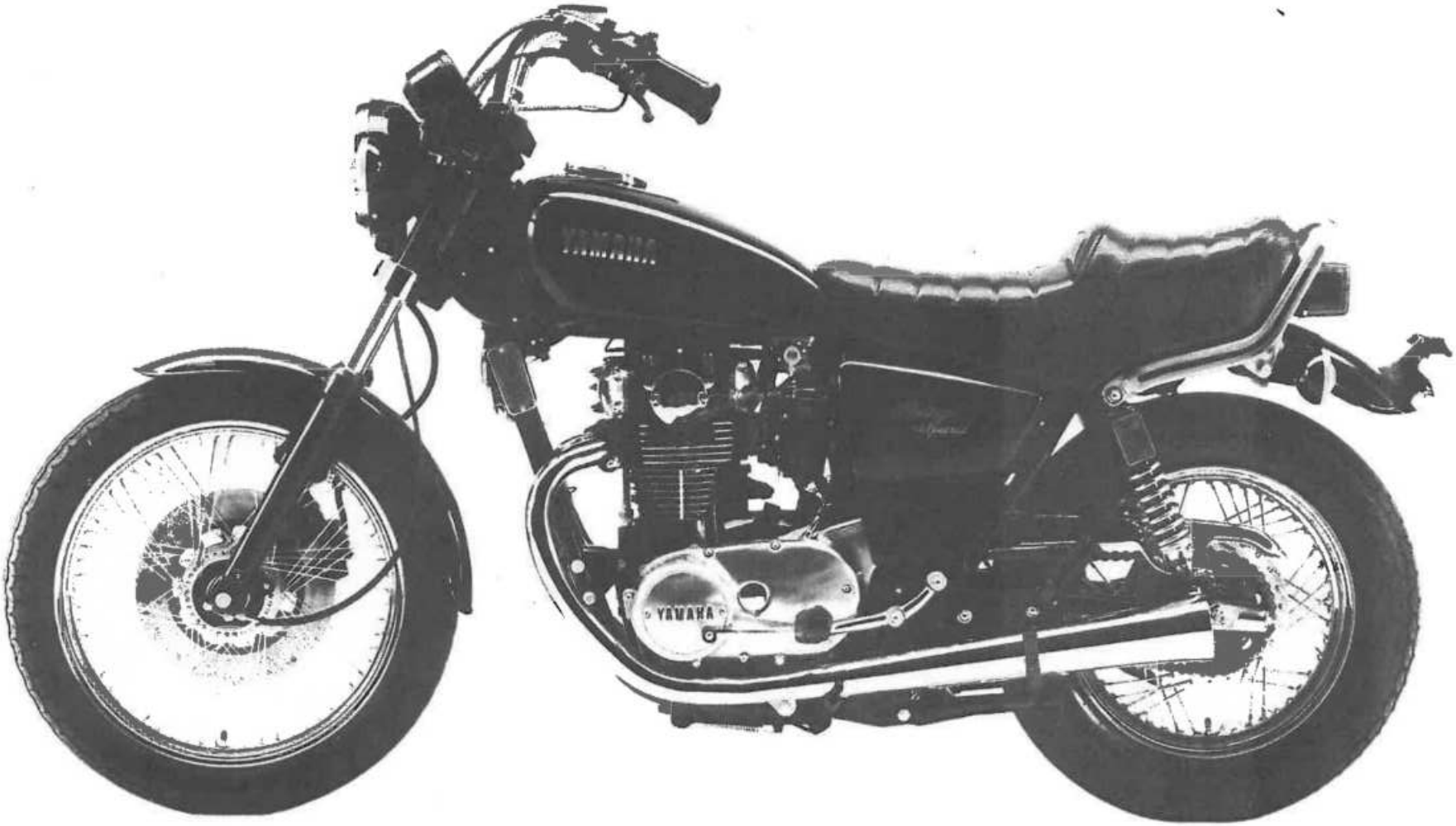
YAMAHA

XS650SJ

Service Manual

LIT-11616-02-90

5V4-28197-10


YAMAHA
YAMAHA

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 XS650SJ. 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.

XS650SJ
SERVICE MANUAL
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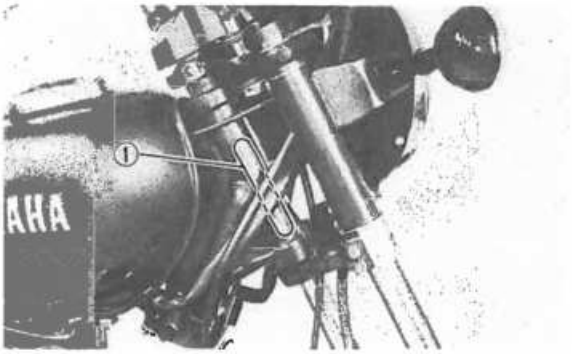
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GENERAL INFORMATION

MOTORCYCLE IDENTIFICATION

A. Frame Serial Number

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



1. Frame serial number

Starting Serial Number:
XS650SH 5V4-000101

B. Engine Serial Number

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

NOTE:

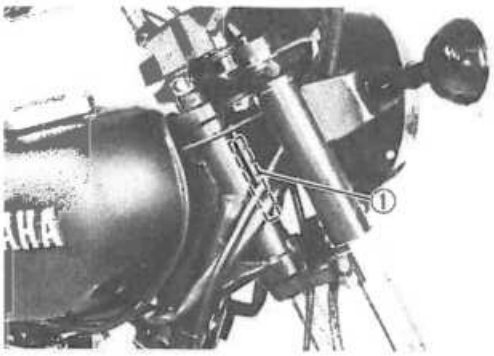
The first three digits of these numbers are for model identification; the remaining digits are the unit production number.



1. Engine serial number

C. Vehicle Identification Number

The vehicle identification number is on the left-side of the steering head pipe.



1. Vehicle identification number

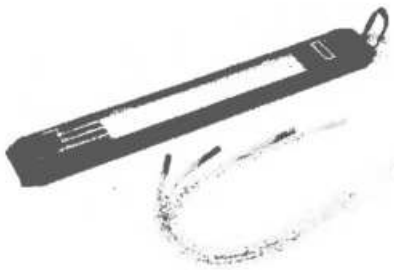


SPECIAL TOOLS

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

A. For Tune-up

1. Compression gauge
2. Timing light
3. Tachometer
4. Vacuum gauge
   P/N TLU-11080-30-02



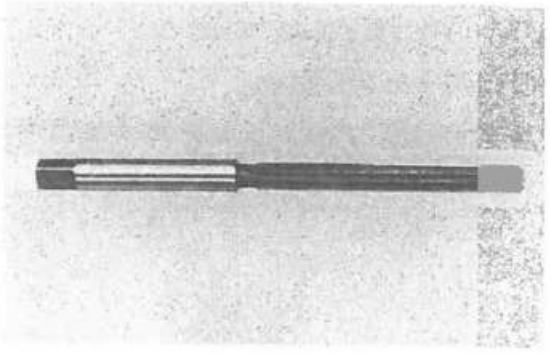
B. For Engine Service

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



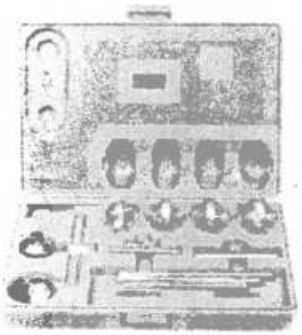
This tool is used to hold the clutch when removing or installing the clutch boss lock nut.

2. Valve guide reamer
   P/N 90890-01211-00



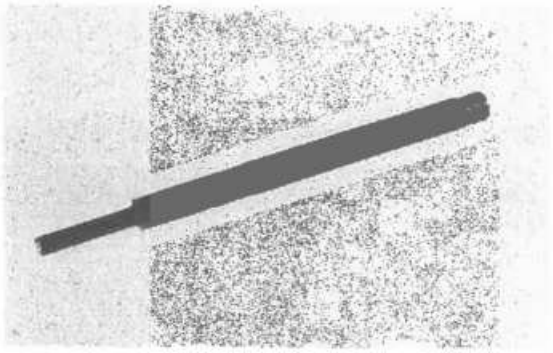
This must be used after installing a new valve guide

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



This tool is needed to resurface the valve seat

4. Valve guide remover
   P/N 90890-01200-00
   Valve guide installer
   P/N 90890-01201-00



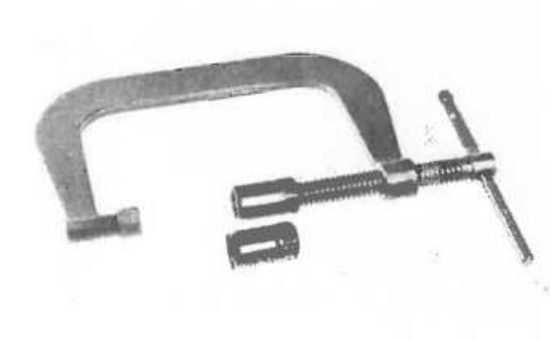
This must be used to remove or install the valve guides.

5. Cam chain tool
P/N 90890-01112



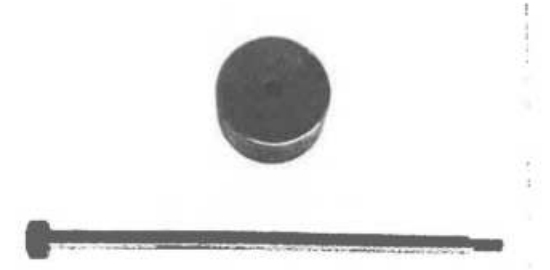
This tool is needed for proper installation of the valve guides.

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



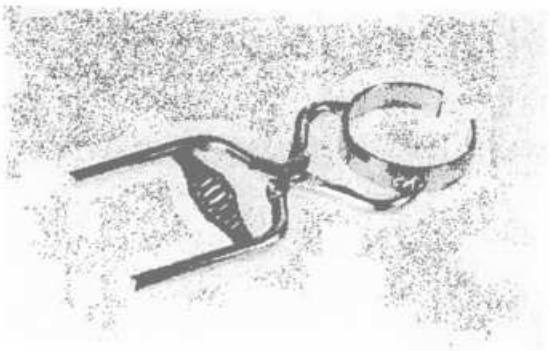
This tool must be used for removing and installing the valve assemblies.

7. Slide hammer
P/N 90890-01083-00 (Bolt)
90890-01084-00 (Weight)



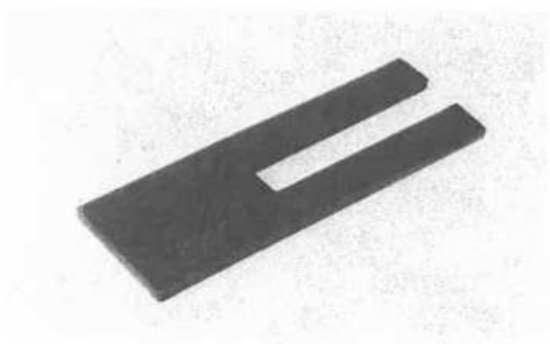
These tools are used when removing the rocker arm shaft.

8. Piston ring compressor
P/N 90890-01253-00



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

9. Piston support plate
P/N 90890-01067



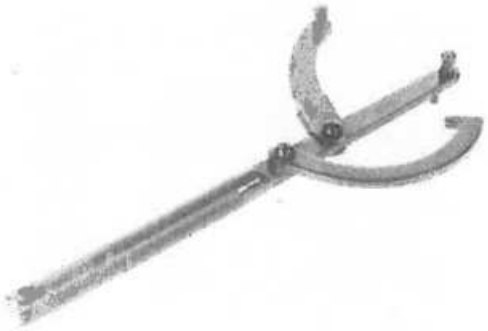
Use 2 of these to hold the pistons during cylinder installation.

10. Rotor puller
P/N 90890-01070-00



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

11. Rotor holding tool
P/N 90890-01235-00



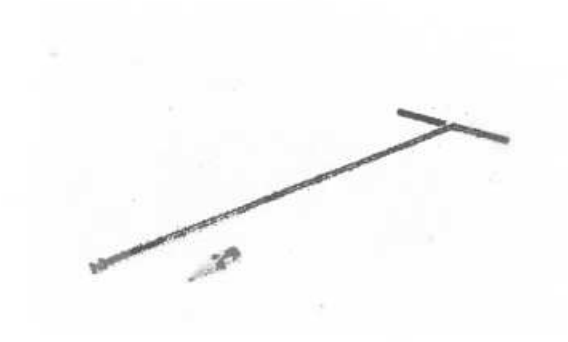
This tool is used to hold the A.C. Generator rotor and remove it using the Rotor puller

12. Clip plier
P/N 90890-01233-00



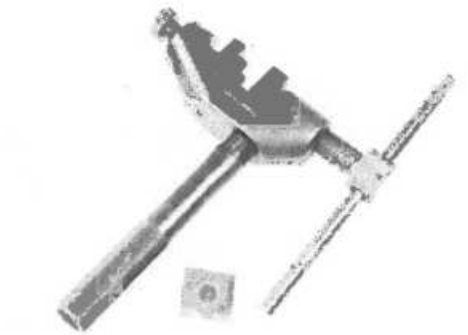
C. For Chassis Service

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



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

2. Drive chain tool
P/N 90890-01081-00



This tool is used to cut or rivet the joint of drive chain.

3. Master cylinder seal installing tool

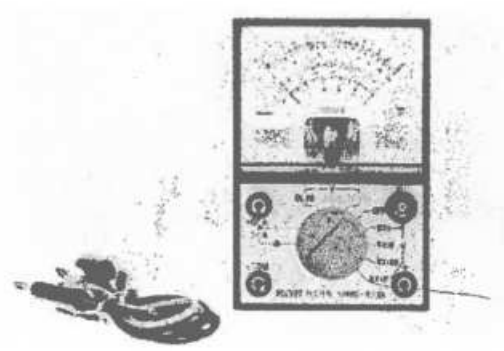


This tool is needed when installing the master cylinder seal.

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 INSPECTION AND ADJUSTMENT

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2

PERIODIC INSPECTION AND ADJUSTMENT

INTRODUCTION

This chapter includes all information necessary to perform recommended inspections and adjustments. These preventive maintenance procedures, if followed, will ensure more reliable vehicle operation and a longer service life. The need for costly overhaul work will be greatly reduced. This information applies to vehicles already in service and to new vehicles that are being prepared for sale. All service technicians 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 maintenance tables, 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	Check and adjust chain tension.	O	O		O
2.	Valve Clearance	Check and adjust valve clearance when engine is cold.	O	O		O
3.	Spark Plugs	Check condition. Adjust gap and clean. Replace after 13,000 km (or 18 months) and thereafter every 12,000 km (or 18 months)		O	O	
4.	Crankcase Ventilation System	Check ventilation hose for cracks or damage. Replace if necessary.		O		O
5.	Fuel Line	Check fuel hose and vacuum pipe for cracks or damage. Replace if necessary.		O		O
6.	Exhaust System	Check for leakage. Retighten if necessary. Replace gasket(s) if necessary.		O	O	
7.	Carburetor Synchronization	Adjust synchronization of carburetors.		O	O	
8.	Idle Speed	Check and adjust engine idle speed. Adjust cable free play if necessary.		O	O	

GENERAL MAINTENANCE/LUBRICATION

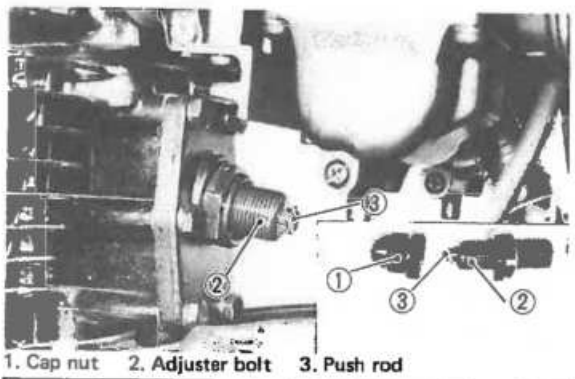
No.	Item	Remarks	Type	Initial Break-In		Thereafter Every		
				1,000 km (600 mi.) or 1 month	5,000 km (3,000 mi.) or 7 months	4,000 km (2,500 mi.) or 6 months	8,000 km (5,000 mi.) or 12 months	16,000 km (10,000 mi.) or 24 months
1.	Engine Oil	Warm up engine before draining.	Yamalube 4-cycle oil or SAE 20W/40 type "SE" motor oil.	○	○	○		
2.	Oil Filter	Clean element in solvent.	–		○		○	
3.	Air Filter	Dry type filter. Clean with compressed air.	–		○		○	
4.	Brake System	Adjust free play. Replace pads (front brake only) or shoes (rear brake only) if necessary.	–	○	○	○		
5.	Clutch	Adjust free play.	–	○	○	○		
6.	Drive chain	Check chain condition. Adjust and lubricate chain thoroughly.	Yamaha chain and cable lube or SAE 10W/30 motor oil	CHECK CHAIN TENSION AND LUBE Every 500 km (300 mi)				
7.	Control and Meter Cable	Apply chain lube thoroughly.	Yamaha chain and cable lube or SAE 10W/30 motor oil	○	○	○		
8.	Rear Arm Pivot Shaft	Apply until new grease shows.	Lithium soap base grease.			○		
9.	Brake Pedal and Change Pedal Shaft	Lubricate. Apply chain lube lightly.	Yamaha chain and cable lube or SAE 10W/30 motor oil.		○	○		
10.	Brake/clutch lever pivot shaft	Apply chain lube lightly.	Yamaha chain and cable lube or SAE 10W/30 motor oil		○	○		
11.	Center/Side Stand Pivots and Kick Crank Boss	Lubricate. Apply chain lube lightly.	Yamaha chain and cable lube or SAE 10W/30 motor oil.		○	○		
12.	Front Fork Oil	Drain completely. Refill to specification.	Yamaha fork oil 10 wt or equivalent					○
13.	Steering Bearings	Check bearings assembly for looseness. Moderately repack every 16,000 km (10,000 mi)	Medium weight wheel bearing grease.		○	○		REPACK
14.	Wheel Bearings	Check bearings for smooth rotation.			○	○		
15.	Battery	Check specific gravity and breather pipe for proper operation.			○	○		
16.	A.C. Generator	Replace generator brushes. Replace at 9,000 km (5,500 mi) and thereafter every 8,000 km (5,000 mi)					○	

ENGINE

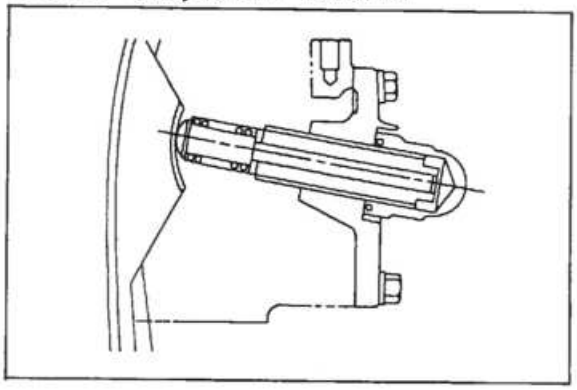
A. Cam Chain/Valve Clearance

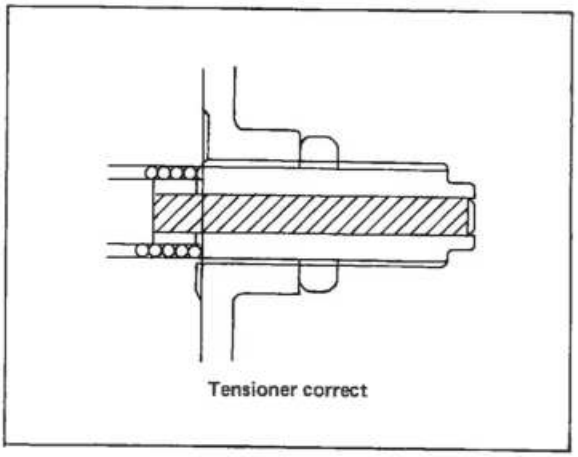
Check and adjust the chain tension as follows:

a. Remove the generator cover.
b. Remove the cap nut and loosen the lock nut.
c. Turn the left end of the crankshaft counterclockwise. As the crankshaft is turning, check to see that the cam chain adjuster push rod is flush with the end of the bolt. If not, turn the adjuster bolt until the push rod is flush.
d. Tighten the lock nut.
e. Reinstall the cap nut and the generator cover.

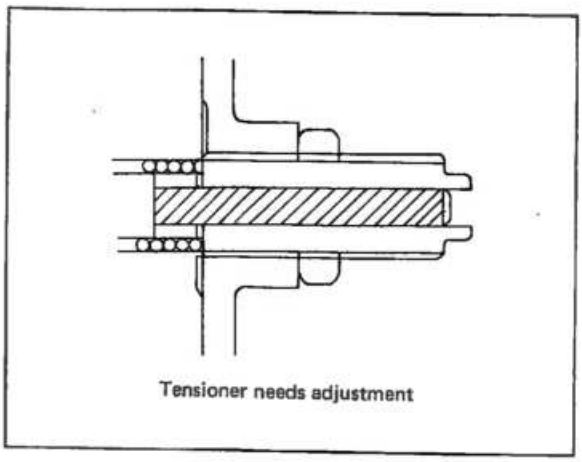


1. Cap nut 2. Adjuster bolt 3. Push rod

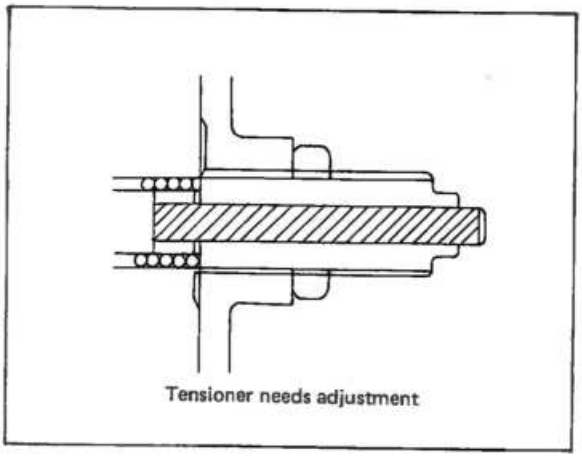




Tensioner correct



Tensioner needs adjustment



Tensioner needs adjustment

• Valve Clearance

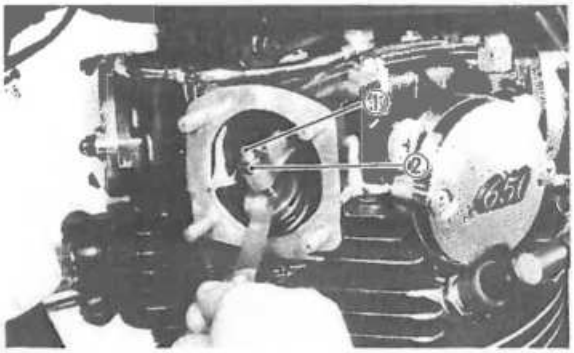
Adjust valve clearance as follows:

NOTE:

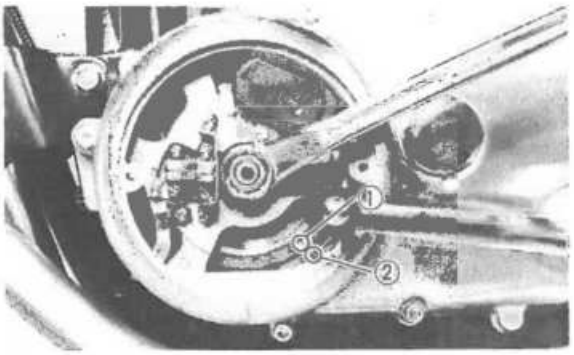
Valve clearance must be measured when the engine is cool to the touch.

1. Remove the intake and exhaust tappet covers and the left crankcase cover.
2. Turn the crankshaft to align the rotor mark with the "T" mark on the starter.
3. Adjust the clearance as specified by turning the adjuster in or out.

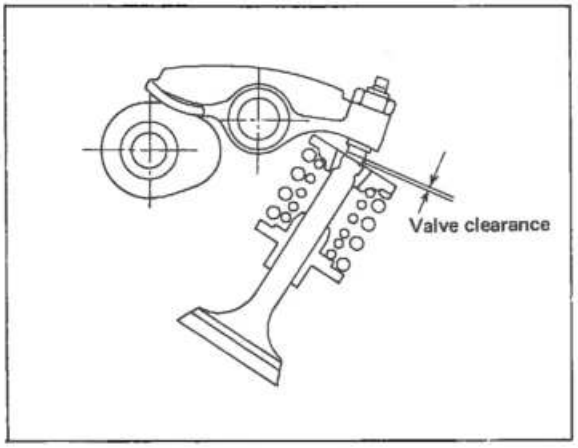
   Valve clearance Intake: 0.06 mm
   Exhaust: 0.15mm
4. Repeat above steps for the other cylinder.

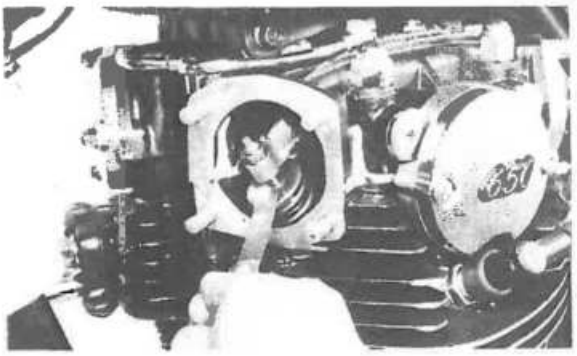


1. Adjuster 2. Lock nut



1. Align mark 2. T mark





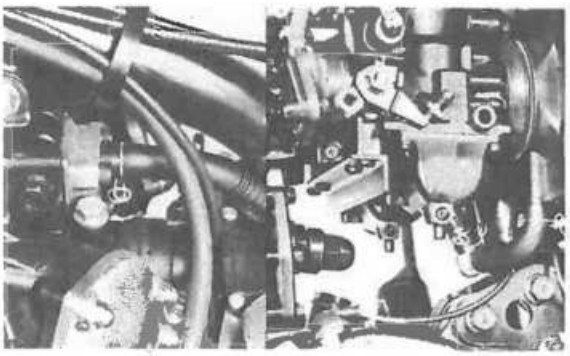
B. Spark Plug

1. Check electrode condition and wear, insulator color, and electrode gap.
2. Clean the spark plug with spark plug cleaner if necessary. Use a wire gauge to adjust the plug gap to the specification.
3. If either electrodes is 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: NGK BP7ES Spark Plug Gap: 0.7 ~ 0.8 mm (0.028 ~ 0.032 in) Spark Plug Tightening Torque: 19.6 Nm (2.0 m·kg, 14.5 ft·lb)

C. Crankcase Ventilation System

Check the ventilation hose from the cylinder head cover to air cleaner case for cracks or damage; replace the hose if necessary.



D. Fuel Line

Check the fuel hoses and vacuum lines for cracks or damage; replace if necessary.

E. Exhaust System

1. Tighten the intake manifold bolts and nuts.
2. Replace the intake manifold gasket(s) if necessary.

F. Carburetor Synchronization

Carburetors must be adjusted to open and close simultaneously. Adjust as follows:

NOTE:

Valve clearance must be set properly before synchronizing the carburetors.

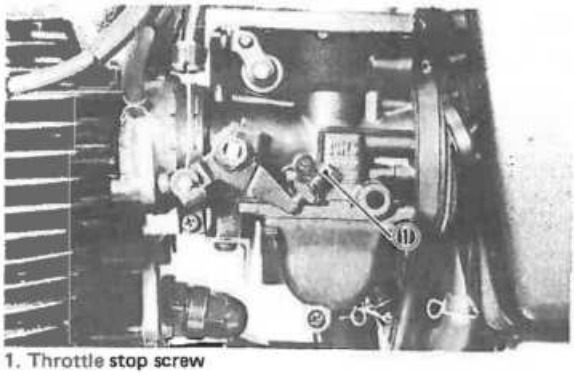
1. Turn petcock to "PRI" position. Remove the vacuum pipe and the rubber cap from intake manifolds.
2. Connect the vacuum gauge on intake manifolds.
3. Start engine and let it warm-up for a few minutes. The warm-up is complete when the engine responds normally to changes in the throttle.
4. Adjust the damping valve on the vacuum gauge until the indicator barely fluctuates. Some fluctuation is required to insure the gauges are not over damped.
5. Both gauge readings will indicate the same reading if the carburetors are synchronized.
6. If not, turn the synchronizing screw until the gauge readings are the same.


1. Synchronizing screw

7. After adjustment, reinstall the vacuum pipe and the rubber cap.

G. Idle Speed

1. Start the engine, and warm it up for a few minutes.
2. Set the engine idle speed to the specified level by adjusting the throttle stop screw. Turning the throttle stop screw in (clockwise) increases the engine speed; turning it out (counterclockwise) decreases the engine speed. Use a tachometer for checking and adjusting the engine speed.

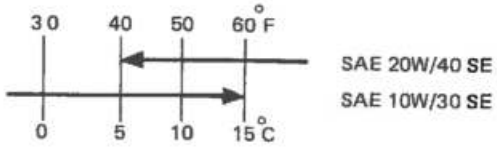

1. Throttle stop screw

Engine Idle: 1,200 r/min

H. Engine Oil

Recommended oil

Use Yamalube 4-cycle oil or SAE 20W 40 SE motor oil if the temperature does not go below 5°C (40°F). Use SAE 10W 30 SE motor oil if the temperature does not go above 15°C (60°F).



Oil level measurement

1. 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.

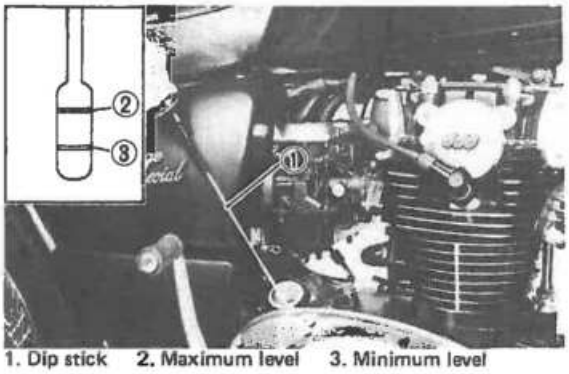
2. With the engine stopped, check the oil level through the level window located at the lower part of the right side crankcase cover, or screw the dip stick completely out and then the stick in the hole.

NOTE:

Wait a few minutes until the oil level settles before checking. When checking engine oil level with the dip stick, let the unscrewed dip stick rest on the case threads.



1. Level window 2. Maximum level 3. Mihimum level



1. Dip stick 2. Maximum level 3. Minimum level

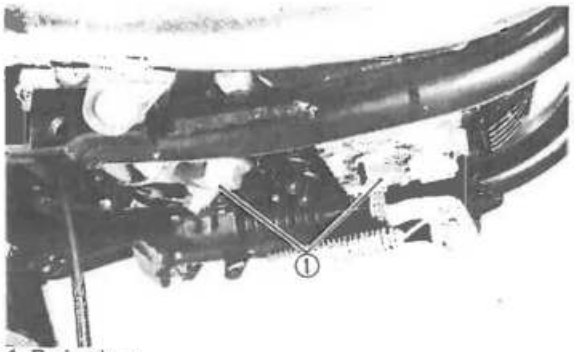
3. The oil level should be between the maximum and minimum marks. If the level is lower, add sufficient oil to raise it to the proper level.

Oil change (without filter change)

1. Warm up the engine for several minutes.
2. Place an oil pan under the engine.
3. Remove the oil filler cap and the drain plugs.
4. Install the drain plugs and the filter cover bolt.

Drain plug torque:
43.2 Nm (4.4 m·kg, 32 ft·lb)

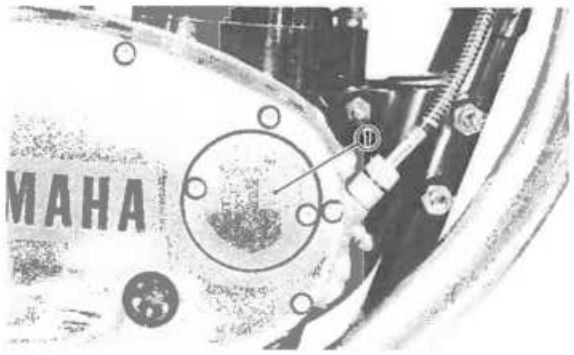
5. Add 2.0 L (1.76 Imp qt, 2.1 US qt) of engine oil. Install the oil filler cap.
6. Start the engine, and let it warm up. During warm-up, check for oil leakage. If oil leaks, stop the engine immediately, and check for the cause.
7. Stop the engine and check the oil level.



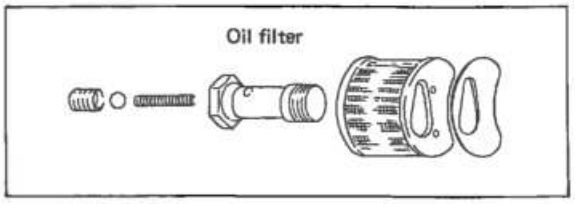
1. Drain plugs

Oil and filter change

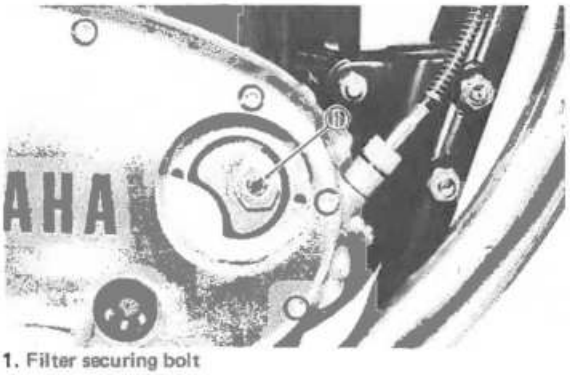
1. Warm up the engine for several minutes.
2. Place an oil pan under the engine.
3. Remove the oil filler cap and the drain plugs; drain the engine oil.



1. Filter cover



4. Remove the oil filter cover and oil filter securing bolt.



1. Filter securing bolt

5. Install the drain plugs, new oil filter, and oil filter cover.

Filter torque: 9.8 Nm (1.0 m-kg , 7 ft-lb)

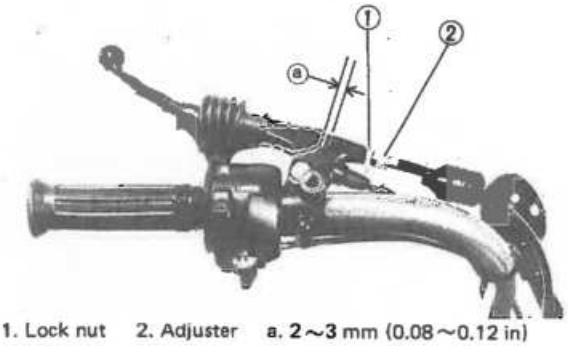
Drain plug torque: 43.2 Nm (4.4 m-kg, 32 ft-lb)

6. Add 2.2 L (1.94 Imp qt, 2.3 US qt) of engine oil. Install the oil filler cap.
7. Start the engine, and let it warm up. During warm-up, check for oil leaks. If oil leaks, stop the engine immediately, and check for the cause.
8. After warm-up, stop the engine and check the oil level.

I. Clutch Adjustment

Free play adjustment

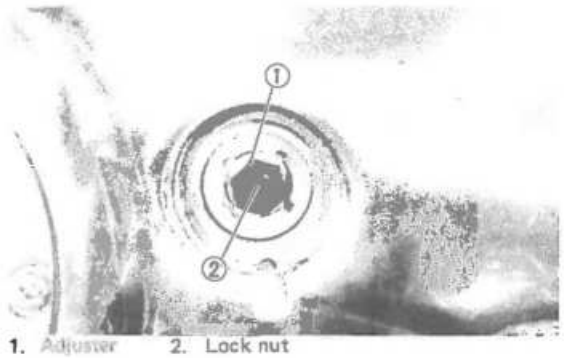
1. Loosen the clutch-lever-adjuster lock nut.
2. Turn the cable adjuster either in or out until proper lever free play is attained. Tighten the lock nut.



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

Mechanism adjustment

1. Completely loosen the clutch cable.
2. Remove the adjuster cover. Loosen the lock nut and turn the adjuster in (clockwise) until it lightly seats against a clutch push rod.



1. Adjuster 2. Lock nut

3. Back the adjuster out 1/4 turn and tighten the lock nut. Install the adjuster cover.
4. Adjust the clutch lever free play.

J. Checking Ignition Timing

Check the ignition timing with a timing light by observing the position of the rotor 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.) cylinder

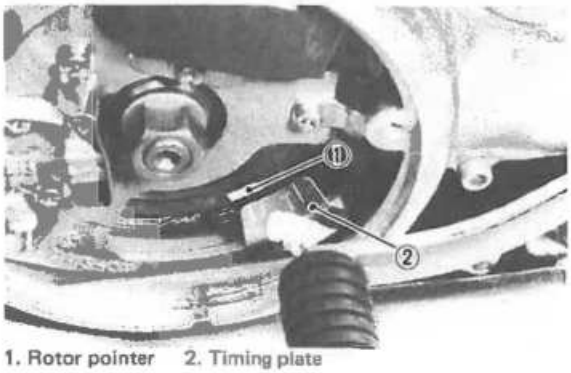
1. Remove the generator cover.
2. Connect the timing light to the left (#1) cylinder spark plug wire.
3. Start the engine, and keep the engine running at the specified speed. Use a tachometer to check the engine speed.

Engine Speed: 1,200 r/min

4. The rotor 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.

NOTE:

Ignition timing is not adjustable.



1. Rotor pointer 2. Timing plate

5. Reinstall the generator cover.

K. Compression Pressure Measurement

Insufficient compression pressure will result in performance loss and may indicate leaking

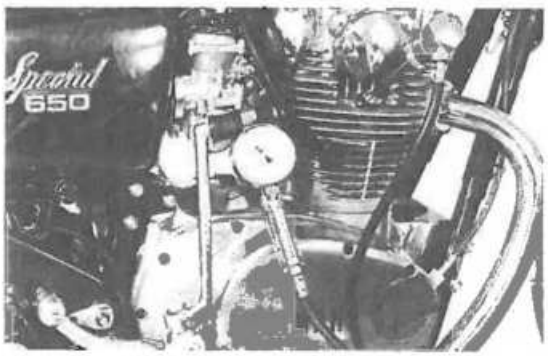
valves or worn or damaged piston rings.

1. Make sure the valve clearance is correct.
2. Warm up the engine for 2~3 minutes; stop the engine.
3. Remove both spark plugs.
4. Install a compression gauge.
5. 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. The compression should be within the specified levels.

Compression pressure (at sea level):	
Standard	
.....	1,080 kPa (11 kg/cm², 156 psi)
Minimum	
.....	883 kPa (9 kg/cm², 128 psi)
Maximum	
.....	1,180 kPa (12 kg/cm², 171 psi)

WARNING:

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



6. If the pressure is too low, squirt a few drops of oil into the cylinder being measured. 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, one or both rings and valves may be the source of the problem.
7. Check both cylinders. Compression pressure should not vary more than the specified value from one cylinder to the other.

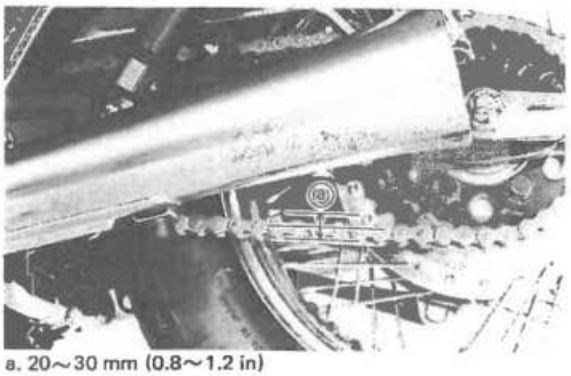
Difference between each cylinder:
Less than 98.1 kPa (1 kg/cm², 14 psi)

CHASSIS

A. Drive Chain Tension Check/Drive Chain Tension Adjustment

NOTE:

Before checking and/or adjusting, rotate rear wheel through several revolutions and check tension several times to find the tightest point. Check and/or adjust chain tension with rear wheel in this "tight chain" position.



a. 20~30 mm (0.8~1.2 in)

Inspect the drive chain with the center stand put up. Check the tension at the position shown in the illustration. The normal vertical deflection is approximately 20 ~ 30 mm (0.8 ~ 1.2 in). If the deflection exceeds 20~30 mm (0.8~1.2 in) adjust the chain tension.

• Drive chain tension adjustment

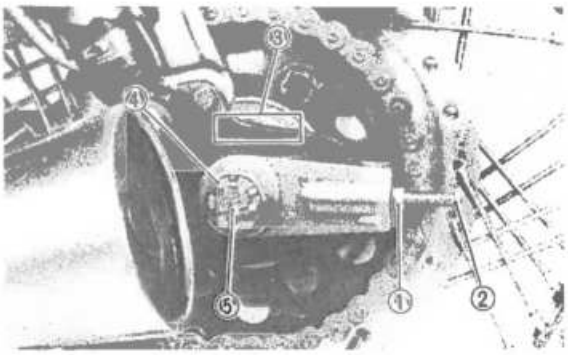
1. Loosen the rear brake adjuster.
2. Remove the cotter pin of the rear wheel axle nut with pliers.

NOTE:

The rear wheel axle nut is located on the right side.

3. Loosen the rear wheel axle nut.
4. Loosen the lock nuts on each side. To tighten chain turn chain puller adjusters clockwise. To loosen chain turn adjusters counterclockwise and push wheel forward. Turn each adjuster exactly the

same amount to maintain correct axle alignment. (There are marks on each side of the rear arm and on each chain puller; use them to check for proper alignment.)

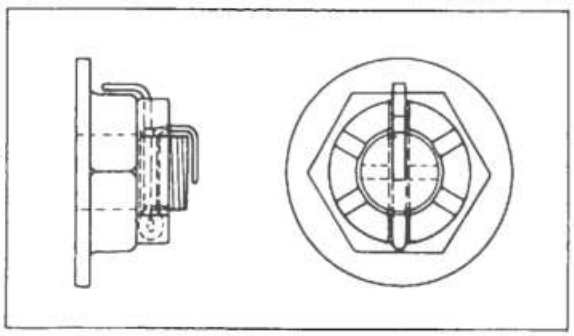


1. Lock nut
2. Adjuster
3. Marks for align
4. Rear wheel axle nut
5. Cotter pin

5. After adjusting, be sure to tighten the lock nuts and the rear wheel axle nut.
6. Insert the cotter pin into the rear wheel axle nut and bend the end of the cotter pin (if the nut notch and the cotter pin hole do not match, tighten the nut slightly to match).

CAUTION:

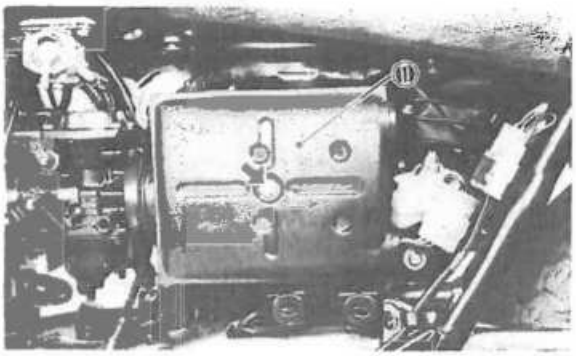
Excessive chain tension will overload the engine and other vital parts; keep the tension within the specified limits. Also, replace the rear axle cotter pin with a new one.



7. In the final step, adjust the play in the brake pedal.

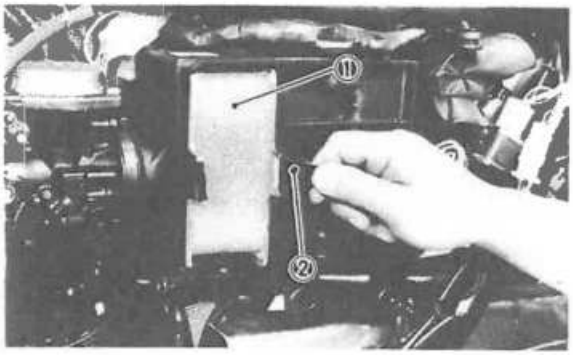
B. Air Filter

1. Remove the left and right hand side covers from the motorcycle.
2. Remove the fitting bolt and remove the air filter cover.



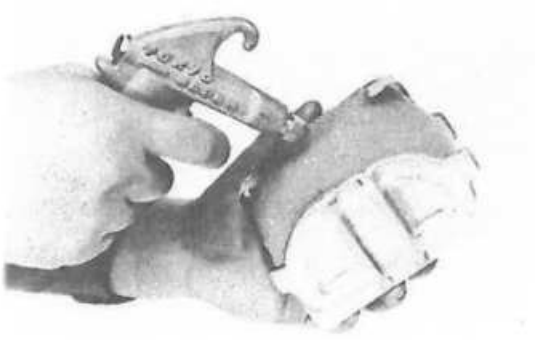
1. Air filter cover

3. Remove the filter fitting plate, and remove the air filter.



1. Air filter 2. Filter fitting plate

4. Clean the air filter with compressed air. Air flow should go from inside the filter towards the outside so dirt will be blown out of the filter element.



5. Install the cleaned filter in the air-filter case, and reinstall the filter fitting plate. Secure the air-filter cover in place with the fitting bolt.

NOTE:

Be sure that the foam rubber gasket is properly seated against the air-filter case.

6. Reinstall the left and right-hand side cover.

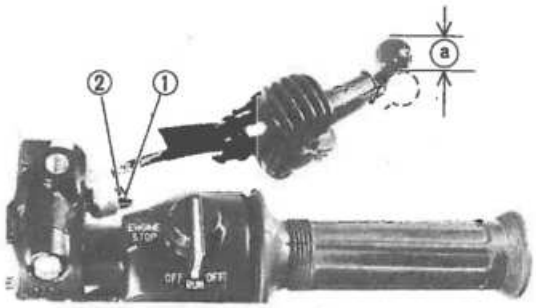
C. Front and Rear Brake

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 a 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. Lock nut 2. Adjuster 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.

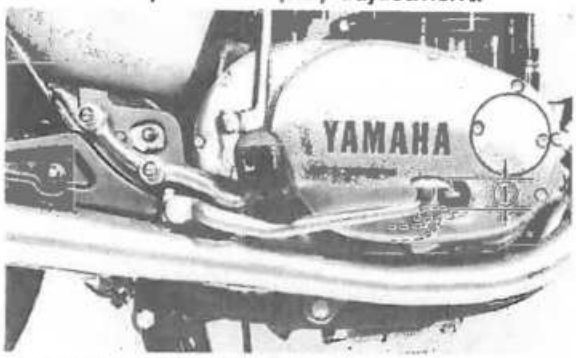
Rear-brake-pedal height adjustment.

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 flush with the top of the footrest.
3. Secure the adjuster lock nut.

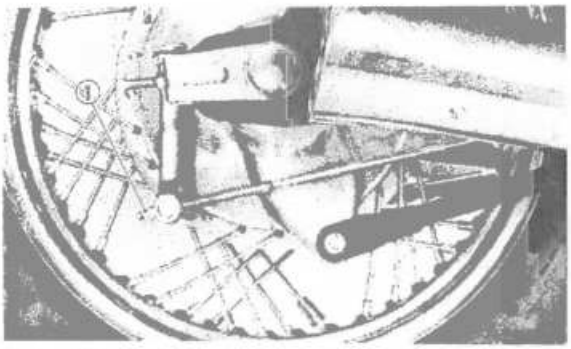
WARNING:

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

Rear brake-pedal free play adjustment.



1. 20 ~ 30 mm (0.8 ~ 1.2 in)



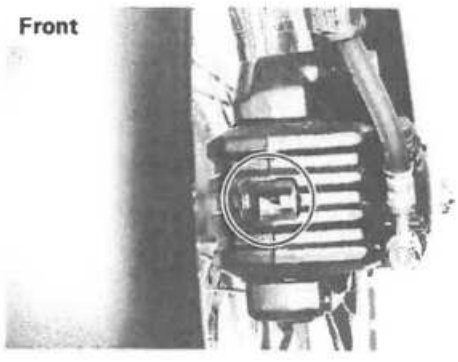
1. Align the punched marks on the brake shaft and the brake pedal, and secure the brake pedal.
2. Turn the adjuster on the brake rod clockwise or counterclockwise to provide the brake pedal end with a free play of 20 ~ 30 mm (0.8 ~ 1.2 in)
3. Check the brake pedal for smooth action.

WARNING:

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

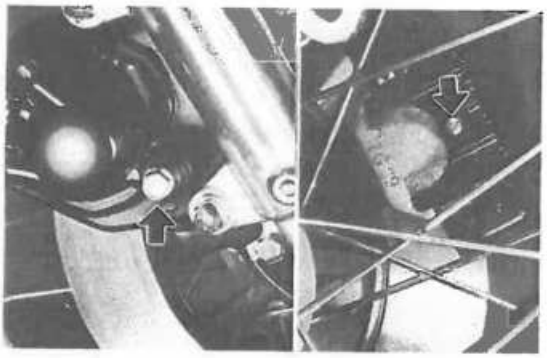
Front brake pad

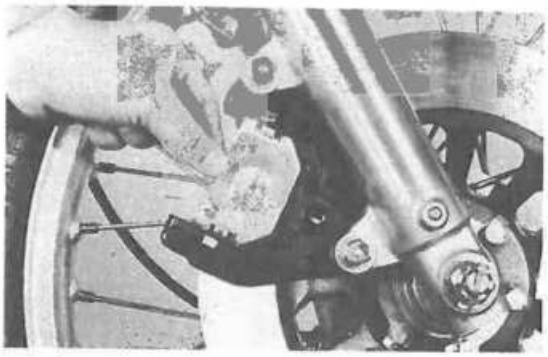
To check, examine the pads in the front brake. If any pad is worn to the wear limit (red line), replace both pads in the caliper.



Brake pad replacement

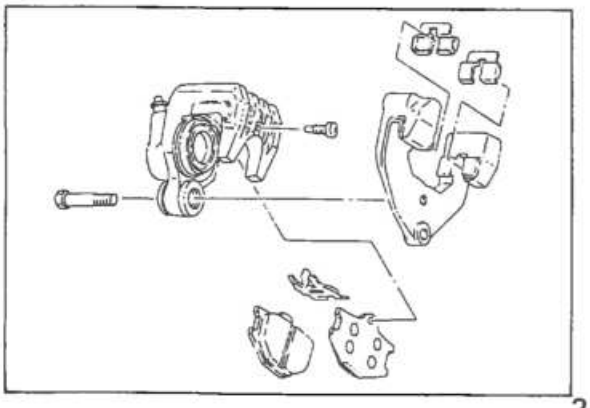
1. Remove the support bolt.
2. Remove the pad screw.
3. Remove the caliper from the support bracket.
4. Remove the pads from the support bracket.





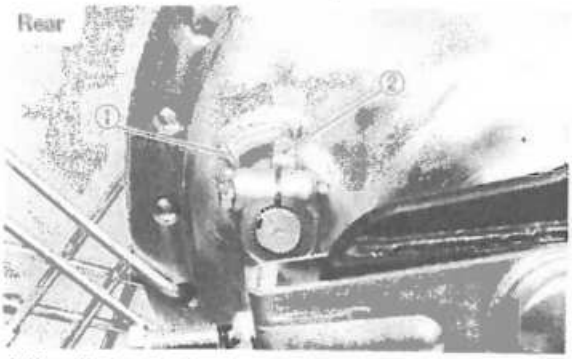
5. Install the new pads into the support bracket.
6. Install the caliper onto the support bracket.
7. Tighten the support bolt and the pad screw.

TIGHTENING TORQUE:
Support bolt
17.6 Nm (1.8 m kg, 13 ft lb)
Pad screw
2.9 Nm (0.3 m kg, 2.17 ft lb)



Rear brake shoe

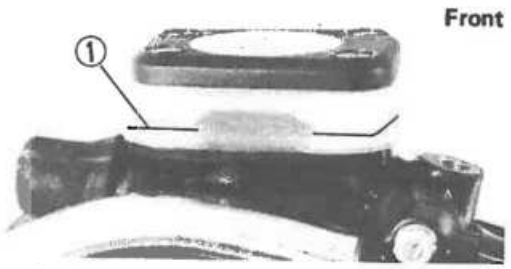
The specified thickness of the brake lining is 4 mm (0.16 in). The lining should be replaced when it wears to less than 2 mm (0.079 in). To check, see the wear indicator position while depressing the brake pedal.



1. Wear limit 2. Wear indicator

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

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

Recommended brake fluid: DOT #3

- Refill with the same type and brand of brake fluid; mixing fluids may result in a harmful chemical reaction and lead to poor performance.
  Be careful that water or other contaminants do not enter the master cylinder when refilling. Water will significantly lower the boiling point of the brake fluid and may result in vapor lock.

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

D. Cable Inspection and 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.

1. Damage to the outer housing of the various cables may cause corrosion. Often free movement will be obstructed. An unsafe condition may result. Replace such cables as soon as possible.
2. If the inner cables do not operate smoothly, lubricate or replace them.

Recommended lubricant:
Yamaha Chain and Cable Lube or
10W 30 motor oil

E. 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
10W 30 motor oil

F. Centerstands and Sidestands

Lubricate the centerstands and sidestands at their pivot points.

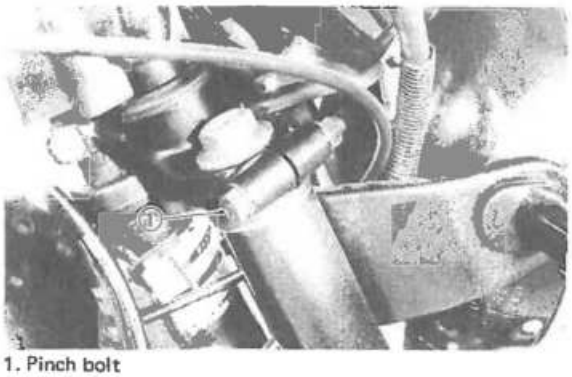
Recommended lubricant:
Yamaha Chain and Cable Lube or
10W 30 motor oil

G. Front Fork Oil Change

WARNING:

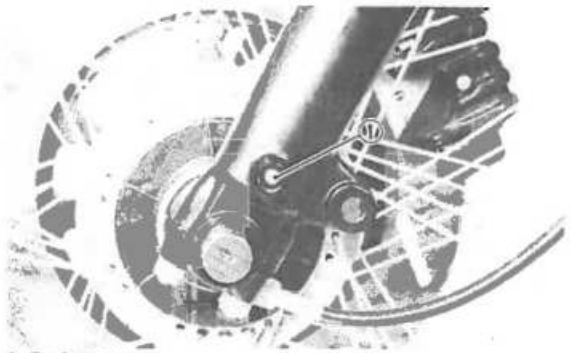
Securely support the motorcycle so there is no danger of it falling over.

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. Loosen the fork pinch bolts.
3. Remove the rubber cap from the top of each fork.



1. Pinch bolt

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



1. Drain screw

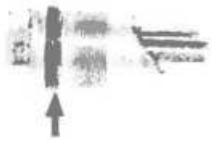
WARNING:

Do not let oil 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.

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

Front fork oil (each fork):
164 ~ 172 cm³ (5.78 ~ 6.07 Imp oz, 5.54 ~ 5.82 US oz)
Recommended oil:
Yamaha Fork Oil 10 wt, 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 if damaged.

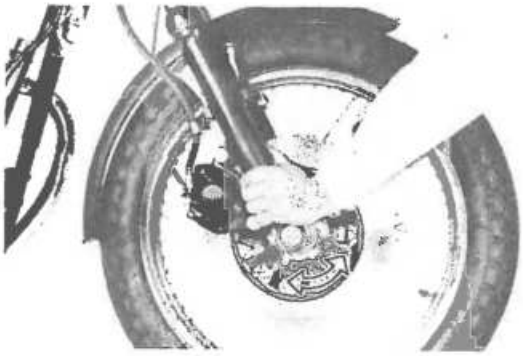
11. Install fork cap bolts.
12. Tighten pinch bolts.

Tightening torque:	Nm	m-kg	ft-lb
Fork cap bolt	49	5.0	36
Pinch bolt	9.81	1.0	7

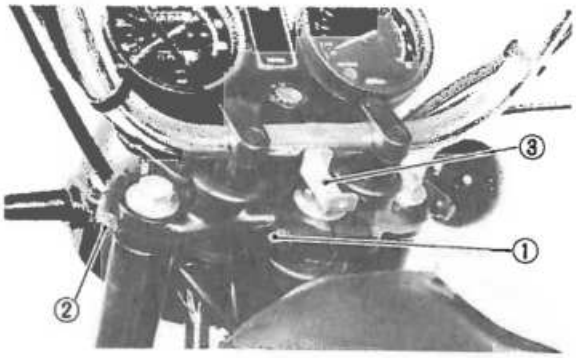
I. Steering Head Adjustment

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 the steering head is loose, adjust it. Loosen the steering stem, front fork pinch bolts, and steering fitting bolt.



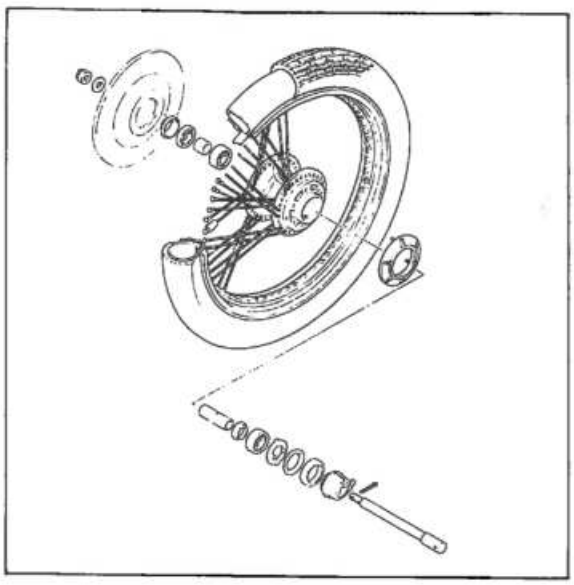
1. Crown pinch bolt 2. Fork pinch bolt
3. Steering fitting bolt

4. Use a steering nut wrench to loosen the 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 the forks are turned.
6. Retighten the top steering fitting nut, steering fitting bolt, and steering stem, and the 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 the adjustment procedure.

J. Wheel Bearings

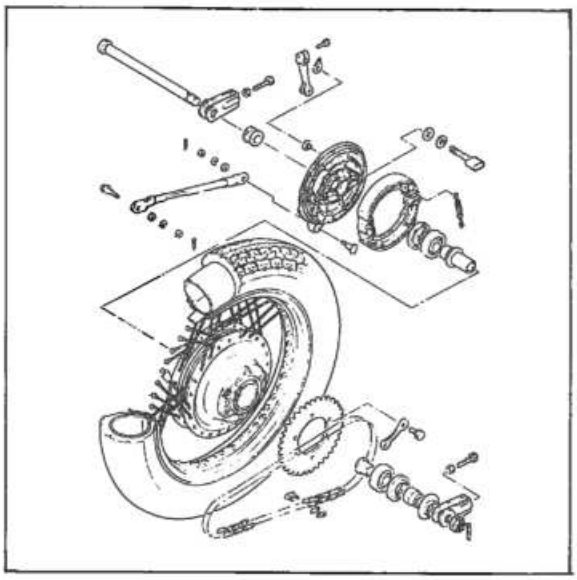
If a rolling rumble is noticed and increases with increasing wheel speed (not engine or transmission speed), the wheel bearings may be worn. Check the wheel bearings for both the front and rear wheels.

Front wheel



1. Raise the front end of the motorcycle, and spin the wheel by hand. Touch the axle or front fender while spinning the wheel. If you feel any excessive vibration, the bearings are rough and should be replaced.

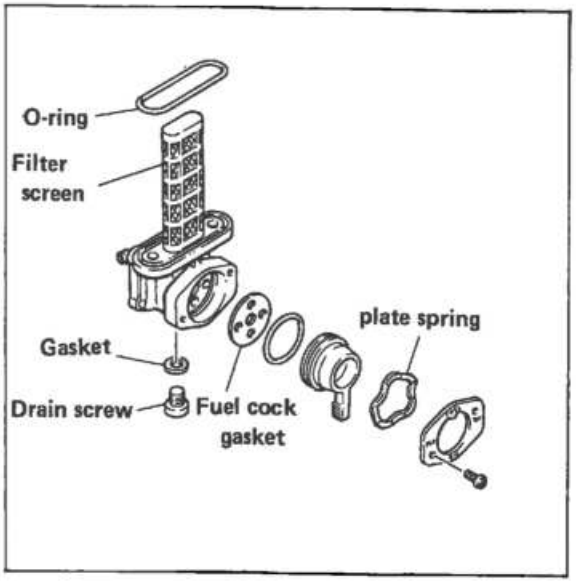
Rear wheel



1. Remove the rear wheel, and check the bearing movement with your finger. Replace the bearings if they are rough or worn.

K. Fuel Cock

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

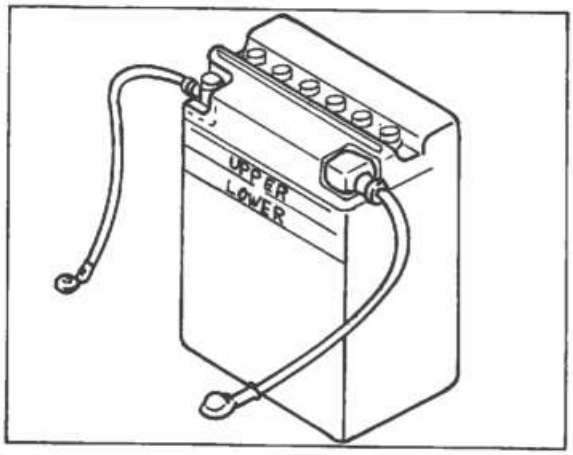


1. Remove the fuel tank and position it so that fuel will not spill when the fuel cock is removed.
2. Remove the fuel cock and inspect the filter screen. Replace the filter if it is seriously contaminated.
3. Remove the screws on the front and rear of the petcock; remove the plate, gaskets, lever, and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

ELECTRICAL

A. Battery

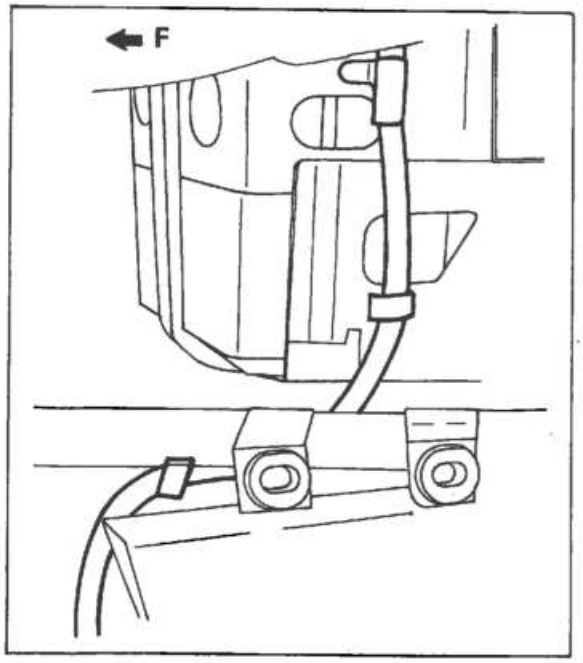
1. The fluid level should be between the upper and lower level marks. Use only distilled water if refilling is necessary.



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:

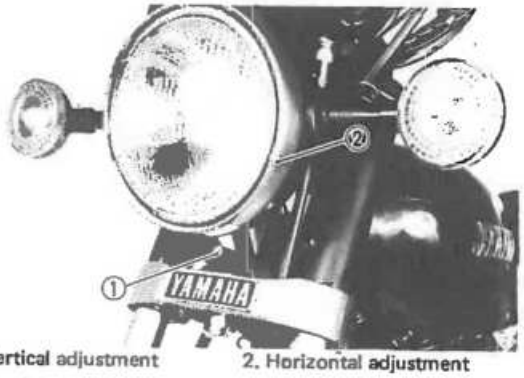
The battery must be charged before using to ensure maximum performance. Failure to charge the battery properly before first use or a low electrolyte level will cause premature failure of the battery. Charging current: 1.6 amps/10 hrs. or until the specific gravity reaches 1.280 at 20°C (68°F)

B. Headlight

1. Headlight beam adjustment
   When necessary, adjust the headlight beam as follows:
   a. Adjust horizontally by tightening or loosening the adjust screw.

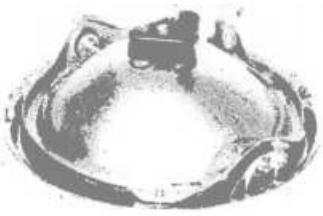
To adjust to the right:
Tighten the screw
To adjust to the left:
Loosen the screw

   b. Adjust vertically as follows:
      1) Loosen adjusting screw and adjust vertically by moving the headlight body.
      2) Retighten the screw.



1. Vertical adjustment 2. Horizontal adjustment

2. Replacing the headlight bulb.



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

NOTE:

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

C. Fuse

The fuse box is located under the seat. If any fuse is blown, turn off the ignition switch and the switch in the circuit in question; install a new fuse of proper amperage. 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 a possible fire.

CHAPTER 3. ENGINE OVERHAUL

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ENGINE OVERHAUL

ENGINE REMOVAL

NOTE:

It is not necessary to remove the engine in order to remove the clutch and/or the AC magneto.

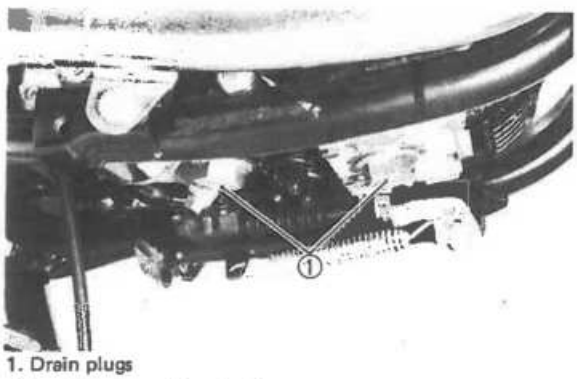
A. Preparation For Removal

1. All dirt, mud, dust, and foreign material must be removed from the engine before removal and disassembly. This will help keep foreign material out of the engine oil.
2. Before engine removal and disassembly, be sure that you have the proper tools and cleaning equipment. With them, you can perform a clean and efficient job.

NOTE:

When disassembling the engine, keep mated parts together. This includes gears, cylinders, pistons, and other parts that have been "mated" through normal wear. Mated parts must be reused as an assembly or replaced.

3. During engine disassembly, clean all parts and place them in trays in the order of disassembly. This will speed up assembly time and help assure that all parts are correctly reinstalled in the engine.
4. Place the motorcycle on its centerstand. Start the engine and let it warm-up. Stop the engine and drain the engine oil.

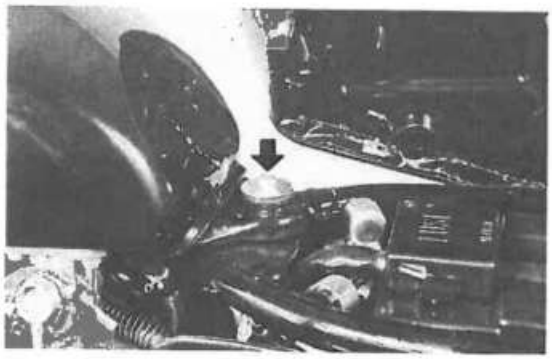


1. Drain plugs

5. Remove the battery.

B. Fuel Tank Removal

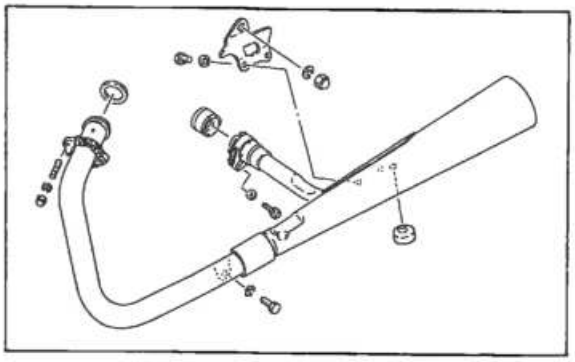
1. Turn fuel petcocks to "on" (there is no "off" position – fuel will not flow from a petcock on the "on" position unless the engine is operating). Disconnect fuel pipes and vacuum pipes from petcock.
2. Lift seat and remove fuel tank holding bolt. Remove fuel tank.



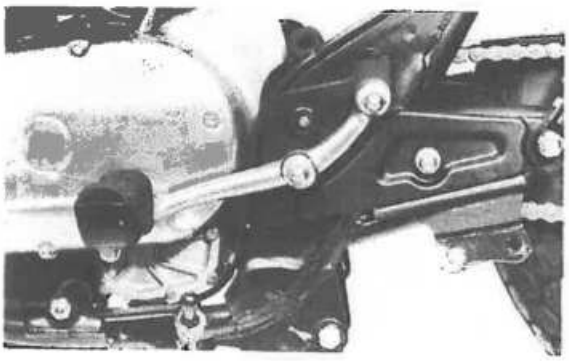
C. Removal of Other Parts

Remove the following parts in the order given.

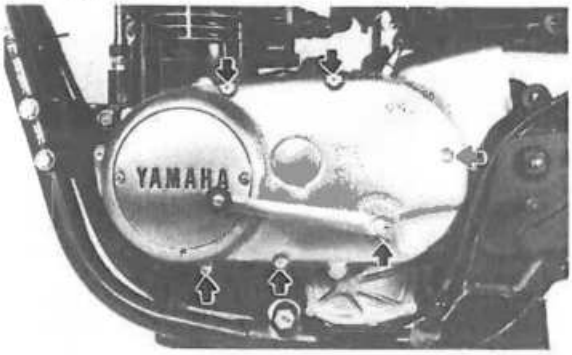
1. Exhaust pipes



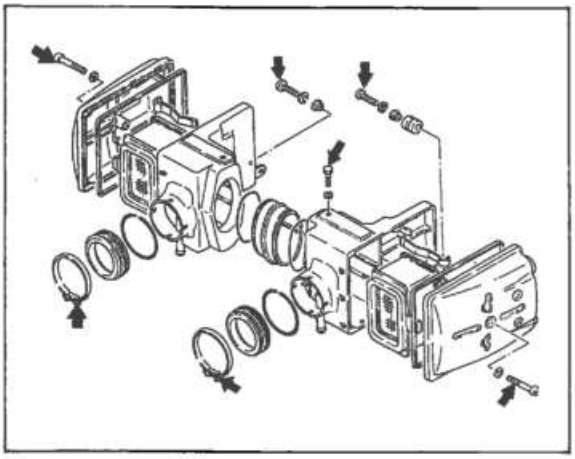
2. Horn (as a unit)
3. Both side footrests



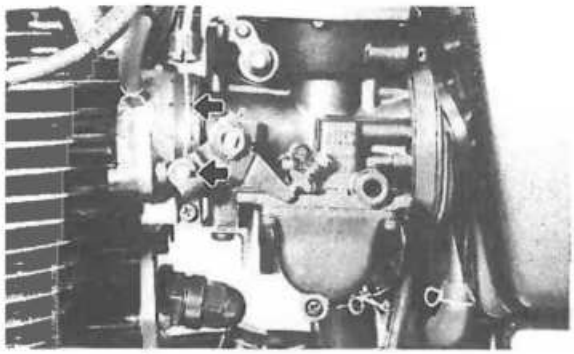
4. Change pedal and drive chain guide
5. Left-hand crank case cover and clutch cable.



6. Side covers
7. Air cleaner assembly and ventilation hoses.



8. Carburetor, and throttle cable



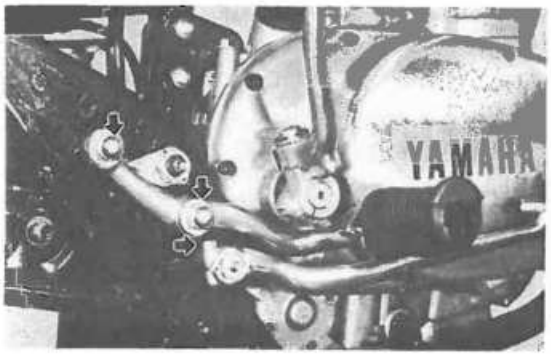
9. Intake manifold



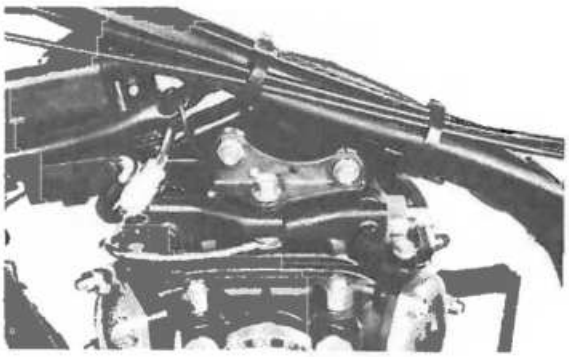
10. Brake pedal

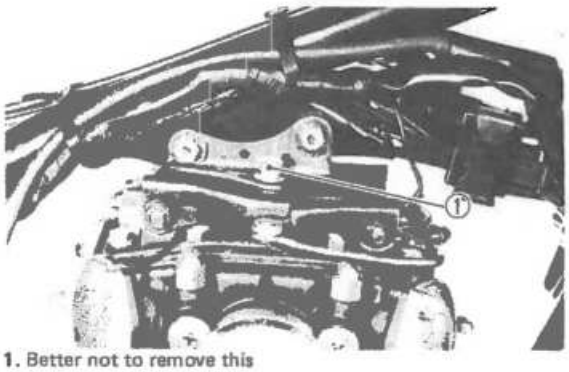
NOTE:

When removing the brake pedal, check the alignment mark between the brake pedal and the shaft.



11. All wires and cables connecting engine and chassis
12. Top center engine mounting brackets (Remove only four bolts for easier re-assembly)



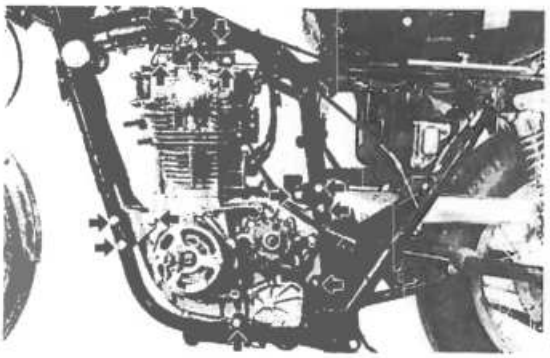


1. Better not to remove this

13. Drive chain (with special tool)

D. Engine Mounting Bolts and Engine Removal

1. Remove the mounting bolts in the order as shown.

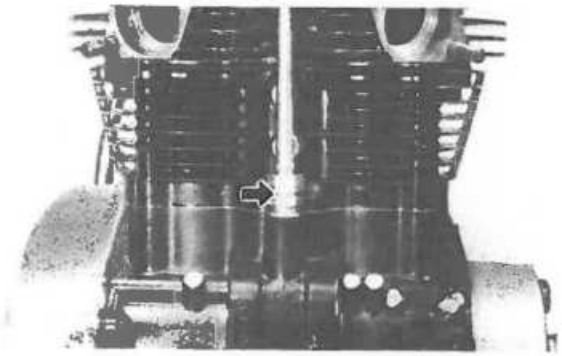


2. Remove the engine to the right.

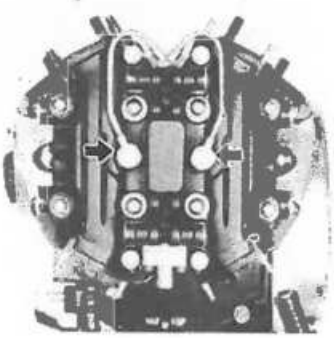
ENGINE DISASSEMBLY

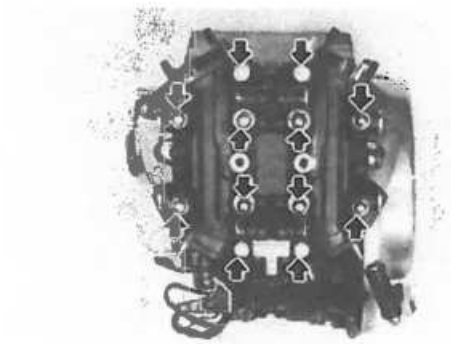
A. Cylinder and Cylinder Head

1. Remove the oil delivery and pipe fitting attached to the crankcase. Note placement of copper gaskets.

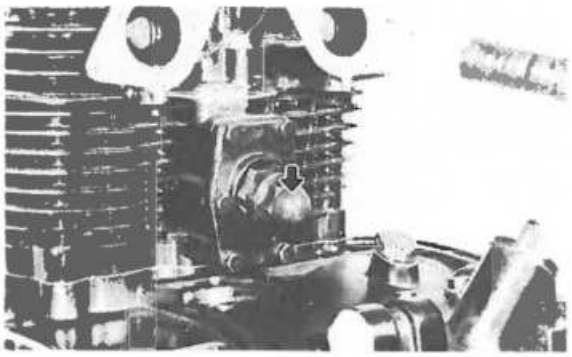


2. Remove all tappet covers.
3. Remove spark plugs.
4. Remove four cylinder head cover holding bolts, three cylinder head holding bolts and eight cylinder head holding nuts.

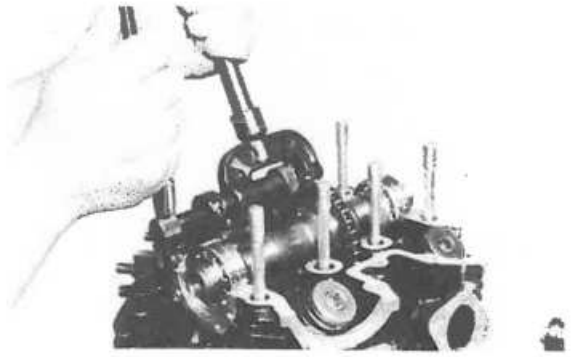




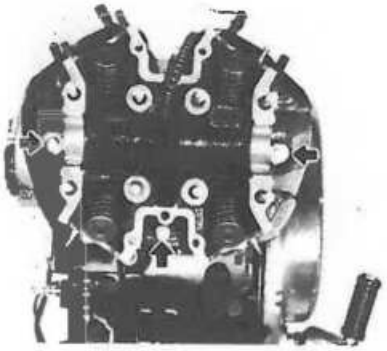
5. Remove the head cover. It may be necessary to tap each lightly with a soft hammer.
6. Remove the camshaft as follows.
   a. Remove tensioner adjusting bolt to make the chain tension loose.



   b. Push out the master link pins with the cam chain cutter.

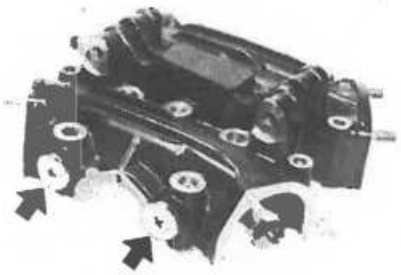


   c. Tie each end of the camchain with a wire to prevent it from falling into the crankcase.
7. Remove the cylinder head and cylinder.



B. Rocker Arm Removal

1. Remove rocker shaft covers.



2. Remove shouldered sleeves and O-rings.

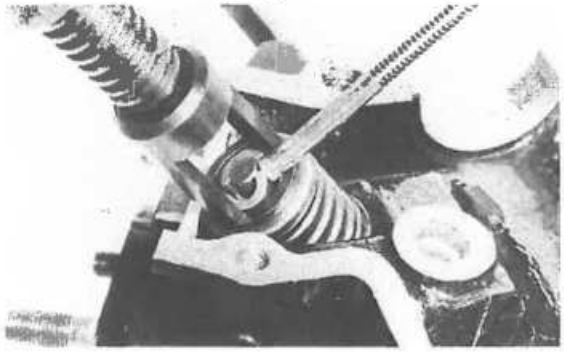


3. Withdraw rocker shafts with the special tool or 6 mm bolt.



C. Valve Removal

1. Compress the valve spring and then remove both retainer locks.
   Remove the compressor and lift off the retainer and springs.



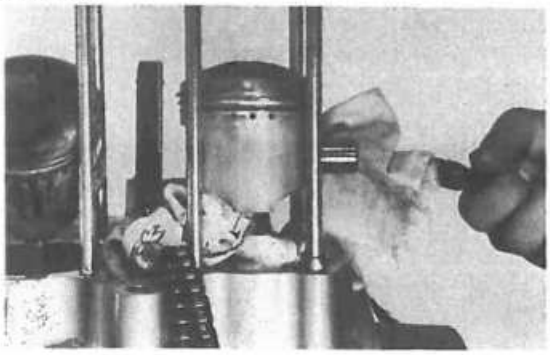
2. Remove valve stem seals.
3. Remove valves.

NOTE:

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

D. Piston Removal

Remove piston pin clips, piston pins and pistons.

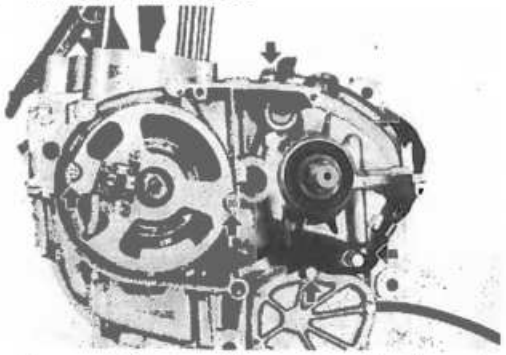


NOTE:

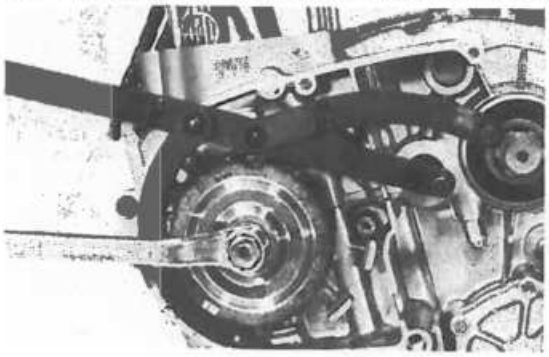
Before removing the piston pin clip, cover the crankcase with a clean rag so you will not accidentally drop the clip into the crankcase.

E. Generator and Drive Sprocket Removal

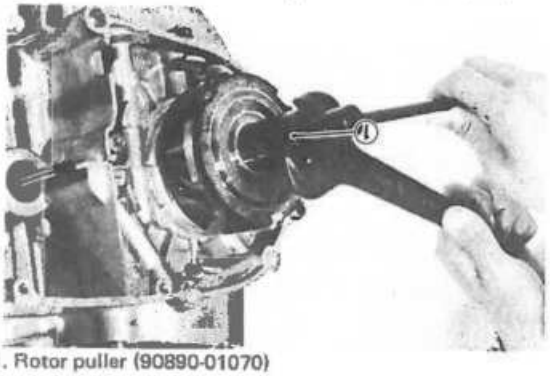
1. Remove the stator.



2. Remove the securing nut and lock washer.

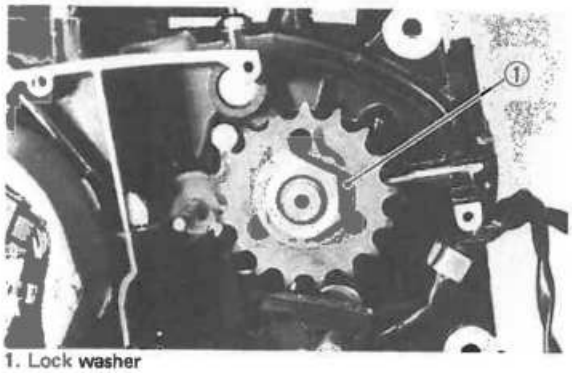


3. Mount the rotor puller (special tool) onto the rotor and pull the rotor off.



1. Rotor puller (90890-01070)

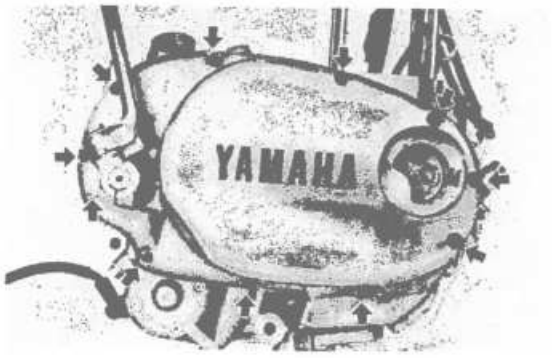
4. Flatten the lock washer and loosen the lock nut.
   Remove the drive sprocket.



1. Lock washer

F. Case Cover (right), Primary Drive Gear and Clutch Assembly Removal

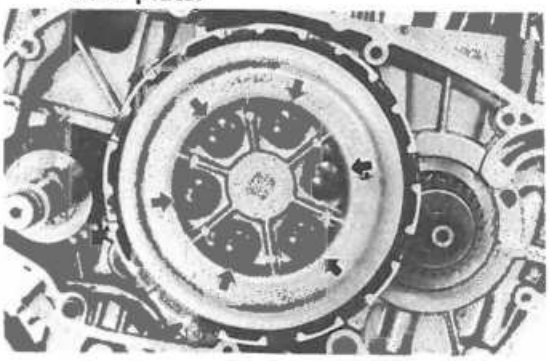
1. Remove the crankcase cover (right).



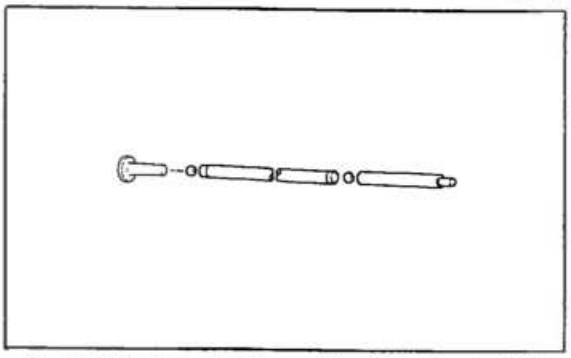
2. Loosen the drive gear securing nut by first placing a rag folded into many layers between the teeth of gears to lock them.



3. Remove six clutch spring screws and pressure plate.



4. Remove clutch plates, friction plates, push crown, two push rods and two balls.

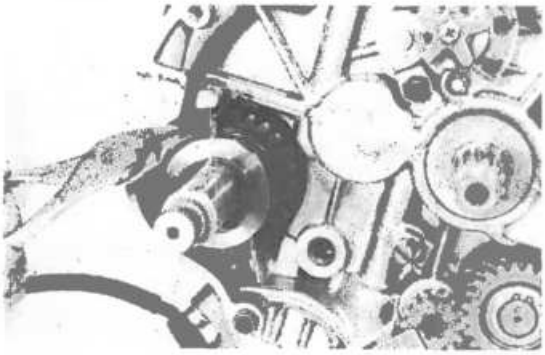


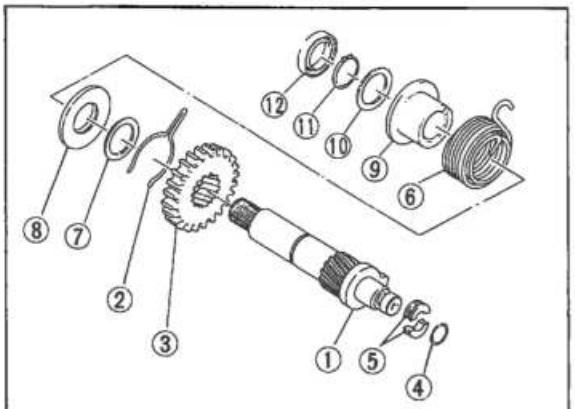
5. Hold the clutch unit with the holding tool (special tool), and unscrew the clutch boss lock nut.



G. Kick Axle and Change Shaft Removal

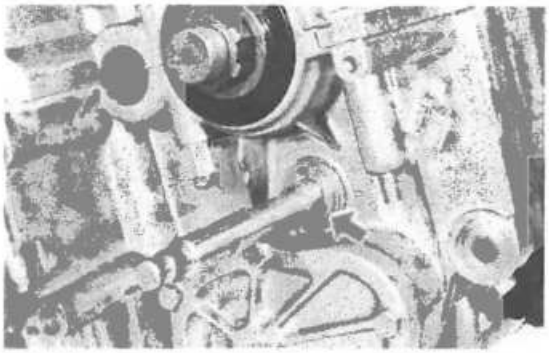
1. Slip the bent spring off and pull the kick axle assembly out.





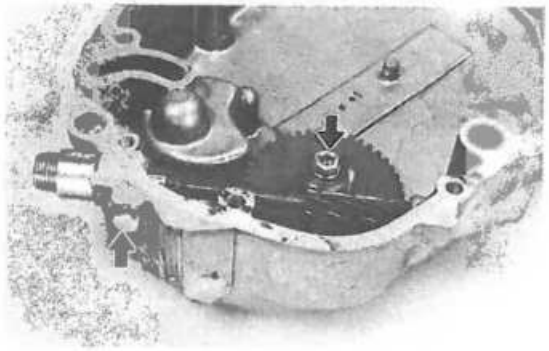
1. Kick axle
2. Kick clip
3. Kick gear
4. Clip
5. Holder
6. Kick spring
7. Shim
8. Spacer
9. Spring guide
10. Washer
11. Circlip
12. Oil seal

2. Remove circlip from left side of change shaft and pull the shaft out.

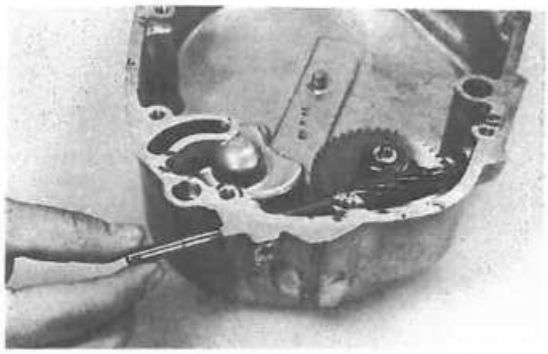


H. Tachometer Gear Removal

1. Remove the drive gear fitting bolt and the driven gear housing bolt.

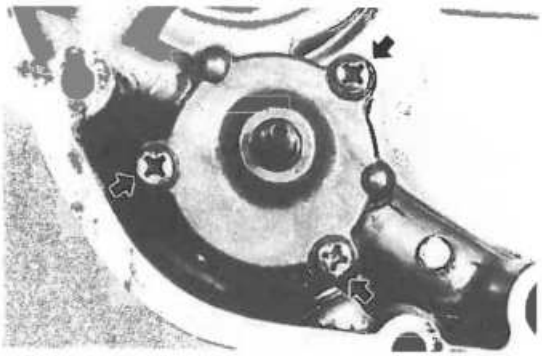


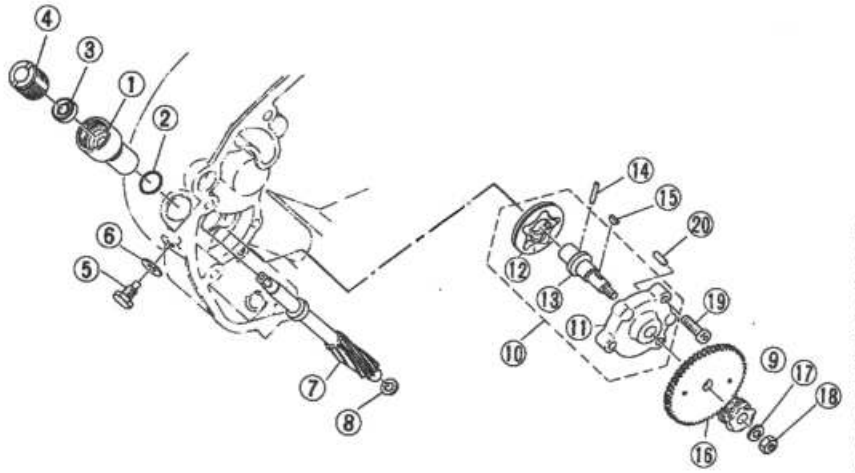
2. Remove the housing bolt and the driven gear.



I. Oil Pump Removal

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

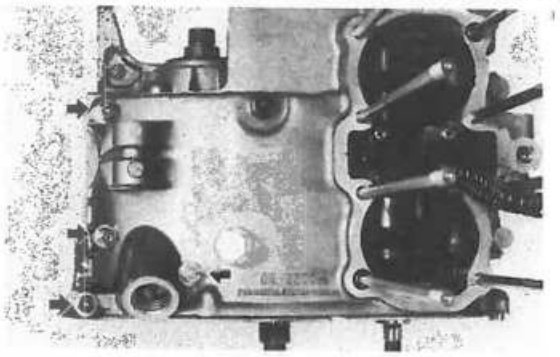




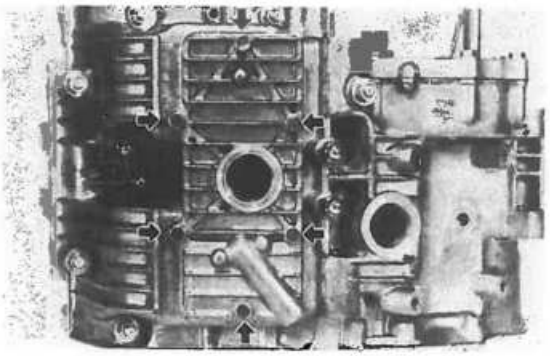
1. Housing
2. O-ring
3. Oil seal
4. Adaptor
5. Bolt
6. Gasket
7. Driven gear
8. Shim
9. Driven gear
10. Rotor and shaft assembly
11. Pump cover
12. Rotor assembly
13. Shaft
14. Dowel pin
15. Woodruff key
16. Driven gear
17. Hexagon nut
18. Spring washer
19. Panhead screw
20. Dowel pin

J. Crankcase Disassembly

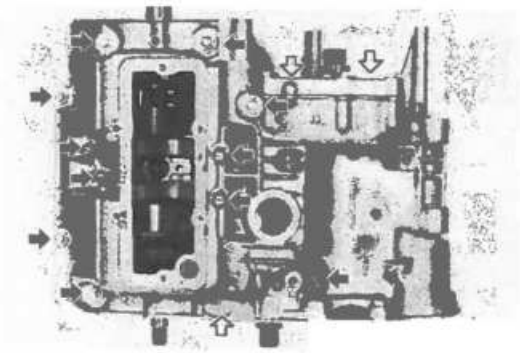
1. Loosen the upper case securing bolts (4).



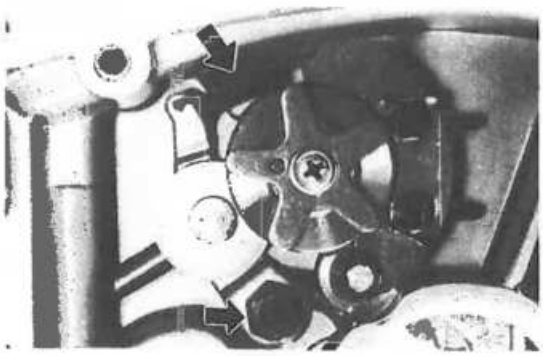
2. Loosen the strainer cover securing bolts (6).
   Remove the cover, gasket and strainer.



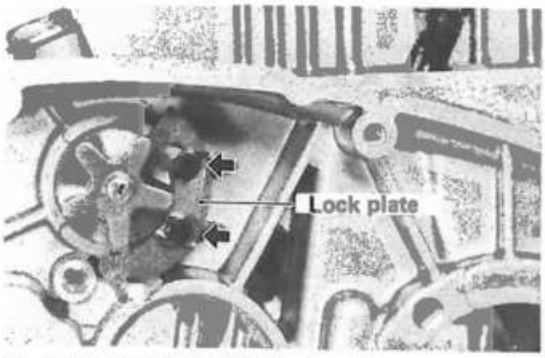
3. Loosen the lower case securing nuts (14).
   – The 6 crown nuts have copper washers.



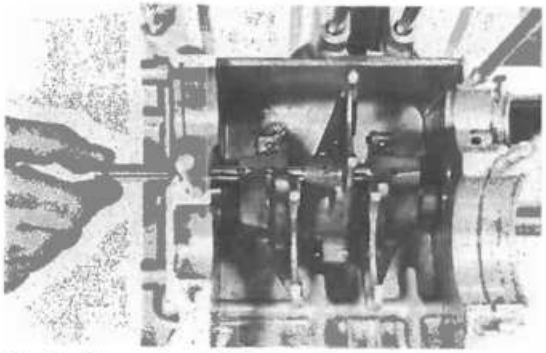
4. Use a soft rubber hammer to carefully separate the crankcases.
5. Remove the crankshaft and the transmission from the lower case.
6. Remove the shift cam stopper bolt and spring.



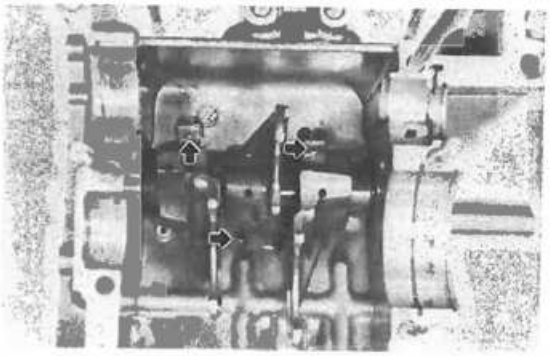
7. Flatten the lock washer and remove the bolts (2) and the stopper plate.



8. Pull out the guide bar.

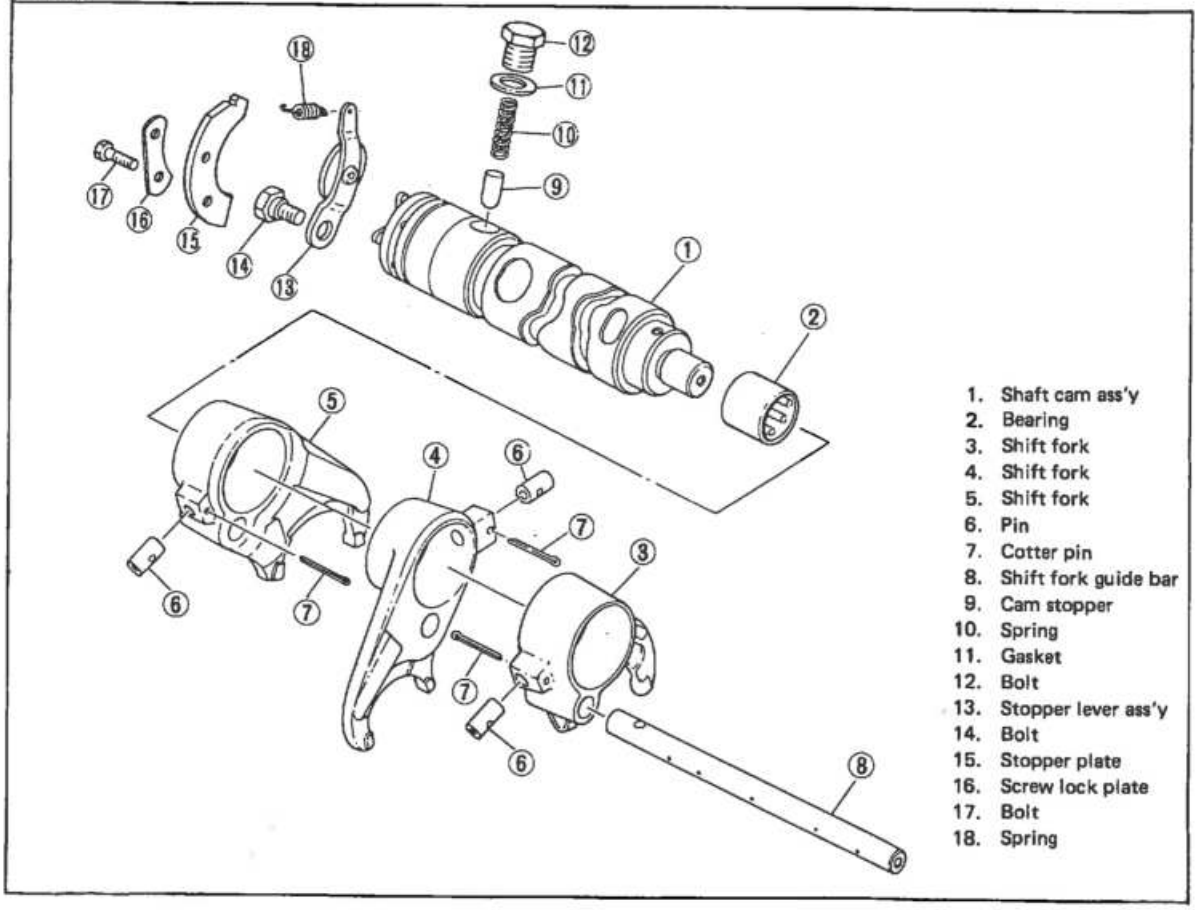


9. Remove the shift fork cotter pins and remove the pins (3).

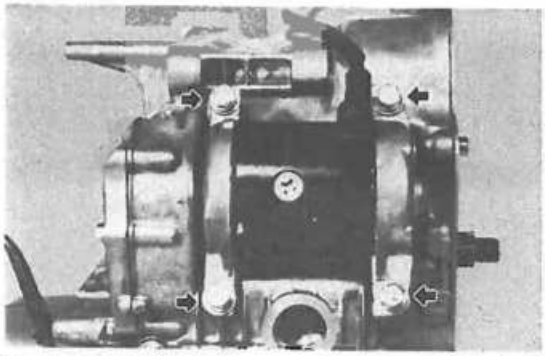


10. Pull out the shift cam.

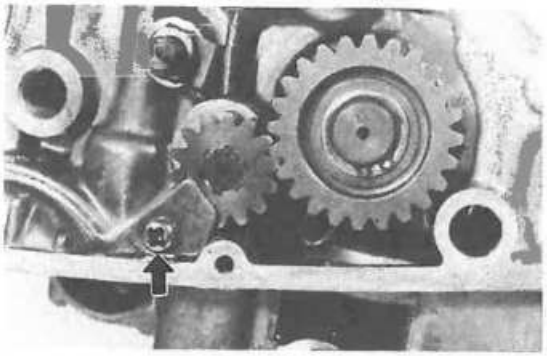
Shifter



11. Loosen the starter motor securing bolts (4) and remove the motor.



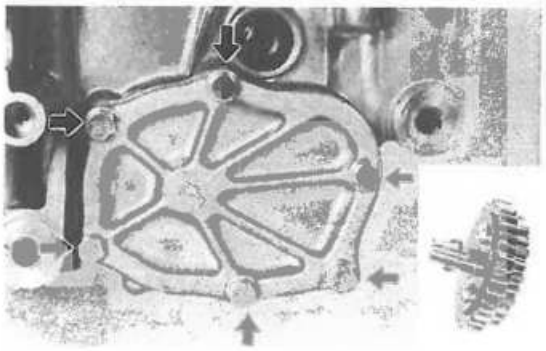
12. Loosen the stopper plate securing bolt and remove the drive gear No. 2.
(Right hand by lower case)



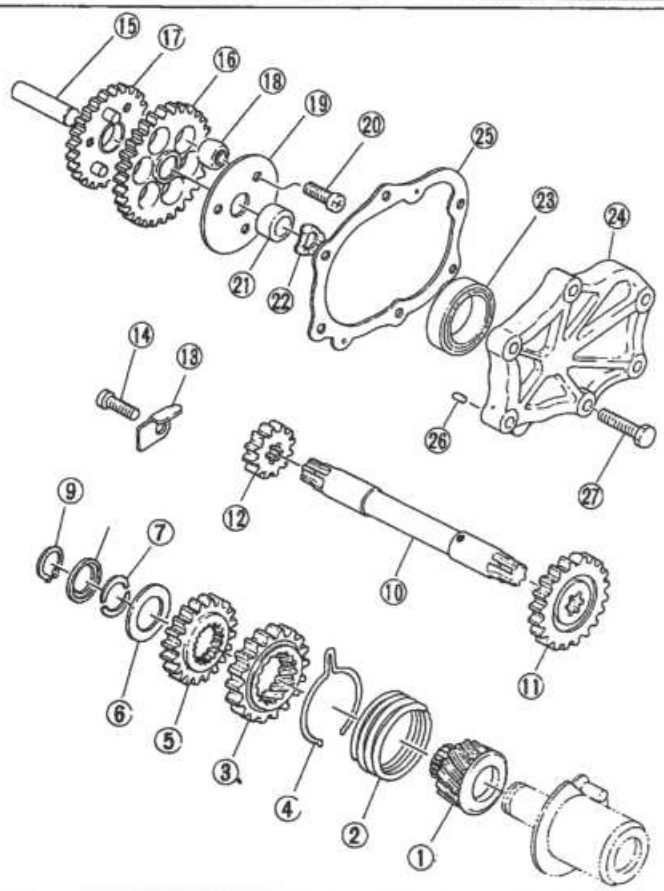
13. Remove the circlip and the wheel gear No. 3 and No. 4.



14. Loosen the gear train cover securing bolts (6).
Remove the idle gear No. 1 and No. 2.
(Left hand by lower case)



Starter gear



1. Starter wheel
2. Compression spring
3. Gear 4
4. Clip
5. Gear 3
6. Plate washer
7. Clip
8. Clip holder
9. Circlip
10. Shaft 2
11. Gear 1
12. Gear 2
13. Stopper plate
14. Panhead screw
15. Shaft 1
16. Idler gear 1
17. Idler gear 2
18. Absorber
19. Idle gear plate
20. Panhead screw
21. Collar
22. Wave washer
23. Oil seal
24. Crankcase cover 3
25. Gear crank cover gasket
26. Dowel pin
27. Bolt

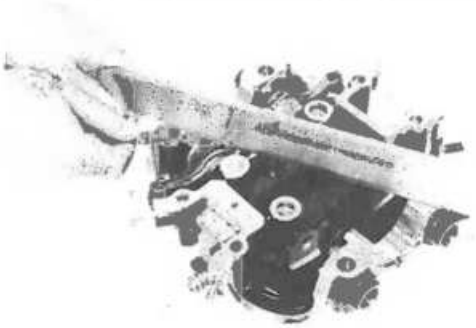
INSPECTION AND REPAIR

A. Cylinder Head Cover

Check the cylinder head cover warpage with a straightedge as shown.

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

Cylinder head cover warpage:
less than 0.03 mm (0.0012 in)
Allowable limit: 0.25 mm (0.010 in)



B. Cylinder Head

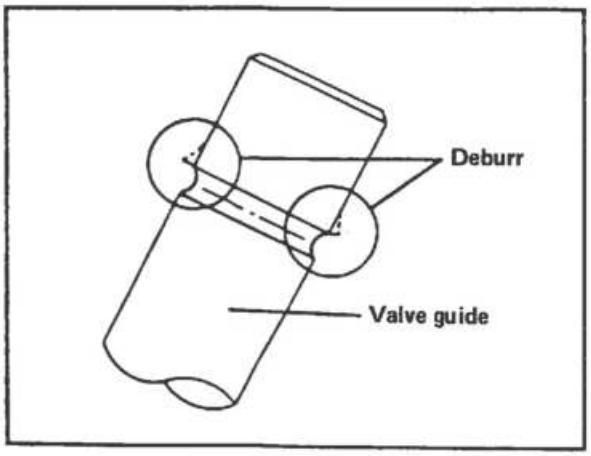
1. Remove the spark plugs.
2. Mount the valve spring compressor on the head and depress each valve spring. Remove the valve retainers with a magnet or tweezers, remove the valve springs.



3. Remove the valves. Mark each valve so it will be reinstalled in the same cylinder head.

NOTE:

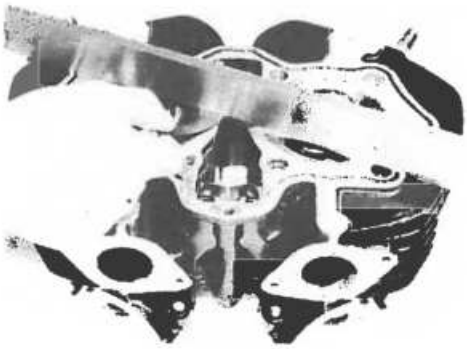
Deburr any deformed valve stem end. Use an oil stone to smooth the stem end. This will help prevent damage to the valve guide during valve removal.



4. Using a rounded scraper, remove the carbon deposits from the combustion chamber. Take care to avoid damaging the spark plug threads and valve seats. Do not use a sharp instrument. Avoid scratching the aluminum.
5. Check the cylinder head warpage with a straightedge as shown.

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

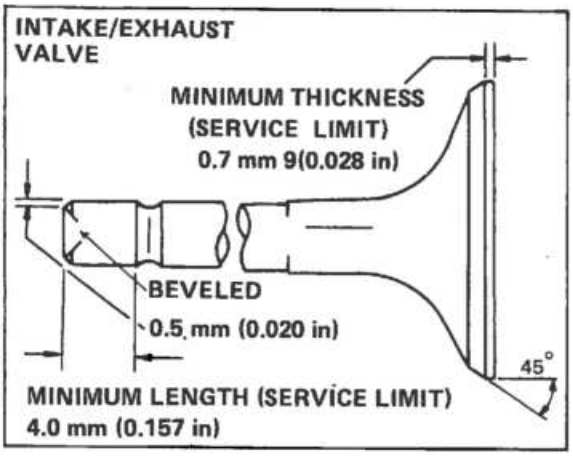
Cylinder head warpage:
less than 0.03 mm (0.0012 in)
Allowable limit: 0.25 mm (0.010 in)



C. Valves, Valve Guides, Valve Seats, and Valve Springs

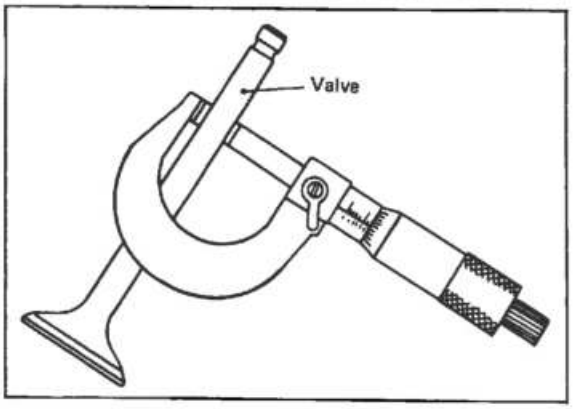
Valves

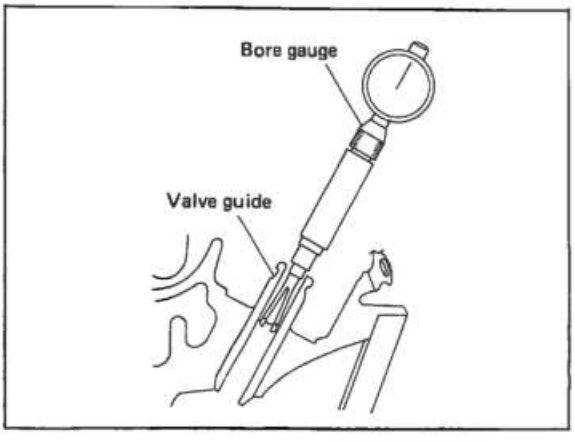
1. Check the valve face and the stem end for wear. If the valve face and/or the stem end are pitted or worn, regrind the valve with a valve refacer. Replace the valve if any dimension exceeds the specifications in the illustration.



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

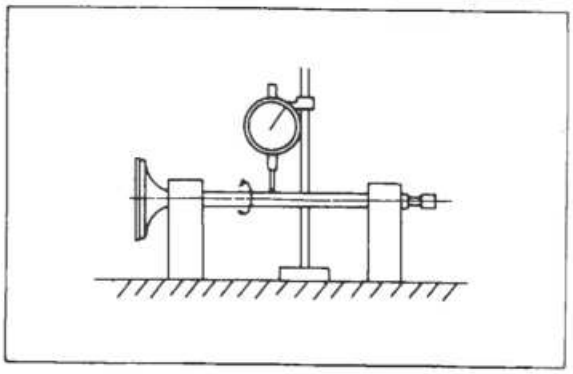
	Valve Stem Clearance	Maximum
Intake	0.020~ 0.044 mm (0.0008~ 0.0017 in)	0.10 mm (0.004 in)
Exhaust	0.035~ 0.059 mm (0.0014~ 0.0023 in)	0.12 mm (0.005 in)





3. 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. Place the 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)



Valve guides

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.

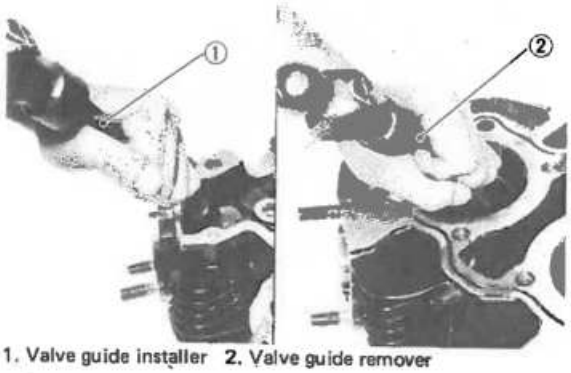
1. Measure the valve guide inside diameter with a small bore gauge. If it exceeds the limit, replace it with an oversize valve guide.

Guide diameter (I.D.):
Limit: 8.10 mm (0.319 in)

2. 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.
3. Use the valve guide remover and valve guide installer to drive the old guide out and drive the new guide in.

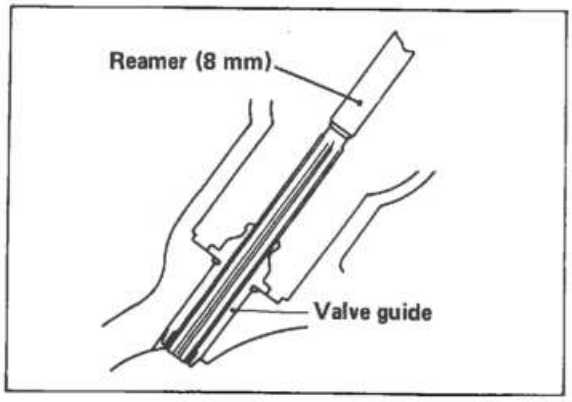
NOTE:

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



1. Valve guide installer 2. Valve guide remover

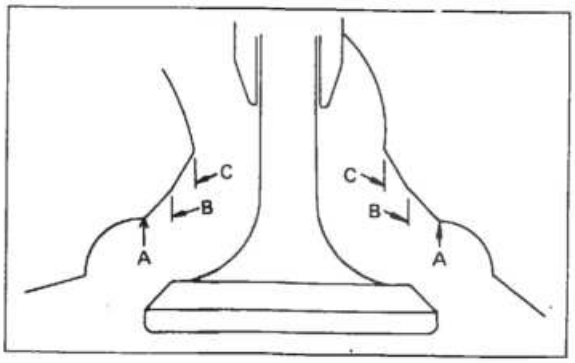
4. After installing the valve guide, use the 8 mm reamer (special tool) to obtain the proper valve-guide-to-valve-stem clearance.



5. After installing the valve guide in the cylinder head, the valve seat must be recut. The valve should be lapped to the new seat.

Valve seat

1. The valve seat is subject to severe wear. Whenever the valve is replaced or the valve face is resurfaced (see caution), the valve seat should be resurfaced at a 45° angle. If a new valve guides has been installed, the valve seat must be recut to guarantee complete sealing between the valve face and seat.



CAUTION:

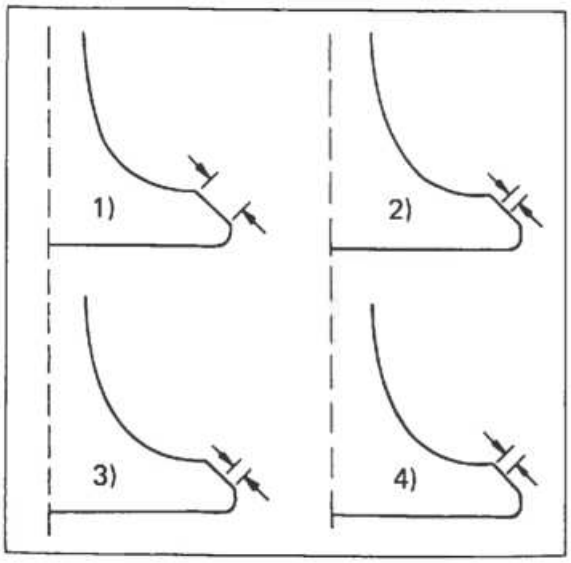
If the valve seat is obviously pitted or worn, it should be cleaned with a valve seat cutter. Use the 45 cutter. When twisting the cutter, keep an even downward pressure to prevent chatter marks.

If cutting section A of the valve seat, use a 30° cutter. If cutting section B, use the 45° cutter. If cutting section C, use the 60° cutter.

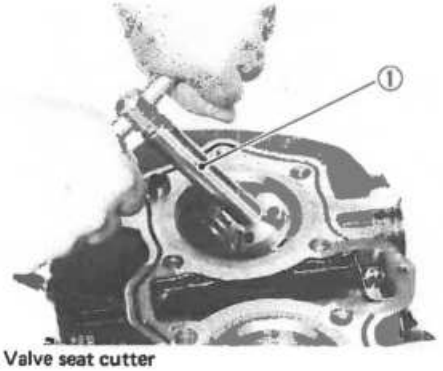
2. Measure the valve seat width. Apply mechanic's building dye (such as Dykem) to the valve face and valve seat, apply a very small amount of fine grinding compound around the surface of the valve face, insert the valve into position, and spin the valve quickly back and forth. Lift the valve, clean off all grinding compound, and check valve seat width. The valve seat and valve face will have removed the bluing whereever they contacted each other. Measure the seat width with vernier calipers. It should measure approximately 1.3 mm (0.051 in). The valve-seat contact area should be one uniform width. If valve seat width varier 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	1.3± 0.1 mm (0.051 ± 0.0039 in)	2.0 mm (0.080 in)

3. 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:



- If the valve face shows that the valve seat is centered on the valve face but is too wide, then lightly use both the 30° and the 60° cutters to reduce the seat width to 1.3 mm (0.051 in).



1. Valve seat cutter

- If the seat shows to be in the middle of the valve face but too narrow, use the 45° cutter until the width equals 1.3 mm (0.051 in).
- 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.

  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.

Lapping

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

1. Apply a small amount of coarse lapping compound to the 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. Applying bluing dye to the valve face and seat, and rotate the valve. Check for full seat contact which is indicated by a grey surface all around the valve face where the bluing has been rubbed away.

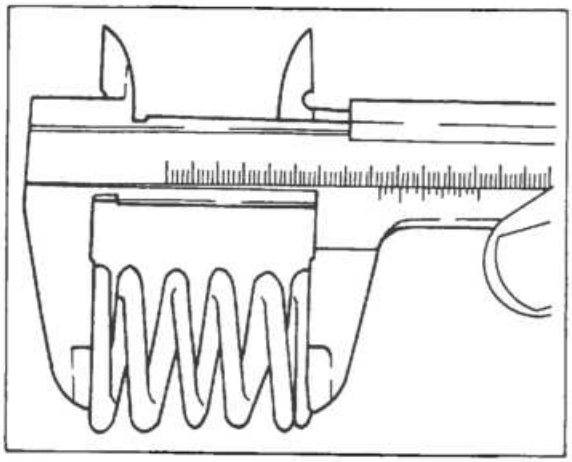


2. After all work has been performed on the valve and valve seat and all head parts have been assembled, check for proper valve/valve seat sealing by pouring solvent into each of the intake ports, then the exhaust ports. There should be no leakage past the seat. If fluid leaks, disassemble and continue 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.

Valve springs

This engine uses two springs of different sizes to prevent valve float or surging. The valve spring specifications show the basic value characteristics.

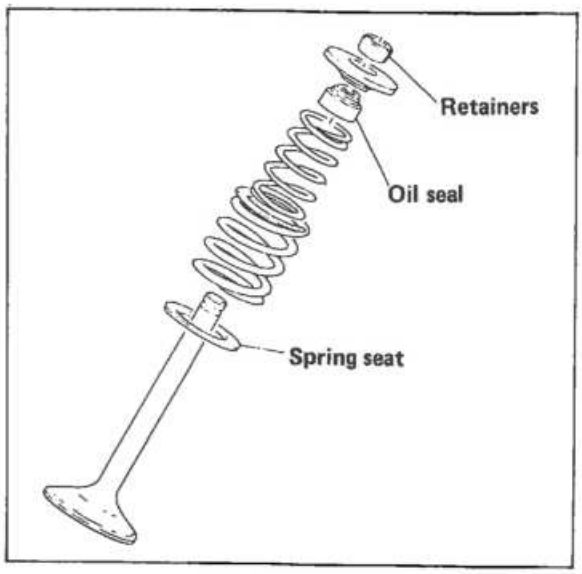
1. Even though the spring is constructed of durable spring steel, it gradually loses some of its tension. This is evidenced by a gradual shortening of free length. Use a vernier caliper to measure spring free length. If the free length of any spring has decreased more than 2 mm (0.080 in) from its specification, replace it.



2. Another symptom of spring fatigue is insufficient spring pressure. This can be checked with a valve-spring-compression-rate gauge. Test each spring individually. Place a spring in the gauge and note the spring pressure when the spring is compressed to the installed length (valve closed). If the pressure does not equal the specified value, replace the spring.

Valve Spring Specifications		
	Outer Spring	Inner Spring
Free length	42.6 mm (1.67 in)	42.0 mm (1.65 in)
Installed length (valve closed)	37.0 mm (1.457 in)	35.0 mm (1.378 in)
Installed pressure (valve closed)	17.7 kg (39.0 lb)	1.0 kg (22.0 lb)
Allowable tilt from vertical	2.5°	←

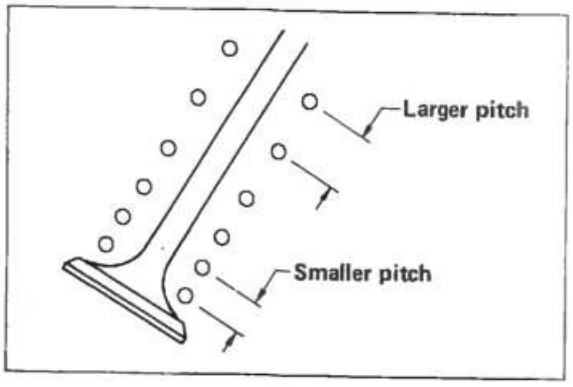
Valve installation



1. Lubricate the valve stem and the oil seal with a high-quality molybdenum disulfide motor oil or molybdenum disulfide grease.
2. Insert the valve in the cylinder head, and install the oil lseal. Carefully fit the oil seal over the valve stem and push it into position on top of the valve guide.
3. Install the spring seat, and install both valve springs.

NOTE:

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



4. Install the collar. Be sure it is properly seated on the valve springs.
5. Install the valve spring compressor, and compress the springs.
6. Install the valve retainers. Be sure the retainers properly engage the valve stem.

7. Carefully remove the valve spring compressor.

WARNING:

Proceed slowly. If a retainer has not been properly installed, it could be ejected from the cylinder head.

8. Gently tap the end of the valve stem with a plastic mallet. This will ensure that the retainers are properly seated in the collar.

D. Rocker Arms and Rocker Arm Shafts

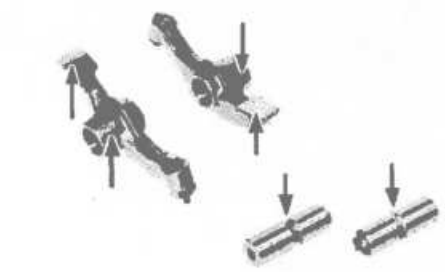
1. The rocker arm usually wears at two locations: at the rocker shaft hole and at the cam-lobe-contact surface. Check these areas for signs of unusual wear.
2. Measure the rocker arm inside diameter. If it exceeds specification, replace the rocker arm.

Maximum inside diameter: 15.018 mm (0.591 in)

3. Measure the outside diameter of the rocker arm shaft. If it is less than the specified value, replace the rocker arm.

Minimum outside diameter: 14.985 mm (0.590 in)

4. Calculate the clearance by subtracting the rocker-arm-shaft outside diameter from the rocker-arm inside diameter. If this clearance is greater than 0.033 mm (0.0013 in) replace either or both parts as necessary.



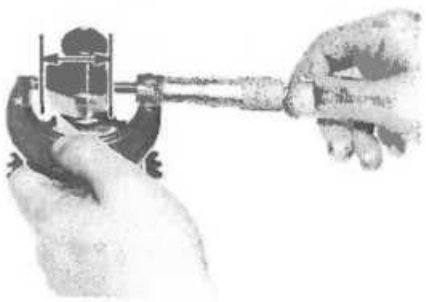
5. The rocker arm shaft has been hardened; it should not wear excessively. If a groove can be felt in the bearing surface or if the shaft shows a blue discoloration, the shaft should be replaced and the lubrication system checked.

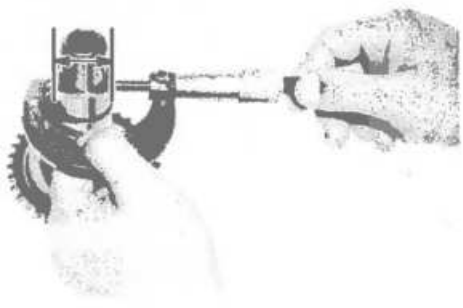
E. Camshafts, Cam Chains, and Cam Sprockets

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.

1. If any of the above wear conditions are readily visible, the camshaft should be replaced.
2. 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 the wear limit, valve timing and lift are affected. Replace the camshaft if wear exceeds the limit.

Wear Limit	A	B
Intake	39.84 mm (1.569 in)	32.09 mm (1.263 in)
Exhaust	39.88 mm (1.570 in)	32.15 mm (1.266 in)





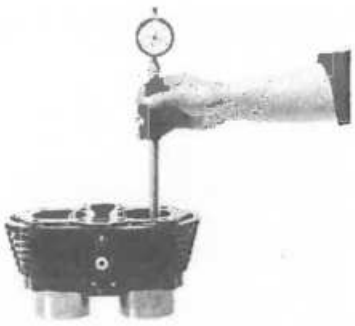
Cam sprocket and cam bearing

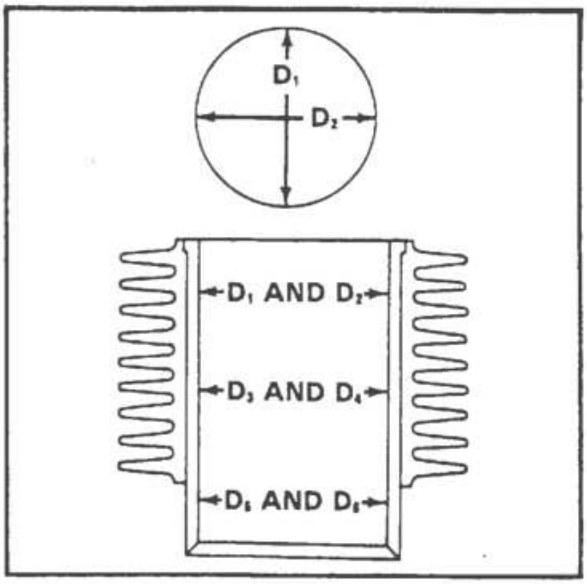
1. Check the cam sprocket for wear.



F. Cylinder

1. Visually check 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 in the manner as shown. If wear is excessive, compression pressure will decrease, and engine trouble will occur. Rebore the cylinder wall, and replace the piston and piston rings.
   Cylinder wear should be measured at three depths by placing the measuring instrument parallel to and at right angles to the crankshaft. (See the illustration.)
   If the cylinder wall is worn beyond the wear limit, it should be rebored.





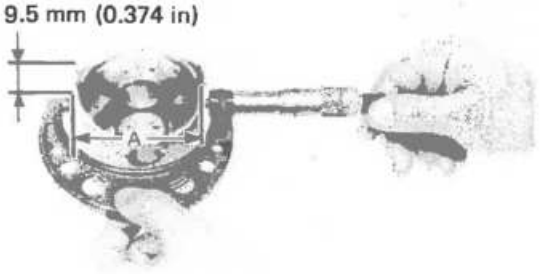
	Standard	Wear limit
Cylinder bore	75.0 mm (2.95 in)	75.1 mm (2.95 in)
Cylinder taper	—	0.05 mm (0.002 in)

G. Piston and Piston Rings

Piston

1. Using the micrometer, measure the outside diameter of the piston at the piston skirt. Measurement should be made at a point 9.5 mm (0.37 in) above the bottom edge of the piston by placing the micrometer parallel to and at right angles to the piston pin.

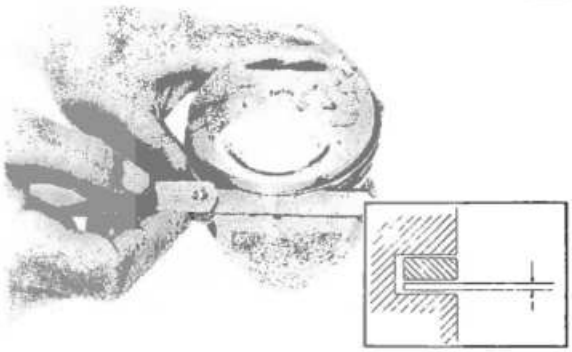
Piston clearance:
0.05 ~ 0.055 mm (0.0019~0.0022 in)



	Size A
Standard	75.00 mm (2.95 in)
Oversize 1	75.25 mm (2.95 in)
Oversize 2	75.50 mm (2.95 in)
Oversize 3	75.75 mm (2.99 in)
Oversize 4	76.00 mm (2.99 in)

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

Side clearance	Top	0.04 ~ 0.08 mm (0.0016 ~ 0.0031 in)
	2nd	0.03 ~ 0.07 mm (0.0118 ~ 0.2753 in)



Piston ring

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)

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.

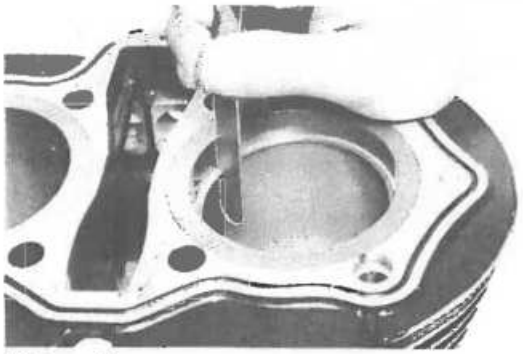
Size	Color
Oversize 1	Brown
Oversize 2	Blue
Oversize 3	Black
Oversize 4	Yellow

1. Measure the end gap of each piston ring. Insert a ring into the cylinder, and push it approximately 20 mm (0.8 inches) into the cylinder. Push the ring with the piston crown so the ring will be at a right angle to the cylinder bore.
2. Measure the ring end gap with a feeler gauge. If the end gap exceeds tolerance, replace the whole set of rings.

NOTE:

You cannot measure the end gap on the expander spacer of the oil control ring. If the oil-control-ring rails show excessive gap, replace all three rings.

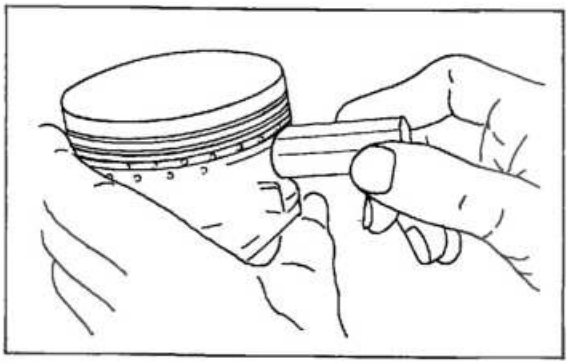
	Standard	Limit
Top ring	0.2 ~ 0.4 mm (0.0079 ~ 0.0157 in)	0.80 mm (0.0315 in)
2nd ring	0.2 ~ 0.4 mm (0.0079 ~ 0.0157 in)	0.80 mm (0.0315 in)
Oil control (Rails)	0.3 ~ 0.9 mm (0.0118 ~ 0.0354 in)	–

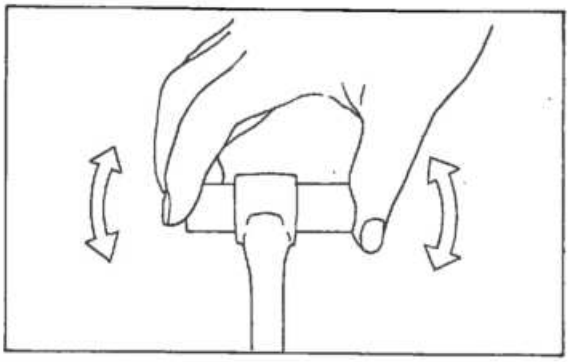


Piston pin

1. Lightly oil the piston pin, and install it in the small end of the connecting rod.
2. Check the free play. There should be no noticeable vertical play. If any free play exists, check the connecting rod for wear. Replace the pin and connecting rod as required.

3. Insert the piston pin in the piston, and check the free play. There should be no noticeable free play when the pin is in place in the piston. If the piston pin is loose, replace the pin and/or the piston as required.





H. Crankshaft and Connecting Rod

Crankshaft bearing

1. Bearings should be cleaned, dried, and the races visually checked for pits, rust spots, or chatter marks where the balls have dragged. If any of these conditions exist, the bearings should be replaced.

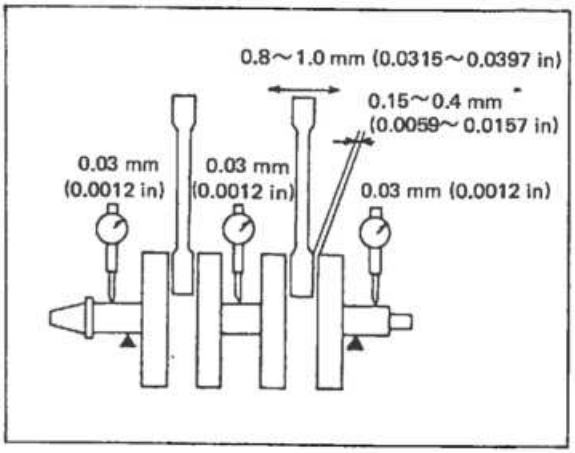
NOTE:

Lubricate the bearings immediately after examining them to prevent rust.

Crankshaft runout

1. Support the crankshaft at both ends on V-blocks. Rotate the crankshaft in the V-blocks, and measure the runout at the main bearing journals. Use a dial gauge.
2. If runout exceeds the specification, replace crankshaft.

Maximum crankshaft runout:
0.03 mm (0.0012 in)



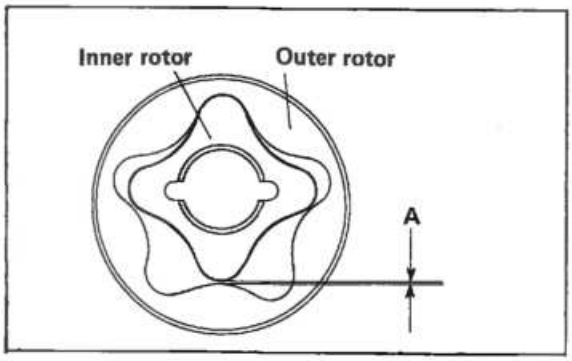
I. Oil Pump

1. Measure the rotor width on both trochoid pumps. If the measurement exceeds specification, replace the pump.

Rotor width:
Crankshaft pump: 6 mm (0.236 in)

2. Measure the inner-outer clearance of each rotor. Replace the pump if the clearance exceeds specifications.

Inner-outer clearance:
0.03~ 0.09 mm (0.0012~ 0.0035 in)



J. Primary Drive

The drive gear is mounted on the crankshaft; the driven gear is mounted on the transmission and is integrated with the clutch assembly.

Primary reduction ratio		
No. of teeth		Ratio
Drive	Driven	2.666
27	72	

1. Check the drive gear and the driven gear for obvious signs of wear or damage from foreign material within the primary case.
2. If the primary drive is excessively noisy during operation, replace both the drive and the driven gears.

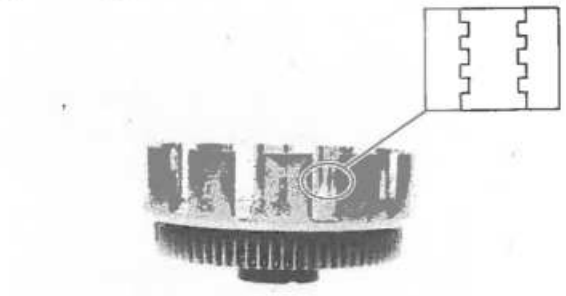
K. Clutch

Clutch housing

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

NOTE:

Galling on the clutch plate splines will cause erratic operation.



2. Check the clutch housing bearing for damage. If damaged, replace the bearing.

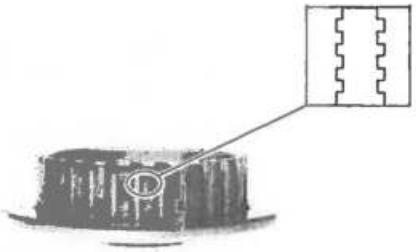
Clutch boss

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 chatterin.

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

NOTE:

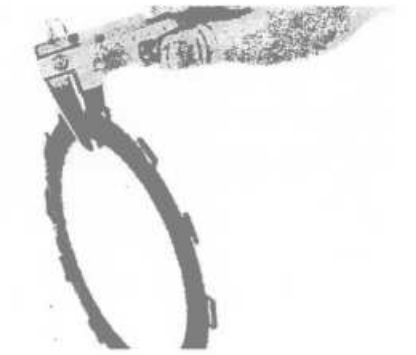
Galling on clutch plate splines will cause erratic operation.



Friction and clutch plates

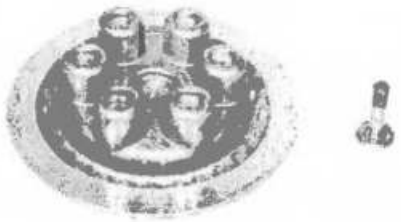
1. Check the clutch plates and friction plates for heat damage. Measure friction plate thickness at 3 or 4 points. Measure the clutch plates for warpage with a feeler gauge and surface plate. Replace clutch plates or friction plates as a set if any is faulty or beyond wear limits.

	Standard	Wear limit
Friction plate thickness	3.0 mm (0.12 in)	2.7 mm (0.106 in)
Clutch plate warp limit	–	0.1 mm (0.004 in)



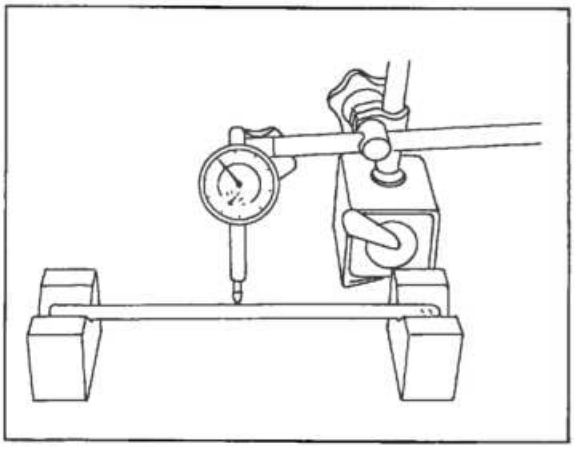


Clutch actuating mechanism



1. Check the short push rod for wear and damage; replace if damaged.
2. Check the short-push-rod thrust bearing for damage; replace if damaged.
3. By rolling the long push rod on the "V" blocks, check for bends. If any bend is found, replace the push rod.

Bend limit: 0.5 mm (0.02 in)



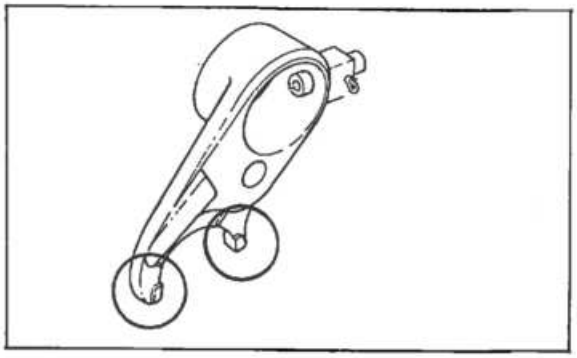
Clutch springs

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

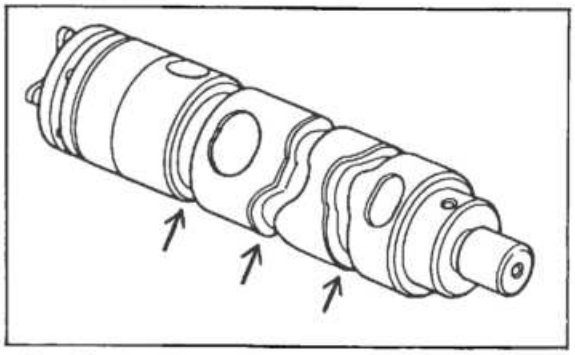
Clutch spring minimum length: 32.5 mm (1.28 in)

L. Transmission

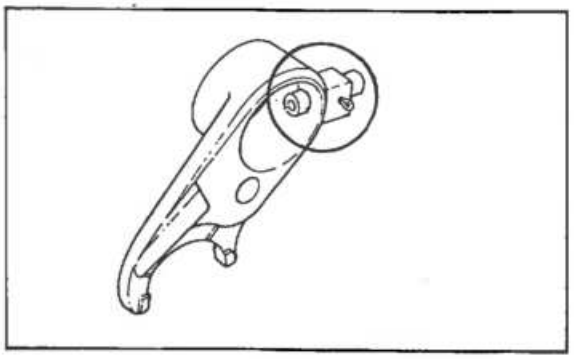
1. Inspect each shift fork for signs of galling on the gear contact surfaces. Check for bending. Make sure each fork slides freely on its guide bar.



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



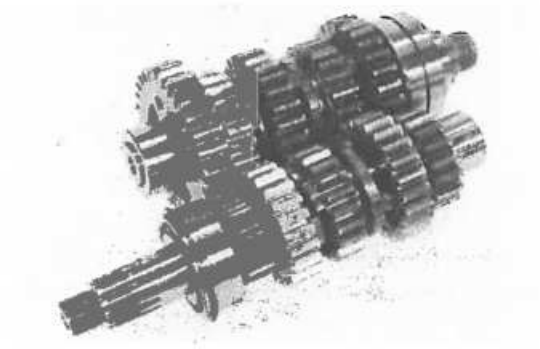
4. Check the cam followers on each shift fork for wear. Check the ends that ride in the grooves in the shift cam. If they are worn or damaged, replace the shift fork.



5. Check the shift cam dowel and side plate for looseness, damage, or wear. Replace as required.
6. Check the shift-cam stopper plate, 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 the specified limit, replace the shaft.

Maximum runout: 0.08 mm (0.0031 in)

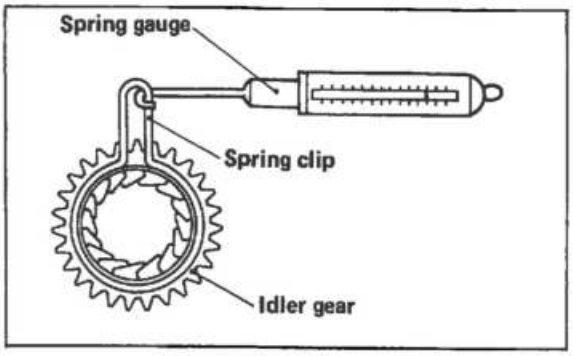
8. Carefully inspect each gear. Look for signs of obvious heat damage (blue discoloration). Check the gear teeth for signs of pitting, galling, or other extreme wear. Replace as required.
9. Check to see that each gear moves freely on its shaft.
10. Check to see that all washers and clips are properly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

1. Check the surface of the idler gears for pitting or other damage. If the damage is severe, replace the gear(s).
2. Check the tension of the return spring. If it is damaged or fatigued, replace the spring.
3. Check the tension of both spring clips with a spring gauge. If either clip is not within specification, replace it.

Spring clip tension:	
Idler gear #2:	21.6N ~ 24.5N (2.2 ~ 2.5 kg, 4.9 ~ 5.5 lb)
Kick gear:	11.8N ~ 16.7N (1.2 ~ 1.7 kg, 2.6 ~ 3.7 lb)



N. Crankcase

1. Thoroughly wash the case halves in a mild solvent.
2. Clean all gasket mating surfaces and crankcase mating surface thoroughly.
3. Visually inspect the case halves for any cracks, road damage, etc.
4. Check all fittings not previously removed for signs of looseness or damage.
5. If bearings have been removed, check their seats for signs of damage (such as the bearing spinning in the seat, etc.).
6. Check oil delivery passages for signs of blockage.
7. If bearings have not been removed, oil them thoroughly immediately after washing and drying. Rotate the bearing, and check for roughness indicating damaged races or balls.
8. Check needle bearing(s) in the transmission for damage; replace as required.

O. Bearings And Oil Seals

Inspection

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

Removal

1. Pry oil seal(s) out of place with a screwdriver.
   Replace all oil seals when overhauling the engine.

NOTE:

Place a piece of wood under the screwdriver to prevent damage to the case.

2. Drive out the bearing(s) with a socket and hammer or with a hydraulic press.

NOTE:

Bearing(s) are most easily removed or installed if the cases are first heated to approximately 95°~125°C (205°~257°F). Bring the case up to proper temperature slowly. Use an oven.

ENGINE ASSEMBLY AND ADJUSTMENT

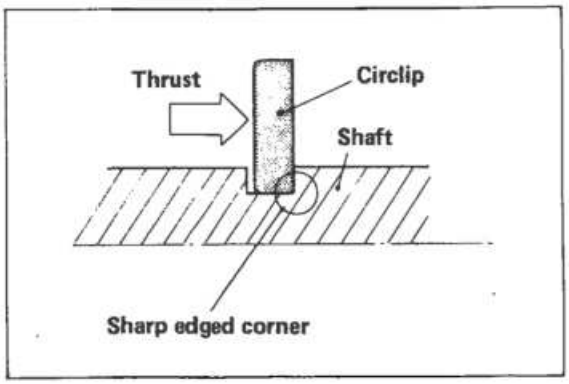
A. Important Information

Gaskets and seals

1. 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 parts and bearings during reassembly.

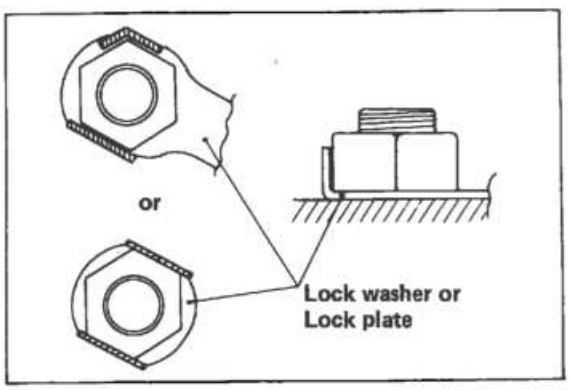
Circlips

1. 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 opposite to the thrust it receives. See the sectional view below.



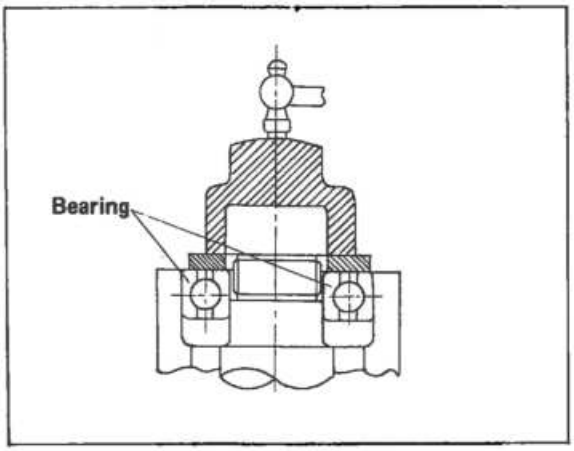
Lock washers/plates and cotter pins

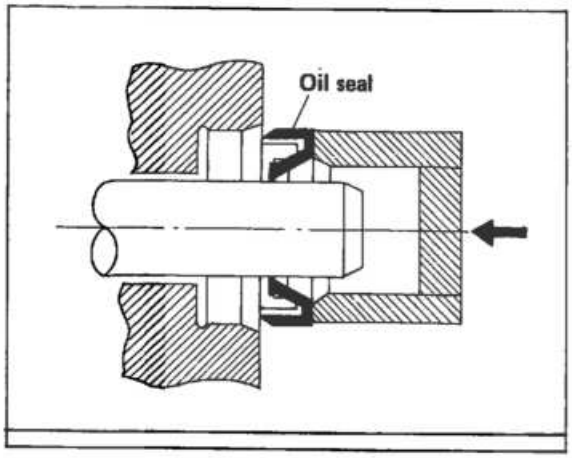
1. All lock washers/plates and cotter pins must be replaced when they are removed. Lock tab(s) should be bent along the bolt or nut flat(s) after the bolt or nut has been properly tightened.



Bearings and oil seals

1. Install the bearing(s) and oil seal(s) with their manufacturer's marks or numbers facing outward. (In other words, the stamped letters must be on the side exposed to view.) When installing oil seal(s), apply a light coating of light-weight lithium base grease to the seal lip(s). When installing bearings liberally oil the bearings.



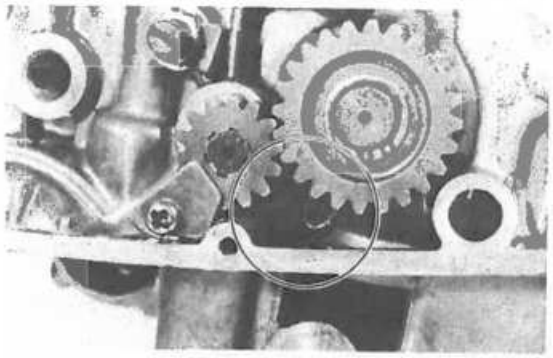


B. Starter Motor Unit

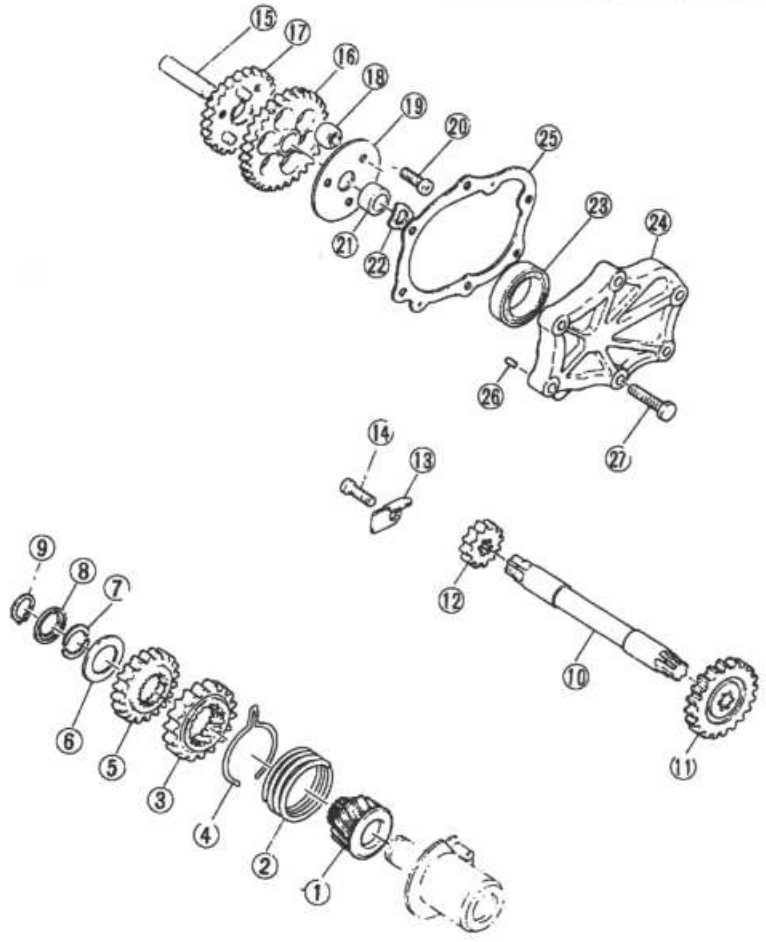
1. Place the lower half crankcase on the bench with its mating surface facing upward.
2. Install shaft 2 and gear 1.
3. Install shaft 1 and idle gears 1 and 2.
4. Install gear 2 and the plate stopper and tighten the screw.
5. Install the starter wheel gear and gears 4 and 3.
   Install the circlip.

NOTE:

The spring clip should be located in the case gap.

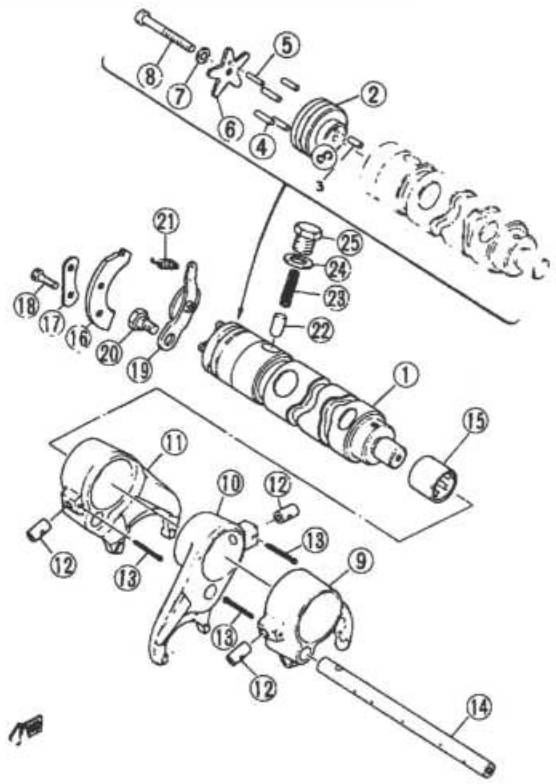


Starting motor unit



1. Starter wheel
2. Compression spring
3. Gear 4
4. Clip
5. Gear 3
6. Plate washer
7. Clip
8. Clip holder
9. Circlip
10. Shaft 2
11. Gear 1
12. Gear 2
13. Stopper plate
14. Pan head screw
15. Shaft 1
16. Idler gear 1
17. Idler gear 2
18. Absorber
19. Idle gear plate
20. Pan head screw
21. Collar
22. Wave washer
23. Oil seal
24. Crankcase cover 3
25. Gear crank cover gasket
26. Dowel pin
27. Bolt

Shift Cam Fork



1. Shift cam assembly
2. Shift cam 2
3. Dowel pin
4. Dowel pin
5. Dowel pin
6. Side plate 1
7. Internal tooth washer
8. Pan head screw
9. Shift fork 1
10. Shift fork 2
11. Shift fork 3
12. Pin
13. Cotter pin
14. Shift fork guide bar 1
15. Bearing
16. Stopper plate 2
17. Lock screw plate
18. Bolt
19. Stopper lever assembly
20. Bolt
21. Tension spring
22. Cam stopper
23. Compression spring
24. Gasket
25. Bolt

C. Shifter, Transmission and Crankshaft

1. Install the shift cam into the crankcase and install the shift fork.
2. Install the shift fork guide bar.
3. Install the stopper plate and the stopper lever assembly.

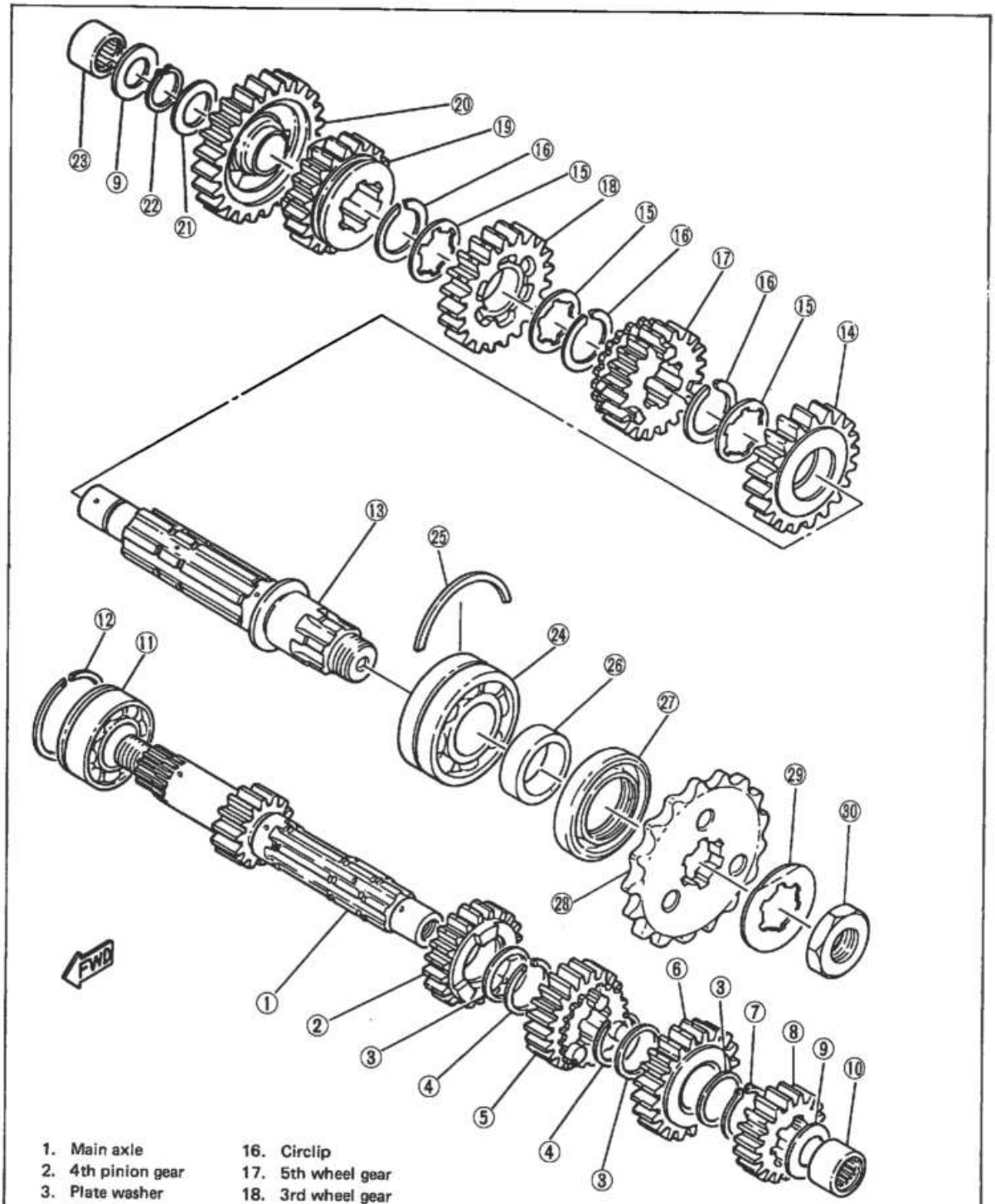
TIGHTENING TORQUE:
Stopper plate: 9.81 Nm (1.0 m·kg, 7.23 ft·lb)
Stopper lever: 9.81 Nm (1.0 m·kg, 7.23 ft·lb)

4. Install the transmission assembly.

NOTE:

1. Install the bearing circlip into the case groove and then the oil seal projection into the corresponding case dent.
2. Apply a liberal amount of oil to each gear, bearing, and shift cam.
3. Apply a thin coat of grease to the oil seal lip.

Transmission

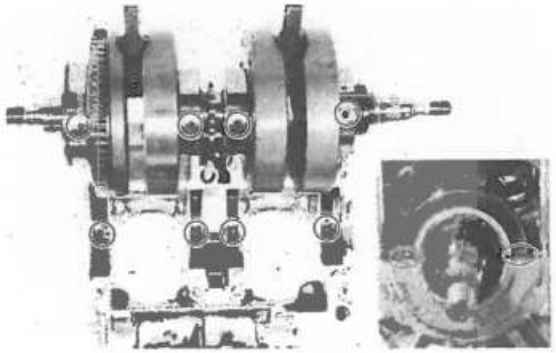


1. Main axle
2. 4th pinion gear
3. Plate washer
4. Circlip
5. 3rd pinion gear
6. 5th pinion gear
7. Circlip
8. 2nd pinion gear
9. Drive axle shim
10. Bearing
11. Bearing
12. Circlip
13. Drive axle
14. 2nd wheel gear
15. Gear hold washer
16. Circlip
17. 5th wheel gear
18. 3rd wheel gear
19. 4th wheel gear
20. 1st wheel gear
21. Plate washer
22. Circlip
23. Bearing
24. Bearing
25. Circlip
26. Collar
27. Oil seal
28. Drive sprocket
29. Lock washer
30. Lock nut

5. Install the crankshaft.

NOTE:

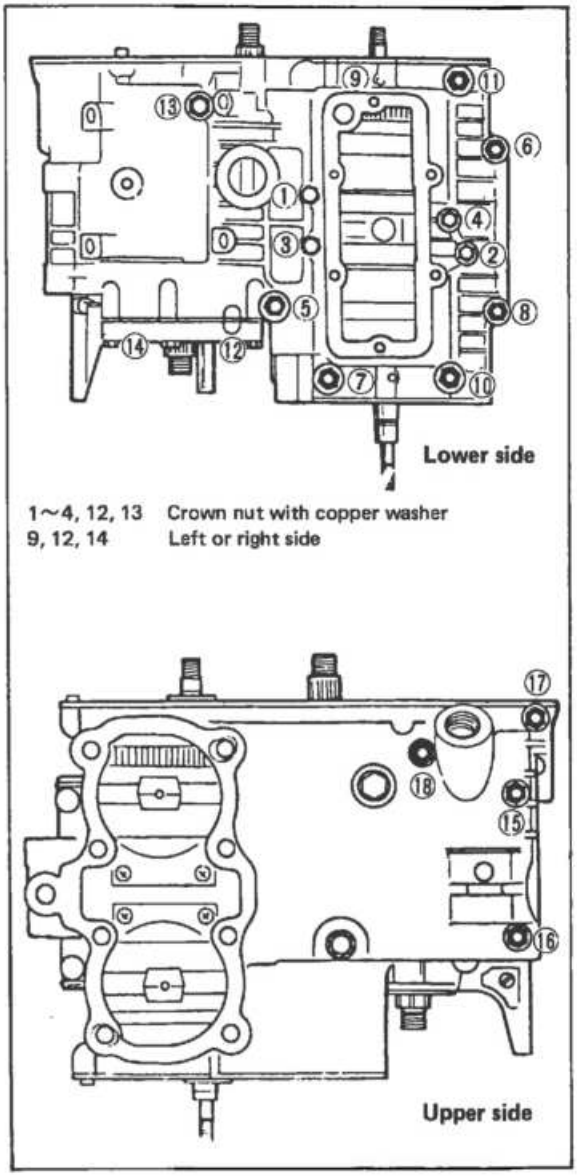
1. Apply a liberal amount of oil to the big end bearing and to the crank journal bearing.
2. Install the bearing circlip into the case groove.
3. Install the bearing dent onto the dowel pin on the case.
   Correct bearing location can be ensured by the level line on the bearing.
4. Install the oil seal projection in the corresponding case dent.



D. Crankcase Assembly

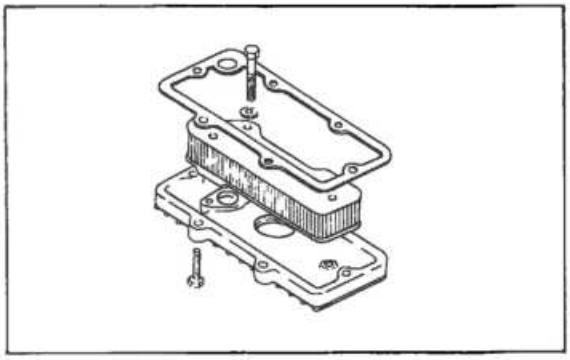
1. Apply Yamaha bond No. 4 to the mating surfaces of the uppe and lower cases.
2. Install the upper case onto the lower case.
3. Tighten the securing bolts in the order as shown in the illustration.

TIGHTENING TORQUE:
20.6 Nm (2.1 m·kg, 15.19 ft·lb)



1~4, 12, 13 Crown nut with copper washer
9, 12, 14 Left or right side

4. Install the oil strainer.



TIGHTENING TORQUE:
9.81 Nm (1.0 m·kg, 7.23 ft·lb)

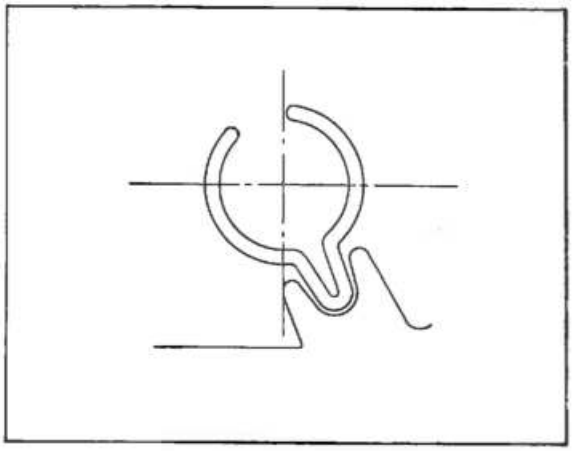
5. Install the starter motor.

TIGHTENING TORQUE:
9.81 Nm (1.0 m·kg, 7.23 ft·lb)

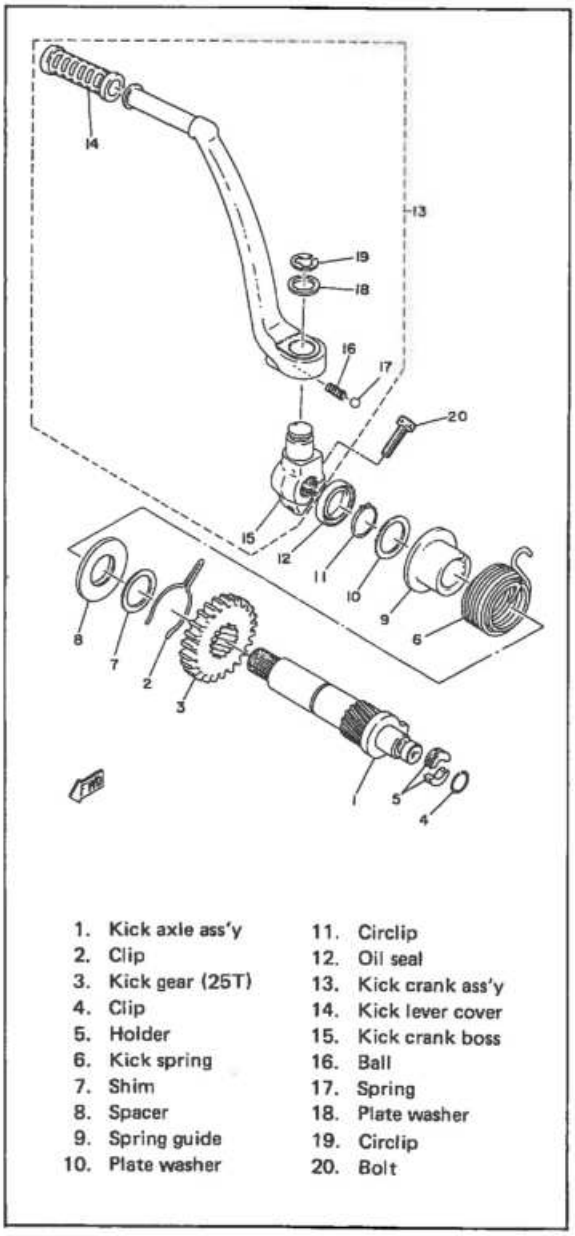
E. Kick Starter, Primary Drive Gear, Clutch Assembly, Oil Pump and Case Cover Right

1. Install the kick shaft.

The spring clip should be installed as shown in the illustration.

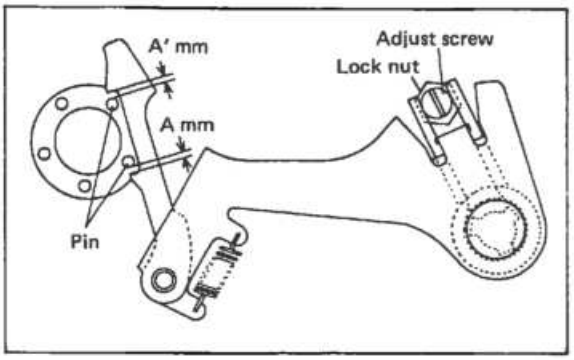


Kick Starter

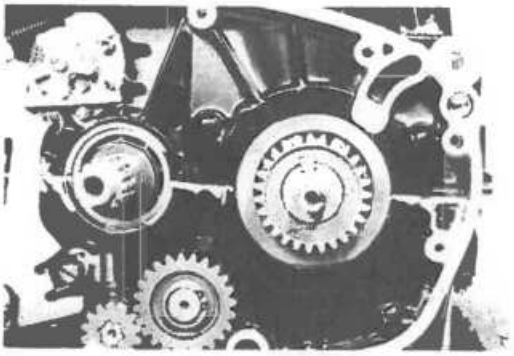


1. Kick axle ass'y
2. Clip
3. Kick gear (25T)
4. Clip
5. Holder
6. Kick spring
7. Shim
8. Spacer
9. Spring guide
10. Plate washer
11. Circlip
12. Oil seal
13. Kick crank ass'y
14. Kick lever cover
15. Kick crank boss
16. Ball
17. Spring
18. Plate washer
19. Circlip
20. Bolt

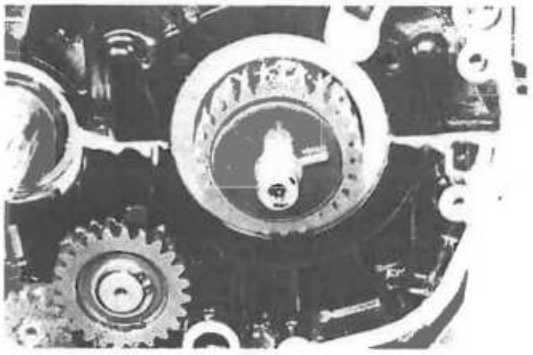
2. Install the change shaft and the change lever.
   Check the gaps "A" and "A'" unless A is nearly equal to A', loosen the lock nut and adjust A with the adjust screw.



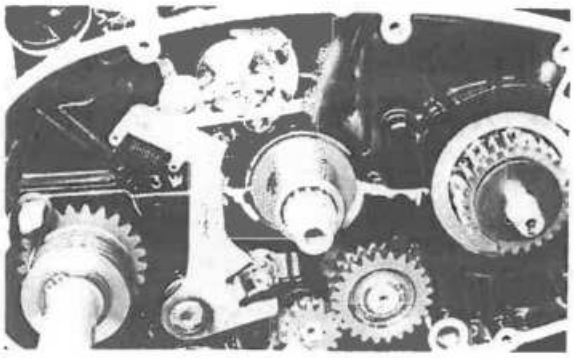
3. Install the primary drive gear onto the crankshaft. Install the key in the keyway.



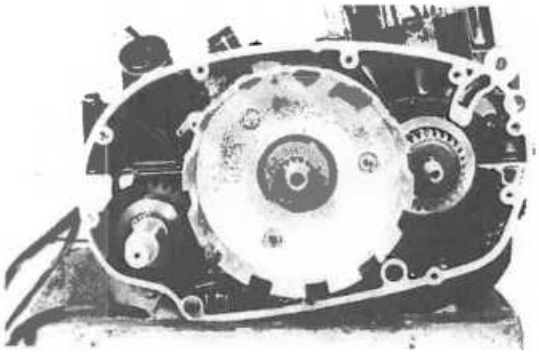
4. Install the plate washer, and securing nut onto the crankshaft. Finger-tighten the securing nut; do not torque it at this point.



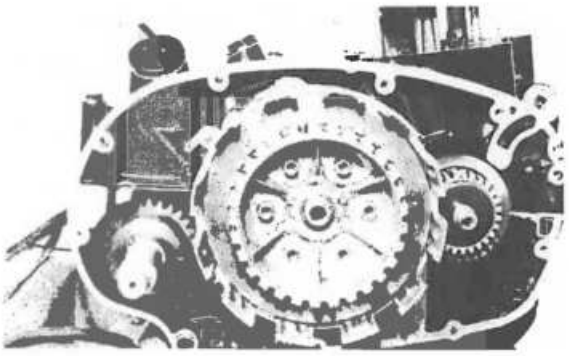
5. Install the plate washer, the thrust plate, the spacer, and the clutch housing onto the transmission main shaft.



6. Install the bearing, the thrust plate, and the clutch boss onto the transmission main shaft.

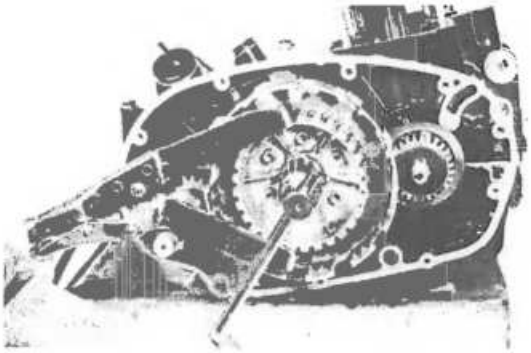


7. Install a new lock washer onto the transmission main shaft. Be sure the tab of the washer engages the slots in the clutch boss.

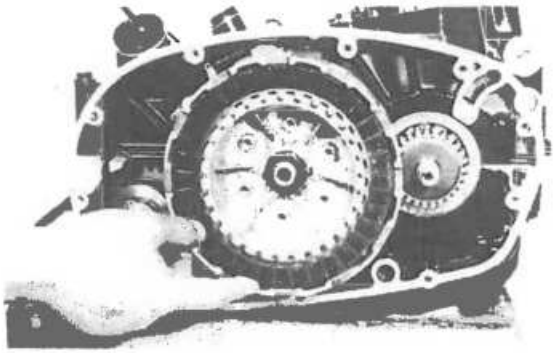


8. Install the clutch-boss securing nut. Using the clutch hub holder, tighten the clutch-boss nut and torque it to specification. Bend a lock tab against a nut flat.

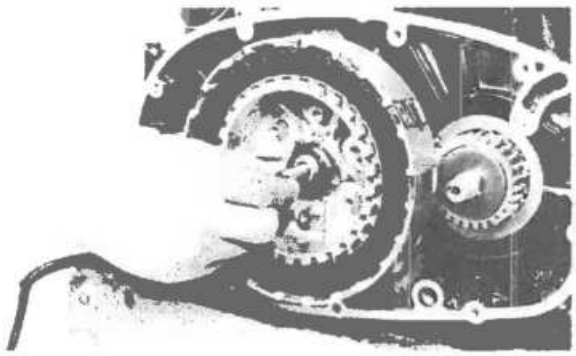
TIGHTENING TORQUE:
87.5 Nm (8.0 m·kg, 57.9 ft·lb)



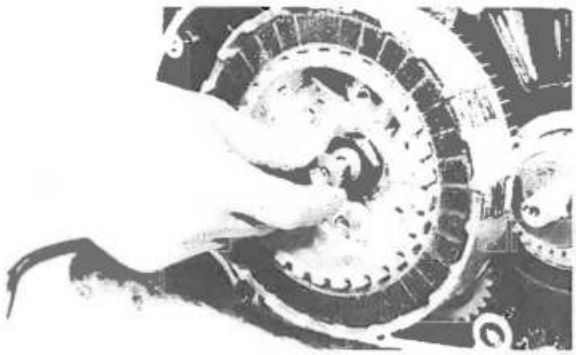
9. Install the friction and clutch plates. Begin with a friction plate and alternate clutch and friction plates until all of the plates are in the clutch boss.



10. Insert the ball, push rod #2, and the ball into the transmission main shaft.

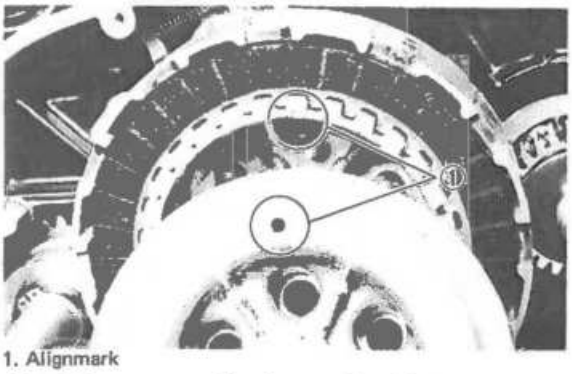


11. Install push rod #1 into the transmission main shaft.



12. Install the clutch pressure plate and the six clutch springs. Torque the clutch plate bolts to specification.

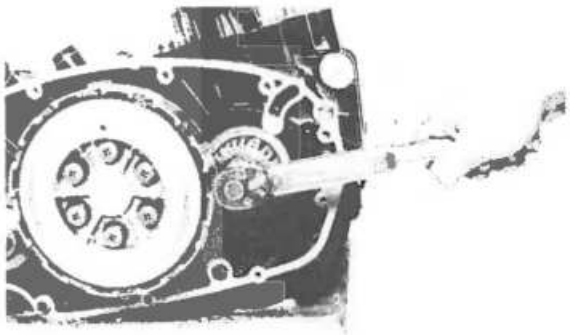
TIGHTENING TORQUE:
7.85 Nm (0.8 m·kg, 5.8 ft·lb)



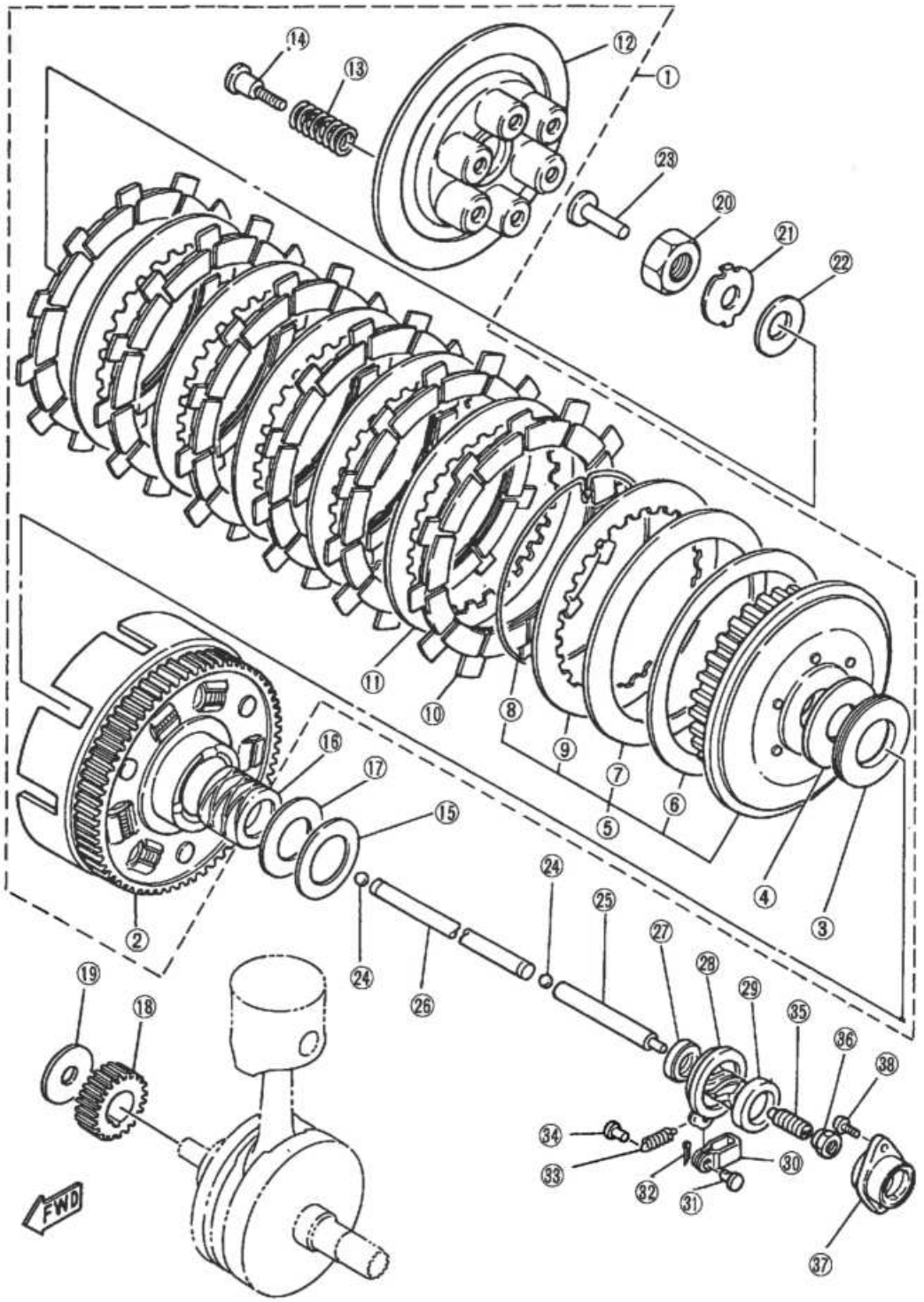
1. Alignmark

13. Place a small piece of rolled rug or a piece of lead between the primary drive gears as shown in the photograph. It will hold the gears so you can tighten the primary-drive securing nut. Torque the nut to specification, and bend the lock tab against a nut flat.

TIGHTENING TORQUE:
88.3 Nm (9.0 m·kg, 65.1 ft·lb)

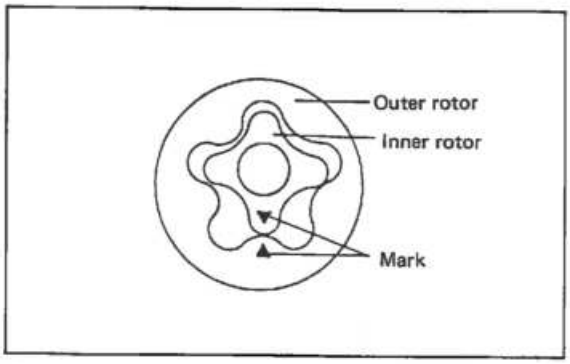


Clutch



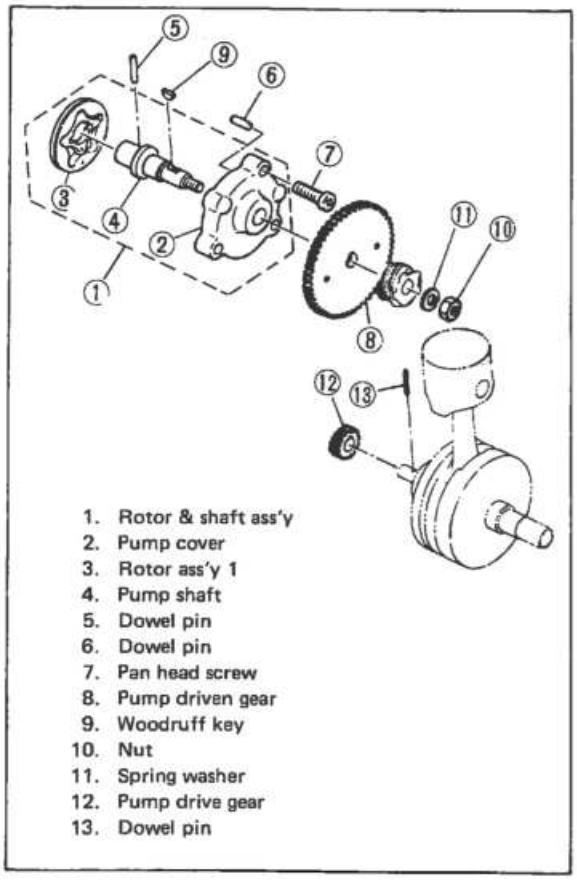
1. Clutch ass'y
2. Primary driven gear comp.
3. Bearing
4. Thrust plate 2
5. Clutch boss ass'y
6. Seat plate
7. Clutch boss spring
8. Clutch boss ring
9. Clutch plate 2
10. Friction plate
11. Clutch plate 2
12. Pressure plate 1
13. Compression spring
14. Screw
15. Plate washer
16. Spacer
17. Thrust plate 2
18. Thrust plate 2
19. Plate washer
20. Nut
21. Lock washer
22. Conical spring washer
23. Push rod 1
24. Ball
25. Push rod 2
26. Push rod 3
27. Oil seal
28. Push lever ass'y
29. Seal dust
30. Joint
31. Pin
32. Pin cotter
33. Spring
34. Hook spring
35. Bolt
36. Nut
37. Housing push screw
38. Panhead screw

14. Install the dowel pin and the rotor assembly 1 onto the pump shaft. Install the pump cover.



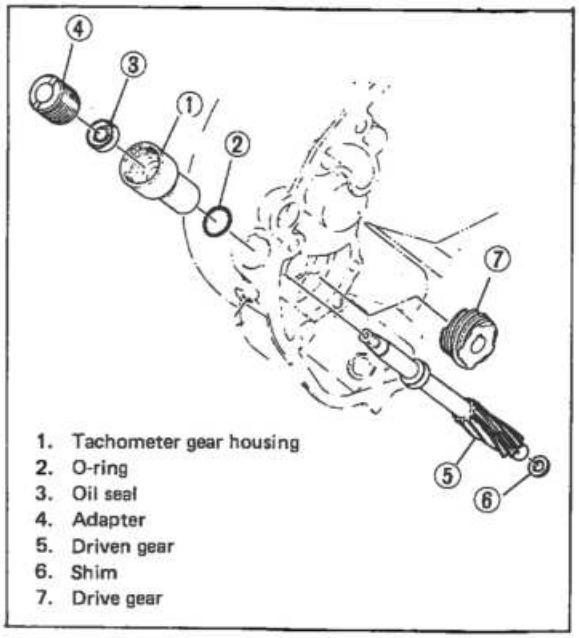
15. Install the woodruff key and the pump driven gear onto the pump shaft.
16. Install the tachometer driven gear onto the pump shaft.
17. Install the tachometer drive gear while rotating.
18. Tighten the tachometer driven gear set screw.
19. Install the tachometer housing into the case cover.

Oil Pump



1. Rotor & shaft ass'y
2. Pump cover
3. Rotor ass'y 1
4. Pump shaft
5. Dowel pin
6. Dowel pin
7. Pan head screw
8. Pump driven gear
9. Woodruff key
10. Nut
11. Spring washer
12. Pump drive gear
13. Dowel pin

Tachometer Gear



1. Tachometer gear housing
2. O-ring
3. Oil seal
4. Adapter
5. Driven gear
6. Shim
7. Drive gear

20. Install the right-side crankcase cover. Use a new gasket and tighten the securing bolts.

TIGHTENING TORQUE:
9.81 Nm (1.0 m·kg, 7.23 ft·lb)

21. Install the kick crank. Tighten the securing bolt.

TIGHTENING TORQUE:
19.6 Nm (2.0 m·kg, 14.5 ft·lb)

F. Case Cover Left

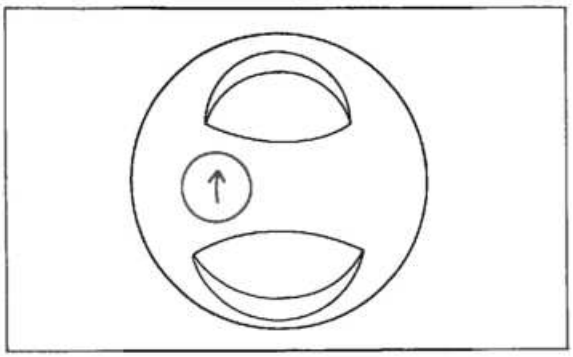
1. Install the key and the rotor assembly onto the crankshaft.
2. Tighten the securing nut using the rotor holding tool.

TIGHTENING TORQUE:
37.3 Nm (3.8 m·kg, 27.5 ft·lb)

3. Install the stator.
4. Install the neutral switch lead wire.
5. Install the chain guide.
6. Install the drive sprocket.

G. Pistons, Cylinders, and Cylinder Heads

1. Install the pistons on the rods. The arrow marks on the pistons should face 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 clip into the crankcase.

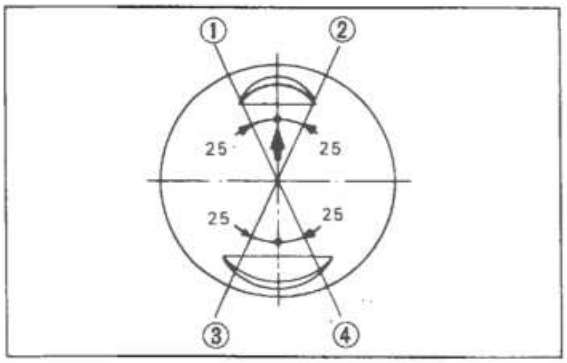
2. Align the piston rings as shown.

CAUTION:

Be sure the ends of the il ring expanders do not overlap.

NOTE:

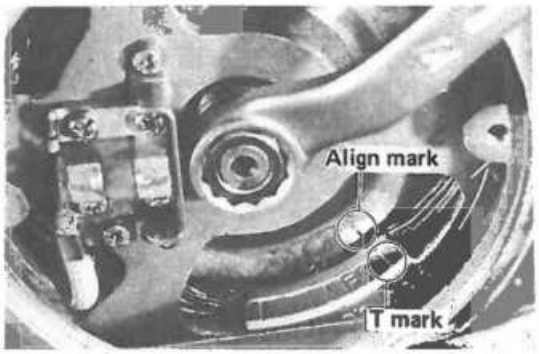
The manufacturer's marks or numbers stamped on the rings should be on the top of the rings.



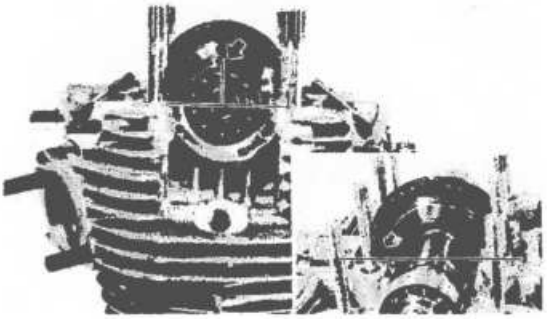
3. Liberally coat the pistons with oil, and install the dowels onto the crankcase.
4. Install a new cylinder-base gasket to the cylinder, and install a new o-ring around each cylinder liner.
5. Install the cylinders using the piston support plates and the piston ring compressors. Route the cam chain journal.
6. Remove the chain tensioner from the cylinder.
7. Install a new cylinder-head gasket.
8. Route the cam chain through the cam chain journal.
9. Install the cylinder head and tighten the securing bolts (3).

H. Cam Shaft and Chain Tensioner

1. Install the cam shaft so the cam sprocket key groove can be located on the left side.
2. Install the bearings onto the both sides of the cam shaft and bring them together close enough to each other.
3. Align the mark on the "T" mark on the stator.



4. Place the cam sprocket with its key groove on top, at the same time the punched mark on it being horizontal.



5. In the above condition, calk the cam chain with the cam chain tool.

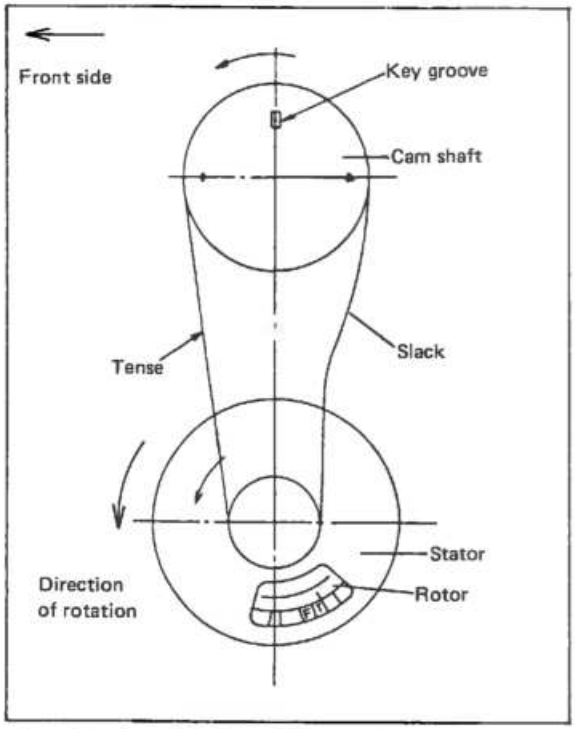
NOTE:

Always use a new chain joint.

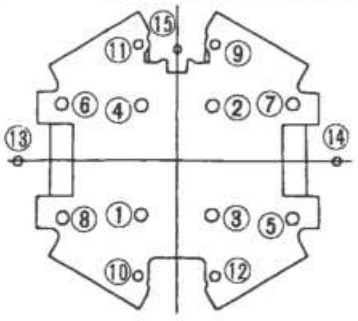
6. Adjust the chain tension.

NOTE:

1. Recheck the "T" mark on the rotor and the cam shaft key groove for alignment.
2. One chain link difference may make 10 degrees difference in valve timing.



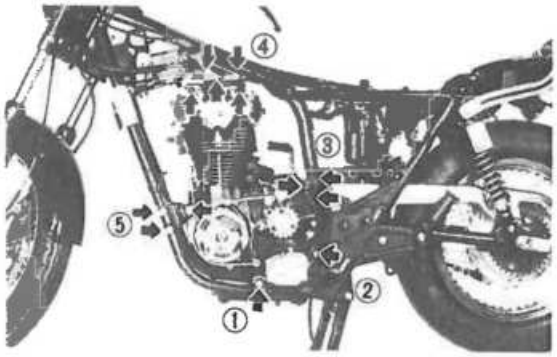
7. Apply HERME-SEAL (Yamaha-bond 5) to the mating surface of the cylinder head cover.
8. Finger-tighten the securing nuts and bolts, and tighten them in the order as shown in the illustration.



(1)~(8) Tightening torque
34.3 ~ 37.3 Nm
(3.5~3.8 m·kg, 25.3~27.5 ft·lb)
(9)~(12) Tightening torque
19.6~ 21.8 Nm
(2.0~2.2 m·kg, 14.5~15.9 ft·lb)
(13)~(15) Tightening torque
7.85~9.81 Nm
(0.8~1.0 m·kg, 5.79~7.23 ft·lb)

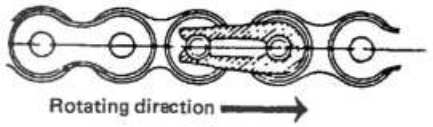
I. Mounting The Engine

1. Install and finger-tighten the mounting bolts in the order as shown.
   Tighten the bolts as specified.



TIGHTENING TORQUE:
(1) 88.3 Nm (9.0 m·kg, 65.1 ft·lb)
(2) 45.1 Nm (4.6 m·kg, 33.3 ft·lb)
(3) 40.2 Nm (4.1 m·kg, 29.7 ft·lb)
(4) 17.7 Nm (1.8 m·kg, 13 ft·lb)(M8)
29.4 Nm (3.0 m·kg, 21.7 ft·lb)
(M10)
(5) 45.1 Nm (4.6 m·kg, 33.3 ft·lb)

2. Install the drive chain to the drive and driven sprockets.
3. Install the chain-joint clip as shown in the illustration.



4. Install the tachometer cable.
5. Install the case cover (left) and the change pedal.

TIGHTENING TORQUE:
9.81 Nm (1.0 m·kg, 7.23 ft·lb)

6. Install the footpeg and the brake pedal.
7. Install the exhaust pipe assembly.
8. Install the carburetors.
9. Install the fuel tank.
10. Install the air cleaner assembly and the air cleaner joints.
11. Connect the fuel and vacuum lines.

12. Install or connect the following wires.
    a) Spark plug cap cords
    b) Starter motor lead wire
    c) A.C. Generator lead wire
    d) Throttle cable and clutch cable
    e) Lead wire for ground

13. Install the side covers.
14. Add Engine oil

2.5 L (2.2 Imp qt, 2.64 US qt)

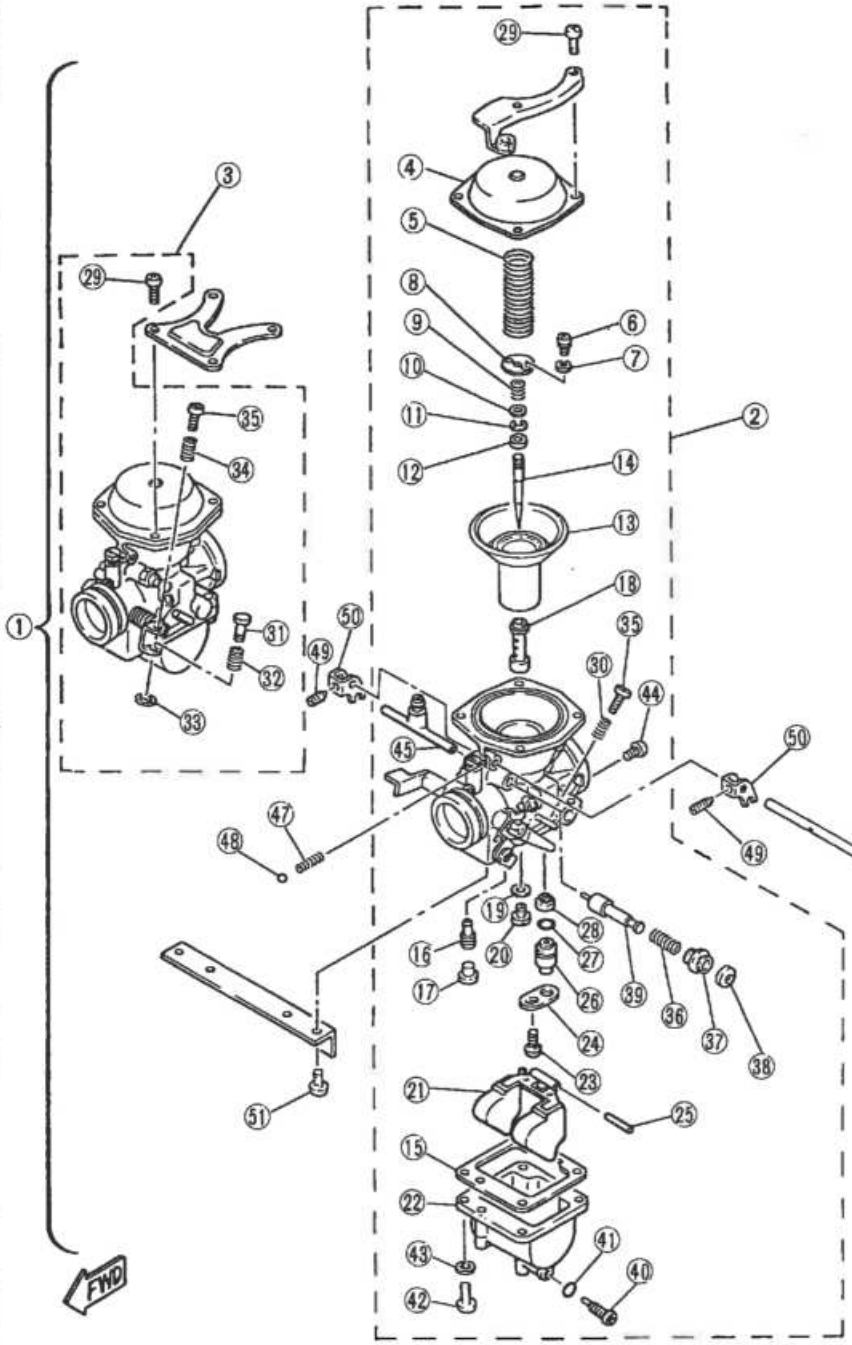
CHAPTER 4. CARBURETION

CARBURETOR 4-1
A. Section View and Operation 4-2
B. Specifications 4-2
C. Operation of Carburetor 4-2
D. Disassembly 4-4
E. Inspection 4-5
F. Assembly 4-6
G. Adjustment 4-6
AIR CLEANER AND CRANKCASE VENTILATION SYSTEM 4-8



CARBURETION

CARBURETOR



1. Carburetor ass'y
2. Carburetor ass'y 1
3. Carburetor ass'y 2
4. Diaphragm cover
5. Diaphragm spring
6. Panhead screw
7. Spring washer
8. Spring seat
9. Spring
10. Washer
11. Clip
12. Ring
13. Diaphragm ass'y
14. Needle
15. Float chamber gasket
16. Pilot jet
17. Screw
18. Main nozzle
19. Main jet washer
20. Main jet
21. Float
22. Float chamber body
23. Panhead screw
24. Plate
25. Float pin
26. Needle valve ass'y
27. O-ring
28. Filter net
29. Panhead screw
30. Throttle stop spring
31. Rod
32. Throttle stop spring
33. Clip
34. Throttle stop spring
35. Throttle screw
36. Plunger spring
37. Plunger cap
38. Plunger cap cover
39. Starter plunger
40. Drain plug
41. O-ring
42. Panhead screw
43. Spring washer
44. Main jet
45. Starter connecting pipe
46. Starter lever shaft
47. Spring
48. Ball
49. Screw
50. Starter lever
51. Panhead screw

A. Section View and Operation

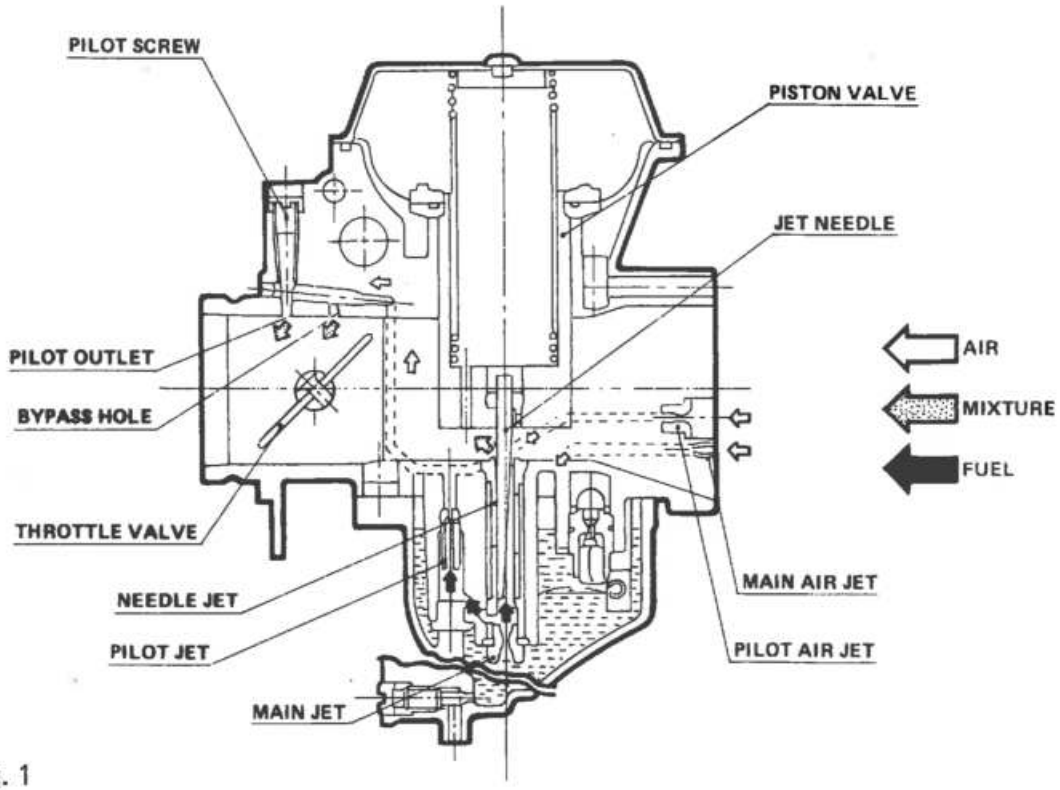


Fig. 1

B. Specifications

Main jet	# 135
Jet needle	5D2-3
Starter jet	# 80
Pilot screw	Preset
Float valve seat	ϕ 2.0
Engine idle speed	1,200 r/min

WARNING

The pilot screw settings are adjusted for maximum performance at the factory with special equipment. DO NOT attempt to change these settings. If all other engine systems are functioning correctly, any changes will decrease performance and cause increased exhaust emissions.

C. Operation of Carburetor

The CV carburetor has a variable whose sectional area can be varied automatically by fluctuations in the negative pressure in the engine.

Idle circuit (See Fig. 1)

1. When the engine is at idle speed, the fuel from the float chamber passes through the main jet and is metered by the pilot jet. Then the fuel is mixed with the air metered by the pilot air jet, and thereafter flows through the bypass and the pilot outlet to the engine.

Main circuit (See Fig. 1)

2. The fuel flow from the float chamber to the main circuit is metered by the main jet and supplied to the engine through the needle jet. As the engine speed increases, the diaphragm begins to act and the piston valve connected to the diaphragm is moved upward. This makes the sectional area of the venturi increase, and more air supplied to the engine. At the same time, the jet needle attached to the center of the piston valve moves up, and thus the opening of the needle jet increases. This makes the fuel flow in-

crease and optimum mixing ratio which is required for the engine is maintained.

3. Starter

The starter carburetor is incorporated in the main carburetor body, but it is independent of the main circuit.

Operation of two-position starter jet. (See Fig. 2)

Full-open:

To start a cold engine, a rich mixture is required.

To supply a rich mixture, move the starter lever all the way to the left so that the needle regulating the fuel flow is pulled up and the flow rate of incoming fuel is increased to a maximum. The fuel is mixed with the air supplied from the diaphragm lower chamber, and thus a rich mixture is produced.

Half-open:

When warming up the engine, a slightly rich mixture is required. Move the starter lever half way back so that the fuel flow is reduced by the needle. The fuel is mixed with the air from the diaphragm lower chamber, thus a slightly rich mixture is produced.

Full-closed:

When the engine fully warms up, no mixture from the starter circuit is necessary. Move the starter lever all the way back so that the flow of incoming air is also stopped by the plunger, and thus no mixture enters the throttle bore.

Starter System

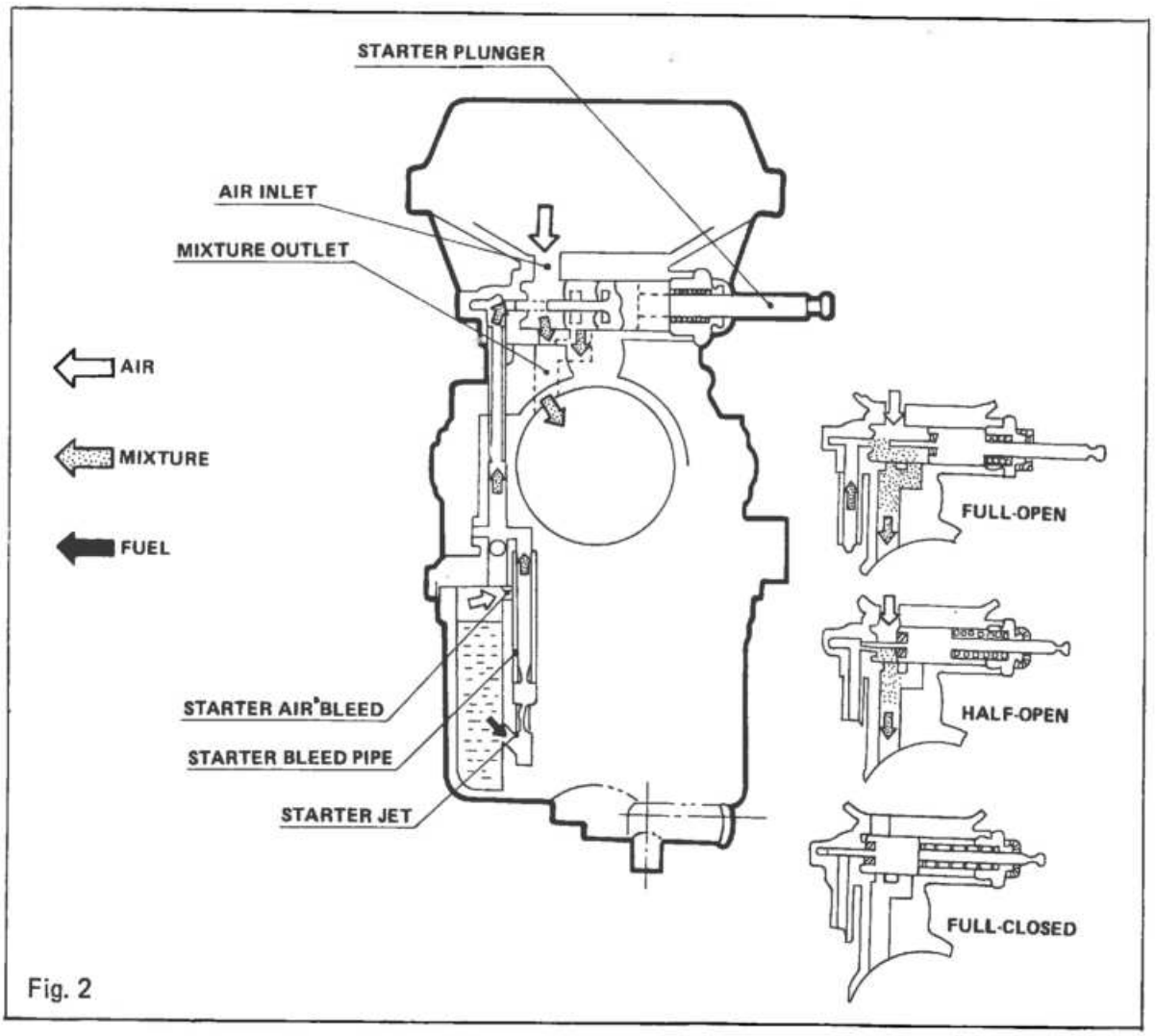
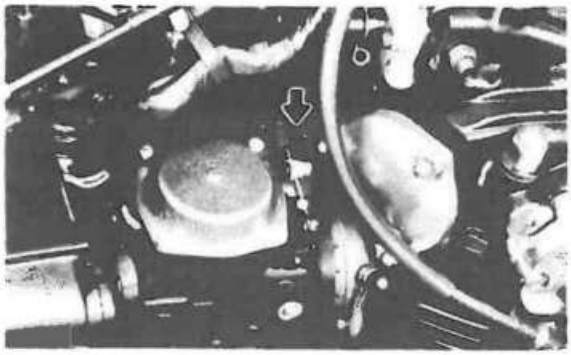


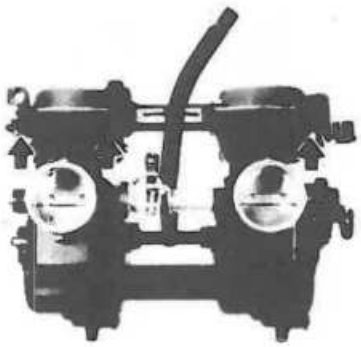
Fig. 2

D. Disassembly

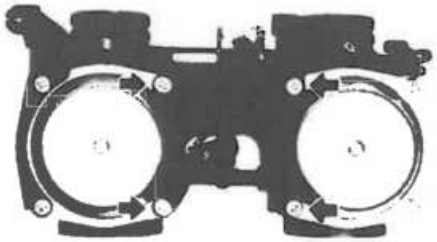
1. Remove the throttle wires bracket from each carburetor.

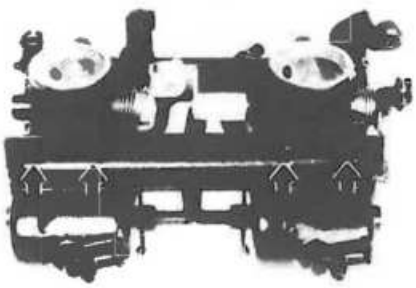


2. Remove the two joint shaft securing screws and remove the shaft from each carburetor.



3. Remove the upper and lower bracket from each carburetor.





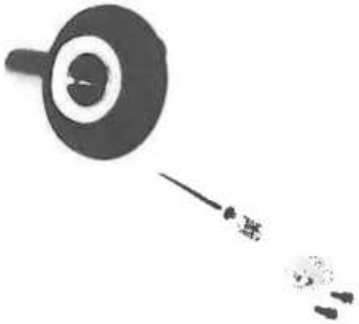
4. Remove the vacuum chamber cover, and remove the spring and diaphragm. The vacuum piston will come out with the diaphragm.



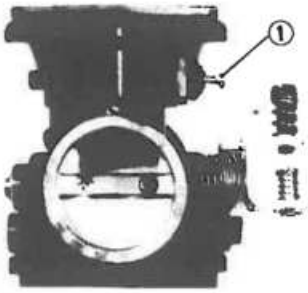
NOTE:

Note the position of the tab on the diaphragm. This tab must be placed in the recess in the carburetor body during reassembly.

5. Remove the circlip and pull out the jet needle.

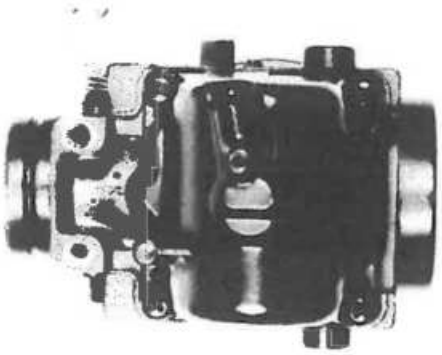


6. Remove the starter plunger from the carburetor body.

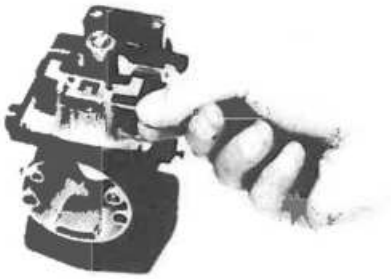


1. Starter plunger

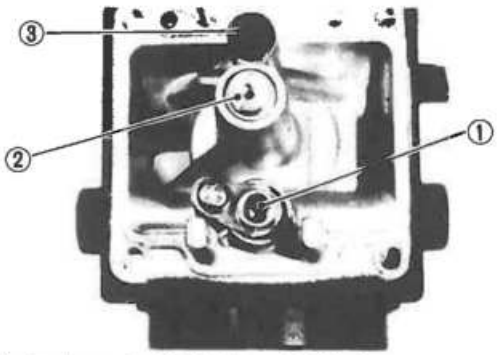
7. Remove the float chamber cover from the carburetor body. The main and pilot jets are located in the float bowl.



8. Remove the float pivot pin, and remove the float assembly. Be careful not to close the float valve which is under the float arm.



9. Remove the jets, float valve seat, and the main nozzle as necessary.

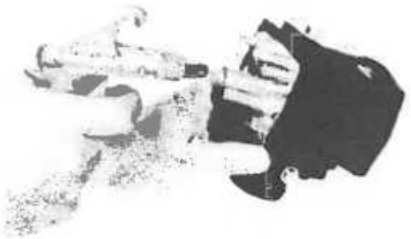


1. Float valve seat 2. Main jet 3. Pilot jet



E. Inspection

1. Examine the carburetor body and fuel passages. If they are contaminated, wash the carburetor in a petroleum-based solvent. Do not use any caustic carburetor cleaning solutions. Blow out all passages and jets with compressed air.



2. Examine the condition of the floats. If the floats are damaged, they should be replaced.
3. Inspect the float neeedle valve and seat for wear or contamination. Replace these components as a set.



4. Inspect the vacuum piston and rubber diaphragm. If the piston is scratched or the diaphragm is torn, the assembly must be replaced.
5. Inspect the jet needle for bends or wear. If the needle is bent or severely worn, replace it.



6. Inspect the starter plunger. If it is worn or damaged, replace it.



F. Assembly

1. To assemble the carburetors, reverse the disassembly procedures. Pay close attention to the installation of the vacuum piston diaphragm and the location of each jet.

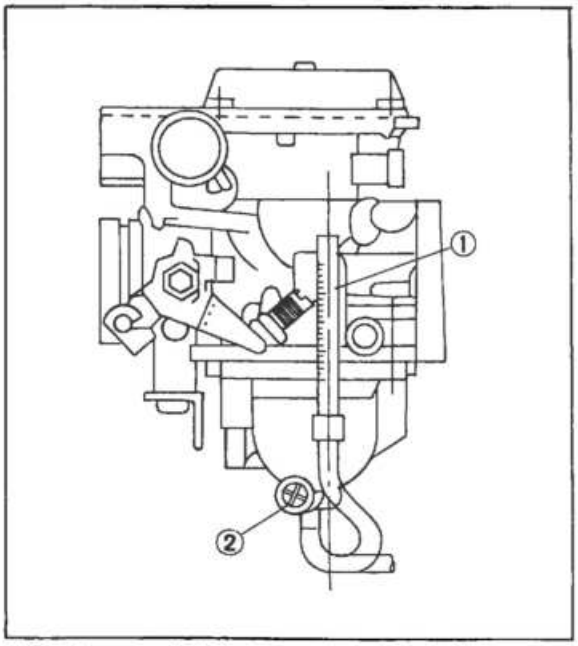
G. Adjustment

Fuel level

NOTE:

Before checking the fuel level, place the motorcycle on a level surface.

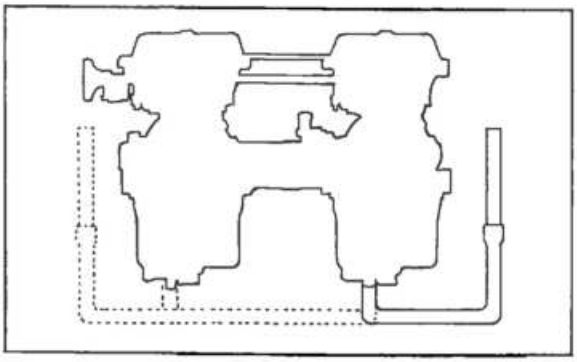
1. Place the motorcycle on the centerstand. Connect the fuel level gauge or a vinyl tube, 6 mm (0.24 in) inside diameter, to the float bowl nozzle on the carburetor.
2. Place the tube next to the throttle stop screw as shown in the photograph.

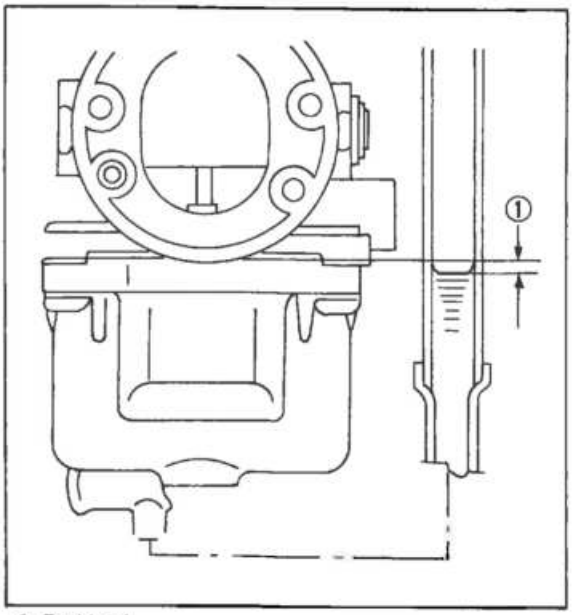


1. Level gauge 2. Drain screw

3. Set the petcock to "ON" and start the engine. Stop it after a few minutes.
4. Check the fuel levle. It should be within the specified range.

Fuel level:
1.0 ± 1.0 mm (0.04 ± 0.04 in)
above the carburetor body





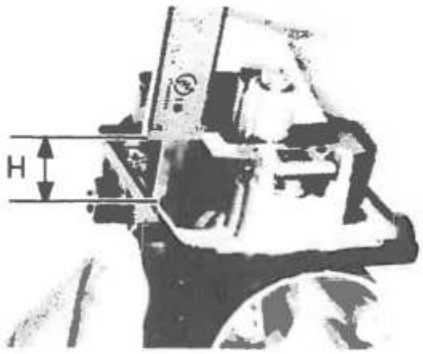
1. Fuel level

5. If the fuel level is not within specification, remove the carburetors, and check the fuel valve and float assembly.
6. If no damage is found in these parts, adjust the float level by slightly bending the tang on the float. Recheck the fuel level.



1. Tang

7. Check the float height using a vernier caliper for reference.

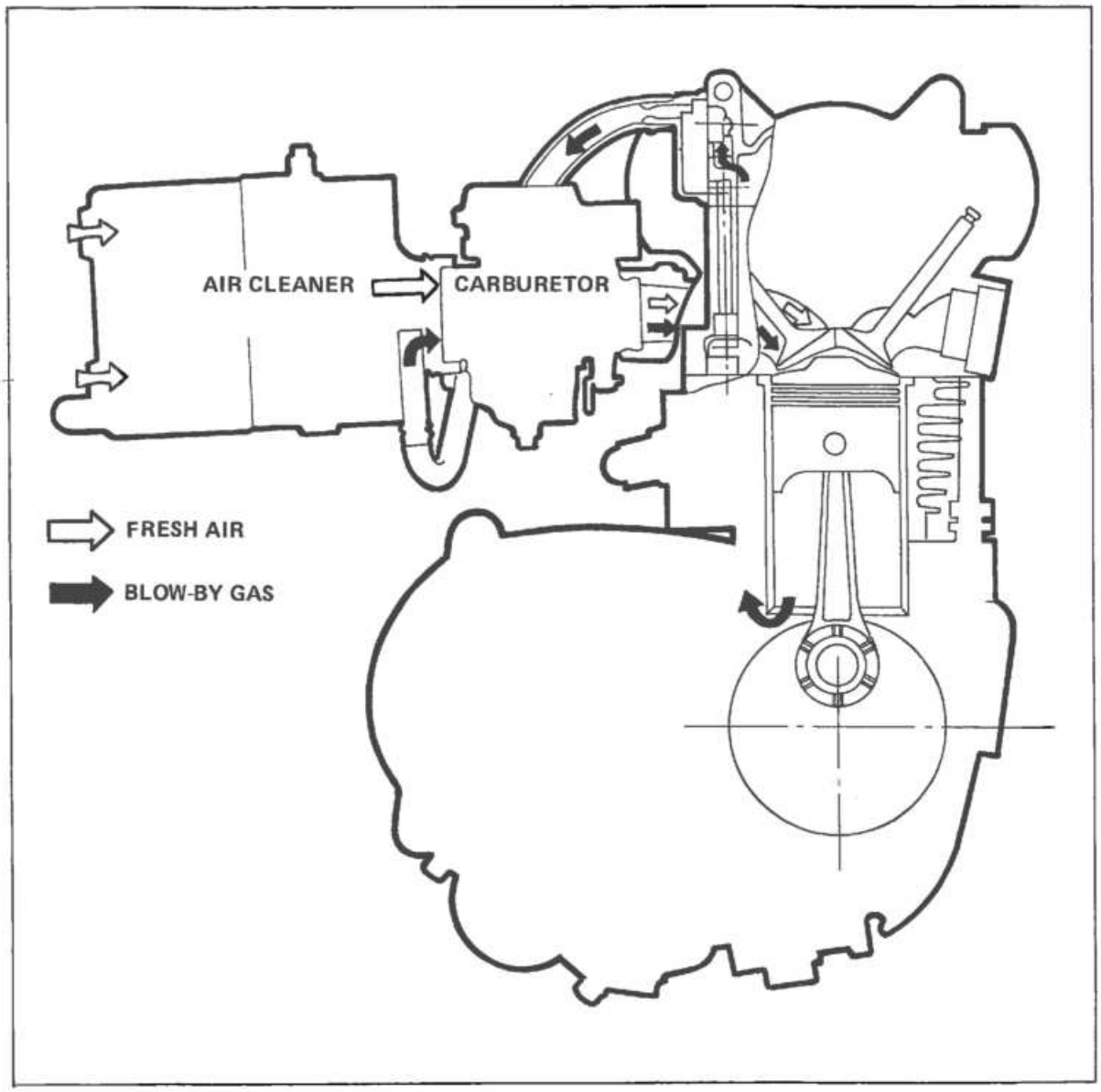


Float height:
H = 22.0 ± 1 mm (0.866 ± 0.039 in)

NOTE:
The float should be just resting on, but not depressing the spring loaded inlet needle.

8. Repeat the procedure for the other carburetor.

AIR CLEANER AND CRANKCASE VENTILATION SYSTEM



Refer to Chapter 2 for the air cleaner maintenance.

CHAPTER 5. CHASSIS

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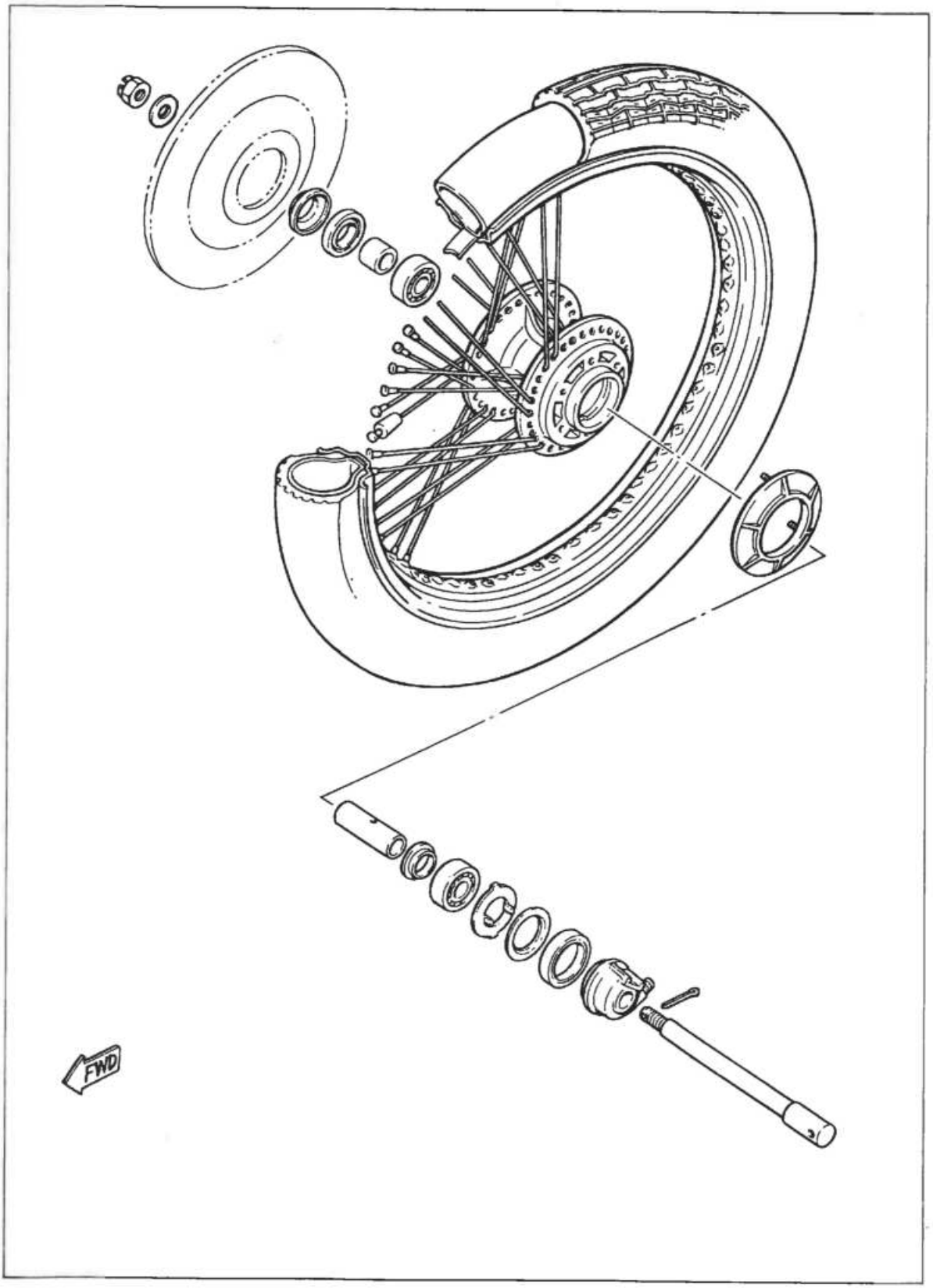
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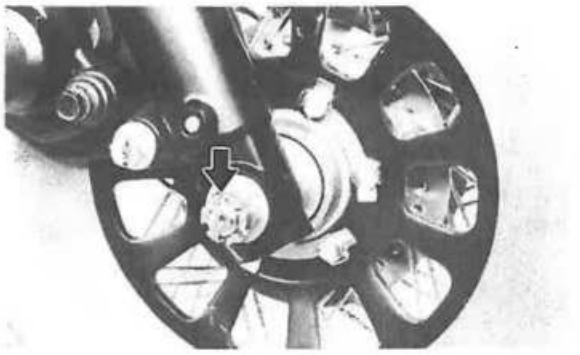
CHASSIS

FRONT WHEEL



A. Removal

1. Place the motorcycle on the centerstand.
2. Remove the cotter pin and axle nut.



3. Loosen the axle holder securing nuts.



4. Remove the speedometer cable.
5. Remove the axle and the front wheel. Make sure the motorcycle is properly supported.

NOTE:

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

B. Front Axle Inspection

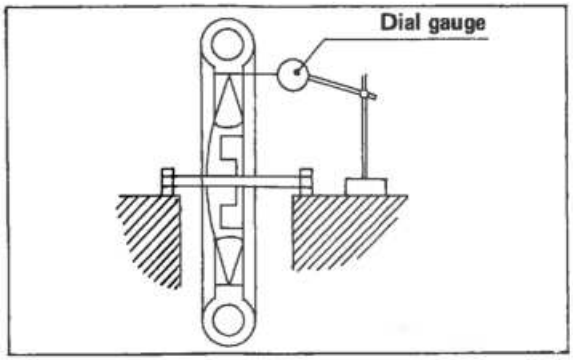
Remove any corrosion from the axle with fine emery cloth. Place the axle on a surface plate, and check for bends. If bent, replace the axle. Do not attempt to straighten a bent axle.

C. Front Wheel Inspection

1. Check for cracks, bends, or warpage of the wheels. If a wheel is deformed or cracked, it must be replaced.
2. Check wheel run-out. If the deflection exceeds the tolerance below, check the wheel bearings or replace the wheel as required.

Rim run-out limits:	
Vertical:	2 mm (0.079 in)
Lateral:	2 mm (0.079 in)

3. Check the wheel balance. Rotate the wheel lightly several times and note where the wheel comes to rest. If the wheel is not statically balanced, it will come to rest at the same point each time. Install an appropriate balance weight at the lightest point (at top).



NOTE:

The wheel should be balanced with the brake disc installed.

4. After installing a tire, ride conservatively to allow the tire to seat itself properly on the rim. Failure to allow proper seating may cause tire failure resulting in damage to the motorcycle and injury to the rider.
5. After repairing or replacing a tire, check to be sure the valve-stem lock nut is securely fastened. If not, toruqe it as specified.

TIGHTENING TORQUE:
1.47 Nm (0.15 m·kg, 1.1 ft·lb)

D. Replacing The Wheel Bearings

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

1. Clean the outside of the wheel hub.

2. Drive the bearing out by pushing the spacer aside and tapping around the perimeter of the bearing inner race with a soft metal drift punch and hammer. The spacer "floats" between the bearings. Both bearings can be removed in this manner.

WARNING:

Eye protection is recommended when using striking tools.

3. To install the wheel bearing, reverse the above sequence. Use a socket that matches the outside diameter of the race of the bearing to drive in the bearing.

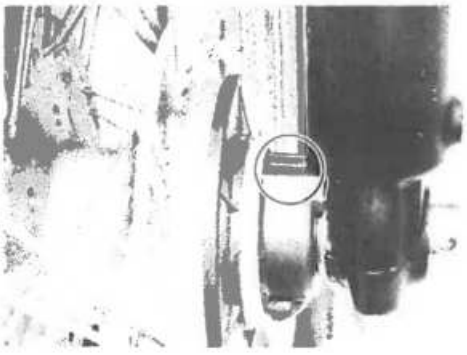
CAUTION:

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

E. Installing The Front Wheel

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

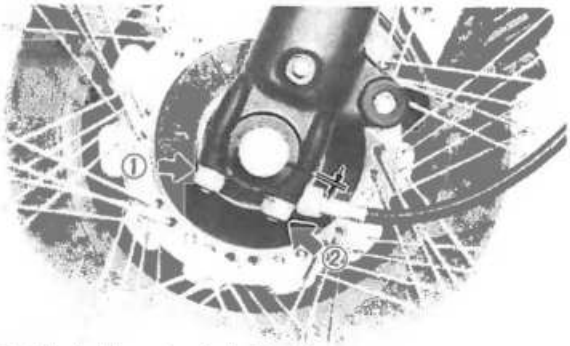
1. Lightly grease the lips of the front-wheel oil seals and the gear teeth of the speedometer drive and driven gears. Use lightweight lithium-soap base grease.
2. Make sure the projecting portion (torque stopper) of the speedometer housing is positioned correctly.



3. Install the speedometer cable.
   Tighten the axle nut and install a new cotter pin.

TIGHTENING TORQUE:
105 Nm (10.7 m·kg, 77.4 ft·lb)

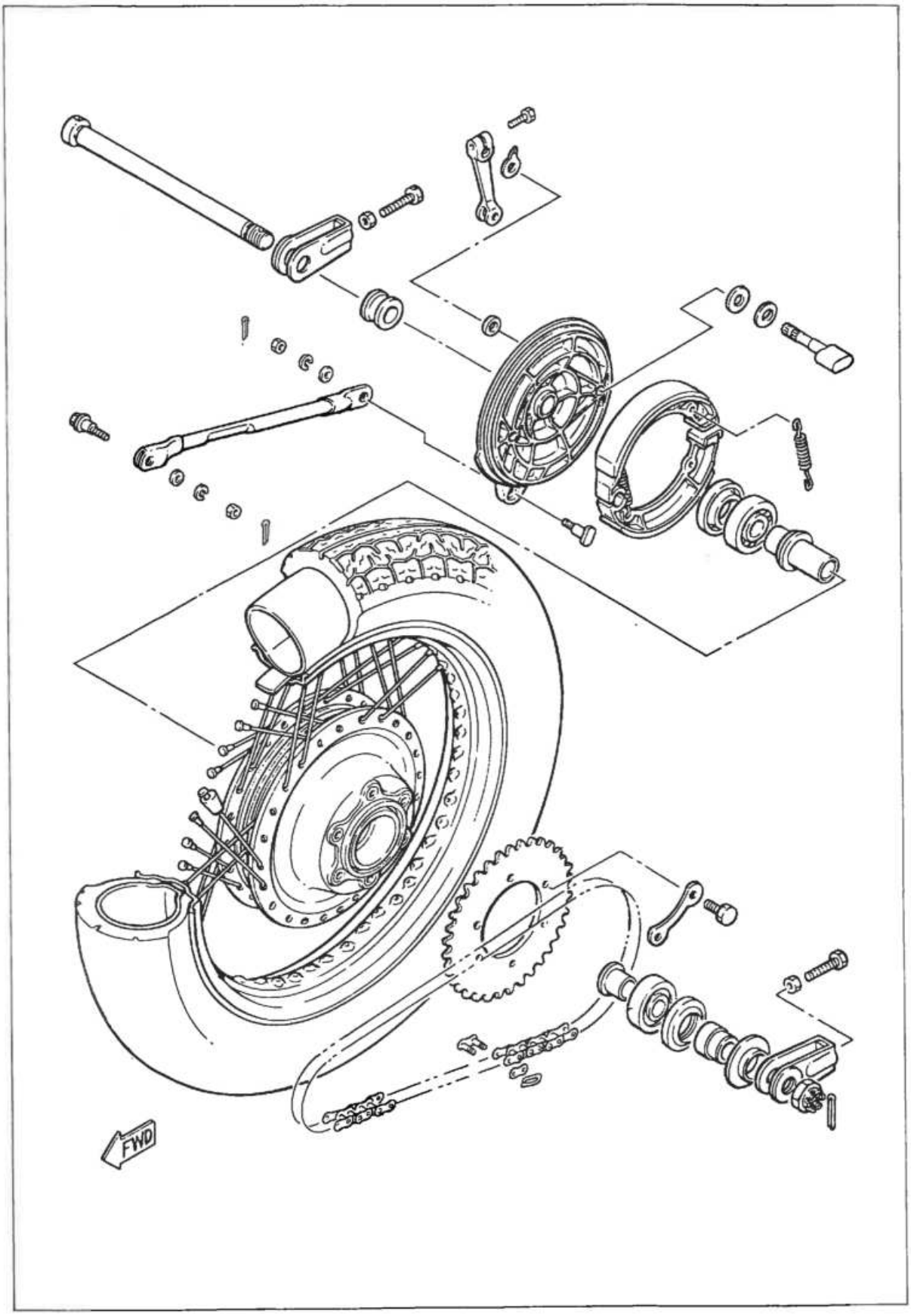
4. Before tightening the pinch bolt, compress the front forks several times to check for proper fork operation.
5. Tighten the axle holder securing nuts.
   Tighten the axle holder securing nuts.
   Tighten first the front side and then the rear side, so the rear side can have clearance.



1. Axle holder nut 2. Axle holder nut

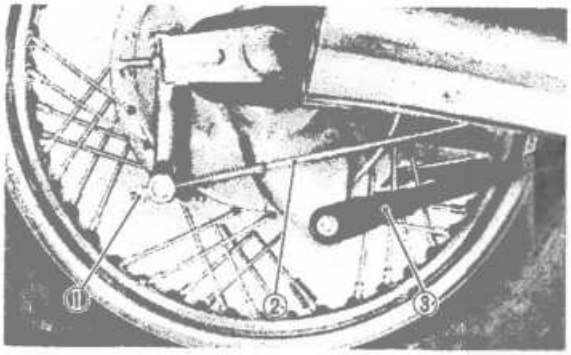
TIGHTENING TORQUE:
19.6 Nm (2.0 m·kg, 14.5 ft·lb)

REAR WHEEL



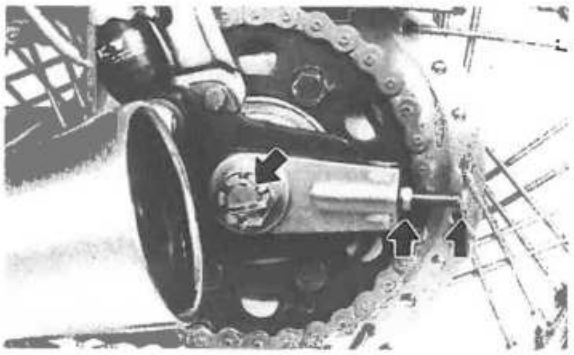
A. Removal

1. Place the motorcycle on the centerstand.
2. Remove the tension bar and the brake rod from the brake shoe plate. The tension bar can be removed by removing the cotter pin and nut from the tension bar bolt. The brake rod can be removed by removing the adjuster.



1. Adjuster 2. Brake rod 3. Tension bar

3. Remove the axle-nut cotter pin and the axle nut. Loosen the lock nuts and the adjust bolts.

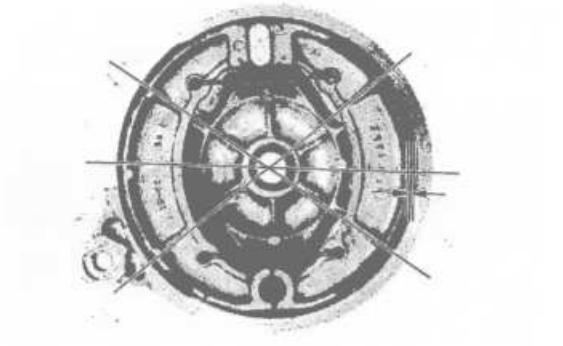


4. Pull out the rear axle.

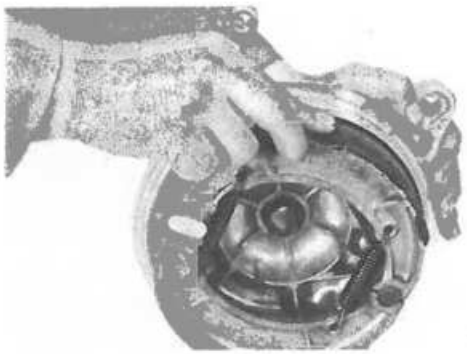
B. Checking Brake Shoe Wear

1. Measure the outside diameter at the brake shoes with slide calipers.

Brake shoe diameter: 180 mm (7.09 in) Replacement limit: 176 mm min. (6.93 in)



2. Remove any glazing from the brake shoes with coarse sandpaper.



C. Brake Drum

Oil or scratches on the inner surface of the brake drum will impair braking performance or result in abnormal noises. Remove oil by wiping the brake drum with a rag soaked in lacquer thinner or solvent. Remove scratches by lightly and evenly polishing the brake drum with emery cloth.

D. Brake Shoe Plate

Remove the camshaft, and grease it. If the cam face is worn, replace the camshaft.

NOTE:

Before removing the cam lever, put alignment marks on the cam lever and camshaft to indicate their relative positions for easy assembly.

E. Rear Axle Inspection

Refer to "Front Axle Inspection" on page 5-1.

F. Replacing The Wheel Bearings

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

G. Rear Wheel Inspection

See "Front Wheel Inspection" on page 5-1.

H. Installing The Rear Wheel

1. Lightly grease the lips of the rear-wheel oil seals.
2. Install the wheel assembly and axle.

NOTE:

Always use a new cotter pin on the axle nut.

TIGHTENING TORQUE:
Axle nut: 147 Nm (15 m·kg, 108.5 ft·lb)

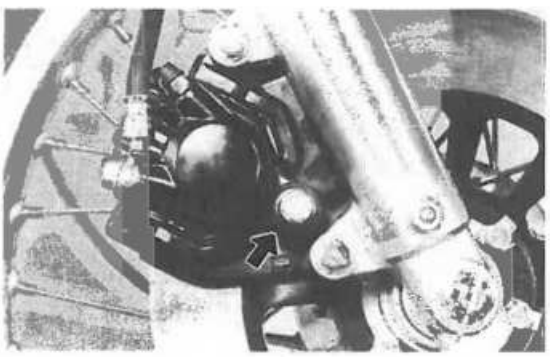
FRONT BRAKE

CAUTION:

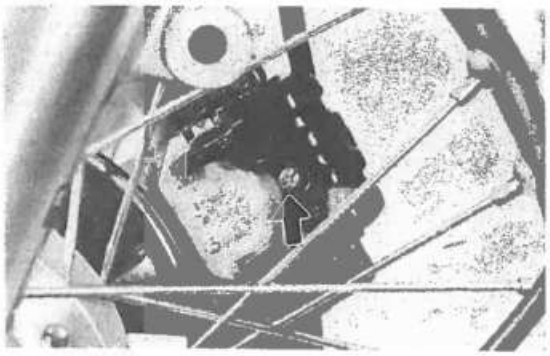
Disc brake components rarely require disassembly. Do not disassemble components unless absolutely necessary. If any hydraulic connection in the system is opened, the entire system should be disassembled, drained, cleaned, and then properly filled and bled upon reassembly. Do not use solvents on brake internal components. Solvents will cause seals to swell and distort. Use only clean brake fluid for cleaning. Use care with brake fluid. Brake fluid can injure your eyes, and it will damage painted surfaces and plastic parts.

A. Brake Pad Replacement

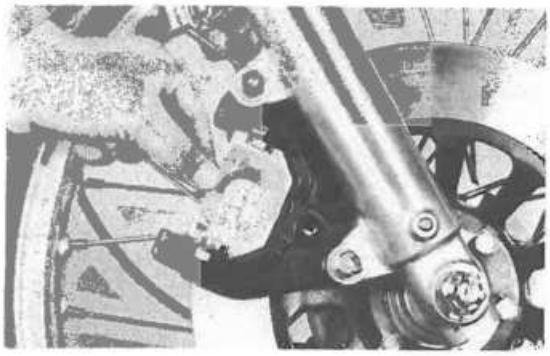
1. Remove the support bolt.



2. Remove the brake pad screw.



3. Remove the caliper from the support bracket.
4. Remove the pads from the support bracket.

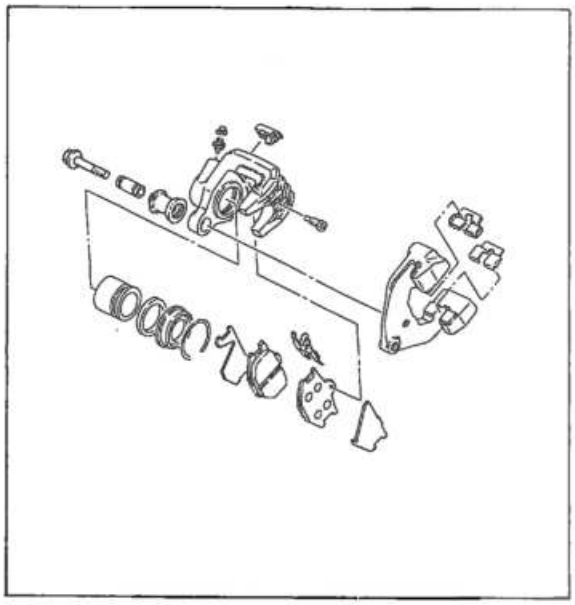


5. Install the new brake pads. Replace the following parts if pad replacement is required.
   - Pads
   - Retainer pad spring

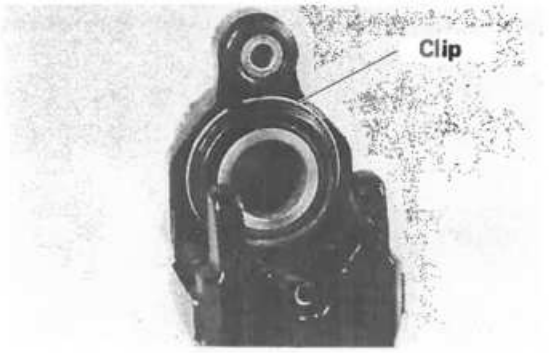
NOTE:

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

B. Caliper Disassembly



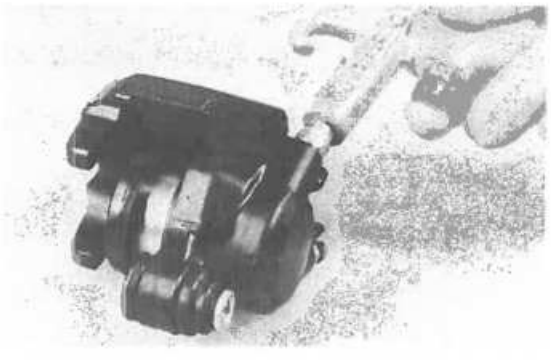
1. Remove the brake hose from the caliper. Allow the caliper assembly to drain into a container.
2. Place the open hose end into the container and pump the old fluid out of te master cylinder.
3. Remove the retaining and the dust seal.



4. Carefully force the piston out of the caliper cylinder with compressed air. Never try to pry out the piston.

WARNING:

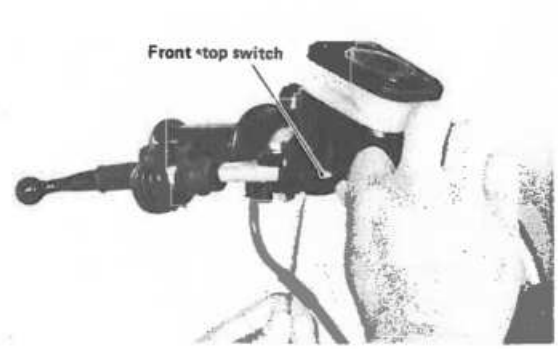
Cover the piston with a rag. Use care so that the piston does not cause injury as it is expelled from the cylinder.



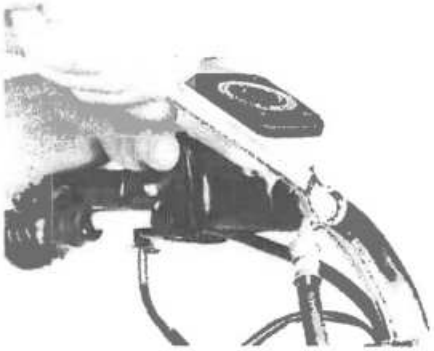
7. Remove the piston seal.

C. Master Cylinder Disassembly

1. Remove the brake light switch.



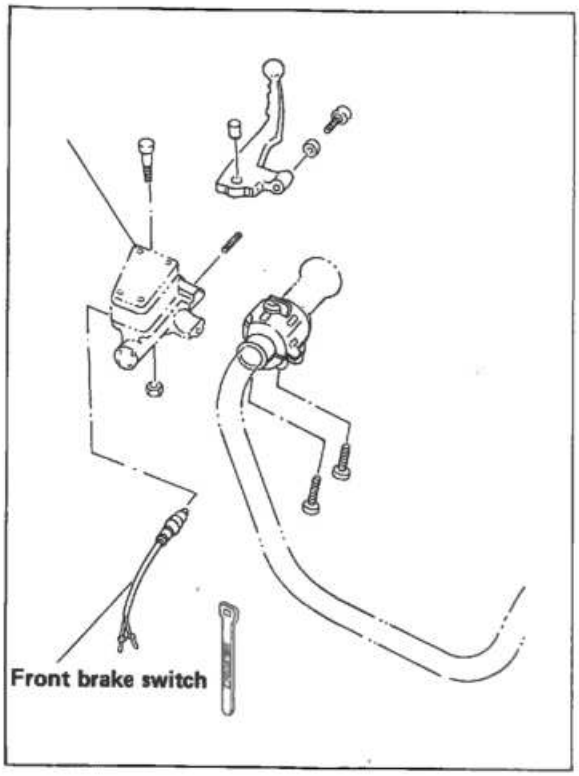
2. Remove the brake hose.



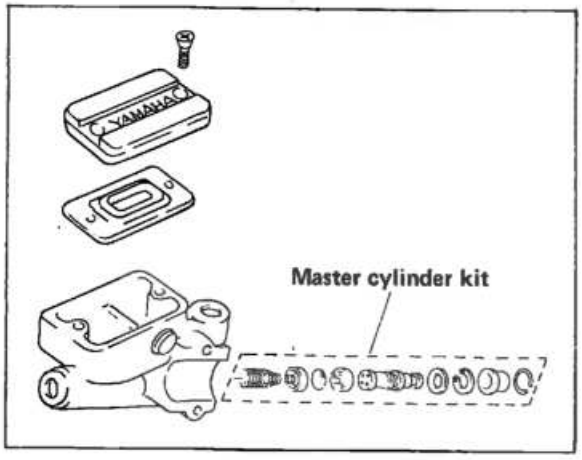
3. Remove the brake lever and spring.

NOTE:

Never lose the spring.



4. Remove the master cylinder from the handlebar. Remove the cap, and drain the remaining fluid.
5. Remove the master cylinder dust boot.
6. Remove the snap ring.

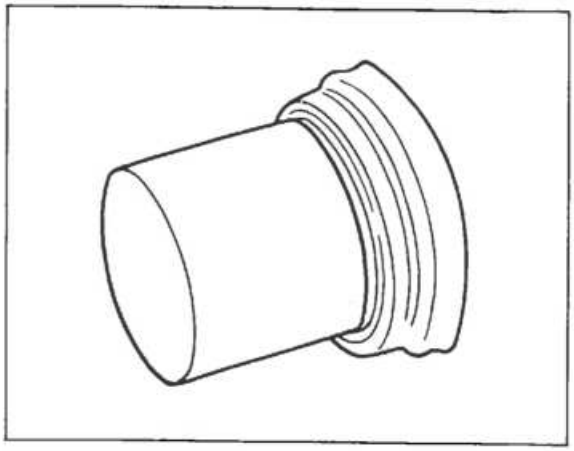


7. Remove the master-cylinder-cup assembly. Note that the cylinder cups are installed with the larger diameter (lips) inserted first.

D. Brake Inspection And Repair

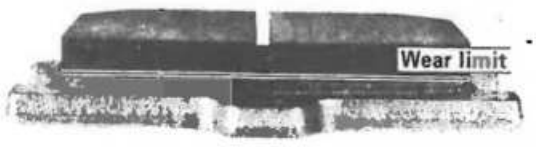
Recommended Brake Component Replacement Schedule:
- Brake pads: As required
- Piston seal, dust seal: Every two years
- Brake hoses: Every four years
- Brake fluid: Replace only when brakes are disassembled

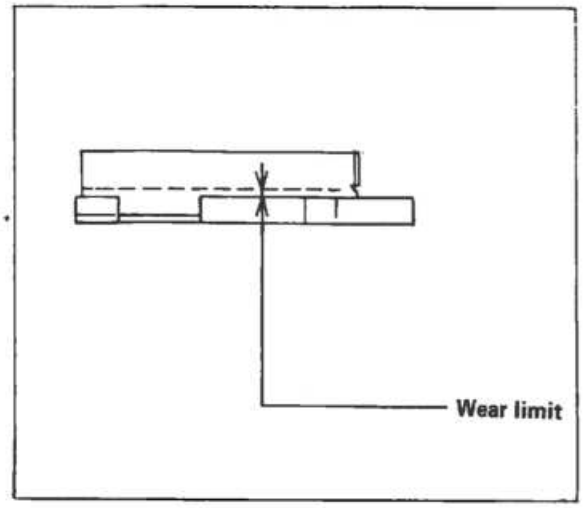
1. Replace the caliper piston if it is scratched.



2. Replace any brake pad that is worn beyond limits. Always replace the brake pads as a set.
   See "Brake Pad Replacement" for a listing of the parts to be replaced when pads are replaced.

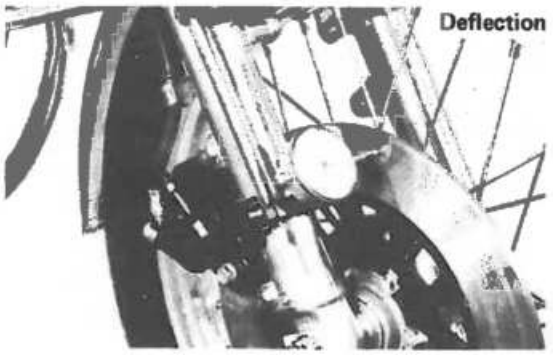
Wear limit: **1.0mm (0.04 in)**

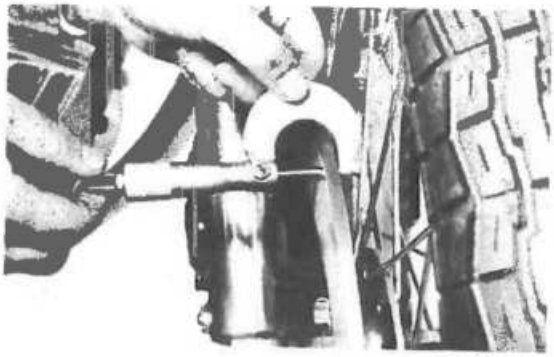




3. Replace the piston and dust seals if damaged. Replace the seals every two years.
4. Inspect the master cylinder body; replace if scratched. Clean all the passages with new brake fluid.
5. Inspect the brake hoses. Replace the hoses every four years or immediately if cracked, frayed, or damaged.
6. Check for wear and deflection of the disc. If the disc is worn beyond minimum thickness or if deflection exceeds the specified amount, replace the disc.

Maximum deflection: 0.5 mm (0.020 in) Minimum disc thickness: 6.5 mm (0.26 in)





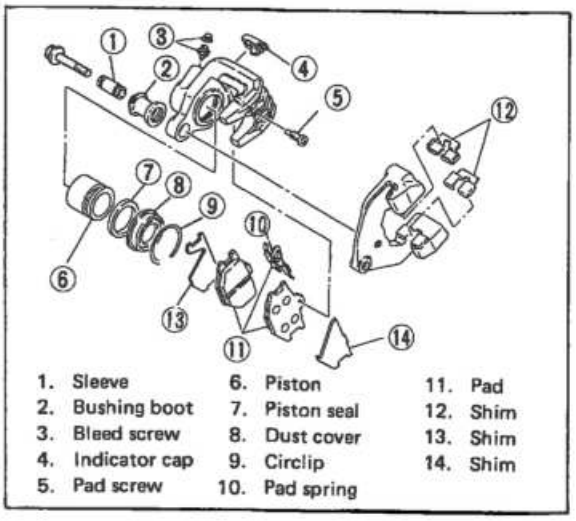
Thickness

E. Brake Assembly

Caliper

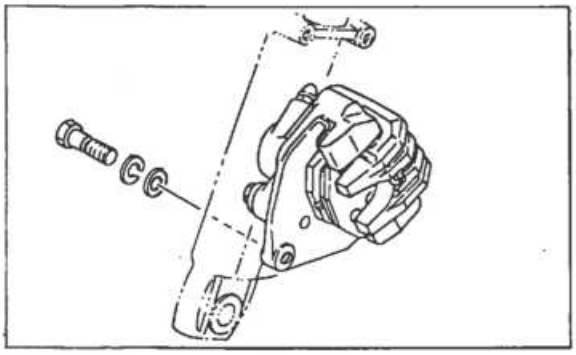
All internal parts should be cleaned in new brake fluid only. Internal parts should be lubricated with brake fluid when installed. Replace the following parts whenever a caliper is disassembled:

- Bleed screw and rubber cap
- Caliper boot
- Piston seal
- Dust seal
- Retaining ring



1. Install the piston seal and the piston.
2. Install the pads.
3. Install the caliper assembly on the front fork. Apply Loctite® Stud N' Bearing Mount to the threads of the pivot bolt, and torque the bolt to specification.

TIGHTENING TORQUE: 25.6 Nm (2.6 m·kg, 18.8 ft·lb)



4. Attach the brake hoses.

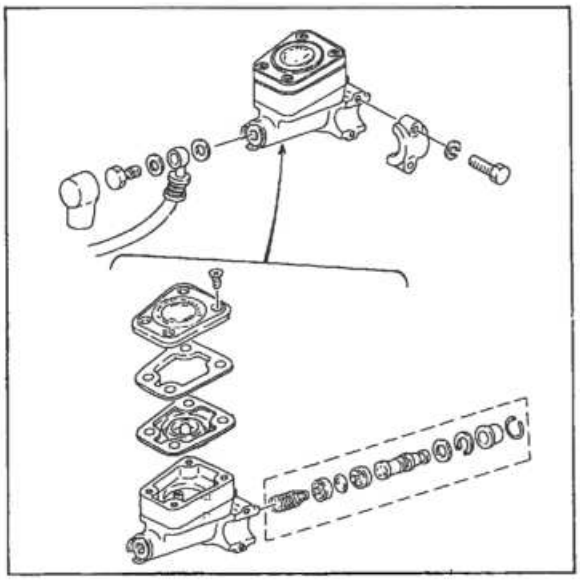
TIGHTENING TORQUE:
25.5 Nm (2.6 m·kg, 18.8 ft·lb,

5. If the brake disc has been removed from the hub or is loose, tighten the bolts. Use new lock plates, and bend the lock tabs against a bolt flat after the bolts are torqued to specification.

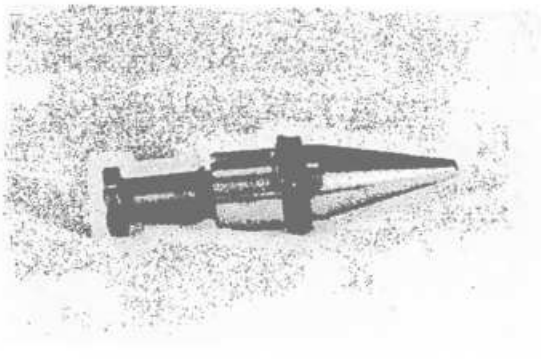
TIGHTENING TORQUE:
19.6 Nm (2.0 m·kg, 14.5 ft·lb)

6. Reassemble the master cylinder as shown in the illustration.

TIGHTENING TORQUE:
(all brake union bolts)
25.5 Nm (2.6 m·kg, 18.8 ft·lb)



Use the special tool, when installing the new cylinder seal into the piston.

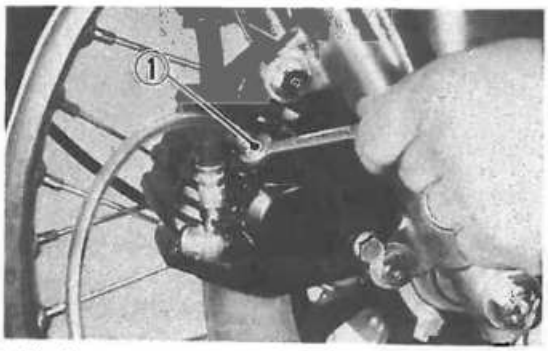


Bleeding the brakes

WARNING:

If the brake system is disassembled or if any brake hose has been loosened or removed, the brake system must be bled to remove air from the brake fluid. If the brake fluid level is very low or brake operation is incorrect, bleed the brake system. Failure to bleed the brake system properly can result in a dangerous loss of braking performance.

1. Add proper brake fluid to the reservoir. Install the diaphragm, being careful not to spill or overflow the reservoir.
2. Connect a clear plastic tube, 4.5 mm (3/16 in) inside diameter, tightly to the caliper bleed screw. Put the other end of the tube into a container.



1. Bleed screw

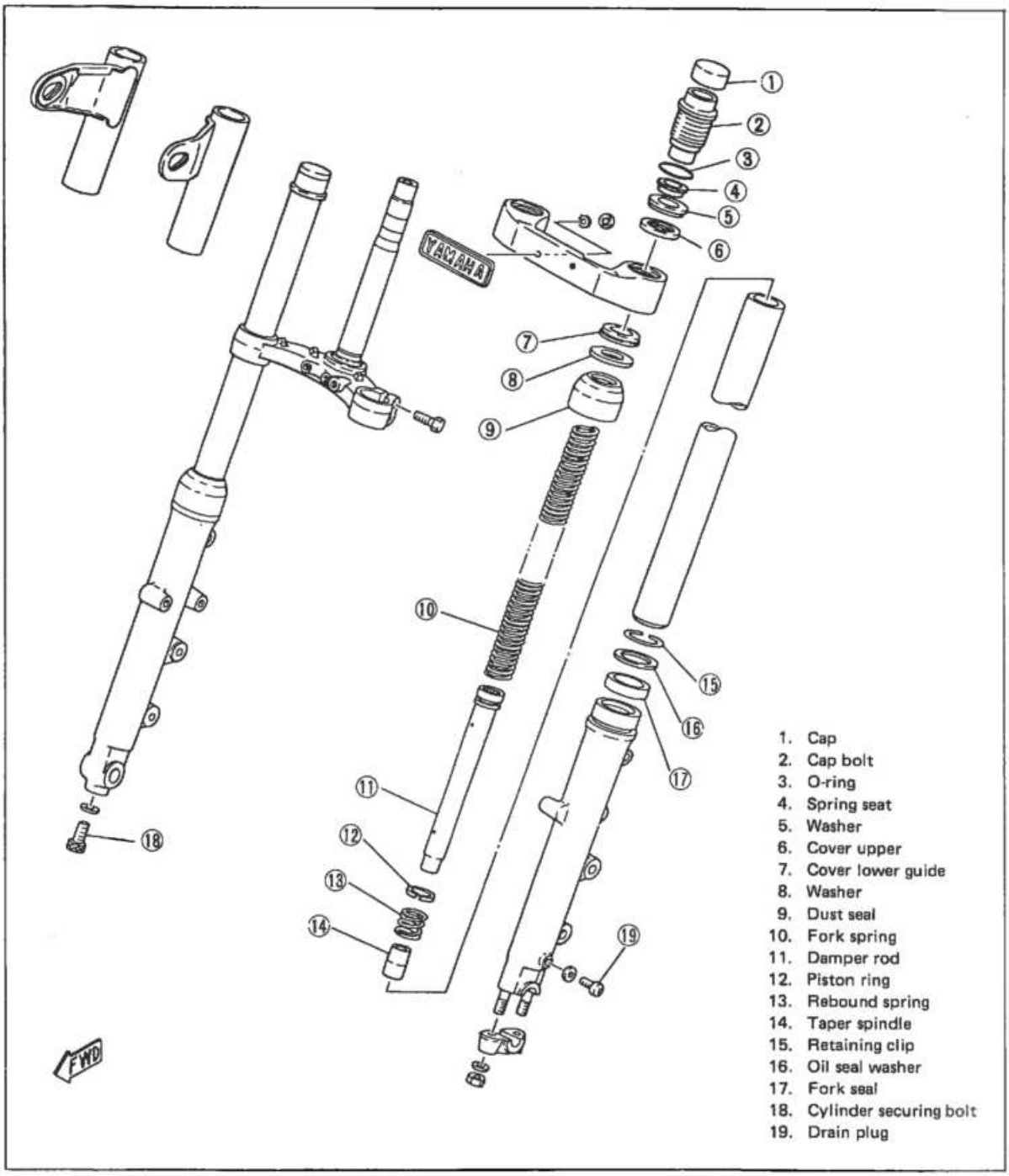
3. Slowly apply the brake lever several times. Pull in the lever. Hold the lever in this "on" position. Loosen the bleed screw. Allow the lever to travel slowly toward its limit. When the limit is reached, tighten the bleed screw. Then release the lever.
4. Repeat the above procedure while adding brake fluid to the reservoir until

all air bubbles are removed from the system.

NOTE:

If bleeding is difficult, it may be necessary to let the brake fluid system stabilize for a few hours. Repeat the bleeding procedure when the tiny bubbles in the system have settled out.

FRONT FORK



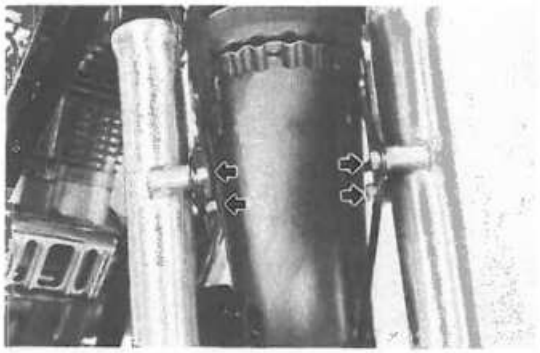
1. Cap
2. Cap bolt
3. O-ring
4. Spring seat
5. Washer
6. Cover upper
7. Cover lower guide
8. Washer
9. Dust seal
10. Fork spring
11. Damper rod
12. Piston ring
13. Rebound spring
14. Taper spindle
15. Retaining clip
16. Oil seal washer
17. Fork seal
18. Cylinder securing bolt
19. Drain plug

A. Removal And Disassembly

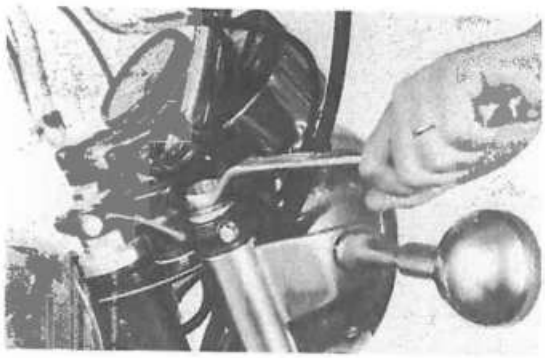
WARNING:

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

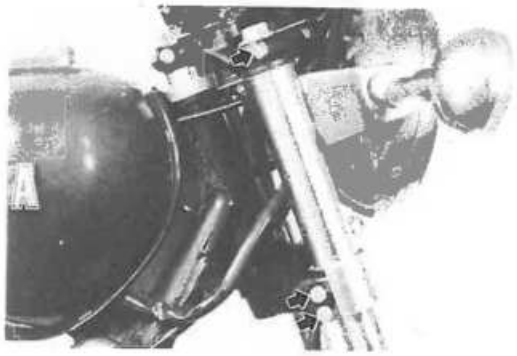
1. Disconnect the speedometer cable. Remove the front wheel. Remove the front fender.



2. Remove the wire holder from the front fender.
3. Loosen the caliper securing bolts (2) and remove the caliper assembly.



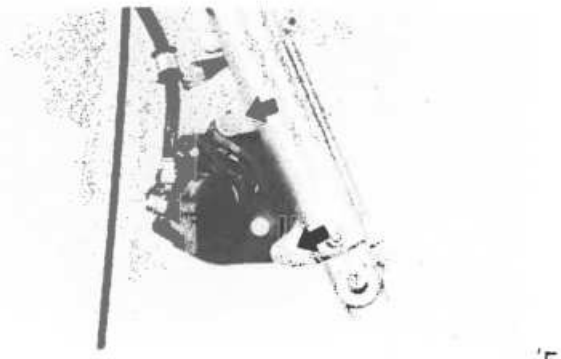
4. Remove the rubber caps and loosen the cap bolts.



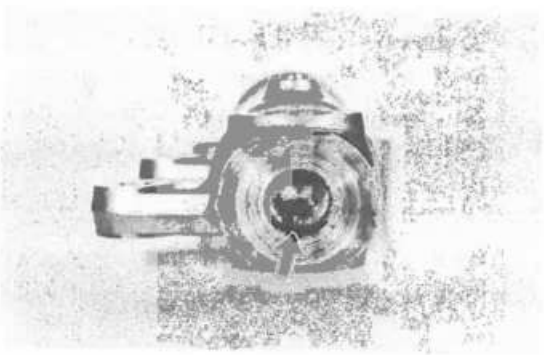
5. Loosen the pinch bolts on the upper and lower brackets and pull down the forks.



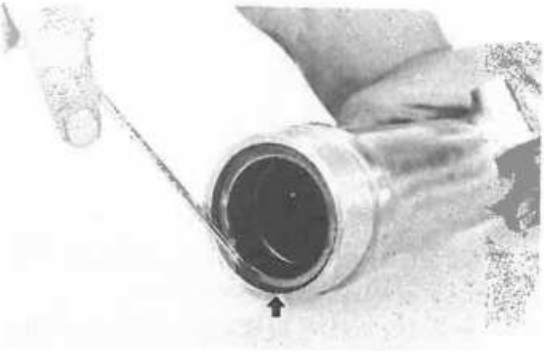
6. Remove the cap bolts and drain fork oil.

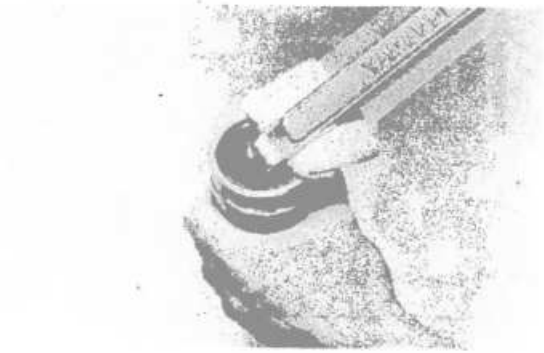


7. Remove the cylinder securing bolt from the bottom of the fork assembly. Hold the inner tube with the front-fork-cylinder holder. Pull the inner fork tube from the outer fork tube.



8. Remove the dust seal and the retaining clip from the outer fork tube, and pry out the fork seal. Be careful not to damage the fork tube surface.





B. Inspection

1. Examine the inner fork tube. If the tube is severely scratched or bent, it should be replaced.

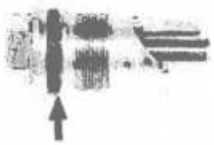
WARNING:

Do not attempt to straighten a bent fork tube; this may dangerously weaken the tube.

2. Inspect the outer surface of the fork seal seat in the outer fork tube. If this surface is damaged, replace the outer fork tube. If it is not damaged, replace the fork seal.
3. Check the outer fork tubes for dents. Replace the tube if it is dented.
4. Check the free length of the springs.

Fork spring free length:
610 mm (24.0 in)

5. Check the o-ring on the cap bolt. If it's damaged, replace it.



C. Assembly

1. Make sure all components are clean before assembly. Always install a new fork seal. Do not reuse a seal.
2. Apply oil to the fork seal, and install the fork seal by pressing it in with a large socket. Install the retaining clip.
3. Install the inner fork tube into the outer fork tube.
4. Apply Loctite Stud N' Bearing Mount (red) to the cylinder securing bolt, and install the bolt and a copper washer into the outer fork tube. Torque the bolt to specification.

TIGHTENING TORQUE:
19.6 Nm (2.0 m·kg, 44.5 ft·lb)

5. Fill fork oil and put the fork springs into the fork tubes. Install the cap bolts.

Recommended oil:
Yamaha Fork Oil 10 wt or Equivalent
Oil capacity: 164 ~ 172 cm^3
(5.78 ~ 6.07 Imp oz,
5.54 ~ 5.82 US oz)

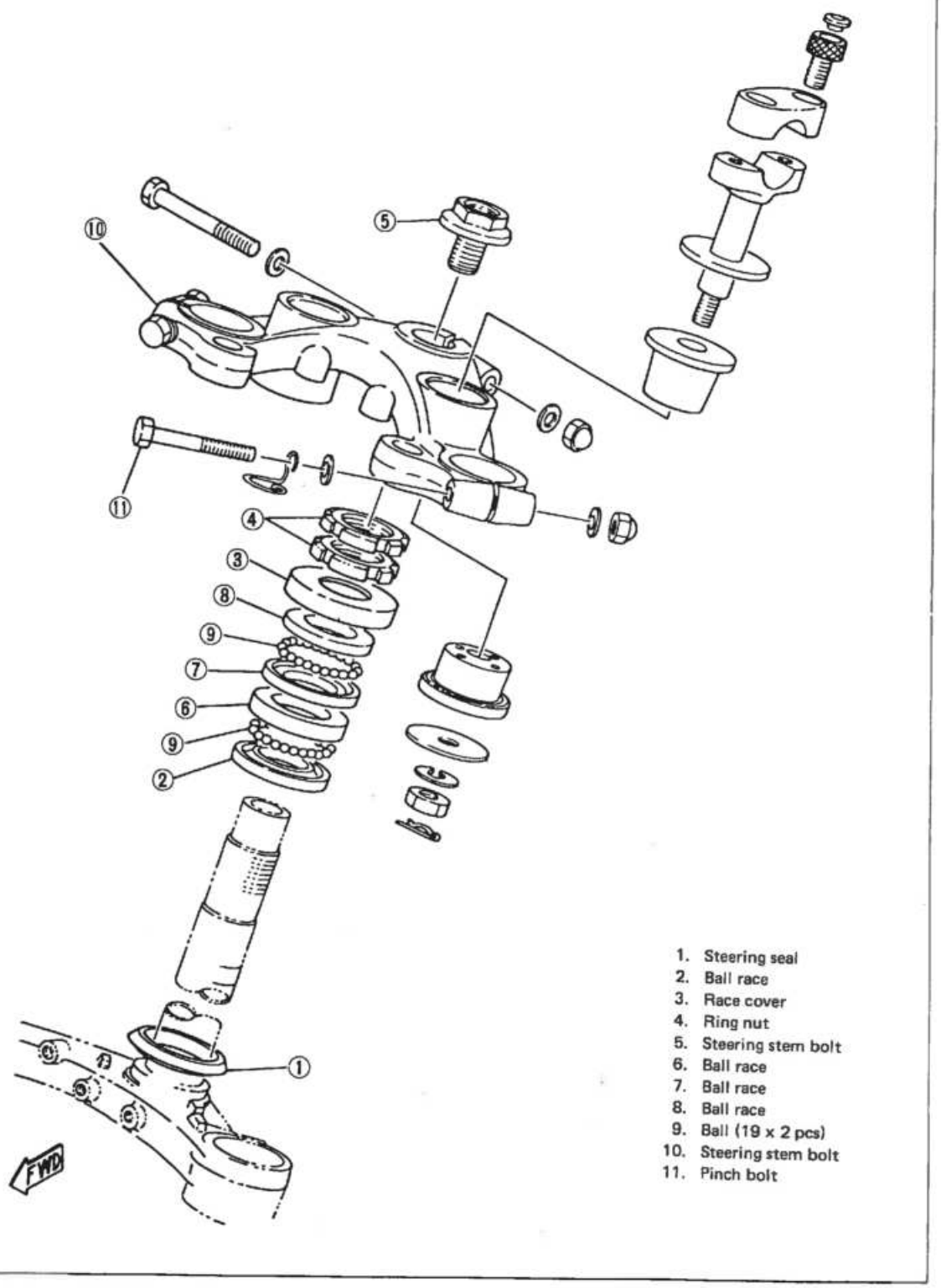
6. Install the fork assembly and tighten the upper and lower pinch bolts.

TIGHTENING TORQUE:
Upper 9.81 Nm (1.0 m·kg, 7.23 ft·lb)
Lower 19.6 Nm (2.0 m·kg, 14.5 ft·lb)

7. Tighten the fork cap bolts.

TIGHTENING TORQUE:
19.6 Nm (2.0 m·kg, 44.5 ft·lb)

STEERING HEAD



A. Adjustment

Refer to "D. Assembly" for steering head adjustment procedures.

B. Removal

1. Remove the seat, fuel tank, and the upper bracket cover.

2. Remove the headlight lens unit, and disconnect all wiring connectors in the headlight shell.
3. Remove the two meter-bracket holding bolts and the headlight vertical-adjustment screw. Remove the meter bracket with the headlight shell.
4. Remove the handlebars.
5. Disconnect the horn lead wire.
6. Remove the front fork assembly.
7. Remove the stem bolt, loosen the pinch bolt, and remove the steering crown.
8. Remove the top ring nut.
9. Support the steering stem, and remove the lower ring nut.
10. Remove the top bearing race and all of the balls from the upper bearing.

Ball quantity (upper and lower): 38 pcs.

C. Inspection

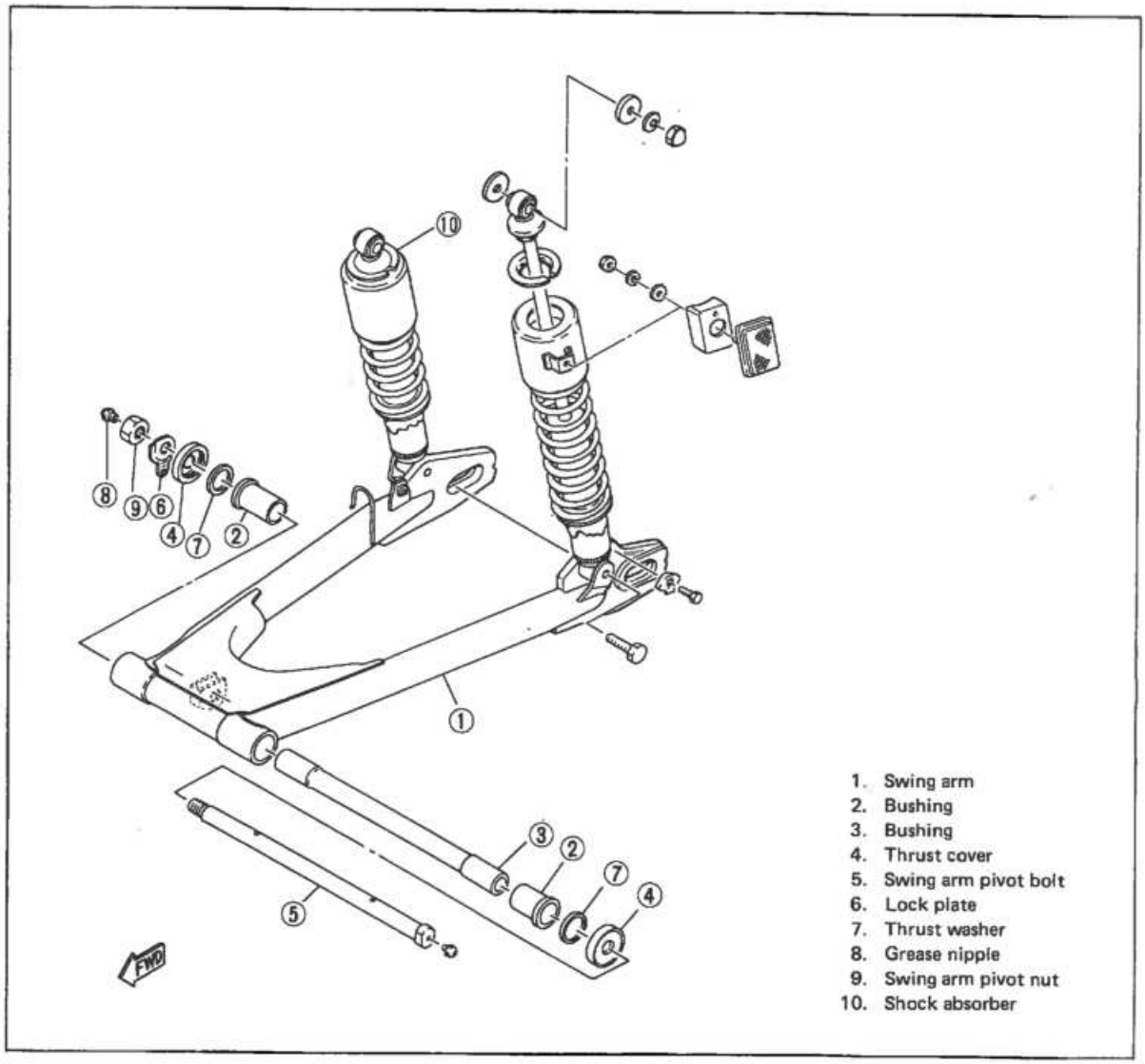
1. Wash the bearings in solvent.
2. Inspect the bearings for pitting or other damage. Replace the bearings if pitted or damaged. Replace the races when the balls are replaced.
3. Clean and inspect the bearing races. Spin the bearings by hand. If the bearings are not smooth in their operation, replace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

D. Assembly

1. Grease the bearings and races with wheel bearing grease.
2. Install the steering stem, balls, and races.
3. Install the lower ring nut. Tighten it to approximately 24.5 Nm (2.5 m·kg, 18 ft·lb) and loosen it approximately 1/4 turn.
4. While holding the lower ring nut with the ring nut wrench, tighten the top ring nut securely.
5. Continue assembly; reverse the disassembly procedure.
6. When assembly is complete, check the steering stem by turning it from lock to lock. If there is any binding or looseness, readjust the tightness of the steering stem.

TIGHTENING TORQUE:
Pinch bolt:
9.81 Nm (1.0 m·kg, 7.23 ft·lb)
Steering stem bolt:
53 Nm (5.4 m·kg, 39.1 ft·lb)

SWING ARM



A. Free Play Inspection

1. Remove the rear wheel and the shock absorber. Grasp the swingarm and try to move it from side to side as shown. There should be no noticeable side play.
2. The swingarm is mounted on bushes. Move the swingarm up and down as shown. The swingarm should move smoothly, without tightness, binding, or rough spots that could indicate damaged bushes.
3. If there is a noticeable side play, change the bushes.
4. If the swingarm does not move smoothly, check the bushing for its movement. When the bushing moves freely, change to thinner thrust washers.

CABLES AND FITTINGS

A. Cable Maintenance

NOTE:

See "Maintenance and Lubrication" intervals charts. Cable maintenance is primarily concerned with preventing deterioration and providing proper lubrication to allow the cable to move freely within its housing. Cable removal is straightforward and uncomplicated. Removal is not discussed within this section.

WARNING:

Cable routing is very important. For details of cable routing, see the cable routing diagrams at the end of this manual. Improperly routed or adjusted cables may make the motorcycle unsafe for operation.

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

NOTE:

Choice of a lubricant depends upon conditions and preferences. However, a semidrying chain and cable lubricant will perform adequately under most conditions.

B. Throttle Maintenance

1. Remove the phillips head screws from the throttle housing assembly and separate the two halves of housing.
2. Disconnect the cable end from the throttle grip assembly, and remove the grip assembly.
3. Wash all parts in a mild solvent, and check all contact surfaces for burrs or other damage. (Also clean and inspect the right-hand end of the handlebar.)
4. Lubricate all contact surfaces with a light coat of lithium-soap base grease and reassemble.

NOTE:

Tighten the housing screws evenly to maintain an even gap between the two halves.

5. Check for smooth throttle operation and quick spring return. Make certain that the housing does not rotate on the handlebar.

CHAPTER 6. ELECTRICAL

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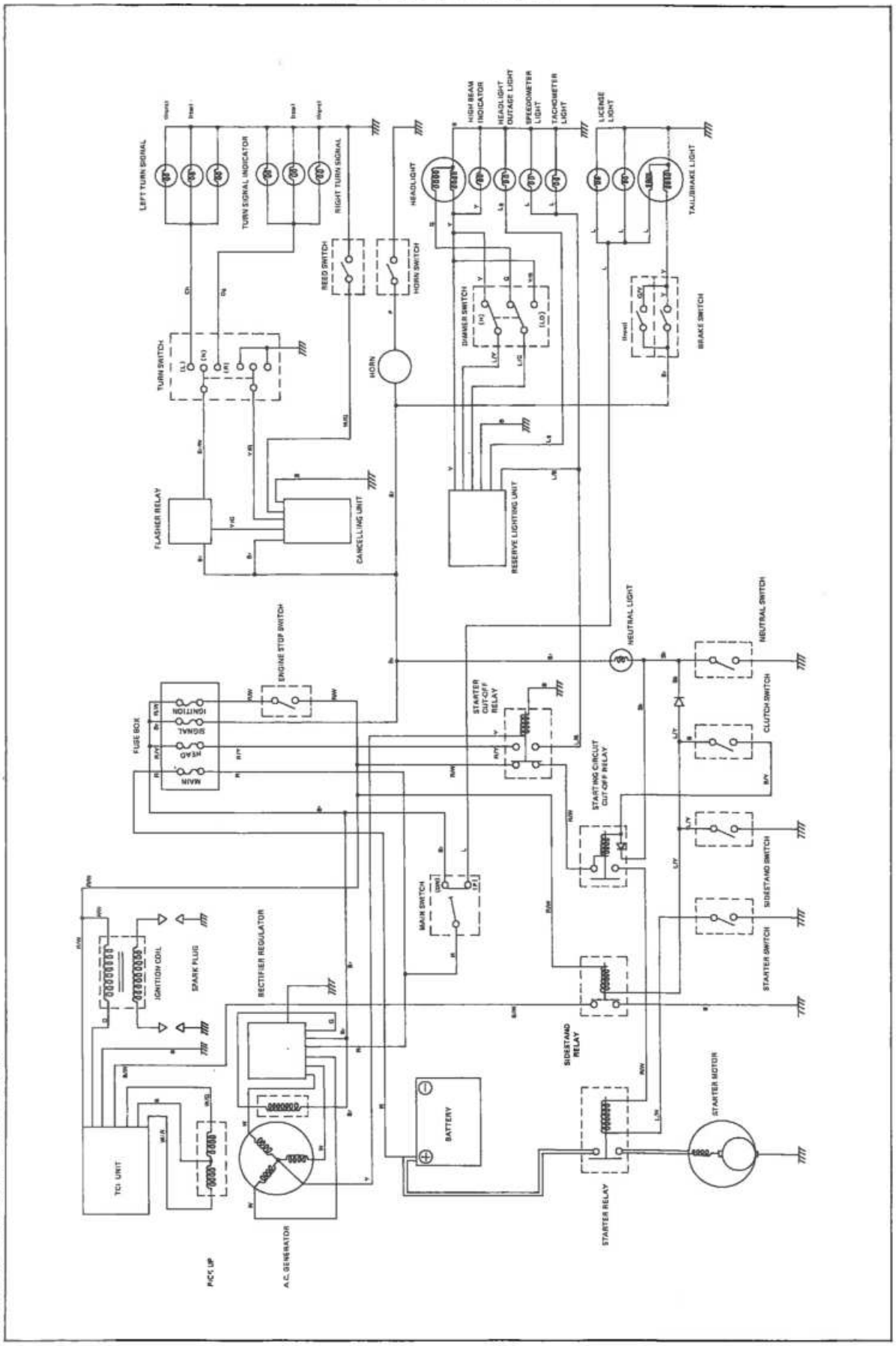
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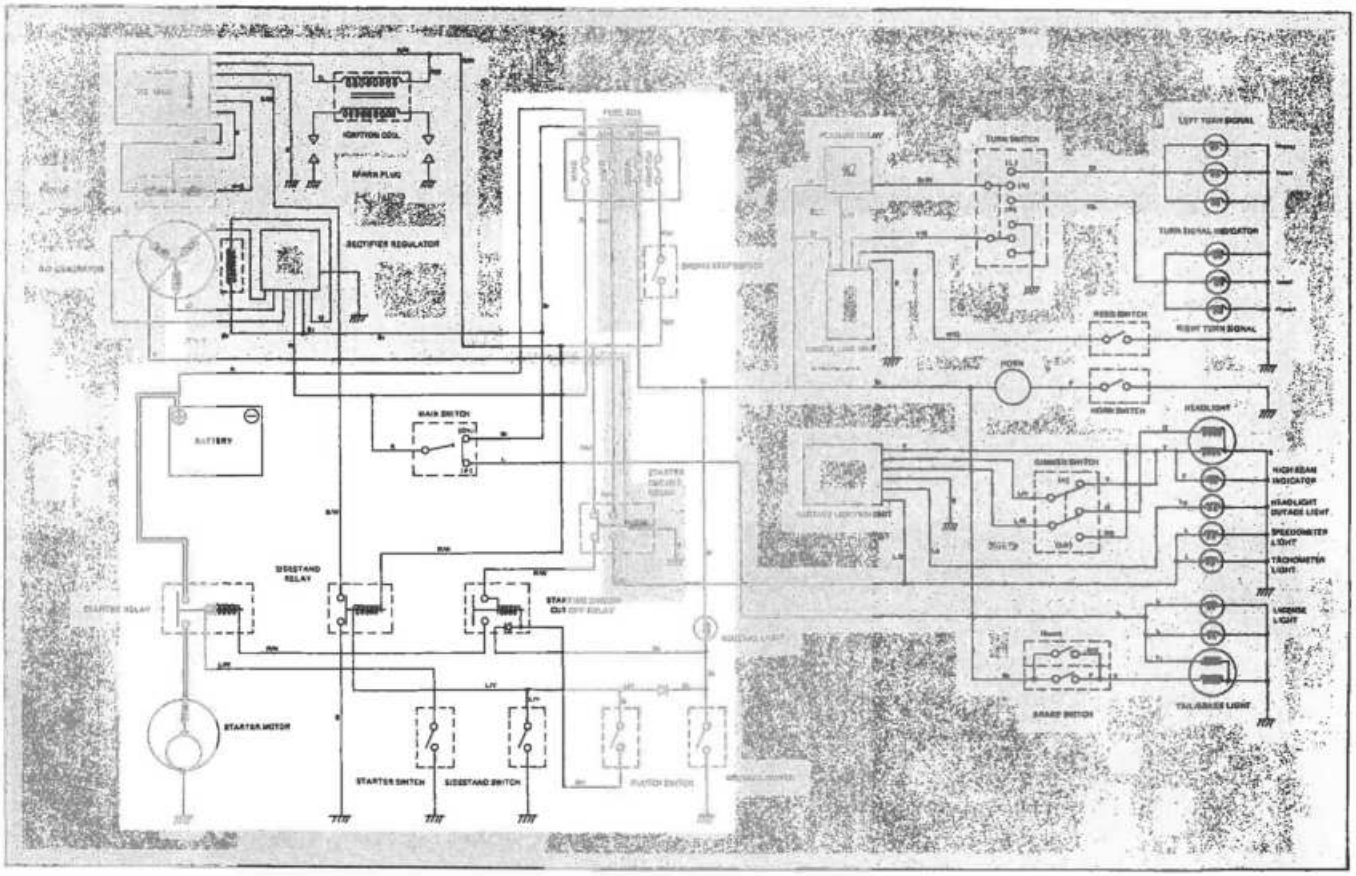
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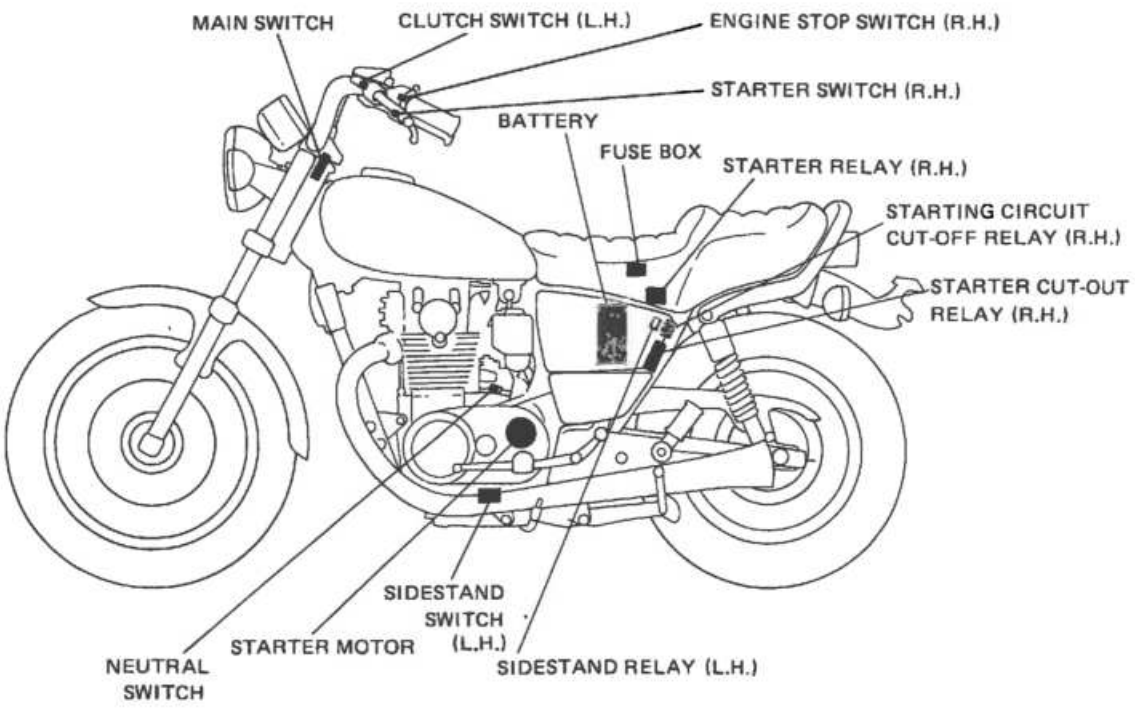
XS650SJ WIRING DIAGRAM



ELECTRIC STARTING SYSTEM



ELECTRIC STARTER SYSTEM



STARTING CIRCUIT OPERATION

The starting circuit on this model consists of the starter motor, starter relay, starter cut-out 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:

a. The transmission is in neutral (the neutral switch is on).

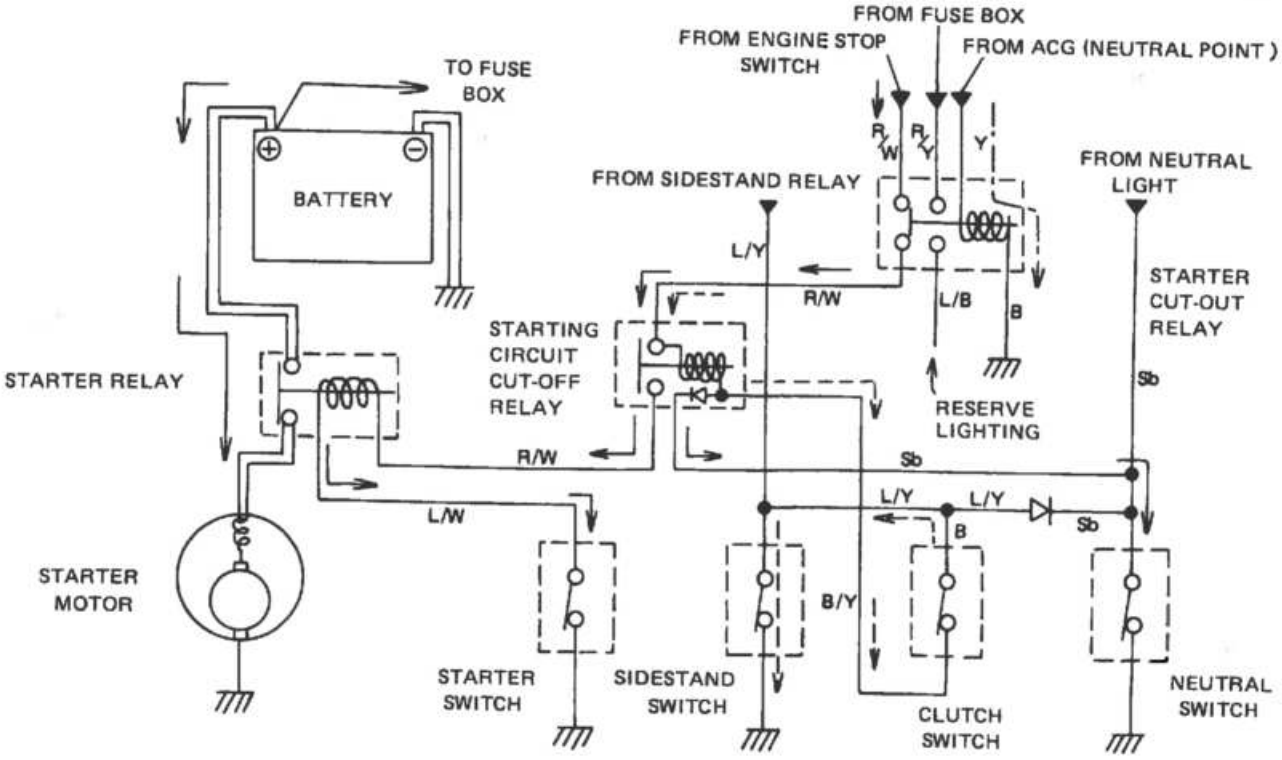
or if

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

The starting-circuit cut-off relay prevents the starter from operating when neither of these conditions has been met. In this instance, the starting-circuit cut-off relay is off so current cannot reach the starter motor.

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.

This starting system also has a starter cut-out relay which protects the starter motor during engine operation. After the engine has started, the tachometer control unit sends current to the starter cut-out relay. The relay switches off, interrupts the current flow to the starter motor, and the starter ceases to operate.

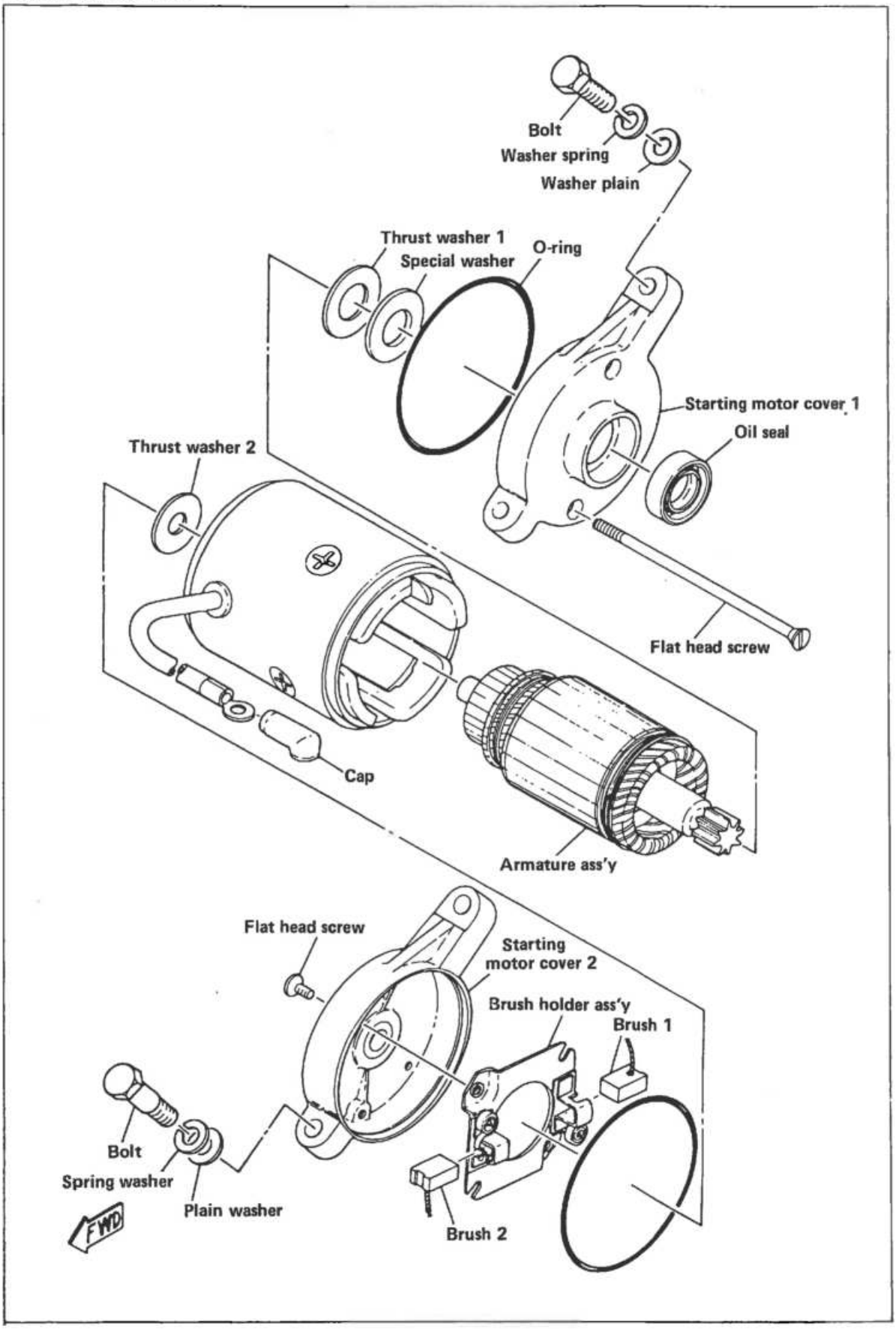


← WHEN THE TRANSMISSION IS IN NEUTRAL.

←- - - WHEN THE CLUTCH LEVER IS PULLED TO THE HANDLEBAR AND THE SIDESTAND IS UP.

←—— WHEN THE ENGINE IS RUNNING.

STARTER MOTOR



A. Removal

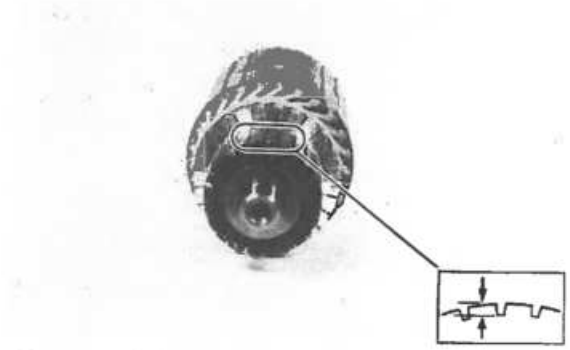
1. See Chapter 3. "ENGINE DISASSEMBLY."

B. Inspection And Repair

1. Check the outer surface of the commutator. If its surface is dirty, clean it with # 600 grit sandpaper.
2. The mica insulation between the commutator segments should be 0.4~ 0.8 mm (0.02 ~ 0.03 in) below the segment level. If not, scrape the mica to proper limits with an appropriately shaped tool. (A hacksaw blade can be ground to fit.)

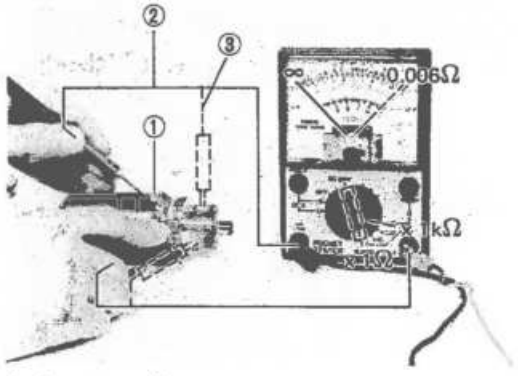
NOTE:

The mica insulation of the commutator must be under-cut to ensure proper operation of commutator.

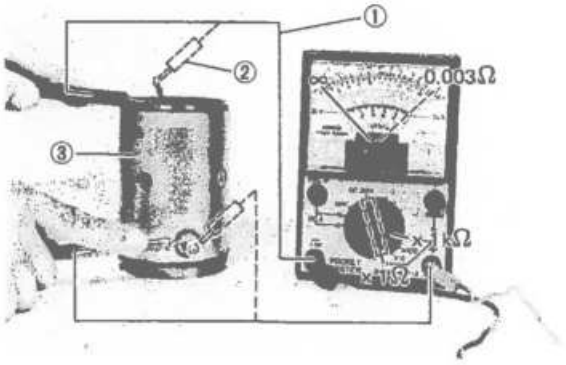


3. The field and armature coils should be checked for insulation breakdown (shorting to each other or to ground) and for continuity. Use a pocket tester.

Coil resistance:
Armature coil: 0.006Ω at 20°C (68°F)
Field coil: 0.003Ω at 20°C (68°F)

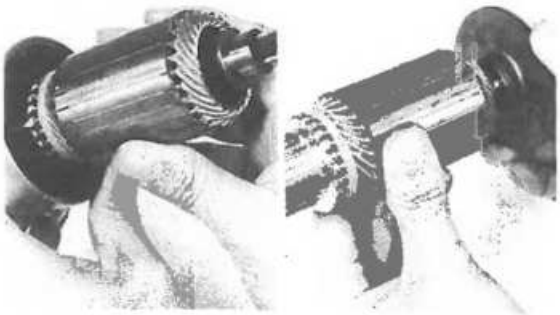


1. Armature coil
2. Insulation check
3. Continuity check



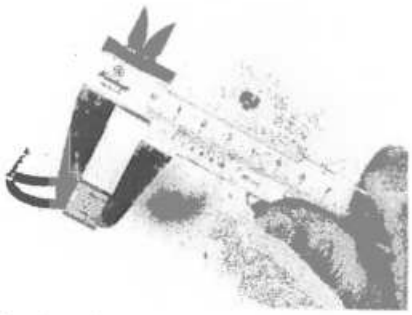
1. Insulation check
2. Continuity check
3. Field coil

4. Check the front and rear cover bearings for damage. If either is damaged, the starter motor must be replaced.



5. Check the brush length. Replace the brush if it's at or near its limits.

Minimum brush length: 4.0 mm (0.157 in)

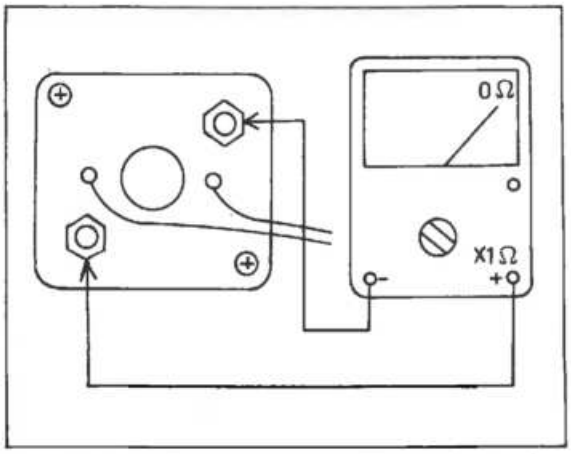


6. Check the brush spring pressure. Compare it with a new spring. Replace the old spring if it is weak.

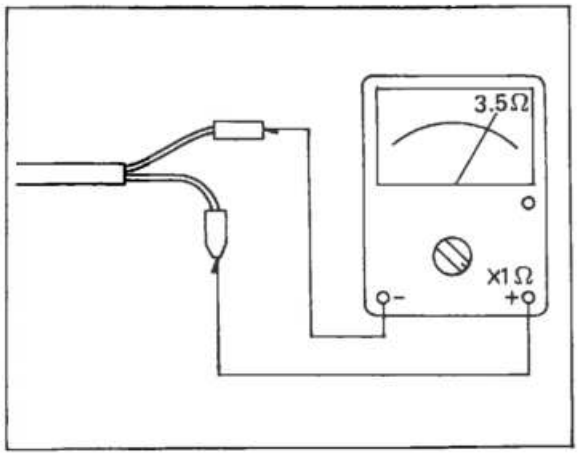
STARTER RELAY

A. Inspection

1. Disconnect the starter cable at the relay.
2. Connect the pocket tester leads to the relay terminals (ohms x 1 scale).
3. Turn the ignition to the "ON" position, the engine stop switch to "RUN", and the shift lever to "NEUTRAL'."
4. Push the starter button. The starter relay should click once, and the scale on the tester should read zero. If it does not read zero, the relay must be replaced.



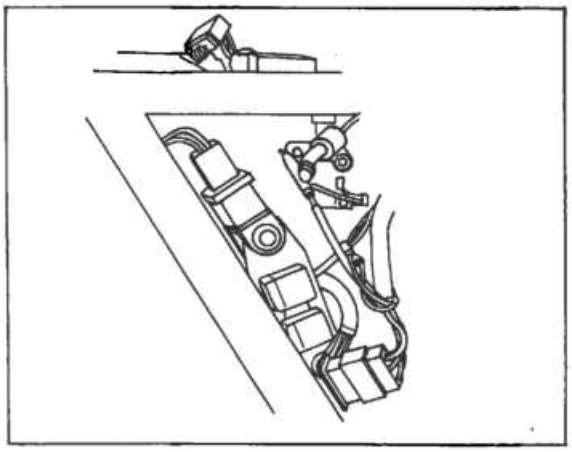
5. If the relay does not click, check the wires from the starter button and from the battery (red/white, blue/white). Turn the ignition off. Use the scale (ohms x 1) on the tester. The resistance between these wires should be no more than 3.5 ohms. If there is more resistance, the relay should be replaced.



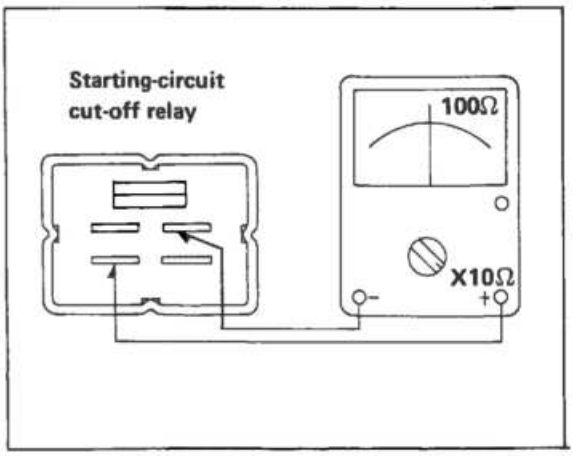
STARTING-CIRCUIT CUT-OFF RELAY

A. Inspection

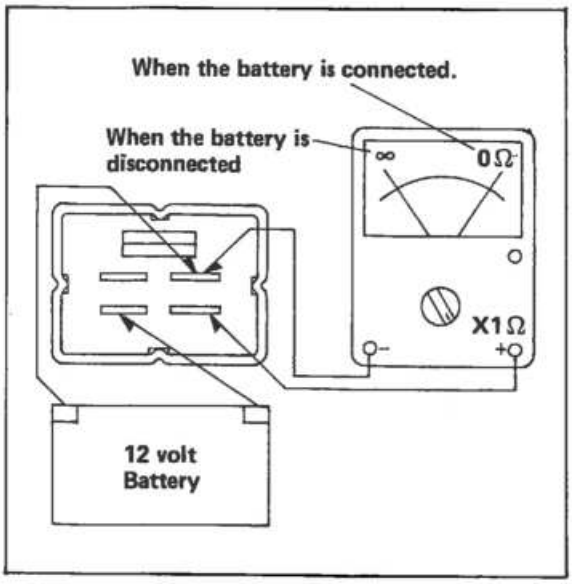
1. Remove the starting-circuit cut-off relay from the rear fender bracket, and disconnect the connector.



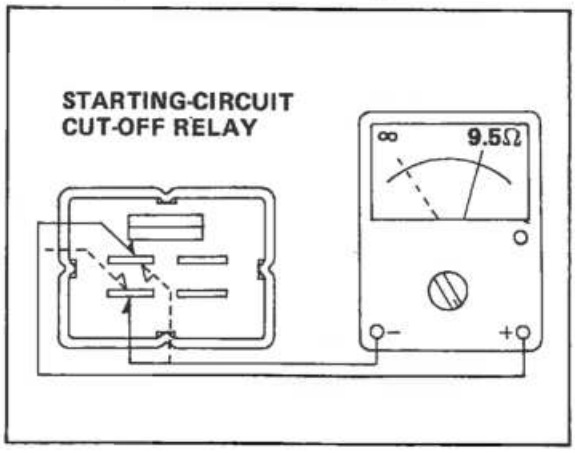
2. Check the resistance of the relay coil windings with the pocket tester. If the resistance is not within specification, replace the relay.



3. 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.



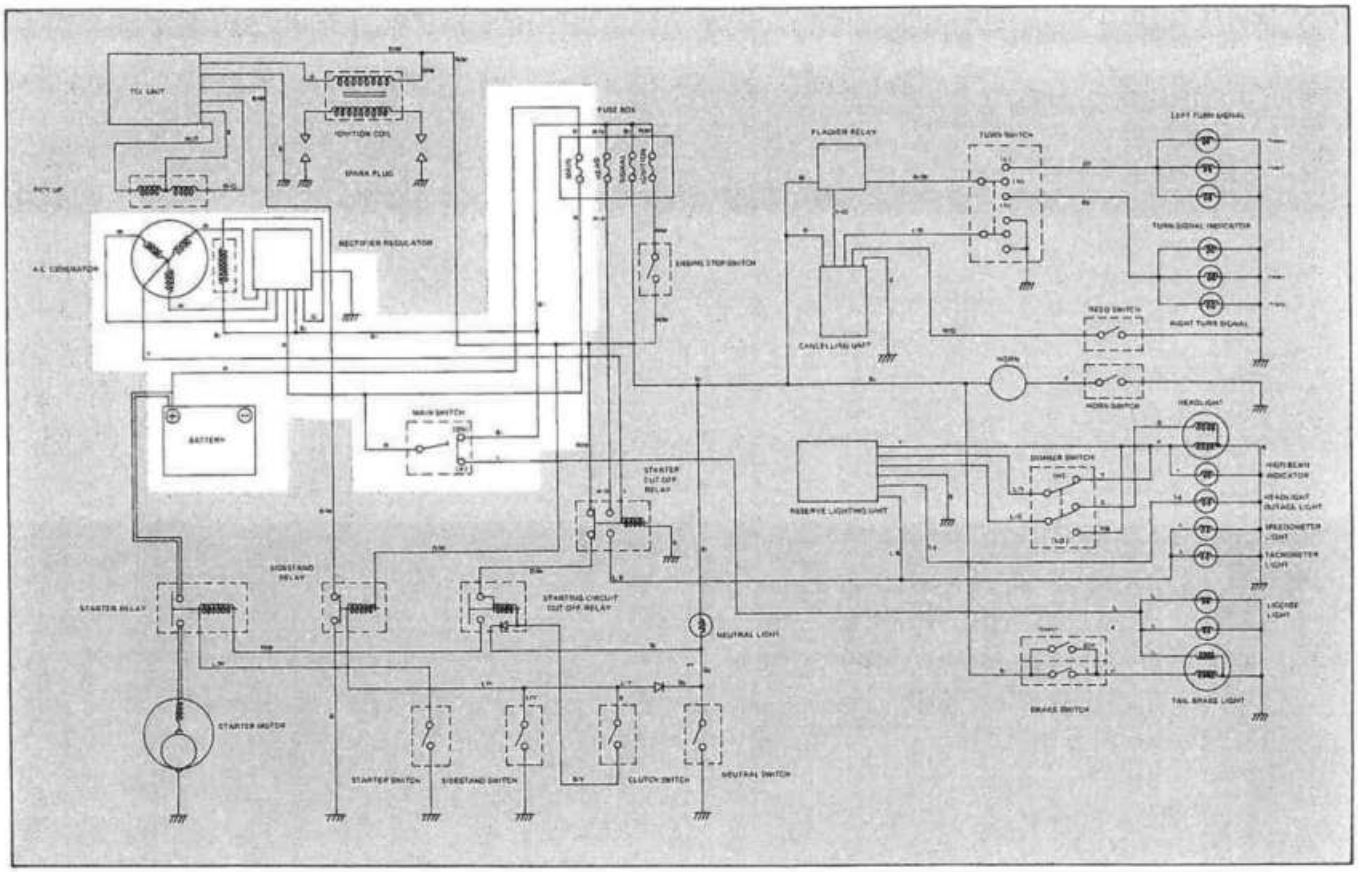
4. Check the diode in the starting circuit cut-off relay with the pocket tester as shown in the illustration. Replace the relay if the diode is damaged.

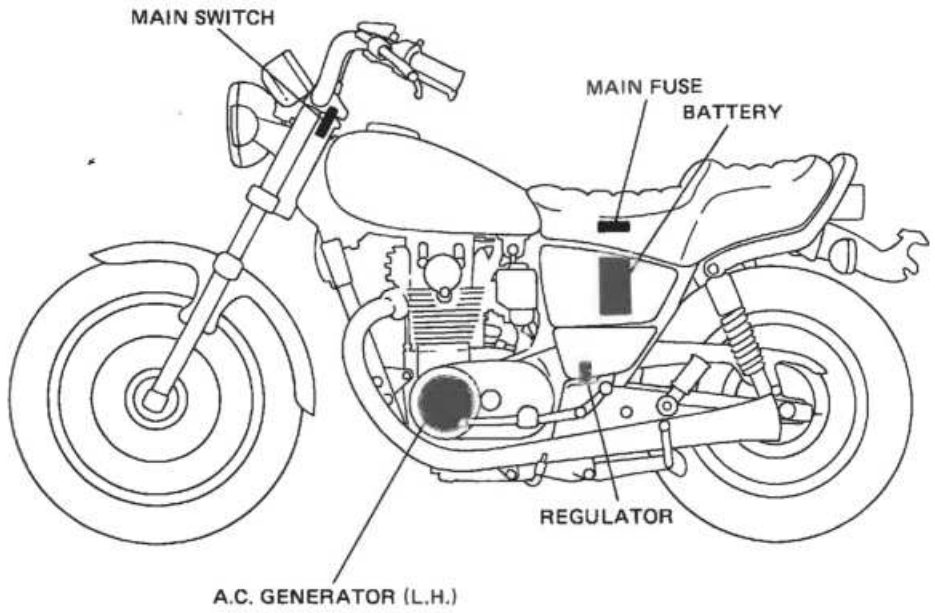


NOTE:

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.

CHARGING SYSTEM



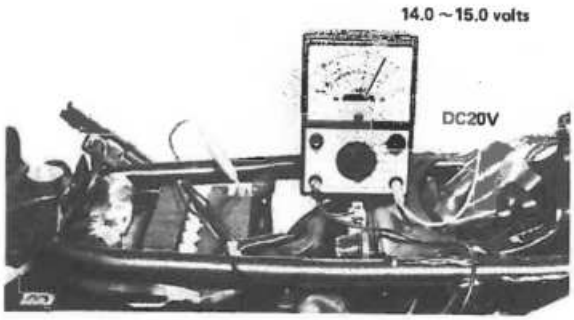


AC GENERATOR AND VOLTAGE REGULATOR

A. Inspection

1. Connect the pocket tester to the battery terminals.
2. Start the engine.
3. Accelerate the engine to approximately 2,000 rpm or more, and check the generator voltage.

Generator voltage: 14.5 ± 0.5 V



4. If the indicated voltage cannot be reached, check all connections. If the connections are all good, check the battery, stator coil, and the regulator/rectifier. If both the battery and stator coil are in working order, the regulator is defective and should be replaced.

CAUTION:

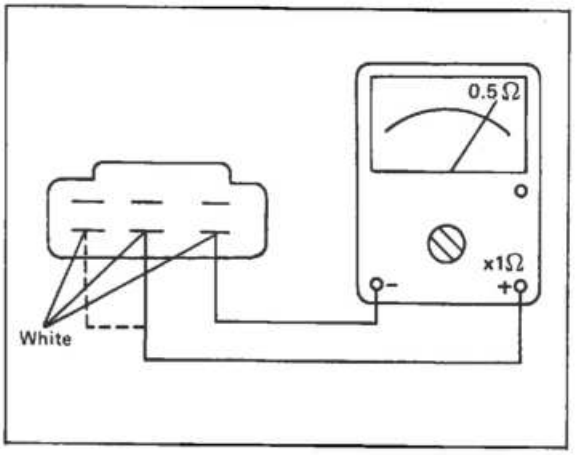
Never disconnect the wires from the battery while the generator is operating. If the battery is disconnected, the voltage across the generator terminals will increase and damage the semi-conductors.

B. Battery Inspection

1. Check the battery terminals and couplers. They should be tight.
2. Measure the specific gravity of the battery. If it is less than 1.260, remove and charge the battery until the specific gravity is greater than 1.260.

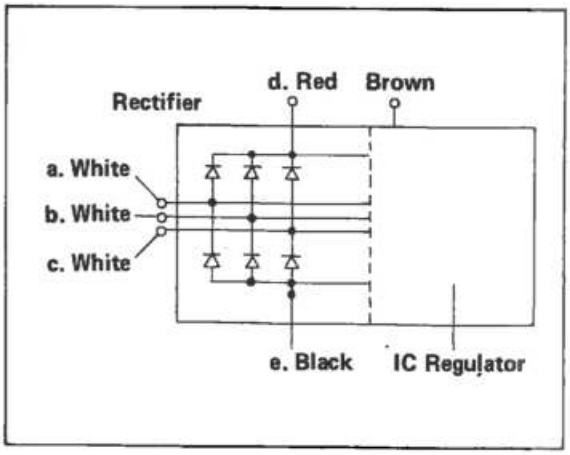
C. Stator Coil Inspection

1. Remove the side cover.
2. Disconnect the stator coil leads from the voltage regulator, and connect the pocket tester as shown. If the resistance does not equal the specified value, the stator coil is defective and should be replaced.



D. Checking The Silicon Rectifier

1. Check the silicon rectifier as specified using the pocket tester.



Checking element	Pocket tester connecting point		Good	Replace (element shorted)	Replace (element opened)
	(+) (red)	(-) (black)			
D1	d	a	O	O	x
	a	d	x	O	x
D2	d	b	O	O	x
	b	d	x	O	x
D3	d	c	O	O	x
	c	d	x	O	x
D4	a	e	O	O	x
	e	a	x	O	x
D5	b	e	O	O	x
	e	b	x	O	x
D6	c	e	O	O	x
	e	c	x	O	x

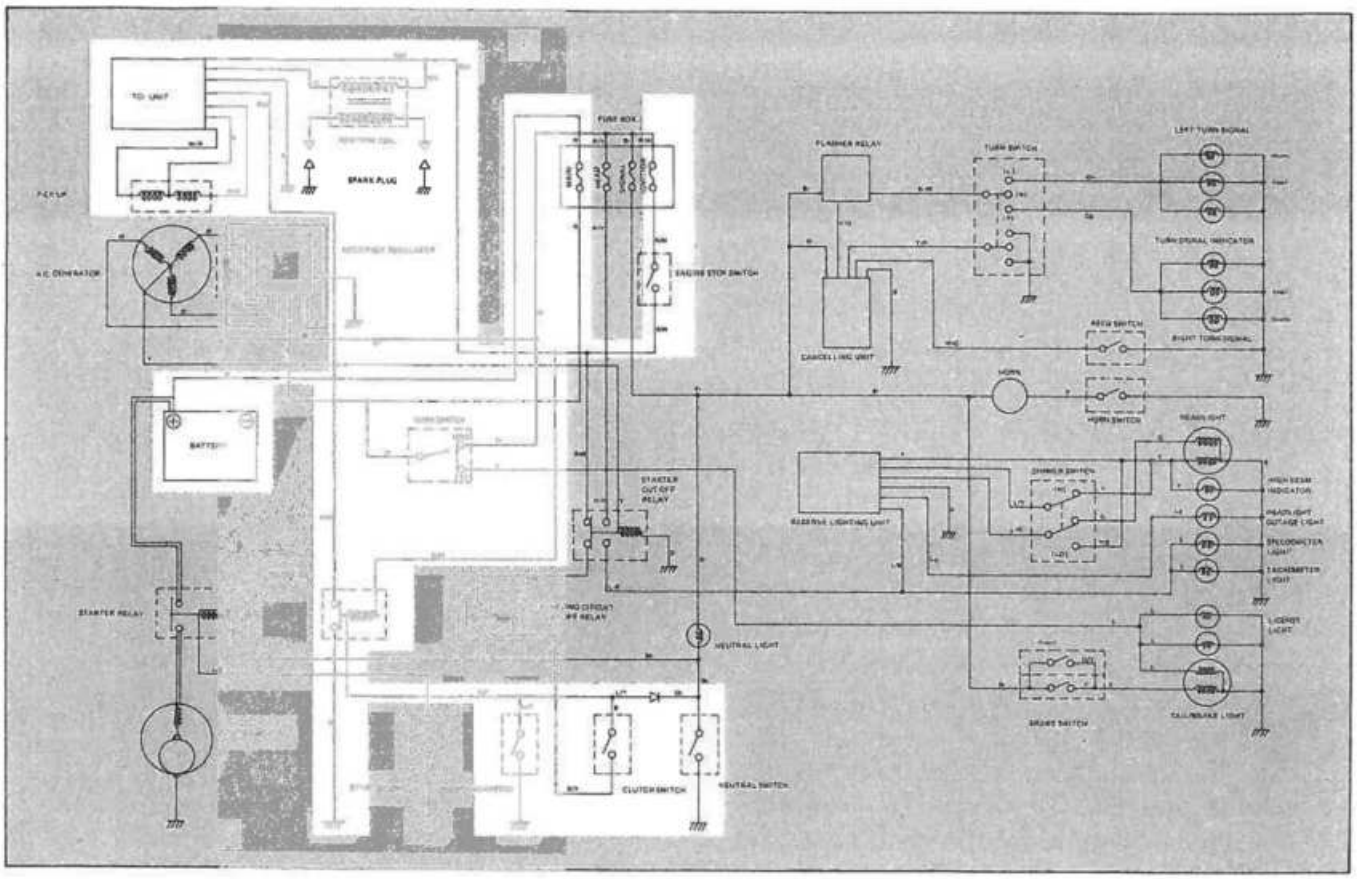
O : Continuity
x : Discontinuity (∞)

2. If any element is broken, replace the entire unit.

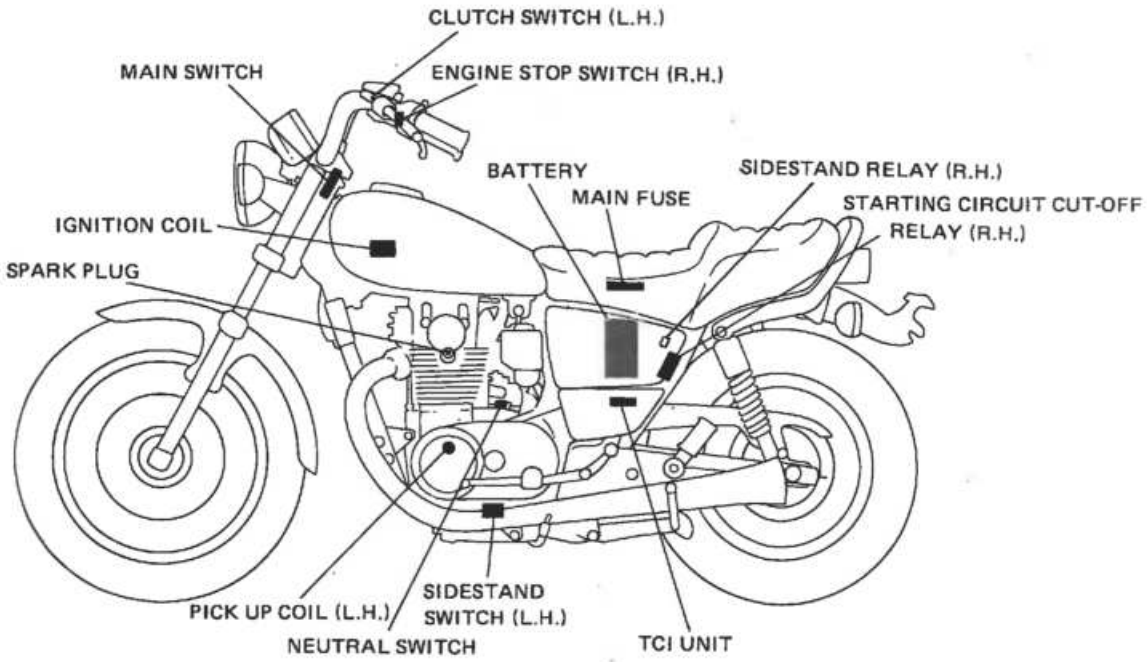
CAUTION:

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

IGNITION SYSTEM



IGNITION SYSTEM



A. 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.

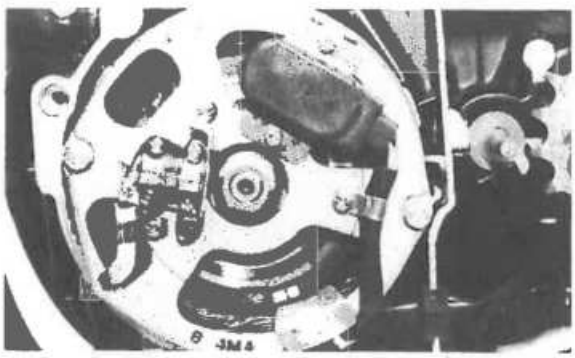
NOTE:

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

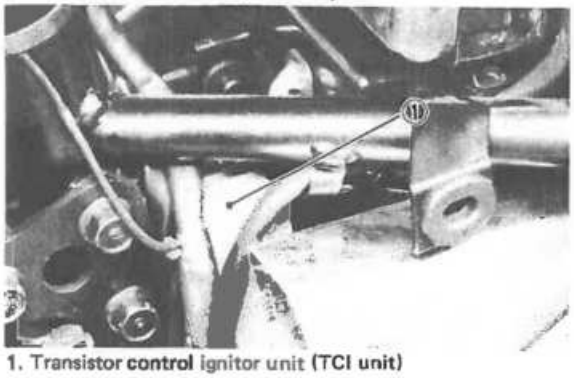
B. Operation

The TCI functions on 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.

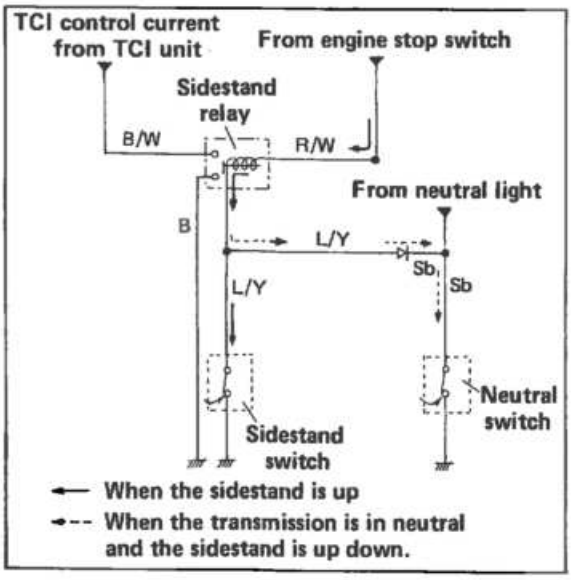


2. Ignitor unit
   This unit controls wave form, duty control, switching, electronic ignition advance, etc. The duty control circuit reduces electrical consumption by controlling the duration of the primary ignition current.
   The ignitor unit also has a protective circuit for the ignition coil. If 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.



1. Transistor control ignitor unit (TCI unit)

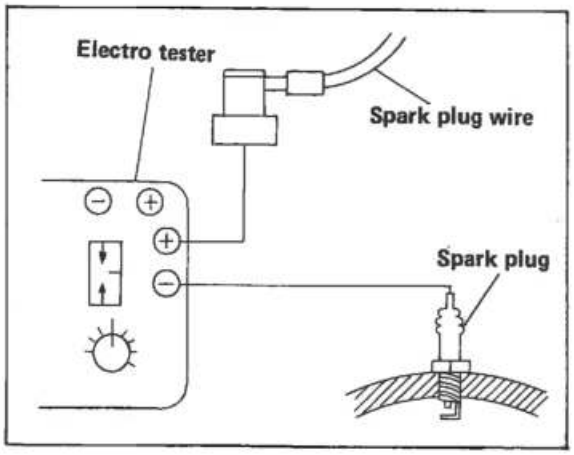
3. Sidestand relay
   The sidestand relay operates by shorting the TCI control current. When the sidestand is down, the sidestand relay is closed, and the TCI control current is grounded through the sidestand relay. Thus, the engine will not run with the sidestand down unless the transmission is in neutral.



C. Troubleshooting

The entire ignition system can be checked for misfire and weak spark by using the Electro Tester. If the ignition system will fire across a specified gap, the entire ignition system is good. If it will not fire across the gap, proceed with the individual component tests until the source of the problem is located.

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



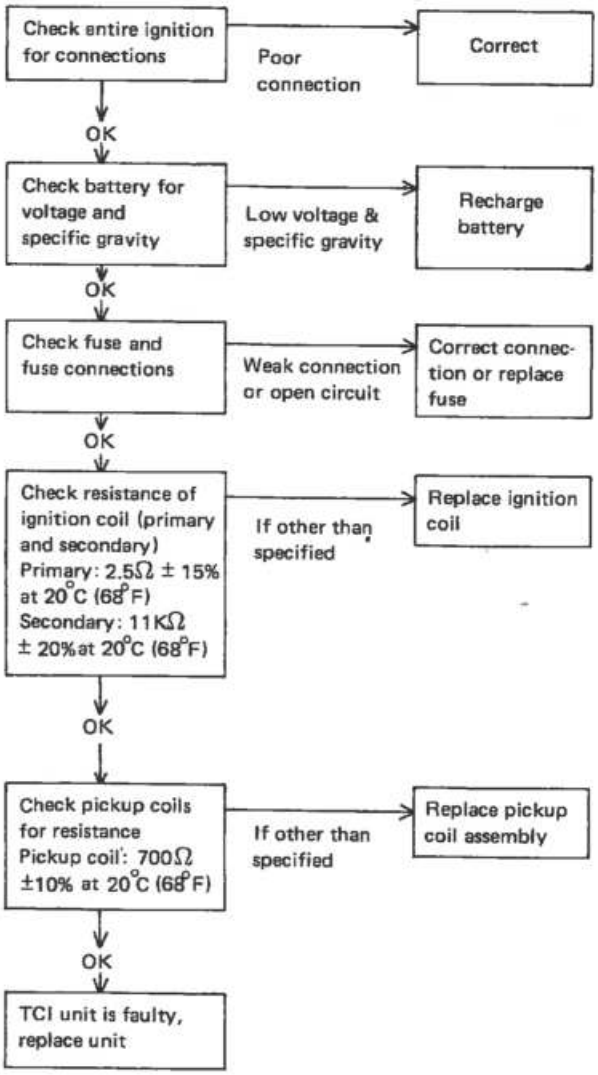
3. Start the engine, and increase the spark gap until misfire occurs. (Test at various rpm between idle and red line.)

Minimum spark gap: 7 mm (0.28 in)

CAUTION:

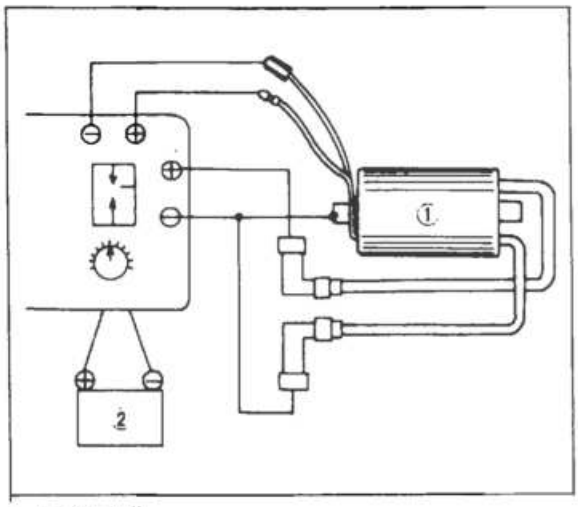
Do not run the engine in neutral above 6,000 rpm for more than 1 or 2 seconds.

If the ignition system becomes inoperative or if the engine misfires at the minimum spark gap or at a smaller gap, there is a problem in the ignition system. Follow the troubleshooting chart until the source of the problem is located.



Ignition spark gap test

1. Remove the seat, fuel tank, and disconnect the ignition coil wires from the wiring harness and from the spark plugs.
2. Connect the Electro Tester as shown.



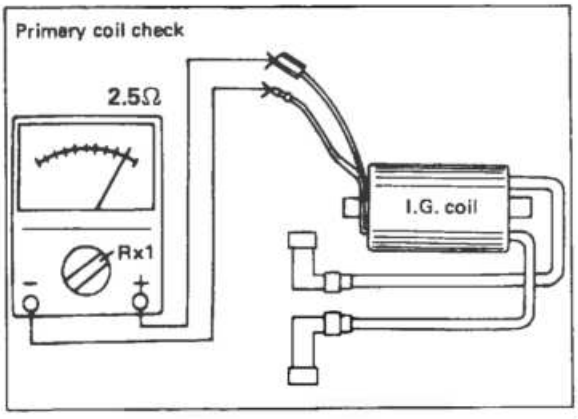
1. Ignition coil
2. Battery

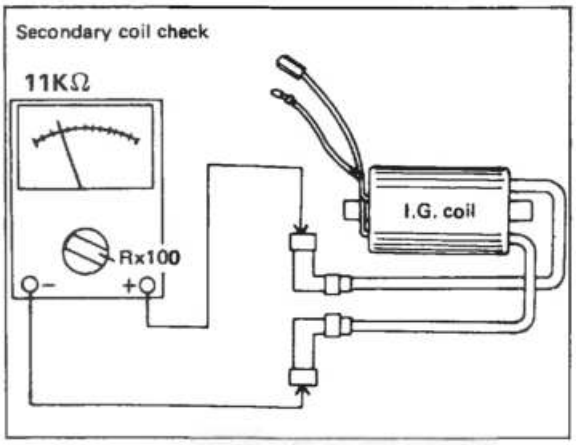
3. Connect a fully charged battery to the tester.
4. Turn on the spark gap switch, and increase the gap to maximum unless misfire occurs first.

Minimum spark gap: 7 mm (0.276 in)

Direct current resistance test.
Use the pocket tester to determine resistance and continuity of primary and secondary coil windings.

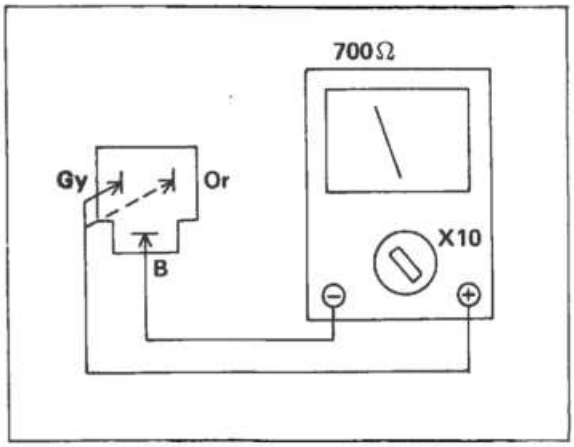
Standard value:
Primary coil resistance:
2.5Ω ± 10% at 20°C (68°F)
Secondary coil resistance:
11KΩ ± 20% at 20°C (68°F)





Pickup coil

1. Remove the left-side cover.
2. Disconnect the pickup coil wires from the TCI unit wires.
3. Check the resistance of the pickup coil windings with the pocket tester. If the resistance is not within specification, replace the pickup coil assembly.



Spark plug

The life of a spark plug and its discoloring vary according to the habits of the rider. At each periodic inspection, replace burned or fouled plugs with new ones of the specified type. It is actually economical to install new plugs often since it will tend to keep the engine in good condition and prevent excessive fuel consumption.

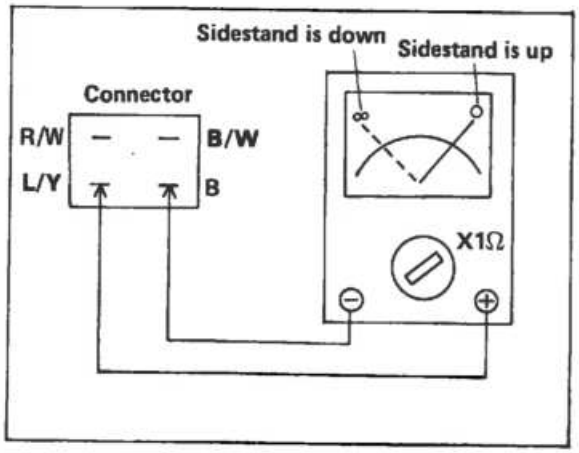
1. Inspect and clean the spark plug every 4,000 km (2,500 mi), and replace after initial 13,000 km (8,000 mi).
2. Clean the electrodes of carbon, and adjust the electrode gap to the specifica-

tion. Be sure to use the proper reach, type, and electrode gap plug(s) as a replacement to avoid overheating, fouling, or piston damage.

Type: BP7ES (NGK) or N-7Y (CHAMPION) Electrode gap: 0.7 ~ 0.8 mm (0.028 ~ 0.031 in) Tightening torque: 19.6 Nm (2.0 m-kg, 14.5 ft-lb)

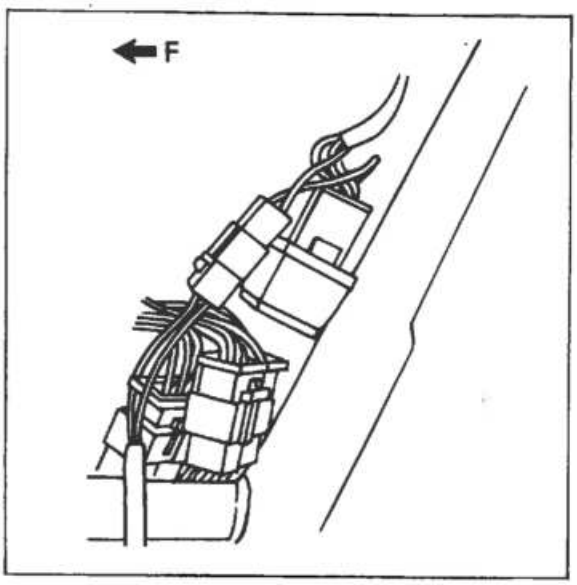
Sidestand switch

1. Remove the sidestand switch from the rear fender bracket, and disconnect the connector.
2. Connect the pocket tester leads as shown, and set the tester selector to ohm x 1. When the sidestand is up, the tester should read zero ohms. When the sidestand is down, the tester should read infinity.

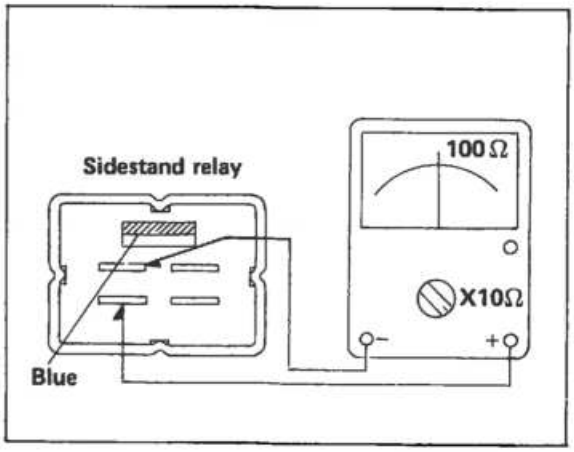


Sidestand relay

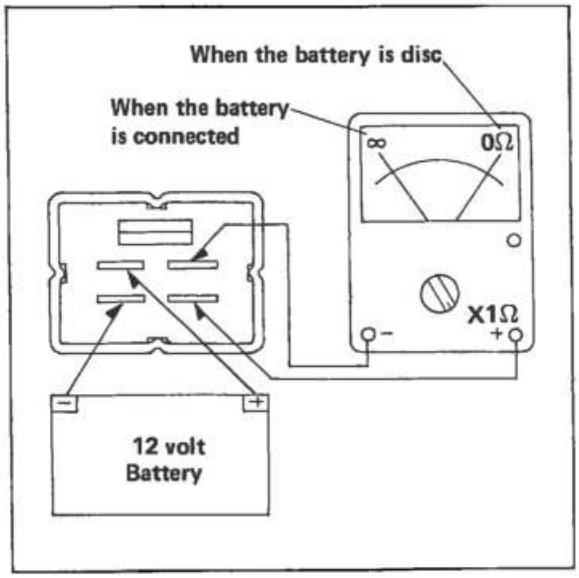
1. Remove the sidestand relay from the rear fender bracket, and disconnect the connector.



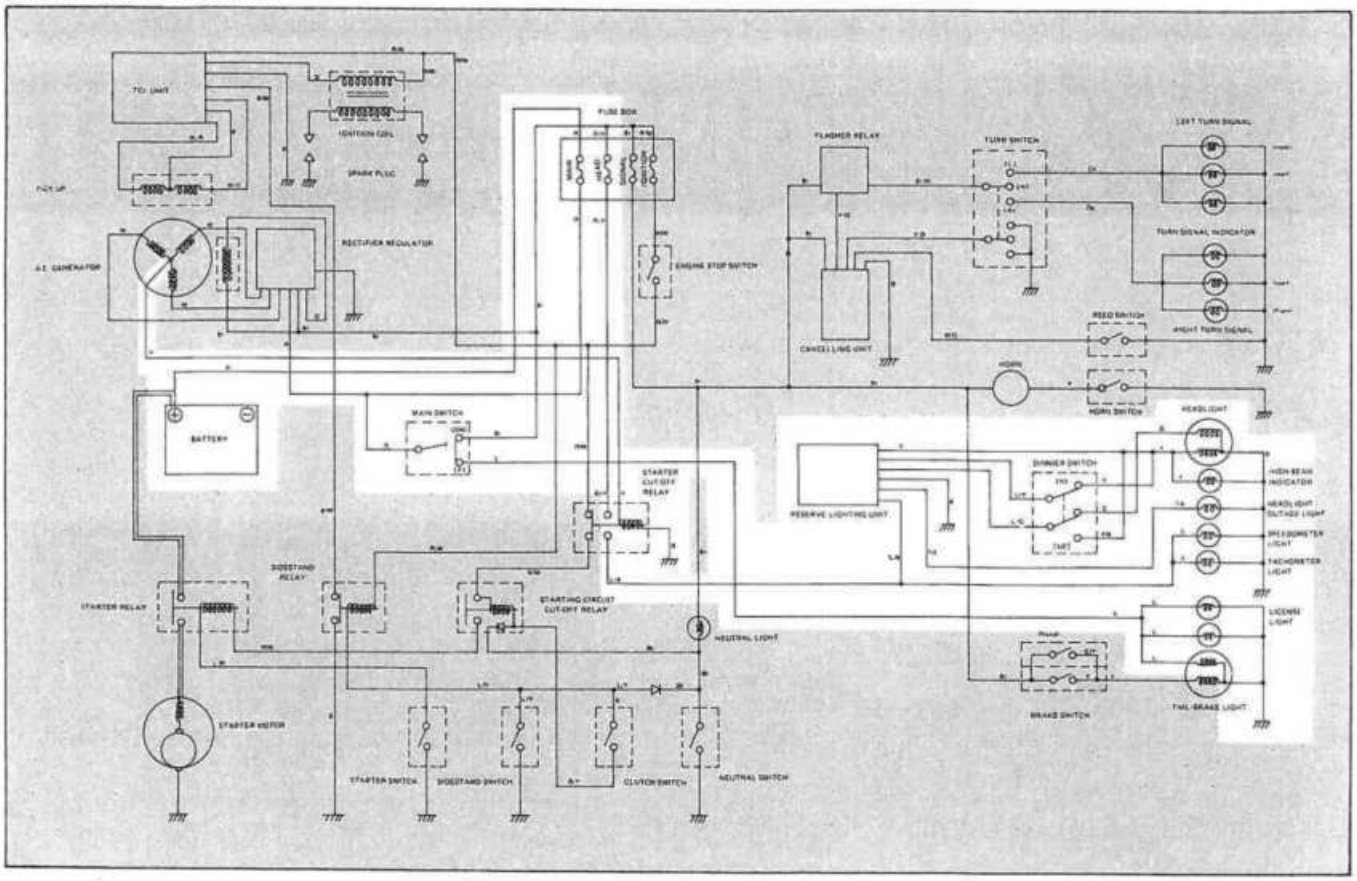
2. Check the resistance of the relay coil windings with the pocket tester. If the resistance is not within specification, replace the relay.



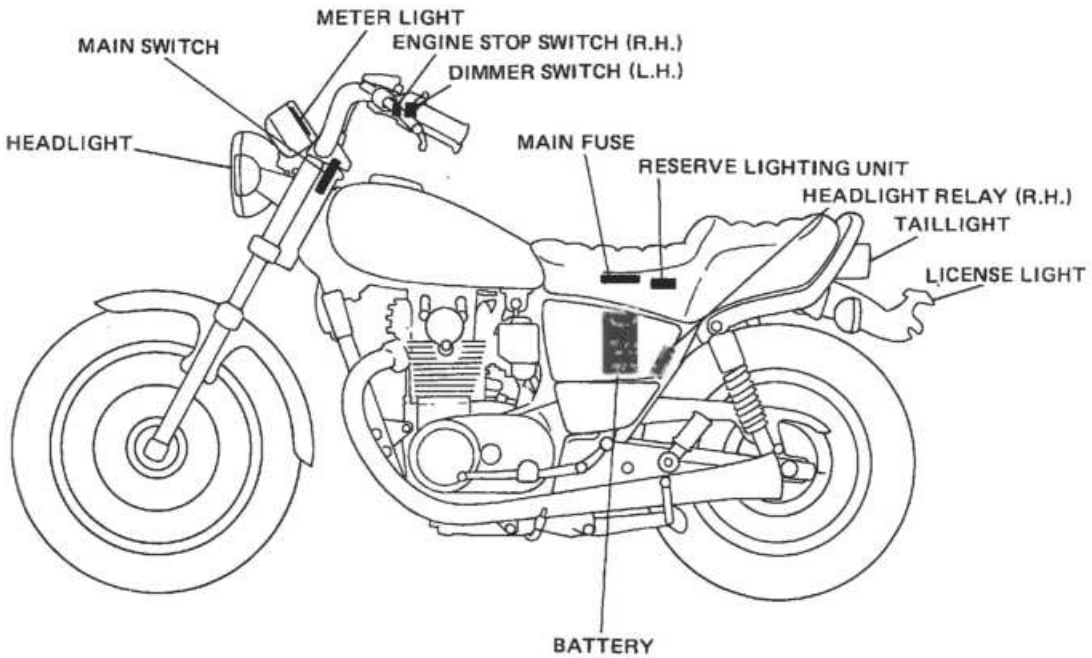
3. Check the relay contact breaker points with the pocket tester and a 12 volt battery. Connect the leads as shown in the illustration. If the resistance readings do not equal those shown in the illustration, replace the relay.



LIGHTING SYSTEM



LIGHTING SYSTEM



A. Lighting Tests and Checks

The battery provides power for operation of the headlight, taillight, and meter lights. If none of the above operates, always check battery voltage before proceeding further. Low battery voltage indicates either a faulty battery, low battery electrolyte, or a defective charging system. See page 6-8 "CHARGING SYSTEM" for checks of the battery and charging system. Also check fuse condition. Replace any "open" fuses. There are individual fuses for various circuits (see the complete circuit diagram).

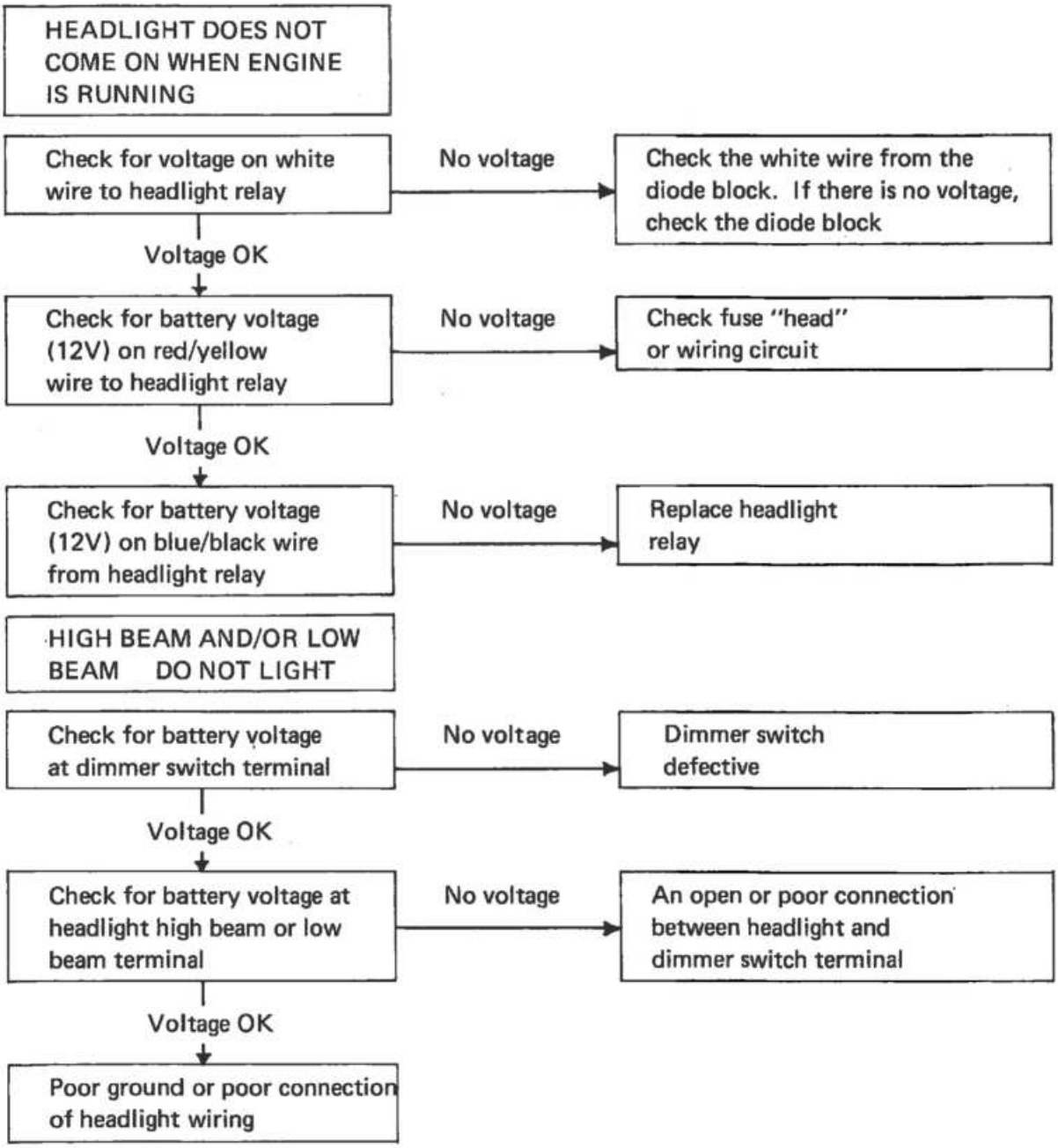
NOTE:

Check the headlight bulb first before performing the following check.

1. Headlight check.

NOTE:

When the engine is started, the headlight and meter lights come on automatically and the lights stay on until the main switch is turned to "OFF" even if the engine stalls.

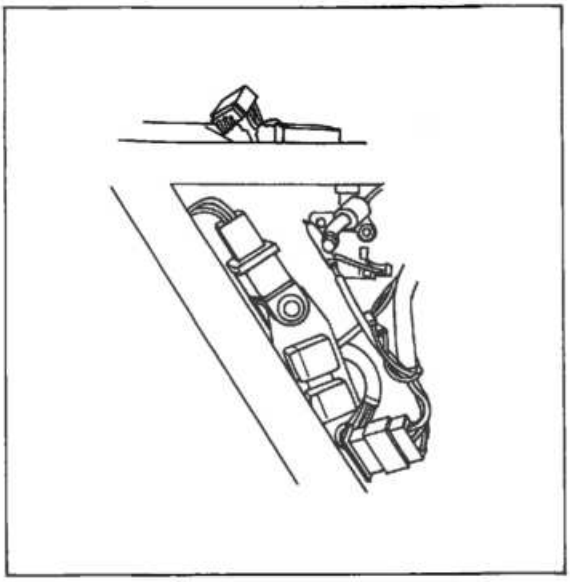


2. Taillight does not work:
   - Check the bulb.
   - Check for 12V on the blue wire.
   - Check for ground on black wire to tail/brake light and/or license light assembly.

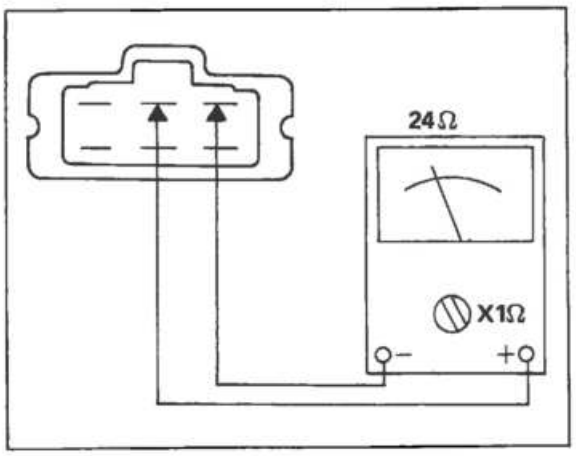
HEADLIGHT/STARTER CUT-OUT RELAY

A. Inspection

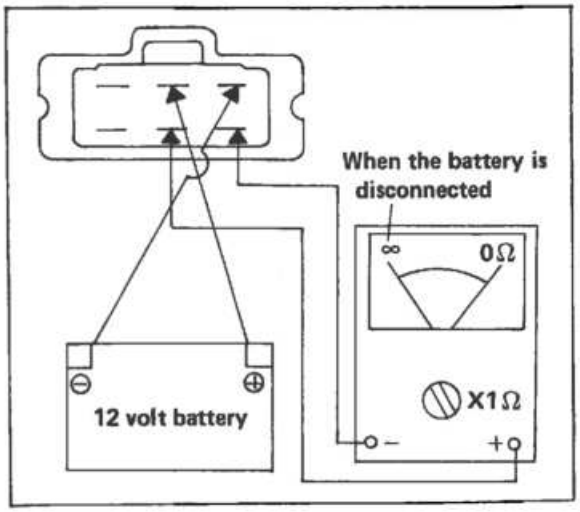
1. Remove the headlight starter cut-out relay from the rear fender bracket, and disconnect the connector.

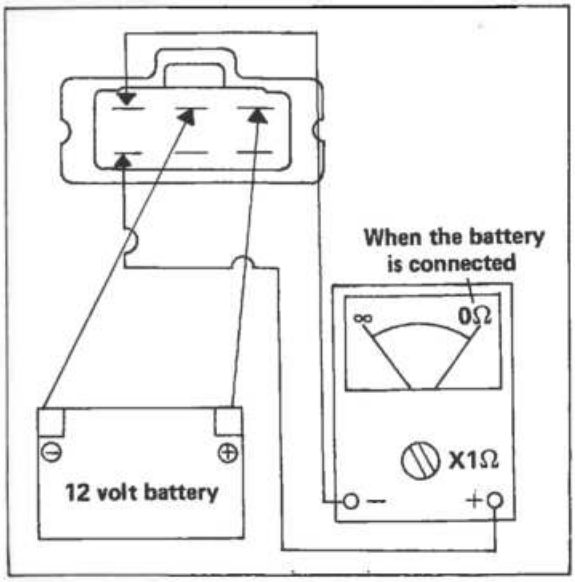


2. Check the resistance of the relay coil windings with the pocket tester. If the resistance is not within specification, replace the relay.



3. 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.

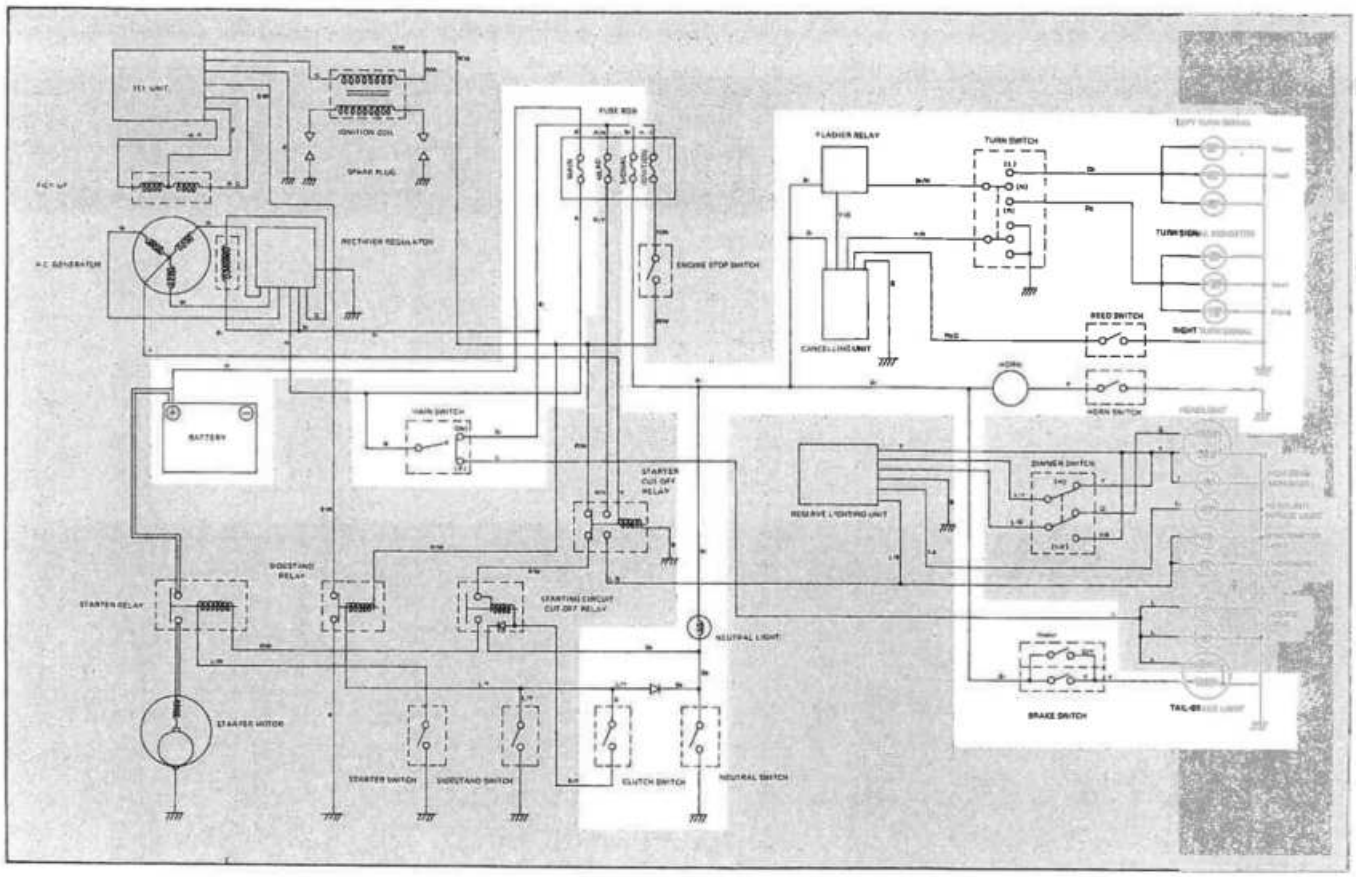




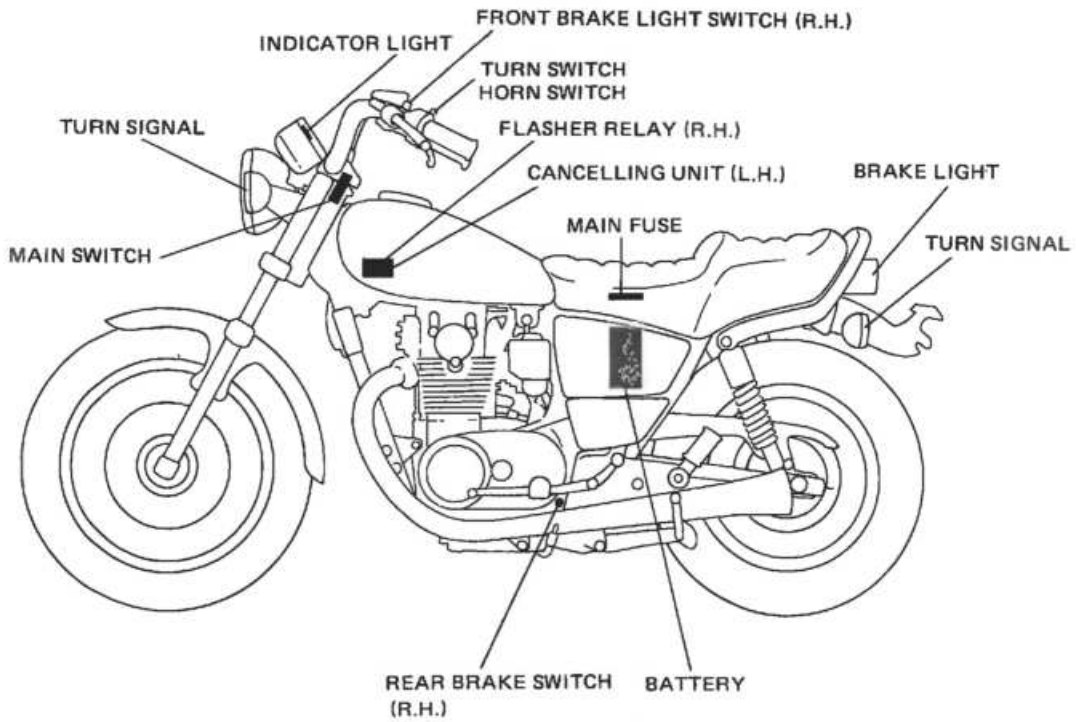
NOTE:

Only the Yamaha Pocket Tester will give a 24Ω reading when testing continuity. The particular characteristics of other tests will vary the continuity test readings.

SIGNAL SYSTEM



SIGNAL SYSTEM



A. Signal System Tests and Checks

The battery provides power for operation of the horn, brake light, indicator lights, and flasher light. If none of the above operates, always check the battery voltage before proceeding further. Low battery voltage indicates either a faulty battery, low battery electrolyte, or a defective charging system. See page 6-8 "CHARGING SYSTEM" for checks of the battery and charging system. Also check the fuse condition. Replace any "open" fuses. There are individual fuses for various circuits (see the complete circuit diagram).

Horn does not work:

1. Check for 12V on the brown wire to the horn.
2. Check for good grounding of the horn (pink wire) when the horn button is pressed.

Brake light does not work:

1. Check the bulb.
2. Check for 12V on the yellow wire to the brake light with brake pedal depressed.
3. Check for 12V on the brown wire to each brake light switch (front brake and rear brake switches).

Flasher light(s) do not work:

1. Check the bulb.
2. Right circuit:

a. Check for 12V on the dark green wire to the light.
b. Check for ground on the black wire to the light assembly.

3. Left circuit:

a. Check for 12V on the dark brown wire to the light.
b. Check for ground on the black wire to the light assembly.

4. Right and left circuits do not work:

a. Check for 12V on the brown/white wire to the flasher switch on the left handlebar.
b. Check for 12V on the brown wire to the flasher relay.
c. Replace the flasher relay.
d. Replace the flasher switch.

5. Check the self-cancelling unit. (Refer to Flasher Self-Cancelling Unit.)

The neutral light does not work:

1. Check the bulb.
2. Check for 12V on the sky blue wire to the neutral switch.
3. Replace the neutral switch.

B. Flasher Self-Cancelling Unit

The self-cancelling unit turns off the flashers. Generally, the signal will cancel after either 10 seconds of operation or after the motorcycle has traveled 150 meters (490 feet), whichever is greater. At low speed, the cancelling is a function of distance; at high speeds, it's a function of both time and distance.

The self-cancelling mechanism only operates when the motorcycle is moving; thus the signal will not self-cancel while you are stopped at an intersection.

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

Inspection

If the flasher self-cancelling unit should become inoperative, proceed as follows:

1. Pull off the 6-pin connector from the flasher self-cancelling unit, and operate the handlebar switch. If the signal operates normally in L, R, and OFF, the following are in good condition.

a. Flasher unit
b. Bulb
c. Lighting circuit
d. Handlebar switch light circuit

If (a) and (b) are in good condition, the following may be faulty:

- Flasher cancelling unit.
- Handlebar switch reset circuit.
- Speedometer sensor circuit.

2. Pull off the 6-pin connector from the flasher self-cancelling unit, and connect a tester (ohms x 100 range) across the white/green and the black lead wires on the wiring harness side. Turn the speedometer shaft. If the tester needle swings back and forth between 0 and ∞ , the speedometer sensor circuit is in good condition. If not, the sensor to wiring harness may be inoperative.
3. Pull the 6-pin connector from the flasher self-cancelling unit. Check if there is continuity between the yellow/red lead wire on the wiring harness side and the chassis.

Flasher switch OFF: ∞ Flasher switch L or R: 0 ohms

If the tester needle does not swing as indicated above, check the handlebar switch circuit and wiring harness.

4. If no defect is found with the above three checks and the flasher cancelling system is still inoperative, replace the flasher cancelling unit.
5. If the signal flashes only when the handlebar switch lever is turned to L or R and it turns off immediately when the handlebar switch lever returns to center, replace the flasher cancelling unit.

C. Switches

Switches may be checked for continuity with a pocket tester on the "ohms x 1" scale.

1. Main switch.

Switch position	Wire Color		
	R	Br	L/Y
ON	○——	——○	——○
OFF			
LOCK			
P (parking)	○——		——○

2. Engine stop switch

Switch position	Wire color	
	Br	R/W
RUN	○——	——○
OFF		

3. Start switch

Button position	Wire color	
	L/W	Ground
PUSH	○——	——○
OFF		

4. Lights (dimmer) switch

Switch position	Wire Color				
	Y	L/Y	G	L/G	Y/B
HI	○——	——○	○——	——○	
LO		○——	——○	○——	——○

5. Turn switch

Switch position	Wire color				
	Dg	Br/W	Ch	Y/R	Ground
R	○——	——○		○——	——○
N	○——	——○			
L		○——	——○	○——	——○

6. Horn switch

Button position	Wire color	
	P	Ground
PUSH	○——	——○
OFF		

D. Battery

If the battery shows the following defects, it should be replaced:

1. The battery voltage will not rise to a specific value or no bubbles rise in any cell even after many hours of charging.
2. Sulfation of one or more cells is indicated by the plates turning white or an

accumulation of material in the bottom of the cell.

3. Specific gravity readings after a long, slow charge indicate a cell to be lower than any others.
4. Warpage or buckling of plates or insulators is evident.

WARNING:

Battery fluid is poisonous and dangerous, causing severe burns, etc. It contains sulfuric acid. Avoid contact with the skin, eyes, or clothing.

Antidote: EXTERNAL — Flush with water. INTERNAL — Drink large quantities of water or milk. Follow with milk of magnesia, beaten eggs, or vegetable oil. Call physician immediately.

Eyes: Flush with water for 15 minutes, and get prompt medical attention. Batteries produce explosive gases. Keep sparks, flame, cigarettes, etc. away. Ventilate when charging or using in an enclosed space. Always shield your eyes when working near batteries.

KEEP OUT OF REACH OF CHILDREN.

The service life of a battery is usually two to three years. Lack of care, as described below, will shorten the life of the battery.

- Negligence in keeping battery topped off with distilled water.
- Battery left discharged.
- Over-charging with heavy charge.
- Freezing.
- Filling with tap water or sulfuric acid containing impurities.
- Improper charging voltage or current on new battery.

If the motorcycle is not to be used for a long time, remove the battery and have it stored. The following instructions should be observed:

1. Recharge the battery periodically.
2. Store the battery in a cool, dry place.
3. Recharge the battery before reinstallation.

Battery	YB16AL
Electrolyte	Specific gravity: 1.280
Initial charging current	1.6 amp for 10 hours (new battery)
Recharging current	10 hours (or until specific gravity reaches 1.280)
Refill fluid	Distilled water (to maximum level line)
Refill period	Check once per month (or more often, as required)

CHAPTER 7. APPENDICES

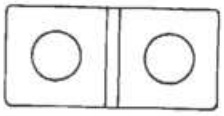
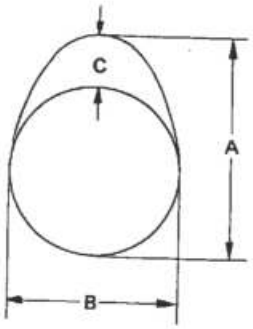
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GENERAL SPECIFICATIONS

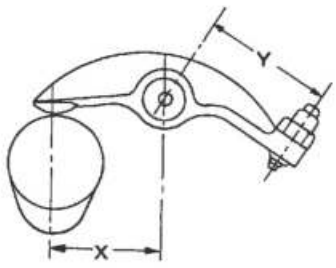
Model IBM Number:	5V4
Engine Starting Number:	5V4-000101
Frame Starting Number:	5V4-000101
Dimension: Overall Length Overall Width Overall Height Seat Height Wheelbase Minimum Ground Clearance	 2,120 mm (83.5 in) 925 mm (36.4 in) 1,220 mm (48.0 in) 790 mm (31.1 in) 1,435 mm (56.5 in) 130 mm (5.1 in)
Weight: Net Weight	 212 kg (467 lb)
Performance: Minimum Turning Radius	 2,500 mm (98.4 in)
Engine: Type Model Cylinder Displacement Bore x Stroke Compression Ratio Starting System Ignition System	 Air Cooled, 4-Stroke, Gasoline, SOHC 5V4 Vertical-Twin, Parallel forward incline 653 cm^3 75 x 74 mm (2.95 x 2.91 in) 8.7 : 1 Electric or Kick Starter TCI
Engine Oil. Type	 Yamalube 4-cycle oil or SAE 20W/40 SE motor oil
Oil Capacity: Total Amount Periodic Oil change	 2.5 ℓ (2.20 Imp qt, 2.64 US qt) 2.0 ℓ (1.76 Imp qt, 2.11 US qt)
Lubrication System	Wet Sump
Generator System	AC Magneto
Spark Plug	BP7ES (NGK) N-7Y (CHAMPION)
Carburetor x Quantity	BS34 x 2
Air Cleaner Element	Dry Type Element
Clutch Type	Wet, Multiple-Disc
Transmission: Primary Reduction System Primary Reduction Ratio Secondary Reduction System Secondary Reduction Ratio Transmission Type Operation System Gear Ratio 1st 2nd 3rd 4th 5th	 Gear 72/27 (2.666) Chain Drive 34/17 (2.000) Constant Mesh, 5-Speed Left Foot Operation 32/13 (2.461) 27/17 (1.588) 26/20 (1.300) 23/21 (1.095) 22/23 (0.956)

Chassis: Frame Type	Double cradle, high tensile frame					
Steering: Caster Trail	27° 115 mm (45.3 in)					
Fuel: Type Tank Capacity', Total Reserve	Regular Gasoline 11.5 ℓ (10.1 Imp gal, 12.2 US gal) 2.3 ℓ (2.02 Imp gal, 2.43 US gal)					
Tire Size: Front Rear	3.50S 19-4PR (Tube-type tire) 130/90-16 67S (Tube-type tire)					
Tire Pressure (Cold):		Front			Rear	
	kPa	kg/cm²	psi	kPa	kg/cm²	psi
Up to 90 kg (198 lb) load)	157	1.6	23	196	2.0	28
90 kg (198 lb) load ~ 206 kg (453 lb) load	196	2.0	28	226	2.3	32
High Speed Riding	196	2.0	28	226	2.3	32
Braking System: Front Rear	Disc Brake/Right-Hand operation Drum/Right Foot Operation					
Suspension: Front Rear	Telescopic Fork Swingarm					
Shock Absorber: Front Rear	Coil Spring, Oil Damper Coil Spring, Oil Damper					
Electrical: Voltage	12V					
Bulb Wattage x Quantity: Headlight Tail/Brake Light Turn Light Meter Light License Light Indicator Lights Neutral Highbeam Headlight failure Turn	 50-40W x 1 (Sealed beam) 3/32 cp (8W/27W) x 2 32 cp (27W) x 4 3.4W x 2 3.8W x 2 3.4W x 1 3.4W x 1 3.4W x 1 3.4W x 2					
Battery: Model/Capacity	YB14L-A2 (YUASA)/12V 14AH					

MAINTENANCE SPECIFICATIONS
A. Engine

Cylinder Head: Volume Warp Limit Head Gasket Thickness (New)	$59.2 \pm 0.4\ cm^3$ 0.03 mm (0.0012 in) 1.2 mm (0.047 in) 
Cylinder: Material Bore Size Taper Limit	Aluminum alloy with cast iron sleeve 75.0 mm (2.95 in) 0.05 mm (0.002 in)
Camshaft: Drive Method Bearing Type/Number Cam Bearing Size	Chain drive Ball bearing (6005) x 4
Camshaft Outside Diameter Shaft-to-Bearing Clearance Cam Dimensions 	$24^{-0.020}_{-0.033}$ mm ($0.9448^{-0.0008}_{-0.0013}$ in) $/25^{-0.020}_{-0.033}$ mm ($0.9843^{-0.0008}_{-0.0013}$ in) 0.020 ~ 0.054 mm (0.0008 ~ 0.0021 in)

Intake	Standard	Wear Limit
A	39.99 mm (1.574 in)	39.84 mm (1.569 in)
B	32.24 mm (1.269 in)	32.09 mm (1.263 in)
C	7.99 mm (0.314 in)	—
Exhaust		
A	40.03 mm (1.576 in)	39.88 mm (1.570 in)
B	32.30 mm (1.271 in)	32.15 mm (1.266 in)
C	8.03 mm (0.316 in)	—

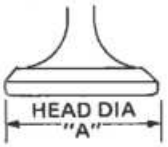
Cam Chain Type/No. of Links	TSUBAKIMOTO BF05M/106L
Rocker Arm/Rocker Arm Shaft: Rocker Arm Inside Diameter Shaft Outside Diameter Arm-to-Shaft Clearance Lift Ratio/X:Y 	$15^{+0.018}_{-0}$ mm ($0.591^{+0.0007}_{-0}$ in) $15^{-0.009}_{-0.015}$ mm ($0.591^{-0.0004}_{-0.0006}$ in) 0.009 ~ 0.033 mm (0.00035 ~ 0.00130 in) 40 : 48.41 mm (1.575 : 1.906 in)/1:1.21

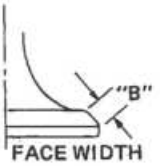
Valve/Valve Seat/Valve Guide:

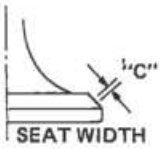
Valve Clearance (Cold) IN. 0.06 mm (0.0024 in)

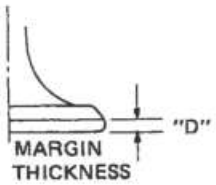
EX. 0.15 mm (0.0059 in)

Valve Dimensions









Intake	Standard	Limit
A	41.0 mm (1.614 in)	–
B	2.1 mm (0.083 in)	–
C	1.3 mm (0.051 in)	2.0 mm (0.08 in)
D	1.3 mm (0.051 in)	0.7 mm (0.028 in)
Exhaust	Standard	Limit
A	35.0 mm (1.378 in)	–
B	2.1 mm (0.083 in)	–
C	1.3 mm (0.051 in)	2.0 mm (0.08 in)
D	1.3 mm (0.051 in)	0.7 mm (0.028 in)

Stem Diameter (O.D.) IN. $8\,^{0}_{-0.015}$ mm ($0.315\,^{0}_{-0.0006}$ in)

EX. $8\,^{-0.025}_{-0.040}$ mm ($0.315\,^{-0.0010}_{-0.0016}$ in)

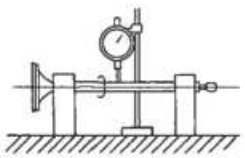
Guide Diameter (I.D.) IN. $8\,^{+0.019}_{+0.010}$ mm ($0.315\,^{+0.0007}_{+0.0004}$ in)

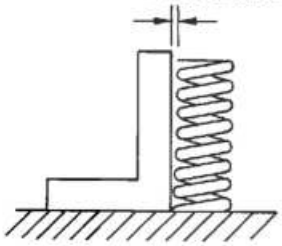
EX. $8\,^{+0.019}_{+0.010}$ mm ($0.315\,^{+0.0007}_{+0.0004}$ in)

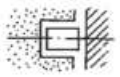
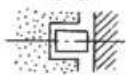
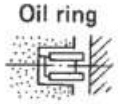
Stem-to-Guide Clearance/Limit IN. 0.01 ~ 0.034 mm (0.0004 ~ 0.0013 in)

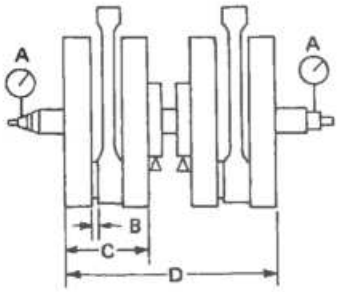
EX. 0.035 ~ 0.059 mm (0.0014 ~ 0.0023 in)

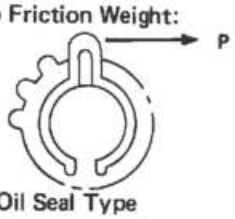
Stem Run-Out Limit 0.03 mm (0.0012 in)

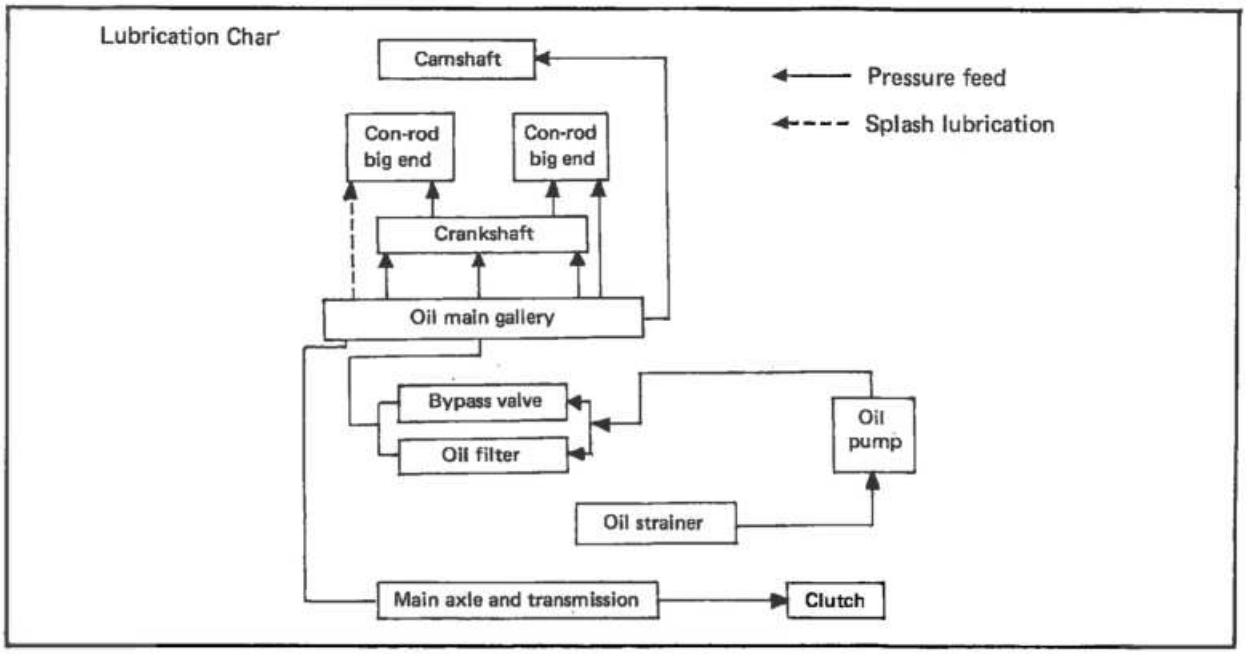


Valve Spring:	Inner		Outer	
	Intake	Exhaust	Intake	Exhaust
Free Length	42.0 mm (1.654 in)	←	42.55 mm (1.675 in)	←
Spring Rate	K1 = 141 N/mm (K1 = 1.43kg/mm) (K1 = 80.1 lb/in) K2 = 17.8 N/mm (K2 = 1.81kg/mm) (K2 = 101 lb/in)	← ←	K1 = 314 N/mm (K1 = 3.2kg/mm) (K1 = 179 lb/in) K2 = 40.1 N/mm (K2 = 4.18kg/mm) (K2 = 234 lb/in)	← ←
Installed Length (Valve Closed)	35.00mm (1.378 in)	←	37.0 mm (1.457 in)	←
Installed Pressure (Valve Closed)	10.0 ± 0.7 kg (22.0 ± 1.5 lb)	←	17.7 ± 1.25 kg (39.0 ± 2.8 lb)	←
Tilt Limit — Allowable Tilt From Vertical	2.5°	←	2.5°	←
				
Direction of Winding	Left		Right	

Piston:			
Piston Size/Measuring Point	75.0 mm (2.95 in)		
Piston Clearance	0.050 ~ 0.055 mm (0.0020 ~ 0.0022 in)		
Oversize 1st	75.25 mm (2.95 in)		
2nd	75.50 mm (2.95 in)		
3rd	75.75 mm (2.99 in)		
4th	76.00 mm (2.99 in)		
Offset	0 mm (0 in)		
Piston Ring:	Top	2nd	Oil ring
Design			
	1.2 mm (0.047 in)	1.5 mm (0.059 in)	2.8 mm (0.110 in)
End Gap (Installed)	0.2~0.4 mm (0.0079~0.0157 in)	0.2~0.4 mm (0.0079~0.0157 in)	0.3~0.9 mm (0.0118~0.0351 in)
Side Clearance	0.04~0.08 mm (0.0016~0.0031 in)	0.03~0.07 mm (0.0012~0.0028 in)	0 (0)
Plating/Coating	Chrome/Ferox	Chrome/Ferox	Chrome/Ferox

Connecting Rod:	
Big End I.D.	$34^{+0.016}_{0}$ mm ($1.339^{+0.0006}_{0}$ in)
Big End Bearing — Type	Needle Bearing
— Size	ϕ 26 x ϕ34 x 19.8
Small End I.D.	$20^{+0.028}_{+0.015}$ mm ($0.787^{+0.0011}_{+0.0006}$ in)
Crankshaft: 	
Crankshaft Deflection Limit (A)	0.05 mm (0.002 in)
Con-rod Large End Clearance (B)	0.15 ~ 0.4 mm (0.0059 ~ 0.0157 in)
Width of Crankshaft (C)	$66^{-0.05}_{-0.10}$ mm ($2.598^{-0.002}_{-0.004}$ in)
(D)	$186^{0}_{-0.3}$ mm ($7.323^{0}_{-0.012}$ in)
Crank Pin I.D.	$26^{-0.077}_{-0.095}$ mm ($1.024^{-0.003}_{-0.004}$ in)
Crank Pin O.D. x Length	$26^{0}_{-0.006}$ x $65^{+0.1}_{-0.2}$ mm
	($1.024^{0}_{-0.0002}$ x ($2.559^{+0.004}_{-0.008}$ in)
Crankshaft Bearing	
- Type (Right)	Ball Bearing ϕ 30- ϕ78-19
- Type (Others)	Ball Bearing ϕ32-ϕ68-17
Oil Seal	
- Type (Right)/Quantity	Rollar Bearing SD-25-40-9
Clutch:	
Clutch Type	Wet, multiple type
Clutch Operating Mechanism	Inner push type, screw push system
Primary Reduction Ratio and Method	72/27 (2.666), Spar gear
Primary Reduction Gear Back Lash (4 teeth)	$21.45^{0}_{-0.025}$ mm ($0.8445^{0}_{-0.00010}$ in)
Friction Plate	
Thickness/Quantity	3 mm (0.118 in)/6 pcs.
Wear Limit	2.7 mm (0.106 in)
Clutch Plate	
Thickness/Quantity	1.4 mm (0.055 in)/5 pcs.
Warp Limit	0.05 mm (0.002 in)
Clutch Spring	
Free Length/Quantity	42.8 mm (1.69 in)/6 pcs.
Clutch Housing Radial Play	0.027 ~ 0.081 mm (0.0011 ~ 0.0032 in)
Push Rod Bending Limit	0.2 mm (0.008 in)

Transmission:	
Main Axle Deflection Limit	0.08 mm (0.0031 in)
Drive Axle Deflection Limit	0.08 mm (0.0031 in)
Main Axle Bearing - Type (Left)	Needle Bearing φ 20-φ30-20
- Type (Right)	Ball Bearing φ 25-φ52-20.6
Drive Axle Bearing - Type (Left)	Ball Bearing φ 30-φ62-23.8
- Type (Right)	Needle Bearing φ 20-φ 30-16
Gear Ratio: 1st	32/13 (2.461)
2nd	27/17 (1.588)
3rd	26/20 (1.300)
4th	23/21 (1.095)
5th	22/23 (0.956)
Shifter:	
Shifting Type	Cam Drum, Guide Bar
Change Pedal Shaft Oil Seal Type	SDO-14-24-6
Kick Starter:	
Type	Bendix Type
Spring Clip Friction Weight: 	P = 1.2 ~ 1.7 kg (2.6 ~ 3.7 lb)
Kick Axle Oil Seal Type	SD-25-35-7
Carburetor:	
Type/Manufacturer/Quantity	BS34III/MIKUNI/2
I.D. Mark	5V4 00
Venturi Size	φ 34
Main Jet (M.J.)	#132.5
Main Air Jet (M.A.J.)	#85
Jet Needle (J.N.)	5HX12
Pilot Jet (P.J.)	#42.5
Pilot Air Jet (P.A.J.)	#135
Pilot Screw (P.S.)	Preset
Starter Jet (G.S.)	#30
Valve Seat Size (V.S.)	φ 2.0
Fuel Level (F.L.)	1.0 ± 1.0 mm (0.12± 0.04 in)
Float Height (F.H.)	22.0 ± 1.0 mm (0.87 ± 0.04 in)
Engine Idling Speed	1,200 ± 50 rpm
Vacuum Pressure	180 mm Hg (7.09 in Hg)
Lubrication System:	
Oil Filter Type	Paper Type
Oil Pump Type	Trochoid Pump
Tip Clearance	0.03 ~ 0.09 mm (0.0012 ~ 0.0035 in)
Side Clearance	0.03 ~ 0.08 mm (0.0012 ~ 0.0031 in)
Bypath Valve Setting Pressure	1.0 ± 0.2 kg/cm² (14.2± 2.8 psi)
Relief Valve Operating Pressure	5 ± 0.5 kg/cm² (71.1± 7.1 psi)



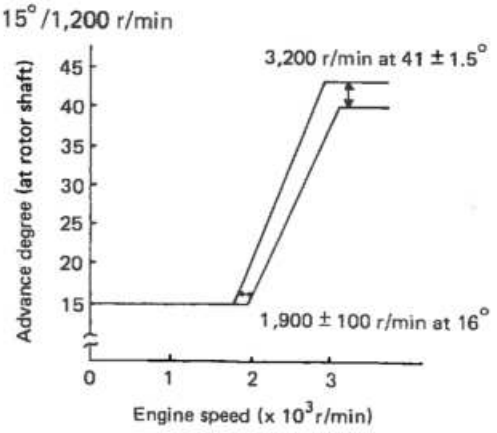
B. Chassis

Steering System:	Ball Bearing
Head Pipe Bearing Type	
Number and Size of Balls in Steering Head	
- Upper	19 pcs 1/4 in
- Lower	19 pcs 1/4 in
Front Suspension:	
Front Fork — Travel/Diameter	150 mm (5.91 in)/36 mm (1.42 in)
- - Spring Free Length	482 mm (19.0 mm)
— Spring Rate	K_1 = 4.71 N/mm (0.48 kg/mm, 26.9 lb/in)/ 0 ~ 100 mm (0 ~ 3.94 in)
	K_2 = 6.37 N/mm (0.65 kg/mm, 36.4 lb/in)/ 100 ~ 150 mm (3.94 ~ 5.91 in)
— Oil Capacity	169 cm^3 (5.96 Imp oz, 5.71 US oz)
— Oil Type	Yamaha Fork Oil 10 wt or Equivalent
Rear Suspension:	
Shock Absorber	
- Travel	80 mm (3.15 in)
- Spring Free Length	226 mm (8.90 in)
- Spring Rate	K_1 = 63.7 N/mm (6.5 kg/mm, 3.64 lb/in)/ 0 ~ 27.5 mm (0 ~ 1.08 in)
	K_2 = 84.3 N/mm (8.6 kg/mm, 482 lb/in)/ 27.5 ~ 55 mm (1.08 ~ 2.17 in)
Swing Arm Free Play - Side	1 mm (0.04 in)
Pivot Shaft - Bearing Type	Bush Type
- Dust Seal Type	Thrust Cover

Wheel:	
Type – Front/Rear	Spoke wheel
Rim Size - Front/Material	MT1.85 x 19/Steel
- Rear/Material	MT2.75 x 16/Steel
Rim Run Out Limit (Front/Rear)	
- Vertical	2 mm (0.079 in)
- Lateral	2 mm (0.079 in)
Front Wheel Bearing Type - Left	6302Z
- Right	6302Z
Rear Wheel Bearing Type - Left	6203RS/6203
- Right	6303RS
Front Wheel Oil Seal Type - Right	SD-22-42-7-1
Meter Gear Oil Seal Type	SDD-45-56-6
Disc Brake (Front):	
Type	Single Disc
Disc Size- Outside Dia. x Thickness	298 x 7 mm (11.73 x 0.28 in)
Disc Wear Limit	6.5 mm (0.256 in)
Pad Thickness	6.5 mm (0.26 in)
Pad Wear Limit	1.0 mm (0.04 in)
Master Cylinder Inside Diameter	14.0 mm (0.551 in)
Caliper Cylinder Inside Diameter	38.1 mm (1.50 in)
Brake Fluid Type/Quantity	DOT#3 Brake Fluid/38.1 cm^3 (1.34 Imp oz, 1.29 US oz)
Drum Brake (Rear):	
Type	Leading Trailing
Drum Diameter	180 mm (7.087 in)
Lining Thickness	4 mm (0.157 in)
Lining Wear Limit	2 mm (0.079 in)
Shoe Spring Free Length	68 mm (2.677 in)

C. Electrical

Voltage	12V
Ignition System:	
Ignition Timing (BTDC)	15° at 1,200 rpm
- Advance (BTDC)	41° at 3,200 rpm



Advancer Type	Electrical
Ignition Type	TCI
Pickup Coil Resistance (Color)	700Ω ± 10% at 20°C (68°F) **(Gy ~ B), (Or ~ B)**
TCI Unit - Model/Manufacturer	TID12-01B/Hitachi
Ignition Coil - Model/Manufacturer	CM12-11/Hitachi
- Minimum Spark Gap	6 mm (0.236 in)
- Primary Winding Resistance	2.5Ω ± 10 % at 20°C (68°F)
- Secondary Winding Resistance	11KΩ ± 20% at 20°C (68°F)
Spark Plug Gap/Torque/Cap Resistance	0.7 ~ 0.8 mm (0.028 ~ 0.32 in)/20 Nm (2,0 m-kg, 14.5 ft-lb)/5KΩ ± 15% at 20°C (68°F)
Charging System:	
Type	AC Magneto
Model /Manufacturer	LD115-07B/Hitachi
Output	14V-16A at 5,000 rpm
Armature Coil Resistance (Color)	0.46Ω ± 10% at 20°C (68°F)(W-W)
Rectifier - Model/Manufacturer	S8515/Toshiba
- Capacity	16A
Voltage Regulator - Type	IC Type
- Model/Manufacturer	S8515/Toshiba
- No Load Regulated Voltage	14.5 ± 0.3V
Battery:	
Capacity	12V-14AH
Specific Gravity	1.280
Electric Starter System:	
Type	Constant Mesh
Starter Motor - Model/Manufacturer	S108-35/Hitachi
- Output	0.5 kw
- Armature Coil Resistance	0.006Ω ± 10%
- Field Coil Resistance	0.003Ω ± 10%
- Brush - Overall Length	16 mm (0.630 in)
- Wear Limit	4 mm (0.157 in)
- Spring Pressure	800 g (28.2 oz)
- Commutator - Min Diameter	33 mm
- Mica Undercut	0.7 mm
Starter Switch Manufacturer	A104-70/Hitachi
- Amperage Rating	100A
- Coil Winding Resistance	3.5Ω ± 10%
Horn:	
Type/Quantity	Plain type
Model/Manufacturer	CF-12/Nikko
Maximum Amperage	2.5 ± 0.5A
Flasher Relay:	
Type	Condenser type
Model/Manufacturer	FU257CD/ND
Self-Cancelling Device	Yes
Flasher Frequency	85
Capacity	12V-27 x 2W + 3.4W

Headlight Relay/Starter Cut-off Relay Model/Manufacturer Coil Winding Resistance Color Code	 C2MW-1121T-100-YZ/Omron 100Ω ± 10% at 20°C
Sidestand Relay: Model/Manufacturer Coil Winding Resistance Color Code	 G2MW-1121T-100Y4/Omron 100Ω ± 10% at 20°C Blue
Circuit Breaker: Type Rating	 Fuse Main 20A-1 Headlight 10A-1 Signal 10A-1 Ignition 10A-1

TORQUE SPECIFICATIONS

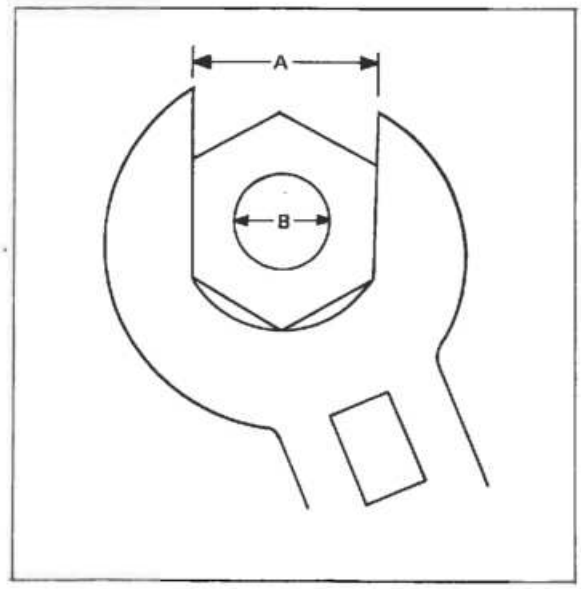
Part to be tightened	Thread dia. and part name	Tightening torque
Engine:		
Cylinder head and cylinder head cover	10 mm nut 8 mm bolt	36.3 Nm (3.7 m·kg, 27.0 ft·lb) 20.6 Nm (2.1 m·kg, 15.0 ft·lb)
Cylinder head	6 mm bolt	8.8 Nm (0.9 m·kg, 6.5 ft·lb)
Cylinder head cover side	6 mm crown nut 8 mm crown nut	8.8 Nm (0.9 m·kg, 6.5 ft·lb) 12.7 Nm (1.3 m·kg, 9.5 ft·lb)
Spark plug	14 mm	19.6 Nm (2.0 m·kg, 14.5 ft·lb)
Generator	12 mm nut	37.3 Nm (3.8 m·kg, 27.5 ft·lb)
Stator coil	6 mm pan head screw	8.8 Nm (0.9 m·kg, 6.5 ft·lb)
Governer	6 mm bolt	7.8 Nm (0.8 m·kg, 6.0 ft·lb)
Vlave clearance adjustment nut	8 mm nut	26.5 Nm (2.7 m·kg, 19.5 ft·lb)
Cam chain tensioner	18 mm cap	20.6 Nm (2.1 m·kg, 15.0 ft·lb)
Pump cover	6 mm pan head screw	9.8 Nm (1.0 m·kg, 7.2 ft·lb)
Strainer cover	6 mm bolt	9.8 Nm (1.0 m·kg, 7.2 ft·lb)
Drain plug	30 mm bolt	41.2 Nm (4.2 m·kg, 30.5 ft·lb)
Oil filter	6 mm bolt	8.8 Nm (0.9 m·kg, 6.5 ft·lb)
Delivery pipe	10 mm union bolt	20.6 Nm (2.1 m·kg, 15.0 ft·lb)
Exhaust pipe	8 mm nut	12.7 Nm (1.3 m·kg, 9.5 ft·lb)
Crankcase	8 mm bolt/nut	20.6 Nm (2.1 m·kg, 15.0 ft·lb)
Kick crank boss	8 mm bolt	19.6 Nm (2.0 m·kg, 14.5 ft·lb)
Primary drive gear	14 mm nut	88.3 Nm (9.0 m·kg, 65.0 ft·lb)
Clutch boss	18 mm nut	78.5 Nm (8.0 m·kg, 58.0 ft·lb)
Drive sprocket	22 mm nut	63.7 Nm (6.5 m·kg, 47.0 ft·lb)
Change pedal	6 mm bolt	9.8 Nm (1.0 m·kg, 7.2 ft·lb)
Chassis:		
Front wheel axle	14 mm nut	105 Nm (10.7 m·kg, 77.5 ft·lb)
Front fork and axle holder	8 mm nut	13.7 Nm (1.4 m·kg, 10.0 ft·lb)
Handle crown and inner tube	8 mm nut	9.8 Nm (1.0 m·kg, 8.0 ft·lb)
Handle crown and steering shaft	8 mm nut	9.8 Nm (1.0 m·kg, 8.0 ft·lb)
Handle crown and steering shaft	14 mm bolt	53 Nm (5.4 m·kg, 39.0 ft·lb)
Handle crown and handlebar holder	8 mm bolt	17.7 Nm (1.8 m·kg, 13.0 ft·lb)
Under bracket and inner tube	8 mm nut	19.6 Nm (2.0 m·kg, 14.5 ft·lb)
Engine mounting Upper	8 mm nut	17.7 Nm (1.8 m·kg, 13.0 ft·lb)
Engine mounting Upper	10 mm nut	29.4 Nm (3.0 m·kg, 21.5 ft·lb)
Engine mounting Front	10 mm nut	45.1 Nm (4.6 m·kg, 33.5 ft·lb)
Engine mounting Rear	10 mm nut	40.2 Nm (4.1 m·kg, 29.5 ft·lb)
Engine mounting Rear-Lower	10 mm nut	45.1 Nm (4.6 m·kg, 33.5 ft·lb)
Engine mounting Lower	10 mm nut	88.3 Nm (9.0 m·kg, 65.0 ft·lb)
Front flasher and headlight	8 mm nut	9.8 Nm (1.0 m·kg, 7.2 ft·lb)
Master cylinder and brake hose	10 mm union bolt	25.5 Nm (2.6 m·kg, 19.0 ft·lb)

Part to be tightened	Thread dia. and part name	Tightening torque
Brake disc and hub	8 mm bolt	19.6 Nm (2.0 m·kg, 14.5 ft·lb)
Caliper and support bracket	8 mm bolt	17.7 Nm (1.8 m·kg, 13.0 ft·lb)
Caliper and pad	5 mm bolt	2.9 Nm (0.3 m·kg, 2.2 ft·lb)
Caliper and bleed screw	8 mm bolt	5.9 Nm (0.6 m·kg, 4.5 ft·lb)
Front caliper and front fork	10 mm bolt	34.3 Nm (3.5 m·kg, 25.5 ft·lb)
Master cylinder and cylinder bracket	6 mm bolt	5.9 Nm (0.6 m·kg, 4.5 ft·lb)
Pivot shaft	14 mm nut	63.7 Nm (6.5 m·kg, 47.0 ft·lb)
Rear wheel axle	16 mm nut	147 Nm (15.0 m·kg, 108.5 ft·lb)
Tension bar and brake caliper (plate)	8 mm nut	17.7 Nm (1.8 m·kg, 13.0 ft·lb)
Tension bar and rear arm	8 mm nut	31.4 Nm (3.2 m·kg, 23.0 ft·lb)
Rear shock absorber Upper	10 mm bolt	29.4 Nm (3.0 m·kg, 21.5 ft·)
Rear shock absorber Lower	10 mm bolt	38.2 Nm (3.9 m·kg, 28.0 ft·lb)
Rear arm and rear arm end	8 mm bolt	9.8 Nm (1.0 m·kg, 7.2 ft·lb)
Front fender	8 mm bolt	9.8 Nm (1.0 m·kg, 7.2 ft·lb)
Neutral switch	12 mm	12.7 Nm (1.3 m·kg, 9.5 ft·lb)

General Torque Specifications

This chart specifies torque for standard fasteners with standard I.S.O. pitch threads. Torque specifications for special components or assemblies are included in the applicable sections of this book. To avoid warpage, tighten multi-fastener assemblies in a criss-cross fashion, in progressive stages, until full torque is reached. Unless otherwise specified, torque specifications call for clean, dry threads. Components should be at room temperature.

A (Nut)	B (Bolt)	Standard tightening torque		
		Nm	m·kg	ft·lb
10 mm	6 mm	5.9	0.6	4.5
12 mm	8 mm	14.7	1.5	11
14 mm	10 mm	29.4	3.0	22
17 mm	12 mm	53.9	5.5	40
19 mm	14 mm	83.4	8.5	61
22 mm	16 mm	127.5	13.0	94



CONSUMER INFORMATION

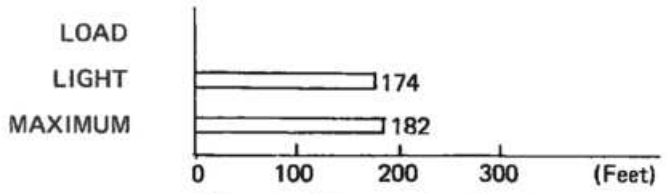
NOTICE

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



Using the fully operational service brake system, at lightly loaded and maximum loaded vehicle weight.

DEFINITION OF UNITS:

Unit	Read	Definition	Measure
mm cm	millimeter centimeter	10^{-3} meter 10^{-2} meter	Length Length
kg	kilogram	10^{3} gram	Weight
N	Newton	1 kg x m/sec^2	Force
N.m m.kg	Newton meter Meter kilogram	N x m m x kg	Torque Torque
Pa N/mm	Pascal Newton per millimeter	N/m^2 N/mm	Pressure Spring rate
L cm	Liter Cubic centimeter	—	Volume or or Capacity
r/min	Rotation per minute	—	Engine speed

COLOR CODES

Dg	: Dark green	Br	: Brown	L/W	: Blue/White
Ch	: Chocolate	O	: Orange	Br/W	: Brown/White
B	: Black	L	: Blue	Y/G	: Yellow/Green
Y	: Yellow	P	: Pink	B/W	: Black/White
Lg	: Light green	L/B	: Blue/Black	W/G	: White/Green
G	: Green	R/W	: Red/White	W/R	: White/Red
W	: White	R/Y	: Red/Yellow	G/Y	: Green/Yellow
Sb	: Sky blue	L/Y	: Blue/Yellow	Y/R	: Yellow/Red
R	: Red	L/G	: Blue/Green	Y/B	: Yellow/Black

CONVERSION TABLE

DEFINITION OF TERMS:

Unit	Read	Definition	Measure
mm cm	millimeter centimeter	10^{-3} meter 10^{-2} meter	Length Length
kg	kilogram	10^{3} gram	Weight
N	Newton	1 kg x m/sec^2	Force
Nm m-kg	Newton meter Meter kilogram	N x m m x kg	Torque Torque
Pa N/mm	Pascal Newton per millimeter	N/m^2 N/mm	Pressure Spring rate
L cm	Liter Cubic centimeter	—	Volume or Capacity
r/min	Rotation per minute	—	Engine Speed

FORCE

	N	kgf	lb
1 N	1	0.1020	0.2248
1 kgf	9.807	1	2.205
1 lb	4.448	0.4536	1

TORQUE

	N m	m.kg	ft.lb
1 Nm	1	0.1020	0.7375
1 m-kg	9.807	1	7.233
1 ft-lb	1.356	0.1383	1

LENGTH

	mm	cm	m	in	ft
1 mm	1	0.1	0.001	0.03937	0.003281
1 cm	10	1	0.01	0.39 37	0.03281
1 m	1000	100	1	39.37	3.281
1in	25.40	2.54	0.02540	1	0.08333
1 ft	304.8	30.48	0.3048	12.00	1

SPRING RATE

	N/mm	kg/mm	lb/in
1 N/mm	1	0.1020	5.708
1 kg/mm	9.807	1	55.98
1 lb/in	0.1752	0.01786	1

WEIGHT

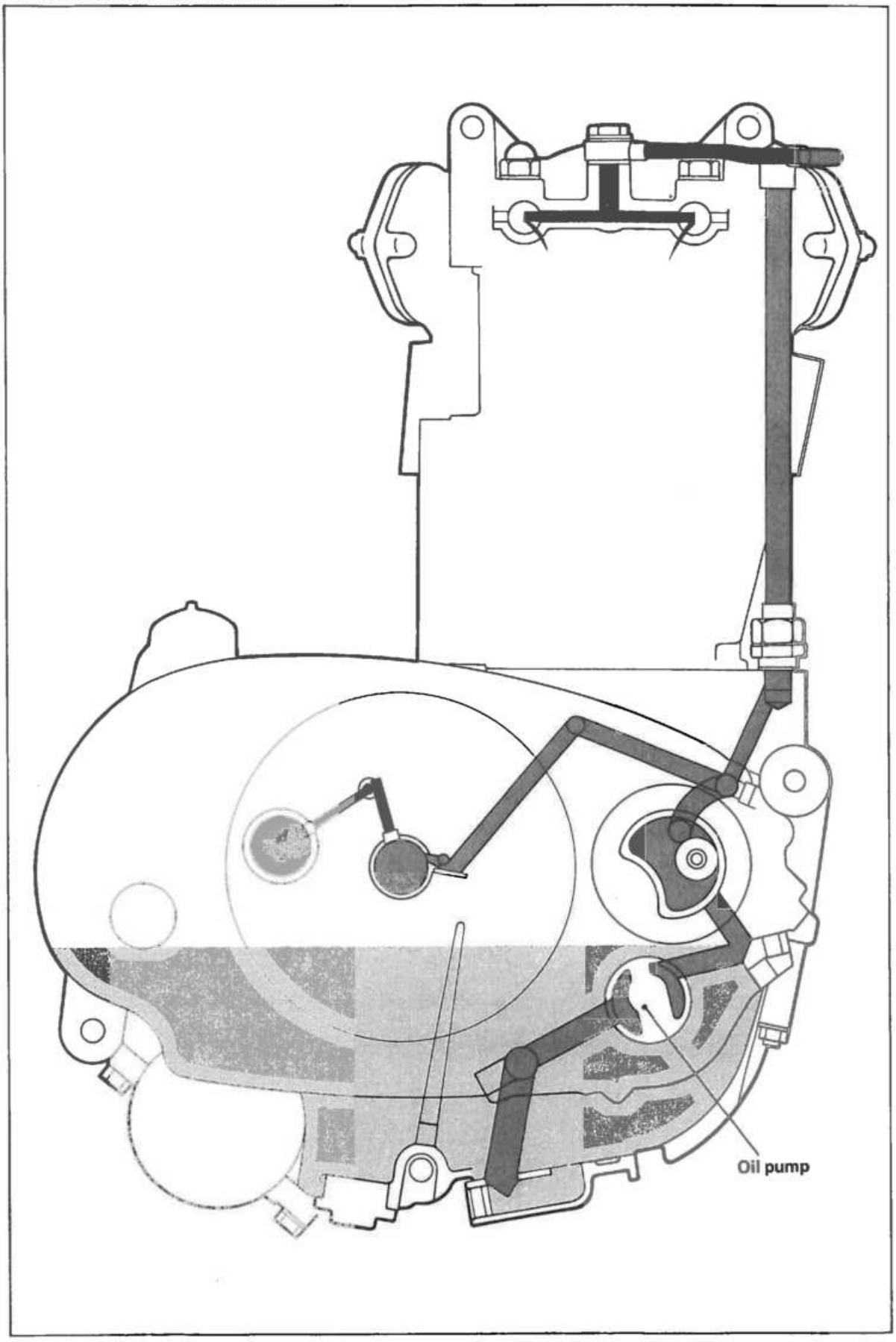
	kg	g	lb	oz
1 kg	1	1000	2.205	35.27
1 g	0.001	1	0.002205	0.03527
1 lb	0.4535	453.5	1	16.00
1 oz	0.02833	28.33	0.0625	1

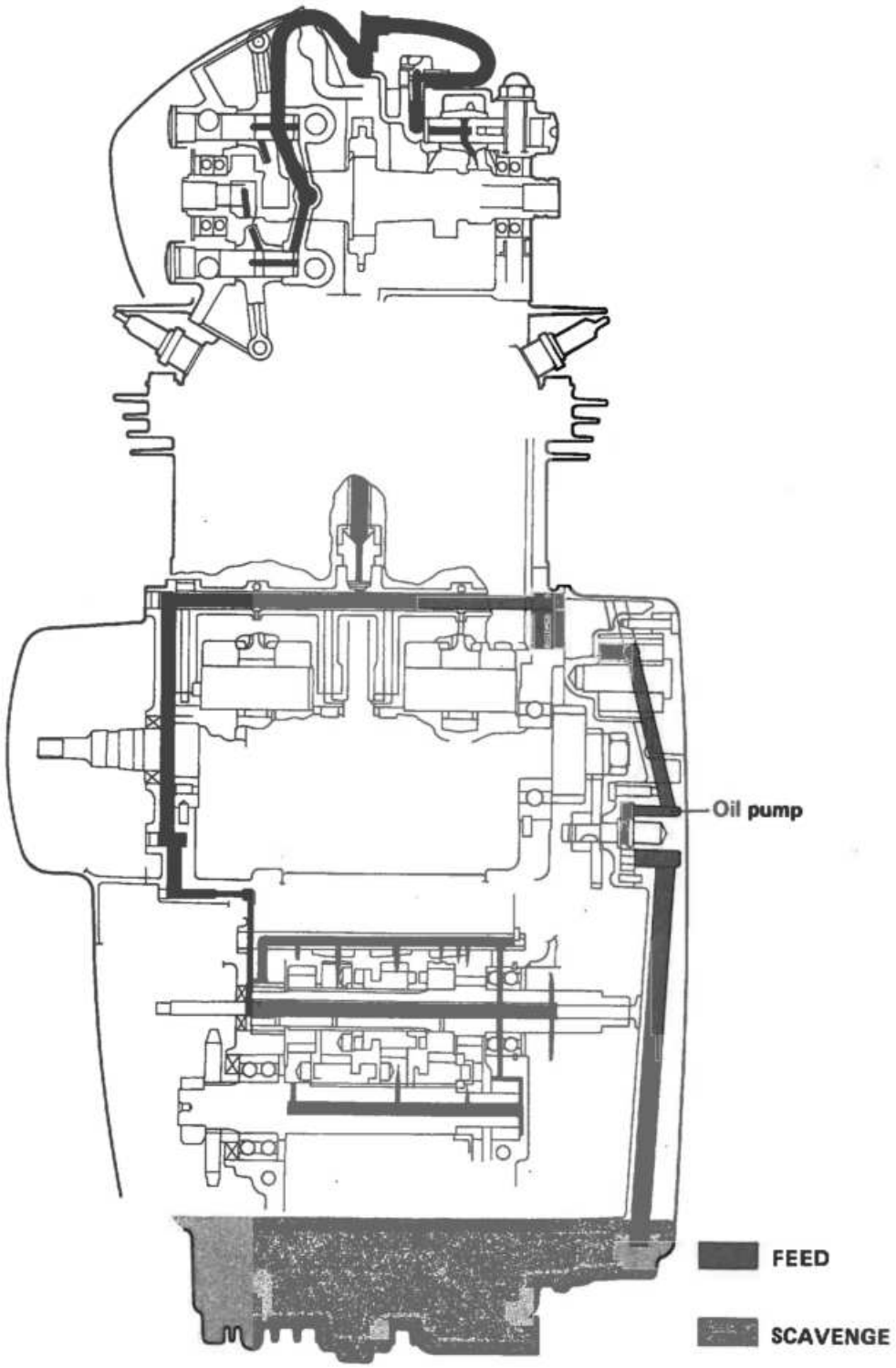
PRESSURE

	kpa	kg/cm^2	psi	mmHg	inHg
1 kpa	1	0.01020	0.1450	7.502	0.2955
1 kg/cm^2	98.07	1	14.22	735.7	28.97
1 psi	6.897	0.07033	1	51.74	2.037
1 mmHg	0.1333	0.001360	0.01933	1	0.03937
1 in Hg	3.386	0.03454	0.4910	25.40	1

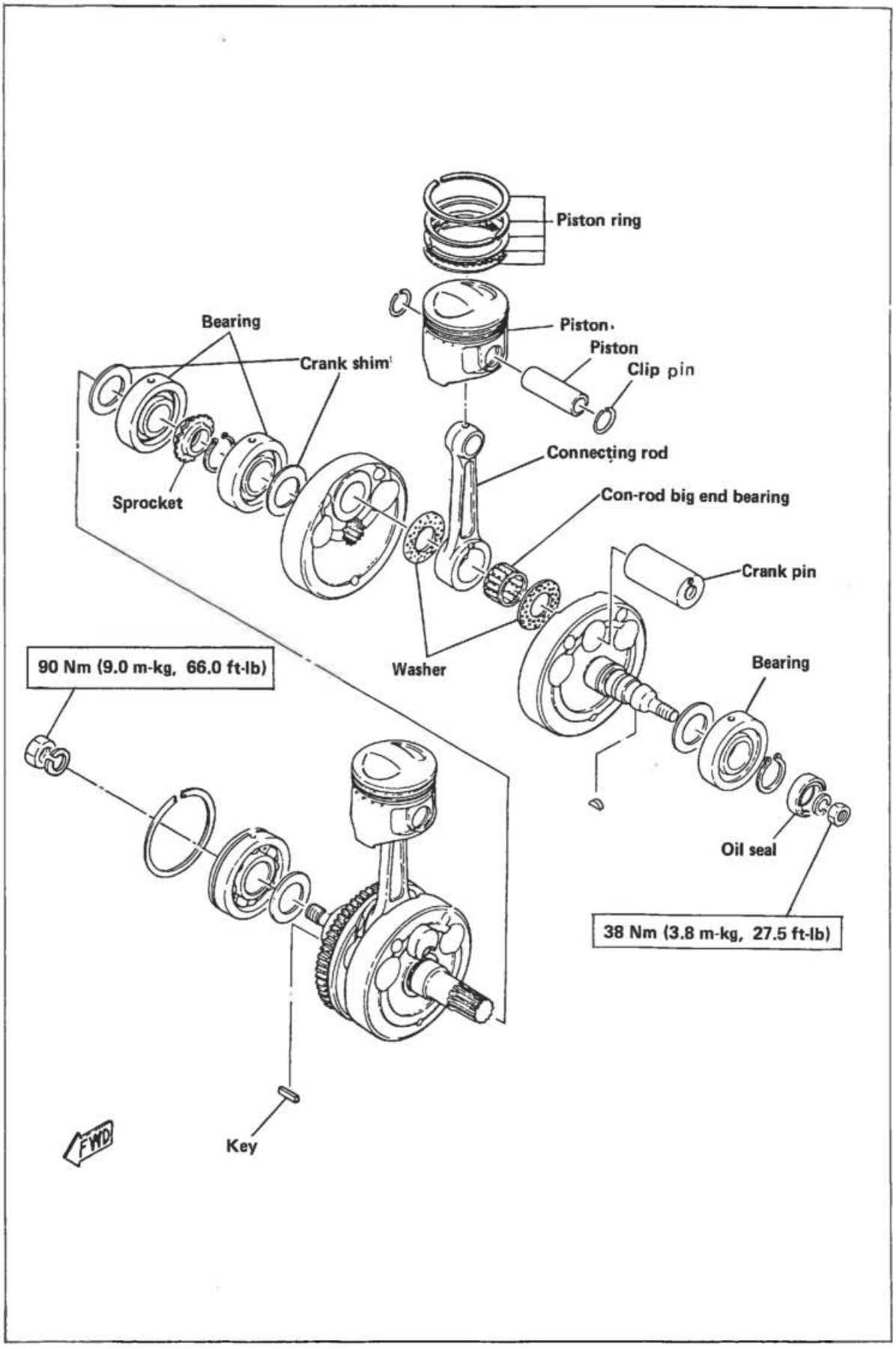
VOLUME OR CAPACITY

	cm^3	L	Cu.in	US oz	Imp oz	US gal	Imp gal
1 cm^3	1	0.001	0.06102	0.03381	0.03527	0.0002642	0.0002200
1 L	10000	1	61.02	33.81	35.27	0.2642	0.2200
1 cu in	16.39	0.01639	1	0.5545	5.784	0.004333	0.003608
1 US oz	29.57	0.02957	1.804	1	10.44	0.007817	0.006509
1 Imp oz	28.35	0.02835	1.730	0.959	1	0.007494	0.006240
1 US gal	3785	3.785	231.0	128.0	135.5	1	0.8331
1 Imp gal	4545	4.545	277.4	153.7	160.3	1.201	1

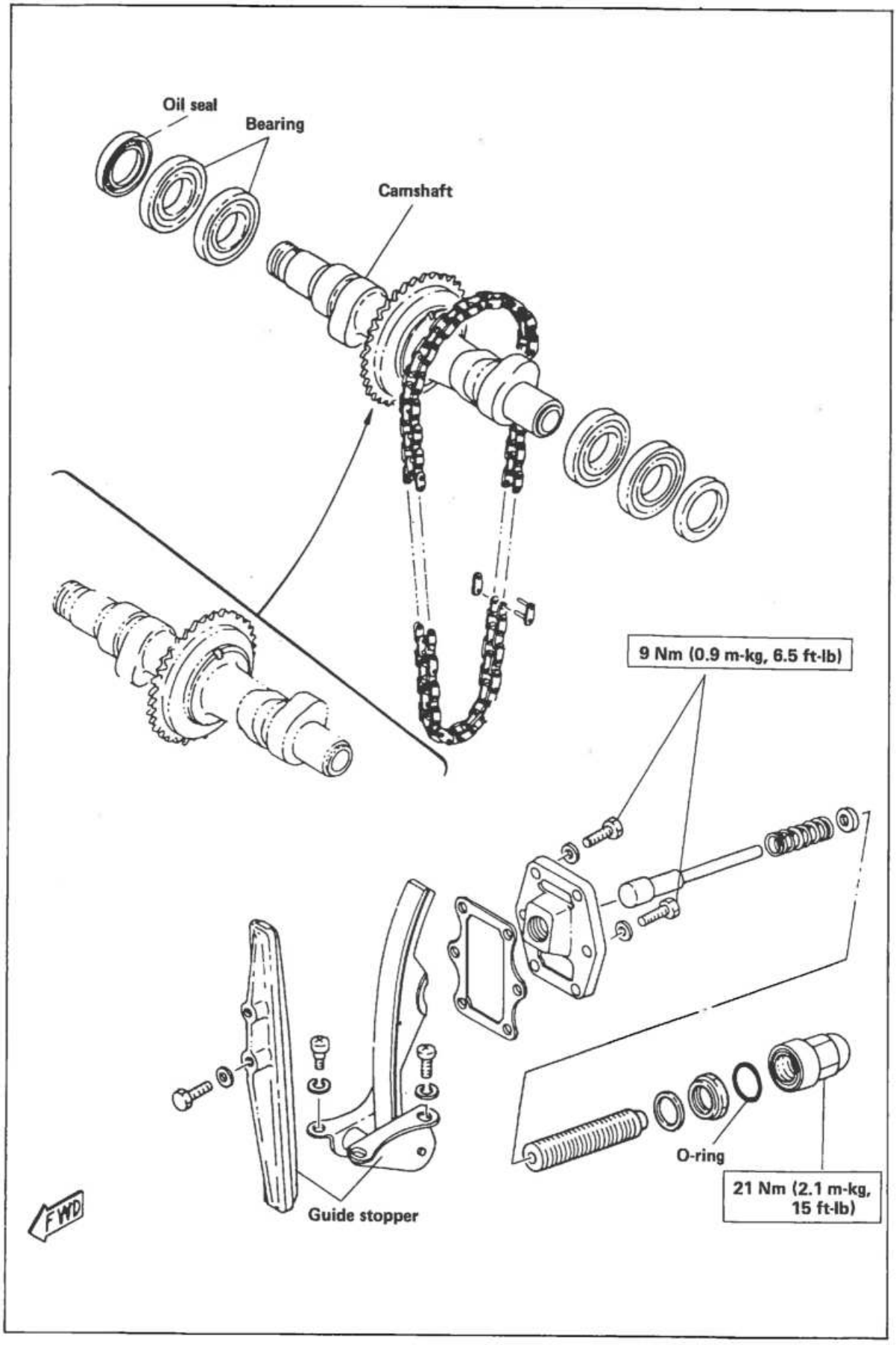

Oil pump


Oil pump
FEED
SCAVENGE

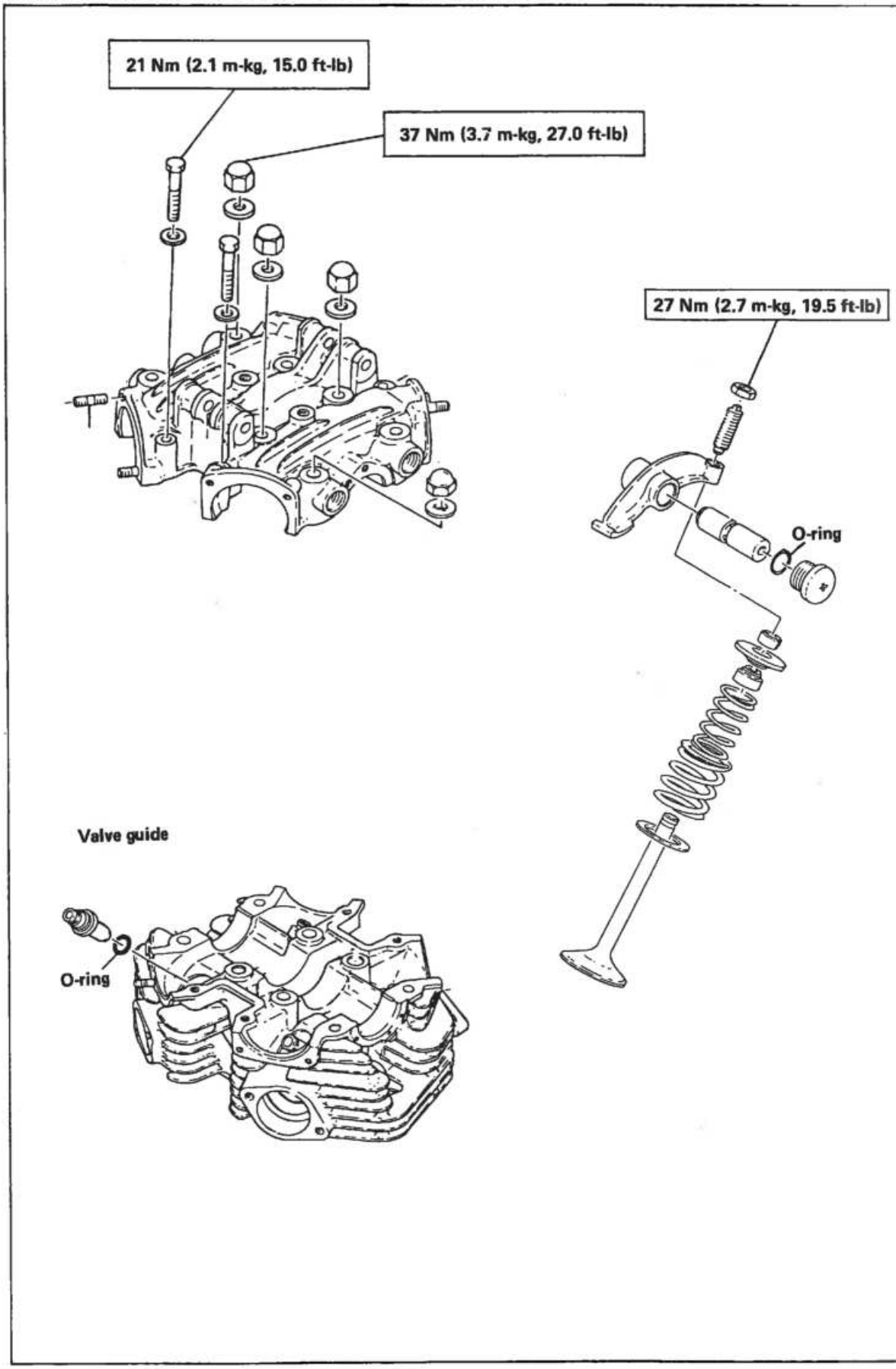
CRANKSHAFT CONNECTING ROD/PISTON

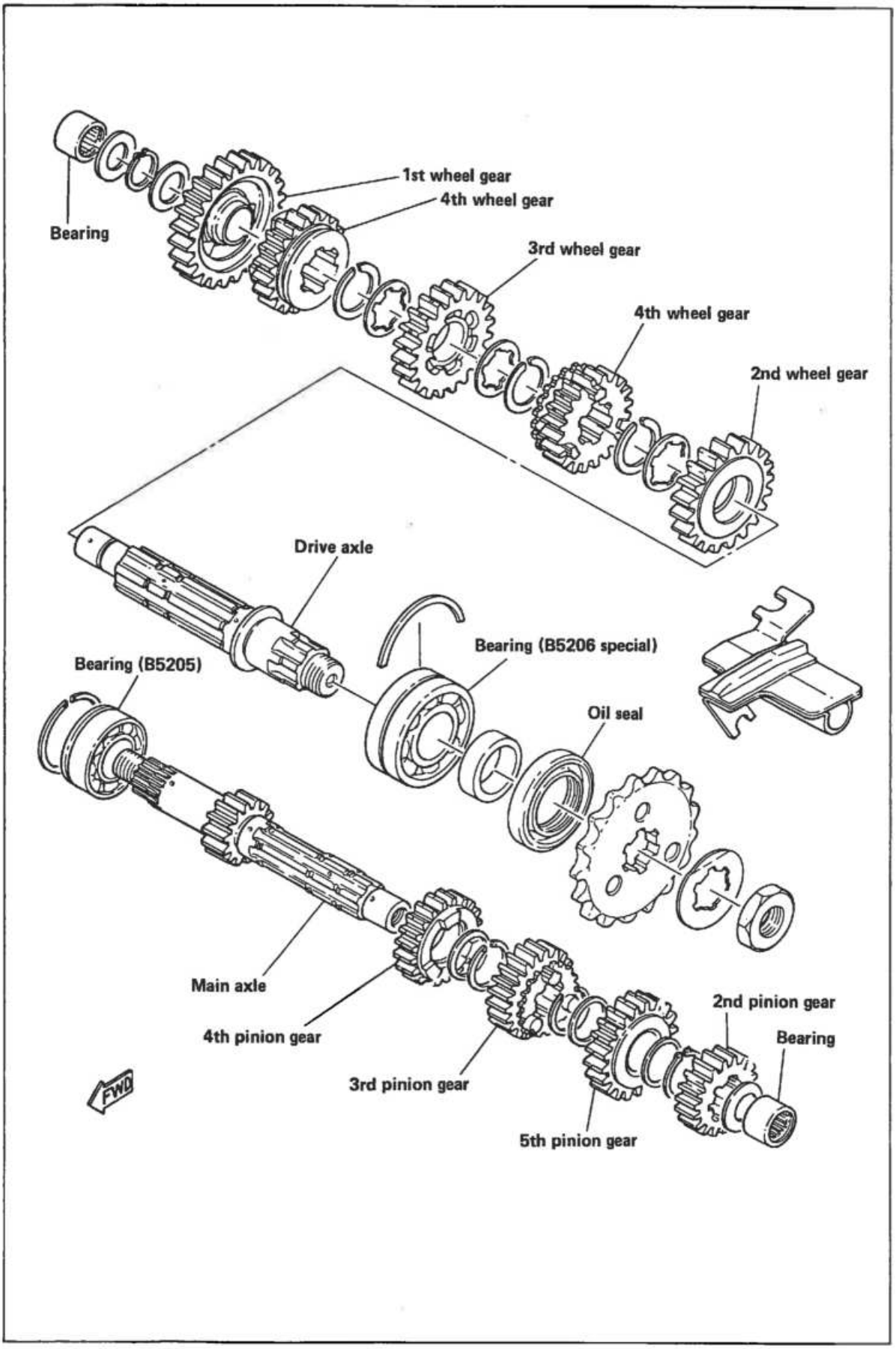


CAM CHAIN

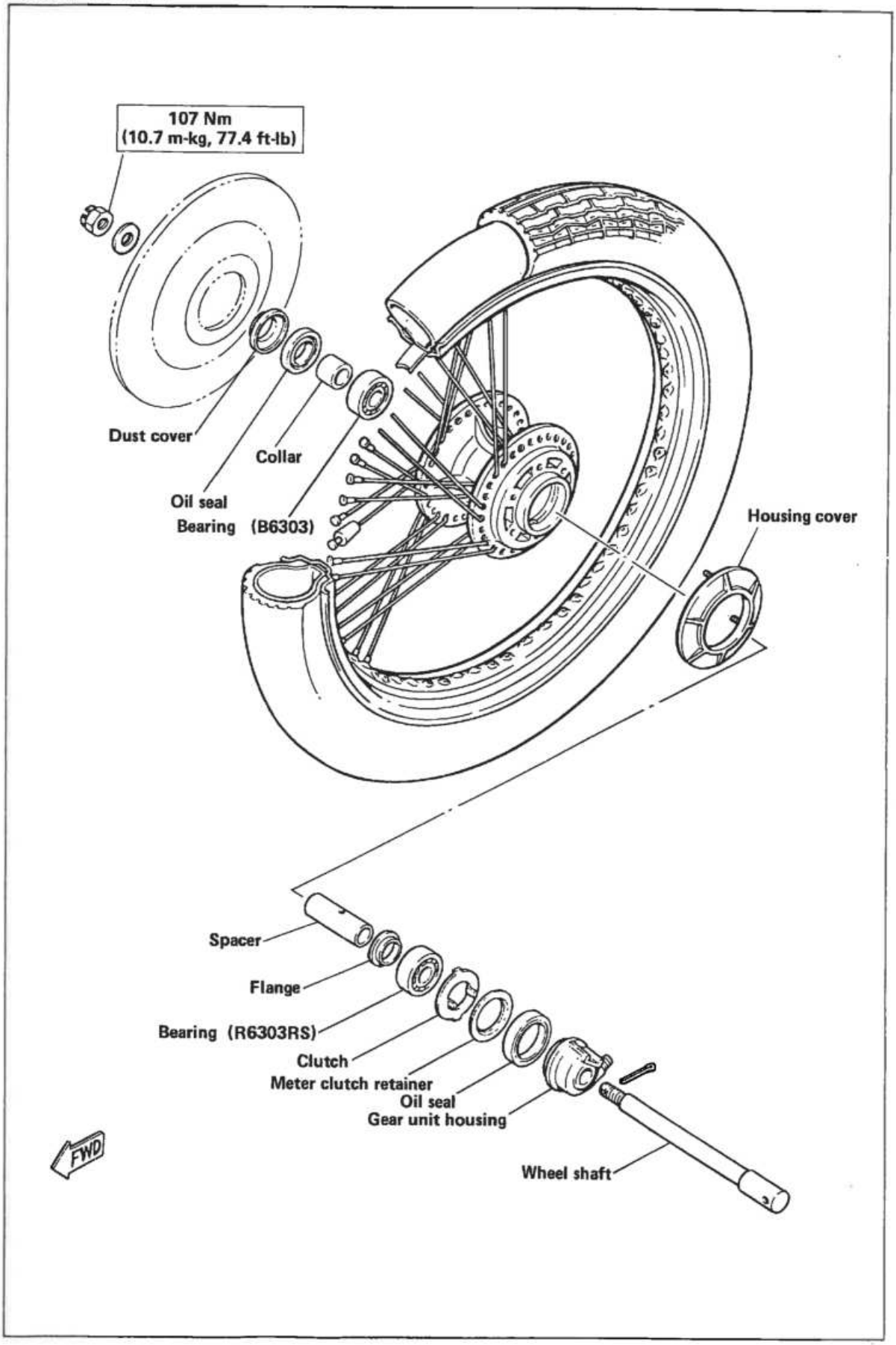

Oil seal
Bearing
Camshaft
9 Nm (0.9 m-kg, 6.5 ft-lb)
O-ring
21 Nm (2.1 m-kg, 15 ft-lb)
Guide stopper
FWD

CYLINDER HEAD COVER/CYLINDER HEAD/VALVE

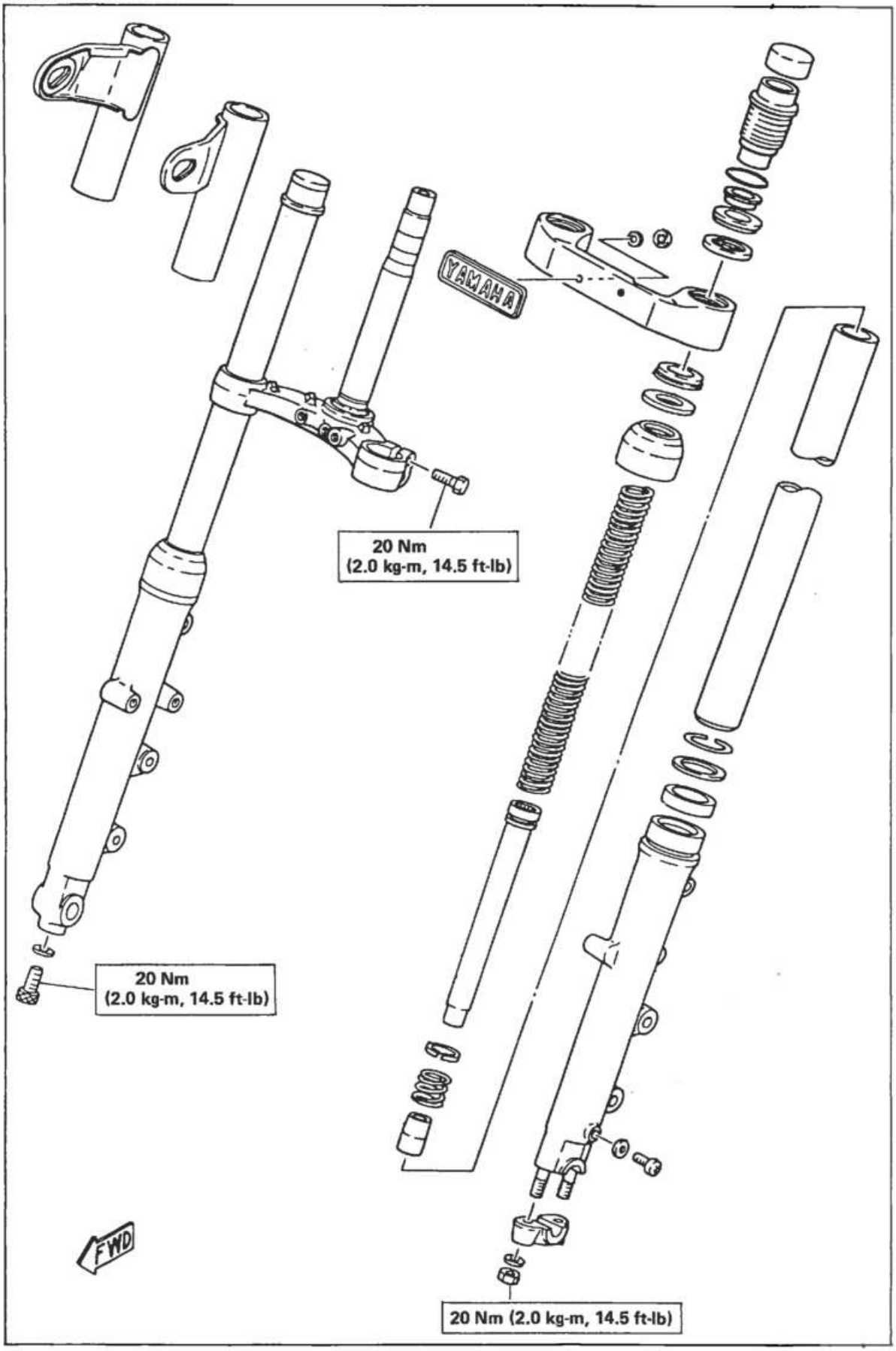



Bearing
1st wheel gear
4th wheel gear
3rd wheel gear
4th wheel gear
2nd wheel gear
Drive axle
Bearing (B5206 special)
Bearing (B5205)
Oil seal
Main axle
4th pinion gear
3rd pinion gear
2nd pinion gear
Bearing
5th pinion gear
FWD

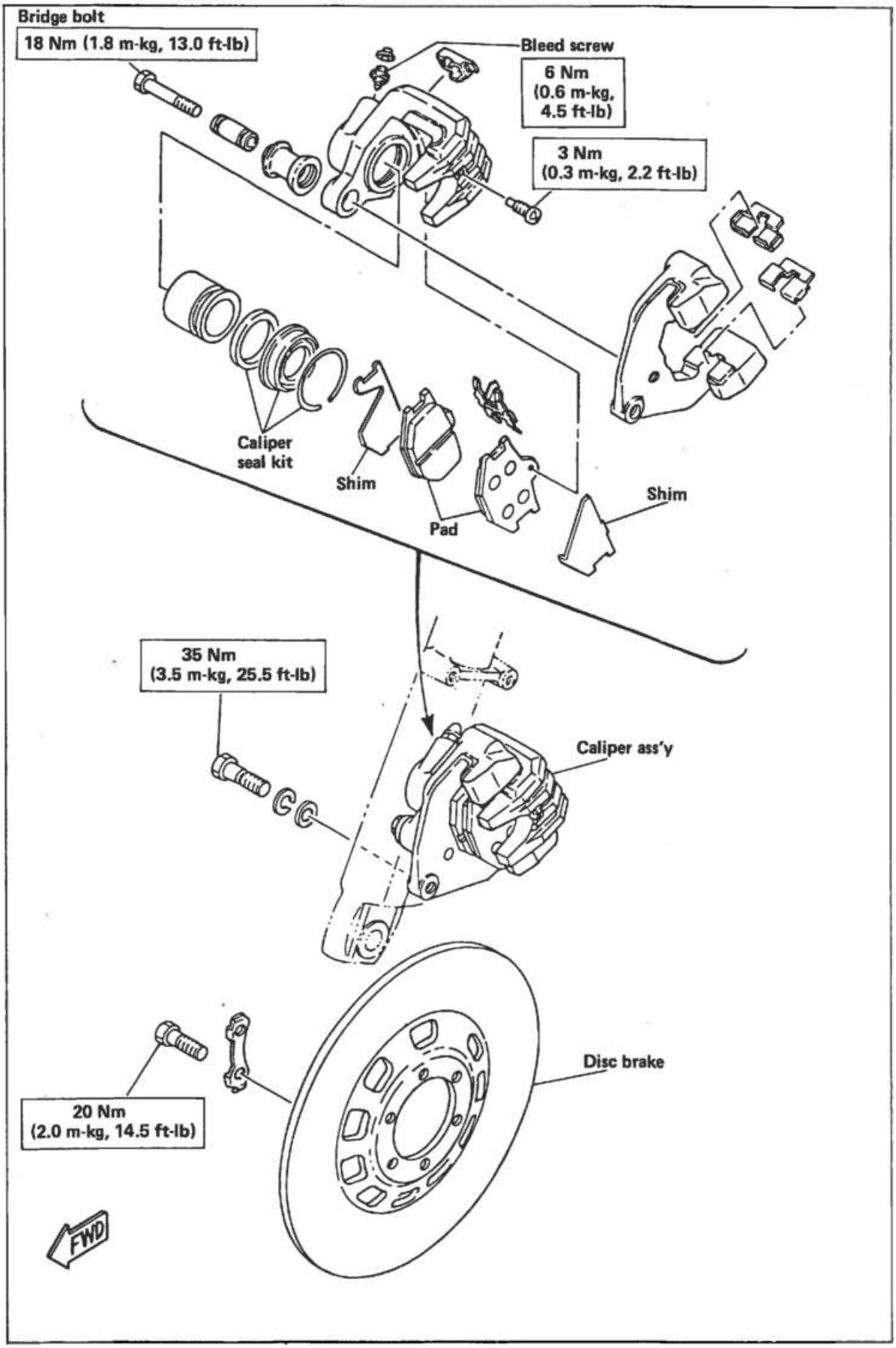
FRONT WHEEL


107 Nm
(10.7 m-kg, 77.4 ft-lb)
Dust cover
Collar
Oil seal
Bearing (B6303)
Housing cover
Spacer
Flange
Bearing (R6303RS)
Clutch
Meter clutch retainer
Oil seal
Gear unit housing
Wheel shaft
FWD

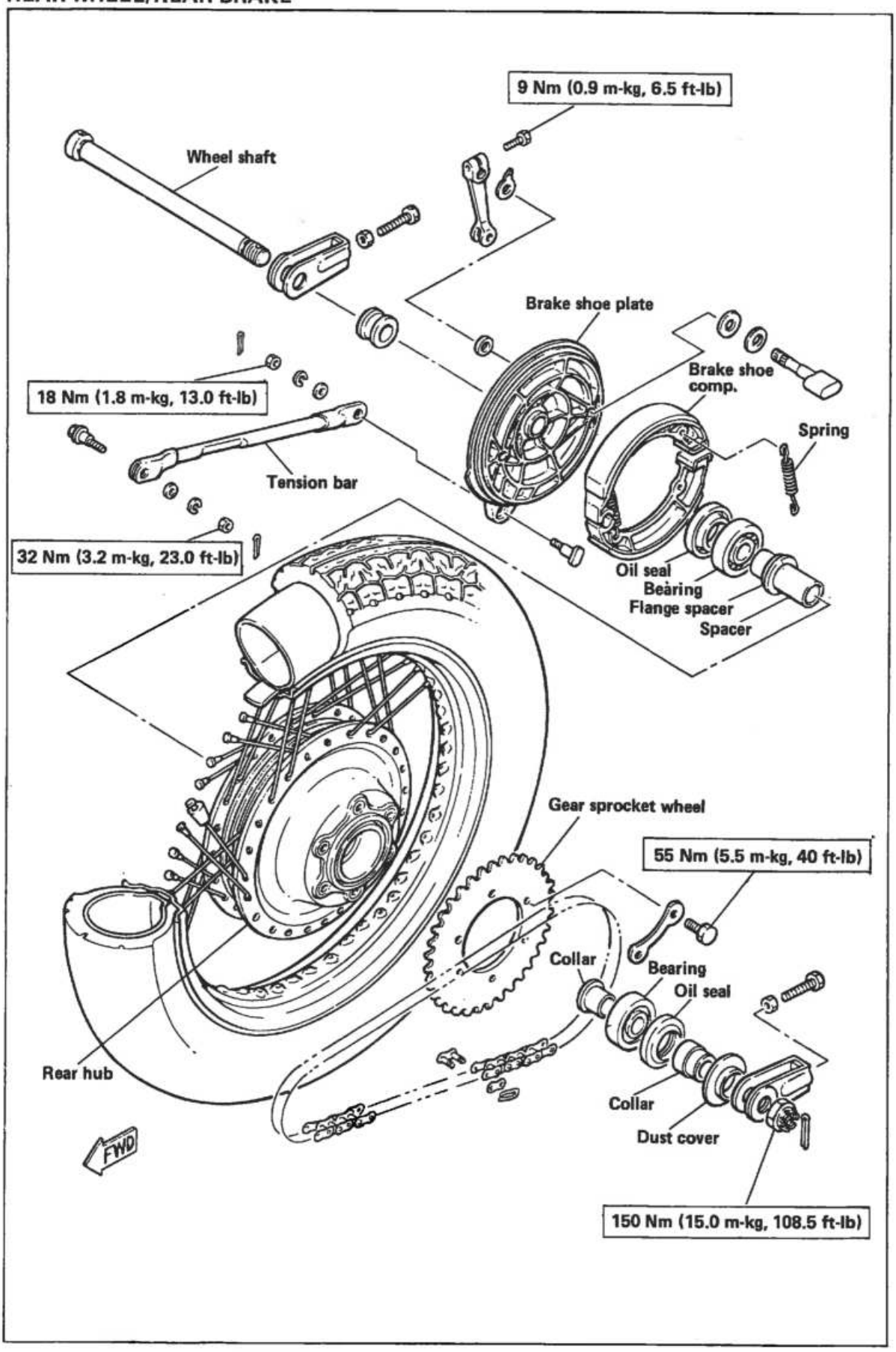
FRONT FORK


YAMAHA
20 Nm
(2.0 kg-m, 14.5 ft-lb)
20 Nm
(2.0 kg-m, 14.5 ft-lb)
FWD
20 Nm (2.0 kg-m, 14.5 ft-lb)

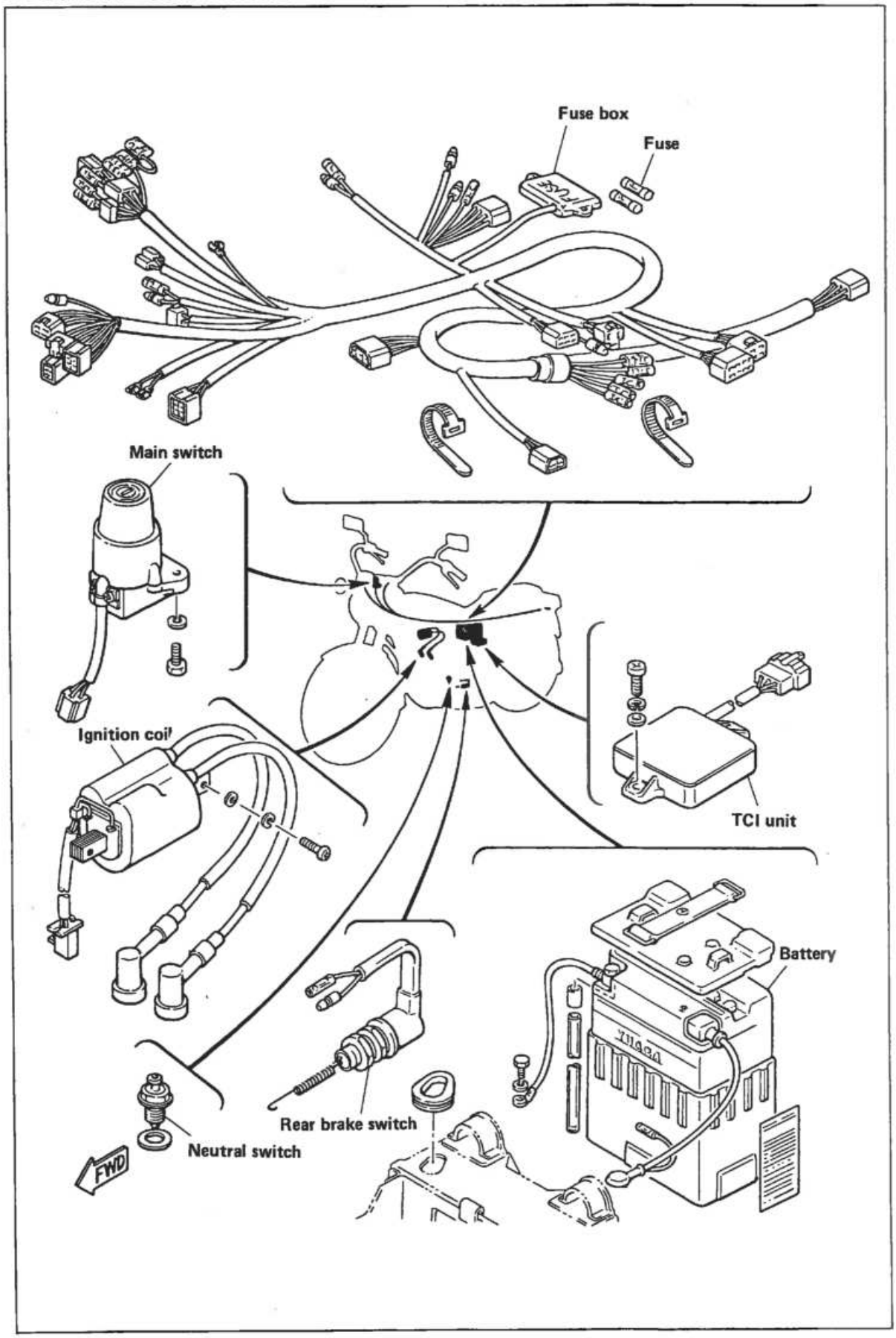
FRONT BRAKE CALIPER



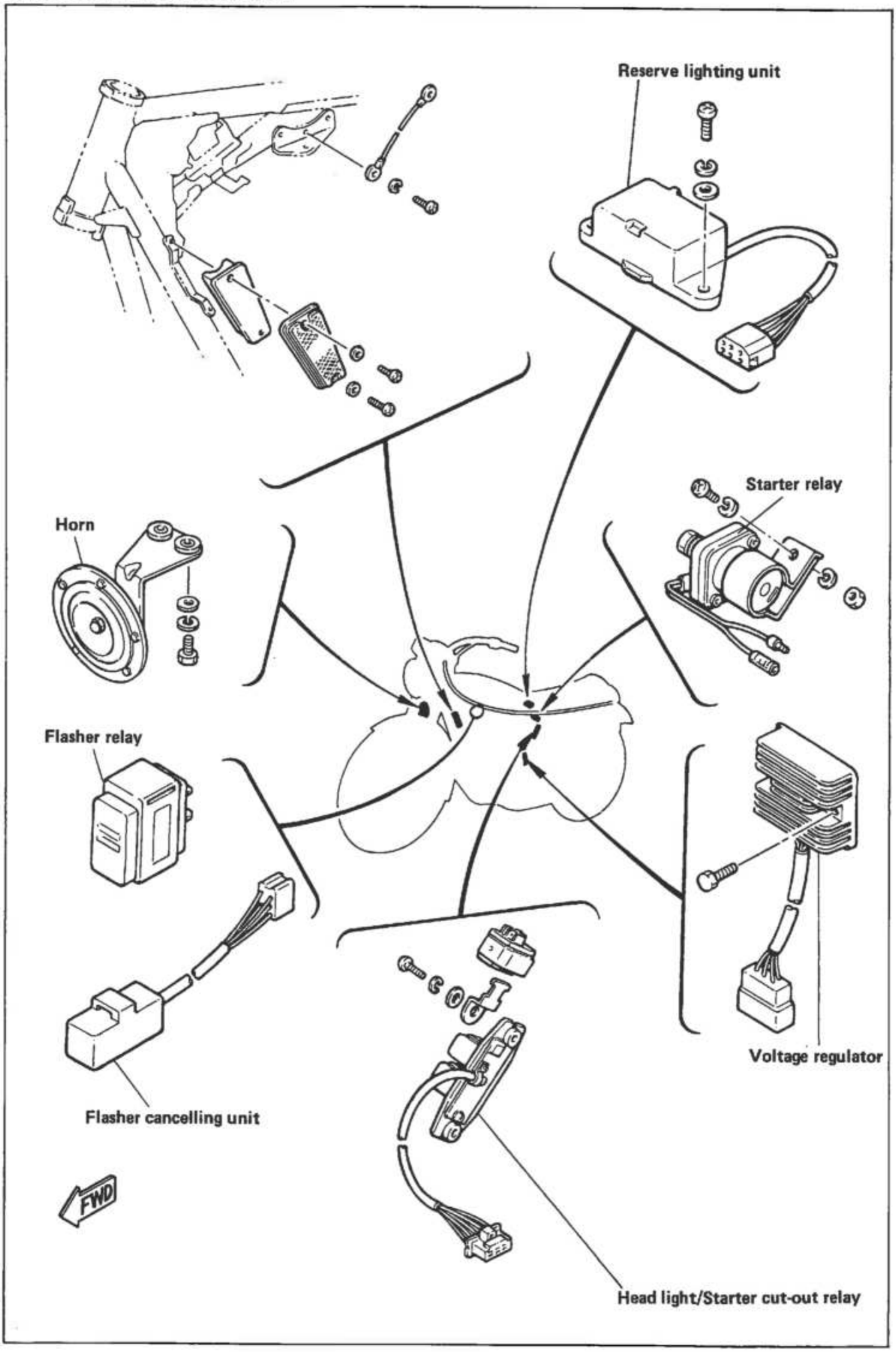
REAR WHEEL/REAR BRAKE



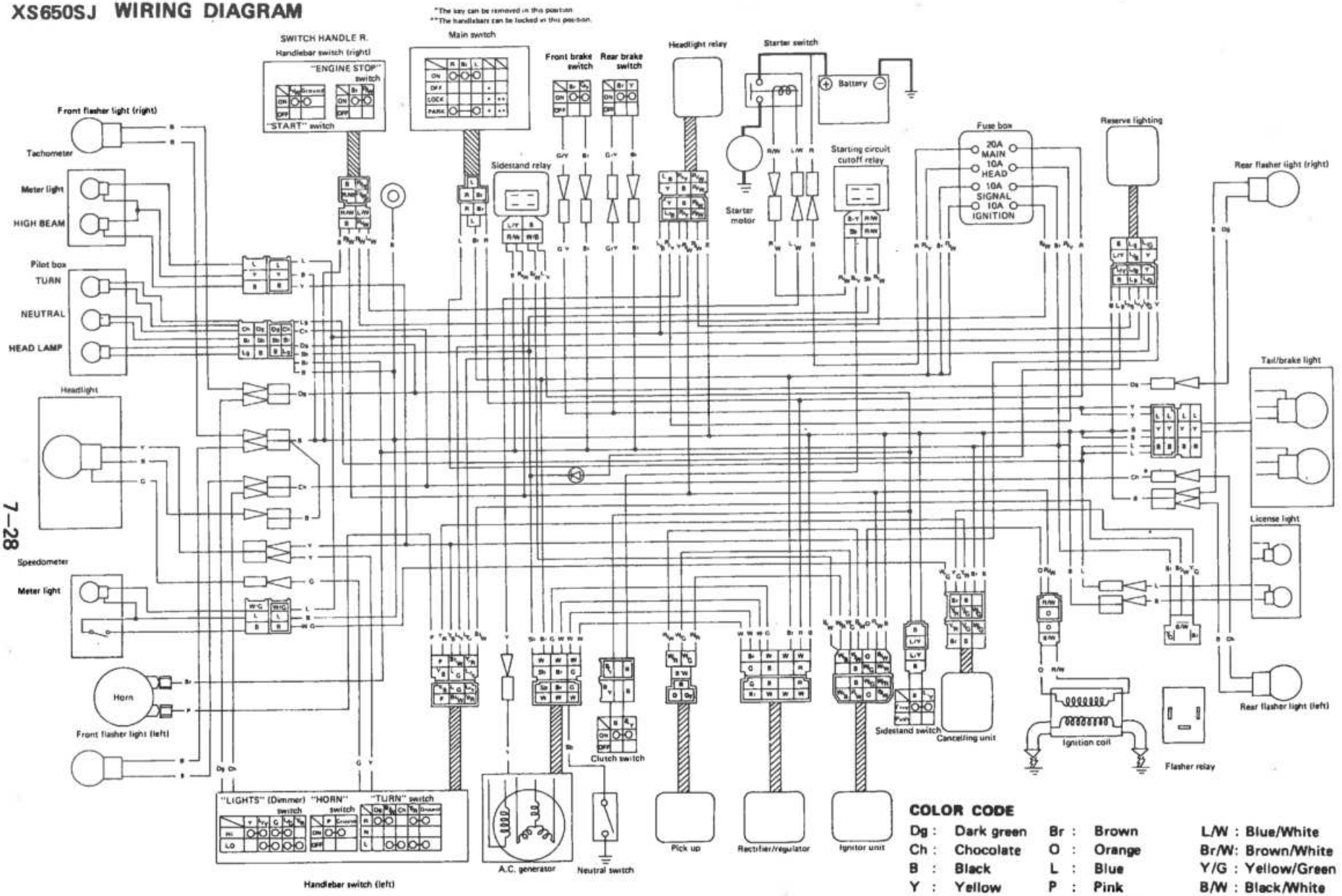
ELECTRICAL COMPONENTS



ELECTRICAL COMPONENTS



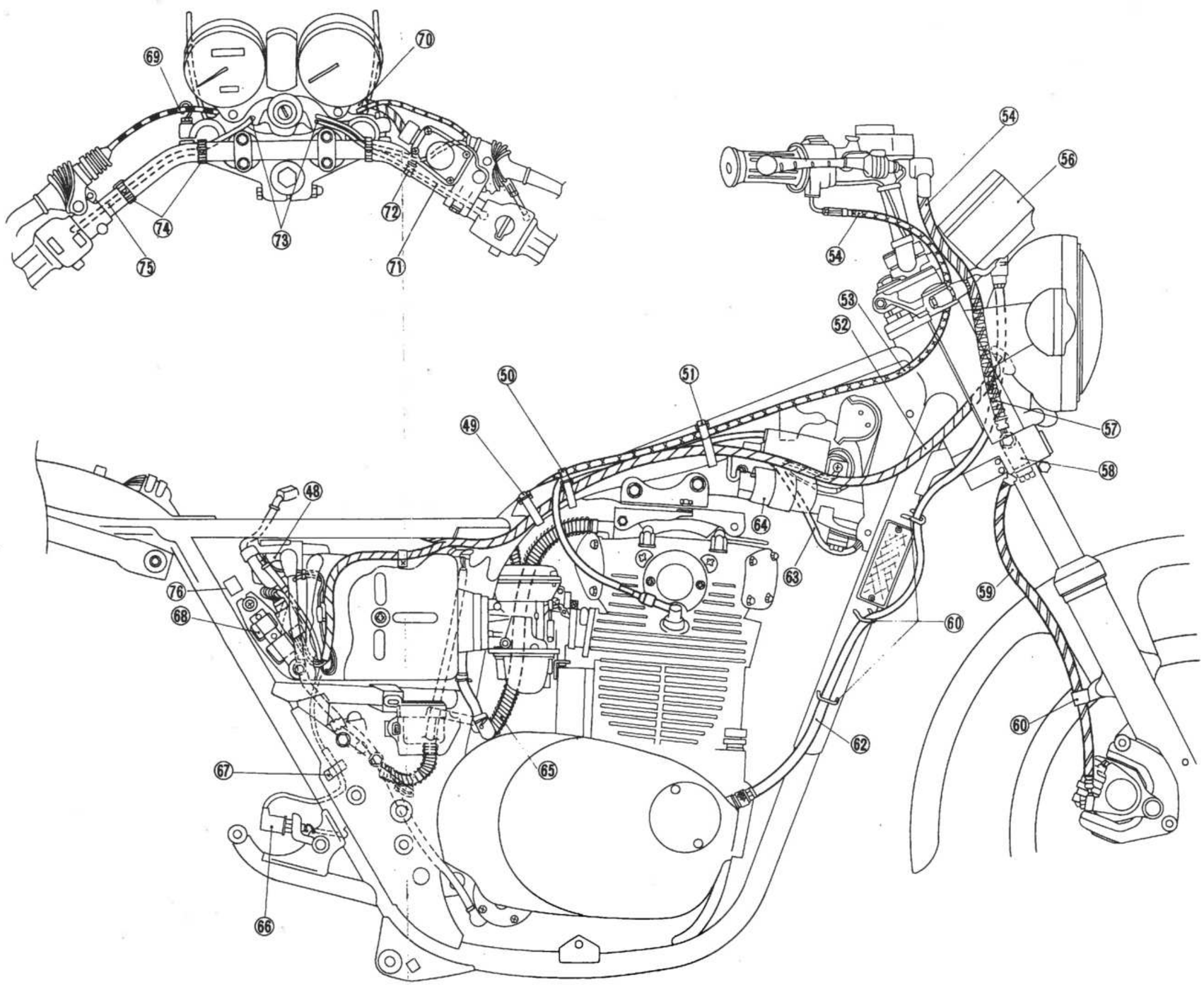
XS650SJ WIRING DIAGRAM



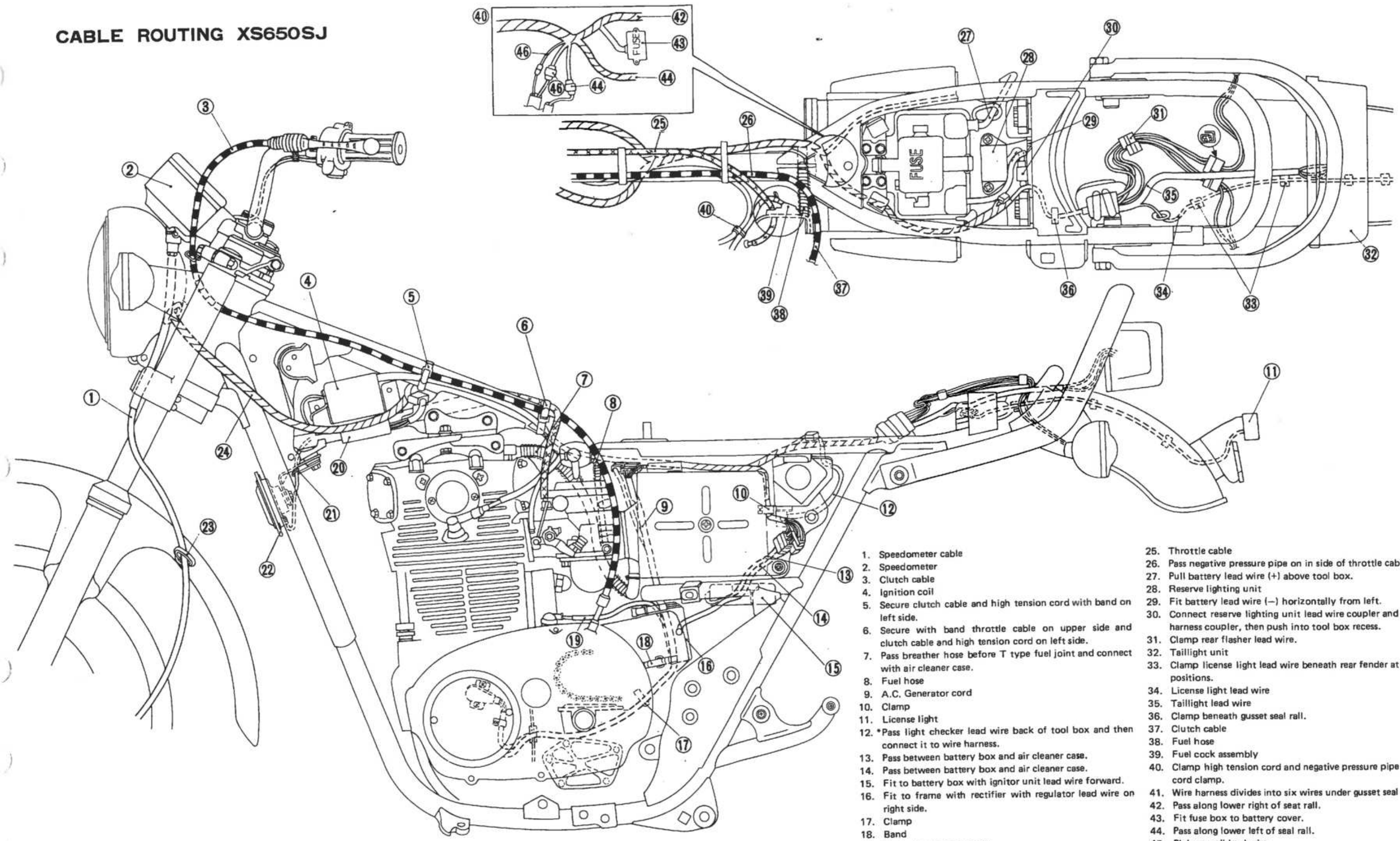
COLOR CODE

Dg :	Dark green	Br :	Brown	L/W :	Blue/White
Ch :	Chocolate	O :	Orange	Br/W :	Brown/White
B :	Black	L :	Blue	Y/G :	Yellow/Green
Y :	Yellow	P :	Pink	B/W :	Black/White
G :	Green	L/B :	Blue/Black	W/G :	White/Green
W :	White	R/W :	Red/White	G/Y :	Green/Yellow
Sb :	Sky blue	R/Y :	Red/Yellow	Y/R :	Yellow/Red
R :	Red	L/Y :	Blue/Yellow	B/Y :	Black/Yellow
Gy :	Gray	B/R :	Black/Red		

48. Starter switch
49. Secure wire harness with band.
50. Secure with band throttle cable on upper side and wire harness and high tension cord on right side.
51. Secure flasher relay lead wire, ground lead wire, throttle cable, high tension cord, wire harness and ignition coil lead wire with band on right side.
52. Pass wire harness (right) under fuel tank fitting bracket (right).
53. Pass throttle cable upper fuel tank fitting bracket (right).
54. Throttle cable
55. Brake hose
56. Tachometer
57. Pass brake hose between light stay and tachometer cable.
58. Joint
59. Brake hose
60. Clamp
61. Pass tachometer cable through three cable holders.
62. Tachometer cable
63. Horn lead wire
64. Flasher relay
65. Breather pipe
66. Rear brake switch
67. Rear brake switch lead wire clamp
68. Head Light/Stator Cut Out Relay
69. Pass first through cable holder and then between light stay and meter bracket.
70. Pass between light stay and meter bracket.
71. Handlebar switch (right) lead wire.
72. Band
73. Pass between main switch and meter bracket.
74. Band
75. Handlebar switch (left) lead wire
76. Starting Circuit Cut-off Relay



CABLE ROUTING XS650SJ



1. Speedometer cable
2. Speedometer
3. Clutch cable
4. Ignition coil
5. Secure clutch cable and high tension cord with band on left side.
6. Secure with band throttle cable on upper side and clutch cable and high tension cord on left side.
7. Pass breather hose before T type fuel joint and connect with air cleaner case.
8. Fuel hose
9. A.C. Generator cord
10. Clamp
11. License light
12. *Pass light checker lead wire back of tool box and then connect it to wire harness.
13. Pass between battery box and air cleaner case.
14. Pass between battery box and air cleaner case.
15. Fit to battery box with ignitor unit lead wire forward.
16. Fit to frame with rectifier with regulator lead wire on right side.
17. Clamp
18. Band
19. Neutral switch lead wire
20. Flasher cancelling unit
21. Clamp horn lead wire
22. Horn
23. Through cable holder.
24. Pass wire harness (left) under fuel tank fitting bracket (left).
25. Throttle cable
26. Pass negative pressure pipe on in side of throttle cable.
27. Pull battery lead wire (+) above tool box.
28. Reserve lighting unit
29. Fit battery lead wire (—) horizontally from left.
30. Connect reserve lighting unit lead wire coupler and wire harness coupler, then push into tool box recess.
31. Clamp rear flasher lead wire.
32. Taillight unit
33. Clamp license light lead wire beneath rear fender at fourr positions.
34. License light lead wire
35. Taillight lead wire
36. Clamp beneath gusset seal rall.
37. Clutch cable
38. Fuel hose
39. Fuel cock assembly
40. Clamp high tension cord and negative pressure pipe with cord clamp.
41. Wire harness divides into six wires under gusset seal rall.
42. Pass along lower right of seat rall.
43. Fit fuse box to battery cover.
44. Pass along lower left of seal rall.
45. Pick-up coil lead wire
46. A.C. Generator lead wire
47. Yellow