



YAMAHA

XJ650G

Service Manual G

NOTICE

This manual was written by the Yamaha Motor Company primarily for use by Yamaha dealers and their qualified mechanics. It is not possible to put an entire mechanic's education into one manual, so it is assumed that persons using this book to perform maintenance and repairs on Yamaha motorcycles have a basic understanding of the mechanical concepts and procedures inherent to motorcycle repair technology. Without such knowledge, attempted repairs or service to this model may render it unfit to use and/or unsafe.

This model has been designed and manufactured to perform within certain specifications in regard to performance and emissions. Proper service with the correct tools is necessary to ensure that the motorcycle will operate as designed. If there is any question about a service procedure, it is imperative that you contact a Yamaha dealer for any service information changes that apply to this model. This policy is intended to provide the customer with the most satisfaction from his motorcycle and to conform with federal environmental quality objectives.

Yamaha Motor Company, Ltd. is continually striving to improve all models manufactured by Yamaha. Modifications and significant changes in specifications or procedures will be forwarded to all Authorized Yamaha dealers and will, where applicable, appear in future editions of this manual.

NOTE: _____

This Service Manual contains information regarding periodic maintenance to the emission control system for the XJ650G. Please read this material carefully.

Particularly important information is distinguished in this manual by the following notations.

NOTE: A NOTE provides key information to make procedures easier or clearer.

CAUTION: A CAUTION indicates special procedures that must be followed to avoid damage to the motorcycle.

WARNING: A WARNING indicates special procedures that must be followed to avoid injury to a motorcycle operator or person inspecting or repairing the motorcycle.

SERVICE DEPT.
INTERNATIONAL DIVISION
YAMAHA MOTOR CO., LTD.

INDEX

This manual has been combined with previous service manuals to provide complete service information for: **XJ750RH.**

Please read and give special consideration to the "NOTICE" on the preceding page for your safety.

XJ750RH SUPPLEMENT

RH

XJ650G SERVICE MANUAL

G



YAMAHA

XJ750RH

**Supplementary
Service Manual**

RH

FOREWORD

This Supplementary Service Manual has been prepared to introduce new service and new data for the XJ750RH. For complete information on service procedures, it is necessary to use this Supplementary Service Manual together with following manual:

XJ650G Service Manual (LIT-11616-01-94)

**SERVICE DEPT.
INTERNATIONAL DIVISION
YAMAHA MOTOR CO., LTD.**

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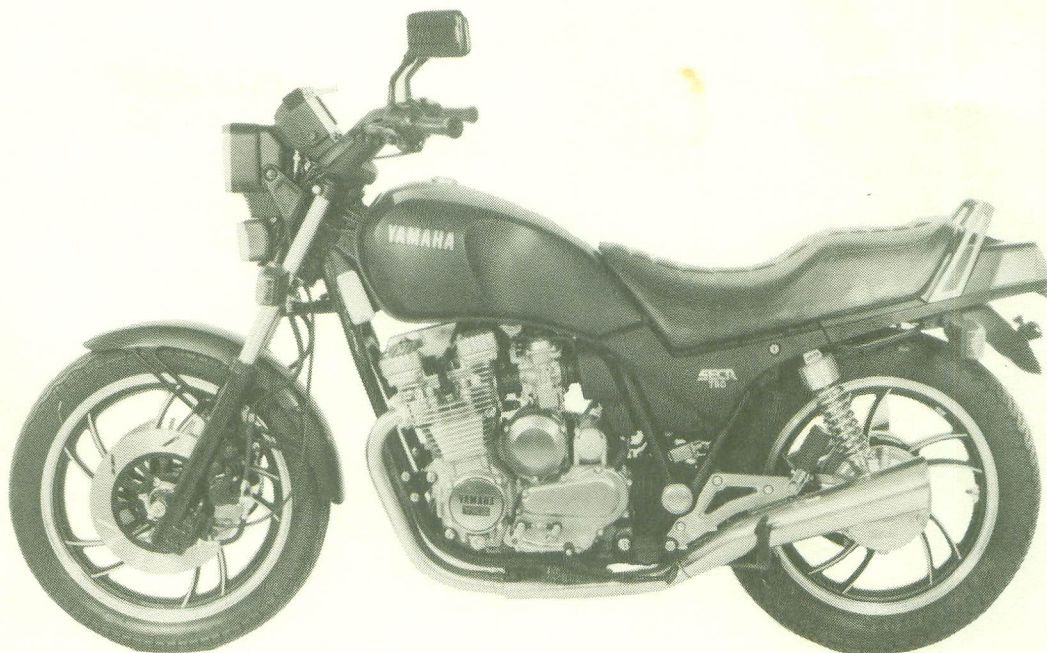
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Starting Serial Number

XJ750RH	5G2-000101
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MAINTENANCE AND LUBRICATION CHART

Periodic maintenance emission control system

No.	Item	Remarks	Initial break-in		Thereafter every	
			1,000 km (600 mi) or 1 month	5,000 km (3,000 mi) or 7 months	4,000 km (2,500 mi) or 6 months	8,000 km (5,000 mi) or 12 months
1*	Valve clearance	Check and adjust valve clearance when engine is cold.		○		○
2	Spark plugs	Check condition. Adjust cap. Clean. Replace at 13,000 km (or 18 months) or thereafter every 12,000 km (or 18 months).		○	○	Replace every 12,000 km (7,500 mi) or 18 months.
3*	Crankcase ventilation system	Check ventilation hose for cracks or damage. Replace if necessary.		○		○
4*	Fuel line	Check fuel hose and vacuum pipe or damage. Replace if necessary.		○		○
5*	Exhaust system	Check for leakage. Retighten if necessary. Replace gasket(s) if necessary.		○	○	
6*	Carburetor synchronization	Adjust synchronization of carburetors.		○	○	
7*	Idle speed	Check and adjust engine idle speed. Adjust cable free play if necessary.		○	○	

* It is recommended that these items be serviced by a Yamaha dealer or other qualified mechanic.

General maintenance/lubrication

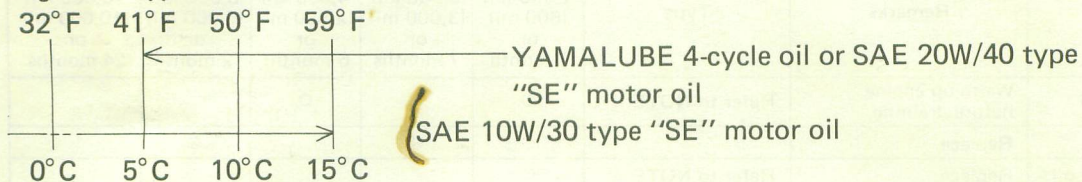
No.	Item	Remarks	Type	Initial break-in		Thereafter every		
				1,000 km (600 mi) or 1 month	5,000 km (3,000 mi) or 7 months	4,000 km (2,500 mi) or 6 months	8,000 km (5,000 mi) or 12 months	16,000 km (10,000 mi) or 24 months
1	Engine oil	Warm-up engine before draining.	Refer to NOTE	○	○	○		
2	Oil filter	Replace.	—	○	○		○	
3	Final gear oil	Replace.	Refer to NOTE	○			○	
4*	Air filter	Chain with compressed air.	—		○		○	
5*	Brake system	Adjust free play. Replace pads if necessary. Check plunger case for brake fluid leakage (front). Replace shoes if necessary (rear).	—	○	○	○		
6*	Clutch	Adjust free play.	—	○	○	○		
7*	Control and meter cable	Apply chain lube thoroughly.	Yamaha chain and cable lube or SAE 10W/30 motor oil	○	○	○		
8	Brake pedal and change pedal shaft pivots	Apply chain lube lightly.	Yamaha chain and cable lube or SAE 10W/30 motor oil		○	○		
9	Center and side stand pivots	Apply chain lube lightly.	Yamaha chain and cable lube or SAE 10W/30 motor oil		○	○		
10*	Rear arm pivot bearing	Check bearings assembly for looseness. Moderately repack every 16,000 km (10,000 mi).	Medium weight wheel bearing grease					Repack

No.	Item	Remarks	Type	Initial break-in		Thereafter every		
				1,000 km (600 mi) or 1 month	5,000 km (3,000 mi) or 7 months	4,000 km (2,500 mi) or 6 months	8,000 km (5,000 mi) or 12 months	16,000 km (10,000 mi) or 24 months
11*	Front fork oil	Drain completely. Refill to specification.	Yamaha fork oil 10Wt or equivalent					○
12*	Steering bearing and races	Check bearings assembly for looseness. Moderately repack every 16,000 km (10,000 mi).	Medium weight when bearing grease		○	○		Repack
13*	Wheel bearings	Check bearings for smooth rotation. Replace if necessary.	—		○	○		
14	Battery	Check specific gravity Check breather pipe for proper operation.	—		○	○		
15	Brake/Clutch lever pivot shaft	Apply chain lube lightly.	Yamaha chain and cable lube or SAE 10W/30 motor oil		○	○		
16*	A.C. Generator	Replace generator brushes. Replace at initial 13,000 km (8,000 mi) and thereafter every 16,000 km (10,000 mi).	—					Replace

* It is recommended that these items be serviced by a Yamaha dealer or other qualified mechanic.

NOTE:

Engine oil type:



Final gear oil type:

SAE 80 API "GL-4" Hypoid gear oil

NEW SERVICE

*ENGINE

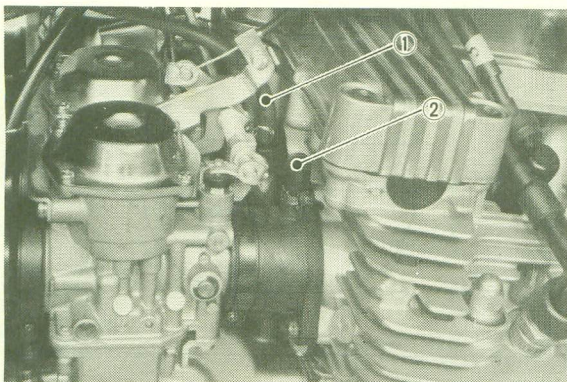
A. SYNCHRONIZATION

The seat must be opened and the rear of the tank elevated to gain access to the vacuum connections and synchronizing screw of the carburetors.

NOTE:

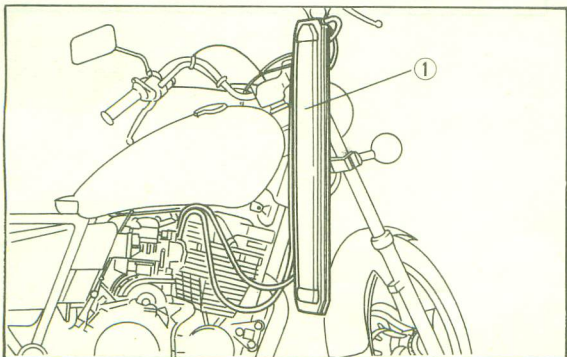
The valve clearances must be set properly before synchronizing the carburetors.

1. Remove the vacuum pipe from the carburetor manifold (No. 3 cylinder) and turn the fuel petcock to "PRI".
2. Remove the rubber caps from the No. 1, 2, and 4 carburetor manifolds.



1. Vacuum pipe 2. Rubber cap

3. Remove either the left or right (but not both) blind plug at the end of the YICS (Yamaha Induction Control System) passage in the cylinder.
4. Insert the YICS shutoff tool (special tool) fully and flip the locking lever.
5. Connect each vacuum gauge hose to its proper carburetor.



1. Vacuum gauge

6. Start the engine allow it to warm-up for a few minutes. The warm-up is complete when engine responds normally to the throttle opening.
7. Make sure the engine idle speed is 950 ~ 1,000 r/min. If it does not, adjust the idle speed with the throttle stop screw.

NOTE:

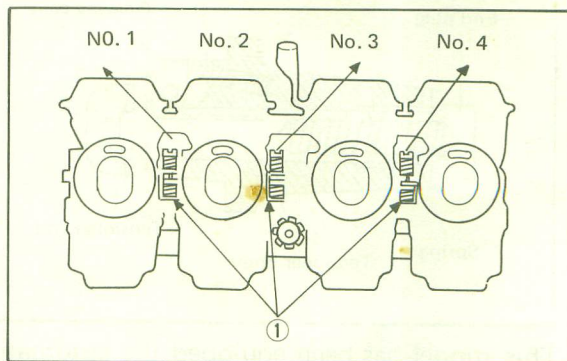
With the YICS shutoff tool fitted, the engine speed generally drops a little. Thus, continue with the following steps at idle speed of 950 ~ 1,000 r/min.

8. Each gauge reading will indicate the same if the carburetors are synchronized. The No. 3 carburetor has no synchronizing screw and the other carburetors are to be synchronized to it in order, one at a time.

First, synchronize carburetor No. 1 to carburetor No. 2 by turning the No. 1 synchronizing screw until both gauges read the same.

Second, in the same way synchronize carburetor No. 4 to carburetor No. 3.

Third, by adjusting No. 2 screw to watch No. 3 carburetor reading, No. 1 and No. 2 carburetors will both change to match No. 3 carburetor.



1. Synchronizing screws

9. Remove the YICS shutoff tool and reinstall the blind plug.

Tightening torque: 2.2 m·kg (16.0 ft·lb)

10. Check the idle speed.
Adjust if necessary.
(Refer to B. IDLE SPEED ADJUSTMENT)

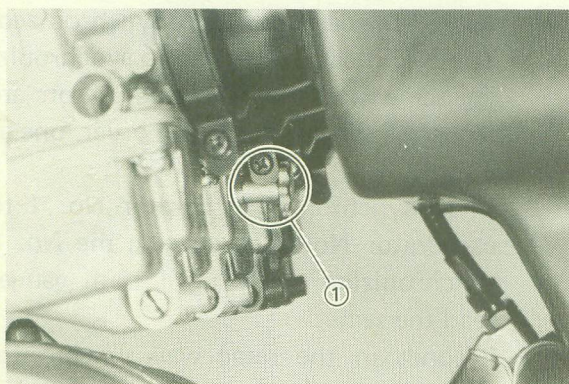
B. IDLE SPEED ADJUSTMENT

NOTE:

Carburetors must be synchronized before setting *final* idle speed. The idle speed adjustment is made by turning only one throttle stop screw.

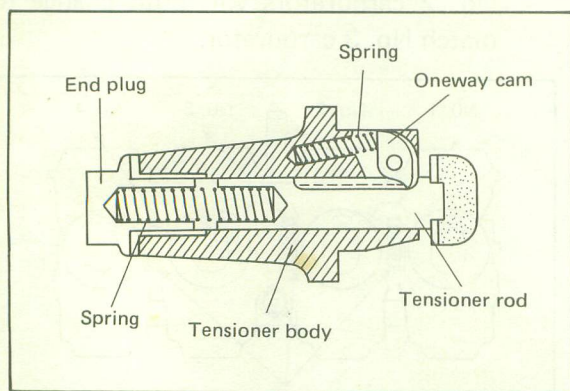
1. The engine must be warmed up before setting idle speed.
2. Set the engine idle speed by turning the throttle stop screw in (to increase engine speed) or out (to decrease engine speed).

Standard idle speed: 1,050 r/min



1. Throttle stop screw

C. CAM CHAIN TENSIONER



This model has been equipped the automatic cam chain tensioner. No adjustment is necessary.

When installing this tensioner onto the cylinder proceed as follows:

1. Remove the end plug and spring from the tensioner assembly.

2. Unlock the oneway cam by pushing it with your *finger* and push the tensioner rod into the tensioner body until it stops.
3. Install the tensioner to the cylinder and torque the bolts to the specification.

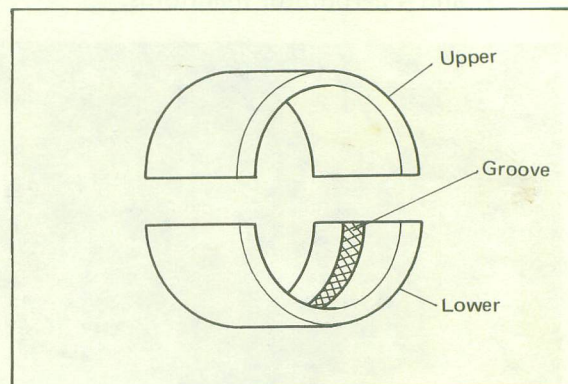
Tightening torque: 1.0 m·kg (7.2 ft·lb)

4. Reinstall the spring and end plug with the gasket. Torque the end plug to the specification.

Tightening torque: 1.5 m·kg (11 ft·lb)

D. CRANKSHAFT BEARING

The crankshaft main bearing which has no groove on the bearing surface should be installed in the upper crankcase.



E. CARBURETION

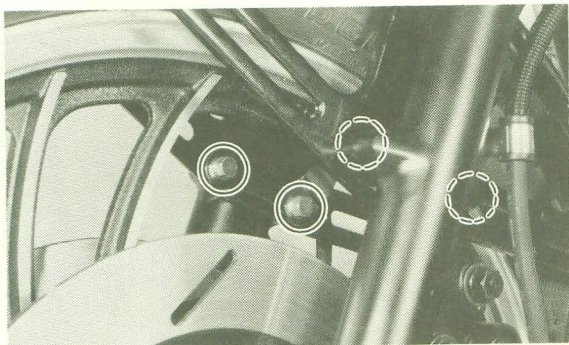
1. Specification

Main jet	#120
Jet needle	Y-3
Starter jet	#40
Fuel level	3 ± 1 mm (0.118 ± 0.039 in)
Pilot screw	Preset
Float valve seat	φ2.0
Engine idle speed	1,050 r/min

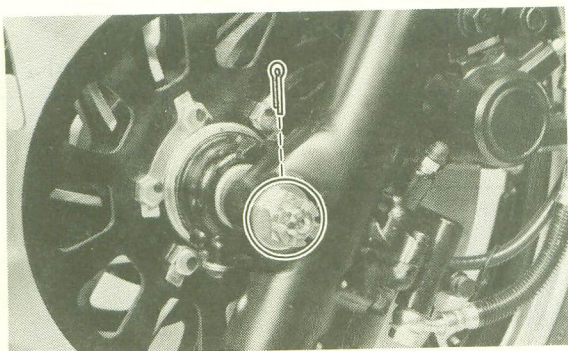
*CHASSIS

A. FRONT WHEEL

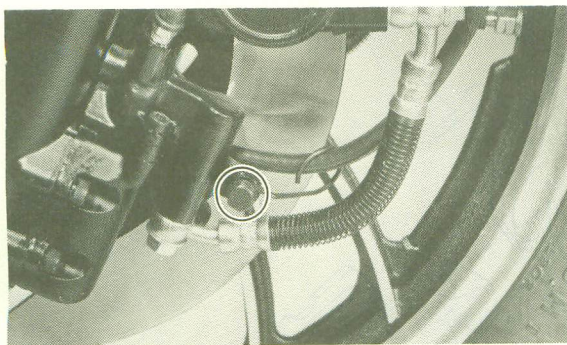
1. Place the motorcycle on the center stand.
2. Remove the front fender securing bolts and remove the fender.



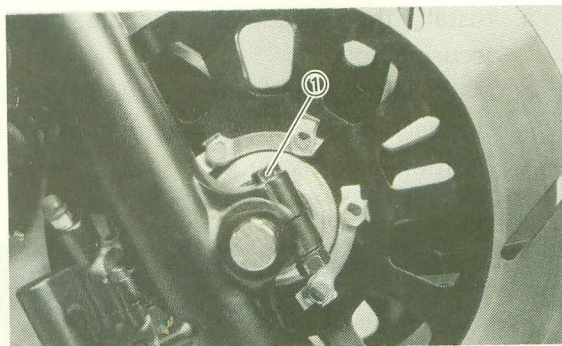
3. Remove the cotter pin and wheel axle nut.



4. Remove the speedometer cable holder securing bolt.

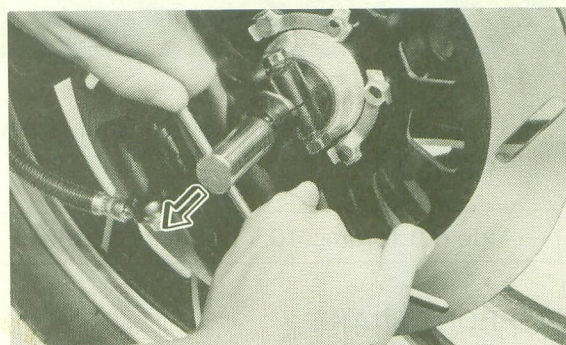


5. Loosen the pinch bolt securing the axle.



1. Pinch bolt

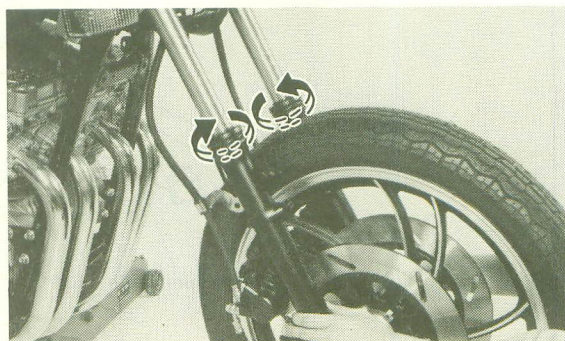
6. Remove the axle shaft and the front wheel. In this case, make sure the motorcycle is properly supported.



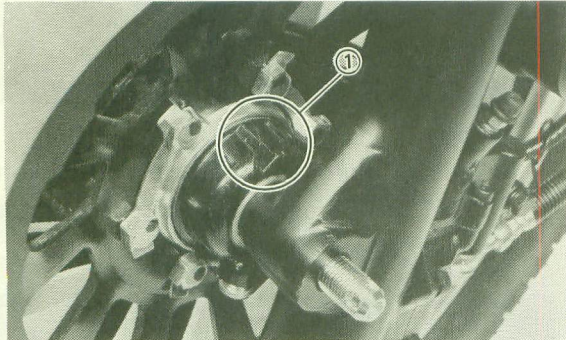
NOTE:

Do not depress the brake lever when the wheel is off the motorcycle as the brake pads will be forced to shut.

7. Lower the wheel until the brake discs come off the calipers. Turn the calipers outward so they do not obstruct the wheel and remove the wheel.



8. For reassembly, follow the procedure below with case;
 - a. Install the speedometer cable holder securing bolt.
 - b. Make sure the projecting portion (torque stopper) of the speedometer housing is positioned correctly.

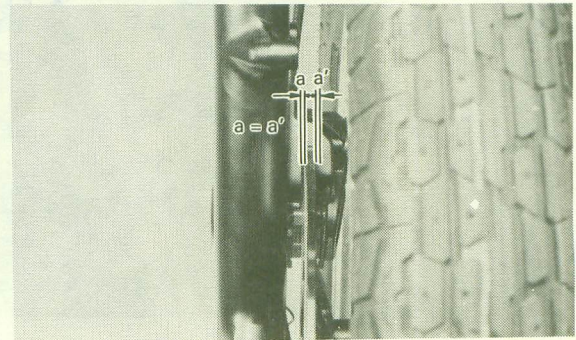


1. Torque stopper

- c. Tighten the axle nut and install a new cotter pin.

Axle nut torque: 10.7 m-kg (77.5 ft-lb)

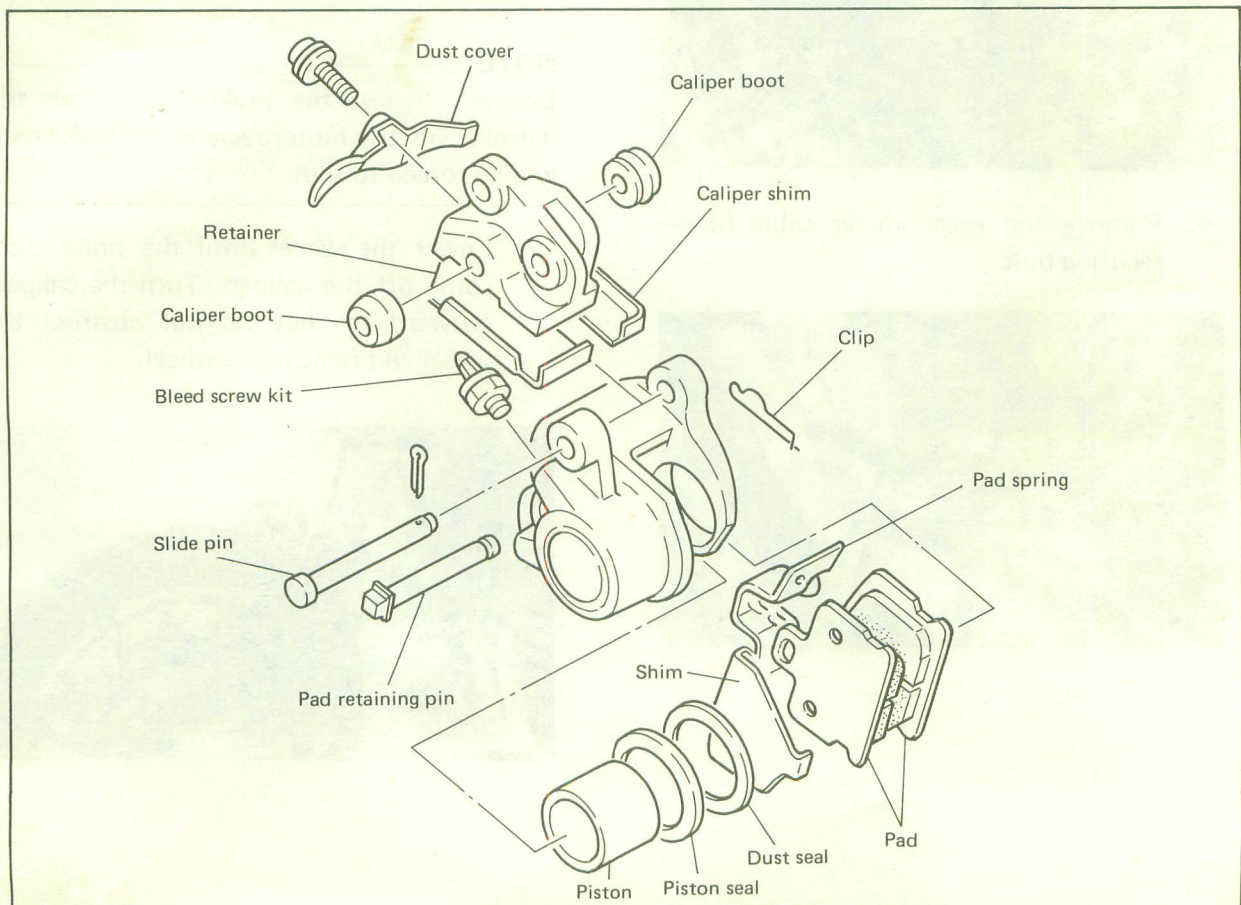
- d. Install the front fender.
- e. Before tightening the pinch bolt, compress the front forks several times to make sure of proper fork operation. With the axle pinch bolt loose, work the right fork leg back and forth until the proper clearance between the disc and caliper bracket on the front is obtained.



- f. Tighten the axle pinch bolt.

Axle pinch bolt torque:
2.0 m-kg (14.5 ft-lb)

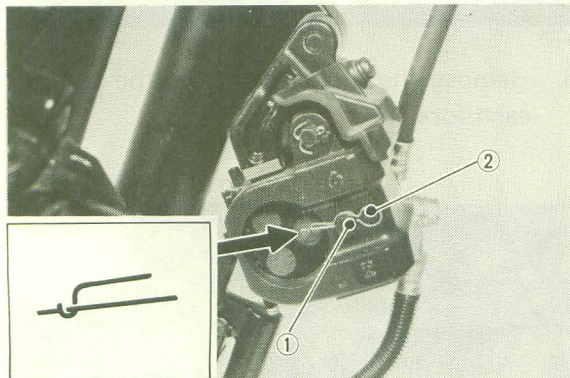
B. FRONT BRAKE



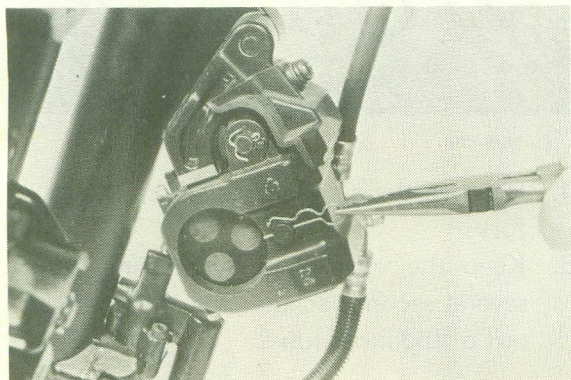
Caliper Pad Replacement

It is not necessary to disassembly the brake caliper and brake hose to replace the brake pads.

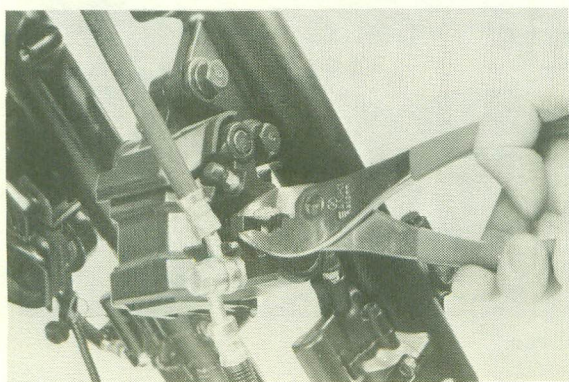
1. Remove the front fender and front wheel.
2. Unhook the pad retaining pin clip and remove the clip.



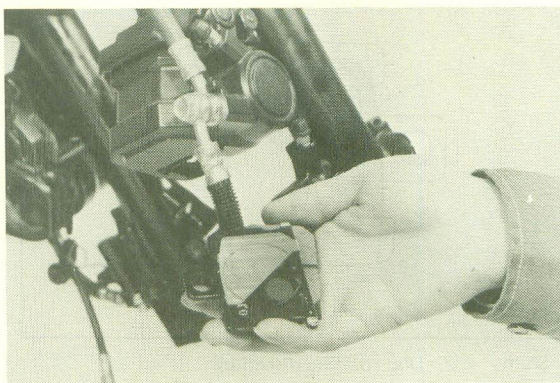
1. Pad retaining pin 2. Clip



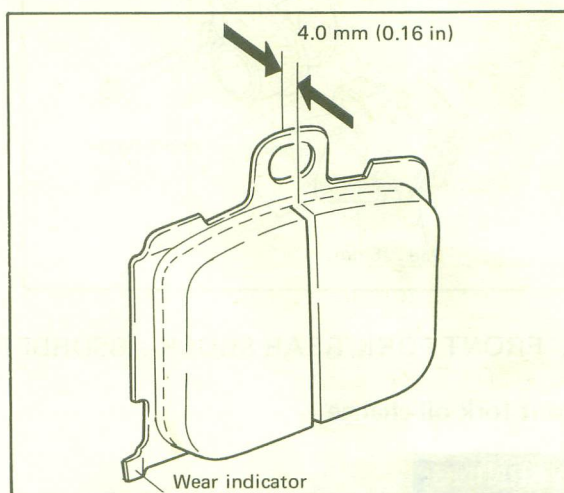
3. Pull out the pad retaining pin.



4. Remove the pads.



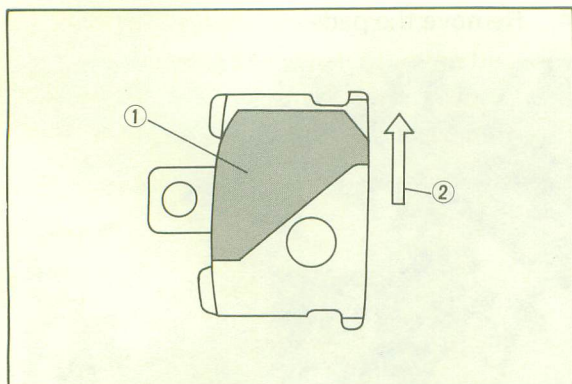
Pad wear limit: 4.0 mm (0.16 in)



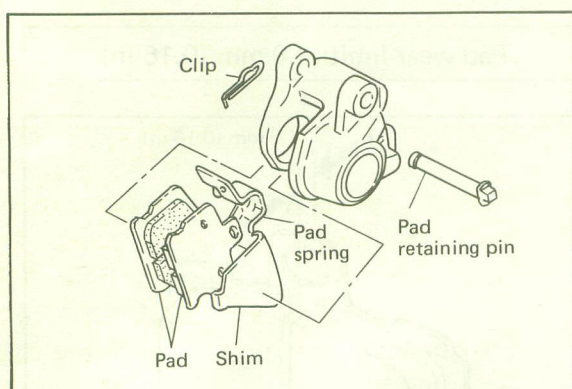
5. Install the new brake pads and shims. Before installing the pads, install the shim on the back plate which faces the caliper piston, as shown. Also replace the following parts if pad replacement is required.
 - a. Pad spring
 - b. Shim
 - c. Pad retaining pin
 - d. Clip

NOTE:

Replace the pads as a set if either is found to be worn to the wear limit.



1. Shim 2. Disc rotating direction



C. FRONT FORK/REAR SHOCK ABSORBER

Front fork oil change

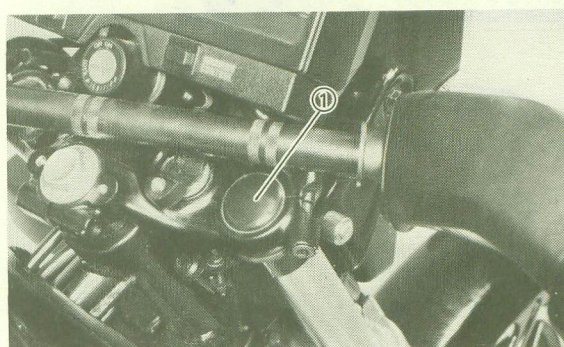
WARNING:

1. Fork oil leakage can cause loss of stability and safe handling. Have any problem corrected before operating the motorcycle.
2. Securely support the motorcycle so there is no danger of it falling over.

1. Raise the motorcycle or remove the front wheel so that there is no weight on the front end of the motorcycle.
2. Remove the center handlebar cover and handlebar.

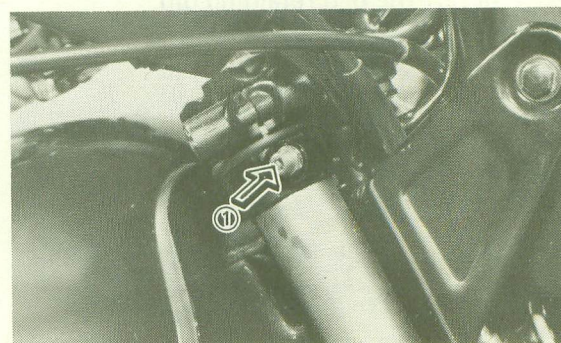


3. Remove the rubber cap from the top of each fork.



1. Rubber cap

4. Remove the air valve caps from the each fork.
5. Keep the valve open by pressing it for several seconds so that the air can be let out of the inner tube.

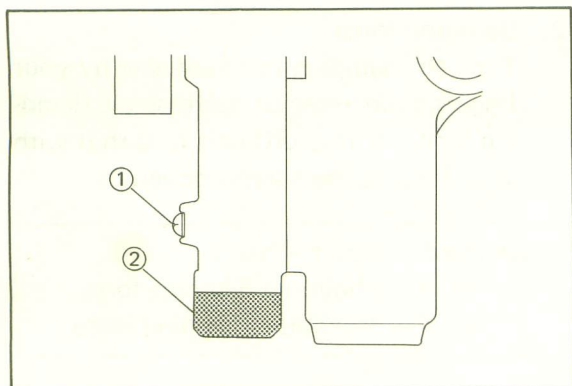


1. Push

6. The spring seat and fork spring are retained by a stopper ring (spring wire circlip). It is necessary to depress the spring seat and fork spring to remove the stopper ring. Remove the stopper ring by carefully prying out one end with a small screwdriver.
7. Place an open container under each drain hole. Remove the drain screw from each anti-dive unit.

WARNING:

Do not allow oil to contact the disc brake components. If any oil should contact the brake components it must be removed before the motorcycle is operated. Oil will cause diminished braking capacity and will damage the rubber components of the brake assembly.

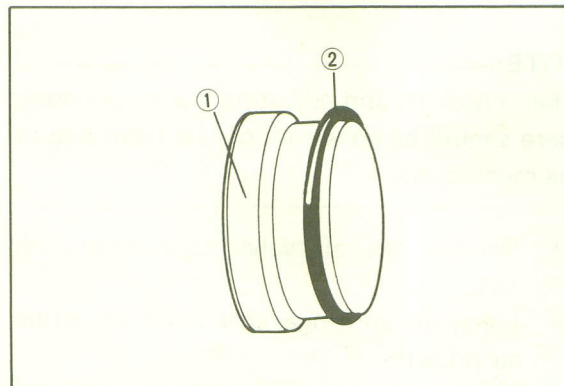


1. Drain screw 2. Rubber cap

8. When most of the oil has drained, slowly raise and lower the outer tubes to pump out the remaining oil.
9. Inspect the drain screw gasket. Replace if damaged. Reinstall the drain screw.
10. Pour the specified amount of oil into the fork inner tube.

Front fork oil (each fork):
 309 cc (10.5 oz)
 Yamaha Fork Oil 20Wt or equivalent

11. After filling, slowly pump the forks up and down to distribute the oil.
12. Inspect the O-ring on the spring seat. Replace O-ring if damaged.



1. Spring seat 2. O-ring

13. Reinstall the spring seat and fill the fork with air using a manual air pump or other pressurized air supply. Refer to "Front fork and rear shock absorber adjustment" for proper air pressure adjusting.

CAUTION:

Always use a new stopper ring (spring wire circlip).

Maximum air pressure:
 2.5 kg/cm² (36 psi)
 Do not exceed this amount.

Front fork and rear shock absorber adjustment

Front fork:

1. Elevate the front wheel by placing the motorcycle on the center stand.

NOTE:

When checking and adjusting the air pressure, there should be no weight on the front end of the motorcycle.

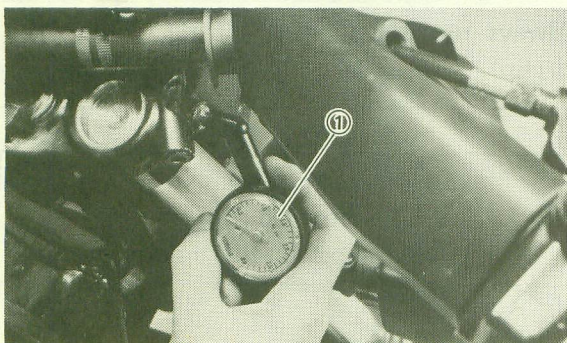
2. Remove the air valve caps from each fork.
3. Using the air gauge, check and adjust the air pressure.
If the air pressure is increased, the suspension becomes stiffer and if decreased, it becomes softer.

To increase:

Use a manual air pump or other pressurized air supply.

To decrease:

Replace the air by pushing the valve pin.



1. Air gauge

Standard air pressure:

0.4 kg/cm² (5.7 psi)

Maximum air pressure:

2.5 kg/cm² (36 psi)

Minimum air pressure: Zero

* Never exceed the maximum pressure, or oil seal damage may occur.

* The difference between both the left and right tubes should be 0.1 kg/cm² (1.4 psi) or less.

4. Install the air valve caps securely.

Rear shock absorber:

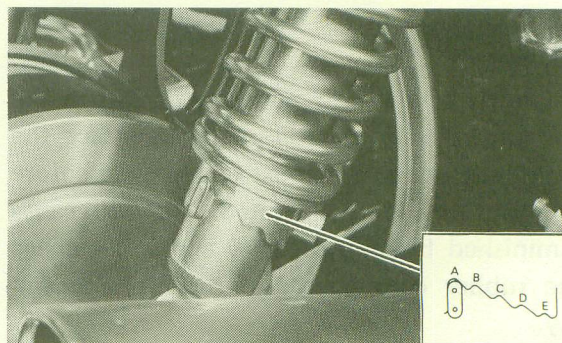
1. Spring preload

If the spring seat is raised, the spring becomes stiffer and if lowered, it becomes softer.

Standard position — A

A. position — Softest

E. position — Stiffest



2. Damping force

Turn the damping force adjuster by your fingers to increase or decrease the damping force. If it is difficult to turn it with your fingers, use a screw driver.

Standard position — No. 1

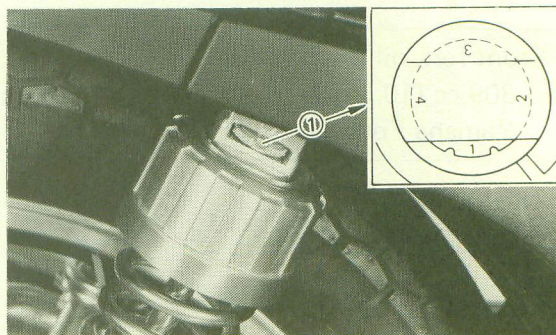
No. 1 — Minimum damping force

No. 4 — Maximum damping force

NOTE:

When adjusting the damping force, the adjuster should be placed in the clicked position. If not, the damping force will be set to the maximum (No. 4).

Always adjust both the right and left absorbers to the same position.



1. Damping force adjuster

Recommended combinations of the front fork and the rear shock absorber.

Use this table as guidance to meet specific riding conditions and motorcycle load.

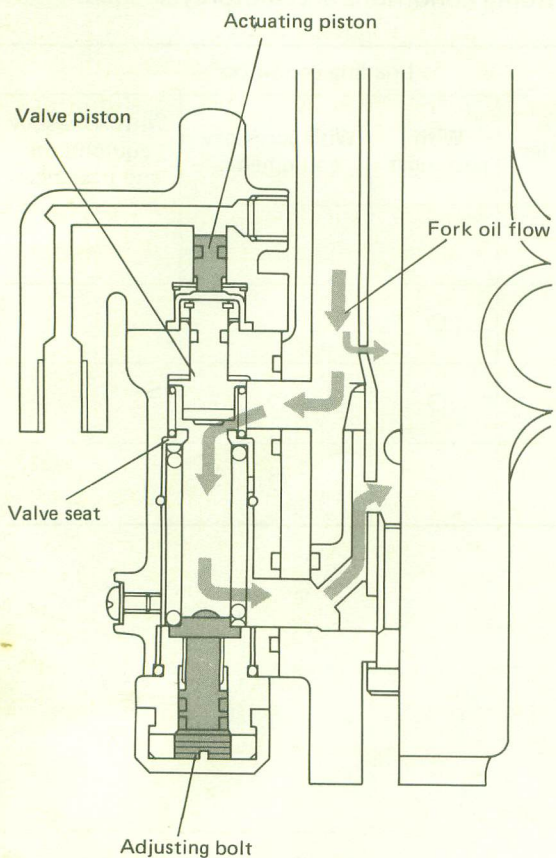
	Front fork	Rear shock absorber		Loading condition			
	Air pressure	Spring seat	Damping adjuster	Solo rider	With passenger	With accessory equipments	With accessory equipments and passenger
1.	0.4 ~ 0.8 kg/cm ² (5.7 ~ 11.4 psi)	A ~ C	1	○			
2.	0.4 ~ 0.8 kg/cm ² (5.7 ~ 11.4 psi)	A ~ C	2	○	○		
3.	0.4 ~ 0.8 kg/cm ² (5.7 ~ 11.4 psi)	C ~ E	3		○	○	
4.	0.8 ~ 1.2 kg/cm ² (11.4 ~ 17.1 psi)	E	4			○	○

D. ANTI-DIVE SUSPENSION

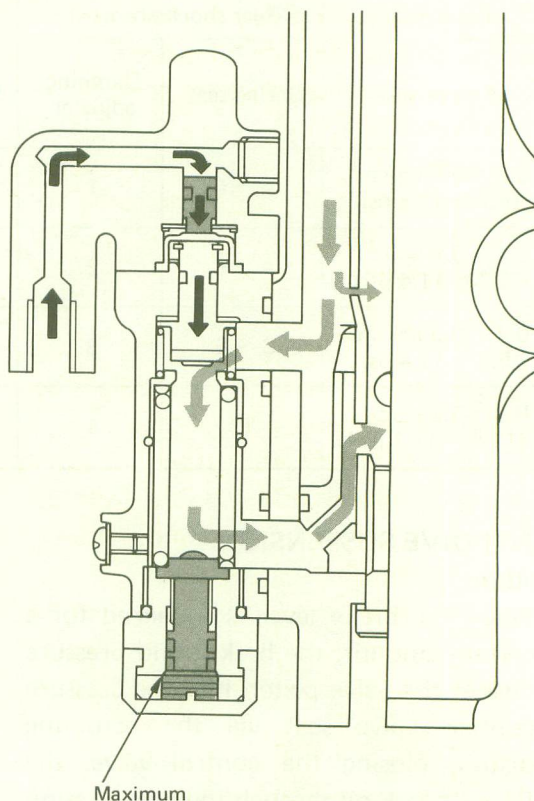
Operation

1. When the brake lever is squeezed for a certain amount, the brake fluid pressure pushes the valve piston into the pressure control valve seat via the actuating piston, closing the control valve; the flow of fork oil through the compression damping circuit is restricted substantially and prevent the motorcycle front dive.
2. This anti-dive effect can be adjusted to suit motorcycle load and riding conditions by turning the adjusting bolt (see illustrations). This control valve controls the compression oil pressure in the front fork.
3. When a bump is encountered during braking, the fork oil pressure in the compression damping circuit increases. This increased pressure override the system by pushing the spring-loaded pressure control valve seat away from the valve piston, and fork oil flows through the valve. The fork then responds to absorb the shock of the bump.
4. As the road becomes smooth again, the pressure in the compression damping circuit decreases, allowing the valve seat to return to its position against the valve piston, then the system resumes its stabilizing effect on the fork.

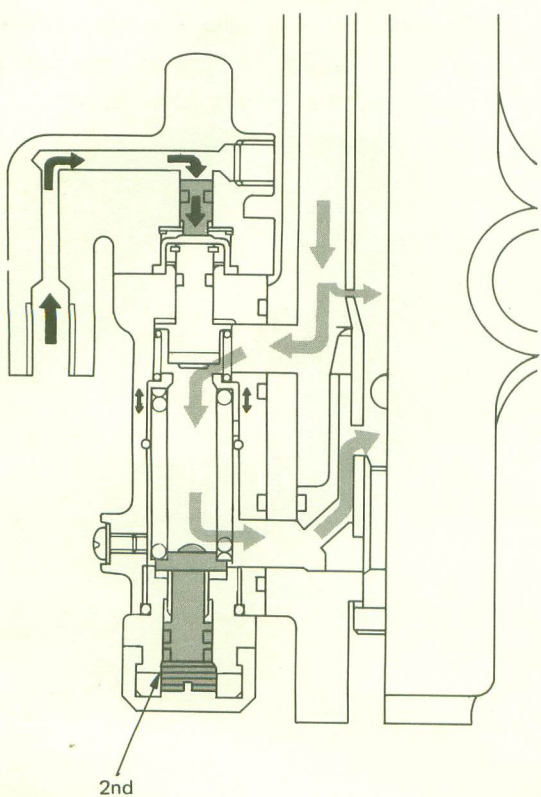
ANTI-DIVE SYSTEM



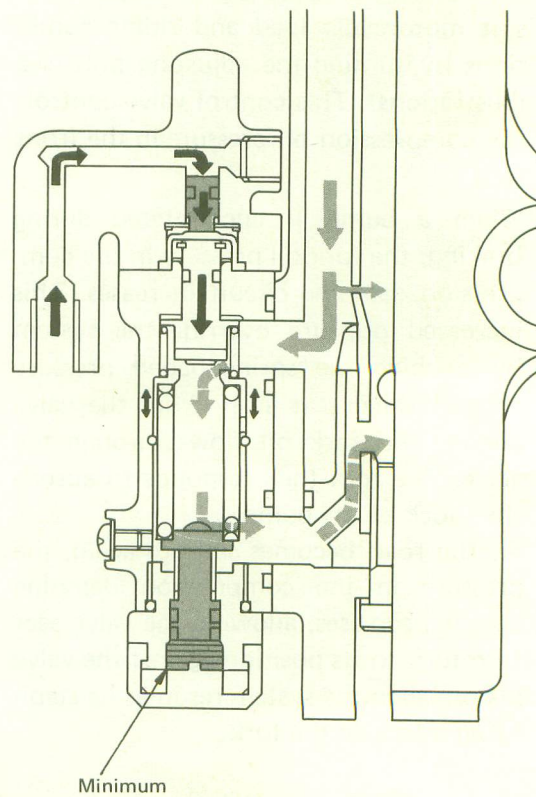
Oil flow as the adjusting bolt is set to the minimum.



Oil flow as the adjusting bolt is set to the 2nd.



Oil flow as the adjusting bolt is set to the maximum.

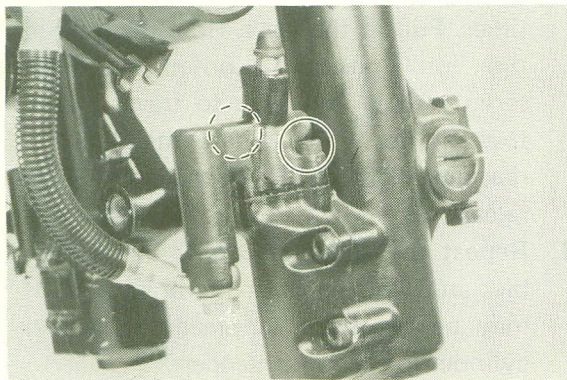


System inspection

1. Apply the front brake for a few minutes and check to see if any brake fluid leaks out of the pipe joint and/or the vent.
2. Check the fork for fork oil leakage.
3. Turn the anti-dive adjusting bolt to the maximum position.
4. Compress the front forks while applying the front brake. If the front forks are compressed easily, the anti-dive system may be damaged.

Removal

1. Release the air from the front fork by pressing the air valve pin.
2. Remove the drain screw from the anti-dive valve housing and drain the fork oil.
3. Remove the brake hose from the actuating piston housing.
4. Remove the bolts securing the actuating piston housing, and remove the housing from the anti-dive valve housing.



5. Remove the anti-dive adjusting bolt cover and remove the adjusting bolt seat.

CAUTION:

The adjusting bolt can not be removed from its seat.

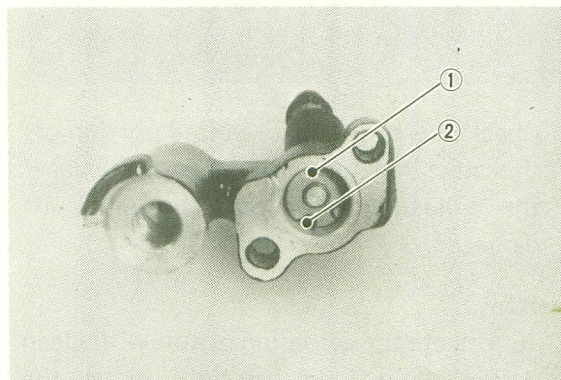
6. Remove four bolts securing the anti-dive valve assembly and remove the housing assembly from the front fork. Remove two O-rings from the front fork.

Inspection

NOTE:

The anti-dive valve housing can not be disassembled so it must be replaced with a new one if the anti-dive valve malfunction is found.

1. Remove the circlip and remove the actuating piston from the actuating piston housing.

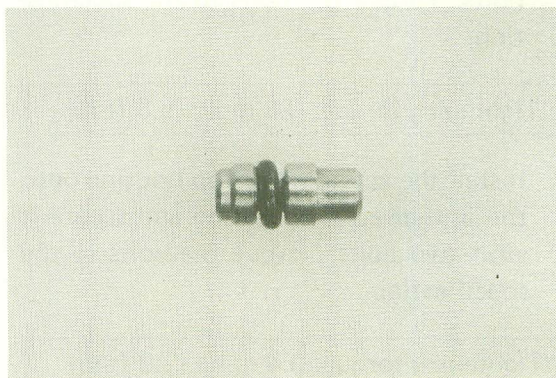


1. Circlip 2. Actuating piston

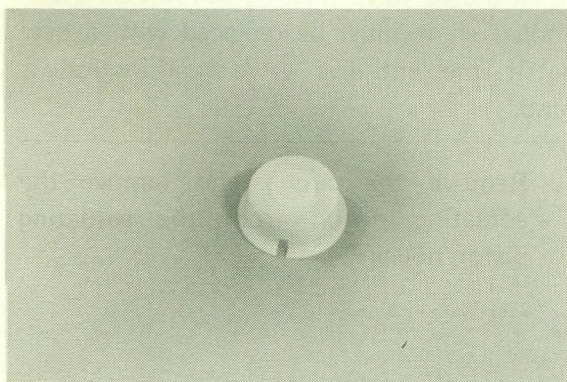
CAUTION:

Do not remove the O-ring from the actuating piston.

2. Check the piston, O-ring, and cylinder for wear, cracks, rust, and/or scratches. If any damage is found, replace the actuating piston housing assembly.



3. Check the piston separator for cracks and replace if damaged.



4. Check the spring seat rivetted portion of the adjusting bolt for damage. Replace the adjusting bolt seat assembly if damaged.

Assembly

1. Lubricate the actuating piston with clean brake fluid, and carefully insert the piston into the actuating piston housing cylinder until the shoulder of the piston is flush with the cylinder edge.
2. Install the washer and circlip.
3. Install the separator into the actuating piston housing.
4. Install new O-rings around the front fork oil passages.
5. Install the anti-dive valve housing onto the front fork and secure it with four bolts. Torque the bolts to the specification.

Tightening torque: 0.8 m·kg (5.8 ft·lb)

6. Install the actuating piston housing onto the anti-dive valve housing and secure it with two bolts. Torque the bolts to the specification.

Tightening torque: 0.4 m·kg (2.9 ft·lb)

7. Install a new O-ring onto the adjusting bolt seat and apply a thread locking compound. Install the adjusting bolt seat assembly and tighten it to the specification.

Tightening torque: 2.0 m·kg (14.5 ft·lb)

8. Connect the brake hose to the actuating piston housing with the union bolt and copper washers. Torque it to the specification.

Tightening torque: 2.6 m·kg (18.8 ft·lb)

9. Pour the specified amount of front fork oil into the fork inner tube.

Front fork oil capacity (each leg):

309 cc (10.5 oz)

Recommended oil:

Yamaha fork oil 20Wt or equivalent

10. Add proper brake fluid into the brake reservoir being careful not to spill or overflow.
11. Connect the clear plastic tube of 4.5 mm in inside diameter tightly to the actuating piston housing bleed screw. Put the other end of the tube into a container.
12. Slowly apply the brake lever several times. Pull in the lever. Hold the lever in the "on" position. Loosen the bleed screw. Allow the lever to travel slowly toward its limit. When the limit is reached, tighten the bleed screw. Then release the lever.
13. Repeat the above step until all air bubbles are removed from the brake line. It may be necessary to bleed the caliper cylinder in the same manner.

NOTE:

If the bleeding is difficult, it may be necessary to let the brake fluid in the system stabilize for a few hours and repeat the bleeding procedure.

14. Fill the fork with air using a manual air pump or other pressurized air supply.

Standard air pressure: 0.4 kg/cm² (5.7 psi)

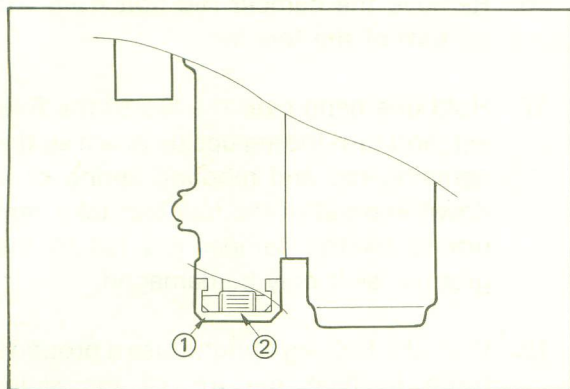
15. Adjust the anti-dive adjusting bolt.

WARNING:

The anti-dive setting must be the same on both anti-dive units.

Anti-dive adjustment

1. Remove the rubber cap from the bottom of the anti-dive unit.
2. Observe the head of the adjusting bolt through the machine's slot(s) in the bottom of the anti-dive unit. In the standard position, four lines will be visible on the adjusting bolt head. Consult the fork adjustment chart below to determine the proper setting.

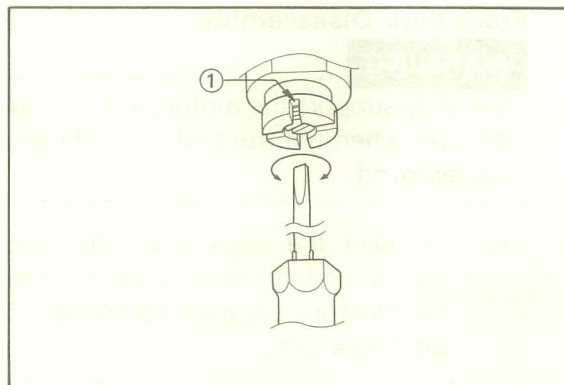


1. Rubber cap 2. Adjusting bolt

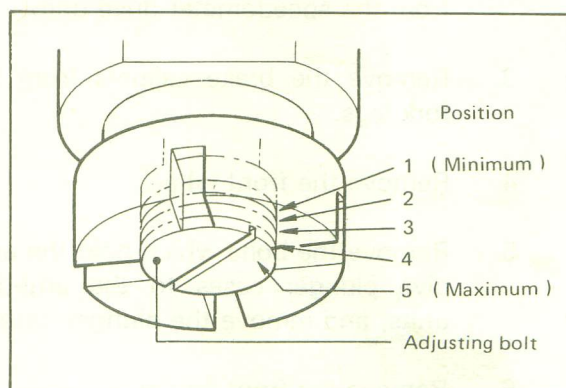
3. To decrease the anti-dive effect, turn the adjusting bolt counterclockwise until the first line appears level to the top of the machined slot(s).

WARNING:

When the first line appears in the machined slot(s), the adjusting bolt will bottom in the anti-dive unit and a resistance will be felt. Do not attempt to turn the adjusting bolt beyond this point, or the anti-dive unit will be damaged.



1. Machined slot



4. To increase the anti-dive effect, turn the adjusting bolt clockwise.
5. Replace the rubber cap.

WARNING:

The anti-dive settings must be the same on both anti-dive units. Hence, be sure to perform the above procedure on both anti-dive units.

Adjusting bolt position	Loading condition		
	Solo rider	With accessory equipments or passenger	With accessory equipments and passenger
1	○		
2	○	○	
3	○	○	○
4		○	○
5			○

Front Fork Disassembly

WARNING:

Securely support the motorcycle so it won't fall over when the front wheel and fork legs are removed.

1. Remove the caps from the fork air valves, and depress the valves until the air pressure escapes completely from both fork legs.
2. Disconnect the speedometer cable from the speedometer drive unit.
3. Remove the brake calipers from the fork legs.
4. Remove the front wheel.
5. Remove the bolts which hold the anti-dive plunger cases to the anti-dive units, and remove the plunger cases.
6. Remove the front fender.
7. Loosen the fork pinch bolts in the handle crown and underbracket.
8. Slide the fork legs out of the handle crown, and remove the rubber O-rings and the air valve brackets from the fork legs.
9. Remove the spring wire circlips from the outside of the fork legs, and remove the fork legs from the motorcycle.

NOTE:

Perform the fork leg disassembly and reassembly procedures on one fork leg at a time.

10. Remove the rubber cap from the top of the fork tube.
11. Push down on the spring seat, and remove the spring seat circlip from the fork tube.
12. Remove the spring seat and fork spring.

13. Inspect the O-ring on the spring seat, and replace the O-ring if it is damaged.
14. Over a drain pan, turn the fork leg upside down and slowly pump the fork oil out of the fork leg.
15. Remove the four bolts that hold the anti-dive unit to the fork leg, and remove the anti-dive unit.
16. Remove the damper rod bolt from the bottom of the fork leg.
17. Hold one hand over the top of the fork leg, and turn the leg upside down so the damping rod and rebound spring slide down and out of the fork leg; take care not to let the damper rod fall to the ground, as it may be damaged.
18. With the fork leg upright, use a propane torch to heat the top of the slider lightly, and remove the dust seal with a thin screwdriver. Take care not to scratch the inner tube. Discard the dust seal.

CAUTION:

Do not apply too much heat to the slider, as the paint will be damaged.

19. Remove the retaining clip and oil seal washer.
20. Hold the fork leg horizontally, securely clamp the axle-mounting boss of the slider in a vise with soft jaws, and again heat the top of the slider.
21. Slowly push the inner tube into the slider, and then pull the inner tube back out quickly until it tops out; the oil seal and guide bushing will be dislodged from the slider after this is done several times.

CAUTION:

Avoid bottoming the inner tube in the slider during the above procedure, as the oil lock valve assembly will be damaged.

22. Remove all components of the oil lock valve assembly and inspect them; replace the assembly if there are any damaged components.
23. Remove the oil seal, seal spacer, and both bushings from the inner tube; discard these parts and use new ones during reassembly.
24. Clean all components of the fork leg and inspect them; replace any worn or damaged components prior to reassembly.

Front Fork Reassembly

1. Install the rebound spring on the damper rod.
2. Install the slide bushing (slide metal 2) on the inner tube.
3. Install the damper rod in the inner fork tube, and allow it to slide slowly down the tube until it protrudes from the bottom.
4. Install the oil lock plate washer and valve spring, the oil lock valve, and the oil lock piece on the damper rod.
5. Carefully insert the inner tube and damper rod assembly into the slider, and align the damper rod bolt hole with the hole in the bottom of the slider. Also align the middle hole in the oil lock piece with the lowest hole leading to the anti-dive unit.
6. Apply a thread-locking compound such as Locktite® to the threads of the damper rod holding bolt, install the bolt in the damper rod, and torque it to specification.

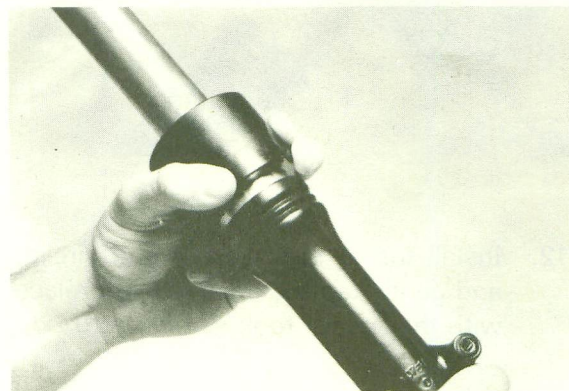
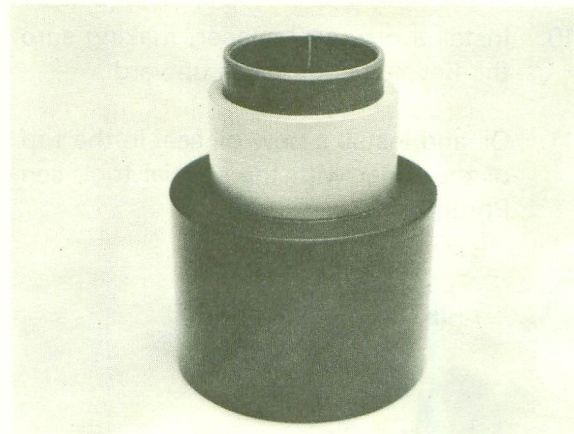
TIGHTENING TORQUE: 2.0 m-kg
(14.5 ft-lb)

7. Make sure both O-rings are in place in the anti-dive unit; apply thread-locking compound to the bolts which hold the

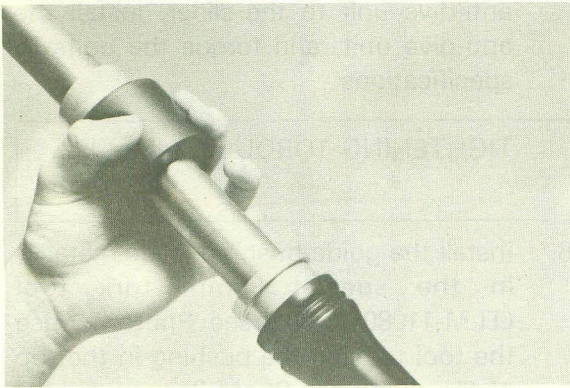
anti-dive unit to the slider, install the anti-dive unit, and torque the bolts to specifications.

TIGHTENING TORQUE: 0.8 m-kg
(5.8 ft-lb)

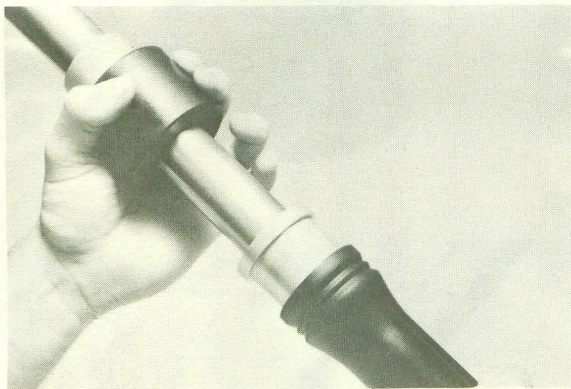
8. Install the guide bushing (slide metal 1) in the special 36mm fork tool (TLM-11080-10-00); see Photo 1. Use the tool to align the bushing in the top of the slider; see Photo 2.



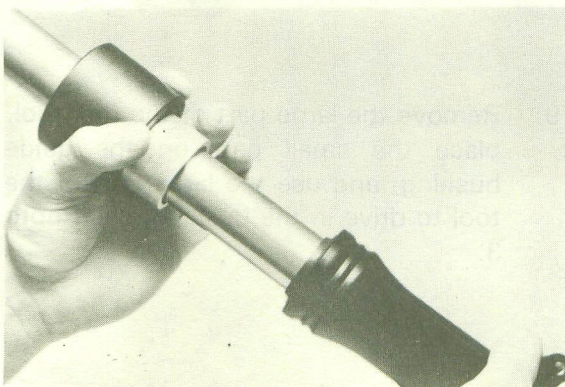
9. Remove the large part of the fork tool, place the small part on the guide bushing, and use the large part of the tool to drive in the bushing; see Photo 3.



10. Install a new seal spacer, making sure the beveled edge faces upward.
11. Oil and install a new oil seal in the top of the slider with the special tool; see Photo 4.



12. Install the oil seal washer and circlip, and gently tap the dust seal into place with the special tool; see Photo 5.



13. Pour the specified amount of the recommended fork oil into the fork leg.

FORK OIL CAPACITY: 309cc
(10.4 oz) per leg

RECOMMENDED OIL: 20wt Yamaha Fork Oil

11. Slowly pump the fork leg up and down to distribute the oil.
12. Install the fork spring, spring seat, and a new spring seat circlip.
13. Install the rubber cap in the top of the fork leg.
14. Slide the fork leg into the underbracket, and install the spring wire circlip, air valve bracket, and rubber O-ring on the fork leg.
15. Slide the fork leg the rest of the way into the handle crown, and align the air valve bracket properly. Torque the pinch bolts in the handle crown and underbracket.

TIGHTENING TORQUE: 2.0 m-kg
(14.5 ft-lb)

16. Install the proper amount of air pressure in the fork legs. Take care not to exceed the maximum allowable air pressure.

MAXIMUM FORK AIR PRESSURE:
2.5 kg/cm² (36 psi)

17. Install the air valve caps.

WARNING:

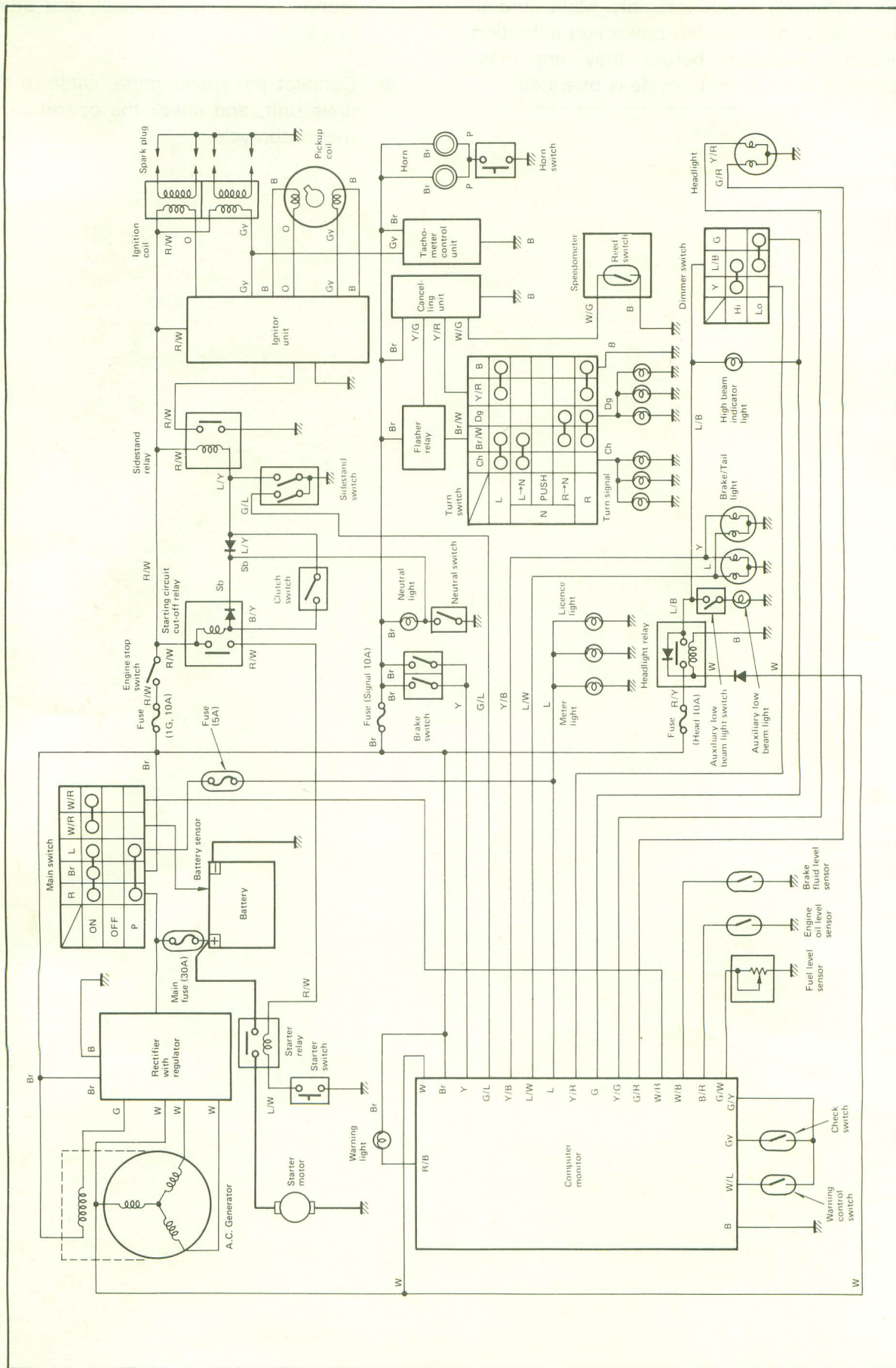
Make sure no oil has contacted any disc brake components or the anti-dive actuating piston housing; oil will cause diminished braking capacity and damage the rubber

components of the brake assembly and anti-dive actuating piston assembly. Make sure all oil is removed from the brake and actuating piston assemblies before they are reassembled and the motorcycle is operated.

18. Install the front fender, anti-dive plunger cases, front wheel, and brake calipers.
19. Connect the speedometer cable to the drive unit, and check the operation of the motorcycle.

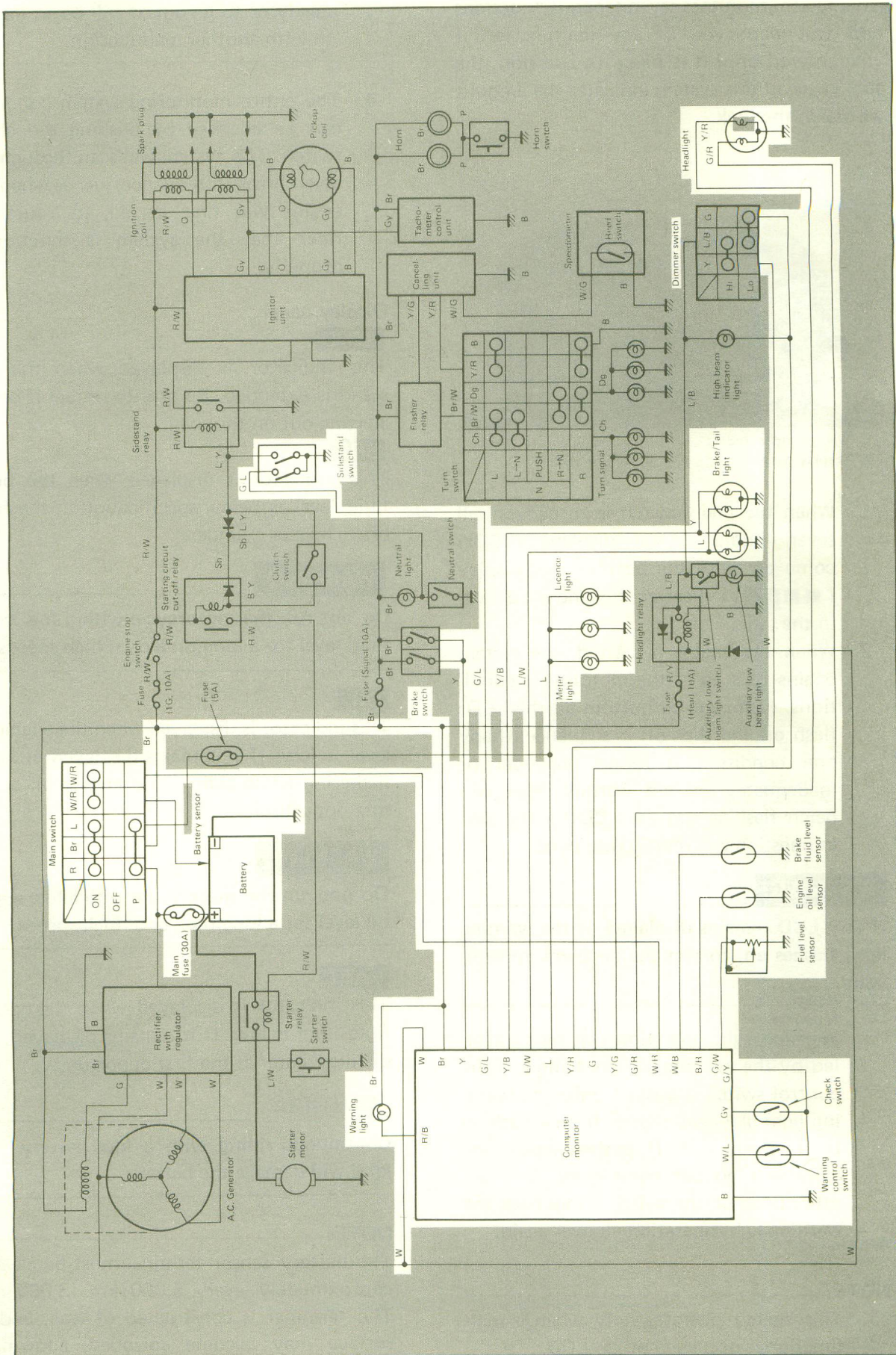
* ELECTRICAL

A. XJ750RH WIRING DIAGRAM



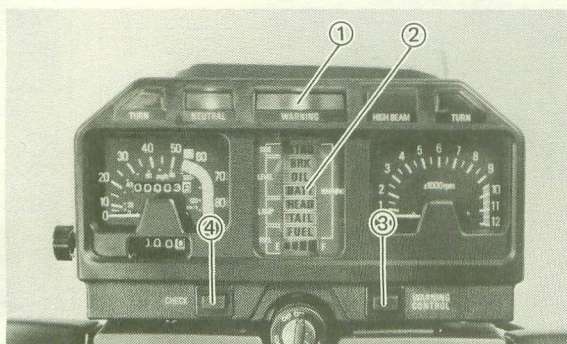
B. COMPUTERIZED MONITOR SYSTEM

Circuit diagram



Operation

This system monitors seven separate functions and will warn you of any malfunction if encountered until it is fixed. In addition, the fuel gauge in this system indicates the amount of fuel in the tank.



1. Warning light (red)
2. Display panel
3. Warning control switch
4. Check switch

1. When the main switch is turned on, all seven liquid crystal displays (LCDs) come on, with the bottom fuel display (■■■■) indicating the amount of fuel in the tank.
2. When the engine is started, the system begins its scan of the motorcycle conditions. From top to bottom all the LCDs flash on and then off in sequence. If any one condition is found improper or inadequate, the red warning light will begin flashing and the LCD for the area in question will remain displayed.

WARNING:

If any LCD remains displayed or the warning light flashes on, correct the problem immediately.

3. Warning light operation can be controlled by the warning control switch. If the control switch is pushed once, the warning light glow will change from a flashing to a steady one. If pushed again, the glow will go out completely. Still another push on the switch brings back the warning light operation all over again.

NOTE:

1. This switch operates only when a malfunction is displayed on an LCD.

2. Even if the warning light is made to glow steady or to go out, it will begin flashing on with another malfunction.

4. The entire monitoring system condition can be checked by pushing the check switch. The system will scan through the seven areas in sequence, just as when the engine was first started, to assure the rider that the system is functioning properly.

Display panel

STND

This indicator is displayed when the side stand is extended. Be sure to retract it before starting out on the road.

BRK

This indicator is displayed when the brake fluid level is below specification in the front brake master cylinder.

WARNING:

Do not run the motorcycle with a low brake fluid level for a long time or at high speeds.

OIL

This indicator is displayed when the engine oil level is low. If it remains displayed or keeps flickering while riding, add engine oil at the first opportunity.

WARNING:

Do not run the motorcycle with a low engine oil level for a long time or at high speeds.

BATT

This indicator is displayed when the battery fluid level is low. If it remains displayed, add distilled water at the first opportunity.

CAUTION:

Continuous riding with a low battery fluid level will damage the battery.

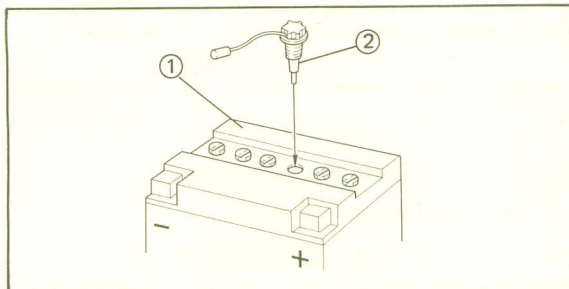
NOTE:

The battery sensor terminal must be cleaned approximately every 5,000 km (3,000 mi). The terminal is constructed of lead, and its surface may become corroded, allowing a system malfunction. Also, the terminal must

be installed in the fourth cell from the negative terminal on the battery, as the sensor must pick up a specified voltage.

CAUTION:

Make sure that the connection to the battery is correct; otherwise, damage to the microcomputer may occur.



1. Battery

2. Battery sensor

HEAD

This indicator is displayed when the headlight bulb is burned out. If it remains displayed, have it replaced and correctly adjusted at the first opportunity.

TAIL

This indicator is displayed when the taillight and/or brake light bulb is burned out. If it

remains displayed, have it replaced at the first opportunity.

FUEL

This indicator is displayed when the fuel level is low. If it remains displayed or keeps flickering while riding, add fuel at the first opportunity.

GENERAL CAUTION:

Failure to observe any of the following "mustn'ts" may result in malfunction of the microcomputer or damage to the electrical circuit.

1. Taillight, brake light and other bulbs of wattage other than specified mustn't be used.
2. Extra electric accessories mustn't be connected to the computerized monitor system circuit (ex: taillight, headlight, etc.)
3. The instrument panel mustn't be subjected to any water splashes or steam from underneath.
4. The display panel mustn't be pressed hard or given any shock.
5. A magnet or other magnetized objects mustn't be put near the display panel.

Troubleshooting

1. After the main switch is turned on:

PROBLEM	CAUSE	SOLUTION
a. Warning light doesn't come on.	Bulb is burned out. Low battery charge. Faulty coupler connection. Broken wire. CMS control unit failed.	Replace bulb. Recharge battery. Clean coupler contacts. Replace wiring. Replace CMS control unit.
b. Liquid crystal display (LCD) flashes on and off.	CMS control unit failed.	Replace CMS control unit.
c. LCD does not function.	LCD connectors incorrectly installed. Broken wire. Faulty contact between LCD panel and control unit. LCD panel failed. CMS control unit failed.	Reinstall connectors. Replace wiring. Clean contacts. Replace LCD panel. Replace CMS control unit.
d. LCD only partially displays.	LCD panel failed.	Replace LCD panel.

2. After the engine is started.

PROBLEM	CAUSE	SOLUTION
a. LCD does not cycle.	Faulty coupler connection. Broken wire. CMS control unit failed.	Clean coupler contacts. Replace wiring. Replace CMS control unit.

3. After the check switch is pushed:

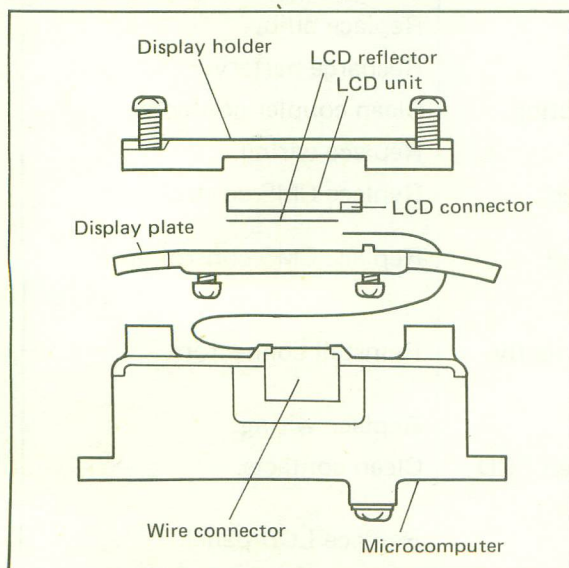
PROBLEM	CAUSE	SOLUTION
a. LCD does not cycle.	Check switch failed. Faulty coupler connection. Broken wire. CMS control unit failed.	Replace check switch. Clean coupler contacts. Replace wiring. Replace CMS control unit.

4. After the warning control switch is pushed:

PROBLEM	CAUSE	SOLUTION
a. Warning light continues to flash.	Warning control switch failed. Faulty coupler connection. Broken wire. CMS control unit failed.	Replace warning control switch. Clean coupler contacts. Replace wiring. Replace CMS control unit.

Cleaning and replacement

Use the following procedure to replace the LCD unit or the microcomputer unit.



1. Remove the headlight lens and the two headlight-body holding bolts. This will give you easy access to the instrument-panel holding nuts.

2. Disconnect the wire connectors in the headlight assembly that lead to the instrument panel.
3. Disconnect the speedometer cable.
4. Disconnect the instrument-panel holding nuts, and remove the panel.
5. Remove the three nuts which secure the instrument-panel mounting bracket, and remove the bracket.
6. Place the instrument panel assembly on a clean work surface, and remove the back panel.
7. Remove the four phillips-head screws which secure the LCD/microcomputer, and remove the unit.
8. Remove the four screws which hold the LCD display holder.
9. Very carefully turn the display holder over, and completely remove the five display plate holding screws. Remove the LCD reflector and the display plate.
10. Detach the wire connector from its indexing points.

CAUTION:

Disconnect the wire connector carefully. Do not pull on the wire connector. It is indexed and could be damaged if you pull on it. Do not touch the connector contacts. They are gold plated.

11. Remove the display plate and the LCD unit.
12. Clean the display plate and the LCD unit.

CAUTION:

- a. Use compressed-air lens cleaner (as used on cameras) to clean the display and the LCD unit. Do not use shop air for this purpose.
- b. Use a soft cloth. Do not use cotton. It will leave lint deposits which will interfere with the delicate contacts.
- c. Very carefully clean the LCD unit because it is possible to generate enough static electricity to damage it.

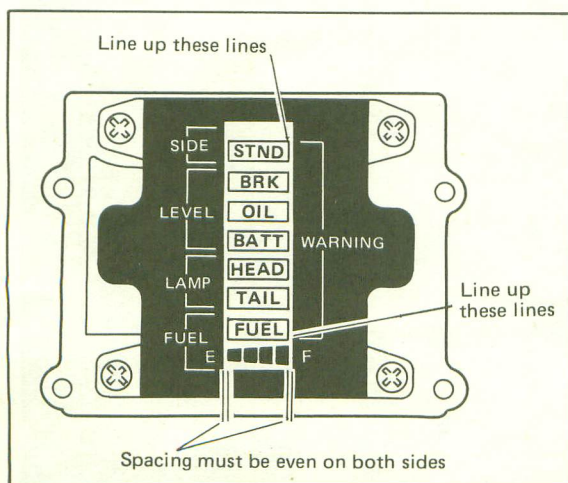
13. Reinstall the LCD unit into the display holder.

CAUTION:

Do not touch the LCD connector with bare hands.

IMPORTANT NOTE:

The LCD unit must line up as shown in the illustration to seal the LCD unit properly.



14. Reinstall the LCD reflector so that the shiny surface faces toward the LCD unit.
15. Carefully place the wire connector on the LCD connector and seat it on its two indexing points. Install the display plate and carefully screw in the wire connector indexing screw first. Then screw in the remaining four holding screws. Do not overtighten the screws.

Tightening torque:

3 mm: 10 cm-kg (0.7 ft-lb)

(Use LOCTITE)

4 mm: 24 cm-kg (1.7 ft-lb)

16. Reinstall the display holder on the microcomputer.

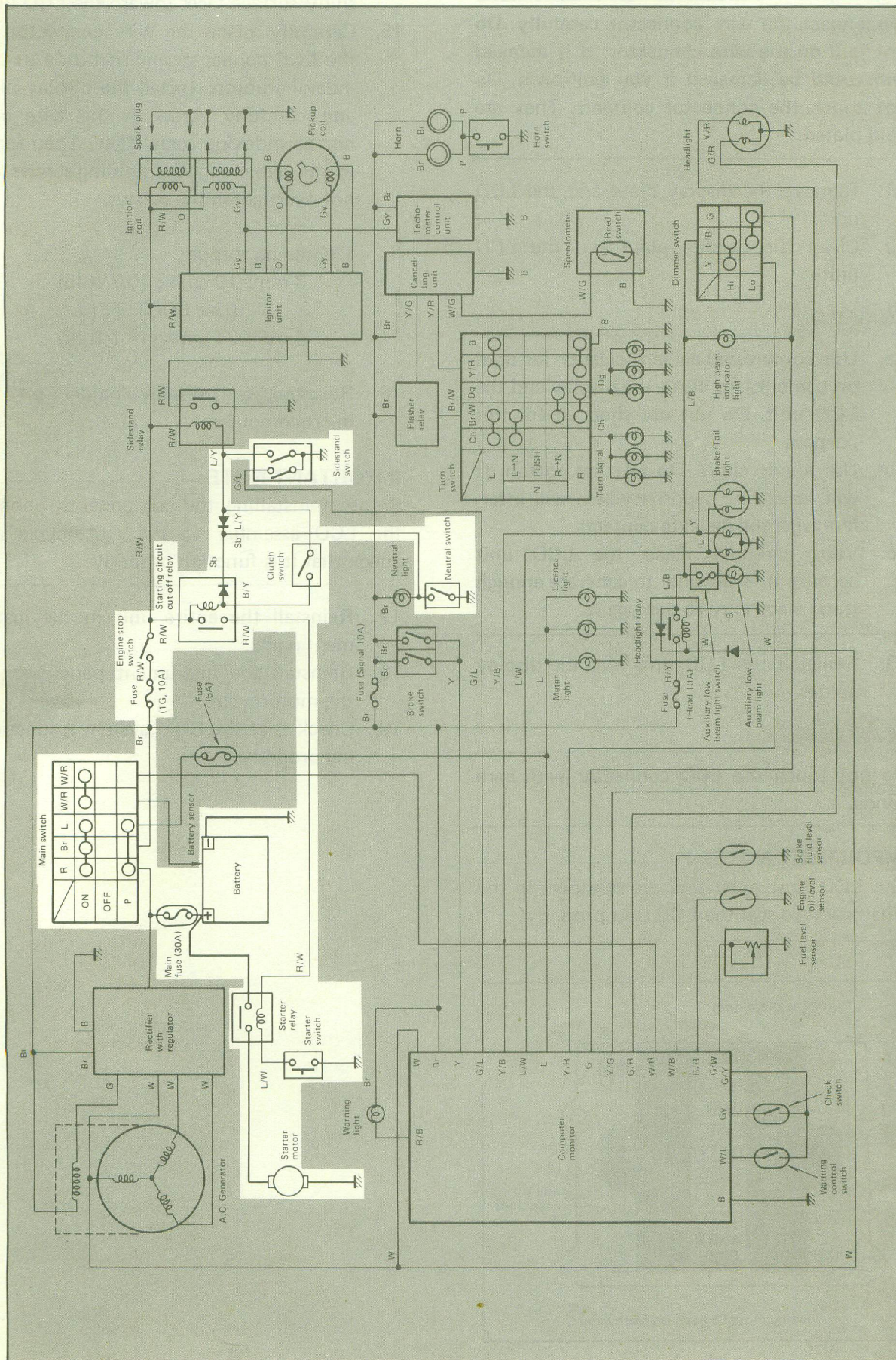
IMPORTANT NOTE:

Before reinstalling the components, connect the LCD assembly to the motorcycle and check that it is function properly.

17. Reinstall the entire unit in the instrument panel.
18. Reinstall the instrument panel back to the motorcycle.
19. Check that the COM system is functioning properly.

C. ELECTRIC STARTING SYSTEM

Circuit diagram



The starting circuit on this model consists of the starter motor, starter relay, and the starting-circuit cut-off relay. If the engine stop switch and the main switch are both on, the starter motor can operate only if:

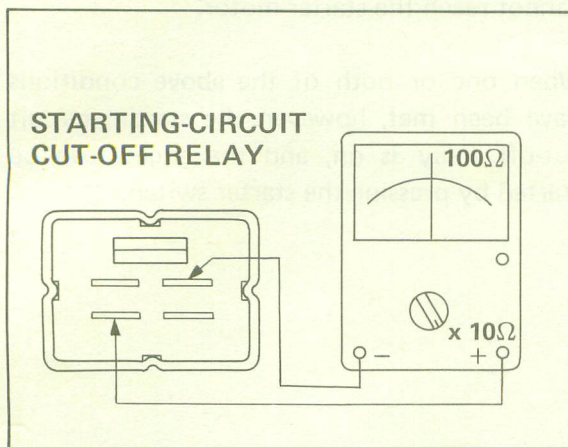
- b. The clutch lever is pulled to the handlebar (the clutch switch is on) and the sidestand is up (the sidestand switch is on.)

When one or both of the above conditions have been met, however, the starting-circuit cut-off relay is on, and the engine can be started by pressing the starter switch.

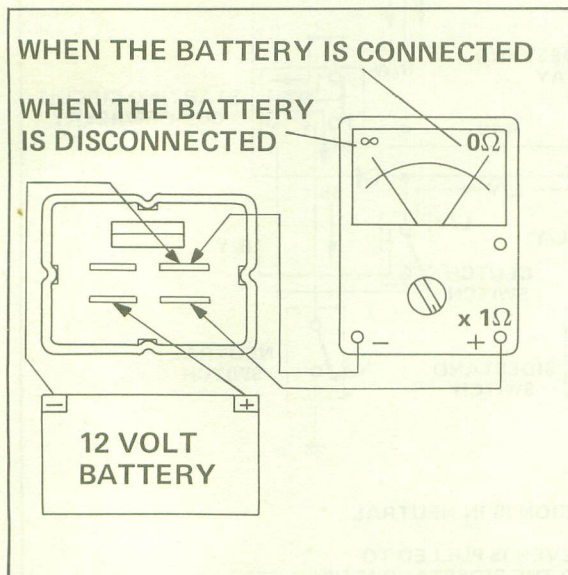


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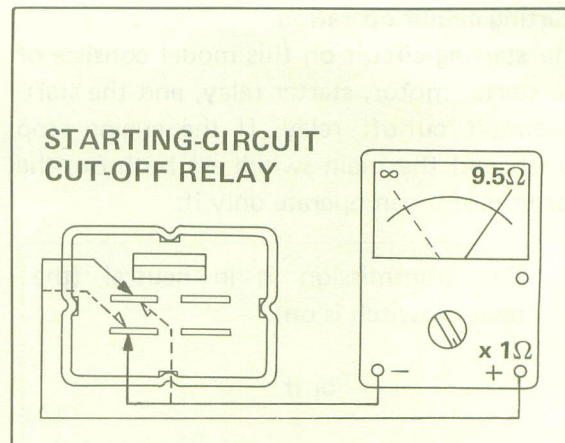
3. Check the resistance of the relay coil windings with the pocket tester. If the resistance is not within specification, replace the relay.



4. Check the relay function with a 12 volt battery and the pocket tester. Connect the leads as shown in the illustration. If the resistance readings do not equal those shown in the illustration, replace the relay.



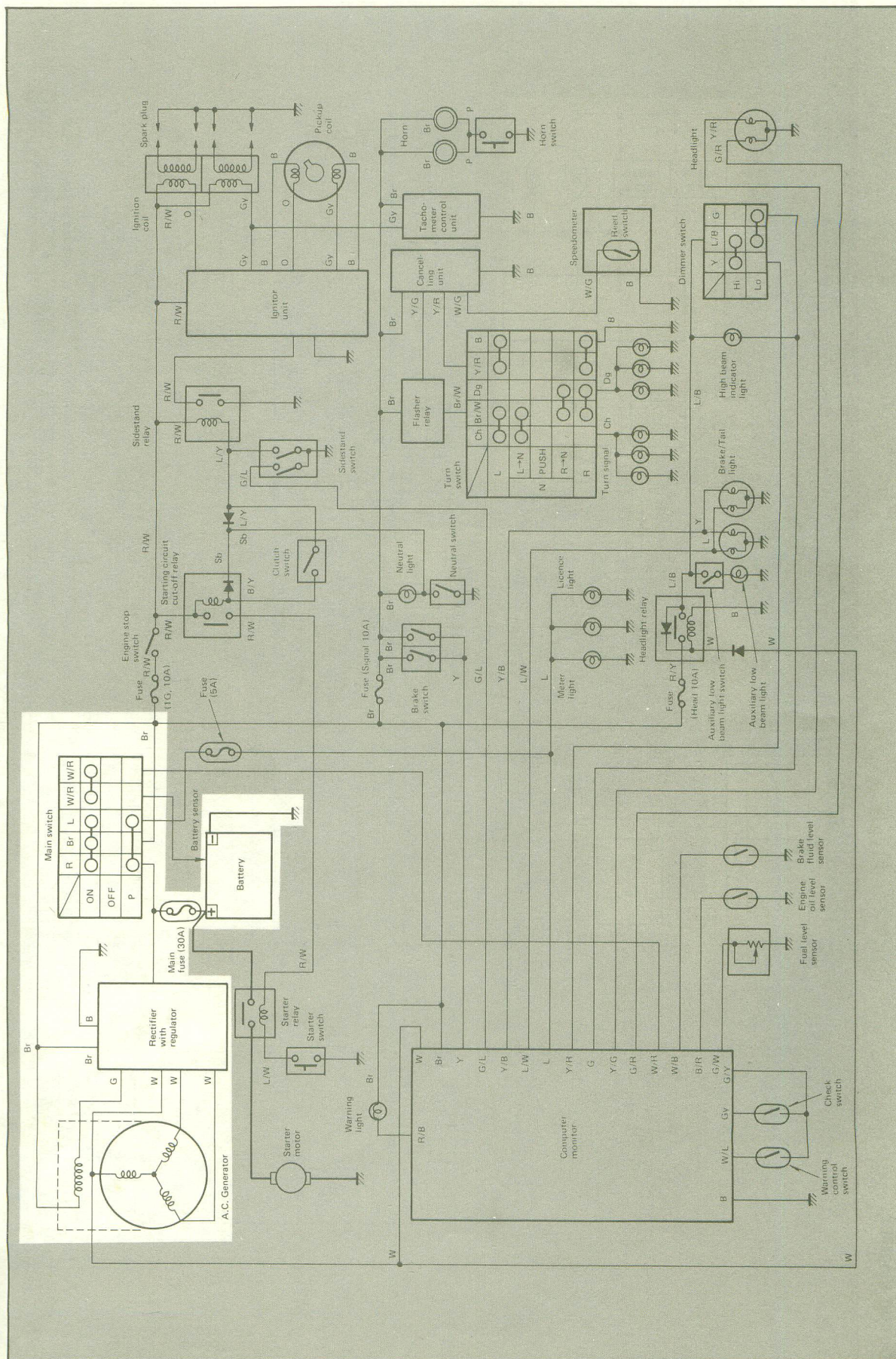
5. Check the diode in the starting circuit cut-off relay with the pocket tester as shown in the illustration. Replace the relay if the diode is damaged.



NOTE:

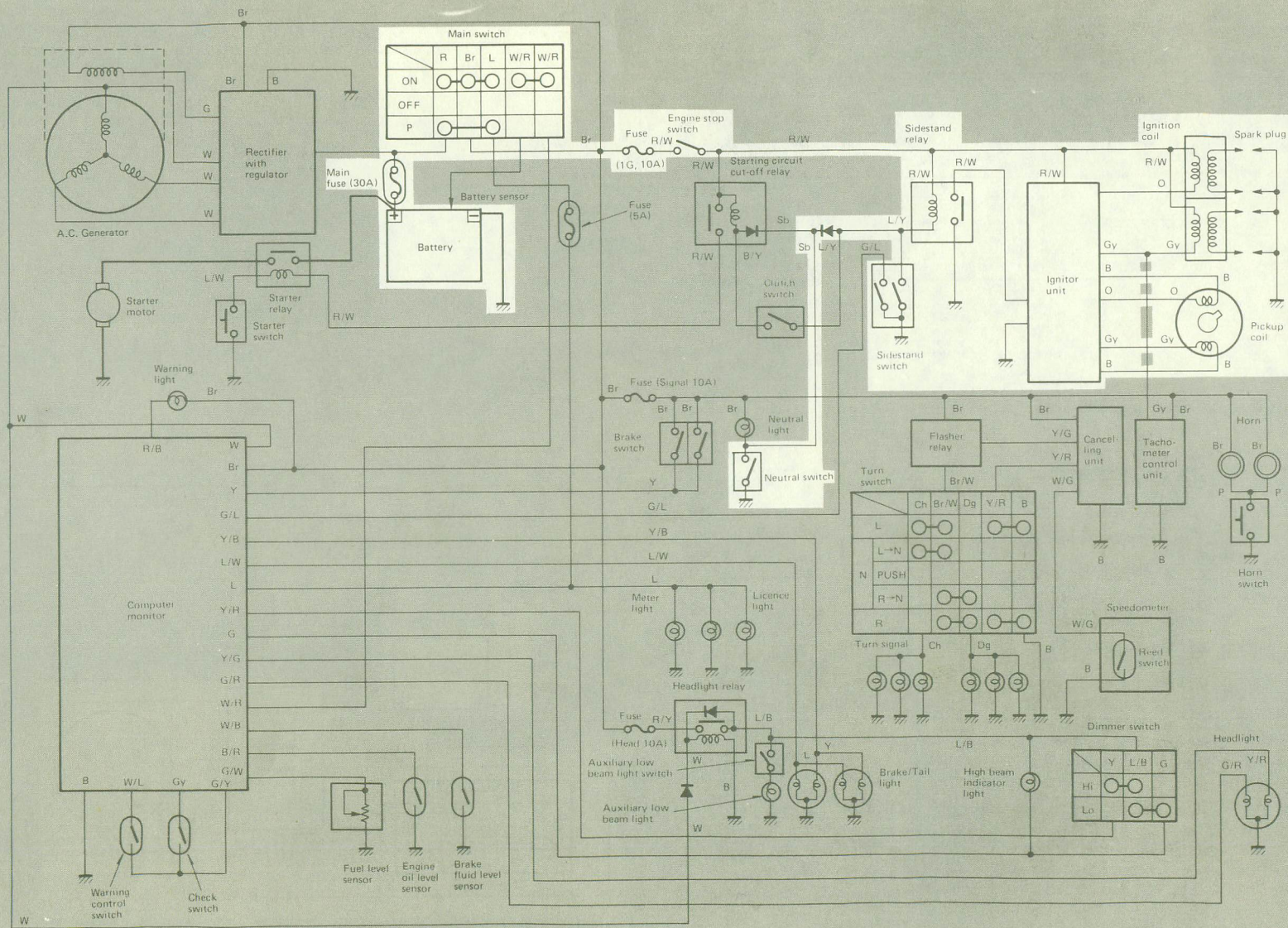
Only the Yamaha Pocket Tester will give a 9.5Ω reading when testing continuity. The particular characteristics of other testers will vary the continuity test readings.

Circuit diagram



Circuit diagram

E. IGNITION SYSTEM



Description

This model is equipped with a battery operated, fully transistorized, breakerless ignition system. By using magnetic pickup coils, the need for contact breaker points is eliminated. This adds to the dependability of the system by eliminating frequent cleaning and adjustment of points and ignition timing. The TCI (Transistor Control Ignition) unit incorporates an automatic advance circuit controlled by signals generated by the pickup coil. This adds to the dependability of the system by eliminating the mechanical advancer. This TCI system consists of two units; a pickup unit and an ignitor unit.

NOTE:

The ignition circuit can be operated only when the sidestand is up (the sidestand switch is on) or the transmission is in neutral.

Operation

The TCI functions to the same principle as a conventional DC ignition system with the exception of using magnetic pickup coils and a transistor control box (TCI) in place of contact breaker points.

1. Pickup unit

The pickup unit consists of two pickup coils and a flywheel mounted onto the crankshaft. When the projection on the flywheel passes a pickup coil, a signal is generated and transmitted to the ignitor unit. The width of the projection on the flywheel determines the ignition advance.

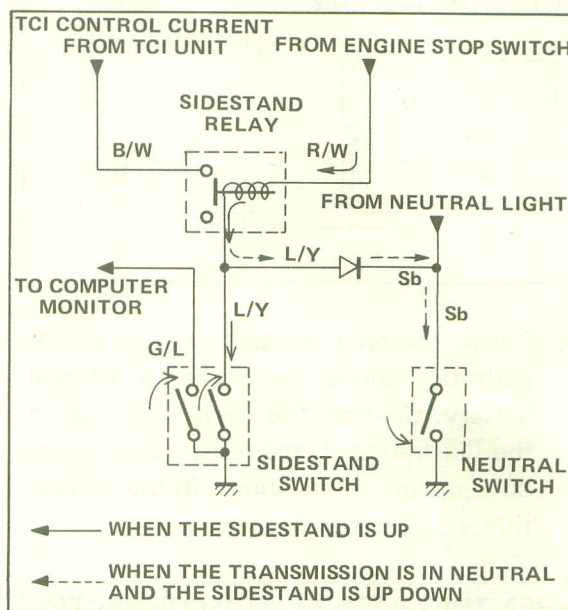
2. Ignitor unit

This unit controls when, how, duty control, switching, electronic ignition advance, etc. The duty control circuit reduces electrical consumption by controlling the duration of the primary ignition current.

The ignitor unit also has a protective circuit for the ignition coil. If the ignition switch is on and the crankshaft is not turning, the protective circuit interrupts the current flow to the primary coil after a few seconds. When the crankshaft is turning, however, the ignitor unit sends current to the primary coil.

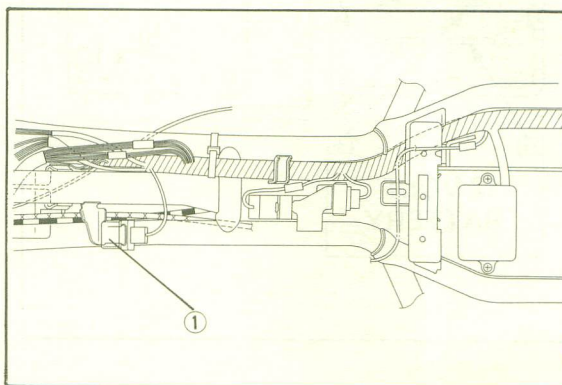
3. Sidestand relay

The sidestand relay operates by shorting the TCI control current. When the sidestand is down, the sidestand relay is closed, and the TCI control current is grounded through the sidestand relay. Thus, the engine will not run with the sidestand down unless the transmission is in neutral.



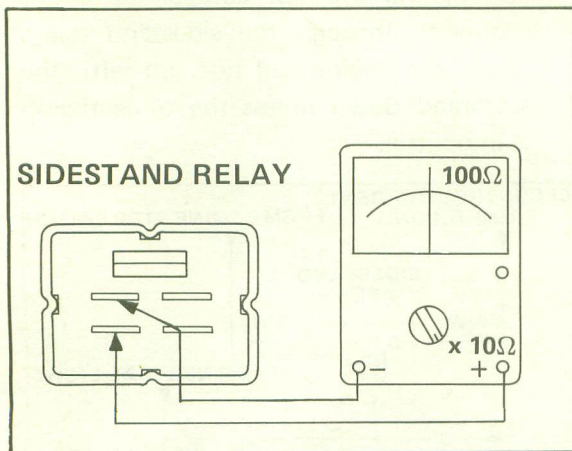
Sidestand relay inspection

1. Open the seat, and remove the fuel tank.
2. Remove the sidestand relay from the frame, and disconnect the connector.

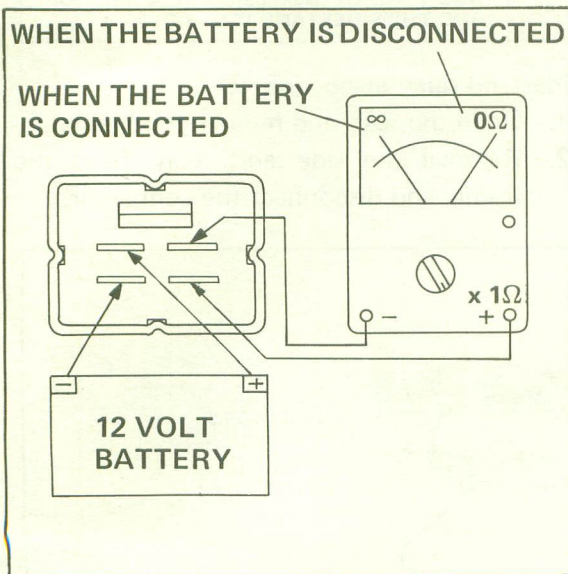


1. Sidestand relay

3. Check the resistance of the relay coil windings with the pocket tester. If the resistance is not within specification, replace the relay.

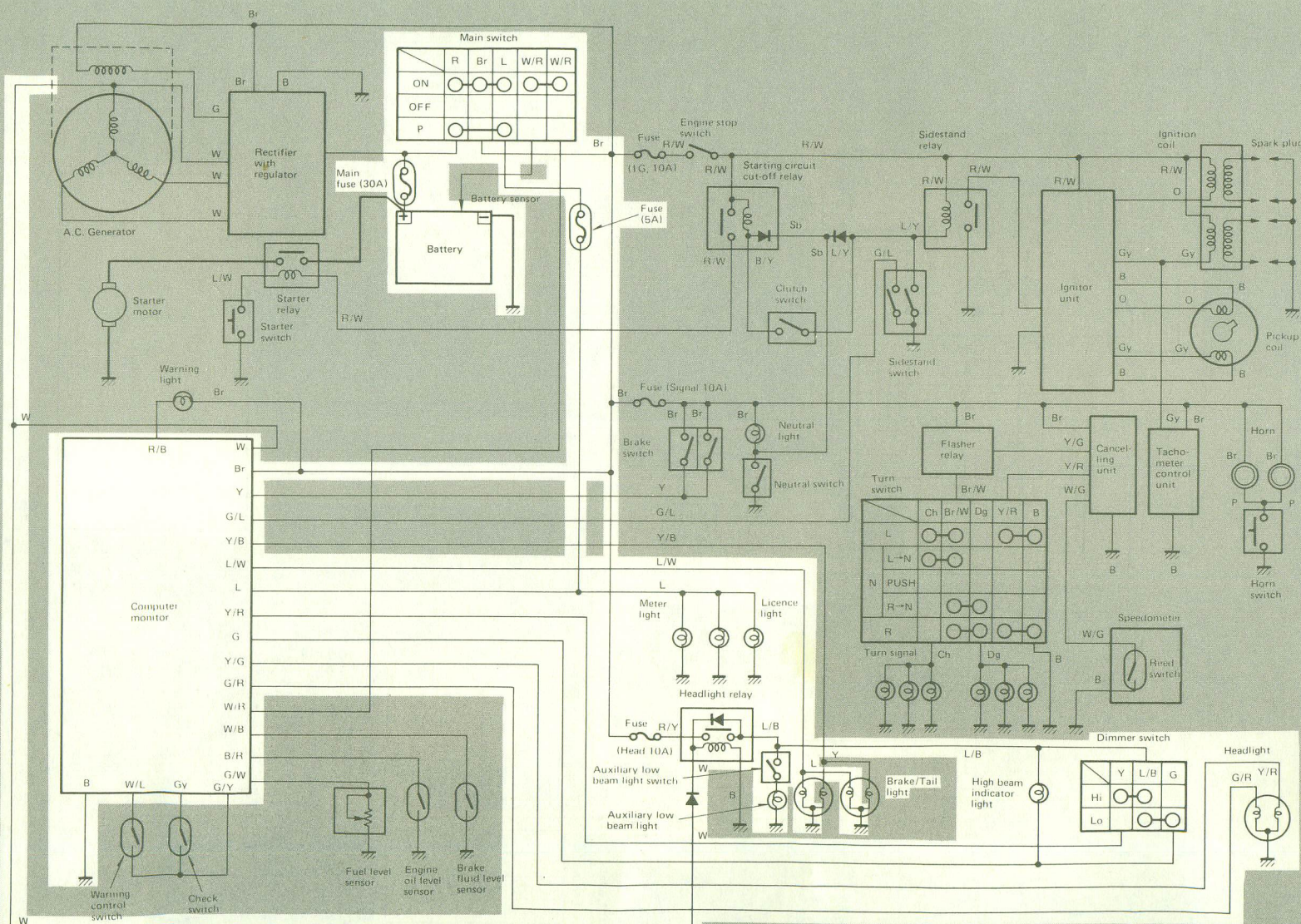


4. Check the relay contact breaker points with the pocket tester and a 12 volt battery. Connect the leads as shown in the illustration. If the resistance readings do not equal those shown in the illustration, replace the relay.



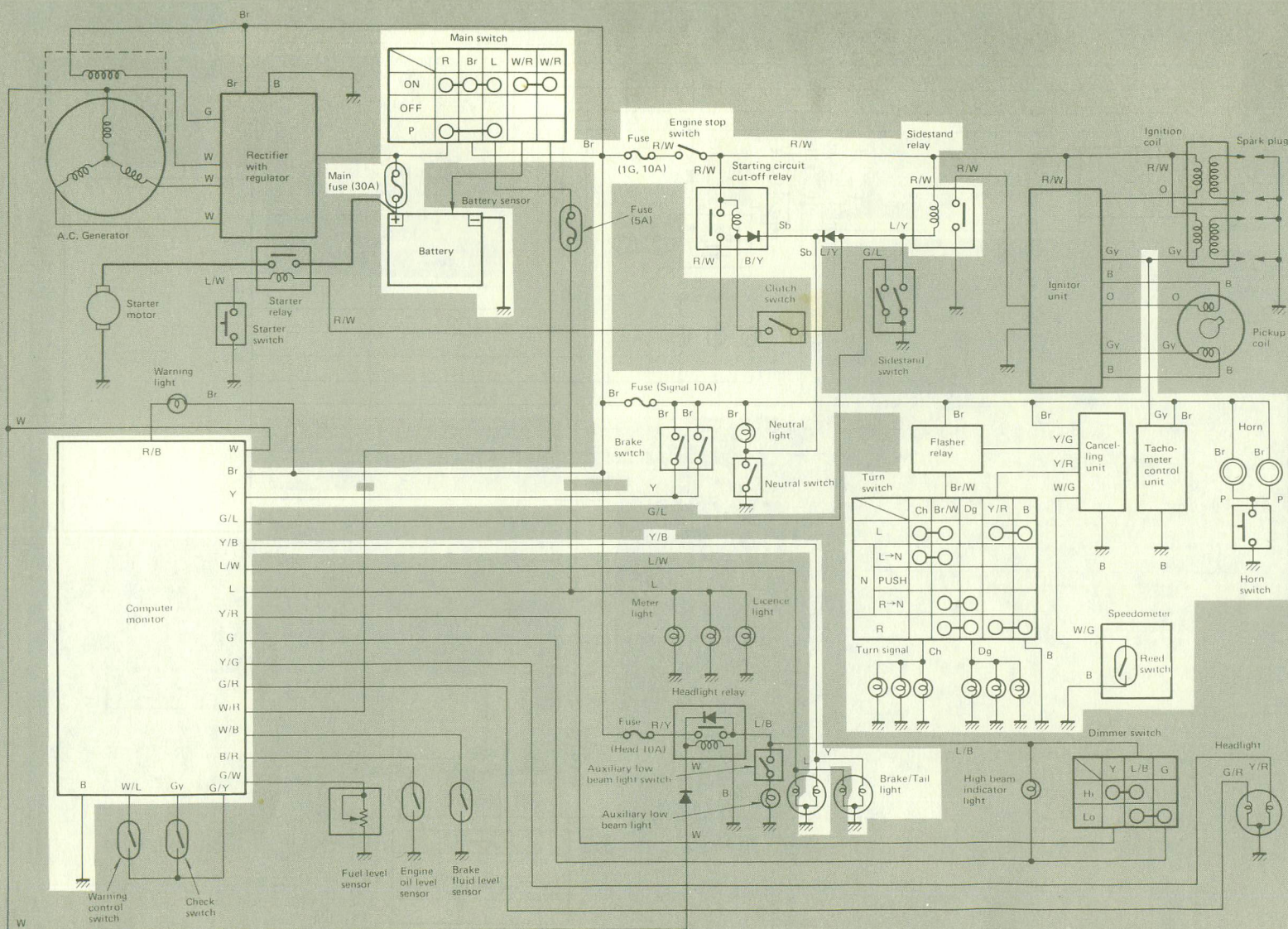
Circuit diagram

F. LIGHTING SYSTEM



Circuit diagram

G. SIGNAL SYSTEM



SPECIFICATIONS

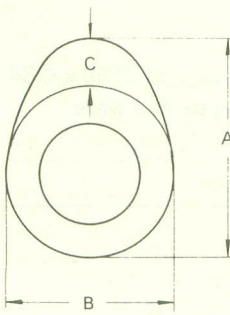
General Specifications

	XJ750RH
Basic color	New Yamaha Black or Brilliant Red
Dimensions:	
Overall length	2,110 mm (83.1 in)
Overall width	860 mm (33.9 in)
Overall height	1,120 mm (44.1 in)
Seat height	775 mm (30.5 in)
Wheelbase	1,445 mm (56.9 in)
Minimum ground clearance	140 mm (5.5 in)
Caster (steering head angle)	28°
Trail	114 mm (4.49 in)
Weight:	
Net	218 kg (480 lb)
Engine:	
Type	D.O.H.C. air-cooled, gasoline
Bore x stroke x cylinders	65.0 x 56.4 mm x 4 (2.559 x 2.220 in x 4)
Displacement	748 cc (45.64 cu.in)
Compression ratio	9.2 : 1
Lubrication:	
Lubrication system	Pressure lubricated, wet sump
Delivery pump type	Trochoid
Carburetion:	
Manufacture	HITACHI
Type	HSC32, constant velocity
Rated venturi size	25.3 mm (0.996 in)
Air filter:	Dry type element
Ignition:	
Type	Battery ignition (Full transistor ignition)
Spark plug	BP7ES (NGK) or W22EP (ND)
Charging:	
Type	Three-phase, regulated alternator
Manufacture, I.D. No.	HITACHI, LD119-08
Maximum output	14V 19A
Battery type	YB14L-A2
Battery dimensions	89 x 116 x 134 mm (3.50 x 6.54 x 5.28 in)
Regulator/Rectifier	S8534, I.C. type, full wave
Regulating voltage (No. load)	14.2 ~ 14.8V
Starting:	Electric starter
Primary drive:	
Type	Spur gear
Teeth, ratio	97/58 1.672
Clutch:	Wet, multiple disc
Transmission:	
Type	Constant mesh, 5-speed drum shifter
Teeth, ratio 1st	35/16 2.187
2nd	30/20 1.500
3rd	30/26 1.153
4th	28/30 0.933
5th	26/32 0.812

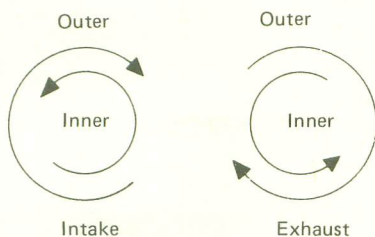
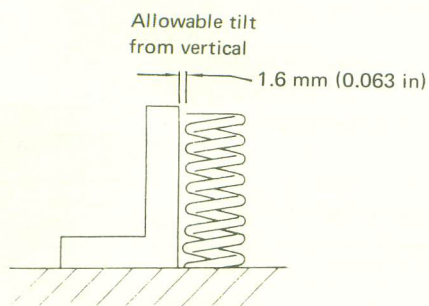
	XJ750RH
Secondary type: Type Transmission output: Type, teeth, ratio Middle gear case: Type, teeth, ratio Final gear case: Type, teeth, ratio	Shaft drive Spur gear, 49/36, 1.361 Bevel gear, 19/18, 1.055 Bevel gear, 32/11, 2.909
Chassis: Frame Suspension: Front (type, travel) Rear (type, travel) Tires: Front Rear Brakes: Front Rear Fuel tank: Total Reserve Wheels: Front Rear	Tubular steel double cradle Telescopic fork (Pneumo-mechanical) 150 mm (5.91 in) Swing arm, 80 mm (3.15 in) 3.25H19-4PR, Tubeless 120/90-18 65H, Tubeless Dual hydraulic disc Drum brake 19 lit (5.0 US. gal) 4.1 lit (1.08 US.gal) MT1.85 x 19, Cast Aluminum MT2.15 x 18, Cast Aluminum

Maintenance Specifications

1. Engine

Engine oil capacity: Total amount Oil and filter change Oil change Recommended lubricant: If temperature does not go below 5°C (40°F) If temperature does not go above 15°C (60°F)	3,500 cc (3.70 US.qt) 2,800 cc (2.96 US.qt) 2,500 cc (2.64 US.qt) SAE 20W/40 SE motor oil SAE 10W/30 SE motor oil																	
Cranking pressure (at seal level): Maximum difference between cylinders:	11 kg/cm ² (156 psi) 1 kg/cm ² (14 psi)																	
Camshafts:  Camshaft bearing surface diameter: Camshaft-to-cap clearance: Standard Maximum Camshaft runout limit	<table border="1"><thead><tr><th>Dimensions</th><th>Standard size</th><th>Wear limit</th></tr></thead><tbody><tr><td rowspan="3">Intake</td><td>A 36.80 mm (1.449 in)</td><td>36.65 mm (1.443 in)</td></tr><tr><td>B 28.00 mm (1.102 in)</td><td>27.85 mm (1.096 in)</td></tr><tr><td>C 8.80 mm (0.346 in)</td><td>—</td></tr><tr><td rowspan="3">Exhaust</td><td>A 35.80 mm (1.449 in)</td><td>35.65 mm (1.404 in)</td></tr><tr><td>B 28.00 mm (1.102 in)</td><td>27.85 mm (1.096 in)</td></tr><tr><td>C 7.80 mm (0.307 in)</td><td>—</td></tr></tbody></table> 24.967 ~ 24.980 mm (0.9830 ~ 0.9835 in) 0.020 ~ 0.054 mm (0.0008 ~ 0.0021 in) 0.160 mm (0.006 in) 0.1 mm (0.004 in)	Dimensions	Standard size	Wear limit	Intake	A 36.80 mm (1.449 in)	36.65 mm (1.443 in)	B 28.00 mm (1.102 in)	27.85 mm (1.096 in)	C 8.80 mm (0.346 in)	—	Exhaust	A 35.80 mm (1.449 in)	35.65 mm (1.404 in)	B 28.00 mm (1.102 in)	27.85 mm (1.096 in)	C 7.80 mm (0.307 in)	—
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	C 7.80 mm (0.307 in)	—																

Valve spring:

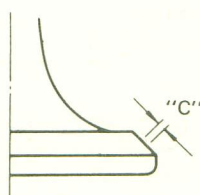
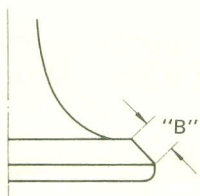
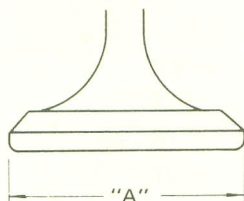


	Inner Intake/Exhaust	Outer Intake/Exhaust
Free length	35.9 mm (1.413 in)	39.5 mm (1.555 in)
Spring rate	2.36 kg/mm (132.2 lb/in)	4.58 kg/mm (256.5 lb/in)
Installed length (valve closed)	31.0 mm (1.220 in)	34.0 mm (1.339 in)
Installed pressure (valve closed)	9.0 kg (19.8 lb)	19.1 kg (42.1 lb)
Compressed length (valve open)	IN: 22.5 mm (0.886 in) EX: 23.5 mm (0.925 in)	IN: 25.5 mm (1.004 in) EX: 26.5 mm (1.043 in)
Wire diameter	2.8 mm (0.110 in)	3.9 mm (0.154 in)
Number of windings	7.75	6.0
Winding O.D.	20.6 ^{+0.3} ₀ mm (0.811 ^{+0.012} ₀ in)	29.4 ⁰ _{-0.3} mm (1.157 ⁰ _{-0.012} in)

Valves:

Valve stem run-out maximum
Valve seat width standard/maximum

0.03 mm (0.0012 in)
1.0 mm (0.0039 in)/2.0 mm (0.080 in)

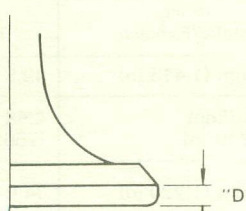


INTAKE

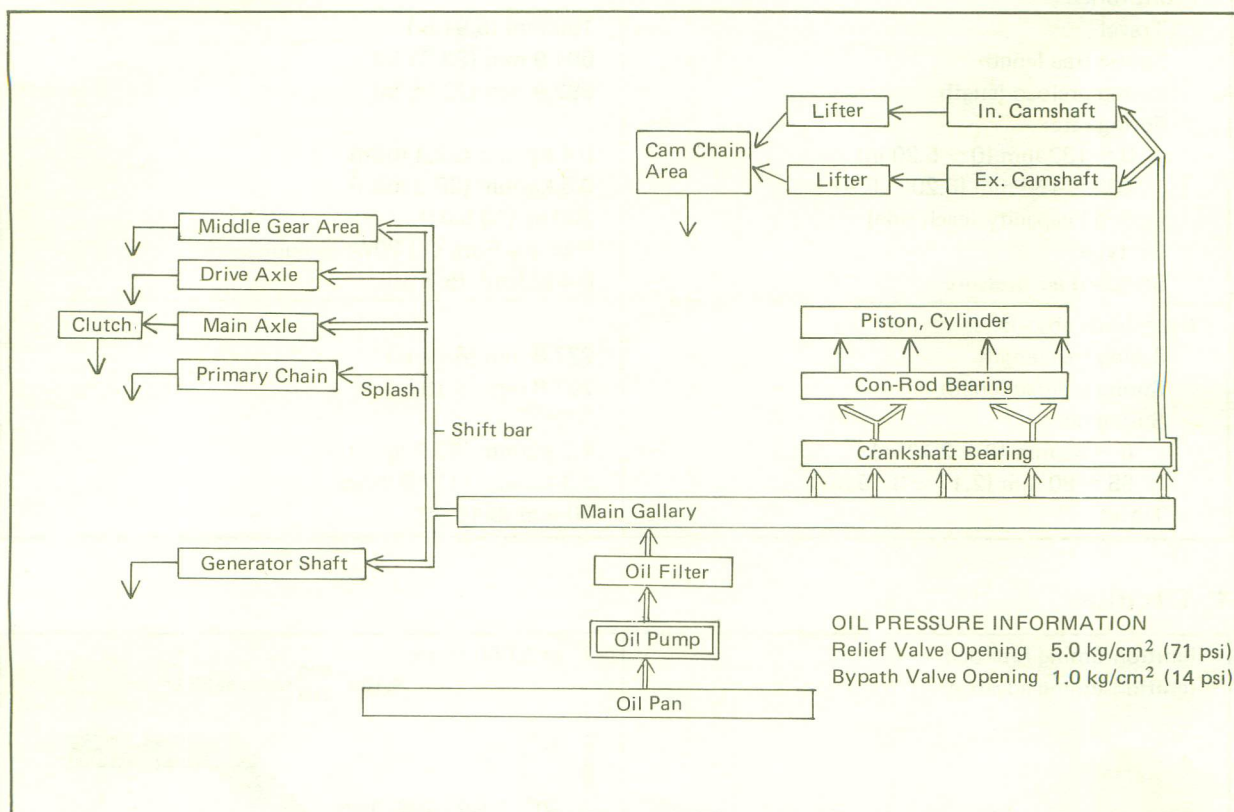
Clearance (Cold engine)	0.11 ~ 0.15 mm (0.004 ~ 0.006 in)
"A" head diameter	33 ± 0.1 mm (1.2992 ± 0.0039 in)
"B" face width	2.3 mm (0.0906 in)
"C" seat width	1.0 ± 0.1 mm (0.0394 ± 0.0039 in)
"D" margin thickness (minimum)	1.2 ± 0.2 mm (0.0472 ± 0.0079 in)
Stem diameter (O.D.)	7 ^{-0.010} _{-0.025} mm (0.2756 ^{-0.0004} _{-0.0010} in)
Guide diameter (I.D.)	7 ^{+0.012} ₀ mm (0.2756 ^{+0.0005} ₀ in)
Stem-to-guide clearance	0.010 ~ 0.037 mm (0.0004 ~ 0.0015 in)

EXHAUST

Clearance (Cold engine)	0.16 ~ 0.20 mm (0.006 ~ 0.008 in)
"A" head diameter	28 ± 0.1 mm (1.2205 ± 0.0039 in)
"B" face width	2.3 mm (0.0906 in)
"C" seat width	1.0 ± 0.1 mm (0.0394 ± 0.0039 in)
"D" margin thickness (minimum)	1.0 ± 2.0 mm (0.0392 ± 0.0079 in)

	<table><tr><td>Stem diameter (O.D.)</td><td>7 $\begin{matrix} -0.025 \\ -0.040 \end{matrix}$ mm (0.2756 $\begin{matrix} -0.0010 \\ -0.0016 \end{matrix}$ in)</td></tr><tr><td>Guide diameter (I.D.)</td><td>7 $\begin{matrix} +0.012 \\ 0 \end{matrix}$ mm (0.2756 $\begin{matrix} +0.0005 \\ 0 \end{matrix}$ in)</td></tr><tr><td>Stem-to-guide clearance</td><td>0.025 ~ 0.052mm (0.0010 ~ 0.0020 in)</td></tr></table>	Stem diameter (O.D.)	7 $\begin{matrix} -0.025 \\ -0.040 \end{matrix}$ mm (0.2756 $\begin{matrix} -0.0010 \\ -0.0016 \end{matrix}$ in)	Guide diameter (I.D.)	7 $\begin{matrix} +0.012 \\ 0 \end{matrix}$ mm (0.2756 $\begin{matrix} +0.0005 \\ 0 \end{matrix}$ in)	Stem-to-guide clearance	0.025 ~ 0.052mm (0.0010 ~ 0.0020 in)												
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Stem-to-guide clearance	0.025 ~ 0.052mm (0.0010 ~ 0.0020 in)																		
Cylinder and piston: Cylinder material Cylinder liner Bore size: Standard Wear limit Cylinder taper limit Cylinder out-of-round limit Piston clearance: Standard Maximum	Aluminum alloy Pressed in; special cast iron 65.00 mm (2.5591 in) 65.10 mm (2.5630 in) 0.05 mm (0.0020 in) 0.01 mm (0.0004 in) 0.030 ~ 0.050 mm (0.0012 ~ 0.0020 in) 0.1 mm (0.0039 in)																		
Piston ring: Design End gap (installed): Standard Limit Side clearance: Standard Limit	<table><tr><td>Top</td><td>2nd</td><td>Oil</td></tr><tr><td> Barrel</td><td> Taper</td><td> Expander</td></tr><tr><td>0.15 ~ 0.35 mm (0.0059 ~ 0.0318 in)</td><td>0.15 ~ 0.35 mm (0.0059 ~ 0.0138 in)</td><td>0.3 ~ 0.9 mm (0.0018 ~ 0.035 in)</td></tr><tr><td>1.0 mm (0.0394 in)</td><td>1.0 mm (0.0394 in)</td><td>1.5 mm (0.0591 in)</td></tr><tr><td>0.03 ~ 0.07 in (0.0012 ~ 0.0028 in)</td><td>0.02 ~ 0.06 in (0.008 ~ 0.0024 in)</td><td>—</td></tr><tr><td>0.15 mm (0.0059 in)</td><td>0.15 mm (0.0059 in)</td><td>—</td></tr></table>	Top	2nd	Oil	 Barrel	 Taper	 Expander	0.15 ~ 0.35 mm (0.0059 ~ 0.0318 in)	0.15 ~ 0.35 mm (0.0059 ~ 0.0138 in)	0.3 ~ 0.9 mm (0.0018 ~ 0.035 in)	1.0 mm (0.0394 in)	1.0 mm (0.0394 in)	1.5 mm (0.0591 in)	0.03 ~ 0.07 in (0.0012 ~ 0.0028 in)	0.02 ~ 0.06 in (0.008 ~ 0.0024 in)	—	0.15 mm (0.0059 in)	0.15 mm (0.0059 in)	—
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0.15 mm (0.0059 in)	0.15 mm (0.0059 in)	—																	
Crankshaft: Crank journal/bearing oil clearance Main journal run-out (maximum) Connecting rods: Rod bearing oil clearance	0.004 ~ 0.064 mm (0.0016 ~ 0.0025 in) 0.040 mm (0.0016 in) 0.03 ~ 0.09 mm (0.0012 ~ 0.0035 in)																		
Oil pump: Housing-to-outer rotor clearance Outer rotor-to-inner rotor clearance	0.09 ~ 0.15 mm (0.0035 ~ 0.0059 in) 0.03 ~ 0.09 mm (0.0012 ~ 0.0035 in)																		
Clutch: Friction plate: Thickness/q'ty Minimum thickness Clutch plate: Thickness Warp limit Clutch spring: Length/q'ty Minimum length Spring rate Clutch lever free play (at lever pivot point)	3.0 mm (0.12 in)/8 2.8 mm (0.11 in) 1.6 mm (0.063 in)/7 0.05 mm (0.0020 in) 41.2 mm (1.622 in)/5 40.2 mm (1.583 in) 1.22 kg/mm (68.3 lb/in) 2 ~ 3 mm (0.08 ~ 0.12 in)																		
Transmission shaft run-out maximum: Middle gear case lash:	0.08 mm (0.0031 in) 0.1 ~ 0.2 mm (0.0039 ~ 0.0079 in)																		

LUBRICATION CHART



2. Carburetion

Manufacturer	HITACHI	Fuel level	3 ± 1 mm (0.118 ± 0.039 in)
Model I.D. No.	5G200	Pilot screw	Preset
Main jet	#120	Air jet, Main	#80
Pilot jet	#40	Air jet, Pilot	#225
Starter jet	#40 (φ0.9)	Float valve seat	φ2.0
Jet needle	Y-13	Engine idle speed	1,050 r/min

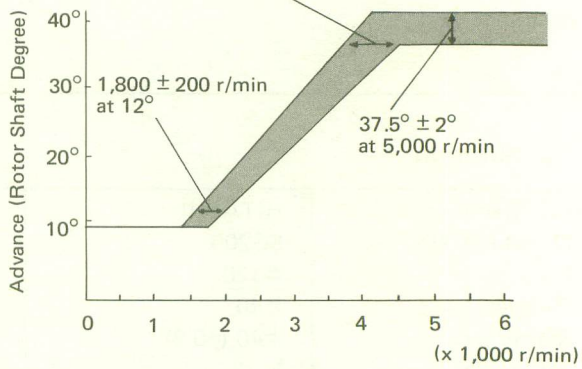
3. Chassis

*Total weight of accessories, etc. excepting motorcycle.

Wheels and tires:		
Rim run-out: Vertical	2.0 mm (0.079 in)	
Horizontal	2.0 mm (0.079 in)	
Tire pressure (cold)	Front	Rear
Up to 90 kg (198 lb) load*	1.8 kg/cm ² (26 psi)	2.0 kg/cm ² (28 psi)
90 kg (198 lb) ~ 215 kg (474 lb) load* (Maximum load)	2.0 kg/cm ² (28 psi)	2.3 kg/cm ² (32 psi)
High speed riding	2.3 kg/cm ² (32 psi)	2.5 kg/cm ² (36 psi)
Minimum tire tread depth	0.8 mm (0.03 in)	0.8 mm (0.03 in)
Brakes:		
Recommended fluid	DOT #3	
Pad wear limit	4.0 mm (0.16 in)	
Rear brake lining wear limit	2 mm (0.08 in)	
Brake disc maximum deflection	0.15 mm (0.006 in)	
Brake disc minimum thickness	4.5 mm (0.18 in)	
Front brake free play (at lever pivot point)	1.0 ~ 2.0 mm (0.04 ~ 0.08 in)	
Rear brake free play (end of pedal)	20 ~ 30 mm (0.8 ~ 1.2 in)	

Front forks: Travel Spring free length Spring preload length Spring rate: 0 ~ 132 mm (0 ~ 5.20 in) 132 ~ 150 mm (5.20 ~ 5.91 in) Fork oil capacity (each side) Oil type Standard air pressure	150 mm (5.91 in) 604.9 mm (23.81 in) 582.9 mm (22.95 in) 0.4 kg/mm (22.4 lb/in) 0.5 kg/mm (28.0 lb/in) 309 cc (10.5 oz) Yamaha Fork Oil 20Wt or equivalent 0.4 kg/cm ² (5.7 psi)
Rear shock absorbers: Spring free length Spring preload length Spring rate: 0 ~ 55 mm (0 ~ 2.17 in) 55 ~ 80 mm (2.17 ~ 3.15 in) Travel	227.8 mm (8.97 in) 207.8 mm (8.18 in) 1.7 kg/mm (95.2 lb/in) 2.1 kg/mm (117.6 lb/in) 80 mm (3.15 in)

4. Electrical

Ignition timing retarded Ignition timing advance	7° at 1,050 r/min 4,100 ⁺⁴⁰⁰ ₋₃₅₀ r/min at 35.5° 
Spark plug: Electrode gap	NGK BP7ES or ND W22EP 0.7 ~ 0.8 mm (0.023 ~ 0.032 in)
Spark plug cap resistance	5.0 kΩ (No. 1, No. 4), 10 kΩ (No. 2, No. 3)
Pick up coil: Resistance	650Ω ± 20% at 20°C (68°F)
Ignition coil type: Spark gap Primary resistance Secondary resistance	HITACHI CM12-09 2.5Ω ± 10% at 20°C (68°F) 11 kΩ ± 20% at 20°C (68°F)
Starter motor type: Armature coil resistance Brush length: Standard Minimum Brush spring pressure Armature mica undercut	ND, ADB4D2 0.014Ω ± 6% at 20°C (68°F) 12.0 mm (0.472 in) 8.5 mm (0.33 in) 800 ± 150g (28.24 ± 5.30 oz) 0.6 mm (0.024 in)
Battery type: Charging rate	YUASA YB14L-A2 1.4 Amps for 10 Hours

Generator type: Output Field (inner) coil resistance Stator (outer) coil resistance	HITACHI LD119-08 14V-19A at 5,000 r/min 4.0Ω ± 10% at 20°C (68°F) 0.46Ω ± 10% at 20°C (68°F)
Regulator type: Regulated voltage Allowable amperage	I.C. (S8534) 14.5 ± 0.3V 3A
Starter relay switch: Cut-in voltage	Less than 8V
Headlight Tail/brake light Flasher light License light Pilot lights: Turn High beam Neutral Warning Meter light Auxiliary low beam light	12V, 60W/55W 12V, 8W (3CP)/27W (32CP) 12V, 27W (32CP) x 4 12V, 8W (3CP) x 2 12V, 3.4W x 2 12V, 3.4W x 1 12V, 3.4W x 1 12V, 3.4W x 1 12V, 3.4W x 2 12V, 35W x 1

Tightening torque

Part to be tightened	Part name	Thread size	Q'ty	Tightening torque		Remarks
				m-kg	ft-lb	
ENGINE:						
Cylinder head	Nut	M10 P1.25	12	3.2	23.1	Apply oil.
Cylinder head cover	Bolt	M6 P1.0	20	1.0	7.2	
Spark plug	—		4	2.0	14.5	
Cylinder	Nut	M8 P1.25	2	2.0	14.5	Cam chain case Front & Rear
Cam shaft cap	Bolt	M6 P1.0	20	1.0	7.2	Tighten in 3-stages.
Cam sprocket	Bolt	M7 P1.0	4	2.0	14.5	
Cam chain tensioner adjustment lock nut	Nut	M8 P1.25	1	0.9	6.5	
Cam chain tensioner end plug	Bolt	M8 P1.25	1	1.5	10.8	
Connecting rod	Nut	M7 P0.75	8	2.5	18.1	
Generator (rotor)	Bolt	M10 P1.25	1	5.5	39.8	
Drain plug	Bolt	M14 P1.5 M8 P1.25	1 1	4.3 1.6	31.0 11.6	Crankcase drain Middle gear case drain
Oil filter	Bolt	M20 P1.5	1	1.5	11.0	
Pump cover	Screw	M6 P1.0		0.7	5.1	
Strainer cover	Bolt	M6 P1.0	13	0.7	5.1	
Crankcase	Flange bolt	M8 P1.25 M6 P1.0	12 27	2.4 1.2	17.5 8.7	
Clutch boss	Nut	M20 P1.0	1	7.0	50.6	
Clutch spring screw	Bolt	M6 P1.0	5	1.0	7.2	
Change pedal	Bolt	M6 P1.0	1	0.8	5.8	
Neutral switch	—	M10 P1.25	1	2.0	14.5	
Exhaust pipe	Nut	M6 P1.0	8	0.75	5.4	

Part to be tightened	Part name	Thread size	Q'ty	Tightening torque		Remarks
				m-kg	ft-lb	
SHAFT DRIVE:						
Middle gear:						
Drive shaft	Nut	M34 P1.5	1	11	80.0	Stake.
Mount cover	Screw	M8 P1.25	4	2.5	18.1	Stake.
Driven shaft	Nut	M14 P1.5	1	12	87.0	Use LOCTITE: Stake.
Bearing cap	Flange bolt	M8 P1.25	4	2.5	18.1	
Final gear:						
Drive shaft	Nut	M14 P1.5	1	11	80.0	
Bearing housing	Flange bolt	M10 P1.25	2	2.3	16.6	
Bearing housing	Nut	M8 P1.25	6	2.3	16.6	
Oil mount screw	Plug	M14 P1.5	1	2.3	16.6	
Oil drain screw	Plug	M14 P1.5	1	2.3	16.6	
Bearing retainer	—	M65 P1.5	1	11	80.0	Left hand screw
CHASSIS:						
Engine mounting bolt:						
Front, upper	Nut	M10 P1.25	1	4.2	30.4	
Front, under	Nut	M10 P1.25	2	4.2	30.4	
Rear	Nut	M10 P1.25	2	7.0	50.6	
Engine mounting stay:						
Front	Nut	M8 P1.25	4	2.0	14.5	
Handle crown & Steering shaft	Bolt	M14 P1.25	1	5.4	39.1	
	Nut	M8 P1.25	1	2.0	14.5	
Handle crown & Inner tube	Nut	M8 P1.25	1	2.0	14.5	
Handle crown & Handle holder	Bolt	M8 P1.25	2	2.0	14.5	
Front fork:						
Under bracket & Inner tube	Bolt	M8 P1.25	4	2.0	14.5	
Front wheel shaft	Nut castle	M14 P1.5	1	10.7	77.4	
Front wheel axle pinch bolt	Nut self locking	M8 P1.25	2	2.0	14.5	
Pivot shaft	Bolt	M22 P1.5	1	0.55	4.0	Taper roller bearing
Rear wheel shaft	Nut castle	M14 P1.5	1	10.7	77.4	
Rear shock absorber (Upper)	Nut cap	M10 P1.25	2	3.0	21.7	
Rear shock absorber (Lower)	L Nut cap R Bolt	M10 P1.25	2	3.0	21.7	
Footrest	Bolt	M10 P1.25	2	4.2	30.4	
Tension bar & Brake plate	Bolt	M8 P1.25	1	2.0	14.5	
Tension bar & Rear arm	Bolt	M8 P1.25	1	2.0	14.5	
Camshaft lever & Camshaft	Bolt	M6 P1.0	1	0.9	6.5	
Disc brake section:						
Brake disc & Hub (Front)	Bolt	M8 P1.25	12	2.0	14.5	Lock washer
Master cylinder & Brake hose (Front)	Bolt union	M10 P1.25	1	2.0	14.5	
Brake hose & Joint	Bolt union	M10 P1.25	1	2.6	18.8	
Caliper & Brake hose	Bolt union	M10 P1.25	1	2.6	18.8	
Caliper & Front fork (Front)		M10 P1.25	1	4.5	32.5	
Caliper bleed screw (Front)		M8 P1.25	1	0.6	4.3	
Front fender	Bolt	M8 P1.25	4	1.0	7.2	

Part to be tightened	Part name	Thread size	Q'ty	Tightening torque		Remarks
				m-kg	ft-lb	
Pivot shaft	Bolt	M22 P1.5	1	10.0	72.3	Lock washer
Final gear & Rear arm	Nut	M10 P1.25	4	4.2	30.4	
Cross joint	Hexagon bolt with washer	M8 P1.25	4	4.4	31.8	
Muffler bracket & Frame	Bolt	M10 P1.25	3	4.3	31.1	
Rear fender	Bolt	M10 P1.25	2	3.2	23.1	
Muffler bracket & Muffler	Bolt	M10 P1.25	2	2.5	18.1	

DEFINITION OF TERMS:

- m-kg = Meter-kilogram(s) (usually torque)
- g = Gram(s)
- kg = Kilogram(s) (1,000 grams)
- lit = Liter(s)
- km/lit = Kilometer(s) per liter (fuel consumption)
- cc = Cubic centimeter(s) (cm^3) (volume or capacity)
- kg/mm = Kilogram(s) per millimeter (usually spring compression rate)
- kg/cm² = Kilogram(s) per square centimeter (pressure)

CONSUMER INFORMATION

Notice

The information presented represents results obtainable by skilled drivers under controlled road and vehicle conditions, and the information may not be correct under other conditions.

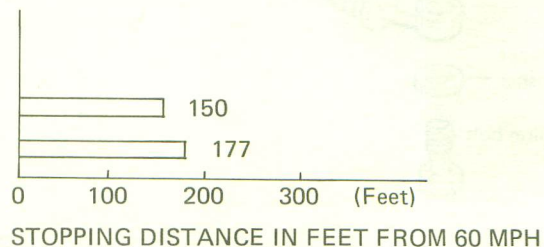
STOPPING DISTANCE

This figure indicates braking performance that can be met or exceeded by the vehicles to which it applies, without locking the wheels, under different conditions of loading and with partial failures of the braking system.

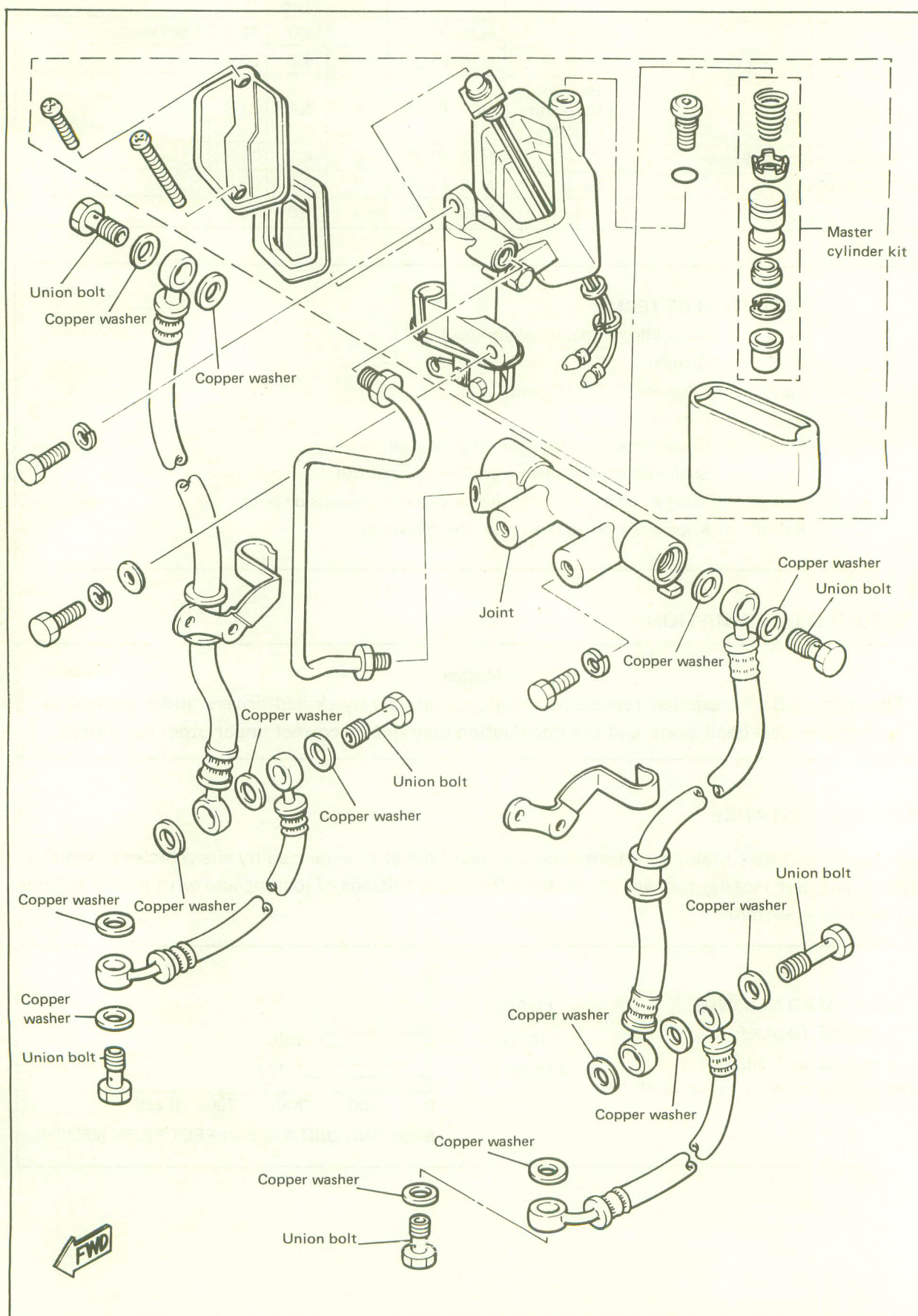
FULL OPERATIONAL SERVICE BRAKE

("Partial failure" information is not applicable and is not included)

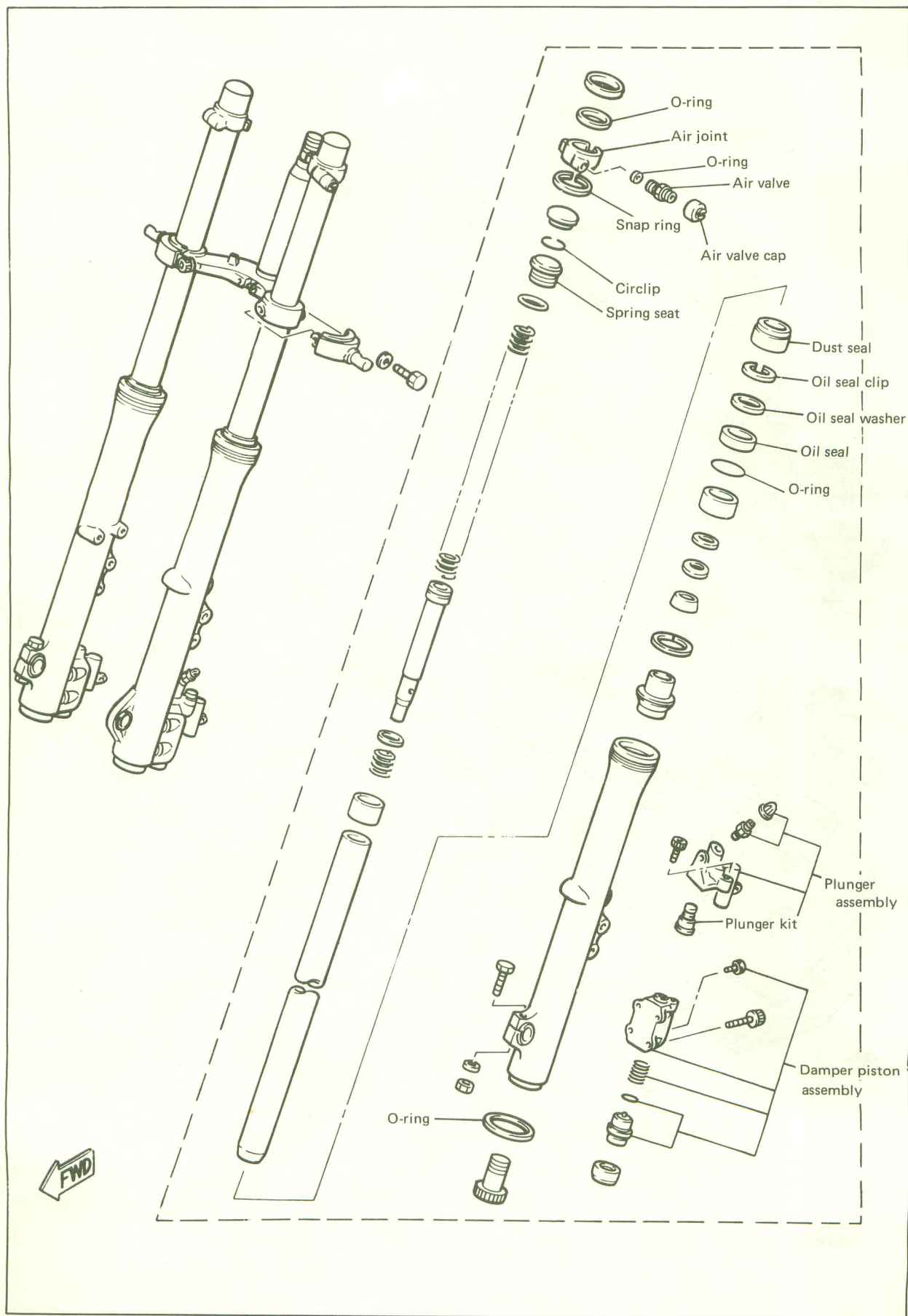
LOAD
LIGHT
MAXIMUM



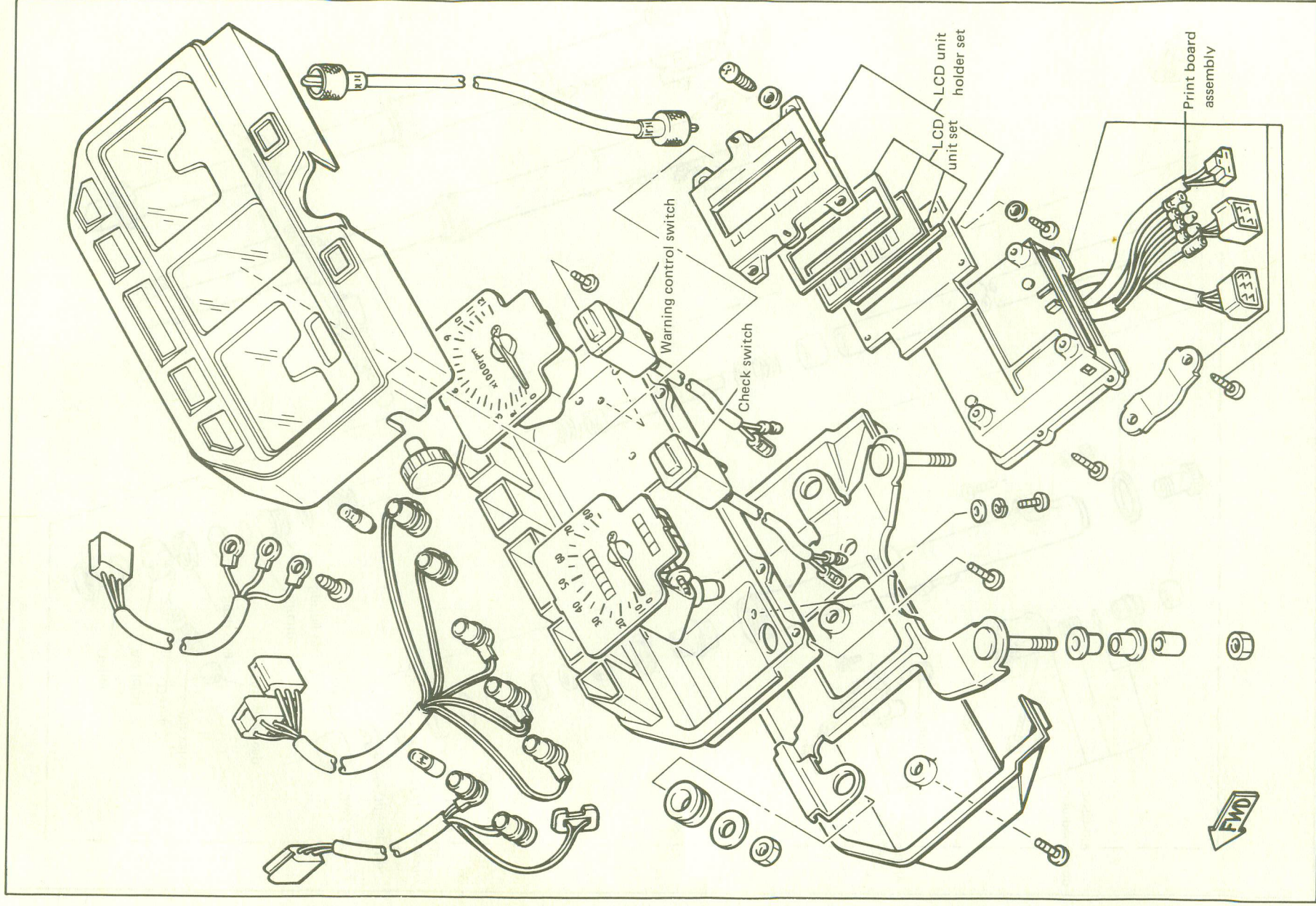
PARTS ILLUSTRATIONS FRONT BRAKE (MASTER CYLINDER)



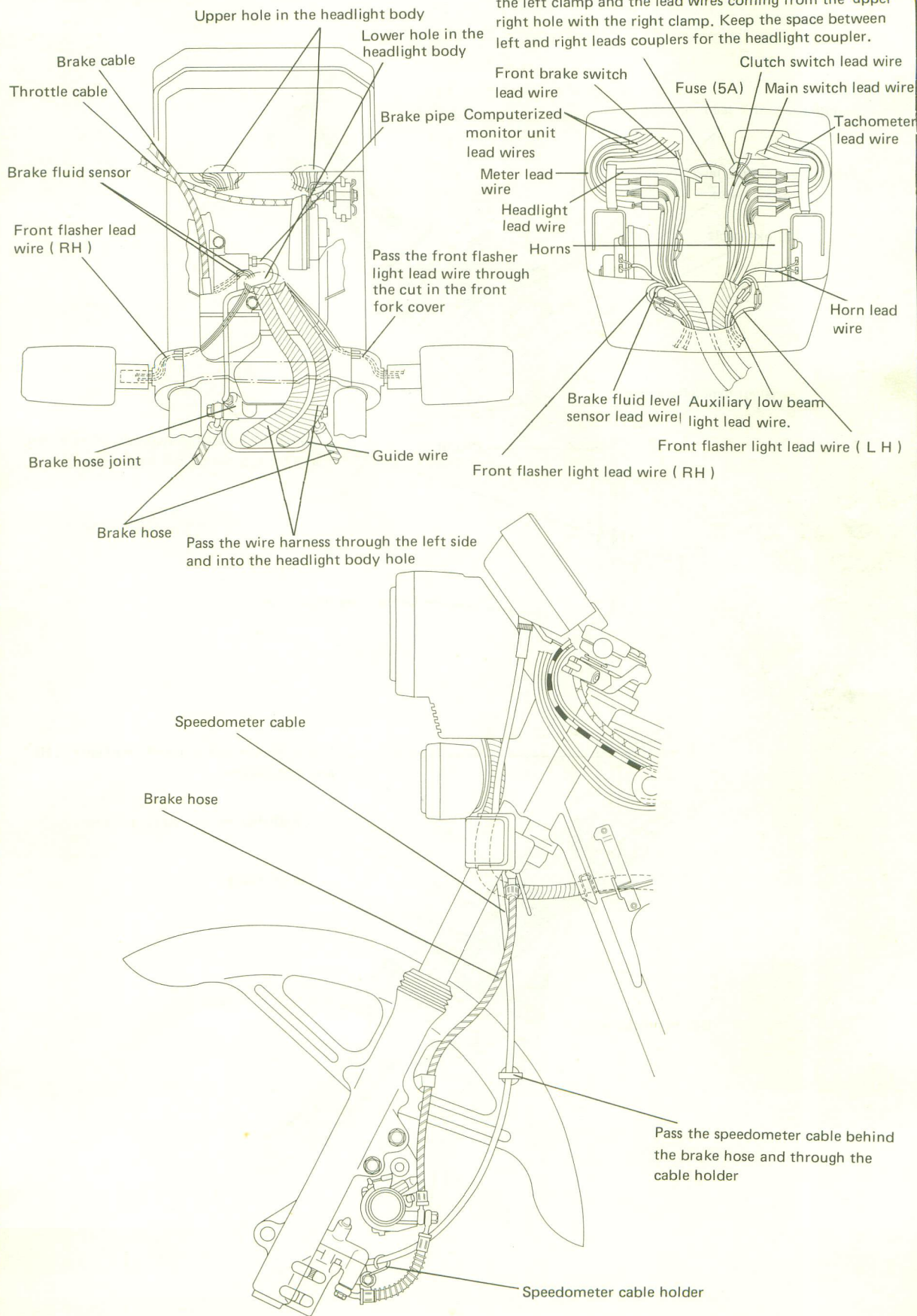
FRONT FORK

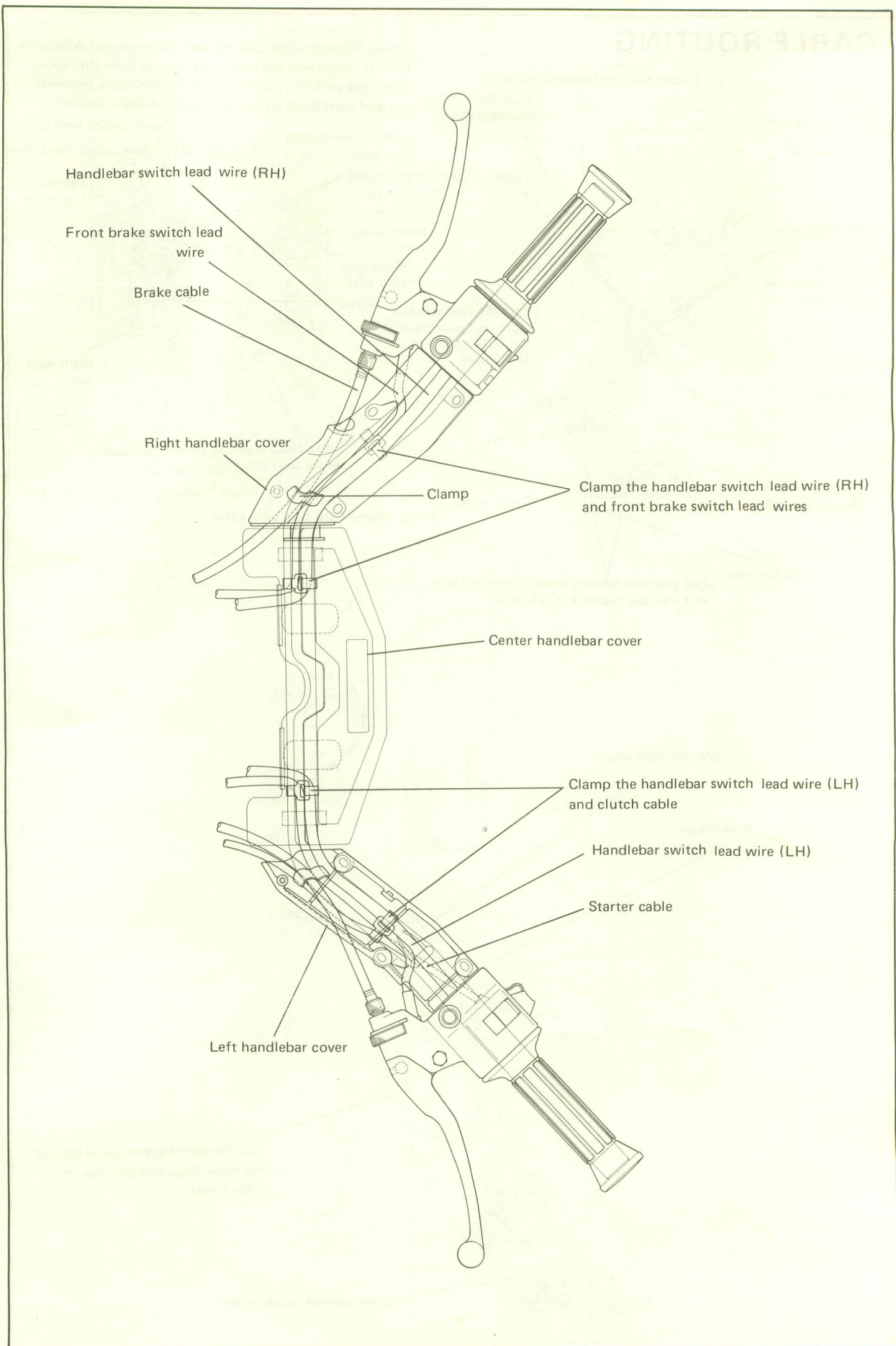


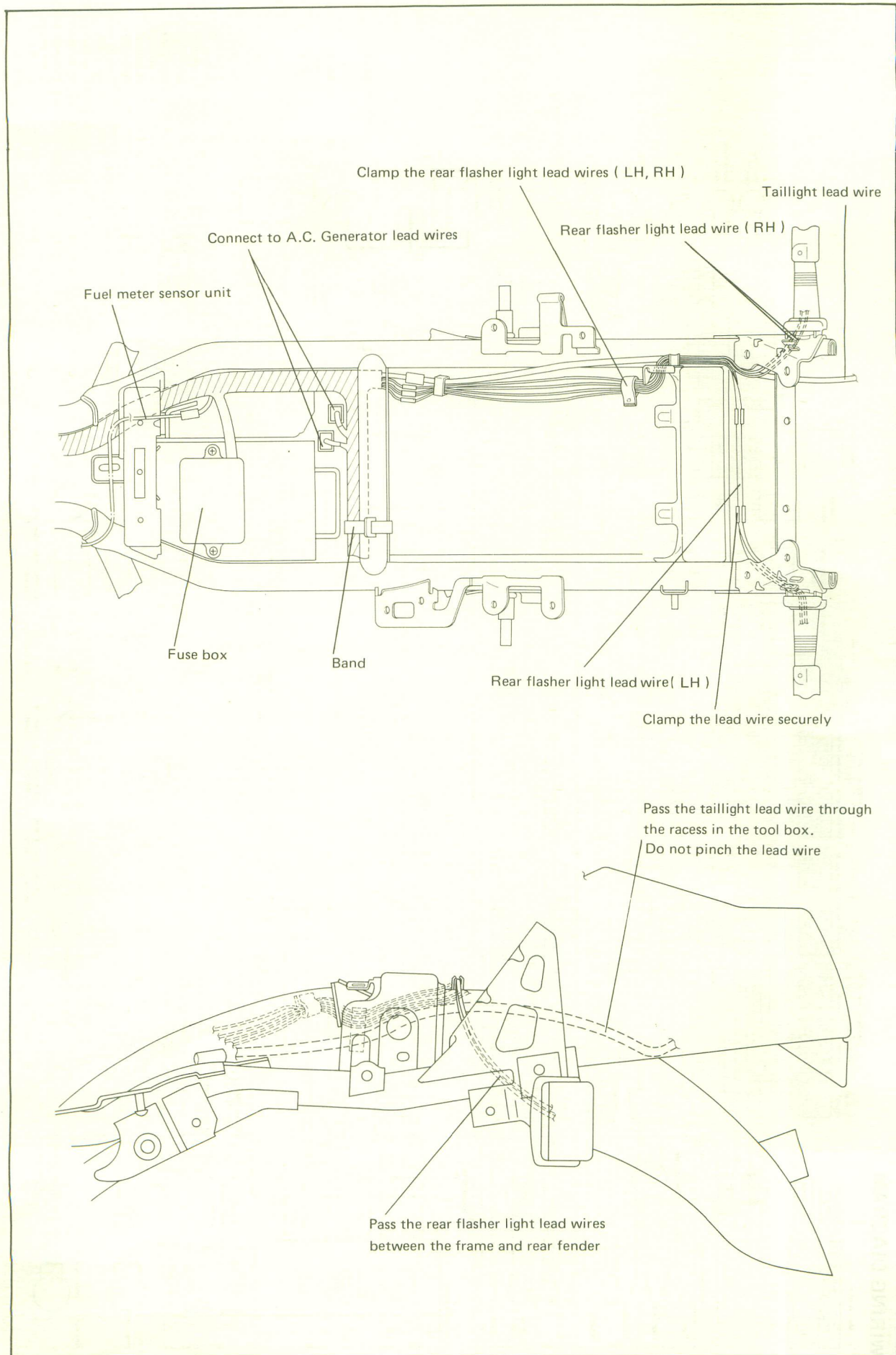
METER



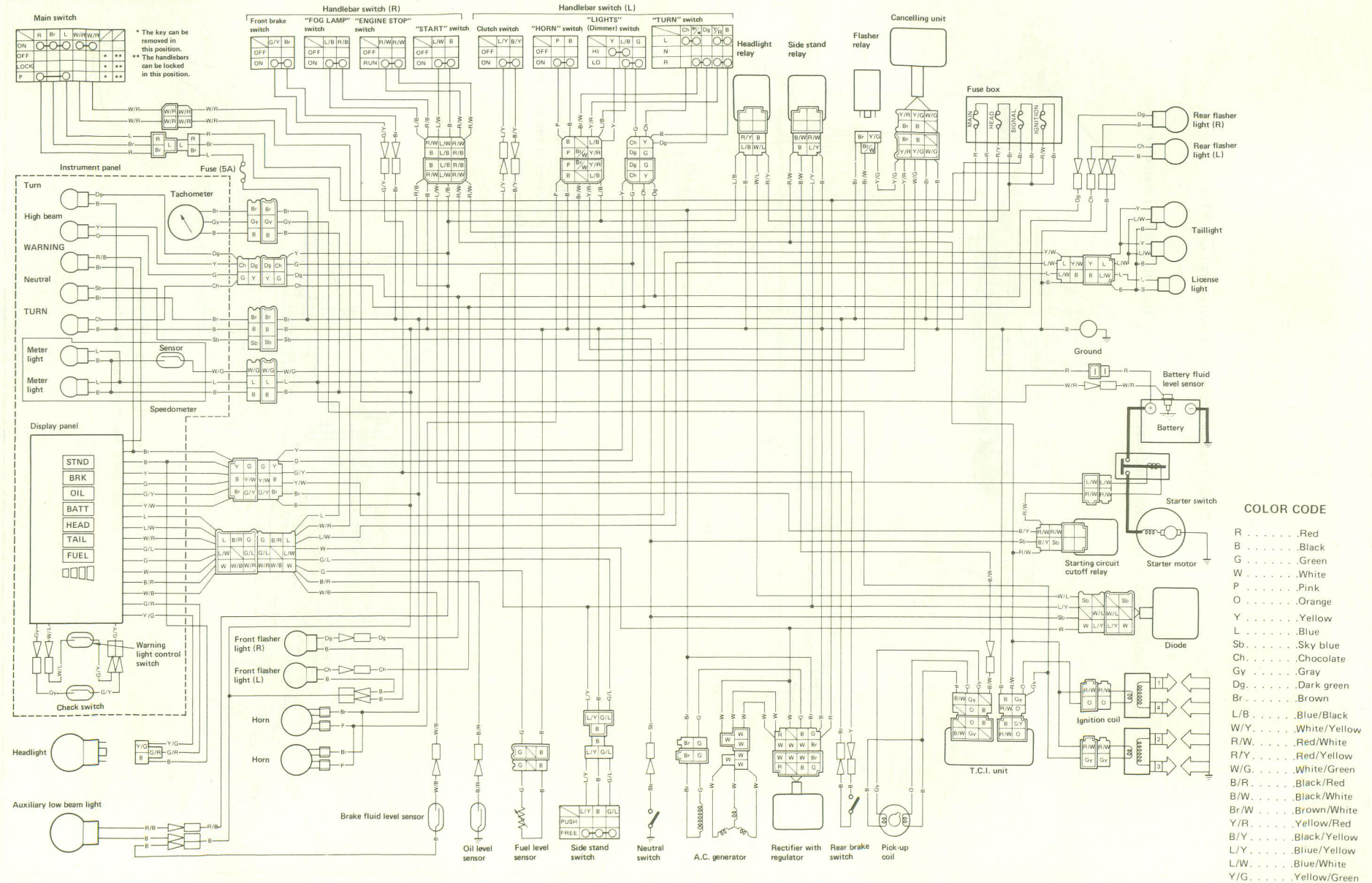
CABLE ROUTING







WIRING DIAGRAM





YAMAHA MOTOR CO., LTD.

IWATA, JAPAN

PRINTED IN U.S.A.



YAMAHA

XJ650G

Service Manual G

NOTICE

This manual was written by the Yamaha Motor Company primarily for use by Yamaha dealers and their qualified mechanics. It is not possible to put an entire mechanic's education into one manual, so it is assumed that persons using this book to perform maintenance and repairs on Yamaha motorcycles have a basic understanding of the mechanical concepts and procedures inherent to motorcycle repair technology. Without such knowledge, attempted repairs or service to this model may render it unfit to use and/or unsafe.

This model has been designed and manufactured to perform within certain specifications in regard to performance and emissions. Proper service with the correct tools is necessary to ensure that the motorcycle will operate as designed. If there is any question about a service procedure, it is imperative that you contact a Yamaha dealer for any service information changes that apply to this model. This policy is intended to provide the customer with the most satisfaction from his motorcycle and to conform with federal environmental quality objectives.

Yamaha Motor Company, Ltd. is continually striving to improve all models manufactured by Yamaha. Modifications and significant changes in specifications or procedures will be forwarded to all Authorized Yamaha dealers and will, where applicable, appear in future editions of this manual.

NOTE:

This Service Manual contains information regarding periodic maintenance to the emission control system for the XJ650G. Please read this material carefully.

Particularly important information is distinguished in this manual by the following notations.

NOTE: A NOTE provides key information to make procedures easier or clearer.

CAUTION: A CAUTION indicates special procedures that must be followed to avoid damage to the motorcycle.

WARNING: A WARNING indicates special procedures that must be followed to avoid injury to a motorcycle operator or person inspecting or repairing the motorcycle.

SERVICE DEPT.
INTERNATIONAL DIVISION
YAMAHA MOTOR CO., LTD.

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CHAPTER 1. GENERAL INFORMATION

MOTORCYCLE IDENTIFICATION

A. Frame Serial Number

The frame serial number is stamped into the right side of the steering head pipe.

B. Engine Serial Number

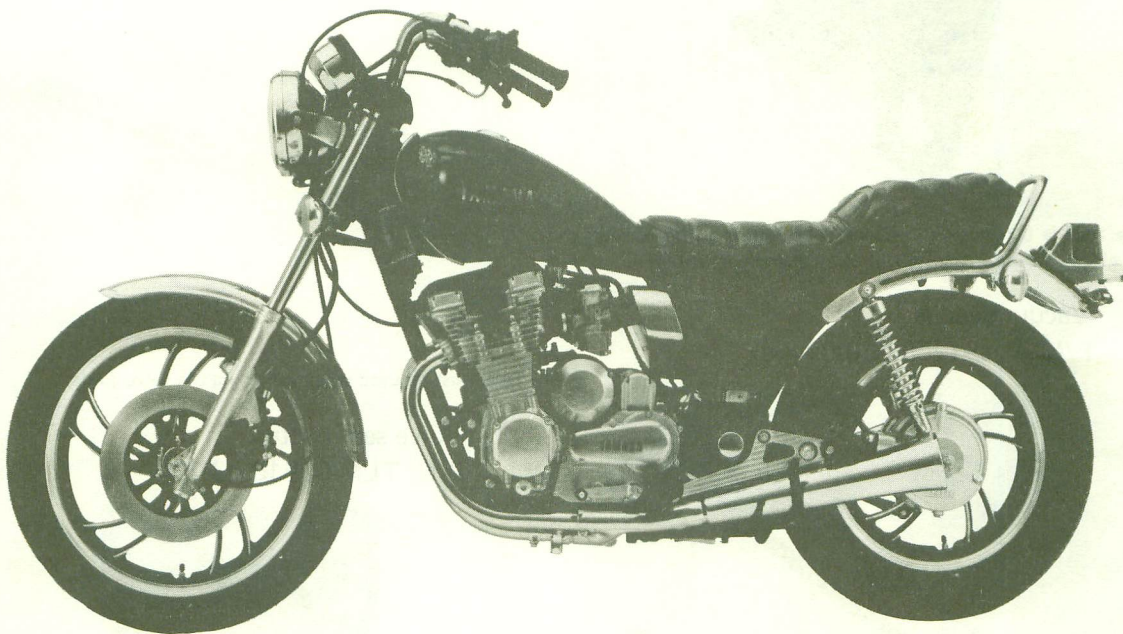
The engine serial number is stamped into the elevated part of the right rear section of the engine.

NOTE: _____

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

Starting Serial Number:

XJ650G 4H7-000101

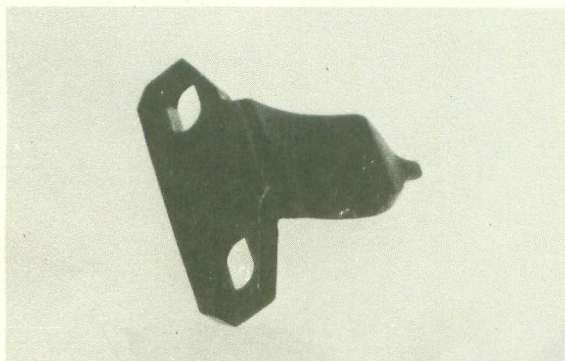


SPECIAL TOOLS

The proper special tools are necessary for complete and accurate tune-up and assembly. Using the correct special tool will help to prevent damage from improper tools or improvised techniques.

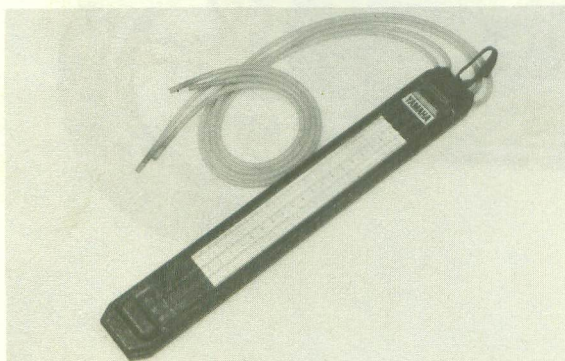
A. For Tune-up

1. Compression gauge
2. Timing light
3. Tachometer
4. Tappet adjusting tool
P/N. 90890-01245-00



This tool is necessary to replace valve adjusting pads. This can also be used for the XS750, XS850 and XS1100.

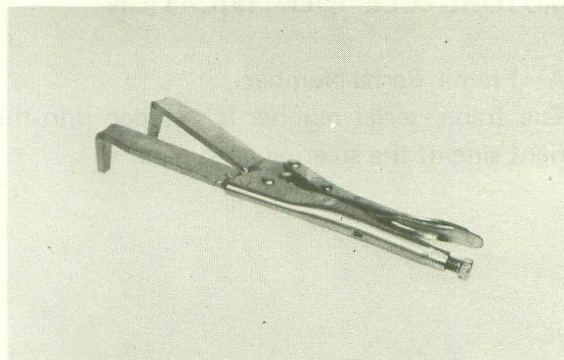
5. Vacuum gauge
P/N. TLU-11080-30-02



This gauge is needed for carburetor synchronization.

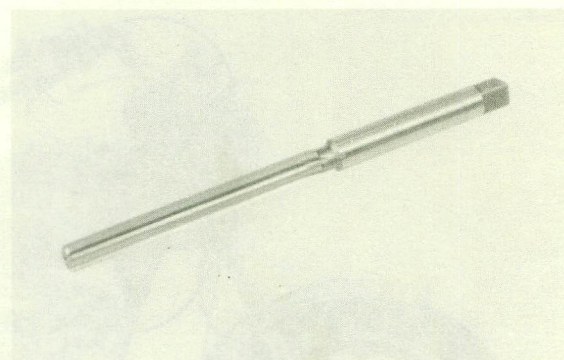
B. For Engine Service

1. Clutch hub holder
P/N. TLM-90910-42-00



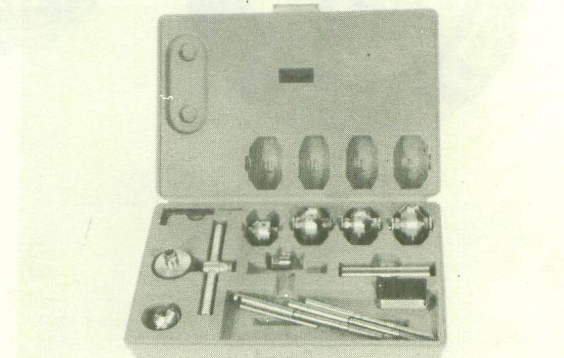
This tool is used to hold the clutch when removing or installing the clutch boss lock nut.

2. Valve guide reamer
P/N. 90890-01227-00



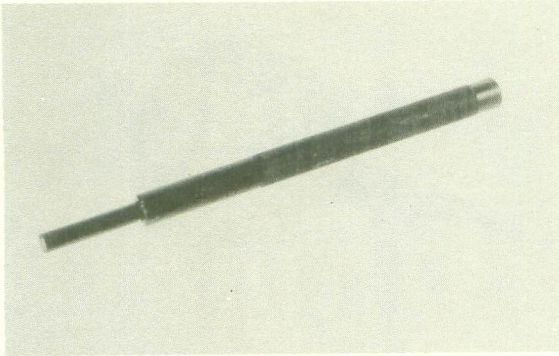
This must be used when replacing the valve guide.

3. Valve seat cutter
P/N. TLM-90910-43-20



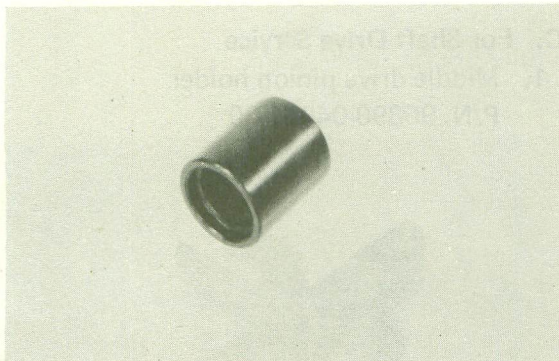
This tool is needed to re-surface the valve seat.

4. Valve guide remover
P/N. 90890-01225-00



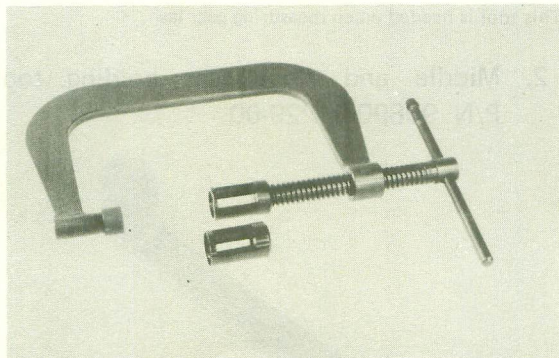
This must be used to remove the valve guides.

5. Valve guide installer
P/N. 90890-04017-00



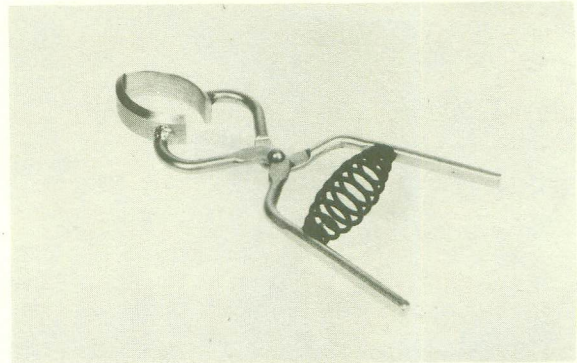
This tool is needed for proper installation of the valve guides.

6. Valve spring compressor
P/N. 90890-01253-00



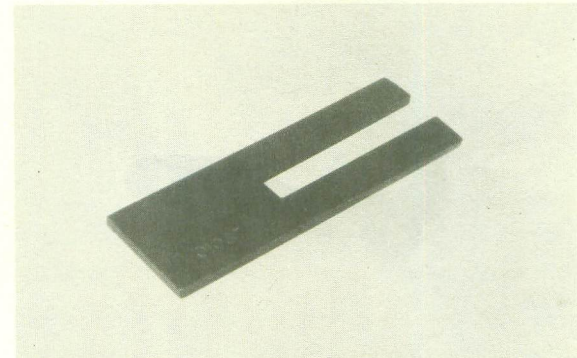
This tool must be used for removing and installing the valve assemblies.

7. Piston ring compressor
P/N. 90890-04044-00



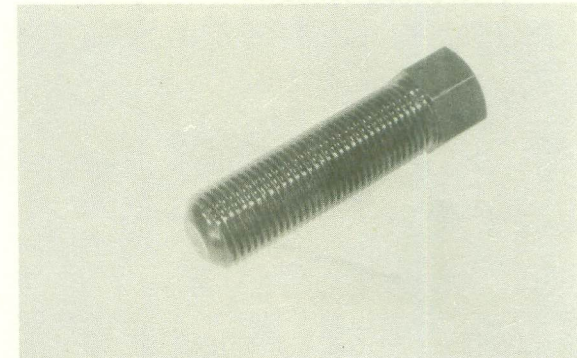
This is used to compress piston rings when installing the cylinder.

8. Piston base
P/N. 90890-01067-00



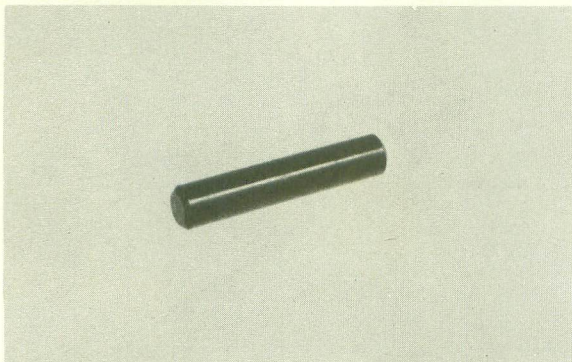
Use 4 of these to hold the pistons during cylinder installation.

9. Rotor puller
P/N. 90890-01080-00



This tool is needed to remove the A.C. Generator rotor.

10. Rotor puller attachment
P/N. 90890-04052-00



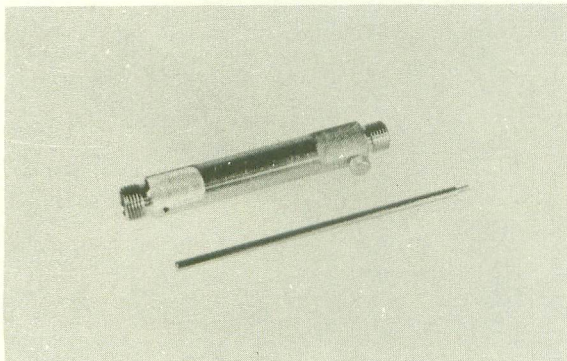
This tool is needed when removing the A.C. Generator rotor together with the rotor puller.

11. Rotor holding tool
P/N. 90890-04043-00



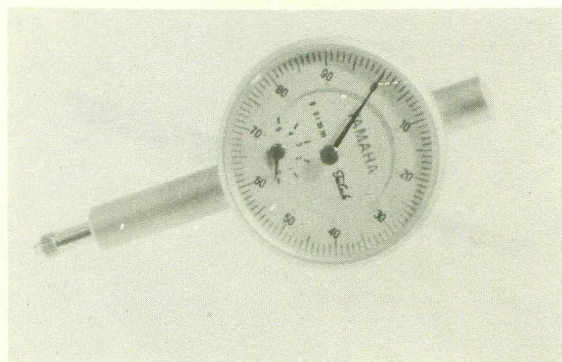
This tool is used to hold the A.C. Generator rotor during removal and installation.

12. Dial gauge stand
P/N. 90890-01258-00



This tool is needed to hold the dial gauge.

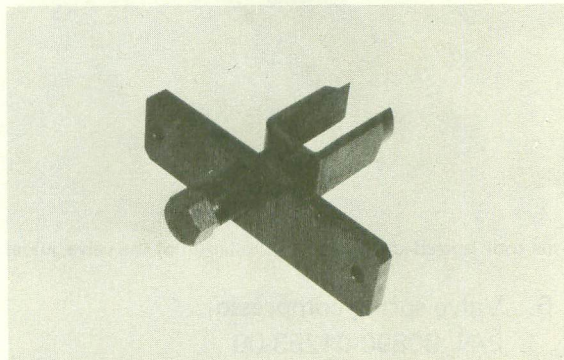
13. Dial gauge
P/N. 90890-03097-00



This dial gauge is used to determine piston position for correct timing.

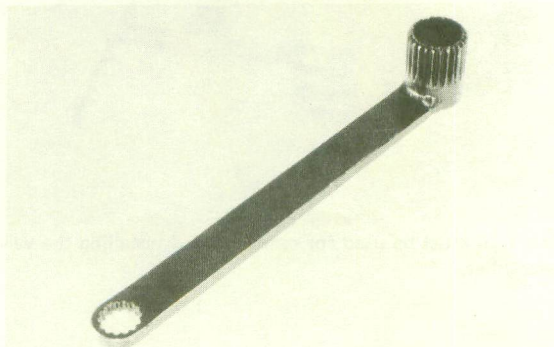
C. For Shaft Drive Service

1. Middle drive pinion holder
P/N. 90890-04051-00



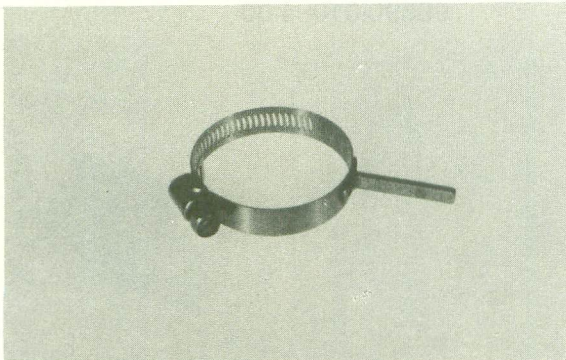
This tool is needed when measuring gear lash.

2. Middle and final gear holding tool
P/N. 90890-01229-00



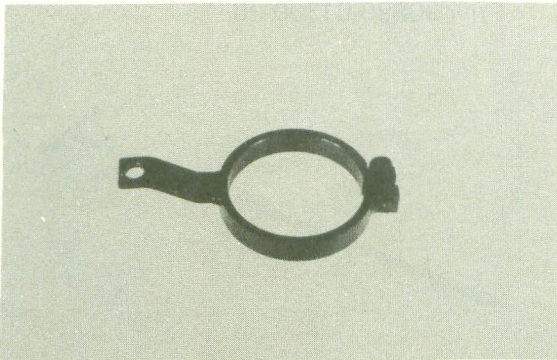
This tool is needed when measuring gear lash.

3. Gear lash measurement tool (Final gear)
P/N. 90890-01230-00



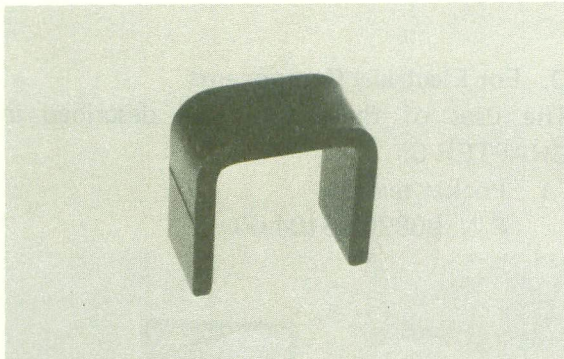
This tool is needed when measuring gear lash for final gear.

4. Final gear holding tool
P/N. 90890-01254-00



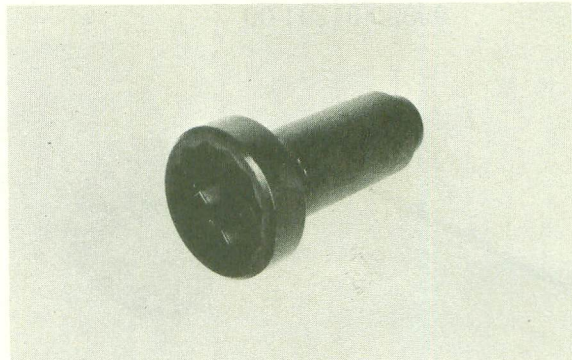
This tool is needed when measuring gear lash.

5. Damper compressor
P/N. 90890-04011-00



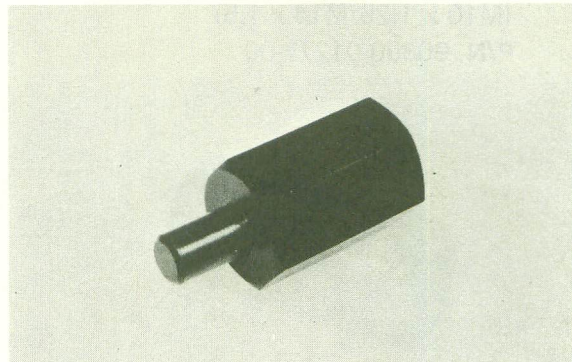
This tool is needed to disassemble and reassemble the middle gear damper.

6. Middle drive shaft nut wrench
P/N. 90890-04045-00



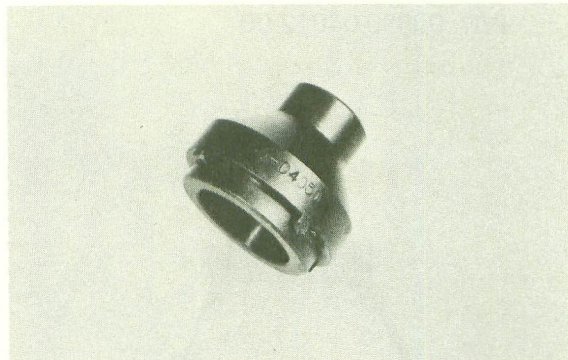
This tool is used to loosen and tighten the drive shaft nut.

7. Middle drive shaft holder
P/N. 90890-04046-00



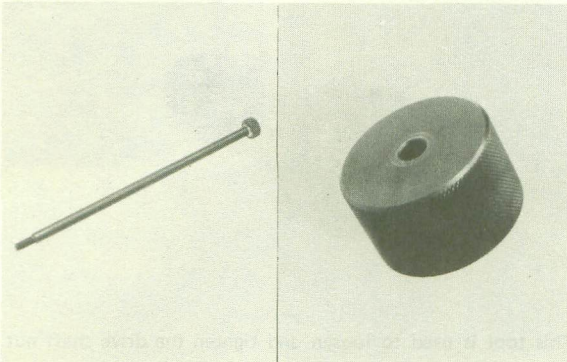
This tool is needed when loosening and tightening the drive shaft nut.

8. Drive pinion bearing retainer remover
P/N. 90890-04050-00



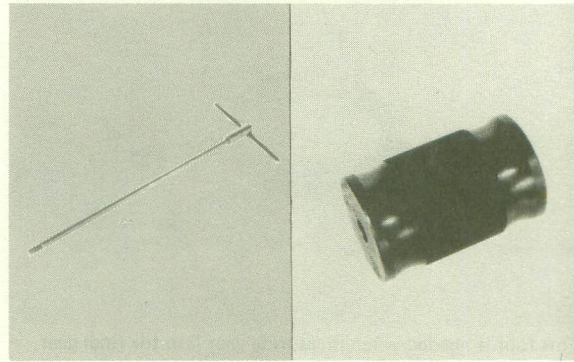
This tool is used to loosen and tighten the final gear drive pinion bearing retainer.

9. Armature shock puller (M10 x 1.25)
P/N. 90890-01290-00,
90890-01291-00



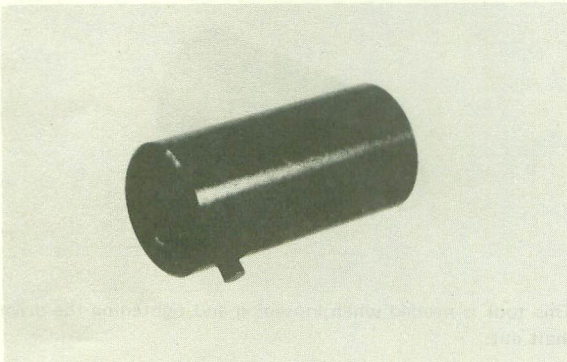
These tools are used to remove the final gear drive pinion.

12. Slide hammer
P/N. 90890-01083-00,
90890-01084-00



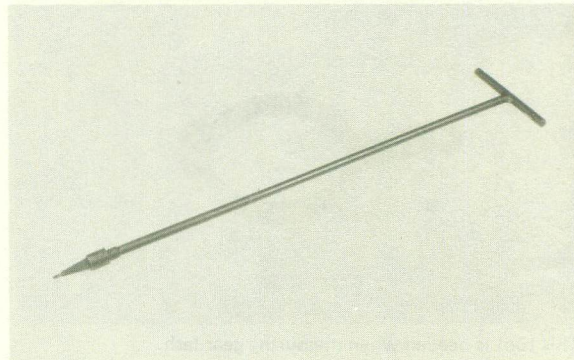
These tools are used to remove the drive shaft.

10. Crank installer adapter
(M10 x 1.25/M14 x 1.5)
P/N. 90890-01277-00



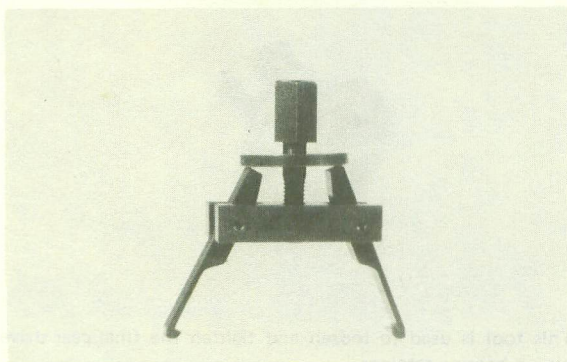
This adapter is needed when using the armature shock puller.

13. Front fork cylinder comp. holder
P/N. 90890-01300-00



This tool is used to loosen and tighten the front fork cylinder comp. holding bolt.

11. Drive shaft puller
P/N. 90890-04012-00

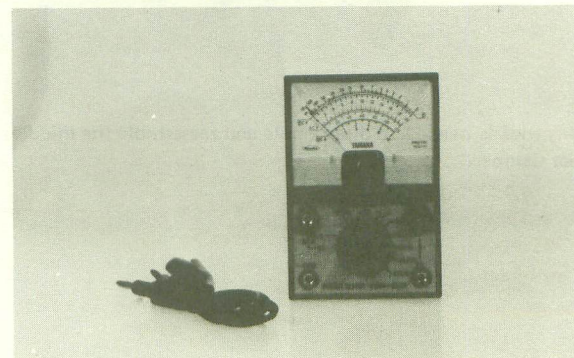


This tool is used to remove the drive shaft.

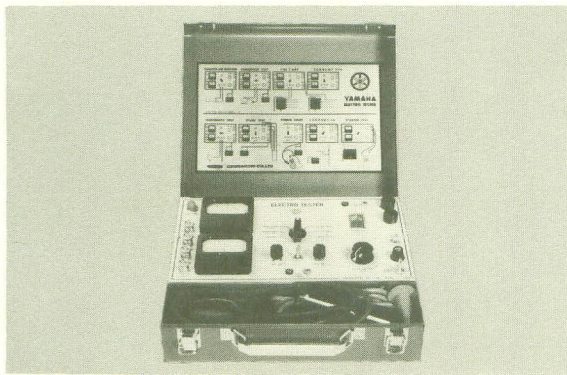
D. For Electrical Components

The uses of these tools are described in CHAPTER 6.

1. Pocket tester
P/N. 90890-03104-00



2. Electro tester
P/N. 90890-03021-00



CHAPTER 2.

PERIODIC INSPECTIONS AND ADJUSTMENTS

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2

CHAPTER 2.

PERIODIC INSPECTIONS AND ADJUSTMENTS

INTRODUCTION

This chapter includes all information necessary to perform recommend inspection and adjustments. These preventative 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.

MAINTENANCE INTERVALS CHARTS

Proper periodic maintenance is important. Especially important are the maintenance services related to emissions control. These controls not only function to ensure cleaner air but are also vital to proper engine operation and maximum performance. In the following tables of periodic maintenance, the services related to emissions control are grouped separately.

PERIODIC MAINTENANCE EMISSION CONTROL SYSTEM

No.	Item	Remarks	Initial break-in		Thereafter every	
			1,000 km (600 mi) or 1 month	5,000 km (3,000 mi) or 7 months	4,000 km (2,500 mi) or 6 months	8,000 km (5,000 mi) or 12 months
1*	Cam chain	Adjust chain tension.	○	○		○
2*	Valve clearance	Check and adjust valve clearance when engine is cold.		○		○
3	Spark plugs	Check condition. Adjust gap/Clean. Replace after initial 13,000 km (8,000 mi) or 18 months and thereafter every 12,000 km (7,500 mi) or 18 months.		○	○	Replace every 12,000 km (7,500 mi) or 18 months
4*	Crankcase ventilation system	Check ventilation hose for cracks or damage. Replace if necessary.		○		○
5*	Fuel line	Check fuel hose for cracks or damage. Replace if necessary.		○		○
6*	Exhaust system	Check for leakage. Retighten as necessary. Replace gasket(s) if necessary.		○	○	
7*	Carburetor synchronization	Adjust synchronization of carburetors.		○	○	
8*	Idle speed	Check and adjust engine idle speed. Adjust cable free play if necessary.		○	○	

* It is recommended that these items be serviced by a Yamaha dealer or other qualified mechanic.

GENERAL MAINTENANCE/LUBRICATION

No.	Item	Remarks	Type	Initial break-in		Thereafter every		
				1,000 km (600 mi) or 1 month	5,000 km (3,000 mi) or 7 months	4,000 km (2,500 mi) or 6 months	8,000 km (5,000 mi) or 12 months	16,000 km (10,000 mi) or 24 months
1	Engine oil	Warm-up engine before draining.	Refer to page 17.	○	○	○		
2	Oil filter	Replace.	—	○	○		○	
3	Final gear oil	Replace.	Refer to page 18.	○			○	
4	Air filter	Clean with compressed air.	—		○		○	
5*	Brake system	Adjust free play. Front: Replace pads if necessary. Rear: Replace shoes if necessary.	—	○	○	○		
6*	Clutch	Adjust free play	—	○	○	○		
7*	Control and meter cable	Apply chain lube thoroughly.	Yamaha chain and cable lube or SAE 10W/30 motor oil	○	○	○		
8*	Rear arm pivot bearings	Check bearing assembly for looseness. Moderately repack every 16,000 km (10,000 mi).	Medium weight wheel bearing grease					Repack
9*	A.C. generator	Replace generator brushes. Replace at initial 13,000 km (8,000 mi) and thereafter every 16,000 km (10,000 mi)	—					Replace
10	Brake/clutch lever pivot shaft	Apply chain lube lightly.	Yamaha chain and cable lube or 10W/30 motor oil		○	○		
11	Change/Brake pedal shaft pivot	Apply chain lube lightly.	Yamaha chain and cable lube or 10W/30 motor oil		○	○		
12	Center and side stand pivots	Apply chain lube lightly.	Yamaha chain and cable lube or 10W/30 motor oil		○	○		
13*	Front fork oil	Drain completely. Refill to specification.	Yamaha fork oil 10wt or equivalent					○
14*	Steering Ball Bearing and races	Check bearings assembly for looseness. Moderately repack every 16,000 km (10,000 mi).	Medium weight wheel bearing grease		○	○		Repack
15*	Wheel bearings	Check bearings for smooth rotation. Replace if necessary.	—		○	○		
16	Battery	Check specific gravity. Check breather pipe for proper operation.	—		○	○		

*It is recommended that these items be serviced by a Yamaha dealer or other qualified mechanic.

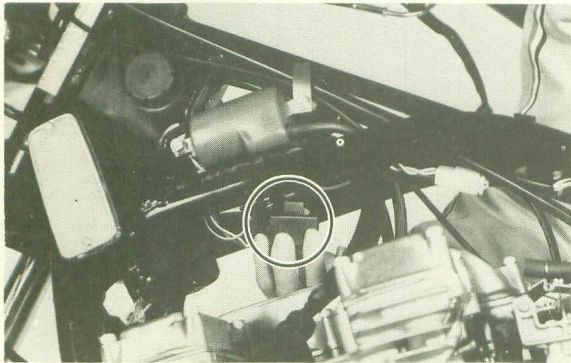
ENGINE

A. Valve Clearance Adjustment

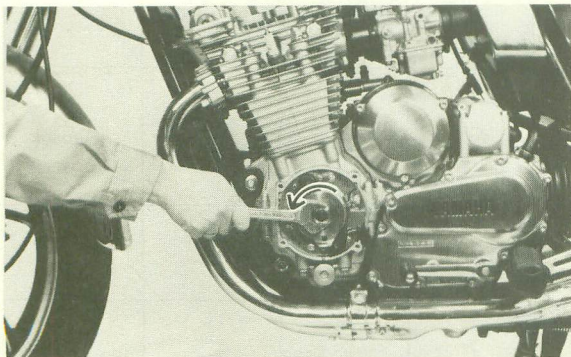
NOTE:

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

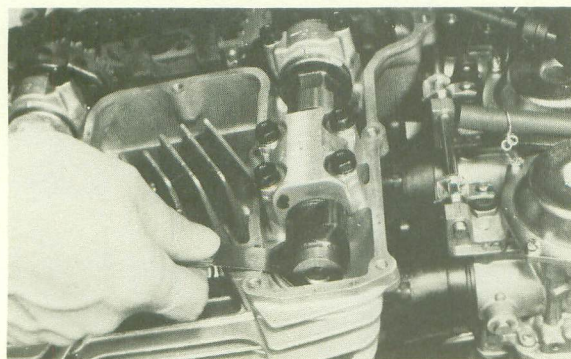
1. Remove the seat and fuel tank.
2. Remove the horn, flasher relay, and spark plug lead wires.



3. Remove the cylinder head cover and left crankcase cover (pick-up base cover). Care should be taken to not scratch or damage the gasket sealing surfaces.
4. Turn the crankshaft with the nut on the left end of the crankshaft to turn the cams. The proper position of the cam when measuring the valve clearance is with the cam lobe directly opposite the valve lifter.



5. Insert a feeler gauge between the valve lifter and the camshaft base circle.



Intake valve clearance (cold):

0.11 ~ 0.15 mm (0.004 ~ 0.006 in)

Exhaust valve clearance (cold):

0.16 ~ 0.20 mm (0.006 ~ 0.008 in)

Adjustment

Valve clearance is adjusted by replacing the adjusting pad on the top of the valve lifter. Adjusting pads are available in 25 thicknesses ranging from No. 200 (2.00 mm) to No. 320 (3.20 mm) in steps of 0.05 mm. The thickness of each pad is marked on the pad face that contacts the valve lifter (not the cam). Adjustment of the valve clearance is accomplished as follows:

1. Determine valve clearance (feeler gauge measurement.)
2. Remove adjusting pad and note number.
3. Select proper pad from appropriate chart (intake or exhaust chart).
4. Install new pad and check installed clearance.

Procedure

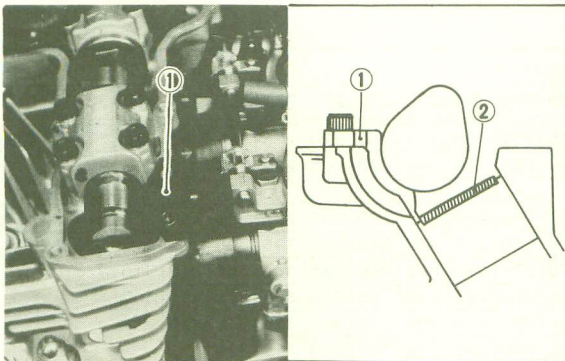
1. Measure valve clearance. If clearance is incorrect, record the measured amount of clearance. This must be measured carefully.
2. There is a slot in the valve lifter. This slot must be positioned opposite the blade of the tappet adjusting tool before the tools is installed.
3. Turn the cam until the lobe fully depresses the valve lifter and opens the valve. Install the tappet adjusting tool as shown to hold the lifter in this depressed position.

NOTE:

The tappet adjusting tool is fastened to the cylinder head securely using an allen screw. Make sure that the tool contacts the lifter only, and not the pad.

CAUTION:

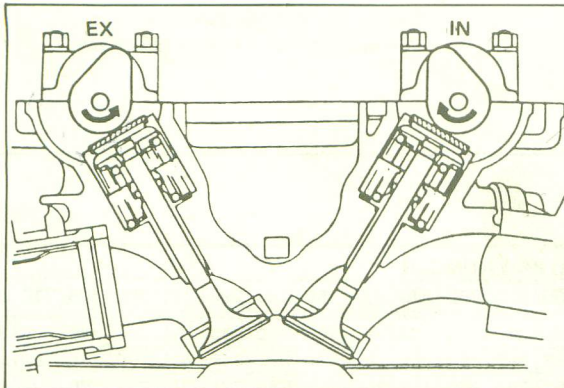
If the cam lobe touches the tappet adjusting tool, the stress may fracture the cylinder head. **DO NOT ALLOW THE CAM LOBE TO CONTACT THE TAPPET ADJUSTING TOOL.**



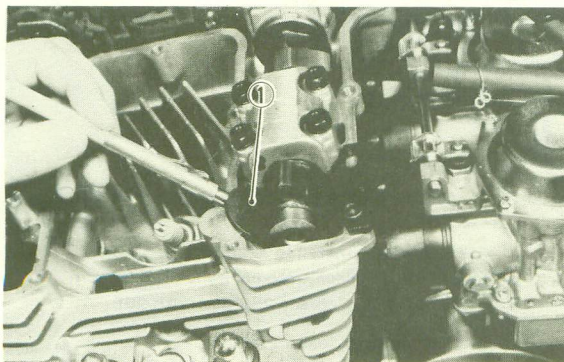
1. Tappet adjusting tool

2. Adjusting pad

4. Carefully rotate the cam so that the pad can be removed. To avoid cam touching the adjusting tool, turn cams as follows: (view from left side of the motorcycle)
Intake: Carefully rotate **CLOCKWISE**.
Exhaust: Carefully rotate **COUNTER-CLOCKWISE**.



5. Remove the pad from the lifter. There is a slot in the lifter. Use a small screwdriver or other blade and tweezers or a magnetic rod to remove the pad. Note the number on the pad.



1. Adjusting pad

6. Proper pad selection is made as follows: (Use appropriate chart for exhaust or intake valves.)

- a. Find number of original (installed) pad number on chart. **Read down on chart.**
- b. Find measured valve clearance (from step 1) on chart. **Read across.**
- c. At the intersection of installed pad number (down) and measured clearance (across) is a new pad number.

EXAMPLE:

Intake valve, installed pad:

No. 250 (read down)

Measured clearance:

0.32 mm (read across)

New pad number: No. 270

(intersection of down & across)

NOTE:

The new pad number is to be used as a guide only. Verify the correctness of this choice in the following step(s).

7. Install the new pad in the lifter. Install the pad with the number down.
8. Remove tappet adjusting tool.
9. Turn crankshaft to rotate cam several rotations. This will set the pad in the lifter.
10. Check valve clearance (step 3). If clearance is incorrect, repeat preceding steps until proper clearance is obtained.
11. Inspect head cover gasket. If bent or torn, replace gasket.
12. Reinstall removed parts in reverse order.

Intake

MEASURED CLEARANCE	INSTALLED PAD NUMBER*																									
	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	
0.00 ~ 0.05			200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315
0.06 ~ 0.10		200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	
0.11 ~ 0.15																										
0.16 ~ 0.20	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320		
0.21 ~ 0.25	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320			
0.26 ~ 0.30	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320				
0.31 ~ 0.35	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320					
0.36 ~ 0.40	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320						
0.41 ~ 0.45	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320							
0.46 ~ 0.50	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320								
0.51 ~ 0.55	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320									
0.56 ~ 0.60	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320										
0.61 ~ 0.65	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320											
0.66 ~ 0.70	255	260	265	270	275	280	285	290	295	300	305	310	315	320												
0.71 ~ 0.75	260	265	270	275	280	285	290	295	300	305	310	315	320													
0.76 ~ 0.80	265	270	275	280	285	290	295	300	305	310	315	320														
0.81 ~ 0.85	270	275	280	285	290	295	300	305	310	315	320															
0.86 ~ 0.90	275	280	285	290	295	300	305	310	315	320																
0.91 ~ 0.95	280	285	290	295	300	305	310	315	320																	
0.96 ~ 1.00	285	290	295	300	305	310	315	320																		
1.01 ~ 1.05	290	295	300	305	310	315	320																			
1.06 ~ 1.10	295	300	305	310	315	320																				
1.11 ~ 1.15	300	305	310	315	320																					
1.16 ~ 1.20	305	310	315	320																						
1.21 ~ 1.25	310	315	320																							
1.26 ~ 1.30	315	320																								
1.31 ~ 1.35	320																									

VALVE CLEARANCE (engine cold) 0.11~ 0.15mm

Example: Installed is 250
Measured clearance is 0.32 mm
Replace 250 pad with 270

*Pad number (example):
Pad No. 250 = 2.50 mm
Pad No. 255 = 2.55 mm

Always install pad with number down.

VALVE CLEARANCE (engine cold) 0.11~ 0.15mm

Example: Installed is 250
Measured clearance is 0.32 mm
Replace 250 pad with 270

*Pad number (example):
Pad No. 250 = 2.50 mm
Pad No. 255 = 2.55 mm
Always install pad with number down.

Exhaust

MEASURED CLEARANCE	INSTALLED PAD NUMBER*																								
	200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320
0.00 ~ 0.05				200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305
0.06 ~ 0.10			200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310
0.11 ~ 0.15		200	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315
0.16 ~ 0.20																									
0.21 ~ 0.25	205	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320	
0.26 ~ 0.30	210	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320		
0.31 ~ 0.35	215	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320			
0.36 ~ 0.40	220	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320				
0.41 ~ 0.45	225	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320					
0.46 ~ 0.50	230	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320						
0.51 ~ 0.55	235	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320							
0.56 ~ 0.60	240	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320								
0.61 ~ 0.65	245	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320									
0.66 ~ 0.70	250	255	260	265	270	275	280	285	290	295	300	305	310	315	320										
0.71 ~ 0.75	255	260	265	270	275	280	285	290	295	300	305	310	315	320											
0.76 ~ 0.80	260	265	270	275	280	285	290	295	300	305	310	315	320												
0.81 ~ 0.85	265	270	275	280	285	290	295	300	305	310	315	320													
0.86 ~ 0.90	270	275	280	285	290	295	300	305	310	315	320														
0.91 ~ 0.95	275	280	285	290	295	300	305	310	315	320															
0.96 ~ 1.00	280	285	290	295	300	305	310	315	320																
1.01 ~ 1.05	285	290	295	300	305	310	315	320																	
1.06 ~ 1.10	290	295	300	305	310	315	320																		
1.11 ~ 1.15	295	300	305	310	315	320																			
1.16 ~ 1.20	300	305	310	315	320																				
1.21 ~ 1.25	305	310	315	320																					
1.26 ~ 1.30	310	315	320																						
1.31 ~ 1.35	315	320																							
1.36 ~ 1.40	320																								

VALVE CLEARANCE (engine cold) 10.16 ~ 0.20 mm

Example: Installed is 250
Measured clearance is 0.32 mm
Replace 250 pad with 265

*Pad number (example):
Pad No. 250 = 2.50 mm
Pad No. 255 = 2.55 mm

Always install pad with number down.

VALVE CLEARANCE (engine cold) 10.16~0.20 mm

Example: Installed is 250
Measured clearance is 0.32 mm
Replace 250 pad with 265

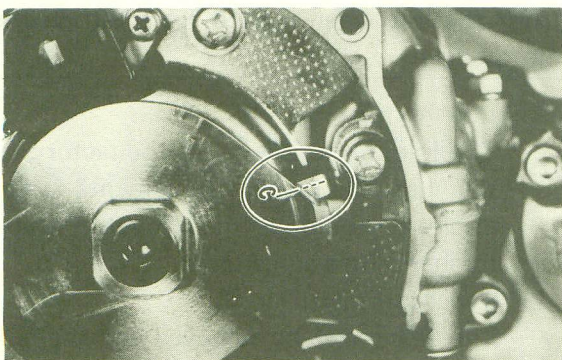
*Pad number (example):
Pad No. 250 = 2.50 mm
Pad No. 255 = 2.55 mm

Always install pad with number down.

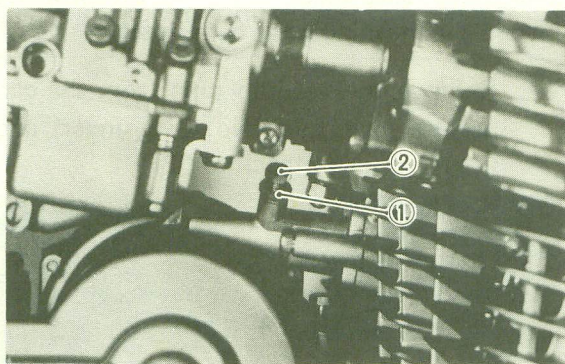
B. Cam Chain Adjustment

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. Remove the timing plate cover.
2. Slowly rotate the crankshaft counter-clockwise until the "C" mark on the timing plate aligns with the stationary pointer.



3. Loosen the tensioner lock nut and then loosen the stopper bolt. This releases the cam chain tensioner with the proper tension.



1. Lock nut 2. Stopper bolt

4. Tighten the stopper bolt and lock nut.

Stopper bolt torque: 0.6 m·kg (4.3 ft·lb)
Lock nut torque: 0.9 m·kg (6.5 ft·lb)

5. Reinstall the timing plate cover.

C. Ignition Timing

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

The timing plate is marked as follows:

"□" ... Firing range for No.1 (L.H.) cylinder
"T" Top Dead Center for No. 1 (L.H.) and No. 4 (R.H.) cylinders

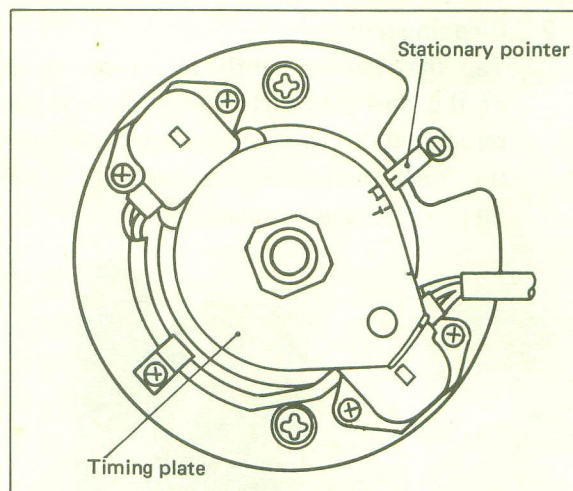
2. Connect the timing light to No. 1 (L.H.) spark plug lead wire.
3. Start the engine and keep the engine speed as specified. Use a tachometer to check the engine speed.

Specified engine speed: 1,050 r/min

4. The stationary pointer should be within the limits of "□" on the timing plate. If it exceeds the limits or does not steady, check the timing plate for tightness and/or ignition system for damage. (See "CHAPTER 6. ELECTRICAL")

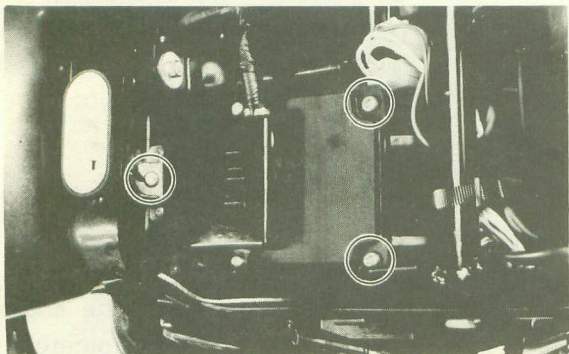
CAUTION:

Never bend the stationary pointer.

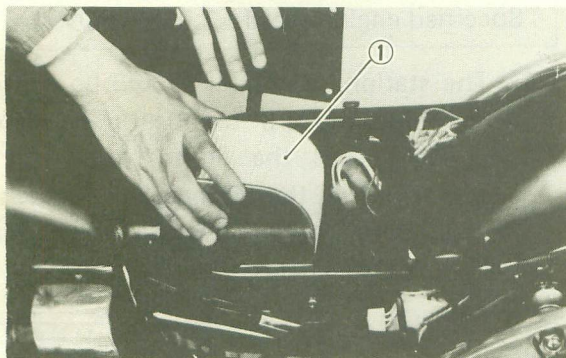


D. Air Cleaner

1. Removal
 - a. Remove the seat.
 - b. Remove the tool tray.
 - c. Remove the air filter case cover by removing the three screws.



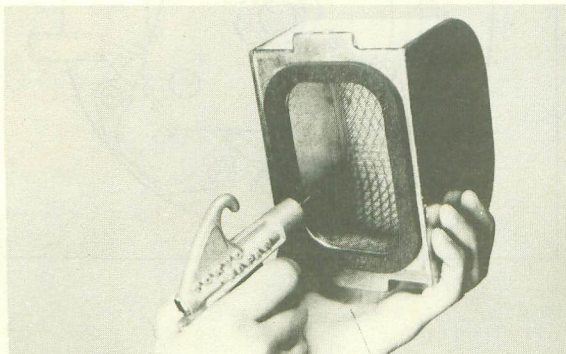
- d. Pull out the element.



1. Air filter element

2. Cleaning method

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



3. Reassemble by reversing the removal procedure. Check whether the element is seated completely against the case.
4. The air filter element should be cleaned at the specified intervals.

CAUTION:

The engine should never be run without the air cleaner element installed; excessive piston and/or cylinder wear may result.

E. Carburetor

NOTE:

The carburetors are numbered 1, 2, 3, and 4 from the left when viewed from astride the motorcycle.

1. Idle mixture

The idle mixture is set at the factory by the use of special equipment. Not attempt should be made by the dealer to change this adjustment.

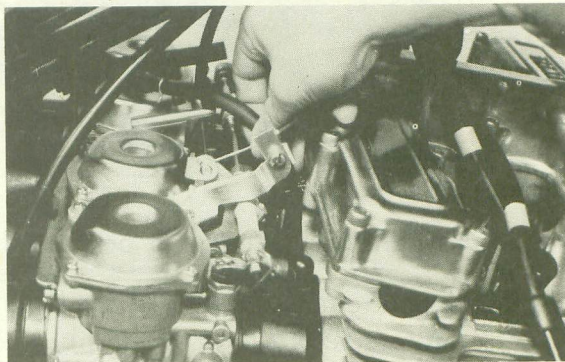
2. Synchronization

The seat must be removed and the rear of the tank elevated to gain access to the vacuum connections and throttle adjustment screws.

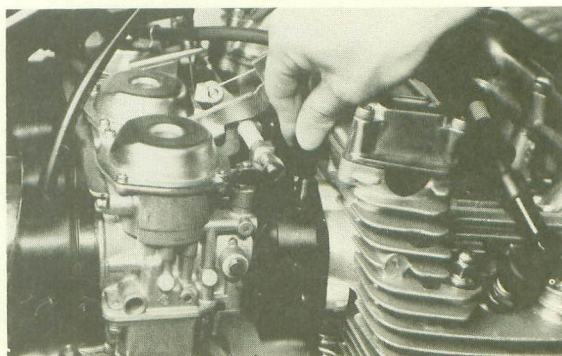
NOTE:

The valve clearances must be set properly before synchronizing the carburetors.

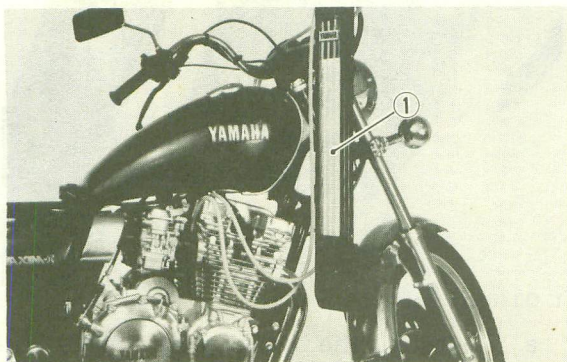
- a. Remove the vacuum pipe from the carburetor manifold (No. 3 cylinder) and turn the fuel petcock to "PRI".



- b. Remove the rubber caps from the No. 1, 2, and 4 carburetor manifolds.



- c. Connect the each vacuum gauge hose to its proper carburetor.

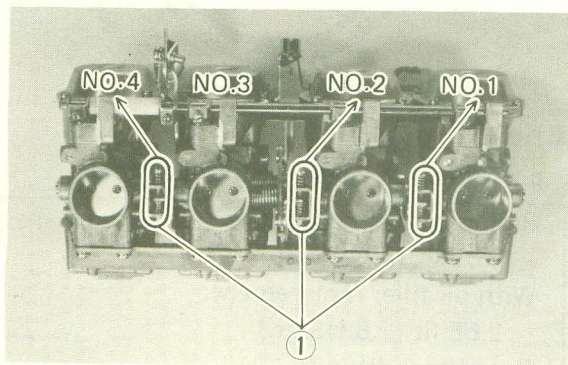


1. Vacuum gauge

- d. Start the engine and allow it to warm-up for a few minutes. The warm-up is complete when engine responds normally to the throttle opening.
- e. Set the engine idle at approximately 1,050 r/min.
- f. Each gauge reading will indicate the same if the carburetors are synchronized. The No. 3 carburetor has no synchronizing screw and the other carburetors are to be synchronized to it in order, one at a time.

First, synchronize carburetor No. 1 to carburetor No. 2 by turning the No. 1 synchronizing screw until both gauges read the same.

Second, in the same way synchronize carburetor No. 4 to carburetor No. 3. Third, by adjusting No. 2 screw to watch No. 3 carburetor reading, No. 1 and No. 2 carburetors will both change to match No. 3 carburetor.



1. Synchronizing screws

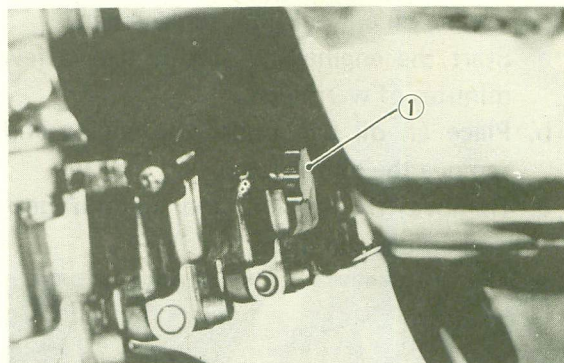
3. Idle speed adjustment

NOTE: _____

Carburetors must be synchronized before setting final idle speed. The idle speed adjustment is made by turning only one throttle stop screw.

- The engine must be warmed up before setting idle speed.
- Set the engine idle speed by turning the throttle stop screw in (to increase engine speed) or out (to decrease engine speed).

Standard idle speed: 1,050 ± 50 r/min



1. Throttle stop screw

F. Engine Oil

1. Oil level measurement

- Place the motorcycle on the center stand. Warm up the engine for several minutes.

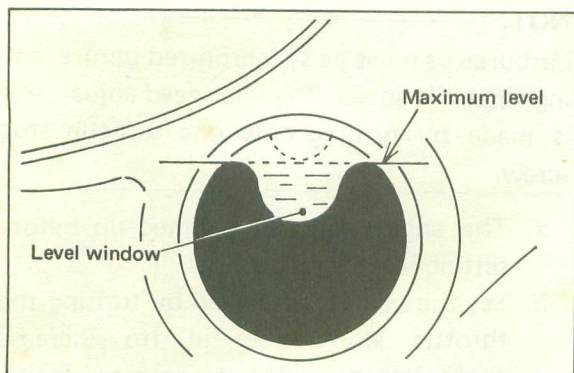
NOTE: _____

Be sure the motorcycle is positioned straight up when checking the oil level; a slight tilt toward the side can produce false readings.

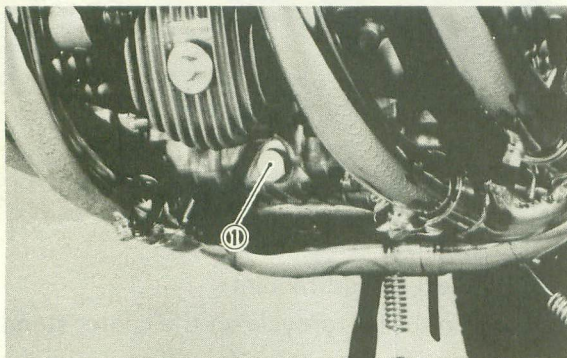
- With the engine stopped, check the oil level through the level window located at the lower part of the right side crank-case cover.

NOTE: _____

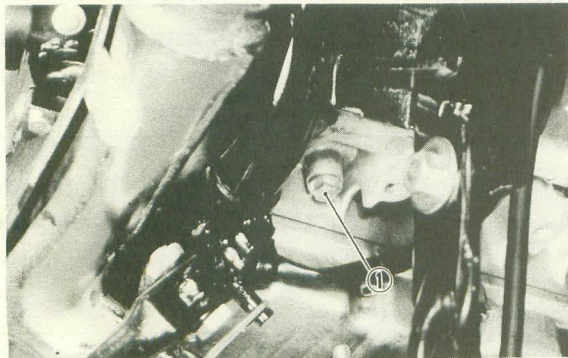
Wait a few minutes until the oil level settles before checking.



- c. The oil level should be maximum level. If the level is lower, add sufficient oil to raise it to the maximum level.
2. Engine oil and oil filter replacement
 - a. Start the engine and stop it after a few minutes of warm-up.
 - b. Place an oil pan under the engine and remove the oil filler cap.
 - c. Remove the engine and middle gear drain plugs and drain the oil.

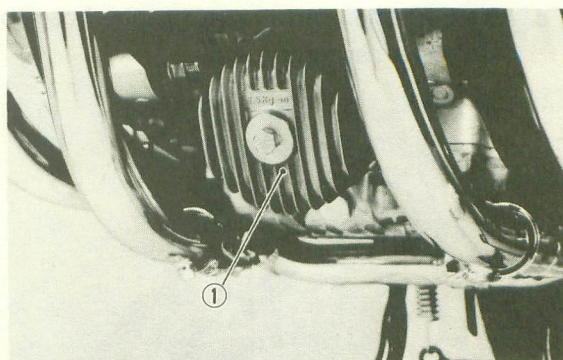


1. Engine drain plug



1. Middle gear drain plug

- d. Remove the oil filter bolt and filter element.



1. Oil filter cover

- e. Re-install the drain plugs (make sure they are tight).

Drain plug torque:

Middle gear: 1.6 m-kp (11.6 ft-lb)

Engine: 4.3 m-kp (31.0 ft-lb)

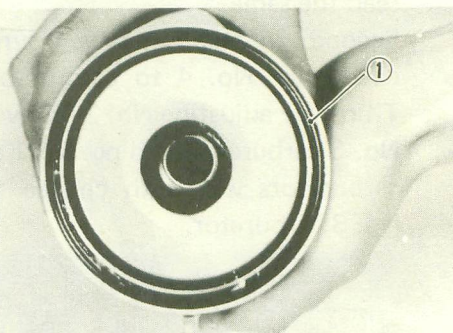
- f. Install the new oil filter element, new "O-ring" and filter cover, tighten the oil filter bolt.

Oil filter bolt torque:

1.5 m-kp (11.0 ft-lb)

NOTE:

When installing the filter cover, make sure the "O-ring" is positioned properly and insert the locating projection on it into the corresponding guides on the crankcase.



1. Proper O-ring position

- g. Add oil through the oil filler hole.

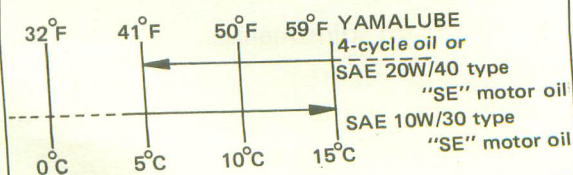
Periodic oil change:

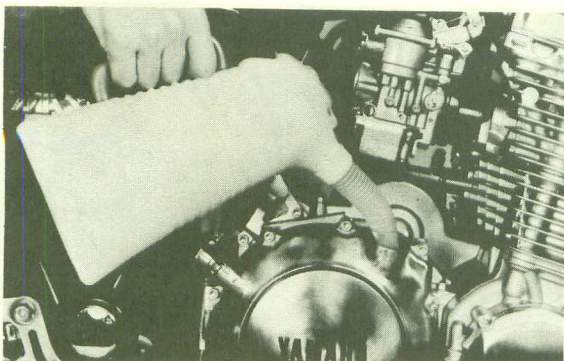
2.35 lit (2.5 US qt.)

With oil filter replacement:

2.65 lit (2.8 US qt.)

Recommended oil:





- h. After replacement of the engine oil, and/or oil filter, be sure to check for oil leakage. The oil level indicator light should go off after the oil is filled.

CAUTION:

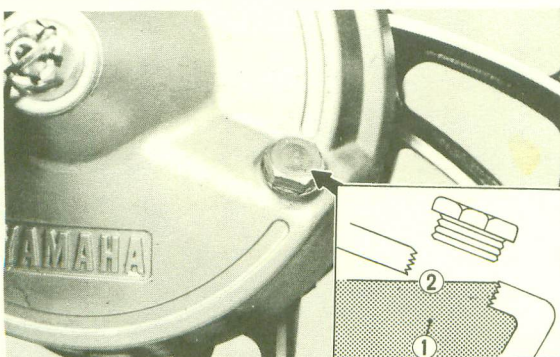
If the indicator light flickers or remains on, the oil level switch may be damaged. Refer to "CHAPTER 6" for corrective action.

G. Final Gear Oil

1. Oil level measurement
 - a. Place the motorcycle on a level place and place it on the center stand. The engine should be cool (at atmospheric temperature).
 - b. Remove the oil filler cap and check the oil level whether it is to the hole brim. If it is not up to this level, replenish oil.

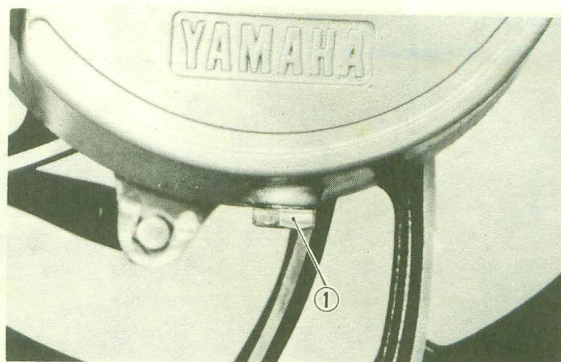
CAUTION:

Take care not to allow foreign material to enter the final gear case.



1. Final gear oil 2. Correct oil level

2. Gear oil replacement
 - a. Place an oil pan under the final gear case.
 - b. Remove the final gear oil filler cap and the drain plug, and drain the oil.



1. Final gear drain plug

- c. Reinstall and tighten the final gear drain plug.
- d. Fill the gear case to the specified level.

Oil capacity: 0.20 lit (0.21 US qt.)

Recommended oil: SAE 80 API "GL-4"
Hypoid gear oil

If desired, an SAE 80W/90 hypoid gear oil may be used for all conditions.

- e. Reinstall the filler cap securely.

H. Compression Pressure Measurement

Insufficient compression pressure will result in performance loss and may indicate leaking valves or worn or damaged piston rings.

Procedure:

1. Make sure the valve clearance is correct.
2. Remove the headlight fuse from the fuse box.
3. Warm up the engine 2~3 minutes.
Stop the engine.
4. Remove the all spark plugs.
5. Install a compression check gauge.
6. Turn over the engine with the electric starter (make sure the battery is fully charged) with the throttle wide open until the pressure indicated on the gauge does not increase further.

Compression pressure (at sea level):

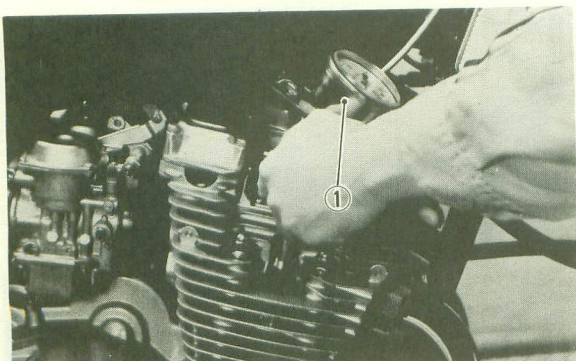
Standard 11 kg/cm² (156 psi)

Minimum 9 kg/cm² (128 psi)

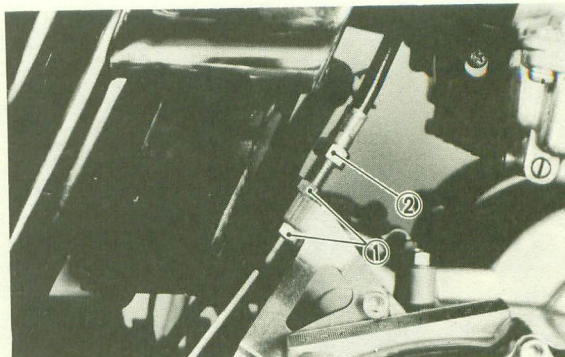
Maximum 12 kg/cm² (171 psi)

WARNING:

When cranking the engine, ground the removal spark plug wires to prevent sparking.



1. Compression gauge



1. Lock nut 2. Adjuster

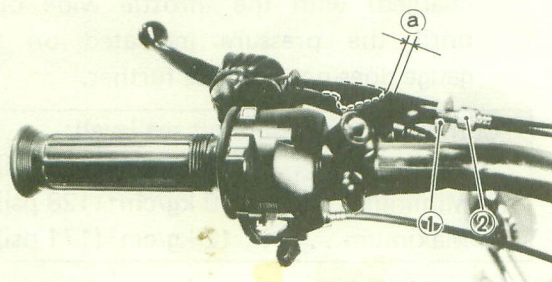
7. If the pressure is too low, squirt a few drops of oil into the cylinder being measures. Measure compression again. If there is a higher reading than before (without oil), the piston rings may be worn or damaged. If the pressure remains the same after measuring with the oil, either or both the rings and valves may be the cause.
8. Check each cylinder. Compression pressure should not vary more than specified value from one cylinder to any other cylinder.

Difference in gauge reading:
Less than 1 kg/cm² (14 psi)

I. Clutch Adjustment

Free play adjustment

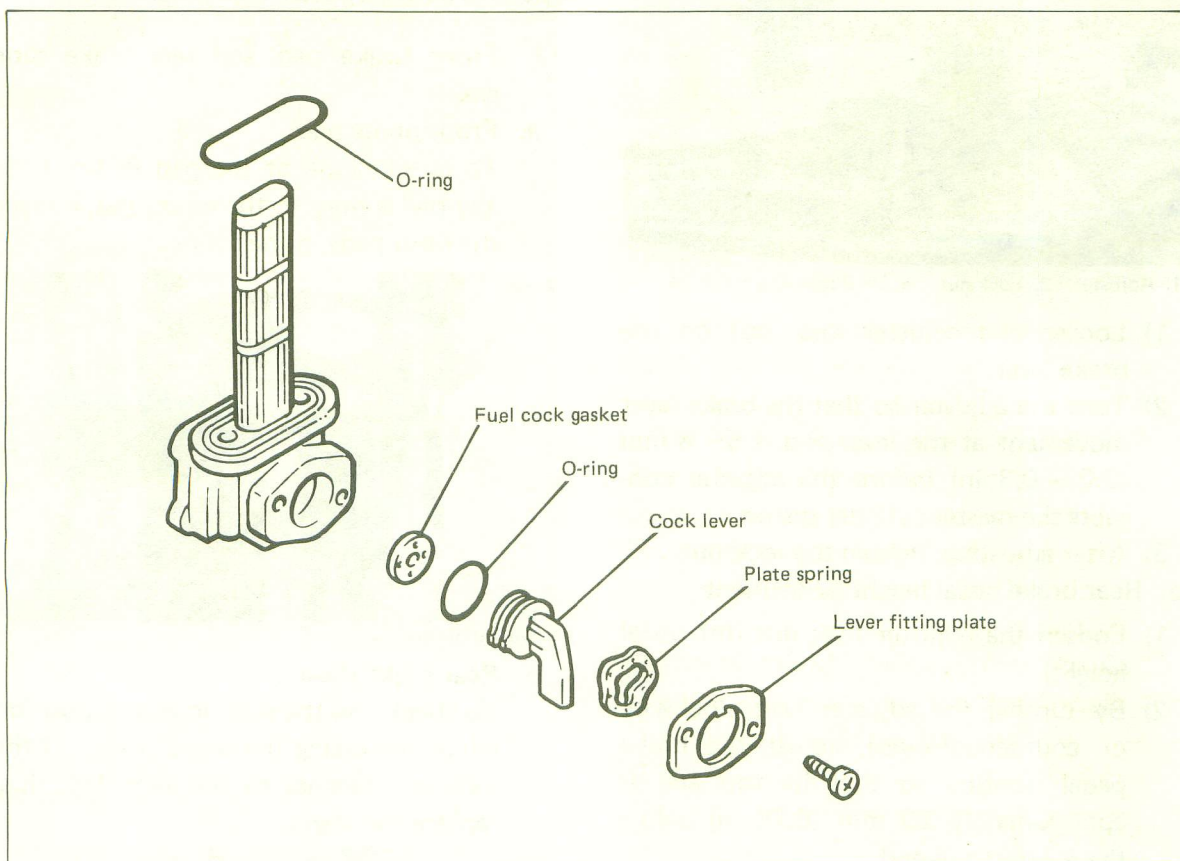
- a. Loosen either the handle lever adjuster lock nut or the cable length adjuster lock nut.
- b. Turn the cable length adjuster either in or out until proper lever free play is achieved.



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

CHASSIS

A. Fuel Petcock



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

1. Remove the fuel tank and position it so that fuel will not spill when the petcock is removed.
2. Remove the petcock and inspect the filter screen. Replace the filter if seriously contaminated.
3. Remove the screws on the front and rear of the petcock and remove the 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 the petcock and install it on the fuel tank.

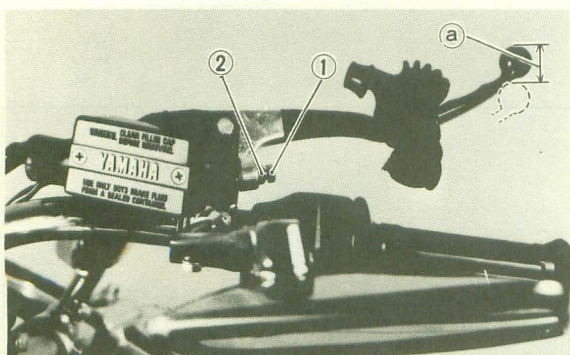
B. Front and Rear Brake

1. Brake adjustment
 - a. Front brake lever free play adjustment.

The brake can be adjusted by simply adjusting the free play of the brake lever. The piston in the caliper moves forward as the brake pad wears out, automatically adjusting the clearance between the brake pads and brake disc.

CAUTION:

Proper lever free play is essential to avoid excessive brake drag.



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

- 1) Loosen the adjuster lock nut on the brake lever.
- 2) Turn the adjuster so that the brake lever movement at the lever end is 5~8 mm (0.2 ~ 0.3 in) before the adjuster contacts the master cylinder piston.
- 3) After adjusting, tighten the lock nut.

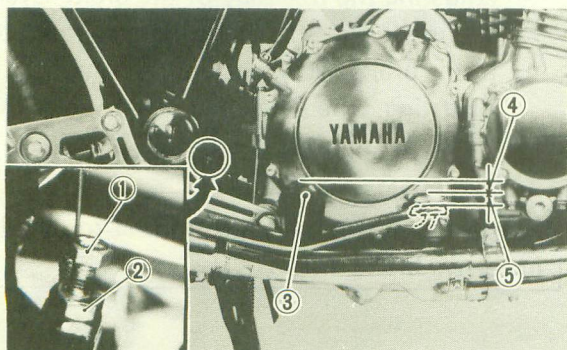
b. Rear brake pedal height adjustment

- 1) Loosen the adjuster lock nut (for pedal height).
- 2) By turning the adjuster bolt clockwise or counterclockwise, adjust the brake pedal position so that its top end is approximately 20 mm (0.78 in) below the footrest top end.
- 3) Secure the adjuster lock nut.

WARNING:

After adjusting the pedal height, the brake pedal free play should be adjusted.

c. Rear brake pedal free play adjustment



1. Adjuster bolt (for pedal height) 2. Lock nut 3. Footrest 4. Pedal height 20 mm (0.8 in) 5. Free play 20~30 mm (0.8~1.2 in)

Turn the adjuster on the brake rod clockwise or counterclockwise to provide the brake pedal end with a free play of 20 ~ 30 mm (0.8 ~ 1.2 in).

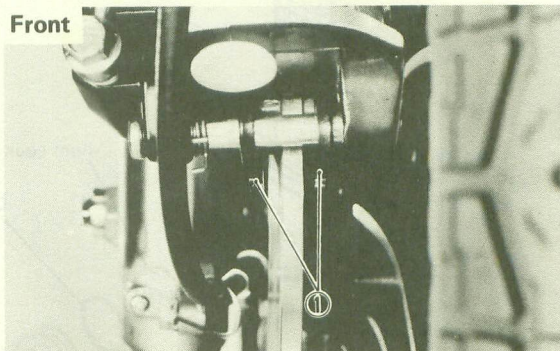
NOTE:

Check to see whether or not the brake light operates correctly after adjusting.

2. Front brake pad and rear brake shoe check

a. Front brake pad

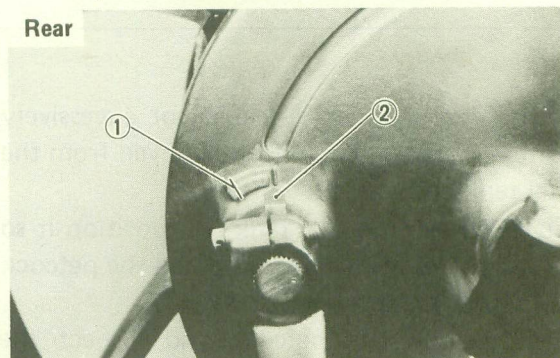
To check, look at the pad in front. If any pad is worn to the wear limit, replace the both pads in the caliper.



1. Wear indicator

b. Rear brake shoe

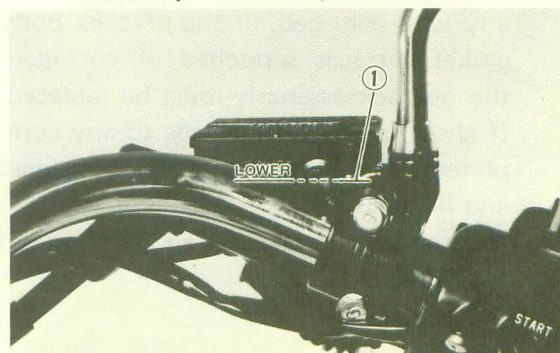
To check, see the wear indicator position while depressing the brake pedal. If the indicator reaches to the wear limit line, replace the shoes.



1. Wear limit 2. Wear indicator

3. Brake fluid

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 observing these precautions:



1. Lower level

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

Recommended brake fluid: DOT # 3

- 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.
- d. Brake fluid may erode painted surfaces or plastic parts. Always clean up spilled fluid immediately.

C. Tubeless Tires and Aluminum Wheels

This motorcycle is equipped with aluminum wheels designed to be compatible with either tube or tubeless tires. Tubeless tires are installed as standard equipment.

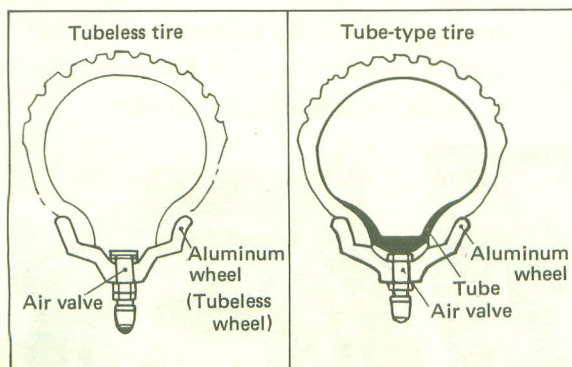
—WARNING:—

Do not attempt to use tubeless tires on a wheel designed for use only with tube-type tires. Tire failure and personal injury may result from sudden deflation.

Tube-type Wheel — Tube-type tires only

Tubeless-type Wheel — Tube-type or
Tubeless tires

When using tube-type tires, be sure to install the proper tube also.



To insure maximum performance, long service, and safe operation, note the following precautions:

1. Check tire pressure, before riding, adjust as necessary.
2. Before operation, always check the tire surfaces for wear and/or damage; look for cracks, glass, nails, metal fragments, stones, etc. Correct any such hazard before riding.
3. Always inspect the aluminum wheels before a ride. Place the motorcycle on the center stand and check for cracks, bends or warpage of the wheels. Do not attempt even small repairs to the wheel. If a wheel is deformed or cracked, it must be replaced.
4. Tires and wheels should be balanced whenever either one is changed or replaced. Failure to have a wheel assembly balanced can result in poor performance, adverse handling characteristics, and shortened tire life.
5. After installing a tire, ride conservatively to allow the tire to seat itself on the rim properly. Failure to allow proper seating may cause tire failure resulting in damage to the motorcycle and injury to the rider.
6. After repairing or replacing a tire, check to be sure the valve stem lock nut is securely fastened. If not, torque it as specified.

Tightening torque:

0.15 m-kp (1.1 ft-lb)

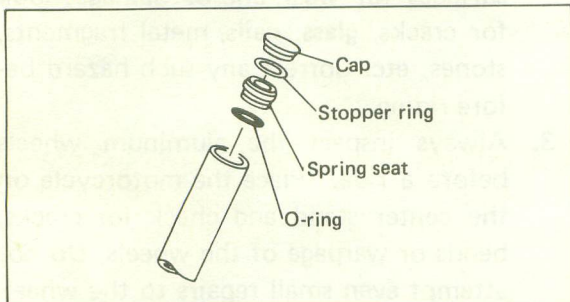
D. Front Fork Oil Change

—WARNING:—

Securely support the motorcycle so there is no danger of it falling over.

1. Raise the motorcycle or remove the front wheel so that there is no weight on the front end of the motorcycle. Remove the handlebar if necessary.
2. Remove the rubber cap from the top of each fork.
3. The spring seat and fork spring are retained by a stopper ring (spring wire circlip). It is necessary to depress the

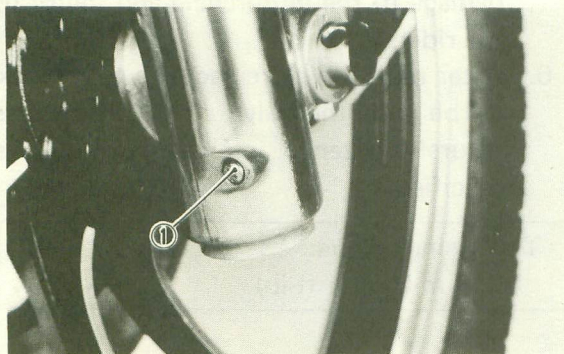
spring seat and fork spring to remove the stopper ring. Remove the stopper ring by carefully prying out one end with a small screwdriver.



4. Place an open container under each drain hole. Remove the drain screw from each outer tube.

WARNING:

Do not allow oil to contact the disc brake components. If any oil should contact the brake components it must be removed before the motorcycle is operated. Oil will cause diminished braking capacity and will damage the rubber components of the brake assembly.



1. Drain screw

5. When most of the oil has drained, slowly raise and lower the outer tubes to pump out the remaining oil.
6. Inspect the drain screw gasket. Replace if damaged. Reinstall the drain screw.
7. Pour the specified amount of oil into the fork inner tube.

Front fork oil (each fork):

262 cc (9.24 oz)

Recommended oil:

Yamaha Fork Oil 10wt or equivalent

9. After filling, slowly pump the forks up and down to distribute the oil.

10. Inspect the "O-ring" on the spring seat. Replace "O-ring" if damaged.
11. Reinstall the spring seat, stopper ring and rubber cap.

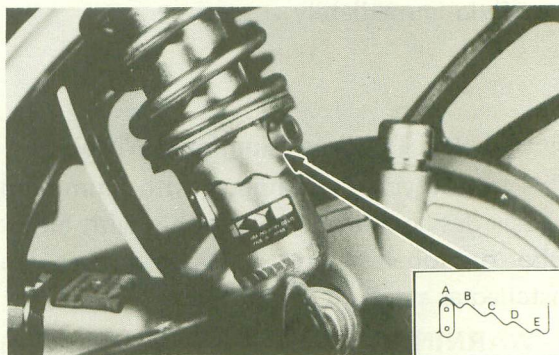
CAUTION:

Always use a new stopper ring (spring wire circlip).

E. Rear Shock Absorber

If the spring seat is raised, the spring becomes stiffer and if lowered, it becomes softer.

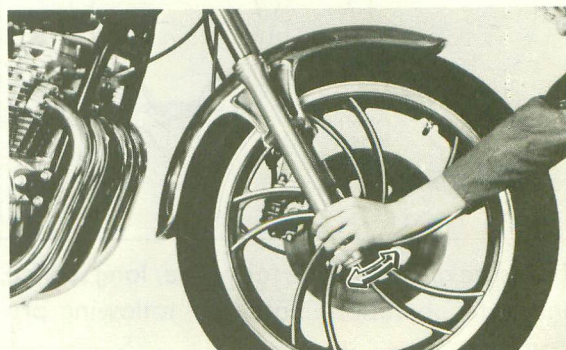
Standard position	A
A. position	Softest
E. position	Stiffest



F. Steering Head Adjustment

The steering assembly should be checked periodically for looseness.

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



3. If there is looseness in the steering head, loosen the steering stem and front fork pinch bolts and steering fitting bolt.
4. Use a steering nut wrench to loosen top steering fitting nut. The top nut serves as a lock nut.
5. Tighten the lower steering fitting nut until the steering head is tight, but does not bind when forks are turned.
6. Retighten the top steering fitting nut, steering fitting bolt and steering stem and front fork pinch bolts, in that order.
7. Recheck steering adjustment to make sure there is no binding when the forks are moved from lock to lock. If necessary, repeat adjustment procedure.

G. Cable Inspection and Lubrication

—WARNING:—

Damage to the outer housing of the various cables, may cause corrosion and often free movement will be obstructed. An unsafe condition may result so replace such cables as soon as possible.

1. If the inner cables do not operate smoothly, lubricate or replace them.

Recommended lubricant:

Yamaha Chain and Cable Lube or
SAE 10W/30 motor oil

H. Throttle Cable and Grip Lubrication

The throttle twist grip assembly should be greased when 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 the throttle grip disassembled, coat the metal surface of the grip assembly with a suitable all-purpose grease to cut down friction.

I. Rear Arm Pivot Bearings

The swing arm must pivot freely on its bearings but not have any excess play. Check and adjust pivot bearings if necessary. (Refer to CHAPTER 5. SWING ARM).

J. Brake and Change Pedals/Brake and Clutch Levers

Lubricate the pivoting parts of each lever and pedal.

Recommended lubricant:

Yamaha Chain and Cable Lube or
SAE 10W/30 motor oil

K. Center and Side Stand Pivots

Lubricate the center and side stands at their pivot points.

Recommended lubricants:

Yamaha Chain and Cable Lube or
SAE 10W/30 motor oil

ELECTRICAL

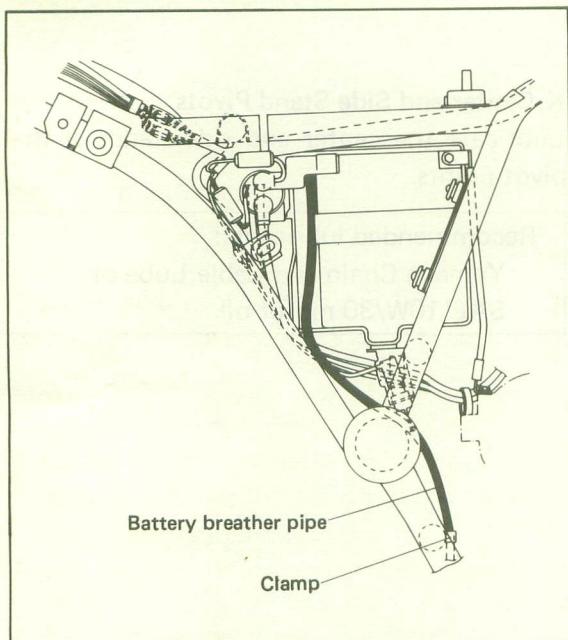
A. Battery

1. The fluid level should be between the upper and lower level marks. Use only distilled water if refilling is necessary.

CAUTION:

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. Make sure the breather pipe is properly connected, properly routed, and is not damaged or obstructed.



CAUTION:

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

Charging current: 1.2 amps/10 hrs or until the specific gravity reaches 1.280 at 20°C (68°F)

WARNING:

Battery electrolyte is poisonous and dangerous, causing severe burns, etc. Contains sulfuric acid. Avoid contact with skin, eyes or clothing.

Antidote: EXTERNAL-Flush with water.

INTERNAL—Drink large quantities of water or milk. Follow with milk of magnesia, beaten egg or vegetable oil. Call physician immediately.

Eyes: Flush with water for 15 minutes and get prompt medical attention. Batteries produce explosive gaseous gases. Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in closed space. Always shield eyes when working near batteries. **KEEP OUT OF REACH OF CHILDREN.**

B. Spark Plug

1. Check the electrode condition and wear, insulator color and electrode gap.
2. Use a wire gauge for measuring the plug gap.
3. If the electrodes become too worn, replace the spark plug.
4. When installing the plug, always clean the gasket surface. Wipe off any grime that might be present on the surface of the spark plug, and torque the spark plug properly.

Standard spark plug:

BP7ES (NGK) or W22EP (ND)

Spark plug gap:

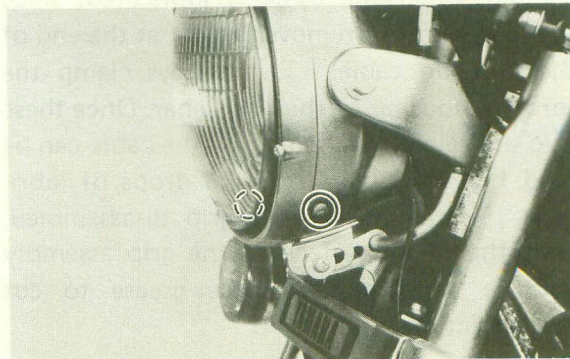
0.7 ~ 0.8 mm (0.028 ~ 0.032 in)

Spark plug tightening torque:

2.0 m·kg (14.5 ft·lb)

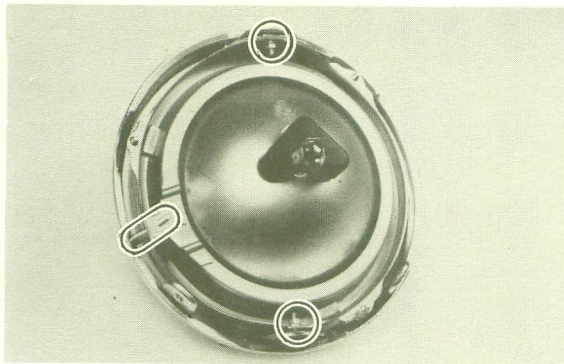
C. Headlight

1. Headlight bulb replacement
 - a. Remove the 2 screws holding the light unit assembly to the headlight body.

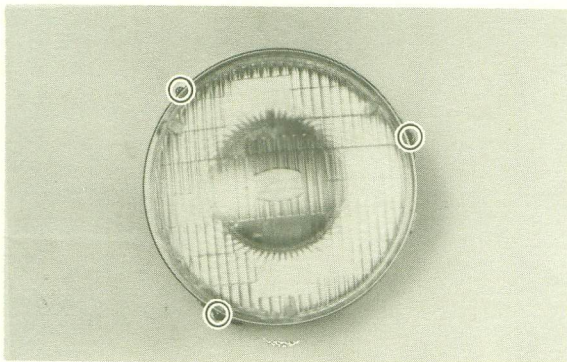


- b. Disconnect the lead wires and remove the light unit assembly.

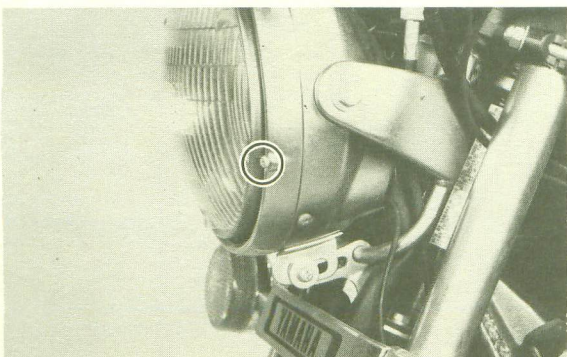
- c. Remove the top and bottom fitting screws and the horizontal adjusting screw. Remove the light unit assembly from the headlight rim.



- d. Remove the sealed beam unit holding screws. Remove the unit retaining ring and the defective unit.

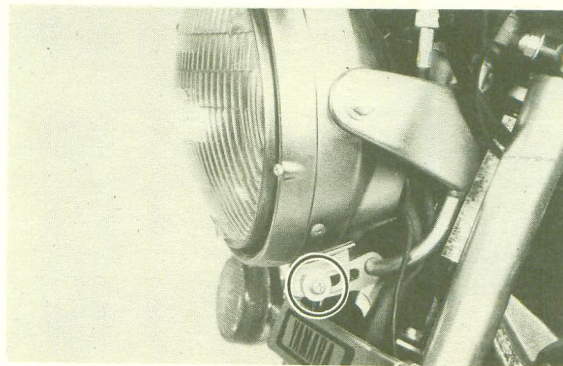


- e. Slip a new sealed beam unit into position and secure it with the retaining ring and install it into the headlight rim.
- f. Reinstall the light unit assembly to the headlight body. Adjust the headlight beam.
2. Headlight beam adjustment
- a. Horizontal adjustment
- To adjust the beam to the right, turn the adjusting screw clockwise.
- To adjust the beam to the left, turn the screw counterclockwise.



- b. Vertical adjustment:

Loosen the adjusting screw under the headlight body. Adjust vertically by moving the headlight body. When proper adjustment is determined, retighten the adjusting screw.



D. Fuse

The fuse block is located under the seat. If any fuse is blown, turn off the ignition switch and the switch in the circuit in question and install a new fuse of proper amperage. Then turn on the switches, and see if the electrical device operates. If the fuse immediately blows again, check the circuit in question (refer to "CHAPTER 6. ELECTRICAL").

—WARNING:—

Do not use fuses of a higher amperage rating than those recommended. Substitution of a fuse of improper rating can cause extensive electrical system damage and possible fire.

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CHAPTER 3. ENGINE OVERHAULING

ENGINE REMOVAL

NOTE:

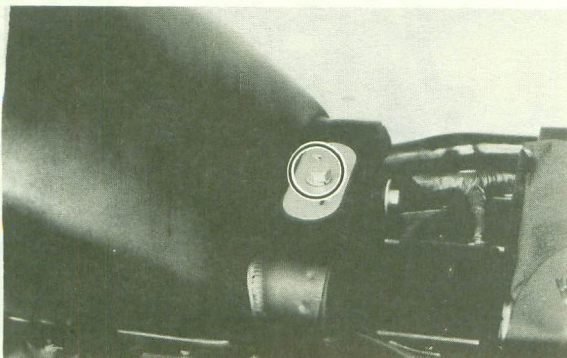
It is not necessary to remove the engine in order to remove the cylinder head, cylinder, or pistons.

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. This will help prevent any harmful foreign material from engine oil.
2. Before the engine removal and disassembly, be sure that you have the proper tools and cleaning equipment so that you can perform a clean and efficient job.
3. During disassembly of the engine, clean and place all of the parts in trays in order of disassembly. This will speed up assembly time and help insure correct reinstallation of all the engine parts.
4. Place the motorcycle on its center stand. Start the engine and allow it to warm up. Stop the engine and drain the engine and middle gear oil.
5. Remove the oil filter element from the crankcase.
6. Remove the left and right side covers.

B. Seat and Fuel Tank

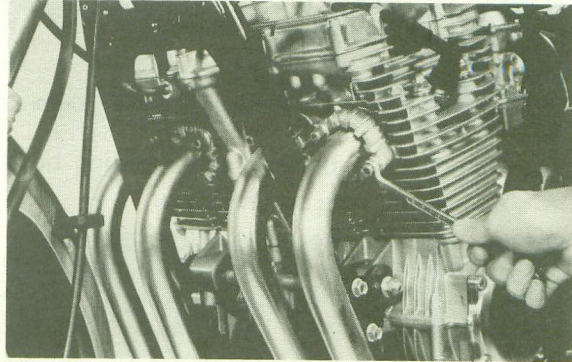
1. Turn the fuel petcock to "ON".
2. Remove the seat and the fuel tank holding bolt. Lift the rear end of the fuel tank and disconnect the fuel pipes and vacuum pipe from the petcock.



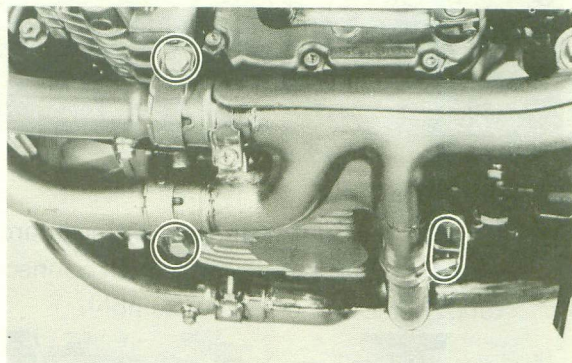
3. Remove the tool tray.

C. Mufflers

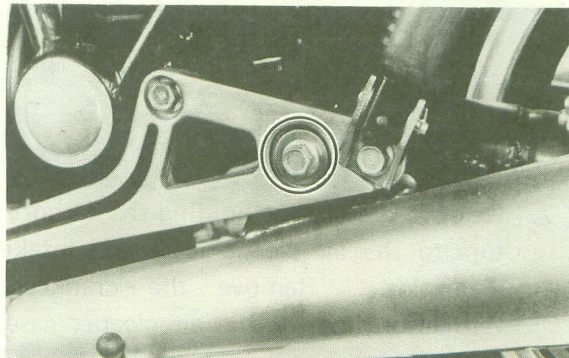
1. Remove the rear brake pedal.
2. Remove the exhaust pipe holding nuts from the cylinder head.



3. Loosen the calmp bolts securing the muffler joints.

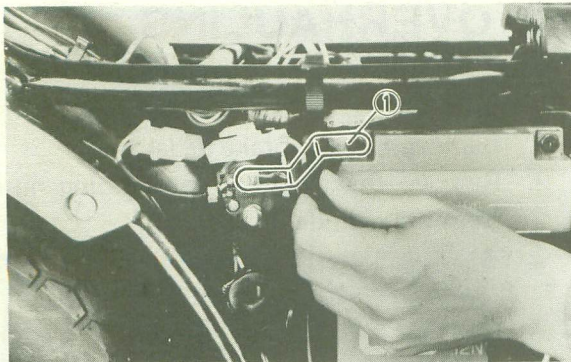


4. Remove the bolts holding the right and left mufflers to the muffler bracket and remove the left and right mufflers.



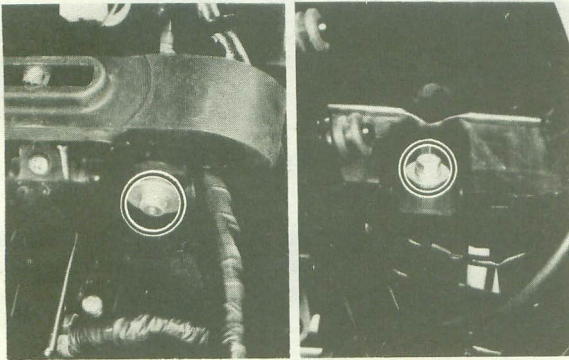
D. Battery Case

1. Remove the negative battery cable from the battery terminal then remove the positive battery plate. Remove the battery.



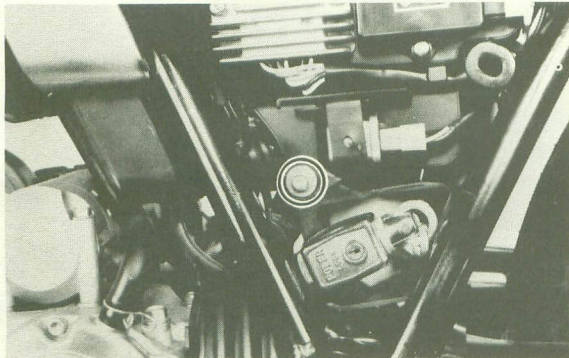
1. Positive battery plate

2. Remove the battery case holding bolts and remove the battery case.

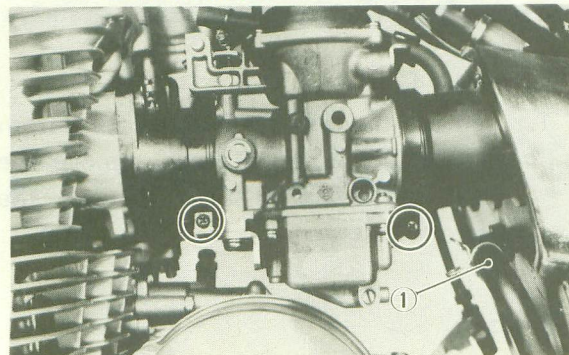


E. Air Cleaner Case

1. Remove the ignitor unit mounting board securing screw and disconnect all connectors. Remove the board assembly.

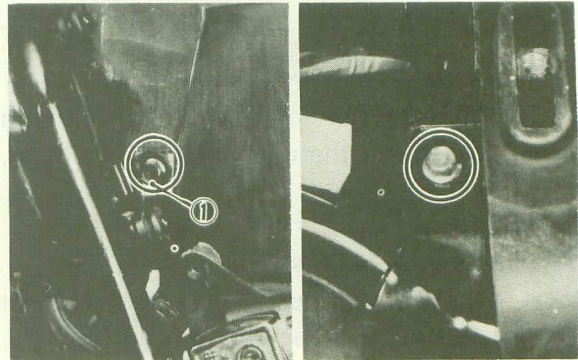


2. Remove the clamps holding the carburetors to the air cleaner case and intake manifolds. Remove the crankcase ventilation hose at the air cleaner case.



1. Crankcase ventilation hose

3. Remove the bolts holding the air cleaner case to the frame (left and upper)

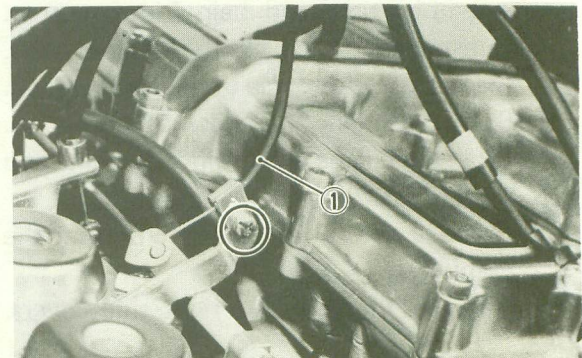


1. Engine ground wire

NOTE:

The engine ground wire is secured together with left side holding bolt.

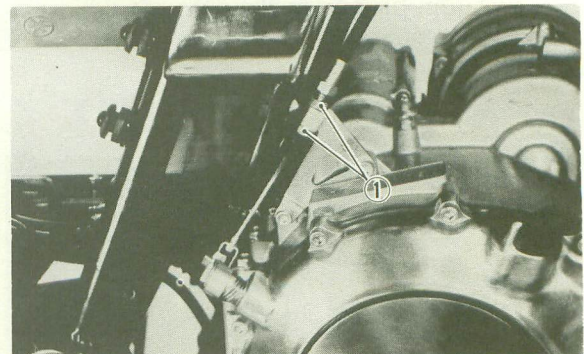
4. Remove the starter (CHOKE) cable from the carburetor.
5. Remove the air cleaner joint rubbers and pull the carburetor assembly to the rear.
6. Disconnect the throttle cable from the carburetor throttle lever and remove the carburetor assembly to the right.



1. Starter (CHOKE) cable 2. Throttle cable

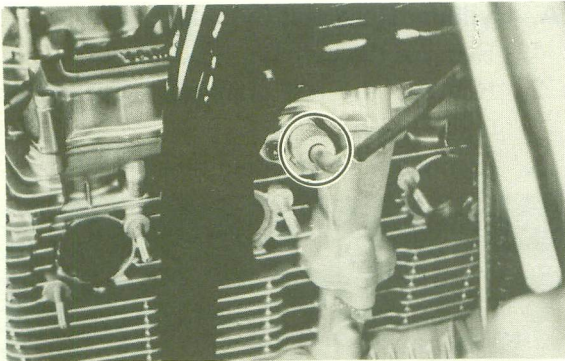
F. Wiring and Cables

1. Disconnect the clutch cable at the crankcase side.

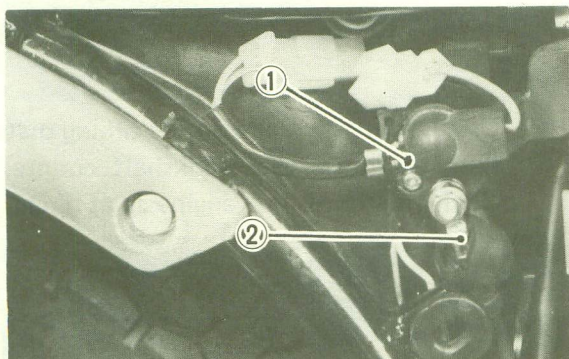


1. Lock nut

2. Remove the spark plug lead wires and the tachometer cable.

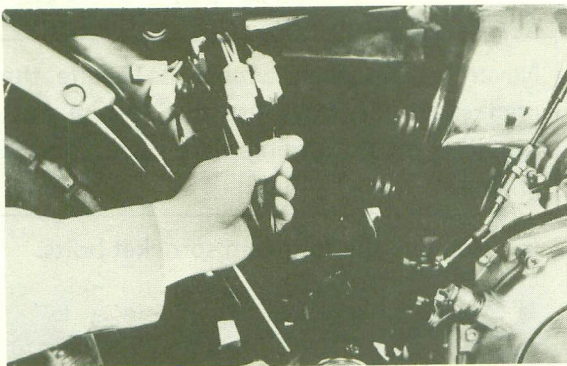


3. Disconnect the electric starter cable at the starter relay switch.



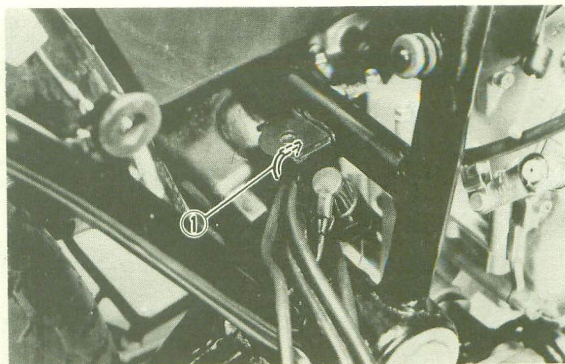
1. Starter relay switch
2. Electric starter cable

4. Disconnect the pick-up coil and A.C.G. lead wire couplers.
Position the disconnect lead wires so that they can be safely removed.



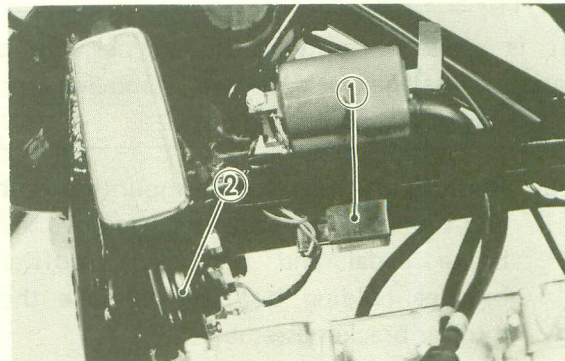
CAUTION:

The A.C.G. lead, starter cable, and pick-up lead are clamped at the upper cross tube of the frame. Do not forget to remove this clamp before removing the engine.



1. Clamp

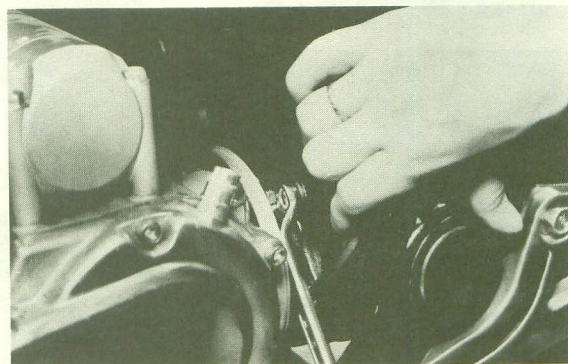
5. Remove the horn and flasher relay.



1. Flasher relay
2. Horn

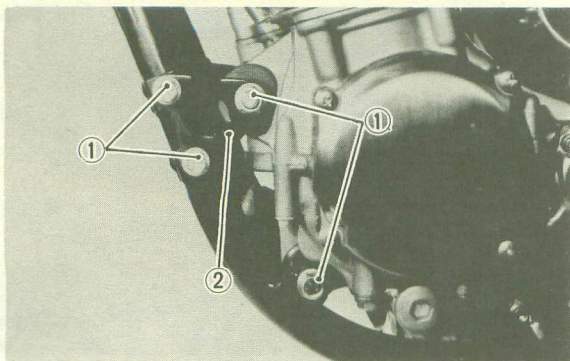
G. Drive Shaft Joint

1. Remove the coil spring holding the rubber boot.
2. Pull the rubber boot from the drive shaft coupling to expose the joint bolts.
3. Remove the joint bolts on the drive shaft coupling.



H. Engine Removal

1. Remove the front engine mounting bolts and nuts. Remove the brackets.

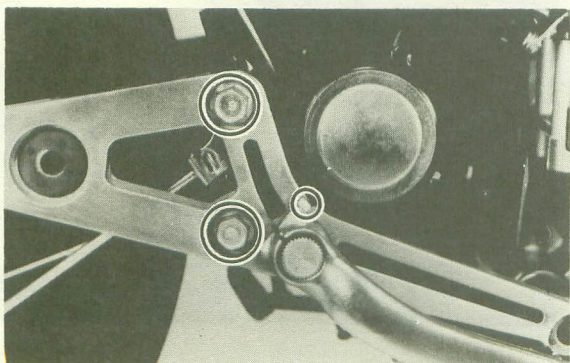
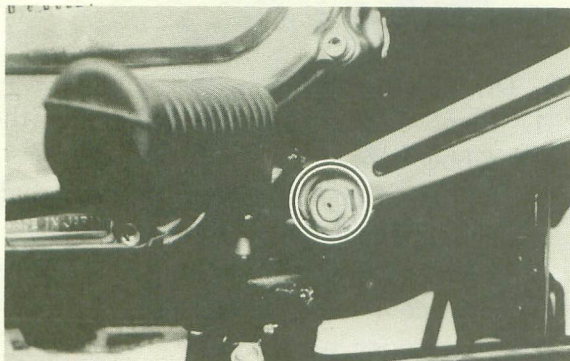


1. Front engine mounting bolts 2. Engine stay

NOTE:

It is advisable to hold the engine with a suitable garage jack before removing the engine mounting bolts and nuts.

2. Remove the rear engine mounting bolt and right and left footrests. Remove the brake pedal and right side muffler bracket holding bolt and remove the muffler bracket assembly.



3. Slide the engine forward slightly and remove the engine to the right.

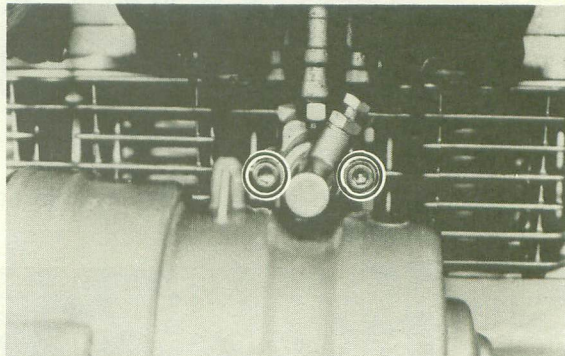
NOTE:

Position a box or other support to the right side of the motorcycle for the assistance when removing the engine.

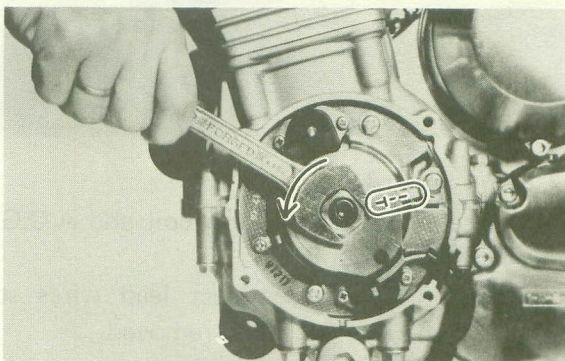
ENGINE OVERHAUL

A. Cylinder Head and Cylinder

1. Remove the cylinder head cover.
2. Remove the left crankcase cover (pick-up coil cover).
3. Remove the cam chain tensioner.



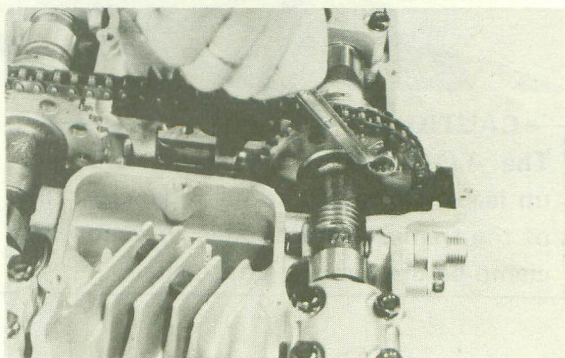
4. Use a 19 mm wrench on the timing plate flats to rotate the crankshaft counter-clockwise until the engine is at T.D.C.



CAUTION:

Never use an allen wrench to rotate the crankshaft. Always use the 19 mm flats provided on the timing plate to rotate this engine.

5. Remove the four cam sprocket bolts.

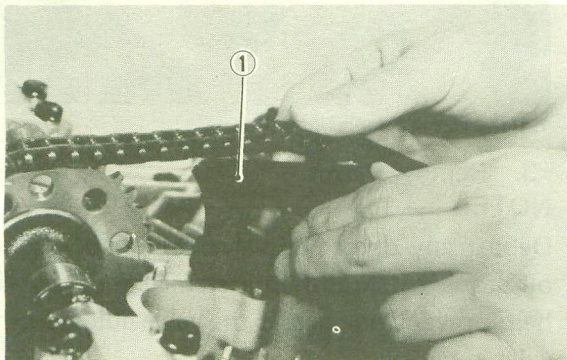


6. Slip each sprocket off its mounting boss on the cam.

CAUTION:

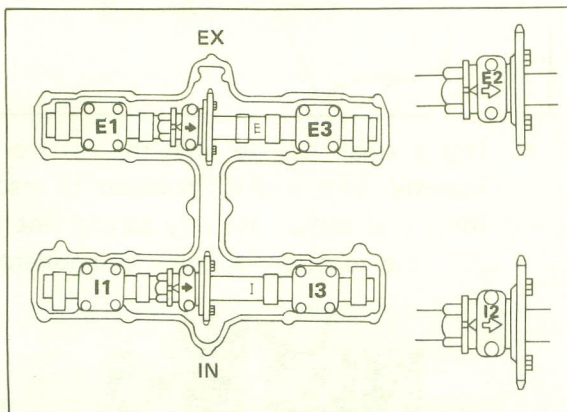
From this point on, do not rotate the cam shaft or valve damage may occur. On this, it is not necessary to break the cam chain. However, it can be broken if so desired. It is easier to disassemble the engine without separating the chain.

7. Remove the cam chain guide.

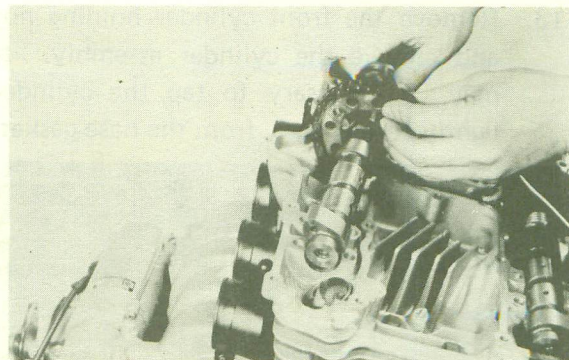


1. Cam chain guide

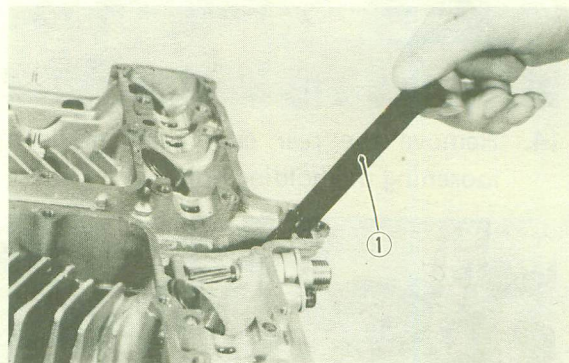
8. Remove the cam caps. Note the location of the cam caps. The caps for the intake cam shaft are identified I-1 through I-3. The exhaust cam caps are identified E-1 through E-3. Directional arrows are cast on each cap and point toward the clutch side.



9. Fasten safety wire to the cam chain to prevent its falling into the crankcase cavity. Slide the cams and sprockets from under the chain and remove the cams and sprockets.

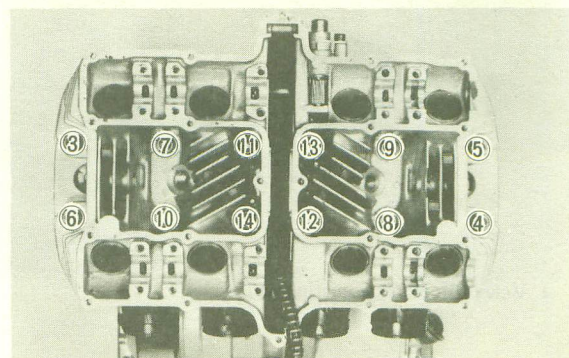
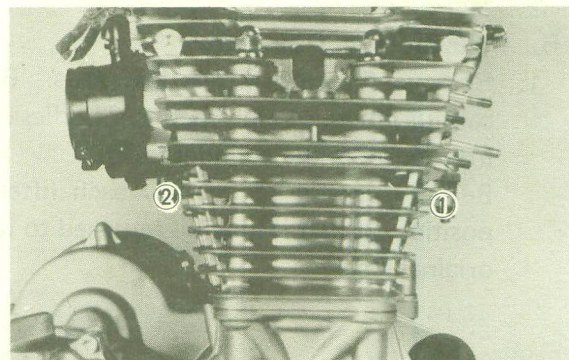


10. Remove the front cam chain guide.

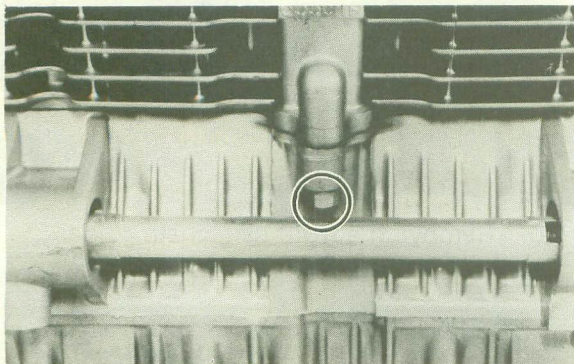


1. Front cam chain guide

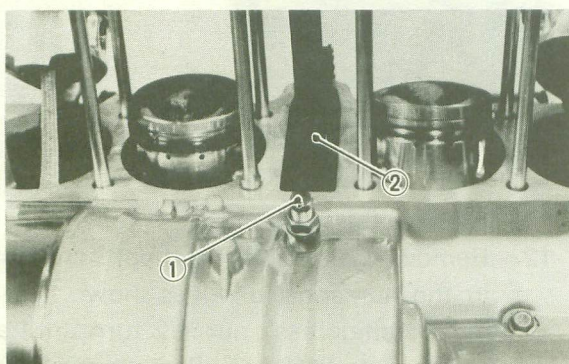
11. Remove the spark plugs.
12. Remove the cylinder head bolts and nuts in the numerical order as shown. Start by loosening each nut 1/2 turn until all of the nuts are loose. Remove the cylinder head.



13. Remove the front cylinder holding nut and remove the cylinder assembly. It may be necessary to tap the cylinder lightly to loosen it from the base gasket.



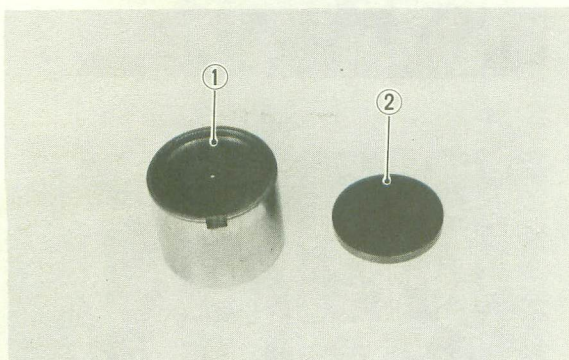
14. Remove the rear cam chain guide by loosening the holding bolt.



1. Holding bolt 2. Rear cam chain guide

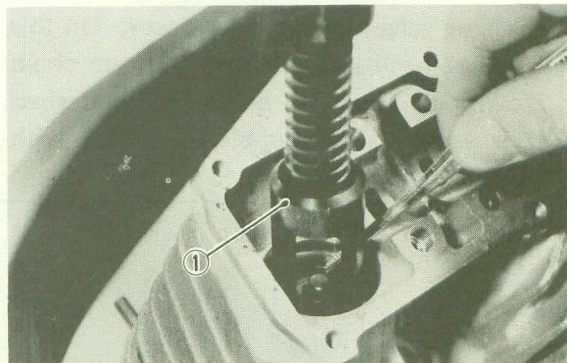
B. Cylinder Head Disassembly

1. Remove the valve lifters and pads. Be careful not to scratch the lifter bodies or lifter bores in the cylinder head. Be very careful to identify each lifters position so that it may be returned to its original place.



1. Valve filter 2. Adjusting pad

2. Mount the valve spring compressor on the head and depress each valve spring. Take out the retainer and valve spring with tweezers.

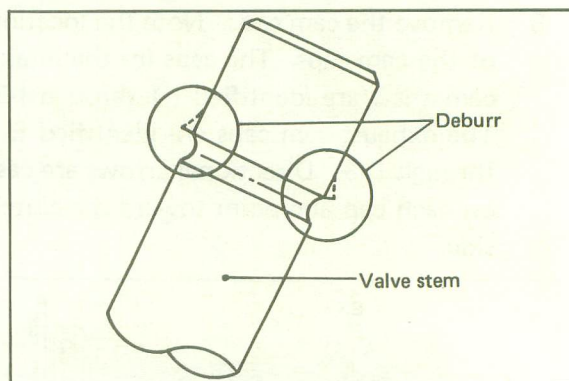


1. Valve spring compressor

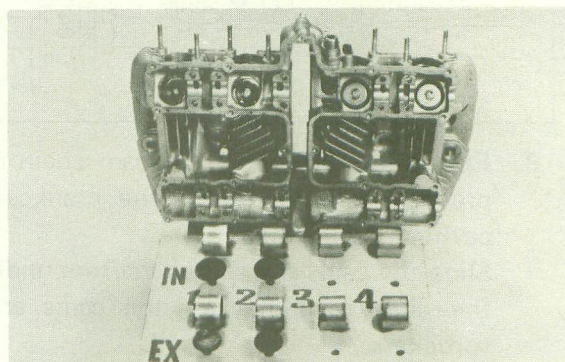
3. Remove valves.

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.

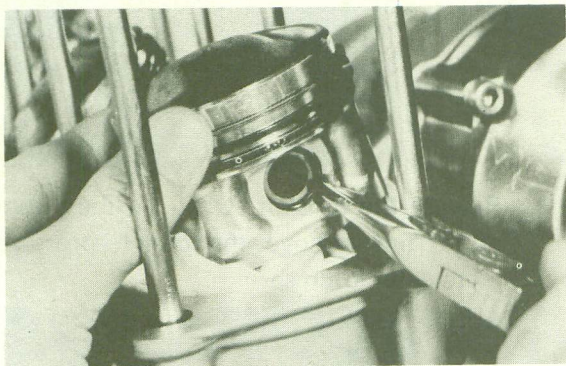


4. Use a small box to hold the parts and identify the original position of each lifter and valve. Be very careful not to mix the location of these components.



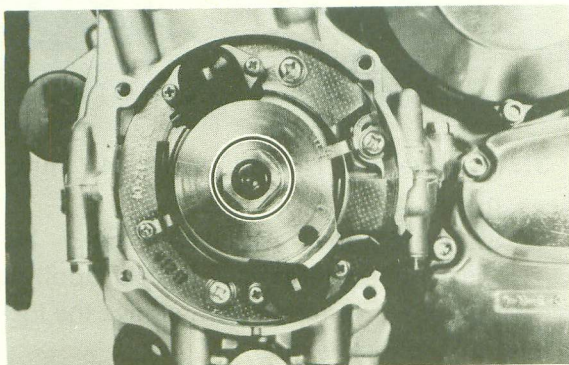
C. Piston

1. Make each piston to aid in reassembly.
2. Place a clean towel or rag into the crankcase to keep circlips and material from falling into the engine.
3. Remove piston pin clips, piston pins, and pistons.

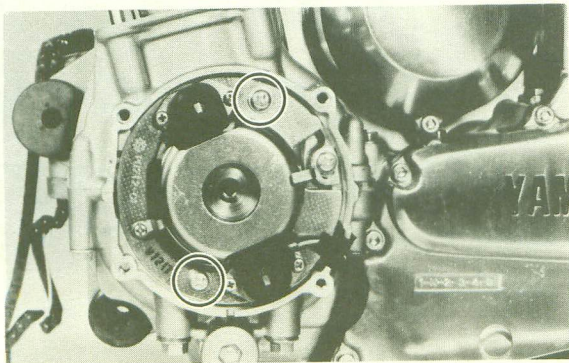


D. Pick-up Coil Assembly

1. Remove the allen bolt that holds the timing plate.

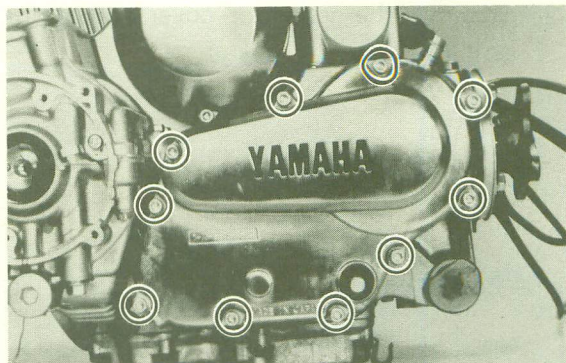


2. Remove the pick-up coil securing screws and remove the pick-up coil assembly.

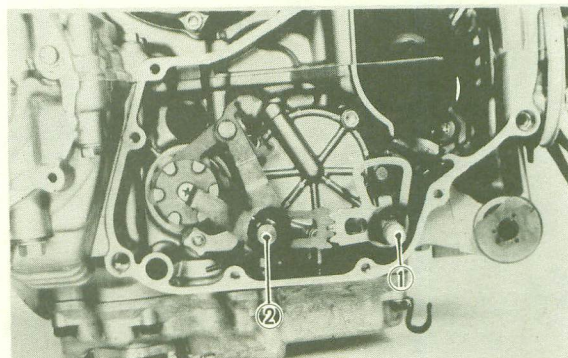


E. Shifter

1. Remove the change pedal.
2. Remove the left crankcase cover.

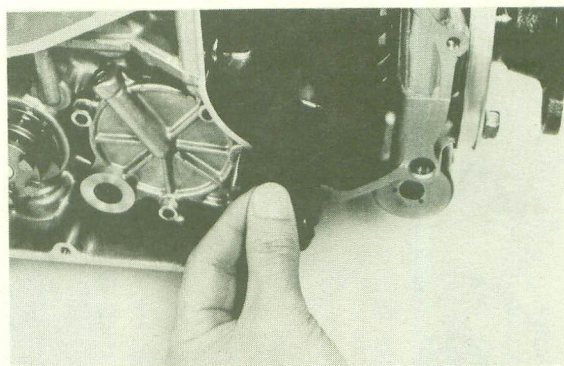


3. Remove the shift lever assembly and shift shaft assembly.



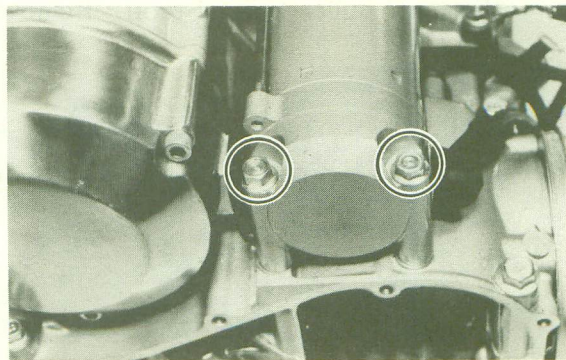
1. Shift lever assembly 2. Shift shaft assembly

4. Remove the middle gear case oil level maintaining plug.

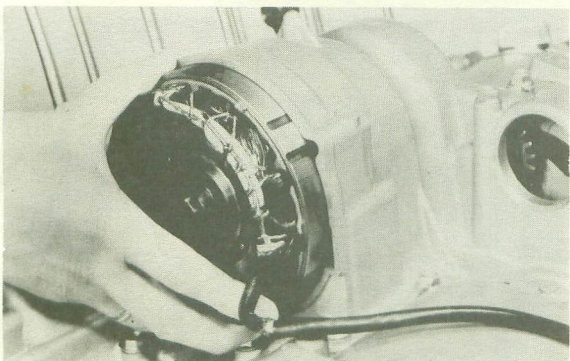
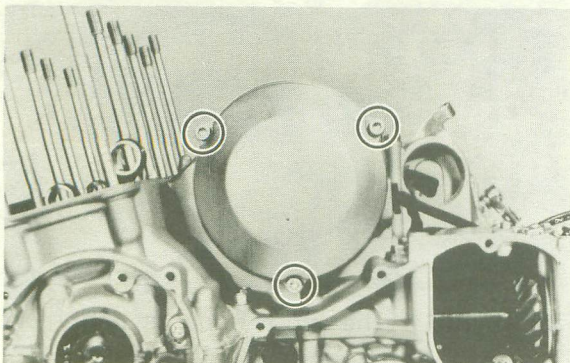


F. Starter Motor and Generator

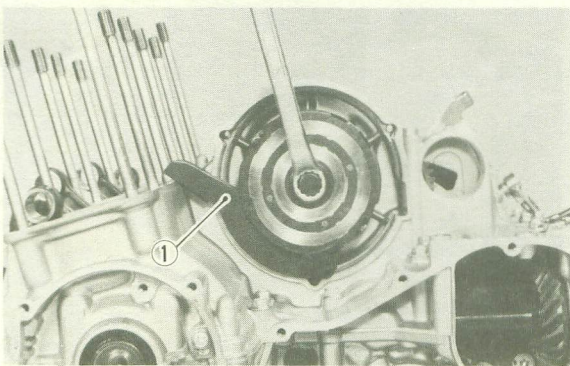
1. Remove the starter motor securing bolts and remove the motor assembly.



2. Remove the generator cover and stator coil assembly.

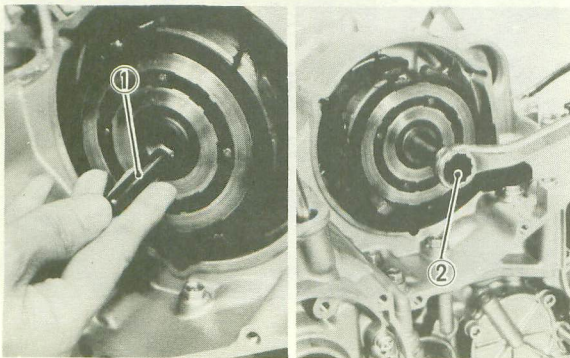


3. Install the rotor holding tool (special tool) on the rotor as shown and remove the rotor holding bolt.



1. Rotor holding tool

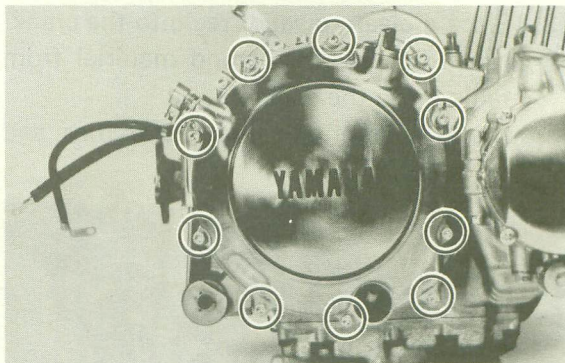
4. Invert the holding tool as shown and insert the rotor puller adapter (special tool) into the rotor shaft and screw in the rotor puller (special tool). Remove the rotor.



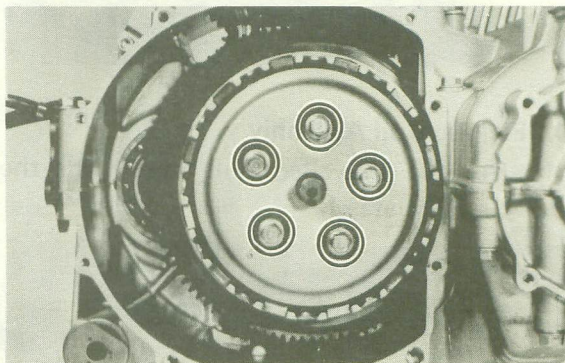
1. Rotor puller adapter
2. Rotor puller

G. Clutch

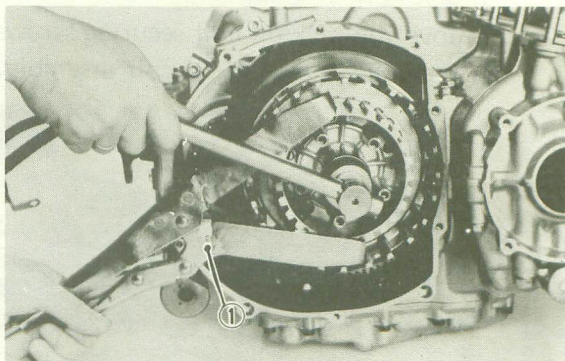
1. Remove right crankcase cover.



2. Release the tension evenly on the 6 mm bolts and remove the clutch pressure plate and clutch springs.

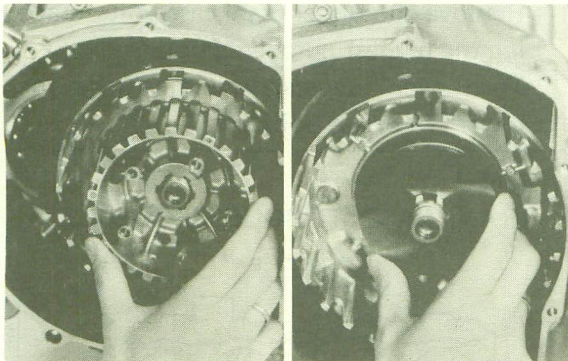


3. Remove the friction plates and clutch plates.
4. Straighten the lock washer tab. Use the clutch boss holder (special tool) to hold the clutch boss and remove the lock nut and lock washer.

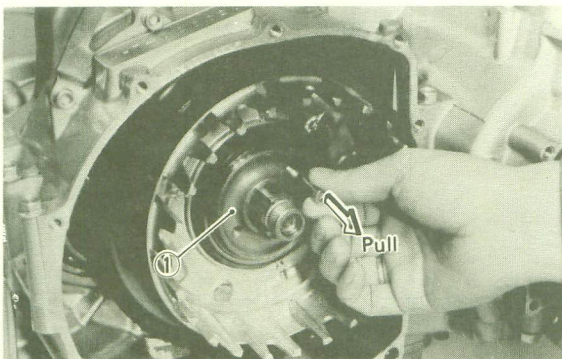


1. Clutch boss holder

5. Remove the clutch boss and spacer.

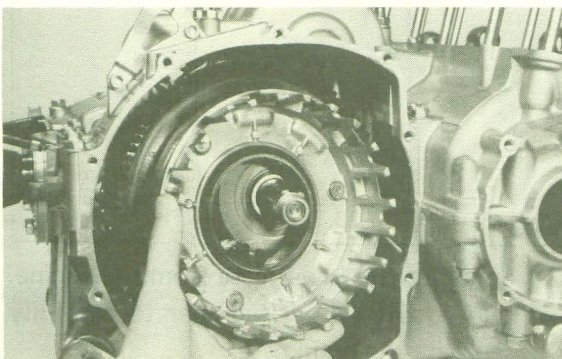


6. Screw in a suitable length of 6 mm bolt into the one of the threaded holes on the collar and pull out the collar and needle bearing from the primary driven gear.



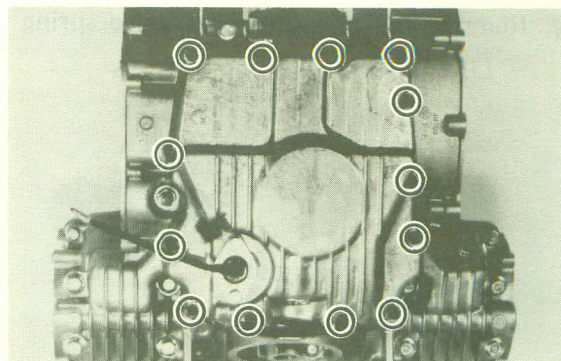
1. Collar

7. Remove the primary driven gear assembly and oil pump drive sprocket.

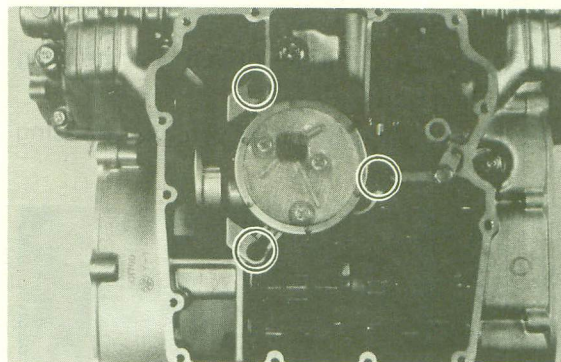


H. Oil Pump Removal and Disassembly

1. Remove the strainer cover. Note the wire harness clip position.



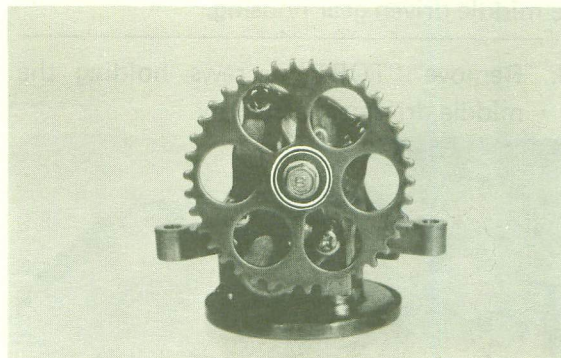
2. Remove the oil pump securing bolts and remove the sprocket cover and oil pump assembly.



CAUTION:

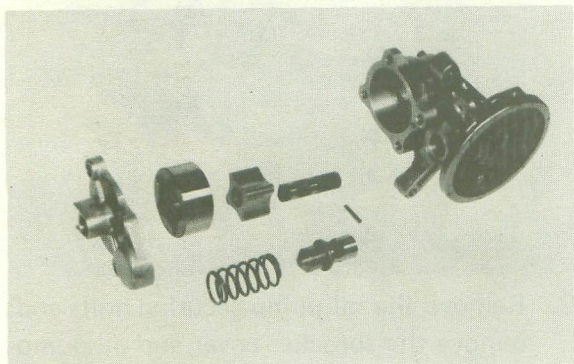
Do not attempt to remove the strainer screen as it is permanently fitted onto the pump housing. If the pump housing and/or any parts of the pump are damaged, the pump assembly must be replaced with a new one.

3. Remove the oil pump driven sprocket.



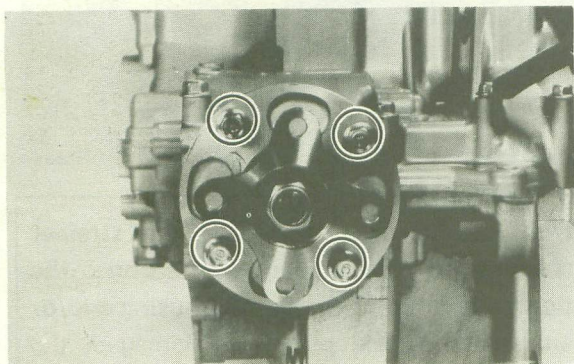
4. Remove the oil pump cover and rotor assembly.

- Remove the pressure relief valve spring and plunger.



I. Middle Gear

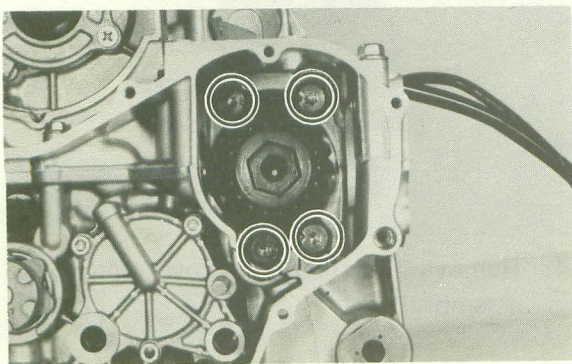
- Remove the middle driven gear housing holding bolts.
- Remove the middle driven gear housing assembly and shims.



NOTE:

If it is difficult to remove housing assembly, loosen the two crankcase bolts located near the middle driven gear housing.

- Remove "TORX" screws holding the middle drive gear assembly.



- Remove the bearing retainers.

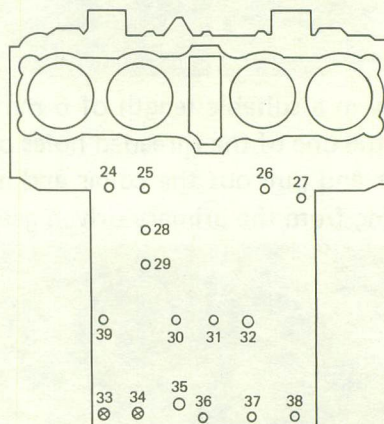
J. Crankcase Disassembly

- Remove the upper crankcase bolts, starting the highest numbered bolt.
Turn over the engine and remove the lower crankcase bolts.

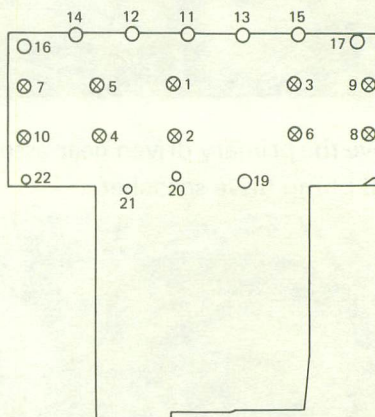
XJ650

CRANKCASE TORQUE SEQUENCE

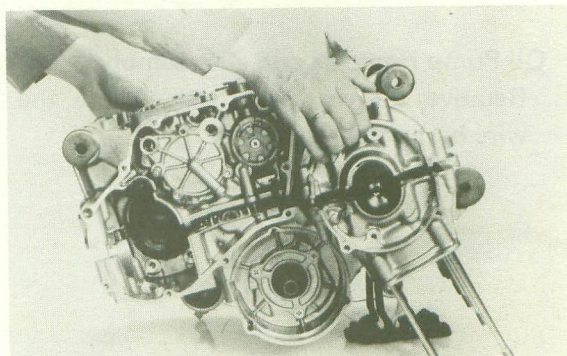
UPPER CASE



LOWER CASE

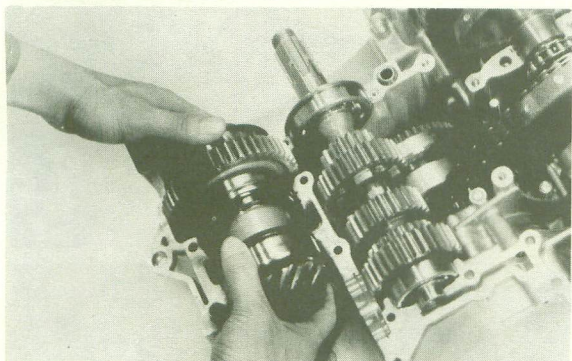


- Separate the lower case from the engine.
Use a soft rubber hammer to carefully separate the crankcase.

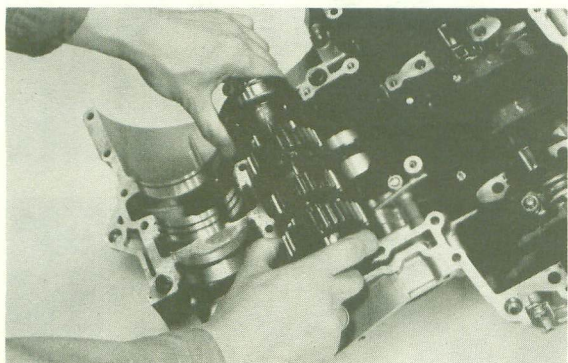


K. Upper Crankcase

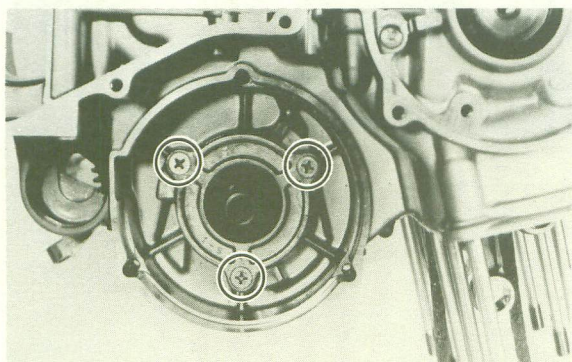
1. Remove the middle drive gear and damper assembly.



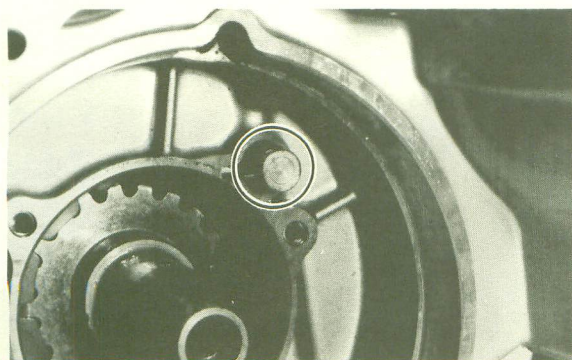
2. Remove the transmission main shaft assembly.



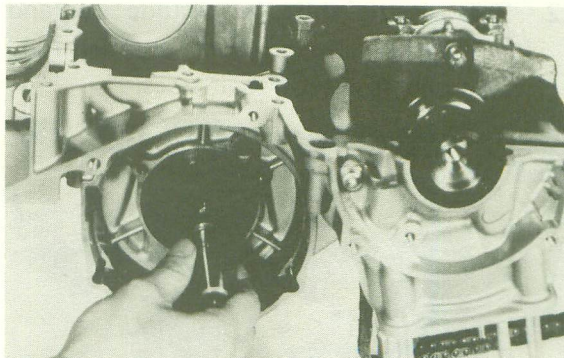
3. Remove the A.C.G. shaft cover.



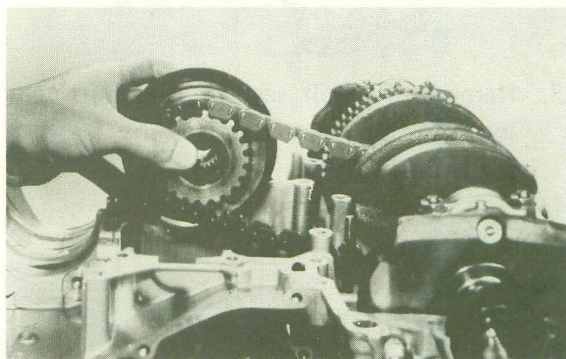
4. Remove the oil spray nozzle.



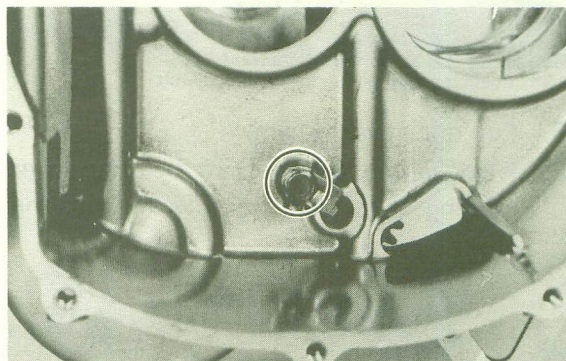
5. Carefully remove the A.C.G. shaft from the gear.



6. Remove the gear from the chain.

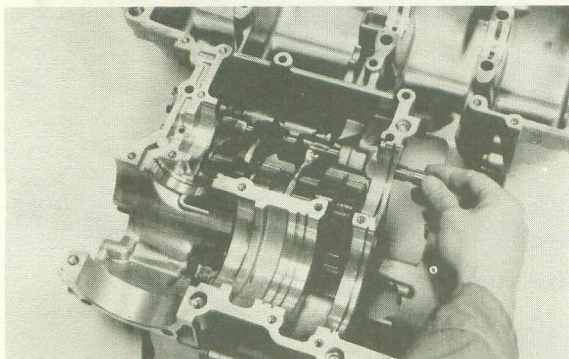


7. Straighten the lock washer tube and remove the bolt securing the starter idle gear shaft. Remove the shaft and starter idle gear.

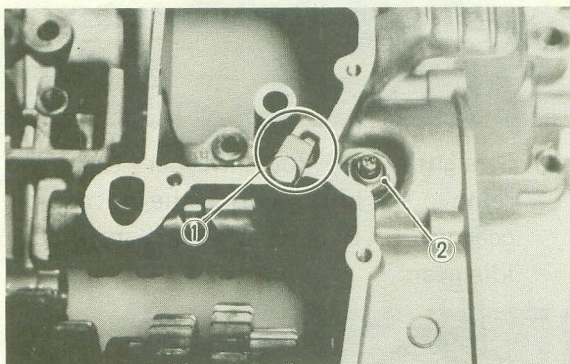


L. Lower Crankcase

1. Remove the dowel pin and "O-ring".
2. Remove the shift fork guide bar and shift forks. The shift forks are identified by numbers cast on their sides.

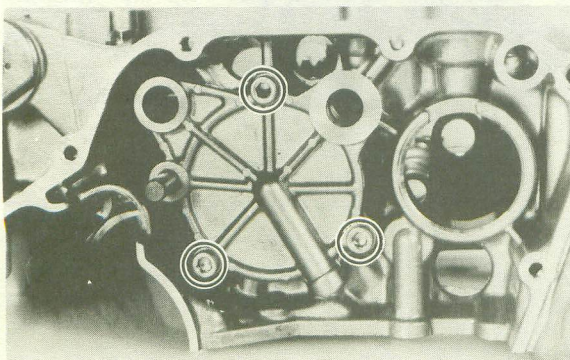


3. Remove the bolt securing the shift cam locating pin and remove the stopper plate and locating pin.
4. Remove the neutral switch.

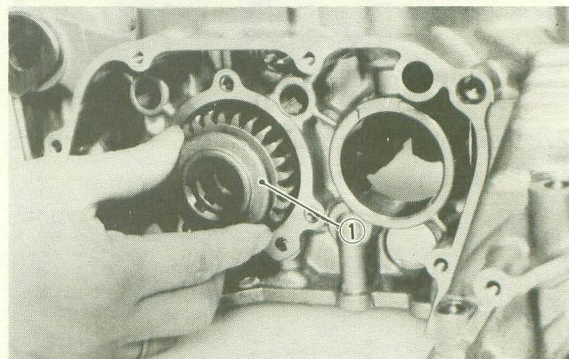
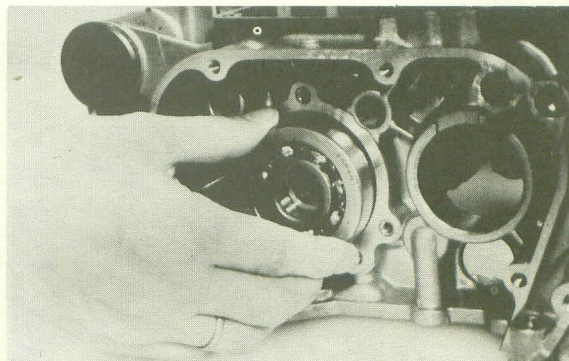


1. Shift cam locating pin 2. Neutral switch

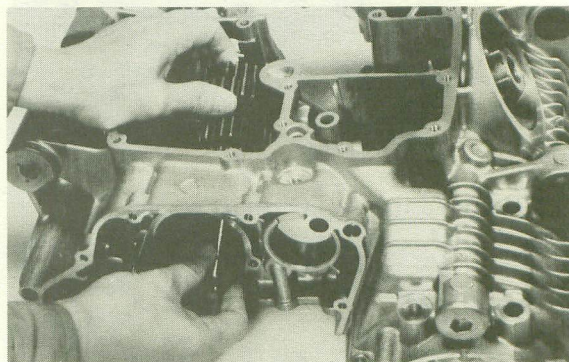
5. Pull out the shift cam.
6. Remove the driven shaft bearing cover holding screws and remove the bearing cover.



7. Remove the bearing and 5th wheel gear from the driven shaft and pull out the driven shaft assembly.



1. 5th wheel gear



INSPECTION AND REPAIR

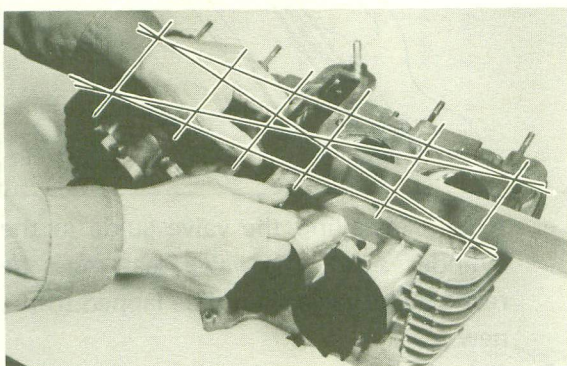
A. Cylinder Head Cover

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. 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.
2. Check the cylinder head warpage with a straight edge as shown.



The warpage should not exceed the specified limit, if necessary resurface. If the warpage exceeds allowable limit, the cylinder head should be replaced with a new one.

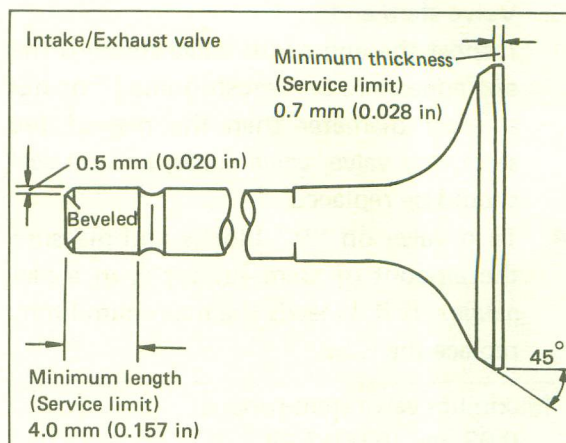
Cylinder head warpage:

less than 0.05 mm (0.002 in)

Allowable limit: 0.25 mm (0.010 in)

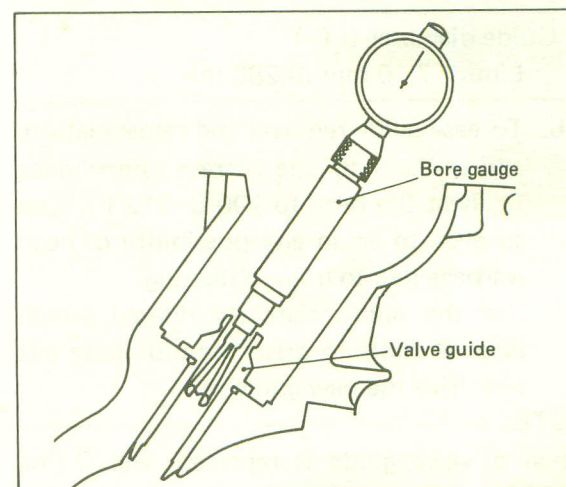
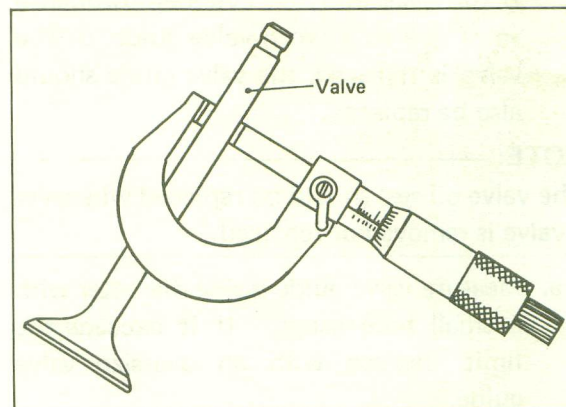
C. Valve, Valve Guide, and Valve Seat

1. Check the valve face and the stem end for wear. If the valve face and/or the stem end are pitted or worn, regrind the valve with a valve refacer. Replace the valve if any dimension exceeds the specifications in the illustration.



2. Valve stem wear must be measured and then combined with valve guide measurements to guide clearance. This clearance must be within tolerances. If it exceeds the maximum limit, then replace either or both valve and guide, as necessary.

	Valve Stem Clearance	Maximum
Intake	0.010 ~ 0.037 mm (0.0004 ~ 0.0015 in)	0.10 mm (0.004 in)
Exhaust	0.025 ~ 0.052 mm (0.0010 ~ 0.0020 in)	0.12 mm (0.005 in)

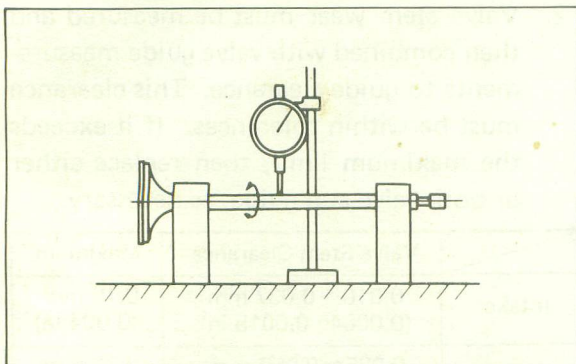


3. Valve stem end

Inspect the end of the valve stem. If the end appears to be "mushroomed" or has a larger diameter than the rest of the stem, the valve, valve guide, and oil seal should be replaced.

4. Turn valve on "V" blocks and measure the amount of stem runout with a dial gauge. If it exceeds the maximum limit, replace the valve.

Maximum valve stem runout:
0.03 mm (0.0012 in)



5. Valve guide and valve oil seal replacement

If oil leaks into the cylinder through a valve due to a worn valve guide, or if a valve is replaced, the valve guide should also be replaced.

NOTE:

The valve oil seal should be replaced whenever a valve is removed or replaced.

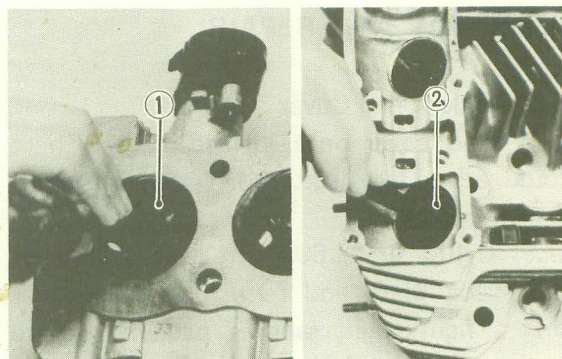
- a. Measure valve guide inside diameter with a small bore gauge. If it exceeds the limit, replace with an oversize valve guide.

Guide diameter (I.D.):
Limit: 7.10 mm (0.280 in)

- b. To ease guide removal and reinstallation, and to maintain the correct interference fit, heat the head to 100°C (212°F). Use an oven to avoid any possibility of head warpage due to uneven heating.
- c. Use the appropriate shouldered punch (special tool) to drive the old guide out and drive the new guide in.

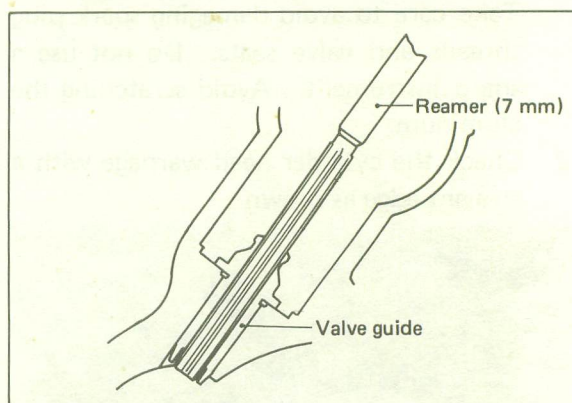
NOTE:

When a valve guide is replaced, the O-ring should also be replaced.

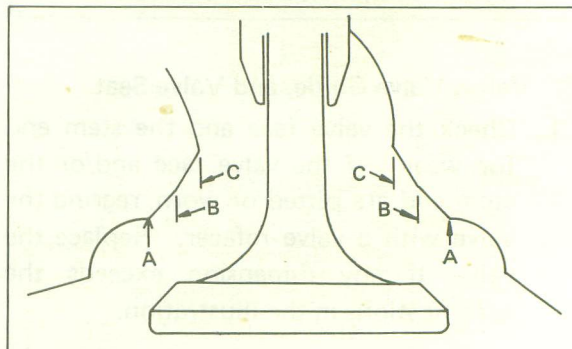


1. Valve guide remover
2. Valve guide installer

- d. After installing the valve guide, use the 7 mm reamer (special tool) to obtain the proper valve guide to valve stem clearance.



- e. After installing the valve guide in the cylinder head, the valve seat must be recut. The valve should be lapped to the new seat.
- ### 6. Grinding the Valve Seat
- a. The valve seat is subject to severe wear. Whenever the valve is replaced or the valve face is re-surfaced (see caution) the valve seat should be re-surfaced at a 45° angle. If a new valve guide has been installed the valve seat must be recut to guarantee complete sealing between the valve face and seat.



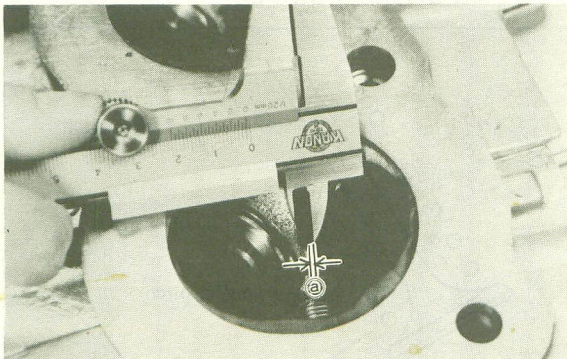
CAUTION:

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 30° cutter. If cutting section "B", use the 45° cutter. If cutting section "C" use 60° cutter.

- b. Measure valve seat width. Apply mechanic's bluing dye (such as Dykem) to the valve face and valve seat, apply a very small amount of fine grinding compound around the surface of the valve face 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 and valve face will have removed bluing wherever they contacted each other. Measure the seat width with vernier calipers. It should measure approximately 1.1 mm (0.0433 in). Also, the seat should be uniform in contact area. If valve seat width varies, or if pits still exist, further cutting will be necessary. Remove just enough material to achieve a satisfactory seat.

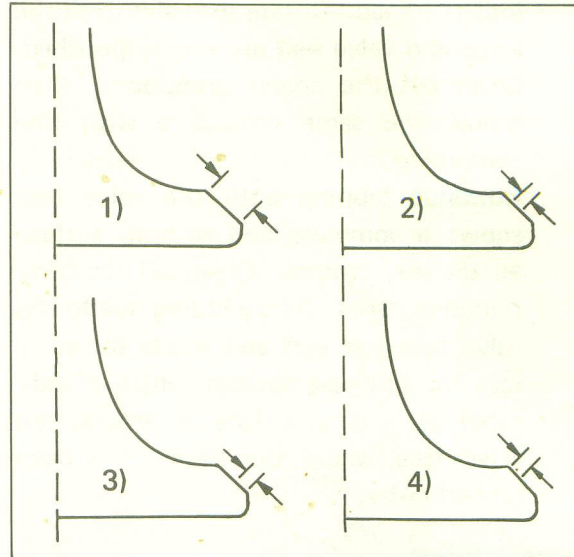
	Standard Width	Wear Limit
Seat width	1.0 ± 0.1 mm (0.0394 ± 0.0039 in)	2.0 mm (0.080 in)



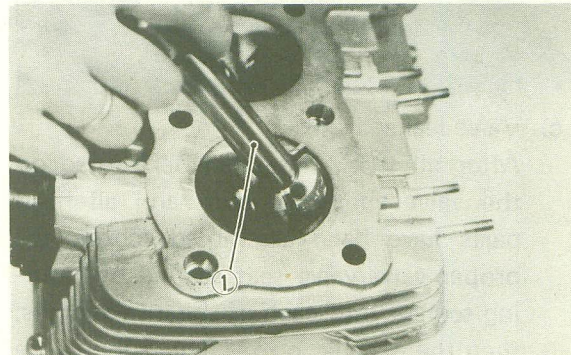
a. Seat width

- 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 30°, 45° or 60° 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 30° and the 60° cutters to reduce the seat width to 1.1 mm (0.0433 in).



1. Valve seat cutter

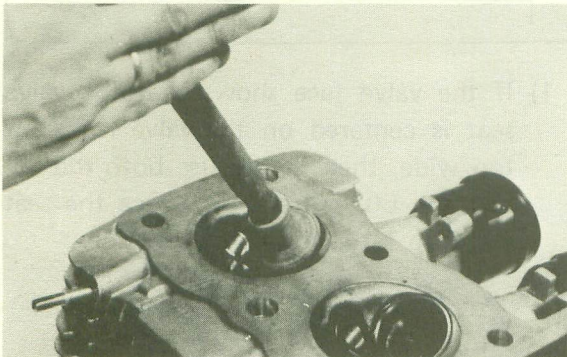
- 2) If the seat shows to be in the middle of the valve face, but too narrow, use the 45° cutter until the width equals 1.1 mm (0.0433 in).
- 3) If the seat is too narrow and right up near the valve margin, then first use the 30° cutter and then the 45° cutter to get the correct seat width.
- 4) If the seat is too narrow and down near the bottom edge of the valve face, then first use the 60° cutter and then the 45° cutter.

7. Lapping the valve/valve seat assembly

- a. The valve/valve seat assembly should be lapped if neither the seat nor the valve face are severely worn.

- 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 seat and rotate the valve face for full seat contact which is indicated by a grey surface all around the valve face where the bluing has been rubbed away.



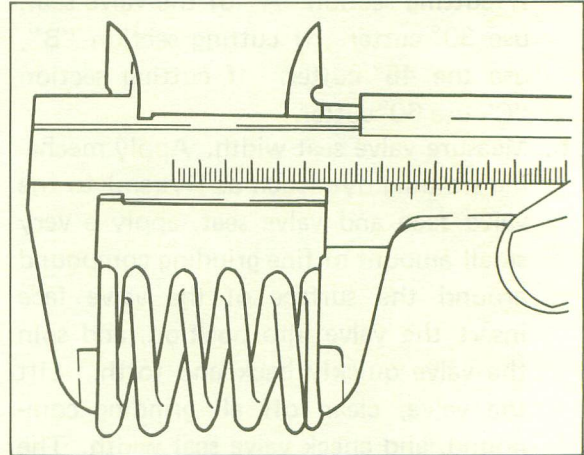
- c. Valve leakage check

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.

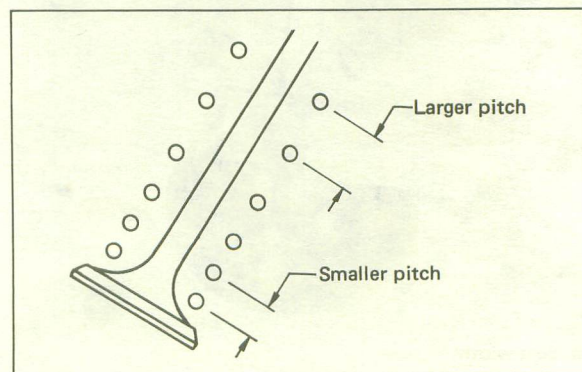
D. Valve Spring and Lifters

1. Checking the valve springs
 - a. This engine uses two springs of different sizes to prevent valve float or surging. The valve spring specifications show the basic value 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 (0.080 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 the length with the valve open. Note the poundage indicated on the scale at each setting. Use this procedure with the outer springs, then the inner springs.



NOTE:

All valve springs must be installed with larger pitch upward as shown.

Valve Spring Specifications		
	OUTER	INNER
Free length	39.5 mm (1.55 in)	35.9 mm (1.413 in)
Installed length (valve closed)	34.0 mm (1.339 in)	31.0 mm (1.220 in)
Installed pressure	19.1 kg (42.1 lb)	9.0 kg (19.8 lb)
Allowable tilt from vertical	1.6°	←

2. Valve lifter

- a. Check each valve lifter for scratches or other damage. If the lifter is damaged in any way, the cylinder head surface in which it rides is probably also damaged. If the damage is severe, it may be necessary to replace both the lifter and the cylinder head.

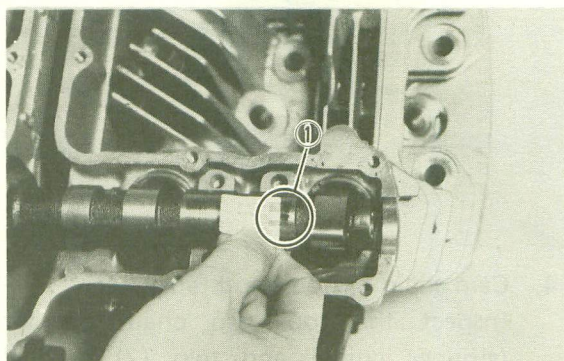
NOTE: _____
For proper valve lifter-to-head clearance, always install lifters on their original valves.

E. Camshafts, Cam chain and Cam Sprockets

1. Camshaft

- a. 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.
- b. If any of the above wear conditions are readily visible, the camshaft should be replaced.
- c. 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.
- d. Install the camshaft on the cylinder head. Place a strip of Plastigage between camshaft and camshaft cap as illustrated (lengthwise along camshaft). Tighten the nuts with specified torque. Remove the camshaft cap and determine the clearance by measuring the width of the flattened Plastigage.

Cap nut tightening torque:
1.0 m-kp (7.2 ft-lb)



1. Plastigage

NOTE: _____
Do not turn camshaft when measuring clearance with Plastigage.

Camshaft-to-cap clearance:

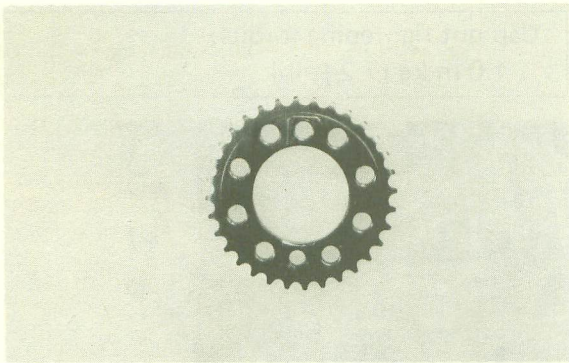
Standard: 0.020 ~ 0.054 mm
(0.0008 ~ 0.0021 in)
Maximum: 0.160 mm (0.006 in)

If the camshaft-to-cap clearance exceeds specification, measure camshaft bearing surface diameter.

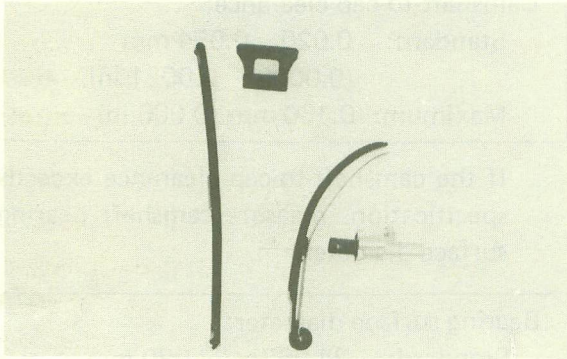
Bearing surface diameter:

Standard: 24.967 ~ 24.980 mm
(0.9830 ~ 0.9835 in)

- 1) If camshaft diameter is less than specification, causing excessive clearance, replace camshaft.
- 2) If camshaft is within specification and camshaft-to-cap clearance is excessive, replace cylinder head.
2. 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.
3. Cam sprockets
Check cam sprockets for obvious wear.



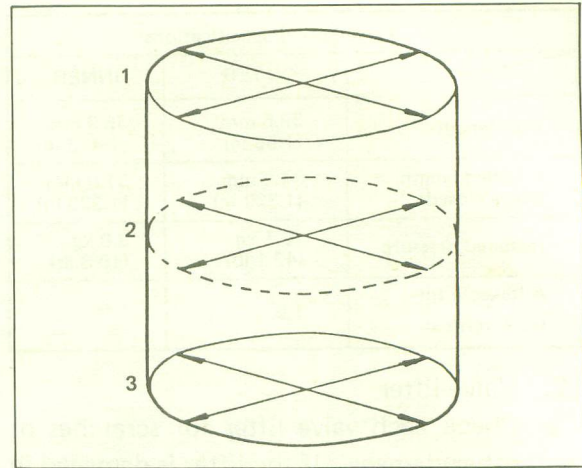
4. Cam chain dampers and tensioner
Inspect the top cam chain damper (stopper guide) and two (2) vertical (slipper-type) dampers for excessive wear. Any that shows excessive wear should be replaced. Worn dampers may indicate an improperly adjusted or worn-out cam chain.



F. 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	63.00 mm (2.480 in)	63.10 mm (2.484 in)
Cylinder taper	—	0.05 mm (0.002 in)
Cylinder out-of-round	—	0.01 mm (0.0004 in)



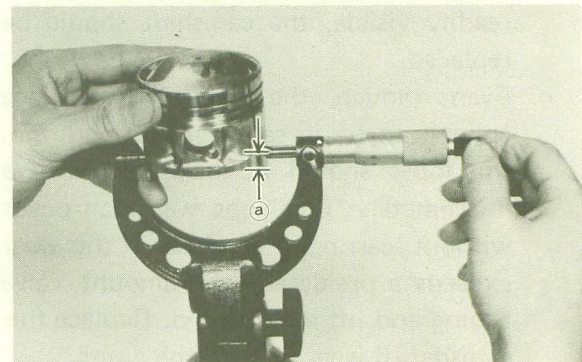
If the cylinder wall is worn more than the wear limit, it should be rebored.

G. 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 7.5 mm (0.3 in) above the bottom edge of the piston. Place the micrometer at right angles to the piston pin.

Standard	63.00 mm (2.480 in)
Oversize 1	63.25 mm (2.490 in)
Oversize 2	63.50 mm (2.500 in)
Oversize 3	63.75 mm (2.510 in)
Oversize 4	64.00 mm (2.520 in)



a. 7.5 mm (0.3 in)

- b. Determine piston clearance as follows:

Minimum bore measurement
— Maximum piston measurement
= Piston clearance

EXAMPLE:

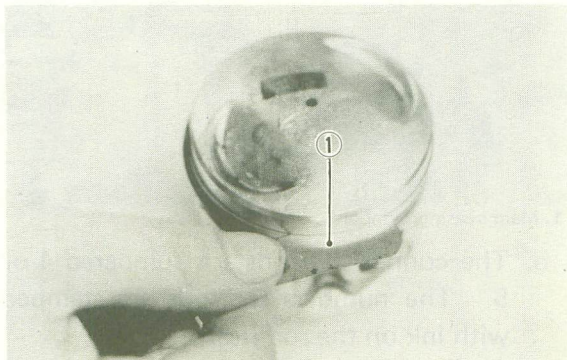
63.0 mm (2.4803 in)
— 62.96 mm (2.4787 in)
= 0.04 mm (0.0016 in)
Piston clearance

Piston clearance:

Standard: 0.030 ~ 0.050 mm
(0.0012 ~ 0.0020 in)
Service limit: 0.1 mm (0.0039 in)

- 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 ring should then be re-installed. Use a feeler gauge to measure the gap between the ring and the land.

Side clearance	Top	0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in)
	2nd	0.02 ~ 0.06 mm (0.0008 ~ 0.0024 in)



1. Feeler gauge

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

Oversize 1	0.25 mm (0.0098 in)
Oversize 2	0.50 mm (0.0197 in)
Oversize 3	0.75 mm (0.0295 in)
Oversize 4	1.00 mm (0.0394 in)

- b. The expander spacer of the bottom ring (oil control ring) is color-coded to identify sizes. The color mark is painted on the expander spacer.

Size	Color
Oversize 1	Brown
Oversize 2	Blue
Oversize 3	Black
Oversize 4	Yellow

- c. 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 the oil control ring rails show excessive gap, all three components should be replaced.

	Standard	Limit
Top/2nd ring	0.15 ~ 0.35 mm (0.006 ~ 0.014 in)	1.0 mm (0.039 in)
Oil control (Rails)	0.3 ~ 0.9 mm (0.012 ~ 0.035 in)	1.5 mm (0.059 in)

H. 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.

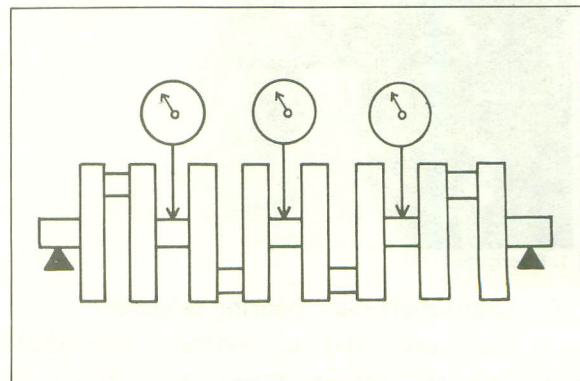
I. Crankshaft

1. Crankshaft run-out

Support the crankshaft at both ends on V-blocks. Measure the amount of crankshaft run-out on the main bearing journals with a dial gauge while rotating crankshaft.

Run-out limit: 0.040 mm (0.0016 in)

If run-out exceeds limit, replace crankshaft.



2. Inspection of bearings

Check the bearings. If the inner or outer surface is burned, flaked, rough, scratched or worn, the bearings should be replaced.

replaced.

3. Measuring main bearing oil clearance
 - a. Clean all crankshaft and crankcase journal surfaces.
 - b. Place upper crankcase half upside-down on a bench. Install bearing inserts into top crankcase.
 - c. Install crankshaft into upper crankcase.
 - d. Place Plastigage on crankshaft journal surface to be inspected.

NOTE:

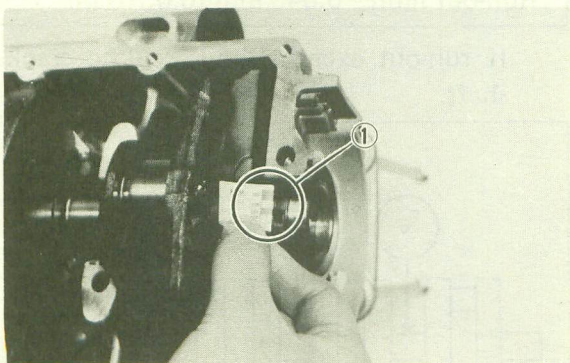
Do not move crankshaft until clearance check has been completed.

- e. Install bearings into bottom crankcase. Carefully, place lower crankcase onto upper crankcase.
- f. Install crankcase holding bolts 1 through 10. Tighten to full torque in torque sequence cast on crankcase.

Crankcase torque (8 mm bolt):
2.4 m·kg (17.5 ft·lb)

- g. Remove bolts in reverse assembly order (10, 9, 8 ... etc.)
- h. Carefully remove lower crankcase. Measure width of Plastigage on crankshaft journals to determine clearance.

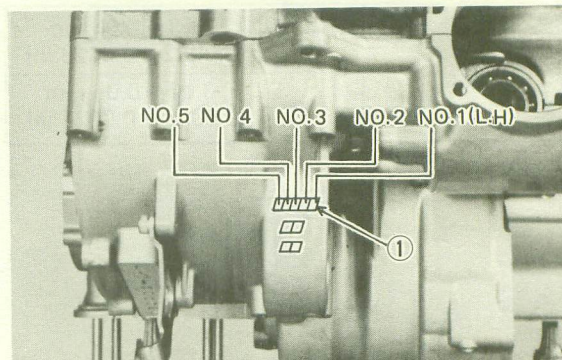
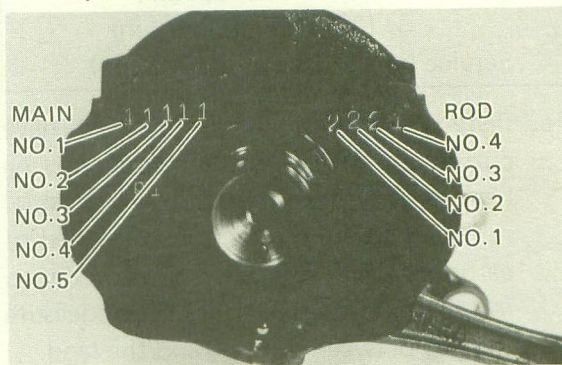
Main bearing oil clearance:
0.040 ~ 0.064 mm
(0.0016 ~ 0.0025 in)



1. Plastigage

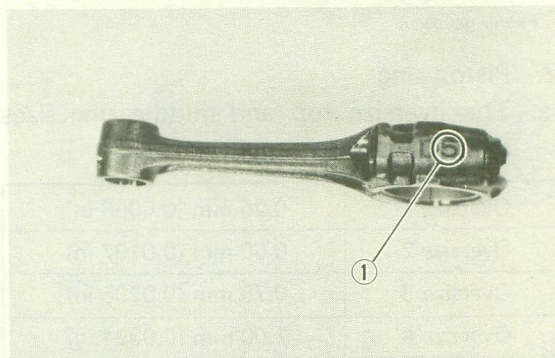
4. Crankshaft main bearing selection
 - a. Numbers used to indicate crankshaft journal sizes are stamped on the L.H. crank web. The first five (5) are main bearing journal numbers, starting with the left journal. The four (4) rod bearing journal numbers follow in the same sequence.

The upper crankcase half is numbered 4, 5, or 6 as shown.



1. Main bearing numbers

- b. The connecting rods are numbered 4 or 5. The numbers for rods are stamped with ink on the rod itself.



1. Connecting rod size number

- c. The proper bearing selection is made by subtracting the crankshaft journal number from the crankcase or rod size number. Use the color code to choose the proper bearing.

EXAMPLE:

Rod No. (Minus) Journal No.
= Bearing No.

$$5 - 2 = 3$$

No. 3 bearing is Brown. Use Brown bearing inserts.

BEARING COLOR CODE	
No. 1	Blue
No. 2	Black
No. 3	Brown
No. 4	Green
*No. 5	Yellow

*For crankshaft main bearing only.

- d. When assembling, apply a liberal coat of motor oil to all bearing surfaces.

NOTE:

When applying final torque to the rod caps, observe the following procedures:

- e. Apply molybdenum disulfide grease to connecting rod bolt threads. Apply torque evenly to both ends of the cap. While tightening, if a torque of 2.0 m-kg (14.5 ft-lb) or more is reached, DO NOT STOP tightening until final torque is reached. If tightening is interrupted between 2.0 m-kg and 2.5 m-kg, loosen the nut to less than 2.0 m-kg and start again. Tighten to full torque specification without pausing.

J. Oil Pump

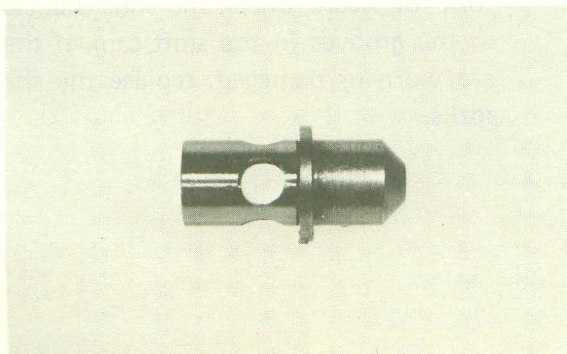
1. Check the clearance between housing and outer rotor.

Standard clearance:
0.09 ~ 0.15 mm
(0.0035 ~ 0.0059 in)

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

Standard clearance
0.12 mm (0.005 in) or less

3. Check the plunger for scratches and wear.



1. Relief valve plunger

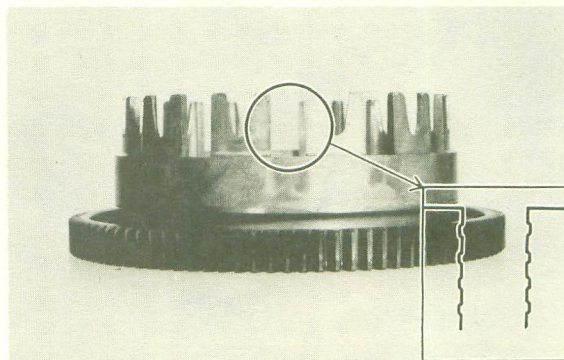
K. Clutch

1. Clutch housing

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

NOTE:

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



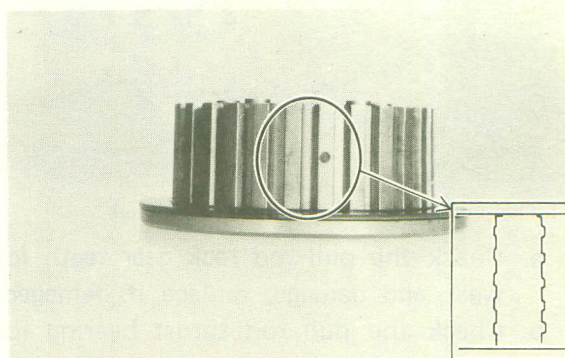
- b. Check the clutch housing bearing for damage. If damaged replace bearing.

2. Clutch boss

- a. The clutch boss contains a built-in damper beneath the first clutch plate (clutch plate 2). It is not normally necessary to remove the circlip and disassemble the built-in damper unless there is serious clutch chattering.
- b. 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 operation.

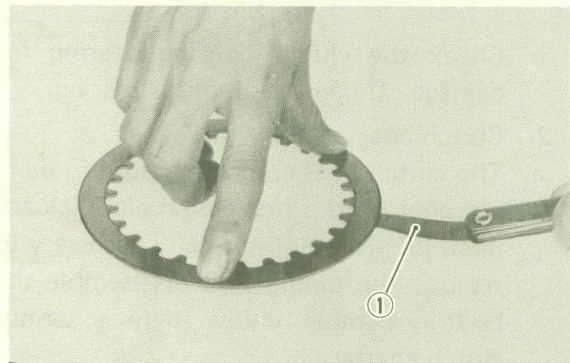
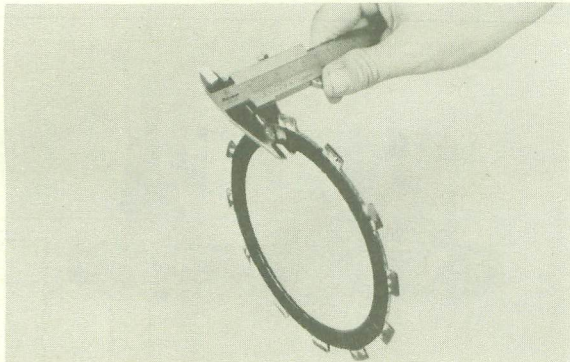


3. Friction and clutch plates

Check clutch steel plates and friction plates for heat damage. Measure friction plate thickness at 3 or 4 points. Measure

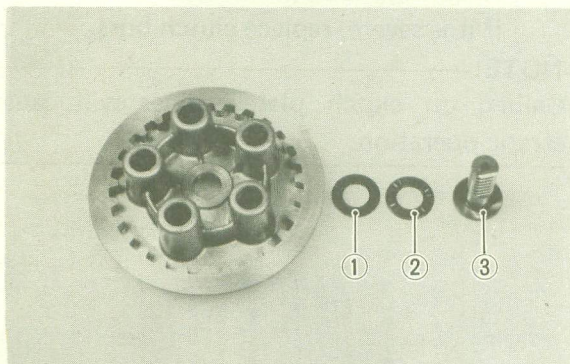
clutch plates for warpage with a dial gauge and stand. Replace clutch plate or friction plates as a set if any is faulty or beyond wear limits.

	Standard	Wear limit
Friction plate thickness	3.0 mm (0.12 in)	2.8 mm (0.11 in)
Clutch plate warp limit	—	0.05 mm (0.0020 in)



1. Feeler gauge

4. Clutch actuating mechanism



1. Plate washer 2. Thrust bearing 3. Pull rod

- Check the pull rod rack gear teeth for wear and damage, replace if damaged.
- Check the pull rod thrust bearing for damage, replace if damaged.
- Check the clutch lever shaft pinion gear teeth for damage, replace if damaged.

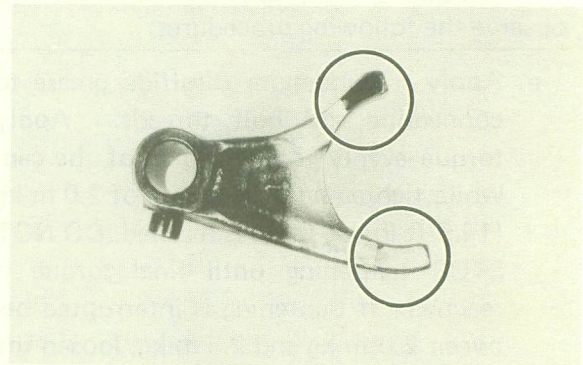
5. Clutch springs

Measure the clutch spring free length. Replace the springs as a set if any is less than minimum free length.

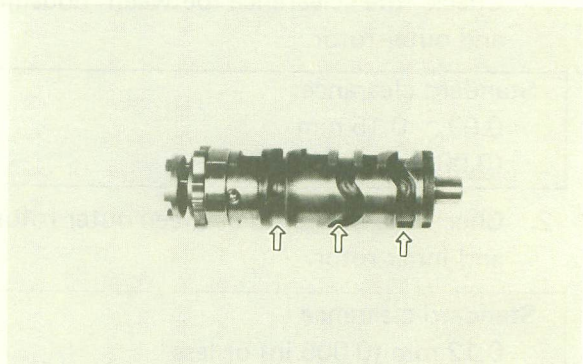
Clutch spring minimum length:
39.1 mm (1.539 in)

L. Transmission

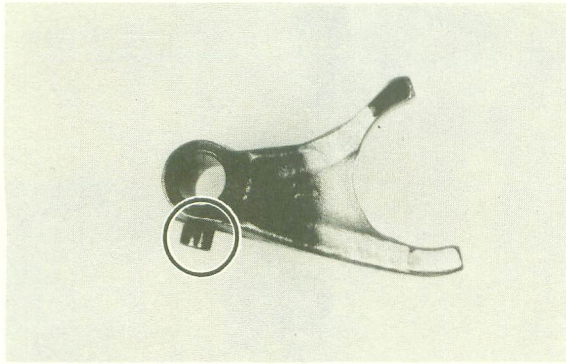
- Inspect each shift fork for signs of galling on gear contact surfaces. Check for bending. Make sure each fork slides freely on its guide bar.



- Roll the guide bar across a surface plate. If the bar is bent, replace.
- Check the shift cam grooves for signs of wear or damage. If any profile has excessive wear and/or damage, replace cam.



- Check the cam followers on each shift fork for wear. Check the ends that ride in the grooves in the shift cam. If they are worn or damaged, replace the shift forks.

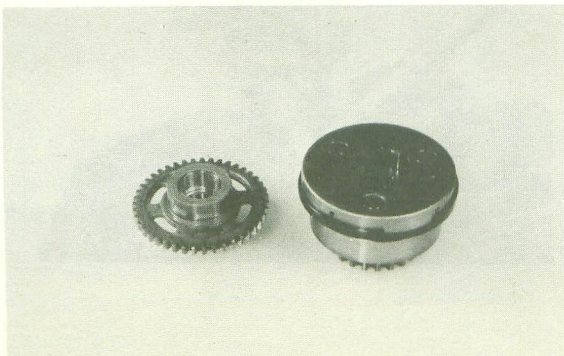


5. Check shift cam dowel pins and side plate for looseness, damage or wear. Replace as required.
6. Check the shift cam stopper plate and circlip and stopper for wear. Replace as required.
7. Check the transmission shafts using a centering device and dial gauge. If any shaft is bent beyond specified limit, replace shaft.

Maximum run-out: 0.08 mm (0.0031 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.

M. Starter Drivers



1. Electric starter clutch and gears
 - a. Check the surface of the idle gear for pitting or other damage. If severe, replace the gear.
 - b. Check the spring caps and the springs for deformation or damage. If severe, replace as necessary.
 - c. Check the starter clutch bolts (allen screw) for looseness. If loose, remove the bolts and replace with new bolts. Apply a thread locking compound such as "LOCTITE" to threads and tighten to specified torque. Stake over the end of the bolts.

Starter clutch bolt torque:
3.0 m·kg (21.7 ft·lb)

- d. Check the "HY-VO" chain for damage and wear, replace if damaged.
- e. Check the "HY-VO" chain guide for damage, replace if damaged.

N. Crankcases and Strainer Cover

1. Check crankcase for cracks or other damage.
2. Clean all oil passages and blow out with compressed air.
3. Strainer cover: Apply a thread locking compound such as "LOCTITE" to strainer cover bolts during reassembly.

O. Bearing and Oil Seals

1. After cleaning and lubricating bearings, rotate inner race with a finger. If rough spots are felt, replace the bearing.

NOTE: Bearings are most easily removed or installed if the housings are first heated to approximately 95°~125°C (200°~250°F). Bring the case up to proper temperature slowly. Use an oven to avoid distortion.

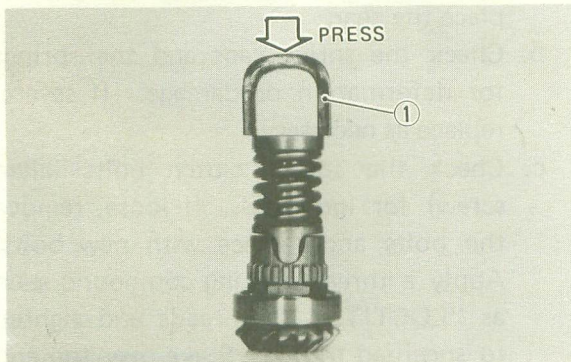
2. Check oil seal lips for damage and wear. Replace as required.

P. Middle Gear

1. Damper disassembly

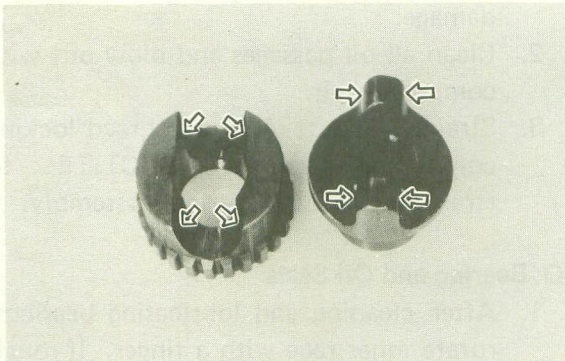
NOTE: Disassembly of the middle gear damper requires the damper compressor (special tool) and a hydraulic press.

- a. Place the middle drive shaft in a press with the damper compressor (special tool) in place as shown.



1. Damper compressor

- b. Press the damper spring and remove the spring retainers.
 - c. Remove the spring seat, spring, and damper cams from the drive shaft.
2. Inspection
- a. Inspect the damper cam surfaces. Check for smooth cam action and excessive wear on the cam surface. If cam surface is severely worn, replace damper assembly.



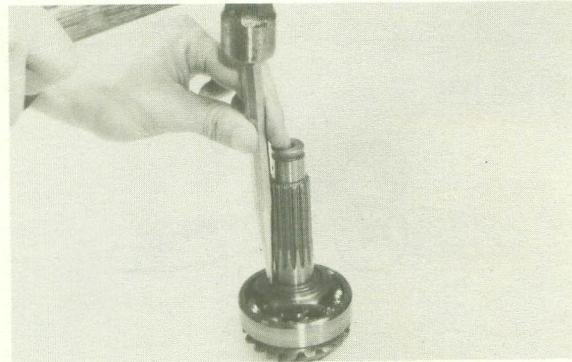
- b. Inspect the damper spring for fatigue, wear and damage. Replace as necessary.
 - c. Check bearing movement for damage to balls, rouge spots, bearing looseness. Inspect gear teeth. If any gear tooth and/or bearing are damaged, the gear set and/or bearing must be replaced.
3. Middle drive/driven shaft bearing removal

CAUTION:

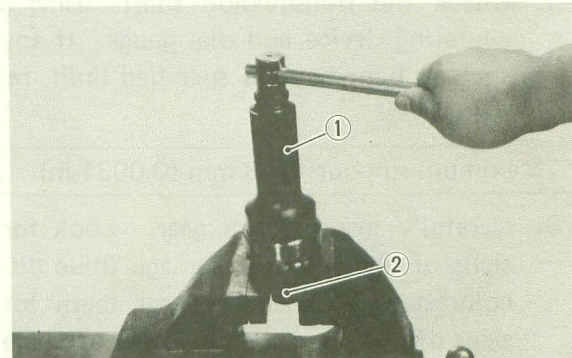
The following procedures should be performed only if the bearing or gear is to be replaced.

a. Middle drive gear

- 1) Bend down the locking collar of the nut with a suitable center punch.



- 2) Support the middle drive shaft holder (special tool) in a vise securely and put the drive pinion on it as shown. Remove the bearing holding nut with the 46 mm socket (special socket) and remove the bearing.



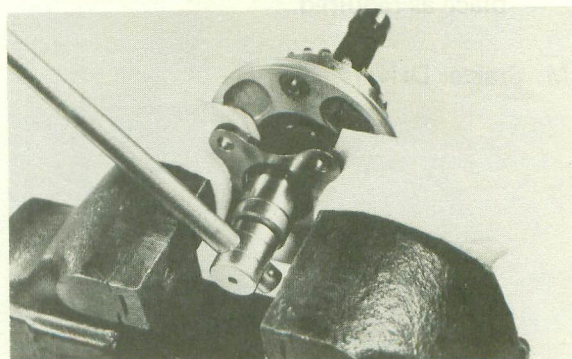
1. Middle drive shaft nut wrench (46 mm socket)
2. Middle drive shaft holder

b. Middle driven gear

- 1) Support the drive flange in a vise securely. Remove the flange holding nut.

CAUTION:

This holding nut has been locked with a thread locking compound, when reinstalling do not forget to apply a thread locking compound such as "LOCTITE" and punch.



- 2) Remove the drive flange from the driven shaft.

NOTE:

Driven gear shaft bearing should be replaced together with a bearing housing.

4. Middle gear reassembly
 - a. Middle drive gear bearing and damper
 - 1) Install the bearing onto the drive pinion and secure it with a new lock nut using the middle drive shaft holder and special socket.

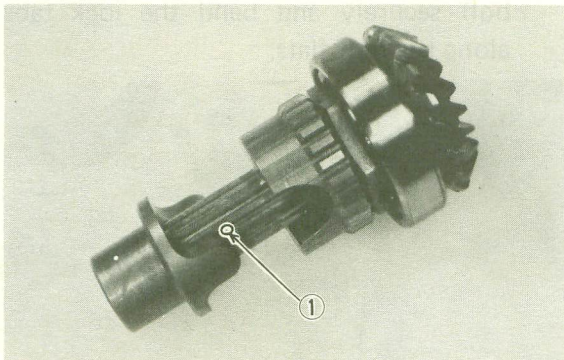
Tightening torque:

11 m·kg (80 ft·lb)

- 2) Stake the locking collar of the nut to the slot on the drive pinion shaft.



- 3) Install the driven damper cam onto the drive pinion shaft with the cam lobes positioned 90° from the row of shaft oil holes. Positioning tolerance is ± 1 spline (15°) from the 90° position.



1. Oil hole

- 4) Install the drive damper cams, spring, spring seat, and retainers using a press and the damper compressor.
 - b. Middle driven gear
 - 1) Install the new bearing housing assembly onto the driven pinion shaft.

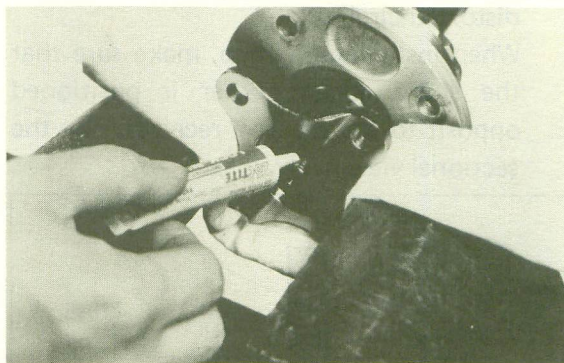
CAUTION:

Do not press the bearing outer race. Always press the inner race with care when installing.

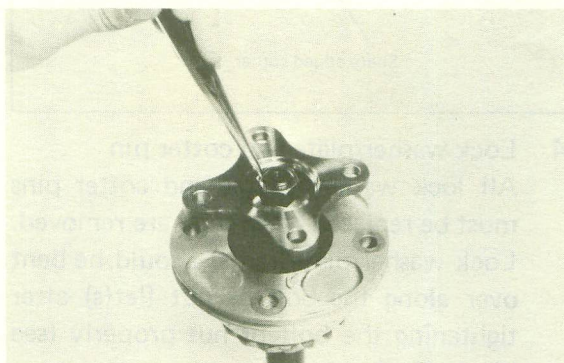
- 2) Install the drive flange and new "O-ring" onto the driven gear shaft. Apply a thread locking compound such as "LOCTITE" to the shaft threads and tighten the nut to the specified torque.

Tightening torque:

12 m·kg (87 ft·lb)



- 3) Stake the nut with a center punch to lock as shown.



- 4) Install the new "O-ring" onto the bearing housing.

ENGINE ASSEMBLY AND ADJUSTMENT

A. Important Informations

1. Gasket and seal

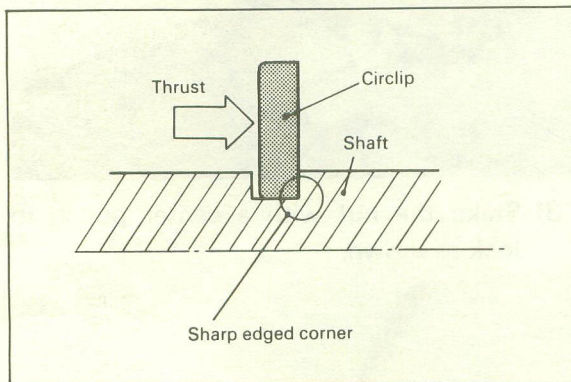
All gaskets and seals should be replaced when an engine is overhauled. All gasket surfaces and oil seal lips must be cleaned.

2. Properly oil all mating engine and transmission parts and bearings during reassembly.

3. Circlip

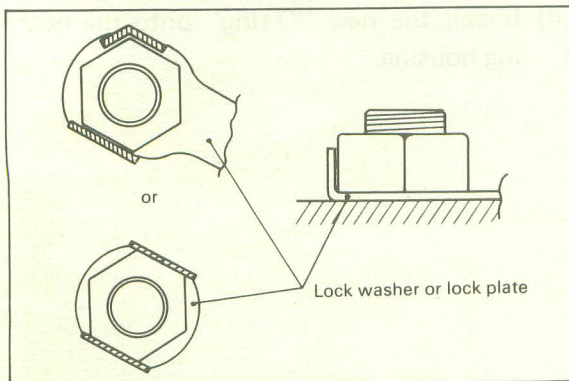
All circlips should be inspected carefully before reassembly. Always replace piston pin clips after one use. Replace distorted circlips.

When installing a circlip, make sure that the sharp edged corner is positioned opposit to the thrust it receives. See the sectional view below.



4. Lock washer/plate and cotter pin

All lock washers/plates and cotter pins must be replaced when they are removed. Lock washer/plate tab(s) should be bent over along the bolt or nut flat(s) after tightening the bolt or nut properly (see illustration).



Cotter pins should be replaced after one use.

B. Engine Assembly

1. Upper crankcase

- Install the connecting rods onto the crankshaft with the proper connecting rod bearings and apply molybdenum disulfide grease to the bolt threads. Apply torque evenly to both ends of the cap.

CAUTION:

While tightening, if a torque of 2.0 m-k_g (14.5 ft-lb) or more is reached, **DO NOT STOP** tightening until final torque is reached.

If tightening is interrupted between 2.0 m-k_g and 2.5 m-k_g, loosen the nut to less than 2.0 m-k_g and start again. Tighten to full torque specification without pausing.

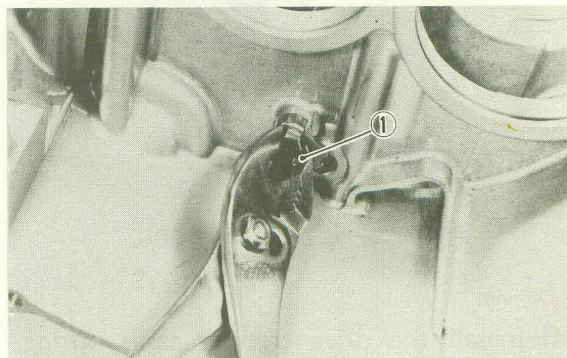
Rod cap torque: 2.5 m-k_g (18.1 ft-lb)

- Install the proper crankshaft main bearings into the crankcase and place the crankshaft. Oil the bearings liberally.

NOTE:

Do not forget to install the crankshaft oil seal (L.H.), blind plug (R.H.), "HY-VO" chain and cam chain on the crankshaft before installing. Also, install the chain guide into upper crankcase if removed.

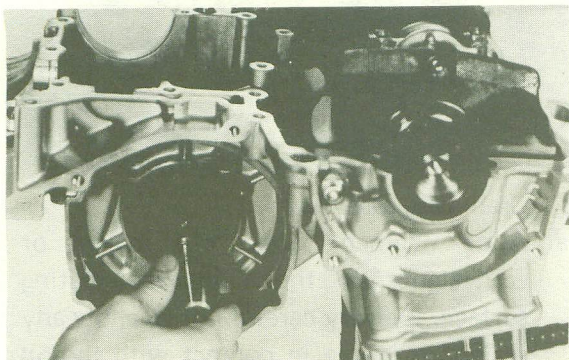
- Install the starter idle gear, shaft, stopper plate, and new lock plate. Tighten the bolt securely and bend the lock tabs along the bolt flats.



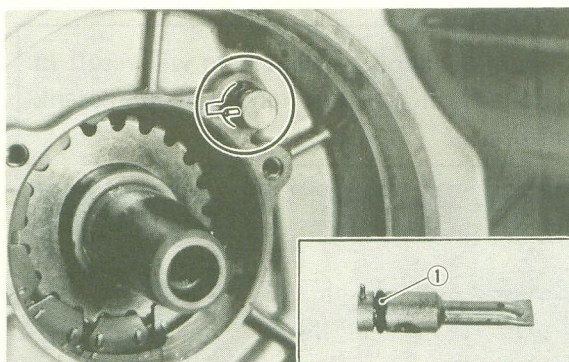
1. Lock washer

Tightening torque: 1.0 m-k_g (7.2 ft-lb)

- d. Put the starter clutch and sprocket assembly in the "HY-VO" chain and lay it into the crankcase.
- e. Install the A.C.G. Generator shaft into the starter clutch assembly.

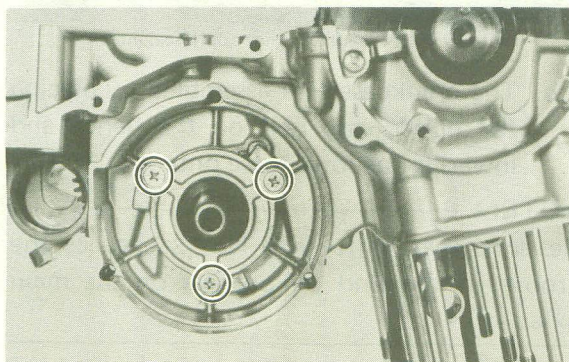


- f. Install the "HY-VO" chain oil spray nozzle. The locating pin on the nozzle should be placed into the crankcase locating slot. Do not forget to install the new "O-ring" onto the nozzle.

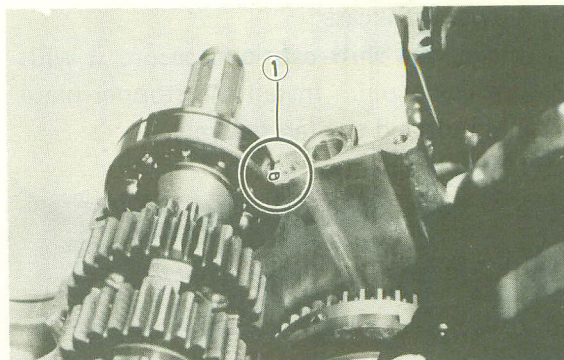


1. O-ring

- g. Install the new "O-ring" onto the bearing housing and install it with the panhead screw.

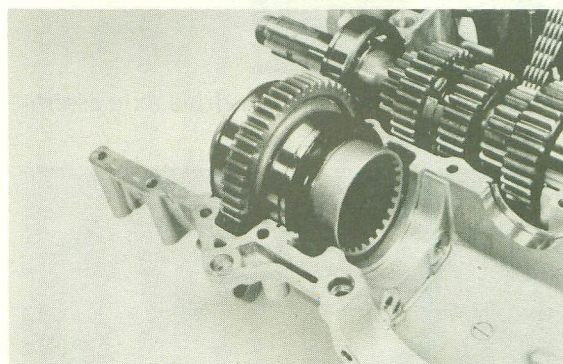


- h. Install the transmission main axle assembly on the upper crankcase. Point the bearing locating pin toward the crankshaft and lay it on the case.

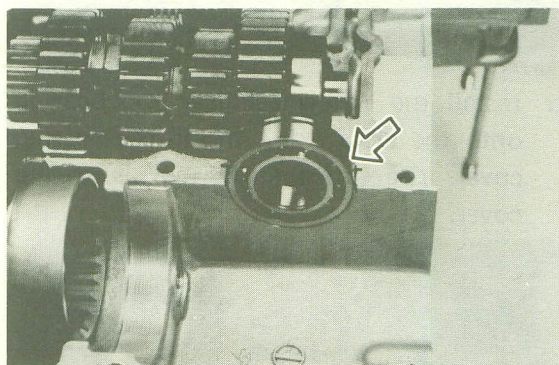


1. Bearing locating pin

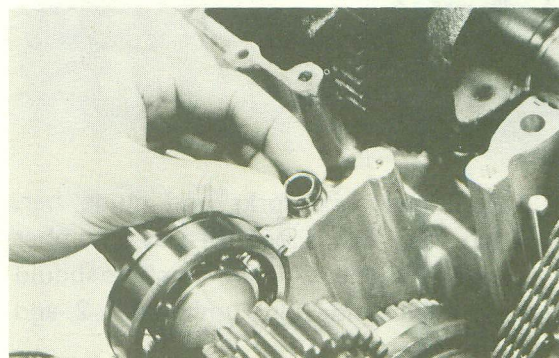
- i. Install the middle driven gear (without the middle drive pinion gear).



- j. Install the middle driven gear shaft end bearing.

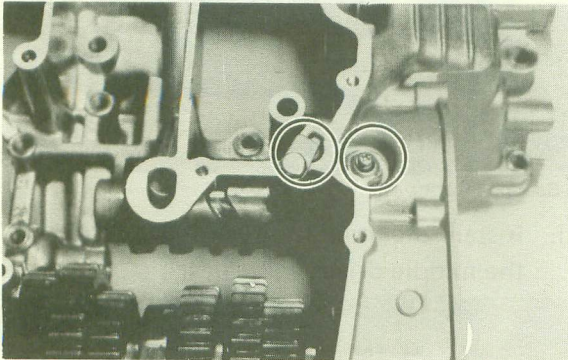


- k. Install the dowel pin with "O-ring" into the crankcase.

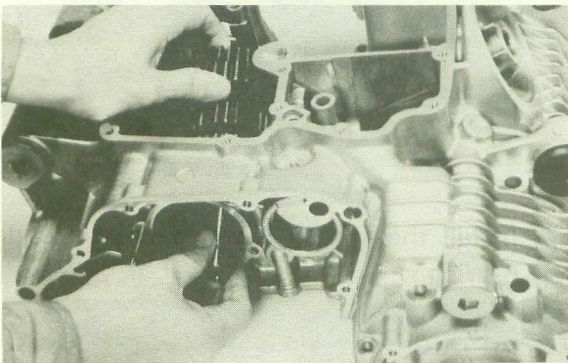


2. Lower crankcase

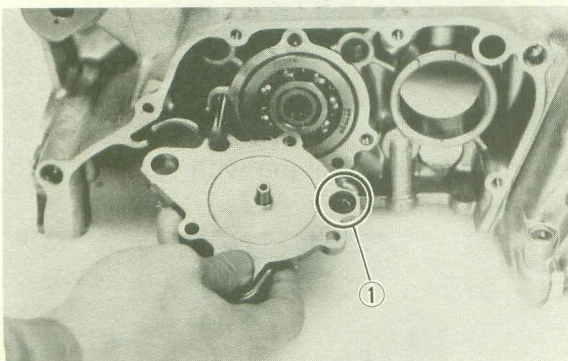
- a. Install the shift cam and secure it with the guide pin. Install the stopper plate and bolt and tighten securely.
- b. Install the neutral switch.



- c. Install the transmission drive axle assembly into the crankcase.

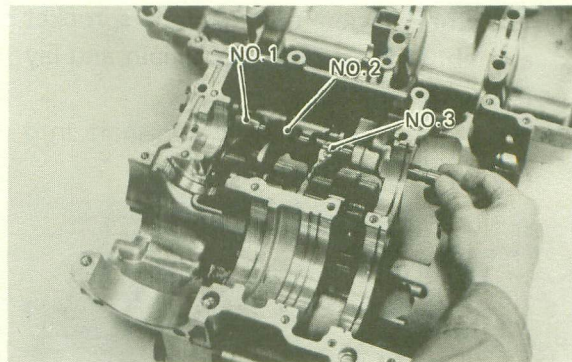


- d. Install the 5th wheel gear and bearing onto the drive axle. Install the bearing cover. Be sure the "O-ring" is on the cover.



1. O-ring

- e. Install the shift forks and guide bar. Each shift fork is identified by a number cast on its side. All the numbers should face the left side and numbered 1, 2, and 3 from left.

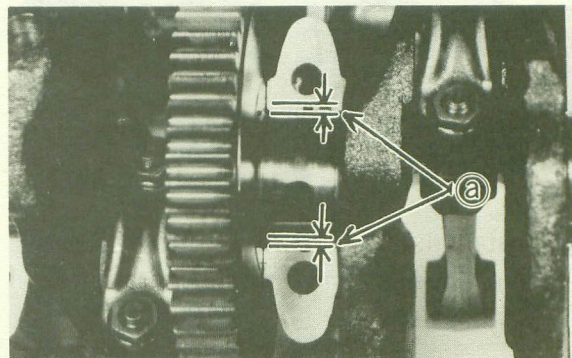


3. Crankcase assembly

- a. Apply Yamaha bond # 4 sealant or equivalent to the crankcase mating surface. Be very careful not to allow any sealant to come in contact with the oil gallery "O-ring" and crankshaft bearings. It is extremely important, however, that sealant be applied around the case stud holes. Apply sealant to within 2 ~ 3 mm (0.08 ~ 0.12 in) of the bearings.

CAUTION:

Failure to apply sealant here will result in reduced oil pressure and possible crank seizure.



a. 2 ~ 3 mm (0.08 ~ 0.12 in) Do not apply sealant.

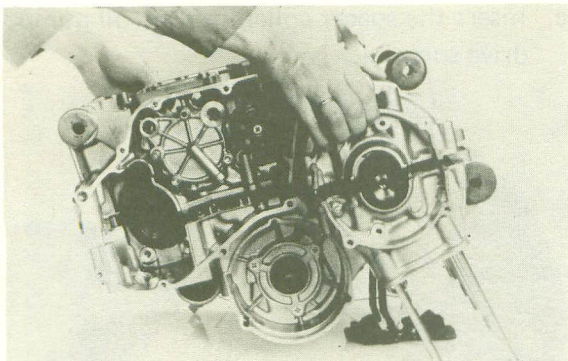
- b. The crankcases are assembled by placing the upper case half on the bench and lowering the lower case onto it.

NOTE:

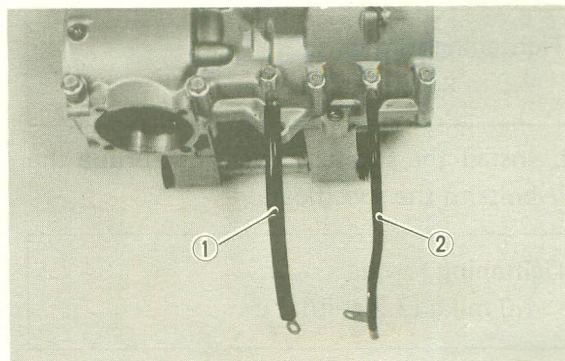
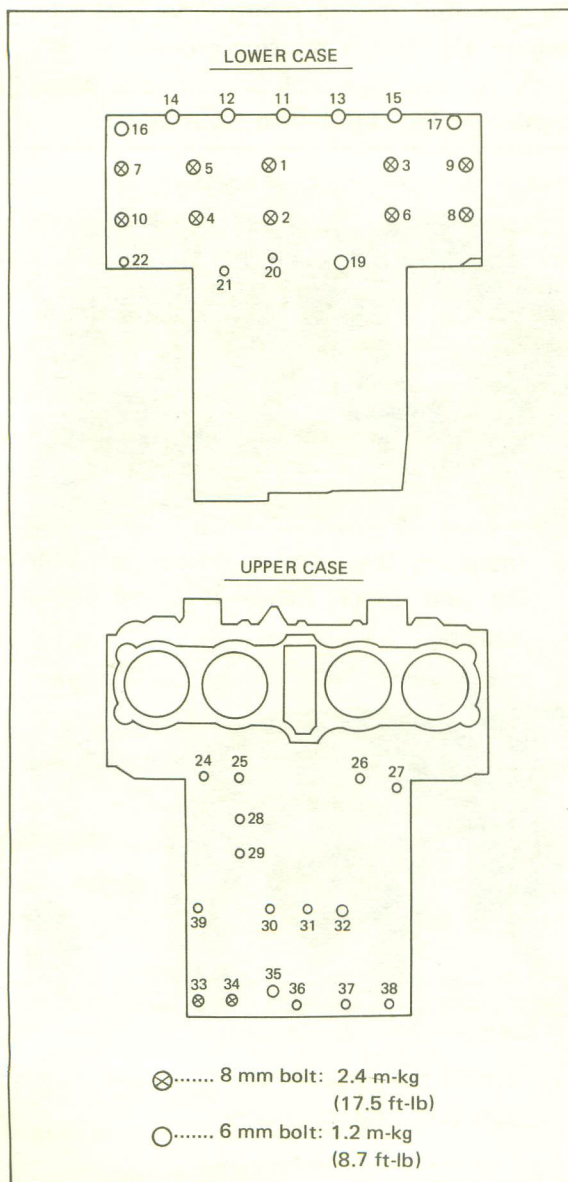
Be sure that shift fork No. 2 engages the groove in the 2nd pinion gear on the main axle.

CAUTION:

Before installing and torquing the crankcase bolts, check to make sure the transmission is functioning properly by shifting it by hand with the shift cam.

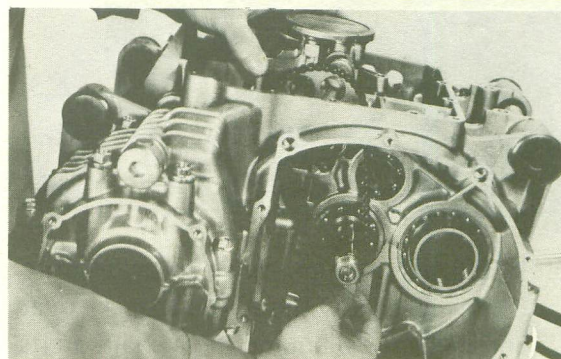
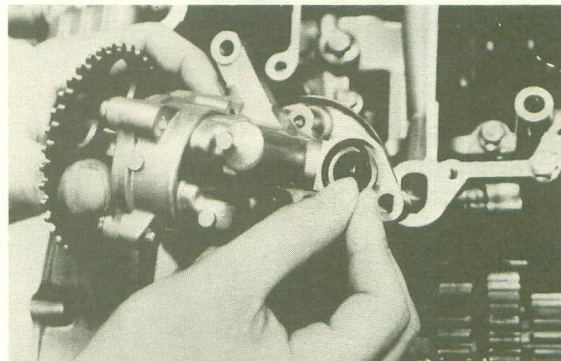


- c. Start installation of the crankcase bolts with the center crankshaft area bolts. Place the two bolts without washers in the oil filter area.
- d. The crankcase bolts should be torqued in proper sequence. Refer to the tightening sequence in the illustration.

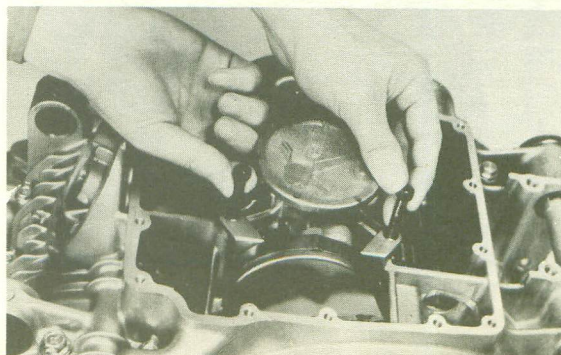


1. Engine ground wire 2. Battery ground wire

4. Oil pump and strainer cover
 - a. Place the oil pump drive chain on the transmission main axle.
 - b. Place the drive chain on the oil pump driven sprocket and install the pump on the crankcase. The "O-ring" should be installed properly.



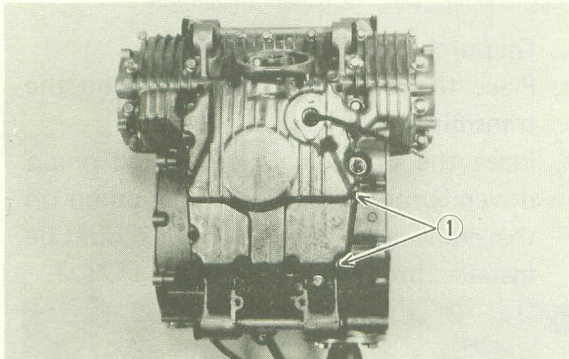
- c. Install the drive chain cover on the oil pump and secure with the 2 shouldered bolts and one normal 6 mm bolt.



Tightening torque:
1.0 m-kg (7.2 ft-lb)

- d. Install the strainer cover and torque the bolts to the specification.

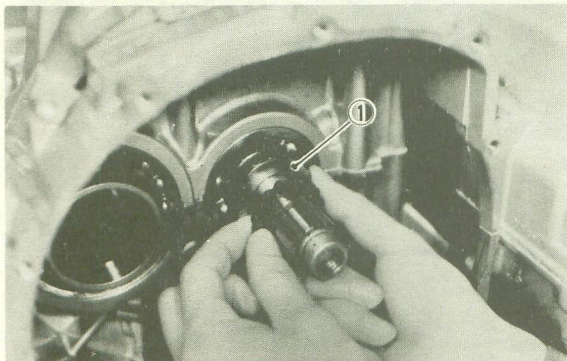
Tightening torque:
1.0 m-kg (7.2 ft-lb)



1. Wire clamps

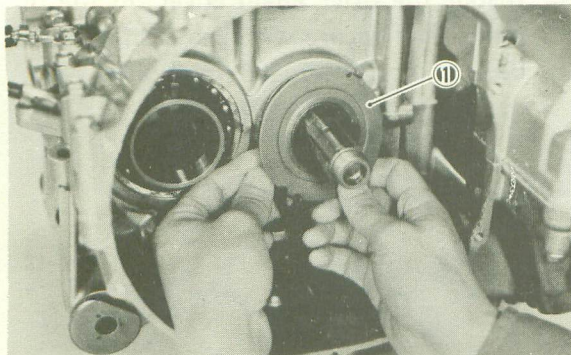
5. Clutch assembly

- a. Install the thrust plate onto the transmission main axle.



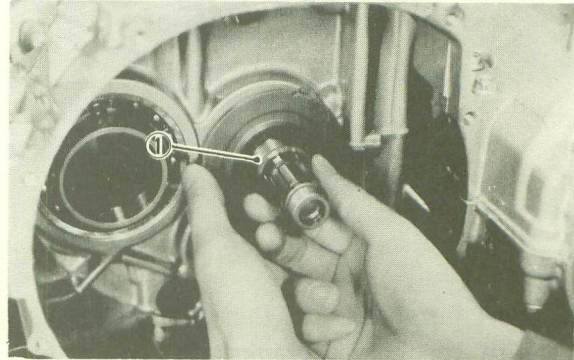
1. Thrust plate

- b. Install the oil pump drive sprocket onto the main axle without the spacer collar and place the oil pump drive chain on its sprocket.



1. Oil pump drive sprocket

- c. Insert the spacer collar into the oil pump drive sprocket.

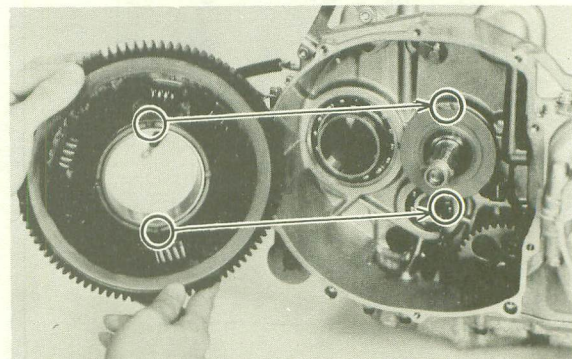


1. Spacer collar

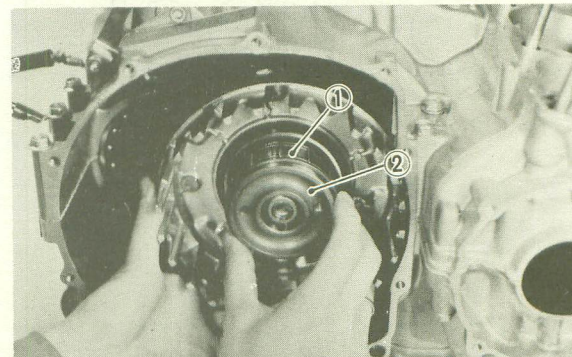
- d. Install the primary driven gear (clutch housing) without the bearing and inner spacer.

CAUTION:

Be sure that the oil pump drive gear tabs engage the clutch housing grooves on its back or the tabs will be damaged when tightening the clutch boss securing nut.

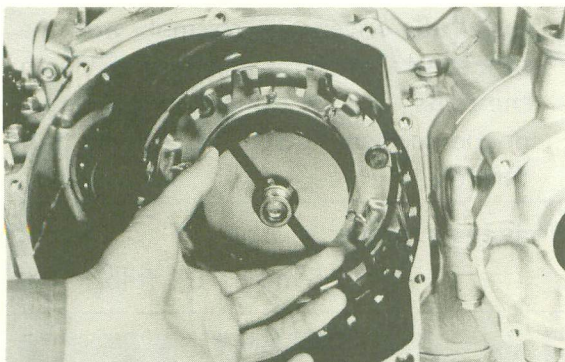


- e. Installing the primary driven gear bearing and inner spacer into the clutch housing.

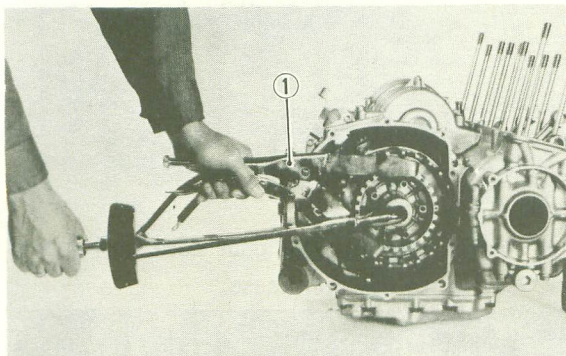


1. Driven gear bearing 2. Inner spacer

- f. Install the large thrust plate and clutch boss onto the main axle.



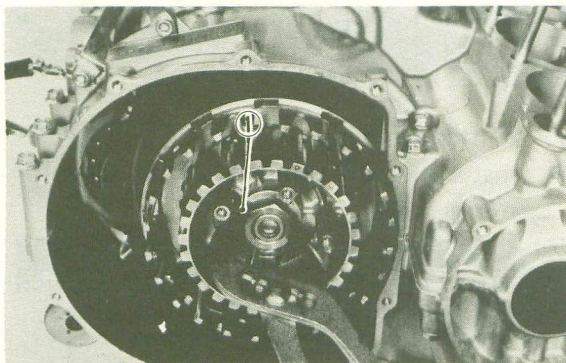
- g. Install a new lock washer and nut and tighten the nut to the specified torque. Use the clutch boss holder (special tool).



1. Clutch boss holder

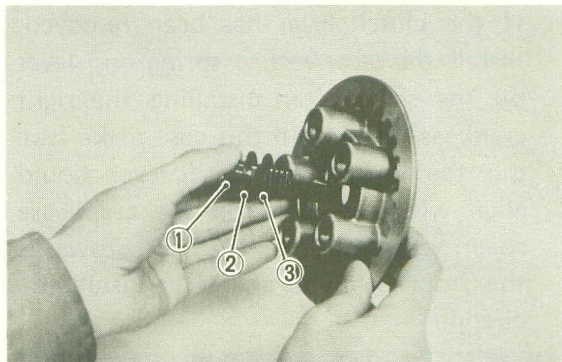
Tightening torque:
7.2 m·kg (52 ft·lb)

- h. Bend the lock washer tabs along the nut flats.



1. Lock tab

- i. Install the clutch plates and friction plates alternately on the clutch boss, starting with a friction plate and ending with a friction plate.
- j. Install the plate washer, thrust bearing, and clutch pull rod into the clutch pressure plate from inside.

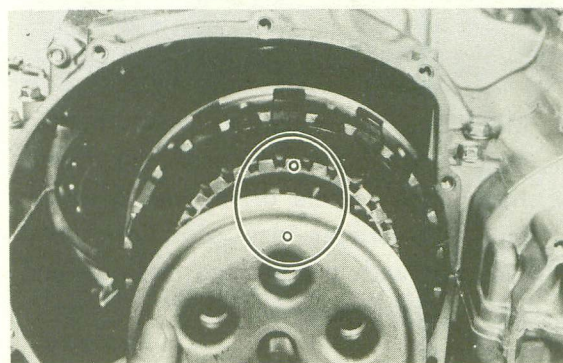


1. Pull rod 2. Thrust bearing 3. Plate washer

- k. Install the pressure plate assembly onto the clutch boss.

NOTE:

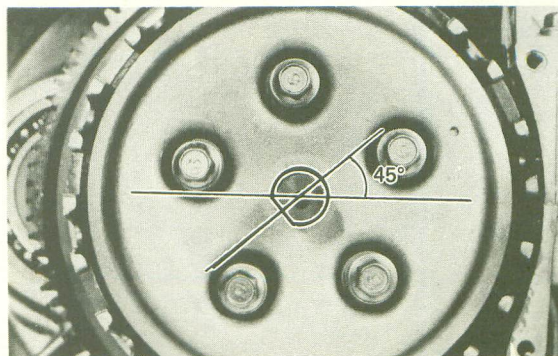
Pressure plate has a dot on it which must line up with the dot on clutch boss.



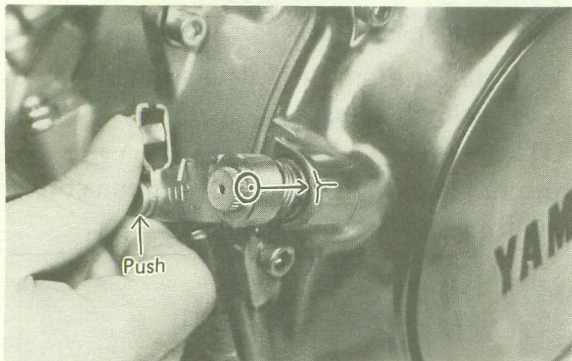
- l. Install the clutch springs and screws. Tighten the screws.

Clutch screw torque:
1.0 m·kg (7.2 ft·lb)

- m. Set the gear of the clutch pull rod on the pressure plate facing approximately 45° from horizontal toward the rear; set the clutch lever (if installed) on the right crankcase cover parallel to the gasket surface and install the cover to the crankcase. Do not forget to install two dowel pins.

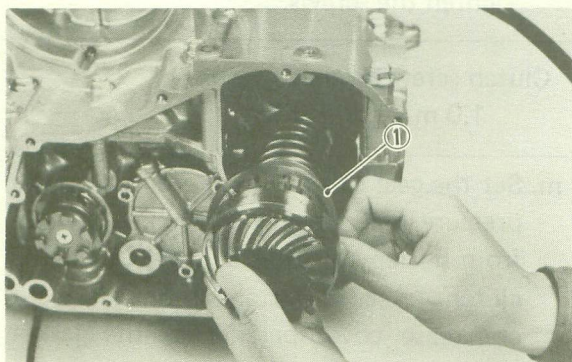


- n. If the clutch lever has been removed, install the lever return spring and lever on the shaft after installing the right crankcase cover. In this case make sure that the punch mark on the lever should align with the mark on the crankcase cover when pushing the lever towards the front by hand and then install the circlip.



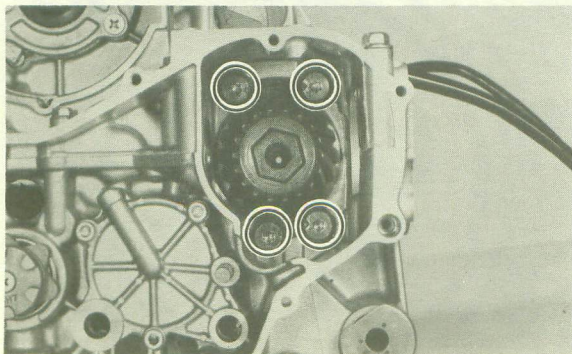
6. Middle gear (installation only, refer to page 67 for the middle gear adjustment).
- Install the middle drive gear assembly with the proper size of shim(s) and secure it with the bearing retainers and new "TORX" screws.

Tightening torque: 2.5 m-kp (18 ft-lb)



1. Shims

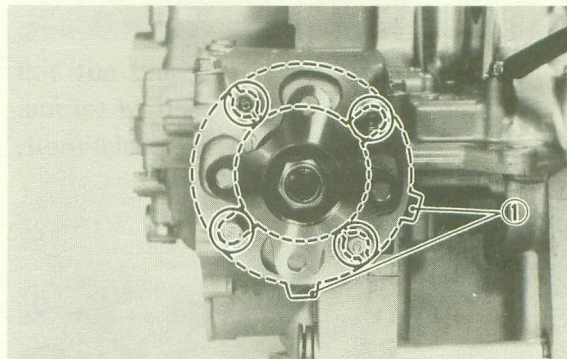
- Stake the screw heads to the dents on the bearing retainers with a center punch.



- Install the driven gear assembly with the proper size of shims and secure it with the bolts. Apply a thread locking compound such as "LOCTITE" to the bolt threads.

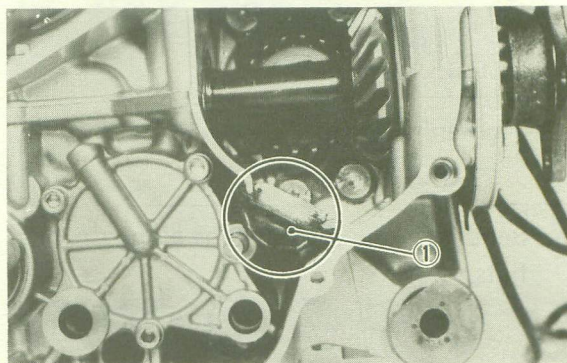
Tightening torque:

2.5 m-kp (18.1 ft-lb)



1. Shims

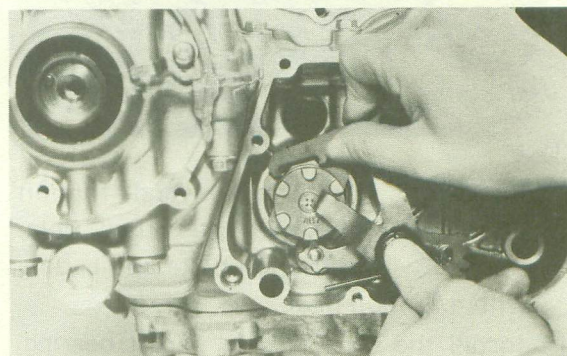
- Install the middle gear case half moon seal onto the crankcase.



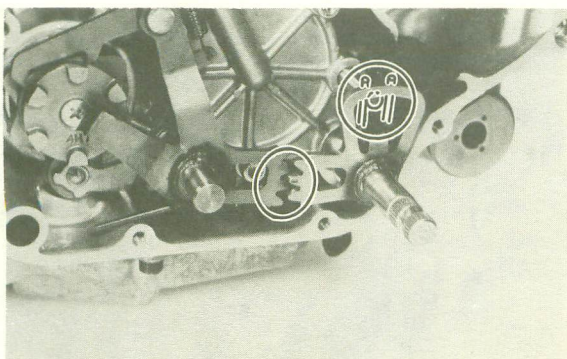
1. Seal

7. Shifter assembly

- Install the shift shaft assembly with the stopper lever.

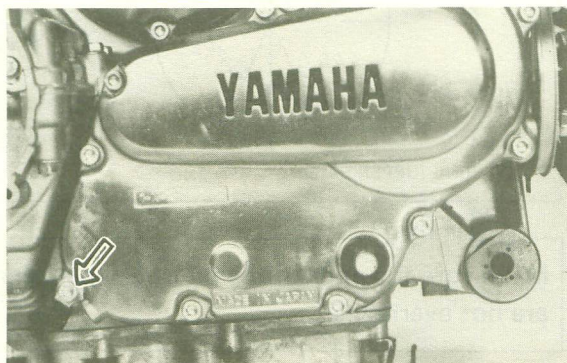


- Install the shift lever assembly with the positioning spring is properly located on the stopper pin and the teeth should be set properly as shown.



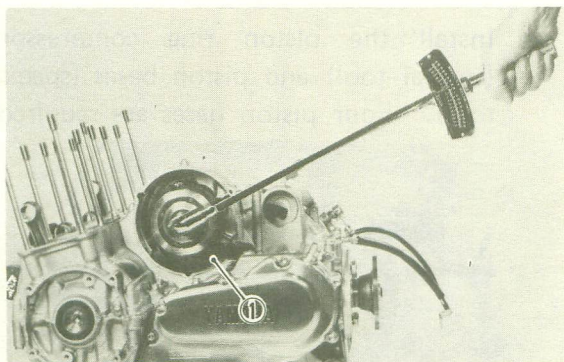
- c. Install the left crankcase cover (shifter cover) using a new gasket. Make sure the wire harness clips are properly positioned.

Tightening torque:
1.0 m-kg (7.2 ft-lb)



8. A.C. Generator

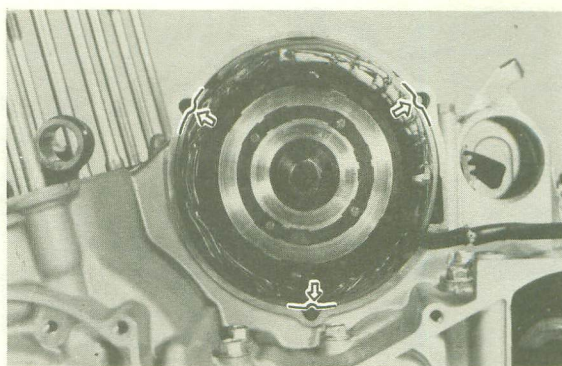
- a. Install the rotor onto the shaft and tighten the bolt using the rotor holding tool (special tool) as shown.



1. Rotor holding tool

Tightening torque:
5.5 m-kg (39.8 ft-lb)

- b. Install the stator coil assembly onto the crankcase and align the grooves on the stator core with the bolt holes on the crankcase.



- c. Install the A.C.G. cover assembly and tighten the bolts to the specification. Do not forget to install the new gasket.

Tightening torque:
1.0 m-kg (7.2 ft-lb)

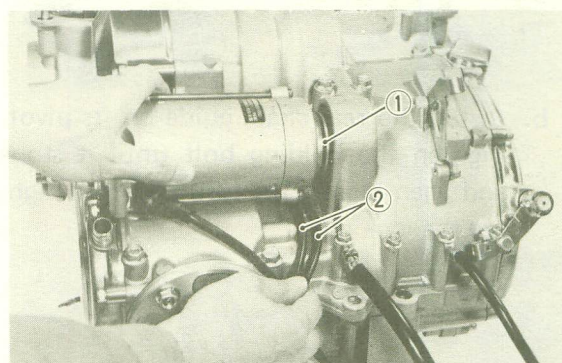
9. Starter motor

- a. Route the A.C.G. lead wires as shown.
b. Install the starter motor and tighten the bolts to the specification.

Tightening torque:
1.2 m-kg (8.7 ft-lb)

NOTE:

Be careful the "O-ring" is not damaged when installing the starter motor.



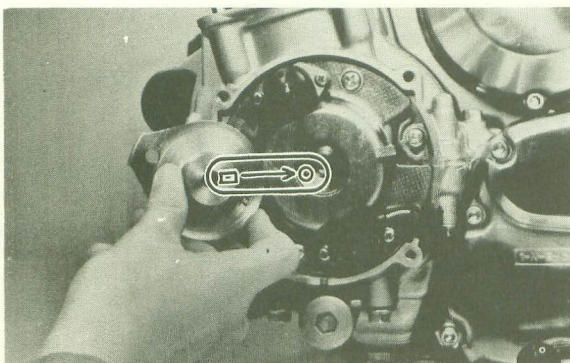
1. O-ring 2. A.C.G. lead wires

10. Pick-up coil assembly

- a. Install the pick-up coil assembly onto the crankcase.
b. Install the timing plate on the crankshaft and tighten the bolt to the specification.

NOTE:

Note that there is the locating pin on the crankshaft and the corresponding slot in the timing plate which must be aligned to install the timing plate.



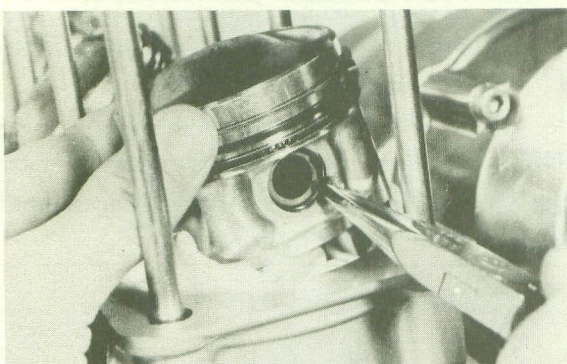
11. Pistons and Cylinder

- a. Install the pistons on the rods. The arrow on the piston must point to the front of the engine.

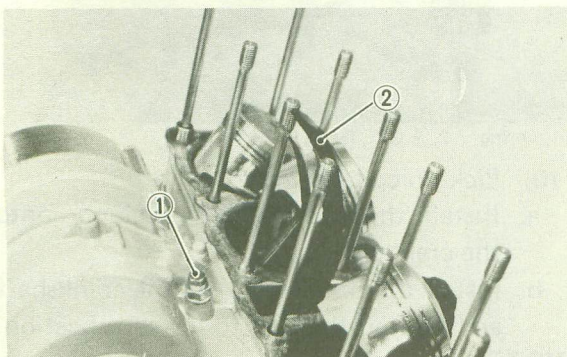
NOTE:

Before installing the piston pin clips, cover the crankcase with a clean rag so you will not accidentally drop the circlip into the crankcase.

Always install new piston pin circlips.

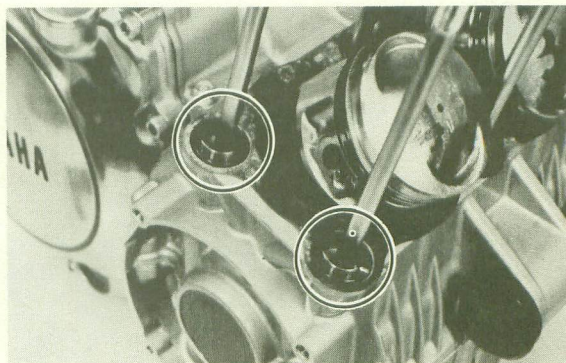


- b. Install the rear chain guide on its pivot. Tighten the holding bolt until it stops and then loosen 1/4 turn and then tighten the lock nut.

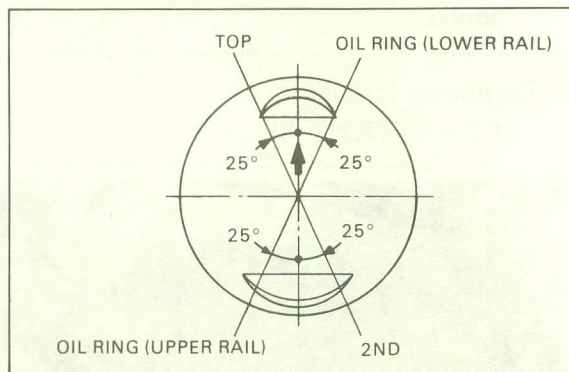


1. Holding bolt 2. Rear chain guide

- c. Install the new cylinder base gasket and dowel pins. Install the new "O-rings" to the right side dowel pins.



- d. Set the crankshaft so that the all pistons are equal height and align the piston rings as shown.



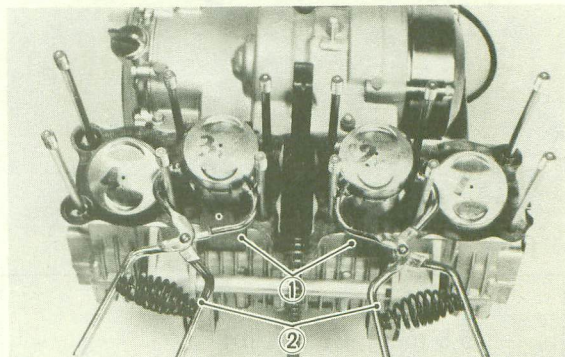
CAUTION:

Make sure the ends of the oil ring expanders are not overlapped.

NOTE:

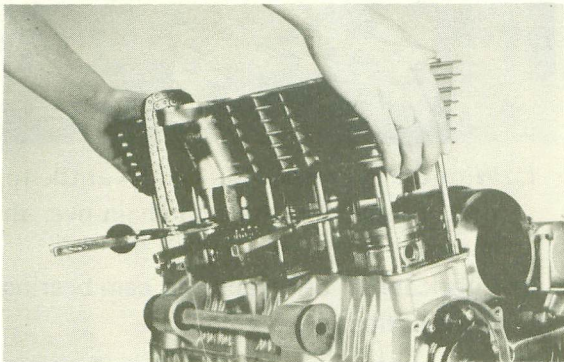
Manufacturer's marks or numbers stamped on the rings are on the top side of the rings. Coat the pistons and rings well with oil.

- e. Install the piston ring compressors (special tool) and piston bases (special tool). Four piston bases are required.



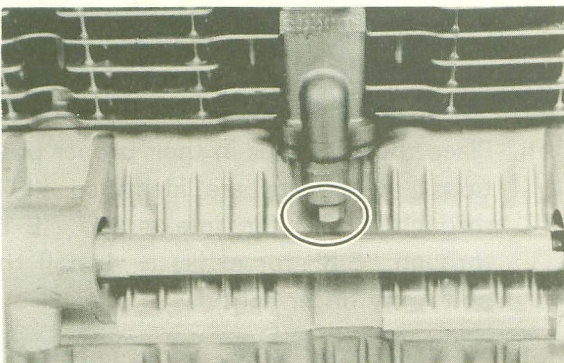
1. Piston bases 2. Piston ring compressors

- f. Tie the cam chain with a piece of mechanic's wire and feed it through the chain opening. Carefully lower the cylinder onto the pistons. Remove the ring compressors and piston bases and repeat this procedure for pistons 1 and 4.

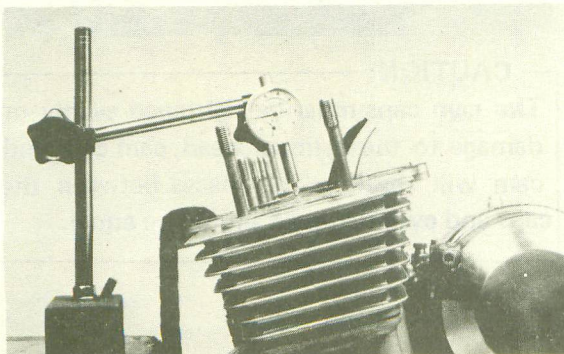


- g. Install the cylinder securing nut (front side) and tighten it to the specification.

Tightening torque:
2.0 m-kG (14.5 ft-lb)

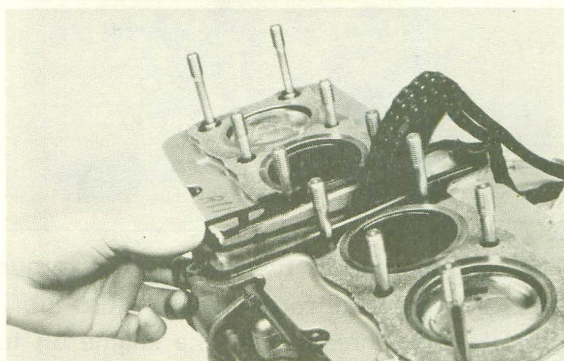
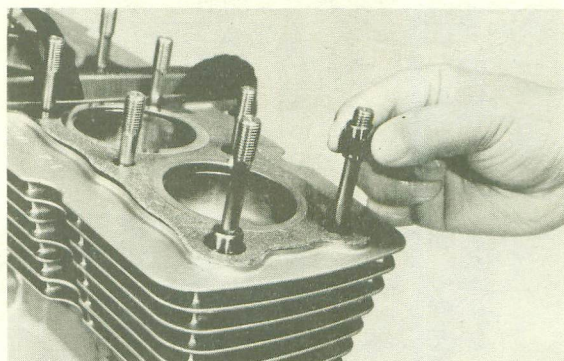


- h. Set the dial gauge on the No. 1 piston head center as shown to find the No. 1 piston top dead center and check whether the "T" mark on the timing plate and stationary pointer are aligned or not. If not, loosen the pointer securing screw and adjust.



12. Cylinder head and Cam shafts

- a. Install the new cylinder head gasket. Install the dowel pins and "O-rings". Locate the cam chain cavity cylinder seal with the tabs down.

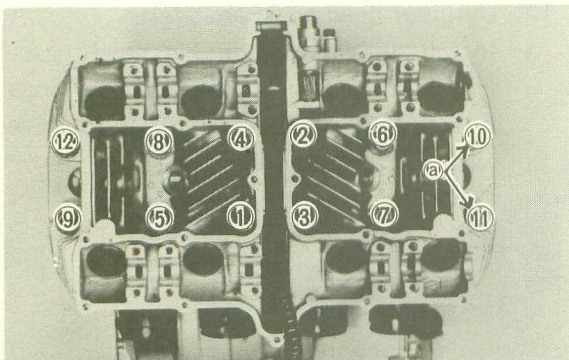


- b. Install the cylinder head onto the cylinder. Pull the cam chain through the cylinder head as it is installed. Tie the cam chain so that it does not fall into the crankcase.
- c. Place the upper cylinder head nuts and washers in place. Follow the illustration for the proper tightening sequence. Torque all nuts in two stages and final torque the upper nuts to the specification.

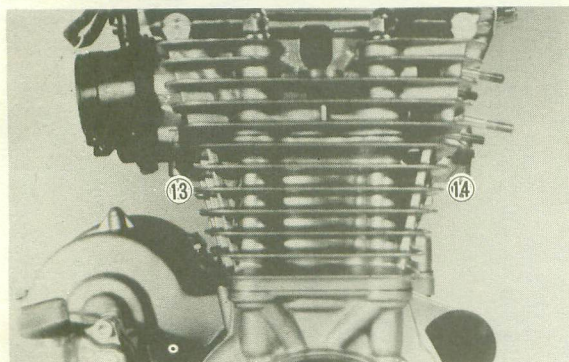
Tightening torque: 3.2 m-kG (23.1 ft-lb)

Don't forget the lower nuts on the front and rear of the cylinder head. Torque to the specification.

Tightening torque: 2.0 m-kG (14.5 ft-lb)



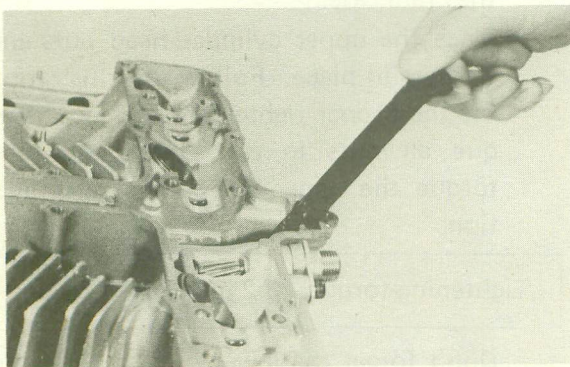
a. Copper washers



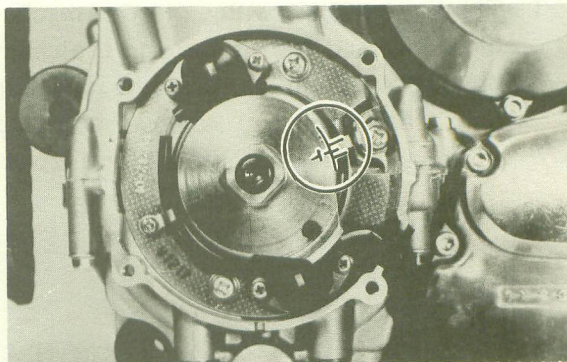
NOTE:

Tighten the nuts in two stages, 1/2 torque value and then full torque value. Also lubricate the bolt threads with the engine oil to achieve proper torque values.

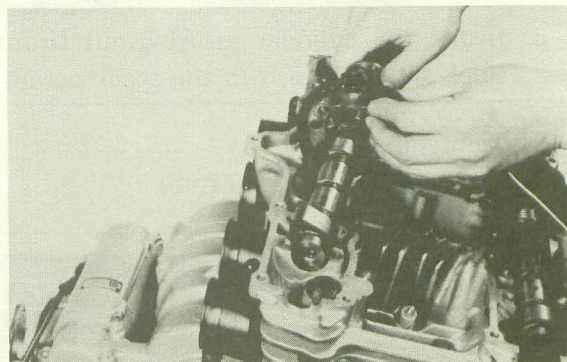
- d. Install the front cam chain guide being certain that it is in its holder down below.



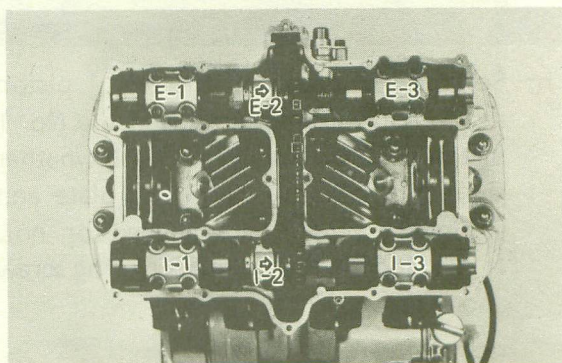
- e. Rotate the engine in a counterclockwise direction until the crankcase pointer and "T" mark on the timing plate are aligned.



- f. With the cylinders No. 1 and 4 at the top dead center, slip the cam chain over the sprocket.
- g. Lubricate all cam caps and cam bearings surfaces liberally with oil.



- h. Place the cam caps in their proper positions. The caps are identified "I-1" through "I-3" for intake and "E-1" through "E-3" for exhaust. Install the bolts only finger tight.



CAUTION:

The cam caps must be tightened evenly or damage to the cylinder head, cam caps and cam will result. The spaces between the caps and cylinder head should be equal.

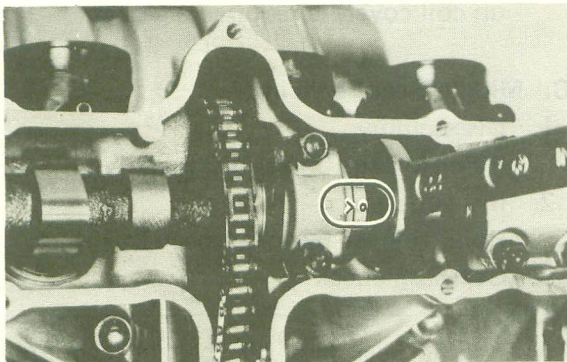
- I. Torque the cam cap bolts in two stages and final torque to the specification.

Tightening torque: 1.0 m-k_g (7.2 ft-lb)

13. Cam chain, cam sprockets and chain tensioner
 - a. Rotate each cam shaft until the dot on the cam is aligned with the arrow on the center cam cap.

CAUTION:

Use extreme caution when rotating the cams. Two possible dangers exist. First, the wrench may contact the head and fracture it. Or second, a valve may become bent if the cam is turned the wrong way.

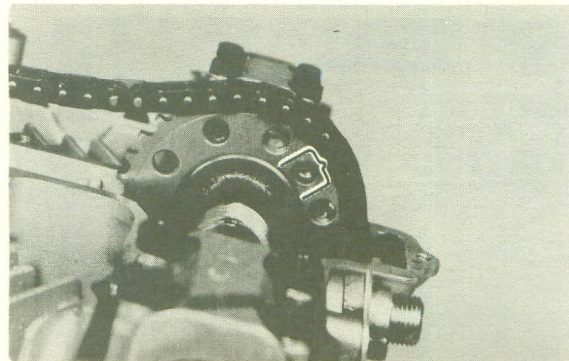


- b. Carefully lift the cam chain from the exhaust cam sprocket and pull upward to remove any slack in the chain between the crankshaft and the exhaust cam sprocket. With all slack removed, place the chain back on the cam sprocket.
 - c. Grip each sprocket simultaneously and place them on the camshaft shoulders while continuing to keep tension on the chain from the crankshaft to the exhaust sprocket.

CAUTION:

Use only the special hardened shouldered bolts to install the cam chain sprockets to the cams.

Make sure the rollers of the cam chain are centered on both chain guides.

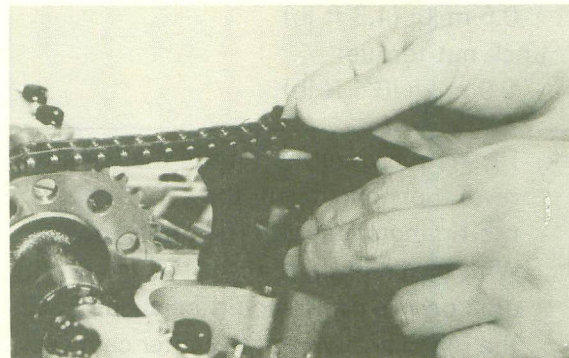


- d. Rotate the sprockets slightly to align the bolt holes and insert one special bolt in each sprocket.

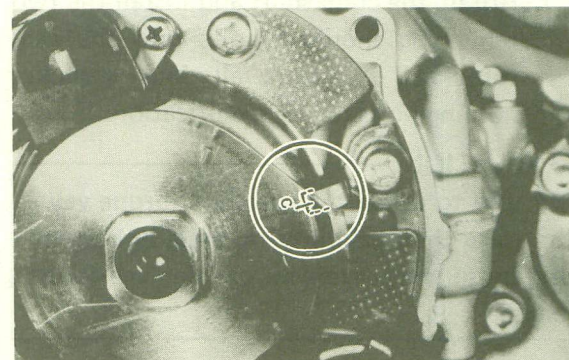
NOTE:

Tighten only finger tight at this time.

- e. Install the center chain guide.

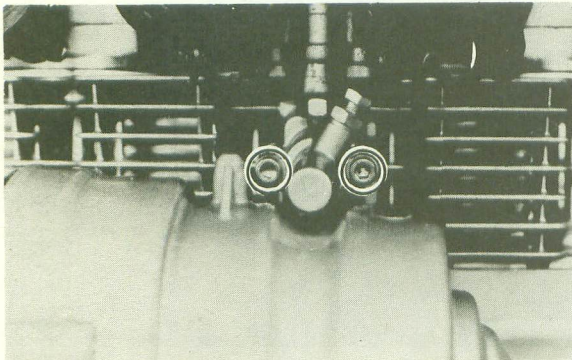


- f. Rotate the crankshaft counterclockwise and align the "C" mark on the timing plate with the timing pointer.



- g. Compress the cam chain tensioner and lock in the retracted position.
 - h. Install the chain tensioner to the engine and torque the bolts to the specification.

Tightening torque: 1.0 m-k_g (7.2 ft-lb)



- i. Release the tensioner holding bolt, an audible click will be heard when the tensioner is released.
- j. Torque the holding bolt and the lock nut to the specifications.

Holding bolt torque:

0.6 m-kG (4.3 ft-lb)

Lock nut torque:

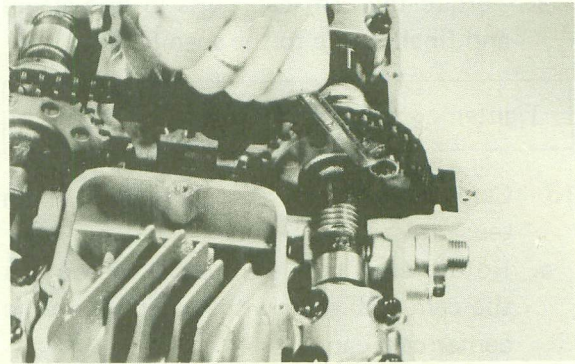
0.9 m-kG (6.5 ft-lb)

- k. Rotate the crankshaft more than one full revolution and align the "T" mark on the timing plate with the timing pointer. With the crankshaft at the "T" mark, the dots on the cams should be aligned with the raised arrows on the center cam caps. If they are not aligned, disassemble the sprockets and chain tensioner and repeat above procedures.
- l. Rotate the crankshaft and install the two remaining shoulder bolts into the cam sprockets. Torque all four sprocket holding bolts to the specification.

CAUTION:

Be sure to attain the specified torque value to avoid the possibility of these bolts coming loose and causing serious damage to the engine.

Tightening torque: 2.0 m-kG (14.5 ft-lb)



- m. Adjust all valves as described in the "PERIODIC INSPECTIONS AND ADJUSTMENTS".
- n. Install the cylinder head cover with a new gasket.
- o. Install the left and right crankcase covers. The left crankcase cover (pick-up coil cover) is required a gasket.

C. Middle Gear Servicing

1. Disassembly
Refer to page 39 for disassembly.
2. Inspection
Refer to page 52 for inspection.
3. Gear lash check

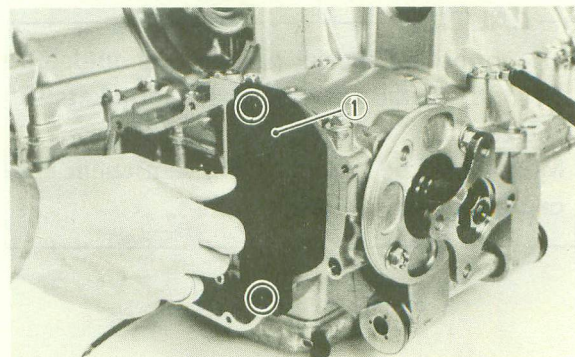
NOTE:

The middle gear lash can be checked only when the gears are installed in the crankcase.

- a. Install the middle drive pinion holder (special tool) on the crankcase to hold the drive gear stationary during the lash measurement.

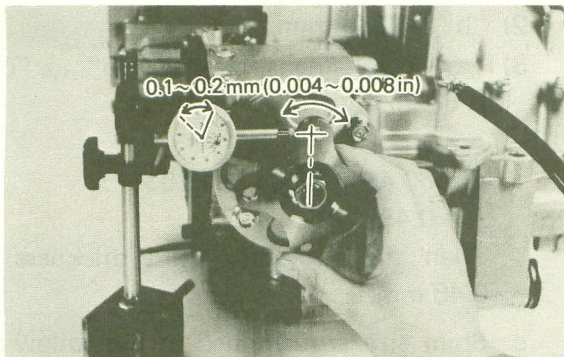
NOTE:

Before installing the tool, loosen the holder bolt all the way out and after installation tighten this bolt as tight as necessary (finger tight is generally sufficient).



1. Middle drive pinion holder

- b. Set the dial gauge to the middle drive flange as shown and gently rotate the drive flange back and forth. Note the lash measurement on the dial gauge.



Middle gear lash:

0.1 ~ 0.2 mm (0.004 ~ 0.008 in)

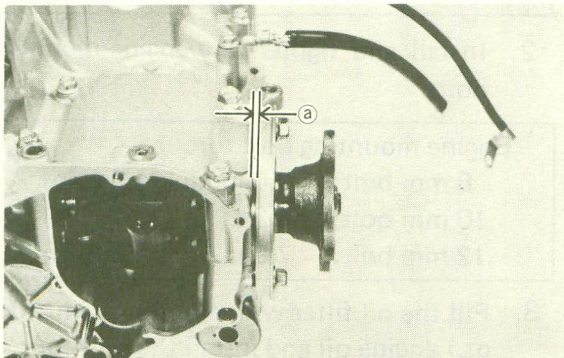
- c. Check this engagement at 4 positions. Rotate the drive flange 90° each time and repeat the gear lash check.

NOTE:

If the gear lash exceeds the specified limit and adjustment is necessary, the engine or swing arm should be removed from the motorcycle.

4. Gear lash adjustment

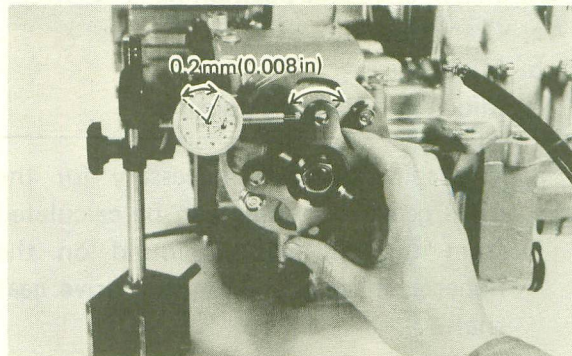
- a. Install the driven gear housing assembly into the crankcase leaving about a 2 mm (0.080 in) gap between the housing and crankcase and install the two bolts to the bearing housing 180° opposite to each other.



a. 2 mm (0.080 in)

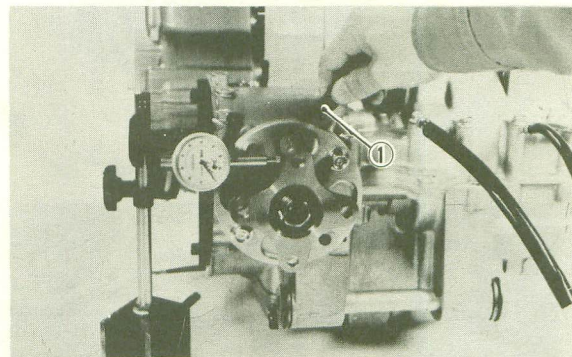
- b. Install the middle drive shaft holder and dial gauge (refer to "Middle gear lash check").

- c. Slowly tighten the bolts alternately until the dial gauge lash measurement reaches 0.2 mm (0.008 in).



- d. Measure the gap between the driven gear bearing housing flange and the crankcase with a feeler gauge.

This is the shim size required.

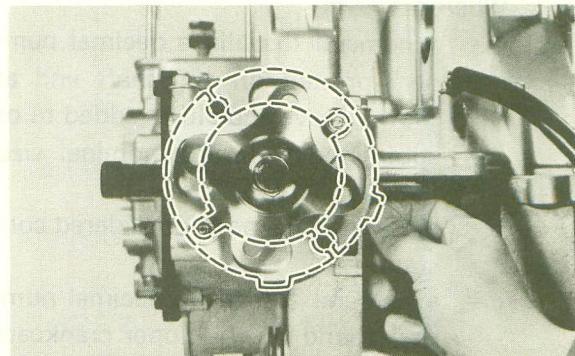


1. Feeler gauge

- e. Install the proper sized shims as shown and tighten the driven gear housing to the specified torque.

Recheck the gear lash, it should be within the specification, if not readjust the shims.

Gear lash: 0.1 ~ 0.2 mm (0.004~0.008 in)



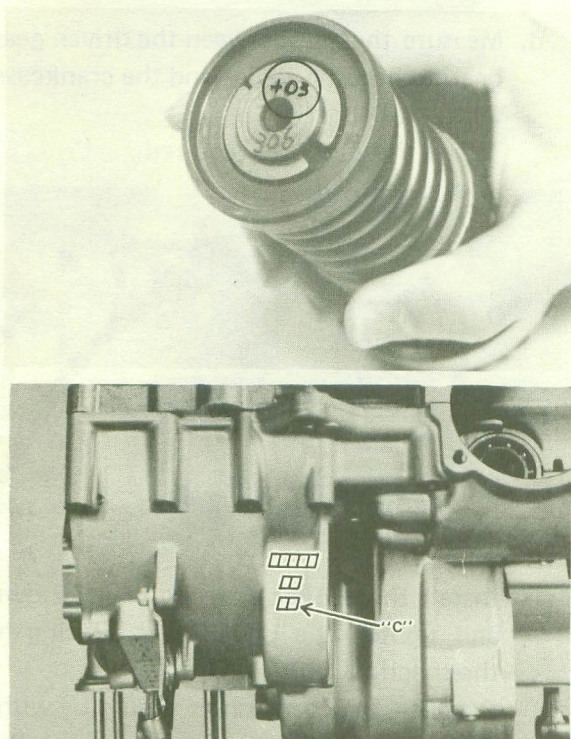
5. Drive gear positioning

NOTE:

When the following part(s) is replaced with new one(s), drive gear positioning is necessary:

- Crankcase
- Middle gears
- Middle gear bearing housing

- The shim thickness necessary for the drive gear positioning can be calculated from the informations found on the upper crankcase and on the drive gear shaft.



- To find shim thickness "A" use the formula:

$$A = c - a - b$$

Where:

- a = a numeral (usually a decimal number) printed on the shaft end as shown above and either added to or subtracted from the nominal size "43".
- b = a bearing thickness (considered constant)
- c = a numeral (usually a decimal number) found on the upper crankcase half near the main bearing selection numbers and added to the nominal size "60".

$$\text{Distance "b"} = 16.94 \text{ mm}$$

Example:

- If the shaft is marked +03 "a" is 43.03 mm.
- "b" is 16.94 mm.
- If the crankcase is stamped "45" "c" is 60.45 mm.

$$A = c - a - b$$

$$A = 60.45 - 16.94 - 43.03$$

$$A = 0.48$$

Then the necessary shim thickness is 0.48 mm.

- Shim size are supplied in the following thicknesses:

0.15 mm, 0.20 mm, 0.30 mm, 0.40 mm, and 0.50 mm.

Because the shims can only be selected in 0.05 mm increments the following chart should be used when encountering last digits that are not 5 or zero (0):

Last digits	Rounding
0, 1, 2	0
3, 4, 5, 6, 7	5
8, 9	10

D. Remounting Engine

Refer to page 30 for engine removal.
Reverse the applicable removal steps.

CAUTION:

Always use new bolts in the drive shaft coupling.

- Install and tighten the engine mounting bolts.

Engine mounting bolt torque:

8 mm bolt:	2.0 m-kG (14.5 ft-lb)
10 mm bolt:	4.2 m-kG (30.4 ft-lb)
12 mm bolt:	7.0 m-kG (50.6 ft-lb)

- Fill the oil filter with approx. 0.3 lit (0.3 qt.) engine oil and install the oil filter.

CAUTION:

The filter must be filled with the specified amount of oil to prime the oil pump of an overhauled engine.

4. Tighten engine oil drain plug, oil filter mounting bolt, and middle drain plug.

Torque:

Engine oil drain plug:

4.3 m-kg (31.0 ft-lb)

Oil filter mounting bolt:

1.5 m-kg (11.0 ft-lb)

Middle gear drain plug:

2.4 m-kg (17.5 ft-lb)

5. Add oil to the engine.

Engine oil: 2.9 lit (3.1 US qt.)