



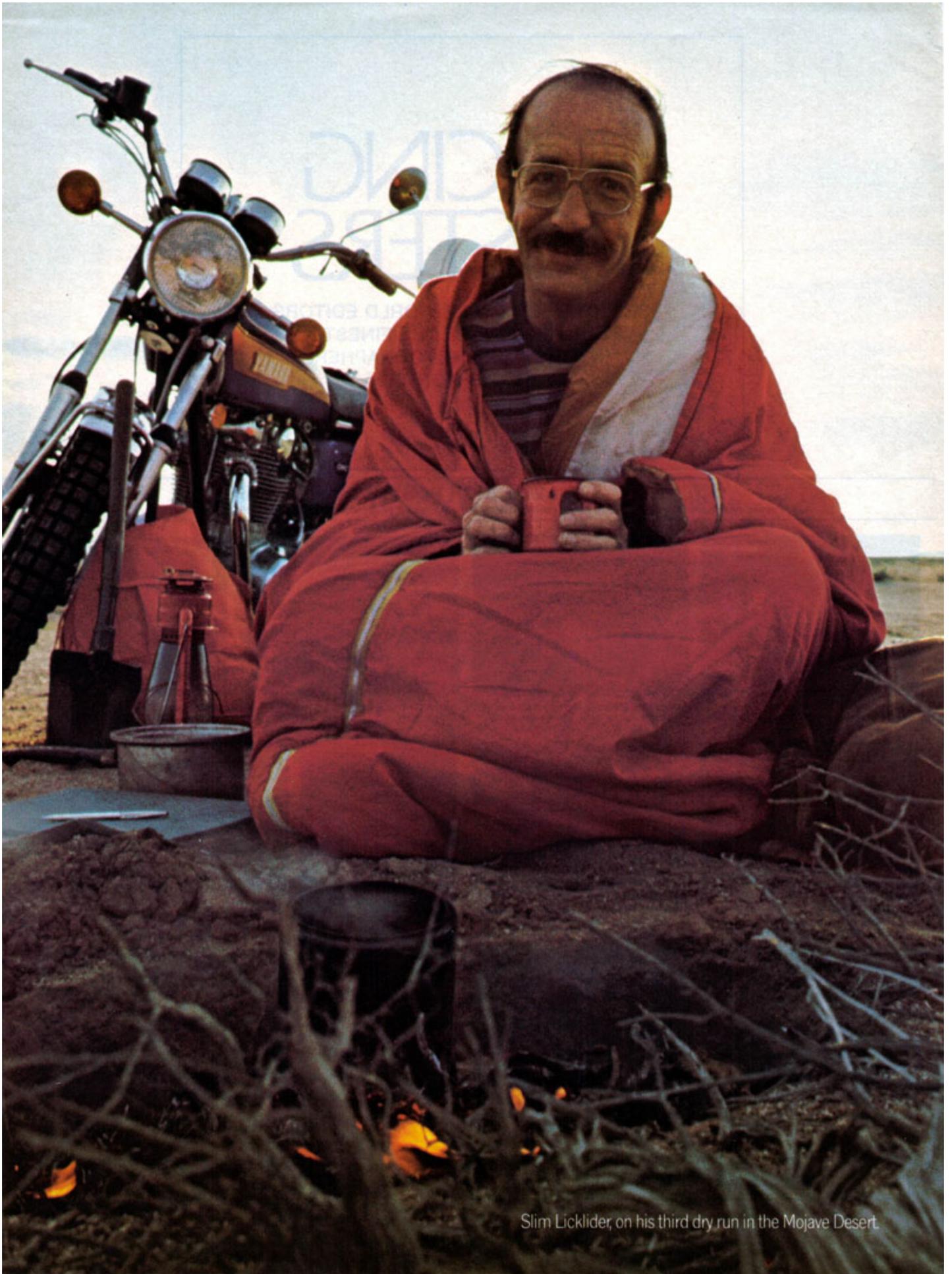
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Yamaha XS650

Shop Manual

[Click here to find the
Yamaha Xs650 model ID table](#)



Slim Licklider, on his third dry run in the Mojave Desert.

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XS650E

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XS650SE SUPPLEMENT

8

(EPA)
XS650E SUPPLEMENT

9

*XS650SF USES THIS SUPPLEMENT (EPA)

XS650SE SUPPLEMENT

10

XS650SF/2F SUPPLEMENT

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XS650G/SG SUPPLEMENT

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CHAPTER 1. GENERAL INFORMATION

I-1.	MACHINE IDENTIFICATION1
I-2.	SPECIAL TOOLS



CHAPTER 1. GENERAL INFORMATION

I-I. MACHINE IDENTIFICATION

Frame serial number

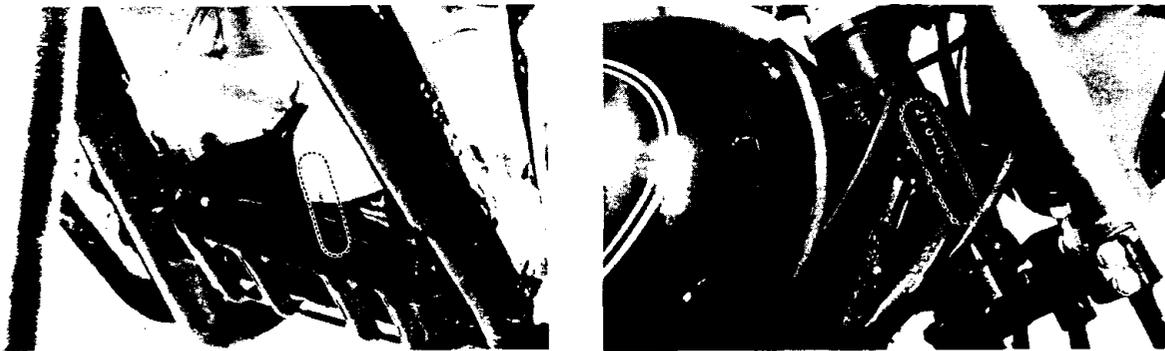
The frame serial number is stamped on the right side of the steering head stock.

Engine serial number

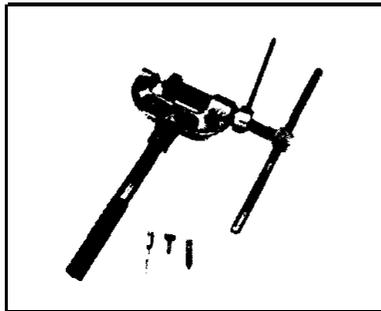
The engine serial number is stamped on the front of the engine crank case.

NOTE:

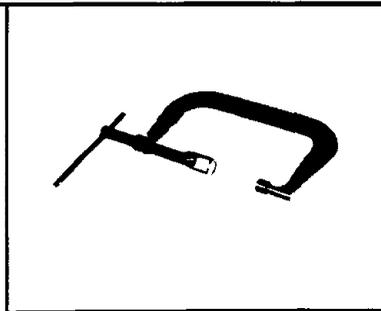
The first three digits of these numbers are for model identifications; the remaining digits are the unit production number.



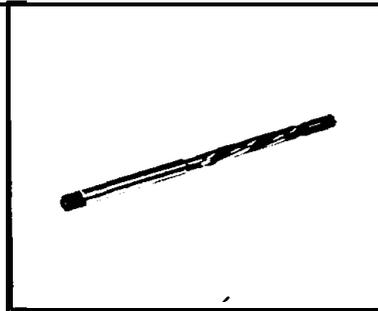
1-2. SPECIAL TOOLS



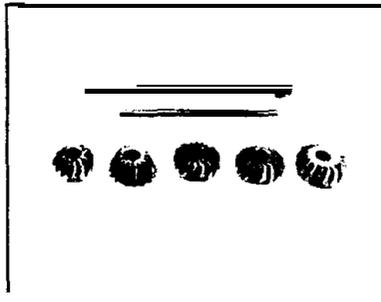
1. Cam chain cutter
Parts No. (90890-01112)



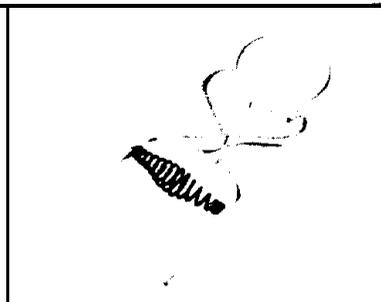
2. Valve spring compressor
(90890-01253)



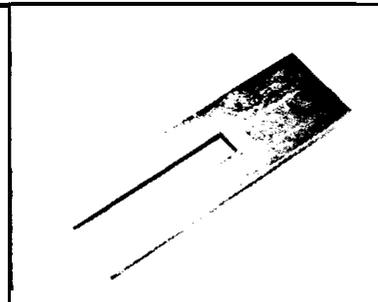
3. Valve guide reamer
(90890-01211)



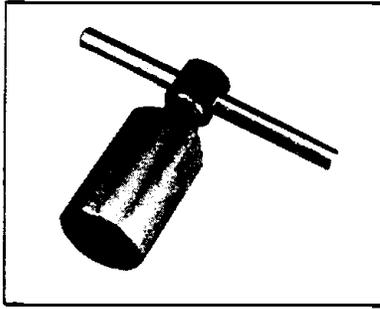
4. Valve seat cutter set
(90890-01179)



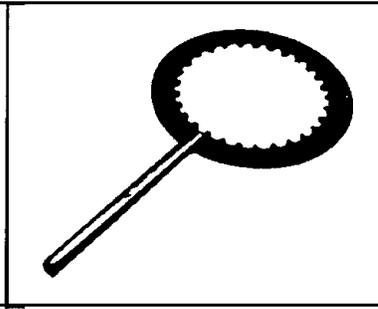
5. Piston ring compressors
(90890-01066)



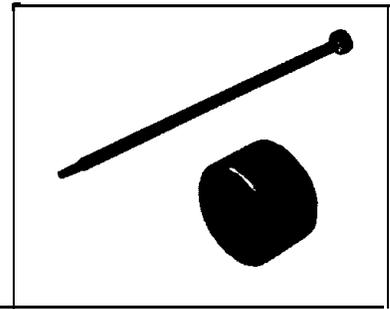
6. Piston support plate
(90890-01067)



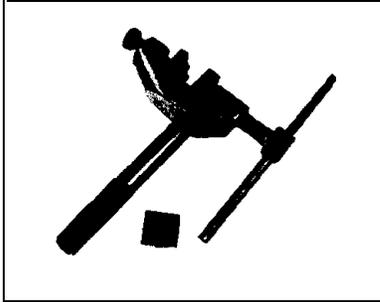
7. Rotor puller
(90890-01070)



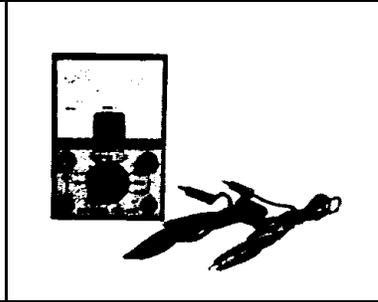
8. Clutch holding tool
(90890-01069)



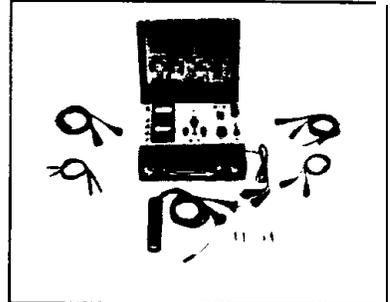
9. Slide hammer
(90890-1083)
(90890-1084)



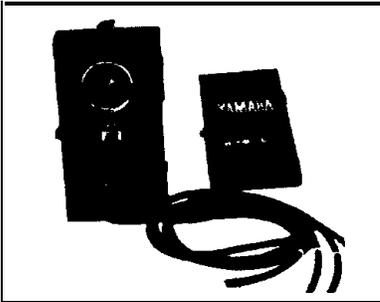
10. Drive chain cutter
(90890-01081)



11. Pocket tester
(90890-03096)



12. Electro tester
(90890-0302 1)



13. Vacuum gauge
(90890-03094)

OTHER TOOL	PARTS No.
Valve guide remover	90890-01200
Valve guide installer	90890-01201
Spoke wrench	90890-05087
Steering nut wrench	90890-01051
Tappet adjuster wrench	256-28137-00

CHAPTER 2. PERIODIC INSPECTION AND ADJUSTMENT

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CHAPTER 2. PERIODIC INSPECTION AND ADJUSTMENT

2-1. INTRODUCTION

This chapter includes all information necessary to perform recommended inspection and adjustments, These preventive maintenance procedures, if followed, will insure more reliable vehicle operation and a longer service life. The need for costly overhaul work will be greatly reduced. This information applies not only to vehicles already in service, but also to new vehicles that are being prepared for sale. Any service technician performing preparation work should be familiar with this entire chapter.

2-2. MAINTENANCE INTERVALS CHARTS

The following charts should be considered strictly as a guide to general maintenance and lubrication intervals. You must take into consideration that weather, terrain, geographical location, and a variety of individual uses all tend to alter this time schedule. For example, if the motorcycle is continually operated in an area of high humidity, then all parts must be lubricated much more frequently than shown on the chart to avoid damage caused by water to metal parts,

A. PERIODIC MAINTENANCE

Periodic inspection, adjustment and lubrication will keep your motorcycle in the safest and most efficient condition. Safety is an obligation of the motorcycle owner.

Unit: km (mi)

Item	Remarks	initial				Thereafter every		
		400 (250)	800 (500)	1,600 (1,000)	3,200 (2,000)	1,600 (1,000)	3,200 (2,000)	6,400 (4,000)
Cylinder	Check compression				○			○
Valves	Check/Adjust valve clearance			○	○			○
Cam chain	Check/Adjust chain tension		○					○
Spark plugs	inspect/Clean or replace as required	○			○		○	
Air filter	Dry type – Clean/Replace as required			○		○		
Carburetor	Check operation/Adjust as required		○		○		○	
Brake system (complete)	Check/Adjust as required – Repair as required		○	○		○		
Clutch	/Adjust free play		○		○		○	
Wheel and tires	Check pressure/Wear/Balance	○	○	○		○		
Fuel petcocks	Clean/Flush tank as required	○		○			○	
Battery	Top-up/Check specific gravity and breather pipe	○	○	○	○	○		
Ignition timing	Adjust/Clean or replace parts as required		○	○	○		○	
Lights/Signals	Check operation/Replace as required	○	○	○	○	○		
Fittings/Fasteners	Tighten before each trip and/or	○	○	○	○	○		
Generator brushes	Check brush wear/Replace if necessary							○

B. LUBRICATION INTERVALS

Unit: Km (mi)

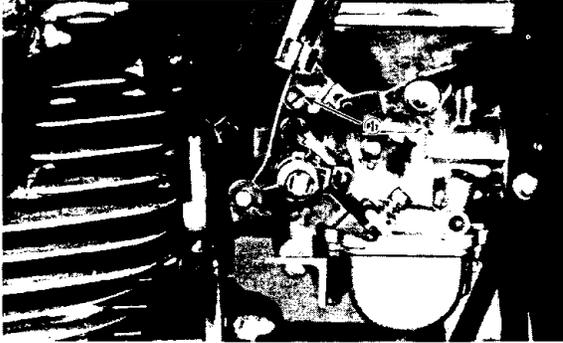
Item	Remarks	Type	Initial				Thereafter every		
			400 (250)	800 (500)	1,600 (1,000)	3,200 (2,000)	1,600 (1,000)	3,200 (2,000)	6,400 (4,000)
Engine/Transmission oil	Replace/Warm engine before draining	YAMALUBE 4-cycle oil or SAE 20W/40 "SE" motor oil	○			○		○	
Drive chain	Lube/Adjust as required	Yamaha chain and cable lube or SAE 10W/30 motor Oil	every 400 (250)						
	Remove/Clean/Lube				○		○		
Brake pedal shaft/Change pedal shaft	Light application	Yamaha chain and cable lube or SAE 10W/30 motor oil			○		○		
Control/Meter cables	Apply thoroughly	Yamaha chain and cable lube or SAE 10W/30 motor oil			○	○		○	
Throttle grip/Housing	Apply lightly	Lithium base grease				○		○	
Hydraulic brake fluid reserve	Use new fluid only	DOT No. 3 Brake fluid	check	check	check	check	check		
Oil filter element	Clean/Replace as required	—	○			○		○	
Front forks	Drain completely – Check specifications	Yamaha Fork Oil 10 wt.				○			○
Steering bearings	Inspect thoroughly Yearly or ...	Medium-weight wheel bearing grease							12,800 (8,000)
Speedometer gear housing	Inspect thoroughly/Pack moderately	Lithium base grease							12,800 (8,000)
Rear arm pivot shafts	Apply grease fully	Medium-weight wheel bearing grease				○			○
Wheel bearings	Do not over/Yearly or ...	Medium-weight wheel bearing grease							12,800 (8,000)
Point cam lubrication wicks	Apply very lightly	Light-weight machine oil		0	0	0		0	

2-3. ENGINE

A. Carburetor

1. Idle mixture

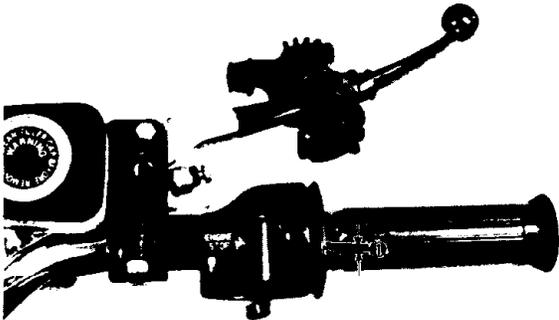
The idle mixture is set at the factory by the use of special equipment. No attempt should be made to change this adjustment by the dealer.



1. Do not adjust

2. Throttle

Turn the throttle grip to see if it operates properly and if the play is normal. Make certain the throttle snaps closed when released.



1.5 ~ 8 mm (0.2 ~ 0.3 in)

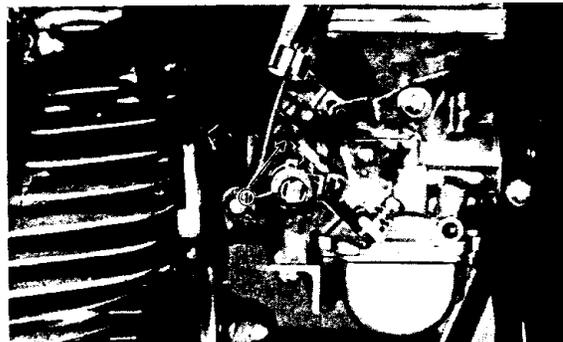
3. Synchronization

NOTE: _____

Ignition timing and valve clearances must be set properly before synchronizing carburetors.

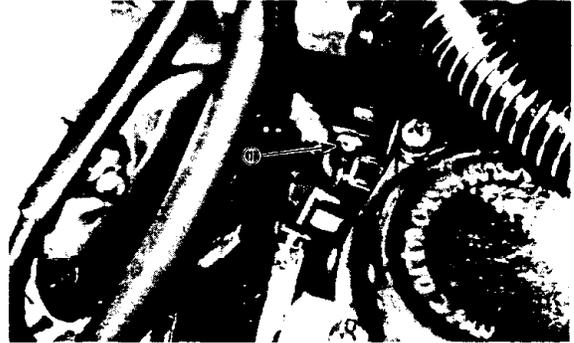
Procedure:

- a. Turn fuel petcocks to "PRIME", and remove the plug screws for the adapter attachment holes in the carburetor body.



1. Plug screw

- b. Install the attachment and set the vacuum gauge.
- c. Start motorcycle and allow it to warm up for 2 ~ 3 minutes. The warm-up is complete when engine responds normally to throttle opening.
- d. Adjust damping valve on each vacuum gauge until the needle flutters only slightly. The gauge needles must respond quickly to rapid opening of the throttle.
- e. Both gauge will indicate the same reading if the carburetors are synchronized.
- f. Turn the synchronizing screw until the gauge readings are the same.



1. Synchronizing screw

- g. After adjustment, firmly tighten the plug screws.

NOTE: _____

Check gasket. Replace if damaged.

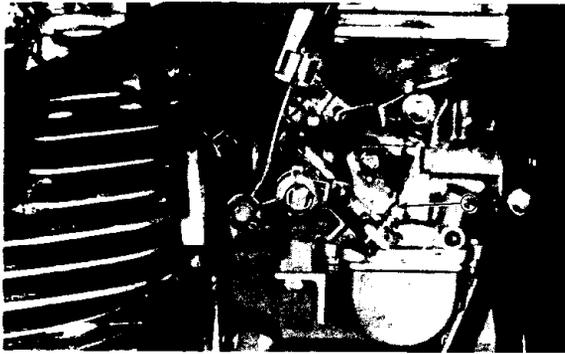
4. Idle speed adjustment.

NOTE: _____

Carburetors must be synchronized before setting final idle speed.

- a. Start the engine and warm it up for a few minutes.
- b. Set the engine idle speed to specified rpm by turning the throttle stop screw in to increase the engine speed and back off the screw to decrease the engine speed. Use a tachometer for checking and adjusting the engine speed.

Standard idle rpm: 1,200 rpm



1. Throttle stop screw

B. Air filters

This model uses a cartridge type air filter element which consists of foam rubber.

1. Removal

- a. Remove the air filter cover by removing the bolts.
- b. Pull out the springs and elements.



2. Cleaning method

- a. Tap the element lightly to remove most of the dust and dirt; then blow out the remaining dirt with compressed air through the inner surface of the element. If element is damaged, replace.



- b. Reassemble by reversing the removal procedure. Check whether the element is seated completely against the case.
- c. The air filter element should be cleaned once a month or every 1,600 km(1,000

mi.). It should be cleaned more often if the machine is operated in extremely dusty areas.

CAUTION:

The engine should never be run without the air cleaner element installed. Excessive oil contamination and engine wear may result.

C. Engine/transmission oil and filter

1. Oil level measurement

- a. To check the level, warm the engine up for several minutes. Stop the engine. With the engine stopped, screw the dip stick completely out and then rest the stick in the hole.



1. Oil level dip stick

NOTE:

When checking engine oil level with the dip stick, position the machine straight up and on main stand.

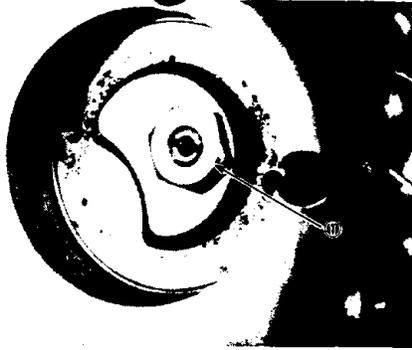
- b. The dip stick has a minimum and a maximum mark. The oil level should be between the two. If the level is low, add sufficient oil to raise it to the proper level.
- ### 2. Oil replacement and filter cleaning
- a. Start the engine. Allow it to warm up for 2-3 minutes. Stop the engine.
 - b. Place an oil pan under the engine.
 - c. Remove the drain plugs and drain the oil.



1. drain plugs

- d. Remove the filter cover and oil filter securing bolt.

HA



1. Filter securing bolt.

- e. Slip the filter element out and clean.
f. Install the filter and filter cover.

Filter torque:
1.0 m-ko (7 ft-lb)

- g. Reinstall the drain plugs. (Make sure it is tight.)

Drain plug torque:
4.4 m-kg (32 ft-lb)

- h. Add oil through the dip stick hole.

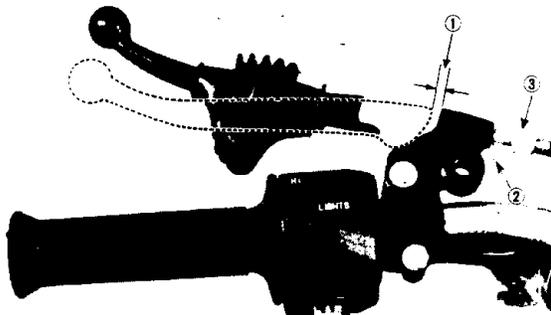
Oil quantity:
2.0 lit (2.1 qt): periodic oil change
2.5 lit (2.6 qt): engine overhauling
Recommended oil:
Yamalube 4-cycle oil or SAE
20W/40 type "SE" motor oil

D. Clutch adjustment

This model has a clutch cable length adjuster and a clutch mechanism adjuster. Normally, once the mechanism is properly adjusted, the only adjustment required is maintenance of free play at the clutch handle lever.

1. Free play adjustment

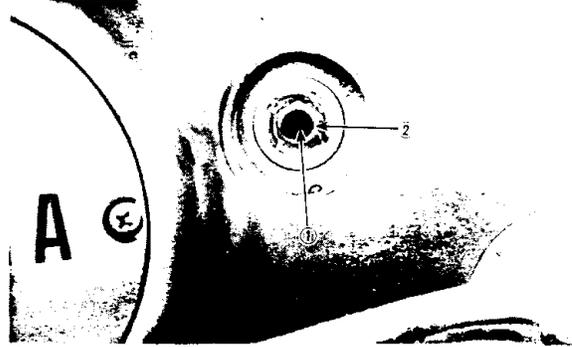
Loosen the handle lever adjuster lock nut. Next, turn the length adjuster either in or out until proper lever free play is achieved.



1. 2 ~ 3 mm (0.08 ~ 0.12 in)
2. Lock nut
3. Adjuster

2. Mechanism adjustment

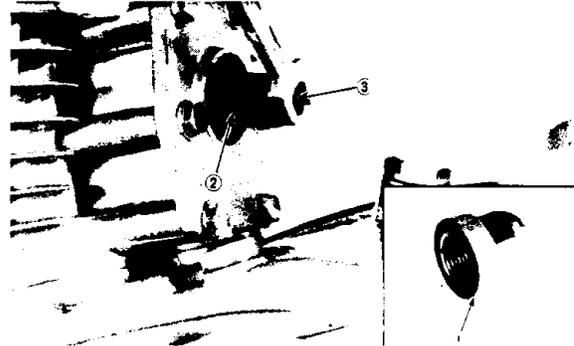
- a. Screw in the cable adjuster (on the lever holder) until tight.
b. Screw in the adjuster (push screw) until it lightly seats against a clutch push rod.
c. Back the adjuster out 1/4 turn and tighten the lock nut.
d. Adjust the free play of clutch lever by turning the cable adjuster.



1. Adjuster 2. Lock nut

E. Cam chain adjustment

The cam chain becomes stretched with use, resulting in improper valve timing and engine noise. To prevent this the cam chain tensioner must be adjusted regularly.



1. Cap nut 2. Adjuster bolt 3. Push rod

1. Remove the cap nut.
2. Turn the adjuster bolt in until the push rod (inside the adjuster bolt) is flush with the end of the adjuster bolt.

NOTE:

The push rod will not come out beyond a certain limit even if the adjuster bolt continues to be screwed in.

3. Reinstall the cap nut.

F. Valve clearance adjustment

NOTE:

Valve clearance must be measured with the engine at room temperature.

1. Remove all four tappet covers and the generator cover.
2. Turn the crankshaft to align the rotor mark with the "T" mark on the stator.
3. This places the pistons at the top dead center and the valve clearance should be checked and adjusted at the top dead center on the compression stroke by observing when the valve adjusters have clearance.
4. Use a feeler gauge to determine the clearance.

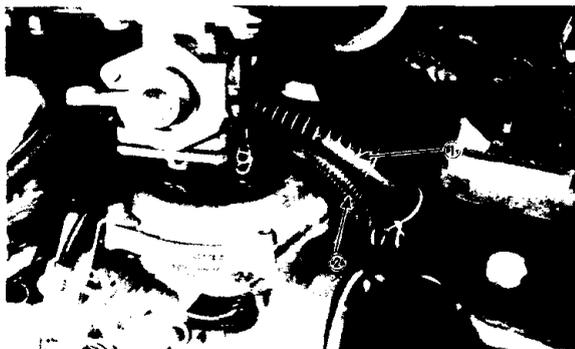
Exhaust valve clearance (cold):
 0.15 mm (0.0059 in)
 Intake valve clearance (cold):
 0.10 mm (0.0039 in)



5. Loosen the valve adjuster lock nut. Turn the adjuster in or out to obtain the correct clearance. Hold the adjuster to prevent it from moving and thoroughly tighten the lock nut.
6. Recheck the clearance after tightening.

G. Crankcase ventilation system

1. Check ventilation hose for cracks or damage.
2. Replace it if necessary.



1. Ventilation hose
2. Fuel pipe

H. Exhaust system

1. Check for leakage from exhaust joints and retighten joint bolts and nuts.
2. Replace gaskets if necessary.

2-4. CHASSIS

A. Fuel petcock cleaning

1. Turn the petcock lever to the "ON" or "RES" position. Remove the fuel pipe.
2. Remove the drain cover and clean it with solvent.



1 "RES" position
2. Drain cover

B. Fuel petcock disassembly

If the fuel petcock is leaking or excessively contaminated, it should be removed from the fuel tank and inspected.

1. Remove fuel tank and position it so that fuel will not spill when the petcock is removed.
2. Remove petcock and inspect filter screen. Clean or replace filter if seriously contaminated.
3. Remove screws on front and rear of petcock and remove plate, gaskets, lever and diaphragm.
4. Inspect all components and replace any that are damaged. If the diaphragm is in any way damaged, or the petcock body gasket surfaces scratched or corroded, the petcock assembly must be replaced. If there is abrasive damage to any component, the fuel tank must be drained and flushed.
5. Reassemble petcock and install on fuel tank.

C. Fuel hose

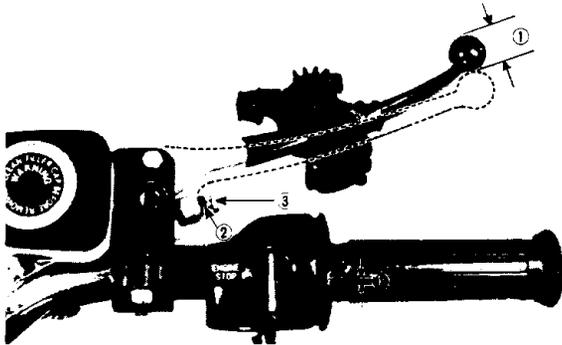
1. Check fuel hose for cracks or damage.
2. Replace it if necessary.

D. Front brake

The brake can be adjusted by simply adjusting the distance that the brake lever can travel. (The piston in the caliper moves forward as the brake pad wears out, automatically adjusting the clearance between the brake pad and the brake disc.)

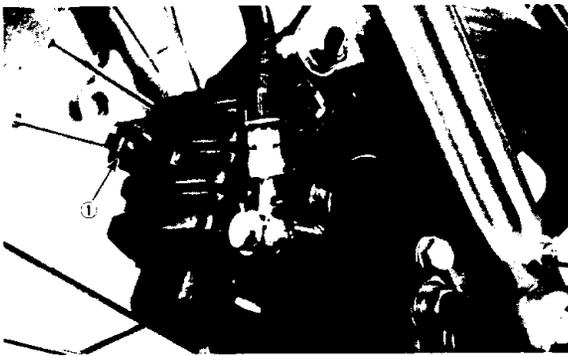
1. Adjustment

- a. Turn adjuster so that a brake lever end is 5 – 8 mm (0.2 – 0.3 in) before adjuster contacts master cylinder piston.



1. 5 ~ 8 mm (0.2 ~ 0.3 in)
2. Lock nut
3. Adjuster

2. Brake pad check



1. Indicator cap

To check, open the wear indicator cap and if any pad is worn to the red line, replace pads.

3. Check the brake fluid level

Insufficient brake fluid may allow air to enter the brake system, possibly causing the brake to become ineffective. Check the brake fluid level and replenish when necessary and observe these precautions:

- a. Use only the designated quality brake fluid; otherwise, the rubber seals may deteriorate, causing leakage and poor brake performance.

Recommended brake fluid:
DOT No. 3 Brake fluid

- b. Refill with the same type and brand of brake fluid; mixing fluids may result in a harmful chemical reaction and lead to poor performance.

- c. Be careful that water or other contamination does not enter the master cylinder when refilling. Water will significantly lower the boiling point and may result in vapor lock.

E. Rear brake

1. Adjust rear brake pedal play to suit, providing a minimum of 20 – 30 mm (0.8 – 1.2 in) freeplay. Turn the adjuster on the rear brake rod in or out until brake pedal free play is suitable.

NOTE:

Rear brake pedal adjustment must be checked anytime chain is adjusted or rear wheel is removed and then reinstalled.



1. Adjuster

F. Wheels and tires

1. Wheels

- a. Check each spoke for tightness.

NOTE:

If loose spokes are found, tighten and repeat rim runout check.

2. Tires

- a. Important notice

Proper loading of XS650E is important for the handling, braking, and other performance and safety characteristics. NEVER OVERLOAD THE MOTORCYCLE.

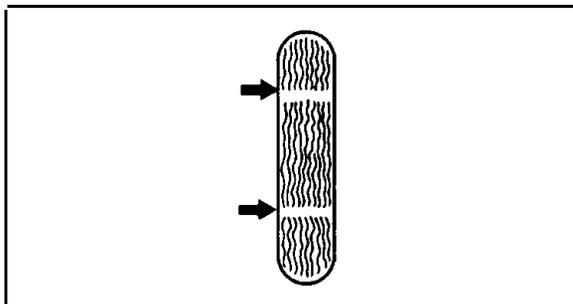
WARNING: Never overload the motorcycle beyond specified tire limits. Operation of an overloaded tire could cause tire damage, an accident and injury.

	FRONT	REAR
XS650E BASIC WEIGHT with oil and full fuel tank	104 kg(229lb)	119 kg(262lb)
Standard tire	Bridgestone or Yokohama 3.50H19-4PR	Bridgestone or Yokohama 4.00H18-4PR
Tire load limit	234 kg (515lb)	280 kg (615 lb)
Cold tire pressure		
Normal riding	1.6 kg/cm ² (22 psi)	2.0 kg/cm ² (28 psi)
With passenger or high speed riding	2.0 kg/cm ² (28 psi)	2.3 kg/cm ² (32 psi)
With passenger and extra load riding	2.8 kg/cm ² (40 psi)	2.8 kg/cm ² (40 psi)
Minimum tire tread depth	0.8 mm (0.03 in)	0.8 mm (0.03 in)

Make sure the total weight of the motorcycle with accessories, rider(s) etc., does not exceed the tire limits.

b. Check the tire wear

If a tire tread shows cross wise lines, it means that the tire is worn to its limit. Replace the tire.

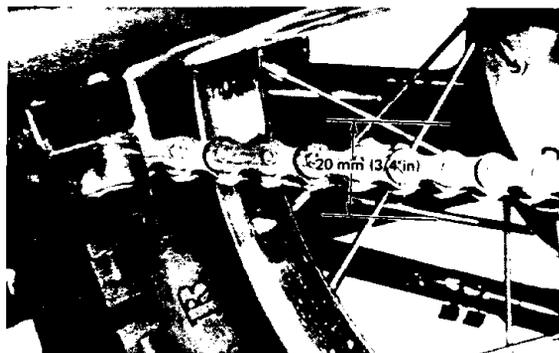


c. Check the wheel damage and check the tightness of spokes.

G. Drive chain

1. Tension check

- a. Inspect the drive chain with mainstand erected. Check the tension at the position shown in the illustration. The normal vertical deflection is approximately 20 mm (3/4 in).



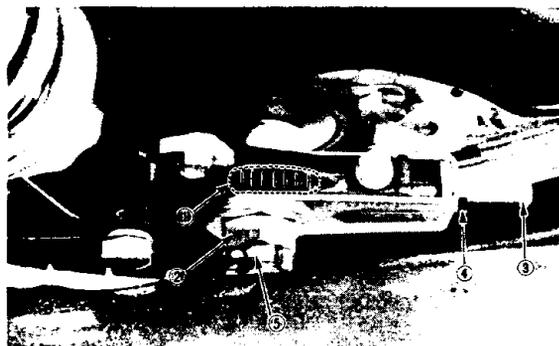
20 mm (3/4 in)

2. Tension adjustment

- a. Loosen the rear brake adjuster.
- b. Remove the cotter pin of the rear wheel axle nut.
- c. Loosen the rear wheel axle nut.
- d. Loosen the adjuster lock nuts on each side.
- e. To tighten chain turn chain puller adjuster clockwise.

Turn each bolt exactly the same amount to maintain correct axle alignment.

There are marks on each side of rear arm and on each chain puller; use them to check for proper alignment.



1. Alignment marks
2. Rear axle nut
3. Adjuster
4. Lock nut
5. Cotter pin

- f. After adjusting be sure to tighten the lock nuts and the rear wheel axle nut.
 - g. Install a new cotter pin and bend the end over.
 - h. In the final step, adjust the play in the brake pedal and stoplight switch free play.
- #### 3. Lubrication
- a. First, remove dirt and mud from the chain with a brush or cloth and then spray the lubricant between both rows of side plates and on all center rollers.

- b. To clean the entire chain, first remove the chain from the motorcycle, dip it in solvent and clean with stiff brush. Then take the chain out of the solvent and dry it. Immediately, lubricate the chain to prevent the formation of rust.

Recommended lubricant:
YAMAHA CHAIN AND CABLE LUBE, or SAE 10W/30 type "SE" motor oil

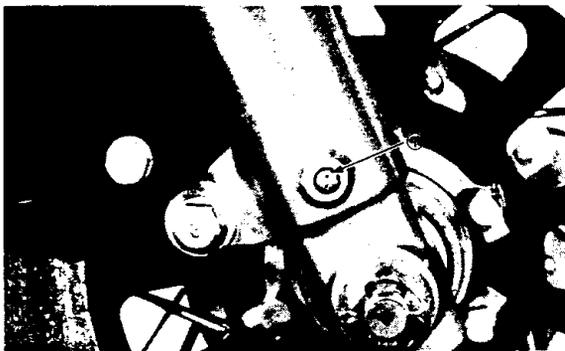
H. Front fork oil change

1. Raise the front wheel off the floor with a suitable frame stand.
2. Loosen the fork pinch bolts.
3. Remove the rubber cap from the top of each fork.



1. Pinch bolt 2. Cap

4. Loosen the cap bolt (adjuster unit).
5. Remove drain screw from each outer tube with open container under each drain hole.



1. Drain screw

CAUTION:

Do not allow oil to contact disc brake components.

6. After most oil has drained, slowly raise and lower outer tubes to pump out remaining oil.

7. Install drain screw.

NOTE:

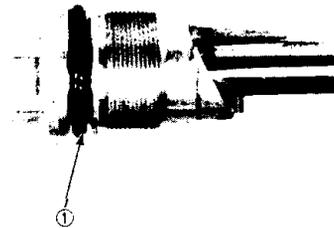
Check gasket. Replace if damaged.

8. Pour specified amount of oil into the inner tube through the upper end opening.

Front fork oil:
 Yamaha fork oil 10 Wt

Front fork oil capacity:
 164 ~ 172 cc (5.54 ~ 5.82 oz)
 each side

9. After filling, slowly pump the outer tubes up and down to distribute the oil.
10. Inspect O-ring on fork cap bolts and replace if damaged.



1. O-ring

11. Install fork cap bolts.
12. Tighten pinch bolts.

Tightening torque:		
	m-kg	ft-lb
Fork cap bolt	5.0	36
Pinch bolt	1.0	7

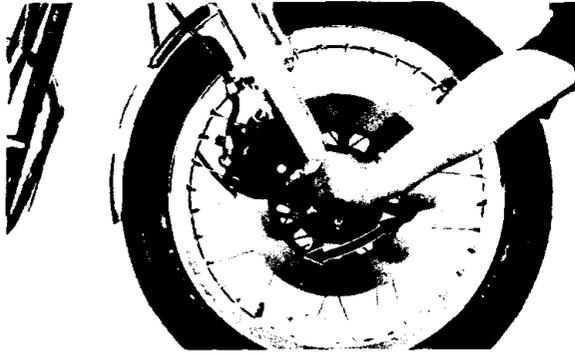
I. Steering head

1. adjustment

The steering assembly should be checked periodically for looseness.

Do this as follows:

- a. Raise front end of machine so that there is no weight on the front wheel.
- b. Grasp bottom of forks and gently rock fork assembly backward and forward, checking for looseness in the steering assembly bearings.



- c. If there is looseness in the steering head, loosen the crown pinch bolt, fork pinch bolts, and steering fitting bolt.



1. Crown pinch bolt
2. Fork pinch bolt
3. Steering fitting bolt

- d. Use steering nut wrench to loosen top steering fitting nut. The top nut serves as a lock nut.
- e. Tighten the lower steering fitting nut until the steering head is tight, but does not bind when forks are turned.
- f. Retighten the top steering fitting bolt, crown pinch bolts and fork pinch bolts, in that order.
- g. Recheck steering adjustment to make sure there is no binding when the forks are moved from lock to lock. If necessary, repeat adjustment procedure.

2. Lubrication

Refer to PAGE 47.

J. Lubrication of cables, pivots, etc.

1. Throttle cable and grip

The throttle twist grip assembly should be greased at the time that the cable is lubricated since the grip must be removed to get at the end of the throttle cable. Two screws clamp the throttle housing to the handlebar. Once these two are removed,

the end of the cable can be held high to pour in several drops of lubricant. With throttle grip disassembled, coat the inside surface of the throttle grip guide tube with a suitable all-purpose grease to cut down friction.

2. Meter cables

Pull the inner cable out and apply cable lube thoroughly.

Recommended lube:

Yamaha chain and cable lube or SAE 10W/30 motor oil.

3. Rear arm pivot shaft

Apply grease to grease nipple on top of pivot with low pressure hand operated gun. Apply until fresh grease appears at both ends of pivot shaft.

Recommended lube:

Medium-weight wheel bearing grease

4. Brake and change pedal shafts, and center and side stand pivots Lubricate the shafts and pivots with Yamaha chain and cable lube or SAE 10W/30 motor oil.

5. Wheel bearings

Refer to PAGE 39.

2-5. ELECTRICAL

A. Contact breaker point adjustment

1. Remove breaker point cover.
2. Check contact breaker point gap (at largest gap) with clean feeler gauge.

Contact breaker gap:

0.3 ~ 0.4 mm (0.012 ~ 0.016 in)

If necessary, adjust by loosening securing screws and moving the adjustable contact point.

3. Tighten adjusting screws and recheck breaker point gap.

B. Contact breaker point maintenance

1. The contact breaker should be checked for the following:
 - a. Wear of the bakelite cam heel
 - b. Damage of contact point surfaces

- c. Rust or wear on the breaker arm or arm shaft.
 - d. Faulty insulation of the contact breaker assembly.
 - e. Oil or dirt on the assembly.
2. To clean the points, run a point file between the points until the grey deposits and pits have been removed. Spray the points with ignition point cleaner or lacquer thinner, then snap the points shut on a white business card (or paper of hard texture) and repeatedly pull the card through until no more carbon or metal particles come off on the card. (The card may be dipped in lacquer thinner or other cleaner to facilitate this procedure.)
 3. Point replacement should be necessary when the points become severely pitted, if the heel is broken or worn unevenly, or if the points become shorted or show faulty operation.

NOTE: _____
 New points must be cleaned and adjusted.

4. Add a few drops of light-weight machine oil onto the felt rubbing pad after each point adjustment to lubricate the point cam surface. Do not over oil.

C. Ignition timing

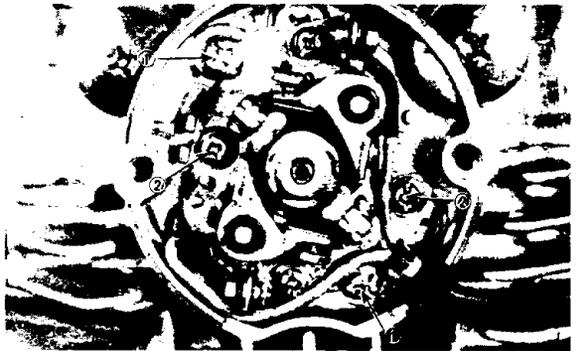
NOTE: _____
 Point gap must be set before setting timing.

1. Ignition timing is checked with a timing light by observing the position of the stationary marks stamped on the stator and the pointer on the generator.



1. Top dead center
 2. 15° BTDC/1,200 rpm
 3. Advanced mark

2. Ignition timing of right-hand cylinder must be set first. Connect timing light to right-hand spark plug lead wire.
3. Start engine.
4. The mark stamped on the rotor_ should line up with the stationary "F" timing mark. If it does not align, loosen two breaker backing plate screws and move the complete backing plate until the mark on the rotor and the "F" mark align.
5. Retighten screws. Check timing again for the right-hand cylinder.
6. Rev the engine to above 3,500 rpm. Check whether the mark on the rotor is in the vicinity of the stationary "full advance" mark.
7. Repeat procedure (steps 2-6) for another cylinder.



1. Right cylinder timing adjustment
 2. Left cylinder timing adjustment

D. Carbon brushes

Visually inspect the carbon brush holder brushes for obvious breakage or wear. Standard brush length is 14.5 mm(0.571 in). Wear limit is 7.0 mm (0.276 in) and marked there.

E. Battery

A poorly maintained battery will deteriorate quickly. The battery fluid should be checked at least once a month.

1. The level should be between the upper and lower level marks. Use only distilled water for refilling. Normal tap water contains minerals which are harmful to a battery; therefore, refill only with distilled water.
2. Always make sure the connections are correct when installing the battery. The magnet relay lead is for the (+) terminal

and the chassis lead is for the (-) terminal. Make sure the breather pipe is properly connected, properly routed, and is not damaged or obstructed.

NOTE: _____

The battery must be charged before using to insure maximum performance. Failure to properly charge the battery before first use, or a low electrolyte level, will cause premature failure of the battery.

Charging current:	1.4 Amp
Charging hours:	10 hrs

F. Spark plug

The spark plug indicates how the engine is operating. If the engine is operating correctly, and the machine is being ridden properly, the tip of the white insulator around the positive electrode of the spark plug will be a medium tan color. If the insulator is very dark brown

1. If the insulator is very dark brown or black color, then a plug with a hotter heat range might be required. This situation is quite common during the engine break-in period.
2. If the insulator tip shows a very light tan or white color or is actually pure white and glazed, or if electrodes show signs of melting, then a spark plug with a colder heat range is required. Remember, the insulator area surrounding the positive electrode of the spark plug must be a medium tan color. If it is not, check carburetion, timing and ignition adjustments.
3. The spark plug must be removed and checked. Check electrode wear, insulator color, and electrode gap.

Spark plug gap: 0.7 ~ 0.8 mm (0.028 ~ 0.031 in)
--

Engine heat and combustion chamber deposits will cause any spark plug to slowly break down and erode. If the electrodes finally become too worn, or if for any reason you believe the spark plug is not functioning correctly, replace it. When installing the plug, always clean the gasket surface, use a new gasket, wipe off any grime that might be pre-

sent on the surface of the spark plug, and torque the spark plug properly.

Standard spark plug: Champion N-7Y or NGK BP 7ES
Tightening torque: 2.0 m-kg (14 ft-lb)

G. Headlight

1. Headlight beam adjustment.

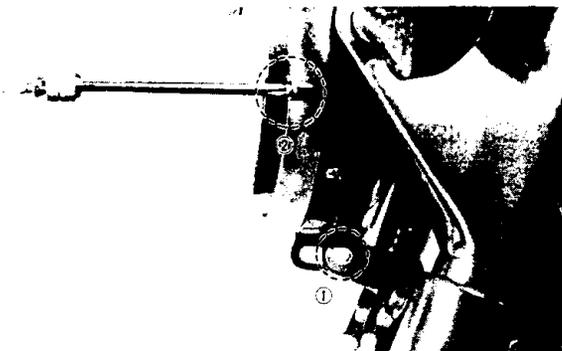
When necessary, adjust the headlight beam as follows:

- a. Adjust horizontally by tightening or loosening the adjust screw.

To adjust to the right: Tighten the screw
To adjust to the left: Loosen the screw

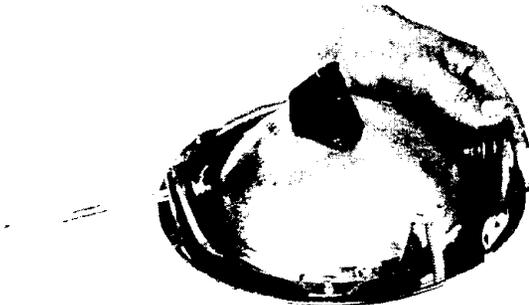
- b. Adjust vertically as follows:

- 1) Loosen adjusting screw and adjust vertically by moving the headlight body.
- 2) Retighten the screw.



1. Vertical adjustment
2. Horizontal adjustment

2. Replacing the headlight bulb.



- a. Loosen bolts and replace bulb.
- b. After installing, adjust headlight beam.

NOTE: _____

Take care not to damage the headlight. It is very fragile.

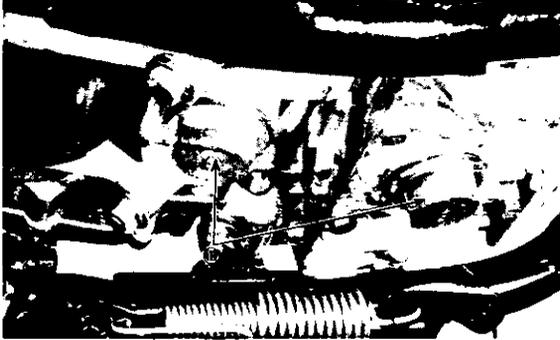
3-4.	ENGINE ASSEMBLY AND ADJUSTMENT	..29
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CHAPTER 3. ENGINE OVERHAUL

31. ENGINE REMOVAL

A. Preparation for removal

1. All dirt, mud, dust and foreign material should be thoroughly removed from the exterior of the engine before removal and disassembly.
2. Place machine on center stand. Start engine and allow it to warm up. Stop engine and drain engine/transmission oil.



1. Drain plugs

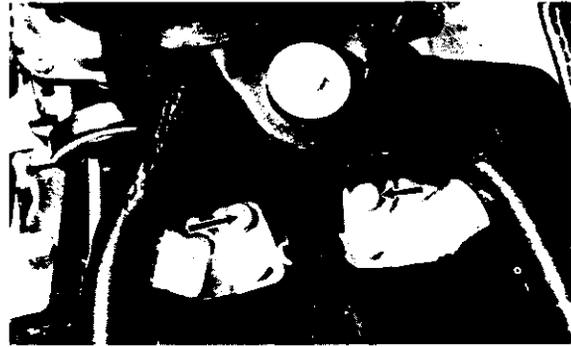
B. Fuel tank removal

1. Turn fuel petcocks to "on" (there is no "off" position – fuel will not flow from a petcock on the "on" position unless the engine is operating). Disconnect fuel pipes and vacuum pipes from petcock.
2. Lift seat and remove fuel tank holding bolt. Remove fuel tank.

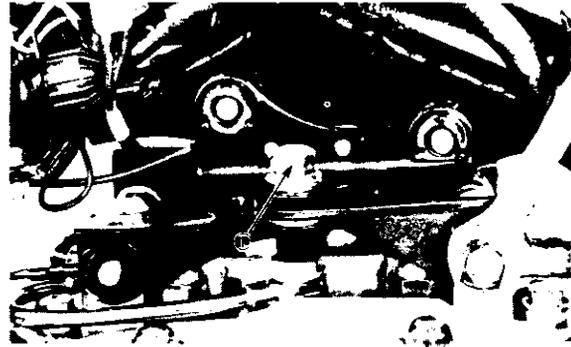
C. Removal of other parts

Remove the following parts in the order given.

1. Exhaust pipes
2. Horn (as a unit)
3. Both side footrests
4. Change pedal and drive chain guide
5. Left-hand crank case cover and clutch cable.
6. Side covers
7. Air cleaner assembly and ventilation hoses.



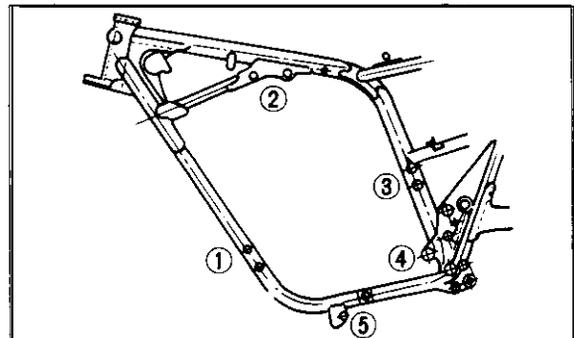
8. Carburetor (to the left), and throttle cable
9. Brake pedal
10. All wires and cables connecting engine and chassis
11. Top center engine mounting brackets (Remove only four bolts for easier re-assembly)



1. Better not to remove this
12. Drive chain (with special tool)

D. Engine mounting bolts and engine removal

1. Remove mounting bolts in the order as shown.



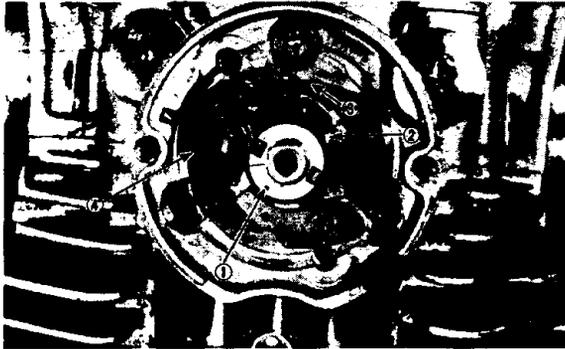
2. Remove the engine to the right.

3-2 ENGINE DISASSEMBLY

A. Governor and breaker assembly removal

Remove the following parts in the order given.

1. Breaker cover
2. Breaker backing plate
3. Breaker housing
4. Governor cover
5. Notched plate
6. Lock nut (using punch and hammer)
7. Governor assembly



1. Notched plate
2. Lock nut
3. Loosen
4. Governor assembly
8. Breaker shaft (to the point side)
9. Dowel pin
10. Advance unit housing

B. Cylinder head and cylinder removal

1. Remove the oil delivery and pipe fitting attached to the crankcase. Note placement of copper gaskets.
2. Remove all tappet covers.
3. Remove spark plugs.
4. Remove four cylinder head cover holding bolts, three cylinder head holding bolts and eight cylinder head holding nuts.
5. Remove the head cover. It may be necessary to tap each lightly with a soft hammer.
6. Remove the camshaft as follows.
 - a. Remove tensioner adjusting bolt to make the chain tension loose.
 - b. Push out the master link pins with the cam chain cutter.
 - c. Tie each end of the camchain with a wire to prevent it from falling into the crankcase.
7. Remove the cylinder head and cylinder.

NOTE:

It is advisable to remove the stator and rotor after finding the place of the master link pins. Refer to item "F. Generator removal."

C. Rocker arm removal

1. Remove rocker shaft covers.
2. Remove shouldered sleeves and O-rings.
3. Withdraw rocker shafts with the special tool or 6 mm bolt.

D. Valve removal

1. Compress the valve spring and then remove both retainer locks. Remove the compressor and lift off the retainer and springs.
2. Remove valve stem seals.
3. Remove valves.

NOTE:

Deburr any deformed valve stem end. Use an oil stone to smooth the stem end. This will help prevent damage to the valve guide during valve removal.

E. Piston removal

Remove piston pin clips, piston pins and pistons.

F. Generator removal

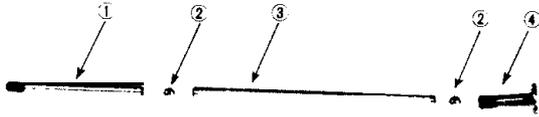
1. Remove the stator.
2. Remove the securing nut and lock washer.
3. Mount the rotor puller (special tool) onto the rotor and pull the rotor off.



1. Rotor puller (90890-01070)

G. Primary drive gear and clutch assembly removal

1. Remove the crankcase cover (right).
2. Loosen the drive gear securing nut by first placing a rag folded into many layers between the teeth of gears to lock them.
3. Remove six clutch spring screws and pressure plate.
4. Remove clutch plates, friction plates, push crown, two push rods and two balls.



1. Push rod
2. Ball
3. Push rod (Aluminum)
4. Push crown

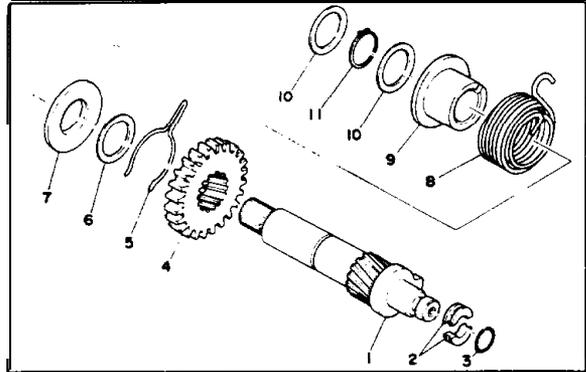
5. Hold the clutch unit with the holding tool (special tool), and unscrew the clutch boss lock nut.

H. Kick axle and change shaft removal

1. Slip the bent spring off and pull the kick axle assembly out.
2. Remove circlip from left side of change shaft and pull the shaft out.

I. Electric starter unit removal

1. Remove the gear train cover, and idle gear 1 and 2.



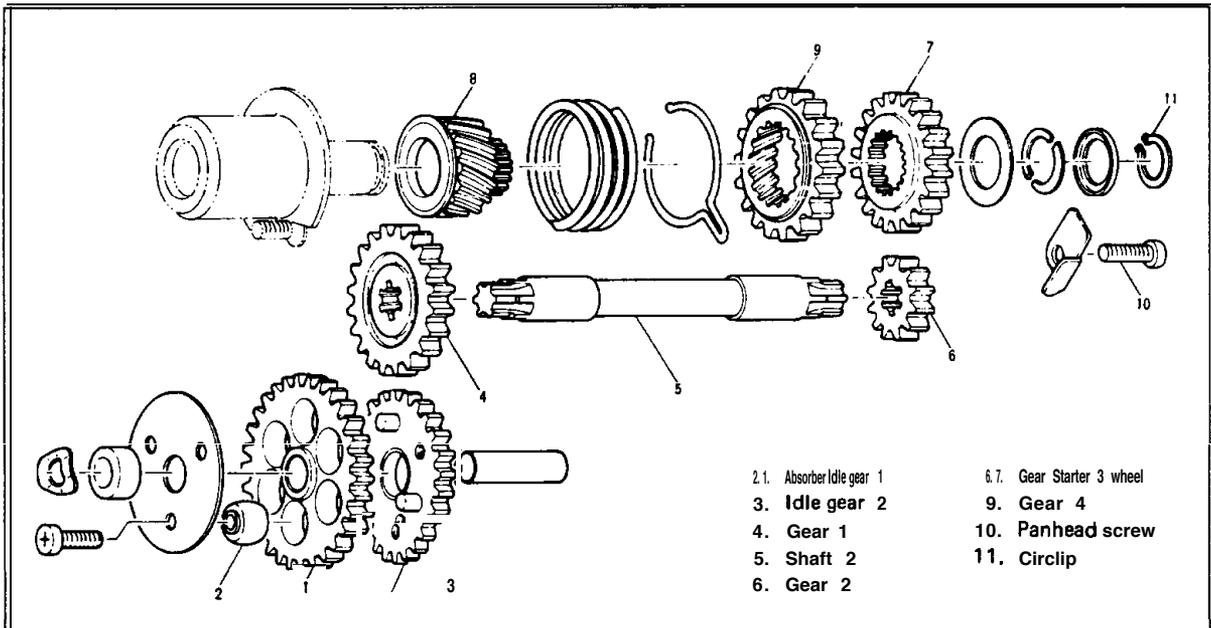
1. Kick axle
2. Holder
3. Clip
4. Kick gear
5. Kick clip
6. Shim
7. Spacer
8. Kickspring
9. Spring guide
10. Washer
11. Circlip

2. Remove the four mounting bolts and motor.

3. Remove the panhead screw (10), gear 2 (6), shaft 2 (5), and gear 1 (4).

4. Remove the circlip (11), and gear assembly (7) (8) (9).

5. Starter gears illustration



- 2.1. Absorber idle gear 1
3. Idle gear 2
4. Gear 1
5. Shaft 2
6. Gear 2
- 6.7. Gear Starter 3 wheel
9. Gear 4
10. Panhead screw
11. Circlip

J. Oil pump removal

1. Remove the tachometer drive gear, oil pump driven gear, and key.
2. Remove the three Phillips screws.
3. Remove the pump unit.

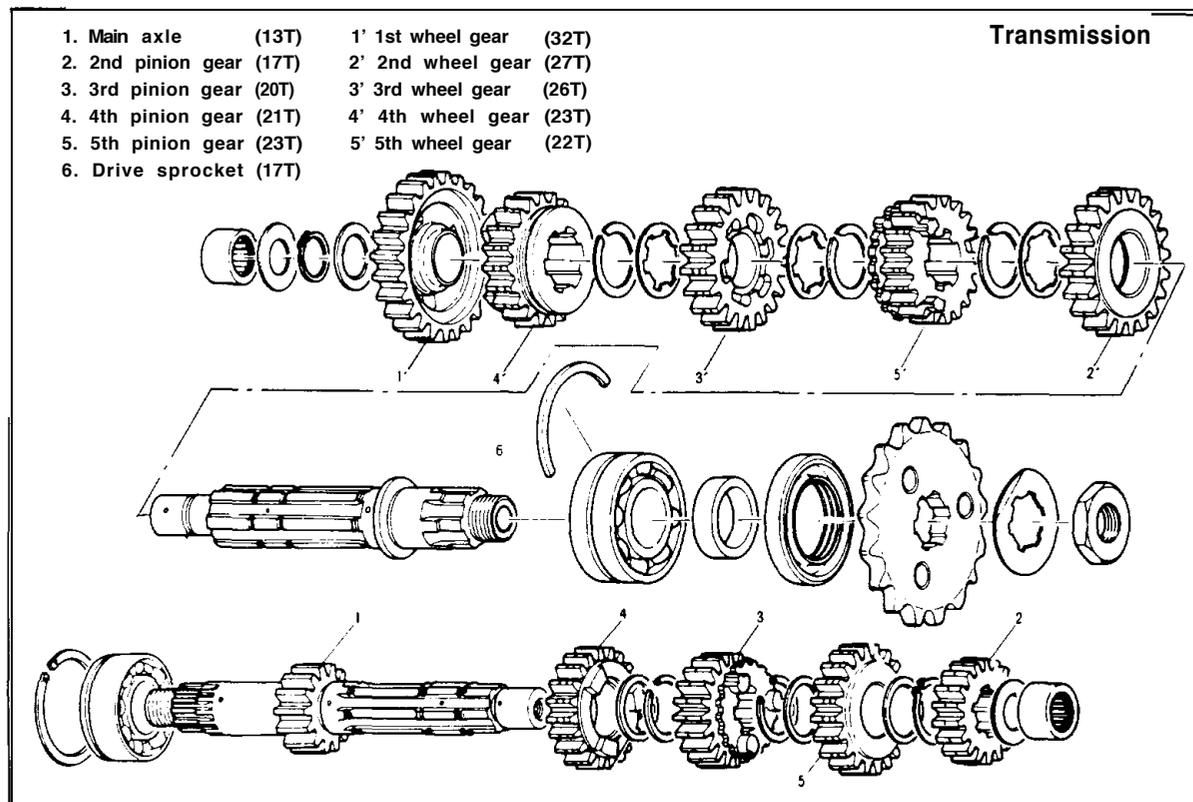
K. Crankcase disassembly

1. Loosen all case securing bolts and nuts 1/4 turn at a time to avoid case warpage, and remove them.
2. Use a soft rubber hammer to carefully separate the crankcases.

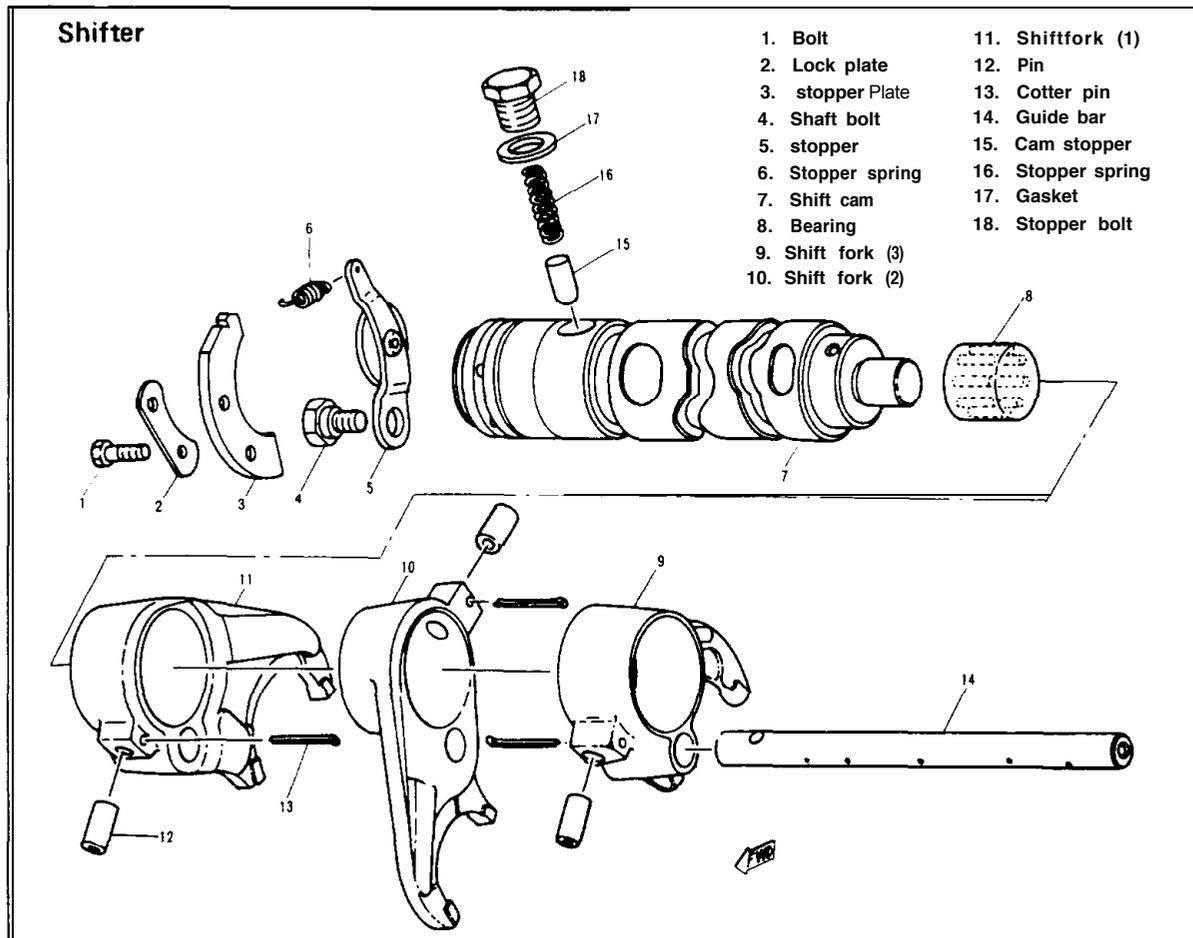
CAUTION:

There is one hidden crankcase holding nut. This nut is located near the primary drive gear.

L. Transmission illustration



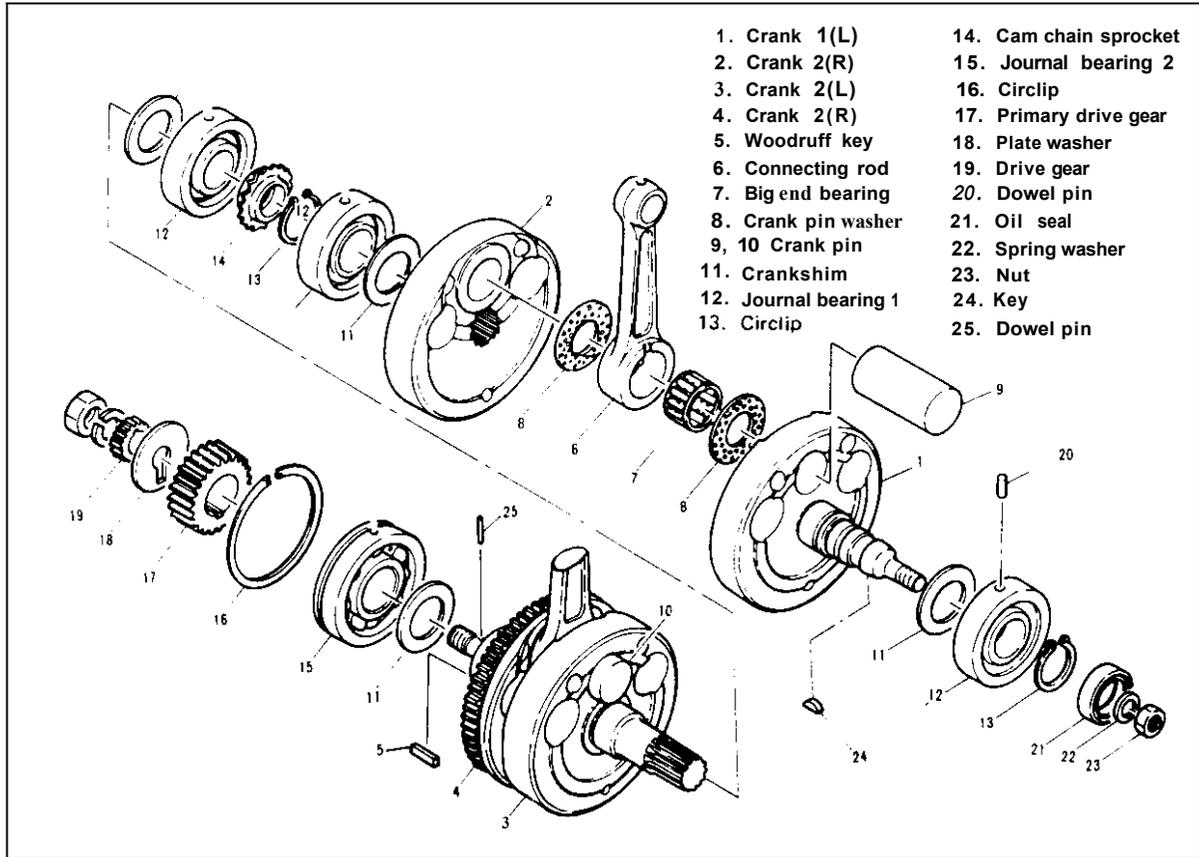
M. Shift drum removal



1. Release the stopper spring (6).
2. Remove the bolts (1) and stopper plate(3).
3. Pull the guide bar (14) out.
4. Remove the neutral detent unit (15-18).
5. Remove cotter pins (13), and pin (12)
6. Pull out the shift cam (7).

N. Crankshaft removal

1. Tap the crankshaft with a rubber hammer to loosen it, then lift it out.
2. Crankshaft illustration



3-3. INSPECTION AND REPAIR

A. Cylinder head cover

Place head cover on a surface plate. There should be no warpage. Correct by re-surfacing as follows:

Place #400 or #600 grit wet sandpaper on surface plate and re-surface head cover using a figure-eight sanding pattern. Rotate head cover several times to avoid removing too much material from one side.

B. Cylinder head

1. Remove spark plugs.
2. Remove valves.

3. Using a rounded scraper, remove carbon deposits from combustion chamber. Take care to avoid damaging spark plug threads and valve seats. **Do not use** a sharp instrument. Avoid scratching the aluminum.

4. Place on a surface plate. There should be no warpage. Correct by re-surfacing as follows:

Place #400 or #600 grit wet sandpaper on surface plate and re-surface head using a figure-eight sanding pattern. Rotate head several times to avoid removing too much material from one side.

C. Valve, valve guide and valve seat

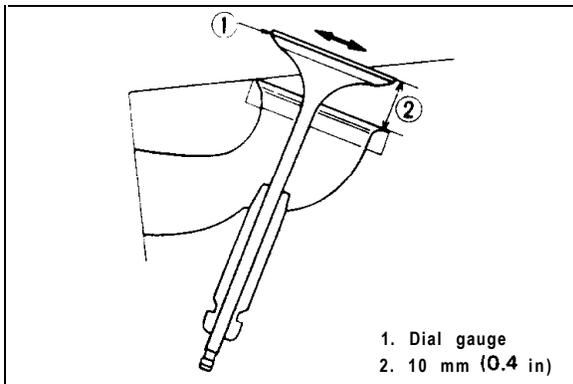
1. Valve guide

- a. If the valve guide inside diameter is beyond serviceable limits, replace with an oversize valve guide.

	Standard
Guide diameter (I.D.) (IN.EX)	8.010 – 8.019 mm (0.315 – 0.316 in)

- b. Measuring the clearance between valve and valve guide.

- 1) Insert the valve into the valve guide in the cylinder head and measure the clearance in both the X and Y axes, using a small dial gauge.



- 2) If the measured clearance is greater than 0.10 mm (0.0039 in) for the inlet valve or 0.12 mm (0.0047 in) for the exhaust valve, both the valve and valve guide should be replaced. The replacement valve guide should be one that is oversize.

Valve guide oversize:	
Part No.	Size (O.D.)
256-I 1133-I 1 (IN)	15.1 mm (0.594 in)
256-I 1133-21	15.2 mm (0.598 in)
256-I 1134-I 1 (EX)	15.1 mm (0.594 in)
256-I 1134-21	15.2 mm (0.598 in)

- c. To ease guide removal and reinstallation, and to maintain the correct interference fit, heat the head to 100°C. Use an oven to avoid any possibility of head warpage due to uneven heating.

- d. Use the appropriate shouldered punch (special tool) to drive the old guide out and drive the new guide in.
- e. After installing the valve guide, use 8 mm reamer (special tool) to obtain the proper valve clearance.
- f. After fitting the valve guide into the cylinder head, be sure to grind the valve seat, and perform valve lapping. The valve must be replaced with a new one.

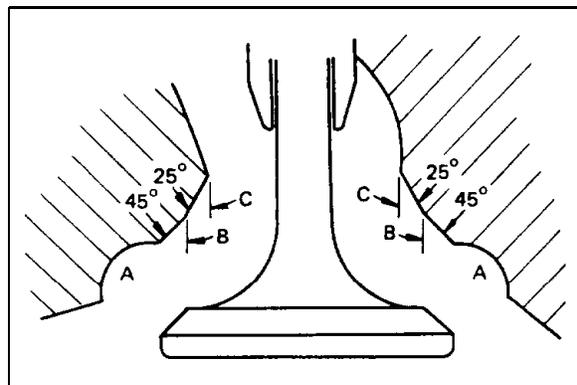
2. Grinding the valve seat.

- a. The valve seat is subject to severe wear similar to valve face. Whenever the valve face is resurfaced, the valve seat should also be re-surfaced at a 45° angle. In addition, if a new valve guide has been installed (without any valve repair), the valve seat should be checked to guarantee complete sealing between the valve face and seat.

CAUTION :

If the valve seat is obviously pitted or worn, it should be cleaned with a valve seat cutter. Use the 45° cutter, and when twisting the cutter, keep an even downward pressure to prevent chatter marks.

If cutting section "A" of the valve seat, use the 8R cutter (radius cutter). If cutting section "B", use the 45° cutter.



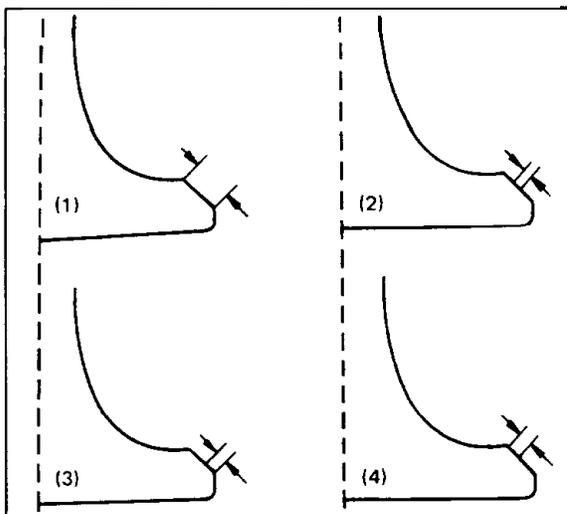
- b. Measure valve seat width. Apply mechanic's bluing dye (such as Dykem) to the valve face, apply a very small amount of fine grinding compound around the surface of the valve seat, insert the valve into position, and spin the valve quickly back and forth. Lift the valve, clean off all grinding compound, and check valve seat

width. The valve seat will have removed the bluing wherever it contacted the valve face. Measure the seat width with vernier calipers. It should measure approximately 1.3 mm. Also, the seat should be uniform in contact area. If valve seat width varies, or if pits still exist, then continue to cut with the 45° cutter. Remove just enough material to achieve a satisfactory seat.

	Standard width	Wear limit
Seat width	1.3 mm (0.051 in)	2.0 mm (0.079 in)

c. If the valve seat is uniform around the perimeter of the valve face, but is too wide or not centered on the valve face, it must be altered. Use either the 8R, 45° or 25° cutters to correct the improper seat location in the manner described below:

- 1) If the valve face shows that the valve seat is centered on the valve face, but too wide, then lightly use both the 8R and the 25° cutters to reduce the seat width to 1.3 mm.
- 2) If the seat shows to be in the middle of the valve face, but too narrow, use the 45° cutter until the width equals 1.3 mm.
- 3) If the seat is too narrow and right up near the valve margin, then first use the 8R cutter and then the 45° cutter to get the correct seat width.
- 4) If the seat is too narrow and down near the bottom edge of the valve face, then first use the 25° cutter and then the 45° cutter.



3. Lapping the valve/valve seat assembly.
 - a. The valve/valve seat assembly should be lapped if (1) neither the seat nor the valve face are severely worn, or (2) if the valve face and valve seat have been resurfaced and now require a final light grinding operation for perfect sealing.

b. Apply a small amount of coarse lapping compound to valve face. Insert the valve into the head. Rotate the valve until the valve and valve seat are evenly polished. Clean off the coarse compound, then follow the same procedure with fine compound.

Continue lapping until the valve face shows a complete and smooth surface all the way around. Clean off the compound material. Apply bluing dye to the valve face and rotate the valve face for full seat contact which is indicated by a shiny surface all around the valve face where the bluing has been rubbed away.

c. Valve leakage check

After all work has been performed on the valve and valve seat, and all head parts have been assembled, check for proper valve/valve seat sealing by pouring solvent into each of the intake ports, then the exhaust ports. There should be no leakage past the seat. If fluid leaks, disassemble and continue to lap with fine lapping compound. Clean all parts thoroughly, reassemble and check again with solvent. Repeat this procedure as often as necessary to obtain a satisfactory seal.

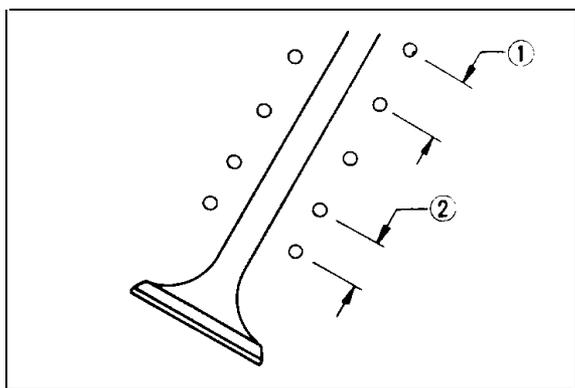
D. Valve spring

1. Checking the valve springs

- a. This engine uses two springs of different sizes to prevent valve float or surging. The chart below shows the basic valve characteristics.
- b. Even though the spring is constructed of durable spring steel, it gradually loses some of its tension. This is evidenced by a gradual shortening of free length. Use a vernier caliper to measure spring free length. If the free length of any spring has decreased more than 2 mm (0.08 in) from its specification, replace it.

c. Another symptom of a fatigued spring is insufficient spring pressure when compressed. This can be checked using a valve spring compression rate gauge. Test each spring individually. Place it in the gauge and compress the spring first to the specified compressed length with the valve closed (all spring specifications can be found in the previous section, valve spring), then to length with the valve open. Note the poundage indicated on the scale at each setting. Use this procedure with outer springs, then the inner spring.

NOTE: _____
All valve springs must be installed with greater pitch upward as shown.



1. Larger pitch
2. Smaller pitch

d. Valve spring specifications

	Outer	Inner
Free length	42.55 mm (1.675 in)	42 mm (1.645 in)
Installed pressure and length (valve closed)	16.5 ~ 19.0 kg (36.4 ~ 41.9 lb) 37 mm (1.457 in)	9.3 ~ 10.7 kg (20.5 ~ 23.6 lb) 35 mm (1.378 in)
Compressed pressure and length (valve open)	53.5 ~ 61.5 kg (117.9 ~ 135.6 lb) 27.5 mm (1.083 in)	25.5 ~ 29.0 kg (56.2 ~ 63.9 lb) 25.5 mm (1.004 in)
Allowable tilt from vertical	1.6 mm or 2.5° (0.063 in)	←

E. Rocker arm and rocker shaft.

1. The rocker arm usually wears at two locations: (1) at the rocker shaft hole, (2) at the cam lobe contacting surface.
2. Measure the rocker shaft hole in the rocker arm.

Standard size:

15.000 ~ 15.018 mm
(0.5906 ~ 0.5913 in)

3. The shaft has been hardened and it should not wear excessively. If a groove has developed in this surface that can be felt, or if it shows a blue discoloration, then the shaft should be replaced and the lubrication system (pump and passages) checked.

Standard shaft diameter:

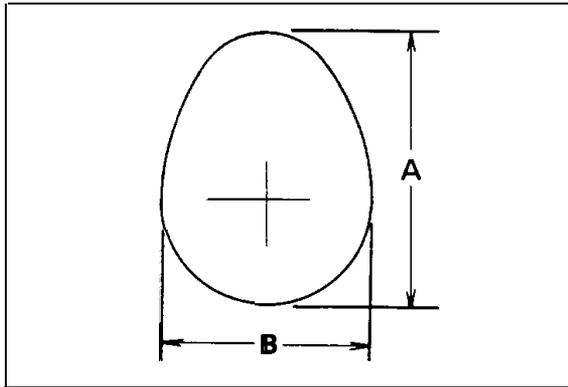
14.985 ~ 14.991 mm
(0.5900 ~ 0.5902 in)

4. Standard clearance between the rocker shaft and hole should be 0.009 ~ 0.033 mm (0.00035 ~ 0.00130 in). If measurement shows more than 0.1 mm (0.0004 in) clearance, replace either or both parts as necessary.

F. Camshaft wear

1. The cam lobe metal surface may have a blue discoloration due to excessive friction. The metal surface could also start to flake off or become pitted. This is due to poor lubrication, incorrect clearances (from poor adjustment or valve bounce), or due to normal wear.
2. If any of the above wear conditions are readily visible, the camshaft should be replaced. Also, the corresponding rocker arm contacting surface should be checked for similar wear and replaced if obvious wear is noted.
3. Even though the cam lobe surface appears to be in satisfactory condition, the lobes should be measured with a micrometer. Cam lobe wear can occur without scarring the surface. If this wear exceeds a pre-determined amount, valve timing and lift are affected. Replace the camshaft if wear exceeds the limits listed below.

	Cam Lift(A)		Width (B)	
	Standard Value	Wear Limit	Standard Value	Wear Limit
Intake	39.99±0.05 mm (1.574±0.002 in)	39.84 mm (1.569 in)	32.24±0.05 mm (1.269±0.002 in)	32.09 mm (1.263 in)
Exhaust	40.03±0.05 mm (1.576±0.002 in)	39.88 mm (1.570 in)	32.30±0.05 mm (1.272±0.002 in)	32.15 mm (1.266 in)



4. All camshaft bearings should be removed, cleaned, dried, and the races visually checked for pits, rust spots or chatter marks where the balls have dragged, If any of these conditions exists the bearing(s) should be replaced.

G. Cam chain, sprocket and dampers

1. Cam chain

Except in cases of oil starvation, the cam chain wears very little. If the cam chain has stretched excessively and it is difficult to keep the proper cam chain tension, the chain should be replaced.

2. Cam sprockets

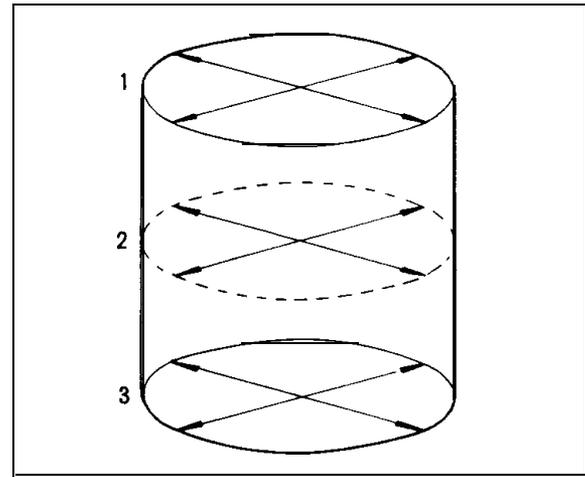
Check cam sprockets for obvious wear.

3. Cam chain dampers

Inspect the two vertical (slipper-type) dampers for excessive wear. Any that shows excessive wear should be replaced. Worn dampers may indicate an improperly adjusted or worn-out cam chain,

H. Cylinder

1. Inspect the cylinder walls for scratches. If vertical scratches are evident, the cylinder wall should be rebored or the cylinder should be replaced.
2. Measure cylinder wall wear as shown. If wear is excessive, compression pressure will decrease. Rebore the cylinder wall and replace the piston and piston rings. Cylinder wear should be measured at three depths with a cylinder bore gauge. (See illustration.)



	Standard	Wear limit
Cylinder bore	75.00 ~ 75.02 mm (2.9528 ~ 2.9536 in)	75.1 mm (2.9567 in)
Cylinder taper	-	0.05 mm (0.002 in)
Cylinder out-of-round		0.01 mm (0.0004 in)

If the cylinder wall is worn more than wear limit, it should be rebored.

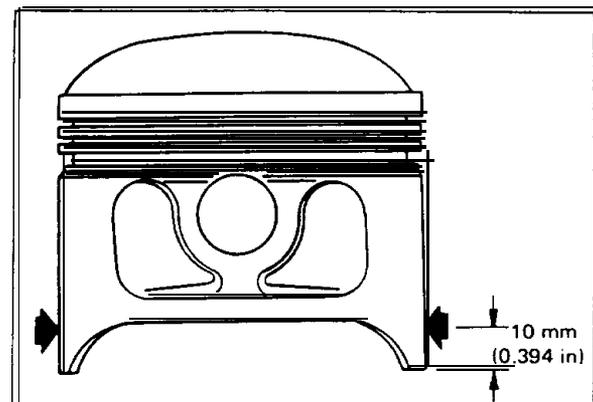
I. Piston and piston rings

1. Piston

- a. Measure the outside diameter of the piston at the piston skirt.

Measurement should be made at a point 10 mm (0.394 in) above the bottom edge of the piston. Place the micrometer at right angles to the piston pin.

Standard:	74.96, 74.97 mm (2.951, 2.952 in)
Oversize 1:	75.25 mm (2.963 in)
Oversize 2:	75.50 mm (2.972 in)
Oversize 3:	75.75 mm (2.982 in)
Oversize 4:	76.00 mm (2.992 in)



b. Determine piston clearance as follows:

Minimum bore measurement – Maximum piston measurement = Piston clearance
--

Example:

75.02 mm
-74.97 mm

=0.05 mm piston clearance

c. Piston ring/ring groove fit must have correct clearance. If the piston and ring have already been used, the ring must be removed and the ring groove cleaned of carbon. The rings should then be reinstated. Use a feeler gauge to measure the gap between the ring and the land.

	Top	2nd
Side clearance	0.04 ~ 0.08 mm (0.0016 ~ 0.0031 in)	0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in)

2. Piston ring

a. The oversize top and middle ring sizes are stamped on top of the ring.

Oversize 1:	0.25 (mm)
Oversize 2:	0.50 (mm)
Oversize 3:	0.75 (mm)
Oversize 4:	1.00 (mm)

b. Push the ring into the bore and check end gap clearance with a feeler gauge.

NOTE: _____
 The end gap on the expander spacer of the oil control ring is unmeasurable. If oil control ring rails show excessive gap, all three components should be replaced.

	Standard	Limit
Top/2nd ring	0.2 ~ 0.4 mm (0.0079 ~ 0.016 in)	1.0 mm (0.039 in)
Oil control (Rails)	0.2 ~ 0.9 mm (0.0079 ~ 0.0354 in)	Visual inspection

J. Piston pin

1. Apply a light film of oil to pin. install in connecting rod small end. Check for play. There should be no noticeable vertical play. If play exists, check connecting rod small end for wear. Replace pin and connecting rod as required.
2. The piston pin should have no noticeable free play in piston. If the piston pin is loose, replace the pin and/or the piston.

K. Crankshaft

1. Main bearing and big end bearing visually inspect all friction surfaces for obvious pits, scratches, chatter marks, or rust. Replace it if necessary.
2. Small end play(A)

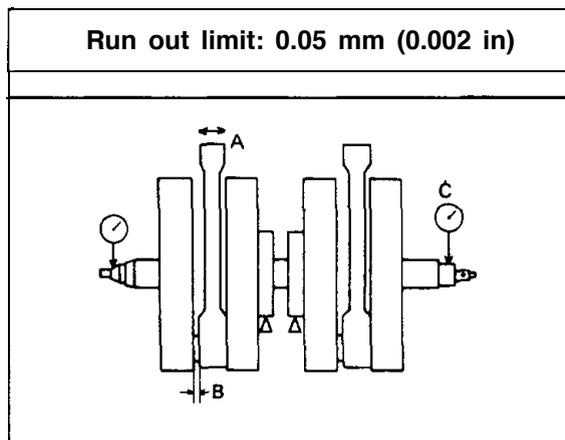
Maximum allowable tolerance: 2.0 mm (0.079 in)

3. Big end side clearance(B)

Standard clearance: 0.15 – 0.4 mm (0.0059 ~ 0.016 in)
--

4. Crankshaft run out(C)

Mount the crankshaft in V-blocks and check for run out using a dial gauge.



L. Oil pump

1. Check the clearance between housing and outer rotor.

Standard clearance: 0.10 ~ 0.18 mm (0.0039 ~ 0.0071 in)
--

2. Check the clearance between outer rotor and inner rotor.

Standard clearance:
0.03 ~ 0.09 mm (0.0012 ~ 0.0035 in)

M. Clutch

1. Clutch housing

Check dogs on clutch housing. Look for cracks and signs of galling on edges. If damage is moderate, deburr. If severe, replace clutch housing.

NOTE: _____
Galling on the friction plate dogs of the clutch housing will cause erratic clutch operation.

2. Clutch boss

Check splines on clutch boss for galling. If damage is slight to moderate, deburr. If it is severe, replace clutch boss.

NOTE: _____
Galling on clutch plate splines will cause erratic clutch operation.

3. Friction and clutch plates

Check clutch steel plates and friction plates for heat damage. Measure friction plate thickness at 3 or 4 points. Measure clutch plates for warpage. Replace clutch plate or friction plates as a set if any is faulty or beyond wear limits.

	Standard	Wear limit
Friction plate thickness	3.0 mm (0.118 in)	2.7 mm (0.106 in)
Clutch plate warp limit	—	0.05 mm (0.002 in)

4. Clutch push rod

Check ends of clutch push rod for indentation. If severe, clutch adjustment may be difficult. Check for looseness of the steel ends of the push rod. If ends are loose or indented, replace push rod.

5. Clutch springs

Measure clutch spring free length. Replace springs as a set if necessary.

Clutch spring length:
34.6 mm (1.362 in)

N. Transmission

1. Inspect each shift fork for signs of galling on gear contact surfaces. Check for bending. Make sure each fork slides freely on its guide bar.
2. Roll the guide bar across a surface plate. If bar is bent, replace.
3. Check the shift cam grooves for signs of wear or damage. If any profile has excessive wear and/or damage, replace cam.
4. Check the cam followers on each shift fork for wear. The follower should fit snugly into its seat in the shift fork, but should not be overly tight. Check the ends that ride in the grooves in the shift cam. If they are worn or damaged, replace followers.
5. Check shift cam dowel pins and side plate for looseness, damage or wear. Replace as required.
6. Check the shift cam stopper plate and circlip and stopper for wear. Replace as required.
7. Check the transmission shafts using a centering device and dial gauge. If any shaft is bent beyond specified limit, replace shaft.

Maximum run-out:
0.03 mm (0.001 in)

8. Carefully inspect each gear. Look for signs of obvious heat damage (blue discoloration). Check the gear teeth for signs of pitting, galling or other extreme wear. Replace as required.
9. Check to see that each gear moves freely on its shaft.
10. Check to see that all washers and clips are properly installed and undamaged. Replace bent or loose clips and bent washers.

11. Check to see that each gear properly engages its counterpart on the shaft. Check the mating dogs for rounded edges, cracks, or missing portions. Replace as required.

0. Electric starter gears and clip spring

1. Check the gears for wear or scratches on teeth, particularly in the chamfered area of each gear.
2. The clip spring is fitted to gear (4) (Refer to PAGE 20) and slides in the groove. A too-tight or loose-fitting clip may result in improper operation. If too loose, bend the clip so that the friction increases, or replace clip.

Friction tension: 2.2 ~ 2.5 kg (4.9 ~ 5.5 lb)
--

P. Kick starter

1. Kick gears

Check the kick gears for wear or scratches on teeth, particularly in the chamfered area of each gear.

2. Kick clip spring

The kick clip is fitted to kick gear and slides in the groove. A too-tight or loose-fitting clip may result in improper operation. If too loose, bend the kick clip so that the friction increases, or replace clip.

Friction tension: 1.2 ~ 1.7 kg (2.0 ~ 3.7 lb)
--

Q. Crankcases and oil passages

1. Check crankcases for cracks or other damage.
2. Clean all oil passages and blow out with compressed air.

R. Bearings and oil seals

1. After cleaning and lubricating bearings, rotate inner race with a finger. If rough spots are felt, replace the bearing.
2. Check oil seal lips for damage and wear. Replace as required.

3-4. ENGINE ASSEMBLY AND ADJUSTMENT

NOTE:

- 1) All gaskets and seals should be replaced when an engine is overhauled. All gasket surfaces must be cleaned.
- 2) Properly oil all mating engine and transmission parts during assembly.
- 3) All circlips should be inspected before assembly. Replace distorted circlips. Always replace cotter pins and piston pin clips after one use.

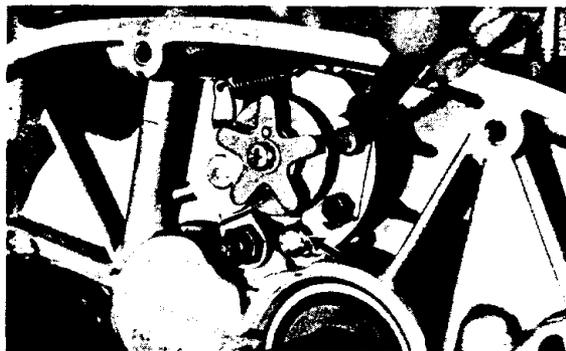
A. Shift

(Refer to PAGE 21)

Install shift forks, shift cam, guide pin, cotter pin, guide bar, stoper plate and detent. Apply LOCK-TITE to eccentric bolt.

NOTE:

Check for smooth and complete shifting after installing transmission.



B. Transmission and crankshaft

1. Rotate shift cam to neutral position.
2. Install the transmission, bearings and seals onto the upper case.
3. Install crankshaft, seal and bearings.

NOTE:

Fit each bearing over each locating pin and push the crankshaft into position by hand. Each bearing has line or punch mark which indicates the position of mating surface.

4. Make sure all bearings are positioned properly as shown.

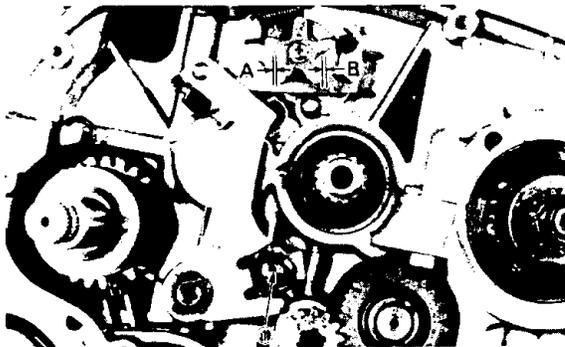


1. No clearance
5. Fit the chain over the cam sprocket,
6. Apply Yamaha Bond No. 4 sealant to crankcase mating surface.
7. Install bottom crankcase and nuts. Install nuts as follows:
 - a. Use copper washers and blind nuts on bolts (1), (2), (3), (4), (12), (13).
 - b. Tighten nuts in two stages in proper torque sequence. Start with bolt number one.

Crankcase torque:
2.2 m-kg (16 ft-lb)

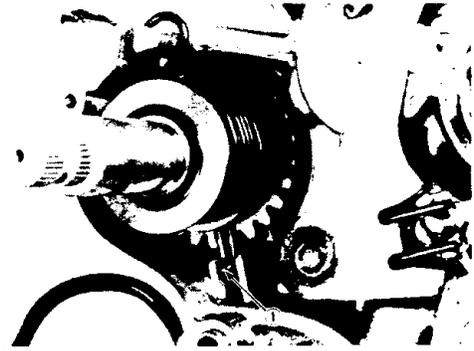
NOTE: _____
Before installing crankcase, make sure electric starter shaft 2 and gear 1 (PAGE 20) is installed.

- C. Shifter assembly
 1. Install shift shaft. Install circlip (E-clip) on left side of crankcases.
 2. Make sure distances A and B are equal. Adjust them by adjuster if necessary.



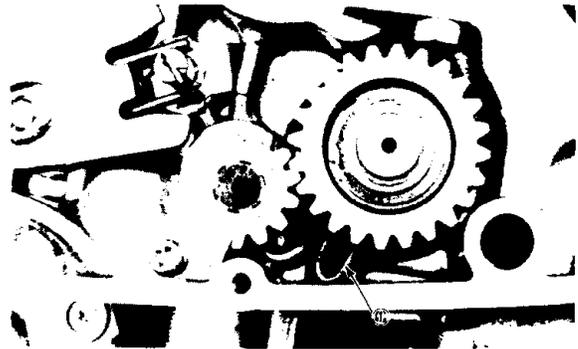
1. Adjuster 2. A = B

- D. Kick starter assembly
 1. Partially insert the assembly until the return spring can be slipped over its anchor point.



1. Kick clip
2. Positioning the kick clip in the groove, rotate the kick axle by kick lever 1/2 turn counterclockwise.
3. Push the axle in.
4. Check for correct operation.

E. Electric-starter gear assembly
Install the unit as shown.
(Refer to PAGE 20, if necessary.)



1. Clip

- F. Clutch
 1. Install the following parts in the order given.
 - a. Plate 1, t = 1 mm (0.039 in)
 - b. Plate 2, t = 2 mm (0.079 in)
 - c. Spacer shaft
 - d. Housing
 - e. Bearing plate, t = 1 mm (0.039 in)
 - f. Bearing
 - g. Plate 2, t = 2 mm (0.079 in)
 - h. Clutch boss
 - i. Plane washer, t = 2.6 mm (0.102 in)
 - j. Conical spring
 - k. Nut (using special tool)

Clutch lock nut torque:
6.5 m-kg (47 ft-lb)

- I. Friction plates and clutch plates
- m. Push rods, balls and push crown

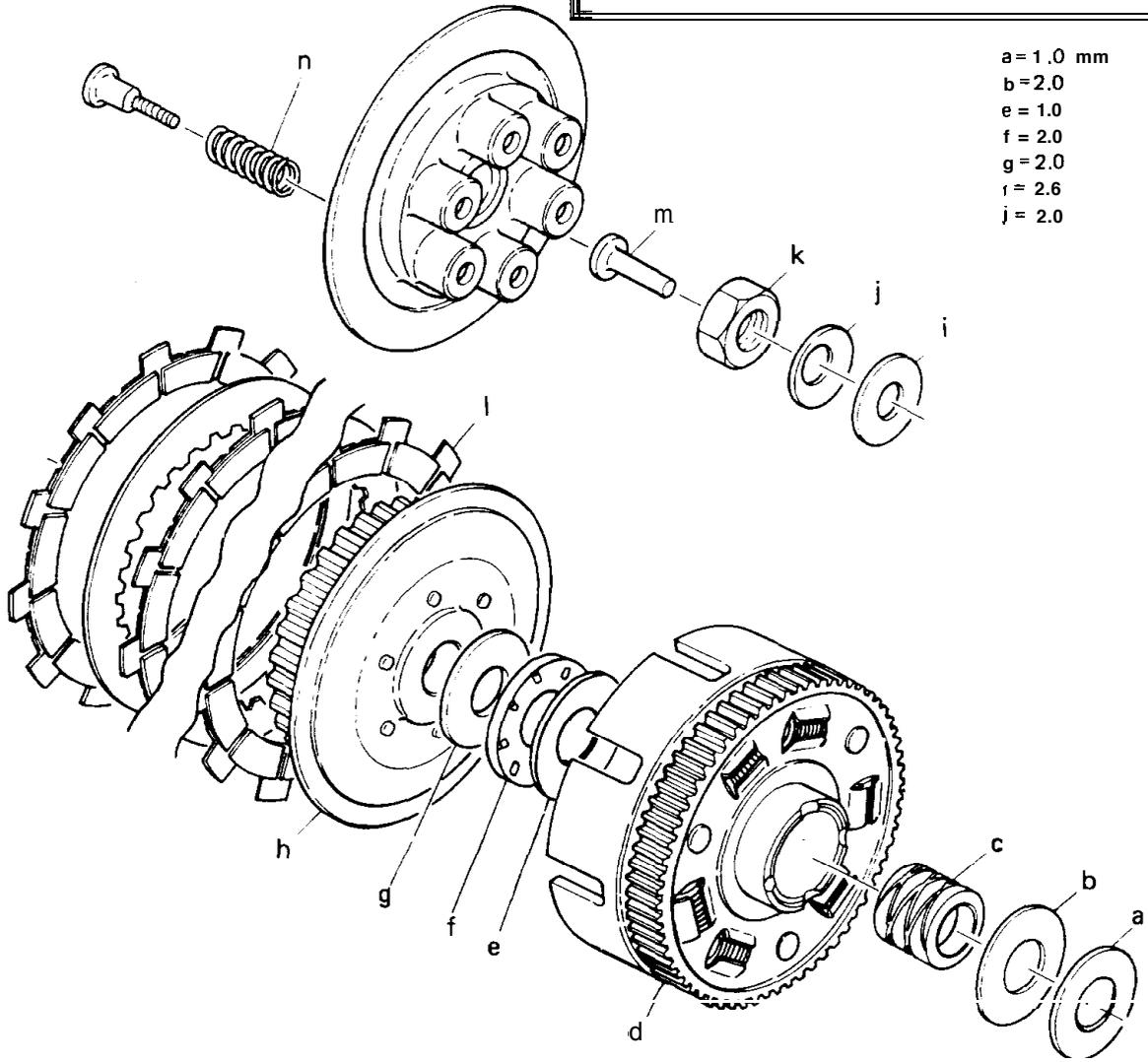
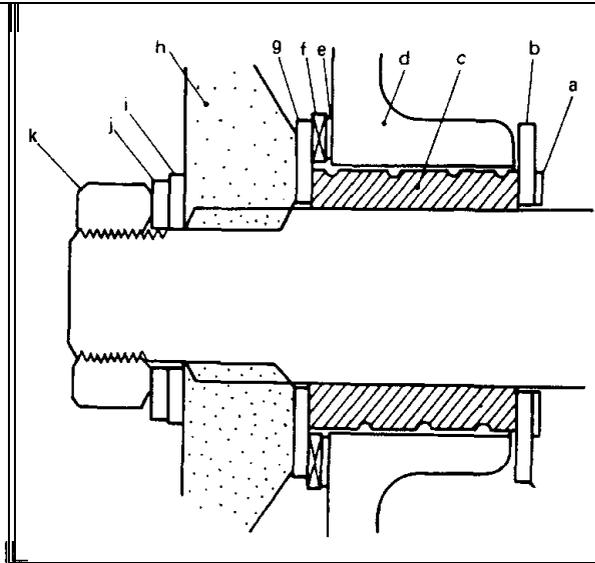
n. Pressure plate and clutch springs

o. Primary drive gear

Clutch screw torque:
1.0 m-kg (7 ft-lb)

Drive gear torque:
9 m-kg (65 ft-lb)

- a. Plate 1
- b. Plate 2
- c. Spacer shaft
- d. Housing
- e. Bearing plate
- f. Bearing
- g. Plate 2
- h. Clutch boss
- i. Plane washer
- j. Conical spring
- k. Nut (using special tool)
- l. Friction plates and clutch plates
- m. Push rods, balls and push crown
- n. Pressure plate and clutch spring



- a = 1.0 mm
- b = 2.0
- e = 1.0
- f = 2.0
- g = 2.0
- r = 2.6
- j = 2.0

G. Generator

1. Lock the crank rotation at the primary drive gear.
2. Reverse the generator removal sequence.

H. Oil pump

Reverse the oil pump removal sequence.



I. Right-hand crankcase cover

While properly engaging oil pump gear, install new case cover gasket and right-hand crankcase cover. Tighten holding screws gradually until proper torque is reached.

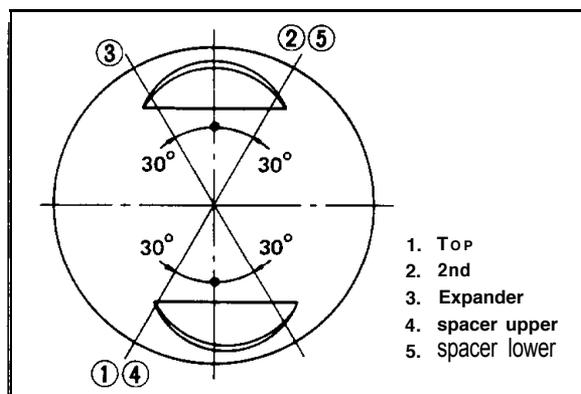
Crankcase cover holding screw torque:
1.0 m-kg (7 ft-lb)

J. Piston

1. Position piston rings as shown.

NOTE: _____

- 1) Make sure ends of oil ring expanders are not overlapped.
- 2) Manufacturer's marks or numbers stamped on the rings are on the top side of the rings. Coat pistons and rings well with oil.



2. Install pistons on rods. The arrow on the pistons must point to the front of the engine.

NOTE: _____

Always install new piston pin clips.

K. Cylinder and cylinder head

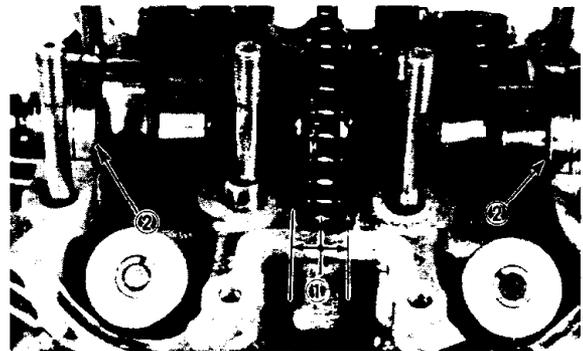
1. Install the tensioner cushion onto crankcase.
2. Install a new cylinder base gasket.
3. Install cylinder using special tool.
4. Install the cylinder head gasket and cylinder head.

NOTE: _____

The assembly of the cylinder head is the reverse of the disassembly procedure. Install valve springs with tighter windings (smaller pitch) down,

L. Camshaft

1. Rotate the piston to TDC.
2. Install the chain onto the camshaft with no slack in the cam chain on the front portion (opposite side from the tensioner).



1. Center
2. No clearance

3. Position the groove in the left side of the cam sprocket so that it lines up with the sprocket centers.

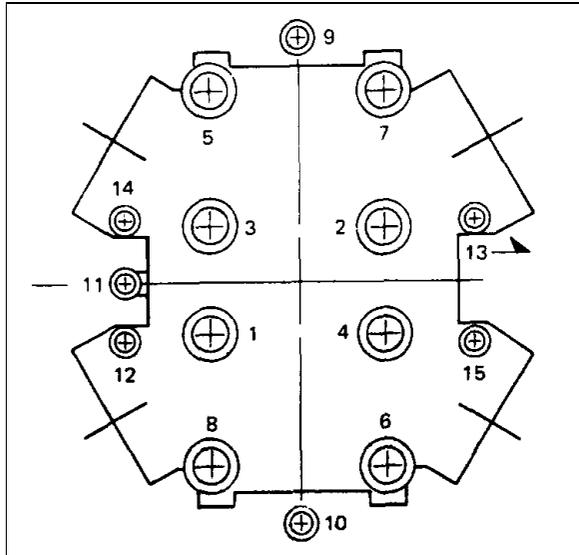


1. 90°

4. Joint the chain together and revet a new link.
5. Install the cam chain tensioner, and adjust chain tension. Refer to PAGE. (8).
6. Make sure the timing is correct.

M. Cylinder head cover

1. Install all components in the head cover.
2. Apply Yamaha No. 4 sealant to cover mating surfaces.
3. Install all head cover retaining nuts and bolts and thread them down until lightly seated.
4. Tighten them with torque wrench in the order given



Tightening torque:
 1 – 8 3.8 m-k_g (27 ft-lb)
 11 1.0 m-k_g (7 ft-lb)
 Others 2.2 m-k_g (16 ft-lb)

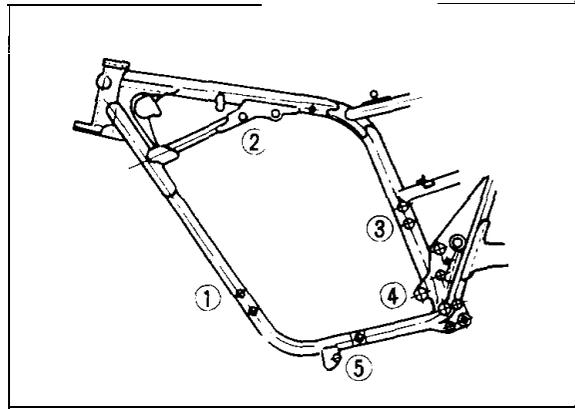
N. Governor and breaker assembly

Reverse the governor and breaker removal sequence.

NOTE:

Before inserting the governor rod, supportive bearings should be lubricated with molybdenum disulfide.

O. Engine

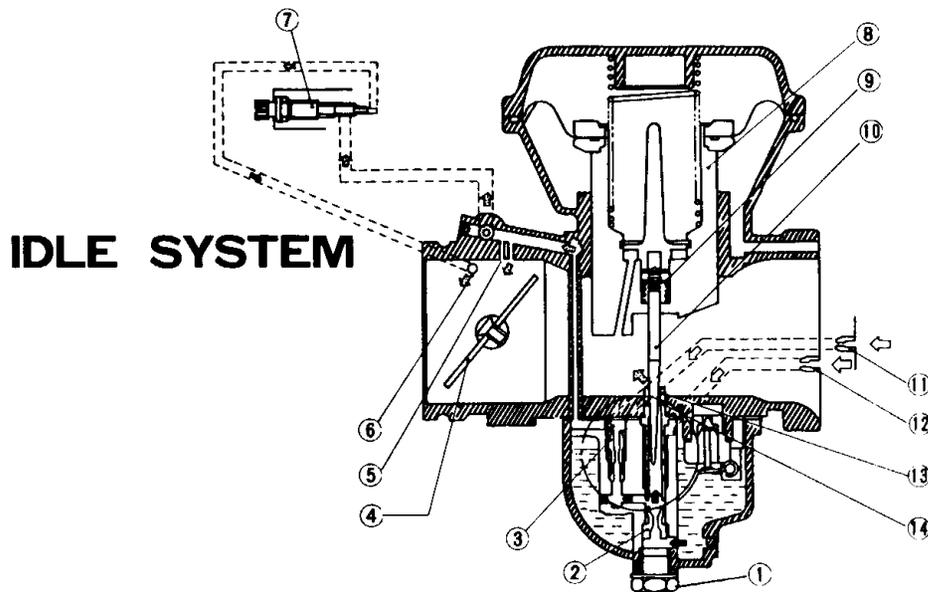


Tightening torque:
 1. 4.5(M10) ; 5.0 m-k_g (36 ft-lb)
 2. (M8) ; 2.0 m-k_g (14 ft-lb)
 3. (M10) ; 4.5 m-k_g (33 ft-lb)

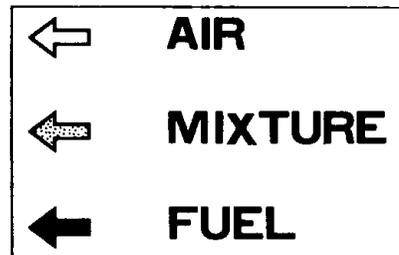
CHAPTER 4. CARBURETION

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MAIN METERING SYSTEM

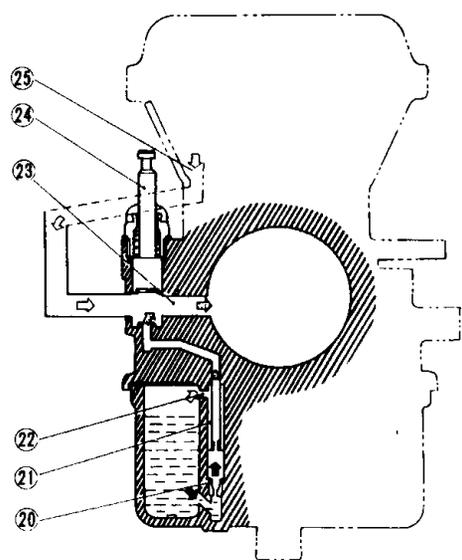


IDLE SYSTEM

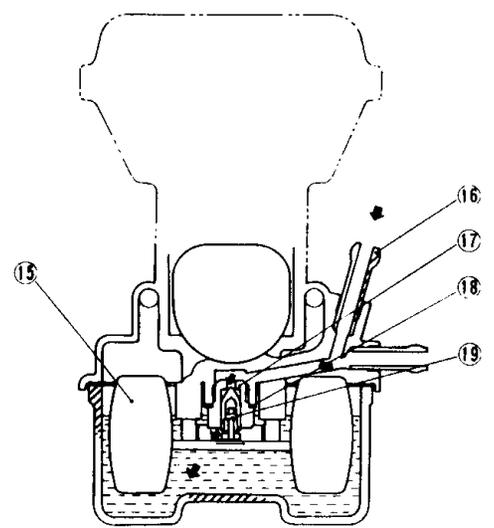


1. DRAIN SCREW
2. MAIN JET
3. PILOT JET
4. THROTTLE VALVE
5. BY-PASS HOLE
6. PILOT OUTLET
7. PILOT SCREW
8. PISTON VALVE
9. SPRING CLIP
10. JET NEEDLE
11. PILOT AIR JET
12. MAIN AIR JET
13. NEEDLE JET
14. O-RING
15. FLOAT
16. FUEL INLET
17. FLOAT NEEDLE SEAT
18. GASKET
19. FLOAT NEEDLE
20. STARTER JET
21. STARTER BLEED PIPE
22. STARTER AIR BLEED
23. MIXTURE OUTLOT
24. STARTER PLUNGER
25. AIR INLET

STARTER SYSTEM



FLOAT SYSTEM



41. CARBURETOR

A. Description

Air flow through the venturi is controlled by a throttle slide (vacuum piston). The slide is raised and lowered by engine vacuum rather than a cable linked directly to the throttle grip.

B. Specifications

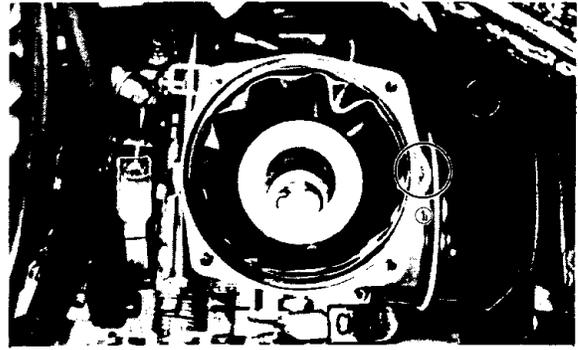
Main jet	#135
Jet needle	502-3
Needle jet	z-2
Starter jet	#80
Fuel valve seat	2 mm
Pilot jet	#27.5
Fuel level	24±1mm(0.94±0.04 in) (above gasket surface)

NOTE:

The low speed mixture screw settings are adjusted at the factory with the use of specialized equipment. Do not attempt to change these settings.

C. Disassembly

1. Prepare to separate carburetors (separation not necessary if only float level adjustment or throttle value inspection is to be done). Remove starter lever. Loosen starter lever securing screws and remove starter lever rod.
2. Remove upper and lower brackets. Note position of synchronizing screws for guidance in reassembly. Separate carburetors.
3. Remove vacuum chamber cover. Remove the spring, needle fitting clip, needle, and diaphragm (piston valve).
4. Note that there is tab on the rubber diaphragm. There are matching recesses in the carburetor body for the diaphragm tab.



1. Tab

5. To inspect starter jet, remove three (3) screws holding the starter body to the right side of the carburetor.
6. Remove the four screws holding the float bowl cover. Remove float bowl cover. The main jet is located under a cover in the float bowl.
7. Pull out float pivot pin. Remove the float assembly. Be careful not to lose the float valve needle located under the float level adjustment tongue. Remove the needle jet.
8. Reassemble in reverse order. Pay close attention to the installation of the vacuum piston diaphragm.

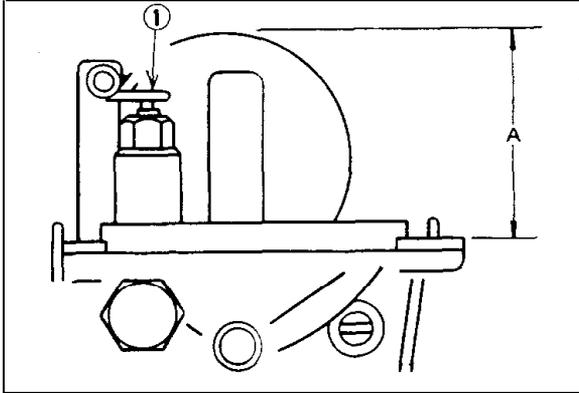
D. Inspection

1. Examine carburetor body and fuel passages. If contaminated, wash carburetor in petroleum-based solvent. Do not use caustic carburetor cleaning solutions. Blow out all passages and jets with compressed air.
2. Examine condition of floats. If floats are leaking or damaged, they should be replaced.
3. Inspect inlet needle valve and seat for wear or contamination. Replace these components as a set.
4. Inspect piston valve and rubber diaphragm. If the piston is scratched or the diaphragm is torn, the assembly must be replaced.

E. Adjustments

1. Float level adjustment

Measure the distance from the bottom of the float to the float bowl gasket surface. Bend the tongue on the float arm if any float level adjustment is necessary. Both floats must be at the same height. If the fuel level is too high, a rich air/fuel mixture will occur. If too low, a lean mixture will result.



1. Tongue A. 24 ± 1 mm (0.94 ± 0.04 in)

5

CHAPTER 5. CHASSIS

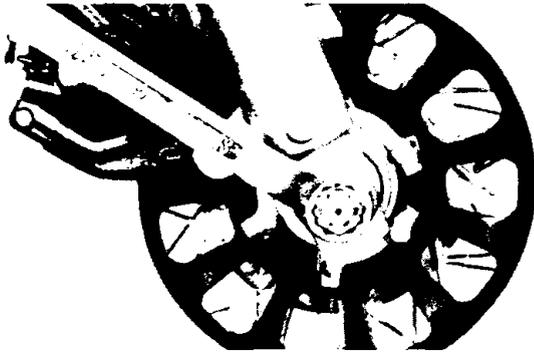
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CHAPTER 5. CHASSIS

5-I. FRONT WHEEL

A. Removal

1. Remove cotter pin from front axle nut.
2. Remove the front axle nut.
3. Loosen the two **axle** holder nuts at the bottom of the fork leg.
4. Raise the front wheel of the machine by placing suitable stand under the engine.
5. Remove the front wheel axle by simultaneously twisting and pulling out on the axle. Then remove the wheel assembly. The speedometer gear unit housing must be removed.



B. Front axle inspection

Remove any corrosion from axle with emery cloth. Place the axle on a surface plate and check for bends. If bent, replace axle.

C. Front wheel inspection

1. A rim can develop warpage. It is due to (1) running the wheel into an object and bending the outer rim, or (2) one or more spokes loosening.
2. Check for warpage by mounting the wheel on a stand (or, if the wheel is attached to a motorcycle, it can be blocked up and held in place). Use some device to measure or detect movement then slowly spin the wheel and note the amount of rim "run-out". It should not exceed 2 mm(0.08 in).
3. If all the spokes are tight, and the rim shows no obvious signs of damage, and yet run out is still excessive, do the following:

- a) If the run out is up and down, loosen spokes opposite the high spot and tighten the spokes at the high spot.
- b) If the run out is sideways, loosen the spokes at the high spot, and tighten the spokes opposite the high spot.

D. Replacing wheel bearings

If the bearings allow play in the wheel hub or if wheel does not turn smoothly, replace the bearings as follows:

1. Clean the outside of the wheel hub.
2. Drive the bearing out by pushing the spacer aside and tapping around the perimeter of the bearing inner race with a soft metal drift pin and hammer. The spacer "floats" between the bearings. Both bearings can be removed in this manner.
3. To install the wheel bearing, reverse the above sequence. Be sure to grease the bearing before installation. Use a socket that matches the outside race of the bearing as a tool to drive in the bearing.

CAUTION:

Do not strike the center race or balls of the bearing. Contact should be made only with the outer race.

E. Installing front wheel

When installing front wheel, reverse the removal procedure. Note the following points:

1. Lightly grease lips of front wheel oil seals and gear teeth of speedometer drive and driven gears. Use lightweight lithium soap base grease.
2. Make sure there is enough gap between disc pads.
3. Check for proper engagement of the boss on the outer fork tube with the locating slot on speedometer gear unit housing.
4. Always secure the front wheel axle as follows:
 - a Tighten the front axle nut.

Axle nut torque:
8.5 m-kg (61 ft-lb)

- b. Tighten axle holder nuts. First tighten nut on front end of axle holder, then tighten nut on rear end.

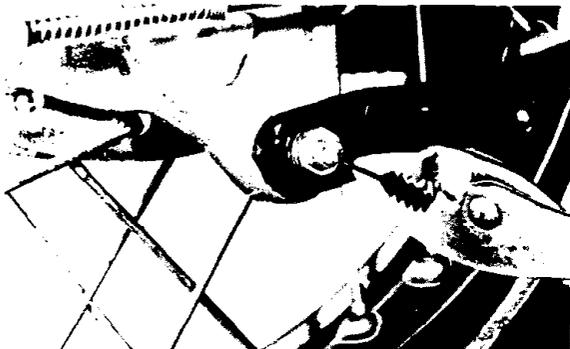
Holder nut torque:
1 .0 m-kg (7 ft-lb)

- c. install a new cotter pin.

5-2. REAR WHEEL

A. Removal

1. Place machine on center stand.
2. Disconnect the tension bar, and the brake rod from the rear shoe plate. Pay strict attention to the presence and location of the tension bar lock washer and cotter key. These are safety parts and must be included during assembly.



2. Loosen the chain tension adjusting nuts and bolts on both right and left sides.
3. Remove the rear axle cotter pin and nut.
4. Remove the right-hand chain adjuster and distance collar.
5. Remove the rear brake plate.
6. Lean the machine to the left and remove the rear wheel assembly.

B. Rear axle inspection

(See front Wheel, Axle Inspection Procedure.)

C. Replacing wheel bearings

Rear wheel bearing replacement is similar to the procedure for the front wheel.

D. Rear wheel inspection

(See Front Wheel, Inspection Procedures.)

E. Installing rear wheel

1. Lightly grease lips of rear wheel oil seals.
2. To install the rear wheel, reverse the removal procedure.

NOTE: _____

Always use a new cotter pin on the axle nut.

Torque:
Axle nut: 15 m-kg(108 ft-lb)

F. Rear Wheel lubrication (on page 41)

5-3. BRAKES

CAUTION: _____

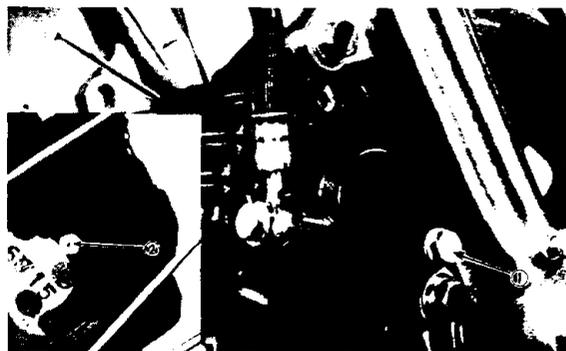
Disc brake components rarely require disassembly. Do not disassembly components unless absolutely necessary. If any hydraulic connection in the system is opened, the entire system should be disassembled, drained, cleaned and then properly filled and bled upon reassembly.

CAUTION: _____

Do not use solvents on brake internal components. Solvents will cause seals to swell and distort. Use only clean brake fluid for cleaning. Use care with brake fluid. Brake fluid is injurious to eyes and will damage painted surfaces.

A. Caliper pad replacement

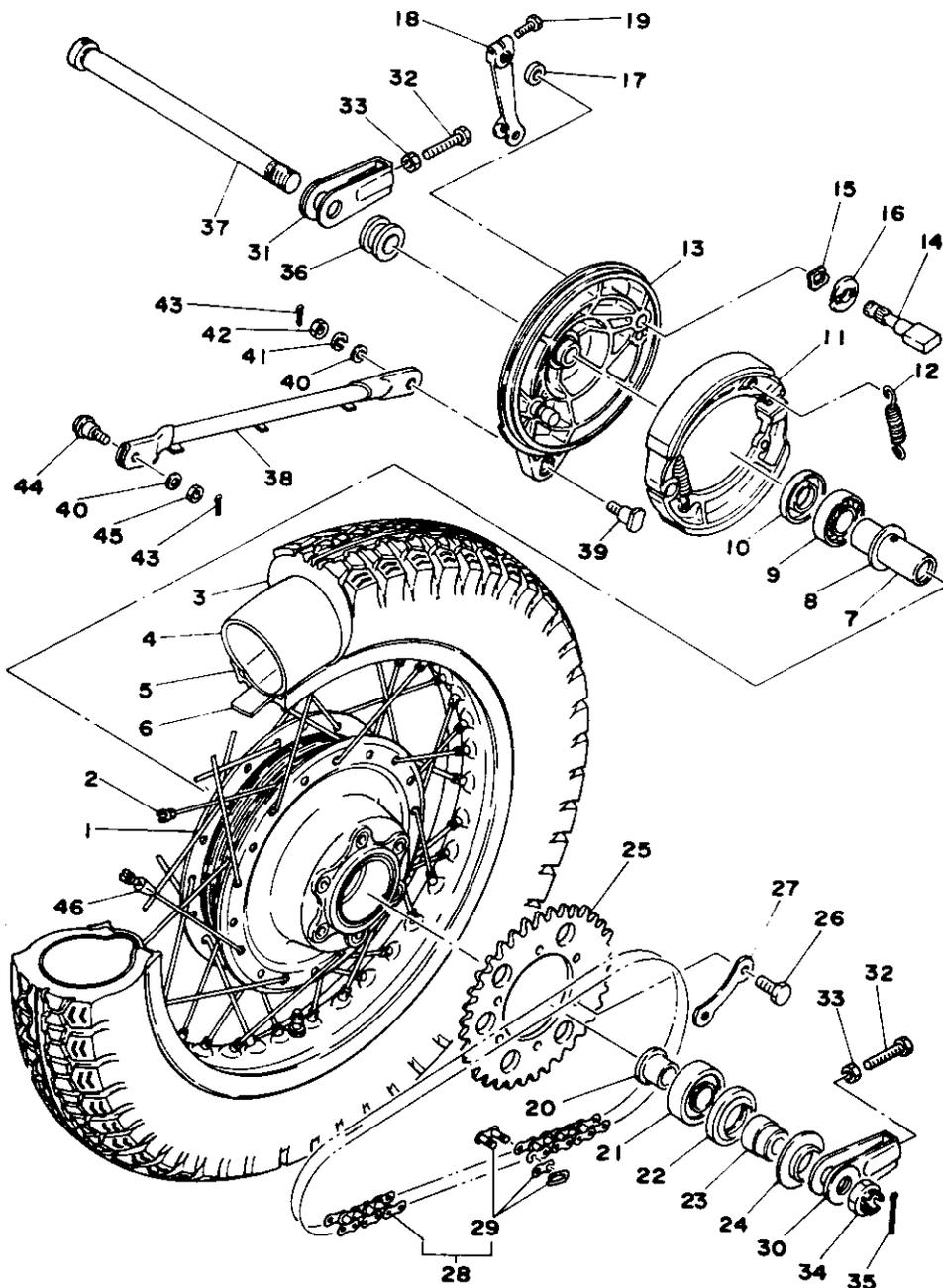
1. It is not necessary to disassemble the brake fluid hoses to replace the brake pads.
2. Remove the caliper support bolt.*
3. Remove the phillips screw that holds the brake pads.



1. Caliper support bolt
2. Pad screw

4. Pull caliper cylinder off caliper frame.
5. Install new brake pads. Replace pads as a set.

REAR WHEEL



- | | | |
|----------------------|--------------------------|---------------------|
| 1. Rear, hub | 17. Cam shaft, seal | 33. Hexagon, nut |
| 2. Spoke set | 18. Cam shaft lever | 34. Castle, nut |
| 3. Rear, tire | 19. Hexagon, bolt | 35. Cotter, pin |
| 4. Tube | 20. Colour | 36. Collar |
| 5. Rim | 21. Bearing | 37. Wheel, shaft |
| 6. Rim, bend | 22. Oil seal | 38. Tension, bar |
| 7. Spacer | 23. Collar | 39. Bolt |
| 8. Flange | 24. Dust, cover | 40. Plate, washer |
| 9. Bearing | 25. Sprocket wheel, gear | 41. Spring, washer |
| 10. Oil seal | 26. Bolt | 42. Nut, hexagon |
| 11. Brake shoe comp. | 27. Lock, washer | 43. Cotter, pin |
| 12. Spring, tension | 28. Chain | 44. Bolt |
| 13. Brake shoe plate | 29. Chain, joint | 45. Hexagon, nut |
| 14. Cam shaft | 30. Chain left, puller | 46. Wheel, balancer |
| 15. Wave, washer | 31. Chain right puller | |
| 16. Cam shaft shim | 32. Hexagon bolt | |

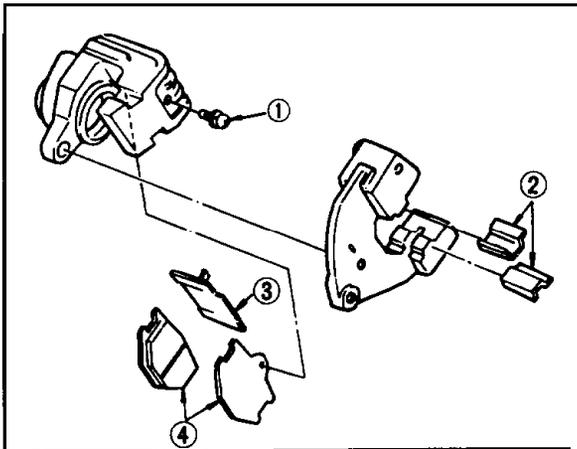
B. Caliper disassembly

1. Remove caliper brake hose. Allow caliper assembly to drain into a container.
2. Place the open hose end into the container and pump the old fluid out of the master cylinder.
3. Remove caliper support bolt and pad securing screw as in Caliper pad replacement procedure.
4. Remove caliper assembly from caliper frame.
5. Remove retaining ring and dust seal.
6. Carefully force the piston out of the caliper cylinder with compressed air. Never try to pry out the piston.

CAUTION:

Cover the piston with a rag. Use care so that piston does not cause injury as it is expelled from the cylinder.

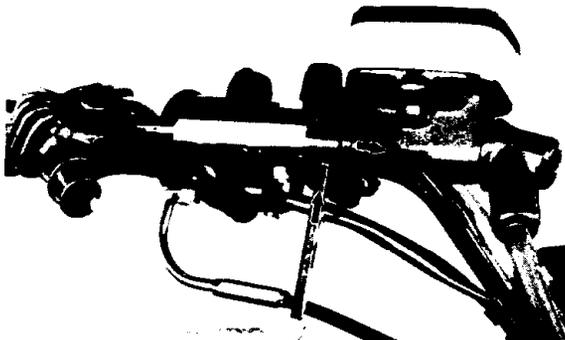
7. Remove piston seal.



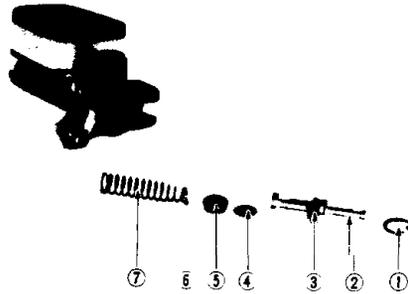
1. Pad screw 3. Shim
2. Shim 4. Pads.

C. Master cylinder disassembly

1. Remove brake hose.
2. Remove front brake switch.



3. Remove brake lever and spring.
4. Remove master cylinder from handlebars. Remove cap and drain remaining fluid.



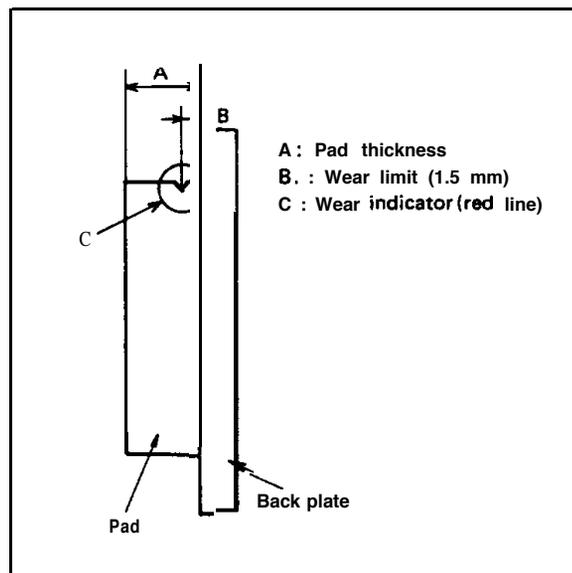
1. Snap ring
2. Cylinder cup (R)
3. Piston
4. Shim
5. Piston cup
6. Spacer
7. Return spring

D. Brake inspection and repair

Recommended Brake Component Replacement Schedule:

Brake padsAs required
 Piston seal, dust seal Every two years
 Brake hosesEvery four years
 Brake fluid Replace only when brakes are disassembled

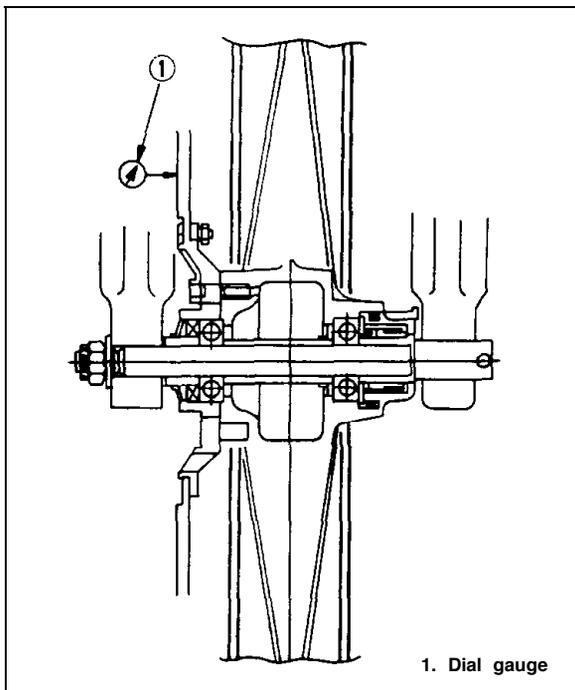
1. Replace caliper piston if it is scratched.
2. Replace any brake pad worn beyond limits.
 Replace brake pads as a set.



See "Caliper Replacement Pad" procedure for parts to be replaced when pads are replaced.

3. Replace piston and dust seals if damaged.
4. Inspect master cylinder body. Replace if scratched. Clean all passages with new brake fluid.
5. Inspect brake hoses. Replace every four years or if cracked, frayed or damaged.
6. Check for wear and deflection of disc.

Wear limit:
1.5 mm (0.06 in)



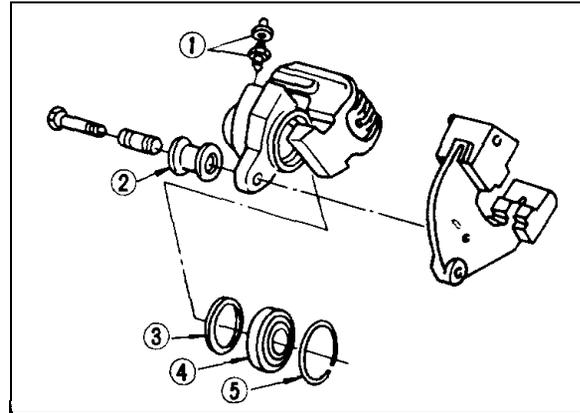
Maximum deflection: 0.15 mm(0.006 in)
Minimum disc thickness: 6.5 mm(0.26 in)

If disc is worn beyond minimum thickness or deflection exceeds specified amount, replace disc.

E. Brake reassembly

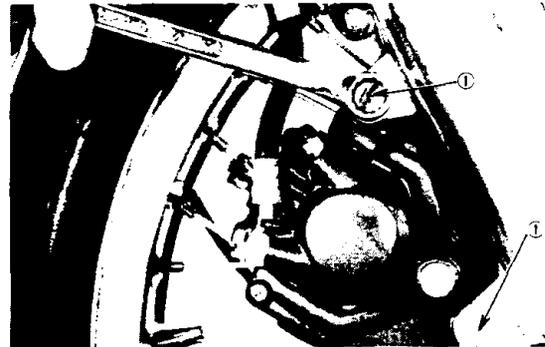
1. All internal parts should be cleaned in new brake fluid. Internal parts should be lubricated with brake fluid when installed.
2. Caliper reassembly
Replace the following parts whenever a caliper is disassembled: bleed screw and

cap, boot bushing, piston seal, dust seal, retaining ring.



- | | |
|---------------------------|-------------------|
| 1. Bleed screw (with cap) | 4. Dust seal |
| 2. Bush boot | 5. Retaining ring |
| 3. Piston seal | |

- a. Install piston seal and piston. Place caliper cylinder into caliper frame.
- b. Install pad spring and retainer. Install dust seal and clip.
- c. Install pad spring and pads.
- d. Install support bolt and remount caliper on brackets.



1. Mounting bolt

Mounting bolt torque:
3.5 m-kG (25 ft-lb)

3. Attach brake hoses.
4. Master cylinder reassembly
Reassemble master cylinder.

Brake hose torque:
(all brake union bolts)
2.5 m-kG (18 ft-lb)

5. Brake disc assembly

If brake disc has been removed from hub or is loose, tighten bolts. Use new locking washers and bend over locking tabs after bolts are tightened.

Disc bolt torque:
2.0 m·kg (14 ft·lb)

6. Air bleeding

CAUTION:
If the brake **system is disassembled or if any brake hose has been loosened or removed, the brake system must be bled to remove air from the brake fluid. If the brake fluid level is very low or brake operation is incorrect, bleed the brake system.**

- a. Add proper brake fluid to the reservoir. Install the diaphragm, being careful not to spill or overflow the reservoir.
- b. Connect the clear plastic tube tightly to the caliper bleed screw. Put the end of the tube into a container.
- c. Slowly apply the brake lever several times. Pull in lever. Hold lever in "on" position. Loosen bleed screw. Allow the lever to travel slowly toward its limit. When the limit is reached, tighten bleed screw.
- d. Continue step C until all air bubbles are removed from system.

NOTE:
If bleeding is difficult, it may be necessary to let the brake system stabilize for a few hours. Repeat bleeding procedure.

5-4. WHEELS, TIRES, TUBES

A. Wheel inspection

Wheels should be inspected frequently. Wheel run-out is discussed in Chapter 5-1.

B. Tire, tube removal

- 1. Remove valve cap, valve core and valve stem lock nut.
- 2. When all air is out of tube, separate tire bead from rim (both sides) by stepping on tire with your foot.

- 3. Use two wide, flat tire irons with rounded edges to work the tire bead over the edge of the rim, starting **180°** opposite the tube stem. Be careful not to pinch the tube as you do this.
- 4. After you have worked on side of the tire completely off the rim, slip the tube out. Be very careful not to damage the stem while pushing it back out of the rim hole.

NOTE:
If you are changing the tire itself, then finish the removal by working the second bead off the rim.

C. Installation

Reinstall the tire and tube by reversing the disassembly procedure. After the tube has been installed, but before the tire has been completely slipped onto the rim, put a small amount of air into the tube. This removes any creases that might exist. Release the air and continue with reassembly. After the tire has been completely slipped onto the rim, make sure the stem comes out of the hole in the rim at a right angle to the rim. Finally inflate the tire. Refer to PAGE (10).

	Front Tire	Rear Tire
Normal riding	1.6 kg/cm ² (22 psi)	2.0 kg/cm ² (29psi)

NOTE:
Make sure the wheel is balanced every time the tire is _____ to "Front wheel inspection".)

5-5. REAR WHEEL SPROCKET

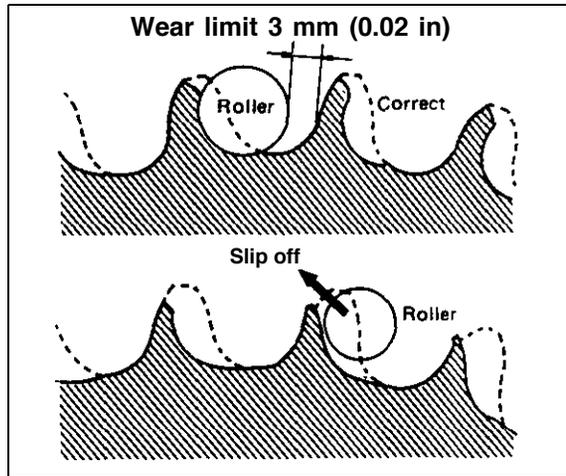
- 1. Bend the lock washer ears flat.
- 2. Remove the sprocket mounting bolts. Check the lock washer and bolt for damage. If the lock washer is not bent over the hexagon bolt head, or is broken, or the bolt is loose, the sprocket can come loose.

Tightening torque:
3.0 m·kg (22 ft·lb)

NOTE:

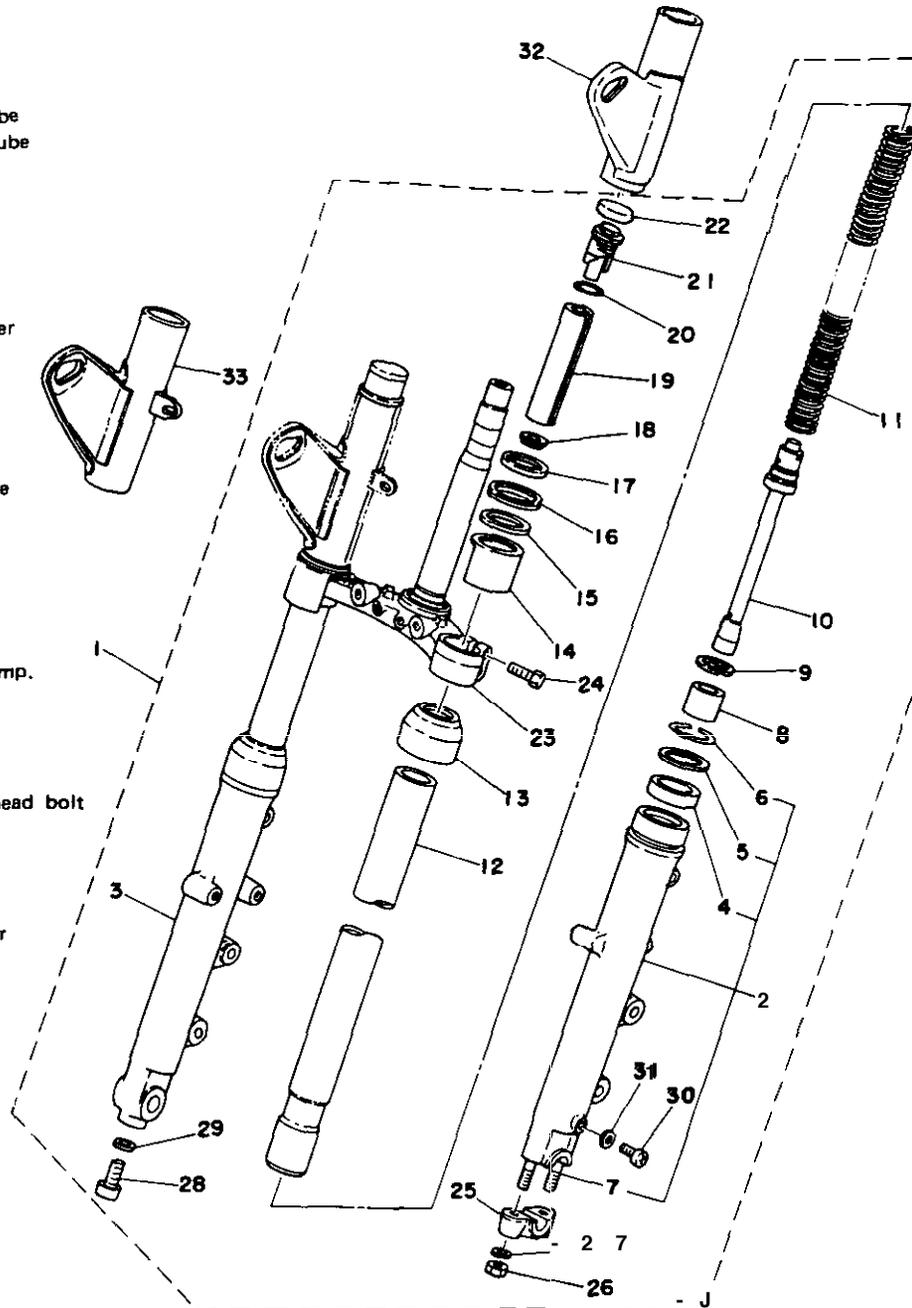
Be sure that all lock tabs are not cracked or broken and that they are all bent up against the bolts.

- 3 Constant friction and force from the chain creates wear on the sprocket teeth. If wear has progressed to the extent shown in this illustration, replace the sprocket.



5-6. FRONT FORKS

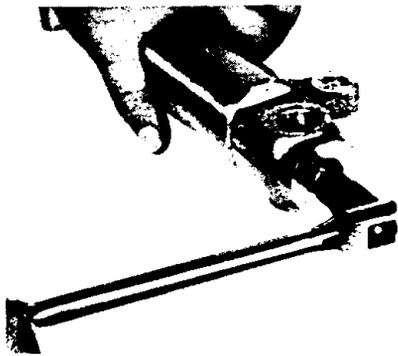
- 1. Front fork Ass'y
- 2. Outer lift fork tube
- 3. Outer right fork tube
- 4. Oil seal
- 5. Oil seal washer
- 6. Oil seal clip
- 7. Bolt
- 8. front fork piston
- 9. Circlip
- 10. Front fork cylinder
- 11. Spring
- 12. Inner fork tube
- 13. Dust seal
- 14. Outer cover
- 15. Gasket
- 16. Cover under guide
- 17. Washer
- 18. Spring upper seal
- 19. Spacer
- 20. O-ring
- 21. Cap bolt
- 22. Cap
- 23. Under bracket comp.
- 24. Bolt
- 25. Axle holder
- 26. Nut
- 27. Plate washer
- 28. Hexagon socket head bolt
- 29. Gasket
- 30. Drain plug
- 31. Drain plug gasket
- 32. Upper left cover
- 33. Upper right cover



A. Removal and disassembly

NOTE: _____
For fork oil replacement only, refer to PAGE (12)

1. Disconnect speedometer cable. Disconnect brake calipers and remove front wheel. Place wooden wedge or other object into caliper assemblies to keep brake pads apart. Remove front fender.
2. Loosen pinch bolts on steering stem and crown and remove fork.
3. Remove fork tube caps, spring stopper seats, and oil drain screws. Drain fork oil.
4. Remove Allen bolt from bottom of fork assembly. Pull inner tube out of outer tube.



5. To remove fork seal, pull off dust cover. Remove spring clip over oil seal. Pry out oil seal, being careful to not damage the fork tube.



B. inspection

1. Examine fork inner tube for scratches and straightness. If the tube is scratched severely or bent, it should be replaced.
2. If the lips of the oil seal are worn, or the oil seal is leaking, replace it.
3. Check the outer tube for dents. If any dent causes the inner tube to "hang up" during operation, the outer tube should be replaced.
4. Check the free length of the springs.

Spring free length:
482 mm (18.98 in)

5. Check the O-ring on the top spring seat. If damaged, replace O-ring.



1. O-ring

C. Assembly

1. Make sure all components are clean before assembly.
2. Apply oil to the fork seal and install the seal spacer and seal by pressing in with a large socket. Install retaining clip.
3. Install inner tube into outer tube. Install dust cover. Install and tighten Allen bolt and washer. Assembly procedure is the reverse of the disassembly procedure.

NOTE: _____
When installing fork springs, the greater pitch should be at the bottom.



1. Bottom
2. Top

5-7. STEERING HEAD

A. Adjustment

(See Chapter 2-4 for Steering Head Adjustment.)

B. Removal

1. Remove front wheel, front forks and handle bars.
2. Remove front brake pipe junction.
3. Loosen steering stem (underbracket) pinch bolt. Remove stem bolt and washer.



1. Crown pinch bolt
2. Fork pinch bolt
3. Steering fitting bolt

4. Remove steering crown.
5. Remove top fitting nut. Use proper spanner.
6. Support steering stem (underbracket) and remove bottom fitting nut.
7. Remove bearings.

C. Inspection

1. Wash bearings in solvent.
2. inspect bearings for pitting or other damage. Replace bearings if pitted or damaged. Replace races when bearings are replaced.
3. Clean and inspect bearing races. If races are damaged, replace races and bearings.
4. Install bearings in races. Spin bearings. If the bearings hang up or are not smooth in their operation in the races, replace bearings and races.

D. Reassembly

1. Grease bearings and races with wheel bearing grease.



2. Install steering stem (underbracket) and bearings.
3. Install bottom fitting nut. Tighten to approximately 2.0 ~ 2.6 m-kg (14 ~ 19 ft-lb). Do not over-tighten. Tighten top fitting nut.
4. Continue reassembly in reverse assembly order.
5. When assembly is complete, check steering stem by turning it from lock to lock. If there is any binding or looseness, re-adjust steering stem tightness.

Pinch bolt torque:

Handle crown 1.0 m-kg (7 ft-lb)

Under bracket. 1.5 m-kg (11 ft-lb)

Steering stem bolt torque:

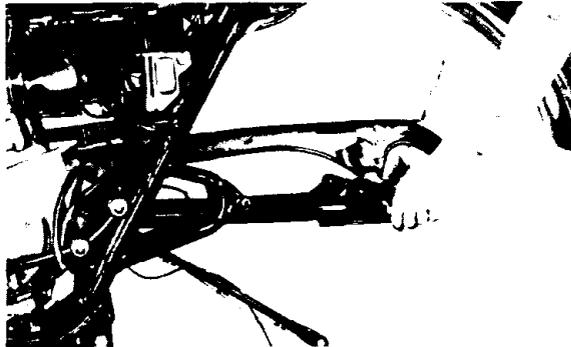
5.5 m-kg (40 ft-lb)

5-8. SWING ARM

A. Inspection

1. Free play inspection

Remove rear wheel and shock absorbers. Grasp the swing arm and move it from side to side as shown. There should be no noticeable side play.



Swing arm freeplay: 1 mm (0.4 in)

2. If freeplay is excessive, remove swing arm and replace swing arm bushing.

B. Swing arm removal

1. Remove nut on swing arm pivot bolt and tap out bolt with a long aluminum or brass rod.

NOTE: _____
Carefully remove the arm while noting the location of spacing washers and shims.

Pivot bolt torque: 6.5 m-kg (47 ft-lb)

2. Tap out old bushing from each side of pivot using the long rod.
3. Install new bushings using a press.

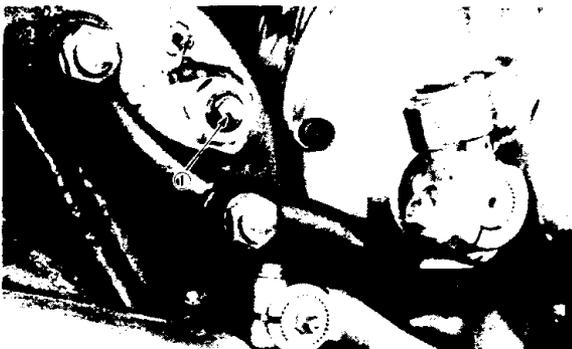
NOTE: _____
If tapping on bushing, bushing may be broken.

C. Swing arm lubrication

1. Apply grease to grease fitting on top of pivot with low pressure hand operated gun. Apply until fresh grease appears at both ends of pivot shaft.

Recommended lubricant:
Medium-weight grease

2. Wipe off excess grease.



1. Grease fitting

5-9. REAR SHOCK ABSORBER

A. Removal

Remove one (1) rear shock absorber at a time, inspect and reinstall before removing the other.

B. Inspection

1. Check the rod. If it is bent or damaged, replace the shock absorber.
2. Check for oil leakage. If oil leakage is evident, replace the shock absorber.

3. Operate shock absorber rod to check damping. There should be no noticeable damping as shock extends.
4. Install the shock absorber on the machine.

Rear shock absorber tightening
torque:
3 m-kg (22 ft-lb)

5-10. CABLES AND FITTINGS

A. Cable maintenance

NOTE: _____
See maintenance and lubrication intervals charts. Cable maintenance is primarily concerned with preventing deterioration through rust and weathering and providing proper lubrication to allow the cable to move freely within its housing. Cable removal is straightforward and uncomplicated. Removal will not be discussed within this section.

WARNING: _____
Cable routing is very important. For details of cable routing, see the table routing diagrams! at the end of the manual. Improperly routed, assembled or adjusted cables may make the vehicle unsafe for operation.

1. Remove the cable.
2. Check for free movement of cable within its housing. If movement is obstructed, check for fraying or kinking of cable strands. If damage is evident, replace the cable assembly.
3. To lubricate cable, hold in vertical position. Apply lubricant to uppermost end of cable. Leave in vertical position until lubricant appears at bottom. Allow excess to drain and reinstall.

NOTE: _____
Choice of lubricant depends upon conditions and preferences. However, a semi-drying chain and cable lubricant will probably perform adequately under most conditions.

B. Throttle maintenance

1. Remove Phillips head screws from throttle housing assembly and separate two halves of housing.
2. Disconnect cable end from throttle grip assembly and remove grip assembly.

CHAPTER 6. ELECTRICAL

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CHAPTER 6. ELECTRICAL

6-1. STARTER

A. Armature

1. If the commutator surface is dirty, clean with #600 grit sandpaper as shown in the drawing below.
After sanding, wash thoroughly with electrical contact cleaner and dry with high-pressure air steam.
2. The mica insulation between commutator segments should be 0.5 ~ 0.8 mm (0.02-0.03 in). below the segment level. If not, scrape to proper limits with appropriately shaped tool. (A hacksaw blade can be ground to fit).
3. Each commutator segment should show zero ohm resistance to the others and at least $3M\Omega$ resistance to the core. If there is less than $3M\Omega$ resistance to the core, or one of segments is open, replace the armature.

In addition, the armature can be placed on a "growler" (testing device) and checked magnetically for internal shorts. Follow manufacturer's test recommendations.

4. If the commutator surface shows heavy scoring, it can be turned down on a lathe or commutator turning machine. Check the specification chart for minimum allowable commutator diameter. Recut the mica after.

NOTE: _____

Should turning be required, check the condition of the cover bearings, armature electrical properties starter amperage draw and rpm and, finally, carbon brushes.

B. Yoke

1. If the yoke area is dirty, clean with clean solvent and dry with high-pressure air.
2. Yoke coil resistance is 0.05 ohm.
The coil should be show zero ohm resistance, if it shows more than zero ohm, replace it.
If the yoke shows leakage to ground (re-

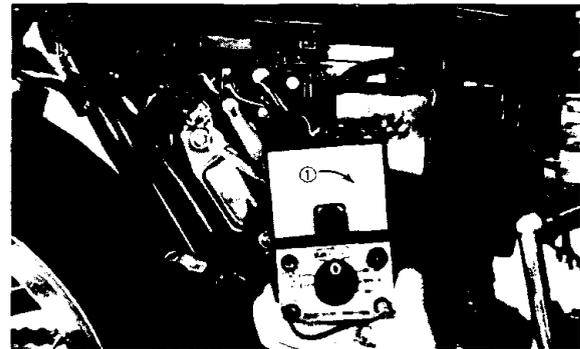
sistance is less then 100 $k\Omega$) replace it.

NOTE: _____
Immediately after cleaning, the yoke may show some insulation leakage. Wait for it to thoroughly dry before checking or re-installing.

C. Starter relay switch

1. Inspection

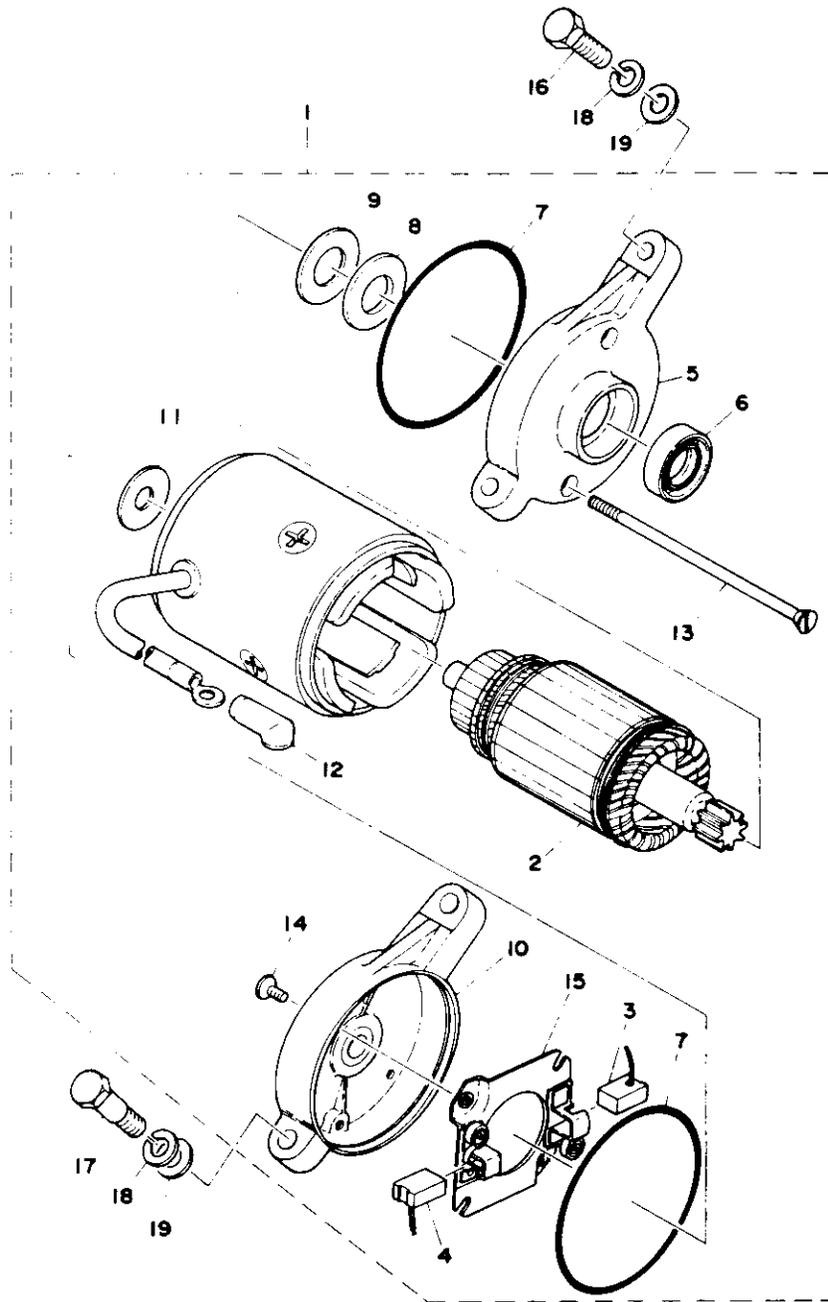
- a. Disconnect starter relay leads at the relay.
- b. Connect pocket tester leads to the relay terminals (ohm x 1 scale).
- c. Turn ignition ON ("1" position) and engine stop switch to "RUN".
- d. Push starter button. The relay should click once and the scale should read zero ohm. If the relay clicks but the scale does not read zero, the relay must be replaced.



1. Starter button "ON"

- e. If the relay does not click, check the wires from the starter button and the battery (red/white, blue/white). Turn ignition off. Use (ohm x 1) scale on tester. The resistance between these wires should be no more than 3.5Ω . If there is more resistance, the relay should be replaced.

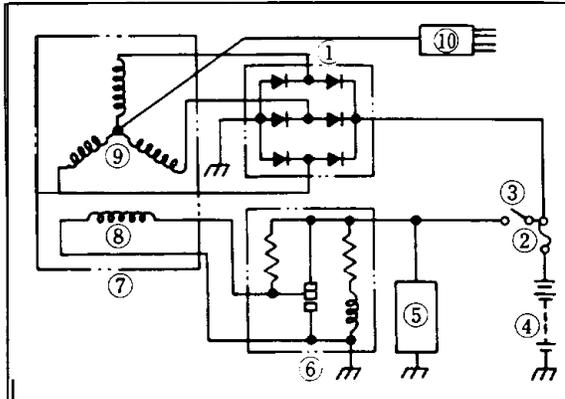
STARTING MOTOR



- | | |
|----------------------------|---------------------|
| 1. Starting motor Ass'y | 11. Thrust 2 washer |
| 2. Armature | 12. Cap |
| 3. Brush 1 | 13. Special screw |
| 4. Brush 2 | 14. Flathead screw |
| 5. Starting motor 1 cover | 15. Brush holder |
| 6. Oil seal | 16. Bolt |
| 7. O-ring | 17. Hexagon bolt |
| 8. Special washer | 18. Spring washer |
| 9. Thrust 1 washer | 19. Plain washer |
| 10. Starting motor 2 cover | |

6-2. CHARGING SYSTEM

A. Charging circuit diagram



- | | | |
|----------------|----------------------|----------------|
| 1. Rectifier | 4. Load | 9. Stator coil |
| 2. Fuse | 6. Voltage regulator | 10. Relay unit |
| 3. Main switch | 7. A.C. Generator | |
| 4. Battery | 8. Field coil | |

B. A.C. Generator

1. Checking method.

- Connect D.C. voltmeter to the battery terminals. Battery should be fully charged.
- Start engine.
- Accelerate engine to approximately 2,000 rpm or more and check generated voltage.

Generated voltage:
 $14.5 \pm 0.5 \text{ v}$

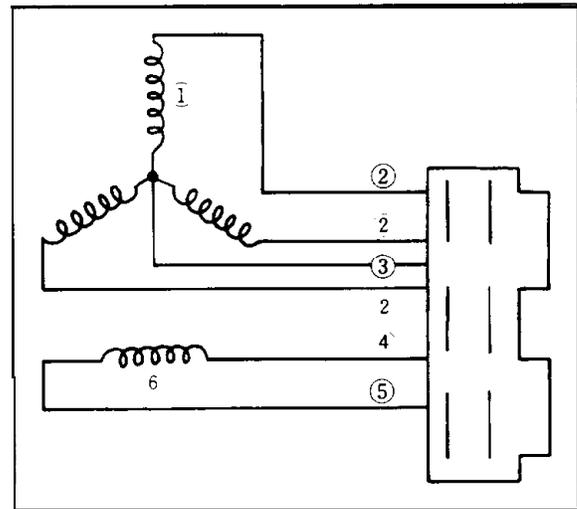
- If the indicated voltage cannot be reached, then perform the tests in step 2.

NOTE:

Never disconnect wires from the battery while the generator is in operation. If the battery is disconnected, the voltage across the generator terminals will increase, damaging the diodes.

- Resistance test of field coil and stator coil. Check the resistance between terminals. If resistance is out of specification, coil is broken. Check the coil connections. If the coil connections are good, then the coil is broken inside and it should be replaced.

Field coil resistance:
(Green-Black)
 $5.25\Omega \pm 10\%$ at 20°C
Stator coil resistance:
(W1-W2, W2-W3, W3-W1)
 $0.46\Omega \pm 10\%$ at 20°C

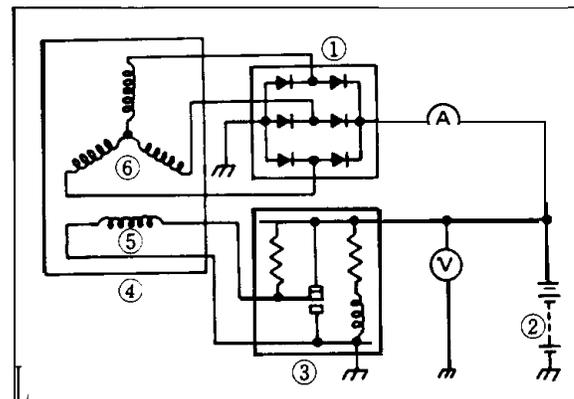


- | | |
|---------------------------|---------------|
| 1. Stator coil | 4. Black |
| 2. White | 5. Sky blue |
| 3. Yellow (Pick up cable) | 6. Field coil |

C. Voltage regulator

The regulator's function is to pass a controlled amount of current through the field windings which creates a magnetic field that produces a charging voltage in the three stator windings.

- When adjusting the regulator, a D.C. voltmeter, ammeter, and tachometer are necessary. They are connected as illustrated, and adjustment should be made in the following sequence:

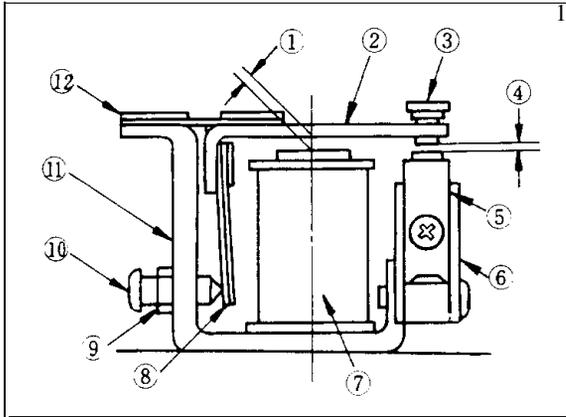


- | | | |
|--------------|----------------------|------------------|
| A. Ammeter | 1. Rectifier | 4. AC. Generator |
| V. Voltmeter | 2. Battery | 6. Field coil |
| | 3. Voltage regulator | 6. Stator coil |

- Remove the regulator from the frame, and check the contact points. If the point surfaces are rough, they should be smoothed with sand paper (#500 or #600). After sandpapering, thoroughly clean contact points with contact point cleaner.

b. Check the core and points for gap adjustment. If any gap is incorrect, it should be adjusted.

First adjust the core gap and then the point gap
 Core gap 0.6 ~ 1.0 mm
 Point gap 0.3 ~ 0.4 mm



- Core gap 5. upper contact 9 Locknut
- 2. Armature 6. Contact set 10 Adjusting screw
- 3. Lower contact 7. Coil 11. Yoke
- 4. Point gap 8. Adjusting spring 12. Contact spring

c. Charging voltage output can be controlled at the regulator. Inside the housing is a screw that pushes against a flat spring steel plate. This is the adjusting screw.

d. Before starting engine, disconnect wire connector (coupler) containing 5 wires from rectifier (1 red, 1 black, 3 white). Remove the RED wire from the connector. Connect pocket tester (DC20V) red tester lead (+) to red wire from rectifier. Connect tester black (-) to good ground. Start engine. Tester should indicate 14.5 ~ 15 V (DC).

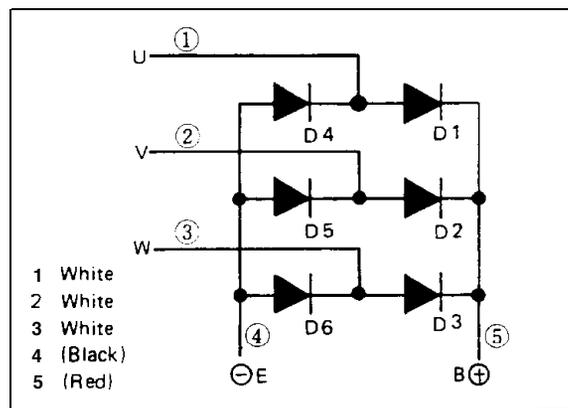
CAUTION:
 Take care to not short the red wire. If this wire is shorted, the rectifier could be damaged.

D. Checking silicon rectifier

1. Check silicon rectifier as specified using the Yamaha Pocket Tester.

Continuity: Con

Checking element	Pocket tester connecting point		Element O.K.	Replace (element shorted)	Replace (element opened)
	(+) (red)	(-) (black)			
D1	B U	U B	Con ∞	Con Con	
D2	B V	V B	Con ∞	Con Con	
D3	B W	W B	Con ∞	Con Con	∞
D4	U E	E U	Con ∞	Con Con	∞ ∞
D5	V E	E V	Con ∞	Con Con	∞ ∞
D6	W E	E W	Con ∞	Con Con	∞



Even if only one element is broken, replace assembly.

CAUTION:
 The silicon rectifier can be damaged if subjected to overcharging. Special care should be taken to avoid a short circuit, and/or incorrect connection of the positive and negative leads at the battery. Never connect the rectifier directly to the battery to make a check.

E. Battery

1. Checking

- a. If battery sulfation (white accumulation) occurs on plates due to lack of battery electrolyte, the battery should be replaced.
 - b. If the bottoms of the cells are filled with corrosive material falling off the plates, the battery should be replaced.
2. The service life of a battery is usually 2 to 3 years, but lack of care as described below will shorten the life of the battery.

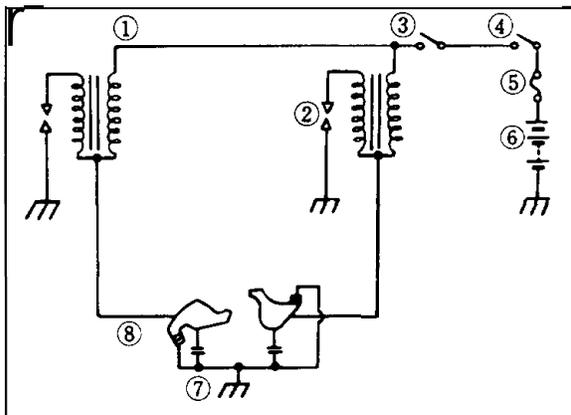
- a. Negligence in keeping battery topped off with distilled water.
- b. Battery being left discharged.
- c. Over-charging with heavy charge.
- d. Freezing.
- e. Filling with water or sulfuric acid containing impurities.
- f. Improper charging voltage or current on new battery.

Battery	12V, 14AH
Electrolyte	Specific gravity: 1.28
Initial charging current	1.4 amp (new battery)
Recharging current	1.4 amp until specific gravity reaches 1.28
Refill fluid	Distilled water (to maximum level line)
Refill period	Check once per month (or more often, as required)

3. If the motorcycle is not to be used for a long time, remove the battery and have it stored. The following instructions should be observed :
 - a. Recharge the battery periodically.
 - b. Store the battery in a cool, dry place.
 - c. Recharge the battery before reinstallation.

6-3. IGNITION SYSTEM

A. Ignition circuit diagram



- | | |
|-----------------------|--------------------|
| 1. Ignition coil | 5. Fuse (20A) |
| 2. Spark plug | 6. Battery |
| 3. Engine stop switch | 7. Condenser |
| 4. Main switch | 8. Contact breaker |

B. Governor assembly

1. Inspection
 - a. Both weights must pivot smoothly or ignition advance will not occur at the

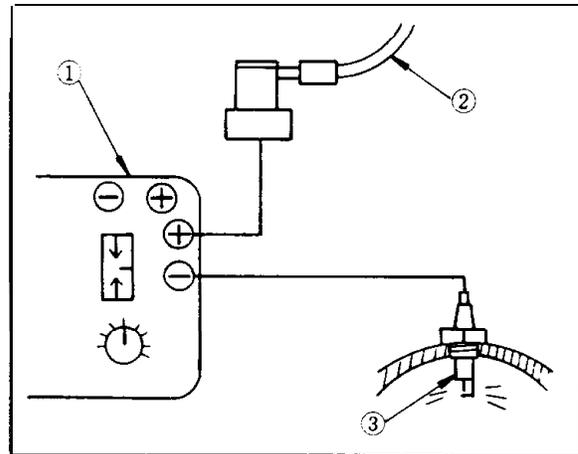
proper rpm, nor will it advance to its fullest extent. On occasion, lightweight grease must be applied to the weight pivot pins.

- b. Check the operation of the point cam on the shaft. It must rotate smoothly.
- c. Examine point cam surface. If surface is pitted or worn, the governor assembly must be replaced.

C. Spark gap test

The entire ignition system can be checked for misfire and weak spark using the Electro Tester. If the ignition system will fire across a sufficient gap, the engine ignition system can be considered good. If not, proceed with individual component tests until the problem is found.

1. Warm up engine thoroughly so that all electrical components are at operating temperature.
2. Stop engine and connect tester as shown.



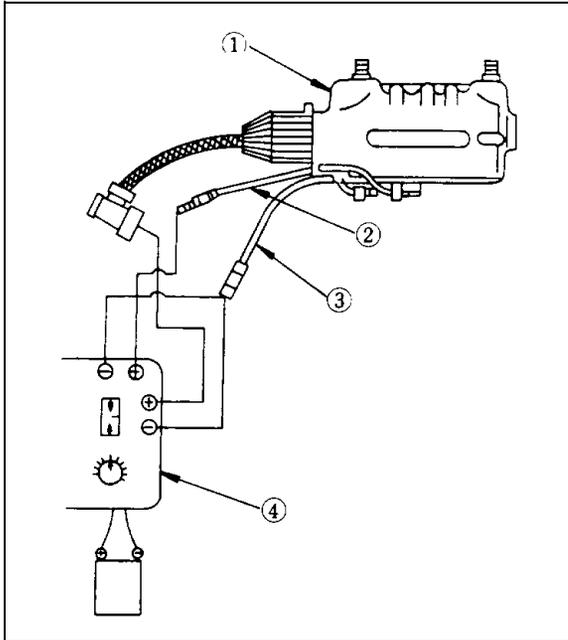
1. Electro tester
2. Plug wire from coil
3. Spark plug

3. Start engine and increase spark gap until misfire occurs. (Test at various rpm's between idle and red line.)

**Minimum spark gap:
6 mm (0.24 in)**

D. Ignition coil

1. Coil spark gap test.
 - a. Remove fuel tank and disconnect ignition coil from wire harness and spark plug.
 - b. Connect Electro Tester as shown.

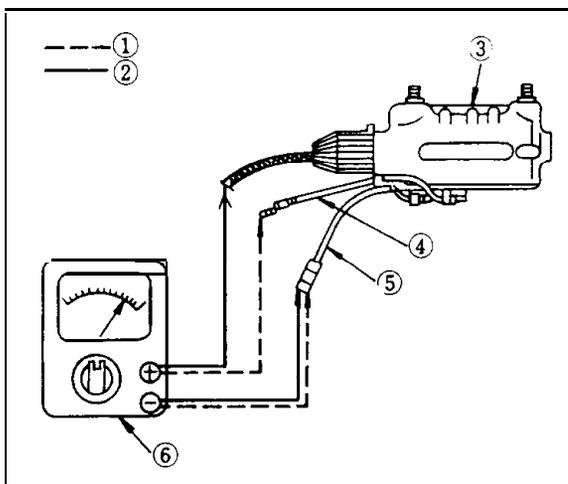


1. Ignition coil 3. Orange
2. Red/white 4. Electro tester

- c. Connect fully charged battery to tester.
- d. Turn on spark gap switch and increase gap until misfire occurs.

**Minimum spark gap:
6 mm (0.24 in)**

2. Direct current resistance test.
Use a pocket tester or equivalent ohmmeter to determine resistance and continuity of primary and secondary coil windings.



1. Primary coil resistance value 4. Red/white
2. Secondary coil resistance value 5. Orange
3. Ignition coil 6. Ohmmeter ($\Omega \times 1$)

Standard values:

Primary coil resistance:

$3.9\Omega \pm 10\%$ at 20°C

Secondary coil resistance:

$8\text{K}\Omega \pm 20\%$ at 20°C

E. Condenser test

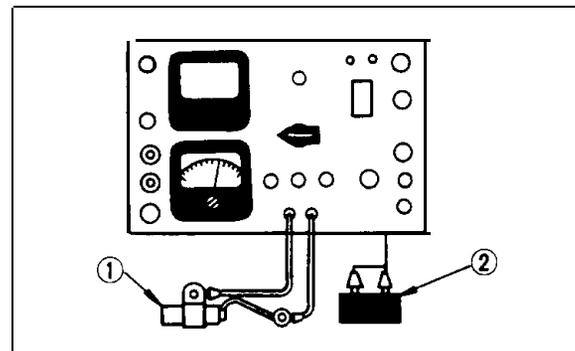
If the contact points show excessive wear, or the spark is weak (but the ignition coil is in good condition), check the condenser.

1. Capacity test (use Electro Tester).
 - a. Calibrate capacity scale.
 - b. Connect tester.
 - c. Meter needle will deflect and return to center as condenser is charged. After needle stops, note reading on " μF " scale.

Condenser capacity:

$0.22\mu\text{F} \pm 10\%$

2. Insulation test.
 - a. Connect ohmmeter as shown ($\Omega \times 1,000$ or more).
 - b. Resistance reading should be ∞ or at least 3MR. If less, replace.



1. Condenser
2. Battery

CAUTION:

After this measurement, the condenser should be discharged by shorting the positive lead wire to the condenser case.

6-4. SPARK PLUG

The life of a spark plug and its discoloring vary according to the habits of the rider. At each periodic inspection, replace burned or fouled plugs with suitable ones determined by the color and condition of the bad plugs.

One machine may be ridden only in urban areas at low speeds; another may be ridden for hours at high speed. Confirm what the present plugs indicate by asking the rider how long and how fast he rides. Recommend a hot, standard, or cold plug type accordingly. It is actually economical to install new plugs often since it will tend to keep the engine in good condition and prevent excessive fuel consumption.

A. How to "Read" a spark plug (condition)

1. **Best condition:** When the porcelain around the center electrode is a light tan color.
2. If the electrodes and porcelain are black and somewhat oily, replace the plug with a hotter type for low speed riding.
3. If the porcelain is burned or glazed white and/or the electrodes are partially burned away, replace the plug with a colder type for high speed riding.

B. inspection

Instruct the rider to:

1. Inspect and clean the spark plug every 3,200 km. (2,000 mil)
2. Clean the electrodes of carbon and adjust the electrode gap.
3. Be sure to use the proper reach plug as a replacement to avoid overheating, fouling or piston damage.

Spark plug type: N-7Y (Champion) or BP7ES (NGK)
--

Spark plug gap: 0.7 ~ 0.8 mm (0.027 ~ 0.031 in)
--

6-5. LIGHTING AND SIGNAL SYSTEMS

A. Lighting tests and checks

The battery provides power for operation of the horn, tail light, stop light, neutral light, and flasher light. If none of the above

operates, always check battery voltage before proceeding further. Low battery voltage indicates either a faulty battery, low battery water, or a defective charging system. See section 6-2 Charging System, for checks of battery and charging system. Also check fuse condition. Replace any "open" fuses. There are individual fuses for various circuits.

1. Horn does not work:
 - a. Check for 12V on brown wire to horn.
 - b. Check for good grounding of horn (pink wire) when horn button is pressed.
2. Stop light does not work:
 - a. Check bulb.
 - b. Check for 12V on yellow wire to stop light.
 - c. Check for 12V on brown wire to each stop light switch (front brake and rear brake switches).
3. Tail light does not work:
 - a. Check bulb.
 - b. Check for 12V on blue wire.
 - c. Check for ground on black wire to tail/stop light assembly.
4. Flasher light(s) do not work:
 - a. Check bulb.
 - b. Right circuit:
 - 1) Check for 12V on dark green wire to light.
 - 2) Check for ground on black wire to light assembly.
 - c. Left circuit:
 - 1) Check for 12V on dark brown wire to light.
 - 2) Check for ground on black wire to light assembly.
 - d. Right and left circuits do not work:
 - 1) Check for 12V on brown/white wire to flasher switch on left handlebar.
 - 2) Check for 12V on brown wire to flasher relay.
 - 3) Replace flasher relay.
 - 4) Replace flasher switch.
 - e. Check flasher self-canceling system. (Refer to flasher self-canceling system.)
5. Neutral light does not work:
 - a. Check bulb.
 - b. Check for 12V on sky blue wire to neutral switch.
 - c. Replace neutral switch.

B. Reserve lighting system

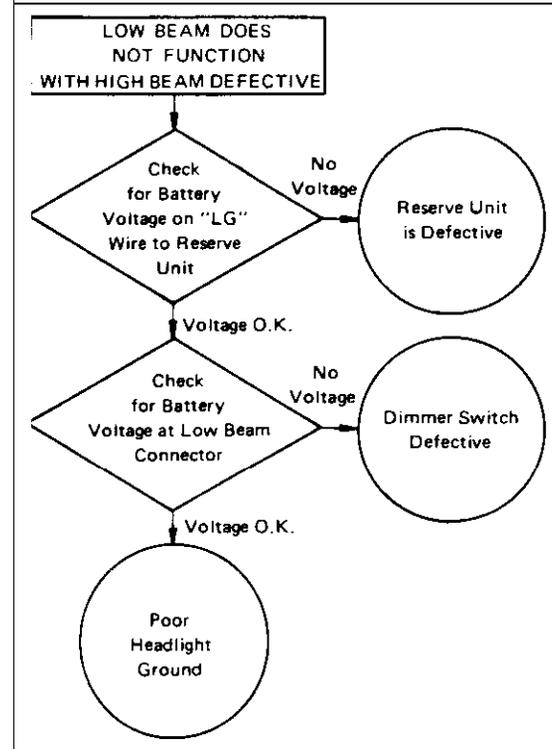
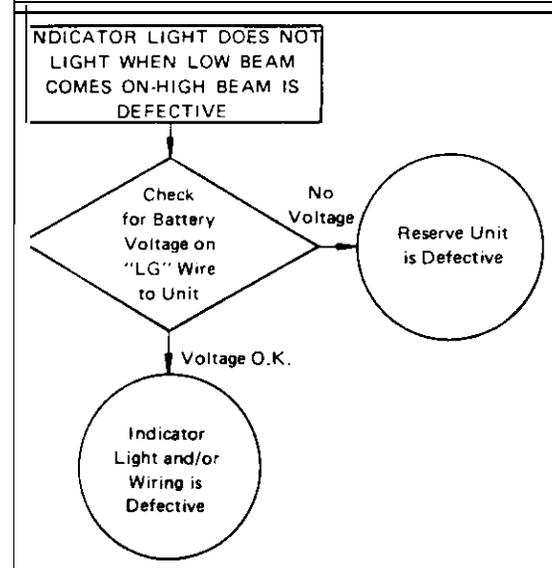
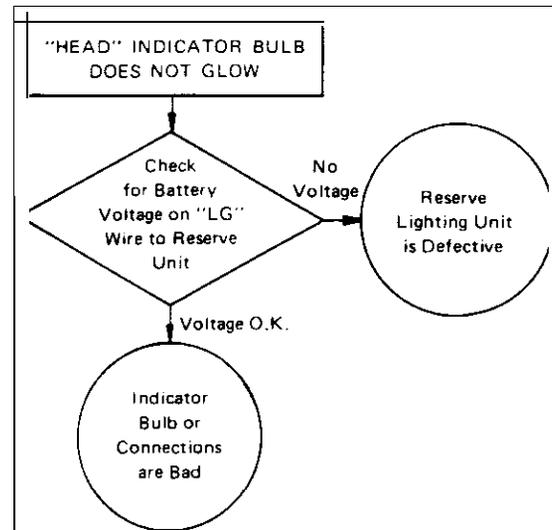
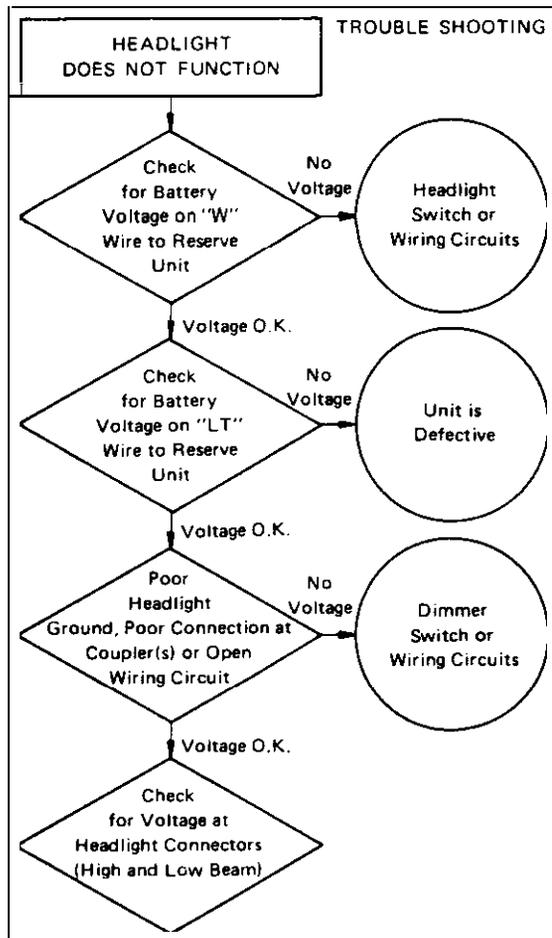
1. Description:

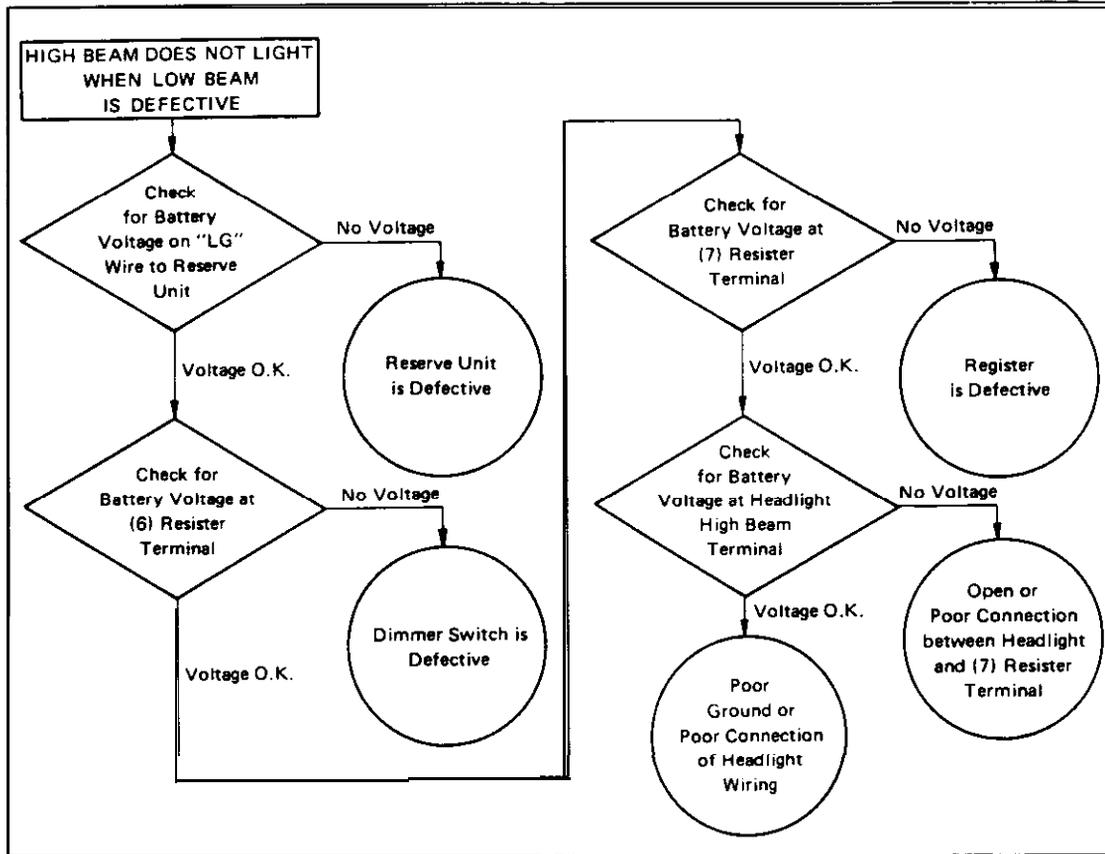
The reserve lighting system has two functions: (1) It notifies the rider that one of the head lamp filaments is inoperative, and (2) it switches current from the inoperative filament to the remaining functional filament.

The system is connected to the headlight circuit only. The reserve lighting system unit is located under the fuel tank.

HEADLIGHT CONDITION	"HEAD" INDICATOR LIGHT	RESERVE LIGHTING FUNCTION
Normal	* Comes on (very dim)
High beam faulty	Comes on	Low beam comes on
Low beam faulty	Comes on	High beam comes on at low brilliance

*Can only be seen by removing cover and inspecting bulb.





C. Self-canceling flasher system

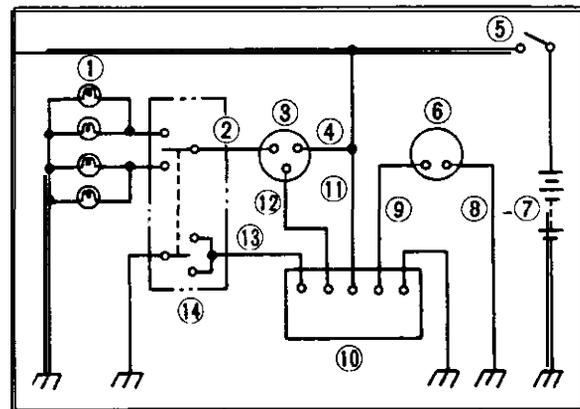
1. Description

The self-canceling flasher system turns off the turn signal after a period of time or distance involved in turning or changing lanes. Generally, the signal will cancel after either 10 seconds, or 130 meters, whichever is greater. At very low speed, the function is determined by distance; at high speed, it is determined by time. At low speed, especially when changing speeds, the canceling determination is a combination of both time and distance.

2. Operation:

The handle switch has three positions: L (left), OFF, and R (right). The switch lever will return to the "OFF" position after being pushed to L or R, but the signal will function. By pushing the lever in, the signal may be cancelled manually,

3. Circuit diagram.



1. Flasher light
2. Brown/White
3. Flasher relay
4. Brown
5. Main switch
6. Speedometer sensor
7. Buffery
8. Black
9. White/Green
10. Flasher cancelling unit
11. Brown
12. Yellow/green
13. Yellow/red
14. Handle switch

4. Inspection:

If the flasher self-canceling system should become inoperative, proceed as follows:

- a. Pull off the 6-pin connector from the flasher canceling unit, and operate the handle switch. If the signal operates normally in L, R, and OFF, the following are in good condition:

- 1) Flasher unit.
- 2) Bulb.
- 3) Lighting circuit.
- 4) Handle switch light circuit.

If (1) through (4) are in good condition, the following may be faulty:

- 1) Flasher canceling unit.
- 2) Handle switch reset circuit.
- 3) Speedometer sensor circuit.

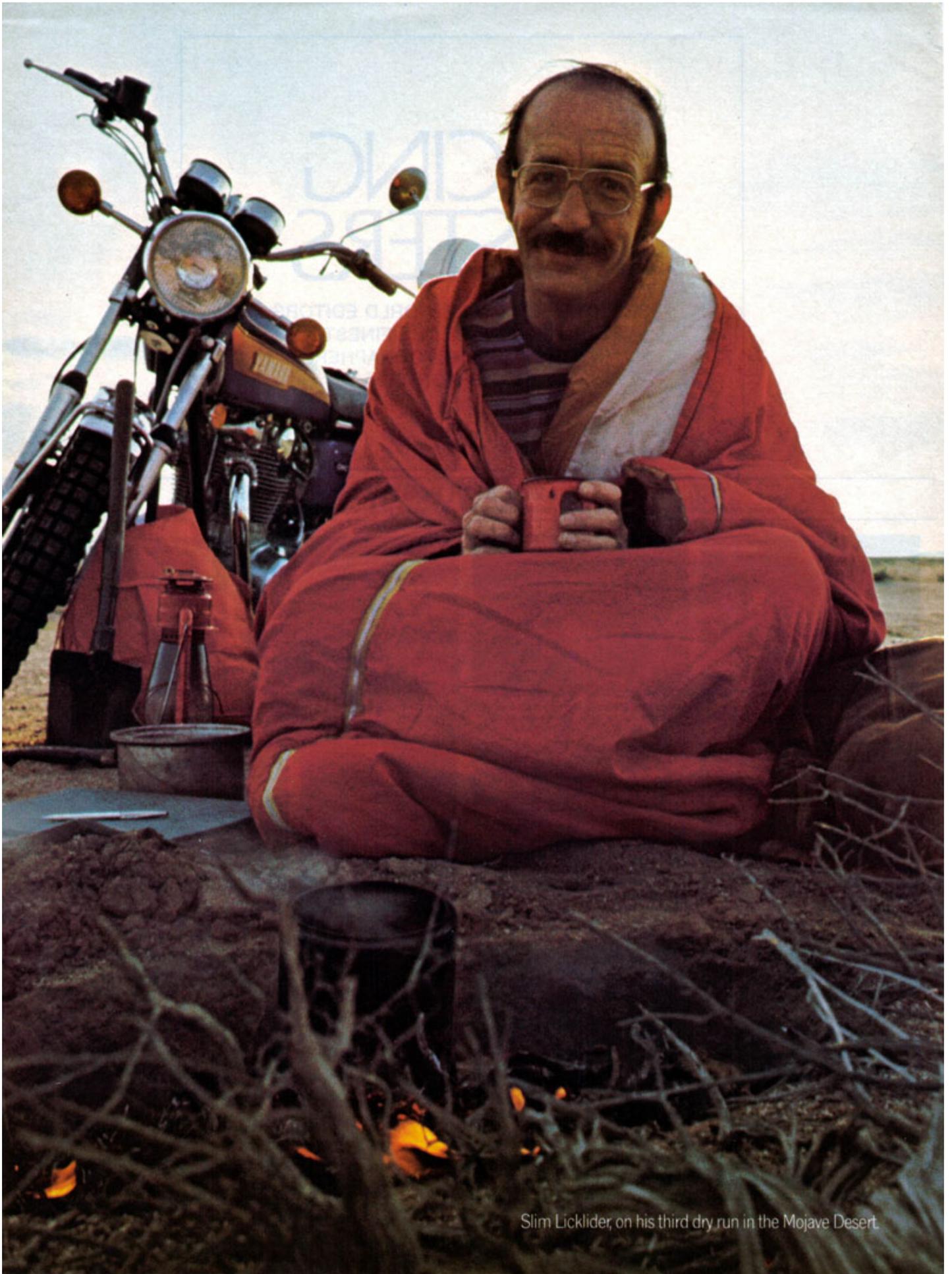
- b. Pull off the 6-pin connector from the flasher canceling unit, and connect a tester ($\Omega \times 100$ range) across the white/green and the black lead wires on the wire harness side. Turn the speedometer shaft. If the tester needle swings back and forth, four times between 0 and ∞ , the speedometer sensor circuit is in good condition. If not, the sensor or wire harness may be inoperative.
- c. Pull off the 6-pin connector from the flasher canceling unit. Check if there is continuity between the yellow/red lead wire on the wire harness side and the chassis.

Flasher switch OFF ∞
Flasher switch L or R 0Ω

If the test needle does not swing as indicated above, check the handle switch circuit and wire harness.

- d. If no defect is found with the above three check-ups and the flasher canceling system is still inoperative, replace the flasher canceling unit.
- e. If the signal flashes only when the handle switch lever is turned to L or R and it turns off immediately when the handle switch lever returns to center, replace the flasher canceling unit.





Slim Licklider, on his third dry run in the Mojave Desert.

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