SHOP MANUAL

Kawasaki

KS Series



Decimal Equivalents

INCH	MM INCH
1/64 .015625	
1/32 .03125	1mm= .03937 inch
3/64 .046875	
1/16 .0625	
5/64 .078125	2mm= .07874 inch
3/32 .09375	
7/64 .109375	3mm= .11811 inch
1/8 .125	
9/64 .140625	
5/32 .15625	4mm= .15748 inch
11/64 .171875	
3/16 .1875	5mm= .19685 inch
13/64 .203125	
7/32 .21875	
15/64 .234375	6mm= .23622 inch
1/4 .25	
17/64 .265625	7mm= .27559 inch
9/32 .28125	
19/64 .296875	
5/16 .3125	8mm= .31496 inch
21/64 .328125	
11/32 .34375	9mm= .35433 inch
23/64 .359375	
3/8 .375	
25/64 .390625	10mm= .39370 inch
13/32 .40625	
27/64 .421875	11mm= .43307 inch
7/16 .4375	
29/64 .453125	
15/32 .46875	12mm= .47244 inch
31/64 .484375	
1/2 .5	13mm= .51181 inch

INCH	MM INCH
33/64 .515625	
17/32 .53125	
35/64 .546875	14mm= .55118 inch
9/16 .5625	
37/64 .578125	15mm= .59055 inch
19/32 .59375	
39/64 .609375	
5/8 .625	16mm= .62992 inch
41/64 .640625	
21/32 .65625	17mm= .66929 inch
43/64 .671875	
11/16 .6875	
45/64 .703125	18mm= .70866 inch
23/32 .71875	
47/64 .734375	19mm= .74803 inch
3/4 .75	
49/64 .765625	
25/32 .78125	20mm= .78740 inch
51/64 .796875	
13/16 .8125	21mm= .82677 inch
53/64 .828125	
27/32 .84375	
55/64 .859375	22mm= .86614 inch
7/8 .875	
57/64 .890625	23mm= .90551 inch
29/32 .90625	
59/64 .921875	
15/16 .9375	24mm= .94488 inch
61/64 .953125	
31/32 .96875	25mm= .98425 inch
63/64 .984375	
1 1.	

Unit Conversion Table

cc	x	.0610	=	cu in
cc	x	.02816	=	fl oz (imp)
cc	x	.03381	=	fl oz (U S)
cu in	x	16.39	=	cc
fl oz (imp)	x	35.51	=	cc
fl oz (U S)	x	29.57	=	cc
ft-lbs	x	12	=	in-lbs
ft-lbs	x	.1383	=	kg-m
gal (imp)	x	4.546	=	liters
gal (imp)	x	1.201	=	gal (U S)
gal (U S)	x	3.7853	=	liters
gal (U S)	x	.8326	=	gal (imp)
grams	x	.03527	=	oz
in	x	25.40	=	mm
in-lbs	x	.0833	=	ft-lbs
in-lbs	x	.0115	=	kg-m
kg	x	2.2046	=	lb
kg	x	35.274	=	oz
kg/cm^2	x	14.22	=	lbs/sq in
kg-m	x	7.233	=	ft-lbs
kg-m	x	86.796	=	in-lbs
km	x	.6214	=	miles
lb	x	.4536	=	kg
lb/sq in	x	.0703	=	kg/cm^2
liter	x	28.16	=	fl oz (imp)
liter	x	33.81	=	fl oz (U S)
liter	x	.8799	=	qt (imp)
liter	x	1.0567	=	qt (U S)
meter	x	3.281	=	ft
mile	x	1.6093	=	km
mm	x	.03937	=	in
oz	x	28.35	=	grams
qt (imp)	x	1.1365	=	liters
qt (imp)	x	1.201	=	qt (U S)
qt (U S)	x	.9463	=	liters
qt (U S)	x	.8326	=	qt (imp)

$°C \rightarrow °F: \quad \frac{9(°C + 40)}{5} - 40 = °F$

$°F \rightarrow °C: \quad \frac{5(°F + 40)}{9} - 40 = °C$

List of Abbreviations

ABDC ..... after bottom dead center
ATDC ..... after top dead center
BBDC ..... before bottom dead center
BDC ..... bottom dead center
BTDC ..... before top dead center
cc ..... cubic centimeters
cu in ..... cubic inches
fl oz ..... fluid ounces
ft ..... foot, feet
ft-lbs ..... foot-pounds
gal ..... gallon, gallons
hp ..... horsepower
in ..... inch, inches
in-lbs ..... inch-pounds
kg ..... kilogram, kilograms
kg/cm^2 ..... kilograms per square centimeter
kg-m ..... kilogram-meters
km ..... kilometer
kph ..... kilometers per hour
lb, lbs ..... pound, pounds
lbs/sq in ..... pounds per square inch
ℓ ..... liter
m ..... meter, meters
mi ..... mile, miles
mm ..... milimeters
mph ..... miles per hour
oz ..... ounce, ounces
psi ..... pounds per square inch
qt ..... quart, quarts
rpm ..... revolutions per minute
sec ..... second, seconds
SS ..... standing start
TDC ..... top dead center
" ..... inch, inches

SHOP MANUAL

Kawasaki

KS Series

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Printed in Japan First Issue:December 25, 1973

Foreword

This manual is designed primarily for use in a properly equipped shop by motorcycle mechanics 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 by using the proper instruments, and the use of substitute tools may adversely affect safe operation of the motorcycle.

This manual is divided into the following four sections:

(1) Adjustment

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

(2) Disassembly

This section shows the best method for the removal, disassembly, assembly, and installation which are necessary for maintenance and repair. Since assembly and installation are usually the reverse of disassembly and removal, assembly and installation are not explained in detail in many 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 section. An explanation on the structure and functioning of each of the major parts and assemblies is given to enable the mechanic to understand better what he is doing.

(4) Appendix

The appendix in the back of this manual contains miscellaneous information, including a special tool list, a torque table, a table for periodic maintenance, and a troubleshooting guide.

Since this Shop Manual is based on the first production units of the KS125, there may be minor discrepancies between the actual vehicle and the illustrations and text in this manual. Major changes and additions pertaining to later year units will be explained in a supplement following the appendix or by a new edition.

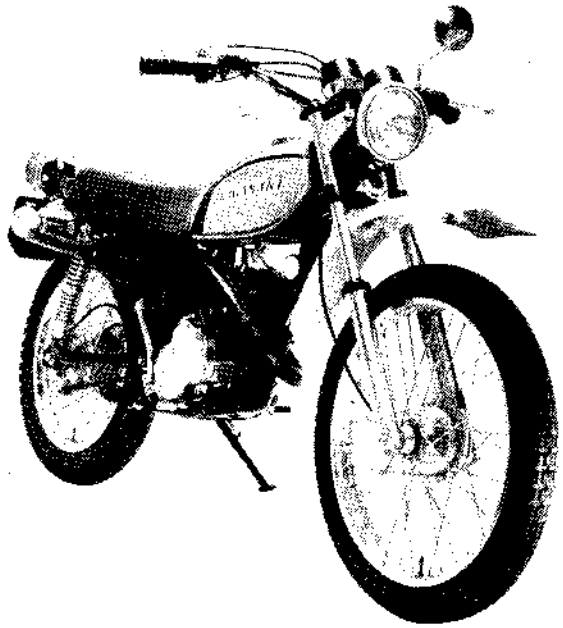


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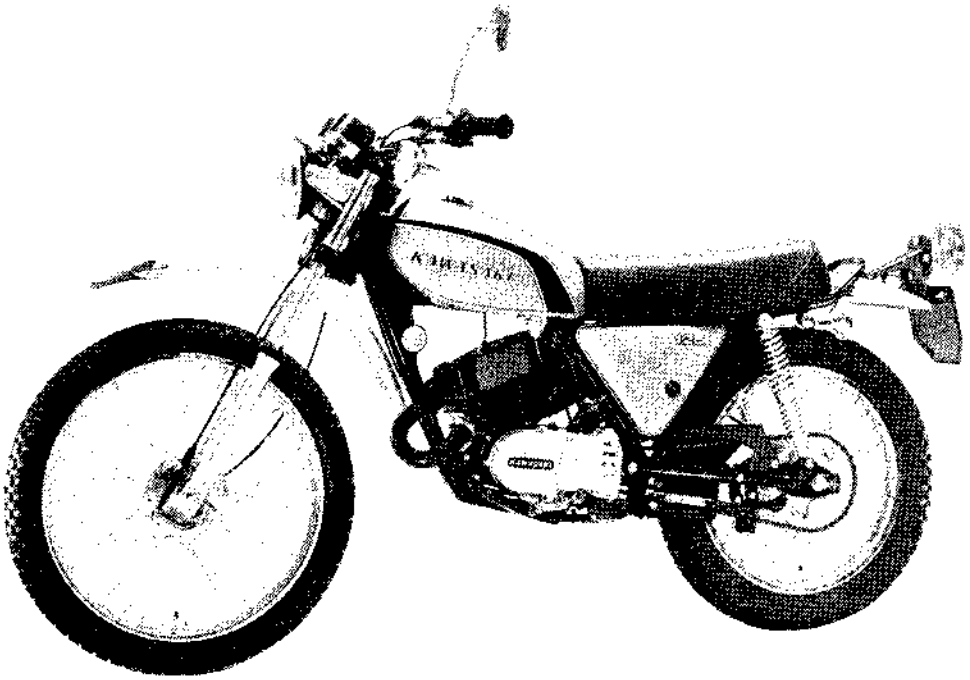
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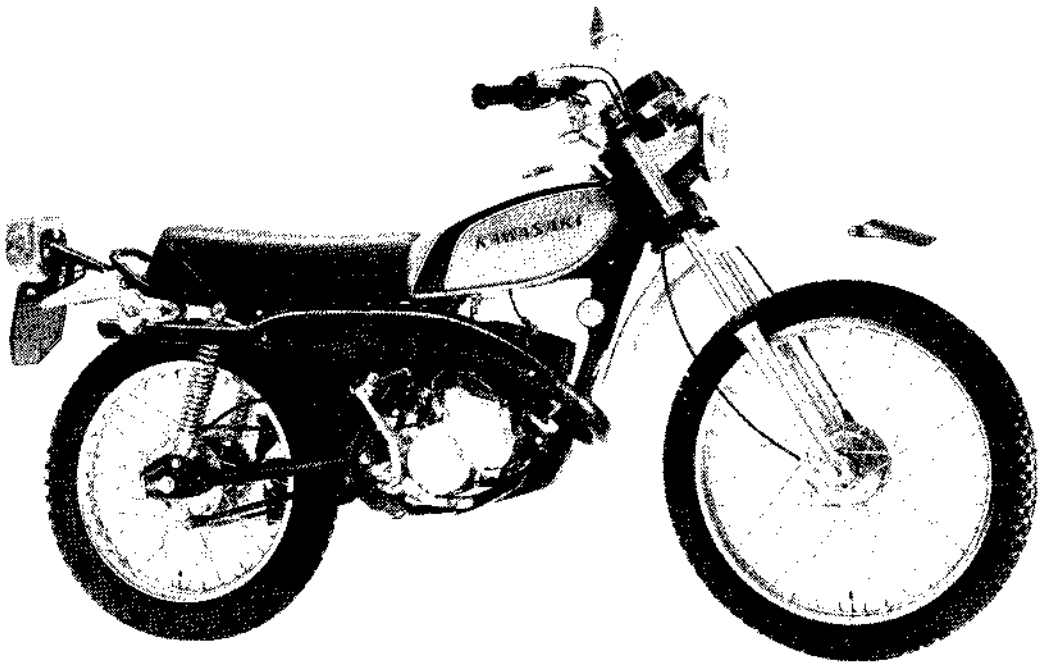
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KAWASAKI

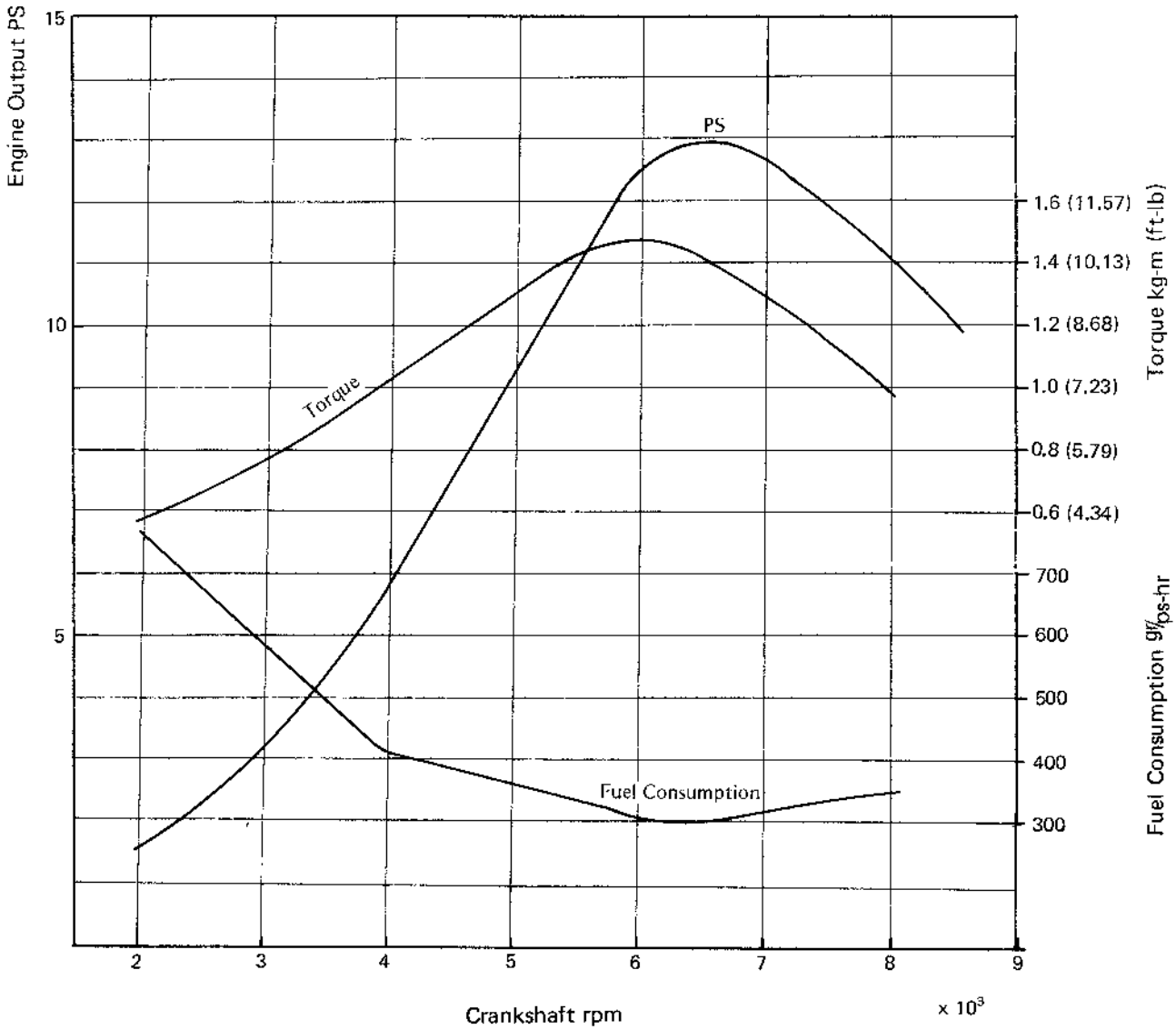
Specifications

Dimensions		
Overall length		2,075 mm (81.7 in.)
Overall width		885 mm (34.8 in.)
Overall height		1,075 mm (42.3 in.)
Wheelbase		1,350 mm (53.1 in.)
Road clearance		245 mm (9.6 in.)
Dry weight		97 kg (214 lb.)
Fuel tank capacity		7.4 ℓ (1.95 U.S. gal.)
Oil tank capacity		1.3 ℓ (1.4 U.S. qt.)
Performance		
Fuel consumption		50 km/ℓ @40 kph (118 mi./gal. @25 mph)
Climbing ability		32°
Braking distance		12 m @50 kph (37 ft. @30 mph)
Minimum turning radius		2.0 m (79 in.)
SS 1/8 mile		11.1 sec.
Engine		
Type		2 stroke, single cylinder, rotary disc valve
Bore and stroke		56 x 50.6 mm (2.2 x 1.99 in.)
Displacement		124 cc (7.56 cu.in.)
Compression ratio		7.0 : 1
Maximum horsepower		13 HP @6,500 rpm
Maximum torque		1.48 kg-m @6,000 rpm (10.7 ft-lbs @6,000 rpm)
Port timing		
Intake	Open	115° B.T.D.C.
	Close	55° A.T.D.C.
Scavenging	Open	56° B.B.D.C.
	Close	56° A.B.D.C.
Exhaust	Open	83° B.B.D.C.
	Close	83° A.B.D.C.
Carburetor type		Mikuni VM24SC
Lubrication system		Superlube (Oil injection)
Engine Oil		2 stroke oil
Starting system		primary kick
Ignition system		Magneto
Ignition timing		23° B.T.D.C./2.52 mm (0.0992 in.) B.T.D.C.
Spark Plug		NGK B-8HCS
Transmission		
Type		6-speed constant mesh, return-shift
Clutch		Wet, multi disc

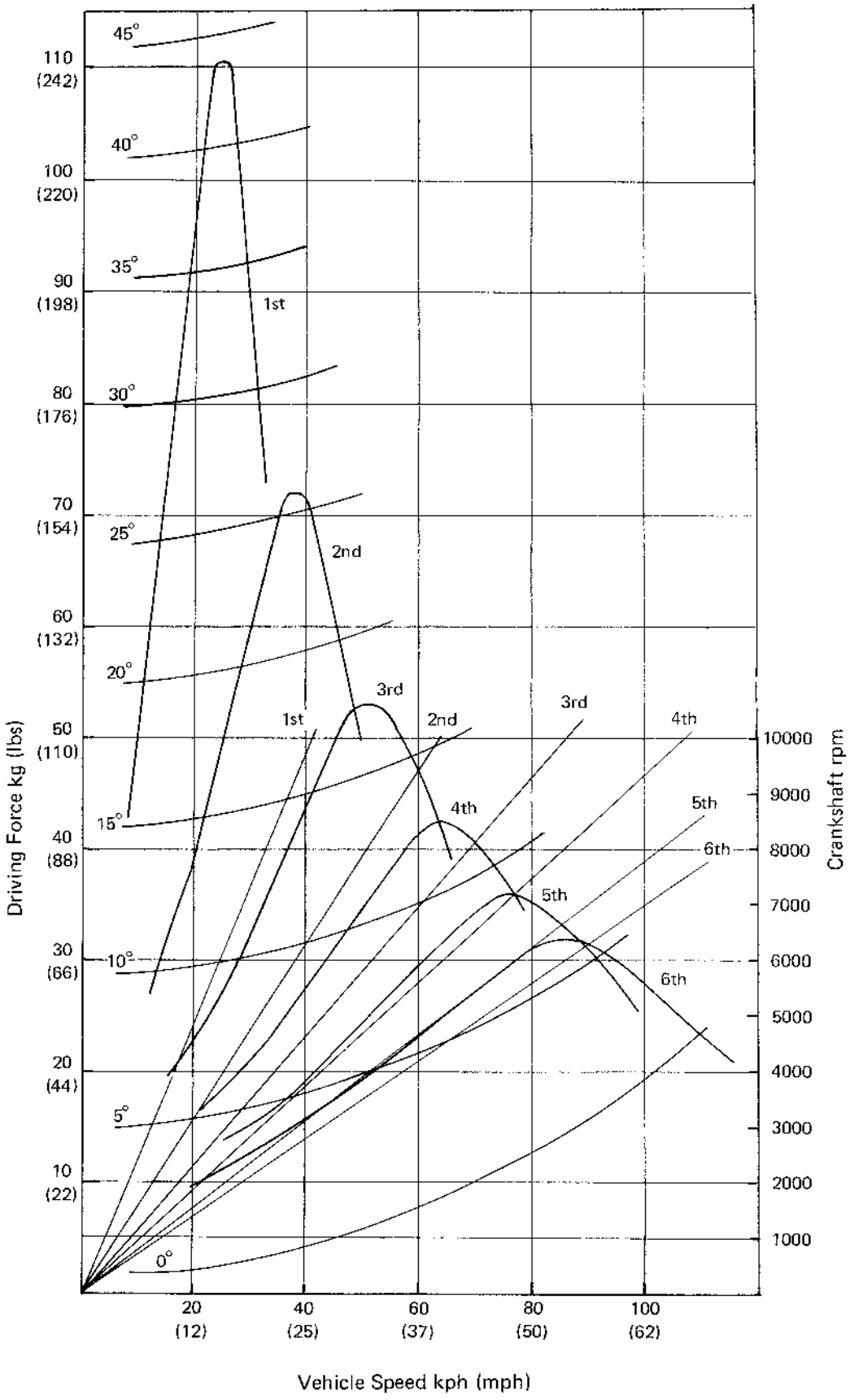
Gear ratios:		
1st		2.60 (26/10)
2nd		1.69 (22/13)
3rd		1.25 (20/16)
4th		1.00 (22/22)
5th		0.84 (16/19)
6th		0.75 (15/20)
Primary reduction ratio		3.14 (69/22)
Final reduction ratio		3.57 (50/14)
Overall drive ratio		8.40 (6th)
Transmission oil capacity		0.65 ℓ (0.69 qt.)
Transmission oil		SAE 10W-30 or 10W-40
Electrical equipment		
Flywheel magneto		Kokusan FP6109
Ignition coil		Kokusan IG3122
Battery		6V6AH
Headlight type		Sealed beam
Headlight		6V30/30W
Tail/Brake light		6V5.3/25W
Speedometer light		6V1.5W
Tachometer light		6V1.5W
Neutral indicator light		6V1.5W
High beam indicator light		6V1.5W
Turn signal lights		6V17W x 4
Horn		6V1.8A
Frame		
Type		Tubular signal cradle
Steering angle		50° to either side
Caster		59°
Trail		135 mm (5.3 in.)
Tire size	Front	2.75–21 4PR
	Rear	3.50–18 4PR
Suspension	Front	Telescopic fork
	Rear	Swing arm
Suspension stroke	Front	150 mm (5.91 in.)
	Rear	90 mm (3.54 in.)
Front fork oil capacity (per shock absorber)		145 ~ 155 cc (4.9 ~ 5.3 U.S.fl.oz.)
Front fork oil		SAE 5W–20
Brake		
Type		Internal expansion, leading-trailing
Inside diameter	Front	120 x 28 mm (4.72 x 1.1 in.)
	Rear	130 x 28 mm (5.12 x 1.1 in.)

Specifications subject to change without notice.

Engine Performance Curves



Runnig Performance Curves



Adjustment

THROTTLE CONTROL CABLE

The throttle control cable is actually an assembly of three cables: the throttle grip cable, the carburetor cable, and the oil pump cable. The throttle grip cable runs from the throttle grip to the cable assembly junction where it connects to the carburetor cable, which leads to the carburetor, and the oil pump cable, which leads to the oil pump.

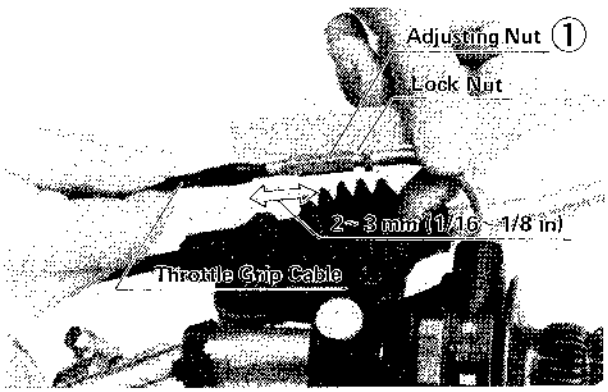
Since the throttle grip controls both the carburetor and the oil pump simultaneously, it is important that each cable be adjusted to its designated base position so that the quantity of oil and fuel/air mixture reaches the engine in the correct proportion at all throttle openings. Stretching of the cables creates excess play at the throttle grip and alters the base positions of the cables at the carburetor and the oil pump, necessitating periodic adjustment.

Throttle Grip Cable

The throttle grip cable, connecting to both the carburetor cable and the oil pump cable, controls both the carburetor throttle valve and the oil pump lever. If there is too much play in the cable, neither the carburetor nor the oil pump will respond immediately when the grip is turned. Most of this excess play must be adjusted out. However, a small amount has to be left so that the steering movement will have no effect on the throttle valve or oil pump lever.

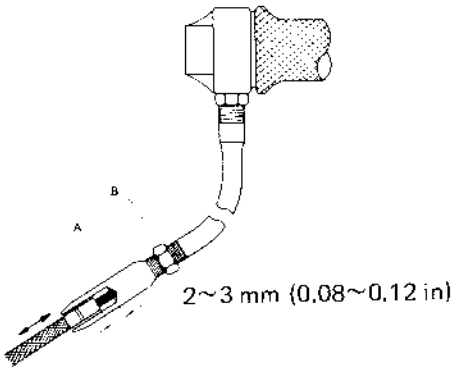
To determine the amount of cable play, first place a ruler alongside the upper end of the throttle grip cable as shown in Fig. 1 . Then pull out and push in the outer cable; the amount of cable travel is the amount of cable play. The proper amount of play is 2 ~ 3 mm ($^1/_{16}$ ~ $^1/_8$ in). If the play is insufficient or excessive, adjust the cable.

- Loosen the lock nut at the throttle grip end of the throttle grip cable.
- Turn the adjusting nut until the proper amount of throttle grip play is reached.
- Tighten the lock nut.



- Check the oil pump cable adjustment.
- If the throttle grip cable had insufficient play, adjust the carburetor cable.

Throttle Grip Adjustment ②

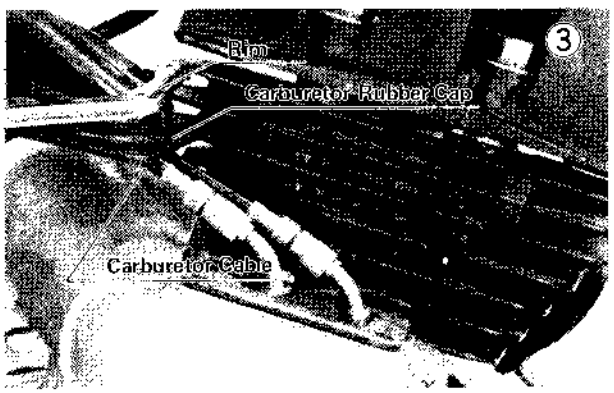


Carburetor Cable

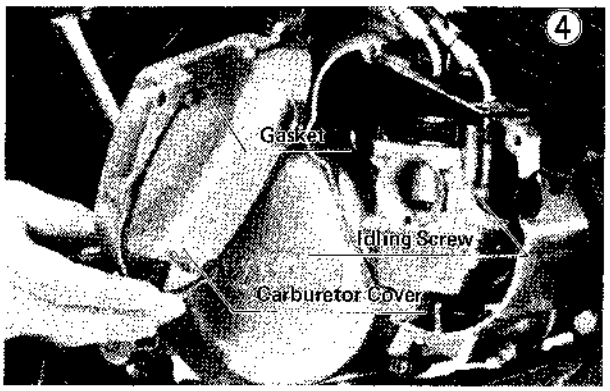
The carburetor cable forms one of the two lower branches of the throttle control cable assembly. It is adjusted so that, should the throttle valve be closed fully (not at idle but all the way down), all the play in the carburetor cable would be taken up.

The play that develops as the cable stretches will cause a delayed engine response, and should faulty adjustment cause the cable to pull the throttle valve out of its rest position, proper idling cannot be achieved. If the carburetor cable is out of adjustment, the oil and fuel/air mixture ratio will be incorrect, resulting in over or under-lubrication. Adjust the carburetor cable whenever the throttle does not respond properly and at least every 3,000 km (2,000 mi) to compensate for cable stretch.

- Remove the nuts (2) from the muffler exhaust collar.
- Remove the bolts (2) that connect the muffler to the frame and to the bracket at the rear shock absorber, and then remove the muffler and gasket.
- Check to see that the throttle grip has the proper amount of play (Pg. 9).
- Remove the bolts (4) from the carburetor rim, and slide the rim and carburetor rubber cap up the cables.



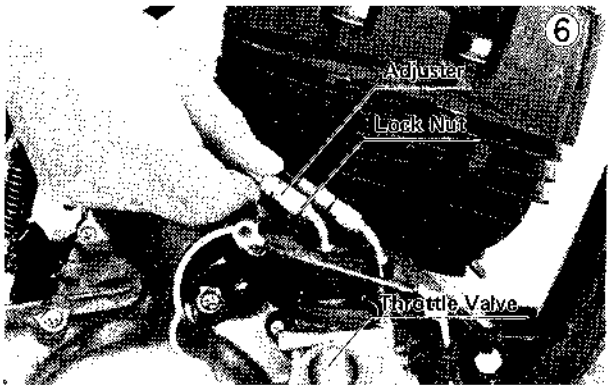
•Remove the carburetor cover and gasket, and pull out the cap from the hole to the idling screw.



•Back out the idling screw (throttle stop screw) 3 or 4 turns.



•Loosen the lock nut, and turn in the adjuster so that the throttle valve is at its lowest possible position.



•Being careful not to turn the adjusting nut so far that the throttle valve rises out of its lowest position, turn the adjuster back out to eliminate the play so that the slightest tug on the outer cable will affect the throttle valve.
•Tighten the lock nut.
•Replace the carburetor cover and gasket, slide back the carburetor rubber cap and rim, and tighten the rim bolts.
•Fit the muffler and gasket back into the cylinder exhaust port, and loosely tighten the bolts that connect the muffler to the frame and to the bracket at the rear shock absorber.
•Replace the muffler exhaust collar nuts, tightening them together so that they tighten evenly to avoid an exhaust leak. Be sure that the spring side of the nuts face out.
•Tighten the muffler mounting bolts.
•Check to see that the throttle grip has the proper amount of play (Pg. 9).
•Turn in the idling screw 3 or 4 turns, and start the engine.
•Warm the engine up for 5 minutes, and then adjust the idling speed with the idling screw to the lowest stable speed obtainable, which will normally be 1,300 rpm.
•Replace the cap on the idling screw hole.

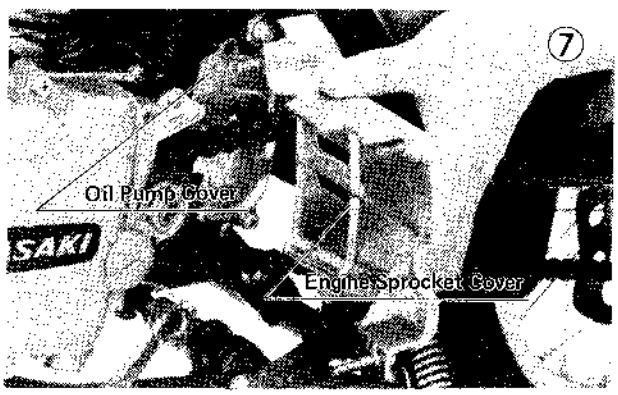
NOTE: After this adjustment has been completed, a certain amount of play will exist between the carburetor inner cable and the throttle valve, the extent of which may be detected by taking out the adjuster clip and pulling on the outer cable. This play, which is the proper amount for a correct oil and fuel/air mixture ratio, must not be altered. To ensure the proper ratio, the oil pump alignment marks should be checked after the carburetor cable adjustment.

Oil Pump Cable

The oil pump cable forms one of the two lower branches of the throttle control cable assembly and connects to the oil pump lever. The cable must be kept adjusted so that the oil pump output which is dependent on throttle movement is minimal at zero throttle and increases at a predetermined throttle opening. This adjustment is correct when the lower mark on the oil pump lever lines up with the mark on the oil pump lever stopper at zero throttle.

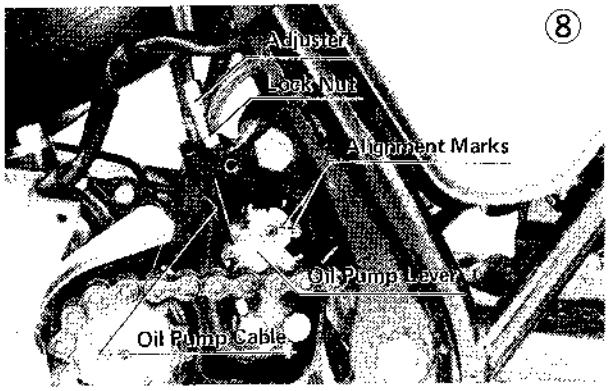
If adjustment is neglected or not carried out properly whenever necessary, the oil supply to the engine will become too low or too high, resulting in piston seizure from under-lubrication or poor performance and spark plug trouble from over-lubrication. The oil pump cable must be adjusted whenever the oil pump marks are found to be misaligned at zero throttle. At least every 3,000 km (2,000 mi) and whenever white exhaust smoke is observed or an oil insufficiency is suspected, check the oil pump alignment marks, and then, if necessary, adjust the oil pump cable.

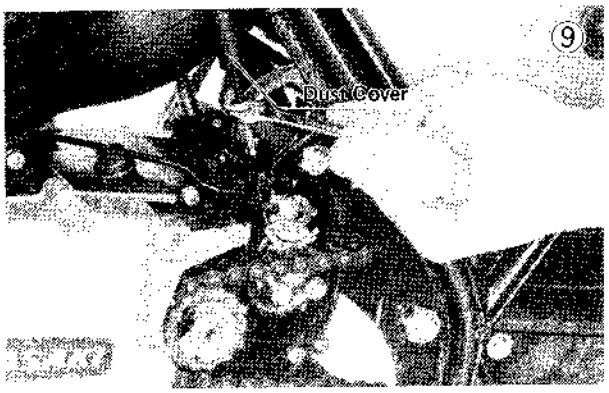
•Check that the throttle grip has the proper amount of play (Pg. 9).
•Remove the engine sprocket cover and oil pump cover.



•If the marks are not properly aligned, slide up the adjuster dust cover, loosen the adjuster lock nut, and turn the adjuster so that with the throttle grip fully closed the lower mark on the oil pump lever lines up with the mark on the lever stopper.

NOTE: The upper mark on the oil pump lever is designed to line up with the mark on the lever stopper when the throttle grip is fully open. It may be used to check whether or not the throttle grip is opening fully.





•Tighten the lock nut, and slide back the adjuster cover.
•Replace the oil pump cover and engine sprocket cover.
•Check that the throttle grip has the proper amount of play (Pg. 9).

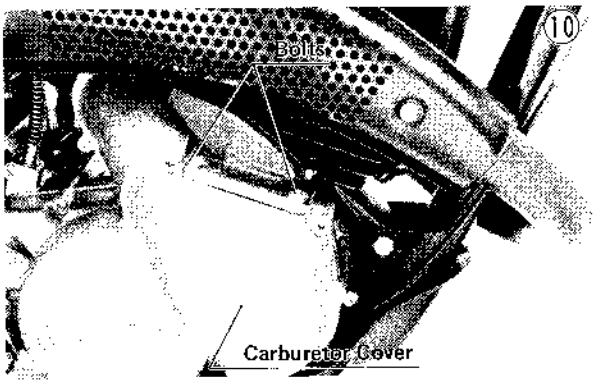
CARBURETOR

Although some internal carburetor parts can be adjusted by replacement, repositioning, etc., these adjustments are covered in the Maintenance Section of this manual. The following procedure covers the idling adjustment, which is the adjustment necessary in periodic maintenance and whenever the idling setting has been disturbed.

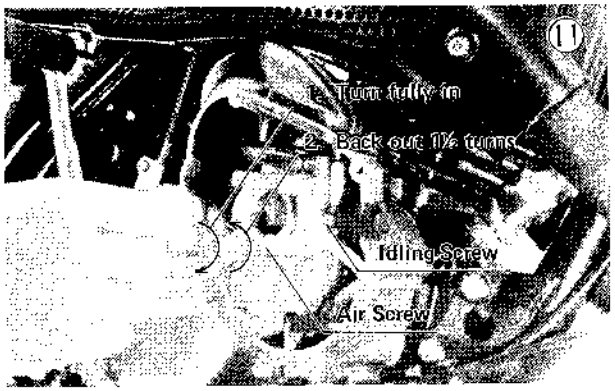
When the idling speed is too low, the engine may stall, and when the idling speed is too high, the fuel consumption becomes excessive, and a resulting lack of engine brake may make the motorcycle difficult to control.

For a proper fuel/air mixture at idling and low speed, it is important when adjusting the idling that the proper setting of the air screw is not neglected.

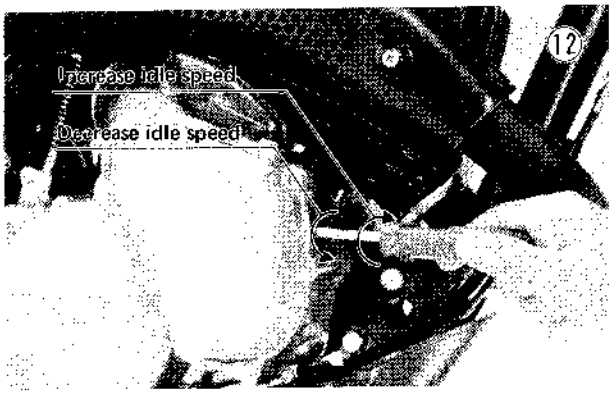
•Remove the carburetor rim bolts (2) which screw into the carburetor cover.



•Remove the carburetor cover.
•Turn in the air screw fully but not tightly, and then back it out 1½ turns.



•Replace the carburetor cover and tighten the rim bolts with 0.4~0.5 kg-m (35~43 in-lbs) of torque.
•Warm up the engine for about 5 minutes.
•Pull out the cap from the idling screw grommet.
•Adjust the idling speed with the idling screw to the lowest stable speed obtainable, which will normally be 1300 rpm. Turning the idling screw clockwise raises engine speed, while turning it counterclockwise lowers it.



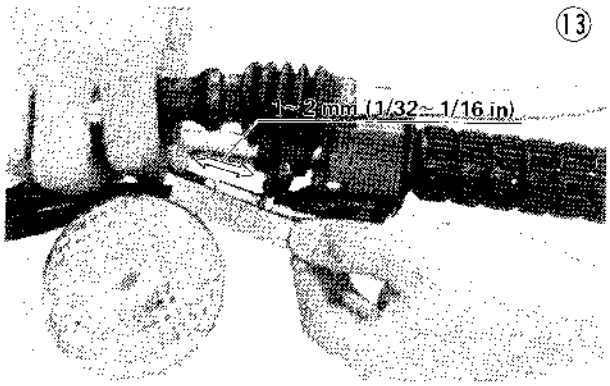
- Turn the throttle grip a few times to make sure that the idling speed is not changed after the grip is returned. Readjust if necessary.
- Turn the handlebar from side to side while idling the engine. If idling speed varies, the throttle control cable assembly may be poorly routed or the throttle grip cable play insufficient.
- Replace the idling screw grommet cap.

NOTE: The ignition timing must be correct for proper idling adjustment.

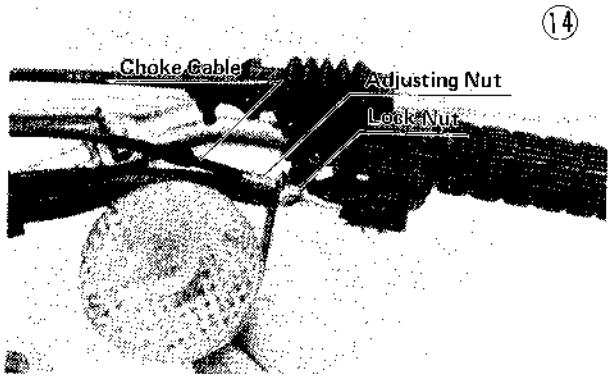
CHOKE CABLE

If the choke cable (more appropriately called a starter cable) is left too loose, the starter plunger may not open far enough when the choke lever is used. If the cable does not have enough play, the starter plunger may not fully close when the choke lever is returned, and the engine will always be running on too rich a mixture.

To determine the amount of cable play, first check to see that the choke lever is all the way returned to the left, and place a ruler alongside the upper end of the choke cable as shown in Fig. 13 . Then pull out and push in the cable; the amount of cable travel is the amount of cable play. The proper amount of play is 1 ~ 2 mm (1/32 ~ 1/16 in). If the play is insufficient or excessive, adjust the choke cable.



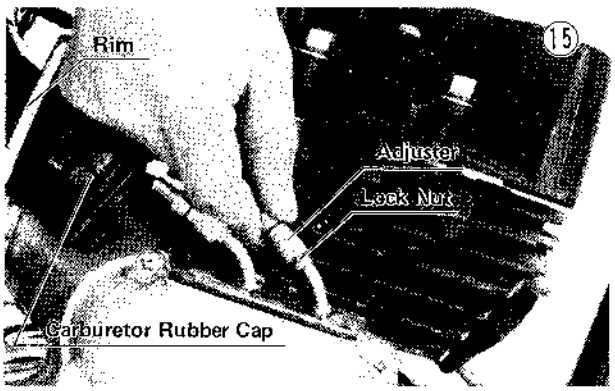
- Loosen the lock nut at the upper end of the choke cable, and turn the adjusting nut until the cable has the proper amount of play.



- Tighten the lock nut.

If the proper amount of play cannot be obtained with the adjusting nut at the upper end of the cable, carry out the following steps:

- Remove the muffler (Pg. 30).
- Remove the bolts (4) from the carburetor rim, and slide the rim and carburetor rubber cap up the cable to gain access to the adjuster at the lower end of the choke cable.
- Loosen the lock nut, and turn the adjuster until the cable has the proper amount of play.

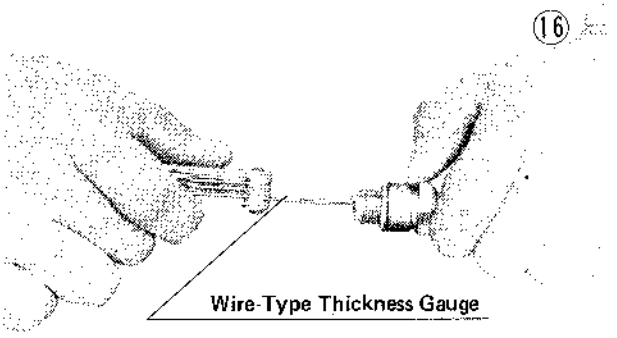


- Tighten the lock nut.
- Slide back the carburetor rubber cap and rim, and tighten the rim bolts.
- Install the muffler (Pg. 30).

SPARK PLUG

Spark plug electrode wear will widen the gap and cause missing and difficulty in starting. Too narrow a gap as a result of maladjustment will also result in poor performance since the small gap will produce only a weak spark.

- Remove the spark plug using a spark plug wrench.
- Clean off the electrodes, and measure the gap with a wire-type thickness gauge. The gap should be 0.6 ~ 0.7 mm (0.024~0.028 in); if it is not, bend the outer electrode with a suitable tool to obtain the correct gap.



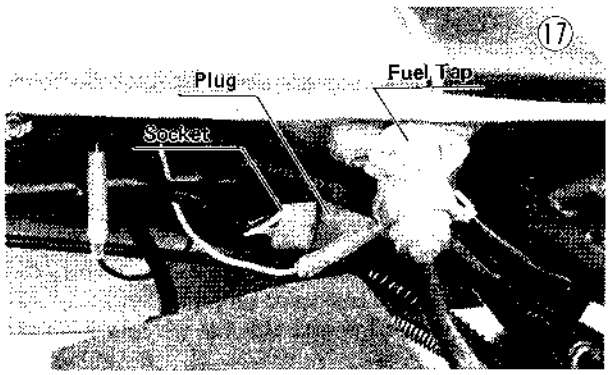
- Tighten the spark plug into the cylinder head with 2.5~3.0 kg-m (18.5~21.0 ft-lbs) of torque.

IGNITION TIMING

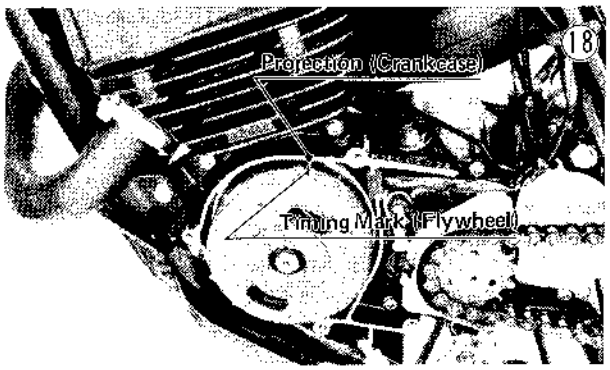
Incorrect ignition timing can cause poor performance, knocking, overheating, and serious engine damage. Periodic adjustment will be necessary to compensate for wear of parts, and the ignition timing must be checked whenever ignition related parts have been disassembled or replaced.

Correct ignition timing is achieved by adjusting through the inspection window of the magneto flywheel the position of the contact breaker base so that the points are just beginning to open when the timing mark on the outer circumference of the flywheel aligns with the timing projection on the crankcase, or when the piston is positioned 2.52 mm (0.0992 in) BTDC (before top dead center) by the use of a dial gauge. When the timing mark is aligned with the timing projection, the piston is positioned 2.52 ± 0.22 mm (0.0992 ± 0.009 in) BTDC, by which the ignition can be set for good performance. However, superior performance is generally achieved by having ignition take place as close as possible to 2.52 mm BTDC. When precise ignition timing is desired, a dial gauge is used in place of the timing mark and projection to set the position of the piston. Once the timing has been adjusted, it may be checked for accuracy by the use of a strobe light. There is no adjustment for maximum point gap.

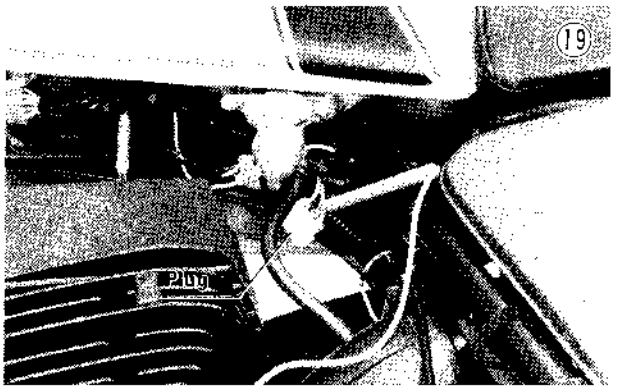
- Remove the engine sprocket cover and left engine cover.
- Undo the white socket and plug from where they connect near the fuel tap.



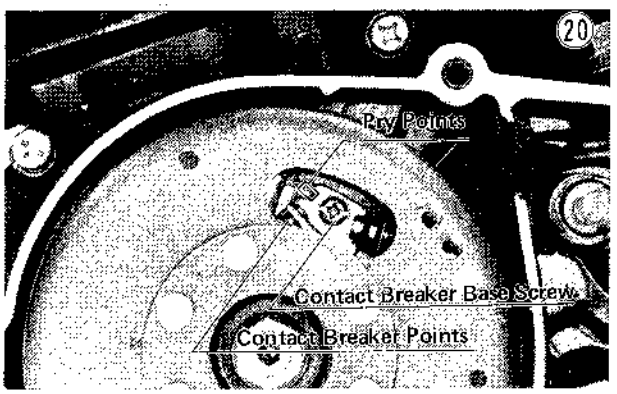
- Turn the magneto flywheel clockwise until the left line (timing mark) on the flywheel outer circumference aligns with the projection on the crankcase. (The line to the right indicates where the woodruff key groove is located on the flywheel hub to facilitate flywheel installation).



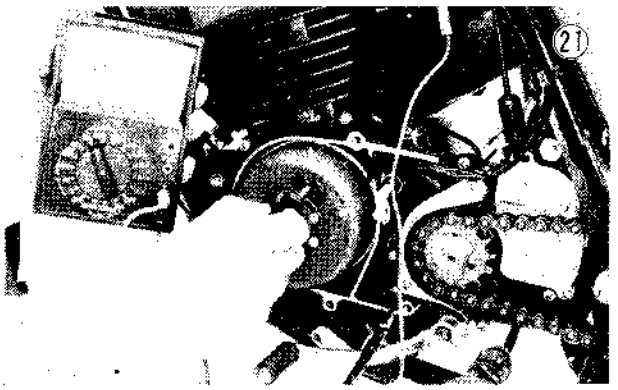
- Connect an ohmmeter set to the Rx1 range across the contact breaker points by securing one lead to chasis ground (such as the crankcase) and inserting the other lead into the hole where the black magneto output lead connects to the white plug. Be sure that the ohmmeter leads are connected with firm electrical contact.



- Loosen the contact breaker base screw just enough to allow the base to move.



- Use a screwdriver on the pry points to adjust the position of the contact breaker base until the contact breaker points are just at the point of opening. The ohmmeter needle starts to rise when the points just begin to open. Note that total needle travel as the points open is only about 3Ω.

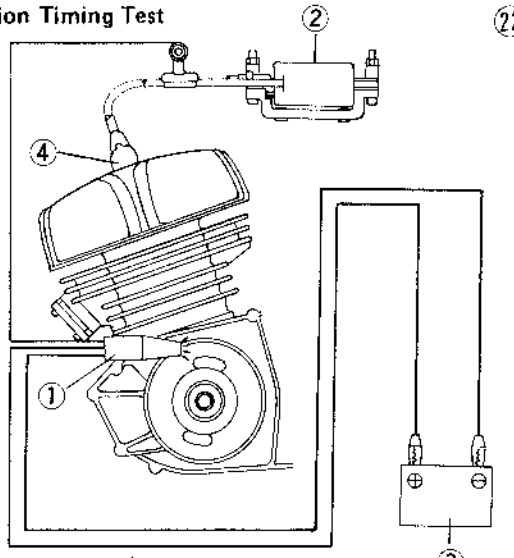


- Once the base seems properly positioned, tighten the base screw, rotate the flywheel a little clockwise, and then slowly rotate it counterclockwise. When the needle starts to rise, the timing mark and projection should be aligned. If they are not, readjust and recheck until the correct contact breaker base position is reached.
- Disconnect the ohmmeter, and reconnect the white plug and socket, being careful not to reverse the connection.

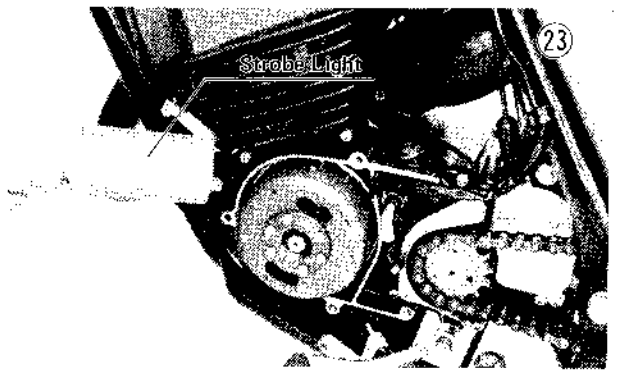
To check to see whether or not the ignition timing is correctly set, a strobe light may be used.

- Connect the light in the manner prescribed by the manufacturer. One example is shown in Fig. 22 .
- With the engine idling, direct the light at the timing mark on the crankcase. If the timing mark and the timing projection are aligned when the light flashes, the ignition timing is correctly set.

Ignition Timing Test (22)

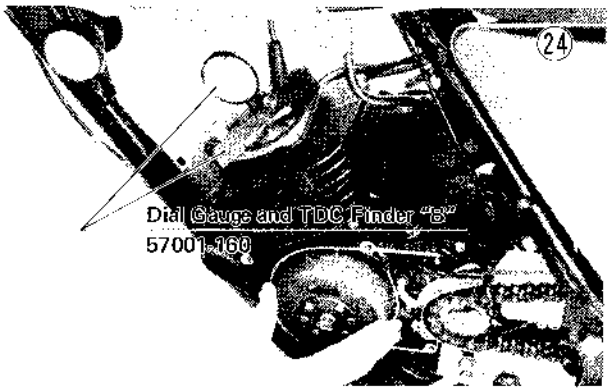


1. Strobe Light
2. Ignition Coil
3. Battery
4. Spark Plug Cap

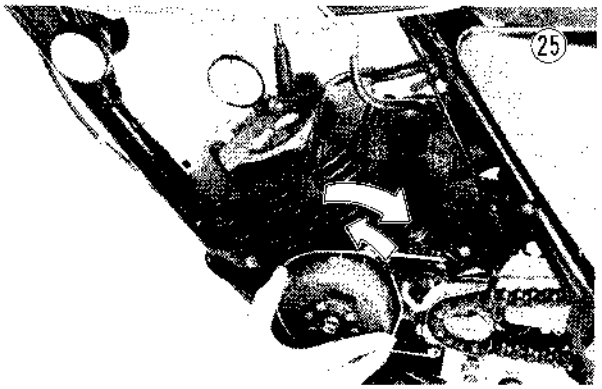


For even better accuracy, a dial gauge can be used to set the position of the piston. Instead of aligning the timing mark and projection, the following steps can be substituted:

- Remove the cylinder head (Pg. 31). Muffler removal is not necessary.
- Rotate the magneto flywheel counterclockwise until the position of the piston is close to the top.
- Using TDC finder "B" (special tool), mount a dial gauge on the cylinder, rotate the flywheel to set the piston at exact TDC, and set the dial to zero.



- Rotate the flywheel clockwise until the dial gauge reads about 3.0 mm (0.12 in) and then counterclockwise until the dial gauge reads 2.52 mm (0.0992 in).



At this point the piston is properly positioned such that, while using an ohmmeter (or some other suitable device), the contact breaker base can be adjusted to set the timing. When replacing the cylinder head, be sure that the gasket is properly fitted and that the nuts are tightened in a cross pattern with 2.2 kg-m (16 ft-lbs) of torque (Pg. 156).

NOTE: When setting the ignition timing by the use of a dial gauge to determine piston position, the flywheel timing mark is not used to check the timing. The dial gauge reading is referred to throughout the entire adjustment instead of the timing mark and projection. Before checking with a strobe light, first make a new timing mark by marking the flywheel just under the projection once the piston has been set at 2.52 mm (0.0992 in) BTDC.

CLUTCH

Stretching of the clutch cable causes the clutch lever to develop excessive play. Too much play will prevent the lever from fully disengaging the clutch and will result in shifting difficulty and possible clutch or transmission damage. Most of the play must be adjusted out, but a small amount has to be left so that the clutch will engage fully without slipping.

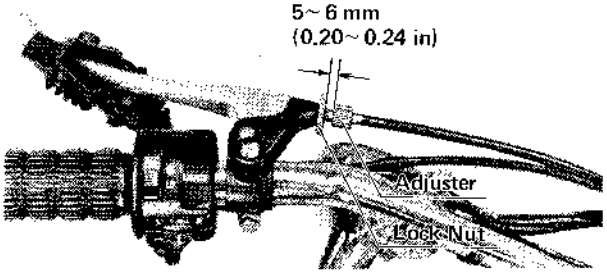
Besides cable stretch, clutch plate wear also causes the clutch to go out of adjustment. Although the clutch lever is not pulled in, the push rod will begin to oppose clutch spring pressure as this wear progresses. For proper clutch adjustment, the clutch adjusting screw must be screwed out to eliminate the push rod opposition to spring pressure while the clutch is engaged.

Adjust the clutch at least every 3,000 km (2,000 mi) and whenever the clutch does not function properly. If satisfactory clutch operation is not achieved by clutch adjustment, inspect the clutch for wear and damage (Pg. 104).

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

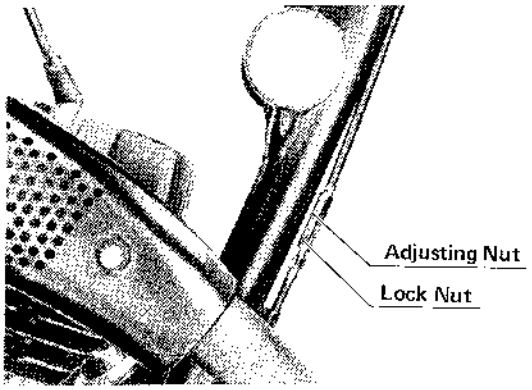
- Slide the clutch lever dust cover out of place.
- Loosen the lock nut just enough so that the adjuster will turn freely, and then turn the adjuster to make a 5~6 mm (0.20~0.24 in) gap between the adjuster and lock nut.

(26)



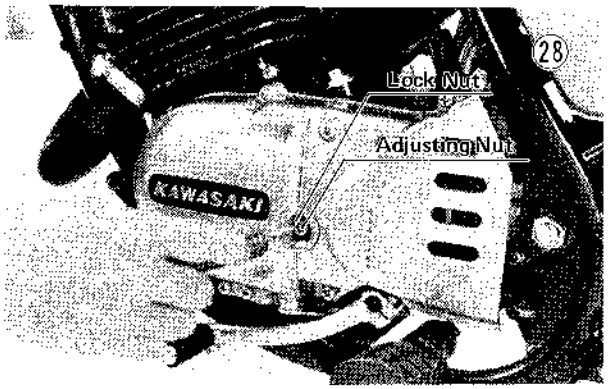
- Loosen the lock nut at the center of the clutch cable, and screw in the adjusting nut to give the cable plenty of play.

(27)



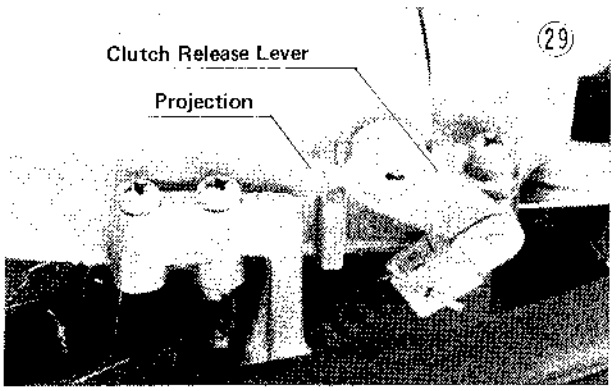
- Unscrew and remove the clutch adjusting hole cap and gasket.
- Loosen the lock nut. If the clutch adjusting screw does not turn loosely already, back it out until it does.

(28)



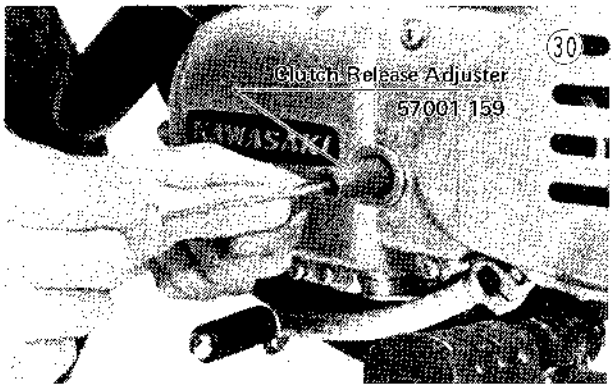
- Turn the adjusting nut at the center of the clutch cable so that the clutch release lever projection becomes parallel to the seam between the left engine cover and left crankcase half.

(29)



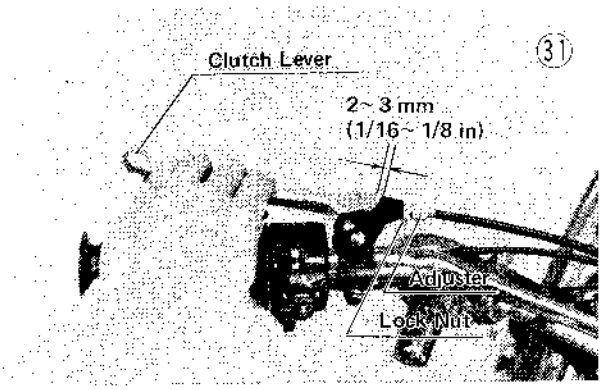
- Turn the clutch adjusting screw in to just where a resistance is felt, and then tighten the lock nut.

(30)



- Take up any play at the clutch lever by turning the adjusting nut at the center of the clutch cable, and tighten the lock nut.

●Turn the adjuster at the clutch lever so that the clutch lever will have 2~3 mm ($^1/_{16}$~$^1/_8$ in) of play, and tighten the lock nut.



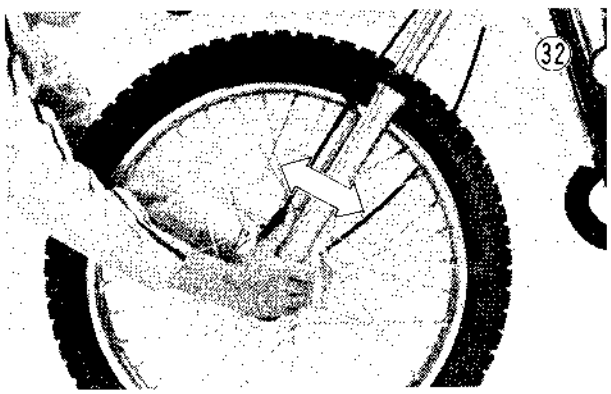
●Screw in the clutch adjusting hole cap together with its gasket.
●Slide back the clutch lever dust cover.

STEERING

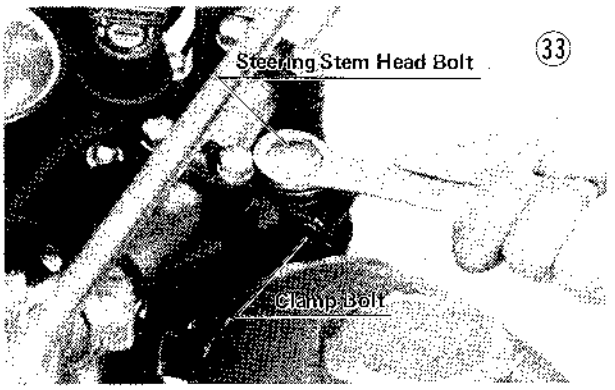
For safety, the steering should always be kept adjusted so that the handlebar will turn freely but not have excessive play.

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

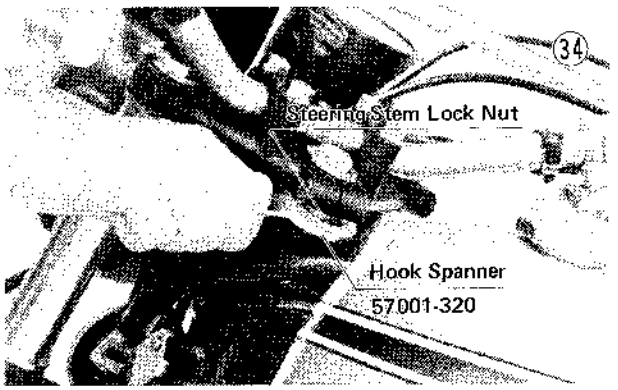
To check the steering adjustment, first place a stand or block under the engine so that the front wheel is raised off the ground. Push the handlebar lightly to either side; if it continues moving under its own momentum, the steering is not too tight. Squatting in front of the motorcycle, grasp the lower ends of the front fork at the axle, and push and pull the front end back and forth; if no play is felt, the steering is not too loose.



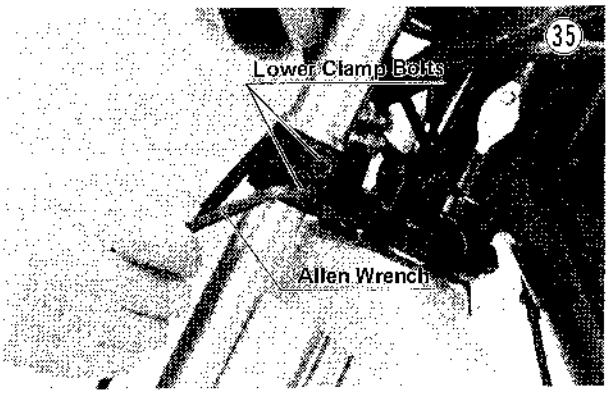
●Loosen the steering stem head bolt and the clamp bolt.



●Using a hook spanner, turn the steering stem lock nut down to tighten the steering or up to loosen it.



●Tighten down the steering stem head bolt with 5.5 kg-m (40 ft-lbs) of torque.
●Tighten the clamp bolt with 1.5~2.3 kg-m (11~16.5 ft-lbs) of torque.
●Loosen the lower clamp bolts (4) on the left and right shock absorbers to let the tubes reseat themselves, and then retighten the bolts with 1.5~2.3 kg-m (11~16.5 ft-lbs) of torque.



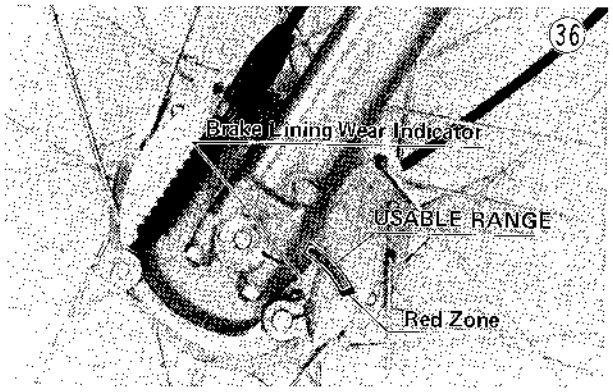
●Check the steering again, and readjust if necessary.

BRAKES

Brake lining wear, drum wear, and cable stretch cause the brakes to go out of adjustment, increasing lever and pedal play and decreasing braking effectiveness. Brake adjustment to compensate for this consists of correcting the cam lever angle and adjusting the front brake lever and rear brake pedal travel.

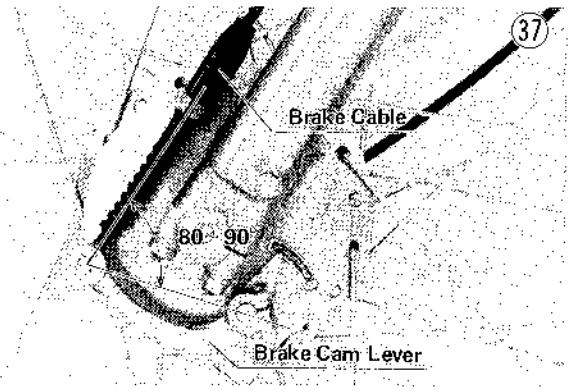
Once the brakes have been adjusted, spin or turn the wheels to check for drag. If any drag is heard or felt, disassemble the brake (Pgs. 65 & 68), and inspect for wear or damage (Pg. 123). Also, if the brake lever or pedal does not return to its rest position quickly upon release, inspect the brake for wear or damage.

On the outside of both the front and rear brake panels there is a brake lining wear indicator. Whenever the indicator has gone past USABLE RANGE into the red zone, the brake shoes must be immediately replaced and the other brake parts examined. Adjustment alone cannot compensate for the wear of a brake worn into the red zone.



Front and Rear Brake Cam Lever Angle

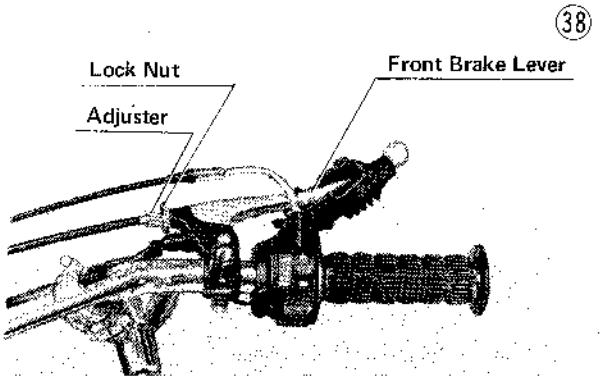
- When the brake is fully applied, the brake cam lever should come to an 80~90° angle with the threaded extension of the brake cable. If it does not, loosen the cable adjusting nut, remount the cam lever at a new position on the shaft for the proper angle, and then adjust cable play.



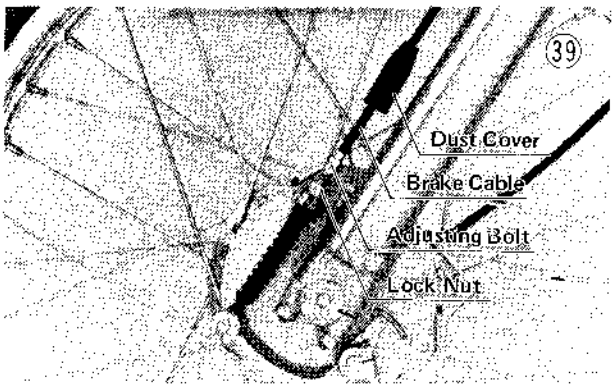
CAUTION: Since a cam lever angle greater than 90° reduces braking effectiveness, this adjustment should not be neglected. When remounting the cam, be sure that the position of the indicator on the serrated shaft is not altered. The change in cam lever angle is caused by wear of internal brake parts.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

Front Brake Lever

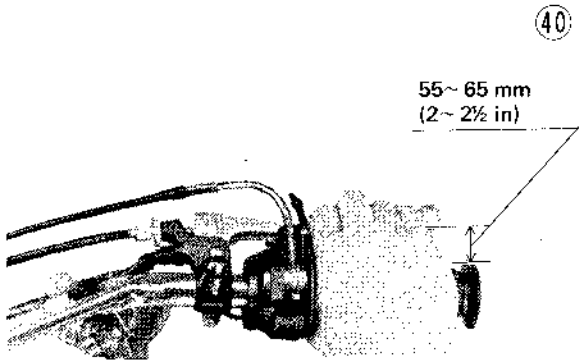
- Slide the front brake lever dust cover out of place.
- Loosen the lock nut at the front brake lever, screw the adjuster fully in, and tighten the lock nut.



- Slide up the dust cover, and loosen the lock nut at the lower end of the brake cable.



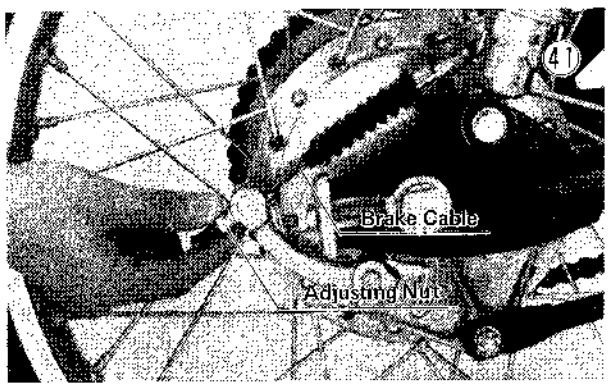
•Turn the adjusting bolt on the lower end of the front brake cable so that when the brake is fully applied, there is 55 ~ 65 mm (2 ~ 2½ in) of space left between the throttle grip and the end of the brake lever.

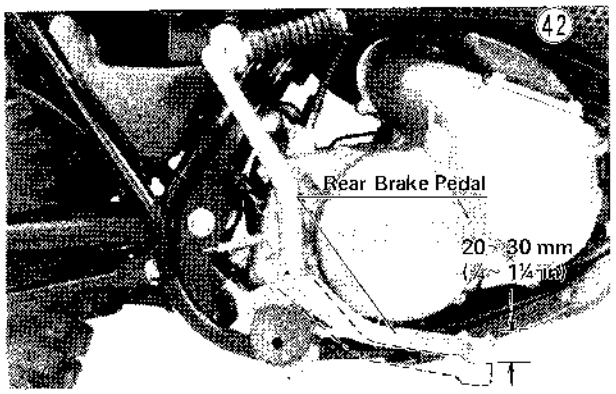


•If sufficient adjustment cannot be made with the adjusting bolt, complete the adjustment with the adjuster at the brake lever, and then tighten all lock nuts.
•Check for brake drag.
•Operate the lever a few times to see that it returns to its rest position immediately upon release.
•Slide back the dust covers.
•For minor corrections while riding, use the adjuster at the front brake lever.

Rear Brake Pedal

•Turn the adjusting nut on the end of the threaded extension of the rear brake cable so that the brake pedal has 20 ~ 30 mm (¾ ~ 1¼ in) of travel from the rest position to the fully applied position.





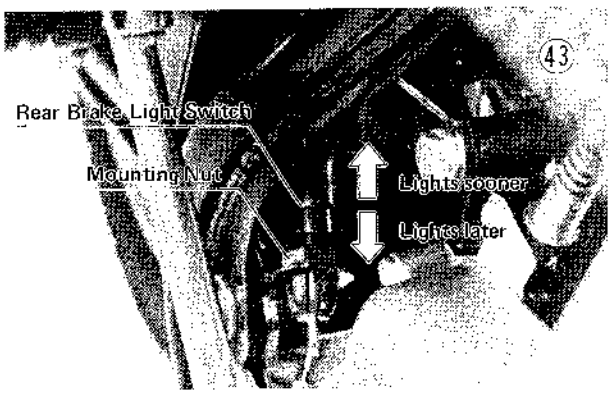
•Check for brake drag.
•Operate the pedal a few times to see that it returns to its rest position immediately upon release.
•Check the rear brake light switch adjustment.

BRAKE LIGHT SWITCH

The front brake light switch, mounted on the front brake lever, is operated by simple electrical contact and should not need adjustment. However, the rear brake light switch, activated by a wire spring attached to the brake pedal, may require adjustment if the spring has gotten stretched or if the spring or brake pedal has gotten bent or warped.

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 ($^5/_8$ in) of pedal travel or shortly before the brake pedal reaches the fully applied position.

•Turn the switch adjusting nut up or down so that the brake light will go on after the correct amount of brake pedal travel. A higher switch position will make the light go on after less travel.

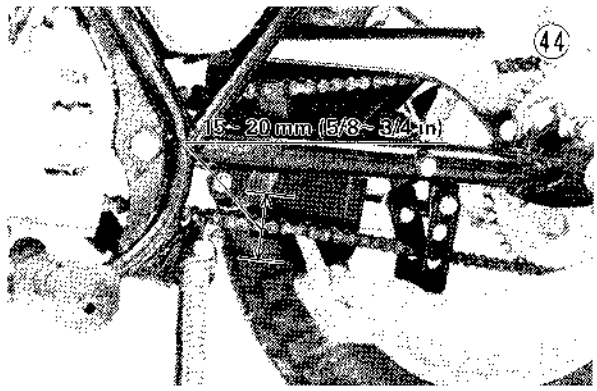


CAUTION: To avoid damaging the electrical connections inside the switch, be sure that the switch body does not turn during adjustment.

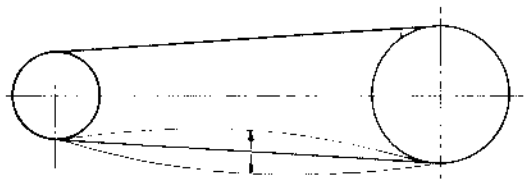
DRIVE CHAIN

Chain and sprocket wear causes the chain to lengthen, which results in power loss, accelerated chain and sprocket wear, and increased noise. A lengthened chain which is not adjusted properly may possibly be thrown off the sprockets or break. A chain that has been adjusted too tight will wear excessively and possibly break.

With the motorcycle off its side stand and vertical to the ground, the chain should have a maximum of about 15 ~ 20 mm ($^5/_8 \sim ^3/_4$ in) of vertical movement at its greatest point. If the slack exceeds 20 mm ($^3/_4$ in), adjust the chain.



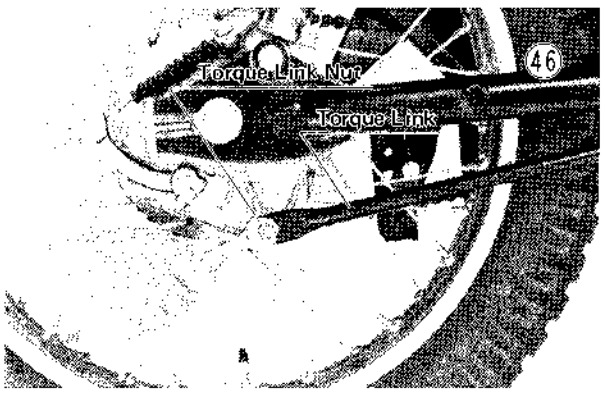
Chain Slack



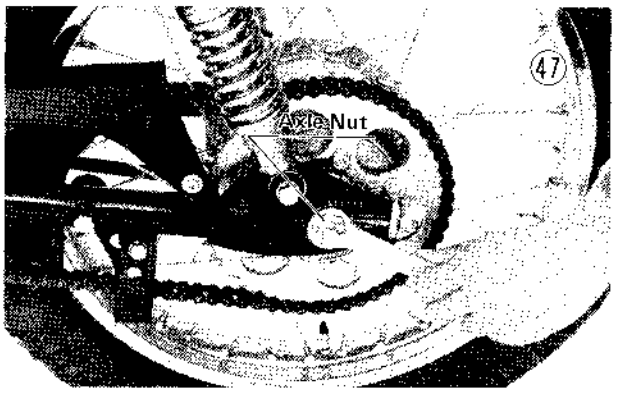
15~20 mm ($^5/_8 \sim ^3/_4$ in)

CAUTION: A chain worn past the service limit (Pg.125) should be replaced. Such wear cannot be adequately compensated by adjustment.

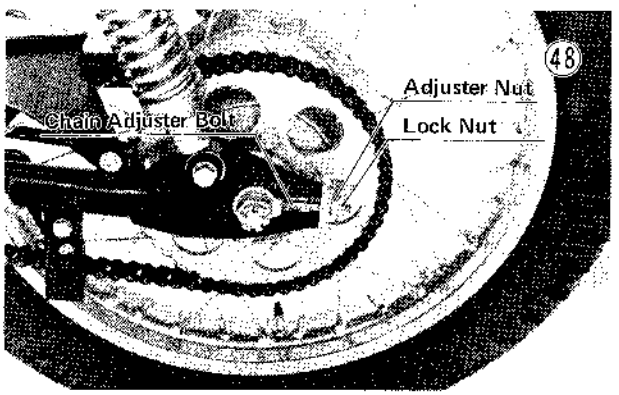
- Remove the cotter pin, and loosen the torque link rear nut.



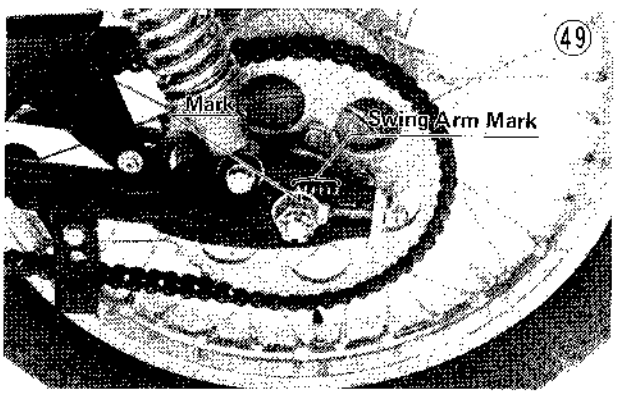
- Remove the cotter pin, and loosen the axle nut.



- Loosen the lock nut on both chain adjuster bolts.



- If the chain is too tight, back out the adjuster nut on both chain adjuster bolts, and then kick the wheel forward until the chain becomes overly loose.
- Turn in the right and left chain adjuster nuts evenly until the chain has the correct amount of slack. To keep the chain and the wheel aligned, the mark on the left chain adjuster must come to the same swing arm mark that the right chain adjuster mark comes to.

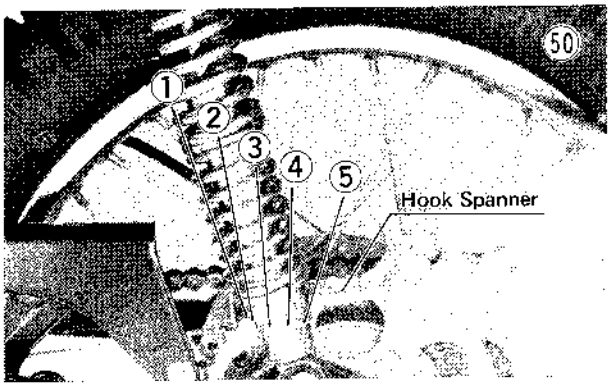


- Tighten both adjuster lock nuts, and then tighten the axle nut with 8.5~11.5 kg-m (61~83 ft-lbs) of torque.
- Rotate the wheel, measure the amount of slack, and readjust if necessary.
- Insert a new cotter pin through the axle nut and axle.
- Tighten the torque link rear nut with 2.0~2.2 kg-m (14.5~16 ft-lbs) of torque, and insert a new cotter pin.

REAR SHOCK ABSORBERS

The rear shock absorbers can be adjusted to one of 5 positions to suit riding conditions. They can be left soft for average riding but should be adjusted slightly harder for high speed riding or for riding on bad roads.

Adjustment is made by turning the adjusting sleeve with a hook spanner. The higher the adjusting sleeve is positioned, the harder the shock absorption. Be sure to turn both left and right shock absorbers to the same position in order to maintain stability.

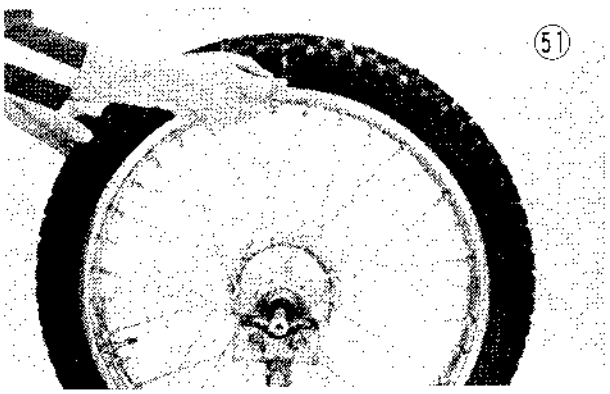


WHEEL BALANCE

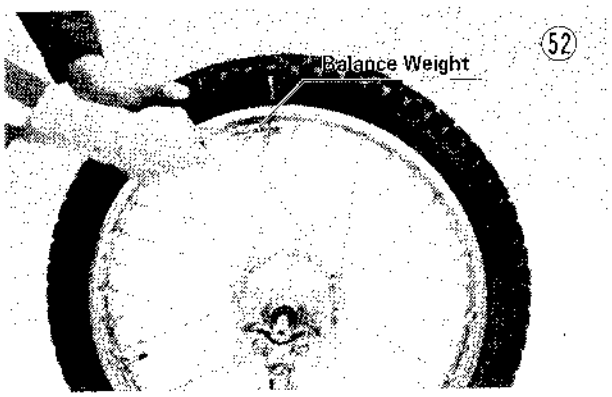
To improve stability and decrease vibration at high speed, the front and rear wheels must be kept balanced.

Check and balance each wheel as follows:

- Remove the wheel (Pg. 67 or 64).
- Check that all the spokes are tightened evenly.
- Suspend the wheel so that it can be spun freely.



- Spin the wheel lightly several times, and see if it stops of its own accord in various positions, indicating that it is correctly balanced.
- If one part of the wheel always stops at the bottom, mark the side of the tire at the top, and attach a balance weight loosely to the spoke closest to the mark.



- Repeat the previous two steps as many times as necessary to correctly balance the wheel, and then clamp the weights on firmly using pliers.
- Remount the wheel onto the motorcycle.

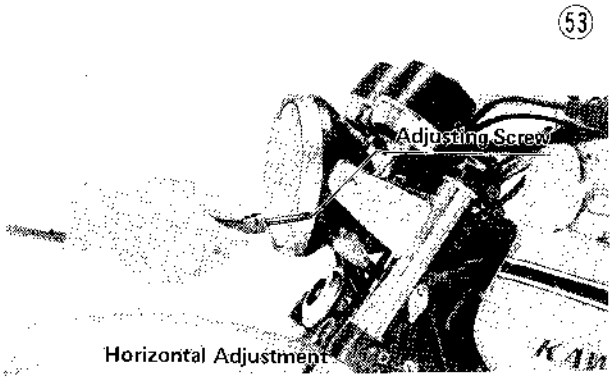
NOTE: Balance weights are available from Kawasaki Dealers in 10, 20, and 30 gram ($^1/_3$, $^2/_3$, and 1 oz) sizes. An imbalance of less than 10 grams will not usually affect running stability.

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.

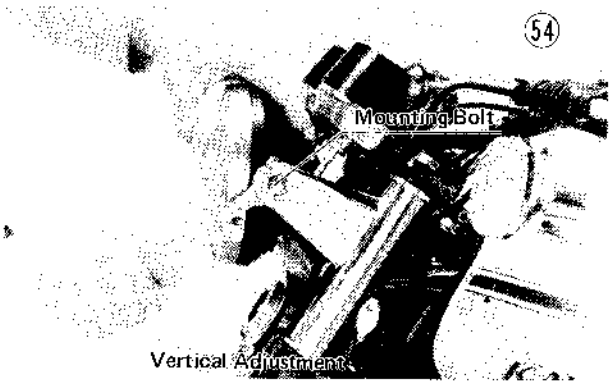
Horizontal Adjustment:

- Turn in or out the small screw on the headlight rim until the beam points straight ahead.

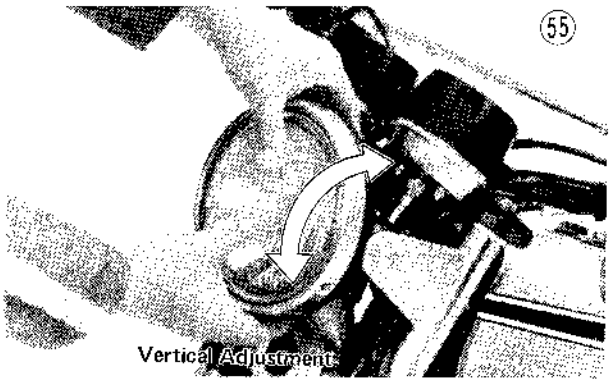


Vertical Adjustment:

- Loosen the headlight housing mounting bolts just enough so that the headlight can be moved.



•Move the headlight up or down by hand to where the vertical aim is correct.



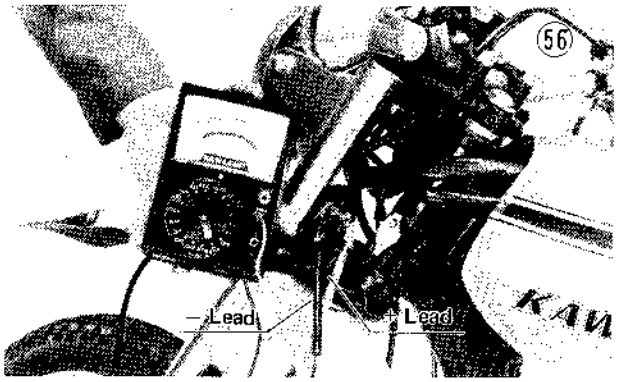
•Tighten the headlight housing mounting bolts.

HORN

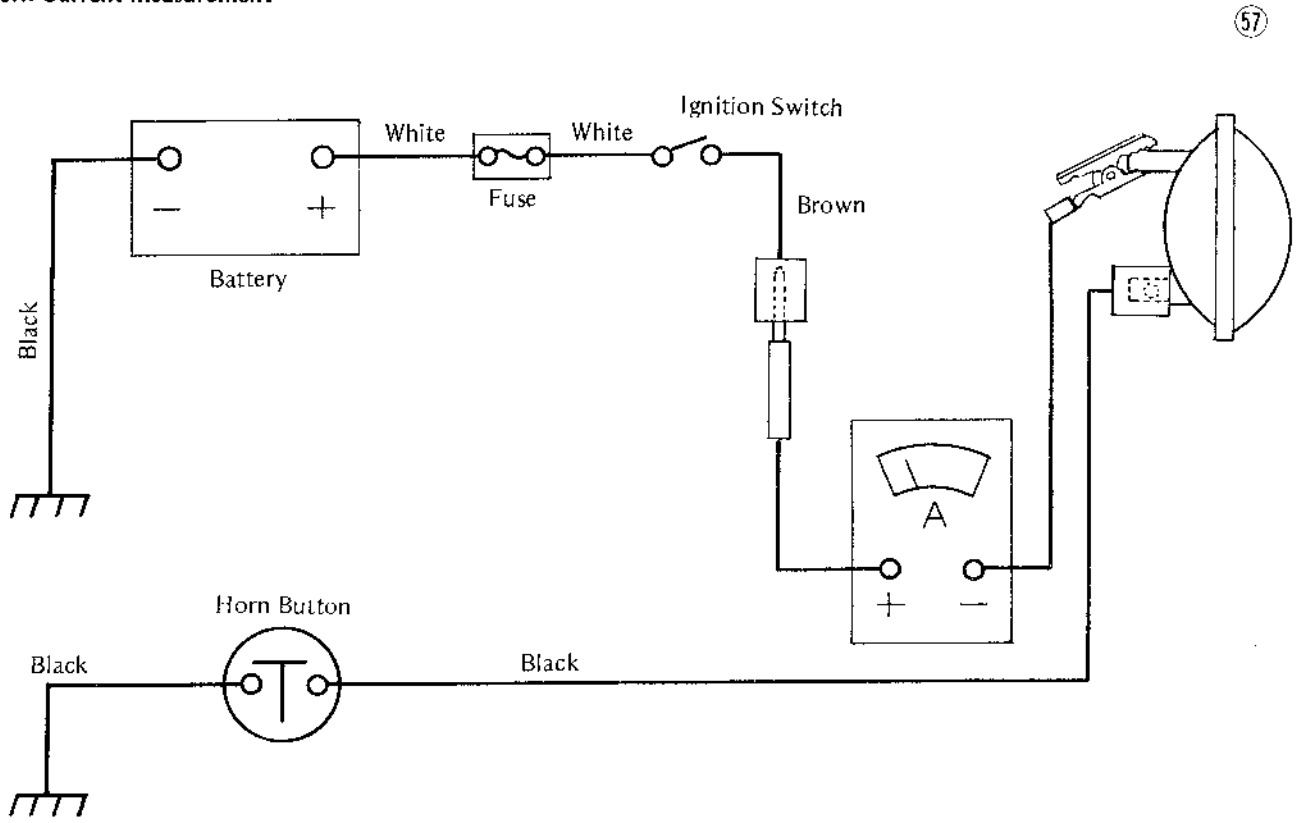
The horn contacts wear down after long use and will need to be adjusted from time to time. Turning out the adjusting screw compensates for contact wear. If satisfactory horn performance cannot be obtained by this adjustment when the rest of the electrical system is functioning properly, the horn must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

CAUTION: Do not turn the adjusting screw out too far since doing so will damage the horn spring and increase the horn current, possibly burning out the horn coil.

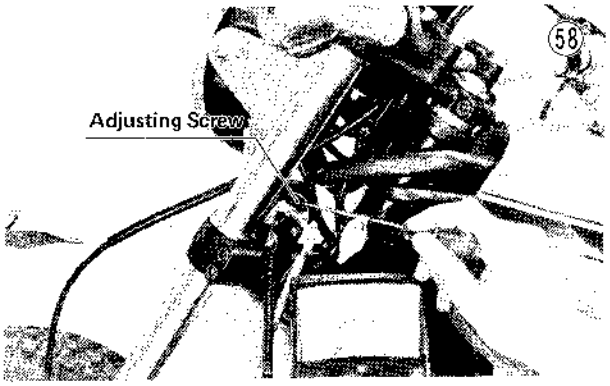
•Disconnect the brown lead from the horn, and connect an ammeter into the circuit in series. The + ammeter lead goes to the brown lead, and the – ammeter lead goes to the horn terminal.



Horn Current Measurement



- Turn on the ignition key, and keep the horn button pressed while turning the horn adjusting screw. Adjust for a healthy horn sound while keeping the current as close as possible to 1.5 amperes. In no event should the current be allowed to exceed 2.2 amperes since at higher amperage the horn life is seriously shortened.



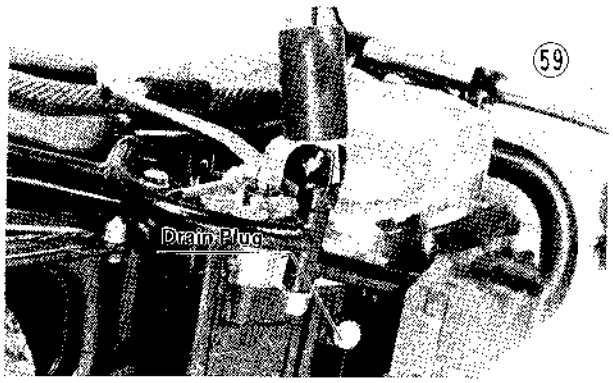
NOTE: The horn will not sound properly if it is mounted incorrectly or if any cables or other parts are touching it.

Disassembly

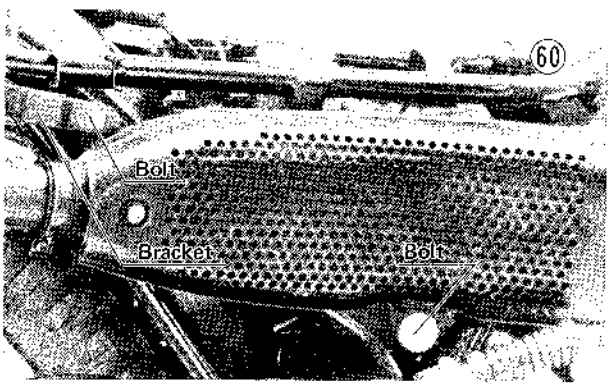
ENGINE

Removal:

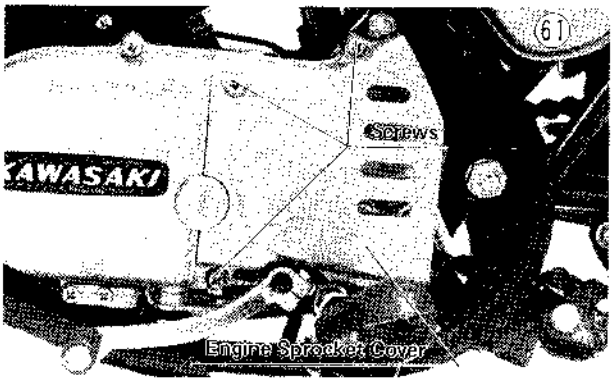
•With the motorcycle fully perpendicular to the ground, place an oil pan beneath the engine, and remove the engine drain plug so that all the transmission oil drains out. The drain plug may be replaced later either after all the oil is drained and before the engine is removed, or during engine installation.



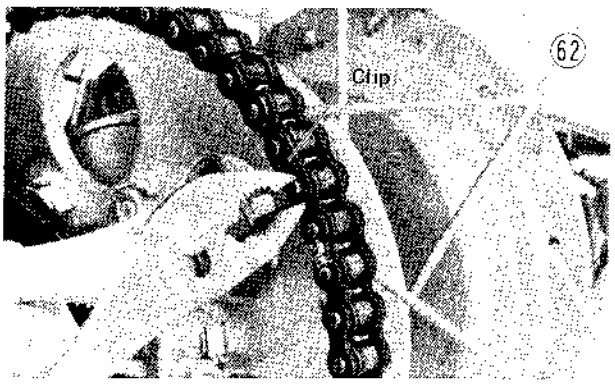
•Release the catches (2) at the rear of the seat, and pull off the seat.
•Turn the fuel tap to the "O" position, slide down the hose clamp, and pull the fuel hose off the tap.
•Unhook the rubber retaining band, and pull the fuel tank off towards the rear.
•Remove the nuts (2) from the muffler exhaust collar.
•Remove the bolts (2) that connect the muffler to the frame and to the bracket at the rear shock absorber, and then remove the muffler and gasket.



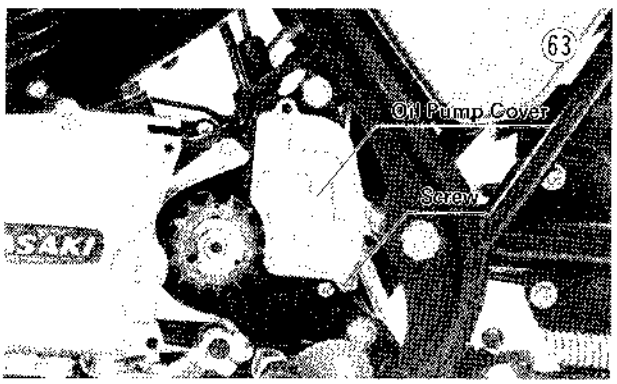
•Check to see that the transmission is in neutral.
•Remove the engine sprocket cover screws (3), and remove the engine sprocket cover.



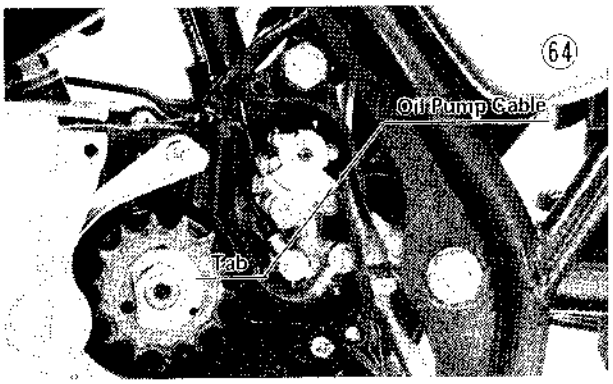
•Undo the clip carefully from the drive chain master link using pliers, and remove the master link.



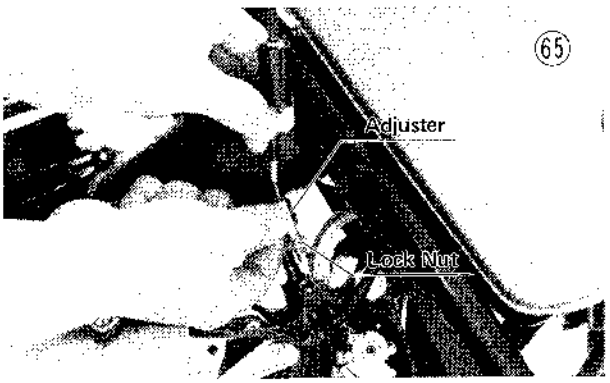
•Free the drive chain from the engine sprocket, being careful that the chain does not get dirty from contact with the ground.
•Remove the oil pump cover.



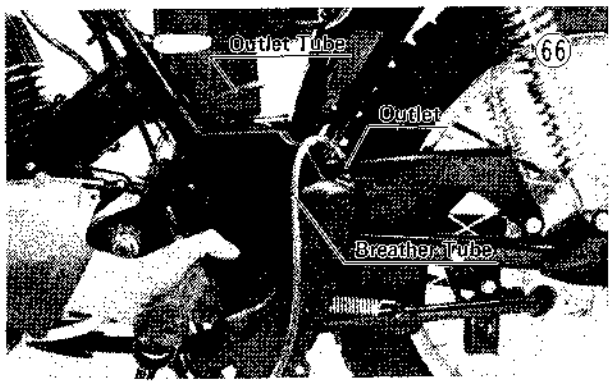
•Bend out the tab on the oil pump lever, and free the end of the oil pump cable from the oil pump lever.



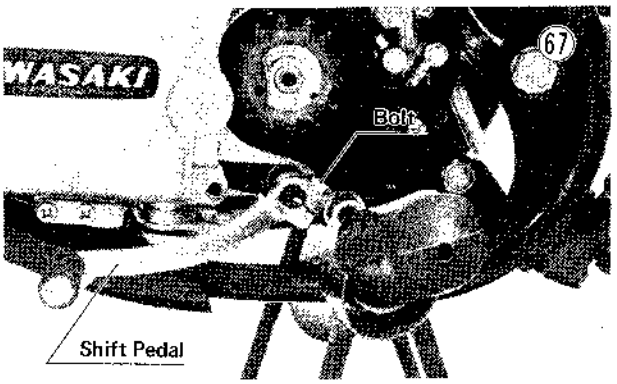
•Slide the oil pump adjuster dust cover up out of place.
•Loosen the lock nut, screw the oil pump adjuster off the crankcase, and pull the oil pump inner cable out from the adjuster crankcase hole.



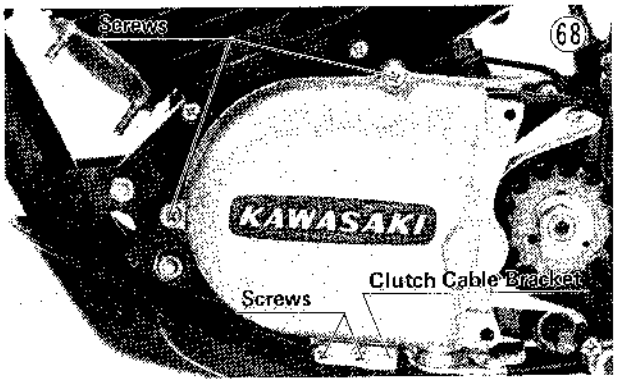
•Pull off the left side cover.
•Remove the engine oil tank mounting screws (3), and slip the oil tank and its breather tube free from the frame. With the oil tank upside down and its breather tube elevated, pull off the outlet tube. Screw one of the mounting screws into the outlet tube to keep the oil from flowing out, and fit the end of the breather tube onto the oil tank outlet. Set the tank to one side.



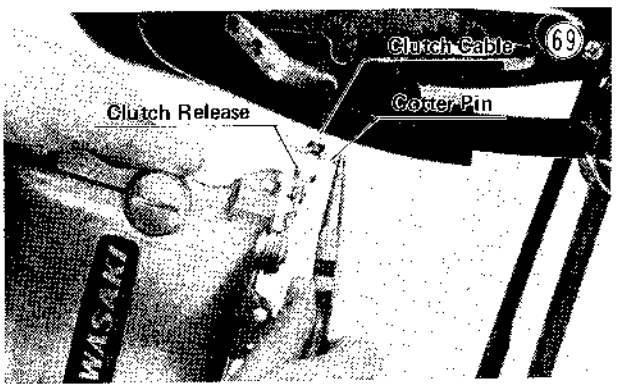
•Mark the position of the shift pedal so that it can later be replaced on the shaft in the same position.



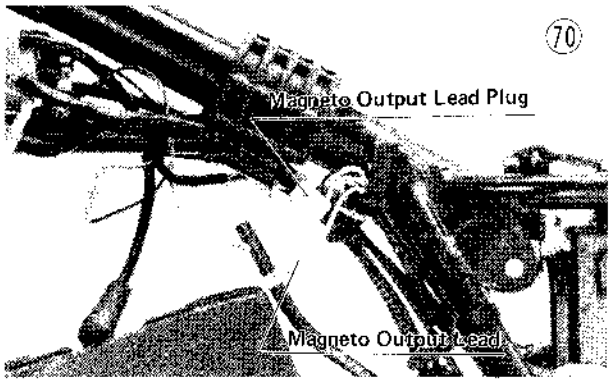
•Remove the shift pedal bolt, and remove the shift pedal.
•Remove the clutch cable bracket and left engine cover screws (4), and remove the left engine cover and gasket.



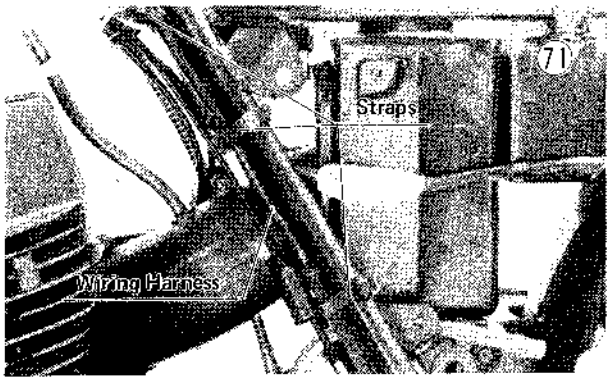
•Remove the clutch release cotter pin, and free the tip of the clutch cable from the clutch release.



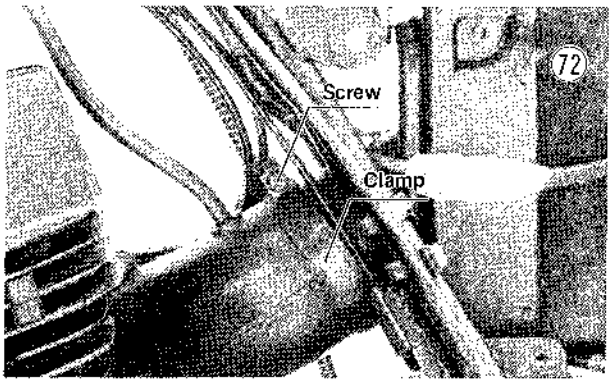
•Disconnect the white magneto output lead plug from where it connects to the white socket mounted under the frame top tube.
•Disconnect the light blue magneto output lead from where it connects to the light blue lead under the frame top tube.



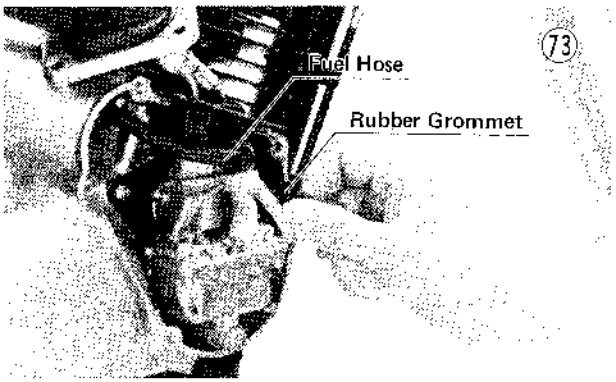
•Loosen the straps that hold the magneto wiring harness to the frame, and free the magneto wiring harness from the frame.



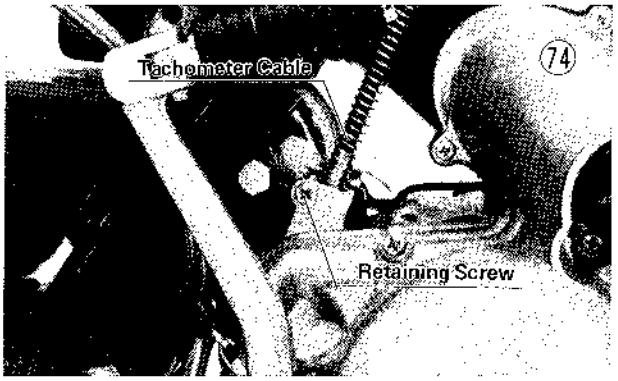
•Loosen the air cleaner tube clamp.



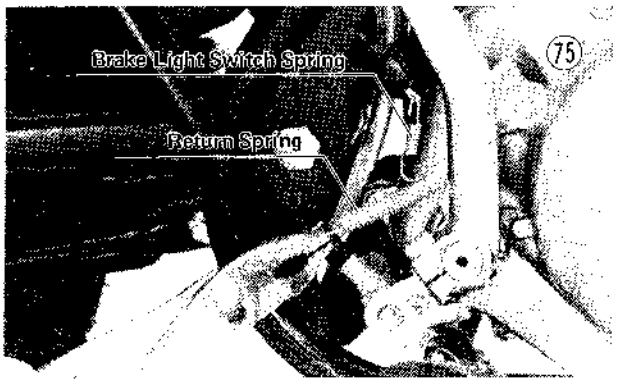
•Pull off the spark plug lead from the spark plug.
•Remove the bolts (4) from the carburetor rim, and slide the rim and carburetor rubber cap up the cables.
•Remove the carburetor cover and gasket.
•Pull off the idling screw rubber grommet from the right engine cover.



•Slide the clamp out of place, and pull the fuel hose off the carburetor.
•Pull off the carburetor.
•Place a clean cloth on top of the battery, and lay the carburetor on it so that the carburetor is not left dangling.
•Take out the tachometer cable retaining screw from the crankcase, and pull the tachometer cable free.

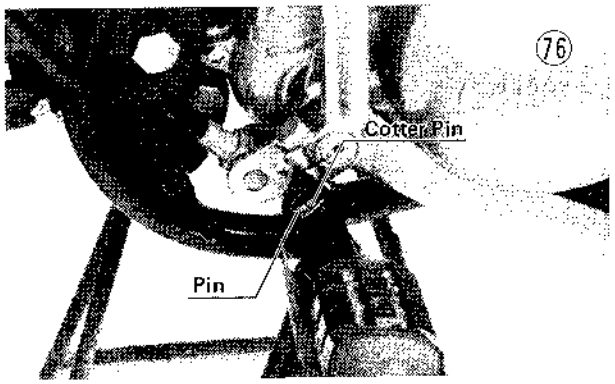


•Free the rear brake light switch spring from the flange on the rear of the brake pedal, being careful not to bend or otherwise damage it.
•With pliers, free the brake pedal return spring from its hole on the frame, and then remove the spring from the brake pedal flange.

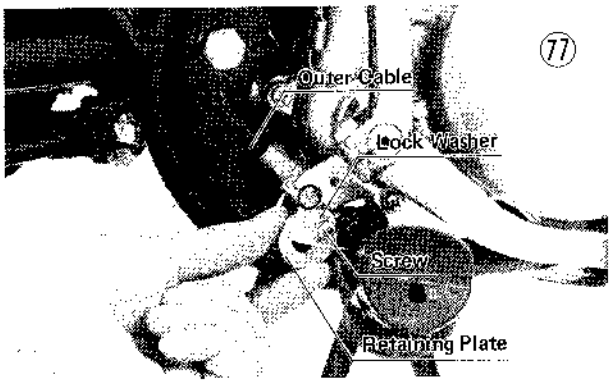


•Loosen the adjusting nut on the end of the threaded extension of the rear brake cable so that the cable has plenty of play.

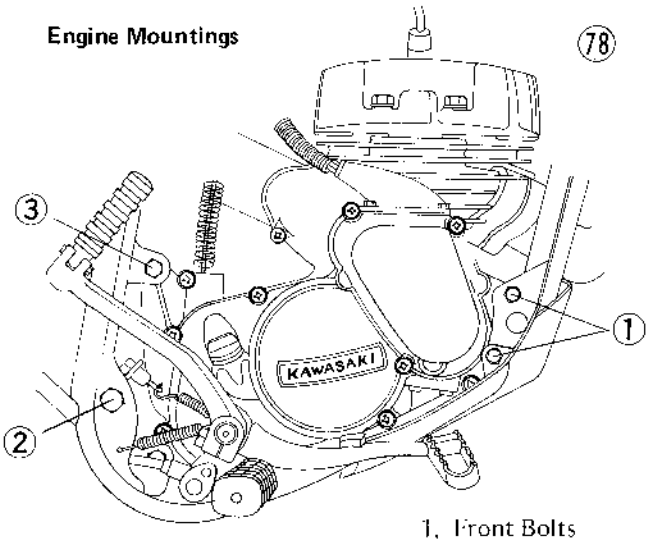
•Remove the cotter pin from the pin which holds the rear brake inner cable to the frame, and then remove the pin.



•Remove the outer cable screw from the rear of the brake pedal, and free the rear brake outer cable from the brake pedal. A lock washer and the outer cable retaining plate come off with the screw.



•Remove the nuts on the engine mounting bolts (4).

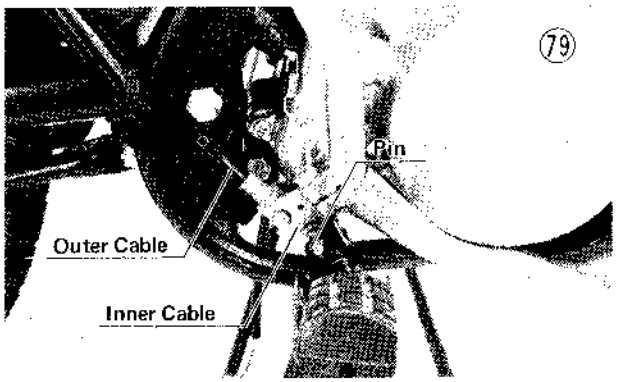


1. Front Bolts
2. Lower Rear Bolt
3. Upper Rear Bolt

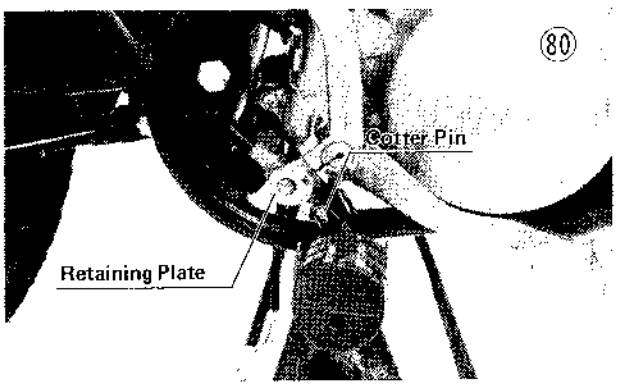
•Remove the engine mounting bolts. Be careful not to damage the threads upon removal, raising the engine up a little as necessary.
•Remove the engine from the right side of the frame.

Installation:

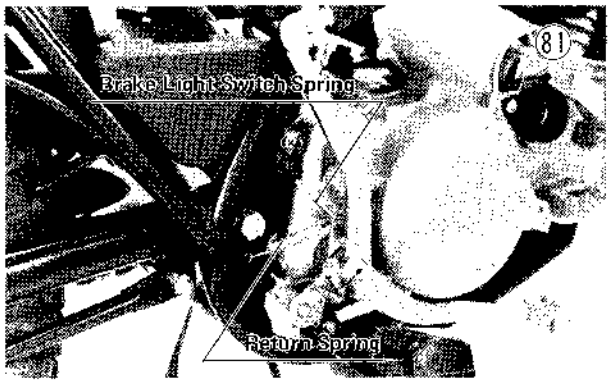
•Place the engine back into the frame from the right side. Be sure that the air cleaner tube fits on the air cleaner body.
•Lifting the engine as necessary so that the mounting bolt threads do not get damaged, insert the engine mounting bolts from the right side. Tighten the 17 mm nuts (2) with 3.1 ~ 4.2 kg-m (23 ~ 30 ft-lbs) of torque, and tighten the 13 mm nuts (2) with 2.0 ~ 2.2 kg-m (14.5 ~ 16 ft-lbs) of torque. Be sure that the spring side of each nut faces out.
•Fit the outer cable end into its proper position at the rear of the brake pedal, push in on the inner cable threaded extension so that the end of the inner cable will fit into its place in the frame below the brake pedal, and replace the inner cable pin.



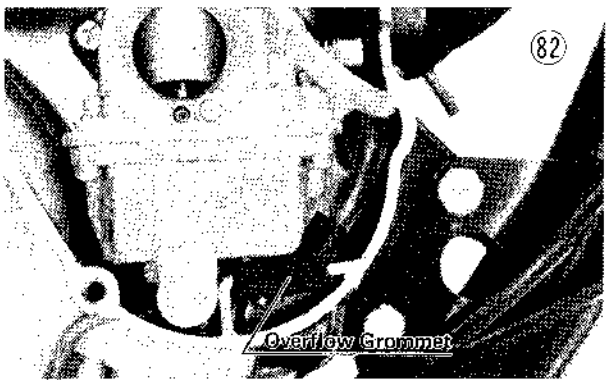
•Insert a new cotter pin into the inner cable pin, and bend out its ends.
•Replace the outer cable retaining plate, lock washer, and screw to secure the rear brake outer cable to the rear of the brake pedal.



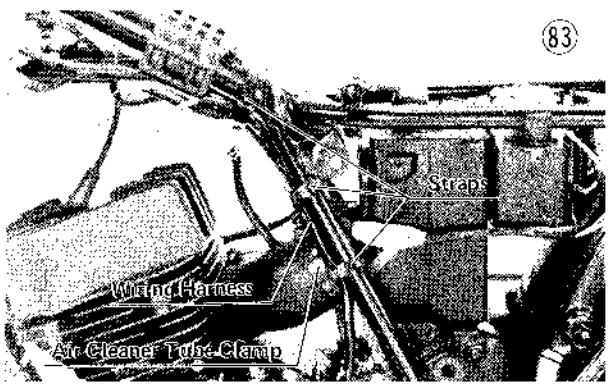
•Replace the brake pedal return spring.
•Carefully fit the rear brake light switch spring back into the spring hole on the brake pedal flange.



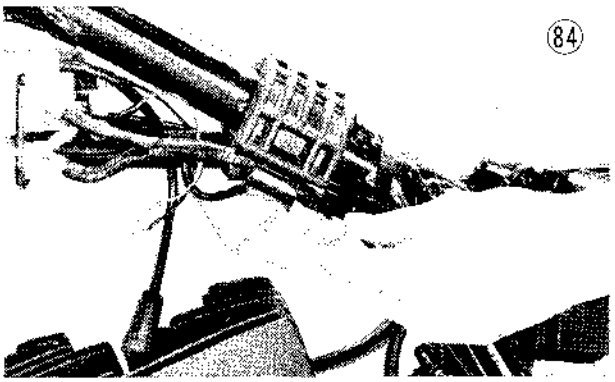
- Fit the bottom end of the tachometer cable into its hole in the crankcase. Turn it if necessary so that it fits all the way back into place, and tighten its retaining screw.
- Check to see that the carburetor overflow grommet is properly positioned, and then press the carburetor back into its place on the right engine cover. Be sure that it is all the way back into place.



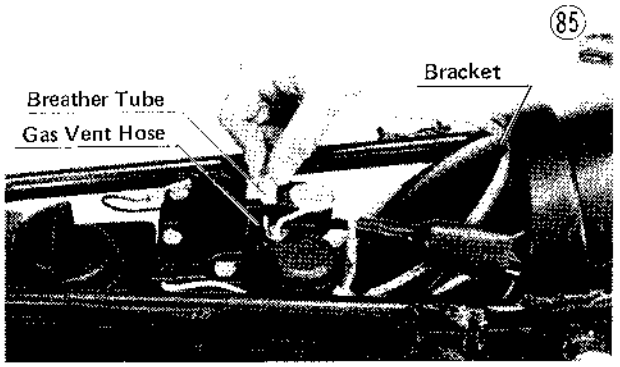
- Fit the fuel hose on the carburetor, and slide back its clamp.
- Install the idling screw grommet back into the right engine cover.
- Replace the carburetor cover and gasket, slide back the carburetor rubber cap and rim, and tighten the rim bolts.
- Fit the spark plug lead onto the spark plug.
- Tighten the air cleaner tube clamp.
- Route the magneto output leads through the straps (3) that connect the leads to the frame, and tighten the straps.



- Reconnect the magneto leads that were disconnected. Be sure that the white plug does not get reversed.

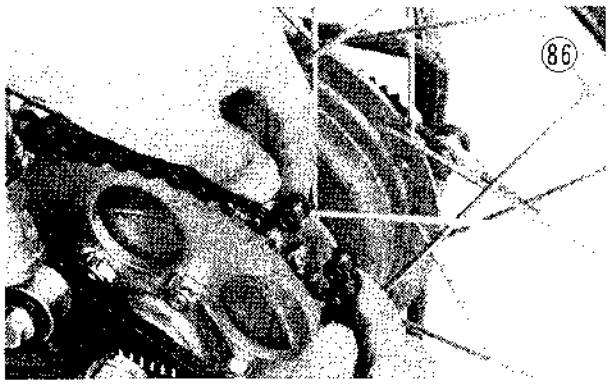


- Fit the tip of the clutch inner cable back into its place in the clutch release lever, insert a new cotter pin, and bend back the ends.
- Replace the left engine cover and clutch cable bracket.
- Replace the shift pedal.
- Remove the screw from the oil tank outlet tube. With the oil tank situated to avoid spillage, pull the breather tube off the oil tank outlet, connect the outlet tube to the outlet, and slip the oil tank back into the frame.
- Route the oil tank breather tube through the bracket on the outside front of the rear fender. Be sure that the tube does not get pinched or twisted.

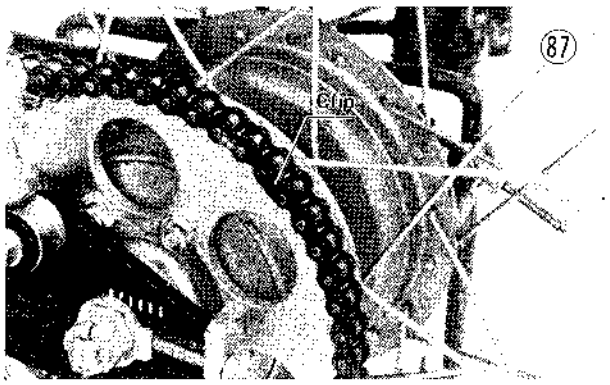


- Replace the oil tank mounting screws. Each screw has a lock washer and flat washer.
- Replace the left side cover.
- Route the oil pump inner cable through the adjuster crankcase hole, screw the oil pump adjuster into the hole, and tighten its lock nut.
- Fit the oil pump inner cable on the oil pump lever, and bend the tab back onto the end of the cable.
- Check to see that the lower mark on the oil pump lever lines up with the mark on the oil pump lever stopper. Adjust if necessary (Pg. 10).

•Fit the chain back onto the engine sprocket, and set the ends of the chain on the rear sprocket as shown in Fig. 86 .



•Replace the chain master link. The direction of the master link clip should be as shown in Fig. 87 .

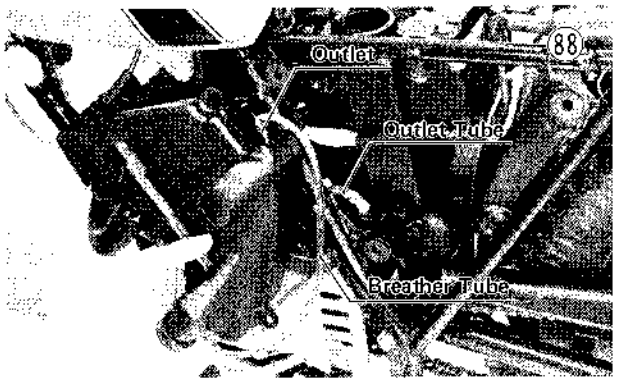


•Fit the gasket and muffler back into the cylinder exhaust port, and loosely tighten the bolts that connect the muffler to the frame and to the bracket at the rear shock absorber. Both the frame bolt and the bracket bolt have a lock washer and flat washer.
•Replace the muffler exhaust collar nuts, tightening them together so that they tighten evenly to avoid an exhaust leak. Be sure that the spring side of the nuts face out.
•Tighten the muffler mounting bolts.
•Replace the fuel tank, and hook its retaining band.
•Fit the fuel hose back onto the fuel tap, and slide the clamp back into place.
•Push the seat back into place.
•Replace the engine drain plug, tightening it with 0.7~1.0 kg-m (61 ~ 86 in-lbs) of torque.
•Pour the transmission oil back in, and check the oil level (Pg.153) after kicking the kickstarter 3-4 times.
•Bleed the oil pump (Pg. 115).
•Fit the oil pump cover back into its proper position, and replace its screw (lower).
•Replace the engine sprocket cover.
•Adjust the drive chain (Pg. 19), rear brake cable (Pg. 18), and rear brake light switch (Pg. 18).

ENGINE OIL TANK

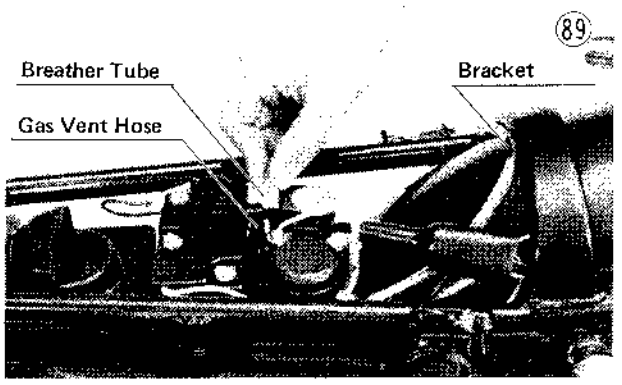
Removal:

•Release the catches (2) at the rear of the seat, and pull off the seat.
•Pull off the left side cover.
•Remove the engine oil tank mounting screws (3), and slip the oil tank and its breather tube free from the frame. With the tank upside down and the breather tube elevated, pull off the oil tank outlet tube. Screw one of the mounting screws into the outlet tube to keep the oil from flowing out, and fit the end of the breather tube onto the oil tank outlet.



Installation:

•Remove the screw from the oil tank outlet tube.
•With the oil tank situated to avoid spillage, pull the breather tube off the oil tank outlet, connect the outlet tube to the outlet, and slip the oil tank back into the frame.
•Route the oil tank breather tube through the bracket on the outside front of the rear fender. Be sure that the tube does not get pinched or twisted.

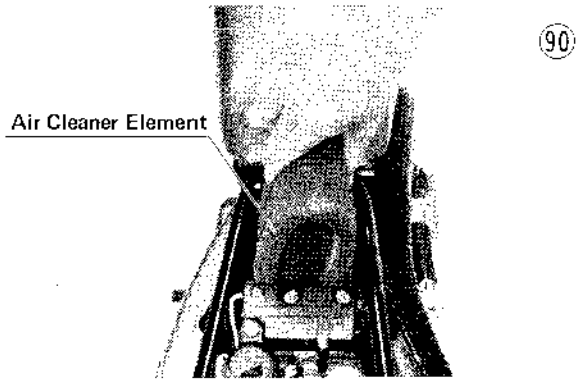


•Replace the oil tank mounting screws. Each screw has a lock washer and flat washer.
•Push the seat back into place.
•If any air has gotten trapped in the outlet hose, bleed the oil pump (Pg.115).
•Replace the left side cover.

AIR CLEANER ELEMENT

Removal:

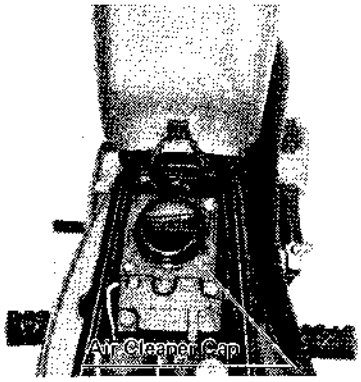
- Release the catches (2) at the rear of the seat, and pull off the seat.
- Remove the air cleaner cap screws (2), and remove the air cleaner cap.
- Pressing in on the sides of the air cleaner element, pull it out.



- Remove the element from its wire frame.

Installation Note:

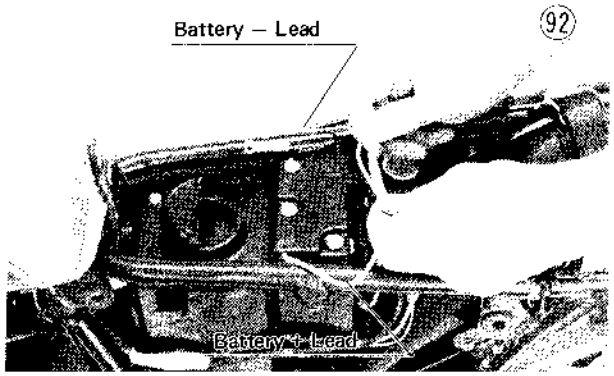
- The air cleaner cap opening faces the rear.



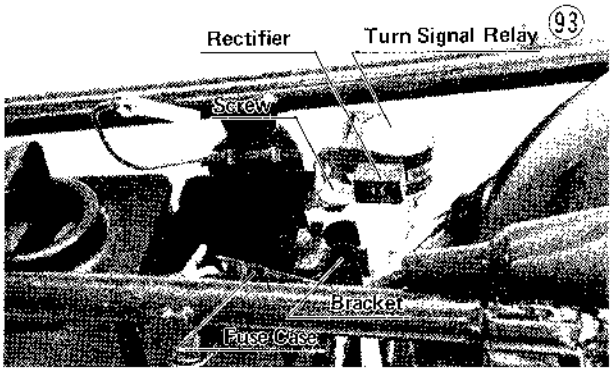
AIR CLEANER HOUSING

Removal:

- Remove the engine oil tank (Pg. 28).
- Disconnect the battery leads, and remove the battery.



- Remove the muffler (Pg. 30).
- Push down on the top of the tool case cap, and pull out on the bottom of the cap. Remove the tool kit.
- Remove the tool case mounting bolt, washers, and nut. The nut is part of the rear brake cable guide.
- Remove the tool case.
- Pull the fuse case out of its bracket at the rear of the battery housing.



- Remove the screw to free the rectifier from the rear of the battery housing, and pull off the turn signal relay from the bracket.
- Remove the bolts (2) that connect the battery housing to the frame.
- Remove the air cleaner cap screws (2), and remove the air cleaner cap.
- Loosen the air cleaner tube clamp.
- Pull the air cleaner and battery housing assembly back slightly to free the air cleaner from where its mountings (2) fit onto the frame. Remove the assembly by first pushing the top part to the left and then sliding the assembly bottom first out the right side of the frame.



Installation:

- Fit the assembly back into the frame battery housing first. Slip the air cleaner outlet into the air cleaner tube, and fit its mountings (2) into place.

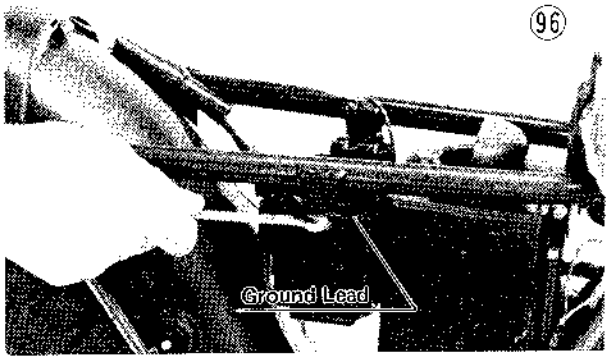
•Replace the air cleaner cap with the opening facing the rear.

(95)



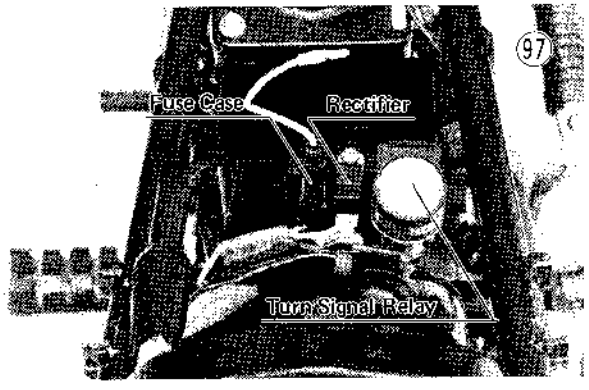
•Replace the bolts that connect the battery housing part of the assembly to the frame. Each bolt has a lock nut. The black ground lead that connects to the black battery lead is fitted on the right side bolt.

(96)



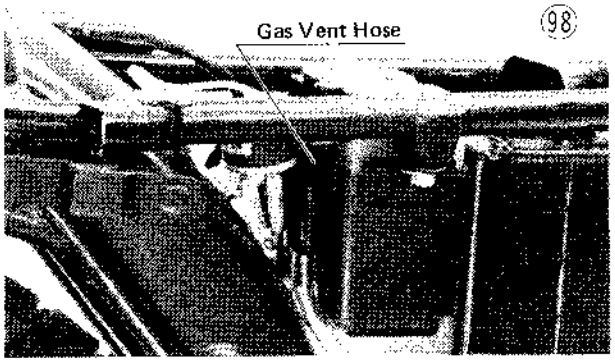
•Tighten the air cleaner tube clamp.
•Replace the turn signal relay, rectifier, and fuse case. The rectifier screw has a lock nut.

(97)



•Fit the tool case back into its bracket at the bottom of the air cleaner housing, and replace the washers and bolt. Be sure that the rear brake cable runs through its guide.
•Replace the tool kit, and close the case cap.
•Place the battery back into the battery housing, and route the gas vent hose as shown in Fig. 98 . Reconnect the battery leads.

(98)



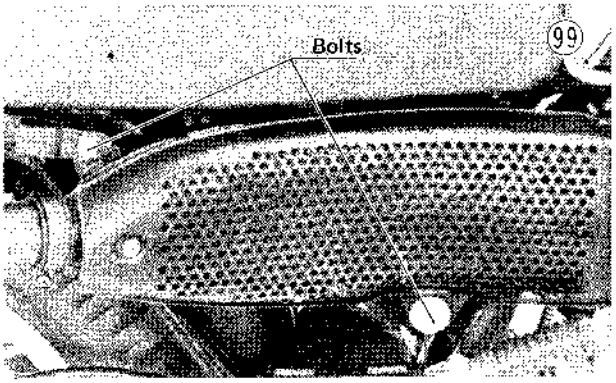
•Install the muffler (Pg. 30).
•Install the engine oil tank (Pg. 28).
•Check to see that the air cleaner clamp fastens the tube to the air cleaner securely.

MUFFLER

Removal:

•Remove the nuts (2) from the muffler exhaust collar.
•Remove the bolts (2) that connect the muffler to the frame and to the bracket at the rear shock absorber, and then remove the muffler and gasket.

(99)

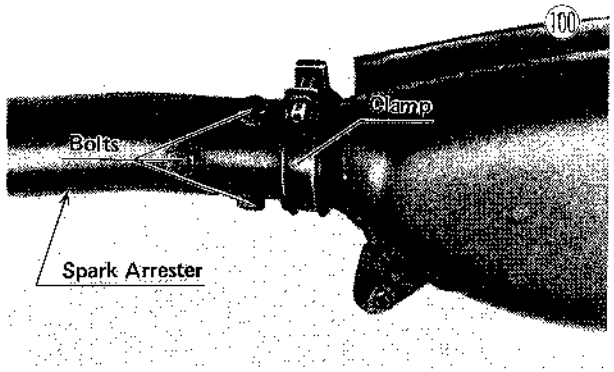


Installation:

•Fit the gasket and muffler into the cylinder exhaust port, and loosely tighten the bolts that connect the muffler to the frame and to the bracket at the rear shock absorber. The frame bolt has a lock washer and large flat washer. The bracket bolt has a lock washer and small flat washer.
•Replace the muffler exhaust collar nuts, tightening them together so that they tighten evenly to avoid an exhaust leak. Be sure that the spring side of the nuts face out.
•Tighten the muffler mounting bolts.

Disassembly:

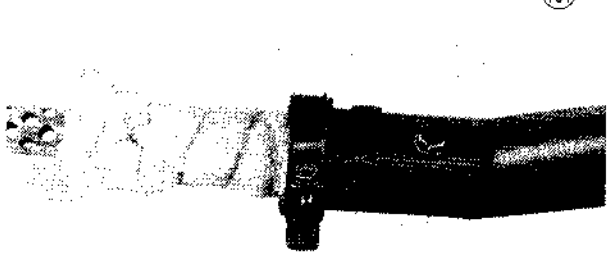
•Loosen the spark arrester clamp, and remove the three bolts nearest the clamp.



- Twist the spark arrester out of the muffler.
- Remove the spark arrester end piece bolt, and pull out the end piece. The bolt has a lock washer.
- Pull the glass wool unit out of the muffler.
- Remove the screws (4), and remove the muffler side cover.
- To remove the exhaust collar, first grip the collar insert in a vice grip or with pliers, and free the insert from the collar. Next, broaden the gap on the insert, and remove the insert and the collar.

Assembly:

- If the exhaust collar was removed, replace it and the insert. Fit the insert in the collar.
- Install the side cover tightening its screws. Each screw has a lock washer.
- Fit the end piece into the spark arrester, and tighten its bolt. The bolt has a lock washer.
- Fit the glass wool unit into the spark arrester, and replace and tighten the bolt farthest from the clamp.

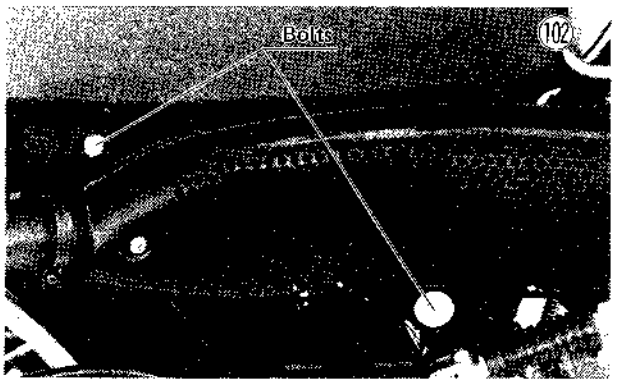


- Insert the glass wool unit into the muffler, and replace and tighten the remaining bolts (2).
- Tighten the clamp.

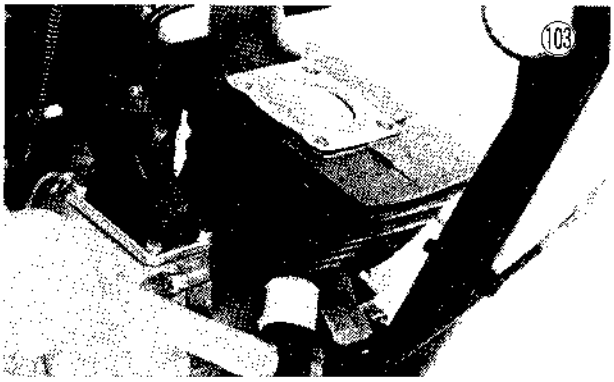
CYLINDER HEAD & CYLINDER

Removal:

- Remove the nuts (2) from the muffler exhaust collar.
- Remove the bolts (2) that connect the muffler to the frame and to the bracket at the rear shock absorber, and then remove the muffler and gasket.



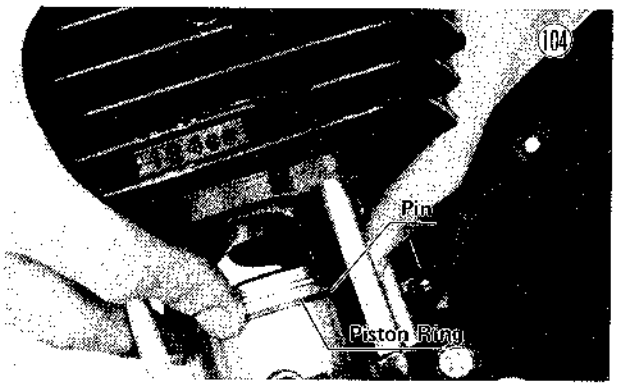
- Pull off the spark plug lead from the spark plug.
- Remove the cylinder head nuts (4), and remove the cylinder head and gasket.
- Lift off the cylinder and the cylinder base gasket. If necessary, lightly tap around the base of the cylinder with a plastic hammer, taking care not to damage the cooling fins.



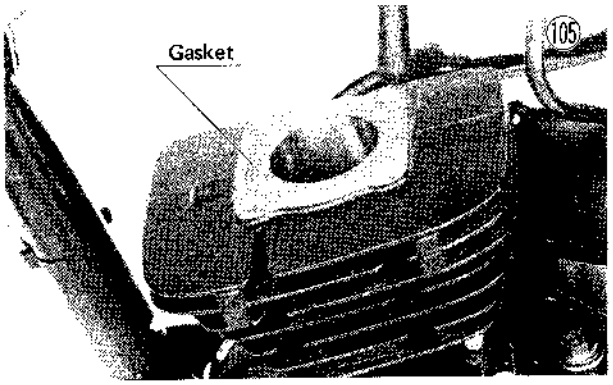
- If there is a time lapse before reinstallation, cover the cylinder base hole with a clean cloth to prevent dirt or moisture from entering.

Installation:

- Replace the cylinder base gasket for a new one.
- Daub a little 2 stroke oil on the piston rings and the inside surface of the cylinder.
- Set the piston at BDC, and fit the base of the cylinder over the rings, pressing in on opposite sides of the rings as necessary. Be certain that the rings do not slip out of their proper position. The pin in each piston groove must be between the ends of its piston ring.



●Replace the cylinder head gasket on the cylinder so that the gasket holes perfectly match the cylinder bore and stud holes. Only one of the four possible positions is correct. The top side (the side with the beveled inner perimeter) should face up.

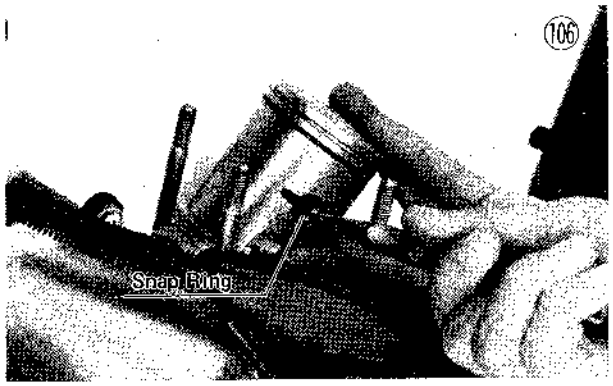


●Put on the cylinder head, and insert the cylinder head nuts. Each nut has both a lock washer (next to nut head) and a flat washer. Tighten the cylinder head nuts evenly in a cross pattern with 2.2 kg-m (16 ft-lbs) of torque.
●Fit the spark plug lead onto the spark plug.
●Fit the muffler and gasket back into the cylinder exhaust port, and loosely tighten the bolts that connect the muffler to the frame and to the bracket at the rear shock absorber.
●Replace the muffler exhaust collar nuts, tightening them together so that they tighten evenly to avoid an exhaust leak. Be sure that the spring side of the nuts face out.
●Tighten the muffler mounting bolts.

PISTON & PISTON RINGS

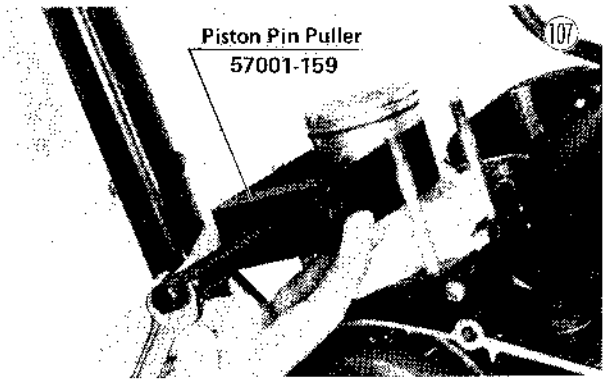
Removal:

●Remove the cylinder head and cylinder (Pg. 31).
●Wrap a clean cloth around the base of the piston to secure it in position for removal and so that no parts fall into the crankcase.
●Remove one of the piston pin snap rings.

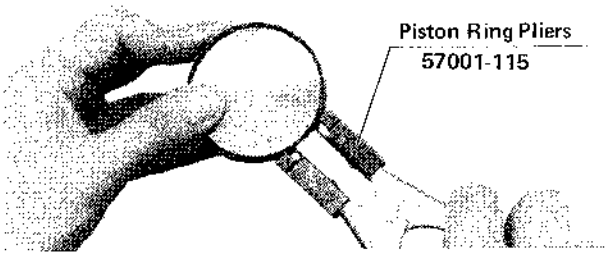


●Using the piston pin puller (special tool), remove the piston pin from the side the snap ring was removed.

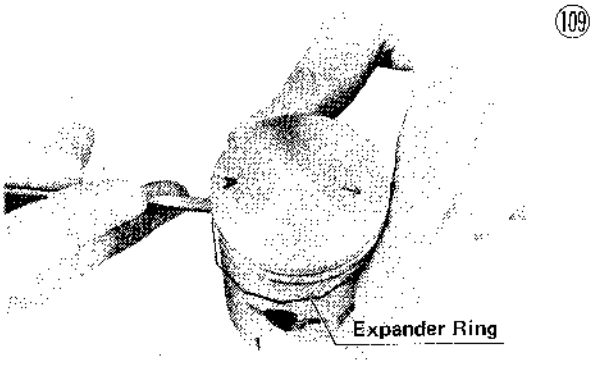
An alternate means of removing the piston pin is as follows: insert a bolt of appropriate size through the pin, screw a nut on the end, and then pull on the head of the bolt.



●Remove the piston and the con-rod needle bearing.
●Remove both piston rings with piston ring pliers (special tool). If no special tool is available, spread the ring opening with the thumbs, and then push up on the opposite side of the ring to remove it.



●Remove the expander ring.

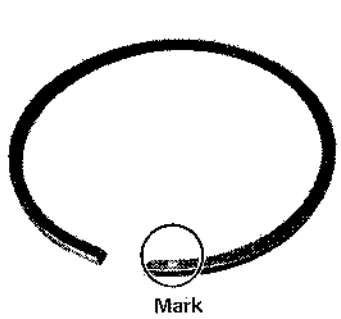


Installation Notes:

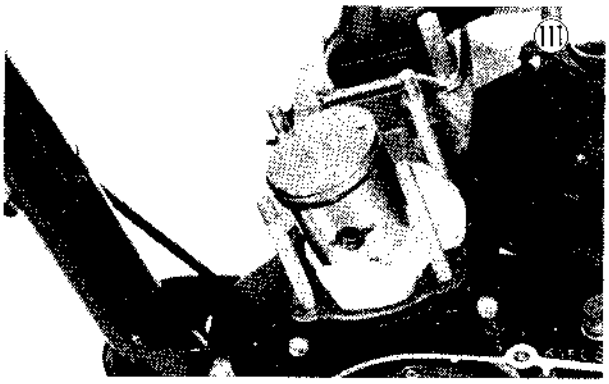
1. Apply oil to the con-rod needle bearing before insertion.
2. If the piston is replaced with a new one, piston to cylinder clearance changes (Pg. 99). Also, when a new piston or piston pin is used, check that the piston to pin clearance is 0.0024 ~ 0.0084 mm (0.00009 ~ 0.00033 in).

To the Dealer: When possible, match parts from stock so that a marked pin is assembled with an "A" piston and an unmarked pin with a "B" piston.

3. Install the piston rings so that the correct side (marked "N") faces up (Fig. 110).



4. When replacing the piston rings by hand, first fit one end of the piston ring against the pin in the piston groove, spread the ring opening with the other hand, and then slip the ring into the groove.
5. The arrow on the top of the piston must point towards the front.

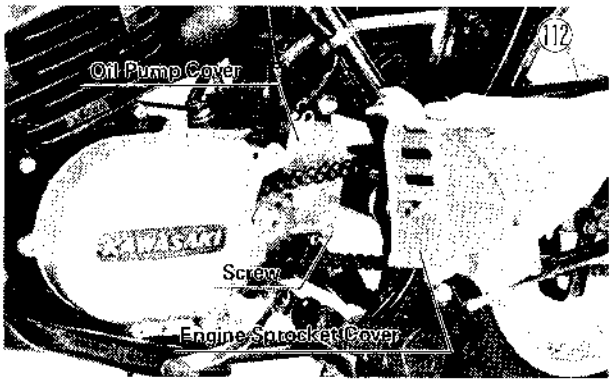


6. Apply a little oil to the piston pin before inserting it.
7. Use a new piston pin snap ring in place of every one that is removed since removal weakens and deforms it. After installation, turn the snap ring so that its opening does not coincide with either groove in the side of the piston.

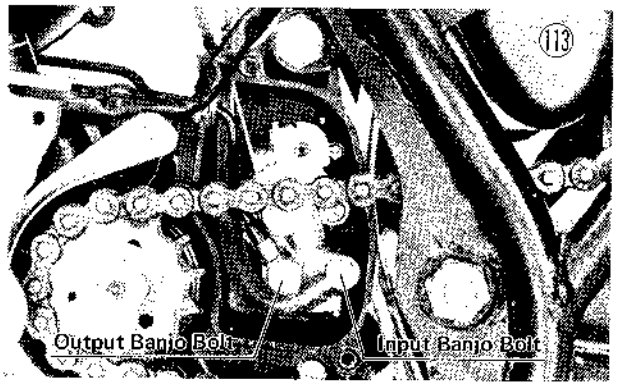
OIL PUMP

Removal:

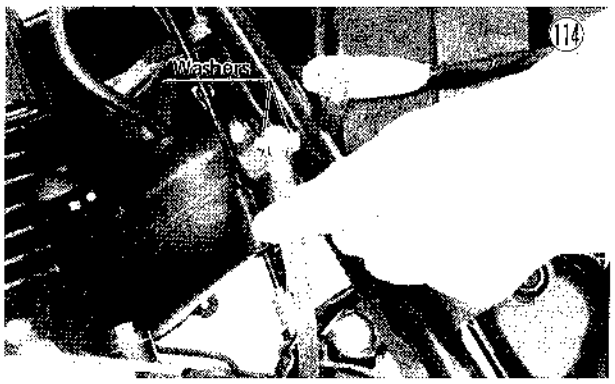
- Remove the engine oil tank (Pg. 28).
- Remove the engine sprocket cover and oil pump cover.



- Bend out the tab on the oil pump lever, and free the end of the oil pump cable from the oil pump lever.
- Remove the oil pump output banjo bolt, and prop the end of the tube up out of the way. There are two washers on the banjo bolt, one on each side of the connector.



- Remove the oil pump input banjo bolt. To keep the oil from flowing out of the tube, elevate the oil pump end of the input tube so that it is higher than the oil tank end. There are two washers on the banjo bolt, one on each side of the connector.

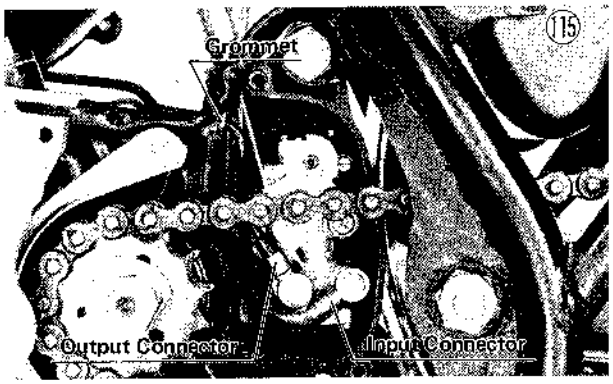


- Remove the oil pump mounting screws (2), and remove the oil pump and gasket.

Installation:

- Note the position of the notch on the oil pump gear shaft, and then turn the oil pump shaft so that it will fit into the notch when fitting the oil pump back into place.

- Put the oil pump and gasket back into place, and tighten the mounting screws. There is a copper washer for each screw.
- Connect both connectors back onto the pump. Be sure that the connectors do not get mixed up and that there is a washer on each side of each connector. Maximum banjo blot torque is 0.2 ~ 0.25 kg-m (17 ~ 22 in-lbs). The output tube grommet fits into the crankcase.



- Fit the oil pump inner cable on the oil pump lever, and bend the tab back onto the end of the cable.
- Check to see that the lower mark on the oil pump lever lines up with the mark on the oil pump lever stopper. Adjust if necessary (Pg. 10).
- Install the engine oil tank (Pg. 28).
- Bleed the oil pump (Pg. 115).
- Fit the oil pump cover back into its proper position, and replace its screw (lower).
- Replace the engine sprocket cover.

Disassembly:

- Wrap a piece of cloth around the end of the oil pump shaft ⑰ to protect it, and pull it out with pliers. A copper spacer ⑯ will also come out.
- Pull the bushing ⑲ off the pump shaft. The **O** ring ⑱ and oil seal ⑳ , if worn or damaged, can be removed for replacement with a small hook.
- Pressing down on the plunger cap ⑧ so that the cap will not be thrown off by the spring inside, remove the two plunger cap screws ⑩ and the cap.
- Remove the spring seat ⑥ , spring ⑤ , valve sleeve stopper ⑦ , and **O** ring ⑪ .
- Remove the cap ⑬ on the other side. If the **O** ring ⑫ needs to be replaced, it may be pulled out with a small hook.
- Insert a thin rod pass the control cam ㉒ , and push out the plunger follower ④ , plunger ② , and valve sleeve ③ .
- Remove the control lever nut ㉗ , and remove the lever ㉔ , washer ㉕ , and spring ㉓ .
- Pull out the control cam ㉒ . If the **V** ring ㉑ on the control cam needs to be replaced, it may be pulled off with a small hook.

Assembly Notes:

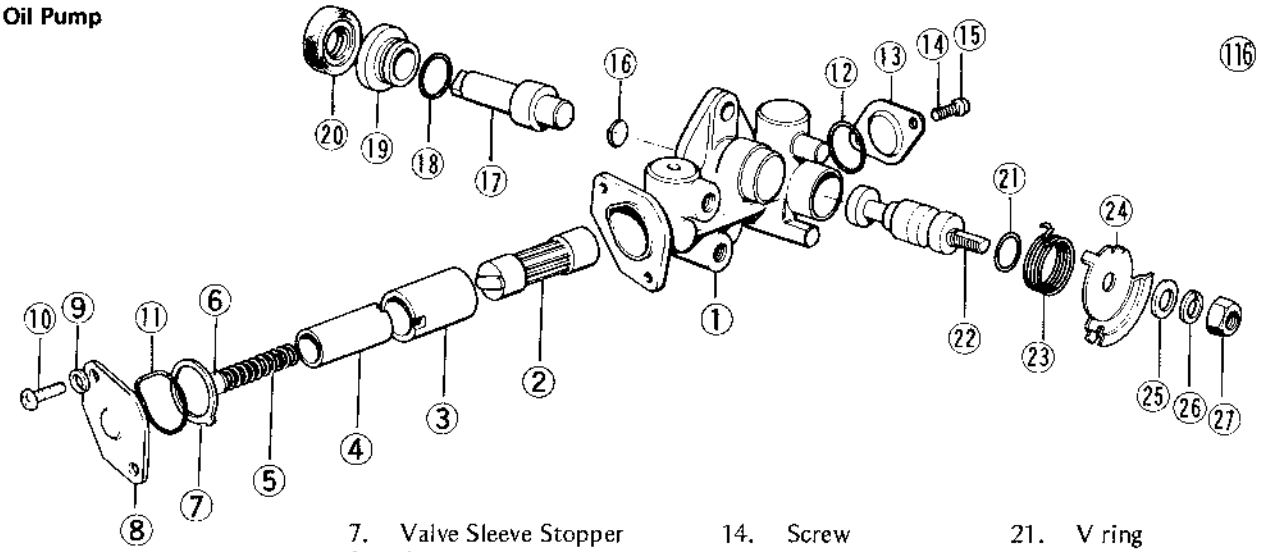
1. When replacing the oil seal with a new one, apply oil to it and fit it in using a press.
2. Apply oil to the **O** and **V** rings, plunger follower, plunger, and valve sleeve before assembly.

CARBURETOR

Removal:

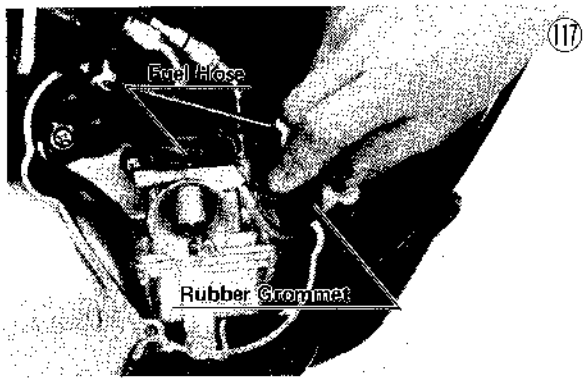
- Remove the nuts (2) from the muffler exhaust collar.
- Remove the bolts (2) that connect the muffler to the frame and to the bracket at the rear shock absorber, and then remove the muffler and gasket.
- Remove the bolts (4) from the carburetor rim, and slide the rim and carburetor rubber cap up the cables.
- Remove the carburetor cover and gasket.

Oil Pump



1. Pump Body
2. Plunger
3. Valve Sleeve
4. Plunger Follower
5. Plunger Spring
6. Spring Seat
7. Valve Sleeve Stopper
8. Cap
9. Lock Washer
10. Screw
11. O ring
12. O ring
13. Cap
14. Screw
15. Lock Washer
16. Spacer
17. Pump Shaft
18. O ring
19. Bushing
20. Oil Seal
21. V ring
22. Control Cam
23. Pump Lever Spring
24. Pump Lever
25. Washer
26. Lock Washer
27. Nut

•Pull off the idling screw rubber grommet from the right engine cover.

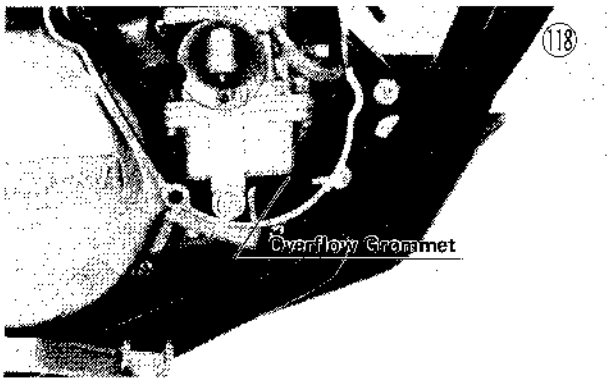


⑰

•Turn the fuel tap to the "O" position, slide the clamp, out of place and pull the fuel hose off the carburetor.
•Pull off the carburetor.

Installation:

•Check to see that the carburetor overflow grommet is properly positioned, and then press the carburetor back into its place on the right engine cover. Be sure that it is all the way back into place.



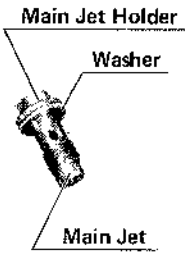
⑱

•Fit the fuel hose on the carburetor, and slide back its clamp.
•Install the idling screw grommet back into the right engine cover.
•If the carburetor was disassembled, adjust the air screw at this point (Pg. 11).
•Also, if the cable(s) had been affected by disassembly, adjust the carburetor cable (Pg. 9) and/or choke cable (Pg. 12).
•Replace the carburetor cover and gasket.
•Slide back the carburetor rubber cap and rim, and tighten the rim bolts with 0.4~0.5 kg-m (35~43 in-lbs) of torque.
•Fit the muffler and gasket into the cylinder exhaust port, and loosely tighten the bolts that connect the muffler to the frame and to the bracket at the rear shock absorber. The frame bolt has a lock washer and large flat washer. The bracket bolt has a lock washer and small flat washer.
•Replace the muffler exhaust collar nuts, tightening them together so that they tighten evenly to avoid an exhaust leak. Be sure that the spring side of the nuts face out.
•Tighten the muffler mounting bolts.

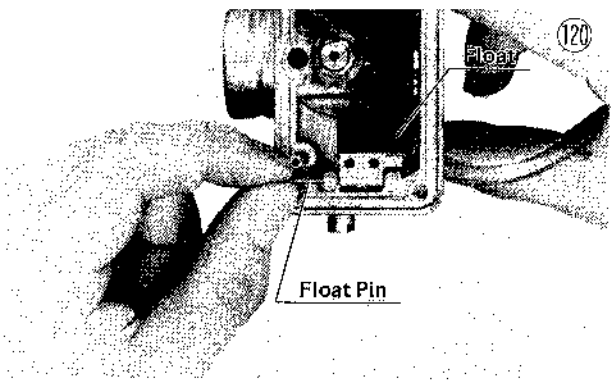
Disassembly:

•Slide the carburetor rubber cap plate up the cables.
•Unscrew the choke cable cap ② , and pull the starter plunger ④ out of the carburetor body.
•Unscrew the carburetor cap ㊱ , and pull out the throttle valve assembly.
•To remove the throttle valve ⑦ from the cable, pull the spring ㉞ up from where it seats in the valve so that the spring seat ㉛ will fall out of place, and slip the tip of the cable to the other side of the slot in the valve base. This releases the spring from the cable, and the spring seat and the jet needle ㉜ with its clip ㉝ can be removed from the valve.
•To remove the carburetor cap from the cable guide ㊳ , remove the clip ㉟ on the inside of the cap.
•Pull off the overflow tube ⑫ and overflow grommet ㉕ .
•To remove the main jet ㉘ , unscrew the main jet holder ㉙ at the base of the float bowl ㉖ , and then unscrew the main jet from the holder. There is a flat washer on the main jet holder.

⑲



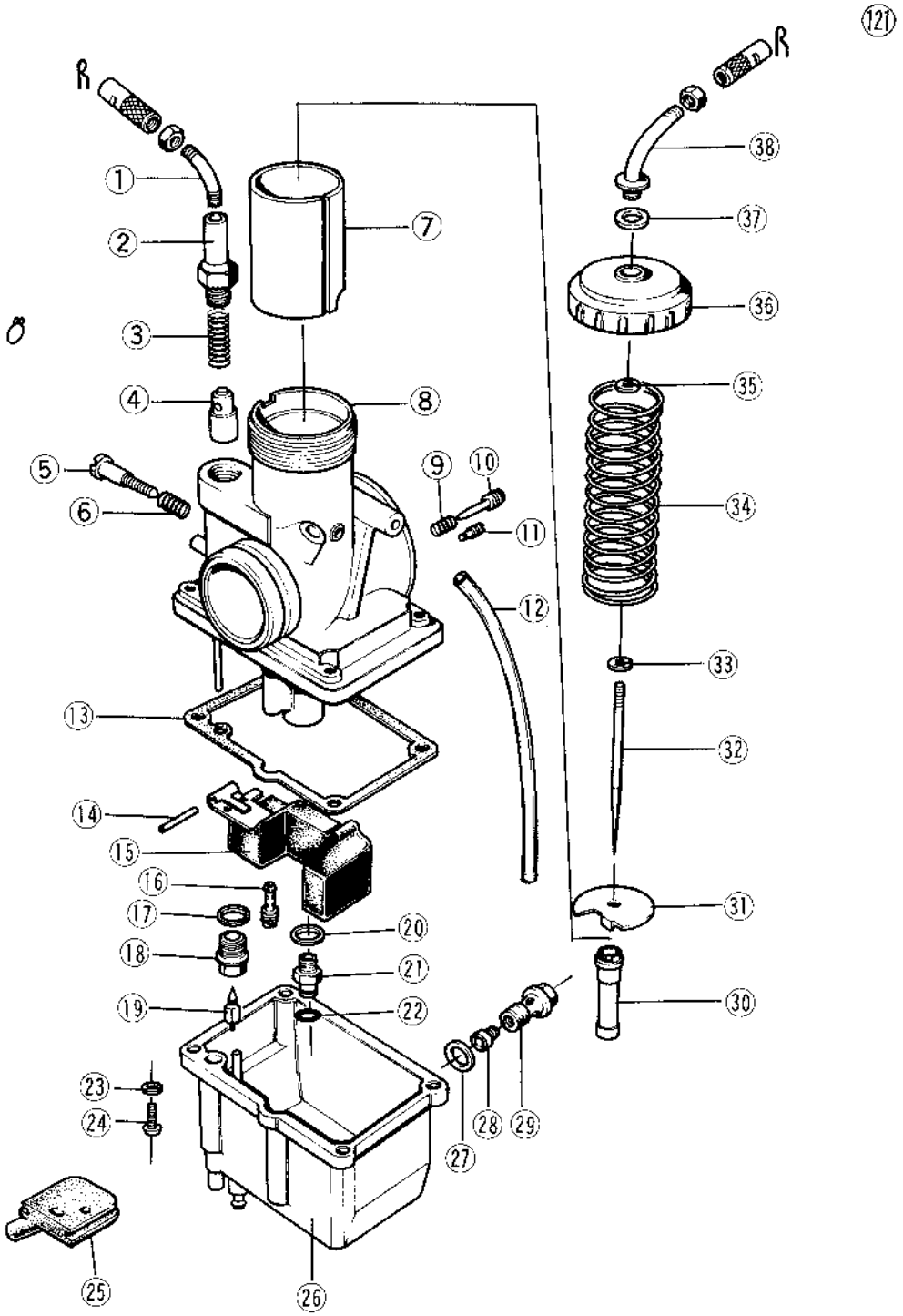
•Remove the 4 screws ㉔ at the base of the carburetor, and remove the float bowl and gasket ⑬ .
•Push out the float pin ⑭ , and remove the float ⑮ . The float needle ⑲ will readily drop out from the float valve seat ⑱ .



⑳

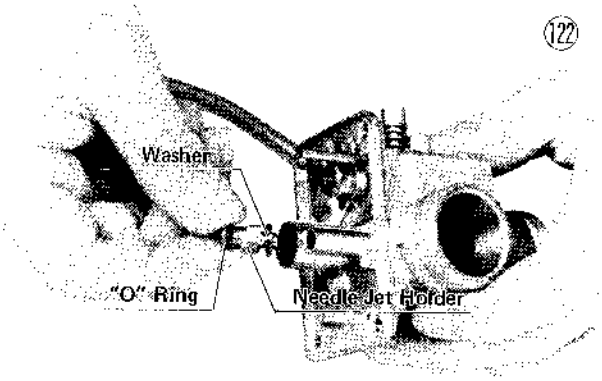
•To remove the float valve seat, screw it out with a socket or "T" wrench.

Carburet



1. Choke Cable Guide
2. Choke Cable Cap
3. Spring
4. Starter Plunger
5. Idling Screw
6. Spring
7. Throttle Valve
8. Carburetor Body
9. Spring
10. Air Screw
11. Air Jet
12. Overflow Tube
13. Gasket
14. Float Pin
15. Float
16. Pilot Jet
17. Washer
18. Valve Seat
19. Float Needle
20. Washer
21. Needle Jet Holder
22. O Ring
23. Lock Washer
24. Screw
25. Overflow Grommet
26. Float Bowl
27. Gasket
28. Main Jet
29. Main Jet Holder
30. Needle Jet
31. Spring Seat
32. Jet Needle
33. Clip
34. Spring
35. Clip
36. Carburetor Cap
37. Gasket
38. Throttle Cable Guide

•To remove the needle jet ㉚ , first unscrew the needle jet holder ㉑ , and remove its washer ㉘ . Then push or pull the needle jet up out of the needle jet bore inserting a soft rod, such as a pencil, through the bottom of the bore if necessary.



•To remove the pilot jet ⑯ , unscrew it with a thinbladed screwdriver.
•To remove the starter jet, unscrew it with a thinbladed screwdriver.
•To remove the air screw ⑩ , unscrew it, and remove its spring ⑨ .

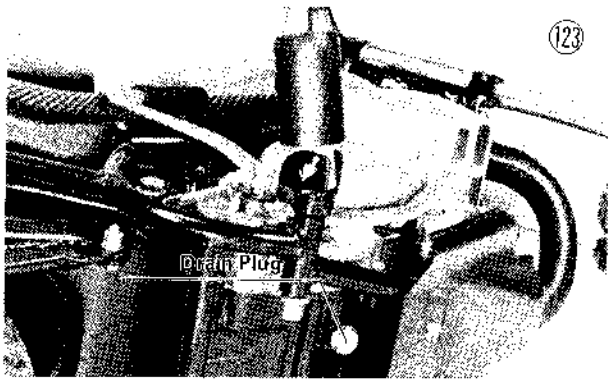
Assembly Notes:

1. Replace the float bowl gasket for a new one if it is deteriorated or damaged.
2. Replace the needle jet holder O ring if it is deteriorated or damaged.
3. The needle jet is replaced through the top of the needle jet bore. Align the groove on the bottom of the needle jet with the guide pin.
4. To reattach the throttle valve to the cable, first compress the spring into the cap. Next, insert the tip of the carburetor cable through the slot in the throttle valve base, and slip it to its rest position in the other side of the slot. Lastly, insert the jet needle, and position the spring seat on the valve base with its tab in the slot.

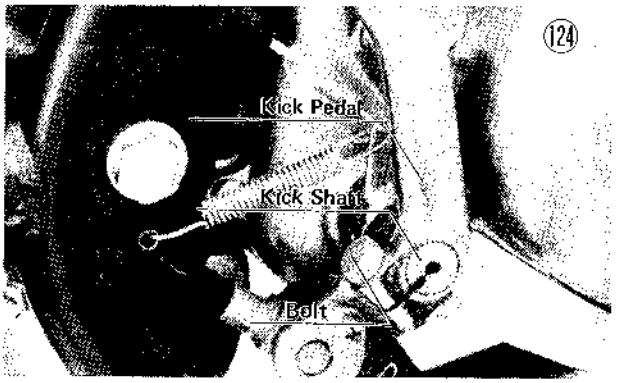
RIGHT ENGINE COVER

Removal:

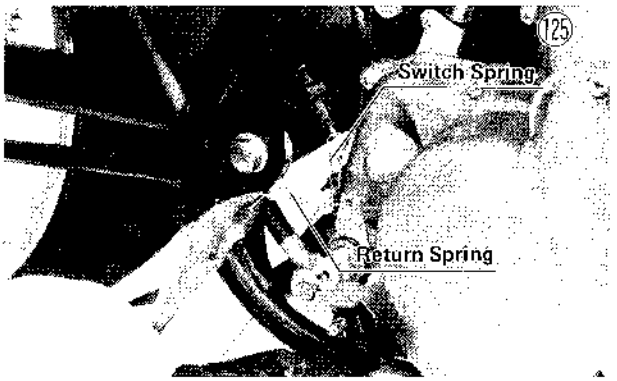
•With the motorcycle fully perpendicular to the ground, place an oil pan beneath the engine, and remove the engine drain plug so that all the transmission oil drains out.



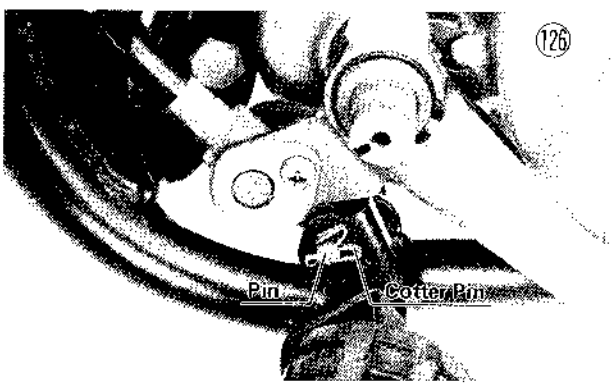
•Remove the nuts (2) from the muffler exhaust collar.
•Remove the bolts (2) that connect the muffler to the frame and to the bracket at the rear shock absorber, and then remove the muffler and gasket.
•Mark the position of the kick pedal on the shaft so that it can be replaced later in the same position.



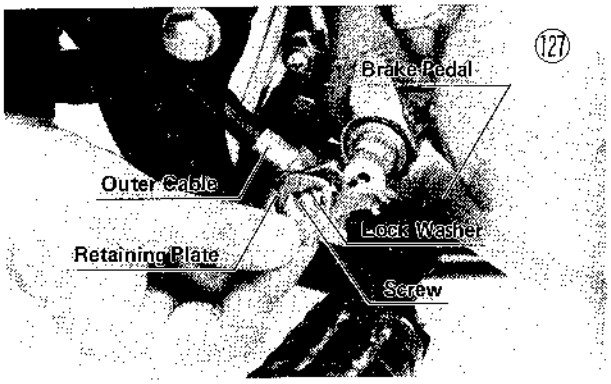
•Remove the kick pedal bolt, and pull off the kick pedal.
•Free the rear brake light switch spring from the flange on the rear of the brake pedal being careful not to bend or otherwise damage it.
•With pliers, free the brake pedal return spring from its hole on the frame, and then remove the spring from the brake pedal flange.



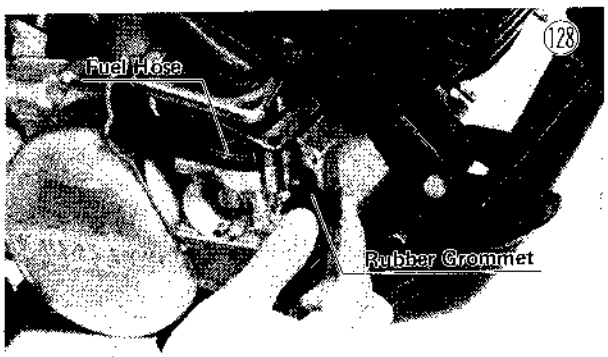
•Loosen the adjusting nut on the end of the threaded extension of the rear brake cable so that the cable has plenty of play.
•Remove the cotter pin from the pin which holds the rear brake inner cable to the frame, and then remove the pin.



•Remove the outer cable screw from the rear of the brake pedal, and free the rear brake outer cable from the brake pedal. A lock washer and the outer cable retaining plate come off with the screw.



•Pull off the brake pedal.
•Remove the bolts (4) from the carburetor rim, and slide the rim and carburetor rubber cap up the cables.
•Remove the carburetor cover and gasket.
•Pull off the idling screw rubber grommet from the right engine cover.



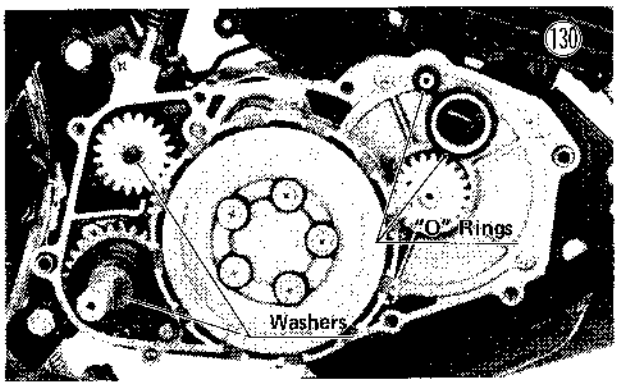
•Turn the fuel tap to the "O" position, and pull the fuel hose off the carburetor.
•Pull off the carburetor.
•Prop the carburetor up out of the way to the rear on top of the tool case.
•Remove the banjo bolt from the right engine cover. There is a washer on each side of the check valve.



•Remove the 6 mm screws (9) that secure the right engine cover to the crankcase and the 5 mm screws (3) that secure the right engine cover air duct to the air cleaner tube.
•Pull off the right engine cover and gasket. A washer on the kick shaft, a washer on the oil pump gear shaft, an O ring on the rotary valve cover intake port, and an O ring on the oil passage pipe may fall loose from the cover.

Installation:

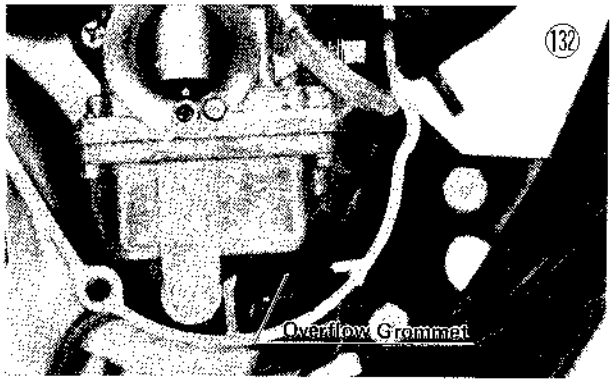
•See that the washer for the kick shaft, the washer for the oil pump gear shaft, the O ring for the rotary valve cover intake port, and the O ring for the oil passage pipe are all in place.



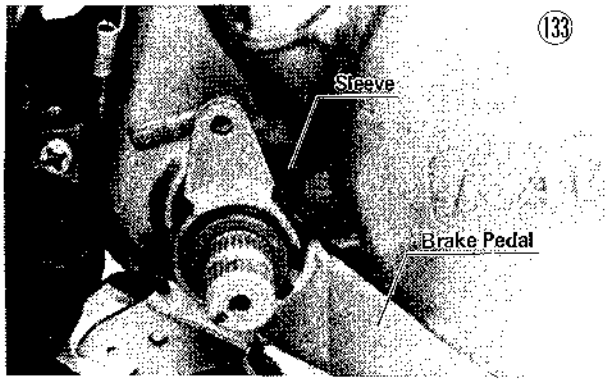
•Using a new right engine cover gasket, fit the right engine cover back onto the crankcase. Use an oil seal guide to protect the oil seal, and see that the O ring does not fall off the rotary valve cover intake port.



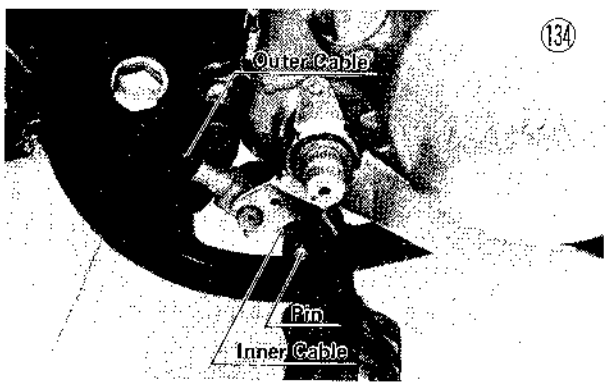
•Replace the 6 mm screws (9) and the 5 mm screws (3).
•Replace the banjo bolt on the right engine cover. There is a washer for each side of the check valve.
•Check to see that the carburetor overflow grommet is properly positioned, and then press the carburetor back into its place on the right engine cover. Be sure that it is all the way back into place.



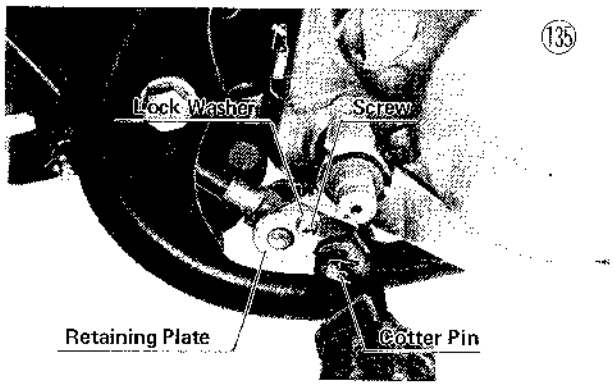
- Fit the fuel hose on the carburetor.
- Install the idling screw grommet back into the right engine cover.
- Replace the carburetor cover and gasket.
- Slide back the carburetor rubber cap and rim, and tighten the rim bolts.
- Place the brake pedal back on the kick shaft. Situate the brake pedal sleeve so that the cutaway fits on its knob on the crankcase.



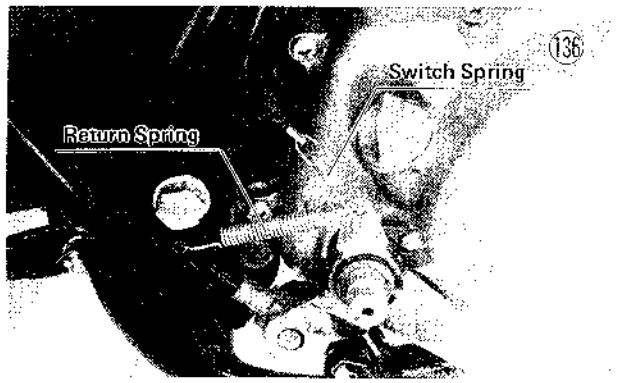
- Fit the outer cable end into its proper position at the rear of the brake pedal, push in on the inner cable threaded extension so that the end of the inner cable will fit into its place in the frame below the brake pedal, and replace the inner cable pin.



- Insert a new cotter pin into the inner cable pin, and bend out the ends.
- Replace the outer cable retaining plate, lock nut, and screw to secure the rear brake outer cable to the rear of the brake pedal.



- Replace the brake pedal return spring.
- Carefully fit the rear brake light switch spring back into the spring hole on the brake pedal flange.

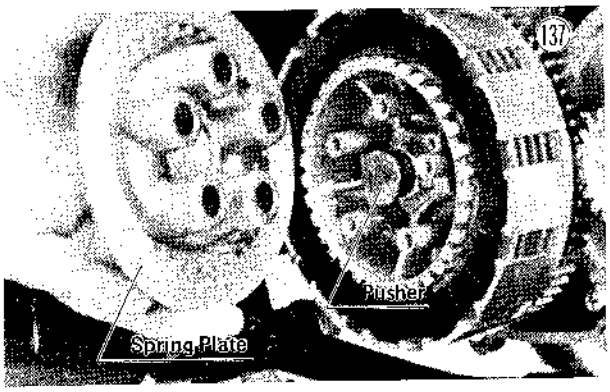


- Replace the kick pedal, and tighten its bolt.
- Fit the muffler and gasket into the cylinder exhaust port, and loosely tighten the bolts that connect the muffler to the frame and to the bracket at the rear shock absorber. The frame bolt has a lock washer and large flat washer. The bracket has a lock washer and small flat washer.
- Replace the muffler exhaust collar nuts, tightening them together so that they tighten evenly to avoid an exhaust leak. Be sure that the spring side of the nuts face out.
- Tighten the muffler mounting bolts.
- Replace the engine drain plug, tightening it with 0.7~1.0 kg-m (61~86 in-lbs) of torque.
- Pour the transmission oil back in.
- Adjust the rear brake cable (Pg. 18) and the rear brake light switch (Pg. 18).

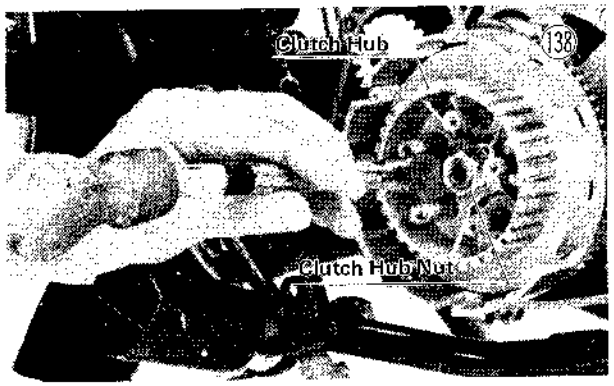
CLUTCH

Removal:

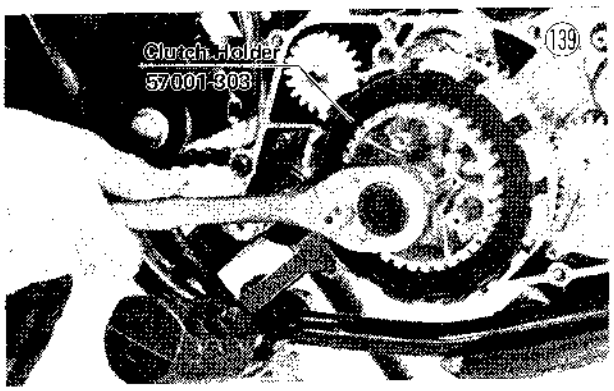
- Remove the right engine cover (Pg. 37).
- Take out the clutch spring bolts (5) .
- Take off the spring plate ⑥ and the spring plate pusher ⑩ .



- Pull out the friction plates (5) ③ , steel plates (4) ④ , and steel rings (5) ⑤ .
- Straighten back the portion of the washer ⑦ which is bent over the side of the clutch hub nut ⑧ .

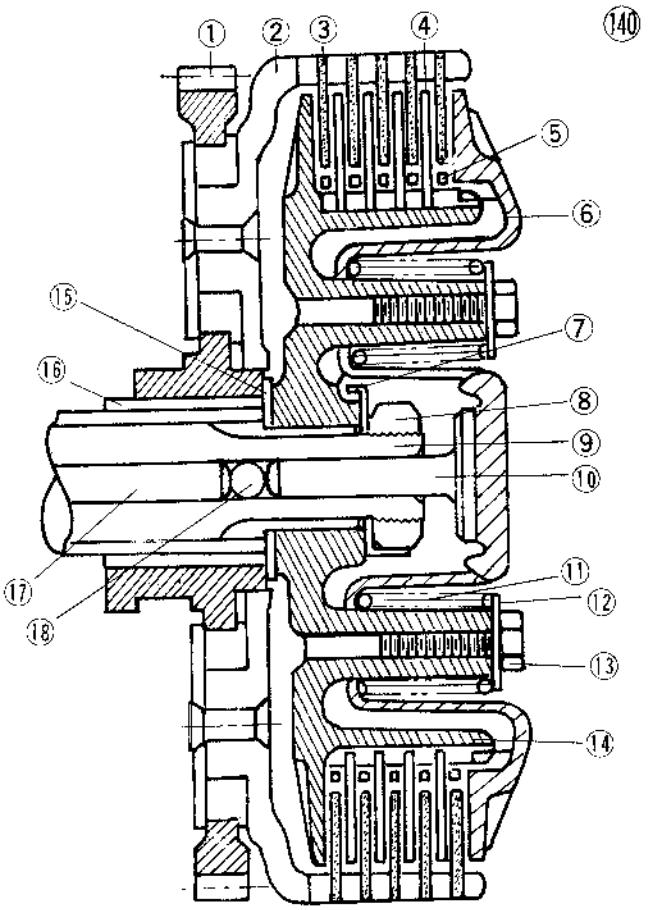


- Holding the clutch hub ⑭ steady with the clutch holder (special tool), undo the clutch hub nut, and remove the washer.



- Pull off the clutch hub. There is a thrust washer at the rear of the hub.
- Pull off the clutch housing ② .

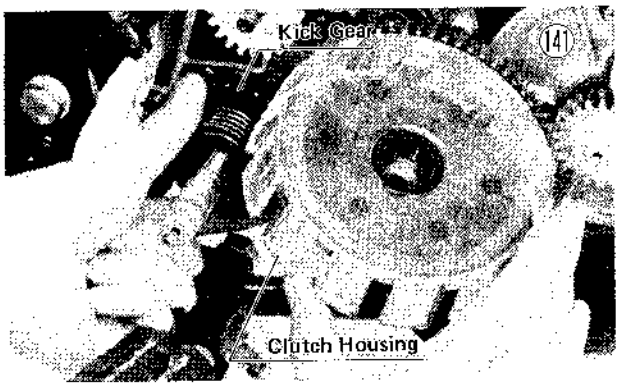
Clutch Construction



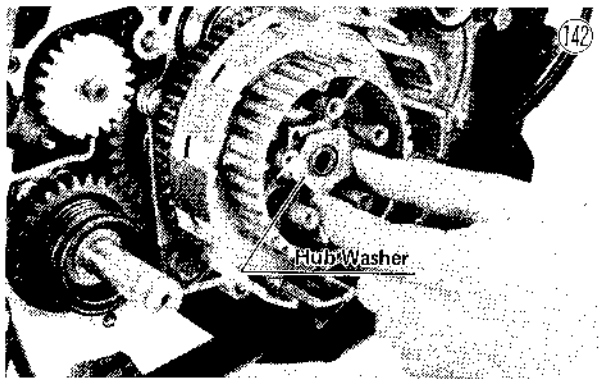
1. Housing Gear
2. Clutch Housing
3. Friction Plate
4. Steel Plate
5. Steel Ring
6. Spring Plate
7. Washer
8. Hub Nut
9. Drive Shaft
10. Spring Plate Pusher
11. Clutch Spring
12. Washer
13. Bolt
14. Clutch Hub
15. Thrust Washer
16. Bushing
17. Push Rod
18. Steel Ball

Installation:

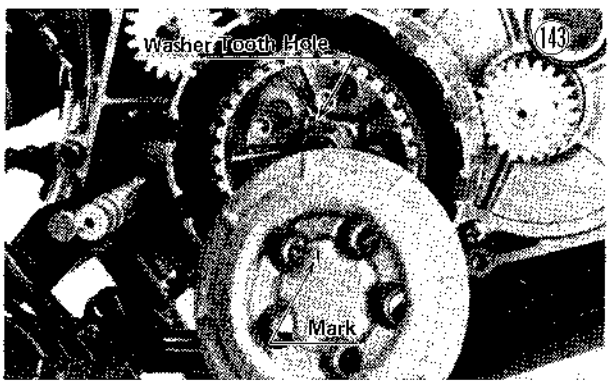
- Fit the clutch housing back on the drive shaft while turning the kick gear by hand so that the rear of the housing will fit into the side of the drive shaft idle gear.



•Replace the thrust washer and then the clutch hub.
•Replace the hub washer, fitting its tooth into the hole in the hub.



•Holding the hub steady with the clutch holder (special tool), tighten the clutch hub nut with 8.0 ~ 11.0 kg-m (50 ~ 80 ft-lbs) of torque.
•Bend back part of the clutch hub washer over the side of the nut.
•Replace the clutch plates. The sequence is friction plate, steel ring, steel plate, friction plate, steel ring, etc. finishing with a steel ring.
•Replace the spring plate pusher.
•Fit the spring plate back into place, aligning the mark on the plate with the washer tooth hole in the hub.

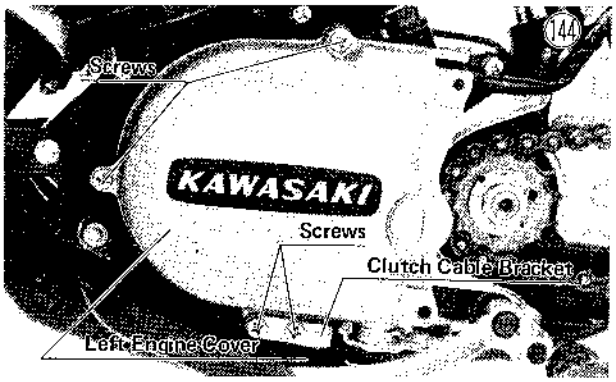


•Replace the spring bolts (5), each with its washer and spring. Tighten the bolts in a cross pattern to 0.4 ~ 0.5 kg-m (35 ~ 43 in-lbs) of torque. Tighten by hand rather than use compressed air, which might make spring pressure uneven.
•Install the right engine cover. (Pg. 37).

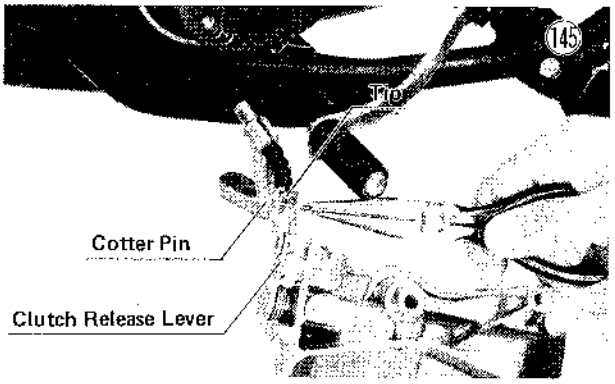
CLUTCH RELEASE MECHANISM

Removal:

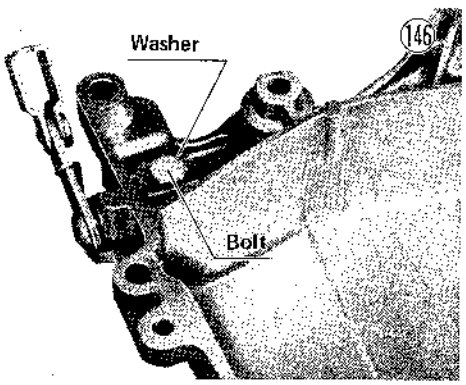
•Remove the engine sprocket cover screws (3), and remove the engine sprocket cover.
•Remove the clutch cable bracket and left engine cover screws (4), and remove the left engine cover and gasket.



•Remove the clutch release cotter pin, and free the tip of the clutch cable from the clutch release lever.

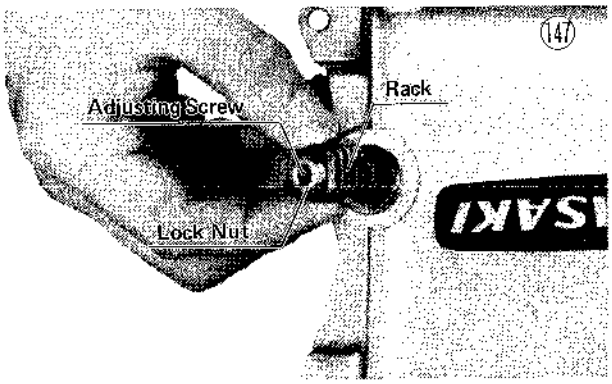


•Straighten back the portion of the washer that is bent over the side of the clutch release mechanism bolt, and then remove the bolt and washer.



•Pull out the clutch release lever shaft.
•Unscrew and remove the clutch adjusting hole cap and gasket.

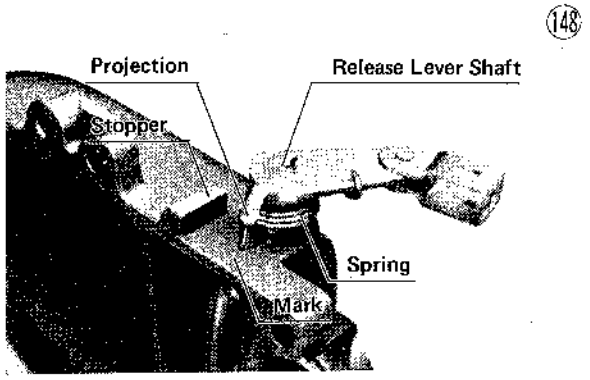
•Pull out the adjusting screw, lock nut, and clutch release rack.



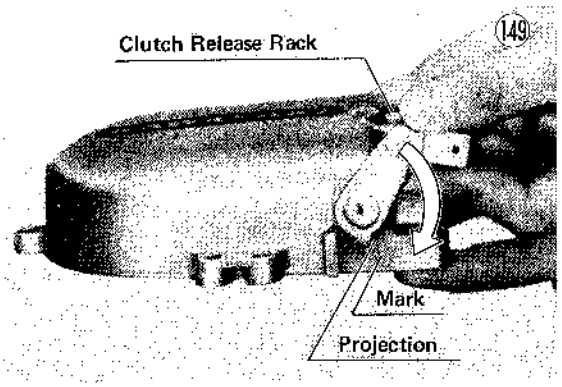
Installation;

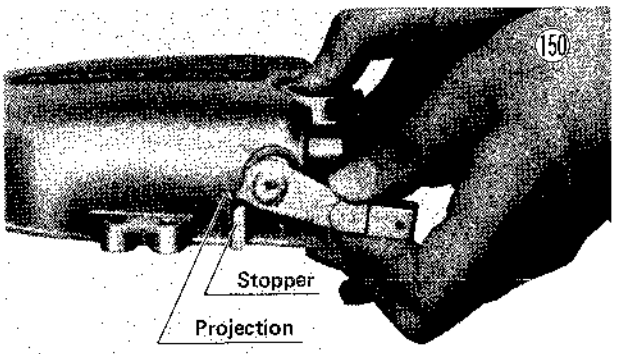
•Apply grease liberally to the clutch release lever shaft, release rack, and inside the holes (2) in the left engine cover.

•Insert the clutch release lever shaft with its spring part of the way into the left engine cover as shown in Fig. 148 so that the lever projection does not strike the stopper if rotated. Note the location of the lever projection. One end of the spring should be hooked onto the clutch release lever.



•Fit the clutch release rack into the left engine cover. While pushing on it lightly but firmly, rotate the clutch release lever in the direction of the arrow in Fig. 149 . When it has rotated to the position shown in Fig. 150 , insert the release lever shaft the rest of the way in.





•Replace the clutch release mechanism bolt and washer, and bend part of the washer over one end of the bolt.

•Fit the tip of the clutch inner cable back into its place in the clutch release lever, insert a new cotter pin, and bend back the ends.

•Replace the left engine cover and clutch cable bracket.

•Replace the engine sprocket cover.

•Adjust the clutch (Pg. 14).

ROTARY DISC VALVE

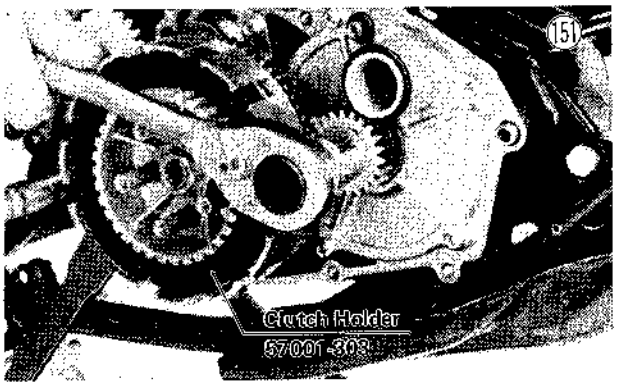
Removal:

•Remove the clutch (Pg. 40).

•Straighten back the portion of the washer which is bent over the side of the primary gear nut.

•Temporarily place the clutch housing and hub back onto the drive shaft.

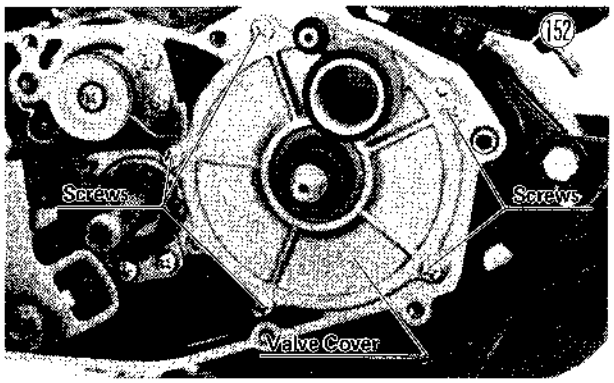
•Holding the clutch steady with the clutch holder (special tool), remove the primary gear nut.



•Remove the clutch hub and housing.

•Remove the primary gear washer, and pull off the primary gear.

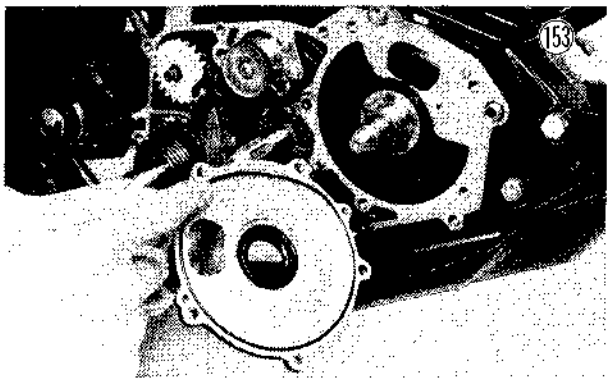
•Remove the valve cover screws (5), and pull off the valve cover.



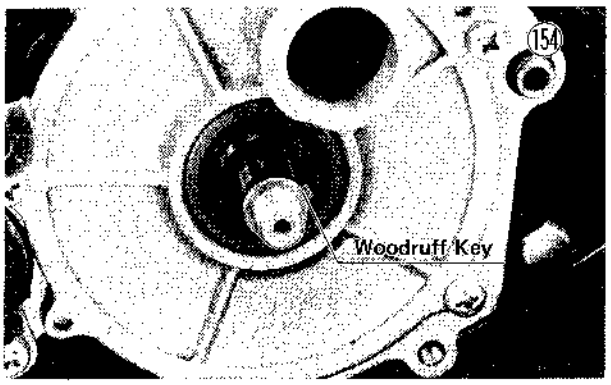
•Remove the rotary disc, taking care not to bend it. It should come off easily.
•If the valve cover oil seal requires replacement, pull it out with a hook. The large O ring in the valve cover may also be removed with a hook.

Installation:

•Fit in the rotary disc matching its hub groove with the crankshaft pin.
•Be sure that the large O ring is properly in place in the valve cover, and replace the cover tightening its screws with an impact driver.

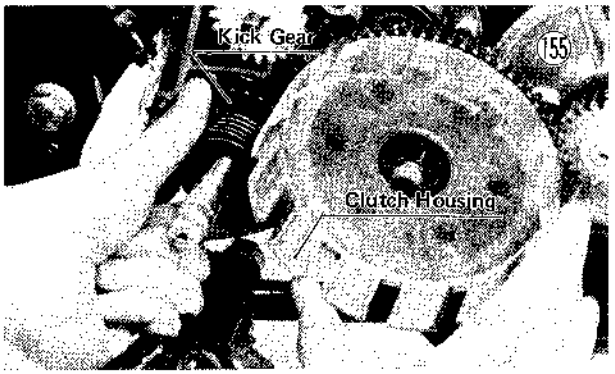


•Check to see that the woodruff key is properly positioned on the crankshaft.

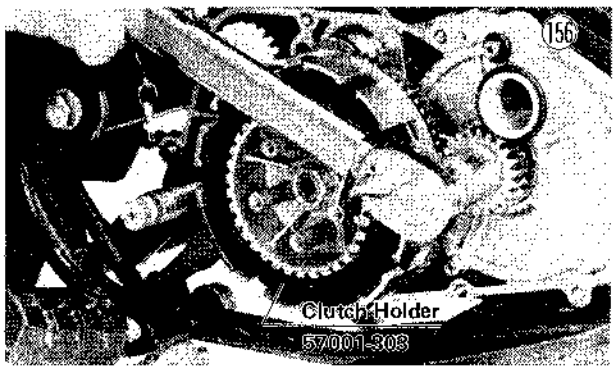


•Replace the primary gear with the hole facing outward to accommodate the tooth washer. Avoid tapping the primary gear when fitting it in place. Striking the gear will necessitate cylinder removal to check the crankcase/crankshaft clearance (Pg. 57).

•Once the primary gear is fully in place, replace the tooth washer with the tooth fitted in the primary gear hole.
•Fit the clutch housing back on the drive shaft while turning the kick gear by hand so that the rear of the housing will fit into the side of the drive shaft idle gear.



•Replace the thrust washer and then the clutch hub.
•Holding the clutch steady with the clutch holder (special tool), tighten the primary gear nut with 7.0~7.5 kg-m (51~54 ft-lbs) of torque.

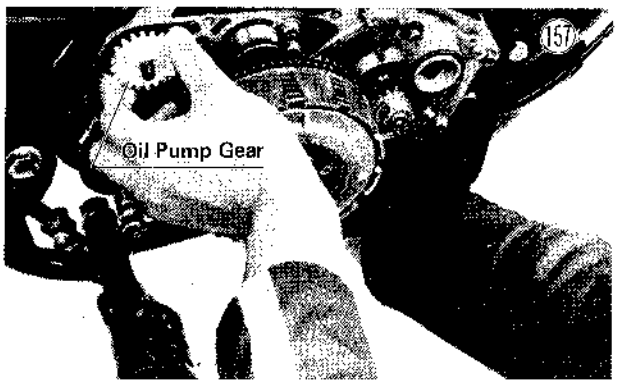


•Bend back a portion of the primary gear washer over the side of the nut.
•Finish installing the clutch (Pg. 41).

OIL PUMP GEAR

Removal:

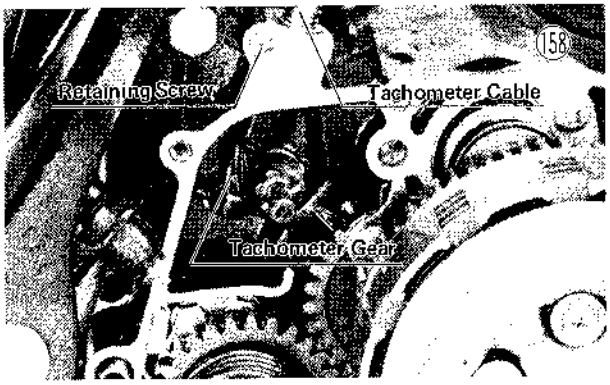
•Remove the right engine cover (Pg. 37).
•Depress the arm on the external shift mechanism, and pull off the oil pump gear.



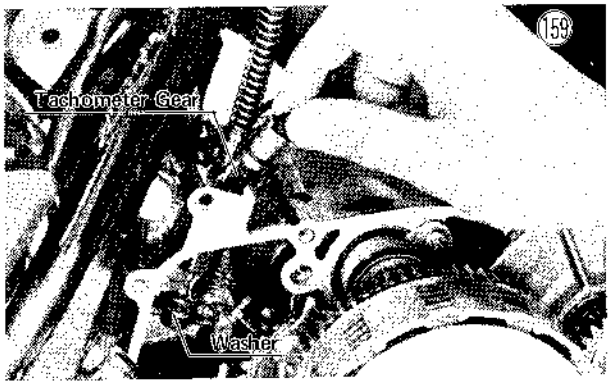
TACHOMETER GEAR

Removal:

- Remove the oil pump gear (Pg. 43).
- Take out the tachometer cable retaining screw from the crankcase, and pull the tachometer cable free.



- Push or tap the tachometer gear from the bottom up and out of the crankcase opening. There is a washer at the base of the gear.



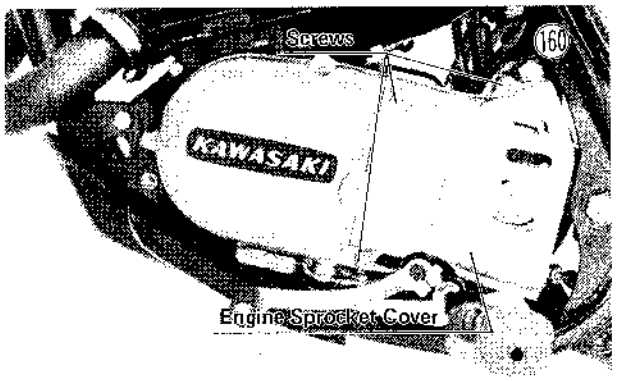
Installation:

- Fit the tachometer gear, sleeve, and cable together, and push down into place. The bottom of the gear seats in a washer.
- Replace the tachometer cable retaining screw.
- Fit the oil pump gear back into place, and install the right engine cover (Pg. 38).

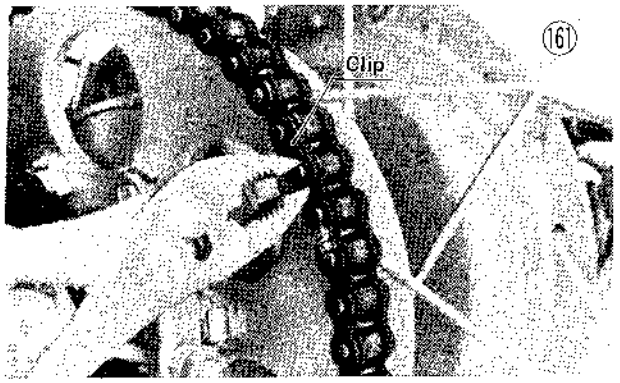
DRIVE CHAIN

Removal:

- Check to see that the transmission is in neutral.
- Remove the engine sprocket cover screws (3), and remove the engine sprocket cover.



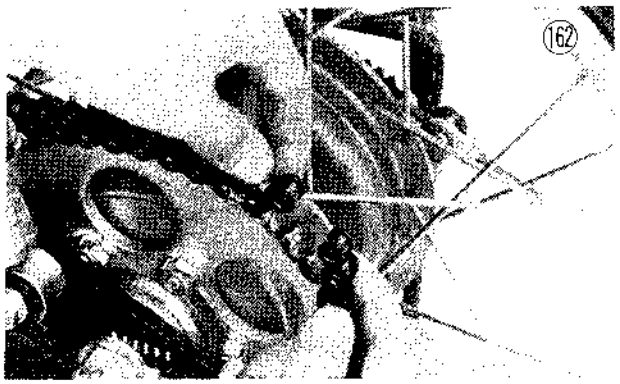
- Undo the clip carefully from the drive chain master link using pliers, and remove the master link.



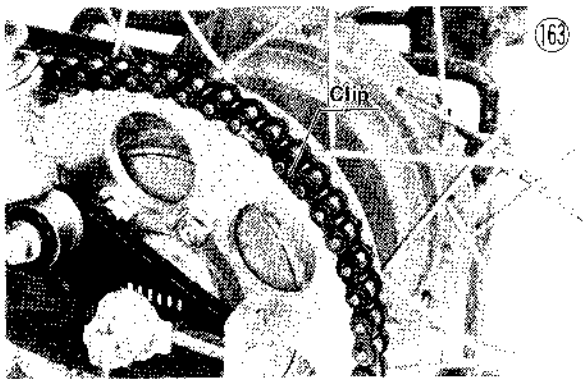
- Remove the drive chain from the sprockets.

Installation:

- Fit the drive chain back on the sprockets, and set the ends of the chain on the rear sprocket as shown in Fig. 162 .



- Replace the chain master link. The direction of the master link clip should be as shown in Fig. 163 .



•Replace the engine sprocket cover.

ENGINE SPROCKET

Removal:

•Remove the drive chain (Pg. 44).
•Straighten back the bent portion of the engine sprocket tooth washer.
•Using the engine sprocket holder (special tool) to keep the engine sprocket steady, remove the engine sprocket nut and tooth washer.



•Pull off the engine sprocket.

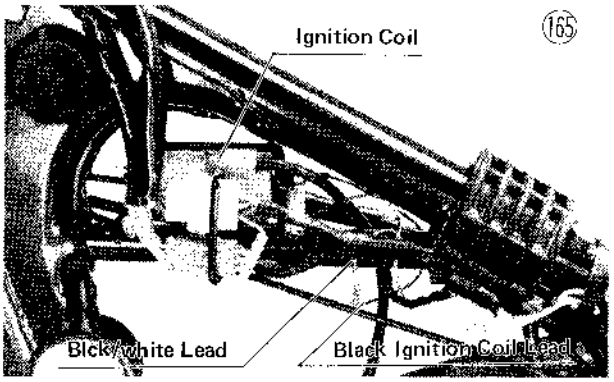
Installation:

•Place the engine sprocket back onto the output shaft, and replace the tooth washer so that its tooth fits into one of the holes in the engine sprocket.
•Tighten the engine sprocket nut with 7.0~7.5 (51~54 ft-lbs) of torque.
•Bend back one side of the tooth washer over the nut.
•Install the drive chain (Pg. 44).

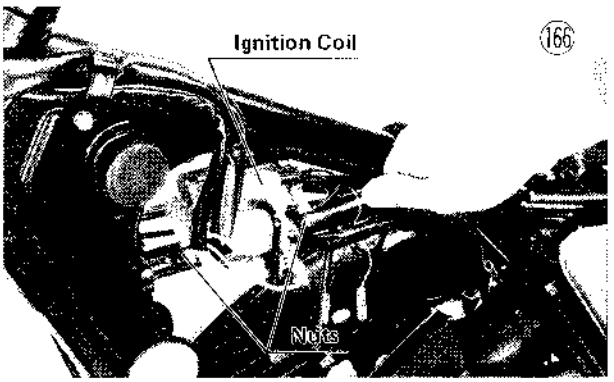
IGNITION COIL

Removal:

•Release the catches (2) at the rear of the seat, and pull off the seat.
•Turn the fuel tap to the "O" position, slide down the hose clamp, and pull the fuel hose off the tap.
•Unhook the rubber retaining band, and pull the fuel tank off towards the rear.
•Pull off the spark plug lead from the spark plug.
•Disconnect the black ignition coil lead from where it connects to the black/white lead.

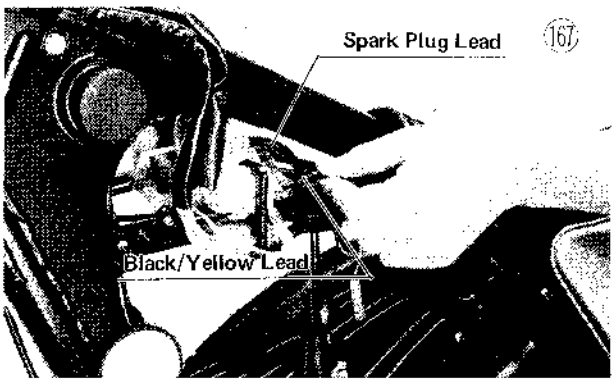


•Remove the nuts (2) from the ignition coil mounting screws, and lift off the ignition coil.



Installation:

•Run the spark plug lead between the cables and the frame top tube, and fit the ignition coil mounting screws into their place under the frame top tube. A black/yellow lead is grounded between the ignition coil lower assembly nut and the frame.



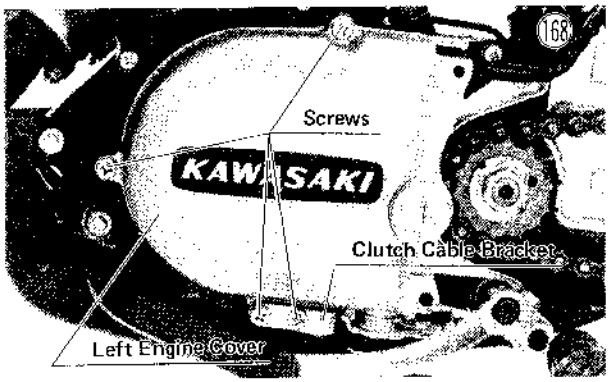
•Tighten the ignition coil mounting nuts (2). There is a lock washer for each nut.

- Connect the black ignition coil lead to the black/white lead.
- Fit the spark plug lead onto the spark plug.
- Replace the fuel tank, and hook its retaining band.
- Fit the fuel hose back onto the fuel tap, and slide the clamp back into place.
- Push the seat back into place.

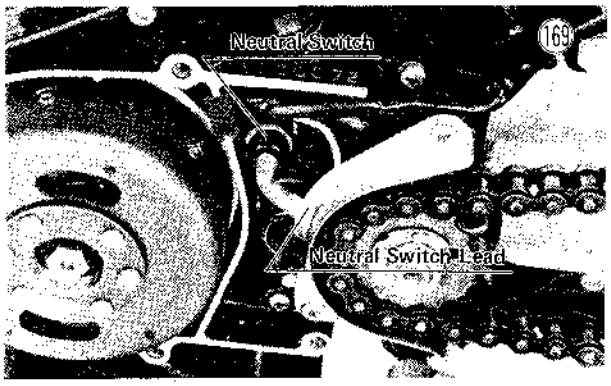
NEUTRAL SWITCH

Removal:

- Remove the engine sprocket cover.
- Remove the clutch cable bracket and left engine cover screws (4), and drop down the left engine cover.



- Pull off the light green neutral switch lead from the neutral switch.

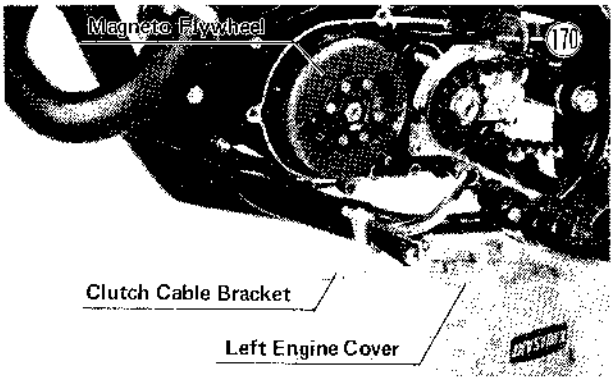


- Unscrew the neutral switch from the side of the crankcase.

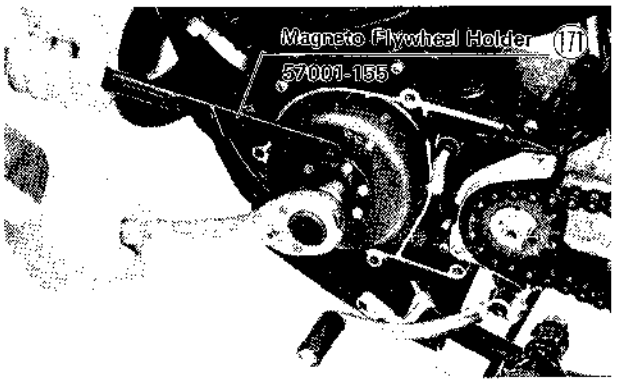
MAGNETO FLYWHEEL

Removal:

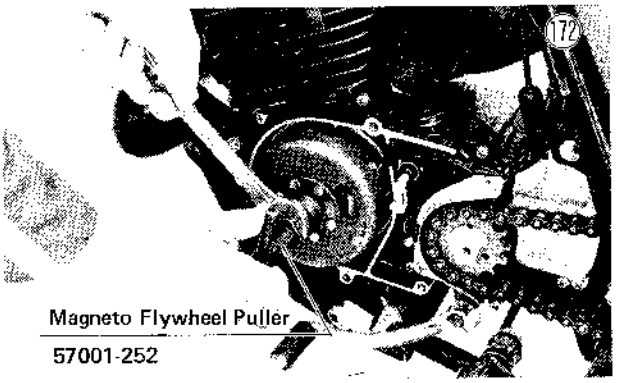
- Remove the engine sprocket cover.
- Remove the clutch cable bracket and left engine cover screws (4).
- Drop down the left engine cover, and remove the left engine cover gasket.



- Using the magneto flywheel holder (special tool) to keep the magneto flywheel steady, remove the magneto nut with a socket wrench, and take out the lock washer.



- Using the special tool to keep the flywheel steady, remove the magneto flywheel with a special magneto flywheel puller (special tool).

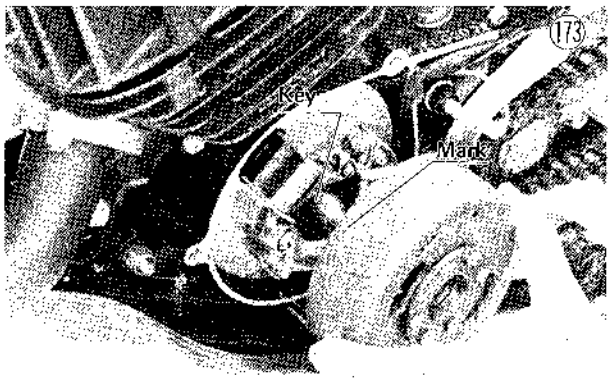


CAUTION: If a hammer is used to tap the flywheel puller in case the flywheel should be difficult to remove, be careful that the flywheel itself is not struck. Striking the flywheel can cause the magnets to lose their magnetism.

Installation:

- See that the key is fitted in its place on the crankshaft properly, and then fit the flywheel in place so that the key fits in the groove in the hub of the flywheel. A line on the circumference of the flywheel (of the two, the

one on the right), which indicates where the key groove is located on the flywheel hub, may be referred to facilitate installation.



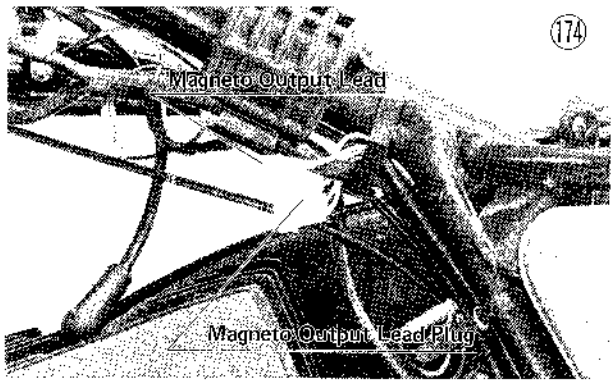
•Once the flywheel is all the way back in place, replace the lock washer, and tighten the magneto nut while holding the flywheel steady by the special tool. The maximum torque for the magneto nut is 5 kg-m (36 ft-lbs).

•Replace the left engine cover and gasket.
•Replace the clutch cable bracket.
•Replace the engine sprocket cover.
•Check ignition timing (Pg. 13).

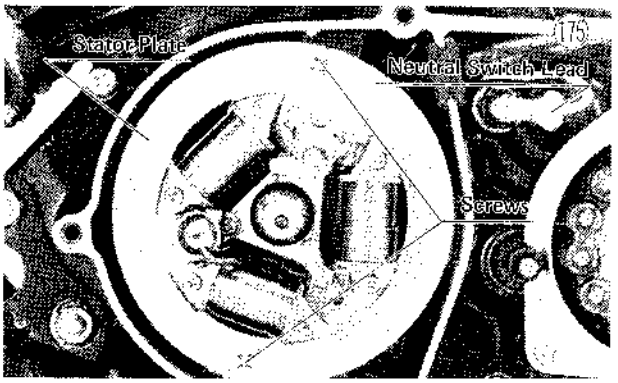
MAGNETO STATOR

Removal:

•Remove the magneto flywheel (Pg. 46).
•Release the catches (2) at the rear of the seat, and pull off the seat.
•Turn the fuel tap to the "O" position, slide down the hose clamp, and pull the fuel hose off the tap.
•Unhook the rubber retaining band, and pull the fuel tank off towards the rear.
•Disconnect the white magneto output lead plug from where it connects to the white socket mounted under the frame top tube.



•Disconnect the light blue magneto output lead from where it connects to the light blue lead under the frame top tube.
•Loosen the straps (3) that hold the magneto wiring harness to the frame, and free the magneto wiring harness from the frame.
•Pull the light green neutral switch lead off the neutral switch.



•Remove the magneto stator plate screws (2), and pull the stator free from the side of the crankcase.

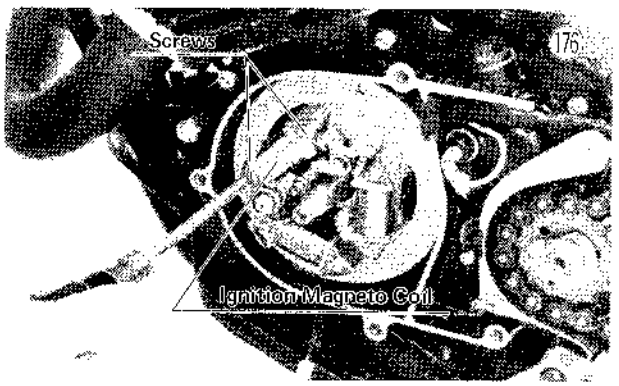
Installation Note:

•Be sure that the white magneto output lead plug connection does not get reversed.

IGNITION MAGNETO COIL

Removal:

•Remove the magneto flywheel (Pg. 46).
•Remove the screws (2) that mount the ignition magneto coil to the stator.



•If the condenser has not been removed, unsolder the ignition magneto coil lead from where it connects to the condenser.
•Remove the ignition magneto coil from the stator plate.

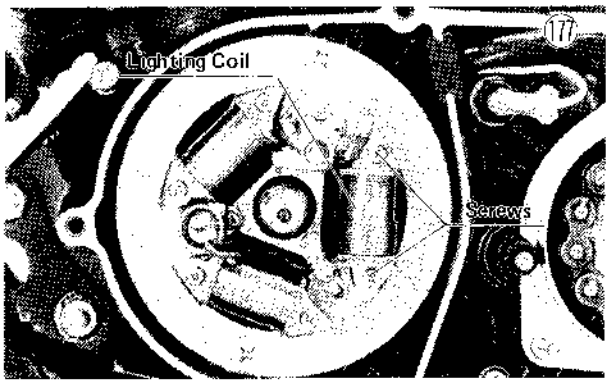
Installation Note:

•Be careful not to strike or damage the coil with the soldering iron or screwdriver.

LIGHTING COIL

Removal:

- Remove the magneto flywheel (Pg. 46).
- Remove the screws (2) that mount the coil to the stator plate.



- Cut off the insulation from where the lead is to be disconnected.
- Unsolder or cut the lead to free the coil from the output lead.

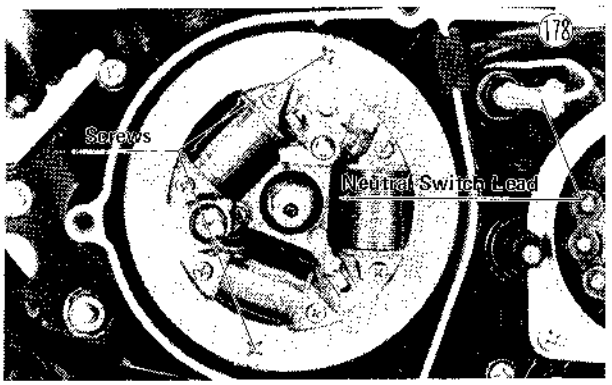
Installation Notes:

1. Be careful not to strike or damage the coil with the soldering iron or screwdriver.
2. Wrap new insulation around where the lead is reconnected.

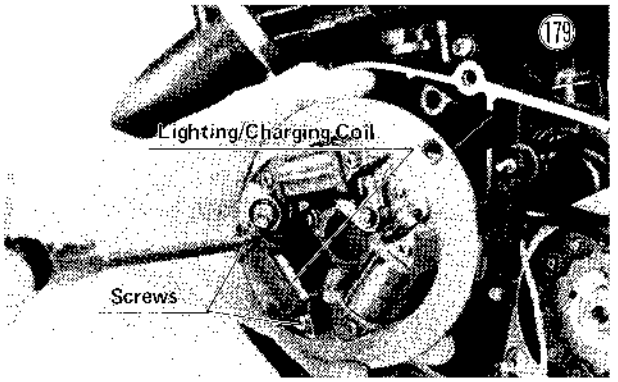
LIGHTING/CHARGING COIL

Removal:

- Remove the magneto flywheel (Pg. 46).
- Pull the light green neutral switch lead off the neutral switch.



- Remove the magneto stator plate screws (2), and free the stator from the side of the crankcase.
- Remove the screws (2) that mount the coil to the stator plate.



- Cut off the insulation from where the leads are to be disconnected.
- Unsolder or cut the leads to free the coil from the output leads.

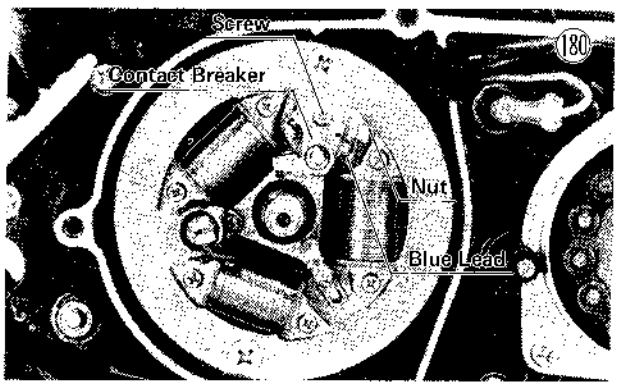
Installation:

1. The proper connections for the lighting/charging coil are red to pink and dark blue to light blue.
2. Be careful not to strike or damage the coil with the soldering iron or screwdriver.
3. Wrap new insulation around where the leads are reconnected.

CONTACT BREAKER

Removal:

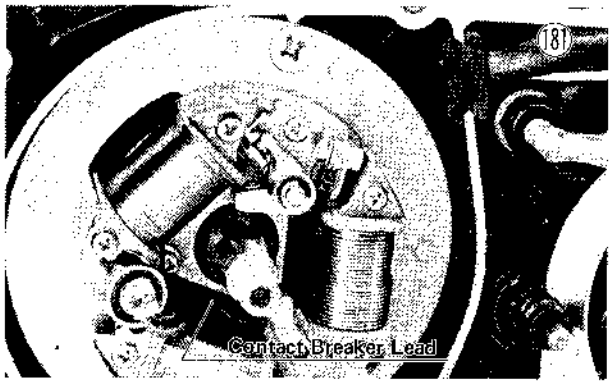
- Remove the magneto flywheel (Pg. 46).
- Remove the contact breaker base screw.,



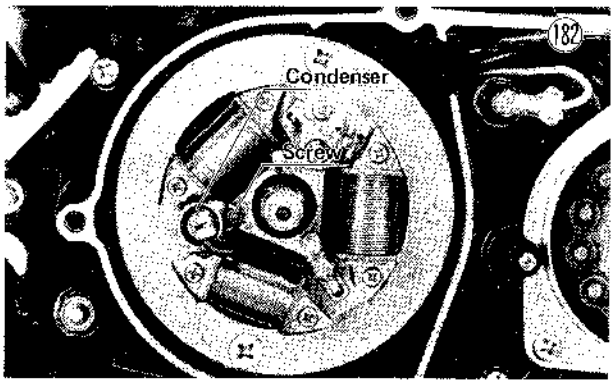
- Loosen the nut on the contact breaker, and remove the blue lead to free the contact breaker from the stator. Take note of the exact spot where the lead is attached so that it can be replaced properly later.

Installation Notes:

1. Refer to Fig. 181 for the proper position of the contact breaker lead.



2. Adjust the ignition timing (Pg. 13).



•Unsolder the leads (3) from where they connect to the condenser with a soldering iron to remove the condenser from the stator.

Installation Notes:

•Be careful not to strike or damage any coil with the soldering iron or screwdriver.

CONDENSER

Removal:

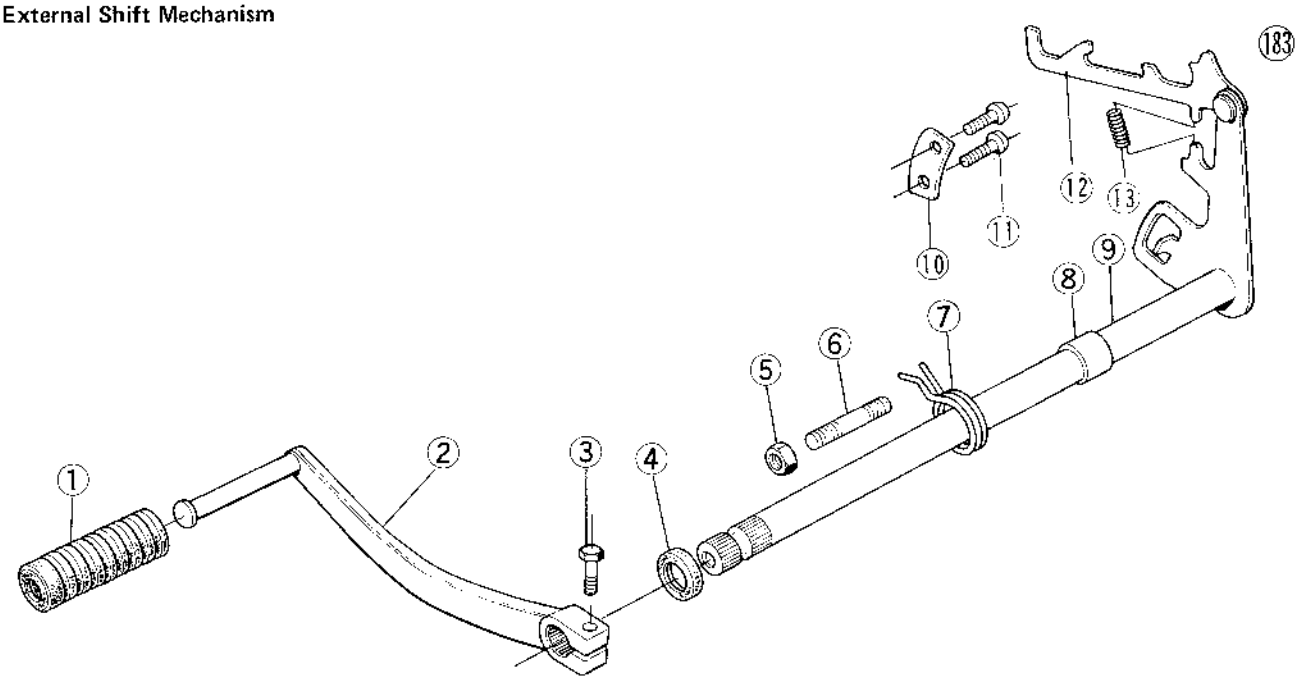
•Remove the magneto flywheel (Pg. 46).
•Remove the screw that holds the condenser to the stator plate.

EXTERNAL SHIFT MECHANISM

Removal:

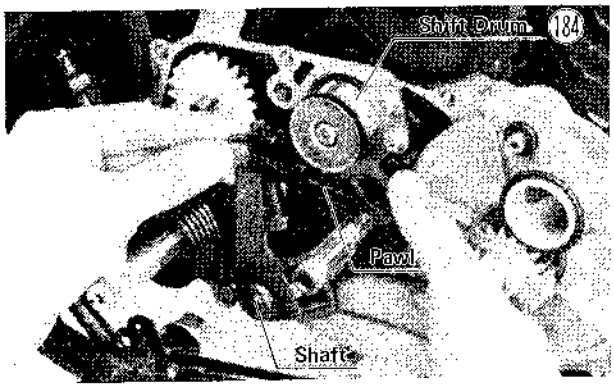
•Remove the clutch (Pg. 40).
•Remove the shift pedal bolt ③ , and remove the shift pedal ②

External Shift Mechanism



1. Shift Pedal Rubber
2. Shift Pedal
3. Bolt
4. Oil Seal
5. Nut
6. Return Spring Pin
7. Return Spring
8. Sleeve
9. Shift Mechanism Shaft
10. Shift Drum Stopper
11. Screw
12. Shift Mechanism Pawl
13. Spring

•Move the external shift mechanism pawl ⑫ out of its position on the end of the shift drum, and pull the external shift mechanism shaft ⑨ out of the crankcase. Two springs ⑦ & ⑬ and a sleeve ⑧ come off with the mechanism.



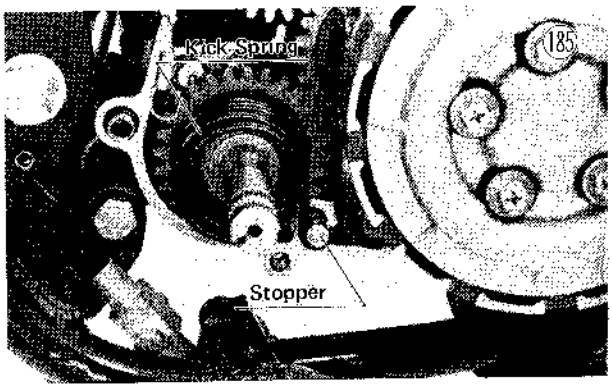
Installation:

•Fit the spring into the external shift mechanism, and check to see that the sleeve is in place.
•Using the oil seal guide (special tool) on the crankcase shift shaft oil seal, insert the shaft back through the crankcase, and fit the pawl back onto the end of the shift drum.
•Install the clutch (Pg. 40).

KICKSTARTER

Removal:

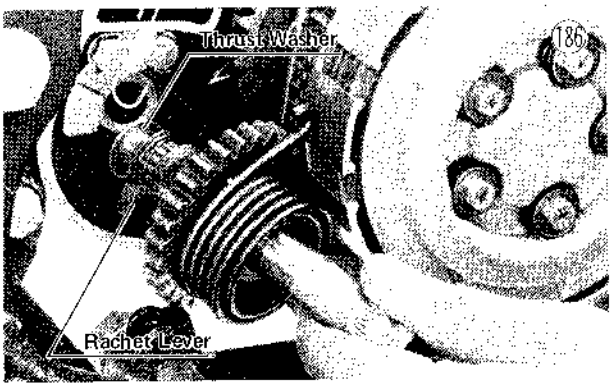
•Remove the right engine cover (Pg. 37).
•With needle nose pliers, remove the end of the kick spring ⑫ from its stopper ⑪ .



•Pull out the kickstarter assembly. There is a thrust washer ① where the kick shaft ⑩ fits into the crankcase.

Installation:

•Put the thrust washer on the crankcase end of the kick shaft, and then push the kickstarter back into place with the ratchet lever ⑤ to the left.



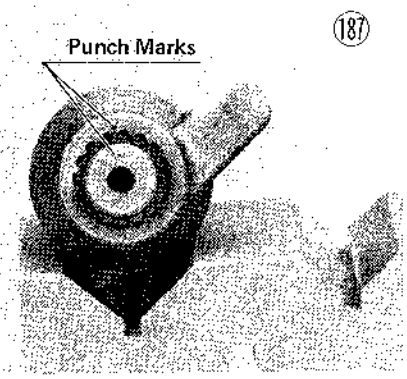
•Using needle nose pliers, fit the kick spring back onto the stopper.
•Install the right engine cover (Pg. 38).

Disassembly:

•Remove the circlip ② and washer ③ from the spline portion of the kick shaft ⑩ .
•Pull off the spring ④ and the ratchet ⑤ .
•Remove the circlip ⑭ from the kick spring end of the kick shaft.
•Drop out the plastic spring guide ⑬ .
•Remove the kick spring.
•Remove the circlip and washer ⑨ from the kick spring side of the kick gear ⑧ .
•Pull off the kick gear. There is a washer ⑦ for each side of the gear.
•Remove the remaining circlip ⑥ .

Assembly Note:

•When installing the ratchet, line the punch mark on the ratchet lever with the punch mark on the kick shaft.

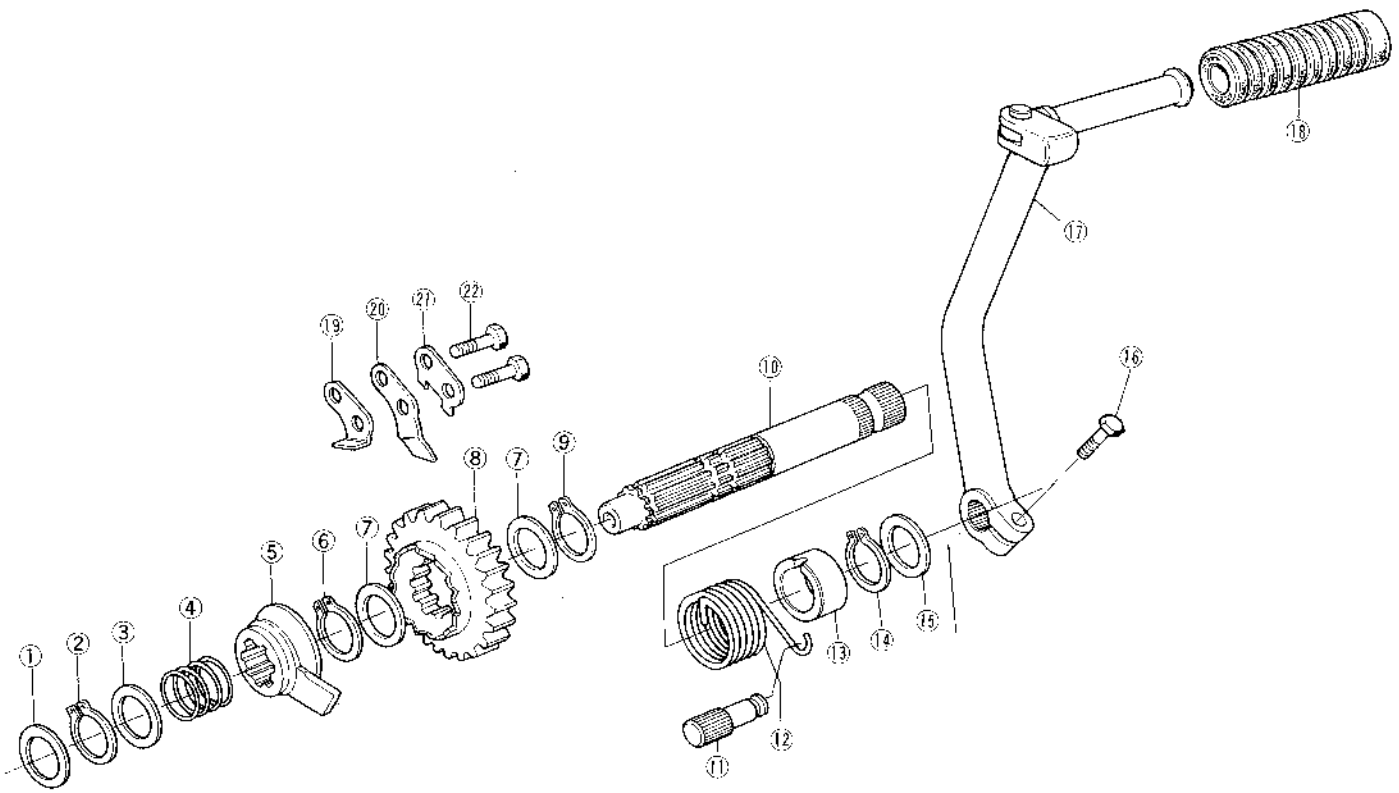


TRANSMISSION

NOTE: Due to close tolerance between the crankshaft and crankshaft bearings, a press will be necessary for the following procedure. Do not attempt to service the transmission if a press is not available.

Kick Starter

(188)

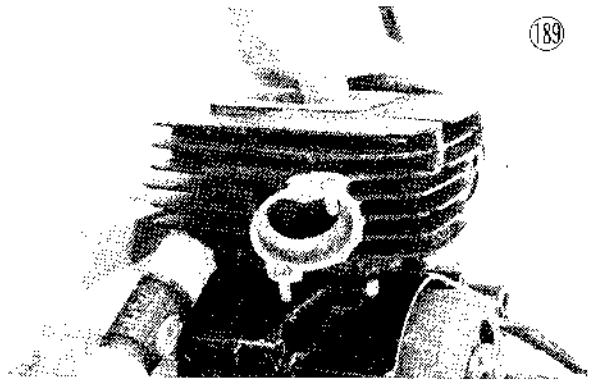


1. Thrust Washer
2. Circlip
3. Washer
4. Spring
5. Ratchet
6. Circlip
7. Washer
8. Kick Gear
9. Circlip
10. Kick Shaft
11. Stopper
12. Kick Spring
13. Spring Guide
14. Circlip
15. Washer
16. Bolt
17. Kick Pedal
18. Pedal Rubber
19. Stopper
20. Guide
21. Lock Washer
22. Bolt

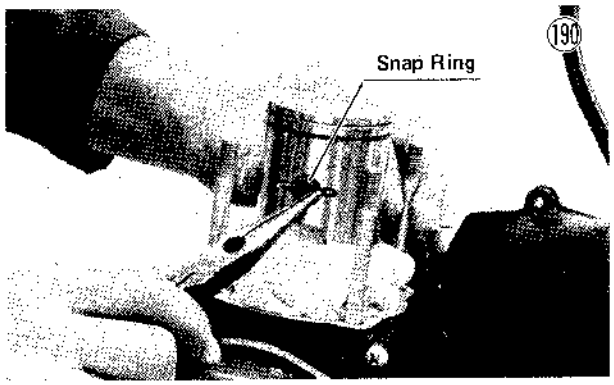
Removal:

- Remove the engine (Pg. 23).
- Set the engine on a clean surface or into a disassembly apparatus with some means of holding the engine steady while parts are being removed,
- Remove the cylinder head nuts (4), and remove the cylinder head and gasket.
- Lift off the cylinder and cylinder base gasket. If necessary, lightly tap around the base of the cylinder with a plastic hammer, taking care not to damage the cooling fins.

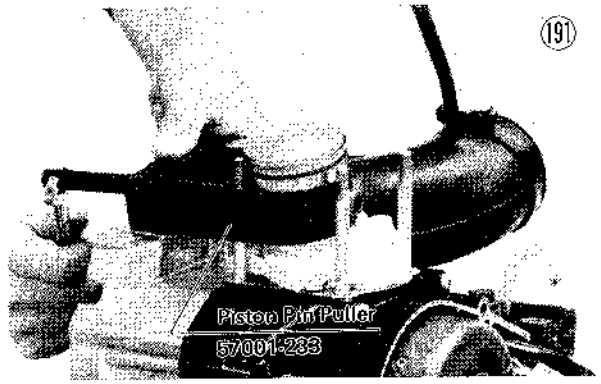
(189)



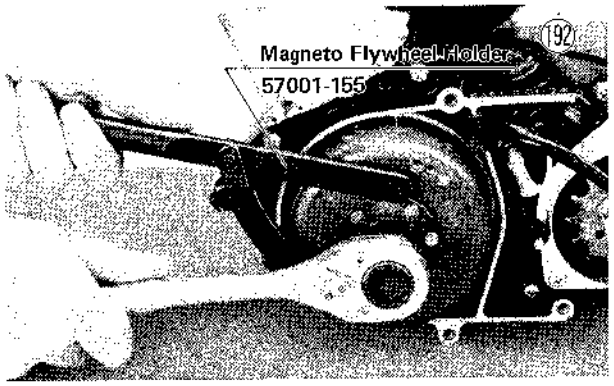
•Wrap a clean cloth around the base of the piston to secure it in position for removal.
•Remove one of the piston pin snap rings.



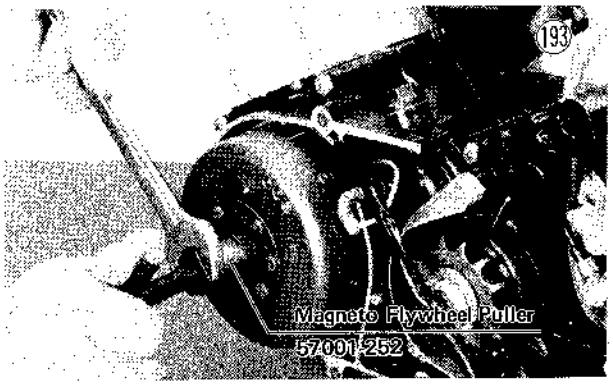
•Using the piston pin puller (special tool), remove the piston pin from the side the snap ring was removed. An alternate means of removing the piston pin would be as follows: insert a bolt of appropriate size through the pin, screw a nut on the end, and then pull on the head of the bolt.



•Remove the piston and con-rod needle bearing.
•Using the magneto flywheel holder (special tool) to keep the flywheel steady, remove the magneto nut with a socket wrench, and take out the lock washer.

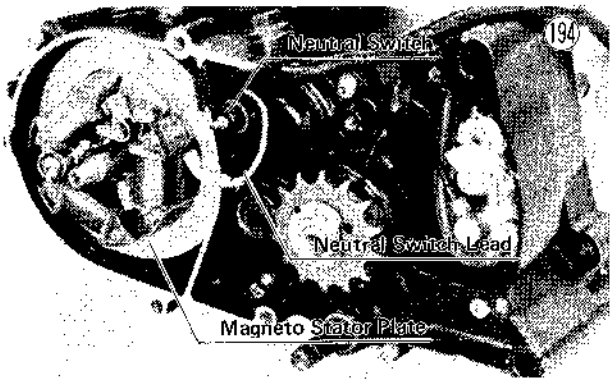


•Using the special tool to keep the flywheel steady, remove the magneto flywheel with a special magneto flywheel puller (special tool).

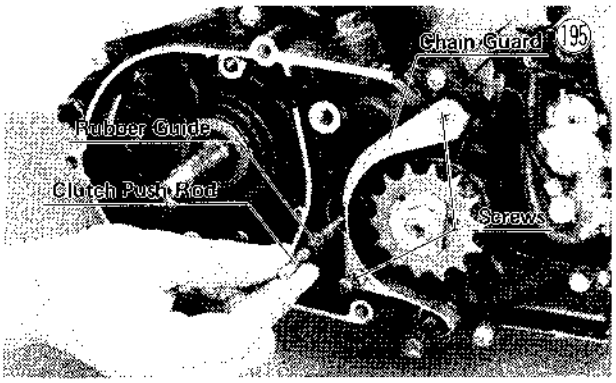


CAUTION: If a hammer is used to tap the flywheel puller in case the flywheel should be difficult to remove, be careful that the flywheel itself is not struck. Striking the flywheel can cause the magnets to lose their magnetism.

•Pull the light green neutral switch lead off the neutral switch.

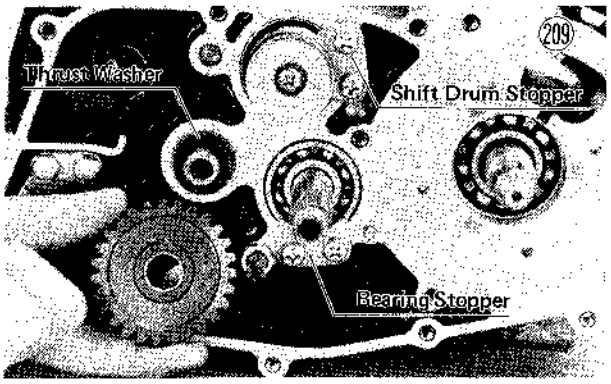


•Remove the magneto stator plate screws (2), and pull the stator free from the side of the crankcase.
•Unscrew the neutral switch from the side of the crankcase.
•Pull out the clutch push rod together with its rubber guide.

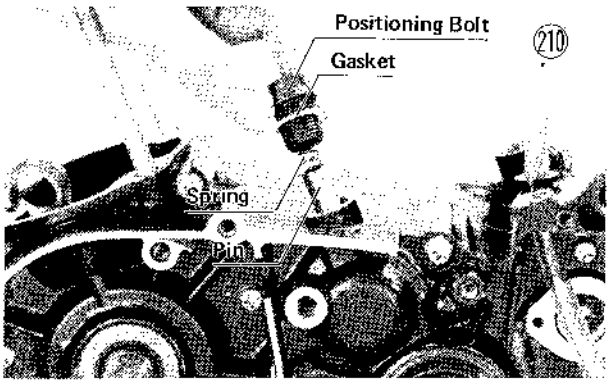


•Remove the engine sprocket chain guard screws (2), and remove the guard.
•Straighten back the bent portion of the engine sprocket tooth washer.

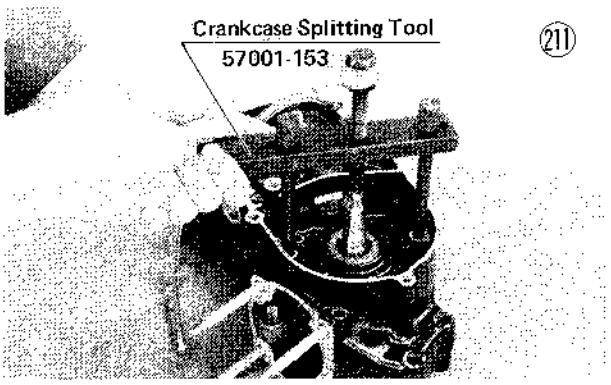
•Remove the output shaft idle gear circlip and thrust washer.
•Pull off the output shaft idle gear and another thrust washer.



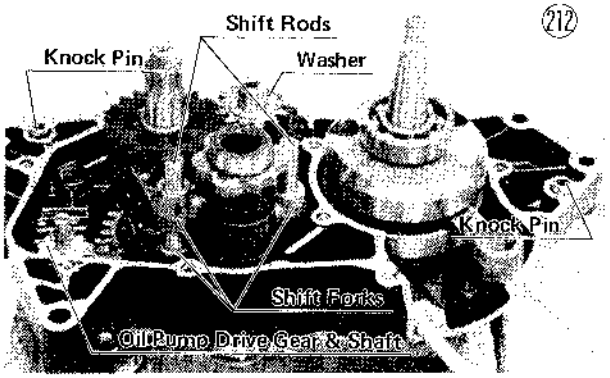
•Remove the drive shaft bearing stopper.
•Remove the shift drum stopper.
•Remove the shift drum positioning bolt, gasket, spring, and pin.



•Set the crankcase on its right side. A steel ball will come out of the drive shaft.
•Remove the crankcase screws (12) with an impact driver.
•Screw the crankcase splitting tool (special tool) into the left side of the crankcase as shown in Fig. 211. Be certain to screw the tool in all the way.



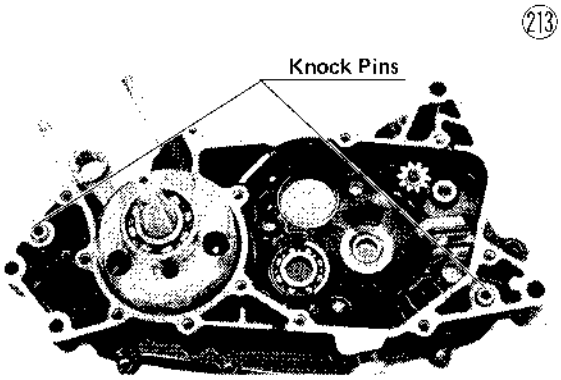
•Tighten the bolt on the crankcase splitting tool to split the crankcase.
•Once the crankcase is split, remove the crankcase splitting tool, and lift off the left crankcase half. Remove the shift rods (2), shift forks (3), shift drum, and output and drive shaft assemblies. A washer on the left side of the drive shaft, a washer where the oil pump drive gear fits in the right crankcase half, the crankcase knock pins (2), and the oil pump drive gear & shaft may fall loose. Remove and place the washers, knock pins (if loose), and the oil pump drive gear & shaft to one side.



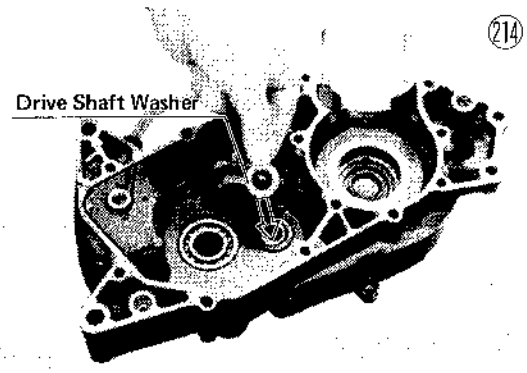
•Pull out the output shaft sleeve and O ring from the left crankcase half.

Installation:

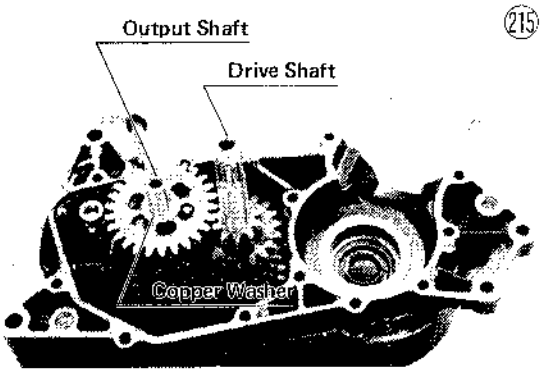
•Clean out the crankcase, and clean off any grime on any of the transmission and crankshaft parts with kerosene.
•Check to see that both crankcase halves are fully assembled (Pgs. 63 & 64).
•Replace the crankcase knock pins (2) if they were removed.



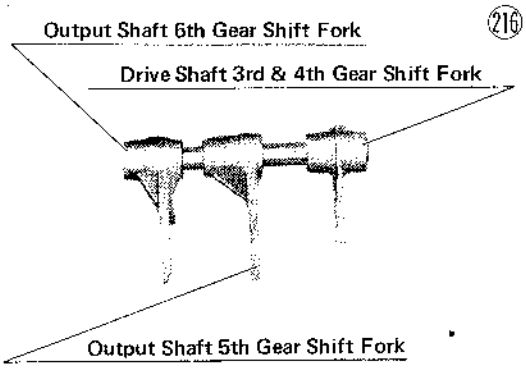
•Place the drive shaft washer onto its place in the left crankcase half.



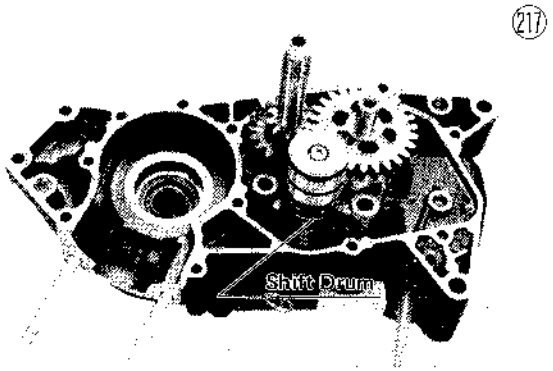
•Mesh the output shaft gears with those on the drive shaft, and fit both assemblies into the left crankcase half. Check to see that the copper washer is on the upper end of the output shaft assembly.



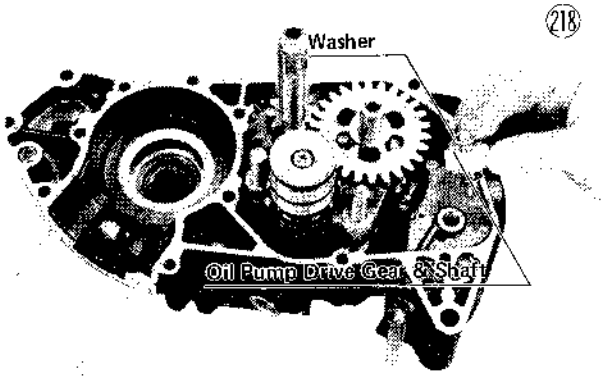
•Fit each shift fork into the groove on its gear. Drive shaft 3rd & 4th gear shift fork-ears are centrally located on the fork hub. Output shaft 5th gear shift fork-ears are non-centrally located on the fork hub to one extreme side. Output shaft 6th gear shift fork-ears are non-centrally located on the fork hub slightly off center.



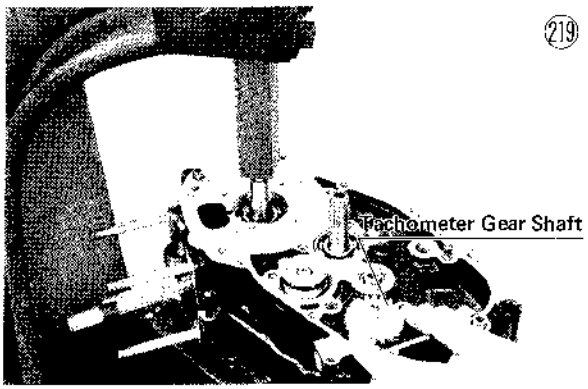
•Fit the shift drum into the left crankcase half fitting each shift fork guide pin into its shift drum groove.



•Insert the shift rods. The long shift rod is for the output shaft side.
•Fit the washer and the oil pump drive gear & shaft back into place in the left crankcase half.

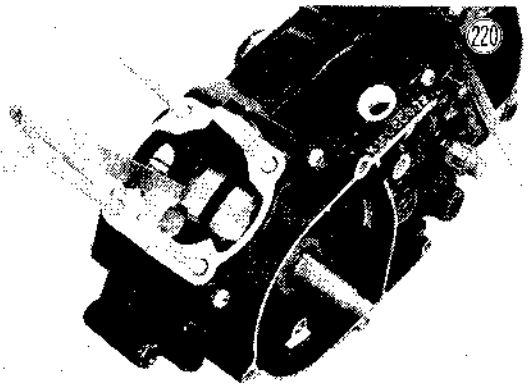


•Replace the oil pump gear.
•Apply liquid gasket to the fitting surface of the left crankcase half, and fit the crankcase halves together using a press. As the halves come together, rotate the tachometer gear shaft so that the oil pump drive gear will mesh with tachometer drive gear #1. While using the press, be sure that the surface on the right crankcase half where the rotary disc rubs does not get scratched.

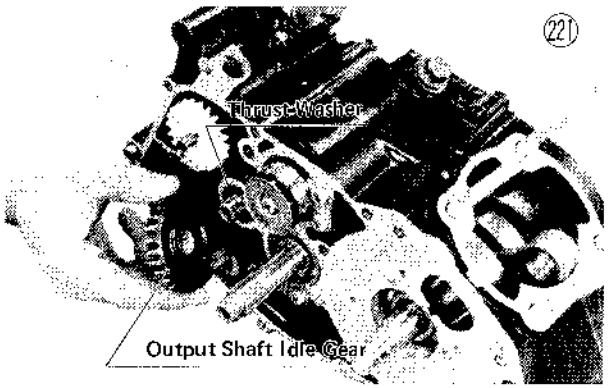


•After the crankcase halves are fitted together, screw in the crankcase screws (12). Tighten them with an impact driver.

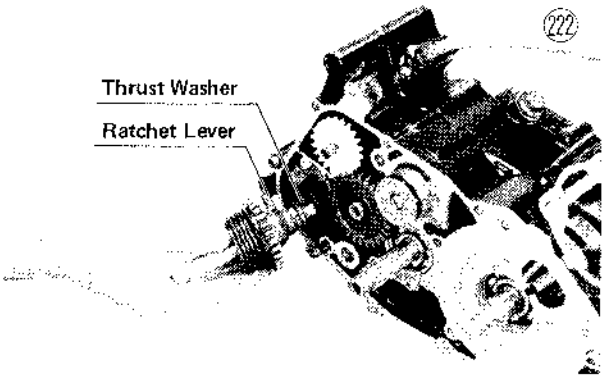
•Measure with a thickness gauge the clearance between each flywheel and the crankcase. If the crankshaft is not centrally located, tap the appropriate end of the crankshaft with a plastic, soft brass, or lead hammer to reposition it.



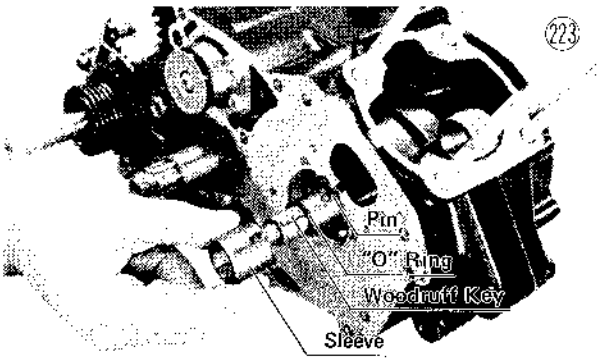
•Check to see that the crankshaft, drive shaft, and output shaft all turn freely.
•Replace the shift drum stopper. The shift drum stopper is thicker than the drive shaft bearing stopper.
•Replace the shift drum positioning pin, spring, gasket, and tighten the bolt with 1.5 kg-m (11 ft-lbs) of torque.
•Replace the drive shaft bearing stopper.
•Replace the thrust washer, output shaft idle gear, thrust washer, and circlip. The side of the hub that protrudes the most faces in.



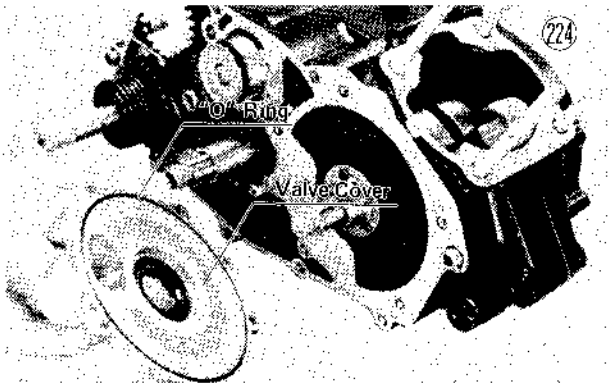
•Put the thrust washer on the crankcase end of the kick shaft, and then push the kickstarter back into place with the ratchet lever to the left.



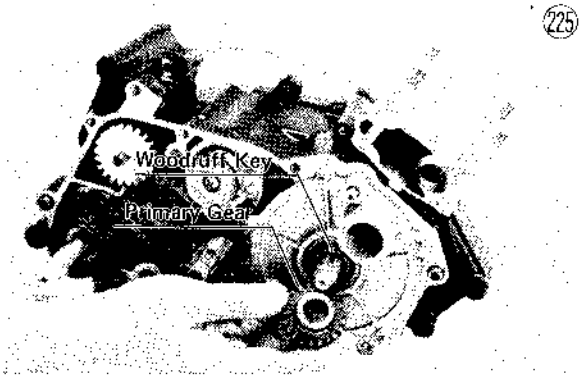
•With pliers or some other means, fit the kick spring back onto the stopper.
•Replace the thrust washer, sleeve, and drive shaft idle gear. The dogged side faces out.
•Replace the pin, O ring, sleeve, and then the woodruff key on the right side of the crankshaft.



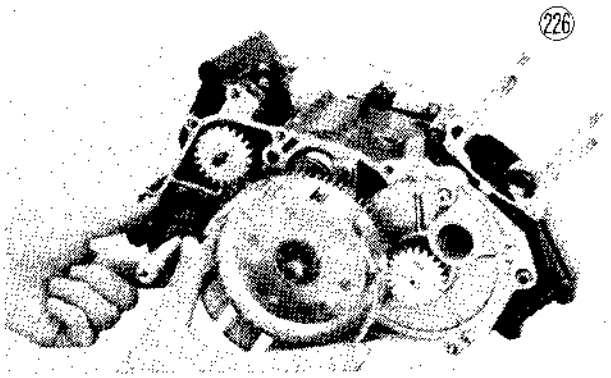
•Fit in the rotary disc matching its hub groove with the crankshaft pin.
•Be sure that the large O ring is properly in place in the valve cover, and replace the cover tightening its screws with an impact driver.



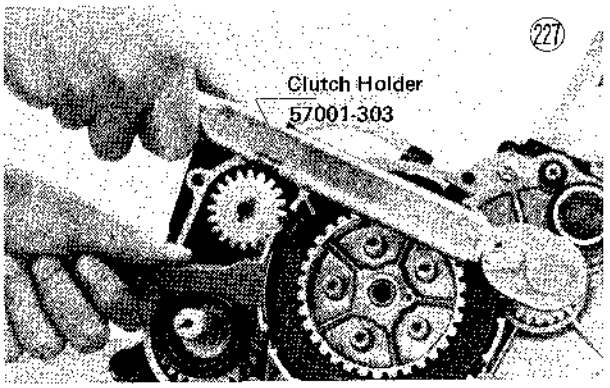
•Check to see that the woodruff key is properly positioned on the crankshaft.



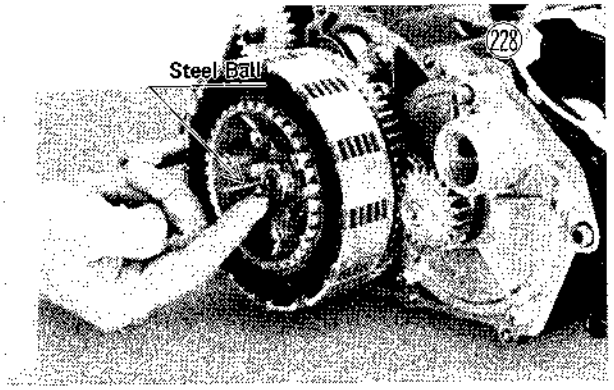
- Replace the primary gear with the hole facing outward to accommodate the tooth washer. If the primary gear must be tapped into place, recheck the crankcase/crankshaft clearance. Reposition the crankshaft if necessary in the manner already described.
- Once the primary gear is fully in place, replace the tooth washer with the tooth fitted in the primary gear hole.
- Fit the spring in the external shaft mechanism, and check to see that the sleeve is in place.
- Using the oil seal guide (special tool) on the crankcase shift shaft oil seal, insert the external shift mechanism back through the crankcase, and fit the pawl back onto the end of the shift drum.
- Fit the clutch housing back on the drive shaft while turning the kick gear by hand so that the rear of the housing will fit into the side of the drive shaft idle gear.



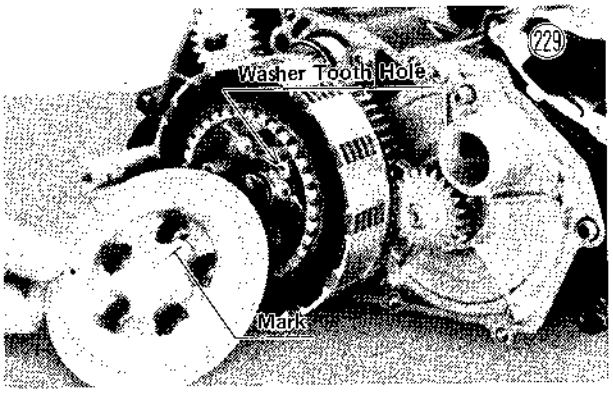
- Replace the thrust washer and then the clutch hub.
- Replace the clutch hub washer fitting its tooth in the clutch hub.
- Holding the clutch steady with the clutch holder (special tool), tighten the clutch hub nut with 8.0 ~ 11.0 kg-m (58 ~ 80 ft-lbs) of torque and the primary gear nut with 7.0 ~ 7.5 kg-m (51 ~ 54 ft-lbs) of torque.



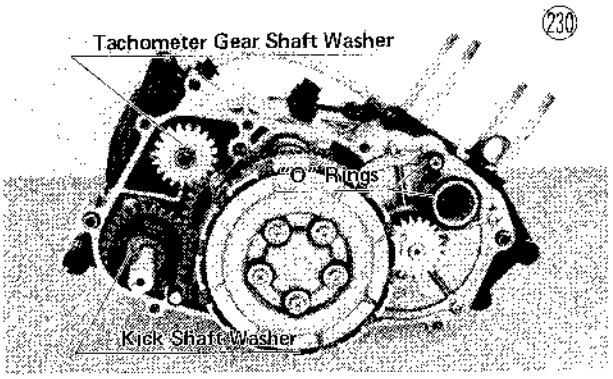
- Bend back part of the primary gear washer over the side of the primary gear nut.
- Bend back part of the clutch hub washer over the side of the clutch hub nut.
- Replace the clutch plates. The sequence is friction plate, steel ring, steel plate, friction plate, steel ring, etc., finishing with a steel ring.
- Drop the drive shaft steel ball into the drive shaft.



- Replace the spring plate pusher.
- Fit the spring plate back into place, aligning the mark on the plate with the washer tooth hole in the hub.

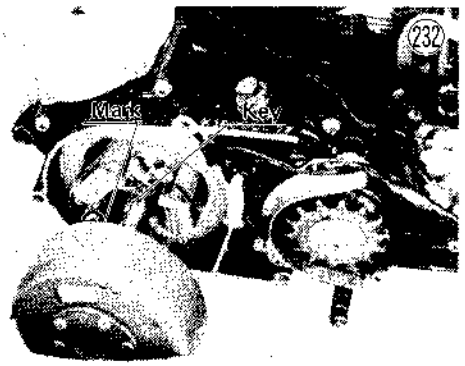


- Replace the spring bolts (5), each with its washer and spring, and tighten them evenly in a cross pattern to 0.4 ~ 0.5 kg-m (35 ~ 43 in-lbs) of torque. Tighten by hand rather than use compressed air, which might make spring pressure uneven.
- Replace the kick shaft washer and the tachometer gear shaft washer.
- Replace the rotary valve cover intake port O ring and the oil passage pipe O ring.

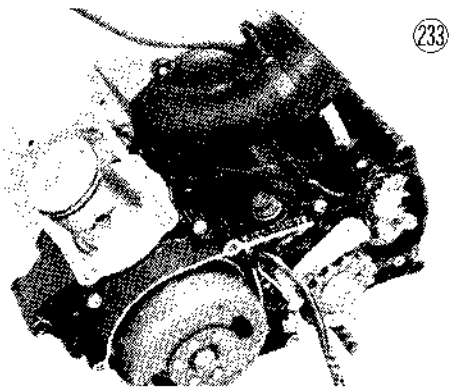


- Using a new right engine cover gasket, fit the right engine cover back onto the crankcase. Use an oil seal guide to protect the right engine cover oil seal, and see that the O ring does not fall off the rotary valve cover intake port.





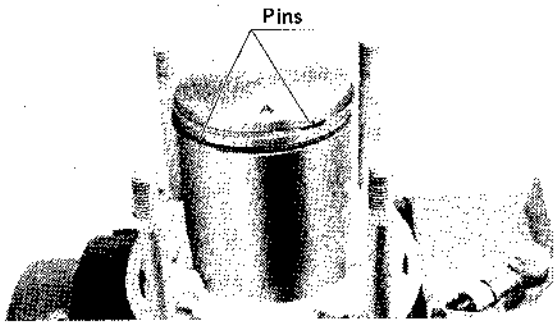
- Replace the 6 mm right engine cover screws (9), and tighten them with an impact driver.
- Install the air cleaner tube to the right engine cover air duct, tightening its 5 mm screws (3).
- Replace the brake pedal back on the kickstarter shaft. Situate the brake pedal sleeve so that the cutaway fits on its knob on the crankcase.
- Replace the kick pedal.
- Note the position of the notch on the oil pump gear shaft, and then turn the oil pump shaft so that it will fit into the notch when fitting the oil pump back into place.
- Put the oil pump back into place, and tighten the oil pump mounting screws. There is a copper washer for each screw.
- Replace the oil pump input connector banjo bolt. There is a washer for each side of the connector.
- Replace the right engine cover banjo bolt, and fit the oil pump output hose grommet into place. There is a washer for each side of the check valve.
- Fit a new O ring onto the output shaft, and then replace its sleeve.
- Fit the engine sprocket onto the output shaft, and replace the tooth washer so that its tooth fits into one of the engine sprocket holes.
- Using the engine sprocket holder (special tool) to keep the engine sprocket steady, tighten the engine sprocket nut with 7.0~7.5 kg-m (51~54 ft-lbs) of torque.
- Bend back one side of the tooth washer over the nut.
- Replace the engine sprocket chain guard.
- Replace the clutch push rod together with its rubber guide.
- Screw in the neutral switch.
- Replace the magneto stator, and tighten its screws (2) with an impact driver.
- Run the magneto output leads through the rubber grommet in the left crankcase half.
- Connect the light green neutral switch lead to the neutral switch.
- See that the key is fitted in its place on the crankshaft properly, and then fit the flywheel in place so that the key fits in the groove in the flywheel hub. A line on the circumference of the flywheel (of the two, the one on the right), which indicates where the key groove is located on the flywheel hub, may be referred to to facilitate installation. Push the flywheel into place by hand.
- Once the flywheel is all the way back in place, replace the lock washer, and tighten the magneto nut while holding the flywheel steady with the magneto flywheel holder (special tool). The maximum torque for the magneto nut is 5 kg-m (36 ft-lbs).
- Fit a piece of clean cloth into the crankcase opening around the con-rod so that no parts will fall into the crankcase.
- Apply oil to the con-rod needle bearing, and fit it into the con-rod.
- Apply a little oil to the piston pin, and replace the piston and piston pin. The arrow on the top of the piston must point towards the front.



- Fit a new piston pin snap ring into the side of the piston, and turn it so that its opening does not coincide with either groove in the side of the piston.
- Remove the cloth, and fit a new cylinder base gasket into place.
- Apply a small amount of 2 stroke oil to the piston rings and the inside surface of the cylinder.
- Set the piston at BDC, and fit the base of the cylinder over the rings, pressing in on opposite sides of the rings as necessary. Be certain that the rings do not slip out of their proper position. The pin in each

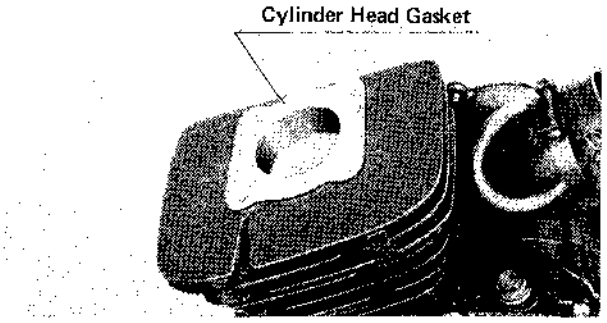
piston groove must be between the ends of its piston rings.

(234)



- Replace the cylinder head gasket on the cylinder so that the gasket holes perfectly match the cylinder bore and stud holes. Only one of the four possible positions is correct. The top side (the side with the beveled inner perimeter) should face up.

(235)



- Put on the cylinder head, and insert the cylinder head nuts. Each nut has both a lock washer (next to nut head) and a flat washer. Tighten the cylinder head nuts evenly in a cross pattern with 2.2 kg-m (16 ft-lbs) of torque.
- Install the engine (Pg. 26).
- Adjust the clutch (Pg. 14).

Shift Drum Disassembly:

- Remove the circlip ⑯ , and take off the shift drum operating plate ⑰ .
- Remove the pin holder screw ㉓ , washer ㉒ , and pin holder ㉑ .
- Remove the pins (6) ⑳ .

Shift Drum Assembly Notes:

1. The operating plate projection faces out.
2. Be sure that the screw is firmly tightened.

Drive Shaft Disassembly

- Pull off 2nd gear ③ .
- Remove the circlip ④ , and take off the spline washer ⑤ , 6th gear ⑥ , and spline washer ⑦ .
- Remove the circlip ⑧ , and slide off 3rd & 4th gear ⑨ .
- Remove the circlip ⑩ , and slide off the flat washer ⑪ and 5th gear ⑫ . 1st gear is part of the drive shaft ⑮ .

Drive Shaft Assembly Notes:

1. Be sure that all parts are put back in the correct sequence and all circlips are properly in place (replace any that are bent or damaged). Proper sequence starting from 1st gear is 1st gear, 5th gear, flat washer, circlip, 4th gear then 3rd gear, circlip, spline washer, 6th gear, spline washer, circlip, and 2nd gear.
2. 1st gear—part of drive shaft
   5th gear—dogs, no dog recesses
   4th & 3rd gear—3rd gear smaller diameter
   6th gear—dog recesses, no dogs, both sides flat
   2nd gear—no dogs, no dog recesses, depressed side faces in

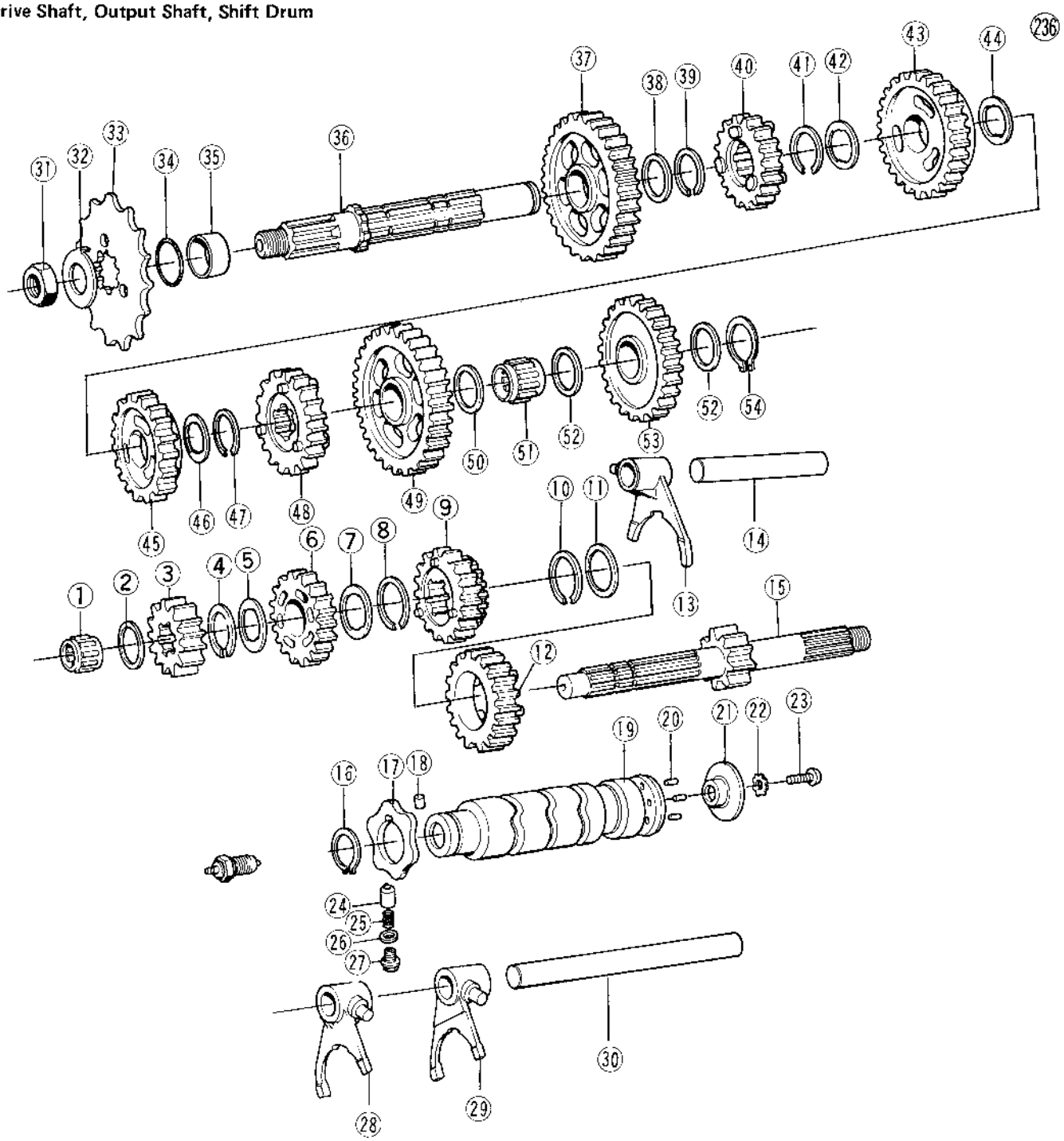
Output Shaft Disassembly:

- Pull off the copper washer ㊵ , 1st gear ㊾ , and 5th gear ㊽ .
- Remove the circlip ㊼ , and slide off the spline washer ㊻ , 4th gear ㊺ , spline washer ㊹ , 3rd gear ㊸ , and spline washer ㊷ .
- Remove the circlip ㊶ , and slide off 6th gear ㊿ .
- Remove the circlip ㊴ , and slide off the flat washer ㊳ , 2nd gear ㊲ .

Output Shaft Assembly Notes:

1. Be sure that all parts are put back in the correct sequence and all circlips are properly in place (replace any that are bent or damaged). Proper sequence from the engine sprocket side is flat washer, 2nd gear, flat washer, circlip, 6th gear, circlip, spline washer, 3rd gear, spline washer, 4th gear, spline washer, circlip, 5th gear, 1st gear, and copper washer.
2. 2nd gear—dog openings, plain side faces out (towards sprocket end)
   6th gear—15 teeth, double dogged, tooth side dogs fit into 2nd gear
   3rd gear—dog recesses for 6th gear, thin with large diameter, plain side faces plain side of 4th gear
   4th gear—dog recesses for 5th gear, thick with small diameter, plain side faces plain side of 3rd gear, 22 teeth
   5th gear—16 teeth, double dogged, tooth side dogs fit into 1st gear
   1st gear—dog openings, copper bush in hub, plain side faces out

Drive Shaft, Output Shaft, Shift Drum

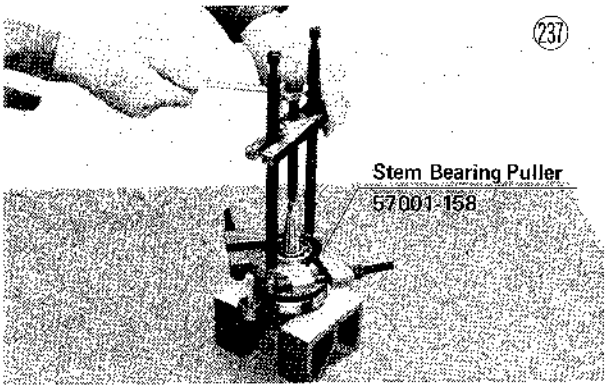


1. Needle Bearing
2. Washer
3. 2nd Gear (D)
4. Circlip
5. Spline Washer
6. 6th Gear (D)
7. Spline Washer
8. Circlip
9. 3rd & 4th Gear (D)
10. Circlip
11. Washer
12. 5th Gear (D)
13. 3rd & 4th Gear Shift Fork
14. Short Shift Rod
15. Drive Shaft
16. Circlip
17. Drum Operating Plate
18. Pin
19. Shift Drum
20. Drum Pin
21. Drum Pin Holder
22. Washer
23. Screw
24. Drum Positioning Pin
25. Spring
26. Gasket
27. Drum Positioning Bolt
28. 6th Gear Shift Fork
29. 5th Gear Shift Fork
30. Long Shift Rod
31. Nut
32. Lock Washer
33. Engine Sprocket
34. O Ring
35. Collar
36. Output Shaft
37. 2nd Gear (O)
38. Washer
39. Circlip
40. 6th Gear
41. Circlip
42. Spline Washer
43. 3rd Gear (O)
44. Spline Washer
45. 4th Gear (O)
46. Spline Washer
47. Circlip
48. 5th Gear (O)
49. 1st Gear (O)
50. Washer
51. Needle Bearing
52. Washer
53. Kick Starter Idle Gear
54. Circlip

CRANKSHAFT

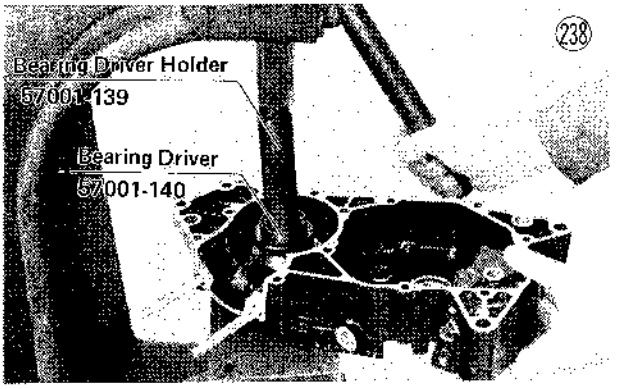
Removal:

- Remove the transmission (Pg. 50).
- Remove the crankshaft from the right crankcase half using a press.
- Remove the bearing on the left side of the crankshaft with the stem bearing puller (special tool).



Installation:

- Install the left crankshaft bearing into the left crankcase half using the bearing driver, bearing driver holder (special tools), and a press.

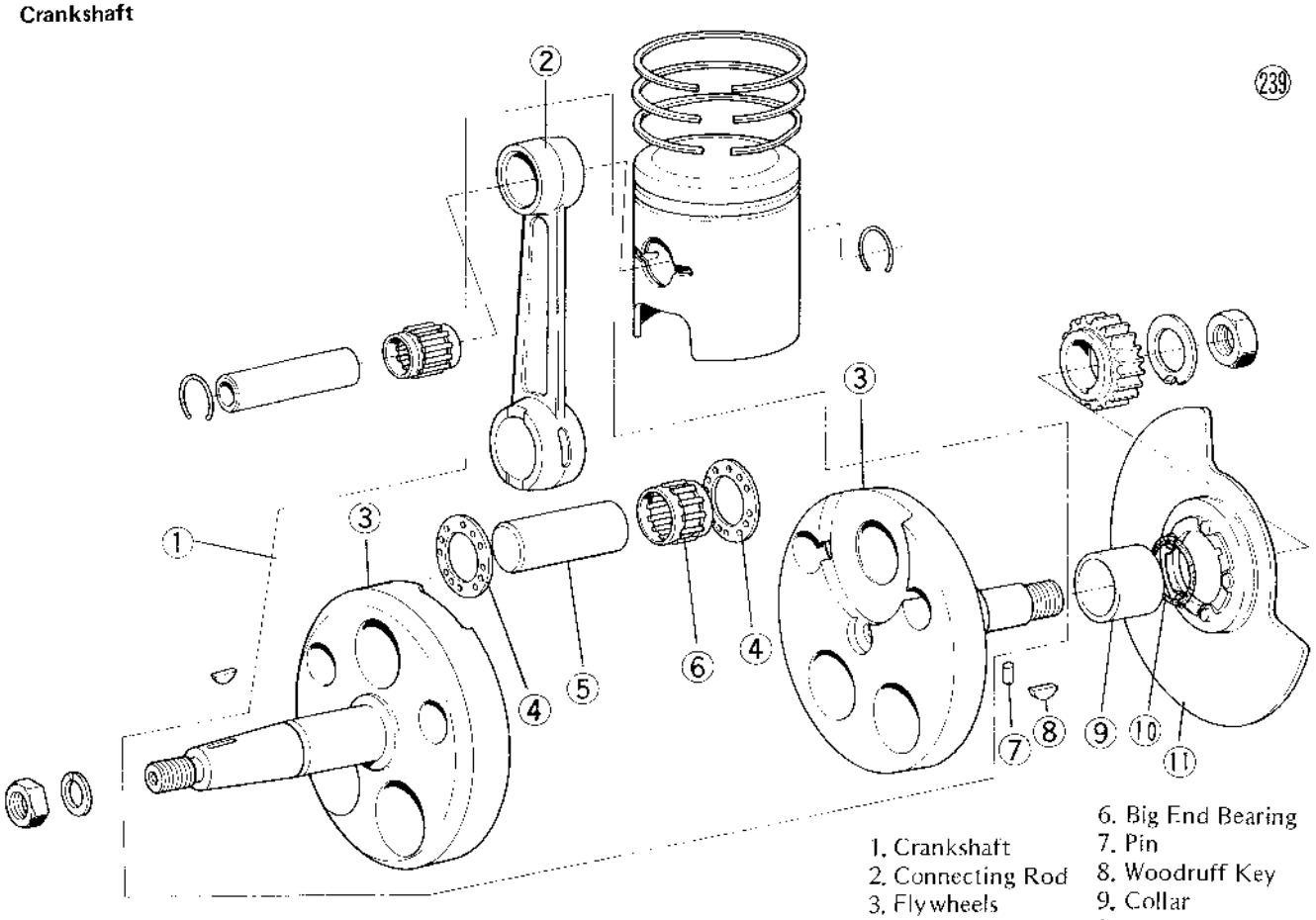


- Install the crankshaft into the left side of the crankcase using a press.
- Install the transmission (Pg. 55).

Disassembly:

- If it should be necessary to disassemble the crankshaft ① , use a press to remove the crankpin ⑤ . Removal of the crankpin separates the flywheels ③ , con-rod ② , big end bearing ⑥ , crankpin, and con-rod side washers ④ .

Crankshaft



1. Crankshaft
2. Connecting Rod
3. Flywheels
4. Washers
5. Crankpin
6. Big End Bearing
7. Pin
8. Woodruff Key
9. Collar
10. O Ring
11. Rotary Disc

Assembly Notes:

- Since the assembly of the crankshaft demands exacting tolerances, the disassembly and reassembly of the crankshaft can only be done by a shop having the necessary tools and equipment. The following information gives the tolerances that are necessary for a properly equipped shop to reassemble the crankshaft.

1. The flywheels and crankpin are cold-fitted to a tolerance of 0.073 ~ 0.094 mm (0.0029 ~ 0.0037 in).
2. Select a crankpin, needle bearing, and con-rod such that the radial clearance will be 0.0192~0.0290 mm (0.00076 ~ 0.00114 in).
3. Press with a thickness gauge inserted between the con-rod and one of the flywheels so that the side clearance will be 0.35 ~ 0.40 mm (0.0138 ~ 0.0157 in).
4. Supporting both ends of the crankshaft, check the crankshaft runout using a dial gauge. The flywheels must be aligned so that the runout is under 0.10 mm TIR (0.0039 in) (Pg. 103).

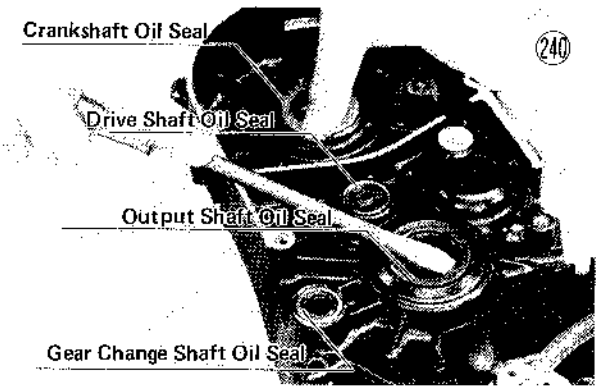
CRANKCASE

Removal:

- Remove the crankshaft (Pg. 62).

Left Crankcase Half Disassembly:

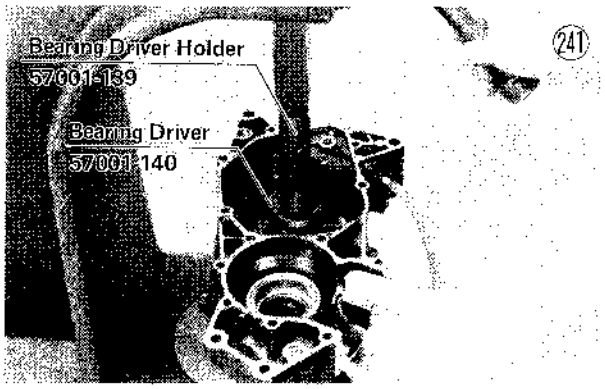
- Remove the crankshaft, gear change shaft, output shaft, and drive shaft oil seals with a hook.



- Using the bearing driver holder (special tool) and a press, remove the output shaft bearing out the right side.
- Remove the drive shaft needle bearing out the left side.

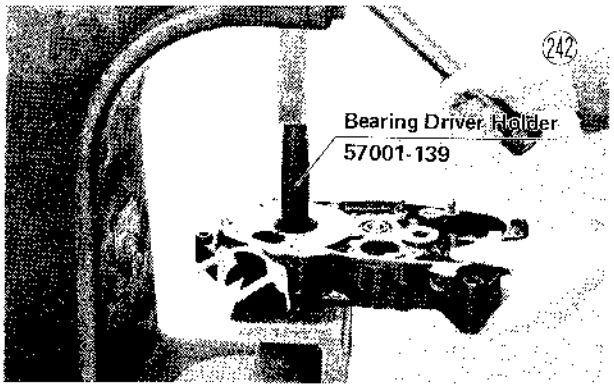
Left Crankcase Half Assembly Notes:

1. Any oil seal that is removed must be replaced for a new one.
2. Inspect the bearings and replace if necessary (Pg.117).
3. Apply oil to the bearings and oil seals, and install the output shaft bearing using a press and the bearing driver holder (special tool); the crankshaft oil seal using a press and the bearing driver and bearing driver holder (special tools); and the drive shaft and output shaft oil seals using a press and suitable adapters.

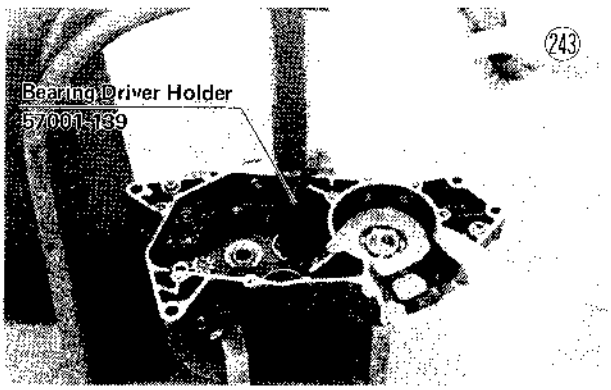


Right Crankcase Half Disassembly:

- Remove the crankshaft bearing holder screws (4), and then remove the holder.
- Using the bearing driver holder (special tool) and a press, remove the crankshaft bearing out the left side.



- Using the bearing driver holder (special tool) and a press, remove the drive shaft bearing out the right side.

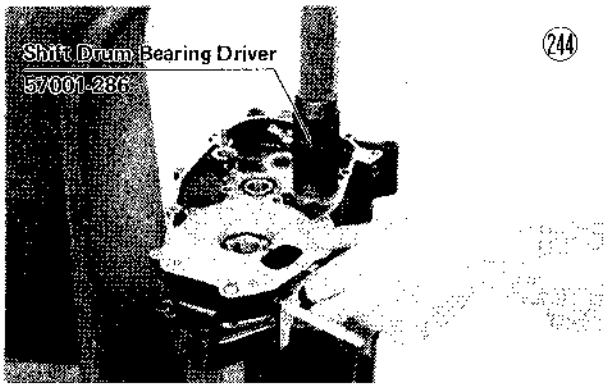


- Remove the output shaft needle bearing out the right side.
- Drive out the shift drum needle bearing.
- Remove the clip and washer, and pull tachometer drive gear #1 off the tachometer gear shaft.

- Remove the tachometer drive shaft pin, and then pull the shaft out the other side. Tachometer drive gear #2 is part of the tachometer drive gear shaft. There is a washer on the shaft for each side of where the shaft fits in the crankcase.
- Push or tap the tachometer gear from the bottom up and out of the crankcase opening. There is a washer at the base of the gear and a sleeve and O ring on the shaft at one end.

Right Crankcase Half Assembly Notes:

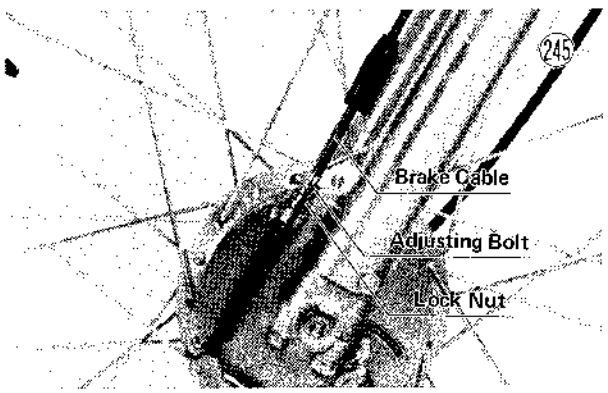
1. When replacing the tachometer gears, be sure that the flat washers (4) are replaced properly,
2. Tap the tachometer gear sleeve down all the way.
3. Inspect the bearings and replace if necessary (Pg.117).
4. Apply oil to the bearings, and install using a press and the special tools used for disassembly. For the shift drum needle bearing, use a press and the shift drum bearing driver (special tool).



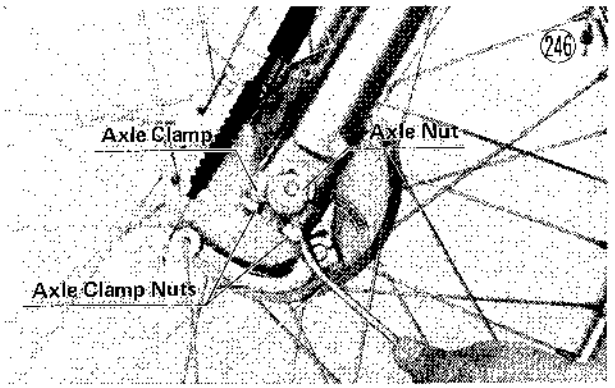
FRONT WHEEL

Removal:

- Disconnect the lower end of the speedometer cable with pliers.
- Undo and slide back the front brake lever dust cover.
- Loosen the lock nut at the front brake lever, and screw in the adjuster.
- Slide up the dust cover, loosen the lock nut on the front brake cable adjusting bolt at the front brake panel, and screw in the adjusting bolt.
- Line up the slots on the adjusting bolt, lock nut, and brake panel cable mount, and remove the front brake cable from the brake panal.

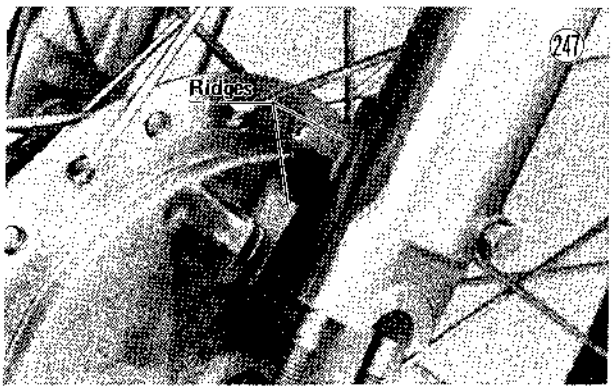


- Jack up the engine so that the front wheel is off the ground.
- Remove the axle clamps, loosen one of the axle nuts if necessary, and remove the wheel.

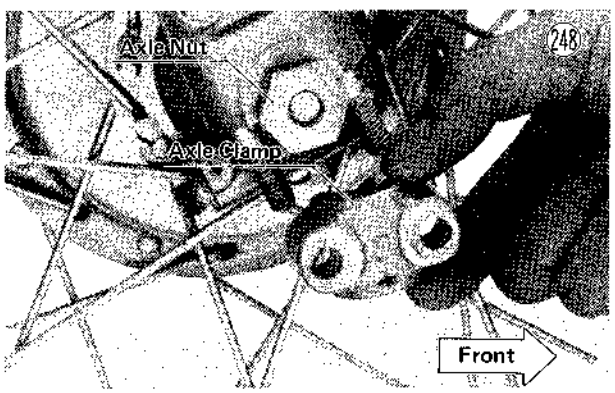


Installation:

- Loosen one of the axle nuts if not always loose, and fit the wheel between the front fork shock absorbers with the left shock absorber fitted between the two brake panel ridges and the speedometer gear housing lug positioned in back of the right shock absorber lug.



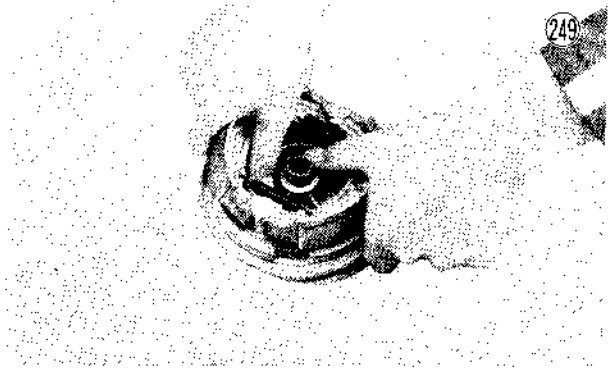
- Replace the axle clamps tightening them loosely. Each clamp must be positioned so that the arrow on the bottom points to the front. Each nut has a lock washer.



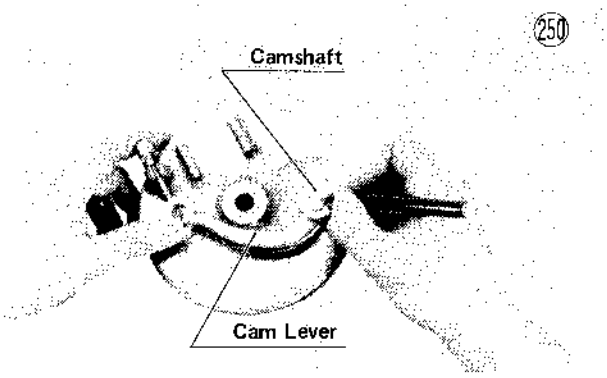
- Insert the speedometer inner cable into the speedometer gear housing while turning the wheel so that the slot in the end of the cable will seat in the tongue of the speedometer pinion. Tighten the cable nut with pliers.
- Tighten the axle nuts with 7.0 ~ 8.0 kg-m (51 ~ 58 ft-lbs) of torque while making sure that the speedometer gear housing is not moved out of its proper position. Tighten such that the axle nut/clamp gap is about the same on each side.
- Remove the jack from under the engine.
- Tighten the axle clamp nuts, first the front ones and then the rear with 1.8 ~ 2.0 kg-m (13 ~ 14.5 ft-lbs) of torque.
- Replace the front brake cable.
- Adjust the front brake (Pg. 17).

Front Brake Disassembly:

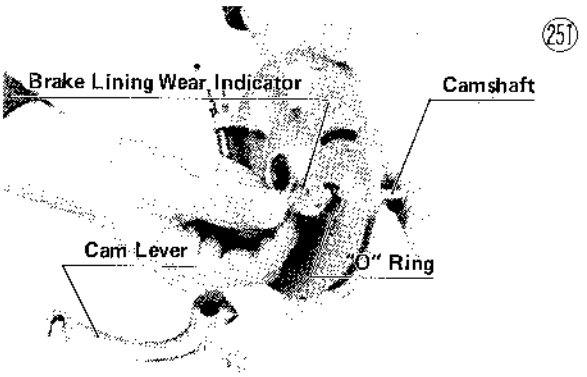
- Remove the left axle nut ① , and pull off the brake panel ⑧ .
- Remove the brake shoes ⑩ by pulling up on the center of the linings as shown in Fig.249.



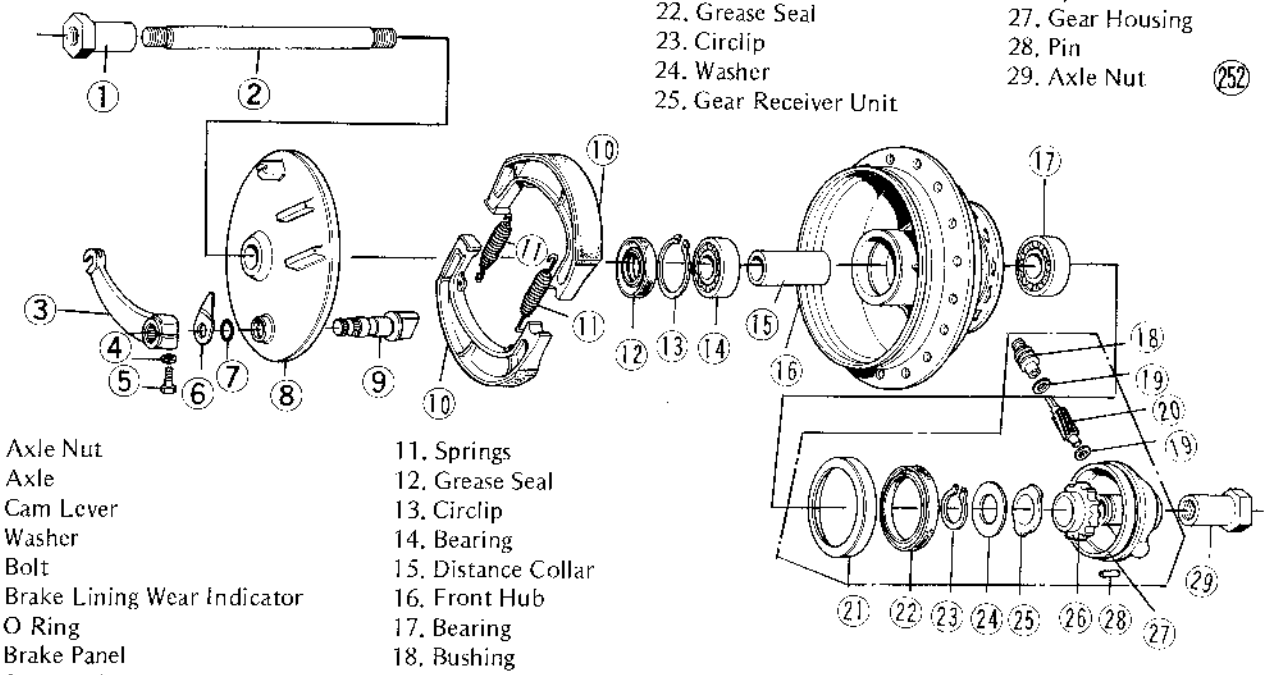
- Remove the springs (2) ⑪ to separate the two brake shoes.
- Mark the position of the cam lever ③ so that it can later be installed at the same angle.



- Unbolt and remove the cam lever, brake lining wear indicator ⑥ , O ring ⑦ , and camshaft ⑨ .



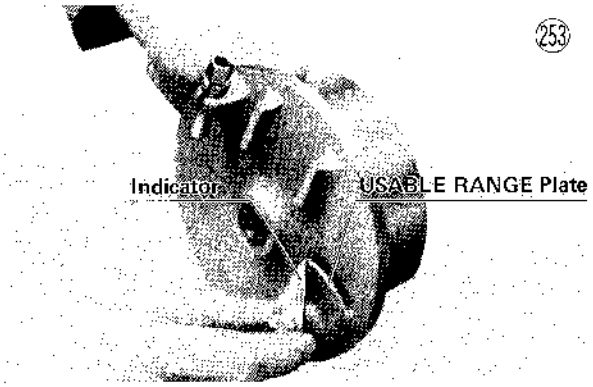
Front Hub



1. Axle Nut
2. Axle
3. Cam Lever
4. Washer
5. Bolt
6. Brake Lining Wear Indicator
7. O Ring
8. Brake Panel
9. Cam Shaft
10. Brake Shoes
11. Springs
12. Grease Seal
13. Circlip
14. Bearing
15. Distance Collar
16. Front Hub
17. Bearing
18. Bushing
19. Washer
20. Speedometer Pinion
21. Dust Cover
22. Grease Seal
23. Circlip
24. Washer
25. Gear Receiver Unit
26. Speedometer Gear
27. Gear Housing
28. Pin
29. Axle Nut ㉙

Front Brake Assembly:

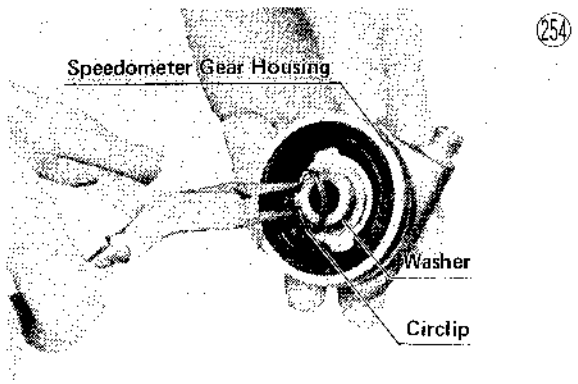
- Put the camshaft back into the panel.
- Fit the springs onto the brake shoes, and replace the shoes onto the brake panel. The longer spring should be on the camshaft side.
- Once the shoes have been replaced, place the O ring on the camshaft, and fit the indicator on the serration so that it points to the extreme left of the USABLE RANGE plate.



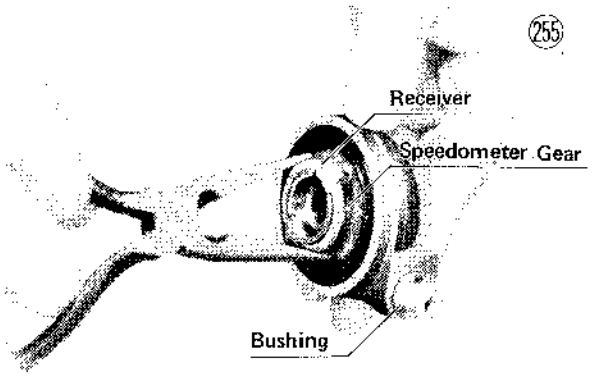
- Replace the cam lever into its original position on the camshaft, and tighten its bolt. The bolt has a flat washer.
- Fit the brake panel back onto the axle, and replace the left axle nut.

Speedometer Gear Housing Disassembly:

- Remove the right axle nut ㉙ , and pull off the speedometer gear housing ㉗ .
- Pull off the oil seal dust cover ㉑ .
- Remove the circlip ㉓ and washer ㉔ .



- Pull out the speedometer gear and gear receiver unit ㉕ with large size circlip pliers (close-in type) or some other suitable tool.



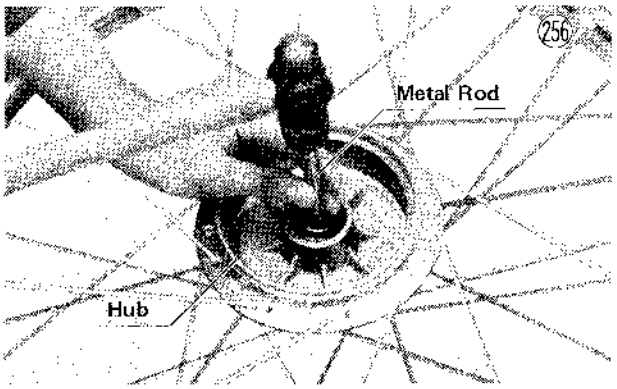
- If the speedometer cable bushing ⑱ or speedometer pinion ⑳ needs to be removed, the pin ㉘ in the speedometer gear housing must first be drilled out.
- If the speedometer gear housing grease seal ㉒ is deteriorated or damaged, remove it with a hook.

Speedometer Gear Housing Assembly Notes:

1. If the grease seal was removed, it must be replaced with a new one. Install it using a press or a suitable driver.
2. Regrease the speedometer gear (Pg. 122).
3. Fit the speedometer gear housing into the hub so that the speedometer gear receiver fits in the hub notches.

Front Hub Disassembly:

- Remove the left axle nut ① , and pull off the brake panel ⑧ .
- Pull out the axle ② .
- Pull off the speedometer gear housing ㉗ .
- Insert a metal rod into the hub from the brake side, and tap out the bearing ⑰ . The distance collar ⑮ will come out with the bearing.

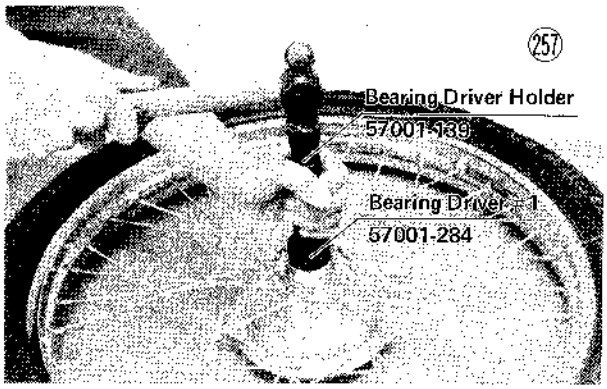


- Remove the grease seal ⑫ by pulling it off with a hook.
- Remove the circlip ⑬ .

•Insert a metal rod into the hub from the speedometer gear housing side, place the rod on the bearing (14) inner race, and tap out the bearing.

Front Hub Assembly Notes:

1. Replace the grease seal with a new one using a press or wheel bearing driver #2 (special tool).
2. Regrease the bearing (Pg. 122). Install the left bearing using a press or wheel bearing driver #2 (special tool); install the right bearing using a press or wheel bearing driver #1 (special tool).



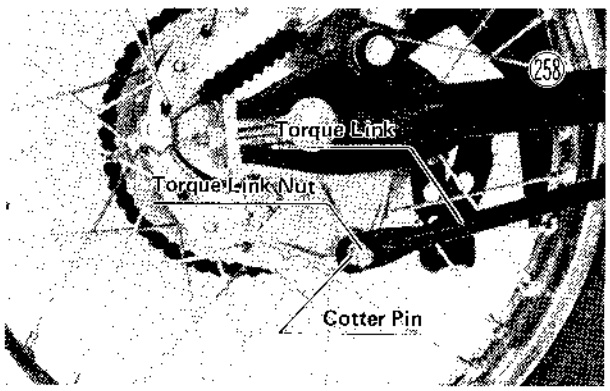
3. Fit the speedometer gear housing into the hub so that the speedometer gear receiver fits in the notches.

REAR WHEEL

Removal:

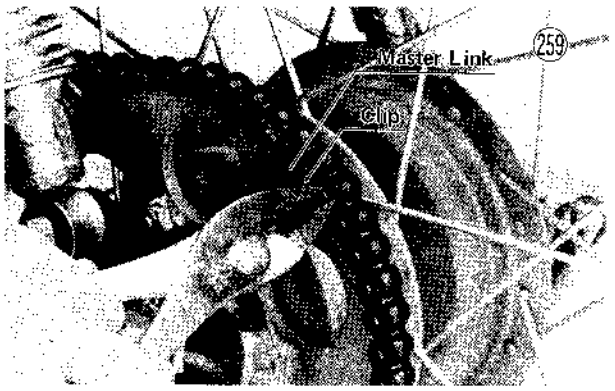
•Jack up the engine so that the rear wheel is off the ground.

•Remove the cotter pin from the torque link bolt, take off the torque link nut, and free the torque link from the bolt.



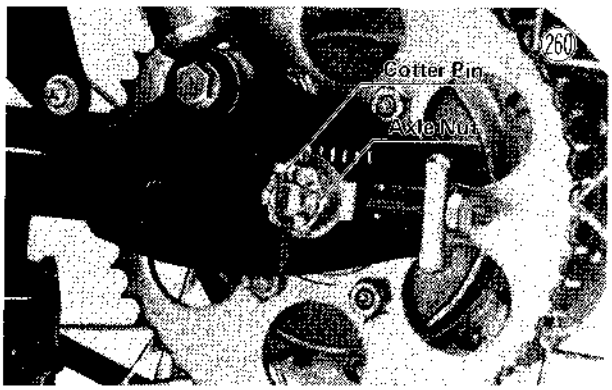
•Remove the cotter pin from the rear of the rear brake cable threaded extension, screw off the adjuster, and free the rear brake cable from the brake panel. Remove also the brake cable joint and the dust cover.

•Undo the clip carefully from the drive chain master link using pliers, and remove the master link.



•Remove the drive chain from the rear sprocket, being careful that the chain does not get dirty from contact with the ground.

•Take out the cotter pin, and remove the axle nut.



•Pull off the rear wheel.

Installation:

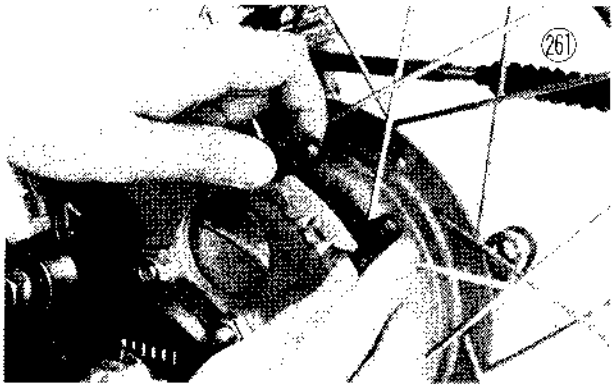
•Check to see that the torque link bolt and the left chain adjuster are in place, and slip the wheel back into the end of the swing arm.

•Rotate the brake panel, fit the torque link bolt into the torque link, and tighten the nut with 2.0~2.2 kg-m (14.5~16 ft-lbs) of torque.

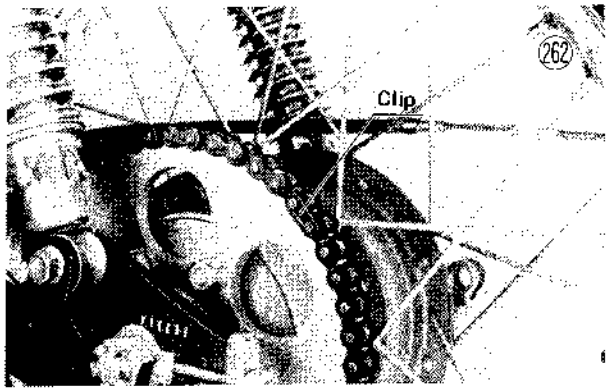
•Replace the axle nut loosely on the axle.

•Fit the drive chain back onto the rear sprocket, and set the ends into the position shown in Fig. .

•Tighten the axle nut with 8.5~11.5 kg-m (61~83 ft-lbs) of torque on the axle.



- Replace the chain master link. The direction of the master link clip should be as shown in Fig. 262.

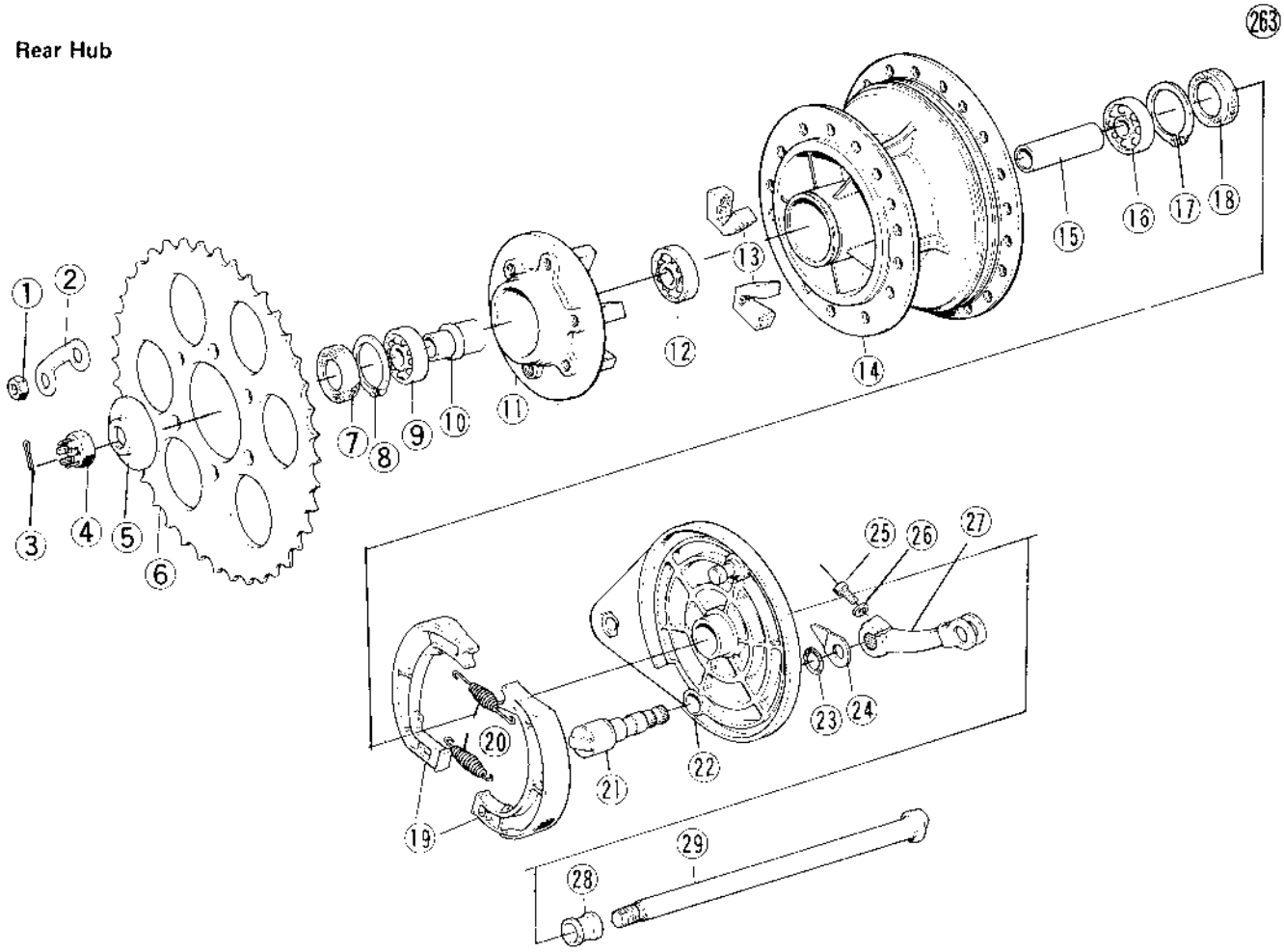


- Replace the rear brake cable, dust cover, brake cable joint, and adjuster onto the brake panel.
- Adjust the drive chain (Pg. 19).
- Adjust the rear brake (Pg. 18).
- Insert a new cotter pin at the end of the rear brake cable threaded extension, and bend the ends.

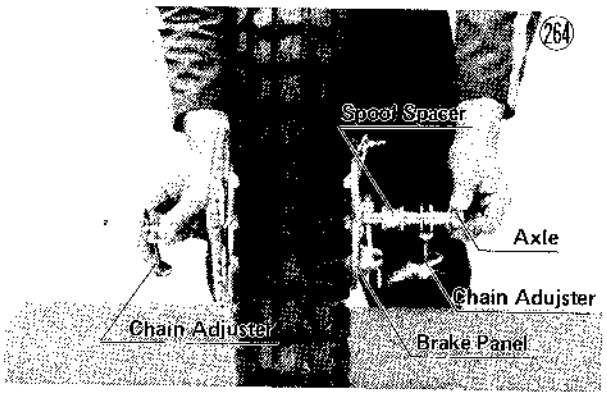
Rear Brake Disassembly:

- Pull out the axle (29) , and remove the brake panel (22) . The left chain adjuster drops off, and the right chain adjuster and a spool spacer (26) come off with the axle.

Rear Hub

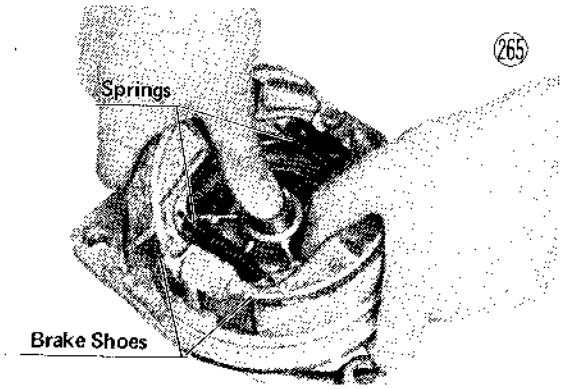


1. Nuts
2. Washers
3. Cotter Pin
4. Axle Nut
5. Grease Seal Cap
6. Rear Sprocket
7. Grease Seal
8. Cir Clip
9. Bearing
10. Sleeve
11. Coupling
12. Ball Bearing
13. Dampers
14. Rear Hub
15. Distance Collar
16. Bearing
17. Cir Clip
18. Grease Seal
19. Brake Shoes
20. Springs
21. Camshaft
22. Brake Panel
23. O Ring
24. Indicator
25. Bolt
26. Washer
27. Cam Lever
28. Spool Spacer
29. Axle



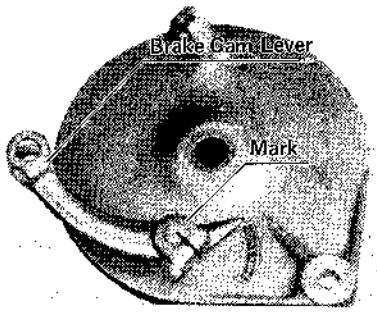
(264)

•Remove the brake shoes (19) by pulling up on the center of the linings as shown in Fig. 265.



(265)

•Remove the springs (2) (20) to separate the two brake shoes.
•Mark the position of the cam lever (27) so that it can later be installed at the same angle.

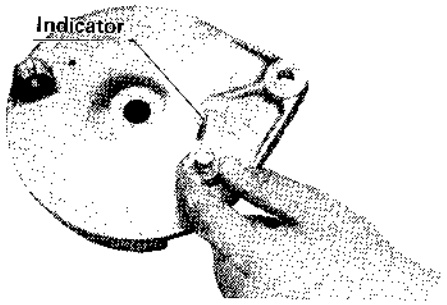


(266)

•Unbolt and remove the cam lever, brake lining wear indicator (24), and camshaft (21).

Rear Brake Assembly:

•Put the camshaft back into the panel.
•Fit the springs onto the brake shoes, and replace the shoes onto the brake panel. The longer spring should be on the camshaft side.
•Once the shoes have been replaced, fit the indicator on the serration so that it points to the extreme left of the USABLE RANGE plate.

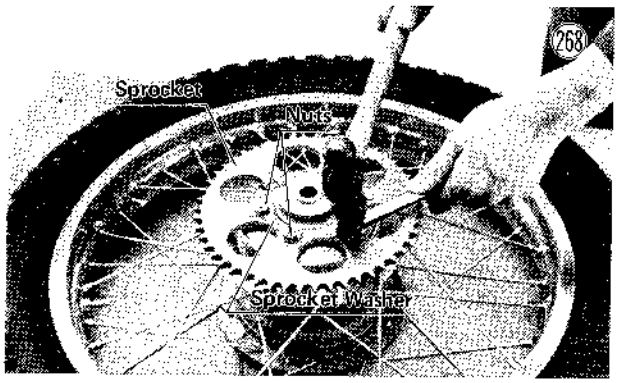


(267)

•Replace the cam lever into its original position on the camshaft, and tighten its bolt.
•Fit the brake panel back onto the axle.
•Fit the torque link bolt back into the panel, push the axle back into the hub, and put the left chain adjuster back onto the axle,

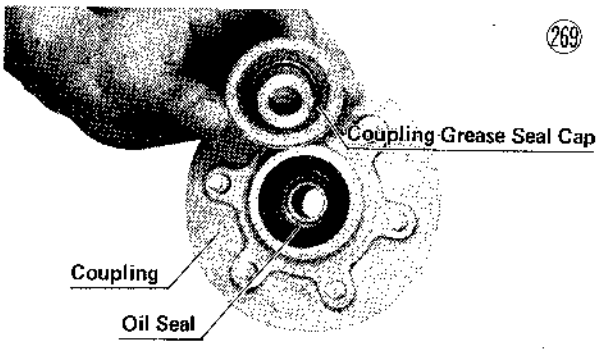
Coupling Disassembly:

•Pull off the axle (29) and brake panel (22)
•Straighten back the portions of the rear sprocket washers (2) that are bent over the sprocket nuts (1).



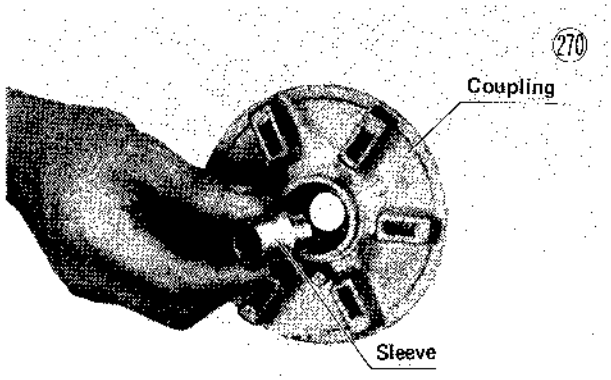
(268)

•Remove the rear sprocket nuts (6) and the sprocket washers (3).
•Pull off the rear sprocket (6).
•Pull the coupling (11) off the hub (14), and remove the coupling grease seal cap (5).

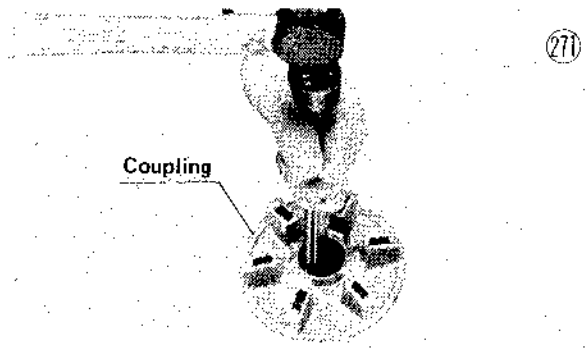


(269)

•Pull out the sleeve ⑩ from the inside of the coupling.



•Remove the grease seal ⑦ by pulling it off with a hook.
•Remove the circlip ⑧ .
•Insert a metal rod into the hub side of the coupling, place the rod on the bearing ⑨ inner race, and tap out the bearing.

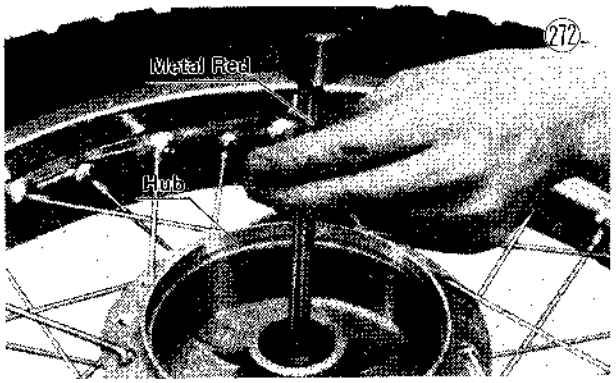


Coupling Assembly Notes:

1. If the grease seal was removed, replace it with a new one using a press or wheel bearing driver #2 (special tool).
2. If the bearing was removed, regrease it (Pg.122), and install it using a press or wheel bearing driver #2 (special tool).
3. Bend back the washer tabs onto the rear sprocket nuts.

Rear Hub Disassembly:

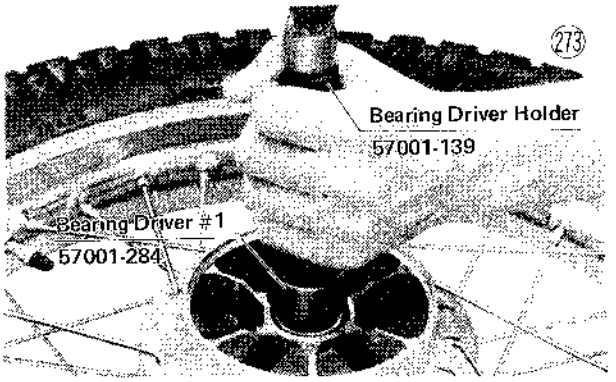
•Pull off the axle ㉙ and brake panel ㉒ .
•Pull off the coupling ⑪ .
•Insert a metal rod into the hub from the brake side, and tap out the bearing ⑫ . The distance collar ⑮ will come out with the bearing.



•Remove the grease seal ⑱ by pulling it off with a hook.
•Remove the circlip ⑰ .
•Insert a metal rod into the hub from the coupling side, place the rod on the bearing ⑯ inner race, and tap out the bearing.

Rear Hub Assembly Notes:

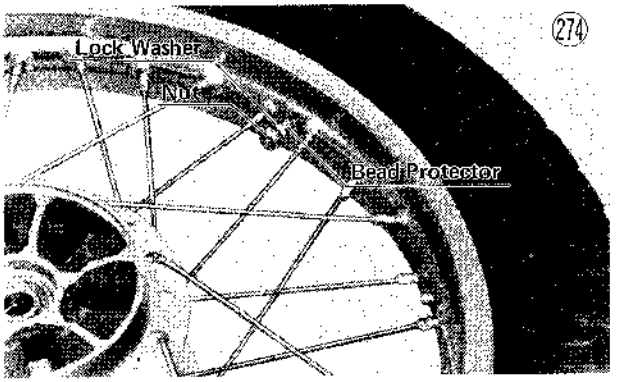
1. Replace the grease seal with a new one using a press or wheel bearing driver #1 (special tool).
2. Regrease the bearings (Pg.122), and install them using a press or wheel bearing driver #1 (special tool).



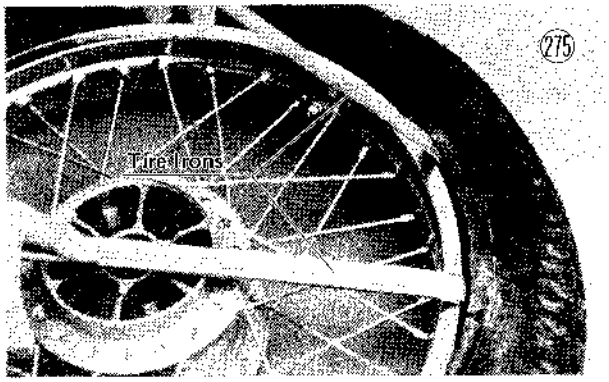
TIRE & TUBE

Removal:

•Remove the wheel from the motorcycle (Pg. 64 or 67).
•Take out the valve core to let out the air.
•Remove the valve stem nut, and loosen the bead protector nut (if fitted).



•Use a rubber mallet to break the tire beads away from both sides of the wheel rim.
•Step on the side on the tire opposite the valve stem, and start prying the tire off the rim near the valve stem with tire irons. Take care not to insert the tire irons so deeply that the tube gets damaged.



•Remove the tube when one side of the tire is pried off.
•Pry the tire off the bead protector (if fitted), and then pry the tire off the rim.

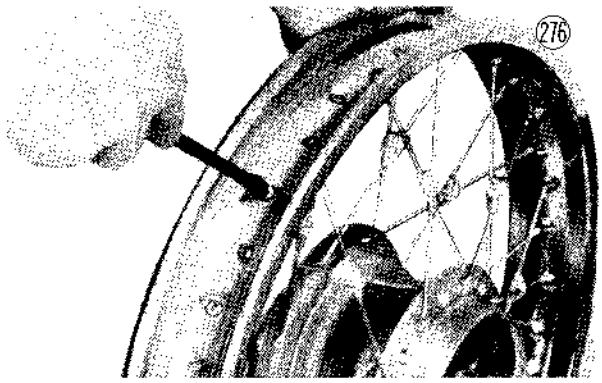
Installation:

•Put just enough air in the tube to keep it from getting caught between the tire and the rim, and insert it into the tire at this point, even if the tire was completely removed from the rim. Insert the valve stem into the rim, and screw the nut on loosely.
•If the tire was completely removed, pry one side back onto the rim, and fit the bead protector (if fitted) into the tire.
•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 the rim, and then inflate it to the standard pressure (Pg. 118).
•Tighten the bead protector nut (if fitted) and valve stem nut, and then put on the valve cap.
•Balance the wheel (Pg. 20).
•Mount the wheel back onto the motorcycle (Pg. 64 or 67).

RIM

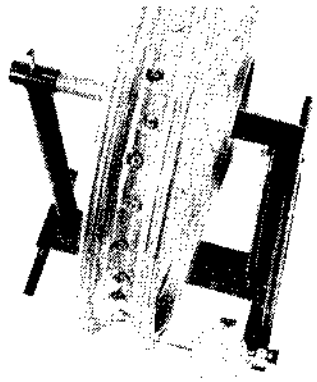
Removal:

•Remove the wheel from the motorcycle (Pg. 64 or 67).
•Take the tire and tube off the rim (Pg. 70).
•Tape or wire all the spoke intersections so that the spokes don't get mixed up, and unscrew the nipples from all the spokes with a screwdriver.



Installation:

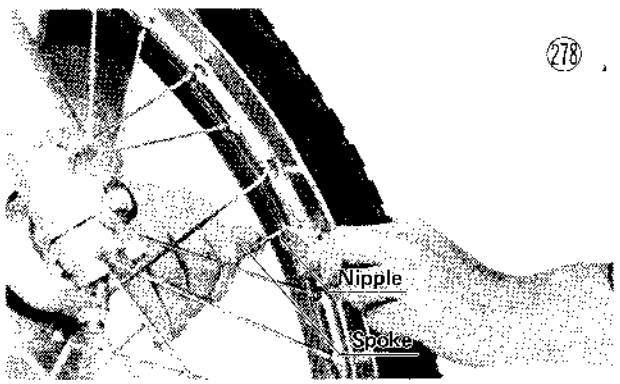
•Fit all the spokes through the holes, and screw all the nipples onto the spokes, tightening them partially.
•Suspend the wheel by the axle, and set up a dial gauge to measure rim runout. Fix the axle in place if necessary to prevent horizontal movement.



•Tighten the spokes evenly so that the radial (out from the axle) runout is less than 0.8 mm (0.032 in) and the axial (side to side) runout is less than 0.5 mm (0.020 in).
•Make sure the spokes are tightened evenly. Standard torque is 0.25 ~ 0.3 kg-m (22 ~ 26 in-lbs).
•Mount the tube and tire (Pg. 71·), and balance the wheel (Pg. 20·).
•Mount the wheel onto the motorcycle (Pg. 64 or 67).

SPOKE (breakage replacement)

•Reduce the tire air pressure by a small amount.
•Insert the new spoke through the hub, and bend it to meet the nipple,

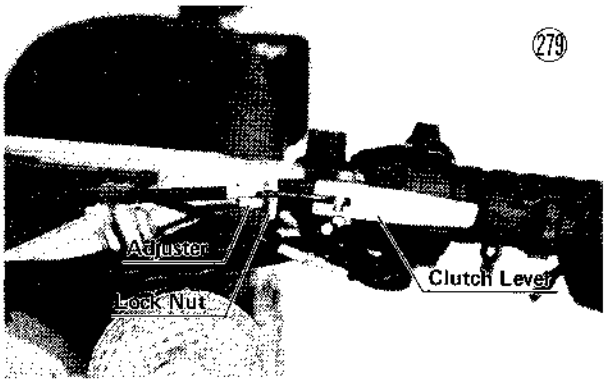


- Tighten with a spoke wrench. Standard torque is 0.25 ~ 0.3 kg-m (22 ~ 26 in-lbs).
- Inflate the tire to standard pressure (Pg.118).

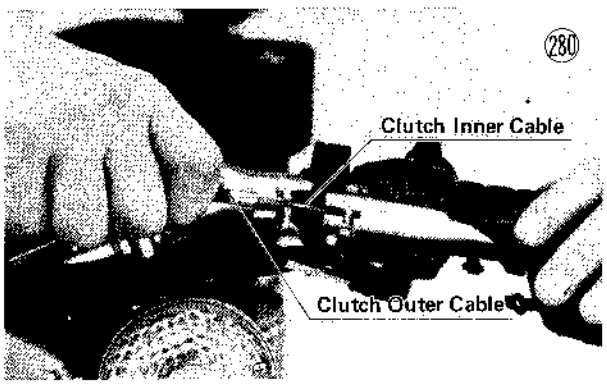
HANDLEBAR

Removal:

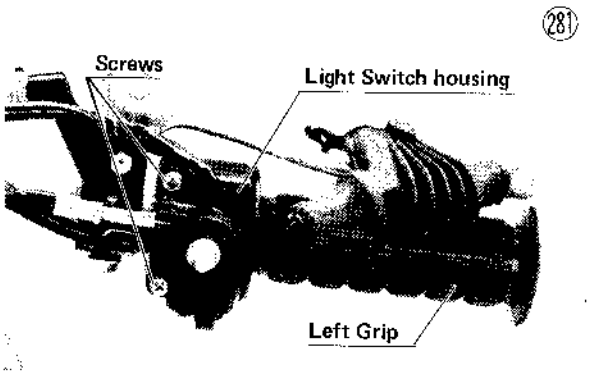
- Take off the rear view mirrors.
- Slide the clutch lever dust cover out of place.
- Loosen the lock nut on the clutch lever, and screw in the adjuster.
- Line up the slots in the clutch lever, lock nut, and adjuster.



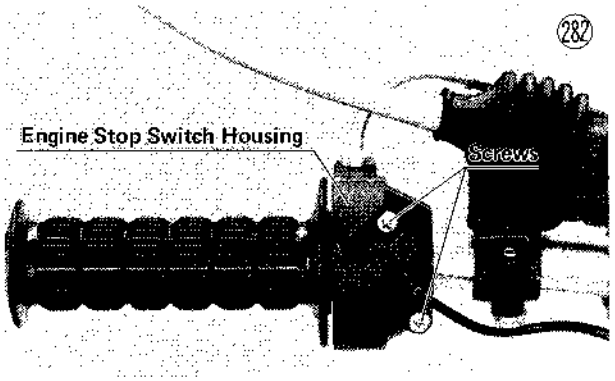
- Pull in the clutch lever, grasp the clutch outer cable with the other hand, and slowly release the lever while pulling on the outer cable to free it from the adjuster. Free the inner cable from the lever.



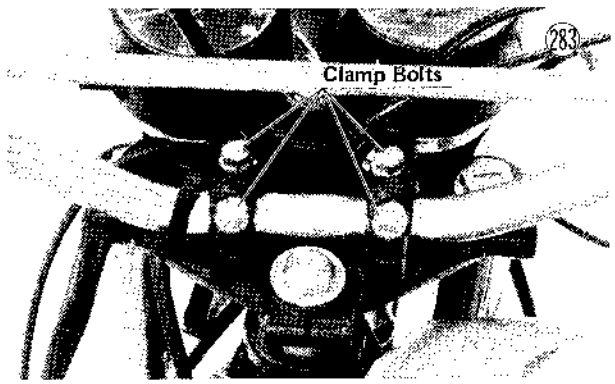
- Remove the straps (3) which hold the wiring to the handlebar.
- Take out the light switch housing screws (2), and remove the light switch housing from the handlebar.



- Take out the mounting bolts (2) from each turn signal clamp, and remove both turn signals.
- Loosen the engine stop switch housing screws (2), and loosen the front brake lever bolt.



- Undo the handlebar clamp bolts (4), remove the clamps, and slide the handlebar from the front brake lever and the engine stop switch and right handlegrip assembly.

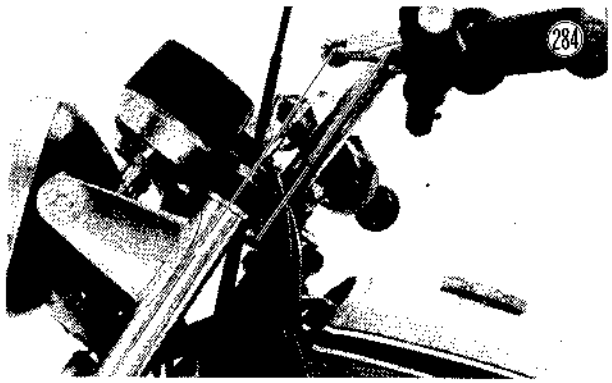


- To remove the clutch lever, loosen the clutch lever bolt, cut off the left handlegrip, which is bonded to the handlebar, and slide off the clutch lever.

Installation:

- If the clutch lever and left handlegrip were removed, slide the clutch lever back on the handlebar, tighten its bolt with the lever at the proper angle, and bond a new left handlegrip onto the handlebar.

•Slide the right side of the handlebar through the front brake lever into the engine stop switch and right handlegrip assembly (the throttle grip cable runs above the front brake lever), and mount it in its clamps so that the angle of the handlebar matches the angle of the front fork as shown in Fig. 284. Torque for the handlebar clamp bolts is 1.6 ~ 2.1 kg-m (12 ~ 15 ft-lbs). Each bolt has a lock washer.

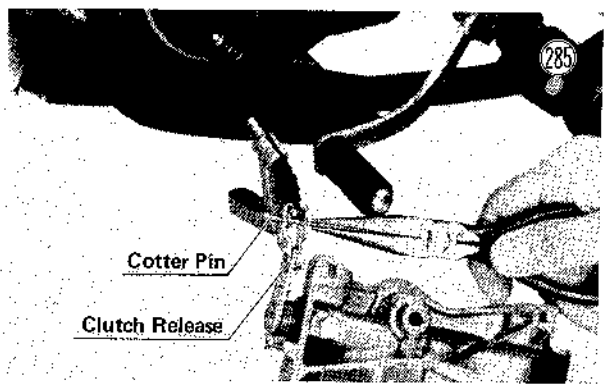


•Tighten the engine stop switch housing screws, and tighten the front brake lever bolt.
•Replace both turn signals. Each bolt has a lock washer and flat washer.
•Replace the light switch housing.
•Replace the straps (3) which hold the wiring to the handlebar.
•Replace the rear view mirrors.
•Unscrew the clutch adjusting hole cap from the left engine cover, and turn out the adjusting screw to give the cable plenty of play.
•Fit the clutch cable back into the clutch lever.
•Adjust the clutch (Pg. 14).

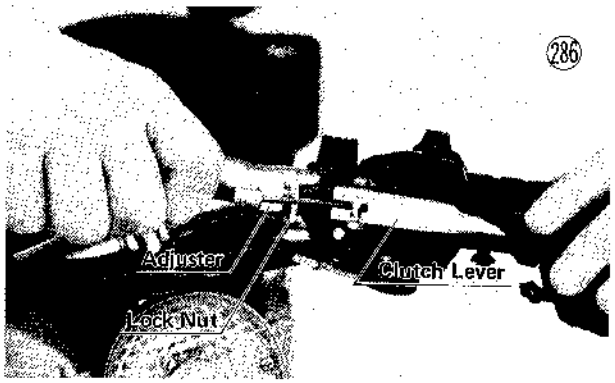
CLUTCH CABLE

Removal:

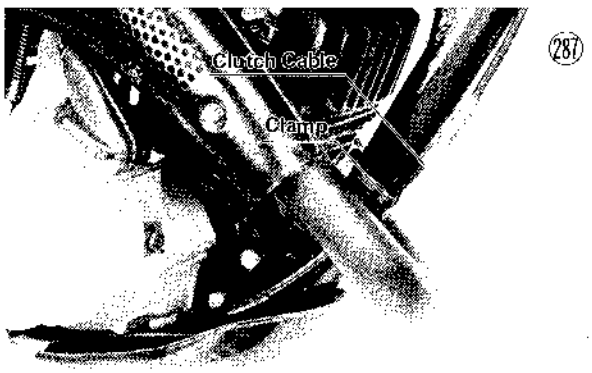
•Remove the engine sprocket cover.
•Remove the clutch cable bracket and left engine cover screws (4), drop down the left engine cover, and remove the left engine cover gasket.
•Remove the clutch release cotter pin, and free the clutch cable tip from the clutch release.



•Remove the bracket from the end of the clutch cable.
•Slide the clutch lever dust cover out of place.
•Line up the slots in the clutch lever, lock nut, and adjuster, and free the inner cable from the lever.

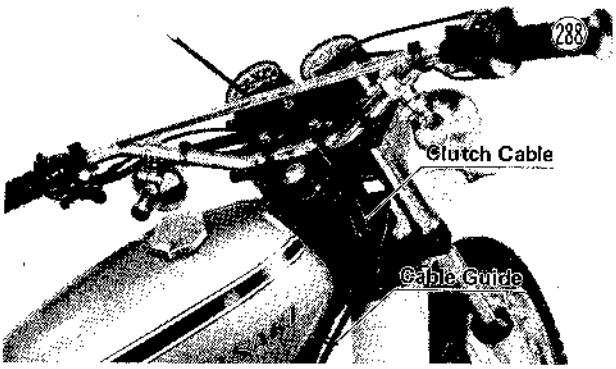


•Remove the clamp that holds the cable to the down tube, and pull the cable free from the motorcycle.



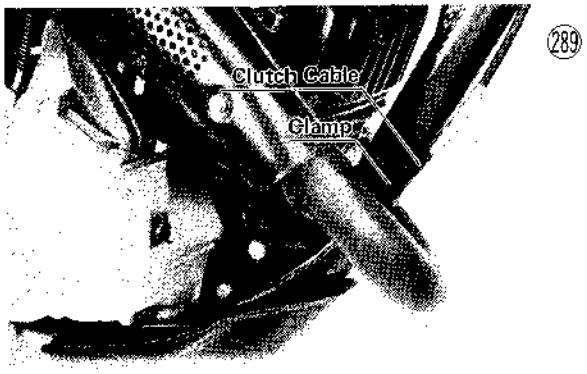
Installation:

•Run the upper end of the cable through the guide on the frame below the fuel tank and then between the handlebar and the ignition switch to the clutch lever.

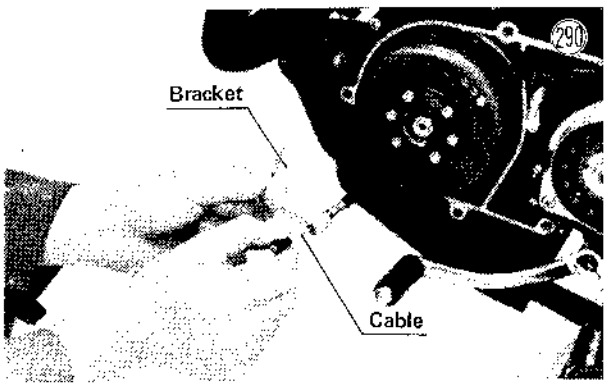


•Fit the cable back into the clutch lever.

•Clamp the cable back on the down tube, and run the lower end of the cable between the engine and the bottom tubes to where it connects to the clutch release.



•Release the bracket on the end of the cable.



•Connect the inner cable tip to the clutch release lever, insert a new cotter pin, and bend back the ends.
•Replace the left engine cover, and tighten the cable bracket back onto the left engine cover.
•Replace the engine sprocket cover.
•Adjust the clutch (Pg. 14).

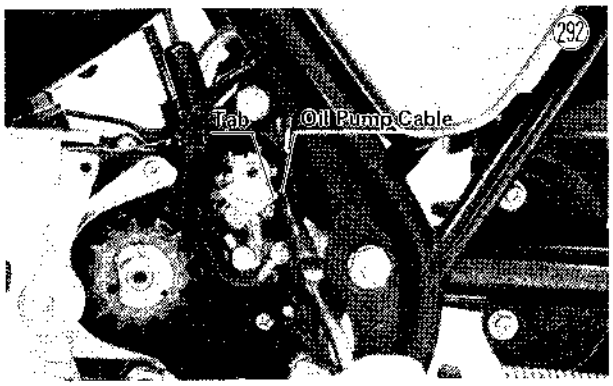
THROTTLE CONTROL CABLE (Throttle Grip, Carburetor, and Oil Pump Cable Unit)

Removal:

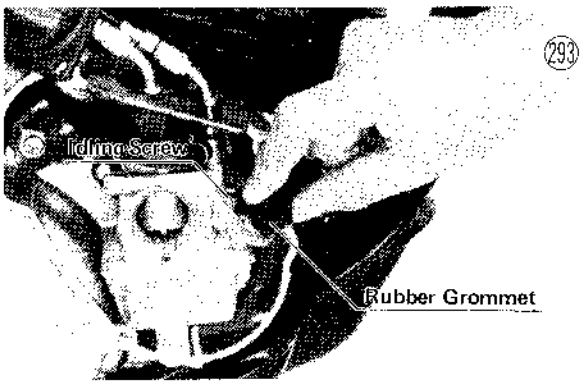
•Release the catches (2) at the rear of the seat, and then pull off the seat.
•Turn the fuel tap to the "O" position, slide down the hose clamp, and pull the fuel hose off the tap.
•Unhook the retaining band, and pull the fuel tank off towards the rear.
•Remove the engine sprocket cover and oil pump cover.



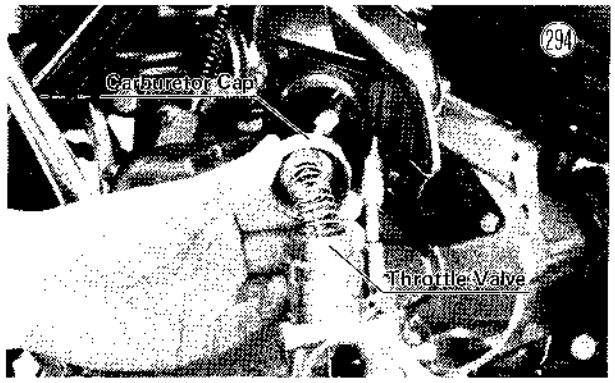
•Bend out the tab on the oil pump lever, and free the end of the oil pump cable from the oil pump lever.



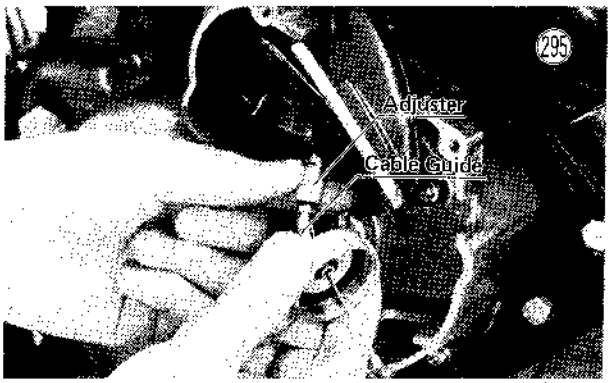
•Slide the oil pump adjuster dust cover up out of place.
•Loosen the lock nut, screw the oil pump adjuster off the crankcase, and then pull the oil pump inner cable out from the adjuster crankcase hole.
•Remove the nuts (2) from the muffler exhaust collar.
•Remove the bolts (2) that connect the muffler to the frame and to the bracket at the rear shock absorber, and then remove the muffler and gasket.
•Remove the bolts (4) from the carburetor rim, and slide the rim and the carburetor rubber cap up the cables.
•Remove the carburetor cover and gasket.
•Pull off the idling screw rubber grommet from the right engine cover.



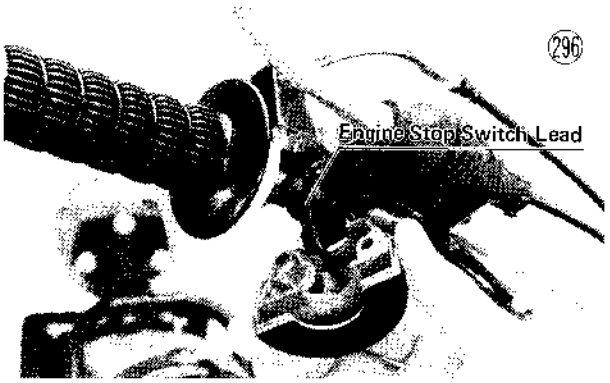
•Pull the fuel hose off the carburetor.
•Pull off the carburetor.
•Slide the carburetor rubber cap plate up out of place.
•Unscrew the carburetor cap, and pull out the throttle valve assembly.



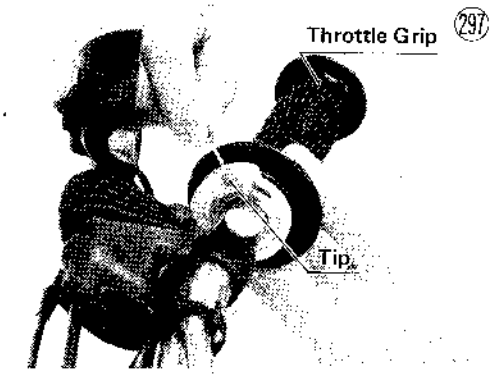
•Pull the spring up from where it seats in the valve so that the spring seat will fall out of place, slip the tip of the cable to the other side of the slot in the valve base, and pull the inner cable free from the throttle valve.
•Unscrew the carburetor cap cable guide from the adjuster, and remove the carburetor cap and cable guide unit from the inner cable.



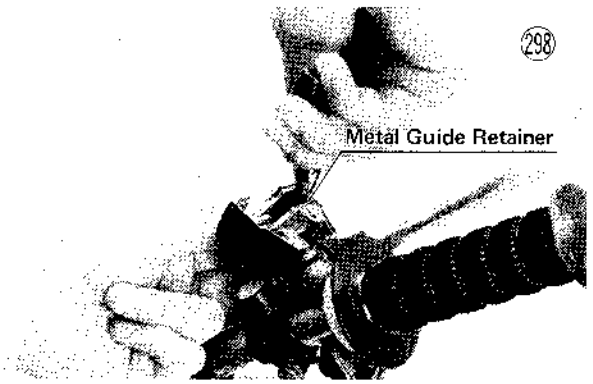
•Remove the clip from the adjuster, and remove the adjuster from the cable.
•Remove the engine stop switch housing screws (2), and slide the lower part of the switch housing a short ways down the switch lead.



•Slide the throttle grip cable tip out of its slot in the throttle grip.



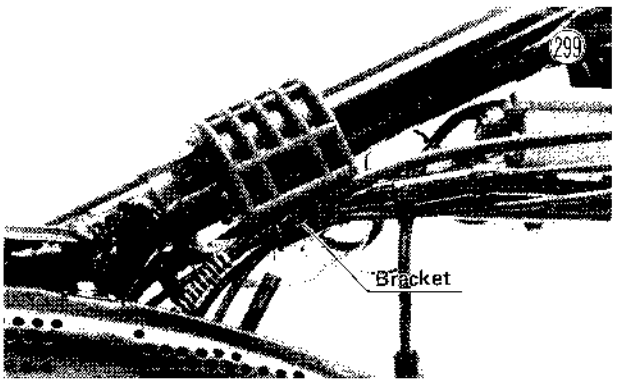
•Pull out the throttle grip metal guide retainer from the engine stop switch housing, and free the cable from the housing.



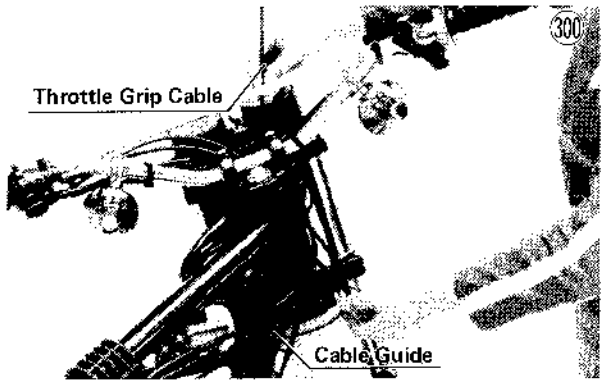
•Pull the lower end of the carburetor cable from the carburetor rubber cap, and free the entire throttle control cable from the motorcycle. The throttle grip, carburetor, and oil pump cables are not made to be separated.

Installation:

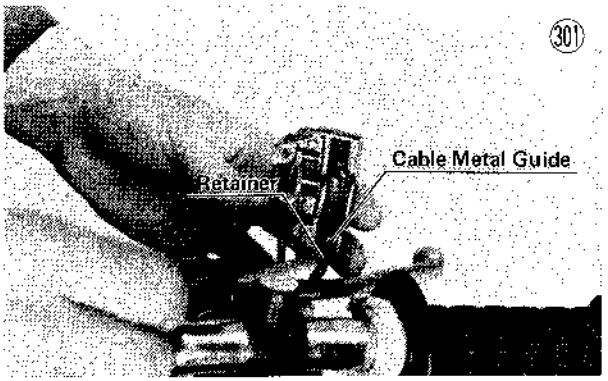
•Run the lower end of the carburetor cable through the wire coil around the choke cable, and then push the end of the carburetor outer cable back through its hole in the carburetor rubber cap.
•Seeing that no cable gets twisted with another, fit the carburetor and oil pump cables in their frame bracket.



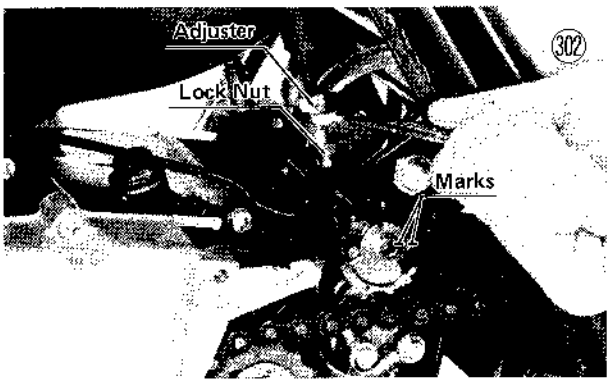
•Run the throttle grip cable through its guide on the frame and then between the handlebar and the ignition switch to the engine stop switch housing.



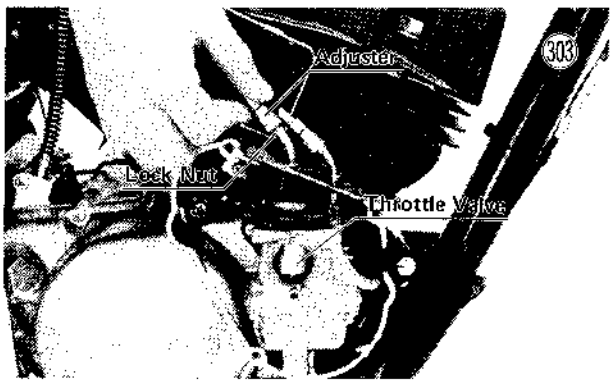
•Fit the throttle grip inner cable metal guide back into the engine stop switch housing, and secure it in place with the retainer. The throttle grip cable runs above the front brake cable.



•Fit the inner cable back into its groove in the throttle grip.
•Slide back the lower part of the engine stop switch housing, and tighten its screws.
•Replace the adjuster and clip back onto the end of the carburetor outer cable.
•Screw the carburetor cap and cable guide unit onto the adjuster.
•Compress the spring into the cap, insert the tip of the carburetor cable through the slot in the throttle valve base, and slip it to its rest position in the other side of the slot.
•Insert the jet needle, and position the spring seat on the valve base with its tab in the slot.
•Fit the throttle valve back into the carburetor, and screw on the carburetor cap.
•Slide the carburetor rubber cap plate back down into plate on top of the carburetor.
•Check to see that the carburetor overflow grommet is properly positioned, and then press the carburetor back into its place on the right engine cover. Be sure that it is all the way back into place.
•Fit the fuel hose on the carburetor.
•Install the idling screw grommet back into the right engine cover.
•Replace the carburetor cover and gasket.
•Route the oil pump inner cable through the adjuster crankcase hole, and screw the oil pump adjuster into the hole.
•Fit the oil pump inner cable on the oil pump lever, and bend the tab back onto the end of the cable.
•Loosen the lock nut at the throttle grip end of the throttle grip cable, turn the adjusting nut so that the cable will have 2~3 mm ($\frac{1}{16}$~$\frac{1}{8}$ in) of play (Pg. 9), and tighten the lock nut.
•Turn the oil pump cable adjuster so that with the throttle grip fully closed the lower mark on the oil pump lever lines up with the mark on the lever stopper, tighten the lock nut, and slide back the adjuster dust cover.



•Back out the idling screw 3~4 turns.
•Loosen the lock nut, and turn in the adjuster so that the throttle valve is at its lowest possible position.



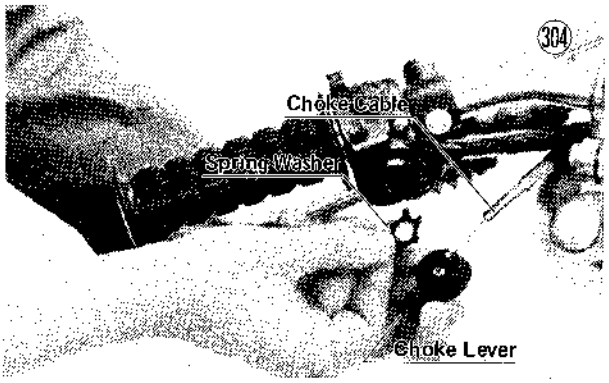
•Being careful not to turn the adjusting nut so far that the throttle valve rises out of its lowest position, turn the adjuster back out to eliminate the play so that the slightest tug on the outer cable will affect the throttle valve. Tighten the lock nut.
•Slide back the carburetor rubber cap and rim, and tighten the rim bolts.
•Fit the muffler and gasket back into the cylinder exhaust port, and loosely tighten the bolts that connect the muffler to the frame and to the bracket at the rear shock absorber.
•Replace the muffler exhaust collar nuts, tightening them together so that they tighten evenly to avoid an exhaust leak. Be sure that the spring side of the nuts face out.

- Tighten the muffler mounting bolts.
- Fit the oil pump cover back into its proper position, and replace its screw (lower).
- Replace the engine sprocket cover.
- Replace the fuel tank, and hook its retaining band.
- Fit the fuel hose back onto the fuel tap, and slide the clamp back into place.
- Push the seat back into place.

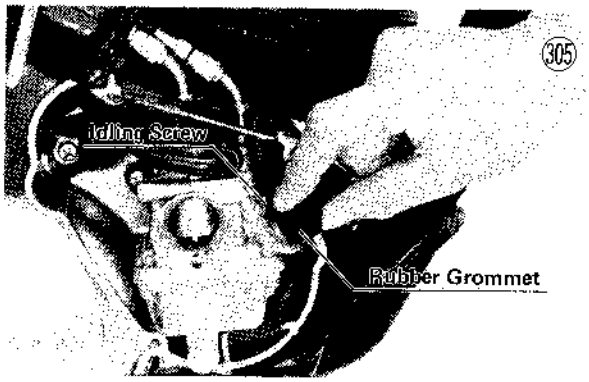
CHOKE CABLE

Removal:

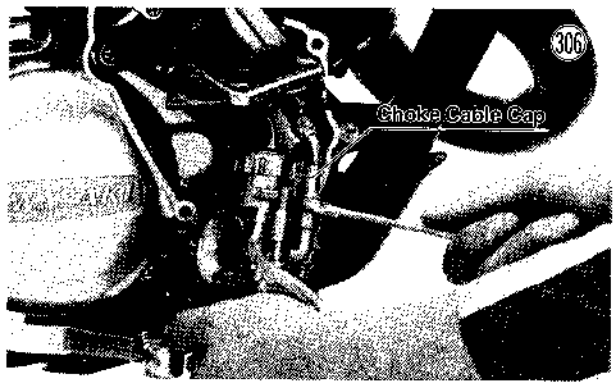
- Release the catches (2) at the rear of the seat, and then pull off the seat.
- Turn the fuel tap to the "O" position, slide back the hose clamp, and pull the fuel hose off the tap.
- Unhook the retaining band, and pull the fuel tank off towards the rear.
- Remove the choke lever bolt and washer, and pull out the choke lever and spring washer.



- Free the cable from the choke lever,
- Remove the nuts (2) from the muffler exhaust collar.
- Remove the bolts (2) that connect the muffler to the frame and to the bracket at the rear shock absorber, and then remove the muffler and gasket.
- Remove the bolts (4) from the carburetor rim, and slide the rim and the carburetor rubber cap up the cables.
- Remove the carburetor cover and gasket.
- Pull off the idling screw rubber grommet from the right engine cover.



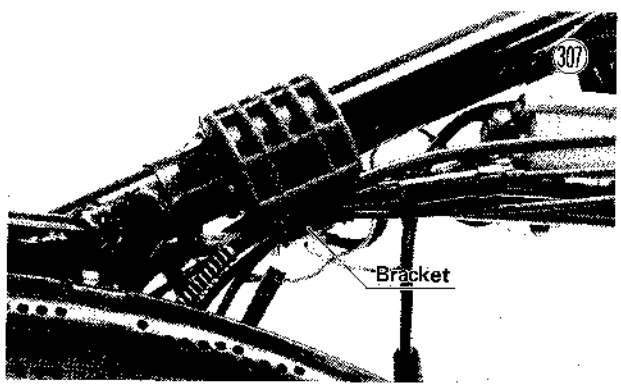
- Pull the fuel hose off the carburetor.
- Pull off the carburetor.
- Slide the carburetor rubber cap plate up out of place.
- Unscrew the choke cable cap, and pull out the starter plunger.



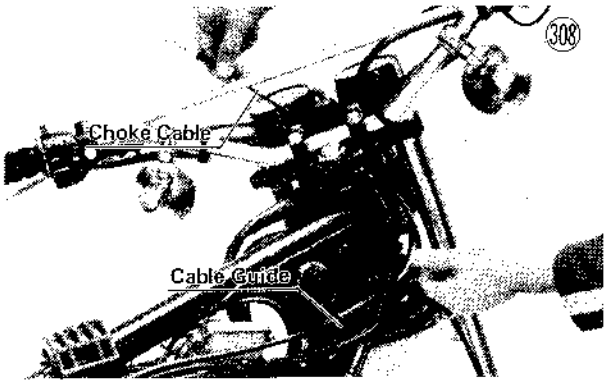
- Remove the plunger, spring, and choke cable cap from the cable.
- Remove the clip from the adjuster, and unscrew the cable guide from the adjuster.
- Pull off the cable guide and then the adjuster from the cable.
- Remove the cable from its frame brackets, and pull the lower end from the carburetor rubber cap.

Installation:

- Run the lower end of the choke cable through the wire coil around the carburetor cable, and then push the end of the outer cable back through its hole in the carburetor rubber cap,
- Seeing that the cable does not get twisted with the carburetor cable, fit the cable in its bracket on the frame.



- Run the cable through its guide on the frame and then between the handlebar and the ignition switch to the light switch housing. Route the cable so that it does not interfere with any other cable and has a minimum of bending so that the inner cable will slide smoothly.

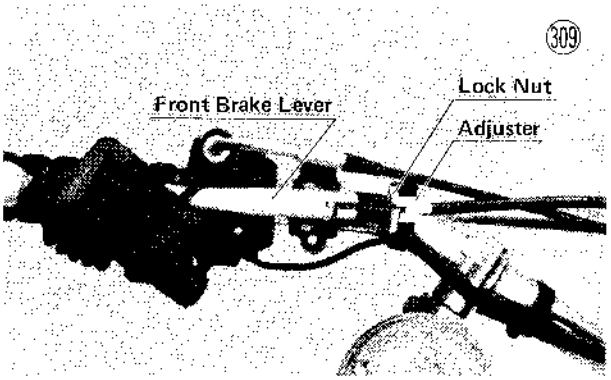


- Replace the adjuster and clip back onto the end of the outer cable.
- Fit the cable guide onto the inner cable, and screw it into the adjuster.
- Replace the choke cable cap, spring, and brass tip onto the inner cable, fit the plunger back into the carburetor, and screw on the choke cable cap.
- Slide the carburetor rubber cap plate back down into place on top of the carburetor.
- Check to see that the carburetor overflow grommet is properly positioned, and then press the carburetor back into its place on the right engine cover. Be sure that it is all the way back into place.
- Fit the fuel hose on the carburetor.
- Install the idling screw grommet back into the right engine cover.
- Replace the carburetor cover and gasket.
- Fit the upper end of the inner cable into the choke lever, fit the spring washer and the lever and cable into the bottom of the light switch housing, and replace the washer and bolt.
- Using either the upper or lower adjuster, adjust so that cable play is 1~2 mm ($\frac{1}{32}$~$\frac{1}{16}$ in) (Pg. 12).
- Slide back the carburetor rubber cap and rim, and tighten the rim bolts.
- Fit the muffler and gasket back into the cylinder exhaust port, and loosely tighten the bolts that connect the muffler to the frame and to the bracket at the rear shock absorber.
- Replace the muffler exhaust collar nuts, tightening them together so that they tighten evenly to avoid an exhaust leak. Be sure that the spring side of the nuts face out.
- Tighten the muffler mounting bolts.
- Replace the fuel tank, and hook its retaining band.
- Fit the fuel hose back onto the fuel tap, and slide the clamp back into place.
- Push the seat back into place.

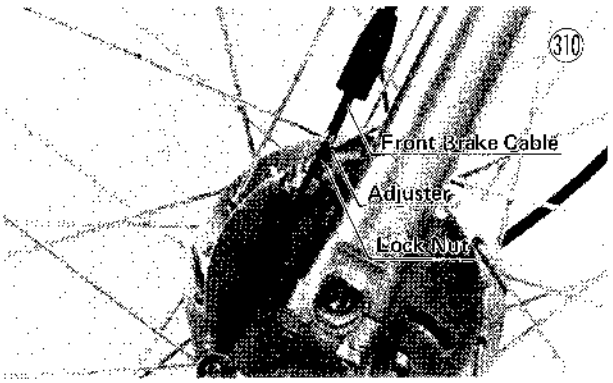
FRONT BRAKE CABLE

Removal:

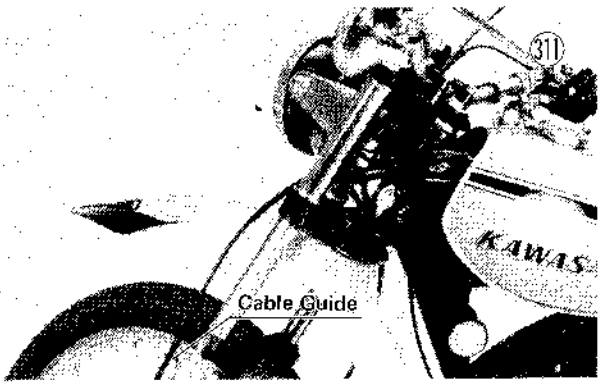
- Slide the front brake lever dust cover out of place.
- Loosen the lock nut on the front brake lever, and screw in the adjuster.



- Slide up the dust cover, and loosen the lock nut on the front brake cable adjusting bolt on the front brake panel, and screw in the adjusting bolt.



- Line up the slots on the adjusting bolt, lock nut, and brake panel cable mount, and remove the front brake cable from the brake panel.
- Line up the slots on the brake lever, lock nut, and adjuster, and free the front brake cable from the brake lever.
- Slide the cable out of the guide on the front fork left shock absorber.



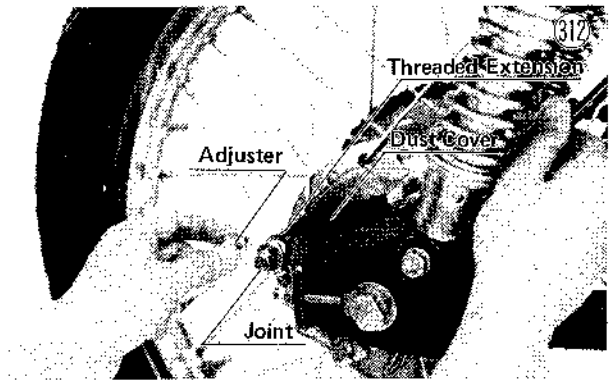
Installation:

- Run the cable through the guide on the front fork left shock absorber and then between the handlebar and the ignition switch. Route the cable with a minimum of bending so that the inner cable will slide smoothly.
- Connect the upper end of the cable back into the brake lever and through the slots on the brake lever, lock nut, and adjuster.
- Slip the lower part of the inner cable back through the slots on the adjusting bolt, lock nut, and brake panel cable mount and onto the end of the cam lever.
- Adjust the front brake (Pg. 17).

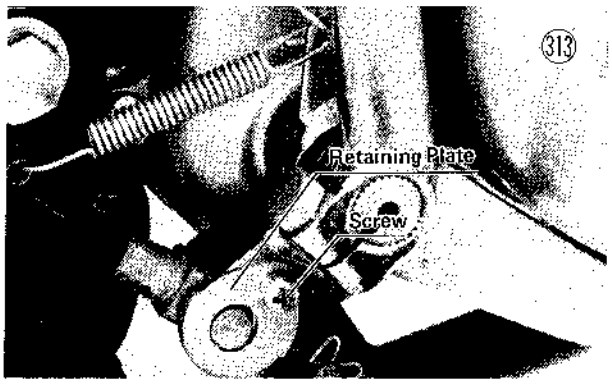
REAR BRAKE CABLE

Removal:

- Remove the cotter pin from the rear of the rear brake cable threaded extension, screw off the adjuster, and free the rear brake cable from the brake panel. Remove also the brake cable joint and the dust cover.



- Remove the cotter pin from the pin which holds the rear brake inner cable to the frame, and then remove the pin.
- Remove the outer cable screw from the rear of the brake pedal, and free the rear brake outer cable from the brake pedal. A lock washer and the outer cable retaining plate come off with the screw.



- Free the cable from the motorcycle.

Installation:

- Run the cable through its guide, fit the outer cable into its proper position at the rear of the brake pedal.
- Push in on the inner cable threaded extension so that the end of the inner cable will fit into its place in the frame below the brake pedal, and replace the inner cable pin.
- Insert a new cotter pin into the inner cable pin, and bend out the ends.
- Replace the outer cable retaining plate, lock washer, and screw to secure the rear brake outer cable to the rear of the brake pedal.
- Replace the rear brake cable, dust cover, brake cable joint, and adjuster onto the brake panel.
- Insert a new cotter pin at the end of the rear brake cable threaded extension, and bend the ends.
- Adjust the rear brake (Pg. 18) and the rear brake light switch (Pg. 18).

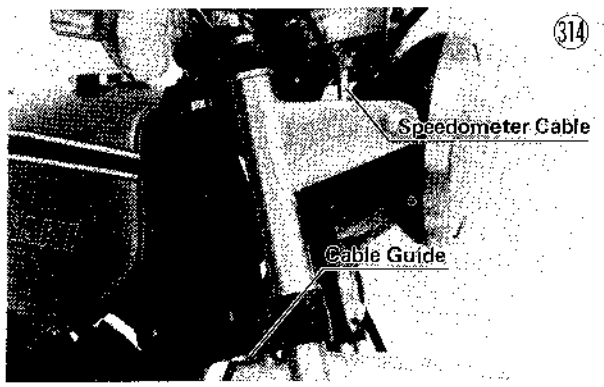
SPEEDOMETER CABLE

Removal:

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

Installation:

- Run the cable through the guide on the right side of the steering stem base, and route the upper end of the cable between the headlight housing and the front brake cable to the speedometer.

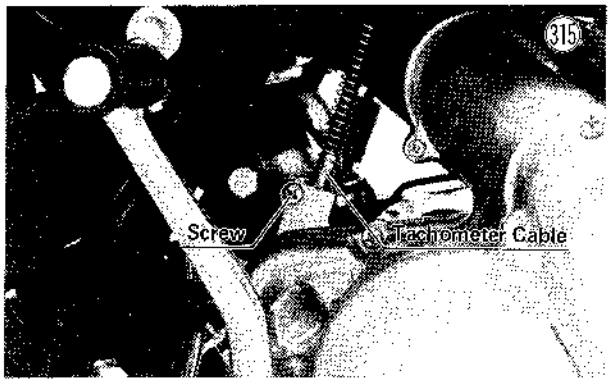


- Secure the upper end of the cable to the speedometer with pliers.
- Insert the speedometer inner cable into the speedometer gear housing while turning the wheel so that the slot in the end of the cable will seat in the tongue of the speedometer pinion. Tighten the cable nut with pliers.

TACHOMETER CABLE

Removal:

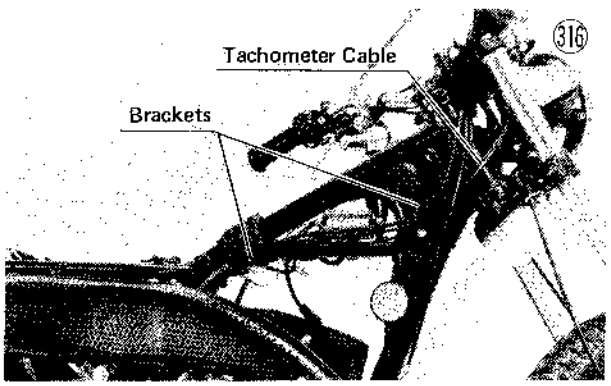
- Release the catches (2) at the rear of the seat, and then pull off the seat.
- Turn the fuel tap to the "O" position, slide down the hose clamp, and pull the fuel hose off the tap.
- Unhook the retaining band, and pull the fuel the tank off towards the rear.
- Disconnect the upper end of the tachometer cable with pliers.
- Take out the tachometer cable retaining screw from the crankcase, and pull the end of the tachometer cable from where it seats.



- Remove the tachometer cable from the frame brackets.

Installation:

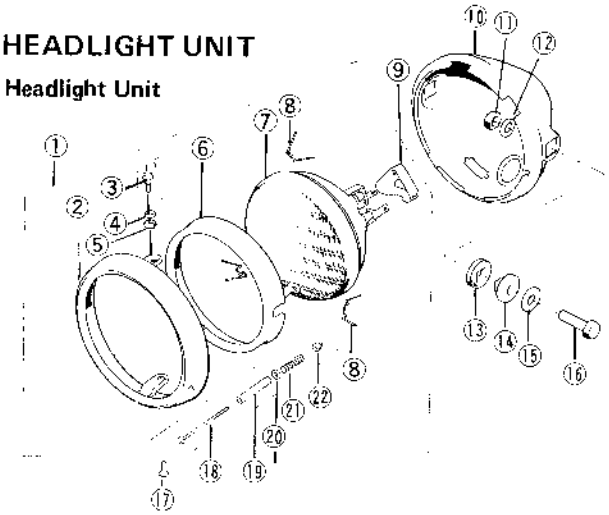
- Fit the bottom end of the cable into its hole in the crankcase. Turn it if necessary so that it fits all the way back into place, and replace its retaining screw.
- Run the cable through its frame brackets and between the clutch cable and frame to the tachometer.



- Fit the inner cable into the tachometer, and tighten the cable nut with pliers.
- Replace the fuel tank, and hook its retaining band.
- Fit the fuel hose back onto the fuel tap, and slide the clamp back into place.
- Push the seat back into place.

HEADLIGHT UNIT

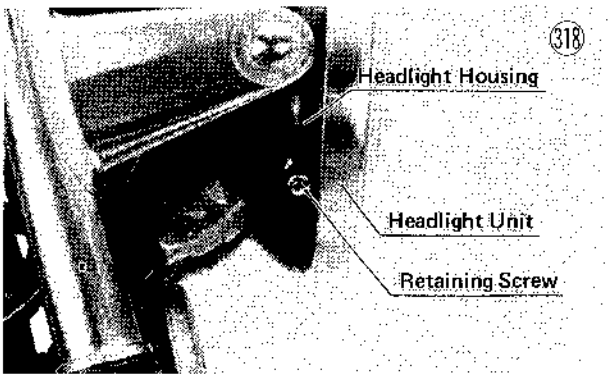
Headlight Unit



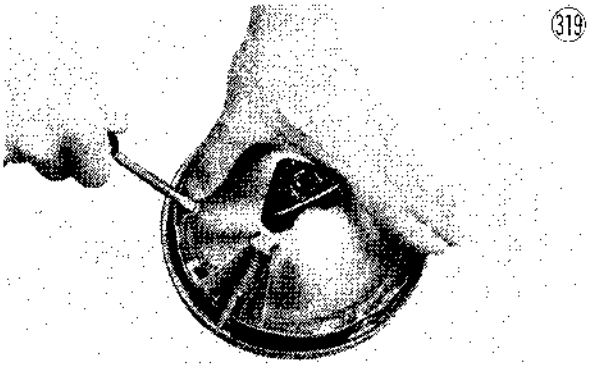
1. Headlight Unit
2. Outer Rim
3. Screw
4. Lock Washer
5. Nut
6. Inner Rim
7. Sealed Beam Unit
8. Springs
9. Rubber Cap
10. Headlight Housing
11. Nut
12. Lock Washer
13. Damper Rubber
14. Collar
15. Washer
16. Bolt
17. Retaining Screw
18. Adjusting screw
19. Collar
20. Washer
21. Spring
22. Nut

Removal:

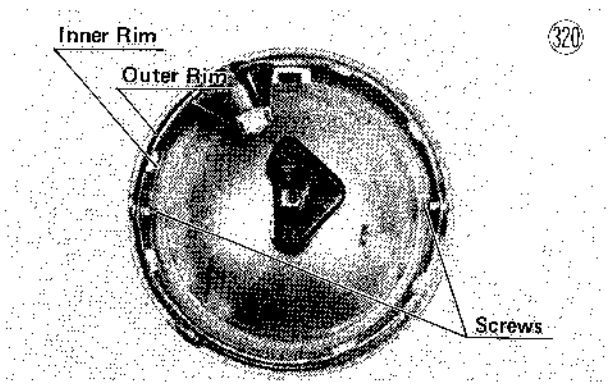
- Take out the retaining screw ⑰ , and pull the headlight unit ① out of its housing ⑩ .



- Disconnect the headlight socket from the rear of the unit.
- Holding a thumb on one end of one of the springs ⑧ to keep it from flying off, pry the center up, and then remove the spring.



•Remove the other two springs the same way.
•Remove the screws (2) ③ which hold the inner rim ⑥ to the outer rim ② .

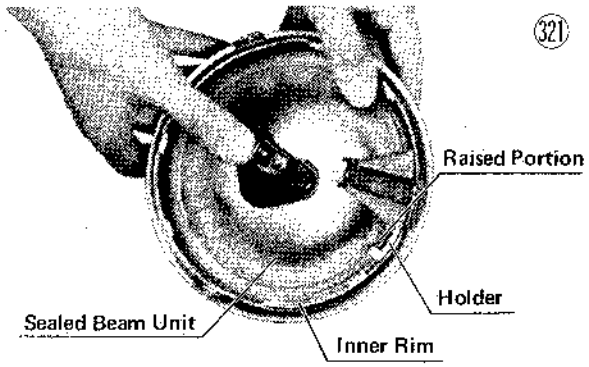


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•Remove the sealed beam unit ⑦ from the rim.

Installation:

•Place the sealed beam unit into the inner rim, fitting the raised portion into its holder on the inner rim. This ensures that the part of the sealed beam unit marked "TOP" will be to the top after the headlight unit is mounted back into the headlight housing.



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•Tighten the rim screws. Each screw has a lock washer and nut.
•Replace each spring. Fit one end into place with the spring center on the unit edge, and then fit the other end into place using needle pliers.
•Connect the headlight socket to the rear of the unit.
•Place the headlight unit back into the housing, and tighten its retaining screw.

SPEEDOMETER

Removal:

•Disconnect the upper end of the speedometer cable with pliers.
•Remove the cap nuts (2) from the bottom of the speedometer mounting bracket. A small lock washer, large flat washer, and damper rubber also come off each stud.
•Pull the speedometer up a little, undo the clamp if necessary to give the speedometer light lead slack, and remove the speedometer light lead to free the speedometer.

TACHOMETER

Removal:

•Disconnect the upper end of the tachometer cable with pliers.
•Remove the cap nuts (2) from the bottom of the tachometer mounting bracket. A small lock washer, large flat washer, and damper rubber also come off each stud.
•Pull the tachometer up a little, undo the clamp if necessary to give the tachometer leads slack, and remove the tachometer light and the three indicator lights to free the tachometer.

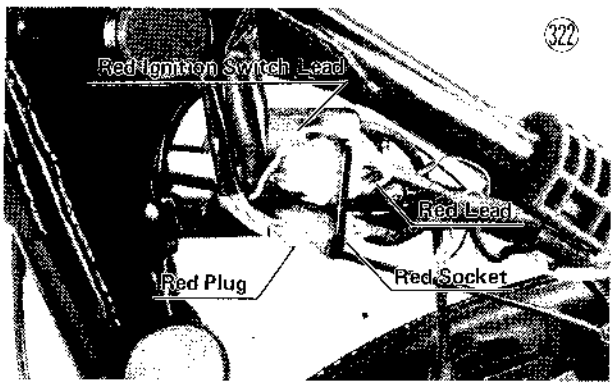
Installation Note:

•The proper connections in the base of the tachometer are as follows: black/yellow and red to tachometer light socket, brown and light green to neutral indicator light socket, black/red and black/yellow to high beam indicator socket, and gray and green to turn signal indicator light socket.

IGNITION SWITCH

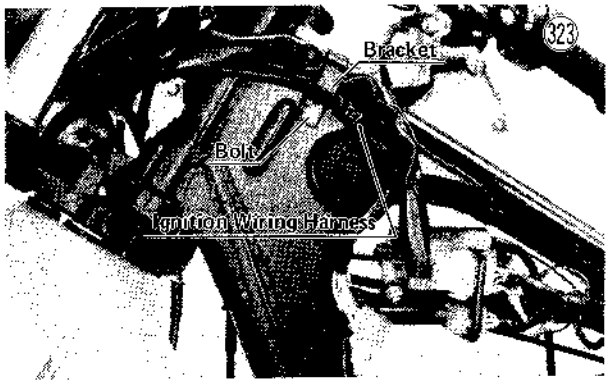
Removal:

•Release the catches (2) at the rear of the seat, and then pull off the seat.
•Turn the fuel tap to the "O" position, slide down the hose clamp, and pull the fuel hose off the tap.
•Unhook the rubber retaining band, and pull the fuel tank off towards the rear.
•Disconnect the red ignition switch plug from the red socket and the red ignition switch lead from the red lead.



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•Slip the ignition switch wiring harness out of its frame bracket.

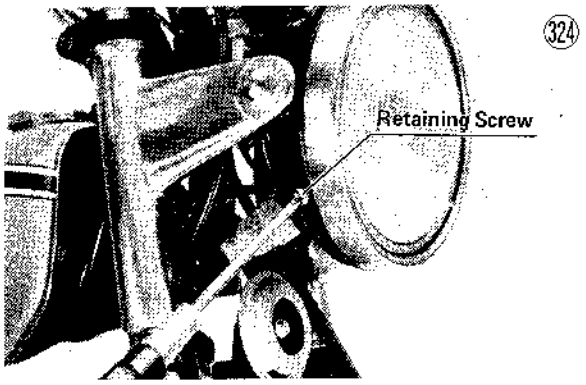


•Remove the ignition switch mounting bolts (2). There is a flat washer for each bolt.
•Free the ignition switch and wiring harness from the motorcycle. A damper rubber comes off with the switch.

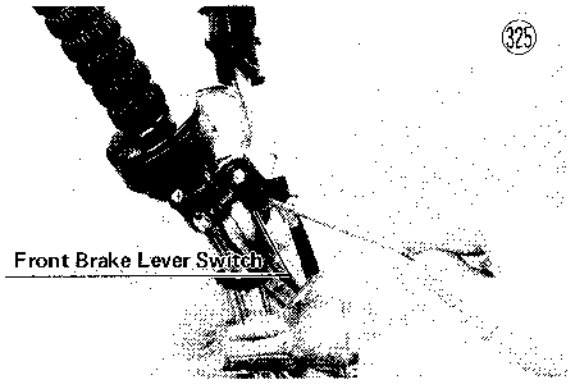
FRONT BRAKE LIGHT SWITCH

Removal:

•Take out the retaining screw, and pull the headlight unit out of its housing.



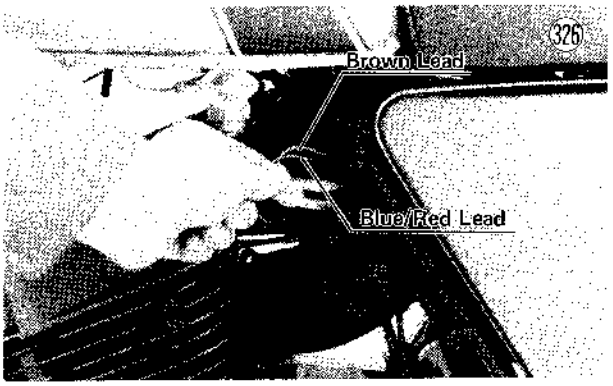
•Disconnect the brown and the blue/red front brake switch lead connections in the headlight housing, and pull these plugs out of the housing.
•Undo the straps (2) on the right side of the handlebar, free the front brake switch leads, and refasten the straps.
•Using a thin-bladed screwdriver or some other suitable tool, press in the front brake light switch tab which catches in the hole in the underside of the front brake lever body, and then remove the switch.



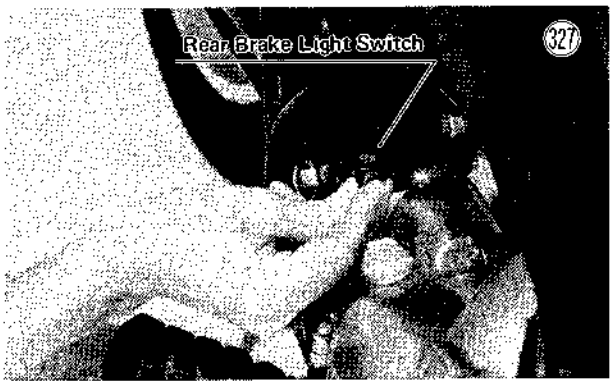
REAR BRAKE LIGHT SWITCH

Removal:

•Remove the muffler (Pg. 30).
•Remove the rear brake light switch spring.
•Disconnect the blue/red and the brown rear brake light switch connections near the air cleaner housing, and unfasten the strap that holds the leads to the frame.



•Hold the switch body steady, and turn the adjusting nut counterclockwise until the lower portion can be pressed inward.
•Pressing inward on the lower portion of the adjusting nut, push the switch up and out of its bracket.



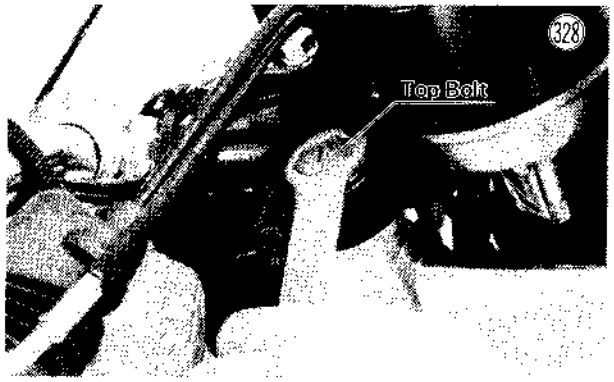
Installation Note:

•Adjust the switch after installation (Pg. 18).

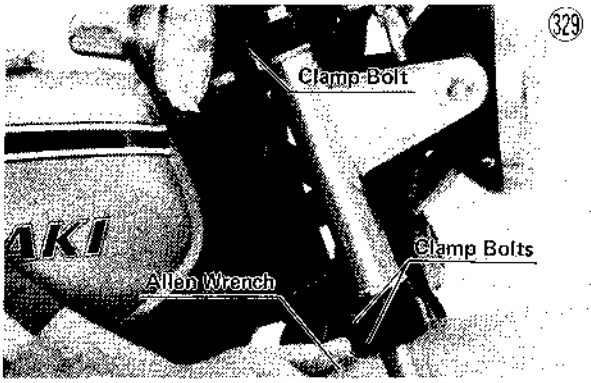
FRONT FORK

Removal (per shock absorber)

- Remove the front wheel (Pg. 64).
- If the shock absorber is to be disassembled after removal, loosen the shock absorber top bolt.



- Loosen the upper and lower clamp bolts with an Allen wrench.

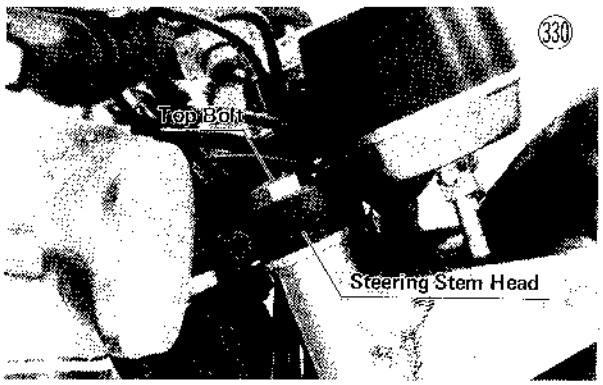


- With a twisting motion, work the shock absorber down and out.

NOTE: If the shock absorber cannot be twisted out, first remove the fork cover and damper rubbers (2) (Pg. 85 , steering stem removal).

Installation (per shock absorber):

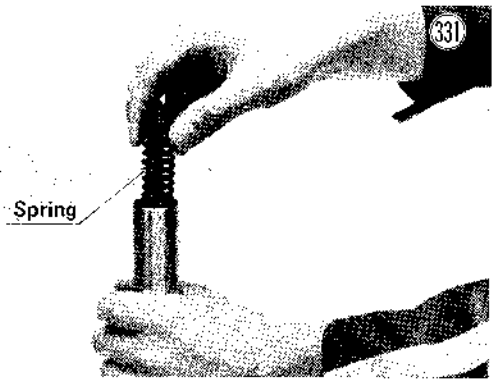
- Daub a little oil on the inside of the damper rubbers at the ends of the fork cover,
- Slide the shock absorber up through the lower and upper clamps until the upper surface of the top bolt flange is even with the upper surface of the stem head.



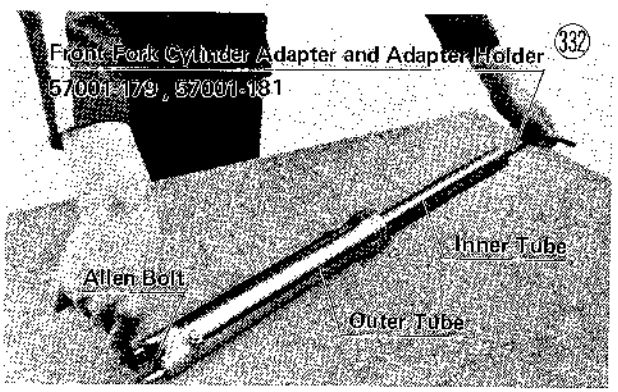
- Tighten the lower clamp bolts with 1.5 ~ 2.3 kg-m (11 ~ 16.5 ft-lbs) of torque.
- If the top bolt was loosened during removal, tighten it with 1.5 ~ 2.0 kg-m (11 ~ 14.5 ft-lbs) of torque.
- Tighten the upper clamp bolt with 1.5 ~ 2.3 kg-m (11 ~ 16.5 ft-lbs) of torque.
- Install the front wheel (Pg. 64).

Disassembly:

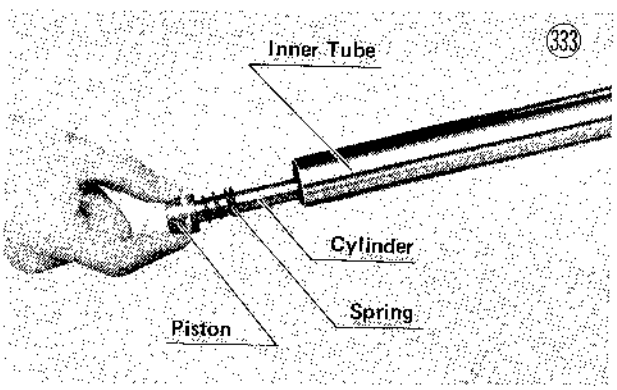
- Remove the top bolt , and pull out the spring



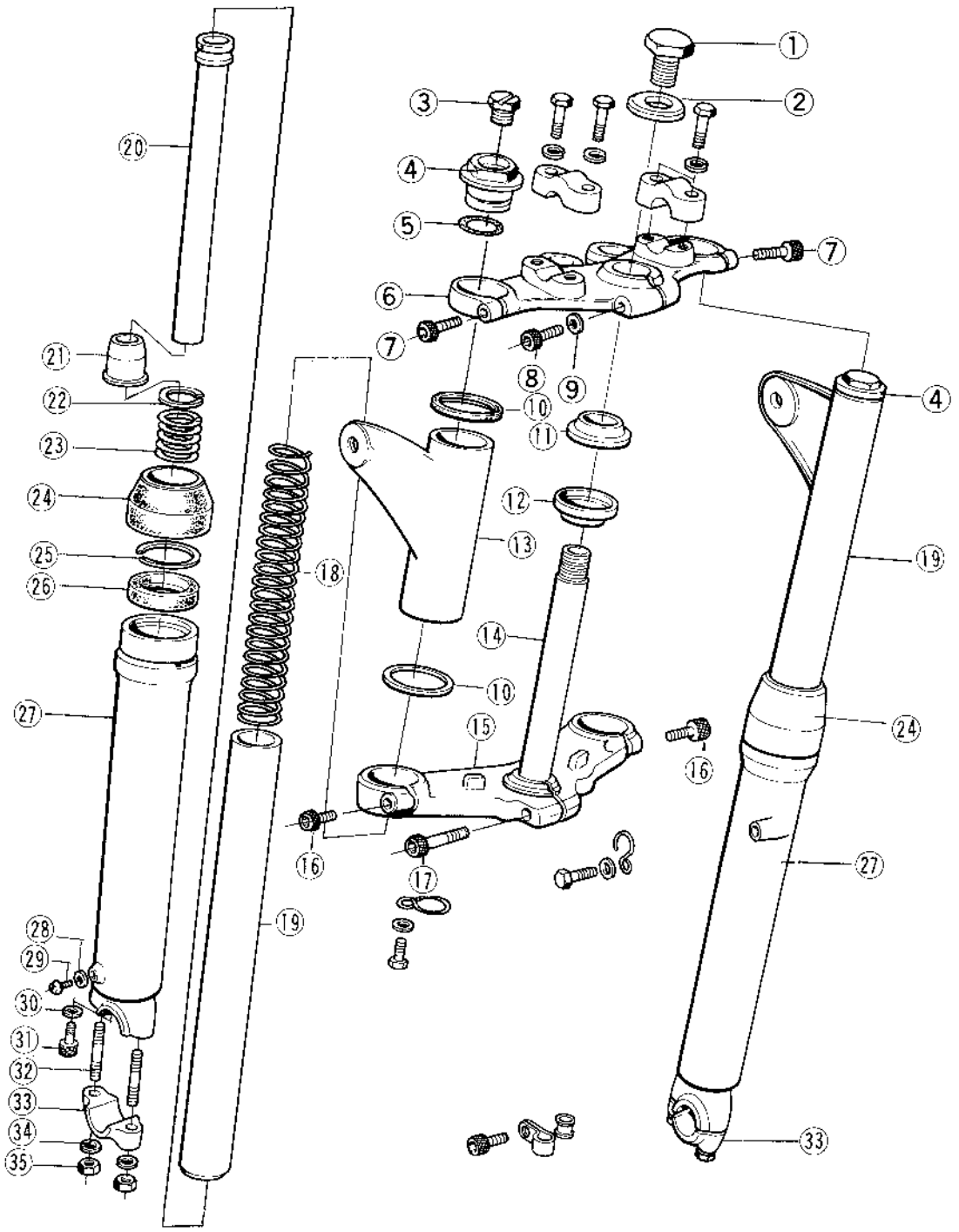
- Pour the oil into a suitable container, pumping as necessary to empty out all the oil.
- Slide the dust seal (24) off the inner tube
- Stop the cylinder (20) from turning by using the front fork cylinder adapter and adapter holder (special tools), unscrew the Allen bolt (31) from the bottom of the outer tube (27) , and then separate the inner tube from the outer tube by pulling it out.



- Slide the cylinder and piston unit and its spring out the top of the inner tube.

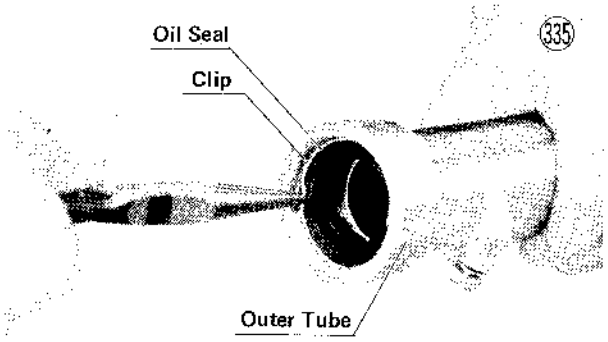


Front Fork



1. Stem Head Bolt
2. Washer
3. Bolt
4. Top Bolt
5. O Ring
6. Stem Head
7. Clamp Bolt
8. Stem Head Clamp Bolt
9. Washer
10. Rubber Damper
11. Outer Race
12. Outer Race
13. Fork Cover
14. Steering Stem Shaft
15. Steering Stem Base
16. Clamp Bolt
17. Steering Stem Base Clamp Bolt
18. Spring
19. Inner Tube
20. Cylinder Assembly
21. Cylinder Base
22. Lock Washer
23. Spring
24. Dust Seal
25. Circlip
26. Oil seal
27. Outer Tube
28. Gasket
29. Drain Screw
30. Washer
31. Allen Bolt
32. Stud Bolt
33. Axle Clamp
34. Lock Washer
35. Nut

•Remove the clip (25) from the outer tube, and then pull out the oil seal (26). It may be necessary to heat the outer tube around the oil seal before pulling it out.



•Remove the cylinder base (21) out the top of the outer tube.

Assembly:

•Place the cylinder base into the outer tube.
•Fit in a new oil seal using the front fork oil seal driver (special tool).



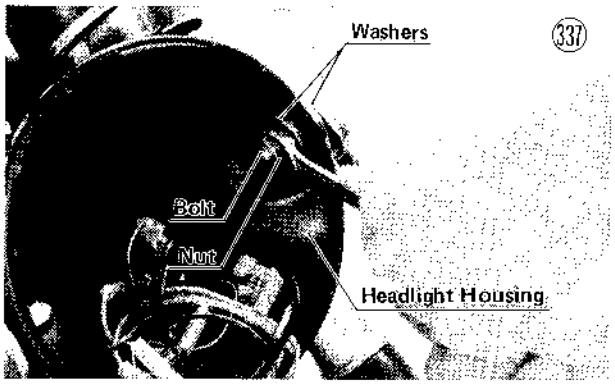
•Replace the clip.
•Replace the cylinder and piston unit together with its spring into the inner tube, fit the bottom of the cylinder into the cylinder base, and then push the inner tube fully into the outer tube.
•Apply a non-permanent locking agent to the Allen bolt, and tighten it in place.
•Slide the dust seal into place.
•Refill with 145 ~ 155 cc (4.9 ~ 5.2 US fl oz) of fresh SAE 5W20 oil.
•Insert the spring with the relatively concentrated end at the top, and replace the top bolt.

STEERING STEM

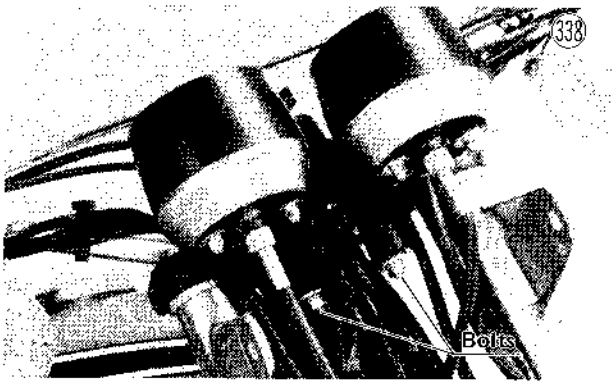
Removal:

•Remove the front wheel (Pg. 64).
•Remove the front brake cable guide from where it connects to the shock absorber outer tube.
•Remove the front fender mounting bolts (4), and remove the front fender.

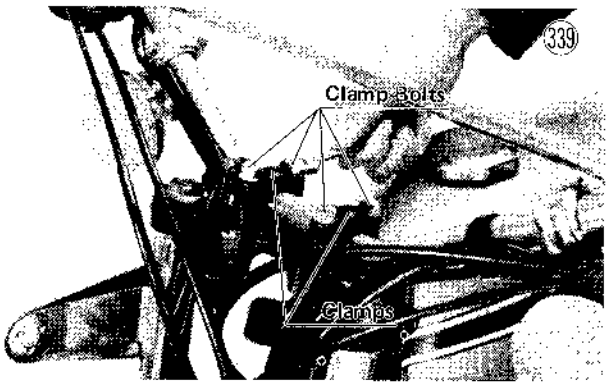
•Remove the horn by disconnecting the horn from the horn leads.
•Take out the retaining screw, and pull the headlight unit out of its housing.
•Disconnect the headlight socket from the rear of the headlight unit.
•Remove the headlight housing bolts (2), nuts (2), and washers (4).



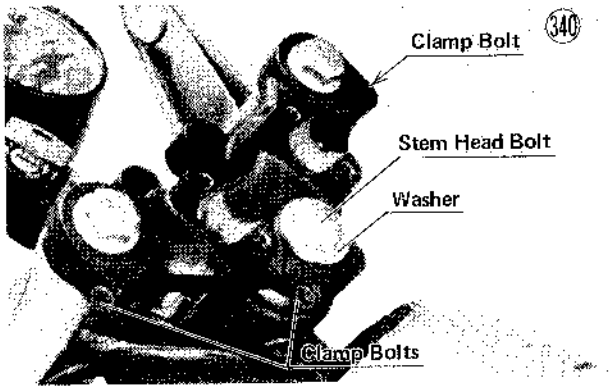
•Remove the nuts (2) that secure the meter and ignition switch housing to the stem head, and remove the meter and ignition switch assembly from the stem head. A nut and two washers come off each bolt. There is a damper rubber in both the bottom and the top of each meter and ignition switch assembly mount.



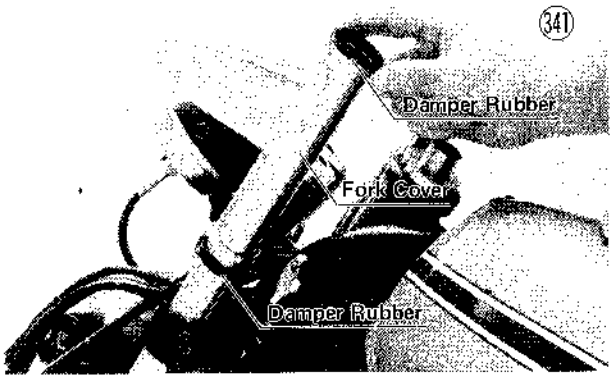
•Take out the handlebar clamp bolts (4), remove the clamps (2), and hang the handlebar assembly down to the front.



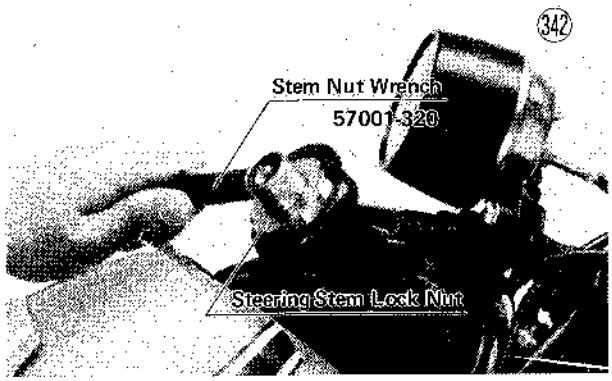
•Remove the steering stem head bolt and washer.



•Loosen the stem head clamp bolts (3), and remove the stem head.
•Remove the right and left fork covers and damper rubbers (1 upper and 1 lower for each fork cover).



•Loosen the lower clamp bolts, and pull out each shock absorber.
•Slide the speedometer cable out of its wire loop on the stem base.
•Pushing up on the stem base, remove the steering stem lock nut with the stem nut wrench (special tool), and then remove the steering stem and stem base. As the stem is removed, some of the steel balls will drop out of the lower inner race. Remove the rest.



•Remove the steering stem cap and upper inner race, and then remove the upper steel balls (23).

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, and then replace the upper steel balls (23) and the lower steel balls (19).
•Insert the steering stem into the head pipe, replace the upper inner race and steering stem cap, and then tighten the steering stem lock nut. The stepped portion of the steering stem lock nut faces down.
•Situate the handlebar with all the wiring and cables to the front of the stem base.
•Apply a little oil to the inside of the damper rubbers (4).
•Run the inner tube of each shock absorber up through its clamp in the stem base, replace the fork cover and damper rubbers (2) for each tube, and tighten temporarily one of the lower clamp bolts on each side to hold each shock absorber in place with its inner tube protruding about 30 mm (1¼ in) above the top of its fork cover. Note that the shock absorber to which the cable guide is fitted is the left shock absorber.
•Replace the stem head and then the stem head washer (flat side facing down), and tighten the stem head bolt with 5.5 kg-m (40 ft-lbs) of torque and then the rear clamp bolt.
•Mount the handlebar in its clamps so that the angle of the handlebar matches the angle of the front fork as shown in Fig. 343. Tighten the clamp bolts with 1.6 ~ 2.1 kg-m (12 ~ 13 ft-lbs) of torque. The wiring and all cables go between the fork covers.



•Secure the meter and ignition switch housing to the stem head. The bolt sequence is damper rubber, stem head, damper rubber, flat washer, lock washer, and nut. The front brake, throttle, clutch, and choke cables all run between the handlebar and the ignition switch.
•Mount the headlight housing back in place. The bolt sequence is bolt head, flat washer, housing and damper rubber, housing mount washer, lock washer, and nut.
•Connect the headlight socket to the rear of the headlight unit.
•Place the haedlight unit back into the housing, and tighten its retaining screw.
•Replace the front fender together with the horn bracket and horn, and tighten the fender mounting bolts (4).

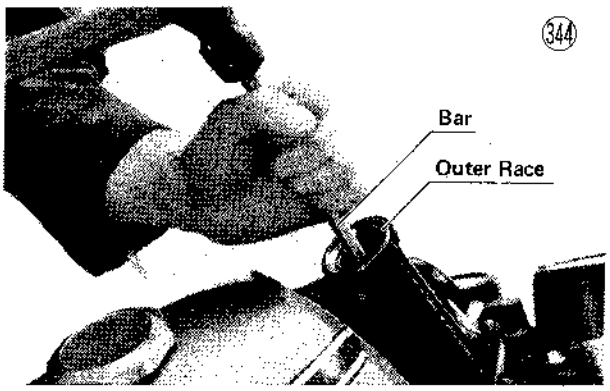
From the stem base the sequence is horn bracket (front bolts only), flat washer, damper rubber, fender, damper rubber, metal insert, lock washer, and bolt head.

- Run the speedometer cable back through the wire loop on the stem base.
- Replace the front brake cable guide onto the left shock absorber, and run the front brake cable through it. The bolt has a flat washer.
- For each shock absorber, loosen the lower clamp bolt that was tightened, and align the upper surface of the top bolt flange with the upper surface of the stem head. Tighten the upper and lower clamp bolts with 1.5 ~ 2.3 kg-m (11 ~ 16.5 ft-lbs) of torque.
- Check that all cables and wiring are routed properly so that the steering has absolutely no hindrance in its movement and that the cables have a minimum of bending.
- Adjust the steering (Pg. 16) and the headlight (Pg. 20).
- Install the front wheel (Pg. 64).

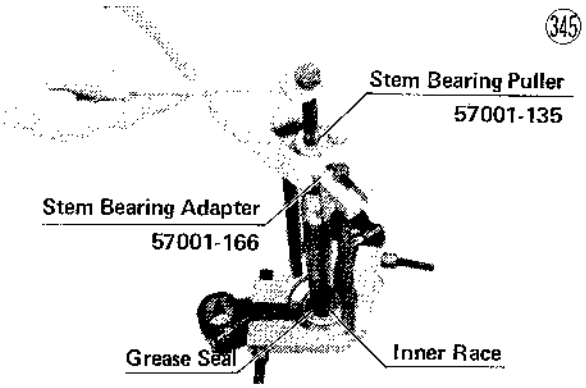
STEERING STEM BEARINGS

Removal:

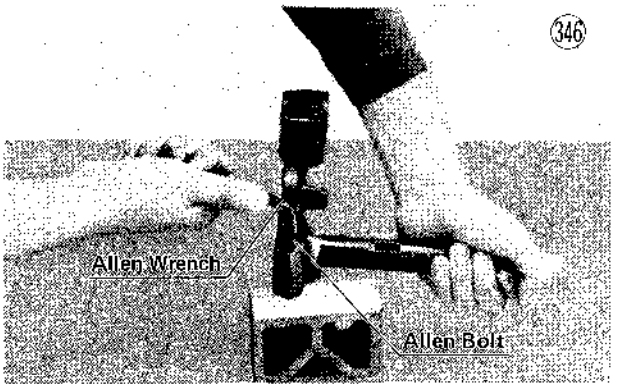
- Remove the steering stem (Pg. 85).
- To remove the outer races pressed into the head pipe, insert a bar into the head pipe and hammer evenly around the circumference of each race to drive it out.



- Remove the lower inner race with the stem bearing puller and stem bearing adapter (special tools). Be careful not to damage the grease seal under the race during race removal.

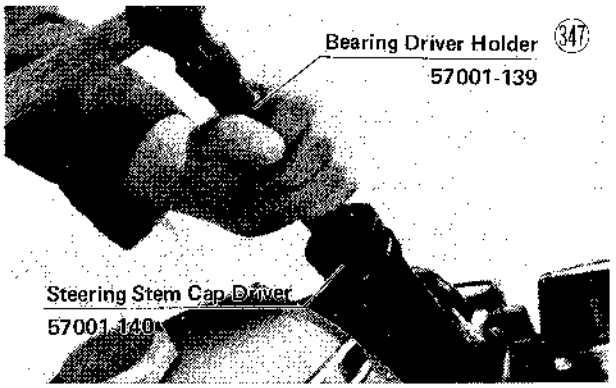


- Loosen the Allen bolt, and separate the steering stem and stem base with a press.

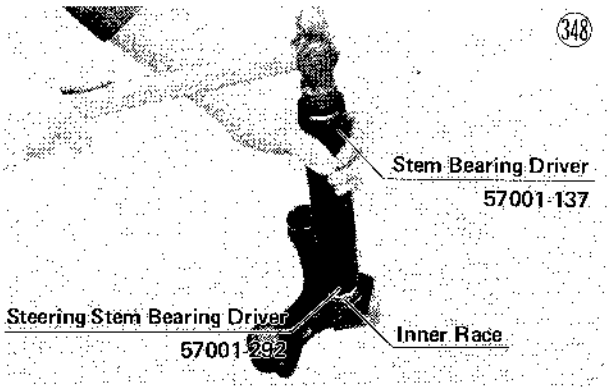


Installation Notes:

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



2. Tighten the stem base Allen bolt with 2.0~3.0 kg-m (14.5 ~ 22 ft-lbs) of torque.
3. Apply oil to the lower inner race, and drive it onto the steering stem using the steering stem bearing driver (special tool).

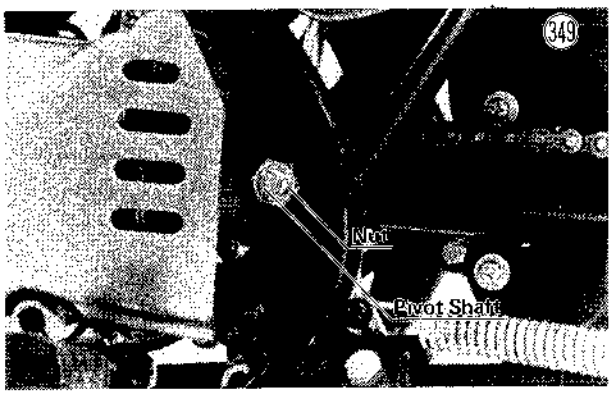


4. Replace the steering stem grease seal for a new one if it is damaged.

SWING ARM

Removal:

- Remove the rear wheel (Pg. 67).
- Remove the rear shock absorber bottom mounting bolts.
- Remove the pivot shaft nut, and pull out the pivot shaft.



- Remove the swing arm.

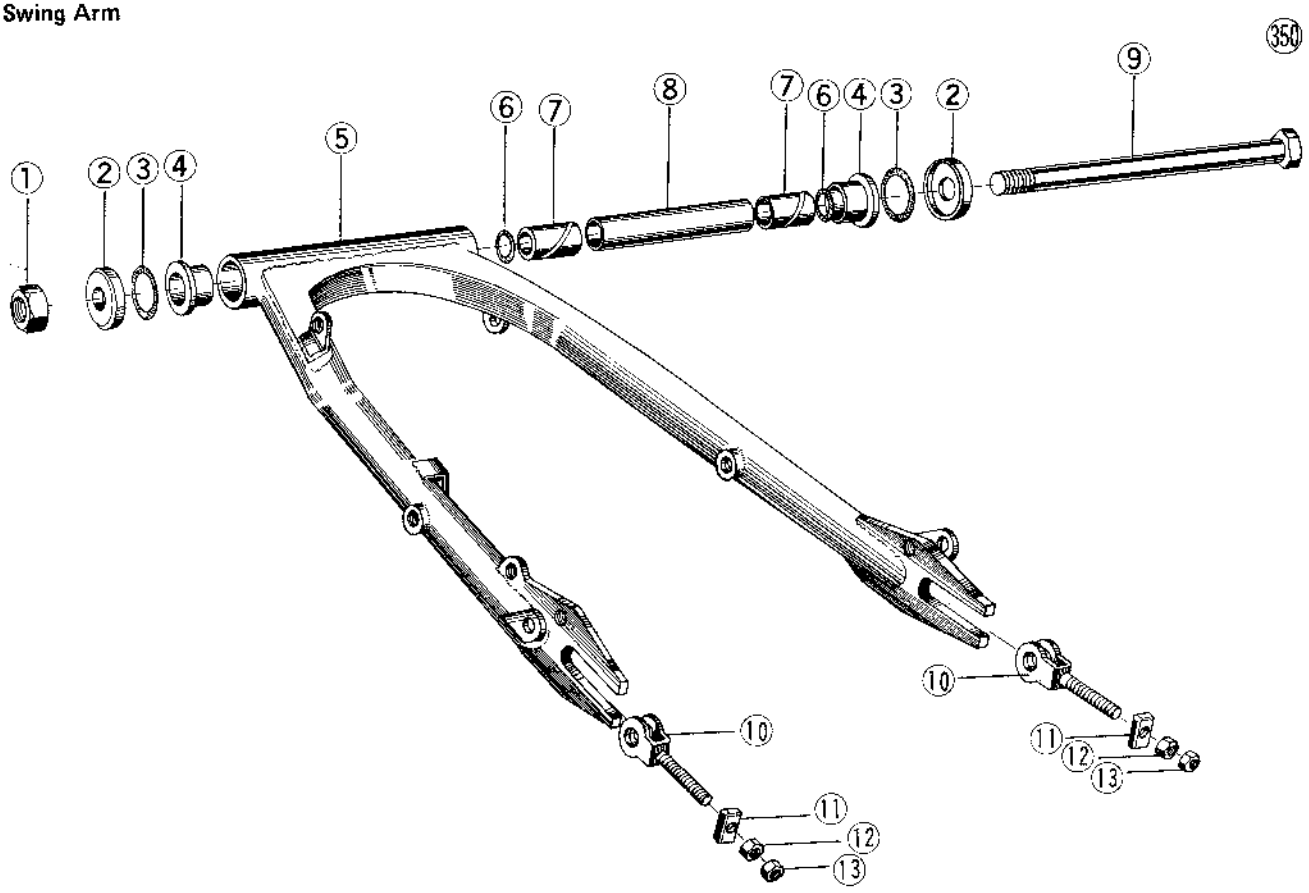
Installation Notes:

1. Be sure that the swing arm bushing caps are in their proper place before inserting the pivot shaft.
2. Tighten the pivot shaft nut with 7.0 ~ 7.5 kg-m (51 ~ 54 ft-lbs) of torque.
3. Tighten the rear shock absorber cap nuts with 3.1 ~ 4.2 kg-m (23 ~ 30 ft-lbs) of torque and the bolts on the bottom with 3.0 ~ 3.5 kg-m (22 ~ 25 ft-lbs) of torque.

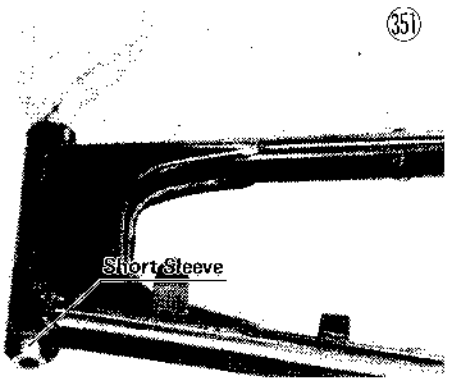
Disassembly:

- Remove the screws (3) and bolts (2) to remove the chain guards. Each screw has a lock nut and flat washer. The upper bolt has a lock washer and nut; the lower bolt has a lock washer.
- Pull out the short sleeve from each side, and slip out the long sleeve. The long sleeve has two **O** rings.

Swing Arm



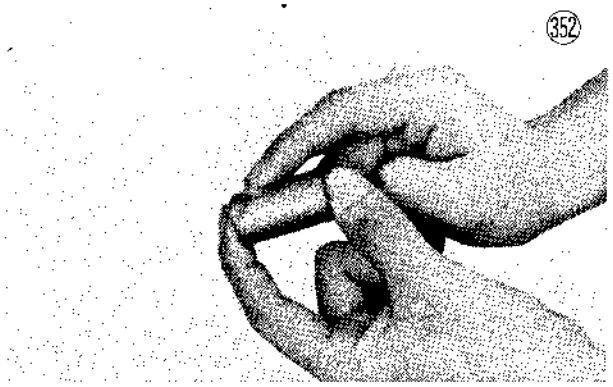
1. Lock Nut
2. Cap
3. O Ring
4. Bushing
5. Swing Arm
6. O Ring
7. Sleeve
8. Collar
9. Pivot Shaft
10. Chain Adjuster
11. Chain Adjuster Plate
12. Adjusting Nut
13. Lock Nut



•Inserting a rod into the pivot, tap out the bushing on each side.

Assembly Notes:

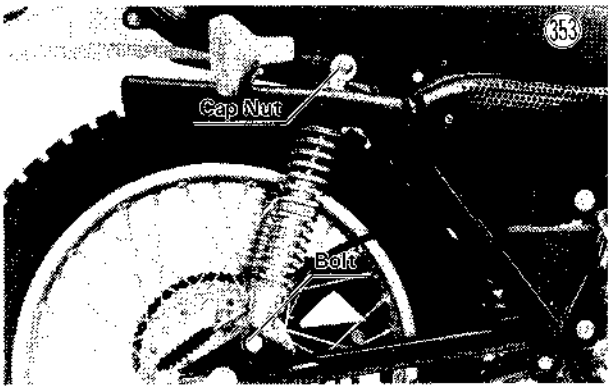
1. Whenever the bushings are removed, replace them with new ones. Apply a little oil to each bushing, and then install them with a press.
2. Grease the groove in each short sleeve before assembly.



REAR SHOCK ABSORBERS

Removal (per side)

•Take off the cap nut from the top and the bolt from the bottom.



•Slide the bottom out of its bracket, and then pull off the absorber.

Installation Notes:

1. The sequence on the right absorber upper bolt is small flat washer, absorber, large flat washer, muffler bracket, lock nut, and cap nut.
2. Replace the lower bolt while lifting up on the rear wheel if necessary in order to avoid damaging the bolt threads.
3. Tighten the cap nut with 3.1 ~ 4.2 kg-m (23 ~ 30 ft-lbs) of torque and the bolt on the bottom with 3.0 ~ 3.5 kg-m (22 ~ 25 ft-lbs) of torque.

REAR SPROCKET

Removal:

•Remove the rear wheel (Pg. 67).
•Pull the left chain adjuster off the axle.
•Straighten back the portions of the rear sprocket washers that are bent over the sprocket nuts.
•Remove the rear sprocket nuts (6) and the sprocket double washers (3).
•Pull off the rear sprocket.

Installation:

•Put the sprocket back on the rear hub, replace the double washers, and tighten the sprocket nuts with 2.0 ~ 2.2 kg-m (14.5 ~ 16 ft-lbs) of torque.
•Bend the washer tabs back onto the sprocket nuts.
•Put the left chain adjuster back onto the axle.
•Install the rear wheel (Pg. 67).

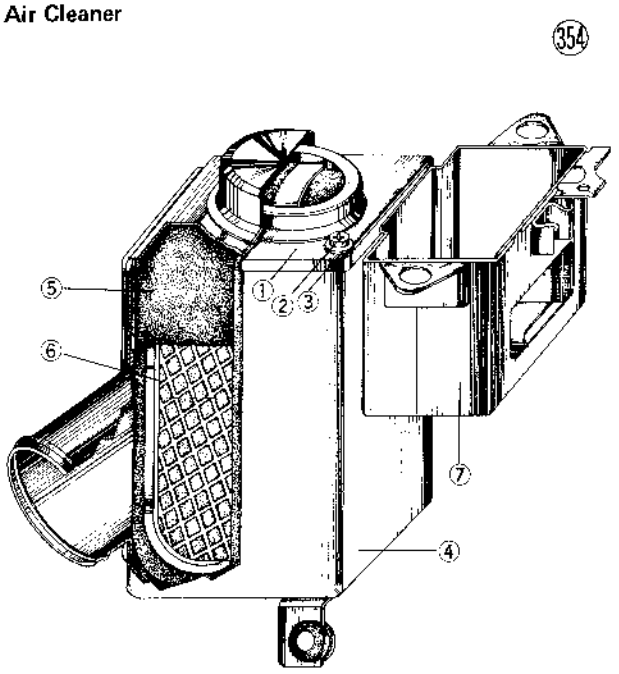
Maintenance

AIR CLEANER

A properly cared for air cleaner ensures that only clean, filtered air is supplied through the carburetor into the engine. If the air is supplied directly without filtering, not only will dirt and dust from the air plug up carburetor passages causing the engine to run poorly, but also the dust that enters the engine will act like grinding compound wearing down the cylinder, piston, and rings. If the air cleaner element is damaged or too coarse, the result will be the same as though 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, reducing engine power.

Air Cleaner



1. Cleaner Cap
2. Screw
3. Washer
4. Cleaner Body
5. Element
6. Element Frame
7. Battery Case

Cleaning and replacement

The air cleaner element must be cleaned at least every 3,000 km (2,000 mi). In dusty areas, the element should be cleaned every 800 km (500 mi) or less. After riding through rain or on muddy roads, the element should be cleaned immediately.

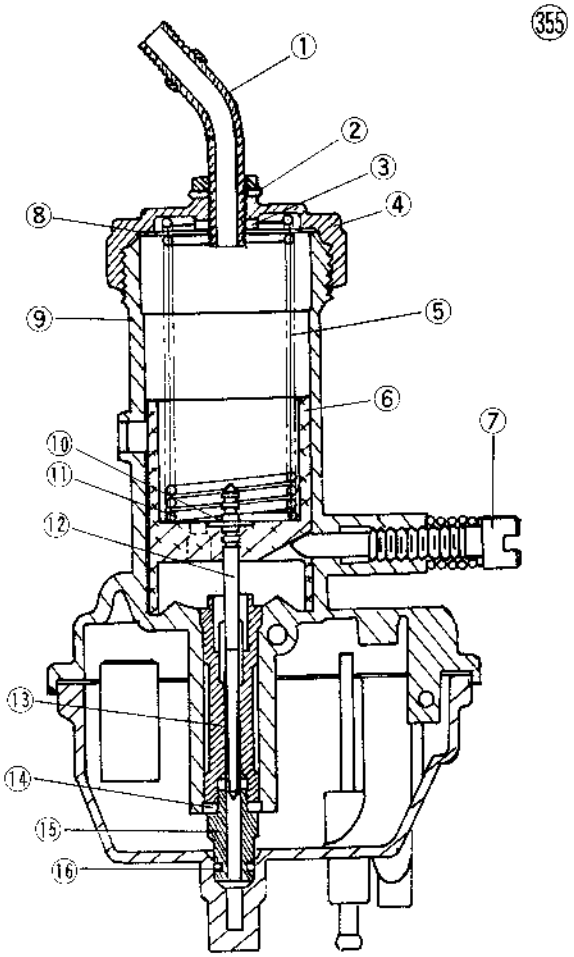
Remove the air cleaner element (Pg. 29), clean it in regular solvent, and squeeze it dry. After cleaning, dampen it with a small amount of gasoline/oil mixture (about a 20:1 mixture of gasoline and SAE 30 motor oil). Oil it again any time it dries out.

Since repeated cleaning coarsens the element, replace it for a new one every 10,000 km (6,000 mi) or after it has been cleaned 5 times, whichever is sooner.

CARBURETOR

The carburetor (Fig. 355) performs the function of mixing the fuel and air in the proportions necessary for good engine performance at varying speeds and loads. In order for it to function satisfactorily, it must be kept well adjusted and maintained. The carburetor cable (Pg. 9) and idling speed (Pg. 11) adjustments are covered in the Adjustment Section. The discussion here concerns the fundamentals of carburetor operation, special adjustments, and the cleaning and replacement of carburetor parts.

Carburetor Cross Section



1. Cable Guide
2. Gasket
3. Clip
4. Cap
5. Spring
6. Throttle Valve
7. Idling Screw
8. Gasket
9. Carburetor Body
10. Clip
11. Spring Seat
12. Jet Needle
13. Needle Jet
14. Washer
15. Needle Jet Holder
16. O Ring

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 at atmospheric pressure. This difference in air pressure forces the fuel up through the passages into the carburetor bore where it is then atomized by the air, which is flowing at high speed to 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, 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 (variable in case of the needle 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 (variable by the throttle valve) just above the jet. The size of the jet openings, the various dimensions of the air passages, and the engine rpm's are correlated through carburetor design so that, when properly adjusted, the carburetor meters (measures) the fuel and air in the correct proportions at different throttle openings.

The ratio of the fuel to air at different throttle openings is set through carburetor design by a number of interrelating factors, but alteration of the ratio is primarily effected through the following:

0~1/8 throttle	pilot air screw
1/8~1/4 throttle	throttle valve cutaway, pilot air screw
1/4~3/4 throttle	jet needle position
3/4~1 throttle	main jet size

The carburetor specifications (Table 1) have been chosen for best all around performance, and ordinarily will not require any change. However, sometimes an alteration may be desirable for improved performance under special conditions, and when proper mixture is not obtained after the carburetor has been properly adjusted and all parts cleaned and found to be functioning properly. For example, the quantity of air entering the carburetor bore is less at high altitude due to the lower atmospheric pressure. To obtain the proper carburetor fuel/air mixture, it may be necessary to raise the clip on the jet needle and to exchange the main jet for one a size smaller. In particularly cold weather, the increased density of the air may necessitate a lower clip position on the jet needle and a size larger main jet.

Since the carburetor regulates and mixes fuel and air going to the engine, there are two general types of carburetor trouble: too rich a mixture (too much fuel); too lean a mixture (too little fuel). Such 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 2 Mixture Trouble Symptoms

Mixture too rich	Mixture too lean
Engine is sluggish	Engine overheats
Smoky exhaust	Runs better with choke lever pushed in
Runs worse when warm	Spark plug burned white
Spark plug fouled back	Running is unstable
Runs better without air cleaner	No power

The following explanation of the functioning and maintenance of the carburetor covers the four main systems for fuel regulation and supply: the starter system, which supplies the necessary rich mixture for starting the engine; the pilot system, which supplies fuel at idling and low speeds; the main system, which supplies fuel at medium and high speeds; and the float system, which maintains the fuel at a constant level in the float chamber.

Starter System

Fig. 356 shows the starter system, which includes the starter jet ⑤ , starter pipe ④ , and starter plunger ③ .

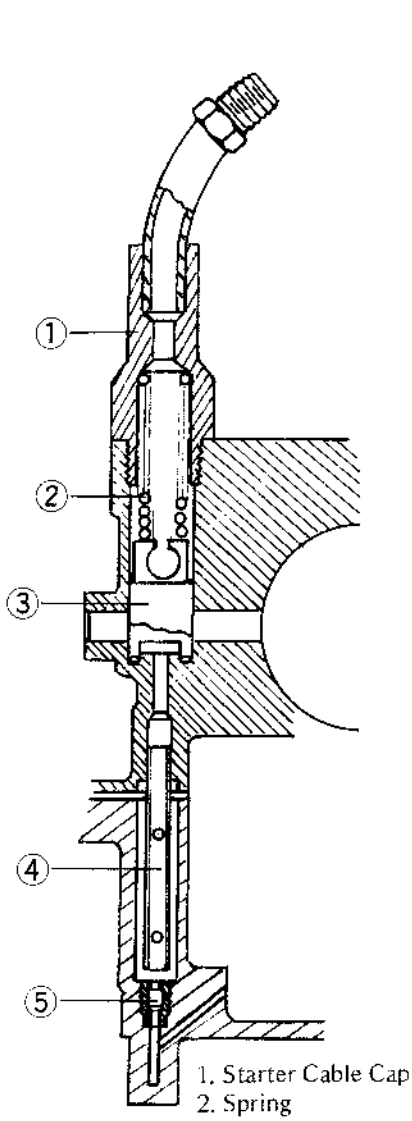
The starter system is used for starting to provide the exceptionally rich 1:1 fuel/air ratio that is necessary to enable easy starting when the engine is cold. When starting the engine, the throttle valve is left closed, and the starter plunger is pulled fully open by pushing the choke lever. Since the throttle valve is closed, a high intake vacuum (low pressure or suction) is developed at the engine side of the carburetor bore. The starter plunger, when raised, opens up the starter passage and an air hole so that they connect to the engine side of the carburetor bore. The intake vacuum from the engine as it is kicked over draws in air through this air hole and the fuel from the float chamber through the starter passage. Fuel metered by the starter jet mixes with a small amount of air drawn in through air bleed holes in the

Table 1 Carburetor Specifications

Type	Main Jet	Air Jet	Needle Jet	Jet Needle	Pilot Jet	Throttle Valve Cutaway	Air Screw	Fuel Level
VM 24SC	100R	0.5	0-4/2	4EJ3-4*	30	2.5	1½ turns out	27~29 mm (1.06~1.14 in)

*The "3" in 4EJ3-4 is the lot number, which may vary. The "4" is the clip position and is not stamped on the needle.

Starter System



1. Starter Cable Cap
2. Spring
3. Starter Plunger
4. Starter Pipe
5. Starter Jet

starter pipe as it rises in the starter passage. This small amount of air prepares the fuel for better atomization once it reaches the plunger chamber (the area just below the raised plunger) where the fuel mixes with the air drawn in through the air hole. This mixture is then drawn into the carburetor bore where it, together with a small amount of mixture supplied by the pilot system, is drawn into the engine.

In order for the starter system to work properly, the throttle must be kept closed so that sufficient vacuum can be built up at the starter outlet. Also, the choke lever must be pushed fully so that the starter plunger will fully open up the air hole and starter passage to the carburetor bore. Clogged starter pipe air bleed holes will cause insufficient atomization, thus impairing starter efficiency. Fuel mixture trouble results if, due to dirt, gum or a defective spring, the plunger does not seat properly in its rest position after the choke lever is returned.

Cleaning

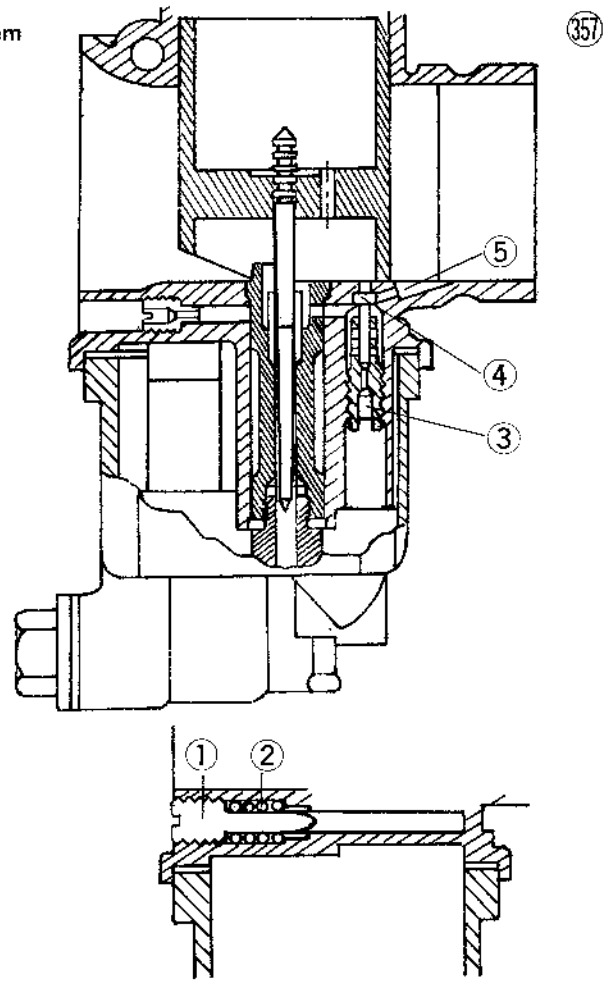
Remove the float bowl, and blow the starter pipe and the starter jet clean with compressed air. Do not clean them with wire or any other hard object which may cause damage.

Remove the starter plunger, and clean it with gasoline.

Pilot System

Fig. 357 shows the pilot system, which includes the pilot jet ③ , air screw ① , pilot outlet passage ⑤ , and pilot jet passage ④

Pilot System



1. Air Screw
2. Spring
3. Pilot Jet
4. Pilot Jet Passage
5. Pilot Outlet Passage

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) brought about by the demand for air by the engine and the limited 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 created by the engine around the pilot outlet 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.

Up to roughly 1/8 throttle valve opening, the fuel as it is drawn out of the pilot jet, located within the pilot jet passage, mixes with both air drawn in through the air screw controlled air passage and through the part of the pilot jet passage that connects to the carburetor bore. However, as the throttle valve rises further, air to the pilot jet is drawn in only through the air screw controlled air passage, and the fuel exits through both the pilot outlet passage and the pilot jet passage. This change of role for the upper part of the pilot jet passage is caused by the increased carburetor bore air flow, the speed of which at lower speeds is set by the throttle valve cutaway. 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. As the air screw is backed out, more air is permitted to enter, making the mixture leaner. Conversely, turning the screw in restricts the air flow, making the mixture richer.

Flow Characteristic (358)

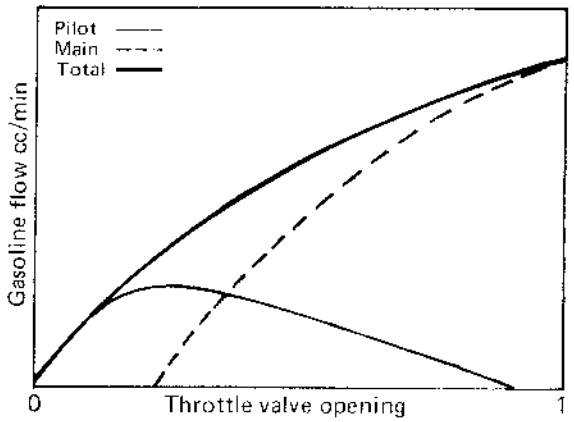
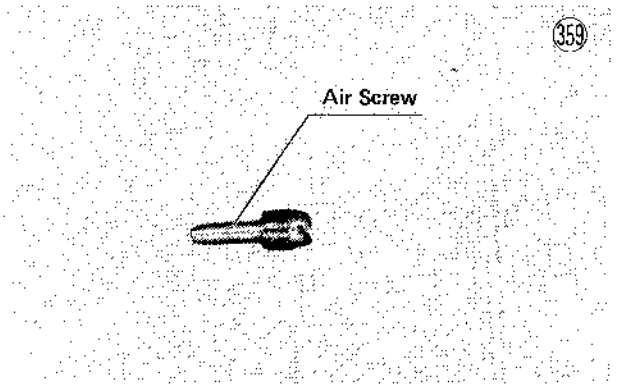


Fig. 358 shows throttle valve opening versus fuel flow for the main and pilot systems. If trouble occurs in the pilot system, not only are starting and low speed running affected, but the transition from pilot to main system is not smooth as the throttle is opened, causing a drop in acceleration efficiency. Pilot system trouble might be due to maladjustment; a dirty or loose pilot jet; or clogging of the pilot outlet passage, pilot jet passage, or air screw air passage.

Cleaning and replacement

Wash the pilot jet with gasoline, and blow it clean with compressed air. Also use compressed air to clean the pilot outlet passage, pilot jet passage, and air screw air passage. If necessary, use a both of automotive-type carburetor cleaner. Do not use wire for cleaning as this could damage the jet.

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



Main System

Fig. 360 shows the main system, which consists of the main jet ⑧ , main jet holder ⑩ , needle jet ④ , jet needle ③ , throttle valve ① , and air jet ② .

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 holder and the main jet, through the space in the needle jet not blocked by the jet needle, and into the carburetor bore, where it is atomized by the air flow to the engine.

On one side of the needle jet is a hole to admit the air measured by the air jet. This air mixes with the fuel in the needle jet to prepare the fuel for better atomization in the carburetor bore.

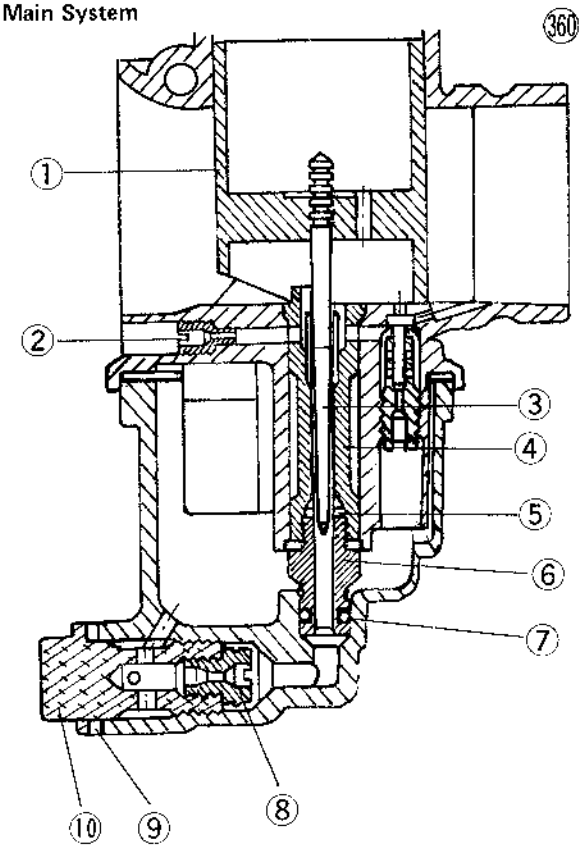
The lower portion of the jet needle is tapered and extends down into the needle jet. It is fixed to the throttle valve, and thus rises up in the needle jet as the throttle valve rises. At ¼ throttle opening, the tapered portion of the needle starts coming up out of the jet, which increases needle to 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 jet passage and needle jet outlets.

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.

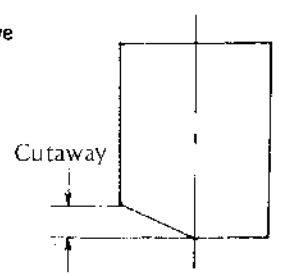
Trouble in the main system is usually indicated by poor running or lack of power at high speeds. A dirty or clogged main jet will cause the mixture to become too lean. An overly rich mixture could be caused by clogging of the air jet, its air passage, or the air hole in the needle jet; by needle jet or needle wear (increasing clearance); by a loose main jet; or by a loose needle jet.

Main System



1. Throttle Valve
2. Air Jet
3. Jet Needle
4. Needle Jet
5. Washer
6. Needle Jet Holder
7. O Ring
8. Main Jet
9. Gasket
10. Main Jet Holder

Throttle Valve



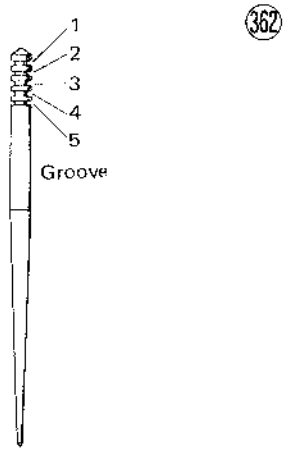
Cleaning and adjustment

Disassemble the carburetor and wash the throttle valve, main jet, needle jet, jet needle, air jet, and air passage with gasoline, blowing them clean with compressed air. If necessary, use a bath of automotive-type carburetor cleaner. Do not use wire for cleaning as this could damage the jets.

A worn needle jet or jet needle should be replaced, although a certain amount of adjustment can be made by lowering 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 top lowers the needle, which makes the mixture leaner at a given throttle opening.

NOTE: The last number of the jet needle number ("4" of 4EJ3-4) 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.

Jet Needle



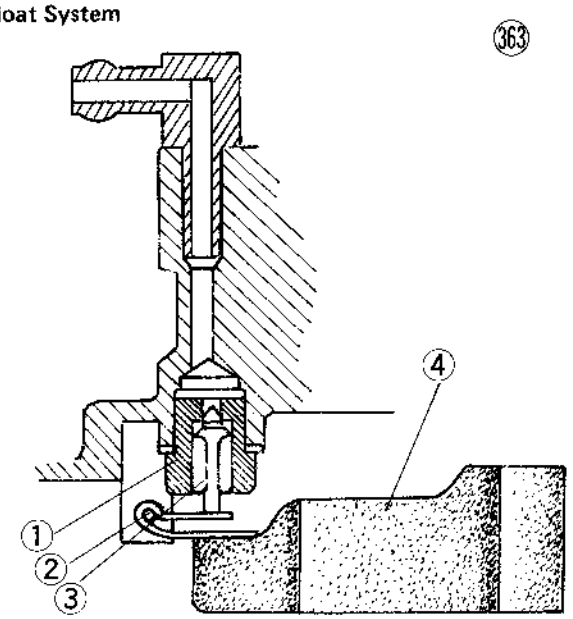
If the engine still exhibits symptoms of overly rich or lean carburetion after all maintenance and adjustments are correctly performed, the main jet can be replaced with a smaller or larger one. A smaller numbered jet gives a leaner mixture and a larger numbered jet a richer mixture. Many jets are available, but it is recommended that any change be limited to one jet size (2.5) difference from the standard jet.

Float System

Fig. 363 shows the float system, which consists of the float ④, float valve needle ③, and float valve seat ①.

The float system serves to keep a more or less fixed level of fuel in the carburetor float chamber at all times so that the fuel mixture to the engine will be stable.

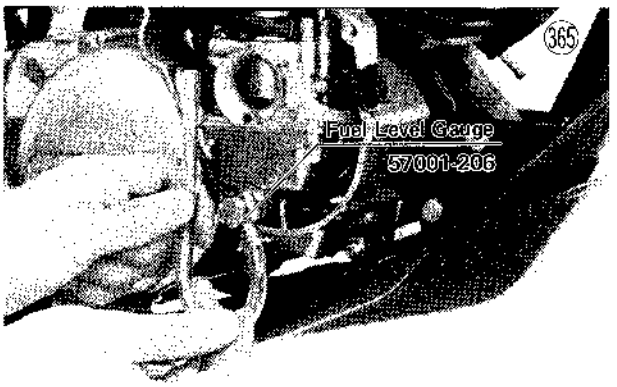
Float System



1. Valve Seat
2. Float Pin
3. Valve Needle
4. Float

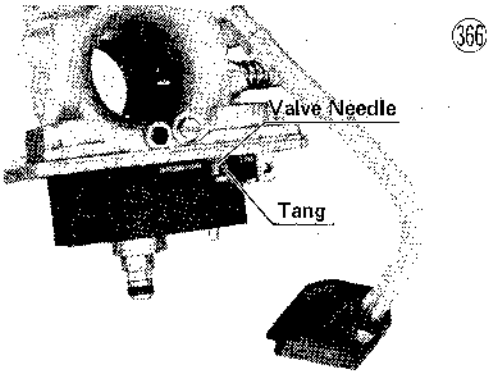
If the fuel level in the float chamber is set too low, it will be more difficult for fuel to be drawn up into the carburetor bore, resulting in too lean a mixture. If the level is set too high, the fuel can be drawn up too easily, resulting in too rich a mixture.

The 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.



If the fuel level is incorrect, remove the carburetor (Pg. 34), 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.

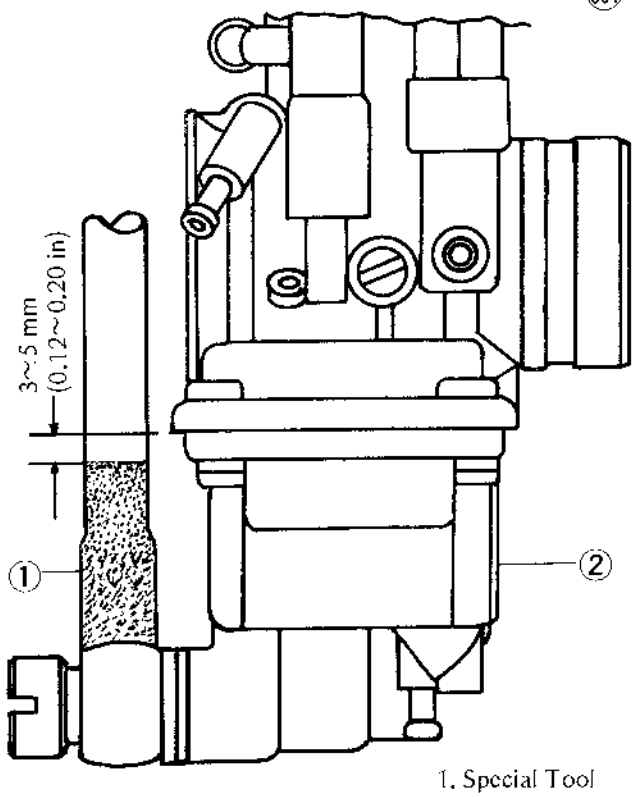
After adjustment, measure the fuel level again, and readjust if necessary.



Fuel level/measurement and adjustment

Turn the fuel tap off, and remove the carburetor cover. Remove the main jet holder, and install in its place the fuel level measuring device (special tool). Hold the plastic tube against the carburetor body, and turn on the fuel tap. The fuel level in the plastic tube should come up to 3~5 mm (0.12~0.20 in) below the edge of the carburetor body.

Fuel Level Measurement 364



1. Special Tool
2. Float Bowl

Cleaning and replacement

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 overworn. 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 gasoline. Use carburetor cleaner if necessary. 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.

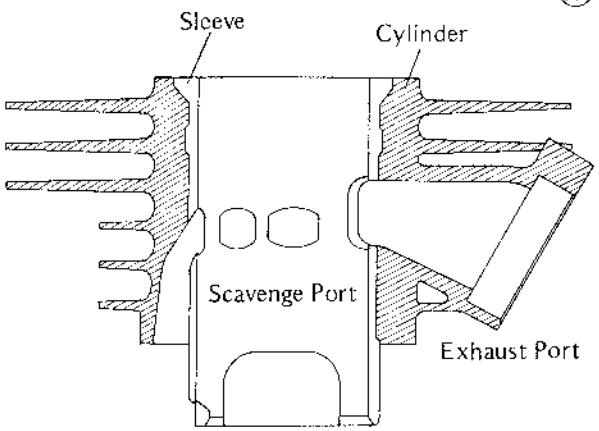
Needle Valve 367



CYLINDER & PISTON

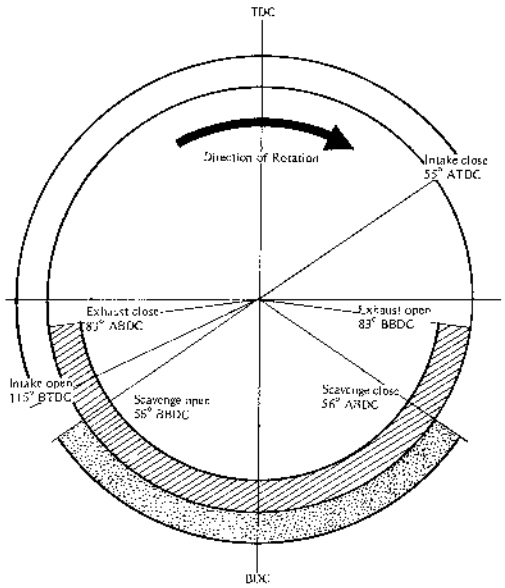
The cylinder, being part of the combustion chamber, is subjected to extremely high temperatures. Since excessive heat can seriously distort the shape of the cylinder or cause piston seizure, the cylinder is made of aluminum alloy for good heat conduction, and the outside is finned to increase the heat radiating surface for better cooling efficiency. To minimize distortion from heat and to maximize durability, a heat durable, wear resistant sleeve is casted in the cylinder.

Cylinder Construction (368)

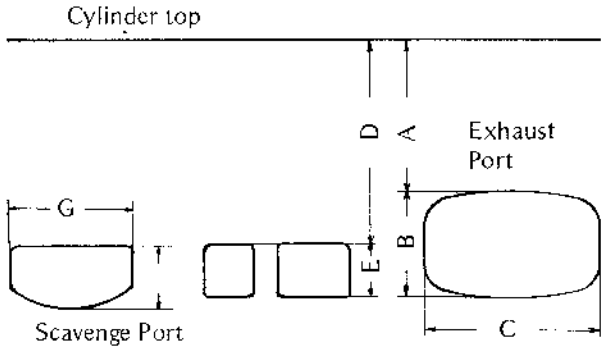


The gas transfer and exhaust are performed by five transfer (scavenge) ports and one exhaust port constructed in the cylinder. These ports are opened up to and closed off from the combustion chamber by the piston as it moves up and down inside the cylinder. The port timing, determined by the port size and position in relation to the moving piston, has been chosen so that the transfer of the fuel/air mixture from the crank chamber and the expulsion of the burned gases from the combustion chamber are timed for the most efficient engine performance. The intake process, on the other hand, is not carried out through an intake port in the cylinder, but is performed by a rotary disc, which opens and closes an intake port in the side of the crankcase.

Port Timing (369)



Port Measurement (370)



The 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.

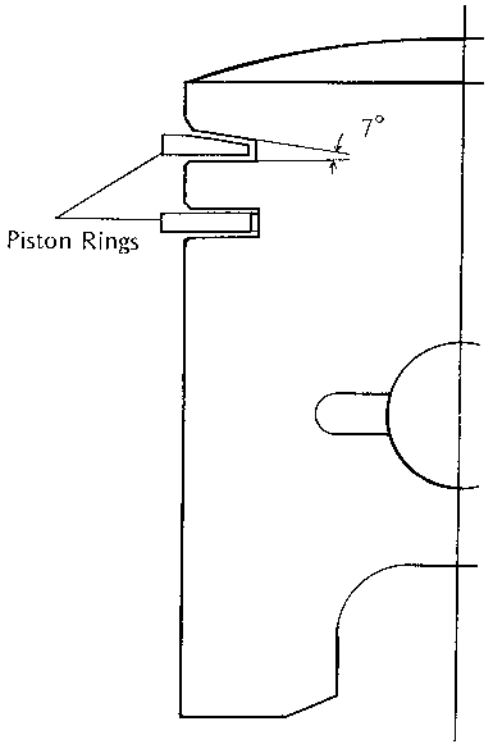
Two piston rings are fitted into grooves near the top of the piston so that gas does not escape between the piston and the cylinder wall into the crank chamber. The upper ring (top ring) is the Keystone type, the upper surface of which slants approximately 7°, while the standard type supplemented with an expander ring to preserve ring pressure on the cylinder wall is used for the lower ring (second ring). To accommodate the Keystone ring, the upper surface of the upper piston ring groove also slants approximately 7°.

The use of the Keystone rather than the standard type as the top ring provides a better compression seal, reduces the possibility of the rings sticking, and allows for better heat transfer from the piston to the cylinder.

Table 3 Port Measurements

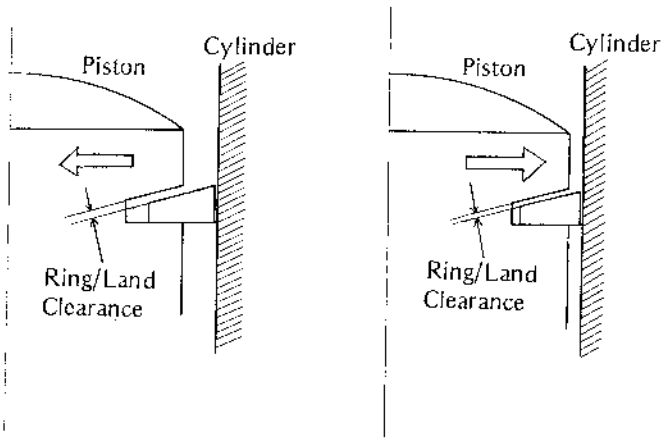
A	B	C	D	E	F	G
32.3~32.7 mm (1.27~1.29 in)	21.1~21.7 mm (0.831~0.854 in)	37.2~37.8 mm (1.46~1.49 in)	42.6 mm (1.68 in)	10.7~11.3 mm (0.421~0.445 in)	12.7~13.3 mm (0.500~0.524 in)	24.7~25.3 mm (0.972~0.996 in)

Keystone Ring Groove (371)



At the time of combustion, combustion gas pressure presses the ring down in its groove and at the same time forces it tightly against the cylinder wall due to its slanted surface. This use of combustion gas pressure minimizes gas combustion blowby, which, if excessive, impairs engine efficiency, allows combustion gum residue to accumulate causing the rings to stick, and interferes with heat transfer. Also, as the piston moves up and down, the slanted surfaces cause a rapid fluctuation in ring/land clearance resulting in a cleansing effect which inhibits the accumulation of gum residue.

Ring/Land Clearance (372)



The full floating type of piston pin is used to connect the piston to the con-rod. The middle part of the piston pin passes through a caged needle bearing fitted into the small end of the con-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 and piston include checking the compression; removing carbon from the piston head, piston ring grooves, and cylinder exhaust port; and checking for wear and proper clearance during top end overhaul. Heavy carbon deposits in the combustion chamber raises compression, which results in overheating, detonation, and preignition. A worn cylinder, worn piston, or worn or stuck piston rings cause a loss of compression from gas blowby pass the rings since the rings will not form a satisfactory seal between the piston and cylinder wall during compression. This gas blowby will result in difficult starting, power loss, excessive fuel consumption, and possibly engine destruction. A worn piston pin causes piston slap, which will result in accelerated piston and cylinder wear.

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 very useful as an aid 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; cylinder head leaks; or damage to the engine such as piston seizure. Too high a compression may be due to carbon build-up on the piston head and cylinder head.

Before measuring compression, check that the cylinder head is tightened down with 2.2 kg-m (16 ft-lbs) of torque, and then thoroughly warm up the engine so that engine oil between the piston and cylinder wall 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 spark plug or the cylinder head gasket.

Stop the engine, remove the spark plug, and screw the compression gauge hose securely into the spark plug hole so that there will be no leakage. With the throttle fully open so that air can flow freely to the engine, turn the engine over sharply by the kick starter several times until the compression gauge stops rising. The compression is the highest reading obtainable.

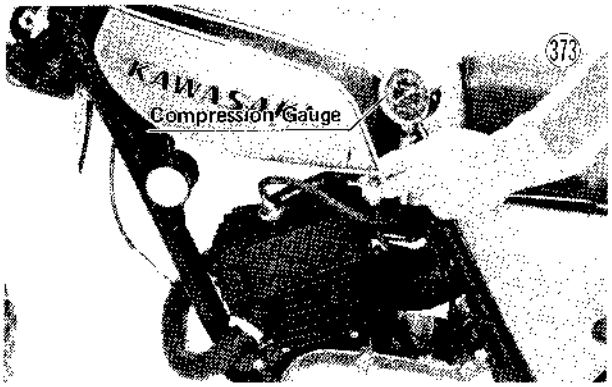
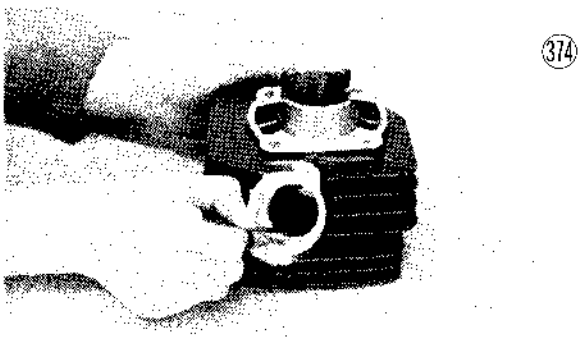


Table 4 Cylinder Compression

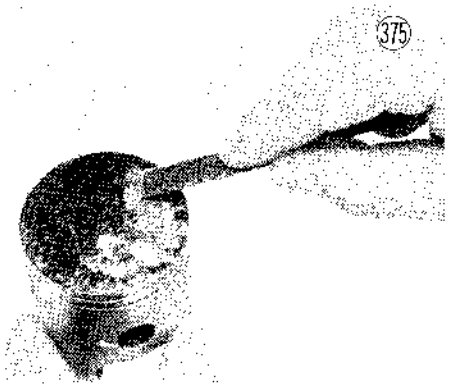
Standard	Service Limit
7 kg/cm^2 (99.5 lbs/sq in)	4.9 kg/cm^2 (69.7 lbs/sq in)

Cylinder, piston decarbonization

Carbon readily accumulates around the cylinder exhaust port, which reduces exhaust efficiency. To remove the carbon, take off the cylinder (Pg. 31), and scrape out the carbon from the exhaust port carefully. At this time, the muffler should also be inspected, and cleaned out if necessary (Pg. 133).



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. 32), 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 (Pg. 32), and clean out any carbon deposits using an end of a broken piston ring or some other suitable tool.



CAUTION: When removing carbon, take ample care not to scratch the cylinder wall, the side of the piston, or the piston ring grooves.

CAUTION: Never clean the piston head with the engine assembled. If the carbon is scraped from the piston head with the cylinder left in place, carbon particles will unavoidably drop between the piston and cylinder 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, piston, cylinder, crankshaft bearings, and oil seals.

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. 377 . If any of the cylinder inside diameter measurements exceeds the service limit, or if there is a difference of more than 0.05 mm (0.002 in) between any two measurements, 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 57 mm (2.24 in), the cylinder must be replaced.

Cylinder Diameter Measurement

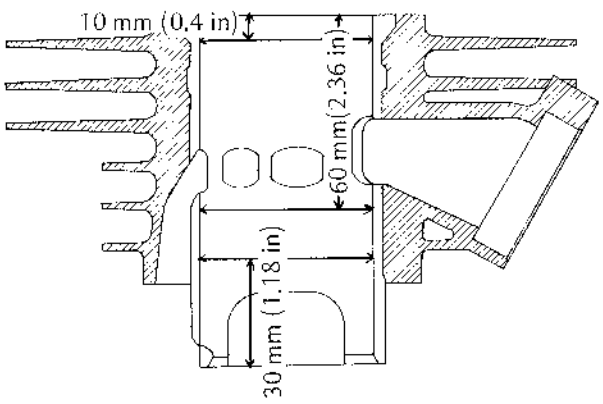
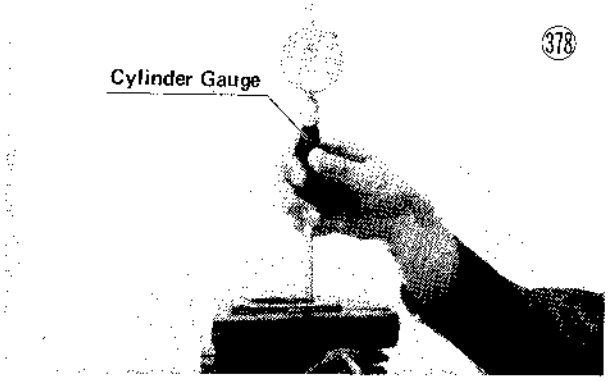


Table 5 Cylinder Inside Diameter

Standard	Service Limit
56.000~56.019 mm (2.2047~2.2055 in)	56.10 mm (2.209 in)



Measure the outside diameter of the piston 5 mm (0.2 in) 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 con-rod or a misaligned crankshaft.

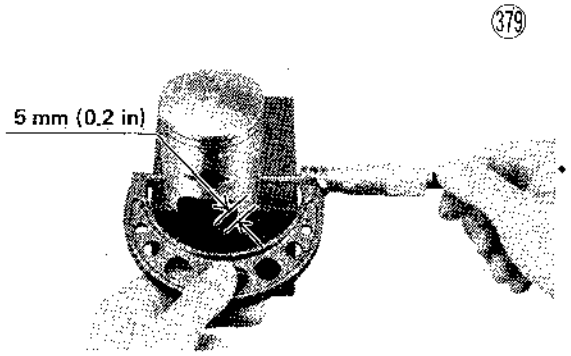


Table 6 Piston Diameter

Standard	Service Limit
55.933~55.953 mm (2.2021~2.2029 in)	55.80 mm (2.2 in)

Table 5 applies only to a cylinder that has not been bored to oversize, and table 6 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 (0.004 in), and the service limit for the piston is the oversize piston original diameter minus 0.15 mm (0.0059 in). 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 the piston or cylinder has been replaced for 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 the piston or cylinder is replaced for a new one, or whenever the cylinder is rebored and an oversize piston installed. The standard piston to cylinder clearance must be adhered to whenever the cylinder is replaced or rebored. However, if only the 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 7 Piston/Cylinder Clearance

Standard
0.057~0.076 mm (0.0022~0.0030 in)

Boring, honing

When boring and honing the cylinder, note the following:

1. Before boring the cylinder, first measure the exact diameter of the oversize piston, and then, in accordance with the standard clearance given in table 7, determine the diameter of the rebore.
2. Cylinder inside diameter must not vary more than 0.01 mm (0.0004 in) at any point.
3. There are two sizes of oversize pistons available: 0.5 mm (0.020 in) and 1.0 mm (0.040 in). Oversize pistons require oversize rings.
4. Be wary of measurements taken immediately after boring since the heat affects cylinder diameter.

Piston/cylinder seizure

Remove the cylinder and piston 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 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.

Measure the thickness of the second ring, and measure the width of the second ring groove. 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 8 Second Ring Thickness

Standard	Service Limit
1.47~1.49 mm (0.0579~0.0587 in)	1.4 mm (0.055 in)

Table 9 Second Ring Groove Width

Standard	Service Limit
1.52~1.54 mm (0.0598~0.0606 in)	1.62 mm (0.0638 in)

With the second ring in its groove, make several measurements with a thickness gauge to determine second ring/groove clearance. If the clearance exceeds the service limit, replace the second ring and/or the piston.

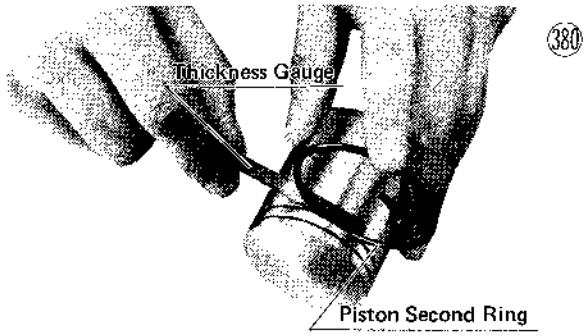


Table 10 Second Ring/Groove Clearance

Standard	Service Limit
0.03~0.07 mm (0.0012~0.0028 in)	0.17 mm (0.0067 in)

When new rings are being fitted into an old 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. Be sure to fit the proper Keystone ring for the top and the standard ring and expander ring for the second ring groove.

Piston ring end gap

Place the piston ring being checked 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.

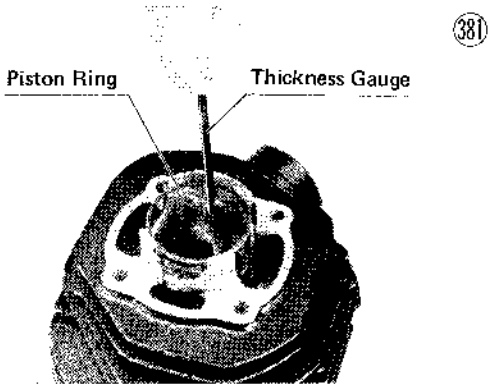


Table 11 Ring End Gap

Standard	Service Limit
0.15~0.35 mm (0.0059~0.0138 in)	0.65 mm (0.0256 in)

Piston ring tension

Piston ring tension can be evaluated by measuring the gap between the ends of the ring with the ring free of any restraint. If the measured gap is less than the service limit, the ring is weak and must be replaced.

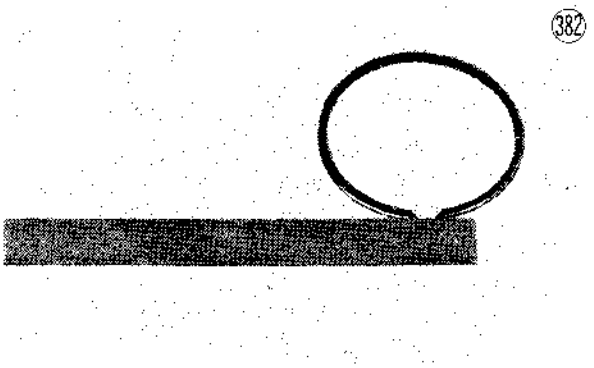


Table 12 Ring Free Gap

	Standard	Service Limit
Top ring	7.5 mm (0.295 in)	4.5 mm (0.177 in)
Second ring	4.5 mm (0.177 in)	1.5 mm (0.059 in)

Piston, piston pin, con-rod, needle bearing 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 con-rod small end. If the diameter exceeds the service limit, replace the con-rod.

The rollers in the needle bearings wear so little that the wear is difficult to measure. Instead, inspect the needle bearing for abrasions, color change, or other damage. If there is any doubt as to its condition, replace the needle bearing.

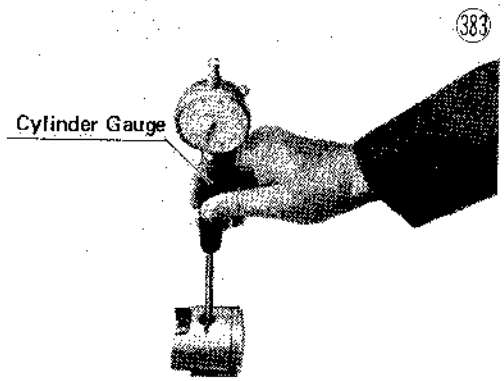


Table 13 Piston Pin, Piston Pin Hole, Small End Dia

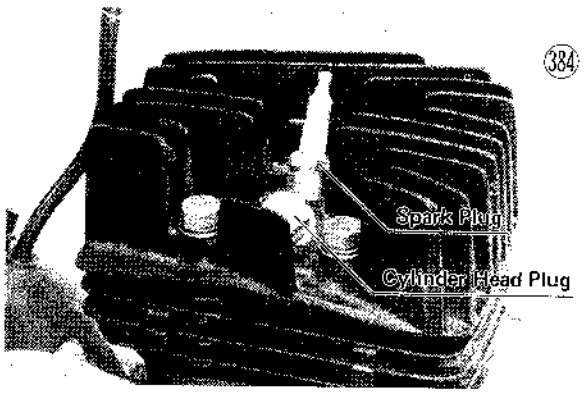
	Standard	Service Limit
Piston Pin	13.994~14.000 mm (0.5509~0.5512 in)	13.96 mm (0.5496 in)
Piston Pin Hole	13.9985~14.0065 mm (0.5511~0.5514 in)	14.08 mm (0.554 in)
Con-rod Small End	18.003~18.014 mm (0.7088~0.7092 in)	18.05 mm (0.7106 in)

To the Dealer: When possible, match parts from stock so that a marked pin is assembled with an "A" piston and an unmarked pin with a "B" piston.

NOTE: When a new piston or pin is used, check that piston to pin clearance is 0.0024~0.0084 mm (0.00009 ~0.00033 in).

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 chamber. A copper gasket fits between the cylinder head and cylinder to prevent gas leakage. On one side of the cylinder head is the spark plug hole, and on the opposite side a hole is tapped to accommodate a decompressor.

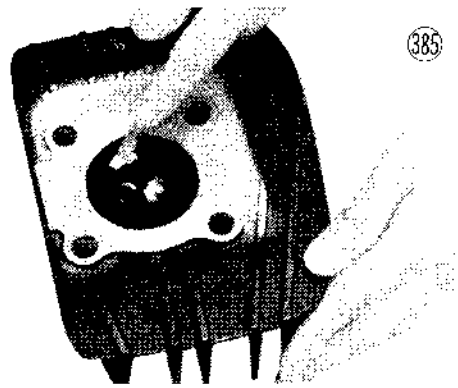


A decompressor may be used to facilitate kick starting the engine. When the decompressor is opened for kick starting, part of the fuel/air mixture escapes during compression through an opening in the decompressor such that the kick starter turns over more easily. However, the decompressor is not necessary under normal conditions; a bolt which has the same thread pitch, diameter, and reach is fitted in its place.

Carbon built up inside the combustion chamber interferes with heat dissipation and increases the compression ratio, which may result in preignition, detonation, and overheating. Compression leakage may be caused by damaged or dirty cylinder or cylinder head gasket surfaces, a damaged or dirty gasket, a loose spark plug, a loose decompressor hole plug, a loose or faulty decompressor, or an improper head mounting or mounting torque. Escaping hot combustion gas not only reduces engine power but could damage the cylinder head and cylinder gasket surfaces beyond repair.

Cleaning and inspection

Remove the cylinder head (Pg. 31). Scrape out any carbon, and clean the head with regular solvent.



Lay a straight edge across the cylinder head gasket surface at several different points, and measure warp by inserting a thickness gauge between the straight edge and the gasket surface. If warp exceeds the service limit, replace the cylinder head.

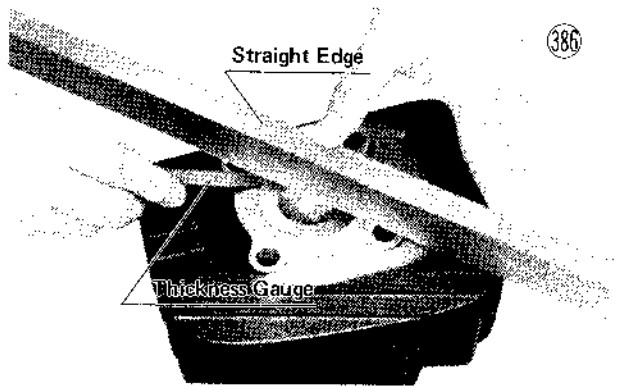
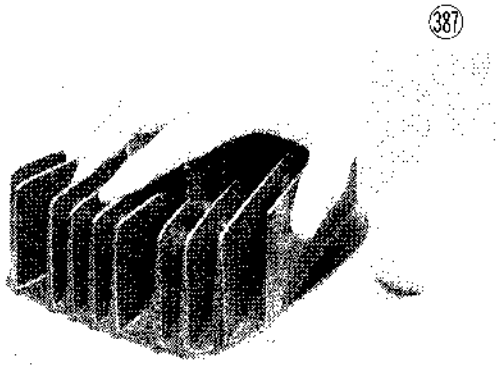


Table 14 Cylinder Head Warp

Standard	Service Limit
under 0.05 mm (under 0.002 in)	0.15 mm (0.006 in)

The cylinder head gasket surface may also be checked for warp or other damage by rubbing it on a surface plate coated with machinist's bluing. Repair light damage by rubbing the gasket surface on emery cloth (first #200, then #400) secured to the surface plate. After smoothing the cylinder head gasket surface, coat it with machinist's bluing, and rub it over the cylinder gasket surface; if necessary, repair the surface in the same manner that the cylinder head was repaired. Severe damage to either of the gasket surfaces necessitates replacement.



NOTE: Use only the proper gasket for the cylinder head. The use of a gasket of incorrect thickness will change the compression.

CRANKSHAFT

The crankshaft is the part that changes the reciprocating motion of the piston into rotating motion, which is transmitted to the rear wheel when the clutch is engaged. Crankshaft trouble, such as excessive play or runout, will multiply the stress caused by the intermittent force on the piston, and will result in not only rapid crankshaft bearing wear, but also noise, power loss, vibration, and a shortened engine life. A defective crankshaft should always be detected at an early stage and then repaired immediately.

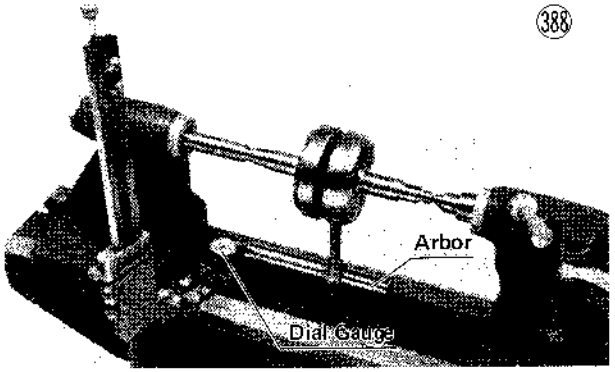
The following explanation concerns the most common crankshaft problems, the method for measuring warp, play, and runout, and the method for correcting flywheel misalignment. Since the crankshaft assembly requires a manual or hydraulic press and special tools to attain the precise tolerances that are required, a defective crankshaft should be either rebuilt by a properly equipped shop or replaced as an assembly.

Connecting rod bending, twisting

Set the crankshaft in a flywheel alignment jig or on V blocks on a surface plate. Select an arbor of the same diameter as the piston pin and of optional length, and insert it through the small end of the connecting rod.

Using a height gauge or dial gauge, measure the difference in the height of the rod above the surface plate over a 100 mm (4 in) length to determine the amount the connecting rod is bent.

Using the arrangement shown in Fig. 389 , measure the amount that the arbor varies from being parallel with the crankshaft over a 100 mm (4 in) length of the arbor to determine the amount the connecting rod is twisted.



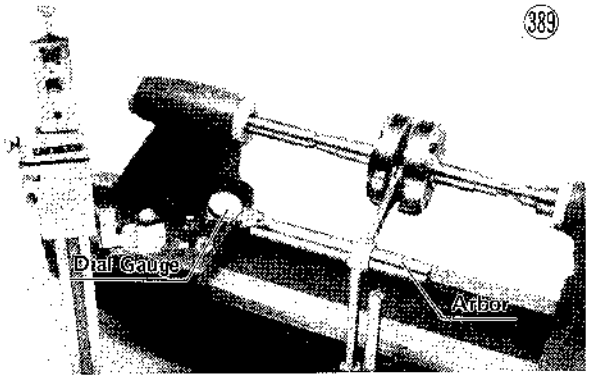


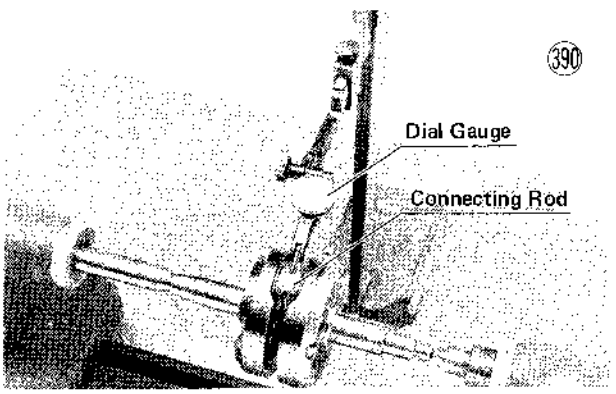
Table 15 Connecting Rod Bend, Twist

Standard	Service Limit
under 0.05 mm/100 mm (under 0.0020 in/4 in)	0.20 mm/100 mm (0.079 in/4 in)

If either of the above measurements exceeds the service limit, the connecting rod or the crankshaft assembly must be replaced.

Connecting rod big end radial clearance

Set the crankshaft in a flywheel alignment jig or on V blocks, and place a dial gauge against the big end of the connecting rod. Push the connecting rod first towards the gauge and then in the opposite direction. The difference between the two gauge readings is the radial clearance.



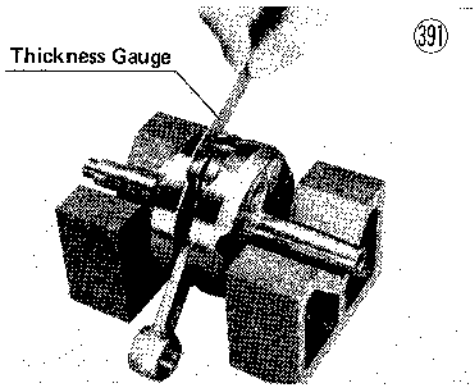
If the radial clearance exceeds the service limit, the crankshaft should be either replaced or disassembled and the crankpin, needle bearing, and connecting rod big end examined for wear.

Table 16 Connecting Rod Radial Clearance

Standard	Service Limit
0.0192~0.029 mm (0.0008~0.0011 in)	0.08 mm (0.0031 in)

Connecting rod side clearance

Measure the side clearance of the connecting rod with a thickness gauge as shown in the figure. If the measured value exceeds the service limit, the crankshaft should be either replaced or disassembled and the side washers examined for wear.



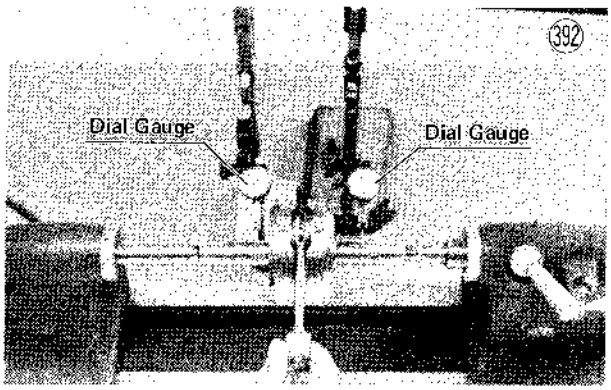
391

Table 17 Connecting Rod Side Clearance

Standard	Service Limit
0.35~0.40 mm (0.014~0.016 in)	0.6 mm (0.024 in)

Crankshaft runout

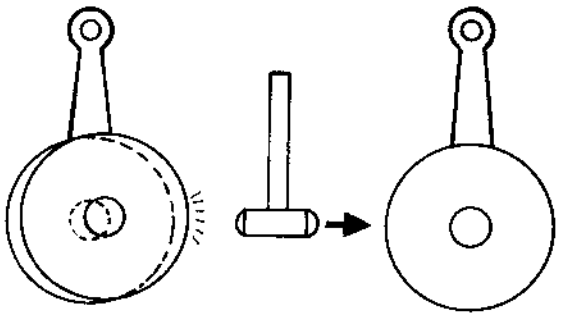
Set the crankshaft in a flywheel alignment jig, and place a dial gauge to the points indicated. Turn the crankshaft slowly. The maximum difference in gauge readings is the crankshaft runout.



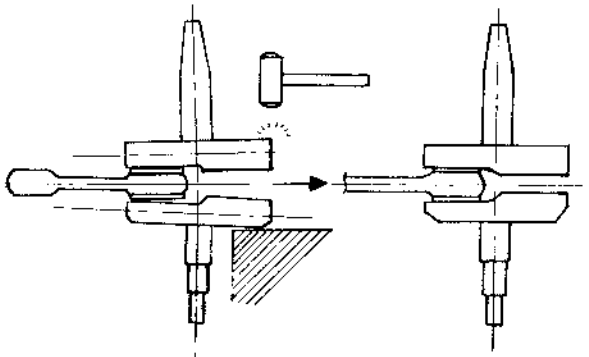
392

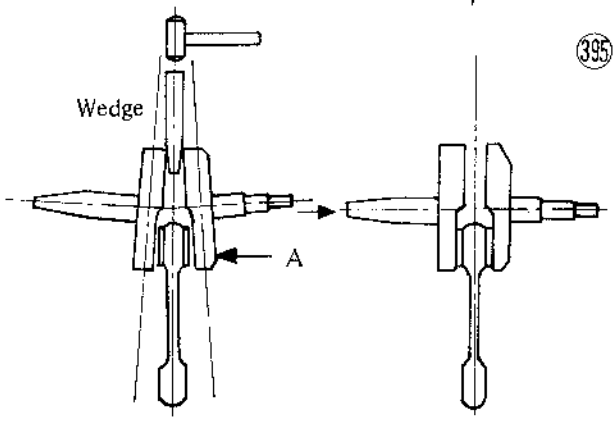
If the runout at either point exceeds the service limit, align the flywheels so that the runout falls within the service limit. As shown in Figs. 393 , 394 , & 395 , there are three types of flywheel misalignment.

Flywheel Horizontal Misalignment 393



Flywheel Vertical Misalignment 394





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In the case of horizontal misalignment, which is the most common, strike the projecting rim of the flywheel with a plastic, soft lead, or brass hammer as indicated in the figure. Recheck the runout with a dial gauge, repeating the process until the runout falls within the service limit. Vertical misalignment is corrected either by driving a wedge in between the flywheels or by squeezing the flywheel rims in a vice, depending on the nature of the misalignment. In case of both horizontal and vertical misalignment, correct the horizontal misalignment first.

If flywheel misalignment cannot be corrected by the above method, replace the crankpin or the crankshaft itself.

NOTE: Don't hammer the flywheel at part "A".

Table 18 Crankshaft Runout

Standard	Service Limit
under 0.04 mm (under 0.0016 in)	0.10 mm (0.0039 in)

Big end seizure

In case of serious seizure with damaged flywheels, the crankshaft must be replaced. In case of less serious damage, disassemble the crankshaft and replace the crankpin, needle bearing, side washers, and connecting rod.

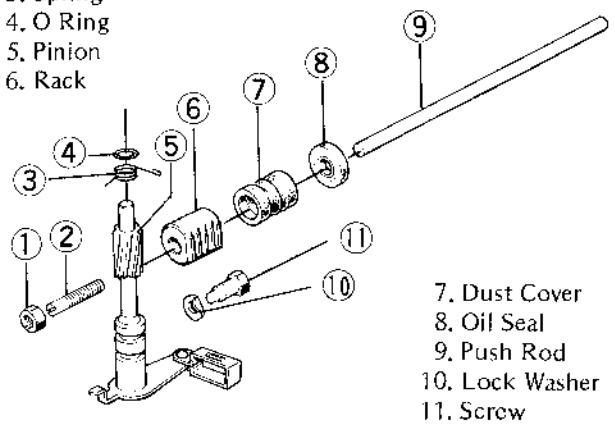
CLUTCH

Fig. 397 shows an exploded view of the clutch, which is a wet, multi-plate type with 5 friction plates ⑧, 4 steel plates ⑨, and 5 steel rings ⑩. The friction plates are made from cork, used for its high coefficient of friction, and bonded on a bakelite core, which provides durability and warp resistance. The clutch housing ④ has a reduction drive gear riveted to one side and contains damper rubbers to absorb shock from the drive train.

The clutch release mechanism is shown in Fig. 396. The clutch release rack ⑥ and pinion ⑤ are both made of steel. Assembled into the center of the rack is the clutch adjusting screw ②, which pushes on the push rod ⑨ inside the drive shaft to release the clutch.

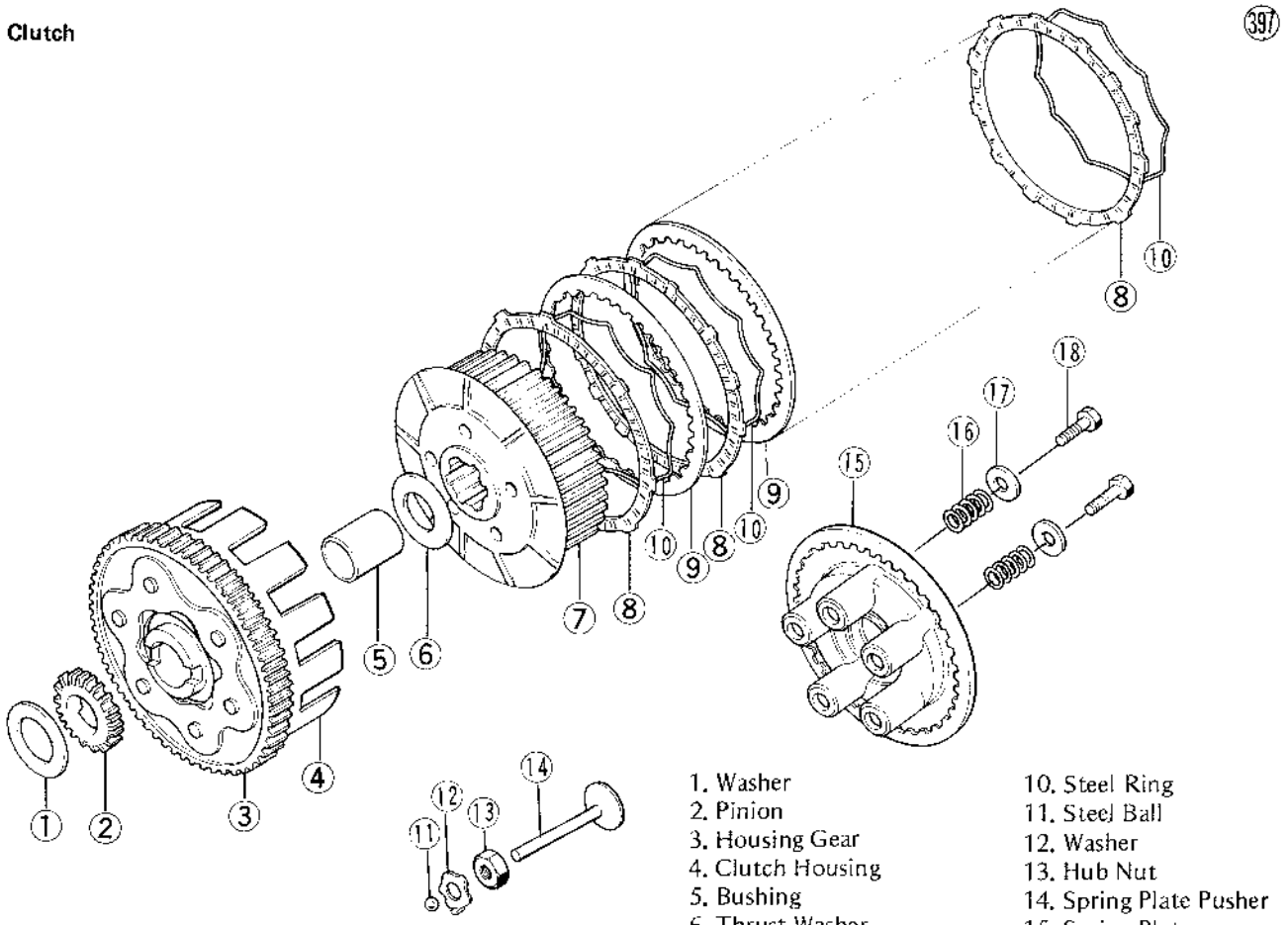
The friction plates are connected to the clutch housing by tangs on the outer circumference of each plate, and, since the clutch housing is gear-driven directly by the crankshaft, these plates are always turning any time the engine is running. The steel plates have a toothed inner circumference, which meshes with the splines in the clutch hub on the drive shaft so that the drive shaft and steel plates always turn together. To improve clutch disengagement, steel rings are inserted between the friction and steel plates.

Clutch Release Mechanism (396)



1. Lock Nut
2. Adjusting Screw
3. Spring
4. O Ring
5. Pinion
6. Rack
7. Dust Cover
8. Oil Seal
9. Push Rod
10. Lock Washer
11. Screw

Clutch (397)



1. Washer
2. Pinion
3. Housing Gear
4. Clutch Housing
5. Bushing
6. Thrust Washer
7. Clutch Hub
8. Friction Plate
9. Steel Plate
10. Steel Ring
11. Steel Ball
12. Washer
13. Hub Nut
14. Spring Plate Pusher
15. Spring Plate
16. Spring
17. Washer
18. Bolt

One end of each clutch spring forces against its washer and bolt, which threads into the clutch hub, and the other end forces against the spring plate. When the clutch is left engaged, the springs pressing against the spring plate force the spring plate, friction and steel plates, steel rings, and clutch hub tightly together so that the friction plates will drive the steel plates by virtue of their mutual friction and thereby transmit the power to the transmission drive shaft.

When the clutch lever is pulled to release (disengage) the clutch, the clutch cable pulls the clutch release lever turning the release shaft. The release pinion, which is part of the release shaft, moves the rack in the direction of the clutch. The clutch adjusting screw in the center of the rack 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 release rack moves and the clutch hub remains stationary, the spring pressure is taken off the clutch plates. Because the plates are no longer pressed together, the power transmission from the crankshaft to the transmission drive shaft is interrupted. However, 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 transmission oil.
5. Transmission oil of too high a viscosity.
6. The clutch housing frozen on the drive shaft.
7. A defective clutch release mechanism.
8. Insufficient clutch release lever angle.
9. An unevenly worn clutch hub or housing.

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. Deteriorated damper rubber.
5. Metal chips jammed into the clutch housing gear teeth.

Clutch spring tension

Clutch springs that have become weak will not return to their original length when disassembled from the clutch. Their condition can thereby be determined by measuring the free length with vernier calipers.

If any spring is shorter than the service limit, replace all the springs as a matched set to ensure even tension on the clutch plates.

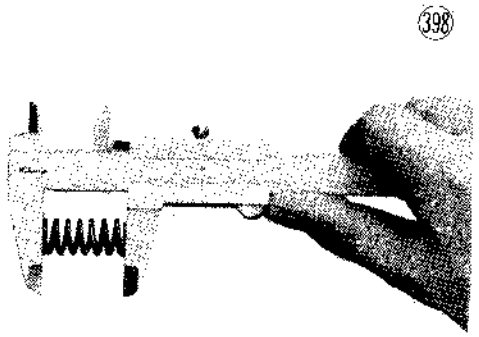


Table 19 Clutch Spring Free Length

Standard	Service Limit
33.1 mm (1.3 in)	31.6 mm (1.24 in)

Friction plate wear, damage

Visually inspect the friction plates to see whether or not they show any signs of heat seizure or have become rough or unevenly worn. Measure the thickness of the plates with vernier calipers.

If any plates show signs of damage, or if they have worn past the service limit, replace them for new ones.

Friction Plate Measurement

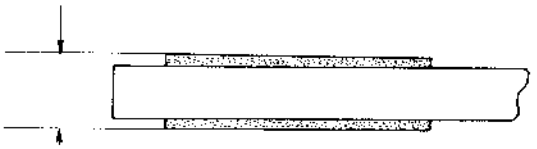


Table 20 Friction Plate Thickness

Standard	Service Limit
2.9 ~ 3.1 mm (0.114 ~ 0.122 in)	2.5 mm (0.098 in)

Clutch plate warp

Place each friction plate and each steel 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.

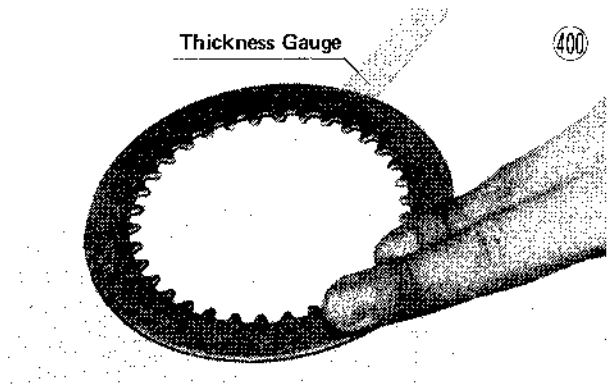


Table 21 Clutch Plate Warp

	Standard	Service Limit
Friction Plate	under 0.3 mm (under 0.0118 in)	0.45 mm (0.0177 in)
Steel Plate	under 0.3 mm (under 0.0118 in)	0.5 mm (0.018 in)

Friction plate/clutch housing clearance

Measure the clearance between the tangs on the friction plates and the fingers of the clutch housing. If this clearance is excessive, the clutch will be noisy.

If the clearance exceeds the service limit, replace the friction plates. Also, replace the clutch housing if it is unevenly or badly worn where the friction plates wear against it.

Friction Plate/Clutch Housing Clearance (401)

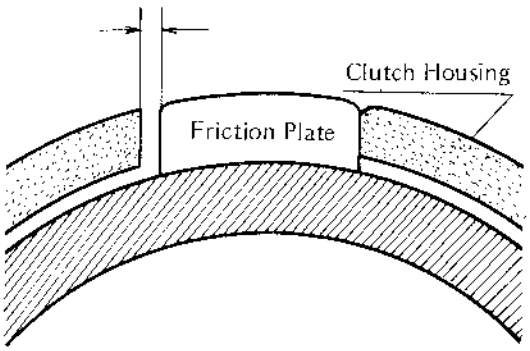


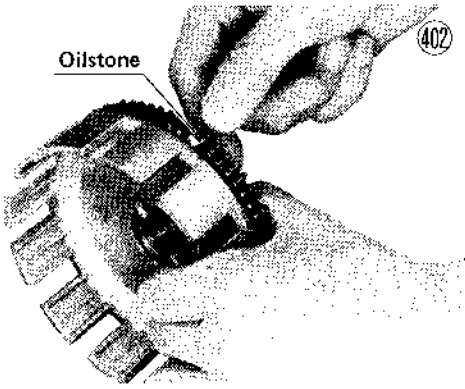
Table 22 Friction Plate/Clutch Housing Clearance

Standard	Service Limit
0.05~0.45 mm (0.114~0.122 in)	0.65 mm (0.026 in)

Clutch housing gear damage

Inspect the teeth on the clutch 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 teeth on 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, and then repaired or replaced if necessary.



Clutch housing/primary gear blacklash

Measure the backlash between the clutch housing gear and primary gear with a dial gauge. Set the dial gauge against a tooth on the clutch housing gear, and rotate the clutch housing gear back and forth while keeping the primary gear stationary. The difference between the highest and lowest dial reading is the amount of backlash. If the amount of backlash exceeds the service limit, replace both the clutch housing and the primary gear.

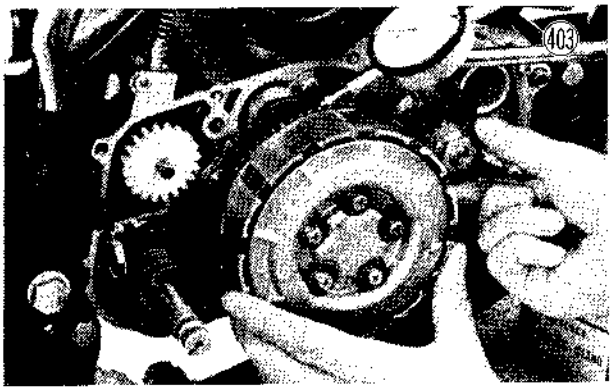


Table 23 Clutch Housing/Primary Gear Backlash

Standard	Service Limit
0.02~0.10 mm (0.0008~0.0039 in)	0.15 mm (0.0059 in)

Clutch housing/drive shaft sleeve wear

Measure the diameter of the drive shaft sleeve with a micrometer, and measure the inside diameter of the clutch housing. Find the difference between the two readings to determine the clearance. Replace the sleeve if the clearance exceeds the service limit.

Table 24 Clutch Housing/Drive Shaft Sleeve Wear

Standard	Service Limit
0.020~0.054 mm (0.0008~0.0021 in)	0.154 mm (0.0061 in)

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 rack and pinion wear

Visually inspect the clutch release rack and pinion for damage or excessive wear. If there is any damage or excessive wear, replace the rack and shift as a set.

Fit the rack and shaft into the left engine cover, and turn the shaft back and forth while holding the rack steady to check rack and pinion movement. If there is excessive play, replace the rack and shaft as a set.

Lubrication

Apply grease liberally to the clutch release shaft, release rack, and inside the holes (2) in the left engine cover.

TRANSMISSION

The transmission is a 6-speed, constant mesh, return shift type. Its cross section is shown in Fig. 404 , and the transmission together with the external shift mechanism is shown in Fig. 405 . For simplicity, the drive shaft gears in the following explanation will be referred to as "D" (e.g., D1 = drive shaft 1st gear) and the output shaft gears as "O".

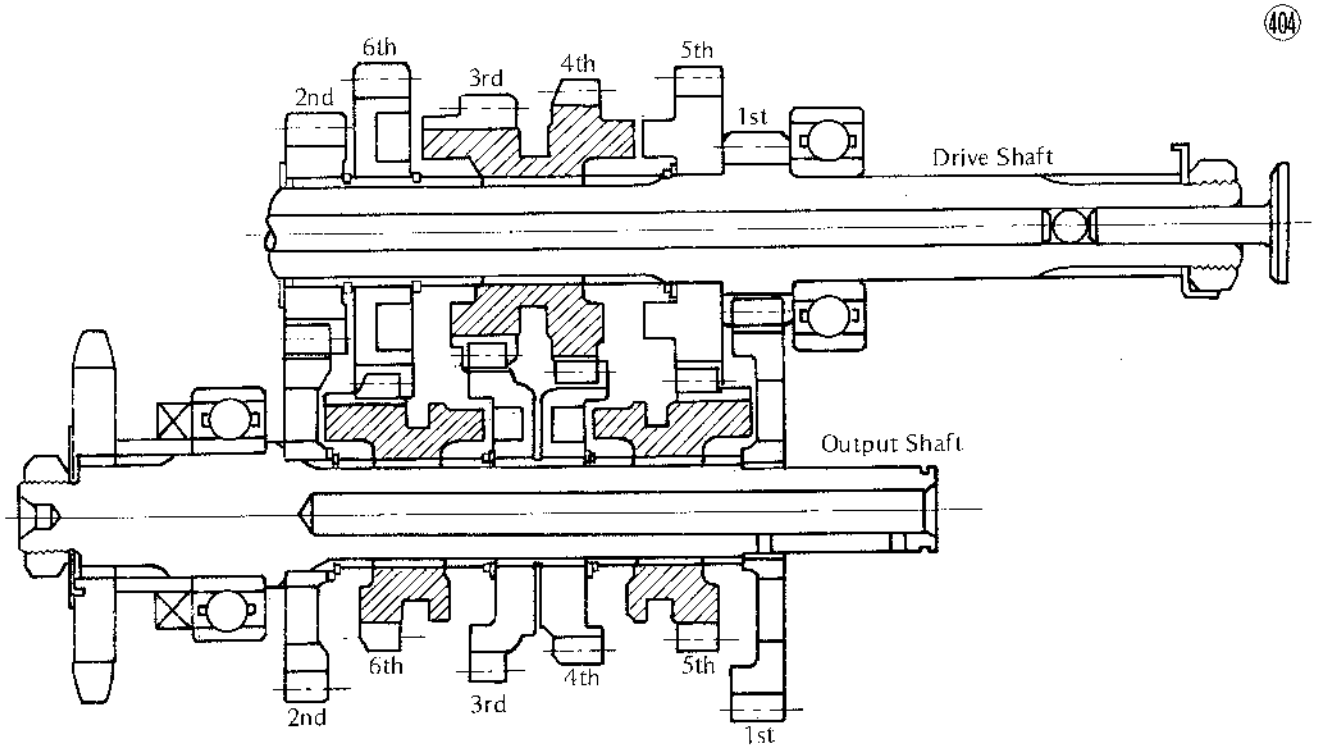
Gears D3 & D4 (single unit), O5, and O6 are all splined to and thus rotate along with their shaft. During gear changes these gears are moved sidewise on their shaft by the 3 shift forks, one for each gear. Gears D2, D5, O1, O2, O3, and O4 rotate free of shaft rotation, but cannot move sidewise. Gears D1 and D6 are fixed in place on the drive shaft, rotating along with the shaft and unable to move sidewise.

When the shift pedal ① is raised or lowered, the gear change shaft ③ turns, a pawl ⑧ on the external shift mechanism arm ④ catches on one of the shift drum pins ⑬ , and the shift drum ㉔ turns. As the shift drum turns, the shift fork guide pins (3) ㉕ , each riding in a groove in the shift drum, shift the position of one or another of the shift forks ⑯ ㉗ in accordance with the winding of the grooves. The shift fork ears then determine the position of gears D3 & D4 ⑰ , O5 ㉚ , and/or O6 ㉙ . Refer to Figs. 406 to 412 for the gear train for neutral and each of the 6 gears.

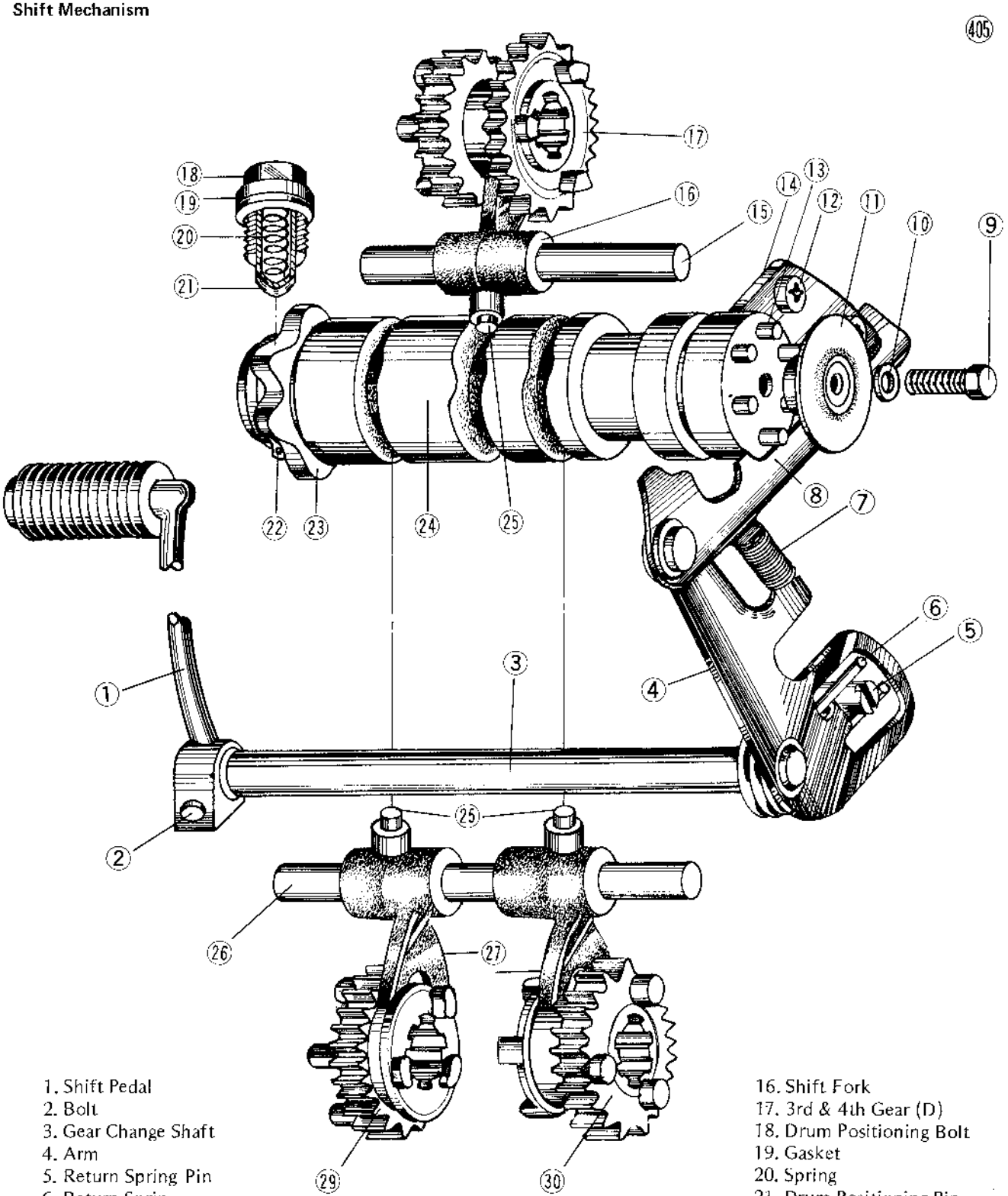
A spring ⑦ is fitted on the external shift mechanism to keep the shift arm pressed against the shift drum pins to ensure proper pawl and pin contact. When the shift pedal is released after shifting, the return spring ⑥ , returns the pawl and shift pedal back to their original position. So that the transmission will remain where it was shifted, another spring, the shift drum positioning pin spring ⑳ , pushes the shift drum positioning pin ㉑ into one of 7 positions on the shift drum operating plate ㉓ . 6 of these positions are equally spaced and correspond to the 6 gears. The other position is halfway between the position for 1st and 2nd gears and corresponds to the half-stroke shift pedal movement from 1st or 2nd gear required to shift into neutral.

The return spring pin ⑤ on the side of the crankcase passes through a cutout on the shift mechanism. Each time that the shift pedal is operated, the pin limits the shift mechanism's range of movement, stopping the shift mechanism after the pawl on the shift mechanism arm has rotated the shift drum the proper amount for gear change. The return spring pin thus prevents the drum from being rotated too far.

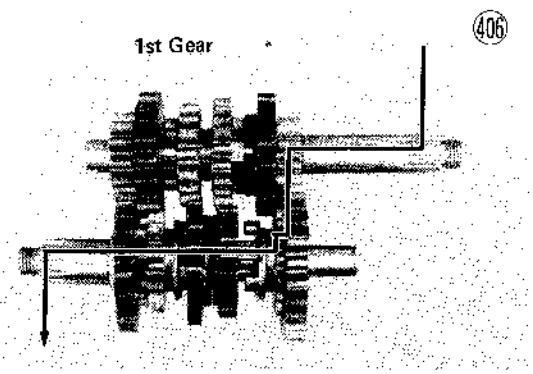
Transmission Cross Section

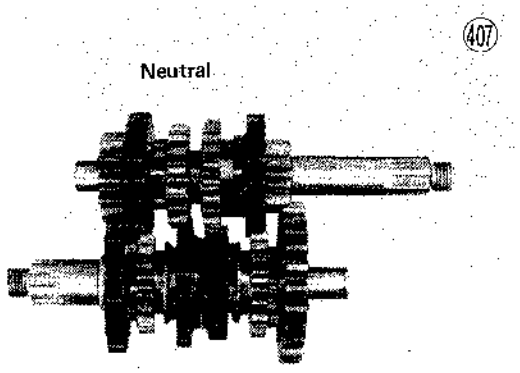


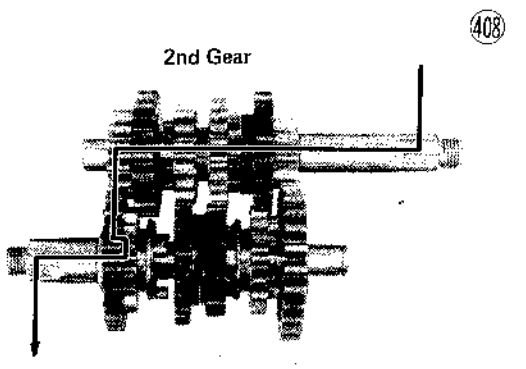
Shift Mechanism

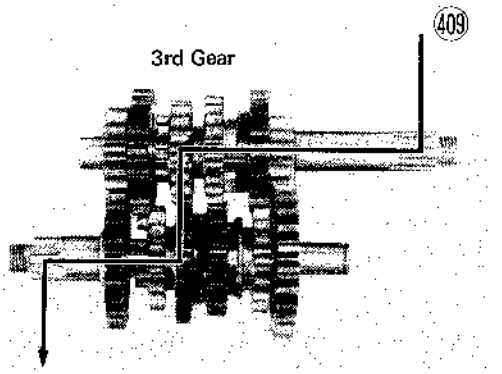


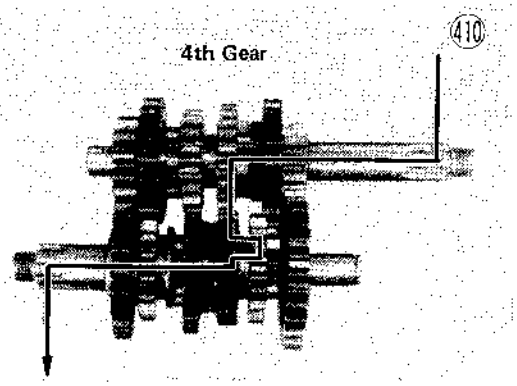
1. Shift Pedal
2. Bolt
3. Gear Change Shaft
4. Arm
5. Return Spring Pin
6. Return Spring
7. Spring
8. Shift Pawl
9. Screw
10. Washer
11. Drum Pin Holder
12. Screw
13. Drum Pin
14. Shift Drum Stopper
15. Short Shift Rod
16. Shift Fork
17. 3rd & 4th Gear (D)
18. Drum Positioning Bolt
19. Gasket
20. Spring
21. Drum Positioning Pin
22. Circlip
23. Drum Operating Disc
24. Shift Drum
25. Guide Pin
26. Long Shift Rod
27. Shift Fork
28. Shift Fork
29. 6th Gear (O)
30. 5th Gear (O)

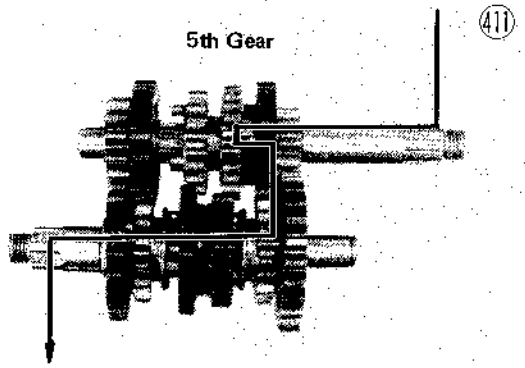


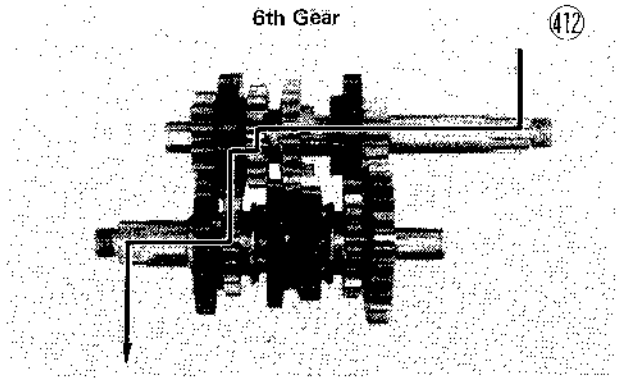












A neutral indicator light is provided so that the rider can readily determine whether or not the transmission is in neutral. The neutral indicator switch, installed in the crankcase near the magneto flywheel, consists of a spring loaded pin which comes into contact with a nub on the side of the shift drum whenever the transmission is in neutral. When the shift drum has shifted the transmission into neutral, the neutral indicator switch pin touching this nub completes the neutral indicator light circuit, which turns the neutral indicator light on.

The transmission oil, when at its proper level, supplies a lubricative film to the surfaces of all moving transmission parts; oil reaches even gear inside circumference in the case of the output shaft idle gear and the alloy hubed gear O1 through oil holes in the output shaft.

However, oil that has been allowed to become deteriorated or contaminated will result in rapid wear and possible heat seizure of transmission parts. The oil must always be kept at its proper level and changed whenever necessary (Pg. 153).

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

1. Loose return spring pin
2. Broken or weakened return spring or shift drum positioning pin spring
3. Broken or weakened shift pawl spring
4. Damaged shift mechanism arm
5. Loose shift drum stopper
6. Bent or worn shift fork(s)
7. Worn shift fork groove on gear D3 & D4, O5, and/or O6.
8. Worn shift fork guide pin(s)
9. Worn shift drum groove(s)
10. Worn or damaged gear dogs, gear dog holes, and/or gear dog recesses
11. Improperly functioning clutch or clutch release
12. Improper assembly or missing parts

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

The idle gears on the output shaft and drive shaft are constantly meshed, and transmit the rotation of the kick gear through the clutch housing gear to the primary gear when the engine is started. Since these gears are not directly related to the transmission, they are covered in the Kickstarter Section (Pg. 111).

External shift mechanism inspection

Inspect the shift pawl spring, shift pawls, and return spring. Replace any broken or otherwise damaged parts.

Measure the free length of the shift pawl spring. If it exceeds the service limit, replace it for a new one.

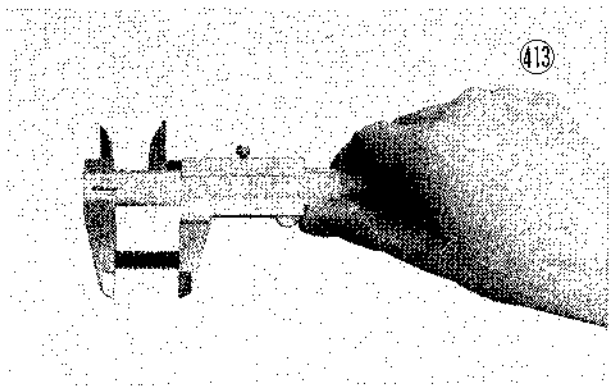
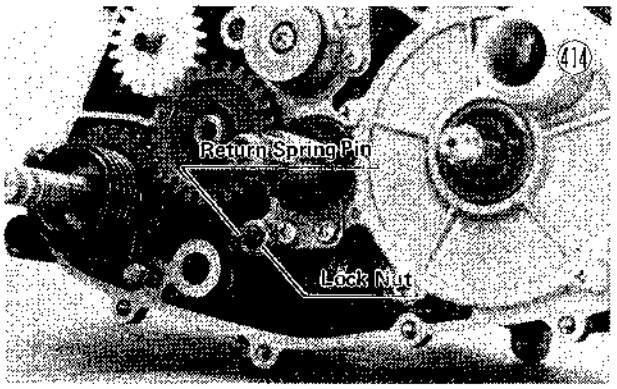


Table 25 Shift Pawl Spring Free Length

Standard	Service Limit
27.9 mm (1.10 in)	26.5 mm (1.04 in)

Check to see if the return spring pin is loose or not. If it is loose, remove it and apply a locking agent to the threads. Then screw it back in tightening its lock nut.

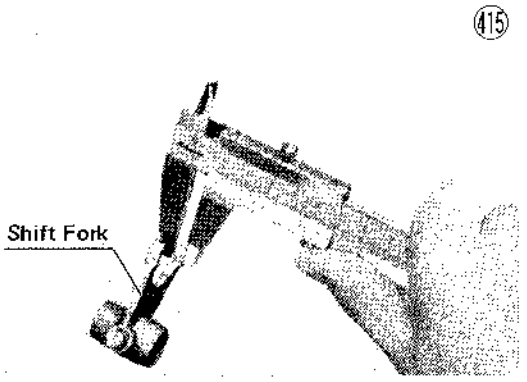


Shift fork bending

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

Shift fork/gear groove wear

Measure the thickness of the ears of each shift fork, and measure the width of the shift fork groove on gears D3 & D4, O5, and O6. 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.



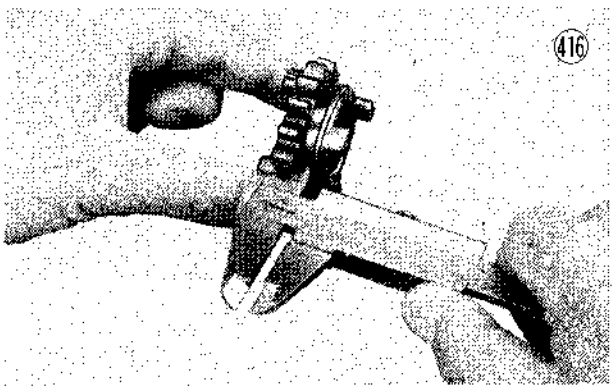


Table 26 Shift Fork Thickness

	Standard	Service Limit
1st, 2nd	3.9~4.0 mm (0.154~0.157 in)	3.8 mm (0.150 in)
3rd	4.9~5.0 mm (0.193~0.197 in)	4.8 mm (0.189 in)

Table 27 Gear Shift Fork Groove Width

	Standard	Service Limit
1st, 2nd	4.05~4.15 mm (0.159~0.163 in)	4.25 mm (0.167 in)
3rd	5.05~5.15 mm (0.199~0.203 in)	5.25 mm (0.207 in)

Shift fork guide pin/shift drum groove clearance

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 28 Shift Fork Guide Pin Diameter

Standard	service Limit
5.9~6.0 mm (0.232~0.236 in)	5.85 mm (0.230 in)

Table 29 Shift Drum Groove Width

Standard	Service Limit
6.05~6.20 mm (0.238~0.244 in)	6.25 mm (0.246 in)

Shift fork guide pin/shift drum groove wear

Measure the clearance between each shift fork guide pin and shift drum groove with a thickness gauge. Replace any shift fork with which the clearance exceeds the service limit.

Table 30 Shift Fork Guide Pin/Shift Drum Groove Clearance

Standard	Service Limit
0.05~0.30 mm (0.002~0.012 in)	0.38 mm (0.015 in)

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 or unevenly or excessively worn dogs, dog holes, or dog recesses.

Gear/shaft wear

Measure the diameter of each shaft 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.

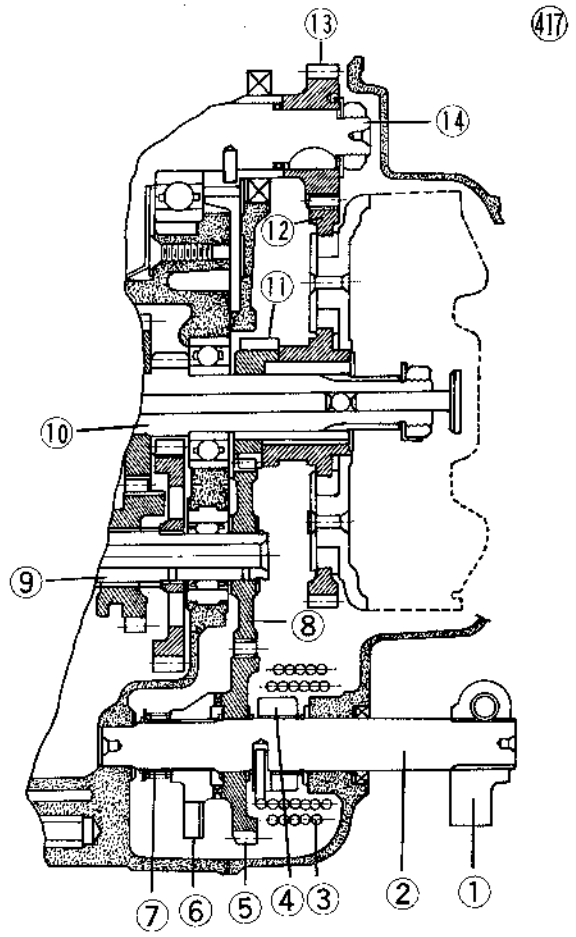
Table 31 Gear/Shaft Clearance

	Standard	Service Limit
D5, D6 02, 03, 04	0.022~0.058 mm (0.0009~0.0022 in)	0.158 mm (0.0062 in)
01	0.032~0.068 mm (0.0013~0.0027 in)	0.168 mm (0.0066 in)

KICKSTARTER

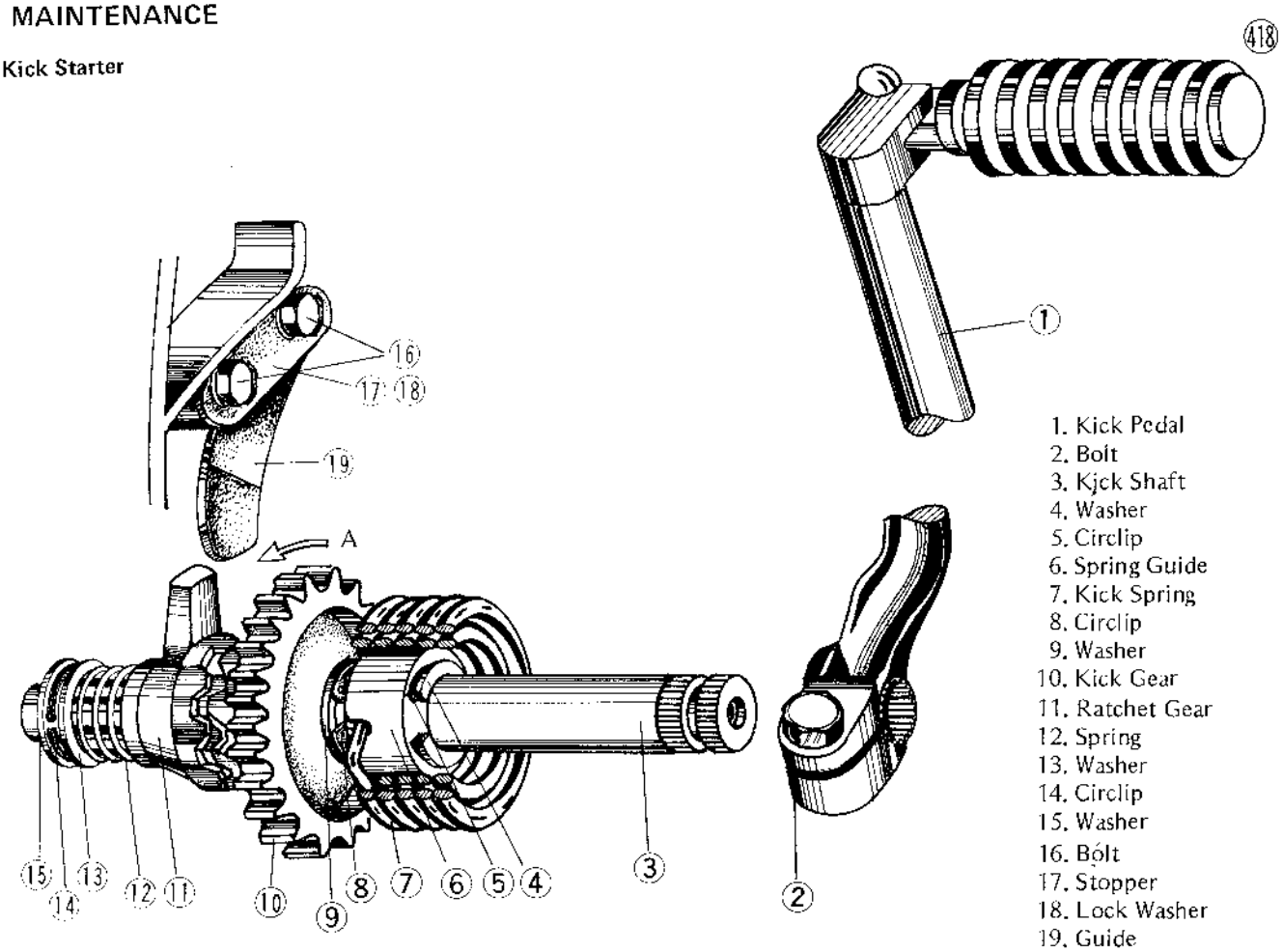
Kickstarter construction is shown in Fig. 418 and its cross section in Fig. 417 . The kick gear is connected to the primary gear on the crankshaft through the idle gear on the output shaft, the idle gear on the drive shaft, and the clutch housing gear. This gear train is free from the drive shaft whenever the clutch is disengaged, thereby allowing the engine to be kicked over even when in gear. This type of starting arrangement is called the primary kick system.

A Cross-sectional Diagram of Primary Kick



1. Kick Pedal
2. Kick Shaft
3. Kick Spring
4. Spring Guide
5. Kick Gear
6. Ratchet Gear
7. Spring
8. Idle Gear
9. Output Shaft
10. Drive Shaft
11. Kick Starter Pinion
12. Clutch Housing Gear
13. Primary Gear
14. Crank Shaft

Kick Starter



1. Kick Pedal
2. Bolt
3. Kick Shaft
4. Washer
5. Circlip
6. Spring Guide
7. Kick Spring
8. Circlip
9. Washer
10. Kick Gear
11. Ratchet Gear
12. Spring
13. Washer
14. Circlip
15. Washer
16. Bolt
17. Stopper
18. Lock Washer
19. Guide

The kick gear ⑩ , constructed with a ratchet on one side, is always meshed with the output shaft idle gear and turns freely anytime the output shaft is turning. The ratchet gear ⑪ , mounted on a splined portion of the kick shaft ③ , always turns with the kick shaft and can be moved sidewise on the shaft. A spring 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 a stopper ⑰, 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 stopper and the ratchet gear then meshes with the kick gear ratchet rotating the kick gear. The gear train of the kick starter 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. 418 , the kick gear ratchet doesn't catch on the ratchet gear.

When the kick pedal is released, the kick shaft is turned by the return spring returning the kick pedal to its original position. At the same time the ratchet gear arm rides up on the stopper, breaking away from the kick gear now. The kick gear turns freely without hindrance.

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, idle gears, kick shaft, drive shaft, or output 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 32 Kick Gear Inside Diameter

Standard	Service Limit
16.0~16.018 mm (0.630~0.631 in)	16.07 mm (0.633 in)

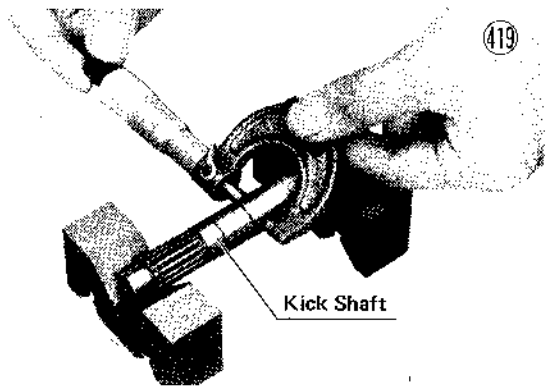


Table 33 Kick Shaft Diameter at Kick Gear

Standard	Service Limit
15.966~15.984 mm (0.6285~0.6293 in)	15.93 mm (0.6272 in)

Drive shaft idle gear, sleeve wear

Measure the inside diameter of the drive shaft idle gear with a cylinder gauge, and measure the diameter of the drive shaft sleeve with a micrometer. Find the difference between the two readings to figure the clearance. Replace the gear if the clearance exceeds the service limit.

Table 34 Drive Shaft Idle Gear/Sleeve Clearance

Standard	Service Limit
0.040~0.074 mm (0.0016~0.0029 in)	0.174 mm (0.0069 in)

Output shaft idle gear, shaft wear

Measure the inside diameter of the output shaft idle gear with a cylinder gauge, and measure the diameter of the output shaft with a micrometer. Find the difference between the two readings to figure the clearance. Replace the gear if the clearance exceeds the service limit.

Table 35 Output Shaft Idle Gear/Shaft Clearance

Standard	Service Limit
0.032~0.061 mm (0.0013~0.0024 in)	0.161 mm (0.0063 in)

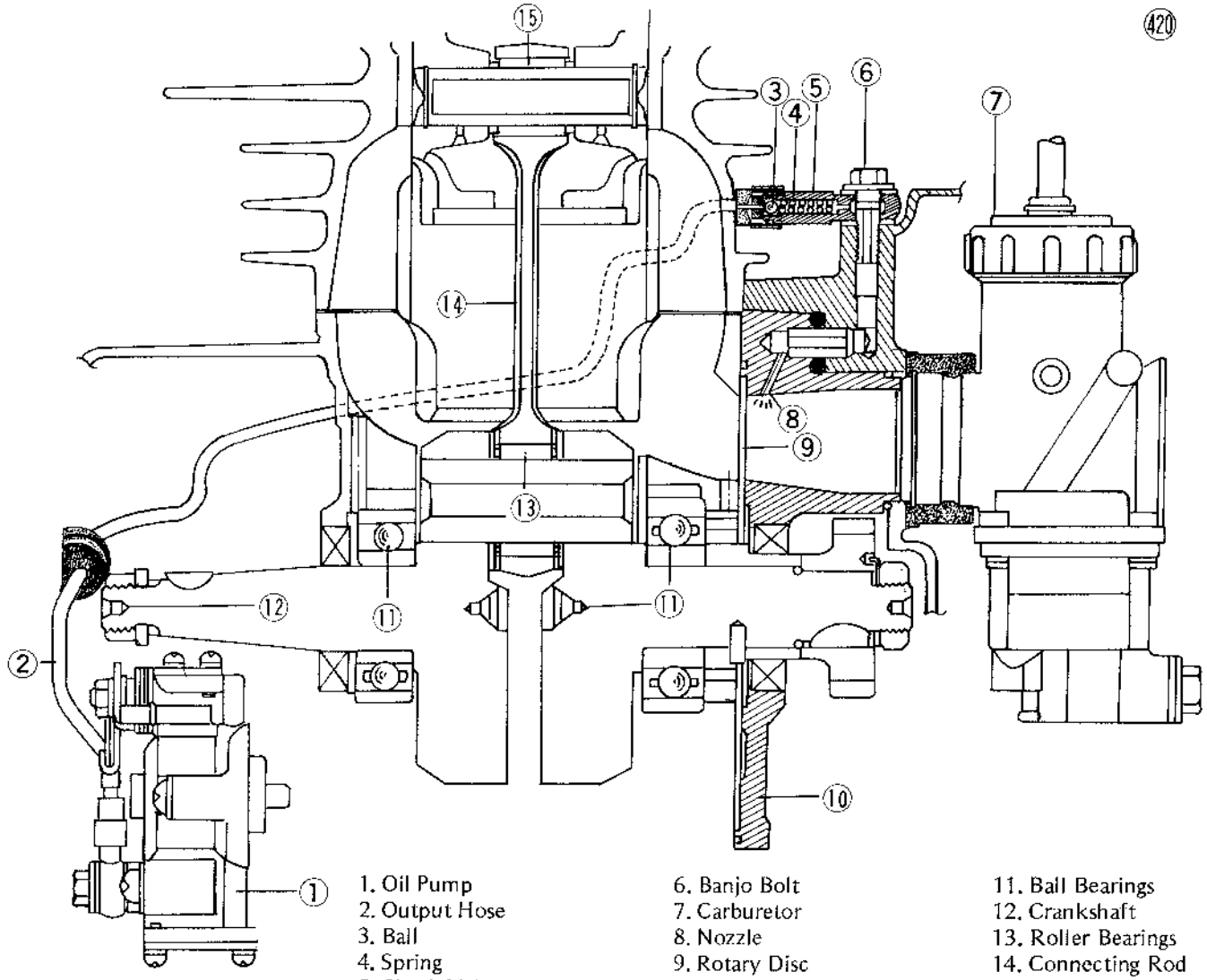
Ratchet, spring damage

Visually inspect the ratchet gear, ratchet on the kick gear, and ratchet gear spring. Replace any part that is damaged.

ENGINE LUBRICATION SYSTEM

In the Kawasaki Superlube System, oil is kept in a tank separate from the engine and pumped by an oil pump to the engine where it mixes with the fuel/air mixture from the carburetor. The rate at which the oil is pumped is controlled by both throttle opening and engine speed so that the quantity of oil will vary with

Engine Lubrication System



1. Oil Pump
2. Output Hose
3. Ball
4. Spring
5. Check Valve
6. Banjo Bolt
7. Carburetor
8. Nozzle
9. Rotary Disc
10. Valve Cover
11. Ball Bearings
12. Crankshaft
13. Roller Bearings
14. Connecting Rod
15. Needle Bearings

engine need. For normal motorcycle operation, this system, as compared to the system whereby the oil is premixed with the fuel, results in better engine lubrication, which means better engine performance and durability.

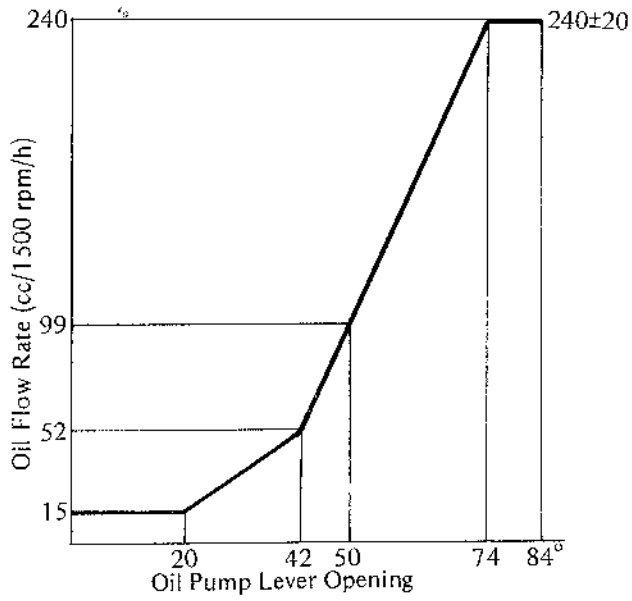
Fig. 420 shows the engine lubrication system. The oil input to the pump is supplied by a hose from the oil tank, and the output from the pump goes through the output hose and then into the non-return check valve at the banjo bolt connection on the right engine cover. The oil pressure, opposing the spring tension on the ball that blocks the valve inlet, causes the oil to flow through the valve and then through the oil pipe that connects to the valve cover where the oil is then ejected through a nozzle into the fuel/air mixture from the carburetor. As this oil and fuel/air mixture reaches the crank chamber, fine droplets of oil lubricate the crankshaft roller bearings and the con-rod needle bearings and coat the cylinder wall to minimize friction between the wall and piston rings. So that the oil reaches the big end needle bearing, slits and grooves are provided in the con-rod big end.

Oil Pump

The oil pump for the engine lubrication system is a plunger type. It supplies oil to lubricate the cylinder, piston, and crank chamber parts by pumping oil from the oil tank to the fuel/air mixture being drawn into the engine from the carburetor. In this type of system the oil pump output is controlled to regulate the ratio of oil to fuel/air mixture so that proper lubrication is achieved at all engine speeds and loads.

The oil pump output is controlled partially by the number of plunger strokes. The number of plunger strokes is determined by the speed of oil pump gear rotation. Since crankshaft rotation is transmitted through the primary gear, clutch housing gear, drive shaft idle gear, and output shaft idle gear to the oil pump gears, the oil pump output changes in direct proportion to engine rpm.

Oil Flow Rate (421)



The other factor that controls oil pump output is the plunger stroke length. This length is determined by the oil pump cam position, which is controlled by the throttle grip through the throttle grip and oil pump cables. As the cam is turned by its cable, the plunger stroke increases. A greater plunger stroke will pump more oil. As shown in Fig. 421 , the cam turns increasing the oil pump output from minimum to maximum between $35 \sim 80^{\circ}$ of oil pump lever opening.

Pump operation and the path for oil flow through the pump are shown in Fig. 422 . The pump shaft has a worm gear at one end, which meshes with the notches in the plunger. A spring pushes the plunger follower and plunger so that the plunger cam face rests against the camshaft. As the plunger turns, the cam on its face causes it to move back and forth according to the height of the cam. One back and forth movement, in which the plunger makes one complete rotation, makes up two strokes or one cycle.

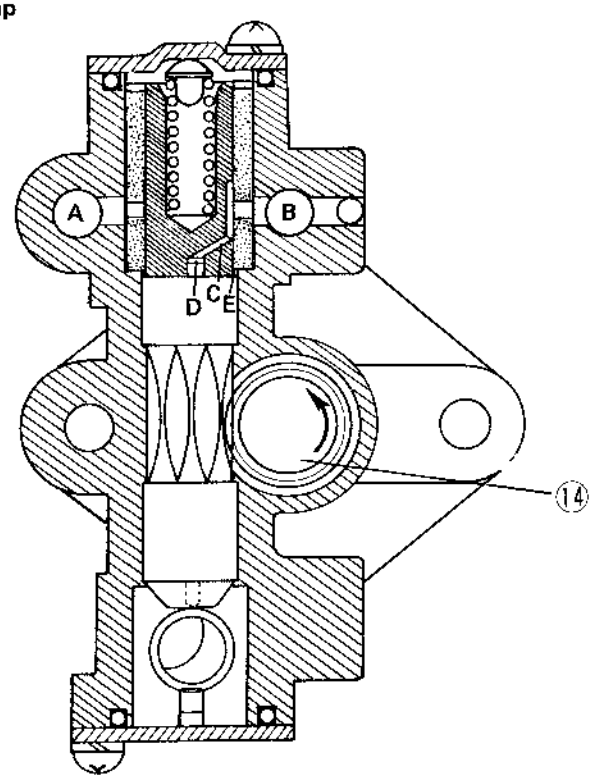
Oil flows into **A**, the oil pump inlet, and then in the inlet passage. As the plunger moves in the direction of the camshaft, a chamber **E** is formed between the plunger follower and the cylinder wall. At this time, the plunger follower is turned so that passage **C** in the plunger follower is aligned with the inlet hole in the valve sleeve, and oil flows from the inlet passage through passage **C**, through space **D**, and into the vacuum in chamber **E**. When the plunger moves back in the other direction on the pumping stroke, chamber **E** becomes gradually smaller. This time, however, the plunger follower rotates so that passage **C** is no longer aligned with the inlet hole in the valve sleeve. Instead, passage **C** is aligned with the valve sleeve outlet hole, and the oil forced from chamber **E** flows through passage **C**, through the valve sleeve outlet hole, and into **B**, the oil pump outlet.

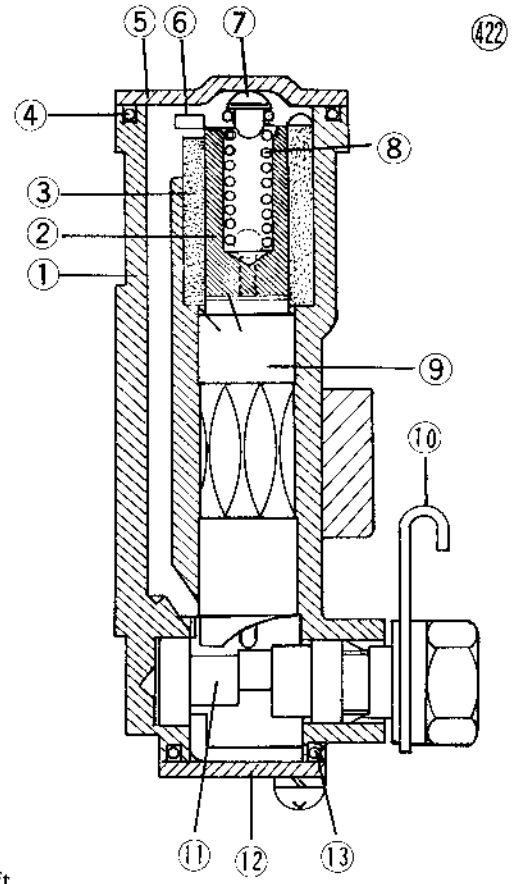
The oil pump is designed so that, at zero throttle when the pump is functioning properly, the oil pump lever lower mark aligns with the mark on the lever stopper, and both the oil pump output that is dependent on the length of the plunger stroke and the throttle valve opening are at their minimum. From this base position the pump lever and the throttle valve move at the same rate as the throttle opens. Any disturbance in this relationship will make the oil pump output too high or too low in relation to the throttle valve opening, resulting in poor performance and spark plug trouble from over-lubrication or piston seizure from under-lubrication.

Pump malfunction is generally caused by a deteriorated or damaged **O** ring or oil seal since the other oil pump parts, being well lubricated by the oil passing through the pump, wear very little and seldom become damaged. A defective part reduces oil pump performance, resulting in under-lubrication. Also, air trapped in an oil hose or the pump itself or a clogged check valve obstructs the flow of oil and results in under-lubrication.

Any good quality 2 stroke engine oil that is recommended for air cooled engines may be used for the Superlube System. Some other type of oil, such as ordinary motor oil or transmission oil, is not acceptable as a substitute for the proper oil. Poor quality or the wrong type of oil may cause serious engine damage.

Oil Pump

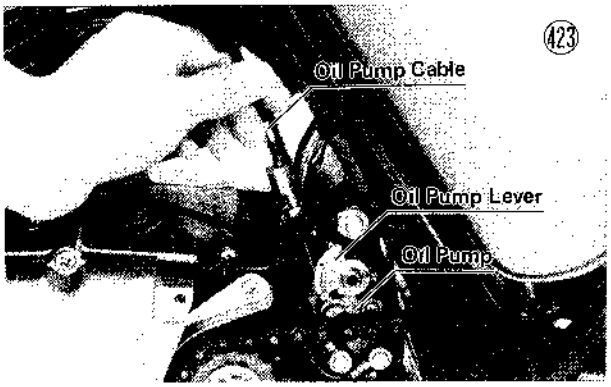




1. Pump Body
2. Plunger Follower
3. Valve Sleeve
4. O Ring
5. Cap
6. Washer
7. Spring Seat
8. Spring
9. Plunger
10. Pump Lever
11. O Ring
12. Cap
13. Camshaft
14. Pump Shaft

Bleeding the oil pump

When either of the oil pump hoses has been removed, air may become trapped inside, which will obstruct oil flow. See that oil flows from the intake hose before reconnecting it to the pump. Bleed the air from the output hose by idling the engine (below 2,000 rpm) while pulling up on the oil pump cable as shown in Fig. 423 in order to maximize the plunger stroke. Keep the engine idling until the air is completely pumped out. If air bubbles continue to appear in the output hose, check the oil hose connections at the pump.



Oil pump performance test

If a drop in oil pump performance is suspected, check the rate that the oil is being pumped.

- Remove the engine sprocket cover and the oil pump cover.
- Remove the muffler (Pg. 30).
- Detach the banjo bolt from the right engine cover, and run the output hose into a container.
- Install the muffler (Pg. 30).
- **USE A 20:1 RATIO OF GASOLINE TO OIL IN THE FUEL TANK IN PLACE OF THE GASOLINE NORMALLY USED.**
- Start the engine, and keep it at 2,000 rpm.
- Pulling up on the oil pump cable, collect the oil that is being pumped for 3 minutes. If the quantity of oil collected corresponds with the table, the oil pump is operating properly.

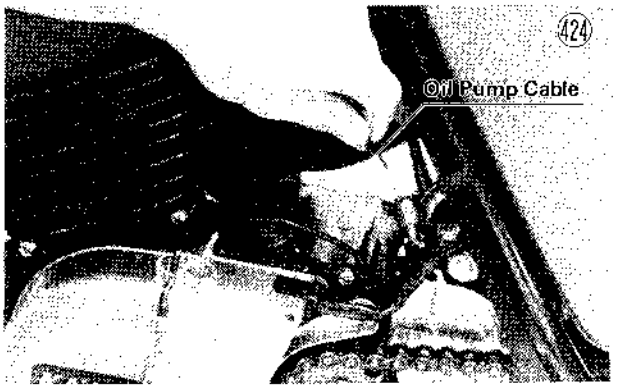


Table 36 Oil Pump Output

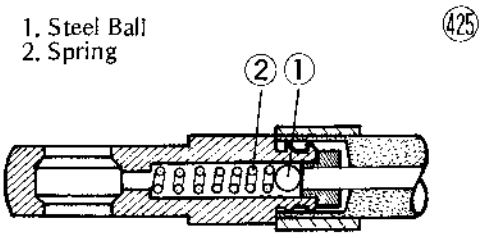
Output/3 minutes @2,000 rpm
3.1~3.7 cc (0.105~0.125 US fl oz)

- If the oil pump output is subnormal, disassemble the pump, inspect the **O** rings and oil seal, and replace if defective. If the trouble is with parts other than the **O** rings or oil seal, replace the oil pump as an assembly. The pump is precision made with no allowance for replacement of individual parts.
- Remove the muffler, and replace the banjo bolt.
- Install the muffler, and replace the oil pump cover and engine sprocket cover.

Check valve

If oil will not pass through the check valve, clean the valve out by using solvent or gasoline in a squirt can or syringe. Do not use compressed air on the valve since doing so would damage the valve spring. If the check valve does not work properly after being cleaned out, either allowing oil to pass in both directions or not allowing oil to pass at all, replace the check valve.

Check Valve



ROTARY VALVE

The rotary valve consists of a rotary disc, valve cover, oil seal, large and small **O** ring, dowel pin, and sleeve. The rotary disc, made of steel, rotates with the crankshaft by virtue of the dowel pin, fitted in a hole in the crankshaft and riding in a groove in the disc hub. The disc is constructed so that as the cutaway portion passes by the intake port in the crankcase, the fuel/air mixture from the carburetor is drawn into the crank chamber below the piston. After the cutaway portion has gone past the intake port, the fuel/air mixture to the crank chamber is cut off.

The groove in the disc hub allows the disc to slide freely along the shaft in the small space between the valve cover and crankcase so that the disc, when the cutaway does not coincide with the intake port, forms a tight seal. It is forced tightly against the crankcase or against the intake port in the valve cover, depending on the pressure in the crank chamber. For example, when the crank chamber is pressurized during the downstroke of the piston, the disc is forced tightly against the intake port in the valve cover by the gas pressure, preventing gas blowback through the carburetor.

This method of drawing in the fuel/air mixture through a port at the side of the crankcase is called the rotary valve system. It contrasts with the method whereby an intake port in the cylinder is opened and closed by the piston as it moves up and down inside the cylinder. The rotary valve system is not dependent on the piston for port timing, in which the timing is symmetrical to BDC. Instead, the timing can be determined freely for higher intake efficiency and elimination of gas blowback.

Table 37 Rotary Valve Timing

Intake Open	Intake Close
BTDC 120°	ATDC 55°

An oil seal and 2 **O** rings in the valve seal off the crank chamber from the area inside the right engine cover. A damaged oil seal or **O** ring thereby results not only in fuel/air mixture leaks, but also in transmission oil being drawn into the combustion chamber. This excess oil adversely affects engine performance the same as though the oil pump were pumping too much oil. Also, as this leakage continues, the transmission may seize from insufficient oil.

Whenever the engine is running, the rotary disc and the inner surface of the valve cover wear against each other. As this wear progresses and the side to side motion of the disc on the shaft increases, and the disc may possibly warp.

Oil seal, O ring damage

Visually inspect the oil seal and the **O** rings. If the lip of the oil seal is deformed, hardened, discolored, or otherwise damaged, replace the oil seal. An **O** ring should be replaced if damaged.

Rotary disc warp, wear

Visually inspect the rotary disc. If the rotary disc has become warped, replace it.

Measure the thickness of the rotary disc. Replace it if it has worn past the service limit.

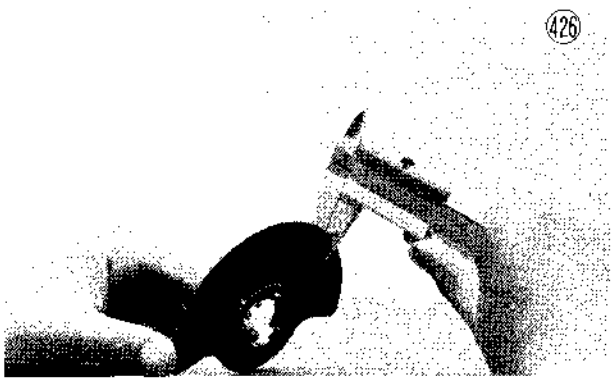


Table 38 Rotary Disc Thickness

Standard	Service Limit
0.396~0.404 mm (0.0156~0.0160 mm)	0.25 mm (0.0098 mm)

Valve cover wear, damage

Visually inspect the valve cover. If it has abrasions or scratches, it should be replaced.

Measure the depth of the inner surface of the valve cover. Replace the valve cover if the inner surface is worn past the service limit.

Valve Cover

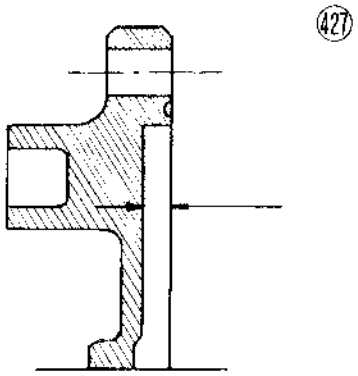


Table 39 Rotary Valve Cover Inner Surface Depth

Standard	Service Limit
0.8~0.9 mm (0.031~0.035 in)	1.2 mm (0.047 in)

ENGINE BEARINGS & OIL SEALS

The engine bearings and oil seals are listed in tables 40 & 41 . Worn or damaged bearings cause engine noise, power loss, and vibration, adversely affect engine and transmission parts, and shorten engine life. The crankshaft oil seals serve to seal the crank chamber, and, if damaged, will permit leaks to the crank chamber, causing a loss of power. Also, the crankshaft oil seal in the rotary valve cover forms a seal between the crank chamber and the transmission part of the crankcase, and, if damaged, will allow oil to be drawn into the crank chamber, causing running problems from an oil rich mixture. Any damaged, hardened, or otherwise defective oil seal will allow oil to leak.

Table 40 Bearings

Crankshaft		Drive Shaft		Output Shaft	
Left	Right	Left	Right	Left	Right
#6204	#6304	7E-HK1412	#6203	#6004	7E-HK1412

Roller bearing wear, damage

Since the roller bearings are made to extremely close tolerances, the clearance cannot normally be measured. Therefore, the condition of the bearings must be judged by feel. Wash each bearing with gasoline, 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. Before reinstalling the bearing, replace its oil seal for a new one. Press in the bearing so that its face is level with that of the crankcase.

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.

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 in with the mark facing out. Press in until the oil seal stops.

FUEL TANK

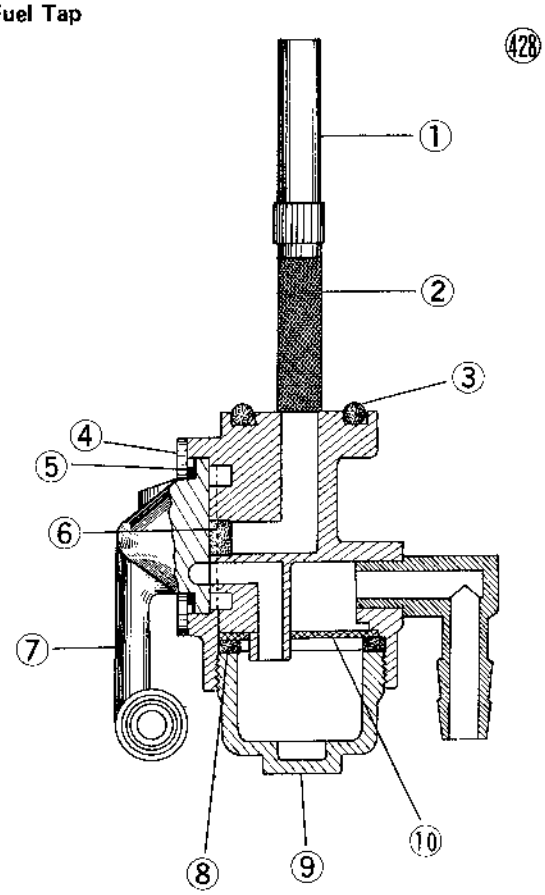
The fuel tank capacity is 7.4 liters (1.95 US gal), 1 liters (¼ US gal) of which forms the reserve supply. A cap is attached to the top of the tank, and a fuel tap to the bottom at one side. Air vents are provided in the cap so that, when the tap is turned on, low pressure, which would hinder or prevent fuel flow to the carburetor, will not develop in the tank.

Fuel tap construction is shown in Fig. 428 . The fuel tap has three positions: off, on, and reserve. With the tap in the off position, no fuel will flow through the tap; with the tap in the on position, fuel flows through the tap by way of the main pipe until only the reserve supply is left in the tank; with the tap in the reserve position, fuel flows through the tap from the bottom of the tank. The fuel tap contains a strainer and a sediment cup to filter out dirt and collect water.

Table 41 Oil Seals

Crankcase				Valve Cover	Right Cover
Crankshaft	Output Shaft	Push Rod	Shift Shaft	Crankshaft	Kick Shaft
PKB204007		RSD6205.5	TB12205.5	PKB254007	SB16244

Fuel Tap



1. Main Pipe
2. Reserve Pipe
3. O Ring
4. Plate
5. Wave Washer
6. Valve Gasket
7. Tap Lever
8. Gasket
9. Sediment Cup
10. Filter

Inspection and cleaning

If fuel leaks from the cap or from around the fuel tap, the cap or tap gasket may be damaged. Visually inspect these parts, and replace if necessary.

Examine the air vents in the cap to see if any are obstructed. Use compressed air to clear any obstructed vents.

Periodically inspect and clean the fuel tap strainer and the sediment cup, using gasoline and a fine brush on the strainer. If the strainer is damaged, it must be replaced. If the sediment cup contains much water or dirt, the fuel tank and the carburetor may also need to be cleaned.

To clean out the fuel tank, disconnect the fuel hose, remove the fuel tap, and flush out the tank with gasoline. To clean out the carburetor float bowl, remove the carburetor (Pg. 34), and remove the four screws to take off the bowl. Drain the fuel, and clean out any sediment.

WHEELS

Wheel construction is shown in Fig. 429 and 430. The following sections Pgs. 118~124 cover the tire, rim and spokes, axle, grease seals, wheel bearings, and brakes.

TIRES

The tires are designed to provide good traction and power transmission during acceleration and braking even under bad surface conditions when they are inflated to the correct pressure and not overloaded. The maximum recommended load in addition to vehicle weight is 136 kg (275 lbs).

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. However, for continuous high speed travel, increase the tire pressure from 0.2~0.4 kg/cm^2 (3 ~ 6 psi) in order to minimize heat buildup. Also, a certain variation from the standard pressure may be desired depending on road surface conditions (rain, ice, rough surface, etc.).

Table 42 Tires, Air Pressure (measured when cold)

	Make	Size	Air Pressure
Front	NITTO NT102B	2.75-21 4PR	1.6 kg/cm^2 (23 psi)
Rear		3.50-18 4PR	2.0 kg/cm^2 (28 psi)

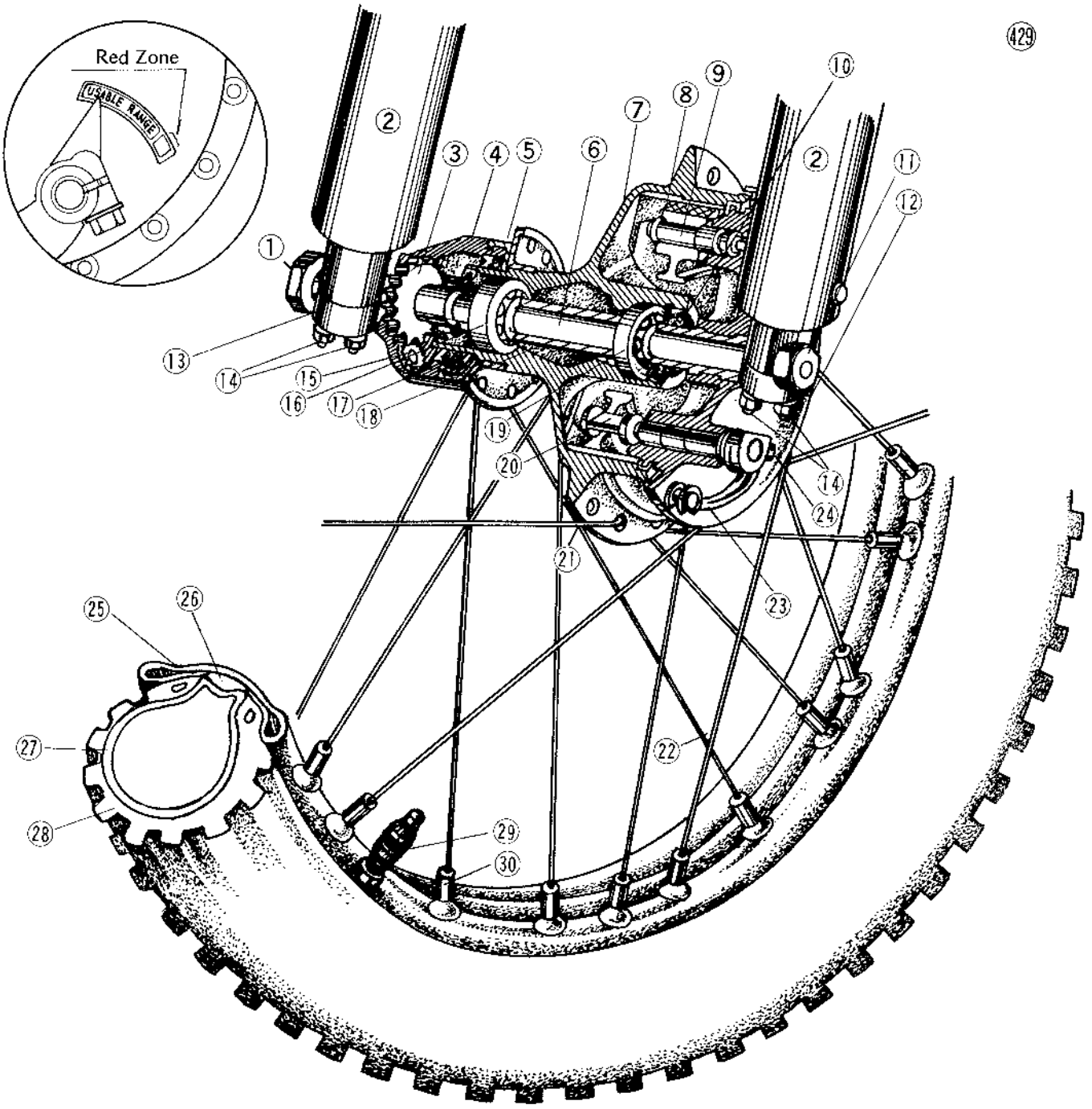
A bead protector is provided on the rear wheel to keep the tire from slipping on the rim and damaging the valve stem when the brakes are heavily applied.

Tire wear, damage

Tires must not be used until they are 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.

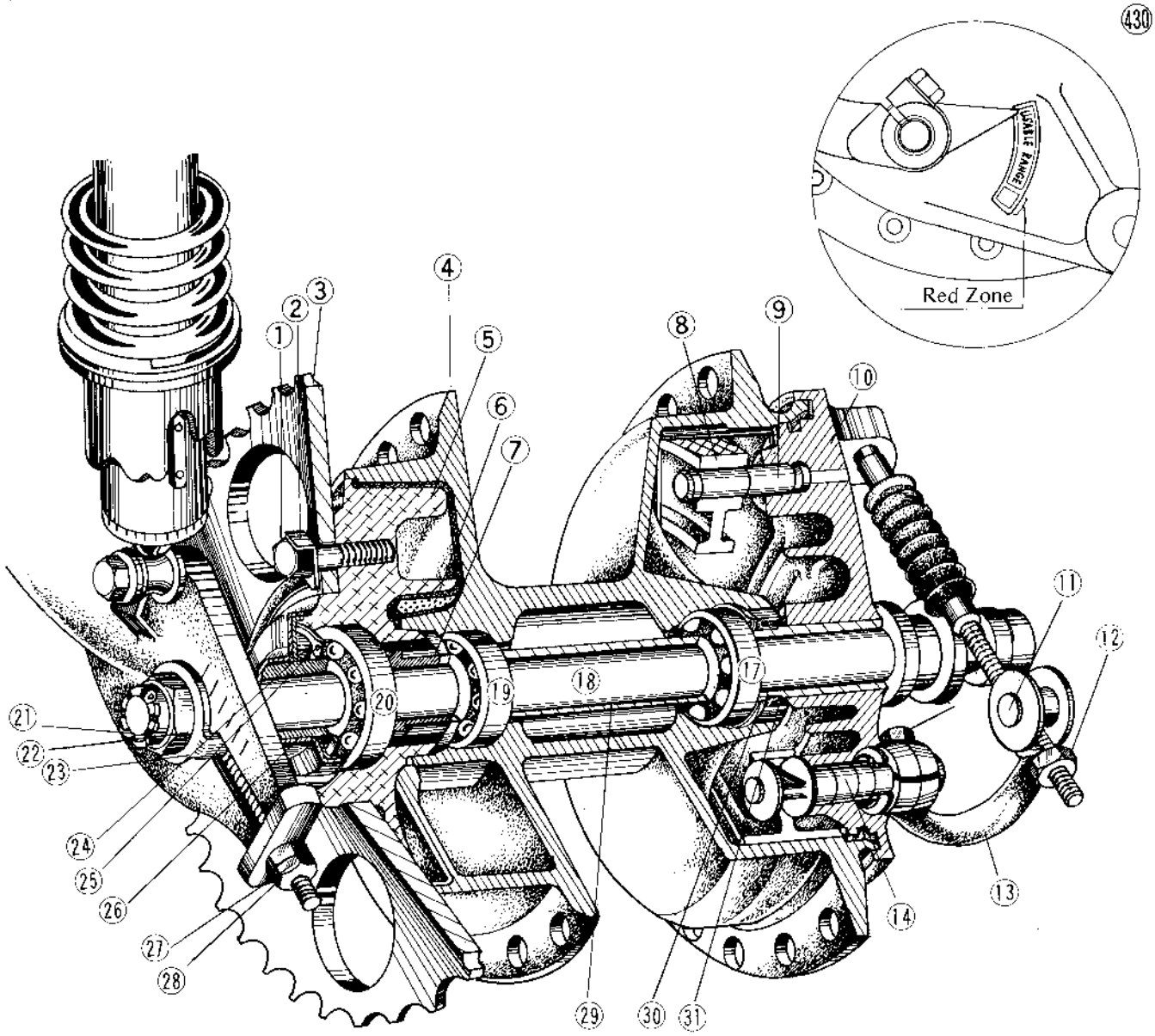
Front wheel

Brake Lining Wear Indicator



1. Axle Nut
2. Front Fork
3. Speedometer Gear
4. Gear Housing
5. Dust Cover
6. Axle
7. Front Hub
8. Brake Shoe
9. Shoe Anchor Pin
10. Grease Seal
11. Axle Nut
12. Brake Panel
13. Axle Clamp
14. Nut
15. Speedometer Pinion
16. Ball Bearing
17. Grease Seal
18. Distance Collar
19. Ball Bearing
20. Cam Shaft
21. Inner Spoke
22. Outer Spoke
23. Cam Lever
24. Bolt
25. Rim
26. Rim Band
27. Tube
28. Tire
29. Valve Stem
30. Nipple

Rear Wheel



1. Nut
2. Washer
3. Cotter Pin
4. Axle Nut
5. Grease Seal Cap
6. Rear Sprocket
7. Grease Seal
8. Circlip
9. Bearing
10. Sleeve
11. Coupling
12. Bearing
13. Shock Damper Rubber
14. Rear Hub
15. Distance Collar
16. Bearing
17. Circlip
18. Grease Seal
19. Brake Shoes
20. Springs
21. Cam Shaft
22. Brake Panel
23. O Ring
24. Brake Lining Wear Indicator
25. Bolt
26. Washer
27. Cam Lever
28. Spool Spacer
29. Axle

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 43 Tire Tread Depth

	Standard	Service Limit
Front	8 mm (0.315 in)	2 mm (0.08 in)
Rear	11 mm (0.433 in)	3 mm (0.12 in)

RIM & SPOKES

The rim of each wheel is made of steel and is connected to the hub by the spokes. A rim band around the outside center of the rim keeps the tube from coming into direct contact with the rim and the spoke nipples.

The spokes are connected to the hub at a tangent and in different directions so that different spokes bear the brunt of the load during 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. 432 A), 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 & C, the spokes that are not stretched (omitted from the diagram) are slightly loose and do not provide support. A damping action to the shock from the ground 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.

Table 44 Rim, Spoke Size

	Rim	Spokes	
		Inner	Outer
Front	1.60Ax21	#9-#10x227 (Right)	#9-#10x227 (Right)
		#9-#10x239.5 (Left)	
Rear	1.85Bx18W	#9-#10x171 (Right)	#9-#10x170 (Right)
		#9-#10x167.5 (Left)	#9-#10x166.6 (Left)

NOTE: The rim size in table 44 is outer width by diameter, both in inches. The "W" means that the rim is welded. 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.

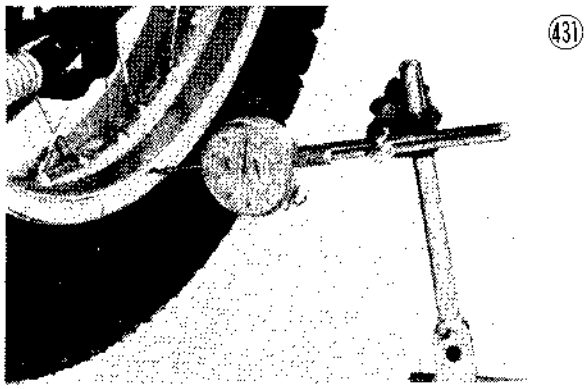
Spoke breakage

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

Periodically check that all the spokes are tightened evenly since they stretch a certain amount during use. Standard spoke tightening torque is 25 ~ 30 kg-cm (22 ~ 26 in-lbs). Over or under tightening may cause breakage.

Rim runout

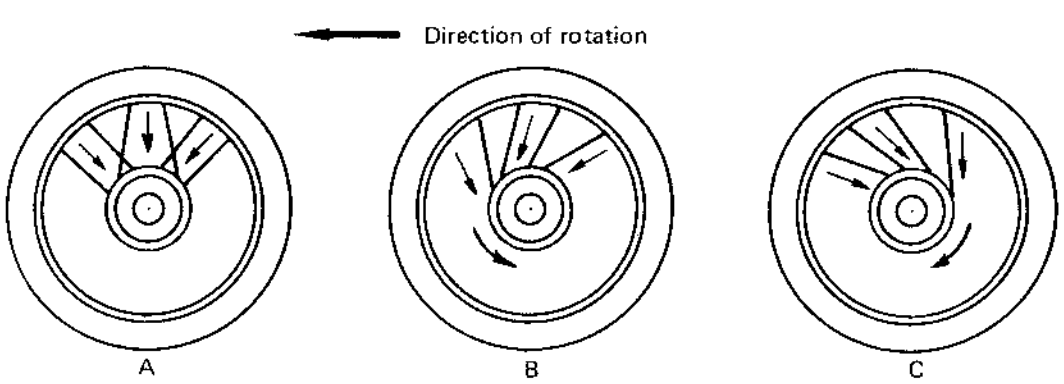
Set a dial gauge to the side of the rim, and rotate the wheel to measure axial runout. The difference between the highest and lowest dial reading is the amount of runout.



(431)

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 reading is the amount of runout.

Spoke Force



(432)

Table 45 Rim Runout

	Standard	Service Limit
Axial	under 0.5 mm (under 0.02 in)	2.0 mm (0.079 in)
Radial	under 0.8 mm (under 0.03 in)	2.0 mm (0.079 in)

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

AXLE

A bent axle causes vibration, poor handling, and instability.

To measure axle runout, remove the axle, place it in V blocks that are 100 mm (4.0 in) 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 (0.028 in), replace the axle.

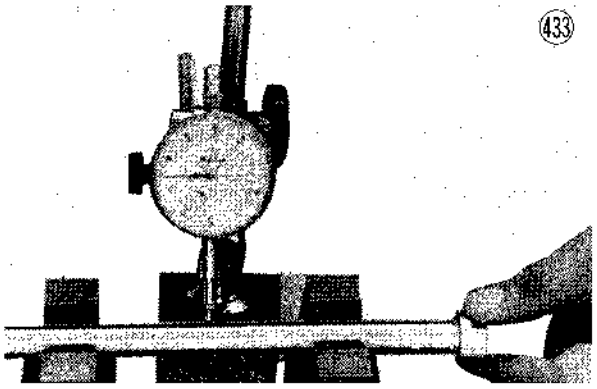


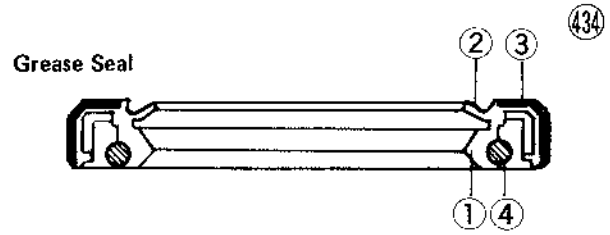
Table 46 Axle Runout/100 mm(4.0 in)

	Standard	Service Limit
Front	0.1 mm (0.0039 in)	0.2 mm (0.079 in)
Rear	0.05 mm (0.002 in)	0.2 mm (0.079 in)

GREASE SEALS & WHEEL BEARINGS

A grease seal is fitted in both sides of the front hub and in the left side of the rear hub. Each grease seal is a rubber ring equipped with a steel band on its outer circumference. The grease seal inner rib is held against the axle collar by a wire spring band. Since the grease seal not only seals in the wheel bearing grease but also keeps dirt and moisture from entering the hub, the use of a damaged grease seal will cause the wheel bearing to wear quickly. A grease seal is also fitted in the front brake panel to keep speedometer gear and bearing grease from getting on the brake linings. Also, this grease seal prevents the minute particles from the brake linings from reaching the speedometer gear and wheel bearings.

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.



1. Primary Lip
2. Secondary Lip
3. Metal Band
4. Wire Spring Band

Inspection and lubrication

If the grease seals are examined without removing the seals themselves, look for discoloration (indicating the rubber has deteriorated), hardening, damage to the internal ribbing, or other damage. If the seal or internal ribbing has hardened, the clearance between the seal and the axle sleeve will not be taken up, which will allow dirt and moisture to enter and reach the bearing. Whenever 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 gasoline, 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 gasoline, 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

Table 47 Grease Seals, Wheel Bearings

	Front Wheel		Rear Wheel		
	Hub Left	Hub Right	Coupling	Hub Left	Hub Right
Bearing	#6301	#6201	#6004	#6202	#6202
Grease Seal	PJA193707	PJA405208	PJA264208		PJA223508

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) approximately every year or 10,000 km (6,000 mi), whichever comes sooner.

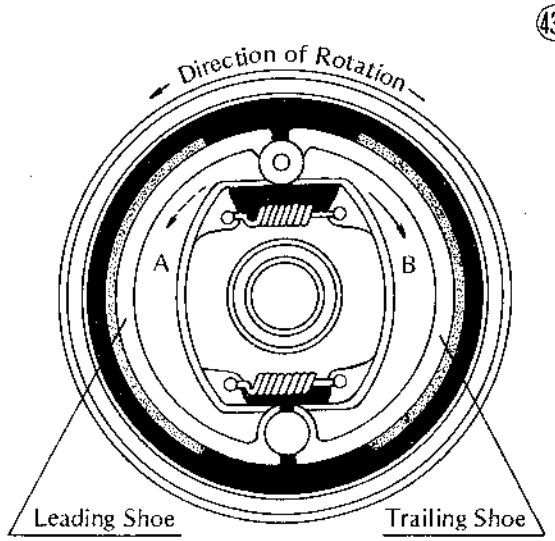
BRAKES

The front and rear wheels are both equipped with a leading-trailing type of drum brake. "Leading-trailing" means that one of the two brake shoes leads, expanding against the drum in the direction of drum rotation, and the other shoe trails, expanding in the direction opposite drum rotation.

On both the front and rear brakes, the force applied by the rider upon braking is transmitted into the interior of the brake by a camshaft. The force applied at the brake lever or pedal is transmitted by a cable to the cam lever which then turns the camshaft. When the camshaft rotates, the large portion of the cam is forced between the two brake shoes. Since the shoes are only held together away from the drum by springs, the cam, overcoming spring tension, pushes the shoes outward against the drum. The leading shoe rotates in direction "A", and the trailing shoe in direction "B" as shown in the diagram.

The friction between the linings and the drum, which decelerates the motorcycle, gradually wears down the brake shoe linings. On the outside of each brake panel is a brake lining wear indicator, which, as the brake is applied, moves in direct proportion to the distance that the brake shoe linings move to reach the brake drum. As the linings wear down, the lining surface has farther to travel before reaching the drum. The indicator accordingly travels farther until it finally reaches the red zone when the lining wear has reached the service limit.

Brake



Due to wear of the brake drum, shoe linings, and cam, periodic brake adjustment is required. However, if the brake parts become overworn, adjustment will not be sufficient to ensure safe brake operation. Not only can overworn parts crack (drum) and otherwise suffer damage as they lose their braking effectiveness, but, if the cam wears to the point where it turns nearly horizontal when the brake is fully applied, the brake may lock in the operated position, or brake lever or pedal return may be very sluggish. All brake parts should be checked for wear at least every 10,000 km (6,000 mi).

Brake drum wear

Measure the inside diameter of the brake drum with calipers to determine wear. Since uneven drum wear will decrease braking effectiveness, take measurements at a minimum of two places. If the drum is worn unevenly or if it is scored, turn the drum down on a brake drum lathe or replace the hub. (Do not turn it down to the service limit, and do not turn it down if any diameter measurement exceeds the service limit.) If any diameter measurement exceeds the service limit, replace the hub for a new one.

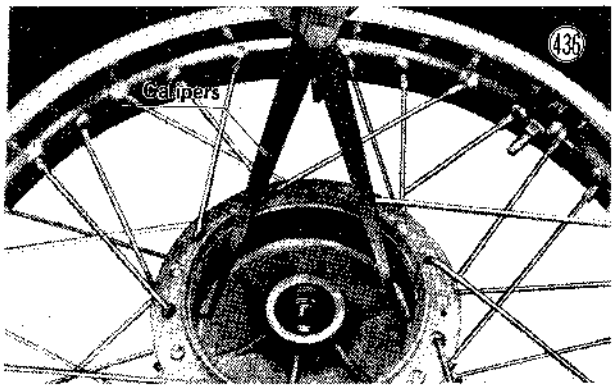
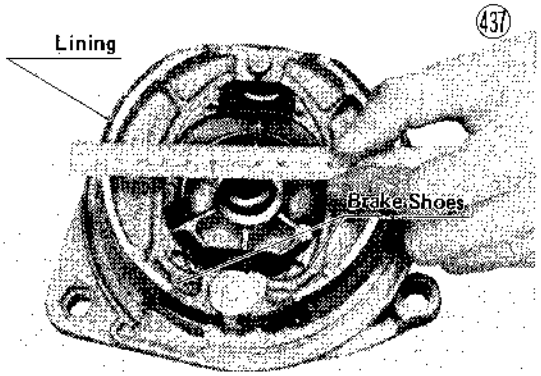


Table 48 Brake Drum Inside Diameter

	Standard	Service Limit
Front	120.000~120.140 mm (4.724~4.730 in)	120.75 mm (4.75 in)
Rear	130.000~130.160 mm (5.118~5.124 in)	130.75 mm (5.15 in)

Brake shoe lining wear

Check the thickness of the brake linings, and replace both shoes as a set if the thickness at any point is less than the service limit. If the thickness of the brake linings is sufficient, check the linings for uneven wear, and file or sand down any high spots. With a wire brush, remove any foreign particles imbedded in the lining surface. Wash off any oil or grease with gasoline. In case the linings are damaged or the surface cannot be restored by sanding and cleaning, the shoes must be replaced.



(437)

Table 49 Brake Lining Thickness

Standard	Service Limit
4 mm (0.16 in)	2 mm (0.08 in)

Brake shoe spring tension

If the brake springs become stretched, they will not pull the shoes back away from the drum after the brake lever or pedal is released, causing the shoes to drag on the drum. Remove the springs, and check their free length with vernier calipers. If either is stretched beyond the service limit, replace both springs.

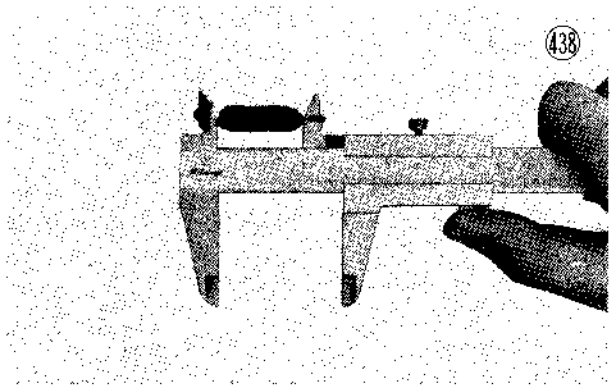

(438)

Table 50 Brake Spring Free Length

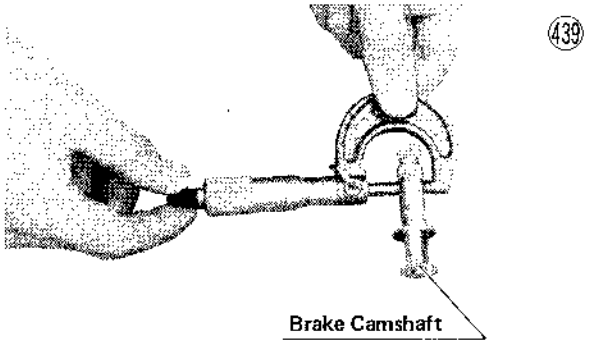
	Standard	Service Limit
Short Spring	30.8~31.2 mm (1.213~1.288 in)	34 mm (1.34 in)
Long Spring	44.5~45.5 mm (1.752~1.791 in)	48 mm (1.89 in)

Camshaft, shaft hole wear

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

Measure the shaft diameter with a micrometer, and replace it if it is worn down to less than the service limit.

Measure the inside diameter of the camshaft hole, and replace the brake panel if the hole is worn past the service limit.



(439)

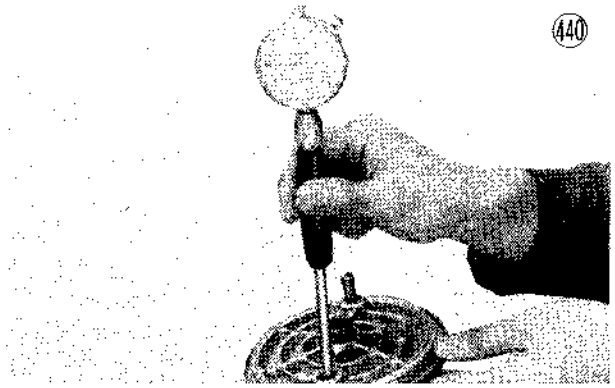
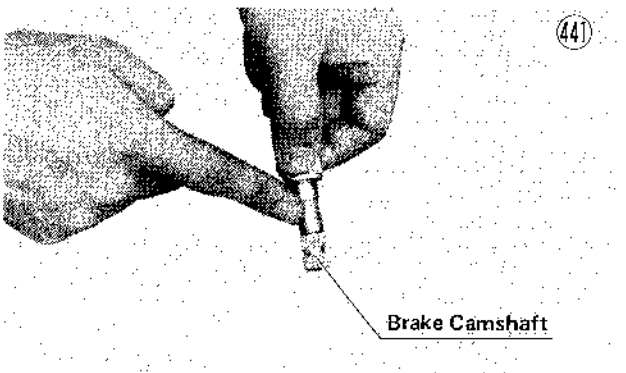

(440)

Table 51 Brake Camshaft, Hole Diameter

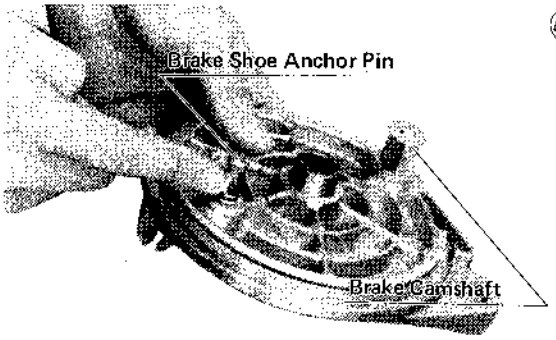
	Standard	Service Limit
Camshaft	11.957~11.984 mm (0.4707~0.4718 in)	11.83 mm (0.466 in)
Shaft Hole	12.000~12.027 mm (0.4724~0.4735 in)	12.18 mm (0.480 in)

Lubrication

Every time that the brakes are disassembled, but at least every year or 10,000 km (6,000 mi), wipe out the old grease, and re-grease the brake pivot points. Apply grease to the brake shoe anchor pins, spring ends, and cam surface of the camshaft, and fill the camshaft groove with grease. Do not get any grease on the brake shoe linings, and wipe off any excess grease so that it will not get on the linings or drum after brake assembly.



(441)

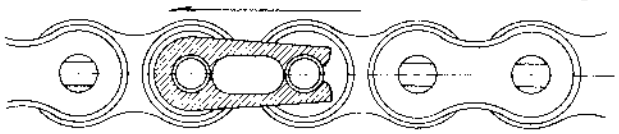


442

DRIVE CHAIN

The drive chain used to transmit the engine power to the rear wheel is the Enuma EK428 SH-G 118 link chain. This chain is provided with a master link to facilitate removal and replacement. To minimize any chance of the master link dislodging, the master link is fitted with the closed end of the "U" pointed in the direction of chain rotation. See Fig. 443

Direction of Chain Rotation


443

Chain construction is shown in Fig. 445 . 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 rapidly accelerates.

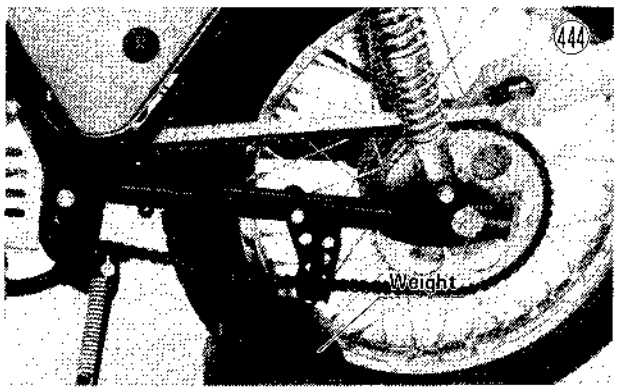
The rate of wear can be greatly reduced, however, by frequent and adequate lubrication, especially between the side plates of the links so that oil can reach the pins and bushings inside the rollers.

Wear

When the chain has worn so much that it is more than 2% longer than when new, it is no longer safe for use and should be replaced. Whenever the chain is replaced, inspect both the engine and rear sprockets, and replace for new ones if necessary. Overworn sprockets will cause a new chain to wear quickly.

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 (20 lb) 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. If the length is greater than the service limit, the chain should be replaced.

NOTE: The drive system was designed for use with the Enuma EK428 SH-G 118 link chain. For maximum strength and safety, the Enuma EK428 SH-G 118 link chain must be used for replacement.



444

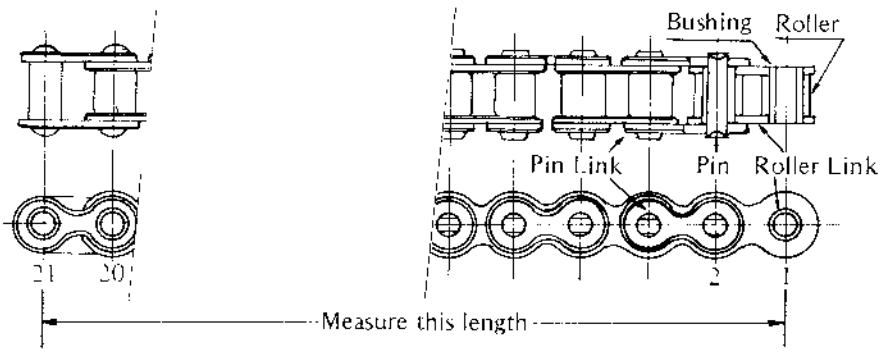
Table 52 Drive Chain Length

	Standard	Service Limit
20-link Length	254 mm (10.0 in)	259 mm (10.2 in)

Lubrication

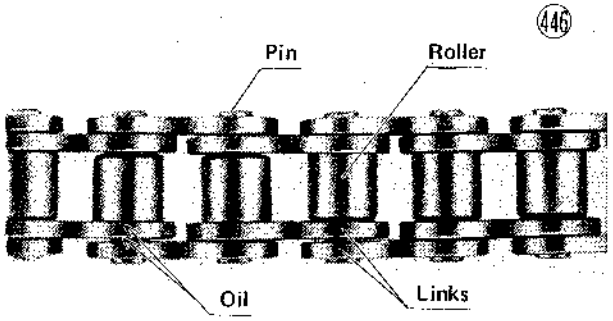
In order for the chain to function safely and wear slowly, it should be properly lubricated at least once a week or every 800 km (500 mi), whichever comes sooner. Lubrication is also necessary after riding through rain or on wet roads, or any time that the chain appears

Drive Chain



445

dry. Anytime that the motorcycle including the chain 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 pins and bushings where most wear takes place. Wipe off any excess oil.

Dirt will cling to the oil and act as an abrasive, accelerating chain wear. Whenever the chain becomes particularly dirty, it must be cleaned in kerosene and then soaked in a heavy oil. Shake the chain while it is in the oil so that oil will penetrate to the inside of the rollers. If choosing to boil the chain in grease, better oil penetration to the interior is achieved, but care must be taken not to overheat the grease.

SPROCKETS

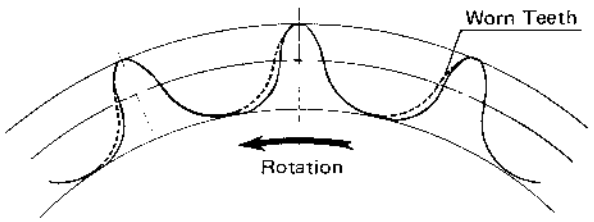
There are two sprockets for the drive chain. A forward sprocket, or engine sprocket, is mounted on the end of the output shaft and is used to drive the chain. A rear sprocket is connected to the rear wheel hub through the rear wheel coupling and is driven by the chain to turn the rear wheel.

Sprockets that have become excessively worn cause trouble with the chain 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 riding at high speed. The sprockets should be checked for wear and the rear sprocket for warp any time that the chain is replaced.

Sprocket wear

Visually inspect the sprocket teeth. If they are worn as illustrated, replace the sprocket.

Sprocket Teeth (447)



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

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.

(448)

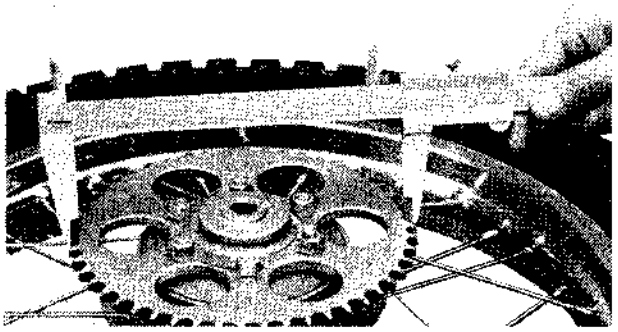


Table 53 Sprocket Diameter

	Standard	Service Limit
Engine	48.37~48.57 mm (1.904~1.912 in)	48 mm (1.89 in)
Rear	143.46~193.76 mm (7.62~7.63 in)	192 mm (7.56 in)

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. 449 . Rotate the rear wheel. The difference between the highest and lowest dial gauge reading is the amount of runout (warp).

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

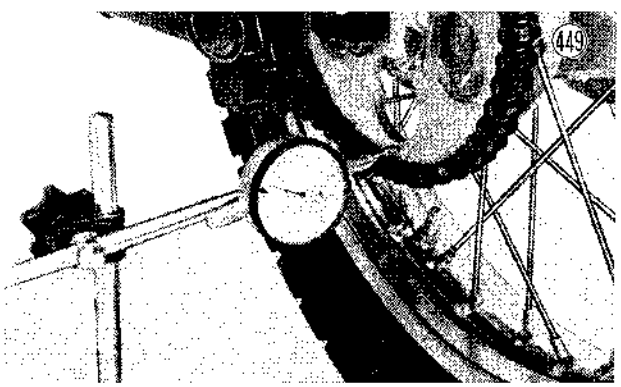


Table 54 Rear Sprocket Warp

Standard	Service Limit
under 0.3 mm (under 0.012 in)	0.5 mm (0.020 in)

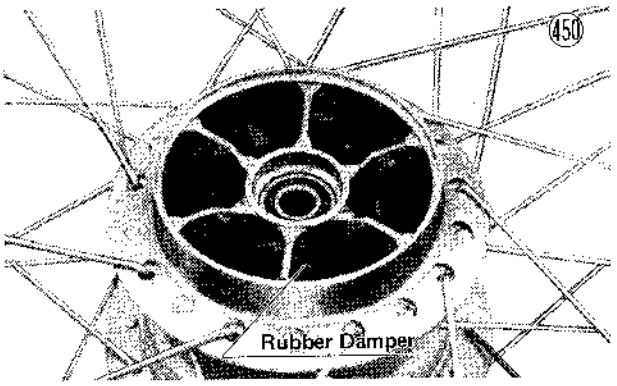
REAR WHEEL COUPLING

The rear wheel coupling connects the rear sprocket to the wheel. The forces that are transmitted between the rear sprocket and the rear hub are transmitted through rubber shock dampers in the coupling to absorb some of the shock resulting from sudden changes in torque due to acceleration or braking.

Damper inspection

Remove the rear wheel coupling (Pg. 69), and inspect the rubber dampers.

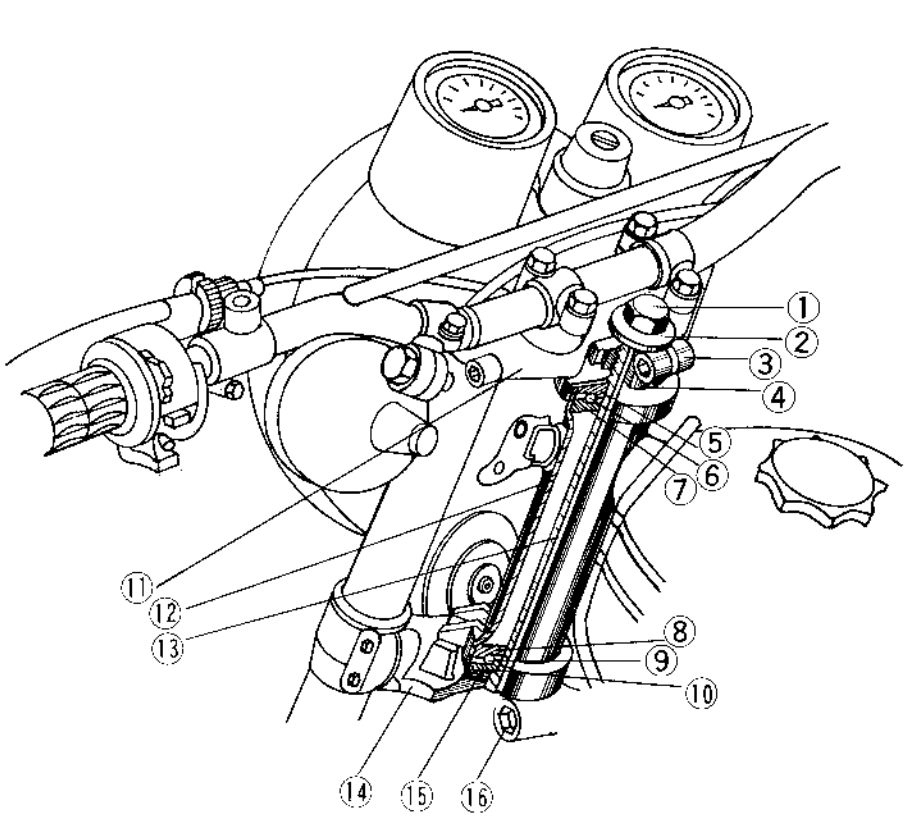
Replace the dampers if any appear damaged or deteriorated.



STEERING STEM

The steering stem supports the handlebar, front fork shock absorbers, and front fender, 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.

Steering Stem



1. Stem Head Bolt
2. Washer
3. Stem Head Clamp
4. Stem Lock Nut
5. Inner Race
6. Bearing Balls
7. Outer Race
8. Outer Race
9. Bearing Balls
10. Inner Race
11. Stem Head
12. Head Pipe
13. Steering Stem Shaft
14. Steering Stem Base
15. Grease Seal
16. Steering Stem Base Clamp Bolt

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 55 Bearing Ball Specifications

	Size	Number
Upper	3/16"	23
Lower	1/4"	19

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

Every two years or 20,000 km (12,000 mi), whichever comes sooner, and whenever the steering stem is disassembled, the steering stem bearings should be relubricated.

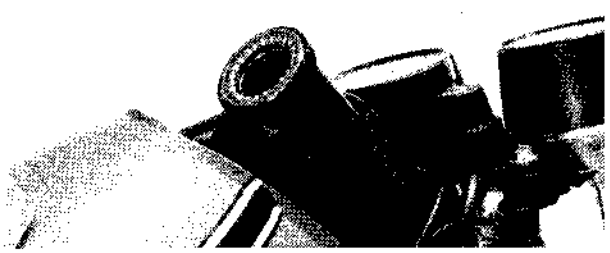
Wipe all the old grease off the races and balls, washing them in gasoline if necessary. Replace the bearing parts if they show wear or damage. Apply grease liberally to the upper and lower races, and stick the bearing balls in place with grease.

Grease seal deterioration, damage

Inspect the grease seal for any signs of deterioration or damage, and replace it if necessary.

Replace the grease seal for a new one whenever it has been removed. The grease seal comes off whenever the lower bearing inner race is removed.

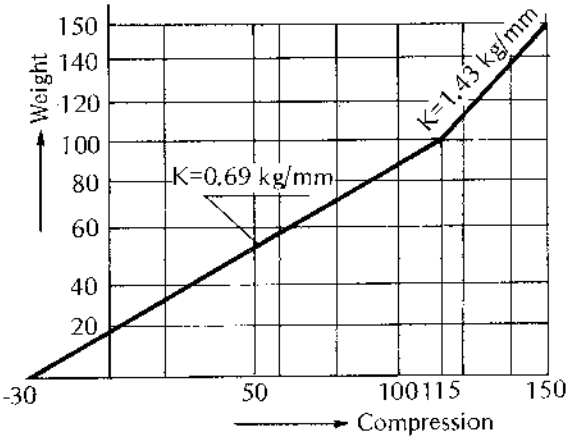
(452)



FRONT FORK

Front fork construction is shown in Fig. 454 . It consists of two shock absorbers 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.

Front Spring Force (453)



Each shock absorber is a telescopic tube including an inner tube ⑪, outer tube ⑮, cylinder ㉒, piston ⑯, collar ㉑, and cylinder base ㉓. 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 ⑰) is secured to the top of the cylinder. The collar (coupled with a non-return valve ⑳), 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 functions to form an oil lock at the end of the compression stroke to prevent the inner tube from striking the bottom. Vertically arranged orifices (3) 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.

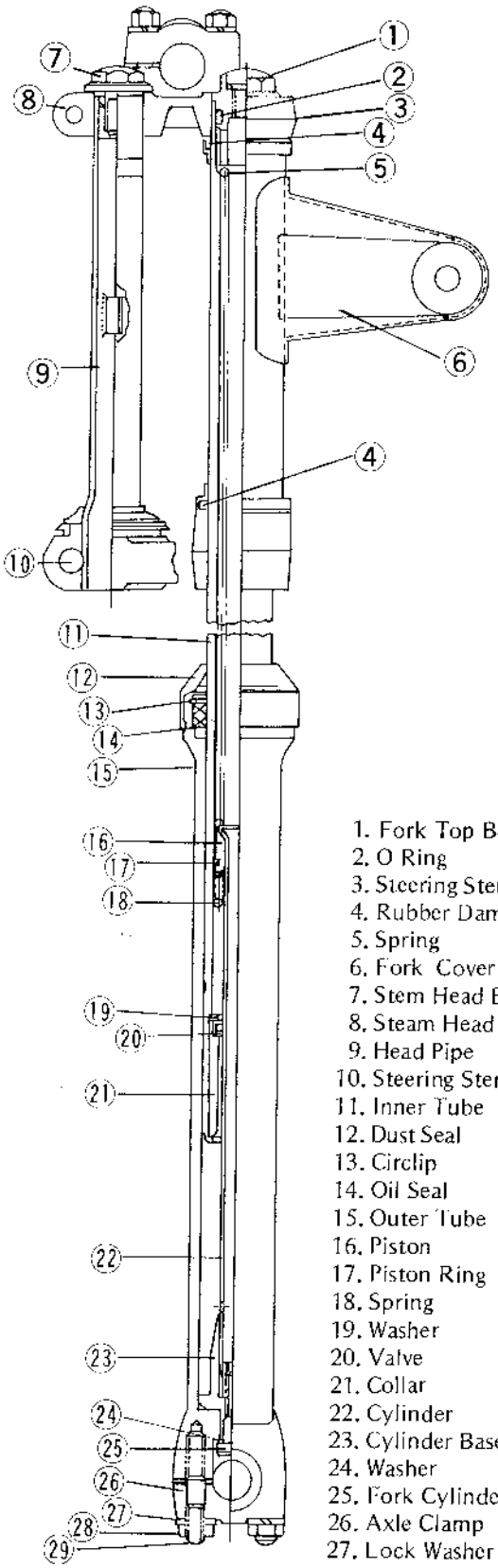
Oil is prevented from leaking out by the oil seal ⑭ , which is fitted at the upper end of the outer tube. A dust seal ⑫ on the outside of the tube keeps dirt and water from entering and damaging the oil seal and tube surface.

Compression stroke

Whenever a load is placed on the front fork and whenever the front wheel receives a shock, the inner tube moves down inside the outer tube ④ , 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 ⑩ , 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 ⑧ into the upper chamber, oil also passes freely through the cylinder lower orifices into the cylinder as the inner tube approaches the cylinder base

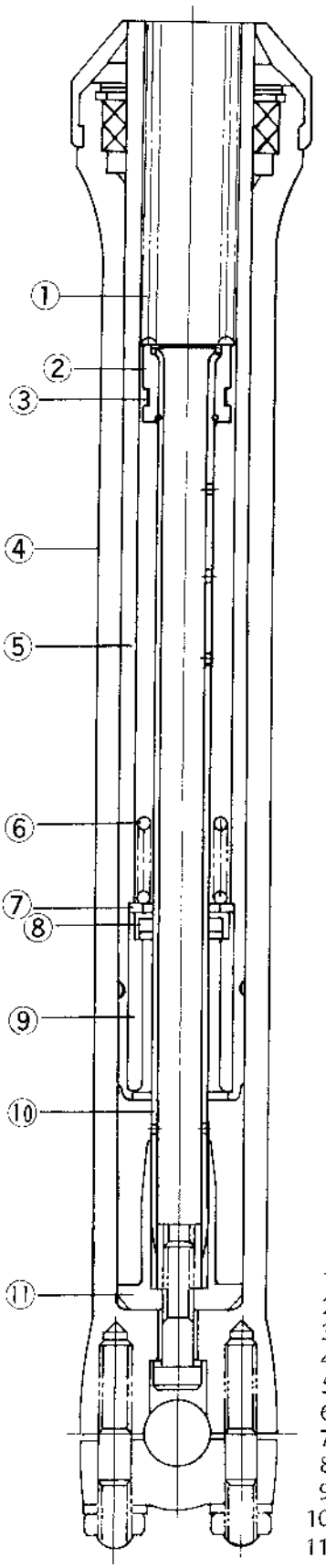
. Near the end of the compression stroke, the clearance between the tapered-out cylinder base and the collar at the lower end of the inner tube approaches zero. The resulting resistance to the flow of oil through this small space slows the downward movement, finally forming an oil lock to finish the compression stroke.

Front Fork (454)



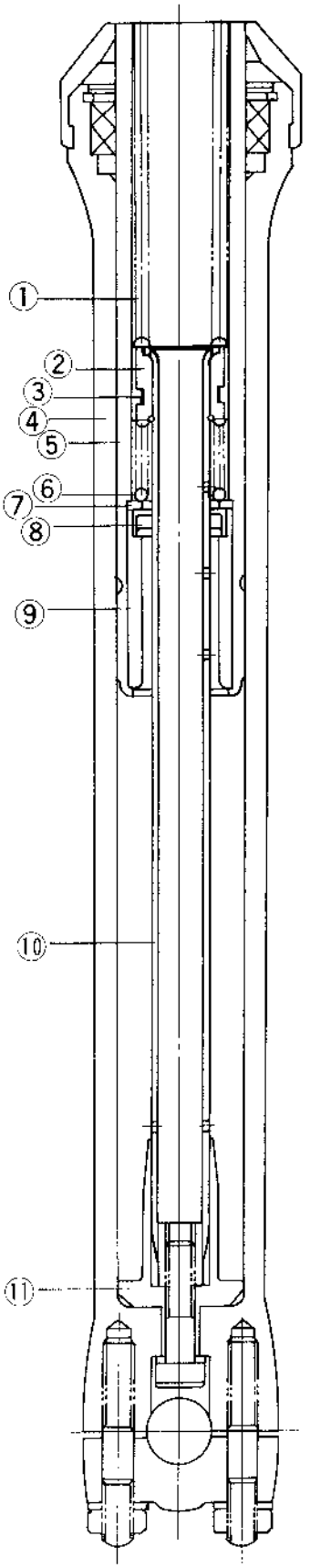
1. Fork Top Bolt
2. O Ring
3. Steering Stem Head
4. Rubber Damper
5. Spring
6. Fork Cover
7. Stem Head Bolt
8. Steam Head
9. Head Pipe
10. Steering Stem Base
11. Inner Tube
12. Dust Seal
13. Circlip
14. Oil Seal
15. Outer Tube
16. Piston
17. Piston Ring
18. Spring
19. Washer
20. Valve
21. Collar
22. Cylinder
23. Cylinder Base
24. Washer
25. Fork Cylinder Bolt
26. Axle Clamp
27. Lock Washer
28. Nut
29. Stud Bolt

Compression Stroke (455)



1. Spring
2. Piston
3. Piston Ring
4. Outer Tube
5. Inner Tube
6. Spring
7. Washer
8. Valve
9. Collar
10. Cylinder
11. Cylinder Base

Extension Stroke



(456)

1. Spring
2. Piston
3. Piston Ring
4. Outer Tube
5. Inner Tube
6. Spring
7. Washer
8. Valve
9. Collar
10. Cylinder
11. Cylinder Base

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 resist the oil flow into the inner tube, 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 as upper chamber outlets one by one. When the last one is eliminated, an oil lock forms, finishing the extension stroke.

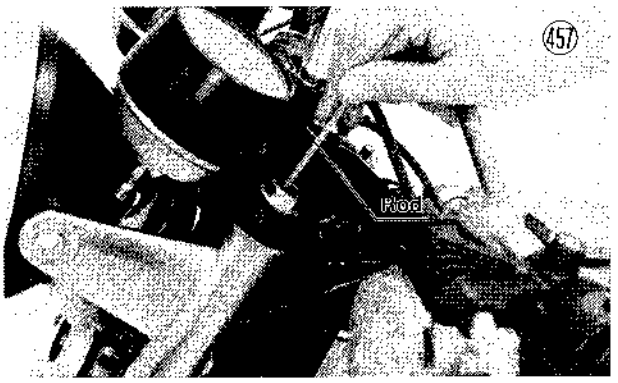
Either too much or too little oil in the shock absorbers will adversely affect shock damping. Too much oil or too heavy an oil makes action too stiff; too little oil or too light an oil makes the action soft, decreases damping potential, and may cause noise during fork movement.

Contaminated or deteriorated oil will also affect shock damping, and, in addition, will accelerate internal wear. The fork oil should be changed every 10,000 km (6,000 mi) or sooner if the oil appears dirty.

A bent, dented, scored, or the 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 screw from the top bolt. Insert a rod down into the tube, and measure the distance from the top of the top bolt 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.

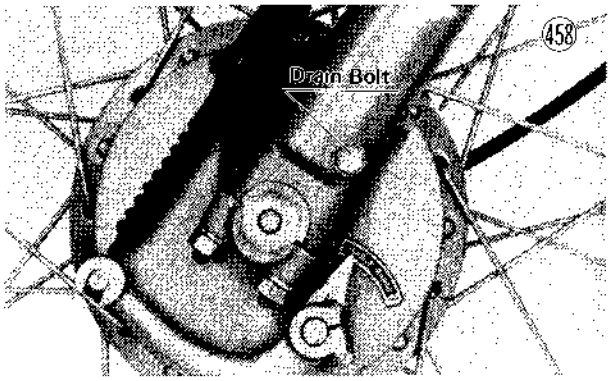


(457)

Table 56 Fork Oil

Type	Amount per side	Oil level from top of top bolt
SAE 5W20	14.5~155 cc (4.9~5.2 US fl oz)	385~415 mm (15.2~16.3 in)

To drain out the old oil, remove the drain bolt from the lower end of the outer tube on each side. With the front wheel on the ground, push down on the handlebar a few times to pump out the oil. Replace the drain bolts, remove the top bolt from each side, and pour in the specified type and amount of oil. Then replace the top bolts, tightening them with 1.5~2.0 kg-m (11~14.5 ft-lbs) of torque.



Spring tension

Since the spring becomes shorter as it weakens, check its free length to determine its condition. If the spring of either shock absorber 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 shock absorbers balanced for motorcycle stability.

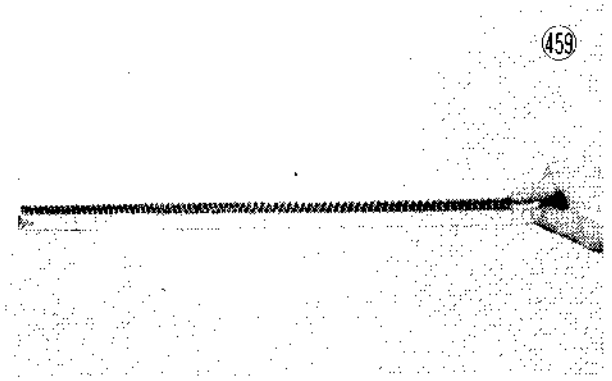


Table 57 Fork Spring Free Length

Standard	Service Limit
500.2 mm (19.7 in)	490 mm (19.3 in)

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.

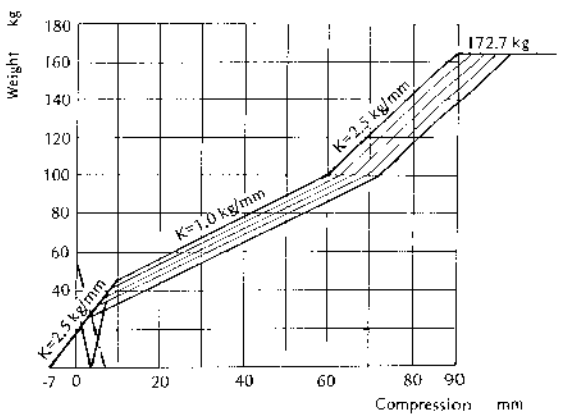
REAR SHOCK ABSORBERS

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 besides spring resistance to compression. When the unit is released, the spring should not suddenly snap it 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 (460)



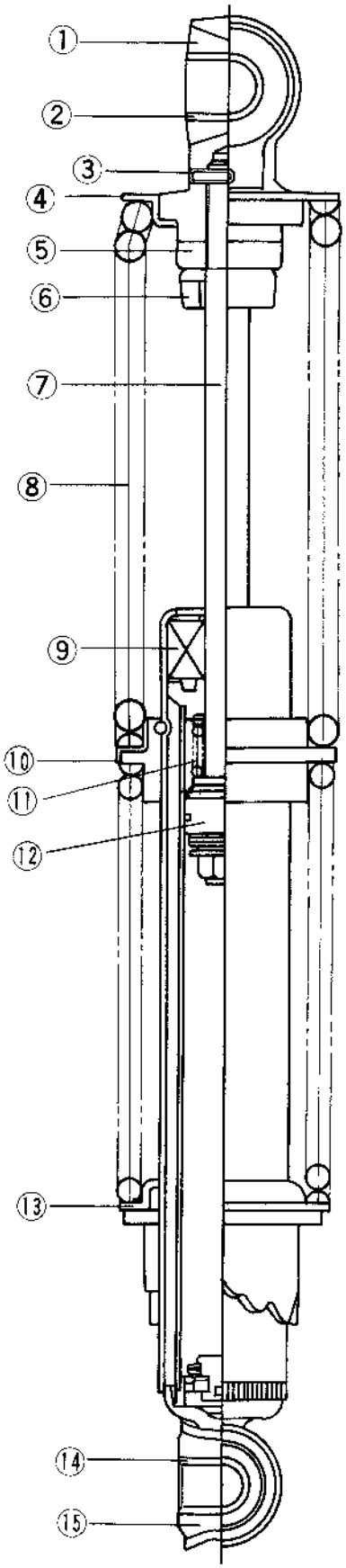
Bushings

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.

Rear Shock Absorber



461

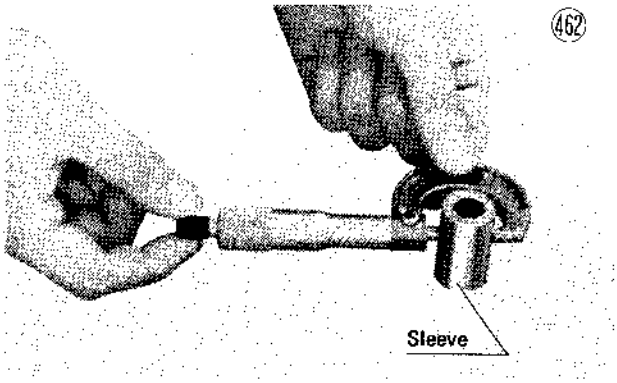
1. Rubber Bush
2. Collar
3. Spring Pin
4. Spring Seat
5. Nut
6. Stopper Rubber
7. Piston Rod
8. Spring
9. Oil Seal
10. Spring Seat
11. Spring
12. Piston
13. Spring Seat
14. Collar
15. Rubber Bush

Wear takes place where the short sleeves and bushes rub together. If 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.

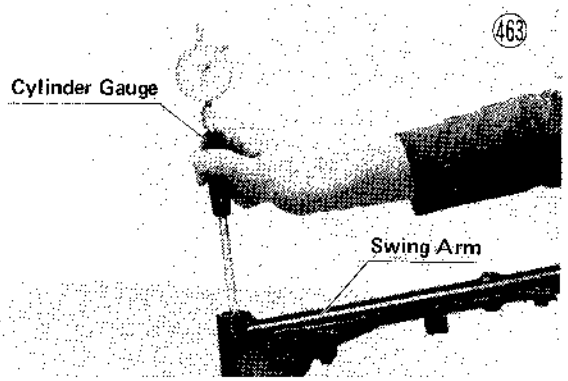
Sleeve, bush wear

Measure the outside diameter of the short sleeves at both ends with a micrometer. Replace a sleeve if the diameter is less than the service limit or if it shows visible damage.



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Measure the inside diameter of each bush with a cylinder gauge. Replace both bushes if the diameter of either exceeds the service limit. Also, replace both bushes if either shows visible damage.



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Table 58 Swing Arm Sleeve, Bush Diameter

	Standard	Service Limit
Sleeve outside dia.	21.979~22.000 mm (0.865~0.866 in)	21.95 mm (0.864 in)
Bush inside dia.	22.128~22.171 mm (0.871~0.873 in)	22.37 mm (0.881 in)

Pivot shaft

Check whether or not the pivot shaft is bent by placing it in two V blocks set 100 mm (3.94 in) apart, setting a dial gauge to the shaft halfway between the blocks, and turning the shaft to get a variation in the dial gauge reading. If the shaft runout exceeds the service limit, straighten it. If it cannot be straightened, or if the runout exceeds 0.7 mm (0.028 in), replace the shaft.

Spring Arm

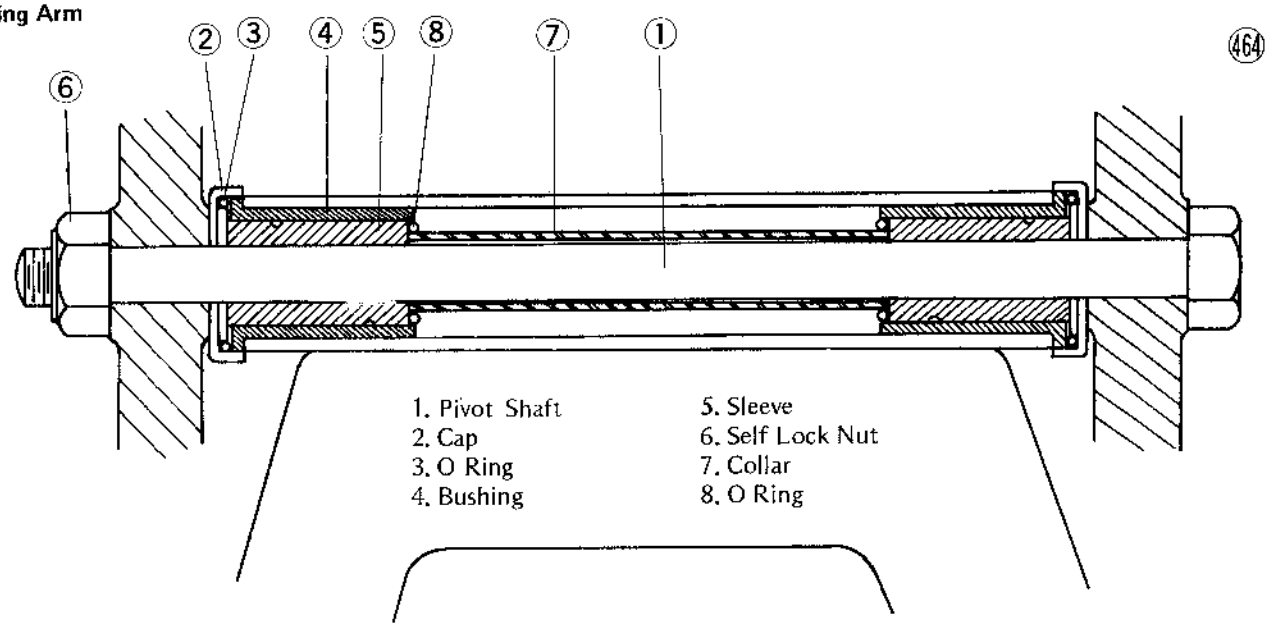
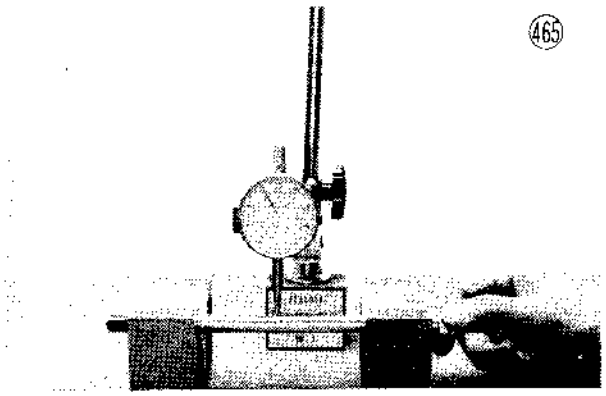


Table 59 Pivot Shaft Runout

Standard	Service Limit
0.1 mm (0.0039 in)	0.2 mm (0.0079 in)



Swing arm lubrication

Lubricate the swing arm with grease at least every 3,000 km (2,000 mi) or 6 months.

Pull out the pivot shaft, and remove all old grease. Apply grease liberally to the portion of the sleeves which comes in contact with the bushes.

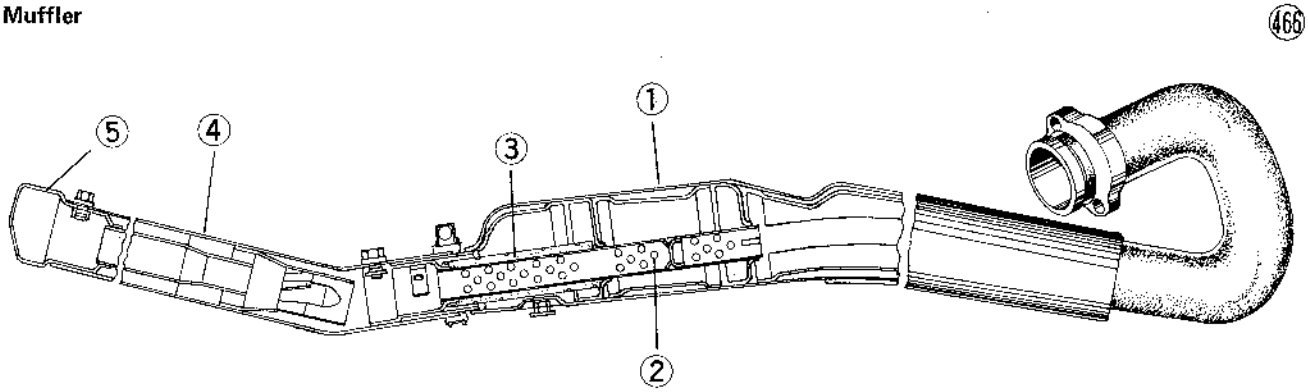
MUFFLER

The muffler reduces exhaust noise and conducts the exhaust gases back away from the rider while keeping power loss to a minimum. If much carbon is built up inside the muffler, exhaust efficiency is reduced, which lowers the engine output power.

To remove built-up carbon, first remove and disassemble the muffler (Pg. 30). Clean the baffle tube with a wire brush and by striking it gently, or by burning the carbon out. Also, examine the glass wool. Remove some of the dirtiest part if it is especially dirty. If it is exceptionally dirty, wash it out in gasoline or replace it for new glass wool.

If there is any exhaust leakage where the muffler connects to the cylinder, or if the muffler gasket appears damaged, replace the gasket. If the muffler is badly damaged, dented, cracked, or rusted, replace it.

Muffler



FLYWHEEL MAGNETO

The flywheel magneto, fundamentally a single phase A.C. generator, can be divided up into a moving part called the flywheel, which is taper fitted to one end of the crankshaft, and a stationary part called the stator, which is located inside the flywheel and fixed to one side of the crankcase. The flywheel has 6 permanent magnets riveted and evenly spaced in its circumference and arranged as 3 north-south sets to generate in the stator coils a current with 3 cycles per flywheel revolution. The outer surface of the hub inside the flywheel serves as a cam to control the opening and closing of the contact breaker. The stator has coils wrapped about 3 laminated iron cores in which current is generated for ignition, lighting, and charging. Also, mounted on the stator plate are the contact breaker, which is provided to make the flow of current to the ignition coil primary winding intermittent, and the condenser, which is provided so that the interruption of current at the contact breaker points is a clean electrical break.

The electrical wiring, shown in Fig. 467 , is made up of circuits to provide for ignition, lighting, and charging. Although the current required by these circuits is supplied basically by the flywheel magneto, electrical troubleshooting should be done first with the parts other than the generating components of the magneto. That is, the condition of the flywheel magneto itself should be checked only after the wiring, ignition switch, spark plug, contact breaker points, fuse, rectifier, battery, etc. have been checked. Flywheel magneto testing and further details on its operation are divided up between the section on the ignition system and the section on the lighting/charging system.

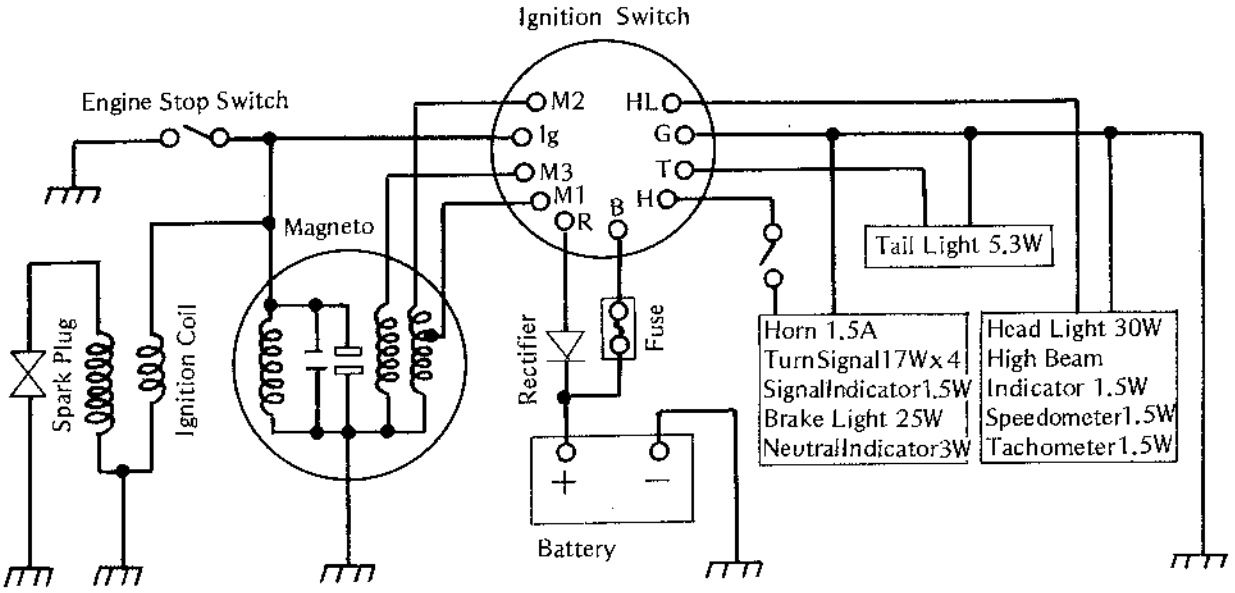
IGNITION SYSTEM

The ignition system, shown in Fig. 468 , consists of the spark plug (Pg. 143), contact breaker, condenser, ignition coil, and ignition magneto coil. The flow of the electrical energy produced in the ignition magneto coil is broken up by the contact breaker and sent as a surge of current or pulse to the ignition coil, which acting as a pulse transformer steps up the voltage such that a spark will jump across the spark plug electrodes. 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, all wiring in good condition (no shorts or breaks and no loose or tarnished connections), and the flywheel magnets supplying a satisfactory magnetic field.

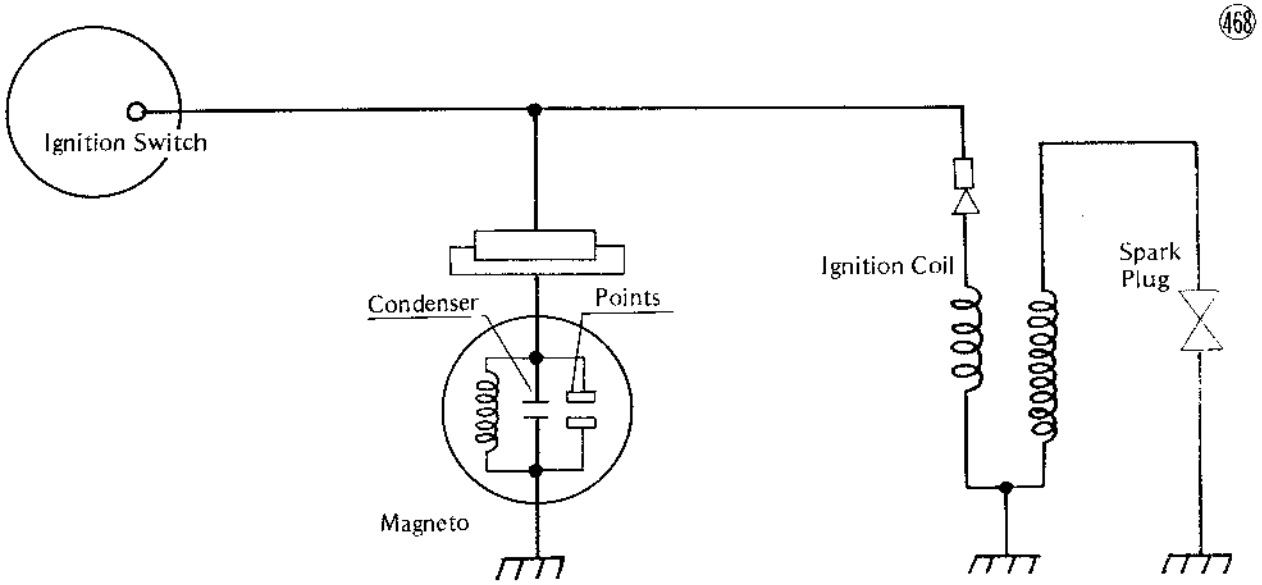
When the flywheel rotates, magnetic flux cutting through the ignition magneto coil induces electric current in the coil. One end of the coil is grounded, while the other end connects both to the ignition coil primary winding and to the contact breaker. When the contact breaker points are closed, the ignition magneto coil current is shorted to the ground. Since the current is shorted to the ground, no appreciable current can flow through the ignition coil primary winding due to the resistance of the winding. However, (assuming correct ignition timing) when the piston reaches a position 20° before top dead center, the contact breaker points open, interrupting the short to the ground and causing the current to flow instead through the primary winding. Then, as the points close, the current is once again shorted through the points and can no longer flow through the primary winding. This pulse in the primary winding produces a rapid build-up of a magnetic field.

Electrical Wiring

(467)



Ignition Circuit

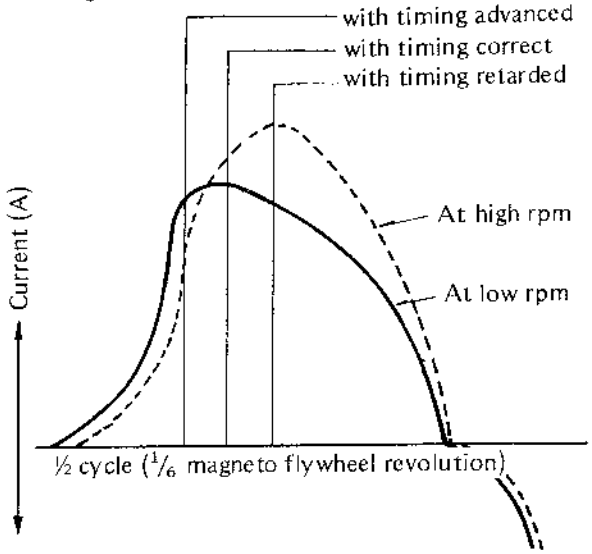


The magnetic flux of this field cuts through the secondary winding, inducing current in the winding. The voltage of this current, dependent on the number of turns in the secondary winding and the speed of the rise of primary winding voltage, is much greater than the voltage in the primary winding. It is this high voltage that causes a spark to jump across the spark plug electrodes. Since a greater ratio of secondary winding turns over primary winding turns and a sharper rise of primary winding voltage increase the secondary winding voltage that is produced, a certain ratio of turns in the ignition coil has been chosen and a certain voltage rise sharpness (determined by condenser and breaker point performance) has been designed in the ignition system such that a spark of sufficient but not excessive strength will be produced.

The single phase alternating current that is generated in the ignition magneto coil fluctuates as the flywheel rotates and increases with the rpm. In order to accommodate this current, the ignition system is designed so that, at the flywheel position where ignition takes place, the generated current for both high and low rpm will be sufficient for good spark plug performance and yet not be excessive. Thus, when the ignition timing is not properly set, not only will there be a loss of power as with the battery ignition system, but also the strength of the current sent to the ignition coil will be inappropriate at certain rpm's. For example, at high rpm if the ignition timing is retarded, the contact breaker points open when the current is too high, resulting in burned points, overheating of the ignition coil, and accelerated spark plug electrode wear. On the other hand, at high rpm if the ignition timing is too far advanced, the contact breaker points open when the current is too low. This current, producing too weak a spark, causes the engine to misfire. Exceptionally retarded timing also results in too weak a spark, causing misfiring and difficult starting.

The contact breaker consists of one fixed and one movable contact point. The movable point is pivoted,

Ignition Magneto Coil Current Current at ignition



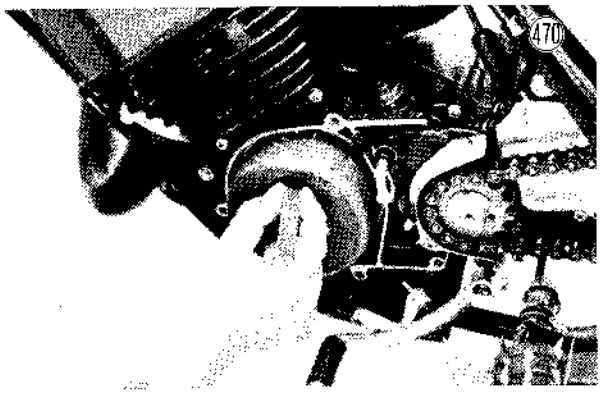
and the heel on one end is held against the cam surface on the flywheel hub by a single leaf spring. As the flywheel rotates, the heel rides on the cam surface, and, as the flywheel reaches the position where ignition takes place, the high spot on the cam surface pushes out on the heel, which opens the points. As the heel wears down, the point gap narrows, retarding ignition timing. Consequently, the ignition timing must be periodically adjusted to compensate for heel wear.

The condenser is connected in parallel across the contact breaker points and serves to prevent current from arcing across the points as they open. Arcing across the points would reduce the sharpness of the voltage rise in the primary winding, thus weakening the spark plug spark, and also damage the surface of the points. When the points are first opening, the condenser 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 condenser shorts, the current will simply be grounded through

the condenser whenever the points open. When the condenser 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.

Contact Breaker

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. At least every 3,000 km (2,000 mi), inspect the contact breaker, and repair or replace if necessary.



Clean the points with clean paper or cloth, or using an oil-free solvent. A business card soaked in trichloroethylene can be used to remove traces of oil. To repair light damage, use sandpaper or an oilstone. If the points are badly worn down or damaged, or if the spring is weak, replace the contact breaker.

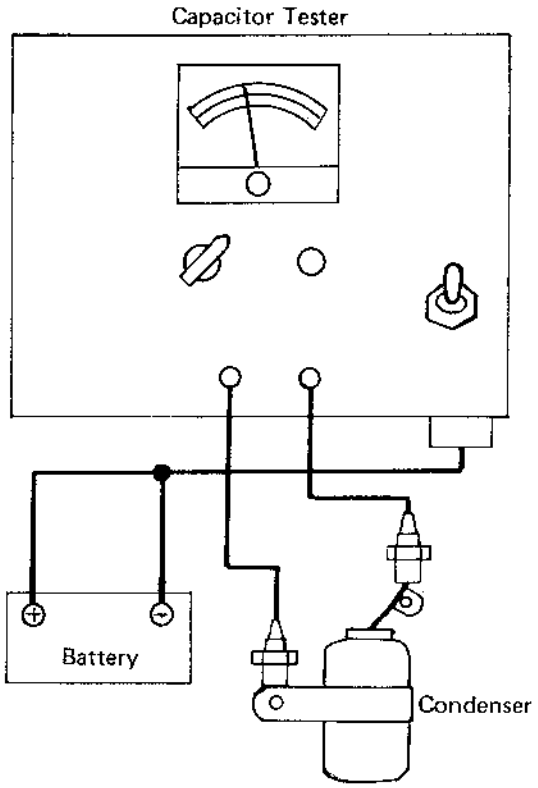
At least every 3,000 km (2,000 mi), or whenever the contact breaker is inspected or replaced, apply a small amount of grease to the felt to lubricate the cam in order to minimize wear of the contact breaker heel. Be careful not to apply so much grease that it can drop off or be thrown onto the points, which will cause the points to foul and burn.

Condenser

The condenser 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 condenser any time it appears defective and whenever the contact breaker is replaced.

NOTE: For checking with a capacitor tester, condenser specifications are: 0.25±0.03μfd., 1,000 WVDC.

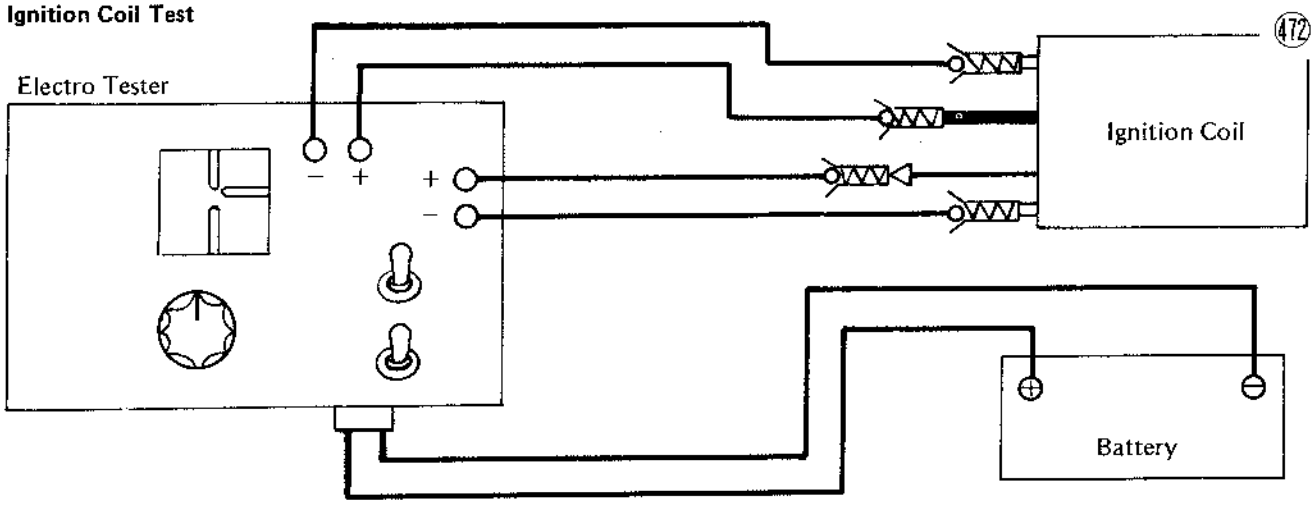
Condenser Test (471)



Ignition coil

The most accurate test for determining the condition of the ignition coil is made with the Kawasaki electro-tester. The ignition coil must be connected to the tester in accordance to the tester directions and should

Ignition Coil Test (472)



produce at least a 5 mm (0.20 in) 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 an electrotester is not available, the coil can be checked for a broken or a badly shorted winding with an ohmmeter. However, an ohmmeter cannot detect layer shorts and shorts resulting from insulation breakdown under high voltage.

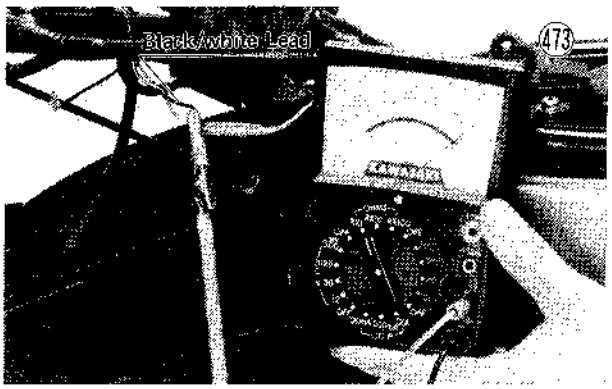
To measure the primary winding resistance, set the ohmmeter to the R x 1 range, and connect one ohmmeter lead to ground and the other to the black lead from the ignition coil. The resistance should be 2.41~ 2.81Ω. To measure the secondary winding resistance, set the ohmmeter to the R x 100 range, and connect one ohmmeter lead to ground and the other to the spark plug lead. The resistance should be about 10KΩ.

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.

Ignition magneto coil

If the spark is weak or non-existent after the spark plug, ignition coil, points, and condenser are found to be all functioning properly, the wiring all in good condition and properly connected, and the ignition timing correctly adjusted, the cause may be a short or open in the ignition magneto coil or a loss of magnetism in the flywheel magnets.

- Rotate the magneto flywheel until the points open, and pull out the magneto harness plug from its socket near the fuel tap.
- Set an ohmmeter to the R x 1 range, and measure the resistance between ground and the magneto black lead. The proper value is between 1.21 ~ 1.48 Ω.



If the resistance in this test is found to be less than the proper value, there is a short in the ignition magneto coil. Discontinuity indicates an open. In either case, replace the ignition magneto coil. If, however, the coil checks out okay, the cause is probably a loss of magnetism in the flywheel, necessitating flywheel replacement.

LIGHTING/CHARGING SYSTEM

The lighting/charging coil and the lighting coil, which together with the ignition magneto coil make up the 3 coils mounted on the stator plate, are where the current is generated for the lighting/charging system. Each coil consists of a wire wrapped around a laminated steel core. One end of each wire is grounded at one side of its core, and the other end leaves the core as an output lead—pink for the lighting/charging coil and yellow for the lighting coil. The lighting/charging coil is tapped part way by a light blue lead. The lighting/charging coil pink lead supplies the current for the nighttime D C circuit, while its light blue lead supplies the current for the daytime D C circuit. The lighting coil lead supplies the current for the A C circuit.

To meet safety standards for lighting at low rpm, the lighting/charging system includes a battery in conjunction with the magneto to supply the current to the turn signals; horn; and brake, neutral, and tail lights. Since the battery, a D C device, must be charged by the magneto, an A C generator; a rectifier (Pg.140) must be included in the D C part of the lighting/charging system so that only direct current will flow in the lighting/charging coil and the D C lighting and charging circuits.

Daytime and nighttime D C	Nighttime lighting A C
1. turn signals	1. headlight
2. horn	2. speedometer light
3. brake light	3. tachometer light
4. neutral light	4. high beam indicator light
5. tail light (nighttime only)	

When the magneto flywheel rotates, magnetic flux cutting through these coils induces a flow of electrons. As the engine speed increases, more magnetic flux cutting through the coils will increase the amount (amperage) and force (voltage) of this flow. But, to prevent an excessive electron flow from burning out electrical components and overcharging the battery, the coil windings are designed to limit the amount of magnetic flux from the magneto magnets which may cut through the coils. The magnetic field that accompanies the electron flow in the lighting/charging coil and lighting coil sector of the magneto will have sufficient opposition to the flywheel magneto magnetic field at high engine speed that the electron flow that can be generated in the windings is limited to the maximum for which the circuit will accommodate.

However, a break (burned out bulb, missing battery, etc.), partial break (loose connection), short (rectifier or bare wire touching frame, a bridge across the resistance in a component, etc.), or partial short (bulb of too high a wattage) in any part of the lighting circuits will change the flux opposition. For example, if the headlight has burned out and the motorcycle is ridden with the ignition switch turned to the night position, not only will the other bulbs in the A C circuit be overloaded and burn out, but the increased resistance or break in the A C circuit will result in less or no current in the winding for the A C circuit. The drop in the flux opposition produced by the winding used for the A C circuit allows more flux in the flywheel magnetic field to cut through the winding used for the D C circuit. The resulting

excess D C voltage will blow the fuse or overcharge the battery and burn out D C circuit components. A short on the other hand may have the opposite effect, reducing the current for the components in both circuits.

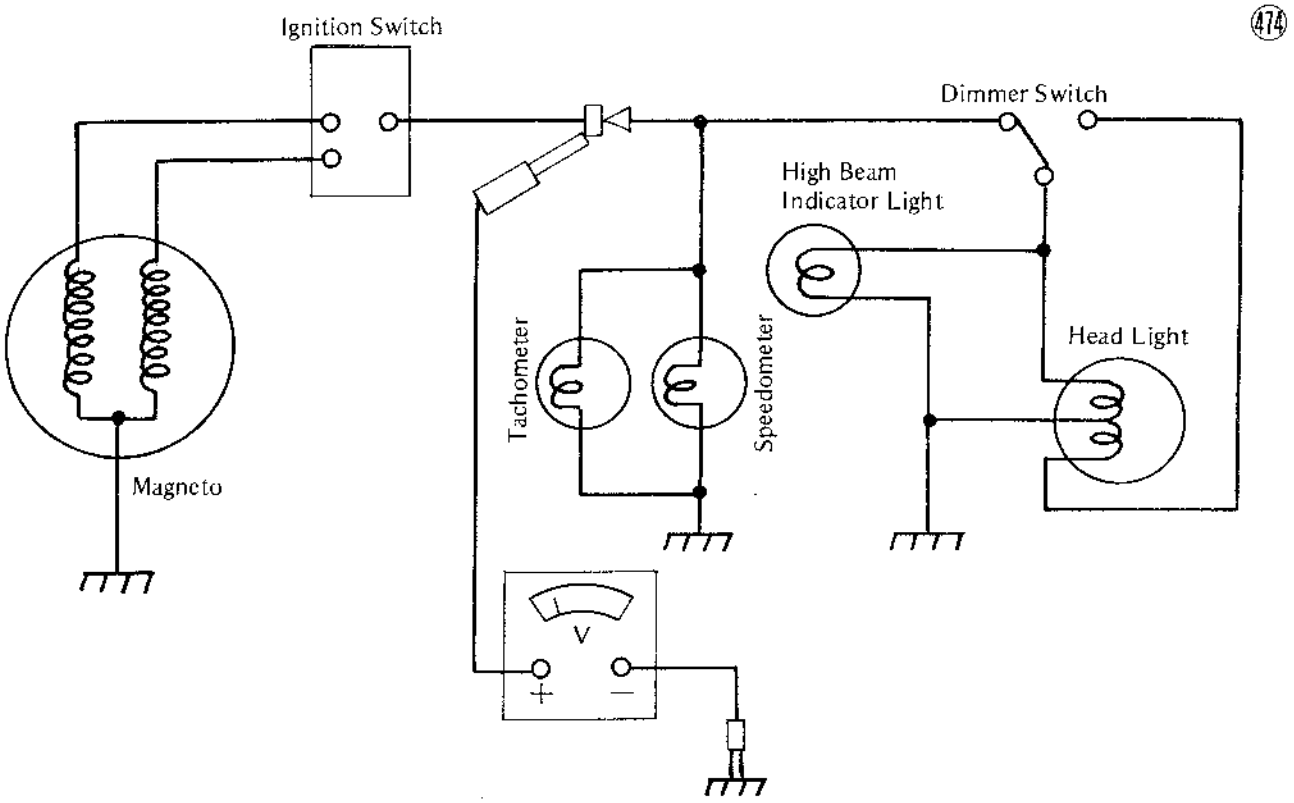
If the voltage produced for the lighting/charging system is insufficient, the lights will not fully light up, and the battery will discharge. If the battery, rectifier, and ignition switch are all functioning properly, the circuit loads (horn and all lights) not defective and of the correct wattage, and the wiring all properly insulated with no loose or tarnished connections, then insufficient voltage means a defective coil or a defective flywheel. A short or break in one of the coil wires may result in either a low output or no output at all. A loss of flywheel magnetism, which may be caused by aging or the flywheel being dropped or struck, will result in a low output.

Lighting/charging coil and lighting coil

The condition of the coils is determined by measuring the voltage of the A C output and the voltage and amperage of the daytime and nighttime D C outputs. Before making this test, check the condition of the battery (Pg. 140) and the rectifier (Pg. 140). The battery must be charged if the voltage is less than 6 volts, and the rectifier replaced if defective. Also, check to see that all circuit loads (headlight, tail light, horn etc.) are of the correct wattage.

- Remove the engine sprocket cover and the left engine cover leaving the clutch cable still attached.
- Start the engine, and set the engine speed at 4,000 rpm.
- To measure the A C voltage produced by the magneto, first switch on the headlight, tail light, high beam indicator light, tachometer light, and speedometer light by turning the ignition switch to the night position and the dimmer switch to high beam.
- See that these lights are all lit.
- Connect the a multimeter, set to 12 or 30 VAC, in parallel across the A C circuit load by connecting the + meter lead to the red lead on the ignition switch and the − meter lead to ground. The voltage should be 6~7.4 VAC.
- Disconnect the meter leads.
- To measure the nighttime D C voltage produced by the magneto, connect the multimeter, set to 12 or 30 VAC, across the battery by connecting the − meter lead to the battery terminal and the + lead to the battery + terminal. The voltage should be 7.3 ~ 8.7 VDC.
- Turn the ignition switch to the daytime position to measure the daytime D C voltage. The voltage should be 7.5~8.9 VDC.
- Disconnect the meter leads, and turn off the engine.
- Set the multimeter to the 12 Amp DC range.
- Disconnect the lead between the fuse and the rectifier where the white lead connects to the white lead. Connect the − meter lead to the white lead on the fuse side, and connect the + meter lead to the white lead on the rectifier side. This puts the meter in series with the rectifier and battery so that the battery charging amperage can be measured.
- Turn the ignition switch to the daytime position, and start the engine.
- Set the engine to 4,000 rpm. The reading should be 2.4 amps or more.

Lighting Voltage (A C Voltage)

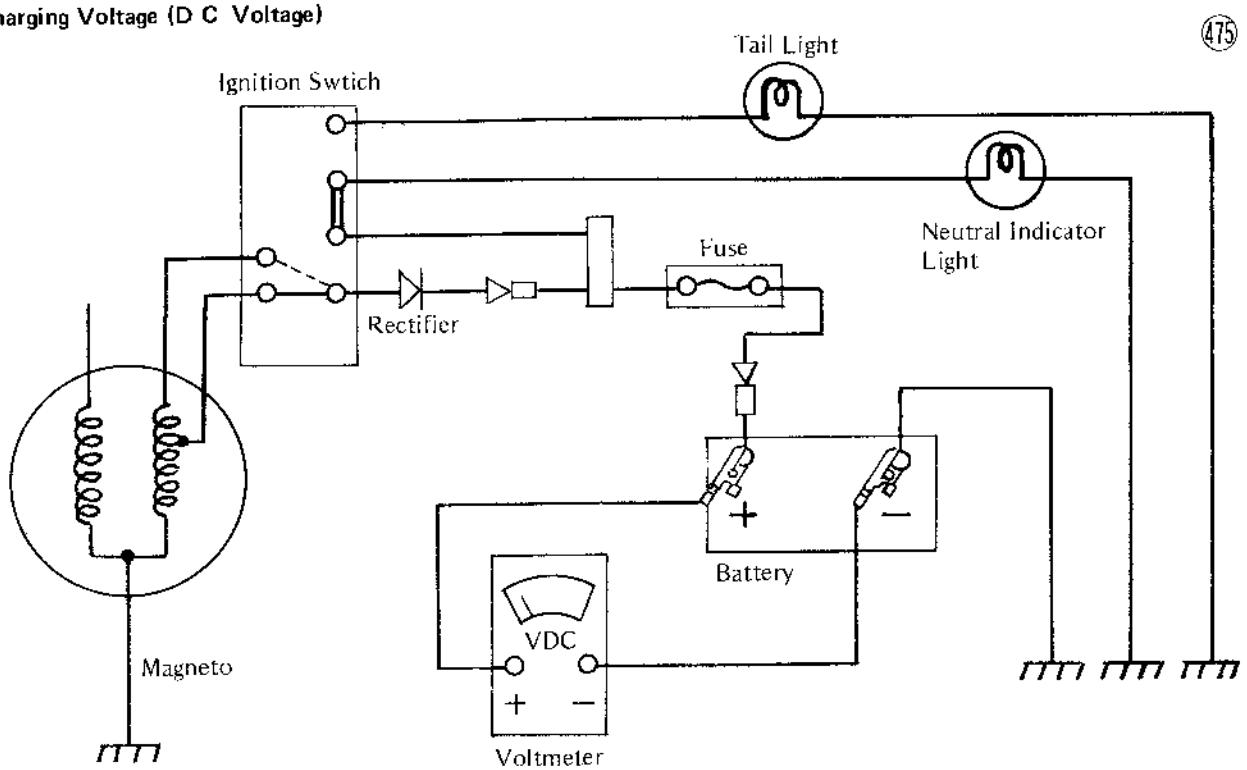


●To measure the nighttime charging amperage, first turn the ignition switch to the nighttime position. Check to see that the headlight, high beam indicator light, speedometer light, tachometer light, and tail light are all lit. The reading should be 2.1 amps or more. Turn off the engine.

——— Daytime Position
- - - - - Nighttime Position
═══ Daytime and Nighttime Position

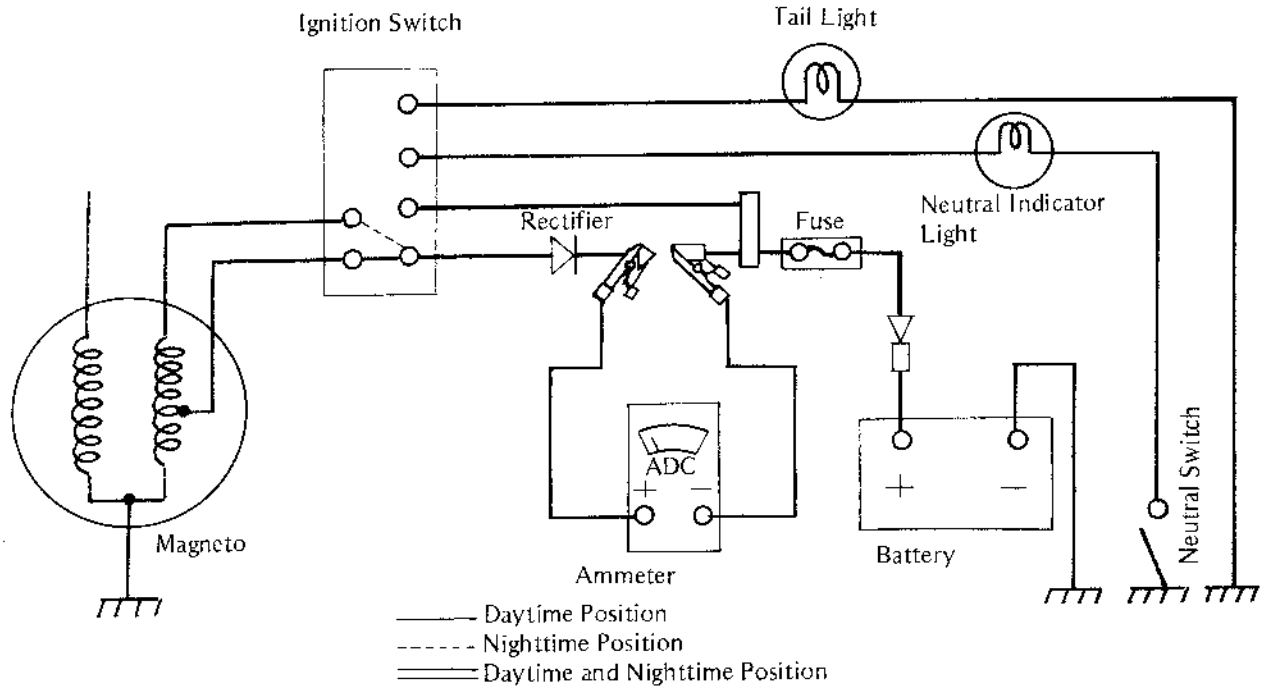
Charging Voltage (D C Voltage)

(475)



Charging Amperage (D C Amperage)

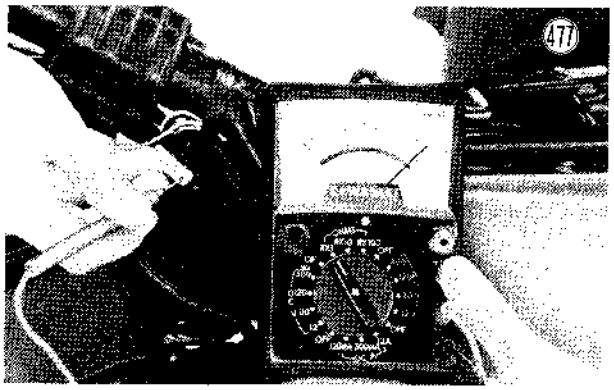
(476)



If any one of the above checks shows a low reading, the lighting/charging system is not functioning satisfactorily. Since the components outside the magneto itself have been determined to be in proper order, the trouble must be either with the coils or with the magneto flywheel.

- Disconnect the magneto output connector under the fuel tank.
- Setting the multimeter to R x 1, measure the resistance between ground and each magneto output lead. The resistance between ground and light blue should be 5.347Ω; between ground and pink, 2.541Ω; and between ground and yellow, 0.441Ω. Less than the proper resistance means a coil short; higher than the proper resistance or no reading at all means a break in the coils. In case of a short or break, replace the lighting/charging coils as a set.

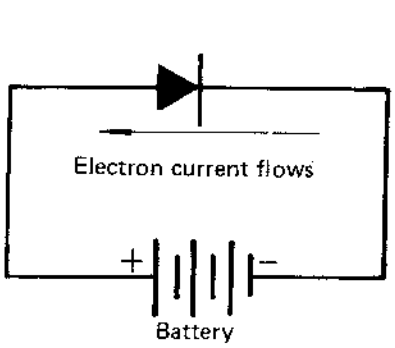
If the coils have normal resistance, but the voltage and amperage checks show the lighting/charging system to be defective, then the permanent magnets in the flywheel have probably weakened, necessitating flywheel replacement.



RECTIFIER

The rectifier, consisting of a diode mounted on a plate for heat dissipation, ensures that only direct current goes for charging the battery, lighting the tail light, and operating the components of the daytime D C circuit. The reason that the rectifier only permits direct current to flow in the circuit in which it is included is that a diode conducts appreciable current in only one direction. However, a defective diode will conduct in both directions (a short) or not conduct at all (a break).

Diode

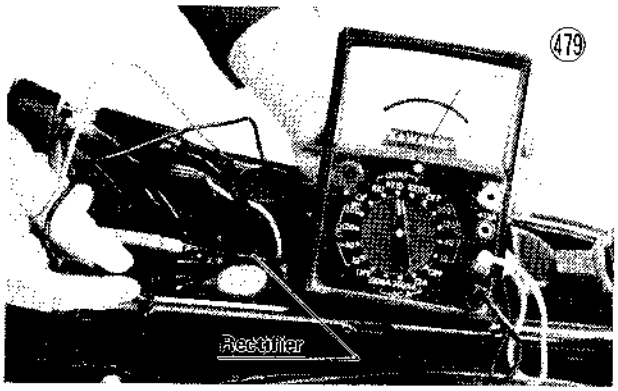


If the rectifier becomes defective, the battery will discharge. A defective rectifier can be readily detected with a resistance check.

NOTE: If the motorcycle is operated with the battery left unconnected, the rectifier will become damaged due to an excessive reverse bias voltage.

Rectifier check

With the engine off, disconnect the blue/white rectifier lead from the blue/yellow lead, and disconnect the brown/white rectifier lead from the brown/white lead. Setting an ohmmeter to the R x 10 or R x 100 range, check the resistance between the blue/white and the brown/white 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.

BATTERY

The battery is a back-up source of power to operate the tail light, brake light, turn signals, and horn whenever the engine is turning too slowly for the magneto to supply sufficient power. However, the battery does not back-up either the ignition or the headlight, both of which are in circuits not connected to the battery.

With proper care, the battery can be expected to last a few 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. Distilled water comes in a sealed, non-metallic container; any other water is not distilled water.**
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 or crimped shut. If battery gases cannot escape from 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 used in warm climates in a fully charged battery is 1.260 at 20°C (68°F). In particularly cold regions a solution with a standard specific gravity of 1.280 is used. 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. 480 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 would be if the temperature were 20°C (68°F). When the temperature goes up, the specific gravity goes down, and vice versa.

Celsius

$$S_{20} = S_t + [0.0007 (t - 20)]$$

Fahrenheit

$$S_{68} = S_t + [0.0004 (t - 68)]$$

S_t = specific gravity at the present temperature

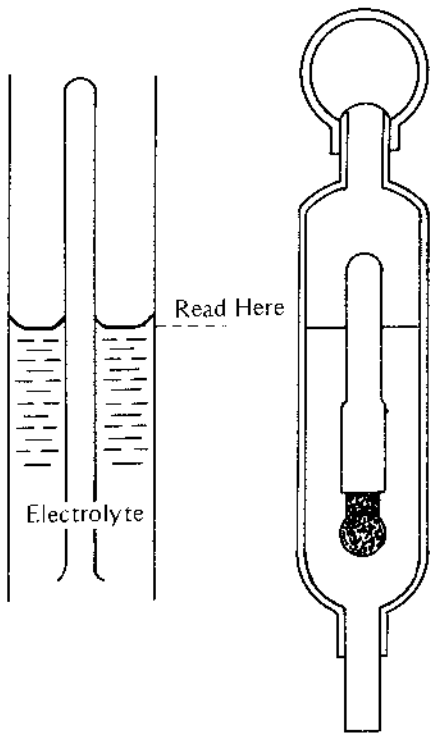
S_{20} = specific gravity at 20°C

S_{68} = specific gravity at 68°F

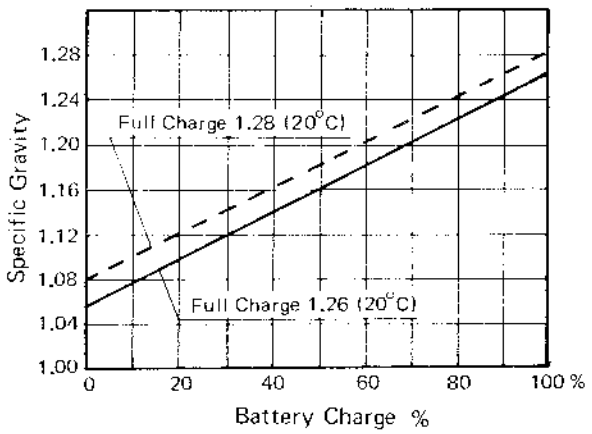
t = present temperature of solution

Generally speaking, a battery should be charged if a specific gravity reading shows it to be discharged to 50 % or less of full charge.

Hydrometer (480)



Specific Gravity/Battery Charge Relationship (481)



Initial charge

New batteries for Kawasaki motorcycles are dry charged and can be used directly after adding the electrolyte. However, the effect of the dry charge deteriorates somewhat during storage, especially if any air has entered the battery from imperfect sealing. Therefore, it is best to give the battery an initial charge before using it in order to ensure long battery life.

CAUTION: 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 1.260 (specific gravity at 20°C or 68°F) sulphuric acid solution into each cell of the battery up to the upper 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 6AH, the charging rate would be 0.6 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 line.
- Check the results of charging by measuring the specific gravity of each cell and by measuring battery voltage. Battery voltage of a 6 volt battery directly after the completion of charging should be 7.5 to 8.0 volts.

Ordinary charge

CAUTION: 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 line but not up to the upper 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 6AH battery would be 3/10 x 6 which equals 1.8 amperes.
- Measure the specific gravity of the electrolyte, and use the graph, Fig. 481 , 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 line.
- Check charging results by measuring the specific gravity of each cell and by measuring battery voltage. Battery voltage of a 6 volt battery directly after the completion of charging should be 7.5 to 8.0 volts. If the voltage is lower than this, the battery is not completely charged or can no longer take a full charge.

Test charging

When the battery is suspected of being defective, first inspect the points noted in the chart below. The battery can be tested by charging it by the ordinary charge. If it will take a charge so that the voltage and specific gravity come up to normal, it may be considered good except in the following cases:

★ If the voltage suddenly jumps to over 7.0 volts just after the start of charging, the plates are probably sulphated. A good battery will rise to 6 volts immediately and then gradually go up to 6.3 ~ 6.5 volts in about 30 to 60 minutes after charging is started.

★ If one cell produces no gas or has a very low specific gravity, it is probably shorted.

Table 49 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 6 volts	below 6 volts	Test charge
Electrolyte level	above plates	below top of plates	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

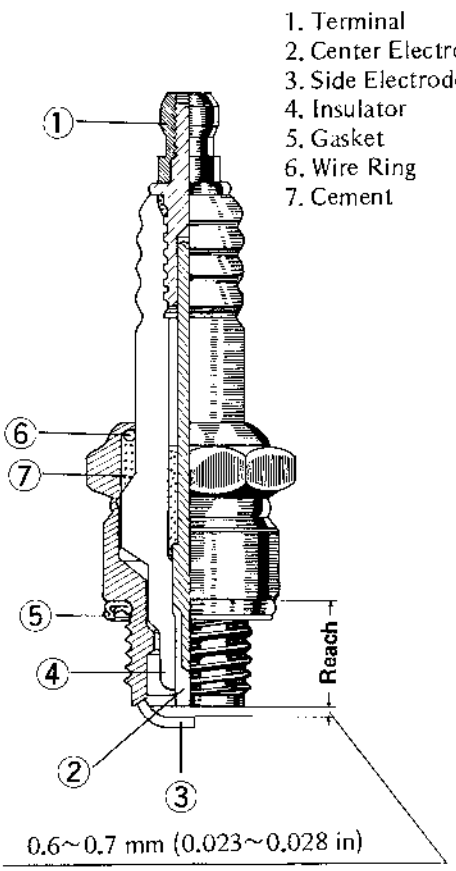
★ If there does not appear to be enough sediment to short the plates, but one cell has a low specific gravity after the battery is fully charged, the trouble may be just that there is insufficient acid in that cell. In this case only, sulphuric acid solution may be added to correct the specific gravity.

★ 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.

SPARK PLUG

The spark plug ignites the fuel/air mixture in the combustion chamber. To do this effectively and at the proper time, the correct spark plug must be used, and the spark plug must be kept clean and adjusted.

Spark Plug (482)



Tests have shown the NGK B-8HCS, set to a 0.6 ~ 0.7 mm (0.024 ~ 0.028 in) gap to be the best plug for general use. But since spark plug requirements change with ignition and carburetion adjustments and with riding conditions, this plug may have to be replaced for one of the next higher or lower heat range. Whether or not a spark plug of a different heat range should be used is generally determined upon removing and inspecting the plug.

When a plug of the correct heat range is being used, the electrodes will stay hot enough to keep all the carbon burned off but cool enough to keep from damaging the engine and the plug itself. This temperature is about 400 ~ 800°C (750 ~ 1450°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 burning at the right temperature.

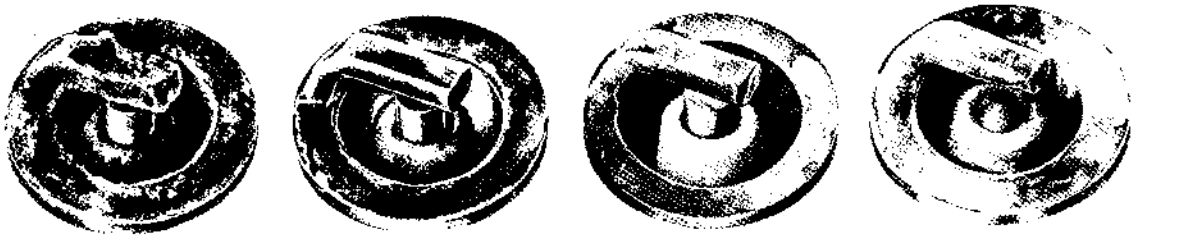
A spark plug for higher operating temperatures is used for racing and other high speed applications. Such a plug is designed for better cooling efficiency so that it will not overheat and thus is often called a "colder" plug. If a spark plug with too high a heat range is used—that is, a "cold" plug that cools itself too well—the plug will stay too cool to burn off the carbon, and the carbon will collect on the electrodes and the ceramic insulator. If enough of this carbon collects, it may prevent a spark from jumping across the gap, or it may short the spark out by bridging across the electrodes or by conducting along the outside of the ceramic. Carbon build-up on the plug can also cause the electrodes to heat up red-hot, which will cause preignition, indicated by knocking, which in turn may eventually burn a hole in the top of the piston.

A spark plug in the lower heat range is used when engine temperature is comparatively low such as for constant city use or during the break-in period when the motorcycle is not operated at high speed. Such a plug is designed to hold the heat and thus is often referred to as a "hotter" plug. If a "hot" plug is used for racing or other high speed use, the plug will be too hot, causing engine overheating and preignition.

Inspection and replacement

Remove the plug and inspect the ceramic insulator. If the insulator is clean and has a light brown color, the correct plug is being used. If it is fouled black,

Spark Plug Condition (483)



Carbon Fouling | Oil Fouling | Normal Operation | Overheating

change to the "hotter" NGK B-7HCS. If the ceramic is burned white and the electrodes are burned, replace the plug with the "colder" NGK B-9HCS. However, if the spark plug still fouls or overheats after changing to a hotter or colder plug, the cause of the trouble may be other than the spark plug such as faulty carburetion or ignition timing.

CAUTION: When the type of riding changes—for example, a change to faster riding after the break-in period is over—the spark plug should be inspected and changed if necessary. The NGK B-7HCS plug in particular can damage the engine if used for high speed riding.

Clean the electrodes and the ceramic insulator around the center electrode by 'sraping off any deposits and cleaning the plug in gasoline. If the gap has widened, reset it to the standard 0.6~0.7 mm (0.024~0.028 in) gap. If the electrodes are badly worn down or burned, replace the plug. The plug must also be replaced any time there is visible damage such as cracked ceramic or damaged threads.

NOTE: If the spark plug is replaced by any other than the recommended NGK B-7HCS, B-8HCS (standard), or B-9HCS, make sure that the replacement plug has the same:

(1) thread pitch
(2) reach (length of threaded portion must be 12.7 mm (1/2 in))
(3) diameter (diameter at threads must be 14 mm (9/16 in))

If a plug with the wrong thread pitch or thread diameter is used, the cylinder head will be damaged. If a plug with too long or short a reach is used, carbon will build up around the plug or plug hole threads, possibly causing engine damage and making the old plug difficult to remove or the new one difficult to install.

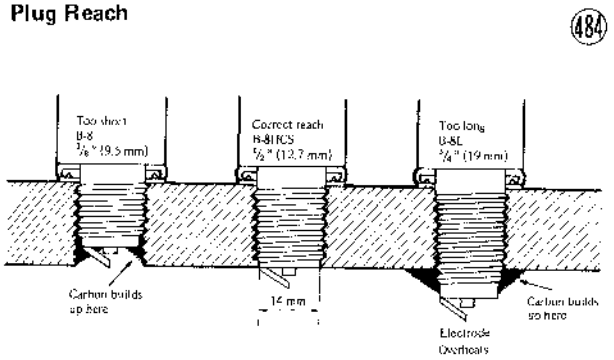
IGNITION SWITCH

The ignition switch has three positions: off, daytime, and nighttime. In the off position the ignition lead is grounded, preventing the engine from running since current from the ignition magneto coil shorts to the ground instead of going to the ignition coil. The circuits for the lighting/charging system are open, and the key can be removed from the switch. In the daytime position the ignition lead is disconnected from ground so that the engine can be started. A lead from the magneto is connected to the rectifier to charge the battery, and a lead from the battery is connected to the horn, turn signals, brake light, and neutral indicator light circuits. In the nighttime position a different lead from the magneto is connected to the rectifier to charge the battery, the lead from the battery is also connected to the tail light circuit, 'and a lead from the magneto is connected to the headlight circuit. When the key is in either the daytime or nighttime position, it cannot be removed from the ignition switch.

Testing the switch

Table 50 shows the internal connections of the ignition switch for each switch position. To check the switch, disconnect the lead plug from the switch, and use an ohmmeter to verify that there is continuity (zero ohms) between all the connections that are listed in the table for each switch position, and that there is no continuity between the leads that are not connected. If the switch has an open or 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.

Plug Reach



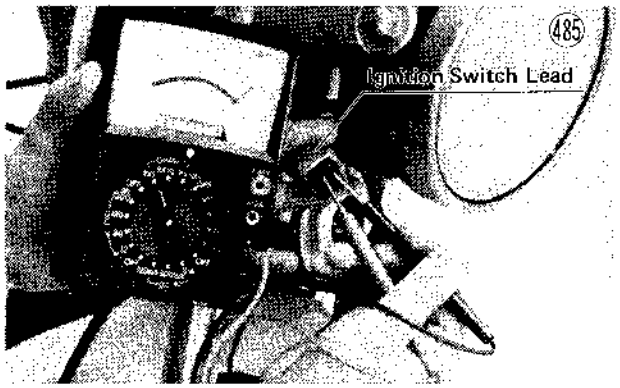
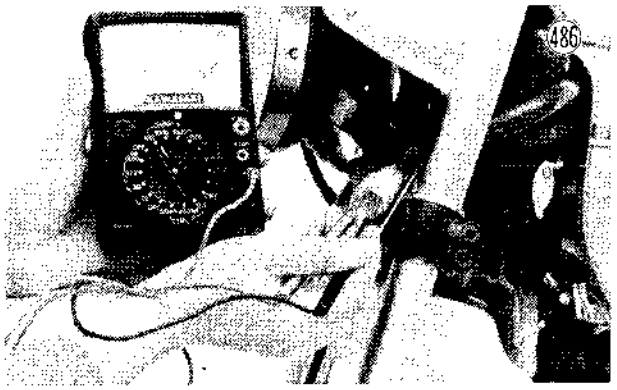


Table 50 Ignition Switch Connections

LEAD	Ig.	Gnd.	Mag. 1	Rect.	Mag.2	H.L.	Mag. 3	Batt.	Horn	Tail
COLOR	Bk/W	Bk/Y	LB	Bl/W	Pink	Red	Yellow	White	Brown	R/W
Off	●	●								
Day			●	●				●	●	
Night				●	●	●	●	●	●	●

HEADLIGHT CIRCUIT

The headlight circuit is shown in Fig. 487 . When the engine is running and the ignition switch is turned to the nighttime position, the headlight circuit is completed, turning on the headlight, speedometer light, and tachometer light. The dimmer switch is used to select high or low beam. When the headlight is on high beam, the high beam indicator light also is lit.



Headlight trouble

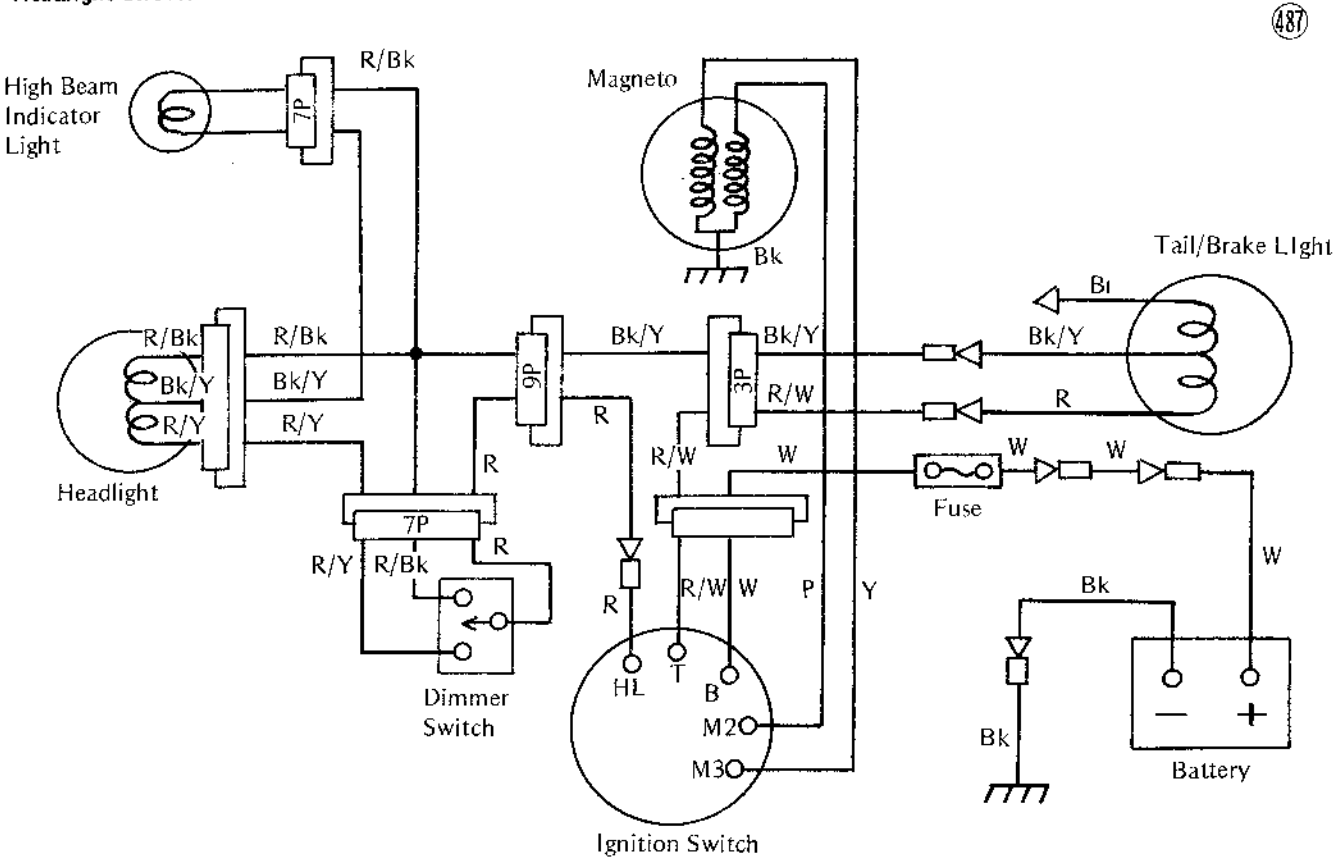
If the headlight does not light, check to see if the bulb has burned out. If the bulb has burned out, the sealed beam unit must be replaced. If the bulb is good, check the dimmer switch. Table 51 shows the connections in the dimmer switch for both high and low beam. Disconnect the leads to the dimmer switch, and use an ohmmeter to see that only the connections shown in the table have continuity (zero ohms). If the switch has an open or a short, it can be disassembled for repair. The contact surfaces may be cleaned, but no internal parts are available for replacement. If any parts are not repairable, the switch must be replaced as a unit. However, if the dimmer switch is good, check the ignition switch, the wiring, and the magneto.

Table 51 Dimmer Switch Connections

Color	R/Y	Red	R/Bk
High Beam		●	●
Low Beam	●	●	

If the headlight lights but does not light brightly, the trouble may be that the headlight is of the improper wattage or that the magneto is not putting out sufficient current. However, the trouble may be also caused by a short or a component drawing too much current in some other part of the lighting/charging system.

Headlight Circuit



BRAKE & TAIL LIGHT CIRCUIT

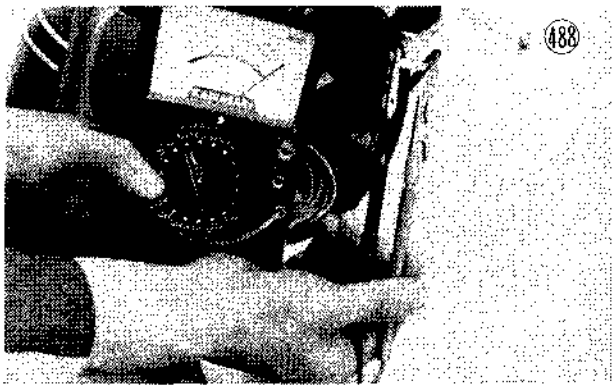
The brake and tail light circuit is shown in Fig. 489 . The same bulb is used for both the brake and tail lights, but the bulb has a separate filament for each light. Each filament is controlled by a separate part of the brake and tail light circuit. When the ignition switch is turned to either the daytime or nighttime position, the brake light goes on whenever the circuit is closed by either the front or rear brake light switch. The tail light is lit whenever the ignition switch is turned to the nighttime position.

The front brake light switch, mounted on the front brake lever body, is actuated when pressed by the front brake lever. The rear brake light switch is actuated when pulled on by the rear brake pedal. Both switches are a sealed plunger type of switch, which cannot be disassembled and must be replaced as a unit if defective. The front brake light switch does not require any adjustment, but the rear switch must be adjusted by changing its position higher or lower in the mounting bracket so that the brake light goes on after a certain amount of brake pedal travel when the brake pedal is applied (Pg. 18).

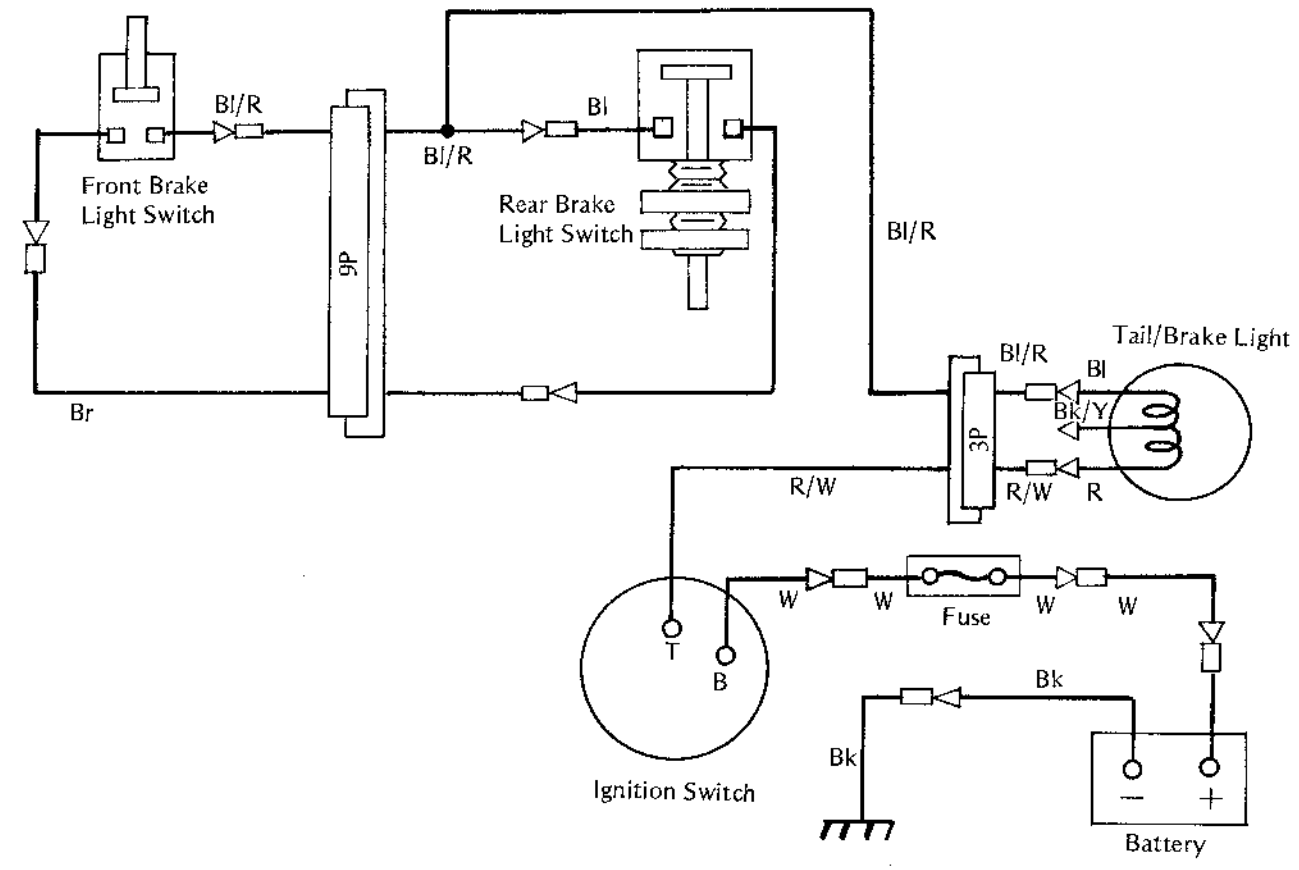
Brake light trouble

If the ignition switch is in the daytime or nighttime position and the brake light does not go on when either the front or rear brake is applied, first push the horn button and flip the turn signal switch to see if the fuse, ignition switch, or battery may be defective. If the turn signals and horn work, check for a burned out brake light filament. If the bulb is good, the trouble is either the wiring or the brake light switches.

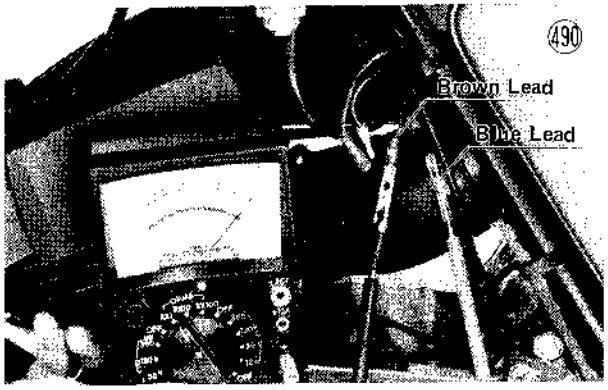
To check the front brake light switch, first disconnect from inside the headlight housing the brown and the blue/red switch leads. Connect an ohmmeter to the switch leads, and pull the front brake lever. The ohmmeter should read zero ohms. If it does not, replace the switch. If the switch checks out okay but the brake light does not light, check the wiring.



Brake Light Circuit



To check the rear brake light switch, disconnect from in front of the air cleaner housing the brown and the blue/red switch leads. Connect an ohmmeter to the switch leads, and pull the switch plunger. The ohmmeter should read zero ohms. If it does not, replace the switch.



Tail light trouble

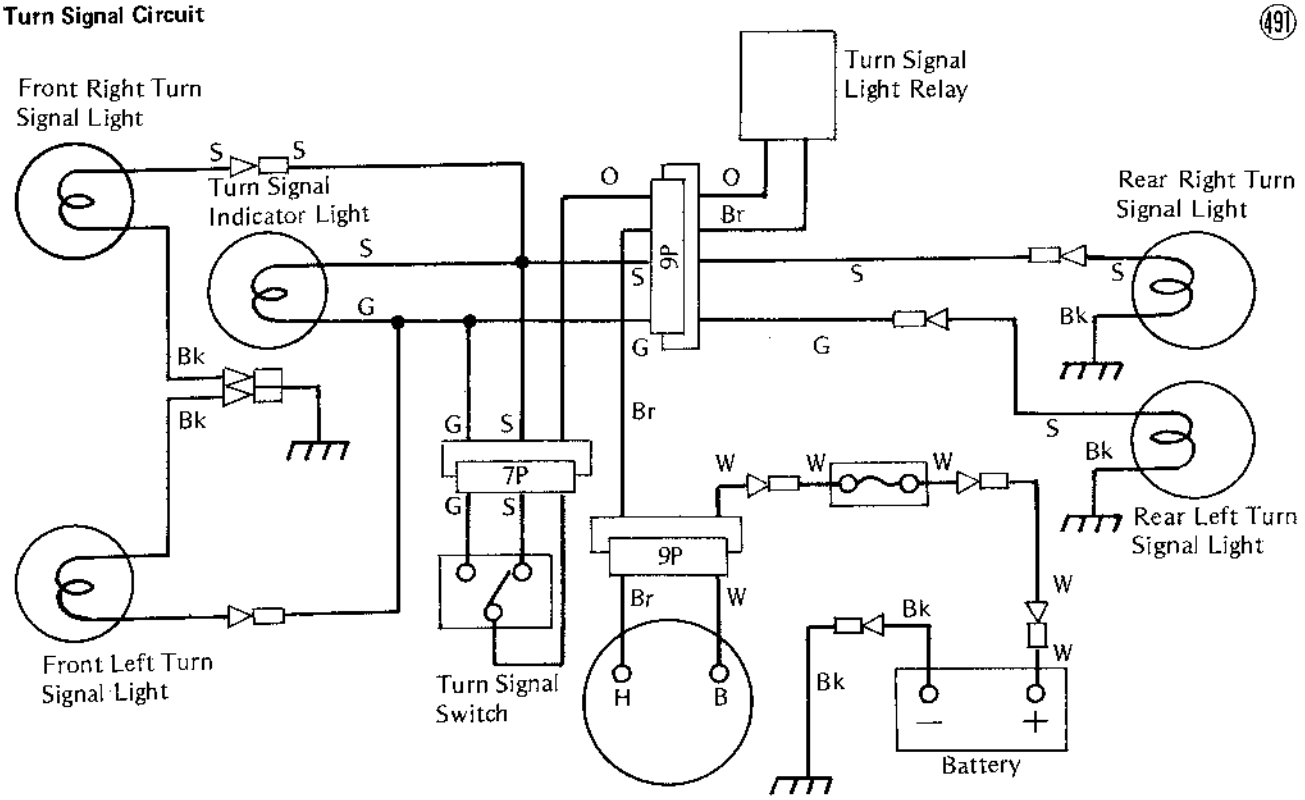
If the tail light does not go on when the ignition switch is turned to the nighttime position, the filament is probably burned out. However, if the bulb is good, check the wiring, ignition switch, fuse, and battery.

TURN SIGNALS

A wiring diagram of the turn signal circuit is shown in Fig. 491 . When the ignition switch is in the daytime or nighttime position and the turn signal switch is turned to R or L, a ground is provided for the circuit so current can flow. Current to the right or left turn signals flows through the closed contacts and the resistance wire inside the turn signal relay, and the turn signals go on. The resistance wire quickly heats up, expands, and allows a spring to pull the contacts open. When the contacts have opened, the circuit is broken, the turn signals go off, and the resistance wire cools and contracts, closing the contacts so that the cycle can begin again. The indicator light in the turn signal circuit flashes on and off with the turn signals to indicate that they are working properly.

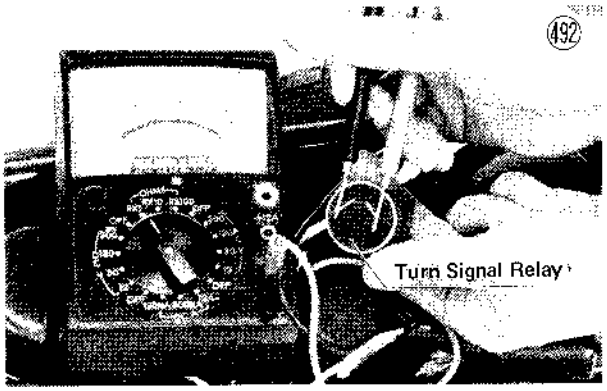
Since the turn signal relay is designed to operate correctly only when two turn signals (one front and one rear) and the turn signal indicator light are properly connected in the circuit, trouble may result from a burned out bulb, a bulb of incorrect wattage, loose wiring, as well as from a defect in the relay itself. In general, if the trouble with the circuit is common to both right and left turn signals, it is probably caused by a defective turn signal relay, although it may be due to a bad switch, wiring, or battery. If the trouble is with only one side—either right or left—then the relay is not at fault since the same relay is used for both sides.

Turn Signal Circuit

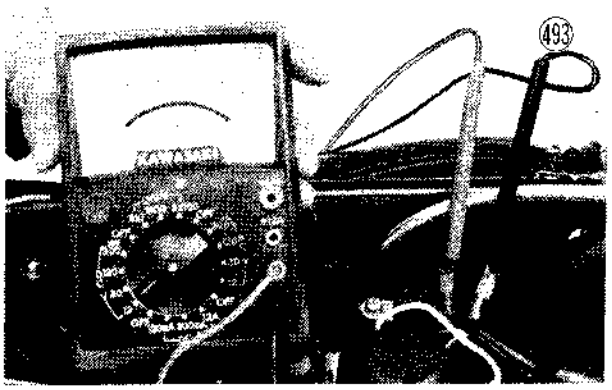


Turn signal trouble

(1)Neither right nor left turn signals come on at all:
- •Check that battery voltage is normal.
- •Unplug the relay leads and use an ohmmeter to check that there is continuity (close to zero ohms) between the relay terminals. If there is no ohmmeter reading, or if there is several ohms resistance, replace the relay for a new one.



- •If the relay checks good, turn the meter to the 12 VDC range, connect the + meter lead to the brown lead that was disconnected from the relay, and connect the − meter lead to the orange lead. With the ignition switch on, first switch the turn signal switch to the R and then to the L position. The meter should register battery voltage at either position. If it does not, the fuse, ignition switch, or wiring is at fault. If battery voltage is read on the meter but the turn signals will still not work when the relay is reconnected, then recheck all wiring connections.



(2)Both right or both left turn signals come on and stay on or flash too slowly:
- •Check that battery voltage is not low.
- •Check that all wiring connections are good.
- •Check that the turn signal bulbs and indicator bulb are of the correct wattage.
- •If all of the above check good, replace the relay.

(3)A single light on one side comes on and stays on:
- •Either the light that does not come on is burned out or of the incorrect wattage, or the wiring is broken or improperly connected.

(4)Neither light on one side comes on:
- •Unless both lights for that side are burned out, the trouble is with the turn signal switch.

(5)Flashing rate is too fast:
- •If this occurs on both the right and left sides, check that the battery is not being overcharged. If the flywheel magneto and battery voltage are normal, replace the turn signal relay.
- •If this occurs on only one side, one or both of the turn signal bulbs are of too high a wattage.

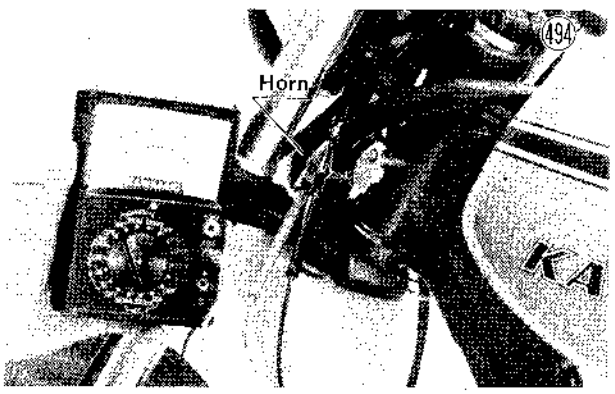
HORN CIRCUIT

The horn circuit and construction are shown in Fig. 495 . When the horn button is pressed with the ignition switch in either the daytime or nighttime position, 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.

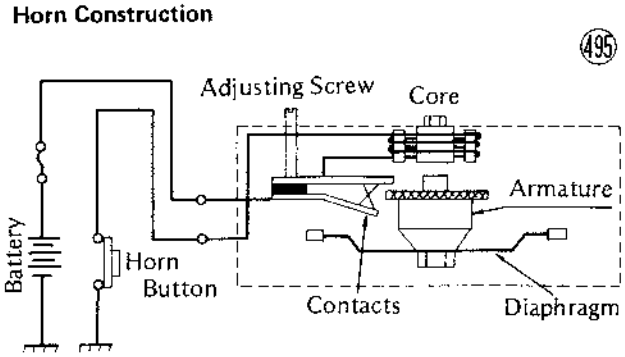
The contacts wear down after long use, requiring adjustment from time to time (Pg. 21). If the horn itself is determined to be at fault and adjustment fails to correct the trouble, the contacts or some other component in the horn is defective. The horn cannot be disassembled and must be replaced if defective.

Horn trouble

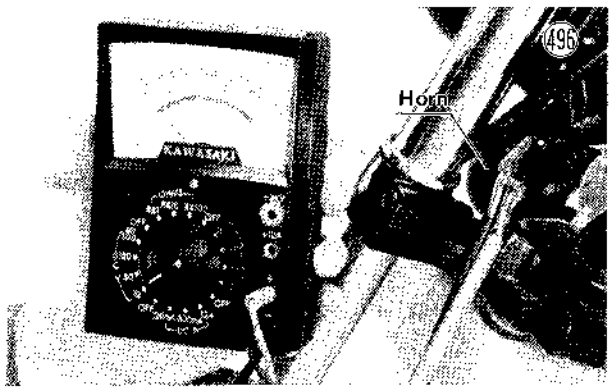
- •Check that battery voltage is normal.
- •Disconnect the leads to the horn, and connect to the horn terminals a multimeter set to the R x 1 range to check for continuity (close to zero ohms). If the reading is several ohms or if there is no reading at all, replace the horn.



Horn Construction



- If the reading is very close to zero, set the multimeter to the 12 VDC range, and connect the meter to the leads that were disconnected from the horn. The + meter lead goes to the brown lead, and the − meter lead goes to the black lead. With the ignition switch on, press the horn button. The meter should register battery voltage. If it does not, the fuse, ignition switch, or the wiring is at fault.
- If the meter does show battery voltage, indicating that the horn trouble lies within the horn itself, and adjustment fails to correct the trouble, replace the horn.



NOTE: Do not loosen the armature mounting since doing so would alter the armature position such that the horn would probably have to be replaced.

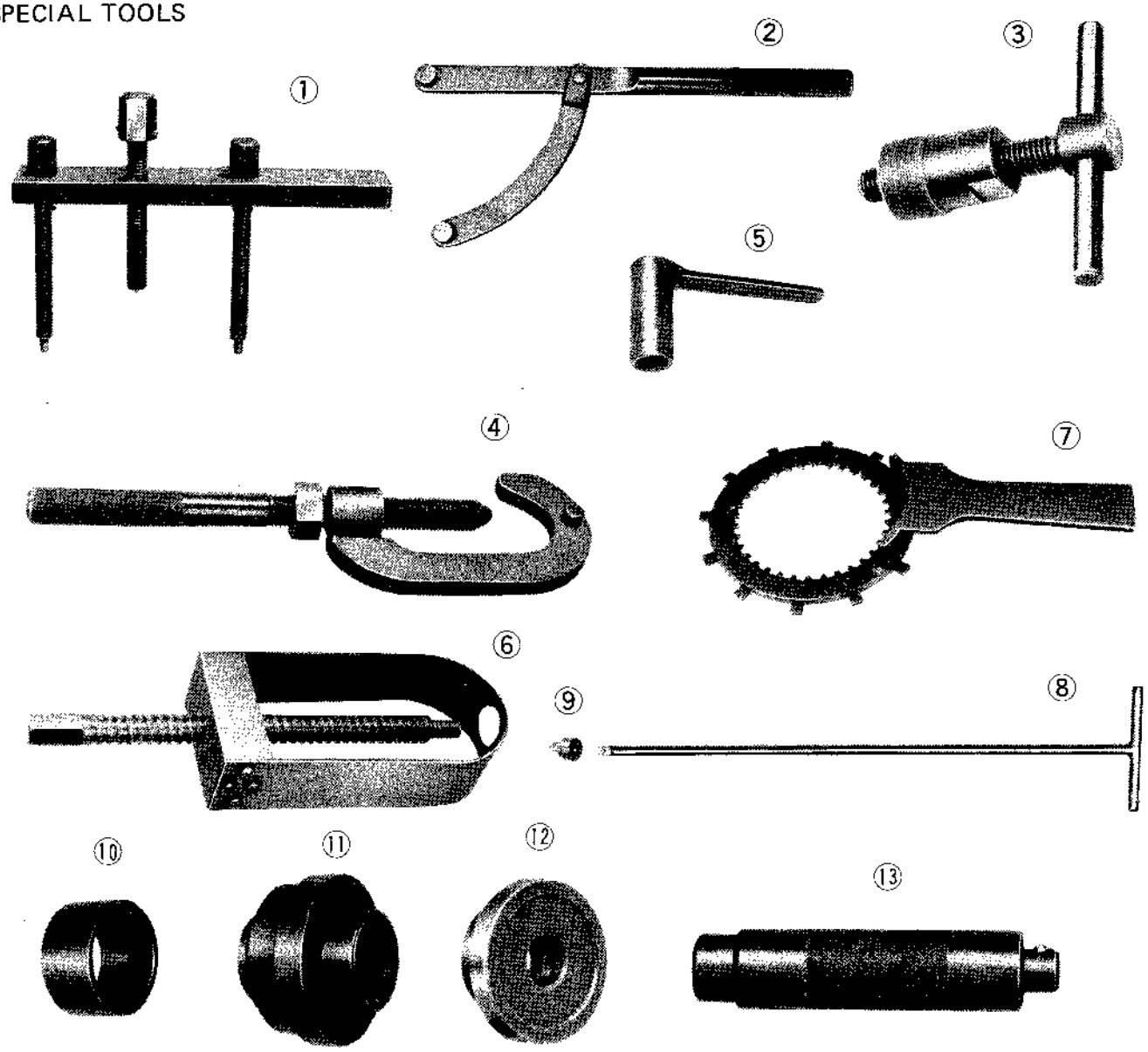
SPEEDOMETER & TACHOMETER

The speedometer and the tachometer are sealed units, which cannot be disassembled. If either fails to work satisfactorily, it must be replaced as a complete unit.

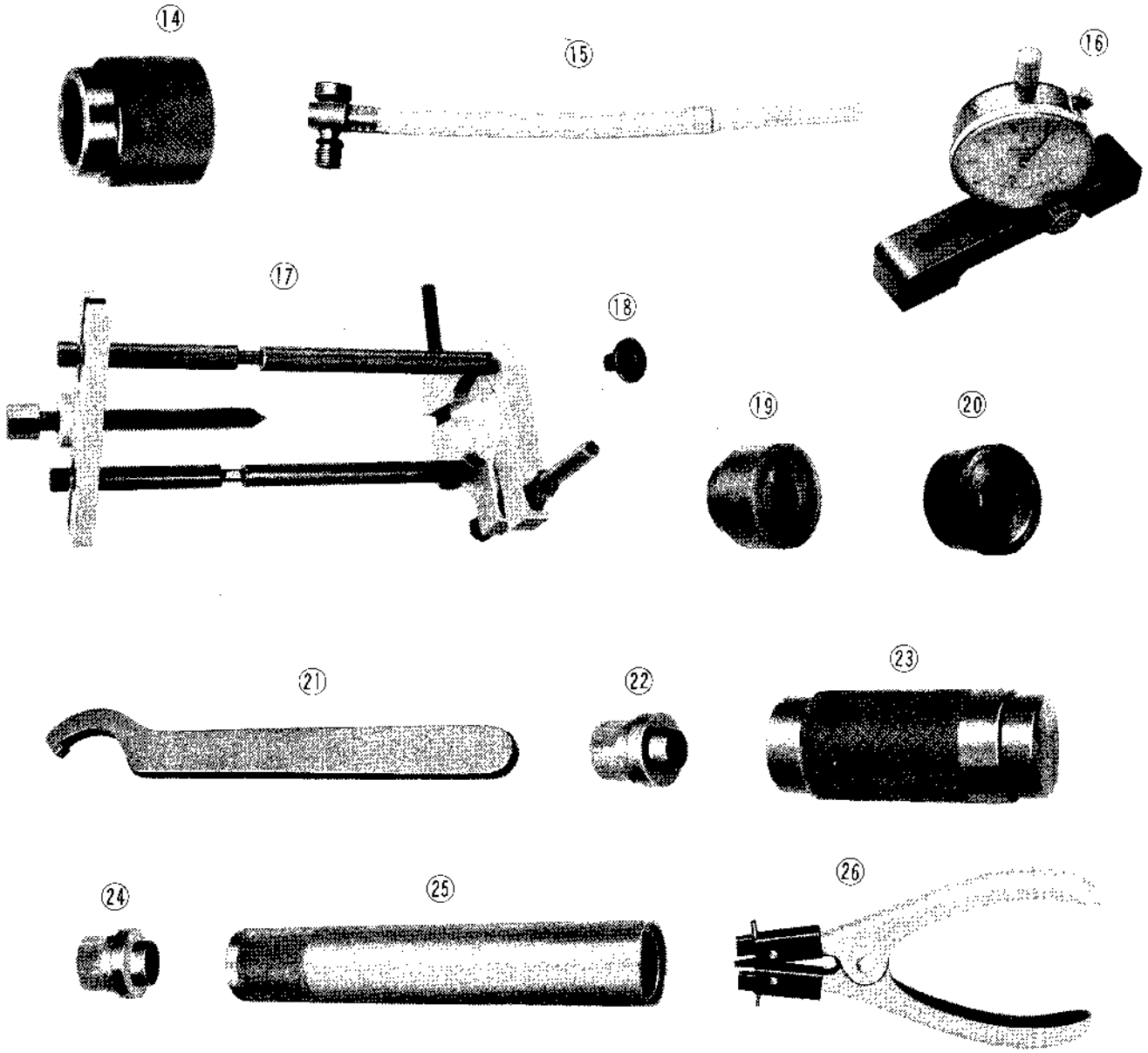
The speedometer and tachometer illumination lights and the indicator lights are independent and can be removed for replacement if necessary.

Appendix

SPECIAL TOOLS



REF.NO	TOOL NO.	DESCRIPTION
1	57001-153	CRANKCASE SPLITTING TOOL
2	57001-155	MAGNETO FLYWHEEL HOLDER
3	57001-252	MAGNETO FLYWHEEL PULLER
4	56019-040	ENGINE SPROCKET HOLDER
5	57001-159	CLUTCH RELEASE ADJUSTER
6	57001-233	PISTON PIN PULLER
7	57001-303	CLUTCH HOLDER
8	57001-179	FRONT FORK CYLINDER HOLDER ASSEMBLY
9	57001-181	FRONT FORK CYLINDER HOLDER ADAPTER
10	57001-292	STEERING STEM BEARING DRIVER
11	57001-293	STEERING STEM CAP DRIVER
12	57001-140	BEARING DRIVER
13	57001-139	BEARING DRIVER HOLDER



REF.NO	TOOL NO.	DESCRIPTION
14	57001-195	FRONT FORK OIL SEAL DRIVER
15	57001-206	FUEL LEVEL GAUGE
16	57001-160	DIAL GAUGE AND TDC FINDER "B" SET
17	57001-158	STEM BEARING PULLER
18	57001-166	STEM BEARING ADAPTER
19	57001-284	WHEEL BEARING DRIVER #1
20	57001-282	WHEEL BEARING DRIVER #2
21	57001-320	STEM NUT WRENCH
22	57001-130	SHIFT SHAFT OIL SEAL GUIDE
23	57001-286	SHIFT DRUM BEARING DRIVER
24	57001-263	KICK SHAFT OIL SEAL GUIDE
25	57001-137	STEM BEARING DRIVER
26	57001-115	PISTON RING PLIERS

PERIODIC MAINTENANCE

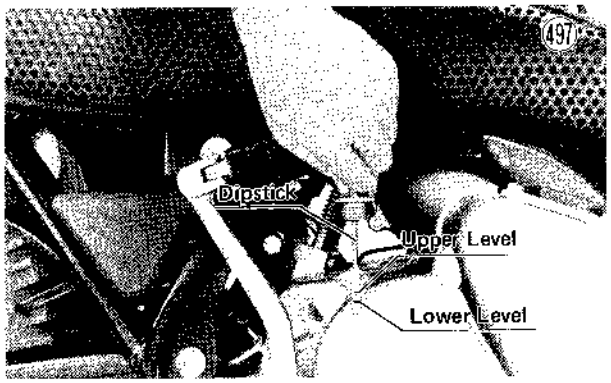
Operation \ Frequency	After initial 800 km (500 mi)	After initial 3,000 km (2,000 mi)	Every subsequent 3,000 km (2,000 mi)	Every 6,000 km (4,000 mi)	See page
Change transmission oil	•	•	•		153
Clean points, check ignition timing	•	•	•		13, 136
Adjust carburetor & oil pump cables	•	•	•		9, 10
Check, adjust clutch	•	•	•		14
Adjust drive chain	•	•	•		19
Clean, lubricate drive chain	•	•	•		125
Check, tighten spokes	•	•	•		71
Adjust brakes	•	•	•		17
Tighten bolts and nuts	•	•	•		—
Clean fuel tap strainer	•		•		118
Clean and oil air cleaner element		•	•		90
Carry out general lubrication		•	•		153
Check chain wear		•	•		125
Lubricate swing arm		•	•		133
Check brake shoes and drum		•	•		123
Check fork oil level				•	130
Decarbon heads and exhaust system				•	98
Check steering play				•	16
Clean, set spark plug	•		•		12, 143
Change front fork oil	Every 10,000 km (6,000 mi)				130
Regrease wheel bearings	Every 10,000 km (6,000 mi)				122

Transmission oil

In order for the transmission and clutch to function properly, maintain the transmission oil at the proper level, and change the oil in accordance with the periodic maintenance table. Motorcycle operation with insufficient, deteriorated, or contaminated transmission oil will cause accelerated wear and may result in transmission seizure.

1) oil level

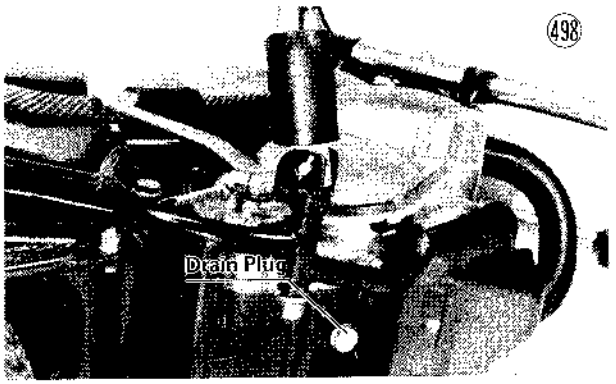
- If the motorcycle has just been used, wait 2 to 3 minutes for all the oil to drain down.
- If the oil has been poured in since the motorcycle was last used, kick the motorcycle over 3 or 4 times with the ignition switch left in the off position. This ensures that the oil will "settle".
- Situate the motorcycle so that it is fully perpendicular to the ground (off its side stand).
- Remove the oil filler opening plug dipstick, and wipe off any oil on the end.
- Insert the dipstick back through the oil filler opening without screwing it in, and then remove it. The oil should be above the lower and below the upper dipstick marks.



- If the amount of oil is excessive, remove the excessive oil using a syringe or some other suitable instrument or device.
- If the amount of oil is insufficient, add the correct amount of oil through the oil filler opening. Fill using the same type and make of oil that already is in the transmission.

2) oil change

- Warm up the engine thoroughly so that the oil will pick up any sediment and drain easily.
- With the motorcycle fully perpendicular to the ground, place an oil pan beneath the engine, and remove the engine drain plug so that all the transmission oil drains out.

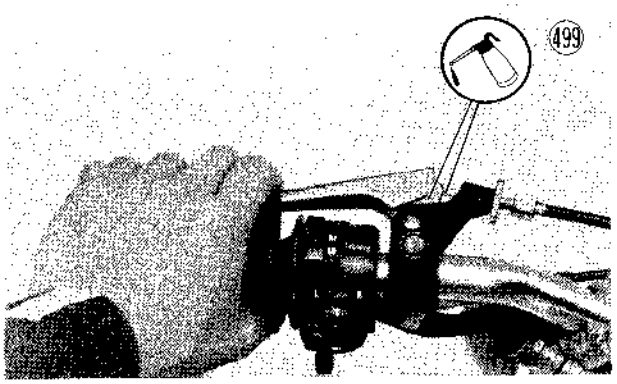


- After the oil has completely drained out, replace the drain plug and gasket, using a new gasket if the old one is deteriorated or damaged. Proper torque for the drain plug is 0.7~1.0 kg-m(61~81 in-lbs).
- Pour in through the oil filler opening in the right engine cover 0.65ℓ (0.69 US qt) of good quality SAE 10W30 or 10W40 motor oil.

General lubrication

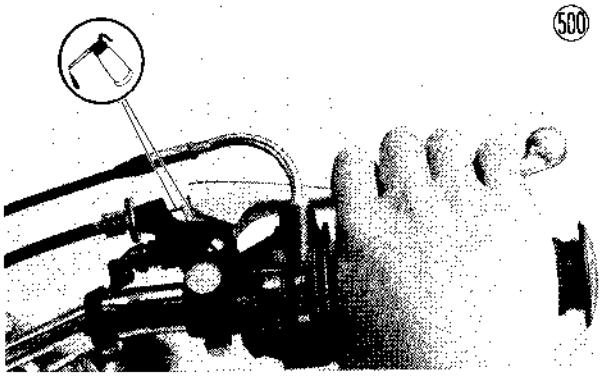
Lubrication of exposed parts subject to rust with either SAE 30 motor oil or regular grease should be carried out periodically and whenever the vehicle has been operated under wet or rainy conditions. Before lubricating each part, clean off any rusty spots with rust remover. Badly rusted nuts, bolts, etc. should be replaced for new ones.

- Slide back the clutch lever dust cover.
- Lubricate the clutch lever pivot and the exposed portion of the clutch inner cable with SAE 30 motor oil.
- Secure the dust cover back into its original position.

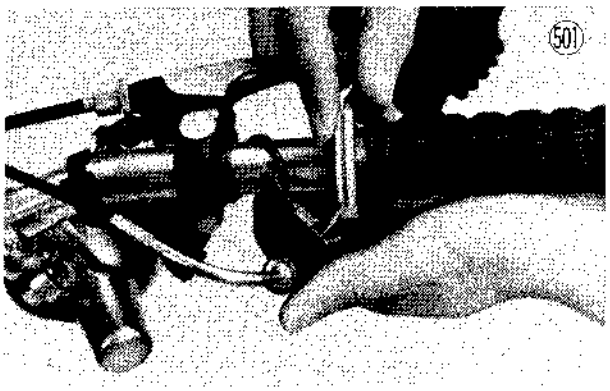


- Slide back the front brake lever dust cover.
- Lubricate the brake lever pivot and the exposed portion of the brake inner cable with SAE 30 motor oil.

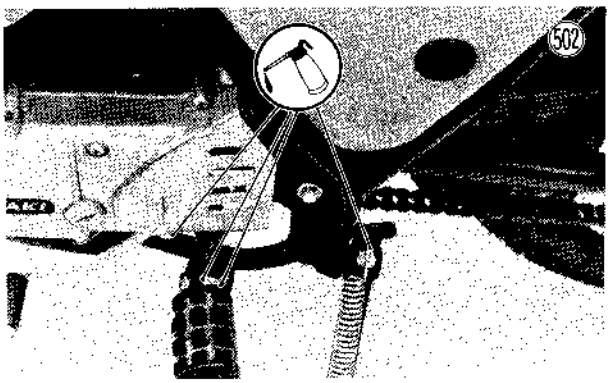
•Secure the dust cover back into its original position.



•Remove the engine stop switch assembly screws (2).
•Apply a light coat of grease to the exposed portion of the throttle grip inner cable.
•Replace the engine stop switch assembly screws.

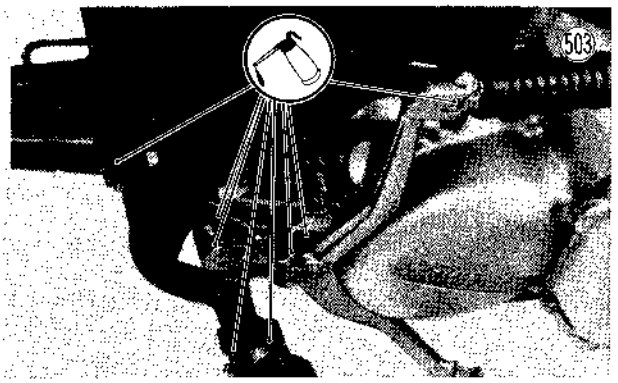


•Wipe off any dirt or grime from around the left footpeg, shift pedal, and side stand.
•Lubricate the exposed metal surfaces around the shift pedal serration and the bolts and nuts for the left footpeg and side stand.
•Wipe off excess lubricant.

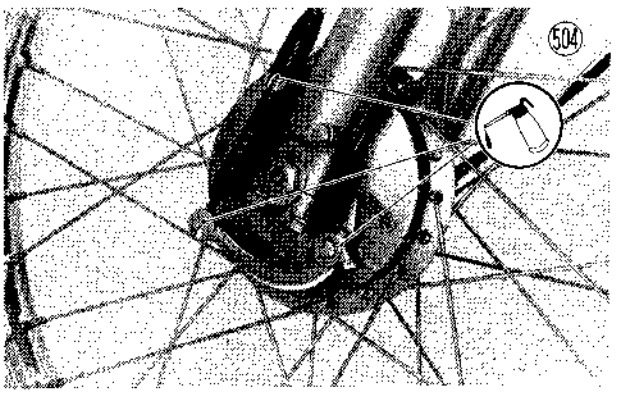


•Wipe off any dirt or grime from around the right footpeg, brake pedal, and kick starter pedal.

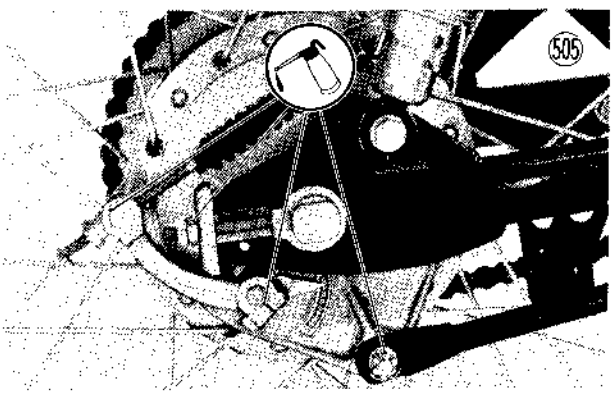
•Lubricate the exposed metal surfaces around the bolts and nuts for the right footpeg, brake pedal, and kick starter pedal.
•Wipe off excess lubricant.



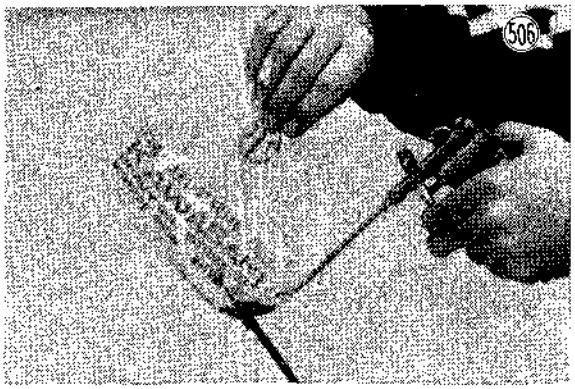
•While pressing down the front brake cable lower dust cover, squirt a few drops of oil onto the front brake inner cable.
•Oil lightly around the camshaft serration and where the cam lever connects to the brake cable.
•Wipe off excess oil.



•Oil lightly the end of each drive chain adjuster, the camshaft serration, and the end of the brake cable.
•Wipe off excess oil.



- Lubricate the front and rear brake cables as shown in the figure.



TORQUE TABLE

Tighten all bolts and nuts to the proper torque using an accurate torque wrench. A bolt or nut if insufficiently tightened may become damaged or fall out, possibly resulting in damage to the motorcycle and injury to the rider. A bolt or nut which is over-tightened may become damaged, strip an internal screw, or break and then fall out.

The following table lists the tightening torque for the major bolts and nuts:

Part Name	Metric	English	Assembly
Carburetor Rim Mounting Bolts (4)	0.4~0.5 kg-m	35~43 in-lbs	pg. 11
Clutch Hub Nut	8.0~11.0 kg-m	58~80 ft-lbs	pg. 41
Clutch Spring Bolts (5)	0.4~0.5 kg-m	35~43 in-lbs	pg. 41
Cylinder Head Nuts (4)	2.2 kg-m	16 ft-lbs	pg. 32
Engine Drain Plug	0.7~1.0 kg-m	61~86 in-lbs	pg. 28
Engine Mounting Bolts 10φ (2)	3.1~4.2 kg-m	23~30 ft-lbs	pg. 26
Engine Mounting Bolts 8φ (2)	2.0~2.2 kg-m	14.5~16 ft-lbs	pg. 26
Engine Sprocket Nut	7.0~7.5 kg-m	51~54 ft-lbs	pg. 45
Front Axle Clamp Bolts (4)	1.8~2.0 kg-m	13~14.5 ft-lbs	pg. 65
Front Axle Nut	7.0~8.0 kg-m	51~58 ft-lbs	pg. 65
Front Fork Clamp Bolts 8φ (2)	1.5~2.3 kg-m	11~16.5 ft-lbs	pg. 83
Front Fork Top Bolts (2)	1.5~2.0 kg-m	11~14.5 ft-lbs	pg. 83
Handlebar Clamp Bolts (4)	1.6~2.1 kg-m	12~15 ft-lbs	pg. 73
Magneto Flywheel Nut	5 kg-m	36 ft-lbs	pg. 59
Oil Hose Banjo Bolts (2)	0.2~0.25 kg-m	17~22 in-lbs	pg. 34
Primary Gear Nut	7.0~7.5 kg-m	51~54 ft-lbs	pg. 43
Rear Axle Nut	8.5~11.5 kg-m	61~83 ft-lbs	pg. 67
Rear Shock Absorber Bolts (2)	3.0~3.5 kg-m	22~25 ft-lbs	pg. 88
Rear Shock Absorber Nuts (2)	3.1~4.2 kg-m	23~30 ft-lbs	pg. 88
Rear Sprocket Bolts	2.0~2.2 kg-m	14.5~16 ft-lbs	pg. 89
Shift Drum Positioning Bolt	1.5 kg-m	11 ft-lbs	pg. 57
Spark Plug	2.5~3.0 kg-m	18.5~21.0 ft-lbs	pg. –
Spokes	0.25~0.3 kg-m	22~26 in-lbs	pg. 71
Steering Base Clamp Bolt 10φ	2.0~3.0 kg-m	14.5~22 ft-lbs	pg. 87
Steering Stem Head Bolt	5.5 kg-m	40 ft-lbs	pg. 86
Swing Arm Pivot Shaft Nut	7.0~7.5 kg-m	51~54 ft-lbs	pg. 88
Torque Link Nut	2.0~2.2 kg-m	14.5~16 ft-lbs	pg. 67

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 Pg. 156 vary to a greater or lesser extent from what is given in this table. Refer to this table for only the bolts and nuts not included in the table on Pg.156 .

Coarse threads

dia (mm)	Pitch (mm)	ft-lbs	kg-m
5	0.90	2.53~3.47	0.35~0.48
6	1.00	4.56~6.37	0.63~0.88
8	1.25	11.6~15.9	1.6~2.2
10	1.50	22.4~30.4	3.1~4.2
12	1.75	39.1~54.2	5.4~7.5
14	2.00	60.0~83.2	8.3~11.5
16	2.00	94.0~130	13~18
18	2.50	130~181	18~25
20	2.50	188~253	26~35

Fine threads

dia (mm)	Pitch (mm)	ft-lbs	kg-m
5	0.50	2.53~3.47	0.35~0.48
6	0.75	3.98~5.57	0.55~0.77
8	1.00	9.76~13.4	1.35~1.85
10	1.25	18.4~25.3	2.55~3.5
12	1.50	32.5~44.8	4.5~6.2
14	1.50	53.5~73.8	7.4~10.2
16	1.50	83.2~116	11.5~16
18	1.50	123~166	17~23
20	1.50	166~239	23~33

TROUBLESHOOTING GUIDE

Engine Doesn't Start; Starting Difficulty

Engine won't turn over
- Cylinder, piston seizure
- Con-rod small end seizure
- Con-rod big end seizure
- Transmission gear or crankcase bearing seizure
- Kickstarter return spring broken
- Kick ratchet gear not engaging

No fuel flow
- No fuel in tank
- Fuel tap turned off
- Tank cap air vents obstructed
- Fuel tap clogged
- Fuel line clogged
- Float valve clogged

Engine flooded
- Float 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
- Spark plug dirty, defective, or maladjusted
- Spark plug cap or high tension wiring defective
- Spark plug cap shorted or not in good contact
- Contact breaker points dirty or damaged
- Condenser defective
- Ignition coil defective
- Ignition timing maladjusted
- Flywheel magneto defective
- Ignition or engine stop switch shorted
- Wiring shorted or open

Fuel/air mixture incorrect
- Air screw and/or idling screw maladjusted
- Pilot jet or air passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Starter jet clogged

Compression low
- Cylinder, piston worn
- Piston rings bad (worn, weak, broken, or sticking)
- Piston ring/land clearance excessive
- Cylinder head gasket damaged
- Cylinder head not sufficiently tightened down
- Cylinder head warped
- Spark plug loose
- Crankshaft oil seal deteriorated or damaged
- Rotary valve sleeve **O** ring deteriorated or damaged
- Rotary valve cover large **O** ring deteriorated or damaged
- Decompressor loose or faulty
- Decompressor hole plug loose

Poor Running at Low Speed

Spark weak
- Spark plug dirty, defective, or maladjusted
- Spark plug cap or high tension wiring defective
- Spark plug cap shorted or not in good contact
- Contact breaker points dirty or damaged
- Condenser defective
- Ignition coil defective
- Ignition timing maladjusted
- Flywheel magneto defective

Fuel /air mixture incorrect
- Air screw and/or idling screw maladjusted
- Pilot jet or air passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Starter plunger stuck open
- Float level too high or too low
- Fuel tank air vents obstructed

Compression low
- Cylinder, piston worn
- Piston rings bad (worn, weak, broken or sticking)
- Piston ring/land clearance excessive
- Cylinder head gasket damaged
- Cylinder head not sufficiently tightened down
- Cylinder head warped
- Spark plug loose
- Crankshaft oil seal deteriorated or damaged
- Rotary valve sleeve **O** ring deteriorated or damaged
- Rotary valve cover large **O** ring deteriorated or damaged
- Decompressor loose or faulty
- Decompressor hole plug loose

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 shorted or not in good contact
- Contact breaker points dirty or damaged
- Condenser defective
- Ignition coil defective
- Ignition timing maladjusted
- 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
- Float level too high or too low
- Air jet or air passage clogged
- Air cleaner clogged, poorly sealed, or missing
- Starter plunger stuck open
- Fuel to carburetor insufficient
- Water or foreign matter in fuel
- Fuel tank air vents obstructed

Compression low
- Cylinder, piston worn
- Piston rings bad (worn, weak, broken, or sticking)
- Piston ring/land clearance excessive
- Cylinder head gasket damaged
- Cylinder head not sufficiently tightened down
- Cylinder head warped
- Spark plug loose
- Crankshaft oil seal deteriorated or damaged
- Rotary valve sleeve **O** ring deteriorated or damaged
- Rotary valve cover large **O** ring deteriorated or damaged

Decompressor loose or faulty
Decompressor hole plug loose

Oil and fuel/air mixture incorrect
Throttle control cable maladjusted
Crankshaft oil seal deteriorated or damaged
Rotary valve sleeve O ring deteriorated or damaged
Rotary valve cover large O ring deteriorated or damaged
Oil passage pipe oil seal damaged
Oil pump defective
Oil line or check valve clogged
Air in oil pump or oil line

Engine rpm will not rise properly
Starter plunger stuck open
Float level too high or too low
Main jet clogged
Throttle valve does not fully open
Air cleaner clogged
Muffler clogged
Water or foreign matter in fuel
Cylinder exhaust port clogged
Brakes dragging
Clutch slipping
Overheating
Transmission oil level too high
Transmission oil viscosity too high
Crankshaft bearing worn or damaged

Knocking
Ignition timing maladjusted
Carbon built up in combustion chamber
Fuel poor quality or incorrect

Miscellaneous
Throttle valve won't fully open
Muffler clogged
Cylinder exhaust port clogged
Brakes dragging
Clutch slipping
Overheating
Transmission oil level too high
Transmission oil viscosity too high
Crankshaft bearing worn or damaged

Overheating

Firing incorrect
Spark plug dirty, damaged, or maladjusted
Ignition timing maladjusted

Fuel/air mixture incorrect
Main jet clogged
Float level too low
Air cleaner clogged

Oil and fuel/air mixture incorrect
Throttle control cable maladjusted
Oil pump defective
Oil line or check valve clogged
Air in oil pump or oil line

Compression high
Carbon built up in combustion chamber

Engine load faulty
Clutch slipping
Transmission oil level too high
Brakes dragging

Fuel and Oil Consumption Excessive

Idling too fast
Idling screw maladjusted
Throttle control cable catching or poorly adjusted

Fuel/air mixture too rich
Air screw maladjusted
Main jet too large
Jet needle or needle jet worn
Starter plunger stuck open
Float level too high
Air cleaner clogged

Compression low
Cylinder, piston worn
Piston rings bad (worn, weak, broken, or sticking)
Piston ring/land clearance excessive
Cylinder head gasket damaged
Cylinder head not sufficiently tightened down
Cylinder head warped
Spark plug loose
Crankshaft oil seal deteriorated or damaged
Rotary valve sleeve O ring deteriorated or damaged
Rotary valve cover large O ring deteriorated or damaged
Decompressor loose or faulty
Decompressor hole plug loose

Exhaust obstructed
Muffler clogged
Cylinder exhaust port clogged

Engine load faulty
Clutch slipping
Brakes dragging

Clutch Operation Faulty

Clutch slipping
No clutch lever play
Friction plates worn or warped
Steel plates worn or warped
Clutch springs weak
Clutch cable 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
Transmission oil deteriorated
Transmission oil of too high a viscosity
Clutch housing frozen on drive shaft
Clutch release mechanism defective

Gear Shifting Faulty

Doesn't go into gear; shift pedal doesn't return
Clutch not disengaging
Shift fork(s) bent or seized
Shift return spring weak or broken
Shift lever broken
Shift return spring pin loose
Shift lever spring broken

Jumps out of gear
- Shift fork(s) worn
- Gear grooves (s) worn
- Gear dogs, dog holes, and/or dog recesses worn
- Shift drum groove(s) worn
- Shift drum positioning pin spring weak or broken
- Shift fork pin(s) worn
- External shift mechanism arm pawl worn
- Drive shaft, output shaft, and/or gear splines worn

Overshifts
- Shift return spring pin loose

Abnormal Engine Noise

Knocking
- Ignition timing maladjusted
- Carbon built up in combustion chamber
- Fuel poor quality or incorrect
- Overheating

Piston slap
- Cylinder/piston clearance excessive
- Cylinder, piston worn
- Con-rod bent
- Piston pin, piston holes worn

Other noise
- Con-rod small end clearance excessive
- Con-rod big end clearance excessive
- Piston ring(s) worn, broken, or stuck
- Piston seizure damage
- Cylinder head gasket leaking
- Exhaust pipe leaking at cylinder connection
- Crankshaft runout excessive
- Engine mounts loose
- Crankshaft bearing worn

Abnormal Drive Train Noise

Clutch noise
- Clutch damping rubber deteriorated
- Clutch housing/friction plate clearance excessive
- Clutch housing gear/primary gear backlash
- Metal chips jammed in clutch housing gear teeth

Transmission noise
- Crankcase bearings worn
- Transmission gears worn or chipped
- Metal chips jammed in gear teeth
- Transmission oil insufficient or too thin
- Kick ratchet gear not properly disengaging from kick gear
- Oil pump gear/pinion gear worn or chipped

Drive chain noise
- Chain worn
- Rear and/or engine sprocket(s) worn
- Chain lubrication insufficient
- Rear wheel misaligned

Abnormal Frame Noise

Front fork shock absorber noise
- Oil insufficient or too thin
- Spring weak or broken

Rear shock absorber noise
- Shock absorber defective

Brake noise
- Brake linings overworn or worn unevenly
- Drum worn unevenly or scored
- Brake spring(s) weak or broken
- Foreign matter in hub
- Brake not properly adjusted

Other noise
- Brackets, nuts, bolts, etc. not properly mounted or tightened

Exhaust smoke

Excessive white smoke
- Throttle control cable maladjusted
- Oil poor quality or incorrect
- Crankshaft oil seal defective
- Rotary valve sleeve O ring deteriorated or damaged
- Rotary valve cover large O ring deteriorated or damaged
- Oil passage pipe oil seal damaged

Brownish smoke
- Air cleaner clogged
- Main jet too large or fallen off
- Starter plunger stuck open
- Float level too high

Handling and/or Stability Unsatisfactory

Handlebar hard to turn
- Steering stem nut 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 bushing damaged
- Rim(s) warped
- Front, rear axle runout excessive
- Spokes loose
- Wheel bearing(s) worn
- Handlebar clamps loose

Handlebar pulls to one side
- Frame bent
- Wheel misalignment
- Swing arm bent or twisted
- Swing arm pivot shaft runout excessive
- Steering stem bent
- Front fork shock absorber(s) bent
- Right/left front fork shock absorber oil level uneven
- Right/left rear shock absorbers unbalanced

Shock absorption unsatisfactory

Too hard:
- Front fork oil excessive
- Front fork oil viscosity too high
- Tire air pressure too high
- Rear suspension maladjusted

Too soft:
- Front fork oil insufficient and/or leaking
- Front fork oil viscosity too low
- Front fork, rear shock absorber spring(s) weak

Brake Doesn't Hold

Brake not properly adjusted
Linings overworn or worn unevenly
Drum worn unevenly or scored
Cam, camshaft, shaft hole worn
Oil, grease on lining and drum
Dirt, water between lining and drum
Overheated

Battery Discharged

Battery faulty(e.g., plates sulfated, shorted through sedimentation, electrolyte level too low)
Battery leads making poor contact
Rectifier defective
Ignition switch defective
Load excessive (e.g., bulb of excessive wattage)
Flywheel magneto defective

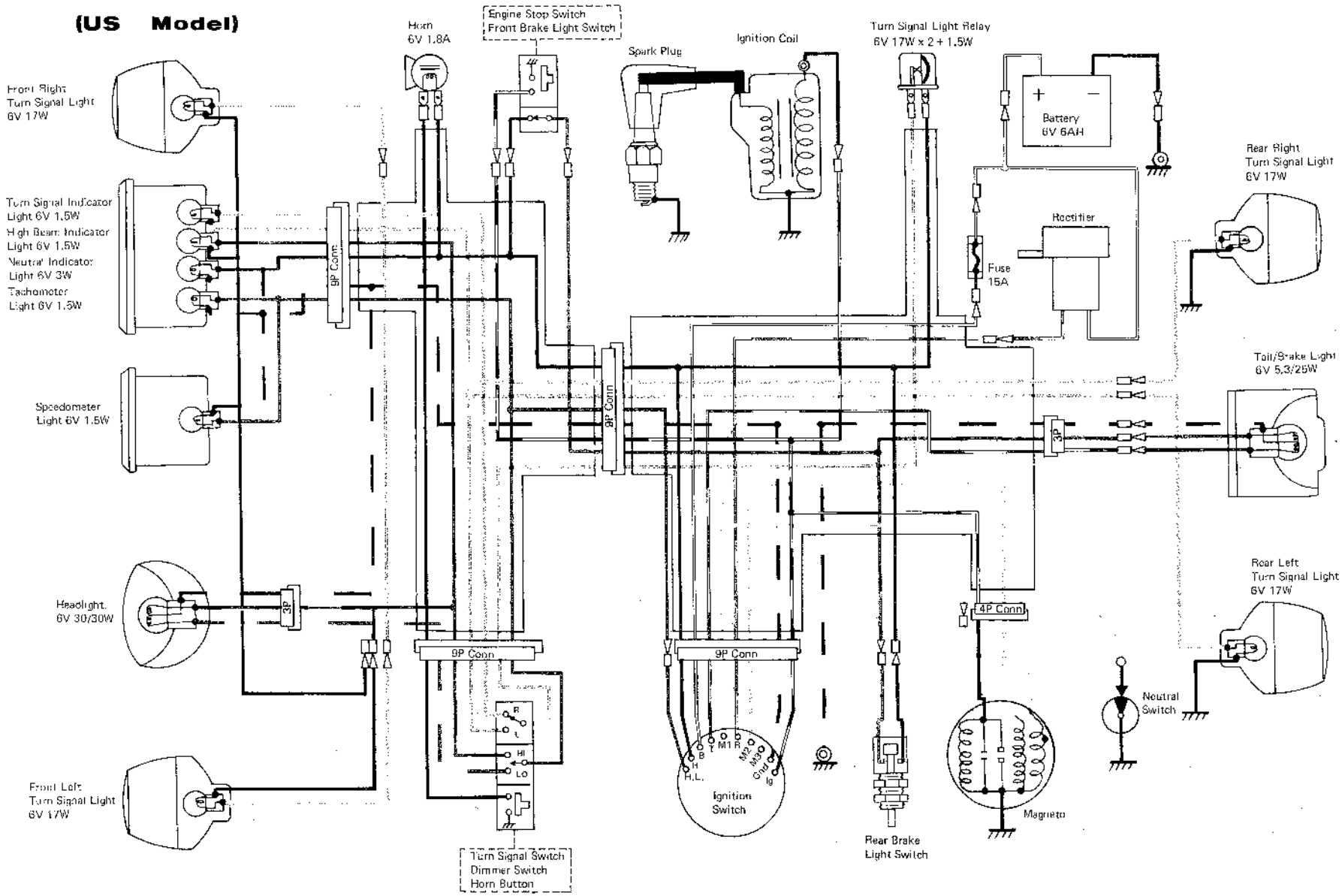
Battery Overcharged

Open in head light circuit
Load inadequate (e.g., light burned out)

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.

KS125 Wiring Diagram

(US Model)

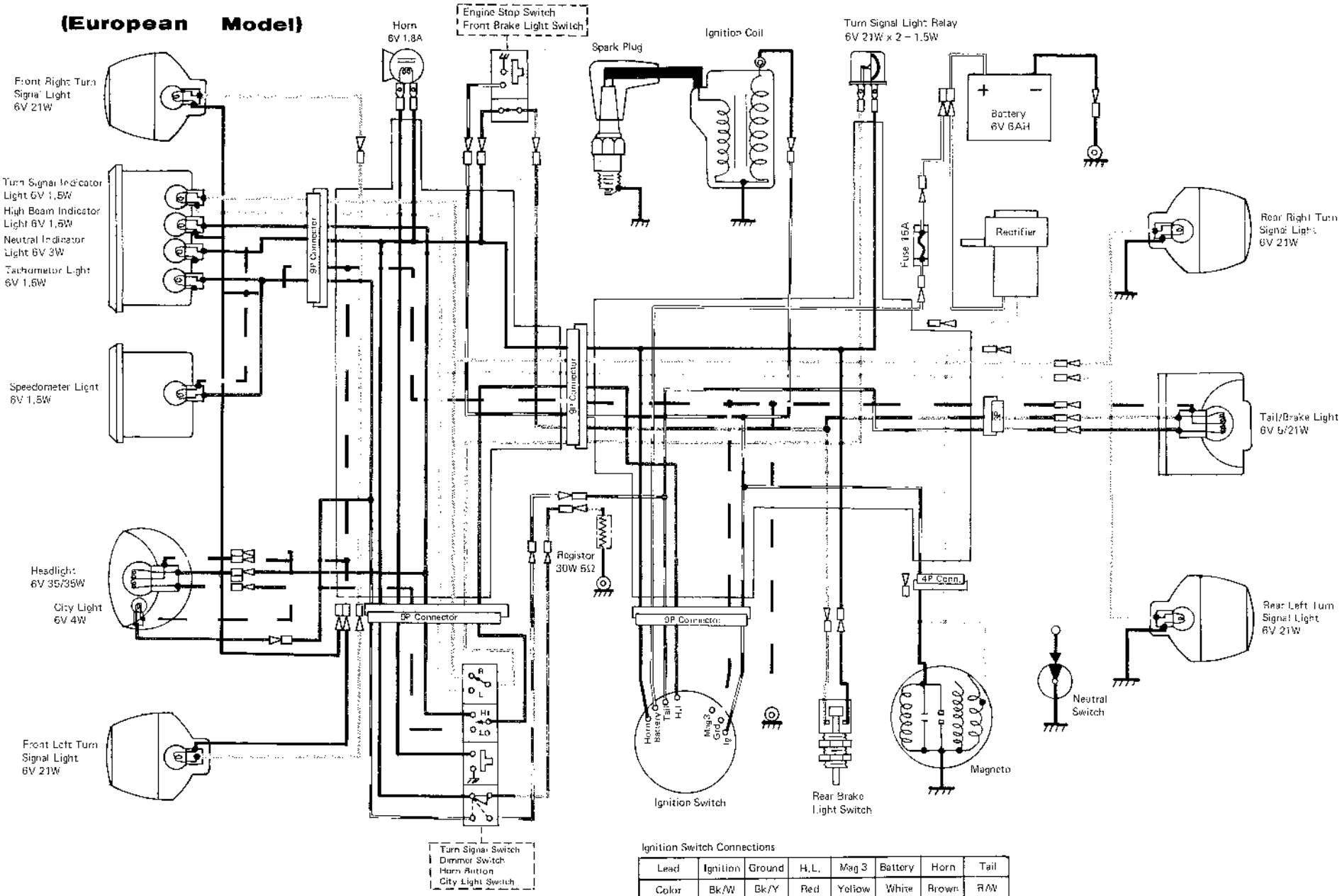


Lead	Ignition	Ground	Mag 1	Rectifier	Mag 2	H.L.	Mag 3	Battery	Horn	Tail
Color	Bk/W	Bk/Y	LB	Bl/W	P	R	Y	W	Br	R/W
OFF	●	●								
DAY			●	●				●	●	
NIGHT				●	●	●	●	●	●	●

(131-1)

KS125 Wiring Diagram

(European Model)



Ignition Switch Connections

Lead	Ignition	Ground	H.L.	Mag 3	Battery	Horn	Tail
Color	Bk/W	Bk/Y	Red	Yellow	White	Brown	R/W
OFF	●	●					
DAY					●	●	
NIGHT			●	●	●	●	●
PARK	●	●			●		●

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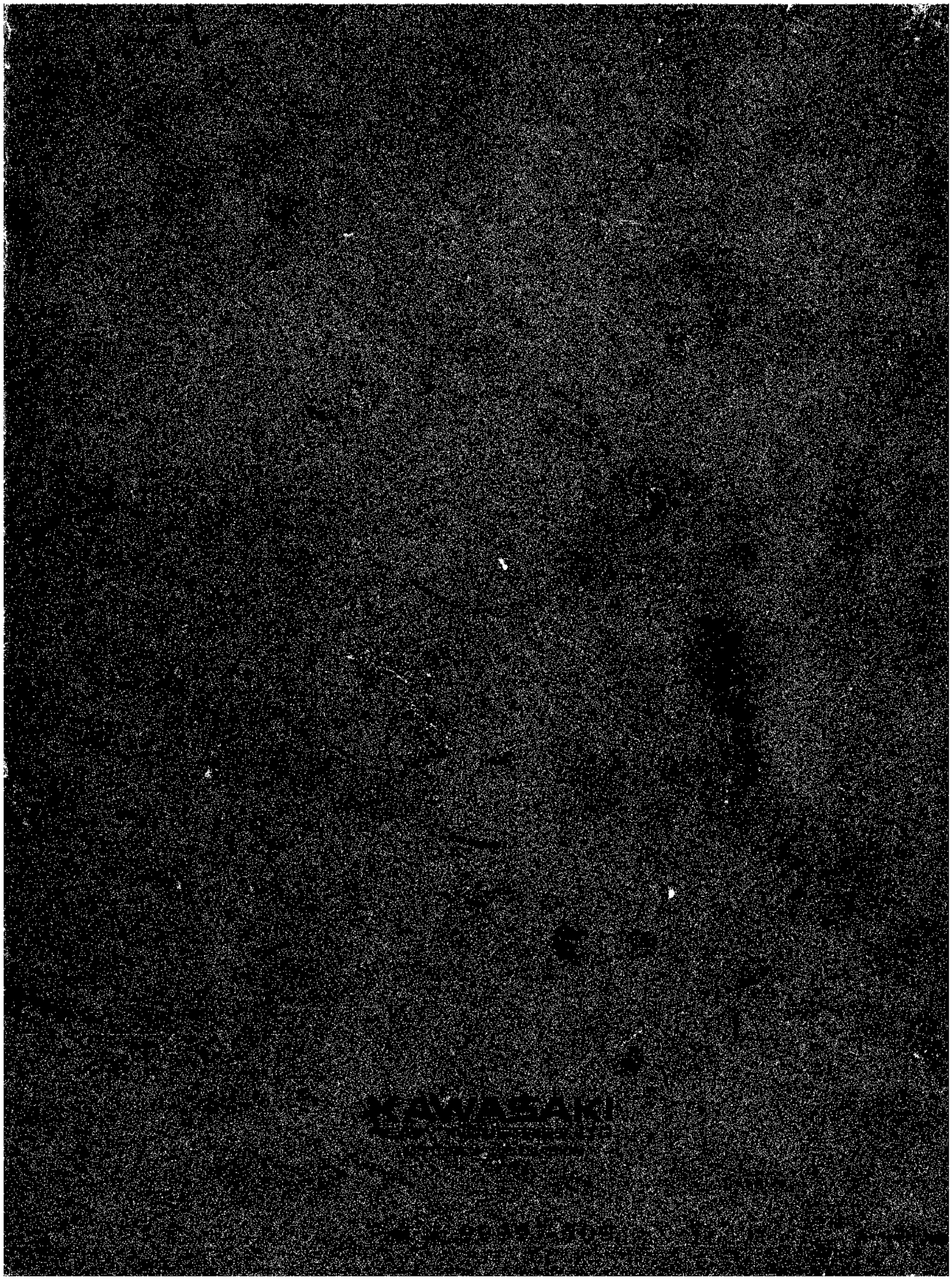
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