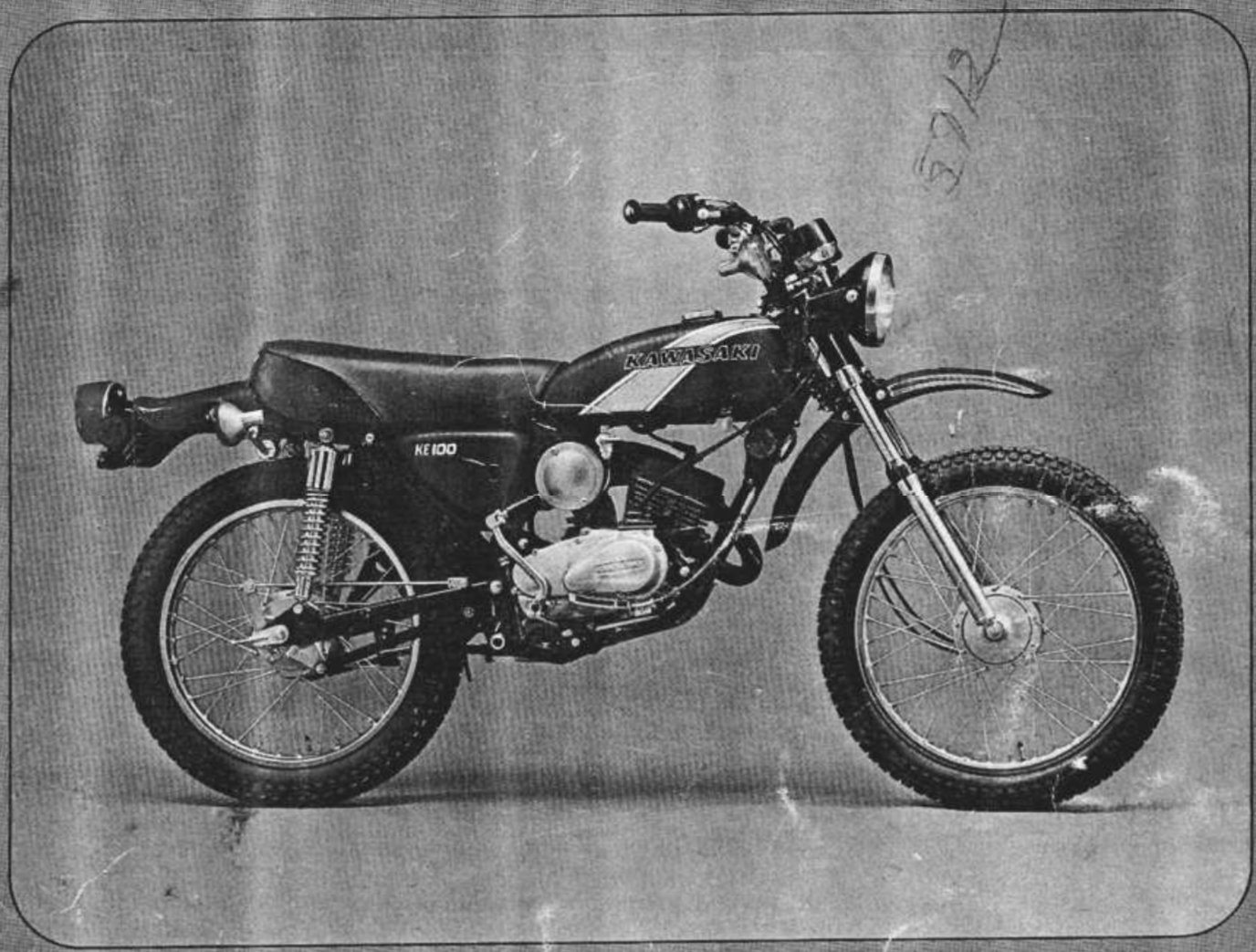
Kawasaki

KE100



MOTORCYCLE SHOP MANUAL

Decimal Equivalents

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

INCH					MM INCH
33/64				.515625	
	17/32			.53125	12 mm= .47244 inch
35/64				.546875	
		9/16		.5625	
37/64				.578125	13 mm= .51181 inch
	19/32			.59375	
39/64				.609375	
			5/8	.625	14 mm= .55118 inch
41/64				.640625	
	21/32			.65625	
43/64				.671875	15 mm= .59055 inch
		11/16		.6875	
45/64				.703125	
	23/32			.71875	16 mm= .62992 inch
47/64				.734375	
			3/4	.75	
49/64				.765625	17 mm= .66929 inch
	25/32			.78125	
51/64				.796875	
		13/16		.8125	18 mm= .70866 inch
53/64				.828125	
	27/32			.84375	
55/64				.859375	19 mm= .74803 inch
			7/8	.875	
57/64				.890625	
	29/32			.90625	20 mm= .78740 inch
59/64				.921875	
		15/16		.9375	
61/64				.953125	21 mm= .82677 inch
	31/32			.96875	
63/64				.984375	
			1	1.	22 mm= .86614 inch

MM INCH
23 mm= .90551 inch
24 mm= .94488 inch
25 mm= .98425 inch

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

Kawasaki

KE100

G5 (1971~1974)
KE100(1975)



MOTORCYCLE SHOP MANUAL

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First Issue: Sep. 1, 1975①

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 the Shop Manual is based on the '74 Model of the G5, 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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KAWASAKI
KE100


KAWASAKI
KE100

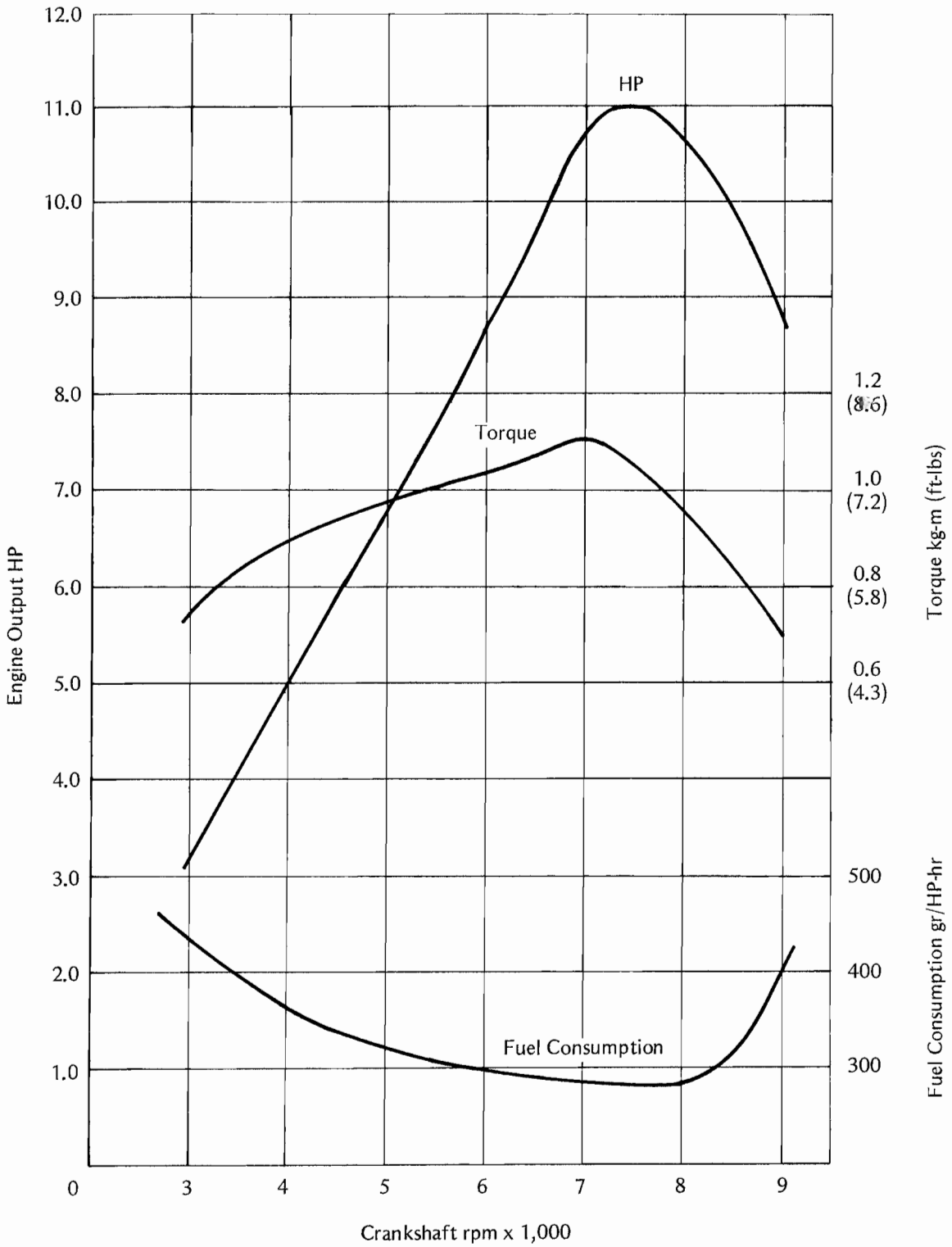
Specifications

		G5	KE100
Dimensions			
Overall length		1,980 mm	—
Overall width		860 mm	—
Overall height		1,070 mm	—
Wheelbase		1,260 mm	—
Road clearance		240 mm	—
Dry weight		89 kg	91 kg
Fuel tank capacity		8.0 ℓ	—
Oil tank capacity		1.2 ℓ	—
Performance			
Climbing ability		33°	—
Braking distance		6.5 m @35 kph	—
Minumum turning radius		2 m	—
Engine			
Type		2-stroke single cylinder	—
		rotary disc valve	—
Bore and stroke		49.5 x 51.8 mm	—
Displacement		99 cc	—
Compression ratio		7.0 : 1	—
Maximum horsepower		11 HP/7,500 rpm	—
Maximum torque		1.1 kg-m/7,000 rpm	—
Port timing			
Intake	Open	120° BTDC	—
	Close	55° ATDC	—
Scavenging	Open	58°35′ BBDC	—
	Close	58°35′ ABDC	—
Exhaust	Open	84°16′ BBDC	—
	Close	84°16′ ABDC	—
Carburetor type		Mikuni VM19SC	—
Lubrication system		Superlube (Oil injection)	—
Engine Oil		2-stroke Oil	—
Starting system		Primary Kick	—
Ignition system		Magneto	—
Ignition timing		20° (1.96 mm) BTDC	—
Spark Plug		NGK B-8HCS	NGK B8HS
Transmission			
Type		5-speed constant mesh return shift	—
Clutch		Wet, multi disc	—

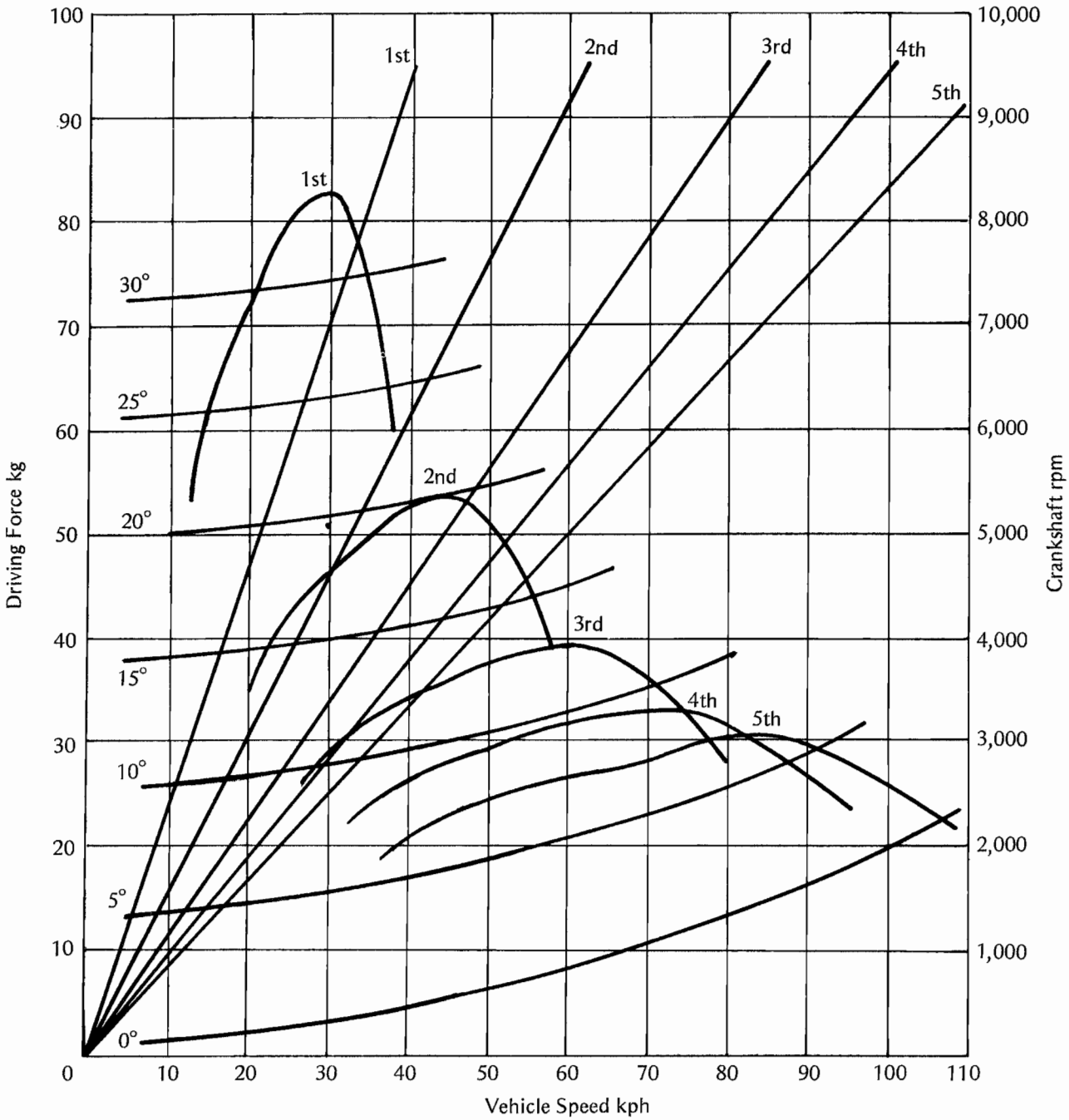
Gear ratios:			
1st		2.92 (35/12)	—
2nd		1.76 (30/17)	—
3rd		1.30 (26/20)	—
4th		1.09 (24/22)	—
5th		0.96 (23/24)	—
Primary reduction ratio		3.52 (74/21)	—
Final reduction ratio		2.80 (42/15)	—
Overall drive ratio (top gear)		9.46	—
Transmission oil capacity		0.6 ℓ	—
Transmission oil		SAE 10W30 or SAE 10W40	—
Electrical equipment			
Flywheel magneto		Kokusan FA6309	—
Ignition coil		Kokusan IG3122AC	—
Battery		6V 4AH	—
Headlight type		Sealed Beam	—
Headlight		6V 25/25W	6V 30/30W
Tail/Brake light		6V 5.3/17W	6V 5.3/25W (3/32 CP)
Speedometer light		6V 3W	—
Neutral indicator light		6V 3W	—
High beam indicator light		6V 1.5W	—
Turn signal lights		6V 17W	—
Horn		6V 1.2A	—
Frame			
Type		Tubular, double cradle	—
Steering angle		43° to either side	—
Castor		60.5°	—
Trail		120 mm	—
Tire size	Front	2.75-19 4PR	—
	Rear	3.00-18 4PR	—
Suspension	Front	Telescopic fork	—
	Rear	Swing arm	—
Suspension stroke	Front	145 mm	—
	Rear	90 mm	—
Front fork oil capacity (per shock absorber)		158~166 cc	—
Front fork oil		SAE 10W	—
Brake			
Type		Internal expansion	—
		Leading trailing	—
Inside diameter	Front	110 x 30 mm	—
	Rear	110 x 30 mm	—

Specifications subject to change without notice.

Engine Performance Curves



Running 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.

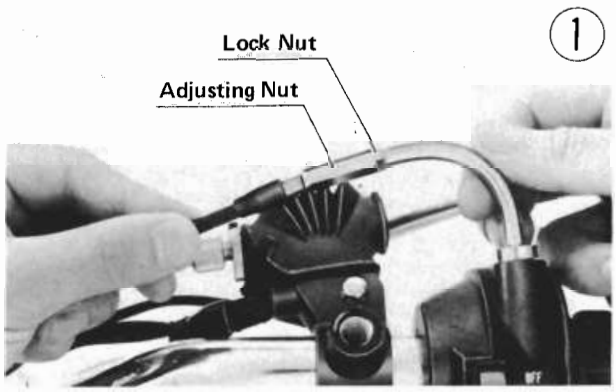
Since the throttle grip controls both the carburetor and the oil pump simultaneously, it is important that each cable be adjusted to its designated base position so that the quantity of oil and fuel/air mixture reaches the engine in the correct proportion at all throttle openings. Stretching of the cables 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 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. 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. If there is too much or too little play, 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 obtained.



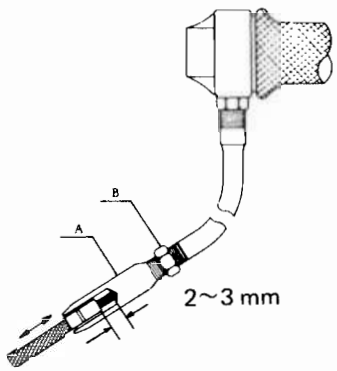
1

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

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.

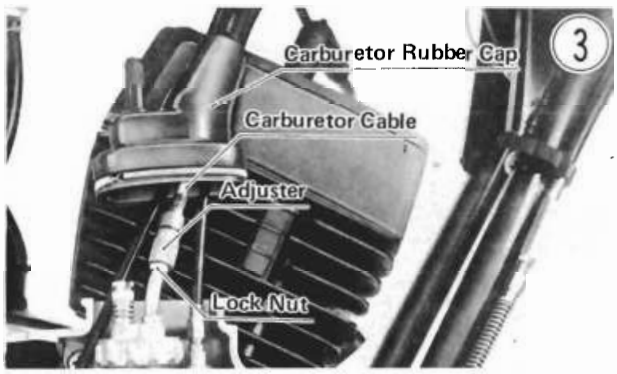
Throttle Grip Adjustment



2

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 to compensate for cable stretch.

- Warm up the engine for about 5 minutes, and then turn off the engine.
- Check to see that the throttle grip has the proper amount of play.
- Slide the carburetor rubber cap up out of place, and remove the carburetor cover.
- Turn in the idling screw (throttle stop screw) until the throttle valve reaches its lowest position.
- Loosen the lock nut at the lower end of the carburetor cable, and with the adjuster, eliminate the play between the cable and the throttle valve so that the slightest tug on the outer cable will affect the throttle valve. Be careful not to turn the adjuster so far that the throttle valve rises out of the zero position.



3

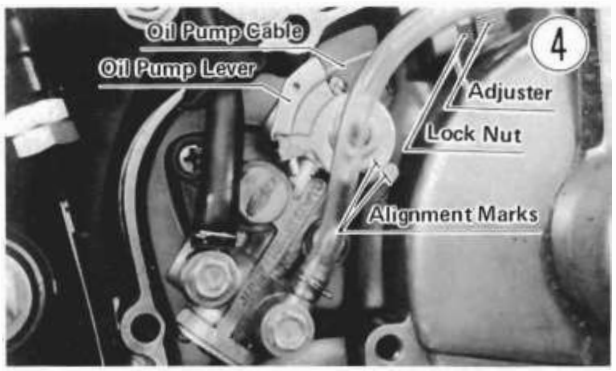
- Tighten the lock nut.
- Replace the carburetor cover and the carburetor rubber cap.
- Adjust the idling speed (Pg. 10).

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 alignemnt 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 from a predetermined throttle opening. This adjustment is correct when the 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 and whenever white exhaust smoke is observed or oil insufficiency is suspected, check the oil pump alignment marks and adjust the oil pump cable if necessary.

- Check that the throttle grip has the proper amount of play (Pg. 9).
- Remove the oil pump cover.
- If the marks are not properly aligned, loosen the oil pump cable lock nut, and turn the adjuster until the marks on the oil pump lever and lever stopper line up. After turning the adjuster, make sure that there is no space between the end of the outer cable and where it should seat in the adjuster due to gripping of the outer cable by the rubber fitting.



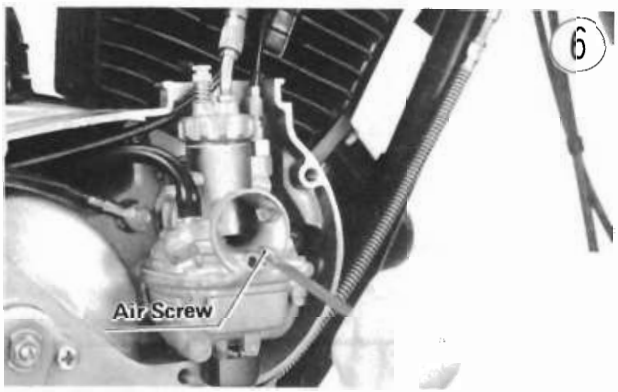
- Tighten the lock nut.
- Replace the oil pump cover.

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 required during periodic maintenance and whenever the idle 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 the resulting lack of engine braking may make the motorcycle difficult to control. For a proper fuel/air mixture at idling and low speed, it is important to set the air screw properly when adjusting the idling.

- Slide the carburetor rubber cap up out of place.
- Remove the carburetor cover.
- Screw in the air screw fully, but not tightly, and then back it out 1¾ turns. This sets the low speed mixture.



- Replace the carburetor cover.
- Warm up the engine for about 5 minutes.
- Screw in the idling screw until the engine is at its lowest possible r.p.m., and then back it out until the engine reaches its lowest stable r.p.m.



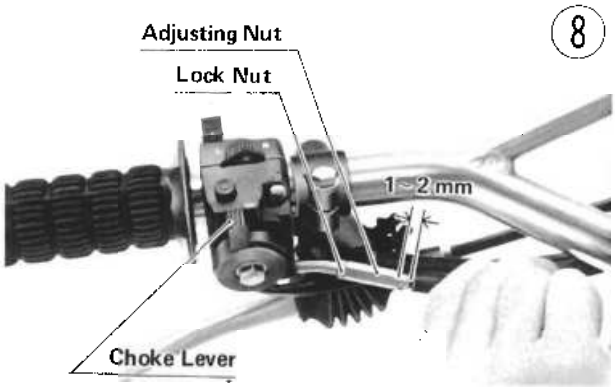
NOTE: The ignition timing must be correct for proper idling adjustment.

CHOKE CABLE

If the choke cable (more appropriately called a starter cable) is left too loose, the starter plunger may not open

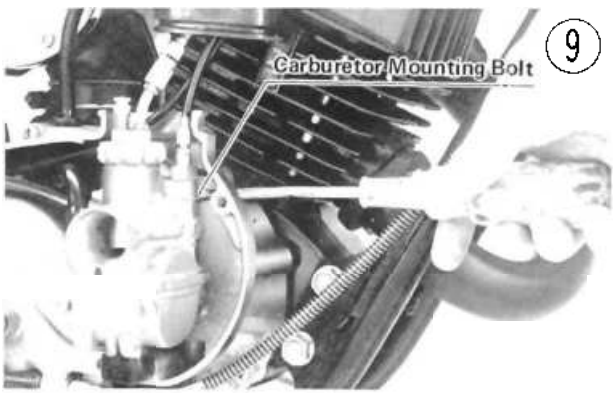
far enough when the choke lever is used. If the cable does not have enough play, the starter plunger may not close fully when the choke lever is returned, and the engine will always be running on too rich a mixture.

To determine the amount of cable play, first check to see that the choke lever is returned all the way to the left, and place a ruler alongside the upper end of the choke cable. 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. If there is too much or too little play, adjust the choke cable.



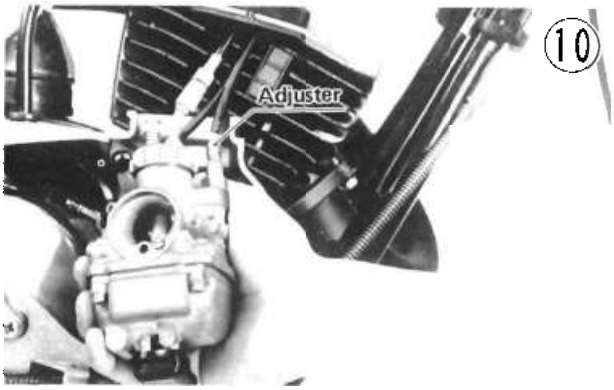
8

- 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;
- Slide the carburetor rubber cap up out of place.
- Remove the carburetor cover and its gasket.
- Remove the rubber grommet from the front of the right engine cover, and insert a screwdriver through the hole to loosen the carburetor mounting bolt.



9

- Pull off the carburetor from the right engine cover.
- Loosen the lock nut, and turn the adjuster until the cable has the proper amount of play.



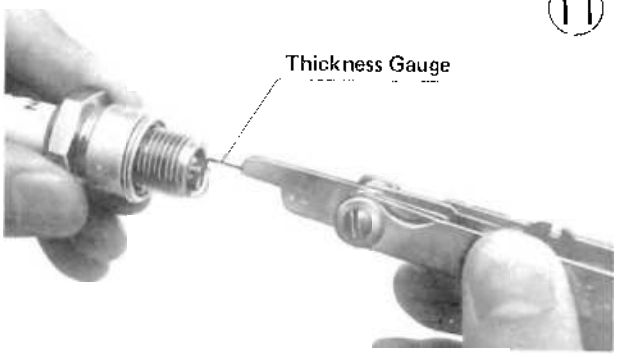
10

- Tighten the lock nut.
- Replace the carburetor. Tighten the mounting bolt and put the rubber grommet back into the front of the right engine cover.
- Replace the carburetor cover and its gasket and tighten the screws.
- Slide down the carburetor rubber cap.

SPARK PLUG

Spark plug electrode wear will widen the plug 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 0.7 mm; if it is not, bend the outer electrode with a suitable tool to obtain the correct gap.



11

- The spark plug should be tightened with 2.5~3.0 kg-m (18~22 ft-lbs) of torque.

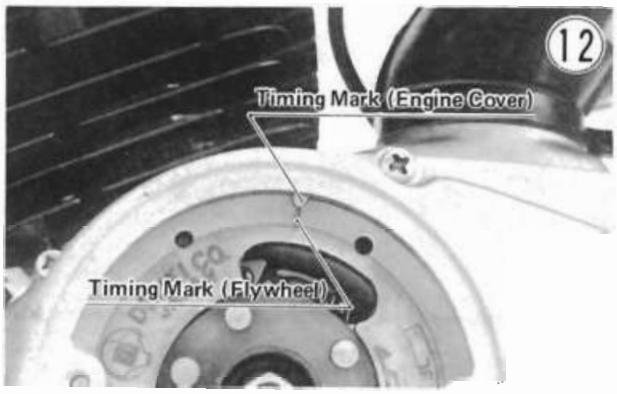
IGNITION TIMING

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.

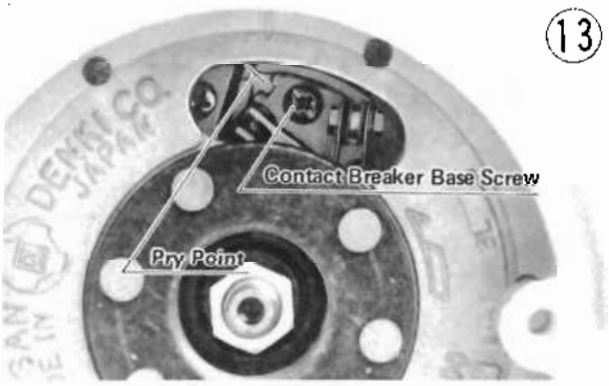
Correct ignition timing is achieved by adjusting the position of the contact breaker base through the

inspection window of the magneto flywheel. The points should just begin to open when the timing mark on the outer circumference of the flywheel aligns with the timing mark on the left engine cover, or when the piston is positioned 1.96 mm BTDC as measured with a dial gauge. Best performance is achieved by having ignition take place as close as possible to 1.96 mm BTDC, and when precise ignition timing is desired, the dial gauge method should be used. 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 point cover.
- Disconnect the black magneto lead from where it connects below the fuel tank to the black ignition coil lead and the black/white ignition switch lead. It should not be necessary to remove the fuel tank to reach these leads.
- Rotate the magneto flywheel counterclockwise until the timing mark on the flywheel lines up with the timing mark on the left engine cover.

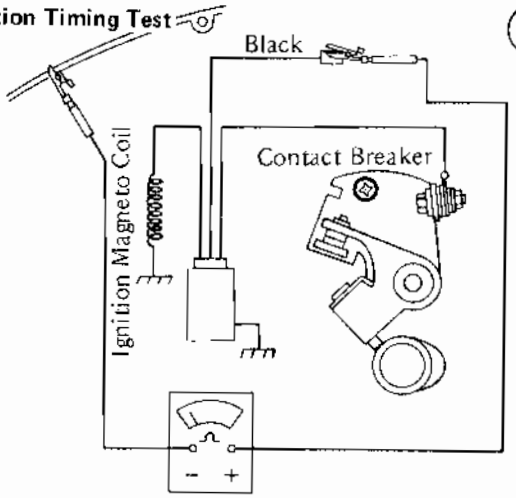


- Connect an ohmmeter (or buzzbox) set to the R x 1 range across the contact points, securing one lead to chassis ground (such as the crankcase) and connecting the other lead to the black magneto lead. Be sure that the ohmmeter leads make good electrical contact.
- Loosen the contact breaker base screw just enough to allow the base to move.



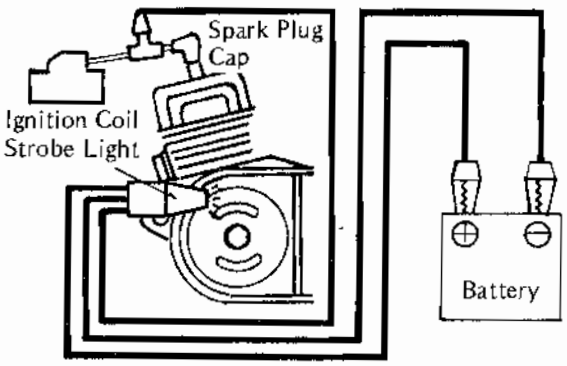
- Use a screwdriver in the pry points to adjust the position of the contact breaker base until the contact breaker points are just at the point of opening. The ohmmeter needle starts to rise when the points just begin to open. Note that total needle travel as the points open is only about 1.5 Ω.

Ignition Timing Test 14



- 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 marks 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 leads that were disconnected.
  A strobe light may be used to check whether or not the ignition timing is correctly set.
- Connect the light in the manner prescribed by the manufacturer. One example is shown below.

Ignition Timing Test 15



- With the engine idling, direct the light at the timing mark on the left engine cover. If the marks are aligned when the light flashes, the ignition timing is correctly set.

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

- Remove the spark plug from the cylinder head, and mount a dial gauge and TDC finder "A" (special tool) in the spark plug hole.
- 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 2.5 mm and then counterclockwise until the dial gauge reads 1.96 mm. At this point the piston is properly positioned so that the contact breaker base can be adjusted to set the timing using an ohmmeter or another timing device.
- When replacing the spark plug, tighten it with 2.5~3.0 kg-m (18~22 ft-lbs) of torque.

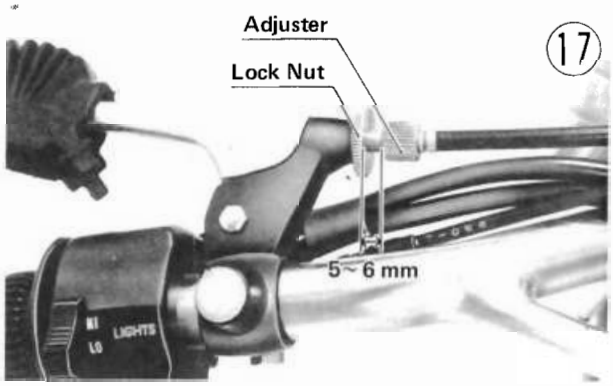
NOTE: When setting the ignition timing using a dial gauge to determine piston position, the flywheel timing marks cannot be relied upon to check the timing and the dial gauge reading instead of the timing marks is refered to throughout the adjustment. Before checking with a strobe light, first make a new timing mark on the flywheel directly under the mark on the left engine cover when the piston has been set to 1.96 mm BTDC.

CLUTCH

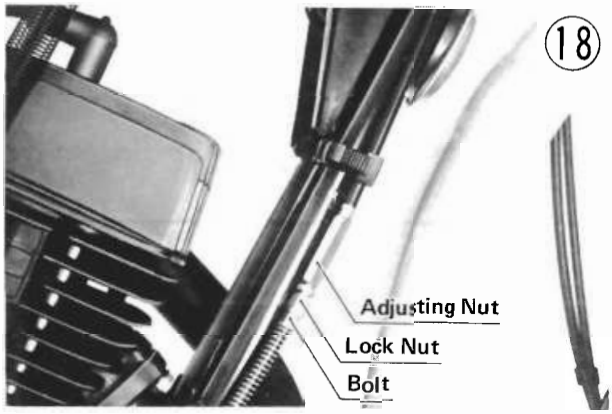
Stretching of the clutch cable and wear of the clutch plates and push rod cause the clutch lever to develop excessive play. Too much play will prevent the lever from fully disengaging the clutch and will resutl in shifting difficulty and possible clutch or transmission damage. Most of the play must be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

Wear of the clutch plates and push rod also increases the angle between the clutch release lever and the clutch cable. Since it is important that this angle be 80° to obtain the most effective stroke for disengaging the clutch, check the angle at least every 3,000 km, and adjust if necessary.

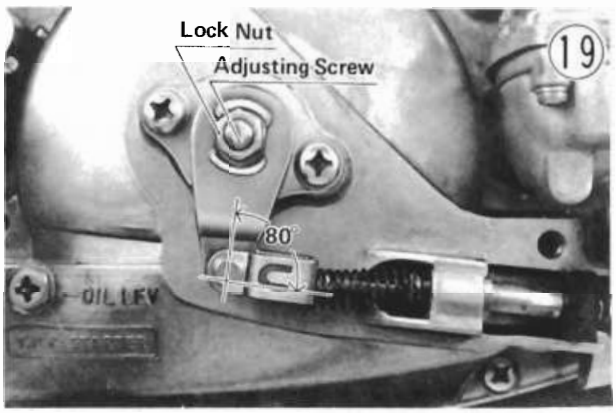
- Slide the clutch lever dust cover out of place.
- Loosen the lock nut just enough so that the adjuster will turn freely, and then turn the adjuster to make a 5 ~ 6 mm gap between the adjuster and lock nut.



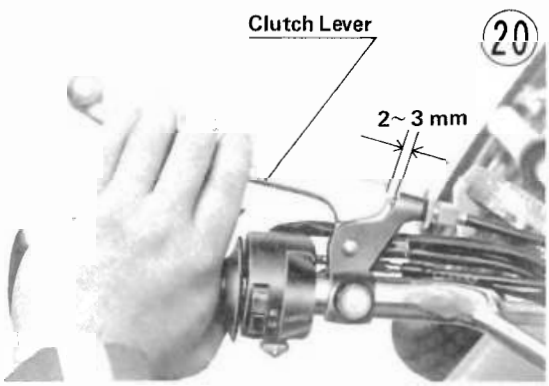
- Loosen the lock nut at the middle of the clutch cable, and screw in the adjusting nut to give the cable plenty of play.



- Slide the carburetor rubber cap up out of place.
- Remove the carburetor cover.
- Loosen the clutch release lever lock nut, and back out the adjusting screw 3 or 4 turns.



- Set the clutch release lever angle at about 80° to the clutch cable by turning the adjusting nut at the middle of the clutch cable.
- Turn the clutch adjusting screw in to where it suddenly becomes hard to turn, and then tighten the lock nut.
- Turn the adjuster at the clutch lever so that the clutch lever will have 2 ~ 3 mm of play, and tighten the lock nut.



- Replace the carburetor rubber cap and carburetor cover.
- When adjustment is finished, start the engine and check

that the clutch does not slip and that it releases properly.
- For minor corrections while riding, use the adjuster at the clutch lever.
- Replace 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 be 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 support the motorcycle 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 shake it back and forth; if no play is felt, the steering is not too loose.



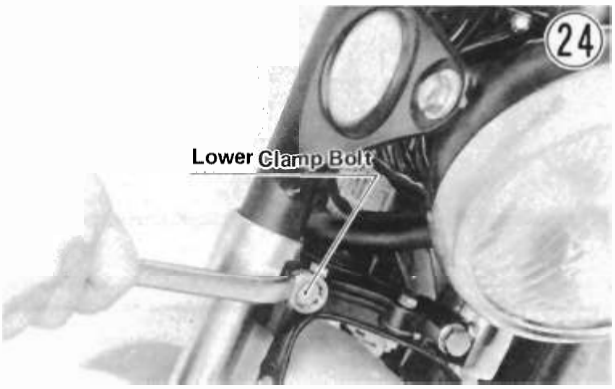
- Loosen the steering stem head bolt and the stem clamp bolt.



- 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 3.0 ~ 3.5 kg-m (22 ~ 25 ft-lbs) of torque.
- Tighten the stem clamp bolt with 1.6 ~ 2.2 kg-m (11.5 ~ 16 ft-lbs) of torque.
- Loosen the lower clamp bolts (2) on the left and right shock absorbers to let the tubes reseat themselves and then retighten the bolts with 2.6 ~ 3.5 kg-m (19 ~ 25 ft-lbs) of torque.



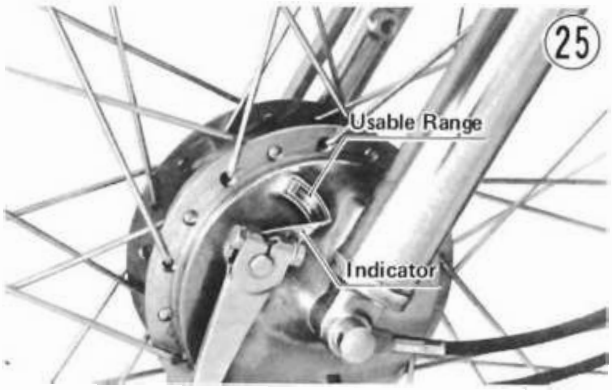
- Check the steering again and readjust it if necessary.

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.

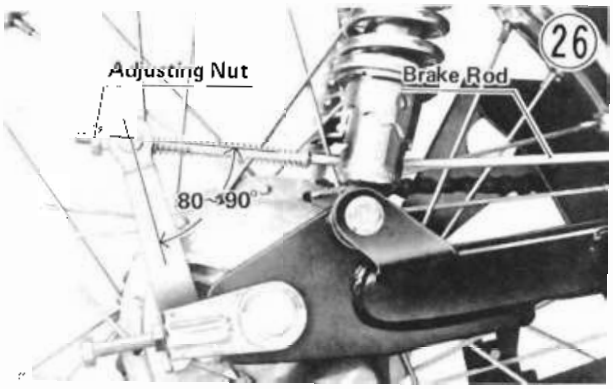
Once the brakes have been adjusted, spin or turn the wheels to check for drag. If any drag is heard or felt, disassemble the brake (Pg. 44 and 46), and inspect for wear or damage (Pg. 91). Also, if the brake lever or pedal does not return to its rest position quickly upon being released, inspect the 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 replaced immediately 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

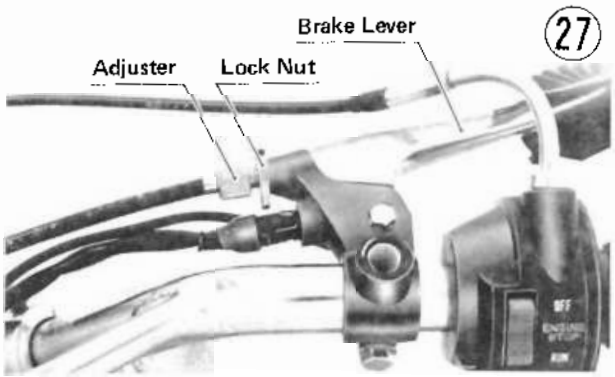
●When the brake is fully applied, the brake cam lever should come to an 80~90° angle with the threaded extension of the brake cable or rod. If it does not, loosen the cable adjusting nut, remount the cam lever at a new position on the shaft for the proper angle, and then adjust cable play.



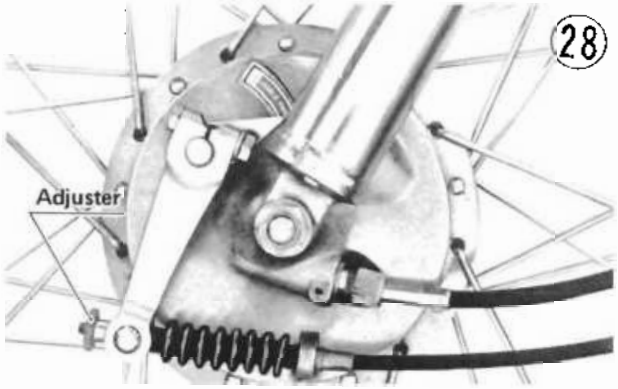
CAUTION: Since a cam lever angle greater than 90° reduces braking effectiveness, this adjustment should not be neglected. When remounting the cam, be sure that the position of the indicator on the serrated shaft is not altered. The change in cam lever angle is caused by wear of internal brake parts. 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.

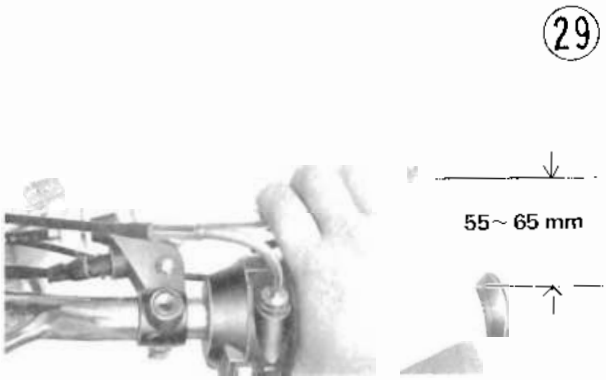
Front Brake Lever

●Loosen the lock nut at the front brake lever, screw the adjuster fully in, and tighten the lock nut.



●Turn the adjuster on the lower end of the front brake cable so that when the brake is fully applied, there is 55~65 mm of space left between the throttle grip and the end of the brake lever.

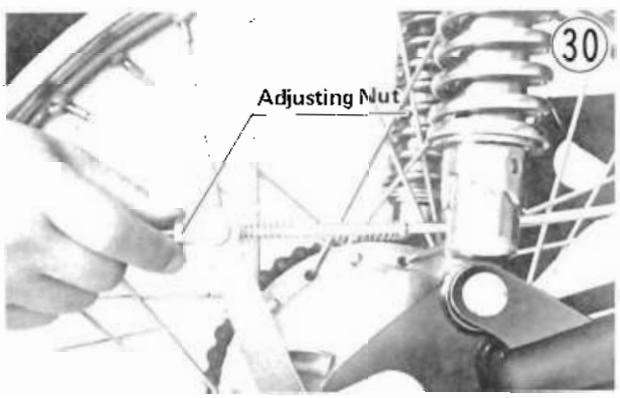


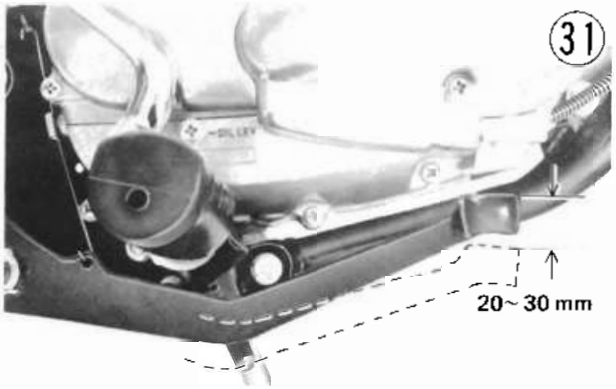


●Check for brake drag.
●For additional adjustment or minor corrections while riding, use the adjuster at the front brake lever.

Rear Brake Pedal

●Screw in the adjusting nut on the end of the brake rod so that the brake pedal has about 20~30 mm of travel from the rest postiion to the fully applied position.





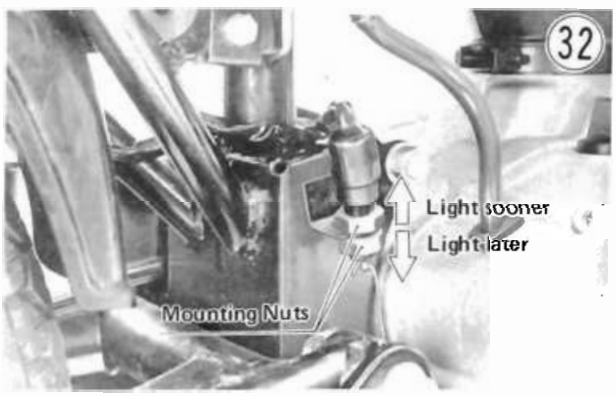
- Check for brake drag.
- Check the brake light switch adjustment.

BRAKE LIGHT SWITCH

The front brake light switch mounted on the front brake lever, is operated by simple electrical contact and does not require adjustment. However, the rear brake light switch, activated by a wire spring attached to the brake pedal, will require adjustment if the spring has 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 of pedal travel, or shortly before the brake pedal reaches the fully applied position.

- Loosen the two switch mounting nuts.
- Move the switch 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.



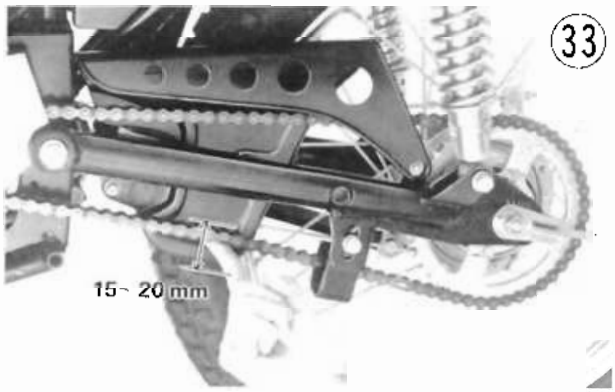
- Tighten the two mounting nuts when the switch is in the correct position.

CAUTION: To avoid damaging the electrical wiring, do not turn the switch body during adjustment.

DRIVE CHAIN

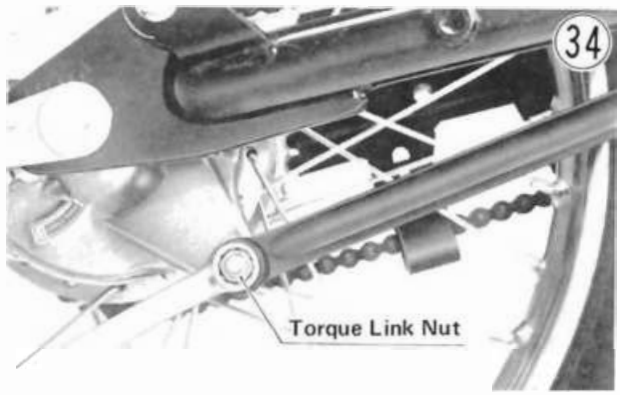
Chain and sprocket wear causes the chain to become loose and results in power loss, increased wear, and noise. A loose chain may break or slip off the sprockets during operation. A chain that is too tight will also wear quickly and may possibly break.

First turn the rear wheel to find the positon where the chain is tightest, and make the adjustment using this position. With the motorcycle on its side stand, the chain should have a maximum of about 15 ~ 20 mm of vertical movement at its greatest point. If the slack exceeds this amount, adjust the chain.

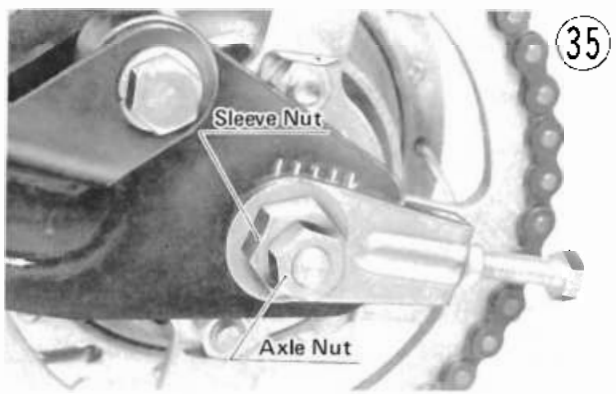


CAUTION: A chain worn past the service limit should be replaced. Such wear cannot be adequately compensated for by adjustment.

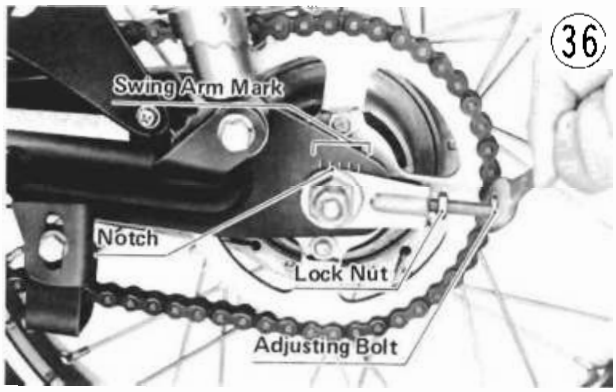
- Loosen the torque link nut.



- Loosen the rear axle nut and sleeve nut.



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

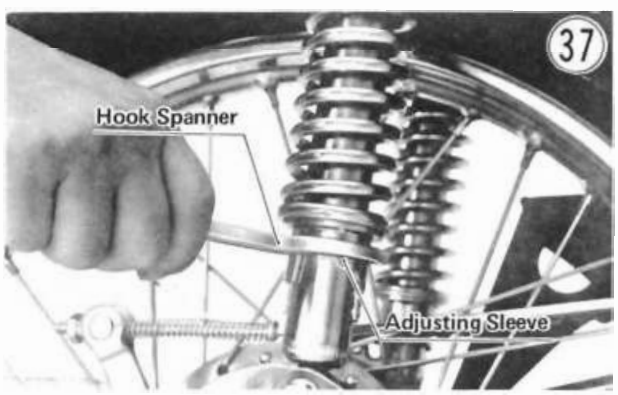


- Tighten both chain adjuster lock nuts, and then tighten the coupling sleeve nut securely.
- Tighten the axle nut with 3.4~4.6 kg-m (25~33 ft-lbs) of torque. Rotate the wheel, measure the amount of slack, and readjust if necessary.
- Tighten the torque link nut with 2.6 ~ 3.5 kg-m (19 ~25 ft-lbs) of torque.
- Check the rear brake (Pg. 14) and rear brake light switch (Pg. 16) adjustments.

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 absorber. Be sure to turn both left and right shock absorbers to the same position in order to maintain 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.

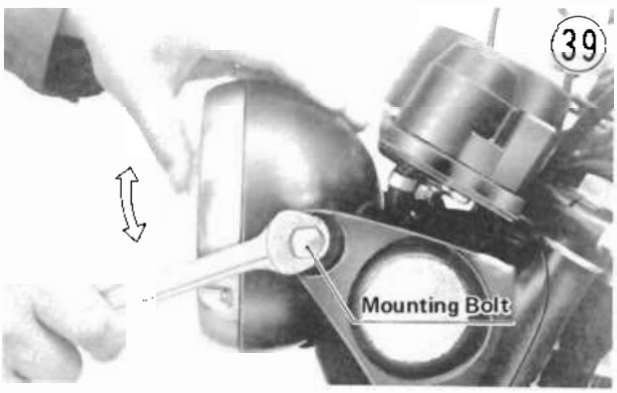
Horizontal Adjustment:

- 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.

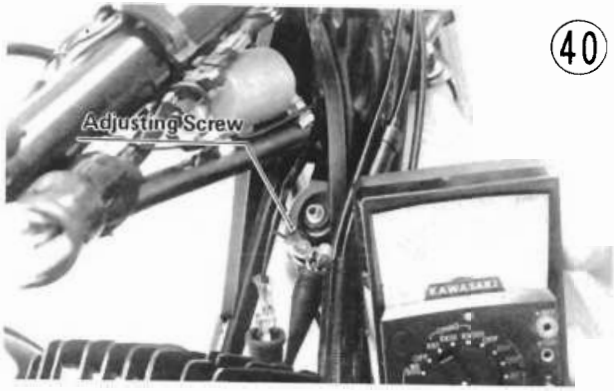
HORN

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 as it cannot be disassembled.

CAUTION: Do not turn the adjusitng 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.
- 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.

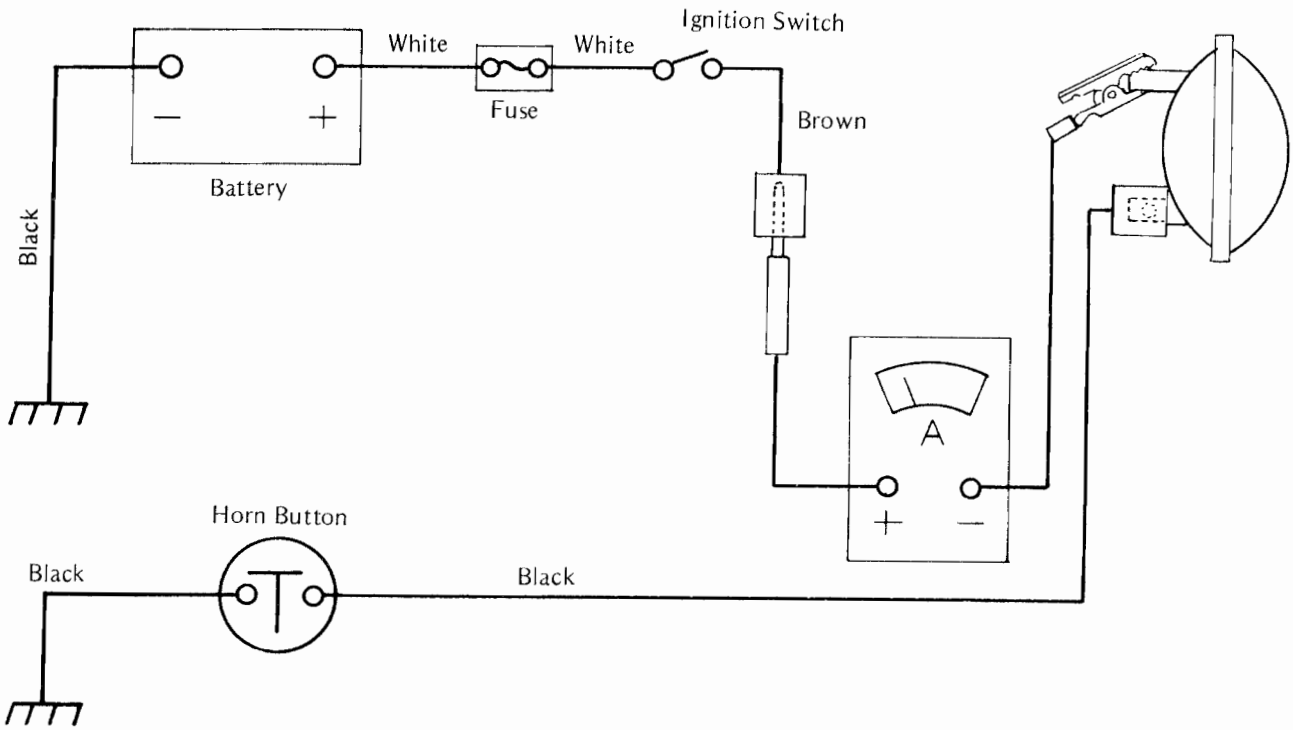


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NOTE: The horn will not sound properly if it is mounted incorrectly or if any cables or other parts are touching it.

Horn Current Measurement

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Disassembly

INTRODUCTION TO DISASSEMBLY

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

Especially note the following:

(1) Force

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

(2) Torque

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

(3) Lubricant

Don't use just any oil or grease. Some oils and greases in particular should be used only in certain applications and may be harmful if used in an application for which they are not intended.

(4) Lubrication

Engine wear is generally at its maximum while the engine is warming up and before all the rubbing surfaces have an adequate lubricative film. During assembly oil should be applied to any bearing surface which has lost its lubricative film. Old grease and dirty oil should be cleaned off. Deteriorated grease has lost its lubricative quality and may contain abrasive foreign particles.

(5) Press

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

(6) Oil Seals

An oil seal guide is required for certain oil seals during installation to avoid damage to the oil seal lips. Before a shaft passes through an oil seal, apply a little oil on the lips to reduce rubber to metal friction.

(7) Gasket

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

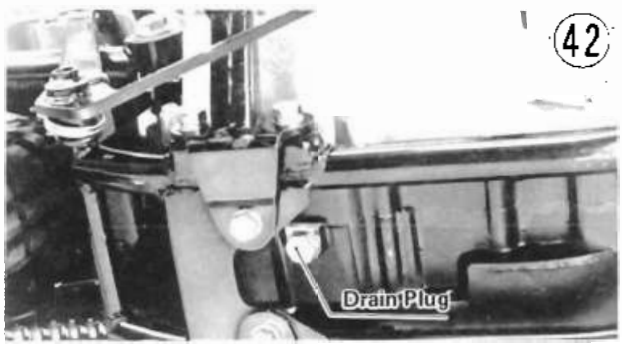
(8) Edges

Watch for sharp edges, especially during major engine disassembly and assembly. Use a clean piece of thick cloth when lifting the engine or turning it over.

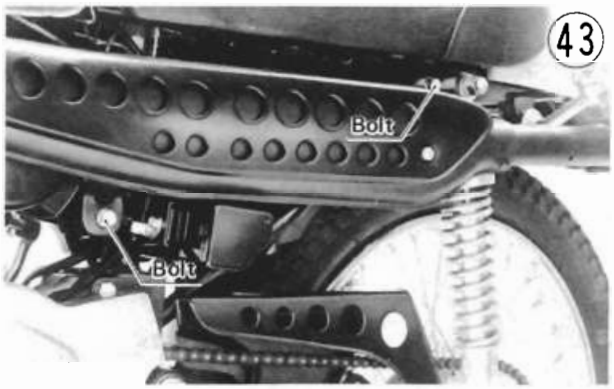
ENGINE

Removal:

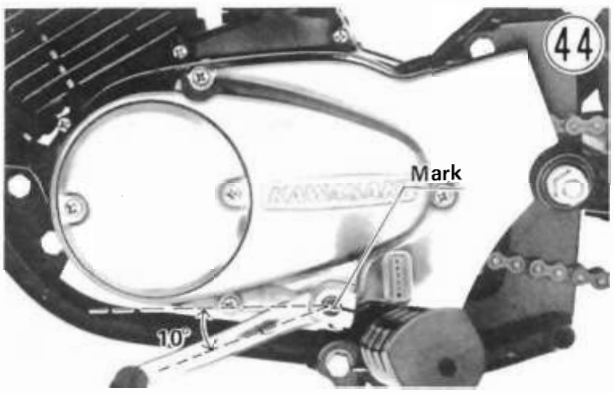
- With the motorcycle fully perpendicular to the ground, place an oil pan beneath the engine, and remove the engine drain plug so that all the transmission oil drains out. The drain plug may be replaced later either after all the oil is drained and before the engine is removed, or during engine installation.



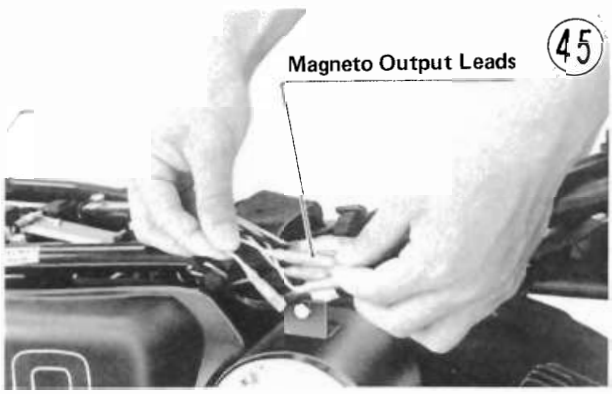
- Turn the fuel tap to the "S" position, slide down the hose clamp, and pull the fuel hose off the tap.
- Release the seat catch, and open the seat. Unhook the rubber retaining band, and pull the fuel tank off toward the rear.
- Remove the bolts (2) from the muffler exhaust collar.
- Remove the bolts (2) that connect the muffler to the frame and then remove the muffler and gasket.



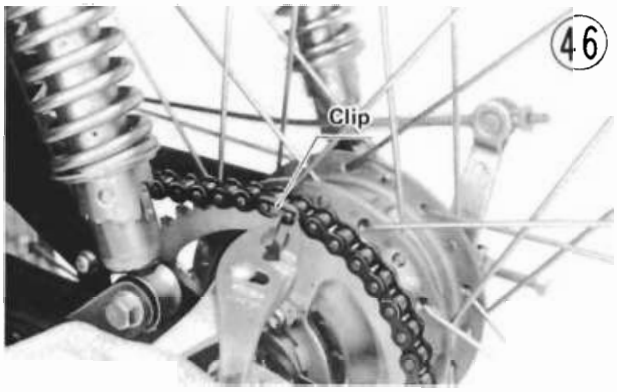
- Check to see that the transmission is in neutral.
- Mark the position of the shift pedal so that it can later be replaced on the shaft in the same position (normally about 10° below the horizontal).



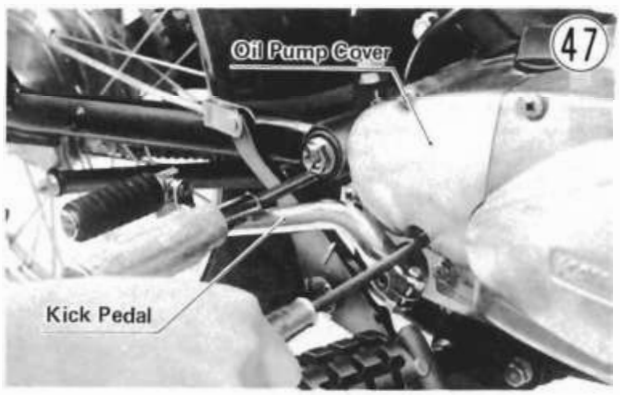
- Take out the shift pedal bolt and remove the shift pedal.
- Remove the left engine cover, being careful not to damage the oil seal.
- Pull off the oil tank cover, remove the engine oil tank screws, and take off the oil tank.
- Disconnect the magneto output leads from where they connect under the frame top tube, first noting whether it is the light blue lead or the yellow/green lead that is not being used.



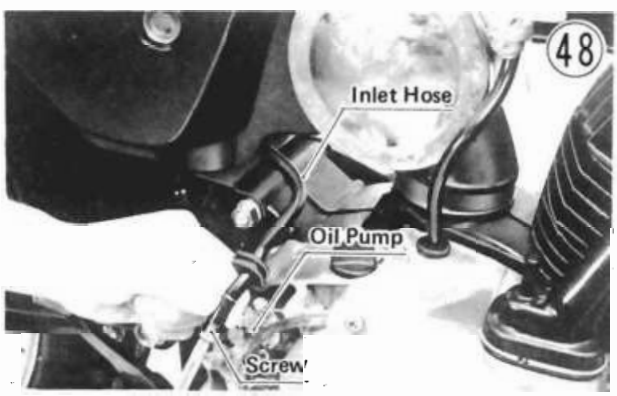
- Undo the strap that holds the wiring to the frame.
- With a screwdriver or some other suitable tool, undo the clip carefully from the drive chain master link, and remove the master link.



- Free the drive chain from the sprockets, being careful that the chain does not get dirty from contact with the ground.
- Remove the air cleaner mounting screw.
- Loosen the air cleaner duct clamp screw and remove the air cleaner assembly.
- Disconnect the spark plug lead.
- Prop the kick pedal out of the way with a screwdriver to facilitate removal of the oil pump cover.



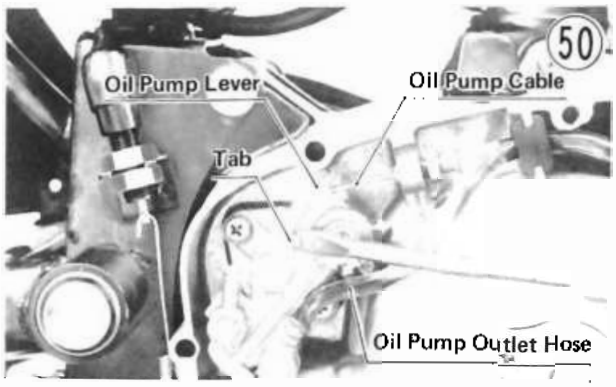
- Take off the screws (3) and remove the oil pump cover.
- Slide up the hose clamp and pull off the oil pump inlet hose. Use one of the oil pump cover screws to plug the hose, and pull the hose and its rubber fitting free from the right engine cover.



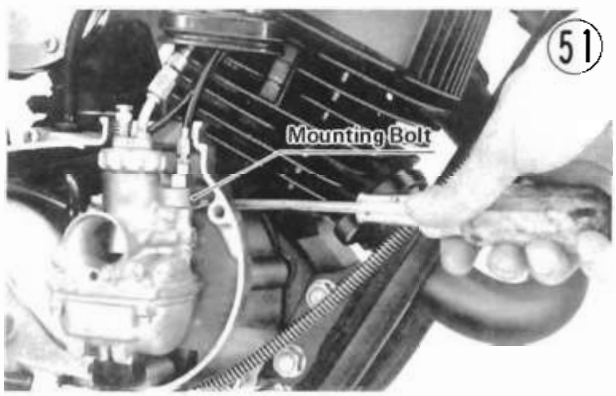
•Slide the carburetor rubber cap up out of place.



•Remove the carburetor cover and its gasket.
•Bend out the tab on the oil pump lever and free the end of the oil pump cable from the oil pump lever.



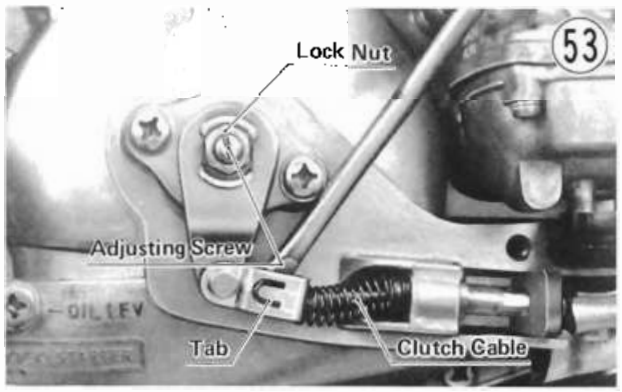
•Free the oil pump outlet hose from the rubber fitting.
•Unlock the lock nut and screw in the oil pump adjuster.
•Pull the oil pump cable with the rubber fitting free from the right engine cover.
•Slide the hose clamp up on the fuel hose, and disconnect the hose from the carburetor.
•Remove the rubber grommet from the front of the right engine cover, and insert a screwdriver through the hole to loosen the carburetor mounting bolt.



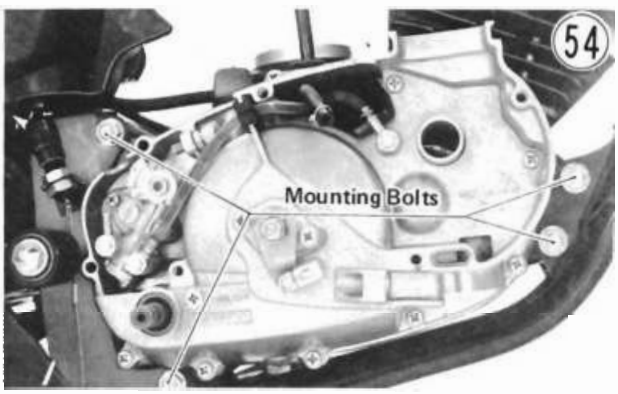
•Pull off the carburetor and let it hang free.
•Remove the carburetor overflow drain from the bottom of the right engine cover.



•Pry open the tab that holds the tip of the clutch cable in place.



•Loosen the clutch release lock nut, back out the screw a couple of turns, and free the tip of the clutch cable from the clutch release lever.
•Remove the spring from theclutch cable and pull eth cable free from the right engine cover.
•Take the nuts (4) off the engine mounting bolts.
•Remove the engine mounting bolts, raising the engine up a little as necessary to keep from damaging the bolt threads.



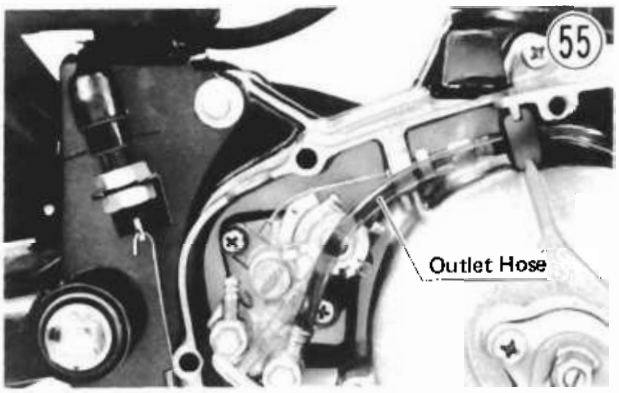
•Remove the engine from the frame through the right side, first lifting up on the front so that it clears the front bracket and then lifting up on the rear.

Installation

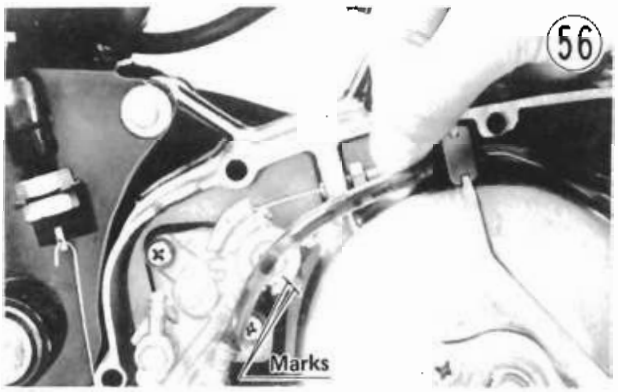
•Put the engine back into the frame from the right side.
•Lifting the engine as necessary so that the mounting bolt threads are not damaged, insert the engine mounting

bolts (4) from the left side. Replace the lock washers and nuts, and tighten each nut with 2.6 ~ 3.5 kg-m (19 ~ 25 ft-lbs) to torque.

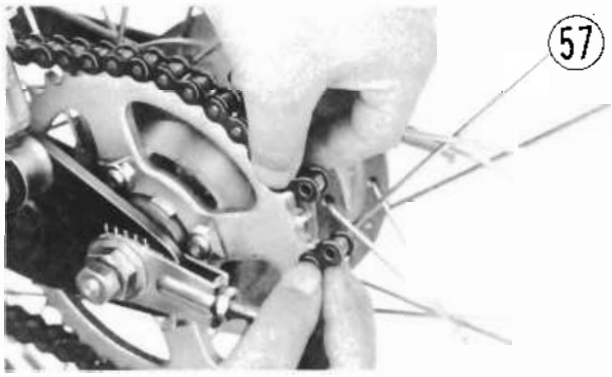
- Slip the oil pump outlet hose into the rubber fitting. Insert the oil pump inner cable into the adjuster and push the rubber fitting back into place.



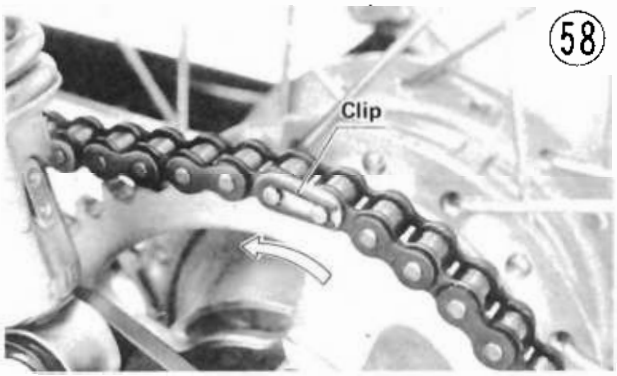
- Attach the oil pump inner cable to the oil pump lever, and bend the tab back onto the end of the cable.
- Check to see that the lower mark on the oil pump lever lines up with the mark on the oil pump lever stopper, adjusting it if necessary (Pg. 10).



- Run the clutch cable through the right engine cover. Replace the spring and connect the tip of the clutch cable to the clutch release lever.
- Bend back the tab so that it holds the tip of the clutch cable.
- Adjust the clutch (Pg. 13).
- Replace the carburetor overflow drain at the bottom of the right engine cover.
- Replace the carburetor. Tighten the mounting bolt and put the rubber grommet back into the front of the right engine cover.
- Fit the fuel hose back onto the carburetor, and slide down the clamp.
- Using a new carburetor cover gasket, replace the carburetor cover and tighten the screws.
- Slide the carburetor rubber cap down.
- Run the magneto output leads and hold it with a clamp. Reconnect the magneto output leads that were disconnected.
- Note that the light blue lead or the yellow/green lead is not connected.
- Replace the oil tank and route the oil tank breather tube, taking care not to pinch or twist the tube.
- Remove any plug used to close the oil pump inlet hose, and connect the hose to the oil pump and slide back the hose clamp.
- Replace the air cleaner assembly. Tighten the air cleaner mounting bolt and the air cleaner duct clamp screw. The bolt has a lock washer and flat washer.
- Fit the drive chain back onto the sprockets with the ends at the rear sprocket.



- Replace the chain master link with pliers. The direction of the master link clip should be as shown in Fig. 58.



- Replace the left engine cover using the shift shaft oil seal guide (special tool), to protect the oil seal in the cover, and tighten the screws (3).



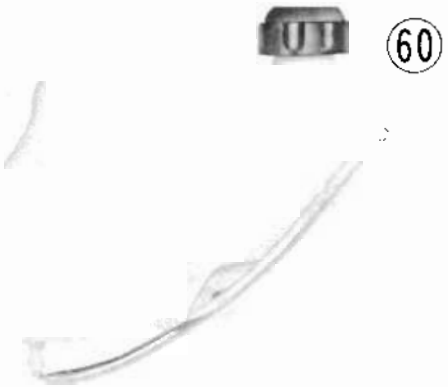
- Mount the shift pedal in the position marked during disassembly, and then tighten the bolt.
- Fit the gasket and the end of the muffler into the exhaust port, and attach the muffler to the frame tightening the muffler mounting bolts (2) loosely. The bolts have lock washers.

- Fit the exhaust collar into place and tighten the bolts (2) evenly to avoid exhaust leakage.
- Tighten the muffler mounting bolts (2).
- Replace the fuel tank.
- Attach the fuel hose to the fuel tap and slide the clamp into place.
- Replace the seat.
- Replace the oil tank cover.
- Connect the spark plug lead.
- Adjust the chain (Pg. 16).
- Bleed the oil pump (Pg. 10).
- Replace the oil pump cover and tighten the screws (3).

ENGINE OIL TANK

Removal:

- Replace the seat catch, and open the seat.
- Pull off the oil tank cover.
- Remove the engine oil tank mounting screws (3) and free the oil tank and its breather tube from the frame. With the tank upside down and the breather tube elevated, pull off the oil tank outlet tube. Fit the end of the breather tube onto the oil tank outlet to close it.



(60)

Installation:

- With the oil tank positioned to avoid spillage, pull the breather tube off the oil tank outlet, connect the outlet tube to the outlet, and fit the oil tank back into the frame.
- Route the oil tank breather tube through the bracket on the outside front of the rear fender, taking care not to pinch or twist the tube.
- Replace the oil tank mounting screws. Each screw has a lock washer and flat washer.
- Push the seat into place.
- If any air has gotten trapped in the outlet hose, bleed the oil pump (Pg. 84).
- Replace the oil tank cover.

AIR CLEANER ELEMENT

Removal:

- Remove the air cleaner cap screws (2) and take off the air cleaner cap.
- Pressing in on the side of the air cleaner element, pull it out.



(61)

- Remove the element from its wire frame.

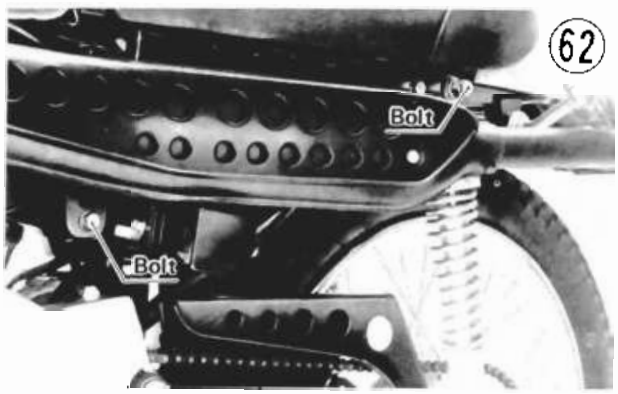
Installation:

- Fit the element over the wire frame.
- Dampen the element with a small amount of gasoline/oil mixture (about a 20 : 1 mixture of gasoline and SAE 30 motor oil), insert the element into the air cleaner housing.
- Replace the air cleaner cap, and tighten the screws. Each screw has a flat washer.

MUFFLER

Removal:

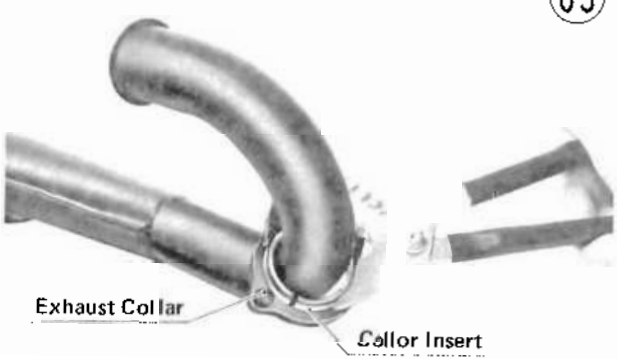
- Remove the nuts (2) from the muffler exhaust collar.
- Remove the bolts (2) that connect the muffler to the frame and then remove the muffler and gasket.



(62)

NOTE: If it should be necessary to remove the exhaust collar from the muffler, the collar insert must be first gripped in a vice grip or with pliers, and then freed from the collar. Next, broaden the gap on the insert, and remove the insert and the collar.

(63)



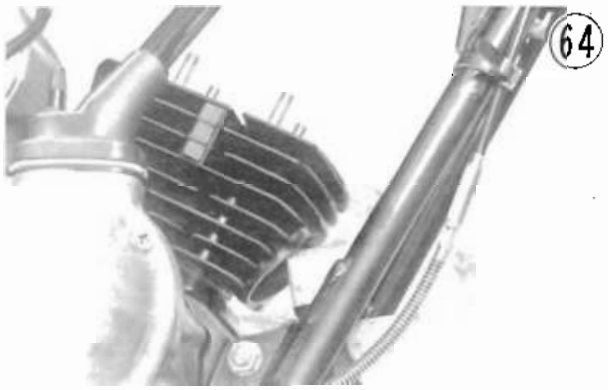
Installation:

- Fit the gasket and muffler into the cylinder exhaust port, and loosely tighten the bolts that connect the muffler to the frame. Each bolt has a lock washer and flat washer.
- Replace the muffler exhaust collar nuts, tightening them evenly together to avoid exhaust leakage.
- Tighten the muffler mounting bolts.

CYLINDER HEAD, CYLINDER

Removal:

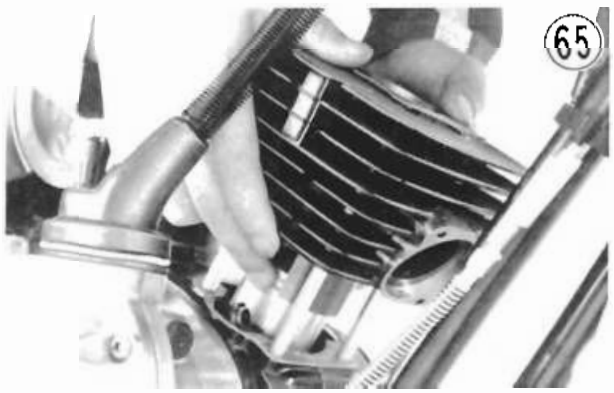
- Remove the muffler (Pg. 23).
- Disconnect the spark plug lead from the spark plug.
- Remove the cylinder head nuts (4), and remove the cylinder head and gasket.
- Lift off the cylinder and the cylinder base gasket. If necessary, lightly tap around the base of the cylinder with a plastic mallet, taking care not to damage the cooling fins.



- If there will be 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 with a new one.
- Apply a little 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 positions. The pin in each piston groove must be between the ends of the 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.
- Put on the cylinder head, and put on first the flat washers (4), next the lock washers (4), and then the cylinder head nuts. Cross tighten the cylinder head nuts evenly with 2.2 kg-m (16 ft-lbs) of torque.
- Attach the spark plug lead to the spark plug.
- Mount the muffler on the frame (Pg. 23).

PISTON, PISTON RINGS

Removal:

- Remove the cylinder head and cylinder (Pg. 24).
- 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.

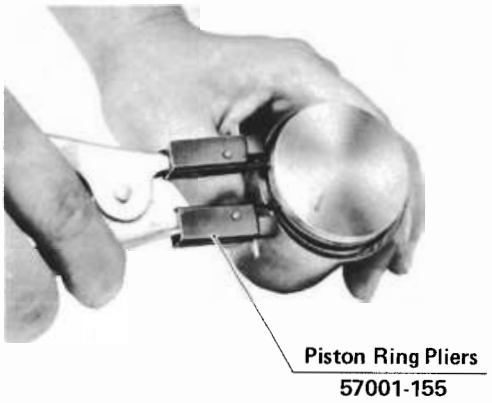


- Using the piston pin puller and adapter "A" (special tools), remove the piston pin from the side the snap ring was removed.



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 connecting rod small end needle bearing.
- Remove both piston rings with the piston ring pliers (special tool). If the special tool is not available, spread the ring open with the thumbs and then push up on the opposite side of the ring to remove it.



(68)

Installation Notes:

1. Apply oil to the connecting rod small end needle bearing before insertion.
2. If a new piston is used, piston to cylinder clearance changes (Pg. 69). Also, when a new piston or piston pin is used, check that the piston to pin clearance is 0.002~0.011 mm.

   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. 69).

(69)



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 toward the front.

(70)

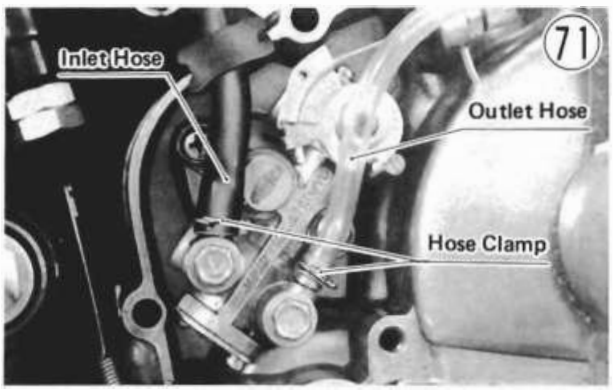


6. Apply a little oil to the piston pin before inserting it.
7. Use a new piston pin snap ring in place of every one that is removed since removal weakens and deforms the ring. After installation, turn the snap ring so that its opening does not coincide with either groove in the side of the piston.

OIL PUMP

Removal:

- Hold the kick pedal out of the way with a screwdriver to facilitate removal of the oil pump cover (Fig. 47).
- Remove the oil pump cover.
- Slide up the hose clamp, and pull off the oil pump inlet hose. Use one of the oil pump cover screws to plug the hose and keep oil from leaking out.



(71)

- Bend out the tab on the oil pump lever and free the end of the oil pump cable from the oil pump lever.
- Slide up the hose clamp, and pull off the oil pump outlet hose.
- Remove the screws (2) which hold the oil pump onto the right engine cover, and remove the oil pump and the oil pump gasket.

Installation:

- When mounting the oil pump, 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.
- Put the oil pump and gasket back into place and tighten the mounting screws. There is a copper washer for each screw.
- Connect both inlet and outlet hoses back onto the oil pump. Be sure that the hoses do not get mixed up (Fig. 71).
- Attach 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, adjusting it if necessary (Pg. 10).
- Bleed the oil pump (Pg. 84).
- Fit the oil pump cover back into its proper position, and replace the screws (3).

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), lock washer (9) 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 past 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.
3. Note that there is a washer on each side of each connector. Maximum banjo bolt torque is 0.4~0.5 kg-m (35~43 in-lbs).

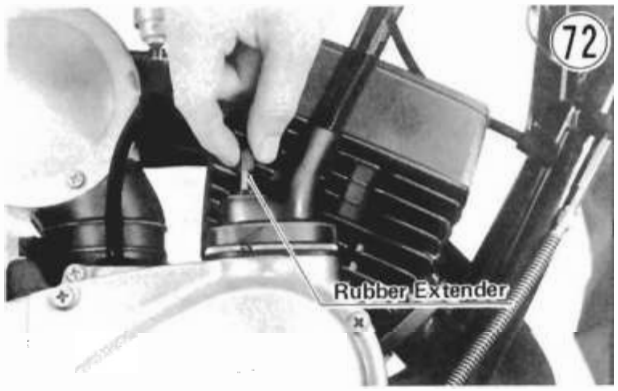
CARBURETOR

Removal:

- Slide the carburetor rubber cap up out of place.
- Remove the carburetor cover and gasket.
- Turn the fuel tap to the S position, slide up the clamp that holds the fuel hose on the carburetor intake, and disconnect the fuel hose from the carburetor.
- Remove the rubber grommet from the front of the right engine cover, and insert a screwdriver through the hole to loosen the carburetor mounting bolt (Fig. 51).
- Pull off the carburetor.

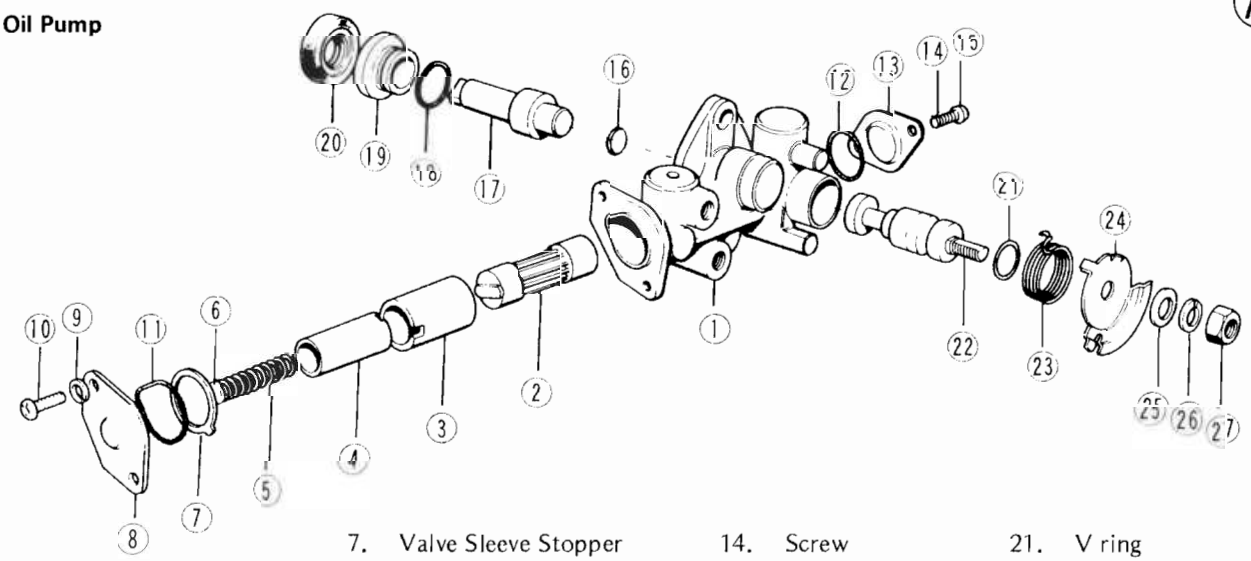
Installation Notes:

1. Be sure that the carburetor mounting bolt is screwed in securely to avoid any air leak.
2. When replacing the carburetor rubber cap, be sure that the rubber extender fits properly on the idling screw.



3. Adjust the carburetor cable (Pg. 7).

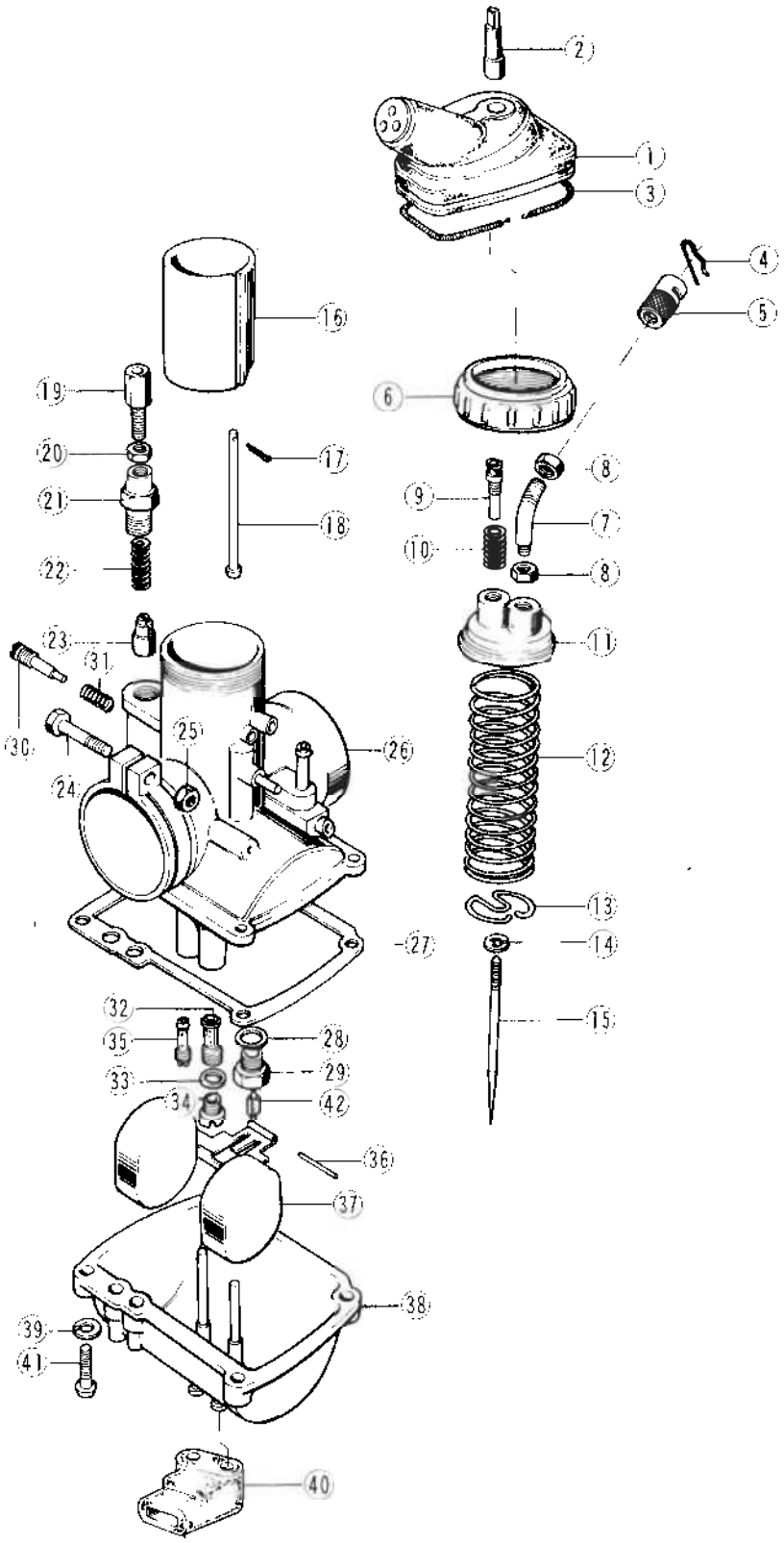
Oil Pump



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

Carburetor

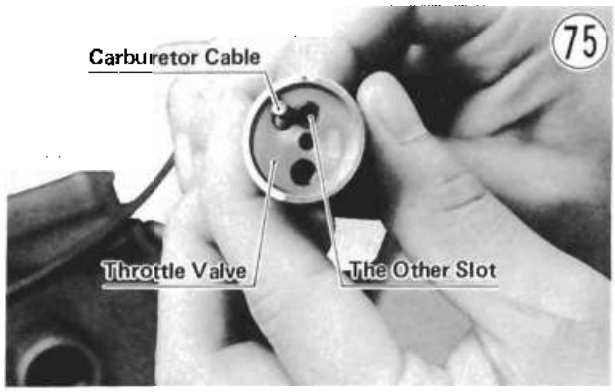
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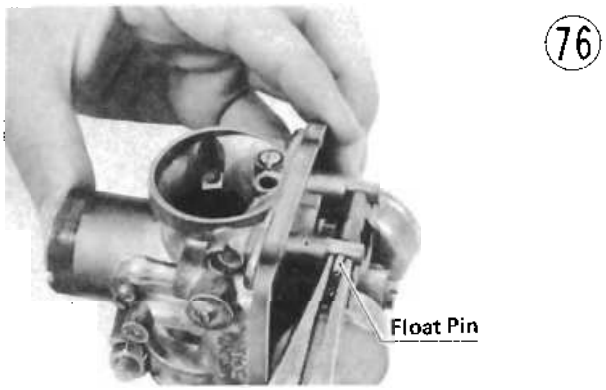
1. Carburetor Rubber Cap
2. Rubber Extender
3. Spring Coil
4. Clip
5. Cable Adjuster
6. Carburetor Cap
7. Throttle Cable Guide
8. Lock Nut
9. Idling Screw
10. Spring
11. Mixing Chamber Top
12. Spring
13. Spring Seat
14. Circlip
15. Jet Needle
16. Throttle Valve
17. Cotter Pin
18. Throttle Valve Rod
19. Choke Cable Adjuster
20. Lock Nut
21. Starter Plunger Cap
22. Spring
23. Starter Plunger
24. Bolt
25. Nut
26. Carburetor Body
27. Gasket
28. Washer
29. Valve Seat
30. Air Screw
31. Spring
32. Needle Jet
33. Washer
34. Main Jet
35. Pilot Jet
36. Float Pin
37. Float
38. Float Bowl
39. Lock Washer
40. Overflow Grommet
41. Screw
42. Valve Needle

Disassembly:

- Unscrew the carburetor cap (6), and pull out the carburetor throttle valve assembly.
- Unscrew the starter plunger cap (21) and remove the starter plunger (23).
- Remove the cotter pin (7) at the top of the idling screw (9).
- Pull out the throttle valve rod (16). The idling screw (9) and its spring (10) can also be removed if necessary.
- To remove the throttle valve (16) from the cable, slip the tip of the cable to the other side of the slot in the base of the throttle valve. The spring (12), jet needle (15) with its clip (14), and spring seat (13) can now be removed.



- Take off the overflow grommet (40).
- Remove the 4 screws (41) at the base of the carburetor, and remove the float bowl (39) and gasket (27).
- Push out the float pin (36) and remove the float (37).



- Remove the float valve needle (42). The float and float valve needle should always be removed before any further disassembly so that they will not get damaged.
- Remove the float valve seat (29) with a socket wrench.
- Unscrew the main jet (34) and remove its washer (33).
- Remove the pilot jet (35) with a narrow bladed screwdriver.
- Using a soft rod such as a pencil, push the needle jet (32) out from the bottom.
- Remove the air screw (30) and air screw spring (31).
- Remove the starter plunger assembly with a wrench.

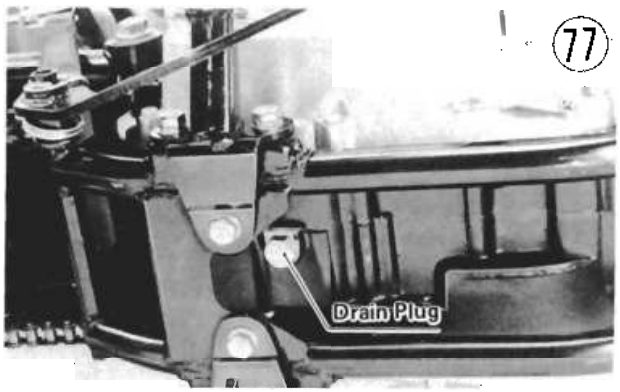
Assembly Notes:

1. See Pg. 62 for carburetor specifications to be sure that the correct carburetor parts are being used.
2. **CAUTION: Be careful that the throttle stop rod is not be during reassembly. Abent throttle stop rod can cause the throttle to stick open.**

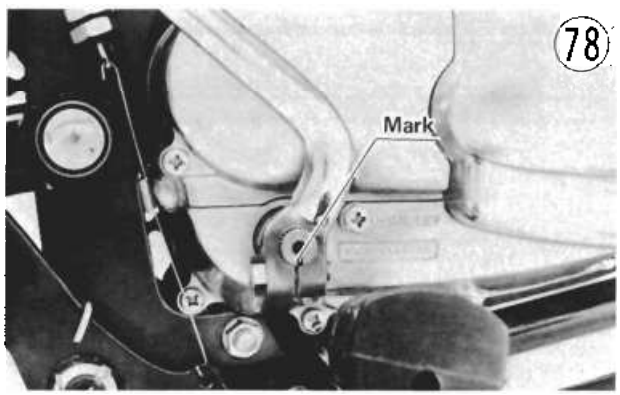
RIGHT ENGINE COVER

Removal:

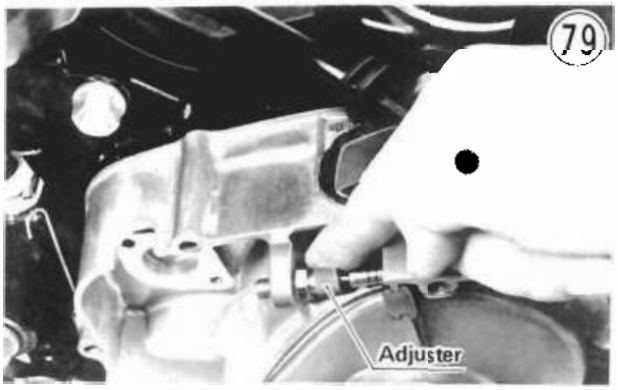
- With the motorcycle fully perpendicular to the ground, place an oil pan beneath the engine and remove the engine drain plug so that all the transmission oil drains out.



- Mark the position of the kick pedal on the shaft so that it can be returned to the same position later.



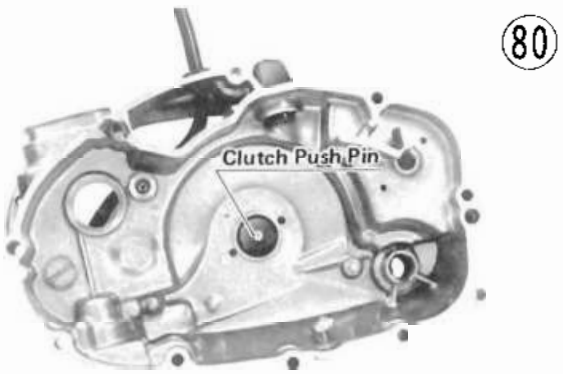
- Remove the kick pedal bolt, widen slightly the gap on the kick pedal with a screwdriver, and then pull off the kick pedal.
- Remove the carburetor (Pg. 26).
- Remove the carburetor overflow drain from the bottom of the right engine cover (Fig. 52).
- Pry open the tab that holds the tip of the clutch cable in place (Fig. 53).
- Loosen the clutch release lever lock nut, back out the screw a couple of turns, and free the tip of the clutch cable from the clutch release lever (Fig. 58).
- Remove the spring from the clutch cable, and pull the cable free from the right engine cover.
- Remove the oil pump (Pg. 25).
- Slide back the rubber fitting from where the oil pump inlet hose (black) runs through the right engine cover.
- Loosen the lock nut, and screw the oil pump adjuster in the right engine cover all the way in.



- Slide off the rubber fitting that holds the oil pump outlet hose and oil pump cable to the right engine cover, and separate the hose from the rubber fitting (Fig. 79).
- Remove the bolt (3) and take off the right footpeg.
- Using an impact driver, take out the screws (8) and remove the right engine cover and its gasket from the crankcase.

Installation:

- Replace the right engine cover gasket with a new one.
- Check to see that the clutch push pin is in its place in the right engine cover.

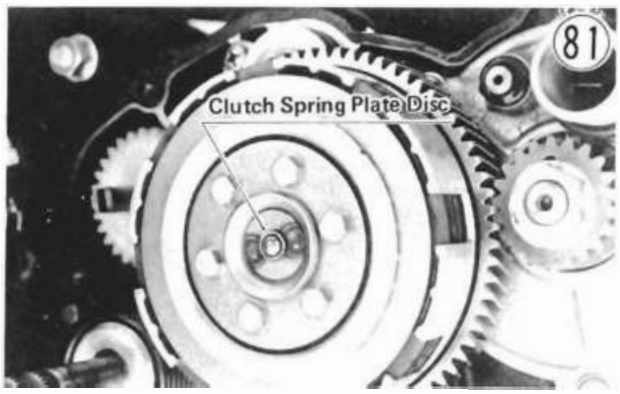


- Fit the right engine cover back onto the crankcase, using an kick shaft oil seal guide (special tool) so that the oil seal does not get damaged.
- Tighten the right engine cover screws.
- Put the oil pump and gasket into place and tighten the mounting screws. There is a copper washer for each screw.
- Slip the oil pump outlet hose into the rubber fitting. Insert the oil pump inner cable into the adjuster and push the rubber fitting back into place.
- 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.
- Fit the oil pump outlet hose onto the connector and slide down the clamp.
- Fit the oil pump inlet hose (black) onto the connector, and slide down the clamp. Push the rubber fitting back into place.
- Run the clutch cable through the right engine cover. Replace the spring and connect the tip of the clutch cable to the clutch release lever.
- Bend back the tab so that it holds the tip of the clutch cable.
- Adjust the clutch (Pg. 13).
- Replace the carburetor overflow drain at the bottom of the right engine cover.
- Replace the carburetor. Tighten the mounting bolt and put the rubber grommet back into the front of the right engine cover.
- Fit the fuel hose back onto the carburetor, and slide down the clamp.
- Using a new carburetor cover gasket, replace the carburetor cover, and tighten the screws.
- Slide the carburetor rubber cap down.
- Replace the footpeg, and tighten the bolts.
- If any air has gotten trapped in the outlet hose, bleed the oil pump (Pg. 84).
- Replace the oil pump cover and tighten the screws.
- Replace the kick pedal and tighten the bolt.

CLUTCH

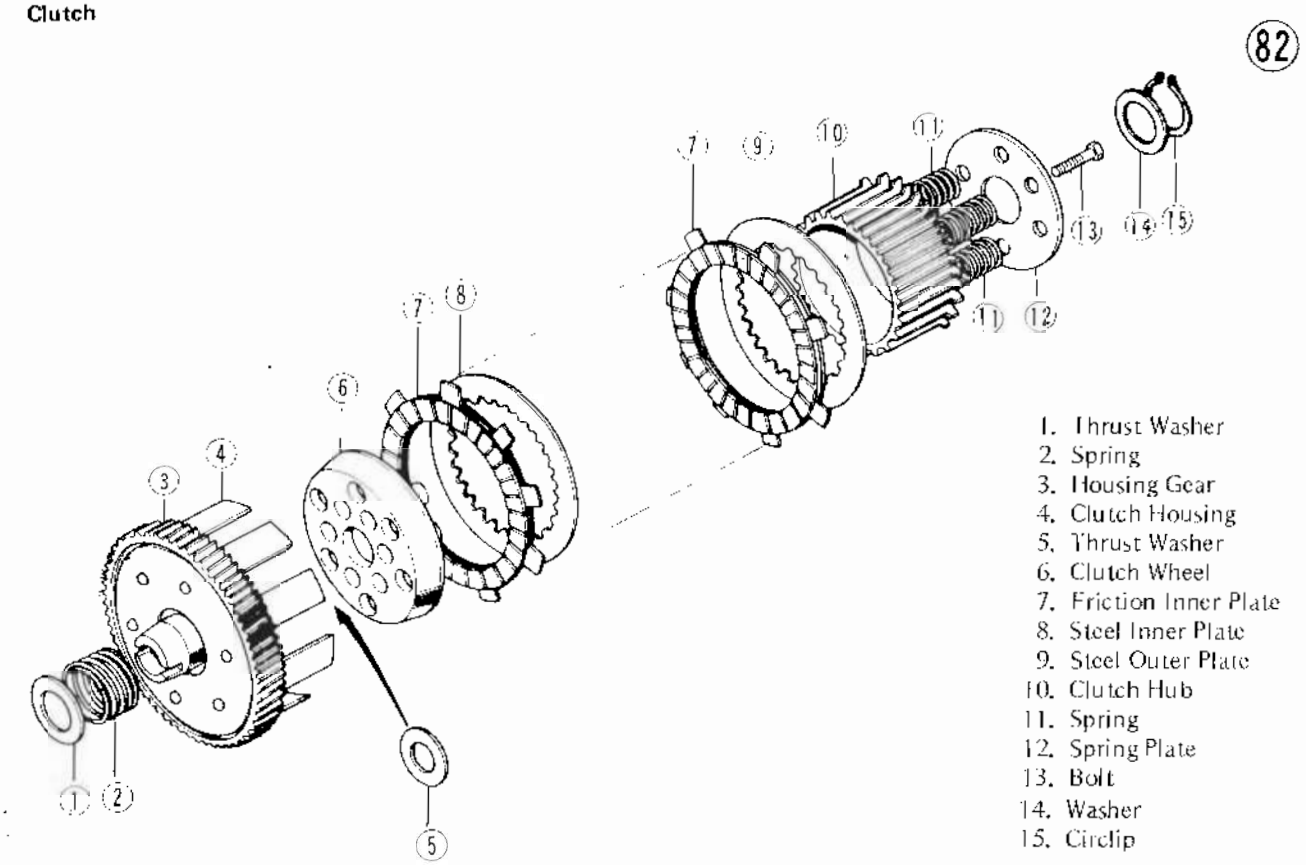
Removal:

- Be sure that the transmission is in neutral in order to facilitate clutch reinstallation later.
- Remove the right engine cover (Pg. 28).
- Remove the clutch spring plate disc.



- Remove the circlip from the drive shaft with circlip pliers, and remove the washer from the clutch wheel.
- Pull the clutch plate assembly out of the clutch housing. There is a thrust washer between the assembly and the housing.
- Pull out the clutch housing and its spring, and remove the thrust washer.
- To disassemble the clutch plate assembly, first take out the bolts (6) on the clutch spring plate, and remove the spring plate and springs (6). Now the clutch wheel, friction plates (4), steel plates (3), a steel outer plate, and clutch hub can be separated.

Clutch



1. Thrust Washer
2. Spring
3. Housing Gear
4. Clutch Housing
5. Thrust Washer
6. Clutch Wheel
7. Friction Inner Plate
8. Steel Inner Plate
9. Steel Outer Plate
10. Clutch Hub
11. Spring
12. Spring Plate
13. Bolt
14. Washer
15. Circlip

Installation:

- Check to see that the thrust washer is on the drive shaft and fit the spring onto the drive shaft.
- To reassemble the clutch plate assembly, first put the steel outer plate onto the clutch hub. Next, alternate the friction and steel plates, and then put on the clutch wheel. Install the clutch springs and spring plate, and lightly screw in the bolts.
- Apply grease to the washer and fit the washer into the clutch housing. Fit the clutch plate assembly into the clutch housing.
- Replace the clutch housing on the drive shaft while turning the kick shaft by hand so that the rear of the housing will fit into the side of the drive shaft idle gear.

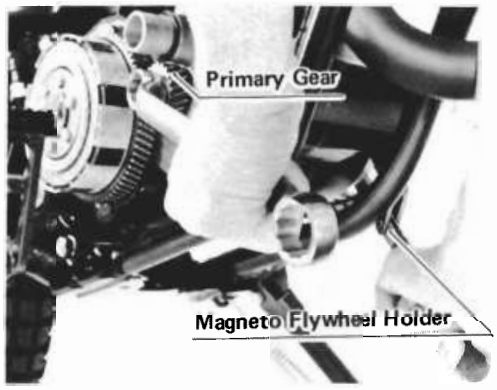


- Put the washer and the circlip back onto the drive shaft.
- Cross tighten the bolts evenly with 0.4 ~ 0.5 kg-m (35 ~ 43 in-lbs) of torque if they are loose. Do not use compressed air, which might make spring pressure uneven.
- Replace the clutch spring plate disc. Apply grease to the disc if necessary to keep it from dropping out.
- Check to see that the clutch push pin is in its place in the cover.
- Replace the right engine cover (Pg. 28).

ROTARY DISC VALVE

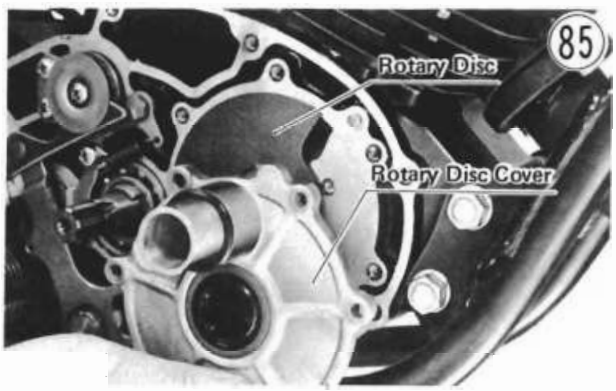
Removal:

- Be sure that the transmission is in neutral in order to facilitate clutch reinstallation later.
- Mark the position of the shift pedal so that it can later be replaced on the shaft in the same position (normally about 10° below the horizontal).
- Take out the shift pedal bolt and remove the shift pedal.
- Take out the screws (3) and remove the left engine cover, being careful not to damage the oil seal.
- Remove the right engine cover (Pg. 28).
- Remove the oil passage pipe and the O ring.
- Remove the clutch spring plate disc.
- Straighten the bent portion of the primary gear washer.
- Hold the magneto flywheel stationary with the magneto flywheel holder (special tool), and loosen the primary gear nut.



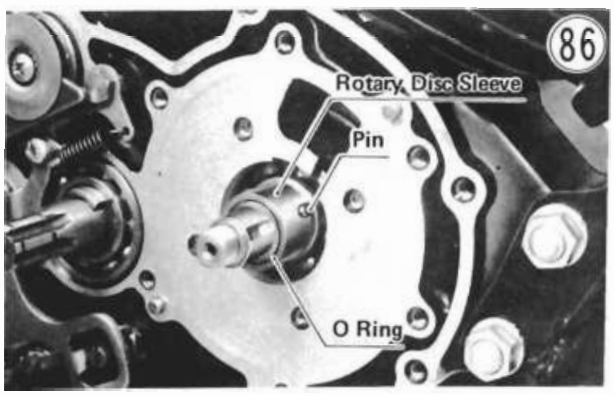
84

- Remove the circlip from the drive shaft with circlip pliers, and remove the washer.
- Pull the clutch plate assembly out of the clutch housing and remove the thrust washer.
- Pull out the clutch housing and its spring and remove the thrust washer.
- Take off the nut, the primary gear washer and the primary gear.
- Remove the woodruff key from the crankshaft.
- Undo the rotary disc cover screws with an impact driver, and remove the rotary disc cover.



85

- Remove the rotary disc valve. If necessary, pry gently using two screwdrivers.
- Pull off the rotary disc sleeve and **O** ring. Remove the pin from the crankshaft.



86

Installation:

- Replace the pin, the rotary disc sleeve, **O** ring and then the woodruff key on the right side of the crankshaft.
- Apply a thin coat of 2-stroke engine oil to both sides of the rotary disc valve, and then fit it in place, matching the 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 the screws with an impact driver. Be careful not to damage the oil seal inside the cover.
- 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 primary gear washer. If the primary gear must be tapped into place, crankcase/crankshaft clearance has to be checked.
- Replace the primary gear washer with the tooth fitted in the primary gear hole. Hold the magneto flywheel stationary with the magneto flywheel holder (special tool), and tighten 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.
- Replace the oil passage pipe and its **O** ring.
- Put the thrust washer and then the clutch housing spring onto the drive shaft.
- Apply grease to the thrust washer and put it in the clutch housing. Put the clutch plate assembly into the clutch housing.
- Fit the clutch housing back onto the drive shaft while turning the kick shaft by hand so that the rear of the housing will fit into the side of the drive shaft idle gear.
- Put the washer and the circlip (with circlip pliers) onto the drive shaft.
- Replace the clutch spring plate disc. Apply grease to the disc if necessary to keep it from dropping out.
- Check to see that the clutch push pin is in its place in the cover.
- Replace the right engine cover (Pg. 28).
- Replace the left engine cover using the shift shaft oil seal guide (special tool) to protect the oil seal in the cover, and tighten the screws (Fig. 59).
- Mount the shift pedal in the position marked during removal, and then tighten the bolt.

DRIVE CHAIN

Removal:

- Check to see that the transmission is in neutral.
- Mark the position of the shift pedal so that it can later be replaced on the shaft in the same position (normally about 10° below the horizontal).
- Take out the shift pedal bolt and remove the shift pedal.
- Take out the screws (3) and remove the left engine cover, being careful not to damage the oil seal.

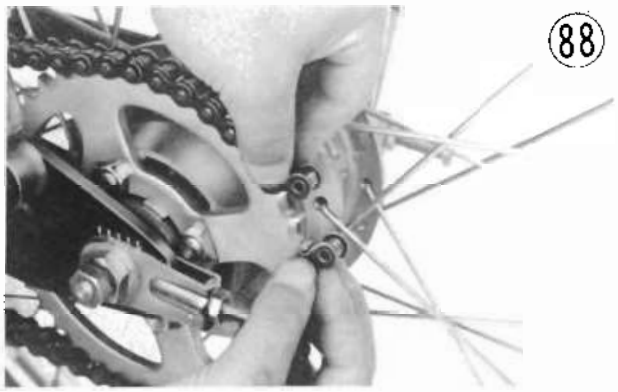
•Undo the clip carefully from the drive chain master link using pliers, and remove the master link.



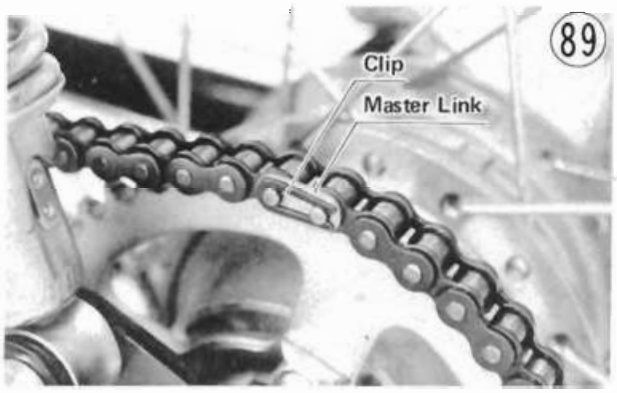
•Free the drive chain from the sprockets, being careful that the chain does not get dirty from contact with the ground.

Installation:

•Fit the drive chain back onto the sprockets with the ends at the rear sprocket.



•Replace the chain master link with pliers. The direction of the master link clip should be as follows.



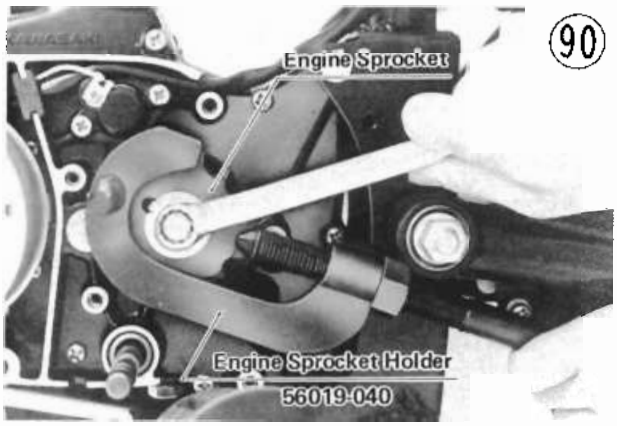
•Replace the left engine cover using the shift shaft oil seal guide (special tool) to protect the oil seal in the cover, and tighten the screws (Fig. 59).

•Mount the shift pedal in the position marked during removal, and tighten the bolt.
•Adjust the drive chain (Pg. 16).

ENGINE SPROCKET

Removal:

•Remove the drive chain and left engine cover (Pg. 31).
•Straighten back the bent portion of the engine sprocket washer.
•Using the engine sprocket holder (special tool) to keep the engine sprocket from turning, remove the engine sprocket bolt or nut, toothed washer and washer.



Installation:

•Put the engine sprocket back onto the output shaft. Replace the washer and the toothed washer so that the tooth fits into a hole in the engine sprocket.
•Using the engine sprocket holder (special tool) to hold the engine sprocket stationary, tighten the engine sprocket bolt with 2.2 ~ 2.5 kg-m (16 ~ 18 ft-lbs) of torque.
•Bend back one side of the toothed water over the bolt.
•Replace the drive chain (Pg. 31).

IGNITION COIL

Removal:

•Turn the fuel tap to the "S" position, slide down the hose clamp, and pull the fuel hose off the tap.
•Unlock the seat and swing it open. Unhook the rubber retaining band and pull the fuel tank off toward the rear.
•Disconnect the black and black/white ignition coil leads.
•Remove the screws (2) that connect the ignition coil to the frame, and remove the ignition coil.

Installation:

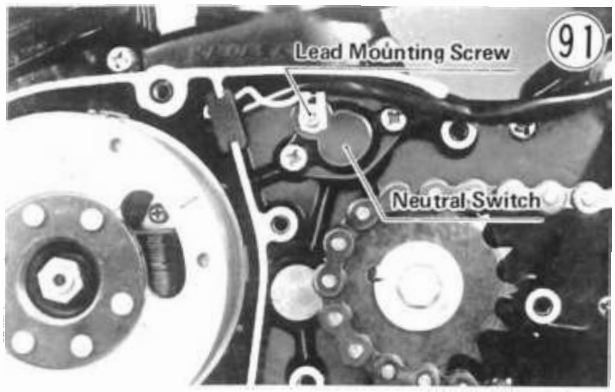
•Run the spark plug lead between the cables and the frame top tube, and fit the ignition coil mounting screws into their place under the frame top tube. The black/yellow lead is grounded between the nut and the frame.

- 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.
- Connect the spark plug lead to the spark plug.
- Replace the fuel tank and hook it with the 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 shift pedal and left engine cover.
- Loosen the neutral switch lead mounting screw, and disconnect the light green lead from the switch.

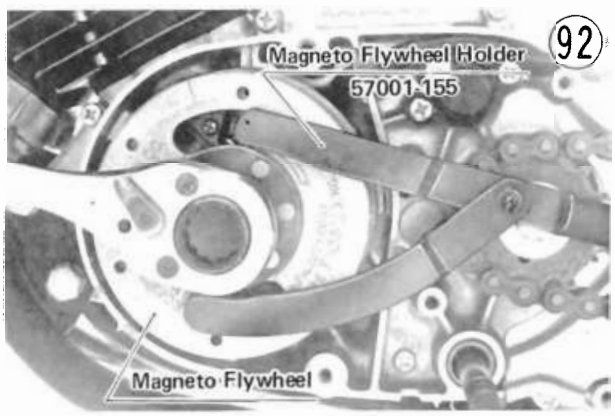


- Take out the screws (2) and remove the neutral switch.

MAGNETO FLYWHEEL

Removal:

- Take out the shift pedal bolt and remove the shift pedal.
- Remove the left engine cover, being careful not to damage the oil seal in the cover.
- Using the magneto flywheel holder (special tool) to hold the magneto flywheel stationary, remove the magneto nut with a socket wrench and take off the lock washer.



- Screw the magneto flywheel puller (special tool) counterclockwise into the magneto flywheel, and tighten the bolt on the puller to pull out the flywheel.



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

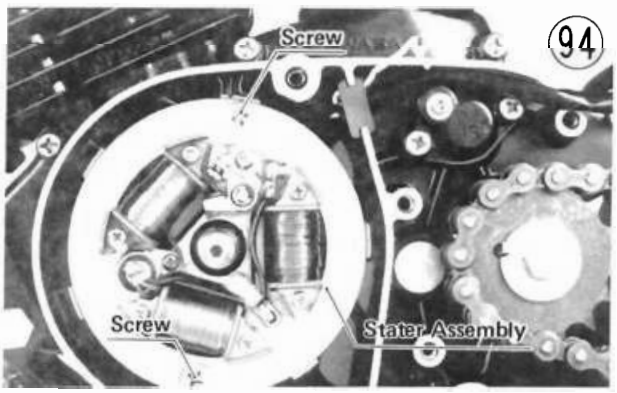
Installation Notes:

1. Before installing the flywheel, see that the key is fitted in its place on the crankshaft properly, and then align the flywheel so that the key fits in the groove in the hub of the flywheel.
2. Maximum torque for tightening the magneto nut is 5.0 kg-m (36 ft-lbs).
3. To avoid damaging the oil seal when replacing the left engine cover, grease the gear shift shaft lightly and use an oil seal guide (special tool).

MAGNETO STATOR

Removal:

- Remove the magneto flywheel (Pg. 33).
- Turn the fuel tap to the "S" position, slide down the hose clamp, and pull the fuel hose off the tap.
- Unlock the seat and swing it open. Unhook the rubber retaining band and pull the fuel tank off toward the rear.
- Disconnect the magneto outlet leads from where they connect under the frame top tube, first noting whether it is the light blue lead or the yellow/green lead that is not being used.
- Undo the strap that holds the lead assembly to the frame.
- Disconnect the neutral switch lead.
- Remove the magneto stator plate screws (2) and pull the stator assembly free from the side of the crankcase.



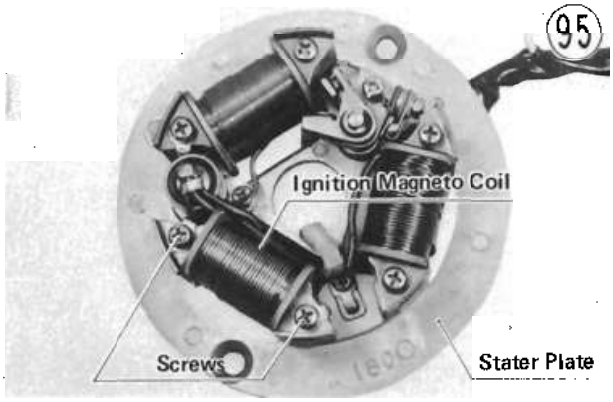
Installation Notes:

1. The electrical wiring is connected as follows; black to black and black/white, yellow to yellow, light green to light green, pink to pink, light blue or yellow/green to light blue.
2. Adjust the ignition timing (Pg. 11).

Disassembly:

To remove the ignition magneto coil:

- Remove the screws (2) that mount the ignition magneto coil to the stator plate.



- Unsolder the ignition magneto coil lead from where it connect at the condenser.
- Remove the ignition magneto coil from the stator plate.

To remove the lighting/charging coils -

- Remove the magneto wiring harness clamp screw.
- Remove the screws (2) that mount each coil to the stator plate.
- Slide back or cut off the yellow insulation from where the leads are to be disconnected, and mark all leads so that they can be reconnected correctly.
- Unsolder or cut the leads to free the lighting/charging coils from the magneto output leads. There are two output leads from each coil.

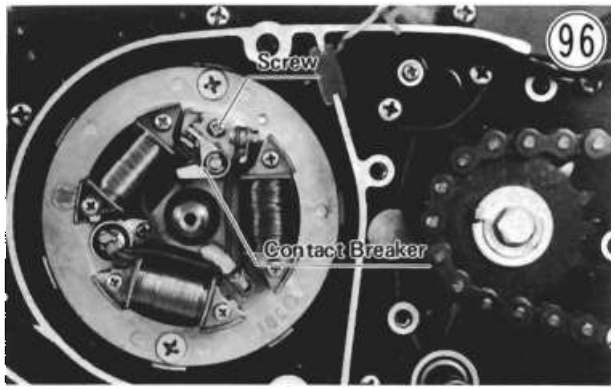
Assembly Notes:

1. Be careful not to strike or damage the coil wires with the soldering iron or screwdriver.
2. Be careful not to mix up the leads for the lighting/charging coils when reconnecting them. The standard connections are: red(thin) to pink, red (thick) to light blue, white (thin) to yellow, and white (thick) to yellow/green.
3. After connecting the leads for the lighting/charging coils, be sure that the yellow insulation is slid back into place or new insulation is wrapped around all exposed wire.

CONTACT BREAKER

Removal:

- Remove the magneto flywheel (Pg. 33).
- Remove the contact breaker base screw.



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

Installation Note:

- Adjust the ignition timing after installation (Pg. 11).

CONDENSER

Removal:

- Remove the magneto flywheel (Pg. 33).
- Remove the screw that holds the condenser to the stator plate.
- Unsolder the leads (3) from the condenser with a soldering iron.
- Remove the condenser from the stator.

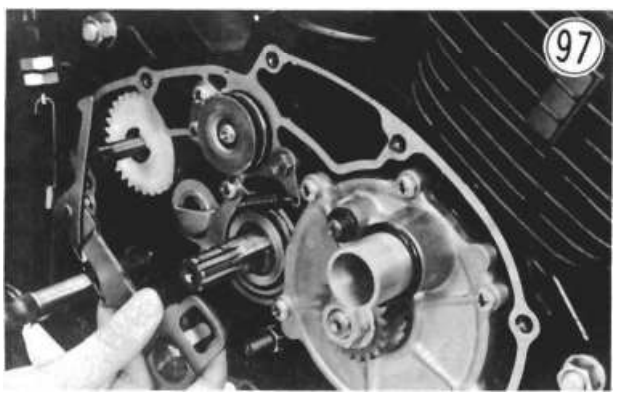
Installation Note:

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

EXTERNAL SHIFT MECHANISM

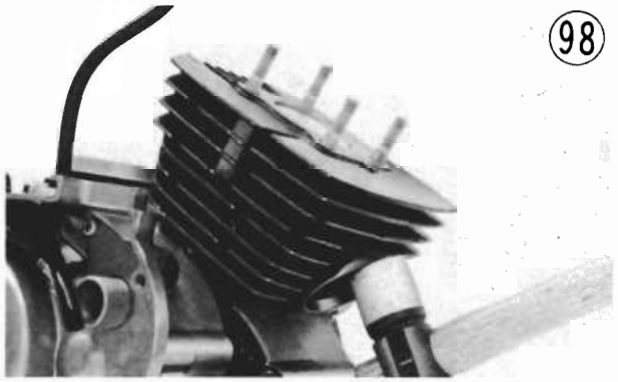
Removal:

- Remove the clutch (Pg. 29).
- Remove the shift pedal bolt ③ and remove the shift pedal ②.
- Move the external shift mechanism pawl ⑮ out of the groove on the shift drum, and pull the external shift mechanism shaft ⑤ out of the crankcase. Two springs ④ ⑭ and a sleeve ⑥ 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 shift shaft 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. 29).

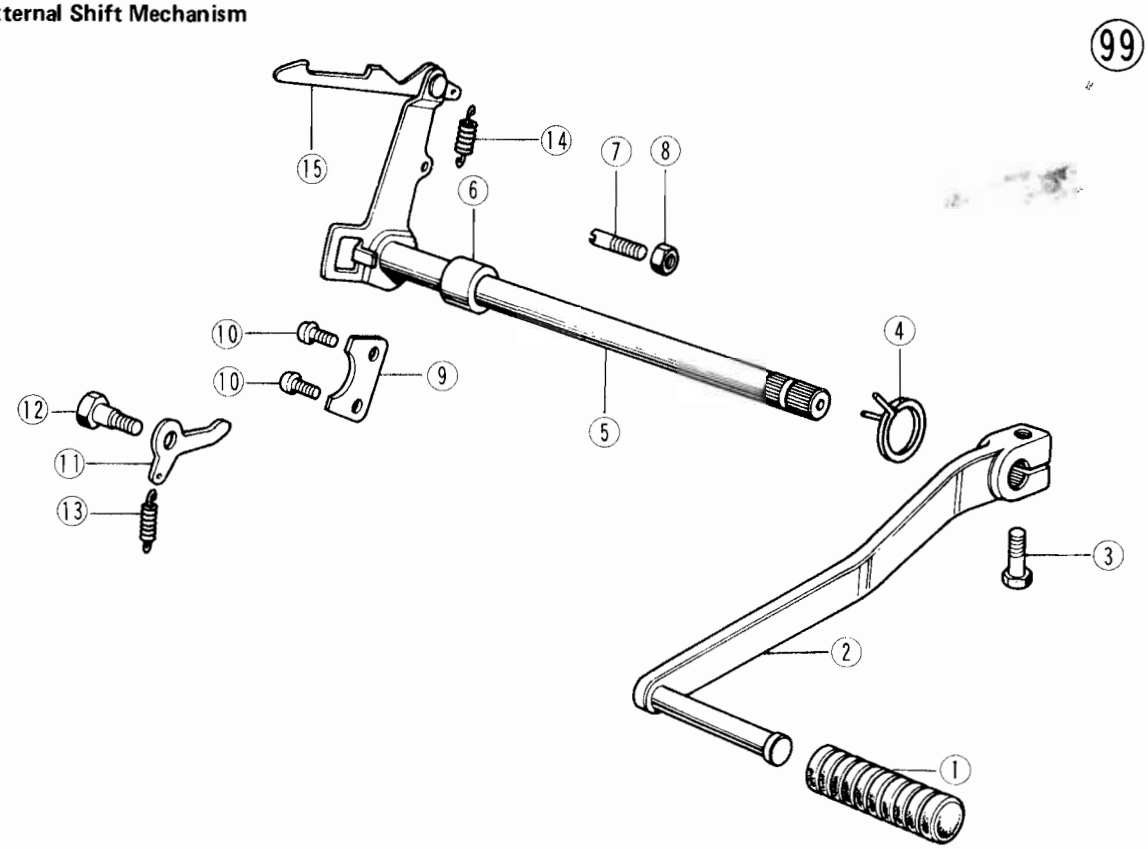


TRANSMISSION

Removal:

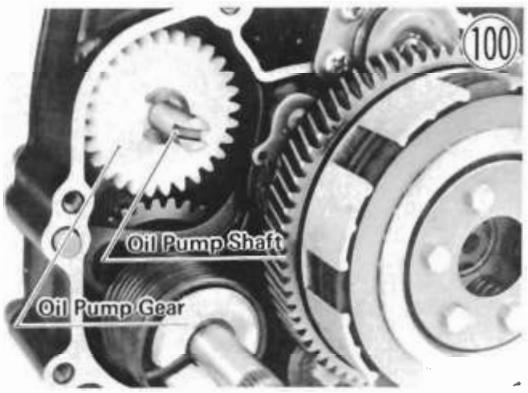
- Remove the engine (Pg. 19).
- Remove the cylinder head nuts (4).
- Take off the cylinder head and cylinder head gasket.
- Lightly tap up opposite sides of the cylinder with a plastic mallet, taking care not to damage the cooling fins, and lift off the cylinder and cylinder base gasket (Fig. 98).
- 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 the piston (Pg. 24).
- Mark the position of the kick pedal on the shaft so that it can be returned to the same position later (Fig. 78).

External Shift Mechanism

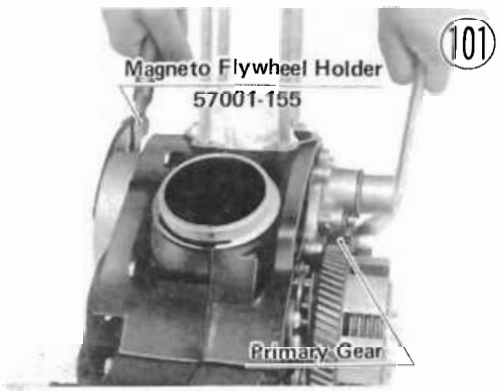


1. Shift Pedal Rubber
2. Shift Pedal
3. Bolt
4. Return Spring
5. Shift Shaft
6. Sleeve
7. Return Spring Pin
8. Nut
9. Shift Drum Stopper
10. Screw
11. Detent Arm
12. Bolt
13. Spring
14. Spring
15. Shift Pawl

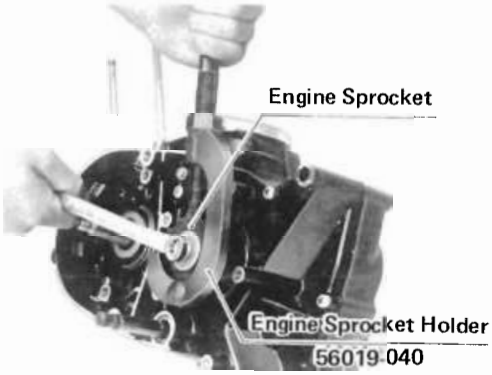
- Remove the kick pedal bolt, widen slightly the gap on the kick pedal with a screwdriver, and then pull off the kick pedal.
- Slide up the hose clamp and disconnect the oil pump outlet hose from the oil pump.
- Remove the oil pump mounting screws (2) and pull off the oil pump.
- Using an impact driver, remove the screws (8) from the right engine cover, and remove the right engine cover and gasket.
- Remove the oil passage pipe and its **O** ring.
- Remove the oil pump shaft and gear.



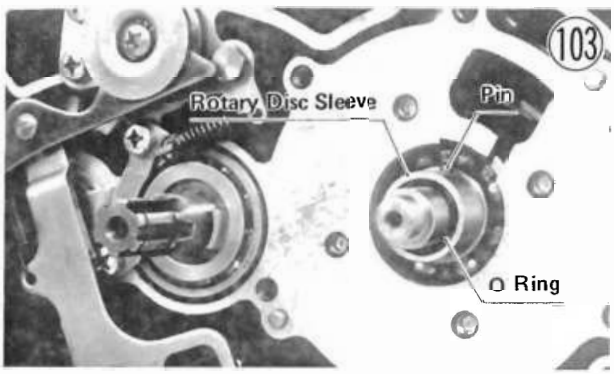
- Pull out the kick spring guide.
- Pull the end of the kick spring from the hole in the kick shaft with pliers, and remove the kick spring.
- Remove the clutch spring plate disc (Fig. 81).
- Straighten the bent portion of the primary gear washer.
- Hold the magneto flywheel stationary with the magneto flywheel holder (special tool), and loosen the primary gear nut.



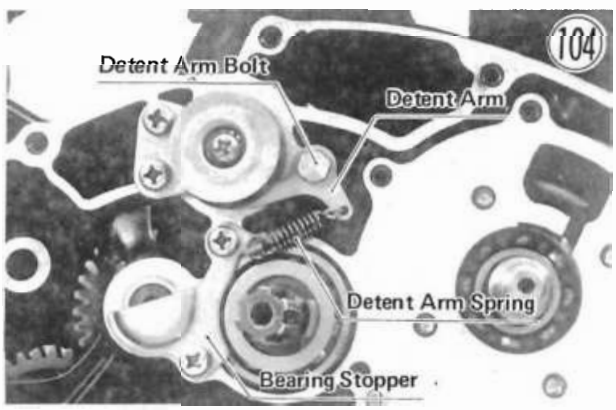
- Remove the magneto flywheel (Pg. 33).
- Loosen the neutral switch lead mounting screw, and disconnect the light green lead from the switch.
- Remove the magneto stator plate screws (2), and take off the magneto stator assembly (Fig. 94).
- Straighten the bent portion of the engine sprocket washer.
- Using the engine sprocket holder (special tool) to keep the engine sprocket from turning, remove the engine sprocket bolt or nut, toothed washer and flat washer (Fig. 102).



- Pull off the engine sprocket.
- Take the engine sprocket collar and **O** ring off the output shaft.
- Remove the screws (2) from the neutral switch housing, and remove the neutral switch housing and gasket.
- Bend up the neutral switch rotor.
- Remove the circlip using a circlip pliers, and remove the washer from the drive shaft.
- Remove the clutch plate assembly and the thrust washer.
- Take off the clutch housing spring and the thrust washer.
- Take off the nut, the primary gear washer and the primary gear.
- Undo the rotary disc cover screws (6) with an impact driver, and remove the rotary disc valve cover.
- Remove the rotary disc. If necessary, pry gently using two screwdrivers.
- Pull off the rotary disc sleeve and **O** ring.



- Remove the pin from the crankshaft.
- Move the external shift mechanism pawl out of the groove on the shift drum, and pull the external shift mechanism shaft out of the crankcase.
- Remove the detent arm bolt, undo the detent arm spring, and take off the detent arm.

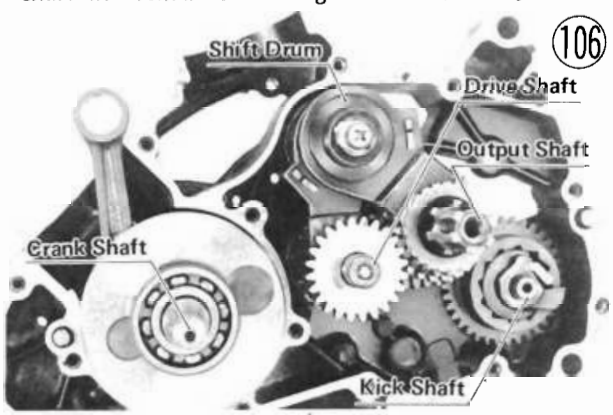


- Remove the transmission bearing stopper.
- Remove the shift drum positioning plate.
- Remove the crankcase screws (13) with an impact driver.
- Screw the crankcase splitting tool (special tool) into the left side of the crankcase.
- Tighten the bolt on the crankcase splitting tool to split the crankcase.



105

- After the crankcase halves have been split, the crankshaft will remain in the right crankcase half.



106

- Remove the kick shaft and gear.
- Remove the drive shaft, output shaft and shift drum assemblies. Note that a ball bearing is located at the end of the drive shaft.

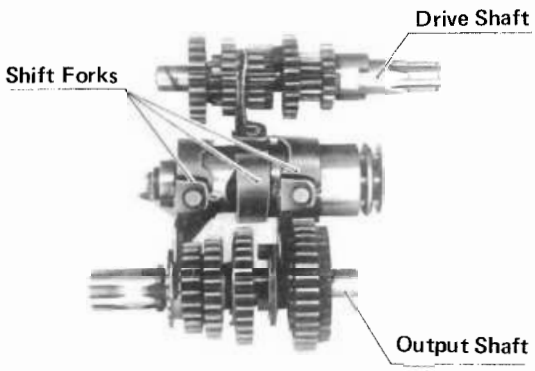
Installation:

- Clean out the crankcase and clean off any grime that is on any of the transmission and crankshaft parts with a high flash point solvent of some kind.
- Put grease on the end of the drive shaft where it fits into the left crankcase half so that the ball bearing will not fall out of place during installation.



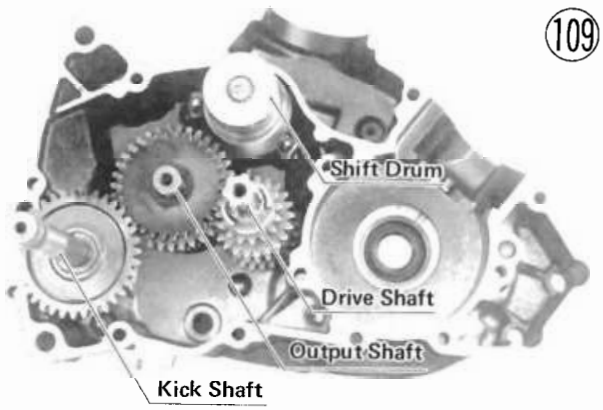
107

- Fit the shift drum, drive shaft and output shaft assemblies together, and then install them in the left crankcase half.



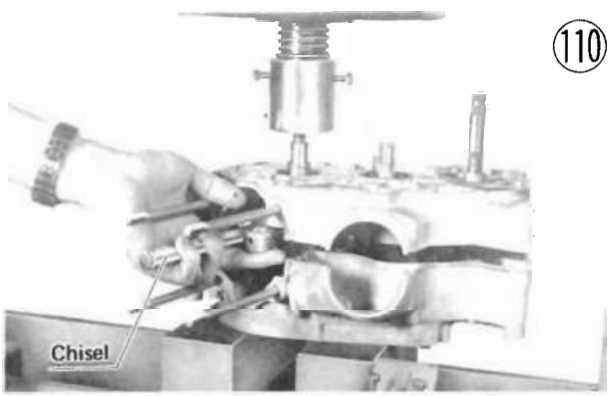
108

- Replace the kick shaft and gear. Check to see that the kick pawl, spring and kick pawl pin are properly in place on the kick shaft.



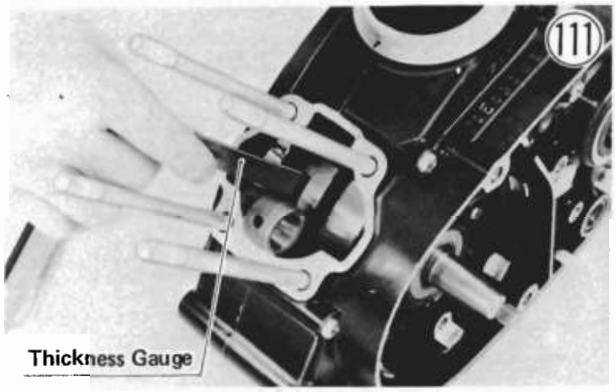
109

- Apply liquid gasket to the fitting surface of the left crankcase half and then, with a chisel or wedge inserted between the flywheels opposite the connecting rod big-end, fit the crankcase halves together by pressing the right end of the crankshaft using a press.

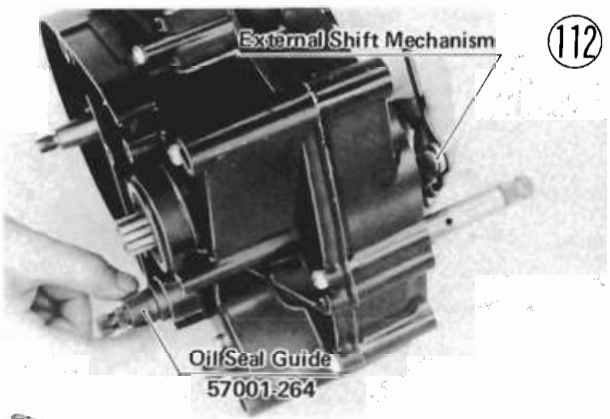


110

- After the crankcase halves are fitted together, place the crankcase on its right side, and screw in the crankcase screws (13).
- With the crankcase on its right side, lightly tap the end of the crankshaft (again using only a plastic, soft brass or lead hammer) so that the crankshaft will center properly and turn freely.



- Check to see that the crankshaft turns freely.
- Check to see that the drive shaft, output shaft and kick gears all turn freely before proceeding.
- Wrap a clean cloth around the connecting rod so that no parts fall into the crankcase.
- Replace the shift drum positioning plate.
- Replace the transmission bearing stopper.
- Replace the detent arm spring, the detent arm and the detent arm bolt. Be certain the bolt is tightened fully into place.
- Fit the spring into the external shift mechanism and check to see that the sleeve is in place.
- Using the shift shaft 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.

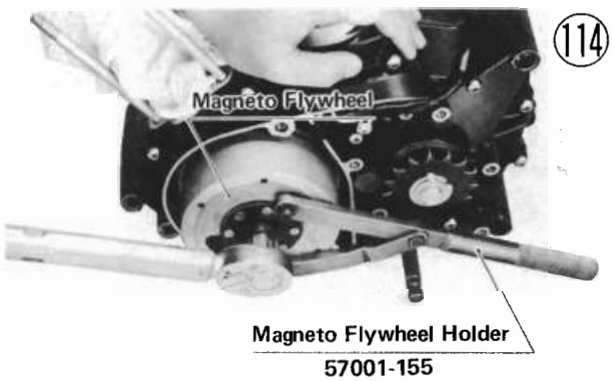


- Replace the pin, the rotary disc sleeve, **O** ring and then the woodruff key on the right side of the crankshaft.
- Apply a thin coat of 2-stroke engine oil to both sides of the rotary disc, and then fit it in place, matching the hub groove with the crankshaft pin.
- Be sure that the large **O** ring is properly in place in the valve cover and replace the cover, tightening the screws with an impact driver. Be careful not to damage the oil seal inside the cover.

- When replacing the engine sprocket, first fit on the **O** ring and then the engine sprocket collar. Replace the flat washer and the toothed washer so that the tooth fits into the hole in the engine sprocket.
- Using the engine sprocket holder (special tool) to hold the engine sprocket stationary, tighten the engine sprocket bolt with 2.2 ~ 2.5 kg-m (16 ~ 18 ft-lbs) of torque.

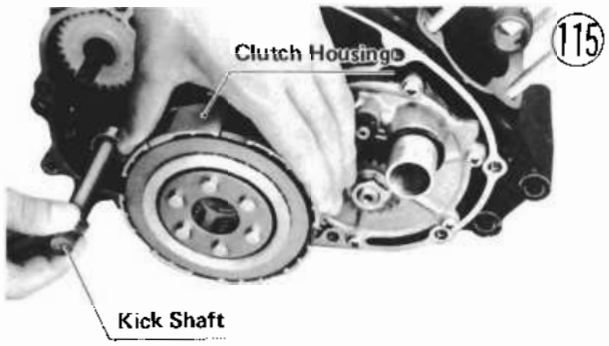


- Bend back one side of the toothed washer over the bolt.
- Replace the neutral switch and tighten the screws (2).
- Replace the magneto stator and tighten the screws (2) with an impact driver.
- Run the magneto output leads through the rubber fitting in the left crankcase.
- Connect the light green neutral switch lead to the neutral switch.
- See that the key is fitted properly into place on the crankshaft, and then install the flywheel so that the key fits in the groove in the flywheel hub. Put 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 stationary with the magneto flywheel holder (special tool). The maximum torque for the magneto nut is 5 kg-m (36 ft-lbs).

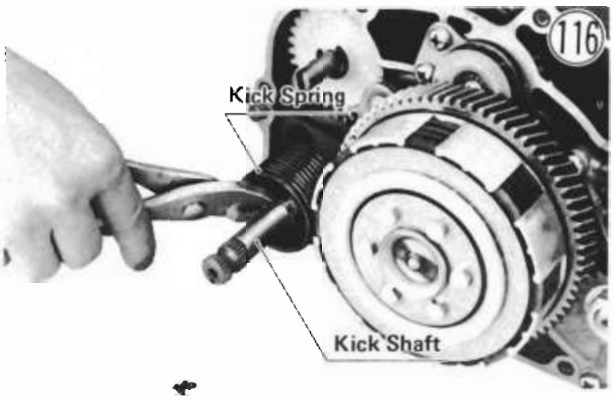


- Check to see that the woodruff key is properly positioned on the crankshaft.
- Replace the primary gear with the hole facing outward to accommodate the primary gear washer. If the primary gear must be tapped into place, recheck the crankcase/crankshaft clearance. Reposition the crankshaft if necessary in the manner already described.

- Once the primary gear is fully in place, replace the primary gear washer with the tooth fitted in the primary gear hole. Hold the magneto flywheel stationary with the magneto flywheel holder (special tool), and tighten 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.
- Put the thrust washer and then the clutch housing spring back onto the drive shaft.
- Apply grease to the thrust washer and put it in the clutch housing. Fit the clutch plate assembly into the clutch housing.
- Fit the clutch housing back onto the drive shaft while turning the kick shaft by hand so that the rear of the housing will fit into the side of the drive shaft idle gear.



- Replace the washer and the circlip (using circlip pliers) onto the drive shaft.
- Before installing the kick starter spring, first turn the shaft all the way clockwise. Install the kick starter spring while twisting the spring counterclockwise using pliers. Replace the kick spring guide.



- Replace the oil pump shaft and gear.
- Replace the oil passage pipe and its O ring.
- Replace the clutch spring plate disc. Apply grease to the disc if necessary to keep it from dropping out.
- Using a new right engine cover gasket, fit the right engine cover back onto the crankcase. Use a kick shaft oil seal guide (special tool) to protect the right engine cover oil seal, and see that the O ring does not fall off the rotary valve cover intake port.
- Check to see that the push pin is in its place in the right engine cover before replacing the cover.
- Replace the right engine cover screws (8), and tighten them with an impact driver.
- When installing the oil pump, 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.
- Put the oil pump back into place using a new gasket, and tighten the oil pump mounting screws (2). There is a copper washer for each screw.
- Connect the oil pump outlet hose to the oil pump connector and slide back its clamp.
- Replace the kick pedal on the kick shaft and tighten the bolt.
- Apply oil to the connecting rod needle bearing, and fit it onto the connecting 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 toward 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 put on a new cylinder base gasket.
- 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 position. The pin in each piston groove must be between the ends of the 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.
- Put on the cylinder head, and install the flat washers (4), lock washers (4), and cylinder head nuts (4), in that order. Cross tighten the cylinder head nuts evenly with 2.2 kg-m (16 ft-lbs) of torque.
- Install the engine (Pg. 19).
- Adjust the oil pump (Pg. 10).
- Adjust the clutch (Pg. 13).

Shift Drum Disassembly:

- Remove the pin holder screw (30), washer (31) and pin holder (32).
- Remove the pins (6).
- To remove a shift fork, pull out the cotter pin, shake out the guide pin, and then slide off the fork.

Shift Drum Assembly Notes:

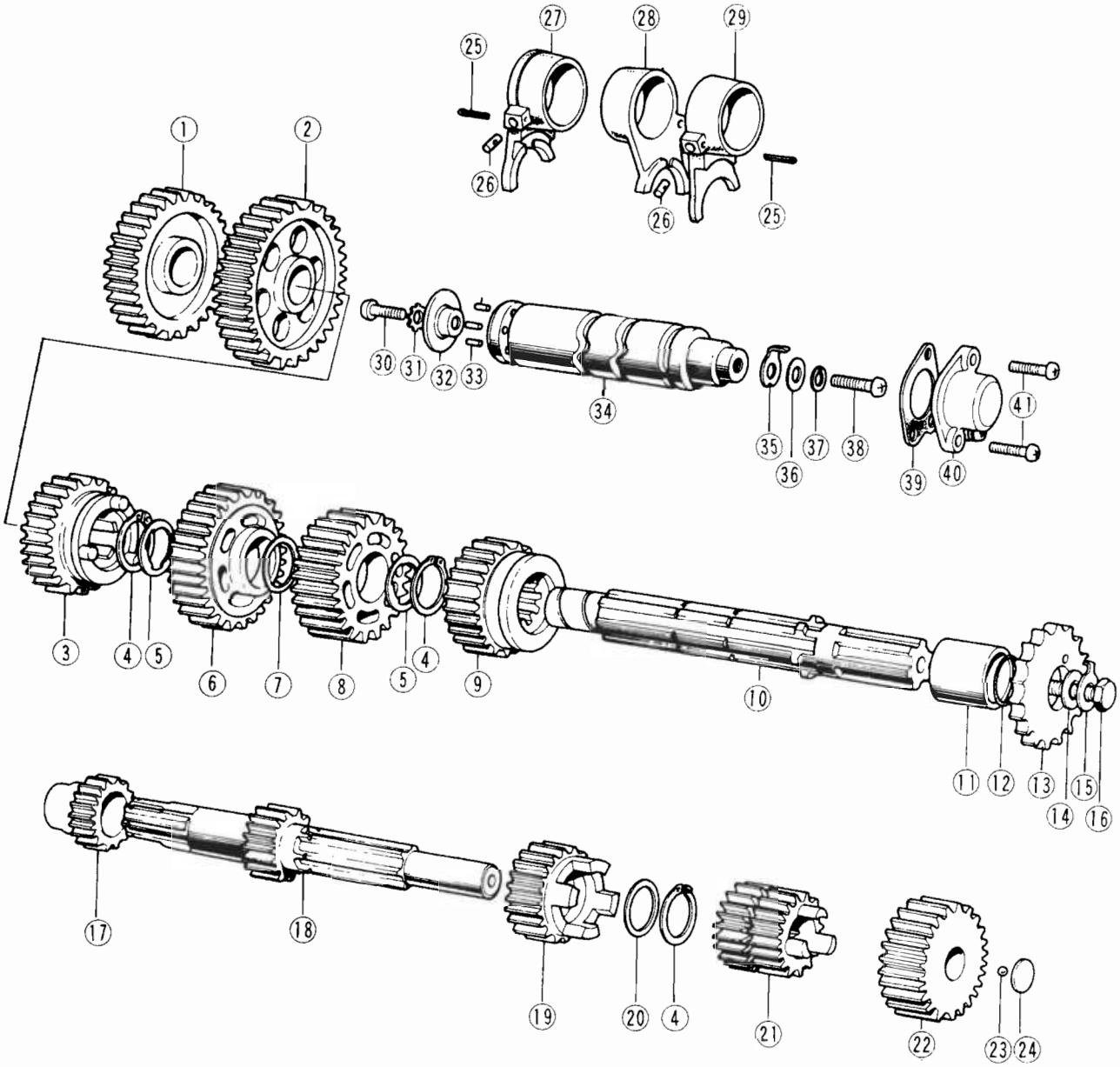
1. Be sure that the screw is securely tightened.
2. The cotter pins should be inserted from the shift drum side (opposite the neutral switch side).

Drive Shaft Disassembly:

- Pull off 5th gear (22) and 2nd & 3rd gear (21).
- Remove the circlip (4), and take off the flat washer (20) and 4th gear (19). 1st gear is part of the drive shaft (18).

Transmission

(117)



1. Idle Gear (O)
2. 1st Gear (O)
3. 4th Gear (O)
4. Circlip
5. Spline Washer
6. 2nd Gear (O)
7. Plain Washer
8. 3rd Gear (O)
9. 5th Gear (O)
10. Output Shaft
11. Collar
12. O Ring
13. Engine Sprocket .
14. Washer
15. Toothed Washer
16. Bolt
17. Idle Gear (D)
18. Drive Shaft & 1st Gear (D)
19. 4th Gear (D)
20. Washer
21. 2nd & 3rd Gear (D)
22. 5th Gear (D)
23. Ball Bearing
24. Washer
25. Cotter Pin
26. Guide Pin
27. 4th Gear Shift Fork
28. 2nd & 3rd Gear Shift Fork
29. 5th Gear Shift Fork
30. Screw
31. Washer
32. Pin Holder
33. Pin
34. Shift Drum
35. Rotor
36. Washer
37. Lock Washer
38. Screw
39. Gasket
40. Neutral Switch Housing
41. Screw

Drive Shaft Assembly Notes:

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

Output Shaft Disassembly:

- Pull off idle gear (1), 1st gear (2) and 4th gear (3).
- Remove the circlip (4) and slide off the splined washer (5), 2nd gear (6), flat washer (7), 3rd gear (8), and splined washer (9).
- Remove the circlip (4) and slide off the 5th gear (9).

Output Shaft Assembly Notes:

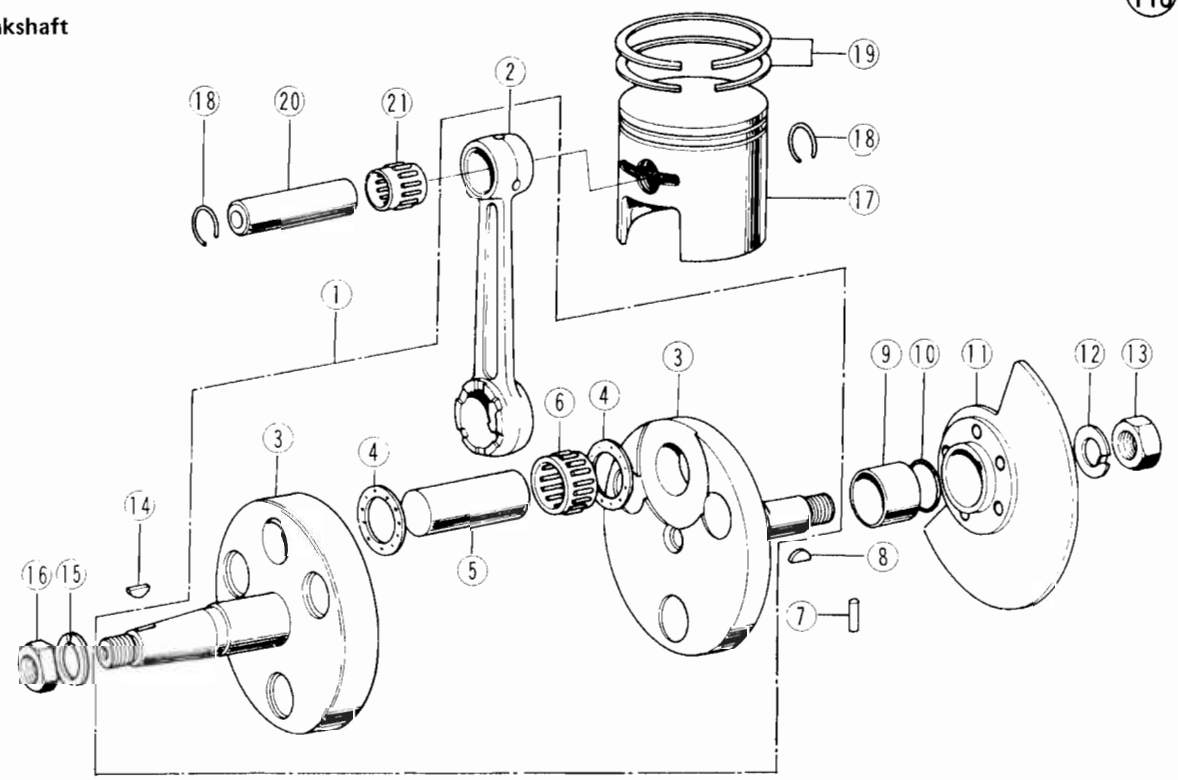
1. Be sure that all parts are put back in the correct sequence and that all circlips are properly in place (replace any that are bent or damaged). Proper sequence from the engine sprocket side is 5th gear, circlip, splined washer, 3rd gear, flat washer, 2nd gear, splined washer, circlip, 4th gear, 1st gear and idle gear.
2. Gear identification
   5th gear — dogs, dog side faces 3rd gear
   3rd gear — no dogs, dog recesses for 5th gear
   2nd gear — dog holes, protruding side faces 3rd gear
   4th gear — double dogged, tooth side dogs fit into 1st gear
   1st gear — dog holes, side which is sunk further in faces 4th gear
   idle gear — no dogs, no recesses, plain side faces out (engine right side).

CRANKSHAFT

Removal:

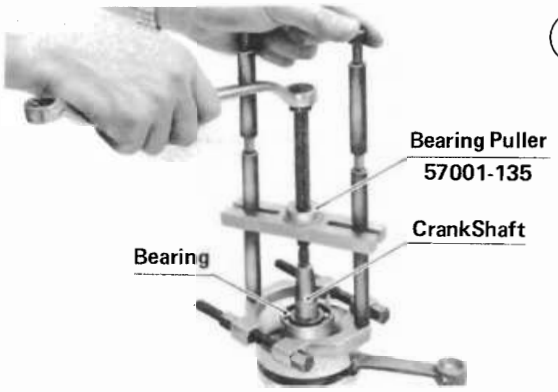
- Remove the transmission (Pg. 35).
- Remove the crankshaft from the right crankcase half using a press.

Crankshaft (118)



1. Crankshaft
2. Connecting Rod
3. Flywheel
4. Washer
5. Crankpin
6. Big End Bearing
7. Pin
8. Woodruff Key
9. Sleeve
10. O Ring
11. Rotary Disc
12. Lock Washer
13. Nut
14. Woodruff Key
15. Lock Washer
16. Nut
17. Piston
18. Snap Ring
19. Piston Ring
20. Piston Pin
21. Small End Bearing

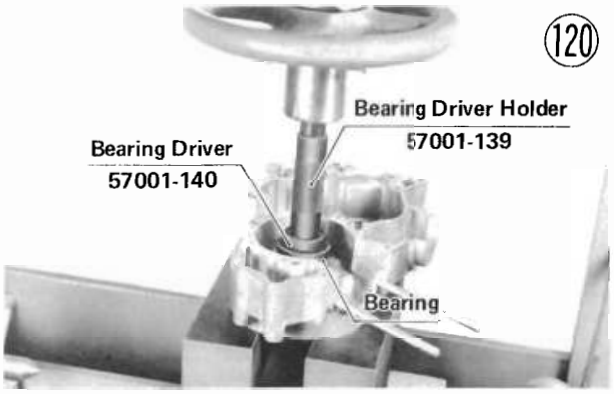
●Remove the bearing on the left side of the crankshaft with the bearing puller (special tool).



(119)

Installation:

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



(120)

●Install the crankshaft into the right crankcase using a press.
●Install the transmission (Pg. 35).

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), connecting rod (2), big end bearing (6), crankpin and connecting rod side washers (4).

Assembly Notes:

●Since 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 0.058 ~ 0.077 mm.
2. Select a crankpin, needle bearing and connecting rod such that the radial clearance will be 0.029 ~ 0.039 mm.
3. Press with a thickness gauge inserted between the connecting rod and one of the flywheels so that the side clearance will be 0.35 ~ 0.45 mm.
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 (Pg. 73).

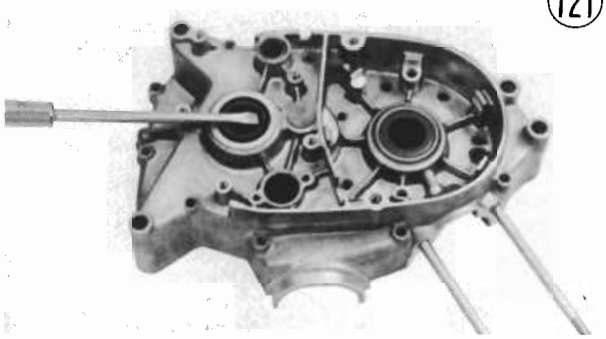
CRANKCASE

Removal:

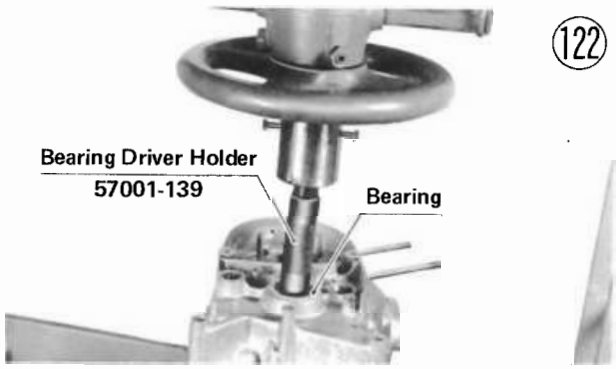
●Remove the crankshaft (Pg. 41).

Left Crankcase Half Disassembly:

●Remove the crankshaft, shift shaft and output shaft oil seals with a hook.


(121)

●Using the bearing driver holder (special tool) and a press, take the output shaft bearing out the right side.



(122)

Left Crankcase Half Assembly Notes:

1. Any oil seal that is removed must be replaced with a new one.
2. Inspect the bearings and replace if bad (Pg. 85).
3. Apply oil to the bearing and oil seals. Using a press and special tools, install the crankshaft, shift shaft, output shaft oil seals and the output shaft bearing.


(123)


(124)


(125)



(126)

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, take the crankshaft bearing out the left side.



(127)

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



(128)

- Remove the kick shaft oil seal with a hook.

Right Crankcase Half Assembly Notes:

1. Any oil seal that is removed must be replaced with a new one.
2. Inspect the bearings and replace if bad (Pg. 85).
3. Apply oil to the bearings and the oil seal. Using a press and special tools, install the crankshaft bearing, the drive shaft bearing and the kick shaft oil seal.



(129)



(130)

FUEL TANK

Removal:

- Unlock and open the seat. Unhook the seat stopper and open the seat further.



- Turn the fuel tap to the "S" position, slide down the hose clamp, and pull the fuel hose off the tap.
- Unhook the rubber retaining band.
- Lift up the rear of the fuel tank and pull off the fuel tank.

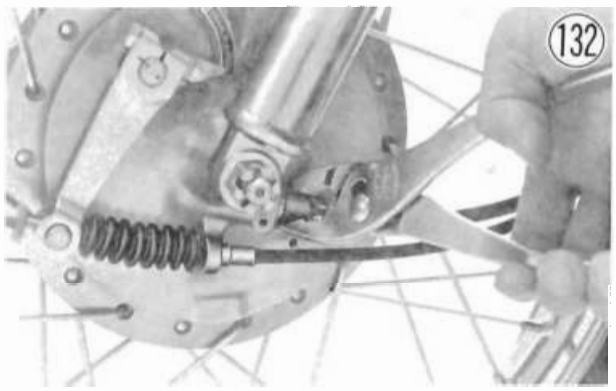
Installation

- Mount the fuel tank.
- Replace the rubber retaining band. Hook the seat stopper, and replace and lock the seat.
- Fit the fuel hose back onto the fuel tap, and slide the clamp into place.

FRONT WHEEL

Removal:

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

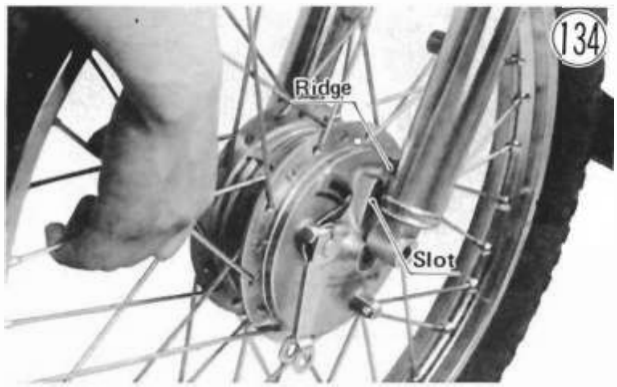


- Remove the adjuster from the lower end of the front brake cable, and pull the cable free from the front brake panel.
- Remove the axle nut and lock washer.
- Using a jack under the engine, take out the axle and remove the front wheel.



Installation

- Replace the front wheel. Be certain that the ridge on the front fork fits into the slot on the brake panel. Tighten the axle nut with 3.4~4.6 kg-m (25~33 ft-lbs) of torque. The axle has the lock washer.



- Turn the front wheel inserting the speedometer cable so that the tongue of the speedometer pinion will seat in the groove in the end of the cable.
- Mount the front brake cable, dust cover, brake cable joint and adjuster onto the brake panel.
- Adjust the front brake (Pg. 14).

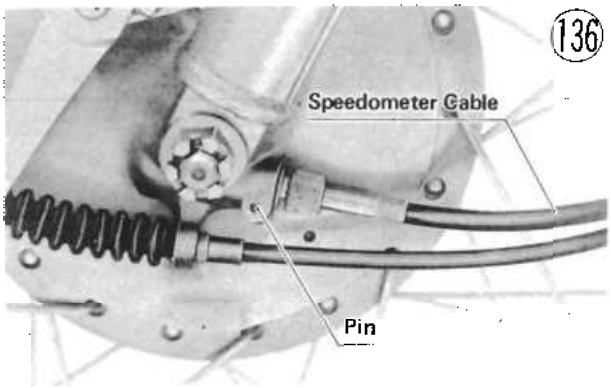
Front Brake Disassembly

- Pull off the brake panel.
- Remove the brake shoes by pulling up at the center of the linings.



- Remove the springs to separate the two brake shoes.
- If the front brake panel oil seal is deteriorated or damaged, remove and replace it with a new one.

•Remove the speedometer gear receiver and speedometer gear. If the speedometer cable bushing or speedometer pinion needs to be removed, the pin in the brake panel must first be drilled out.



•Mark the position of the cam lever so that it can later be installed at the same angle. The angle between the brake cam lever and the brake cable should be 80~90° when the brake is fully applied.

•Unbolt and remove the cam lever, brake lining wear indicator, washer, O ring and camshaft.

Front Brake Assembly

•See Pg. 92 for lubrication information.

•Be careful not to get oil or grease on the brake drum or brake linings. Any that inadvertently gets on the drum or linings should be cleaned off with trichloroethylene.

•Put back the speedometer gear and speedometer receiver, taking care not to damage the oil seal.

•Put the camshaft back into the panel.

•Fit the springs onto the brake shoes, and install the shoes in the brake panel.

•Once the shoes have been replaced, place the O ring on the camshaft and fit the indicator on the serrations so that it points to the extreme right of the USABLE RANGE plate.

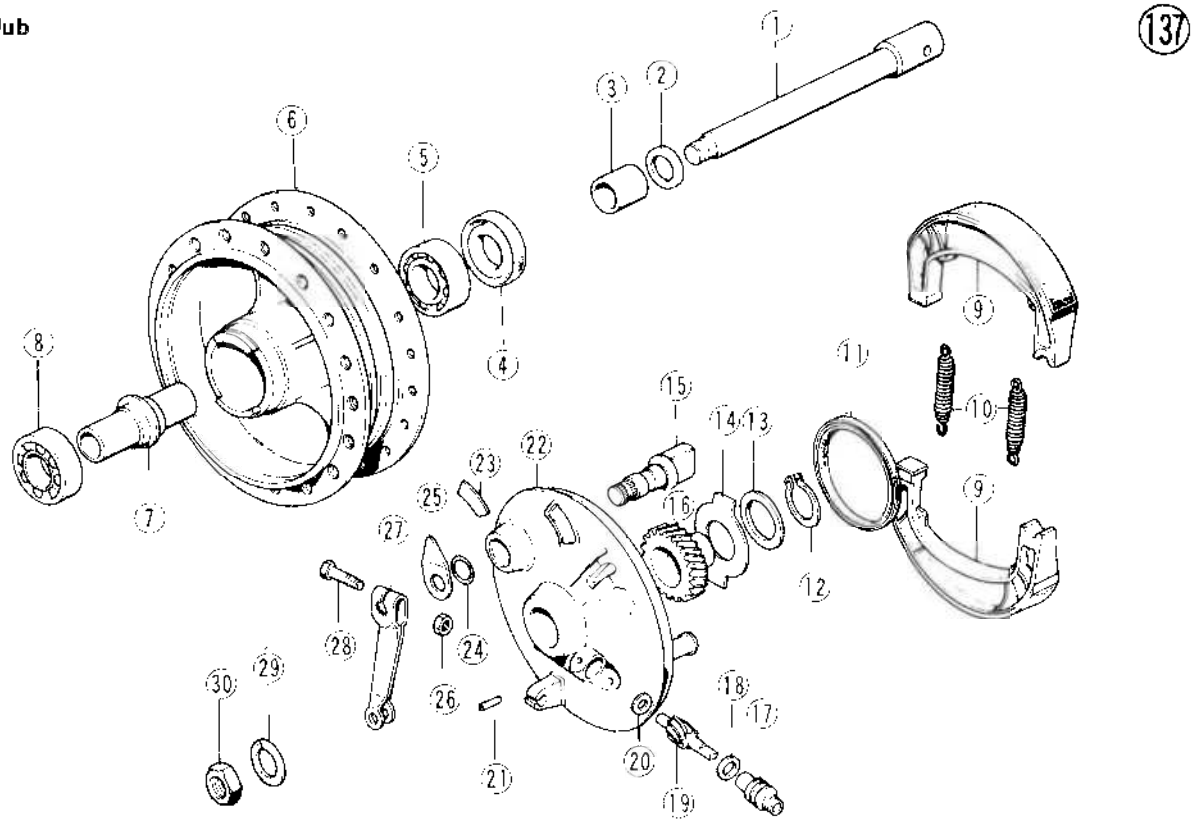
•Put the cam lever back into its original position on the camshaft, and tighten the bolt.

•Replace the front brake panel.

Front Hub Disassembly

•Remove the grease seal cover and hub collar from the right side.

Front Hub



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

- Pull out the front hub grease seal.
- To remove the right side hub bearing, insert a metal rod through from the brake panel side and catch it on the side of the bearing, and remove the bearing by tapping evenly around the bearing inner race.



- Remove the distance collar, and remove the other bearing by tapping evenly around the bearing inner race.

Front Hub Assembly

- See Pg. 92 for lubrication information.
- Install the left bearing using a press or wheel bearing driver (special tool).



- Replace the distance collar.
- Install the right bearing using a press or wheel bearing driver (special tool).

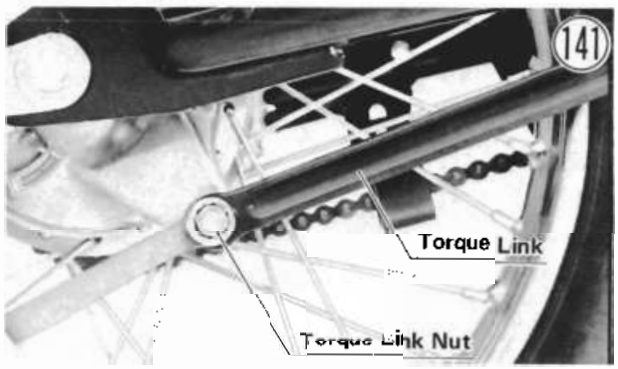


- Replace the grease seal with a new one using a metal rod or suitable tool.
- Replace the hub collar and grease seal cover.

REAR WHEEL

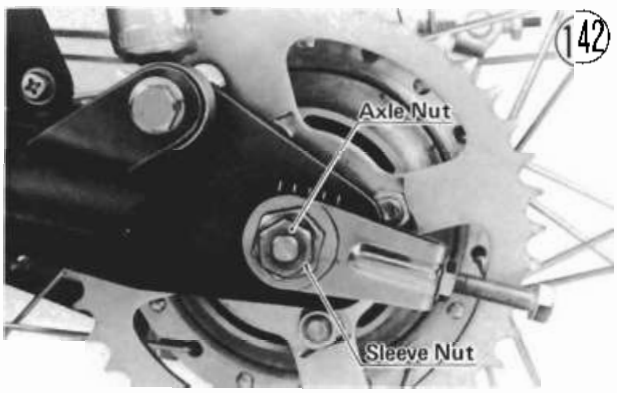
Removal:

- Prop the motorcycle up by placing a box or some other suitable object under the engine.
- Remove the cotter pin, torque link bolt, nut and lock washer to free the torque link from the brake panel.



- Take off the adjusting nut on the brake rod to free the brake rod from the brake cam lever.
- Remove the drive chain (Pg. 31).
- Remove the axle nut and the sleeve nut.

NOTE: If you do not disassemble the rear coupling after, it is not necessary to remove the drive chain and sleeve nut.



- Pull out the axle, removing the right collar while dropping out the wheel.

Installation

- Replace the rear wheel assembly, making sure that the collar is at the right side of the brake panel.
- Check to see that a chain adjuster is located at each end of the axle.
- Replace the torque link and tighten the nut loosely. The torque link bolt has a nut and lock washer.
- Replace the drive chain (Pg. 31).
- Tighten the axle nut with 3.4 ~ 4.6 kg-m (25 ~ 33 ft-lbs) of torque.
- Tighten the sleeve nut.
- Tighten the torque link nut with 2.6 ~ 3.5 kg-m (19 ~ 25 ft-lbs) of torque. Put the cotter pin through the torque link bolt.
- Mount the brake rod, spring, and adjusting nut on the brake lever.
- Adjust the rear brake (Pg. 14).

Rear Hub Disassembly

- Pull off the coupling.
- Insert a metal rod into the hub from the brake side, and remove the bearing by tapping evenly around the bearing inner race.
- Remove the distance collar.
- Insert a metal rod into the hub from the coupling side, set the rod to the inner race of the bearing, and remove the other bearing by tapping evenly around the bearing inner race.

Rear Hub Assembly

- See Pg. 92 for lubrication information.
- Install the left bearing using a press or wheel bearing driver (special tool).



- Replace the distance collar.
- Install the right bearing using a press or wheel bearing driver (special tool).
- Replace the coupling.

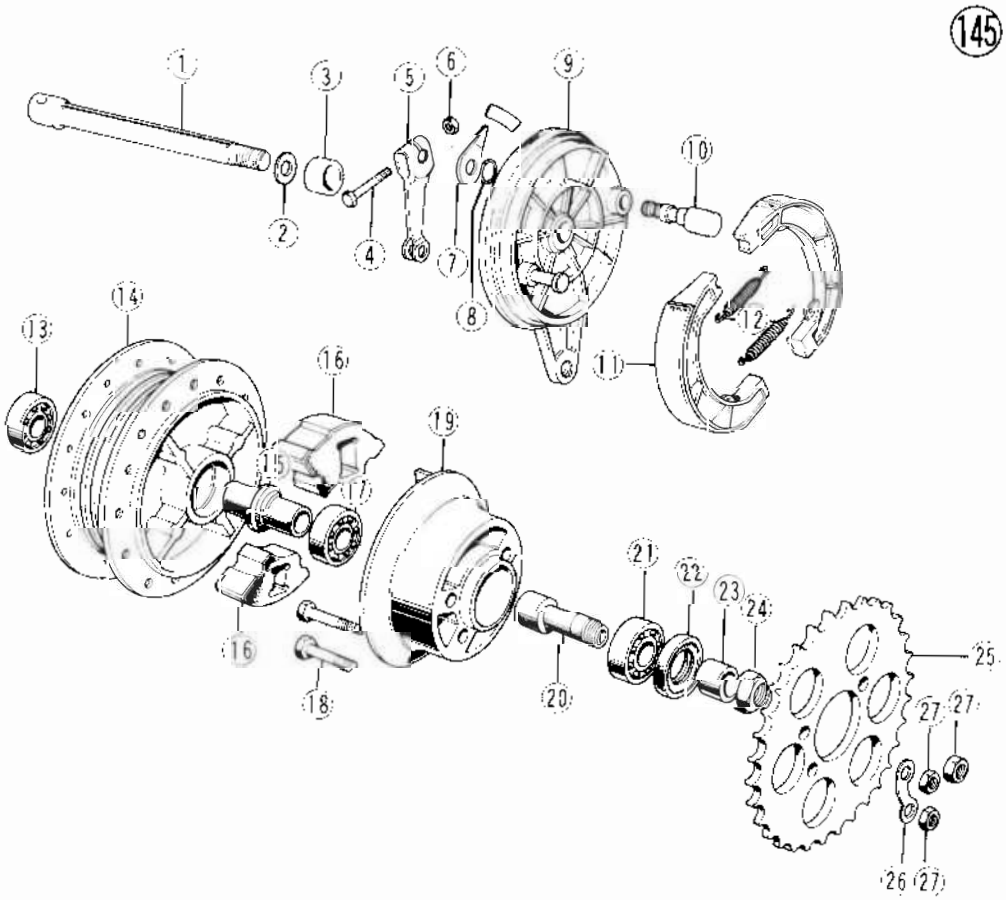
Rear Coupling Disassembly

- Straighten back the bent portions of the rear sprocket washers.



- Remove the rear sprocket nuts (4) and both sprocket washers.
- Pull off the rear sprocket.

Rear Hub



1. Axle
2. Washer
3. Collar
4. Bolt
5. Cam Lever
6. Nut
7. Indicator
8. O Ring
9. Brake Panel
10. Camshaft
11. Brake Shoe
12. Spring
13. Bearing
14. Rear Hub
15. Distance Collar
16. Damper
17. Bearing
18. Bolt
19. Coupling
20. Sleeve
21. Bearing
22. Grease Seal
23. Collor
24. Nut
25. Rear Sprocket
26. Washer
27. Nut

- Pull off the sleeve from the inside of the coupling.
- Pull off the left collar.
- Pull out the rear hub grease seal.
- Insert a metal rod into the hub side of the coupling, set the rod to the inner race of the bearing, and remove the bearing by tapping evenly around the bearing inner race.

Rear Coupling Assembly

- See Pg. 92 for lubrication information.
- Install the bearing using a press or wheel bearing driver (special tool).



- Replace the grease seal with a new one using a press or suitable tool.
- Replace the sprocket, bolts (4), washers (2) and nuts (4), and then tighten the nuts with 2.0 ~ 2.2 kg-m (14.5 ~ 16.0 ft-lbs) of torque.
- Bend back the part of the washer over the side of the nuts.
- Replace the left collar.
- Replace the sleeve.

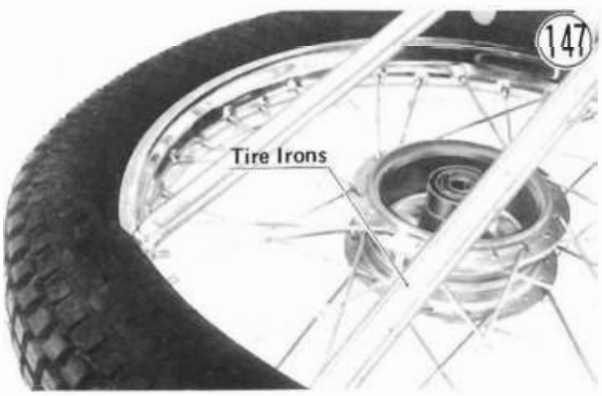
Rear Brake Disassembly

- Same as for front wheel (Pg. 44).

TIRE, TUBE

Removal:

- Remove the wheel from the motorcycle (Pg. 44, 46).
- Take out the valve core to let out the air.
- Remove the valve stem nut.
- Use a rubber mallet to break the tire beads away from both sides of the rim.
- Step on the side of the tire opposite the valve stem, and start prying the tire off the rim near the valve stem with tire irons. **Take care not to insert the tire irons so deeply that the tube gets damaged.**



- Remove the tube when one side of the tire is pried off.
- Pry the tire off the rim.

Installation:

- Put just enough air in the tube to keep it from getting caught between the tire and 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.
- Pry the other side of the tire onto the rim, starting at the side opposite the valve. **Take care not to insert the tire irons so deeply that the tube gets damaged.**
- Check that the tube is not pinched between the tire and rim, and then inflate it to the standard pressure (Pg. 89).
- Tighten the valve stem nuts, and put on the valve cap.
- Mount the wheel on the motorcycle.

RIM

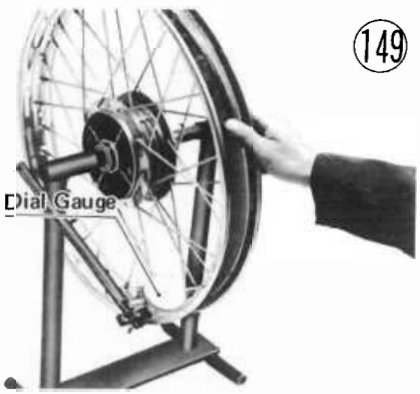
Removal:

- Remove the wheel from the motorcycle (Pg. 44, 46).
- Take the tire and tube off the rim (Pg. 48).
- 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:

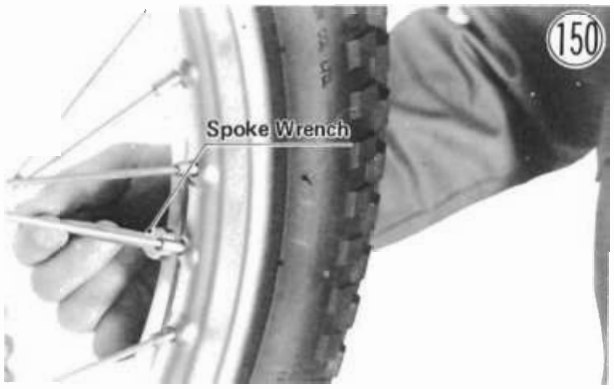
- Fit all the spokes through the holes, and screw all the nipples onto the spokes, tightening them partially.
- Suspend the wheel by the axle, and set up a dial gauge to measure rim runout.



- Tighten the spokes evenly so that the radial (out from the axle) runout is less than 1.0 mm and the axial (side to side) runout is less than 0.8 mm.
- Make sure the spokes are tightened evenly. Standard torque is 0.2~0.4 kg-m (17~35 in-lbs).
- Mount the tube and tire on the rim, and mount the wheel on the motorcycle.

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 it with a spoke wrench. Standard torque is 0.2~0.4 kg-m (17~35 in-lbs).

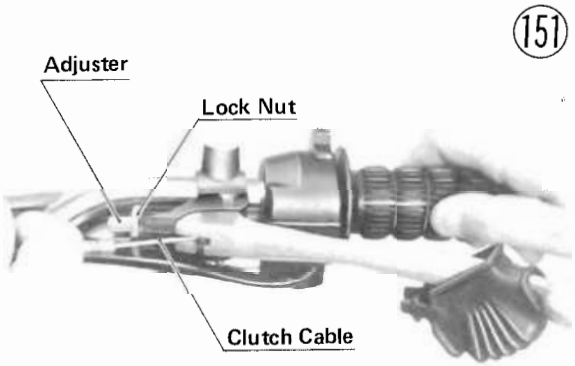


- Inflate the tire to standard pressure (Pg. 89).

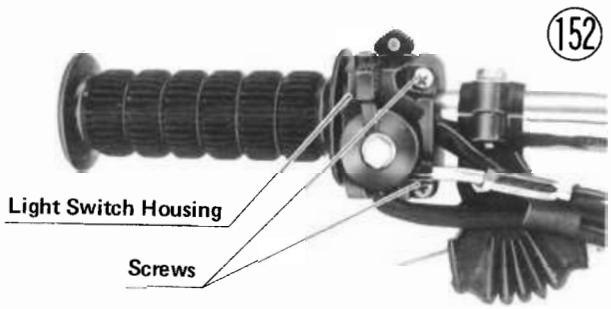
HANDLEBAR

Removal:

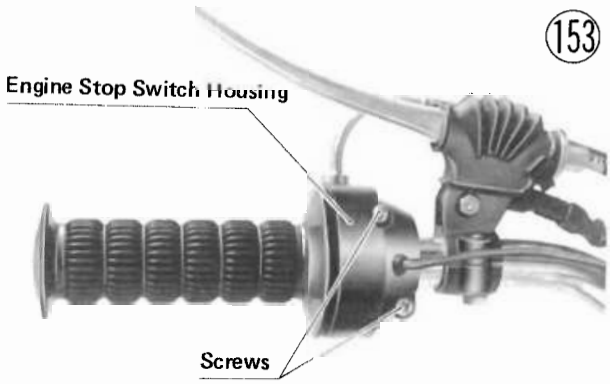
- Take off the rear view mirror.
- Slide the clutch lever dust cover out of place.
- Loosen the lock nut on the clutch lever, and screw in the adjuster.
- Line up the slots in the clutch lever, lock nut and adjuster.
- Remove the carburetor cover.
- Loosen the lock nuts, and back out the clutch adjusting screw to give the clutch cable plenty of play. Free the inner cable from the lever.



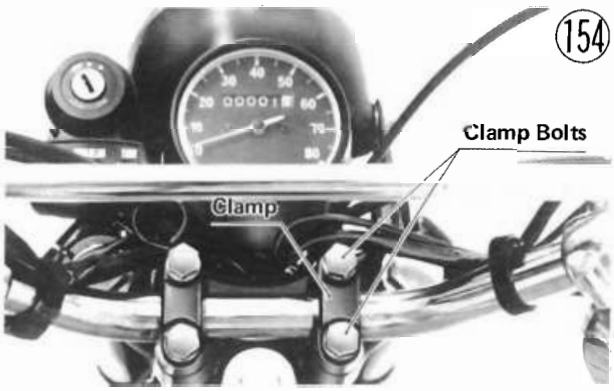
- Remove the straps (2) which hold the wiring to the handlebar.
- Take out the light switch housing screws (2) and remove the light switch housing from the handlebar.



- 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 throttle grip assembly.

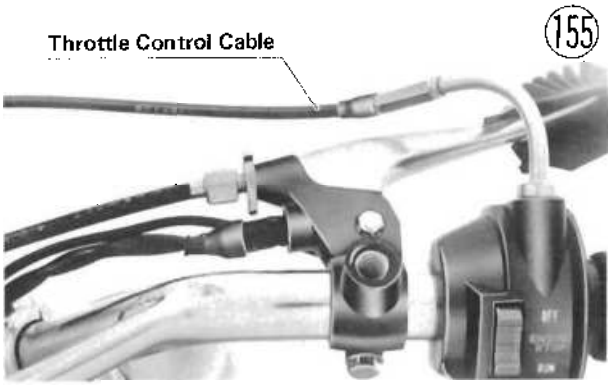


- To remove the clutch lever, loosen the clutch lever bolt, cut off the left handlegrip, which is bonded to the handlebar, and slide off the clutch lever.

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 glue 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 throttle grip assembly (the throttle grip cable runs above the front brake lever), and mount it in the clamps so that the angle of the handlebar matches the angle of the front fork as shown in Fig. 168. Torque for the handlebar clamp bolts is 1.6 ~ 2.2 kg-m (11.5 ~ 16 ft-lbs). Each bolt has a lock washer.



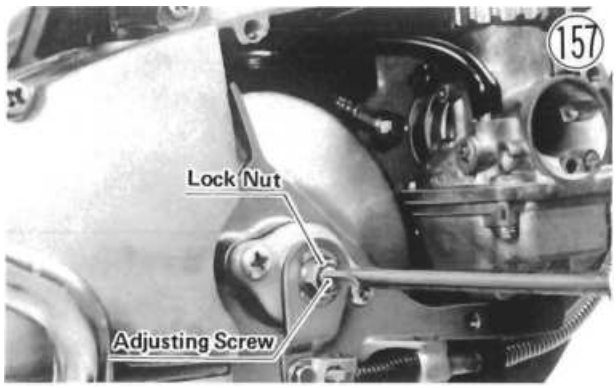


•Tighten the engine stop switch housing screws, and tighten the front brake lever bolt.
•Replace both turn signals. Each bolt has a lock washer and flat washer.
•Replace the light switch housing.
•Replace the straps (2) which hold the wiring to the handlebar.
•Replace the rear view mirror.
•Fit the clutch cable back into the clutch lever.
•Adjust the clutch (Pg. 13).

CLUTCH CABLE

Removal:

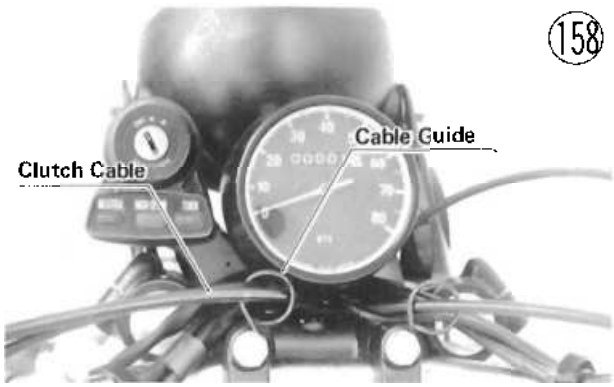
•Slide the carburetor rubber cap up out of place.
•Take off the carburetor cover and gasket.
•Remove the carburetor overflow drain (Fig. 52).
•Loosen the clutch release lever lock nut, and back out the adjusting screw a couple of turns.



•Pry open the tab that holds the tip of the clutch cable in place, and free the tip of the cable from the clutch release lever (Fig. 53).
•Remove the spring, and pull the clutch cable free from the right engine cover.
•Remove the strap that holds the clutch cable to the down tube.
•Slide back the clutch lever dust cover.
•Loosen the lock nut at the clutch lever.
•Line up the slots on the clutch lever, lock nut, and adjuster, and then slip the cable out.

Installation

•Hook the clutch cable back to the clutch lever.
•Be certain that the clutch cable runs through the cable guide on the handlebar clamp.



•Route the clutch cable through the right engine cover. Replace the spring and connect the tip of the cable to the clutch release lever.
•Bend back the tab so that it holds the tip of the clutch cable.
•Adjust the clutch (Pg. 13).
•Replace the carburetor overflow drain at the bottom of the right engine cover.
•Replace the carburetor cover and its gasket, and tighten the screws.
•Slide the carburetor rubber cap down. Be sure that the rubber extender fits properly on the idling screw.
•Clamp the cable back on the down tube.

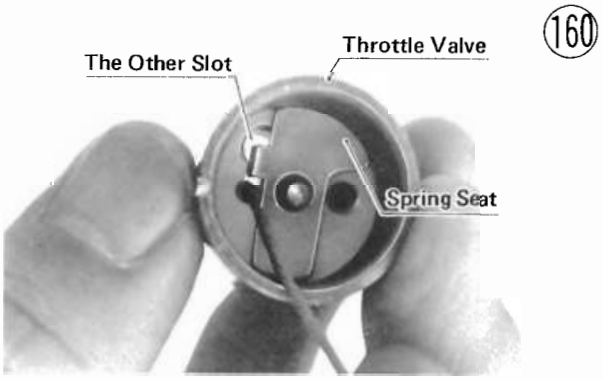
THROTTLE CONTROL CABLE (Throttle Grip, Carburetor, and Oil Pump Cable Unit)

Removal:

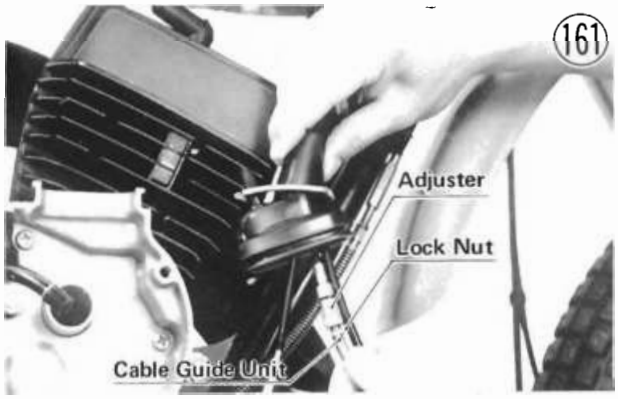
- Slide the carburetor rubber cap up out of place.
- Take off the carburetor cover and gasket.
- Hold the kick pedal out of the way with a screwdriver to facilitate removal of the oil pump cover.



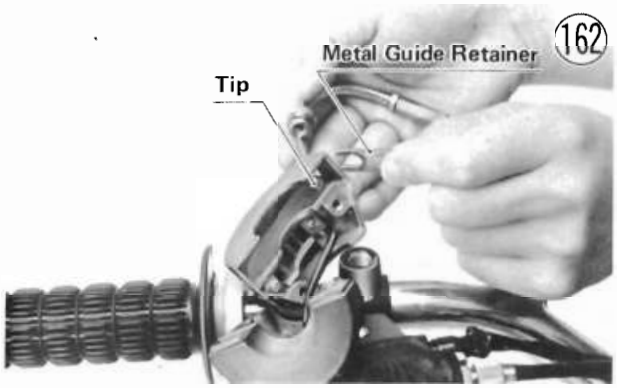
- Remove the oil pump cover.
- Bend out the tab on the oil pump lever, and free the end of the oil pump cable from the lever (Fig. 50).
- Slip the oil pump outlet hose out of the rubber fitting.
- Pulling the rubber fitting free, pull the oil pump cable from the right engine cover.
- Turn the fuel tap to the S position, slide up the hose clamp and pull the fuel hose from the carburetor.
- Remove the rubber grommet from the front of the right engine cover, insert a screwdriver through the hole, and loosen the carburetor mounting bolt.
- Pull off the carburetor.
- 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, slip the tip of the cable to the other side of the slot in the base of the throttle valve, and pull the inner cable free from the base of the throttle valve.



- Loosen the lock nut, unscrew the adjuster and pull the cable out of the carburetor top together with the adjuster and cable guide unit.



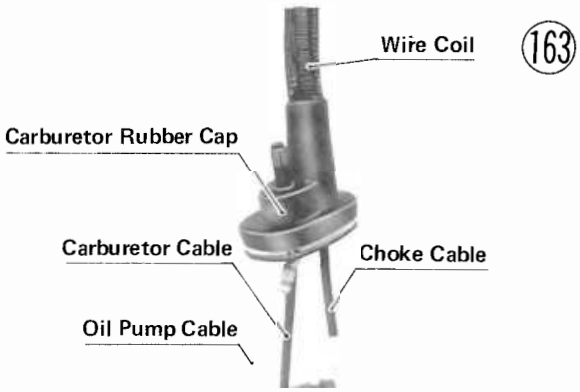
- Open the clip slightly with a screwdriver and pull the adjuster and cable guide unit off the carburetor cable.
- Take out the engine stop switch housing screws (2), and slide the lower part of the housing a short way down the switch lead. Slide the throttle grip cable tip out of the groove in the throttle grip. Pull the metal guide retainer out of the housing and free the cable.



- Pull the carburetor cable and oil pump cable from the carburetor rubber cap, and free the entire throttle control cable from the motorcycle.

Installation

- Run the lower end of the carburetor cable and oil pump cable through the wire coil around the choke cable, and pass the cables through the carburetor rubber cap.



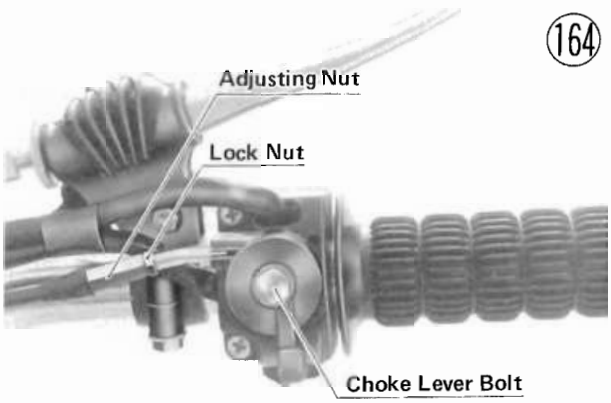
- Seeing that no cable gets twisted with another, clamp the throttle control cable to the top tube.
- Route the throttle grip cable between the handlebar and the speedometer.

- Fit the throttle grip 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 the groove in the throttle grip. Replace the engine stop switch housing and tighten the screws.
- Push the adjuster and cable guide unit onto the carburetor cable.
- Insert the cable through the carburetor cap and mixing chamber top. Compress the spring into the cap, insert the tip of the cable into the slot in the base of the throttle valve base, and slip it to its rest position in the other side of the rest.
- Screw the cable guide into the carburetor top.
- Pull the spring up, and position the spring seat on the base of the throttle valve with its tab in the slot.
- Fit the throttle valve and the carburetor top back into the carburetor, and screw on the carburetor cap.
- Check to see that the carburetor overflow grommet is properly positioned.
- Replace the carburetor. Tighten the mounting bolt and put the rubber grommet back into the front of the right engine cover.
- Fit the fuel hose back onto the carburetor, and slide down the clamp.
- Route the oil pump inner cable through the oil pump adjuster. Install the rubber fitting with the oil pump outlet hose. Hook the oil pump inner cable onto the oil pump lever, and bend the tab back onto the end of the cable.
- Adjust the throttle control cable (Pg. 9).
- Replace the carburetor cover and gasket and tighten the screws.
- Slide the carburetor rubber cap down.
- Replace the oil pump cover and tighten the screws.
- Replace the fuel tank and the seat (Pg. 44).

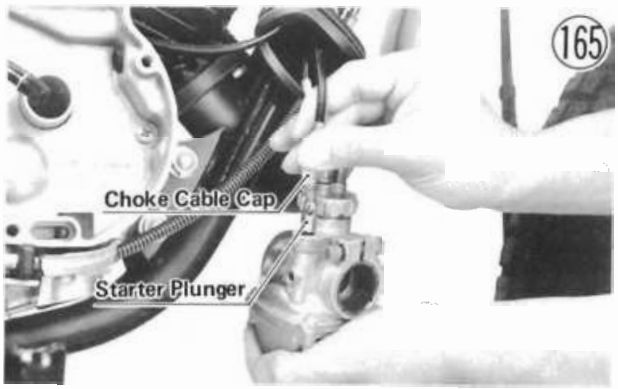
CHOKE CABLE

Removal

- Remove the fuel tank and the seat (Pg. 44).
- Loosen the lock nut, and screw the adjusting nut all the way in. Take out the choke lever bolt and washer. Push the choke lever to the right, grasp the choke outer cable with the other hand, and slowly release the lever while pulling on the outer cable to free it from the lever and the light switch housing. Free the inner cable from the lever.



- Slide the carburetor rubber cap out of place.
- Take off the carburetor cover and gasket.
- Slide up the hose clamp, and pull the fuel hose from the carburetor.
- Remove the rubber grommet from the front of the right engine cover, insert a screwdriver through the hole, and loosen the carburetor mounting bolt.
- Pull off the carburetor.
- Unscrew the choke cable cap and pull out the starter plunger.



- Remove the plunger, spring, and choke cable cap from the choke cable.
- Remove the cable from the strap, and pull the cable from the carburetor rubber cap.

Installation

- Route the lower end of the choke cable through the wire coil around carburetor cable, and fit the cable through the carburetor rubber cap.
- Seeing that no cable gets twisted with another, clamp the choke cable to the top tube.
- Route the choke cable between the handlebar and speedometer, and then through the cable guide.
- Fit the upper end of the inner cable into the choke lever, fit the spring washer, lever and cable into the bottom of the light switch housing, and replace the washer and bolt.
- Replace the choke cable cap, spring and plunger onto the choke cable.
- Fit the plunger back into the carburetor, and screw on the choke cable cap.
- Adjust the choke cable (Pg. 10).
- Replace the carburetor. Tighten the mounting bolt, and put the rubber grommet back into the front of the right engine cover.
- Fit the fuel hose back onto the carburetor, and slide down the clamp.
- Replace the carburetor cover and its gasket, and tighten the screws.
- Slide the carburetor rubber cap down.
- Replace the fuel tank and the seat (Pg. 44).

FRONT BRAKE CABLE

Removal

- Remove the adjuster from the lower end of the front brake cable, and pull the cable free from the front brake panel.

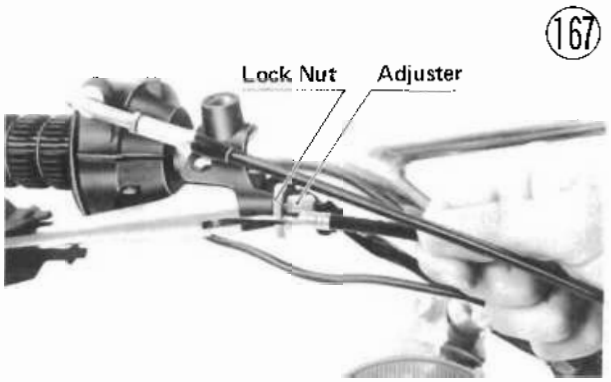
•Free the front brake cable from the plastic mount that holds it to the speedometer cable. Slide back the front brake lever dust cover.



•Loosen the lock nut at the front brake lever, and screw in the adjuster.
•Line up the slots on the brake lever, lock nut, and adjuster, and free the front brake cable from the brake lever.

Installation

•Run the cable through the guide, and then between the handlebar and speedometer. 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 through the slots on the brake lever, lock nut and adjuster.



•Slide back the front brake lever dust cover. Route the cable through the wire coil on the handlebar clamp.
•Slide the cable back into the plastic mount to hold it.
•Replace the lower part of the inner cable, spring, dust cover, and joint, and screw in the adjuster.
•Adjust the front brake (Pg. 14).

SPEEDOMETER CABLE

Removal

•Unscrew the upper and lower ends of the speedometer cable with pliers.



•Slide the cable free from the plastic mount that holds it to the front brake cable.
•Pull the cable free from the motorcycle.

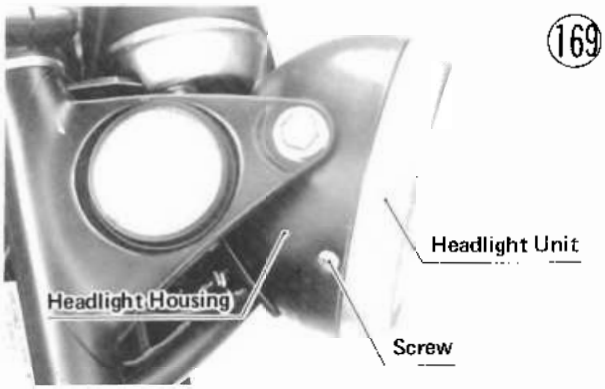
Installation

•Run the speedometer cable through the wire coil on the steering stem base to the speedometer.
•Screw 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 tongue of the speedometer pinion will seat in the slot in the end of the cable. Tighten the cable nut will pliers.
•Slide the cable back into the plastic mount to hold it.

HEADLIGHT

Removal

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



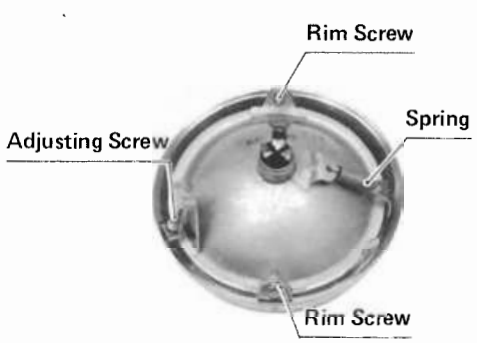
•Take out the mounting bolts and let the headlight housing and headlight unit hang free.

Installation

•Replace the headlight housing, and tighten the mounting bolts. Each toothed washer should be placed between the headlight housing and its bracket.
•Install the headlihgt unit in the housing and tighten the retaining screw.
•Adjust the headlight (Pg. 17).

Headlight Unit Disassembly

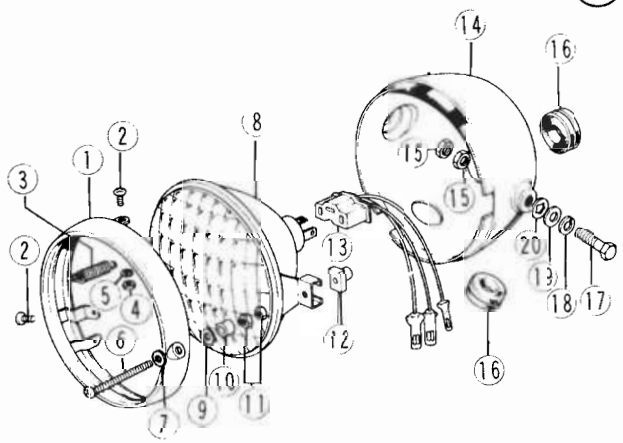
- Disconnect the headlight socket from the rear of the unit.
- Remove the adjusting screw, rim screws (2) and the spring.



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- Pull the sealed beam unit from the rim.

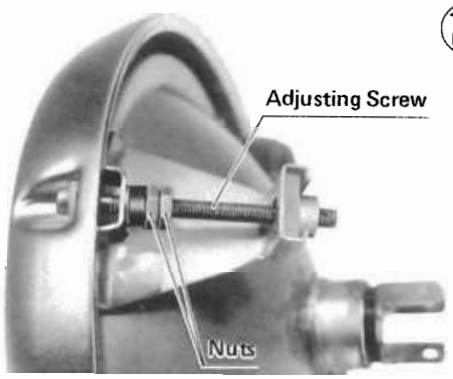
Headlight Unit


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1. Rim
2. Screw
3. Spring
4. Nut
5. Washer
6. Adjusting Screw
7. Washer
8. Sealed Beam Unit
9. Washer
10. Collar
11. Nut
12. Focus Adjusting Nut
13. Socket
14. Headlight Housing
15. Nut
16. Rubber Grommet
17. Bolt
18. Lock Washer
19. Washer
20. Lock Washer

Headlight Unit Assembly

- Mount the sealed beam unit back onto the rim and tighten the screws. Each screw has a lock washer and nut.
- Replace the springs with pliers.
- Turn the adjusting screw all the way in, through the washer, rim, a flat washer, rubber damper, two nuts, and then adjusting nut. Lock the nut, that is, tighten one nut against the other nut.



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- Connect the headlight socket to the rear of the unit.

SPEEDOMETER

Removal

- Remove the headlight assembly (Pg. 53).
- Unscrew the upper end of the speedometer cable with pliers.
- Remove the nuts (2) from the bottom of the speedometer mounting bracket. A flat washer and rubber damper come off with each nut.
- Pull the speedometer up a little.
- Disconnect the speedometer light lead to free the speedometer.

Installation

- Be certain that the rubber damper is on the speedometer bracket. Replace the speedometer cover over it.
- Run the speedometer light lead up through the cover, and connect it to the speedometer.
- Put a rubber damper, a flat washer, a lock washer and a nut on each stud, and tighten the nuts.
- Fit the cable into the speedometer, and tighten its nut.
- Replace the headlight assembly (Pg. 53).

IGNITION SWITCH

Removal

- Remove the headlight assembly (Pg. 53).
- Remove the fuel tank and the seat (Pg. 44).
- Loosen the straps and disconnect the ignition leads.
- Bend out the clamp that holds the lead to the ignition switch bracket.



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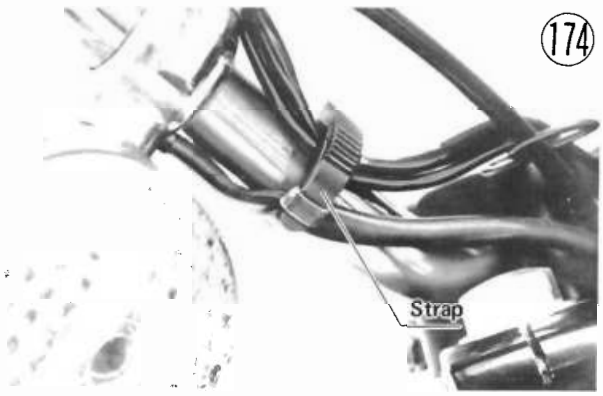
- Take out the screws (2), and remove the ignition switch.

- Put the ignition switch into the place, and tighten the screws.
- Bend the clamp over the ignition switch lead to secure it.
- Route the leads through the straps, and connect them to the main harness.
- Tighten the straps.
- Replace the headlight assembly (Pg. 53).
- Replace the fuel tank and the seat (Pg. 44).
- Check that all the electrical equipment works properly.

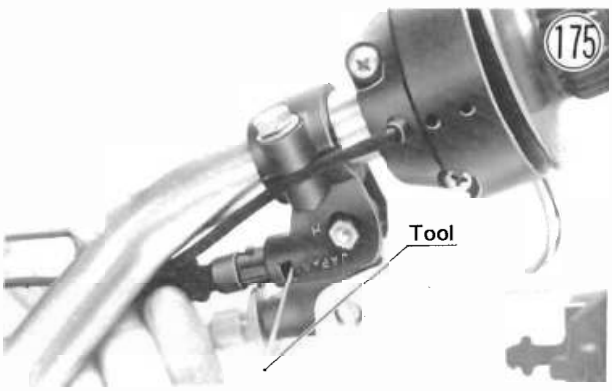
FRONT BRAKE LIGHT SWITCH

Removal

- Take out the retaining screw and pull the headlight unit out of its housing.
- Disconnect the switch leads in the headlight housing and pull the leads out of the housing.
- Undo the strap on the right side of the handlebar, and free the leads.



- 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.



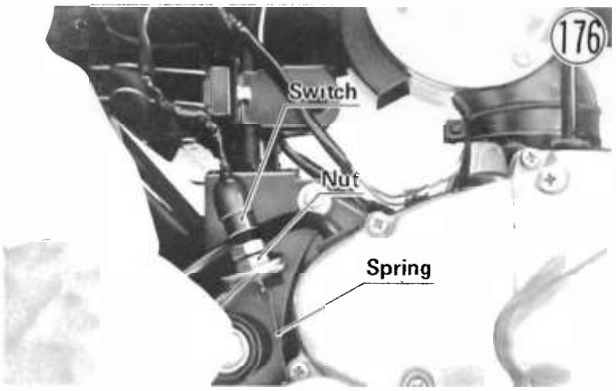
Installation

- Put the front brake light switch back into the front brake lever body, with its tab side down.
- Tighten the strap.
- Reconnect the leads in the headlight housing.
- Replace the headlight unit, and tighten the retaining screw.

REAR BRAKE LIGHT SWITCH

Removal

- Remove the fuel tank and the seat (Pg. 44).
- Pull off the oil tank cover. Take out the screws (2) and let the oil tank hang free.
- Disconnect the rear brake light switch leads near the top tube. Loosen the straps, and bend out the clamp.
- Unscrew the nut, pull off the switch, and remove the spring.



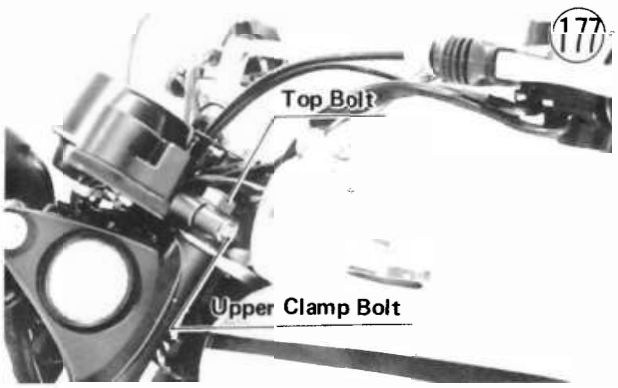
Installation

- Replace the spring, and then replace the rear brake light switch.
- Route the switch leads through the straps and connect them, and tighten the straps. Bend the clamp over the switch leads.
- Replace the oil tank, tighten the screws (3), and replace the oil tank cover.
- Replace the fuel tank and the seat (Pg. 44).
- Adjust the rear brake light switch (Pg. 16).

FRONT FORK

Removal

- Remove the front wheel (Pg. 44).
- If the shock absorber is to be disassembled after removal, loosen the shock absorber top bolt. Loosen the upper clamp bolt.



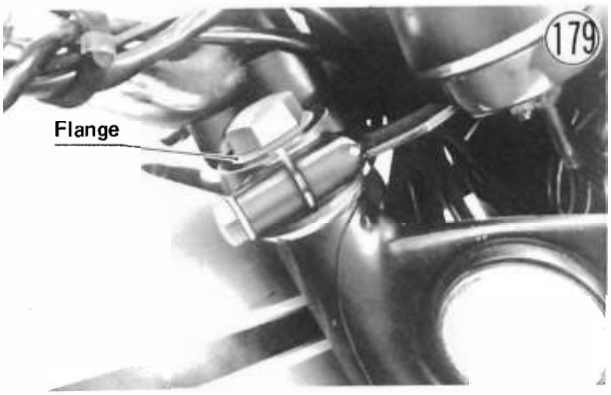
●Loosen the lower clamp bolt.



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

Installation

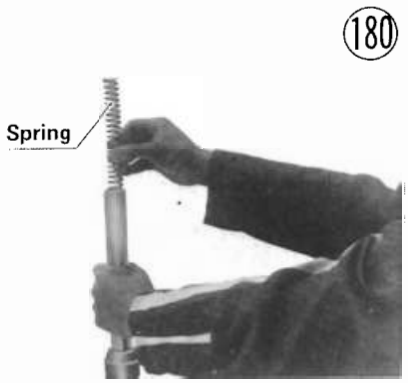
●Apply a little oil to the inner tube.
●Slide the shock absorber up through the lower and upper clamps until the upper surface of the top bolt flange is even with the upper surface of the stem head.



●Tighten the upper clamp bolt with 1.6 ~ 2.2 kg-m (11.5 ~ 16 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 lower clamp bolt with 2.6 ~ 3.5 kg-m (19 ~ 25 ft-lbs) of torque.
●Replace the front wheel (Pg. 44).

Disassembly

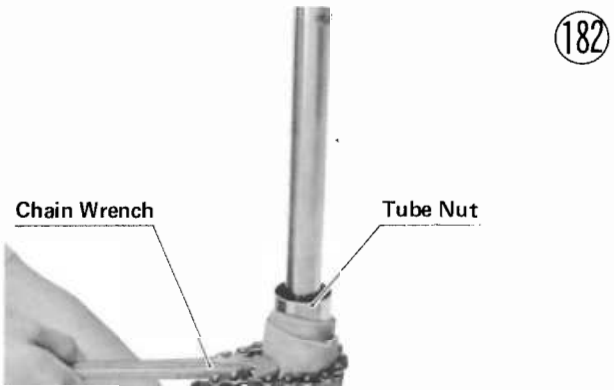
●Remove the top bolt, and pull out the spring.



●Take the drain screw from the bottom of the outer tube, and drain the oil into a suitable container, pumping as necessary to empty out all the oil. Replace the drain screw.



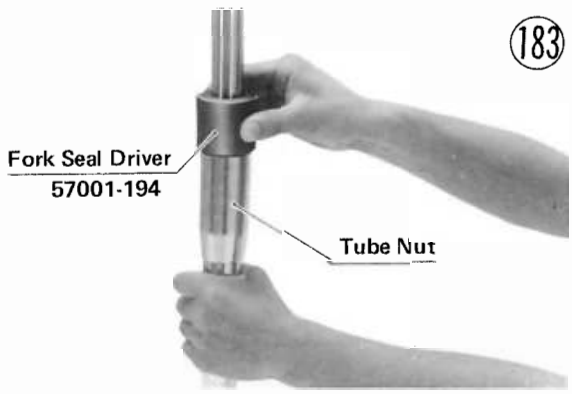
●Slide the dust seal off the inner tube.
●Clamp the lower end of the fork in a vice. Wrap the tube nut with a piece of tire tube or rubber to prevent scratching, and then loosen it with a chain wrench or pipe wrench. Slide off the tube nut.



●Pull the inner tube out of outer tube. Pull the inner tube guide and **O** ring out of the tube nut by hand.
●Remove the oil seal from the tube nut by some means.

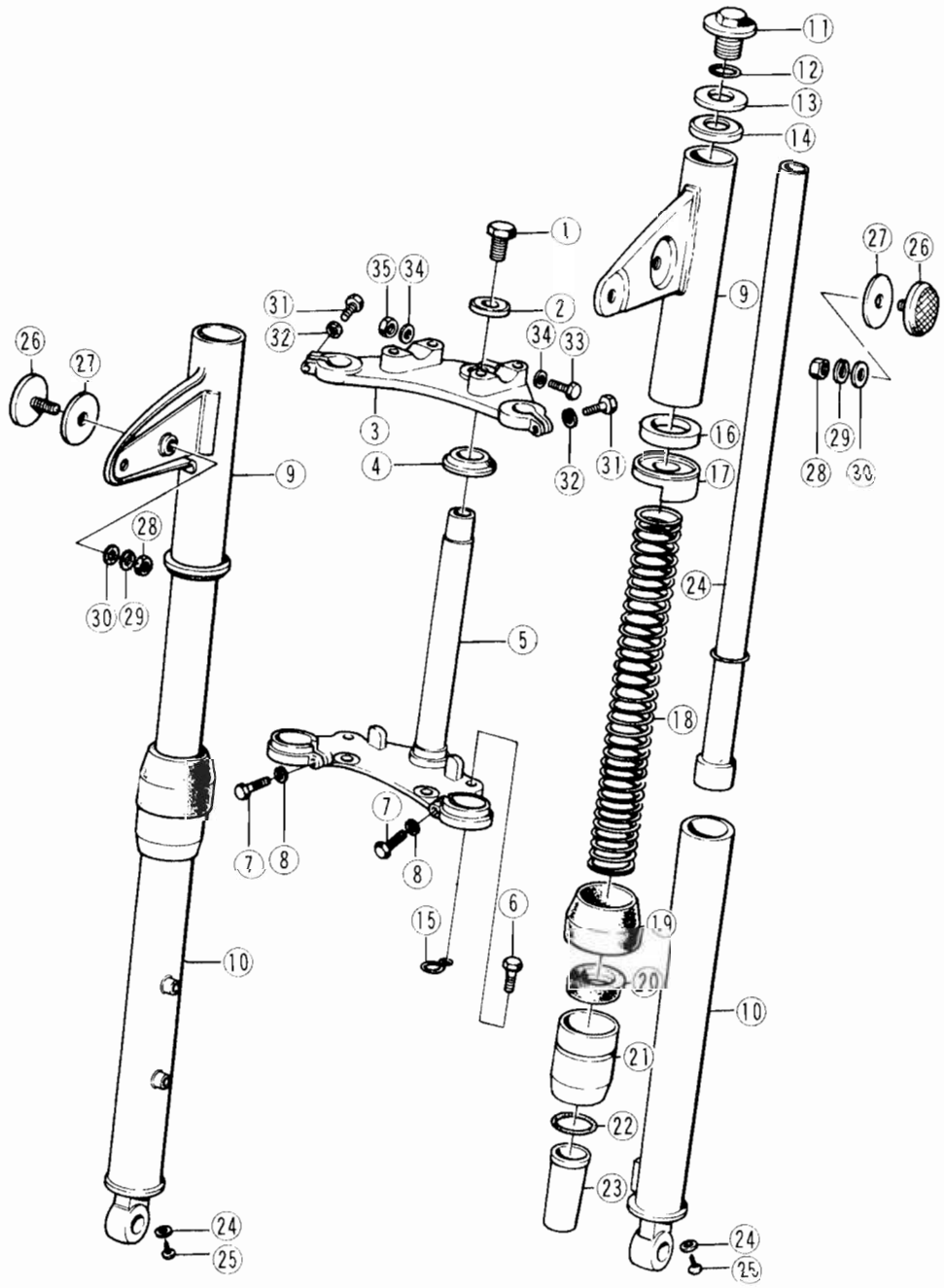
Assembly

●Install a new oil seal using the front fork oil seal driver (special tool).



Front Fork

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1. Stem Head Bolt
2. Washer
3. Stem Head
4. Outer Race
5. Steering Stem
6. Bolt
7. Bolt
8. Washer
9. Fork Cover
10. Outer Tube
11. Top Bolt
12. O Ring
13. Washer
14. Rubber Damper
15. Cable Guide
16. Rubber Damper
17. Fork Cover Guide
18. Spring
19. Dust Seal
20. Oil Seal
21. Tube Nut
22. Washer
23. Slide Metal
24. Gasket
25. Drain Screw
26. Reflecter
27. Washer
28. Nut
29. Lock Washer
30. Washer
31. Bolt
32. Washer
33. Bolt
34. Washer
35. Nut

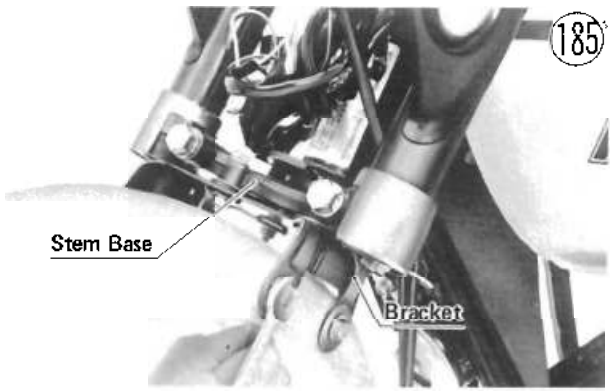
- Put the O ring and the inner tube guide into the tube nut.
- Slide the inner tube back into the outer tube, replace the tube nut, and tighten it fully. Slide the dust seal into place.
- Refill with 158 ~ 166 cc of new SAE 10W oil. Insert the spring with the relatively concentrated end at the top.
- Replace the top bolt.



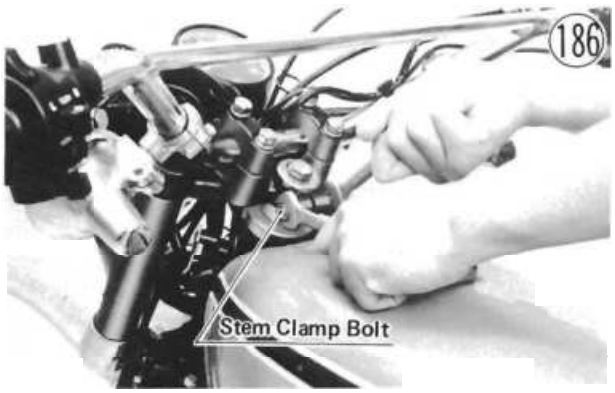
STEERING STEM

Removal

- Remove the front wheel and front forks (44, 55).
- Take out the bolts (4) and remove the front fender from its bracket. Take out the bolts (4) and remove the front fender bracket from the stem base. Each bolt has a nut, lock washer and flat washer.

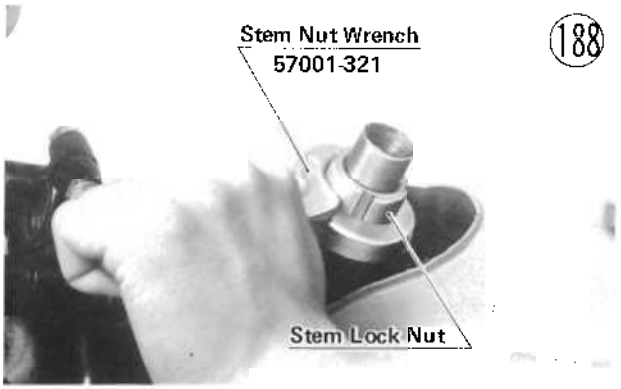


- Remove the headlight assembly (Pg. 53).
- Remove the rear view mirror.
- Loosen the stem clamp bolt.

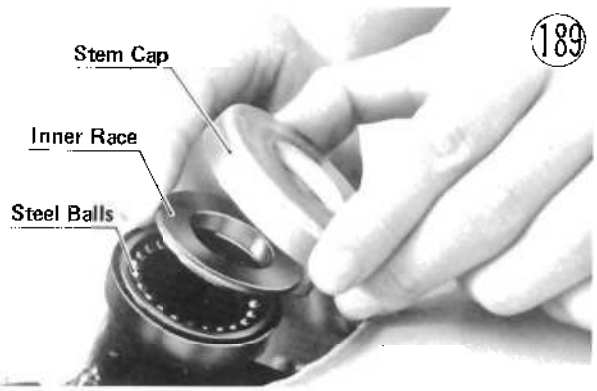


- Take out the stem head bolt and its washer.
- Remove the right and left fork covers, damper rubbers, fork cover guides and fork cover washers.
- Separate the handlebar from the stem together with the steering stem head, and let it hang free.

- Take out the steering stem lock nut using the stem nut wrench (special tool), and then remove the steering 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, upper inner race, and then remove the upper 23 steel balls.



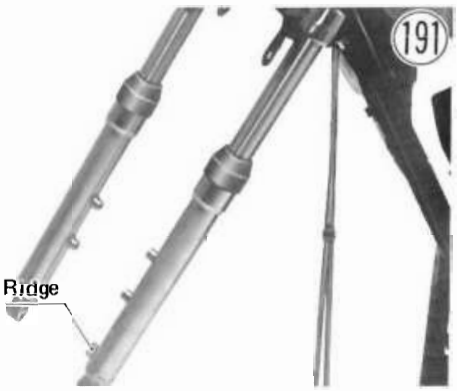
Installation

- 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 23 upper and 23 lower steel balls.

- 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.
- Apply a little oil to the inside of the damper rubbers (4).
- Position the handlebar with all the wiring and cables to the front of the stem base.
- Run the inner tube of each shock absorber up through its clamp in the stem base, and replace from the bottom, the rubber damper (smaller one), fork cover guide, fork cover, fork cover washer, and then the rubber damper of each tube. Temporarily tighten the lower clamp bolt on each side to hold each shock absorber in place with its inner tube protruding about 20 mm above the top of its fork cover.



- Note that the shock absorber which has the ridge fitting into the brake panel is the left shock absorber.



- Replace the handlebar with the steering stem head, steering head bolt and its washer in place, and tighten the head bolt with 3.0 ~ 3.5 kg-m (22 ~ 25 ft-lbs) of torque.
- Tighten the stem clamp bolt.
- Replace the headlight assembly (Pg. 53).
- 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 (Fig. 179). Tighten the lower clamp bolt with 2.6 ~ 3.5 kg-m (19 ~ 25 ft-lbs) of torque, the upper clamp bolt with 1.6 ~ 2.2 kg-m (11.5 ~ 16 ft-lbs) of torque for each side.
- Replace the front fender bracket and tighten the bolts.
- Replace the front fender, and tighten the bolts.
- Replace the front wheel (Pg. 44).
- Adjust the steering (Pg. 14).

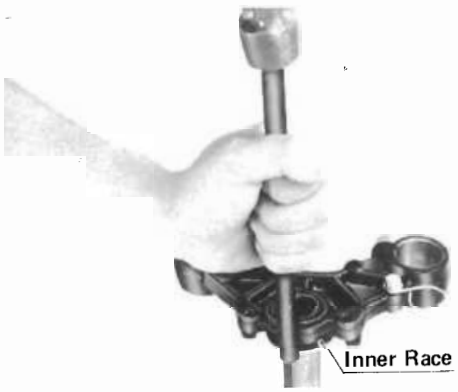
STEERING STEM BEARINGS

Removal:

- Remove the steering stem (Pg. 58).
- 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.



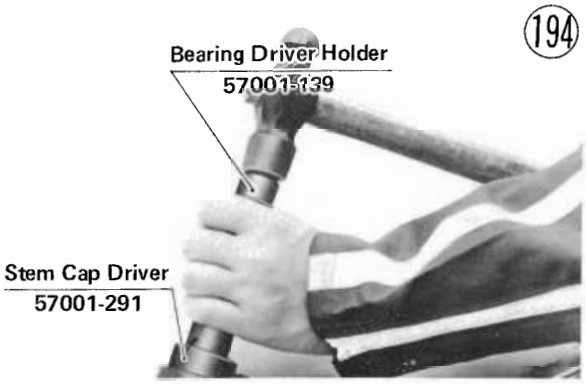
- Turn the steering stem and stem base upside down. Wrap the steering stem with a piece of cloth, and clamp it in a vise. Hammer the lower inner race to drive it out.



Installation

- Apply oil to the outer races, and drive them into the

head pipe using the steering stem cap driver and the bearing driver holder (special tools).



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

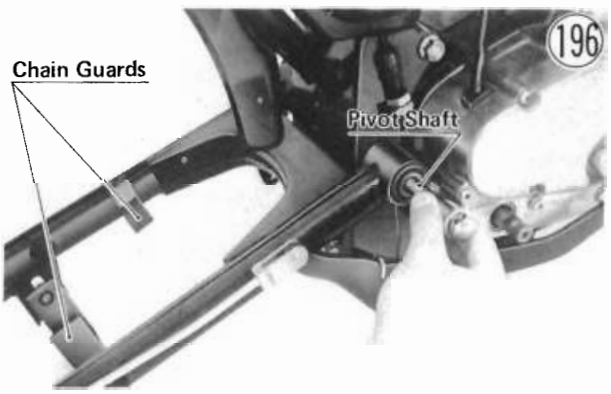


- Replace the steering stem (Pg. 58).

SWING ARM

Removal

- Remove the rear wheel (Pg. 46).
- Remove the rear shock absorber bottom mounting bolts. Each bolt has a lock washer.
- Loosen the rear shock absorber upper mounting nuts.
- Remove the pivot shaft nut and pull out the pivot shaft.



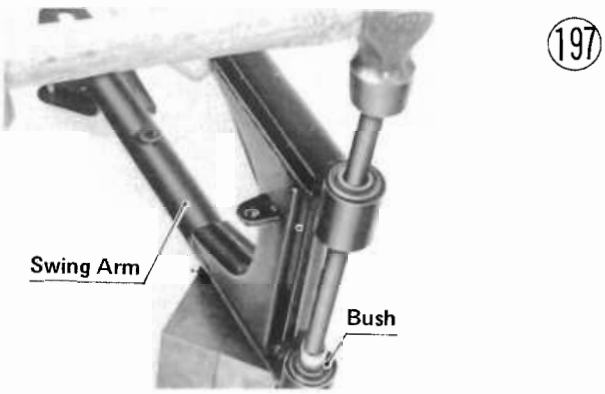
- Pull the swing arm free from the motorcycle.
- Take out the screws (3) and the bolt, and remove the chain guards.
- Remove the cotter pin, nut, lock washer and torque link.

Installation

- Replace the torque link and tighten the nut loosely. The torque link bolt has a lock washer and nut.
- Replace the chain guards, and tighten the screws and the bolt.
- Replace the swing arm, and slide in the pivot shaft, and then tighten the pivot shaft nut with 4.0 ~ 6.0 kg-m (29 ~ 43 ft-lbs) of torque.
- Replace the rear shock absorbers and tighten the bottom mounting bolts with 2.6 ~ 3.5 kg-m (19 ~ 25 ft-lbs) of torque.
- Tighten the rear shock absorber upper mounting nuts which were loosened with 2.6 ~ 3.5 kg-m (19 ~ 25 ft-lbs) of torque.
- Replace the rear wheel (Pg. 46).
- Tighten the torque link nut with 2.6 ~ 3.5 kg-m (19 ~ 25 ft-lbs) of torque. Put the cotter pni through the torque link bolt.

Disassembly

- Using a metal rod and hammer, tap out the bush from each side of the swing arm.



Assembly

- Replace the bushes with new ones if either one is deteriorated or damaged, or if it had to be removed for some reason. First apply oil to the bushes and then, install them with a press.

REAR SHOCK ABSORBER

Removal

- Take off the cap nut from the top and the bolt from the bottom of the rear shock absorber.
- Slide the bottom out of its bracket and then pull off the absorber.

Installation

- Fit the rear shock absorber on its stud.
- Tighten the upper mounting nut with 2.6 ~ 3.5 kg-m (19 ~ 25 ft-lbs) of torque.
- Replace the bottom mounting bolt and lock washer, and tighten the bolt with 2.6 ~ 3.5 kg-m (19 ~ 25 ft-lbs) of torque.

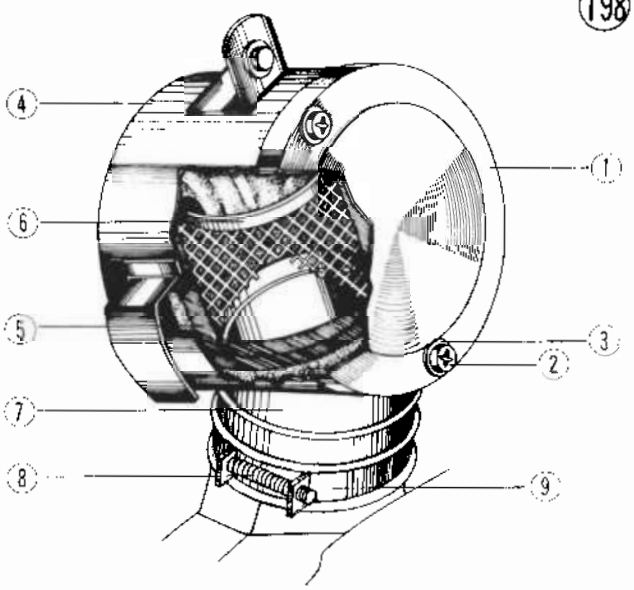
Maintenance

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 198



1. Cleaner Cap
2. Screw
3. Washer
4. Cleaner Body
5. Element
6. Element Frame
7. Cleaner Duct
8. Screw
9. Clamp

Cleaning and replacement

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

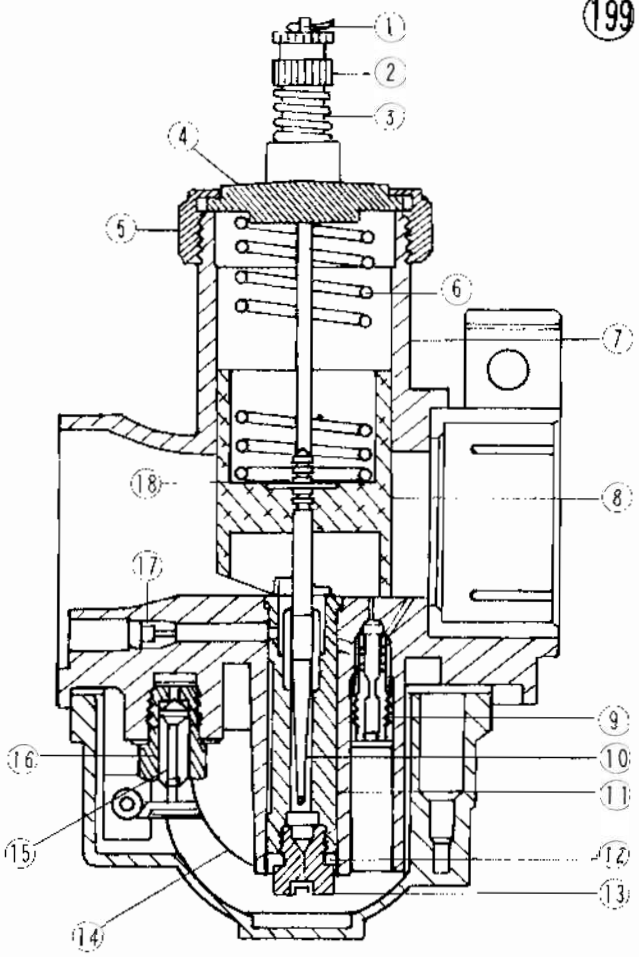
Remove the air cleaner element (Pg. 23), clean it in a high flash point solvent of some kind, and squeeze it dry. After cleaning, dampen it with a small amount of gasoline/oil mixture (about a 20 : 1 mixture of gasoline and SAE 30 motor oil). Oil it again any time it dries out.

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

CARBURETOR

The carburetor (Fig. 199) 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. 10) 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 199



1. Cotter Pin
2. Adjuster
3. Spring
4. Carburetor Top
5. Carburetor Cap
6. Spring
7. Carburetor Body
8. Throttle Valve
9. Pilot Jet
10. Jet Needle
11. Needle Jet
12. Washer
13. Main Jet
14. Float
15. Valve Needle
16. Valve Seat
17. Air Jet

One of the basic principles of 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. 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 interrelated 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~full 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, so 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); and 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 black	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

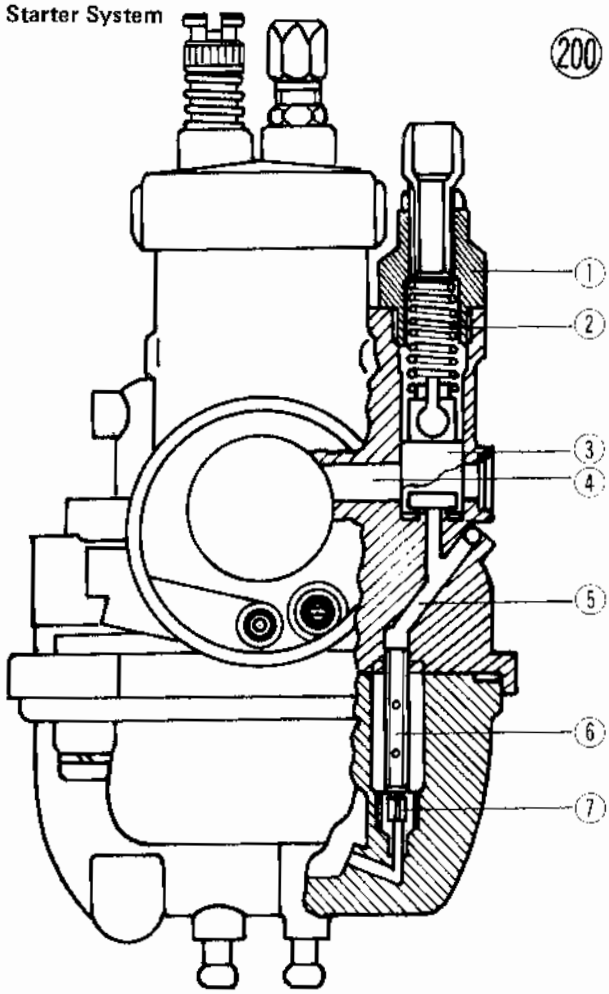
Fig. 200 shows the starter system, which includes the starter jet 7 , starter pipe 6 , and starter plunger 3 .

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 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.

Table 1 Carburetor Specifications

Type	Main Jet	Air Jet	Needle Jet	Jet Needle	Pilot Jet	Throttle	Air Screw	Fuel Level
VM 19SC	75R	0.5	0-2/2	4EJ7-3	17.5	2.0	1½ turns out	27~29 mm

Starter System



1. Starter Cable Cap
2. Spring
3. Starter Plunger
4. Air Hole
5. Starter Passage
6. Starter Pipe
7. Starter Jet

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

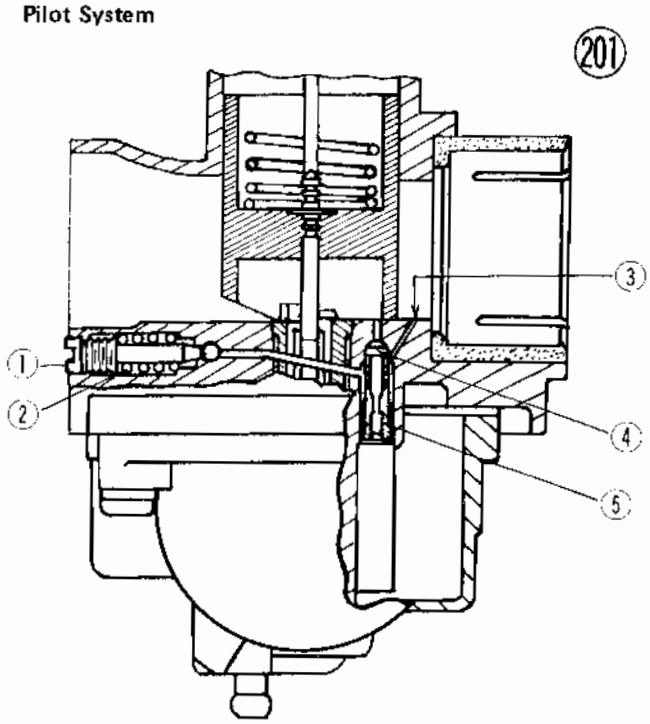
Remove the float bowl, and blow the starter pipe and the starter jet clean with compressed air. Do not clean them with wire or any other hard object which may cause damage.

Remove the starter plunger, and clean it with a high flash point solvent of some kind.

Pilot System

Fig. 201 shows the pilot system, which includes the pilot jet ⑤, air screw ①, pilot outlet passage ③, and pilot jet passage ④.

Pilot System



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

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 $\frac{1}{8}$ 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 exists 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 (202)

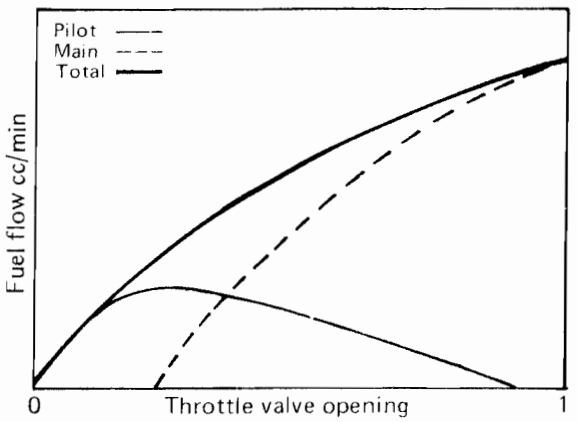
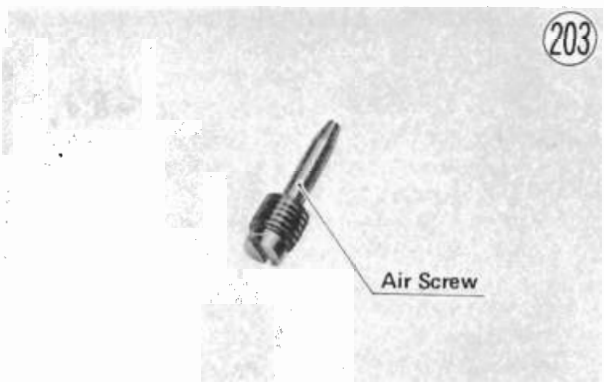


Fig. 202 shows throttle valve opening versus fuel flow for the main and pilot systems. If trouble occurs in the pilot system, not only are starting and low speed running affected, but the transition from pilot to main system is not smooth as the throttle is opened, causing a drop in acceleration efficiency. 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 a high flash point solvent of some kind, 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 bath 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

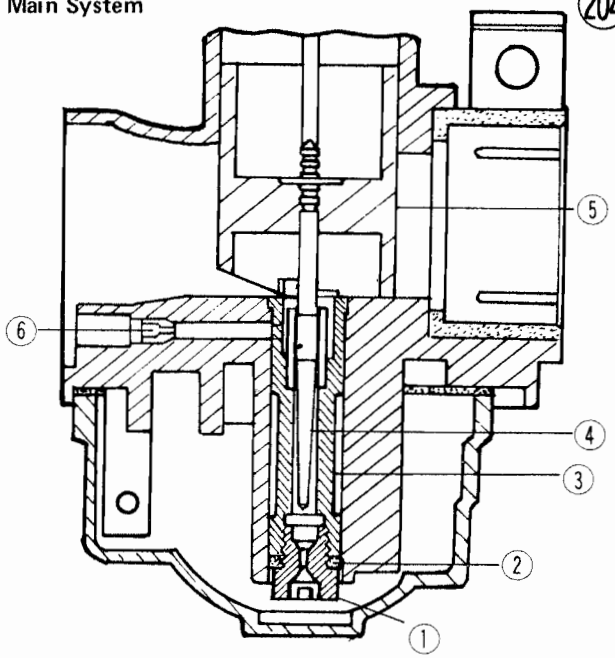
Fig. 204 shows the main system, which consists of the main jet ①, needle jet ③, jet needle ④, throttle valve ⑤, and air jet ⑥.

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.

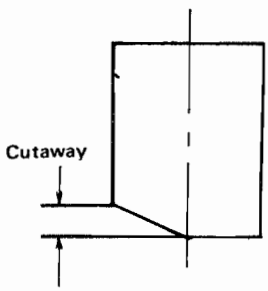
The lower portion of the jet needle is tapered and extends down into the needle jet. It is fixed to the throttle valve, and thus rises up in the needle jet as the throttle valve rises. At ¼ throttle opening, the tapered portion of the needle starts coming up out of the jet, which increases needle to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

Main System (204)



1. Main Jet
2. Washer
3. Needle Jet
4. Jet Needle
5. Throttle Valve
6. Air Jet

Throttle Valve (205)



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 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. On the other hand, a rich condition will 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 a loose needle jet.

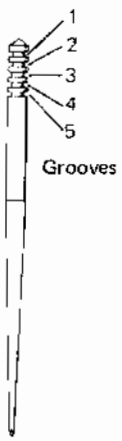
Cleaning and adjustment

Disassemble the carburetor and wash the throttle valve, main jet, needle jet, jet needle, air jet, and air passage with a high flash point solvent of some kind, 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 ("3" of G54EJ7-3) is not stamped on the needle, but is the number of the standard groove in which the clip is set. The groove numbers are counted from the top of the needle, 1 being the topmost groove, and 5 being the lowest groove.

Jet Needle (206)

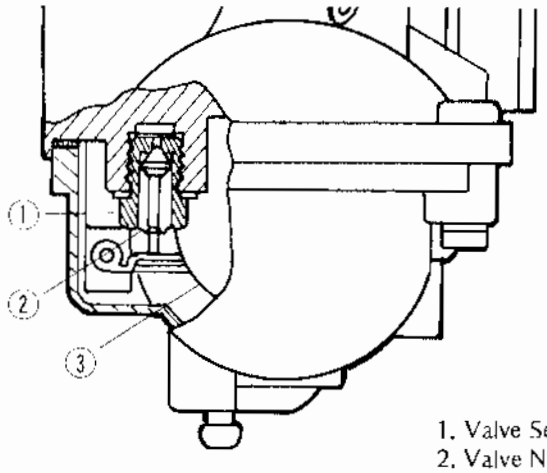


If the engine still exhibits symptoms of overly rich or lean carburetion after all maintenance and adjustments are correctly performed, the main jet can be replaced with a smaller or larger one. A smaller numbered jet gives a leaner mixture and a larger numbered jet a richer mixture. Many jets are available,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

Float System

Fig. 207 shows the float system, which consists of the float 3 , float valve needle 2 , and float valve seat (1).

Float (207)



1. Valve Seat
2. Valve Needle
3. Float

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. 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.

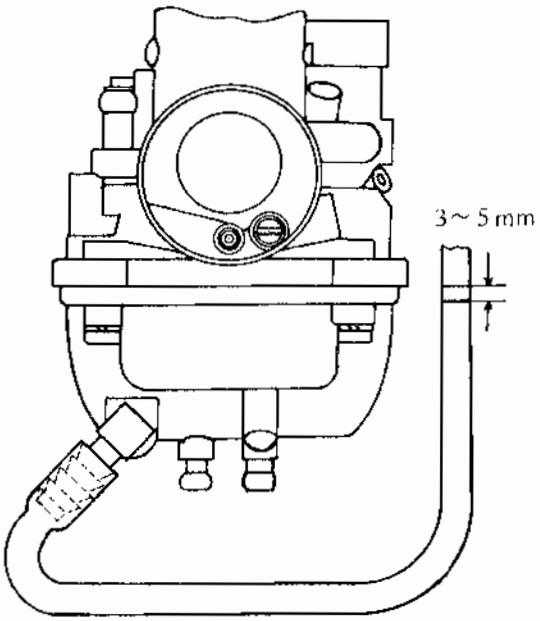
The fuel level is defined as the vertical distance from the center of the carburetor bore to the surface of the fuel in the float chamber. The fuel level is maintained at a constant value by the action of the float valve, which opens and closes according to the fuel level. As fuel flows through the float 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, closing 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.

Fuel level measurement and adjustment

Turn the fuel tap off, and remove the carburetor cover. Remove the float bowl 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 below the edge of the carburetor body.

If the fuel level is incorrect, remove the carburetor (Pg. 26), and then remove the float bowl and float.

Fuel Level Measurement (208)



Bend the tang on the float a very slight amount to change the fuel level. Bending it down towards the float valve (see photo) closes the valve sooner and lowers the fuel level. Bending it up away from the float valve raises the level. After adjustment, measure the fuel level again and readjust if necessary.



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 a high flash point solvent of some kind. Use carburetor cleaner if necessary. Blow out the fuel overflow pipe with compressed air.

Examine the float, and replace it if damaged. If the needle is worn as shown in the diagram, replace the needle and seat as a set.

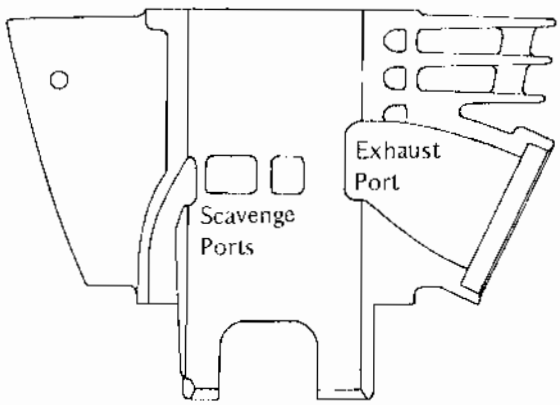
Needle Valve (210)



CYLINDER, PISTON

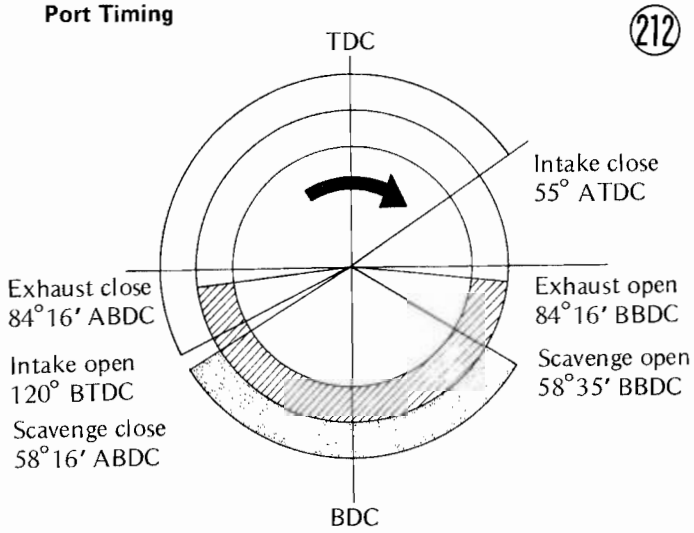
The cylinder, being part of the combustion chamber, is subjected to extremely high temperatures. Since excessive heat can seriously distort the shape of the cylinder or cause piston seizure, the cylinder is made of aluminum alloy for good heat conduction, and the outside is finned to increase the heat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

Cylinder Construction (211)

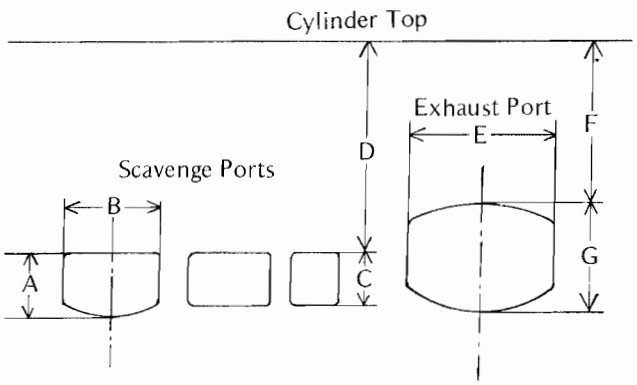


The gas transfer and exhaust are performed by five transfer (scavenge) ports and one exhaust port provided in the cylinder. These ports are opened up to and closed off from the combustion chamber by the piston as it moves up and down inside the cylinder. The port timing, determined by the port size and 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



Port Measurement

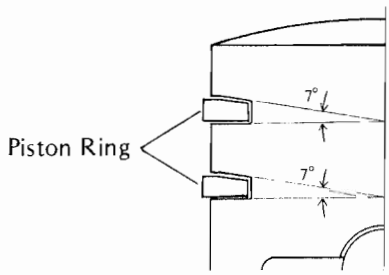


The piston is made from an aluminum alloy, which expands and distorts slightly from heat during engine operation. So that the piston will become cylindrical after heat expansion, it is designed such that, when cold, it is tapered in towards the head and is elliptical rather than perfectly round. The 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 piston rings are the Keystone type, the upper surface of which slants approximately 7°. To accommodate the Keystone ring, the upper surface of the piston ring groove also slants approximately 7°.

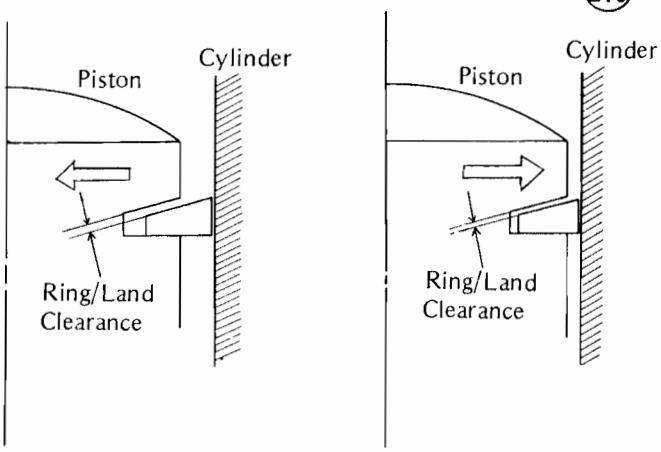
The use of the Keystone rather than the standard type provides a better compression seal, reduces the possibility of the rings sticking, and allows for better heat transfer from the piston to the cylinder.

Keystone Ring Grooves



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



The full floating type of piston pin is used to connect the piston to the connecting rod. The middle part of the piston pin passes through a caged needle bearing fitted into the small end of the connecting rod, and a snap ring is fitted at each end of the piston pin in a groove to prevent the pin from coming out. Since the pin is the full floating type, a small amount of clearance exists between the piston pin and the piston when the engine is at normal operating temperatures.

Table 3 Port Measurement

A	B	C	D	E	F	G
13.4 mm	29.7~30.3 mm	10.7~11.3 mm	32.4~32.8 mm	29.7~30.3 mm	32.4~32.8 mm	22.3~22.9 mm

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 result in overheating, detonation, and preignition. A worn cylinder, worn piston, or worn or stuck piston rings causes a loss of compression from gas blowby past 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 with the kick starter several times until the compression gauge stops rising. The compression is the highest reading obtainable.

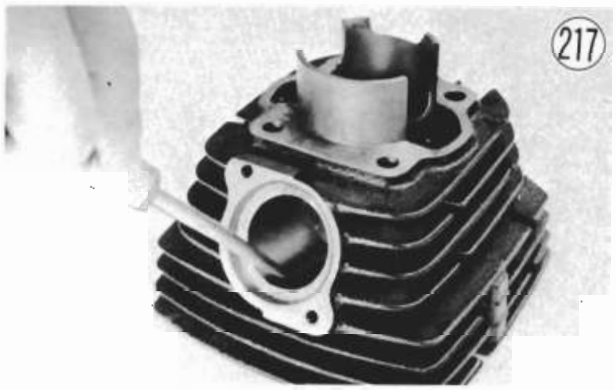


Table 4 Cylinder Compression

Standard	Service Limit
9.8 kg/cm^2 (139.4 lbs/sq in)	6.9 kg/cm^2 (98.118 lbs/sq in)

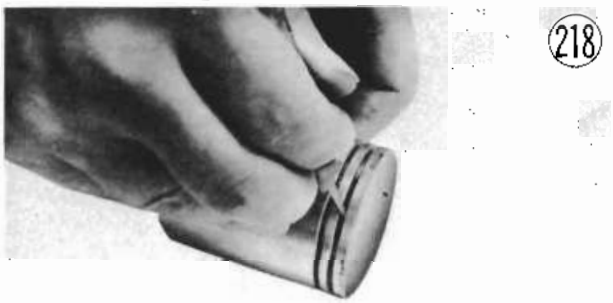
Cylinder, piston decarbonization

Carbon readily accumulates around the cylinder exhaust port, which reduces exhaust efficiency. To remove the carbon, take off the cylinder (Pg. 24), 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. 100).



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



CAUTION:

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

2) 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. 219. If any of the cylinder inside diameter measurements exceeds the service limit, or if there is a difference of more than 0.05 mm 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 50.5 mm, the cylinder must be replaced.

Cylinder Diameter Measurement (219)

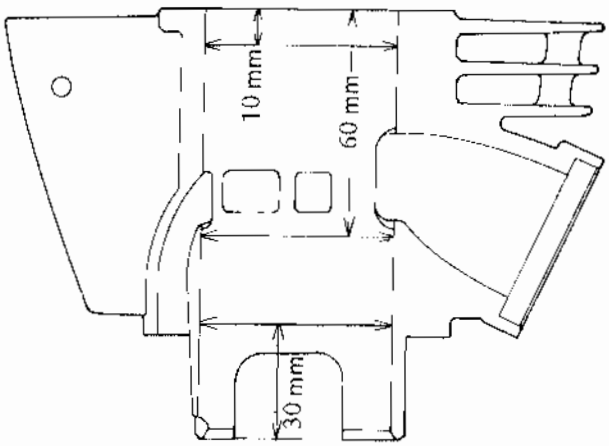
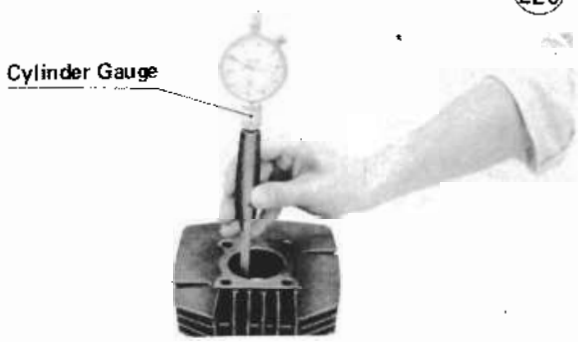


Table 5 Cylinder Inside Diameter

Standard	Service Limit
49.500~49.516 mm	49.60 mm

(220)



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

NOTE: Abnormal wear such as a marked diagonal pattern across the piston skirt may mean a bent connecting rod or a misaligned crankshaft.

(221)

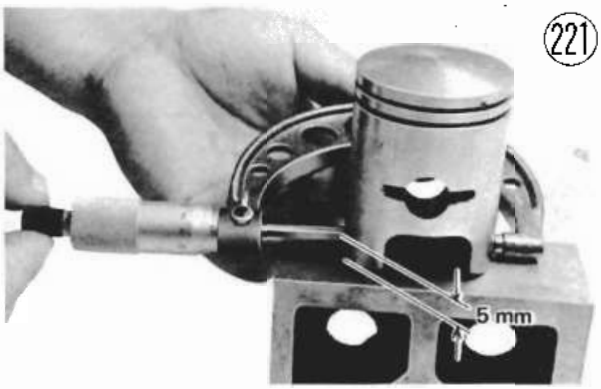


Table 6 Piston Diameter

Standard	Service Limit
49.472~49.492 mm	49.37 mm

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 pistons, the service limit for the cylinder is the diameter that the cylinder was bored to plus 0.1 mm, and the service limit for the piston is the oversize piston original diameter minus 0.15 mm. If the exact figure for the rebored diameter is unknown, it can be roughly determined by measuring the diameter at the base of the cylinder.

NOTE: Whenever the piston or cylinder has been replaced with a new one, the motorcycle must be broken in the same as with a new machine.

Piston/cylinder clearance

The piston to cylinder clearance is measured whenever the piston or cylinder is replaced with 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
0.025~0.031 mm

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 at any point.
3. There are two sizes of oversize pistons available: 0.5 mm and 1.0 mm. Oversize pistons require oversize rings.
4. Be wary of measurements taken immediately after boring since the heat affects cylinder diameter.

Piston/cylinder seizure

Remove the cylinder 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.

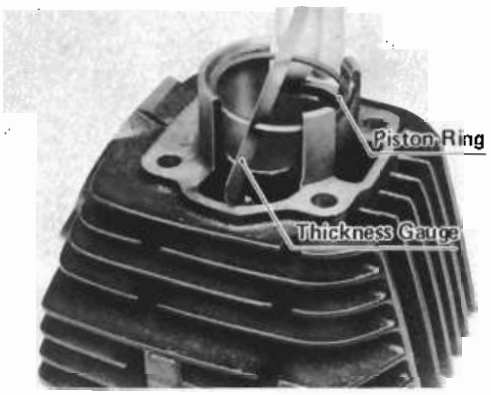
Piston ring, piston ring groove wear

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.

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 use the Keystone rings.

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.



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Table 8 Ring End Gap

Standard	Service Limit
0.15~0.35 mm	0.65 mm

Piston ring tension

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



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Table 9 Ring Free Gap

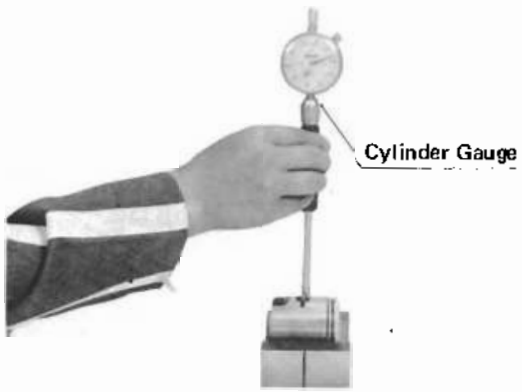
Standard	Service Limit
7.0 mm	5.0 mm

Piston, piston pin, connecting 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 connecting rod small end. If the diameter exceeds the service limit, replace the connecting 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.



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Table 10 Piston Pin, Piston Pin Hole, Small End Dia.

	Standard	Service Limit
Piston Pin	13.994~14.000 mm	13.96 mm
Piston Pin Hole	13.998~14.005 mm	14.10 mm
Con-rod Small End	18.003~18.014 mm	18.05 mm

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.

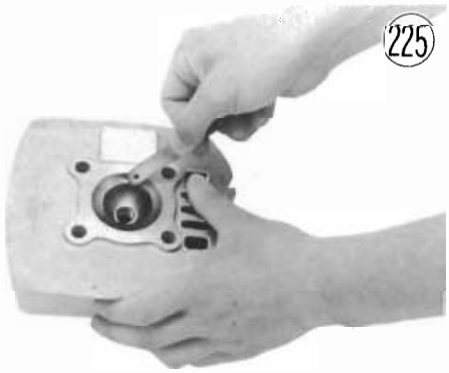
CYLINDER HEAD

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.

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, 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. 24). Scrape out any carbon, and clean the head with a high flash point solvent of some kind.



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.

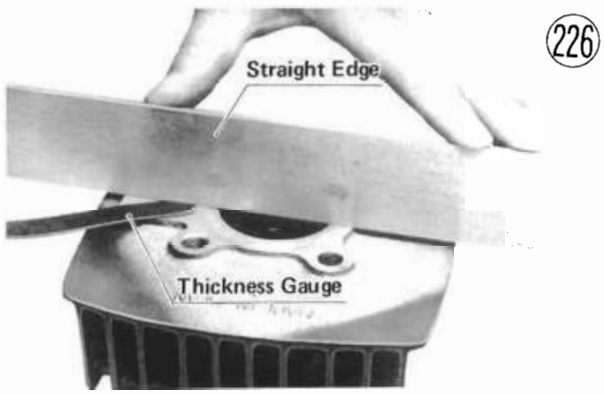


Table11 Cylinder Head Warp

Standard	Service Limit
under 0.05 mm	0.15 mm

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.

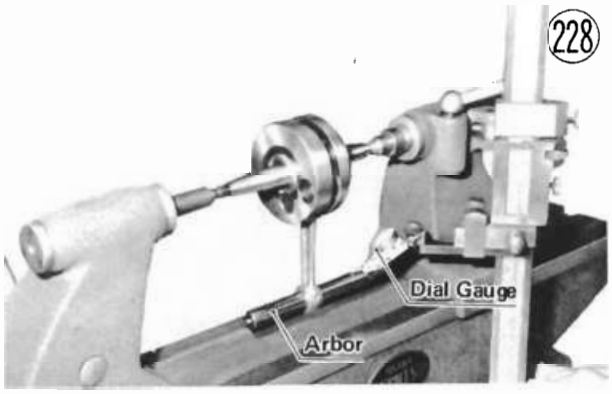
Connecting rod bending, twisting

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 length to determine the amount the connecting rod is bent.

Using the arrangement shown in Fig. 229, measure the amount that the arbor varies from being parallel

with the crankshaft over a 100 mm length of the arbor to determine the amount the connecting rod is twisted.



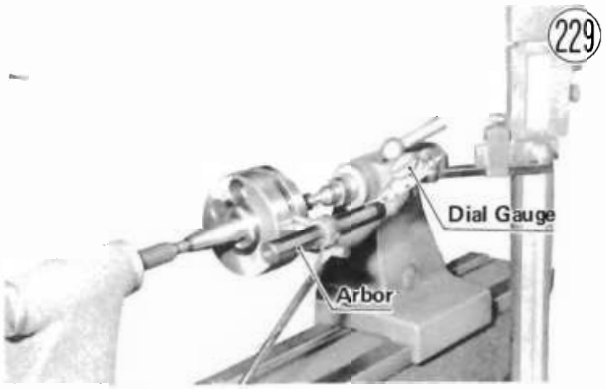


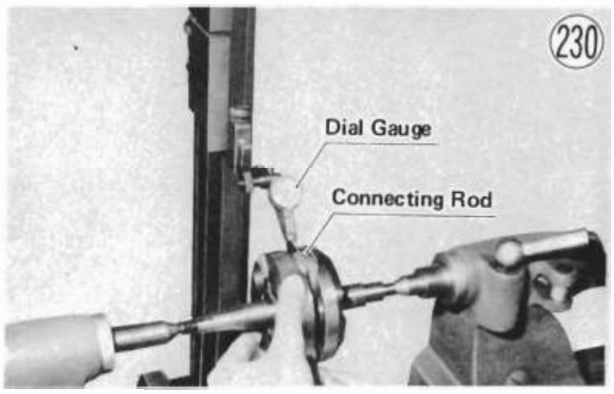
Table 12 Connecting Rod Bend, Twist

Standard	Service Limit
under 0.05 mm/100 mm	0.20 mm/100 mm

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.

Table13 Connecting Rod Radial Clearance

Standard	Service Limit
0.029~0.039 mm	0.08 mm

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.

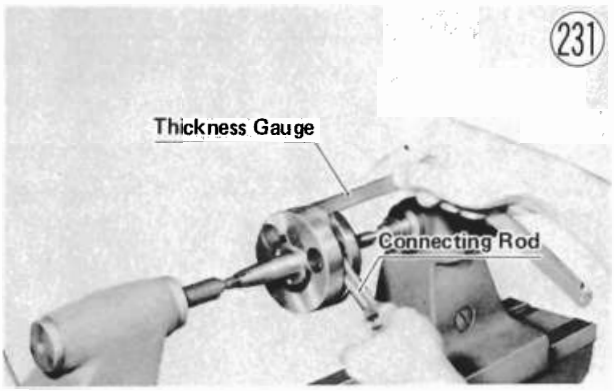
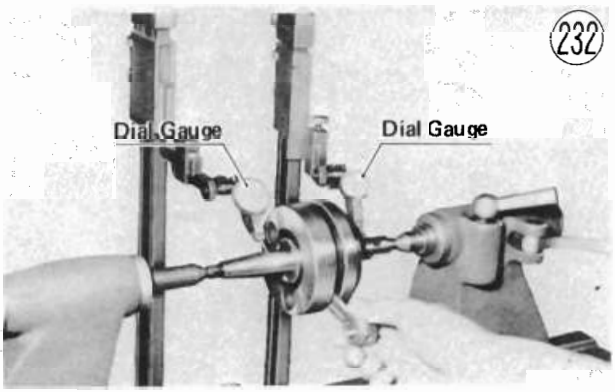


Table 14 Connecting Rod Side Clearance

Standard	Service Limit
0.35 ~ 0.45 mm	0.6 mm

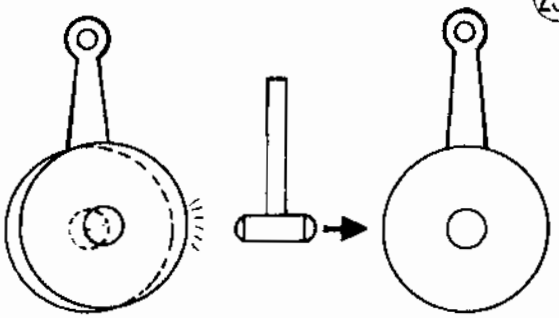
Crankshaft runout

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.

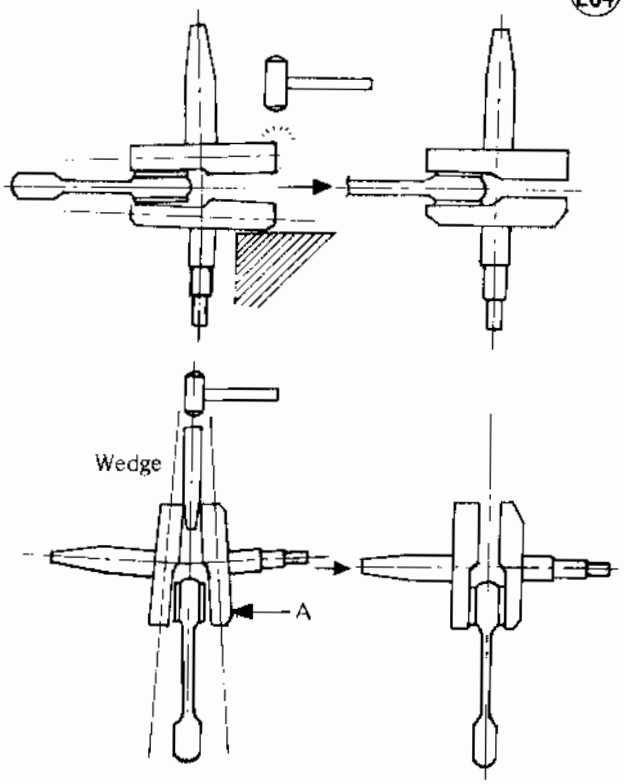


If the runout at either point exceeds the service limit, align the flywheels so that the runout falls within the service limit. As shown in Figs. 233, 234, there are three types of flywheel misalignment.
In the case of horizontal misalignment, which is the most common, strike the projecting rim of the 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

Flywheel Horizontal Misalignment (233)



Flywheel Vertical Misalignment (234)



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 15 Crankshaft Runout

Standard	Service Limit
under 0.04 mm	0.10 mm

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. 235 shows the cross-sectional diagram of the clutch, which is a wet multi-plate type with 4 friction plates ③ alternated with 3 steel inner plates ④ and 1 steel outer plate ⑤. The friction plates are made from cork, used bakelite core, which provides durability and warp resistance. The clutch housing ⑫ has a reduction drive gear riveted to one side. At the rear of the clutch housing is the clutch housing spring ⑭ to control the axial play of the clutch housing, which floats on the drive shaft.

The clutch release mechanism is shown in Fig. 236. The clutch release worm gears ⑤ , ⑤ , made of nylon, have the clutch adjusting screw ⑩ constructed in the center of the inner gear. The clutch adjusting screw pushes on the push rod ⑫ when the clutch is disengaged.

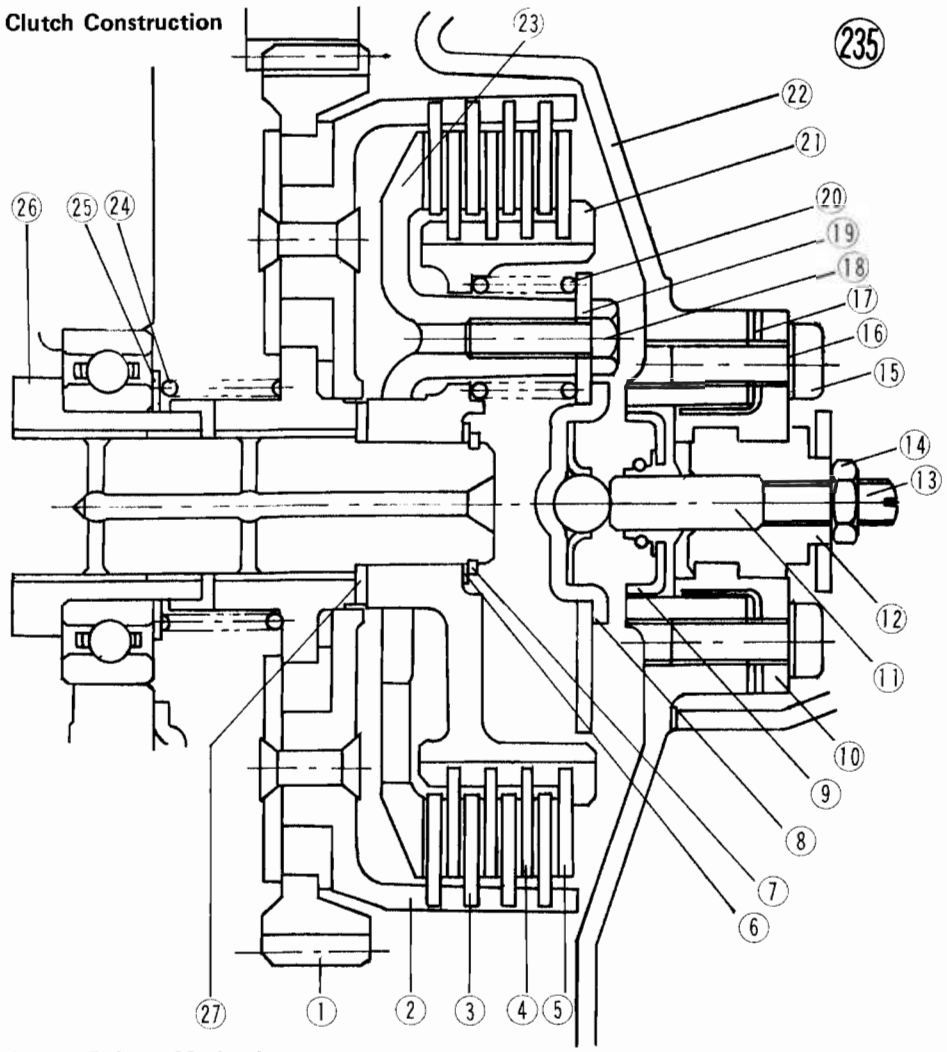
The clutch friction plates are connected to the clutch housing by tangs on the outer circumference of each plate, and since the clutch housing is gear-driven directly by the crankshaft, these plates are always turning any time the engine is running. The steel inner and outer plates have a toothed inner 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. When the clutch is engaged, the force of the springs, pressed in between the clutch hub ⑪ and the spring plate ⑲ which is bolted to the clutch wheel ㉓ , forces the clutch hub, the plate assembly, and the clutch wheel together so that the clutch 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 turns the clutch release worm gear in towards the clutch. The clutch adjusting screw, constructed inside the clutch release worm gear, then pushes the push rod, which in turn pushes the spring plate and clutch wheel. Since the clutch wheel moves towards the crankcase the same distance that the clutch release worm gear moves, and the clutch hub remains stationary and the 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 clutch wheel and once again force the clutch hub, the plate assembly, and the clutch wheel 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:

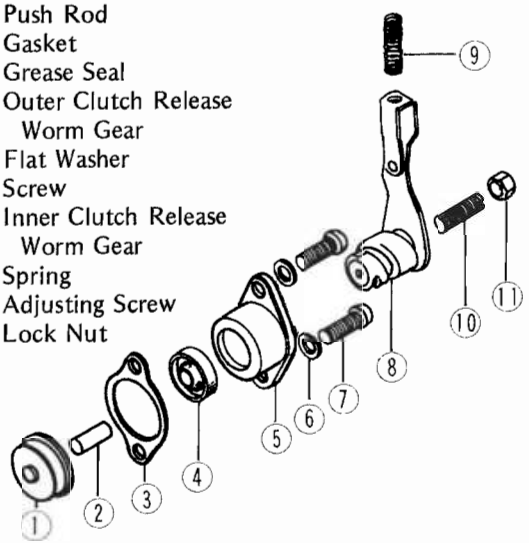
1. Excessive clutch lever play.
2. Clutch plates that are warped or too rough.
3. Uneven clutch spring tension.
4. Deteriorated transmission oil.

Clutch Construction



1. Clutch Housing Gear
2. Clutch Housing
3. Friction Plate
4. Steel Inner Plate
5. Steel Outer Plate
6. Thrust Washer
7. Circlip
8. Spring Plate Disc
9. Grease Seal
10. Outer Clutch Release Worm Gear
11. Push Rod
12. Inner Clutch Release Worm Gear
13. Adjusting Screw
14. Lock Nut
15. Screw
16. Flat Washer
17. Gasket
18. Bolt
19. Spring Plate
20. Spring
21. Clutch Hub
22. Right Engine Cover
23. Clutch Wheel
24. Spring
25. Washer
26. Idle Gear
27. Thrust Washer

Clutch Release Mechanism



1. Spring Plate Disc
2. Push Rod
3. Gasket
4. Grease Seal
5. Outer Clutch Release Worm Gear
6. Flat Washer
7. Screw
8. Inner Clutch Release Worm Gear
9. Spring
10. Adjusting Screw
11. Lock Nut

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. Metal chips jammed into the clutch housing gear teeth.

5. Transmission oil viscosity too high.
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.
10. Missing parts

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.

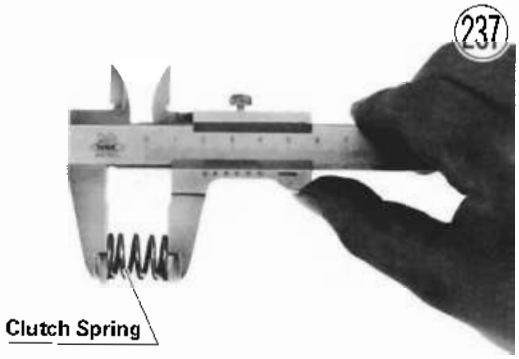


Table 16 Clutch Spring Free Length

Standard	Service Limit
21.6 mm	20.0 mm

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, of if they have worn past the service limit, replace them with new ones.

Friction Plate Measurement

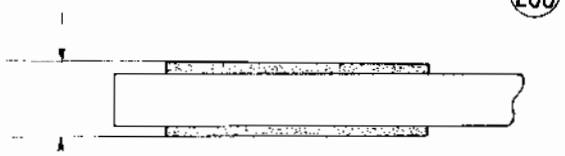


Table 17 Friction Plate Thickness

Standard	Service Limit
3.1~3.3 mm	2.8 mm

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.

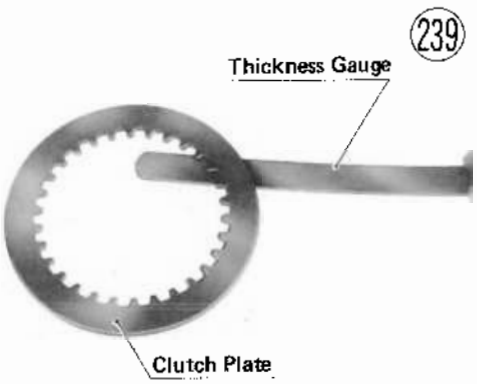


Table 18 Clutch Plate Warp

	Standard	Service Limit
Friction Plate	0.3 mm	0.4 mm
Steel Plate	0.15 mm	0.3 mm

Friction plate/clutch housing clearance

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

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

Friction Plate/Clutch Housing Clearance

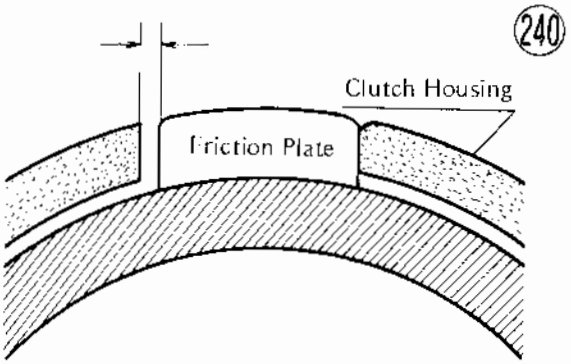


Table 19 Friction Plate/Clutch Housing Clearance

Standard	Service Limit
0.15~0.40 mm	0.50 mm

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 backlash

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 20 Clutch Housing/Primary Gear Backlash

Standard	Service Limit
0.02~0.10 mm	0.15 mm

Clutch housing, drive shaft wear

Measure the diameter of the drive shaft 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 clutch housing if the clearance exceeds the service limit.



Table 21 Clutch Housing Drive Shaft Wear

Standard	Service Limit
0.038~0.062 mm	0.162 mm

Clutch hub damage

Inspect where the teeth on the steel plates wear against the splines of the clutch hub. If there are notches worn into the splines, replace the clutch hub.

Clutch release gear wear

Fit the outer and inner clutch release worm gears together, and push them back and forth in the direction of the shaft without turning them. If there is excessive play, replace them both. Also, replace them if either one is visibly damaged.

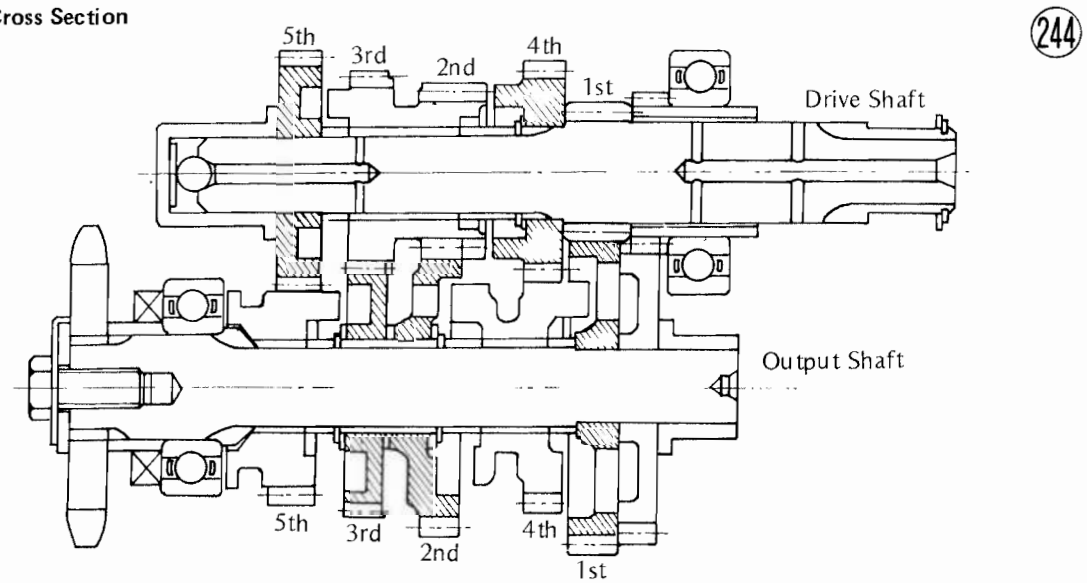
Lubrication

Lubricate the clutch release worm gears with grease.

TRANSMISSION

The transmission is a 5-speed, constant mesh, return shift type. Its cross section is shown in Fig. 244, and the external shift mechanism is shown in Fig. 245. 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".

Transmission Cross Section



Gears D2 & D3 (single unit), O4, and O5 all rotate along with their shaft, but during gear changes are moved sidewise on their shaft by 3 shift forks, one for each of these 3 gears. Gears D4, D5, O1, O2 and O3 rotate free of shaft rotation, but cannot move sidewise. Gear D1 is constructed as part of the drive shaft.

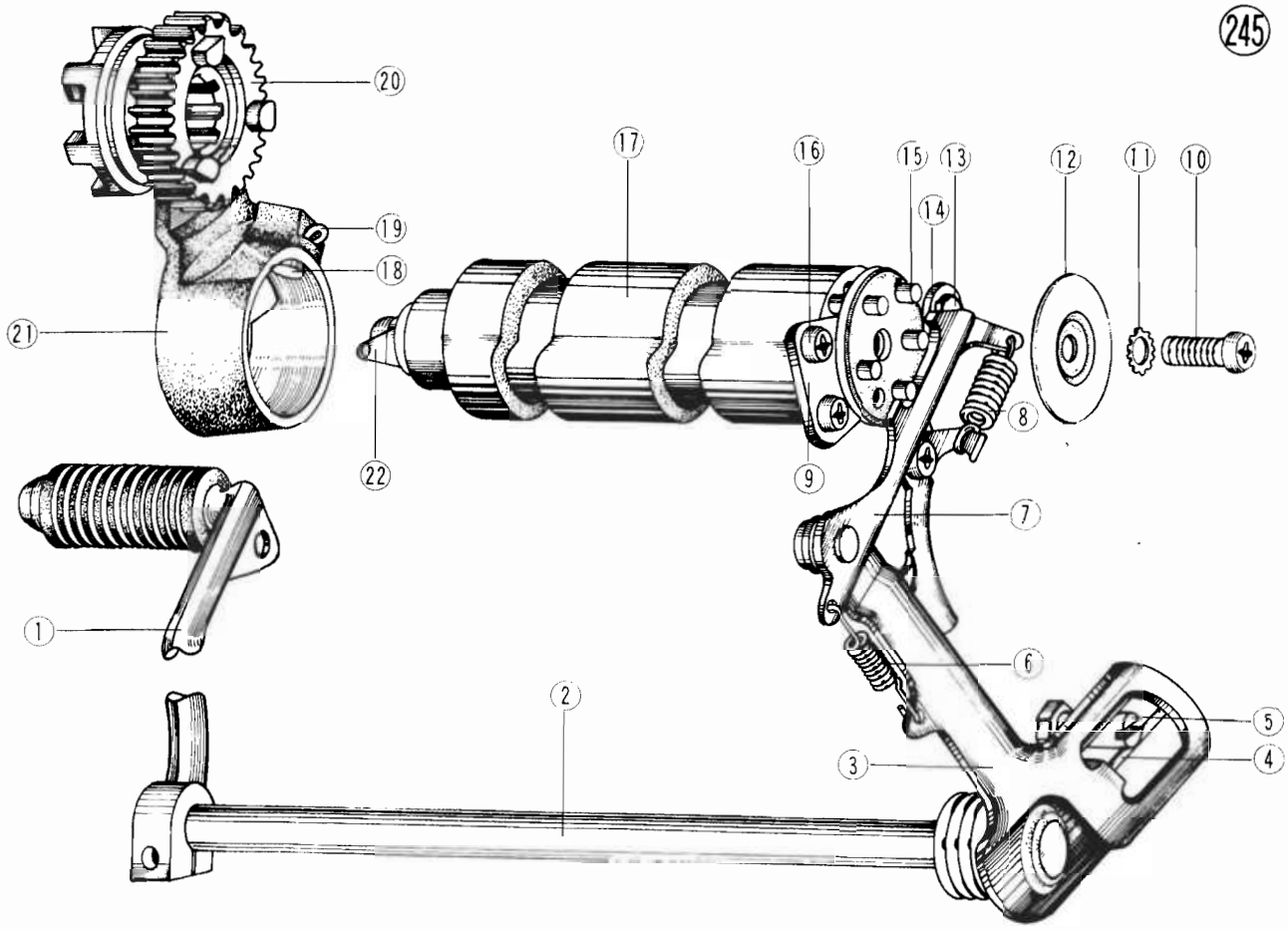
When the shift pedal 1 is raised or lowered, the mechanism arm catches on one of the shift drum pins 15, and the shift drum 17 turns. As the shift drum turns, the shift fork guide pins (3) 18, each riding in a groove in the shift drum, shift the position of one or another of the shift forks 21 in accordance with the winding of the grooves. The shift fork ears then determine the position of gears D2, D3, O4, and O5. Refer to Figs. 246 to 251 for the gear train for neutral and each of the 5 gears.

When the shift pedal is released after shifting gear, the return spring 14 returns the shift pedal to its original position. To keep the shift drum in its new position, a detent arm 14 is held against the shift drum pins by the detent arm spring

The return spring pin 5, fitted in 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.

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 is installed on the crankcase, and the switch rotor inside the switch housing is turned by the shift drum. When the shift drum has shifted the transmission into neutral, the neutral indicator switch lead on the switch housing

Shift Mechanism



1. Shift Pedal
2. Shift Shaft
3. Arm
4. Return Spring
5. Return Spring Pin
6. Spring
7. Shift Pawl
8. Spring
9. Shift Drum Stopper
10. Screw
11. Washer
12. Pin Holder
13. Bolt
14. Detent Arm
15. Pin
16. Screw
17. Shift Drum
18. Guide Pin
19. Cotter Pin
20. Gear
21. Shift Fork
22. Rotor

grounds through the rotor, completing the neutral indicator light circuit, which turns the neutral indicator light on.

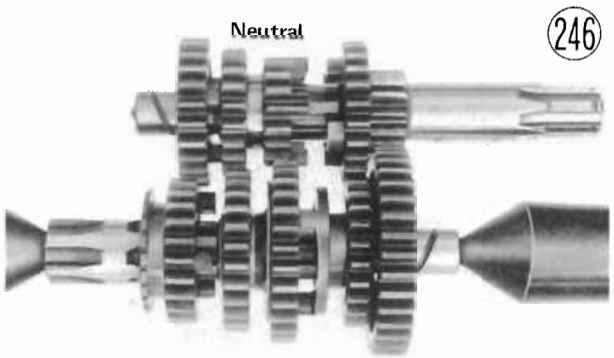
When the rotor and the housing do not have good electrical contact, the circuit will not be completed when the transmission shifts into neutral. If the electrical contact becomes insufficient for the light to go on, the rotor should be bent out so that it will brush firmly against the side of the housing.

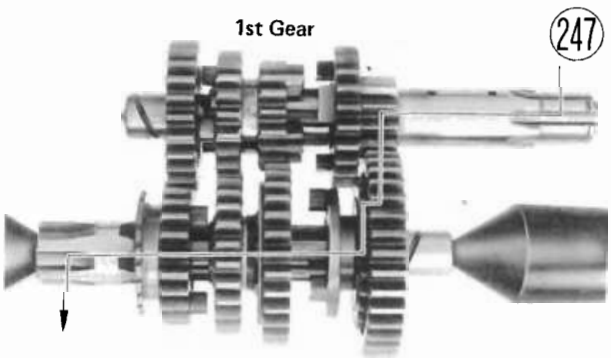
Transmission damage, causing the transmission to misshift, overshift, and jump out of gear, brings about more damage to the transmission and also overrev damage to the engine itself. An improperly functioning transmission may be caused by the following:

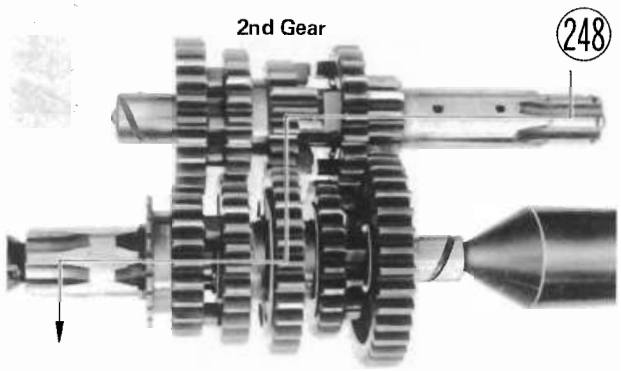
1. Loose return spring pin
2. Broken or weakened return spring or detent arm spring.
3. Broken shift lever pawl spring
4. Damaged shift lever
5. Loose shift drum positioning plate
6. Bent or worn shift fork
7. Worn shift fork groove on gears D2 & D3, O4, and/or O5
8. Worn shift fork pin (s)
9. Worn shift drum groove(s)
10. Worn or damaged gear dogs and/or gear dog recesses
11. Improperly functioning clutch
12. Improper assembly or missing parts

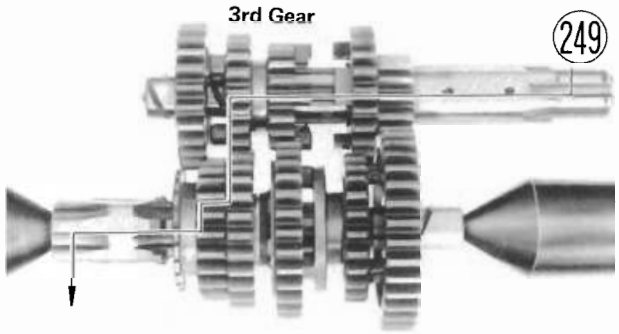
Transmission noise results from worn or damaged gear teeth, gear bushings, shafts, bearings, etc.

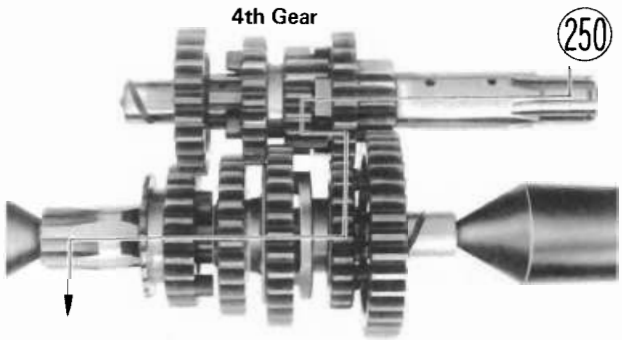
The idle gears on the output shaft and drive shaft are constantly meshed, and transmit the rotation of the kick gear through the clutch housing gear to the primary gear when the engine is started. Since these gears are not directly related to the transmission, they are covered in the Kickstarter section (Pg. 81).

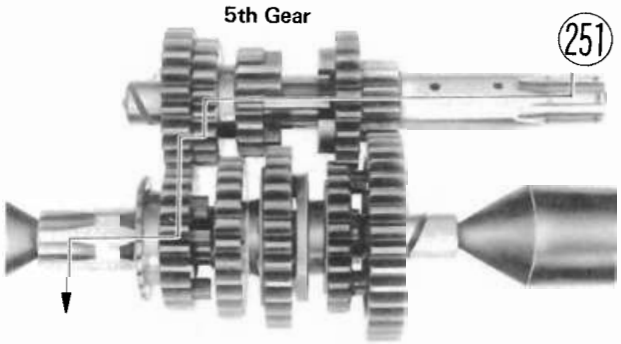












External shift mechanism inspection

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

Check that the drum positioning plate is not loose. If it is loose, tighten the screws.

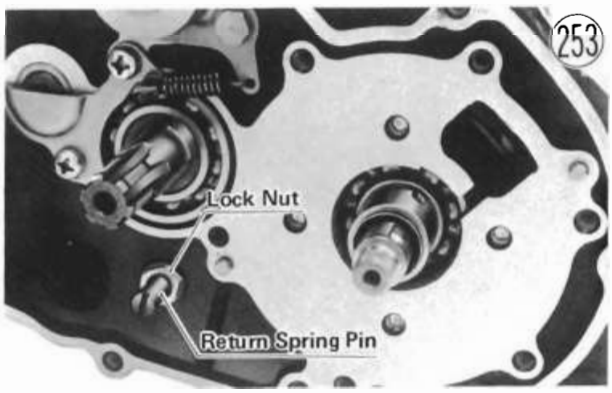
Measure the free length of the shift pawl spring. If it exceeds the service limit, replace it with a new one.



Table 22 Shift Pawl Spring Free Length

Standard	Service Limit
29.4 mm	31.0 mm

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.

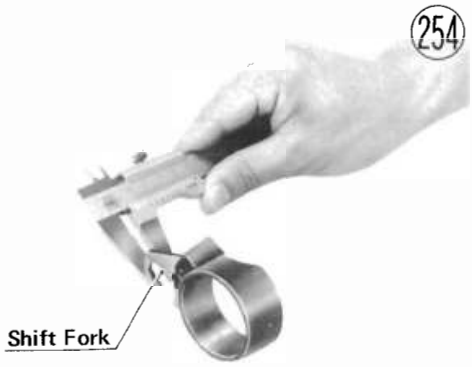


Shift fork bending

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

Shift fork/gear groove wear

Measure the thickness of the ears of each shift fork, and measure the width of the shift fork groove on gears D2 & D3, O4, and O5. If the thickness of a shift fork ear is under the service limit, the shift fork must be replaced. If a gear shift fork groove is worn over the service limit, the gear must be replaced.



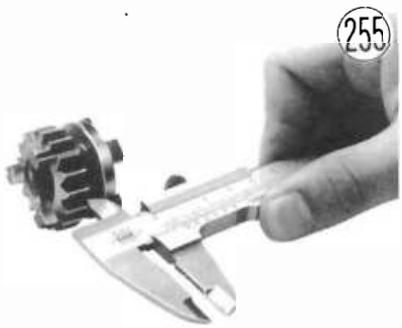


Table 23 Shift Fork Thickness

Standard	Service Limit
4.9 ~ 5.0 mm	4.8 mm

Table 24 Gear Shift Fork Groove Width

Standard	Service Limit
5.05 ~ 5.15 mm	5.25 mm

Shift fork guide pin, shift drum groove wear

Measure the diameter of each shift fork guide pin, and measure the width of each shift drum groove. Replace any shift fork guide pin which has worn past the service limit. If a shift drum groove is worn past the service limit, replace the shift drum.

Table 25 Shift Fork Guide Pin Diameter

Standard	Service Limit
7.985 ~ 8.000 mm	7.94 mm

Table 26 Shift Drum Groove Width

Standard	Service Limit
8.000 ~ 8.015 mm	8.20 mm

Shift fork guide pin/shift drum groove clearance

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

Table 27 Shift Fork Guide Pin/Shift Drum Groove Clearance

Standard	Service Limit
0.05~0.22 mm	0.30 mm

Gear dog, gear dog hole, gear dog recess damage

Visually inspect the gear dogs, gear dog holes, and gear dog recesses. Replace any gears that have damaged 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 28 Gear/Shaft Clearance

	Standard	Service Limit
D5 O1	0.016~0.045 mm	0.145 mm
D4 O3 O2	0.016~0.052 mm	0.152 mm

KICKSTARTER

Kickstarter construction is shown in Fig. 256 and its cross section in Fig. 257. 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.

The kick gear itself turns freely on the kick shaft. A ratchet is built into the inside of the kick gear, which, when the starter is kicked, is caught by a pawl secured to the kick shaft. The pawl is pushed towards the kick gear by the pawl spring. However, when the kick shaft is in its normal position, the pawl is arrested by a stopper and cannot catch on the ratchet portion of the kick gear.

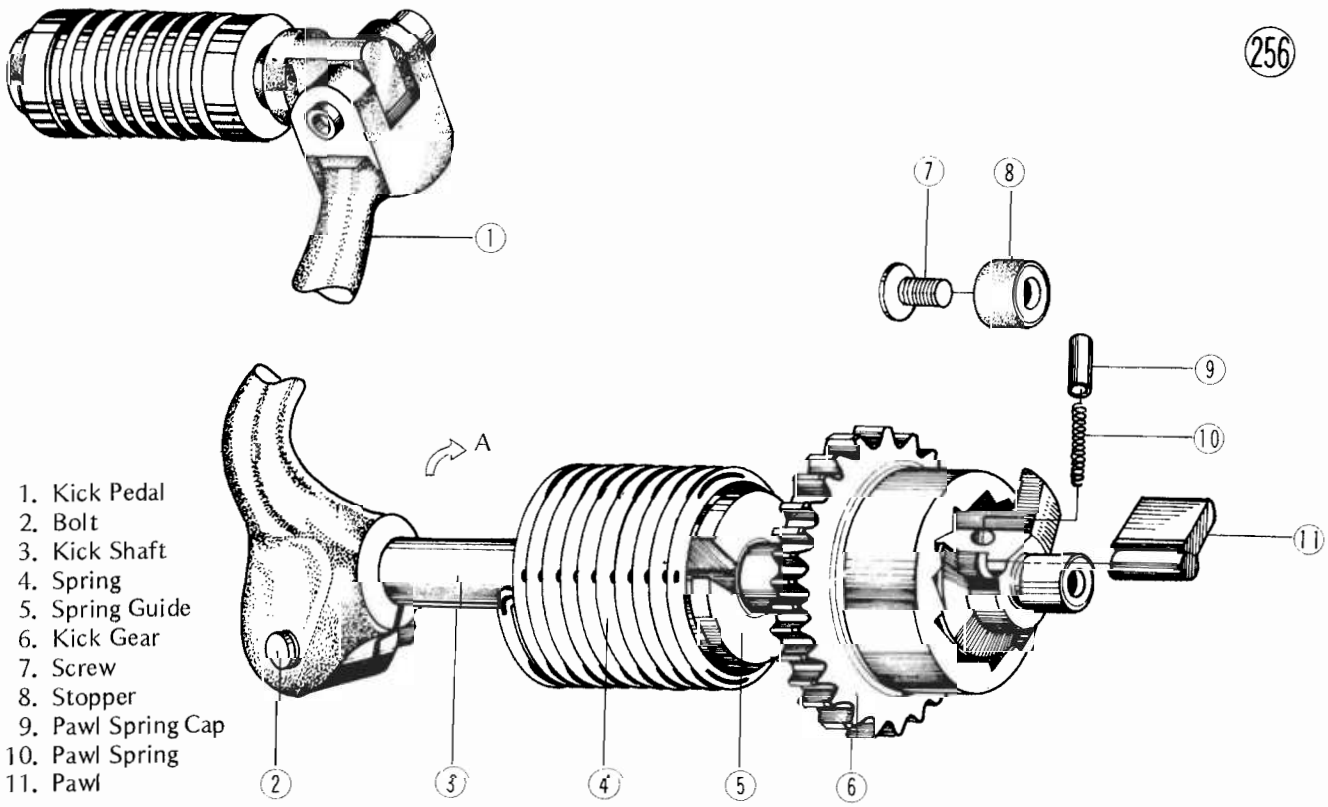
Fig. 256 shows the kickstarter when the kick gear is engaged with the kick shaft by the pawl. As the starter is kicked, the kick shaft rotates in the direction of arrow "A" and releases the pawl from the stopper. By the force of the pawl spring, the pawl then catches on the ratchet portion of the kick gear and rotates the kick gear. The gear train of the kick starter system then cranks over 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", the kick gear does not catch on the pawl.

When the kick pedal is released, the kick shaft is turned by the return spring until the kick shaft lever strikes the stopper, whereupon the pawl rides up on the stopper, breaking away from the kick gear. The kick gear now turns freely.

If the kick pedal return spring weakens or breaks, the kick pedal will not return completely or at all, and the kick gear and the pawl 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, pawl, or pawl spring is worn or damaged, the kick gear will slip, and it will not be

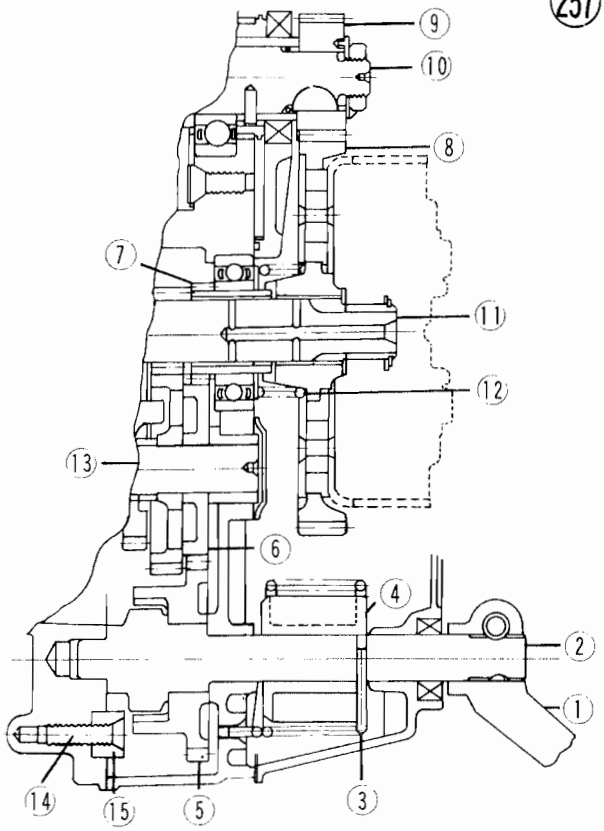
Kick Starter



1. Kick Pedal
2. Bolt
3. Kick Shaft
4. Spring
5. Spring Guide
6. Kick Gear
7. Screw
8. Stopper
9. Pawl Spring Cap
10. Pawl Spring
11. Pawl

possible to kick start the engine.

A Cross-sectional Diagram of Primary Kick (257)



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

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, the kick gear must be replaced.

Measure the outside diameter of the kick shaft, and replace it if it is under the service limit.

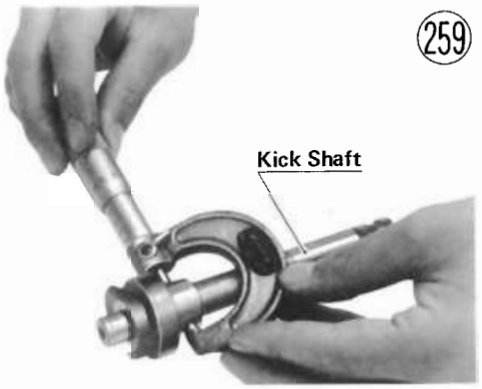

(258)

Table 29 Kick Gear Inside Diameter

Standard	Service Limit
20.000~20.021 mm	20.07 mm

Table 30 Kick Shaft Diameter at Kick Gear

Standard	Service Limit
19.959~19.980 mm	19.92 mm



(259)

Drive shaft idle gear, shaft wear

Measure the inside diameter of the drive shaft idle gear with a cylinder gauge, and measure the diameter of the drive 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 31 Drive Shaft Idle Gear Cap/Shaft Clearance

Standard	Service Limit
0.040 ~ 0.074 mm	0.174 mm

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 32 Output Shaft Idle Gear/Shaft Clearance

Standard	Service Limit
0.032 ~ 0.061 mm	0.161 mm

Pawl, pawl spring damage

Visually inspect the pawl and the pawl spring. If either one is damaged or badly worn, it must be replaced.

Put the pawl and pawl spring into place on the kick shaft, and push the pawl by hand. If the pawl will not return smoothly, replace the pawl, pawl spring, and pawl spring cap.

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 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.

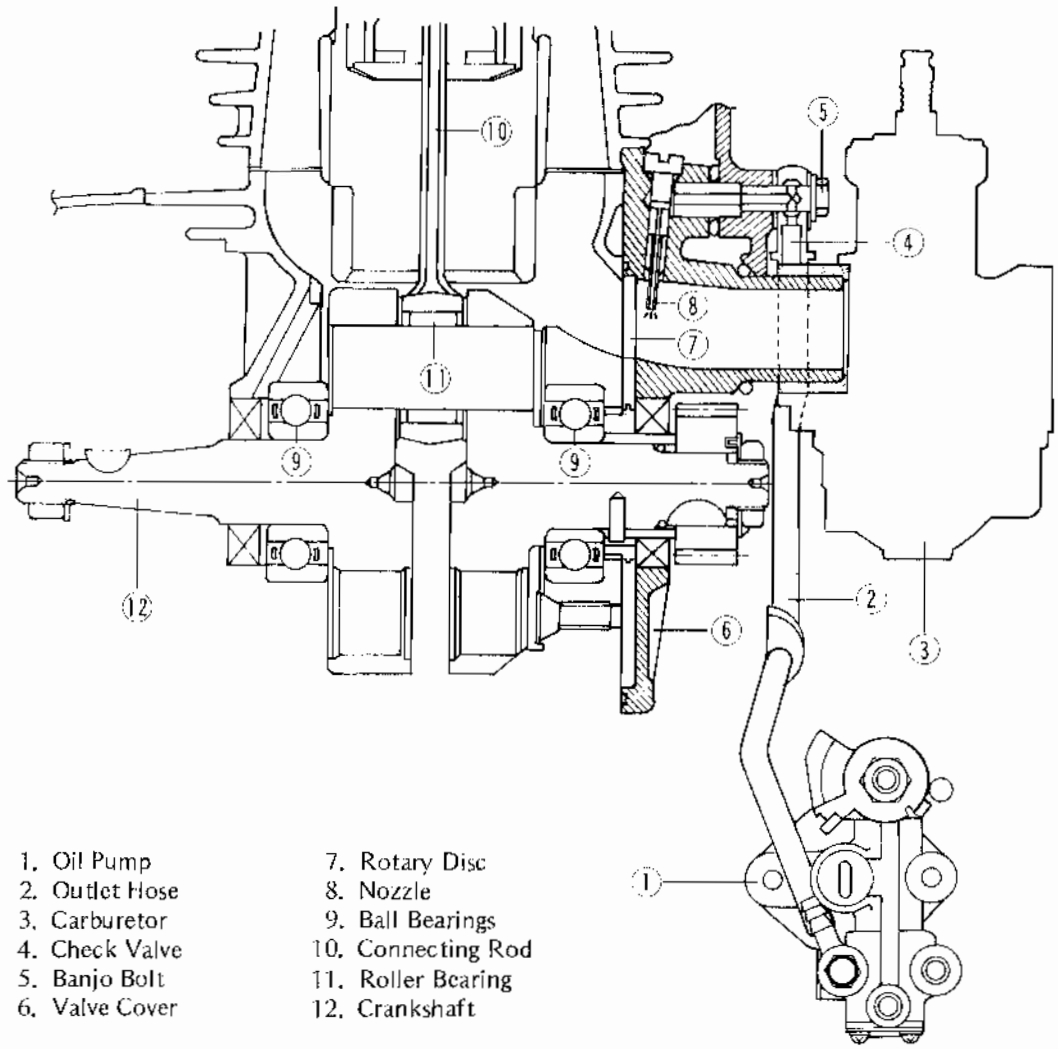
Fig. 260 shows the engine lubrication system. The oil input to the pump is supplied by a hose from the oil tank, and the output from the pump goes through the outlet hose and then into the non-return check valve at the banjo bolt connection on the right engine cover. The oil pressure, opposing the spring 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 connecting 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 connecting 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.

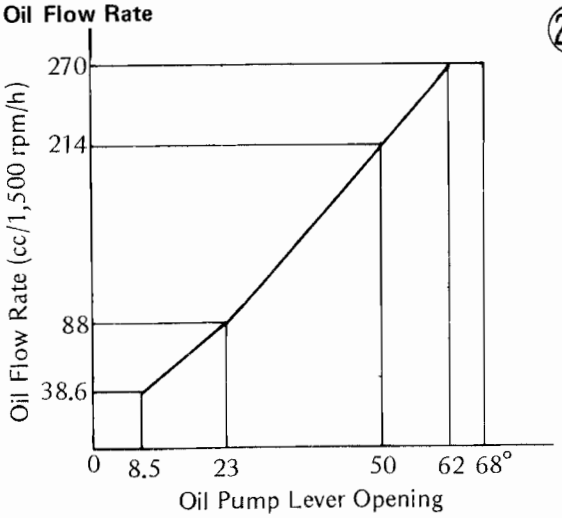
The oil pump output is controlled partially by the number of plunger strokes. The number of plunger strokes is determined by the speed of oil pump gear rotation. Since crankshaft rotation is transmitted through the primary gear, clutch housing gear, drive shaft idle gear, and output shaft idle gear to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

Engine Lubrication System (260)



1. Oil Pump
2. Outlet Hose
3. Carburetor
4. Check Valve
5. Banjo Bolt
6. Valve Cover
7. Rotary Disc
8. Nozzle
9. Ball Bearings
10. Connecting Rod
11. Roller Bearing
12. Crankshaft

Oil Flow Rate

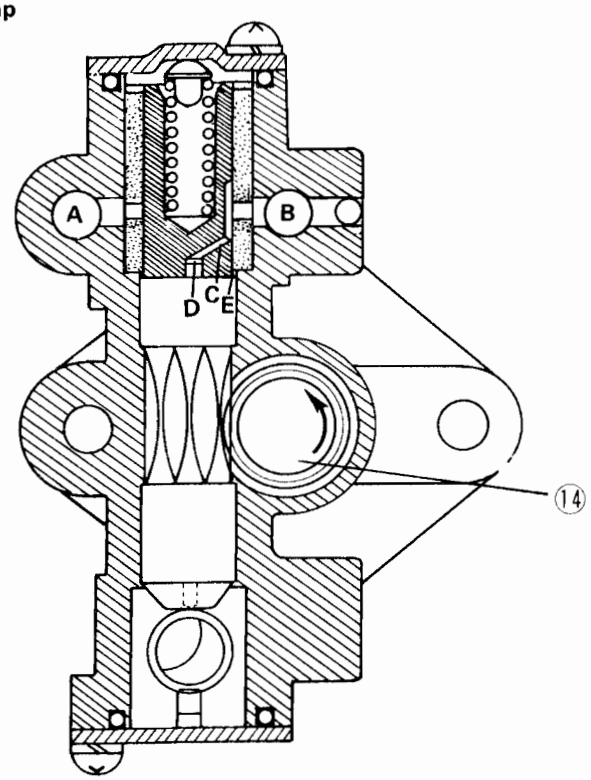


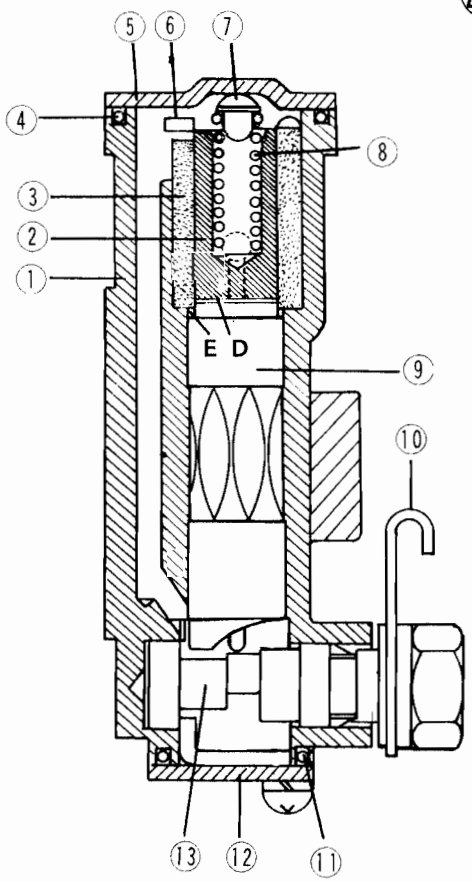
The other factor that controls oil pump output is the plunger stroke length. This length is determined by the oil pump cam position, which is controlled by the throttle grip through the throttle grip and oil pump cables. As the cam is turned by its cable, the plunger stroke increases. A greater plunger stroke will pump more oil. As shown in Fig. 261, the cam turns increasing the oil pump output from minimum to maximum between 35 ~ 80° of oil pump lever opening.

Pump operation and the path for oil flow through the pump are shown in Fig. 262. 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.

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

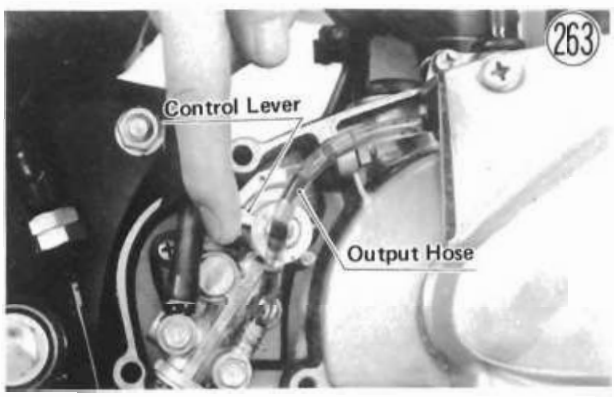
The oil pump is designed so that, at zero throttle when the pump is functioning properly, the oil pump lever lower mark aligns with the mark on the lever stopper, and both the oil pump output that is dependent on the length of the plunger stroke and the throttle valve opening are at their minimum. From 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.

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 inlet hose before reconnecting it to the pump. Bleed the air from the outlet hose by idling the engine (below 2,000 rpm) while holding the oil pump control lever fully open by hand 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 outlet 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.

- Slide the carburetor rubber cap up out of place.
- Remove the oil pump cover and carburetor cover.
- Detach the banjo bolt from the right engine cover, and run the outlet hose into a container.
- **USE A 20:1 MIXTURE OF GASOLINE TO OIL IN THE FUEL TANK IN PLACE OF THE GASOLINE NORMALLY USED.**
- Attach an instrument for measuring engine rpm to the magneto fly wheel, and start the engine. Set the engine at 2,000 rpm.
- Holding the oil pump lever fully open by hand, 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.

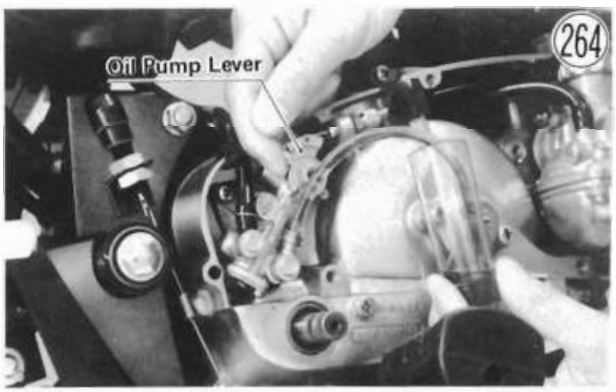


Table 33 Oil Pump Output

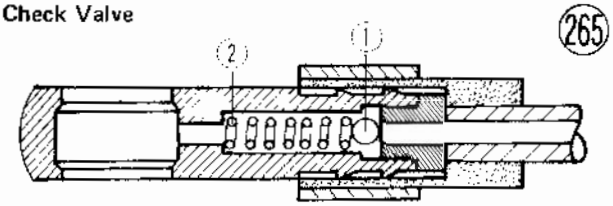
Output/3 minutes @2,000 r.p.m.
2.6~3.0 cc

- 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.

Check valve

If oil will not pass through the check valve, clean the valve out by using a high flash point solvent of some kind in a 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



1. Steel Ball 2. Spring

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 heat hardened phenol resin molded on a steel hub, 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 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 blow back 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 blow back.

Table 34 Rotary Valve Timing

Intake Open	Intake Close
120° BTDC	55°ATDC

An oil seal and two **O** rings fitted in the valve cover 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, weakening the disc and increasing the side to side motion of the disc on the shaft, the disc may possibly warp or suffer other damage.

Oil seal, O ring damage

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

Rotary disc wear, damage

Visually inspect the rotary disc. If it is cracked, warped, or loose on its hub, replace it.

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



Table 35 Rotary Disc Thickness

Standard	Service Limit
3.00~3.20 mm	2.85 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

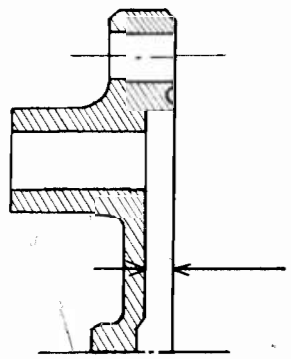


Table 36 Rotary Valve Cover Inner Surface Depth

Standard	Service Limit
3.35~3.45 mm	4.0 mm

ENGINE BEARING, BUSHINGS, OIL SEALS

The engine bearings, bushings and oil seals are listed in Tables 37 and 38. Worn or damaged bearings and bushes 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 overly rich mixture. Any damaged, hardened, or otherwise defective oil seals will allow oil to leak.

Table 37 Bearings, Bushings

Crankshaft		Drive Shaft		Output Shaft	
Left	Right	Left	Right	Left	Right
#6204	#6204	Bushing	#6005	#6004	Bushing

Bearing wear, damage

Since the 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 the bearing with a high flash point solvent of some kind, 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 with a new one. Press in the bearing so that its face is level with that of the crankcase.

Bushing wear, damage

Since adequate lubrication is provided by an oil groove on each bushing, there ordinarily should be no bushing wear. However, foreign particles in the transmission oil may damage the inner surface of the bushings. If the inner surface of either bushing is scratched, the bushing must be replaced.

Oil seal damage

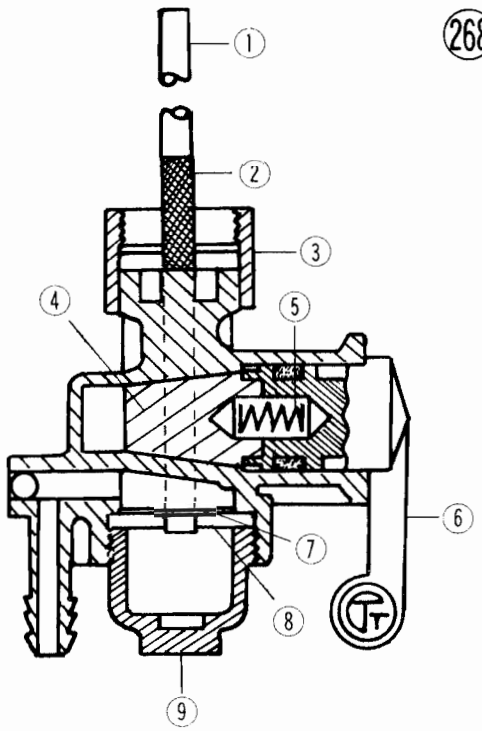
Inspect the oil seals, and replace any if the lips are misshapen, discolored (indicating the rubber has deteriorated), hardened or otherwise damaged. Since an oil seal is nearly always damaged on removal, any removed oil seals must be replaced. When pressing in an oil seal which is marked, press it in with the mark facing out. Press it in until the oil seal stops.

FUEL TANK

The fuel tank capacity is 8.0 liters. 1.5 liters of which froms 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 will not develop in the tank to hinder or prevent fuel flow to the carburetor.

Fuel tap construction is shown in Fig. 268. 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 form the bottom of the tank. The fuel tap contains a strainer and a sediment cup to filter out dirt and collect water.

Fuel Tap



1. Main Pipe
2. Reserve Pipe
3. Nut
4. Valve
5. Spring
6. Tap Lever
7. Filter
8. Gasket
9. Sediment Cup

Inspection and cleaning

If fuel leaks from the cap or from around the fuel tap, the cap, tap gasket, or O ring 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 a high flash point solvent of some kind 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 a high flash point solvent of some kind. To clean out the carburetor float bowl, remove the carburetor (Pg. 26), and remove the four screws to take off the bowl. Drain the fuel, and clean out any sediment.

WHEELS

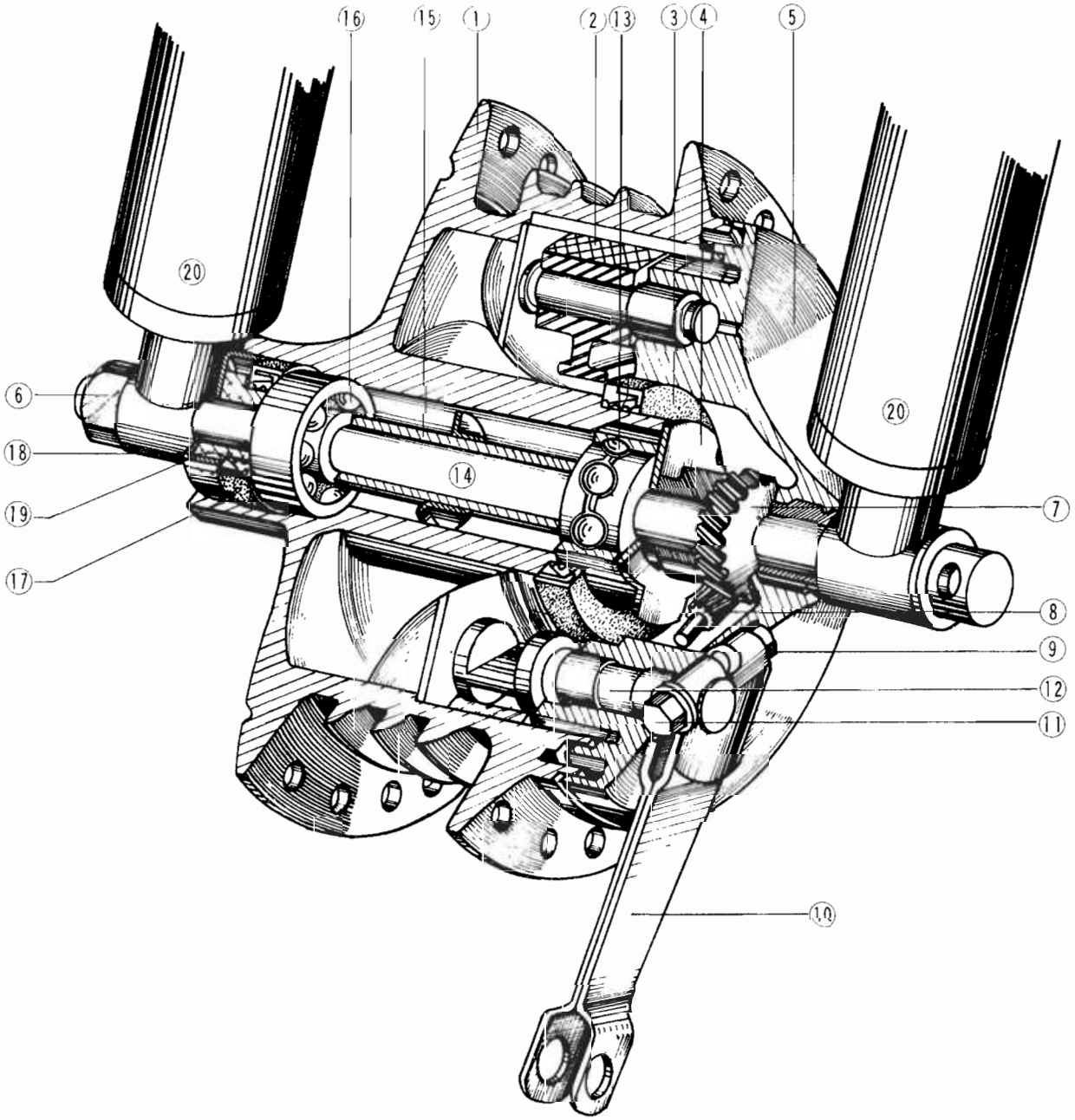
Wheel construction is shown in Fig. 269 and 270. The following sections Pgs. 86 ~ 93 cover the tire, rim and spokes, axle, grease seals, wheel bearings and brakes.

Table 38 Oil Seals

Crankcase			Valve Cover	Left Cover	Right Cover
Crankshaft	Output Shaft	Shift Shaft	Crankshaft	Shift Shaft	Kick Shaft
TB20407	SC25376	SB12205	TB25407	VC12185	TB14257

Front Wheel

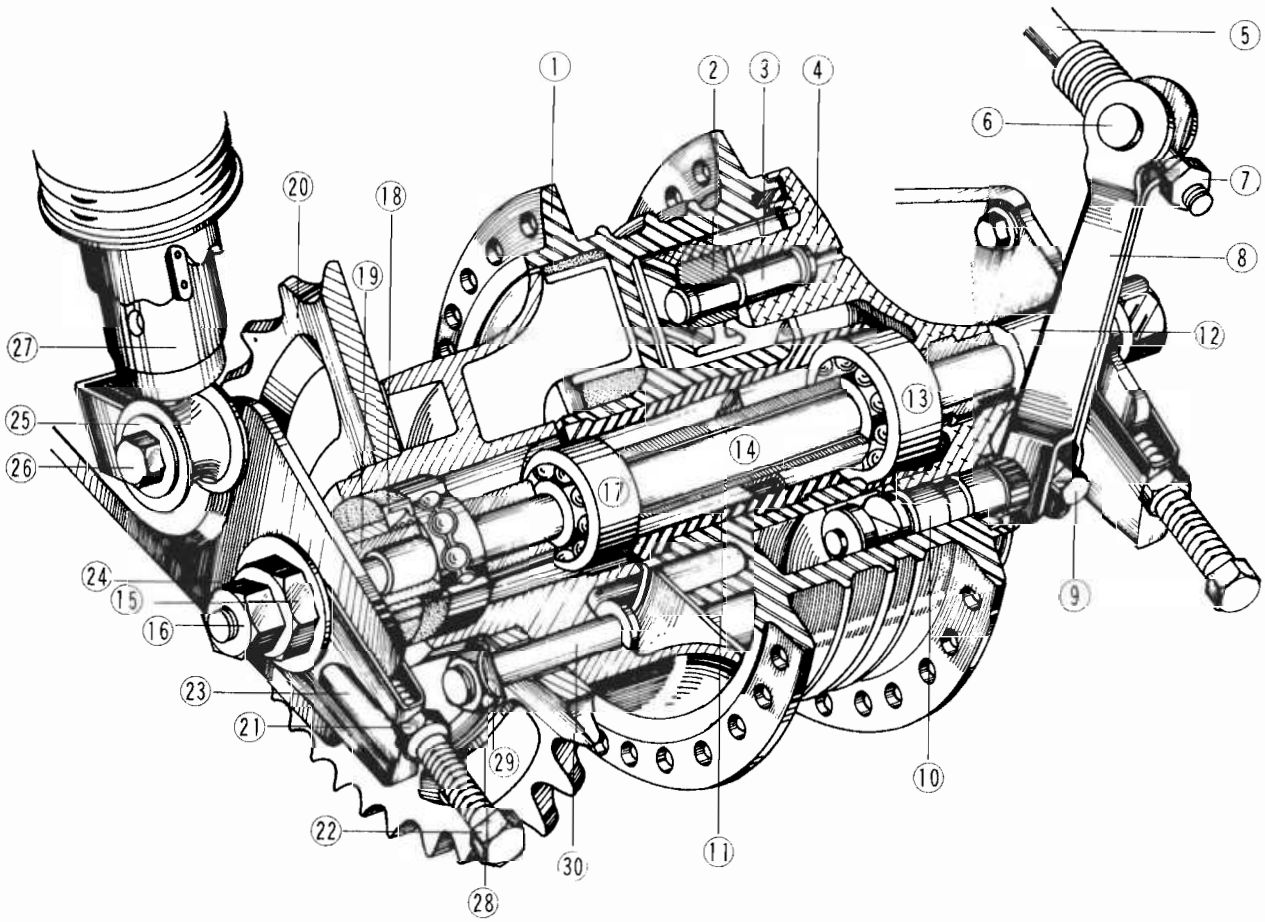
269



1. Front Hub
2. Brake Shoe
3. Grease Seal
4. Gear Receiver
5. Panel Assembly
6. Nut
7. Speedometer Gear
8. Speedometer Pinion
9. Nut
10. Brake Cam Lever
11. Bolt
12. Camshaft
13. Bearing
14. Axle
15. Distance Collar
16. Bearing
17. Grease Seal
18. Grease Seal Cover
19. Collar
20. Front Fork

Rear Wheel

270



1. Rear Hub
2. Brake Shoe
3. Shoe Anchor Pin
4. Panel Assembly
5. Brake Rod
6. Pin
7. Adjusting Nut
8. Cam Lever
9. Bolt
10. Camshaft
11. Distance Collar
12. Collar
13. Bearing
14. Axle
15. Sleeve Nut
16. Axle Nut
17. Bearing
18. Grease Seal
19. Collar
20. Rear Sprocket
21. Nut
22. Adjusting Bolt
23. Chain Adjuster
24. Swing Arm
25. Lock Washer
26. Bolt
27. Rear Shock Absorber
28. Nut
29. Lock Washer
30. Bolt

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 100 kg.

If the tires are inflated to too high a pressure, riding becomes rough, the center portion of the tread wears quickly, and the tires are easily damaged.

If inflation pressure is too low, the shoulder portions wear quickly, the cord suffers damage, fuel consumption is high, and handling is poor. In addition, heat builds up at high speeds, and tire life is greatly shortened.

To ensure safe handling and stability, use only the recommended standard tires for replacement, inflating them to the standard pressure. 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 39 Tires, Pressure (measured When Cold)

Wheel	Make	Size	Air Pressure
Front	Yokohama Y-620	2.75-19 4PR	1.6 kg/cm² (23 psi)
Rear	Yokohama Y-620	3.00-18 4PR	2.0 kg/cm² (28 psi)

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.

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 40 Tire Tread Depth

	Standard	Service Limit
Front	8 mm	2 mm
Rear	7.5 mm	2 mm

RIM, SPOKES

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

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. 271 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 and 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 41 Rim, Spoke Size

	Rim	Spokes	
		Inner	Outer
Front	1.60 x 19	#10 x 185.5 x 99°	#10 x 185.0 x 89°
Rear	1.60A x 18W	#10 x 171.5 x 100°	#10 x 171.0 x 88°

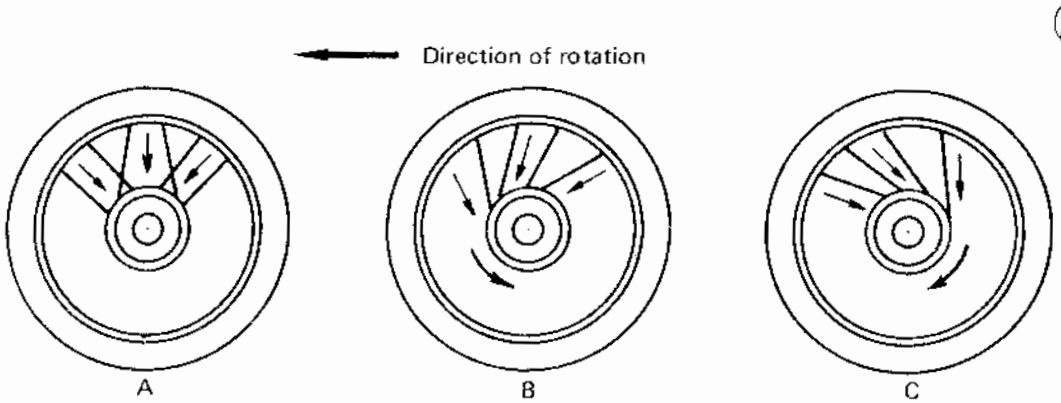
NOTE: The rim size in Table 41 is outer width by diameter, both in inches. The "W" means that the rim is welded. The spoke size is diameter number by length in milimeters. The two numbers for diameter size mean that each spoke has two diameters. To make the spoke more resistant to breakage, the diameter is greater near the hub.

Spoke breakage

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

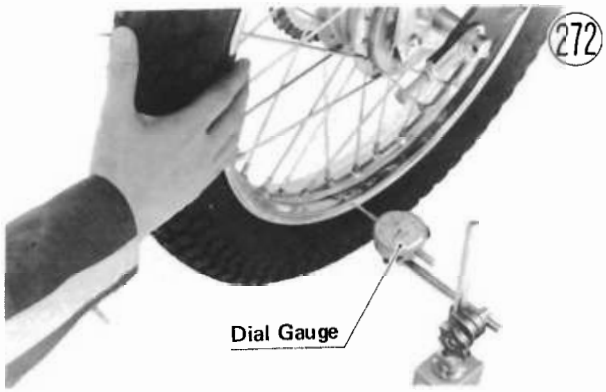
Periodically check that all the spokes are tightened evenly since they stretch a certain amount during use. Standard spoke tightening torque is 0.2 ~ 0.4 kg-m (17 ~ 35 in-lbs). Over or under tightening may cause breakage.

Spoke Force



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.



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.

Table 42 Rim Runout

	Standard	Service Limit
Axial	under 0.5 mm	2.0 mm
Radial	under 0.8 mm	2.0 mm

A certain amount of rim warp (runout) can be corrected by recentering the rim, that is, loosening some spokes and tightening 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 replace the axle.

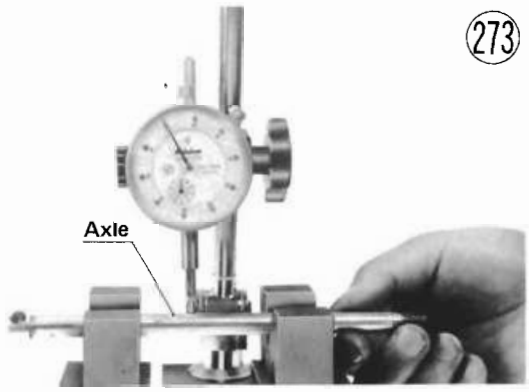


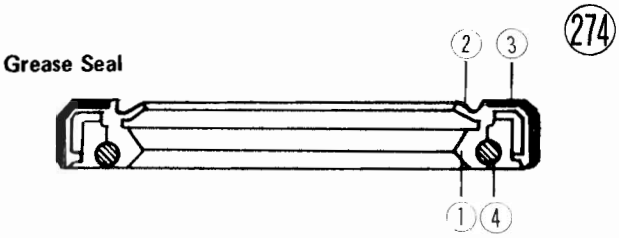
Table 43 Axle Runout/100 mm

	Standard	Service Limit
Front	0.1 mm	0.2 mm
Rear	0.05 mm	0.2 mm

GREASE SEALS, WHEEL BEARINGS

A grease seal is fitted in 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

Table 44 Wheel Bearings

	Front Wheel		Rear Wheel		
	Hub Left	Hub Right	Coupling	Hub Left	Hub Right
Bearing	6300Z	6200	6203	6201	6301Z
Grease Seal	92050-002	92050-003	92052-003	—	—

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 a high flash point solvent of some kind, dry it (do not spin it while it is dry), and oil it. Spin it by hand to check its condition. If it is noisy, does not spin smoothly, or has any rough spots, it must be replaced. If the same bearing is to be used again, re-wash it with a high flash point solvent of some kind, dry it, and pack it with good quality bearing grease before installation. Turn the bearing around by hand a few times to make sure the grease is distributed uniformly inside the bearing, and wipe the old grease out of the hub before bearing installation. Clean and grease the wheel bearings and the front hub gear box (speedometer gear) in accordance with the periodic maintenance chart (Pg. 118).

BRAKES

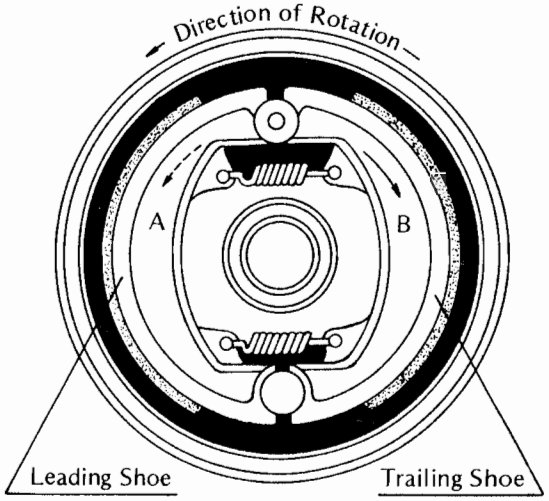
The front and rear wheels are both equipped with a leading-trailing type of drum brake. "Leading-trailing" means that one of the two brake shoes leads, expanding against the drum in the direction of drum rotation, and the other shoe trails, expanding in the direction opposite drum rotation.

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.

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 in accordance with the periodic maintenance chart (Pg. 118).

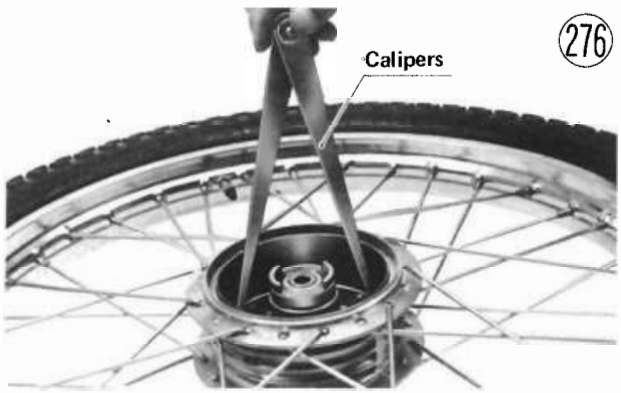
Brake (275)



Brake drum wear

It is extremely difficult to find a place that will turn a drum for a motorcycle with the rim spoked up.

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.



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Table 45 Brake Drum Inside Diameter

	Standard	Service Limit
Front	110.000~110.087 mm	110.75 mm
Rear	110.000~110.087 mm	110.75 mm

Brake shoe lining wear

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

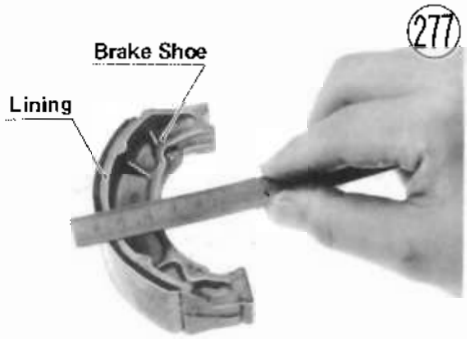


Table 46 Brake Thickness

	Standard	Service Limit
Front	3 mm	1.5 mm
Rear	3 mm	1.5 mm

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.

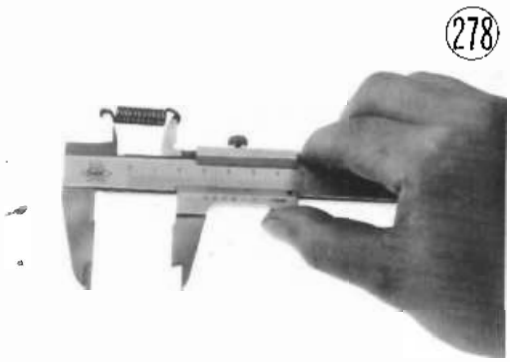


Table 47 Brake Spring Free Length

Standard	Service Limit
30.8~31.2 mm	34 mm

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.

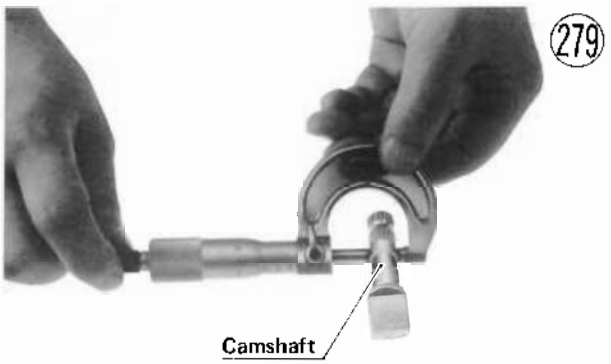


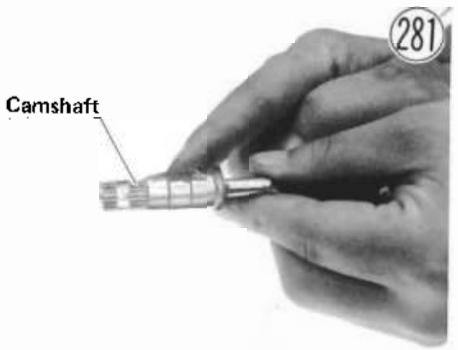


Table 48 Brake Camshaft, Hole Diameter

	Standard	Service Limit
Camshaft	11.957 ~ 11.984 mm	11.83 mm
Shaft Hole	12.000 ~ 12.027 mm	12.18 mm

Lubrication

Every time that the brakes are disassembled, and in accordance with the periodic maintenance chart (Pg.118), 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.





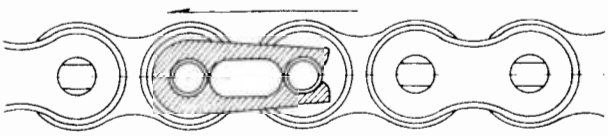
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DRIVE CHAIN

The drive chain used to transmit the engine power to the rear wheel is the Enuma EK428-G (110 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 link is fitted with the closed end of the "U" clip pointed in the direction of chain rotation. See Fig. 283.

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Direction of Chain Rotation



Chain construction is shown in Fig. 285. 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.

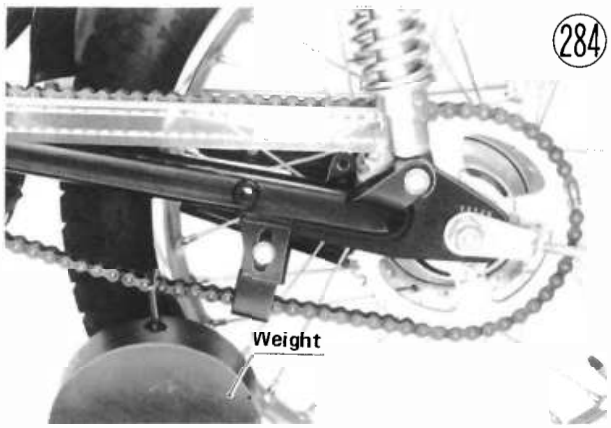
The rate of wear can be greatly reduced, however, by frequent and adequate lubrication, especially between the side plates of the links so that oil can reach the pins and bushings inside the rollers.

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 them 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 using the chain adjusters, 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-G (110 link) chain, and for maximum strength and safety only this chain must be used for replacement.



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Table 49 Drive Chain Length

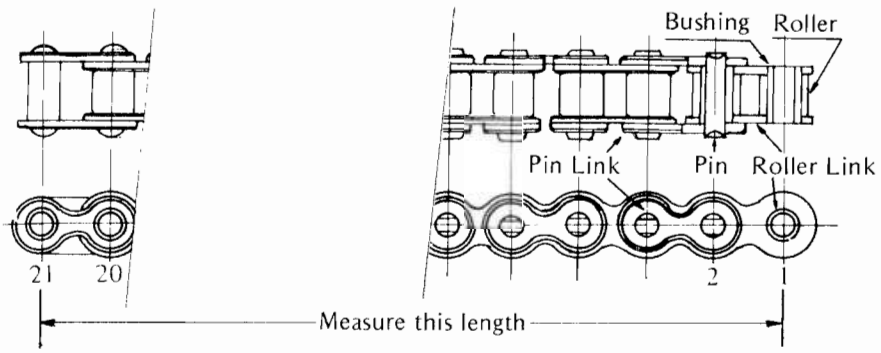
	Standard	Service Limit
20-link Length	254 mm	259 mm

Lubrication

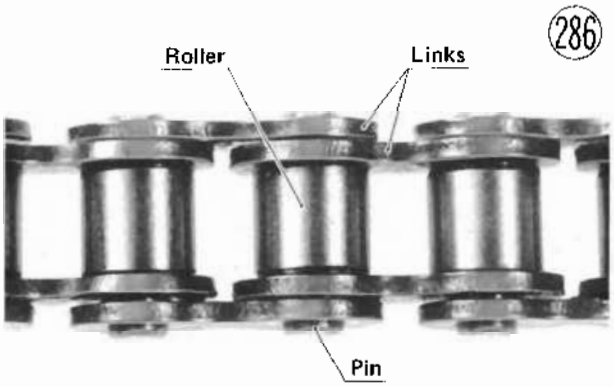
In order for the chain to function safely and wear slowly, it should be properly lubricated in accordance with the periodic maintenance chart (Pg. 118). Lubrication is also necessary after riding through rain or on wet roads, or any time that the chain appears dry.

Drive Chain

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Anytime that the motorcycle including the chain has been washed, the chain should be adequately lubricated immediately 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 preferrable over 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

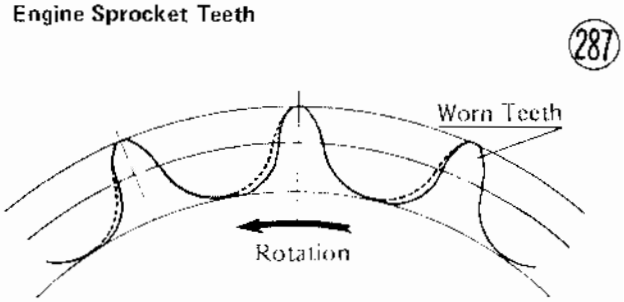
There are two sprockets for the drive chain. A forward sprocket, or engine sprocket, is mounted on the end of the output shaft and is used to drive the chain. A rear sprocket is connected to the rear wheel hub and is driven by the chain to turn the rear wheel.

Sprockets that have become excessively worn cause noise 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 traveling 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.

Engine Sprocket Teeth



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.



Table 50 Sprocket Diameter

	Standard	Service Limit
Engine	52.05~52.25 mm	51.7 mm
Rear	161.15~161.45 mm	159 mm

Rear sprocket warp

Elevate the rear wheel so that it will turn freely, and set a dial gauge against the rear sprocket near the teeth as shown in Fig. 289. Rotate the rear wheel. This 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.

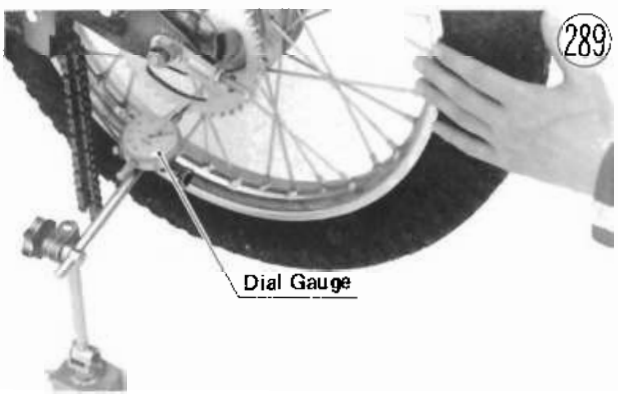


Table 51 Rear Sprocket Warp

Standard	Service Limit
under 0.3 mm	0.5 mm

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. 47), 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.

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 52 Bearing Specifications

	Size	Number
Upper	$^{3}/_{16}$"	23
Lower	$^{3}/_{16}$"	23

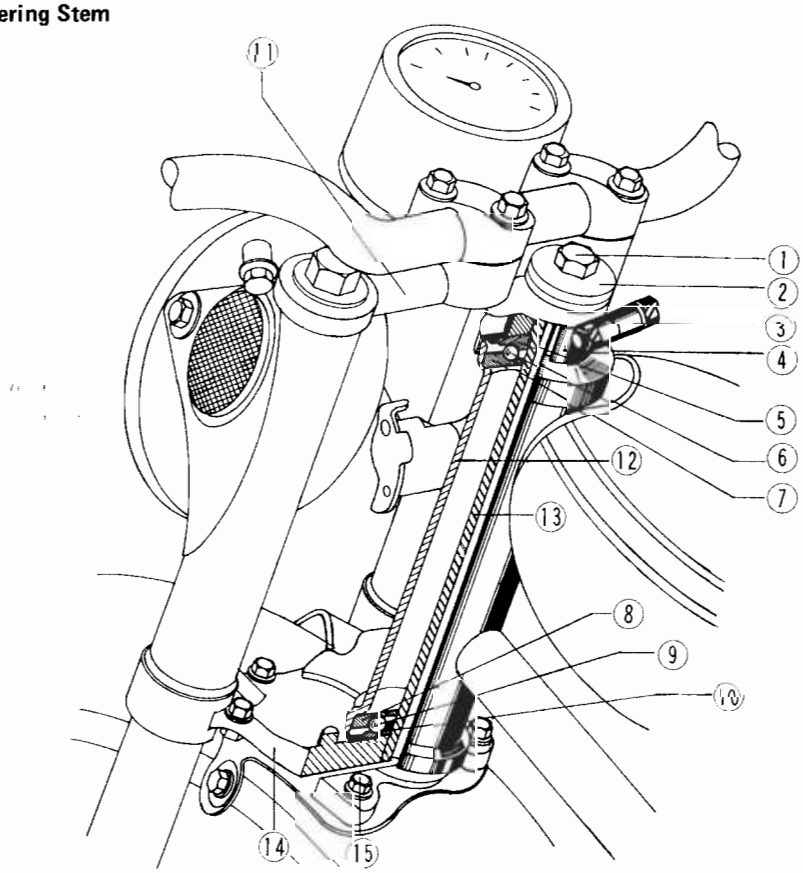
Steering stem warp

Examine the steering stem, and replace it if it is bent.

Bearing wear, damage

Wipe the bearings clean of grease and dirt, and examine the races and balls. If the balls or races are worn, or if either race is dented, replace both races and all the balls for that bearing as a set.

Steering Stem



1. Stem 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. Bolt

Bearing lubrication

In accordance with the periodic maintenance chart (Pg. 118), and whenever the steering stem is disassembled, the steering stem bearings should be relubricated.

Wipe all the old grease off the races and balls, washing them in a high flash point solvent of some kind 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.

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Grease seal deterioration, damage

Inspect the grease seal for any signs of deterioration or damage, and replace it if necessary.

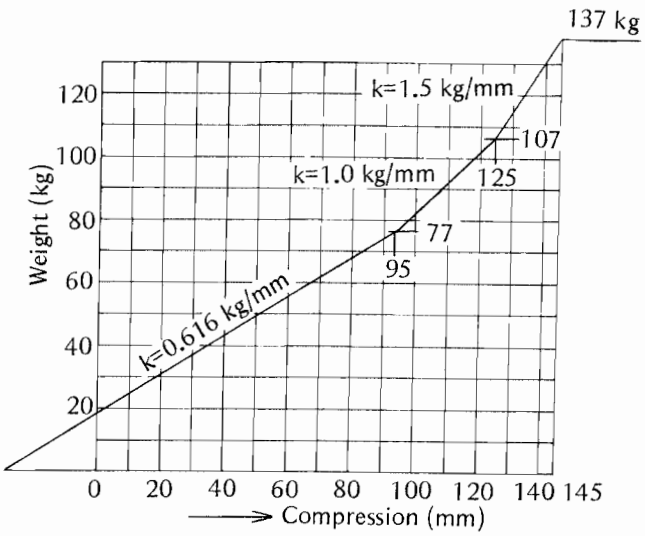
Replace the grease seal with a new one whenever it has been removed. The grease seal comes off whenever the lower bearing inner race is removed.

FRONT FORK

The front fork consists of two shock absorbers connected to the frame head pipe by the steering stem and the stem head bracket. It accomplishes shock damping through spring action, air compressing in the inner tube, and resistance to the flow of the oil forced into the inner tube by tube movement.

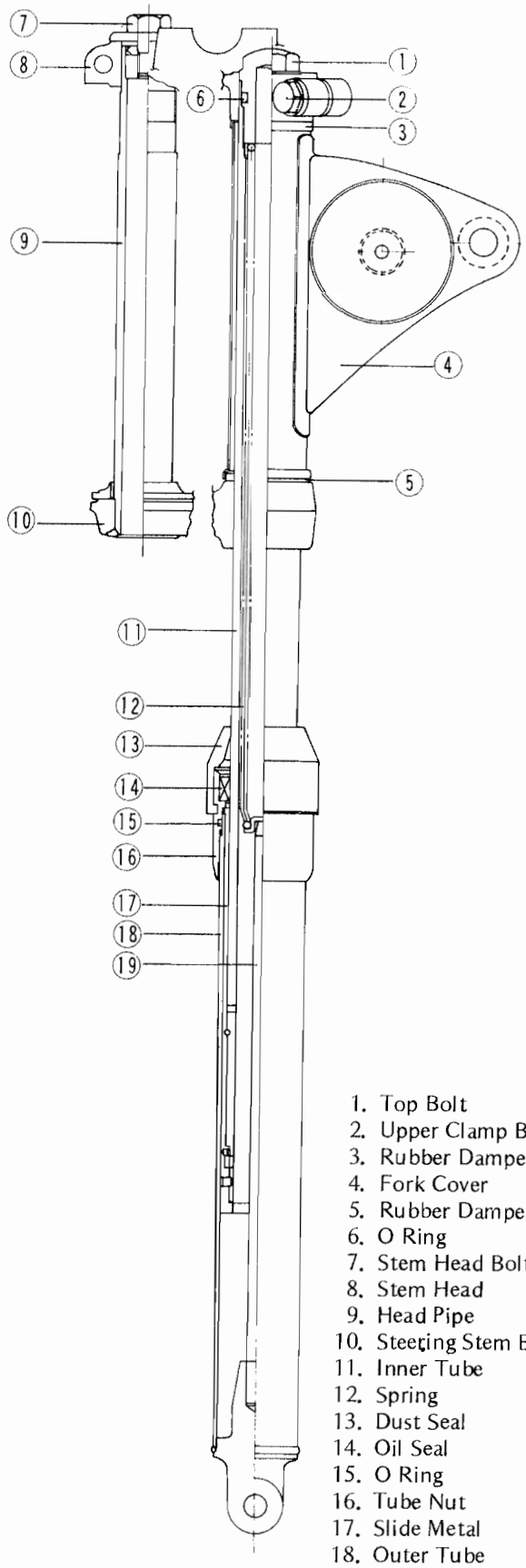
Front Spring Force

(293)



Front Fork

(294)



1. Top Bolt
2. Upper Clamp Bolt
3. Rubber Damper
4. Fork Cover
5. Rubber Damper
6. O Ring
7. Stem Head Bolt
8. Stem Head
9. Head Pipe
10. Steering Stem Base
11. Inner Tube
12. Spring
13. Dust Seal
14. Oil Seal
15. O Ring
16. Tube Nut
17. Slide Metal
18. Outer Tube
19. Spring Holder

Each shock absorber is a telescopic tube including an inner tube, outer tube, spring and oil seal. The spring supplies most of the damping during the compression stroke.

A nut containing an oil seal is screwed onto the outer tube.

Oil is prevented from leaking out by the oil seal, which is fitted at the upper end of the tube nut. A dust seal 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, compressing both the spring 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 outer tube, and draws in oil from a diminishing chamber (lower chamber) formed in the bottom of the outer tube through the inner tube orifice. Near the end of the compression stroke, the clearance between the lower end of the inner tube and the tapered out bottom of the outer tube approaches zero. The resulting resistance to the flow of oil through this small space slows the downward movement, finally forming an oil lock to finish the compression stroke.

Extension stroke

Following the compression stroke is the extension stroke, in which the inner tube is pushed back out by the compressed spring. As the tubes move apart, the chamber between the outer and inner tubes grows smaller, forcing the oil through the inner tube oil orifice. This small hole resists the oil flow into the inner tube, damping fork extension.

Near the end of the extension stroke, the orifice slides into the slide metal, which forms an oil lock 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 in accordance with the periodic maintenance chart (Pg. 118), 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

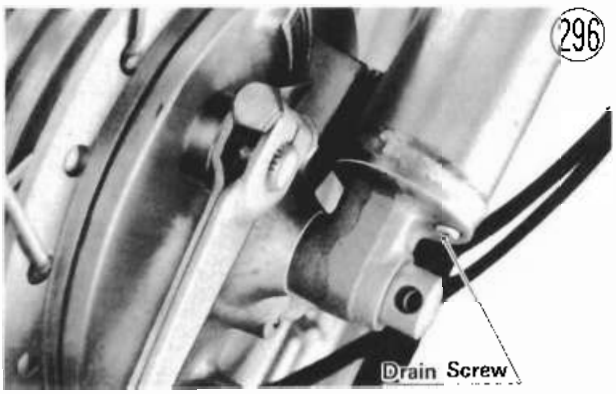
To check the fork oil level, first place a jack or stand under the engine so that the front wheel is raised off the ground. Remove the top bolt from the inner tube. Insert a rod down into the tube, and measure the distance from the top of the tube to the oil level. If the oil is below the correct level, add enough oil to bring it up to the proper level, taking care not to overfill.



Table 53 Fork Oil

Type	Amount per Side	Oil Level from Top of Inner Tube
SAE 10W	170~178 cc	395 mm

To drain out the old oil, remove the drain screw 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 screws, 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 (11.0 ~ 14.5 ft-lbs) of torque.

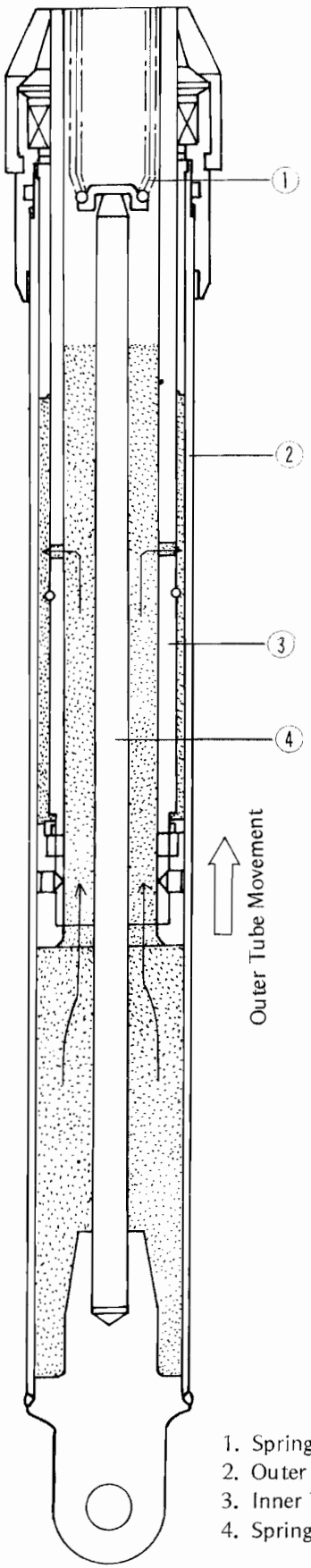


Spring tension

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.

Compression Stroke

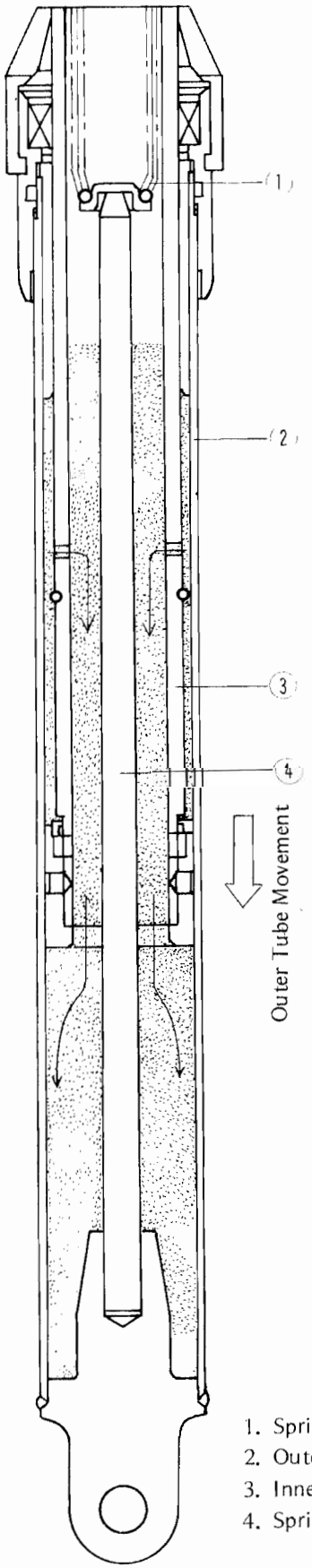
297



1. Spring
2. Outer Tube
3. Inner Tube
4. Spring Holder

Extension Stroke

298



1. Spring
2. Outer Tube
3. Inner Tube
4. Spring Holder



Table 54 Fork Spring Free Length

Standard	Service Limit
405 mm	395 mm

Inner tube damage

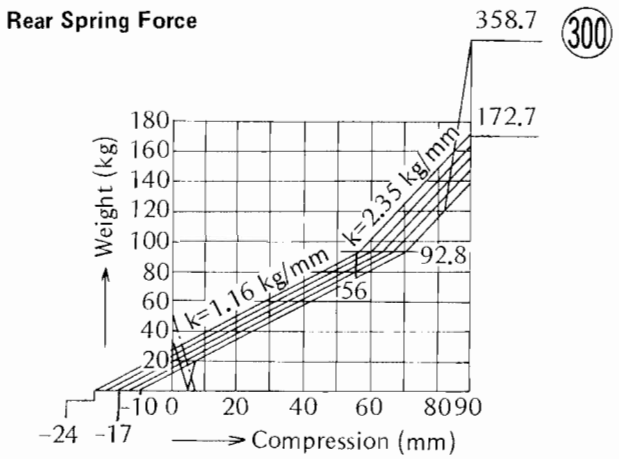
Visually inspect the inner tube, and repair any damage. If the damage is not repairable, replace the inner tube. Since damage to the inner tube damages the oil seal, replace the oil seal whenever the inner tube is repaired or replaced.

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, motorcylce instability at high speeds may result.

Shock absorber spring force for the 5 different setting is shown in the graph.



Bushings

Check the rubber bushings, and replace any that are worn, cracked, hardened, or otherwise damaged.

SWING ARM

The swing arm is designed to work with the shock absorbers to dampen the shock to the frame from the rear wheel. The rear of the swing arm is connected to the frame by the rear shock absorbers, while the front end through rubber dampened bushes 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.

Each bush consists of rubber cemented between steel sleeves. The outer sleeve is press fitted to the swing arm, and the inner sleeve is fitted around the pivot shaft and pressed against the frame. The movement of the swing arm in relation to the frame is permitted by the elasticity of the rubber.

Since the pivoting of the swing arm depends on the bush rubber, there are no wearing parts requiring lubrication. However, as the rubber deteriorates and loses its resiliency, a resulting looseness between the swing arm and the pivot shaft will adversely affect motorcycle stability.

Bushes

Visually inspect the bushes in the swing arm. If they are deteriorated or damaged, they must be replaced.

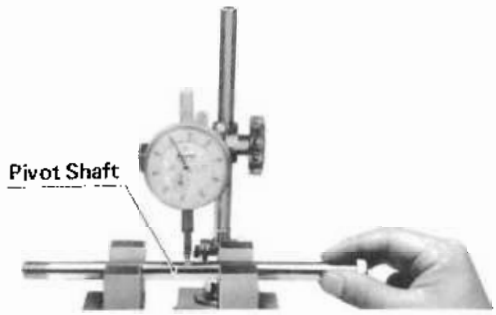
Pivot shaft

Check whether or not the pivot shaft is bent by placing it in two V blocks set 100 mm apart, setting a dial gauge to the shaft 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, replace the shaft.

Table 55 Pivot Shaft Runout

Standard	Service Limit
0.1 mm	0.2 mm

(301)



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. 23). Clean the baffle tube with a wire brush and by striking it gently, or by burning the carbon out. Also, examine the glass wool and remove some of the dirtiest part if it is especially dirty. If it is exceptionally dirty, wash it out in a high flash point solvent of some kind or replace it.

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.

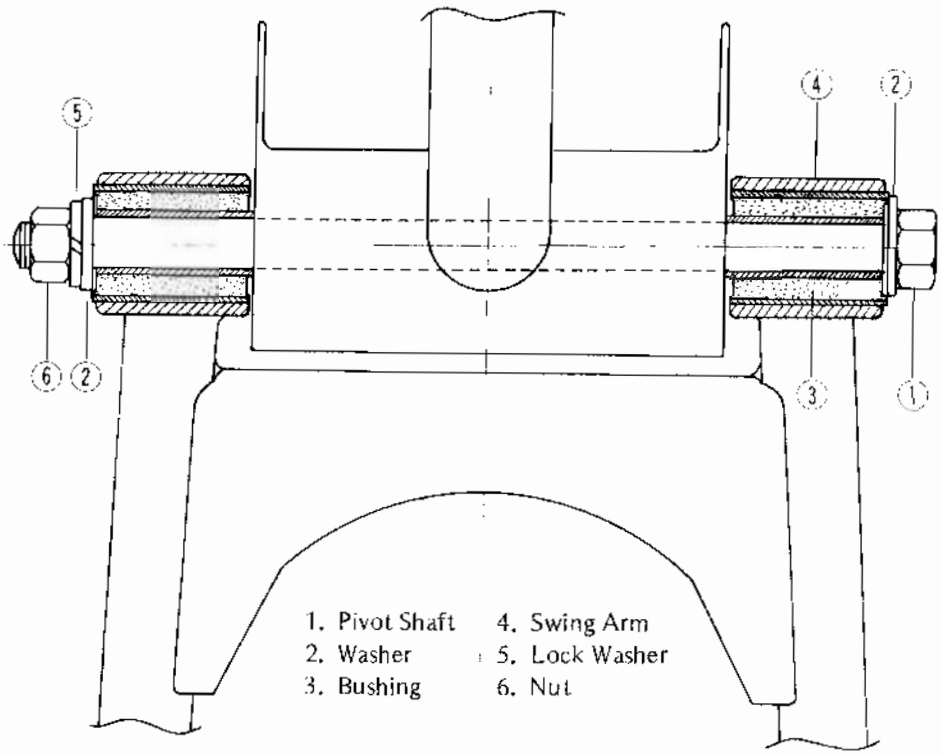
FLYWHEEL MAGNETO

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 is die cast with 6 permanent magnets 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 is 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. 303, 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.

Swing Arm

(302)



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

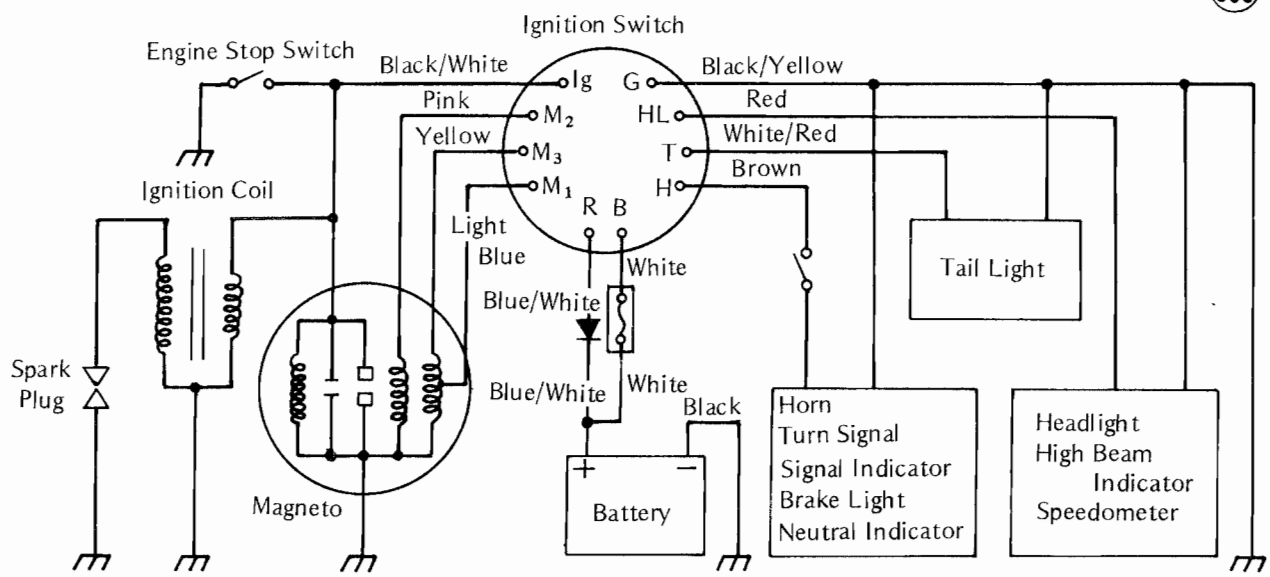
The ignition system shown in Fig. 304, consists of the spark plug (Pg. 109), contact breaker, condenser, ignition coil and ignition magneto coil. The flow of the electrical energy produced in the ignition magneto coil is broken up by the contact breaker and sent as a surge of current or pulse to the ignition coil, which acting as a pulse transformer steps up the voltage so 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. Howevever, (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 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. 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 increases 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 so that a spark of sufficient but not excessive strength will be produced.

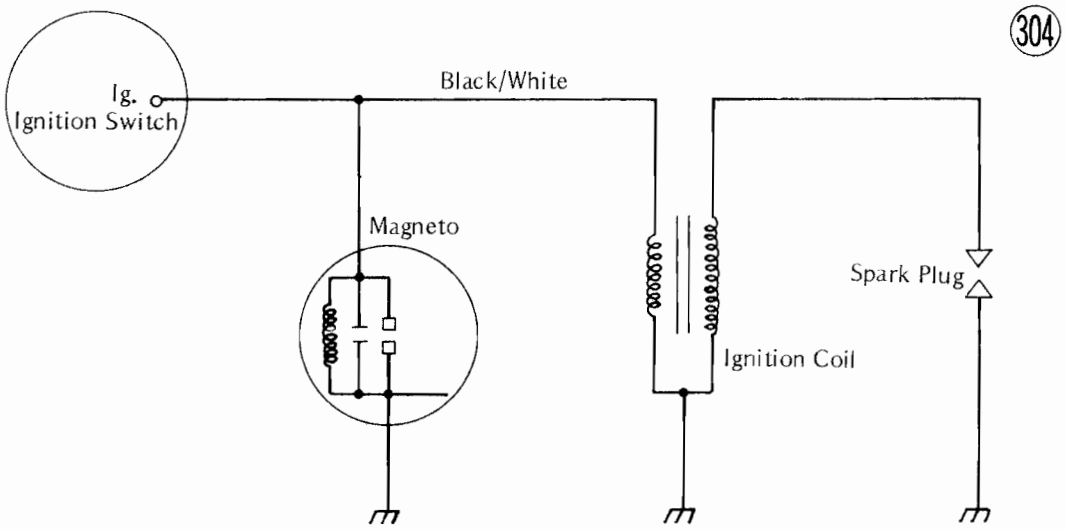
The single phase alternating current that is generated in the ignition magneto coil fluctuates as the flywheel rotates and increases with the rpm. In order to accommodate this current, the ignition system is designed so that, at the flywheel position where ignition takes place, the generated current 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.

Electrical Wiring

303

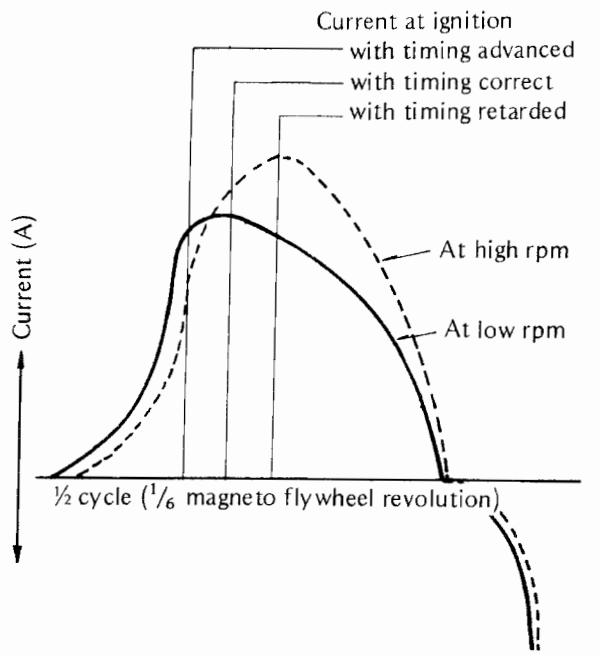


Ignition Circuit



The contact breaker consists of one fixed and one movable contact point. The movable point is pivoted, and the heel on one end is held against the cam surface on the 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.

Ignition Magneto Coil Current



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. In accordance with the periodic maintenance chart (Pg. 118), inspect the contact breaker, and repair or replace it 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.

In accordance with the periodic maintenance chart (Pg. 118), 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

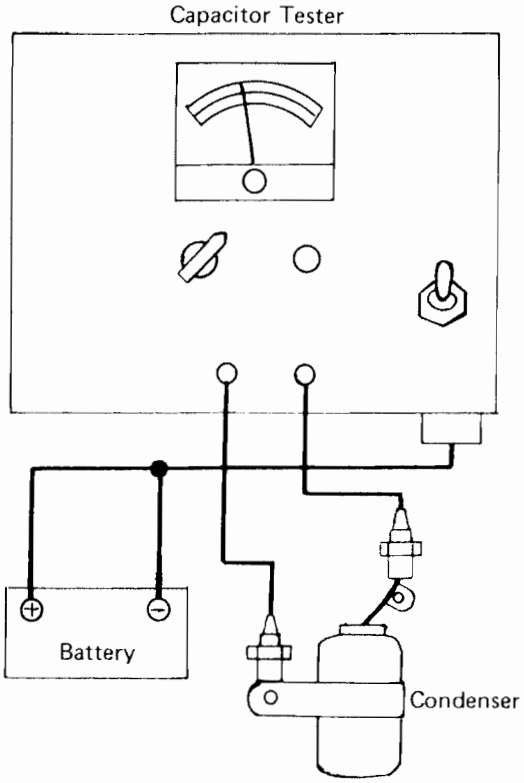
the contact breaker heel. Be careful not to apply so much grease that it can drop off or be thrown onto the points, which will cause the points to foul and burn.

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 ±0.03 μfd, 1,000 WVDC.

Condenser Test (307)



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 with the tester directions and should produce at least a 5 mm spark. Since an electro-tester 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 1.9 ~ 2.3 Ω. 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.

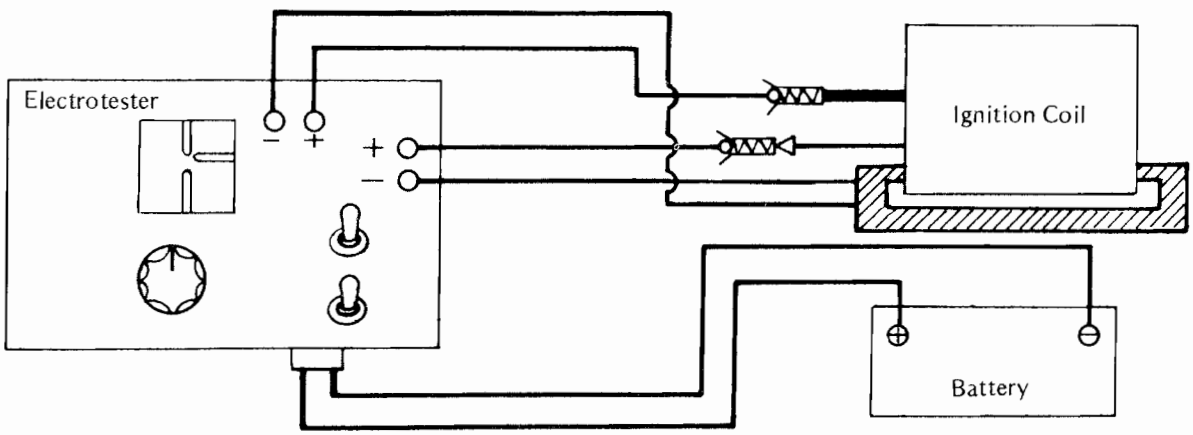
If the coil does not produce an adequate spark, or if either the primary or secondary winding does not have the correct resistance, replace the ignition coil.

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

Ignition Coil Test (308)



the resistance between ground and the magneto black lead. The proper value is between 1.3 ~ 1.5Ω.



If the resistance in this test is found to be less than the proper value, there is a short in the ignition magneto coil. No reading indicates an open. In either case, replace the ignition magneto coil. If, however, the coil checks out good, 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 DC circuit, while its light blue lead supplies the current for the daytime DC circuit. The lighting coil lead supplies the current for the AC 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 DC device, must be charged by the magneto, and AC generator; a rectifier (Pg. 107) must be included in the DC part of the lighting/charging system so that only direct current will flow in the lighting/charging coil and the DC lighting and charging circuits.

Daytime and nighttime DC	Nighttime lighting AC
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 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 current 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 current flow which 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 AC circuit be overloaded and burn out, but the increased resistance or break in the AC circuit will result in less or no current in the winding for the AC circuit. The drop in the flux opposition produced by the winding used for the AC circuit allows more flux in the flywheel magnetic field to cut through the winding used for the DC circuit. The resulting excess DC voltage will blow the fuse or overcharge the battery and burn out DC 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.

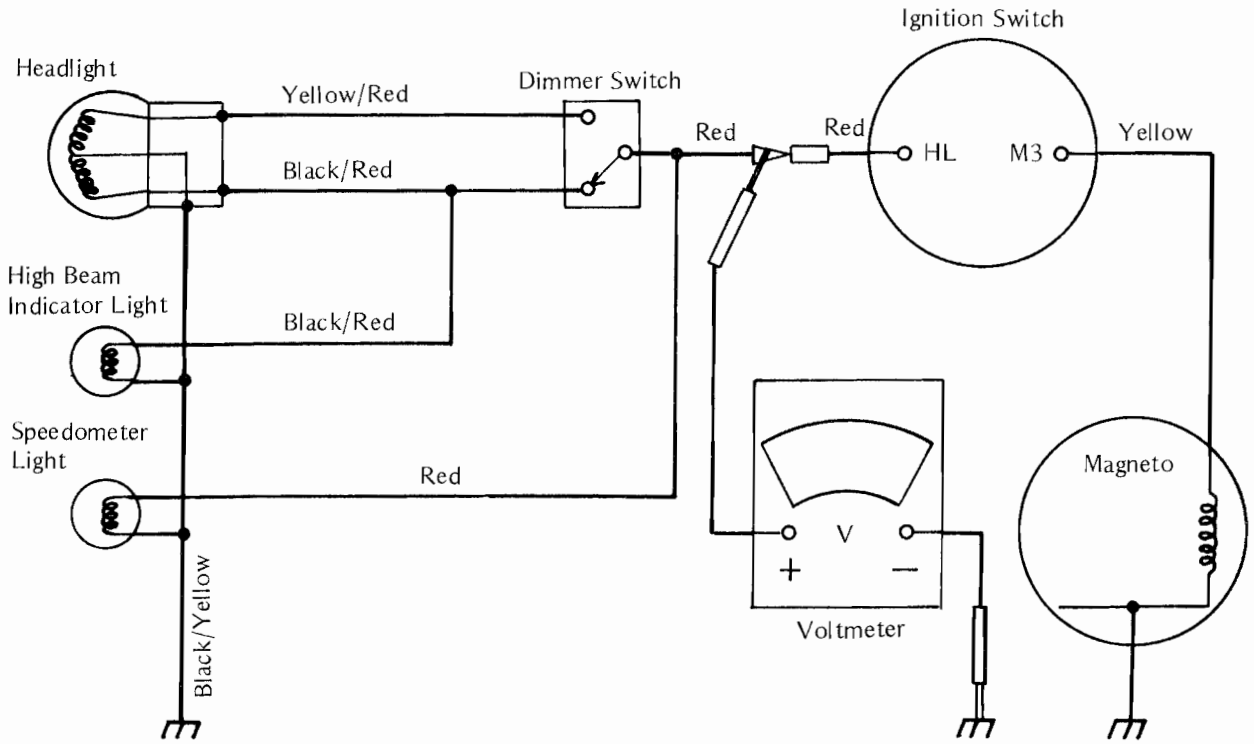
Lighting/charging coil and lighting coil

The condition of the coils is determined by measuring the voltage of the AC output and the voltage and amperage of the daytime and nighttime DC outputs. Before making this test, check the condition of the battery (Pg. 107) and the rectifier (Pg. 107). 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 shift pedal and left engine cover.
- Start the engine, and set the engine speed at 4,000 rpm.
- To measure the AC voltage produced by the magneto, first switch on the headlight, tail light, high beam

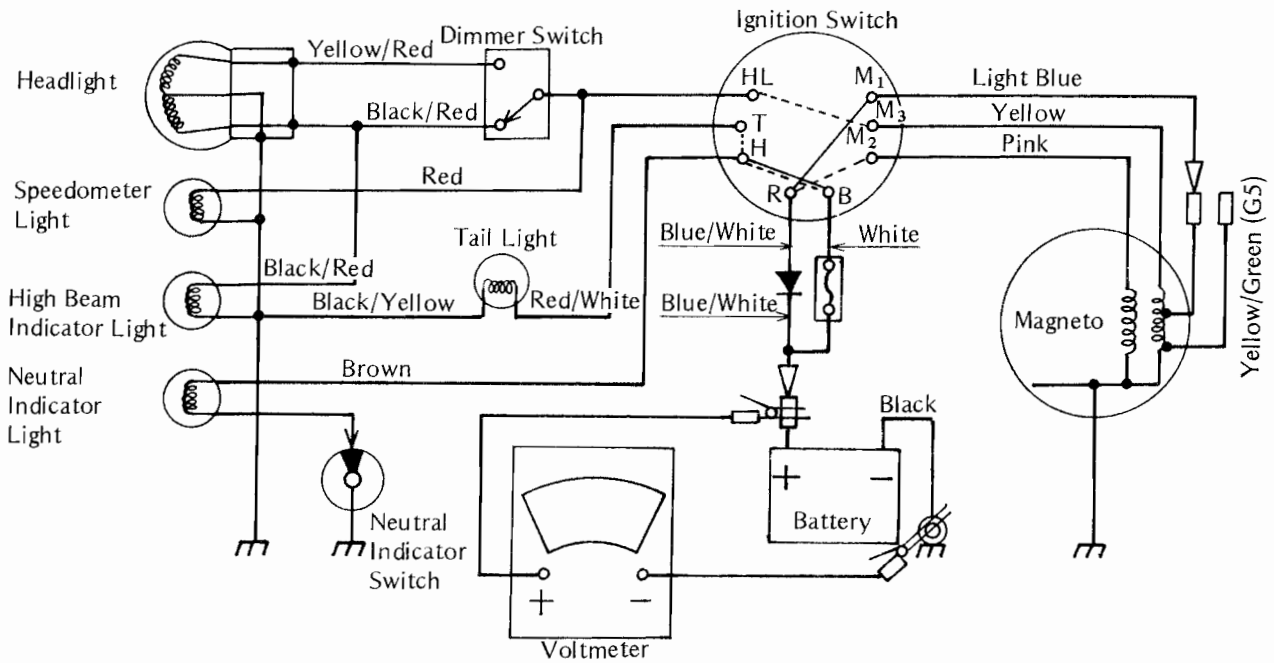
Lighting Voltage (AC Voltage)

310



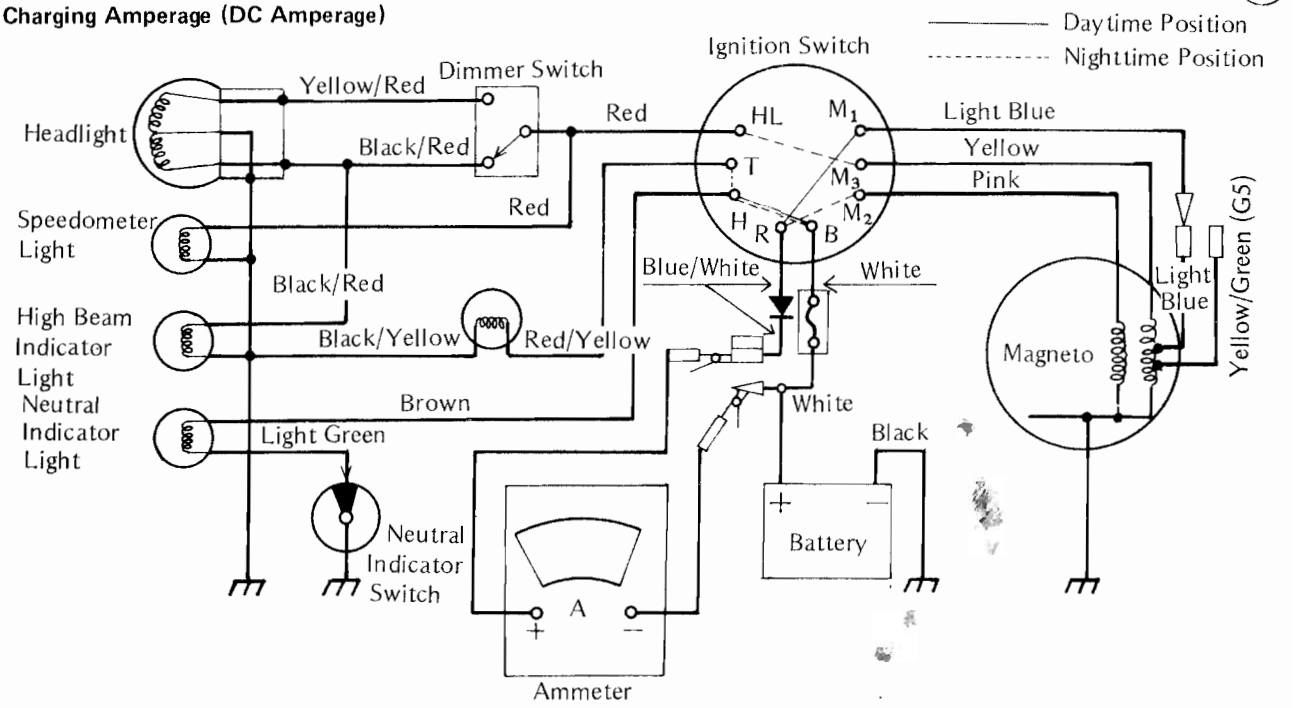
311

Charging Voltage (DC Voltage)



312

Charging Amperage (DC Amperage)



indicator 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 multimeter, set to 12 or 30 VAC, in parallel across the AC 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 6.5 ~ 7.1 VAC.
- Disconnect the meter leads.
- To measure the nighttime DC 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 ~ 8.9 VAC.
- 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 0.95 ~ 1.14 amps.
- 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, and tail light are all lit. The reading should be 0.4 ~ 0.6 amps. Turn off the engine.

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 0.21 ~ 0.25Ω and between ground and pink, 1.1 ~ 1.3Ω and between ground and yellow, 0.46 ~ 0.56Ω and between ground and yellow/green, 0.14 ~ 0.16Ω. 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.

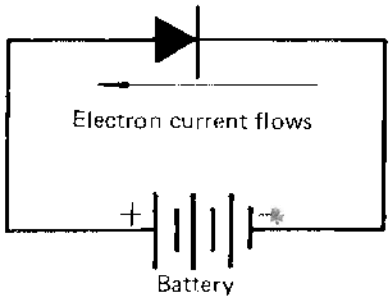
313



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 DC 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 (shorted) or not conduct at all (open).

Diode (314)

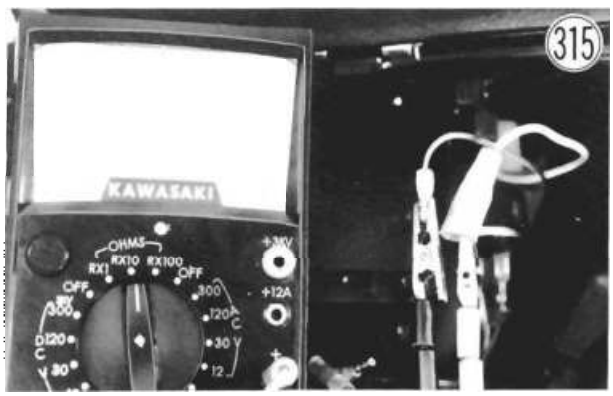


If the rectifier becomes defective, the battery will discharge. A defective rectifier can be readily detected with a resistance check.

NOTE: If the motorcycle is operated with the battery left unconnected, the rectifier will become damaged due to excessive inverse 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 ⅓ 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 backup 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.

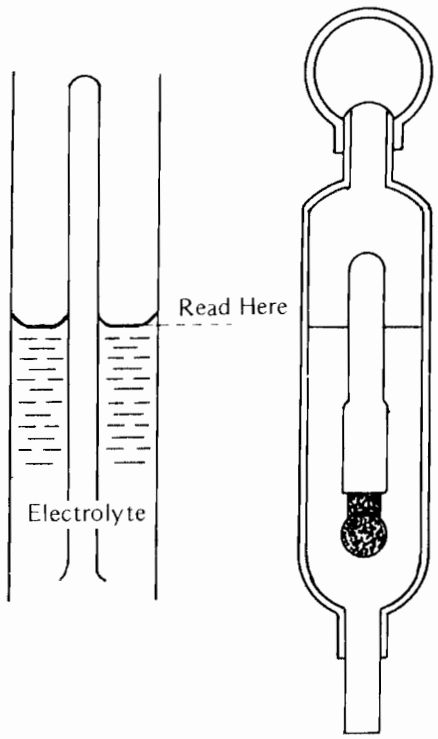
1. **When the level of the electrolyte in the battery is low, add only distilled water to each cell until the level is at the upper level line marked on the outside of the battery. Ordinary tap water is not a substitute for distilled water and will shorten the life of the battery. Distilled water comes 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. **DO NOT 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, and 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. 317 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

Hydrometer (316)



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

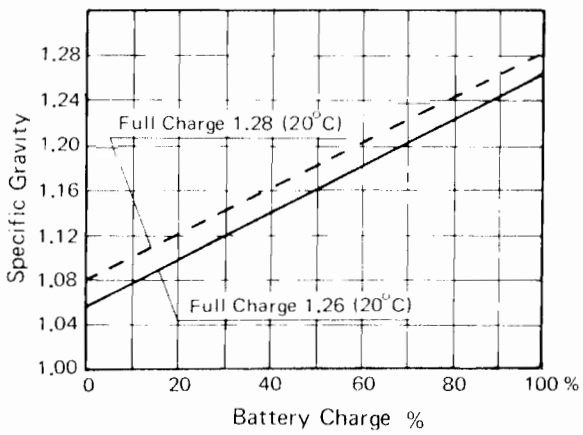
S_{20}=specific gravity at 20°C

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.

Specific Gravity/Battery Charge Relationship (317)



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 into it 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 $\frac{1}{10}$ 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.

Table 56 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	Fill and Test charge
Specific gravity	above 1.200 in all cells; no two cells more than 0.020 different.	below 1.100, or difference of more than 0.020 between two cells	Test charge

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. 356, 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 Table 55. The battery can be tested by charging it with an 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.

★ 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.

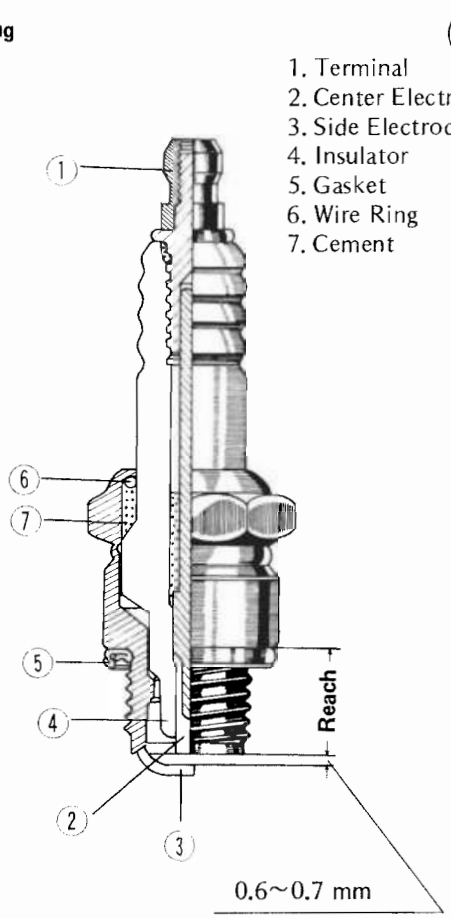
★ If a fully charged battery not in use loses its charge after 2 to 7 days, or if the specific gravity drops markedly, the battery is defective. The self-discharge rate of a good battery is only about 1% per day.

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.

Tests have shown the NGK B8HS, set to a 0.6 ~ 0.7 mm 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 with 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.

Spark 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 (750~1,450°F) and can be judged by noting the condition and color of the ceramic insulator around the center electrode. If the ceramic is clean and of a light brown color, the plug is operating at the right temperature.

A spark plug for higher operating temperatures is used for racing 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 as in 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, change to the "hotter" NGK B7HS. If the ceramic is burned white and the electrodes are burned, replace the plug with the "colder" NGK B9HS. 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 scraping off any deposits and cleaning the plug in a high flash point solvent of some kind. If the gap has widened, reset it to the standard 0.6~0.7 mm gap. If the electrodes are badly worn 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 B7HS, B8HS (standard), or B9HS, make sure that the replacement plug has the same:

(1)thread pitch
(2)reach (length of threaded portion must be 12.7 mm)

Spark Plug Condition

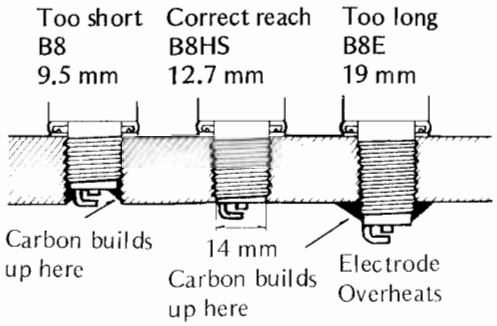


Carbon Fouling | Oil Fouling | Normal Operation | Overheating

(3)diameter (diameter at threads must be 14 mm).
(4)electrode configuration (standard, not projected insulator or racing)

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.

Plug Reach (320)



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 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 57 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 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.



HEADLIGHT CIRCUIT

The headlight circuit is shown in Fig. 322. When the engine is running and the ignition switch is turned to the nighttime position, the headlight circuit is completed, turning on the headlight and speedometer 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.

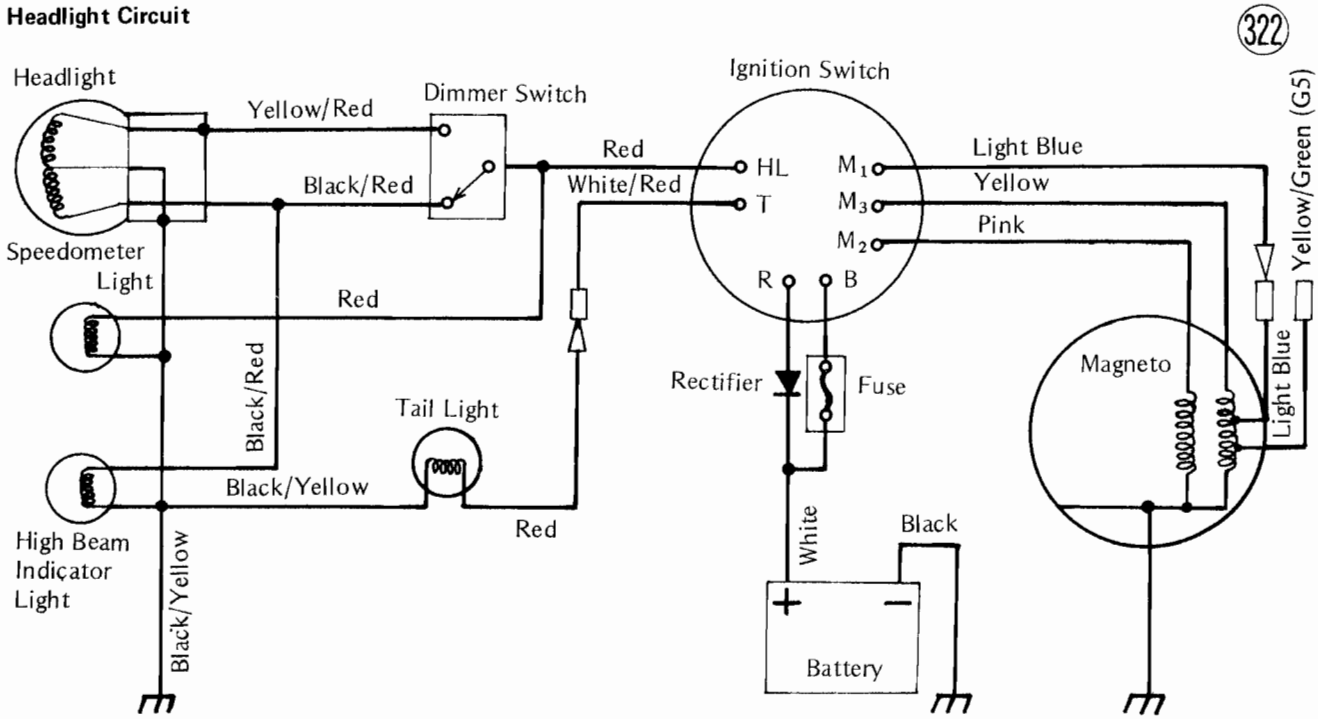
Headlight trouble

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 58 shows the connections in the dimmer switch for both high and low

Table 57 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



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 58 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.

BRAKE, TAIL LIGHT CIRCUIT

The brake and tail light circuit is shown in Fig. 324. 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.

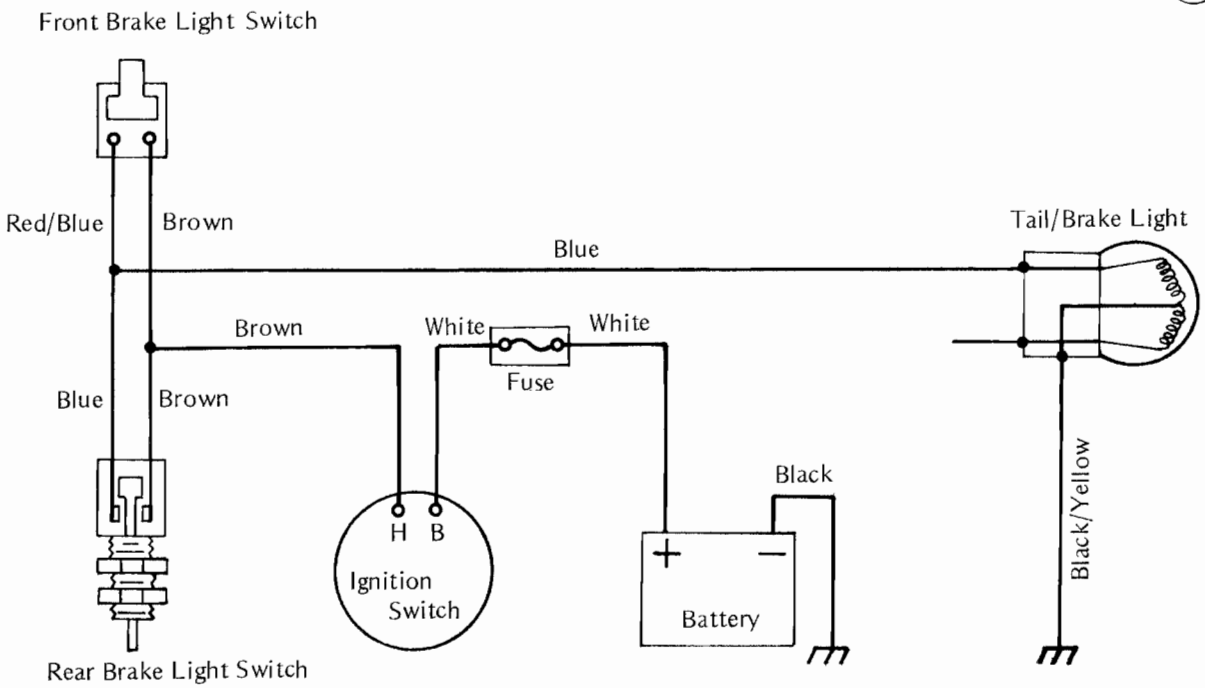
The front brake light switch, mounted on the front brake lever body is actuated when pressed by the front brake lever. The rear brake light switch is actuated when pulled on by the rear brake pedal. Both switches are a sealed plunger type of switch, which cannot be disassembled and must be replaced as 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. 16).

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

Brake Light Circuit



lever. The ohmmeter should read zero ohms. If it does not, replace the switch. If the switch checks out good but the brake light does not light, check the wiring.



To check the rear brake light switch, disconnect from under the oil tank 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

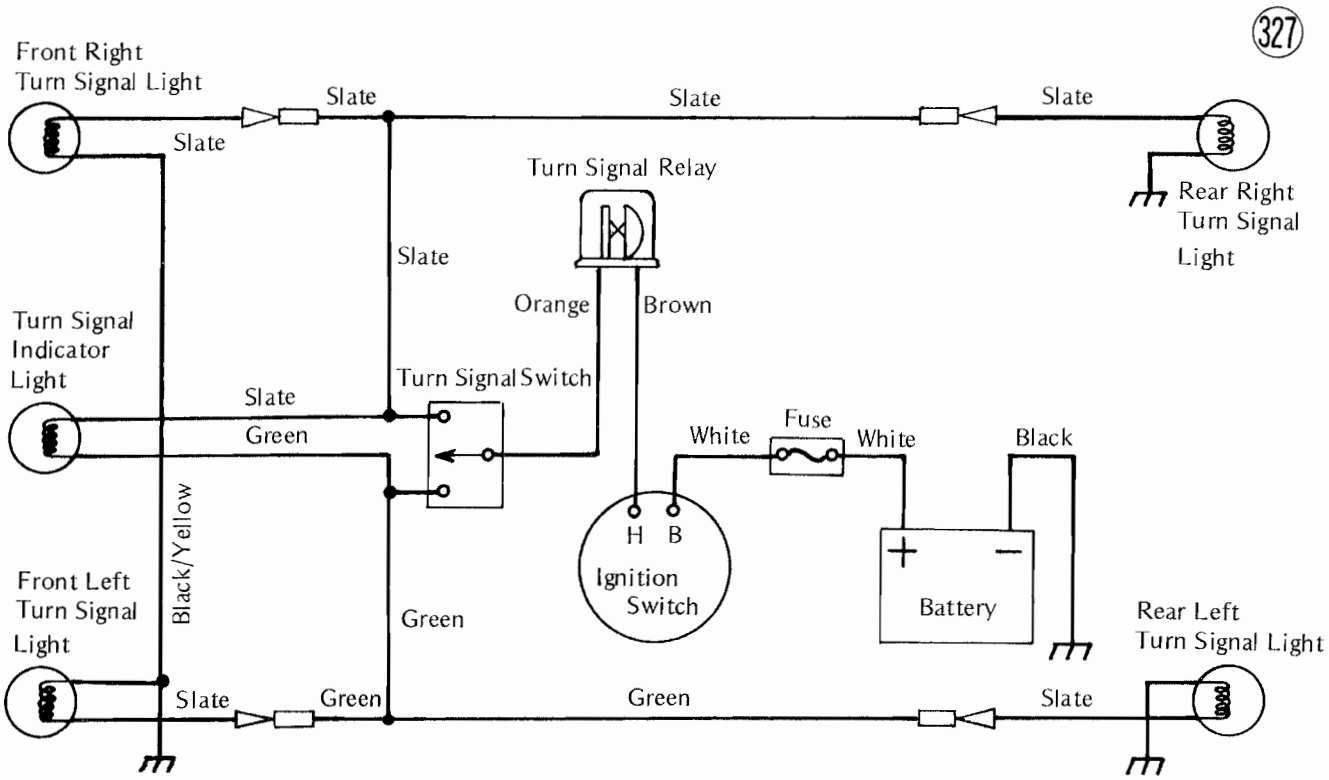
If the tail light does not go on when the ignition switch is turned to the nighttime position, the filament is probably burned out. However, if the bulb is good, check the wiring, ignition switch, fuse and battery.

TURN SIGNALS

A wiring diagram of the turn signal circuit is shown in Fig. 327. 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.



- 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. 331. 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.

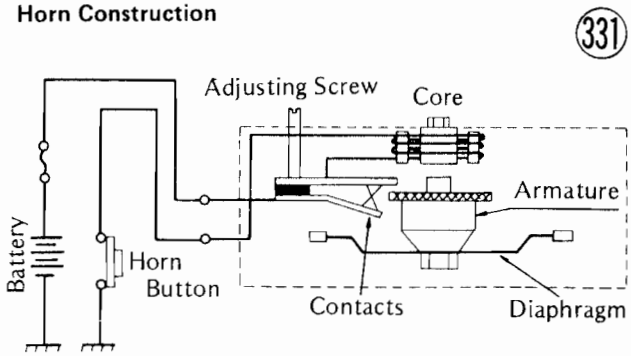
The contacts wear down after long use, requiring adjustment from time to time (Pg. 17). If the horn itself is determined to be at fault and adjustment fails to correct the trouble, the contacts or some other component in the horn is defective. The horn cannot be disassembled and must be replaced if defective.

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 horn armature mounting since doing so would alter the armature position such that the horn would probably have to be replaced.

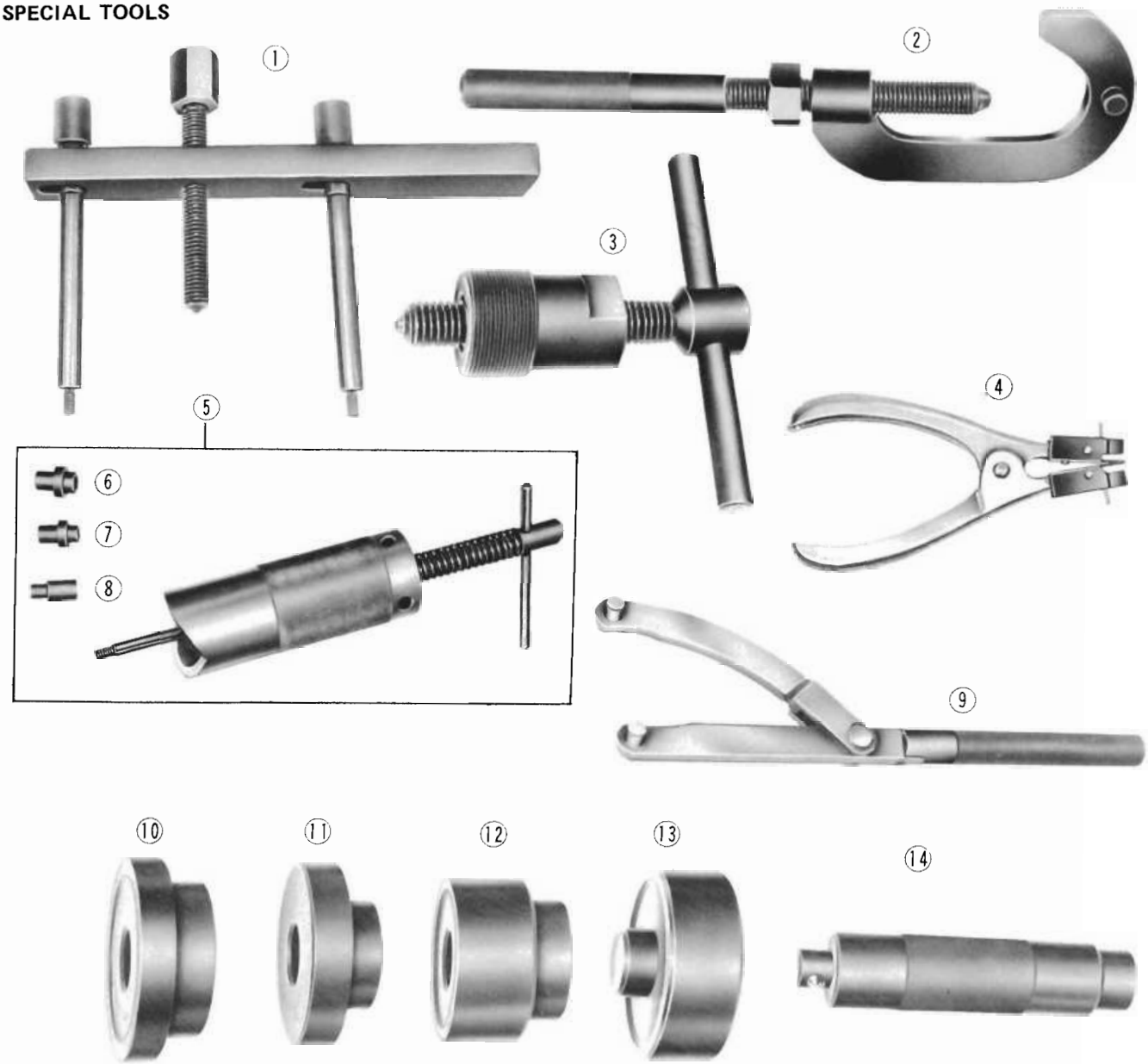
SPEEDOMETER

The speedometer is a sealed unit which cannot be disassembled. If it fails to work satisfactorily, it must be replaced as a complete unit.

The speedometer illumination light and the indicator light 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.	56019-040	ENGINE SPROCKET HOLDER
3.	57001-252	MAGNETO FLYWHEEL PULLER
4.	57001-115	PISTON RING PLIERS
5.	57001-910	PISTON PIN PULLER ASSEMBLY
6.	57001-914	PISTON PIN PULLER ADAPTER "C"
7.	57001-913	PISTON PIN PULLER ADAPTER "B"
8.	57001-912	PISTON PIN PULLER ADAPTER "A"
9.	57001-155	MAGNETO FLYWHEEL HOLDER
10.	57001-140	BEARING DRIVER
11.	57001-290	WHEEL BEARING DRIVER "C"
12.	57001-282	WHEEL BEARING DRIVER
13.	57001-291	STEERING STEM CAP DRIVER
14.	57001-139	BEARING DRIVER HOLDER

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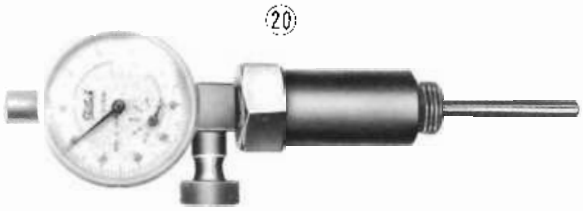
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REF. NO.	TOOL NO.	DESCRIPTION
15.	57001-194	FRONT FORK OIL SEAL DRIVER
16.	57001-144	OUTSIDE CIRCLIP PLIERS
17.	57001-137	STEM BEARING DRIVER
18.	57001-321	STEM NUT WRENCH
19.	57001-203	FUEL LEVEL GAUGE
20.	56019-029	TDC FINDER "A"
21.	57001-130	SHIFT SHAFT OIL SEAL GUIDE
22.	57001-264	SHIFT SHAFT OIL SEAL GUIDE
23.	57001-261	KICK SHAFT OIL SEAL GUIDE

PERIODIC MAINTENANCE

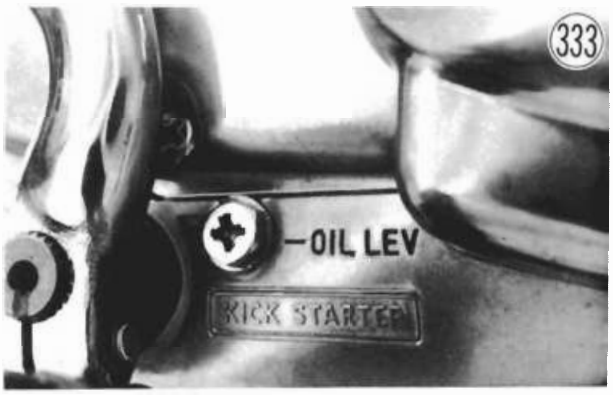
Operation \ Frequency	After initial 800 km	After initial 3,000 km	Every subsequent 3,000 km	Every subsequent 6,000 km	See Page
Change transmission oil	•	Every subsequent 5,000 km			119
Adjust brakes	•	•	•		14
Adjust drive chain	•	•	•		16
Check, adjust clutch	•	•	•		13, 73
Check, adjust carburetor and oil pump cables	•	•	•		9, 10
Check spoke tightness and rim runout	•	•	•		89
Tighten nuts and bolts	•	•	•		—
Clean fuel line	•	•	•		86
Clean, set spark plugs	•	•	•		13, 109
Check steering play	•			•	14
Adjust points, check timing	•	•	•		11
Clean air cleaner element		•	•		61
Carry out general lubrication		•	•		119
Check tire wear		•	•		88
Check drive chain wear		•	•		93
Lubricate drive chain	Every 300 km				93
Check brake wear	Every 6,000 km				91
Check front fork oil level	Every 6,000 km				96
Change air cleaner element	Every 10,000 km				61
Change front fork oil	Every 10,000 km				97
Regrease wheel bearings	Every 1 year or 10,000 km				90
Regrease brake camshaft	Every 1 year or 10,000 km				92
Lubricate steering stem bearings	Every 2 years or 20,000 km				96

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 chart. 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 level inspection screw from the lower part of the right engine cover.
- The oil level is correct if a small amount of oil comes out of the hole.



- If there is too much oil, remove the excess oil using a syringe or some other suitable device.
- If no oil comes out, add oil slowly through the oil filler opening until the level is up to the screw hole. 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.

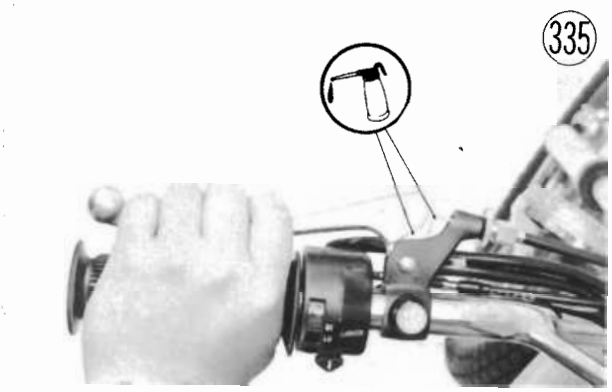


- After the oil has completely drained out, replace the drain plug and gasket, using a new gasket if the old one is deteriorated or damaged. Proper torque for the drain plug is 0.7 ~ 1.0 kg-m (61 ~ 87 in-lbs).
- Pour in through the oil filler opening in the right engine cover 0.6 ℓ of good quality SAE 10W30 or 10W40 motor oil.

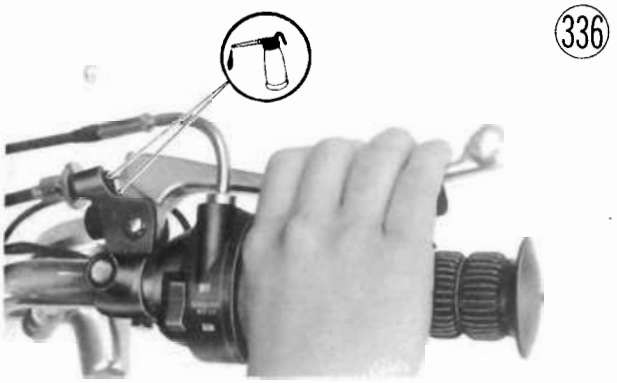
General lubrication

Exposed parts subject to rust should be lubricated with either SAE 30 motor oil or regular grease 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.

- 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.

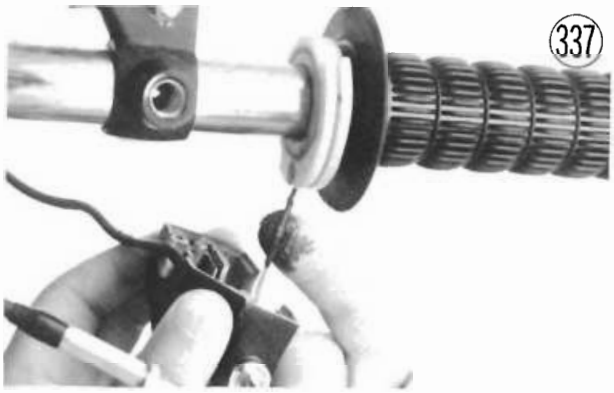


- Slide back the front brake lever dust cover.
- Lubricate the brake lever pivot and the exposed portion of the brake inner cable with SAE 30 motor oil.
- Secure the dust cover back into its original position.

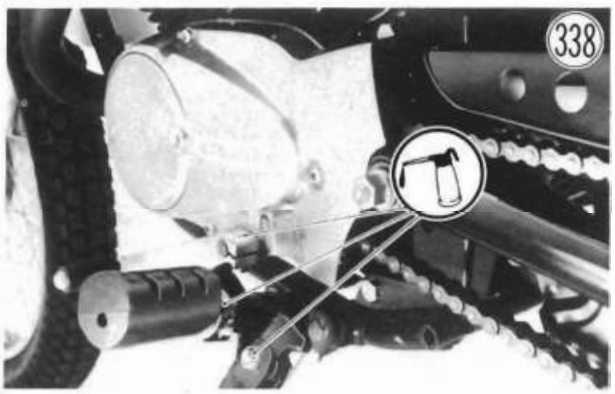


- Remove the engine stop switch assembly screws (2).
- Apply a light coat of grease to the exposed portion of the throttle grip inner cable.

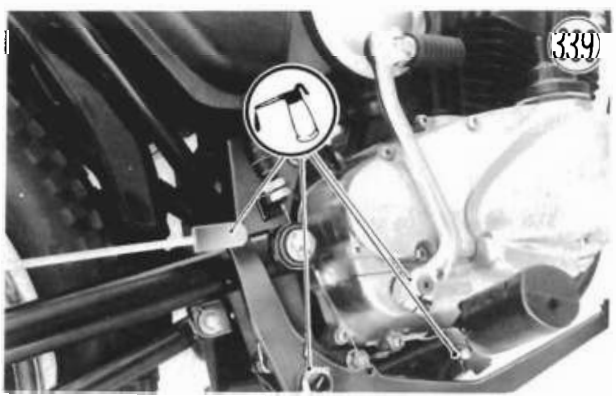
●Replace the engine stop switch assembly screws.



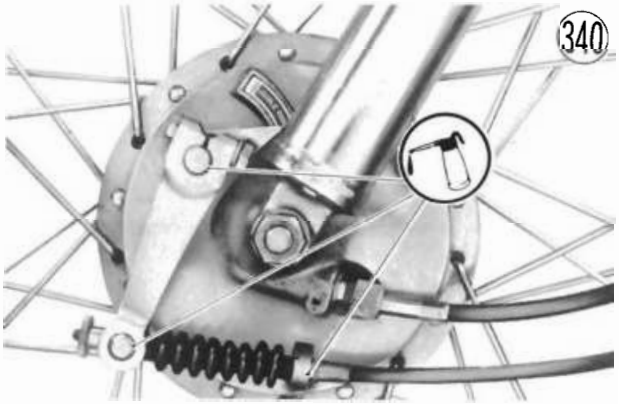
●Wipe off any dirt or grime from around the left footpeg, shift pedal, and side stand.
●Lubricate the exposed metal surfaces around the shift pedal serration and the bolts and nuts for the left footpeg and side stand.
●Wipe off excess lubricant.



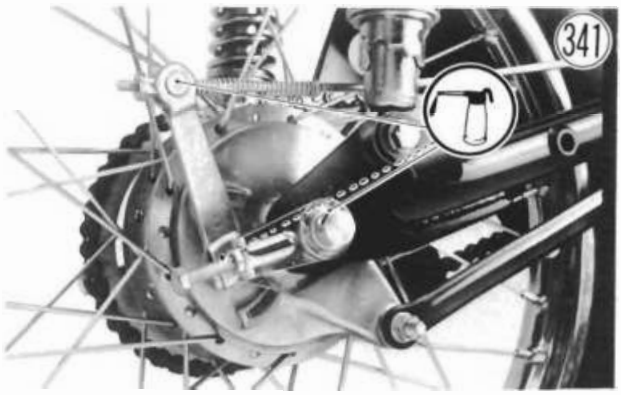
●Wipe off any dirt or grime from around the right footpeg, brake pedal and kick starter pedal.
●Lubricate the exposed metal surfaces around the bolts and nuts for the right footpeg, brake pedal and kick starter pedal.
●Wipe off excess lubricant.



●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 rod.
●Wipe off excess oil.



●Lubricate the front brake cable and clutch cable 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	See Pg.
Clutch Spring Bolts 5$^{\phi}$	0.4~0.5 kg-m	35~43 in-lbs	30
Cylinder Head Nuts 8$^{\phi}$	2.2 kg-m	16 ft-lbs	24,39,68
Engine Drain Plug	0.7~1.0 kg-m	61~87 in-lbs	119
Engine Mounting Nuts 10$^{\phi}$ (4)	2.6~3.5 kg-m	19~25 ft-lbs	22
Engine Sprocket Bolt 8$^{\phi}$	2.2~2.5 kg-m	16~18 ft-lbs	32,38
Front Axle Nut 10$^{\phi}$	3.4~4.6 kg-m	25~33 ft-lbs	44
Front Fork Clamp Bolts 8$^{\phi}$ (Upper)	1.6~2.2 kg-m	11.5~16.0 ft-lbs	56,59
Front Fork Clamp Bolts 10$^{\phi}$ (Lower)	2.6~3.5 kg-m	19~25 ft-lbs	14,56,59
Front Fork Top Bolts (2)	1.5~2.0 kg-m	11~14.5 ft-lbs	56,97
Handlebar Clamp Bolts 8$^{\phi}$	1.6~2.2 kg-m	11.5~16 ft-lbs	50
Magneto Flywheel Nut 10$^{\phi}$	5 kg-m	36 ft-lbs	33,38
Oil Hose Banjo Bolts (3)	0.4~0.5 kg-m	35~43 in-lbs	26
Primary Gear Nut 12$^{\phi}$	7.0~7.5 kg-m	51~54 ft-lbs	31,39
Rear Axle Nut 10$^{\phi}$	3.4~4.6 kg-m	25~33 ft-lbs	17,46
Rear Shock Absorber Nuts 12$^{\phi}$ (Upper)	2.6~3.5 kg-m	19~25 ft-lbs	60
Rear Shock Absorber Bolts 10$^{\phi}$ (Bottom)	2.6~3.5 kg-m	19~25 ft-lbs	60
Rear Sprocket Nuts 8$^{\phi}$ (4)	2.0~2.2 kg-m	14.5~16 ft-lbs	48
Spark Plug	2.5~3.0 kg-m	18~22 ft-lbs	11,13
Spokes	0.2~0.4 kg-m	17~35 in-lbs	49
Steering Stem Clamp Bolt 8$^{\phi}$	1.6~2.2 kg-m	11.5~16 ft-lbs	14
Steering Stem Head Bolt	3.0~3.5 kg-m	22~25 ft-lbs	14,59
Swing Arm Pivot Shaft Nut 10$^{\phi}$	4.0~6.0 kg-m	29~43 ft-lbs	60
Torque Link Nut 10$^{\phi}$	2.6~3.5 kg-m	19~25 ft-lbs	17,46,60
Steering Stem Nut	1.8~2.2 kg-m	13~16 ft-lbs	—

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. 121 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. 121. All of these values are for use with dry solvent cleaned threads.

Coarse threads

dia (mm)	pitch (mm)	kg-m	ft-lbs
5	0.90	0.35 ~ 0.50	2.5 ~ 3.5
6	1.00	0.6 ~ 0.9	4.5 ~ 6.5
8	1.25	1.6 ~ 2.2	11.5 ~ 16.0
10	1.50	3.1 ~ 4.2	22 ~ 30
12	1.75	5.4 ~ 7.5	39 ~ 54
14	2.00	8.3 ~ 11.5	60 ~ 83
16	2.00	13 ~ 18	94 ~ 130
18	2.50	18 ~ 25	130 ~ 181
20	2.50	26 ~ 35	188 ~ 253

Fine threads

dia (mm)	pitch (mm)	kg-m	ft-lbs
5	0.50	0.35 ~ 0.50	2.5 ~ 3.5
6	0.75	0.6 ~ 0.8	4.5 ~ 5.5
8	1.00	1.4 ~ 1.9	10.0 ~ 13.5
10	1.25	2.6 ~ 3.5	19.0 ~ 25
12	1.50	4.5 ~ 6.2	33 ~ 45
14	1.50	7.4 ~ 10.2	54 ~ 74
16	1.50	11.5 ~ 16	83 ~ 116
18	1.50	17 ~ 23	123 ~ 166
20	1.50	23 ~ 33	166 ~ 239

TROUBLESHOOTING GUIDE

Engine Doesn't Start; Starting Difficulty

Engine won't turn over
- Cylinder, piston seizure
- Connecting rod small end seizure
- Connecting rod big end seizure
- Transmission gear or crankcase bearing seizure
- Kickstarter return spring broken
- Pawl not engaging with ratchet

No fuel flow
- No fuel in tank
- Fuel tap turned off
- Fuel tap clogged
- Tank cap air vents obstructed
- 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

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 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
- Carburetor is attached loosely

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

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
- Contact breaker spring weak
- Condenser defective
- Ignition coil defective
- Ignition timing maladjusted

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
- Carburetor is attached loosely
- 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

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

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

Engin 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

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 viscocy too high
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
Shift drum broken

Jumps out of gear
Shift fork(s) worn
Gear groove (s) worn
Gear dogs, dog holes, and/or dog recesses worn
Shift drum groove(s) worn
Detent arm spring weak or broken
Shift fork guide 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
Connecting rod bent
Piston pin, piston holes worn

Other noise
Connecting rod small end clearance excessive
Connecting rod big end clearance excessive
Piston ring(s) worn, broken, or stuck
Piston seizure damage
Cylinder head gasket leaking
Exhaust pipe leaking at cylinder connection
Engine mounts loose
Crankshaft bearing worn

Abnormal Drive Train Noise

Clutch noise
Clutch housing/friction plate clearance excessive
Clutch housing gear/primary gear backlash
Clutch housing spring weak or broken
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
Pawl 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 or not baranced
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

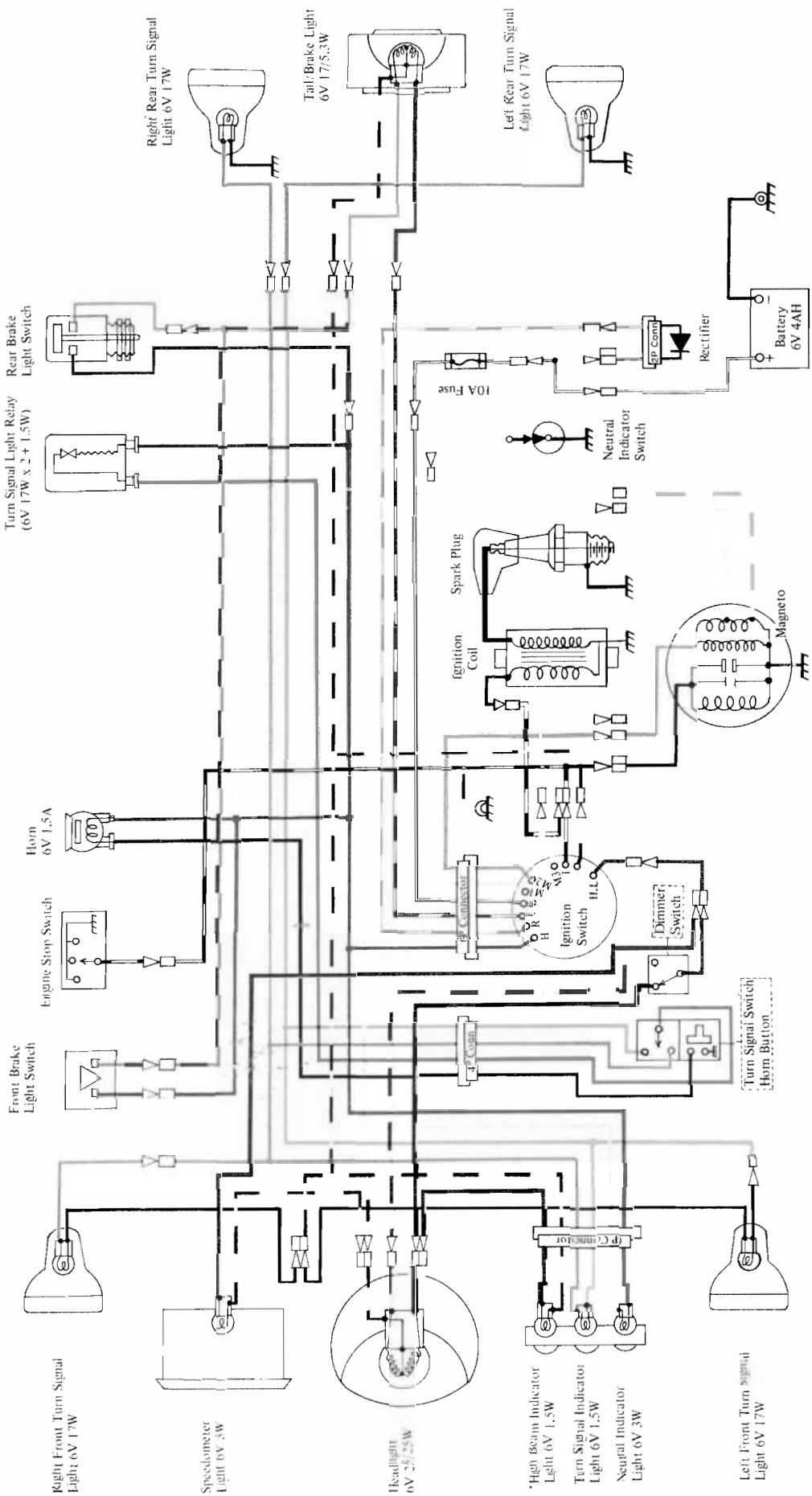
Battery faulty (e.g., plates sulfated, shorted through sedimentation, electrolyte level too low)
Battery leads making poor contact
Rectifier defective
Ignition switch defective
Load excessive (e.g., bulb of excessive wattage)
Flywheel magneto defective

Battery Overcharged

Open in Headlight 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 in troubleshooting 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.

G5 Wiring Diagram



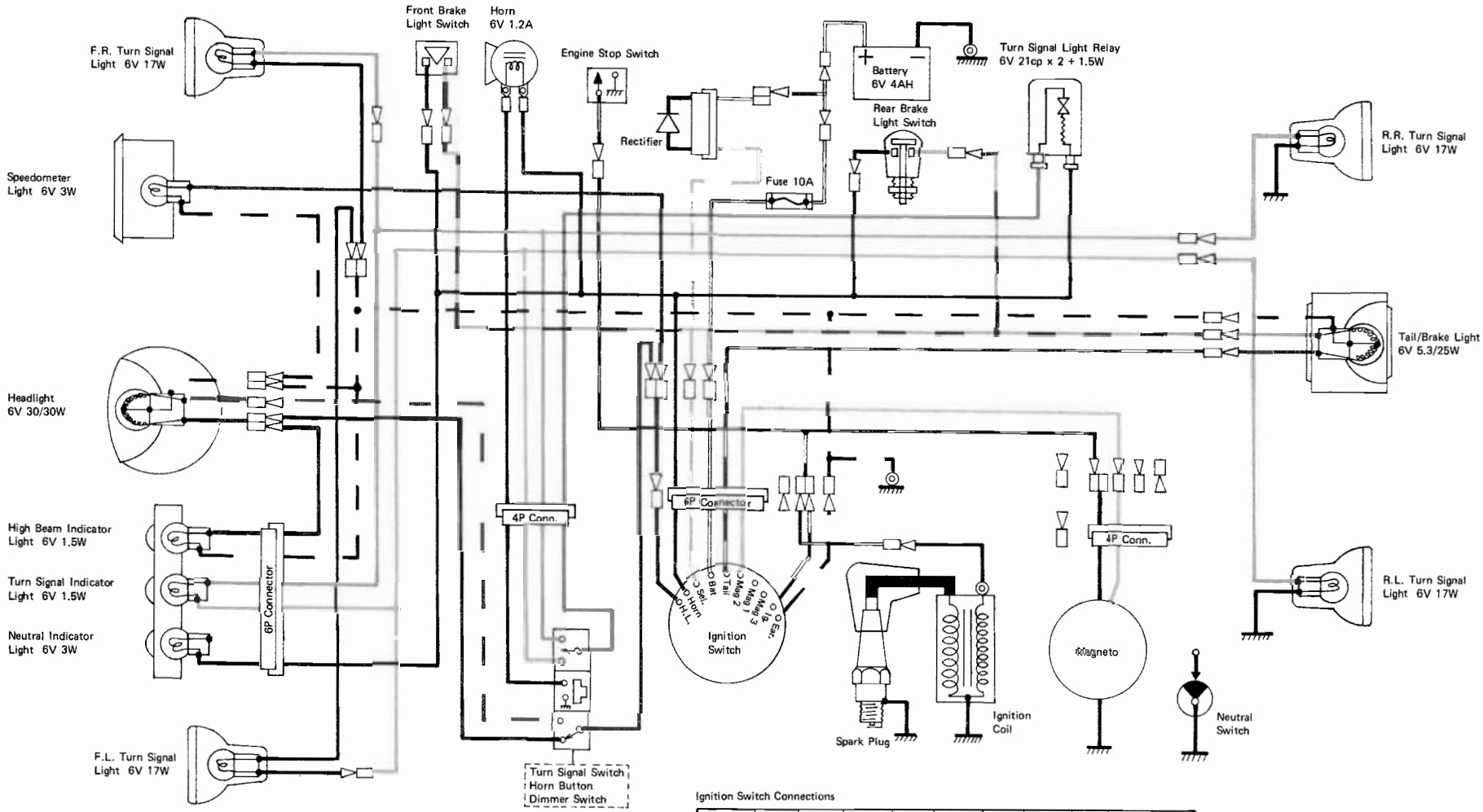
Note: If battery overcharges, when headlight is off, disconnect the Light Blue wire to the magneto and reconnect it to the Yellow/Green wire. (There is no such alternative for '75 model).

Ignition Switch Connections

Lead	Ignition	Ground	Magneto	Rect	Magneto	Rec	Magneto	Battery	Horn	Tail
Color	Bk/W	Bk/Yel	LB	Bl/Wh	Pink	Red	Yellow	White	Brown	R/Wh
OFF	•									
DAY				•		•		•		
NIGHT				•	•	•		•	•	•

(149-1)

KE100-A5 Wiring Diagram (US Model)

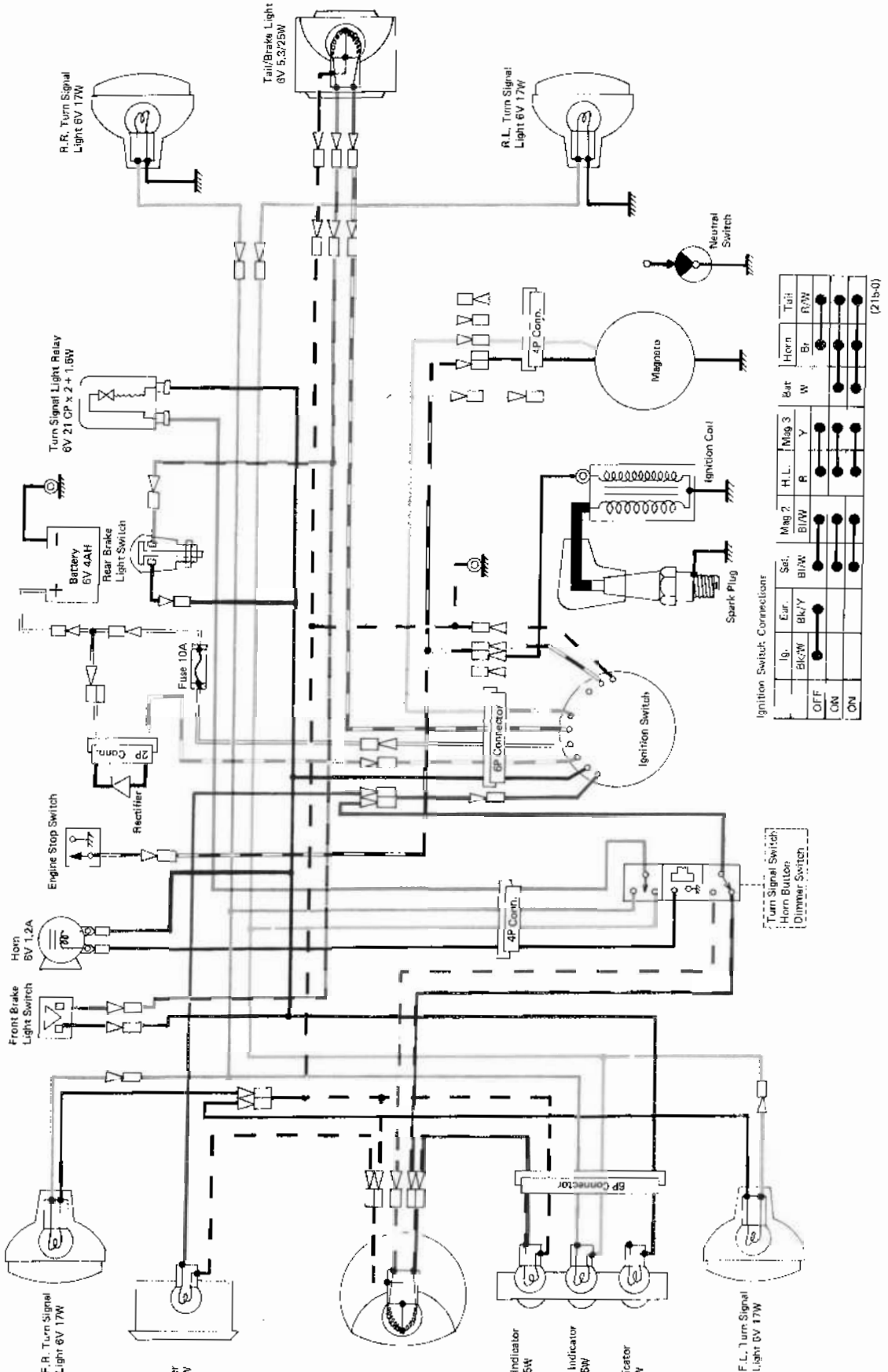


Ignition Switch Connections

	Ig.	Ear.	Mag 1	Sel.	Mag 2	H.L.	Mag 3	Bat	Horn	Tail
	Bk/W	Bk/Y	LB	Bl/W	P	R	Y	W	Br	R/W
OFF	●	●								
DAY			●	●				●	●	
NIGHT				●	●	●	●	●	●	●

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KE100-A5 Wiring Diagram
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KAWASAKI
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