc diameter		
Front and Rear		250 mm

Specifications subject to change without notice.

ENGINE PERFORMANCE CURVES



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 →	ODOMETER READING* km							
	Every	800 ± 100	5,000 ± 250	10,000 ± 250	15,000 ± 250	20,000 ± 250	25,000 ± 250	30,000 ± 250	See Page
Battery electrolyte level — check †	month	•	•	•	•	•	•	•	192
Brake adjustment — check †		•	•	•	•	•	•	•	27
Brake wear — check †			•	•	•	•	•	•	176
Brake fluid level — check †	month	•	•	•	•	•	•	•	181
Brake fluid — change	year			•		•		•	179
Clutch — adjust		•	•	•	•	•	•	•	21
Carburetors — adjust		•	•	•	•	•	•	•	18
Throttle cables — adjust		•	•	•	•	•	•	•	16
Steering play — check †		•	•	•	•	•	•	•	28
Spoke tightness and rim runout — check †		•	•	•	•	•	•	•	172
Drive chain wear — check †			•	•	•	•	•	•	175
Front fork — inspect/clean		•	•	•	•	•	•	•	184
Rear shock absorbers — inspect		•	•	•	•	•	•	•	187
Nuts, Bolts, Fasteners — check and torque		•		•		•		•	37 ~ 40
Spark plugs — clean and gap †		•	•	•	•	•	•	•	12
Camshaft chain — adjust		•	•	•	•	•	•	•	14
Points, timing — check †		•	•	•	•	•	•	•	12
Valve clearance — check †		•	•	•	•	•	•	•	15
Air cleaner element — clean			•		•		•		134
Air cleaner element — replace	5 cleanings			•		•		•	43
Fuel system — clean		•	•	•	•	•	•	•	23
Tire tread wear — check †			•	•	•	•	•	•	172
Engine oil — change	year	•	•	•	•	•	•	•	22
Oil filter — replace		•		•		•		•	22
General lubrication — perform			•	•	•	•	•	•	31
Front fork oil — change				•		•		•	186
Timing advancer — lubricate				•		•		•	204
Swing arm — lubricate				•		•		•	189
Wheel bearings — grease	2 years					•			173
Speedometer gear housing — grease	2 years					•			173
Steering stem bearings — grease	2 years					•			184
Drive chain — lubricate	Every 300 ± 50 km								175
Drive chain — adjust	Every 800 ± 100 km								26

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

B

Adjustment—Engine

Table of Contents

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.

Table B1 Spark Plug

Plug	NGK B8ES, ND W24ES-U
Gap	0.7 ~ 0.8 mm
Tightening Torque	2.5 ~ 3.0 kg-m (18.5 ~ 22.0 ft-lbs)

Spark Plug Gap

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 the electrical maintenance section, Pg. 204, 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 gaps (this can also be achieved by adjusting the dwell angles to the specified amount) and then changing the position of the adjusting plates. 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.

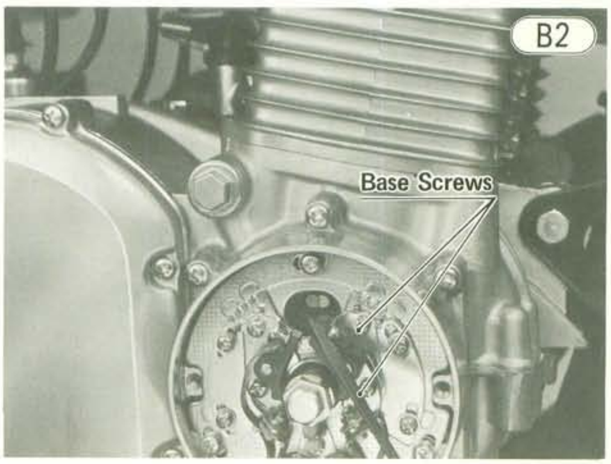
This motorcycle has two sets of contact breaker points, the left set fires spark plugs 1 and 4 simultaneously, and the right set fires plugs 2 and 3 180° later. The gap for each set of points must be adjusted separately.

NOTE: The spark plugs and cylinders are numbered consecutively, starting from the left.

There are two "F" marks on the timing advancer, which can be viewed through the inspection window by turning the crankshaft. One set is marked "1 4" and the other is marked "2 3". After the gap is adjusted for both sets of points, timing must also be adjusted twice, once using the "1 4" **F** mark, and once using the "2 3 " **F** mark.

Point Gap Adjustment (using a thickness gauge):

- 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 the point cam oil felt sparingly with suitable point cam lubricant. Do not overlubricate. Replace the oil felt if it is worn.
- Using a 17 mm wrench on the crankshaft, turn the engine clockwise until the contact breaker points are at their widest opening.
- Determine the size of the point gap with a thickness gauge. The proper gap is 0.3 ~ 0.4 mm.



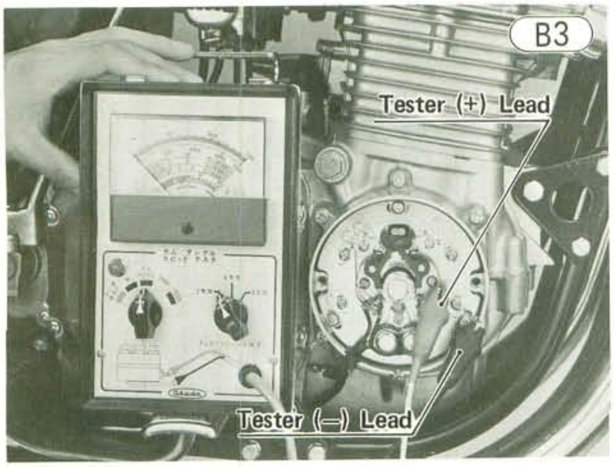
- If the gap is incorrect, loosen the contact breaker base screws (2) just enough to allow the base to move. Open the points using a slot screwdriver on the contact breaker base pry point, and insert a blade thickness of 0.35 mm between the points. Tighten the contact breaker base screws (2), and remove the blade. Again turn the crankshaft, and recheck the point gap.
- Repeat the steps above for the other set of points.
- Perform the timing test.

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 points are closed. 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 the point cam oil felt sparingly with suitable point cam lubricant. Do not overlubricate. Replace the 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.

WARNING **Make sure that no tools, clothes, or 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 190° for a tester calibrated in degrees and 52.8% 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 B2 Relation between Selector Knob Setting and Meter Reading†

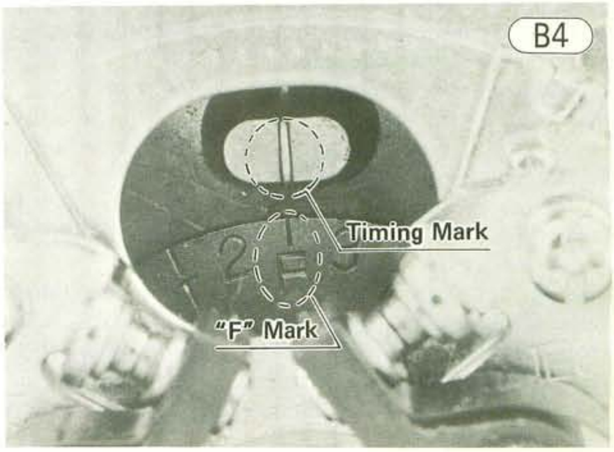
Selector Knob Setting	Dwell Angle Tester Reading
1 cyl.	185.0 ~ 200.0°
2 cyls.	92.5 ~ 100.0°
3 cyls.	61.5 ~ 66.7°
4 cyls.	46.5 ~ 50.0°

†Running the engine at idling speed.

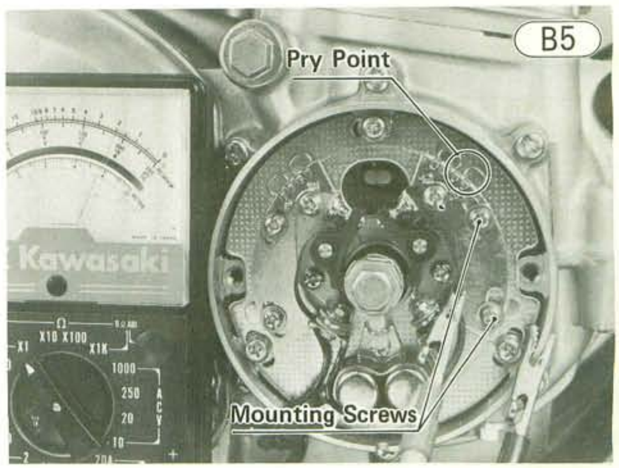
- If the dwell angle is not the same as the specification, loosen the contact breaker base screws (2) just enough so that a slot screwdriver at the contact breaker pry point will be able to change the gap (Fig. B2). Adjust the gap until the dwell angle specification is obtained. Tighten the screws (2).
- Repeat the steps above for the other set of points.
- Stop the engine, and disconnect the tester.
- Perform the timing test.

Timing Test (Static):

- Be sure that the ignition switch is turned off.
- Check the point gap, and adjust if necessary.
- Turn the crankshaft so that the "F" mark on the timing advancer is aligned with the timing mark as shown.



- Connect an ohmmeter set to the R x 1 range across the appropriate set of points, one lead to the wire coming from the points (or to the spring leaf), and the other ohmmeter lead to chassis ground (engine, frame, contact breaker mounting, etc.). Make sure that both leads are positively connected.



- Loosen its mounting screws (2) and turn the adjusting plate, using a screwdriver in the pry points so that the contacts are just at the point of opening. This point can be found by watching the ohmmeter needle, which will flicker just when the points begin to open or close.
- If the adjusting plate *will not travel* far enough to allow correct timing adjustment, loosen the mounting plate mounting screws (3) and turn the mounting plate to provide more room for adjustment.

- Turn the crankshaft clockwise and check to see if the "F" mark is aligned with the timing mark when the needle jumps. If not, readjust.
- Tighten all the screws that were loosened.
- Repeat the steps above using the other "F" mark.
- Check the point gap again, and adjust if it was disturbed.
- Disconnect the ohmmeter leads.
- Install the contact breaker cover and gasket.

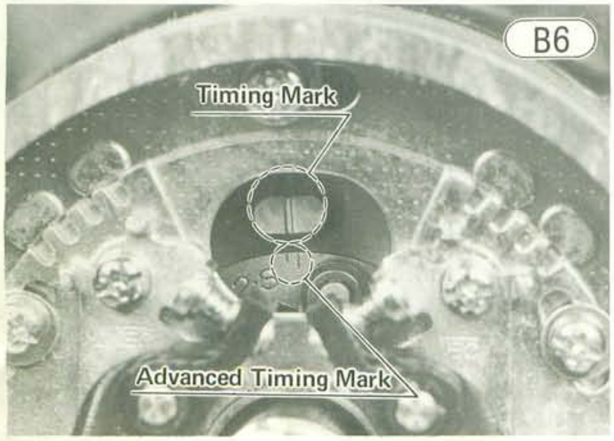
Timing Test (Dynamic):

Timing advance begins at 1,350 ~ 1,580 rpm and reaches the maximum advance at 2,250 ~ 2,450 rpm. So timing must be checked at idle below 1,350 rpm, and then at above 2,450 rpm when it is fully advanced. Make these checks as follows.

- Check the point gap, and adjust if necessary.
- Connect a strobe light in the manner prescribed by the manufacturer in order to check the ignition timing under operating conditions.
- Turn on the ignition switch and engine stop switch. Start the engine, and direct the strobe light at the timing marks.
- Below 1,350 rpm, the "F" mark on the timing advancer must be aligned with the timing mark above the advancer for correct low rpm ignition timing (Fig. B4). If the timing is not correct, adjust it by moving the adjusting plate (the left side one for the "1" and "4" cylinders).
- Above 2,450 rpm, the advanced timing mark (the vertical lines on the right side of the "3" or "4" mark) must be aligned with the timing mark above the advancer for correct high rpm ignition timing (Fig. B6). If the timing is not correct, examine the timing advancer mechanism for binding.
- Check the timing for #2 and #3 (or #1 and #4) cylinder.

Table B3 Timing Advancing

	Engine Speed
Advance Begins	1,350 ~ 1,580 rpm
Full Advance	2,250 ~ 2,450 rpm



- Check the point gap again, and adjust if it was disturbed.
- Install the contact breaker cover and gasket.

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).

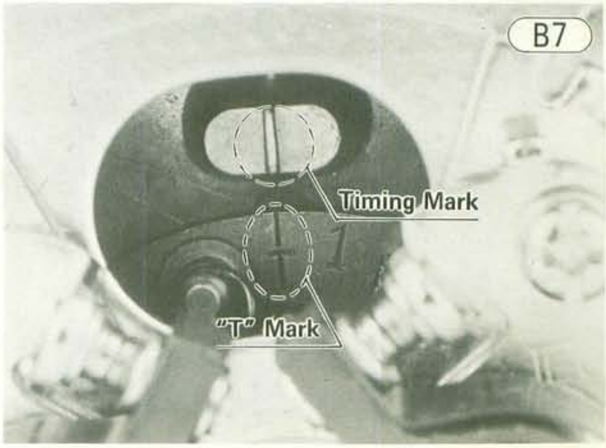
However, if the adjustment fails to keep the chain from making noise, the chain guides have probably worn past the service limit and will need to be replaced.

To adjust the camshaft chain:

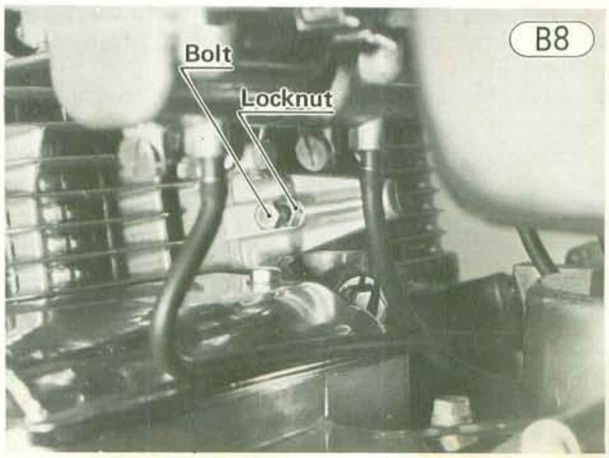
- Remove the contact breaker cover.
- Turn the engine over a couple of times so that slack is taken up evenly on all parts of the chain, and set either the #1 and #4, or the #2 and #3 pistons to TDC (i.e., where the "T" mark on the timing advancer aligns with the mark on the right engine cover).

NOTES: 1. Do not turn the crankshaft backwards (counterclockwise). Turning the crankshaft backwards may cause improper adjustment.

2. When adjusting the camshaft chain, always stop turning the engine when either the #1 and #4 or the #2 and #3 pistons is at TDC.



- Loosen the locknut and bolt. (With the bolt loose, a spring inside takes up slack automatically.)



- Tighten the bolt with 0.7 ~ 0.9 kg-m (61 ~ 78 in-lbs) of torque and then tighten its locknut.
- Install the contact breaker cover and gasket.

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.

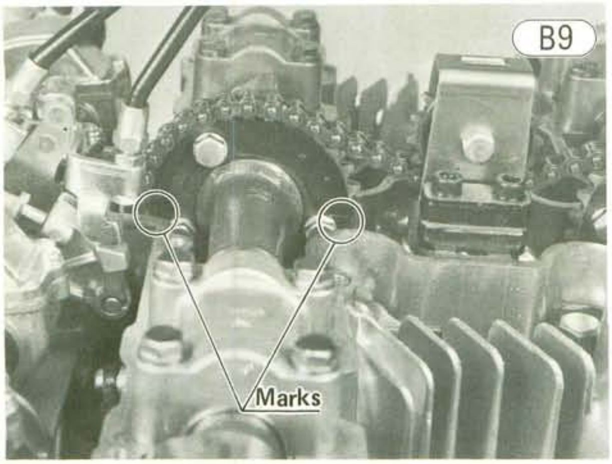
Valve clearance for each valve should be checked and, if incorrect, adjusted in accordance with the Periodic Maintenance Chart (Pg. 10) and any time that clearance may have been affected by disassembly.

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.

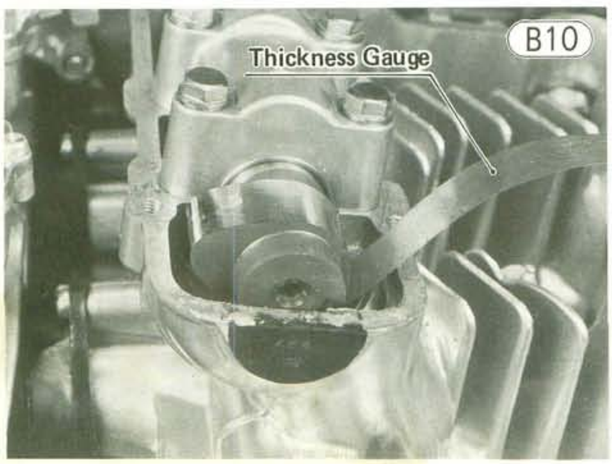
NOTE: Valve clearance must be checked when the engine is cold.

To check and adjust the valve clearance:

- Remove the fuel tank (Pg. 44).
- Remove the spark plug cap from all plugs.
- Remove the cylinder head cover bolts (16), and lift the cover off the cylinder head and out of the way.
- Check the tightening torque of the camshaft cap bolts [1.1~1.3 kg-m (95~113 in-lbs)].
- Remove the contact breaker cover.
- Using a 17 mm wrench, turn the crankshaft until the marks on the appropriate camshaft sprocket line up with the surface of the cylinder head.



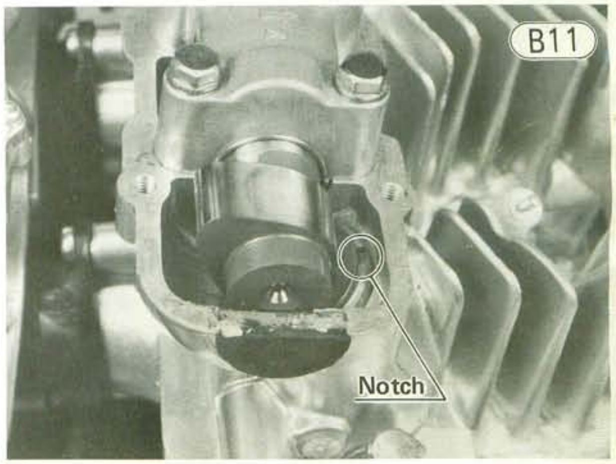
- For two valves (1 and 3, or 2 and 4) at a time, measure the clearance between the cam and the shim. The correct clearance is 0.05~0.10 mm.



- Turn the crankshaft another one turn until the markes on the sprocket line up again, and measure the other two valve clearances.
- 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.

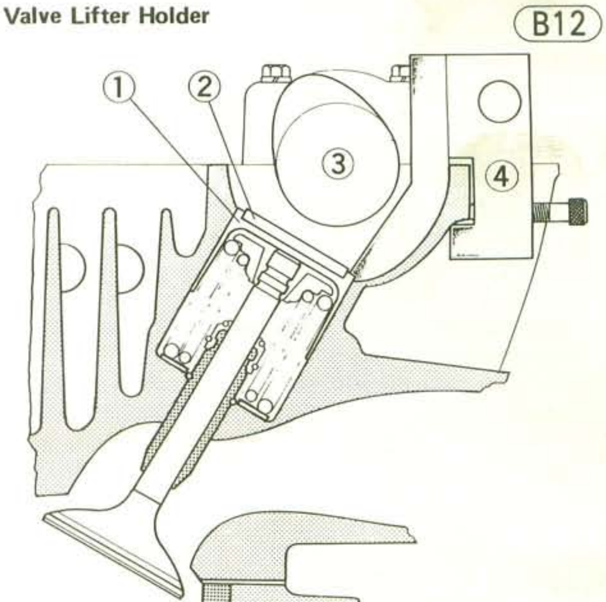
NOTE: If there is no clearance between the shim and cam, select a shim which is several sizes smaller and then remeasure the gap once it is installed.

- 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 and fit the tool in place.

Valve Lifter Holder



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.

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.**

NOTES: 1. The camshaft rotates in the same direction as the crankshaft.
2. If the camshafts are unbolted instead of using a special tool to remove the shims, see information on valve timing (Pg. 50) and camshaft installation (Pg. 48) 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 2.00 to 3.20 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 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. 146), (b) grind down the stem lightly (Pg. 145), (c) then recheck the clearance.

●Turn the crankshaft so that the cam is again pushing down the lifter, and remove the special tool.

●Make sure that the valve clearance is correct. If it is not, readjust.

●See information on cylinder head cover installation (Pg. 50), and install the cover.

●Install the contact breaker cover and gasket.

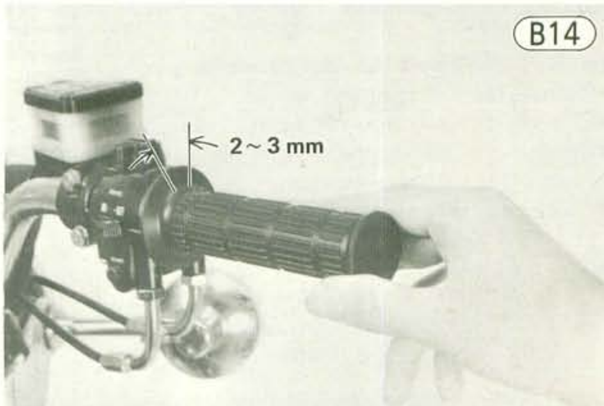
●Install the fuel tank (Pg. 44).

THROTTLE CABLES

There are two throttle cables: an accelerator cable for opening the throttle valves, and a decelerator cable for closing them. If the cables are too loose due either to cable stretch or maladjustment, the excessive play in the throttle grip will cause a delay in throttle response, which will be especially noticeable at low rpm. Also, the throttle 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.

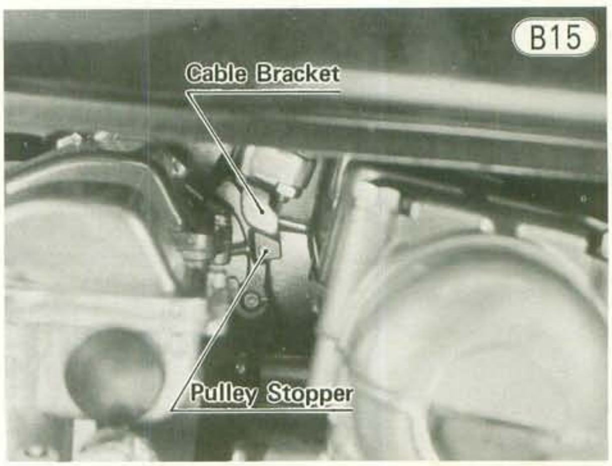
To check the throttle cable adjustment:

●Check that there is 2~3 mm throttle grip play.



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

NOTE: This assures that the stress of throttle grip return will be taken by the pulley, protecting the carburetor linkage mechanism.



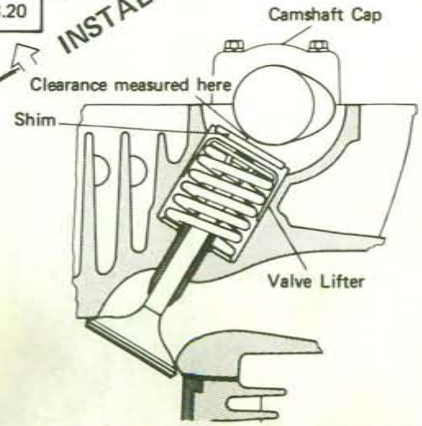
If any one of the above checks shows improper adjustment, adjust the throttle cables as follows:

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

Table B4 Valve Adjustment Chart

PART NUMBER 12037	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015	016	017	018	019	020	021	022	023	024	025
	PRESENT SHIM SIZE																								
MILLIMETERS	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20
VALVE CLEARANCE MILLIMETERS																									
0.00 ~ 0.05		2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15
0.05 ~ 0.10	SPECIFIED CLEARANCE/NO CHANGE REQUIRED																								
0.10 ~ 0.14	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	
0.15 ~ 0.19	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20		
0.20 ~ 0.24	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20			
0.25 ~ 0.29	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20				
0.30 ~ 0.34	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20					
0.35 ~ 0.39	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20						
0.40 ~ 0.44	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20							
0.45 ~ 0.49	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20								
0.50 ~ 0.54	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20									
0.55 ~ 0.59	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20										
0.60 ~ 0.64	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20											
0.65 ~ 0.69	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20												
0.70 ~ 0.74	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20													
0.75 ~ 0.79	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20														
0.80 ~ 0.84	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20															
0.85 ~ 0.89	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20																
0.90 ~ 0.94	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20																	
0.95 ~ 0.99	2.90	2.95	3.00	3.05	3.10	3.15	3.20																		
1.00 ~ 1.04	2.95	3.00	3.05	3.10	3.15	3.20																			
1.05 ~ 1.09	3.00	3.05	3.10	3.15	3.20																				
1.10 ~ 1.14	3.05	3.10	3.15	3.20																					
1.15 ~ 1.19	3.10	3.15	3.20																						
1.20 ~ 1.24	3.15	3.20																							
1.25 ~ 1.30	3.20																								

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.

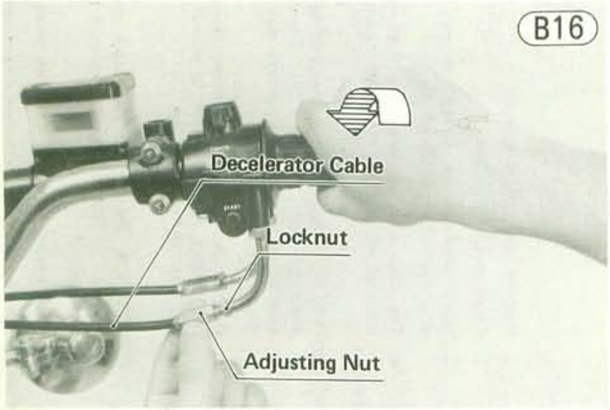
NOTES: 1. Check the valve clearance with the proper method in text (Pgs. 15 ~ 16). Checking the clearance at any other cam position may result in improper valve clearance.

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

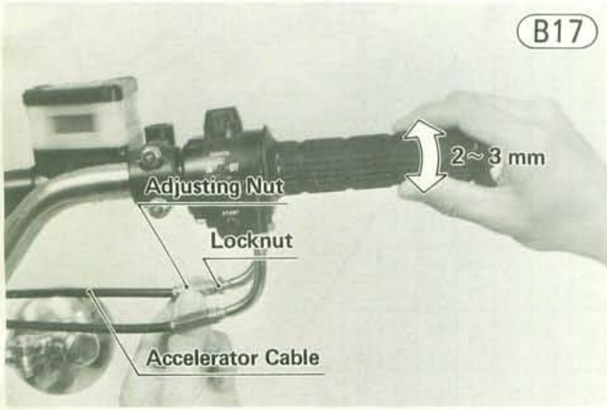
CAUTION 1. Do not put shim stock under the shim. This may cause the shim to pop out at high rpm.

2. Do not grind the shim. This may cause it to fracture.

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



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



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

CARBURETORS

For internal carburetor maintenance and adjustment of parts, see the maintenance section (Pg. 135) 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 steps for obtaining proper carburetor synchronization.

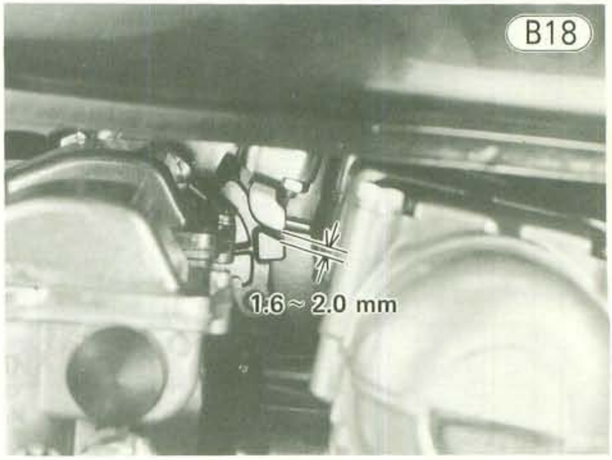
When the idle speed is too low, the engine may stall; when the idle speed is too high, the fuel consumption becomes excessive, and the resulting lack of engine braking may make the motorcycle difficult to control. Poor carburetor synchronization will cause unstable idling, sluggish throttle response,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

The following procedure consists of three parts: initial synchronization—mechanical (sometimes necessary), idling adjustment, and fine synchronization—vacuum.

Initial Synchronization—Mechanical:

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

- Turn the idle adjusting screw so that there is 1.6 ~ 2.0 mm clearance between the throttle cable bracket and the stopper on the pulley.

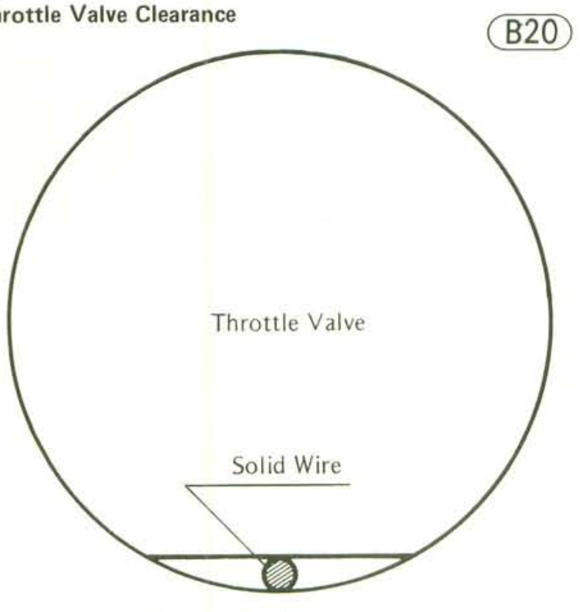


- Push the throttle grip completely closed. At this time there should be no clearance between the cable bracket and the stopper. When the throttle grip is released, there should be 1.6 ~ 2.0 mm clearance between the cable bracket and the stopper. Replace the cable bracket if it does not work as above.
- Remove the carburetors from the engine (Pg. 44).
- Synchronize the throttle valves using the following procedure.
- Remove the top covers (4) and loosen the locknuts(4).

•Turn the adjusting screw so that there is 0.7 mm clearance between the throttle valve and the bottom of the carburetor bore. This is a very fine adjustment, so make it carefully for each of the four carburetors.

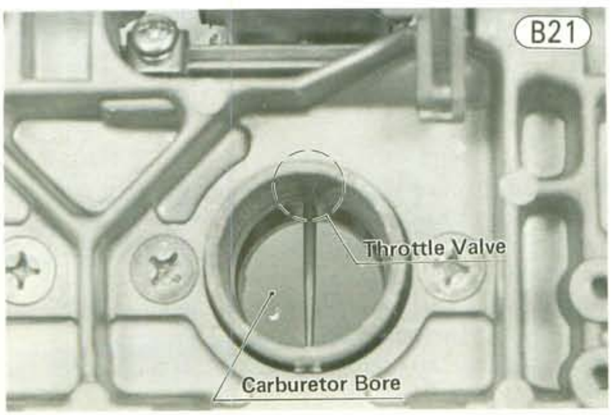
NOTE: An easy method of performing this adjustment is to carefully insert a piece of 0.7 mm solid wire in the space between the bottom of the carburetor bore and the throttle valve, lifting the valve and slowly letting it seat on the wire. Then, with the carburetor throat facing downward, slowly turn the adjusting screw out until the wire just falls out. Repeat the procedure above for each carburetor. This will insure a correct and uniform setting for each valve.

Throttle Valve Clearance



•Tighten the locknuts without changing the position of the screws. Install the top covers.

•Open the throttle so that the bottom edge of the lowest of the four carburetor throttle valves is even with the top of the carburetor bore. Turn the pulley stop screw so the pulley is stopped at that point.



•Install the carburetor (Pg. 44), and adjust the play in the throttle cable (Pg. 16).

Idling Adjustment:

1) Idle speed adjustment

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

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

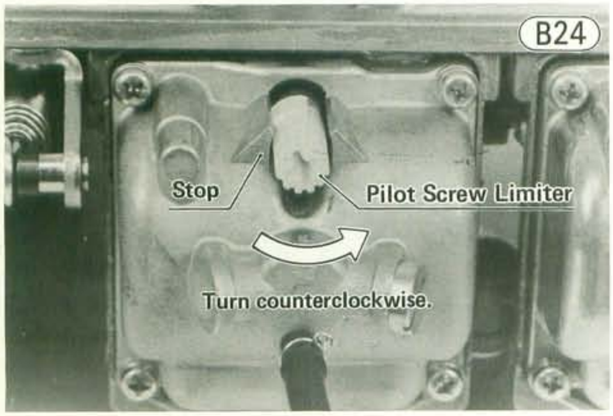
•Open and close the throttle a few times to make sure that the idle speed does not change. Readjust if necessary.

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.**

2) Idle mixture adjustment

•For all the carburetors, *turn the pilot screw limiter* of each carburetor fully counterclockwise (when viewed from below) until it comes to rest against the stop.



- Perform the idle speed adjustment.
- Turn all the pilot screw limiters fully clockwise against the other stop.
- If idle speed has dropped by 100 rpm or more, return all the pilot screw limiters an equal amount to the point where idle rpm does not quite drop 100 rpm. Stop turning the limiters, wait a few moments for the engine speed to stabilize, then check to make sure that idle speed has not dropped by more than 100 rpm.
- Perform the idle speed adjustment.

NOTE: If proper idle speed can not be obtained by this adjustment alone, first check the following and correct as necessary.

Engine Oil (Pg. 22)
Spark Plugs (Pg. 12)
Ignition Timing (Pg. 12)
Throttle Cables (Pg. 16)
Cylinder Compression (Pg. 150)
Air Cleaner Element (Pg. 134)
Air Cleaner Duct and Carburetor Holder Leakage
Camshaft Chain (Pg. 14)
Valve Clearance (Pg. 15)

Fine Synchronization–Vacuum:

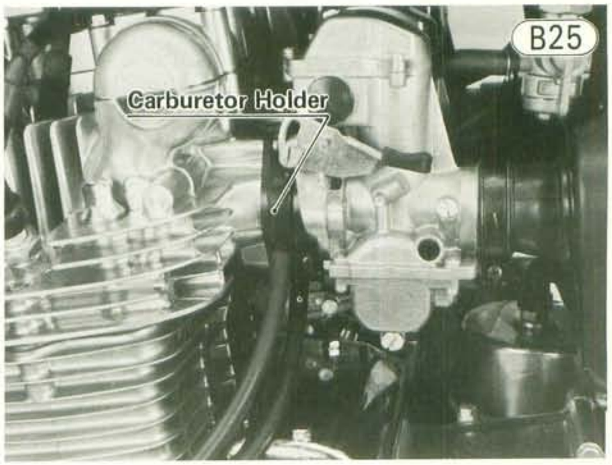
Fine adjustment of carburetor synchronization, necessary for smooth engine operation, requires the use of vacuum gauges. Differences between the left two cylinders and right two cylinders might be found from exhaust noise and exhaust pressure; but to accurately synchronize each carburetor, the use of vacuum gauges is essential.

NOTES: 1. 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.

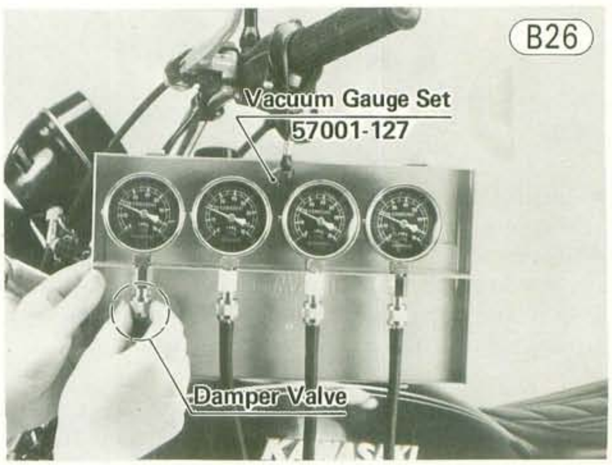
2. If fuel is supplied to the carburetors from another optional tank, the vacuum hose for the automatic fuel tap will be open and extra air drawn into the carburetor bore through the vacuum hose. This results in improper carburetor synchronization. To prevent this, plug the open end of the vacuum hose during carburetor synchronization so that no extra air can be drawn into the carburetor.

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

- Start the engine, and warm it up for 5 minutes.
- Perform idling adjustment (Pg. 19).
- Remove the rubber caps from the vacuum gauge attachments on the carburetor holder, and attach the vacuum gauges (special tools).



- With the engine running at idling speed, close the vacuum gauge damper valves until gauge needle flutter is less than 3 cm Hg. Normal vacuum gauge reading is 20 ~ 28 cm Hg, and the difference between any two cylinders should be less than 2 cm Hg.



- If the difference in vacuum readings between any two cylinders is greater than 2 cm Hg, readjust the individual throttle adjusting screws according to the following procedure.
- Remove the fuel tank (Pg. 44), and supply fuel for the carburetors by some means during adjustment.
- Remove the carburetor top covers (4) and loosen the locknuts (Fig. B19).

•With the engine running at idling speed, readjust the individual throttle adjusting screws to set all the carburetors to within 2 cm Hg of each other. Backing the screw out decreases vacuum and turning it in increases it. If any gauge reads less than 15 cm Hg after synchronizing the carburetors, recheck the points listed in the end of the idling adjustment; check and clean the carburetor starter system if necessary.

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

•Perform idling adjustment again.
•Open the throttle grip and let it snap shut a few times. Make sure the vacuum readings stay within the specified vacuum reading. If they do not, repeat the last two steps.
•After the carburetors are properly synchronized, tighten the locknuts without changing the positions of the screws. Install the top covers.
•Install the fuel tank (Pg. 44).
•Detach the vacuum gauge and install the rubber caps on the vacuum gauge attachments.
•For any carburetors readjusted, readjust the pilot screw as explained in Idling Adjustment (Pg. 19).
•Adjust idling speed to 950 ~ 1,050 rpm with the idle adjusting screw.

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.

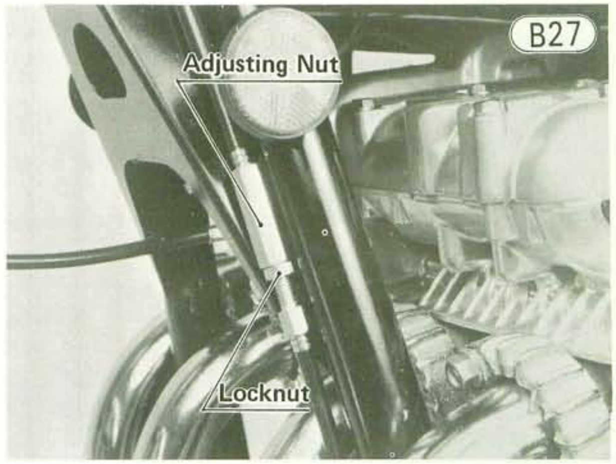
NOTE: Even though the proper amount of play exists at the clutch lever, clutch lever play alone cannot be used to determine whether or not the clutch requires adjustment.

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

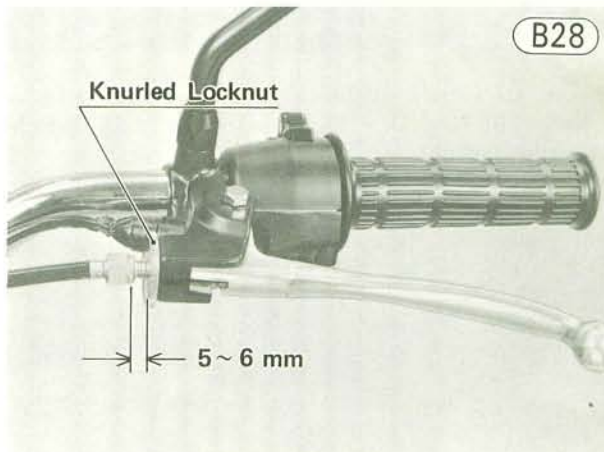
To adjust the clutch:

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

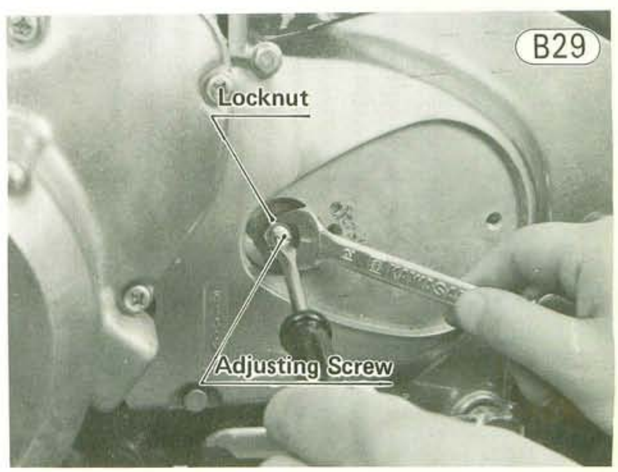
•Screw in fully the locknut and adjusting nut at the center of the clutch cable to give the cable plenty of play.



•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.



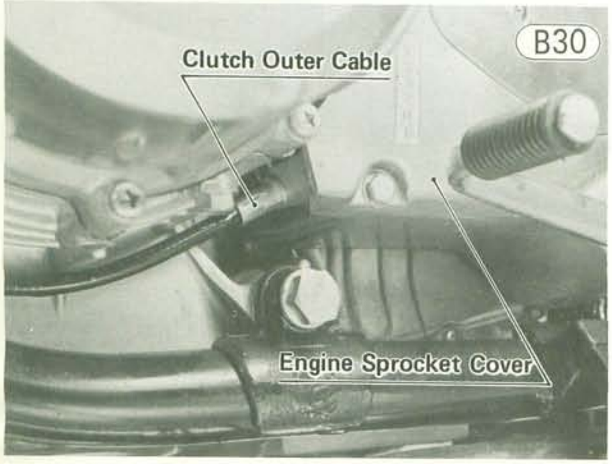
•Remove the clutch adjusting cover.
•Loosen the locknut, and back out the clutch adjusting screw 3 or 4 turns until the screw turns without drag.



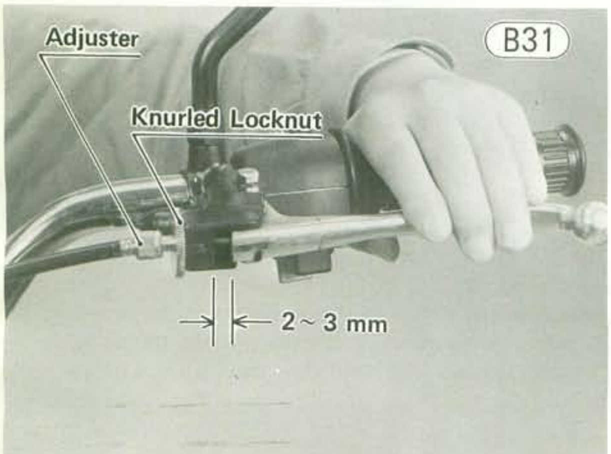
•Turn the adjusting screw in until it becomes hard to turn. This is the point where the clutch is just starting to release.
•Back out the adjusting screw ½ turn from that point, and tighten the locknut.

- 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 sprocket 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 and tighten the knurled locknut.



- Install the clutch adjusting cover and gasket.

ENGINE OIL

Inspection and Change:

In order for the engine, transmission, and clutch to function properly, always maintain the engine oil at the proper level and change the oil in accordance with the Periodic Maintenance Chart (Pg. 10).

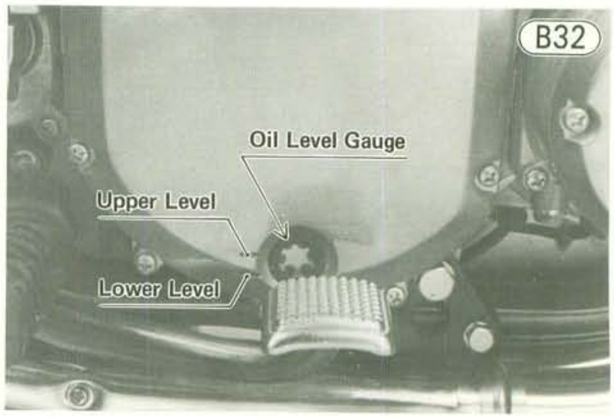
CAUTION **Motorcycle operation with insufficient, deteriorated, or contaminated engine oil will cause accelerated wear and may result in engine or transmission seizure.**

1) 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.

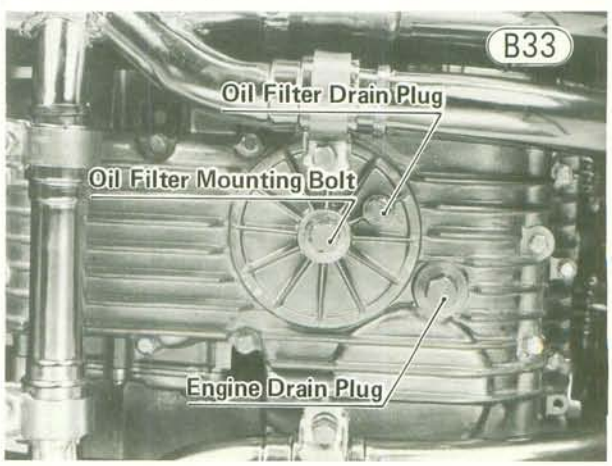


- If the oil level is too high, remove the excess oil, using a syringe or some other suitable device.
- If the amount of oil is insufficient, add oil through the oil filler opening. Use the same type and brand of oil that already is in the engine.

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.**

2) Oil and oil filter change

- Warm up the engine thoroughly, and then stop the engine.
- Set the motorcycle up on its center stand, place an oil pan beneath the engine, and remove the engine and oil filter drain plugs.



- The engine drain plug is magnetic to catch steel filings. Be sure to clean it off before reinstalling it.
- If the oil filter is to be changed, remove the filter mounting bolt and drop out the oil filter.
- Replace the oil filter with a new one. Check that it is properly assembled (Pg. 73).

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

- Install the oil filter, tightening its bolt to 1.8 ~ 2.2 kg-m (13 ~ 16 ft-lbs) of torque; and filter drain plug to the same torque.
- After the oil has completely drained out, install the engine drain plug. Proper torque for the drain plug is 2.7~3.3 kg-m (19.5~24.0 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 3.7 liters.

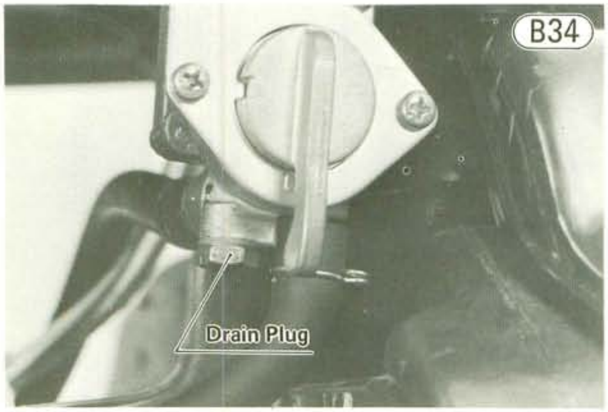
NOTE: After the engine has been run and then stopped for a few minutes, the oil level should come to between the upper and lower marks.

FUEL SYSTEM

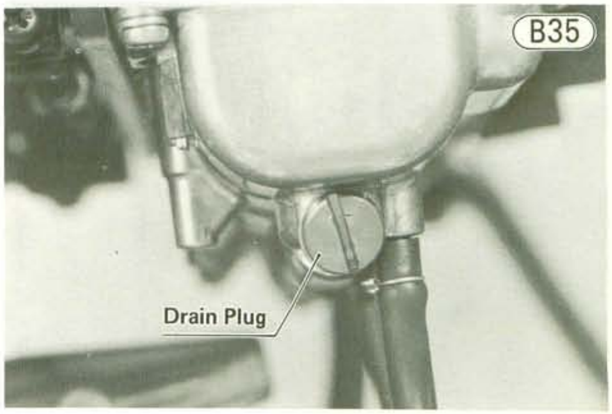
Accumulation of water in the fuel tank will restrict the flow of fuel and cause the carburetor to malfunction. The fuel system should be cleaned out periodically in the following manner.

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

- Remove the drain plug at the bottom of the fuel tap.



- Holding a container under the fuel tap, turn the tap to the "PRI" position to drain the tank until only gasoline comes out, and then turn the tap to the "ON" position. Install the gasket and the drain plug on the tap.
- If water has accumulated in the fuel tank, water may also have accumulated in the float bowl.
- Remove the drain plug from the bottom of each carburetor float bowl to drain the bowls.



- Install the **O** rings and drain plugs on the float bowls.

Adjustment – Chassis

Table of Contents

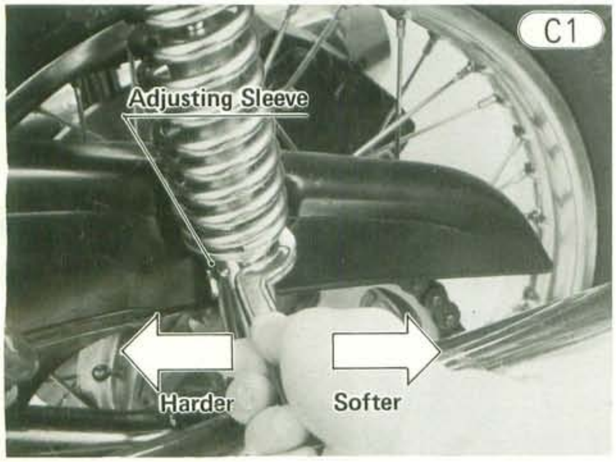
C

REAR SHOCK ABSORBERS

The rear shock absorbers can be adjusted to one of five 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.

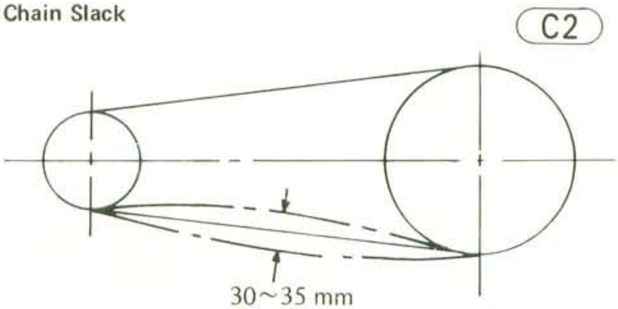
WARNING **If they are not adjusted to the same position, an unsafe riding condition may result.**

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 30 mm or more than 40 mm, adjust the chain so that the vertical movement will be about 30~35 mm.

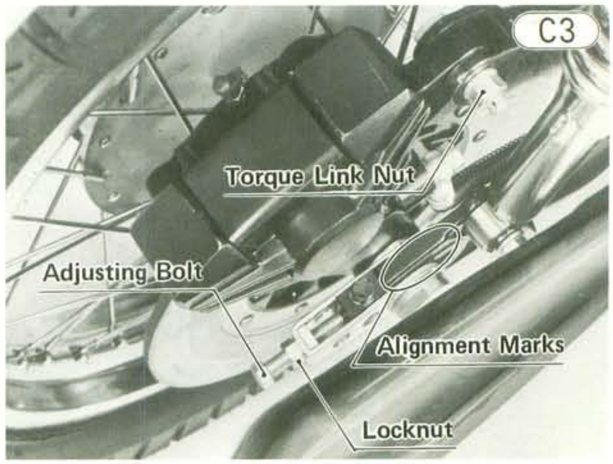
Chain Slack



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

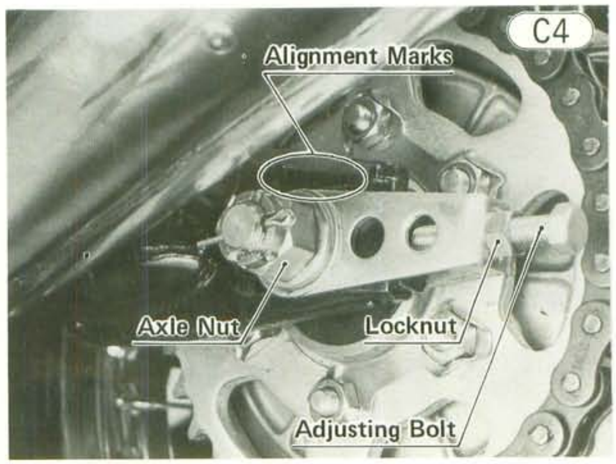
2. Take care not to damage the brake hose. Damaging the brake line greatly reduces the brake line strength and causes brake fluid leakage, resulting in the loss of brake control.

•Remove the safety clip, and loosen the nut at the rear end of the torque link.



•Loosen the left and right chain adjuster locknuts.

•Remove the axle cotter pin and loosen the axle nut.



•If the chain is too tight, back out the left and right chain adjusting bolts, and kick the wheel forward until the chain is too loose.
•Turn in the left and right chain adjusting 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.
•Tighten the axle nut with 10.0 ~ 14.0 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 ~ 25.0 ft-lbs) of torque, and insert the safety clip.

BRAKES

Front Brake:

Disc and disc pad wear is automatically compensated for and has no effect on the brake lever action. So there are no parts that require adjustment on the front brake. However if the brake lever has a soft, or "spongy feeling", check the brake fluid level in the master cylinder and bleed the air from the brake line (Pg. 180).

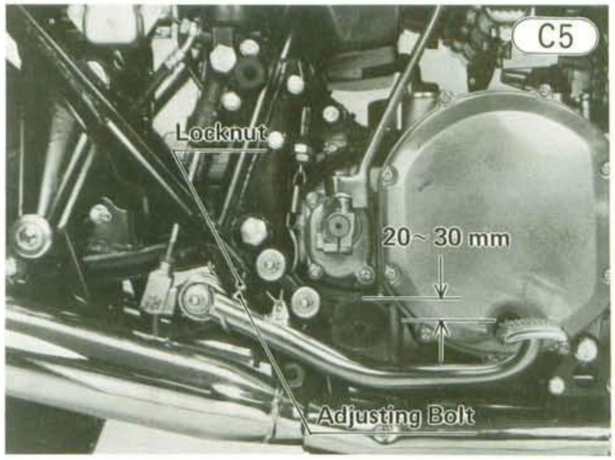
Rear Brake:

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 inside the pedal assembly itself, 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 brakes, be sure that air is bled from the brake lines (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 low; loosen the locknut and then turn the brake pedal adjusting bolt to obtain the correct pedal position, and then tighten the locknut.
•If it is too high; loosen the locknut, slide down the push rod dust cover, and shorten the brake push rod to give the brake pedal plenty of play. Then adjust the brake pedal position.
•Check brake pedal travel, and tighten the brake push rod locknut.

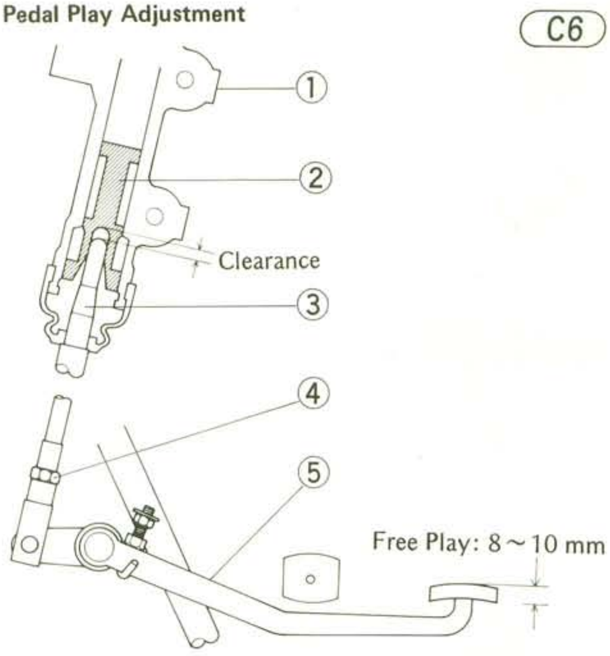


To check the brake pedal play:

•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 Adjustment



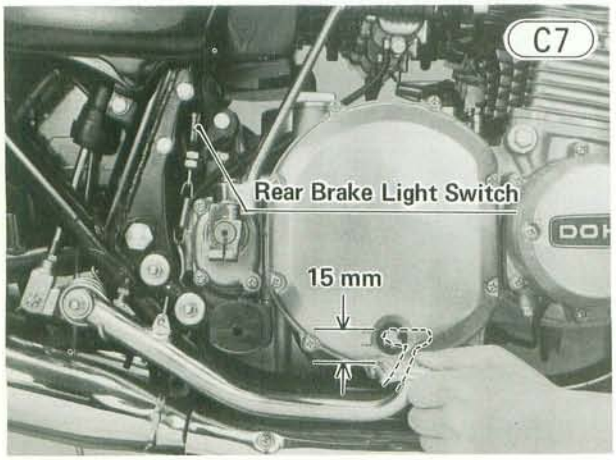
1. Master Cylinder
2. Piston
3. Push Rod
4. Locknut
5. Pedal

•To adjust play, loosen the locknut and turn the push rod. Tighten the locknut.
•Check the rear brake light switch.
•Check for brake drag, and check braking effectiveness.

BRAKE LIGHT SWITCH

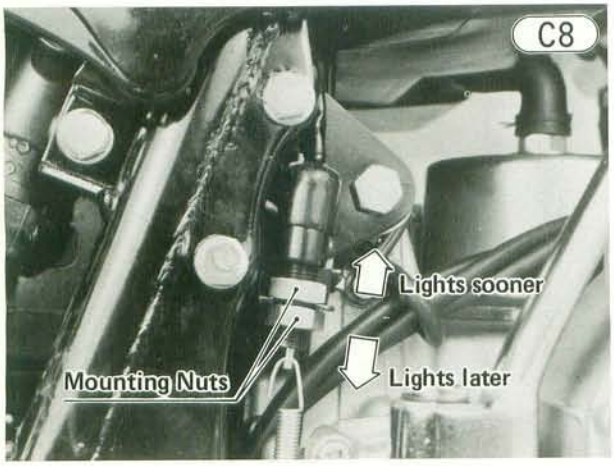
The front brake light switch, mounted on the steering stem base, operates hydraulically and is non-adjustable. However, the rear brake light switch, activated by a spring attached to the brake pedal, requires periodic adjustment to compensate for any change in spring shape or tension.

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, do not turn the switch body during adjustment.**

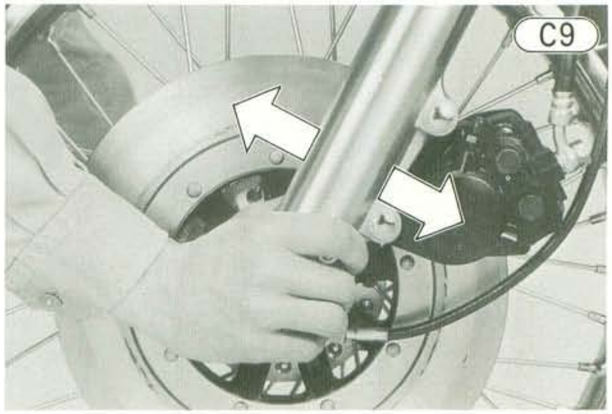


STEERING

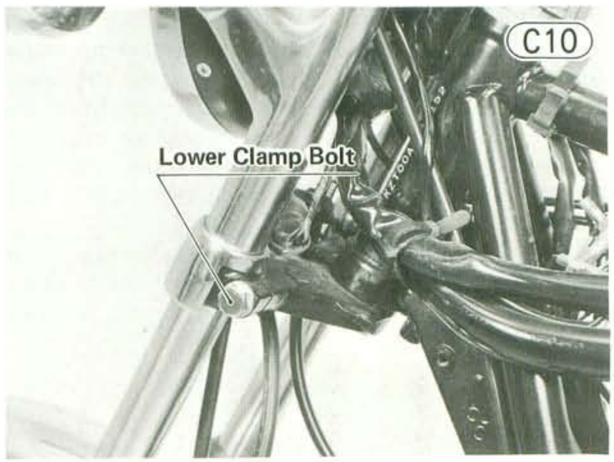
For safety, the steering should always be kept adjusted so that the handlebar will turn freely but have no play.

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:
- Raise the front wheel 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.

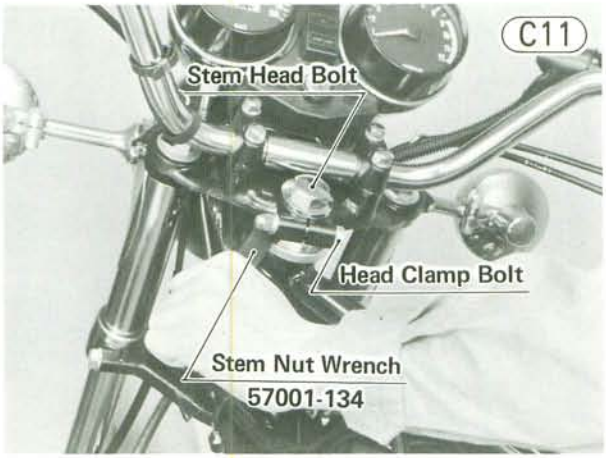


To adjust the steering:
- Remove the fuel tank (Pg. 44) to avoid damaging the painted surface.
- Loose the front fork lower clamp bolts (2) to free the fork tubes from the steering stem base during adjustment.



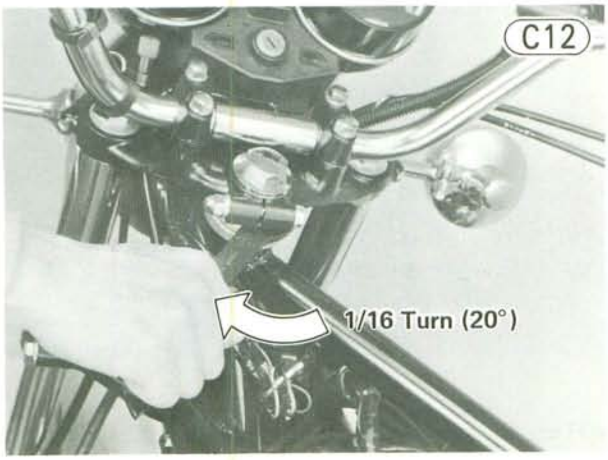
- Loosen the steering stem head bolt and head clamp bolt, and back out the steering stem locknut using the stem nut wrench (special tool) 1 or 2 turns until it turns without drag.

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 to 2.7 ~ 3.3 kg-m (19.5 ~ 24.0 ft-lbs) of torque.

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



•Tighten the steering stem head bolt with 4.0 ~ 5.0 kg-m (29 ~ 36 ft-lbs) of torque.
•Tighten the steering stem head clamp bolt with 1.6 ~ 2.2 kg-m (11.5 ~ 16.0 ft-lbs) of torque.
•Tighten the front fork lower clamp bolts (2) to 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. 183).
•Remount the fuel tank (Pg. 44).

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 (Pgs. 99, 106).
•Check that all the spokes are tightened evenly and the rim runout is within the service limit (Pg. 172).
•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 procedures 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 (Pgs. 99, 107).

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.
4. If a new tire is installed, the yellow paint mark on the tire should be aligned with the valve stem for best balancing results (Fig. G48 on Pg. 114).

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 vertically, neither low nor high beam will illuminate the road far enough ahead. If adjusted too high vertically, high beam will fail to illuminate the road close ahead, and low beam will blind oncoming drivers.

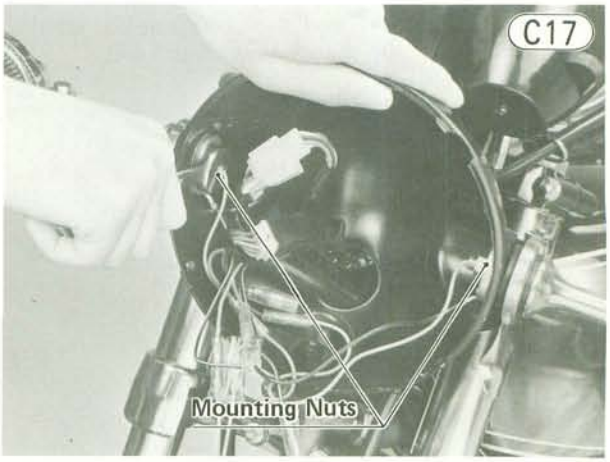
Horizontal Adjustment:

•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:

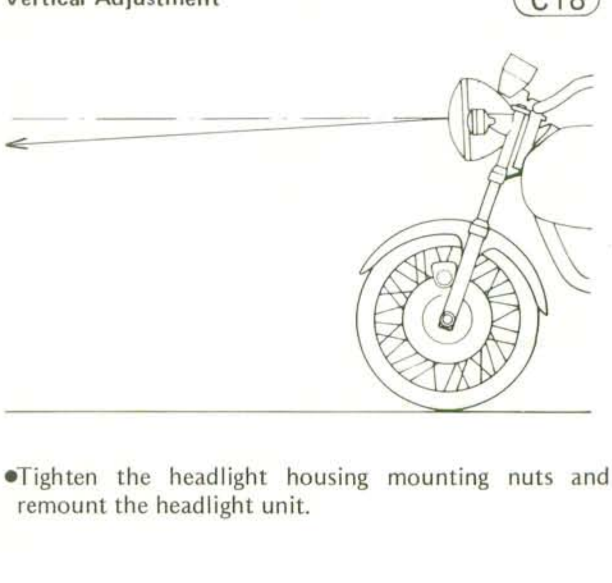
•Remove the two screws from the lower side of the headlight housing, and drop out the headlight unit.

•Loosen the headlight housing mounting nuts, and adjust the headlight vertically.



NOTE: On high beam, the brightest point should be slightly below horizontal. Adjust the headlight to the proper angle according to the regulation that applies to its operation.

Vertical Adjustment



•Tighten the headlight housing mounting nuts and remount the headlight unit.

HORN

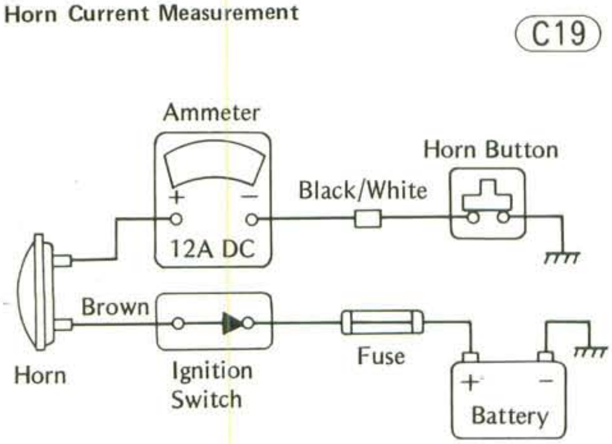
The horn contacts wear down after long use and may need to be adjusted from time to time. Turning in the adjusting screw compensates for contact wear. If satisfactory horn performance cannot be obtained by this adjustment when the rest of the electrical system is functioning properly, the horn must be replaced. It cannot be disassembled.

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

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

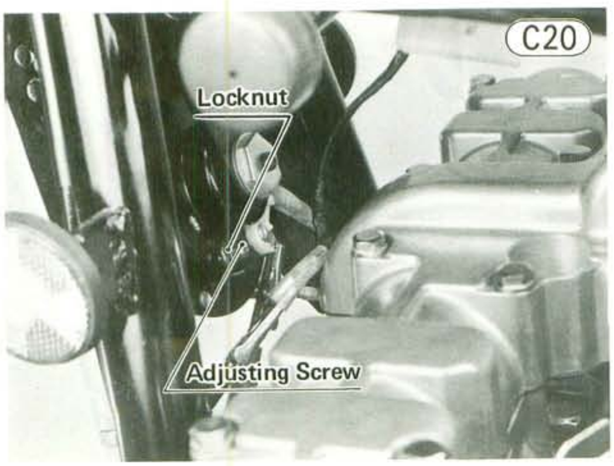
- Remove the fuel tank to gain access to the horn wires.
- Disconnect the black/white horn lead, and connect an ammeter in series to the horn circuit. The + ammeter lead goes to the horn terminal and the – ammeter lead to the black/white lead.

Horn Current Measurement



- 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.

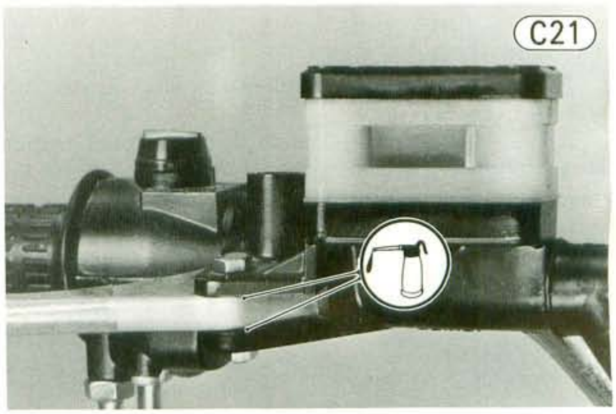
NOTE: The horn will not sound properly if it is mounted incorrectly or if any cable or other part is touching it.



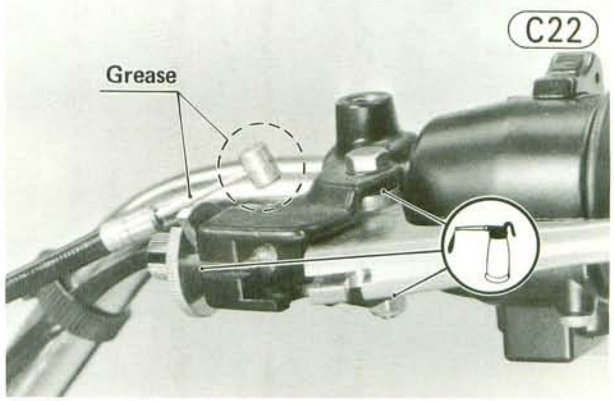
LUBRICATION

Lubricate exposed parts which are subject to rust, with either motor oil or regular grease whenever the vehicle has been operated under wet or rainy conditions, and especially after using a high-pressure spray washer. Before lubricating each part, clean off any rusty spots with rust remover and wipe off any grease, oil, dirt, or grime.

Brake Lever

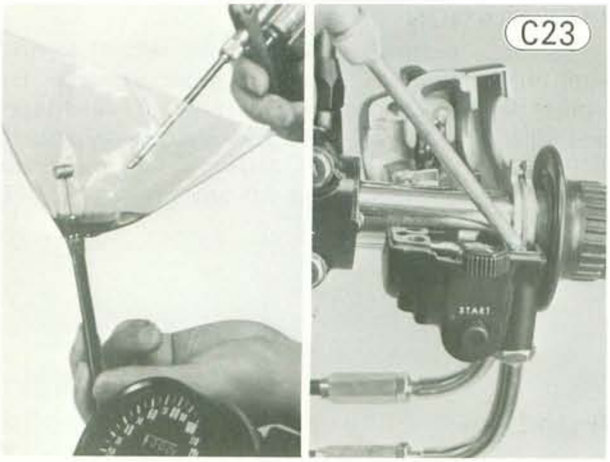


Clutch Lever



Clutch and Throttle Cables

Lubricate the clutch cable and throttle cables, as shown in the figure. Refer to Pg. 114 and 115 for cable removal.



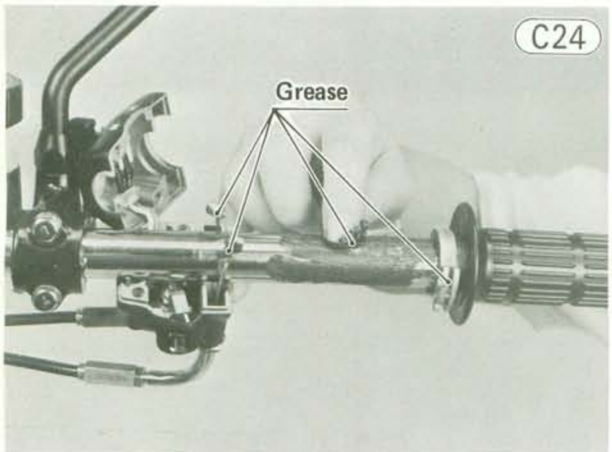
C23

Throttle Grip

Apply grease to the handlebar where the throttle grip turns.

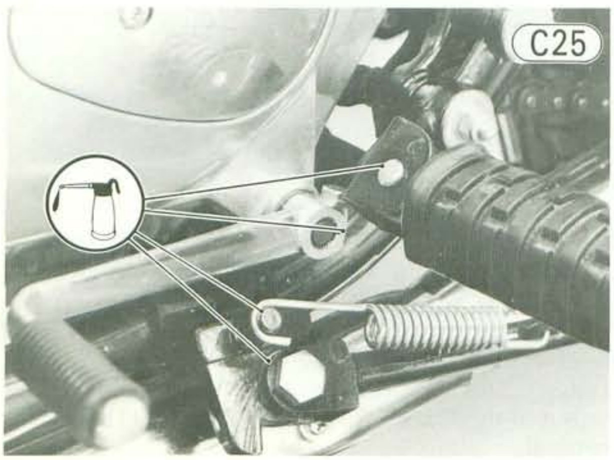
Apply a light coat of grease to the exposed portion of the throttle grip inner cables and their catches in the throttle grip.

Fit the throttle cables into the throttle grip. Refer to throttle cable installation (Pg. 115).



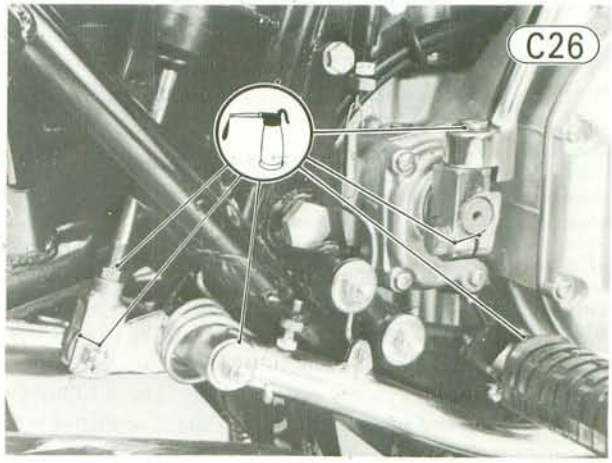
C24

Left Footpeg, Side Stand



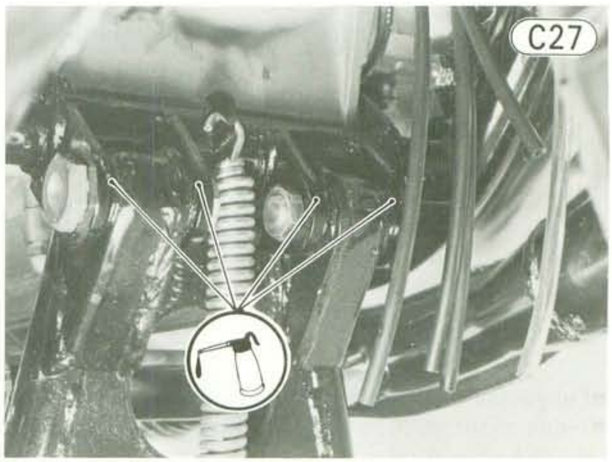
C25

Kickstarter Pedal, Right Footpeg, Brake Pedal, and Brake Push Rod



C26

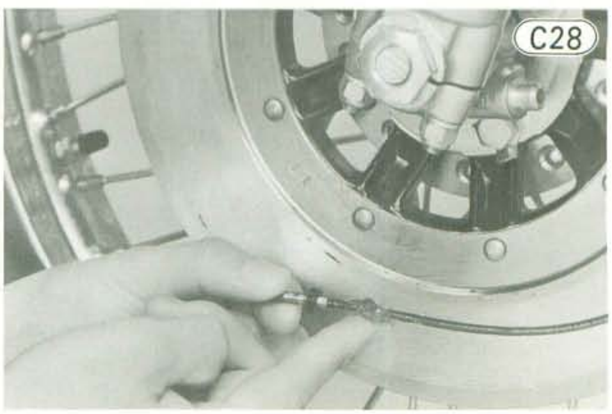
Center Stand



C27

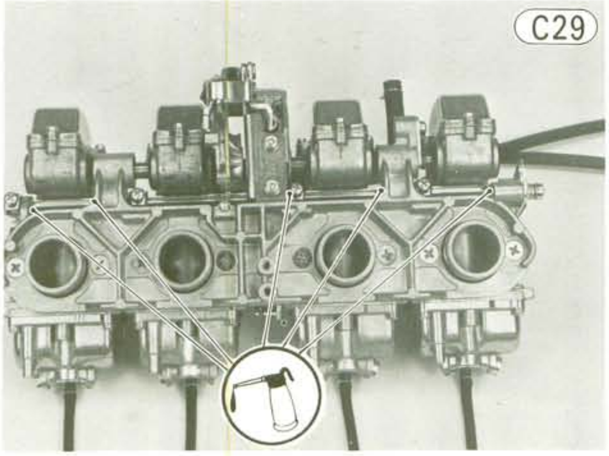
Speedometer and Tachometer Cables

Apply grease sparingly to the inner cables.



C28

Carburetor Choke Link Mechanism



Others

Lubricate the drive chain, wheel bearings, speedometer gear housing, swing arm, and steering stem bearings as explained in the Maintenance Section.
NOTE: A few drops of oil are effective to keep bolts and nuts from rusting and sticking. This makes removal easier. Badly rusted nuts, bolt, etc. should be replaced with new ones.

Disassembly – Introduction

Table of Contents

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 filings.

(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 clockwise, viewed from the right side of the engine. This will ensure proper adjustments.

(9) Lubrication
Engine wear is generally at its maximum while the engine is warming up and before all the rubbing surfaces have an adequate lubricative film. During assembly, oil should be applied to any bearing 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 stopper 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.

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 requiring use of a non-permanent locking agent.

When checking the tightening torque of the bolts and nuts, first loosen the bolt or nut by half a turn and then tighten to the specified torque.

ENGINE

Part	Locking Agent (•), Liquid Gasket (★) Required	Quantity	Metric (kg-m)	English (ft-lbs)	See Pg.
Breather cover bolt ϕ8 P1.25	–	1	1.3 ~ 1.7	9.5 ~ 12.0	59
Camshaft cap bolts ϕ6 P1.0	–	16	1.1 ~ 1.3	95 ~ 113 in-lbs	49
Camshaft chain guide screw (front) ϕ6 P1.0	•	1	–	–	59
Camshaft chain guide sprocket shaft bolt ϕ6 P1.0	•	1	0.8 ~ 1.0	69 ~ 87 in-lbs	57
Camshaft chain guide sprocket Allen bolts ϕ6 P1.0	•	4	0.9 ~ 1.1	78 ~ 95 in-lbs	57
Camshaft chain tensioner bolt ϕ6 P1.0	–	1	0.7 ~ 0.9	61 ~ 78 in-lbs	14
Camshaft sprocket bolts ϕ6 P1.0	•	6	1.4 ~ 1.6	10.0 ~ 11.5	51
Carburetor holder screws ϕ6 P1.0	•	8	–	–	57
Carburetor mounting screws ϕ6 P1.0	•	8	–	–	47
Clutch hub nut ϕ20 P1.5	–	1	11.0 ~ 13.0	80 ~ 94	72
Clutch release screws ϕ6 P1.0	•	2	–	–	61
Clutch spring bolts ϕ6 P1.0	–	5	0.9 ~ 1.1	78 ~ 95 in-lbs	72
Crankcase bolts					
upper ϕ6 P1.0	•, ★	5	0.9 ~ 1.1	78 ~ 95 in-lbs	88
lower ϕ6 P1.0	•, ★	17	0.9 ~ 1.1	78 ~ 95 in-lbs	87
lower ϕ8 P1.25	•, ★	8	2.3 ~ 2.7	16.5 ~ 19.5	87
Crankshaft main bearing cap bolts ϕ8 P1.25	–	4	2.3 ~ 2.7	16.5 ~ 19.5	96
Cylinder head					
bolts ϕ6 P1.0	–	2	1.1 ~ 1.3	95 ~ 113 in-lbs	51,52
nuts ϕ10 P1.25	–	12	3.7 ~ 4.3	27 ~ 31	51,52
Cylinder head cover bolts ϕ6 P1.0	–	16	1.4 ~ 1.6	10.0 ~ 11.5	50
Dynamo armature Allen bolts ϕ6 P1.0	•	3	0.9 ~ 1.1	78 ~ 95 in-lbs	65
Dynamo cover screws ϕ6 P1.0	•	8	–	–	65
Dynamo rotor bolt ϕ10 P1.25	–	1	7.0 ~ 7.5	51 ~ 54	67

Part	Locking Agent (●), Liquid Gasket (★) Required	Quantity	Metric (kg-m)	English (ft-lbs)	See Pg.
Engine drain plug ϕ20 P1.5	–	1	2.7~3.3	19.5~24.0	73
Engine mounting bolts					
front ϕ10 P1.25	–	1	3.4~4.6	25~33	82,83
center ϕ12 P1.25	–	2	3.4~4.6	25~33	82,83
rear upper ϕ10 P1.25	–	1	3.4~4.6	25~33	82,83
rear lower ϕ10 P1.25	–	1	3.4~4.6	25~33	82,83
Engine mounting brackets					
front ϕ8 P1.25	–	2	2.0~2.8	14.5~20.0	82,83
center ϕ8 P1.25	–	2	2.0~2.8	14.5~20.0	82,83
rear ϕ8 P1.25	–	4	2.0~2.8	14.5~20.0	82,83
Engine sprocket nut ϕ20 P1.25	–	1	7.5~8.5	54~61	62
External shift mechanism cover screw ϕ6 P1.0	●	9	–	–	64
Neutral indicator switch ϕ12 P1.5	–	1	1.3~1.7	9.5~12.0	62
Oil breather cover bolt ϕ8 P1.25	–	1	1.3~1.7	9.5~12.0	59
Oil filter drain plug ϕ8 P1.25	–	1	1.8~2.2	13.0~16.0	73
Oil filter mounting bolt ϕ20 P1.5	–	1	1.8~2.2	13.0~16.0	73
Oil pan bolts ϕ6 P1.0	–	17	0.9~1.1	78~95 in-lbs	74
Oil passage plug ϕ14 P1.5	●	1	–	–	166
Oil pressure switch ϕ20 P1.5	–	1	0.5~0.7	43~61 in-lbs	60
Oil pump cover screws ϕ6 P1.0	●	5	–	–	74
Oil pump mounting bolts ϕ6 P1.0	●	3	0.7~0.9	61~78 in-lbs	74
Ratchet gear stop bolts ϕ6 P1.0	●	2	0.9~1.1	78~95 in-lbs	94
Return spring pin ϕ8 P1.25	●	1	–	–	63
Right engine cover screws ϕ6 P1.0	●	6	–	–	89
Shift drum pin plate screw ϕ6 P1.0	●	1	–	–	91
Spark plugs ϕ14 P1.25	–	4	2.5~3.0	18.5~22.0	12
Starter clutch Allen bolts ϕ8 P1.25	●	3	3.3~3.7	24~27	67
Starter motor lead terminal nuts	–	2	0.4~0.6	35~52 in-lbs	68
Starter motor retaining bolts ϕ6 P1.0	●	2	0.9~1.1	78~95 in-lbs	68
Stud bolts					
cylinder ϕ10 P1.50	●,★	12	less than 1.0	less than 87 in-lbs	–
exhaust ϕ8 P1.0	●	8	less than 0.5	less than 43 in-lbs	–
Timing advancer bolt ϕ8 P1.25	–	1	2.3~2.7	16.5~19.5	70

CHASSIS

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. 102.				
Front axle clamp nuts ϕ8 P1.25	–	4	1.6 ~ 2.2	11.5 ~ 16.0	99
Front axle nuts ϕ16 P1.5	–	2	7.0 ~ 9.0	51 ~ 65	99
Front brake light switch PT 1/8	●	1	2.6 ~ 3.0	19.0 ~ 22.0	121
Front fork bottom Allen bolts ϕ10 P1.25	●, ★	2	2.0 ~ 2.6	14.5 ~ 19.0	127
Front fork clamp bolts					
upper ϕ8 P1.25	–	2	1.6 ~ 2.2	11.5 ~ 16.0	126
lower ϕ12 P1.25	–	2	3.4 ~ 4.6	25 ~ 33	126
Front fork top bolts ϕ28 P1.0	–	2	2.5 ~ 3.0	18.0 ~ 22.0	126
Handlebar clamp bolts ϕ8 P1.25	–	4	1.6 ~ 2.2	11.5 ~ 16.0	122
Pad mounting screw ϕ6 P1.0	●	1	–	–	102
Rear axle nut ϕ18 P1.5	–	1	10.0 ~ 14.0	72 ~ 101	27
Rear shock absorber mounting					
bolts ϕ10 P1.25	–	2	2.6 ~ 3.5	19.0 ~ 25.0	129
nuts ϕ12 P1.25	–	2	2.6 ~ 3.5	19.0 ~ 25.0	129
Rear sprocket nuts ϕ10 P1.25	–	6	3.6 ~ 4.4	26 ~ 32	109
Spokes	–	80	0.20 ~ 0.40	17 ~ 35 in-lbs	114
Steering stem head bolt ϕ16 P1.5	–	1	4.0 ~ 5.0	29 ~ 36	29
Steering stem head rear clamp bolt ϕ8 P1.25	–	1	1.6 ~ 2.2	11.5 ~ 16.0	29
Steering stem locknut ϕ30 P1.0	–	1	2.7 ~ 3.3	19.5 ~ 24.0	29
Swing arm pivot shaft nut ϕ16 P1.5	–	1	8.0 ~ 12.0	58 ~ 87	129
Torque link nuts ϕ10 P1.25	–	2	2.6 ~ 3.5	19.0 ~ 25.0	27,131

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. 37 ~ 39 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. 37 ~ 39. All of these values are for use with dry solvent-cleaned threads.

Coarse threads

dia (mm)	pitch (mm)	kg-m	ft-lbs
5	0.80	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

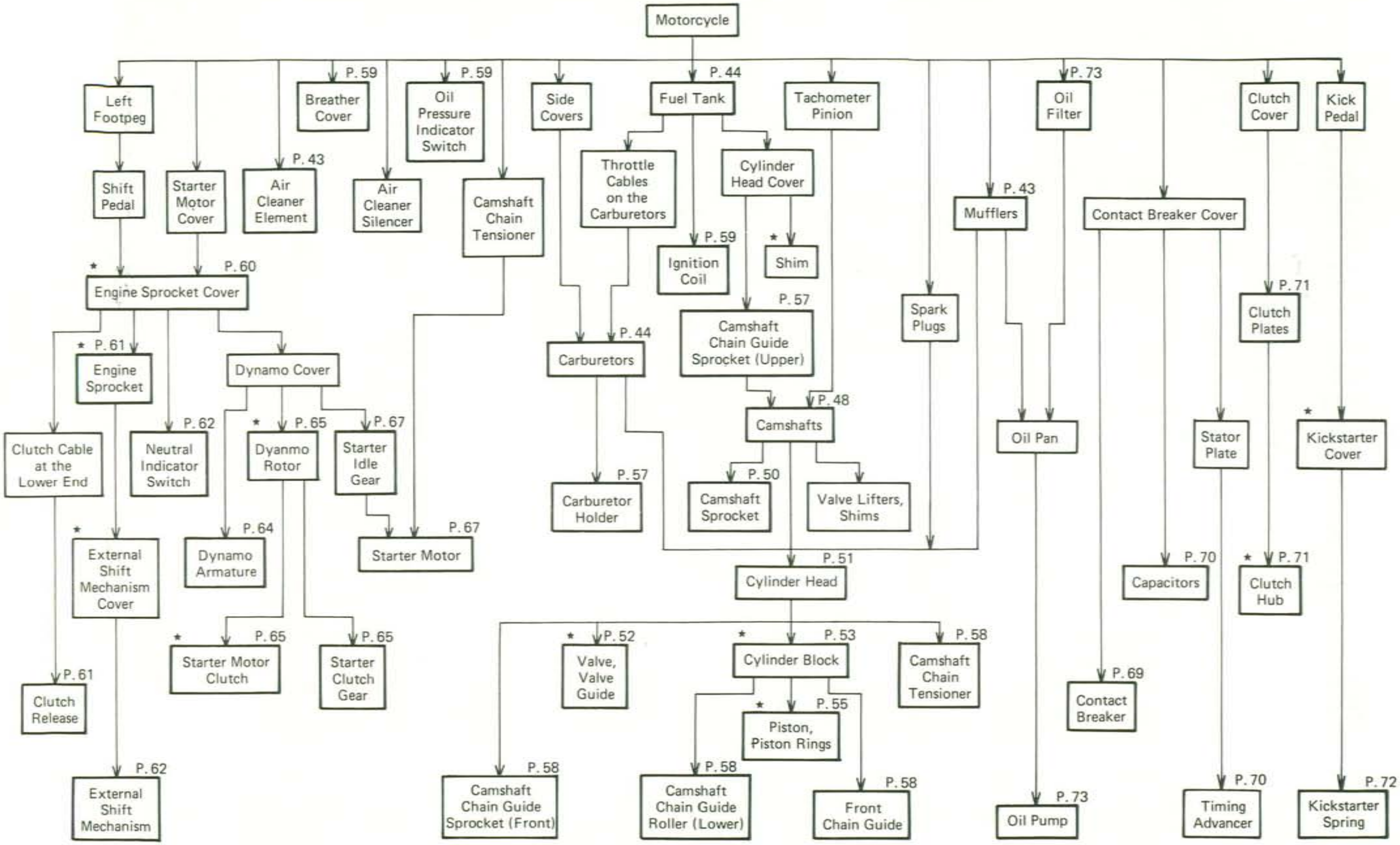
Disassembly – Engine Installed

Table of Contents

E

FLOW CHART
Disassembly – Engine Installed

This 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.

AIR CLEANER ELEMENT

Removal:

•Unlock the seat, and swing it open.
•Remove the tool kit and its tray.
•Take off the air cleaner cap, and pull out the air cleaner element.

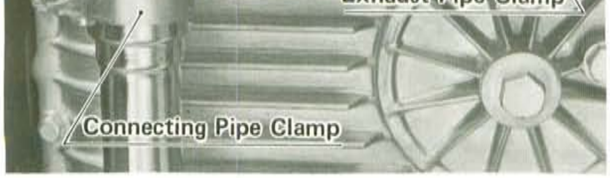
Installation Notes:

1. Take care not to push the sponge gasket out of place during installation.
2. Route the carburetor air vent tubes through the hole in the frame gusset to the place between the air cleaner silencer and the voltage regulator, and fit them on the air cleaner cap.

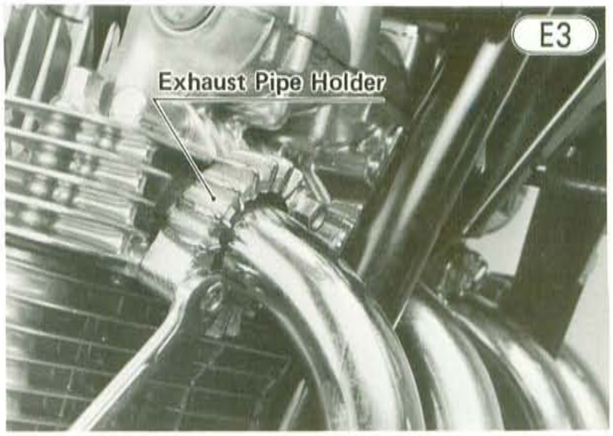
MUFFLERS

Removal:

•Loosen the clamps that secure the muffler connecting pipe to the mufflers, and loosen #2 and #3 exhaust pipe clamps.



•Remove the exhaust pipe holder self-locking nuts (8), and slide the holders (4) off the studs.



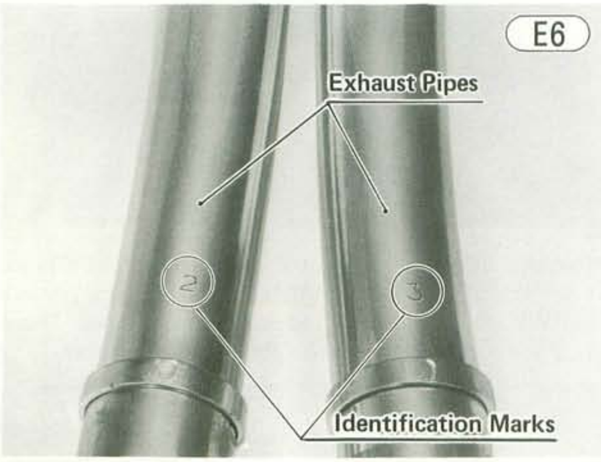
•Remove the mounting bolt and washers at the rear for each side to complete muffler removal. Also, remove gaskets and split keeper for each exhaust pipe. There is a self-locking nut behind the muffler bracket.

Installation:

•Separate the #2 and #3 exhaust pipe from the left and right muffler.
•Fit a new gasket into the #1 and #4 exhaust port, and place an exhaust pipe holders on the stud bolts.
•Fit the end of the exhaust pipes into the exhaust ports, and attach the muffler rear parts to the frame, connecting both mufflers with the connecting pipe. Tighten the bolts loosely.
•Fit the split keeper back into place, tighten the exhaust pipe holder nuts evenly to avoid an exhaust leak, and then tighten the muffler bracket bolts.

- Fit a new #2 and #3 exhaust port gaskets and place an exhaust pipe holders on the stud bolts.
- Fit the #2 and #3 exhaust pipes into the exhaust ports, inserting their lower ends into the mufflers.

NOTE: There is an identification mark on the #2 and #3 exhaust pipes. Do not mix up those exhaust pipes.



- Fit the split keeper back into place, tighten the exhaust pipe holder nuts evenly, and then tighten the exhaust pipe clamp bolt.
- Tighten the clamp bolts of the muffler connecting pipe.
- Thoroughly warm up the engine, wait until the engine grows cold, and retighten all the clamp bolts.

FUEL TANK

Removal:

- Turn the fuel tap to the "ON" position, slide down the hose clamps, and pull the fuel hose and the vacuum hose off the tap.
- Unlock the seat, and swing it open.
- Take off the left side cover.
- Unhook the rubber retaining band and then pull the fuel tank off towards the rear.

Installation:

- Put on the fuel tank.
- Fit the fuel and vacuum hoses back onto the fuel tap, slide the clamps back into place, and then hook the fuel tank retaining band. The vacuum hose has a smaller diameter than the fuel hoses.
- Install the left side cover.
- Push the seat back down.

CARBURETORS

Removal:

- Take off the right and left side covers.
- Remove the fuel tank (See above).
- Remove the tool kit and its tray.
- Loosen the carburetor holder clamp and the air cleaner duct clamp for each carburetor, and slip it out of place.
- Screw in fully the locknuts and adjusting nuts at the upper end of the throttle cables so as to give the cables plenty of play.

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

- Loosen the throttle cable adjuster mounting nuts (2 ea) fully, remove the accelerator throttle cable adjuster from its bracket, and slip the tip of its inner cable out of the pulley. Then do the same with the decelerator throttle cable.

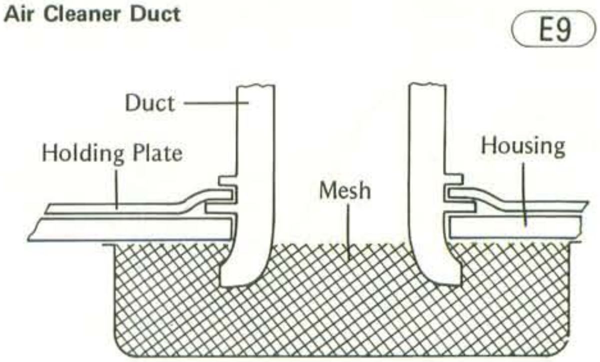
- Remove the carburetor air vent tubes (2) from the air cleaner cap and pull them out towards the engine.
- Pull the carburetor overflow tubes (4) off the rubber guide at the rear right of the engine.
- Pull the carburetor assembly off to the rear and out.

Installation:

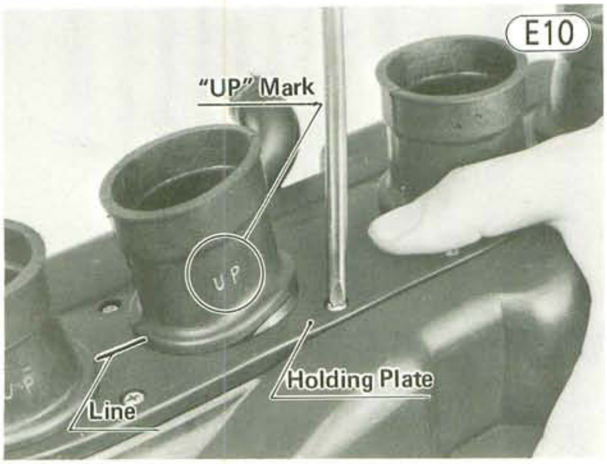
NOTE: If the carburetors are disassembled and assembled, perform initial synchronization-mechanical (Pg. 18) before installing the carburetors.

- Check that the air cleaner ducts are fitted properly in the air cleaner housing. If any ducts are not properly fitted, loosen the eight screws and set the ducts into proper position aligning the lines on both sides of each duct with the lines on the holding plate.

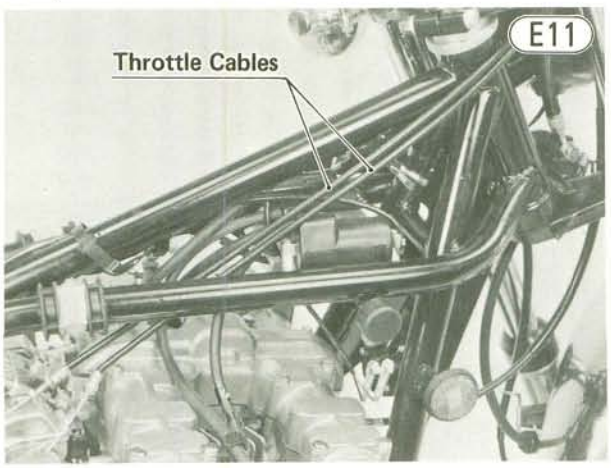
Air Cleaner Duct



NOTE: There are "UP" marks on the air cleaner ducts. Install them into the air cleaner housing, facing the "UP" marks upwards. There is also an "L" mark on the outer left duct and an "R" mark on the outer right duct.



- Slip the carburetors back into place the reverse of how they were removed.
- Fit the tip of the throttle accelerator cable into the rear catch in the pulley, and install its adjuster into the cable bracket. Be sure that both throttle cables run between the frame top tube and the right side cradle tube without kinks or sharp bends, and that they do not twist around each other.

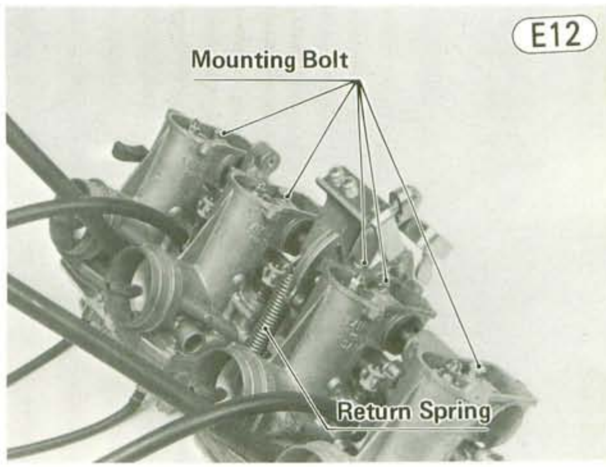


- Fit the tip of the other cable into the other catch, and install its adjuster onto the bracket while turning the throttle grip at the same time, if necessary.
- Center each adjuster in its place in the bracket, and tighten the mounting nuts.
- Check that the ducts and holders are all properly fitted on the carburetors, tighten all eight clamps.
- Route the carburetor overflow tubes (4) to the rear right through their rubber guide.
- Route the carburetor air vent tubes through the hole in the frame gusset to the place between the air cleaner silencer and the voltage regulator, and fit them on the air cleaner cap.
- Put the tool kit and its tray onto the air cleaner cap.
- Install the fuel tank (Pg. 44).
- Fit the right and left side covers.
- Adjust the throttle cables (Pg. 16).
- Adjust the carburetors (Pg. 18).

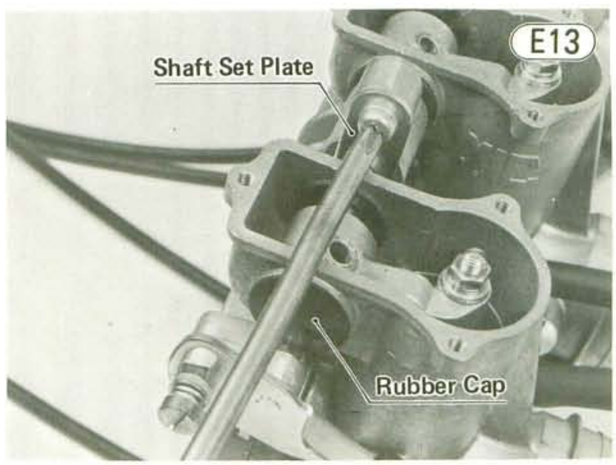
Separation of Carburetors:

NOTE: 1. The four carburetors look the same in appearance but they are slightly different from each other. Note the sequence of assembly prior to removal, especially the following.
○Position of the drain plug
○Existence of the fuel hose 3-way joint
2. All carburetor parts except for the fuel hose 3-way joints and the starter plungers can be removed without separating the carburetors from the mounting plate.

- Remove the idle adjusting screw and spring.
- Remove the screws and lockwashers (12 ea), and the top covers ㉒ and gaskets ㉓ (4 ea).
- Remove the throttle return spring.

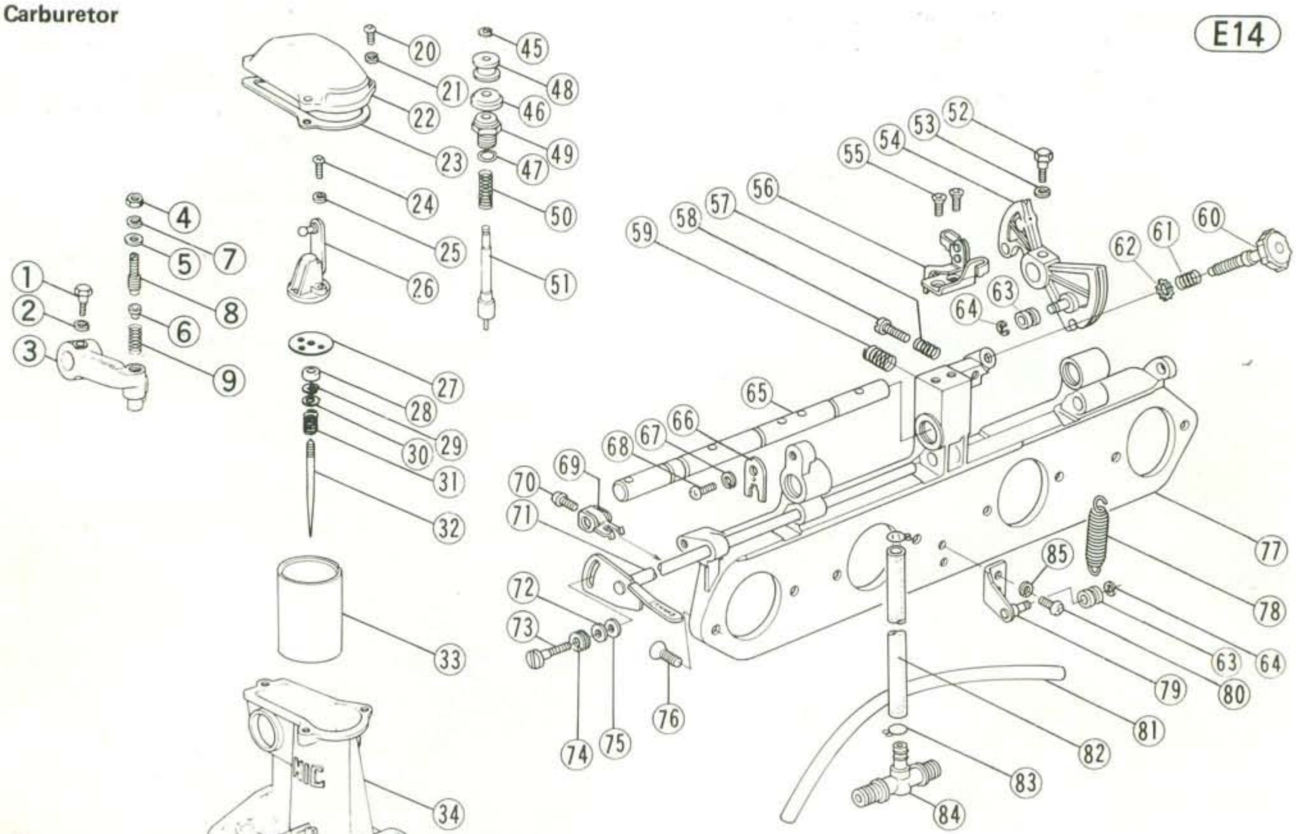


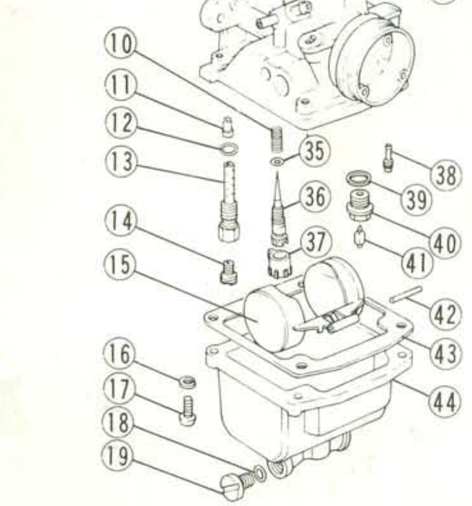
- Unscrew the throttle arm mounting bolts ① (4) and pulley mounting bolt. Each bolt has a lockwasher.
- Remove the screw and lockwasher, and remove the throttle shaft set plate.



- Remove the rubber caps from both sides of the carburetor assembly.
- Pull the throttle shaft out by pushing the other end.
- Remove the mounting screws (8) and remove the carburetors from the mounting plate.

Carburetor





1. Bolt
2. Lockwasher
3. Throttle Arm
4. Locknut
5. Washer
6. Ball Seat
7. Lockwasher
8. Adjusting Screw
9. Spring
10. Spring
11. Needle Jet
12. **O** Ring
13. Air Bleed Pipe
14. Main Jet
15. Float
16. Lockwasher
17. Screw
18. **O** Ring
19. Drain Plug
20. Screw
21. Lockwasher
22. Top Cover
23. Gasket
24. Screw
25. Lockwasher
26. Throttle Valve Bracket
27. Holding Plate
28. Spacer
29. Clip
30. Spring Seat
31. Spring
32. Jet Needle
33. Throttle Valve
34. Carburetor Body
35. **O** Ring
36. Pilot Screw
37. Pilot Screw Limiter
38. Pilot Jet
39. Gasket
40. Valve Seat
41. Valve Needle
42. Float Pin
43. Gasket
44. Float Bowl
45. Clip
46. Dust Seal
47. **O** Ring
48. Bush
49. Plunger Cap
50. Spring
51. Starter Plunger
52. Bolt
53. Lockwasher
54. Pulley
55. Screw
56. Cable Bracket
57. Spring
58. Stop Screw
59. Spring
60. Idle Adjusting Screw
61. Spring
62. Lockwasher
63. Collar
64. Clip
65. Throttle Shaft
66. Set Plate
67. Lockwasher
68. Screw
69. Plunger Lever
70. Screw
71. Linkage Shaft
72. Washer
73. Screw
74. Spring
75. Plastic Washer
76. Screw
77. Mounting Plate
78. Return Spring
79. Bracket
80. Screw
81. Vent Tube
82. Fuel Hose
83. Clamp
84. 3-way Joint
85. Lockwasher

Assembly Notes:

1. Apply a non-permanent locking agent to the mounting screw threads.
2. Apply a thin coat of grease to the throttle shaft before inserting the shaft through carburetors.
3. Perform initial synchronization-mechanical (Pg. 18) before installing the top covers.
4. Replace the top cover gasket with a new one, if it is damaged.

Throttle Valve, Jet Needle Removal

NOTE: The throttle valve and jet needle can be removed without separating the carburetor from the mounting plate.

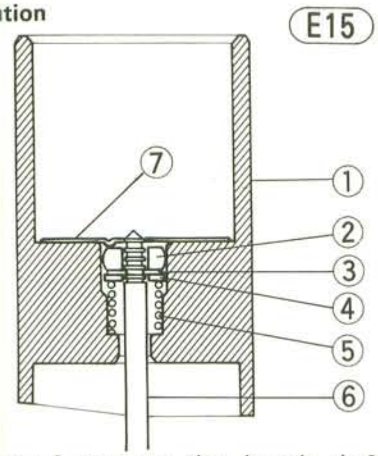
- Remove the throttle shaft as explained in separation of carburetors (Pg. 45).
- Lift up the linkage, and pull out the throttle valve (33) and jet needle (32).
- Remove the screws (24) and lockwashers (25) (2 ea), and take the throttle valve bracket (26), jet needle holding plate (27), spacer (28), jet needle (32), spring seat (30), and spring (31) out of the throttle valve.

Assembly Notes:

1. Install the jet needle holding plate so that the projection on the plate faces the spacer.

Holding Plate Installation

1. Throttle Valve
2. Spacer
3. Clip
4. Spring Seat
5. Spring
6. Jet Needle
7. Holding Plate



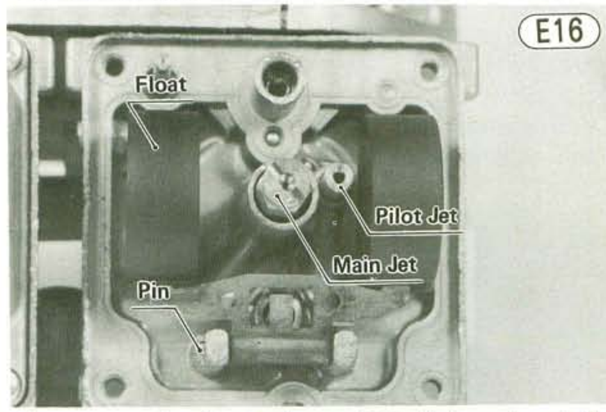
2. Apply a thin coat of grease to the throttle shaft before inserting the shaft through carburetors.
3. Perform initial synchronization–mechanical (Pg. 18) before installing the top covers.

Carburetor Body Disassembly (per carburetor):

NOTE: The following procedure explains removal of the carburetor parts listed below, and these parts except the #1, #2, and #3 starter plungers can be removed without separating the carburetors from the mounting plate.

Main Jet	Pilot Screw
Air Bleed Pipe	Float
Needle Jet	Float Valve
Pilot Jet	Starter Plunger

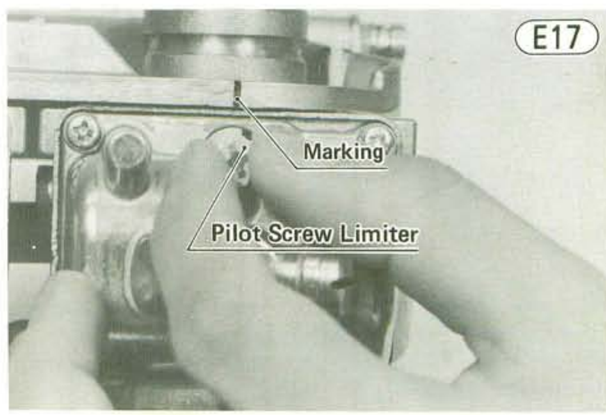
- Carefully mark the position of the pilot screw limiter (37) on the carburetor mounting plate, so that it can be installed and set to its original position later.
- Remove the screws (17) and lockwashers (16) (4 ea), and take off the float bowl (44).
- Turn in the pilot screw and count the number of turns until it seats fully, but not tightly, and then unscrew it and remove it together with the pilot screw limiter. Do not remove the pilot screw limiter from the pilot screw.
- Remove the spring (10).
- Now, the main jet (14), air bleed pipe (13), and pilot jet (38) can be removed.



- To remove the float valve seat (40), first push out the float pin (42), remove the float (15), and pull out the float valve needle (41).
- Remove the float valve seat and gasket (39).
- To remove the starter plunger (51), unscrew the plunger cap (46), and pull out the unit.
- Remove the clip (45) and pull out the starter plunger and spring (50).
- To remove the needle jet (11), remove the throttle valve (See above) and air bleed pipe.
- Make sure that the float is removed so that it does not get damaged during needle jet removal. 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.

Assembly Notes:

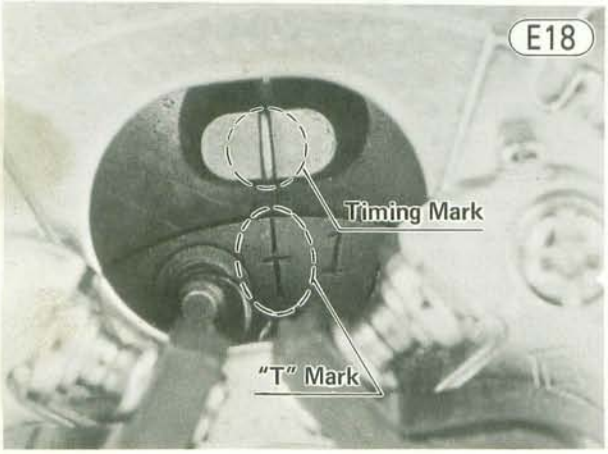
1. Replace any **O** rings and gaskets if damaged or deteriorated.
2. When the old parts are being reinstalled, turn in the pilot screw and pilot screw limiter to their original turned back position.
3. If new parts are being used, first turn in the pilot screw fully, but not tightly, and then back it out the number of turns counted during disassembly. **Without turning the pilot screw, push the limiter on so that it coincides with the marking on the mounting plate.**



CAMSHAFT

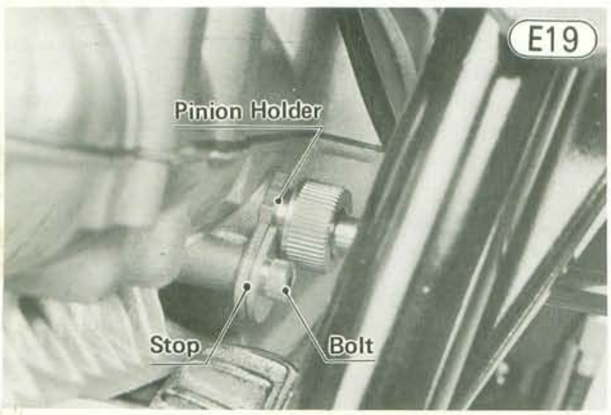
Removal:

- Remove the fuel tank (Pg. 44).
- Remove the tool kit and tool tray.
- Remove the battery ground lead.
- Remove the air cleaner silencer.
- Pull off the spark plug lead from each spark plug and free the leads from their clamps on the cylinder head cover.
- Remove the contact breaker cover and gasket.
- Using a 17 mm wrench on the crankshaft, turn the crankshaft until the "T" mark on the 1, 4 side of the timing advancer is aligned with the timing mark. At this point pistons #1 and #4 are at top dead center.

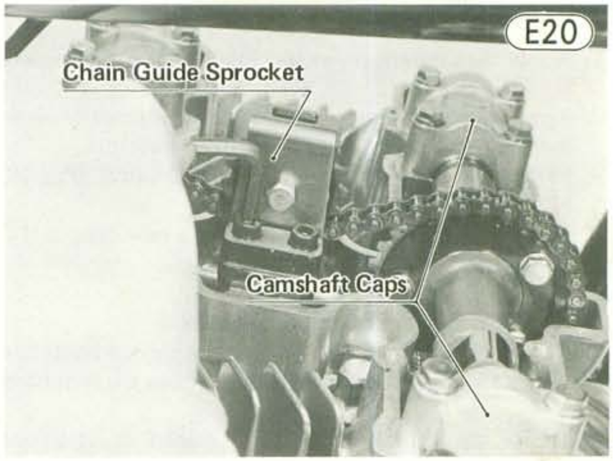


- Remove the Allen bolt (or screw), stop, and pull the tachometer pinion holder and pinion with the tachometer cable off the cylinder head.

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 (16), and slip the cover off the cylinder head.
- Remove the Allen bolts (4), and remove the camshaft chain guide sprocket.



- Remove the camshaft cap bolts (16), and take off the camshaft caps (4). Mark the bearing inserts under each cap as to location. Any bearing inserts that are to be re-used must go back into their original locations.
- 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 the chain and sprocket.**

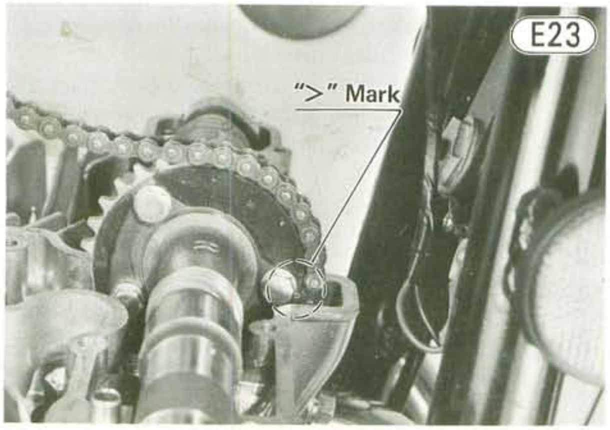
Installation:

- Check that the tachometer pinion is removed from the cylinder head, and all camshaft cap knock pins (8) are fitted.
- Check that all bearing inserts (16) are properly fitted into the cylinder head and camshaft caps.

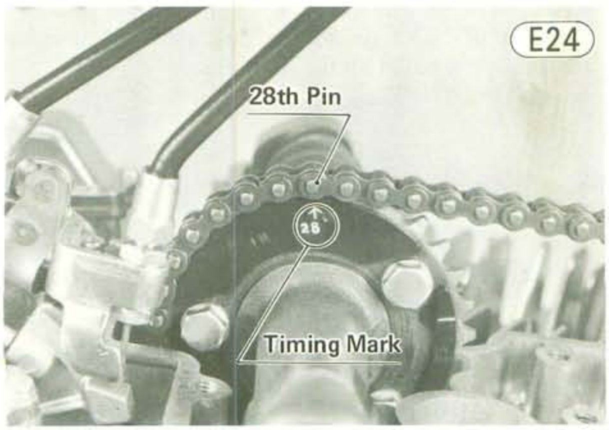
- Check crankshaft position to see that pistons #1 and #4 are still at TDC (Fig. E18), and readjust if necessary. Remember to pull the camshaft chain taut before rotating the crankshaft.
- Apply clean engine oil to all cam parts. If the camshaft(s) and/or bearing inserts are replaced with new ones, apply a thin coat of a high temperature grease on the new cam part surfaces.
- Feed the exhaust camshaft through the chain and remove the screwdriver. (Exhaust camshaft has a

tachometer gear worm, and the "L" mark must come to the left side and the "R" mark to the right.)

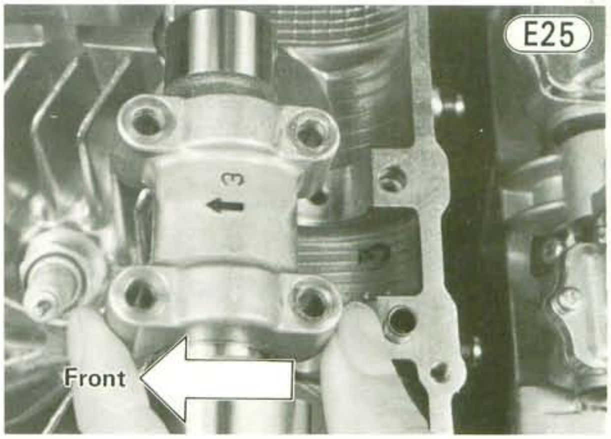
•Turn the exhaust camshaft so that the timing mark on the sprocket is aligned with the cylinder head surface and pointing to the front.
•Pull the chain taut and fit it onto the exhaust camshaft sprocket.



•Starting with the next chain link pin above the one that coincides with the exhaust camshaft sprocket timing mark, count to the 28th pin. Feed the inlet camshaft through the chain and align that 28th pin with the raised timing mark. (Inlet camshaft has an "L" and "R" mark. Position these marks the same as on the exhaust camshaft.)

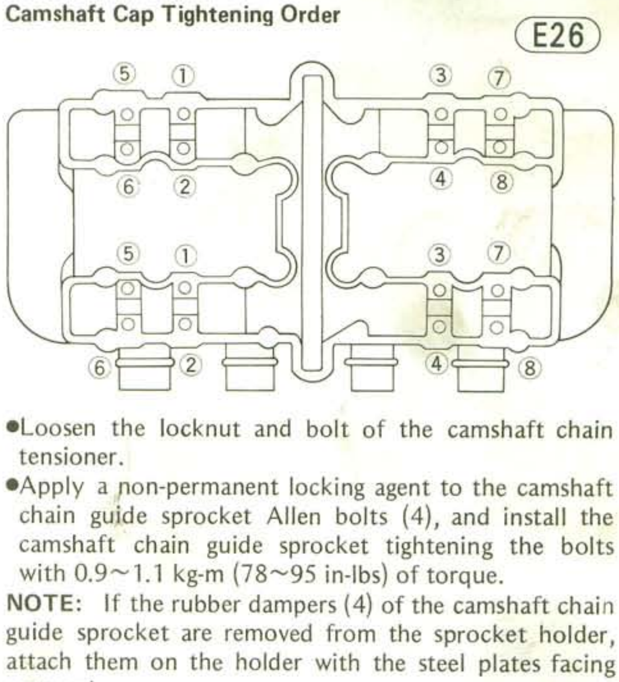


•The camshaft caps are machined together with the cylinder head, so set the camshaft caps into place with the number on the camshaft caps matching the number on the cylinder head, and with the arrow on the cap pointing forward (toward the exhaust side).



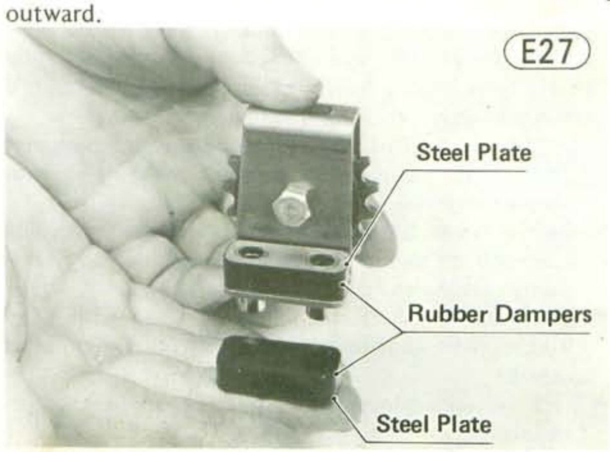
•Partially tighten the left inside camshaft cap bolts first, to seat the camshaft in place. Fully tighten all the bolts with 1.1 ~ 1.3 kg-m (95 ~ 113 in-lbs) of torque, following the tightening sequence shown in the figure.

Camshaft Cap Tightening Order



•Loosen the locknut and bolt of the camshaft chain tensioner.
•Apply a non-permanent locking agent to the camshaft chain guide sprocket Allen bolts (4), and install the camshaft chain guide sprocket tightening the bolts with 0.9~1.1 kg-m (78~95 in-lbs) of torque.

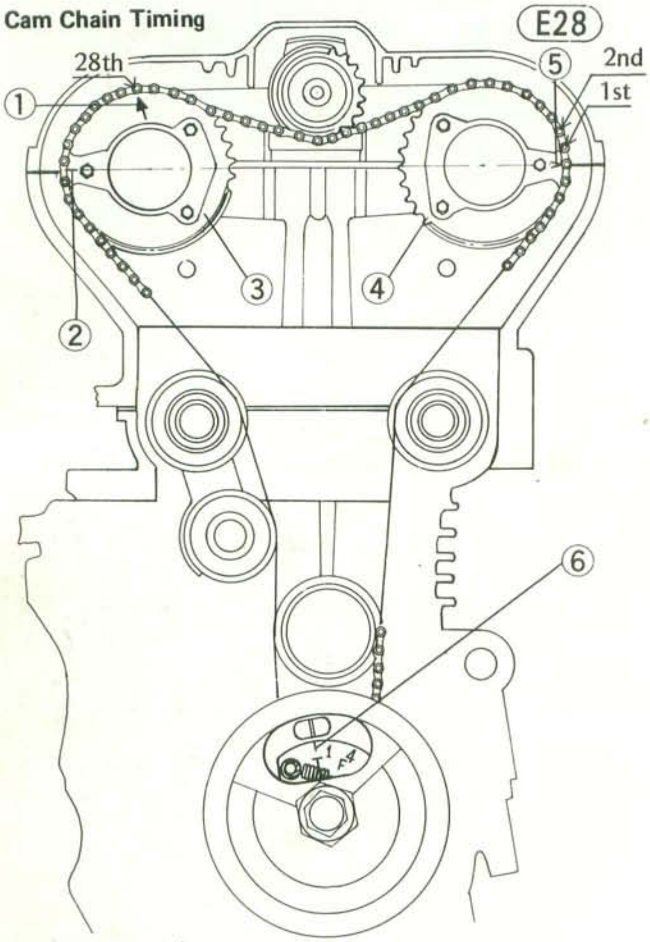
NOTE: If the rubber dampers (4) of the camshaft chain guide sprocket are removed from the sprocket holder, attach them on the holder with the steel plates facing outward.



•Before rotating the crankshaft, check that, with the crankshaft positioned so #1 and #4 pistons are at TDC, the timing marks on the exhaust and inlet camshaft sprockets are aligned with the cylinder head surface (Fig. E28).

CAUTION **Rotation of the crankshaft with improper camshaft timing could cause the valves to contact each other or the piston, and bend.**

Cam Chain Timing



1. 28th Pin Mark
2. Timing Mark
3. Inlet Camshaft Sprocket
4. Exhaust Camshaft Sprocket
5. Timing Mark
6. #1, 4 TDC Mark

•Turn the crankshaft over clockwise until pistons #1 and #4 are at TDC, and re-check the camshaft timing. If the three timing mark pairs are aligned as shown in the figure above, the cam timing is correct.

CAUTION **1. This step includes camshaft chain play adjustment so the crankshaft must be turned clockwise.**
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.

•Tighten the camshaft chain tensioner bolt with 0.7～0.9 kg-m (61～78 in-lbs) of torque, and then tighten its locknut.

•Check valve clearance at this time (Pg. 15), and adjust if necessary.

•Apply a small amount of high temperature grease to the tachometer pinion shaft, insert the pinion and pinion holder into the cylinder head, and secure the pinion holder in the cylinder head with the holder stopper and screw.

•Replace the cylinder head rubber plugs with new ones, applying a liquid gasket to both ends of each rubber plugs before installation.

•Install the cylinder head cover with a new cylinder head cover gasket. Tighten the cover bolts (16) evenly with 1.4～1.6 kg-m (10.0～11.5 ft-lbs) of torque. Do not forget to install the spark plug lead clamps (2) when the cylinder head cover is installed.

•Connect the spark plug lead on each spark plug and insert the leads into the clamps. The numbers on the spark plug leads correspond to the cylinder numbers, counting from the left.

•Install the fuel tank (Pg. 44).

•Check idling and adjust the carburetors if necessary (Pg. 18).

•Install the contact breaker cover gasket and cover.

•Throughly warm up the engine, wait until the engine grows cold, and retighten all the cylinder head cover bolts to the specified torque.

CAMSHAFT SPROCKET

Removal (on each camshaft):

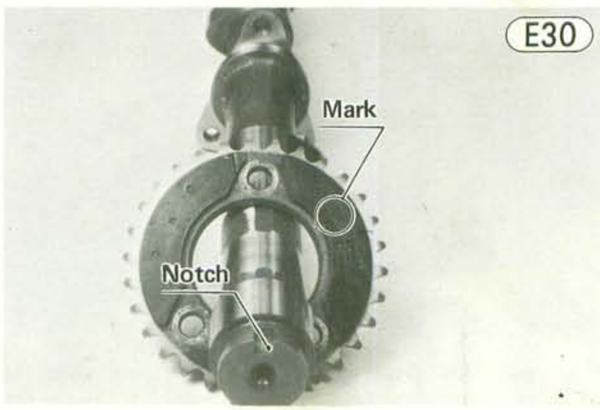
•Remove the fuel tank (Pg. 44).

•Remove the camshaft (Pg. 48).

•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 face the notch on the shaft end.

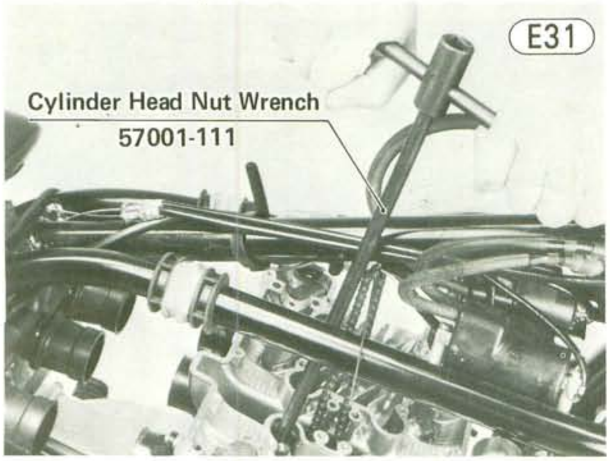


- Apply a non-permanent locking agent to the sprocket bolts (3), and install the bolts tightening them with 1.4~1.6 kg-m (10.0~11.5 ft-lbs) of torque.
- Install the camshaft (Pg. 48), check valve clearance and adjust if necessary (Pg. 15).
- Install the fuel tank (Pg. 44).
- Check idling and adjust the carburetors if necessary (Pg. 18).

CYLINDER HEAD

Removal:

- Remove the mufflers (Pg. 43).
- Remove the fuel tank (Pg. 44).
- Remove the carburetors (Pg. 44).
- Remove the camshafts (Pg. 48).
- Take out the spark plugs using a plug wrench.
- Remove the bolt at either end of the cylinder head nut.
- Remove the cylinder head nuts (12) using a cylinder head nut wrench (special tool).

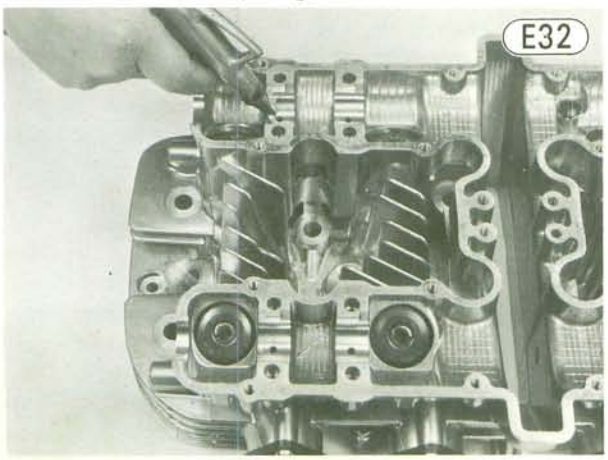


- Mark all the valve lifters and shims, as they must be returned to the same location.
- Take off the cylinder head, gaskets (2), and **O** ring.

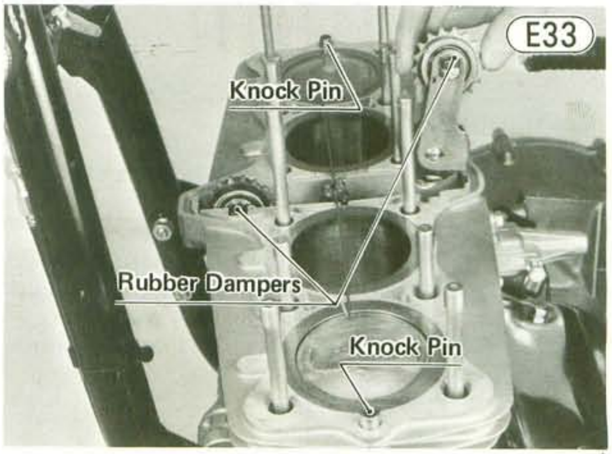
Installation:

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 cylinder head.

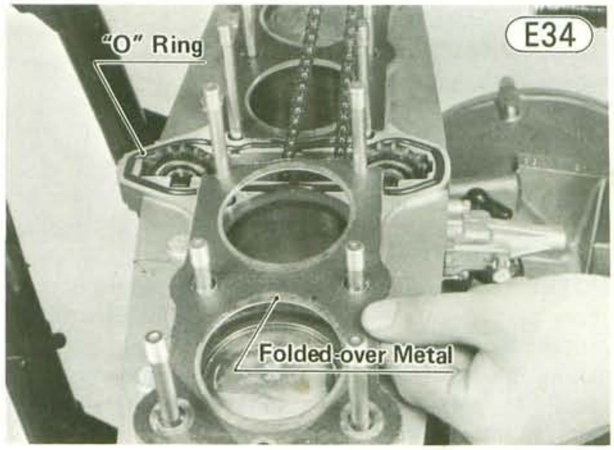
- Using compressed air, blow out any particles which may obstruct the oil passages.



- Apply clean engine oil to the valve lifters and shims, and return them to their original locations.
- **Be sure that the rubber dampers (4) of the camshaft chain tensioner and guide sprocket shafts are in place, and that the knock pins (2) are in place.**



- Install the new gaskets and **O** ring. Make sure that the **O** ring is properly placed into the groove and that the gaskets are placed with the folded-over metal edges upward. There is no distinction between left and right gaskets.

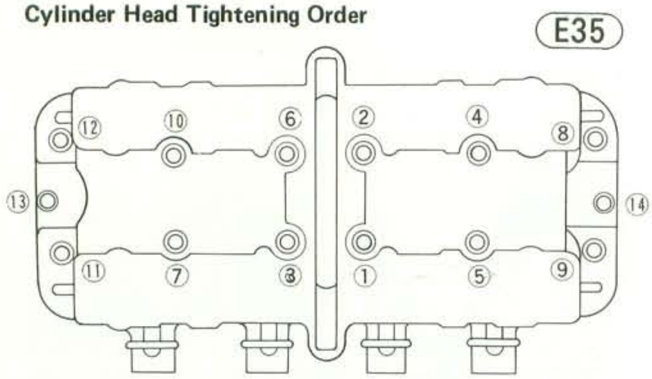


- Install the cylinder head.
- Put the iron flat washers (8) and new copper flat washers (4) under the cylinder head nuts. The copper washers should be located under the nuts at the extreme right and left sides of the cylinder head. These are indicated by the numbers 8, 9, 11, and 12 in Fig. E35.

CAUTION **Replace any damaged copper flat washers with new ones to prevent oil leaks. These copper washers work as gaskets.**

- Tighten the cylinder head nuts first with about 2.5 kg-m (18.0 ft-lbs) of torque and then with 3.7 ~ 4.3 kg-m (27~31 ft-lbs) of torque, following the tightening sequence shown in Fig. E35.
- Tighten the cylinder head bolts (2) with 1.1~1.3 kg-m (95~113 in-lbs) of torque.
- Install the spark plugs and tighten them with 2.5~3.0 kg-m (18.5~22.0 ft-lbs) of torque.
- Lift up the camshaft chain, and use a screwdriver to keep the chain from falling down into the cylinder block.
- Install the camshafts (Pg. 48).

Cylinder Head Tightening Order



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

- Install the carburetors (Pg. 44) and adjust the throttle cables (Pg. 16).
- Install the fuel tank (Pg. 44).
- Install the mufflers (Pg. 43).
- Adjust the camshaft chain (Pg. 14).
- Check idling and adjust the carburetors if necessary (Pg. 18).

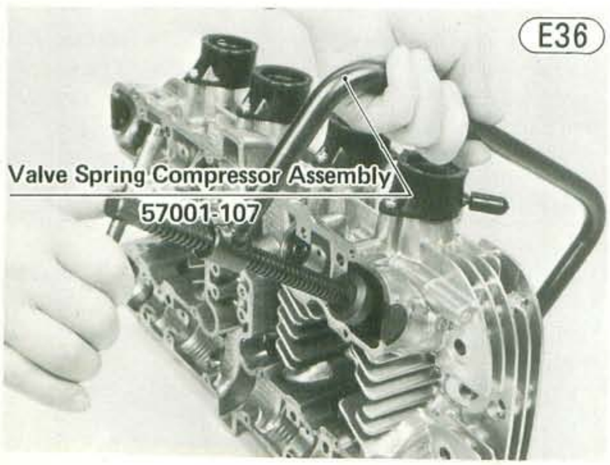
VALVE, VALVE GUIDE

Removal (each valve and valve guide):

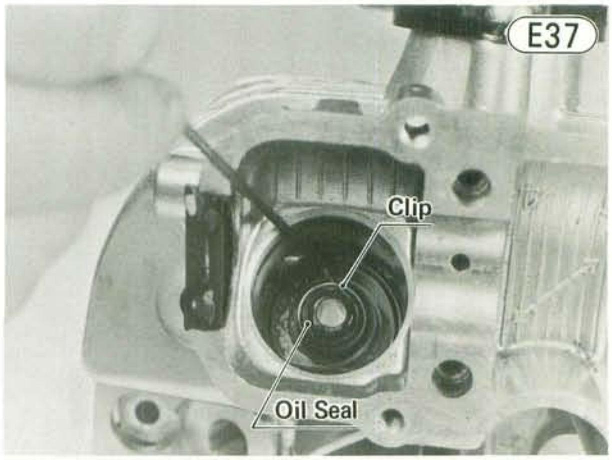
- Remove the mufflers (Pg. 43).
- Remove the fuel tank (Pg. 44).
- Remove the carburetors (Pg. 44).
- Remove the camshafts (Pg. 48).
- Remove the cylinder head (Pg. 51).
- Pull out the valve lifters (8) and shims (8), marking them as to location.

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

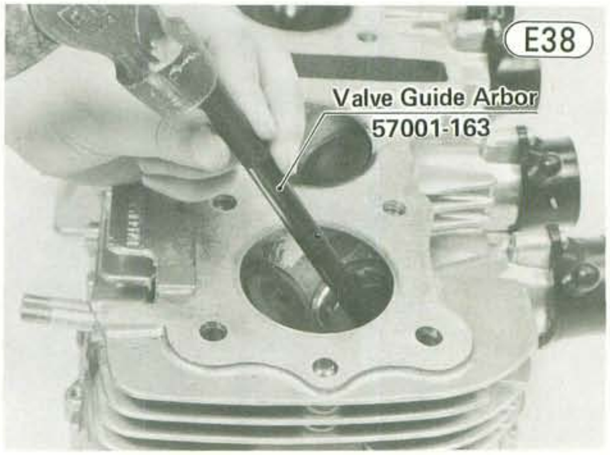
- Using the valve spring compressor assembly (special tool) to press down the valve spring retainer ④, remove the split keeper ③.



- Remove the tool, and then remove the spring retainer ④, outer spring ⑥, and inner spring ⑤.
- Push out the valve ⑪ or ⑫.
- Remove the clip and pull off the oil seal ⑧.

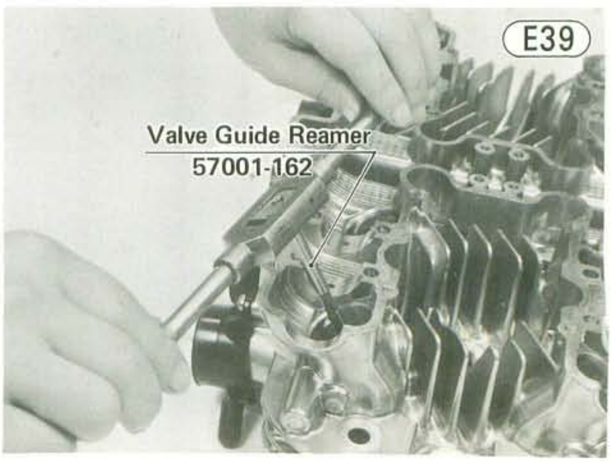


- Remove the spring seat ⑦.
- Heat the area around the guide to about 120 ~ 150°C (248 ~ 302°F), and hammer lightly on the valve guide arbor (special tool) to remove the guide from the top of the cylinder head.

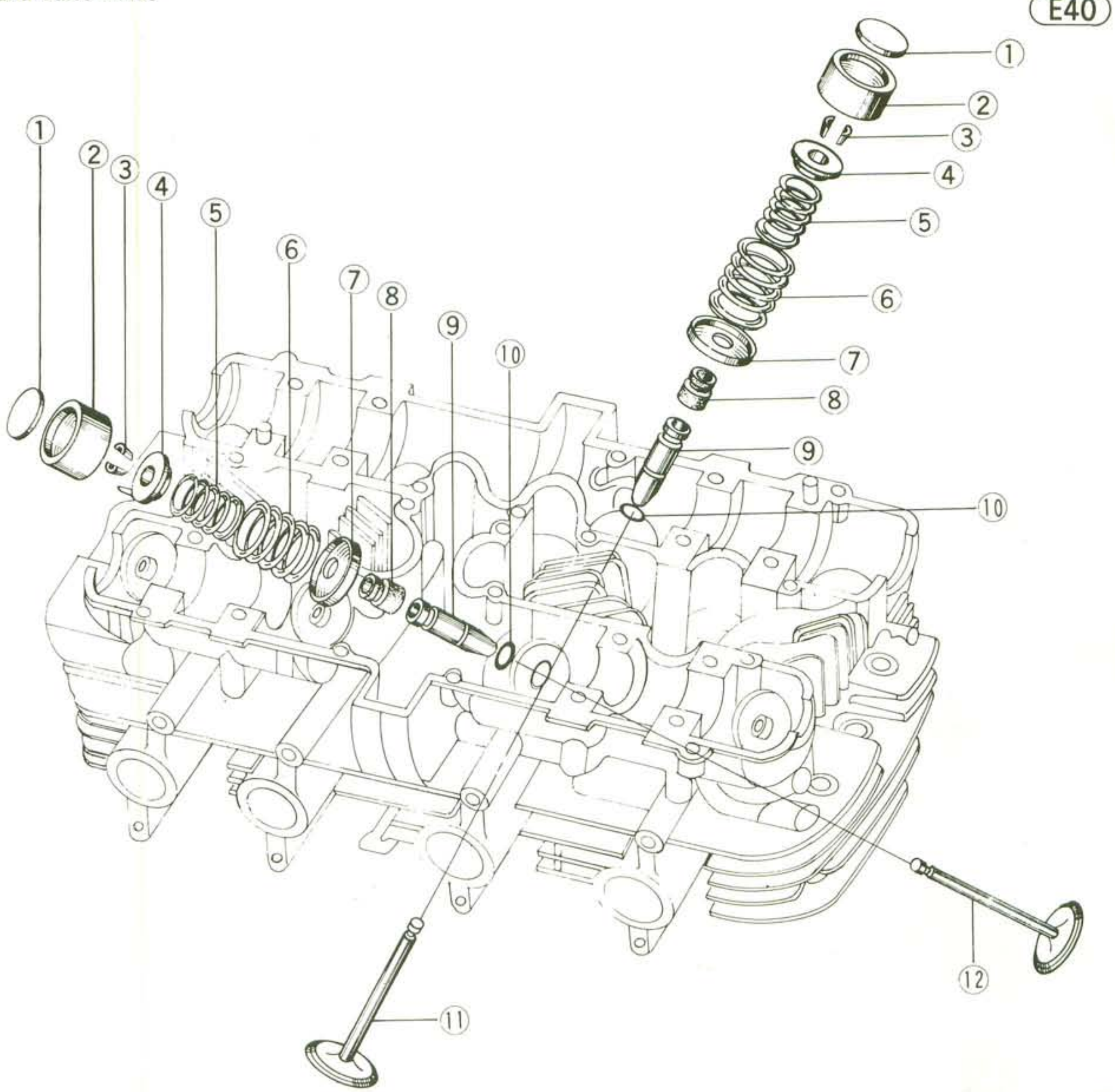


Installation (each valve and valve guide):

- Apply oil to the valve guide, and snap the circlip ⑩ into the groove on 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). The circlip stops the guide from getting in too far.
- Ream the valve guide with the valve guide reamer (special tool) even if the old guide is re-used.



Valve and Valve Guide



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

- Lap the valve to check that it is seating properly. If it is uneven, refer to the Maintenance Section (Pg. 144).
- 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 (special tool), 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.
- Apply engine oil to the valve lifters and shims and mount them in their original locations.
- Install the cylinder head (Pg. 51).
- Install the camshafts (Pg. 48).

NOTE: Check valve clearance (Pg. 15), and adjust if necessary before the cylinder head cover is installed.

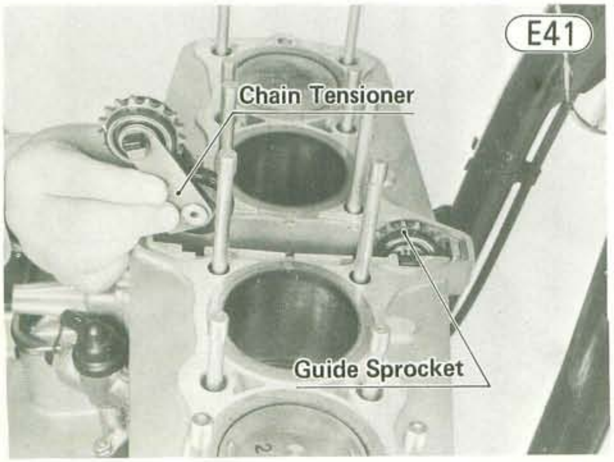
- Install the carburetors (Pg. 44) and adjust the throttle cables (Pg. 16).
- Install the fuel tank (Pg. 44).
- Install the mufflers (Pg. 43).
- Adjust the camshaft chain (Pg. 14).
- Check idling and adjust the carburetors if necessary (Pg. 18).

CYLINDER BLOCK

Removal:

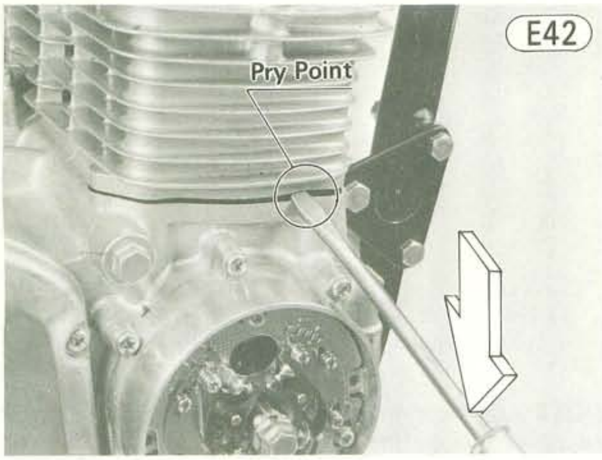
- Remove the mufflers (Pg. 43).
- Remove the fuel tank (Pg. 44).

- Remove the carburetors (Pg. 44).
- Remove the camshafts (Pg. 48).
- Remove the cylinder head, gaskets and O ring (Pg. 51).
- Remove the camshaft chain tensioner and guide sprocket.



- With a wide screwdriver, pry at the gap in each side of the cylinder base to free the cylinder block from the crankcase.

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

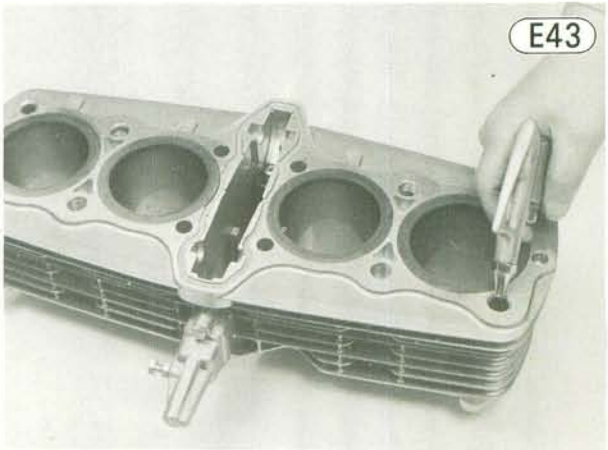


- After lifting up the cylinder slightly, wrap a clean cloth around the base of each piston so that no parts or dirt will fall into the crankcase, and then lift off the cylinder block and gasket.

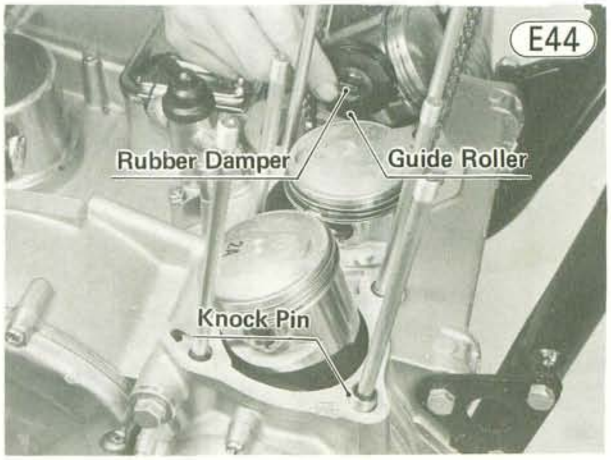
Installation:

NOTE: If the cylinder block is replaced with a new one, piston to cylinder clearance must be checked against the specified value (Pg. 152).

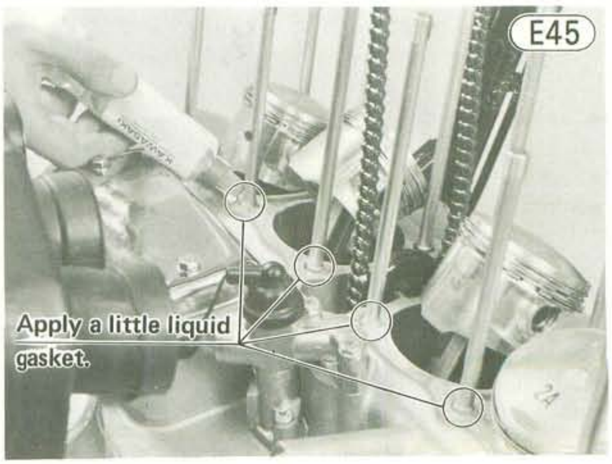
- With compressed air, blow the oil passages to remove dirt or particles which may obstruct oil flow.



- Remove the cloth from under each piston.
- Be sure that the knock pins (2) and the rubber dampers (2) on the camshaft chain guide roller shaft are in place. The knock pins must fit into the forward tension stud hole on either side of the crankcase.



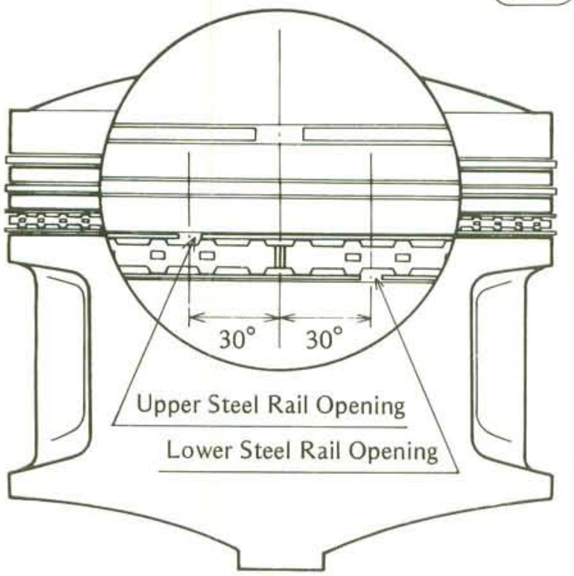
- Apply a little liquid gasket around the studs (4) indicated in the figure. Wipe clean the excess liquid gasket that adheres to the mating surface.



- Install a new cylinder base gasket.
- Lifting up the cam chain so it doesn't get caught, turn the crankshaft so that all the pistons are at about

the same height, and slip the piston bases (special tools) under the pistons to hold them level.
- 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. The openings of the oil ring steel rails must be slipped to both direction about 30° from the opening of the expander.

Piston Rings



- Apply engine oil to the piston rings and the cylinder inside surfaces. If the pistons and/or cylinder block are replaced, apply a thin coat of a high temperature grease on the new pistons and cylinder inside surfaces.
- Compress the piston rings using a piston ring compressor (special tool).

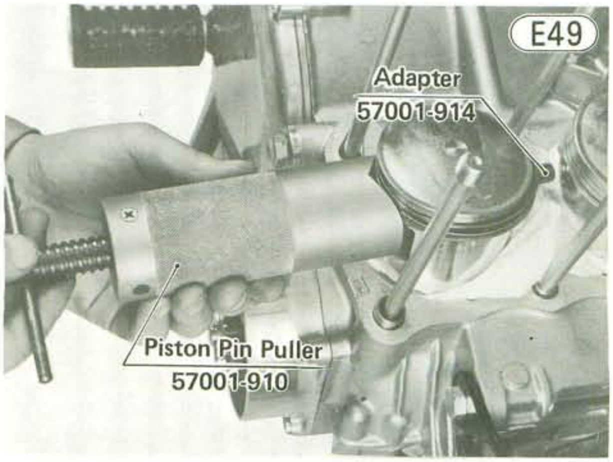
- Reset the bottom of the cylinders on the piston ring compressor.
- Pull the camshaft chain up through the cylinders and insert a screwdriver through it to avoid the chain falling into the crankcase.
- Work the bottom of each cylinder past the rings, and set the cylinder block in place while removing the special tool.
- Install the cylinder head (Pg. 51).
- Install the camshafts (Pg. 48), check valve clearance and adjust if necessary (Pg. 15).
- Install the carburetors (Pg. 44) and adjust the throttle cables (Pg. 16).
- Install the fuel tank (Pg. 44).
- Install the mufflers (Pg. 43).
- Adjust camshaft chain play (Pg. 14).
- Check idling and adjust the carburetors if necessary (Pg. 18).

PISTON, PISTON RINGS

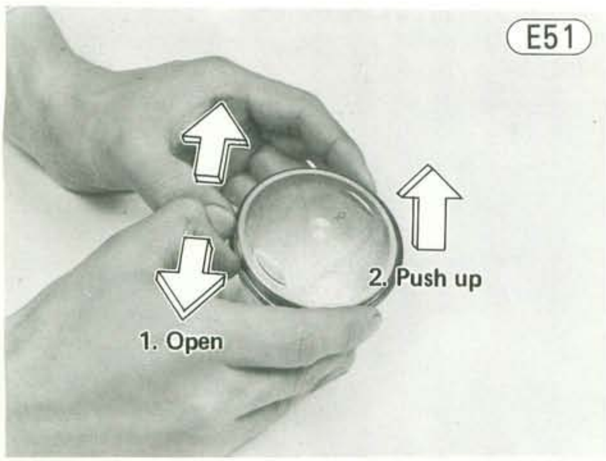
Removal:

- Remove the mufflers (Pg. 43).
- Remove the fuel tank (Pg. 44).
- Remove the carburetors (Pg. 44).
- Remove the camshafts (Pg. 48).
- Remove the cylinder block (Pg. 53).
- 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 ring from the outside of each piston.

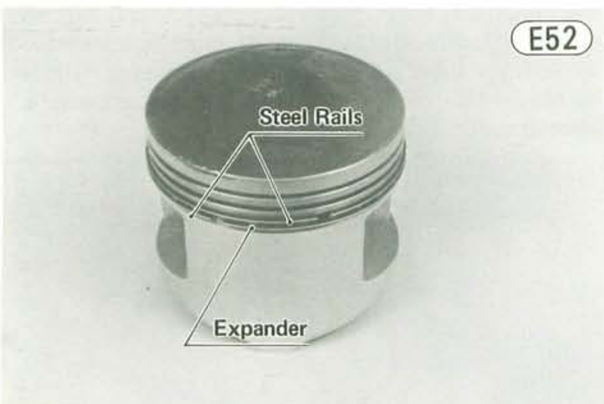
- Remove each piston by pushing its piston pin out the side that the snap ring was removed, and out the pin back inside the piston as it must not be mixed up with the other pins. Mark the pistons as to cylinder number. Use the piston pin puller and adapter "C" (special tools) if necessary.



•Remove the top and second rings with the piston ring pliers (special tool). To remove a ring by hand, spread the ring opening with both thumbs, and then push up on the opposite side (Figs. E50, 51).



•Remove the upper and lower piston ring steel rails, and then remove the expander.

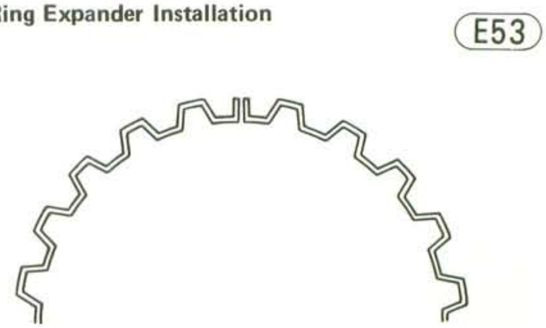


Installation:

NOTE: If the piston is replaced with a new one, check that piston to cylinder clearance has the specified value (Pg. 152). Also, when a new piston or piston pin is installed, check that the piston to pin clearance has the specified value (Pg. 154).

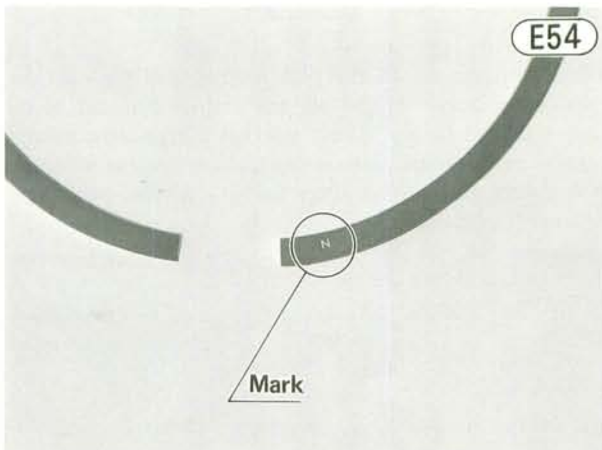
•To install the oil ring, first install the expander so that the expander ends butt together.

Oil Ring Expander Installation

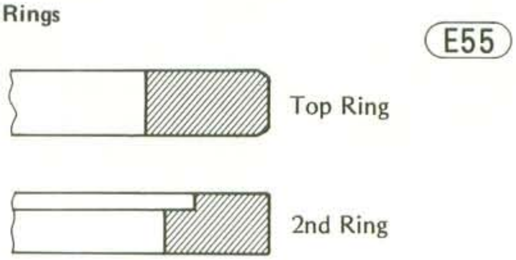


•Install the upper and lower steel rails. The two steel rails are identical. There is no "up" or "down" to the rails: they can be installed either way.

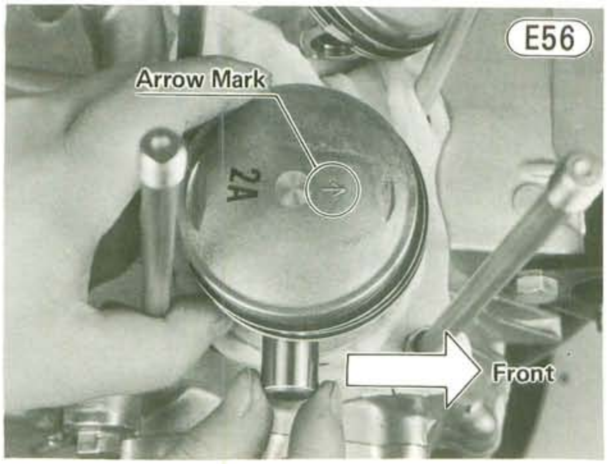
•Install the top and second rings so that the correct side (marked "N") faces up (Fig. E54). Do not mix up the top and second rings. The outer edges of the top ring are chamfered; the upper inner edge of the second ring is notched.



Piston Rings



•Apply a little engine oil to the piston pins, and install the pistons and piston pins. The arrow on the top of each piston must point towards the front.



- 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. 54).
- Install the cylinder head (Pg. 51).
- Install the camshafts (Pg. 48), check valve clearance and adjust if necessary (Pg. 15).
- Install the carburetors (Pg. 44) and adjust the throttle cables (Pg. 16).
- Install the fuel tank (Pg. 44).
- Install the mufflers (Pg. 43).
- Adjust camshaft chain play (Pg. 14).
- Check idling and adjust the carburetors if necessary (Pg. 18).

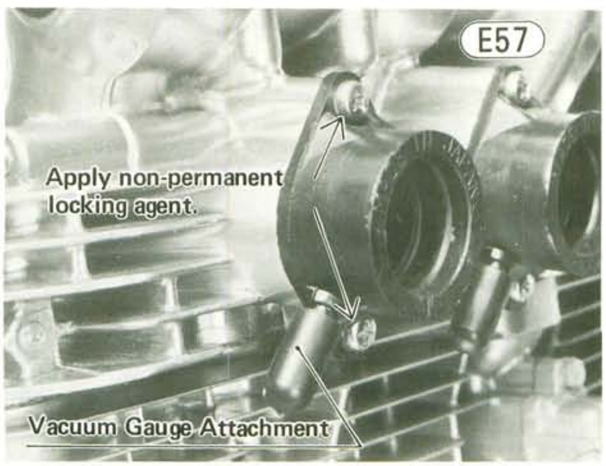
CARBURETOR HOLDER

Removal:

- Remove the fuel tank (Pg. 44).
- Remove the carburetors (Pg. 44).
- Remove the screws (8), and remove the carburetor holders from the cylinder head.

Installation Notes:

1. Install the carburetor holders so that vacuum gauge attachments point downward and to the outside.

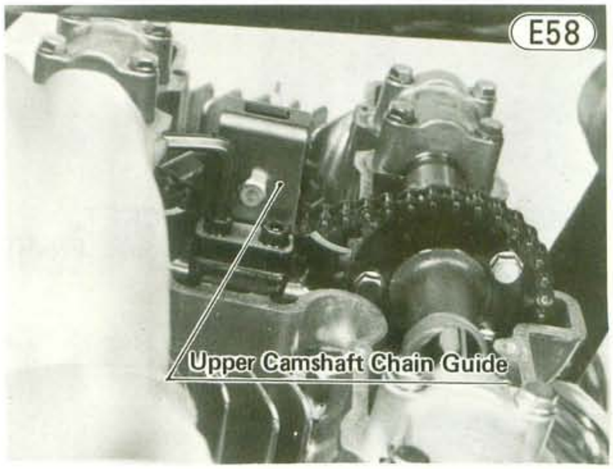


2. Apply a non-permanent locking agent to the mounting screw threads.

CAMSHAFT CHAIN GUIDE SPROCKET (Upper)

Removal:

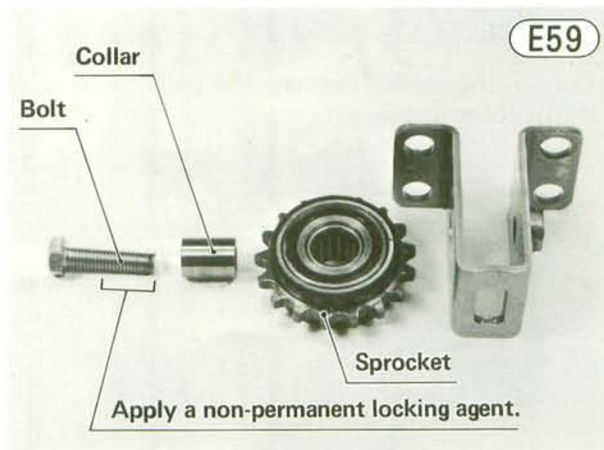
- Remove the fuel tank (Pg. 44).
- Pull off the spark plug cap from each spark plug.
- Remove the bolts (16) and remove the cylinder head cover.
- Remove the Allen bolts (4) and remove the upper camshaft chain guide sprocket.



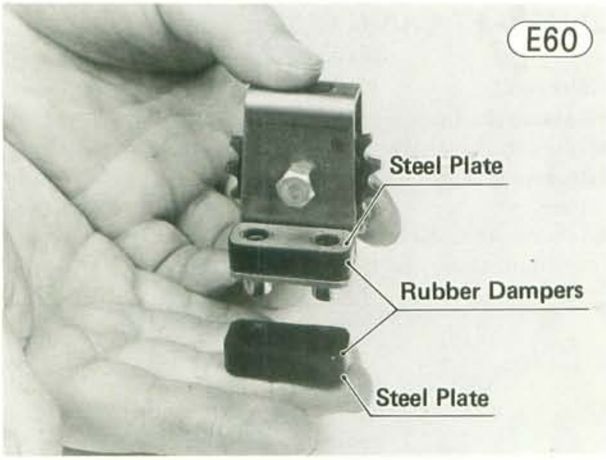
- Remove the sprocket shaft bolt, and remove the sprocket and collar.

Installation Notes:

1. If the camshaft chain guide sprocket is replaced with a new one, apply a non-permanent locking agent to the sprocket shaft bolt, and tighten the bolt with 0.8 ~ 1.0 kg-m (69 ~ 87 in-lbs) of torque. Apply engine oil to the sprocket needle bearings.



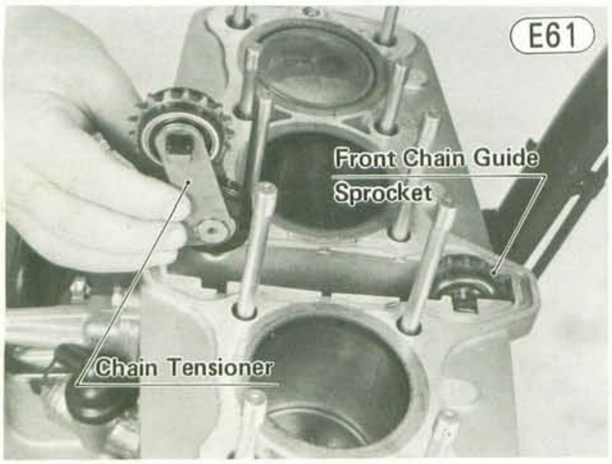
2. Assemble the rubber dampers and collars as shown in Fig. E60. Do not forget to insert the collars into the rubbers.
3. When installing the camshaft chain guide sprocket, apply a non-permanent locking agent to the Allen bolts (4) and tighten them with 0.9 ~ 1.1 kg-m (78~95 in-lbs) of torque.
4. After installing the chain guide sprocket, check the camshaft chain timing (Fig. E28 on Pg. 50).



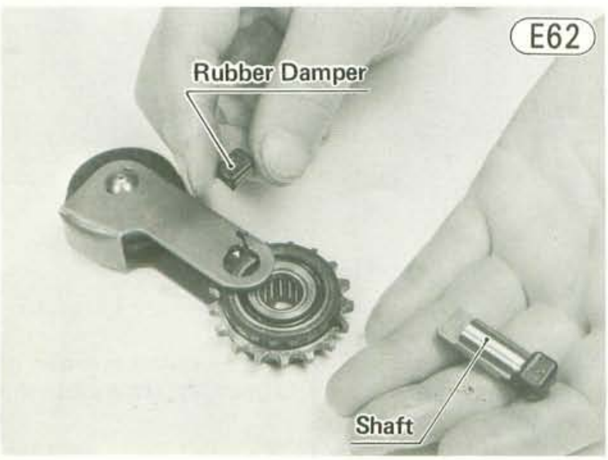
CAMSHAFT CHAIN GUIDE SPROCKET, ROLLER (Tensioner, Front)

Removal:

- •Remove the cylinder head (Pg. 51).
- •Remove the camshaft chain tensioner assembly and front chain guide sprocket.



- •Remove the rubber dampers, and pull the sprocket shafts off the sprockets.



Installation Notes:

1. Install the rubber dampers on the sprocket shaft ends using an adhesive agent, and install the sprocket so that the dampers face upwards.

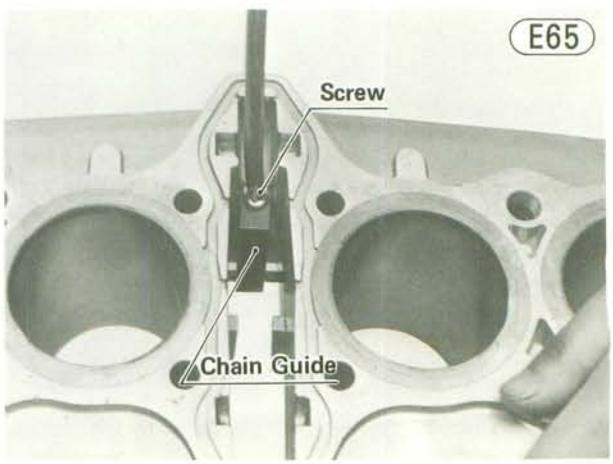
2. If the shafts and/or guide sprockets are replaced with new ones, apply engine oil to them.

CAMSHAFT CHAIN GUIDE ROLLER (Lower), FRONT CHAIN GUIDE

Removal:

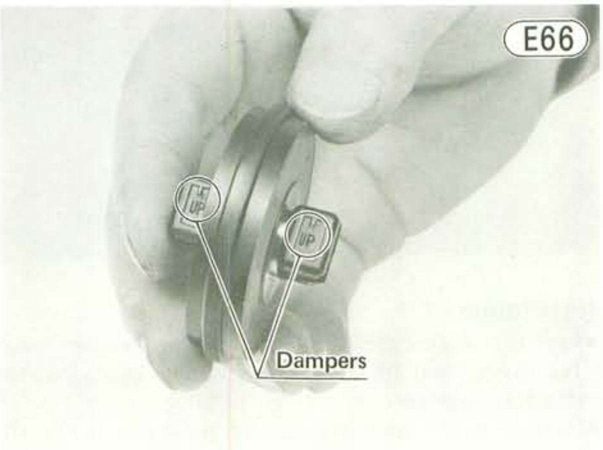
- •Remove the cylinder block (Pg. 53).
- •Remove the lower chain guide roller from the crankcase.

- •Remove the screw, take the front chain guide out of the cylinder block.



Installation Notes:

1. Install the rubber dampers on the roller shaft ends using an adhesive agent, and install the roller so that the dampers face upwards.

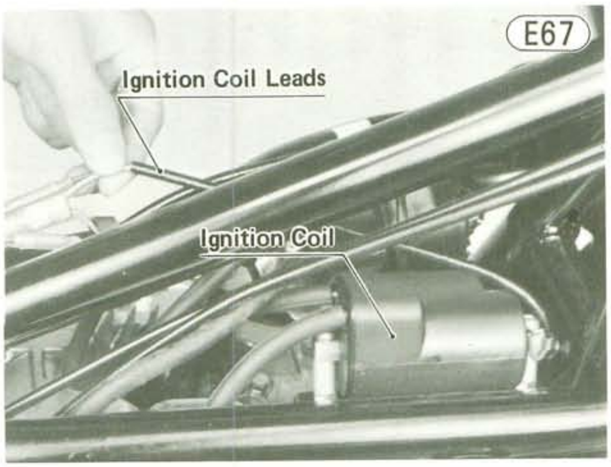


2. If the shaft or guide roller are replaced with new ones, apply engine oil to them.
3. Apply a non-permanent locking agent to the front chain guide mounting screw.

IGNITION COIL

Removal (each ignition coil):

•Remove the fuel tank (Pg. 44).
•Unplug the black or green lead (depending on the coil), and the yellow/red lead.



•Pull off the spark plug leads from the spark plugs.
•Remove the self-locking nuts (2), and remove the ignition coil.

Installation Note:

•Ignition coil leads are connected as follows:

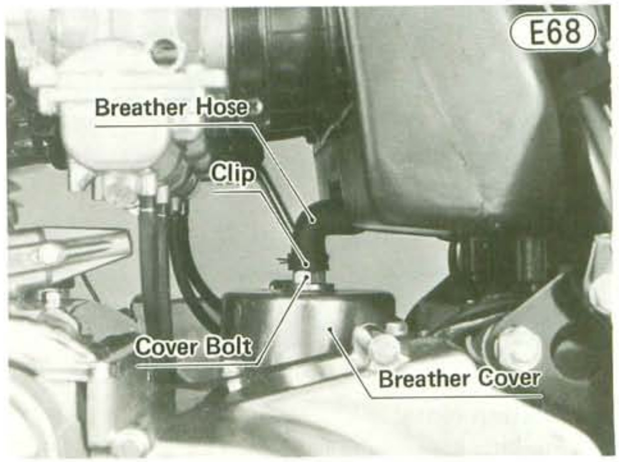
Black → contact breaker black lead
Green → contact breaker green lead
Yellow/red → battery yellow/red lead

The spark plug leads are labeled with the spark plug numbers (counted from the left).

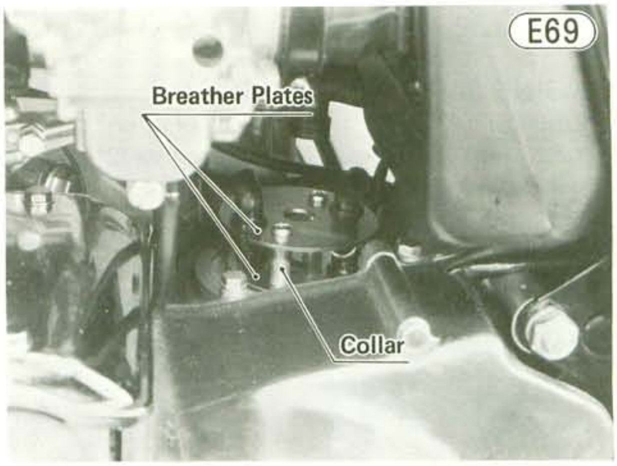
BREATHER COVER

Removal:

•Slide the clip out of place and remove the breather hose 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 collars and breather plates with the breather tubes.



Installation Notes:

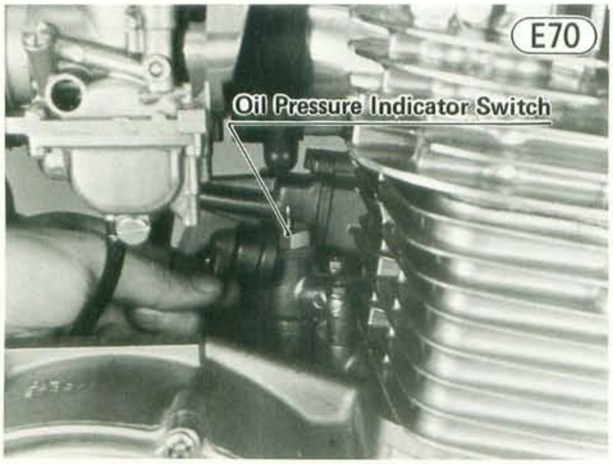
1. Replace the breather cover **O** ring, or breather cover bolt **O** ring with a new one if deteriorated or damaged, and apply little engine oil to them before fitting them back in place.
2. Tighten the breather bolt with 1.3 ~ 1.7 kg-m (9.5 ~ 12.0 ft-lbs) of torque.

OIL PRESSURE INDICATOR SWITCH

Removal:

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

•Unscrew the indicator switch and remove the O ring.



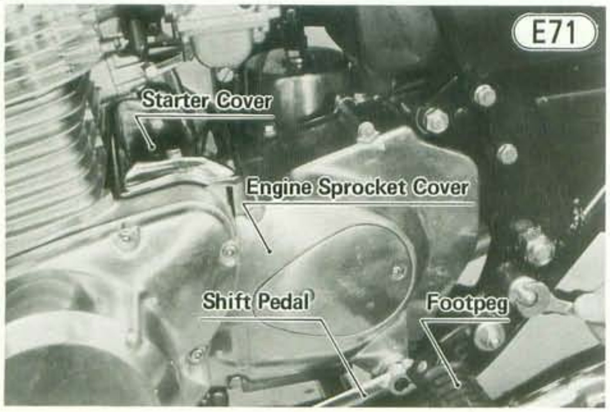
Installation Note:

•Tighten the oil pressure indicator switch with 0.5~0.7 kg-m (43~61 in-lbs) of torque.

ENGINE SPROCKET COVER

Removal:

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

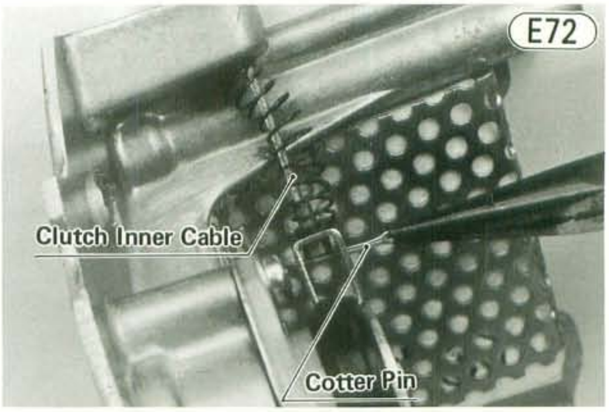


•Take out the shift pedal bolt, and remove the shift pedal.

•Remove the starter cover and gasket. There is a flat washer on each mounting bolt.

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

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



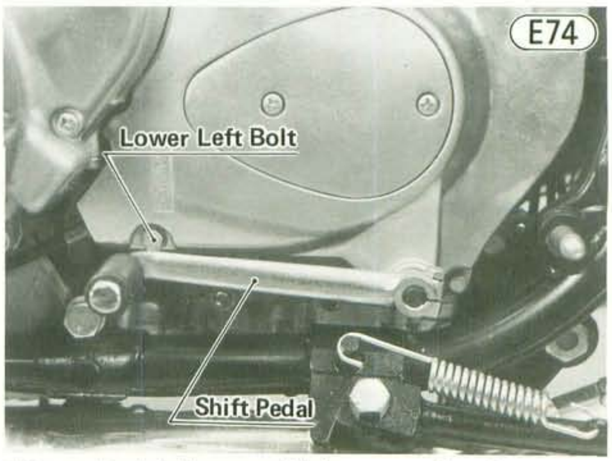
Installation:

•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.

•Check that the engine sprocket cover knock pins (2) are in place, and install the engine sprocket cover using the shift shaft oil seal guide (special tool) to protect the oil seal in the cover. Install the bolts with the flat washers, and tighten them.

•Mount the shift pedal so that its end matches the level of the engine sprocket cover lower left bolt.



•Mount the left footpeg with its nuts and washers.

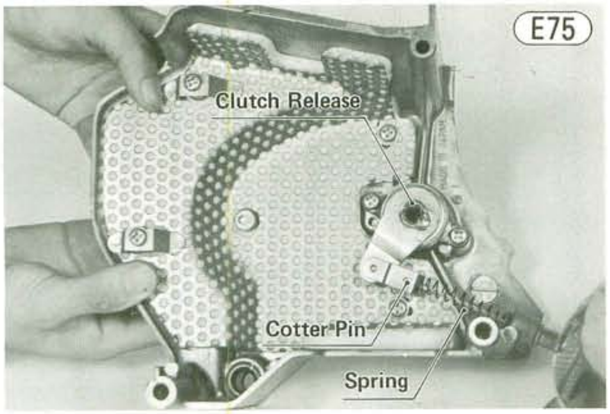
•Install the starter motor cover and gasket with its washers and bolts (2 ea).

•Adjust the clutch (Pg. 21).

CLUTCH RELEASE

Removal:

- Remove the engine sprocket cover (Pg. 60).
- Remove the clutch release assembly mounting screws (2), and remove the release assembly.



- Remove the cotter pin from the clutch release lever, and free the clutch inner cable tip from the lever.
- Take out the circlip, and separate the outer release gear and the inner release gear.

Installation:

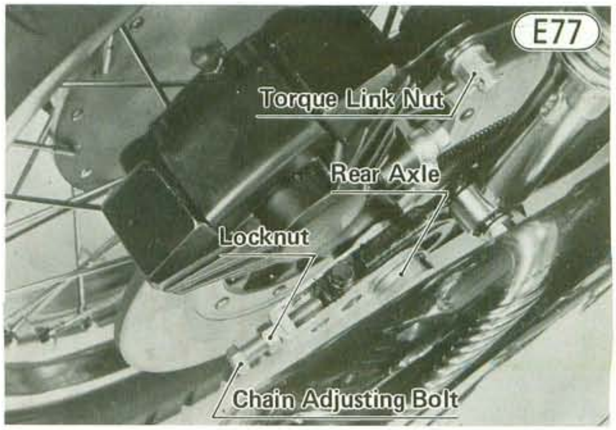
- Wash and clean the release balls and inner release gear with a high flash-point solvent. Dry and lubricate them with grease.
- Fit the inner gear back into the outer release gear. When the two gears are fully meshed, the clutch release lever and the outer release gear must be positioned as shown in the figure. The machined side of the outer release gear must face toward the engine sprocket cover.

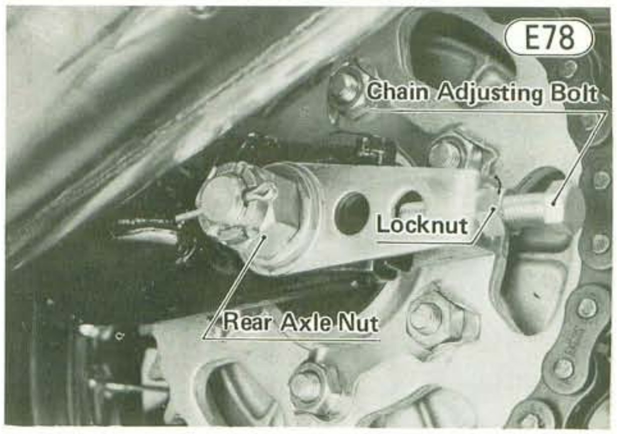
- **Install the circlip on the inner release gear.**
- **Run the clutch cable into the engine sprocket cover and spring, and fit the tip of the inner cable into the clutch release lever.**
- **Using a new cotter pin, secure the cable tip to the release lever.**
- **Fit the clutch release lever assembly 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. E75, when the gears are fully meshed.
- **Install the engine sprocket cover (Pg. 60).**
- **Adjust the clutch (Pg. 21).**

ENGINE SPROCKET

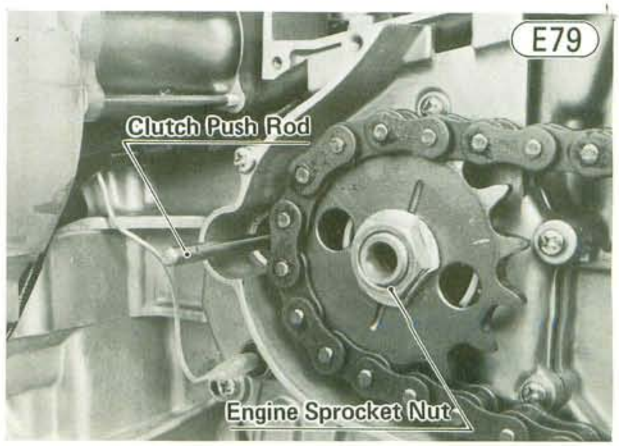
Removal:

- Stand the motorcycle up on its center stand.
- Check that the transmission is in neutral.
- Pull out the safety clip at the rear torque link nut, and take the cotter pin out from the rear axle nut.
- Loosen the rear torque link nut, rear axle nut, and chain adjusting bolt locknuts, and then turn out the chain adjusting bolts in order to give the chain plenty of play. Kick the wheel forward until the chain is slack. This will facilitate removal of the engine sprocket.



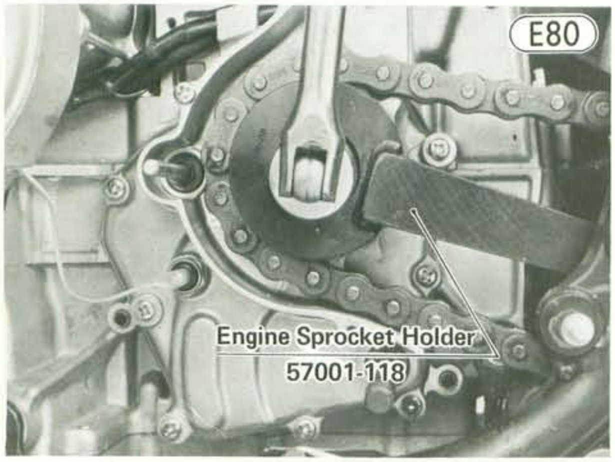


- Remove the engine sprocket cover as explained in engine sprocket cover removal (Pg. 60). The clutch cable does not require removal from the clutch release lever.
- Take the clutch push rod out of the drive shaft.



•Straighten the side of the splined 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 splined washer. Pull the engine sprocket off along with the drive chain.

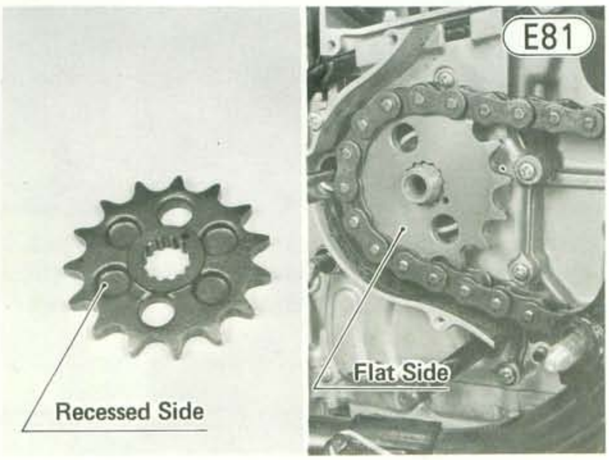
NOTE: The engine sprocket can be also held steady using the engine sprocket and flywheel holder (special tool: P/N 57001-306).



Installation:

•Mount the engine sprocket while meshed with the drive chain. Install a new splined washer on the output shaft, fitting their splines.

WARNING **Install the engine sprocket with the flat side facing out. If it is installed backwards, the drive chain alignment will be upset. This may cause drive chain breakage and result in loss of control.**

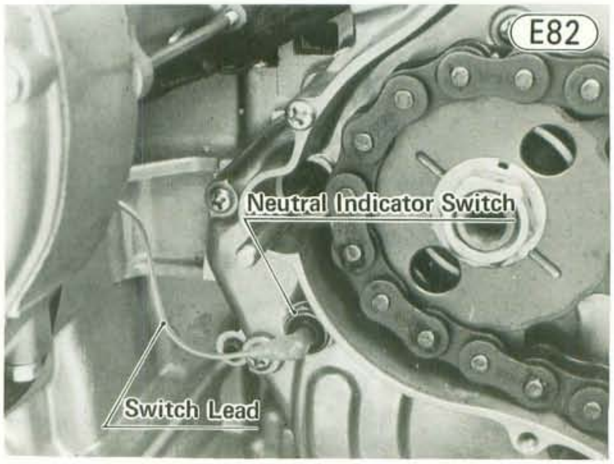


•Install the engine sprocket nut, and tighten the nut with 7.5 ~ 8.5 kg-m (54 ~ 61 ft-lbs) of torque while using the engine sprocket holder (special tool) to keep the sprocket steady.
•Bend back one side of the splined washer over the side of the nut.
•Insert the clutch push rod into the drive shaft, applying a thin coat of a high temperature grease to its surface.
•Install the engine sprocket cover (Pg. 60) and adjust the clutch (Pg. 21).
•Adjust the drive chain (Pg. 26).

NEUTRAL INDICATOR SWITCH

Removal:

•Remove the engine sprocket cover as explained in engine sprocket cover removal (Pg. 60). The clutch cable does not require removal from the clutch release.
•Pull the neutral indicator switch lead off the switch.



•Unscrew the neutral indicator switch and gasket.

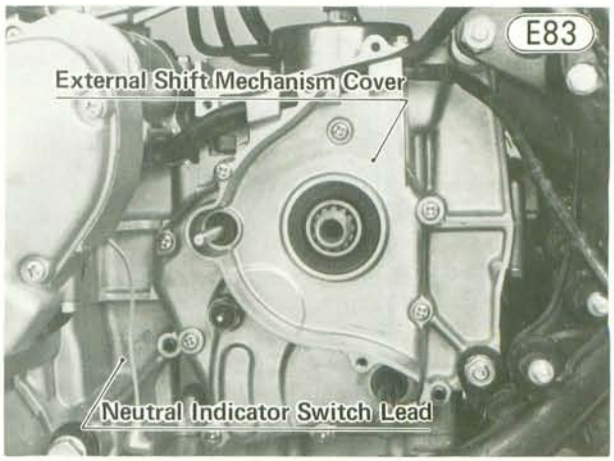
Installation:

•Install the neutral indicator 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. 60) and adjust the clutch (Pg. 21).

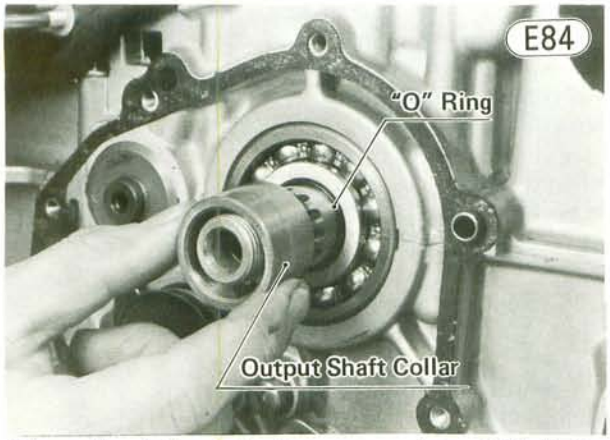
EXTERNAL SHIFT MECHANISM

Removal:

•Remove the engine sprocket cover (Pg. 60) as explained in engine sprocket cover removal. The clutch cable does not require removal from the clutch release.
•Remove the engine sprocket (Pg. 61).
•Place an oil pan beneath the external shift mechanism cover.
•Disconnect the neutral indicator switch lead and remove the external shift mechanism cover screws (9). Pull off the external shift mechanism cover and gasket.

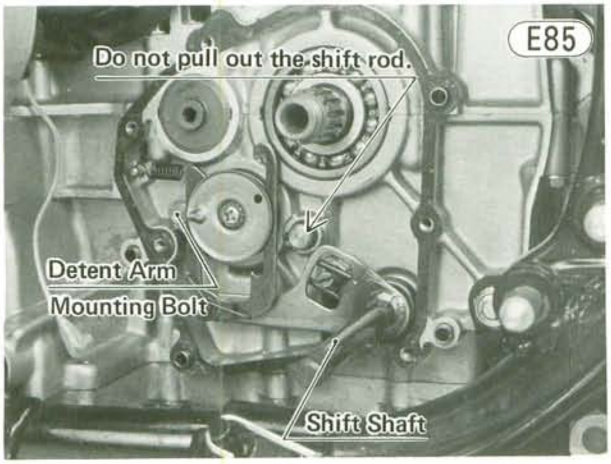


•Remove the output shaft collar using a bearing puller if it is difficult to remove, and take off the **O** ring.



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

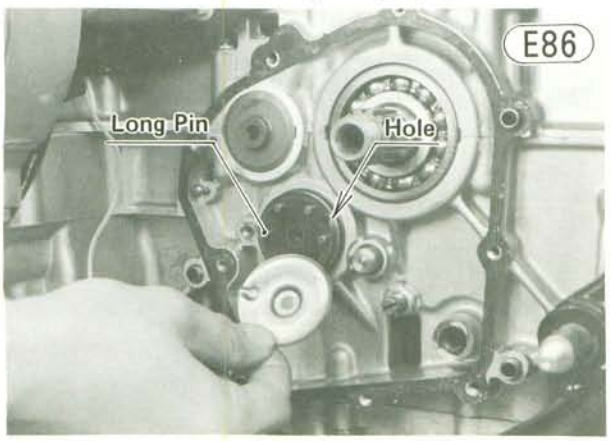
NOTE: Do not pull the shift rod more than 40 mm out of the crankcase, or the shift forks inside the crankcase will fall to the bottom of the oil pan, requiring removal of the mufflers and oil pan to install them.



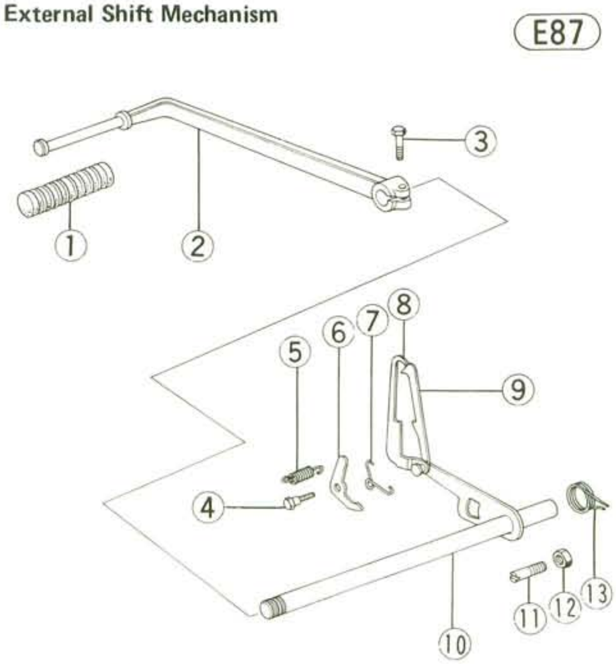
- Take out the detent arm mounting bolt, unhook the spring, and remove the arm.

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. Apply a non-permanent locking agent to the screw when installing the pin plate.

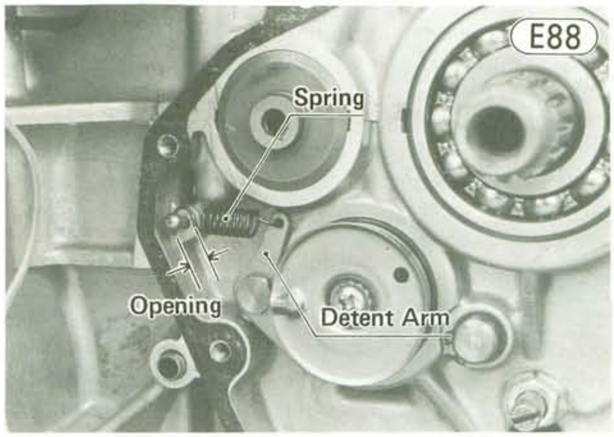


External Shift Mechanism



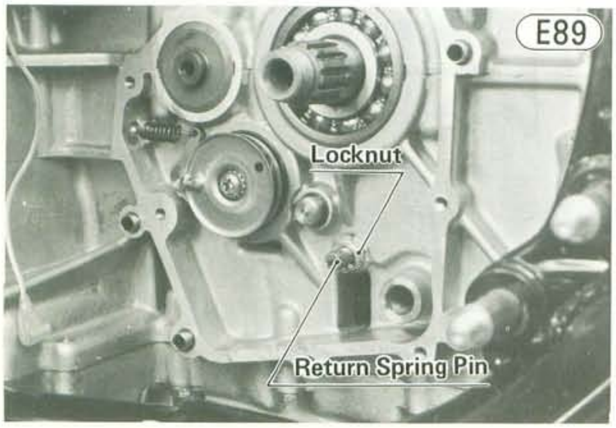
1. Pedal Rubber
2. Shift Pedal
3. Bolt
4. Bolt
5. Spring
6. Detent Arm
7. Pawl Spring
8. Shift Mechanism Arm
9. Over Shift Limiter
10. Shift Shaft
11. Return Spring Pin
12. Locknut
13. Return Spring

- Install the detent arm. The detent arm must ride on the shoulder of its mounting bolt; take care that it is not caught between the bolt and crankcase during installation.
- Hook the detent arm spring on the pin and into the detent arm hole. The opening of the spring end on the pin must face downwards.

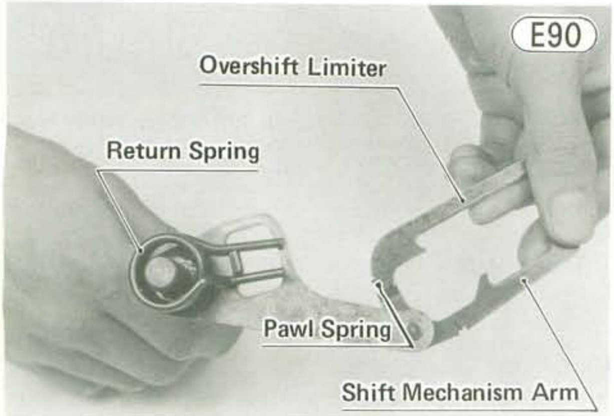


- Check that the external shift mechanism return spring pin is not loose. If it is loose, remove it, apply a non-permanent locking agent to the threads, re-install it, and tighten the locknut.

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 stop.



•Check that the return spring is properly fitted on the shaft and that the pawl spring is on the two arms. Install the shift shaft, and place the shift mechanism arm and overshift limiter on the shift drum pins.



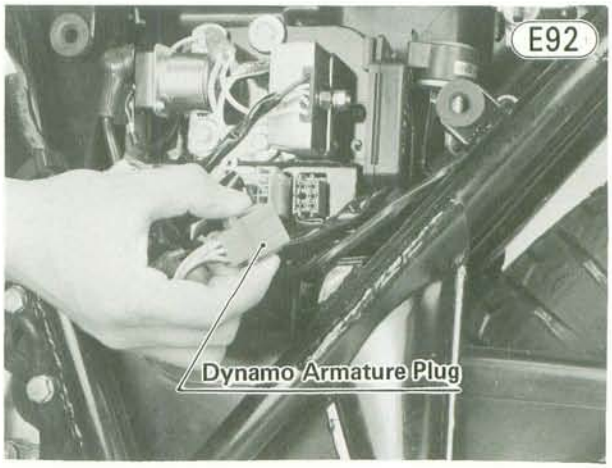
•Stick a new external shift mechanism cover gasket in place with a thin application of grease.
•Check that two knock pins are in place.
•Replace the output shaft O ring with a new one if it is damaged, and install it next to the ball bearing inner race.
•Apply a high temperature grease to the lips of 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. Install the cover and then tighten the screws (9). Apply a non-permanent locking agent to the threads of the screw indicated in the figure.

•Install the output shaft collar on the output shaft.
•Fit the neutral indicator switch lead back on the switch and install the clutch push rod.
•Install the engine sprocket (Pg. 62).
•Install the engine sprocket cover (Pg. 60), and adjust the clutch (Pg. 21).
•Adjust the drive chain (Pg. 26).
•Check the oil level and add oil (Pg. 22).

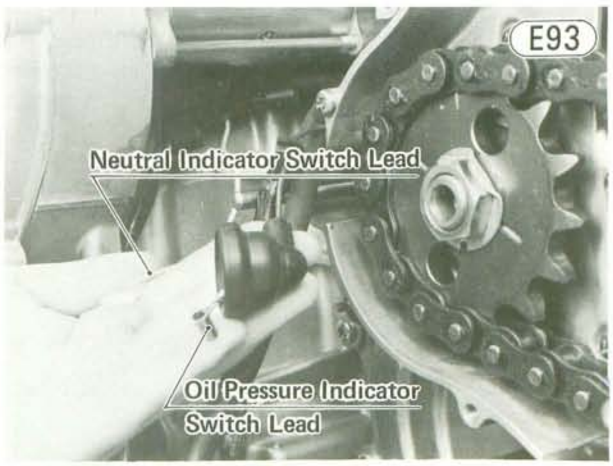
DYNAMO ARMATURE

Removal:

•Remove the engine sprocket cover as explained in engine sprocket cover removal (Pg. 60). The clutch cable does not require removal from the clutch release.
•Remove the left side cover, and disconnect the blue dynamo armature plug from its socket on the electrical panel.

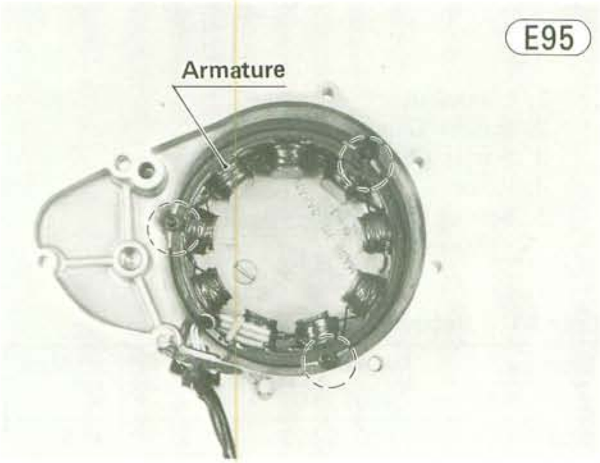


•Disconnect the oil pressure indicator switch lead and the neutral indicator switch lead, and pull out the wiring towards the left side of the engine, releasing the wiring from the clamps (2).



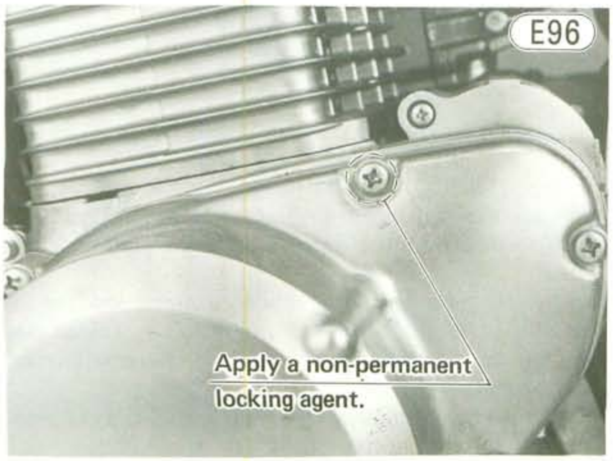
•Place an oil pan beneath the dynamo cover.
•Remove the dynamo cover screws (8), and pull off the dynamo cover and gasket.

•Remove the armature Allen bolts (3), and pull the armature and the grommets out from the cover.

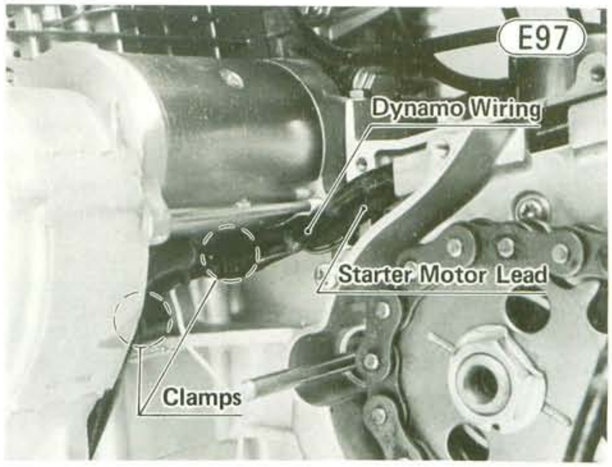


Installation:

•Apply a liquid gasket around the circumference of the armature grommet, install the grommet, and fit the armature into place. Use a non-permanent locking agent on each Allen bolt, and tighten the bolts to 0.9 ~ 1.1 kg-m (78 ~ 95 in-lbs).
•Check that the knock pins (2) are in place, install the dynamo cover using a new gasket, and tighten its screws (8). Apply a non-permanent locking agent to the screw which goes through the upper knock pin.



•Insert the dynamo wiring and starter motor lead into the clamps, and fit them between the external shift mechanism cover and the crankcase.

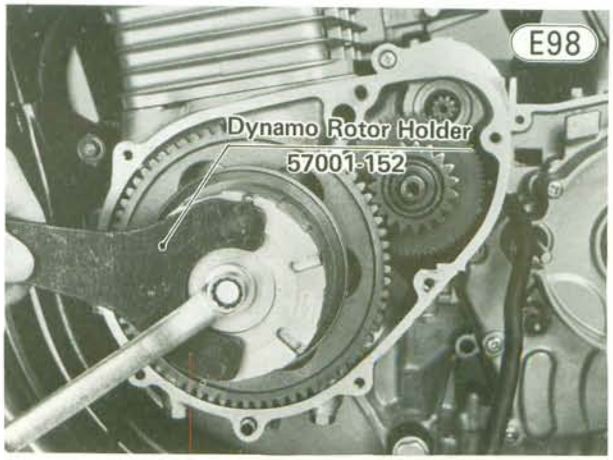


•Connect the oil pressure indicator switch lead and neutral indicator switch lead.
•Run the dynamo armature wiring in front of the upper mounting bolt spacer and to the electrical panel.
•Reconnect the blue plug to its socket on the electrical panel.
•Install the left side cover.
•Install the engine sprocket cover (Pg. 60) and adjust the clutch (Pg. 21).
•Check the oil level and add oil (Pg. 22).

DYNAMO ROTOR, STARTER MOTOR CLUTCH, STARTER CLUTCH GEAR

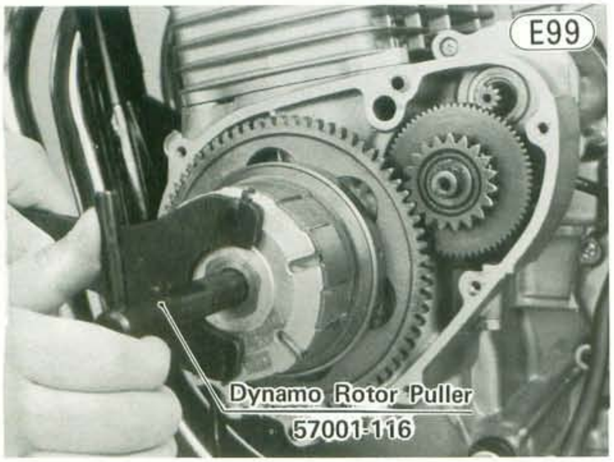
Removal:

•Remove the engine sprocket cover as explained in engine sprocket cover removal (Pg. 60). The clutch cable does not require removal from the clutch release.
•Place an oil pan beneath the dynamo cover.
•Remove the dynamo cover as explained in dynamo armature removal (Pg. 64). The blue dynamo armature plug does not require removal from the electrical panel inside of the left side cover.
•Hold the dynamo rotor steady with the dynamo rotor holder (special tool), and remove the rotor bolt.



•Using the same special tool to hold the rotor steady, remove the rotor, starter motor clutch assembly, and starter clutch gear with the dynamo rotor puller (special tool). There is a thin thrust washer between the starter clutch gear hub and the dynamo rotor. The rubber damper may come out with the starter clutch gear.

CAUTION **If the dynamo rotor is difficult to remove and a hammer is used to tap the dynamo rotor puller, be careful not to strike the dynamo rotor itself. Striking the dynamo rotor can cause the magnets to lose their magnetism.**

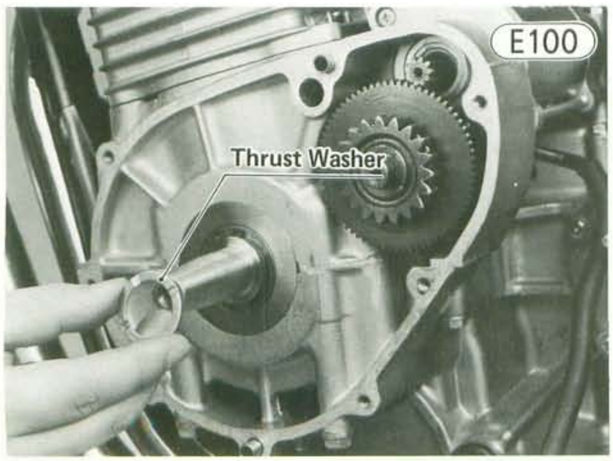


•Remove the needle bearing, and thick thrust washer.

Installation:

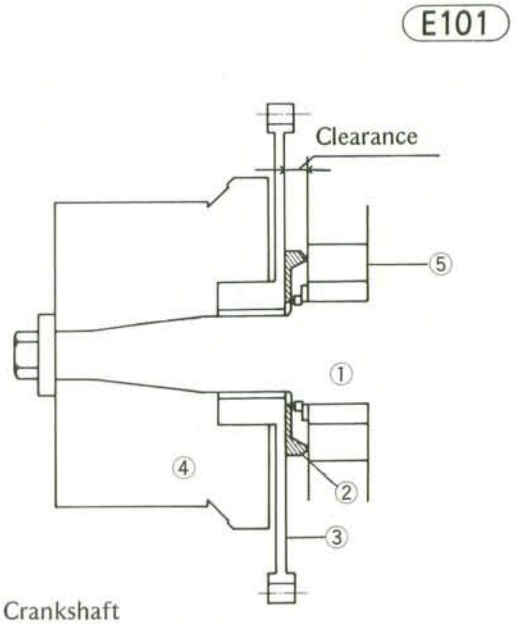
NOTE: If the dynamo rotor, starter clutch gear, crankshaft, and/or crankcase are replaced with new ones, it is necessary to select the right rubber damper from three dampers having different thickness.

•Put the thick thrust washer, needle beairng, starter clutch gear, thin thrust washer, and dynamo rotor onto the crankshaft without inserting the damper. The thrust washer must go onto the crankshaft with its chamfered side facing in.



•Measure the clearance by pressing the rotor by hand, and select the right rubber damper as shown below. There is an identification mark on the damper.

Starter Clutch Gear/Main Bearing Outer Race Clearance



1. Crankshaft
2. Rubber Damper
3. Starter Clutch Gear
4. Rotor
5. Bearing Outer Race

Table E1 Rubber Damper Selection

Clearance	Rubber Damper Part No.	ID Mark
5.06～6.05 mm	92075-192	★
6.06～7.05 mm	92075-193	★ ★
7.06～8.05 mm	92075-194	★ ★ ★

•Remove the dynamo rotor and starter clutch gear and fit the correct rubber damper onto the starter clutch gear.

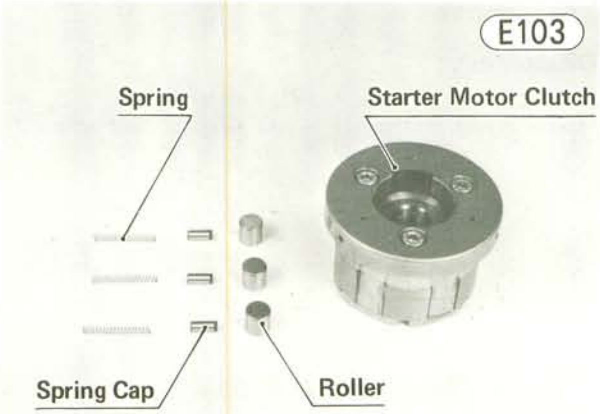
•Apply engine oil to the rubber damper and needle bearing. Using a high flash-point solvent, clean off any oil or dirt that may be on the crankshaft taper and rotor tapered hole.

•Fit the rubber damper, starter clutch gear, and dynamo rotor back onto the crankshaft.

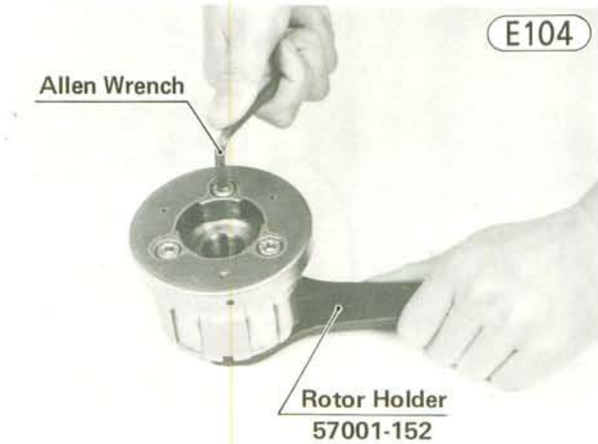
- Tighten the dynamo rotor bolt to 7.0 ~ 7.5 kg-m (51 ~ 54 ft-lbs) of torque while holding the dynamo rotor steady with the dynamo rotor holder (special tool).
- Install the dynamo cover (Pg. 65).
- Install the engine sprocket cover (Pg. 60) and adjust the clutch (Pg. 21).
- Check the oil level and add oil (Pg. 22).

Disassembly:

- Remove the rollers, springs, and spring caps (3 ea) from the starter motor clutch.



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



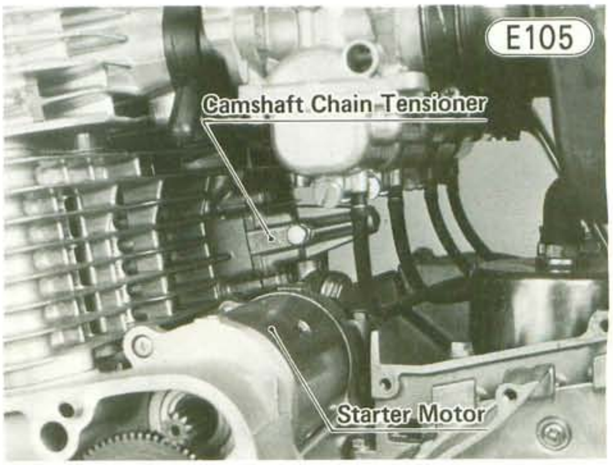
- Remove the steel plate and knock pin from the rotor.

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, STARTER IDLE GEAR

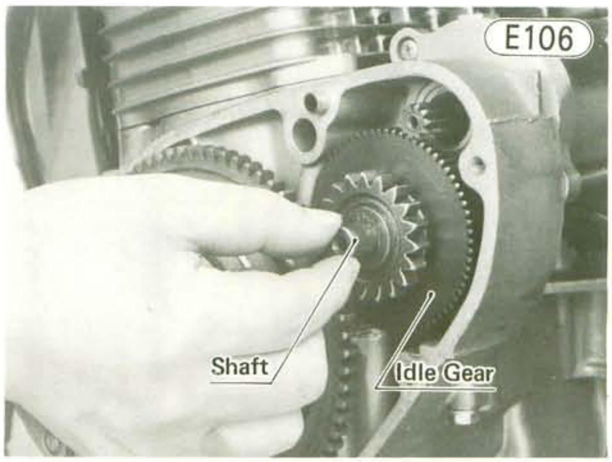
- Remove the engine sprocket cover as explained in engine sprocket cover removal (Pg. 60). The clutch cable does not require removal from the clutch release.
- Place an oil pan beneath the dynamo cover.
- Remove the dynamo cover as explained in dynamo armature removal (Pg. 64). The blue dynamo armature plug does not require removal from the electrical panel inside of the left side cover.
- Remove the bolts (2), and remove the camshaft chain tensioner and gasket.



- Remove the starter motor retaining bolts (2).
- Pry the starter motor loose from the crankcase with a screwdriver, slide the starter motor off towards the right side of the engine, and then lift it upwards.

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

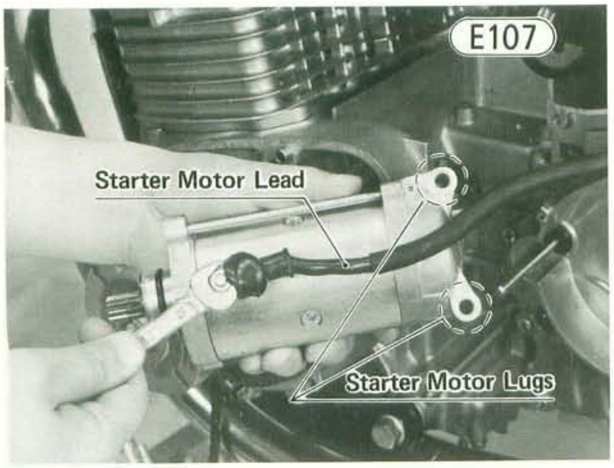
- Slide out the rubber cap, remove the starter motor terminal nut and lockwasher, and take the lead off the motor.
- Remove the shaft and remove the starter idle gear.



Installation:

- Clean the starter motor lugs and crankcase where the starter motor is grounded.

●Reconnect the motor lead onto the terminal with its nut and lockwasher and reinstall the rubber cap. Tighten the nut with 0.4 ~ 0.6 kg-m (35 ~ 52 in-lbs) of torque.

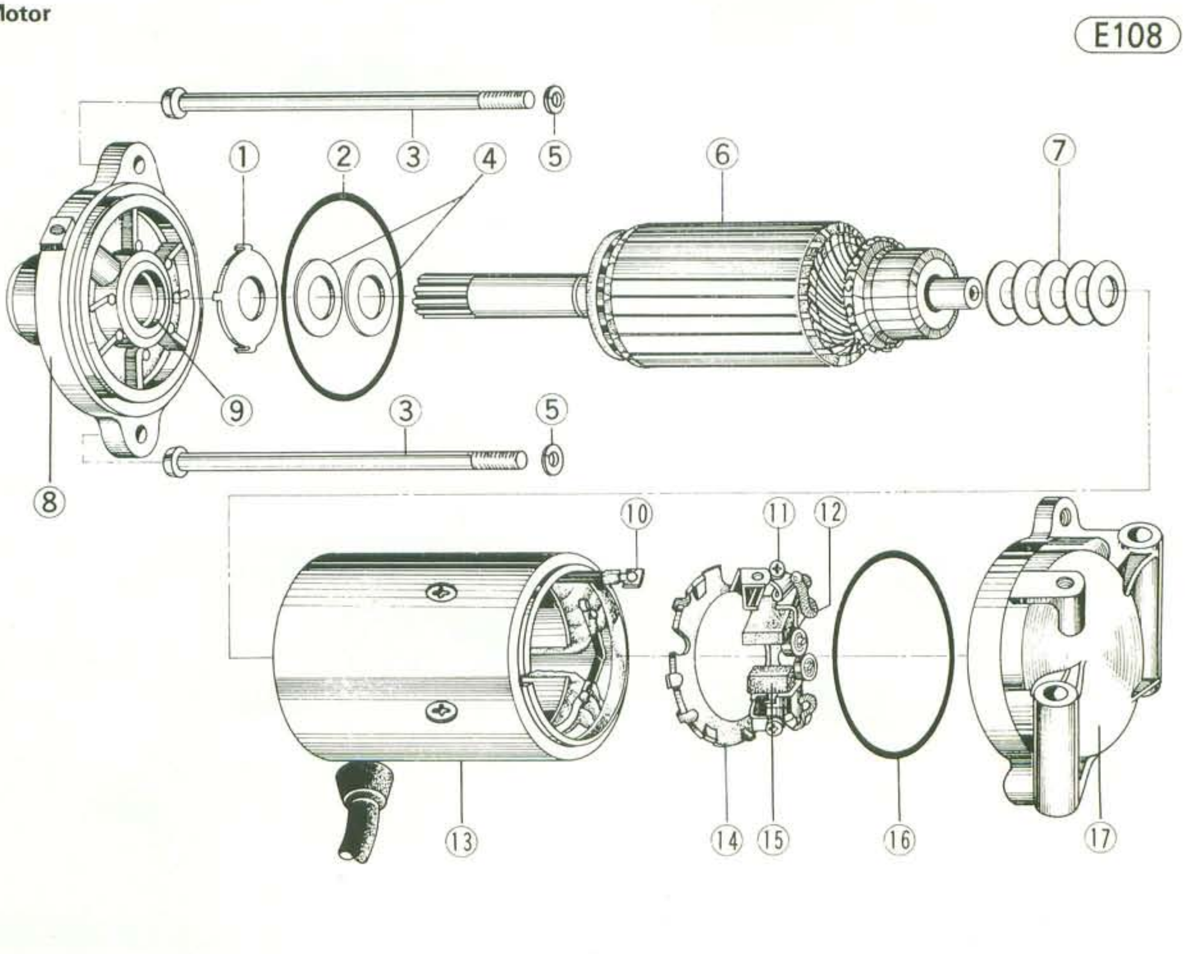


●Replace the **O** ring with a new one, if it is deteriorated or damaged, and apply a little oil to it.
●Place the starter motor back into position, apply a non-permanent locking agent to the starter motor retaining bolts, and tighten the bolts with 0.9 ~ 1.1 kg-m (78 ~ 95 in-lbs) of torque.
●Install the starter idle gear and its shaft. Apply a thin coat of high temperature grease to the shaft.
●Install the dynamo cover as explained in dynamo armature installation (Pg. 65).
●Install the engine sprocket cover and adjust the clutch (Pg. 21).
●Install the camshaft chain tensioner using a new gasket.
●Adjust camshaft chain play (Pg. 14).
●Check the oil level and add oil (Pg. 22).
●Check idle and adjust the carburetors if necessary (Pg. 18).

Disassembly:

●Remove the screws ③ (2), lockwashers ⑤ (2), and remove one end cover ⑰, **O** ring ⑯, and shims ⑦.

Starter Motor



1. Toothed Washer
2. **O** Ring
3. Screw
4. Shim
5. Lockwasher
6. Armature
7. Shim
8. End Cover
9. Grease Seal
10. Field Coil Lead
11. Screw
12. Brush Lead
13. Yoke Assembly
14. Brush Plate
15. Brush
16. **O** Ring
17. End Cover

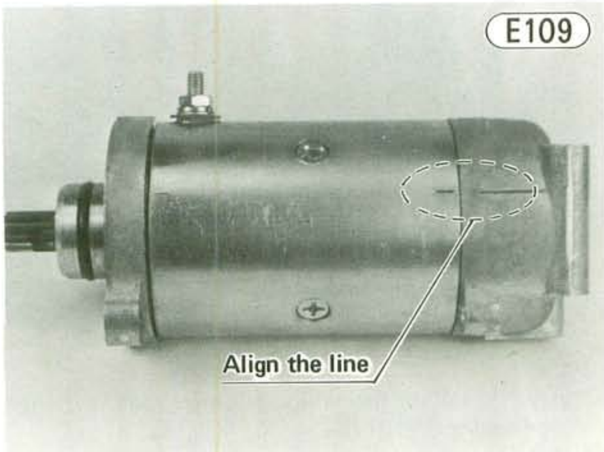
•*Remove the* screw ⑪ which connects the brush lead ⑫ to the field coil lead ⑩, and remove the brush plate ⑭ and brushes ⑮. The screw has a lockwasher.

•Take off the other end cover ⑧ and **O** ring ②, and remove the yoke assembly ⑬ and armature ⑥. There are shims ④ and a toothed washer ① on this side of the armature shaft.

NOTE: The yoke assembly ⑬ is not meant to be disassembled.

Assembly Notes:

1. Replace any **O** rings and gaskets that are deteriorated or damaged with new ones.
2. Align the line on the end cover ⑰ with the line on the housing.

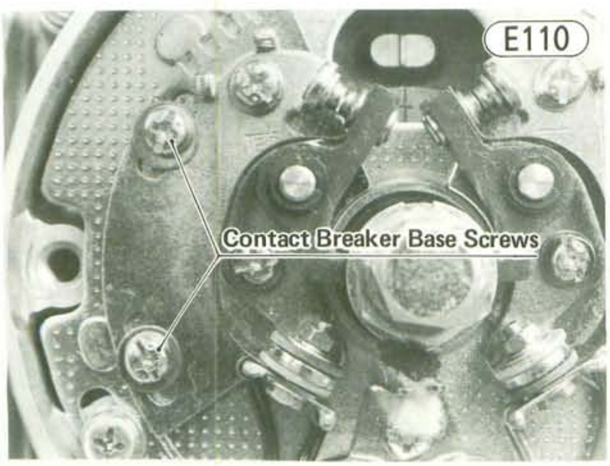


CONTACT BREAKER

Removal:

•Remove the contact breaker cover and gasket.

•Remove the contact breaker base screws (2). Each screw has a flat washer and lockwasher.

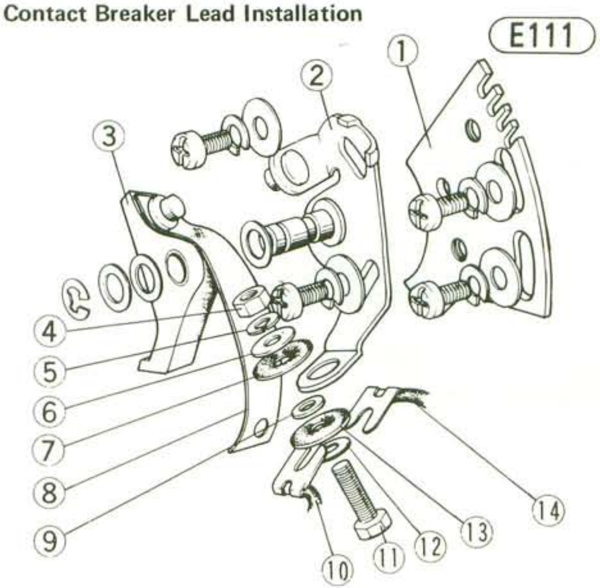


•Loosen the contact breaker terminal nut, and free the contact breaker from the engine by pulling off the contact breaker and capacitor leads at the same time.

Installation Notes:

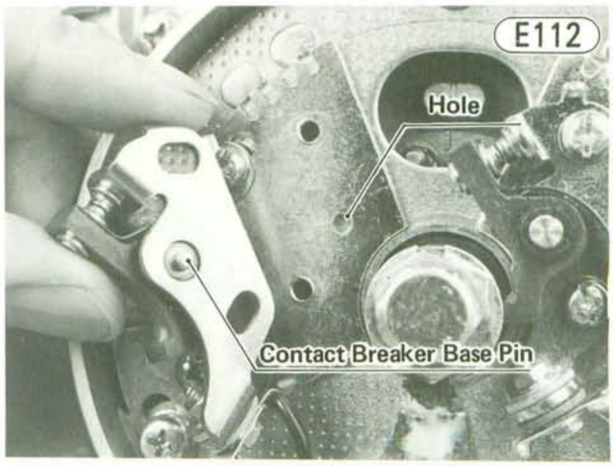
1. The sequence of installation on the contact breaker terminal bolt is: bolt ⑪, flat washer ⑫, contact breaker lead ⑩, capacitor lead ⑭, spring ⑧, large insulator ⑬, small insulator ⑨ (in contact breaker hole), large insulator ⑦, flat washer ⑥, lockwasher ⑤, and nut ④.

Contact Breaker Lead Installation



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

2. When installing the contact breaker, fit the contact breaker base pin into the hole on the ignition timing adjusting plate.

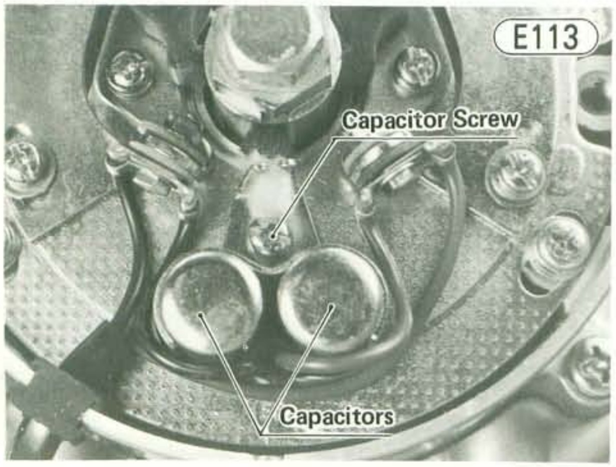


3. After installation, adjust the ignition timing (Pg. 12).

CAPACITORS

Removal:

•Remove the contact breaker cover and gasket.
•Loosen the contact breaker terminal nuts, and remove the capacitor leads from both sets of points.
•Remove the capacitor screw and lockwasher, and remove the two capacitors as a pair.



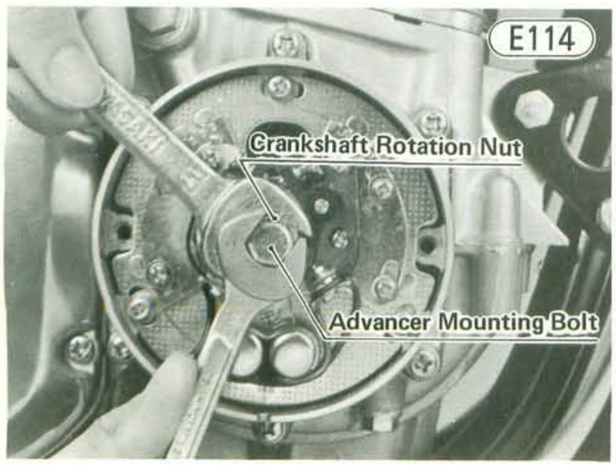
Installation Notes:

1. The sequence of installation on the contact breaker bolt is: bolt, flat washer, contact breaker lead, capacitor lead, spring, large insulator, small insulator (in contact breaker hole), large insulator, flat washer, lockwasher, and nut (Fig. E111).
2. Connect the capacitor leads as follows:
   Black → #1 and #4 contact breaker (left side)
   Green → #2 and #3 contact breaker (right side)

TIMING ADVANCER

Removal:

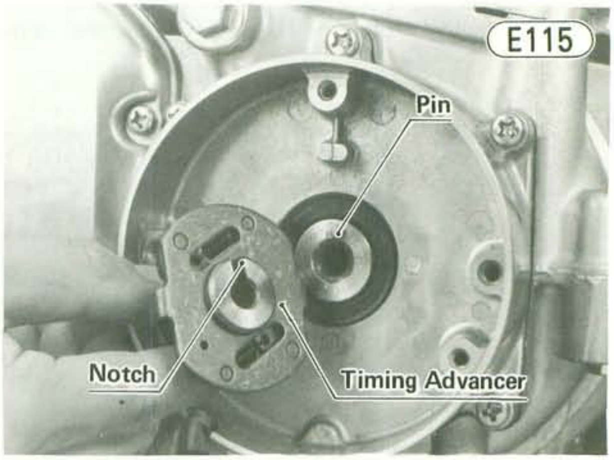
•Remove the contact breaker cover and gasket.
•With a 17 mm wrench on the crankshaft rotation nut to keep the shaft from turning, remove the advancer mounting bolt, and then take off the rotation nut.



•Take out the timing adjusting plate mounting screws, lockwashers, and flat washers (3 ea); and remove the timing plate and timing advancer.

Installation Notes:

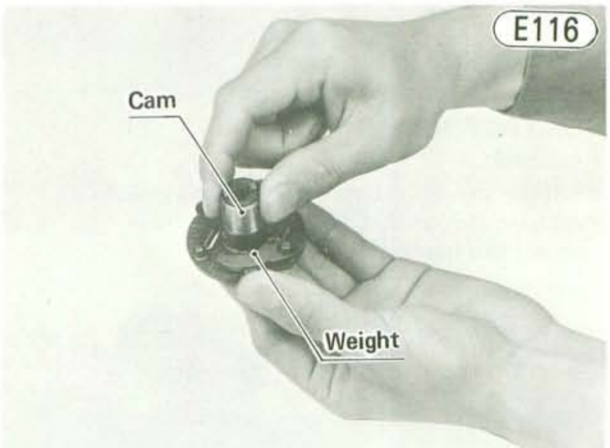
1. Fit the timing advancer onto the crankshaft, matching its notch with the pin in the end of the crankshaft, and install the crankshaft rotation nut and the advancer mounting bolt. The notches in the nut fit the projections on the timing advancer. Tighten the bolt with 2.3 ~ 2.7 kg-m (16.5 ~ 19.5 ft-lbs)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



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

Disassembly:

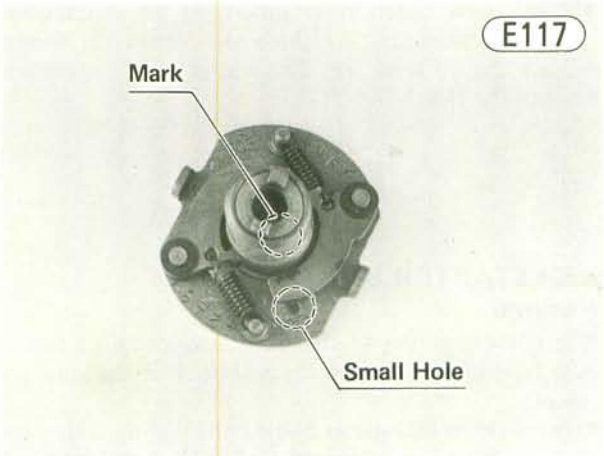
•Turn the cam clockwise and pull off the cam.

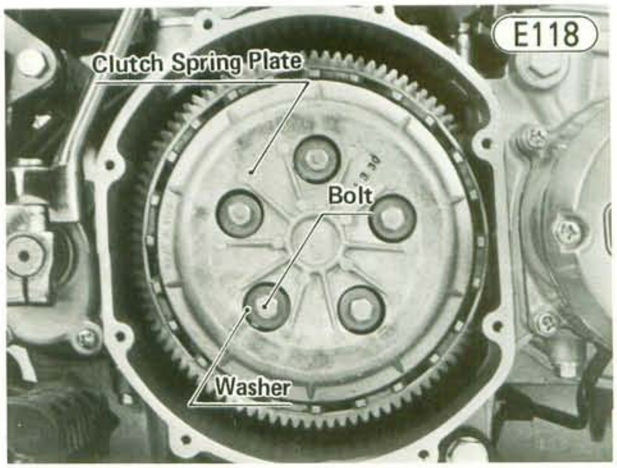


•Remove the **C** rings (2), thrust washers (2), and weights (2).
•Remove the thrust washer from each weight shaft.
•Remove the thrust washer from the advancer body.

Assembly Notes:

1. Wipe the advancer clean, and fill the groove in the advancer body with grease (Fig. K33 on Pg. 204).
2. When installing the cam, align the mark on the cam with the mark on the advancer body.



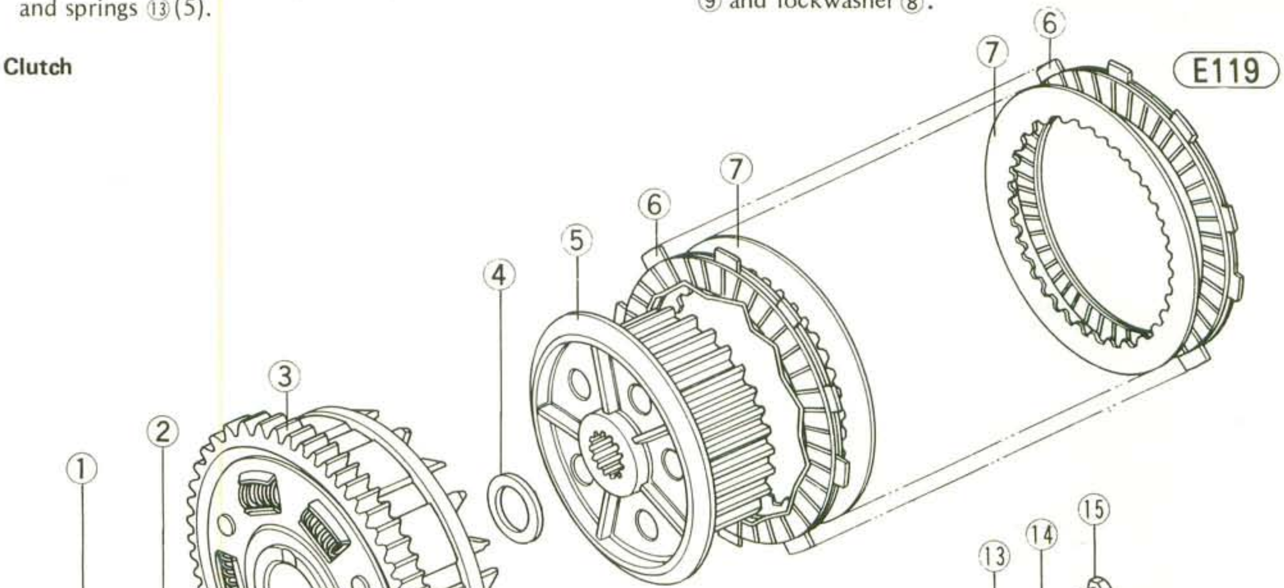


CLUTCH HUB, CLUTCH PLATES

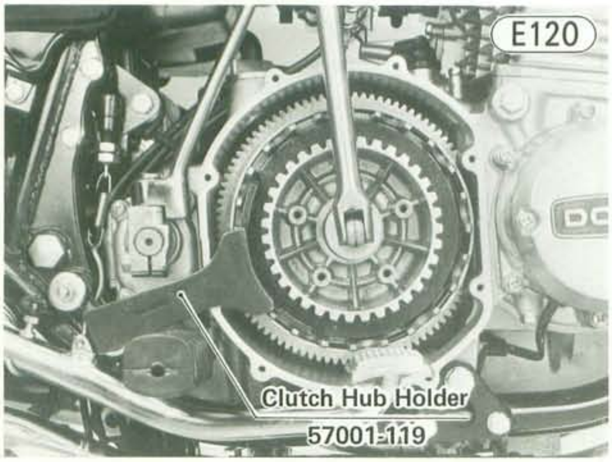
Removal:

- With the motorcycle on its center stand, place an oil pan beneath the clutch cover.
- Remove the screws (9), and pull off the clutch cover and gasket.
- Remove the clutch spring bolts ⑮ (5), washers ⑭ (5), and springs ⑬ (5).
- Pull off the spring plate ⑫, pull out the spring plate pusher ⑪, and tilt the motorcycle so that the steel ball ⑩ will fall out.
- Remove the friction plates ⑥ (8) and steel plates ⑦ (7).
- Hold the clutch hub from turning using a clutch hub holder (special tool), and remove the *clutch hub nut* ⑨ and lockwasher ⑧.

Clutch



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



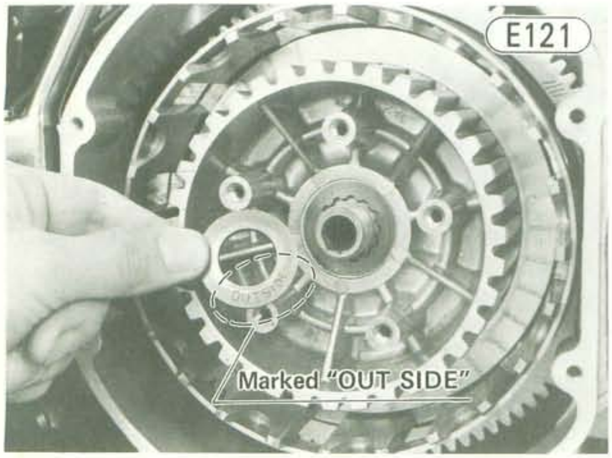
•Pull off the clutch hub ⑤. There is a thrust washer ④ at the rear of the clutch hub.

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

Installation:

•Install the thrust washer, clutch hub, and lockwasher. Replace the clutch hub nut with a new one, screw on the nut, and tighten it with 11.0~13.0 kg-m (80~94 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, "OUT SIDE", facing out. If this washer is installed backwards, the hub nut might loosen during operation. This causes clutch disengagement and might cause primary gear and clutch housing gear breakage, 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 0.9~1.1 kg-m (78~95 in-lbs) of torque.

•Using a new clutch cover gasket, fit the clutch cover onto the crankcase. Tighten the screws (9) firmly.

•Check the oil level (Pg. 22), and add oil if necessary.

•Adjust the clutch (Pg. 21).

KICKSTARTER SPRING

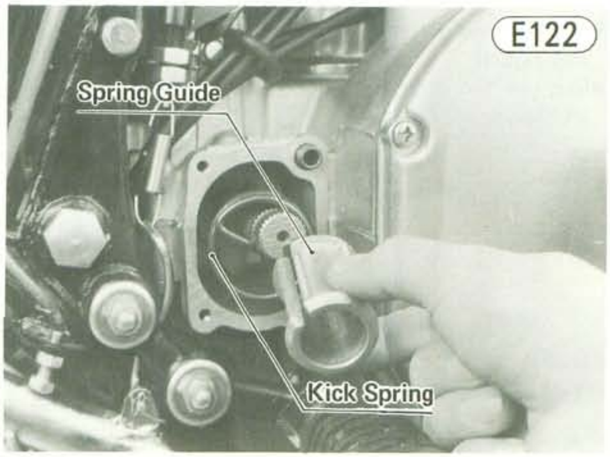
Removal:

•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.

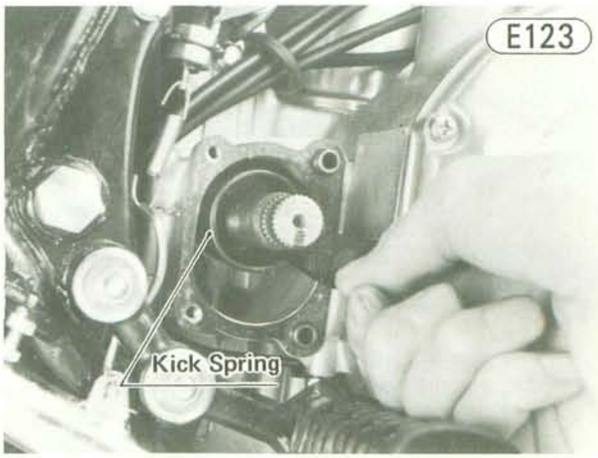
•Remove the kickstarter cover screws (4), and pull off the kickstarter cover and gasket. There are two knock pins.

•Pull out the spring guide, and remove the kick spring

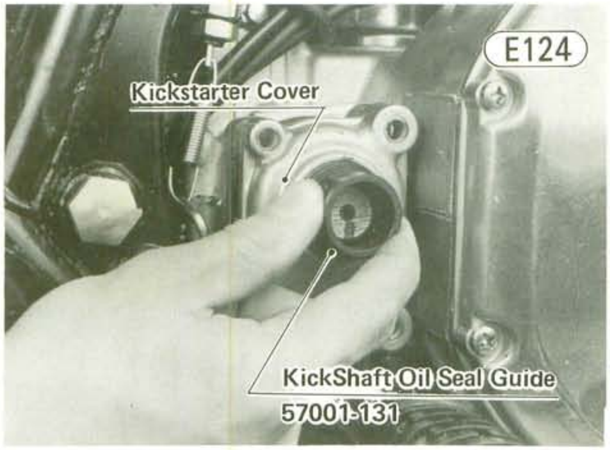


Installation Notes:

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.



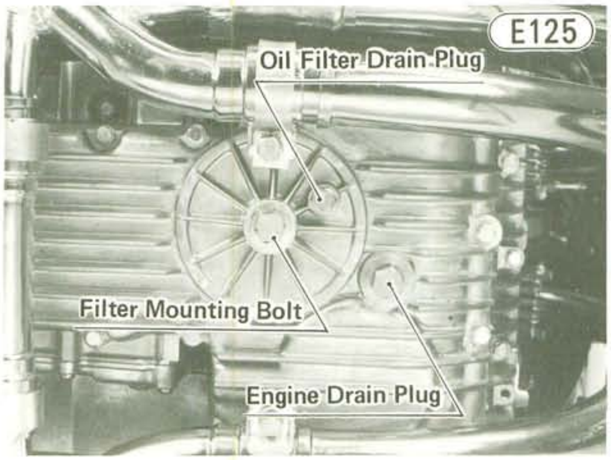
2. Check to see that knock pins (2) are in place.
3. Using a new kickstarter cover gasket, fit the kickstarter cover onto the crankcase. Use the kick shaft oil seal guide (special tool) to protect the kick shaft oil seal. Tighten the screws (4) firmly.



OIL FILTER

Removal:

- Remove the oil filter drain plug and the engine drain plug, and drain the oil from the filter and the engine.

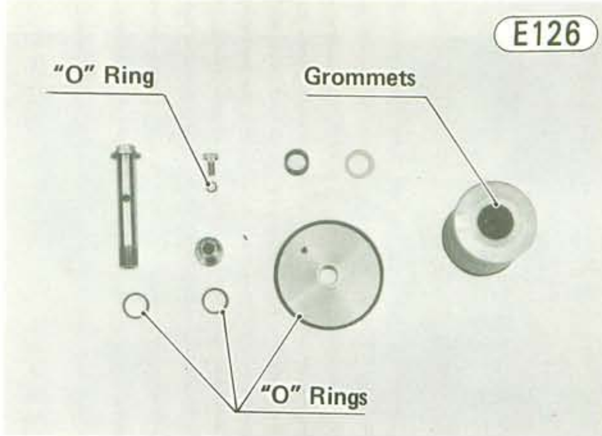


- Remove the filter mounting bolt and drop out the filter.
- Pull the filter off the mounting bolt. There is a spring seat and spring between the oil filter and the filter cover.

Installation:

- Remove the filter mounting bolt from the filter cover, and make sure that the **O** rings on the filter mounting bolt, drain plugs, 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 them with new ones will cause oil leaks and eventually result in little or no oil left in the engine. This will cause serious engine damage. The oil in the oil filter housing is pressurized by the engine oil pump, so these O rings must be inspected with special care. Look for discoloration (indicating the rubber has deteriorated), hardening (the sides which face the mating surfaces are flattened), scoring, or other damage.**

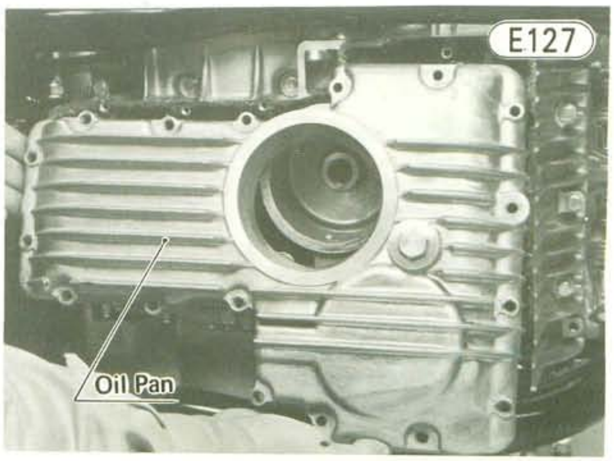


- Apply a little engine oil to the **O** ring on the filter mounting bolt, fit the filter cover on the bolt, and install the spring and spring seat in this sequence.
- Apply a little engine oil on the oil filter grommets, and turn the filter mounting bolt to work the new filter into place while holding the filter steady. Be careful that the filter grommets do not slip out of place.
- 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 1.8~2.2 kg-m (13.0~16.0 ft-lbs) of torque.
- Install the engine drain plug and tighten it with 2.7 ~3.3 kg-m (19.5~24.0 ft-lbs) of torque.
- Fill the engine with oil, check the level (Pg. 22), and add more if necessary.

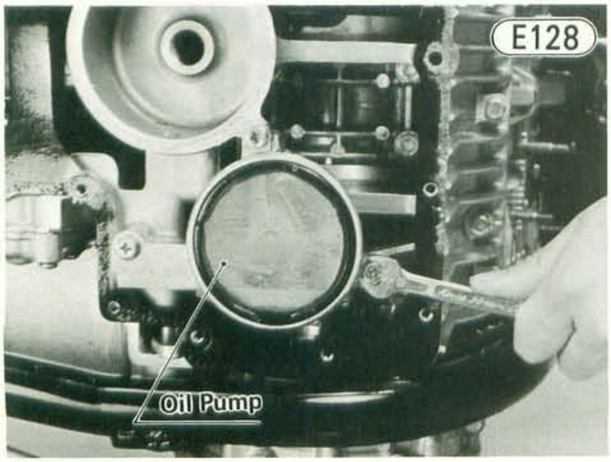
ENGINE OIL PUMP

Removal:

- With the motorcycle on its center stand, place an oil pan beneath the engine, and remove the engine drain plug to drain out the oil.
- Remove the mufflers (Pg. 43).
- Remove the oil filter (See above).
- Remove the oil pan bolts (17), and take off the oil pan, gasket, and **O** ring.



•Remove the engine oil pump bolts (3), and take off the engine oil pump and oil passage **O** ring. There are two knock pins.



Installation Notes:

1. Replace the oil passage **O** ring and oil pan **O** ring with new ones, if deteriorated or damaged, and use a new oil pan gasket.
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 crankshaft mesh properly.
5. Apply non-permanent locking agent to the engine oil pump bolts (3), and tighten them with 0.7~0.9 kg-m (61~78 in-lbs) of torque.
6. Tighten the oil pan bolts (17) with 0.9 ~ 1.1 kg-m (78~95 in-lbs) of torque.
7. Fill the engine with oil, check the oil level (Pg. 22), and add more if necessary.

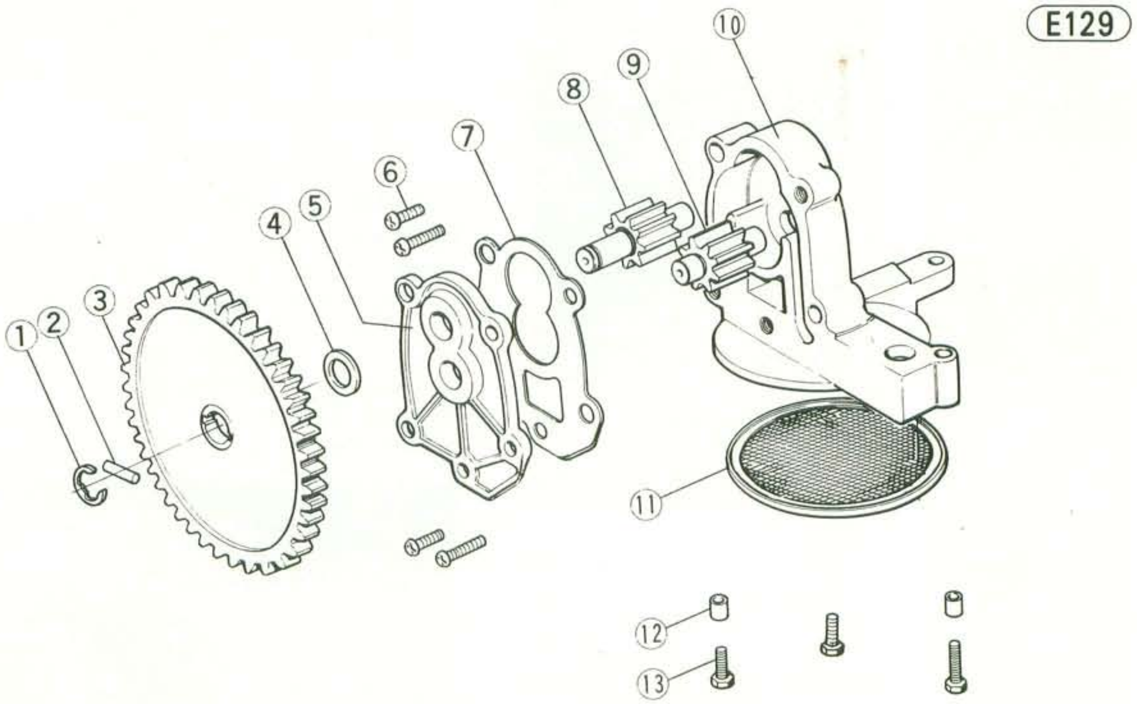
Disassembly:

•Remove the circlip, main gear, alignment pin and washer.
•Remove the screws (5), and take off the oil pump cover and gasket.
•Remove the driving gear and driven gear.

Assembly Notes:

1. Clean mating surfaces of the pump cover and pump body and use a new gasket in assembly.
2. Apply a non-permanent locking agent to the screws.
3. Check to see that knock pins (2) are in place.

Oil Pump

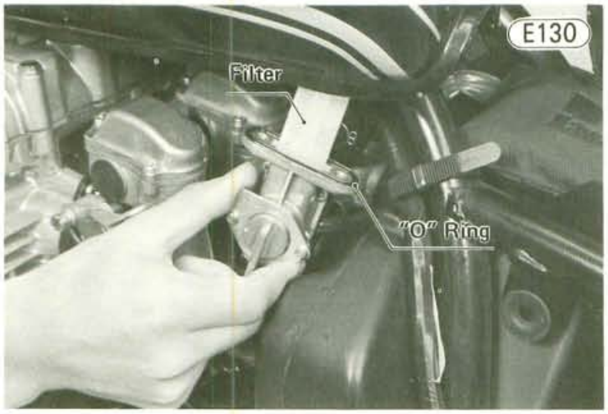


1. Circlip
2. Alignment Pin
3. Main Gear
4. Washer
5. Cover
6. Screw
7. Gasket
8. Driving Gear
9. Driven Gear
10. Pump Body
11. Screen
12. Knock Pin
13. Mounting Bolt

FUEL TAP

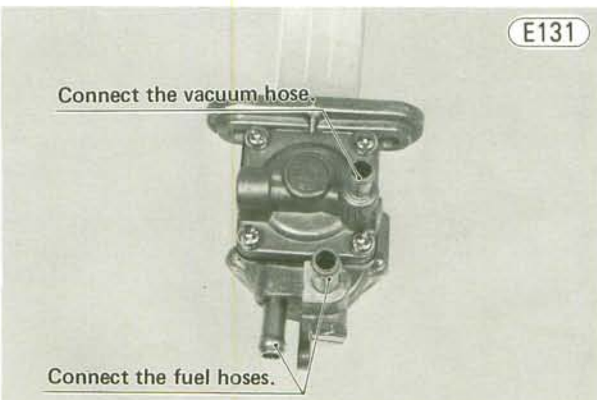
Removal:

- Remove the drain plug and gasket at the bottom of the fuel tap.
- Holding a container under the fuel tap, turn the tap to the "PRI" position to drain the tank.
- Slide the hose clamps out of position, and pull the fuel and vacuum hoses off the tap.
- Remove the bolts and gaskets, and pull the fuel tap off the fuel tank. Be careful not to damage the filter.



Installation Notes:

1. Check the **O** ring, and replace it with a new one if it is damaged or deteriorated.
2. After installaing the fuel tap on the tank, make sure that the fuel stops when the engine stops.
3. Connect the vacuum hose to the pipe on the diaphragm cover. The lower two pipes are the fuel outlets.

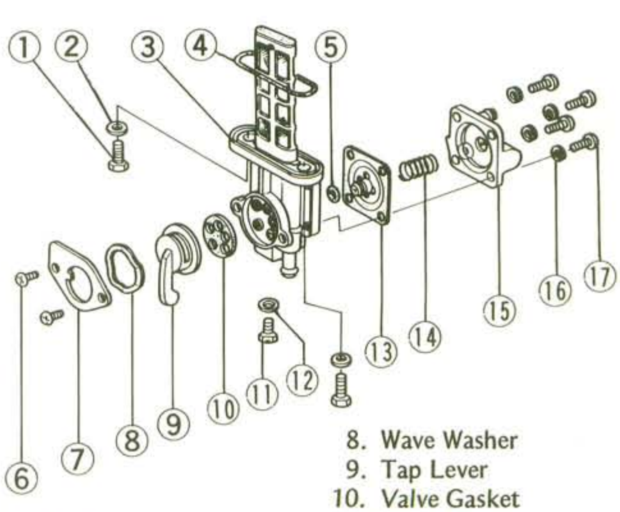


Disassembly:

- Remove the screws ⑥ (2), and remove the tap lever ⑨, wave washer ⑧, and holding plate ⑦.
- Take out the valve gasket ⑩.
- Remove the screws ⑰ and lockwashers ⑯ (4 ea), and remove the diaphragm cover ⑮ and spring ⑭.
- Remove the diaphragm assembly ⑬ from the fuel tap.

Fuel Tap

(E132)



1. Bolt
2. Gasket
3. Fuel Tap
4. **O** Ring
5. **O** Ring
6. Screw
7. Holding Plate
8. Wave Washer
9. Tap Lever
10. Valve Gasket
11. Drain Plug
12. Gasket
13. Diaphragm Assembly
14. Spring
15. Diaphragm Cover
16. Lockwasher
17. Screw

Assembly Notes:

1. Check and clean all the parts (Pg. 168). Replace damaged parts with new ones.
2. Install the diaphragm cover in the direction shown in Fig. E131, making sure that the spring is compressed at the center of the diaphragm between the diaphragm and the cover.

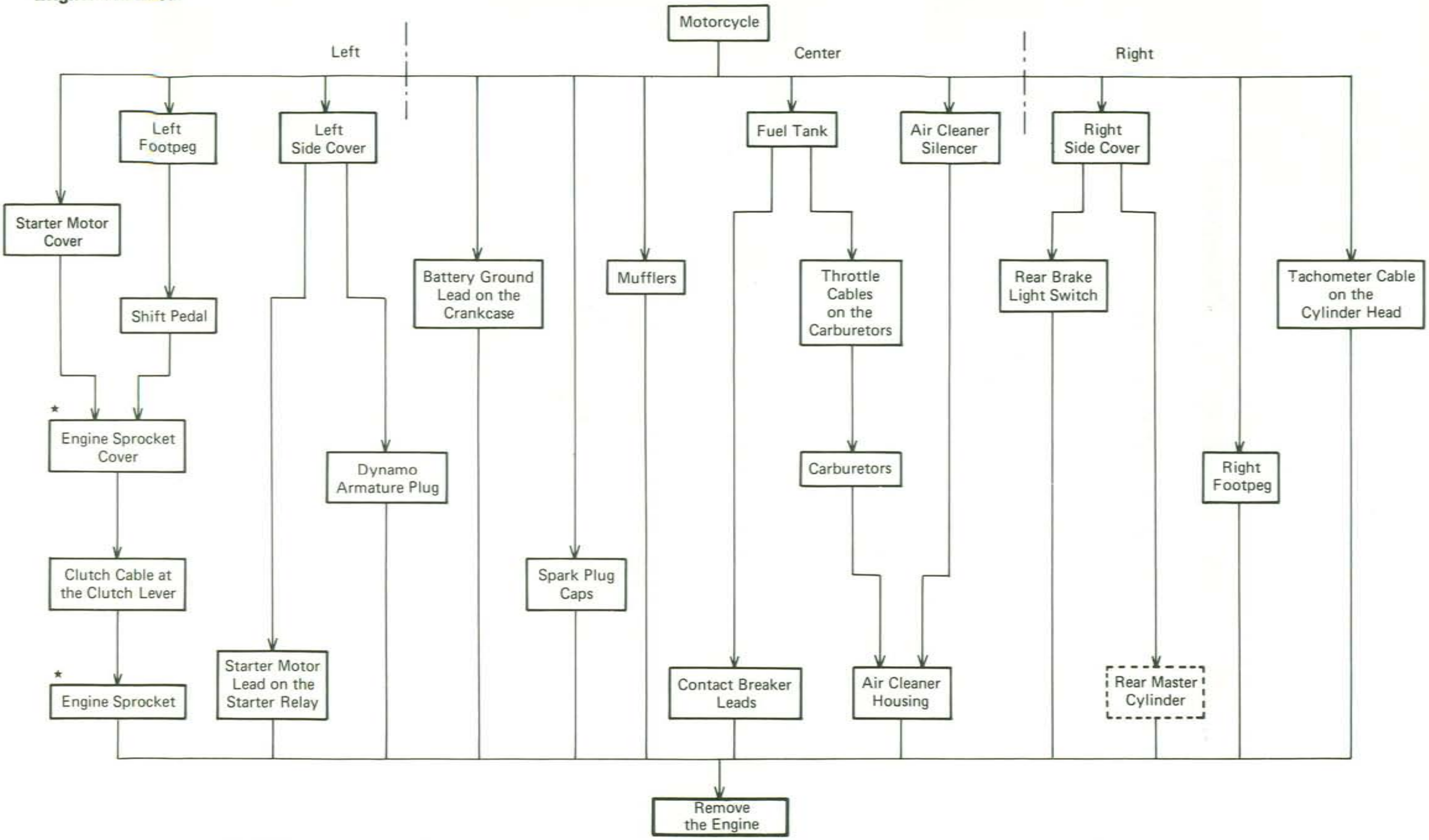
Disassembly—Engine Removed

Table of Contents

F

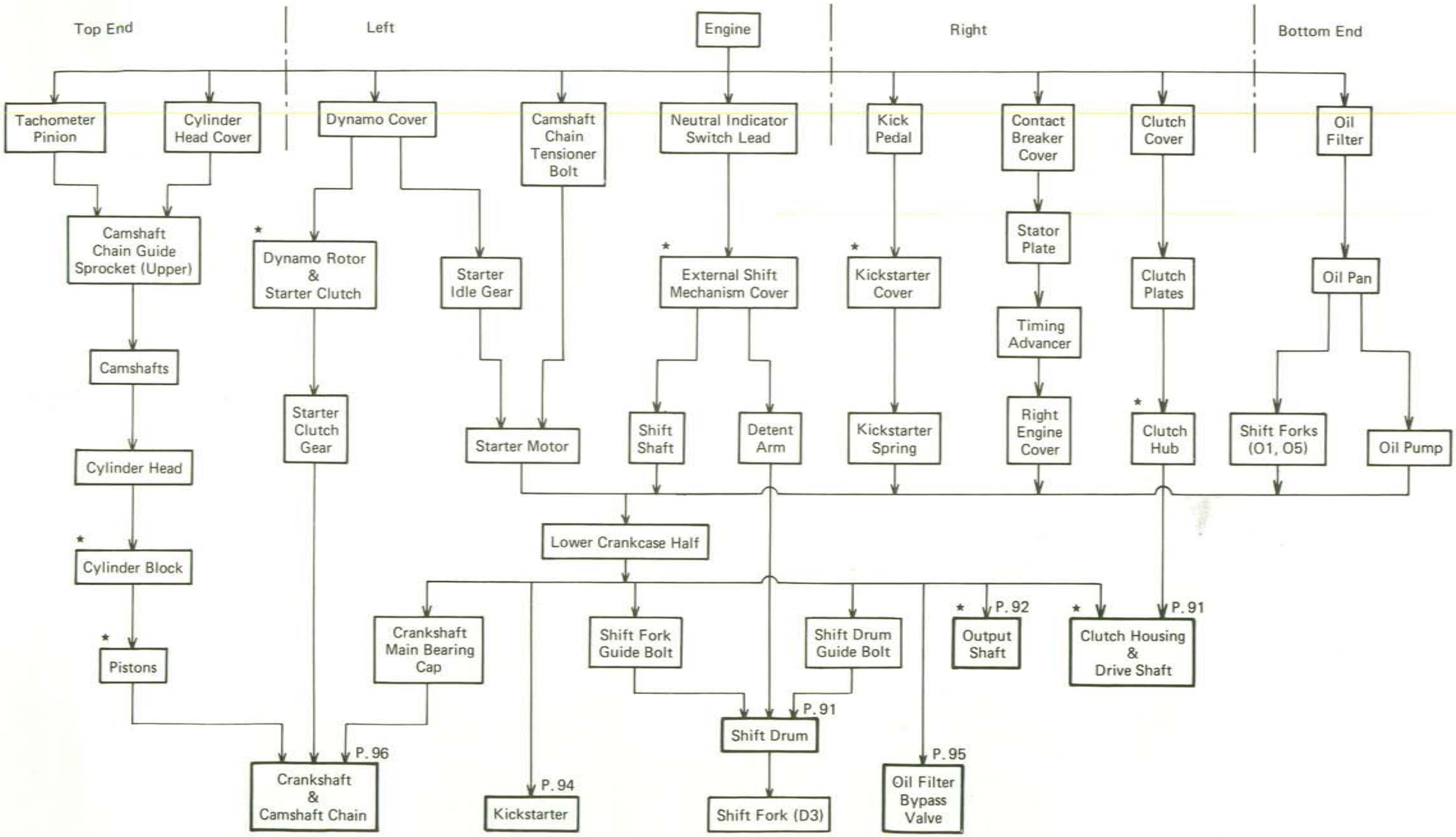
FLOW CHART
Engine Removal

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.



NOTES: 1. Action with a mark (★) requires special tool(s) for removal, installation, disassembly, or assembly.
2. Parts in the broken line are required to remove its mounting bolts, but not necessary its complete removal for engine removal.

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:

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

•After draining the oil, install both drain plugs with their O rings. Tighten the engine drain plug with 2.7 ~ 3.3 kg-m (19.5 ~ 24.0 ft-lbs) of torque and the oil filter drain plug with 1.8 ~ 2.2 kg-m (13 ~ 16 ft-lbs) of torque.

•Pull off the right and left side covers.

•Remove the fuel tank (Pg. 44).

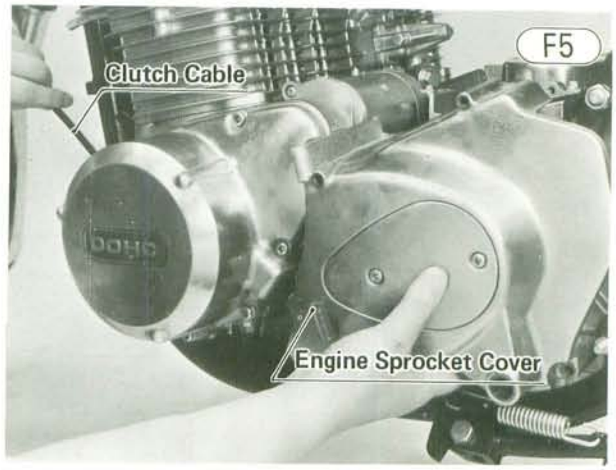
•Remove the carburetors (Pg. 44).

•Remove the muffler on each side (Pg. 43).

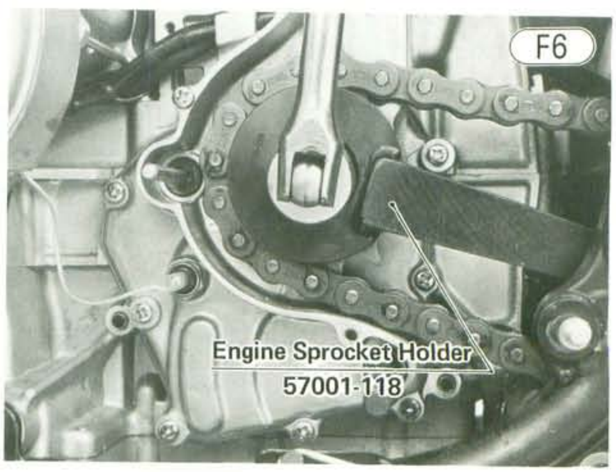
•Remove the engine sprocket cover as explained in engine sprocket cover removal (Pg. 60). The clutch cable does not require removal from the clutch release.

•Line up the slots in the clutch lever, knurled locknut, and adjuster and free the clutch cable from the clutch lever.

•Pull the clutch cable downwards and free the cable and engine sprocket cover from the motorcycle.



•Remove the engine sprocket (Pg. 61).



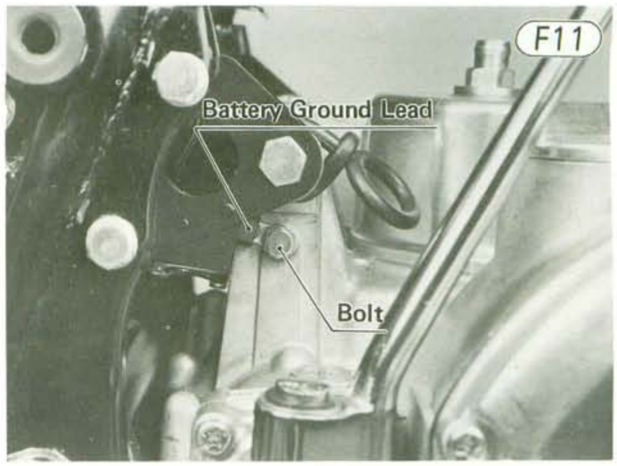
•Disconnect the blue dynamo armature plug from its socket on the electrical panel.

•Slide the rubber cap out of place, remove the nut and lockwasher, and remove the starter lead from the starter relay terminal.
•Pull the armature wiring and starter lead out to side of the engine.
•Remove the tool kit and tool tray.
•Remove the air cleaner silencer retaining screw, lockwasher, and flat washer. Loosen its clamp, and remove the air cleaner silencer.
•Slide the clip out of place to remove the breather hose from the breather cover, and remove the air cleaner housing.

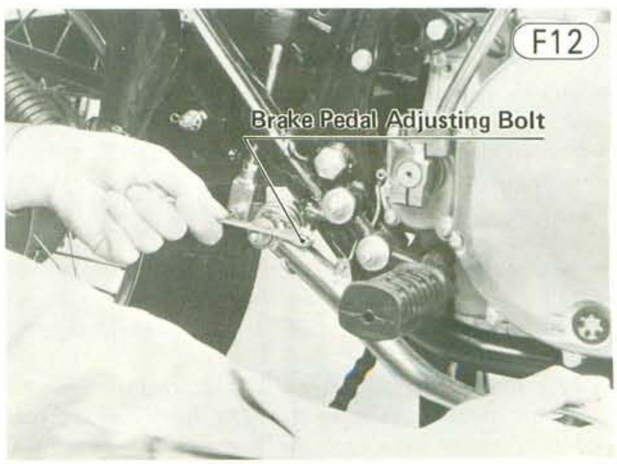
•Disconnect the one black lead and one green lead that join the ignition coils to the contact breaker points, and slide the contact breaker leads free from the frame through the strap and clamps.

•Remove the rear brake light switch (Pg. 121).

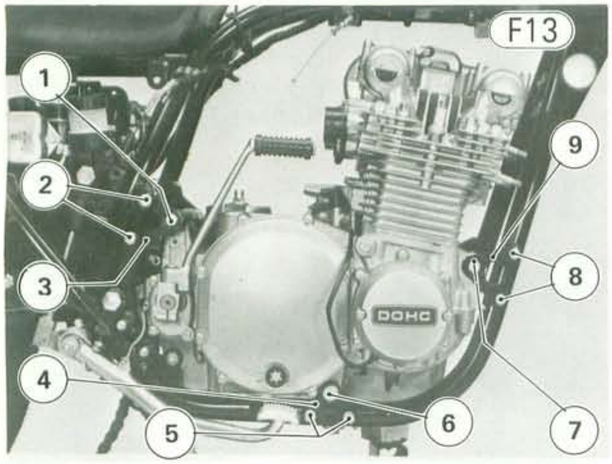
•Remove the bolt and lockwasher, and remove the battery negative ground lead from the engine.

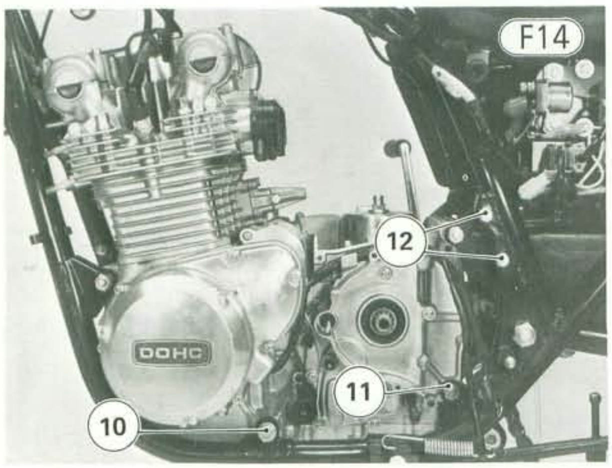


•Remove the rear master cylinder mounting bolts, lockwashers, flat washers (2 ea) and side cover bracket. Loosen the brake pedal adjusting bolt locknut, and back out the adjusting bolt until the pedal is held down out of the way.



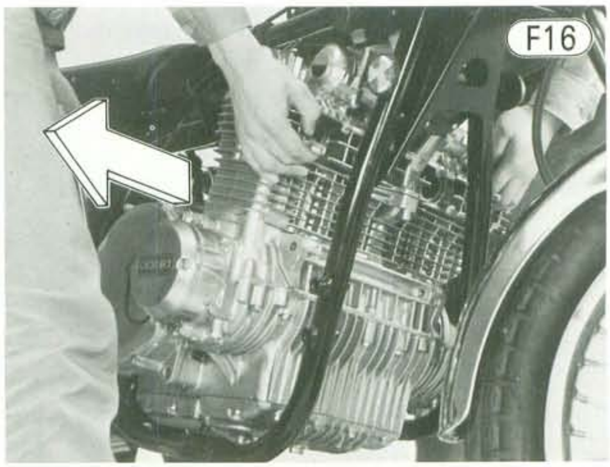
- Remove the right footpeg.
- Unscrew the tachometer cable from the cylinder head and pull off the cable from the cylinder head.
- Pull off the spark plug lead from each spark plug and free the lead from its clamp on the cylinder head cover.
- Make sure that the following cables and leads are free, and properly positioned on the engine and frame so that they will not get damaged during engine removal: starter lead, tachometer cable, contact breaker point leads, dynamo armature wiring, battery negative ground lead, and throttle cables.
- Jack or lever the engine up slightly to take the weight off the mounting bolts.
- Remove the short center mounting bolts ⑥, ⑩ on each side, and take the self-locking nuts and lockwashers (3 ea) off the long mounting bolts ①, ⑦, ⑪. Each short mounting bolt has a nut plate.





- Pull the rear upper mounting bolt ① off the engine, and remove two spacers on both side of the engine.
- Remove the bolts ② (2) and lockwashers (2), remove the rear right upper mounting bracket ③.
- Remove the bolts ⑤ and lockwashers (2), and remove the lower center mounting bracket ④.
- Remove the bolts, lockwashers, and nuts (2 ea) off the front mounting bracket, and pull out the long engine mounting bolts ①, ⑦, ⑪. Be careful not to damage the threads upon removal.
- Level the engine and slowly lift it straight up about 25 mm, then move it to the right slightly so the rear of the engine slips over the lower right rear mount.

- Raise the front of the engine a little so that the cylinder head studs clear the frame.
- Next, drop down the left side so the upper left end of the cylinder head cover is level with the top of the left side reflector and the upper right end of the cylinder head cover is level with the bottom of the frame top tube.



- Pull the engine out diagonally upward to the right.

Installation:

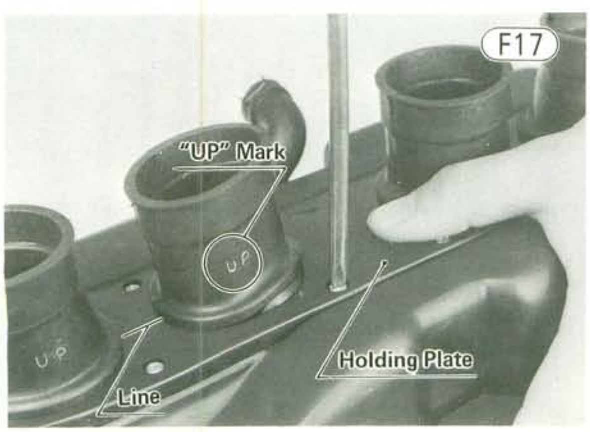
- Place the engine into the frame the reverse of how it was removed.
- Loosely mount the three engine mounting brackets. See Table F1 for bolt location. The front two nuts and the other four bolts have lockwashers.
- Lifting the engine as necessary so that the mounting bolt threads do not get damaged, insert the three long engine mounting bolts and two short mounting bolts, and tighten them loosely. The two short mounting bolts and the three nuts have lockwashers. Two spacers go on the rear upper bolt; a long one on the left side of the engine, and a short one on the right side.
- After engine bolt insertion, first tighten the bracket mounting bolts, and then the engine mounting bolts to the torque specified in Table F1.
- Screw in the brake pedal adjusting bolt and install the rear brake master cylinder and the side cover bracket.

Table F1 Engine Bolt Tightening Torque

Bolt		Length	Torque
Front Mounting Bracket Bolt ⑧	Upper	65 mm	2.0~2.8 kg-m (14.5~20.0 ft-lbs)
	Lower	60 mm	
Right Center Mounting Bracket Bolt ⑤		20 mm	2.0~2.8 kg-m (14.5~20.0 ft-lbs)
Rear Upper Mounting Bracket Bolt	Right ②	40 mm	2.0~2.8 kg-m (14.5~20.0 ft-lbs)
	*Left ⑫	35 mm	
Front Mounting Bolt ⑦		310 mm	3.4~4.6 kg-m (25~33 ft-lbs)
Center Mounting Bolt	Right ⑥	70 mm	3.4~4.6 kg-m (25~33 ft-lbs)
	Left ⑩	55 mm	
Rear Upper Mounting Bolt ①		250 mm	3.4~4.6 kg-m (25~33 ft-lbs)
Rear Lower Mounting Bolt ⑪		165 mm	3.4~4.6 kg-m (25~33 ft-lbs)

*Left Rear Upper Mounting Bracket does not need to be removed during engine removal and installation. This is only reference if it is removed.

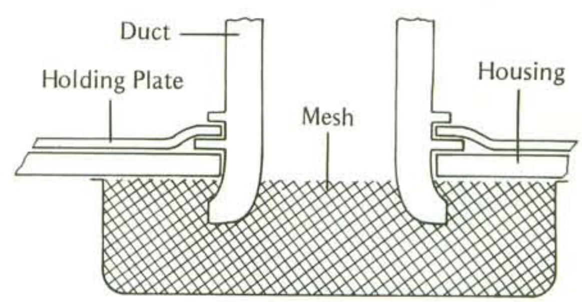
- Install the right footpeg with its nuts and washers (2 ea). Lubricate the rubber dampers with a soap and water solution or liquid soap, if necessary to prevent damage to the rubber dampers.
- Adjust the rear brake pedal position and brake pedal travel (Pg. 27).
- Run the blue and green contact breaker leads through their straps, and connect them to the same color leads from the ignition coils. Insert the contact breaker leads into their clamps under the engine on the right side.
- Run the rear brake light switch leads through the hole in the rear upper engine mounting bracket and through the strap on the frame, and connect the brake light switch spring.
- Connect the blue lead and the brown lead to the same color leads on the main harness side. Adjust the rear brake light switch (Pg. 27).
- Install the tachometer cable to the cylinder head.
- Connect the spark plug lead on each spark plug and insert #1 and #4 leads into their clamps. The numbers on the spark plug leads correspond to the cylinder numbers, counting from the left.
- Install the battery negative ground lead on the engine right side and tighten its bolt.
- Check that the air cleaner ducts are fitted properly in the air cleaner housing. If any ducts are not properly fitted, loosen the eight screws and set the ducts into their proper position aligning the lines on both sides of each duct with the lines on the holding plate.



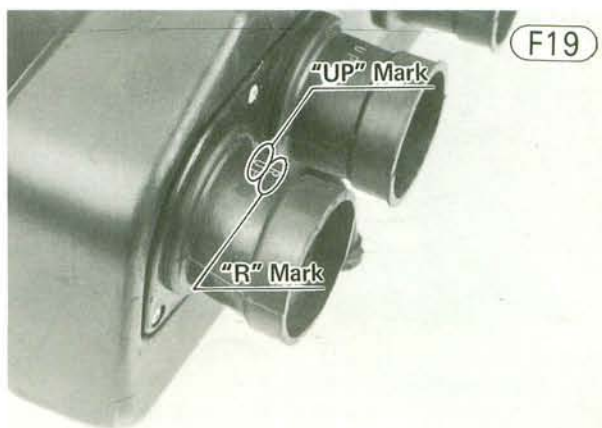
F17

Air Cleaner Duct

F18



NOTE: There are "UP" marks on the air cleaner ducts. Install them into the air cleaner housing, facing the "UP" marks upwards. There is also an "L" mark on the outer left duct and an "R" mark on the outer right duct.

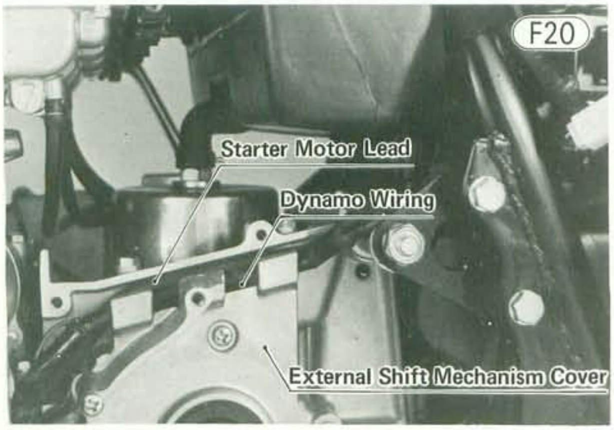


F19

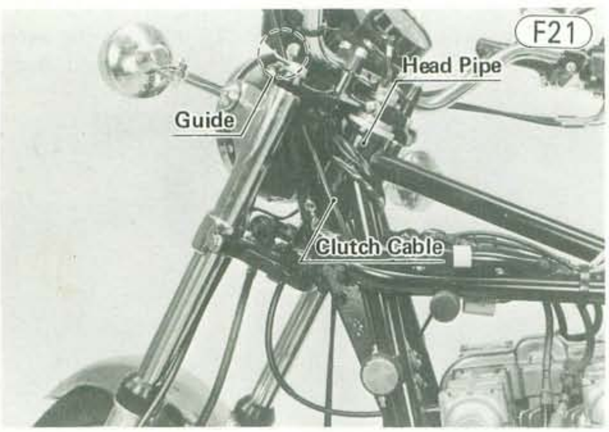
- Install the air cleaner housing. Install the air cleaner silencer and tighten its clamp and retaining screw. Screw has a lockwasher and flat washer.
- Put the tool kit and its tray on the air cleaner silencer.
- Fit the breather hose onto the breather cover, and slide back the clip.
- Run the dynamo armature wiring and starter lead above the engine mounting bolt spacer, and reconnect the blue plug to its socket on the electrical panel.

NOTE: Check to make sure that none of the male pins in the plug have been displaced during the connection of the plug. Tug on the wires to see if any pins are loose. Push any loose pins all the way into the plug until you feel the small locking tang catch in place.

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



•Fit the starter lead to the starter relay terminal. After tightening the nut with 0.4 ~ 0.6 kg-m (35 ~ 52 in-lbs) of torque, slide the rubber cap back onto the relay terminal.
•Install the engine sprocket (Pg. 61).
•Adjust the drive chain (Pg. 26).
•Install the engine sprocket cover (Pg. 60).
•Run the upper end of the clutch cable between the left fork leg and the head pipe, through the guide at the left of the stem head, and to the clutch lever. Hold the cable along the left frame down tube with the clamp.



•Adjust the clutch (Pg. 21).
•Install the mufflers (Pg. 43).

NOTE: There is an identification mark on the #2 and #3 exhaust pipes. Do not mix up those exhaust pipes (Fig. E6 on Pg. 44).

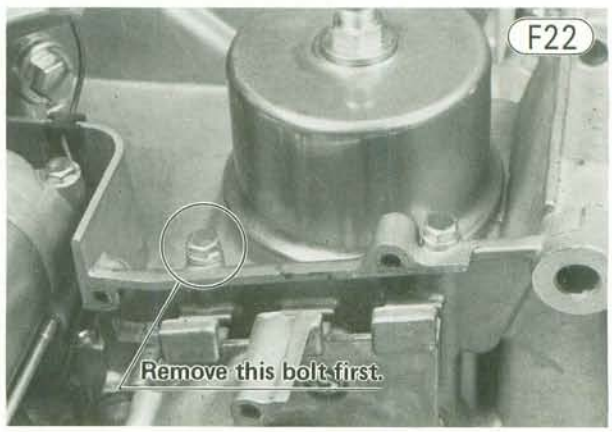
•Connecting both mufflers with the connecting pipe under the engine.
•Install the carburetors (Pg. 44).
•Adjust the throttle cables (Pg. 16).
•Connect the tachometer cable to the cylinder head. There is a gasket between the outer cable and the tachometer pinion holder.
•Install the fuel tank (Pg. 44).
•Fit the right and left side covers.
•Fill the engine with oil, check the level (Pg. 22), and add more if necessary.
•Check the drive chain (Pg. 26).
•Check the clutch (Pg. 21).
•Check the throttle cable (Pg. 16).
•Check the rear brake (Pg. 27).
•Check the rear brake light switch (Pg. 27).
•Adjust the camshaft chain (Pg. 14).
•Check the ignition timing, and adjust if necessary (Pg. 12).
•Check idling and adjust the carburetors if necessary (Pg. 18).

CRANKCASE SPLIT

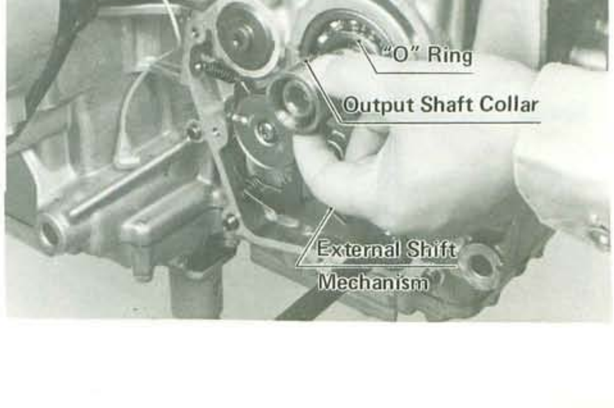
Disassembly:

•Remove the engine (Pg. 80).
•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 (5) shown in the figure must be removed before positioning the engine.

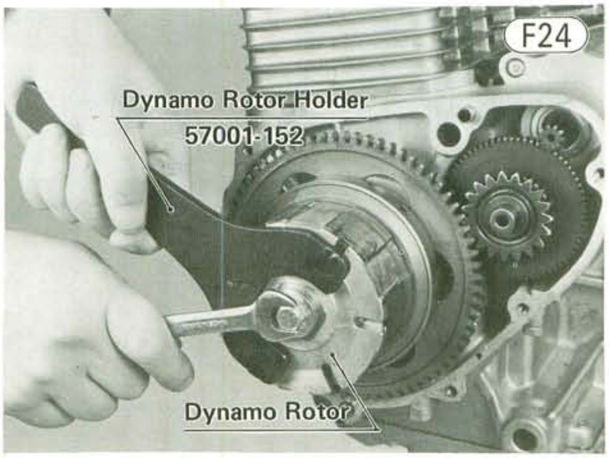


•Pull the neutral indicator switch lead and the oil pressure indicator switch lead from the switches.
•Remove the external shift mechanism cover screws (9), and pull off the external shift mechanism cover and gasket.
•Take off the output shaft collar, using a bearing puller if it is difficult to remove, and take off the **O** ring.



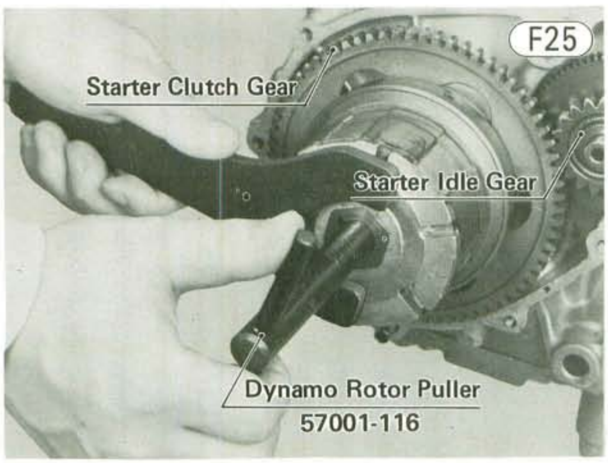
- Move the external shift mechanism lever arms out of their positions on the end of the shift drum, and pull out the external shift mechanism.
- Remove the dynamo cover screws (8), and pull off the dynamo cover and gasket.
- Remove the dynamo rotor using the following 3 steps only if the crankshaft is to be removed.

○Hold the dynamo rotor steady with the dynamo rotor holder (special tool), and remove the rotor bolt.



○Using the same special tool to hold the rotor steady, remove the rotor, starter clutch assembly, and starter clutch gear with the dynamo rotor puller (special tool). There is a thin thrust washer between the rotor and the starter clutch gear hub. The rubber damper may come out with the starter clutch gear.

CAUTION **If the dynamo rotor is difficult to remove and a hammer is used to tap the dynamo rotor puller, be careful not to strike the dynamo rotor itself. Striking the dynamo rotor can cause the magnets to lose their magnetism.**

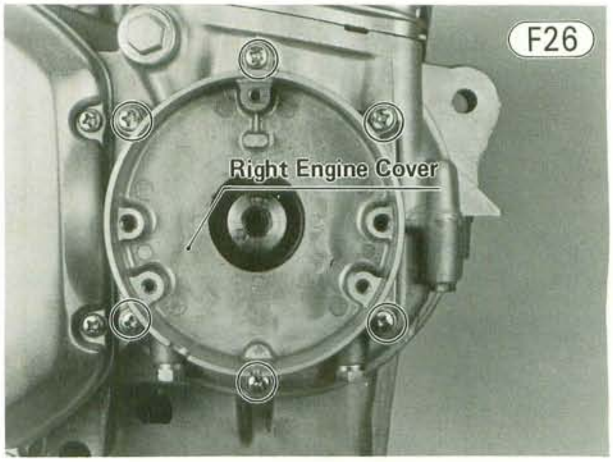


○Remove the needle bearing and thick thrust washer from the crankshaft.

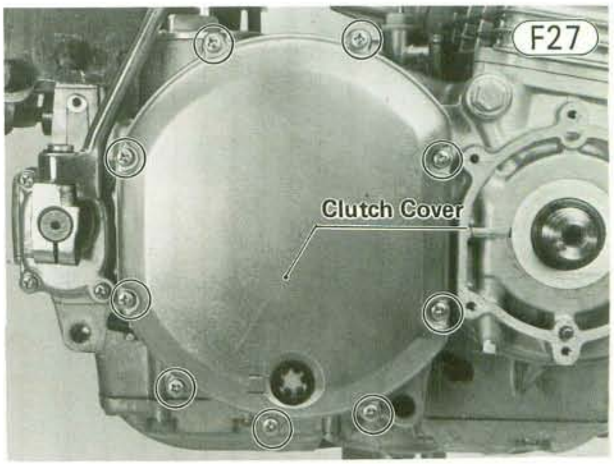
- Remove the starter idle gear and its shaft.
- Loosen the locknut and remove the camshaft chain tensioner bolt.
- Remove the starter motor retaining bolts (2).
- Pry the starter motor loose from the crankcase with a screwdriver and pull the starter motor (with the starter lead) off.

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

- Remove the contact breaker cover and gasket.
- With a 17 mm wrench on the crankshaft rotation nut to keep the shaft from turning, remove the advancer mounting bolt and nut.
- Take out the contact breaker assembly mounting plate screws, lockwashers, and flat washers (3 ea); and remove the breaker assembly and timing advancer.
- Remove the screws (6), and remove the right engine cover and gasket.

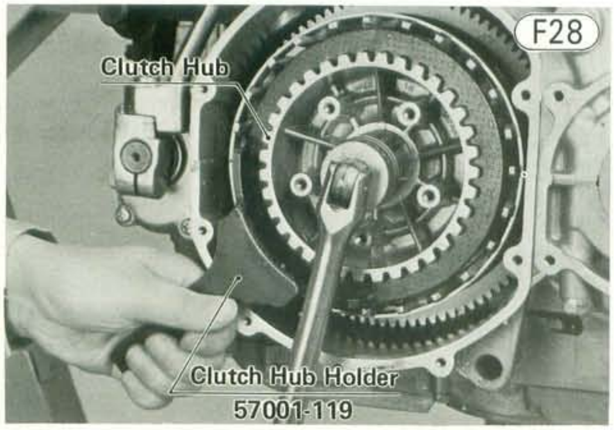


- Remove the screws (9), and pull off the clutch cover and gasket.



- Remove the clutch plates and clutch hub using the following 6 steps only if the clutch housing and/or the ball bearing is to be removed from the driver shaft.

○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 hub holder (special tool), and remove the clutch hub nut and lockwasher.



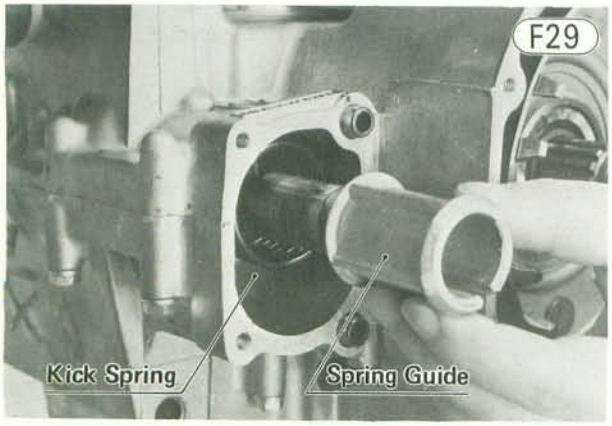
○Pull off the clutch hub. There is a thrust washer at the rear of the clutch hub.

●Mark the position of the kickstarter pedal so that it can later be installed on the kick shaft in the same position.

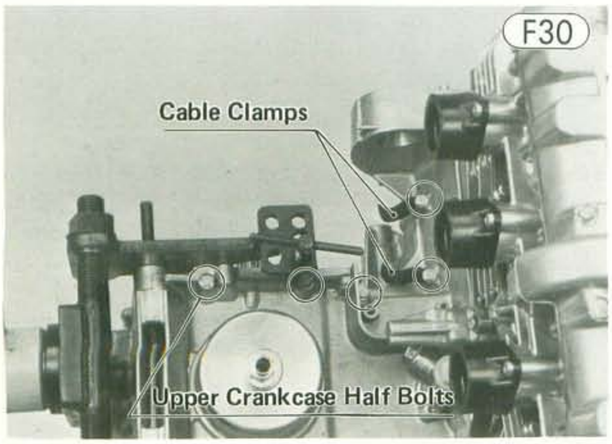
●Take out the kickstarter pedal bolt, slightly widen the gap in the kickstarter pedal with a screwdriver, and then pull off the kickstarter pedal.

●Remove the kickstarter cover screws (4), and pull off the kickstarter cover and gasket.

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



●Remove the five upper crankcase half bolts (four bolts if one was removed just after engine removal), noting that cable clamps (2) are installed under two of them.

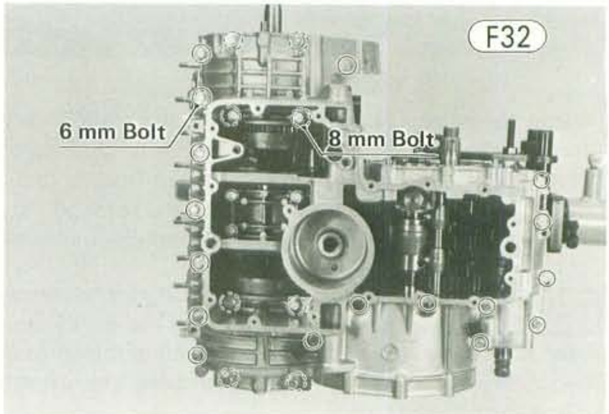


●Turn the engine upside down and remove the oil filter (Pg. 73).

●Remove the oil pan bolts (17), and remove the oil pan, **O** ring, and gasket.

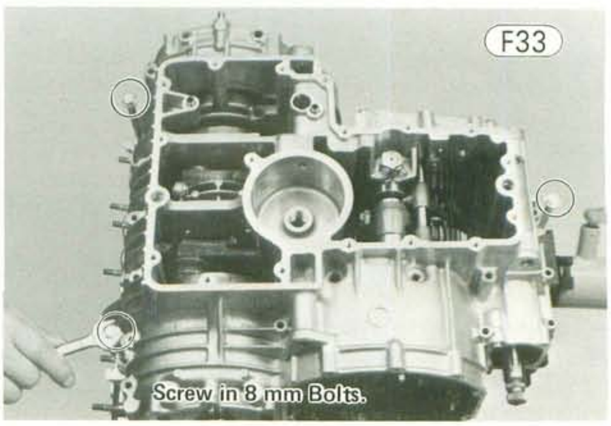
●Remove the engine oil pump bolts (3), and take off the engine oil pump and oil passage **O** ring. There are two knock pins.

●Remove the 6 mm lower crankcase half bolts (17) and the 8 mm bolts (8). Be careful not to take out the 4 bolts that hold down the main bearing cap. There are lead clamps on two of the 6 mm crankcase bolts (17).



●Screw three 8 mm bolts evenly into the holes provided in the lower crankcase to split the two crankcase halves apart.

CAUTION **If there is any resistance, loosen the screws and make certain that all crankcase bolts are removed. Don't overlook the upper bolt under the starter motor. Excessive force can crack the crankcase, requiring replacement.**



•Take out the kick shaft assembly, output shaft assembly, and drive shaft assembly with the clutch housing.

Assembly:

NOTES:

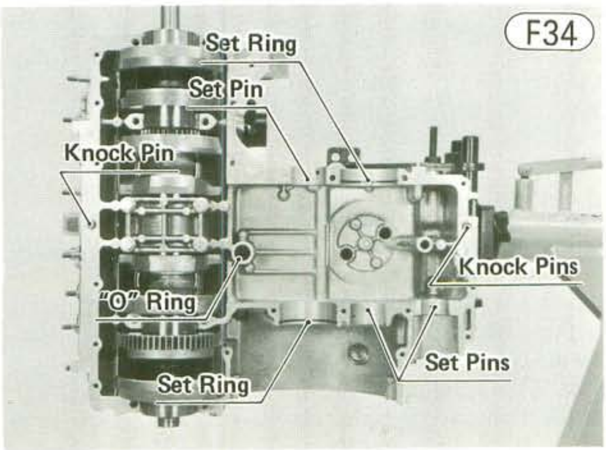
1. The upper crankcase half, the lower crankcase half, and the crankshaft main bearing cap are machined at the factory in the assembled state, so the crankcase halves and the main bearing cap must be replaced together as a set.
2. When replacing new crankcase halves, seat the bypass valve steel ball evenly in the bottom of the upper crankcase half (Pg. 96).
3. If the dynamo rotor, starter clutch gear, crankshaft and/or crankcase are replaced with new ones, check the clearance between the crankshaft main bearing outer race and the inner surface of the starter clutch gear, and select the correct rubber damper if necessary. See Pg. 66.
4. If the drive (output) shaft, crankcase halves, D2 gear, D5 (O1) gear, needle bearing outer race, and/or ball bearing are replaced; check that D5 (O1) gear turns lightly by hand and replace the steel washer if necessary. See Pgs. 92 and 94.

•With a high flash-point solvent, clean off the mating surfaces of the crankcases halves and wipe dry.

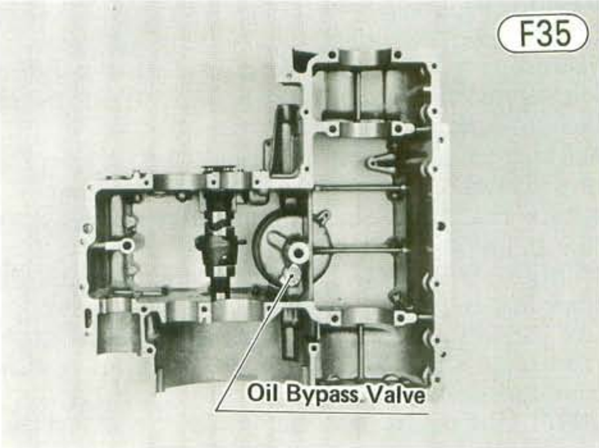
•Check to see that the following parts are in place on both the upper crankcase half and the lower crankcase half, and blow the oil passages clean with compressed air. Check that the drive, output, and kick shaft set pins (3) protrude 1.7 ~ 2.5 mm from their bearing housing.

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

NOTE: If the standard set rings cannot be put into the crankcase grooves, use the thin set rings (P/N: 14013-013) instead of the standard set rings.



Lower crankcase half:
Oil bypass valve.



•Check that the crankshaft main bearing cap is tightened with 2.3 ~ 2.7 kg-m (16.5 ~ 19.5 ft-lbs) of torque.

•Fit the output and drive shaft assemblies, and kick shaft on the upper crankcase half. When installing the output, drive, and kick shafts, the crankcase set pins must go into the holes in the bushing 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.**

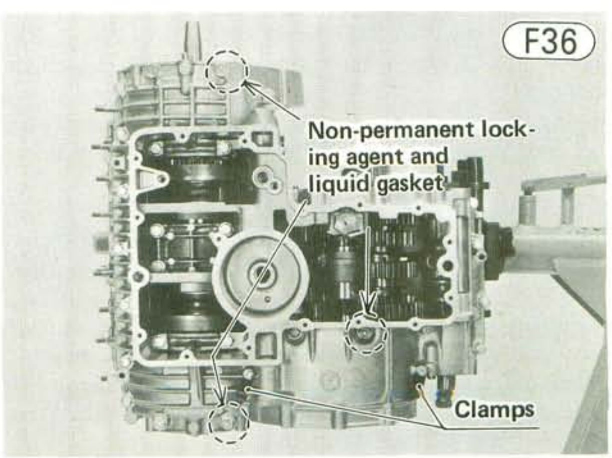
•Apply a little engine oil to the transmission gears, ball bearings, shift drum, and crankshaft main bearings.

•Apply a liquid gasket to the fitting surface of the lower crankcase half.

CAUTION **Take care not to block or obstruct the oil plenum chamber return passage with liquid gasket. This could cause air cleaner oiling.**

•Fit the lower crankcase half on the upper crankcase half inserting the 3rd gear shift fork into the drive shaft gear groove.

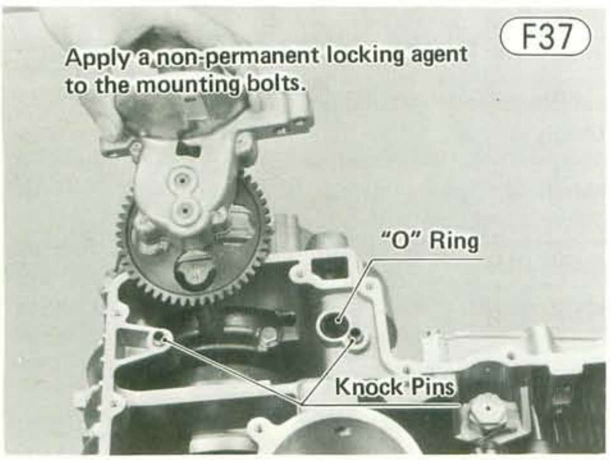
•Install and tighten the 8 mm crankcase half bolts (8) and the 6 mm bolts (17). Be sure to include the contact breaker lead clamps (2) with the lower crankcase bolts. Apply a non-permanent locking agent to the threads and apply liquid gasket to the undersides of the three bolts indicated in the figure.



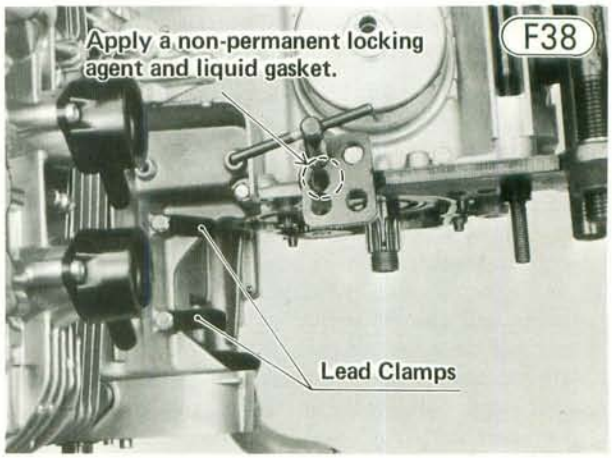
- Tighten the 8 mm bolts (8) first with about 1.5 kg-m (11.0 ft-lbs) of torque, following the tightening sequence numbers on the lower crankcase half and then tighten them with 2.3 ~ 2.7 kg-m (16.5 ~ 19.5 ft-lbs) of torque in the same sequence.
- Tighten the 6 mm bolts (17) with 0.9 ~ 1.1 kg-m (78 ~ 95 in-lbs) of torque.
- Check that the circlip is positioned in the groove at the end of the shift rod.
- 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, while fitting each shift fork guide pin into its shift drum groove.

NOTE: The output shaft 5th gear shift fork and the output shaft 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 not 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.

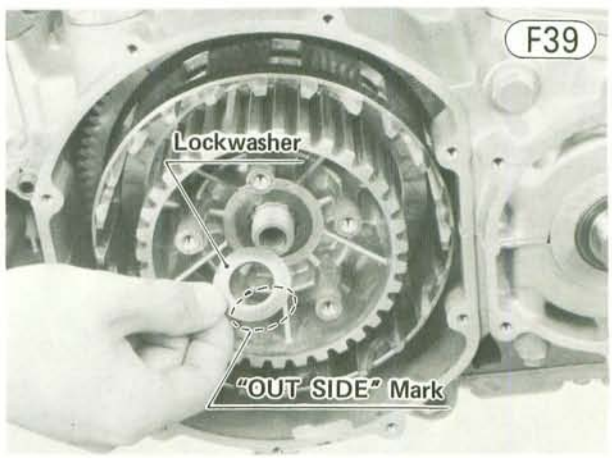


- Install the oil pump, making sure the oil pump gear and pump drive gear at the crankshaft mesh properly. Apply a non-permanent locking agent to the engine oil pump bolts (3), and tighten them with 0.7 ~ 0.9 kg-m (61 ~ 78 in-lbs) of torque.
- Check to see that the oil pan **O** ring is in place. Replace the **O** ring with a new one if deteriorated or damaged.
- Using a new oil pan gasket, install 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 oil filter (Pg. 73).
- Install the upper crankcase bolts (5, or 4 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). Apply a non-permanent locking agent to the threads and apply liquid gasket to the underside of the bolt head indicated in the figure. Be sure to include the lead clamps (2) with the upper crankcase bolts. The clamps must be bent upwards.



- Put on the thrust washer, clutch hub, and lockwasher. Replace the clutch hub nut with a new one, screw on the nut and tighten it with 11.0 ~ 13.0 kg-m (80 ~ 94 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, "OUT SIDE", facing out. If this washer is installed backwards, the hub nut might loosen during operation. This causes clutch disengagement and might cause primary gear and clutch housing gear breakage, resulting in loss of motorcycle control.**

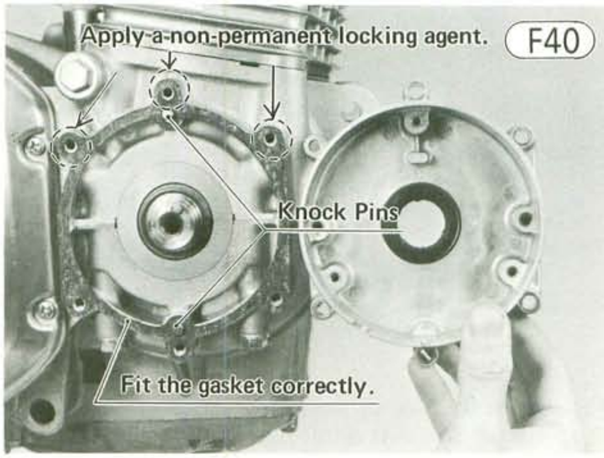


- Install the friction plates (8) and steel plates (7), starting with a friction plate and alternating them.
- Insert the steel ball and spring plate pusher, applying a thin coat of a high temperature grease to their surfaces.
- Install the spring plate, washers, and spring bolts (5 ea). Cross tighten the bolts evenly with 0.9 ~ 1.1 kg-m (78 ~ 95 in-lbs) of torque.
- Using a new clutch cover gasket, fit the clutch cover onto the crankcase. Tighten the screws (9) firmly.
- Check that the spring in the right engine cover crankshaft oil seal has not slipped out of its proper position.

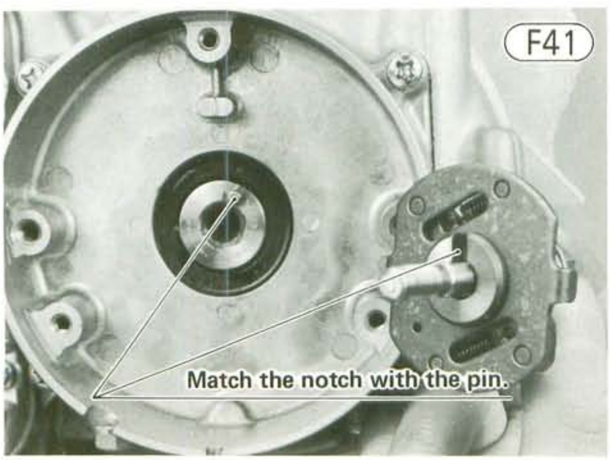
Apply a high temperature grease to the oil seal lip. If the oil seal is damaged, replace it with a new one.

- Check to see that two knock pins are in place on the crankcase, install the right engine cover using a new gasket, and tighten the screws (6) firmly. Apply a non-permanent locking agent to the upper three screws.

CAUTION **The right hand engine cover gasket is not symmetrical, although at first glance it appears to be. Be sure to install it in the correct position as incorrect positioning of the gasket can result in an oil leak.**



- Fit the timing advancer onto the crankshaft matching its notch with the pin in the end of the crankshaft. 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 assembly 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.

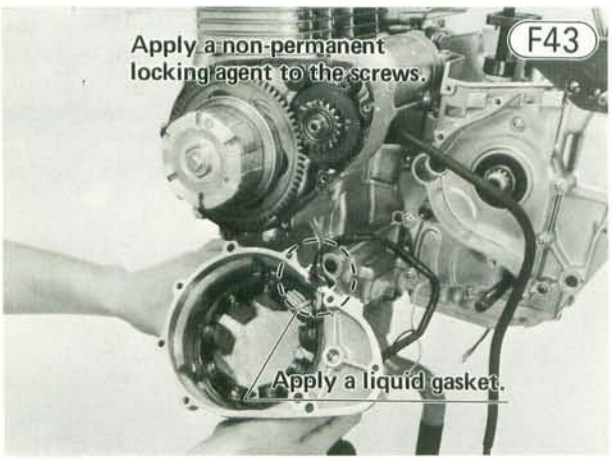
- Install the contact breaker and gasket.
- Turn the kick shaft clockwise until it stops, and insert one end of the spring into the crankcase hole.
- Using needle nose pliers, insert the other end into the kick shaft, and while holding the spring in place, insert the kick spring guide.
- Check to see that knock pins (2) are in place, and using a new kickstarter 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. E124 on Pg. 73). 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 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 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. E89 on Pg. 64), 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 the external shift mechanism cover oil seal (Fig. E91), install the cover with a new gasket, and then tighten the screws (9).
- Install the output shaft collar.
- Put the thick thrust washer and the starter clutch gear needle bearing onto the crankshaft. The thrust washer much go onto the crankshaft with its chamfered side facing in.

- Check to see that the thin thrust washer is between the dynamo rotor and the starter clutch hub, and fit the correct rubber damper onto the starter clutch gear (Pg. 66).

- Apply engine oil to the damper rubber and needle bearing. Using a high flash-point solvent, clean off an any oil or dirt that may be on the crankshaft taper or tapered rotor hole.
- Fit the rotor and starter lcutch assembly, with the starter clutch gear, back on the crankshaft.
- Tighten the rotor bolt with 7.0 ~ 7.5 kg-m (51 ~ 54 ft-lbs) of torque while holding the dynamo rotor steady with the dynamo rotor holder (special tool).
- 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. Apply a non-permanent locking agent to the starter motor retaining bolts (2), and tighten the bolts with 0.9 ~ 1.1 kg-m (78 ~ 95 in-lbs) of torque.
- Install the camshaft chain tensioner bolt and locknut.
- Install the starter idle gear and its shaft. Apply a thin coat of high temperature grease to the shaft.
- Check that knock pins (2) are in place on the crankcase, and install the dynamo cover using a new gasket and applying a liquid gasket to the wiring grommets. Apply a non-permanent locking agent to the screw which goes through the upper knock pin, and then tighten the screws (8).



- Insert the dynamo wiring and starter motor lead into the clamps and, fit them between the crankcase and external shift mechanism cover.
- Connect the oil pressure indicator switch and the neutral indicator light switch leads to their switches.
- Install the spark plugs.
- Install the engine (Pg. 82).

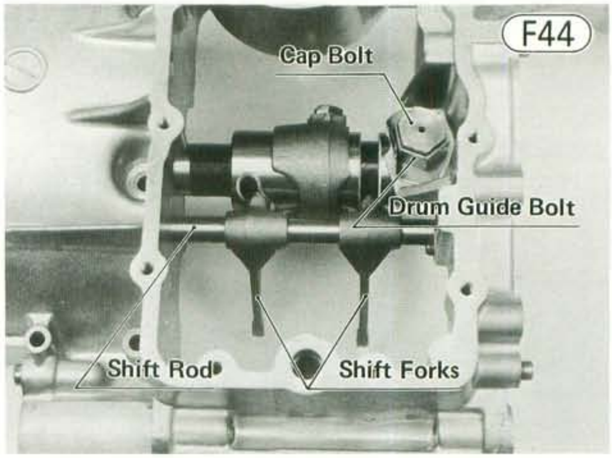
NOTE: Before installing the engine, tighten the remaining upper crankcase bolt if not already tightened. Apply a non-permanent locking agent to the threads and apply liquid gasket to the underside of this bolt. Tighten it with 0.9~1.1 kg-m (78~95 in-lbs) of torque.

- Fill the engine with oil, check the oil level (Pg. 22), and add more if necessary.
- Carry out the adjustment procedures listed at the end of the engine installation section (Pg. 84).

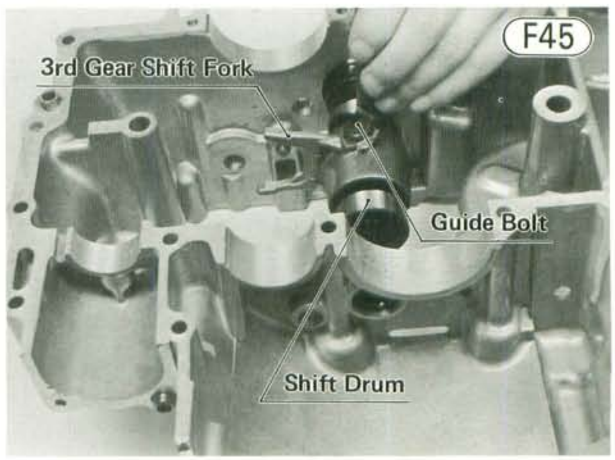
TRANSMISSION

Removal:

- Remove the engine (Pg. 80).
- Split the crankcase (Pg. 84).
- Remove the bolt, and take off the detent arm and spring.
- Pull out the shift rod, and remove the two shift forks in the lower crankcase half.



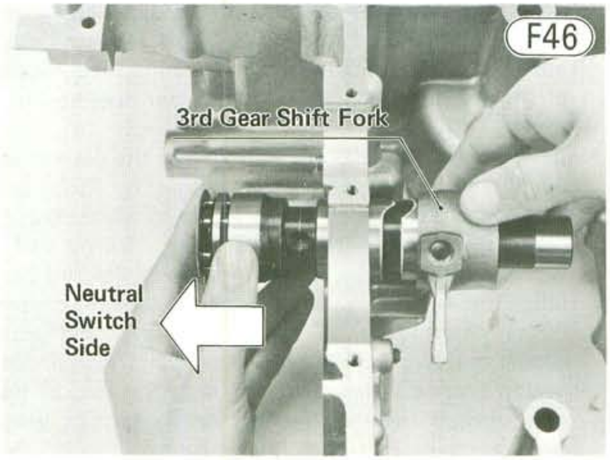
- Straighten the side of the lockwasher that is bent over the side of the shift drum guide bolt, and remove the bolt. The cap bolt may be left installed in the top of this guide bolt unless the neutral detent pin and its spring is to be removed later.
- Straighten the side of the lockwasher that is bent over the side of the drive shaft 3rd gear shift fork guide bolt, and remove the bolt and lockwasher.



- Pull the shift drum out of the crankcase and the drive shaft 3rd gear shift fork will come out.

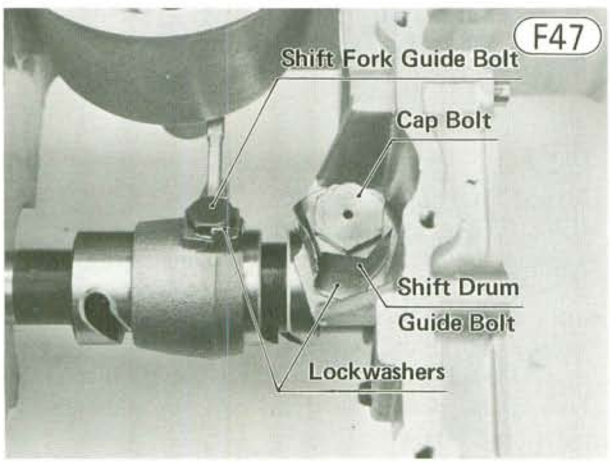
Installation:

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



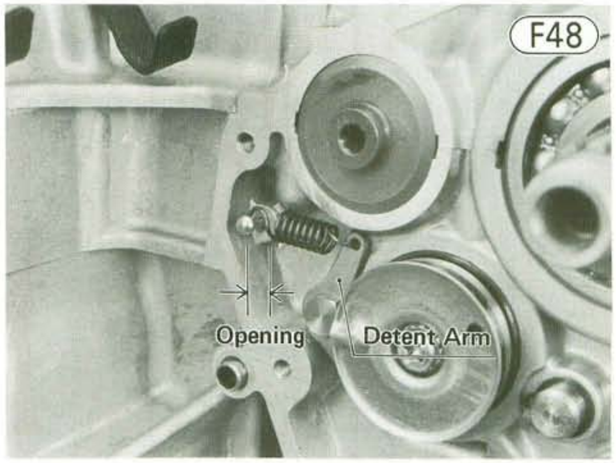
F46

- Push the shift drum in the rest of the way, fit a new lockwasher on the shift drum guide bolt, tighten the shift drum guide bolt, and bend the lockwasher against the side of the bolt. The lockwasher must seat in the crankcase.
- Turn the shift drum to the neutral position, and fit a new lockwasher on the shift fork guide bolt. Tighten the bolt securely, and bend the lockwasher against the side of the bolt. The guide bolt rides in the middle groove of the three guide pin grooves.



F47

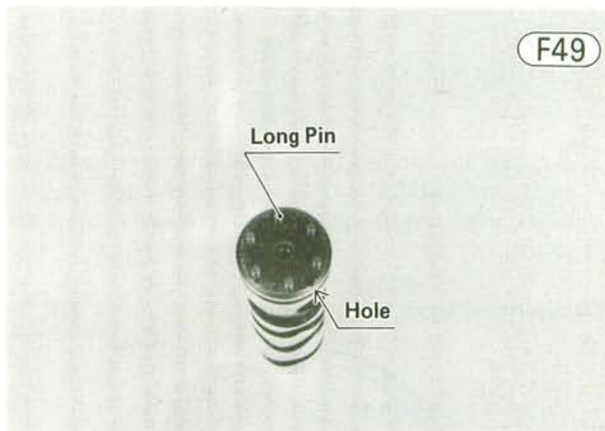
- Check that the cap bolt in the top of the shift drum guide bolt is tightened securely.
- Install the detent arm. The detent arm must ride on the shoulder of its mounting bolt; take care that it is not caught between the bolt and crankcase during installation.
- Hook the detent arm spring on the pin and into the detent arm hole. The opening of the spring end on the pin must face downwards.
- Assemble the crankcase (Pg. 87).
- Install the engine (Pg. 82).



F48

Shift Drum Disassembly:
- Remove the screw ㉘ and the shift drum pin plate ⑲. The screw has a lockwasher ⑱.
- Pull out the pins ⑳ (6).

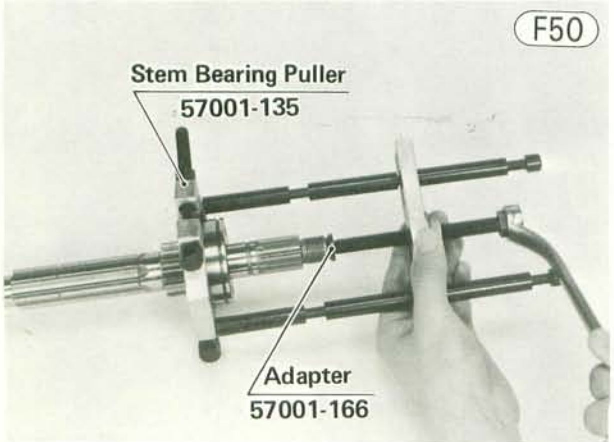
Shift Drum Assembly Notes:
1. Apply a non-permanent locking agent to the pin plate screw ㉘.
2. The long shift drum pin must be in the position shown in Fig. F49. If the pin is assembled in the wrong position, the neutral indicator light will not light when the gears are in neutral.



F49

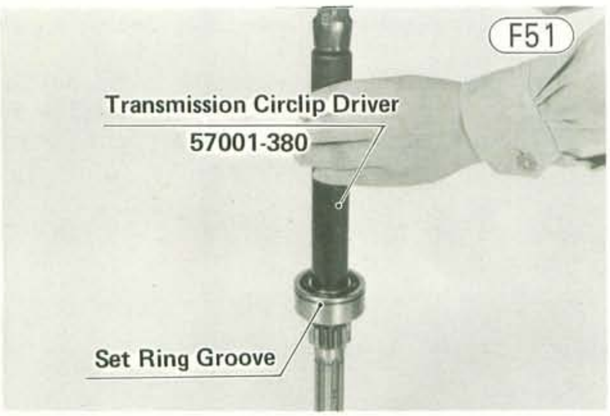
Drive Shaft Disassembly:
- Pull off the clutch housing, needle bearing, and needle bearing inner race from the drive shaft assembly.
- Remove the needle bearing outer race ①.
- Remove the circlip ② and pull off the needle bearing ③, steel washer ④, and copper washer ⑤.
- Pull off 2nd gear ⑥, 5th gear ⑦, the copper bushing ⑧, and splined washer ⑨.

- Remove the circlip ⑩, and pull off 3rd gear ⑪.
- Remove the circlip ⑫, and pull off the splined washer ⑬ and 4th gear ⑭.
- Remove the ball bearing ⑯. Use the stem bearing puller and adapter (special tools) if it is hard to pull off.



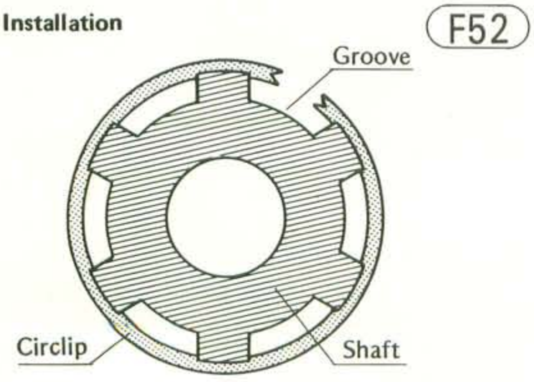
Drive Shaft Assembly Notes:

1. Install the drive shaft ball bearing using the transmission circlip driver (KZ400 special tool). The ball bearing must be pressed on with the set ring groove toward the clutch side (Fig. F53).



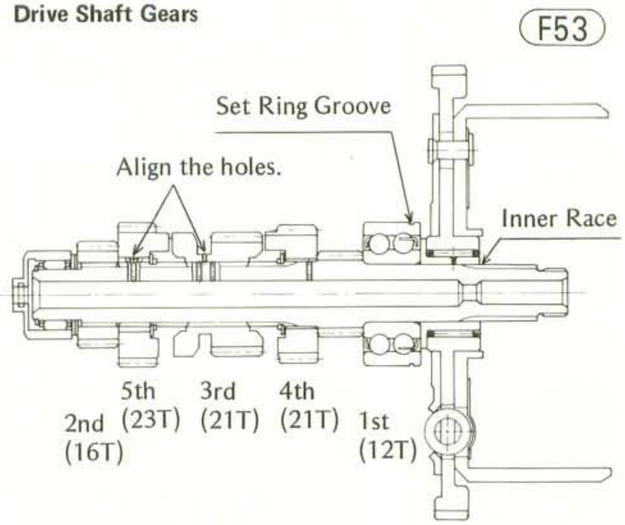
2. Replace any circlips that were disassembled with new ones, and install the circlip so that the opening coincides with one of the splined grooves in the drive shaft.

Circlip Installation



3. When assembling the 5th gear copper bushing and 3rd gear to the drive shaft, align their oil holes with the holes in the shaft.
4. Install the needle bearing inner race of the clutch housing with its flanged side next to the ball bearing (Fig. F53).
5. Check that 5th gear turns freely by hand with the drive sahft assembly installed on the upper crankcase half. The standard steel washer ④ is 1.6 mm thick, but the 1.2 mm thick washer may be installed instead of the 1.6 mm thick washer if 5th gear does not turn freely.
6. Be sure that all parts are put back in the correct sequence, facing the proper direction (Fig. F53), and all circlips and washers are properly in place. Proper sequence starting with 1st gear (part of drive shaft) is: 1st gear, 4th gear, splined washer, circlip, 3rd gear (align the oil holes), circlip, splined washer, copper bushing (align the oil holes), 5th gear, 2nd gear, copper washer, steel washer, needle bearing, circlip, needle bearing outer race. At the other end of the shaft, install the ball bearing, needle bearing inner race, needle bearing, and clutch housing.

Drive Shaft Gears

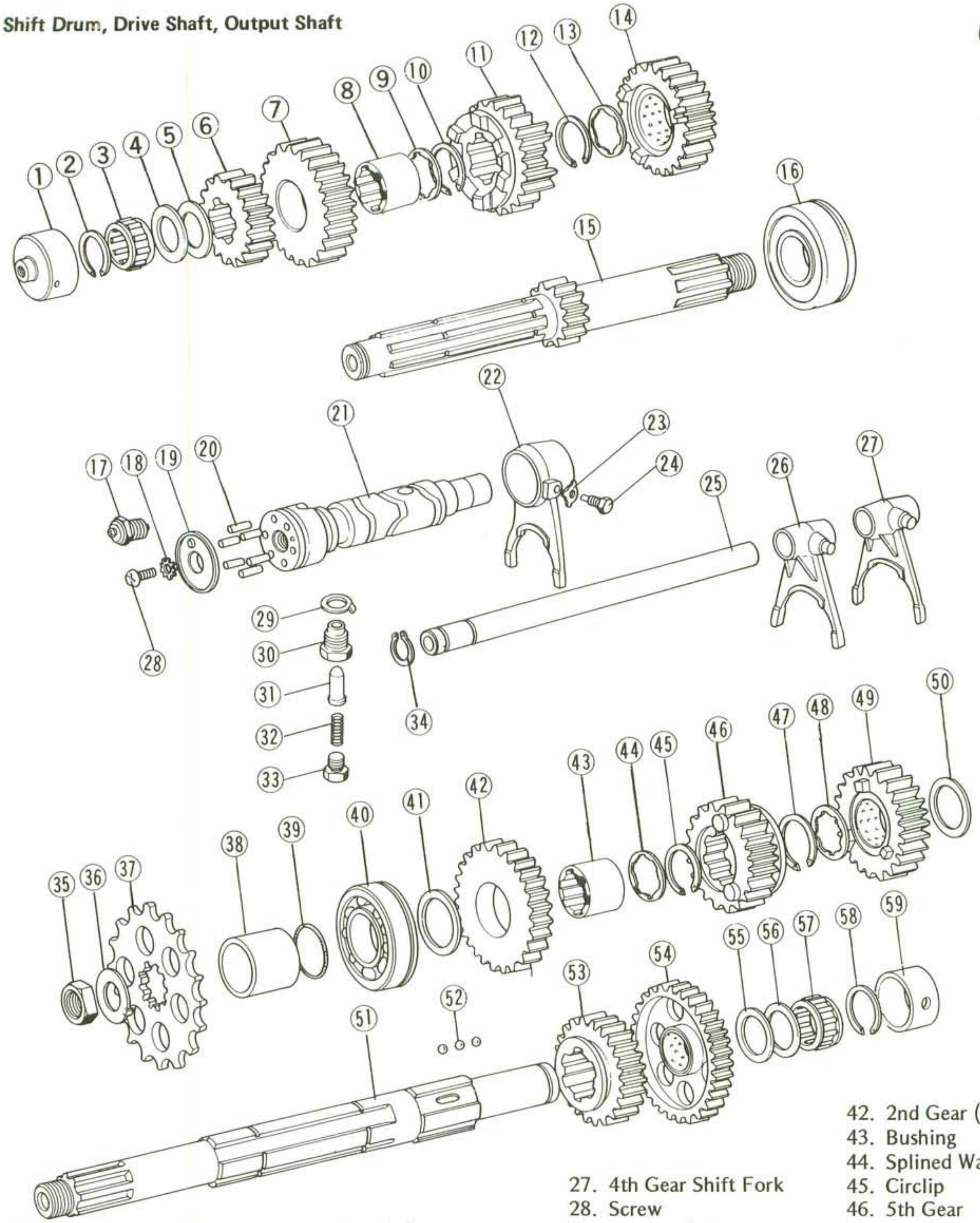


Output Shaft Disassembly:

- Pull off the needle bearing outer race ⑲.
- Remove the circlip ⑱, and pull off the needle bearing ⑰, steel washer ⑯, copper washer ⑮, and 1st gear ⑭.
- 4th gear ⑬ has three steel balls ⑫ assembled into it for neutral positioning. To remove this gear with the balls, quickly spin the shaft in a vertical position while holding 3rd gear ⑨, and pull off 4th gear upwards.

Shift Drum, Drive Shaft, Output Shaft

F55



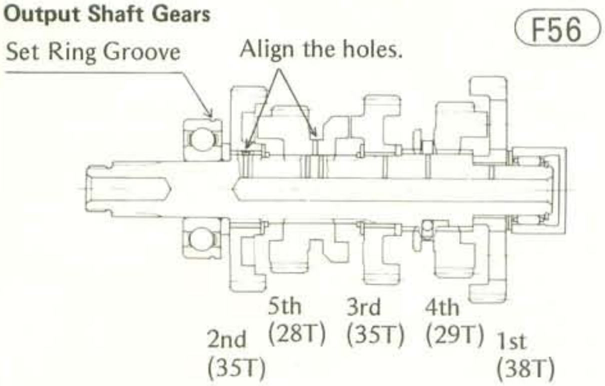
1. Bearing Outer Race
2. Circlip
3. Needle Bearing
4. Steel Washer
5. Copper Washer
6. 2nd Gear (D)
7. 5th Gear (D)
8. Bushing
9. Splined Washer
10. Circlip
11. 3rd Gear (D)
12. Circlip
13. Splined Washer
14. 4th Gear (D)
15. Drive Shaft
16. Ball Bearing
17. Neutral Indicator Switch
18. Lockwasher
19.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

•Remove the output shaft ball bearing ㊵ using the stem bearing puller and adapter (special tools) if it is hard to pull off (Fig. F50).
•Remove the washer ㊶, 2nd gear ㊷, copper bushing ㊸, and splined washer ㊹.
•Remove the circlip ㊺, and pull off 5th gear ㊻.
•Remove the circlip ㊼, and pull off the splined washer ㊽, 3rd gear ㊾, and washer ㊿.

Output Shaft Assembly Notes:

1. Install the output shaft ball bearing using the transmission circlip driver (KZ400 special tool). The ball bearing must be pressed on with the set ring groove toward the center of the shaft (Fig. F56).
2. Replace any circlips that were removed with new ones. Install the circlip so that its opening coincides with one of the splined grooves in the output shaft (Fig. F52).
3. When assembling the 2nd gear copper bushing and 5th gear to the output shaft, align their oil holes with the holes in the output shaft.
4. Do not use grease on the three balls during assembly; these balls must be able to move freely.
5. Check that 1st gear turns freely by hand with the output shaft assembly installed on the upper crankcase half. The standard steel washer (56) is 1.6 mm thick, but the 1.2 mm thick washer may be installed instead of the 1.6 mm thick washer if 1st gear does not turn freely.
6. Be sure that all parts are put back in the correct sequence, facing the proper direction (Fig. F56), and all circlips and washers are properly in place. Proper sequence starting with 3rd gear is: washer, 3rd gear, splined washer, circlip, 5th gear (align the oil holes), circlip, splined washer, copper bushing (align the oil holes), 2nd gear, washer, and ball bearing. At the other end of the shaft, install 4th gear with three balls, 1st gear, copper washer, steel washer, needle bearing, circlip, and needle bearing outer race.

Output Shaft Gears



KICKSTARTER

Removal:

•Split the crankcase as explained in crankcase split (Pg. 84). The transmission itself does not require removal.

•Remove the kick shaft from the upper crankcase half.

Installation Note:

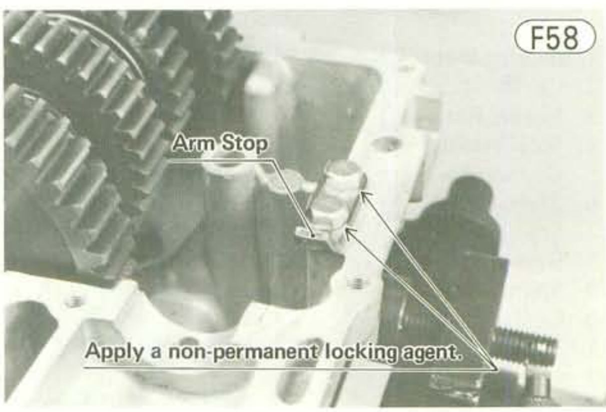
•Fit the kick shaft bushing hole with the pin on the upper crankcase.

Disassembly:

•Straighten out the lockwasher ⑲ ends which are bent over the side of the ratchet gear arm stop bolts ⑳, and remove the bolts (2), lockwasher, and stop ⑱.
•Remove the circlip ⑫ on the kick shaft end, and take off the spring seat ⑬, spring ⑭, and ratchet gear ⑮.
•Remove the circlip ⑯, and pull off the washer ⑰, kick gear ㉑, washer ㉒, and kick shaft bushing ㉓. Remove the circlip ㉔.

Assembly Notes:

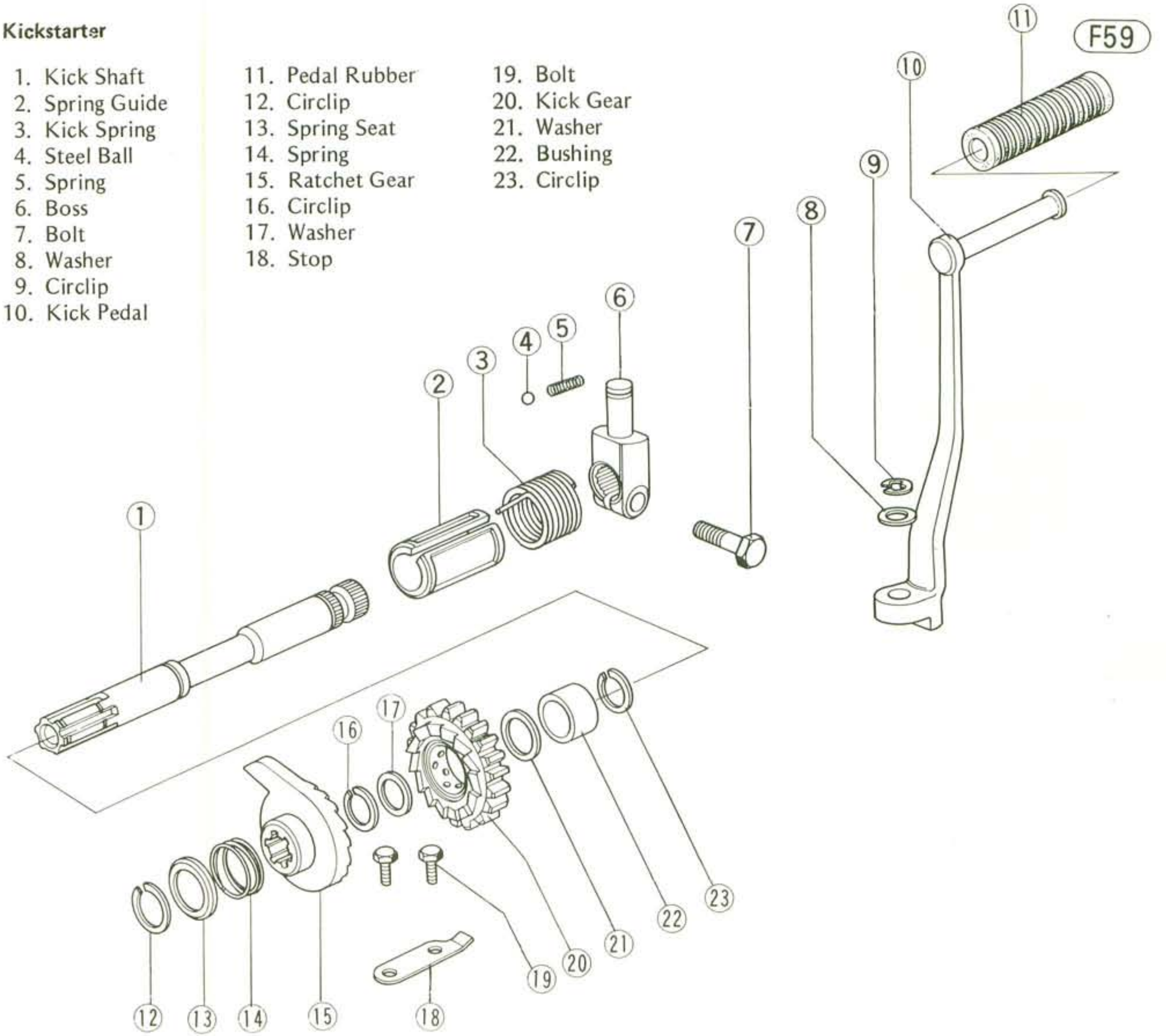
1. Install the ratchet gear arm stop in the direction shown in the figure. Apply a non-permanent locking agent to the threads of the stop bolts, and tighten them to 0.9 ~ 1.1 kg-m (78 ~ 95 in-lbs) of torque.



Kickstarter

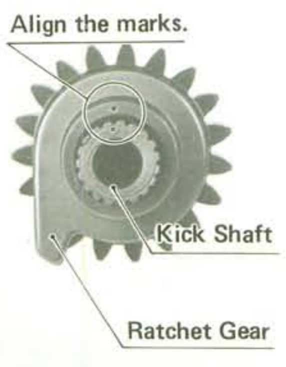
1. Kick Shaft
2. Spring Guide
3. Kick Spring
4. Steel Ball
5. Spring
6. Boss
7. Bolt
8. Washer
9. Circlip
10. Kick Pedal
11. Pedal Rubber
12. Circlip
13. Spring Seat
14. Spring
15. Ratchet Gear
16. Circlip
17. Washer
18. Stop
19. Bolt
20. Kick Gear
21. Washer
22. Bushing
23. Circlip

F59



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

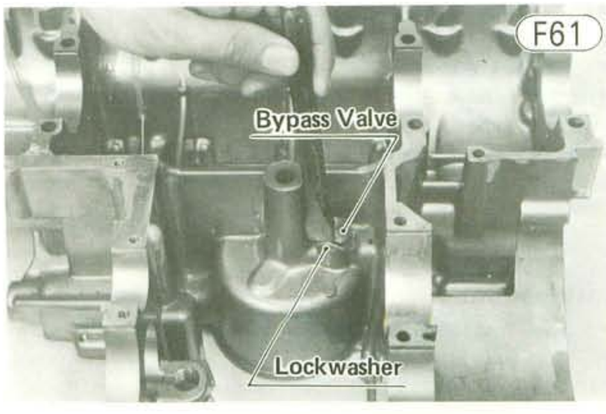
F60



OIL FILTER BYPASS VALVE

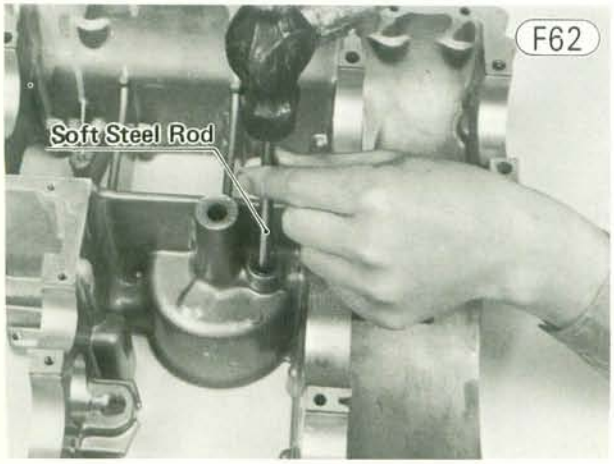
Removal:

- Split the crankcase as explained in crankcase split (Pg. 84). The transmission itself does not require removal.
- Straighten the side of the lockwasher that is bent over the side of the bolt, and remove the bolt, lockwasher, spring, and steel ball from the lower crankcase half.



Installation Notes:

1. If the bypass valve is installed into a new lower crankcase half, seat the bypass valve steel ball evenly in the bottom of the hole, by inserting a soft steel rod and lightly hammering the rod.



2. Install a new lockwasher, and after tightening the bypass valve bolt, bend the side of the new lockwasher over the side of the bolt.

CRANKSHAFT, CAMSHAFT CHAIN

Removal:

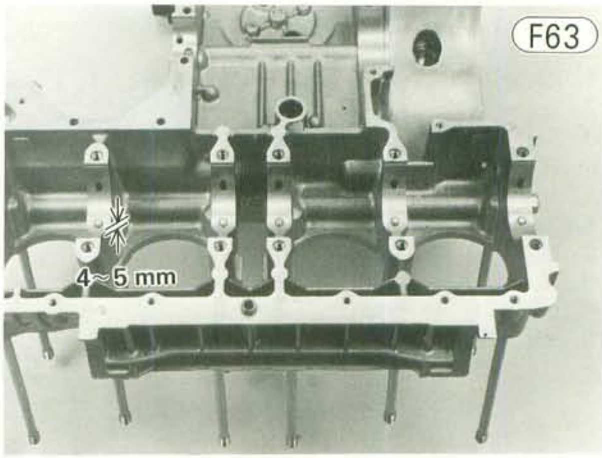
- Remove the engine (Pg. 80).
- Set the engine on a clean surface or, preferably, into a disassembly apparatus with some means of holding the engine steady while parts are being removed.

NOTE: If the engine is to be set onto the Kawasaki engine disassembly apparatus, the one of the upper crankcase half bolts (5) shown in Fig. F22 must be removed before positioning the engine.

- Remove the camshafts as explained in camshaft removal (Pg. 48).
- Remove the cylinder head (Pg. 51).
- Remove the cylinder block (Pg. 53).
- Remove the pistons (Pg. 55).
- Split the crankcase (Pg. 84).
- Remove the bolts (4) and remove the crankshaft main bearing cap.
- Lift off the crankshaft with the camshaft chain.
- Slip the camshaft chain off the crankshaft.

Installation:

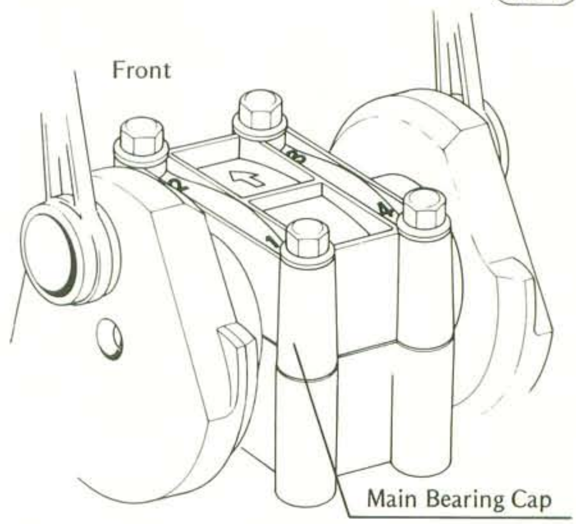
- Blow the oil passages clean with compressed air.
- Check that six crankshaft bearing set pins are in place, and protrude 4~5 mm from their bearing holes.



- Fit the camshaft chain back onto the sprocket, and set the crankshaft back in its place on the upper crankcase half while aligning each set pin in the upper crankcase half with the hole in the crankshaft bearing outer race.
- Apply engine oil to the crankshaft bearings.
- The crankshaft main bearing cap is machined together with the upper crankcase half, so set the main bearing cap into place with the arrow on the main bearing cap pointing forward.

Main Bearing Cap Installation

F64



- Tighten the main bearing cap bolts (4) first with about 1.5 kg-m (11.0 ft-lbs) of torque, following the tightening sequence number on the bearing cap and then tighten them with 2.3~2.7 kg-m (16.5~19.5 ft-lbs) of torque in the same sequence.
- Assemble the crankcase as explained in crankcase assembly (Pg. 87).
- Install the pistons (Pg. 56).
- Install the cylinder block (Pg. 54).
- Install the cylinder head (Pg. 51).
- Install the camshafts (Pg. 48).
- Install the engine (Pg. 82).
- Fill the engine with oil, check the oil level (Pg. 22), and add more if necessary.
- Carry out the adjustment procedures listed at the end of the engine installation section (Pg. 84).

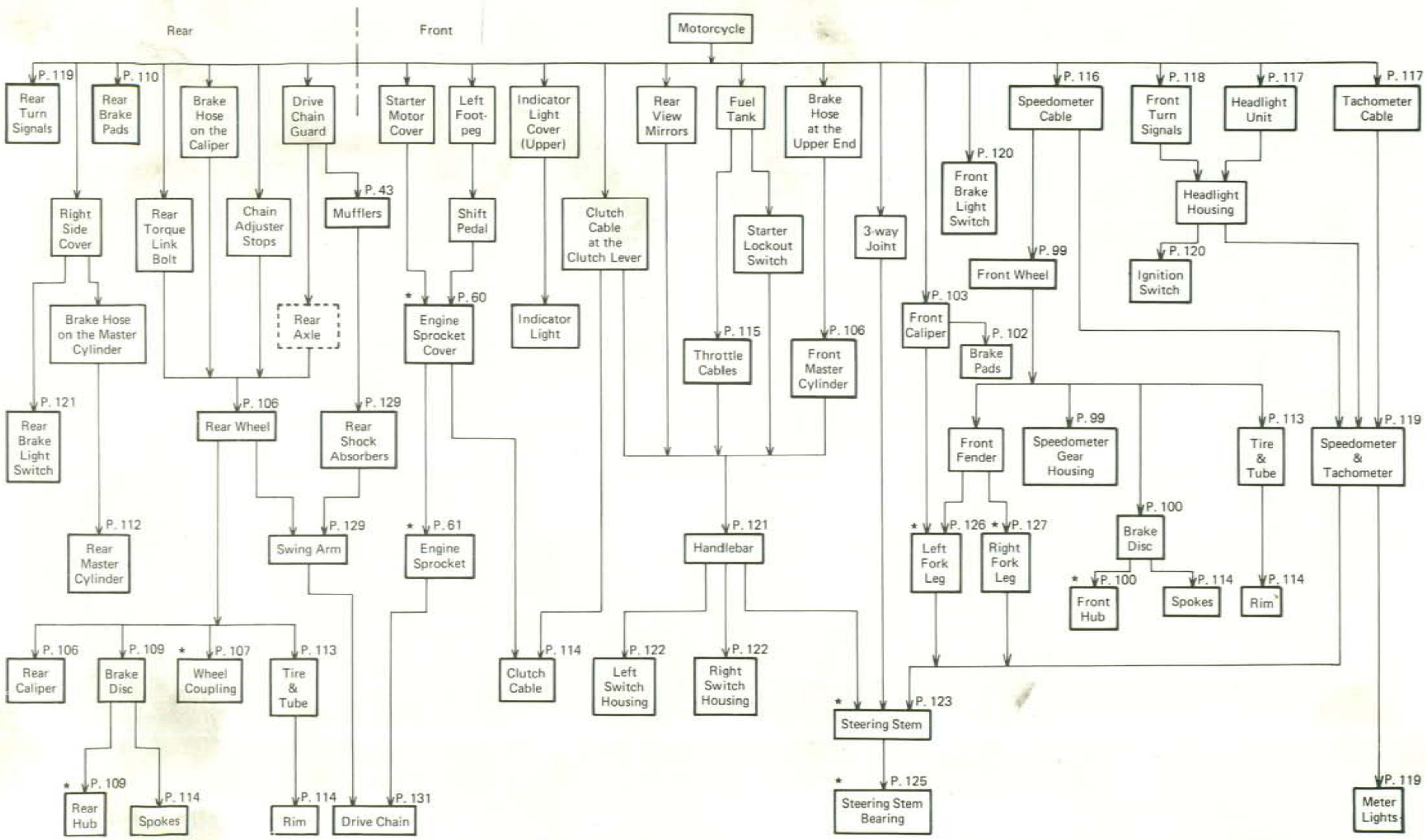
Disassembly – Chassis

Table of Contents

G

FLOW CHART
Disassembly – Chassis

This 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.

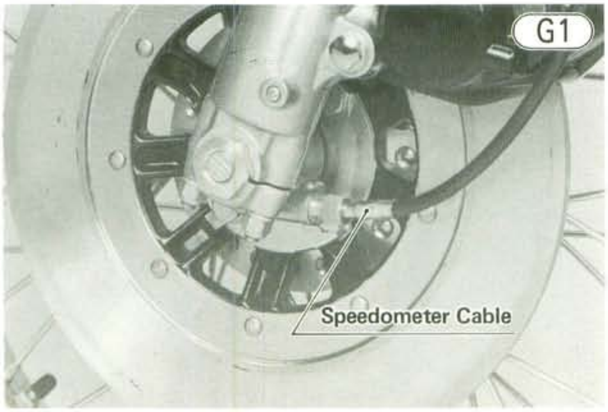


NOTE: Action with a mark (★) requires special tool(s) for removal, installation, disassembly, or assembly.

FRONT WHEEL

Removal:

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

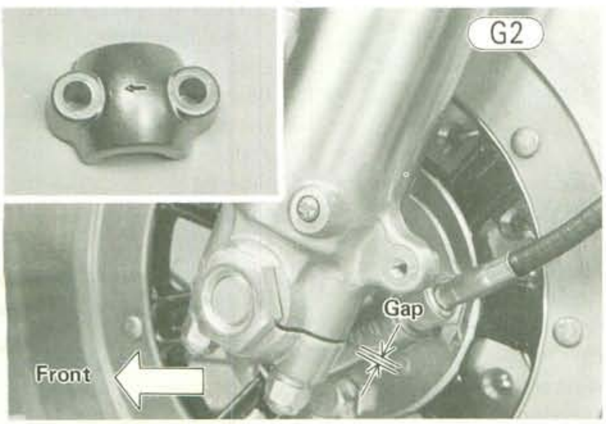


•Loosen the front axle clamp nuts (4) but do not remove them. Then loosen the front axle nuts (2).
•Remove the front axle clamp nuts, lockwashers, and clamps.
•Use a jack under the engine or other suitable means to lift the front of the motorcycle. Drop the front wheel out of the forks, and remove it.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

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.
•Mount the front axle clamps, and tighten the nuts loosely. The arrow at the bottom of the clamp must point to the front Fig. G2.
•Tighten the axle nuts with 7.0~9.0 kg-m (51 ~65 ft-lbs) of 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 ~ 16.0 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 and/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.

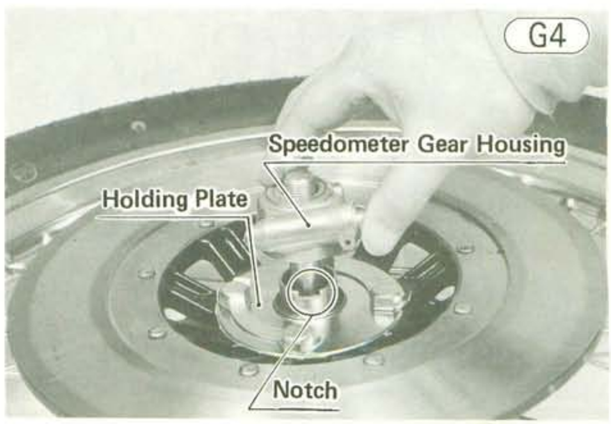
Speedometer Gear Housing Disassembly:

•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.

NOTE: It is recommended that the assembly be replaced rather than attempting to build the components.

Speedometer Gear Housing Assembly Notes:

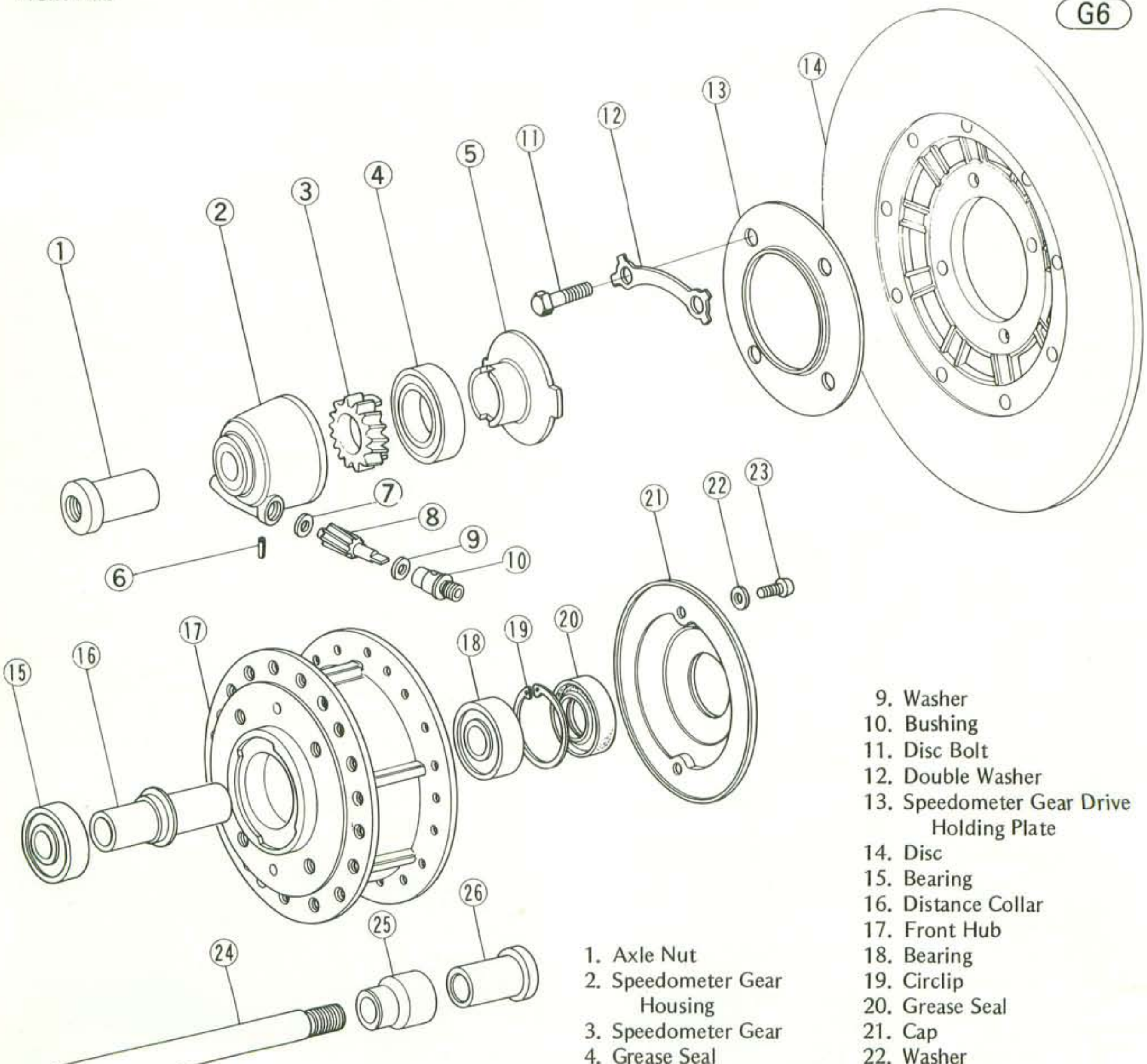
1. Replace the grease seal with a new one. Apply a little grease to the seal. Install it using a press or a suitable driver so that the face of the seal is level with the surface of the housing.
2. After inserting a new pin, punch the housing hole to secure the pin in place.
3. Regrease the speedometer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



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.

Front Hub



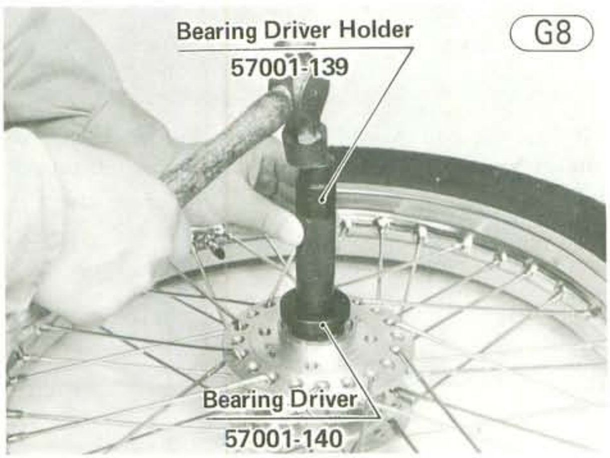
1. Axle Nut
2. Speedometer Gear Housing
3. Speedometer Gear
4. Grease Seal
5. Speedometer Gear Drive
6. Pin
7. Washer
8. Speedometer Pinion
9. Washer
10. Bushing
11. Disc Bolt
12. Double Washer
13. Speedometer Gear Drive Holding Plate
14. Disc
15. Bearing
16. Distance Collar
17. Front Hub
18. Bearing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

• Insert a metal rod into the hub from the speedometer gear side, and remove the bearing ⑱ on the right side by tapping evenly around the bearing inner race. The distance collar ⑯ will come out with the 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. 173). 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 (special tool P/N: 57001-296). 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 (Fig. G9).
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. G4).
6. After installing the disc, check the disc runout (Pg. 183).

7. 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

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

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

NOTE: Disc removal and disc installation are covered in front hub disassembly and front hub assembly sections (Pgs. 100 ~ 101).

Before working on the disc brake, take caution of the following:

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 completely, and will eventually deteriorate the rubber used in the disc brake.**

2. When handling the disc pads or disc, be careful that no disc brake fluid or any oil gets on them. Clean off any fluid or oil that inadvertently gets on the pads or disc with a high flash-point solvent. Replace the pads with new ones if they cannot be cleaned satisfactorily.

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

4. If any of the brake line fittings or the bleed valve is opened at any time, AIR MUST BE BLED FROM THE BRAKE SYSTEM (Pg. 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.

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:

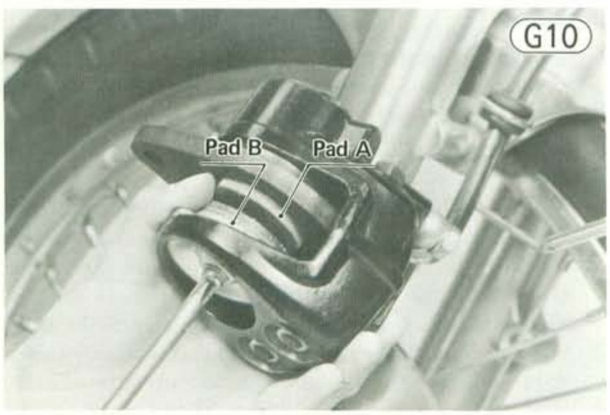
1. **Never blow brake lining dust with compressed air.**
2. **If any components are to be cleaned, wash with detergent, then immediately discard the cleaning solution and wash your hands.**
3. **Do not grind any brake lining material unless a ventilation hood is available and properly used.**

Table G1 Disc Brake Torque (for Front and Rear)

	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 holder shaft nuts	2.4~2.8	17.5~20
Caliper mounting bolts	3.4~4.6	25~33
Disc mounting bolts	3.4~4.6	25~33
Fitting (banjo) bolts	2.9~3.1	21~22
Front brake light switch	2.6~3.0	19~22
Master cylinder clamp bolt	0.6~0.9	52~78 in-lbs
Master cylinder plug (rear)	4.0~5.0	29~36
Rear caliper Allen bolts	2.8~3.2	20~23
3-way joint mounting bolts	0.7~0.9	61~78 in-lbs

Pad Removal:

- Disconnect the lower end of the speedometer cable with pliers.
- Remove the caliper mounting bolts, lockwashers, and flat washers (2 ea).
- Lift the caliper off the disc, take out the mounting screw for pad B, and remove the pad. A lockwasher and metal plate also come off.

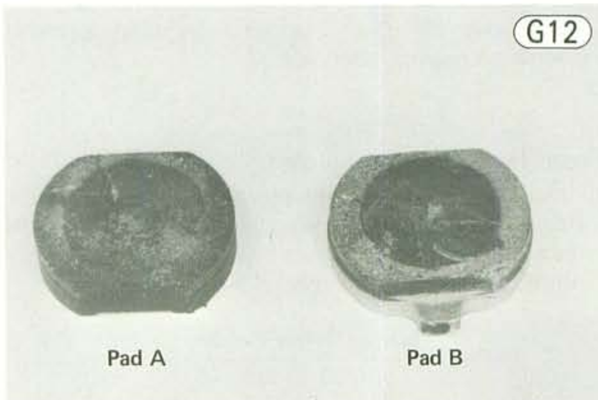


- After pad B is removed, slide the caliper holder to the piston side and remove pad A.

Pad Installation:

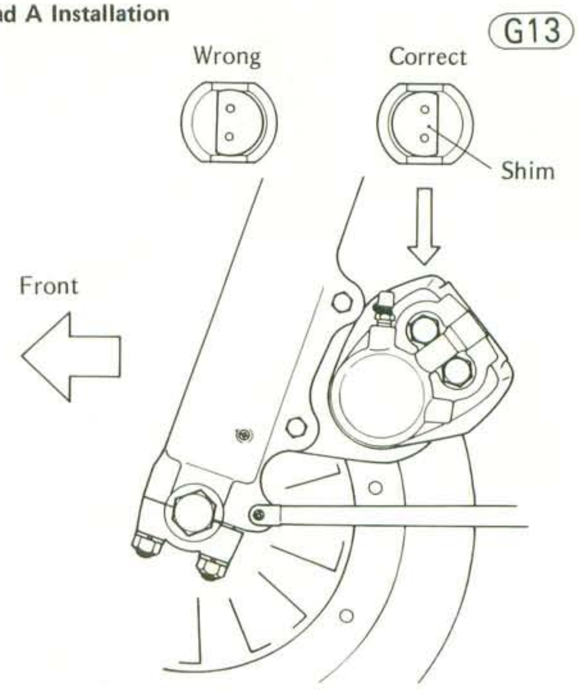
- Remove the bleed valve cap on the caliper, attach a clear plastic hose to the bleed valve, and run the other end of the hose into a container.
- Open (loosen) the valve slightly, push the piston in by hand as far as it will go, and then close (tighten) the valve. Wipe up any spilled fluid, and recap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

- Install pad A in the caliper holder.

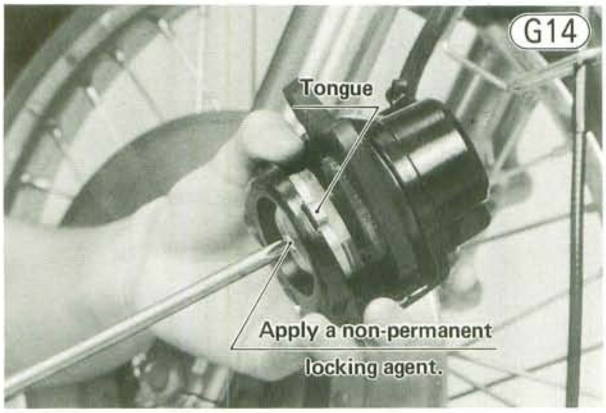


NOTE: Fit pad A into the caliper holder so that the shim on pad A is toward the front of the motorcycle.

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.

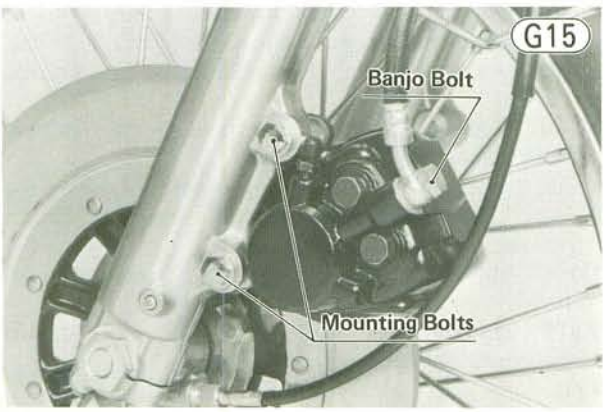


•Install the caliper, tightening the caliper mounting bolts to 3.4 ~ 4.6 kg-m (25 ~ 33 ft-lbs) of torque. Each mounting bolts has a flat washer and lockwasher.
•Install the lower end of the speedometer cable on the speedometer gear housing while turning the wheel.
•Since brake fluid was spilled when 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 done.**

Caliper Removal:

•Disconnect the lower end of the speedometer cable with pliers.
•If the caliper is to be disassembled, loosen the caliper holder shaft nuts ① (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.



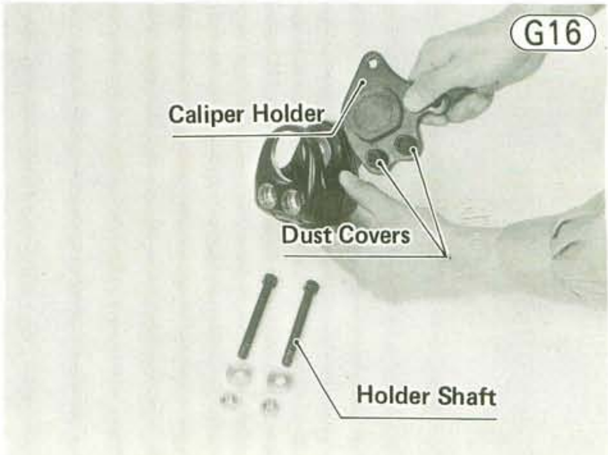
Caliper Installation Notes:

1. Tighten the mounting bolts to 3.4~4.6 kg-m (25~33 ft-lbs) of torque.
2. Tighten the caliper holder shaft nuts to 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 to 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 in turn a little at a time.**



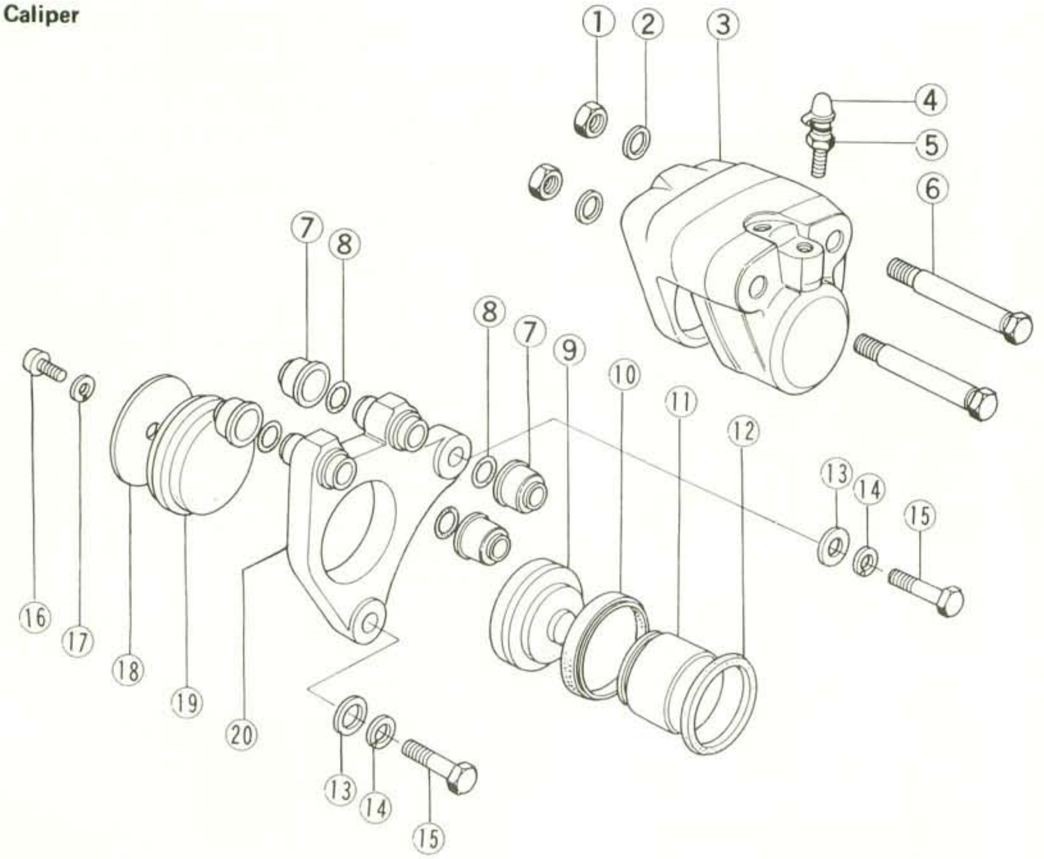
•Remove the dust seal ⑩ around the piston ⑪.
•Cover the caliper opening with a clean, heavy cloth, and remove the piston by lightly applying compressed air to where the brake line fits into the caliper.

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.

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

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

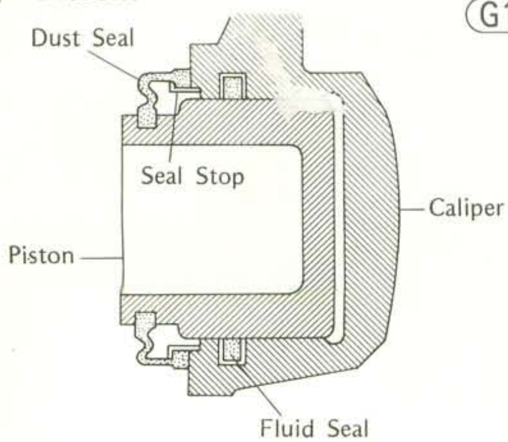
Caliper Assembly:

•Clean the caliper parts with brake fluid or alcohol (See CAUTION – Pgs. 101 ~ 102).
•Fit a new fluid seal in place inside the cylinder.

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

Caliper Dust Seal

(G19)



•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.
•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-resistance grease).

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

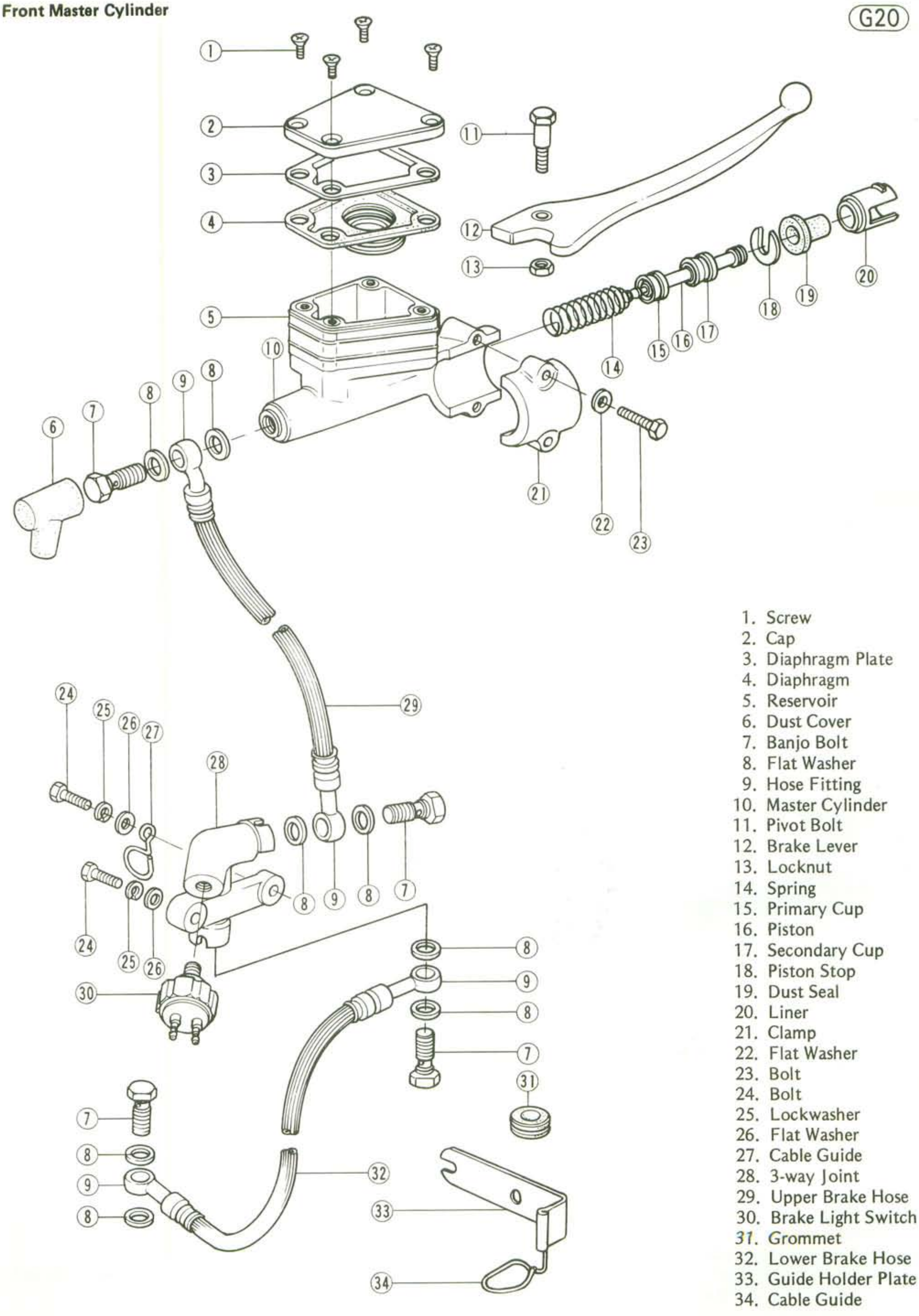
•With the caliper holder properly positioned, insert the caliper holder shafts while carefully turning the shafts to prevent damage to the dust covers.
•Install the spacers and the nuts, and tighten the nuts loosely.

NOTE: Do not forget to tighten the nuts after installing the caliper on the motorcycle (Pg. 103).

•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 (Fig. G14).

Front Master Cylinder

(G20)

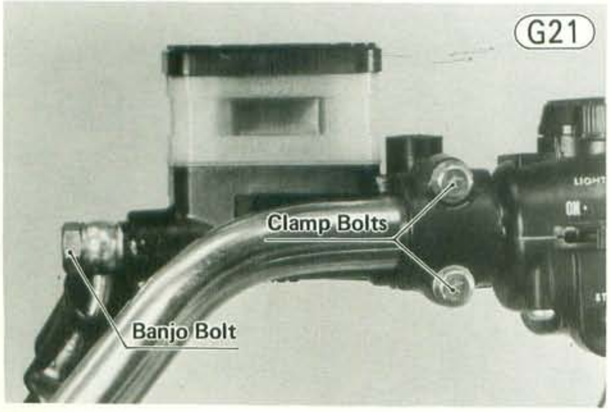


1. Screw
2. Cap
3. Diaphragm Plate
4. Diaphragm
5. Reservoir
6. Dust Cover
7. Banjo Bolt
8. Flat Washer
9. Hose Fitting
10. Master Cylinder
11. Pivot Bolt
12. Brake Lever
13. Locknut
14. Spring
15. Primary Cup
16. Piston
17. Secondary Cup
18. Piston Stop
19. Dust Seal
20. Liner
21. Clamp
22. Flat Washer
23. Bolt
24. Bolt
25. Lockwasher
26. Flat Washer
27. Cable Guide
28. 3-way Joint
29. Upper Brake Hose
30. Brake Light Switch
31. Grommet
32. Lower Brake Hose
33. Guide Holder Plate
34. Cable Guide

Master Cylinder Removal:

•Take off the right rear view mirror.

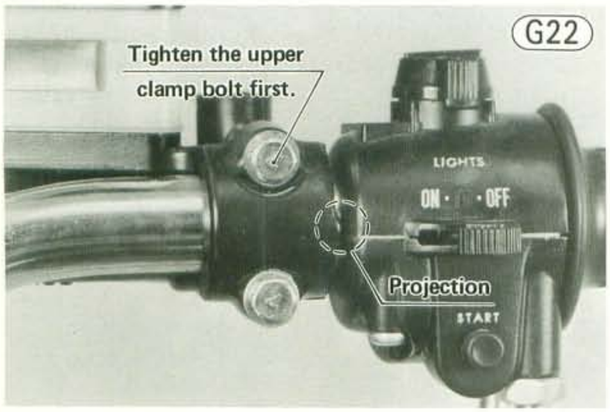
•Pull back the dust cover, and remove the banjo bolt to disconnect the upper brake hose from the master cylinder. There is a flat washer on each side of the hose fitting.



•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 0.6 ~ 0.9 kg-m (52 ~ 78 in-lbs) of torque.



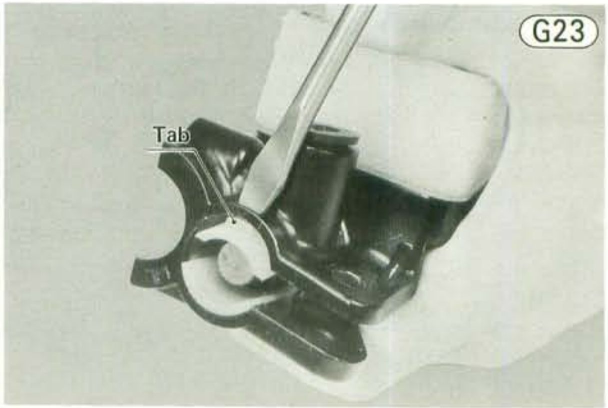
2. Bleed the brake line after master cylinder installation (Pg. 180).

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 ⑬ and pivot bolt ⑪, and remove the brake lever ⑫

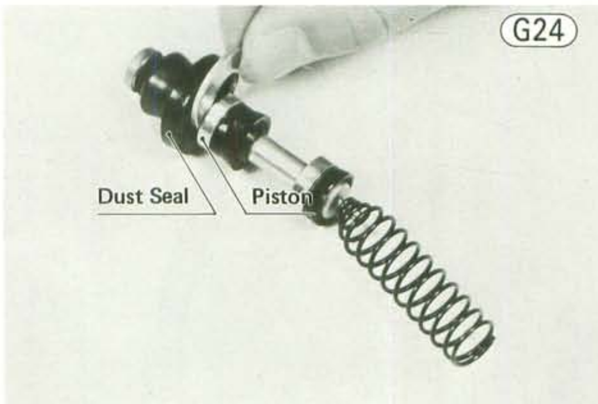
•Using a thin-bladed screwdriver or some other suitable tool, press in the liner tabs which catch in the holes in the master cylinder, and then remove the liner ⑳.



•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. 101 ~ 102). Apply brake fluid to the parts removed and to the inner wall of the cylinder.
2. Be sure that the piston stop ⑱ is between the piston and dust seal ⑲.

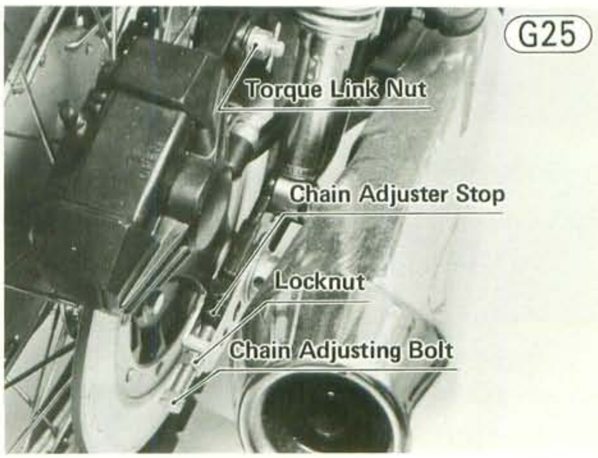


REAR WHEEL, REAR CALIPER

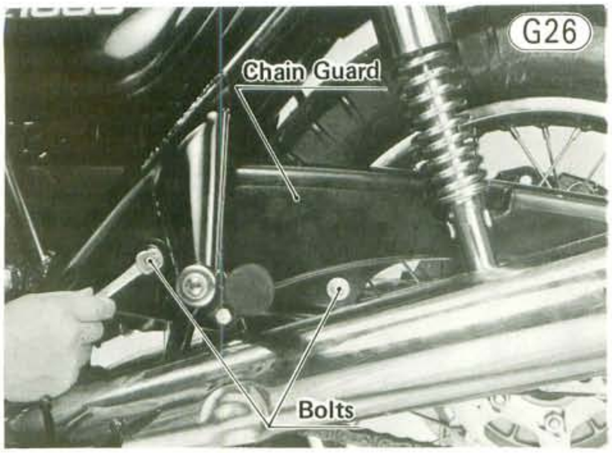
Removal:

•Put the motorcycle up on its center stand.

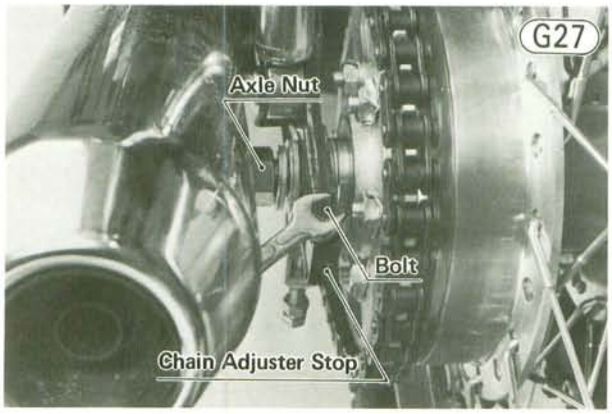
•Remove the safety clip, nut, lockwasher, and bolt at the rear end of the torque link.



•Remove the chain guard bolts (2) and washers (2), and take off the chain guard.



- Remove the axle cotter pin, and loosen the axle nut.
- Slip the caliper off the end of the torque link.
- Loosen the left and right chain adjuster locknuts, fully loosen both chain adjusting bolts, and then push the wheel forward so that the chain can be easily removed from the rear sprocket.
- Remove the bolts and lockwashers (2 ea) and take out the chain adjuster stops (2).



- Slip the caliper off the end of the torque link.
- Remove the drive chain from the rear sprocket, and hang it to the left side of the swing arm.
- Pull the rear wheel together with the rear caliper by pulling them toward the rear.
- Remove the axle nut, washer, and left chain adjuster. Then pull off the axle with the right chain adjuster while holding up the caliper.
- Free the caliper out of the disc, and insert a wood wedge (7 ~ 8 mm thick) between the disc brake pads. This prevents them from being moved out of their proper position, should the brake pedal be pushed accidentally.
- Take out the rear wheel while holding up the caliper.

CAUTION **Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so the disc does not touch the ground.**

- Fit the caliper to the torque link, and run the axle through the swing arm and the caliper holder to prevent the caliper from dangling.
- The rear caliper can be removed by disconnecting the rear end of the brake hose off the caliper.

Installation:

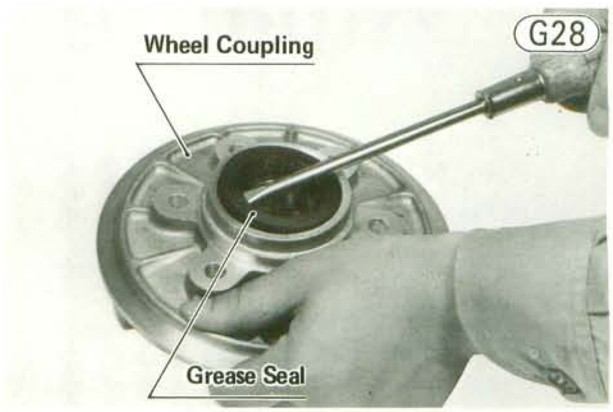
- Remove the wedge from between the brake pads, and pull the rear axle off the caliper holder and the swing arm.
- Slip the rear wheel and coupling assembly back from the left rear.
- Put the caliper on the disc so that the disc is between the pads.
- Run the axle through the right chain adjuster, rear caliper holder, collar, rear hub, coupling sleeve, coupling, coupling collar, left chain adjuster, and washer. Then screw on the axle nut.
- Put the rear wheel into the swing arm end, and install the chain adjuster stops (2). Tighten the bolts (2) with lockwashers (2).
- Fit the drive chain onto the rear sprocket.
- Fit the rear caliper into the torque link end and insert the bolt through them from left to right. Put the lockwasher on the bolt and tighten the torque link nut loosely.
- If the caliper was removed, 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 2.9 ~3.1 kg-m (21~22 ft-lbs) of torque.
- Install the chain guard. The rear mounting bolt is stepped.
- Adjust the drive chain (Pg. 26).
- Check the fluid level in the master cylinder, and bleed the brake line (Pg. 180).

Wheel Coupling Disassembly:

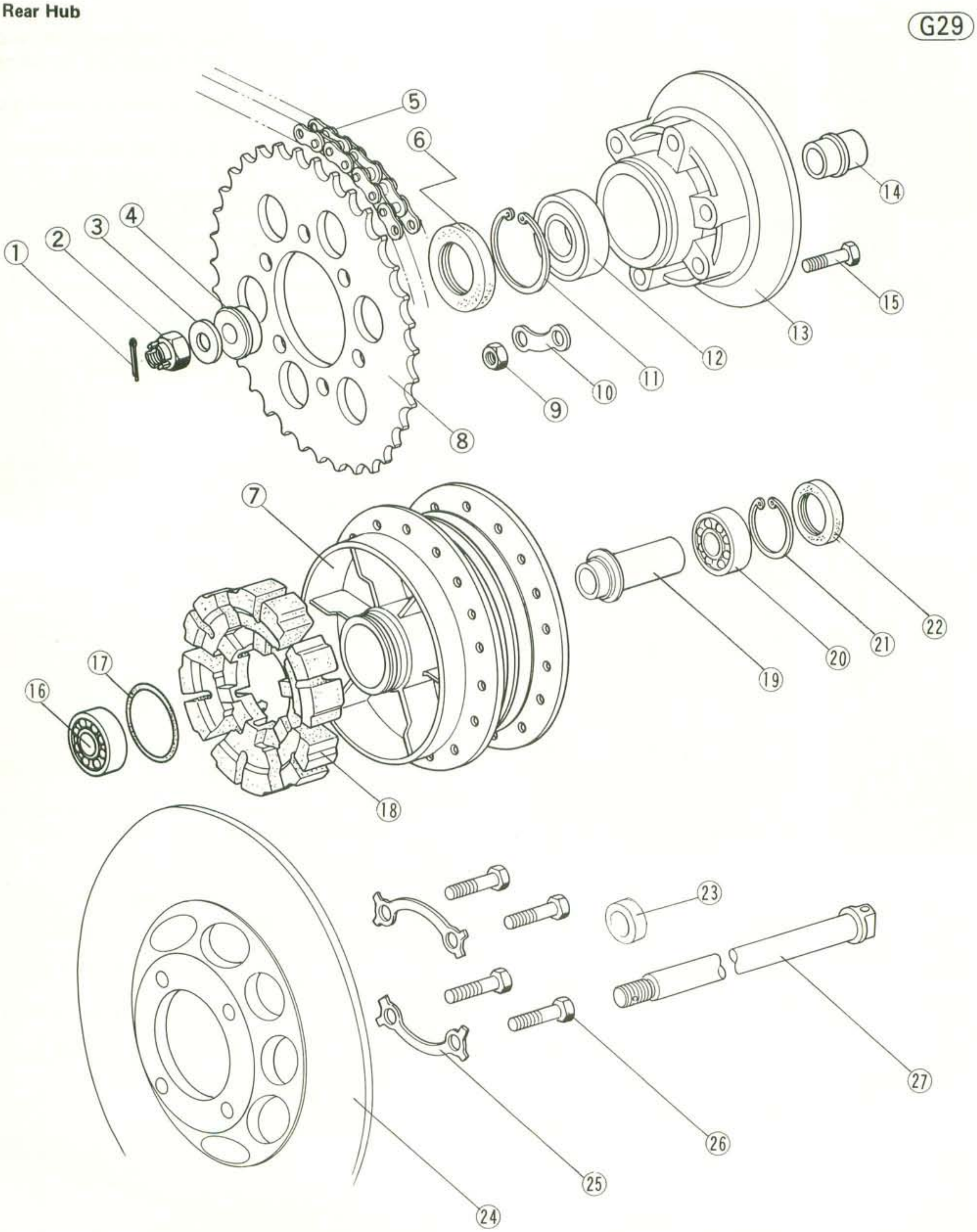
- Straighten the bent portions of the double washers ⑩ (3).

CAUTION **Do not lay the wheel on the ground with the disc facing down. This can damage or warp the disc. Place blocks under the wheel so the disc does not touch the ground.**

- Remove the rear sprocket nuts ⑨ (6) and the double washers to separate the rear sprocket ⑧ and wheel coupling ⑬.
- Remove the rear sprocket and remove the coupling from the rear wheel.
- Pull out the coupling collar ④ from the left, and the coupling sleeve ⑭ from the right.
- Using a hook, pull out the grease seal ⑥ and remove the circlip ⑪.

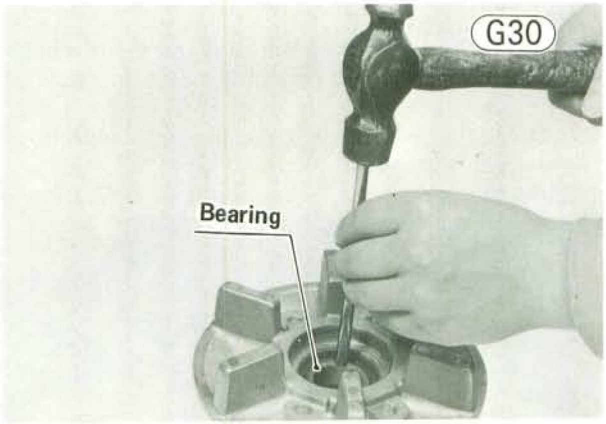


Rear Hub



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

•Remove the bearing ⑫ by tapping from the right side evenly around the bearing inner race.



Wheel Coupling Assembly:

•Inspect the bearing, and replace if necessary (Pg. 173). Lubricate it, and then install it using the wheel bearing driver and the bearing driver holder (special tools). Press the bearing in until it stops at the bottom of the hole.

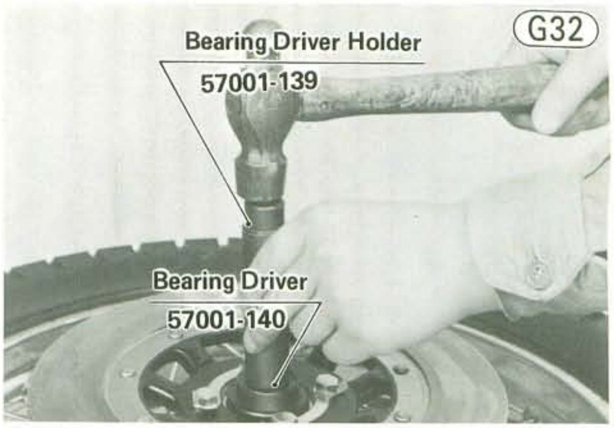
•Install the circlip.
•Replace the grease seal with a new one using the same special tools used for the bearing installation. Press the seal in until the face of the seal is level with the end of the grease seal hole. Apply a little grease to the grease seal lip.
•Install the rear sprocket with the numbered side facing out, bolts (6), new double washers (3), and nuts (6), and then tighten the nuts loosely.
•Install the coupling sleeve on the right side and the coupling collar on the left side of the coupling.
•Inspect the **O** ring ⑰ on the rear hub, replace it with a new one if it has deteriorated, and apply a little grease to the **O** ring.
•Install the rubber damper and wheel coupling on the rear hub, and then tighten the sprocket nuts to 3.6 ~4.4 kg-m (26~32 ft-lbs) of torque.
•Bend the tab portions of the double washers over the nuts.

Rear Hub Disassembly (including disc removal):

•Remove the wheel coupling ⑬ and rubber damper ⑱ from the rear hub ⑦.
•Pull out the collar ㉓ from the disc side.
•Straighten the bent portions of the double washers ㉕ (2), and remove the bolts ㉖ (4), double washers (2), and rear disc ㉔.
•Remove the grease seal ㉒ using a hook, and remove the circlip ㉑.
•Insert a metal rod into the hub from the disc side, and remove the left side bearing ⑯ 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. 173). Install them using the wheel bearing driver and the bearing driver holder (special tools).



2. Inspect the grease seal and replace if necessary (Pg. 173). 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 on the rear hub and replace if necessary. Apply a little grease to the **O** ring before fitting the coupling on the rear hub.
4. After installing the disc, check the disc runout (Pg. 183).

REAR DISC BRAKE

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

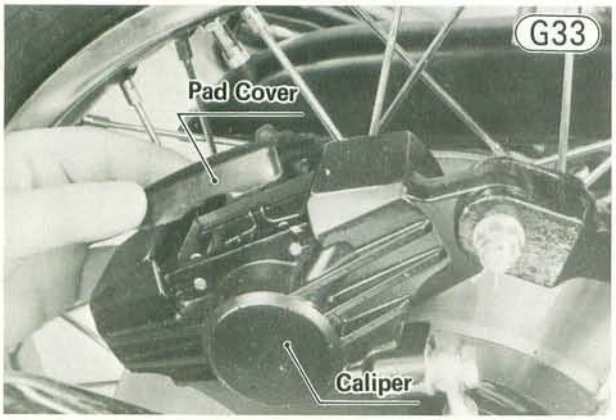
Pad Removal and Installation
Caliper Disassembly and Assembly
Master Cylinder Removal
Master Cylinder Installation Notes
Master Cylinder Disassembly
Master Cylinder Assembly

NOTES:

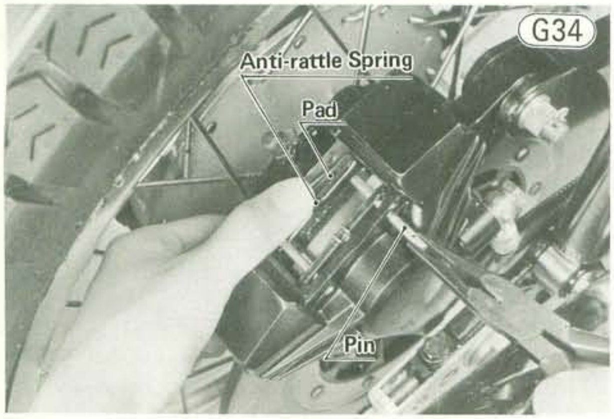
1. Disc removal and disc installation are covered in the rear hub disassembly and assembly sections (See above).
2. Caliper removal and caliper installation are covered in the rear wheel *removal and installation* sections (Pgs. 106~107).
3. Refer to the CAUTION (Pg. 101) for general disc brake information.

Pad Removal:

- Remove the pad cover on the caliper.



- Remove the clips (2) from the pins (2).
- Holding a thumb on the anti-rattle springs to keep it from flying off, pull the pins off the caliper.



- Remove the pads and shims (2 ea) from the caliper.

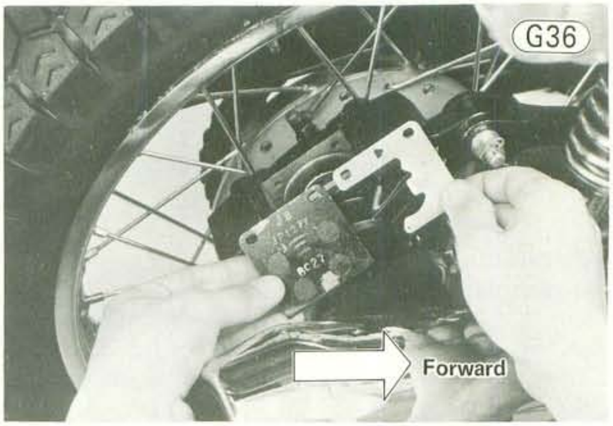
Pad Installation:

- Remove the bleed valve cap, 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 both pistons in by hands as far as they will go using a worn pad, and then close (tighten) the valve. Wipe up any spilled fluid, and recap the bleed valve.

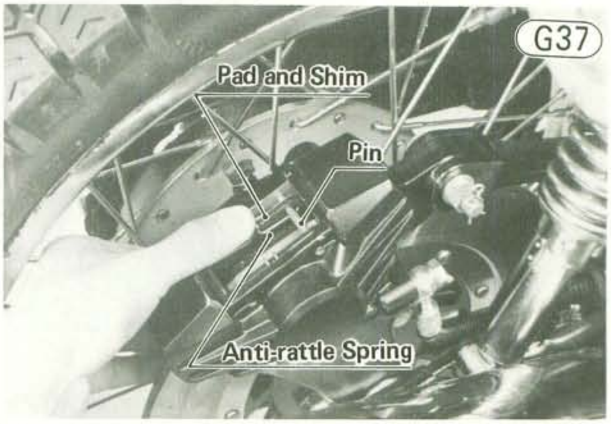
CAUTION **Do not lever the pistons with a screwdriver against the disc. This can damage or warp the disc.**

- Putting the shim on the back of each pad, insert one of the pins through the outer wall of the caliper, the shim, pads, the other shim, and into the inner wall of the caliper.

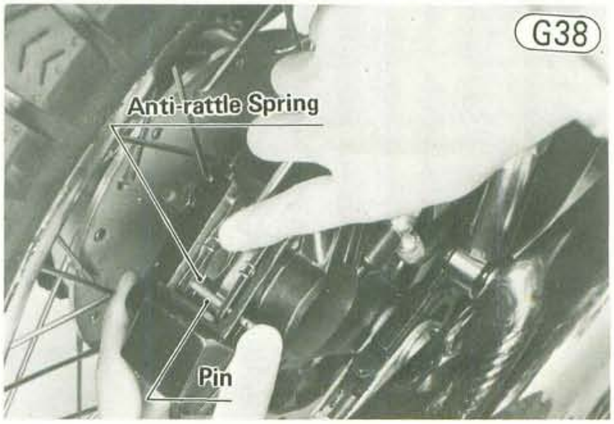
NOTES: 1. When inserting the pads and shims into the caliper, be careful not to get the rubber dust seals out of place.
2. Install each shim so that the triangular hole in the shim points forward.
3. Hold the pin by the end with the hole to insert it.



- Install the anti-rattle springs. Be sure that the end of each spring goes under the installed pin, and that the top of each spring rides on the pad and shim.



- Insert the other pin through caliper, shims, and pads pressing down the free end of each spring so that the pin can pass over it.



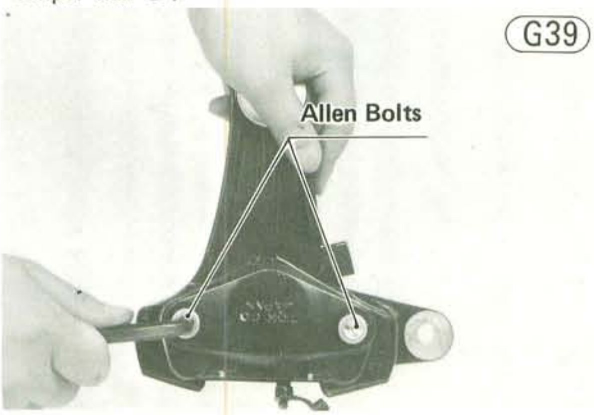
- Insert the clips through the pins on the right side of the right shim.
- Install the pad cover.

•*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).
•Push the bleed valve cap onto the valve.

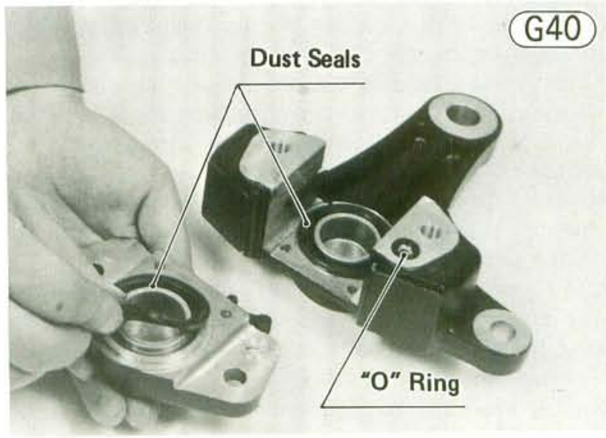
WARNING **Do not attempt to drive the motorcycle until a full brake pedal is obtained by pumping the brake pedal until the pads are against the disc. The brakes will not function on the first application of the pedal if this is not done.**

Rear Caliper Disassembly:

•Remove the rear caliper (see rear wheel removal, Pg. 106).
•Remove the pads as explained in the pad removal section (Pg. 110).
•Remove the Allen bolts ① (2) and separate the left caliper half ②.



•Remove the **O** ring ⑯ (2) and the dust seals ⑬ around the pistons.

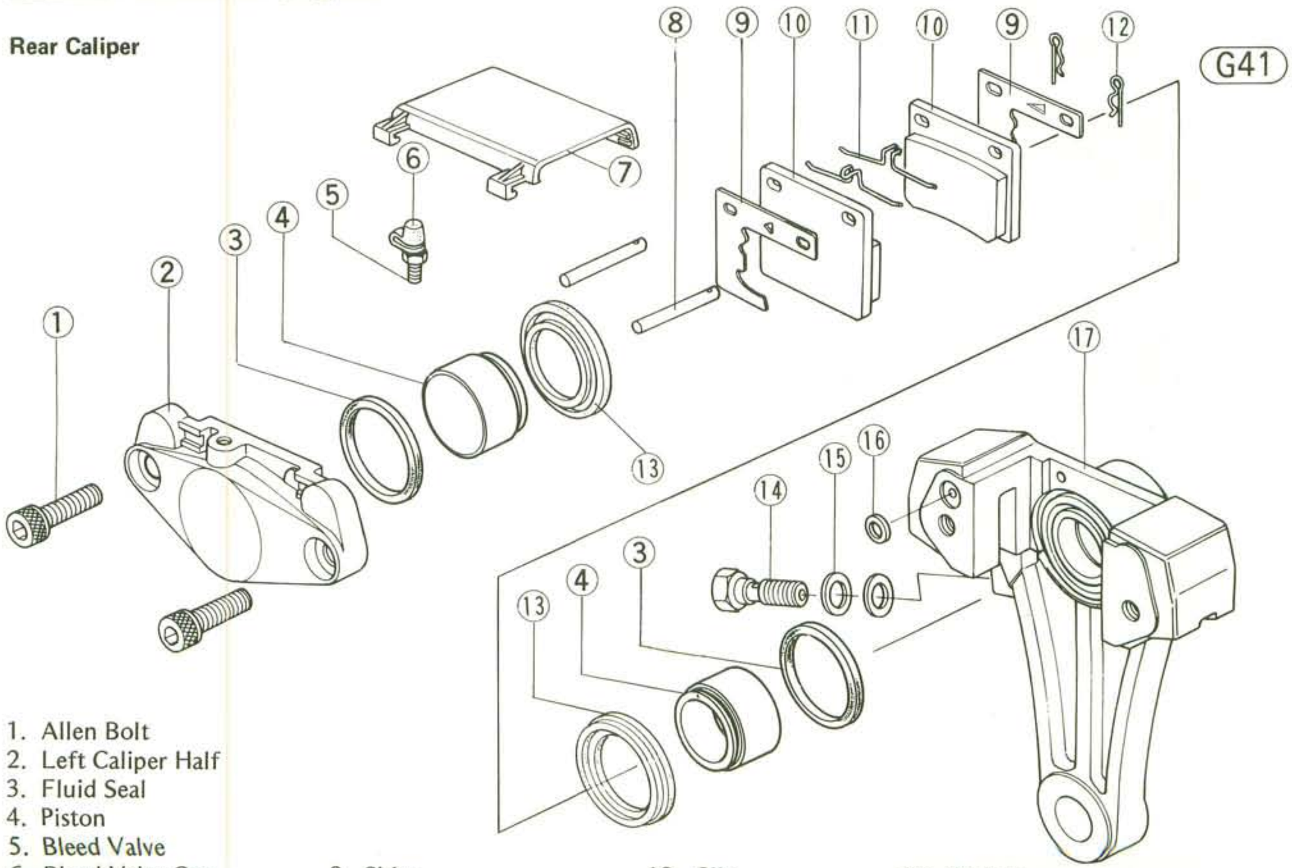


•Wrap each caliper half with a clean, heavy cloth, and remove each piston ④ by lightly applying compressed air to the brake fluid passage.

WARNING **To avoid serious injury, never place your fingers or palm on the piston. If you apply compressed air into the caliper, the piston may crush your hand or fingers.**

•Taking care not to damage the cylinder surfaces, remove the fluid seals ③ with a hook.

Rear Caliper



1. Allen Bolt
2. Left Caliper Half
3. Fluid Seal
4. Piston
5. Bleed Valve
6. Bleed Valve Cap
7. Pad Cover
8. Pin
9. Shim
10. Pad
11. Anti-rattle Spring
12. Clip
13. Dust Seal
14. Banjo Bolt
15. Washer
16. **O** Ring
17. Caliper Body

Caliper Assembly:

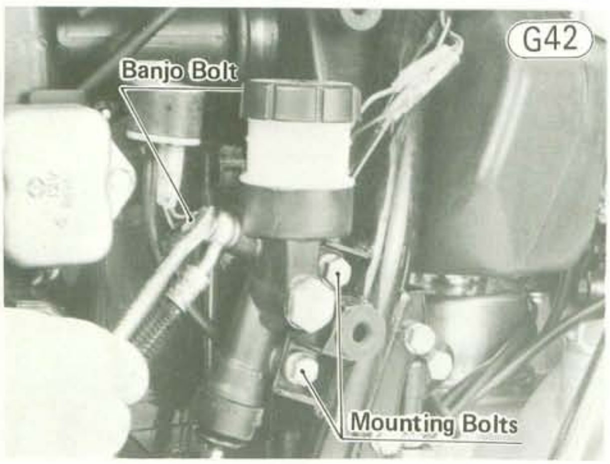
- Clean the caliper parts with brake fluid or alcohol (See CAUTION – Pgs. 101 ~ 102).
- Fit a new fluid seal in place inside each cylinder.

NOTE: It is recommended that the rubber parts, which are removed, be replaced with new ones.

- Apply brake fluid to the outside of each piston and fluid seal, and then push the piston into the cylinder by hand. Take care that neither the cylinder nor the piston skirt are scratched.
- Install a new dust seal around each piston. Check that the dust seals are properly fitted into the grooves in the piston and the caliper halves.
- Fit a new **O** ring onto the right caliper half, and install the left caliper half with the Allen bolts.
- Tighten the Allen bolts to 2.8 ~ 3.2 kg-m (20 ~ 23 ft-lbs) of torque.
- Install the pads as explained in the pad installation section (Pg. 110).
- Install the rear wheel (Pg. 107).
- Adjust the drive chain (Pg. 26).
- Check the fluid level in the master cylinder, and bleed the brake line (Pg. 180).

Rear Master Cylinder Removal:

- Pull off the right side cover.
- Remove the banjo bolt to disconnect the brake hose from the master cylinder. There is a flat washer on each side of the hose fitting. Immediately wipe up any brake fluid that spills.



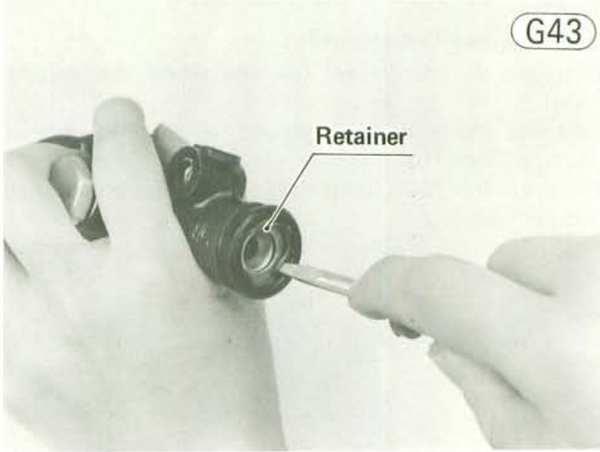
- Remove the master cylinder mounting bolts, lock-washers, flat washers (2 ea), and side cover bracket, and free the rear master cylinder from the motorcycle.

Rear Master Cylinder Installation Notes:

1. Replace the flat washer on each side of the brake hose fitting with new ones.
2. Bleed the brake line after master cylinder installation (Pg. 180).
3. Adjust the rear brake (Pg. 27).

Rear Master Cylinder Disassembly:

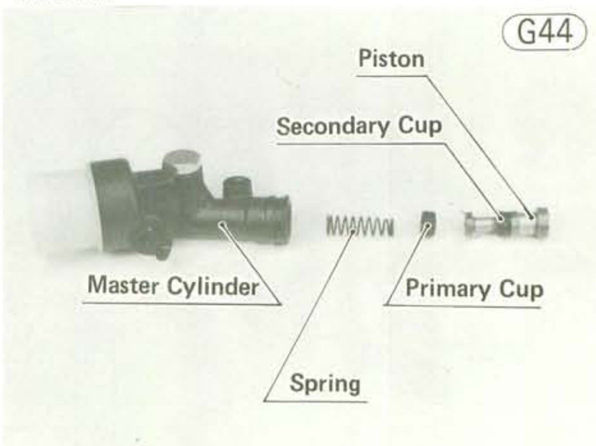
- Remove the push rod dust cover ⑪.
- Take off the master cylinder cap ① and diaphragm ③, and empty the brake fluid into a suitable container.
- Remove the retainer ⑦ with a thin screwdriver, and pull out the piston stop ⑩ and piston ⑨. Do not remove the secondary cup ⑥ from the piston since removal will damage the cup.



- Remove the return spring ⑤ and primary cup ⑧ by lightly applying compressed air into the outlet hole.

Rear Master Cylinder Assembly:

- Before assembly, clean all parts including the master cylinder with brake fluid or alcohol (See CAUTION – Pgs. 101 ~ 102), and apply brake fluid to the removed parts and the inner wall of the cylinder. Take care not to scratch the piston or the inner wall of the cylinder.
- 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.

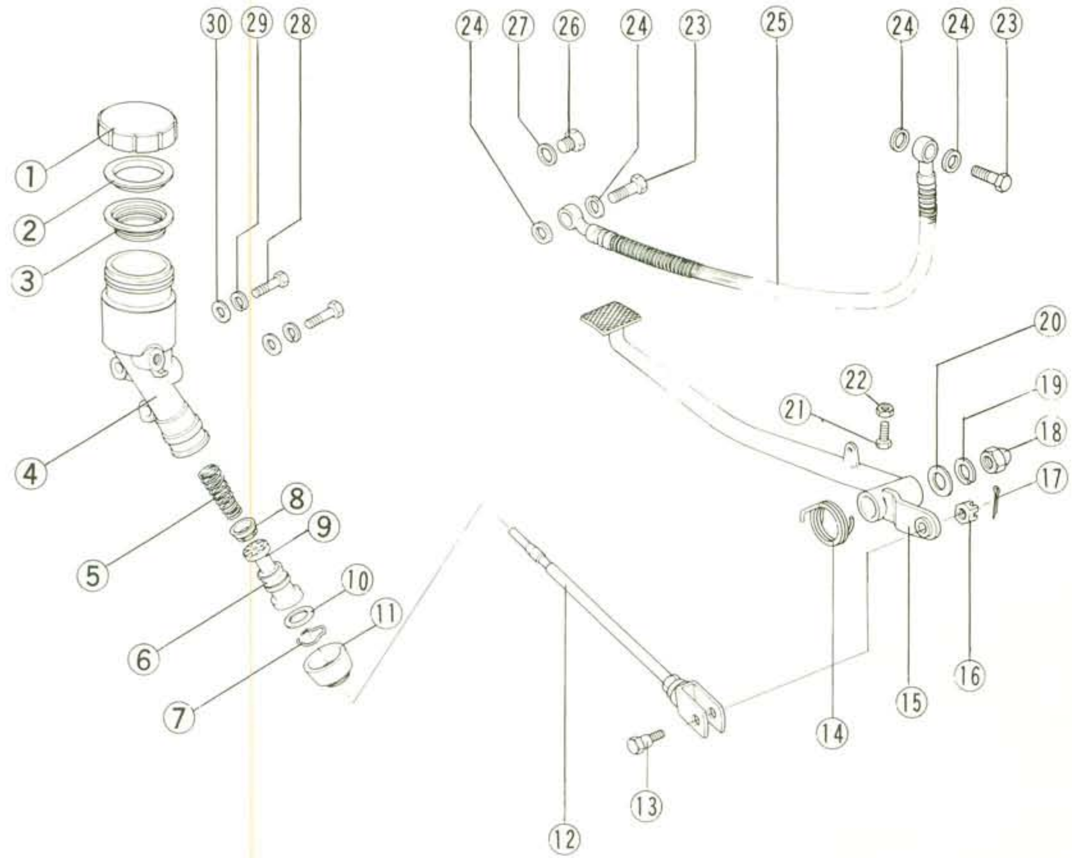


- Install the piston and stop, and with a suitable rod, install the retainer to hold the piston in as far as it will go.
- Fit the diaphragm and the master cylinder cap.
- Fit the push rod dust cover.

NOTE: If the plug ㉖ and gasket are removed, replace the damaged gasket with a new one and tighten the plug with 4.0 ~ 5.0 kg-m (29 ~ 36 ft-lbs) of torque.

Rear Master Cylinder

G45



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

TIRE, TUBE

Removal:

- Remove the wheel from the motorcycle (Pg. 99 or 106).

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.

G46

- Remove the valve stem nuts, 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.

G47

- 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. 29).
- Mount the wheel on the motorcycle (Pg. 99 or 107).
- Adjust the drive chain (Pg. 26), if the rear wheel was removed.

RIM

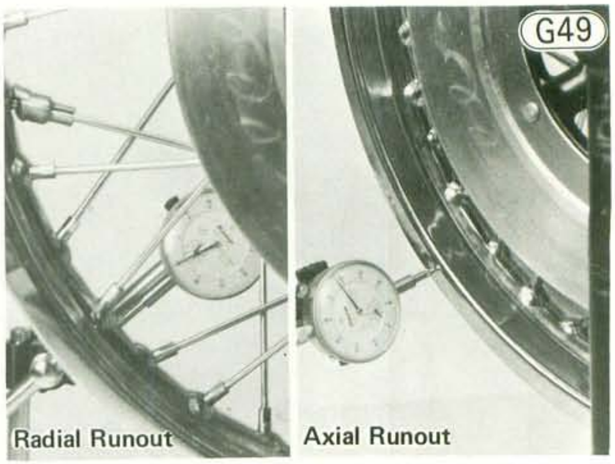
Removal:

- Remove the wheel from the motorcycle (Pg. 99 or 106).
- Take the tire and tube off the rim (Pg. 113).
- Remove the bead protectors (rear wheel only) 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:

NOTE: When assembling the front wheel, check that an arrow is on the inner circumference of the rim. If it is, be sure to assemble the rim and hub so that the arrow coincide with the direction of wheel rotation.

- 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. 114).
- Balance the wheel (Pg. 29).
- Mount the wheel on the motorcycle (Pg. 99 or 107).
- Adjust the drive chain (Pg. 26), if the rear wheel was removed.

SPOKE (breakage replacement)

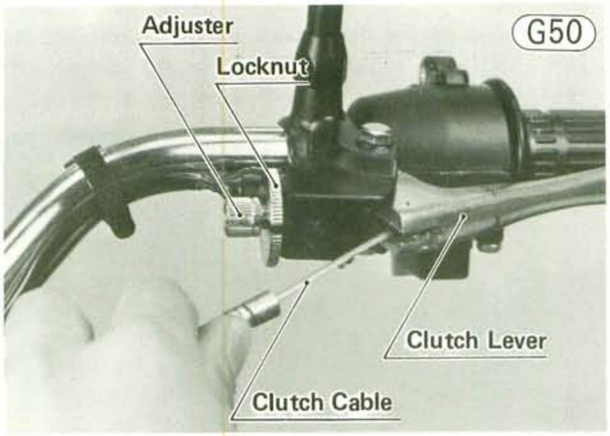
- Remove the wheel (Pg. 99 or 106).
- Remove the disc (Pg. 100 or 109).
- Reduce the tire air pressure by a small amount.
- Insert the new spoke through the hub, and bend it to meet the nipple.
- Tighten with a spoke wrench. Standard torque is 0.20 ~0.40 kg-m (17~35 in-lbs).
- Inflate the tire to standard pressure (Pg. 170).
- Install the disc (Pg. 101 or 109).
- Install the wheel (Pg. 99 or 107).

CLUTCH CABLE

Removal:

- Remove the engine sprocket cover (Pg. 60).
- Remove the clutch cable clamp that holds the clutch cable to the frame down tube.
- Loosen the knurled locknut on the clutch lever holder, and screw in the adjuster.

•Line up the slots in the clutch lever, locknut, and adjuster and then free the cable from the lever.



•Pull the cable free of the motorcycle.

Installation:

•Before installing the clutch cable, lubricate it (Pg. 31).
•Run the upper end of the cable between the head pipe gusset and the frame tube, through 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.
•Install the engine sprocket cover (Pg. 60).
•Fasten the clutch cable to the frame down tube with the clamp.
•Adjust the clutch (Pg. 21).

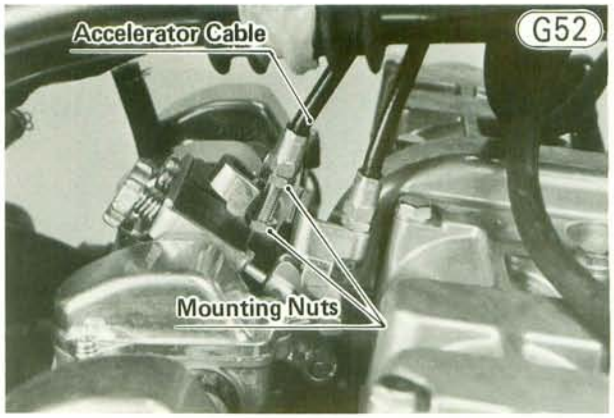
THROTTLE CABLES

Removal:

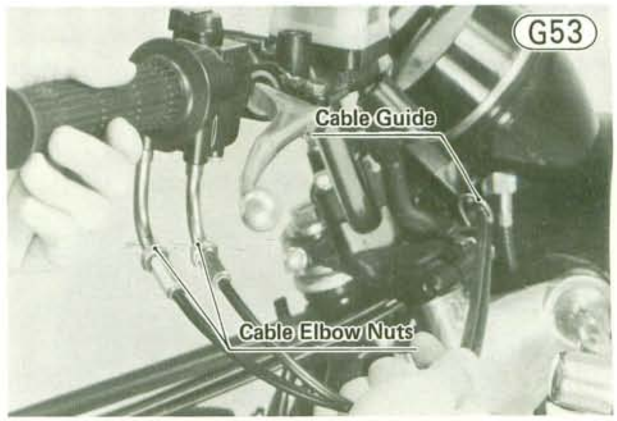
•Remove the fuel tank (Pg. 44).
•Screw in the locknuts and adjusting nuts at the upper end of the throttle cables all the way, to give the cables plenty of play.

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

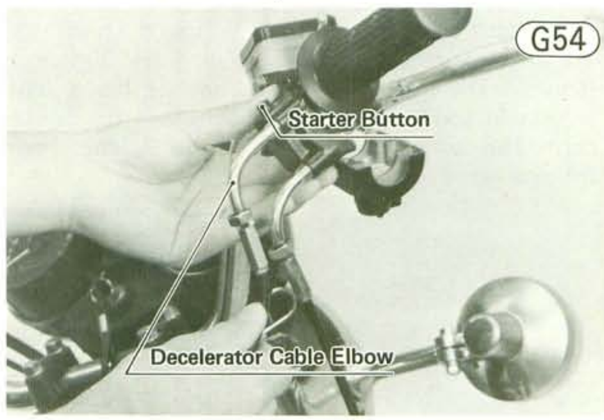
•Loosen the throttle cable adjuster mounting nuts (2 ea) fully, remove the accelerator throttle cable adjuster from its bracket, and then slip the tip of its inner cable out of the pulley. Then do the same with the decelerator throttle cable.



•Loosen both cable elbow nuts, and pull the cables out through the strap on the frame top tube and cable guide on the stem head.



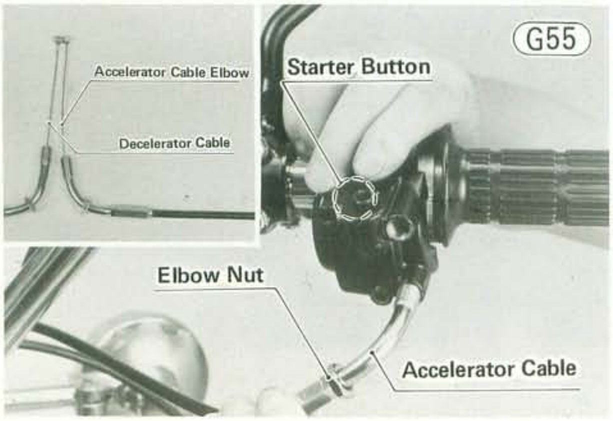
•Remove the right switch housing screws (2), and open the housing.
•Slip both throttle cable tips from their catches in the throttle grip.
•Unscrew the decelerator throttle cable elbow (the cable elbow next to the starter button), and pull the cable out of the right switch housing. Then do the same with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



Installation:

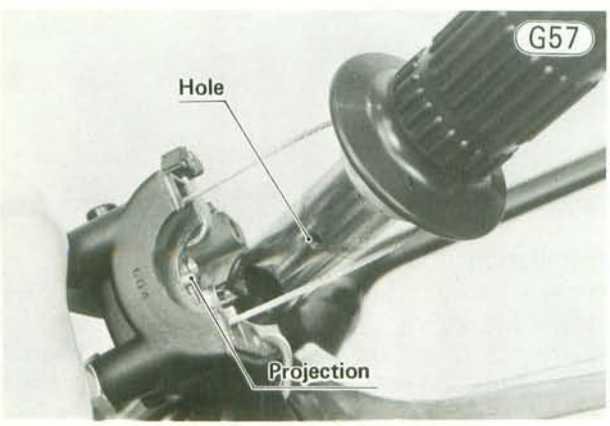
•Before installing the throttle cables, lubricate them (Pg. 31).
•Screw the accelerator throttle cable elbow (shorter than the decelerator throttle cable elbow) into the side of the right switch housing opposite the starter button.

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 right cable guide on the stem head, between the right front fork leg and the head pipe, and between the right top tube and upper tube to the carburetors. The cables should be naturally 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 into the front catch and the other cable tip into the rear catch.
- Put together the right switch housing, and tighten its screws. The lower half of the housing has a small projection which fits into a small hole in the handlebar. The front switch housing screw is longer than the rear screw.



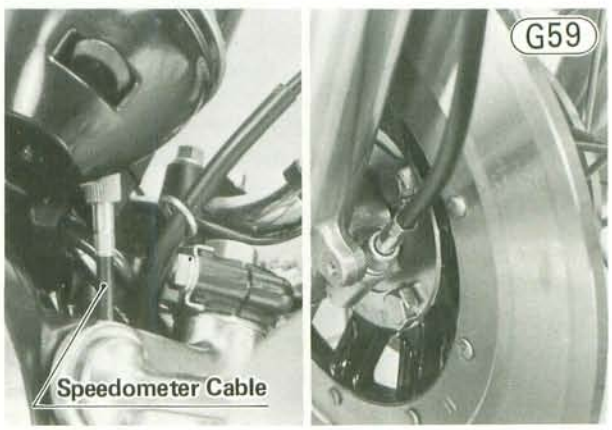
- Turn each elbow in the direction of its cable, and tighten its elbow nut to secure the elbow in the proper position.
- Fit the tip of the decelerator throttle cable into the front catch in the pulley, and install its adjuster into the cable bracket.

- Fit the tip of the other cable into the other catch, install its adjuster into the bracket while turning the throttle grip at the same time, if necessary.
- Center each adjuster in its place in the bracket, and then tighten the mounting nuts.
- Install the fuel tank (Pg. 44).
- Adjust the throttle cables (Pg. 16)

SPEEDOMETER CABLE

Removal:

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

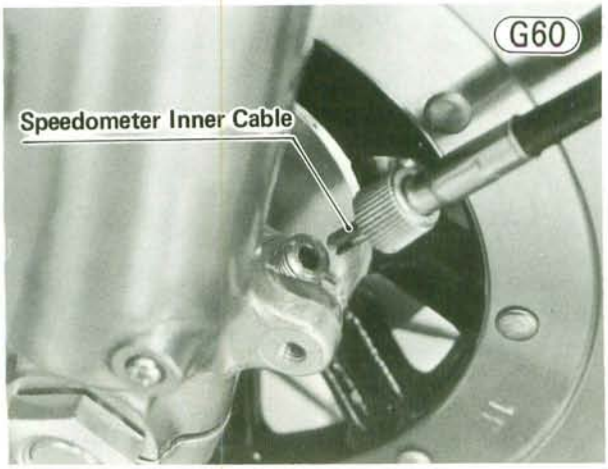


- Pull the cable free.

Installation:

- Run the speedometer cable through its guides at the 3-way joint and the front fender left side, and then 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 fit onto the tongue of the speedometer pinion. Tighten the cable nut with pliers.



TACHOMETER CABLE

Removal:

•Disconnect the upper and lower ends of the tachometer cable with pliers.
•Free the cable from the motorcycle.

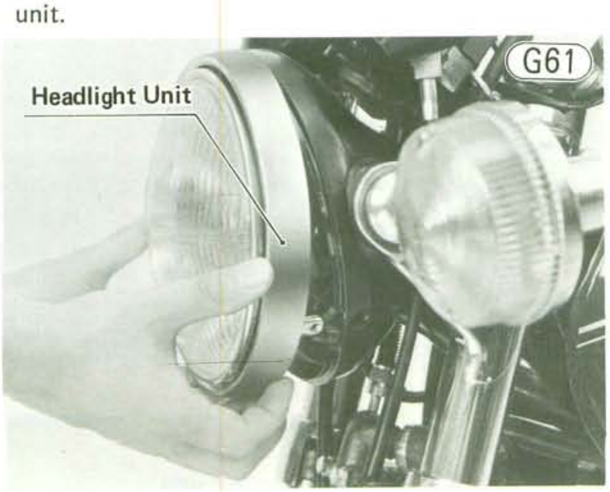
Installation:

•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 pliers. There is a gasket between the outer cable and the tachometer pinion holder.

HEADLIGHT UNIT

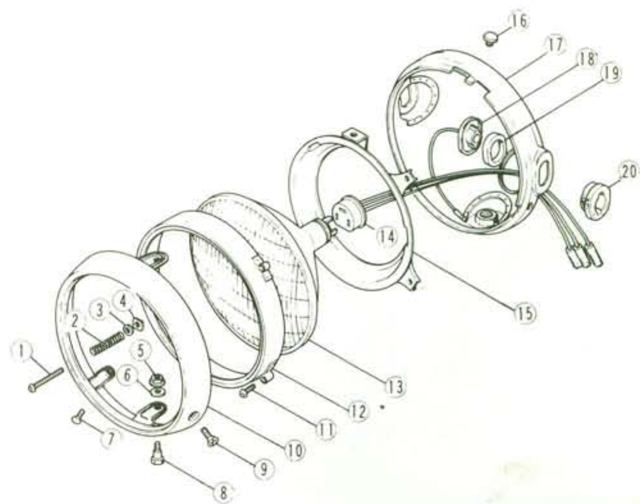
Removal:

•Take out the retaining screws ⑨ (2).
•Swing the unit ⑬ out from the housing ⑰, and disconnect the headlight socket ⑭ from the rear of the unit.



•Remove the pivot screws ⑧, nuts ⑤ with washers, rubber dampers ⑥ (2 ea), and the beam horizontal adjusting screw ①. A nut ④, spring seat ③, and spring ② come off with the adjusting screw.
•Separate the outer rim ⑩ from the inner rim ⑫.
•Remove the screws ⑪ (2), and separate the sealed beam unit from the inner rim and mounting rim ⑮.

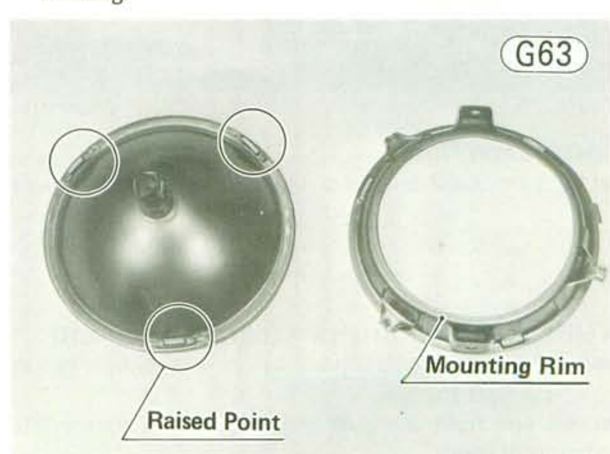
Headlight Unit



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

Installation Notes:

1. Place the sealed beam unit into the mounting rim, fitting the 3 raised portions into the 3 notches 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 in the headlight housing.

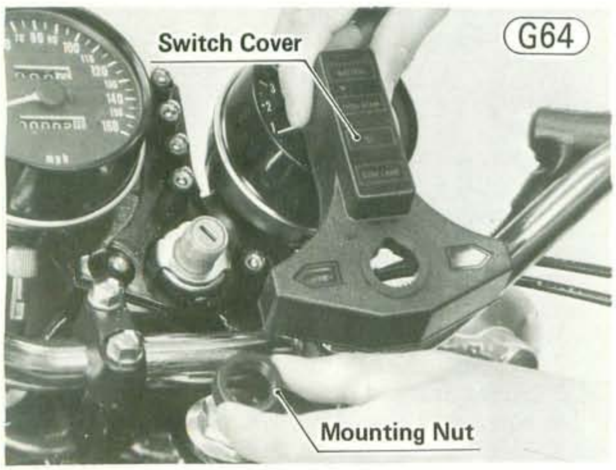


2. The spring seat on the adjusting screw goes between the spring and the bracket.
3. Carry out the horizontal beam adjustment after installation (Pg. 30).

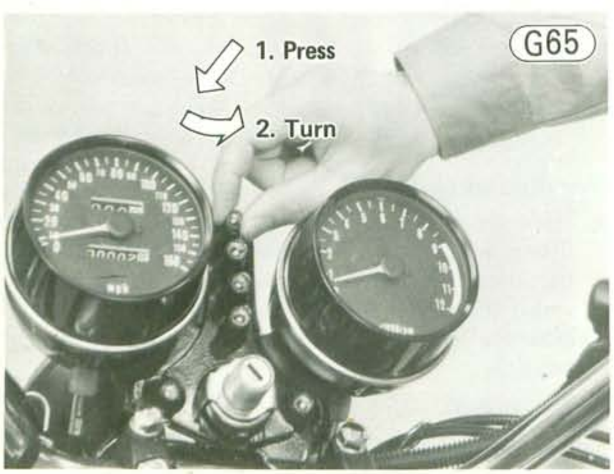
INDICATOR LIGHTS (Neutral, High Beam, Oil, Stop Light, Left and Right Turn)

Removal:

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



•To remove the indicator light bulb, first press and hold the bulb inwards; twist it to the left; then pull it out.



Installation Note:

•Use 12V 3.4W bulbs for indicator light replacement.

TURN SIGNAL LIGHT (Bulb Replacement)

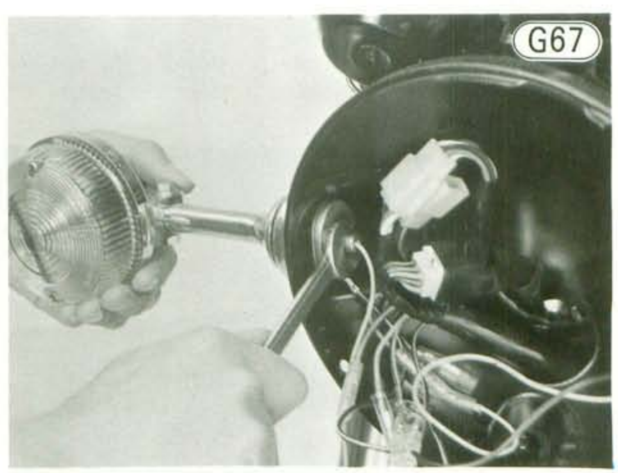
•Remove the lens mounting screws and gaskets (2 ea), and take off the lens.
•Press and hold the bulb inwards; twist it to the left; then pull it out.

•Install a new 12 volt bulb of the correct wattage (see the wiring diagram).
•Be sure the rubber gasket is in place, 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 then swing the unit out away from the housing.
•Disconnect the headlight socket from the rear of the unit.
•Disconnect the gray turn signal lead in the headlight housing.
•Remove the nut and pull the front turn signal from the front fork cover stay.



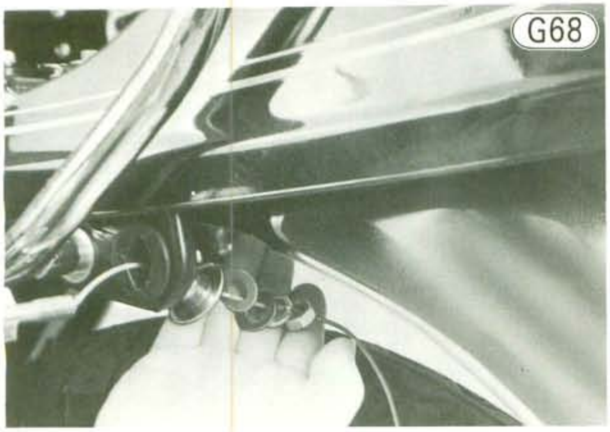
Installation Notes (front, either side):

1. If the front turn signal dampers have been removed, install them as shown in Fig. G62.

2. Adjust the headlight (Pg. 30).

Removal (rear, either side):

- •Unlock the seat and swing it open.
- •Disconnect the gray turn signal lead.
- •Remove the nut, lockwasher, and flat washer, and then 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 in Fig. G71.
2. Connect the turn signal leads according to Table G2.

Table G2 Turn Signal Lead Color

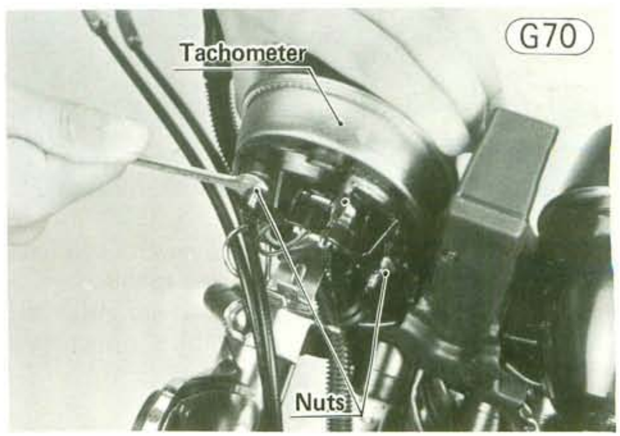
	Turn Signal Lead		Main Wiring Harness Lead
Right	Gray	↔	Gray
	Black/Yellow	↔	Black/Yellow
Left	Gray	↔	Green
	Black/Yellow	↔	Black/Yellow

SPEEDOMETER, TACHOMETER, METER LIGHTS

Removal:

- •Remove the left and right front turn signal assemblies (Pg. 118).
- •Slip the headlight housing down from between the front fork cover stays.
- •Disconnect the upper end of the speedometer cable and tachometer cable with pliers.
- •Remove the screw and lockwasher, and the wiring grommet from the meter cover, and then pull off the cover.

- •Remove the nuts, lockwashers, flat washers, dampers, and collars (2 ea) from the bottom of the meter holder.



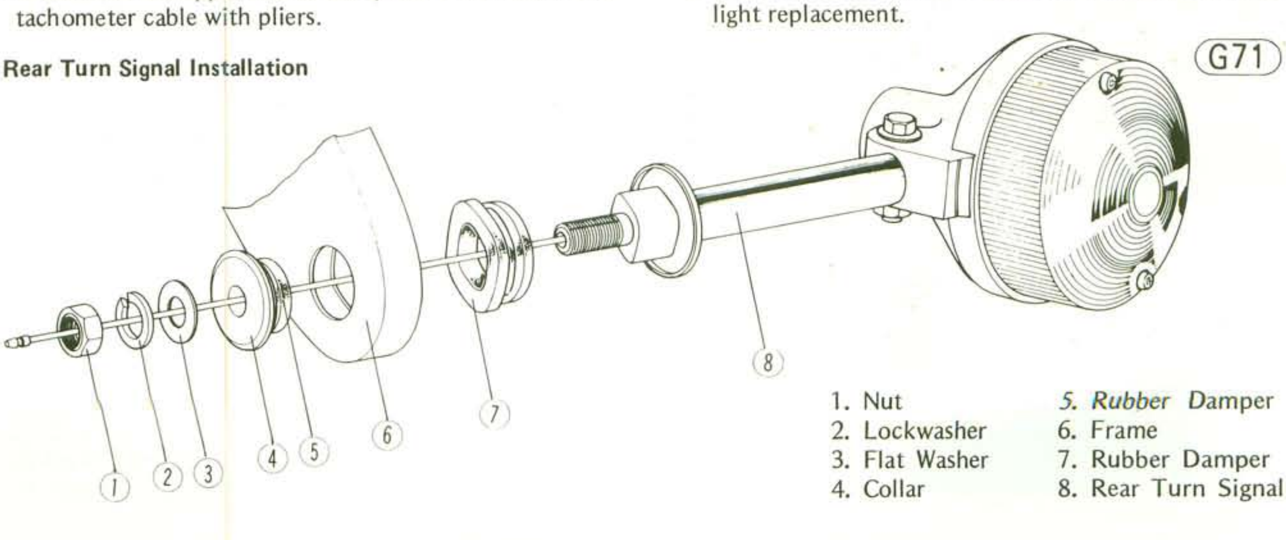
- •Pull up on the front of the meter, and pull the lights (2) out of their base.
- •To remove the bulb, first press and hold it inwards; twist it to the left; then pull it out.

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

Installation Notes:

1. Use 12V 3.4W bulbs for speedometer and tachometer light replacement.

Rear Turn Signal Installation

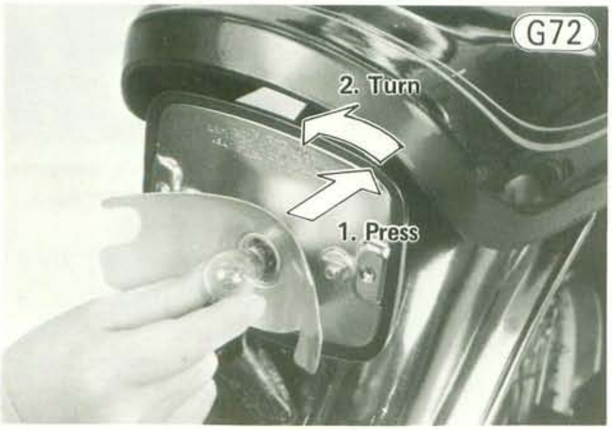


1. Nut
2. Lockwasher
3. Flat Washer
4. Collar
5. Rubber Damper
6. Frame
7. Rubber Damper
8. Rear Turn Signal

2. If the headlight housing dampers have been removed, install the dampers as illustrated in Fig. G62.
3. Carry out the headlight adjustment after installation (Pg. 30).

TAIL/BRAKE LIGHT (Bulb Replacement)

- Remove the lens mounting screws and gaskets, and take off the lens.
- Press and hold the bulb inwards; twist it to the left; then pull it out.



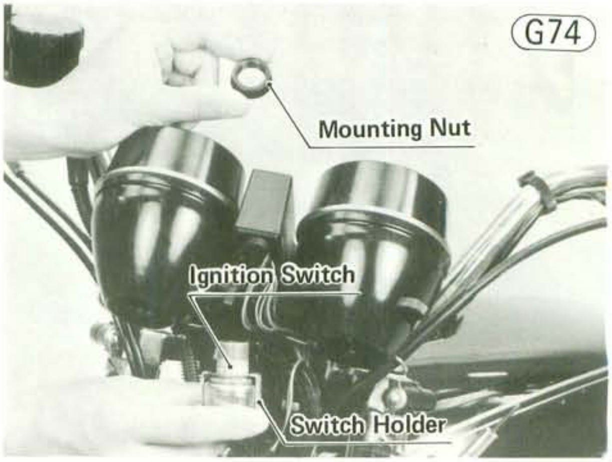
- Replace the burned out bulb with a new 12 volt bulb of the correct wattage (see the wiring diagram).
- Be sure the rubber gasket is in place, and install the lens. Be careful not to overtighten the mounting screws.

IGNITION SWITCH

Removal:

- Remove the left and right front turn signal assemblies (Pg. 118).
- Disconnect the ignition switch wiring harness 6-pin connector in the headlight housing, and then push the socket out of the housing.
- Slip the headlight housing down from between the front fork cover stays.
- Take out the screws, lockwashers, and flat washers (3 ea) from the bottom of the indicator light panel, and then remove the lower cover.

- Pull off the right turn signal indicator light socket.
- Unscrew the ignition switch mounting nut, take off the upper switch cover, and then pull out the ignition switch holder and ignition switch.



Installation:

- Fit the ignition switch and its holder into place, put on the upper switch cover, and then screw the ignition switch mounting nut onto the switch.
- Push the right turn signal indicator light into its place.
- Install the lower cover and tighten the screws (3). Each screw has a flat washer and lockwasher.
- Connect the ignition switch wiring harness 6-pin connector in the headlight housing.
- Install the turn signal assemblies (Pg. 118).
- Adjust the headlight (Pg. 30).

FRONT BRAKE LIGHT SWITCH

Removal:

- Slide the dust cover back, and disconnect the front brake light switch leads from the switch.

- Unscrew the front brake light switch from the 3-way joint.

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

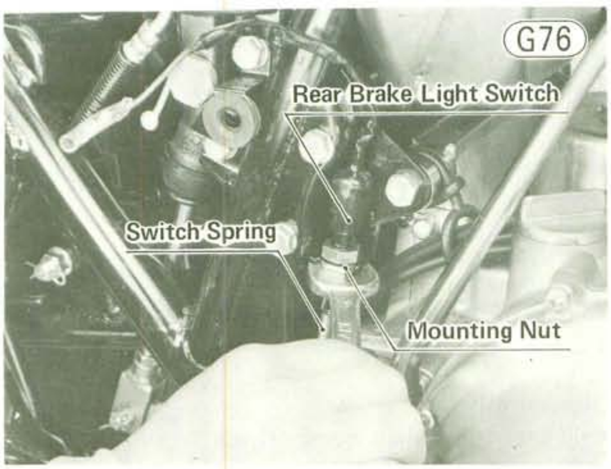
Installation Notes:

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 to 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 right side cover, and then disconnect the blue and brown leads from the rear brake light switch.
•Loosen the lower mounting nut, and remove the rear brake light switch, unhooking the switch spring from the switch.



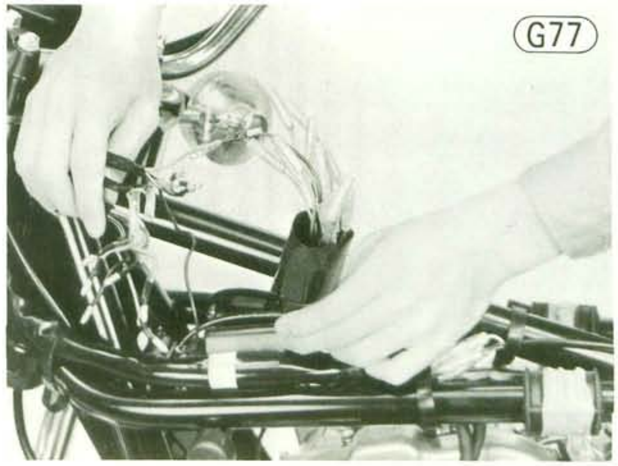
Installation Note:

•Adjust the switch after installation (Pg. 27).

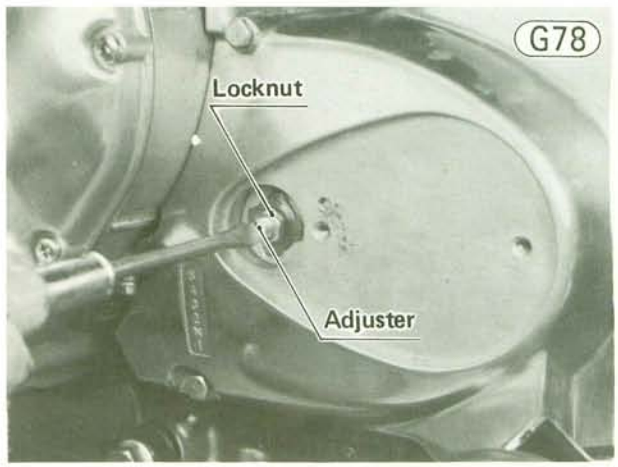
HANDLEBAR

Removal:

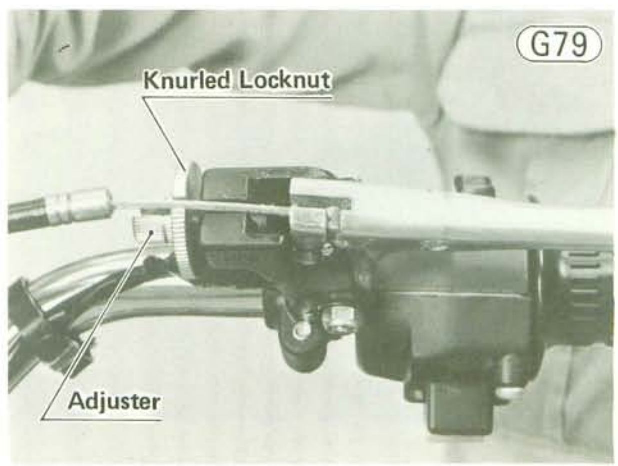
•Take off the rear view mirrors.
•Remove the fuel tank (Pg. 44).
•Remove the throttle cables (Pg. 115).
•Slide the rubber cover out of place and disconnect all the leads from the left and right switch housings under the frame top tube.



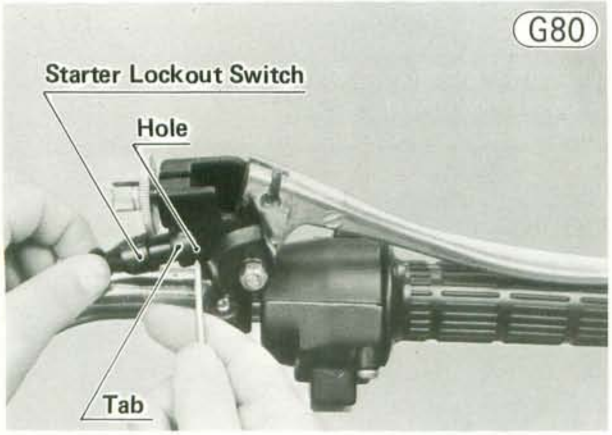
•Remove the clutch adjusting cover.
•Loosen the locknut, and back out the clutch adjusting scre\ a couple of turns to give the clutch cable plenty of play.



•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.



•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 master cylinder clamp bolts and washers (2 ea), and then remove the master cylinder.
- Remove the handlebar clamp bolts and lockwashers (4 ea), and then remove the clamps and handlebar.

Installation:

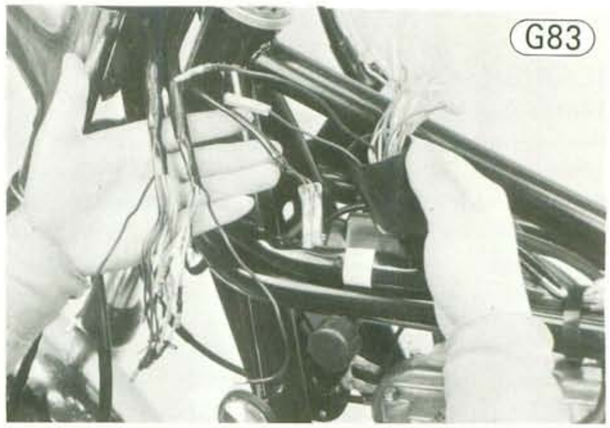
- Run the switch leads between the stem head and the meter holder, and install the handlebar.
- Install the handlebar clamps, lockwashers, and clamp bolts so that the angle of the handlebar matches the angle of the front fork as shown. Tighten the clamp bolts to 1.6 ~ 2.2 kg-m (11.5 ~ 16.0 ft-lbs) of torque.

- Push the starter lockout switch into the clutch lever holder.
- With the brake lever mounted at the proper angle and the master cylinder clamp installed with the small projection towards the throttle grip, tighten first the upper and then the lower master cylinder clamp bolt to 0.6 ~ 0.9 kg-m (52 ~ 78 in-lbs) of torque (Fig. G19 on Pg. 104).
- Connect the right and left switch leads to the same color leads of the main wiring harness.

NOTE: There are four black leads to be connected at the frame top tube. Connect these leads as indicated in the table.

Table G3 Black Lead Connections

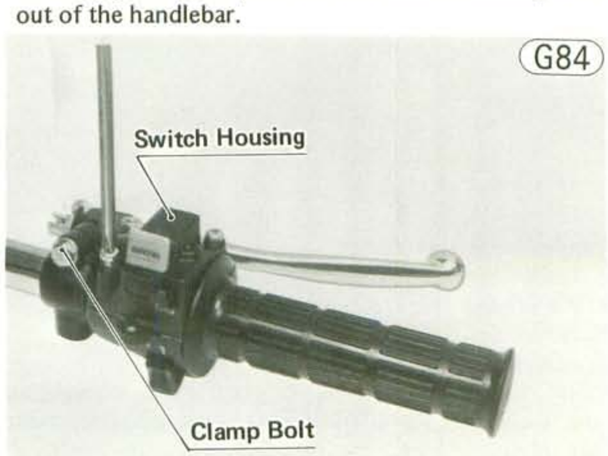
Starter Lockout Switch	→ Main Wiring Harness
	→ Right Switch Housing



- Cover the lead connections with the rubber cover.
- Fit the tip of the clutch cable back into the clutch lever.
- Install the throttle cables (Pg. 115).
- Install the rear view mirrors.
- Adjust the clutch (Pg. 21).
- Adjust the throttle cables (Pg. 16).
- Adjust the rear view mirrors.

Disassembly

- Pull the right switch housing leads out of the handlebar.
- Take out the left switch housing screws (2), and open the switch housing. If necessary, loosen the clutch lever holder bolt, and slide the clutch lever holder to the right. Then pull the left switch housing leads out of the handlebar.

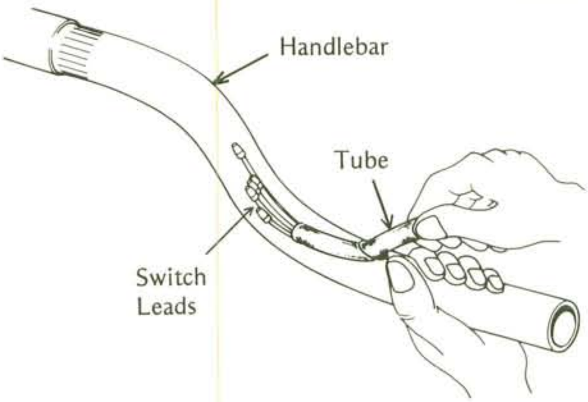


•To remove the clutch lever holder, loosen the clutch lever holder bolt, cut off the left handle grip which is bonded to the handlebar, and then slide off the clutch lever holder.

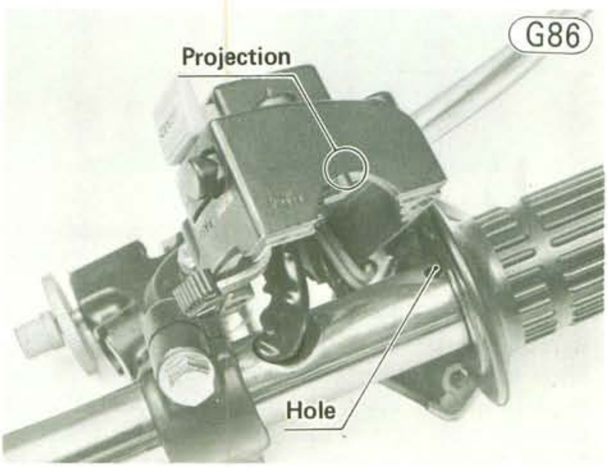
Assembly Notes:

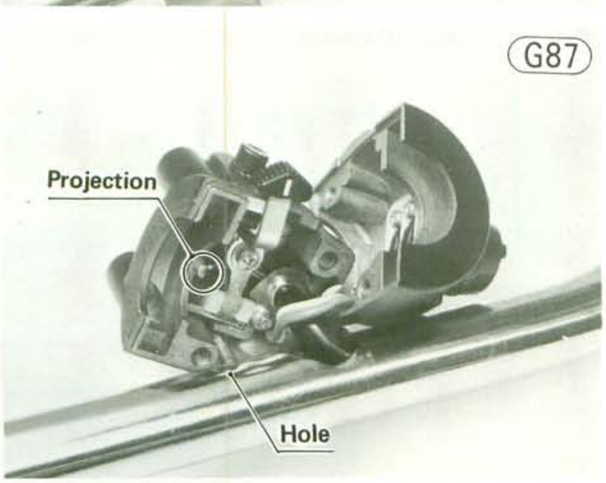
1. For easy insertion, the switch lead must be straight and in a compact bundle. They must not be twisted around one another. Push them into and through the handlebar while sequrely holding the plastic tube that covers the leads. Be careful that the tube does not slip on the leads.

Switch Lead Insertion (G85)



2. The lower half of each switch housing has a small projection which fits into a small hole in the handlebar.



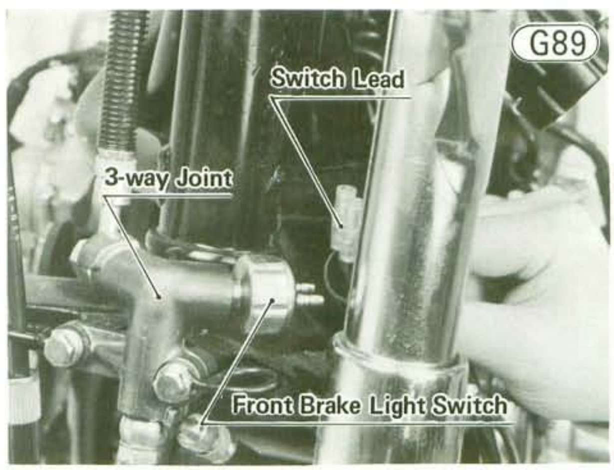


STEERING STEM

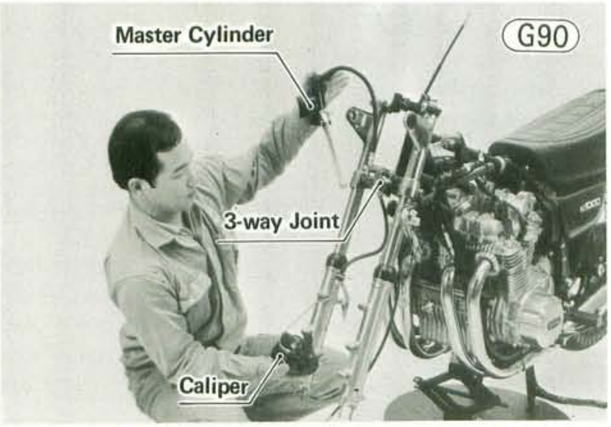
Removal:

•Remove the fuel tank (Pg. 44).
•Remove the turn signals (Pg. 118).
•Remove the handlebar (Pg. 121).
•Remove the front wheel (Pg. 99).
•Disconnect the 9-pin and 6-pin connectors in the headlight housing, and remove the headlight housing.
•Disconnect the tachometer cable at the tachometer.
•Remove the nuts, lockwashers, and flat washers (2 ea) that secure the instrument unit to the stem head, and then remove the instrument unit while pulling the speedometer cable out through its guides. There are four rubber dampers.

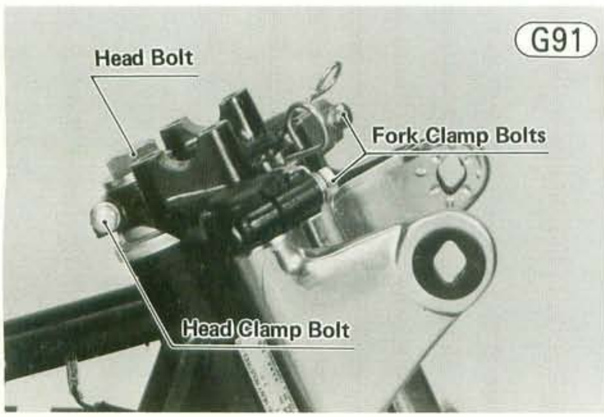
•Remove the fender bolts and lockwashers (4 ea), and take off the fender.
•Slide the dust cover back, and disconnect the front brake light switch leads from the switch.



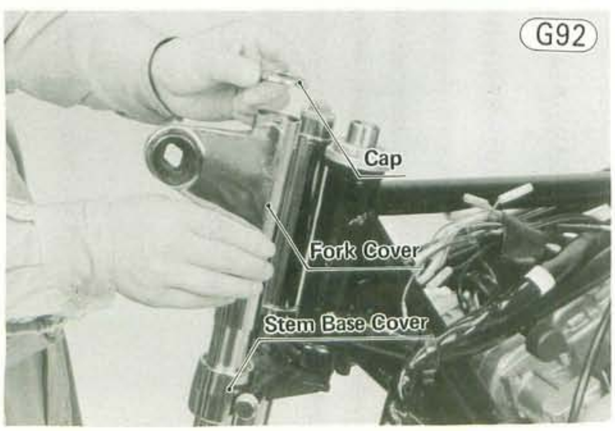
•Remove the 3-way joint mounting bolts, lockwashers, and flat washers (2 ea) with the two cable guides, and then take off the 3-way joint. There are collars between the 3-way joint and the steering stem base.
•Remove the caliper mounting bolts, lockwashers, and flat washers (2 ea), and remove the caliper together with the master cylinder, upper brake hose, 3-way joint, lower brake hose, and brake pipe.



- Remove the front fork upper clamp bolts.



- 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.
- Remove the fork covers. Each fork cover has a ring cap at the top, and a stem base cover, damper ring, and rubber damper at the bottom.

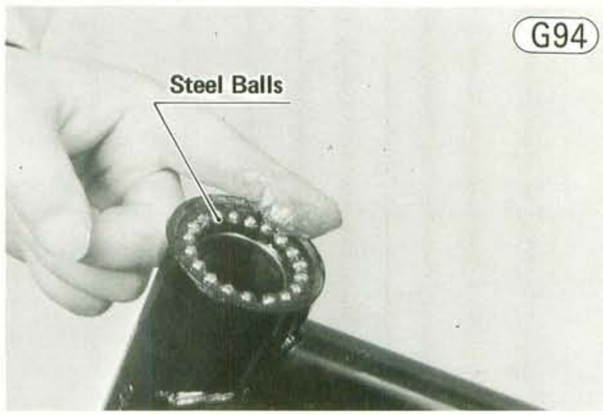


- Loosen the lower clamp bolts, and pull out each fork leg with a twisting motion.
- Push up on the stem base, and remove the steering stem locknut with the stem nut wrench (special tool); then remove the steering stem and stem base (single unit). As the stem is removed, some of the steel balls will drop out of the lower outer race. Remove the rest. There are 20 steel balls in the lower outer race.

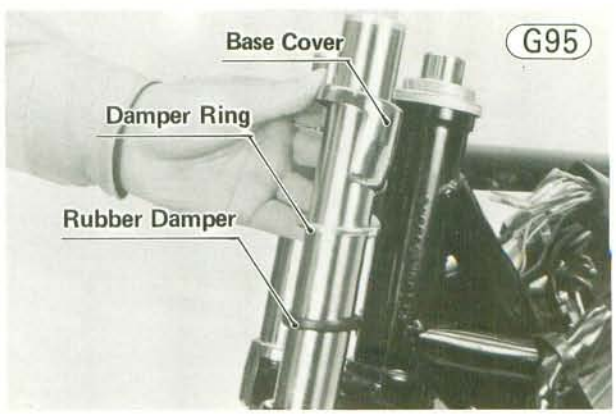
- Remove the steering stem cap, the upper inner race, and the upper steel balls (19).

Installation:

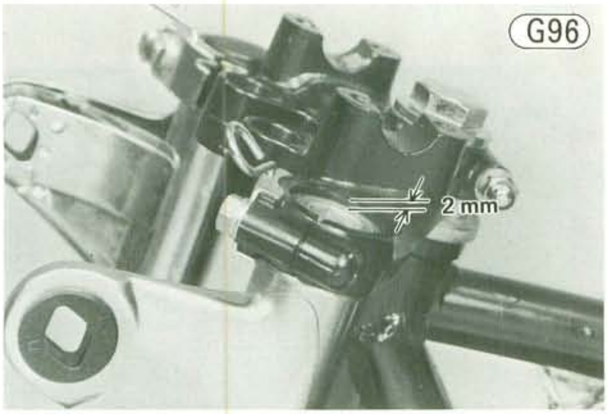
- Apply grease to the upper and lower outer races in the head pipe so that the steel balls will stick in place during stem insertion. Install the upper steel balls (19) and lower steel balls (20). All upper and lower steel balls are one size.



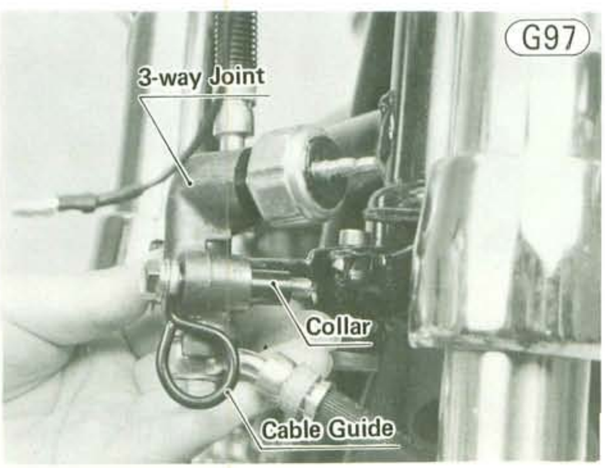
- Put on the upper inner race and steering stem cap. Insert the steering stem into the head pipe, and tighten the steering stem locknut to 2.7 ~ 3.3 kg-m (19.5 ~ 24.0 ft-lbs) of torque.
- Run the inner tube of each front fork leg up through its clamp in the stem base. Temporarily tighten the lower clamp bolt on each side to hold each fork leg in place with its inner tube protruding about 250 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.



•*Install* the stem head 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 in front of the stem head.
•For each 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 head. Tighten the upper clamp bolt to 1.6~2.2 kg-m (11.5~16.0 ft-lbs).



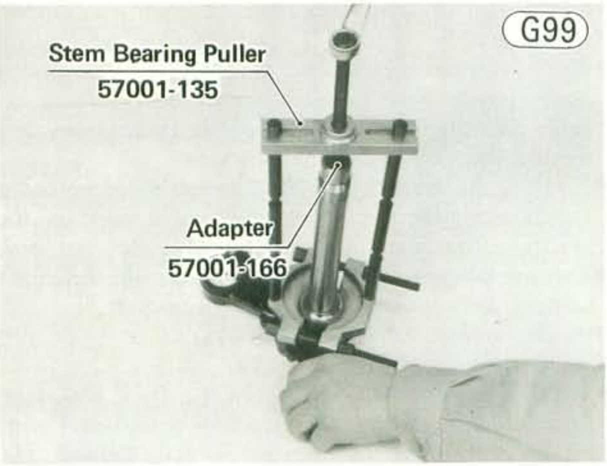
•Tighten the stem head bolt to 4.0~5.0 kg-m (29~36 ft-lbs) of torque and the rear clamp bolt to 1.6~2.2 kg-m (11.5~16.0 ft-lbs) of torque.
•Tighten the front fork lower clamp bolts to 3.4~4.6 kg-m (25~33 ft-lbs) of torque.
•Install the handlebar (Pg. 122).
•Install the master cylinder on the handlebar with the small projection on the clamp facing the throttle grip Fig. G19 on Pg. 104. Tighten first the upper clamp bolt and then the lower bolt, both to 0.6~0.9 kg-m (52~78 in-lbs) of torque. Each clamp bolt has a flat washer.
•Install the caliper on the left front fork leg. Tighten the mounting bolts to 3.4~4.6 kg-m (25~33 ft-lbs) of torque. Each bolt has a lockwasher and flat washer.
•Hook the upper brake hose on the guide on the stem head, and install the 3-way joint, placing the collars (2) between the 3-way joint and the steering stem base. Be sure to include a cable guide, flat washer, and lockwasher with each bolt. Tighten the bolts to 0.7~0.9 kg-m (61~78 in-lbs) of torque.



•Secure the instrument unit to the stem head. Be sure the right switch wiring harness and the left switch wiring harness run between the stem head and the instrument unit. The parts sequence from the top is rubber damper, stem head, rubber damper, flat washer, and nut.
•Run the speedometer cable through its guide at the 3-way joint. Run the tachometer cable through its guide, fit the inner cable into the tachometer, and tighten the cable nut with pliers.
•Connect the front brake light switch leads onto the switch and slide the rubber dust cover back on the switch. The leads may connect to either terminal.
•Run the plugs, sockets, and wiring into the headlight housing, and connect the plugs and sockets.
•Install the front turn signals (Pg. 118).
•Install the headlight unit (Pg. 117).
•Install the front fender between the front fork legs. First screw in the right side mounting bolts (2) with lockwashers, insert the guide holder plate between the left fork leg and the front fender, then install the left side mounting bolts (2) with lockwashers. Tighten the bolts securely.
•Secure the lower brake hose in its guide. Be sure the rubber grommet is in place.
•Run the speedometer cable lower end through its guide next to the front brake hose guide.
•Install the front wheel (Pg. 99).
•Check the front brake and bleed the system, if necessary (Pg. 180).
•Check the steering and adjust it, if necessary (Pg. 28).
•Install the fuel tank (Pg. 44).
•Adjust the clutch (Pg. 21).
•Adjust the headlight (Pg. 30).
•Adjust the throttle cables (Pg. 16).
•Adjust the rear view mirrors.

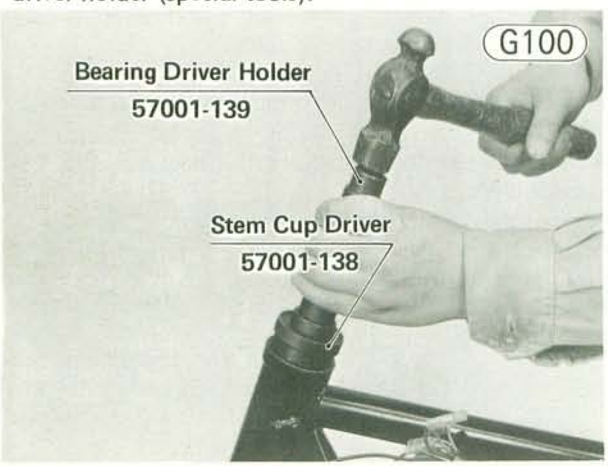
STEERING STEM BEARING
Removal:
•Remove the steering stem (Pg. 123).
•To remove the outer races pressed into the head pipe, insert a bar into the head pipe, and hammer evenly around the circumference of the opposite race to drive it out.

•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 and flat washer under the race during race removal.



Installation:

•Apply oil to the outer races, and then 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 then drive it onto the steering stem using the stem bearing driver (special tool).

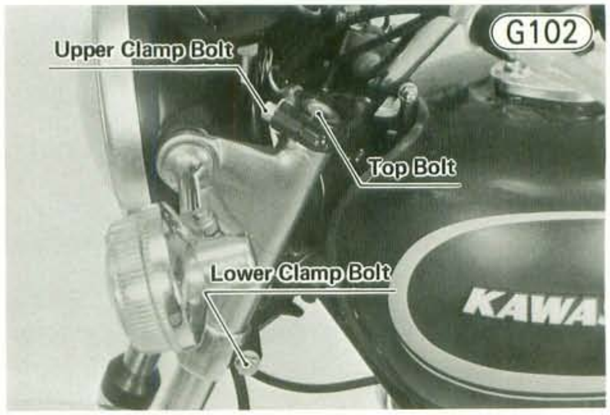
NOTE: Replace the grease seal with a new one, if damaged.

•Install the steering stem (Pg. 124).

FRONT FORK

Removal (left fork leg):

•Remove the front wheel (Pg. 99).
•Remove the bolts and lockwashers (2 ea) that hold the front fender to the left fork leg.
•Remove the caliper mounting bolts, lockwashers, and flat washers (2 ea); and rest the caliper on some kind of stand so that the brake fluid pipe is not bent.
•If the fork leg is to be disassembled after removal, loosen the top bolt now.



•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 to 1.6 ~ 2.2 kg-m (11.5 ~ 16.0 ft-lbs) of torque and the lower clamp bolt to 3.4~4.6 kg-m (25~33 ft-lbs).

•If the top bolt was loosened during removal, tighten it to 2.5 ~ 3.0 kg-m (18.0 ~ 22.0 ft-lbs) of torque.
•Install the caliper, tightening the caliper mounting bolts to 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 fork leg.
•Secure the lower brake hose in its guide. Be sure the grommet is in place.
•Install the front wheel (Pg. 99).

Removal (right fork leg):

•Remove the front wheel (Pg. 99).
•Remove the bolts and lockwashers (2 ea) that hold the front fender to the right fork leg.
•If the fork leg is to be disassembled after removal, loosen the top bolt now.
•Loosen the upper and lower clamp bolts.
•With a twisting motion, work the fork leg down and out.

Installation (right fork leg):

•Slide the fork leg up through the lower and upper clamps in the same way as the left fork leg installation, and tighten the upper and lower clamp bolts with the same torque for the left fork leg.
•If the top bolt was loosened during removal, tighten it with 2.5~3.0 kg-m (18.0~22.0 ft-lbs) of torque.
•Install the fender bolts (2). There is a lockwasher for each bolt.
•Install the front wheel (Pg. 99).

Disassembly:

•Remove the top bolt ⑰, and pull out the spring ㉑, and spring seat ㉟.
•Pour the oil into the 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 ㊸ and gasket ㊷ from the bottom of the outer tube ⑨ or ㊶, and then separate the inner tube from the outer tube by pulling it out.

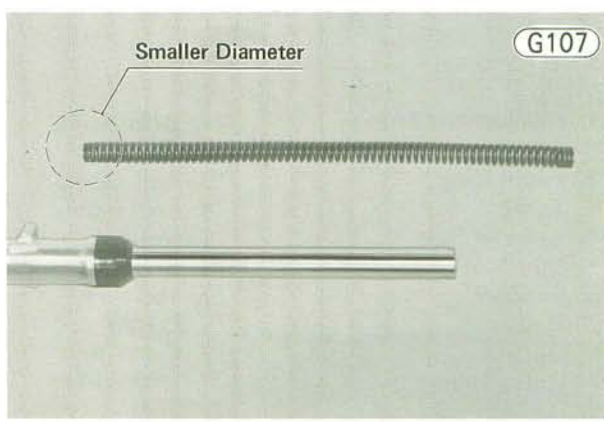
•Remove the dust seal ⑤ off the outer tube.
•Slide or push the cylinder ① and its spring ③ out the top of the inner tube.
•Remove the cylinder base ④ out the top of outer tube.
•Remove the retainer ⑥ from the outer tube with a sharp hook. Remove the washer ⑦, and then pull out the oil seal ⑧. Be careful not do damage the outer tube. It may be necessary to heat the outer tube around the oil seal before pulling it out.

Assembly Notes:

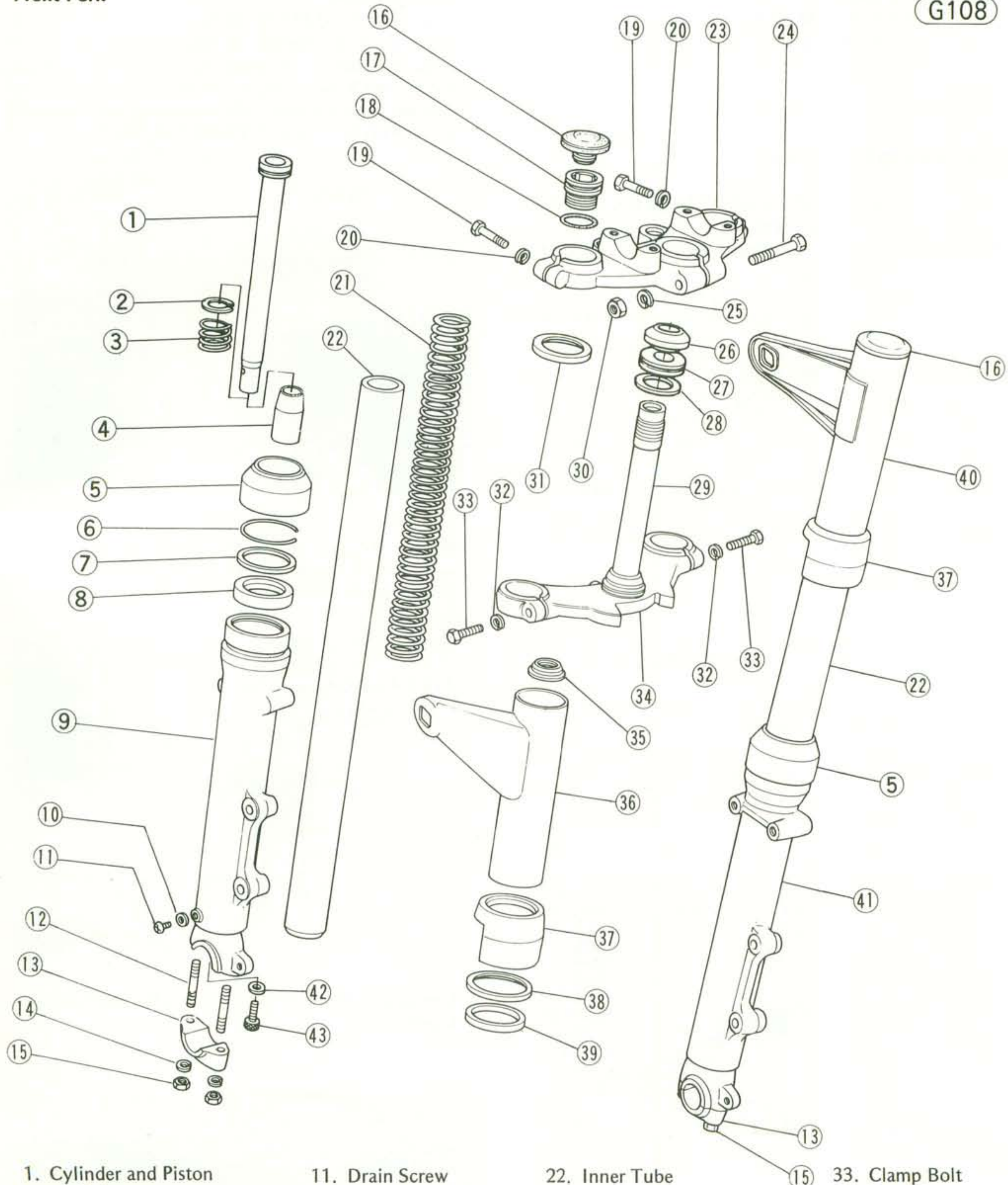
1. Apply liquid gasket to both sides of the gasket, apply a non-permanent locking agent to the Allen bolt, and tighten it using the front fork cylinder holder and holder adapter (special tools) to stop the cylinder from turning. The torque for the Allen bolt is 2.0~2.6 kg-m (14.5~19.0 ft-lbs).

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 ㉑ with the smaller diameter end facing down.



Front Fork



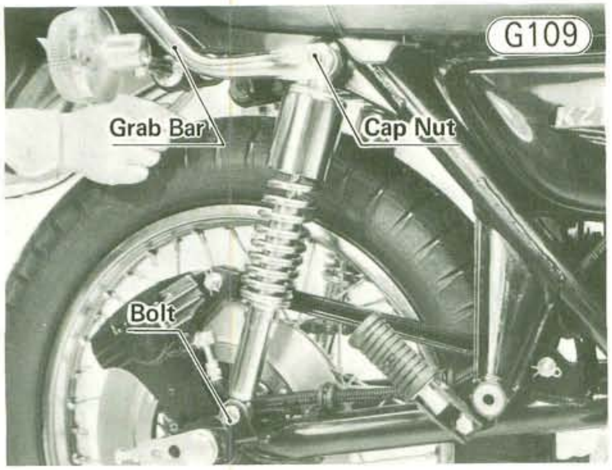
1. Cylinder and Piston Unit
2. Piston Ring
3. Spring
4. Cylinder Base
5. Dust Seal
6. Retainer
7. Washer
8. Oil Seal
9. Outer Tube
10. Gasket
11. Drain Screw
12. Stud
13. Axle Clamp
14. Lockwasher
15. Nut
16. Rubber Cap
17. Top Bolt
18. O Ring
19. Clamp Bolt
20. Lockwasher
21. Spring
22. Inner Tube
23.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

4. Refill with 180 ~ 188 cc of fresh SAE 10W20 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 ABSORBER

Removal (each side):

- Set the motorcycle up on its center stand.
- Remove the muffler (Pg. 43).
- Remove the grab bar mounting bolt, lockwasher, and flat washers on each side.



- Remove the cap nut, lockwasher, and flat washer on each side, and then slide the grab bar toward the rear, and remove the other two flat washers.
- Lift up on the rear wheel as necessary to avoid damaging the shock absorber bolt threads, and remove the shock absorber bolt and lockwasher.
- Pull off the shock absorber.

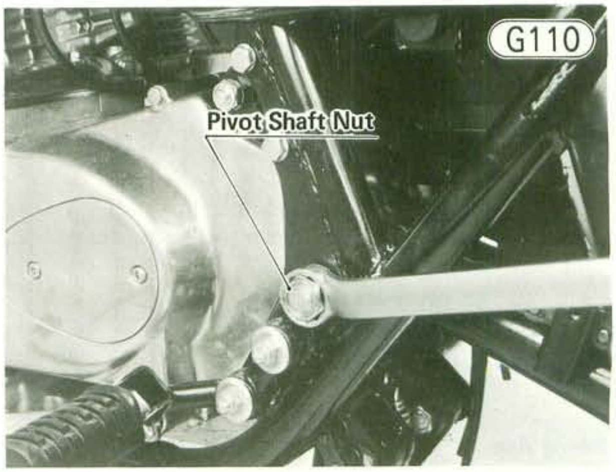
Installation (each side):

- Check that the rubber dampers (2) are fitted in the shock absorber upper pivot hole and fit the shock absorber onto 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 ~ 25.0 ft-lbs) of torque.
- Install the large flat washer, small flat washer, lockwasher, and cap nut, and then fit the passenger grab bar into place between the large and small flat washers on each side.
- Install and tighten the grab bar mounting bolts (2). Each bolt has a lockwasher and flat washers. One flat washer goes between the bar and the frame.
- Tighten each cap nut with 2.6 ~ 3.5 kg-m (19.0 ~ 25.0 ft-lbs) of torque.
- Mount the muffler (Pg. 43).
- Check to see that both adjusting sleeves are turned to the same spring preload position.

SWING ARM

Removal:

- Set the motorcycle up on its center stand.
- Remove the mufflers (Pg. 43).
- Remove the rear wheel (Pg. 106).
- Pull the rear brake hose out of the guides on the swing arm, and secure the brake hose to some place higher than the rear brake reservoir to prevent fluid loss.
- Remove the mounting bolt from the bottom of each shock absorber. A lockwasher comes off with the bolt.
- Move the swing arm up and down to check for abnormal friction.
- Remove the pivot shaft nut, and then pull out the pivot shaft.



- Pull back the swing arm. A cap on each side of the pivot will also drop off.

Installation:

- Lubricate the swing arm pivot (Pg. 189).
- Apply grease to the cap inner surfaces.
- Install the cap on each end of the pivot of the swing arm, and then put the left side of the swing arm through the drive chain loop.
- Position the pivot of the swing arm into place in the frame, and then slide in the pivot shaft from right to left. A screwdriver inserted into the left side of the pivot will keep the left cap in place.

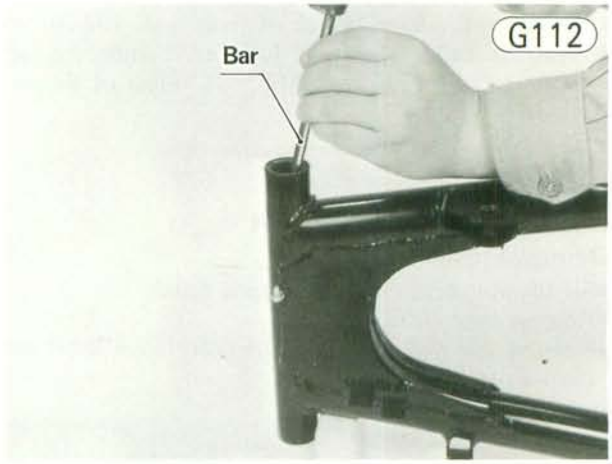
- Install the pivot shaft nut and tighten the nut with 8.0 ~ 12.0 kg-m (58 ~ 87 ft-lbs) of torque.
- Install the rear shock absorber bolts and lockwashers, tightening each bolt with 2.6 ~ 3.5 kg-m (19.0 ~ 25.0 ft-lbs) of torque.

- Secure the brake hose in its guides with the rubber grommets, and then install the brake hose fitting on the caliper, tightening its banjo bolt with 2.9~3.1 kg-m (21 ~ 22 ft-lbs) of torque Use a new flat washer for each side of the fitting.
- Fit the right side cover.
- Install the rear wheel (Pg. 107).
- Install the mufflers (Pg. 43).
- Refill the brake lines and bleed the air from the lines (Pg. 180).
- Adjust the drive chain (Pg. 26).

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 ⑩ from the torque link bolt ⑲. Take out the nut ⑨ and bolt, and then remove the torque link ⑱ from the swing arm ④.
- Pull out the swing arm sleeve ⑥.
- Insert a bar into one side, hammering on it lightly to knock out the needle bearings ③ on the opposite side.

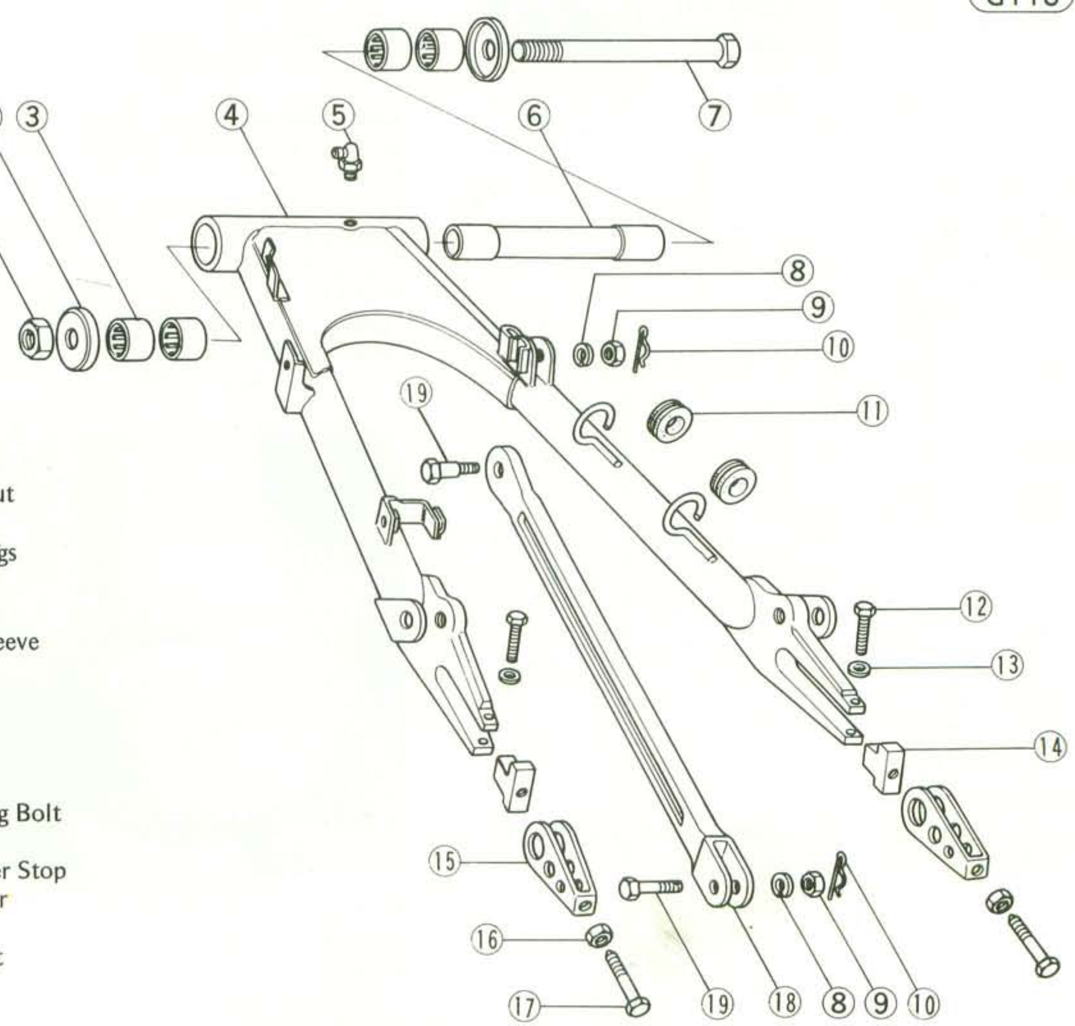


- Use the bar again to knock out the other bearings.

Assembly Notes:

1. Inspect the swing arm sleeve (Pg. 188), and replace it with a new one if it has worn past the service limit or is damaged. Also, replace all the needle bearings whenever the sleeve is replaced.

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. Lockwasher
9. Nut
10. Safety Clip
11. Grommet
12. Stop Mounting Bolt
13. Lockwasher
14. Chain Adjuster Stop
15. Chain Adjuster
16. Locknut
17. Adjusting Bolt
18. Torque Link
19. Bolt

2. Replace the needle bearings with new ones if either 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 with 2.6 ~ 3.5 kg-m (19.0 ~ 25.0 ft-lbs) of torque. Insert the safety clip through the bolt.
4. Adjust the drive chain (Pg. 26) 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. 106).
- Remove the swing arm (Pg. 129).
- Remove the engine sprocket cover (Pg. 60) as explained in the engine sprocket cover removal section. The clutch cable need not be removed from the clutch release lever.
- Remove the engine sprocket (Pg. 61), and then take off the chain.

Installation:

- Install the engine sprocket (Pg. 62), with the chain over it.

WARNING **Install the engine sprocket with the flat side facing out (Fig. E81 on Pg. 62). If it is installed backwards, the drive chain alignment will be upset. This may cause drive chain breakage and result in loss of control.**

- Install the engine sprocket cover (Pg. 60).
- Install the swing arm (Pg. 129).
- Install the rear wheel (Pg. 107).
- Install the mufflers (Pg. 43).
- Adjust the drive chain (Pg. 26).
- Adjust the clutch (Pg. 21).

Maintenance – Engine

Table of Contents

H

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.

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. 43). 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.

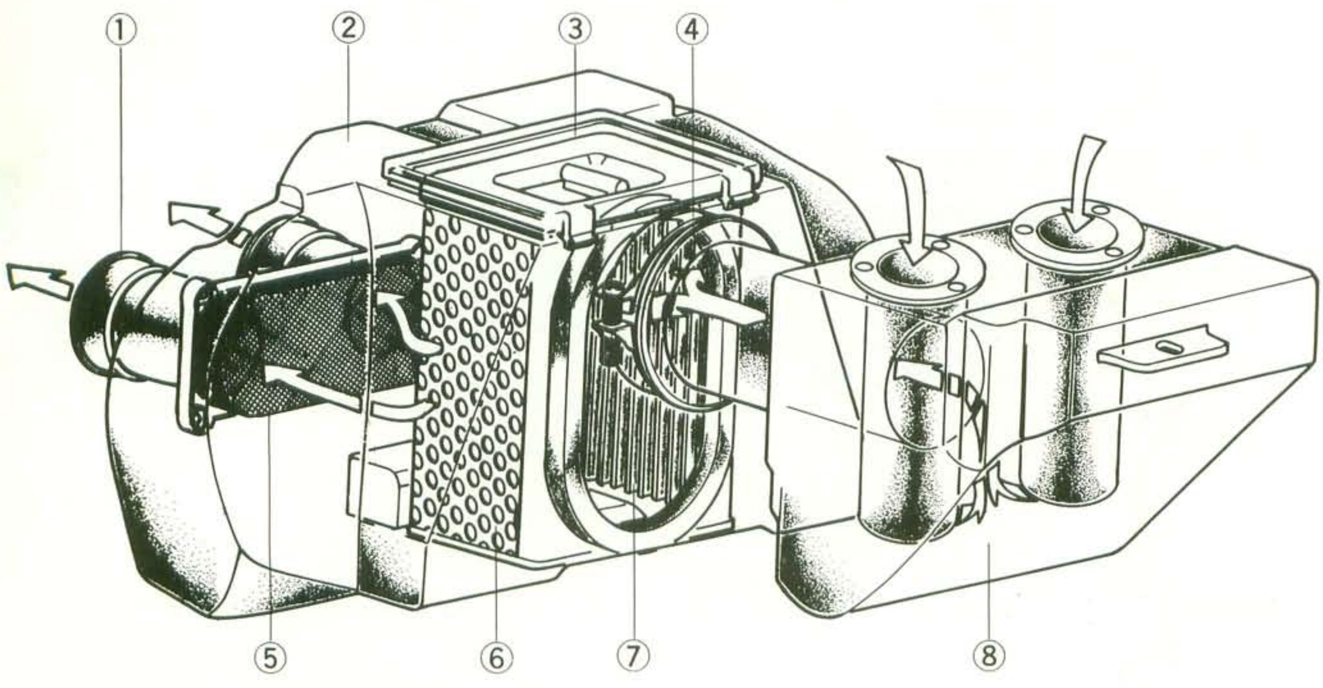
WARNING **Clean the element in a well-ventilated area, and take care that there is no spark or flame anywhere near the working area. Because of the danger of highly flammable liquids, do not use gasoline or low flash-point solvents to clean the element.**

If the sponge gaskets on the sides of the element come loose, stick them back on with bond or other adhesive. If the sponge or the element is damaged or holed, replace 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.

Air Cleaner

H1



1. Air Cleaner Duct
2. Air Cleaner Housing
3. Air Cleaner Cap
4. Clamp
5. Mesh
6. Air Cleaner Element Frame
7. Air Cleaner Element
8. Air Cleaner Silencer

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 (Pg. 16) and the idling, and synchronizing adjustments (Pg. 20) 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.

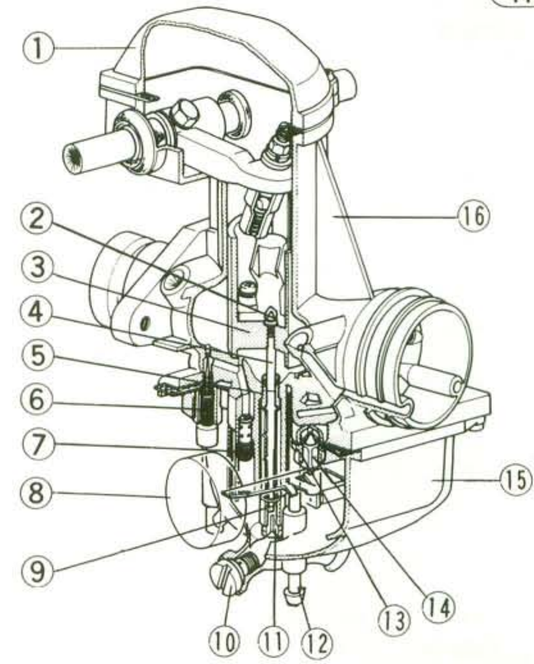
A linkage mechanism opens each carburetor throttle valve the same amount in response to throttle grip movement so that the carburetors operate in unison. As the throttle grip is turned counterclockwise, the throttle accelerator cable turns the carburetor pulley. Through the linkage mechanism the pulley opens the throttle valves. As the throttle grip is turned clockwise or is released, the linkage mechanism return spring, together with the throttle decelerator cable, closes the throttle 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,

Carburetor Constructions

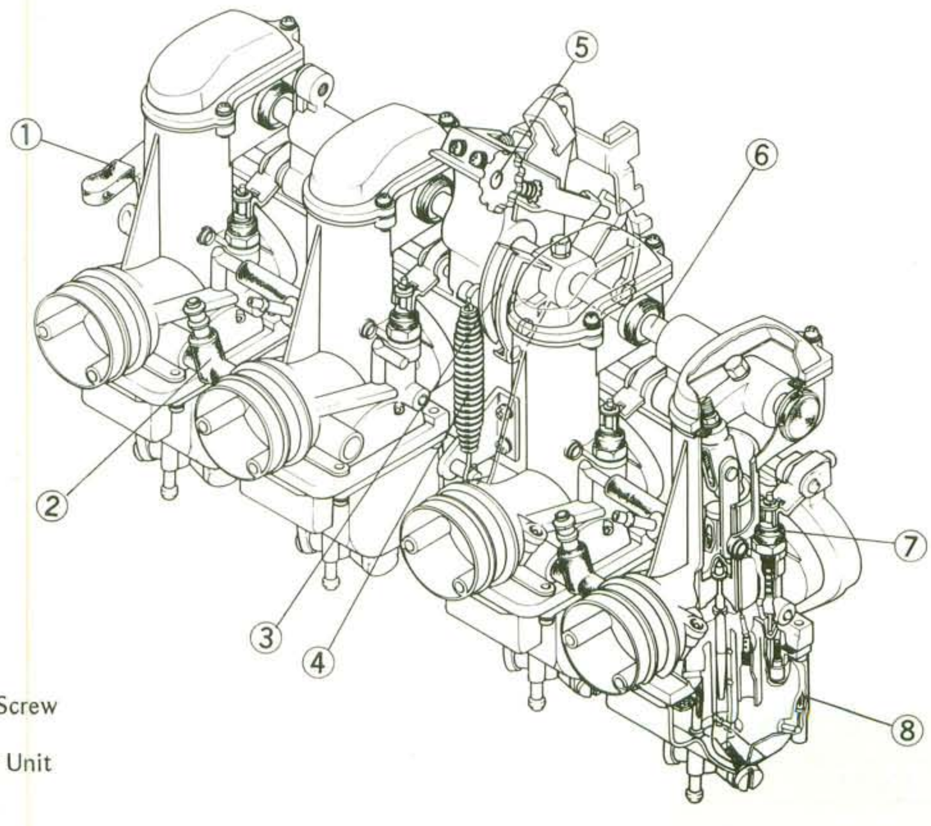
H2



1. Top Cover
2. Clip
3. Throttle Valve
4. Jet Needle
5. Needle Jet
6. Pilot Screw
7. Pilot Jet
8. Float
9. Air Bleed Pipe
10. Drain Plug
11. Main Jet
12. Overflow Pipe
13. Float Valve Seat
14. Float Valve Needle
15. Float Bowl
16. Carburetor Body

Carburetors

H3



1. Choke Lever
2. Fuel Pipe
3. Pulley
4. Spring
5. Idle Adjusting Screw
6. Throttle Shaft
7. Starter Plunger Unit
8. Starter Jet

especially at lower speeds the amount of the cutaway on the throttle valve makes use of this principle in determining the speed, and thus the pressure, of the air passing below it.

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 (varied with the throttle valve) 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 (measures) the fuel and air in the correct porportions at different throttle openings.

The ratio of fuel to air at different throttle openings is set through carburetor design by a number of inter-relating factors.

$0 \sim 1/8$ throttle	pilot screw (air screw)
$1/8 \sim 1/4$ throttle	throttle valve cutaway, pilot screw (air screw)
$1/4 \sim 3/4$ throttle	jet needle position
$3/4 \sim$ full throttle	main jet size

The carburetor specifications (Table H4) have been chosen for best all around performance.

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 H1 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 H2 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 as many rubber or plastic parts from the carburetors (Table H3) as possible before cleaning the carburetors with a cleaning solution. This will prevent damage or deterioration of the parts.**
2. **The carburetor body has plastic parts (Table H3) 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.**
4. **To avoid damaging the float when blowing the carburetor clean with compressed air, remove the float bowl and the float.**

Table H3 Carburetor Rubber Parts and Plastic Parts

Parts	Quantity	Removable
Link Shaft Dust Seal	6	Yes
Link Shaft End Cap	2	Yes
Throttle Valve Guide Pin	4	No
Float	4	Yes
Pilot Screw O Ring	4	Yes
Starter Plunger Seat Rubber	4	No
Fuel Hose	2	Yes
Over Flow Tube	4	Yes
Breather Hose	2	Yes
Air Bleed Pipe O Ring	4	Yes
Starter Plunger Dust Seal	4	Yes
Starter Plunger Bush	4	Yes
Drain Plug O Ring	4	Yes

Starter System

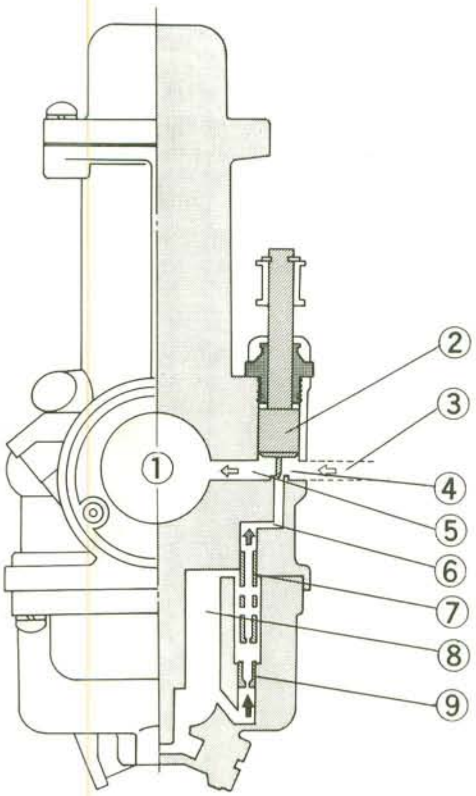
Fig. H4 shows the starter system, which includes the starter jet ⑨, starter pipe ⑦, starter plunger ②, starter air passage ③, plunger chamber ④, and mixture passage ⑤.

Table H4 *Carburetor Specifications*

Type	Main Jet	Needle Jet	Jet Needle	Pilot Jet	Throttle Valve Cutaway	Design Fuel Level	Service Fuel Level
VM26SS	102.5R	O-3	5CN7-4	15	2.0	32 ± 1 mm	2~4 mm

Starter System

H4

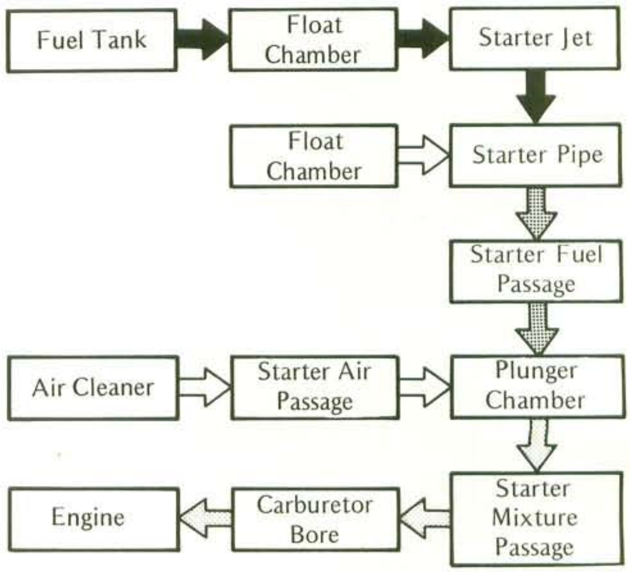


1. Carburetor Bore
2. Starter Plunger
3. Starter Air Passage
4. Plunger Chamber
5. Starter Mixture Passage
6. Starter Fuel Passage
7. Starter Pipe
8. Float Chamber
9. Starter Jet

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 throttle 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. The 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 carubretor bore where it, together with a small amount of mixture supplied by the pilot system, is drawn into the engine.

Starter System Fuel and Air Supply

H5



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 a damaged plunger seat rubber.

Cleaning (See caution Pg. 136)

Remove the 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.

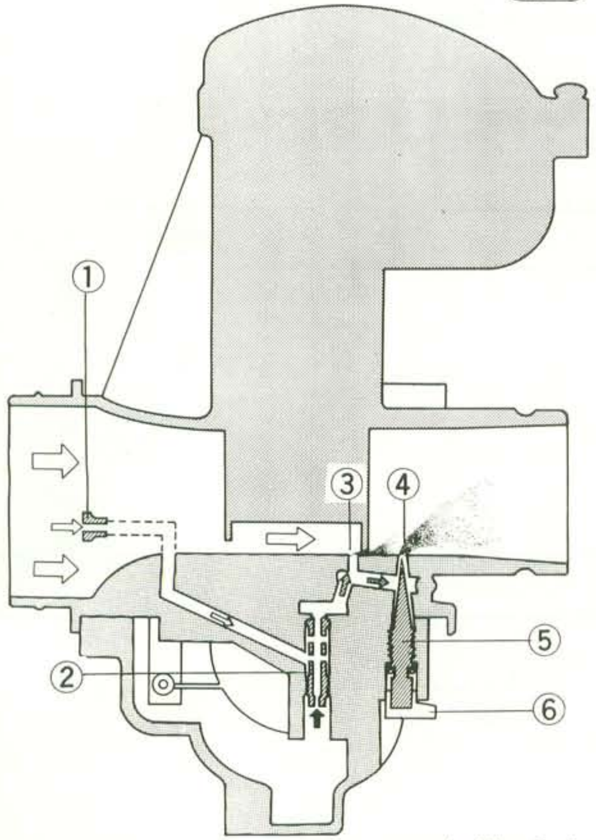
Pilot System

Fig. H6 shows the pilot system, which includes the pilot jet ②, pilot air jet ①, pilot outlet ④, and bypass outlet ③.

The pilot system determines the operation of the carburetor from 0 to ¼ throttle opening. At these small throttle openings, almost no fuel is drawn through the main system due to insufficient air flow. Instead,

Pilot System

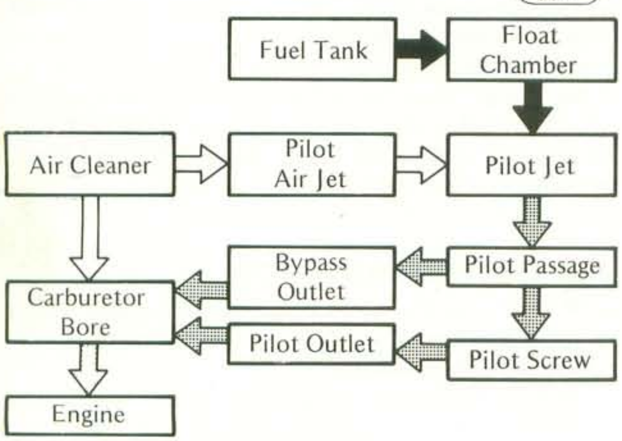
H6



1. Pilot Air Jet
2. Pilot Jet
3. Bypass Outlet
4. Pilot Outlet
5. Pilot Screw
6. Pilot Screw Limiter

Pilot System Fuel and Air Supply

H7



the fuel is drawn through the pilot jet 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 outlet and bypass outlet.

The supply of the fuel and air in the pilot system is shown in Fig. H7. Fuel 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 contorls flow to the pilot outlet, where the mixture enters the carburetor bore.

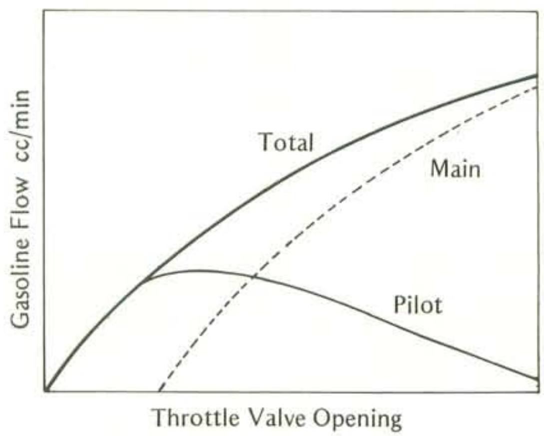
At the idling position the throttle valve restricts the carburetor bore air flow, preventing it from relieving the low pressure around the pilot outlet created by the engine's suction, while the venturi effect (i.e., the narrower the air passage, the faster the flow of air) at the engine side of the throttle valve further reduces the low pressure.

As the throttle valve rises, its position extends the low pressure area to the bypass outlet, allowing fuel to "bypass" part of the pilot passage and go directly to the carburetor bore. The mixture enters the carburetor bore through both the pilot outlet and bypass outlet. Once the throttle valve rises, it no longer concentrates the low pressure area around just the pilot outlet and bypass outlet.

Fig. H8 shows throttle valve opening versus fuel flow for the main and pilot systems. If trouble occurs in the pilot system, not only are starting and low speed runnig affected, but the transition from pilot to main system is not smooth as the throttle is opened, causing a drop in acceleration efficiency. Pilot system trouble might be due to maladjustment; a dirty or loose pilot jet; or clogging of the pilot outlet passage pilot jet passage, or pilot air jet passage.

Flow Characteristic

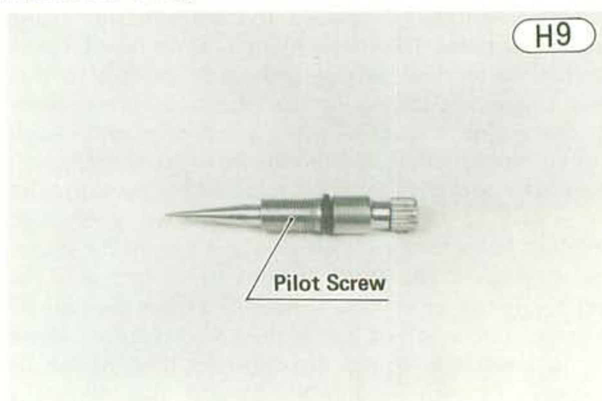
H8



Cleaning and replacement (See cautions Pg. 136)

Wash the pilot jet with a high flash-point solvent, and blow it clean with compressed air. Also use compressed air to clean the pilot outlet passage and air passage.

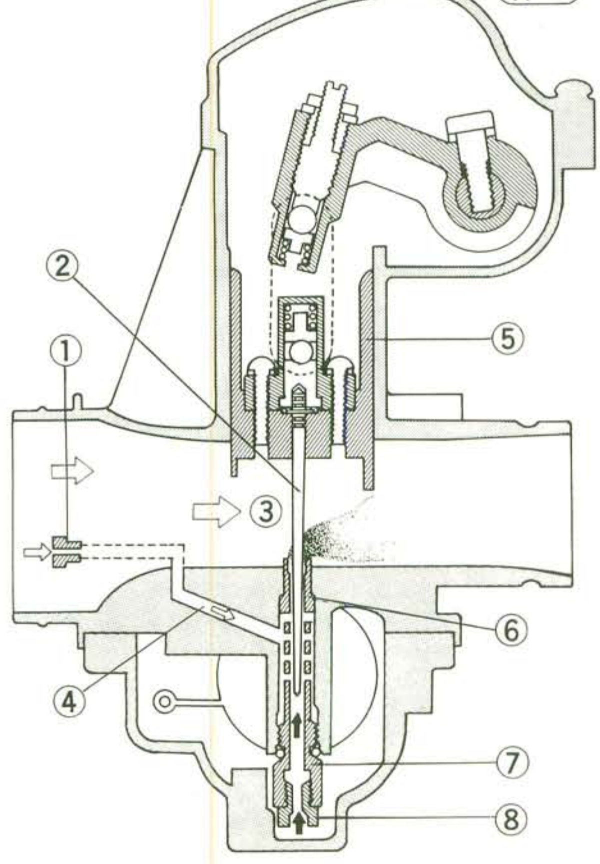
Remove the pilot screw (Pg. 47), and check that the tapered portion is not worn or otherwise deformed. If it is, replace the screw. If the screw **O** ring is damaged, replace the **O** ring.



Main System

Fig. H10 shows the main system, which consists of the main jet ⑧, bleed pipe ⑦, needle jet ⑥, jet needle ②, throttle valve ⑤, and air jet ①.

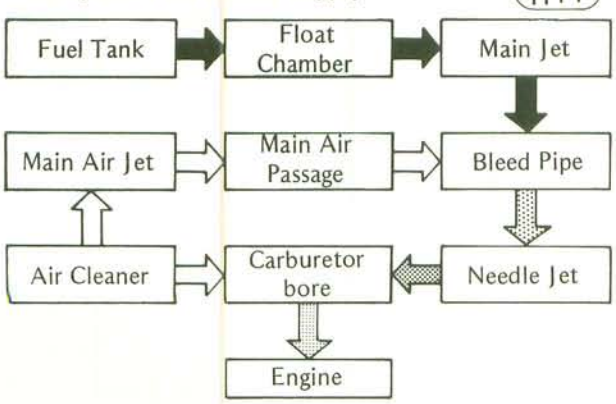
Main System (H10)



1. Main Air Jet
2. Jet Needle
3. Carburetor Bore
4. Main Air Passage
5. Throttle Valve
6. Needle Jet
7. Bleed Pipe
8. Main Jet

From about ¼ throttle opening, the air flow past the needle jet outlet is sufficient to cause most of the engine's fuel supply to be drawn through the main system. Fuel passes through the main jet and the bleed pipe, through the space in the needle jet around the jet needle, and into the carburetor bore, where it is atomized by the air flow to the engine.

Main System Fuel and Air Supply (H11)

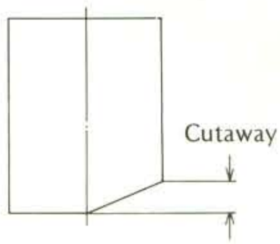


The bleed pipe has holes to admit the air metered by the main air jet. This air mixes with the fuel in the needle jet to prepare the fuel for better atomization in the carburetor bore.

The lower part of the jet needle is tapered and extends down into the needle jet. It is fixed to the throttle valve, and thus rises up in the needle jet as the throttle valve rises. At ¼ throttle opening, the tapered portion of the needle starts coming up out of the jet, which increases needle-to-jet clearance and thereby increases the amount of fuel that can pass up through the jet.

The amount of fuel drawn out of the needle jet is also influenced, particularly at lower speeds, by the amount of cutaway on the throttle valve. The amount of this cutaway, which is on the intake side of the throttle valve, helps define the size of the air passage directly above both the pilot outlets and needle jet outlet.

Throttle Valve (H12)



At near full throttle openings, the cross-sectional area of the needle to jet clearance becomes greater than the cross-sectional area of 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 air jet, its air passage, or the air holes in the bleed pipe; by needle jet or needle wear (increasing clearance); by a loose main jet; or by a loose bleed pipe.

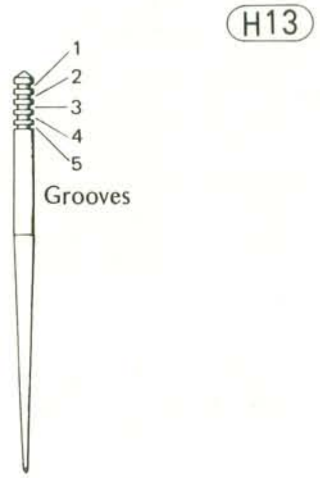
Cleaning and replacement (See caution Pg. 136)

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 ("4 of 5CN7-4) 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 topmost groove, 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.**

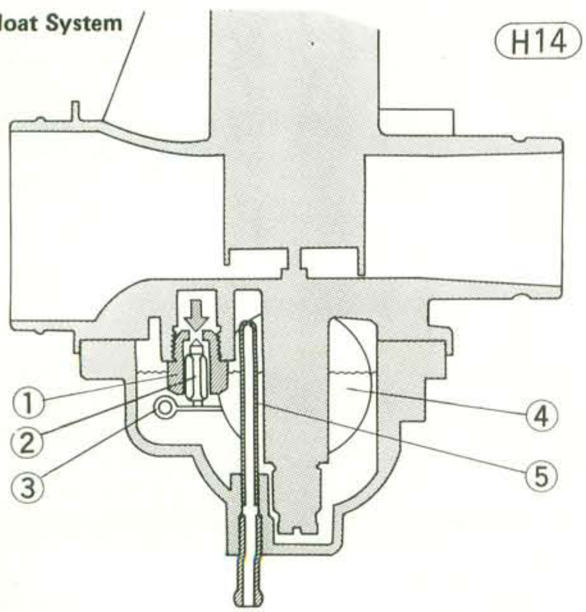
Jet Needle



Float System

Fig. H14 shows the float system, which consists of the float ④, float valve needle ②, float valve seat ①, and overflow pipe ⑤.

Float System



1. Float Valve Seat
2. Float Valve Needle
3. Float Pin
4. Float
5. Overflow Pipe

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. The 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 "ON" or "RES" 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 "PRI" position. Read the service fuel level in the plastic tube.

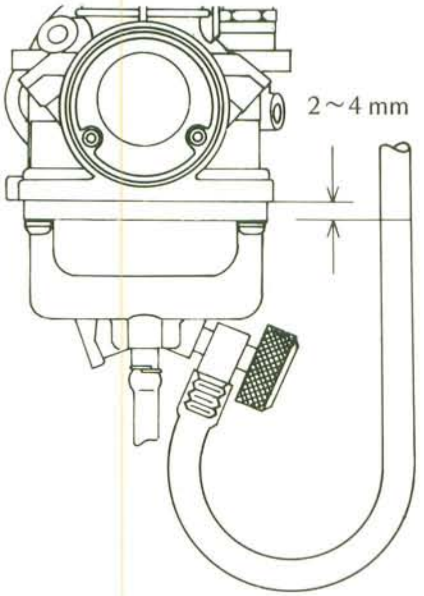
NOTE: Measure the fuel level keeping the carburetors fully perpendicular to the ground.

Table H5 Fuel Level

Service Fuel Level
2~4 mm from the edge of the carburetor body to the fuel level

Fuel Level Measurement

(H16)



If the fuel level is incorrect, remove the carburetor, 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 up closes the valve sooner and lowers the fuel level; bending it down raises the level.

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

Cleaning and replacement (See caution Pg. 136)

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.

Valve Needle

(H17)

CAMSHAFTS

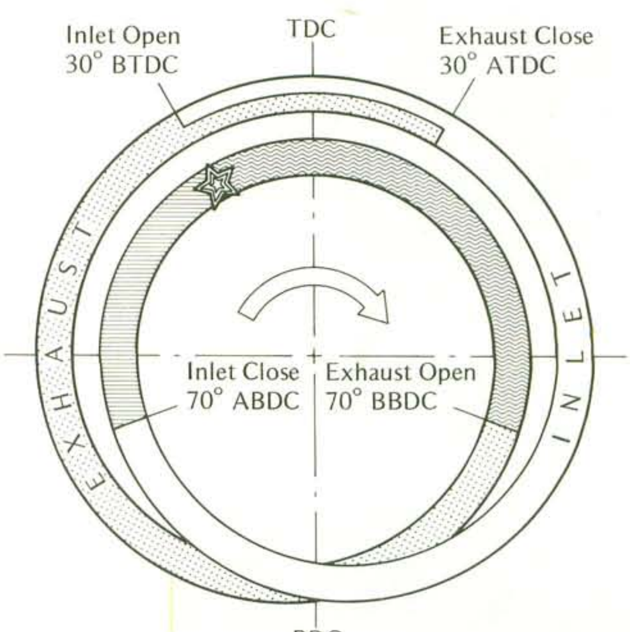
Since this engine is the DOHC (Double Over Head Camshaft) type, there are two camshafts mounted in the top of the cylinder head. One is the inlet camshaft, and is manufactured with four cam lobes, one to open the inlet valve for each cylinder. The other is the exhaust camshaft, and has four cam lobes 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. 50).

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. 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

(H18)



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

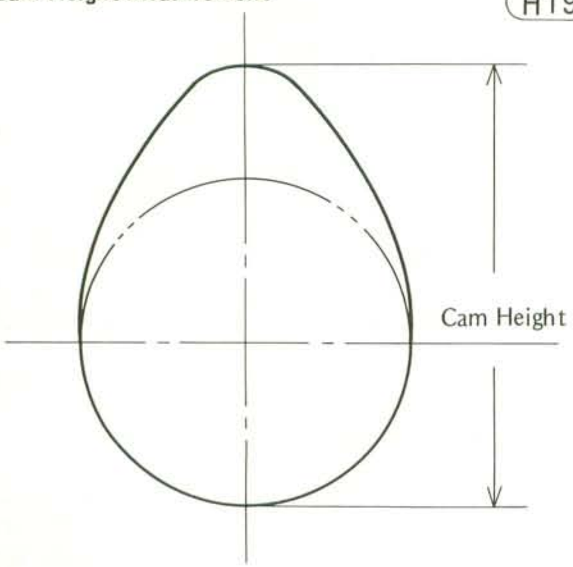


Table H6 Cam Height

	Standard	Service Limit
Inlet	36.21 ~ 36.39 mm	36.12 mm
Exhaust	35.71 ~ 35.89 mm	35.62 mm

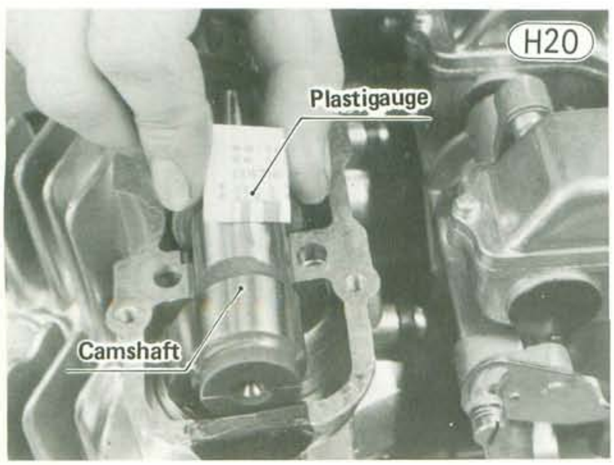
Journal, bearing wear

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

Now fit the chain over the camshaft sprocket so the shaft won't turn, and install the camshaft, tightening the bolts in the correct sequence with the specified torque (Pg. 49).

CAUTION **Install the camshaft while maintaining correct valve timing (according to the marks) (Pg. 50). If it is installed incorrectly, valve may be bent.**



Next, remove the camshaft again, and measure the plastigauge width to determine the clearance between each journal and bearing insert. If any clearance exceeds the service limit, replace all eight bearing inserts for that camshaft.

Table H7 Camshaft Journal/Bearing Insert Clearance

Standard	Service Limit
0.020~0.070 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.

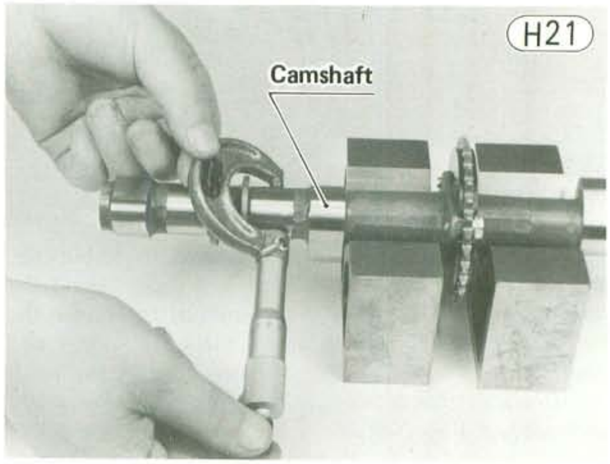


Table H8 Camshaft Journal Diameter

Standard	Service Limit
24.459 ~ 24.480 mm	24.42 mm

Camshaft runout

Remove the camshaft and take the sprocket off the shaft.

Suspend the shaft in **V** blocks at the points on the shaft where the bushings seat. Measure runout with a dial gauge set to the sprocket mounting location, and replace the shaft if runout exceeds the service limit.

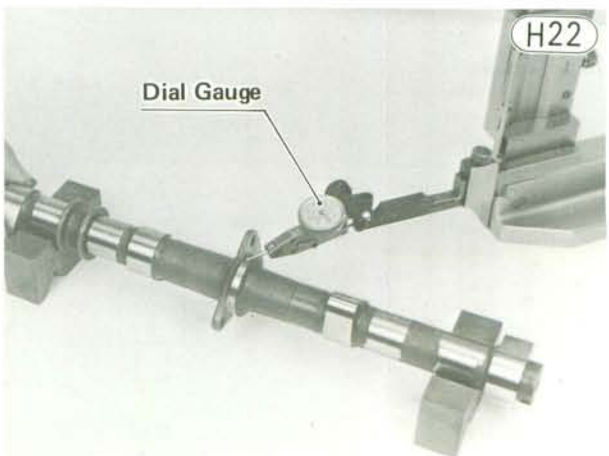


Table H9 Camshaft Runout

Standard	Service Limit
under 0.02 mm	0.10 mm

CAMSHAFT CHAIN, GUIDES

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.

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

Camshaft chain wear

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

Camshaft Chain Measurement

H23

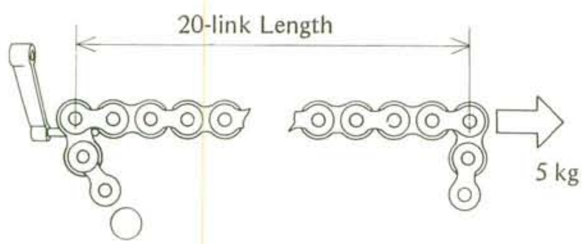
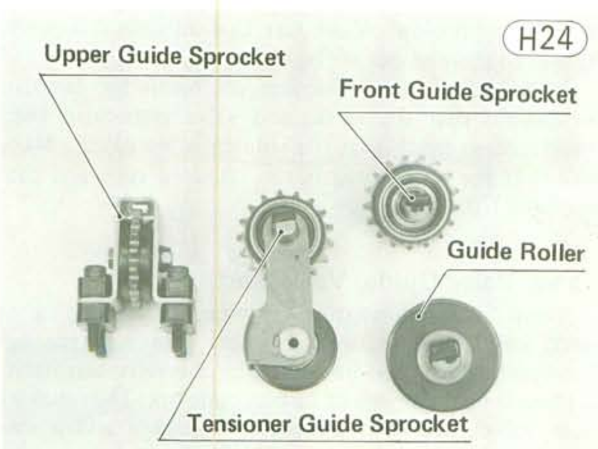


Table H10 Camshaft Chain 20-link Length

Standard	Service Limit
155.48 ~ 155.71 mm	157.8 mm

Chain guide wear

Remove all the chain guides, and inspect them visually. Replace them if the rubber or any other portion shows wear or damage.



CYLINDER HEAD, VALVES

The valves are mounted in the head; they are pushed open by the cams, and closed by the valve springs.

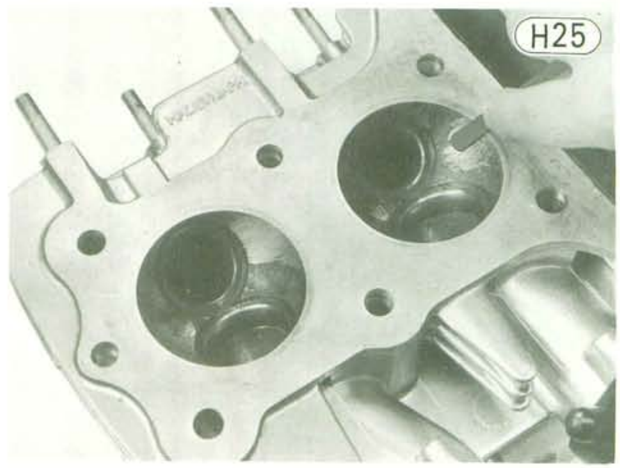
Valve guides are pressed into the cylinder head, and the valve seats are cast in. The valve seat, which is cut to the angles shown in Fig. H40, prevents compression leakage by fitting snugly against the valve. It also prevents the valve from overheating by allowing efficient heat transfer.

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. 51) and valves (Pg. 52). 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, repair the mating surface. Replace the cylinder head if the mating surface is badly damaged.

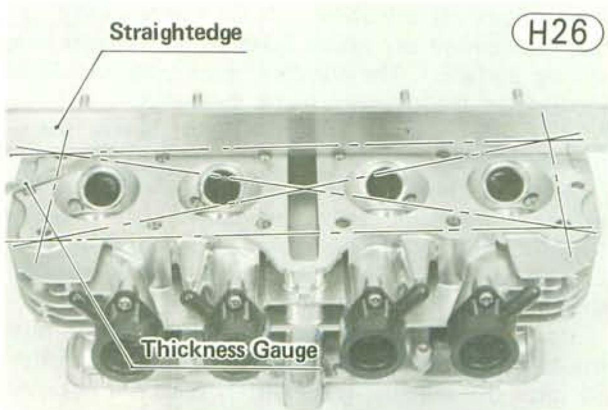


Table H11 Cylinder Head Warp

Service Limit
0.05 mm

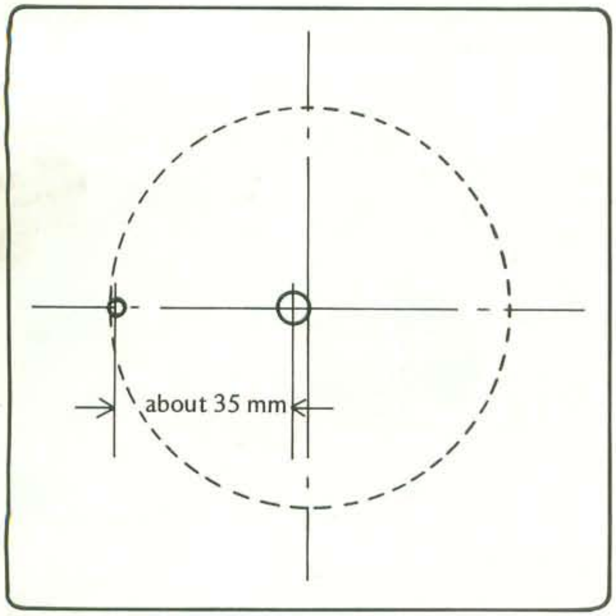
Combustion chamber volume measurement

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 (H27)



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

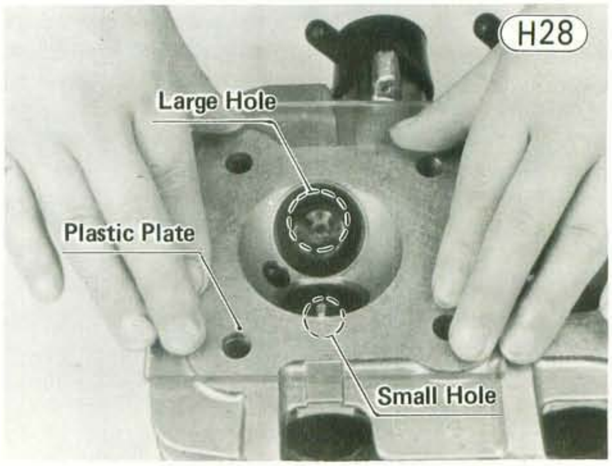
Prior to the combustion chamber volume measurement, clean off any carbon on the combustion chamber, and remove any gasket flakes on the cylinder head mating surface. The standard spark plug should be installed in the chamber to be measured.

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 *within 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 until the chamber is completely filled but not overflowing. 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.



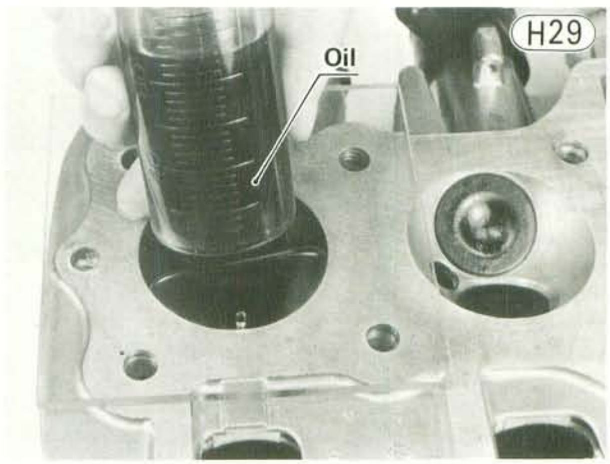


Table H12 Combustion Chamber Volume

Standard
34.3 ~ 35.1 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 if the thickness is under the service limit.

Valve Shape (H30)

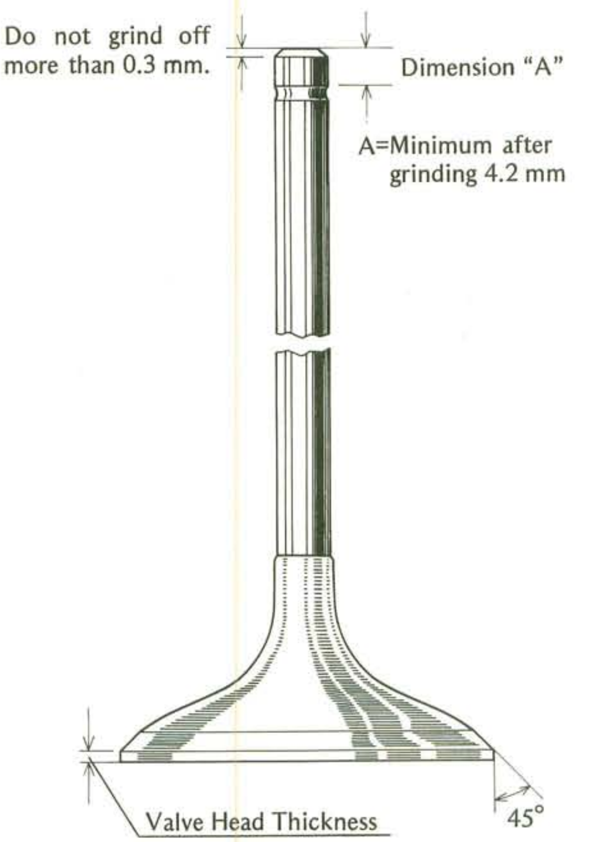


Table H13 Valve Head Thickness

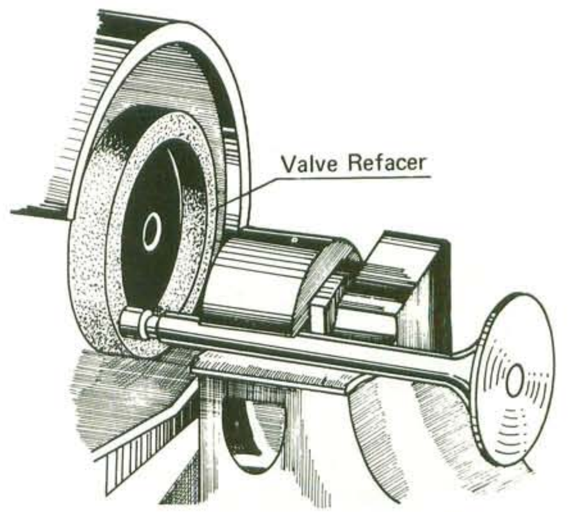
Standard	Service Limit
0.85 ~ 1.15 mm	0.5 mm

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°.

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 Stem Grinding (H31)



Hold the valve at both ends of the straight stem portion, and set a dial gauge against the center of the stem. One example is shown in Fig. H32.

Turning the valve, read a variation in the dial gauge. Replace the valve if it is bent over the service limit.

Valve Stem Bend (H32)

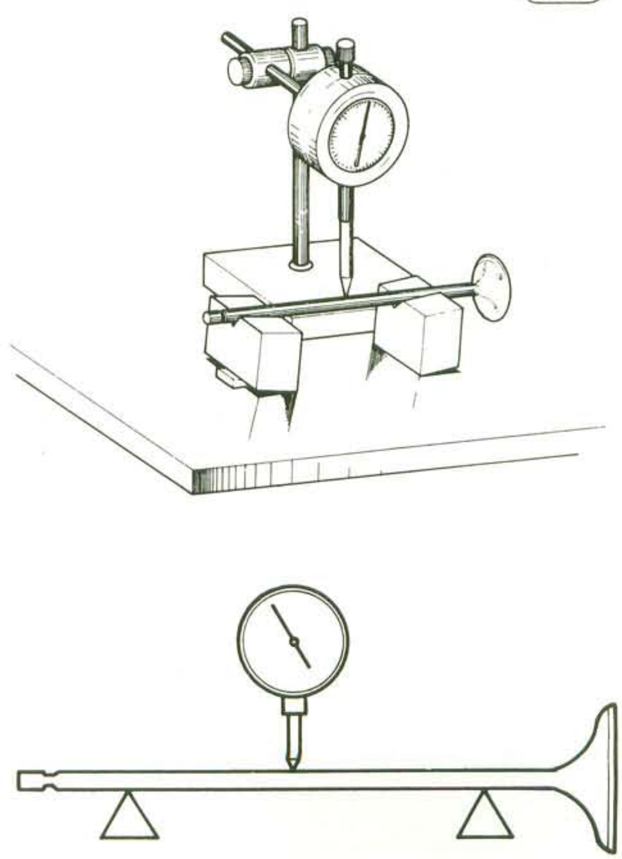


Table H14 Valve Stem Bend

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.

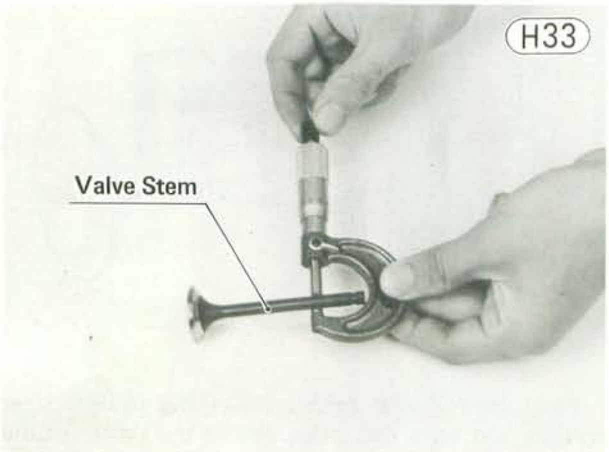


Table H15 Valve Stem Diameter

	Standard	Service Limit
Inlet	6.965~6.980 mm	6.90 mm
Exhaust	6.955~6.970 mm	6.90 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.

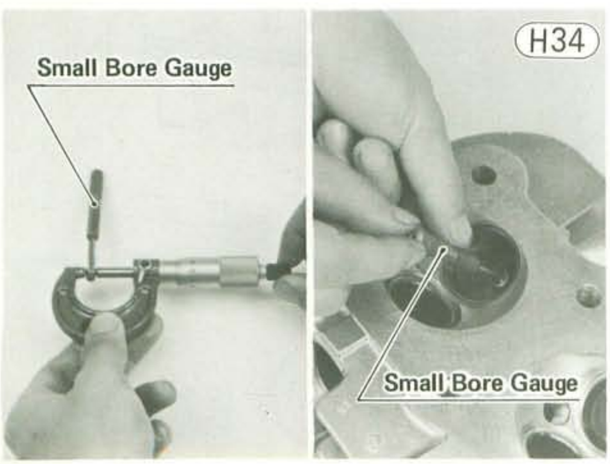


Table H16 Valve Guide Inside Diameter

Standard	Service Limit
7.000~7.015 mm	7.08 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 guage 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.

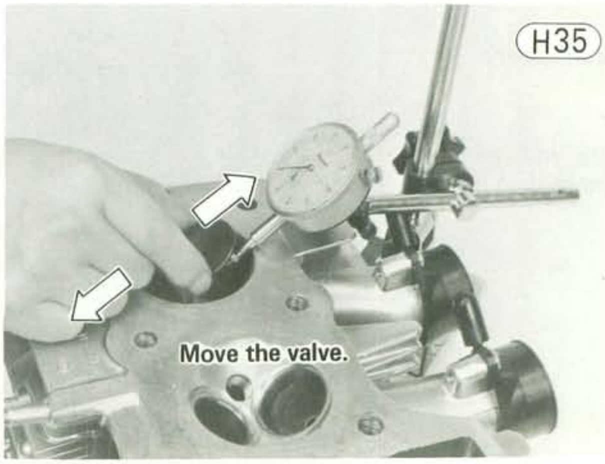


Table H17 Valve/Valve Guide Clearance (Wobble Method)

	Standard	Service Limit
Inlet	0.050~0.124 mm	0.25 mm
Exhaust	0.071~0.142 mm	0.24 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

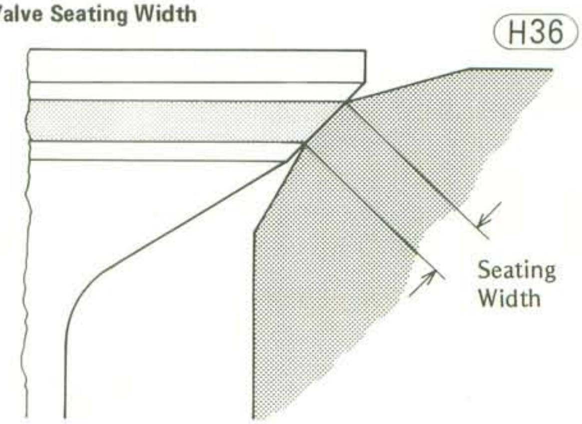
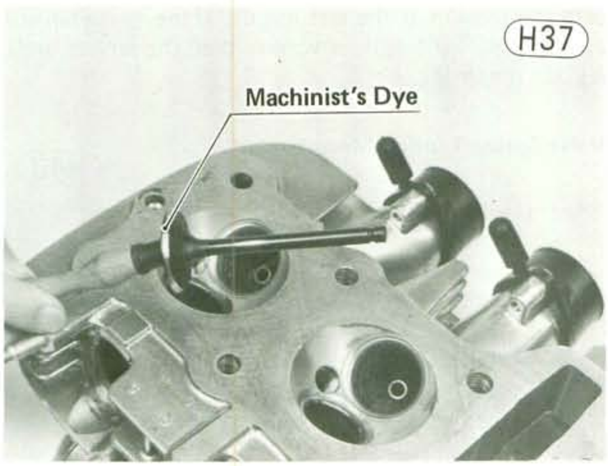


Table H18 Valve Seating Width

Standard
0.8~1.2 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. H36). The distribution of the dye on the seating surface gives an indication of seat condition (Fig. H39).

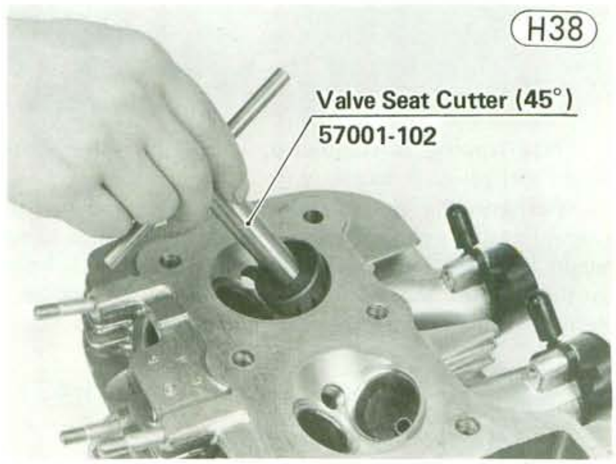
NOTE: The valve and valve guide must be in good condition before this check will give an accurate indication of valve seat condition.



A valve seat which requires repair is cut with a set of valve seat cutters (special tools). Four cutters are required for complete repair; one 30° (inlet valve seat only); one 45°; and two 60° cutters, one for the inelt and the other for the exhaust.

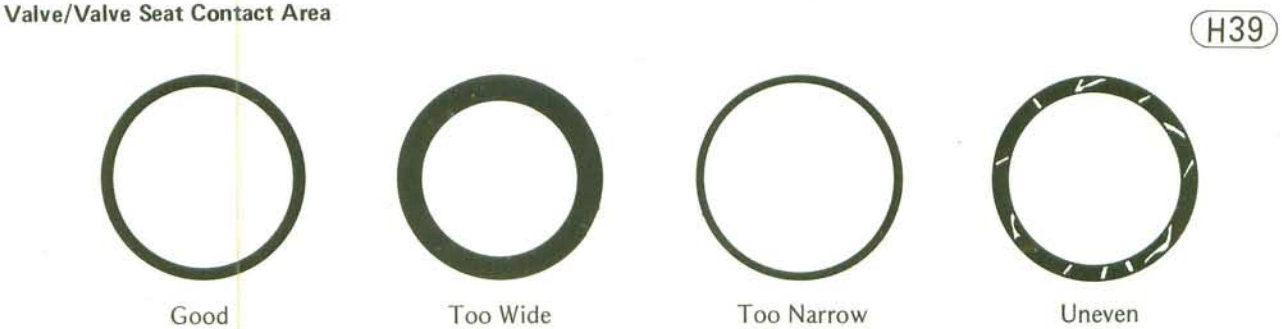
First, cut the seating surface of the valve seat with the 45° cutter. Cut only the amount necessary to make a good surface; overcutting will reduce the valve clearance, possibly making it no longer adjustable.

Next, use the 30° cutter (inlet valve seat only) to cut the surface inside the seating surface, and then use the 60° cutter to cut the outermost surface. Cut these two surfaces so that the seating surface will have the specified width.

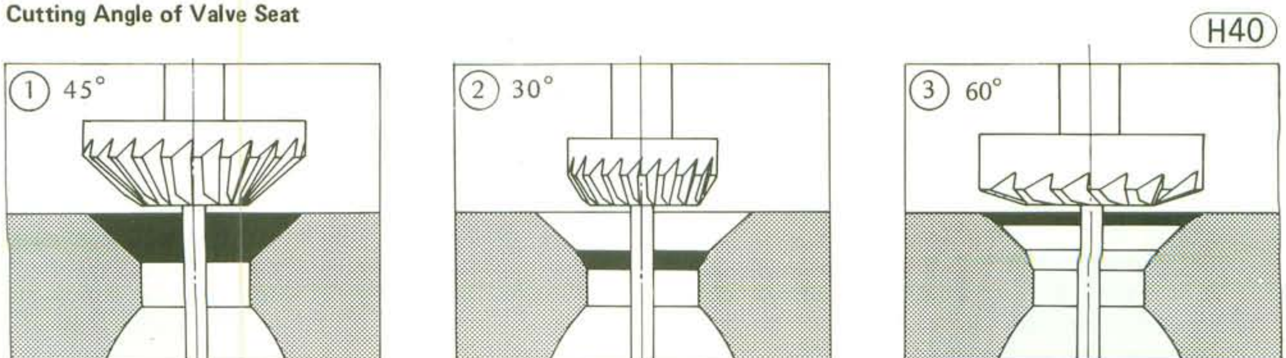


After cutting, lap the valve to properly match the valve and valve seat surfaces. Start off with coarse lapping compound, and finish with fine compound.

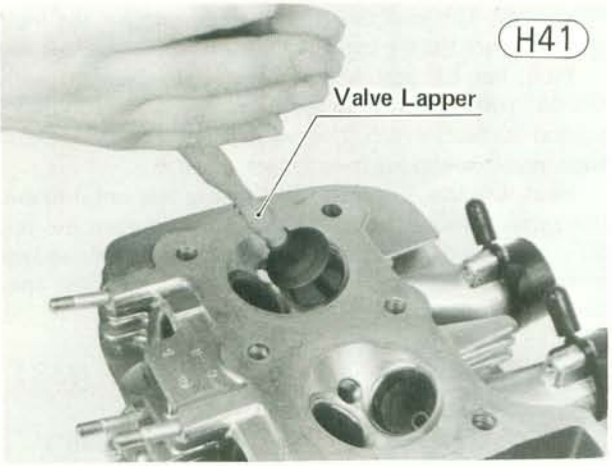
Valve/Valve Seat Contact Area



Cutting Angle of Valve Seat



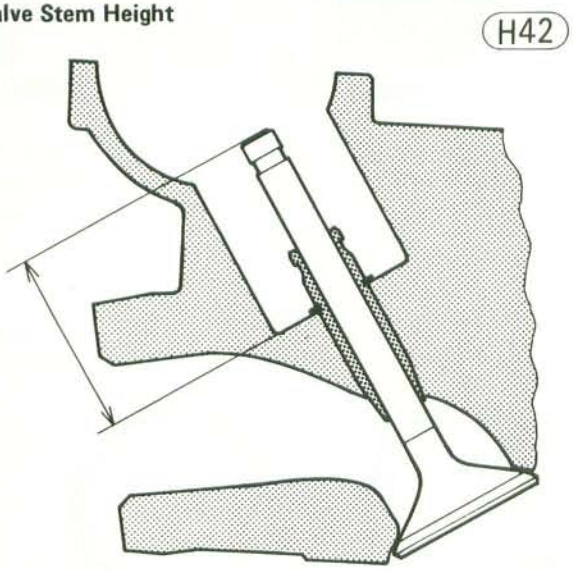
Apply compound to the valve seat, and tap the valve lightly into place while rotating it with a lapper, repeating this until a smooth, matched surface is obtained.



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 Table H20 for the recommended repair.

Valve Stem Height



Be sure to mark each valve so it will be properly matched to its corresponding valve seat during assembly.

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. 145).

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

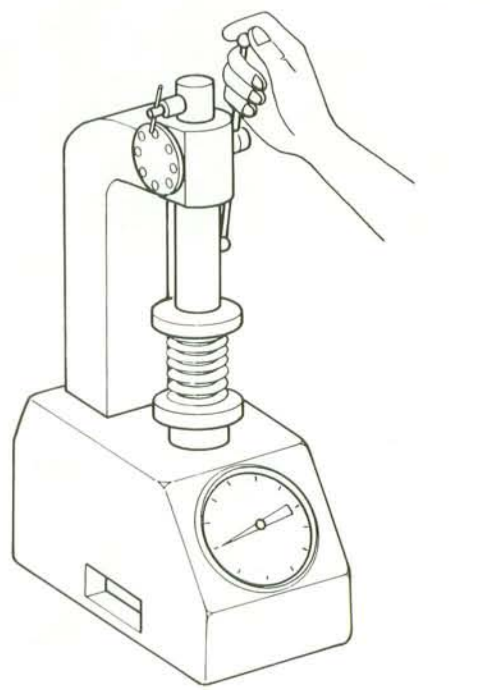


Table H19 Valve Spring Tension

	Length	Standard	Service Limit
Inner	23.6 mm	26.20~28.96 kg	24.7 kg
Outer	25.6 mm	49.06~54.22 kg	46.2 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.

Table H20 Valve Installed Height Procedure

Measurement	Probable Cause	Recommendation	
Less than 37.17 mm	Valve stem ground previously	1. Check to be sure to leave at least 4.2 mm of stem end above the wide groove portion. See Pg. 145. 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.	
		Assemble with this shim:	After checking valve clearance, final shim may be in this range:
37.17~37.21 mm		2.80 mm	2.80~3.20 mm
37.22~37.26		2.75	2.75~3.20
37.27~37.31		2.70	2.70~3.15
37.32~37.36		2.65	2.65~3.10
37.37~37.41		2.60	2.60~3.05
37.42~37.46		2.55	2.55~3.00
37.47~37.51		2.50	2.50~2.95
37.52~37.56		2.45	2.45~2.90
37.57~37.61	Normal/acceptable	2.40	2.40~2.85
37.62~37.66		2.35	2.35~2.80
37.67~37.71		2.30	2.30~2.75
37.72~37.76		2.25	2.25~2.70
37.77~37.81		2.20	2.20~2.65
37.82~37.86		2.15	2.15~2.60
37.87~37.91		2.10	2.10~2.55
37.92~37.96		2.05	2.05~2.50
37.97~38.01		2.00	2.00~2.45
38.02~38.06		2.00	2.00~2.40
38.07~38.37 mm	Wear or grinding of valve face and valve seat allowed valve to drop too far into valve seat.	1. Interchange valve to shallowest cut valve seat. Remeasure. 2. Grind 0.3 mm maximum off valve stem. See CAUTION, Pg. 145. Remeasure.	
More than 38.37 mm	Valve face and valve seat worn out or excessively ground.	1. Replace valve. Remeasure. 2. Replace cylinder head. Remeasure.	

Valve Spring Squareness

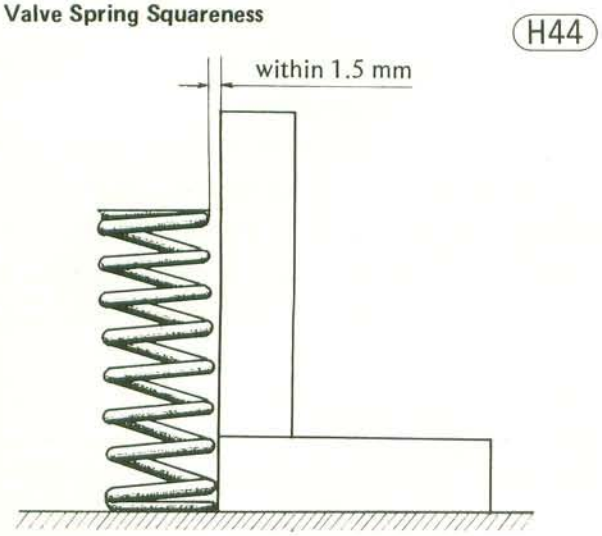


Table H21 Valve Spring Squareness

Standard	Service Limit
under 1.0 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. 37) 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 H22 Cylinder Compression†

Standard	Service Limit
9~11 kg/cm² (128~156 psi)	7 kg/cm² (100 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. Cylinder head volume (Pg. 144).

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

1. Leakage around the cylinder head – replace the head gasket and check the cylinder head warp (Pg. 143).
2. Condition of the valve seating (Pg. 146).
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. H46. 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 71 mm, the cylinder block must be replaced.

Cylinder Diameter Measurement

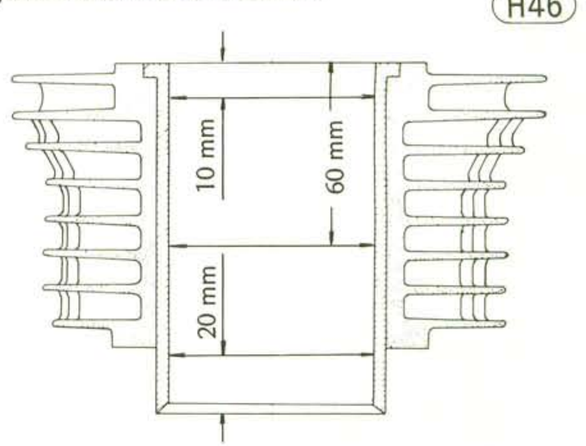


Table H23 Cylinder Inside Diameter

Standard	Service Limit
70.000 ~ 70.012 mm, and less than 0.01 mm difference between any two measurements	70.10 mm, or 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.

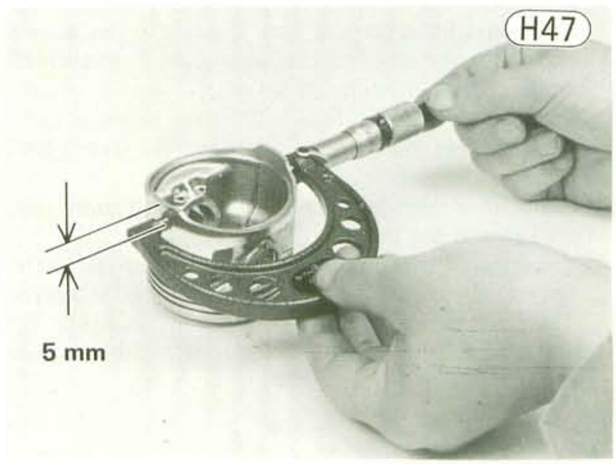


Table H24 Piston Diameter

Standard	Service Limit
69.942~69.957 mm	69.80 mm

Table H23 applies only to a cylinder that has not been bored to oversize, and Table H24 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 H25 Piston/Cylinder Clearance

Standard
0.043 ~ 0.070 mm

Boring, honing

When boring and honing a cylinder, note the following:

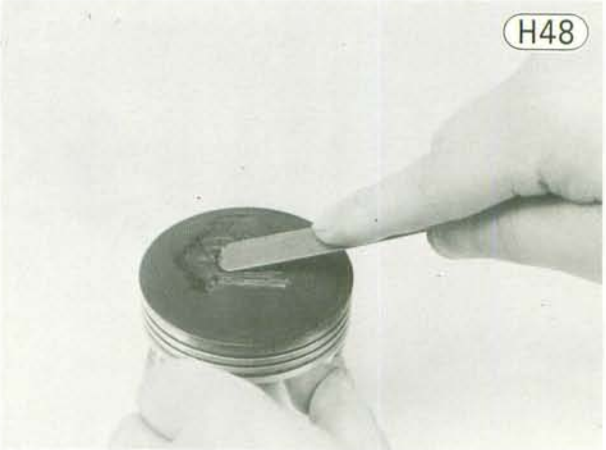
1. Before boring a cylinder, first measure the exact diameter of the oversize piston, and then, in accordance with the standard clearance given in Table H25, determine the diameter of the rebore.
2. To avoid cylinder distortion due to unbalanced metal temperatures, bore the cylinders in 2-4-1-3 or 3-1-4-2 order.
3. Cylinder inside diameter must not vary more than 0.01 mm at any point.
4. Be wary of measurements taken immediately after boring since the heat affects cylinder diameter.
5. There are two sizes of oversize pistons available: 0.5 mm and 1.0 mm. Oversize pistons require oversize rings.

Piston/cylinder seizure

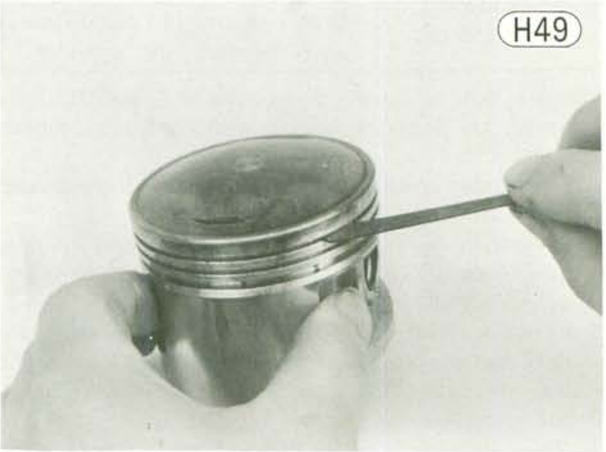
Remove the cylinder block and pistons to check the damage. If there is only slight damage, the piston may be smoothed with #400 emery cloth, and any aluminum deposits removed from the cylinder with either #400 emery cloth or light honing. However, in most cases, the cylinder will have to be bored to 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. 55), 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.**

Piston 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 H26 Piston Ring/Groove Clearance

	Standard	Service Limit
Top	0.040~0.080 mm	0.15 mm
2nd	0.030~0.070 mm	0.15 mm

Table H27 Piston Ring Thickness

	Standard	Service Limit
Top and 2nd	1.170~1.190 mm	1.10 mm

Table H28 Piston Ring Groove Width

	Standard	Service Limit
Top	1.23~1.25 mm	1.33 mm
2nd	1.22~1.24 mm	1.32 mm
Oil	2.51~2.53 mm	2.60 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 (top, second)

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

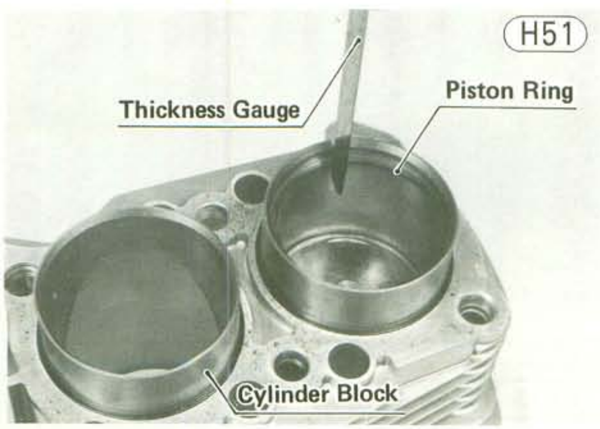


Table H29 Ring End Gap

	Standard	Service Limit
Top and 2nd	0.30~0.50 mm	0.80 mm

Piston ring tension (top, second)

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.

Piston Ring Free Gap

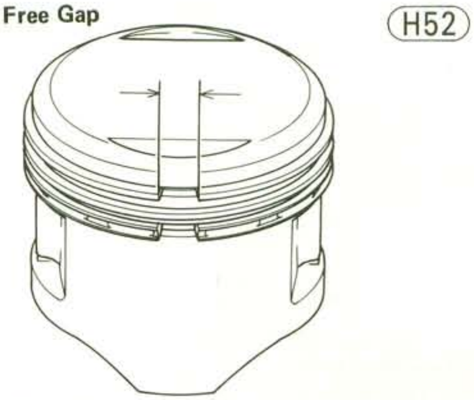


Table H30 Ring Free Gap

	Standard	Service Limit
Top	about 7.0 mm	6.3 mm
2nd	about 8.0 mm	7.2 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.

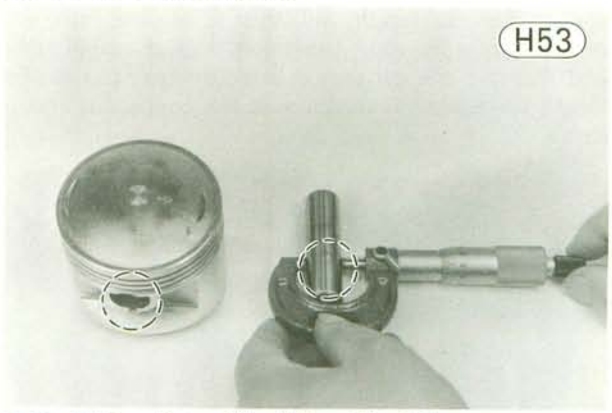


Table H31 Piston Pin, Piston Pin Hole, Small End Diameter

	Standard	Service Limit
Piston Pin	16.995~17.000 mm	16.96 mm
Pin Hole	17.004~17.011 mm	17.08 mm
Small End	17.003~17.014 mm	17.05 mm

NOTE: When a new piston or pin is used, also check that piston-to-pin clearance is 0.004 ~ 0.016 mm, and that pin to small end clearance is within 0.003 ~ 0.019 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.

This manual lists some of the more common crankshaft troubles and the method for detecting them; it does not explain crankshaft disassembly. Crankshaft disassembly requires exacting tolerances and highly specialized equipment; when the crankshaft becomes defective for one or more reasons, it should be replaced as an assembly, or rebuilt by a properly equipped Kawasaki rebuilding station.

NOTE: The crankshaft bearing caps are machined assembled with the crankcase, and if the caps are damaged during repairs or otherwise, the caps and crankcase must be replaced as a machine-matched set.

Connecting rod bending or twisting

Remove the bearing from each end of the crankshaft and set the crankshaft in **V** blocks on a surface plate. Select an arbor of the same diameter as the piston pin and of optional length, and insert it into the small end of the connecting rod. Use a height gauge or dial gauge and measure the difference in height over a 100 mm length to determine the amount the connecting rod is bent.

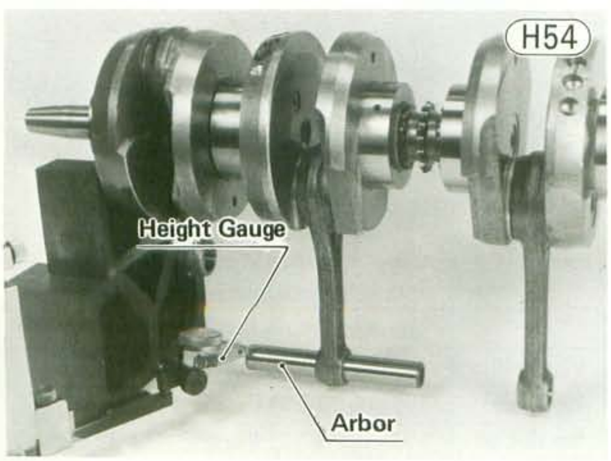


Table H32 Connecting Rod Bend

Standard	Service Limit
under 0.05 mm/100 mm	0.20 mm

Using the arrangement and arbor shown below, measure the amount that the arbor varies from being parallel with the crankshaft, over a 100 mm length of the arbor.

If either of the above measurements exceeds the service limit, the crankshaft assembly should be replaced.

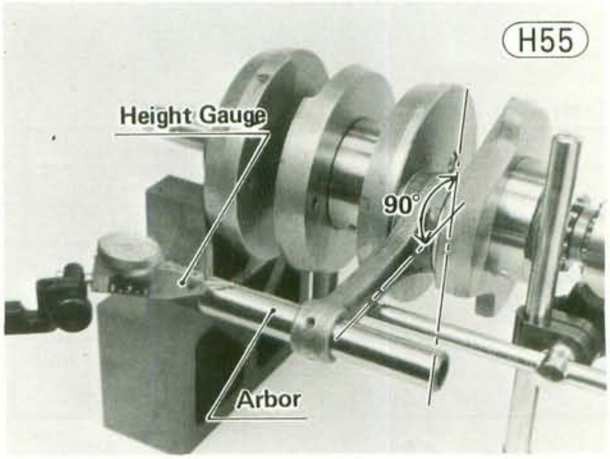


Table H33 Connecting Rod Twist

Standard	Service Limit
under 0.05 mm/100 mm	0.20 mm

Connecting rod big end radial clearance

Remove the bearing from either end of the crankshaft and suspend it in **V** blocks. Set a dial gauge against the big end of the connecting rod, and first push the connecting rod toward the gauge and then in the opposite direction. The difference between the two gauge readings is the radial clearance.

If radial clearance exceeds the service limit, the crankshaft should be replaced.

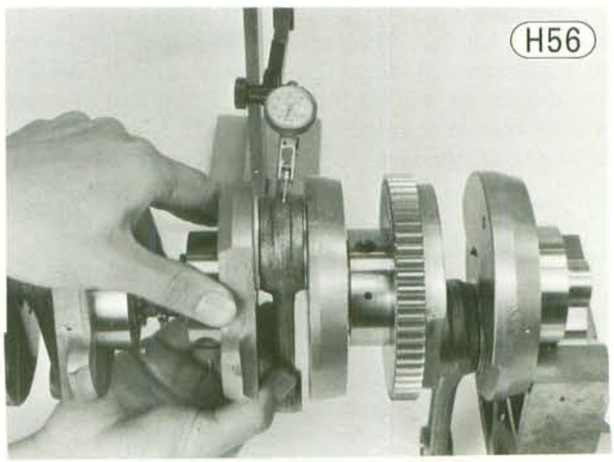


Table H34 Connecting Rod Big End Radial Clearance

Standard	Service Limit
0.016 ~ 0.030 mm	0.08 mm

Connecting rod side clearance

Measure the side clearance of the connecting rod with a thickness gauge as shown. Replace the crankshaft if the clearance exceeds the service limit.

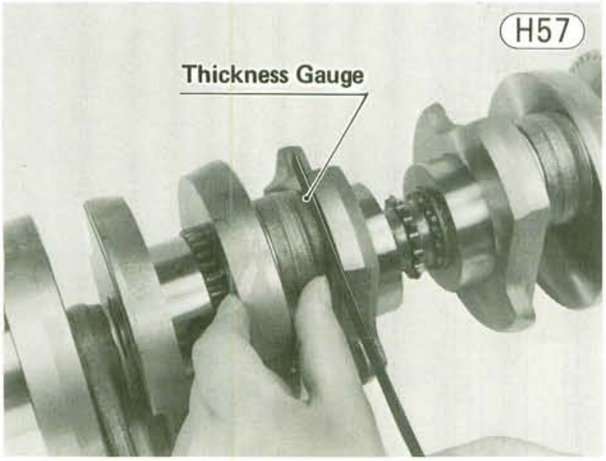


Table H35 Connecting Rod Big End Side Clearance

Standard	Service Limit
0.3 ~ 0.4 mm	0.6 mm

Crankshaft runout

With the six crankshaft bearings in place, set the crankshaft in **V** blocks, suspending it at the both end bearing outer races.

Set a dial gauge against each of the other bearings and turn the crankshaft slowly. The difference between the highest and lowest dial gauge reading for the bearing is the runout.

If runout measured at any bearing exceeds the service limit, the crankshaft should be replaced.

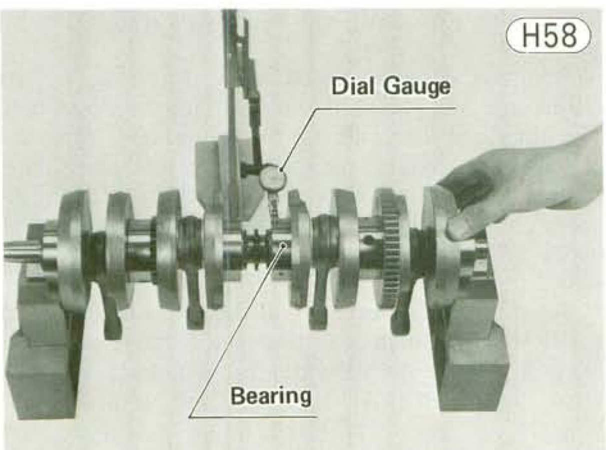


Table H36 Crankshaft Runout

Standard	Service Limit
under 0.04 mm	0.10 mm

Main bearing wear

The crankshaft bearings are made to very close tolerance, and bearing play would be difficult to measure even if all the bearings could be removed. The worth of the bearing, therefore, must be judged by feel.

Wash the bearings in a high flash-point solvent, blow them dry (**DO NOT SPIN THEM**), and lubricate them. Turn each bearing over by hand and see that it makes no noise, turns smoothly, and has no rough spots. If either of the two end bearings is defective, that bearing can be replaced, but the other four bearings can be replaced only as an assembly with the crankshaft.

Bearing outer race side clearance

The No. 5 bearing outer race works not only as a bearing outer race but also as a stopper of crankshaft axial movement (thrust bearing).

Measure the clearance with a thickness gauge as shown. Replace the crankshaft, if the clearance exceeds the service limit.

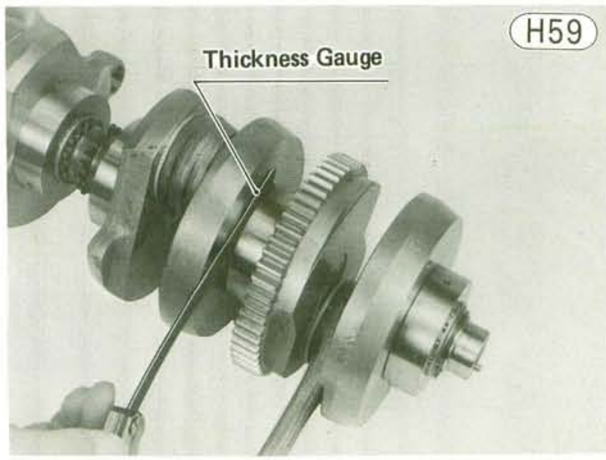


Table H37 Bearing Outer Race Side Clearance

Standard	Service Limit
0.2~0.3 mm	0.5 mm

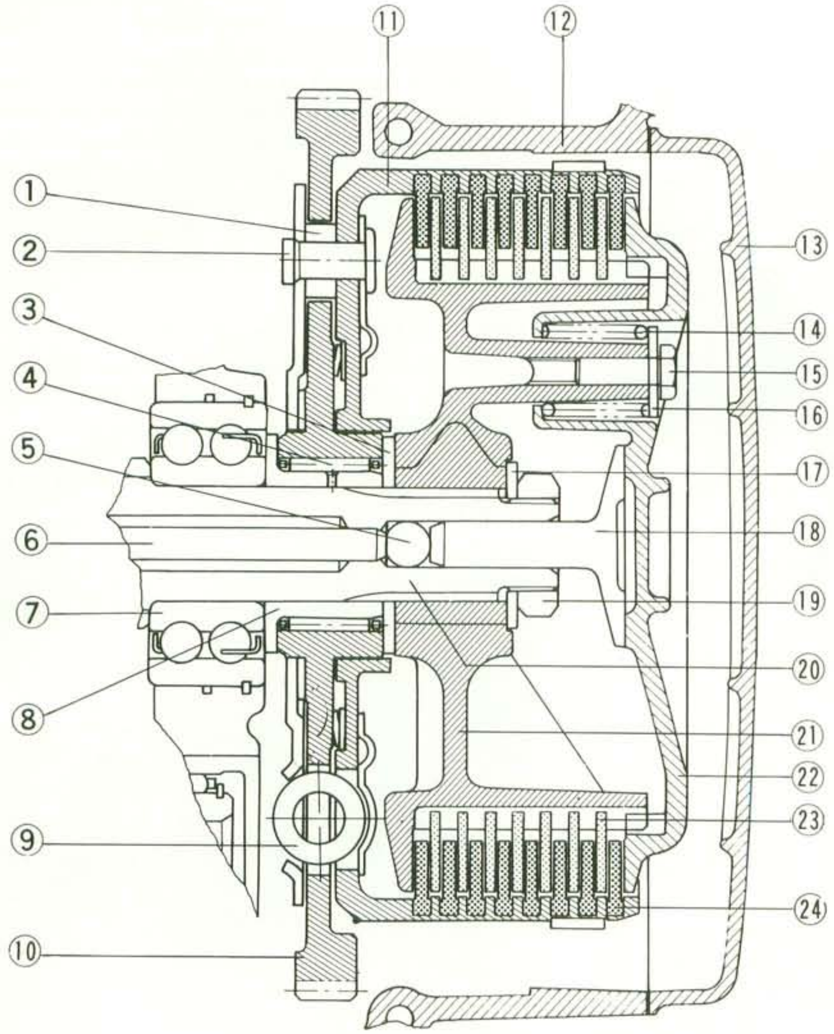
CLUTCH

Fig. H60 shows the construction of the clutch, which is a wet, multi-plate type with 8 friction plates (24) and 7 steel plates (23). 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 (11) has a reduction gear on one side and contains springs (9) to absorb shock from the drive train.

The clutch release mechanism is shown in Fig. H61. The clutch release outer worm gear (5) and the inner worm gear (6) 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 inner worm gear is the clutch adjusting screw (2), which pushes on the push rod (10) and steel ball inside the drive shaft to release the clutch.

Clutch

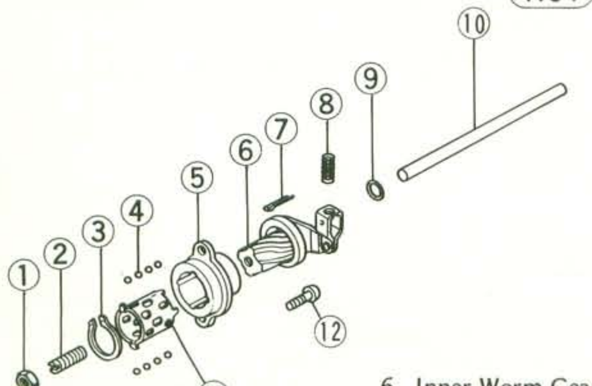
(H60)



1. Collar
2. Rivet
3. Thrust Washer
4. Needle Bearing
5. Steel Ball
6. Push Rod
7. Ball Bearing
8. Drive Shaft Sleeve
9. Spring Damper
10. Clutch Housing Gear
11. Clutch Housing
12. Crankcase
13. Clutch Cover
14. Spring
15. Bolt
16. Washer
17. Lockwasher
18. Spring Plate Pusher
19. Clutch Hub Nut
20. Drive Shaft
21. Clutch Hub
22. Spring Plate
23. Steel Plate
24. Friction Plate

Clutch Release

(H61)



1. Locknut
2. Adjusting Screw
3. Circlip
4. Steel Ball
5. Outer Worm Gear
6. Inner Worm Gear
7. Cotter Pin
8. Spring
9. O Ring
10. Push Rod
11. Retainer
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 gear 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. Too much backlash between the primary gear and the clutch gear.
2. Damaged gear teeth.
3. Too much clearance between the friction plate tangs and the clutch housing.
4. Needle bearing worn or damaged.
5. Weak or damaged damper spring(s).
6. Metal chips jammed into the clutch housing gear teeth.

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 H38 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 uneven wear. 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 (H62)

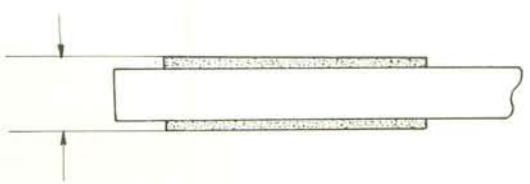


Table H39 Friction Plate Thickness

Standard	Service Limit
3.7 ~ 3.9 mm	3.5 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.

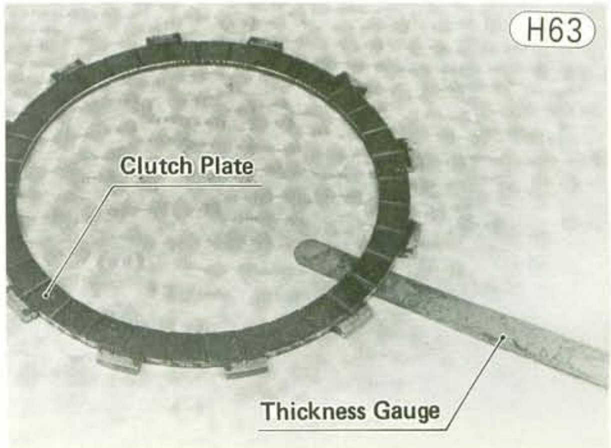


Table H40 Clutch Plate Warp

	Standard	Service Limit
Friction Plate	under 0.15 mm	0.30 mm
Steel Plate	under 0.20 mm	0.35 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, inspect the fingers of the housing where the tangs of the friction plates hit them. If they are badly worn or if there are grooves cut where the tangs hit, replace the clutch housing.

Friction Plate/Clutch Housing Clearance (H64)

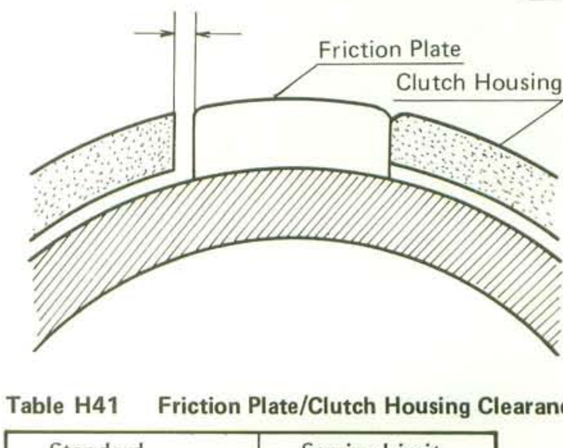


Table H41 Friction Plate/Clutch Housing Clearance

Standard	Service Limit
0.04~0.30 mm	0.5 mm

Clutch housing gear damage

Inspect the teeth on the clutch housing gear. Any light damage can be corrected with an oilstone, but the clutch housing must be replaced if the teeth are badly damaged. Damaged teeth on the clutch housing gear indicate that the primary gear, by which it is driven, may also be damaged. At the same time that the clutch housing gear is repaired or replaced, the primary gear should be inspected. If damaged, the crankshaft must be replaced

Clutch housing/primary gear backlash

Split the crankcase. Leaving the drive shaft and crankshaft in place, measure the backlash between the clutch housing gear and the primary gear. To measure the backlash, set a dial gauge against the teeth of 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 the clutch housing and the crankshaft wherever the amount of backlash exceeds the service limit.

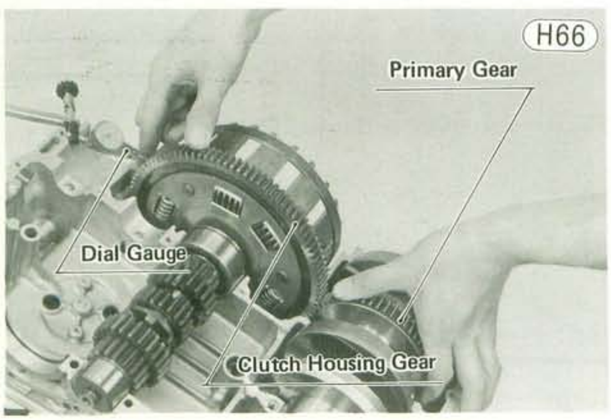


Table H42 Clutch Housing/Primary Gear Backlash

Standard	Service Limit
under 0.06 mm	0.11 mm

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.

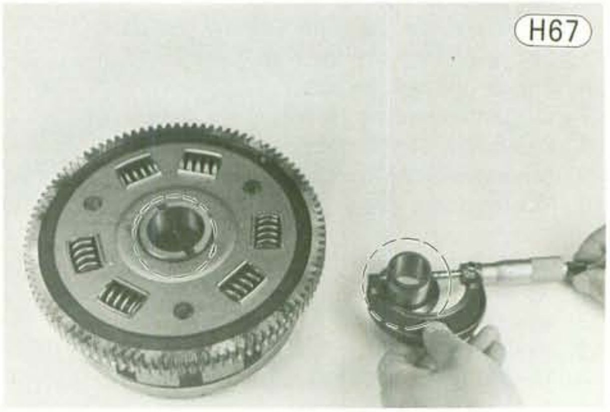


Table H43 Clutch Housing, Drive Shaft Sleeve Diameter

	Standard	Service Limit
Housing I.D.	37.000~37.016 mm	37.03 mm
Sleeve O.D.	31.980~31.995 mm	31.96 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

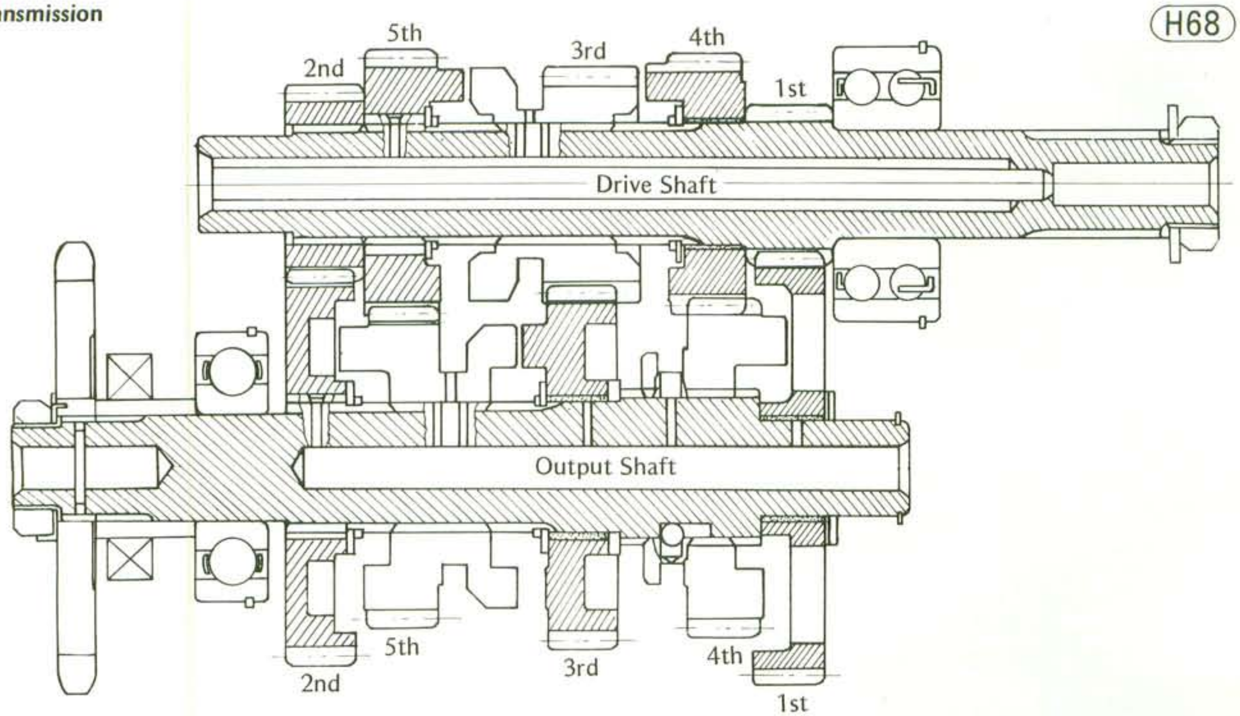
Lubricate the clutch release worm gear with grease.

TRANSMISSION

The transmission is a 5-speed, constant mesh, return shift type. Its cross section is shown in Fig. H68, and the external shift mechanism is shown in Fig. H75. 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 gear as "O".

Gears D3, O4, and O5 are all splined to, and thus rotate with their shafts. During gear changes, these

Transmission



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.

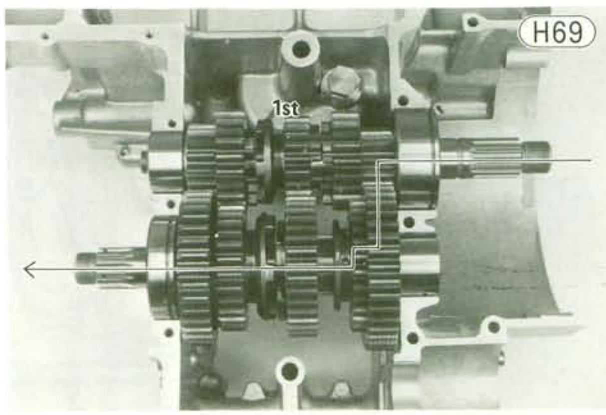
Shift Mechanism

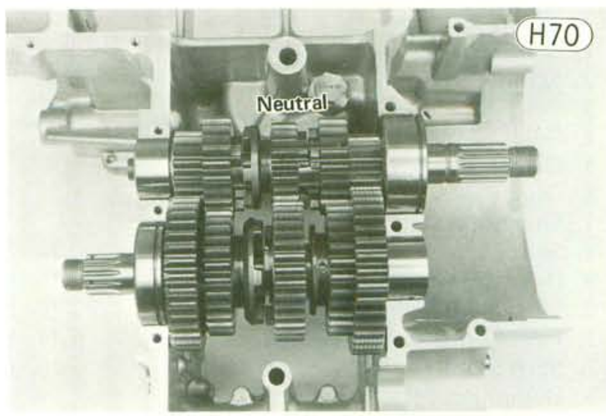
When the shift pedal ① is raised or lowered, the shift shaft ㉑ turns, a pawl on the external shift mechanism arm ⑩ catches on one of the shift drum pins⑥, and the shift drum ⑧ turns. At the same time, the overshift limiter ⑦ on the shift lever ⑫ catches another pin as shown in Fig. H77. As the shift drum turns, the shift fork guide pins ⑱ (3), each riding in a groove in the shift drum, change the position of one or another of the shift forks ⑯, ⑰, ⑲, in accordance with the winding of the grooves. The shift fork ears then determine the position of gears D3 ⑨, O4 ㉕, and/or O5 ㉔. Refer to Fig. H69 to H74 for the gear position and drive path for neutral and each of the 5 gears. A pawl spring ⑪ 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.

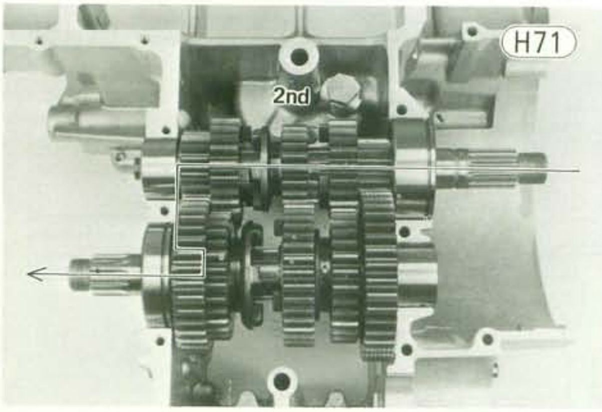
When the shift pedal is released after shifting, the return spring ㉒ returns the shift lever and shift pedal back to their original positions. So that the transmission will remain where it was shifted, the detent arm spring ⑤ pushes the detent arm ④ against the shift drum pins.

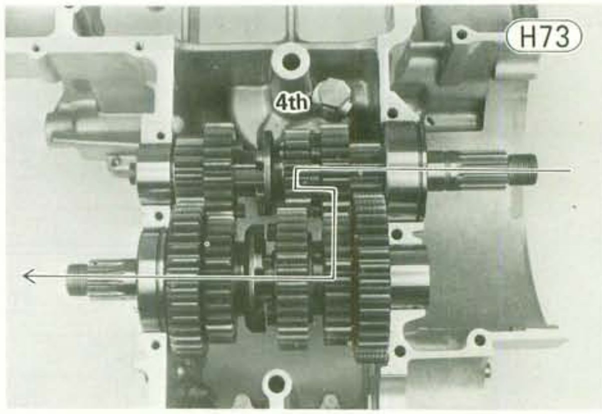
The transmission neutral position is located halfway between 1st and 2nd gears, and shifting into neutral is done by moving the shift pedal a half-stroke from either 1st or 2nd gear. When the transmission is shifted into a gear other than neutral, the detent arm keeps the shift drum in place; but since neutral is between gears, the same detent arm will not help position the drum or keep it in place when neutral is selected. Instead, there is a neutral detent pin ⑬ inside the shift drum guide bolt ⑮ for this purpose. The detent pin is pushed down into the drum positioning groove by a spring ⑭, and drops down into a depression in the groove when the drum is turned to the neutral position.

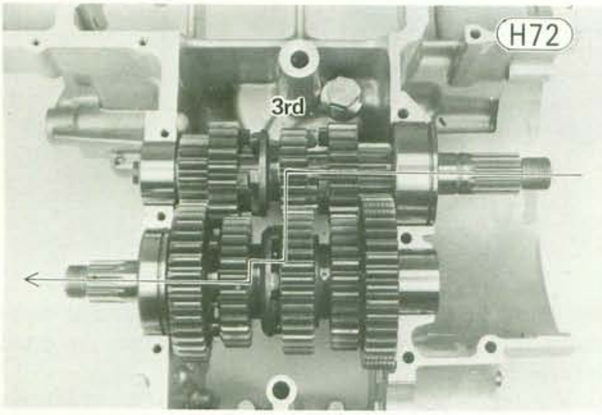
The return spring pin ㉓ on the side of the crankcase passes through a cutout on the shift mechanism lever. This pin engages between the two ends of the shift mechanism return spring. At the end of a full upshift or downshift stroke, the return spring pin makes contact with the cutout on the shift lever to limit the shift lever's range of movement.

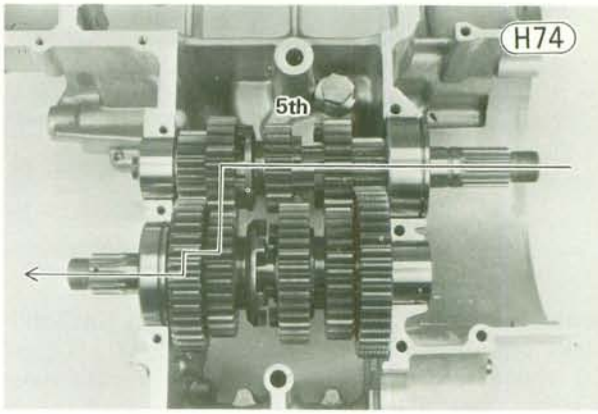




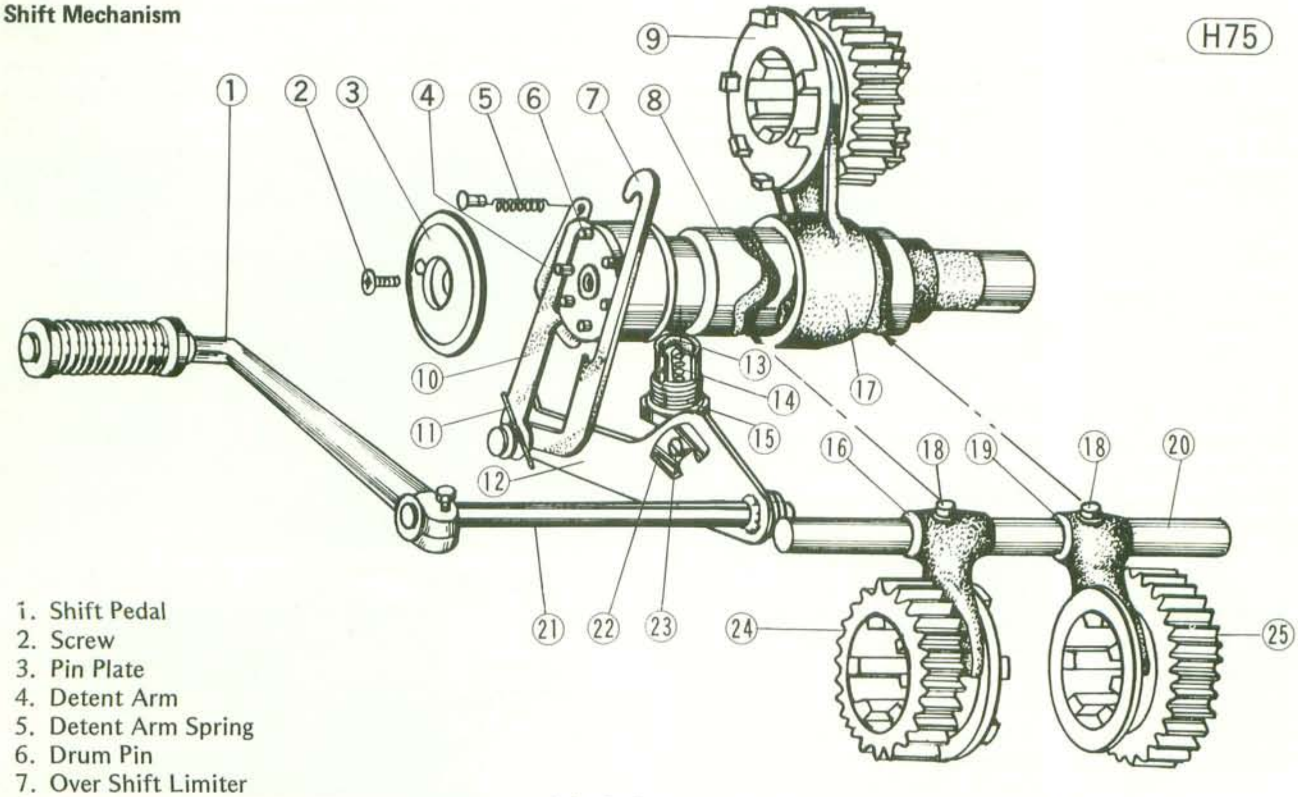








Shift Mechanism



1. Shift Pedal
2. Screw
3. Pin Plate
4. Detent Arm
5. Detent Arm Spring
6. Drum Pin
7. Over Shift Limiter
8. Shift Drum
9. Drive 3rd Gear
10. Shift Mechanism Arm
11. Pawl Spring
12. Shift Lever
13. Detent Pin
14. Spring
15. Guide Bolt
16. Shift Fork (O5)
17. Shift Fork (D3)
18. Guide Pin
19. Shift Fork (O4)
20. Shift Rod
21. Shift Shaft
22. Return Spring
23. Return Spring Pin
24. Output 5th Gear
25. Output 4th Gear

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 boyond 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 Indicator Switch

A neutral indicator light is provided so that the rider can readily determine whether or not the transmission is in neutral. The neutral indicator 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, and/or broken or weakened return spring
2. Broken or weakened detent arm spring
3. Broken or weakened shift pawl spring
4. Damaged shift mechanism arm and/or overshift limiter
5. Loose shift drum guide bolt
6. Bent or worn shift fork(s)
7. Worn shift fork grooves on gears D3, O4, and/or O5
8. Worn shift fork guide pin(s)
9. Worn shift drum groove(s)
10. Binding of neutral detent pin in shift drum guide bolt
11. Worn or damaged gear dogs, gear dog holes, and/or gear dog recesses
12. Improper 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, overshift limiter, and return spring. Replace any broken or otherwise damaged parts.

Measure the free length of the detent arm spring. If it is longer than the service limit, it is weak and should be replaced.

Measure the free length of the neutral detent spring. If it is shorter than the service limit, replace it with a new one.

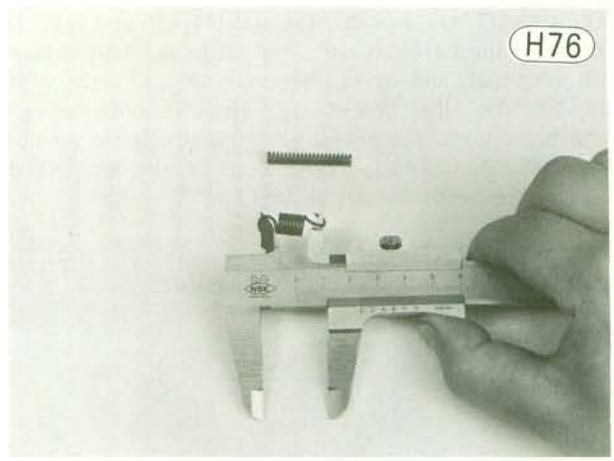
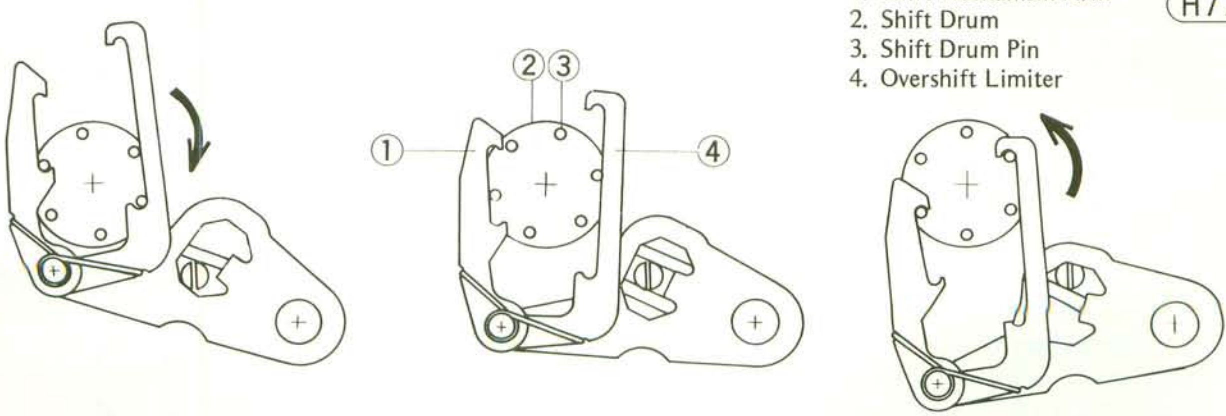


Table H44 Detent Arm Spring, Neutral Detent Pin Spring Free Length

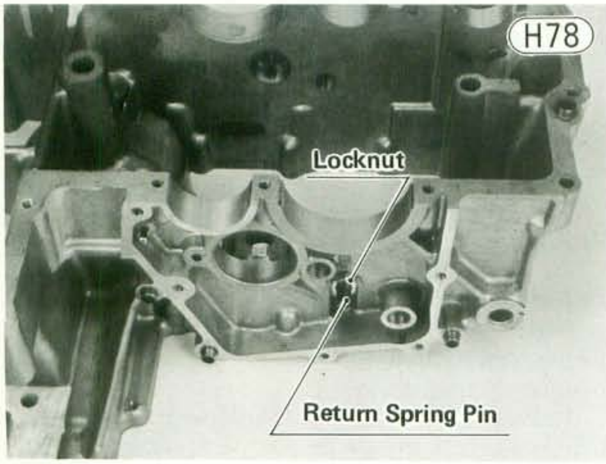
	Standard	Service Limit
Detent Arm	22.2 ~ 22.8 mm	23.9 mm
Neutral Detent Pin	33.7 mm	32.0 mm

Shift Mechanism Arm and Overshift Limiter Operation



1. Shift Mechanism Arm
2. Shift Drum
3. Shift Drum Pin
4. Overshift Limiter

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.

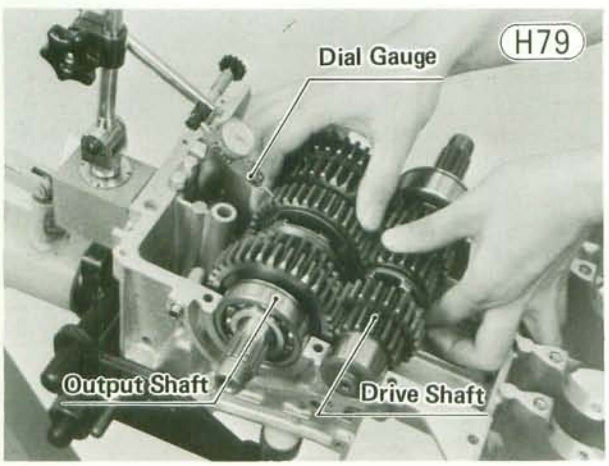


Table H45 Gear Backlash

Standard	Service Limit
0.06~0.23 mm	0.30 mm

Shift fork bending

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

Shift fork/gear groove wear

Measure the thickness of the 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.

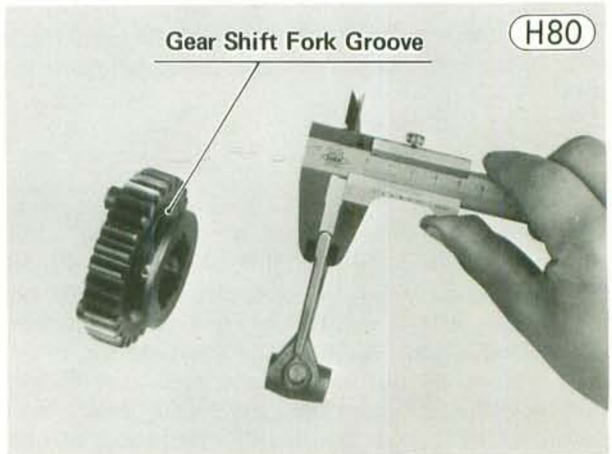


Table H46 Shift Fork Thickness

Standard	Service Limit
5.85~6.00 mm	5.70 mm

Table H47 Gear Shift Fork Groove Width

Standard	Service Limit
6.05~6.15 mm	6.25 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.

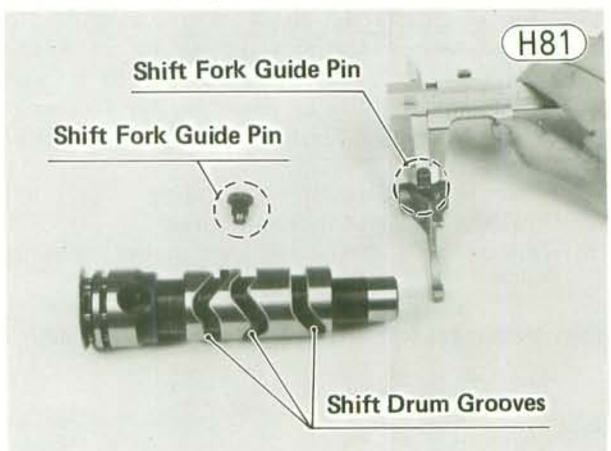


Table H48 Shift Fork Guide Pin Diameter

	Standard	Service Limit
4th, 5th	7.9~8.0 mm	7.85 mm
3rd	7.978~8.000 mm	7.92 mm

Table H49 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 clearance

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.

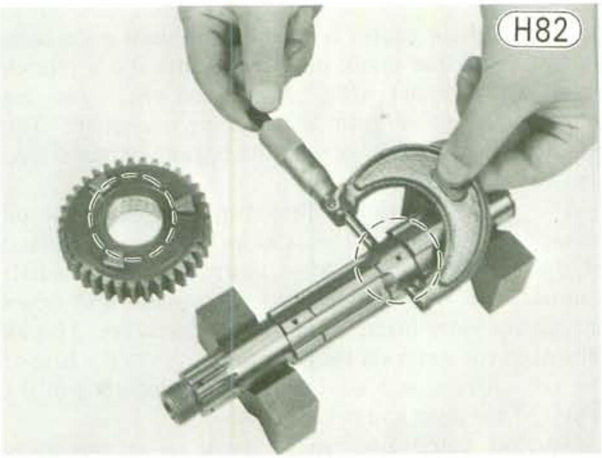


Table H50 Gear/Shaft, Gear/Bush Clearance

Gear	Standard	Service Limit
O1	0.027~0.061 mm	0.16 mm
O2, D5	0.025~0.075 mm	0.17 mm
O3, D4	0.020~0.062 mm	0.16 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.

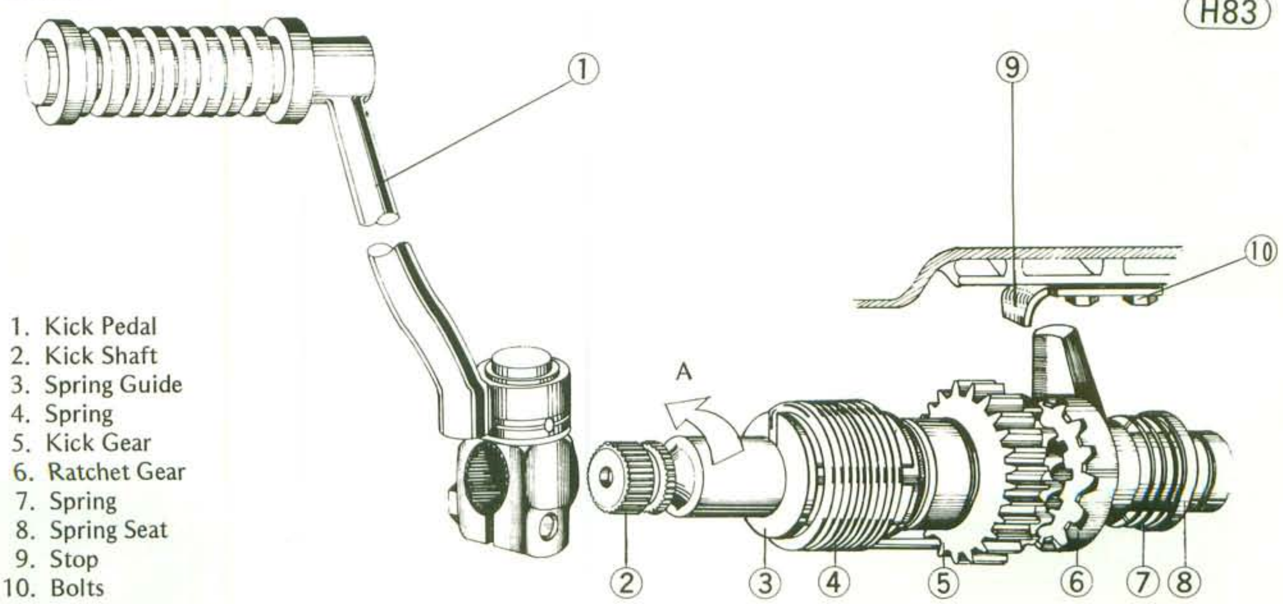
KICKSTARTER

Kickstarter construction is shown in Fig. H83. The kick gear is connected to the primary gear on the crankshaft through the output shaft 1st gear, drive shaft 1st gear, and clutch housing gear.

The kick gear (5), 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 ratchet gear (6), mounted on the splined portion of the kick shaft (2), turns with the kick shaft and can be moved sideways on the shaft. A spring (7) presses on the ratchet gear in the direction of the kick gear. But when the kick pedal (1) is not being operated, an arm on the ratchet gear is caught on the stop (9), 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 gear through the gear train turns the kick gear. But, since the kick gear rotates in the direction of arrow "A" as shown in Fig. H83, the kick gear ratchet doesn't catch on the ratchet gear.

Kickstarter



1. Kick Pedal
2. Kick Shaft
3. Spring Guide
4. Spring
5. Kick Gear
6. Ratchet Gear
7. Spring
8. Spring Seat
9. Stop
10. Bolts

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, bushing, 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.

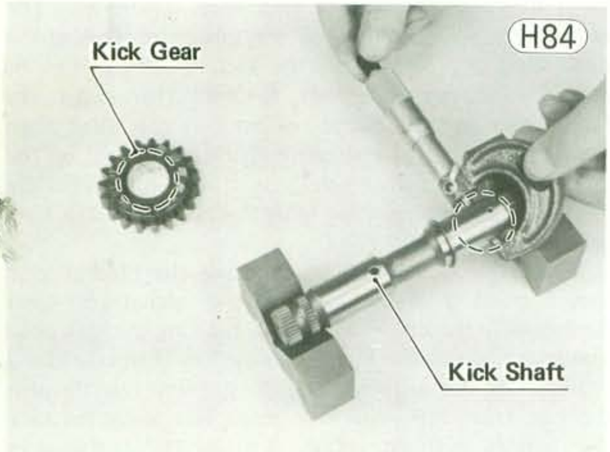


Table H51 Gear Inside Diameter

Standard	Service Limit
21.979~22.000 mm	22.05 mm

Table H52 Kick Shaft Diameter

Standard	Service Limit
21.939 ~ 21.960 mm	21.91 mm

LUBRICATION

The engine lubrication system includes the oil screen, engine oil pump, oil filter, oil bypass 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 (Pgs. 166~167) following engine lubrication.

Since the engine lubrication system is the wet sump type, there is always 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 gears turn. The pump is driven by a gear on the crankshaft. 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 lower crankcase half. After passing through the filter, the oil flows through the crankcase main oil passage to where it branches into three lubrication routes.

One of these routes is to the crankshaft main bearings, then to the crank pins and to the starter clutch gear. 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 second 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.

The oil pump also feeds filtered oil to the transmission. It exits from the oil passage at the needle bearings of the drive and output shafts, and drops down into the crankcase after lubricating the bearings and gears.

The oil pressure indicator 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.

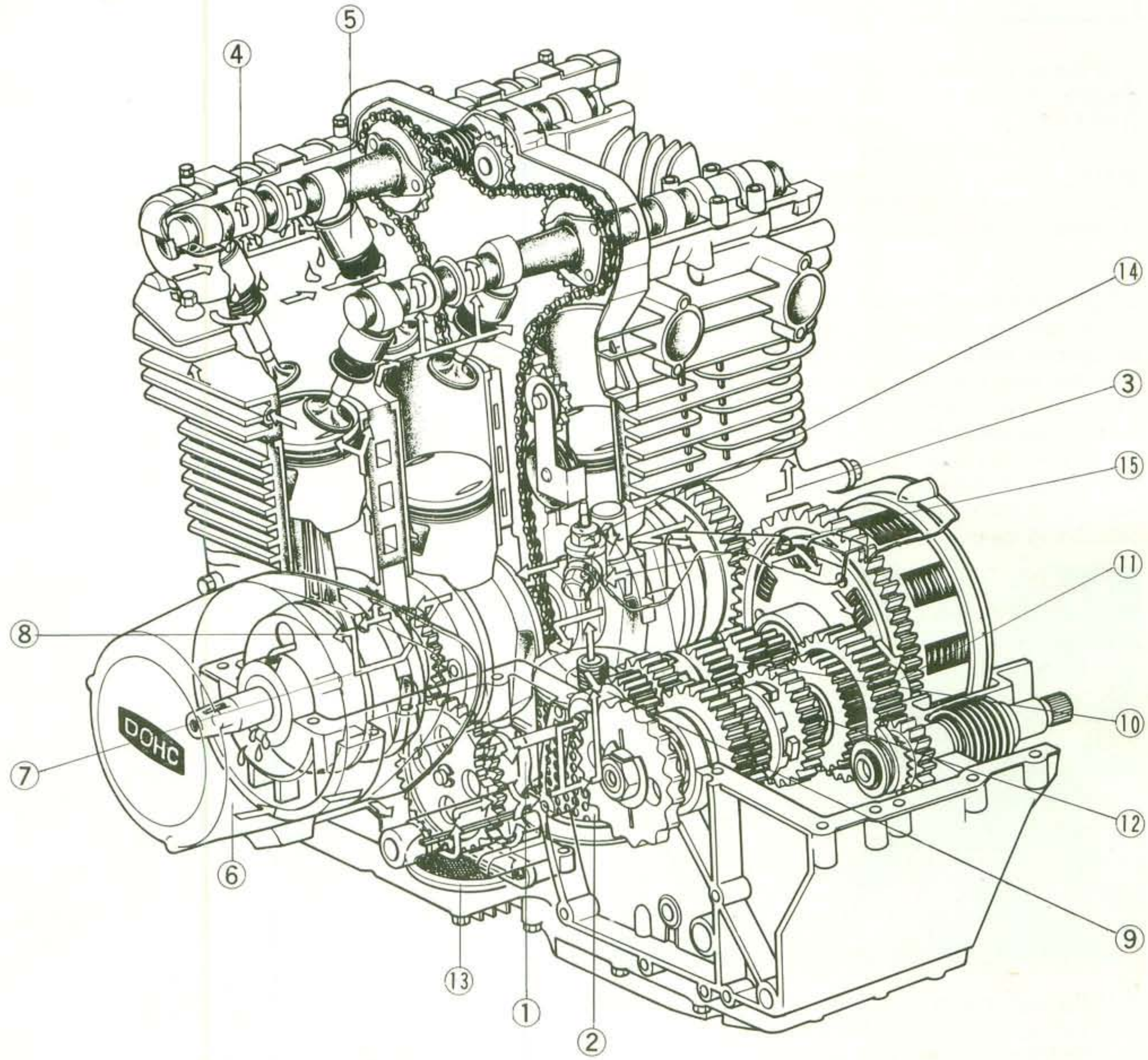
Oil pressure measurement

Warm up the engine. Stop the engine, remove the oil passage plug from the right side of the crankcase, and connect an oil pressure gauge (special tool) in its place to measure oil pressure.

Start the engine again. Run it at the specified speed (Table H53), and read the oil pressure gauge.

Engine Lubrication System

(H86)



Engine Oil Flow Chart

(H87)

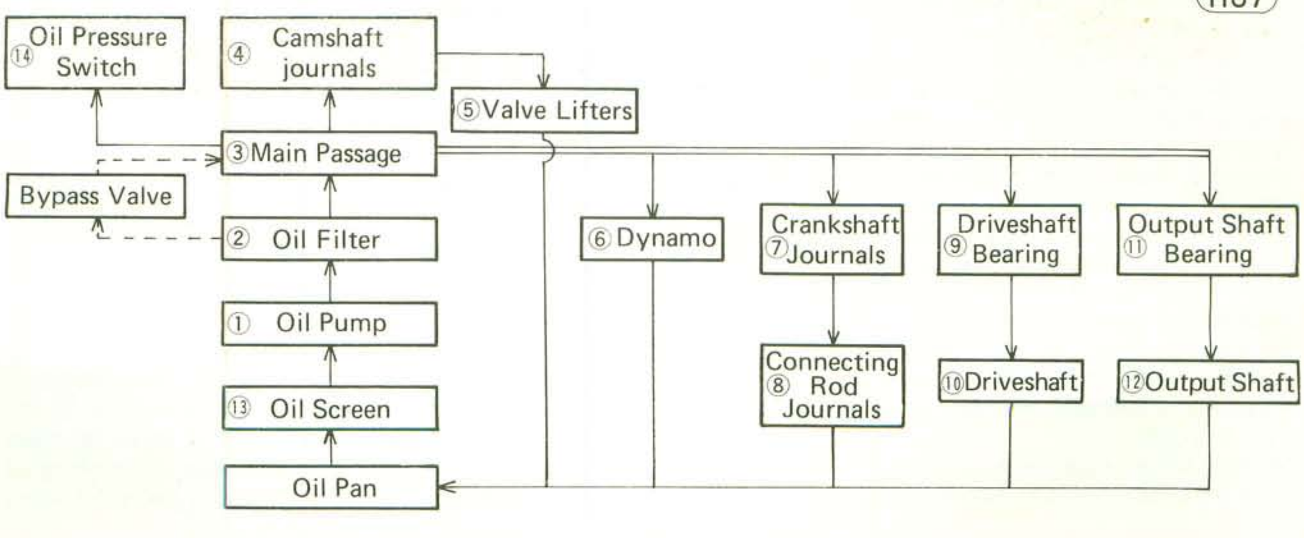


Table H53 Oil Pressure

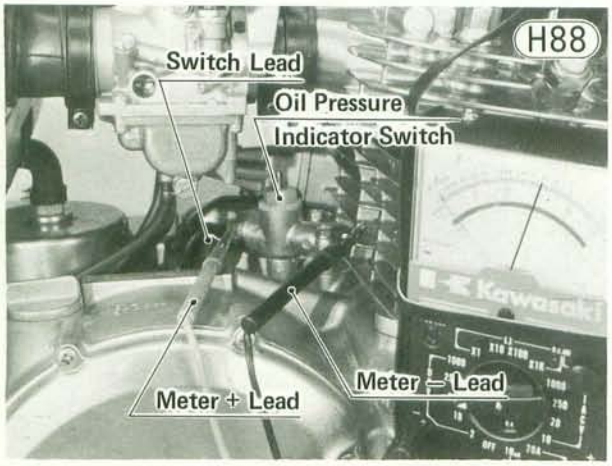
Oil Pressure @3,000 rpm, 60°C (140°F)
About 0.2 kg/cm² (2.8 psi)

If the oil pressure is significantly below the standard pressure when the oil temperature is at or below 60°C (140°F), inspect the engine oil pump. If the pump is not at fault, inspect the rest of the lubrication system.
NOTE: Apply a non-permanent locking agent to the oil passage plug threads. If the plug **O** ring is deteriorated or damaged, replace it with a new one.

Oil pressure indicator 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 20V DC 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 indicator switch may be 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 H54). 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 the specified value with the engine running at the specified speed, the oil pressure indicator switch is defective, and must be replaced.
NOTE: When installing a new switch, tighten it with 0.5~0.7 kg-m (43~61 in-lbs) of torque.

Table H54 Oil Pressure Switch Inspection

Meter	Engine Speed	Oil Pressure Switch
R x 1	Stopped	ON (Ohmmeter reads zero ohms)
	More than 1,300 rpm	OFF (Ohmmeter reads infinity)

Engine Oil Pump

The oil pump, installed in the lower part of the crankcase, is a gear pump with two spur gears. The gear on the pump is driven in direct proportion to engine rpm by a gear on the crankshaft.

If the oil pump becomes worn, it may no longer be able to supply oil to lubricate the engine adequately.

Pump gear/pump body clearance

If pressure is low, remove and disassemble the oil pump, and re-assemble the internal gears in one side of the pump body. With thickness gauges, measure the minimum clearance between the each gear and the body. If the clearance is over the service limit or if the gears are damaged, replace the pump as an assembly.

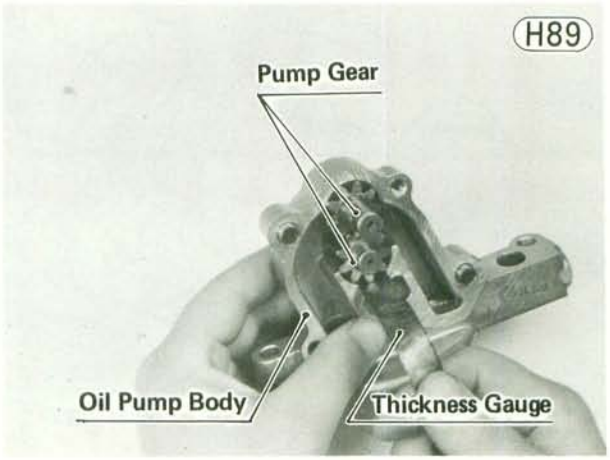


Table H55 Pump Gear/Pump Body Clearance

Standard	Service Limit
0.011~0.083 mm	0.14 mm

Pry out the **O** ring and inspect it. If it appears worn or damaged, replace it.

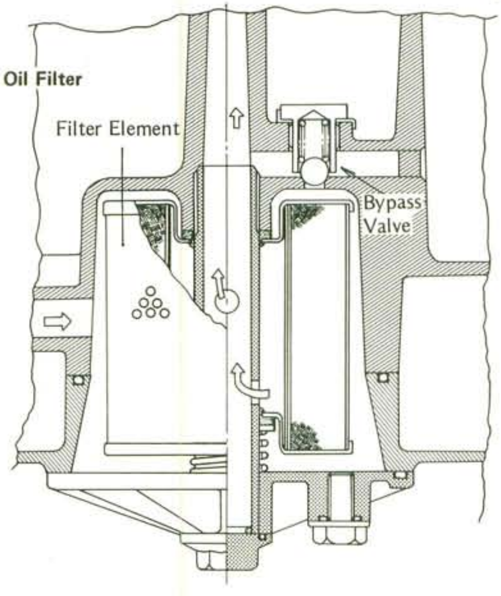
Check the screen filter at the oil pump inlet, and replace it if it is worn or damaged.

Oil Filter

The oil filter, located in the lower part of the crankcase, removes 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 a certain pressure, 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.

Oil Filter



Never neglect the oil filter, or else metal particles or other foreign matter in the oil could reach the crankshaft and transmission, accelerating wear and shortening engine life.

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 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.

OIL SEALS

The crankshaft oil seal in the right engine cover forms a seal between the crank chamber and the contact breaker point 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

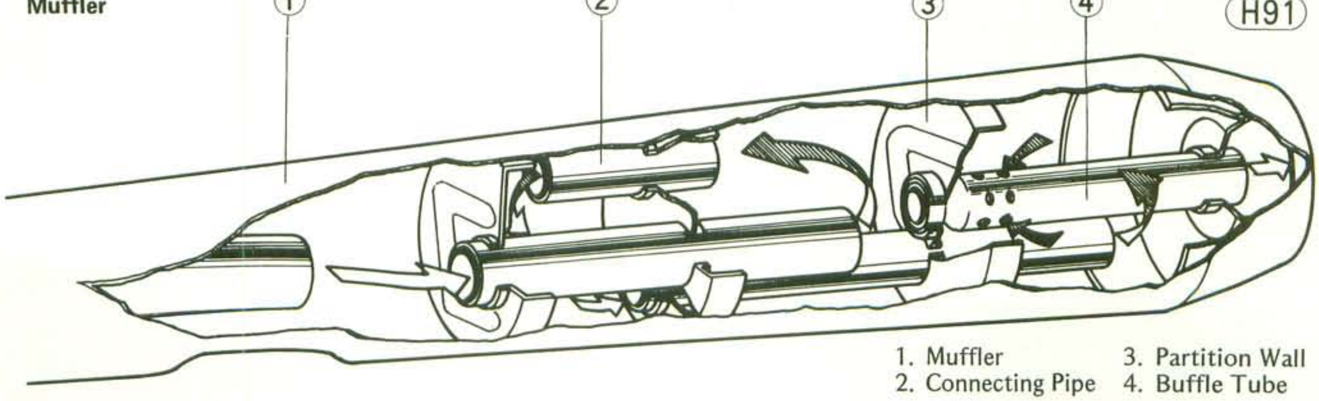
Inspect the oil seals, and replace any if the lips are misshapen, discolored (indicating the rubber has deteriorated), hardened, or otherwise damaged. Since an oil seal is nearly always damaged on removal, any removed oil seals must be replaced. When pressing in an oil seal which is marked, press it 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. Buffle Tube

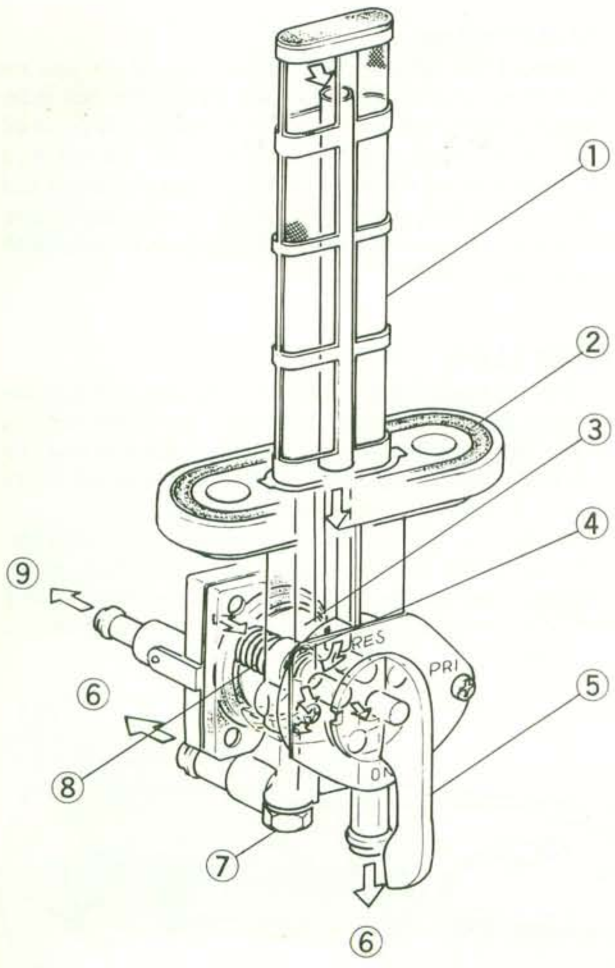
FUEL TANK, FUEL TAP

The fuel tank capacity is 16.7 liters, 2.5 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. H92. The fuel tap is an automatic type which shuts off the fuel supply when the engine is stopped in the **ON** or **RES** position. The fuel tap has three positions: **ON, RES** (reserve), and **PRI** (prime). 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 "Pri" position bypasses the automatic control and is useful for priming the engine after running out of gas, or for completely draining the tank. The fuel tap contains a filter to filter out dirt.

Fuel Tap

(H92)



1. Filter
2. **O** Ring
3. Diaphragm
4. **O** Ring
5. Tap Lever
6. Fuel
7. Drain Plug
8. Spring
9. Vacuum

The automatic valve in the fuel tap operates as follows: When the engine is running, negative pressure (vacuum) is created at the carburetor due to engine intake. This engine intake vacuum is transmitted to the diaphragm vacuum chamber in the fuel tap through the vacuum hose and the check valve. The vacuum pulls the diaphragm ③ against its spring pressure, and the **O** ring ④ on the diaphragm assembly ③ is pulled out of its seat, permitting fuel to flow between the **O** ring and seat. When the engine stops and vacuum is lost, air enters the diaphragm vacuum chamber through the vacuum hose, bringing chamber pressure back up to atmospheric and allowing the diaphragm spring ⑧ to push the diaphragm back into place and hold the **O** ring against the seat.

The check valve in the diaphragm cover keeps the pressure in the diaphragm vacuum chamber negative in spite of the pulsation of the intake vacuum while the engine is running so that fuel flows smoothly.

Inspection and cleaning

If there is any doubt about the condition of the fuel tap, remove and disassemble the fuel tap (Pg. 75), and inspect the parts. Especially examine the diaphragm assembly. Make sure the **O** ring and its seat are clean and undamaged; if the **O** ring is prevented from seating properly or if it is damaged, fuel flow will not stop when the engine is stopped, and may overflow from the carburetors. Visually inspect the diaphragm. If there is any tear or other damage, the diaphragm assembly should be replaced.

(H93)

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

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

Maintenance – Chassis

Table of Contents

WHEELS

Wheel construction is shown in Fig. J1 and J2. The following sections, Pgs. 170~174, cover the tires, rims and spokes, axles, grease seals, and wheel bearings. For the brakes, see Pgs. 176~183.

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.

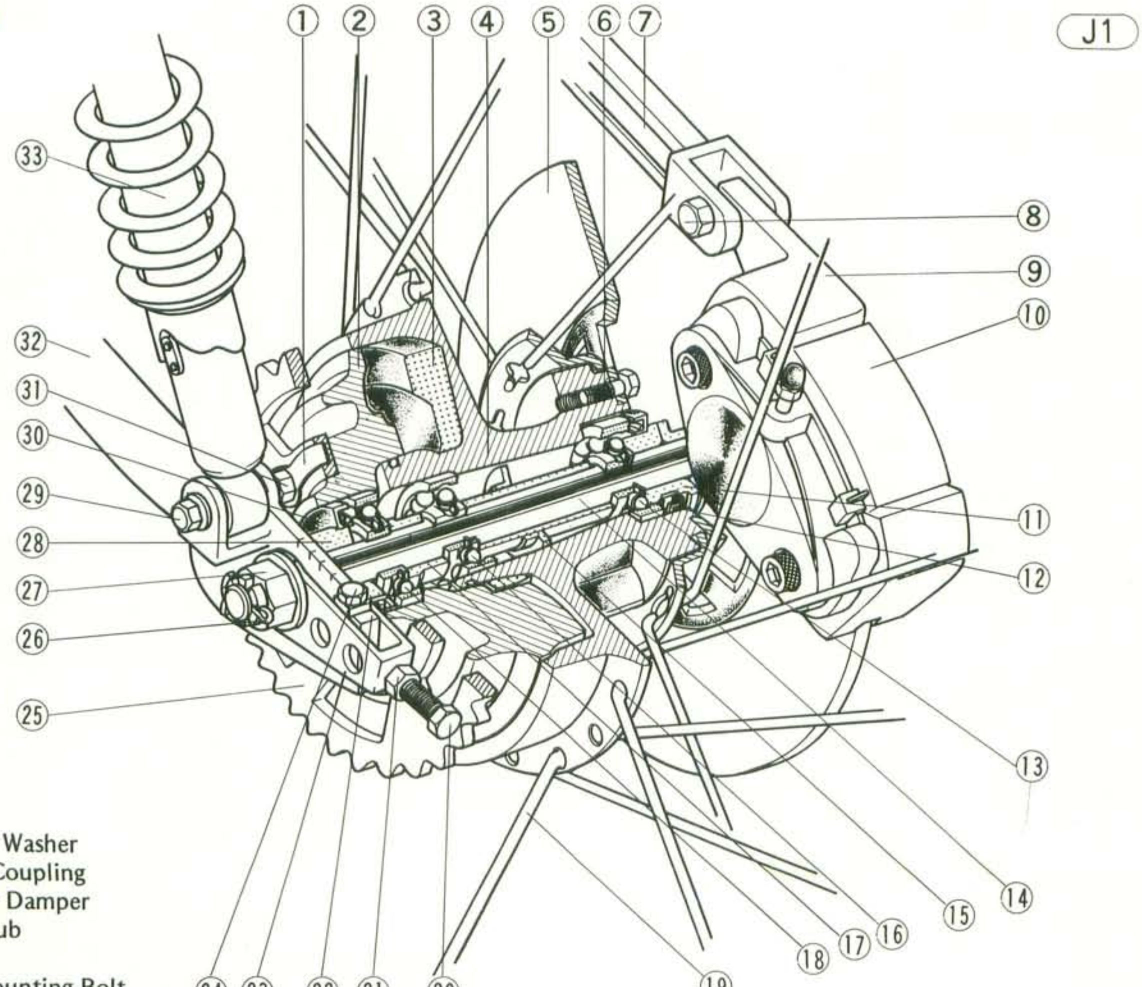
To ensure safe handling and stability, use only the recommended standard tires for replacement, inflating them to the standard pressure. A certain variation from the standard pressure may be desired depending on road surface conditions (rain, ice, rough surface, etc.).

Table J1 Tires, Air Pressure (measured when cold)

	Air Pressure		Size	Make, Type
Front	2.00 kg/cm² (28 psi)		3.25H19 4PR	DUNLOP GOLD SEAL F6B
Rear	Up to 97.5 kg	2.25 kg/cm² (32 psi)	4.00H18 4PR	DUNLOP GOLD SEAL K87 MARKIIM
	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.

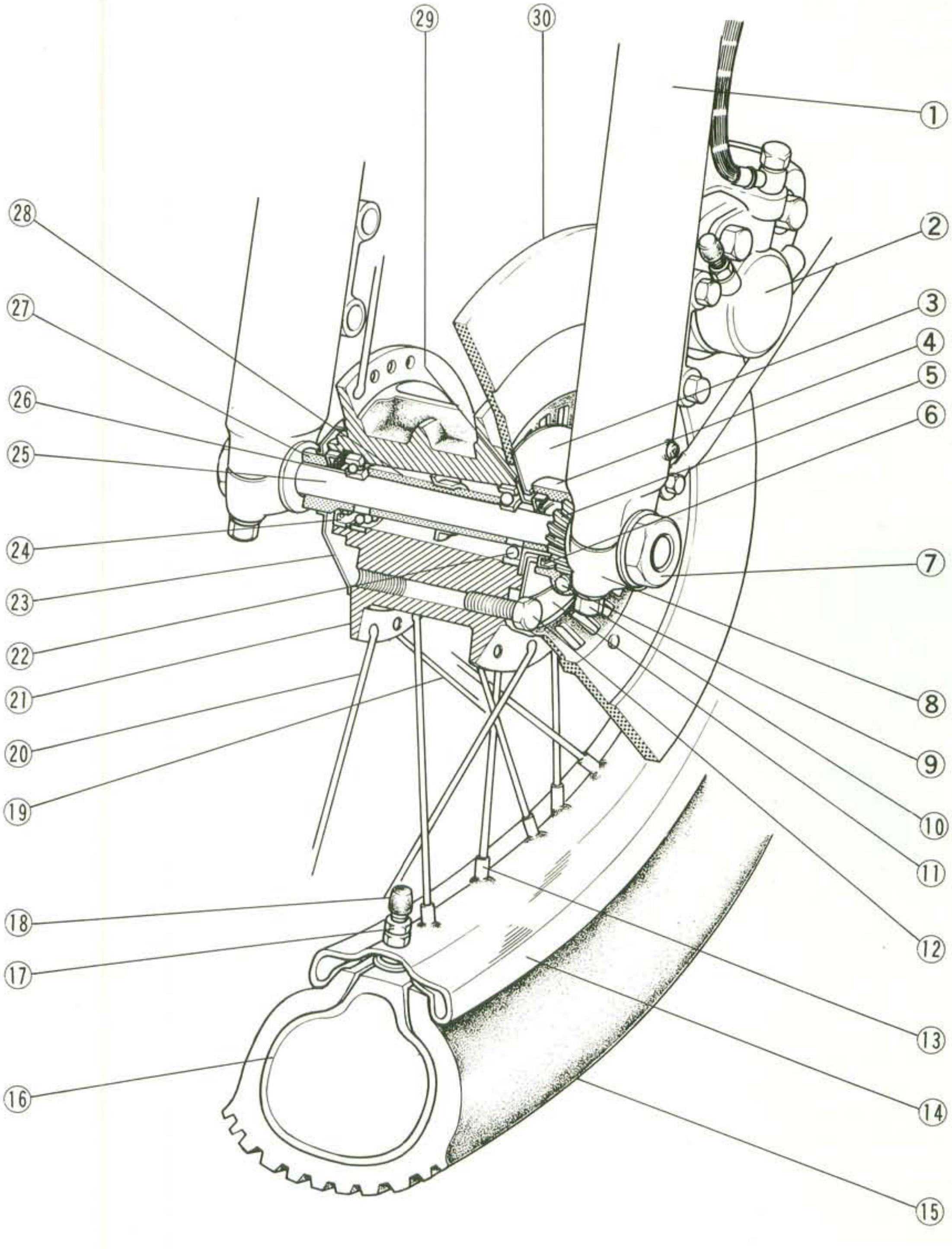
Rear Wheel



1. Double Washer
2. Wheel Coupling
3. Rubber Damper
4. Rear Hub
5. Disc
6. Disc Mounting Bolt
7. Torque Link
8. Torque Link Bolt
9. Rear Caliper
10. Pad Cover
11. Collar
12. Grease Seal
13. Ball Bearing
14. Rear Axle
15. Distance Collar
16. Ball Bearing
17. Coupling Sleeve
18. Ball Beaing
19. Spoke
20. Adjusting Bolt
21. Locknut
22. Chain Adjuster Stop
23. Chain Adjuster
24. Chain Adjuster Stop Bolt
25. Rear Sprocket
26. Cotter Pin
27. Rear Axle Nut
28. Coupling Collar
29. Rear Shock Absorber Mounting Bolt
30. Grease Seal
31. Rear Sprocket Nut
32. Swing Arm
33. Rear Shock Absorber

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

Tire wear, damage

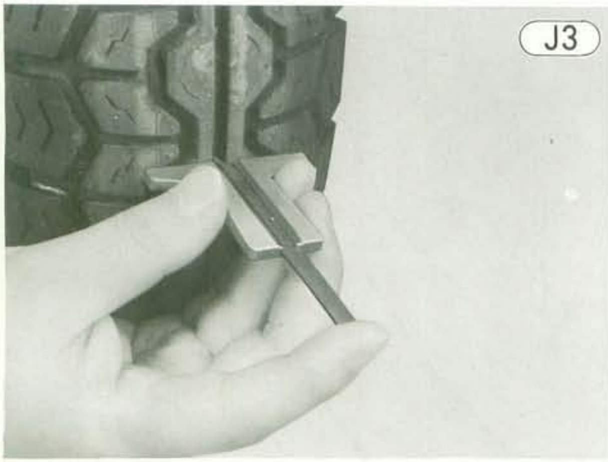
Tires must not be used if they are getting bald, or if they are cut or otherwise damaged. As the tire tread wears down, the tire becomes more susceptible to puncture and failure. 90% of tire failures occur during the last 10% of tire life.

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.

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	3.5 mm	1 mm	1 mm
Rear	7.3 mm	2 mm	3 mm



Rims, 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.

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 J4 is the outer width and diameter, both in inches. The spoke size is diameter number by length in millimeters. 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.

Spoke breakage

If any spoke breaks, it should be repalced 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 (for wire-spoke wheels)

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

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

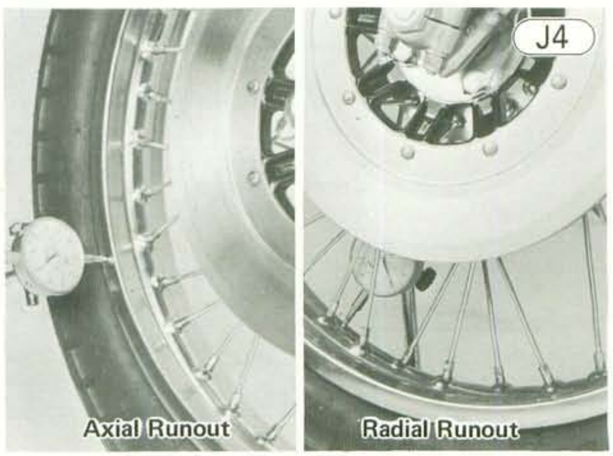


Table J3 Rim Runout (with tire installed)

	Standard	Service Limit
Axial	under 0.8 mm	3 mm
Radial	under 1 mm	2 mm

Spoke Force

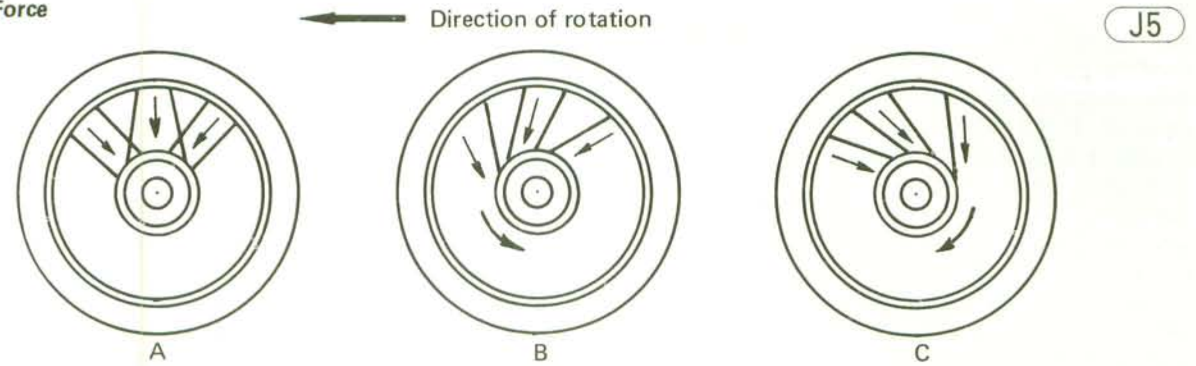


Table J4 Rim, Spoke Size

	Spokes				Rim
	Inner		Outer		
	Left	Right	Left	Right	
Front	#8 x #9 x 184.5 x 97°		#8 x #9 x 184.0 x 83.5°		1.85 x 19
Rear	#8 x #9 x 145.0 x 100.5°	#8 x #9 x 167.5 x 83°	#8 x #9 x 144.0 x 80°	#8 x #9 x 167.5 x 91°	2.15B x 18

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.

Axles

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.

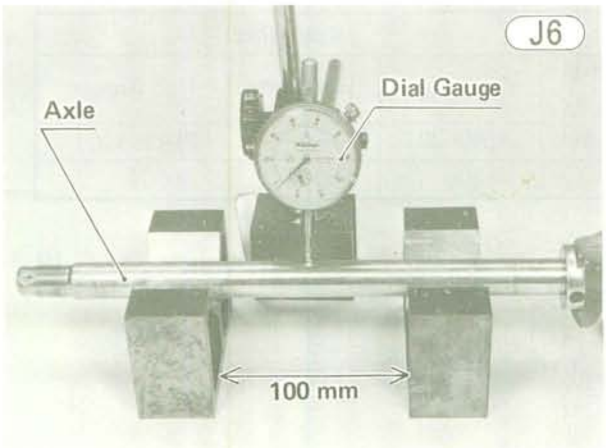


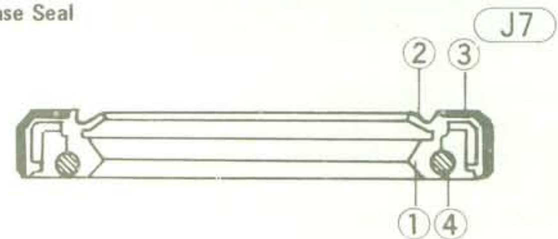
Table J5 Axle Runout/100 mm

	Standard	Service Limit
Front	0.1 mm	0.2 mm
Rear	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.

Grease Seal



1. Primary Lip
2. Secondary Lip
3. Metal Band
4. Wire Spring Band

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.

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 front hub gear box (speedometer gear) 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.

Damper inspection

Remove the rear wheel coupling (Pg. 106), and inspect the rubber damage.

Replace the damper if it appears 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 for replacement, since only this chain has been especially designed to withstand the extremely high torque developed by the engine.

Table J7 Drive Chain Specifications

Make	Type	Link
Enuma	EK630S-T3O	92-link

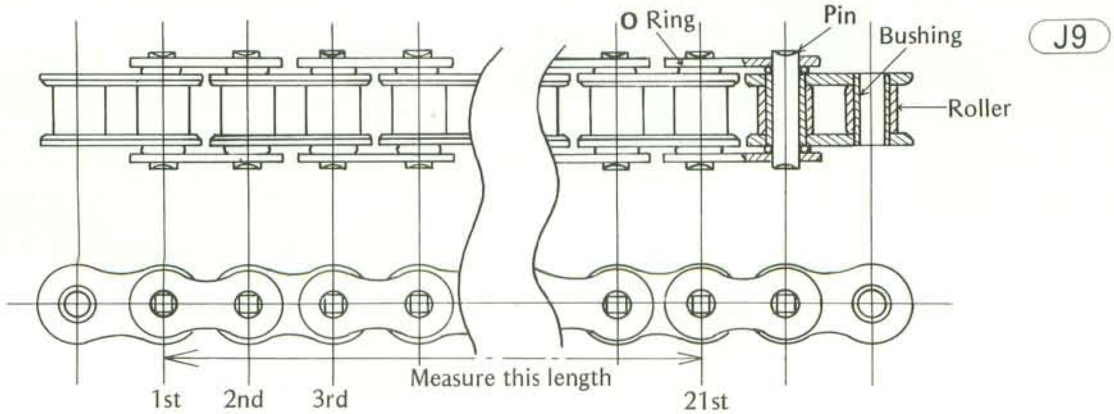
Chain construction is shown in Fig. J9. Most chain wear occurs between the pins and bushings, and between the bushings and rollers, rather than on the outside of the rollers. This wear causes the chain to lengthen. If the chain is left unadjusted, the lengthening will lead to noise, excessive wear, breakage, 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.

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

Drive Chain



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 Page 175 ("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 chain may wear unevenly, take measurements at several places. If any measurements 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.

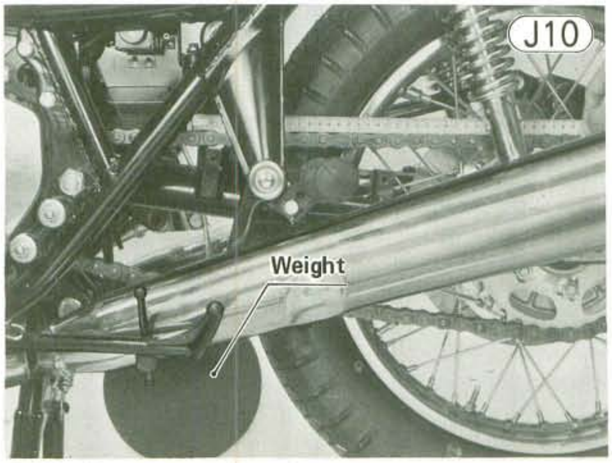


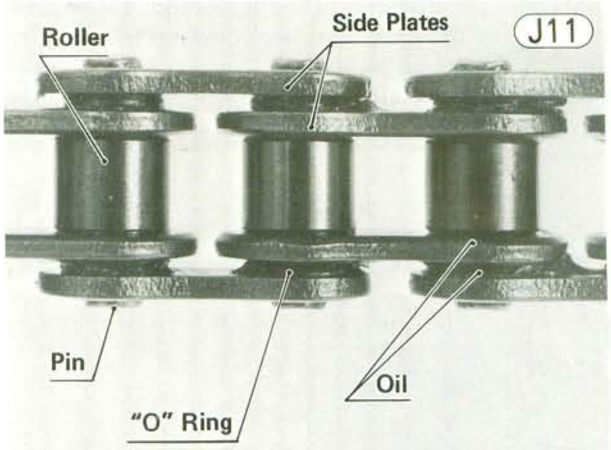
Table J8 Drive Chain 20-link Length

Standard	Service Limit
381.0 ~ 381.8 mm	389 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.

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.



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.

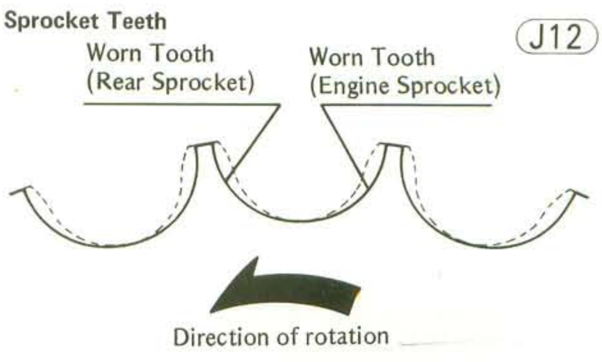
SPROCKETS

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.

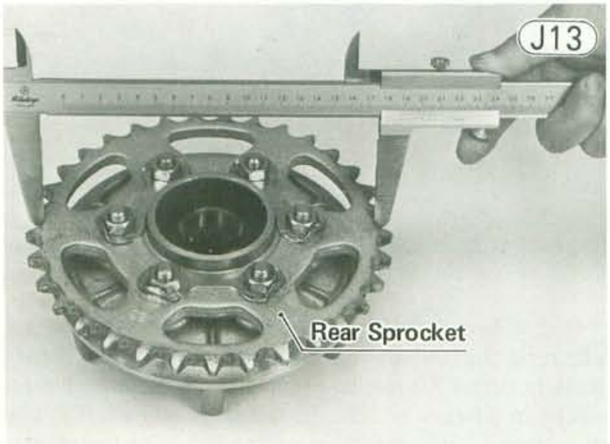


Table J9 Sprocket Diameter

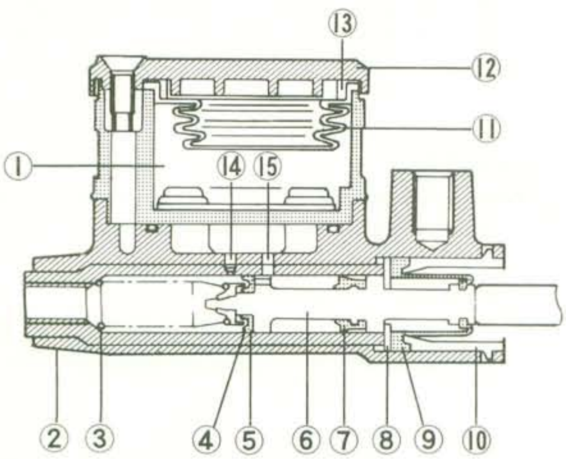
	Standard	Service Limit
Engine	79.01~79.21 mm	78.3 mm
Rear	187.77~188.27 mm	187.4 mm

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. J14. 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.

Master Cylinders



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

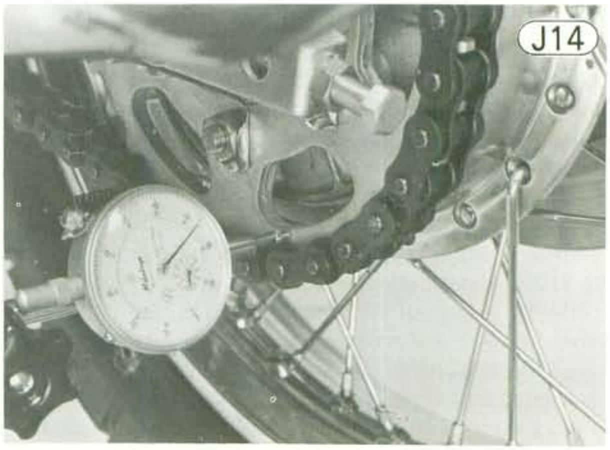


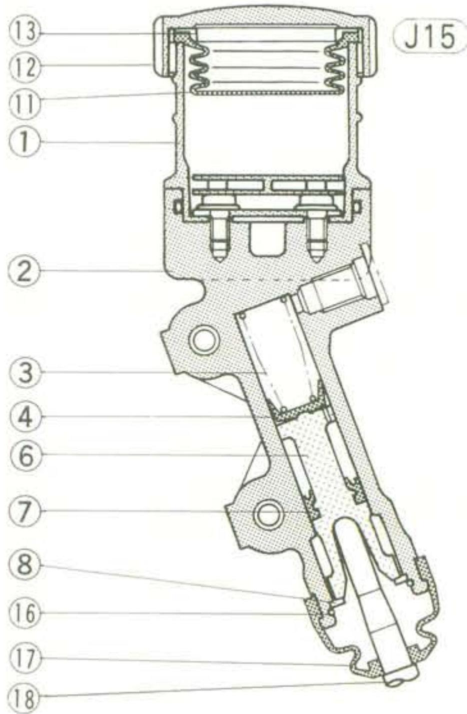
Table J10 Rear Sprocket Warp

Standard	Service Limit
under 0.3 mm	0.5 mm

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

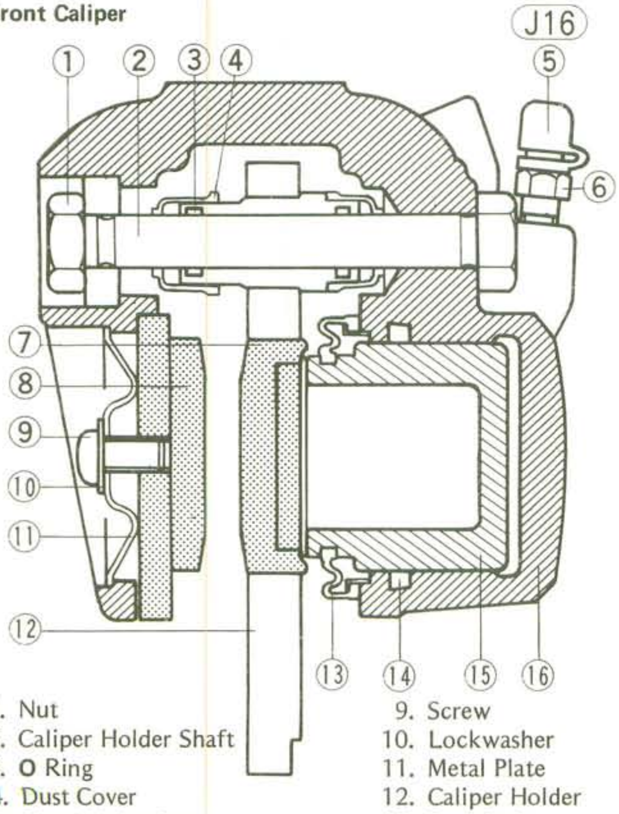


friction of the caliper pads on the disc. Since the boiling point and thus the performance of the fluid would be reduced by contamination with water vapor or dirt from the air, the reservoir is sealed with a rubber diaphragm under the cap. This cap seal also prevents fluid evaporation and spillage should the motorcycle fall over. The fluid is further protected by rubber seals in the caliper assembly and at the master cylinder brake line fitting.

The master cylinder assembly includes the reservoir ①, piston ⑥, primary and secondary cups ④, ⑦, non-return valve ⑤, and spring ③. The reservoir has two holes at the bottom: a relatively large supply port ⑮ to supply fluid to the lines and a small relief port ⑭ 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 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.

The front wheel has a floating-type caliper. The front caliper assembly includes pad A ⑦, pad B ⑧, and the piston ⑮, which is inside the caliper cylinder. Through the caliper run two shafts ②, which also pass through the caliper holder ⑫ to mount the assembly to the left front fork. 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 parallel to the disc.

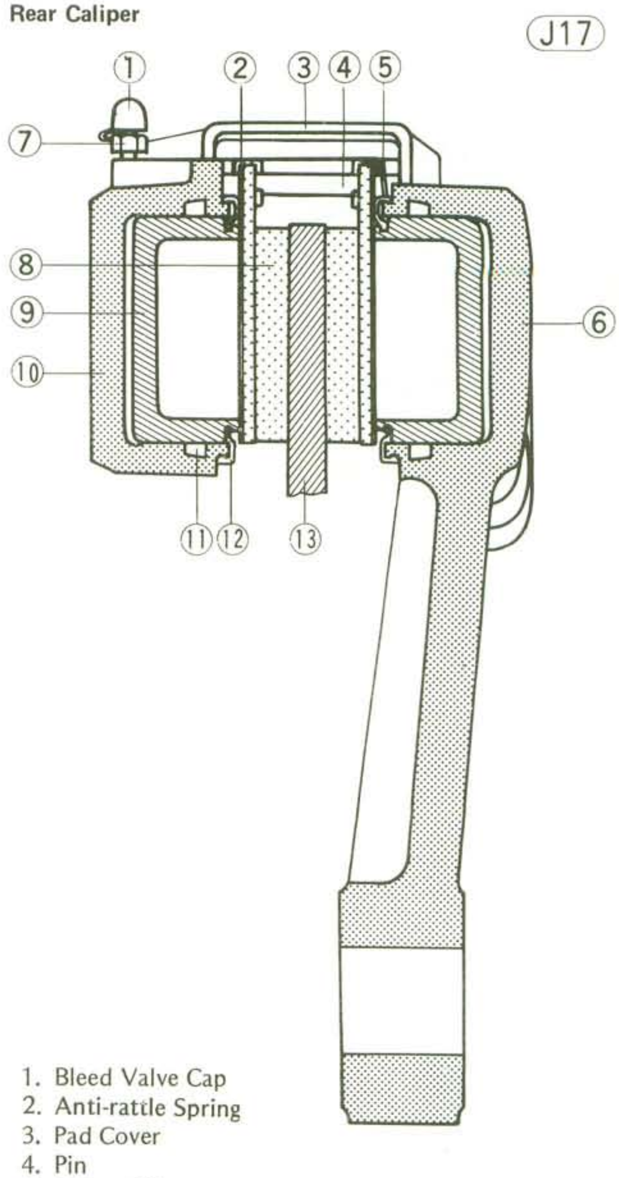
Front Caliper



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

The rear wheel has a fixed caliper. The rear caliper assembly consists of two caliper halves ⑥, ⑩, bolted together, with each half containing a cylinder; a set of opposed pistons ⑨; and two pads ⑧. The pad anti-rattle springs ② hold the pads in position apart from the disc when the rear brake is not applied. When the brake is applied, the pressurized fluid is delivered to the piston areas on both sides of the caliper at the same time. Each piston goes forward until it is pressed against the disc, so no lateral movement of the disc and caliper is needed. There is a drilled internal fluid passage which is sealed by O ring where the two caliper halves join.

Rear Caliper



1. Bleed Valve Cap
2. Anti-rattle Spring
3. Pad Cover
4. Pin
5. Safety Clip
6. Caliper Body
7. Bleed Valve
8. Pad
9. Piston
10. Left Caliper Half
11. Fluid Seal
12. Dust Seal
13. 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.

The automatic wear adjustment mechanism of the rear caliper is the same as that of the front caliper, and caliper operation is the same as for the front caliper except that the rear caliper is held stationary and has two pistons. So a separate explanation of the braking and release strokes of the rear caliper will be omitted.

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 (See Fig. J18). 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 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, the piston ⑦ in the master cylinder is pushed and moves forward against the force of the return spring ④. At this time, the primary cup ⑤ at the head of the piston closes the small relief port ⑧, which connects the pressure chamber ③ and the reservoir ⑩. 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 ① 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.

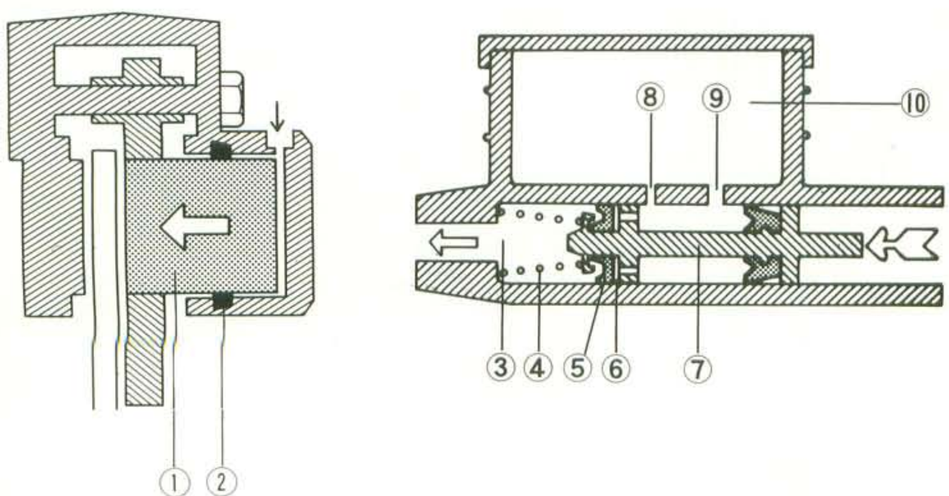
Braking Release Stroke

When the brake lever is released, the piston in the master cylinder is quickly returned toward its rest position by the spring ④, 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 ⑨ into the space between the primary and secondary cups, through the non-return valve ⑥, and passes around the edges of the primary cup to fill the vacuum. When the piston has returned to its rest

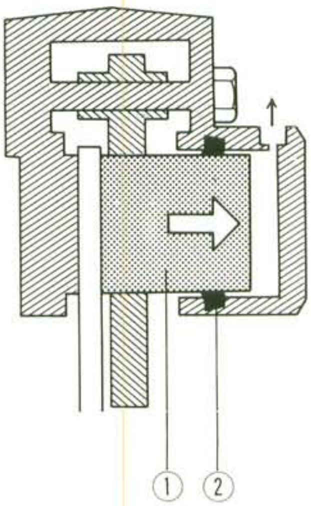
Braking Stroke

(J18)



1. Piston
2. Fluid Seal
3. Pressure Chamber
4. Spring
5. Primary Cup
6. Non-return Valve
7. Piston
8. Relief Port
9. Supply Port
10. Reservoir

Braking Release Stroke

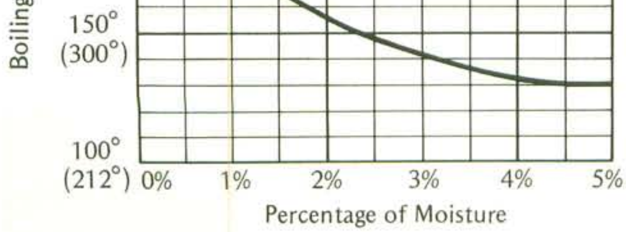


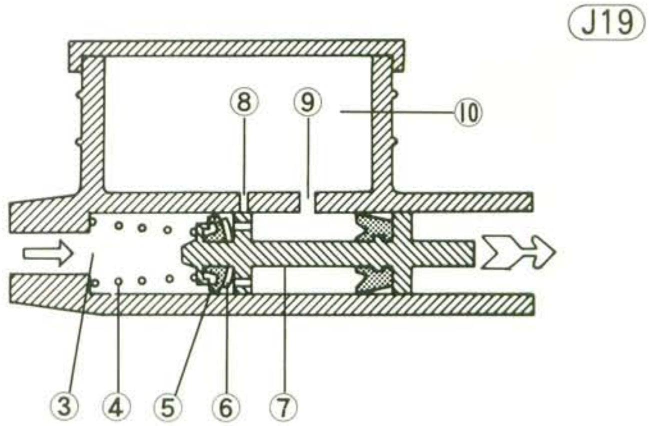
position against the stop, the small relief port is uncovered. As the brake fluid returns from the line, excess fluid passes through the relief port into the reservoir until the brake line pressure returns to zero.

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





1. Piston
2. Fluid Seal
3. Pressure Chamber
4. Spring
5. Primary Cup
6. Non-return Valve
7. Piston
8. Relief Port
9. Supply Port
10. Reservoir

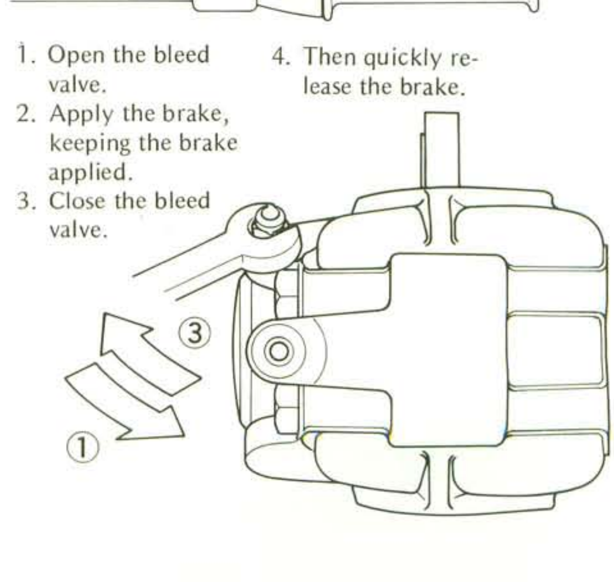
The graph of Fig. J20 shows how brake fluid contamination with moisture lowers the fluid boiling point. Although not shown in the graph, the boiling point also lowers as the fluid gets old, is contaminated with dirt, or if two different types of brake fluid are mixed.

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.

Filling Up the Brake Line



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

- Remove the reservoir cap, and remove the rubber cap on the bleed valve.
- Open the bleed valve (counterclockwise to open), and pump the brake lever or pedal until all the fluid is drained from the line.
- If a dual disc brake is used, repeat the previous step one more time for the other side.
- Close the bleed valve(s), 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.

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 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.

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 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

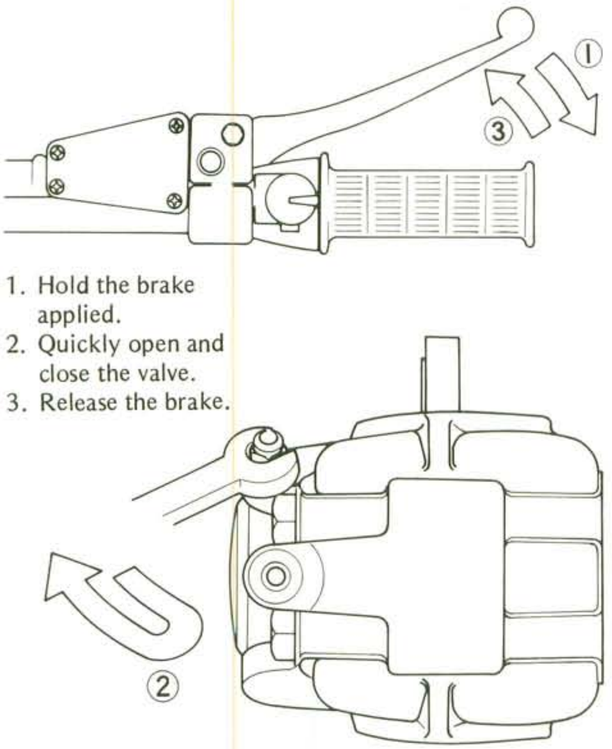
Atlas Extra Heavy Duty
Shell Super Heavy Duty
Texaco Super Heavy Duty
Wagner Lockheed Heavy Duty
Castrol Girling-Green
Castrol GT (LMA)
Castrol Disc Brake Fluid

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 Line

J22

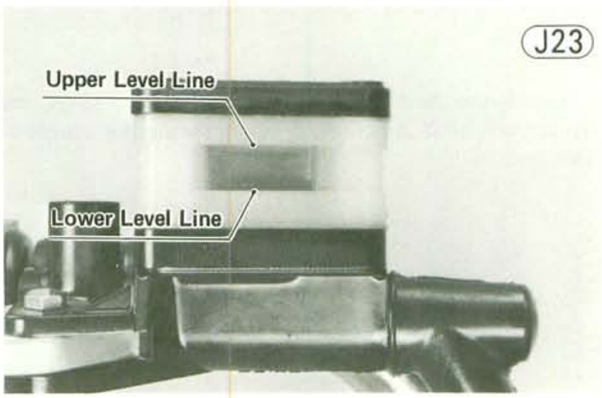


1. Hold the brake applied.
2. Quickly open and close the valve.
3. Release the brake.

•If a dual disc brake is used, repeat the previous step one more time for the other side.

•When air bleeding is finished, install the rubber cap(s) on the bleed valve, and check that the brake fluid is filled to the upper level line marked in the reservoir (handlebar turned so that the reservoir is level).

J23



J24

Master Cylinder

Master cylinder part 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.

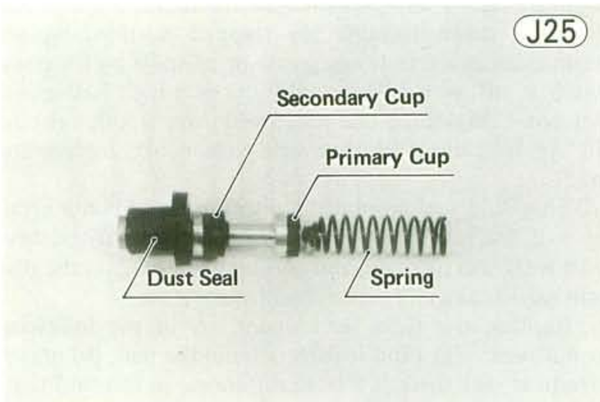
•Check that there are no scratches, rust or pitting on the inside of the master cylinder, and that it is not worn past the service limit.

•Check the piston for these same faults.

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

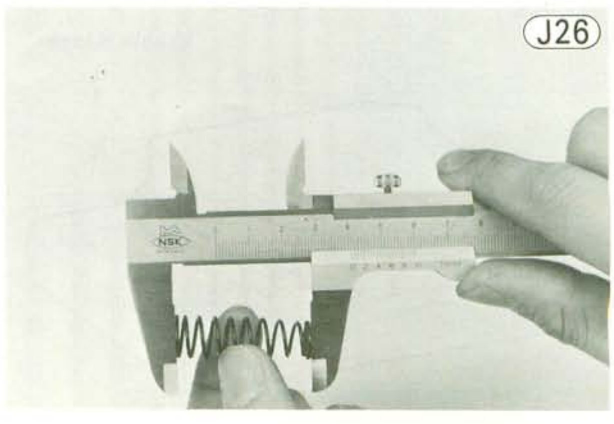
•Inspect the primary and secondary cups. If a cup is worn, damaged, softened (rotted), or swollen, replace it. When inserting the cup into the cylinder, see that it is slightly larger than the cylinder (standard values given in the table). If fluid leakage is noted at the brake lever, the cups should be replaced.

J25



•Check that the spring is not damaged and is not shorter than the service limit.

J26



•Replace the dust seal if damaged.

Table J12 Master Cylinder Parts

		Standard		Service Limit	
	Measurement	Single Disc	Dual Disc	Single	Dual
Front	Cylinder Inside Diameter	14.000~14.063 mm	15.870~15.913 mm	14.08 mm	15.95 mm
	Piston Outside Diameter	13.957~13.984 mm	15.827~15.854 mm	13.90 mm	15.77 mm
	Primary Cup Diameter	14.2~14.6 mm	16.15~16.65 mm	14.1 mm	16.00 mm
	Secondary Cup Diameter	14.65~15.15 mm	16.55~17.05 mm	14.50 mm	16.40 mm
	Spring Free Length		36.6~40.6 mm	46.5 mm	34.7 mm
Rear	Cylinder Inside Diameter	15.870~15.913 mm		15.95 mm	
	Piston Outside Diameter	15.827~15.854 mm		15.77 mm	
	Primary, Secondary Cup Diameter	16.45~16.95 mm		16.30 mm	
	Spring Free Length	49.2~53.2 mm		46.7 mm	

Calipers

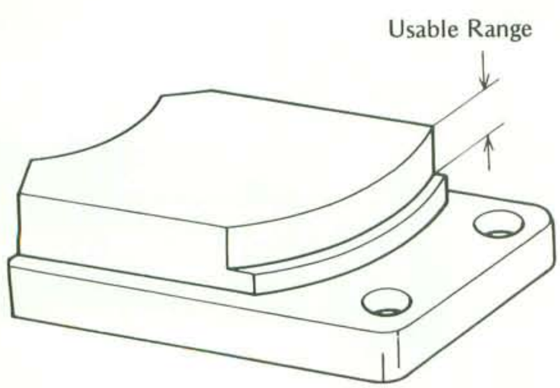
Caliper part wear

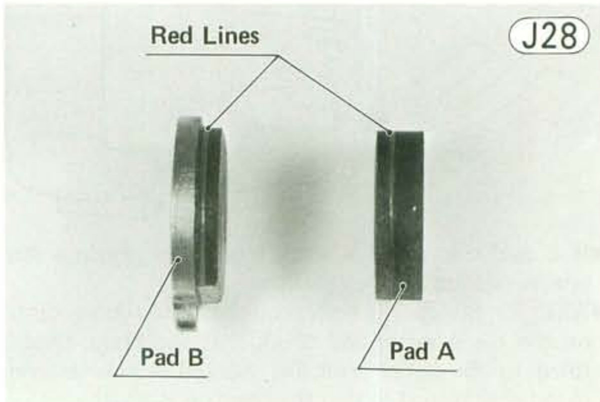
Inspect the pads for wear. For the front disc brake, if either pads is worn down through the red line, replace both pads as s set. For the rear disc brake, if either pad is worn down through the stepped portion, replace both pads as a set. If any grease or oil spills on the pads, wash it off with trichloroethylene or a high flash-point solvent. Do not use one which will leave an oily residue. If the oil cannot be thoroughly clean off, replace the pads.

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

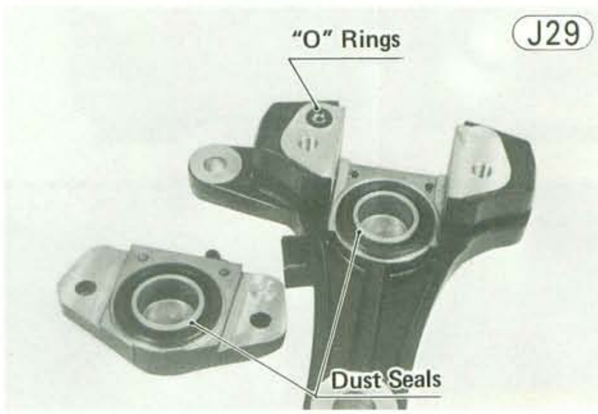
Replace the fluid seals under any of the following conditions: (a) fluid leakage around the pad; (b) brakes overheat; (c) there is a large difference in left and right pad wear; (d) the seal is stuck to the piston. If the fluid seal is replaced, replace the dust seal as well. Also, replace all seals every other time the pads are changed.

Rear Disc Brake Pad (J27)





Check the dust seals, dust covers, and O rings, and replace any that are cracked, worn, swollen or otherwise damaged.



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.

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

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. If the shafts are damaged, replace the shafts and the caliper holder.

Brake Hoses

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.

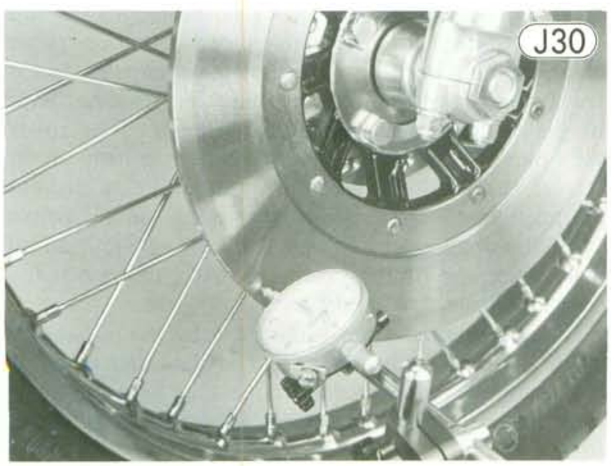
Bend and twist the rubber hose while examining it. Replace it if any cracks or bulges are noticed.

Discs

Disc wear, warp

Besides wearing down, the disc may warp. A warped disc will cause the brake pads to drag on the disc and will wear down both the pads and disc quickly. Dragging will also cause overheating and poor braking efficiency. 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, set the motorcycle up on its center stand, and then measure the rear disc runout. If runout exceeds the service limit, replace the disc.

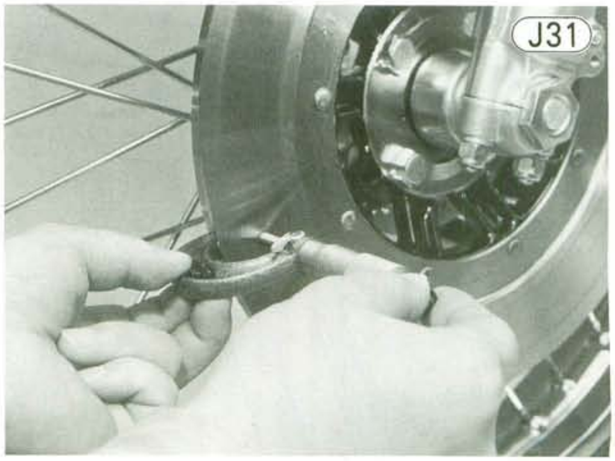


J30

Table J14 Disc Runout (Front, Rear)

Standard	Service Limit
under 0.15 mm	0.3 mm

Measure the thickness of each disc at the point where it has worn the most. Replace the disc if it has worn past the service limit.



J31

Table J15 Disc Thickness (Front, Rear)

Standard	Service Limit
6.9 ~ 7.1 mm	6 mm

STEERING STEM

The steering stem supports the handlebar and front fork, 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.

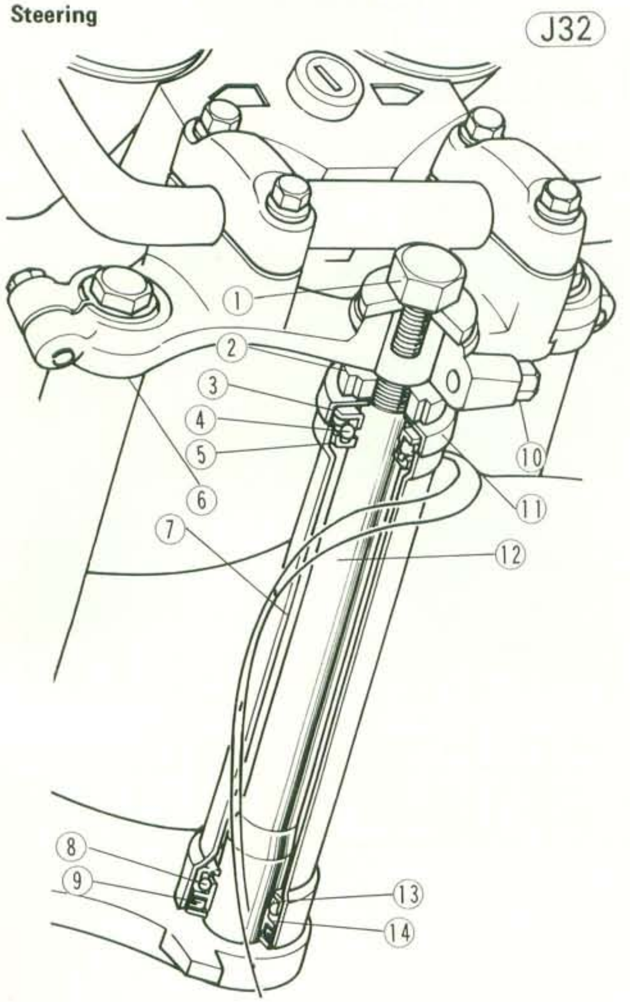
The steering stem will require periodic adjustment as it becomes loose due to bearing wear. Overtightening during adjustment, however, will make the steering stiff and cause accelerated bearing wear. Lack of proper lubrication will also bring about the same results.

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	*Quantity*
Upper	1/4"	19
Lower	1/4"	20

Steering



1. Stem Head Bolt
2. Stem Locknut
3. Upper Inner Race
4. Steel Ball
5. Upper Outer Race
6. Stem Head
7. Frame Head Pipe
8. Steel Ball
9. Grease Seal
10. Stem Head Clamp Bolt
11. Stem Cap
12. Steering Stem
13. Lower Outer Race
14. Lower Inner Race

Steering stem warp

Examine the steering stem, and replace it if it is bent.

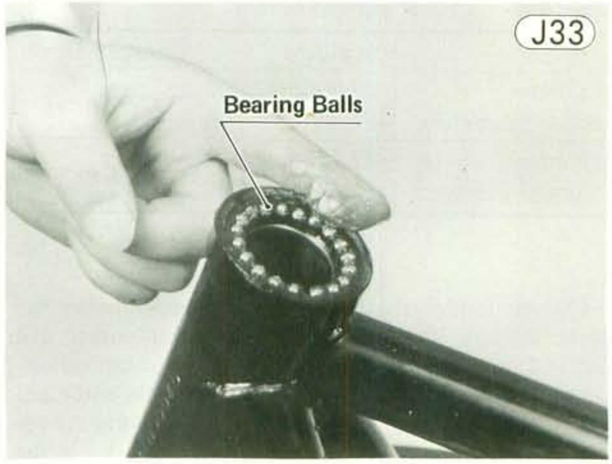
Bearing wear, damage

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.

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

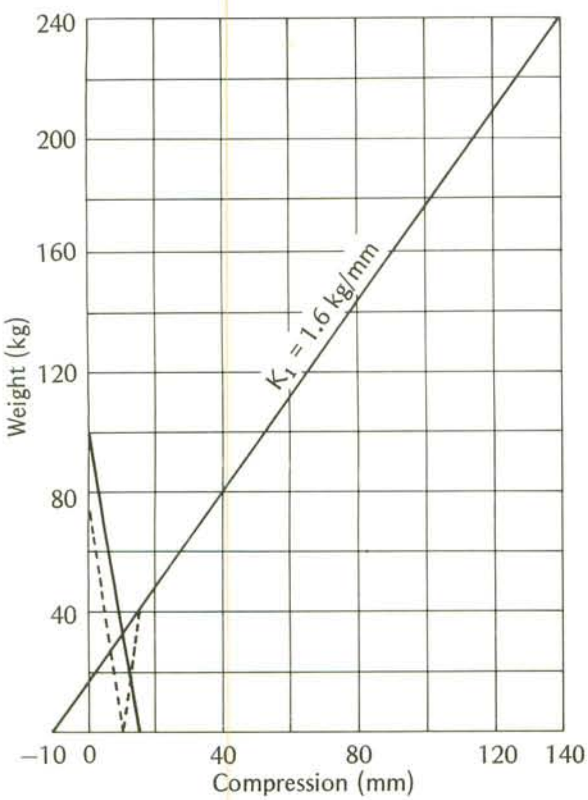
Front fork consists of the fork legs connected to the frame head pipe by the stem base and stem head bracket. It accomplishes shock absorption through spring action, air compression in the inner tube, and resistance to the flow of the oil forced into the cylinder by tube movement.

Each fork leg is telescopic tube including an inner tube (5), outer tube (12), cylinder and piston unit (6), collar (11), and cylinder base (13). 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 piston (equipped with a piston ring (4)) is secured to the top of the cylinder. The collar (coupled with a non-return valve (10)), fixed in the lower end of the inner tube, forms the upper part of the lower chamber 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. Small orifices (2) in the upper part of the cylinder bring about an oil lock at the end of the extension stroke to prevent the inner tube from striking the top.

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 tube surface.

Front Fork Spring Force

(J34)



Compression stroke

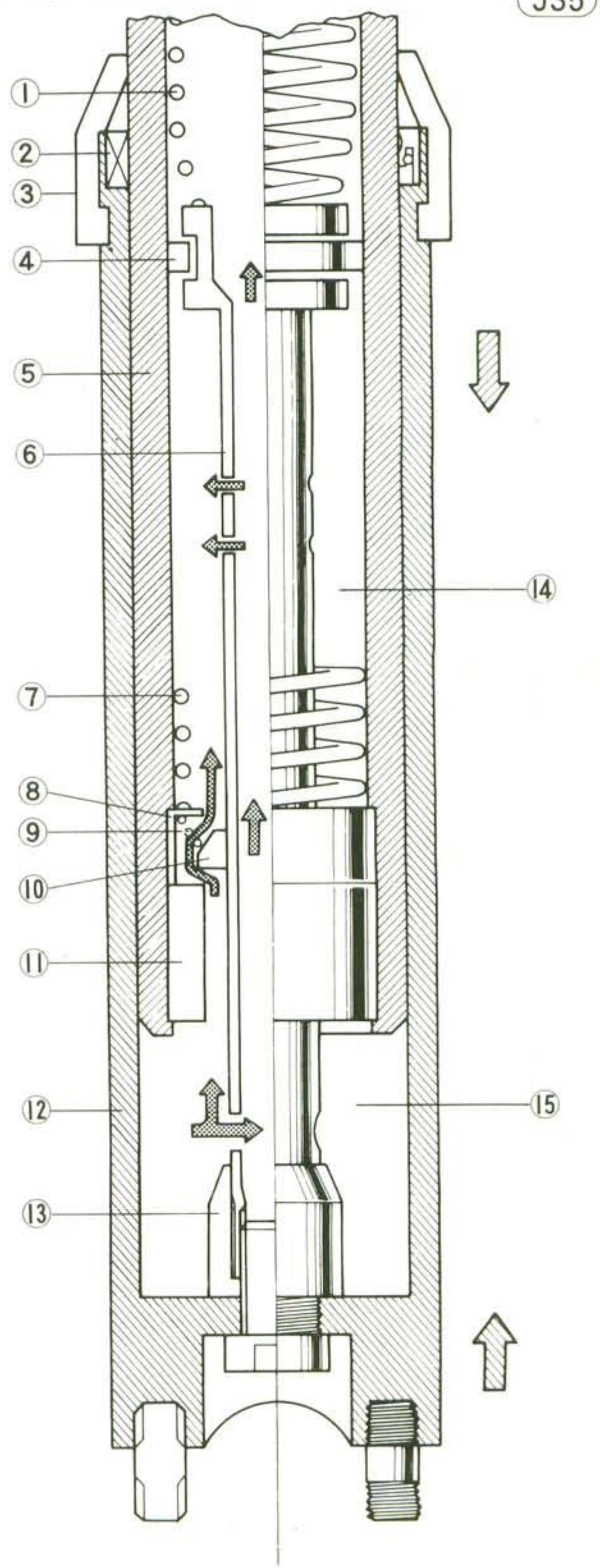
Whenever a load is placed on the front fork and whenever the front wheel receives a shock, the inner tube ⑤ moves down inside the outer tube ⑫, compressing both the spring ① and the air in the inner tube. At the same time, low pressure (suction) is created in an enlarging chamber (upper chamber) formed between the inner tube and the cylinder ⑥, and draws in oil from a diminishing chamber (lower chamber) formed between the outer tube and the cylinder. As the lower chamber shrinks in size with oil passing freely through the non-return valve ⑩ into the upper chamber, oil also passes freely through the cylinder lower orifices into the cylinder as the inner tube approaches the cylinder base ⑬. 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 the compressed spring. As the tubes move apart, the upper chamber grows smaller, forcing the oil through the cylinder upper orifices since the oil cannot return the way it came through the non-return valve. These small holes restrict the oil flow into the inner tube,

Compression Stroke

(J35)



1. Spring
2. Oil Seal
3. Dust Seal
4. Piston Ring
5. Inner Tube
6. Cylinder and Piston Unit
7. Spring
8. Spring Seat
9. Spring
10. Non-return Valve
11. Collar
12. Outer Tube
13. Cylinder Base
14. Upper Chamber
15. Lower Chamber

damping fork extension. Near the end of the extension stroke both the cylinder spring and the arrangement of the cylinder upper orifices provide further resistance to extension. As the collar rises, reducing the size of the upper chamber, the cylinder upper orifices are eliminated and an oil lock forms, 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 action too stiff; too little oil or too light an oil makes the action soft, decreases damping potential, and may cause noise during fork movement.

Contaminated or deteriorated oil will also affect shock damping and, in addition, will accelerate internal wear. The fork oil should be changed periodically (Pg. 10) or sooner if the oil appears dirty.

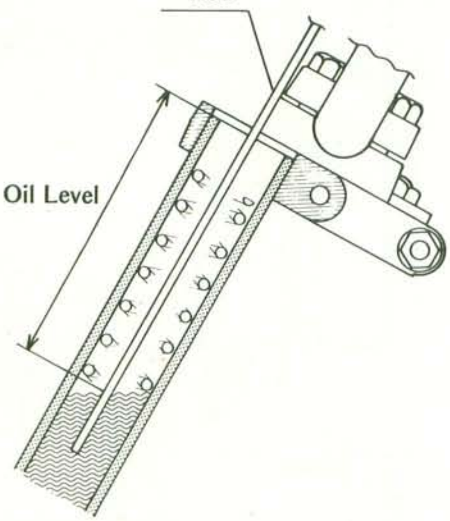
A bent, dented, scored, or otherwise damaged inner tube will damage the oil seal, causing oil leakage. A badly bent inner tube may cause poor handling.

Fork oil

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 top bolt from the inner tube. Insert a thin 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

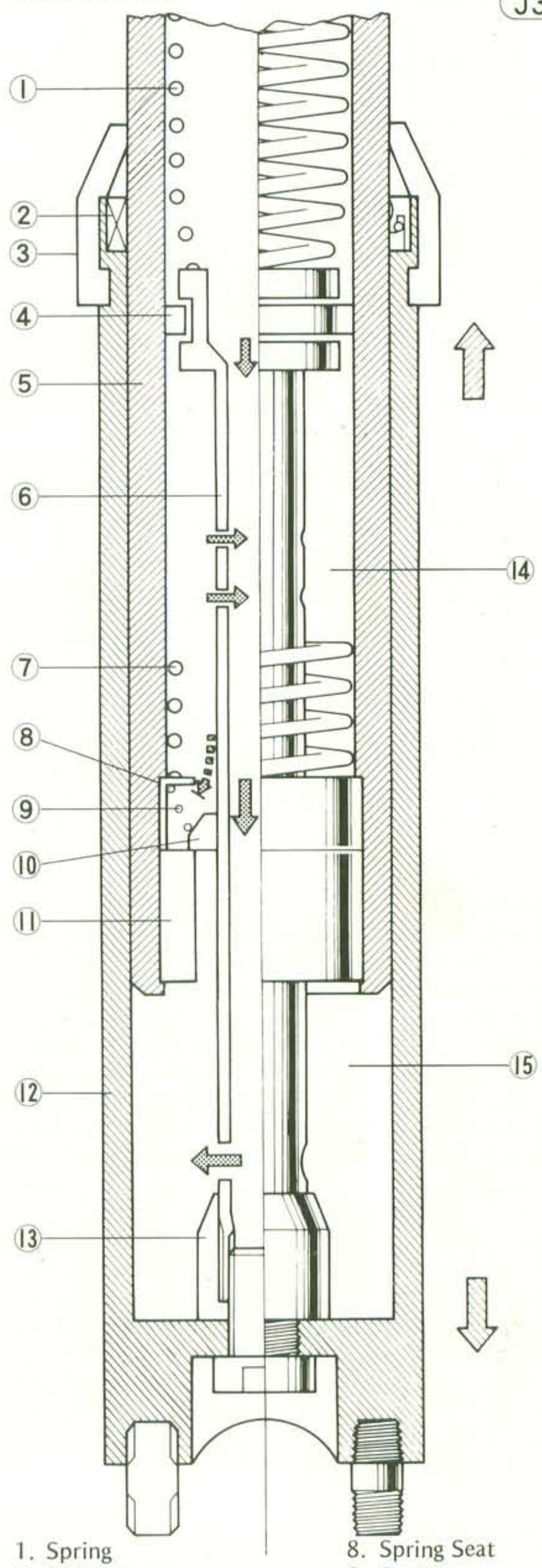


To drain out the old oil, remove the drain screw from the lower end of the outer tube. With the front wheel on the ground and the front brake fully applied push down on the handlebar a few times to pump out the oil. Install the drain screw, remove the top bolt, from the inner tube, and pour in the type and amount of oil specified in Table J17. Then replace the top bolt and check the oil level. If the oil is below the specified level, add oil and re-check 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.

Extension Stroke

J37



1. Spring
2. Oil Seal
3. Dust Seal
4. Piston Ring
5. Inner Tube
6. Cylinder and Piston Unit
7. Spring
8. Spring Seat
9. Spring
10. Non-return Valve
11. Collar
12. Outer Tube
13. Cylinder Base
14. Upper Chamber
15. Lower Chamber

Table J17 Fork Oil

Filling fork oil capacity			
Type	When changing oil	After disassembly and completely dry	Oil Level
SAE 10W20	about 160 cc	180～188 cc	420 mm from top of inner tube

Spring tension

Since the spring becomes shorter as it weakens, check its free length to determine its condition. If the spring of either fork leg is shorter than the service limit, it must be replaced. If the length of a replacement spring and that of the remaining spring vary greatly, the remaining spring should also be replaced in order to keep the fork leg balanced for motorcycle stability.

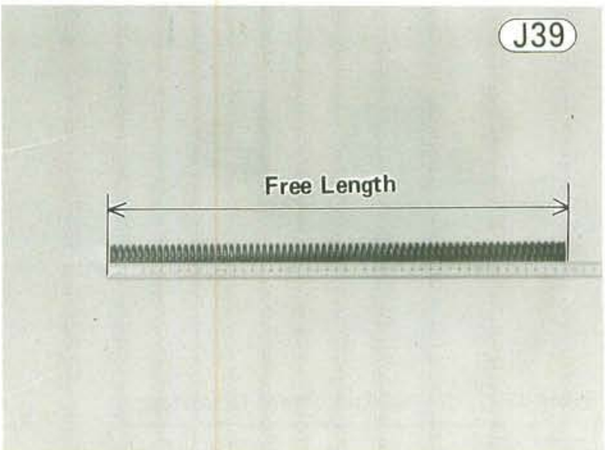


Table J18 Fork Spring Free Length

Standard	Service Limit
521 mm	511 mm

Inner tube damage

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

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

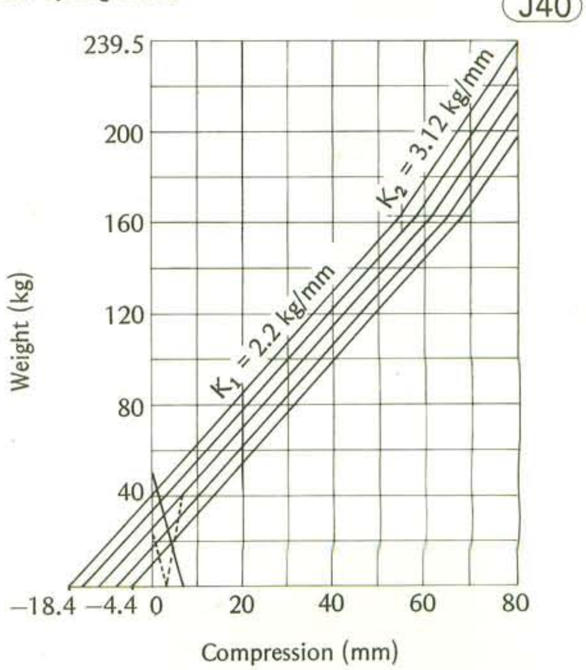
REAR SHOCK ABSORBERS

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.

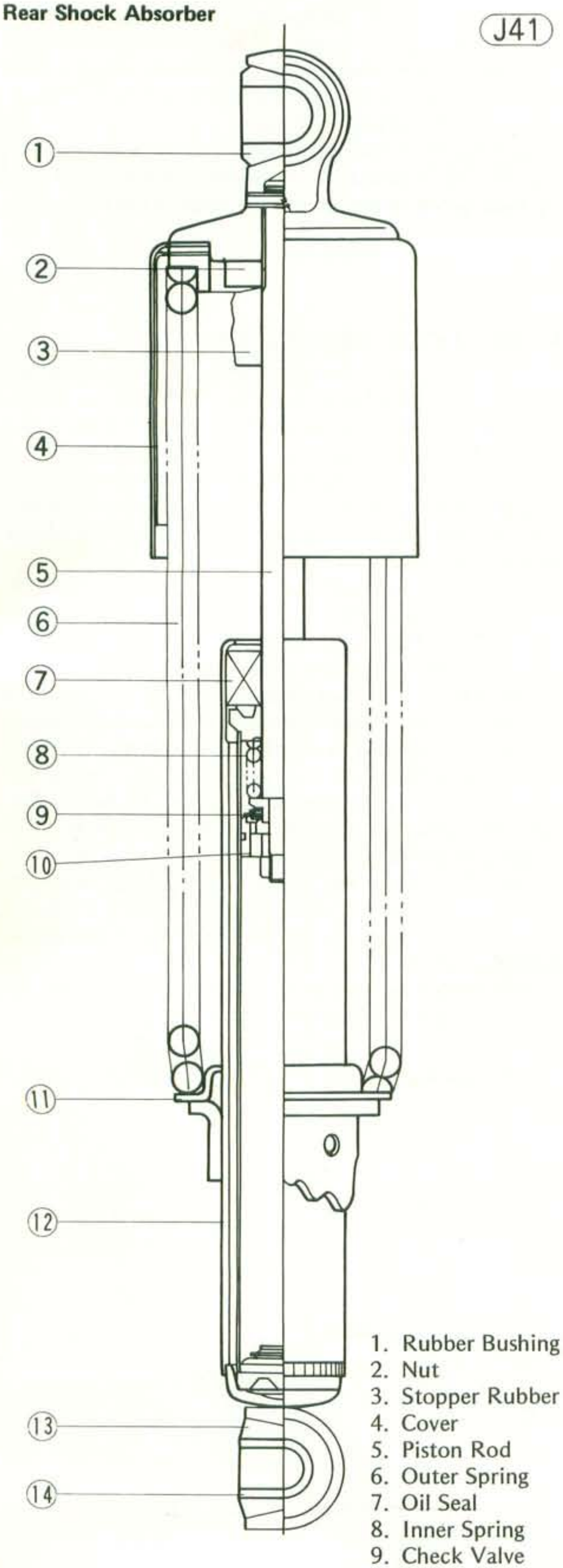
Since the rear shock absorbers are sealed units which cannot be disassembled, only external checks of operation are necessary. With the shocks removed, compress each one and see that the compression stroke is smooth and that there is damping in addition to spring resistance to compression. When the unit is released, the spring should not suddenly snap out 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 5 different settings is shown in the graph.

Rear Spring Force



Rear Shock Absorber



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

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.

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.

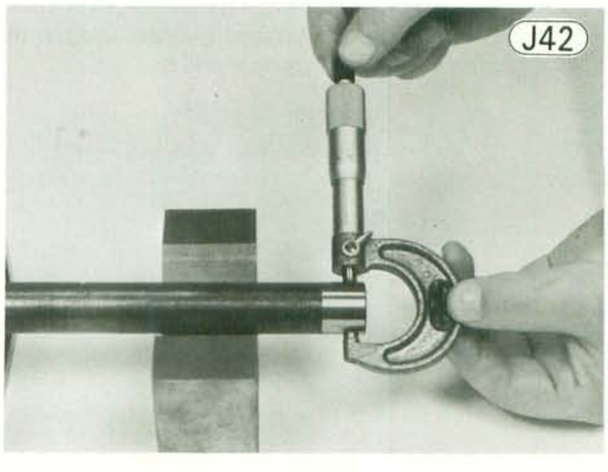


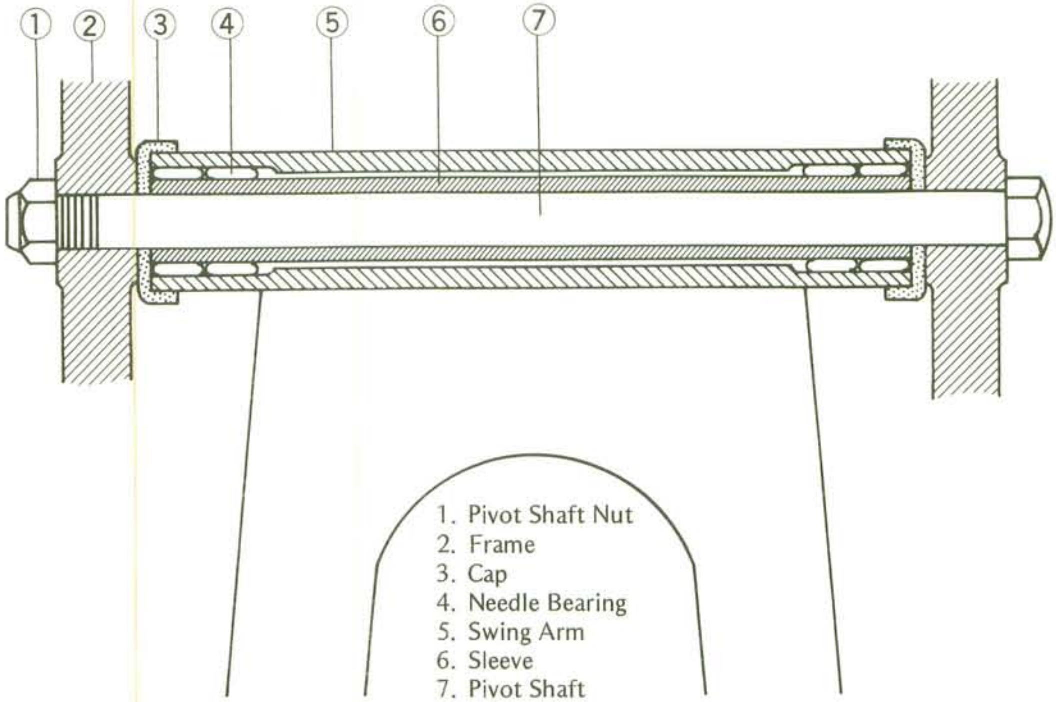
Table J19 Swing Arm Sleeve Diameter

Standard	Service Limit
21.987 ~ 22.000 mm	21.96 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 the condition of any needle bearing, replace all the needle bearings. Whenever the swing arm sleeve is replaced, also replace the needle bearings.

Swing Arm

J43



1. Pivot Shaft Nut
2. Frame
3. Cap
4. Needle Bearing
5. Swing Arm
6. Sleeve
7. Pivot Shaft

Pivot Shaft

To measure the pivot shaft runout, set the pivot shaft on **V** blocks at the ends of the 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 service limit, straighten it. If it cannot be straightened, or if the runout exceeds 0.7 mm, replace the shaft.

Pivot Shaft Runout

J44

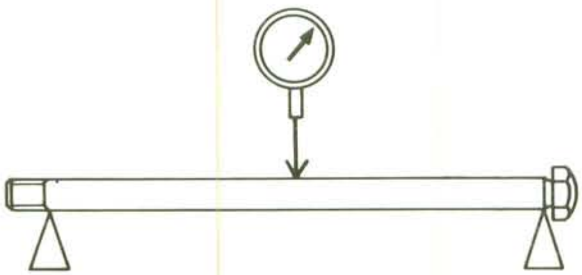


Table J20 Pivot Shaft Runout

Standard	Service Limit
under 0.10 mm	0.14 mm

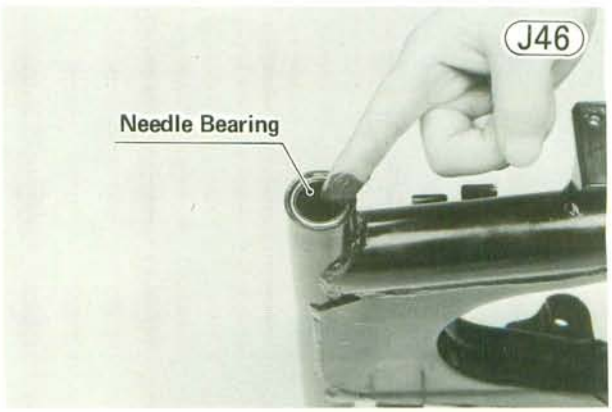
Swing arm lubrication

There is a grease nipple on the swing arm for lubrication. Grease the swing arm with regular cup grease as a part of general lubrication (Pg. 32) with the frequency given in the Periodic Maintenance Chart (Pg. 10). Force the grease into the nipple until it comes out at both sides of the swing arm, and wipe off any excess.

J45

If the grease does not come out, first check that the nipple is not clogged with dirt or old grease. If the nipple is clear but still will not take grease; remove the swing arm (Pg. 129), pull out the sleeve, clean out the old grease, and apply grease to the needle bearings.

J46



Maintenance – Electrical

Table of Contents

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.**

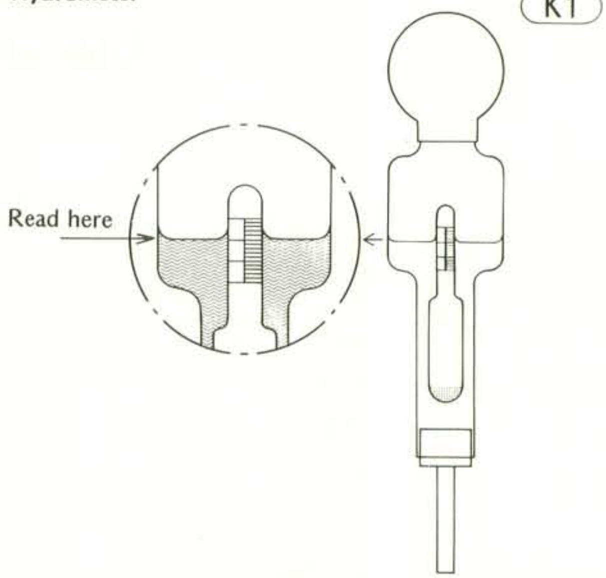
Electrolyte

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.

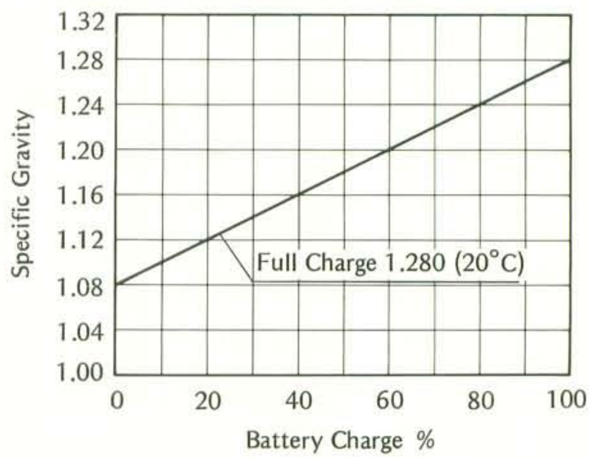
The specific gravity of the electrolyte is measured with a hydrometer and is the most accurate indication of the condition of the battery. When using the hydrometer, read the electrolyte level at the bottom of the meniscus (curved surface of the fluid). Fig. K2 shows the relationship between the specific 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 what the specific gravity will be at any temperature. When the temperature goes up, the specific gravity goes down, and vice versa.

Generally speaking, a battery should be charged if a specific gravity reading shows it to be discharged to 50% or less of full charge.

Hydrometer (K1)



Specific Gravity/Battery Charge Relationship (K2)



○Celsius

$C_{20}=S_t+[0.0007\,(t\text{-}20)]$

○Fahrenheit

$S_{68}=S_t+[0.0004\,(t\text{-}68)]$

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

Initial charge

New batteries for Kawasaki motorcycles are dry charged and can be used directly after adding the electrolyte. Howeve, the effect of the dry charge deteriorates somewhat during storage, especailly 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 to 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 be 3/10 x 14 which equals 4.2 amperes.

CAUTION **Charging the battery at a rate higher than specified above could ruin the battery. Charging at a higher rate causes excess heat, which can warp the plates and cause internal shorting. Higher than normal charging rates also cause the plates to shed active 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.

$$\text{Charging time (hours)} = \frac{\text{Amount of discharge (AH)}}{\text{charging current (A)}} \times 1.2 \sim 1.5$$

- Remove the caps from all the cells, and begin charging the battery at the rate just 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 to 16 volts and the specific gravity of the electrolyte should be more than 1.250. If the voltage is lower than this, the battery is not completely charged or can no longer take a full charge. If the specific gravity of any one cell is lower than 1.250, there may be damage in the cell.

Test charging

When the battery is suspected of being defective, first inspect the points noted in the chart below. The battery can be restored by charging it with the ordinary charge.

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 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 rise to 12 volts immediately and then gradually go up to 12.5 ~ 13 volts in about 30 to 60 minutes after charging is started.

★ If one cell produces no gas bubbles, or has a very low specific gravity, it is probably shorted.

★ If there does not appear to be enough sediment to short the plates, but one cell has a low specific gravity after the battery is fully charged, the trouble may be just that there is insufficient acid in that cell. If 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.

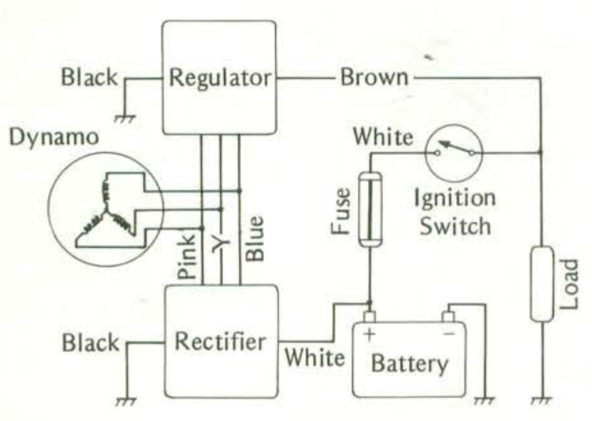
CHARGING SYSTEM

The charging system consists of a dynamo (an alternator), rectifier, and voltage regulator.

The dynamo generates the current required by the electrical circuits. The generated current is a 3 phase alternating current (AC), which is changed to direct current (DC) by a rectifier and controlled by a solid-state regulator 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 in each section. Failure to observe these rules can result in serious system damage. Lean 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 regulator and alternator 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, generator, 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.

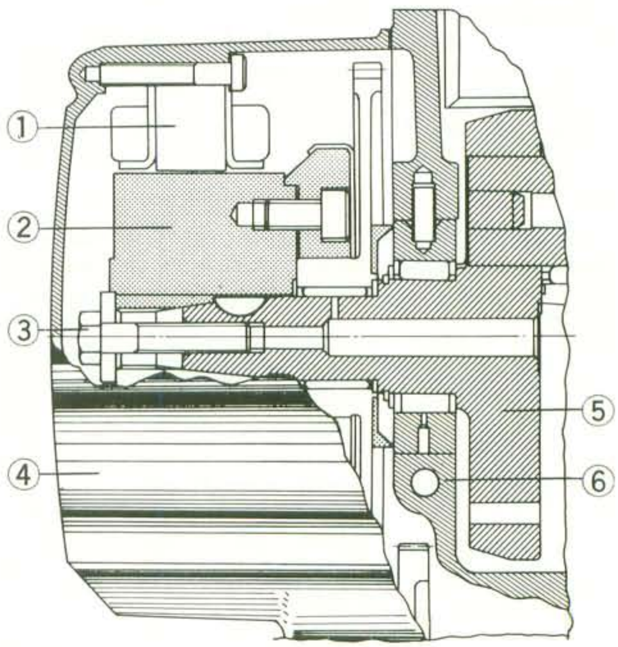
Dynamo

The dynamo is made of a rotor ② and armature ①. The armature is mounted in the dynamo cover ④, while the rotor is secured to the left end of the crankshaft ⑤ and rotates at engine rpm. Permanent magnets in the rotor supply the magnetic field for the armature so that no slip rings or brushes are necessary, making the generator practically maintenance free.

The armature consists of three sets of coils wound on laminated steel cores. These coils are connected in a wye connection to produce a 3 phase alternating current. Since the voltages of these 3 phases overlap, there is a continuous, even supply of current for the circuit components.

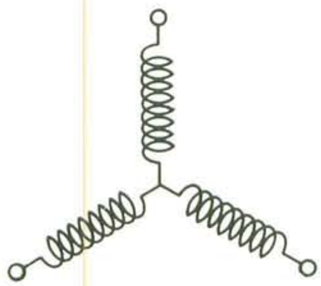
Dynamo Construction

K4

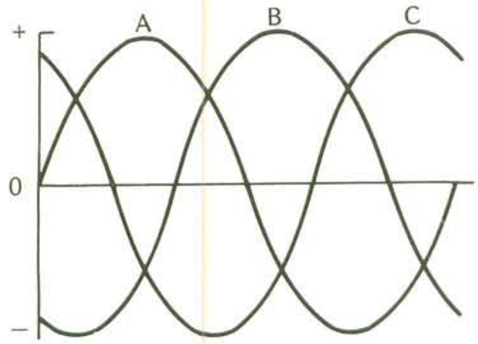


1. Armature
2. Rotor
3. Rotor Bolt
4. Dynamo Cover
5. Crankshaft
6. Crankcase

Wye Connection (K5)



Dynamo Current (K6)



Dynamo failure

If the battery, rectifier, regulator, 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 rotor magnetism. A short or open in one of the coil wires will result in either a low output, or no output at all. A loss in rotor magnetism, which may be caused by dropping or hitting the rotor, leaving it near an electromagnetic field, or just by aging, will result in low output.

Dynamo output test

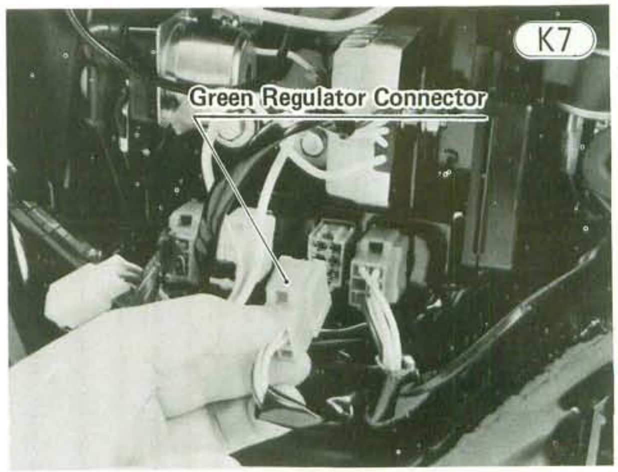
Before making this test, check the condition of the battery (Pg. 192) and rectifier (Pg. 196). If the battery voltage is less than 12 volts, charge the battery. Both the output voltage and output amperage should be checked. Before starting the dynamo test warm up the engine to obtain actual dynamo operating conditions. **NOTE:** In this explanation of the dynamo output test, the use of two multimeters at the same time is described. If two multimeters are not available, this test can be performed by measuring the charging amperage and the charging voltage separately.

To check the dynamo output:

- Remove the left side cover.
- Check that the ignition switch is turned off, and disconnect the green regulator connector.

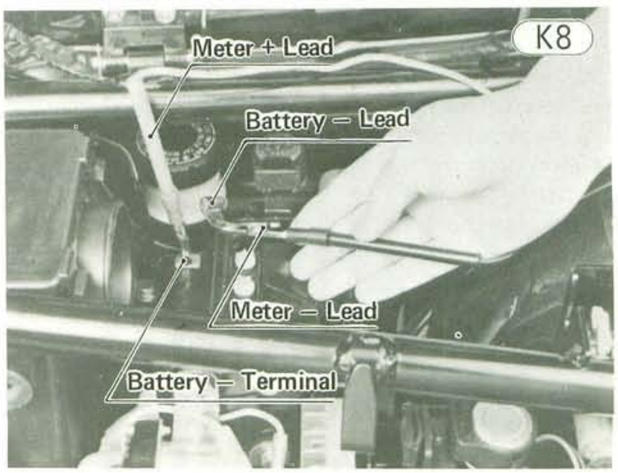
CAUTION **If the regulator connector is disconnected with the ignition switch on, the regulator may be damaged.**

(K7)

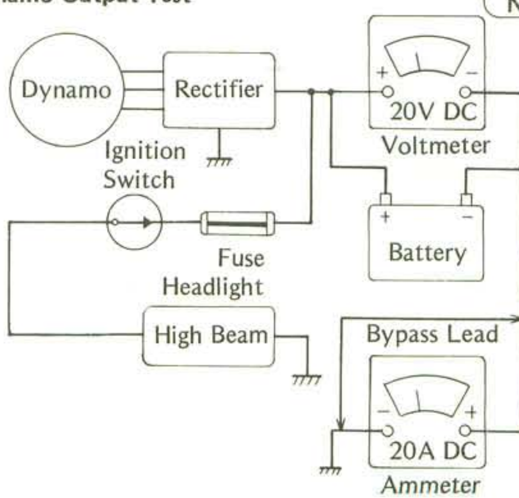


- Unlock the seat, and swing it open.
- Remove the tool kit and tray.
- Loosen the clamp, and remove the air cleaner silencer.
- Disconnect the battery – lead from the battery – terminal. Set the multimeter to the 20A DC range, and connect the meter – lead to the battery – lead and meter + lead to the battery – terminal. This puts the ammeter in series with the battery so that battery charging current can be measured.

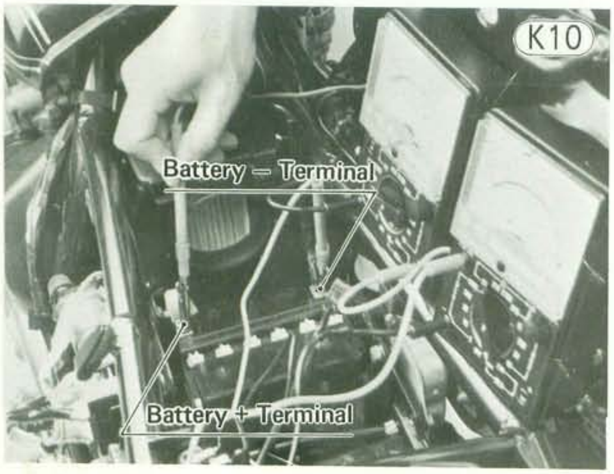
(K8)



Dynamo Output Test (K9)



- Set another multimeter to 20V DC, and connect the meter + lead to the battery + terminal and the meter – lead to the battery – terminal.



- Connect a temporary lead, with alligator clips, to the battery – terminal and meter – lead. This works as a bypass and prevents damage to the multimeter from back current when the engine is not running enough speed to charge the battery.
- Start the engine with the **kickstarter**.

CAUTION **1. Make sure that all connections are firm. A loose connection allows the generator output voltage to increase instantly. This may cause damage to the rectifier or other electrical components.**
2. To prevent damage to the multimeter caused by reverse starting current, DO NOT use the electric starter when starting the engine.

- Check that the dimmer switch is in the high beam position.
- Disconnect one end of the bypass lead.
- Run the engine at the rpm in Table K2, and note the readings of voltage and amperage. A much lower reading indicates that the dynamo is defective.
- Turn off the ignition switch to stop the engine.

If the dynamo was found to be defective, carry out the following checks to determine which part is defective.

Dynamo resistance test

- Disconnect the blue dynamo connector on the electrical panel.
- Set the multimeter to the R x 1 range, and measure the resistance between each pair of the three dynamo wires going to the plug: blue ↔ pink, blue ↔ yellow, pink ↔ yellow. If there is much more resistance than shown in Table K3, or no meter reading (infinity) for any two armature leads, the armature has an open lead and must be replaced. Much less than this resistance means the armature is shorted, and must be replaced.

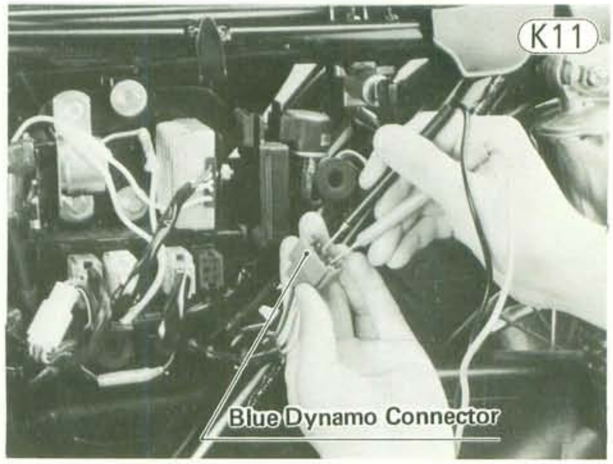
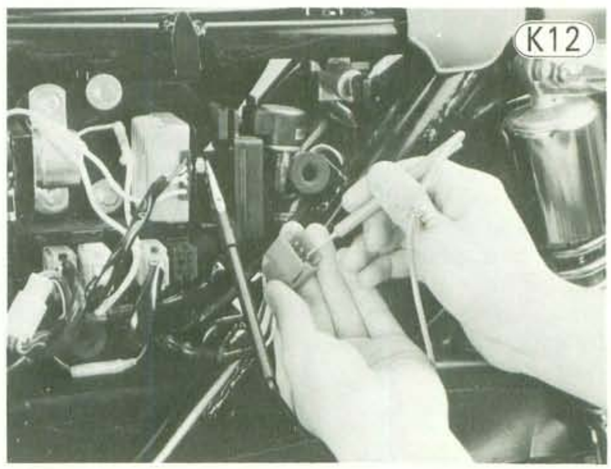


Table K3 Armature Resistance

Meter	Reading
R x 1	0.56 ~ 0.84 Ω

- Using the highest resistance range of the multimeter, measure the resistance between each of the three armature leads (pink, yellow, and blue) and chassis ground. There should be no meter reading (infinity). Any meter reading indicates a short, necessitating armature replacement.



If the armature windings have normal resistance, but voltage and current checks showed the dynamo to be defective, then the rotor magnets have probably weakened, and the rotor must be replaced.

Rectifier

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.

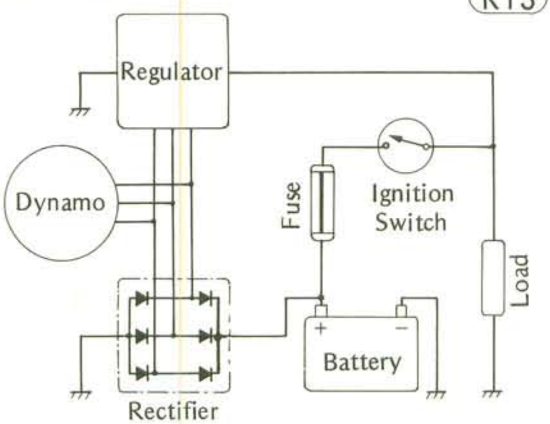
Table K2 Dynamo Output

Meter	Connections	Reading @4,000 rpm
20V DC	Meter + Lead → Battery + Terminal, Meter – Lead → Battery – Terminal	13.5 ~ 14.8 V
20A DC	Meter + Lead → Battery – Terminal, Meter – Lead → Battery – Lead	0.8 ~ 1.8 A

It contains six silicon diodes to rectify (change to DC) the three phases of the dynamo output. The diodes are connected in a bridge circuit arrangement for efficient, full-wave rectification.

Rectifier Circuit

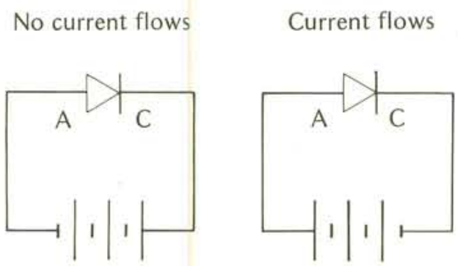
K13



The reason that a diode only permits direct current to flow in the part of the circuit in which it is connected is that a diode conducts current only in one direction. 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 charge adequately.

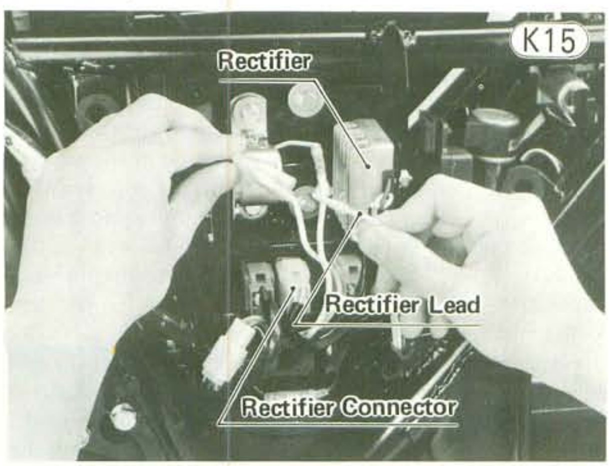
Diode Current Flow

K14



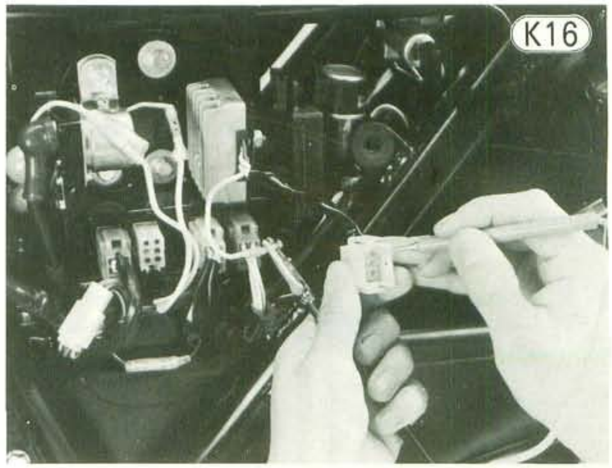
Inspection

•With the ignition switch turned off, remove the left side cover, disconnect the rectifier white lead from the battery + side.



•Disconnect the white rectifier connector on the electrical panel.

•Using the R x 10 or R x 100 ohmmeter range, check the resistance in both directions between the white lead and each yellow lead, and between the black lead and each yellow lead. There is a total of 12 measurements. The resistance should be low in one direction and more than ten times as much in the other direction. If any two leads are low or high in both directions, the rectifier is defective and must be replaced.



NOTE: The actual meter reading varies with the meter used and the individual rectifier, but, generally speaking, the lower reading should be within 1/3 scale of zero ohms.

CAUTION Be careful not to strike, scratch, or in any other way damage the rectifier. Such damage may cause the rectifier to short.

Regulator

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. It is therefore manufactured as a sealed unit, and must be replaced as a unit should it become defective. Internal regulator operation is explained here only to aid the technician in troubleshooting and in understanding test procedures.

Fig. K17 shows the basic circuit of the regulator that is referred to in the following explanation.

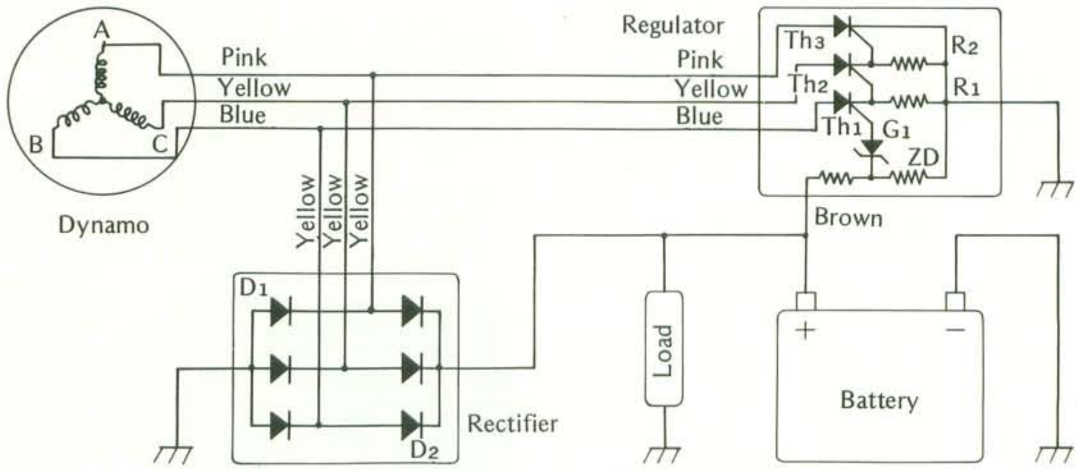
There are three parts to the regulator, one to regulate each phase of the three-phase dynamo output. The main components of the circuit are three thyristors (Th), or Silicon Controlled Rectifiers (SCR) as they are also called, and zener diode (ZD). The Thyristors (Th) and zener diode (ZD) function as follows:

1. Thyristor

Current will flow from the cathode to 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.

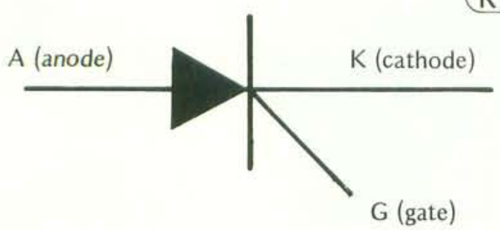
Regulator and Rectifier Circuit

(K17)



Thyristor

(K18)

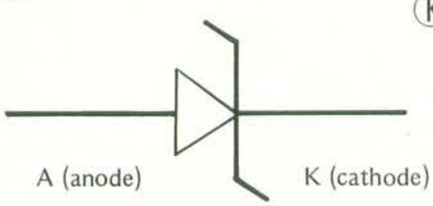


2. Zener diode

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 breakdown 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

(K19)



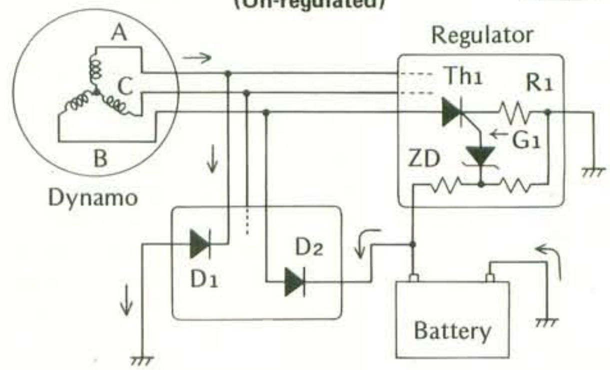
Figs. K20 and K21 show simplified diagrams of the regulator circuit for one phase.

One side of the zener diode (ZD) is connected to the + terminal of the battery to keep a check on charging voltage. The other side is connected to the gate lead (G_1) of the thyristor (Th_1) to signal Th_1 when charging voltage becomes too high. D_1 and D_2 in the diagram are two of the diodes in the rectifier.

When dynamo output voltage is lower than the specified value, such as at low engine speed and/or there is a heavy load on the dynamo, dynamo output current flows form A through D_1 to ground. From ground it goes up through the battery to charge it, and through D_2 back to the dynamo.

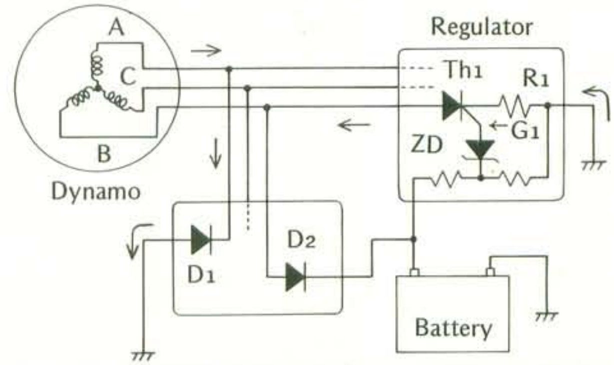
Regulator Circuit for One Phase
(Un-regulated)

(K20)



Regulator Circuit for One Phase
(During Regulation)

(K21)



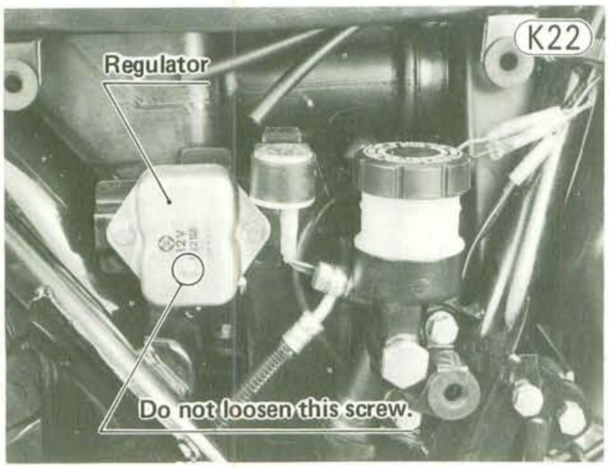
When dynamo output voltage gets too high, however, ZD conducts and signals Th_1 to start conducting. Then, instead of current going through the battery and overcharging it, it flows from ground up through R_1 and Th_1 and directly back to the dynamo. On the portion of the AC sine wave where the voltage is lower than the specified value, Th_1 does not conduct and battery charging current is allowed to flow. This ensures that the battery will still be charged at high engine rpm when dynamo voltage is being regulated.

Fig. K17 shows the complete rectifier and regulator circuits for all three phases, although the internal regulator circuit is simplified. After Th_1 starts conducting to regulate one phase of voltage, the voltage on the right of R_1 turns on Th_2 to regulate the next phase, and the voltage on the right of R2 turns on Th3 to regulate the third phase.

Thus, the regulator bypasses the excessive dynamo output and serves to keep the dynamo output voltage constant.

CAUTION **When inspecting the regulator, observe the following to avoid damage to the regulator.**

1. **Do not reverse the battery lead connections. This will burn out the zener diode.**
2. **Do not disconnect the regulator with the ignition switch on. This may damage the regulator.**
3. **Do not disconnect the battery leads while the engine is running. This may damage the regulator.**
4. **Do not loosen the screw on the outside of the case. This would reduce heat radiation efficiency, and could cause the semiconductors to overheat and short.**



5. **Take care to mount the regulator firmly in place, and to connect the leads correctly. A mistake in wiring will result in damage to the battery, as well as the regulator.**
6. **For the regulator 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.**
7. **Use only a small portable type of multimeter for regulator testing. If a megger or a meter with a large-capacity battery is used, the regulator will be damaged.**

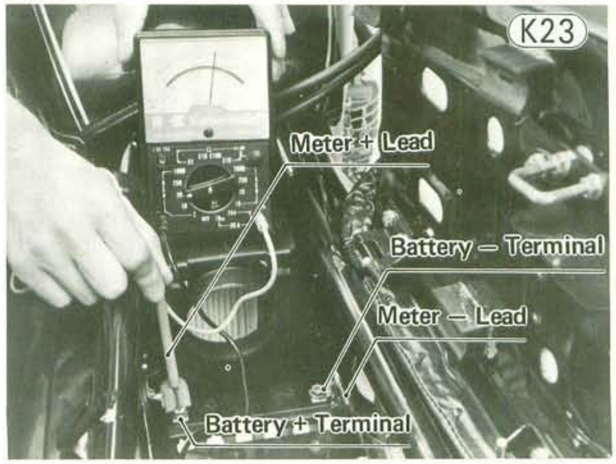
Regulator testing

In circuit:

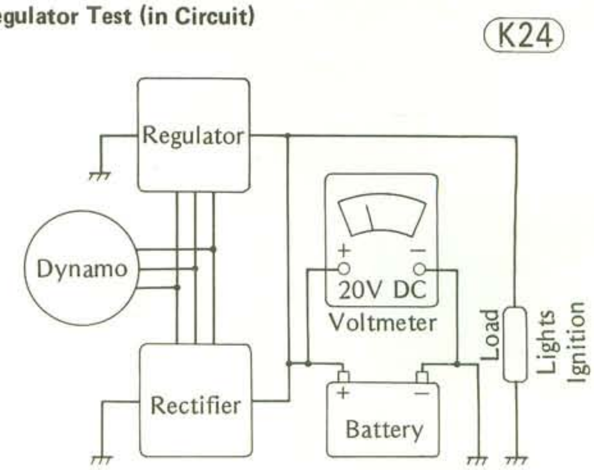
If the battery continually discharges, or if it overcharges, the regulator may be defective. Symptoms of too high a charging voltage are (a) battery water must be added often to all the cells, and (b) lights burn out when running at high rpm.

If the battery is defective or if it is discharged, the regulator will not operate normally and the battery must first be charged before any regulator tests can be made. Check the battery before starting the engine and charge it if it is less than 12 volts.

•Check that all lights are turned off.
•Set a multimeter to the 20V DC range, and connect the + meter lead to the battery + terminal and the – meter lead to the battery – terminal.



Regulator Test (in Circuit)



•Turn on the headlight switch with the headlight on high beam.
•Start the engine, and measure the battery voltage at the specified engine speed. The meter reading should show the value in Table K4.
•Stop the engine by turning the ignition switch off.

Table K4 Regulated Dynamo Output Voltage (Regulator in circuit)

Meter	Connections	Standard
20V DC	Meter (+) → Battery (+) Meter (–) → Battery (–)	14.0~15.0 V @5,000 rpm

If the voltage reading is more than specified, either the regulator is defective, or it is not properly connected into the circuit due to a loose connection, broken wire, etc. Carefully check all connections before replacing the regulator.

If the voltage reading is less than specified, there may be a faulty dynamo, rectifier or regulator. This can be checked easily by leaving the meter connected to the battery as is, stopping the engine, unplugging the green regulator connector from the electrical panel with the ignition switch off, and then restarting the engine. With the engine again running at 5,000 rpm and with the high beam headlight lit, if the meter now reads more than 15 volts, the regulator is defective; if the meter reads less than that, either the dynamo or the rectifier is defective.

Perform the following regulator out-of-circuit test and, if the regulator checks out good, check the rectifire (Pg. 196), dynamo (Pg. 194), and wiring.

Out of circuit:

To test the regulator out of circuit, first use an ohmmeter to check resistance between the various leads.

- Make sure that the ignition switch is turned off, and remove the regulator.
- Connect the multimeter as shown in Table K5, and note the meter readings. If there is any reading far from the specified values, the regulator is damaged and must be replaced

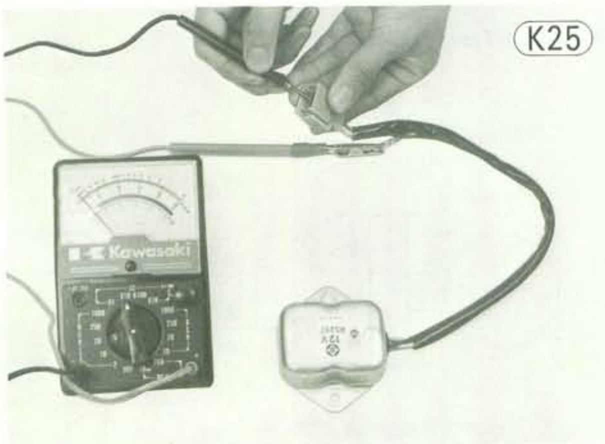


Table K5 Regulator Resistance

Meter	Connections	Reading
R x 100	Meter (+) → Black Lead Meter (–) → Brown Lead	about 1,050Ω
	Meter (+) → Brown Lead Meter (–) → Black Lead	about 300Ω

- With the multimeter set to the highest resistance range, there should be no reading at all (infinity) between any two leads except between the black lead and the brown lead, and no reading between the black or brown and any other lead. There should be also no reading between the regulator case and any lead. Any meter reading other than this indicates that the regulator is defective.

For the second out-of-circuit check, use a DC voltage source which is variable from 12 volts to 17 volts and two 12 V 3~6 W bulbs with sockets and leads.

NOTES: 1. A battery is a good voltage source because of its constant output voltage. An alternate voltage source, such as a battery charger, can not be used to test the regulator, because its output voltage is not perfect direct current.

2. One example of a DC voltage source is shown in Fig. K26. In this case, a rheostat (variable resistor) is used to adjust the output voltage.

- Using auxiliary leads, connect the regulator black lead to the voltage source – terminal, and connect the regulator brown lead to the voltage source + terminal.

Regulator Test (Out of Circuit)

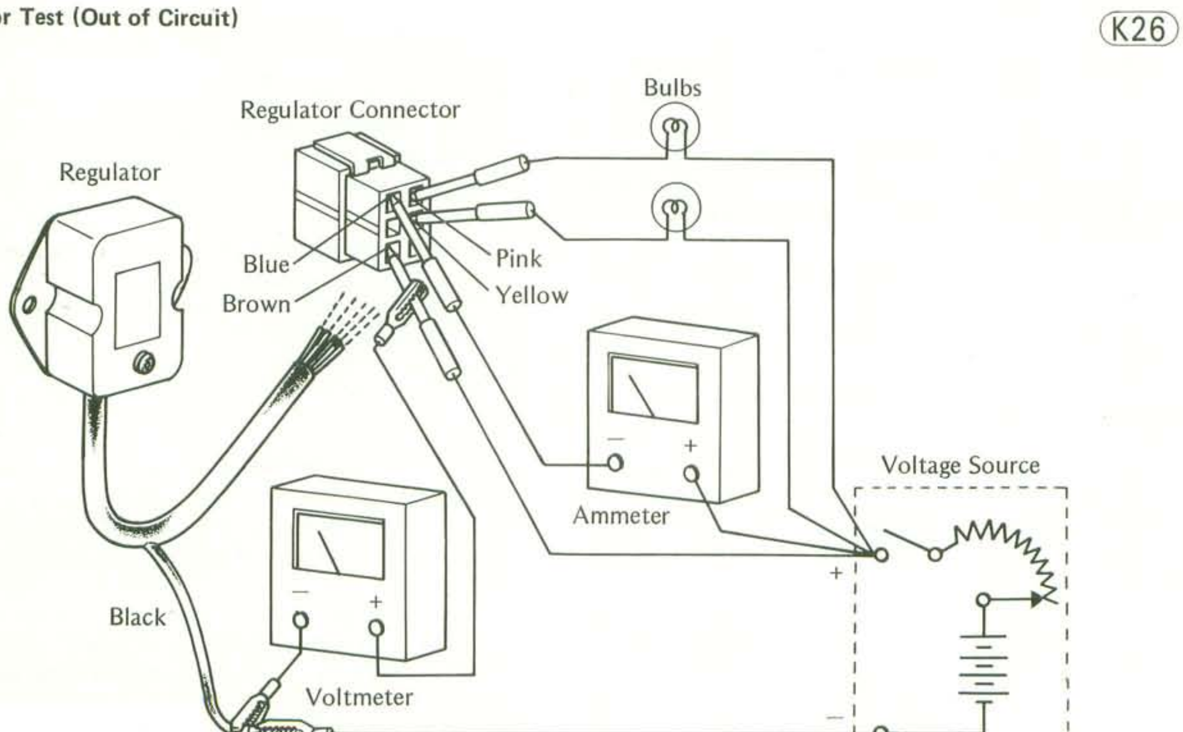


Table K6 Regulator Test (Out of Circuit)

Meter	Connections	Source	Bulbs and Ammeter
20 V DC 120 mA DC	Pink ⟷ Bulb ⟷ Source (+) Yellow ⟷ Bulb ⟷ Source (+) Blue ⟷ Ammeter (–) Ammeter (+) ⟷ Source (+) Black ⟷ Voltmeter (–) Voltmeter (+) ⟷ Source (+) Brown ⟷ Source (+) Black ⟷ Source (–)	Less than 14.0 V DC	Bulbs stay unlit and ammeter indicates 0 amps.
		14.0~15.0 V DC	Bulbs light and ammeter indicates about 40 mA between this range.
		More than 15.0 V DC	Bulbs stay lit and ammeter indicates about 40 mA.

•Set the multimeter to the 120 mA DC range, connect the meter – lead to the regulator blue lead, and the meter + lead to the voltage source + terminal.
•Connect one bulb between the regulator pink lead and the voltage source + terminal.
•Connect another bulb between the regulator yellow lead and the voltage source + terminal.

CAUTION **These bulbs work as indicators and also as current limiters that protect the regulator from excessive current. So do not use ammeters instead of bulbs for the regulator pink and yellow leads.**

•Set the multimeter to the 20V DC range, connect the meter – lead to the black lead, and the meter + lead to the brown lead.
•Set the voltage source to the lowest output voltage, and turn it on. At this time both bulbs should be unlit and the ammeter should indicate 0 amps.
•While gradually increasing the voltage source output, note the exact voltage when the bulbs light and the ammeter shows current flow.

NOTE: If this test must be repeated, first turn off the voltage source, set the voltage source to the lowest output, and then start the test again.

CAUTION **Do not apply more than 18 volts. If more than 18 volts is applied, the regulator may be damaged.**

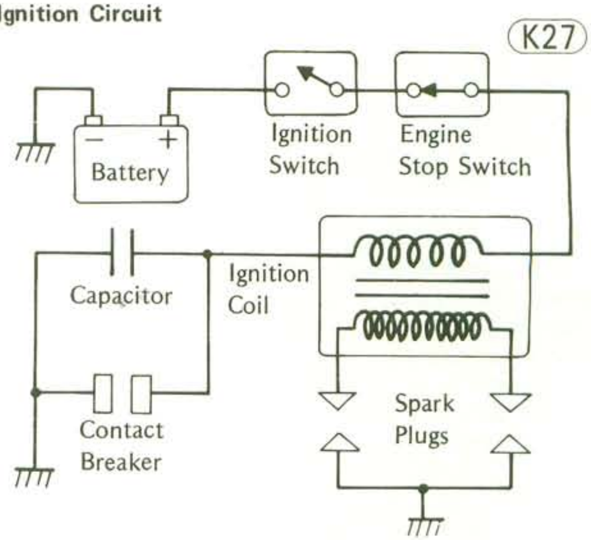
•If the regulator is good, the ammeter will indicate about 40 mA at the voltage shown in Table K6. At the same time the bulbs will light.
•Replace the voltage regulator if either bulb or the ammeter does not work as described above.

NOTE: The above out-of-circuit test is not foolproof. If the above checks show the regulator is not damaged, but there is still trouble in the charging system, first carefully inspect the rectifier, dynamo, battery, wiring, and connections. Replace the regulator if all of them turn out good.

IGNITION SYSTEM

The working electrical part of the ignition system consists of the battery, two sets of contact breaker points, two capacitors, two ignition coils, and four spark plugs. (See Pgs. 204~205 for spark plug information.)

Ignition Circuit



A wiring diagram of one half of the ignition system is shown in Fig. K27. The other half is identical, 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 two spark plugs. The two sets of points and two coils take the place of a distributor, which is left out to increase the reliability of the system. Each set of points fires two spark plugs every time the two pistons rise, that is, once every 360° of crankshaft rotation. Since the two sets of points (and the two sets of pistons) are 180° out of phase, plugs 2 and 3 fire 180° of crankshaft rotation after plugs 1 and 4 fire, and vice versa. 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).

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 field. 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 sharpness (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

The most accurate test for determining the condition of the ignition coil is made with the Kawasaki electrotester. The ignition coil must be connected to the tester in accordance to the tester directions and should produce at least a 7 mm spark. Since an electrotester other than the Kawasaki electrotester may produce a different arcing distance, the Kawasaki electrotester is recommended for a reliable result.

If the distance reading is less than the specified value, the ignition coil or spark plug caps are defective. To determine which part is defective, measure the arcing distance again with the spark plug caps removed from the ignition coil. If the arcing distance is subnormal as before, the trouble is with the ignition coil itself. If the arcing distance is now normal, the trouble is with the spark plug caps.

If an electrotester is not available, the coil can be checked for a broken or badly shorted winding with an ohmmeter. However, an ohmmeter cannot detect layer shorts and shorts resulting from insulation breakdown under high voltage.

To measure the primary winding resistance:

- Remove the fuel tank (Pg. 44).
- Disconnect the red/yellow ignition coil lead, and disconnect the green or black ignition coil lead.
- Set the ohmmeter to the R x 1 range, and connect one ohmmeter lead to the red/yellow lead and the other to the green or black lead from the ignition coil.

To measure the secondary winding resistance:

- Pull off the spark plug leads, numbered 1 and 4, or 2 and 3, from the spark plugs, and unscrew the spark plug caps from the spark plug leads.
- Set the ohmmeter to the R x 1K range, and connect one ohmmeter lead to one of the spark plug leads and the other ohmmeter lead to the remaining spark plug lead.

Ignition Coil Test

K28

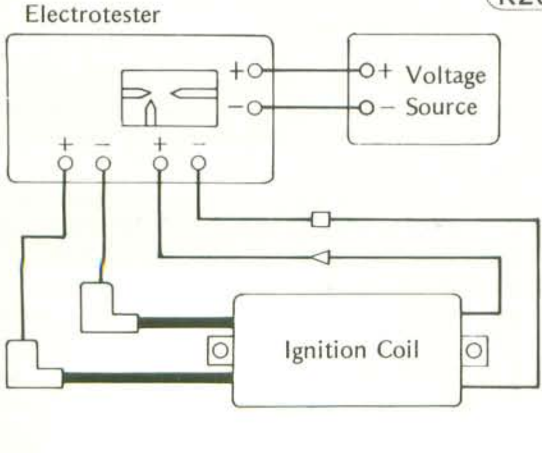


Table K7 Ignition Coil Resistance

	Meter	Reading
Primary Winding	R x 1	3.2~4.8 Ω
Secondary Winding	R x 1K	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 each ignition coil red/yellow lead, and one spark plug lead and the coil core (two tests on each coil). If there is any reading, the coil is shorted and must be replaced. Also, replace the ignition coil if either spark plug lead shows visible damage.

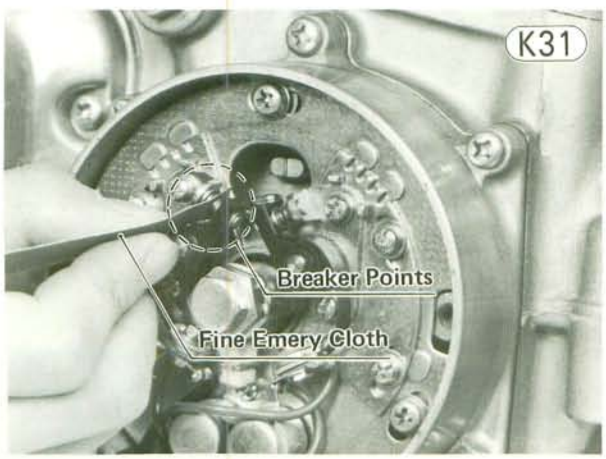
Contact Breaker

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

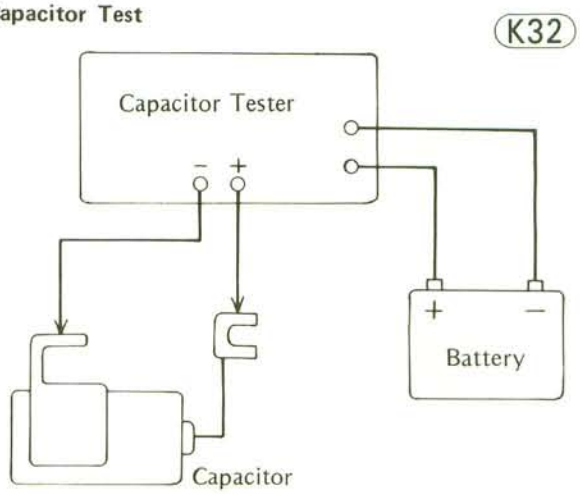
A capacitor is connected in parallel across each set of contact breaker points and serves to prevent current from arcing across the points as they open. Arcing across the points would reduce the sharpness of the current drop in the primary winding, thus weakening the spark plug spark, and also damaging 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 simple 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 capacitors any time either one appears defective and whenever either contact breaker is replaced.

NOTE: For checking with a capacitor tester, capacitor specifications are: 0.24 ± 0.02 μF, 1,000 WVDC.

Capacitor Test

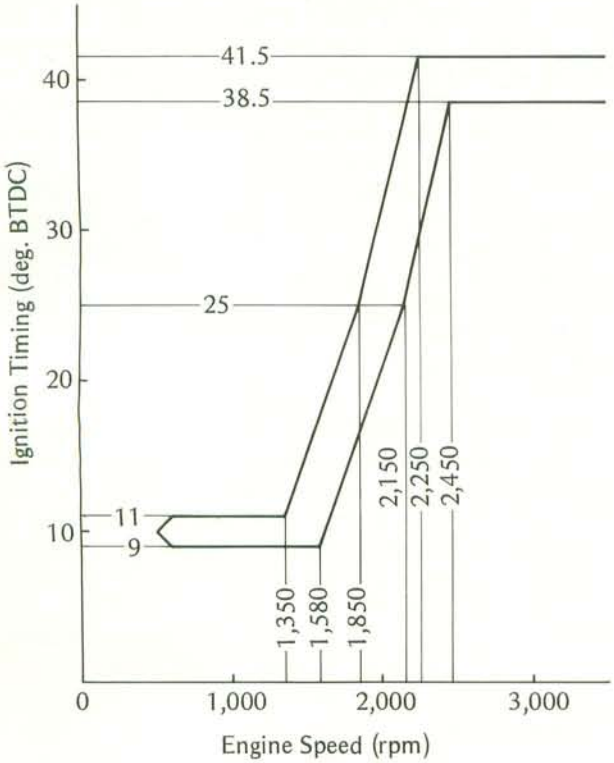


Timing Advancer

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.

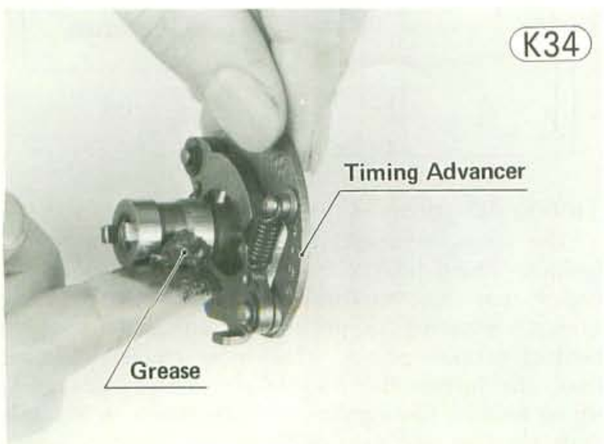
If the mechanism is damaged, has a weak or broken spring(s), or does not move smoothly, the ignition timing will not advance smoothly or it may stick in one position. This will result in incorrect timing at certain engine speeds, causing poor engine performance. Failure to advance at all will cause poor high speed performance, and excessive advance will cause knocking and poor low speed performance.

Ignition Timing/Engine Speed Relationship (K33)



Inspection and lubrication

Remove the timing advancer (Pg. 70), 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 in the advancer body or inside the rotor with grease.



Install the advancer (Pg. 70), adjust the timings (Pgs. 12 ~ 13), and check it with a strobe light for both low and high speed operation (Pg. 14). If the timing differs from that which is shown in the graph (Fig. K32), replace the timing advancer with a new one.

Spark Plugs

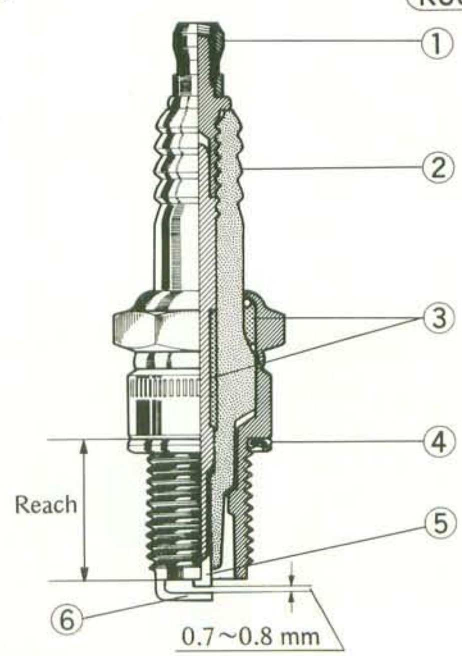
The spark plugs ignite the fuel/air mixture in the combustion chamber. To do this effectively and at the proper time, the correct spark plugs must be used, and the spark plugs must be kept clean and adjusted.

Test have shown the NGK B8ES or ND W24ES-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 – 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.**

Spark Plug (K35)



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

Table K8 Spark Plug Specifications

Required Plug Threads	NGK (ND) Number
Diameter: 14 mm Pitch: 1.25 mm Reach: 19.0 mm	B8ES W24ES-U

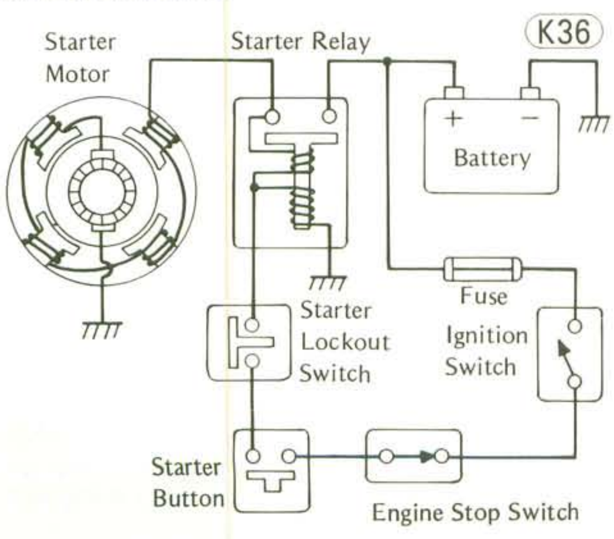
ELECTRIC STARTER SYSTEM

Starter Motor Circuit

The starter motor circuit includes the starter button (switch), starter lockout switch, starter relay, battery, and starter motor. The starter lockout switch mounted on the clutch lever holder is designed to prevent starter motor operation unless the clutch is disengaged. When the ignition switch is on, the clutch lever is pulled (the starter lockout 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 runing 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.**

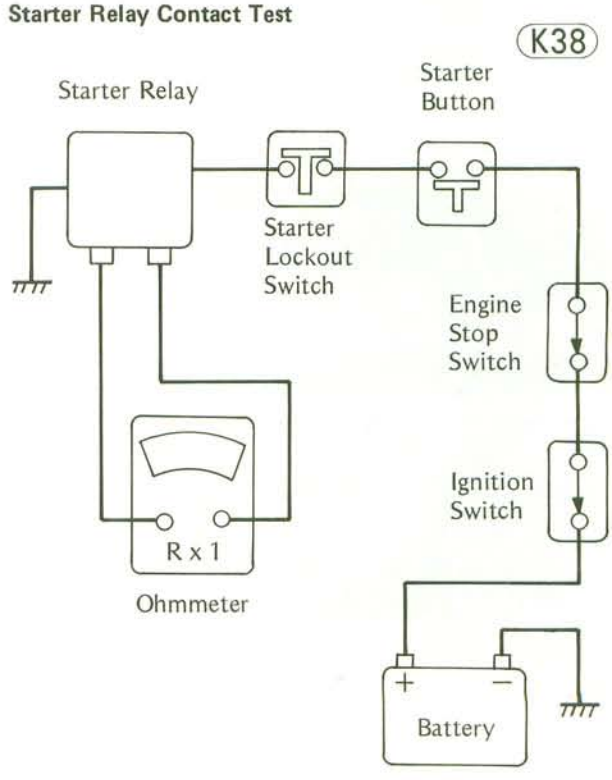
Starter Motor Circuit



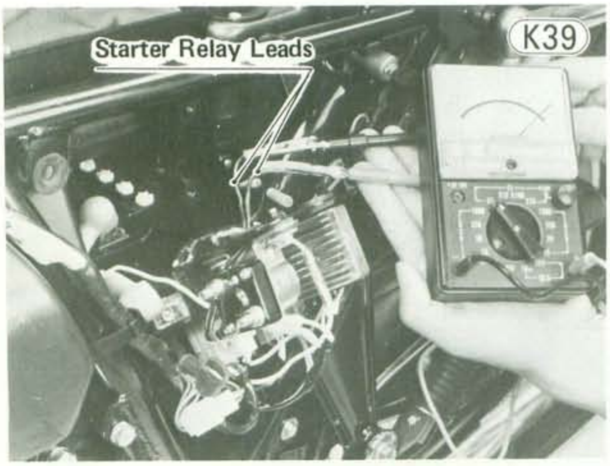
Starter relay test

Disconnect both starter motor leads from the starter relay, and connect an ohmmeter set to the R x 1 range across the relay terminals. Pulling the clutch lever, push the starter button, and see if the meter reads zero ohms. If the relay makes a single clicking sound and the meter reads zero, the relay is good. If the relay clicks but the meter does not read zero, the relay is defective and must be replaced.

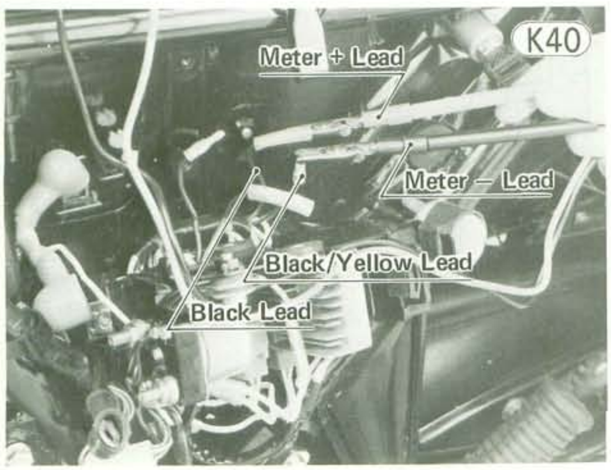
Starter Relay Contact Test



If the relay does not click at all, disconnect the other two leads (black and black/yellow) behind the electrical panel, and measure the resistance across them. There should be a few ohms resistance. If the resistance is infinity (no reading) or zero ohms, the relay is defective.

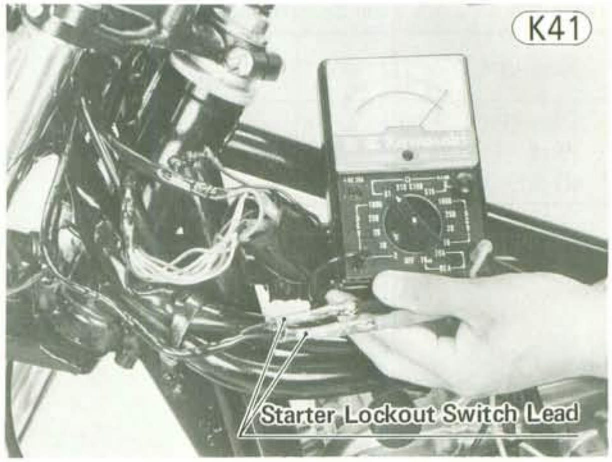


However, if there are a few ohms resistance, the relay may be good; check that there is actually voltage to the relay before deciding that the relay is defective. To check for the voltage, first turn the meter to 20V DC, connect the – meter lead to the black/yellow lead which was disconnected from the relay, and connect the + meter lead to the black lead. Pulling the clutch lever, push the starter button, and see if the meter reads battery voltage. If the meter does not, there is wiring, starter lockout switch, or starter switch trouble. If the meter reads battery voltage but the relay does not click, the relay is defective.



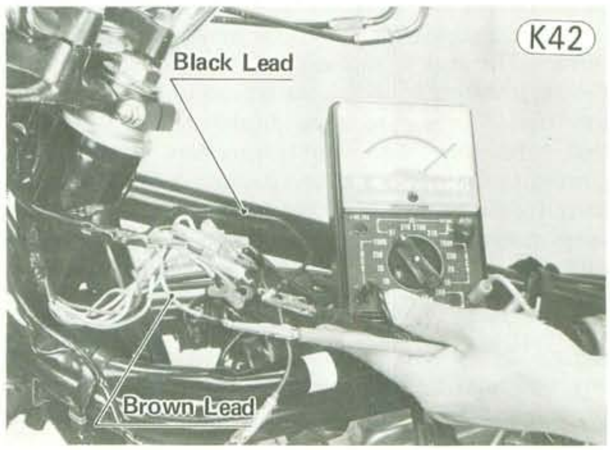
Starter lockout switch test

Remove the fuel tank (Pg. 44), and disconnect the two starter lockout switch black leads. Connect an ohmmeter set to the R x 1 range across the two black leads. Pull the clutch lever, and see if the meter reads zero ohms. If the meter does not, the starter lockout switch is defective and must be replaced.



Starter switch test

Remove the fuel tank (Pg. 44), and disconnect the brown and the black leads from the right switch housing. Connect an ohmmeter set to the R x 1 range across the brown and the black leads. Push the starter button, and see if the meter reads zero ohms. If the meter does not, the starter switch is defective and the entire right switch housing assembly must be replaced.



Starter Motor

The starter motor is installed in a constant-mesh arrangement to transmit starter motor rotation to the crankshaft. A clutch disengages the starter motor once the engine starts. (See the Starter Motor Clutch Paragraph, Pg. 208).

Fig. K45 shows starter motor construction. The field coils (11) are wound around four cores (8), forming the yoke (1), and the armature windings (9) are connected to the commutator (14) and receive their current through the brushes (13). If the brushes are not making good contact, no starter motor current will flow 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 into the bearing at the rear of the motor, causing heat seizure.

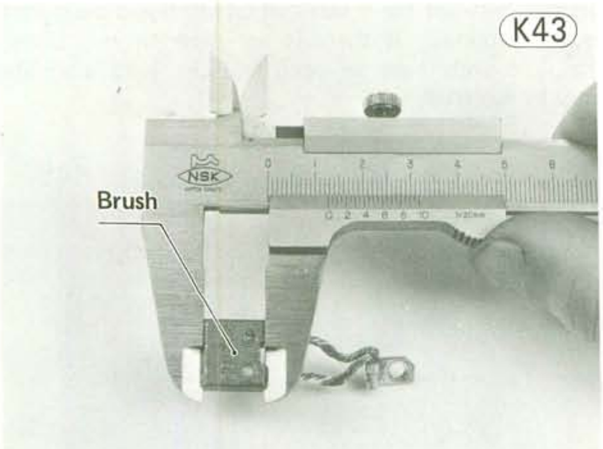
Carbon brushes

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 Starter Motor Brush Length

Standard	Service Limit
12.0 ~ 13.0 mm	6 mm



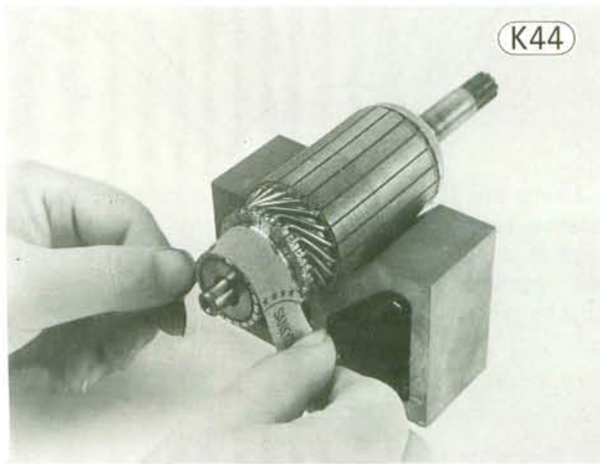
Brush spring

Spring tension should be 560 ~ 680 grams but a spring can be considered serviceable if it will snap the brush firmly into place.

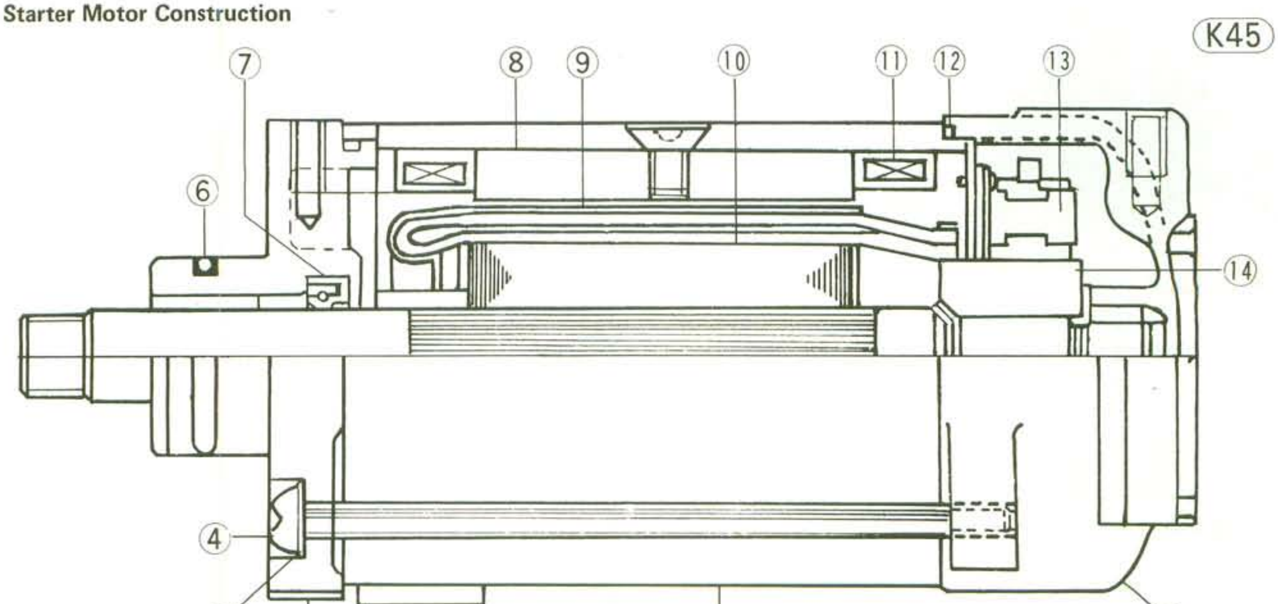
Commutator

A dirty or damaged commutator will reuslt in poor brush contact and cause the brushes to wear down quickly. In addition, particles from brush wear accumulating between commutator segments may cause partial shorts.

Smooth the commutator surface if necessary with fine emery cloth, and clean out the grooves as illustrated. Determine as accurately as possible the depth of the grooves between commutator segments. Replace the armature with a new one if the groove depth is less than the service limit.



Starter Motor Construction

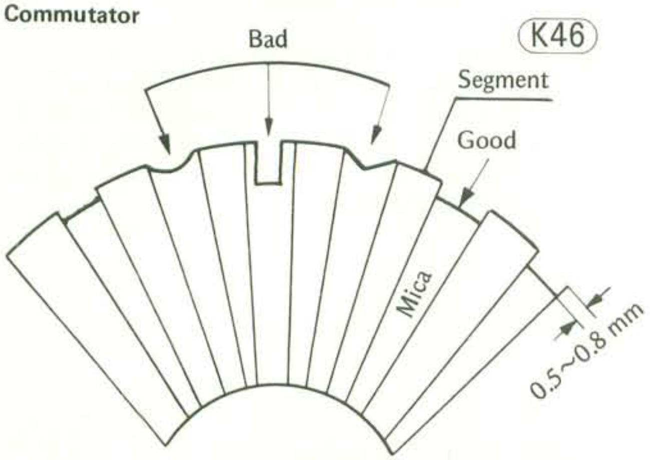


1. Yoke Assembly
2. End Cover
3. End Cover
4. Screw
5. Lockwasher
6. O Ring
7. Grease Seal
8. Yoke Core
9. Armature Winding
10. Armature
11. *Field Coil*
12. O Ring
13. Brush
14. Commutator

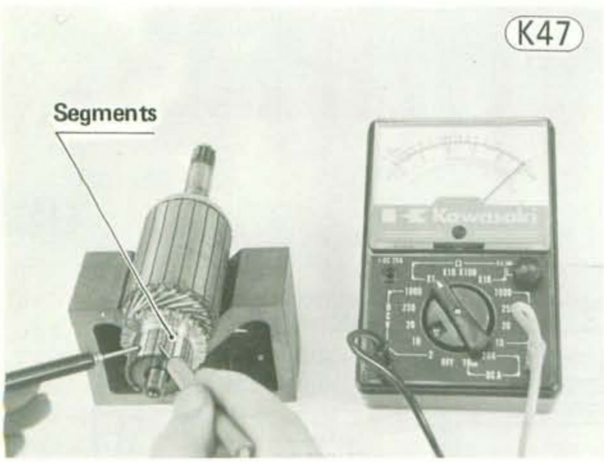
Table K10 Commutator Groove Depth

Standard	Service Limit
0.5 ~ 0.8 mm	0.2 mm

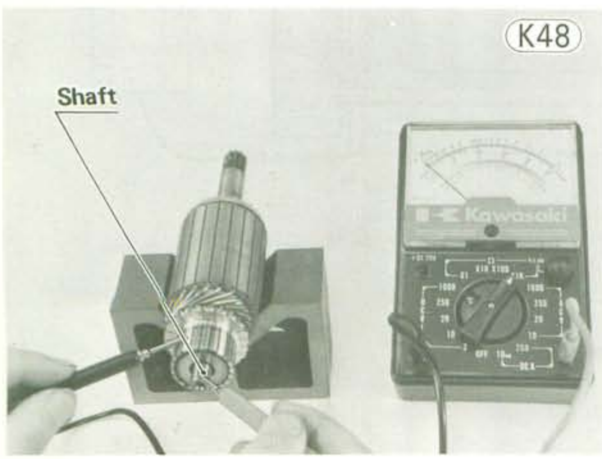
Commutator



Using the R x 1 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.



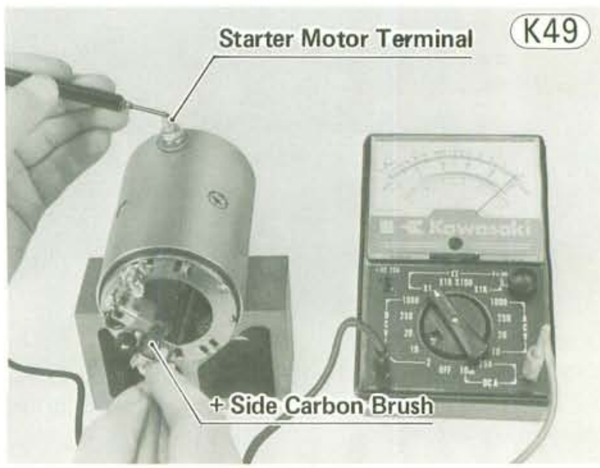
Using the highest ohmmeter range, measure the resistance between the commutator and the shaft. If there is any reading at all, the armature has a short and must be replaced.



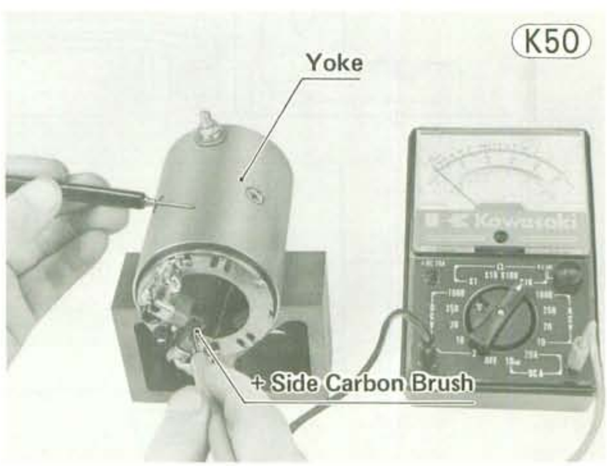
Even if the foregoing checks show the armature to be good, it may be defective in some manner not readily detectable with an ohmmeter. If all other starter motor and starter motor circuit components check good, but the starter motor still does not turn over or only turns over weakly, replace the armature with a new one.

Field coils

Using the R x 1 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.



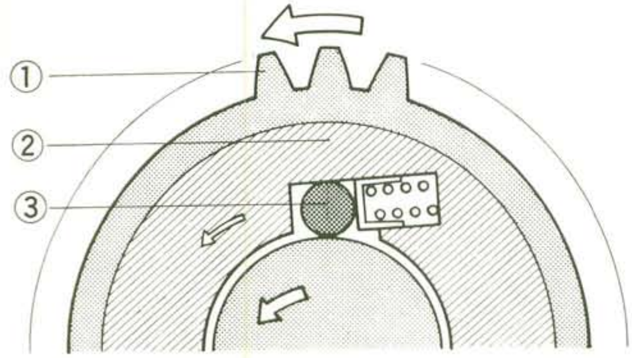
Using the highest ohmmeter range, measure the resistance between the + side carbon brush and the yoke (housing). If there is any meter reading, the coils are shorted to ground and the yoke assembly must be replaced.

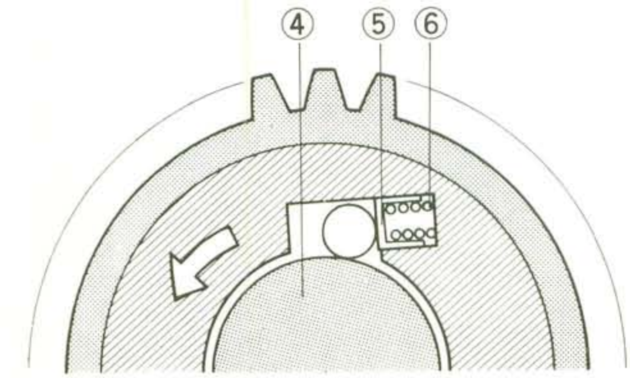


Starter Motor Clutch

Fig. K51 shows starter motor clutch construction. The clutch body ② is fixed to the crankshaft ④ through the dynamo rotor. When the starter clutch gear ① rotates in the direction of the arrow, each of the three rollers ③, pushed by its spring ⑥, is wedged into the

Starter Motor Clutch Operation (K51)





1. Clutch Gear
2. Clutch Body
3. Roller
4. Crankshaft
5. Spring Cap
6. Spring

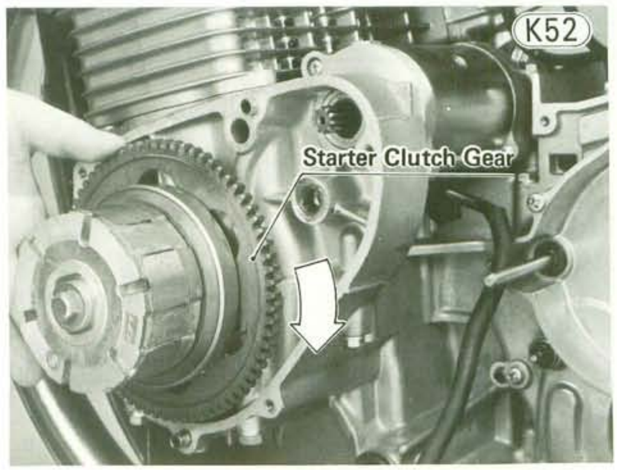
narrower space between the clutch body and the starter clutch gear hub (the portion jutting out from the gear), thereby locking the clutch body and starter clutch gear together. With these two locked, starter motor rotation is transmitted to the crankshaft through the idle gear, starter clutch gear, rollers, clutch body, and rotor.

When the engine starts, friction with the starter clutch gear (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 gear together. In this manner, the engine rotates freely without forcing the starter motor to turn with it.

If the rollers or the starter clutch gear hub becomes 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

Remove the dynamo cover and starter idle gear (Pg. 64), and turn the starter clutch gear by hand. The starter clutch gear should turn clockwise freely, but should not turn counterclockwise. If the clutch does not operate as it should or if it makes noise, disassemble the starter clutch (Pg. 67), examine each part visually, and replace any worn or damaged parts.



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 the on 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 K11 shows the internal connections of the ignition switch for each switch position. To check the switch, remove the headlight unit, and disconnect the 6-pin connector from the switch. Then use an ohmmeter to verify that all the connections 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.

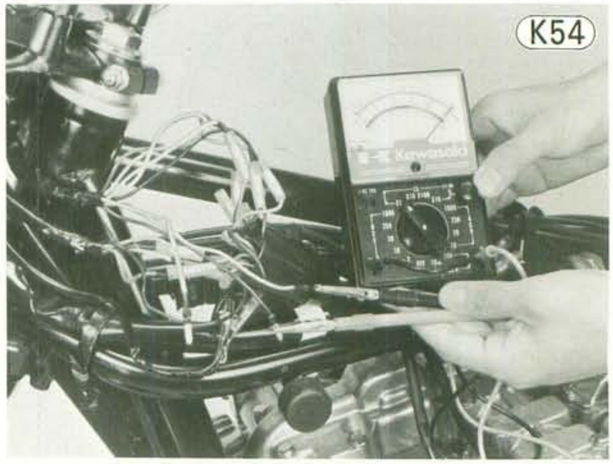
Table K11 Ignition Switch Connections

Lead	B1	IG	TL1	TL2	B2	TL3
Color	White	Brown	Blue	Red	White	G/O
OFF						
ON	●	●	●	●	●	●
PK	●	—	—	●	●	●

be replaced as a unit. If the procedure above does not remedy the problem, check the ignition switch (Pg. 209) and the wiring.

Table K12 Dimmer Switch Connections

	Red/Black	Blue	Red/Yellow
Hi	●	●	
Lo		●	●



LIGHTING SYSTEM

Headlight Circuit

Fig. K55 is US model wiring diagram of the headlight circuit.

When the ignition switch is turned to the on position the headlight circuit is completed, turning on the headlight, tail light, running position lights, and meter lights. With the dimmer switch, high and low beam can be selected.

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. A blown fuse should be replaced. If the bulb and fuses are good, check the dimmer switch and the ignition switch. Table K12 shows the connections in the dimmer switch for both high and low beam. Remove the fuel tank, and disconnect the leads to the dimmer switch. Use an ohmmeter to see that only the connections shown in the tables have continuity (zero ohms). If the switch has an open or a short, it can be disassembled for repair. The contact surfaces may be cleaned, but no internal parts are available for replacement. If any parts are not repairable, the switch must be replaced as a unit.

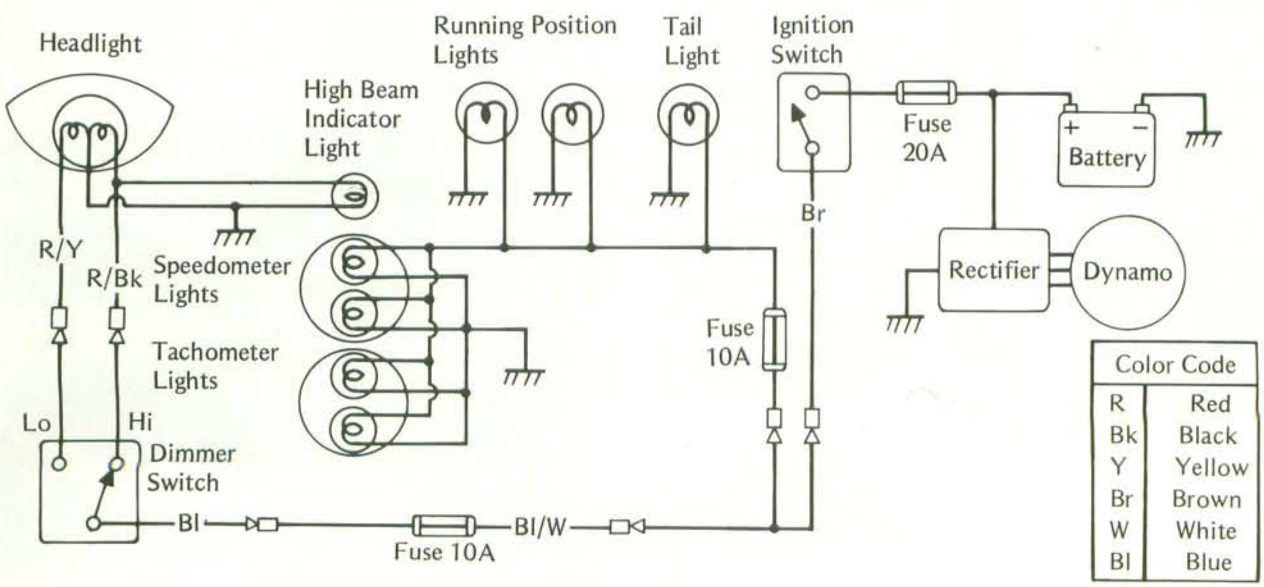
If the headlight lights but does not light brightly, the trouble may be that the headlight is of improper wattage or the dynamo is not supplying sufficient current. However, the trouble may also be caused by a short or a component drawing too much current in some other part of the electrical system.

Tail light trouble

If the tail light does not go on when the circuit is closed, the filament is probably burned out. However, if the bulb is good, check the fuses, wiring, ignition switch, and battery.

Headlight Circuit

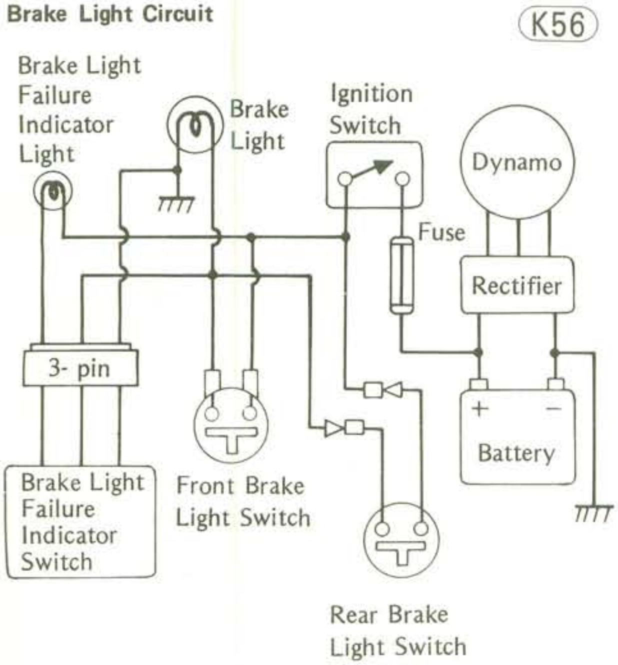
K55



Brake Light Circuit

The brake light circuit is shown in Fig. K56. 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



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 cannot 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. 27).

The brake light failure indicator switch is in the brake light circuit as a warning device to indicate whether or not the brake light is functioning properly during vehicle operation. 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 (See Pg. 120).

Rear brake light switch inspection

- Disconnect the rear brake light switch leads in the right side cover.
- 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 thing. If the indicator lights as shown in Table K13, the brake light failure indicator switch and brake light circuit are functioning properly.

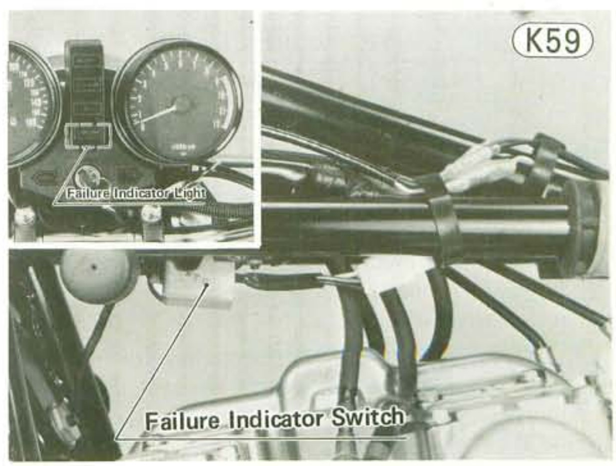


Table K13 Brake Light Failure Indicator Switch Test

		Brake Lever or Pedal	
		Applied	Released
Tail/Brake Light Bulb	In place	Goes on	Goes off
	Out of place	Goes on	Flashes

If the brake light failure indicator does not function properly, find out whether the brake light wiring is defective or the failure indicator switch is defective. The easiest way to test the failure indicator switch is to install and check the suspect switch on a motorcycle with a known good brake light circuit. When this method is impossible, check the circuit as follows (The battery must be charged).

(1) Brake light wiring inspection:

- Check brake light operation and replace any defective parts. The brake light must go on only when the brakes are applied.
- Remove the fuel tank (Pg. 44), and disconnect the indicator switch 3-pin plug.
- Set an ohmmeter to the R x 1 range and a voltmeter to the 20V DC range. Check the wiring as shown in Table K14.

CAUTION **To prevent a meter burning, turn off the ignition switch while using an ohmmeter.**

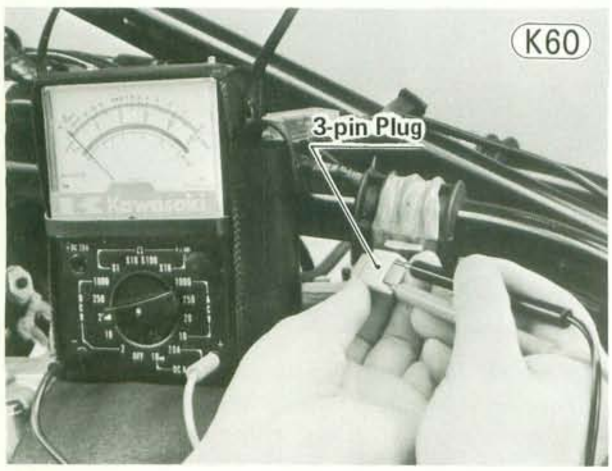


Table K14 Brake Light Wiring Inspection

Meter	Connections†	Brake	Standard
Voltmeter 20V DC	Meter (+) ⟶ Yellow	Apply	Battery Voltage
		Release	0V
	Meter (+) ⟶ Green/White	——	Battery Voltage
Ohmmeter R x 1	Meter (+) ⟶ Black	——	0Ω

†1. Negative (–) meter lead connected to the ground.
2. *Positive (+) meter lead* at 3-pin socket with indicator switch disconnected.

If the meter does not read according to this table, there may be an open or short. In case the voltage of the green/white lead shows 0 volts, the indicator bulb may be burned out.

(2) Brake light failure indicator switch inspection:

- Make sure that the brake light operates properly, and that the brake light wiring is not damaged.
- Connect the indicator switch 3-pin plug.
- Measure the voltage at the 3-pin plug as shown in Table K15.

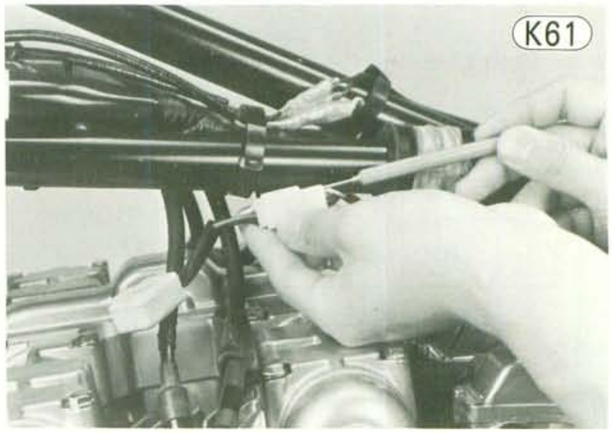


Table K15 Indicator Switch Inspection

Meter	Connections†	Brake	Standard
20V DC	Meter (+) ⟶ Yellow	Apply	Battery Voltage
		Release	0V
	Meter (+) ⟶ Green/White	Apply	0V
		Release	Battery Voltage

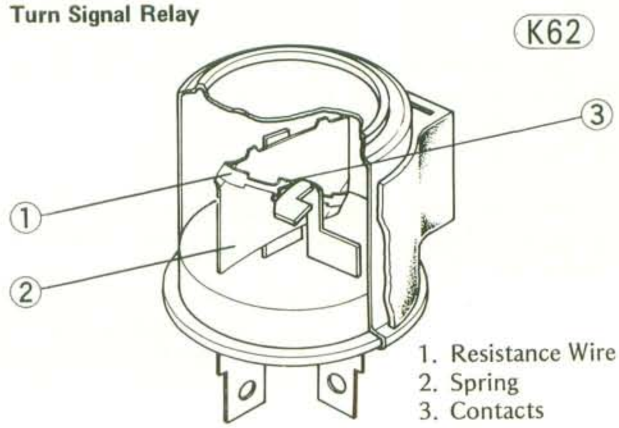
†1. Negative (–) meter lead connected to the ground.
2. Positive (+) meter lead at 3-pin plug with indicator switch connected.

If any one of the meter readings shows an improper value, the brake light failure indicator switch is defective.

Turn Signal and Hazard Circuit

A wiring diagram of the turn signal circuit is shown in Fig. K63. When the ignition 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

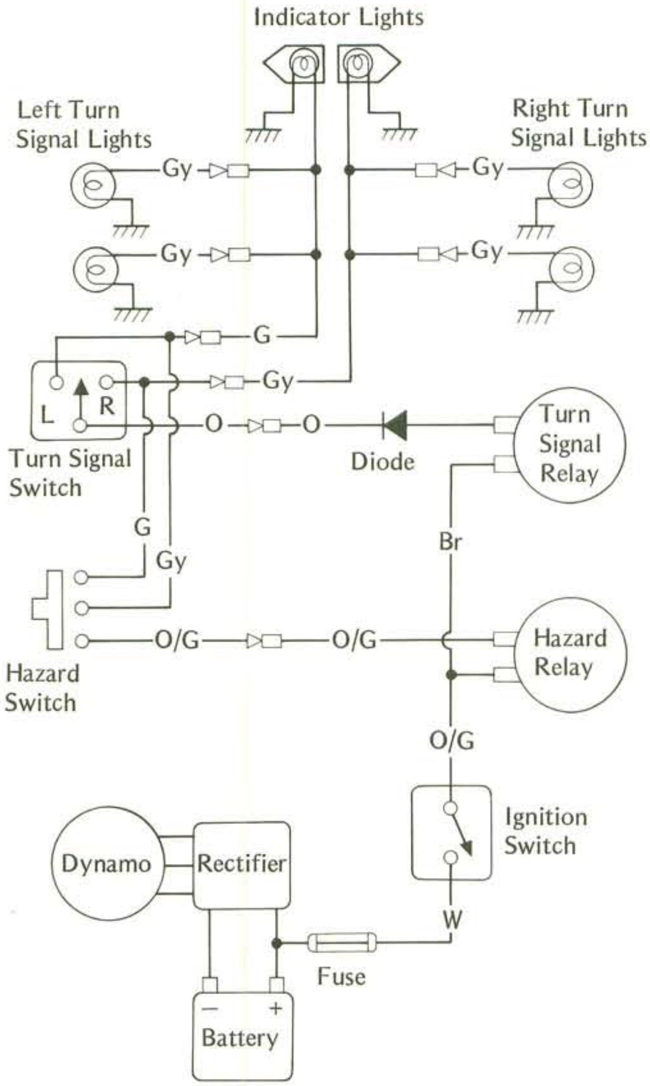
Turn Signal Relay



1. Resistance Wire
2. Spring
3. Contacts

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 and Hazard Circuit (K63)



When the hazard switch is pushed with the ignition switch in the ON or PARK positions, all the turn signal lights and indicator lights flash on and off.

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 trouble

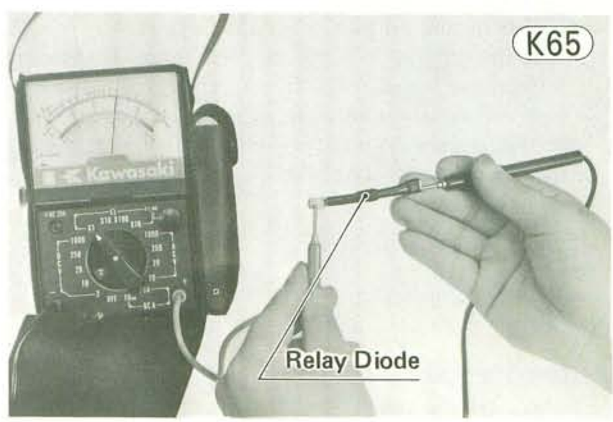
(1)Neither right nor left turn signals come on at all:

- •Check that battery voltage is normal.
- •Remove the left side cover.
- •Unplug the brown lead and relay diode from the relay, and use an ohmmeter to check that there is continuity (close to zero ohms) between the relay terminals. If there is no ohmmeter reading, or if there is several ohms resistance, replace the relay with a new one.

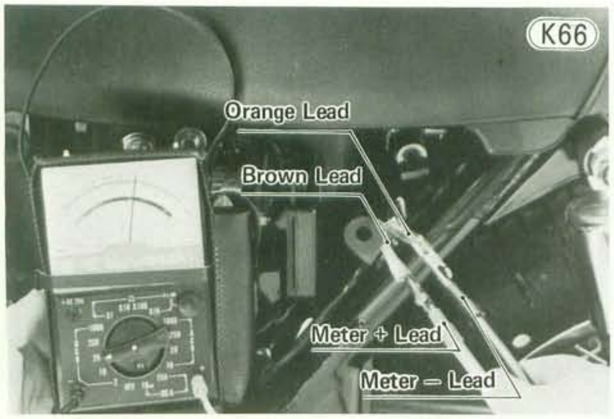
- •Disconnect the relay diode from the orange lead. Setting an ohmmeter to the x 10Ω or x 100Ω range, check the resistance between both rectifier leads. The resistance should be low in one direction and more than ten times as much in the other direction.

NOTE: The actual meter reading varies with the meter used and with the individual rectifier, but, generally speaking, the lower reading should be within 1/3 scale of zero ohms.

If the meter reads low or high in both directions, the rectifier is defective and must be replaced.



- •If the relay and the diode check 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 and with the hazard switch off, 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 still will 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 normal.
- •Check that all wiring connections are good.
- •Check that the turn signal bulbs and indicator bulbs are of the correct wattage.
- •If all of the above check good, replace the relay.

(3) A 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.

Testing the hazard circuit

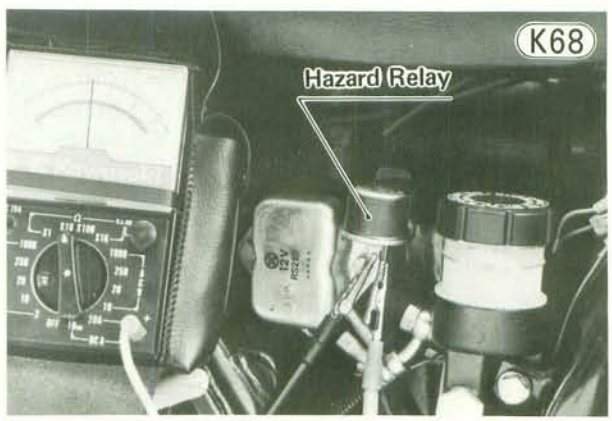
Before testing the hazard circuit, check the ignition switch connections and turn signal operation.

•Table K16 shows the internal connections of the *hazard switch. To check* the switch, disconnect the hazard switch leads (orange/green, green, and gray) under the fuel tank, and use an ohmmeter to verify that there is continuity between all the connections that are listed in the table. If the switch has an open or short, the switch must be replaced.

Table K16 Hazard Switch Connections

Color	Green	Orange/Green	Gray
Off			
On	●	●	●

•Disconnect the hazard relay leads in the right cover, and check the resistance between the relay terminals. There should be about 60Ω. If there is no ohmmeter reading, or if there is zero ohms resistance, replace the relay with a new one.



•If the relay and hazard switch are good, go on to the following check.

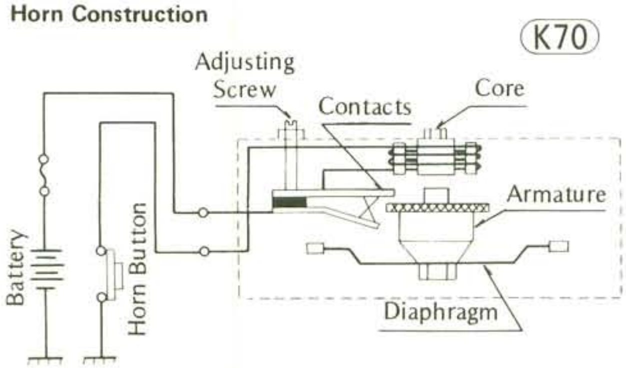
•Connect the hazard switch orange/green lead under the fuel tank.

•Set the multimeter to the 20V DC range, connect the + meter lead to the gray lead from the left switch housing, and connect the – meter lead to the other gray lead. With the hazard switch on, first switch the ignition switch to the ON position and then to the PARK position. Do the same with the green lead from the left switch housing. The meter should register battery voltage at both positions. If it does not, the fuse, hazard switch, or wiring is at fault.

HORN

The horn circuit and construction are shown in Fig. K70. 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 released. Since each cycle takes only a fraction of a second, the diaphragm moves fast enough to produce sound.

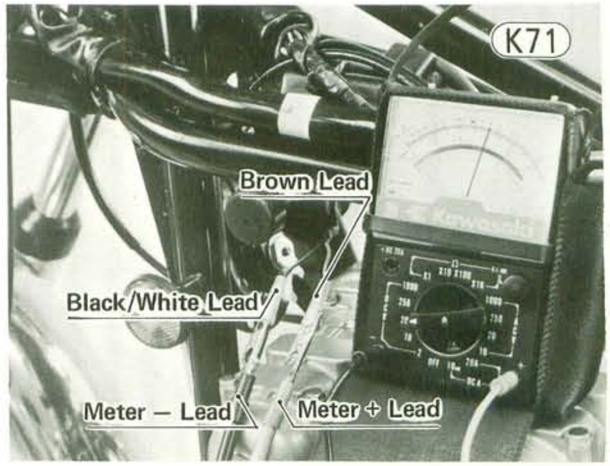
Horn Construction



The contacts wear down after long use, requiring adjustment from time to time (Pg. 31). 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 x 1 Ω range to check for continuity (close to zero ohms). If the reading is several ohms or if there is no reading at all, replace the horn.
- If the reading is very close to zero, set the multimeter to the 20V 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/white 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.



- 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.

CAUTION Do not loosen the armature mounting since doing so would alter the armature position such that the horn probably would have to be replaced.

SPEEDOMETER, TACHOMETER

The speedometer and 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 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 defective
Engine stop switch off
Fuse blown
Starter lock out switch defective

Starter motor rotating but engine doesn't turn over

Starter motor clutch defective
Dynamo rotor bolt loosened

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
Kick ratchet gear not engaging
Primary reduction gear 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 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 spring broken or weak
Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

Poor Running at Low Speed

Spark weak

Battery voltage low
Spark plug dirty, defective, or maladjusted
Spark plug cap or high tension wiring defective
Spark plug cap 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 bleed pipe bleed holes clogged
Air cleaner clogged, poorly sealed, or missing
Air cleaner poorly sealed
Starter plunger stuck open
Fuel level too high or too low
Fuel tank air vent obstructed
Carburetor holders loose
Carburetor linkage mechanism loose

Compression low

Spark plug loose
Cylinder head not sufficiently tightened down
No valve clearance
Cylinder, piston worn
Piston rings bad (worn, weak, broken or sticking)
Piston ring/land clearance excessive
Cylinder head gasket damaged
Cylinder head warped
Valve spring broken or weak
Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface)

Other

Ignition timing maladjusted
Timing not advancing (spring broken or stretched)
Carburetors not synchronizing
Throttle valves don't slide smoothly
Engine oil viscosity too high
Brakes dragging

L

Poor Running or No Power at High Speed

Firing incorrect

Spark plug dirty, defective, or maladjusted
Spark plug cap or high tension wiring defective
Spark plug cap 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
Air bleed pipe bleed hole clogged
Air cleaner clogged, poorly sealed, or missing
Air cleaner duct poorly sealed
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 spring broken or weak
Valve not seating properly (valve bent, worn, or carbon accumulation on the seating surface.)

Knocking

Ignition timing maladjusted
Carbon built up in combustion chamber
Fuel poor quality or incorrect
Spark plug incorrect

Miscellaneous

Throttle valve won't fully open
Throttle valves don't slide smoothly
Brakes dragging
Clutch slipping
Overheating
Engine oil level too high
Engine oil viscosity too high

Overheating

Firing incorrect

Spark plug dirty, damaged, or maladjusted
Spark plug incorrect
Ignition timing maladjusted

Fuel/air mixture incorrect

Main jet clogged
Fuel level too low
Carburetor holders loose
Air cleaner poorly sealed, or missing
Air cleaner duct poorly sealed

Compression high

Carbon built up in combustion chamber

Engine load faulty

Clutch slipping
Engine oil level too high
Engine oil viscosity too high
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 broken or 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 viscosity too high
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 detent arm binding
Shift pedal return spring weak or broken
Shift lever broken
External shift mechanism pawl broken
Shift return spring pin loose
Pawl spring broken

Jumps out of gear

Shift fork(s) worn
Gear groove(s) worn
Gear dogs, dog holes, and/or recesses worn
Shift drum groove(s) worn
Shift drum detent arm spring weak or broken
Shift fork pin(s) worn
Drive shaft, output shaft, and/or gear splines worn

Overshifts

Shift drum detent arm spring weak or broken
Pawl spring weak

Abnormal Engine Noise

Knocking

Ignition timing maladjusted
Carbon built up in combustion chamber
Feul poor quality or incorrect
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
Camshaft chain tensioner defective
Camshaft chain, sprocket, guides worn
Camshaft chain requires adjustment
Loose dynamo rotor

Abnormal Drive Train Noise

Clutch noise

Clutch housing/friction plate clearance excessive
Weak or damaged shock damper springs
Primary reduction gear damaged

Transmission noise

Bearings worn
Transmission gears worn or chipped
Metal chips jammed in gear teeth
Engine oil insufficient
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 noise

Oil insufficient or too thin
Spring weak or broken

Rear shock absorber noise

Shock absorber defective

Disc brake noise

Pad B loose (Front brake only)
Pad A installed revesely
Pad(s) shim missing (Rear brake only)
Pad surface glazed
Disc warped

Other noise

Brackets, nut, 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

Exhaust Smokes Excessively

White smoke

Piston oil ring worn
Cylinder worn
Valve oil seal damage
Valve guide worn
Cylinder head gaskets are damaged
Engine oil level too high

Black smoke

Air cleaner clogged
Main jet too large or fallen off
Starter plunger stuck open
Fuel level too high

Brown smoke

Main jet too small
Fuel level too low
Air cleaner 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 needle bearing 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 bent
Right/left front fork oil level uneven
Right/left rear shock absorbers unbalanced

Shock absorption unsatisfactory

Too hard:
Front fork oil excessive
Front fork oil viscosity too high
Tire air pressure too high
Shock absorber maladjusted
Front fork 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

Air in the brake line
Pad or disc worn
Brake fluid leak
Disc warped
Contaminated pads
Brake fluid deteriorated
Primary or secondary cup defective
Master cylinder scratched inside

Battery Discharged

Battery fault (e.g., plates sulphated, shorted through sedimentation, electrolyte level too low)
Battery leads making poor contact
Load excessive (e.g., bulb of excessive wattage)
Rectifier defective
Ignition switch defective
Regulator defective
Armature coil open or short
Wiring faulty
Dynamo rotor defective

Battery Overcharged

Regulator 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. Electrical troubleshooting is not covered here due to its complexity. For electrical problems, refer to the appropriate heading in the Maintenance Section.

Appendix

Table of Contents

M

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.

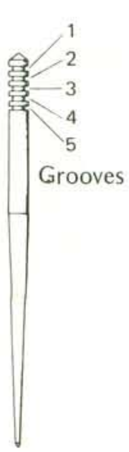
Carburetors

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 ("4" of 5CN7-4) is not stamped on the needle, but is the number of the standard groove in which the clip is set. The groove numbers are counted from the top of the needle, 1 being the topmost groove, and 5 being the lowest groove.

If the engine still exhibits symptoms of overly lean carburetion after all maintenance and adjustments are correctly performed, the main jet can be replaced with a larger one. A larger numbered jet gives a richer mixture.

Spark Plugs

The spark plugs ignite the fuel/air mixture in the combustion chamber. To do this effectively and at the proper time, the correct spark plugs must be used, and the spark plugs must be kept clean and adjusted.

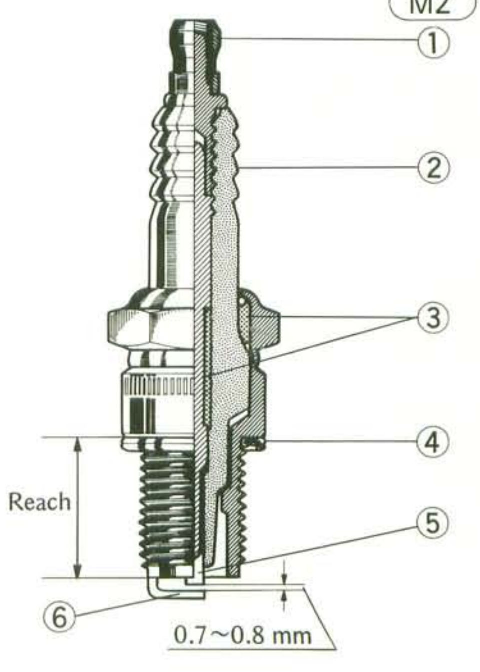
Test have shown the NGK B8ES or ND W24ES-U set to a 0.7 ~ 0.8 mm gap to be the best plug for general use.

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

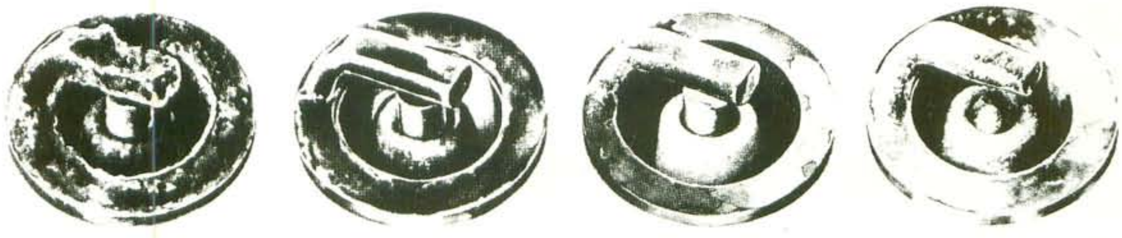
M2



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

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.

To inspect 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.

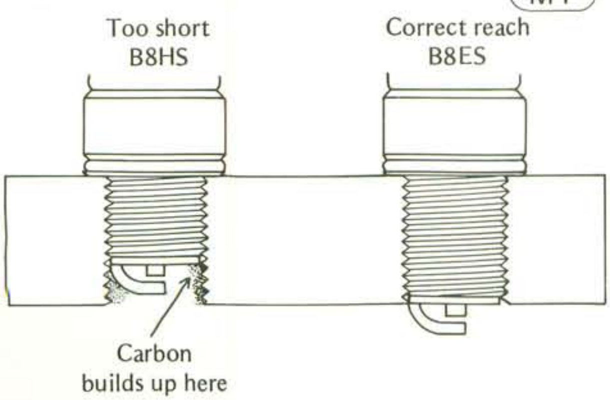
CAUTION **If the spark plugs are replaced with a type other than those mentioned below, make certain the replacement plugs have the same thread pitch and reach (length of threaded portion) as the standard plugs.**

Table M1 Spark Plug Specifications

Required Plug Threads	NGK (ND) Number
Diameter: 14 mm Pitch: 1.25 mm Reach: 19.0 mm	B8ES W24ES-U

Plug Reach

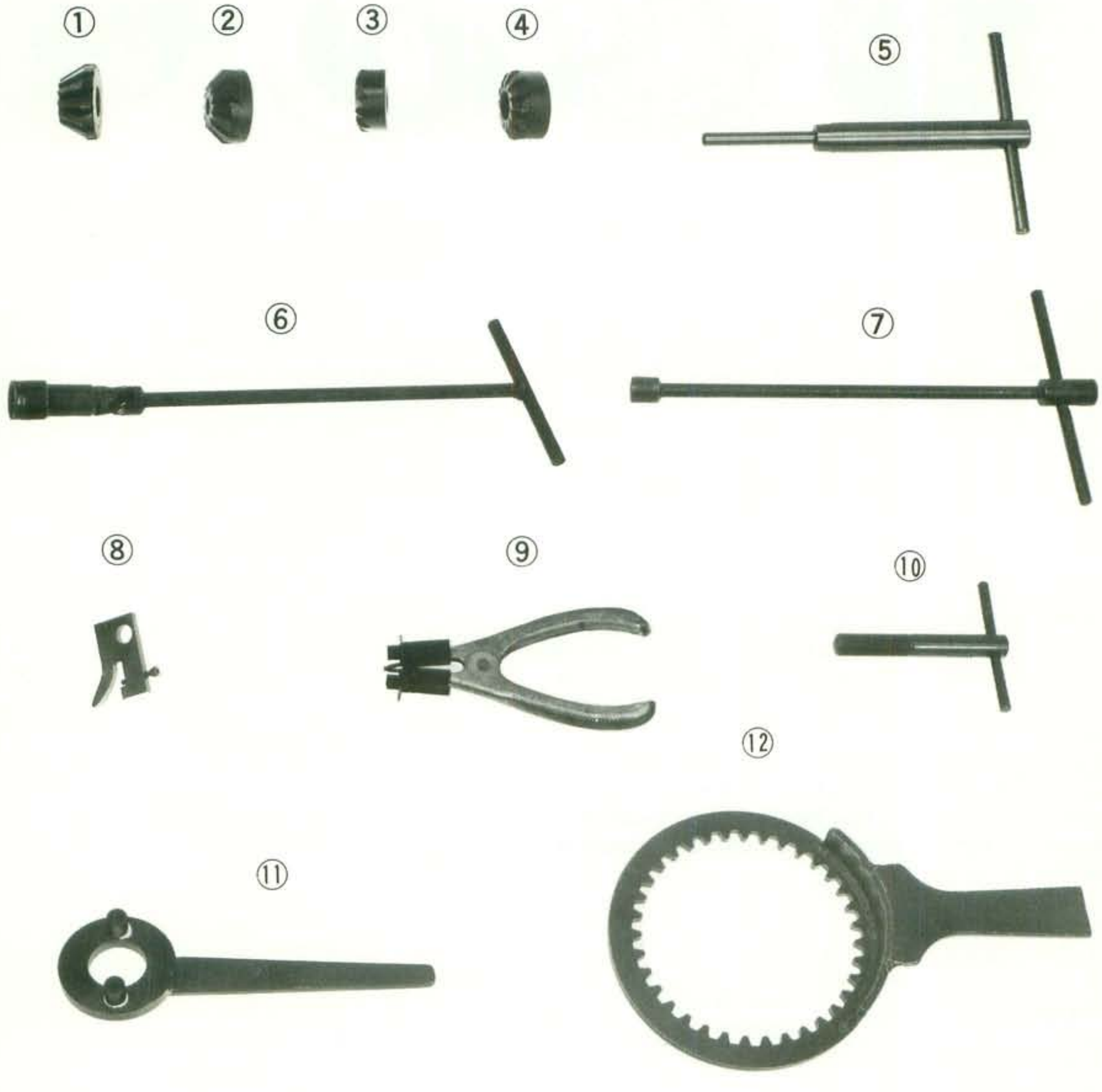
(M4)



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.

SPECIAL TOOLS



REF NO.	PART NO.	DESCRIPTION
1	57001-101	VALVE SEAT CUTTER 30°
2	57001-102	VALVE SEAT CUTTER 45°
3	57001-103	INLET VALVE SEAT CUTTER 60°
4	57001-104	EXHAUST VALVE SEAT CUTTER 60°
5	57001-106	VALVE SEAT CUTTER HOLDER
6	57001-110	SPARK PLUG WRENCH
7	57001-111	CYLINDER HEAD NUT WRENCH
8	57001-113	VALVE LIFTER HOLDER
9	57001-115	PISTON RING PLIERS
10	57001-116	ENGINE SPROCKET HOLDER
11	57001-118 (or P/N 57001-306)	ENGINE SPROCKET HOLDER
12	57001-119	CLUTCH HUB HOLDER

13

14

15

16

17

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27

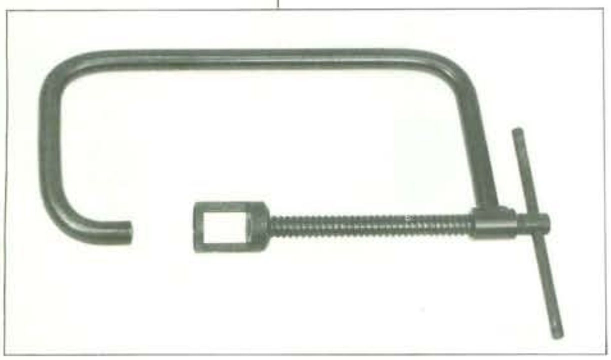
REF. NO.	PART NO.	DESCRIPTION
13	57001-131	KICK SHAFT OIL SEAL GUIDE
14	57001-266	SHIFT SHAFT OIL SEAL GUIDE
15	57001-134	STEM NUT WRENCH
16	57001-135	BEARING PULLER
17	57001-137	STEM BEARING DRIVER
18	57001-138	STEM CUP DRIVER
19	57001-139	BEARING DRIVER HOLDER
20	57001-140	BEARING DRIVER
21	57001-296	BEARING DRIVER
22	57001-166	STEM BEARING PULLER ADAPTER
23	57001-1011	FRONT FORK CYLINDER HOLDER ADAPTER
24	57001-183	FRONT FORK CYLINDER HOLDER HANDLE
25	57001-141	FRONT FORK OIL SEAL DRIVER
26	57001-143	INSIDE CIRCLIP PLIERS
27	57001-144	OUTSIDE CIRCLIP PLIERS

28

29

30

31



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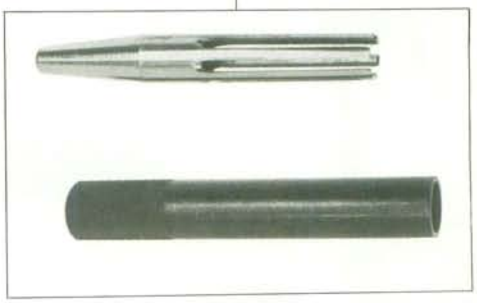

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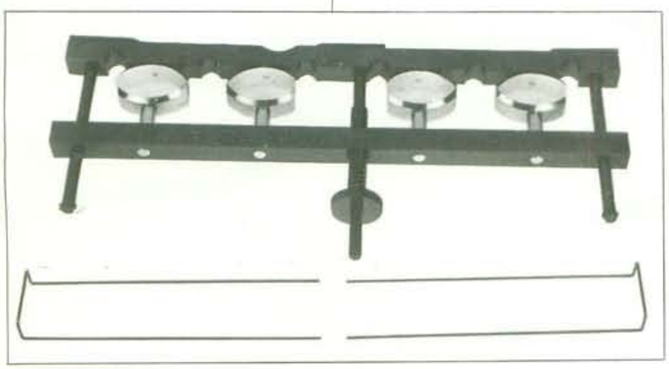


34

REF. NO.	PART NO.	DESCRIPTION
28	57001-152	DYNAMO ROTOR HOLDER
29	57001-162	VALVE GUIDE REAMER
30	57001-163	VALVE GUIDE ARBOR
31	57001-107	VALVE SPRING COMPRESSOR ASSEMBLY
	(or P/No. 57001-241 and 57001-243)	
32	57001-380	TRANSMISSION CIRCLIP DRIVER (Used to install the transmission ball bearing)
33	57001-532	PISTON RING COMPRESSOR SET
34	57001-910	PISTON PIN PULLER ASSEMBLY
35	57001-914	PISTON PIN PULLER ADAPTER "C"

(36)

(37)

(38)

(39)

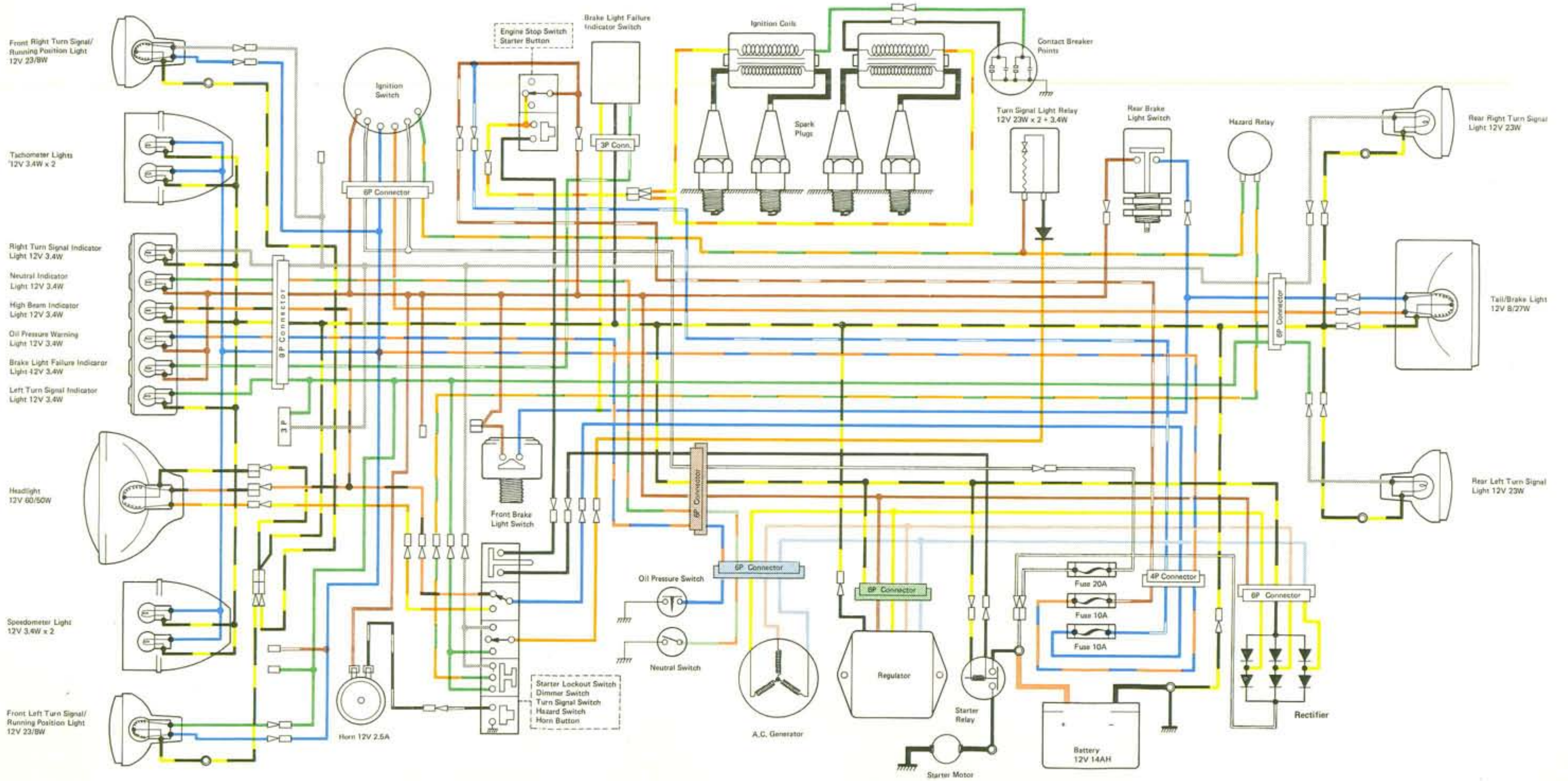
(41)

(40)

(42)

REF. NO.	PART NO.	DESCRIPTION
36	57001-125	OIL PRESSURE GAUGE
37	57001-123	COMPRESSION GAUGE
38	57001-127	VACUUM GAUGE SET
39	57001-208	FUEL LEVEL GAUGE
40	57001-980	ELECTRO TESTER
41	57001-226	VACUUM GAUGE
42	57001-983	HAND TESTER

KZ1000-A2A Wiring Diagram



LEFT HANDLEBAR SWITCH CONNECTIONS

Starter Lockout Switch	Black	Black
ON	●	●

Dimmer Switch	R/Bk	Blue	R/Y
HI	●	●	
LO		●	●

Turn Signal Switch	Green	Orange	Gray
L	●	●	
R		●	●

Hazard Switch	O/G	Green	Gray
ON	●	●	●

Horn Button	Bk/Y	
ON	●	●

IGNITION SWITCH CONNECTIONS

	Battery 1	Ignition	Tail 1	Tail 2	Battery 2	Tail 3
	White	Brown	Blue	Red	White	G/O
OFF						
ON	●	●	●	●	●	●
PARK	●			●	●	●

(1031B)

RIGHT HANDLEBAR SWITCH CONNECTIONS

Engine Stop Switch	Y/R	Brown
RUN	●	●

Starter Button	Black	Y/R
ON	●	●

Supplement

This Supplement is designed to be used in conjunction with the front part of this manual (up to Pg. 229). The maintenance and repair procedures described in this Supplement are only those that are unique to later year units since the first publication of this Service Manual. Complete and proper servicing of later year units therefore requires mechanics to read both this Supplement and the text in front of the Supplement.

This Supplement is divided into few sections. Each section is annually added to the preceding section, and explains procedures per one year unit that are unique to the latest year unit. Complete and proper servicing of later year units therefore requires mechanics to read (1) the section corresponding to the year unit they work at, (2) the previous section(s), and (3) the text in front of this Supplement.

NOTE: The maintenance and repair procedures for the variation model (KZ1000-D) are included in the "Supplement for 1980 Model". Unless otherwise noted, procedures for the 1980 KZ1000-D3 are the same as for the standard 1980 KZ1000-A4.

Table of Contents

Supplement for 1979 Model

Table of Contents

Model Identification

KZ1000-A3A

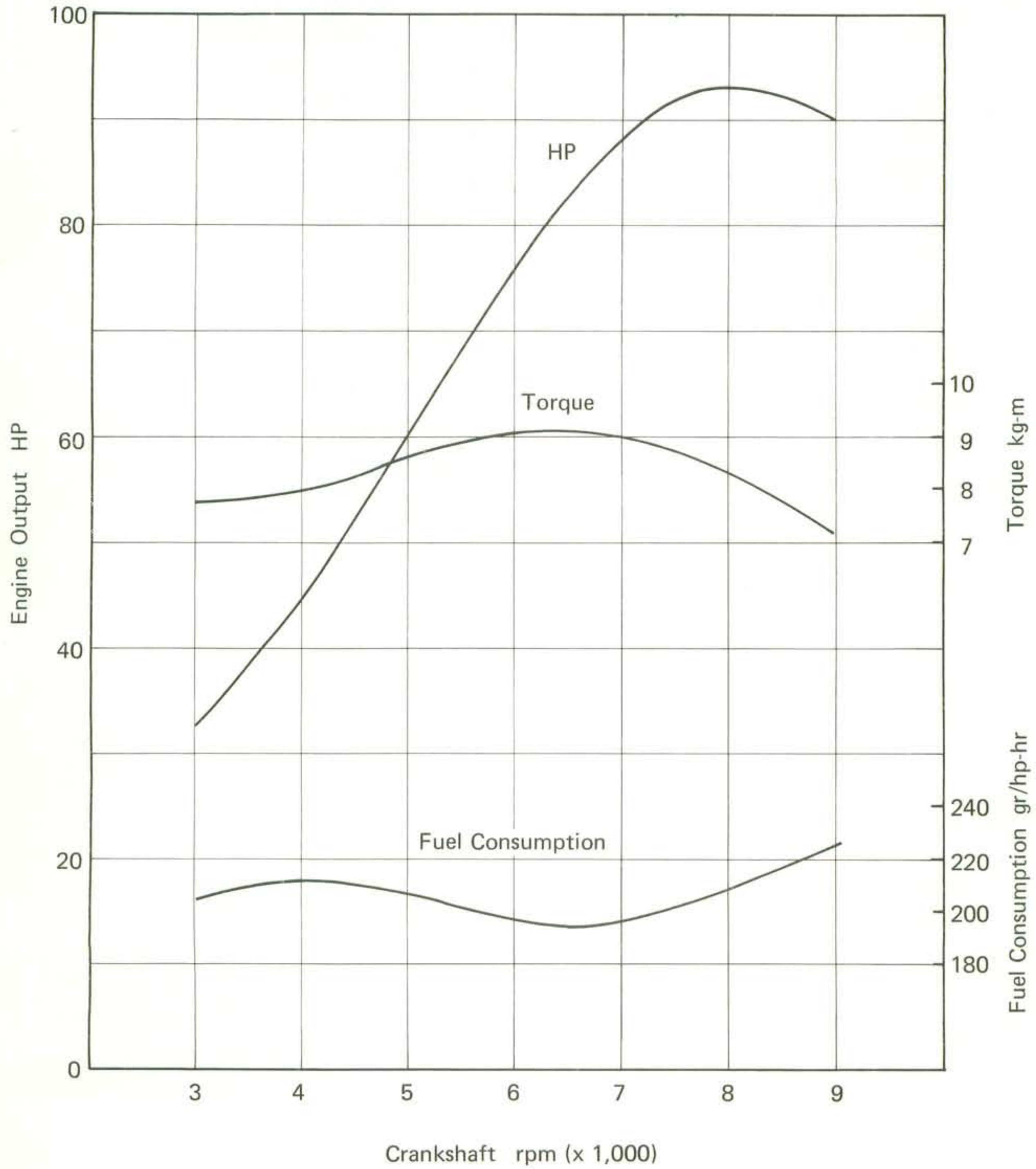
SPECIFICATIONS

		KZ1000-A3A
Dimensions		
Overall length		2,180 mm
Overall width		900 mm
Overall height		1,180 mm
Wheelbase		1,490 mm
Road clearance		155 mm
Dry weight		245 kg
Fuel tank capacity		17.8 ℓ
Performance		
Climbing ability		30°
Braking distance		11.0 m from 50 kph
Minimum turning radius		2.4 m
Engine		
Type		DOHC 4 cylinder, 4 stroke, air-cooled
Bore and stroke		70 x 66 mm
Displacement		1,015 cc
Compression ratio		8.7
Maximum horsepower		93 HP @8,000 rpm
Maximum torque		9.1 kg-m @6,500 rpm
Valve timing		
Inlet	Open	30° BTDC
	Close	70° ABDC
	Duration	280°
Exhaust	Open	70° BBDC
	Close	30° ATDC
	Duration	280°
Carburetors		Mikuni VM28SS x 4
Lubrication system		Forced lubrication (wet sump)
Engine oil		SE class SAE 10W40, 10W50, 20W40, or 20W50
Engine oil capacity		3.7 ℓ
Starting system		Electric and kick
Ignition system		Battery and coil (transistorized ignition)
Cylinder numbering method		Left to right, 1–2–3–4
Firing order		1–2–4–3
Ignition timing		From 10° BTDC @1,000 rpm to 40° BTDC @3,400 rpm
Spark plugs		NGK B8ES or ND W24ES-U
Transmission		
Type		5-speed, constant mesh, return shift
Clutch		Wet multi disc
Gear ratio:	1st	3.17 (38/12)
	2nd	2.19 (35/16)
	3rd	1.67 (35/21)
	4th	1.38 (29/21)
	5th	1.22 (28/23)

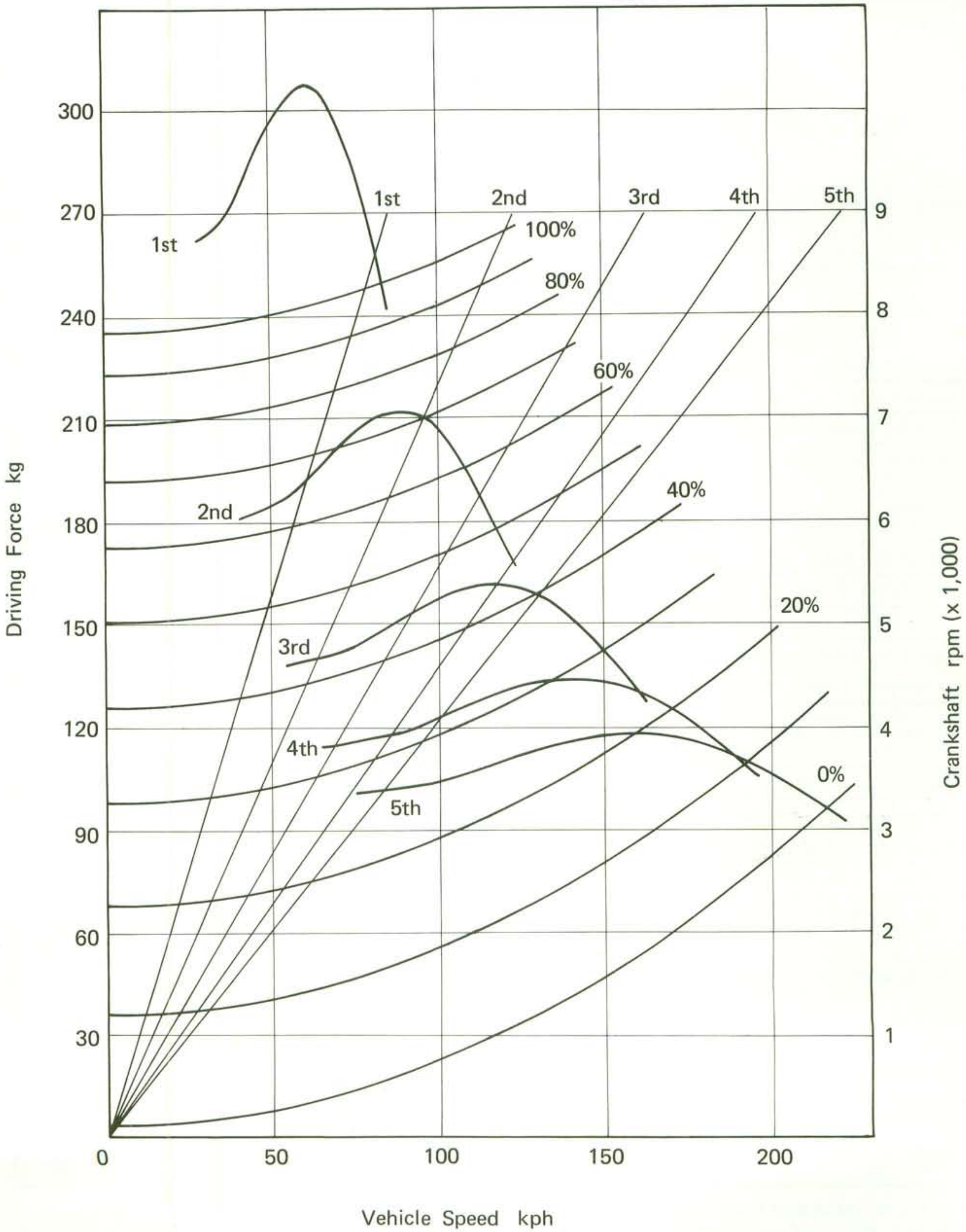
			KZ1000-A3A
Primary reduction ratio			1.73 (97/56)
Final reduction ratio			2.33 (35/15)
Overall drive ratio			4.92 (Top gear)
Electrical Equipment			
Generator (Dynamo)			Kokusan GP9105
Regulator/Rectifier			Shindengen SH230-12 C
Ignition coil			Toyo Denso ZC005-TR12V
Igniter			Toyo Denso UNT 1004K-0000
Battery			Yuasa YB14L-A2 (12V 14AH)
Starter			Mitsuba SM-226-K
Headlight type			Sealed beam
Headlight			12V 60/50W
Tail/Brake light			12V 8/27W
Meter lights			12V 3.4W
Indicator lights			12V 3.4W
Turn signal/running position lights (Front)			12V 23/8W
Turn signal lights (Rear)			12V 23W
Horn			12V 2.5A
Frame			
Type			Tubular, double cradle
Steering angle			41° to either side
Castor			26°
Trail			87 mm
Tire size	Front		3.25V-19 4PR
	Rear		4.00V-18 4PR
Suspension	Front		Telescopic fork
	Rear		Swing arm
Suspension stroke	Front		140 mm
	Rear		80 mm
Front fork oil capacity (each fork)			180 ~ 188 cc
Front fork oil type			SAE 10W20
Brakes			
Type	Front and Rear		Disc brake
Effective disc diameter			
Front and Rear			250 mm

Specifications subject to change without notice.

ENGINE PERFORMANCE CURVES



RUNNING PERFORMANCE CURVES



PERIODIC MAINTENANCE CHART

The maintenance and adjustments for the KZ1000-A3A 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* km: 800 ± 100	5,000 ± 250	10,000 ± 250	15,000 ± 250	20,000 ± 250	25,000 ± 250	30,000 ± 250	See Page
Battery electrolyte level — check †	month	•	•	•	•	•	•	•	192
Brake adjustment — check †		•	•	•	•	•	•	•	27
Brake wear — check †			•	•	•	•	•	•	259
Brake fluid level — check †	month	•	•	•	•	•	•	•	181
Brake fluid — change	year			•		•		•	179
Clutch — adjust		•	•	•	•	•	•	•	21
Carburetors — adjust			•	•	•	•	•	•	241
Throttle cables — adjust		•	•	•	•	•	•	•	16
Steering play — check †		•	•	•	•	•	•	•	28
Drive chain wear — check †			•	•	•	•	•	•	175
Front fork — inspect/clean		•	•	•	•	•	•	•	259
Rear shock absorbers — inspect		•	•	•	•	•	•	•	260
Nuts, Bolts, Fasteners — check and torque		•		•		•		•	243
Spark plugs — clean and gap †		•	•	•	•	•	•	•	12
Valve clearance — check †		•	•	•	•	•	•	•	239
Air suction valve — check †			•	•	•	•	•	•	254
Air cleaner element — clean			•		•		•		134
Air cleaner element — replace	5 cleanings			•		•		•	43
Fuel system — clean		•	•	•	•	•	•	•	23
Tire tread wear — check †			•	•	•	•	•	•	258
Engine oil — change	year	•	•	•	•	•	•	•	22
Oil filter — replace		•		•		•		•	22
General lubrication — perform			•	•	•	•	•	•	242
Front fork oil — change				•		•		•	259
Timing advancer — lubricate				•		•		•	204
Swing arm — lubricate				•		•		•	189
Wheel bearings — grease	2 years					•			258
Speedometer gear housing — grease	2 years					•			173
Steering stem bearings — grease	2 years					•			184
Drive chain — *lubricate*	Every 300 ± 50 km								175
Drive chain — adjust	Every 800 ± 100 km								26

*For higher odometer readings, repeat at the frequency interval established here.

† Replace, add or adjust if necessary.

Adjustment

IGNITION TIMING

This motorcycle has a magnetically controlled transistor ignition system which has no moving parts in the electrical circuit. Consequently, it is not necessary to check and adjust the ignition timing periodically. However, if there is any doubt as to correct ignition timing, inspect the system as explained in the maintenance section (Pg. 265).

NOTE: Lubricate the timing advancer periodically just the same way as the KZ1000-A2A (Pg. 204).

CAMSHAFT CHAIN

The camshaft chain tensioner on this motorcycle is an automatic type. Since the camshaft chain slack (developed by chain and chain guide wear) is taken up by this automatic camshaft chain tensioner, the chain requires no periodic maintenance. Refer to the engine disassembly section (Pg. 245) when handling the camshaft chain tensioner parts.

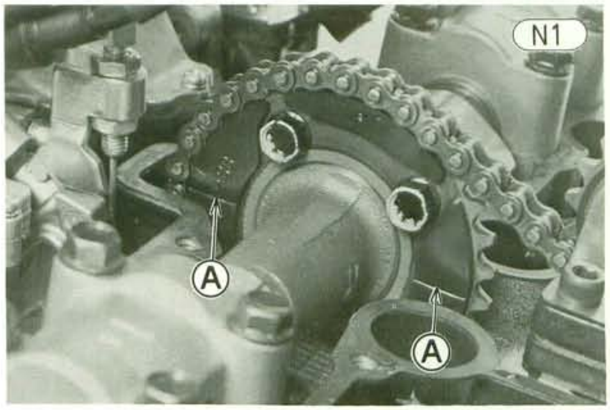
VALVE CLEARANCE

Refer to Pgs. 15~16, noting the following:

- Valve clearance checking method and the specified valve clearance is changed.

To check and adjust the valve clearance (each camshaft):

- Remove the fuel tank (Pg. 44).
- Remove the cylinder head cover (Pg. 246).
- Check that the camshaft cap bolts are tightened.
- Remove the pick-up coil cover.
- Using a 17 mm wrench, turn the crankshaft until the line marks for the valve clearance measurement on the appropriate camshaft sprocket line up with the surface of the cylinder head.



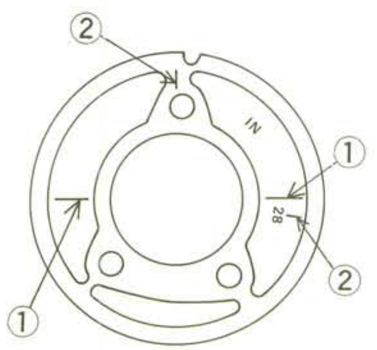
A. Line Marks for Clearance Measurement

- For two valves (#1 and #2, or #3 and #4) at a time, measure the clearance between the cam and the shim. The correct clearance is 0.05~0.15 mm for both inlet and exhaust valves.
- Turn the crankshaft another one turn until the marks on the sprocket line up again, and measure the other two valve clearances.
- Measure the valve clearance for the other camshaft using the same procedure.
- If the valve clearance is incorrect, replace the present shim with a new shim to obtain the proper clearance (See Table N1). Use the valve lifter holder (special tool) as explained in Pgs. 15~16.
- Install the pick-up coil cover.
- Install the cylinder head cover (Pg. 247).
- Install the fuel tank (Pg. 44).

Marks on the Camshaft Sprockets

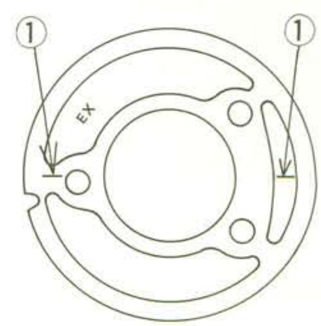
N2

1. Inlet Camshaft Sprocket



1. Mark used during valve clearance measurement
2. Mark used during camshaft installation

2. Exhaust Camshaft Sprocket

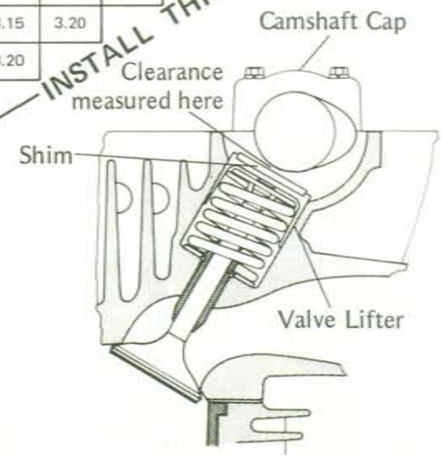


1. Mark used during both valve clearance measurement and camshaft installation

Table N1 Valve Adjustment Chart

	PRESENT SHIM SIZE																								
PART NUMBER 12037	001	002	003	004	005	006	007	008	009	010	011	012	013	014	015	016	017	018	019	020	021	022	023	024	025
MILIMETERS	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20
VALVE CLEARANCE																									
0.00 ~ 0.05			2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10
0.00 ~ 0.05		2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15
0.05 ~ 0.15 mm	SPECIFIED CLEARANCE/NO CHANGE REQUIRED																								
0.15 ~ 0.19	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20	
0.20 ~ 0.24	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20		
0.25 ~ 0.29	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20			
0.30 ~ 0.34	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20				
0.35 ~ 0.39	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20					
0.40 ~ 0.44	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20						
0.45 ~ 0.49	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20							
0.50 ~ 0.54	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20								
0.55 ~ 0.59	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20									
0.60 ~ 0.64	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20										
0.65 ~ 0.69	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20											
0.70 ~ 0.74	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20												
0.75 ~ 0.79	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20													
0.80 ~ 0.84	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20														
0.85 ~ 0.89	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20															
0.90 ~ 0.94	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20																
0.95 ~ 0.99	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20																	
1.00 ~ 1.04	2.90	2.95	3.00	3.05	3.10	3.15	3.20																		
1.05 ~ 1.09	2.95	3.00	3.05	3.10	3.15	3.20																			
1.10 ~ 1.14	3.00	3.05	3.10	3.15	3.20																				
1.15 ~ 1.19	3.05	3.10	3.15	3.20																					
1.20 ~ 1.24	3.10	3.15	3.20																						
1.25 ~ 1.29	3.15	3.20																							
1.30 ~ 1.34	3.20																								

INSTALL THIS SHIM



1. Align the sprocket mark with the cylinder head surface, and measure the clearance (cold).
2. Check present shim size.
3. Match clearance in vertical column with present shim size in horizontal column.
4. Select one of the shims specified where the lines intersect. Either shim 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 clearance.

CAUTION

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

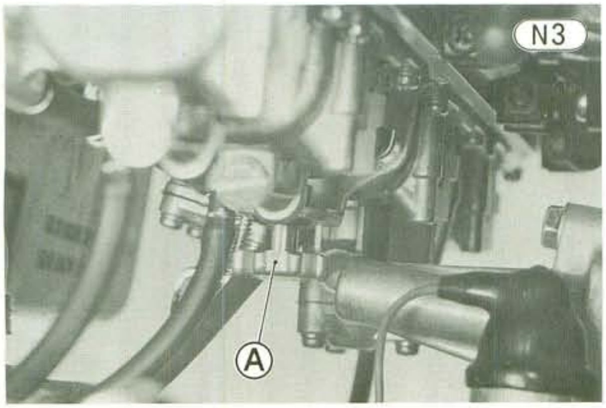
CARBURETORS

The carburetors on the KZ1000-A3A, have an accelerator pump to get an enriched fuel/air mixture during acceleration. Though the accelerator pump does not require periodic maintenance, inspect it if symptoms of accelerator pump trouble appear (Pgs. 253 ~ 254).

Idling Adjustment:

(1) Idle speed adjustment

- Start the engine, and warm it up for 5 minutes.
- Adjust the idle speed to 950 ~ 1,050 rpm by turning the idle adjusting screw.



A. Idle Adjusting Screw

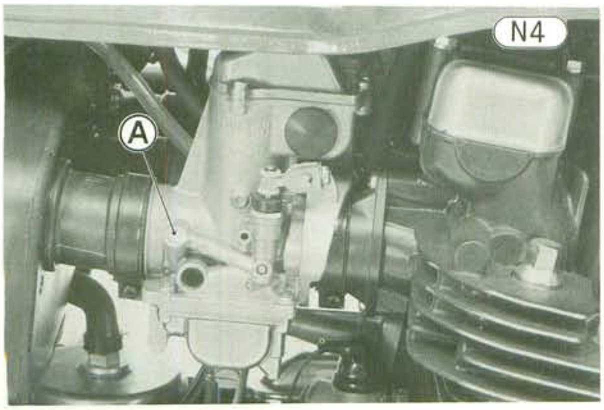
- Open and close the throttle a few times to make sure that the idle speed does not change. Readjust if necessary.

NOTE: With the engine idling, turn the handlebar to either side. If handlebar movement changes the 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.**

(2) Idle mixture check

- Check all carburetors for stripping of the yellow mark painted on the air screw. If the paint falls off, first turn the screw in until it seats lightly, and back it out $1\frac{1}{8}$ turns.



A. Air Screw

- Perform the idle speed adjustment.

NOTE: If proper idle speed cannot be obtained by this adjustment alone, first check the following and correct as necessary.

Engine Oil (Pg. 22)
Spark Plugs (Pg. 12)
Ignition Timing (Pg. 265).
Throttle Cables (Pg. 16)
Cylinder Compression (Pg. 150)
Air Cleaner Element (Pg. 134)
Air Cleaner Duct and Carburetor Holder Leakage
Valve Clearance (Pg. 239)
Air Injection System (Pg. 256).

Fine Synchronization—Vacuum:

Refer to Pgs. 20 ~ 21, noting the following:

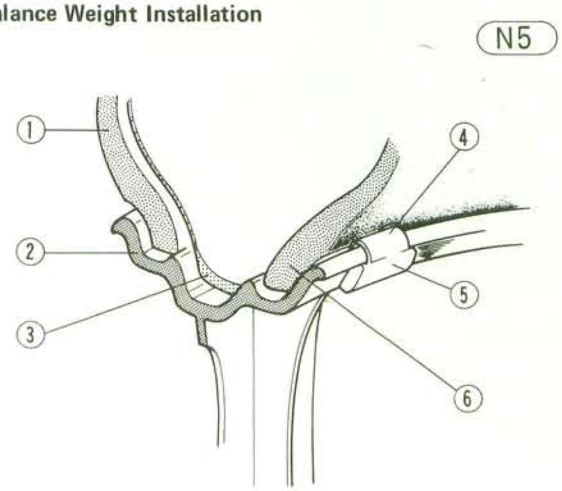
- Slide up the hose clamps, and pull the vacuum hoses off the #1 and #4 vacuum gauge attachments to connect the vacuum gauges to the #1 and #4 carburetor holders.

WHEEL BALANCE (Cast Wheel)

Refer to Pgs. 29 ~ 30, noting the following:

1. 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



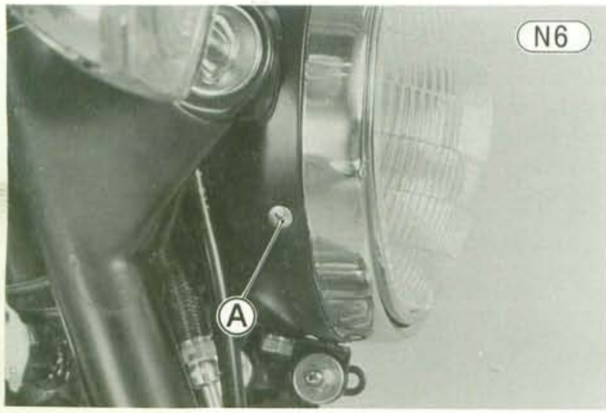
1. Tire
2. Rim
3. Tube
4. Blade
5. Weight
6. Tire Bead

•Inflate the tire to standard pressure (Pg. 258).
2. 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.

HEADLIGHT
Vertical Adjustment:

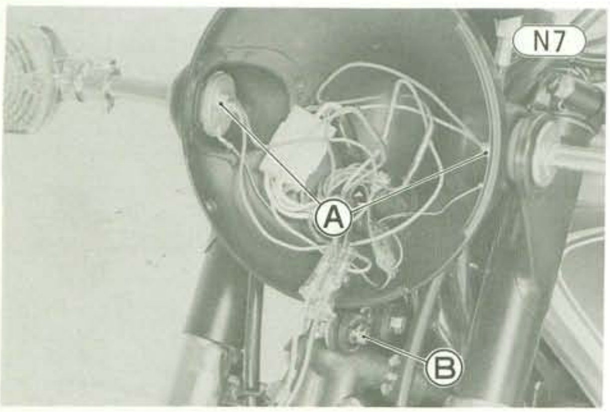
Refer to Pg. 30, noting the following:

•Remove the two screws from the lower side of the headlight housing, and drop out the headlight unit.



A. Screws

•Loosen the mounting bolt underneath the headlight, and loosen the headlight housing mounting nuts.



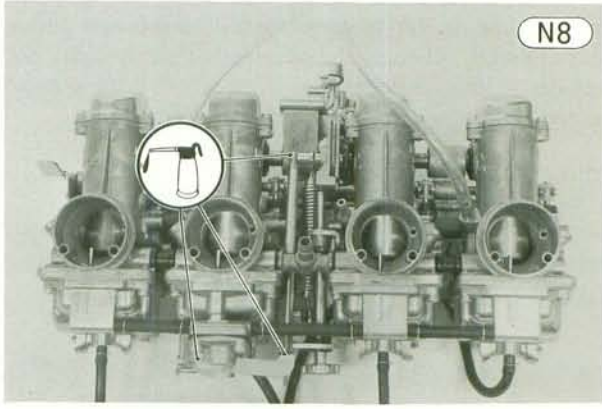
A. Mounting Nuts B. Bolt

•Move the headlight up or down so that the vertical aim is correct, and tighten the bolt and nuts to hold it there.
•Remount the headlight unit.

LUBRICATION

In addition to the points listed in Pgs. 31~33, check and lubricate regularly the following areas:

Accelerator Pump Linkage (US model)



Disassembly

TORQUE AND LOCKING AGENT

The table below shows the tightening torque for the parts which are modified from the previous model. Tighten the other parts to the same torque listed on Pgs. 37 ~ 40.

ENGINE

Part	Locking Agent (•) Required	Quantity	Metric (kg-m)	English (ft-lbs)	See Pg.
Air suction valve cover bolts φ6 P1.0	–	8	1.4 ~ 1.6	10.0 ~ 11.5	246
Camshaft cap bolts φ6 P1.0	–	16	1.6 ~ 1.8	11.5 ~ 13.0	247
Dynamo armature Allen bolts φ6 P1.0	•	3	0.9 ~ 1.1	78 ~ 95 in-lbs	249
Dynamo flywheel bolt φ12 P1.25	–	1	12.0 ~ 14.0	87 ~ 101	249
Starter clutch Allen bolts φ8 P1.25	–	3	3.8 ~ 4.2	27 ~ 30	249

CHASSIS

Part	Locking Agent (•) Required	Quantity	Metric (kg-m)	English (ft-lbs)	See Pg.
Master cylinder mounting bolts φ8 P1.25	•	2	1.6 ~ 2.2	11.5 ~ 16.0	250

FUEL TAP

Removal and Installation:

Refer to Pg. 75, noting the following:

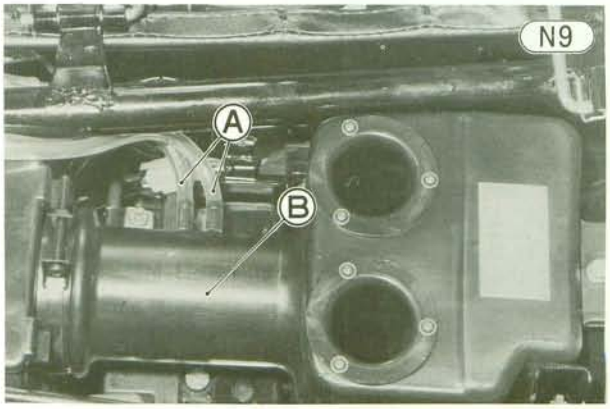
•There is one fuel outlet on the fuel tap whereas there are two for the previous model.

CARBURETORS

Removal and Installation:

Refer to Pgs. 44 ~ 45, noting the following:

1. There is one fuel hose connecting the carburetor to the fuel tap whereas there are two for the previous model.
2. The air cleaner duct holding plate is discontinued. Air cleaner ducts can be repositioned without loosening the screws (Fig. E10 on Pg. 45).
3. For the US model, connect the carburetor air vent tubes (2) to the fittings on the air cleaner silencer. For the other model leave the ends of the air vent tubes open in the air.



A. Air Vent Tubes (US model) **B. Air Cleaner Silencer**

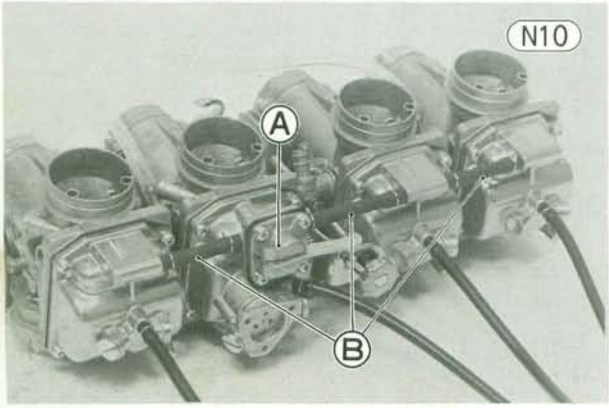
Separation and Assembly of Carburetors:

Refer to Pgs. 45 ~ 47, *noting the following:*

1. The #2 carburetor can be separated together with the accelerator pump rod and the pulley. If accel-

erator pump related parts are replaced, adjust the accelerator pump as explained in the Accelerator Pump Assembly Notes (Pg. 245).

2. There are rubber hoses at the float bowl which lead from the accelerator pump outlet to the pump nozzle in each carburetor.

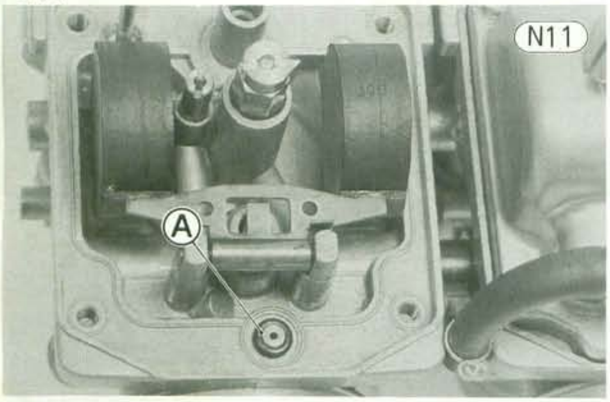


A. Accelerator Pump   B. Connecting Hose

Carburetor Body Disassembly and Assembly:

Refer to Pg. 47, noting the following:

- Remove the clip ⑲, and take off the valve weight ⑳ and outlet check valve ㉑.
- Install the drain plug securely if it was removed.
- For US model, there is an **O** ring ⑱ on the float bowl mating surface. If it is damaged, replace it with a new one.



A. "O" Ring (US model)

- Before removing the air screw ①, to install the air screw and set to its original position later, turn in the air screw and count the number of turns until it seats fully, but not tightly. If a new air screw is being used, first turn in the air screw fully, but not tightly, and then back it out the number of turns counted during disassembly.

Accelerator Pump Disassembly (US model):

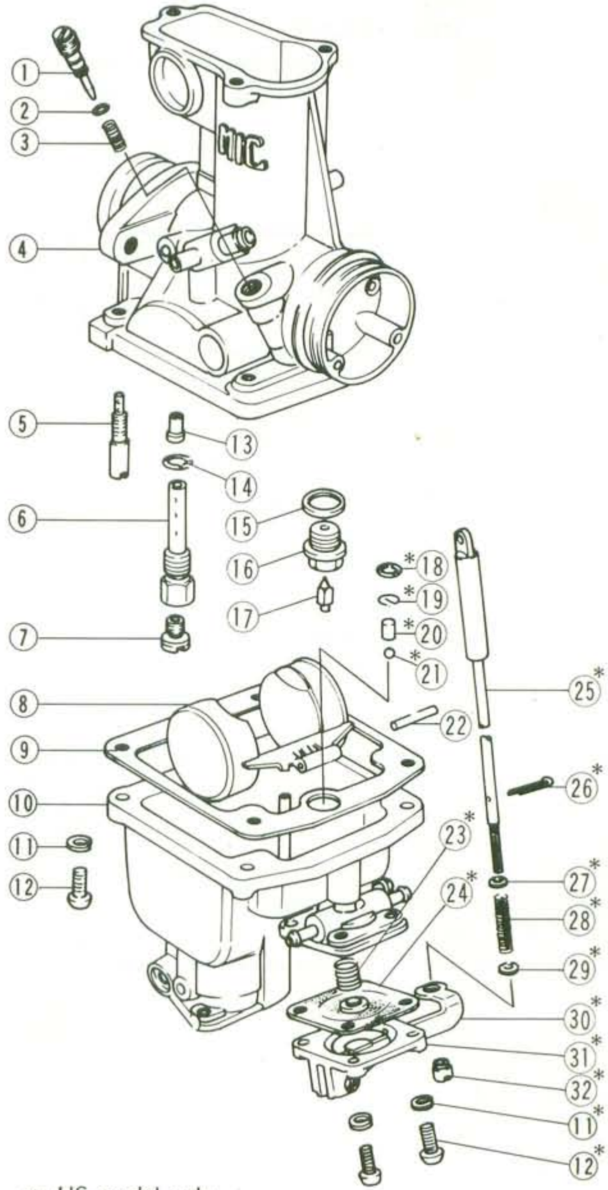
NOTE: The accelerator pump can be disassembled without separating the carburetor from the mounting plate.

- Remove the screws and lockwashers (4 ea), and remove the pump cover ㉛ with the pump lever ㉚ connected to the pump rod ㉕. Be careful not to bend the rod.

CAUTION **Do not attempt to separate the pump lever from the pump rod. This cannot be done without breaking the pump rod.**

Carburetor

N12

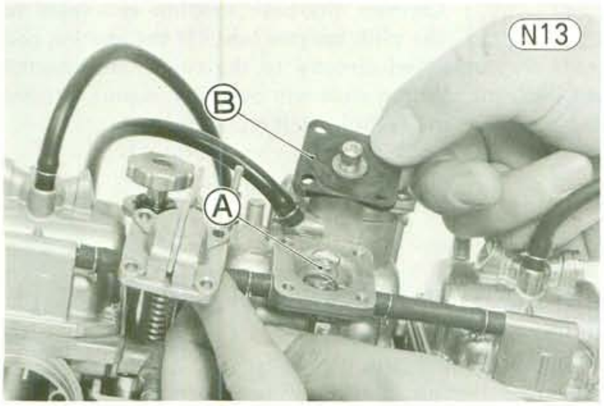


* : US model only

1. Air Screw
2. **O** Ring
3. Spring
4. #2 Carburetor Body
5. Pilot Jet
6. Air Bleed Pipe
7. Main Jet
8. Float
9. Gasket
10. Float Bowl
*11. Lockwasher
*12. Screw
13. Needle Jet
14. **O** Ring
15. Gasket
16. Valve Seat
17. Valve Needle
*18. **O** Ring
*19. Clip
*20. Valve Weight
*21. Outlet Check Valve
22. Float Pin
*23. Spring
*24. Diaphragm
*25. Pump Rod
*26. Cotter Pin
*27. Washer
*28. Spring
*29. Washer
*30. Pump Lever
*31. Accelerator Pump Cover
*32. Adjusting Nut

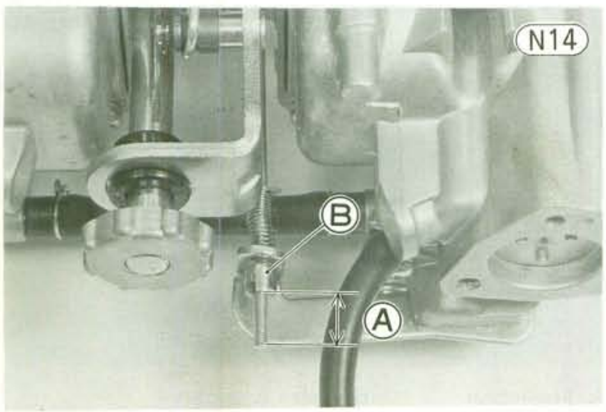
Accelerator Pump Assembly Notes (US model):

1. Check the diaphragm, and replace it with a new one if it shows any damage.
2. Assemble the spring into the correct position. Place the spring between the float bowl and the pump diaphragm.



A. Spring B. Diaphragm

3. If the accelerator pump rod is replaced with a new one, adjust the pump rod as follows:
   - •Measure the length shown in Fig. N14.
   - •If the length is not between 10.7 ~ 10.9 mm, adjust it by turning the adjusting nut.



A. Adjust this length. B. Adjusting Nut

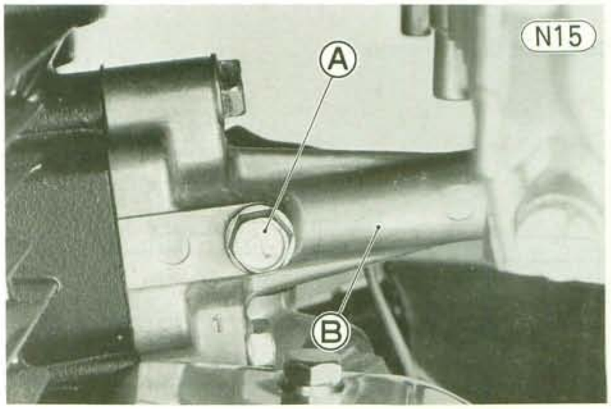
•Apply a drop of a non-permanent locking agent to the adjuster threads to lock the adjusting nut in place.

CAMSHAFT CHAIN TENSIONER

Once the push rod in the camshaft chain tensioner moves out to take up chain slack automatically, it does not return to its original position. So, lock the tensioner before starting any disassembly operation that slackens the chain: camshaft chain guide sprocket (upper) removal, camshaft removal, etc.

To lock the tensioner:

•Remove the lock bolt and washer originally installed on the tensioner, and then turn in and tighten securely a longer 110B0616 bolt to hold the tensioner push rod in place. (Any 6 mm diameter bolt or screw with 1.0 mm pitch threads about 16 mm long or longer will work).



A. Lock Bolt B. Camshaft Chain Tensioner

•Continue the disassembly and assembly operation.

•After completion of the assembly operation, remove the longer lock bolt, and install the original lock bolt and washer to plug the hole.

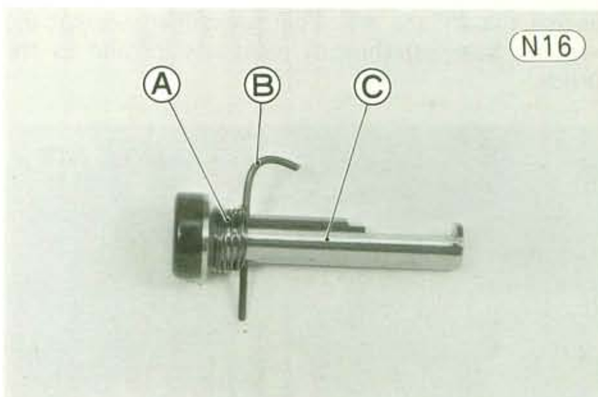
If the tensioner was extended fully, install it as follows:

CAUTION When removing the chain tensioner, do not take out a mounting bolt only half-way. Retightening the mounting bolts from this position could damage the chain tensioner and the camshaft chain.

To install the tensioner:

•Loosen the lock bolt several turns, and take out the push rod and soft spring.

•Compressing the spring against the push rod head, insert a thin wire through the hole in the push rod to keep the spring in place.



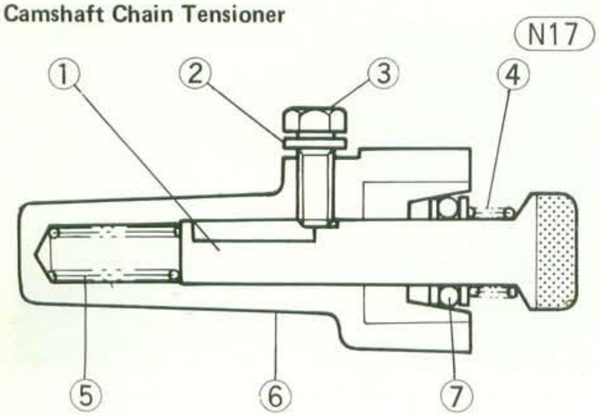
A. Spring B. Wire C. Push Rod

•Check to see that the stiff spring is in the tensioner body.

•Insert the push rod upwards into the tensioner body going through the ball retainer. Hold the tensioner

body with the open end down so that the balls will fall away from the ramp inside the tensioner and allow the push rod to go in. Keep the flat side of the push rod toward the lock bolt, and push in the rod by hand until the wire rests against the tensioner mating surface.
•Holding the push rod in position and facing the flat side toward the bolt, tighten the lock bolt securely to prevent the push rod from sticking out.

Camshaft Chain Tensioner

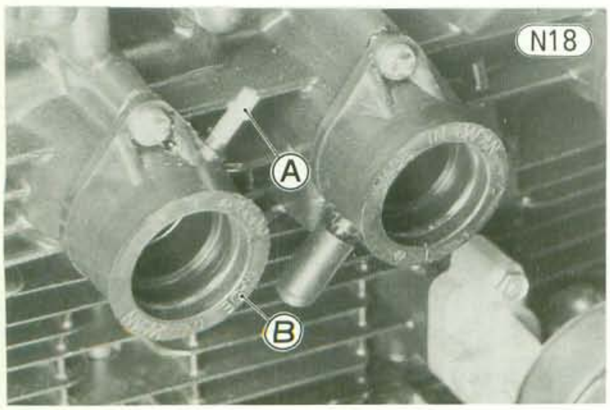


1. Push Rod
2. Washer
3. Lock Bolt
4. Spring
5. Spring
6. Tensioner Body
7. Ball and Retainer

•Pull out the wire, and install the chain tensioner on the cylinder block. If the gasket is damaged, replace it.
•Loosen the lock bolt and then tighten it. With the bolt loose, the stiff spring inside takes up any slack automatically, and the lock bolt can be turned in fully until the bolt head seats closely on the washer.

CARBURETOR HOLDERS (US model)
Removal and Installation:

Refer to Pg. 57, noting the following:
•Install the #1 and #4 carburetor holders so that the vacuum hose attachments point upward and to the inside.



A. Vacuum Hose Attachment
B. #1 Carburetor Holder

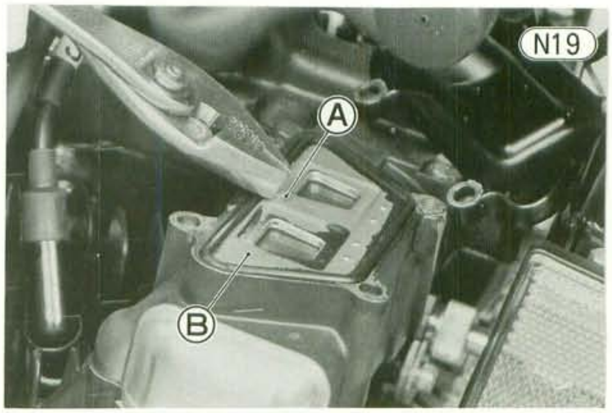
IGNITION COIL, RESISTOR
Removal and Installation:

Refer to Pg. 59, noting the following:
1. The ignition coil resistor is installed on the front mounting bolts of the ignition coils. Install the resistor so that the leads are toward the front side.
2. Connect the leads to leads of the same color.

CAUTION **Connect the pink ignition coil leads to the pink resistor lead. If the ignition coil leads are connected directly to the engine stop switch red lead, the ignition coils will overheat causing internal damage which may require coil replacement.**

AIR SUCTION VALVE (US model)
Removal (either side):

•Remove the fuel tank (Pg. 44).
•Remove the air suction valve cover bolts and flat washers (4 ea), and lift the cover off the air suction valve assembly.
•Remove the valve assembly taking care not to damage the valve reeds and reed contact areas. If the valve assembly sticks in the cylinder head cover, pull it up by grasping the projection with pliers.



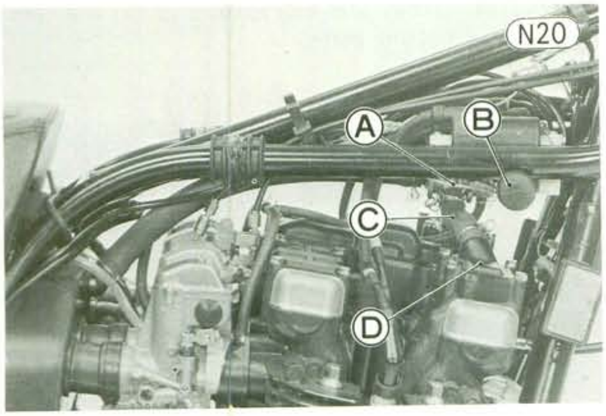
A. Projection **B. Valve Assembly**

Installation Notes (either side):

1. Check the air suction valve assembly, and replace it with a new one if it is damaged (Pg. 255).
2. Tighten the cover bolts (4) to 1.4 ~ 1.6 kg-m (10.0 ~ 11.5 ft-lbs) of torque with a flat washer installed under each bolt head.

CYLINDER HEAD COVER
Removal:

•Remove the fuel tank (Pg. 44).
•Pull the spark plug caps from the spark plugs.
•For US model, slide up the hose clamps (2), and pull the hoses (2) off the air suction valve covers.

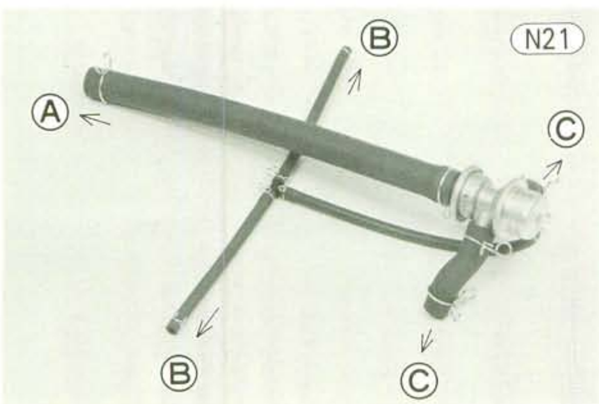


A. Vacuum Switch Valve
B. Damper Rubber
C. Hose
D. Air Suction Valve Cover

- For US model, swing the vacuum switch valve aside so that it does not hinder cylinder head cover removal.
- For US model, remove the right air suction valve (Pg. 246).
- Pull the fuel tank damper rubbers and washers from the pegs.
- Remove the cylinder head cover bolts and flat washers (14 ea), and slip the cover off the cylinder head towards the left.

Installation Notes:

1. Replace the cylinder head rubber plugs (4) and cover gasket with new ones, applying a liquid gasket to both ends of each rubber plug before installation.
2. Tighten the cylinder head cover and the air suction valve cover bolts (20) to 1.4 ~ 1.6 kg-m (10.0 ~ 11.5 ft-lbs) of torque with a flat washer installed under each bolt head.
3. Check to see that the vacuum switch valve is connected firmly to the air cleaner housing, air suction valves, and the #1 and #4 carburetor holders. Each hose end is secured by a hose clamp. Be sure that all the hoses are routed without being flattened or kinked, and are connected correctly to the air cleaner housing, vacuum switch valve, carburetor holders, and air suction valve covers.



A. To Air Cleaner Housing
B. To Carburetor Holder
C. To Air Suction Valve

4. Thoroughly warm up the engine, wait until the engine grows cold, and retighten all the cylinder head cover bolts to the specified torque.

CAMSHAFT

Removal and Installation:

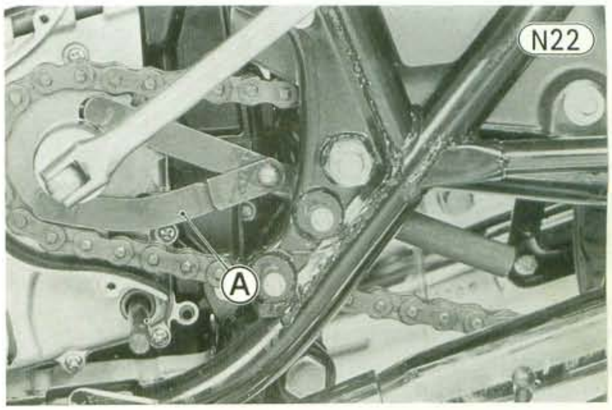
Refer to Pgs. 48 ~ 50, noting the following:

- Tighten the black camshaft cap bolts (16) to 1.6 ~ 1.8 kg-m (11.5 ~ 13.0 ft-lbs) of torque, following the tightning sequence shown in Fig. E26 on Pg. 49.

ENGINE SPROCKET

Refer to Pgs. 61 ~ 62, noting the following:

- When tightening or loosening the engine sprocket nut, hold the engine sprocket steady using the engine sprocket and flywheel holder (special tool).



A. Engine Sprocket and Flywheel Holder (57001-306)

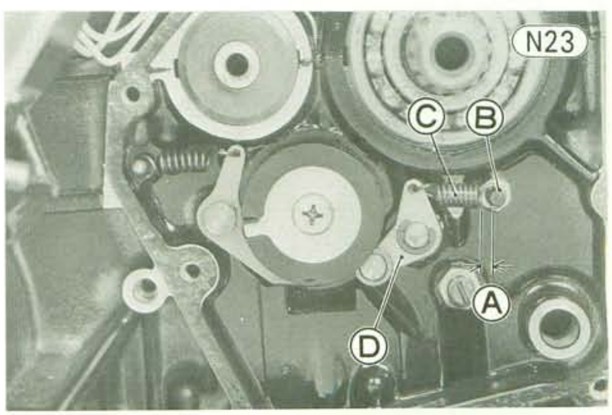
EXTERNAL SHIFT MECHANISM

Removal and Installation:

A neutral detent arm is added on the end of the shift rod.

Refer to Pgs. 62 ~ 64, noting the following:

1. The neutral detent arm is held in place with a circlip.
2. Hook the neutral detent arm spring on the pin and into the detent arm hole. The spring must be hooked over the pin so that the opening on the end of the spring faces downwards.

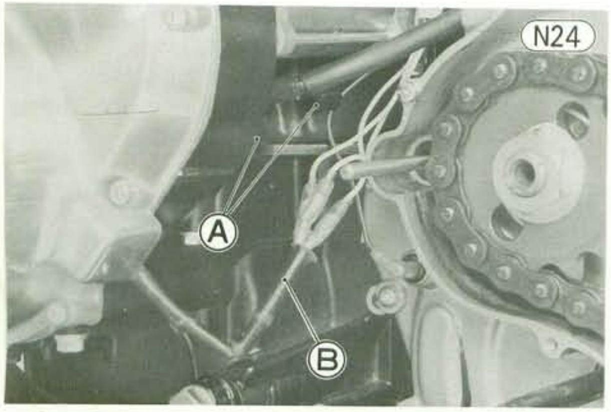


A. Opening
B. Pin
C. Neutral Detent Arm Spring
D. Neutral Detent Arm

DYNAMO ARMATURE

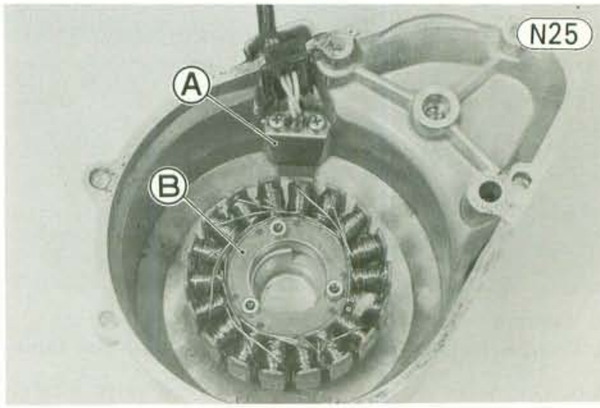
Removal:

- Remove the engine sprocket cover as explained in engine sprocket cover removal (Pg. 60). The clutch cable need not be removed from the clutch release.
- Pull out the dynamo armature yellow leads (3) towards the left side of the engine, releasing the leads from the clamps (2).
- Disconnect the dynamo armature yellow leads (3).



A. Clamps **B. Dynamo Armature Yellow Leads**

- Place an oil pan beneath the dynamo cover.
- Remove the dynamo cover screws (8), and pull off the dynamo cover and gasket.
- Remove the screws and lockwashers (2 ea) and take off the lead holding plate.



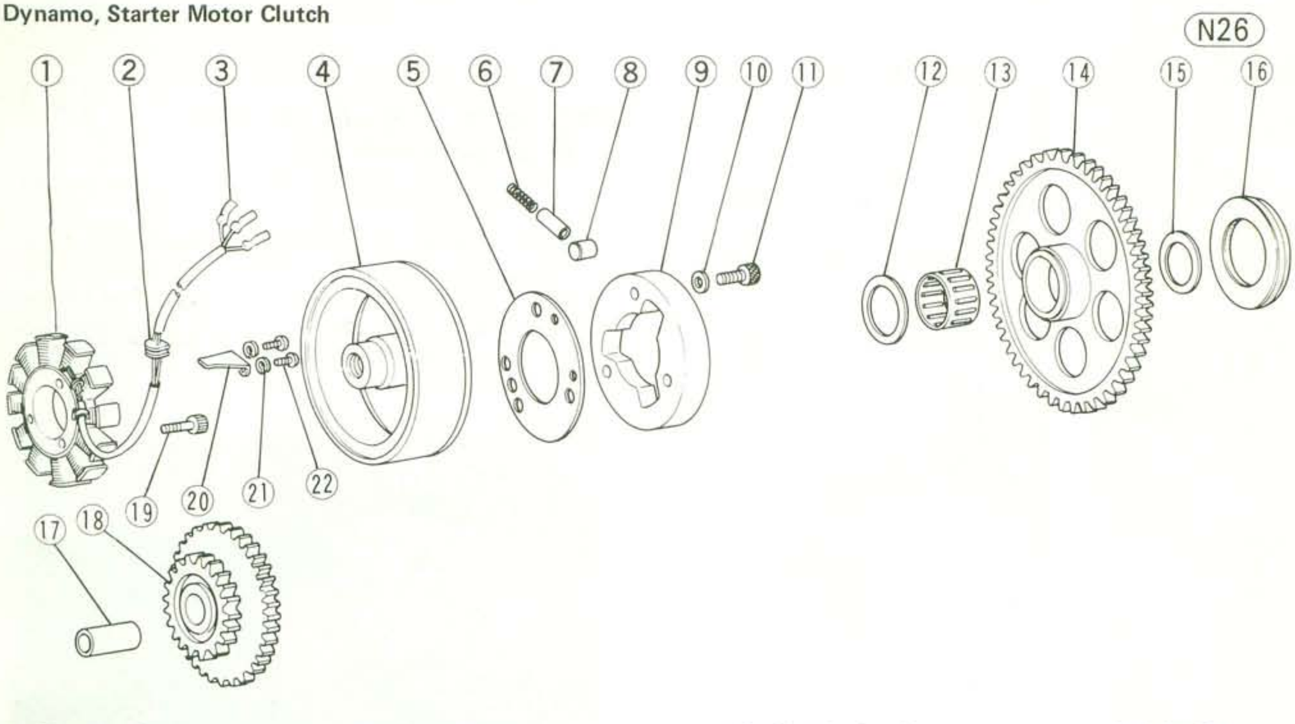
A. Holding Plate **B. Armature**

- Remove the armature Allen bolts 19 (3), and pull the armature 1 and grommet 2 out of the cover.

Installation:

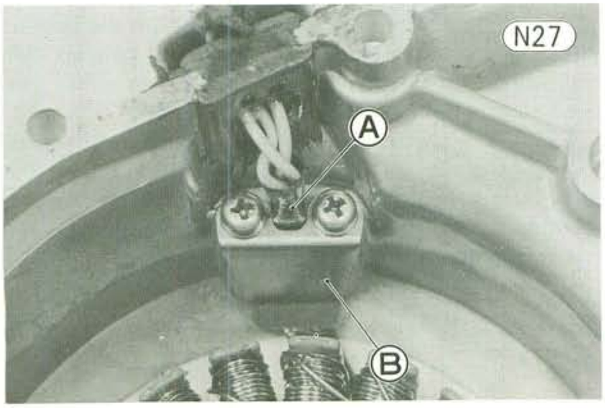
- Apply a liquid gasket around the circumference of the armature grommet, install the grommet, and set the dynamo armature into place.

Dynamo, Starter Motor Clutch



1. Dynamo Armature
2. Grommet
3. Armature Leads
4. Dynamo Flywheel
5. Steel Plate
6. Spring
7. Spring Cap
8. Roller
9. Starter Motor Clutch
10. Washer
11. Allen Bolt
12. Thrust Washer
13. Needle Bearing
14. Starter Clutch Gear
15. Thrust Washer
16. Rubber Damper
17. Shaft
18. Idle Gear
19. Allen Bolt
20. Holding Plate
21. Lockwasher
22. Screw

- Apply a non-permanent locking agent to each Allen bolt, and tighten the bolts to 0.9 ~ 1.1 kg-m (78 ~ 95 in-lbs) of torque.
- Fit the leads into the groove, and hold them in place with the lead holding plate. Tighten the screws (2).



A. Leads B. Holding Plate

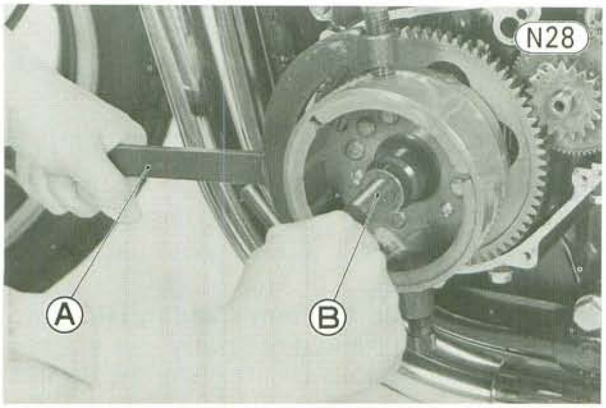
- Check that the knock pins (2) are in place, install the dynamo cover using a new gasket, and tighten its screws (8). Apply a non-permanent locking agent to the screw which goes through the upper knock pin (See Fig. E96 on Pg. 65).
- Connect the dynamo armature yellow leads (3), and secure them in the clamps.
- Install the engine sprocket cover (Pg. 60).
- Check the clutch (Pg. 21), and adjust if necessary.
- Check the oil level (Pg. 22), and add more if necessary.

DYNAMO FLYWHEEL, STARTER MOTOR CLUTCH, STARTER CLUTCH GEAR

Removal and Installation:

Refer to Pgs. 65 ~ 67, noting the following:

1. Use the flywheel holder (special tool) to hold the dynamo flywheel steady. Tightening torque for the dynamo flywheel bolt is 12.0 ~ 14.0 kg-m (87 ~ 101 ft-lbs).



A. Flywheel Holder (57001-308)
B. Rotor Puller (57001-116)

2. Measure the clearance (between the starter clutch gear and the main bearing outer race) by pressing the dynamo flywheel by hand (Fig. E101 on Pg. 66), and select the right rubber damper as shown below. There is an identification mark on the damper.

Table N2 Rubber Damper Selection

Clearance	Rubber Damper P/N	ID Mark
5.06 ~ 6.05 mm	92075-1129	★
6.06 ~ 7.05 mm	92075-1130	★ ★
7.06 ~ 8.05 mm	92075-1131	★ ★ ★

Disassembly and Assembly:

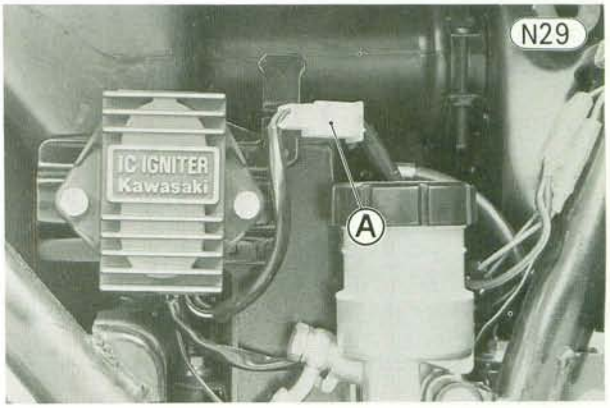
Refer to Pg. 67, noting the following:

- Hold the flywheel using the flywheel holder (special tool: P/N 57001-308). Tightening torque for the Allen bolts (3) is 3.8 ~ 4.2 kg-m (27 ~ 30 ft-lbs).

PICK-UP COIL ASSEMBLY

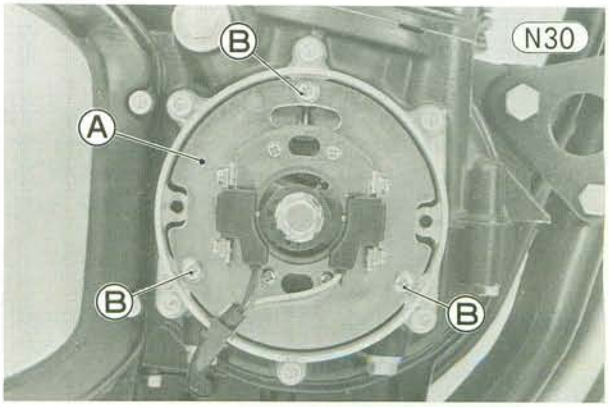
Removal:

- Remove the pick-up coil cover and gasket.
- Pull off the right side cover, disconnect the 4-pin connectors that join the pick-up coil leads to the IC igniter, and slide the leads free from the frame through the clamps.



A. 4-pin Connector

- Remove the mounting screws (3) together with a flat washer and a lockwasher, and remove the pick-up coil assembly.



A. Pick-up Coil Assembly B. Screws

Installation Note:

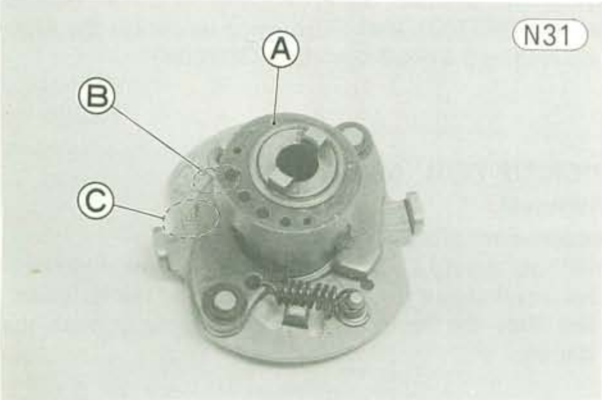
•Fit the lead grommet into the notch in the right engine cover.

TIMING ADVANCER

Disassembly and Assembly:

Refer to Pgs. 70~71, noting the following:

•Install the timing rotor, aligning the projection on the rotor with the "TEC" mark on the advancer body.



A. Timing Rotor
B. Projection
C. Mark

CRANKCASE SPLIT

Disassembly and Assembly:

Refer to Pgs. 84~90, noting the following:

1. See Pg. 249 for the information on dynamo flywheel removal and installation.
2. A flat washer is added to the 6 mm crankcase bolts (22) which fasten the crankcase halves. Do not forget to install the flat washer between each bolt head and the crankcase.

TRANSMISSION

Removal and Installation:

Refer to Pgs. 90~94, noting the following:

1. The neutral detent pin in the shift drum guide bolt is discontinued. In place of the neutral detent pin, a neutral detent arm is adopted at the end of the shift rod. Remove the neutral detent arm spring before removing the shift drum (Fig. N23).
2. The material of each flat washer next to the D2 and O1 gears are changed from copper to steel. The thickness of the new washer, 1 mm, is unchanged. So install the 1 mm thick washer next to these gears. These washers cannot be distinguished from others by color. Other steel washer is 1.6 mm or 1.2 mm thick.

FRONT WHEEL (Dual Disc type)

Removal and Installation:

Refer to Pg. 99, noting the following:

•Unbolt one of the brake calipers before removal of the wheel, and move it free of the fork leg. Avoid straining the brake lines and fittings.

CAUTION **Do not let the wheel lean on the discs or allow the discs to touch the ground. This can damage or warp a disc. Place blocks under the wheel so that discs do not touch the ground.**

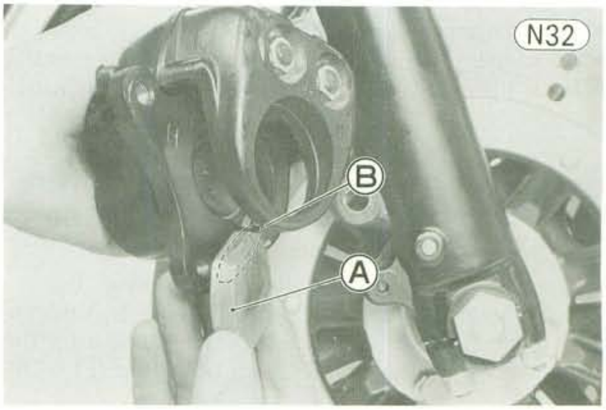
WARNING **Do not ride the motorcycle until the pads are seated against the discs. Pump the brake lever several times until a full, firm lever "feel" is obtained. The front brakes will not function on the first application of the lever if this is not done.**

FRONT DISC BRAKE

Pad Removal and Installation:

Refer to Pgs. 102~103, noting the following:

•The shim on pad A is discontinued. Install pad A in the caliper holder so that the pad lining is toward the disc and stepped portion of the lining is toward the outer circumference of the disc plate.



A. Lining
B. Stepped Portion

REAR DISC BRAKE

Pad Removal and Installation:

Refer to Pgs. 110~111, noting the following:

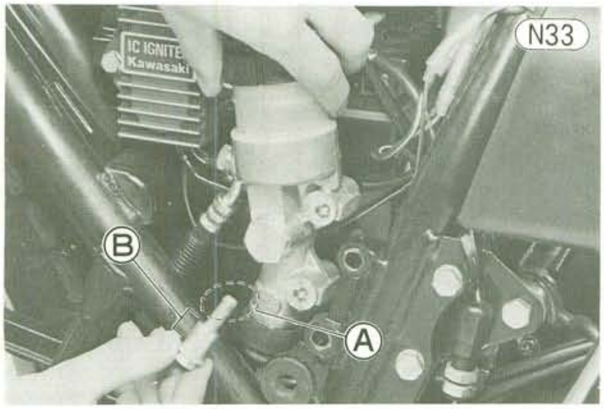
•The shim on the back of each pad is discontinued.

Rear Master Cylinder Removal and Installation:

Refer to Pg. 112, noting the following:

1. Each master cylinder mounting bolt has no lock-washers and flat washers.
2. Apply grease to the bolt holes in the bracket, and apply a non-permanent locking agent to the threads of the mounting bolts (2).
3. Tighten the mounting bolts to 1.6~2.2 kg-m (11.5 ~16.0 ft-lbs) of torque.

NOTE: The correctly installed master cylinder can move within the limit of clearance between the bracket holes and the mounting bolts.



A. Apply a non-permanent locking agent.
B. Apply grease.

TURN SIGNAL ASSEMBLY

Removal and installation (front, either side):

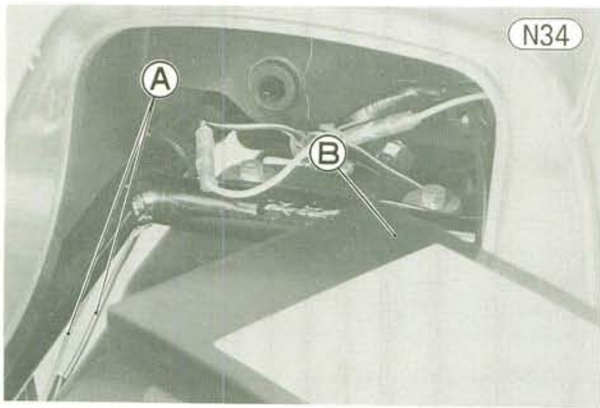
Refer to Pgs. 118 ~ 119, noting the following:

- Connect the gray left turn signal lead to the green main wiring harness lead.

Removal and Installation (rear, either side):

Refer to Pg. 119, noting the following:

- To gain access to the rear turn signal leads, open the seat, and remove the document container.



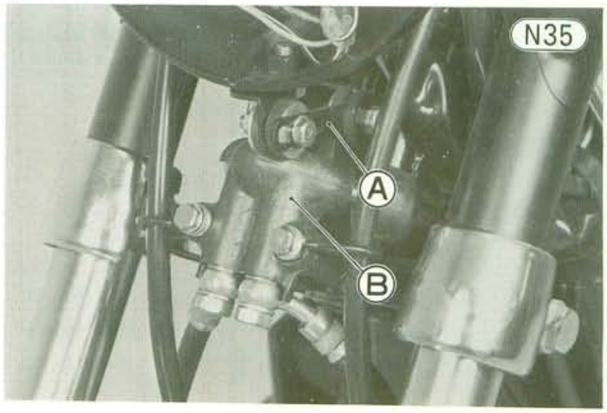
A. Turn Signal Leads B. Document Container

STEERING STEM

Removal and Installation:

Refer to Pgs. 123 ~ 125, noting the following:

- Install the 4-way joint, placing the headlight housing stay between the 4-way joint and the steering stem base.



A. Stay B. 4-way Joint

Maintenance

CARBURETORS

Refer to Pgs. 135~141, noting the following:

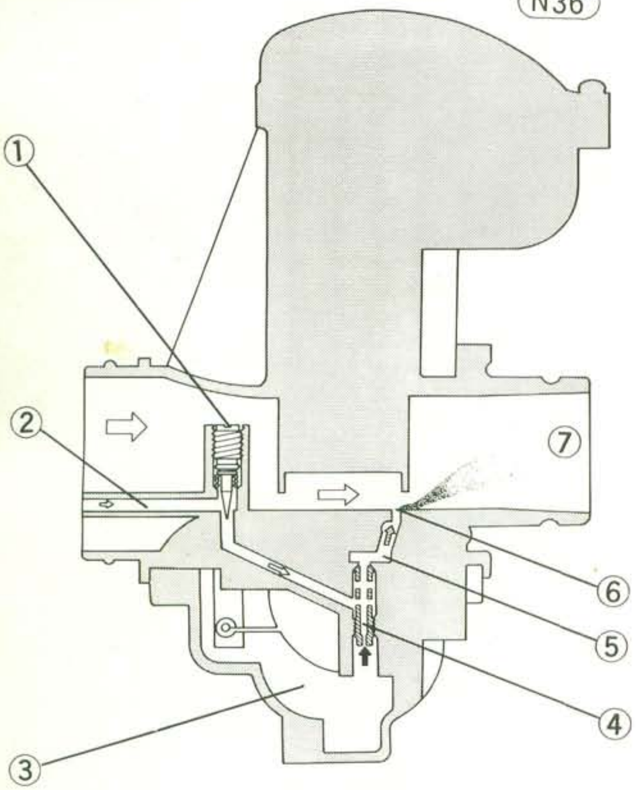
1. The carburetors on 1979 model are changed for the air screw type.
2. The carburetor specifications are shown in Table N3.
3. An accelerator pump is incorporated on the #2 carburetor to supply the necessary rich mixture for sudden acceleration from low speed.

Pilot System

Fig. N36 shows the pilot system, which includes the pilot jet ④, pilot air passage ②, air screw ①, and pilot outlet ⑥. The flow of fuel and air in the pilot system is shown in Fig. N37.

Pilot System

(N36)



1. Air Screw
2. Pilot Air Passage
3. Float Chamber
4. Pilot Jet
5. Pilot Passage
6. Pilot Outlet
7. Carburetor Bore

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 past the needle jet. Instead, the fuel is drawn through the pilot jet as a result of the low pressure (suction) caused by the engine's demand for air and the small, but relatively fast flow of air past the pilot outlet. The low position of the throttle valve restricts the carburetor bore air flow, preventing it from relieving the low pressure around the pilot outlet created by the engine's suction, while the venturi effect (i.e., the narrower the air passage, the faster the flow of air) at the engine side of the throttle valve further reduces the low pressure.

As fuel is drawn out of the pilot jet, and through the pilot passage, it mixes with air drawn in through the air-screw-controlled air passage. Once the throttle valve rises, it no longer concentrates the low pressure area around just the pilot outlet.

The purpose of the pilot system is to provide the rich fuel/air mixture necessary at low engine speed. The pilot system mixture consists primarily of the fuel measured out by the pilot jet and the air let in past the air screw. Since the size of the pilot jet opening is fixed, the fuel to air ratio is controlled by the position of the air screw.

Fig. H8 on Pg. 138 shows throttle valve opening versus fuel flow for the main and pilot systems. If trouble occurs in the pilot system, not only are starting and low speed running affected, but the transition from pilot to main system is not smooth as the throttle is opened, causing a drop in acceleration efficiency. Pilot system trouble might be due to maladjustment; a dirty or loose pilot jet; or clogging of the pilot jet passage, or air-screw-controlled air passage.

Pilot System Fuel and Air Supply

(N37)

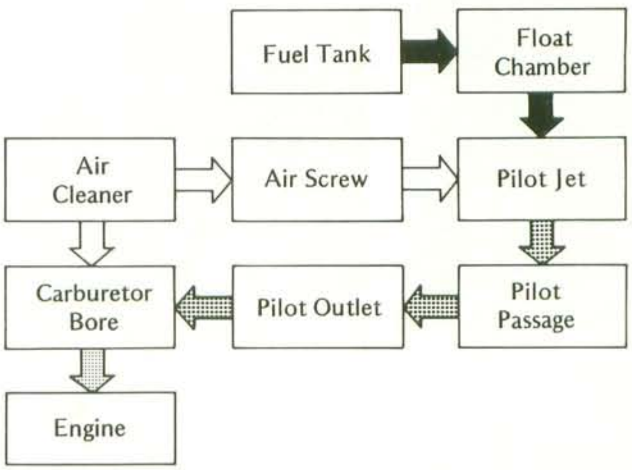


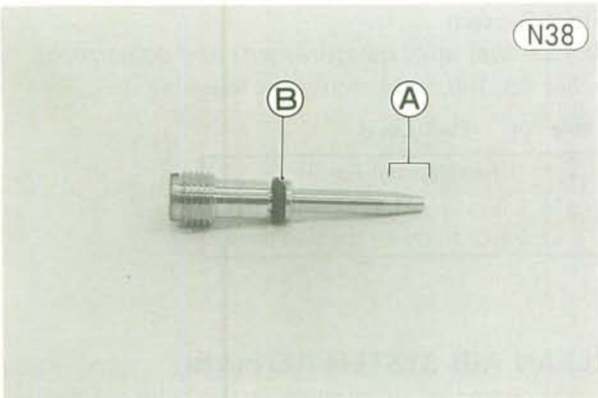
Table N3 Carburetor Specifications

Type	Main Jet	Needle Jet	Jet Needle	Pilot Jet	Throttle Valve Cutaway	Design Fuel Level	Service Fuel Level
VM28SS	102.5R	O-4	5CN17-3	15	2.0	33 ± 1 mm	4 ± 1 mm

Cleaning and replacement
(See caution on Pg. 136)

Remove the float bowl, float, pilot jet, and valve needle. Wash the pilot jet with a high flash-point solvent, and blow it clean with compressed air. Also use compressed air to clean the pilot outlet, pilot jet passage, and air screw air passage. If necessary, use a bath of automotive-type carburetor cleaner.

Remove the air screw (Pg. 244), and check that the tapered portion is not worn or otherwise deformed. If it is, replace the air screw. If the screw **O** ring is damaged, replace the **O** ring.



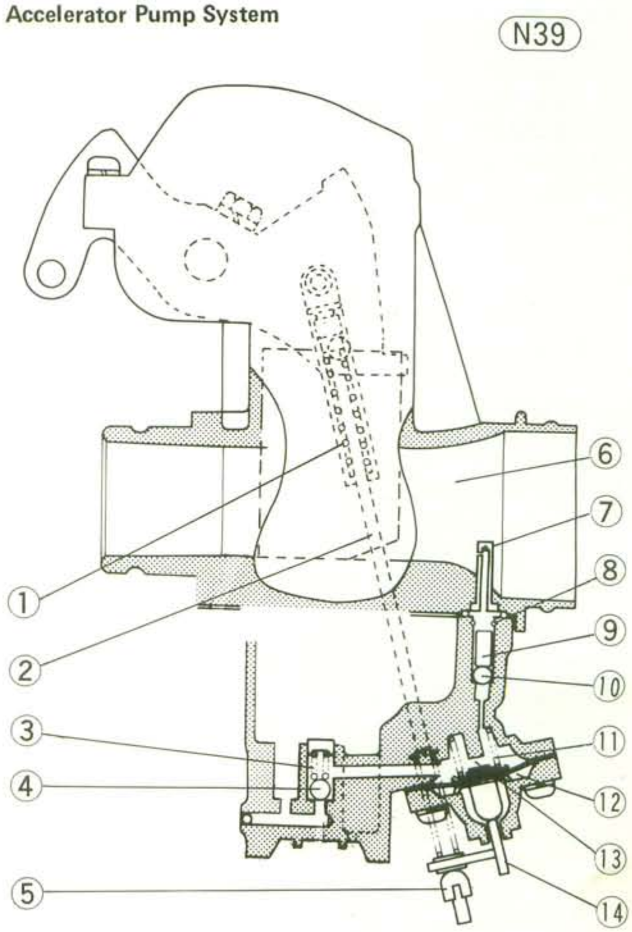
A. Tapered Portion **B. "O" Ring**

Accelerator Pump System (US model)

Fig. N39 shows the accelerator pump system which consists of the accelerator pump chamber ⑬, pump nozzle ⑦, inlet check valve ④, and outlet check valve ⑩.

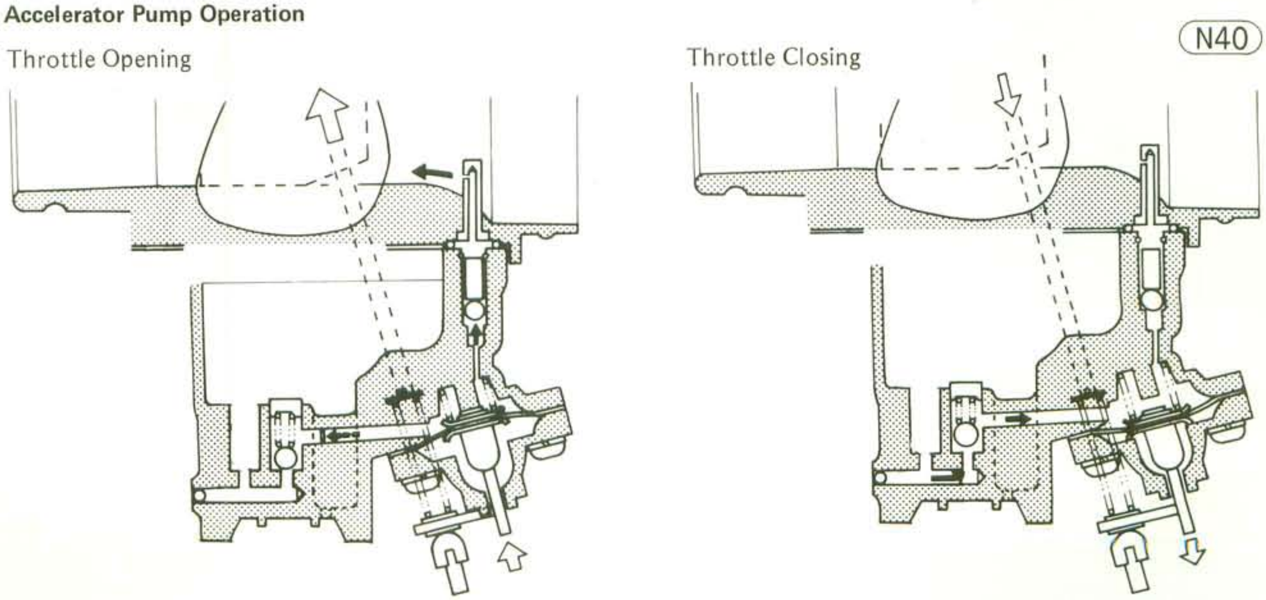
This system temporarily supplies additional fuel to the engine to make up for a too lean mixture which is momentarily caused by sudden acceleration. When the throttle is opened quickly to accelerate suddenly, the flow of fuel lags behind the flow of air because the fuel has greater inertia than the air, and the fuel/air mixture tends to become too lean. The accelerator pump is controlled by the motion of the throttle via

Accelerator Pump System



1. Spring
2. Pump Rod
3. Spring
4. Inlet Check Valve
5. Adjusting Nut
6. Carburetor Bore
7. Pump Nozzle
8. Clip
9. Valve Weight
10. Outlet Check Valve
11. Return Spring
12. Diaphragm
13. Pump Chamber
14. Pump Lever

Accelerator Pump Operation



the pump rod and lever to supply additional fuel. The pump rod operates the pump diaphragm from about 0 to ¼ throttle opening.

When the pump diaphragm is operated, the fuel in the pump chamber is ejected into each carburetor bore from the pump nozzle through the outlet check valve. The fuel from the pump is delivered to the other carburetors through hoses which connect the float bowls.

Inspection

The accelerator pump should eject fuel from the pump nozzle when the pump lever is pulled up. If the accelerator pump is not working properly, acceleration is poor.

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

- Supply fuel to the carburetors.
- Turn the pulley quickly to operate the accelerator pump and check that fuel squirts from each pump nozzle. The fuel must squirt directly into each carburetor bore without hitting the jet needle or the carburetor bore wall. The quantity of fuel eject from each pump nozzle must be the same. If no fuel is ejected at all, the accelerator pump is defective. If any one of the pump nozzles ejects less fuel than the others or none at all, the nozzle or passage is clogged and must be cleaned.

Cleaning and replacement

Disassemble the carburetors, and blow the passages clean with compressed air. Check that the diaphragm and return spring are not damaged or otherwise deformed. If the accelerator pump assembly is replaced with a new one, it must be installed and adjusted referring to the assembly notes (Pg. 245).

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

Float System

Service fuel level measurement and adjustment

See Pgs. 140 ~ 141, noting the following:

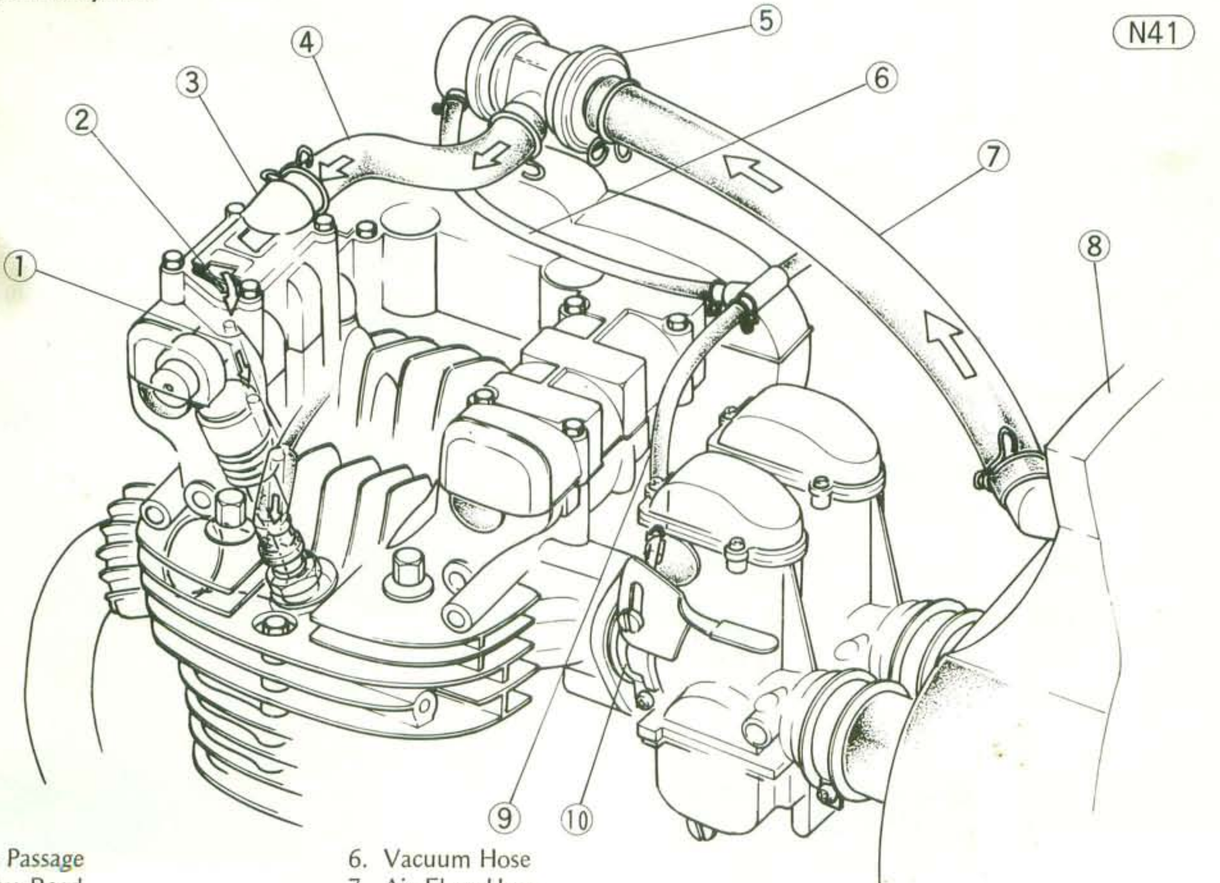
Table N4 Fuel Level

Service Fuel Level
3 ~ 5 mm from the edge of the carburetor body to the fuel level

CLEAN AIR SYSTEM (US model)

The secondary air injection system helps the fuel/air mixture burn more completely. Following the power

Air Injection System



1. Air Passage
2. Valve Reed
3. Air Suction Valve Cover
4. Air Flow Hose
5. Vacuum Switch Valve
6. Vacuum Hose
7. Air Flow Hose
8. Air Cleaner Housing
9. Vacuum Hose
10. Carburetor Holder

stroke, the exhaust valve opens. As the burned fuel charge passes the exhaust valve, it is still hot enough to burn if air is supplied. By introducing a stream of fresh air into the hot exhaust gases just as they pass the exhaust valve, the burning is both intensified and prolonged. This increased burning action tends to burn up a great deal of the normally unburned gases, as well as changing a significant portion of the poisonous carbon monoxide into harmless carbon dioxide.

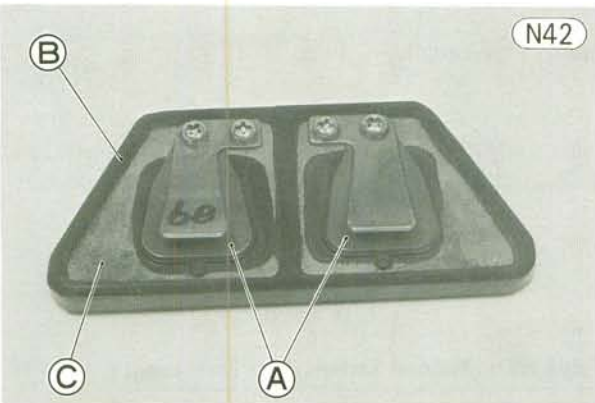
The secondary air injection system consists of a vacuum switch valve, air suction valves, and air hoses. Without the use of an air pump, this system introduces fresh air into the exhaust system near the exhaust ports in response to pressure differentials generated by pulses in the exhaust.

Air Suction Valves

The air suction valve is essentially a check valve which allows fresh air to flow only from the air cleaner into the exhaust port. Any air that has passed the air suction valve is prevented from returning. Remove and inspect the air suction valves periodically (Pg. 238). Also, remove and inspect the air suction valves whenever the idle is unstable, engine power is greatly reduced, or there are abnormal engine noises.

Inspection

Visually inspect the reeds for cracks, folds, warping, 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. Reeds **C. Valve Holder**
B. Sealing Lip Coating

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 coating on the valve holder for the same signs. 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 with a high flash-point solvent. **CAUTION Do not scrape off the deposits as this could damage the rubber, necessitating air suction valve assembly replacement.**

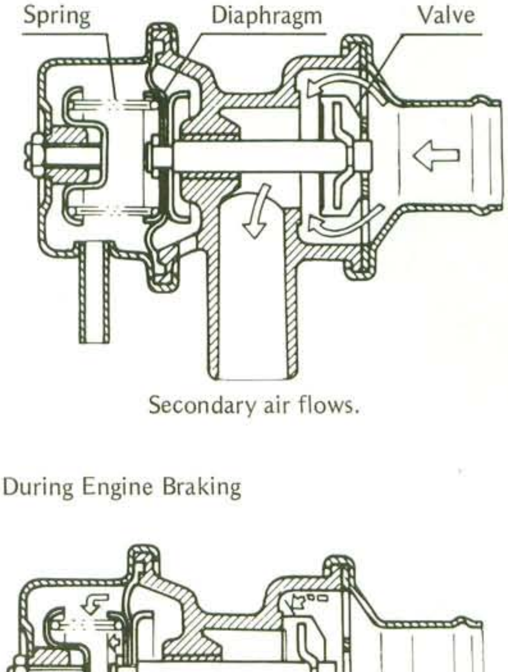
Vacuum Switch Valve

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.

Vacuum Switch Valve Operation

(N43)

1. During Cruising



Secondary air flows.

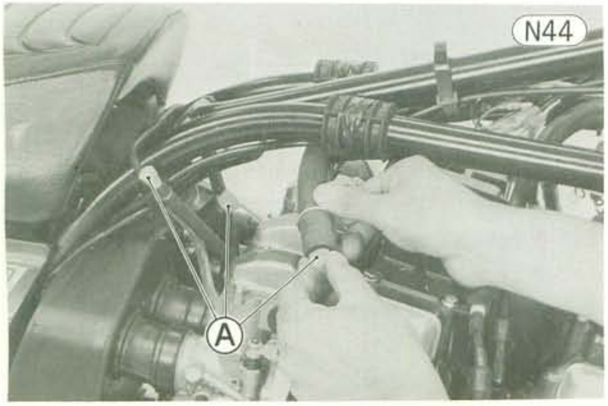
2. During Engine Braking

Secondary air cannot flow.

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:

Inspection

- Be certain that all the hoses are routed without being flattened or kinked, and are connected correctly to the air cleaner housing, vacuum switch valve, #1 and #4 carburetor holders, and air suction valve covers. If they are not, correct them or replace them if damaged.
- Warm up the engine thoroughly.
- Note the frequency and the loudness of backfiring in the exhaust system which takes place when the throttle valves are quickly opened and then closed. Rev the engine to about 4,000 rpm. Too low a speed does not generate a high enough vacuum to operate the vacuum switch valve, and too high a speed is not necessary and may be harmful to the engine.
- Stop the engine.
- At the air cleaner housing, disconnect the hose which connects the air cleaner housing and the vacuum switch valve.
- Plug the hose fitting on the air cleaner housing so that unfiltered air does not enter the air cleaner housing through the hose fitting. Plug the hose that is disconnected so that no air can flow to the air suction valves through the vacuum switch valve.



A. Plug the air passages.

- Start the engine, and note the frequency and loudness of the backfiring as before.
- If the backfiring occurs in the same manner in both cases, the vacuum switch valve works properly. If the backfiring is different the second time, the vacuum switch valve is defective and must be replaced with a new one. Vacuum switch adjustment is not permitted.

TRANSMISSION

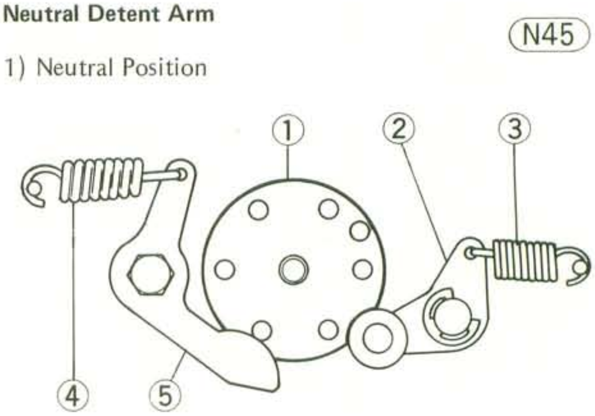
Shift Mechanism

Refer to Pg. 158, noting the following:

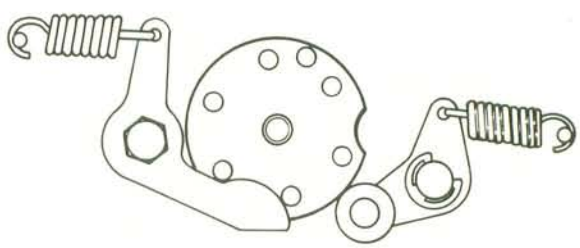
A neutral detent arm is incorporated in place of the neutral detent pin which is used on previous models. The neutral detent arm is pushed against the circumference of the shift drum, and drops into a depression in the circumference when the drum is turned to the neutral position.

Neutral Detent Arm

1) Neutral Position



2) Other than Neutral Position



1. Shift Drum
2. Neutral Detent Arm
3. Spring
4. Spring
5. Gear Detent Arm

External shift mechanism inspection

Refer to Pgs. 161~162, noting the following:

Visually inspect the neutral detent arm and its spring. Replace any parts that are damaged.

Measure the free length of the neutral detent arm spring. If it is longer than the service limit, it is weak and should be replaced.

Spring Free Length

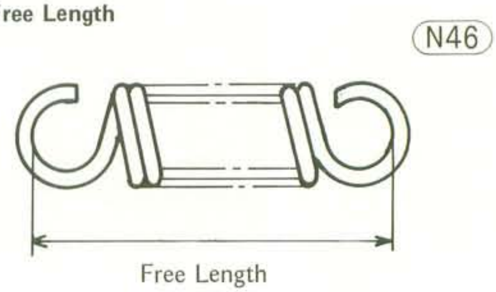


Table N5 Neutral Detent Arm Free Length

Standard	Service Limit
22.2 ~ 22.8 mm	23.9 mm

CYLINDER HEAD, VALVES

Refer to Pgs. 143~150, noting the following:

- As the valve clearance adjustment is changed, refer to Table N6 for repair of the valve or valve seat after valve installed height measurement.

Table N6 Valve Installed Height Procedure

Measurement	Probable Cause	Recommendation	
Less than 37.12 mm	Valve stem ground previously	1. Check to be sure to leave at least 4.2 mm of stem end above the wide groove portion. See Pg. 145. 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.	
		Assemble with this shim:	After checking valve clearance, final shim may be in this range:
37.12 ~ 37.16 mm		2.85 mm	2.85 ~ 3.20 mm
37.17 ~ 37.21		2.80	2.80 ~ 3.20
37.22 ~ 37.26		2.75	2.75 ~ 3.20
37.27 ~ 37.31		2.70	2.70 ~ 3.15
37.32 ~ 37.36		2.65	2.65 ~ 3.10
37.37 ~ 37.41		2.60	2.60 ~ 3.05
37.42 ~ 37.46		2.55	2.55 ~ 3.00
37.47 ~ 37.51		2.50	2.50 ~ 2.95
37.52 ~ 37.56		2.45	2.45 ~ 2.90
37.57 ~ 37.61	Normal/acceptable	2.40	2.40 ~ 2.85
37.62 ~ 37.66		2.35	2.35 ~ 2.80
37.67 ~ 37.71		2.30	2.30 ~ 2.75
37.72 ~ 37.76		2.25	2.25 ~ 2.70
37.77 ~ 37.81		2.20	2.20 ~ 2.65
37.82 ~ 37.86		2.15	2.15 ~ 2.60
37.87 ~ 37.91		2.10	2.10 ~ 2.55
37.92 ~ 37.96		2.05	2.05 ~ 2.50
37.97 ~ 38.01		2.00	2.00 ~ 2.45
38.02 ~ 38.06		2.00	2.00 ~ 2.40
38.07 ~ 38.37 mm	Wear or grinding of valve face and valve seat allowed valve to drop too far into valve seat.	1. Interchange valve to shallowest cut valve seat. Remeasure. 2. Grind 0.3 mm maximum off valve stem. See CAUTION, Pg. 145. Remeasure.	
More than 38.37 mm	Valve face and valve seat worn out or excessively ground.	1. Replace valve. Remeasure. 2. Replace cylinder head. Remeasure.	

WHEELS

Tires

Refer to Pgs. 170 ~ 172, noting the following information:

Table N7 Tires, Air Pressure (measured when cold)

	Air Pressure		Size	Make, Type
Front	2.00 kg/cm² (28 psi)		3.25V-19 4PR	DUNLOP F6B
Rear	Up to 97.5 kg (215 lbs) load	2.25 kg/cm² (32 psi)	4.00V-18 4PR	DUNLOP K87 MARKIIM
	97.5 ~ 165 kg (215 ~ 364 lbs) load	2.80 kg/cm² (40 psi)		

Table N8 Tire Tread Depth

	Service Limit (minimum tread depth)	
	Under 130 kph	Over 130 kph
Front	1 mm	1 mm
Rear	2 mm	3 mm

WARNING **Do not mount any tire other than the standard type or handling characteristics may be seriously impaired.**

Cast Wheels

Inspection

Carefully inspect the wheel for small cracks, dents, bends, or warpage. If there is any damage to the wheel, it must be replaced. Except for replacement of wheel bearings, there is no repair that can be performed on the wheels.

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.**

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.

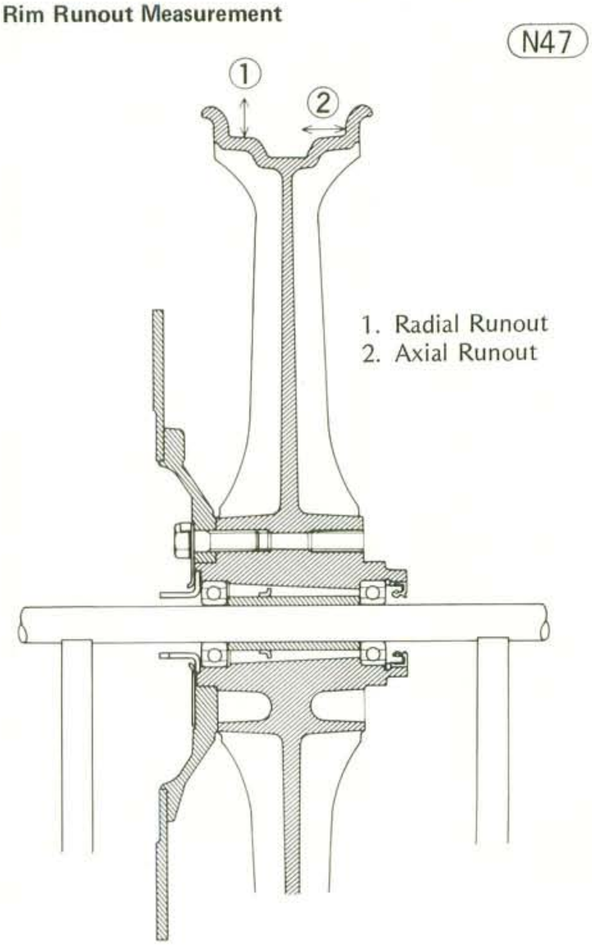
Set the dial gauge to the outer circumference of the rim, and rotate the wheel to measure radial runout. The difference between the highest and lowest dial readings is the amount of runout.

Table N9 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.

Rim Runout Measurement



Grease Seals, Wheel Bearings

Refer to Pgs. 173 ~ 174, noting the following:

- Sealed type ball bearings are incorporated in the wheel hub. Other bearings and grease seals are the same ones as on the previous model.

SPROCKET

Refer to Pgs. 175 ~ 176, noting the following:

- The rear sprocket is larger (35 teeth vs. 33).

Table N10 Rear Sprocket Diameter

Standard	Service Limit
200.39 mm	199.9 mm

BRAKES

Refer to Pgs. 176 ~ 183 for other service information not specifically mentioned here.

The front brake is a dual-disc type. A second disc and caliper are installed, and thinner discs and a larger-diameter master cylinder are used, but operation and maintenance procedures are the same. When referring to the table "Master Cylinder Parts", use the information given for the dual-disc system.

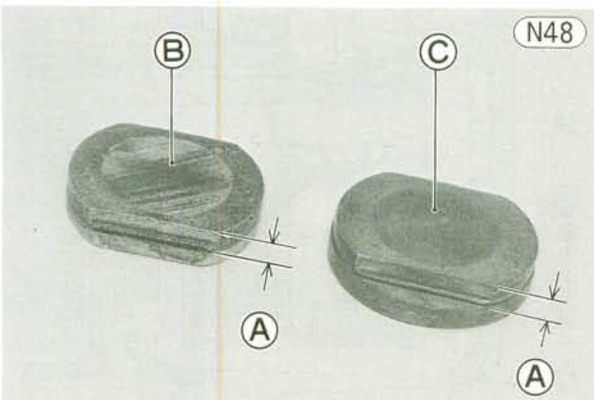
Calipers

Caliper part wear

For the front disc brakes, check the thickness of the pad linings, and replace both pads as a set if the thickness of either pad is less than the service limit.

Table N11 Pad Lining Thickness

Service Limit
1 mm



A. Measure the lining thickness. **C. Pad B**
B. Pad A

Discs

Disc wear, warp

Table N12 Disc Thickness (front dual)

Standard	Service Limit
4.9 ~ 5.1 mm	4.5 mm

FRONT FORK

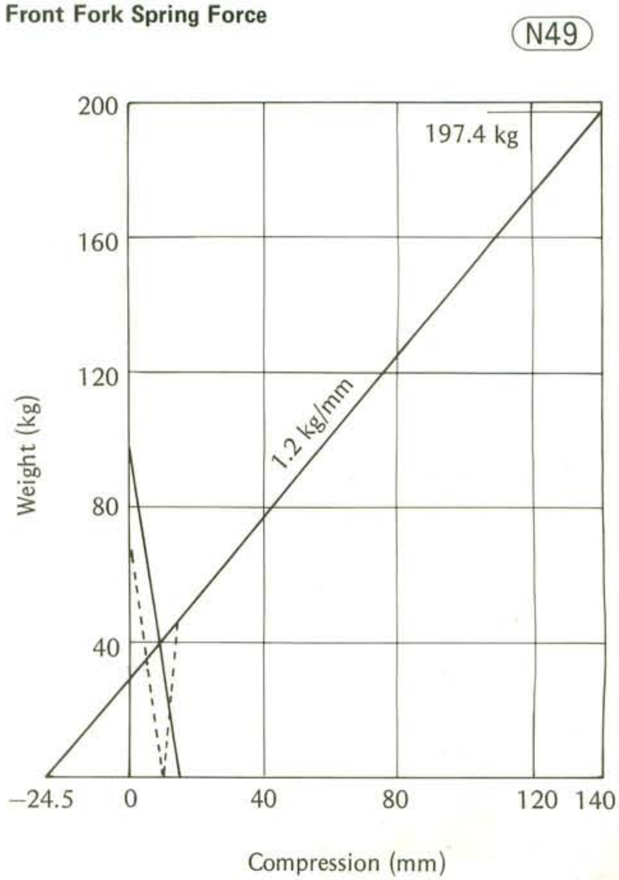
See Pgs. 184 ~ 187, noting the following:

1. The springs are somewhat softer.

Table N13 Fork Spring Free Length

Standard	Service Limit
536.5 mm	527 mm

Front Fork Spring Force



2. The oil level is changed. To check the fork oil level, first place a jack or stand under the engine so that the wheel is raised off the ground. Remove the top bolt from the inner tube, and pull out the fork spring. Insert a thin 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

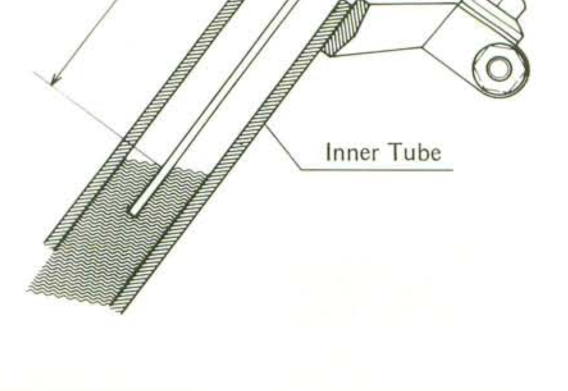


Table N14 Fork Oil

Type	Filling Fork Oil Capacity		Oil level*
	When changing oil	After disassembly and completely dry	
SAE 10W20	about 160 cc	180 ~ 188 cc	441 mm from top of inner tube

*Measure the oil level with the spring being removed.

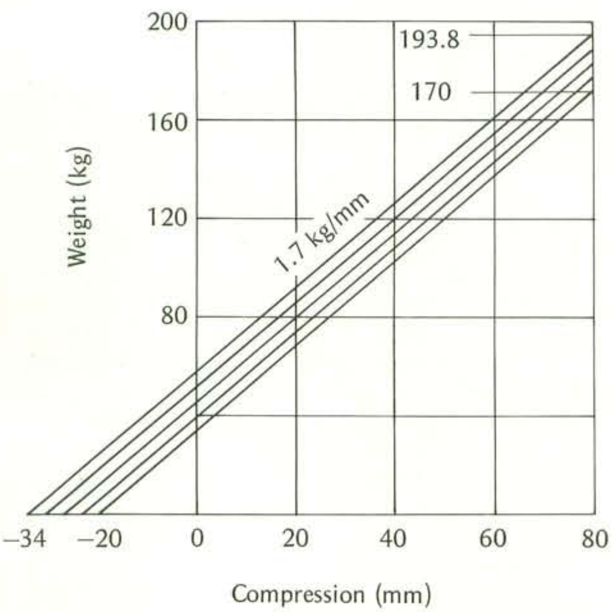
REAR SHOCK ABSORBERS

See Pgs. 187 ~ 188, noting the following:

- The springs are somewhat softer.

Rear Spring Force

(N51)



CHARGING SYSTEM

The charging system consists of a dynamo (an alternator) and an integrated regulator/rectifier.

The dynamo generates the current required by the electrical circuits. The generated current is a 3 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.

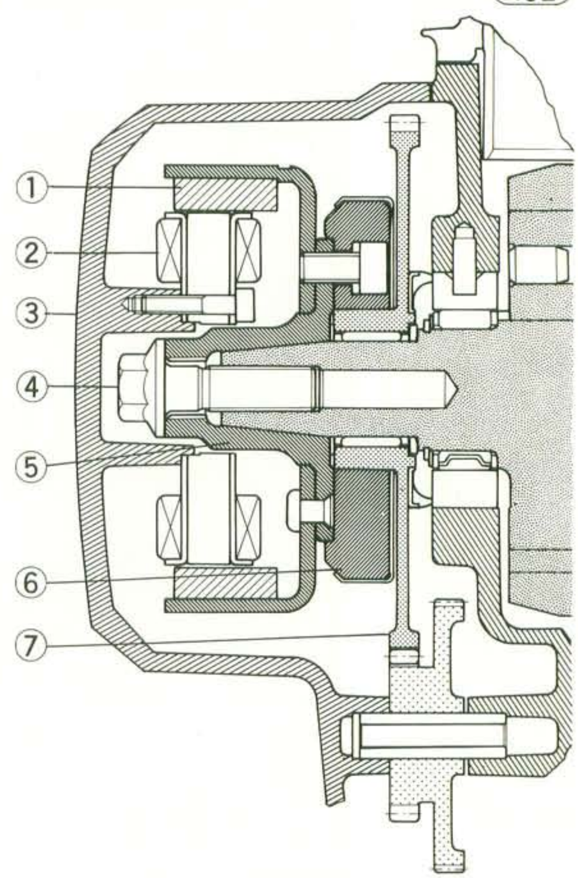
Dynamo

The dynamo is made of a flywheel ① and armature ②. The armature is mounted in the dynamo cover ③, while the flywheel is secured to the left end of the crankshaft ⑤ and rotates at engine rpm. Permanent magnets in the flywheel supply the magnetic field for the armature so that no slip rings or brushes are necessary, making the dynamo practically maintenance free.

The armature consists of three sets of coils wound on laminated steel cores. These coils are connected in a wye connection to produce a 3 phase alternating current. Since the voltages of these 3 phases overlap, there is a continuous, even supply of current for the circuit components.

Dynamo Construction

(N52)



1. Dynamo Flywheel
2. Dynamo Armature
3. Dynamo Cover
4. Flywheel Bolt
5. Crankshaft
6. Starter Motor Clutch
7. Starter Clutch Gear

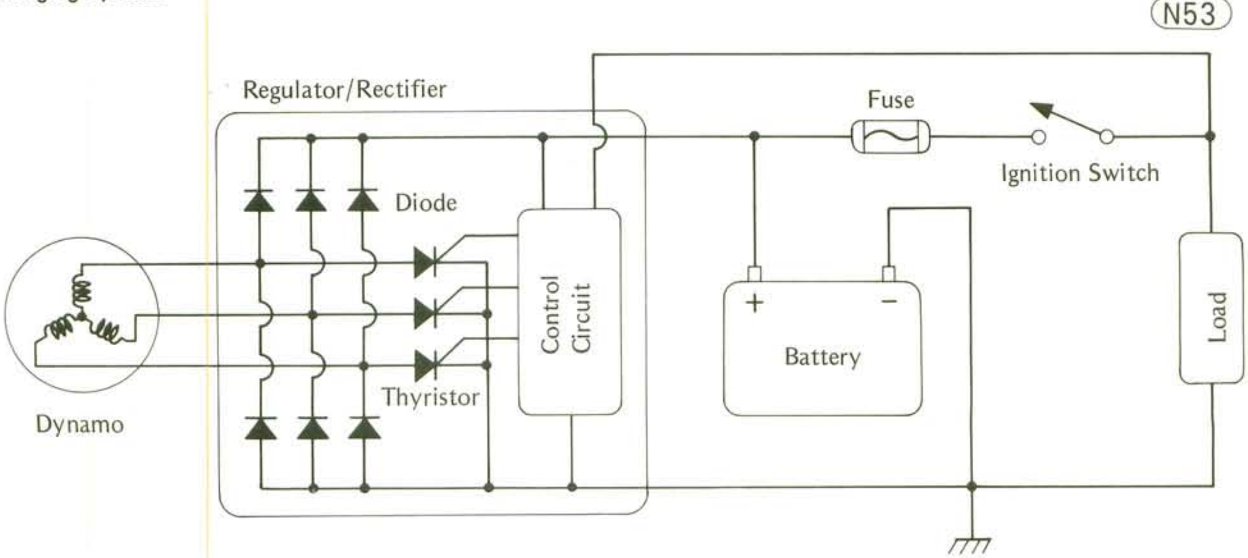
Regulator/Rectifier

Although the regulator and the rectifier are integrated into one unit, the theory of the voltage regulation is the same.

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.

CAUTION When handling the regulator/rectifier, observe the following to avoid damage to the regulator/rectifier:

Charging System



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 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.

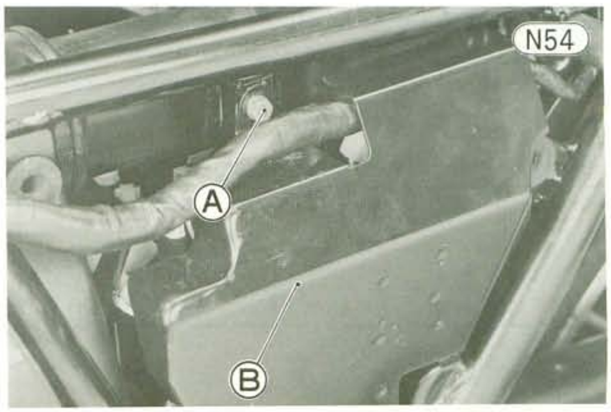
Make sure all connectors in the circuit are clean and tight. Examine wires for signs of burning, fraying, etc. Poor wires and bad connections will affect electrical system operation. Check the dynamo flywheel and regulator/rectifier for evidence of physical damage.

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.

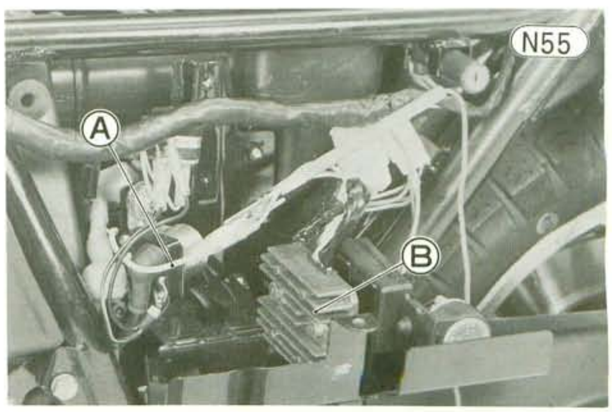
- Warm up the engine to obtain actual dynamo operating conditions.
- Remove the left side cover, and remove the bolt to swing open the electrical panel.



A. Bolt B. Electrical Panel

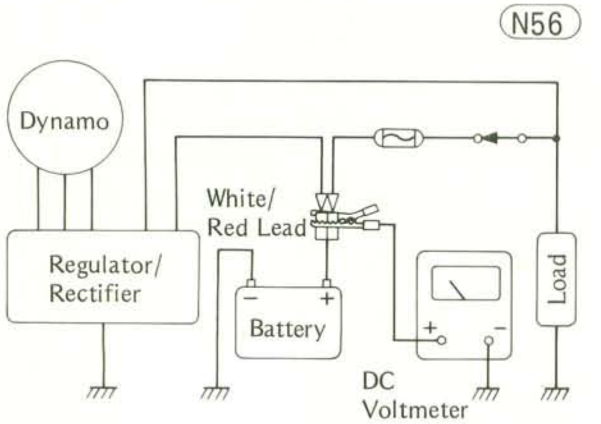
- Check that the ignition switch is turned off, and connect the multimeter as shown in Table N15 to test the regulator/rectifier output voltage.

CAUTION **The white/red lead is connected directly to the battery positive (+) terminal even when the ignition switch is off, so take care not to short the meter probes or clips to the chassis ground.**



A. White/Red Lead B. Regulator/Rectifier

Regulator/Rectifier Output Voltage Measurement



- Start the engine, and note the voltage readings at various engine speeds with the headlight turned on and then turned off. (To turn the headlight off, 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 under the specified voltage.

Table N15 Regulator/Rectifier Output Voltage

Meter Range	Connections	Reading
30V DC	Meter (+) → White/Red Meter (–) → Ground	Battery Voltage ~ 15V

- Turn off the ignition switch to stop the engine, and disconnect the multimeter.

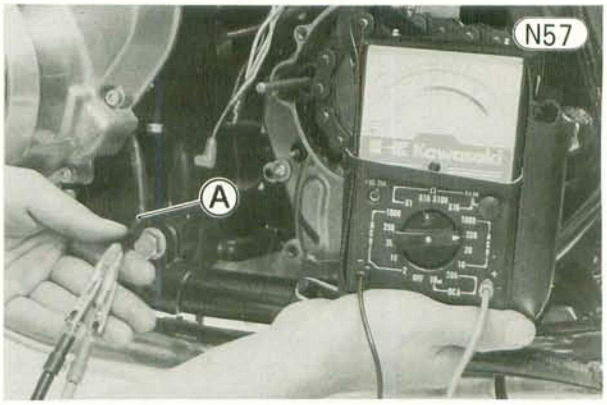
If the output voltage is much higher than the values specified in the table, the regulator/rectifier is defective or the regulator/rectifier leads are loose or open.

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.

Dynamo inspection:

There are three types of dynamo failures: short, open (wire burned out), or loss in flywheel magnetism. A short or open in one of the coil wires will result in either a low output, or no output at all. A loss in flywheel magnetism, which may be caused by dropping or hitting the flywheel, by leaving it near an electromagnetic field, or just by aging, will result in low output.

- Remove the engine sprocket cover, and disconnect the three yellow leads from the dynamo.
- Connect the multimeter as shown in Table N16 to check the dynamo output voltage of each pair of the three dynamo output leads with no electrical loads.



A. Dynamo Output Leads

- Start the engine, run it at the rpm given in Table N16, and note the voltage reading.

If the output voltage shows the value in Table N16, 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 armature resistance as follows:

- Stop the engine, set the multimeter to the x 1 Ω range, and measure for continuity between each pair of the three dynamo output leads. If there is more resistance than shown in Table N17, or no meter reading (infinity) for any two armature leads, the armature has an open lead and must be replaced. Much less than this resistance means the armature is shorted, and must be replaced.

Table N16 Dynamo Output Voltage

Meter Range	Connections	Reading @4,000 rpm
250V AC	One meter lead → One yellow lead The other meter lead → Another yellow lead (Total of 3 measurements)	about 50V

Table N17 Armature Resistance

Meter Range	Connections	Reading
x 1 Ω	One meter lead → One yellow lead The other meter lead → Another yellow lead (Total of 3 measurements)	0.46 ~ 0.70 Ω

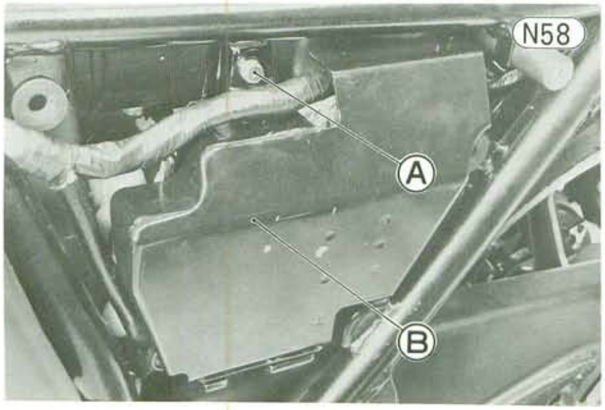
•Using the highest resistance range of the multimeter, measure the resistance between each of the yellow leads and chassis ground. Any meter reading less than infinity (∞) indicates a short, necessitating armature replacement.

If the armature windings have normal resistance, but the voltage check showed the dynamo to be defective; then the flywheel magnets have probably weakened, and the flywheel must be replaced.

Regulator/rectifier inspection

Rectifier inspection:

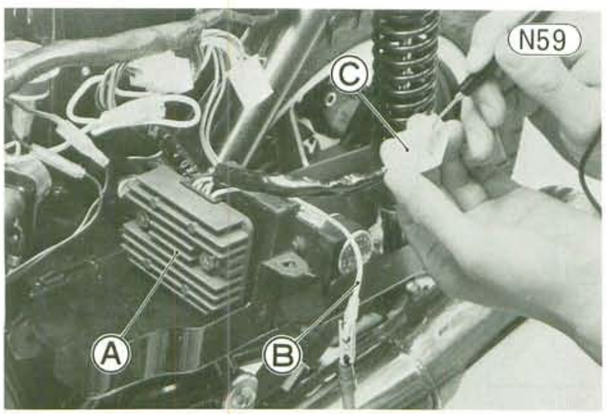
•Pull off the left side cover, and remove the bolt to swing open the electrical panel.



A. Bolt **B. Electrical Panel**

•Disconnect the regulator/rectifier white/red lead and 6-pin connector.

•Using the R x 10 or R x 100 Ω range, check the resistance in both directions between the white/red lead and each yellow lead, and between the black lead and each yellow lead. There is a total of 12 measurements. The resistance should be low in one direction and more than ten times as much in the other direction. If any two leads are low or high in both directions, the rectifier is defective and must be replaced.



A. Regulator/Rectifier **C. 6-pin Connector**
B. White/Red Lead

NOTE: The actual meter reading varies with the meter used and the individual rectifier, but, generally speaking, the lower reading should be within 1/3 scale of zero ohms.

Regulator test:

To test the regulator out of circuit, use three 12V batteries and a test light made from a 12V 3~6W bulb in a socket with leads.

•Remove the regulator/rectifier from the electrical panel.

•Using auxiliary leads, connect one of the yellow leads to the battery (+) terminal, and connect the test light between the black lead and the battery (–) terminal. At this time the bulb should not be lit.

CAUTION **The test light works as an indicator and also as a current limiter to protect the regulator/rectifier from excessive current. Do not use an ammeter instead of a test light.**

•Connect the brown lead to the other battery (+) terminal and connect the black lead to the battery (–) terminal momentarily. At this time the bulb should not be lit.

•To apply 24V to the regulator/rectifier, connect two 12V batteries in series, and connect the brown lead to the battery (+) terminal and the black lead to the battery (–) terminal momentarily. The bulb should now light and stay on until the bulb circuit is opened.

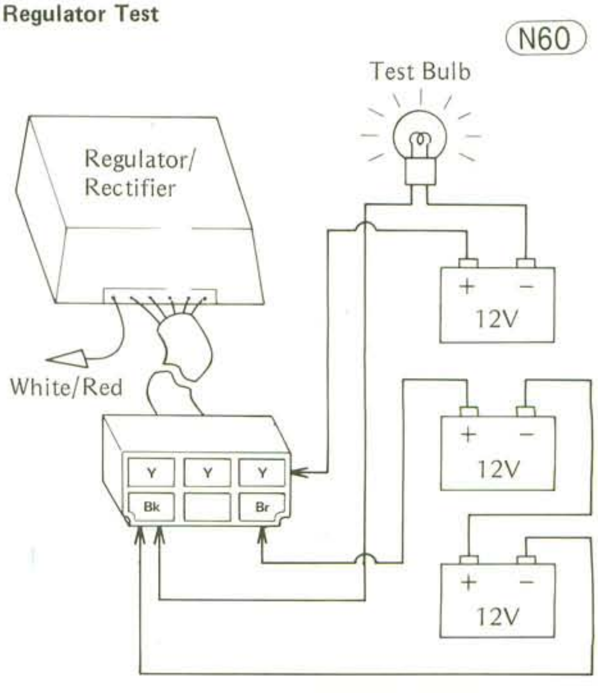
CAUTION **Do not apply more than 24 volts. If more than 24 volts is applied, the regulator/rectifier may be damaged. Do not apply 24 V more than a few seconds. If 24 volts is applied for more than a few seconds, the regulator/rectifier may be damaged.**

•Repeat the above three steps for other two yellow leads.

•Replace the regulator/rectifier if the bulb does not light as described above.

NOTE: The above test is not foolproof. If the above checks show the regulator/rectifier is not damaged, but there is still trouble in the charging system, first carefully inspect the alternator, battery, wiring, and all connections. Replace the regulator/rectifier if all these other components turn out good.

Regulator Test

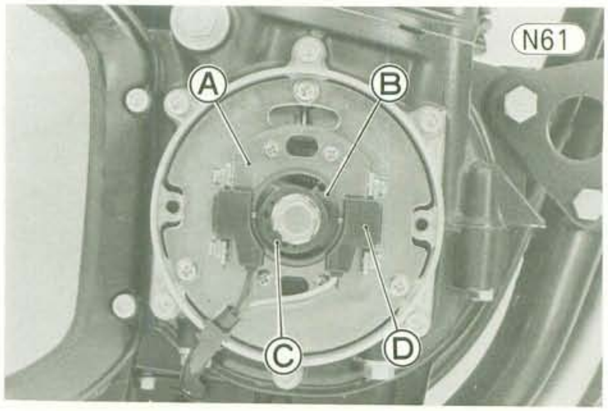


IGNITION SYSTEM

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 pick-up coils and there are no mechanical breaker points, so the only periodic maintenance needed is automatic timing advancer lubrication (Pg. 204).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.

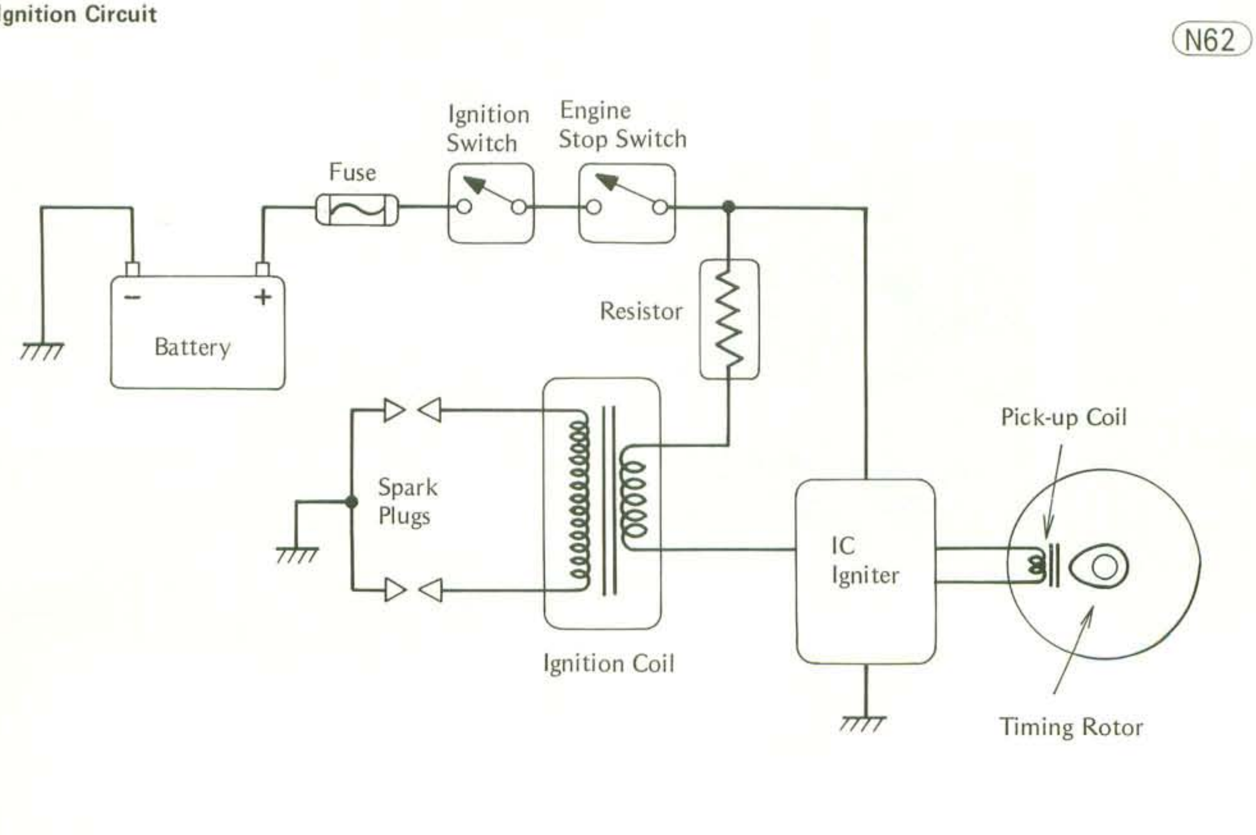
The working electrical part of the ignition system consists of a battery, two pick-up coils, an IC igniter, two ignition coils, a resistor, and four spark plugs. To advance the ignition timing as engine rpm rises, an automatic centrifugal-type timing advancer is used. The resistor limits the amount of primary current flowing through the coil to a safe maximum to prevent overheating of the ignition coil primary winding whose electrical resistance is low to ensure a high performance spark. The ignition system comprises two parts; one part fires #1 and #4 cylinders, and the other part #2 and #3 cylinders. A schematic wiring diagram of one half the system is shown in Fig. N62. The other half is identical. Both work as follows.

The pick-up coil assembly (a magnetic impulse generator) resembles the standard contact breaker assembly in most respects except that the two sets of breaker points have been eliminated. In their places is an iron timing rotor and two magnetic pick-up coils. Each pick-up coil assembly consists of a pair of permanent magnets and a pick-up 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 magnets on the mounting plate, a magnetic field alternately builds up and collapses. Each time the projection passes a pick-up 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.



A. Permanent Magnet
B. Timing Advancer
C. Timing Rotor
D. Pick-up Coil

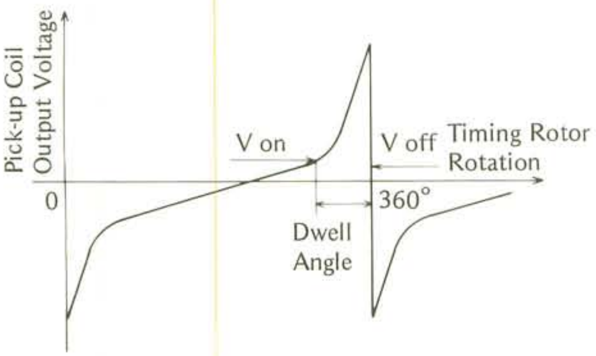
Ignition Circuit



The IC igniter utilizes the voltage pulse sent from the pick-up coil as follows to obtain stable induced high tension voltage from low to high engine speeds. The output voltage of the pick-up coil alternates as shown in Fig. N63.

Output Voltage of Pick-up Coil

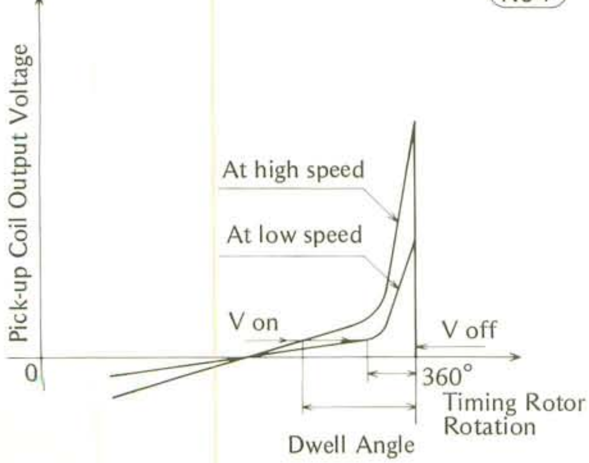
N63



With rotation of the timing rotor the output voltage rises, and the power transistor conducts and permits primary current to flow when the pick-up 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 pick-up coil output voltage. This is because the faster the engine runs, the higher the output voltage of the pick-up 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.

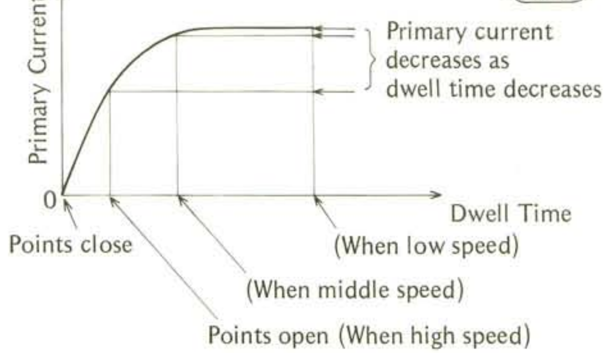
Pick-up Coil Output Voltage at Low and High Speeds

N64



Dwell Time and Primary Current (Breaker Point System)

N65



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. N67. To use this chart, follow the arrows on the chart selecting a "yes" or "no" arrow at each diamond-shaped step until you reach the "end". Each test procedure is explained individually on the pages after the chart. This chart is for one half of the ignition circuit; use the same chart for the other half.

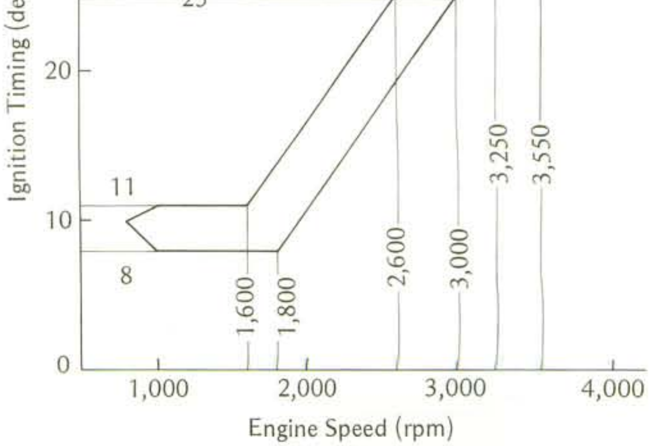
Description of Each Testing Procedure

1. Dynamic Ignition Timing Test

Check the ignition timing with a strobe light for both low and high speed operation. Timing advance begins at 1,600 ~ 1,800 rpm and reaches the maximum advance at 3,250 ~ 3,550 rpm. As a result, the timing must be checked at idle (below 1,600 rpm) and then at above 3,550 rpm when it is fully advanced.

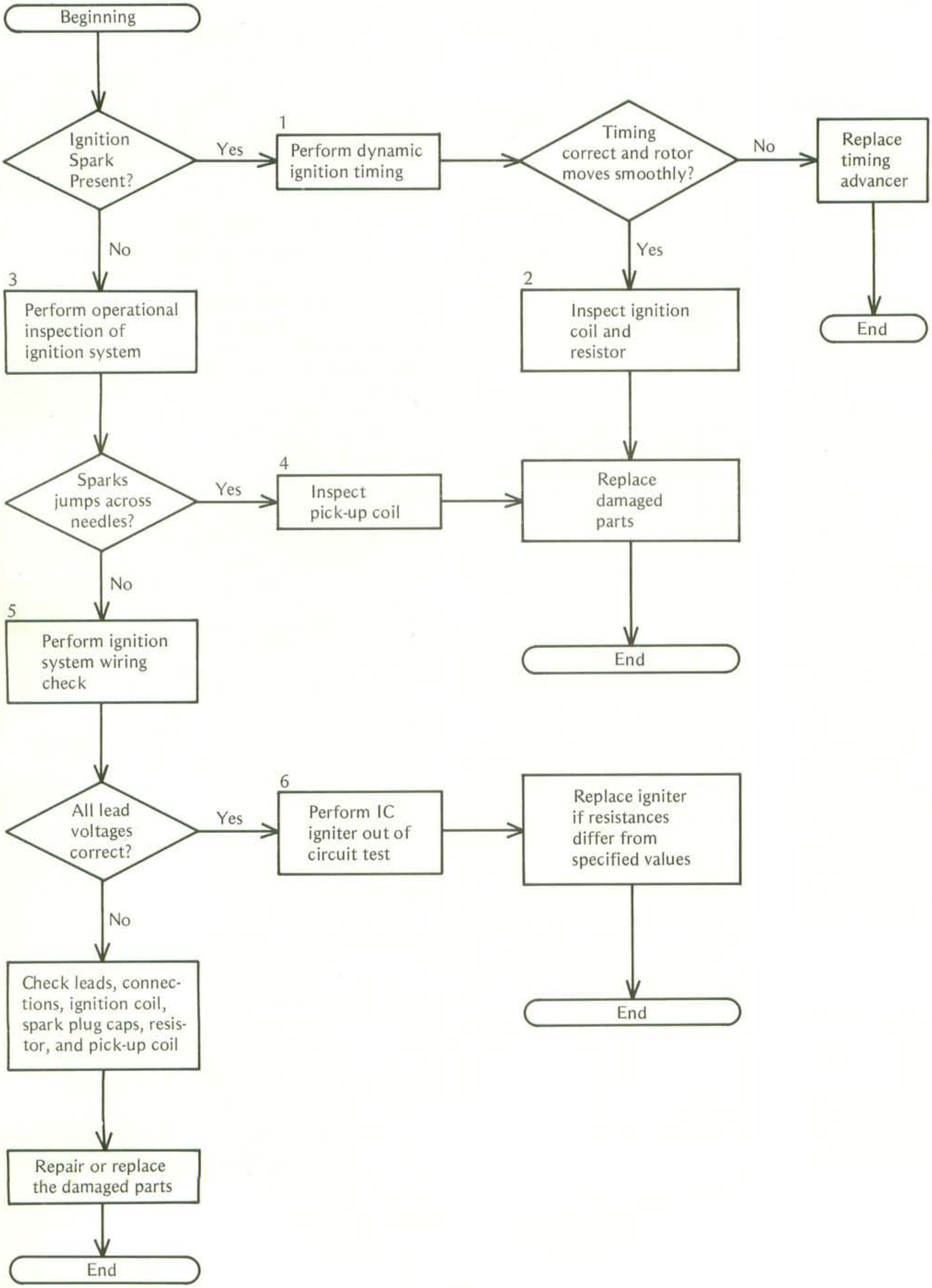
Ignition Timing/Engine Speed Relationship

N66

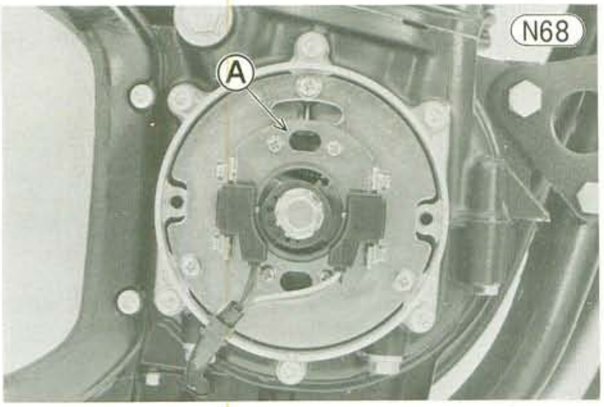


Ignition System Troubleshooting Guide

N67



Check the timing as follows:
- •Connect a strobe light to the #1 or #4 spark plug lead in the manner prescribed by the manufacturer in order to check the ignition timing under opearting conditions.
- •Turn on the ignition switch and engine stop switch. Start the engine, and direct the strobe light at the timing marks.
- •Below 1,600 rpm, the "F" mark on the timing advancer must be aligned with the timing mark above the advancer for correct low rpm ignition timing (Fig. N70A).



A. Inspection Window

- •Above 3,550 rpm, the advanced timing mark (the vertical lines to the right of the "4" mark) must be aligned with the timing mark above the advancer for correct high rpm ignition timing (Fig. N70B).

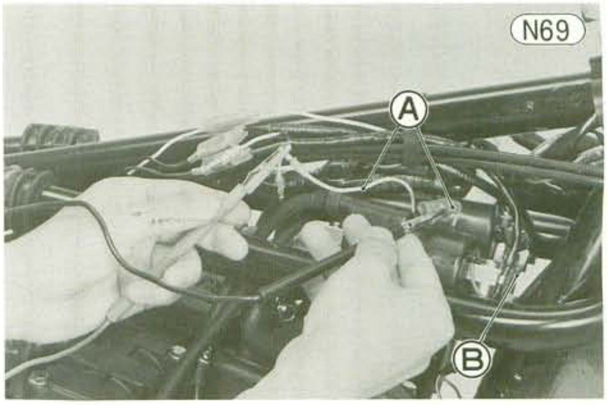
Table N18 Timing Advancing

	Engine Speed
Advance Begins	1,600 ~ 1,800 rpm
Full Advance	3,250 ~ 3,550 rpm

- •If the timing is not correct, check that the rotor on the timing advancer turns smoothly on the shaft by hand and that no parts are visually damaged.
- •If the timing advancer binds on the shaft, lubricate it and re-check the ignition timing.
- •A damaged timing advancer must be replaced with a new one. If advancer lubrication does not remedy the problem, replace the advancer with a new one.

2. Ignition Coil, Resistor Inspection

To check the resistor:
- •Remove the fuel tank, and disconnect the resistor leads (red and pink).
- •Measure for continuity between the resistor leads. If there is more or less resistance than shown in Table N19, replace the resistor.



A. Resistor Leads **B. Resistor**

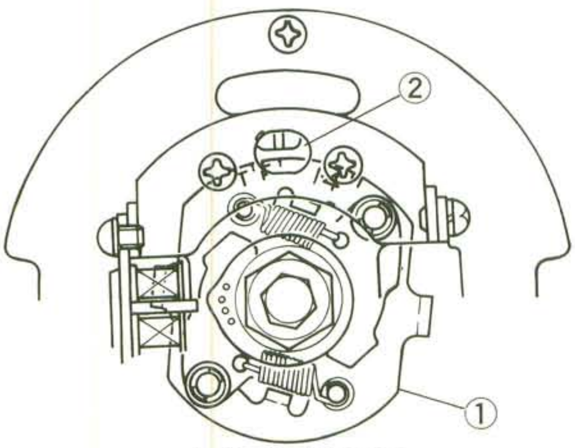
Table N19 Resistor Resistance

Meter	Connections	Reading
x 1 Ω	One meter lead → Red lead The other meter lead → Pink lead	1.5 ~ 1.9 Ω

Timing Marks

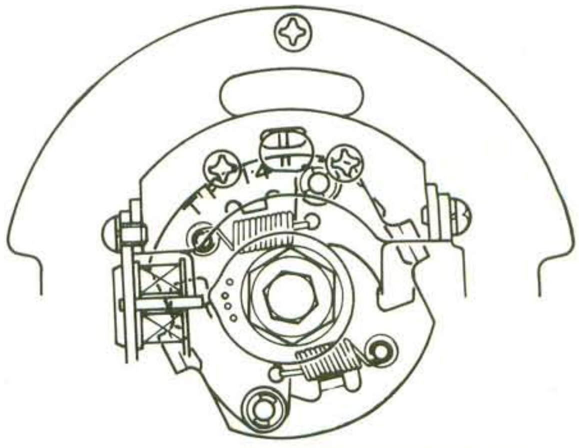
N70

A. Before Advance



1. Timing Advancer
2. Inspection Window

B. Full Advance



- Using the highest resistance range of the multimeter, measure the resistance between the resistor lead and chassis ground. Any meter reading less than infinity (∞) indicates a short, necessitating resistor replacement.

To check the coil:

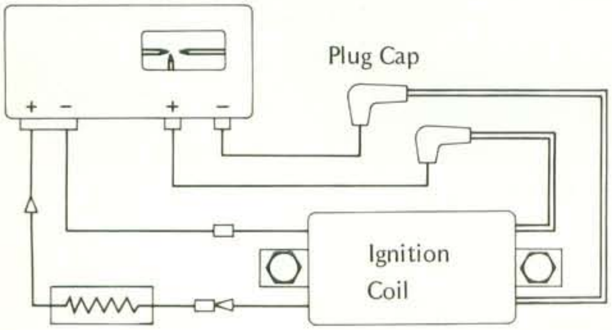
The most accurate test for determining the condition of the ignition coil is made by measuring arcing distance with the Kawasaki Electrotester. Since a tester other than the Kawasaki Electrotester may produce a different arcing distance, the Kawasaki Electrotester is recommended for reliable results.

- Remove the ignition coil and the resistor.
- Connect the ignition coil with its resistor to the Kawasaki Electrotester as shown in the figure. Do not forget to connect the resistor in series with the ignition coil primary winding.

Ignition Coil Test

(N71)

Kawasaki Electrotester



Resistor

- Turn on the tester switches.

WARNING **Do not touch the coil or leads to avoid extremely high voltage shocks.**

- Gradually slide the arcing distance adjusting knob from left to right (small distance to large distance) carefully watching 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 Table N20.

Table N20 Arcing Distance*

Standard
7 mm or more

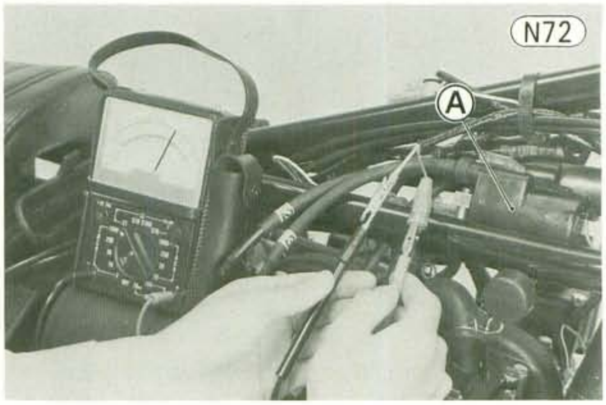
*1. Measure with the Kawasaki Electrotester.
2. Check the resistor before the measurement.

If the distance reading is less than the value shown in the table, the ignition coil or spark plug caps are defective. To determine which part is defective, measure the arcing distance again with the spark plug caps removed from the ignition coil. If the arcing distance is subnormal as before, the trouble is with the ignition coil itself. If the arcing distance is now normal, the trouble is with the spark plug caps.

If an Electrotester is not available, the coil can be checked for a broken or badly shorted winding with an ohmmeter. However, an ohmmeter cannot detect layer shorts and shorts resulting from insulation breakdown under high voltage.

To measure the primary winding resistance:

- Set the ohmmeter to the x 1 Ω range, and connect one ohmmeter lead to the pink lead and the other to the green or black lead from the ignition coil.



A. Ignition Coil

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 N21 Ignition Coil Resistance

	Meter Range	Reading
Primary Winding	x 1 Ω	1.2~1.9 Ω
Secondary Winding	x 1 kΩ	12~18 kΩ

If the coil does not produce an adequate spark, or if either the primary or secondary winding does not have the correct resistance, replace the ignition coil.

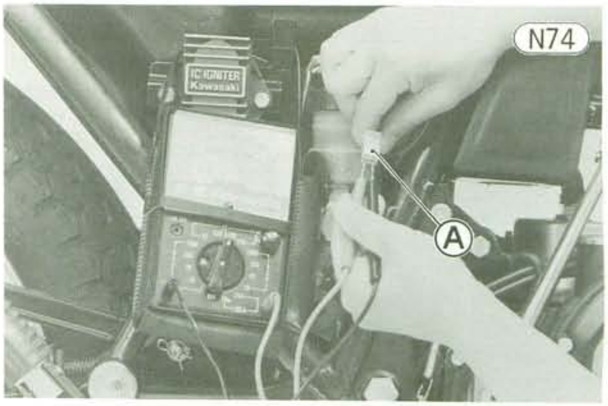
With the highest ohmmeter range, check for continuity between each ignition coil pink lead, and one spark plug lead and the coil core (two tests on each coil). If there is any reading, the coil is shorted and must be replaced. Also, replace the ignition coil if either spark plug lead shows visible damage.

3. Operational Inspection of the Ignition System

- Have a DC voltage source of 6~12 volts output such as a motorcycle battery.
- Pull off the right side cover, and disconnect the 4-pin connector which connects the IC igniter and the pick-up coils.
- Remove the fuel tank, and pull the spark plug caps off the spark plugs.
- Connect the spark plug leads to the Electrotester in the same way as for measuring the arcing distance. For this test, the Electrotester need not be supplied with electric power (See Fig. N75).
- Slide the adjusting knob to set the arcing distance to 5~8 mm.
- In the 4-pin connector from the IC igniter, connect the DC voltage source positive (+) lead to the black lead and the negative (–) lead to the blue lead for the #1 and #4 ignition coil (voltage source positive (+) lead to the yellow lead and the negative (–) lead to the red lead for the #2 and #3 ignition coil).
- Turn the ignition switch to the ON position, and switch the DC voltage source on and off.
- As the DC voltage source is switched, sparks should jump across the needles in the Electrotester.

4. Pick-up Coil Inspection

- Connect the multimeter to the pick-up coil leads to measure the coil resistance as shown in Table N22.



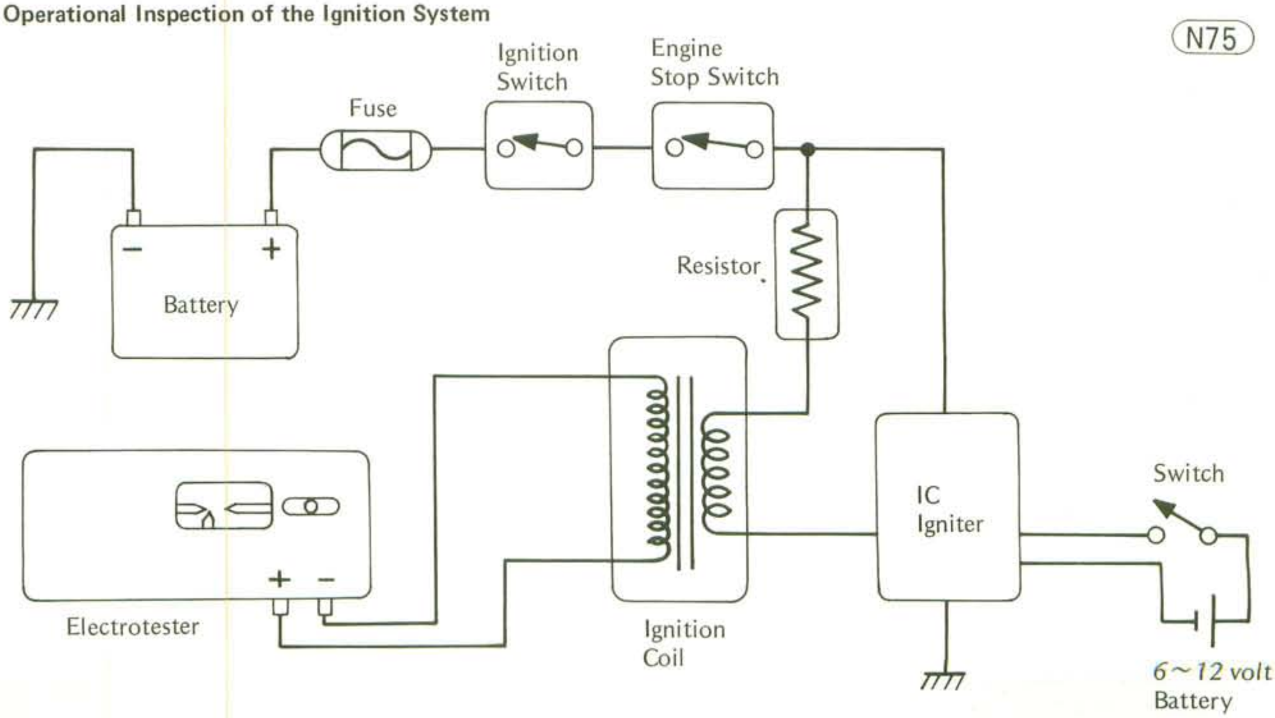
A. Pick-up Coil 4-pin Connector

Table N22 Pick-up Coil Resistance

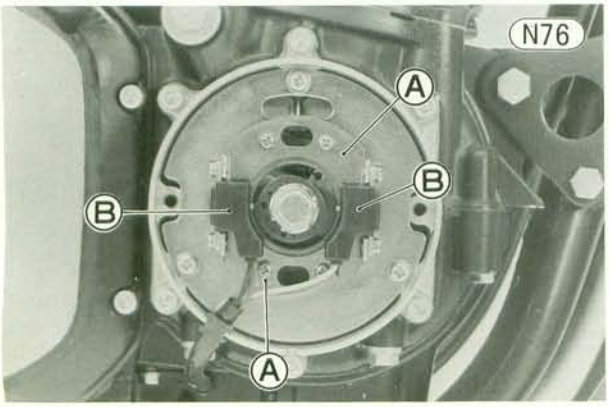
Meter Range	Connections	Reading
x 100 Ω	One meter lead → Black lead (Yellow lead*) The other meter lead → Blue lead (Red lead*)	360~540 Ω

* Leads for #2 and #3 pick-up coil.

Operational Inspection of the Ignition System



- If there is more resistance than shown in the table, the coil has an open lead and must be replaced. Much less than this resistance means the coil is shorted, and must be replaced.
- Using the highest resistance range of the multimeter, measure the resistance between the pick-up coil leads and chassis ground. Any meter reading less than infinity (∞) indicates a short, necessitating replacement of the pick-up coil assembly.
- Visually inspect the pick-up coil assembly. If the permanent magnets and coils are damaged, replace the pick-up coil assembly.



A. Magnet **B. Pick-up Coil**

5. Ignition System Wiring Check

- Reconnect all leads and connectors which were disconnected.
- Connect the multimeter to the IC igniter leads as shown in Table N23, turn on the ignition switch, and note the meter readings. Measure the lead voltages with the engine stopped.

6. IC Igniter Out of Circuit Test

- Turn off the ignition switch, and disconnect all the IC igniter leads and connector.
- Connect the multimeter as shown in Table N24 to check the internal resistance of the igniter.

ELECTRIC STARTER SYSTEM

Starter Motor Circuit

Starter relay test

Refer to Pgs. 205 ~ 206, noting the following:

- Remove the left side cover and the electrical panel to gain access to the starter relay (Fig. N54).

Table N23 Wiring Inspection

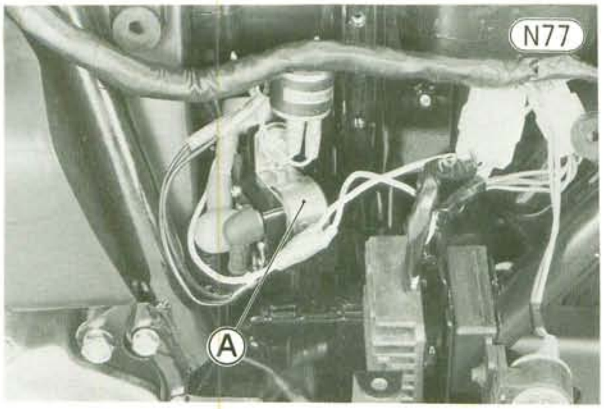
Meter Range	Connections*	Location	Reading
20V DC	Meter (+) → Red, Black, or Green	At the frame top tube	Battery voltage
	Meter (+) → Black, Blue, Yellow, or Red	At the 4-pin connector	0.5~1.0 V

*Connect the meter (–) lead to ground.

Table N24 Igniter Resistance

Meter Range	Connections	Location	Reading*
x 1 kΩ	Meter (+) → Black/Yellow Meter (–) → Black, Green	Inside right side cover, at frame top tube	∞
x 100Ω	Meter (+) → Black, Green Meter (–) → Black/Yellow	"	200~500 Ω
	Meter (+) → Red Meter (–) → Black/Yellow	"	200~600 Ω
	Meter (+) → Black/Yellow Meter (–) → Red	"	300~700 Ω
x 1 kΩ	Meter (+) → Blue (Red) Meter (–) → Black (Yellow)	At 4-pin connector	25~45 kΩ
	Meter (+) → Black (Yellow) Meter (–) → Blue (Red)	"	20~40 kΩ

*Measured with the Kawasaki Hand Tester (57001-983).
A tester other than the Kawasaki Hand Tester may show slightly different readings.

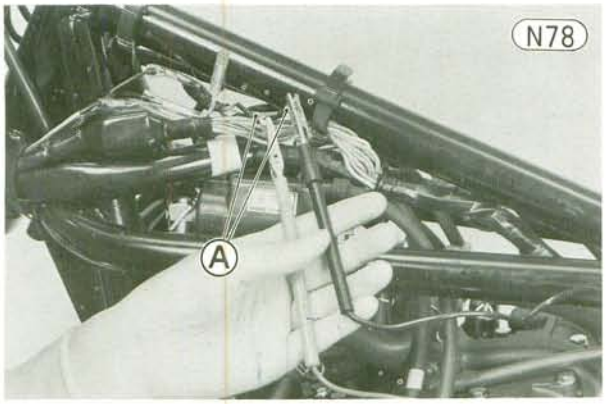


A. Starter Relay

Starter switch test

Refer to Pg. 206, noting the following:

- Connect an ohmmeter between the yellow/red lead and the black lead to check the starter switch.



A. Starter Switch Leads

IGNITION SWITCH

Testing the switch

Table N25 shows the internal connections of the ignition switch for each switch position. To check the switch, remove the headlight unit, and disconnect the 6-pin connector and brown lead from the switch. Then use an ohmmeter to verify that all the connections 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.

LIGHTING SYSTEM

Headlight Circuit

Refer to Pg. 210, noting the following:

- Two tail/brake light bulbs are housed in the lens, and both bulbs go on when the ignition switch is in the on position.

Brake Light Circuit

Refer to Pgs. 211 ~ 212, noting the following:

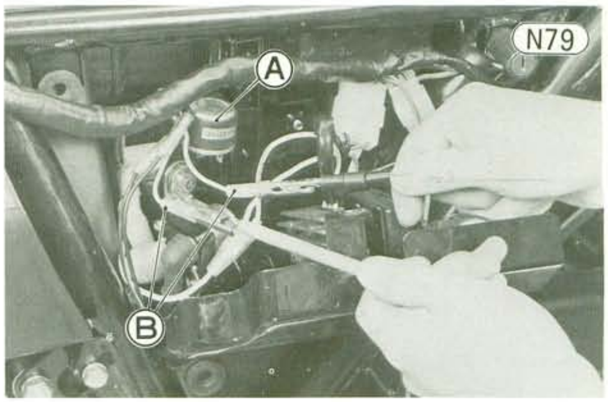
- The brake light failure indicator switch is discontinued with adoption of the double tail/brake light system.

Turn Signal and Hazard Circuit

Turn signal trouble

Refer to Pgs. 213 ~ 214, noting the following:

1. The relay diode is deleted.
2. The color of the turn signal relay positive lead is changed to orange/green from brown. Connect the voltmeter (+) positive lead to the orange/green lead.



A. Turn Signal Relay B. Relay Leads

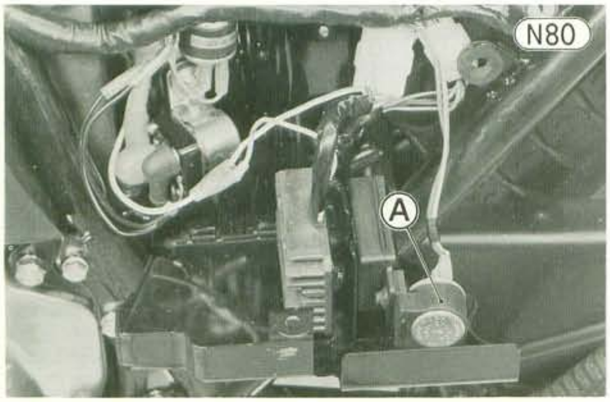
Table N25 Ignition Switch Connections

Lead	Battery 1	Ignition	Running	Tail 1	Tail 2	Battery 2	Tail 3
Color	White	Yellow	Brown	Blue	Red	White	G/O
OFF							
ON	●	●	●	●	●	●	●
PARK	●				●	●	●

Testing the hazard circuit

Refer to Pgs. 214 ~ 215, noting the following:

- Remove the left side cover and the electrical panel to gain access to the hazard relay (Fig. N54).



A. Hazard Relay

Troubleshooting–Guide

Refer to Pgs. 217~220, noting the following:

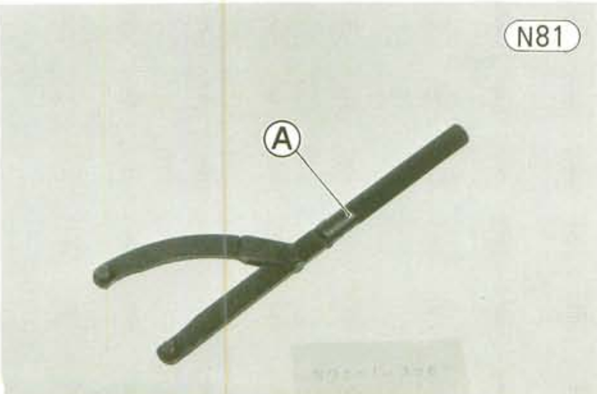
1. If the carburetor accelerator pump is damaged –
   Poor acceleration from low and middle speeds, or exhaust smoke will result.
2. If the air suction valve in the air injection system is damaged –
   Low engine output, unstable idling, or abnormal engine noise will result.
3. If the vacuum switch valve in the air injection system is damaged –
   Frequent backfiring in the exhaust system, or abnormal engine noise will result.

Appendix

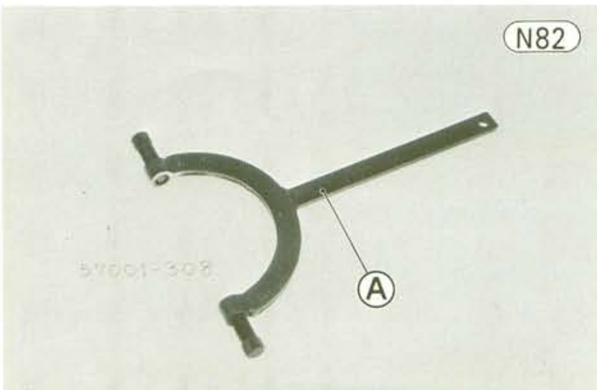
SPECIAL TOOLS

Refer to Pgs. 224~227, noting the following:

1. Use the engine sprocket and flywheel holder to hold the engine sprocket steady.
2. Use the flywheel holder to hold the dynamo flywheel.

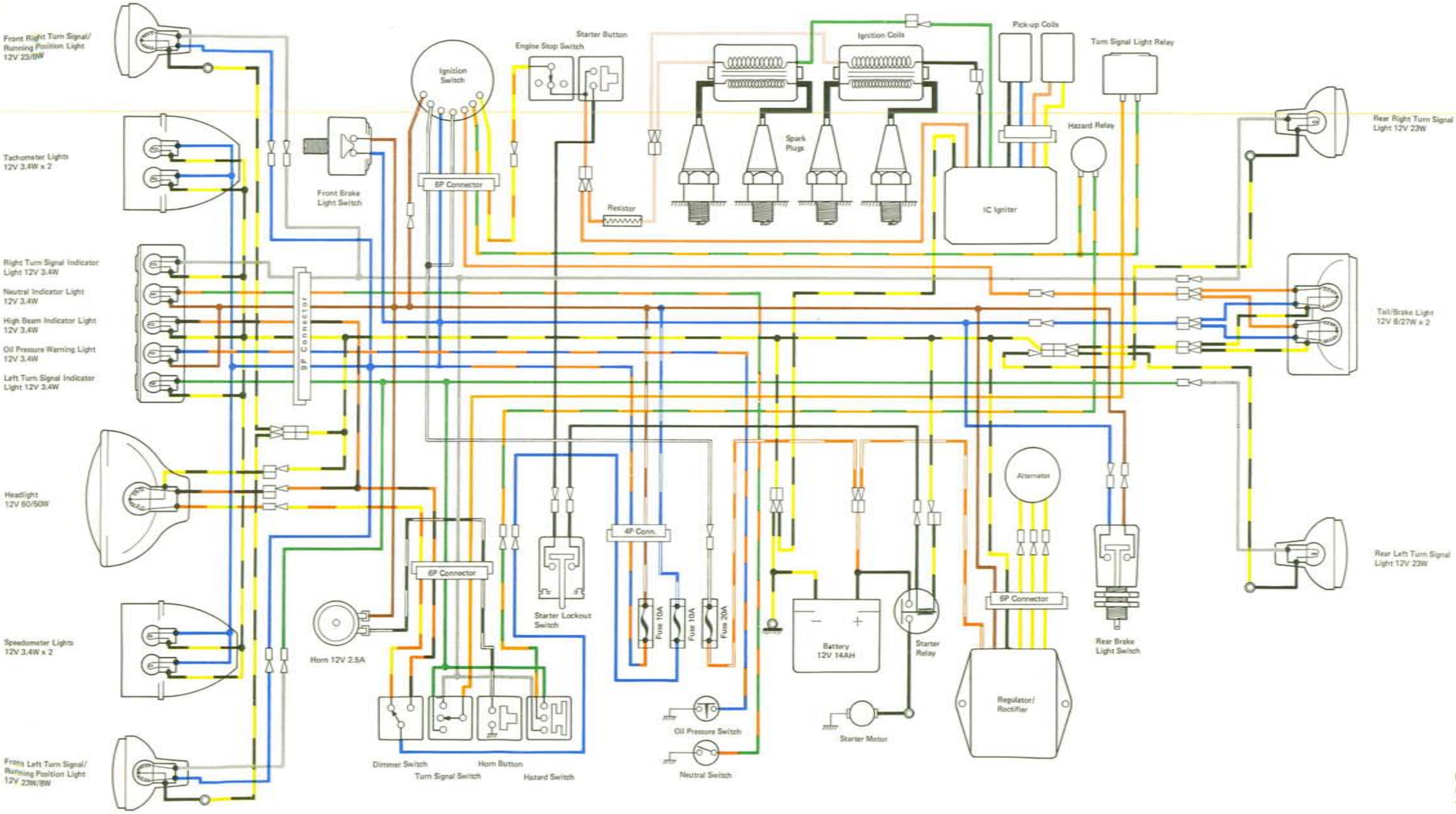


A. Engine Sprocket and Flywheel Holder (57001-306)



A. Flywheel Holder (57001-308)

KZ1000-A4 Wiring Diagram
(US, Canadian Model)



LEFT HANDLEBAR SWITCH CONNECTIONS															
Dimmer Switch				Turn Signal Switch				Horn Button			Hazard Switch				
Color	R/Bk	Blue	R/Y	Color	Green	Orange	Gray	Color	Bk/W	⏚	Color	Green	O/G	Gray	
HI	O	O		R		O	O								
								Push	O	O	Pull	O	O	O	
LO		O	O	L	O	O									

IGNITION SWITCH CONNECTIONS							
	Tail 4	Battery 1	Ignition	Tail 1	Tail 2	Battery 2	Tail 3
Color	Brown	White	Yellow	Blue	Red	White	O/G
OFF							
ON	O	O	O	O	O	O	O
PARK		O			O	O	O

(10768)

RIGHT HANDLEBAR SWITCH CONNECTIONS					
Engine Stop Switch			Starter Button		
Color	Y/R	Red	Color	Red	Black
OFF					
RUN	O	O	Push	O	O
OFF					

Supplement for 1980 Model

Table of Contents

Model Identification

KZ1000-A4

KZ1000-D3

SPECIFICATIONS

	KZ1000-A4	KZ1000-D3
Dimensions		
Overall length	2,240 mm, Ⓤ 2,180 mm	2,230 mm, Ⓤ 2,155 mm
Overall width	815 mm, Ⓤ 900 mm	805 mm
Overall height	1,155 mm, Ⓤ 1,180 mm	1,280 mm
Wheelbase	1,490 mm	1,478 mm
Road clearance	155 mm	135 mm
Dry weight	245 kg	250 kg
Fuel tank capacity	17.8 ℓ	20 ℓ
Performance		
Climbing ability	30°	*
Braking distance	11 m from 50 kph	*
Minimum turning radius	2.4 m	2.7 m
Engine		
Type	4-stroke, DOHC, 4-cylinder, air-cooled	*
Bore and stroke	70.0 x 66.0 mm	*
Displacement	1,015 cc	*
Compression ratio	8.7	*
Maximum horsepower	93 HP @8,000 rpm	94 HP @8,000 rpm
Maximum torque	9.1 kg-m @6,500 rpm	9.2 kg-m @6,500 rpm
Valve timing		
Inlet Open	30° BTDC	*
Close	70° ABDC	*
Duration	280°	*
Exhaust Open	70° BBDC	*
Close	30° ATDC	*
Duration	280°	*
Carburetors	Mikuni VM28SS x 4	*
Lubrication system	Forced lubrication (wet sump)	*
Engine oil	SE class SAE 10W40, 10W50, 20W40, or 20W50	*
Engine oil capacity	3.7 ℓ	*
Starting system	Electric and kick	*
Ignition system	Battery and coil (transisterized ignition)	*
Cylinder numbering method	Left to right, 1–2–3–4	*
Firing order	1–2–4–3	*
Ignition timing	From 10° BTDC @1,000 rpm to 40° BTDC @2,350 rpm, Ⓤ 3,400 rpm	*
Spark plugs	NGK B8ES or ND W24ES-U	NGK B8ES-11 or ND W24ES-U1.1
Transmission		
Type	5-speed, constant mesh, return shift	*
Clutch	Wet multi disc	*
Gear ratio: 1st	3.17 (38/12)	*
2nd	2.19 (35/16)	*
3rd	1.67 (35/21)	*
4th	1.38 (29/21)	*
5th	1.22 (28/23)	*
Primary reduction ratio	1.73 (97/56)	*

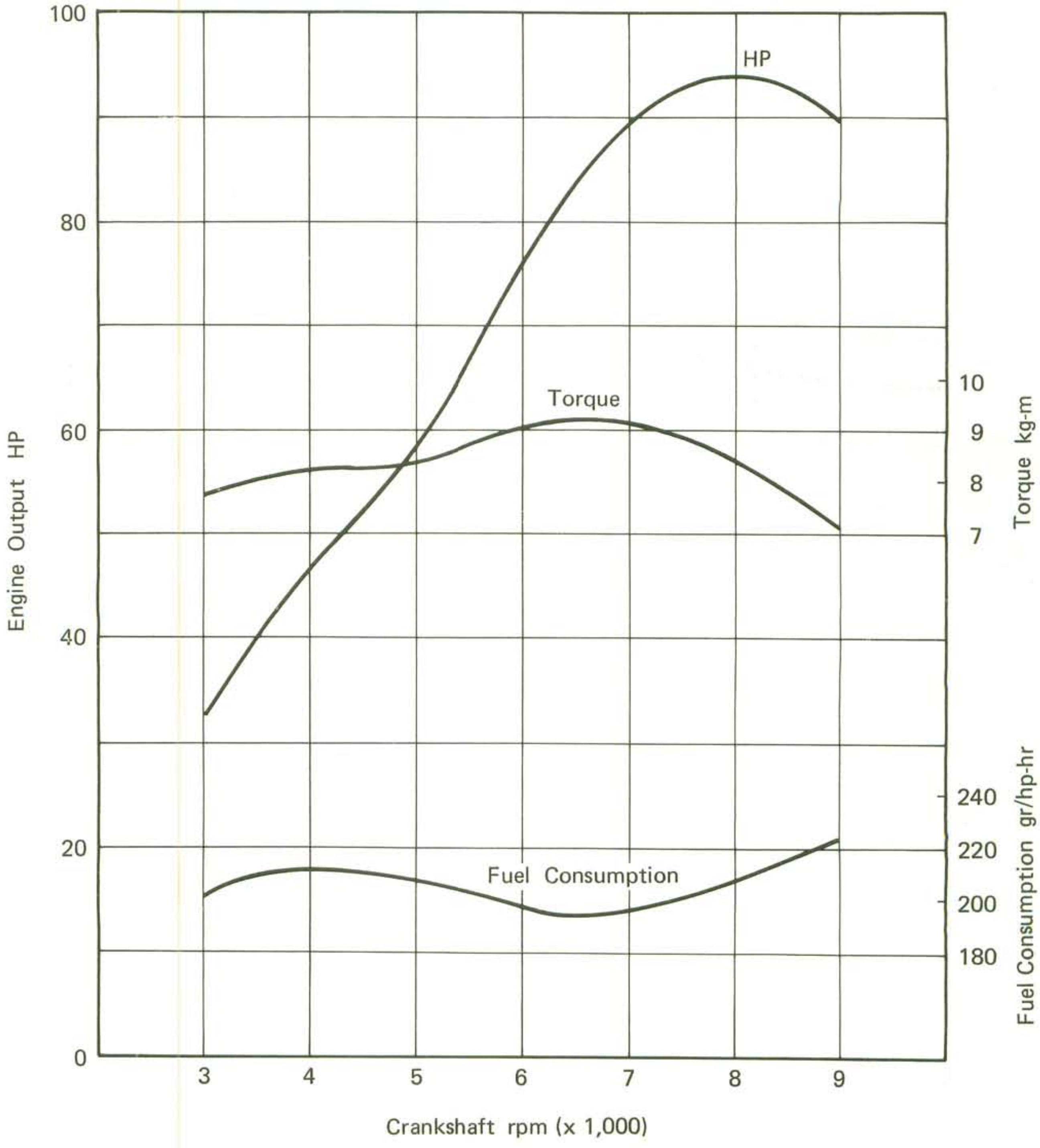
		KZ1000-A4	KZ1000-D3
Final reduction ratio		2.33 (35/15)	*
Overall drive ratio		4.92 (Top gear)	*
Electrical Equipment			
General (Dynamo)		Kokusan GP9105	*
Regulator/Rectifier		Shindengen SH230-12C	*
Ignition coil		Toyo Denso ZC005-TR12V	*
Igniter		Toyo Denso UNT 1004K-0000	*
Battery		Yuasa YB 14L-A2 (12V 14AH)	*
Starter		Mitsuba SM-226-K	*
Headlight type		Sealed beam, Ⓔ Semi-sealed	Semi-sealed beam
Headlight		12V 50/40W, Ⓤ 60/50W, Ⓔ 60/55W	12V 60/55W
Tail/Brake light		12V 5/21W, Ⓤ 8/27W	*
Meter lights		12V 3.4W	*
Indicator lights		12V 3.4W	*
Turn signal/running position lights		Ⓤ 12V 23/8W	*
Turn signal lights		12V 21W, Ⓤ 12V 23W	*
Horn		12V 2.5A	*
Frame			
Type		Tubular, double cradle	*
Steering angle		41° to either side	35° to either side
Castor		26°	*
Trail		87 mm	101 mm
Tire size	Front	3.25V-19 4PR or MN90-19	3.25V-19 4PR
	Rear	4.00V-18 4PR or MP90-18	4.00V-18 4PR
Suspension	Front	Telescopic fork	*
	Rear	Swing arm	*
Wheel travel	Front	140 mm	*
	Rear	90 mm	*
Front fork oil capacity (each fork)		180 ~ 188 cc	*
Front fork oil type		SAE 10W	*
Brakes			
Type	Front	Dual disc brake	*
	Rear	Single disc brake	*
Effective disc diameter			
	Front and Rear	250 mm	*

* : Identical to left column

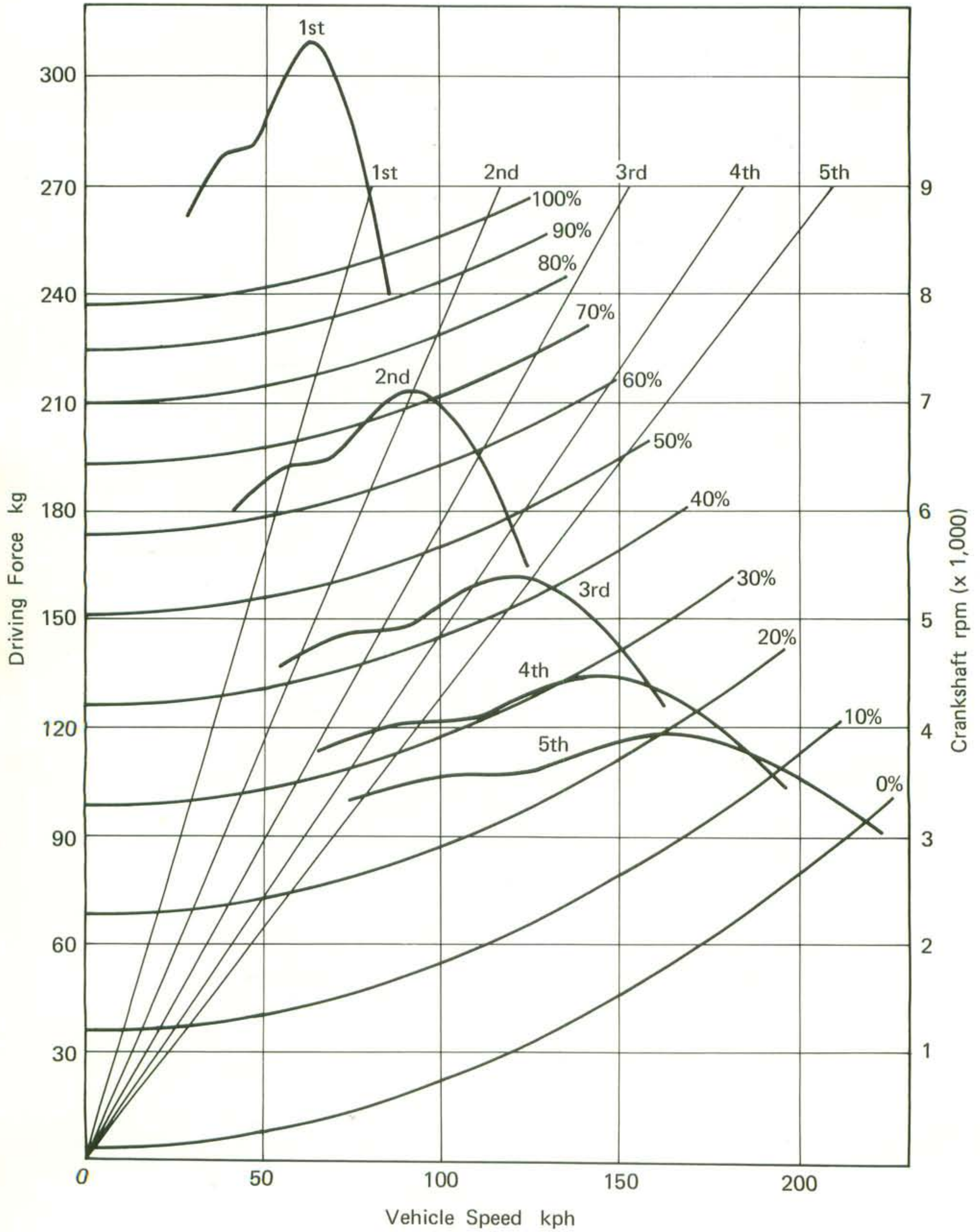
Ⓔ: European models　　Ⓤ: US model

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

KZ1000-D3 ENGINE PERFORMANCE CURVES



KZ1000-D3 RUNNING PERFORMANCE CURVES



PERIODIC MAINTENANCE CHART

The maintenance and adjustments for the KZ1000-A4 and D3 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	•	•	•	•	•	•	•	192
Brake adjustment — check †		•	•	•	•	•	•	•	27,284
Brake wear — check †			•	•	•	•	•	•	299
Brake fluid level — check †	month	•	•	•	•	•	•	•	299
Brake fluid — change	year			•		•		•	179
Clutch — adjust		•	•	•	•	•	•	•	21
Carburetors — adjust			•	•	•	•	•	•	284
Throttle cables — adjust		•	•	•	•	•	•	•	16
Steering play — check †		•	•	•	•	•	•	•	28
Drive chain wear — check †			•	•	•	•	•	•	175
Front fork — inspect/clean		•	•	•	•	•	•	•	300
Rear shock absorbers — inspect		•	•	•	•	•	•	•	260
Nuts, Bolts, Fasteners — check and torque		•		•		•		•	286
Spark plugs — clean and gap †		•	•	•	•	•	•	•	12,284
Valve clearance — check †		•	•	•	•	•	•	•	239
Air suction valve — check †			•	•	•	•	•	•	254
Air cleaner element — clean			•		•		•		134
Air cleaner element — replace	5 cleanings			•		•		•	43
Fuel system — clean		•	•	•	•	•	•	•	23
Tire tread wear — check †			•	•	•	•	•	•	298
Engine oil — change	year	•	•	•	•	•	•	•	22
Oil filter — replace		•		•		•		•	22
General lubrication — perform			•	•	•	•	•	•	242
Front fork oil — change				•		•		•	259
Timing advancer — lubricate				•		•		•	204
Swing arm — lubricate				•		•		•	189
Wheel bearings — grease	2 years					•			258
Speedometer gear housing — grease	2 years					•			173
Steering stem bearings — grease	2 years					•			184
Drive chain — lubricate	Every 300 km								175
Drive chain — adjust	Every 800 km								26

* For higher odometer readings, repeat at the frequency interval established here.

† Replace, add or adjust if necessary.

Adjustment

SPARK PLUGS (KZ1000-D)

The procedures are the same as those for the late 1978 KZ1000-A2A with the following exception. See Pg. 12.

1. The heat range of the KZ1000-D is the same as that of the KZ1000-A whereas the plug gap must be adjusted differently as shown in the table below.

Table N1 Spark Plugs for KZ1000-D

Plug	NGK B8ES-11 or ND W24ES-U1.1
Gap	1.0 ~ 1.1 mm
Tightening Torque	2.5 ~ 3.0 kg-m (18.5 ~ 22.0 ft-lbs)

Spark Plug Gap (N1)

CARBURETORS (KZ1000-A, D)

The procedures are the same as those for the 1979 KZ1000-A3A with the following exceptions. See Pg. 241.

1. US model, common to the KZ1000-A and D

   Each air screw is shielded with a plug, and idle mixture adjustment is not required.
2. All models except US, common to the KZ1000-A and D

   Turn in the air screw of each carburetor until it seats lightly, and then back it out 1¼ turns.

BRAKES (KZ1000-D)

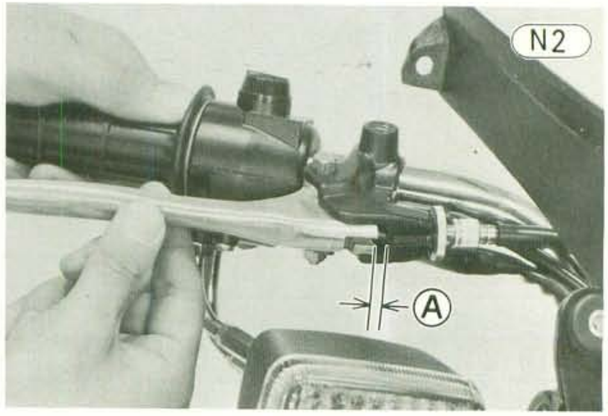
NOTE: Check the brake fluid level in accordance with the Periodic Maintenance Chart (Pg. 283). Before adjusting the brakes, be sure that air is bled from the brake lines (Pg. 180).

Front Brake:

The master cylinder of the front brake is operated by the cable. Disc and disc pad wear is automatically compensated for and has no effect on brake lever action. However the brake lever may occasionally require adjustment due to cable stretch 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.

To check the front brake:

- Check that the brake lever has enough free play. This play should be 2 ~ 3 mm measured at the lever as shown in the figure.



A. 2 ~ 3 mm

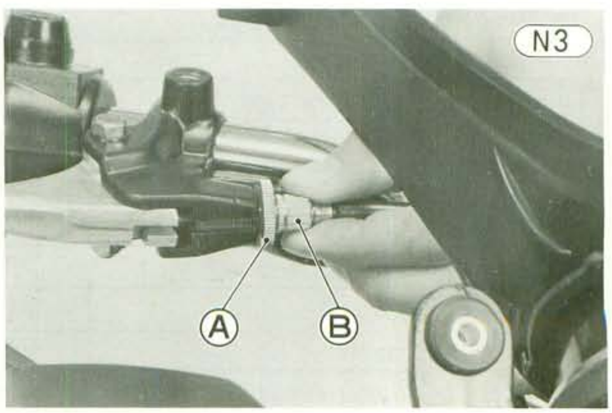
NOTE: This free play is caused by play in the brake cable. Therefore the brake lever must be pulled in further until the calipers start to grip the discs.

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

- Rotate the wheel to check for brake drag.
- Operate the lever a few times to see that it returns to its rest position immediately upon release.
- If the lever has improper free play, adjust it as follows.

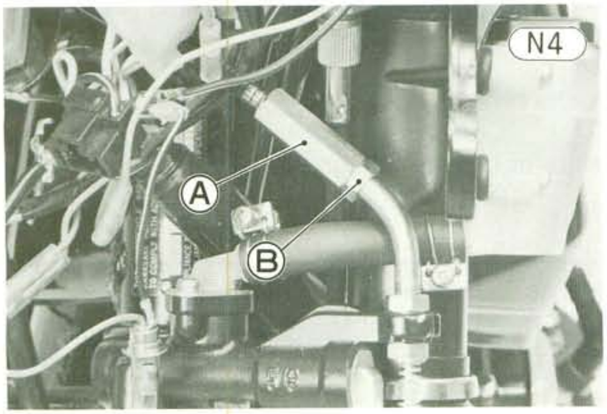
To adjust the front brake:

- Loosen the knurled locknut at the brake lever, and turn the adjuster so that the lever has 2 ~ 3 mm of free play, and then tighten the locknut.



A. Locknut B. Adjuster

NOTE: If the lever play cannot be adjusted with the adjuster at the brake lever, use the adjusting nut on the cable guide as follows.
○Remove the fairing (Pg. 292) and headlight unit (Pg. 296) to gain access to the adjusting nut.
○Loosen the locknut, turn the adjusting nut as necessary, and tighten the locknut.
○Install the removed parts.



A. Adjusting Nut B. Locknut

Rear Brake:

Procedures are the same as for the late 1978 KZ1000-A2A. Refer to Pg. 27.

HEADLIGHT (KZ1000-D)

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 vertically, neither low nor high beam will illuminate the road far enough ahead. If adjusted too high vertically, high beam will fail to illuminate the road close ahead, and low beam will blind oncoming drivers.

Horizontal Adjustment:

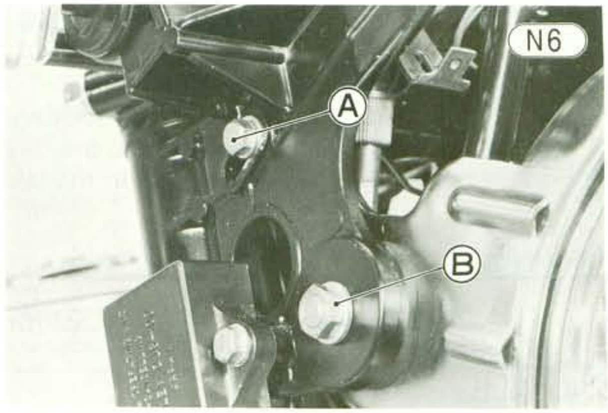
- Remove the fairing (Pg. 292).
- Turn the small screw on the headlight rim in or out until the beam points straight ahead. Turning the adjusting screw clockwise makes the headlight beam point to the left.

A. Adjusting Screw

- Install the fairing (Pg. 292).

Vertical Adjustment:

- Remove the fairing (Pg. 292).
- Loosen the headlight housing mounting bolt and nuts.

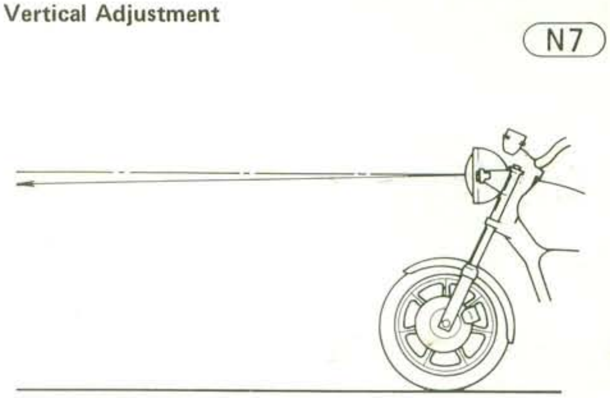


A. Bolt B. Nuts (both sides)

- Move the headlight up or down by hand to where the vertical aim is correct.

NOTE: On high beam, the brightest point should be slightly below horizontal. Adjust the headlight to the proper angle according to local regulations.

Vertical Adjustment



- Tighten the headlight housing mounting bolt and nuts, and install the fairing (Pg292).

LUBRICATION (KZ1000-D)

Front Brake Lever and Cable

Lubricate these parts just the same way as for the clutch lever and cable. Refer to Pg. 31.

Disassembly

TORQUE AND LOCKING AGENT

The following table lists the tightening torque for the major bolts and nuts on the KZ1000-A4 and D3, and the parts requiring use of a non-permanent locking agent and liquid gasket.

Parts marked with an asterisk (*) must be retorqued according to the Periodic Maintenance Chart (Pg. 283). 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).

NOTES: 1. Marks used in the "Remark"

● : Apply a non-permanent locking agent to the thread.

★ : Apply a liquid gasket to the thread.

2. For the bolts and nuts not included in the table below, refer to the table on Pg. 40.

ENGINE

Parts	Quantity	Metric (kg-m)	English (ft-lbs)	Remark	See Pg.
Air suction valve cover bolts ϕ6 P1.0	8	1.4~1.6	10.0~11.5	–	246
Breather cover bolt ϕ8 P1.25	1	1.3~1.7	9.5~12.0	–	59
Camshaft cap bolts ϕ6 P1.0	16	1.6~1.8	11.5~13.0	–	247
Camshaft chain guide screw (front) ϕ6 P1.0	1	–	–	●	59
Camshaft chain guide sprocket Allen bolts ϕ6 P1.0	4	0.9~1.1	78~95 in-lbs	●	57
Camshaft sprocket bolts ϕ6 P1.0	6	1.4~1.6	10.0~11.5	●	51
Carburetor holder screws ϕ6 P1.0	8	–	–	●	246
Carburetor mounting screws ϕ6 P1.0	8	–	–	●	243
Clutch hub nut ϕ20 P1.5	1	11.0~13.0	80~94	–	72
Clutch release screws ϕ6 P1.0	2	–	–	●	61
Clutch spring bolts ϕ6 P1.0	5	0.9~1.1	78~95 in-lbs	–	72
Crankcase bolts					
upper ϕ6 P1.0	5	0.9~1.1	78~95 in-lbs	●, ★	88
lower ϕ6 P1.0	17	0.9~1.1	78~95 in-lbs	●, ★	87
lower ϕ8 P1.25	8	2.3~2.7	16.5~19.5	●, ★	87
Crankshaft main bearing cap bolts ϕ8 P1.25	4	2.3~2.7	16.5~19.5	–	96
*Cylinder head					
bolts ϕ6 P1.0	2	1.1~1.3	95~113 in-lbs	–	51,52
nuts ϕ10 P1.25	12	3.7~4.3	27~31	–	51,52
Cylinder head cover bolts ϕ6 P1.0	16	1.4~1.6	10.0~11.5	–	247
Dynamo armature Allen bolts ϕ6 P1.0	3	0.9~1.1	78~95 in-lbs	●	249
Dynamo cover screws ϕ6 P1.0	8	–	–	●	249
Dynamo flywheel bolt ϕ10 P1.25	1	12.0~14.0	87~101	–	249

Parts	Quantity	Metric (kg-m)	English (ft-lbs)	Remark	See Pg.
Engine drain plug ϕ20 P1.5	1	2.7~3.3	19.5~24.0	–	73
*Engine mounting bolts					
front ϕ10 P1.25	1	3.4~4.6	25~33	–	82,83
center ϕ12 P1.25	2	3.4~4.6	25~33	–	82,83
rear upper ϕ10 P1.25	1	3.4~4.6	25~33	–	82,83
rear lower ϕ10 P1.25	1	3.4~4.6	25~33	–	82,83
Engine mounting brackets					
front ϕ8 P1.25	2	2.0~2.8	14.5~20.0	–	82, 83
center ϕ8 P1.25	2	2.0~2.8	14.5~20.0	–	82,83
rear ϕ8 P1.25	4	2.0~2.8	14.5~20.0	–	82,83
Engine sprocket nut ϕ20 P1.25	1	7.5~8.5	54~61	–	62
*Exhaust pipe holder nuts ϕ8 P1.25	8	–	–	–	–
External shift mechanism cover screw ϕ6 P1.0	9	–	–	•	64
*Muffler clamp bolts (KZ1000-D) ϕ8 P1.25	2	–	–	–	–
Neutral indicator switch ϕ12 P1.5	1	1.3~1.7	9.5~12.0	–	62
Oil breather cover bolt ϕ8 P1.25	1	1.3~1.7	9.5~12.0	–	59
Oil filter mounting bolt ϕ20 P1.5	1	1.8~2.2	13.0~16.0	–	73
Oil pan bolts ϕ6 P1.0	17	0.9~1.1	78~95 in-lbs	–	74
Oil passage plug ϕ14 P1.5	1	–	–	•	166
Oil pressure switch ϕ20 P1.5	1	0.5~0.7	43~61 in-lbs	–	60
Oil pump cover screws ϕ6 P1.0	5	–	–	•	74
Oil pump mounting bolts ϕ6 P1.0	3	0.7~0.9	61~78 in-lbs	•	74
Ratchet gear stop bolts ϕ6 P1.0	2	0.9~1.1	78~95 in-lbs	•	94
Return spring pin ϕ8 P1.25	1	1.8~2.2	13.0~16.0	•	292
Right engine cover screws ϕ6 P1.0	6	–	–	•	89
Shift drum pin plate screw ϕ6 P1.0	1	–	–	•	91
*Shift pedal bolt ϕ6 P1.0	1	–	–	–	–
Spark plugs ϕ14 P1.25	4	2.5~3.0	18.5~22.0	–	12
Starter clutch Allen bolts ϕ8 P1.25	3	3.8~4.2	27~30	–	249
Starter motor lead terminal nuts	2	0.4~0.6	35~52 in-lbs	–	68
Starter motor retaining bolts ϕ6 P1.0	2	0.9~1.1	78~95 in-lbs	•	68
Stud bolts					
cylinder ϕ10 P1.50	12	less than 1.0	less than 87 in-lbs	•, ★	–
exhaust ϕ8 P1.0	8	less than 0.5	less than 43 in-lbs	•	–
Timing advancer bolt ϕ8 P1.25	1	2.3~2.7	16.5~19.5	–	70

CHASSIS

Parts	Quantity	Metric (kg-m)	English (ft-lbs)	Remark	See Pg.
*Brake pedal pivot cap nut φ8 P1.25	1	1.6~2.2	11.5~16.0	–	–
*Clutch lever holder bolt φ6 P1.0	1	–	–	–	–
*Drive chain adjusting bolt locknuts φ10 P1.25	2	–	–	–	–
*Fairing brackets mounting bolts (KZ1000-D) φ6 P1.0	6	0.8~1.0	69~87 in-lbs	•	292
*Footpeg mounting					
nuts φ8 P1.25	4	–	–	–	–
bolts φ10 P1.25	2	–	–	–	–
*Front axle clamp nuts φ8 P1.25	4	1.6~2.2	11.5~16.0	–	99
*Front axle nuts φ16 P1.5	2	7.0~9.0	51~65	–	99
*Front brake lever holder bolt φ6 P1.0	1	–	–	–	–
Front brake light switch PT 1/8	1	2.6~3.0	19.0~22.0	•	121
*Front fender mounting bolts φ8 P1.25	4	–	–	–	–
Front fork bottom Allen bolts φ10 P1.25	2	2.0~2.6	14.5~19.0	•, ★	127
*Front fork clamp bolts					
upper φ8 P1.25	2	1.6~2.2	11.5~16.0	–	126
lower φ12 P1.25	2	3.4~4.6	25~33	–	126
Front fork top bolts φ28 P1.0	2	2.5~3.0	18.0~22.0	–	126
*Handlebar clamp bolts φ8 P1.25	4	1.6~2.2	11.5~16.0	–	122
Pad mounting screw φ6 P1.0	1	–	–	•	250
Rear axle nut φ18 P1.5	1	10.0~14.0	72~101	–	27
*Rear shock absorber mounting					
bolts φ10 P1.25	2	2.6~3.5	19.0~25.0	–	129
nuts φ12 P1.25	2	2.6~3.5	19.0~25.0	–	129
Rear sprocket nuts φ10 P1.25	6	3.6~4.4	26~32	–	109
*Side stand pivot nut φ10 P1.25	1	–	–	–	–
*Steering stem head bolt φ16 P1.5	1	4.0~5.0	29~36	–	29
Steering stem head rear clamp bolt φ8 P1.25	1	1.6~2.2	11.5~16.0	–	29
Steering stem locknut φ30 P1.0	1	2.7~3.3	19.5~24.0	–	29
*Swing arm pivot shaft nut φ16 P1.5	1	8.0~12.0	58~87	–	129
*Torque link nuts φ10 P1.25	2	2.6~3.5	19.0~25.0	–	27

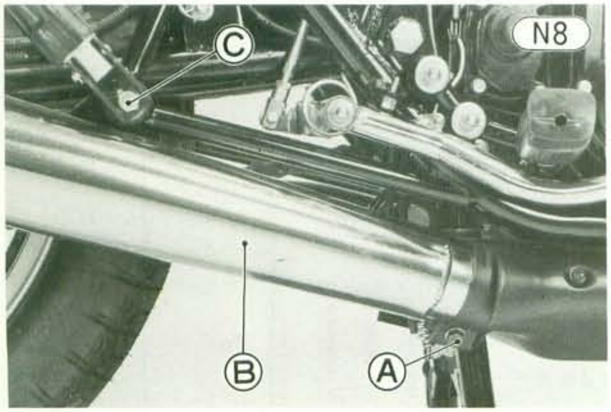
BRAKE

Parts	Quantity	Metric (kg-m)	English (ft-lbs)	Remark	See Pg.
Bleed valves ϕ7 P1.0	3	0.7~1.0	61~87 in-lbs	–	102
Brake lever pivot					
bolt ϕ6 P1.0	1	0.20~0.40	17~35 in-lbs	–	105
locknut ϕ6 P1.0	1	0.50~0.70	43~61 in-lbs	–	105
Disc plate mounting bolts ϕ8 P1.25	12	3.4~4.6	25~33	–	101
Fitting (banjo) bolts ϕ10 P1.25	8	2.9~3.1	21~22	–	105
Front caliper holder shaft nuts ϕ10 P1.25	4	2.4~2.8	17.5~20	–	104
*Front caliper mounting bolts ϕ10 P1.25	4	3.4~4.6	25~33	–	103
Hose (3-way or 4-way) joint mounting bolts ϕ6 P1.0	2	0.7~0.9	61~78 in-lbs	–	251
Master cylinder mounting bolts front (KZ1000-A) ϕ6 P1.0	2	0.6~0.9	52~78 in-lbs	–	106
Pad mounting screw ϕ6 P1.0	2	–	–	•	103
Rear caliper half Allen bolts ϕ10 P1.25	2	2.8~3.2	20~23	–	112

MUFFLERS (KZ1000-D)

Removal (either side):

•Loosen the clamp bolt at the connection of the muffler and the power chamber.



A. Clamp Bolt **C. Footpeg Mounting Bolt**
B. Muffler

•Remove the rear footpeg, and pull the muffler toward the rear. Fasteners: Bolt, flat washer, lockwasher, and nut.

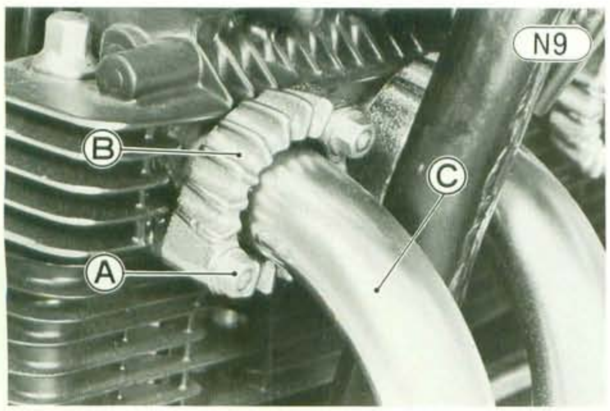
Installation Notes (either side):

1. Check the gasket at the connection, and replace it if damaged.
2. If a new gasket is installed, retighten the clamp bolt after the engine is first put in use and grows cold.

EXHAUST PIPES, POWER CHAMBER (KZ1000-D)

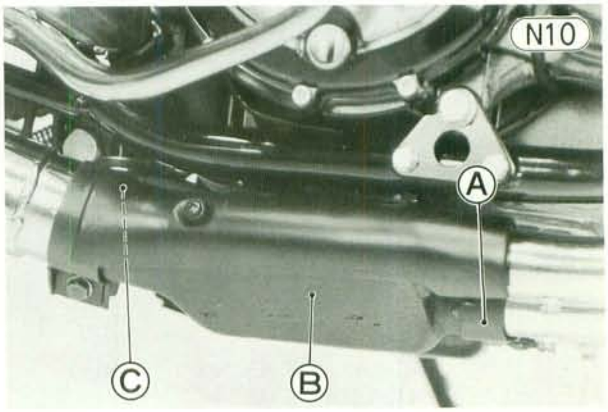
Removal:

•Remove both mufflers (Pg. 290).
•Unscrew the exhaust pipe holder nuts (8), and slide the holders (4) off the studs.



A. Nut **B. Holder** **C. Exhaust Pipe**

•Loosen the #2 and #3 exhaust pipe clamp bolts that secure the exhaut pipes to the power chamber, and remove the #2 and #3 exhaust pipes.

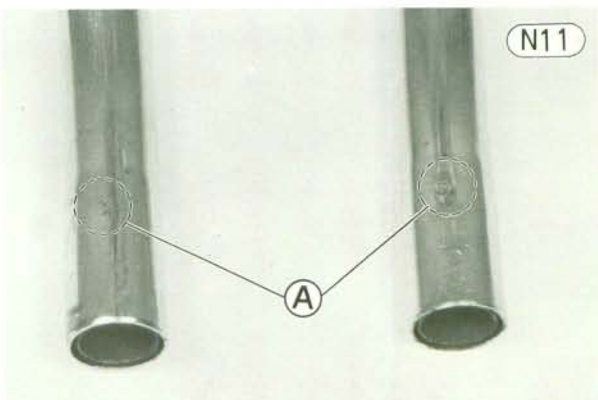


A. Clamps **C. Mounting Bolts**
B. Power Chamber

•Remove the chamber mounting bolts and lockwashers (2 ea) under the engine, and remove the power chamber and #1 and #4 exhaust pipes (one piece). Each bolt has a collar, rubber dampers (2), flat washers (4).
•Remove the gasket, split keeper, and exhaust pipe holder for each exhaust pipe.

Installation Notes:

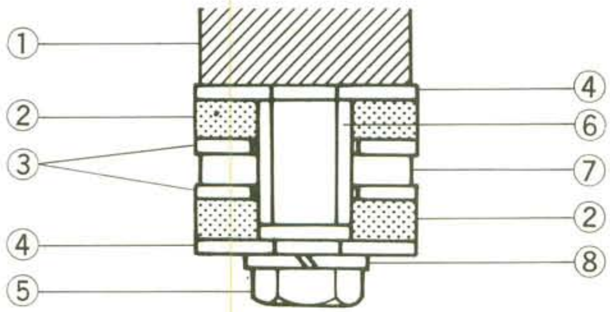
1. Replace the gasket at each exhaust port with a new one.
2. There is an identification mark on the #2 and #3 exhaust pipes to show the cylinder number to be installed on. Fit these exhaust pipes to the correct position.



A. Marking

3. Install the power chamber on the frame as shown in the figure.

Power Chamber Installation (N12)



1. Frame
2. Damper
3. Washers
4. Washers
5. Bolt
6. Collar
7. Chamber Stay
8. Lockwasher

4. After finger-tightening all clamp bolts, and mounting bolts and nuts; first tighten the nuts (8) for the exhaust pipe holders evenly to avoid exhaust leaks, and then tighten the mounting and clamp bolts.

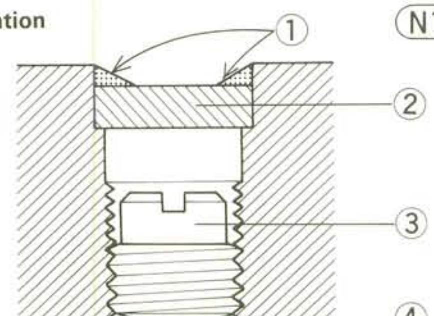
CARBURETORS (KZ1000-A, D)

(1)The procedures for the US models are the same as those for the 1979 KZ1000-A3A with the following exceptions. See Pgs. 243 ~ 245.

Carburetor Body Disassembly and Assembly (KZ1000-A and D US models per carburetor):

1. To remove the air screw, first punch and pry off the plug with an awl or other suitable tools. Turn in the air screw and count the number of turns until it seats fully but not tightly, and then remove it with its O ring and spring. This is to set the air screw to its original position when assembling.
2. Install the air screw as follows:
   - 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 (N13)



1. Apply a bonding agent.
2. Plug
3. Air Screw
4. Carburetor Body

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

Accelerator Pump Disassembly and Assembly Notes (KZ1000-A and D US models):

1. If the accelerator pump rod is replaced with a new one, position the adjusting nut so that the length shown in Fig. N14 on Pg. 245 is between 3.7 and 3.9 mm. Apply a non-permanent locking agent to the adjuster threads to lock the nut in place.

(2)The procedures for all models except US are the same as those for the KZ1000-A3A with the following exception. See Pgs. 243 ~ 244.

1. The carburetors are air screw type carburetors like the US models, but have no accelerator pump.

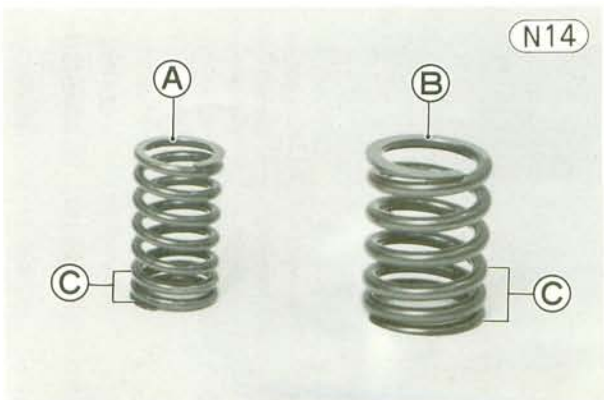
VALVE, VALVE GUIDE (KZ1000-A, D)

Removal and Installation (each valve and valve guide):

The procedures are the same as those for the late 1978 KZ1000-A2A with the following exception. See Pgs. 52 ~ 53.

1. The valve springs of the late 1980 model have the coils closer together at one end than at the other. In an installation of this kind, the end with the more closely spaced coils must be placed against the cylinder head.

NOTE: The early 1980 model has valve springs evenly wound from end to end. For those valves, they can be installed in either direction.



A. Inner Spring
B. Outer Spring
C. Closed Coil End

EXTERNAL SHIFT MECHANISM (KZ1000-A, D)

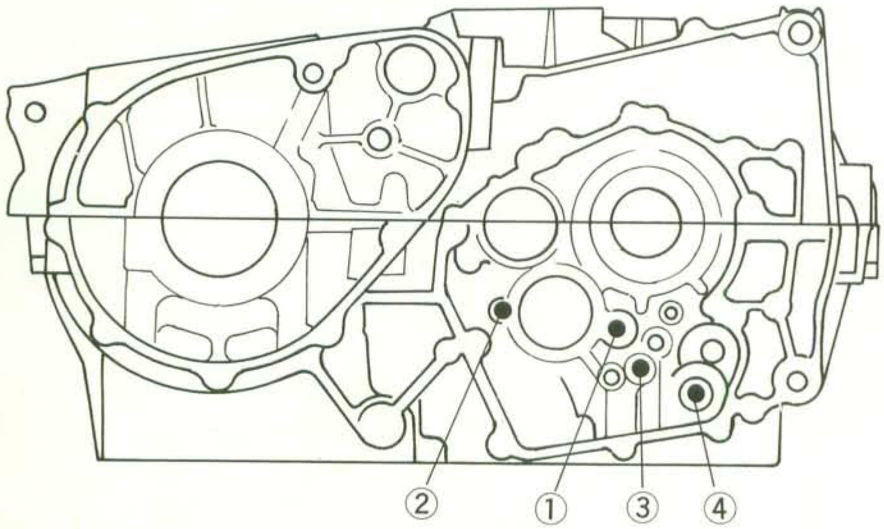
Removal and Installation:

The room for the external shift mechanism is modified for the crankcase unification among all KZ1000 models. The procedures are the same as those for the 1979 KZ1000-A3A with the following exception. See Pg. 247.

1. Install the neutral detent arm, gear position detent arm, return spring pin, and shift shaft in their position shown in the figure.
2. Apply a non-permanent locking agent to the threads of the return spring pin, and tighten it to 1.8 ~ 2.2 kg-m (13.0 ~ 16.0 ft-lbs) of torque.

Location of Parts

(N15)

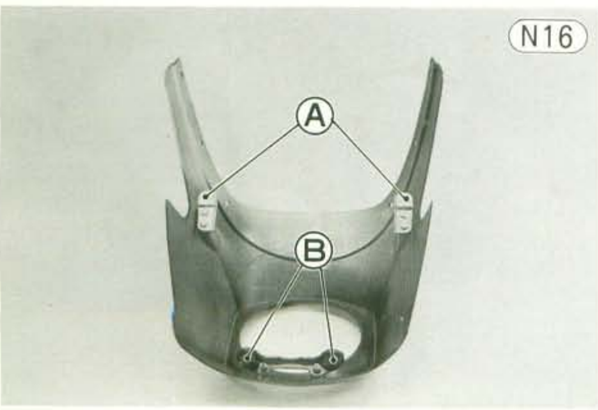


1. Neutral Detent Arm
2. Gear Position Detent Arm
3. Return Spring Pin
4. Shift Shaft

FAIRING (KZ1000-D)

Removal:

- Remove the caps ㉒ and ㉓ at the rear ends of the instrument panel ㉕ on both sides. Fasteners: screws, washers, nuts (2 ea).
- Unscrew the mounting bolts (4), and remove the fairing ④ and windshield ① towards the front. Upper fasteners: Allen bolts ⑯, lockwashers ⑭, and caps ⑬ (2 ea). Lower fasteners: Allen bolts ⑮, lockwasher ⑭, and caps ⑬ (2 ea).



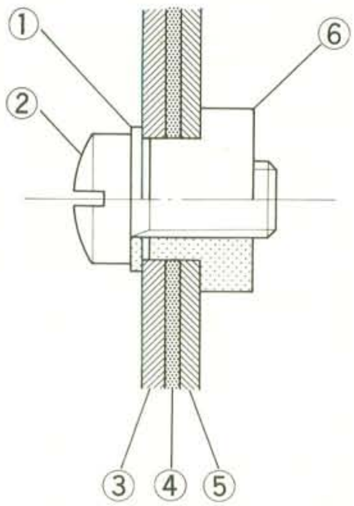
A. Upper Mounting **B. Lower Mounting**

Installation Notes:

1. If the windshield is replaced with a new one, install it on the fairing as shown in the figure.

Windshield Installation

(N17)

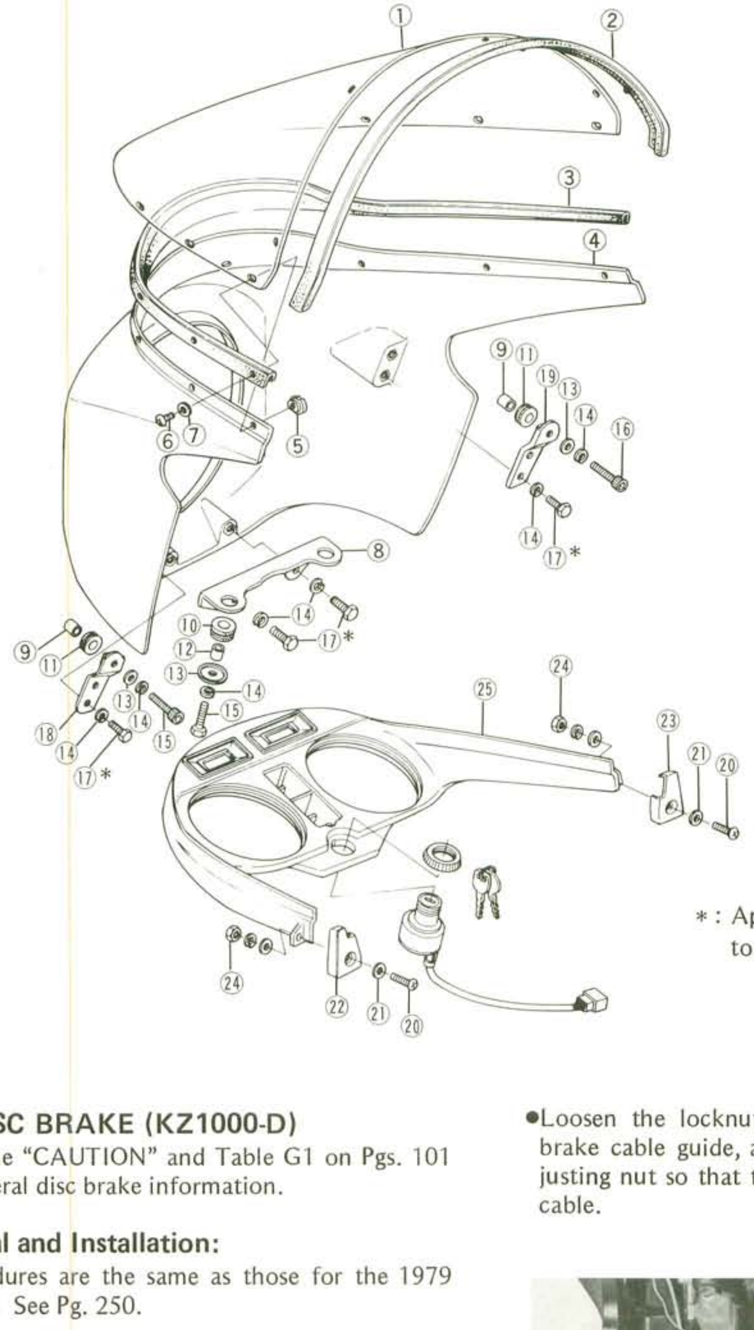


1. Washer
2. Screw
3. Windshield
4. Trim
5. Fairing
6. Nut

2. Apply a non-permanent locking agent to the threads of the bolts ⑰ (6) which secure the brackets ⑧, ⑱, ⑲ to the fairing, and tighten them to 0.8 ~ 1.0 kg-m (69 ~ 87 in-lbs) of torque.

Fairing and Instrument Panel

(N18)



1. Windshield
2. Trim
3. Trim
4. Fairing
5. Nut x 8
6. Screw, $\phi 5$ L12 x 8
7. Washer x 8
8. Bracket
9. Collar x 2
10. Damper x 2
11. Damper x 2
12. Collar x 2
13. Cap x 4
14. Lockwasher x 10
15. Allen Bolt, $\phi 6$ L20 x 2
16. Allen Bolt, $\phi 6$ L25 x 2
*17. Bolt, $\phi 6$ L14 x 6
18. Bracket x 1
19. Bracket x 1
20. Screw, $\phi 5$ L12 x 2
21. Washer x 2
22. Cap x 1
23. Cap x 1
24. Nut x 2
25. Instrument Panel

* : Apply a non-permanent locking agent to the threads.

FRONT DISC BRAKE (KZ1000-D)

Refer to the "CAUTION" and Table G1 on Pgs. 101 ~102 for general disc brake information.

Pad Removal and Installation:

The procedures are the same as those for the 1979 KZ1000-A3A. See Pg. 250.

Caliper Removal and Installation:

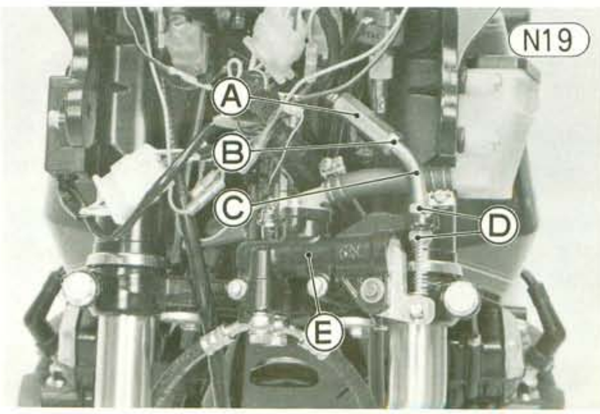
The procedures are the same as those for the late 1978 KZ1000-A2A. See Pg. 103.

Caliper Disassembly and Installation:

The procedures are the same as those for the late 1978 KZ1000-A2A. See Pgs. 103 ~ 104.

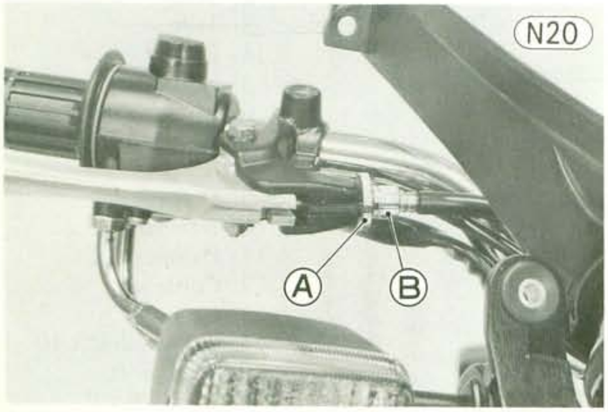
Master Cylinder Removal:

- Drain the brake fluid from the line.
- Remove the fairing (Pg. 292).
- Remove the headlight unit (Pg. 296) and its housing.
- Loosen the locknut and mounting nut on the front brake cable guide, and turn the mounting nut and adjusting nut so that there is plenty of play in the brake cable.



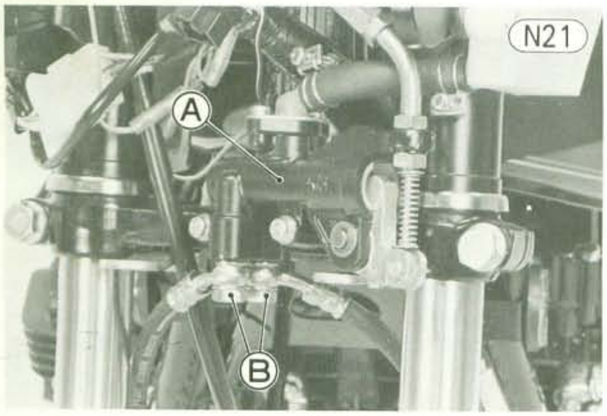
A. Adjusting Nut
B. Locknut
C. Cable Guide
D. Mounting Nuts
E. Master Cylinder

- Loosen the knurled locknut on the brake lever holder, and screw in the adjuster.
- Line up the slots in the brake lever, locknut, and adjuster and then free the cable from the lever.



A. Locknut B. Adjuster

- Remove the banjo bolts to disconnect the brake hoses from the master cylinder. There is a flat washer on each side of the hose fittings.



A. Master Cylinder B. Banjo Bolts

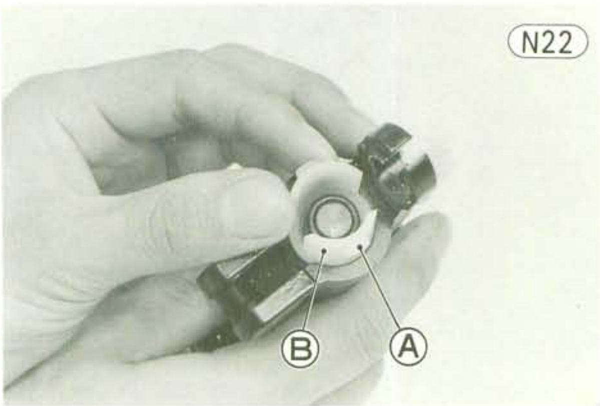
- Remove the brake fluid reservoir mounting screws (3). Each screw has a lockwasher, flat washer, and rubber damper.
- Remove the master cylinder mounting screws (2), and take off the master cylinder together with the brake cable and reservoir.

Master Cylinder Installation Notes:

1. Use a new flat washer on each side of the brake hose fittings.
2. Adjust the front brake (Pg. 284).
3. Bleed the brake line after master cylinder installation (Pg. 180).

Master Cylinder Disassembly:

- Remove brake cable from the master cylinder.
- Remove the screws (2), take off the master cylinder cap ② and diaphragm ④, and empty out the brake fluid.
- Loosen the hose clamp ⑥ and pull the brake hose ⑤ off the master cylinder ㉙.
- Remove the circlip ⑮, flat washer ⑯, and remove the pivot pin ㉘ and lever ㉗.
- Free the liner tabs which catch in the groove in the master cylinder, and then remove the liner ⑳.



A. Tab B. Liner

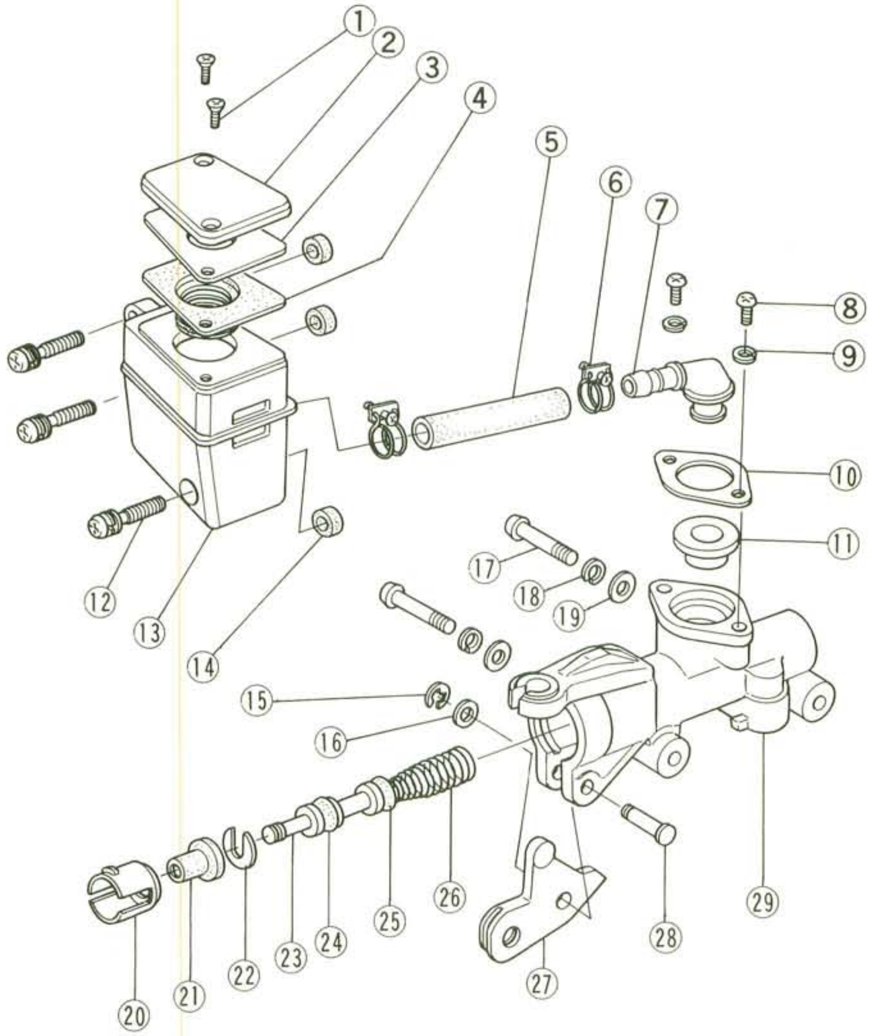
- Pull out the piston ㉓ and spring ㉖.
- Remove the screws ⑧ (2) and lockwashers (2), and remove the holding plate ⑩, grommet ⑪, and hose fitting ⑦.

Master Cylinder Assembly Notes:

1. Visually inspect the rubber parts for any damages, and replace them if they are damaged.
2. Before assembly, clean all parts including the master cylinder with brake fluid or alcohol (See "CAUTION" – Pg. 101). Apply brake fluid to the parts removed and to the inner wall of the cylinder.
3. Be sure that the piston stop ㉒ is between the piston ㉓ and dust seal ㉑.
4. Fit the ends of the brake hose ⑤ all the way onto the fittings on the reservoir and master cylinder body, and tighten the clamp screws securely.

Front Master Cylinder (KA1000-D)

(N23)



1. Screw
2. Cap
3. Plate
4. Diaphragm
5. Hose
6. Clamp
7. Fitting
8. Screw
9. Lockwasher
10. Holding Plate
11. Grommet
12. Screw
13. Reservoir
14. Damper
15. Circlip
16. Flat Washer
17. Screw
18. Lockwasher
19. Flat Washer
20. Liner
21. Dust Seal
22. Stop
23. Piston
24. Secondary Cup
25. Primary Cup
26. Spring
27. Lever
28. Pin
29. Master Cylinder

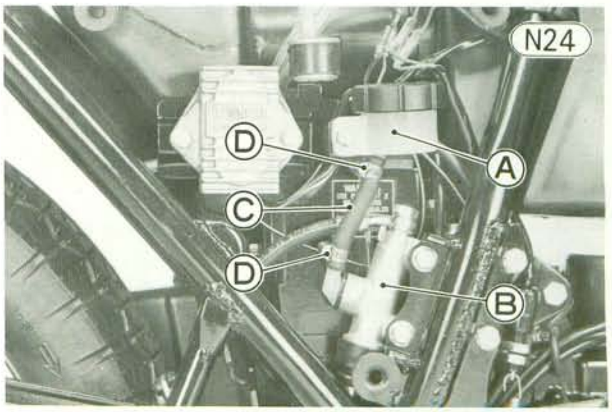
REAR DISC BRAKE (KZ1000-A, D)

The reservoir is separated from the master cylinder body, and connected to it with a brake hose. The mounting bolts for the body do not have the stepped portion, and directly hold the body on the frame without any clearance.

Rear Master Cylinder Removal and Installation:

The procedures are the same as those for the KZ1000-A4 with the following exceptions. See Pgs. 250 ~ 251.

1. To remove the master cylinder assembly, first remove the reservoir mounting bolt.
2. When installing the master cylinder body, grease and non-permanent locking agent are not required to its mounting bolts.
3. If the brake hose ⑦ is replaced with a new one, fit the ends of the hose all the way onto the fittings on the reservoir and master cylinder body, and tighten the hose clamp screws securely.



A. Reservoir **C. Brake Hose**
B. Master Cylinder Body **D. Clamps**

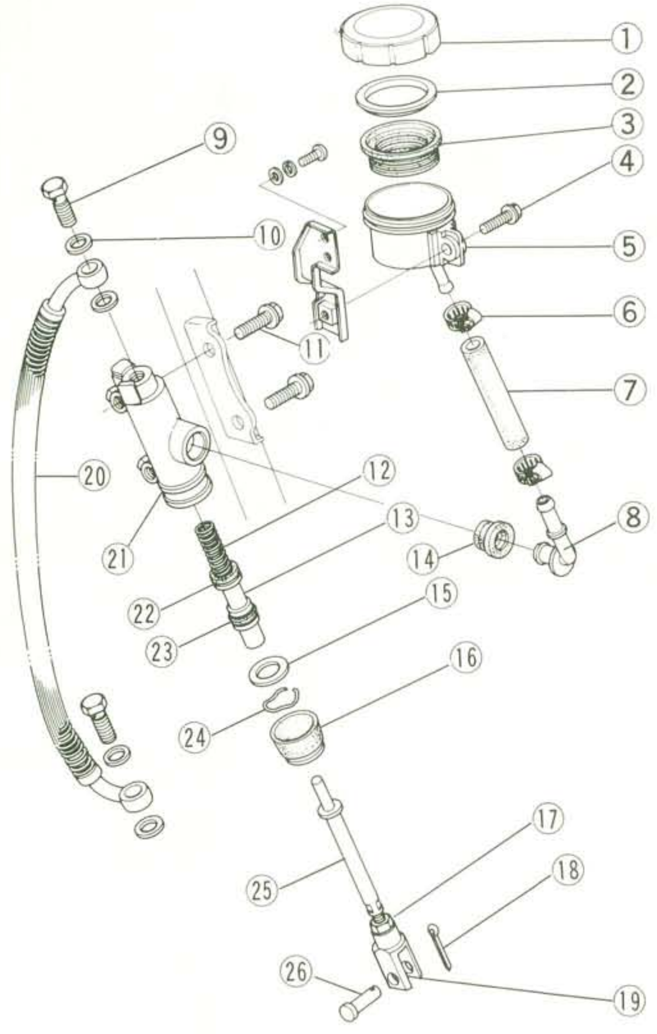
Rear Master Cylinder Disassembly and Assembly:

The procedures are the same as those for the KZ1000-A4 with the following exceptions. See Pgs. 112 ~ 113.

1. The plug and gasket on the master cylinder body is discontinued.
2. If the hose clamps are loosened, tighten them securely after installation of the master cylinder assembly.

Rear Master Cylinder (KZ1000-A, D)

N25



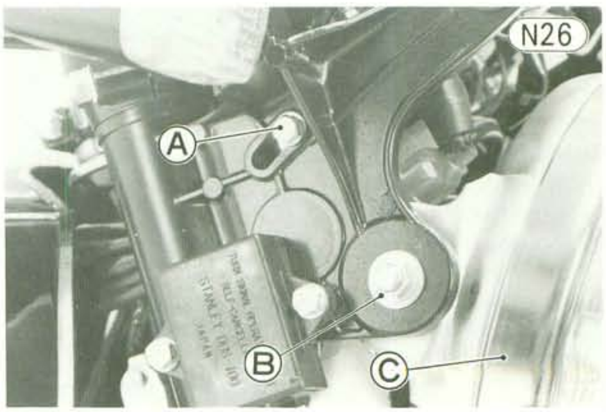
1. Cap
2. Ring Plate
3. Diaphragm
4. Bolt
5. Reservoir
6. Clamp x 2
7. Hose
8. Fitting
9. Banjo Bolt x 2
10. Washer x 4
11. Bolts x 2
12. Spring
13. Piston
14. Grommet
15. Stop
16. Dust Cover
17. Locknut
18. Cotter Pin
19. Clevis
20. Hose
21. Master Cylinder Body
22. Primary Cup
23. Secondary Cup
24. Retainer
25. Push Rod
26. Pin

HEADLIGHT UNIT (KZ1000-D)

Removal:

- Remove the fairing (Pg. 292).
- Remove the small mounting bolt ⑧, lockwasher, flat washer, and nut.
- Remove the nuts ⑰, and lockwashers (2 ea), and pull off the large mounting bolts (2).
- Pull off the headlight socket, and complete the unit removal.
- To disassemble the unit follow the procedures below.
- Remove the dust cover ㉕.
- Unhook the bulb retaining spring, and take out the bulb ㉔.

CAUTION **When handling the quartz-halogen bulb, never touch the glass portion with bare hands. Always use a clean cloth. Oil contamination**



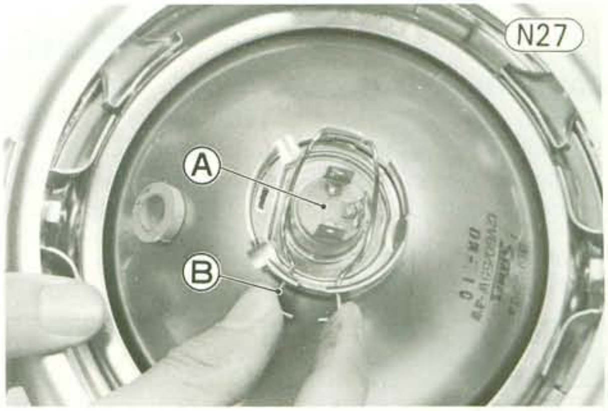
A. Bolt
B. Nuts (both sides)
C. Headlight Unit

from hands or dirty rags can reduce bulb life or even cause the bulb to explode.

- Remove the pivot screws ④, nuts ⑥, and rubber dampers ⑤ (2 ea).
- Remove the beam horizontal adjusting screw ①, and separate the inner rim ㉒ from the outer rim ⑬. A nut ㉗, spring seat ③, and spring ② come off with the adjusting screw.
- Remove the screws ㉑ (2), and separate the reflector from the inner rim and mounting rim ㉖.

Installation Notes:

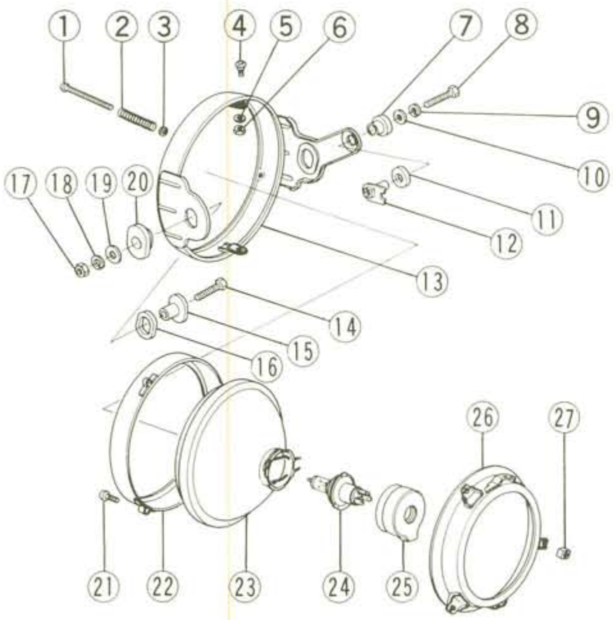
1. Installation instructions are the same as those for KZ1000-A. See Pgs. 117 ~ 118.
2. Adjust the headlight aim (Pgs. 285).



A. Bulb B. Retaining Spring

Headlight Unit

N28



1. Adjusting Screw
2. Spring
3. Spring Seat
4. Screw
5. Damper
6. Nut
7. Collar
8. Bolt
9. Lockwasher
10. Flat Washer
11. Damper
12. Nut
13. Outer Rim
14. Bolt
15. Collar
16. Damper
17. Nut
18. Lockwasher
19. Flat Washer
20. Damper
21. Screw
22. Inner Rim
23. Reflector
24. Bulb
25. Dust Cover
26. Mounting Rim
27. Nut

Maintenance

CARBURETORS (KZ1000-A, D)

Refer to Pgs. 252 ~ 254 for other service information not specifically mentioned here.

1. Table N2 shows the carburetor specifications for the 1980 models.
2. The carburetors on the US models have an accelerator pump to supply an enriched mixture to the engine in the first few moments of acceleration. The carburetors on the other models have no accelerator pump.

Table N2 Carburetor Specifications
(1)US model, KZ1000-A4 and D3

Type	Main Jet	Needle Jet	Jet Needle	Pilot Jet	Throttle Valve Cutaway	Service Fuel Level
VM28SS	102.5R	O-4	5CN29	15	2.0	4 ± 1 mm

(2)All models except US, KZ1000-A4 and D3

Type	Main Jet	Needle Jet	Jet Needle	Pilot Jet	Throttle Valve Cutaway	Air Screw	Service Fuel Level
VM28SS	105R	O-1	5CN15-3	15	1.75	1¼ ± ¼ turns out	4 ± 1 mm

CYLINDER HEAD, VALVES (KZ1000-A, D)

Valve Springs

The procedures are the same as those for the late 1978 KZ1000-A2A with the following exception. See Pgs. 148 ~ 150.

Table N3 Valve Spring Tension

	Test Length	Service Limit
Inner	23.6 mm	24.5 kg
Outer	25.6 mm	44.7 kg

WHEELS (KZ1000-A, D)

Tires

Refer to Pg. 258 for other service information not specifically mentioned here.

Table N4 Tires, Air Pressure (measured when cold)
(1)KZ1000-A4

	Air Pressure (Cold)		Tire Size	Make and Type
Front	2.00 kg/cm^2 (28 psi, 200 kPa)		3.25V-19 4PR, or MM90-19	DUNLOP F6B, or GOOD YEAR EAGLE HST RIB
Rear	Up to 97.5 kg load	2.25 kg/cm^2 (32 psi, 225 kPa)	4.00V-18 4PR, or MP90-18	DUNLOP K87 MARKIIM, or GOOD YEAR EAGLE HST
	97.5 ~ 165 kg load	2.80 kg/cm^2 (40 psi, 280 kPa)		

(2)KZ1000-D3

	Air Pressure (Cold)		Tire Size	Make and Type
Front	2.00 kg/cm^2 (28 psi, 200 kPa)		3.25V-19 4PR	DUNLOP F6
Rear	Up to 97.5 kg load	2.25 kg/cm^2 (32 psi, 225 kPa)	4.00V-18 4PR	DUNLOP K87 MARKIIM
	97.5 ~ 165 kg load	2.80 kg/cm^2 (40 psi, 280 kPa)		

Table N5 Tire Tread Depth
(1)KZ1000-A4

	Service Limit (minimum tread depth)	
	Under 130 kph	Over 130 kph
Front	1 mm	1 mm
Rear	2 mm	3 mm

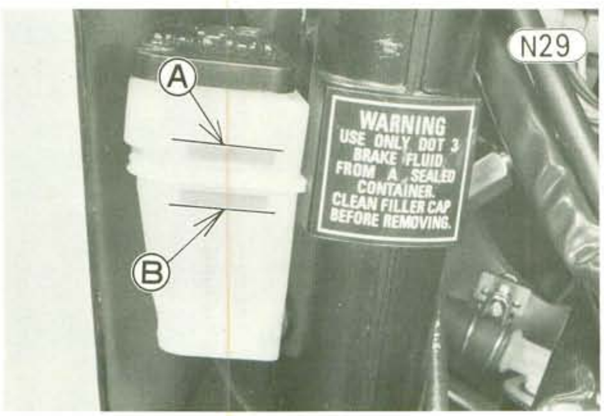
(2)KZ1000-D3

	Service Limit (minimum tread depth)	
	Under 130 kph	Over 130 kph
Front	1 mm	1.5 mm
Rear	2 mm	3 mm

BRAKES (KZ1000-A, D)
Brake Fluid

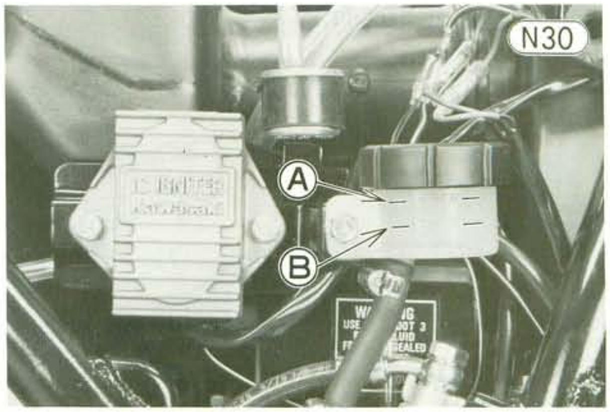
The procedures are the same as those for the 1979 KZ1000-A3A with the following exception. See Pg. 259.

1. Fill the reservoir of the KZ1000-D front master cylinder up to the upper level line.



A. Upper Level Line **B. Lower Level Line**

2. For both the KZ1000-A and D, fill the reservoir of the rear master cylinder up to the upper level line.



A. Upper Level Line **B. Lower Level Line**

Master Cylinder

The front master cylinder of the KZ1000-D is mounted at the steering stem base. The force applied at the front brake lever is transmitted by a cable to the lever ⑧ which pushes the piston ⑫ into the master cylinder body ②. See Pgs. 176~179 for the theory of operation, since the basic theory of operation is the same as for the late 1978 KZ1000-A2A.

Master cylinder part wear

Table N6 shows the service limit for the rear master cylinder parts of the KZ1000-A and D. Refer to Pgs. 181~182 for other service information not specifically mentioned here.

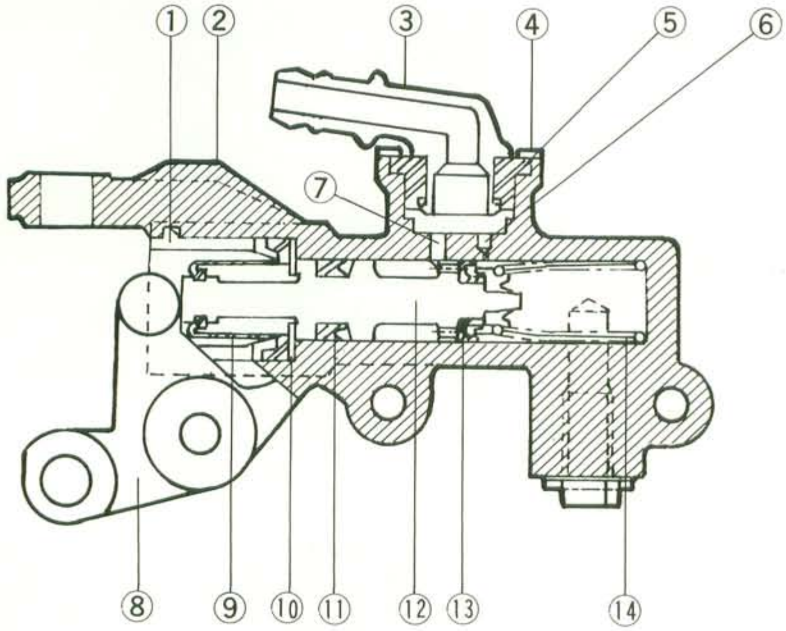
Table N6 Rear Master Cylinder Parts (KZ1000-A, D)

Measurement	Service Limit
Cylinder Inside Diameter	15.95 mm
Piston Outside Diameter	15.64 mm
Primary Cup Diameter	16.0 mm
Secondary Cup Diameter	16.4 mm
Spring Free Length	31.4 mm

NOTE: For the front master cylinder parts of KZ1000-D, use the information given for the dual-disc brake system in Table J12 (Pg. 182).

Master Cylinder (KZ1000-D)

(N31)



1. Liner
2. Mster Cylinder Body
3. Fitting
4. Holding Plate
5. Grommet
6. Relief Port
7. Supply Port
8. Lever
9. Dust Seal
10. Piston Stop
11. Secondary Cup
12. Piston
13. Primary Cup
14. Spring

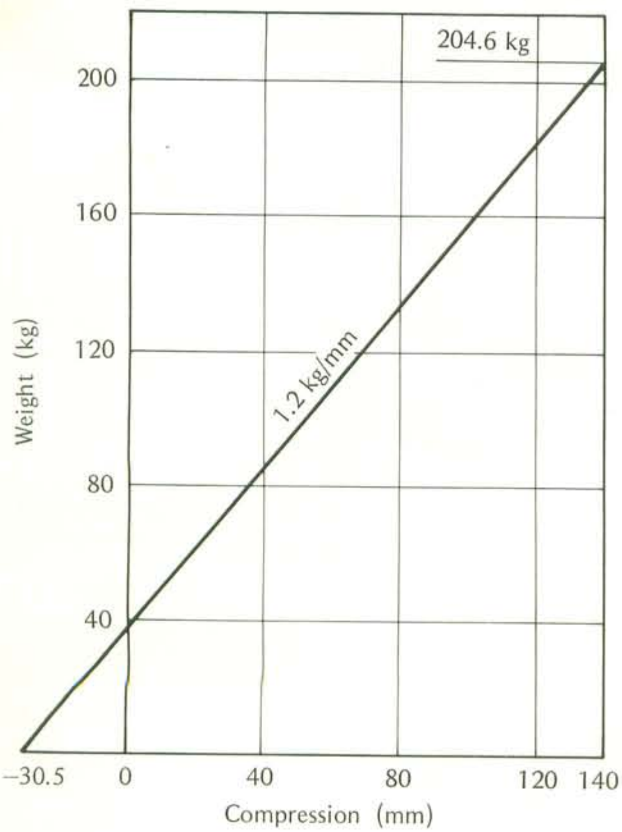
FRONT FORK (KZ1000-D)

The service information for the KZ1000-D is the same as those for the 1979 KZ1000-A3A unless otherwise noted below. See Pgs. 259 ~ 260.

1. Fig. N32 shows the front fork spring force.

Front Fork Spring Force (KZ1000-D)

(N32)



2. The springs of the KZ1000-D are somewhat longer than that of the KZ1000-A3A.

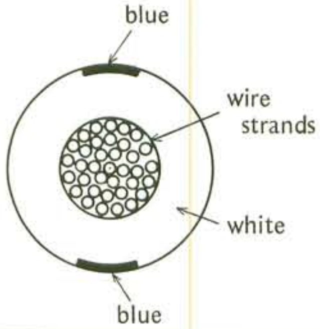
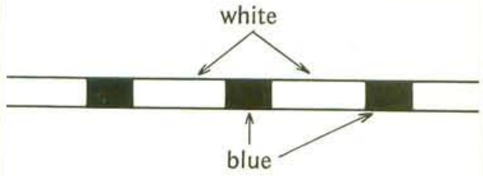
Table N7 Fork Spring Free Length

Service Limit	533 mm

GENERAL INFORMATION (for Electrical System)

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

Table N8 Two-color Lead Identification

Lead (cross-section)	Name of Wire Color	Picture in Wiring Diagram
	white/blue	

RESERVE LIGHTING SYSTEM (KZ1000-D US model)

NOTE: Refer to the General Information before servicing the reserve lighting system.

The reserve lighting system is a safety device that keeps the headlight and tail light on even if one of the filaments burns out. The circuit for this system is shown in Fig. N33.

For the headlight, if either the high or low beam burns out, the reserve lighting system switches over to the remaining filament automatically, and lights the white headlight failure indicator light to show that the headlight bulb must be replaced. If the high beam filament burns out, the low beam is automatically turned on; if low beam burns out, the high beam is turned on but more dimly than normally.

If the tail light filament burns out, both the brake light and brake light indicator will come on dimly to indicate the failure. (If the brake is applied at this time, both the brake light and indicator will become brighter.)

NOTE: Little circuit is always flowing in the headlight failure indicator light when the ignition switch is in the "ON" position. So you may notice the indicator light glimmers even if the headlight filaments do not burn out.

Table N9 Reserve Lighting System
(1)Headlight

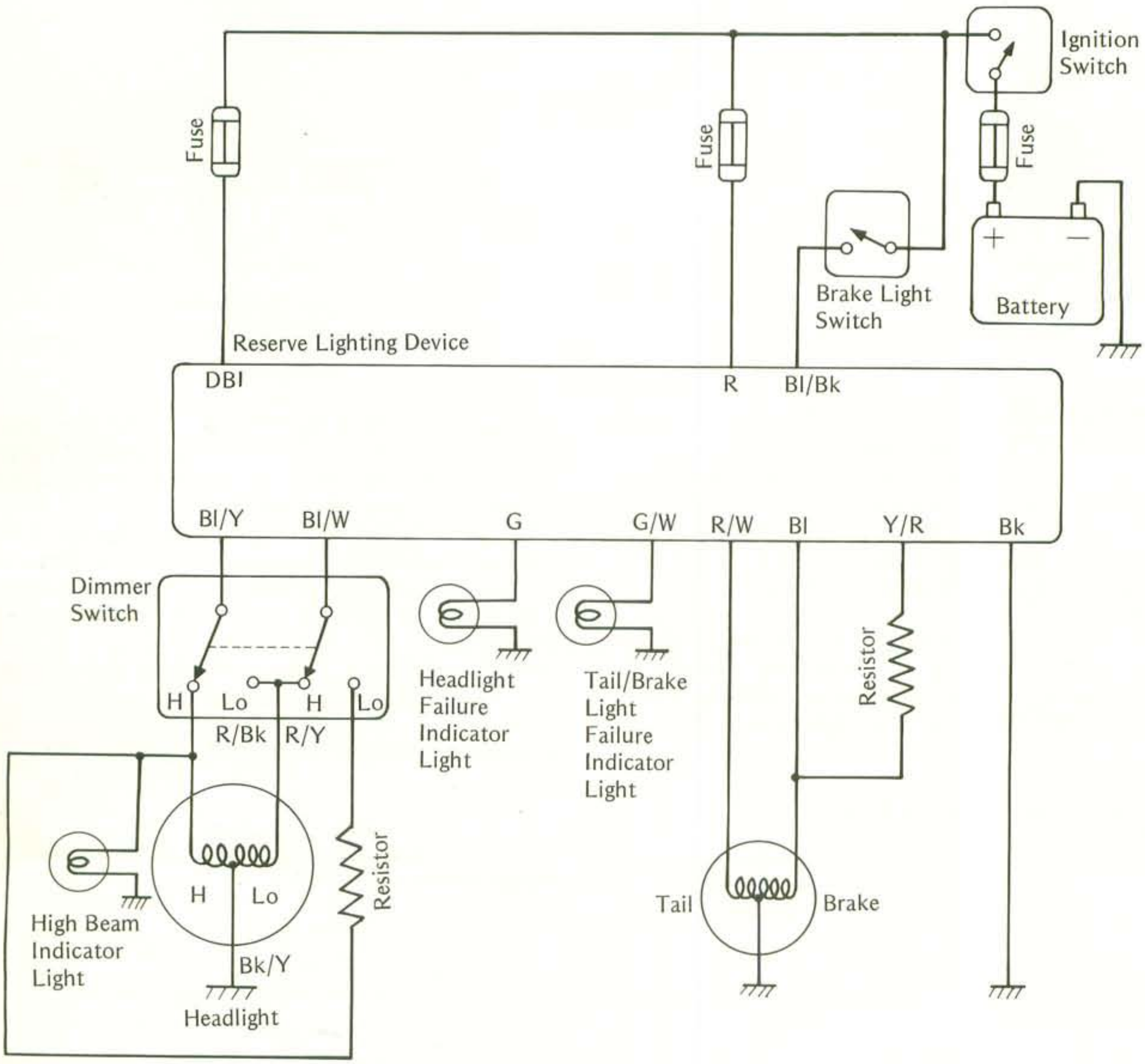
Headlight	Dimmer Switch Position	Headlight Failure Indicator Light	Reserve Lighting
Both high and low beam filaments are normal	HI	Goes on (hardly visible)	———
	LO	Goes on (hardly visible)	———
High beam filament burned out	HI	Goes on	Low beam comes on.
	LO	Goes on (hardly visible)	———
Low beam filament burned out	HI	Goes on (hardly visible)	———
	LO	Goes on	High beam comes on dimly.

(2)Tail Brake Light

Tail/Brake Light	Brake Light Switch Position	Tail/Brake Light Failure Indicator Light	Reserve Lighting
Both tail and brake light filaments are normal	ON	Goes on	———
	OFF	Goes off	———
Brake light filament burned out	ON	Goes off	———
	OFF	Goes off	———
Tail light filament burned out	ON	Goes on	———
	OFF	Goes on dimly	Brake light comes on dimly.

Reserve Lighting System

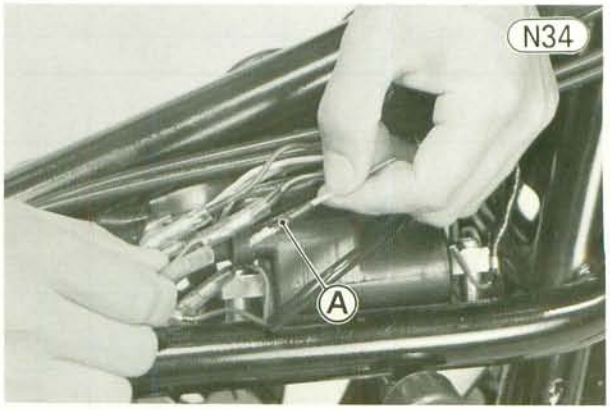
(N33)



Checking the system

(1)Headlight Failure

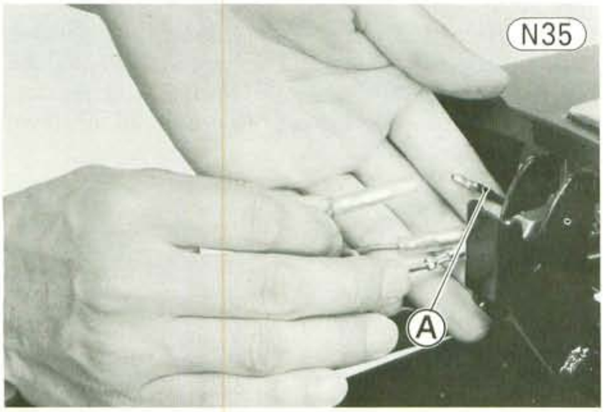
- Remove the fuel tank.
- Turn the ignition switch to the "ON" position to turn on the headlight, and set the dimmer switch to the low beam position.
- Disconnect the red/yellow lead at the top frame pipe to simulate a bad low-beam filament. At this time the high beam should go on more dimly than normal, and the white headlight failure indicator light should come on [Table N9 (1)].



A. Disconnect the red/yellow lead.

•Connect the red/yellow leads, and set the dimmer switch to the high beam position.
•Disconnect the red/black leads at the top frame pipe to simulate high beam failure. At this time the low beam should come on and the white indicator light should light.
•Connect the leads.

(2)Tail Light Failure
•Turn the ignition switch to the "ON" position to turn on the tail light, and disconnect the red lead for the tail light from the main wiring harness under the seat to simulate burning out of the tail light filament. At this time the brake light and the brake indicator light should both come on dimly [Table N9 (2)].



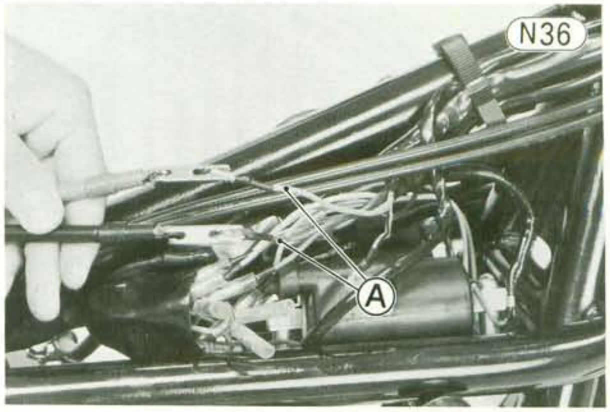
A. Disconnect the red lead.

•Connect the red and red/white leads.
•Apply the front and rear brakes one at a time, and check that the brake light and red indicator light both come on brightly when a brake is applied.
•White applying either brake to turn on the brake light, simulate brake light filament failure by disconnecting the blue wire that goes to the brake light. At this time the brake light and the red indicator light should go off.
•Connect the lead.

If the reserve lighting system does not function properly, check the circuit as follows.

Dimmer switch inspection

Tables N10 and N11 show the connections in the headlight switch, and the connections in the dimmer switch for both high and low beam.
•Remove the fuel tank, and disconnect the leads to the dimmer switch at the top frame pipe.
•Use an ohmmeter to see that only the connections shown in the table has continuity (zero ohms). If the switch has open or a short, it can be disassembled for repair. The contact surfaces may be cleaned, but no internal parts are available for replacement. If any parts are not repairable, the switch must be replaced as a unit.
•Connect the leads.



A. Disconnect the dimmer switch leads.

Table N10 Headlight Switch Connections (not on US model)

	Brown	Blue/White	Brown/White
OFF			
●	●		●
ON	●	●	●

Table N11 Dimmer Switch Connections
(1)US Model

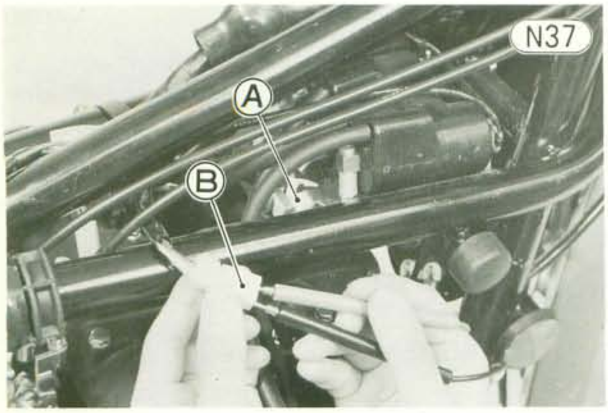
	Red/ Black	Blue/ Yellow	Red/ Yellow	Light Blue	Yellow/ Blue
HI	●	●	●	●	
LO		●	●	●	●

(2)Models except US

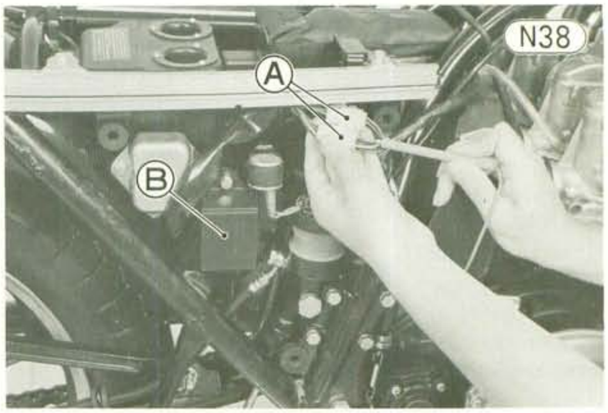
	Red/Black	Blue	Red/Yellow
HI	●	●	
LO		●	●

Resistor inspection

•Disconnect the resistor 4-pin connector at the top frame pipe (Fig. N37).
•Use an ohmmeter as shown in Table N12. Less than the proper resistance means a resistor short; higher than the proper resistance or no reading at all means an open circuit in the resistor. In case of a short or open circuit replace the resistor.
•Connect the 4-pin connectors.



A. Resistor B. 4-pin Connector



A. 9-pin and 3-pin Connectors
B. Reserve Lighting Device

Table N12 Resistor Resistance

	Connections	Reading
Headlight	Yellow/Blue ↔ Yellow/Green	about 1.5 Ω
Brake Light	Yellow/Red ↔ Blue/Red	about 3.9 Ω

Reserve lighting wiring inspection

- Connect all the leads and connectors that are disconnected.
- Measure the voltage at the 9-pin and 3-pin connectors as shown in Tables N13, N14, and N15.

- If any one of the meter leadings shows an improper value, check the wiring and connections among the reserve lighting device, dimmer switch and resistor. Replace the reserve lighting device if all of them turn out good.

Table N13 Headlight Circuit Wiring Inspection*

Meter	Connections**	Headlight Filament	Reading
25V DC	Meter (+) → Dark Blue, Blue/Yellow	Normal	Battery voltage
		Burned out***	
	Meter (+) → Blue/White	Normal	0V
		Burned out***	Battery voltage
	Meter (+) → Green	Normal	about 1.5 V
		Burned out***	about 10 V

*Turn on the ignition switch with the dimmer switch in either position.
**Negative (–) meter lead connected to ground.
***Disconnect the red/yellow (low beam) lead or red/black (high beam) lead.

Table N14 Tail Light Circuit Wiring Inspection*

Meter	Connections**	Tail Light Filament	Reading
25V DC	Meter (+) → Red, Red/White	Normal	Battery voltage
		Burned out***	
	Meter (+) → Yellow/Red	Normal	0 V
		Burned out***	about 10 V
	Meter (+) → Green/White	Normal	0 V
		Burned out***	about 5 V

*Turn on the ignition switch with the dimmer switch in either position.
**Negative (–) meter lead connected to ground.
***Disconnect the red lead from the red/white lead.

Table N15 Brake Light Circuit Wiring Inspection*

Meter	Connections**	Brake Light Filament	Reading
25V DC	Meter (+) → Blue/Black, Blue	Normal	Battery voltage
		Burned out***	
	Meter (+) → Green/White	Normal	Battery voltage
		Burned out***	0 V

*Apply the front or rear brake.
**Negative (–) meter lead connected to ground.
***Disconnect the blue lead.

AUTOMATIC TURN SIGNAL CANCELLING SYSTEM (KZ1000-D)

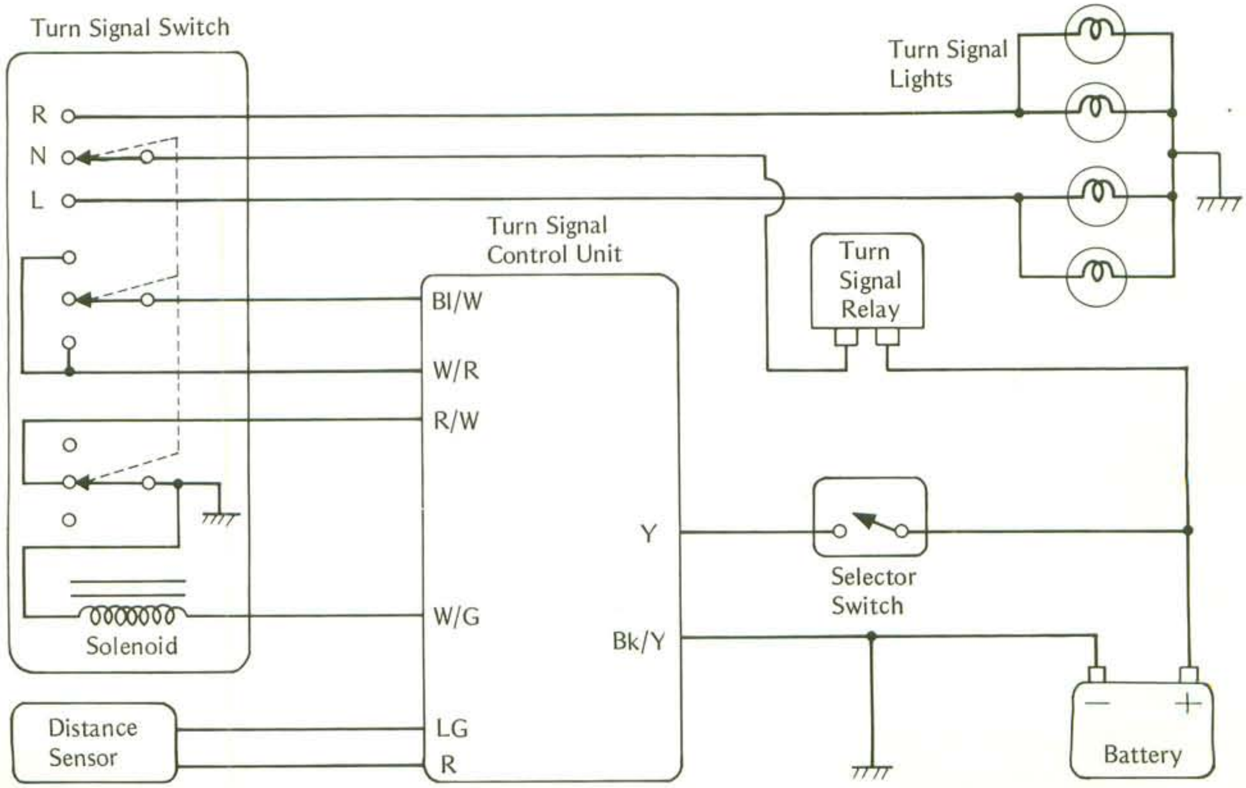
When the turn signal selector switch is in the A (Automatic) position, a solenoid turns off the turn signal after it has been on for 4 seconds, and from that time the motorcycle has traveled an additional 50 meters.

The cancelling system consists of the battery (power source), turn signal control unit, distance sensor, solenoid, and turn signal switch. When the turn signal switch is pushed to the left or right, the turn signals start flashing and the control unit starts counting off 4 seconds. At the end of this time, the control unit starts calculating distance traveled using pulses from the distance sensor at the end of the speedometer cable. When the motorcycle has traveled 50 meters, the control unit operates the solenoid, which returns the turn signal switch to the off position.

If the turn signal cancelling system does not function properly, first check all the wiring connections carefully, and then inspect the distance sensor and turn signal switch/solenoid assembly. If all these are good, replace the turn signal control unit.

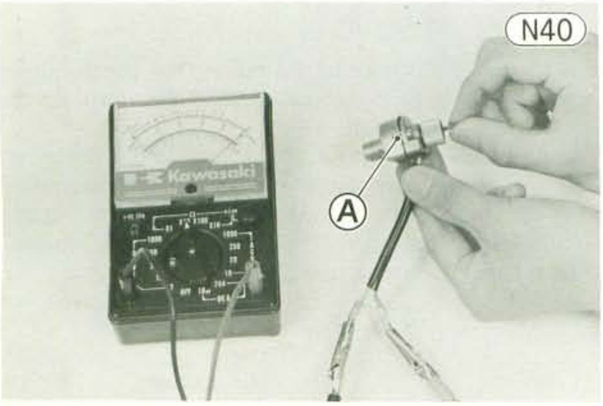
Turn Signal Cancelling System

N39



Distance sensor inspection

- Remove the fairing and the headlight, disconnect the red lead and light green lead from the sensor, and remove the sensor from the speedometer cable using pliers.
- Connect an ohmmeter across to the sensor leads, and check continuity as follows. Turning the sensor shaft slowly count how many times the sensor shows continuity. The ohmmeter should show continuity and then open four times per revolution. If it does not, replace the sensor.

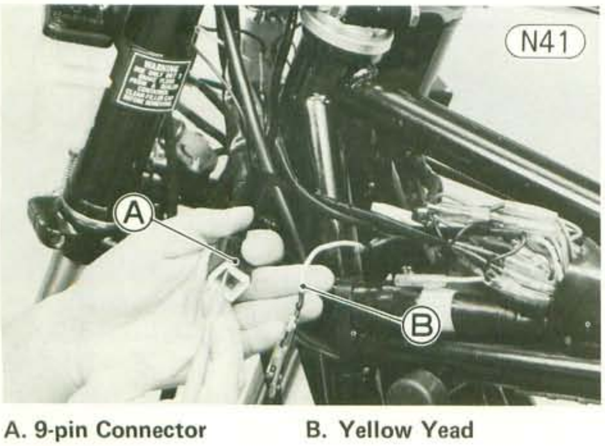


A. Distance Sensor

- Install the distance sensor.

Turn signal and selector switch inspection

First unplug the 9-pin connector and yellow wire, and check the turn signal switch and selector switch connections according to Tables N16 and N17. If the switch has an open or a short, it can be disassembled for repair. The contact surfaces may be cleaned, but no internal parts are available for replacement. If any parts are not repairable, the switch must be replaced as a unit.



A. 9-pin Connector **B. Yellow Yead**

Table N16 Selector Switch Connections

	Gray	Orange/ Green	Green	Brown	Yellow
Δ	●	●	●		
M					
A				●	●

Next check that the solenoid operates properly when it receives a pulse from the control unit.

- Prepare an auxiliary lead which has enough length to reach the 9-pin connector of the selector switch from the battery.
- Connect the one end of the lead to the positive (+) side of the battery.

CAUTION **Take care not to short the lead to the chassis ground during this inspection.**

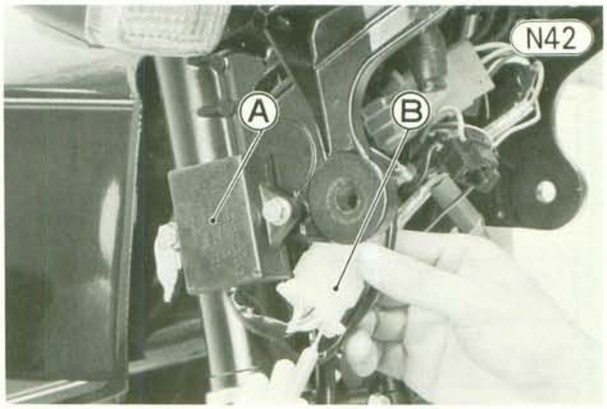
- Switch the turn signal switch to either side, connect the other end of the lead to the white/green lead in the 9-pin connector momentarily. At this time the solenoid should return the turn signal switch to the off position. If it does not do this for both right and left positions, replace the switch assembly.

CAUTION **Do not connect the battery lead to the white/green wire for more than a few seconds, as it could burn out the solenoid.**

- Remove the lead, turn the ignition switch off, and connect the 9-pin connector and yellow lead.

Wiring inspection

- Install the distance sensor, and connect all the leads and connector.
- Measure the voltage at the 6-pin connector as shown in Table N18.



A. Turn Signal Control Unit **B. 6-pin Connector**

- If any one of the meter reading shows an improper value, check the wiring and connections among the turn signal switch, distance sensor, and turn signal control unit. Replace the turn signal control unit if all of them turn out good.

Table N17 Turn Signal Switch Connections

	Gray	Orange	Green	Red/ White	Ground	White/ Red	Blue/ White
R	●	●				●	●
N				●	●		
L		●	●			●	●

Table N18 Wiring Inspection

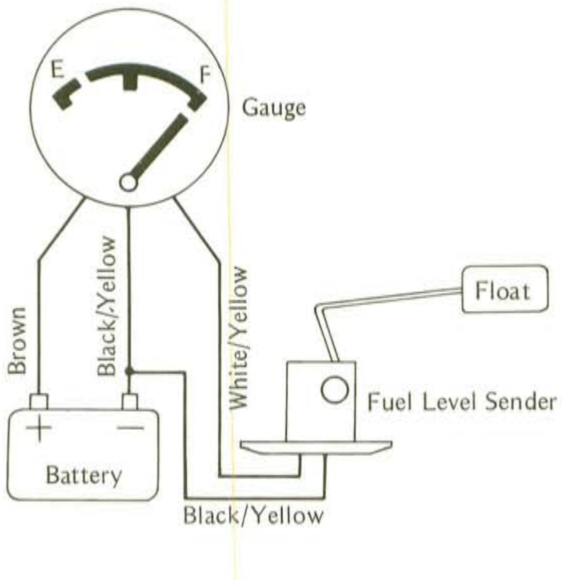
Meter Range	Connections*	Ignition Switch	Selector Switch Position	Turn Signal Switch Position	Reading
25V DC	Meter (+) → Yellow, Blue/White	on	A	Any (R, L, Neu.)	Battery voltage
		off	M or Δ	Any	0 V
	Meter (+) → White/Red	on	A	R or L	Battery voltage
		off	M or Δ	Neutral	0 V

*Connect the meter negative (–) lead to ground.

FUEL GAUGE (KZ1000-D)

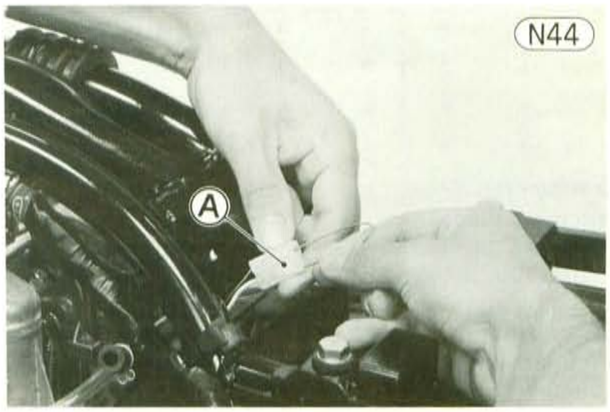
The fuel gauge is electrically operated through a sender in the fuel tank. A float in the tank rides up and down with the level of the fuel, changing the internal resistance of the sender and in this way changing the amount of current flowing through the meter. The gauge is of the bimetal type with a 7-volt voltage regulator built into it for over voltage protection.

Fuel Gauge Circuit (N43)



Gauge circuit check

- Disconnect the 2-pin connector to the sender underneath the fuel tank, and turn on the ignition switch. At this time the gauge should read E.
- Short together the black/yellow and white/yellow leads on the gauge side of the 2-pin connector. At this time the gauge should read F.
- If the above E and F readings are correct, the fuel level sender is bad. If these reading are not obtained, the trouble is with the gauge or wiring.



A. 2-pin Connector

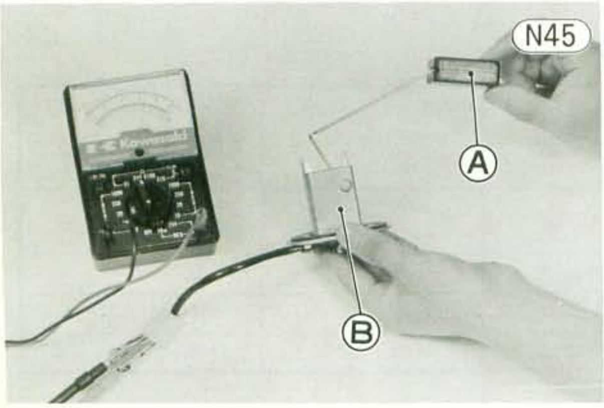
Fuel level sender check

- Drain the fuel tank, and remove the tank.
- Remove the fuel level sender, and check that the float moves up and down smoothly without binding. It should go down under its own weight. If the float does not move smoothly, replace the sender.
- Measure the resistance of the fuel level sender with an ohmmeter.

Table N19 Resistance of Fuel Level Sender

Tank (Float)	Resistance
Full (Highest position)	0.5 ~ 5.5 Ω
Empty (Lowest position)	102 ~ 118 Ω

- If the ohmmeter does not show the values in the table, or the reading does not vary smoothly as the fuel level changes, continue with the following check.

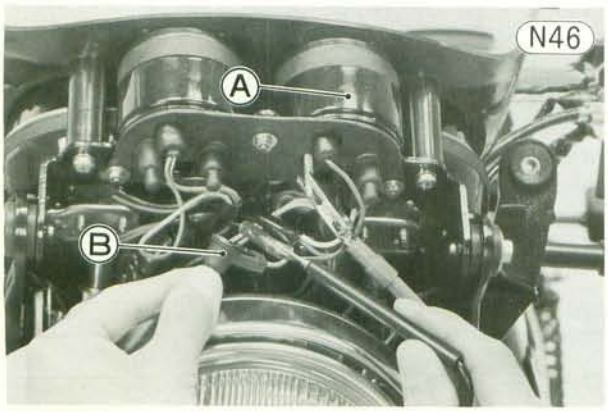


A. Float B. Fuel Level Sender

- Inspect the leads and connector. If they show any damage, replace the sender.

Gauge check

- Remove the fairing.
- Remove the brown lead from the gauge meter, and check the resistance of the meter using an ohmmeter as shown in Table N20. If the resistance in this test is found to be less than the proper value, there is a short in the meter. No reading (∞) indicates an open circuit. In either case, replace the gauge meter.
- Connect the brown lead to the fuel gauge.



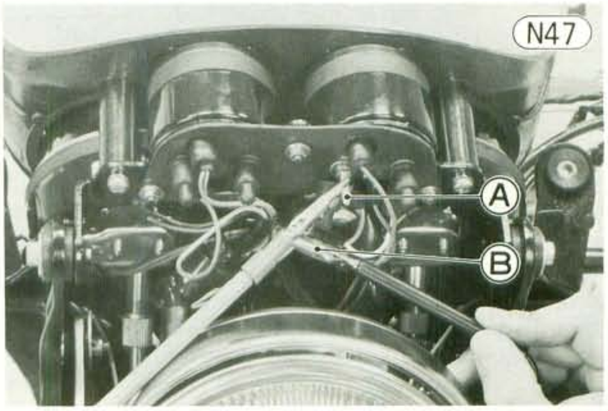
A. Fuel Gauge B. Remove the brown lead.

Table N20 Gauge Resistance

Connections	Reading
One meter lead → Terminal for brown lead	60 ~ 80 Ω
The other meter lead → Black/Yellow lead	

Wiring check

- Connect a voltmeter to the gauge as shown in the table, and turn on the ignition switch. If the voltmeter reading does not correspond to the table, the wiring is bad. Check the leads and connectors, and replace or repair any damaged wiring.



A. Brown Lead Terminal B. Black/Yellow Lead

Table N21 Wiring Check

Meter Range	Connections	Reading
25V DC	Meter (+) → Brown Lead Terminal	Battery voltage
	Meter (–) → Black/Yellow Lead	

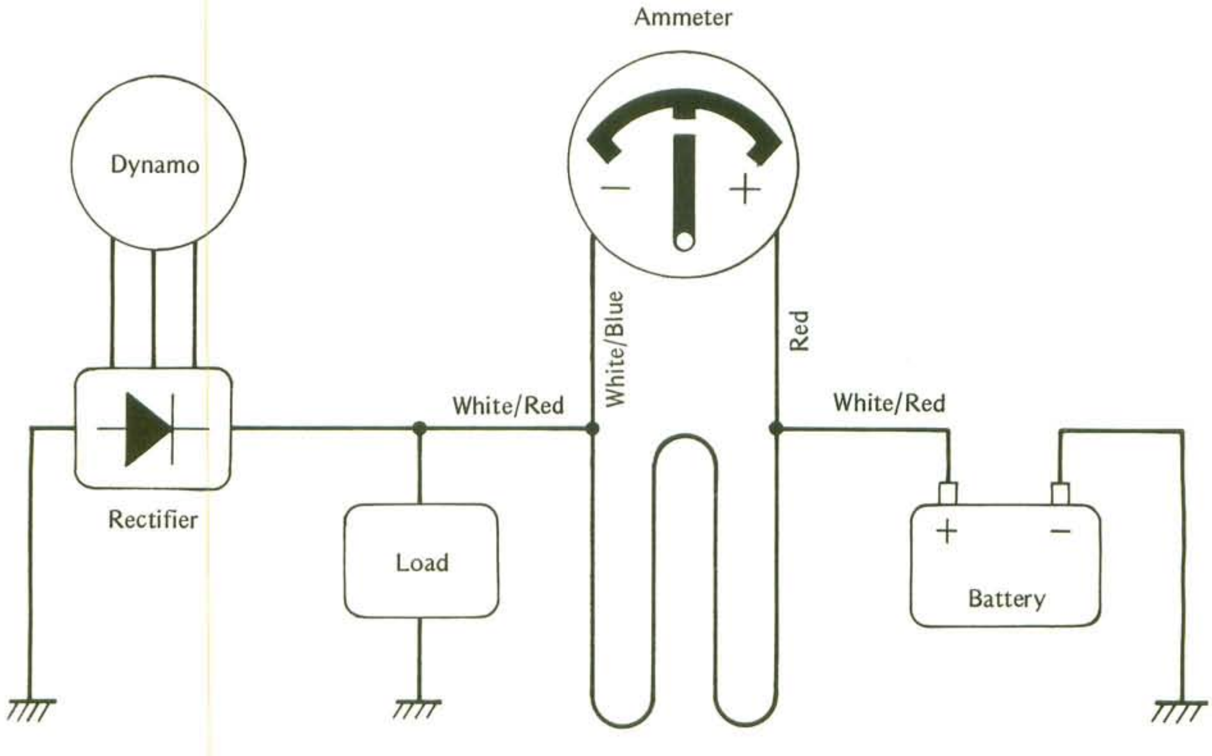
NOTE: With one exception the gauge is considered to be good even if the voltmeter needle fluctuates. The exception is when the trouble is over-indication on the gauge (or indicating near the "F" mark when empty).

AMMETER (KZ1000-D)

The ammeter shows whether the battery is charging (+ side) or discharging (– side). It can also be used to compare the relative amount of charging or discharging that is taking place under different conditions, but it does not show the numerical value of the charging current.

Ammeter Circuit

N48



*This is a lead inside the main wiring harness, cut to a special 1,300 mm length to act as the ammeter shunt. The meter will not indicate properly if the length of this wire is changed or if it is removed.

If the ammeter does not appear to be function properly, check it by the following procedure.

- Remove the fairing and disconnect the red lead and white/blue lead from the ammeter.

CAUTION **Both the red lead and the white/blue lead are connected directly to the battery even when the ignition switch is off, so the positive (+) lead should be disconnected from the battery terminal for safety.**

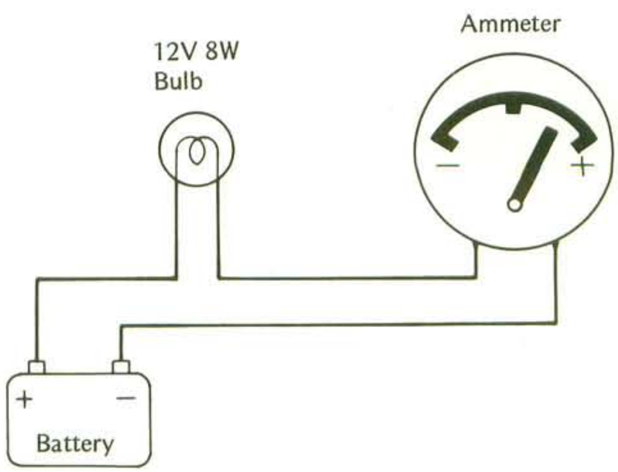
- Obtain a 12V 8W bulb, and connect it in series with the ammeter and a 12V battery as shown. Read the ammeter and then reverse the ammeter leads and read the meter again. In either case the meter should indicate at least halfway to one side. If it does not, replace the meter.

CAUTION **Do not use a bulb rated for other than 12 volts or 8 watts, as the ammeter could be damaged by excessive current.**

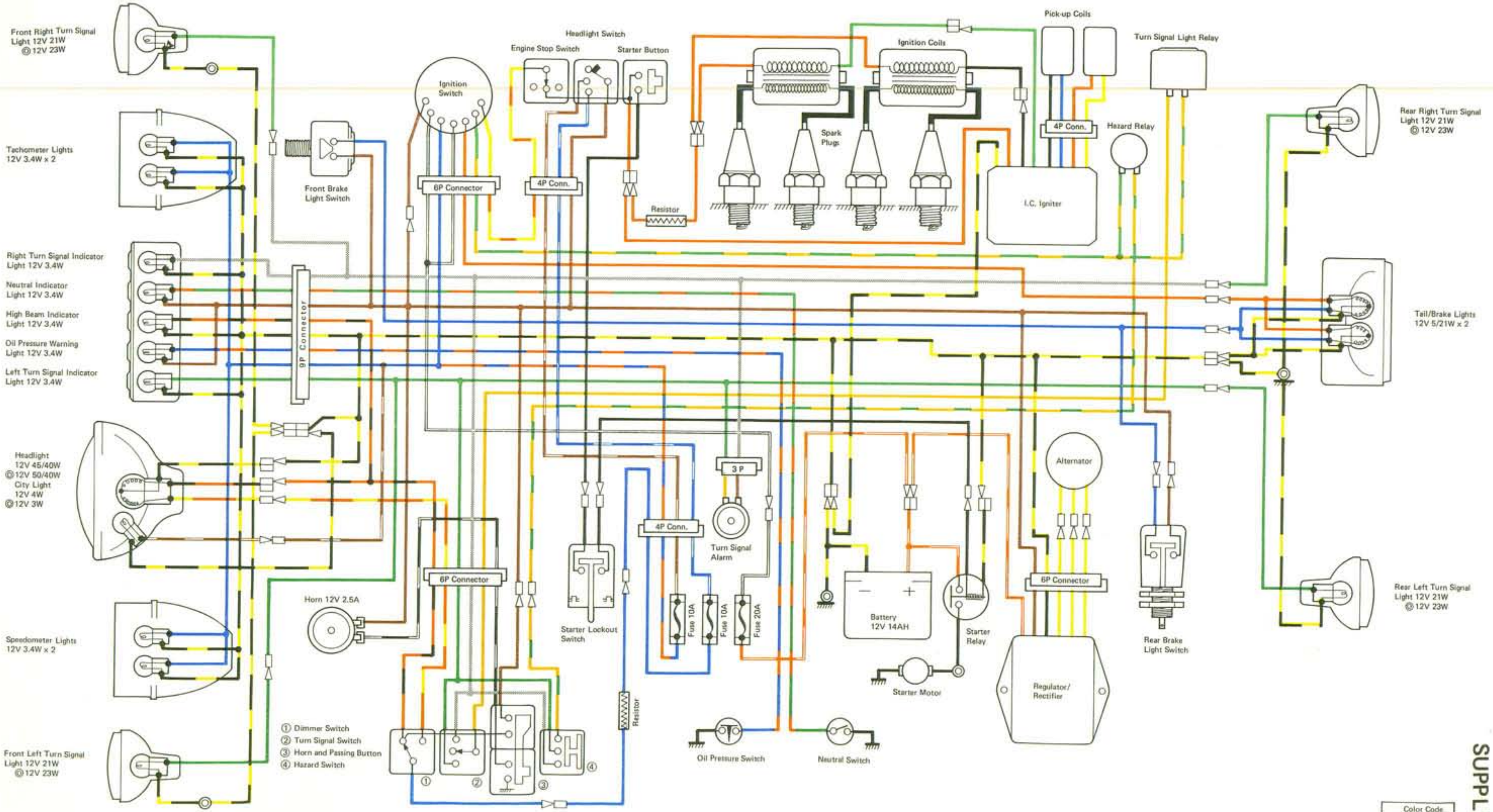
- If the meter checks good, inspect all the related wiring and connectors. Replace any that shows damage.

Ammeter Check

N49



Z1000-A4 Wiring Diagram
(European model)



LEFT HANDLEBAR CONNECTIONS

Dimmer Switch				Turn Signal Switch				Horn and Passing Button						Hazard Switch			
Color	R/Bk	Blue	R/Y	Color	Gray	Orange	Green	Color	Bk/W	⏚	Color	R/Bk	Brown	Color	Green	Gray	O/G
HI				R													
								Push			Push			Push			
LO				L													

IGNITION SWITCH CONNECTIONS

Color	Tail 4	Battery 1	Ignition	Tail 1	Tail 2	Battery 2	Tail 3
Color	Brown	White	Yellow	Blue	Red	White	O/G
OFF							
ON							
PARK							

(1101B)

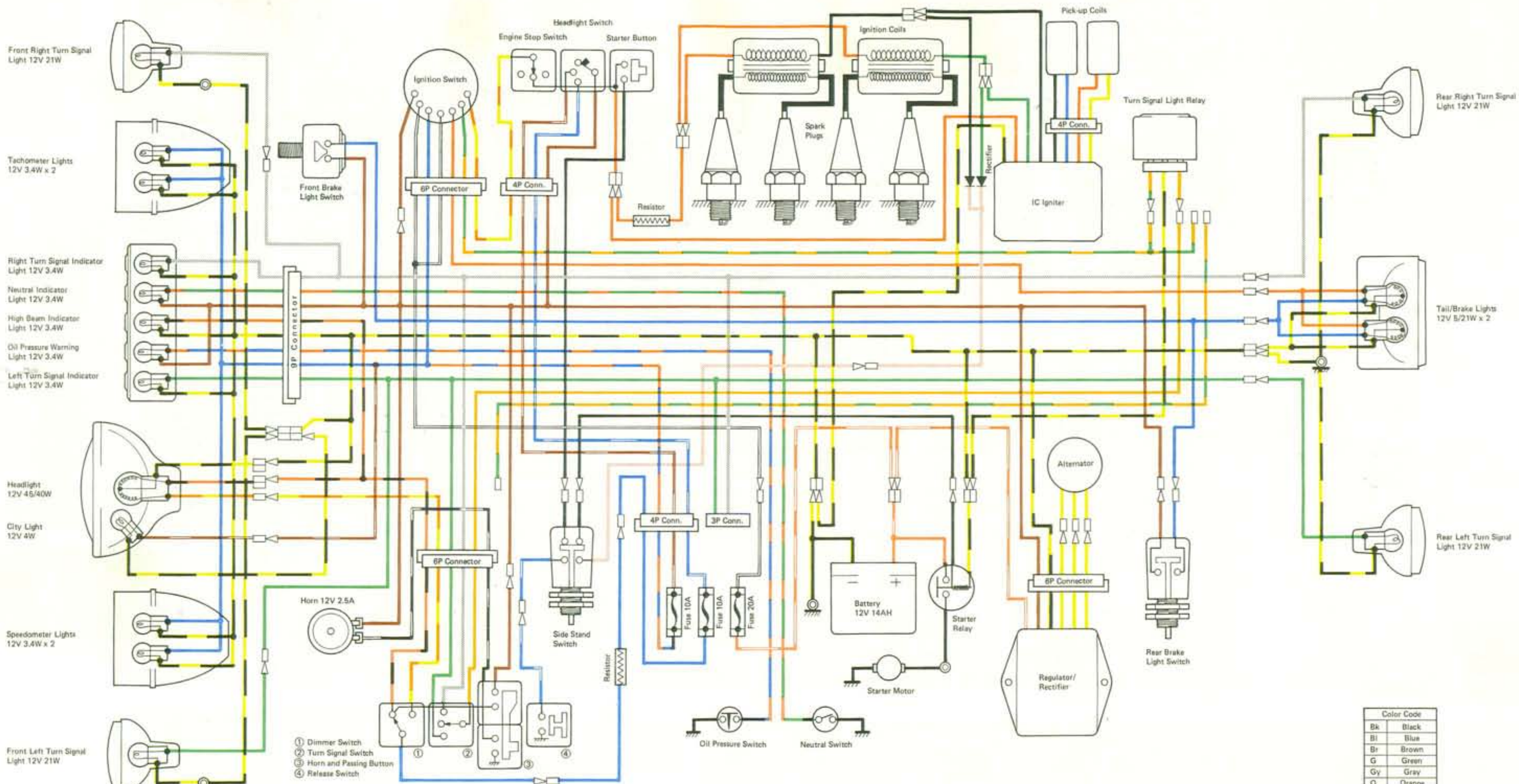
© Model other than European's (1113A)

RIGHT HANDLEBAR SWITCH CONNECTIONS

Engine Stop Switch			Headlight Switch				Starter Button		
Color	Y/R	Red	Color	Brown	Bl/W	Br/W	Color	Black	Y/R
OFF			OFF						
RUN			○				Push		
OFF			ON						

Color Code	
Bk	Black
Bl	Blue
Br	Brown
G	Green
Gy	Gray
O	Orange
P	Pink
R	Red
W	White
Y	Yellow

Z1000-A4 Wiring Diagram (West German Model)



Color Code	
Bk	Black
Bl	Blue
Br	Brown
G	Green
Gy	Gray
O	Orange
P	Pink
R	Red
W	White
Y	Yellow

LEFT HANDLEBAR CONNECTIONS

Dimmer Switch				Turn Signal Switch				Horn and Passing Button						Release Switch		
Color	R/Bk	Blue	R/Y	Color	Gray	Orange	Green	Color	Bk/W	ground	Color	R/Bk	Brown	Color	O/G	ground
HI	○	○		R	○	○								Push		
								Push	○	○	Push	○	○		○	○
LO		○	○	L		○	○									

IGNITION SWITCH CONNECTIONS

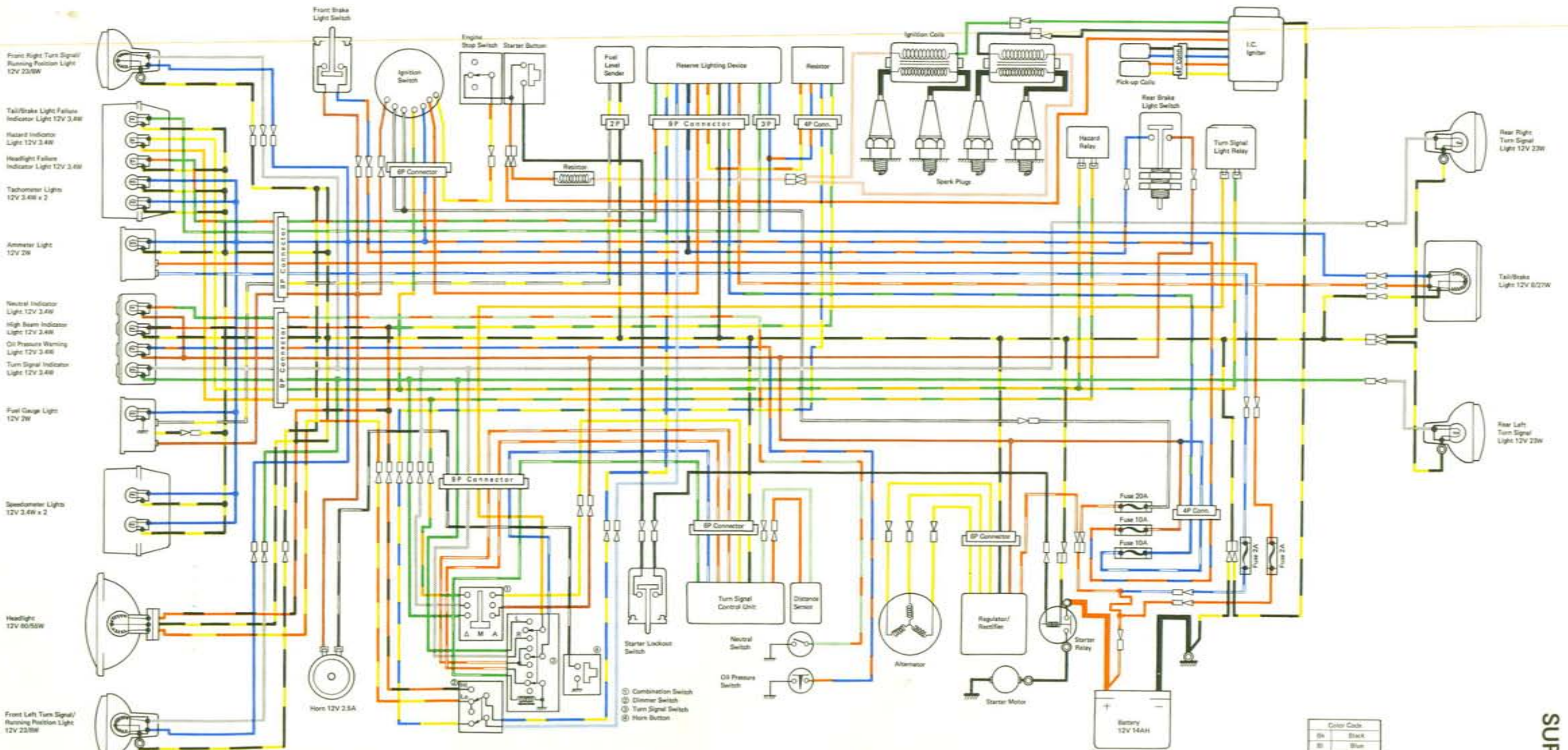
	Tail 4	Battery 1	Ignition	Tail 1	Tail 2	Battery 2	Tail 3
Color	Brown	White	Yellow	Blue	Red	White	O/G
OFF							
ON	○	○	○	○	○	○	○
PARK		○			○	○	○

(11020)

RIGHT HANDLEBAR SWITCH CONNECTIONS

Engine Stop Switch			Headlight Switch				Starter Button		
Color	Y/R	Red	Color	Brown	Bl/W	Br/W	Color	Black	Y/R
OFF			OFF						
RUN	○	○	○	○		○	Push	○	○
OFF			ON	○	○	○			

KZ1000-D3 Wiring Diagram
(US, Canadian Model)



LEFT HANDLEBAR SWITCH CONNECTIONS

Combination Switch						Dimmer Switch						Turn Signal Switch								Horn Button		
	Green	Gray	O/G	Yellow	Brown		R/Bk	Bl/Y	R/Y	Y/Bl	Bl		Gray	Orange	Green	W/R	Bl/W	R/W	Ground		Bk/W	[illegible]
Δ	○	○	○			LO	○	○	○		○	R	○	○		○	○					
M																		○	○	Push	○	○
A				○	○	HI		○	○	○	○	L		○	○	○	○					

IGNITION SWITCH CONNECTIONS

	Ignition	Battery 1	Tail 4	Tail 1	Tail 2	Battery 2	Tail 3
	Yellow	White	Brown	Blue	Red	White	O/G
OFF							
ON	○	○	○	○	○	○	○
PARK		○			○	○	○

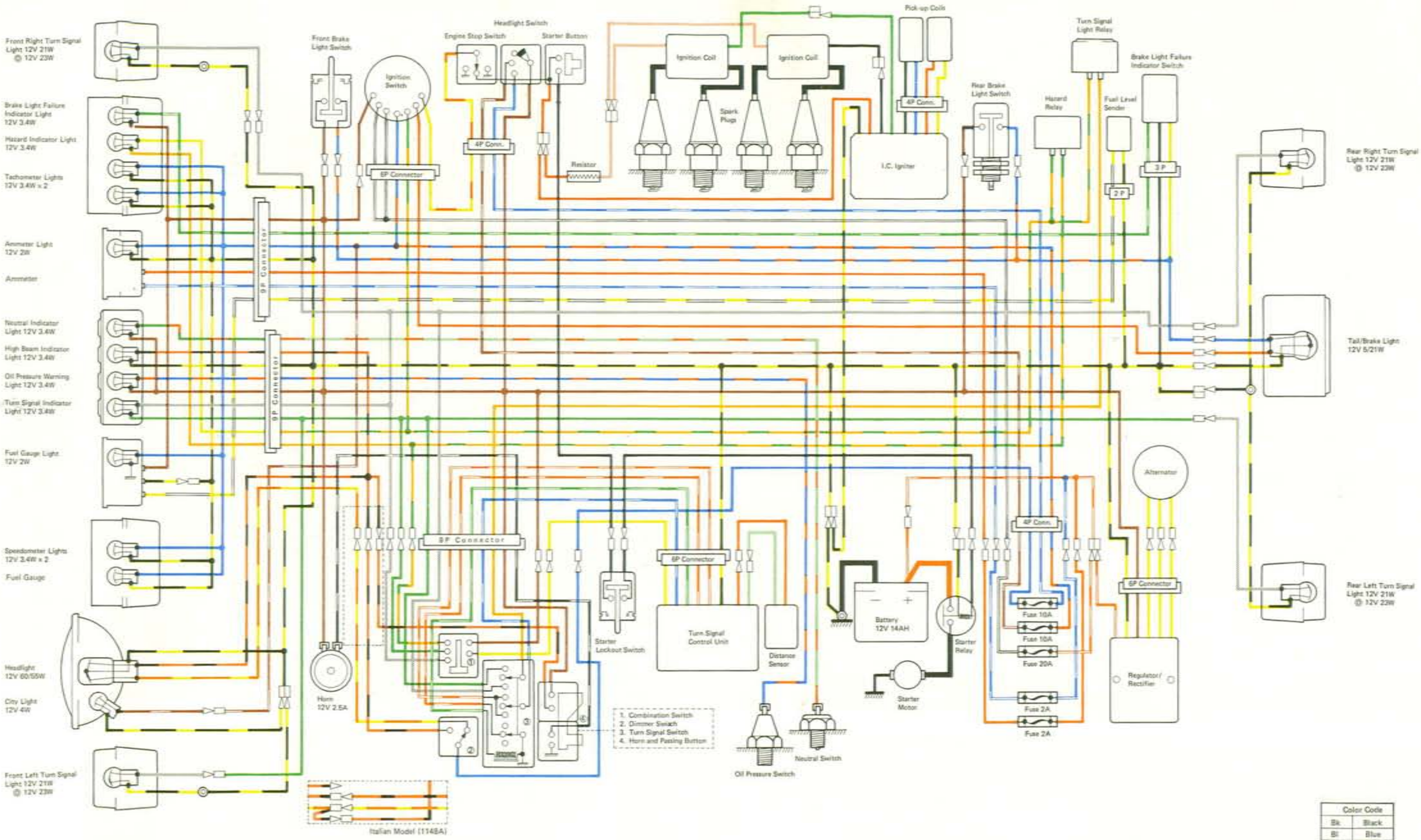
(1114C)

RIGHT HANDLEBAR SWITCH CONNECTIONS

Engine Stop Switch			Starter Button		
	Red	Y/R		Black	Red
OFF					
RUN	○	○	Push	○	○
OFF					

Color Code	
Bk	Black
Bl	Blue
Br	Brown
G	Green
Gy	Gray
LG	Light Green
LB	Light Blue
O	Orange
P	Pink
R	Red
W	White
Y	Yellow

Z1000-D3 Wiring Diagram (European model)



LEFT HANDLEBAR SWITCH CONNECTIONS

Combination Switch						Dimmer Switch				Turn Signal Switch								Passing Button			Horn Button		
	Orange	Gray	O/G	Yellow	Brown		R/Bk	Blue	R/Y		Green	Orange	Gray	W/R	Bl/W	R/W	W/G		Brown	R/Bk		Bk/W	⏚
Δ	○	○	○			HI	○	○		R	○	○		○	○								
M																○	○	Push	○	○	Push	○	○
A				○	○	LO		○	○	L		○	○	○	○								

IGNITION SWITCH CONNECTIONS

	Battery 1	Ignition	Tail 1	Tail 2	Battery 2	Tail 3
	White	Brown	Blue	Red	White	G/O
OFF						
ON	○	○	○	○	○	○
PARK	○			○	○	○

(1146A)

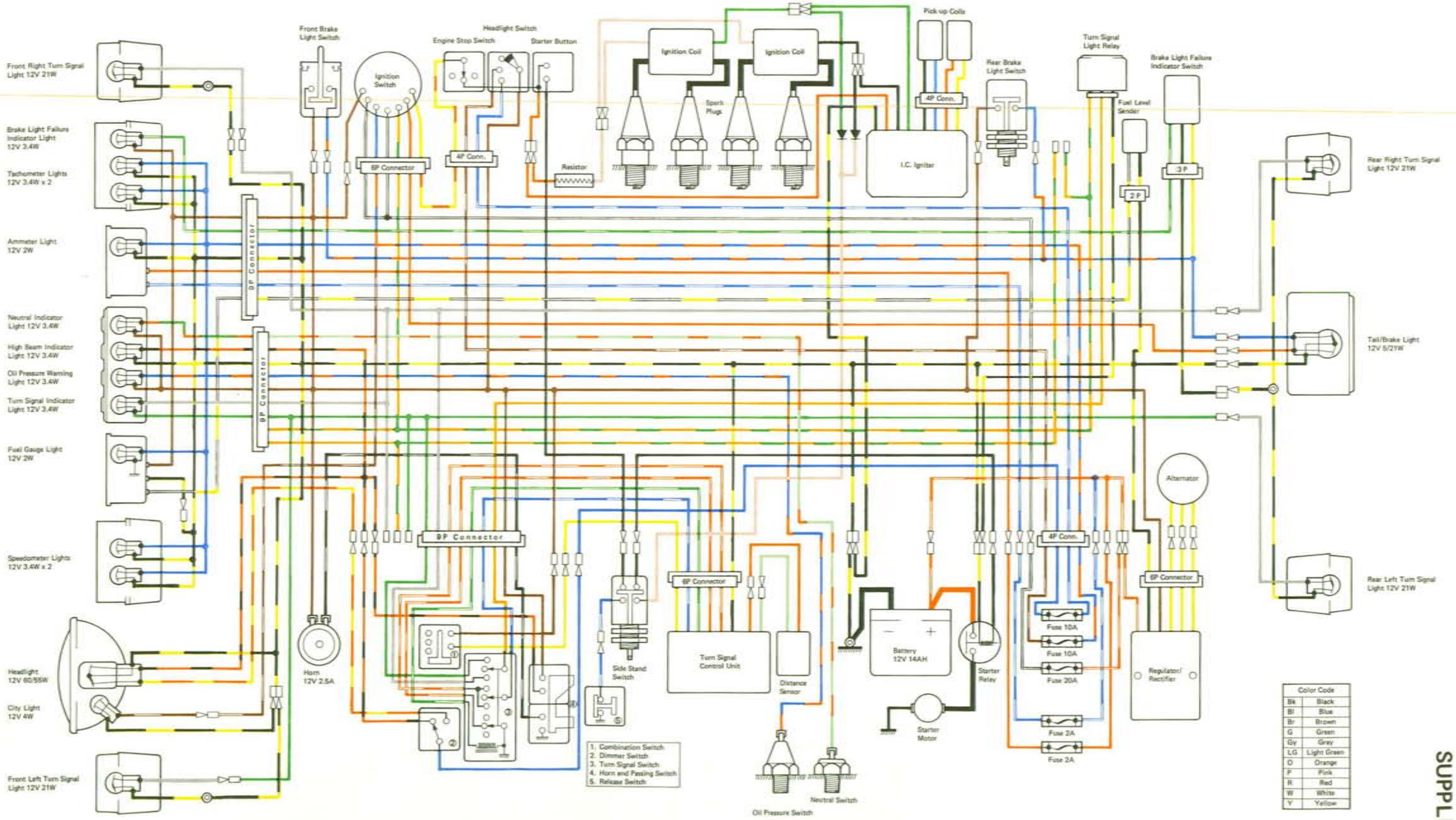
Ⓒ Model other than European's (1150A)

RIGHT HANDLEBAR SWITCH CONNECTIONS

Engine Stop Switch			Headlight Switch				Starter Button		
	Y/R	Red		Brown	Br/W	Bl/W		Red	Black
OFF			OFF						
RUN	○	○	○	○		○	Push	○	○
OFF			ON	○	○	○			

Color Code	
Bk	Black
Bl	Blue
Br	Brown
G	Green
Gy	Gray
O	Orange
P	Pink
R	Red
W	White
Y	Yellow

Z1000-D3 Wiring Diagram
(West German Model)



Color Code	
Bk	Black
Bl	Blue
Br	Brown
G	Green
Gy	Grey
LG	Light Green
O	Orange
P	Pink
R	Red
W	White
Y	Yellow

LEFT HANDLEBAR SWITCH CONNECTIONS

Combination Switch			Dimmer Switch				Turn Signal Switch								Horn and Passing Switch					Release Switch		
	Brown	Yellow		R/Bk	Blue	R/Y		Green	Orange	Gray	W/R	Bl/W	R/W	W/G		Brown	R/Bk	Bk/W	⏚		Bk/W	⏚
Δ			HI	○	○		R	○	○		○	○										
M													○	○	Push	○	○	○	○	Push	○	○
A	○	○	LO		○	○	L		○	○	○	○										

IGNITION SWITCH CONNECTIONS

	Ignition	Battery 1	Tail 4	Tail 1	Tail 2	Battery 2	Tail 3
	Yellow	White	Brown	Blue	Red	White	G/O
OFF							
ON	○	○	○	○	○	○	○
PARK		○			○	○	○

(1147A)

RIGHT HANDLEBAR SWITCH CONNECTIONS

Engine Stop Switch			Headlight Switch				Starter Button		
	Brown	Y/R		Brown	Br/W	Bl/W		Black	Y/R
OFF			OFF						
RUN	○	○	○	○		○	Push	○	○
OFF			ON	○	○	○			

Index

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