YAMAHA

YTM 200EK

Service Manual

EK

LIT-11616-03-82

CHAPTER 1.
GENERAL INFORMATION

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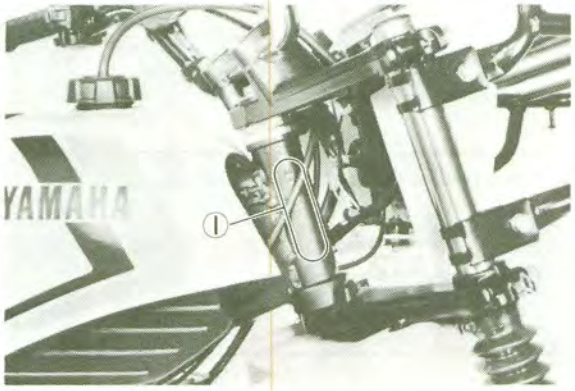
MACHINE IDENTIFICATION

Frame Serial Number

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



1. Frame serial number

NOTE:

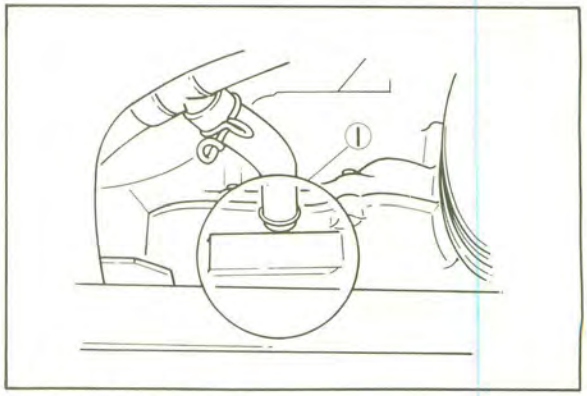
The first three digits of these numbers are for model identification; the remaining digits are the unit production number.

Starting Serial Number:

YTM200EK 24W-000101

Engine Serial Number

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



1. Engine serial number

SPECIAL TOOLS

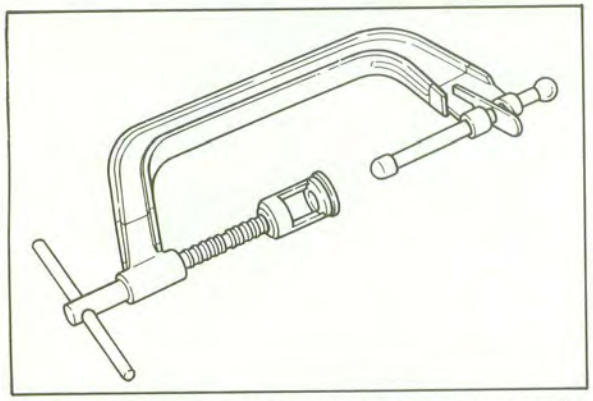
The proper special tools are necessary for complete and accurate tune-up and assembly. Using the correct special tool will help prevent damage caused by the use of improper tools or improvised techniques.

For Tune-up

1. Inductive timing light
   P/N YU-08037
2. Inductive tachometer
   P/N YU-08036
3. Compression gauge
   P/N YU-33223

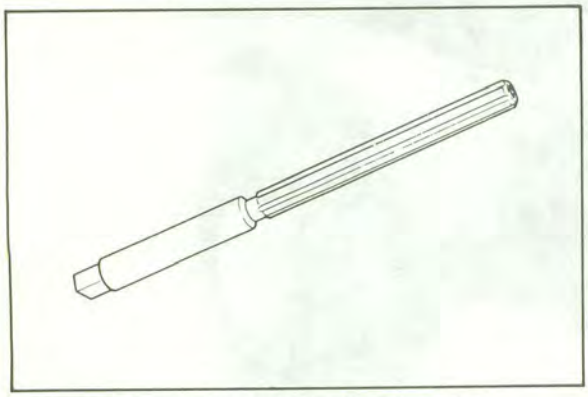
For Engine Service

1. Valve spring compressor
   P/N YM-04019



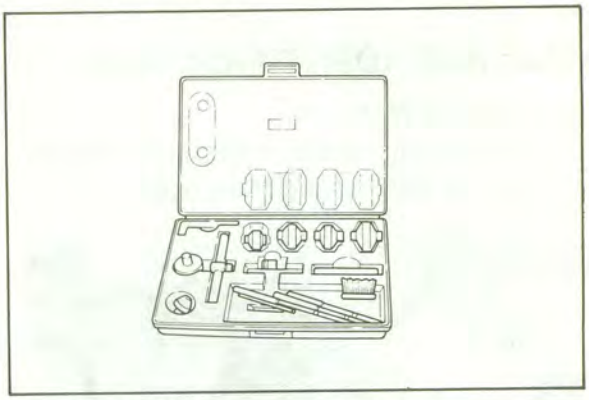
This tool must be used for removing and installing the valve assemblies.

2. Valve guide reamer
   P/N YM-04066



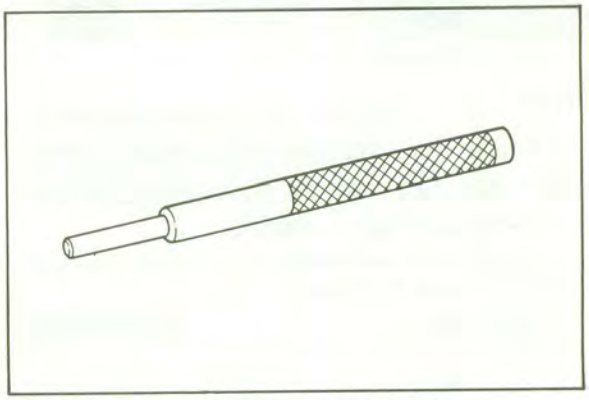
This must be used when replacing the valve guide.

3. Valve seat cutter
   P/N YM-91043



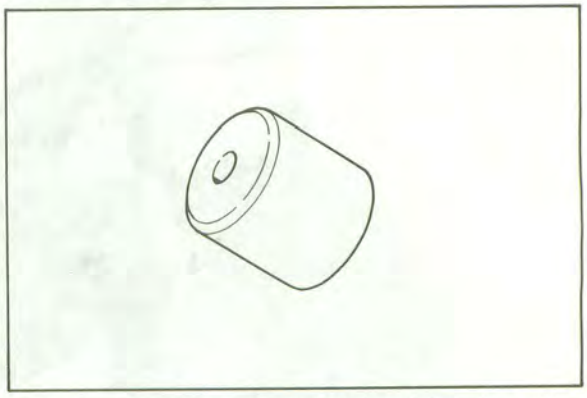
This tool is needed to resurface the valve seat.

4. Valve guide remover
   P/N YM-04064



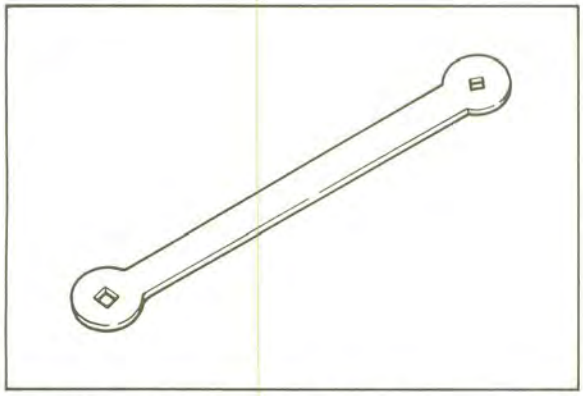
This must be used to remove the valve guides.

5. Valve guide installer
   P/N YM-04065



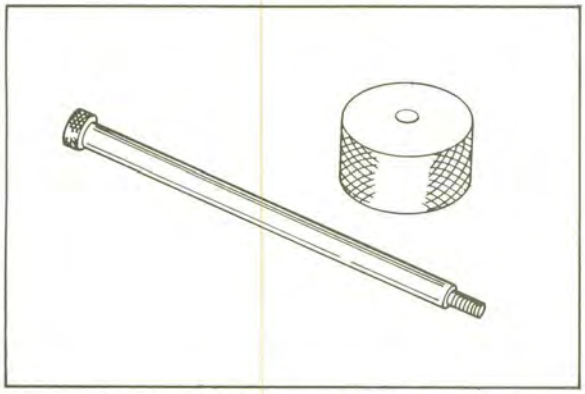
This tool is needed for proper installation of the valve guides.

6. Valve adjusting tool
P/N YM-08035



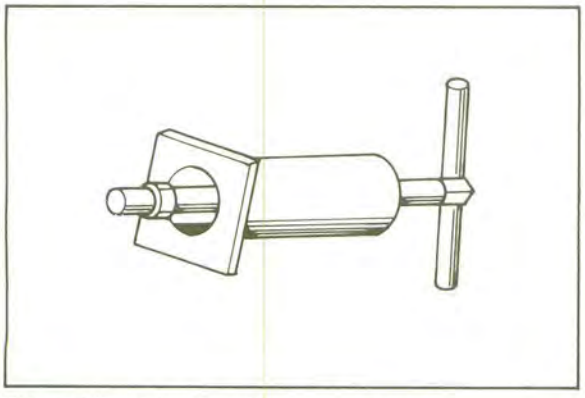
This tool is used when adjusting the valve clearance.

7. Slide hammer
P/N YU-01083



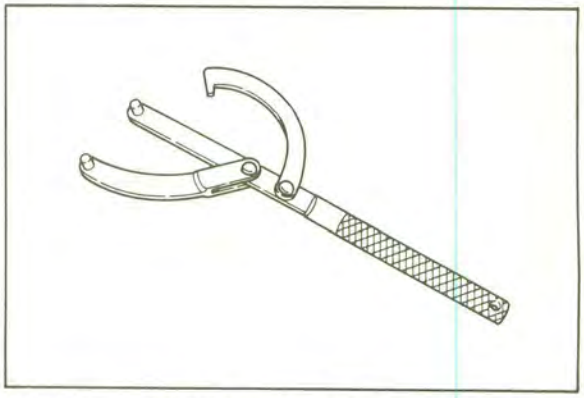
These tools are used when removing the rocker arm shaft.

8. Piston pin puller
P/N YU-01304



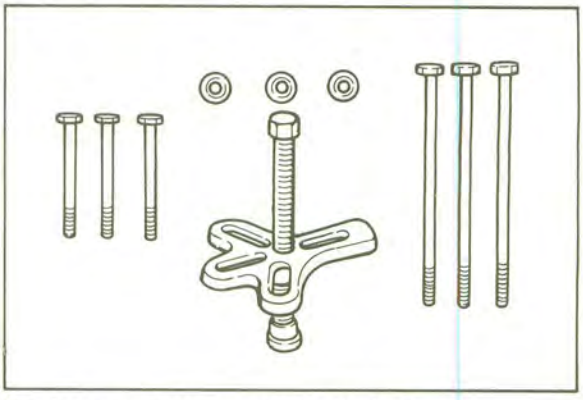
This tool is used when removing the piston pin.

9. Universal rotor holder
P/N YU-01235



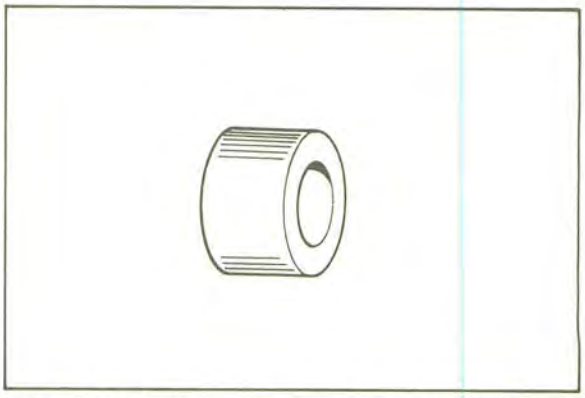
This tool is used to hold the clutch when removing or tightening the clutch boss securing nut, etc.

10. 3-way universal puller
P/N YU-33270



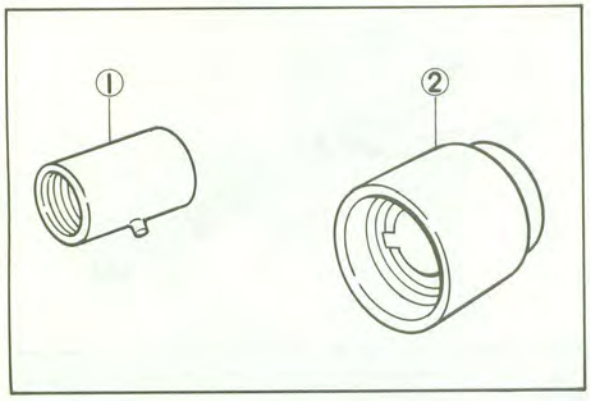
This tool is used for removing the flywheel.

11. Flywheel puller attachment
P/N YM-33278

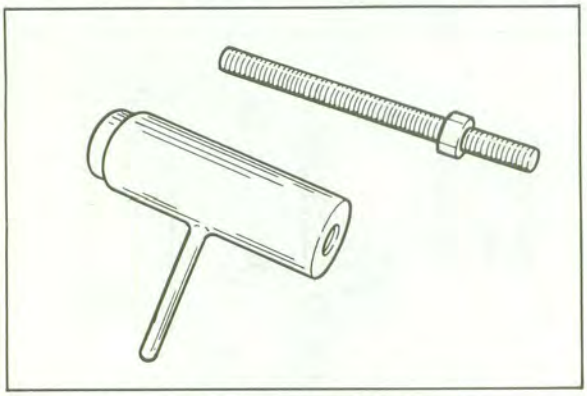


This tool is used to protect the end of the crankshaft when removing the flywheel.

12. Buffer boss installer
P/N YM-33279 (Adapter #11) .....①
P/N YM-33280 (Pot extension) .....②

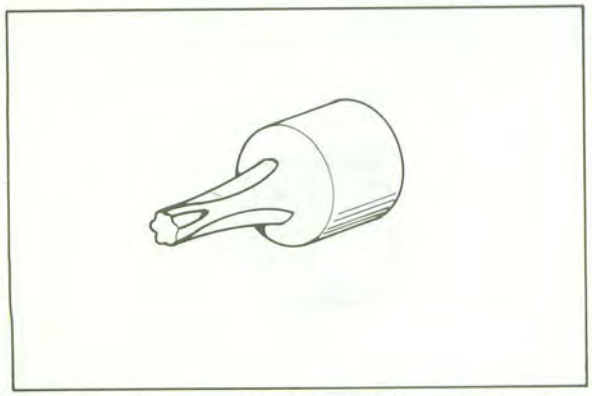


13. Crankshaft installer
P/N YU-90050



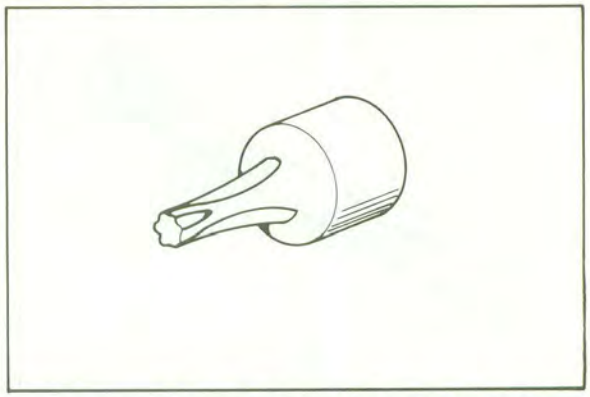
These tools are used to install the buffer boss.

14. (#30) Torx driver
P/N YU-29843-6



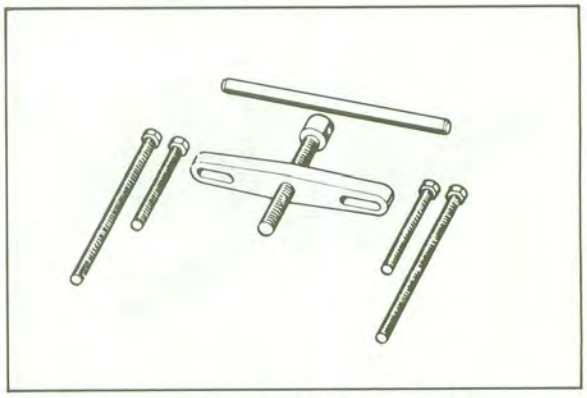
This tool is used to loosen or tighten the shift cam segment securing bolt.

15. (#25) Torx driver
P/N YU-29843-4



This tool is used to loosen or tighten the bearing retainer securing bolt.

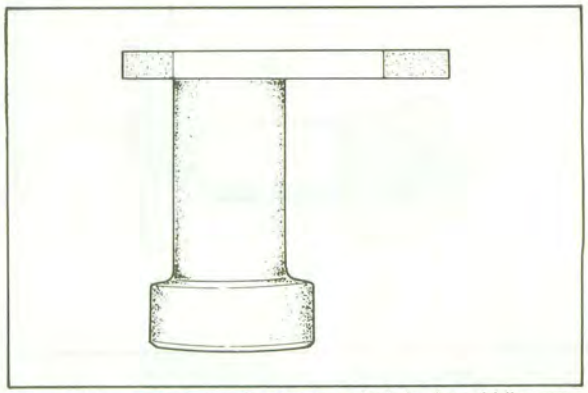
16. Crankshaft separator
P/N YU-01135



This tool is used when separating the crankshaft.

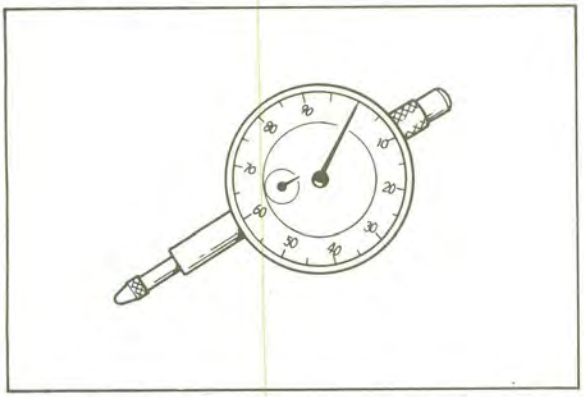
For Middle Gear Service

1. Coupling gear holder
P/N YM-33290



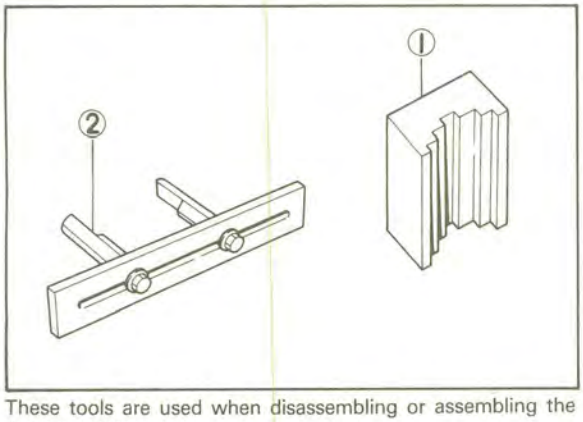
This tool is used when adjusting gear lash in the middle gear.

2. Dial indicator
P/N YU-03097



This tool is used with magnet stand when measuring gear lash for middle and final gear.

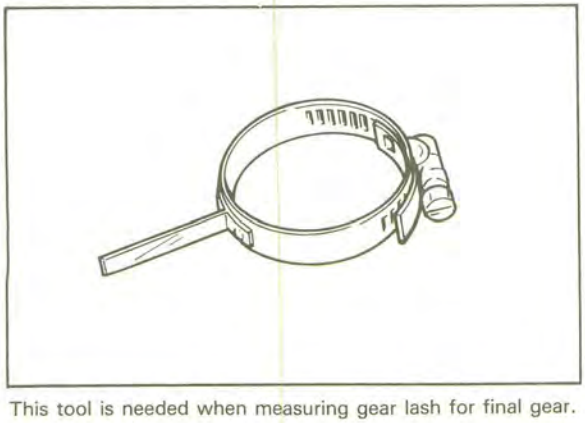
3. Damper spring compressor
P/N YM-33286 ..... ①
P/N YM-33222 ..... ②



These tools are used when disassembling or assembling the damper spring.

For Final Gear Service

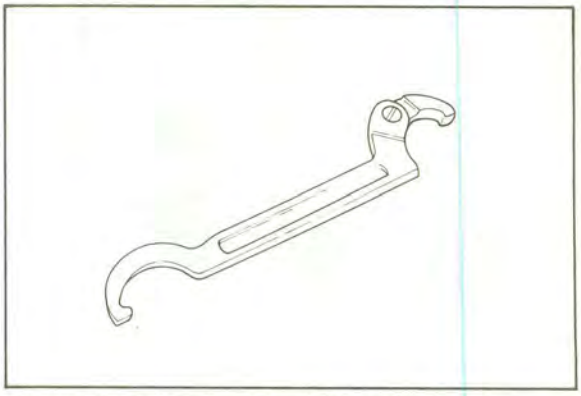
1. Final gear lash tool
P/N YM-01231



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

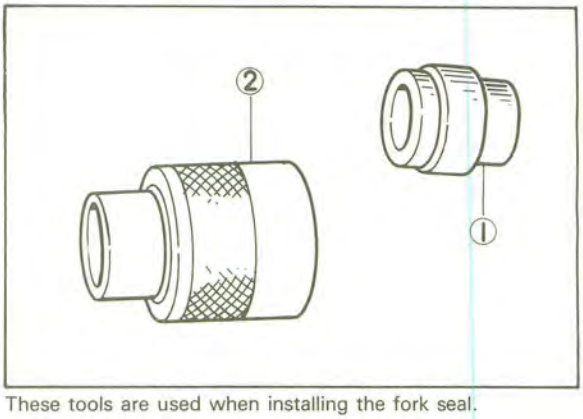
For Chassis Service

1. Ring nut wrench
P/N YU-01268



This tool is used too loosen and tighten the ring nut.

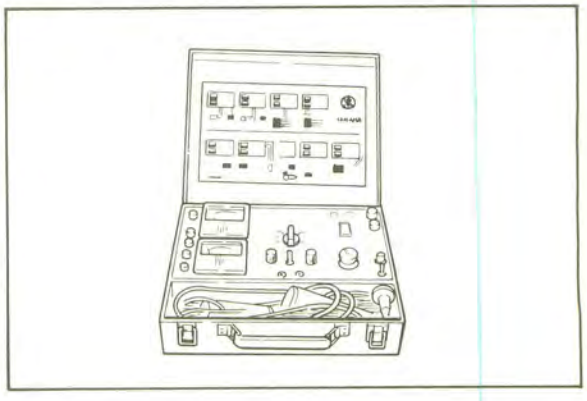
2. Fork seal installer
P/N YM-33281 ..... ①
P/N YM-08010 ..... ②



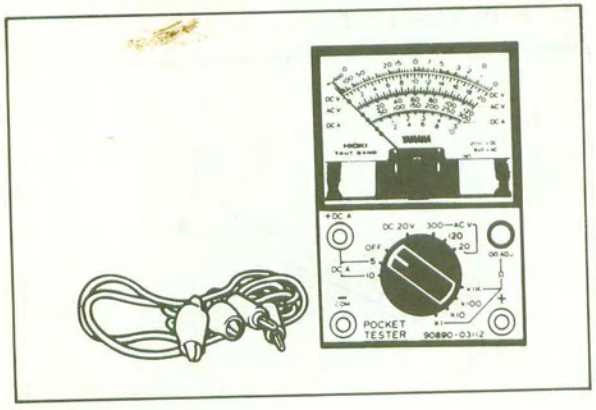
These tools are used when installing the fork seal.

For Electrical Components

1. Electro tester
P/N YM-33263



2. Pocket tester
   P/N YU-03112



CHAPTER 2.
PERIODIC INSPECTIONS AND ADJUSTMENT

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CHAPTER 2.
PERIODIC INSPECTIONS AND ADJUSTMENTS

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

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

PERIODIC MAINTENANCE

Item	Remarks	Initial			Thereafter every	
		1 Month	3 Months	6 Months	6 Months	1 Year
Exhaust system/Spark arrester	Decarbonize		O	O	O	
*Cam chain	Check and adjust chain tension	O		O	O	
*Valve clearance	Check and adjust valve clearance when engine is cold	O		O	O	
*Spark plug	Inspect/Cleaning or replace as required	O	O	O	O	
*Air filter	Wet type-Must be washed and damped with Foam-air-filter oil or SAE 10W30 type SE motor oil		O	O	O	
Carburetor	Check operation/Fittings		O	O	O	
	Clean/Refit/Adjust					O
*Brake system (complete)	Check/Adjust as required-Repair as required	O	O	O	3 Months	
*Battery	Top-up/Check specific gravity and breather pipe	O	O	O	O	
*Wheels and tires	Check pressure/Wear/Balance/Run out	O	O	O	O	
Fuel cock	Clean/Flush tank as required	O	O	O	O	
*Lights	Check operation/Replace as required	O	O	O	O	
*Fittings/Fasteners	Tighten before each trip and/or...	O	O	O	O	

*Indicates pre-operation check items.

LUBRICATION INTERVALS

Item	Remarks	Type	Initial			Thereafter every	
			1 Month	3 Months	6 Months	6 Months	1 Year
*Engine oil	Replace/Warm engine before draining	Yamalube 4-cycle oil or SAE 20W40 type SE motor oil	○	Check	○	○	
*Oil filter/Oil strainer	Clean	—	○		○		○
*Final gear oil	Replace	SAE 80 API GL-4 Hypoid gear oil	○				○
*Throttle lever and housing	Apply lightly	Lithium base grease			○	○	
*Brake lever	Apply lightly	Lithium base grease		○	○	○	
Brake camshaft	Apply lightly	Lithium base grease		○	○	○	
Front forks	Drain completely Check specifications	Yamaha fork oil 10wt or equivalent	○		○		○
Steering bearings	Inspect thoroughly/pack moderately	Medium-weight wheel bearing grease			Check		2 Years
Wheel bearings	Do not over-pack yearly or ...	Medium-weight wheel bearing grease					○

*Indicates pre-operation check items.

ENGINE

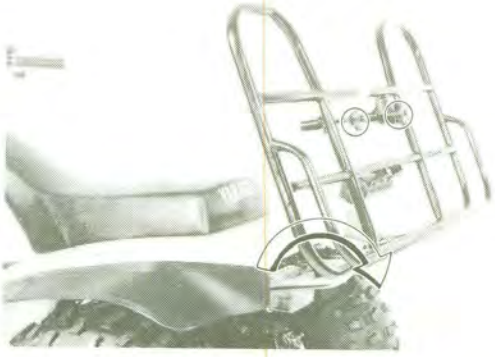
Valve Clearance

Adjust the valve clearance as follows:

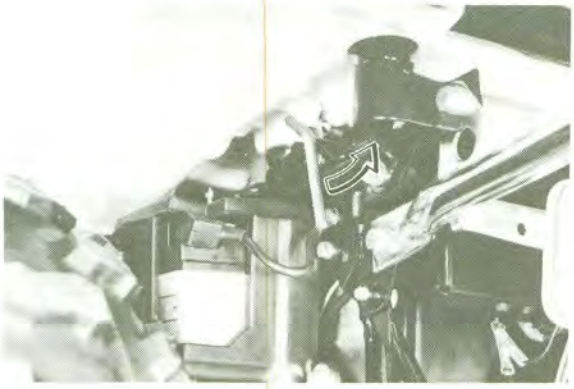
NOTE:

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

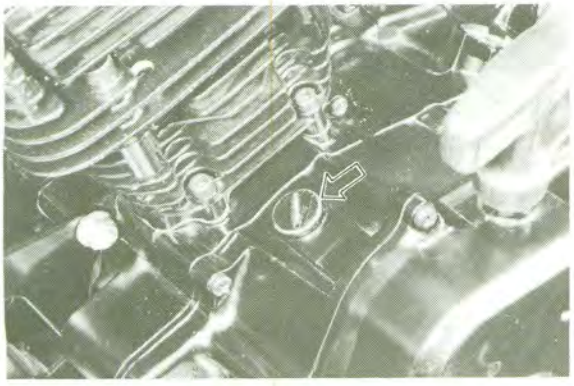
1. Loosen the rear carrier knob, and pull the carrier backward.



2. Remove the seat/rear cowling assembly.

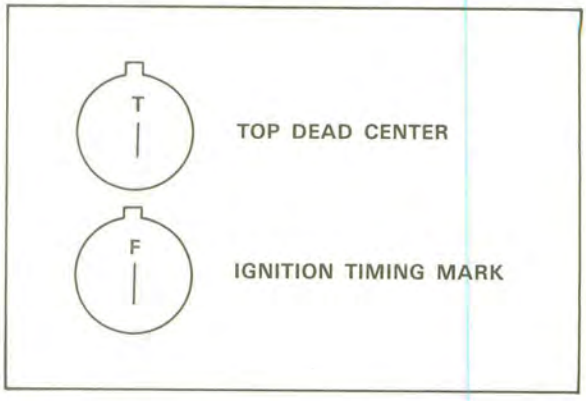


3. Remove the intake and exhaust valve covers.
4. Remove the timing window plug from the left-side crankcase cover.



5. Align the "T" mark on the flywheel with the stationary pointer on the crankcase cover by pulling the recoil starter knob. The pointer can be viewed through the timing window in the crankcase cover. When the "T" mark is alinged with the stationary pointer, the piston is at Top Dead Center (TDC). Valve clearance should be checked and adjusted when the piston is at TDC on the compression stroke. The piston is at TDC on compression when there is free play in both valve adjusters.

The flywheel is marked as follows:

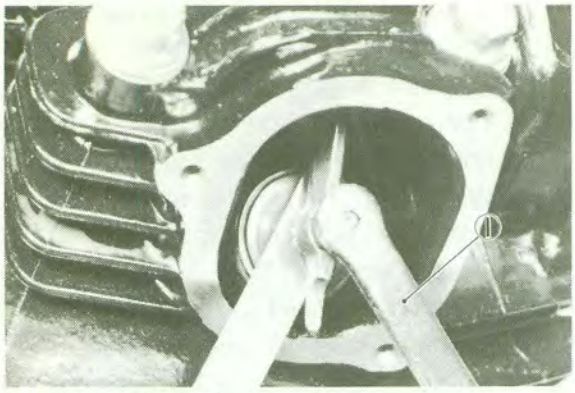


6. Use a feeler gauge to determine the clearance.

Intake valve (cold):
0.05 ~ 0.09 mm (0.002 ~ 0.004 in)
Exhaust valve (cold):
0.11 ~ 0.15 mm (0.004 ~ 0.006 in)

7. Loosen the valve adjuster locknut. Turn the adjuster in or out to obtain the correct clearance. Hold the adjuster to prevent it from moving, and thoroughly tighten the locknut. Recheck the clearance after tightening.

TIGHTENING TORQUE:
14 Nm (1.4 m · kg, 10 ft · lb)



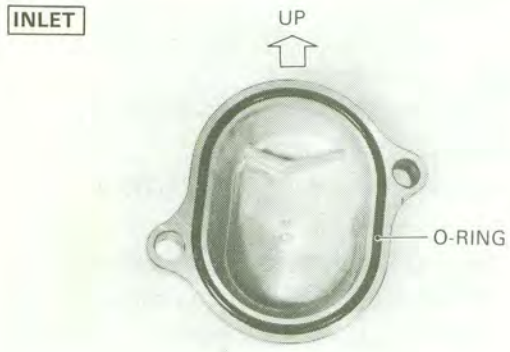
1. Valve adjusting tool

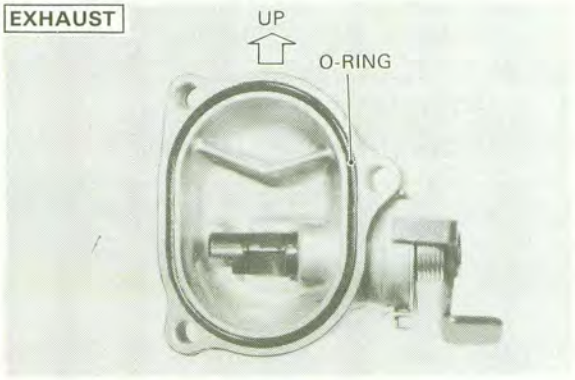
8. Check the valve cover and the timing window plug O-rings for damage. If damaged, replace the O-ring(s).
9. Install the valve covers and the timing window plug.

TIGHTENING TORQUE:
Valve cover:
10 Nm (1.0 m · kg, 7.2 ft · lb)

CAUTION:

Install the valve cover with its ridge as shown upward.





10. Reinstall the rear carrier in the original position.

Spark Plug

1. Check electrode condition and wear, insulator color and electrode gap.
2. Clean the spark plug with a spark plug cleaner if necessary.
   Use a wire gauge to adjust the plug gap to the specification.
3. If the electrodes become too worn, replace it.
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: D7EA (NGK) or X22ES-U (NIPPONDENSO)
Spark plug gap:
0.6 ~ 0.7 mm (0.024 ~ 0.028 in)
Spark plug tightening torque:
20 Nm (2.0 m · kg, 14 ft · lb)

Fuel Line

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

Exhaust System

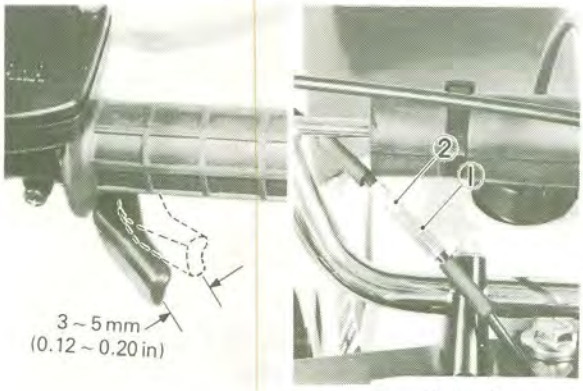
1. Tighten the exhaust pipe flange and muffler securing bolts.

TIGHTENING TORQUE:
Exhaust pipe flange bolt:
10 Nm (1.0 m · kg, 7.2 ft · lb)
Muffler securing bolt:
27 Nm (2.7 m · kg, 19 ft · lb)

2. Replace the exhaust pipe gasket if necessary.

Throttle Lever Adjustment

Loosen the locknut and turn the adjuster until there is the specified free play at throttle lever.

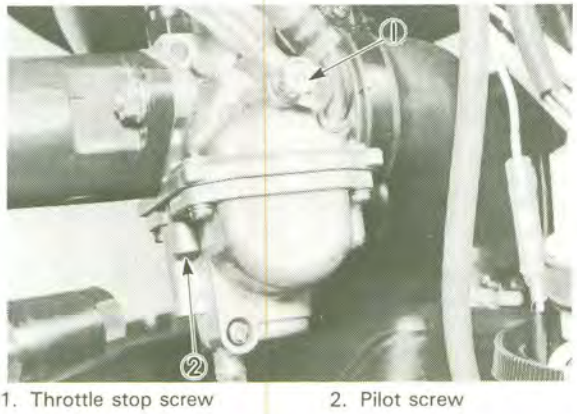


1. Adjuster 2. Locknut

Throttle lever play:
3 ~ 5 mm (0.12 ~ 0.20 in)

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 on the carburetor. Turning the throttle stop screw in (clockwise) increases the engine speed; turning it out (counter-clockwise) decreases the engine speed. Use a tachometer for checking and adjusting the engine speed.



1. Throttle stop screw 2. Pilot screw

Engine idle: 1,400 ± 50 r/min
Pilot screw (turns out): 2 ± 1/2

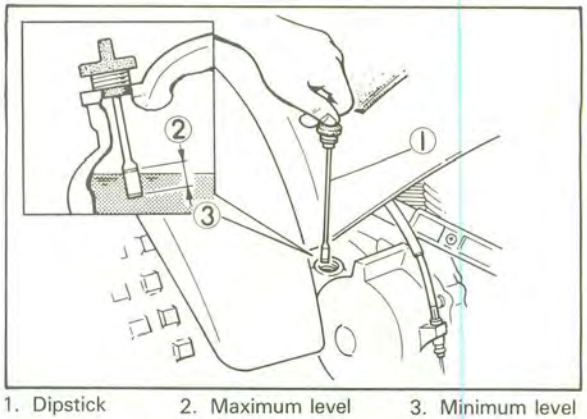
Engine Oil

Oil level measurement

1. To check the level, warm the engine up for several minutes, screw the dipstick completely out and then just rest the stick in the hole.

NOTE:

When checking engine oil level with the dipstick, let the unscrewed dipstick just rest on the case threads. Also, be sure the machine is positioned strainght up and on both wheels.



1. Dipstick 2. Maximum level 3. Minimum level

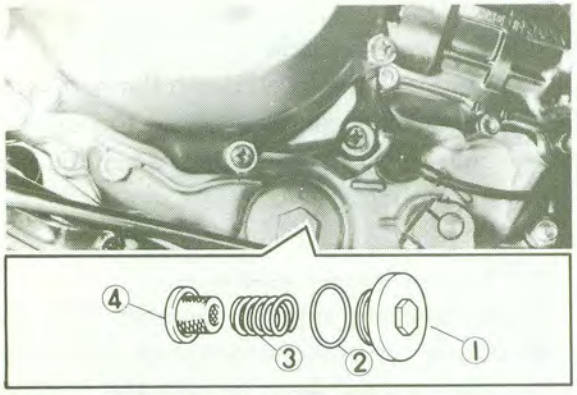
2. The dipstick has a minimum and a maximum mark, and the oil level should be between the two. If the level is lower, then add sufficient oil to raise it to the proper level.

Engine oil replacement

1. Start the engine. After a few minutes of warm-up stop the engine.
2. Place a container under the engine.
3. Remove the dipstick, drain plug, and drain bolt attached to the oil filter cover.

CAUTION:

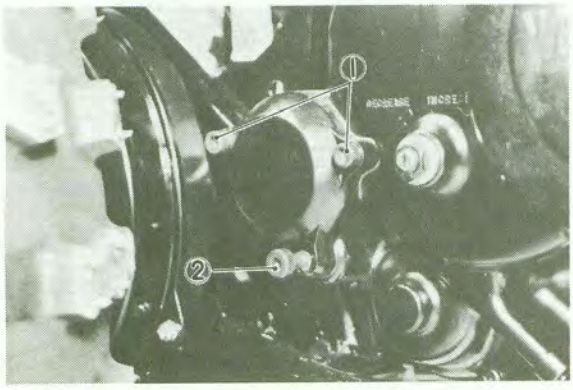
When removing the drain plug, the compression spring, oil strainer, and O-ring will fall off. Take care not to lose these parts.



1. Drain plug
2. O-ring
3. Compression spring
4. Oil strainer

NOTE:

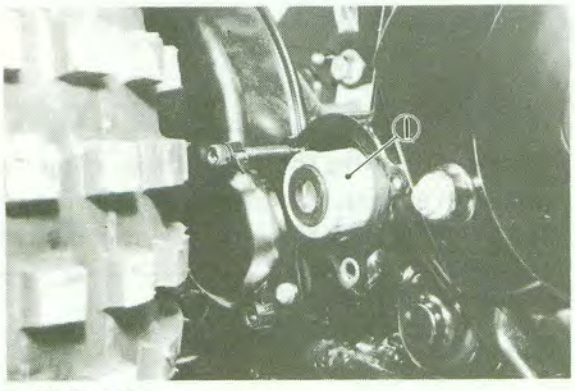
The oil filter cover is secured by two filter cover bolts and the drain bolt. The drain bolt should be loosened until the threaded portion comes out completely.



1. Filter cover bolt
2. Drain bolt

Oil filter removal

1. Remove the oil filter cover and filter element.



1. Oil filter element

2. Clean the filter element with solvent. Replace it if damaged.
3. Check O-rings. If damaged, replace.
4. Install the drain plug, filter element, and filter cover.

TIGHTENING TORQUE:
Drain plug:
43 Nm (4.3 m · kg, 31 ft · lb)
Drain bolt:
10 Nm (1.0 m · kg, 7.2 ft · lb)
Filter cover bolt:
10 Nm (1.0 m · kg, 7.2 ft · lb)

CAUTION:

Before reinstalling the drain plug, do not forget to fit the O-ring, compression spring and oil strainer.

5. Add engine oil. Install the dipstick and tighten.

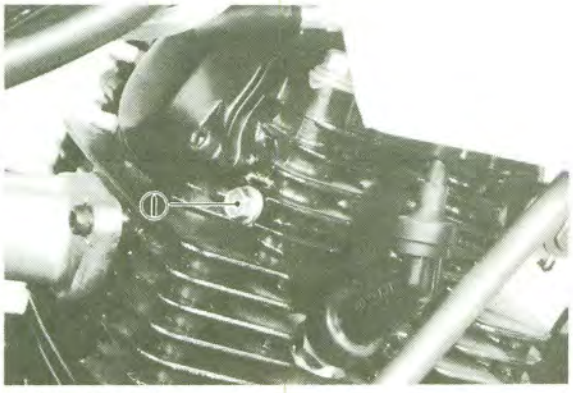
Oil capacity:
Total amount:
1.8 L (1.6 Imp qt, 1.9 US qt)
Periodic oil change:
1.5 L (1.3 Imp qt, 1.6 US qt)
Recommended oil:
Yamalube 4 cycle oil or SAE 20W40 type SE motor oil

6. Start the engine and allow a few minutes of warm-up. While warming 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.

CAUTION:

After replacing the engine oil, be sure to check the oil flow in the following procedures:

1. **Slightly loosen the oil gallery bolt in the cylinder head.**
2. **Start the engine and keep it idling until oil begins to seep from the oil gallery bolt.**
   If no oil comes out after one minute, turn the engine off so it will not seize.
3. **Restart the engine after solving the problem(s), and recheck the oil, pressure.**
4. **After checking, tighten the oil gallery bolt to specification.**

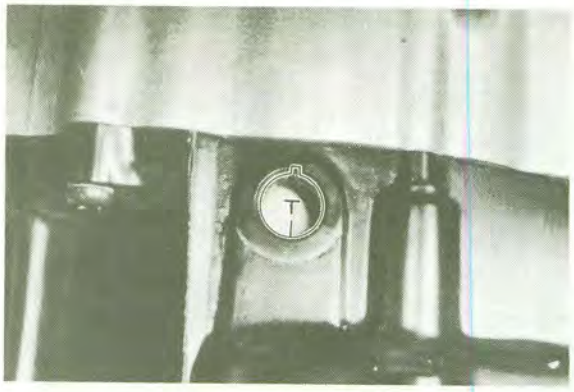


1. Oil gallery bolt

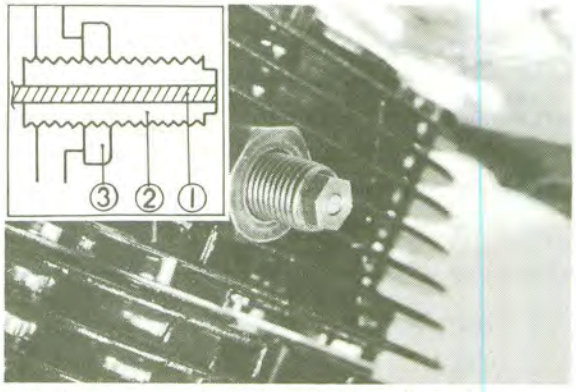
TIGHTENING TORQUE:
Oil gallery bolt:
7 Nm (0.7 m · kg, 5.1 ft · lb)

Cam Chain Adjustment

1. Remove the timing window plug from the left-side crankcase cover.
2. Align the "T" mark on the flywheel with the timing mark on the crankcase by pulling the recoil starter knob.



3. Remove the adjuster cap.
4. Loosen the adjuster locknut.
5. Turn the adjuster in until the push rod (inside the adjuster) is flush with the end of the adjuster.



1. Push rod 2. Adjuster 3. Locknut

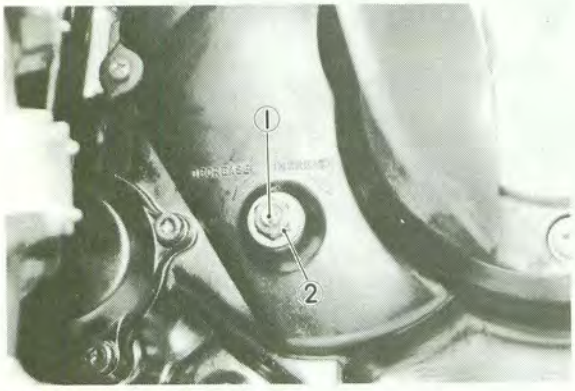
NOTE:

Start the engine. While keeping it idling, check the movement of the push rod. If it moves slightly, the adjustment is correct. If it does not move at all, the adjuster is too tight. Loosen the adjuster so the push rod moves slightly.

6. Tighten the adjuster locknut.
7. Install the adjuster cap and timing window plug.

TIGHTENING TORQUE:
Adjuster locknut:
30 Nm (3.0 m · kg, 22 ft · lb)
Adjuster cap:
5 Nm (0.5 m · kg, 3.6 ft · lb)

Clutch Adjustment

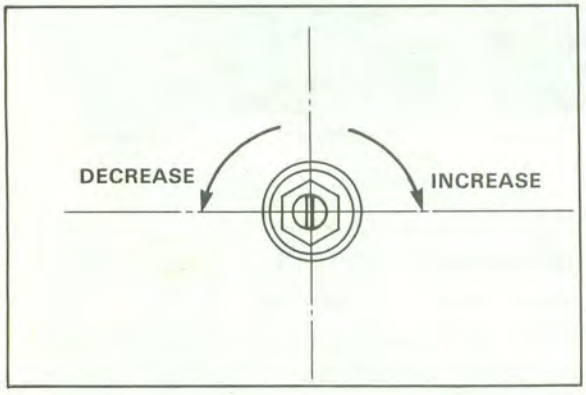


1. Adjuster 2. Locknut

1. Slowly turn the adjuster **counterclockwise** until resistance is felt. This means that the play of the clutch lever is removed. Then, turn it 1/8 **clockwise**.

NOTE:

Turn the adjuster counterclockwise to decrease the clutch lever free play and turn it clockwise to increase the free play.



2. Tighten the adjuster locknut to specification.

TIGHTENING TORQUE:
15 Nm (1.5 m · kg, 11 ft · lb)

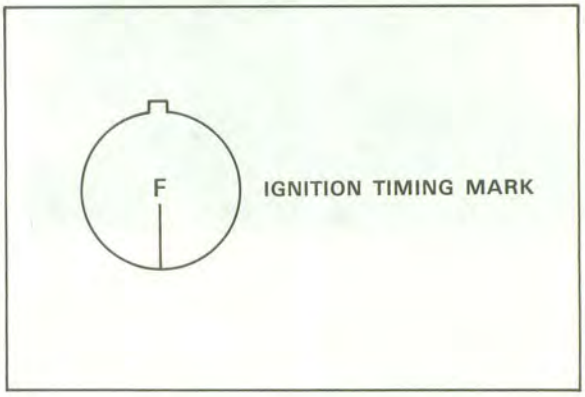
Checking Ignition Timing

Check the ignition timing with a timing light by observing the stationary pointer and the marks stamped on the flywheel.

1. Remove the timing window plug.
2. Connect the timing light to the 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: 1,400 ± 50 r/min

4. The stationary pointer (in the timing window) should be aligned with the ignition timing mark "F" on the flywheel. If the pointer is not aligned with the ignition timing mark, check the flywheel and/or pickup coil assembly for tightness and damage. (See "Chapter 6: Electrical" for further information.)



5. Reinstall the timing window plug.

Compression Pressure Measurement

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

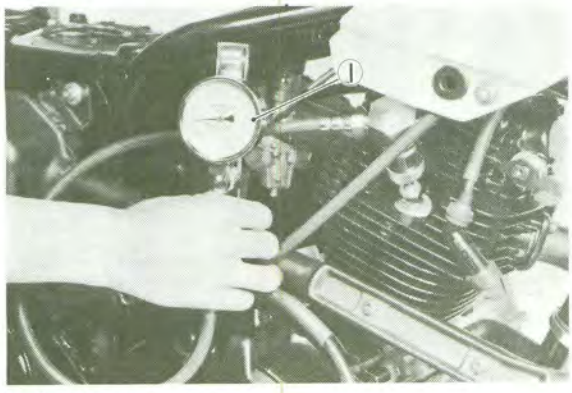
1. Make sure the valve clearance is correct.
2. Warm up the engine for 2 ~ 3 minutes; stop the engine.
3. Remove the spark plug from the cylinder head.
4. Install a compression gauge.

5. Turn over the engine with the starter motor, holding 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: 883 kPa (9 kg/cm^2, 128 psi) Minimum: 785 kPa (8 kg/cm^2, 114 psi) Maximum: 981 kPa (10 kg/cm^2, 142 psi)

WARNING:

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



1. Compression gauge

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.

CHASSIS

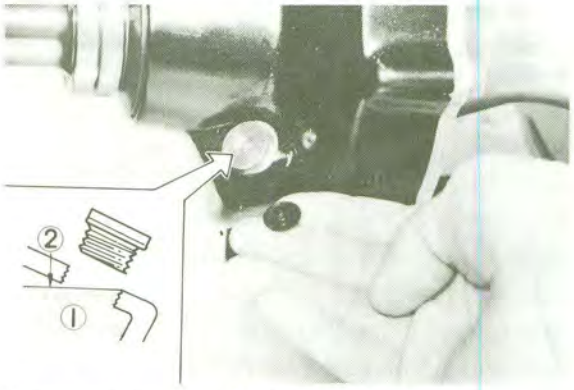
Final Gear Oil

Oil level measurement

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

CAUTION:

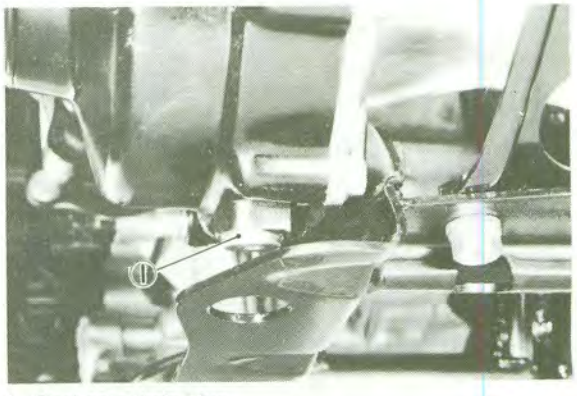
Take care not to allow foreign material to enter the final gear case.



1. Final gear oil 2. Correct oil level

Gear Oil Replacement

1. Place an oil pan under the final gear case.
2. Remove the final gear oil filler cap and the drain plug, and drain the oil.



1. Final gear drain plug

WARNING:

When draining or filling, take care not to allow foreign material to enter the final gear case.

3. Reinstall and tighten the final gear case drain plug.

TIGHTENING TORQUE:
23 Nm (2.3 m · kg, 17 ft · lb)

4. Fill the gear case to the specified level.

Oil capacity:
Final gear case:
0.13 L (0.11 Imp qt, 0.14 US qt)
Recommended Oil:
SAE 80 API "GL-4" Hypoid gear oil
If desired, an SAE 80W90 Hypoid gear oil may be used for all conditions.

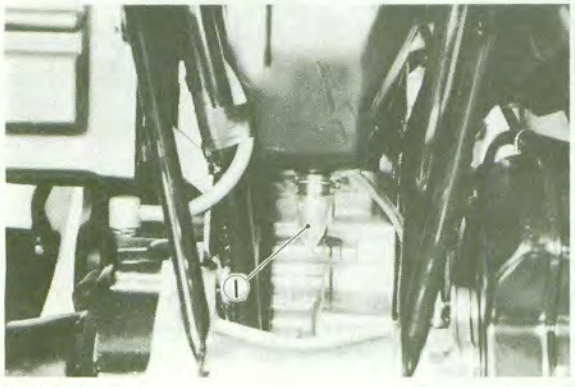
5. Reinstall the filler cap securely.

Air Filter

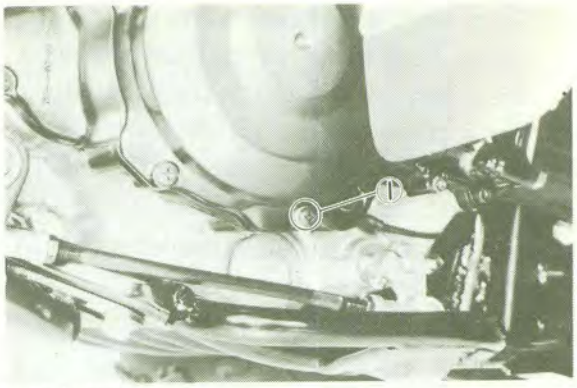
The air filter protects the engine from dirt which can enter with the intake air and cause rapid engine wear. This dirt is filtered from the air by the air filter element. This model uses a cartridge type air filter elements which consists of foam rubber moistened with oil. When this filter element becomes dirty, it should be cleaned.

NOTE:

- There is a check hose at the bottom of the air filter case. If dust and/or water collects in this hose, clean the air filter element and air filter case.
- After running in the water, be sure to drain the trapped water by removing the drain screw on the left bottom of the recoil starter.
- Wash the machine with fresh water if driven in sea water.

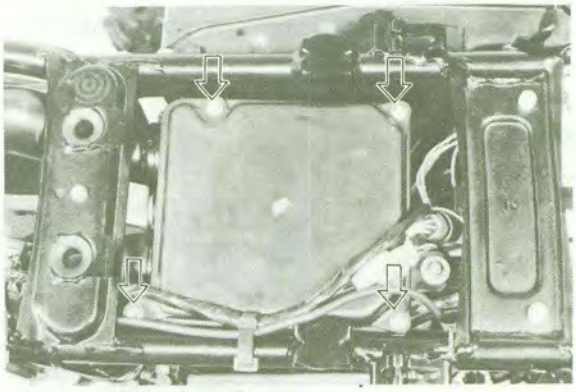


1. Check hose

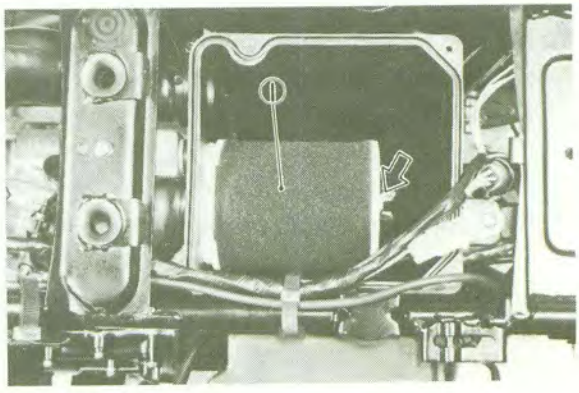


1. Drain screw

1. Loosen the rear carrier knob, and pull the carrier backward.
2. Remove the seat/rear cowling assembly. Remove the filter case cover by removing the four screws.



3. Pull out air filter element assembly from the case.



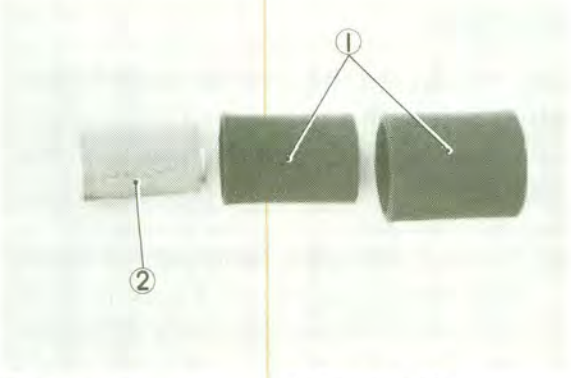
1. Air filter element

CAUTION:

Never operate the engine with the air filter element removed. This will allow unfiltered air to enter, causing rapid wear and possible engine damage. Additionally, operation without the filter element will affect carburetor jetting with subsequent poor performance and possible engine overheating.

4. Remove the wing bolt, element plate, and elements from the element guide.

5. Clean the element with solvent. After cleaning, remove the remaining solvent by squeezing the elements.



1. Air filter element
2. Element guide

6. Then apply foam-air-filter oil or SAE 10W30 type SE motor oil to the entire surface and squeeze out the excess oil. Elements should be wet but not dripping.
7. When installing the air filter element assembly in its case, be sure its sealing surface matches perfectly the sealing surface of the case so there is not air leakage.
8. The air filter element should be cleaned at the specified intervals. It should be cleaned more often if the machine is operated in dusty or wet areas.

NOTE:

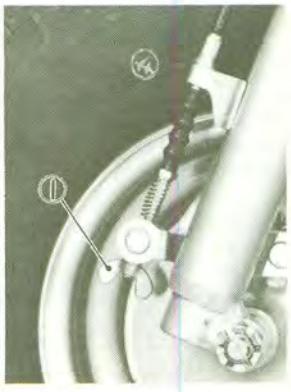
Each time filter element maintenance is performed, check the air inlet to the filter case for obstructions. Check the air cleaner joint rubber to the carburetor and manifold fittings for an air-tight seal. Tighten all fittings thoroughly to avoid the possibility of unfiltered air entering the engine.

Front Brake Lever

Front brake cable free play can be adjusted to suit rider preference, but a minimum free play of 5 ~ 8 mm (0.2 ~ 0.3 in) should be maintained. Free play can be adjusted at handle bar lever and brake shoe plate.

1. Loosen the locknut on the brake lever holder, fully turn the adjuster in.
2. Turn the adjuster on the shoe plate in or out until proper adjustment is achieved.
3. Unless the shoe plate adjuster helps bring a proper play, turn to the lever holder adjuster.
4. Tighten the locknut.

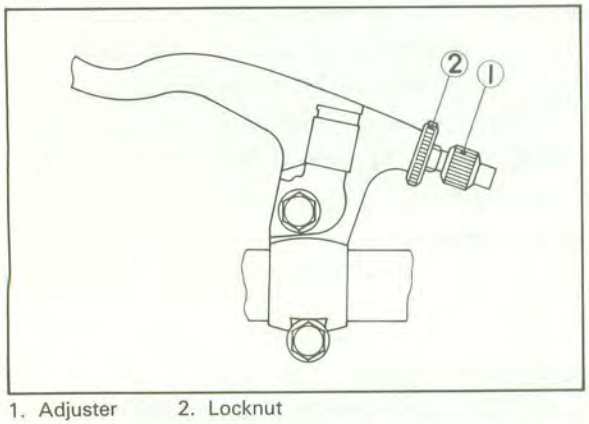
1. Adjuster
2. Locknut
a. 5 ~ 8 mm (0.2 ~ 0.3 in)



1. Adjuster

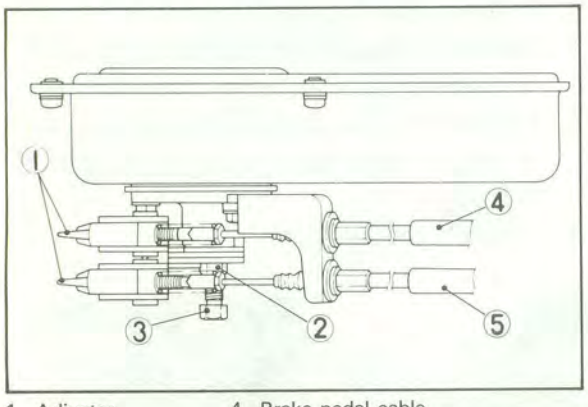
Brake Pedal and Rear Brake Lever Adjustment

1. Pump the brake pedal 2 to 3 times before adjustment.
2. Fully loosen the rear brake lever cable adjuster at the brake lever.



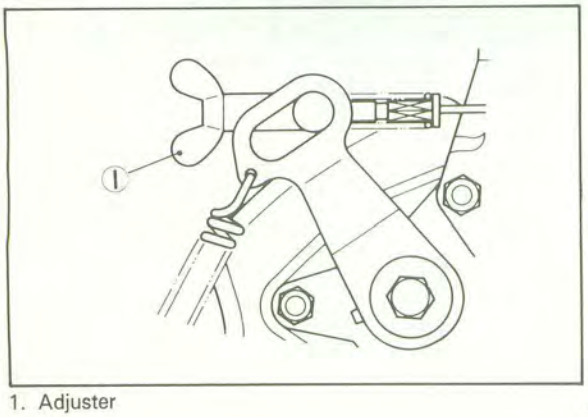
1. Adjuster 2. Locknut

3. Fully loosen both the rear brake lever cable adjuster and the brake pedal cable adjuster at the caliper; then loosen the locknut and adjusting bolt.

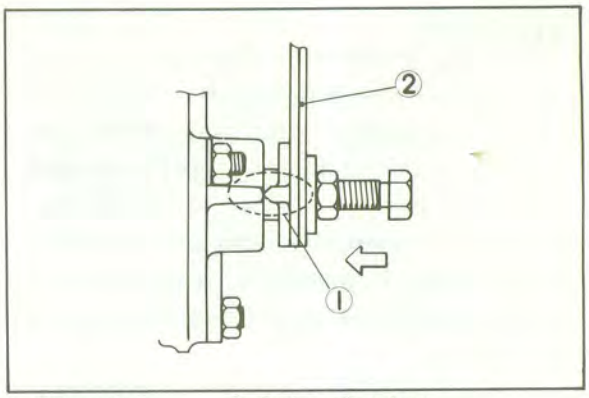


1. Adjuster
2. Locknut
3. Adjusting bolt
4. Brake pedal cable
5. Rear brake lever cable

4. Screw in the rear brake lever cable adjuster so that the brake caliper lever can be set at the position as shown.

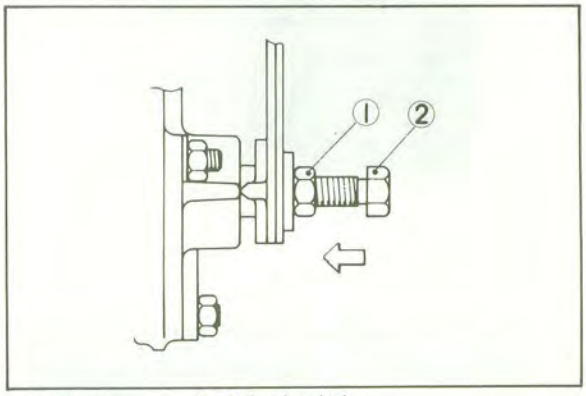


1. Adjuster



1. Set position 2. Brake caliper lever

5. Slowly screw in the adjusting bolt by hand until it feels tight and screw it out 1/4 turn. Then tighten the locknut.

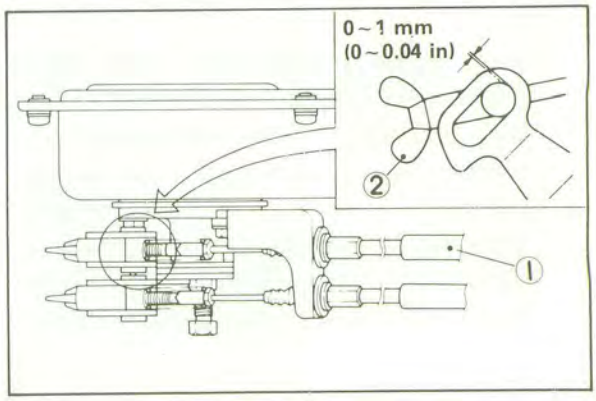


1. Locknut 2. Adjusting bolt

CAUTION:

When tightening the locknut, hold the adjusting bolt with a spanner so that the adjusting bolt is not turned together with the locknut.

6. Screw in the brake pedal cable adjuster to provide a gap of 0 to 1 mm (0 ~ 0.04 in) between the brake caliper lever and the pin.

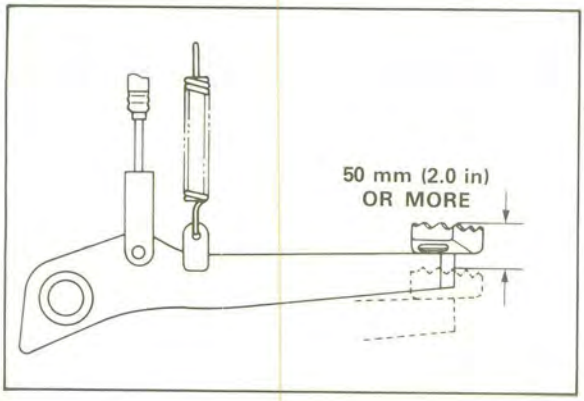


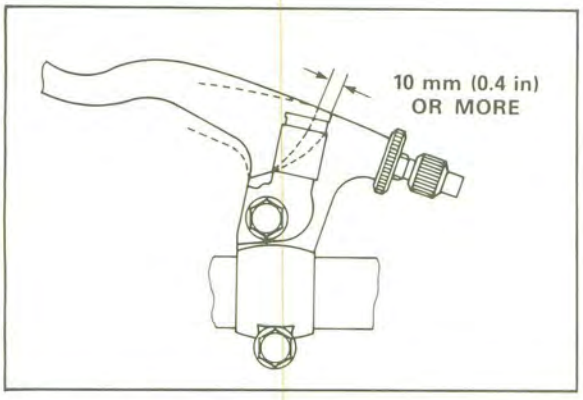
1. Brake pedal cable 2. Adjuster

WARNING:

After this adjustment is performed, block the rear of the machine off the ground, and spin the rear wheels to ensure there is no brake drag. If any brake drag is noticed, perform the above steps again.

7. Adjust the brake when the brake pedal play is over 50 mm (2.0 in) and/or when the rear brake lever play is over 10 mm (0.4 in).



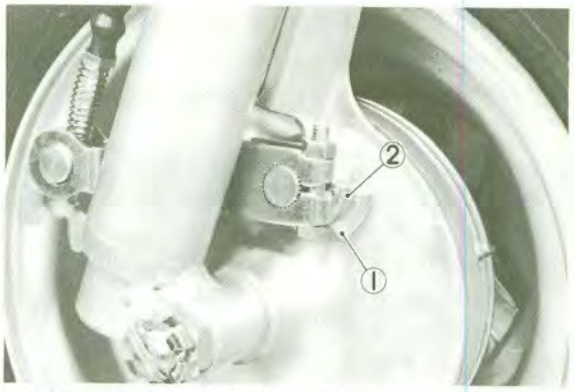


WARNING:

Always adjust both the brake pedal and the brake lever whenever adjusting the rear brake.

Brake Lining Inspection

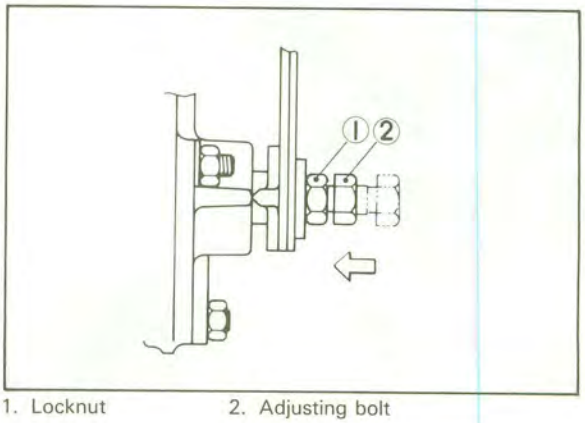
To check, see the wear indicator position while pulling the brake lever. If the indicator reaches to the wear limit line, replace the brake shoes.



1. Wear limit 2. Wear indicator

Brake Pads Inspection

If the adjusting bolt has come so close to touch the locknut with use, replace the both pads in the caliper.



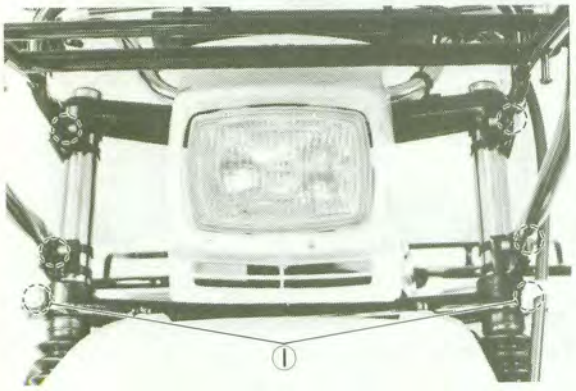
1. Locknut 2. Adjusting bolt

Steering Head Adjustment

The steering assembly should be checked periodically for looseness.

1. Raise the front end of the machine 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 bearings.

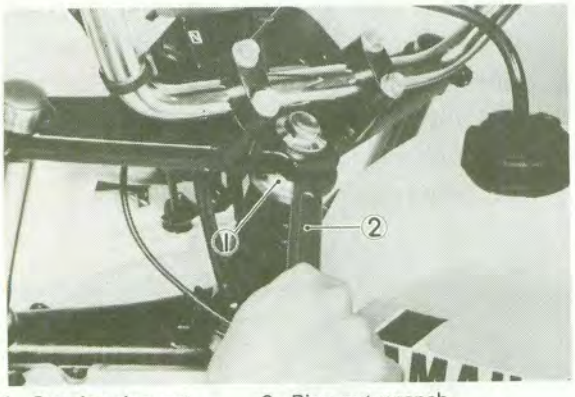
3. If the steering head is loose, adjust it:
   a. Loosen the front carrier securing bolts and the pinch bolts at the under bracket.



1. Pinch bolt

   b. Loosen the steering stem bolt.

   c. Use a ring nut wrench to tighten the steering ring nut until the steering head is tight but does not bind when the forks are turned.



1. Steering ring nut 2. Ring nut wrench

   d. Tighten the pinch bolts and steering stem bolt to specification.

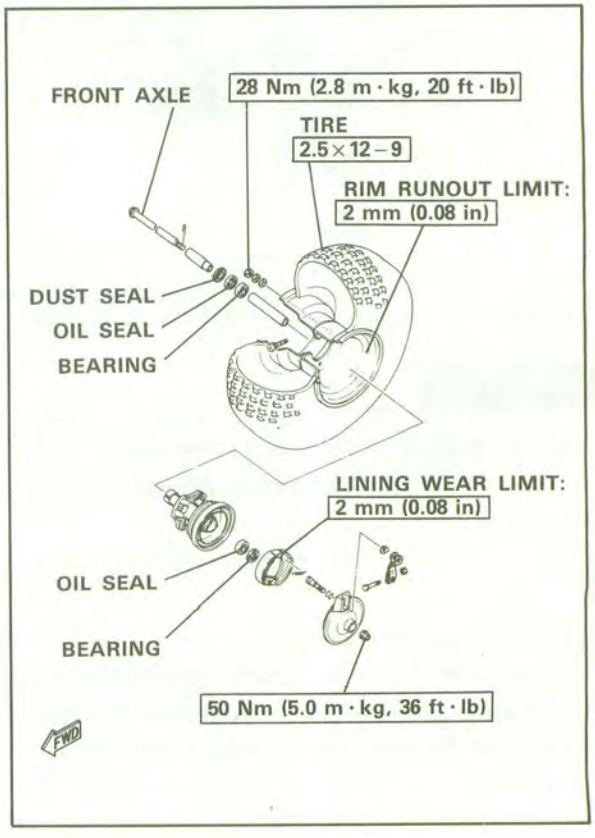
TIGHTENING TORQUE:
Steering stem nut:
85 Nm (8.5 m · kg, 61 ft · lb)
Pinch bolt:
Under bracket:
30 Nm (3.0 m · kg, 22 ft · lb)
Steering crown:
20 Nm (2.0 m · kg, 14 ft · lb)
Front carrier:
15 Nm (1.5 m · kg, 11 ft · lb)

   e. 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.

Wheel Bearings

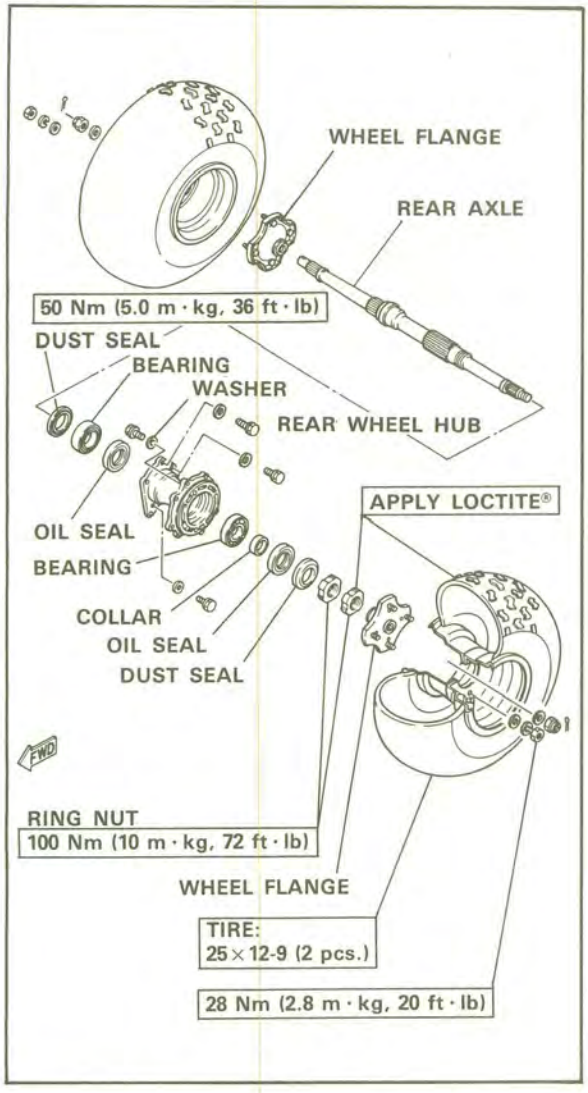
If a rolling rumble is noticed and increases with increasing wheel speed (not engine or transmission speed), the wheel bearings may be worn. Check the wheel bearings for both the front and rear wheels.

Front wheel



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

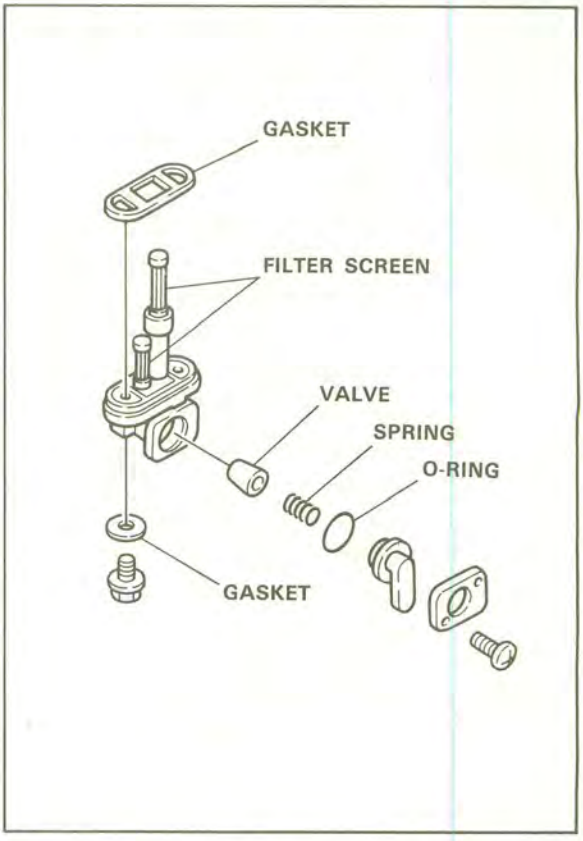
Rear wheel



1. Block the front tire and raise the rear of machine.
2. Spin the wheel by hand and toutch the rear wheel hub while spinning the wheel. If you feel any excessive vibration, the bearings are rough and should be replaced.

Fuel Cock

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



1. Disconnect the fuel pipe and drain the fuel completly from the fuel tank.
2. Remove the fuel cock and inspect the filter screen. Replace the fuel cock if filter screen is seriously contaminated.
3. Remove the screws on the front and rear of the fuel cock; remove the plate, O-ring, lever, and valve.
4. Inspect all components, and if the valve is damaged in any way or if the fuel cock gasket surfaces are scratched or corroded, the fuel cock assembly must be replaced. If there is abrasive damage to any components, the fuel tank must be drained and flushed.
5. Reassemble the fuel cock, and install it on the fuel tank.
6. Connect the fuel pipe.

Tires

WARNING:

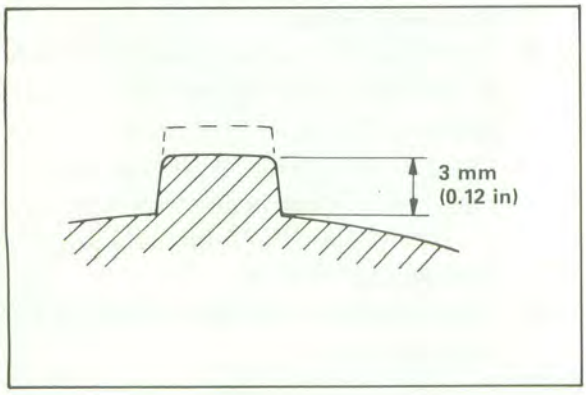
This model is equipped with low pressure tires. Pay attention to the following points:
Recommended tire pressure:
14.7 kPa (0.15 kg/cm^2, 2.2 psi)
Vehicle load limit: 100 kg (220 lb)
Tire size: 25 × 12 – 9

1. **Excessive tire pressure (over 68.6 kPa (0.7 kg/cm^2, 10 psi)) may cause tire to burst. Inflate tires very slowly. Fast inflation could cause tire to burst.**
2. **Too low a pressure (below 11.8 kPa (0.12 kg/cm^2, 1.8 psi)) will cause the rim to dislodge from the tire.**
3. **Put the same pressure in both rear tires. Uneven tire pressure will severely affect the handling.**
4. **Set tire pressures cold.**

How to measure tire pressure
Use an appropriate low-pressure tire gauge. Set tire pressures to the following specifications:

Reference tire pressure:
14.7 kPa (0.15 kg/cm^2, 2.2 psi)
Minimum tire pressure:
11.8 kPa (0.12 kg/cm^2, 1.8 psi)

Tire wear limit
When the tire groove decreases to 3 mm (0.12 in) due to wear, replace the tire.



Cable Inspection and Lubrication

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 10W30 motor oil

Brake and Change Pedals/Front and Rear Brake Levers

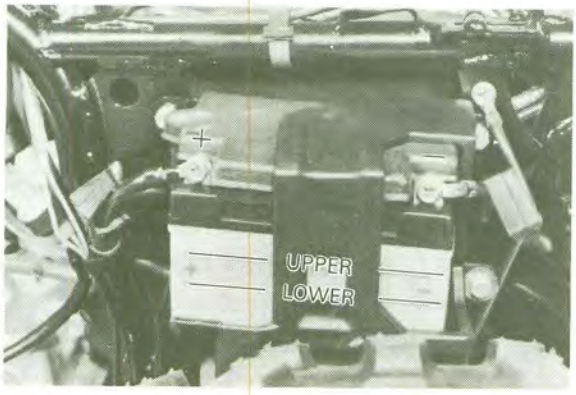
Lubricate the pivoting parts of each lever and pedal.

Recommended lubricant:
Yamaha Chain and Cable Lube or 10W30 motor oil

ELECTRICAL

Battery

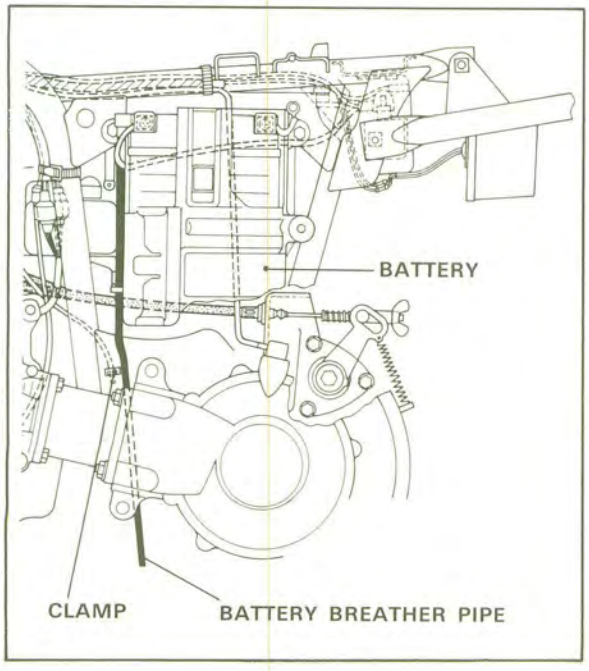
1. The fluid level should be between the upper and lower level marks. Use only distilled water if refilling is necessary.



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.

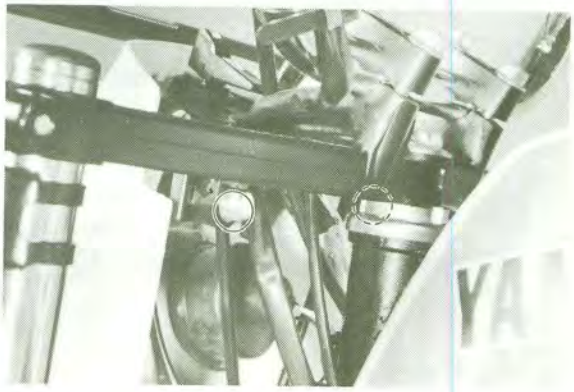


CAUTION:

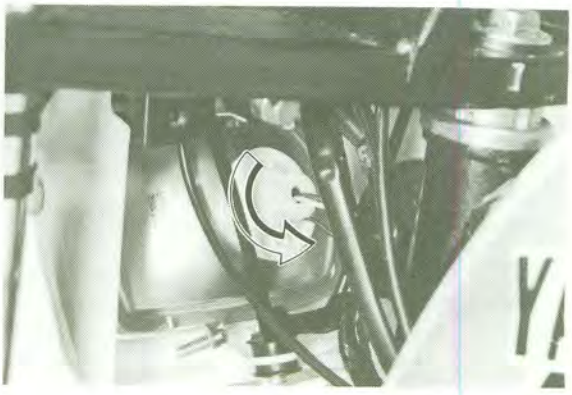
The battery must be charged before using to ensure maximum performance. Failure to charge the battery properly before first use or a low electrolyte level will cause premature failure of the battery. Charging current: 1.4 amps/10 hrs. or until the specific gravity reaches 1.280 at 20°C (68°F)

Headlight Bulb Replacement

1. Remove the front panel/headlight unit assembly securing bolts from the steering crown.



2. Turn the bulb holder counterclockwise and remove the defective bulb.



3. Slip a new bulb into position and secure it with the bulb holder.
4. Reinstall the front panel/headlight unit assembly onto the steering crown. Torque the bolt to specification.

TIGHTENING TORQUE:
15 Nm (1.5 m · kg, 11 ft · lb)

5. Adjust the headlight unit if necessary.

Headlight Beam Adjustment

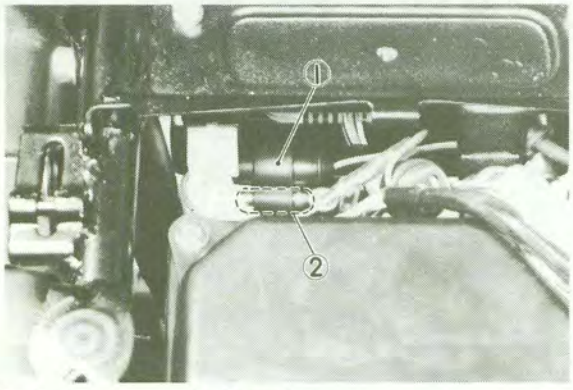
When necessary, adjust the headlight beam as follows:

1. Vertical adjustment
   To adjust the beam to the upper, turn the adjusting screw clockwise.
   To adjust the beam to the lower, turn the adjusting screw counterclockwise.

1. Vertical adjusting screw

Fuse

1. The fuse block is located under the seat.



1. Fuse 2. Spare fuse

2. If the 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:

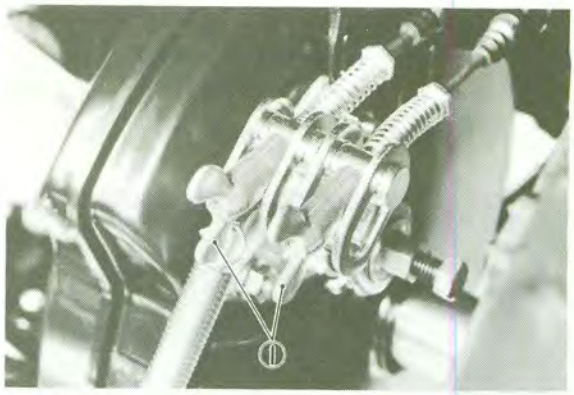
- It is not necessary to remove the engine in order to remove the cylinder and/or the flywheel magneto assembly.
- It is necessary to remove the right-side rear wheel in roder to remove the clutch assembly.
- It is necessary to remove the rear wheel drive assembly in order to remove the engine assembly.

Preparation for Removal

1. All dirt, mud, dust, and foreign material should be thoroughly removed from the exterior of the engine before removal and disassembly. This will prevent any harmful foreign material from entering the interior of the engine assembly.
2. Before engine removal and disassembly, be sure you have proper tools and cleaning equipment so you can perform a clean and efficient job.
3. During disassembly of the engine, clean and place all parts in trays in order of disassembly. This will ease and speed assembly time and insure correct reinstallation of all engine parts.
4. Start the engine and warm it for a few minutes; remove the drain plug, and drain the engine oil.

Rear Brake Cables

1. Loosen the rear brake cable adjusters at the brake caliper lever.

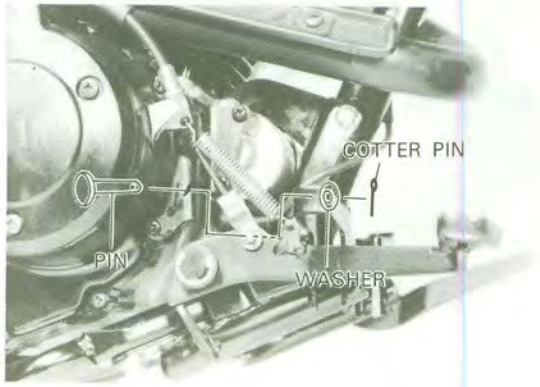


1. Adjuster

2. Disconnect the cables from the brake lever, brake pedal, slit holder, and cable guides.

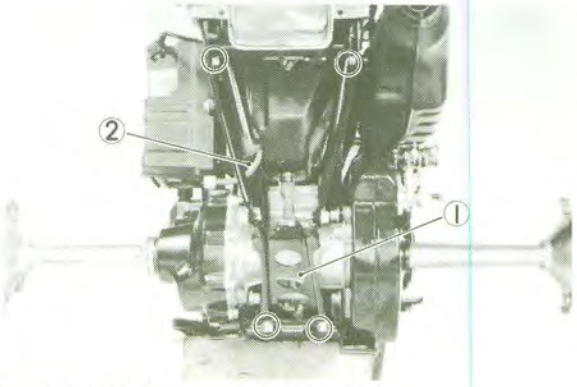
NOTE:

Note the order of brake cable routing for reassembly.



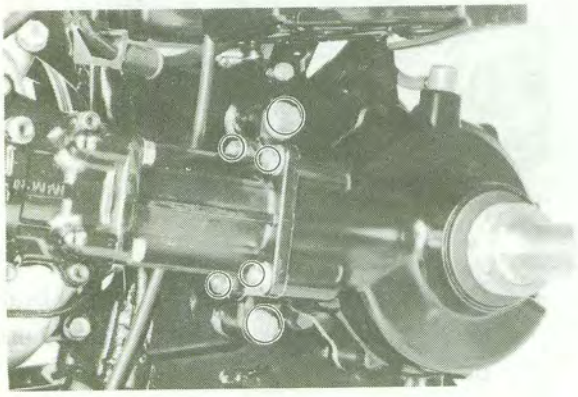
Rear Wheel Drive Assembly

1. Remove the rear wheels and remove the hitch bracket securing bolts. Remove the bracket from the frame.

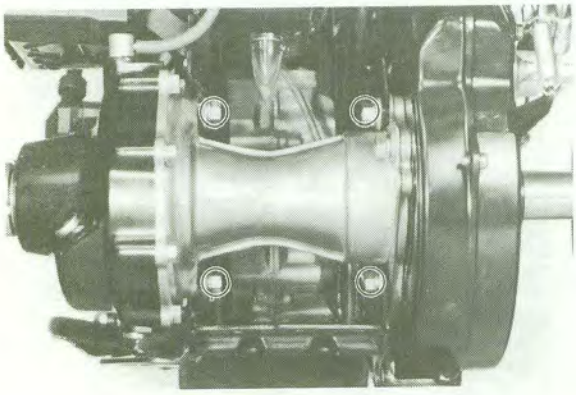


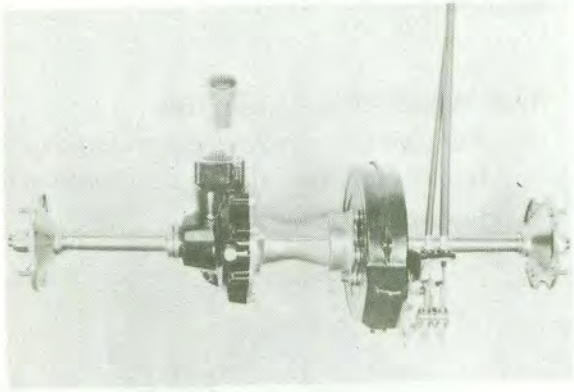
1. Hitch bracket 2. Breather pipe

2. Disconnect the final gear breather pipe from the final gear housing.
3. Remove the four nuts and two bolts securing the final gear housing.



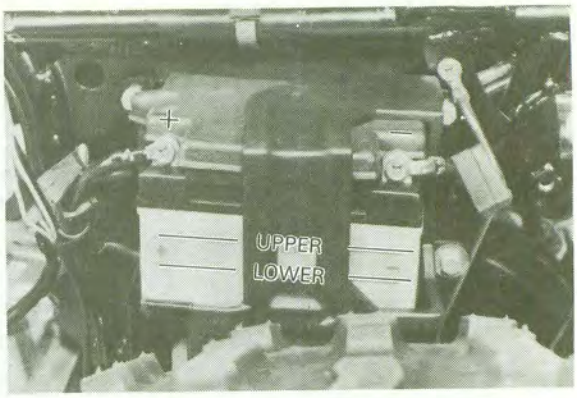
4. Remove the rear wheel housing securing bolts. Remove the rear wheel assembly.





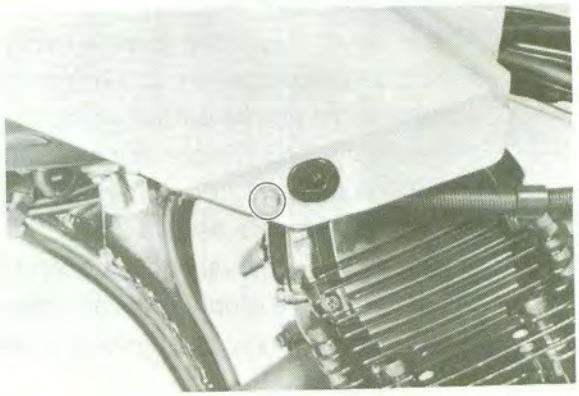
Battery

1. Disconnect the battery leads. Disconnect the negative lead first.

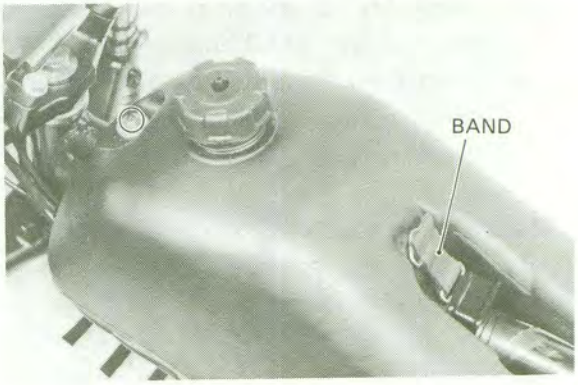


Seat and Fuel Tank

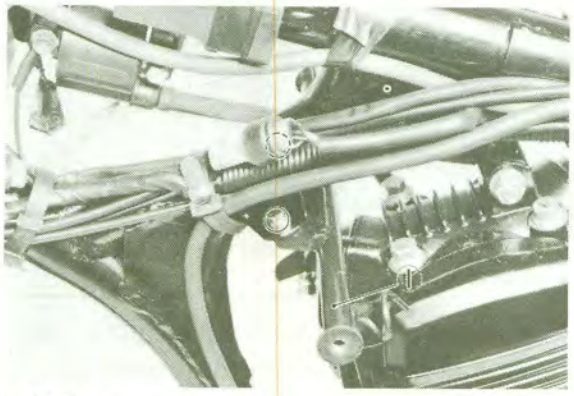
1. Loosen the rear carrier securing knob, and pull the carrier backward.
2. Remove the seat/rear cowling assembly, and remove the fuel tank cover, which is secured by the fuel tank cap and the bracket; see the photograph.



3. Remove the fuel tank holding nut.



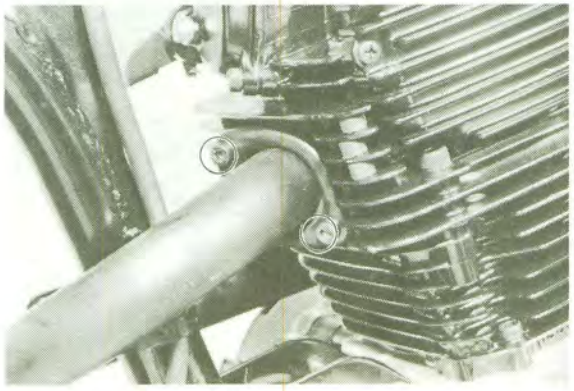
4. Turn the fuel cock to "OFF".
5. Disconnect the fuel lines at the fuel cock and fuel tank, disconnect the rubber retaining band, and remove the fuel tank.
6. Remove the fuel tank cover bracket from the frame.

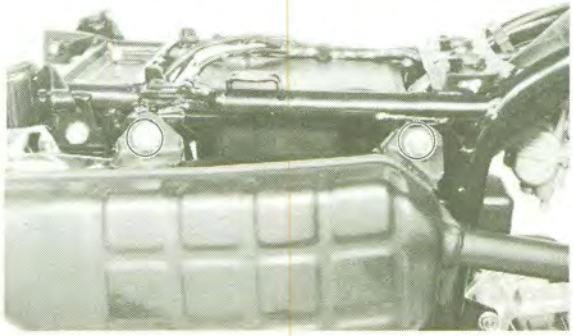


1. Bracket

Muffler Assembly

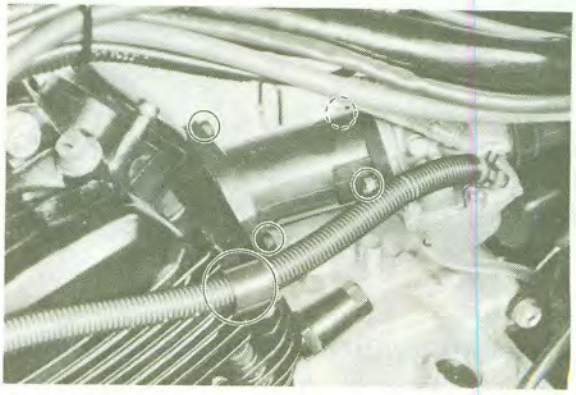
1. Remove the exhaust pipe flange bolts.
2. Remove the muffler securing bolts and remove the muffler assembly.





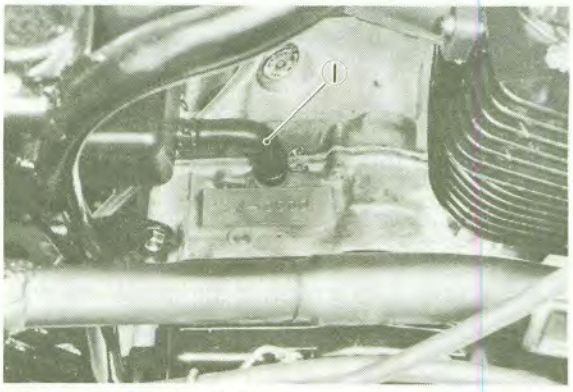
Carburetor

1. Disconnect the fuel pipe from the clamp.
2. Remove the carburetor securing nuts and carburetor joint securing bolts. Remove the carburetor joint.



Wires and Pipe

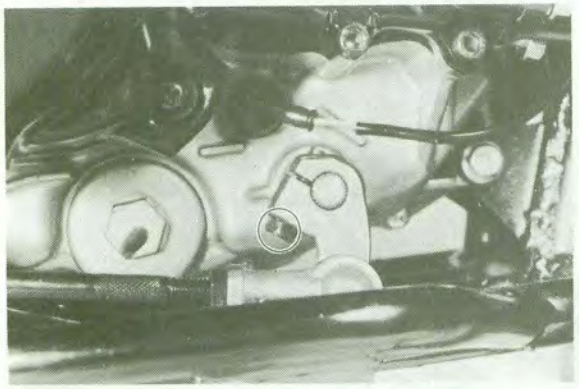
1. Disconnect the spark plug lead.
2. Disconnect the C.D.I. leads at the water proof connector, and disconnect the bullet connectors. Then remove the leads from the bands, and place the leads so that they will not become entangled in the chassis when the engine is removed.
3. Remove the crankcase ventilation pipe from the crankcase.



1. Crankcase ventilation pipe

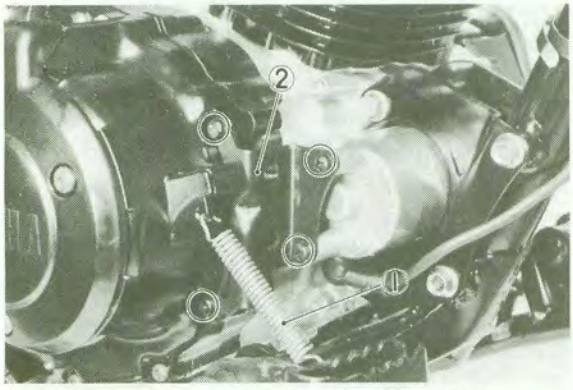
Shift Linkage

1. Remove the shift linkage at the shift shaft.



Starter Motor Bracket and Starter Motor

1. Disconnect the foot brake pedal return spring.
2. Remove the starter motor securing screws and the bracket.

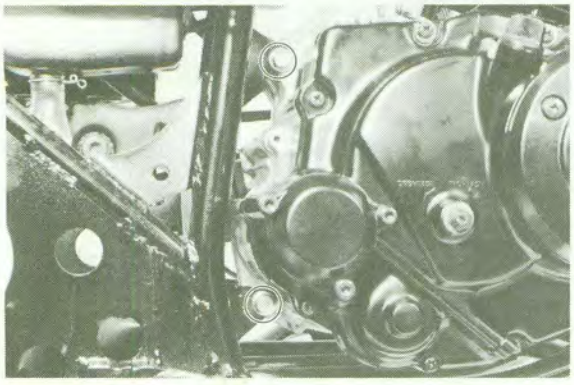


1. Return spring 2. Starter motor bracket

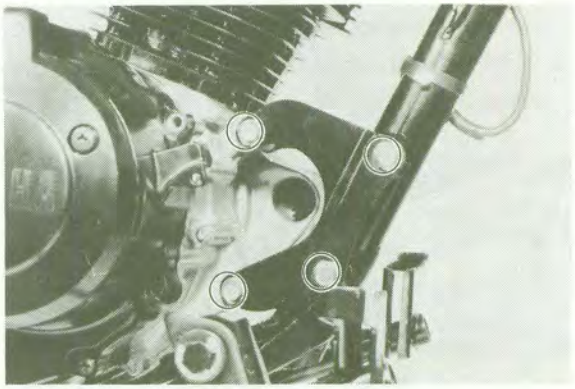
3. Remove the starter motor assembly.

Engine Removal

1. Remove the rear lower and upper engine mounting bolts.



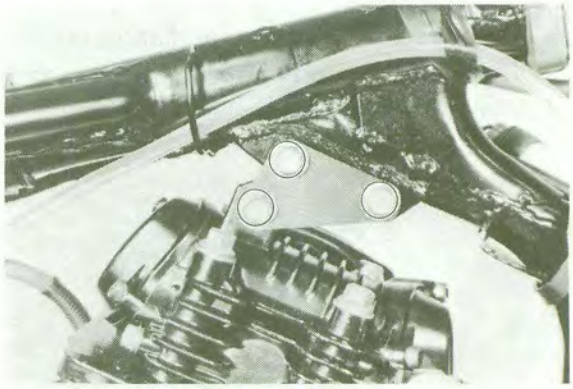
2. Completely remove the front lower engine mounting brackets.



NOTE:

Note the order of installation on the front lower engine mounting brackets for reassembly.

3. Remove the engine stay at the clylinder head.

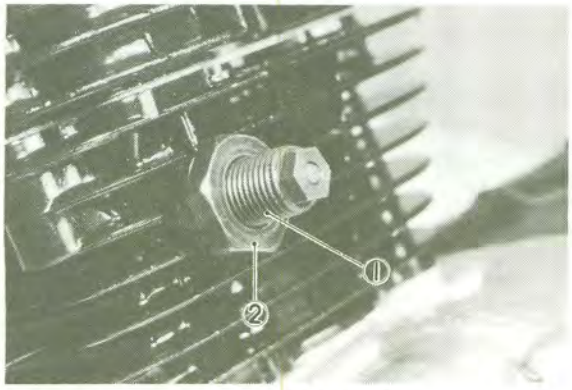


4. Remove the engine from the right side of the chassis.

ENGINE DISASSEMBLY

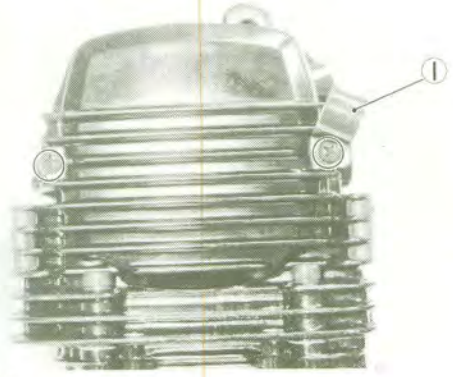
Cylinder Head and Cylinder

1. Remove the cam chain tensioner cap.
2. Loosen the tensioner locknut.
3. Remove the chain tensioner assembly. Note the location of each part.



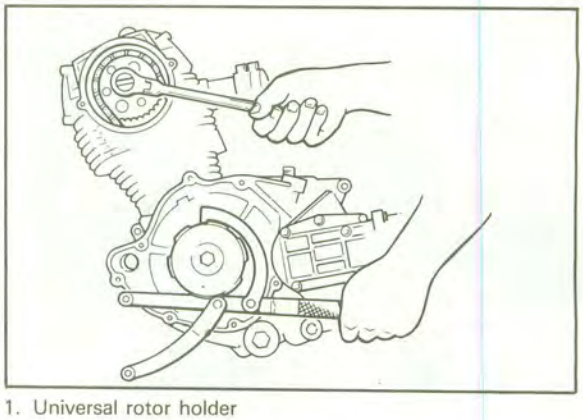
1. Tensioner assembly 2. Locknut

4. Remove the cam sprocket cover securing bolts and remove the cover and fuel pipe bracket.



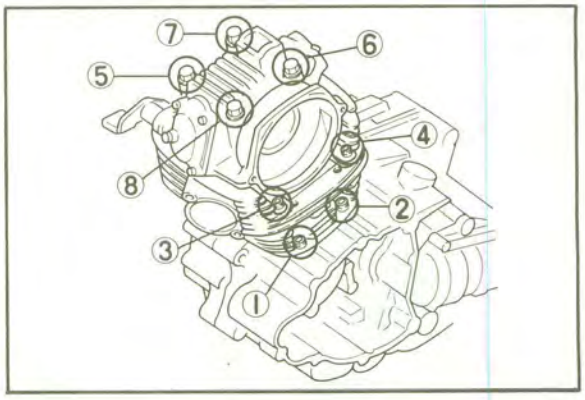
1. Bracket

5. Remove the neutral switch lead, recoil starter assembly, and spark plug.
6. Remove the cam sprocket securing bolt from the left side cylinder head. Hold the recoil starter pulley with the universal rotor holder.

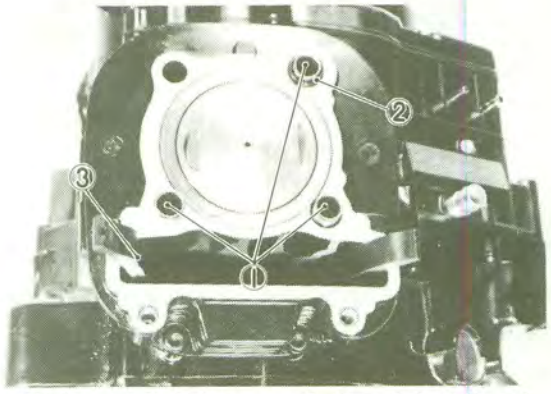


1. Universal rotor holder

7. Remove the cylinder head. Loosen the two cylinder body securing bolts and six cylinder head bolts first. Each bolt must be loose before any one is removed.

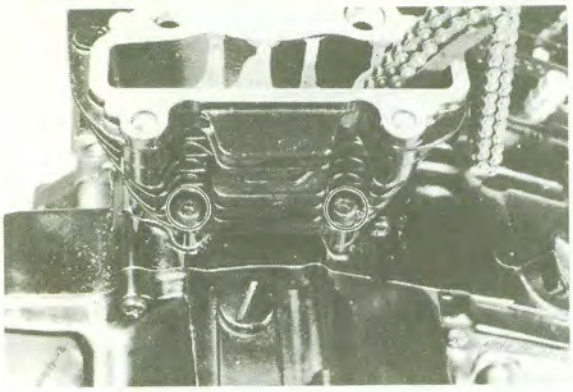


8. Remove the three dowels, O-ring, and cam chain guide #1 from the cylinder.



1. Dowel 2. O-ring 3. Cam chain guide #1

9. Remove the cylinder securing bolts and remove the cylinder.



Piston Pin and Piston

1. Remove the piston pin clip from the piston.

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.

2. Push the piston pin from the opposite side, then pull out.

CAUTION:

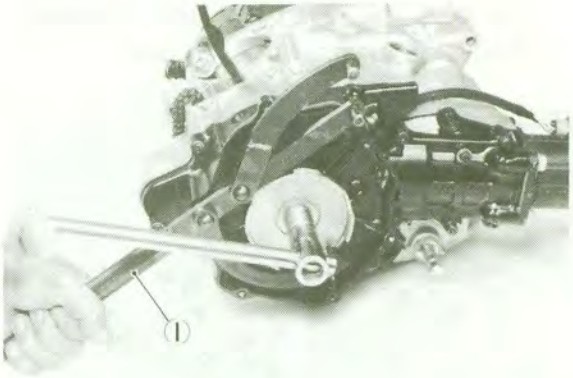
Do not use a hammer to drive the piston pin out.

NOTE:

Before removing the piston pin, deburr the clip groove and pin hole area. If after the piston pin goove is deburred, the piston pin is still difficult to remove, use the piston pin puller.

Crankcase Spacer (Left Side)

1. Remove the recoil starter pulley securing bolt, washer, and pulley. Hold the pulley with the universal rotor holder.

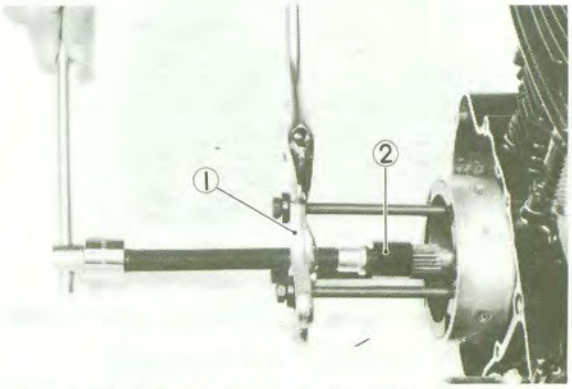


1. Universal rotor holder

2. Remove the left-side crankcase spacer securing bolts and remove the spacer, and two dowels from the crankcase.

Flywheel Magneto

1. Remove the flywheel magneto. Place the 3-way universal puller attachment on the crankshaft, and remove the flywheel with the puller.

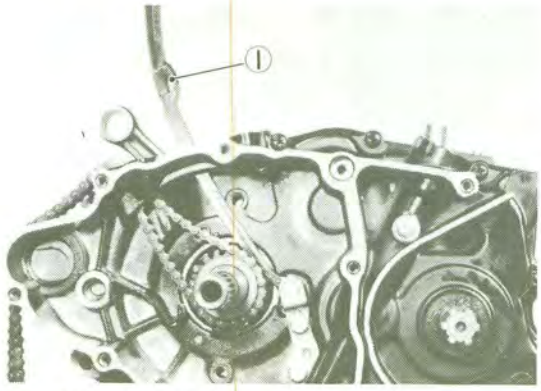


1. 3-way universal puller 2. Attachment

2. Remove the woodruff key, starter idle gears, shaft, and collar.

1. Woodruff key
2. Startor idle gear #2
3. Startor idle gear #1
4. Collar
5. Shaft

3. Remove the cam chain guide #2 securing bolts and remove the cam chain guide #2 and cam chain.

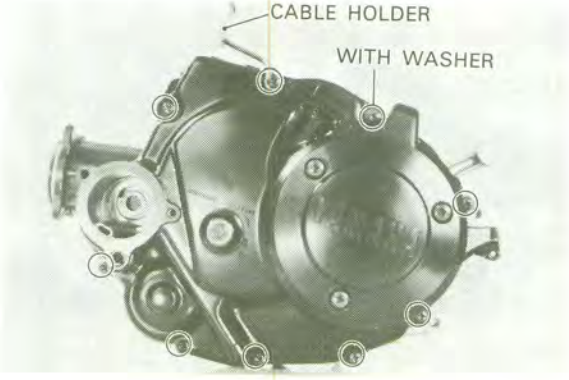


1. Cam chain guide #2

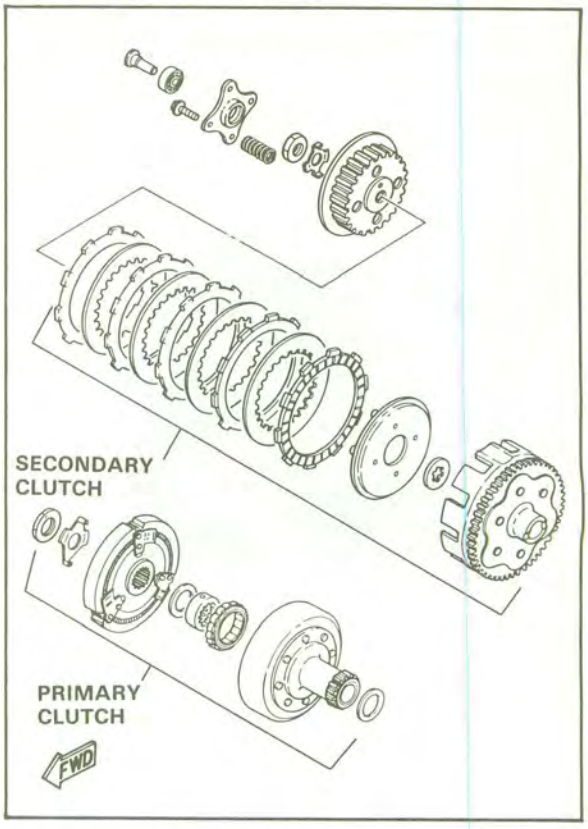
Clutch Cover

1. Remove the oil filter cover securing bolts and remove the filter cover, filter, and O-rings.

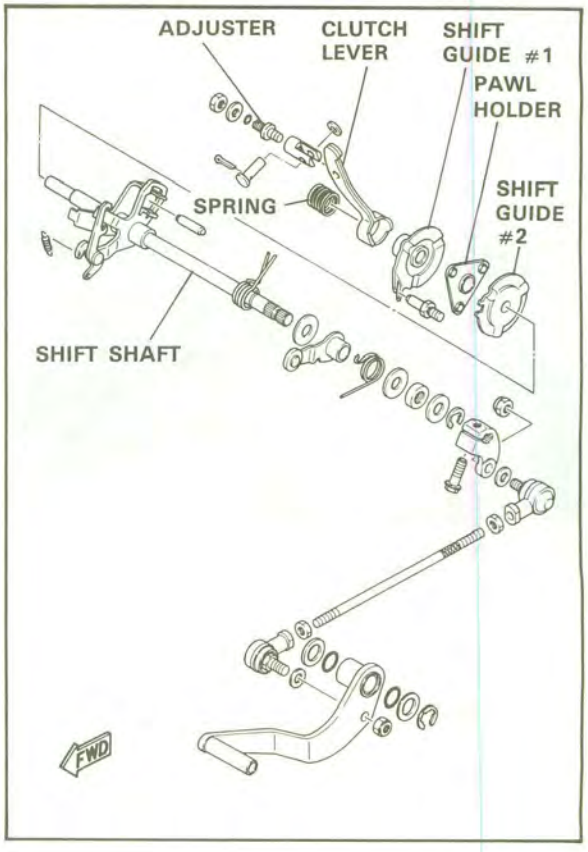
2. Remove the clutch cover securing bolts and remove the cover, cable holder, and two dowels from the right-side spacer.



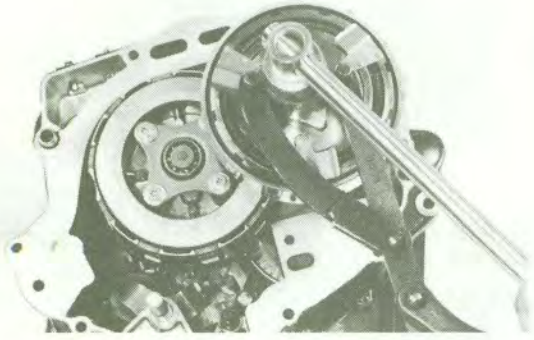
Primary Clutch and Secondary Clutch



1. Remove the clutch lever spring, shift guide #1, pawl holder, and shift guide #2.

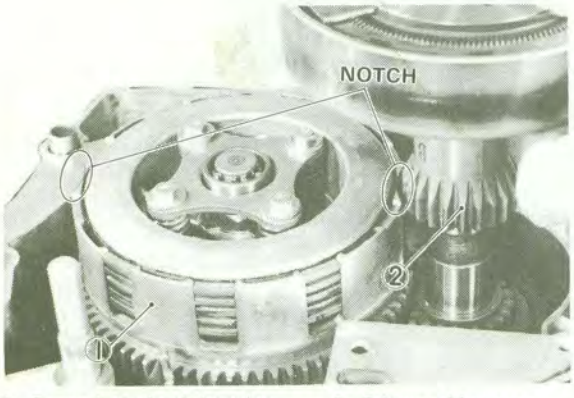


2. Flatten the lock tab on the primary clutch securing nut. Hold the clutch shoe assembly with the universal rotor holder and remove the securing nut, lock washer, and primary clutch assembly.

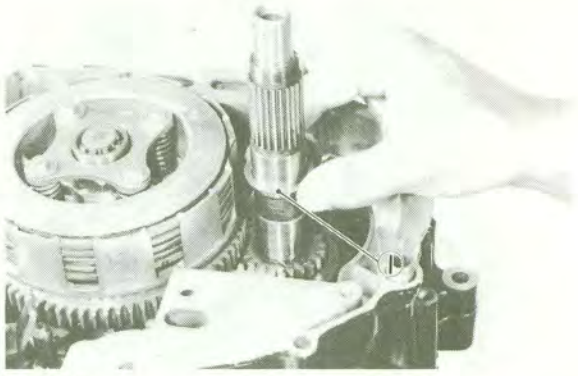


NOTE:

- The secondary clutch housing has two notches machined into it to permit the primary drive gear behind the primary clutch to clear the secondary clutch. Align one of these notches with the primary gear before removing the primary clutch assembly.
- There is a washer under the primary gear which may stick to the primary gear when the primary clutch is removed.

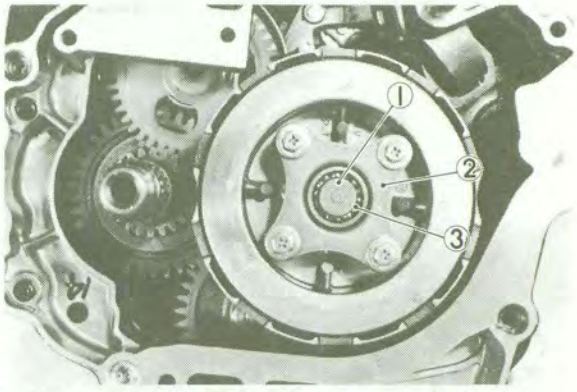


1. Secondary clutch housing 2. Primary drive gear



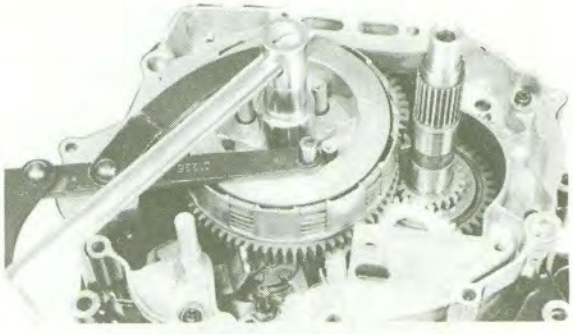
1. Washer

3. Remove the push rod and bearing from the secondary clutch spring plate.



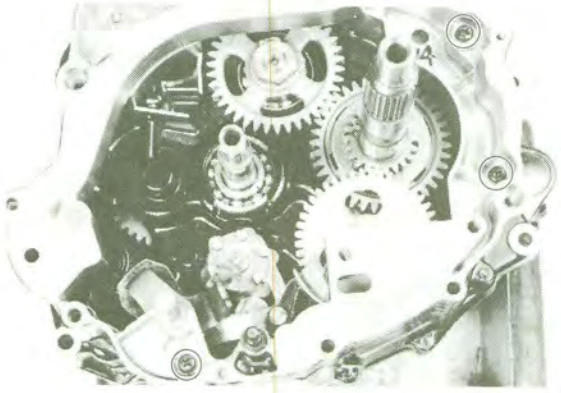
1. Push rod 2. Clutch spring plate 3. Bearing

4. Remove the clutch spring securing bolts, and remove the clutch spring plate and clutch springs.
5. Flatten the lock tab on the clutch boss securing nut. Hold the clutch boss with the universal rotor holder and remove the securing nut, lock washer, clutch boss, pressure plate, friction plates, clutch plates, thrust washer, and clutch housing.



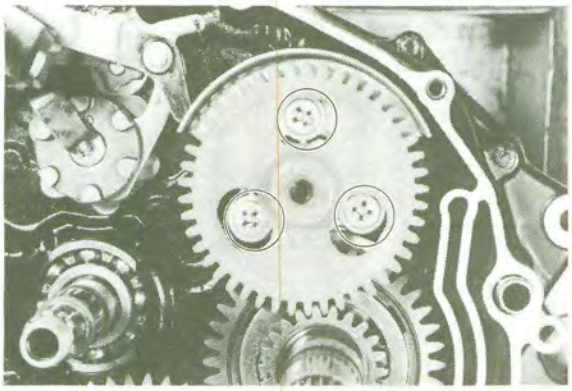
Crankcase Spacer (Right Side)

1. Remove the three bolts securing the crankcase spacer and remove the spacer and two dowels from the crankcase.



Oil Pump and Shifter

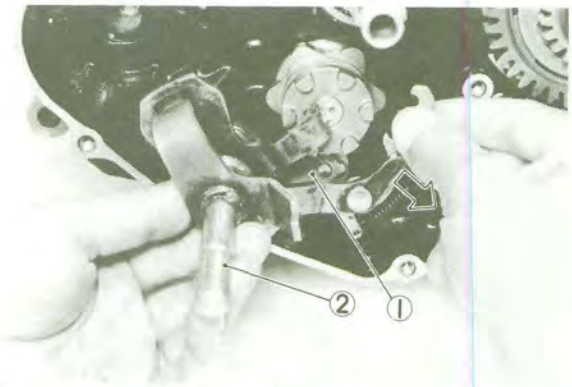
1. Loosen the pump cover securing bolts, and remove the oil pump assembly.



2. Remove the circlip and washer from the shift shaft.

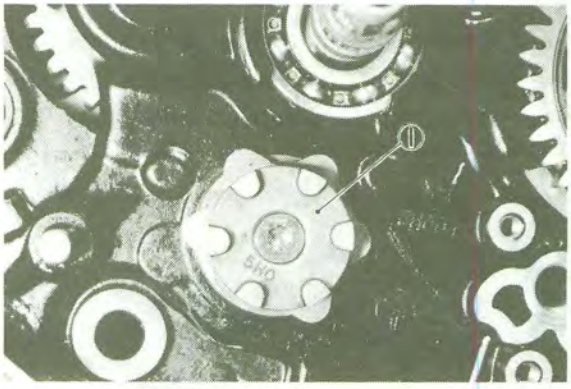
1. Circlip 2. Washer

3. Pull the shift shaft out from the right-hand side.
4. Remove the shift lever assembly, and then remove the stopper-lever assembly with the torsion spring.



1. Stopper lever 2. Shift shaft

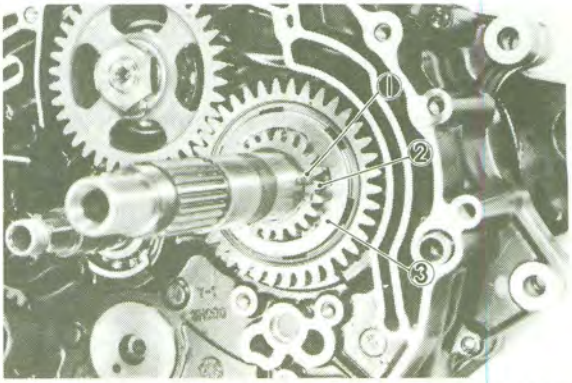
5. Remove the segment from the shift cam. Use the torx driver.



1. Segment

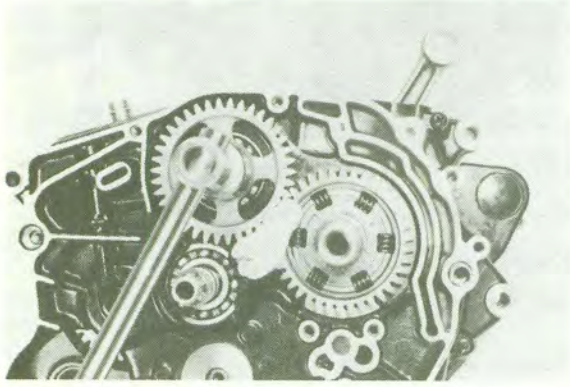
Balancer Drive and Driven Gears

1. Remove the circlip, oil pump drive gear, and plate washer from the crankshaft.



1. Circlip 2. Oil pump drive gear 3. Plate washer

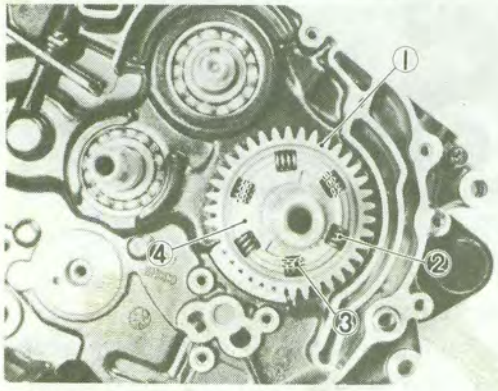
2. Flatten the lock tab on the balancer shaft and remove the securing nut.
3. Place a piece of rolled rag or a piece of lead between the drive and driven gears, and remove the securing nut, lock washer, and straight key.



4. Remove the balancer drive gear.

NOTE:

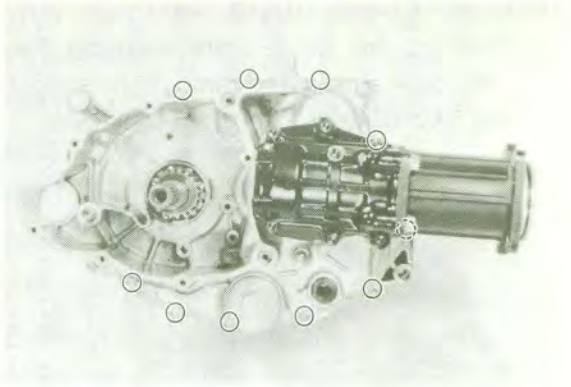
The balancer drive gear has six springs and three pins. Use care so that they don't fall out when removing the balancer drive gear.

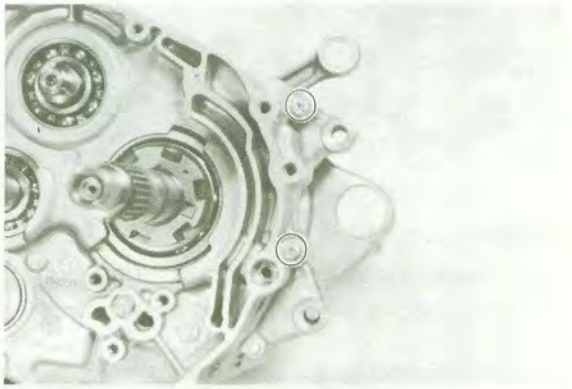


1. Balancer drive gear
2. Spring
3. Pin
4. Boss

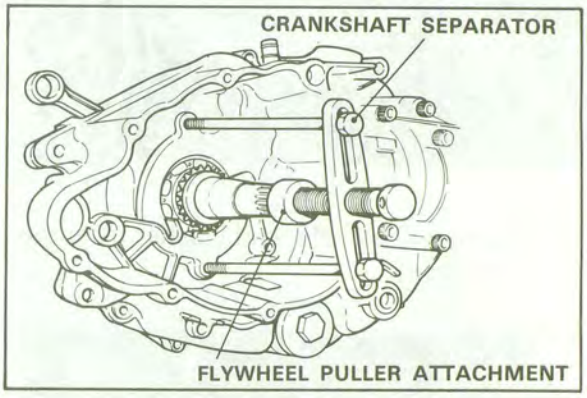
Crankcase

1. Working in a crisscross pattern, loosen all bolts 1/4 turn each. Remove them after all are loosened.





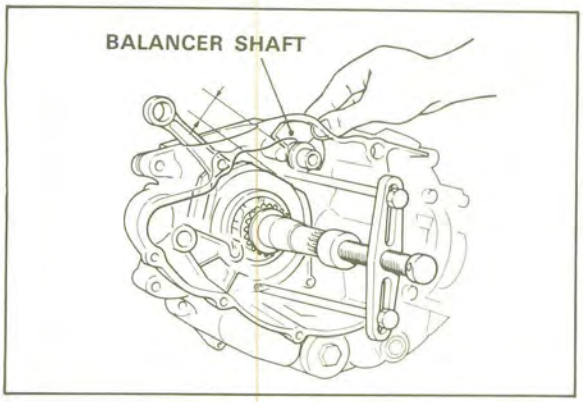
2. Install the flywheel magneto puller attachment onto the crankshaft, and install the crankcase separating tool as shown.

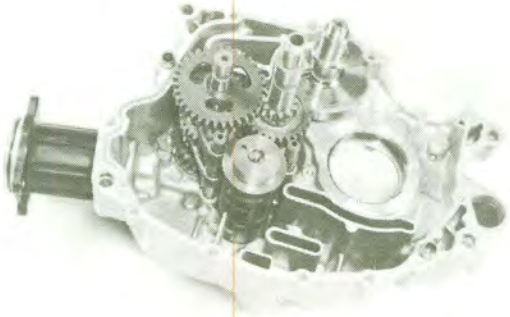


3. Slowly tightening the tool and remove the right-side crankcase with the crankshaft.

NOTE:

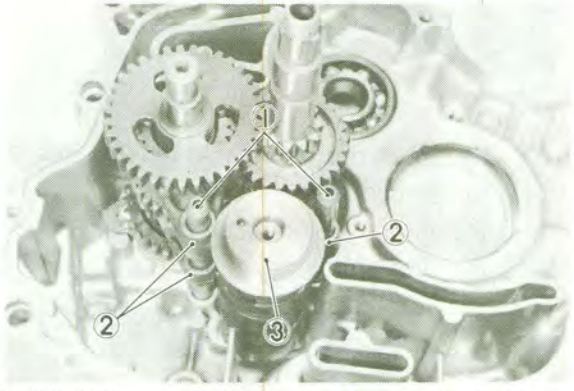
Before tightening the tool, turn the balancer shaft with your finger to make away of both the crankshaft and the balancer shaft web for easy separating.





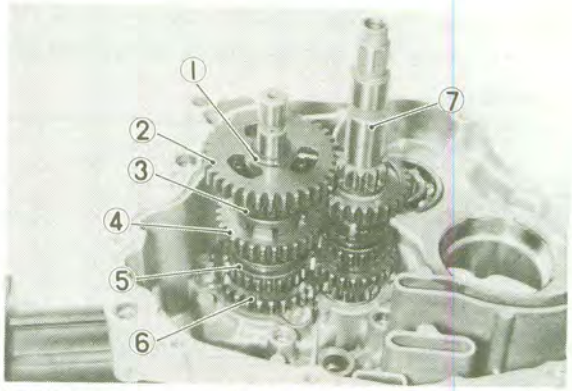
Transmission, Crankshaft, and Balancer Shaft

1. Remove the balancer shaft from the crankcase.
2. Remove the shift fork guide bars first; then remove the shift levers and shift cam.

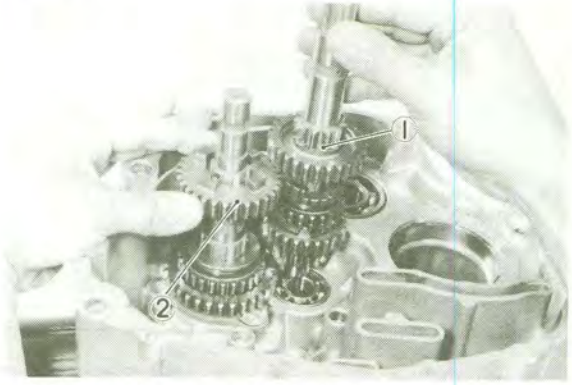


1. Shift fork 2. Shift fork guide 3. Shift cam

3. Remove the washer, 1st wheel, 4th wheel, circlip, washer and 3rd wheel from the drive axle. Remove the main axle subassembly from the crankcase.

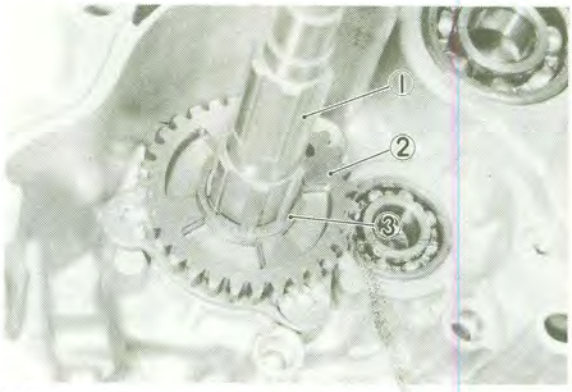


1. Washer
2. 1st wheel
3. 4th wheel
4. 3rd wheel
5. 5th wheel
6. 2nd wheel
7. Main axle



1. Sub-assembly 2. 3rd wheel

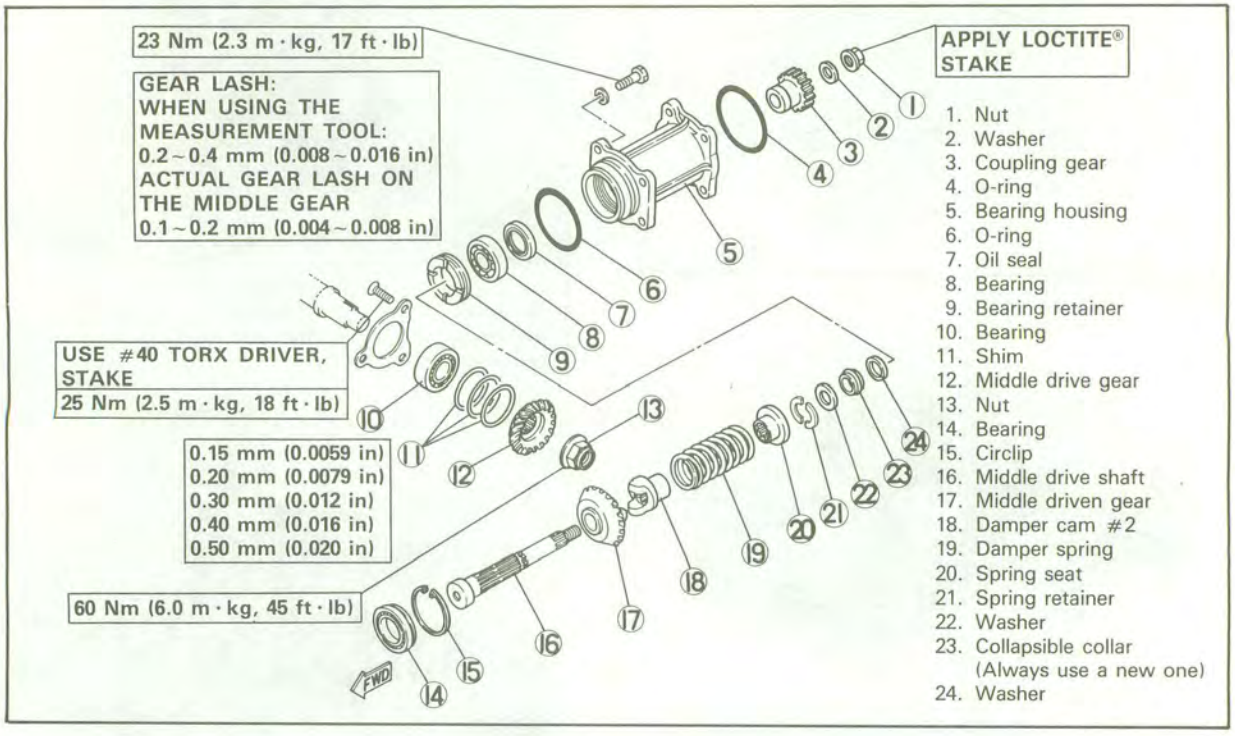
4. Remove the 5th wheel, circlip, washer, and 2nd wheel from the drive axle.



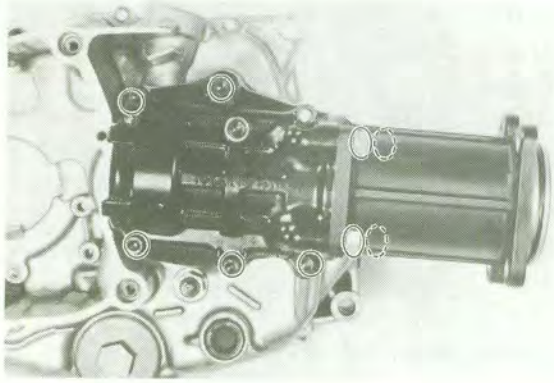
1. Drive axle 2. 2nd wheel 3. Circlip

5. Remove the crankshaft from the right-side crankcase: use with the oil press machine.

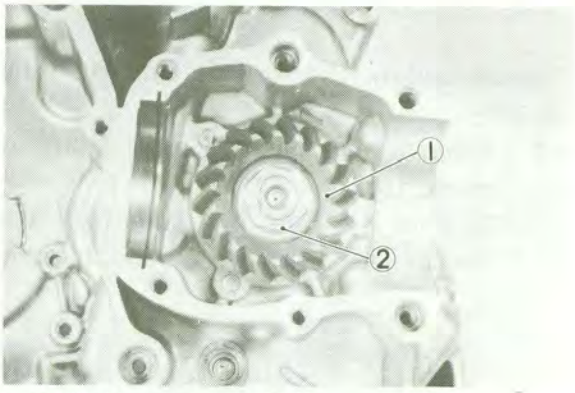
The following steps are necessary only if you must service the middle gears or replace the crankcase.



6. Remove the middle-gear-case cover securing bolts and middle-drive-shaft bearing-housing securing bolts.
   Remove the middle-drive-shaft assembly and semi-circular clip from the left-side crankcase.

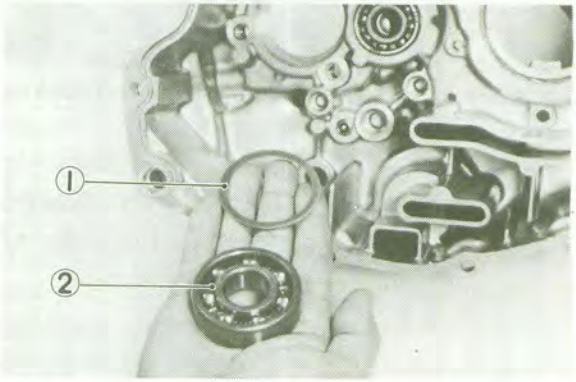


7. Secure the drive axle in a vice or other support.
8. Remove the middle drive gear and the drive axle; With the drift punch, flatten the punched portion of the drive gear securing nut. Remove the drive gear securing nut.



1. Middle drive gear 2. Nut

9. Remove the drive-axle-bearing-stopper bolts; use the #40 torx driver.
10. Remove the bearing stopper plates, bearing and shims.

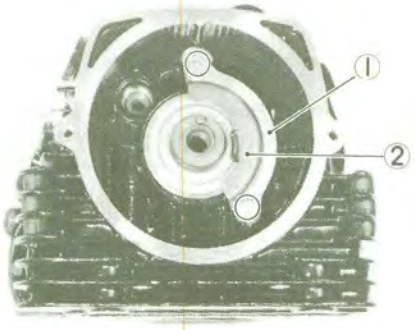


1. Shim 2. Bearing

INSPECTION AND REPAIR

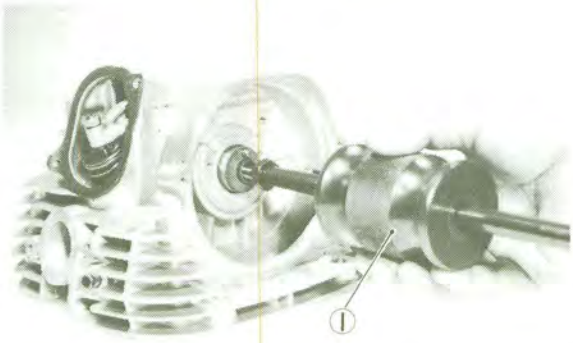
Cylinder Head Disassembly

1. Remove the intake and exhaust valve covers from the cylinder head.
2. Loosen the valve adjuster on both valves, and flatten the lock washer.



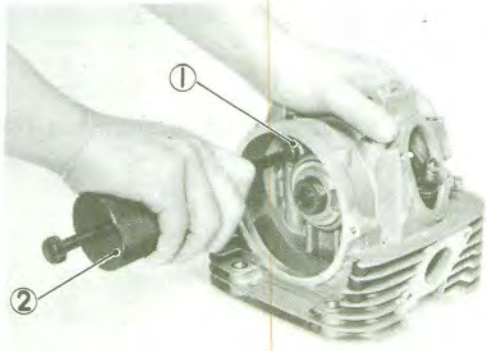
1. Lock washer 2. Plate

3. Remove the cam shaft bearing securing bolts, washer, and plate.
4. Remove each camshaft and camshaft bearing with a slide hammer.



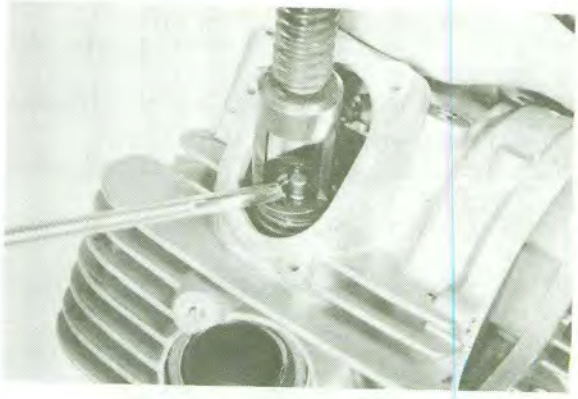
1. Slide hammer

5. Remove each rocker arm shaft with a slide hammer, then remove the rockers.



1. Rocker shaft 2. Slide hammer

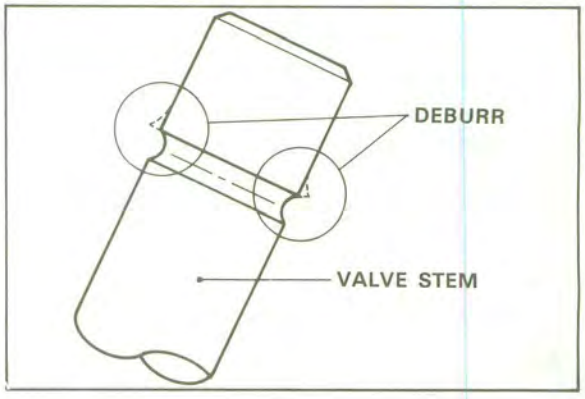
6. Mount the valve spring compressor on the head and depress each valve spring. Remove the valve retainers with a magneto or tweezers, remove the valve springs.



7. Remove the valves.

NOTE:

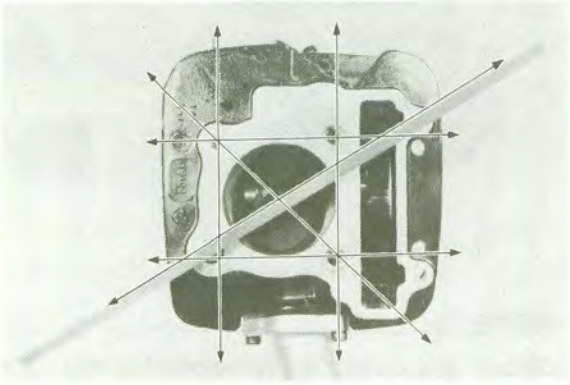
Deburr any deformed valve stem end. Use an oil stone to smooth the stem end. This will help prevent damage to the valve guide during valve removal.



8. 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.

9. 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.

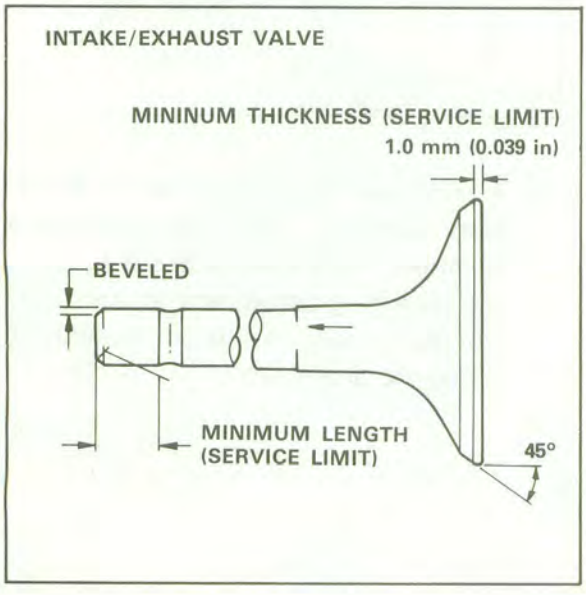
Cylinder head warpage:
Less than 0.03 mm (0.0012 in)



Valves, Valve Guides, Valve Seats, and Valve Springs

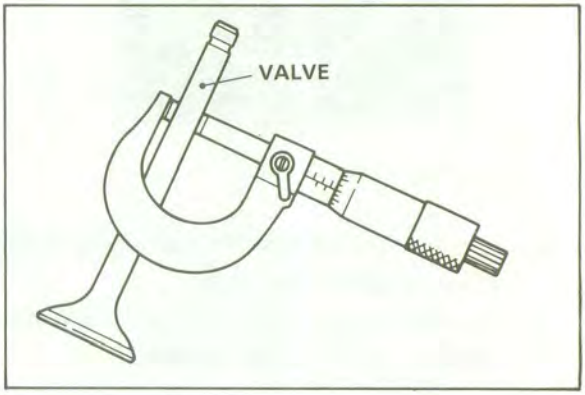
Valves

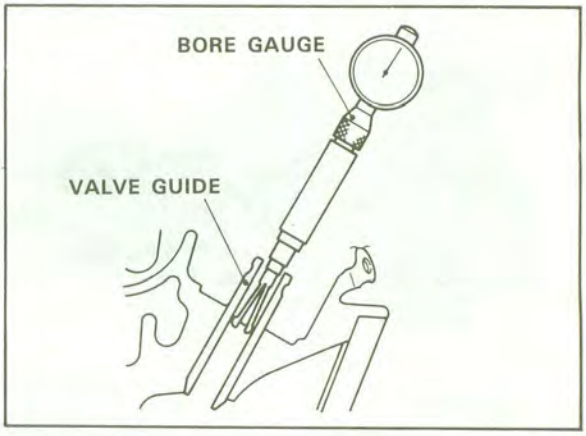
1. Check the valve face and the stem end for wear. If the valve face and/or the stem end are pitted or worn, regrind the valve with a valve refacer. Replace the valve if any dimension exceeds the specifications in the illustration.



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.

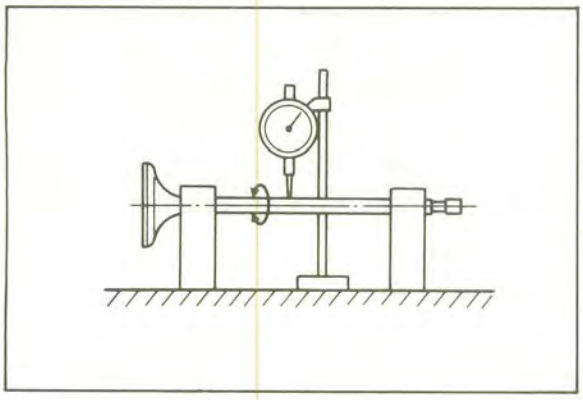
	Valve Stem Clearance	Maximum
Intake	0.010 ~ 0.037 mm (0.0004 ~ 0.0015 in)	0.10 mm (0.004 in)
Exhaust	0.025 ~ 0.052 mm (0.0010 ~ 0.0020 in)	0.12 mm (0.005 in)





3. 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.

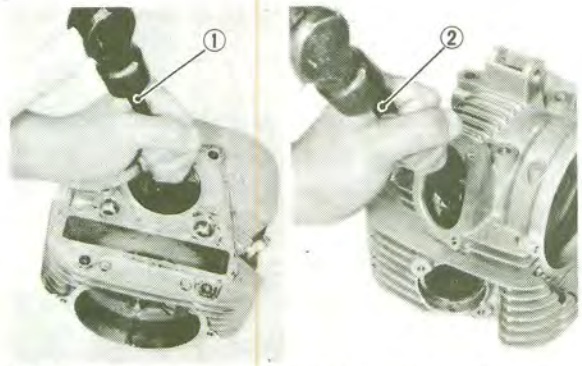
NOTE:

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: 6.1 mm (0.240 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.

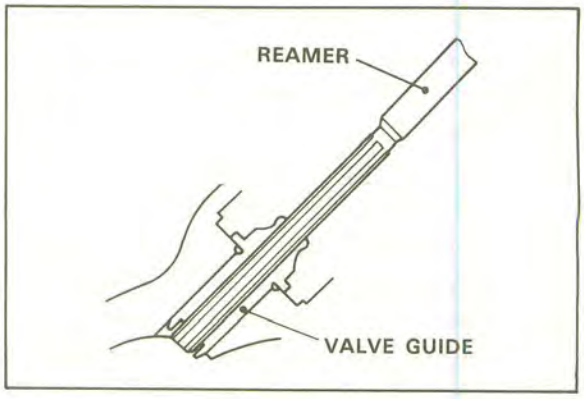


1. Valve guide remover
2. Valve guide installer

NOTE:

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

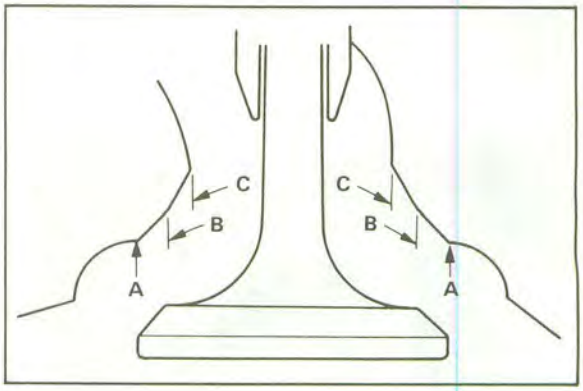
4. After installing the valve guide, use the 6 mm (0.24 in) reamer (special tool) to obtain the proper valve-guide-to-valve-stem clearance.



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 guide has been installed, the valve seat must be recut to guarantee complete sealing between the valve face and seat.



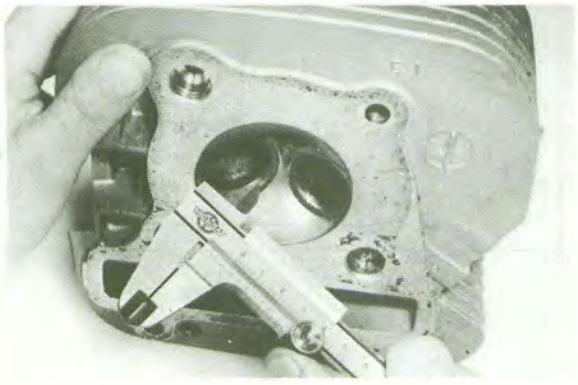
CAUTION:

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

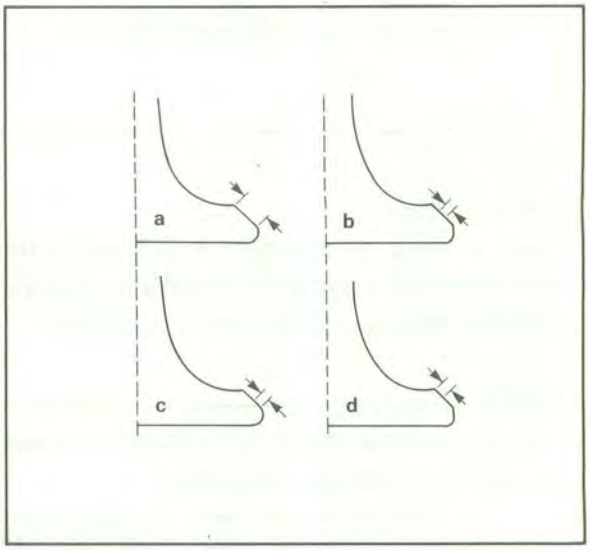
If cutting section A of the valve seat, use a 30° cutter. If cutting section B, use the 45° cutter. If cutting section C, use the 60° cutter.

2. Measure the valve seat width. Apply mechanic's bluing dye (such as Dykem) to the valve face and valve seat, apply a very small amount of 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 wherever they contacted each other. Measure the seat width with vernier calipers. It should measure approximately 1.0 mm (0.039 in). The valve-seat contact area should be one uniform width. If valve seat width varies or if pits still exist, further cutting will be necessary. Remove just enough material to achieve a satisfactory seat.

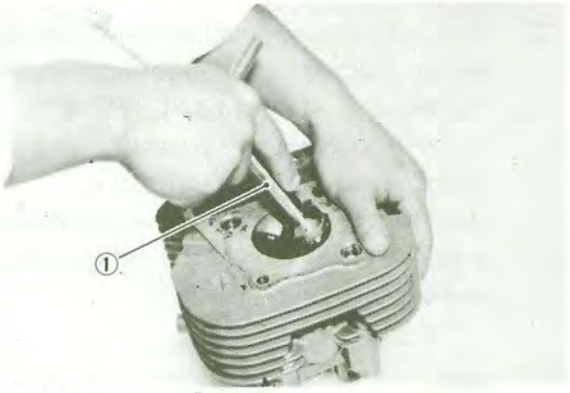
	Standard Width	Wear Limit
Seat Width	1.0 ± 0.1 mm (0.039 ± 0.0039 in)	1.6 mm (0.063 in)



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:



a. 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 1.0 mm (0.039 in).



1. Valve seat cutter

b. If the valve seat is in the middle of the valve face but too narrow, use the 45° cutter until the width equals 1.0 mm (0.039 in).

c. 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.

d. If the seat is too narrow and down near the bottom edge of the valve face, 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 is severely worn.

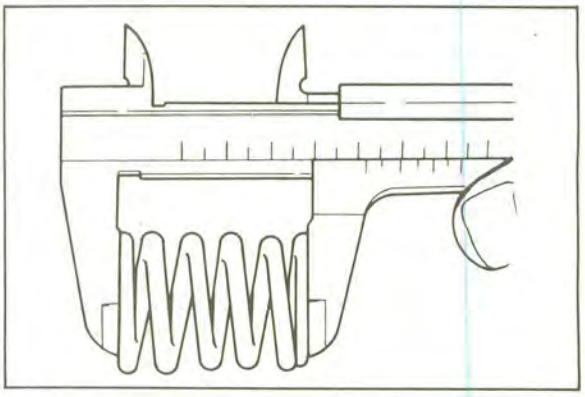
1. Apply a small amount of coarse lapping compound to the valve face. Insert the valve into the head. Rotate the valve until the valve and valve seat are evenly polished. Clean off the coarse compound, then follow the same procedure with fine compound.
   Continue lapping until the valve face shows a complete and smooth surface all the way around. Clean off the compound material. Apply 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.

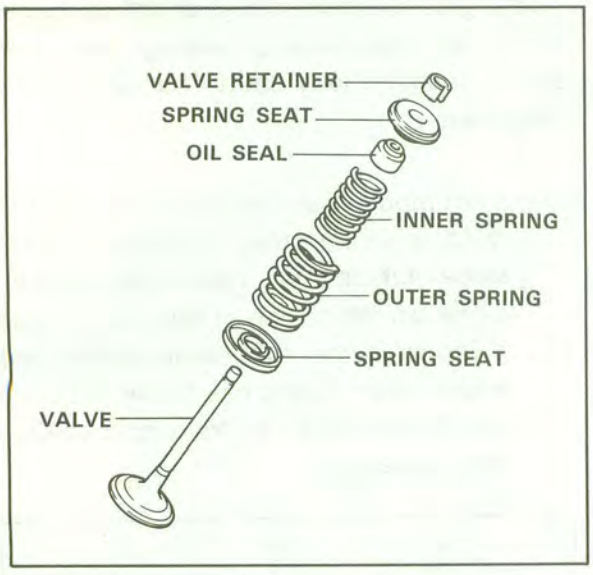
1. Even though the spring is constructed of durable spring steel, it gradually loses some of its tension. This is evidenced by a gradual shortening of free length. Use a vernier caliper to measure spring free length. If any spring has decreased more than 2 mm (0.080 in) from its specification, replace 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	37.2 mm (1.46 in)	35.5 mm (1.40 in)
Installed length (valve closed)	32.0 mm (1.26 in)	30.5 mm (1.20 in)
Installed pressure (valve closed)	18.5 kg (40.8 lb)	9.3 kg (20.5 lb)
Allowable tilt from vertical	2.5°	←

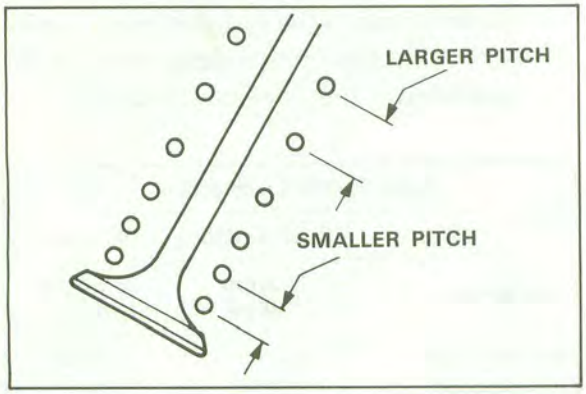
Valve installation



1. Lubricate the valve stem and the oil seal with a high-quality molybdenum disulfide motor oil or molybedenum disulfide grease.
2. Insert the valve in the cylinder head, and install the oil seal. 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 greater 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.

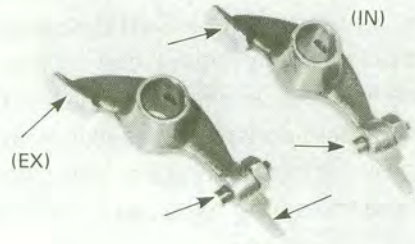
WARNING:

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

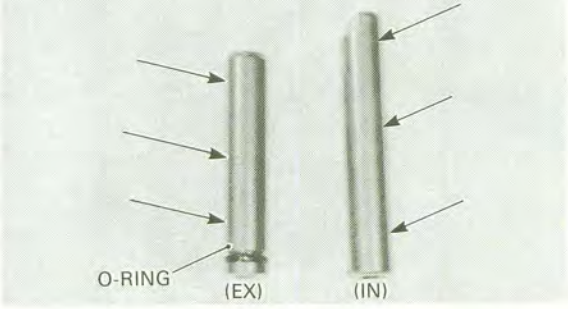
8. Gently tap the end of the valve stem with a plastic mallet. This will ensure that the retainers are properly seated in the collar.

Rocker Arms and Rocker Arm Shafts

ROCKER ARM



ROCKER ARM SHAFT



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.

Wear limit: 12.03 mm (0.474 in)

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

Wear limit: 11.94 mm (0.470 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 0.04 mm (0.0016 in) replace either or both parts as necessary.

Arm-to-shaft clearance:
0.009 ~ 0.037 mm (0.0004 ~ 0.0016 in)

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.
6. Check the rocker-arm-shaft (exhaust) O-ring for damage. If it is damaged replace the O-ring.

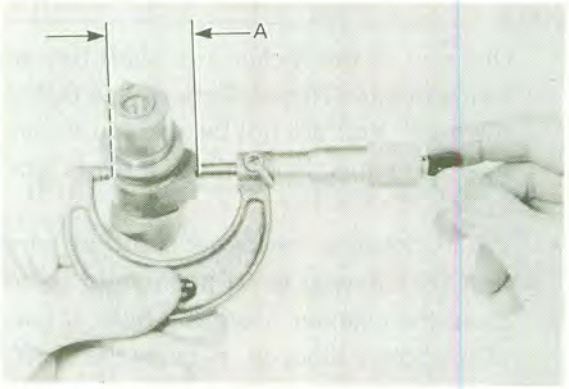
Camshafts, Cam Chains, and Cam Sprockets

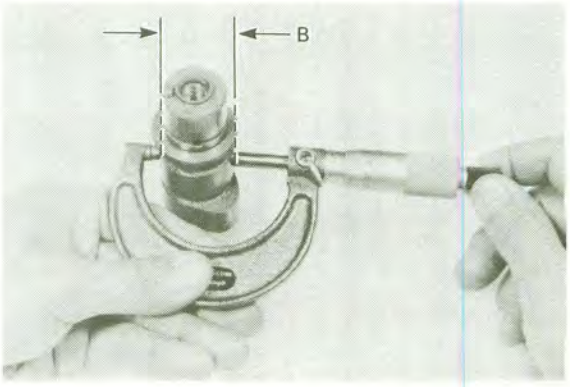
Camshaft

The cam lobe metal suface 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.

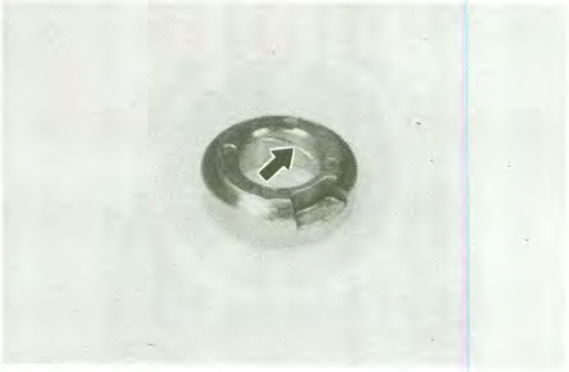
Wear Limit	A	B
Intake	36.58 mm (1.440 in)	30.18 mm (1.188 in)
Exhaust	36.62 mm (1.441 in)	30.26 mm (1.191 in)





Camshaft bushing

Bushing should be cleaned, dried, and the inner surface visually checked for pits, rust spots, or chatter marks. If any of these conditions exist, the bushing should be replaced.

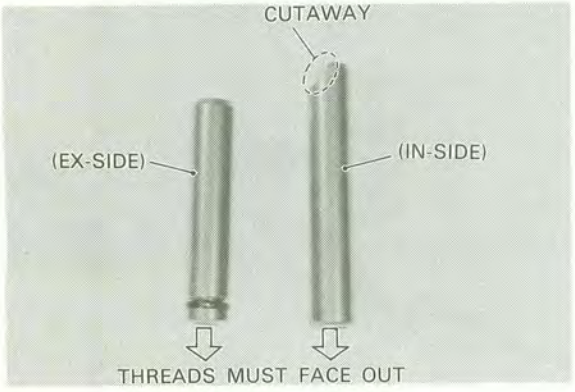


Cylinder Head Assembly

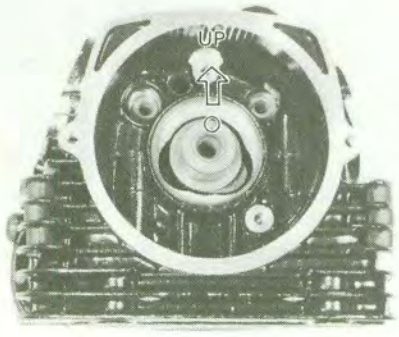
1. Install each rocker arm through the valve cover hole. Install the shorter rocker arm shaft (with O-ring) on the exhaust side and the longer shaft (with cutaway) on the intake side.

NOTE:

- One end of the rocker arm shaft has an inside thread. This end **must** face out of the head. You will not be able to remove the rocker arm shaft if these threads face in.
- When installing the longer shaft, be sure that its cutaway is so positioned as to clean the cylinder head bolt hole. If part of the hole is blocked, reinstall the shaft.



2. Loosen the valve adjuster on both valves, and install the camshaft into the cylinder head. The pin on the end of the camshaft must align with the timing mark on the cylinder head.

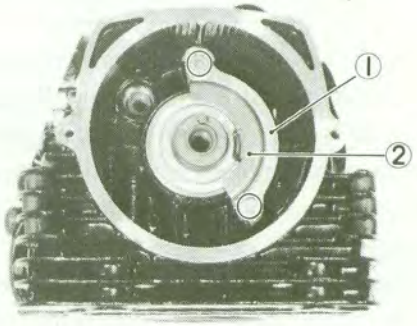


3. Install the camshaft bushing onto the camshaft. Be sure the bushing is completely seated in the cylinder head. The cut-out portion of the bushing must be flush with the cylinder head. Secure the bushing in the head with the securing plate. Torque the securing-plate bolt to specification, and bend the lock tab against a nut flat.

CAUTION:

Do not cock the bushing during installation. The bushing must be perpendicular to the camshaft during installation.

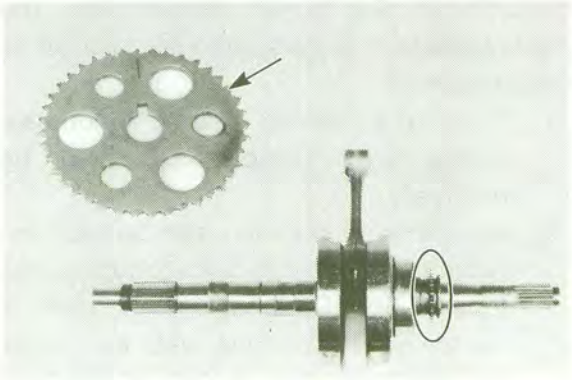
TIGHTENING TORQUE:
10 Nm (1.0 m·kg, 7.2 ft·lb)



1. Lock washer 2. Plate

Cam Sprocket and Cam Drive Sprocket

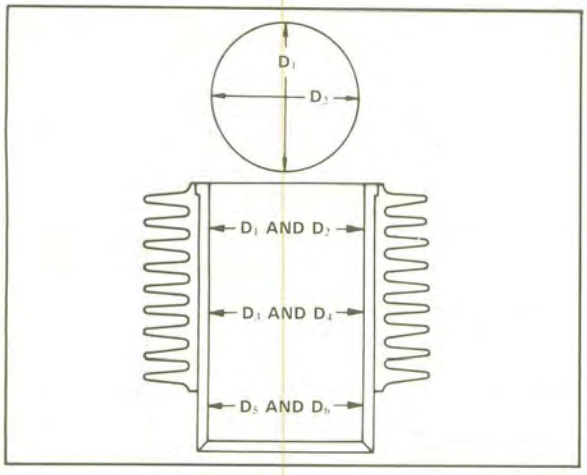
1. Check the cam sprocket and cam drive sprocket for wear.



Cylinder

1. Visually check the cylinder walls for scratches. If vertical scratches are evident, 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 at a right angle 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	$67^{+0.020}_{-0.030}$ mm ($2.64^{+0.0008}_{-0.0012}$ mm)	66.9 mm (2.63 in)
Cylinder taper	—	0.005 mm (0.0002 in)

Piston and Piston Rings

Piston

1. Visualy check the piston for scraches. If vertical scratches are evident, the piston should be replaced.
2. Using the micrometer, measure the outside diameter of the piston at the piston skirt. Measurement should be made at a point 7.5 mm (0.30 in) above the bottom edge of the piston by placing the micrometer parallel to and at right angles to the piston pin. Replace the piston if wear exceeds the limit.

a. 7.5 mm (0.30 in)

Standard	66.935 ~ 66.985 mm (2.635 ~ 2.637 in)
Oversize 2	67.50 mm (2.657 in)
Oversize 4	68.00 mm (2.677 in)

Piston clearance:
0.025 ~ 0.045 mm (0.0010 ~ 0.0018 in)

3. 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. Replace the piston if wear exceeds the limit.

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

Piston ring

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

Oversize 2	0.50 mm (0.0197 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 2	Blue
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 in) 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.

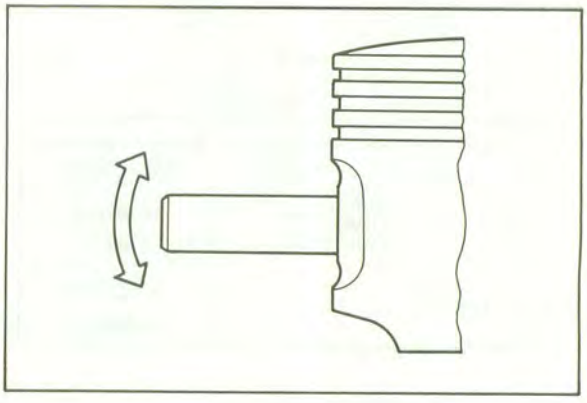
NOTE:

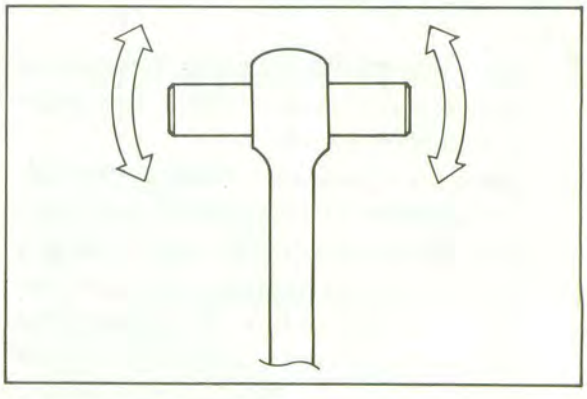
You cannot measure the end gap on the expander spacer of the oil control ring. If the oil-control-ring rails show excessive gap, replace all three rings.

	Standard	Limit
Top ring	0.15 ~ 0.35 mm (0.0059 ~ 0.0138 in)	0.75 mm (0.0295 in)
2nd ring	0.15 ~ 0.35 mm (0.0059 ~ 0.0138 in)	0.75 mm (0.0295 in)
Oil	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.





Crankshaft and Connecting Rod

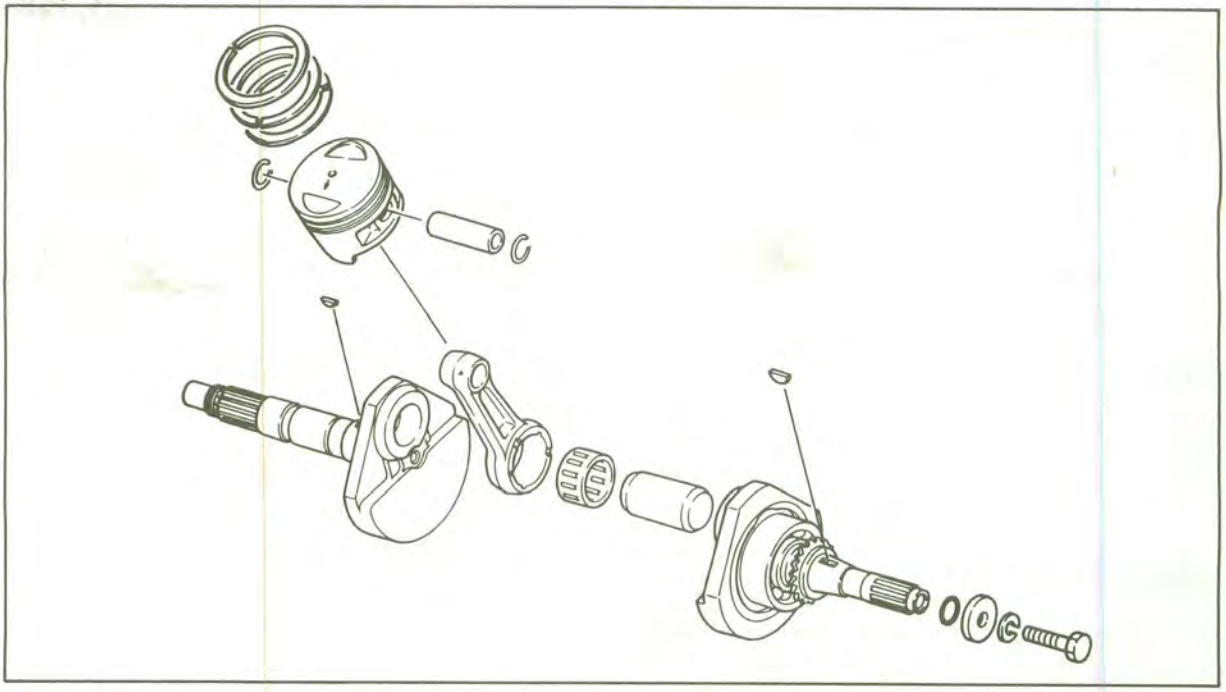
Crankshaft bearing

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 and connecting rod



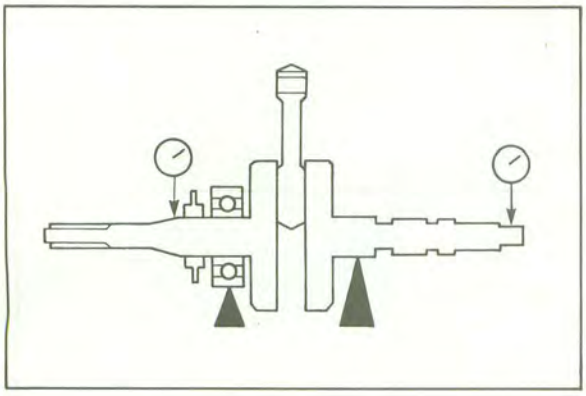
1. Check crankshaft components per chart.

Check connecting-rod axial play at small end (to determine the amount of wear or crank pin and bearing at big end).	Small end play should not exceed 2 mm (0.079 in).	If small end play exceeds 2 mm (0.079 in), replace left crankshaft, connecting rod assembly, buffer boss, and woodruff key. Check right crankshaft bearing. If damaged, replace bearing. Play after reassembly should be within 0.8 ~ 1.0 mm (0.031 ~ 0.039 in)).
Check the connecting rod side clearance at big end.	Move the connecting rod to one side and insert a feeler gauge. Big end axial play should be within 0.35 ~ 0.65 mm (0.014 ~ 0.026 in).	If excessive axial play is present, 0.7 mm (0.028 in) or more, disassemble the crankshaft and replace same parts on above.
Check crankshaft assembly runout. (Misalignment of crankshaft parts.)	Dial gauge readings should be within 0.03 mm (0.00118 in).	Correct any misalignment by tapping the flywheel with a brass hammer and by using a wedge.

2. Crankshaft specifications

Unit: mm (in)

Runout		Flywheel Width	Rod Clearance			
			Axial "P"		Side "C"	
Left side "1"	Right side "2"	"F"	New	Max.	Min.	Max.
0.02 (0.0008)	0.06 (0.0024)	58.95 ~ 59.00 (2.321 ~ 2.323)	0.8 ~ 1.0 (0.03 ~ 0.04)	2.0 (0.08)	0.3 (0.0118)	0.65 (0.0256)



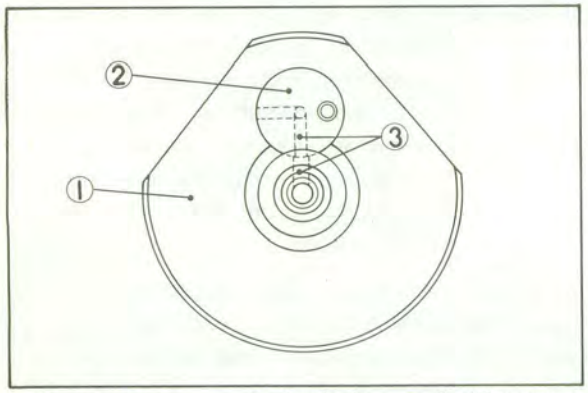
3. To disassemble and reassemble the crank, follow the illustration.

NOTE:

Make sure the oil passages of the crank and crank pin are lined up during assembly.

CAUTION:

The buffer boss and woodruff key should be replaced when removed them from the crankshaft.



1. Crank assembly 2. Crank pin 3. Oil passage

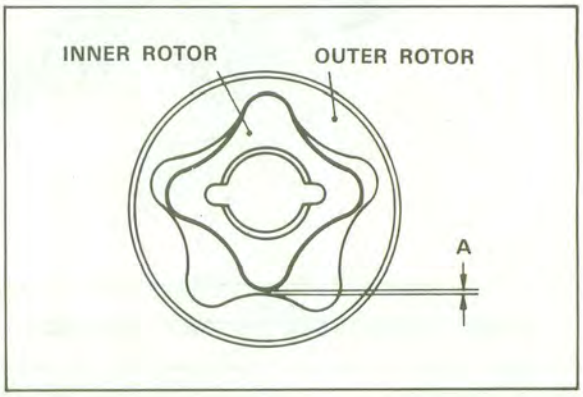
Oil Pump

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

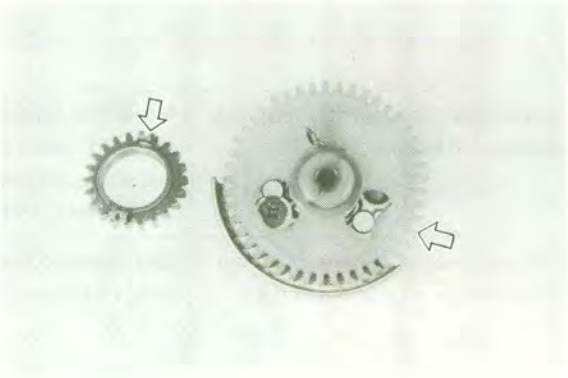
Rotor width:
Crankshaft pump: 6 mm (0.236 in)

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

Inner-outer clearance:
0.15 mm (0.0059 in)

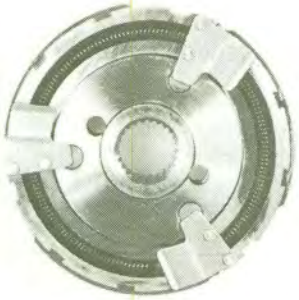


3. Check the drive gear and the driven gear for obvious signs of wear or damage. Replace the gear(s) as required.



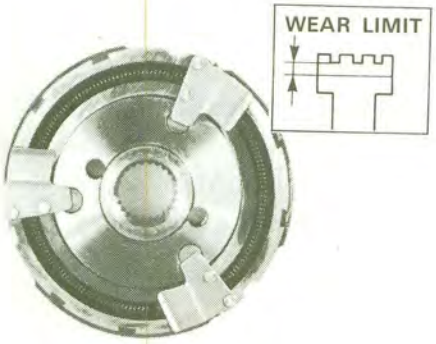
Primary Clutch

1. Check the clutch housing and clutch shoe assembly for heat damage.

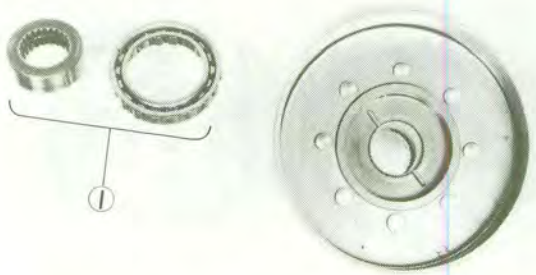


2. Replace clutch shoe assembly if any is faulty or beyond wear limit.

Clutch shoe wear limit: 1.5 mm (0.06 in)



3. Check the primary drive gear for obvious signs of wear or damage. Replace the clutch housing as required.
4. Check the one-way clutch for pitting or other damage. If severe, replace the one-way clutch assembly and clutch housing as a set.



1. One-way clutch assembly

Secondary 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.

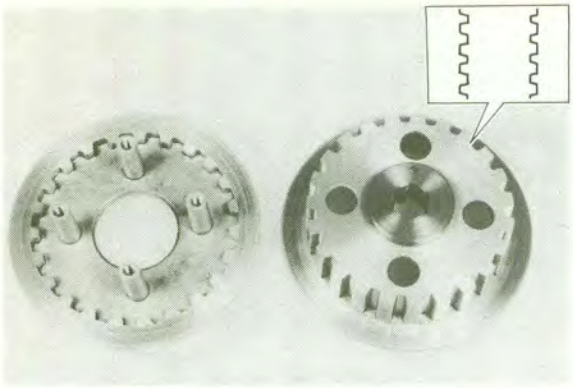
2. Check the clutch housing bearing for damage. If damaged, replace the bearing.

Pressure plate #2

1. Check the splines on the pressure plate for galling. If damage is slight to moderate, deburr; if it is severe, replace the pressure plate #2.

NOTE:

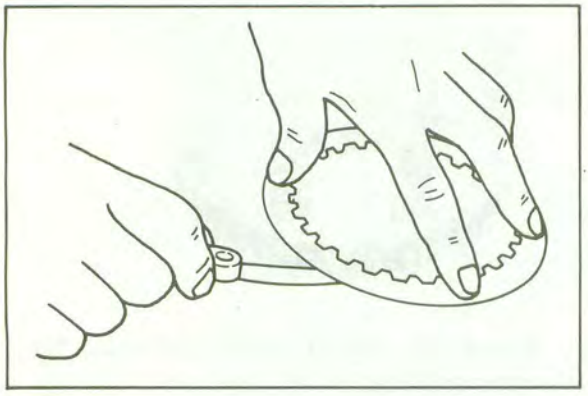
Galling on clutch plate splines will cause erratic operation.

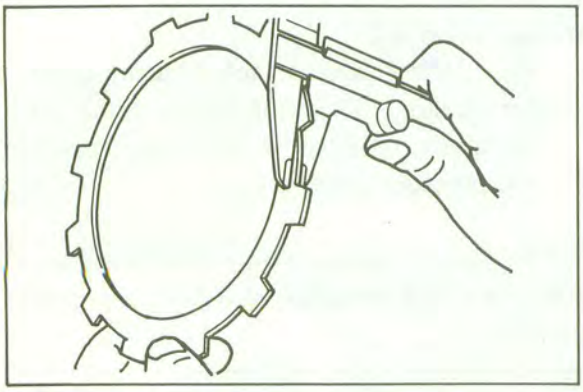


Friction and clutch plates

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)	2.8 mm (0.11 in)
Clutch plate warp limit	—	0.2 mm (0.008 in)



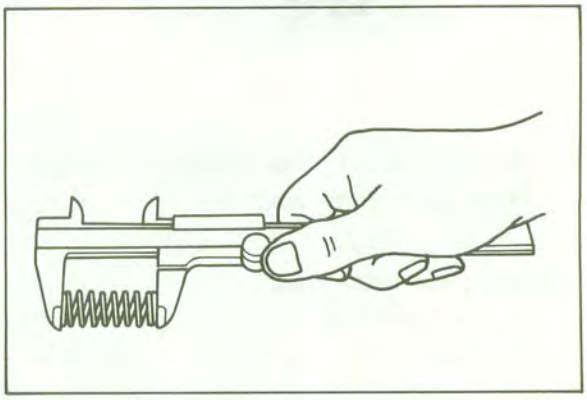


Checking clutch springs

Using the vernier caliper, measure the free length of each spring. If it measures 1.0 mm (0.04 in) less than specified, it should be replaced.

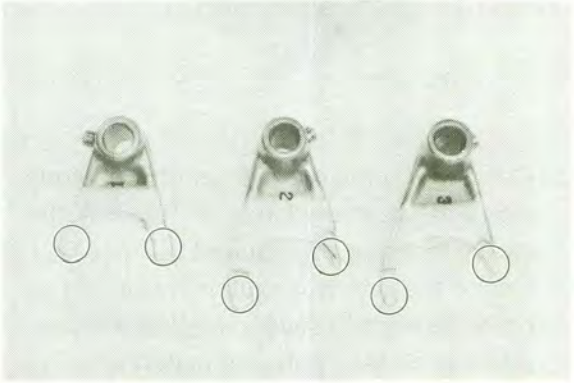
Clutch spring specifications

Number of springs	4 pcs
Free length	34.9 mm (1.37 in)

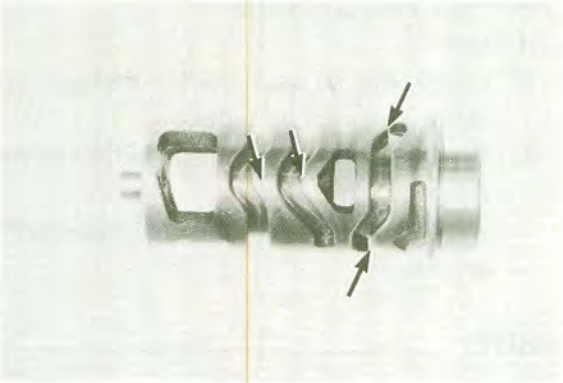


Transmission

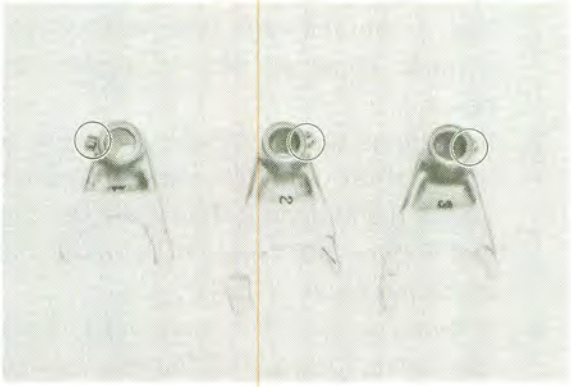
1. Inspect each shift fork for signs of galling on the gear contact surfaces. Check for bending. Make sure each fork slides freely on its guide bar.



2. Roll the guide bar across a surface plate. 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, if it is damaged.



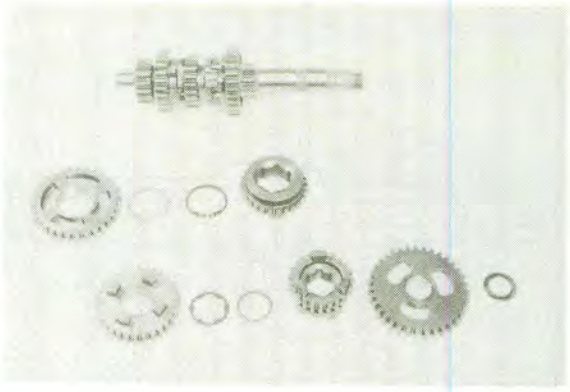
4. Check the cam followers on each shift fork for wear. Check the ends that ride in the grooves in the shift cam. If they are worn or damaged, replace the shift fork.



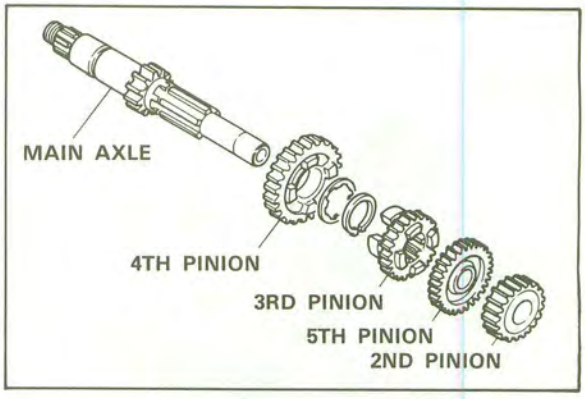
5. Check the shift cam dowel and side plate for looseness, damage, or wear. Replace as required.
6. Check the transmission shafts using a centering device and dial gauge. If any shaft is bent beyond the specified limit, replace the shaft.

Maximum runout: 0.08 mm (0.0031 in)

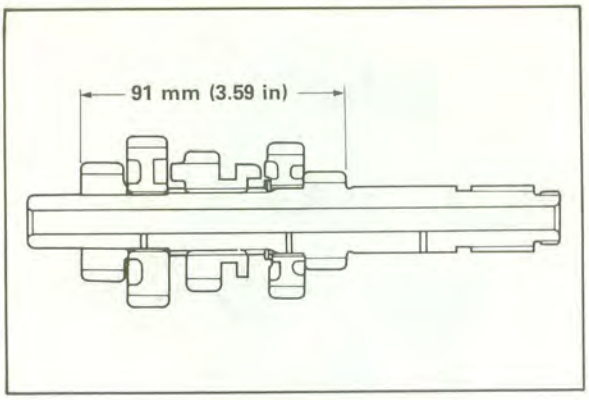
7. Carefully inspect each gear. Look for signs of obvious heat damage (blue discoloration). Check the gear teeth for signs of pitting, galling, or other extreme wear. Replace as required.



8. Check to see that each gear moves freely on its shaft.
9. Check to see that all washers and clips are properly installed and undamaged. Replace bent or loose clips and bent washers.
10. 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.
11. When replacing the main axle or pinions, take the following steps:



a. Apply molybdenum oil to the 4th and 5th pinion bosses.
b. Using a hydraulic press, force-fit the 2nd pinion to the position specified below.



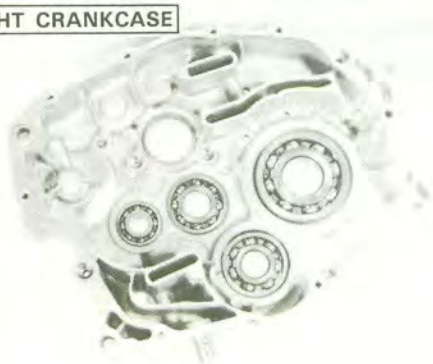
c. After installing the pinions onto the main axle, make sure the 4th and 5th pinions turn freely around the main axle.

Crankcase

1. Thoroughly wash the case halves in a mild solvent.
2. Clean all gasket mating surfaces and crankcase mating surfaces thoroughly.
3. Visually inspect the case halves for any cracks or their damage.
4. Check all fittings not previously removed for signs of looseness or damage.
5. Check oil delivery passages for signs of blockage.

LEFT CRANKCASE

RIGHT CRANKCASE



Bearings and Oil Seals

Oil seals

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

Bearings

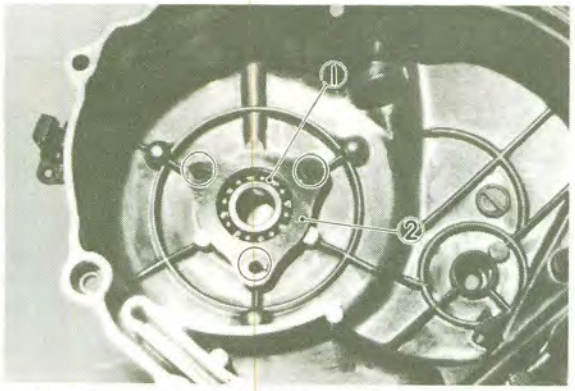
1. After cleaning and lubricating the bearings, rotate the inner race with a finger. If rough spots are noticed, replace the bearing.
2. If bearings have not been removed, oil them thoroughly immediately after washing and drying. Rotate the bearing, and check for roughness indicating damaged races or balls.
3. If bearings have been removed, check their seats for signs of damage (such as the bearing spinning in the seat, etc.).
4. Drive out the bearing(s) from each crankcase. Use the appropriate special tool.

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.

5. After removing the bearing from the clutch cover. Install a new bearing into the cover. Apply Loctite® (red) to the bearing securing bolts, and install the bolts and a bearing retainer onto the cover. Torque the bolts to specification. Use the torx driver.

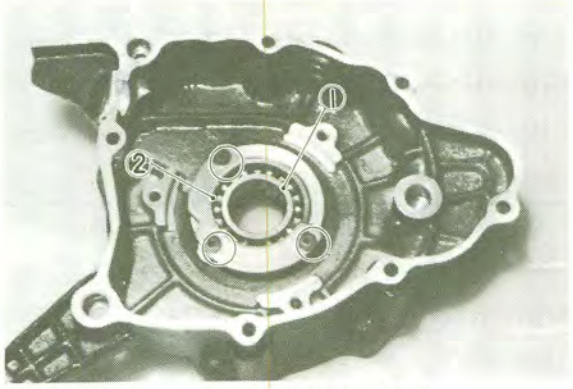
TIGHTENING TORQUE:
7 Nm (0.7 m · kg, 5.1 ft · lb)



1. Bearing 2. Bearing retainer

6. If bearing have been removed from the left-side spacer. Install a new bearing into the spacer. Apply Loctite® (red) to the bearing securing bolts, and install the bolts and a bearing retainer onto the spacer. Torque the bolts to specification.

TIGHTENING TORQUE:
7 Nm (0.7 m · kg, 5.1 ft · lb)

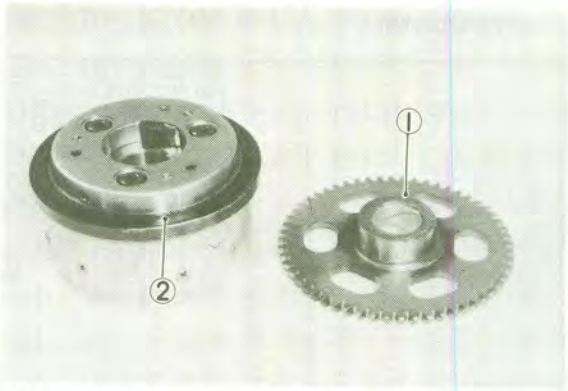


1. Bearing 2. Bearing retainer

Starter Drives

Electric starter clutch and gears

1. Check the surface of the idle gear #2 for pitting or other damage. If severe, replace the gear.
2. Check the spring caps and the springs for deformation or damage. If severe, replace as necessary.

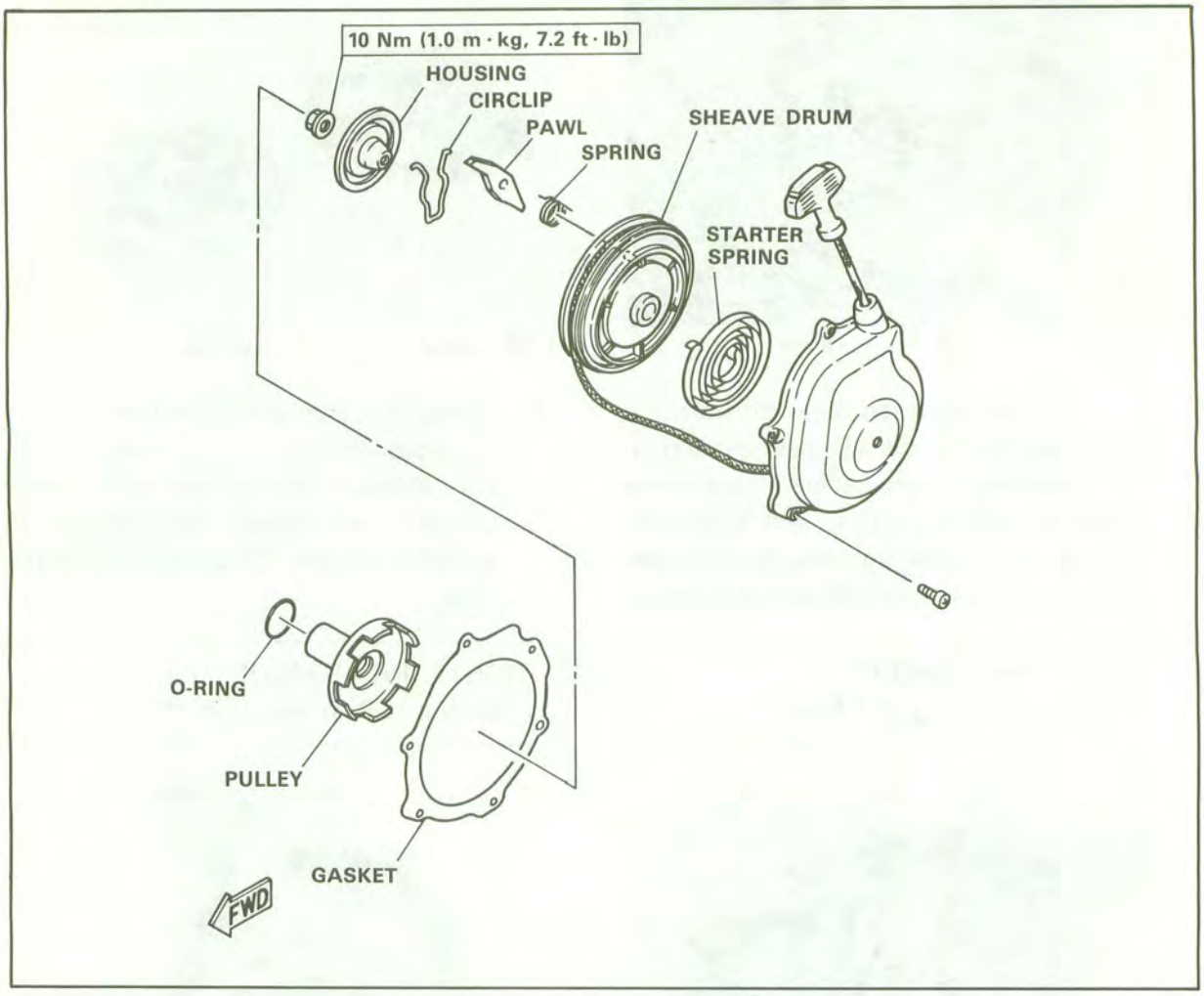


1. Idle gear #2 2. Starter clutch

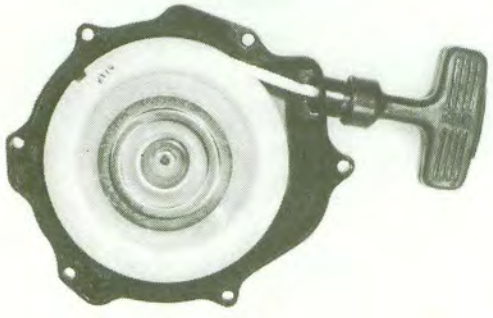
3. Check the starter clutch bolt (Allen screw) for looseness. If loose, remove the bolt and replace with a new bolt. Apply Loctite® to threads and tighten to specified torque. Clinch the end of the bolts.

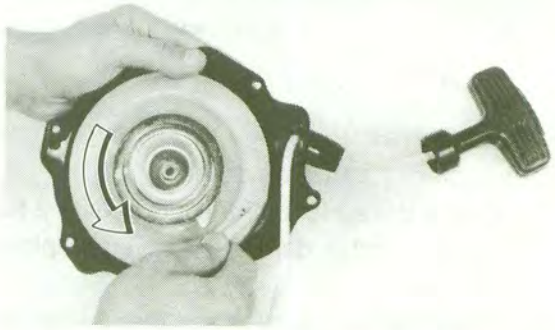
TIGHTENING TORQUE:
30 Nm (3.0 m · kg, 22 ft · lb)

Recoil Starter



Disassembly





1. Pull the starter knob about 400 mm (15.7 in) from the starter case and hold the sheave drum with the thumb.
2. Fit the rope into the indent in the sheave drum. Then reduce the thumb force to allow the sheave drum to wind itself back gradually.
3. Remove the starter handle as a following manner:
   a. Remove the handle cap.
   b. Pull out the rope from the handle and unknot the rope end.
   c. Remove the starter handle.

1. Handle cap 2. Starter handle

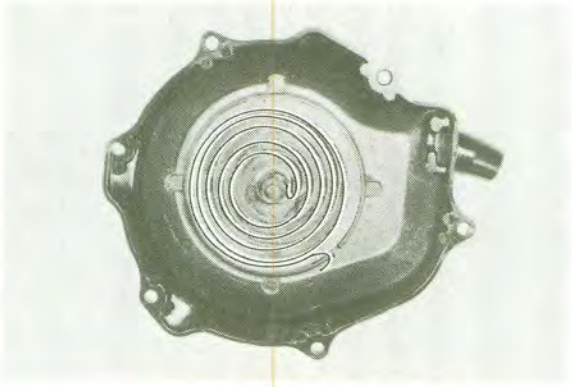
4. Remove the drive housing securing nut. Remove the drive housing, drive pawl, and drive-pawl spring in that order, then slowly remove the sheave drum from the starter case.
5. Carefully remove the starter spring from the case.

NOTE:

Note the order of installation on the starter spring for reassembly.

Assembly

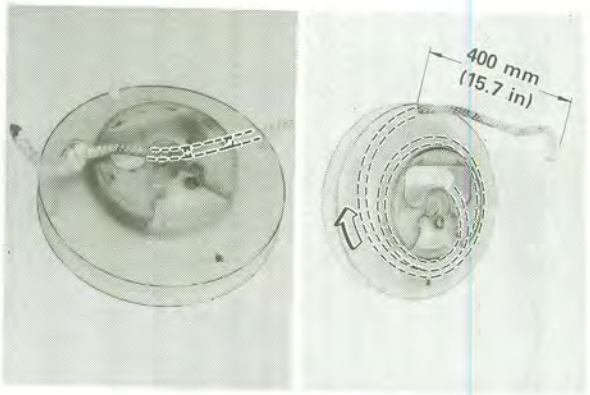
1. Install the starter spring in the starter case.



NOTE:

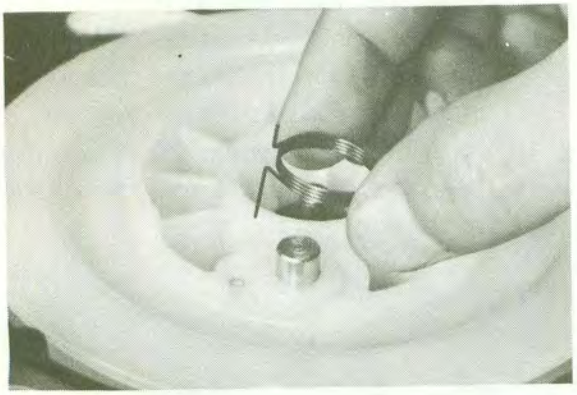
- It is necessary to wind the spring to a small size before installing it in the starter case.
- Be careful not to install the spring in the wrong way.
- Hook the loop on the outer end of the spring onto the spring hook in the starter case. Then thoroughly grease the spring.

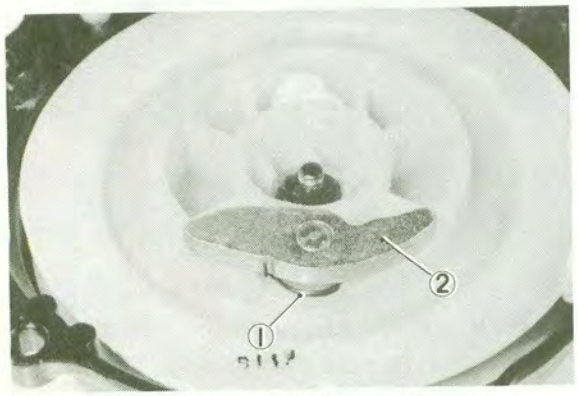
2. Insert the rope end to the hole in the sheave drum and knot on the rope end. Wind the rope around the sheave drum in the direction of the arrow and hook the rope into the indent in the sheave drum periphery 400 mm (15.7 in) from the end of the rope.



3. Install the sheave drum into the starter case. Be sure the inner hook in the spring engages the cutout in the sheave drum. When first placed in the case, the sheave drum will be resting on the spring. Rotate the sheave drum until it drops slightly, then rotate it clockwise until you feel the spring tension.
4. Insert the rope end into the hole in the starter case. Fit the free end through the starter handle, and knot the rope. Install the handle cap onto the handle.
5. Install the drive-pawl spring and the drive pawl as follows: See the photograph.

a. The longer end of the drive spring should be inserted into the hole in the sheave drum.
b. Carefully install the drive pawl onto the spring so that the spring end fits a notch in the drive pawl.
c. Rotate the drive pawl one turn counter-clockwise to preload the spring; then push the drive pawl into the cutout in the sheave drum.

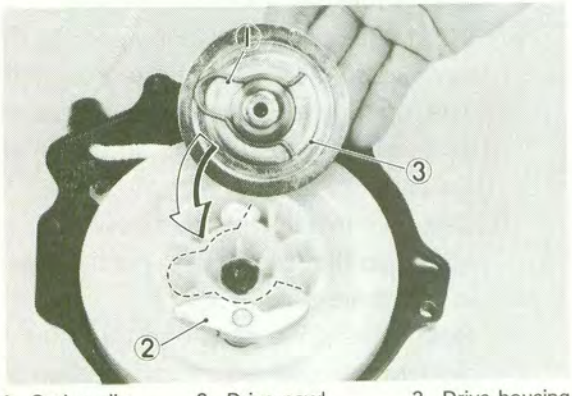




1. Drive-pawl spring 2. Drive pawl

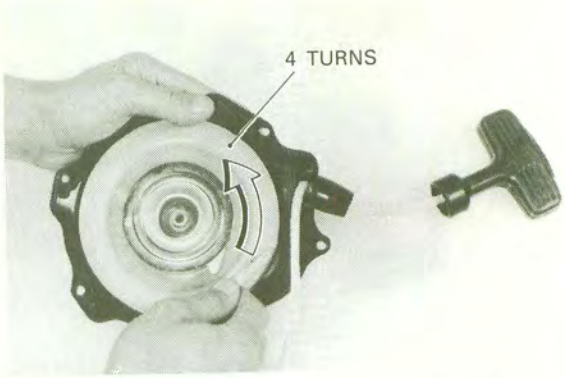
6. Install the spring-clip onto the drive housing as shown in the photograph. Tighten the drive housing securing nut.

TIGHTENING TORQUE:
10 Nm (1.0 m · kg, 7.2 ft · lb)



1. Spring-clip 2. Drive pawl 3. Drive housing

7. Rotate the drum four turns clockwise to preload the spring.



8. Check the movement of the starter. The sheave drum should rotate clockwise and the drive pawl should emerge from the sheave drum when the starter rope is pulled. If the starter does not operate correctly, disassemble the starter and reassemble it correctly.

ENGINE ASSEMBLY AND ADJUSTMENT

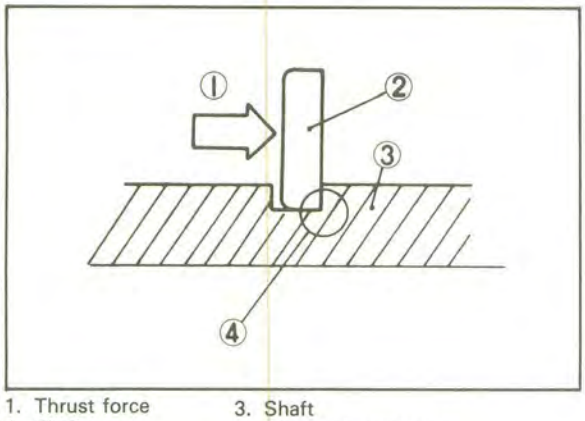
Important Information

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

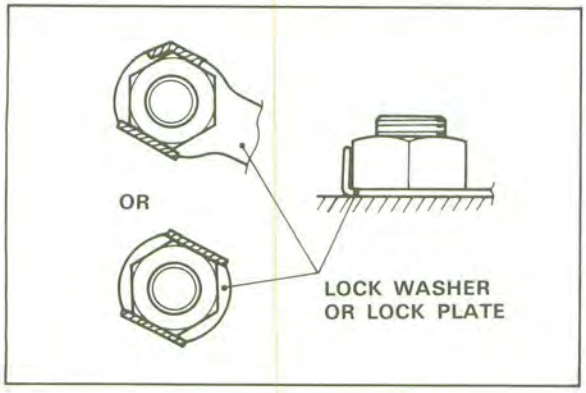
1. All circlips should be inspected carefully before reassembly. Always replace piston pin clips after one use. Replace distorted circlips.
   When installing a circlip, make sure that the sharp edged corner is positioned away from the thrust it receives. See the sectional view below.



1. Thrust force
2. Circlip
3. Shaft
4. Sharp edged corner

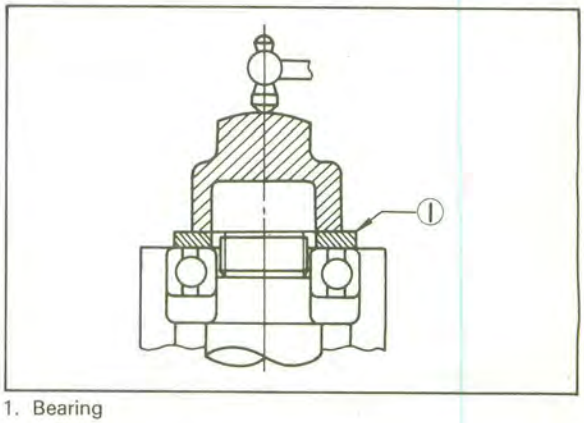
Lock washers/plates and cotter pins

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.

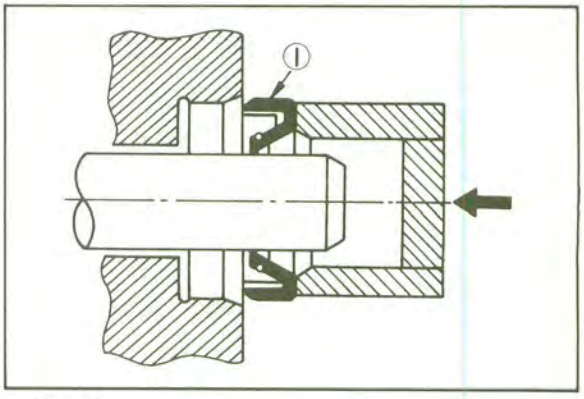


Bearings and oil seals

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 lightweight lithium base grease to the seal lip(s). When installing bearings liberally oil the bearings.

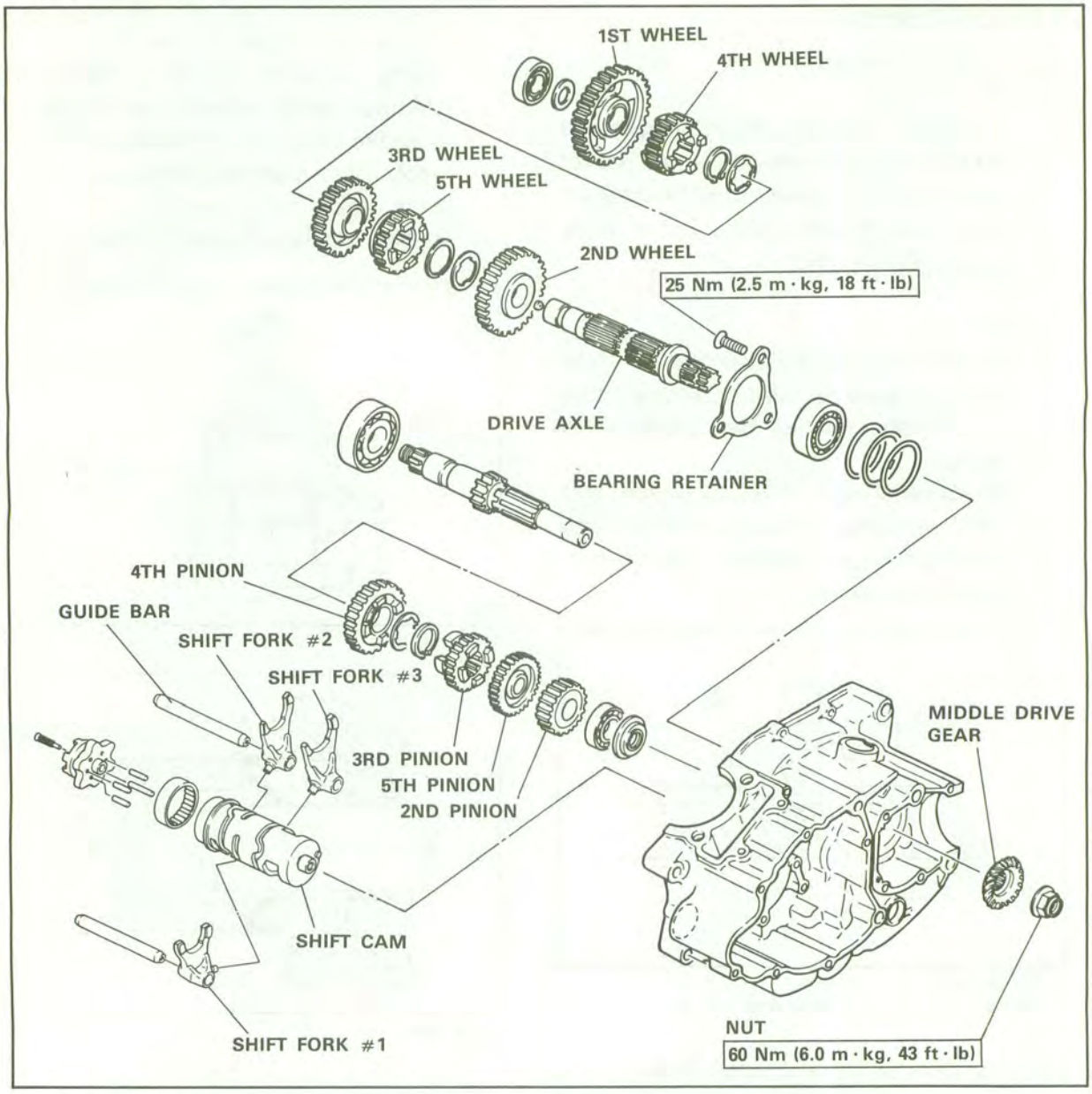


1. Bearing

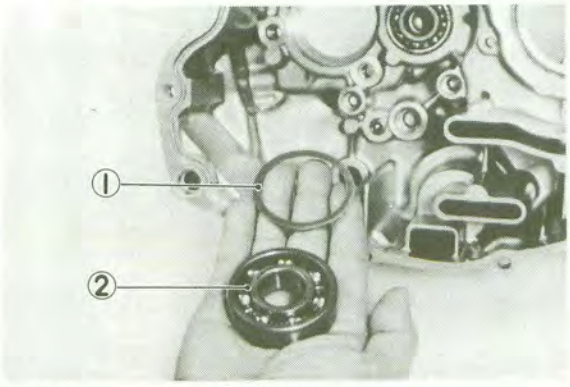


1. Oil seal

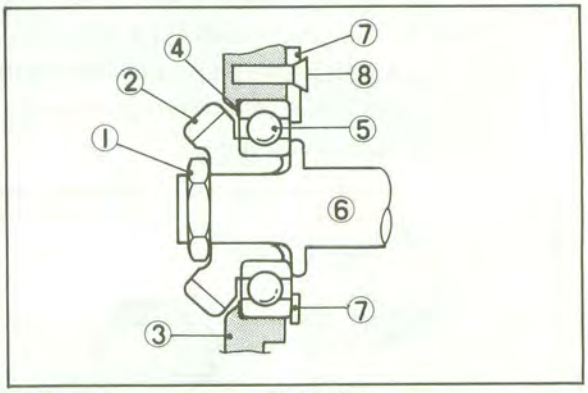
Left-Side Crankcase



1. Install the drive axle bearing with the proper shim(s), drive axle, and middle drive gear into the left-side crankcase. Refer to "MIDDLE GEAR SERVICE" on page 3-54.



1. Shim
2. Bearing

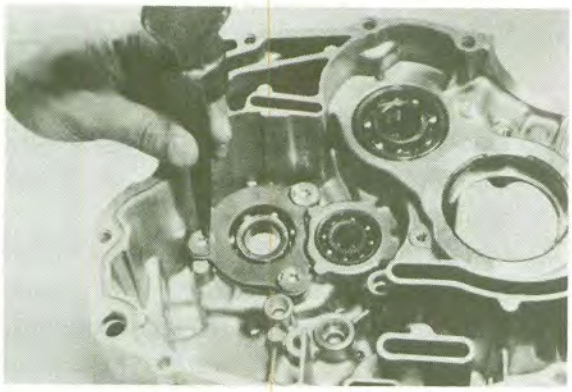


1. Nut
2. Middle drive gear
3. Crankcase
4. Shim
5. Bearing
6. Drive axle
7. Bearing retainer
8. Screw

2. Install the bearing retainer and tighten the screws. Use the Torx driver and torque the bolts to specification.

TIGHTENING TORQUE:
25 Nm (2.5 m · kg, 18 ft · lb)

3. Place a punch on the part of the stopper bolt head which covers the recess in the stopper plate and punch the head.



4. Press the balancer shaft bearing and main axle bearing into the left-side crankcase.

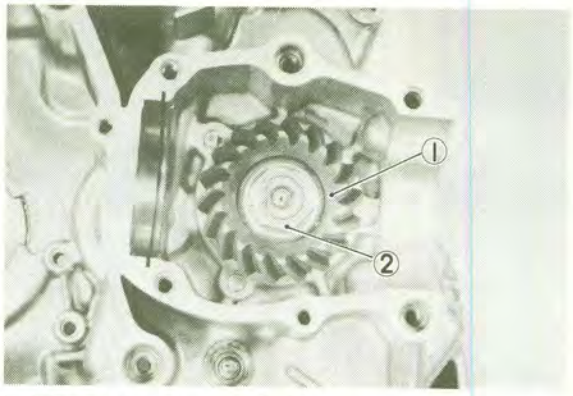
NOTE:

- Liberally oil the bearings before installation.
- The bearing i.d. marks should face the inside of the crankcase. Push the outer, not the inner race.

5. Insert the drive axle into the drive axle bearing.
6. Install the middle drive gear and nut onto the drive axle.
7. Secure the drive axle in a vice or other support. Torque the nut to specification.

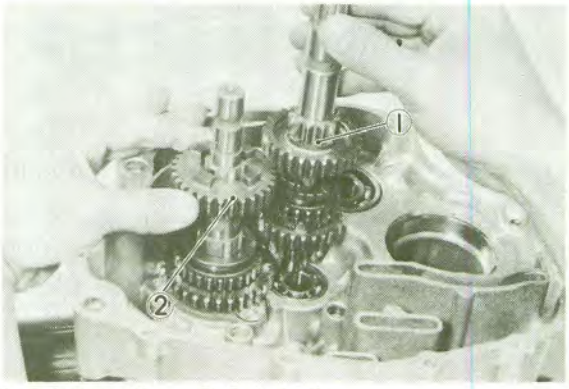
TIGHTENING TORQUE:
60 Nm (6.0 m · kg, 43 ft · lb)

8. Bend a lock tab against a drive axle.



1. Middle drive gear 2. Nut

9. Install the second wheel, washer, circlip, and fourth wheel onto the drive axle in that order.
10. Install the third wheel onto the drive axle and main axle subassembly into the crankcase.

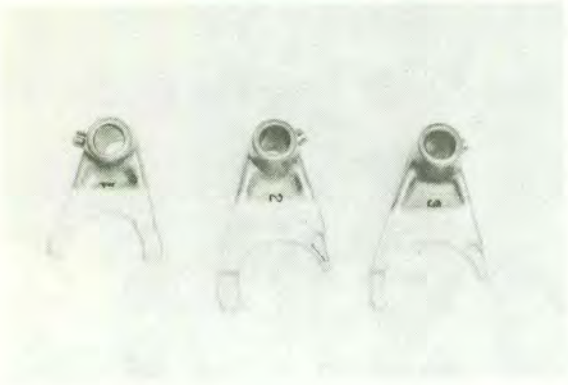


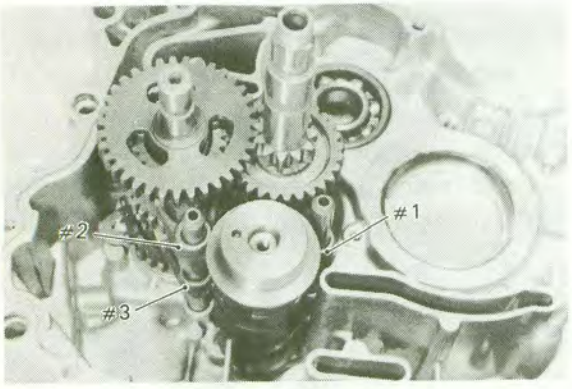
1. Sub-assembly 2. 3rd wheel

11. Install the washer, circlip, fifth wheel, and first wheels onto the drive axle.
12. Install the shift cam into the left-side crankcase.
13. Install the #1 shift fork onto the second-pinion gear, #2 shift fork onto the fifth-pinion gear, and #3 shift fork onto the fourth-pinion gear.

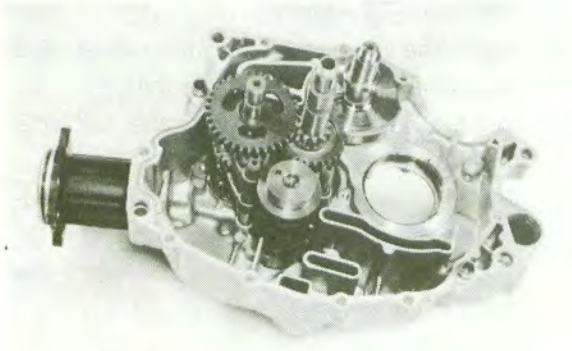
NOTE:

The number forged on the shift fork must face the left-side crankcase. Be sure that the shift-fork guide pin is properly seated in the shift-cam groove.



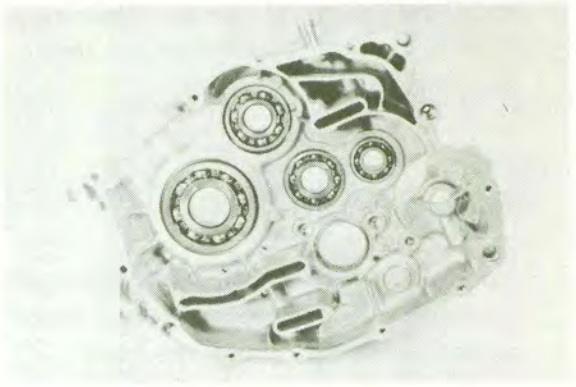


14. Install the guide bars through the shift fork(s).
15. Install the balancer shaft with the non threaded end onto the left-side of the crankcase.



Right-Side Crankcase

1. Press the bearings into the left-side crankcase. Liberally oil the bearings before installation. The bearing i.d. marks should face the inside of the crankcase. Push the outer, not the inner race.



2. Install the crankshaft, with the longer side of the crankshaft into the right-side of the crankcase.
3. Install the woodruff key into the crankshaft keyway. Apply engine oil to the crankshaft.
4. Install the plate washer and new buffer boss onto the crankshaft. The punch mark on the boss must face outward, away from the main bearing. Install the buffer boss with the buffer boss installing tool.

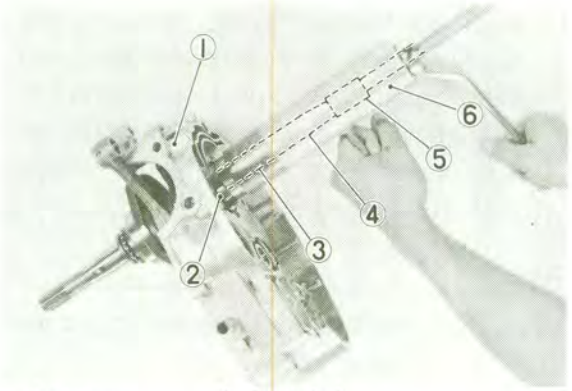
NOTE:

Align the connecting rod with the cylinder sleeve hole. The rod must be in this hole when the boss is properly installed.

1. Plate washer
2. Woodruff key
3. Buffer boss
4. Punch mark

NOTE:

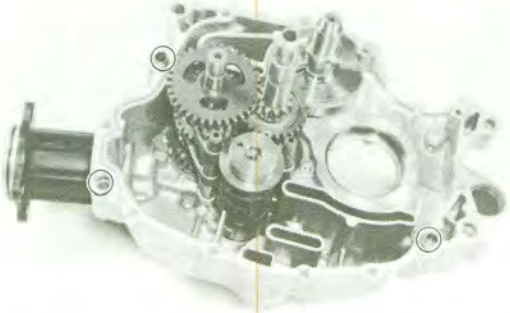
Be sure the woodruff key in the crankshaft should engage the keyway in the buffer boss.



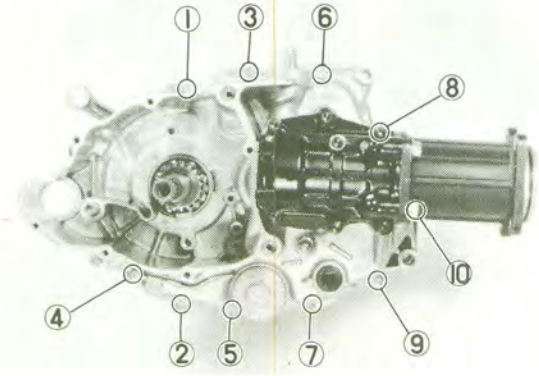
1. Crankcase
2. Buffer boss
3. Pot extension
4. Crankshaft
5. Adapter #11
6. Crankshaft installer

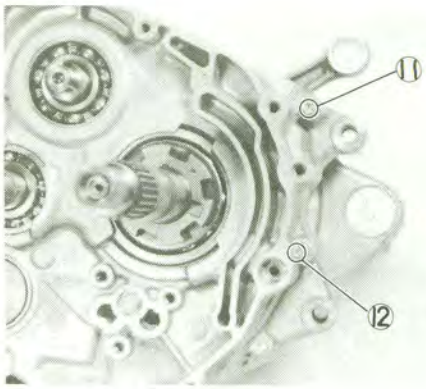
Crankcase Assembly

1. Install the three dowels into the left-side crankcase where in the photograph.

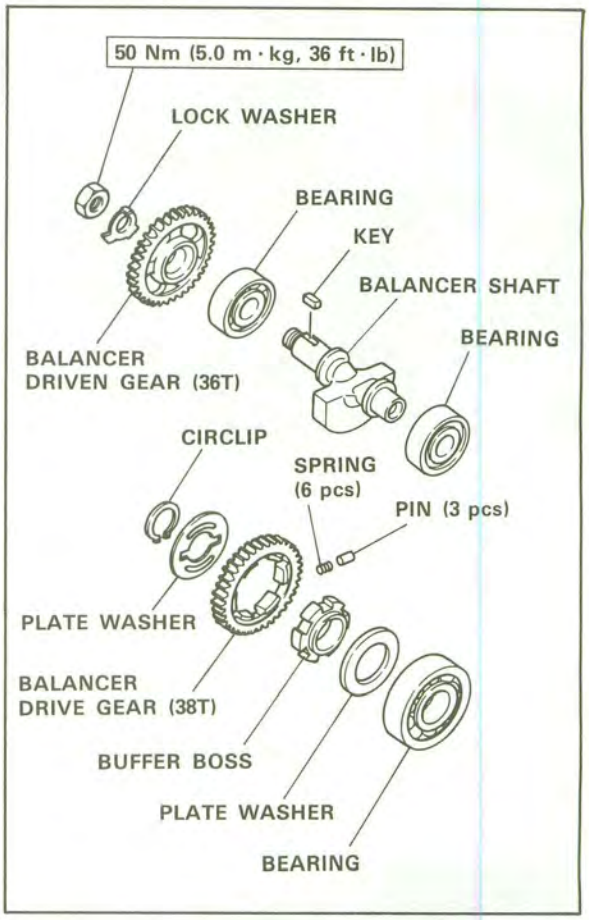


2. Apply Yamabond #4 to the mating surfaces of both case halbes.
   Apply thoroughly, over all mating surfaces.
3. Install the right-side crankcase onto the left-side crankcase.
4. Install the crankcase bolts. Tighten the bolts in the tightening sequence shown in the photograph. After all the bolts are tight, torque them to specification. Torque the bolts in the torquing sequence also shown in the photograph.

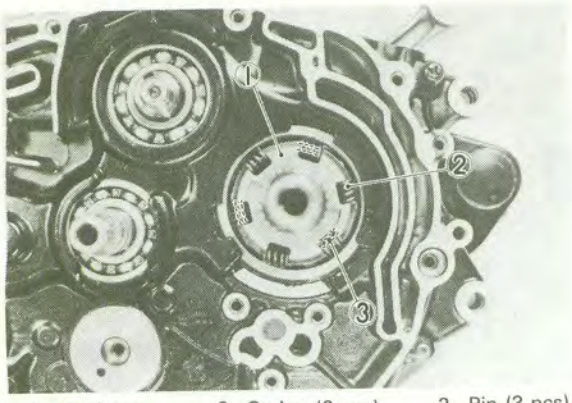




Balancer Drive Gear and Driven Gear

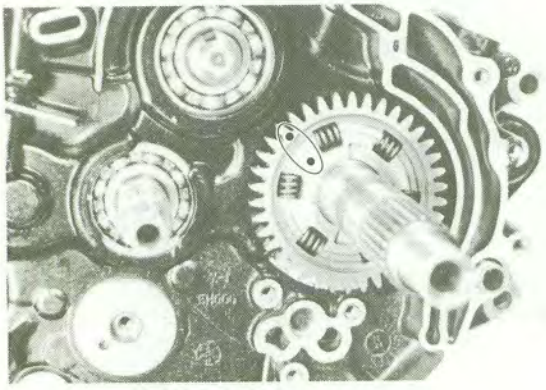


1. Install the balancer drive gear in the following way:
   a. The balancer drive gear damper assembly is composed of 6 springs and 3 pins. Insert a spring into the buffer boss, then insert a spring with a pin in it.



1. Buffer boss 2. Spring (6 pcs) 3. Pin (3 pcs)

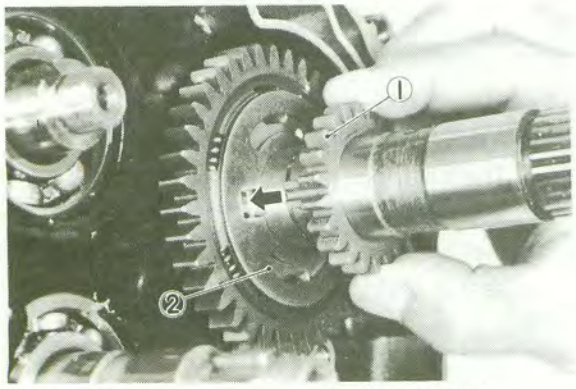
b. Align the punch marks on the buffer boss and drive gear, and install the drive gear.



2. Install the plate washer and oil pump drive gear onto the right-side crankshaft. Install the circlip.

NOTE:

Be sure the tab of the oil pump drive gear engages the slots in the plate washer and buffer boss.



1. Oil pump drive gear 2. Plate washer

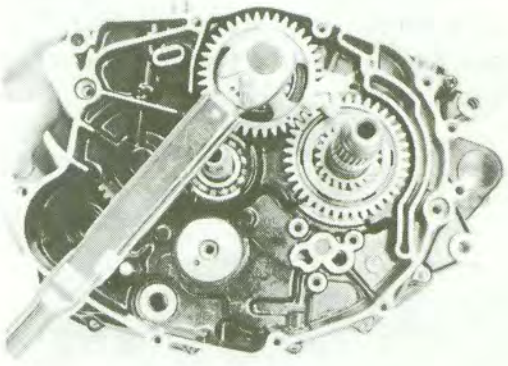
3. Install the balancer driven gear onto the balancer shaft. Align the punch marks on the drive and driven gear. Install the key in the balancer shaft key way. Install the lock washer and securing nut. Finger-tighten the securing nut.

NOTE:

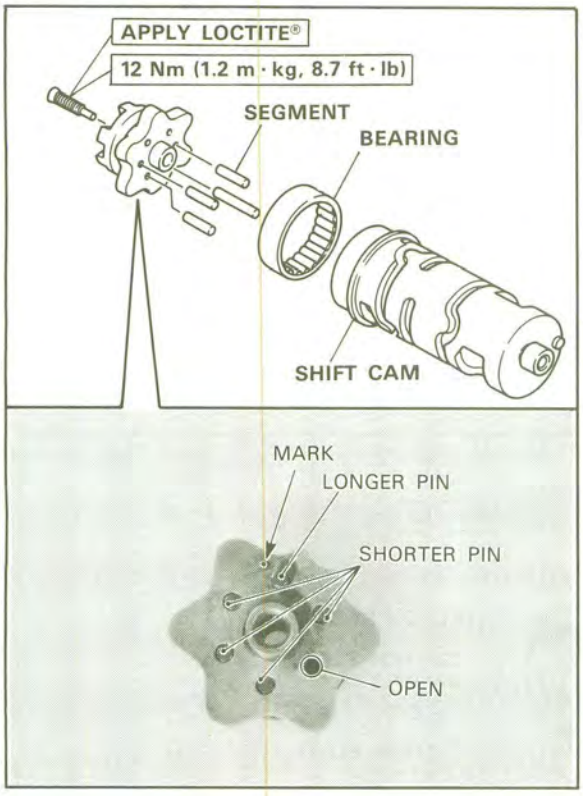
Be sure the tab of the lock washer engages the slot in the balancer shaft.

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

TIGHTENING TORQUE:
50 Nm (5.0 m · kg, 36 ft · lb)

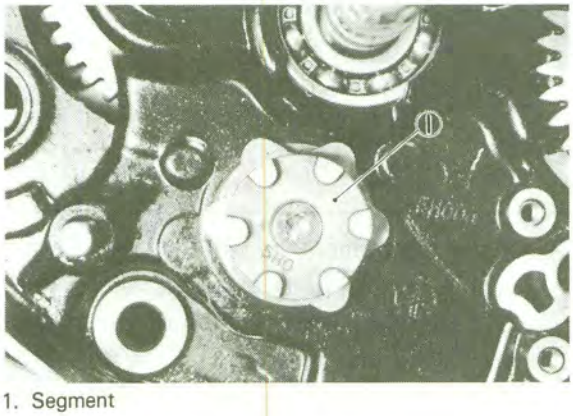


Shifter



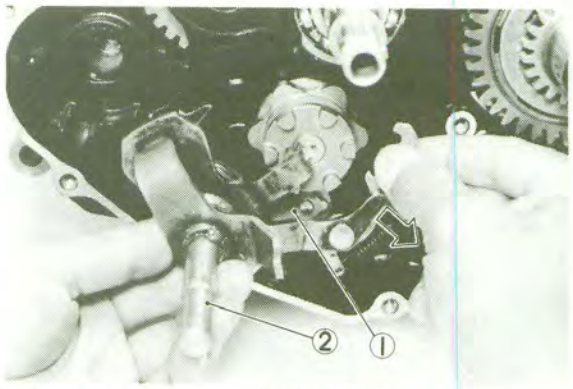
1. Install the segment. Apply Loctite® (red) to the segment securing bolt. Use the torx driver #30 when tightening the bolt.

TIGHTENING TORQUE:
12 Nm (1.2 m · kg, 8.7 ft · lb)



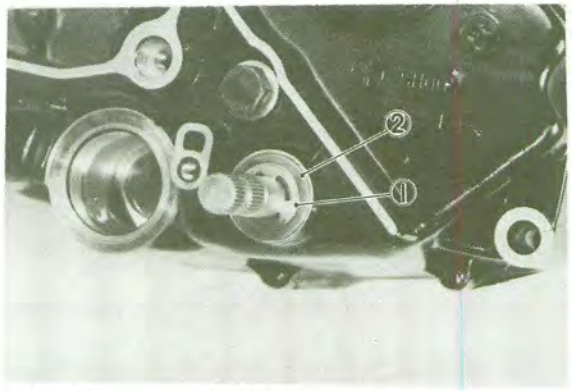
1. Segment

2. Lightly grease the lips of the shift shaft oil seal at the left-side crankcase.
3. Install the shifter into the right-side crankcase. Hook the shift shaft spring beneath the projection in the crankcase. Be sure the shift lever correctly engages the cam shift pins.



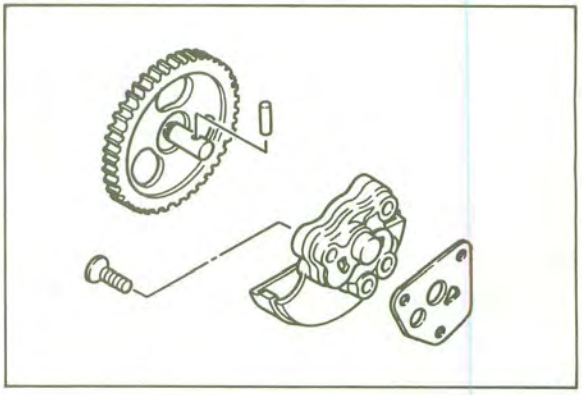
1. Stopper lever 2. Shift shaft

4. Install the washer and circlip onto the shift shaft.



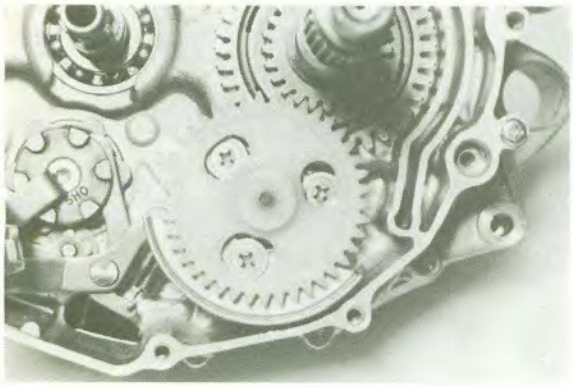
1. Washer 2. Circlip

Oil Pump

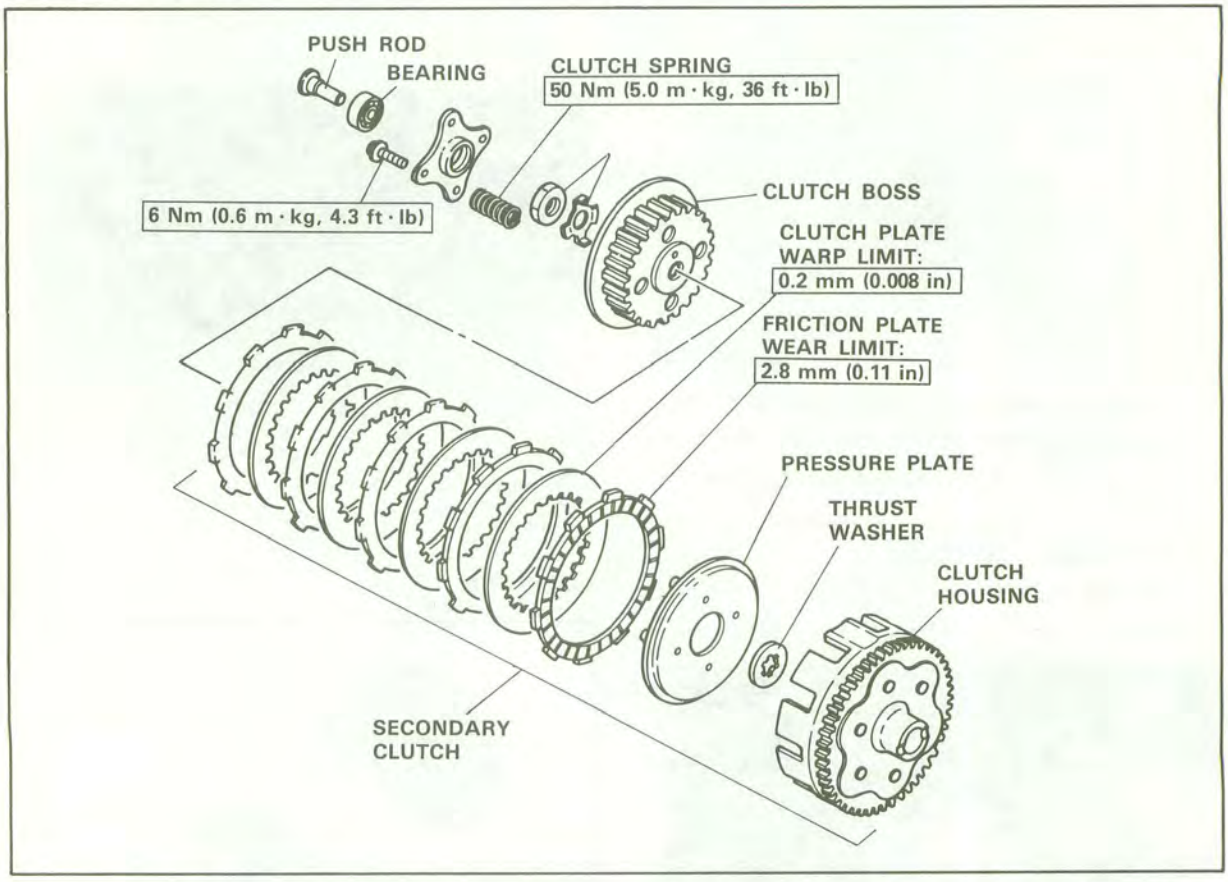


1. Reassemble the oil pump.
2. Install the oil pump assembly with a new gasket onto the right-side crankcase. Torque the bolts to specification.

TIGHTENING TORQUE:
7 Nm (0.7 m · kg, 5.1 ft · lb)



Secondary Clutch



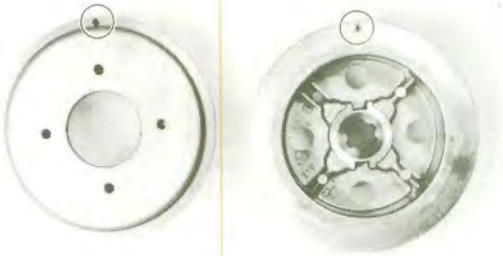
1. Install the clutch housing and thrust washer onto the transmission main axle.

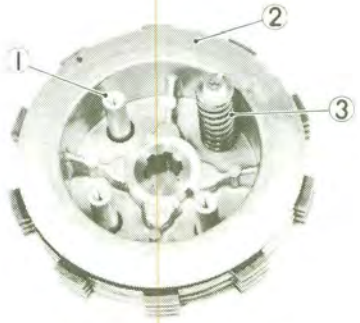
1. Thrust washer

2. 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.
3. Install the clutch pressure plate and the clutch spring. Finger-tighten the clutch spring holding bolt.

NOTE:

When installing the clutch pressure plate, align the arrow marks on the clutch boss and clutch plate.

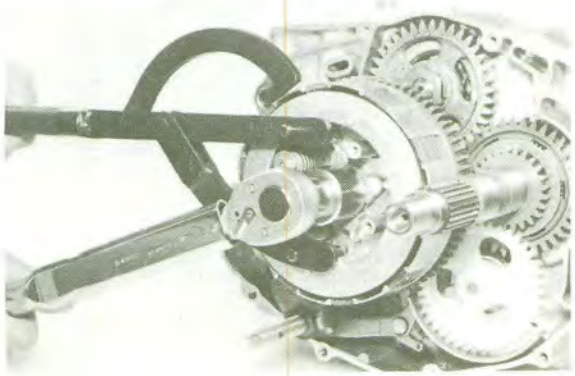




1. Pressure plate 2. Clutch boss 3. Clutch spring

4. Install the clutch subassembly into the clutch housing.
5. Install a new lock washer onto the transmission main axle. Be sure the tab of the washer engages the slots in the clutch boss.
6. Install the clutch-boss securing nut. Using the universal rotor holding tool, tighten the clutch-boss nut and torque it to specification. Bend a lock tab against a nut flat.

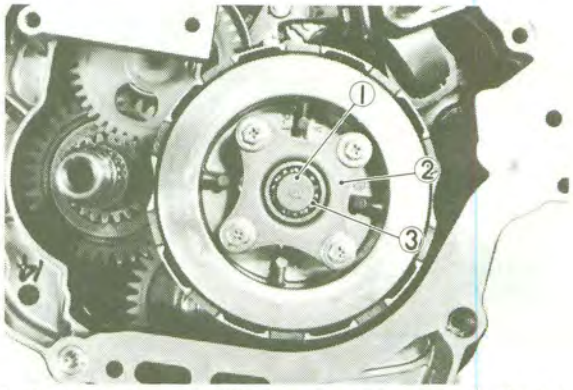
TIGHTENING TORQUE:
50 Nm (5.0 m · kg, 36 ft · lb)



7. Remove the clutch spring holding bolt. Install the three clutch springs and clutch spring plate. Torque the clutch spring holding bolts to specification.

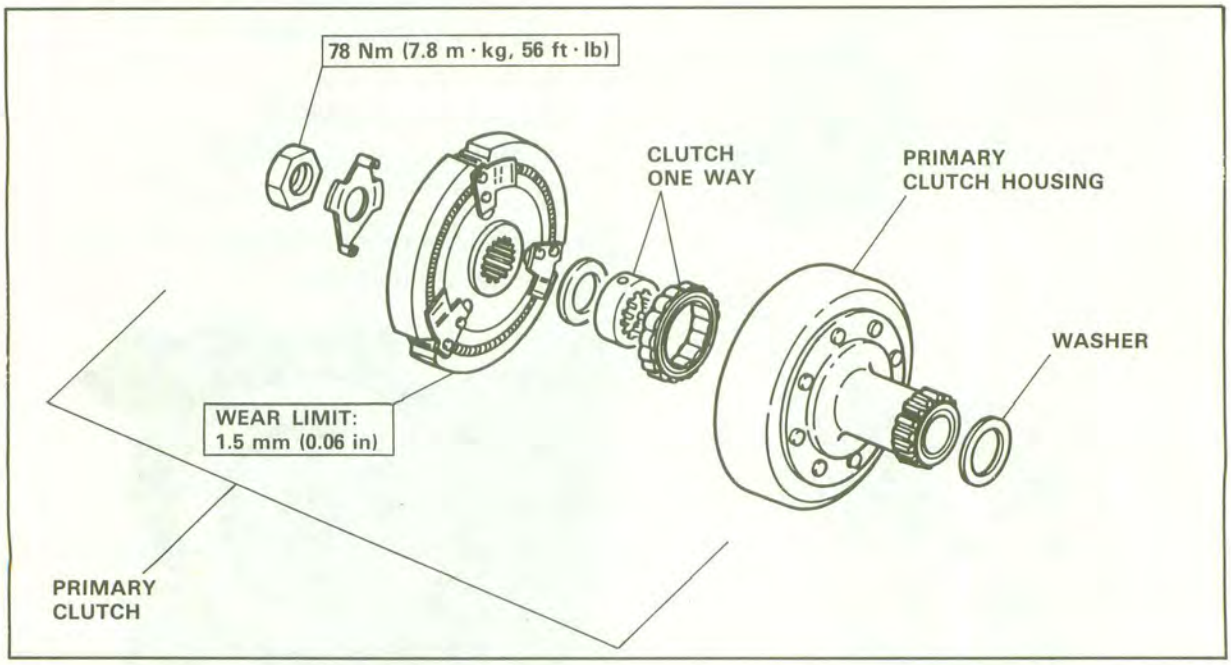
TIGHTENING TORQUE:
6 Nm (0.6 m · kg, 4.3 ft · lb)

8. Install the bearing and push rod into the clutch spring plate.

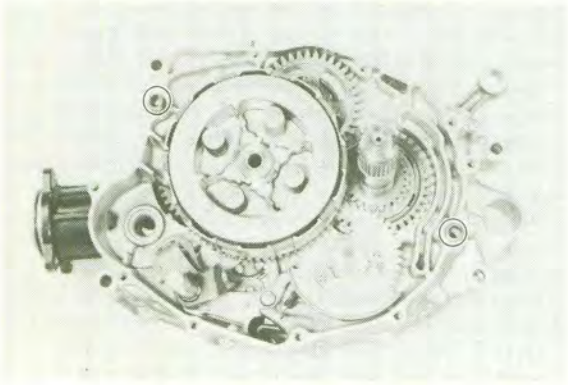


1. Push rod 2. Clutch spring plate 3. Bearing

Crankcase Spacer (Right Side) and Primary Clutch

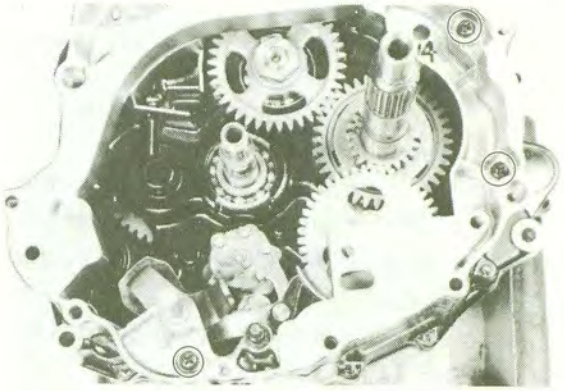


1. Install the two dowels into the right-side crankcase where shown in the photograph.

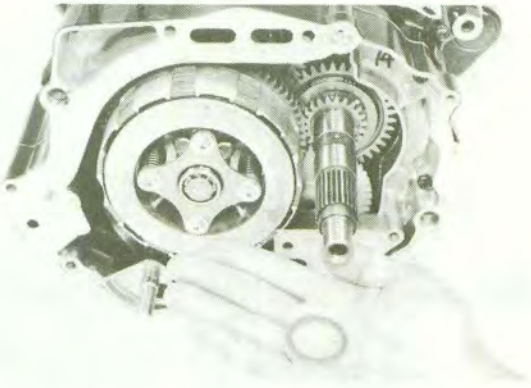


2. Install a new crankcase spacer gasket to the crankcase, and install the right-side crankcase spacer onto the right-side crankcase.
3. Install the three spacer bolts. Tighten the bolts to specification.

TIGHTENING TORQUE:
7 Nm (0.7 m · kg, 5.1 ft · lb)



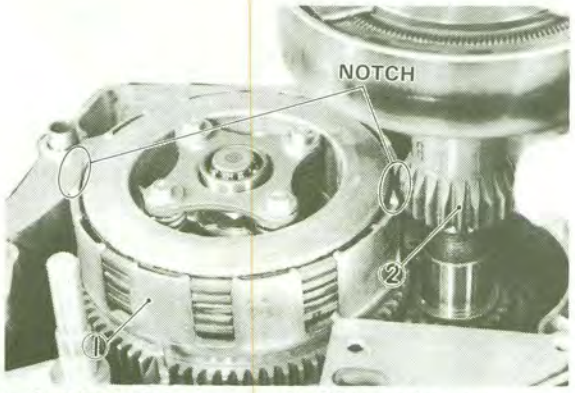
4. Install the washer onto the right-side crankshaft.



5. Install the primary clutch housing onto the right-side crankshaft.

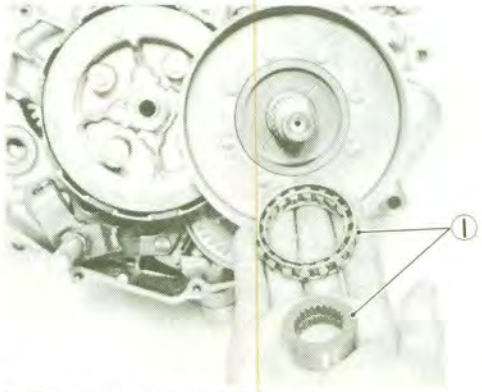
NOTE:

The secondary clutch housing has two notches machined into it to permit the primary drive gear behind the primary clutch housing to clear the secondary clutch. Align one of these notches with the primary gear before installing the primary housing.



1. Clutch housing
2. Primary drive gear

6. Insert the clutch one-way assembly into the clutch housing.



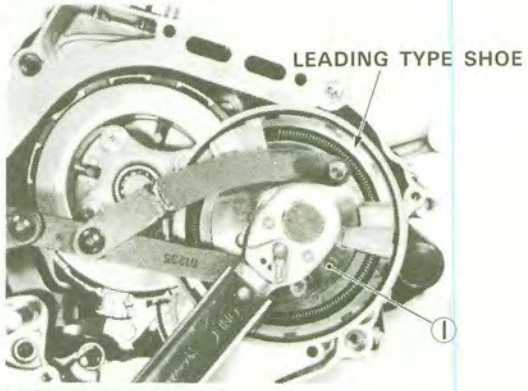
1. Clutch one-way assembly

NOTE:

The flange side of one-way must face inward, away from the clutch shoe.

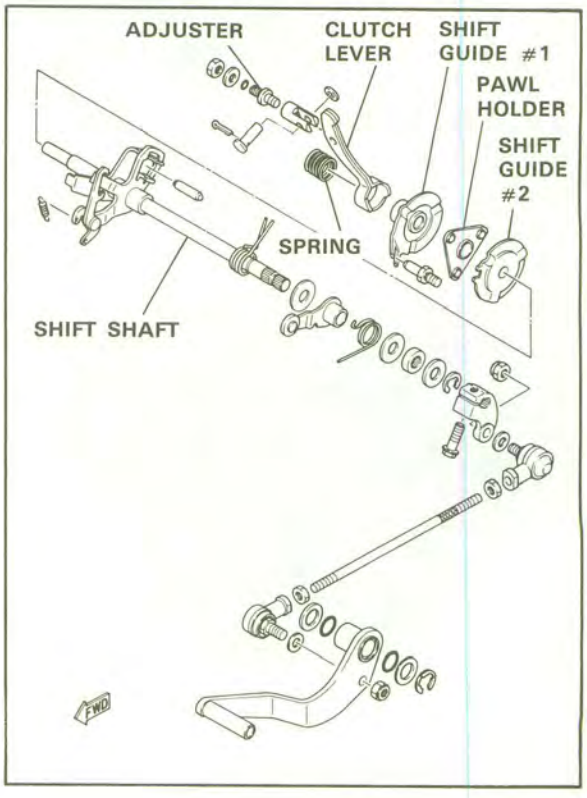
7. Install the washer and clutch shoe assembly into the clutch housing. The four holes side of the clutch assembly must face outward, away from the one-way clutch. Install a new lock washer and primary clutch securing nut.
8. Using the universal rotor holder, tighten the primary clutch securing nut and torque it to specification. Bend a lock tab against a nut flat.

TIGHTENING TORQUE:
78 Nm (7.8 m · kg, 56 ft · lb)

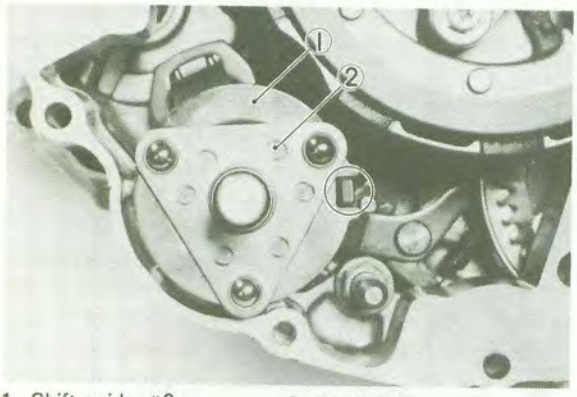


1. Clutch shoe assembly

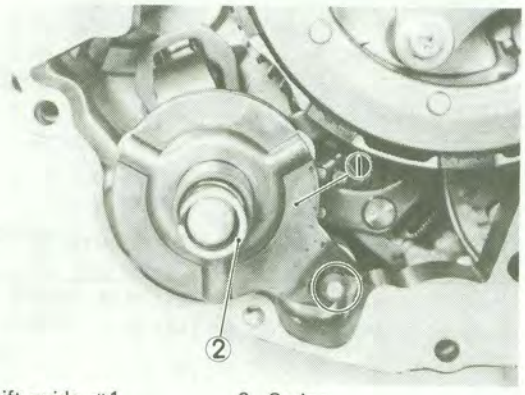
Clutch Lever, Clutch Cover and Oil Filter



1. Install onto the shift shaft the shift guide #2, pawl holder, shift guide #1, clutch lever, and clutch lever spring. The slot in the shift guide #1 must engage the shift shaft projection, and the shift guide #2 slot must engage the projection of the right-side spacer as shown in the photograph.

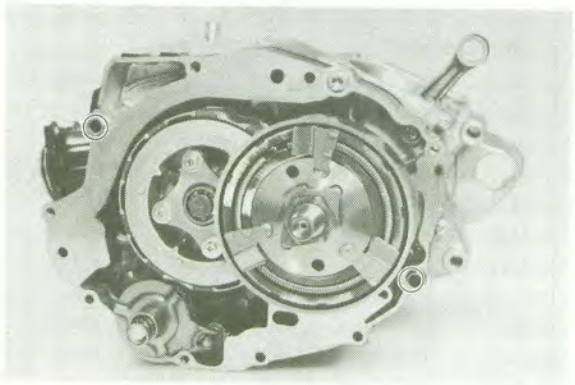


1. Shift guide #2 2. Powl holder

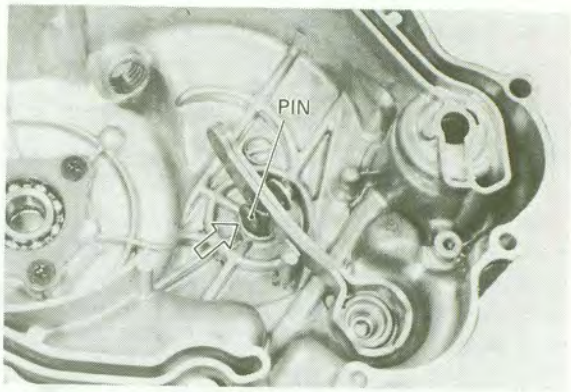


1. Shift guide #1 2. Spring

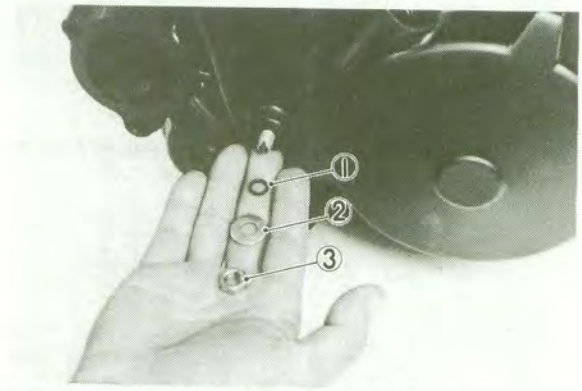
2. Install the two dowels into the right-side spacer.



3. Install the clutch lever into the clutch cover.



4. Install a new O-ring, washer, and locknut onto the clutch adjuster.



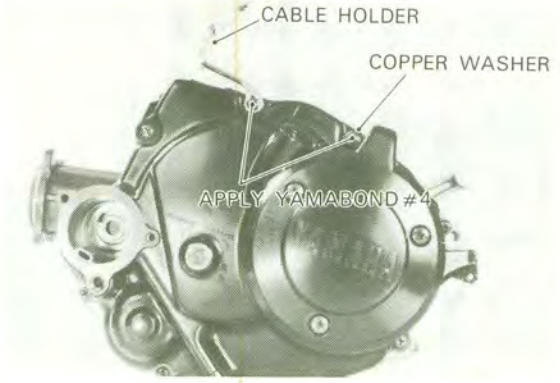
1. O-ring 2. Washer 3. Locknut

5. Install the clutch cover with a new gasket, and torque the securing bolts to specification.

NOTE:

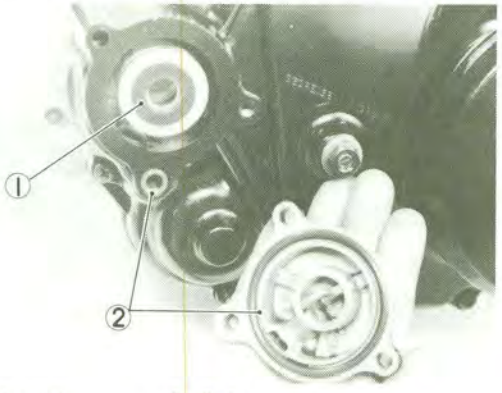
- The bolt with the brake cable will be installed as shown.
- Apply Yamaband #4 to the two clutch cover securing bolts as shown.
- The bolt with a copper washer will be installed as shown.

TIGHTENING TORQUE:
7 Nm (0.7 m · kg, 5.1 ft · lb)



6. Adjust the clutch lever free play. Refer to "Clutch Adjustment" on page 2-8.
7. Install the oil filter element and a new O-ring into the clutch cover. Install the oil filter with a new O-ring onto the clutch cover. Torque the bolts to specification.

TIGHTENING TORQUE:
10 Nm (1.0 m · kg, 7.2 ft · lb)

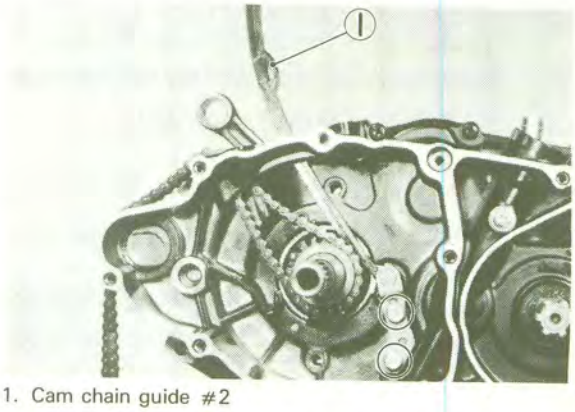


1. Oil element 2. O-ring

Crankcase Spacer (Left Side) and Flywheel

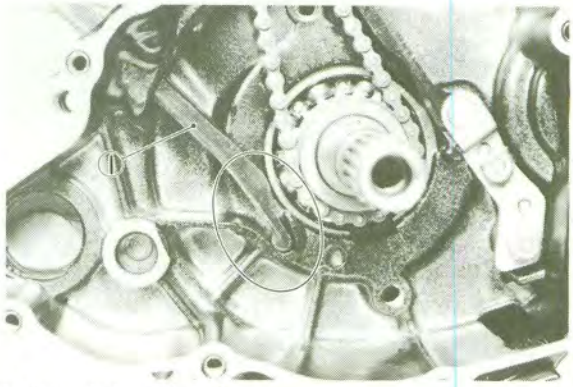
1. Attach a proper length of wire to the cam chain, and place the cam chain around the timing gear sprocket.
2. Install the cam chain guide #2 to the left-side crankcase. Torque the bolts to specification.

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



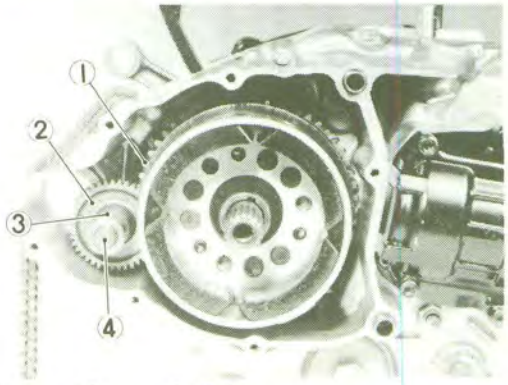
1. Cam chain guide #2

3. Insert the cam chain guide #1. The lower end of the cam chain guide must rest in the cam chain guide slot in the crankcase.



1. Cam chain guide #1

4. Install the starter idle gear #2 onto the crankshaft.
5. Install the woodruff key into the crankshaft keyway.
6. Install the flywheel assembly onto the crankshaft. The key in the crankshaft should engage the keyway in the flywheel.
7. Install the starter idle gear #1, idle gear shaft, and collar.

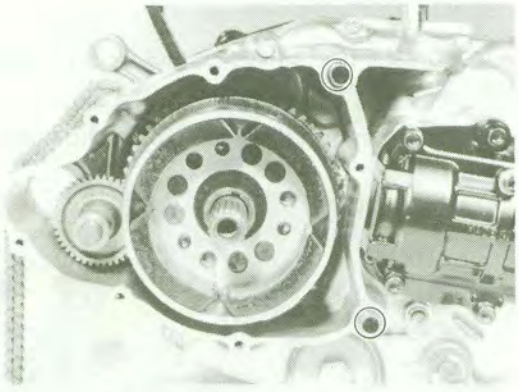


1. Idle gear #2
2. Idle gear #1
3. Collar
4. Idle gear shaft

8. Install the neutral switch with a new gasket into the crankcase. Torque the switch to specification. Install the neutral switch lead onto the switch.

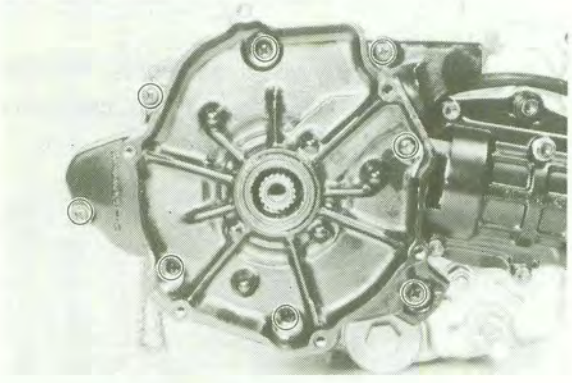
TIGHTENING TORQUE:
20 Nm (2.0 m · kg, 14 ft · lb)

9. Install the two dowels in the left-side crankcase.

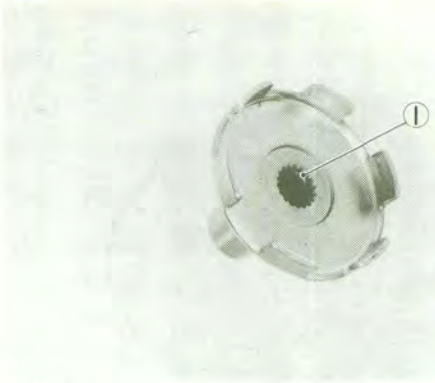


10. Install the left side crankcase spacer. Use a new gasket and torque the securing bolts to specification.

TIGHTENING TORQUE:
7 Nm (0.7 m · kg, 5.1 ft · lb)



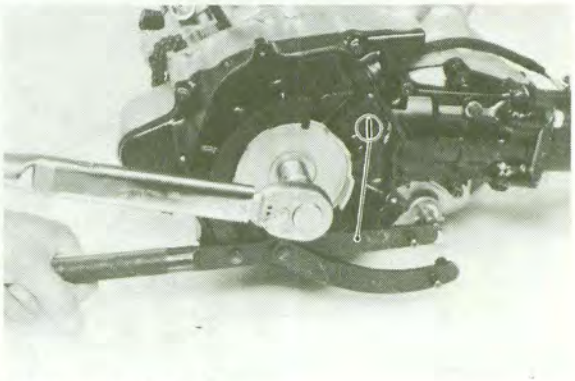
11. Insert a new O-ring into the recoil starter pulley.



1. O-ring

12. Install the pulley onto the left-side crankshaft.
13. Install the washer and pulley securing bolt. Using the universal rotor holder, tighten the pulley bolt and torque it to specification.

TIGHTENING TORQUE:
50 Nm (5.0 m · kg, 36 ft · lb)



1. Universal rotor holder

Piston and Cylinder

NOTE:

During reassembly, coat the piston ring grooves, piston skirt areas, and piston pin with 4-stroke engine oil.

1. Install the piston on the rod. The arrow mark on the piston should face the front of the engine. Use new piston-pin clips.

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.

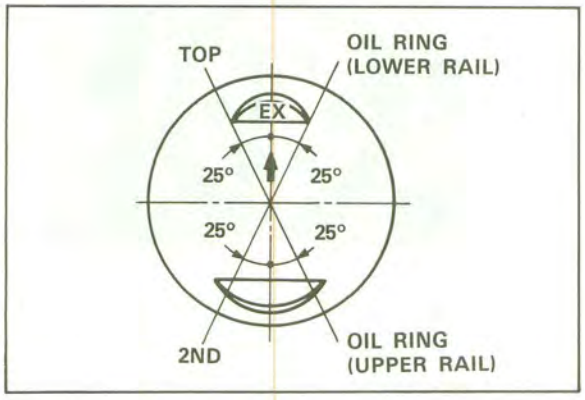
2. Align the piston rings as shown.

CAUTION:

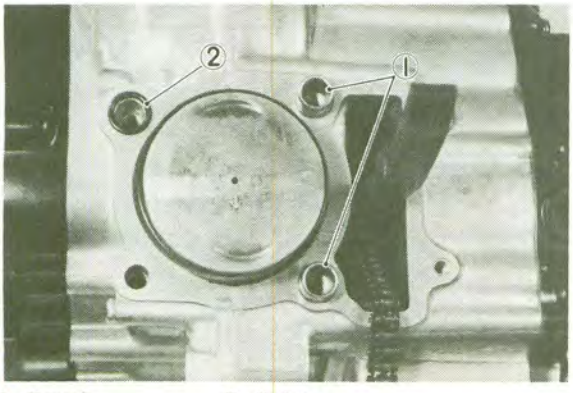
Be sure the ends of the oil ring expanders do not overlap.

NOTE:

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

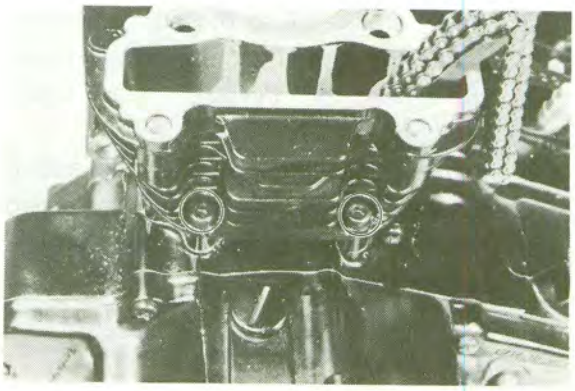


3. Liberally coat the piston with oil, and install the dowels and O-ring onto the crankcase as shown in the photograph.

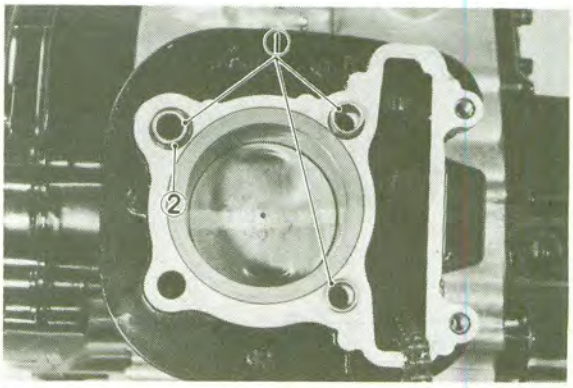


1. Dowels 2. O-ring

4. Install a new cylinder-base gasket to the cylinder.
5. Install the cylinder. Route the cam chain and the cam chain guide through the cam chain journal in the cylinder. You do not need piston ring compress to install the cylinder liner. Simply compress the piston rings with your fingers.
6. Install the cylinder to the crankcase with the two cylinder-base bolts. Finger tighten the bolts.



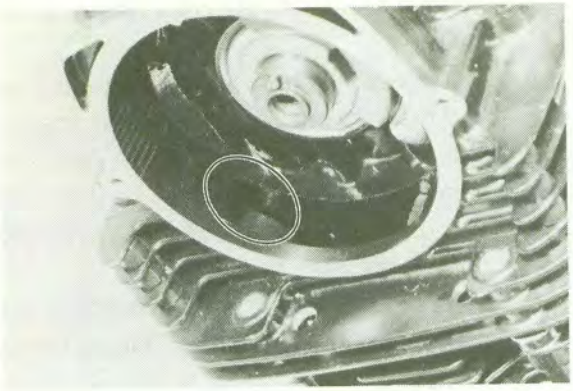
7. Install the two dowels and O-ring onto the cylinder.



1. Dowel 2. O-ring

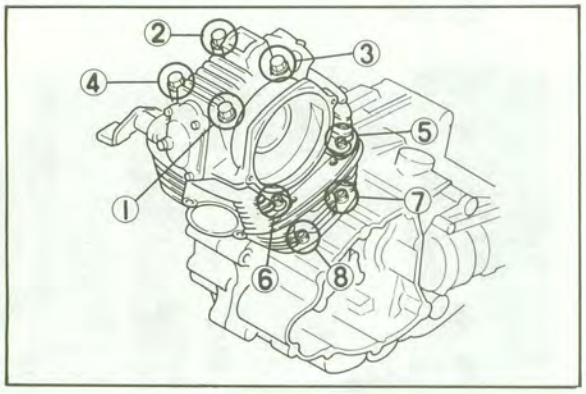
Cylinder Head

1. Install the cylinder head subassembly onto the cylinder. Route the cam chain through the cam chain journal in the head. The cam-chain guide #1 must be secured in the cam-chain-guide slot in the head.



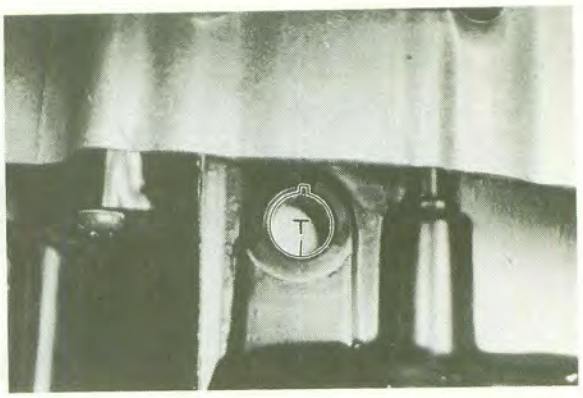
2. Apply engine oil to the copper washers and to the area of decompression bracket to which the cylinder head bolt is attached.
3. Install the cylinder head bolts and the other with copper washer into the cylinder head. Torque them in the sequence shown below.

TIGHTENING TORQUE:
22 Nm (2.2 m · kg, 16 ft · lb)

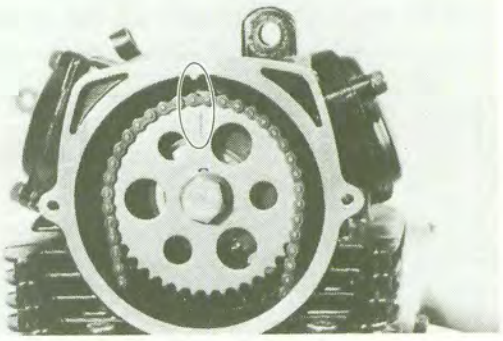


Cam Sprocket and Recoil Starter

1. Remove the timing window plug from the left-side crankcase spaser.
2. Align the "T" mark on the flywheel with the stationaly pointer on the left-side spacer.

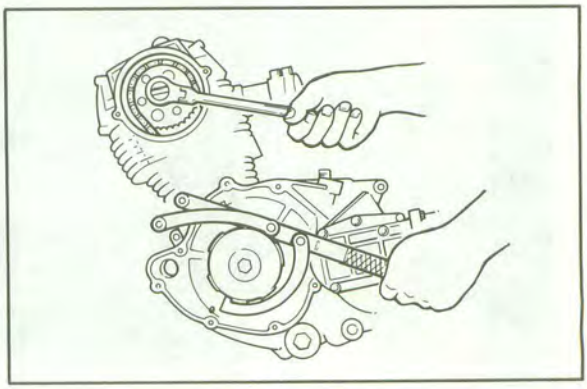


3. Install the cam sprocket onto the camshaft. The timing mark on the sprocket must align with the timing mark on the cylinder head. Pull all the slack from the front side of the cam chain. The front side of the cam chain **must** be taut when the cam chain sprocket is installed.



4. Install the cam sprocket securing bolt. Using the universal rotor holder, tighten the cam-sprocket nut and torque it to specification.

TIGHTENING TORQUE:
60 Nm (6.0 m · kg, 43 ft · lb)



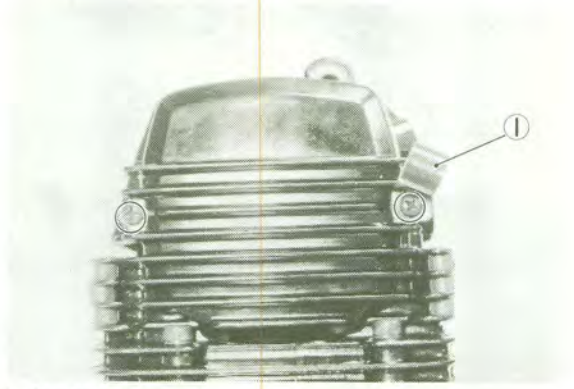
1. Universal rotor holder

5. Install the cam sprocket cover onto the cylinder head.

NOTE:

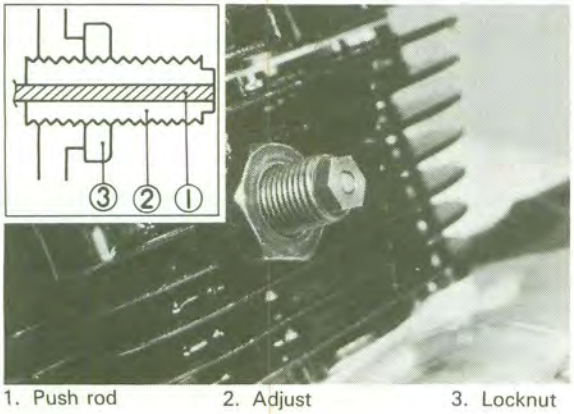
Place the bolt with the bracket where shown in the photograph.

TIGHTENING TORQUE:
7 Nm (0.7 m · kg, 5.1 ft · lb)



1. Bracket

6. Install the chain tensioner assembly. Adjust the tensioner. (Refer to Chapter 2, "Cam Chain Adjustment".)



1. Push rod 2. Adjust 3. Locknut

7. Install the adjuster cap and tighten the cap.

TIGHTENING TORQUE:
Locknut:
30 Nm (3.0 m · kg, 22 ft · lb)
Adjuster cap:
5 Nm (0.5 m · kg, 3.6 ft · lb)

8. Install and tighten the drain plug before filling the engine with oil.

CAUTION:

Before installing the drain plug, do not forget to fit the O-ring, compression spring, and oil strainer.

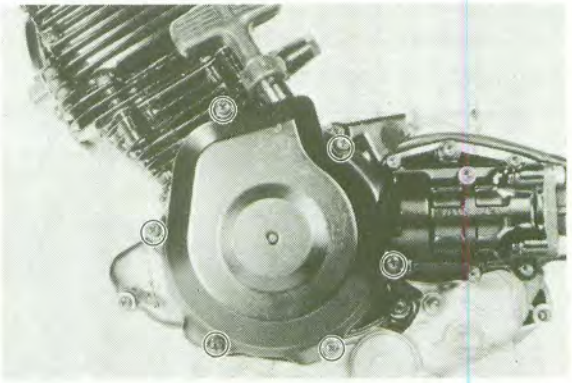
TIGHTENING TORQUE:
43 Nm (4.3 m · kg, 31 ft · lb)

9. Install the recoil starter assembly on to the left-side crankcase spacer. Torque the bolts to specification.

TIGHTENING TORQUE:
7 Nm (0.7 m · kg, 5.1 ft · lb)

NOTE:

Do not install the decompression cable at this point.



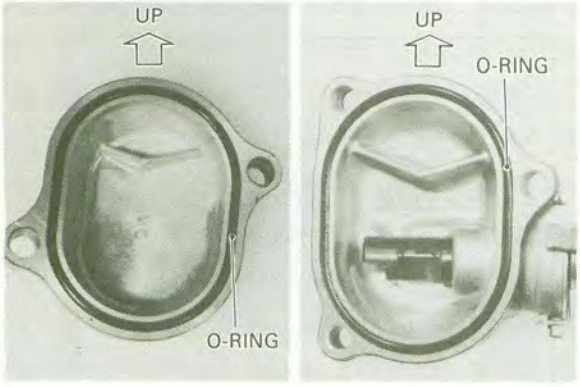
10. Adjust the valve clearance. See page 3-14.
11. Apply engine oil to the camshaft, rocker arms, valve assemblies, and rocker arm shafts.

12. Install the intake and exhaust valve covers. Torque the bolts to specification.

TIGHTENING TORQUE:
10 Nm (1.0 m · kg, 7.2 ft · lb)

CAUTION:

Install the valve cover with its ridge as shown upward.

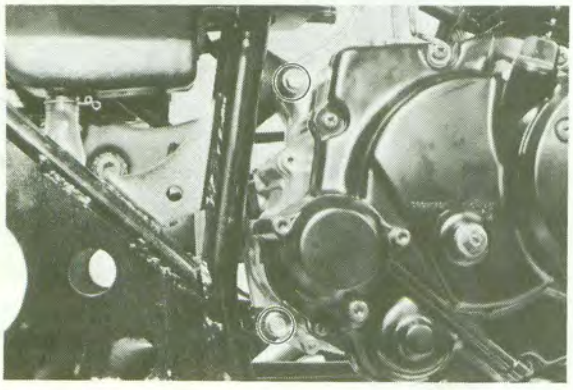


Mounting the Engine

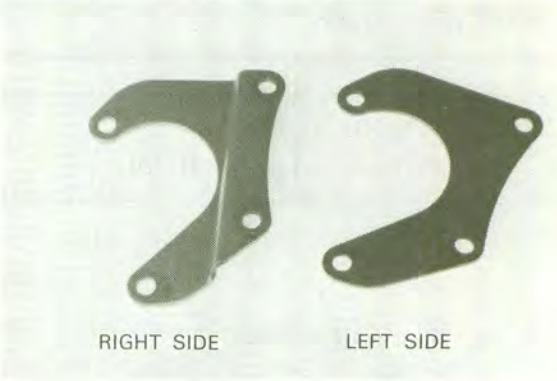
1. Place the engine on a block or other suitable engine stand, and lower the frame over the engine. It is easier if you approach the engine from the right-hand side.
2. Install the rear upper and lower engine mounting bolts. Finger-tighten the mounting nuts; do not torque them at this point.

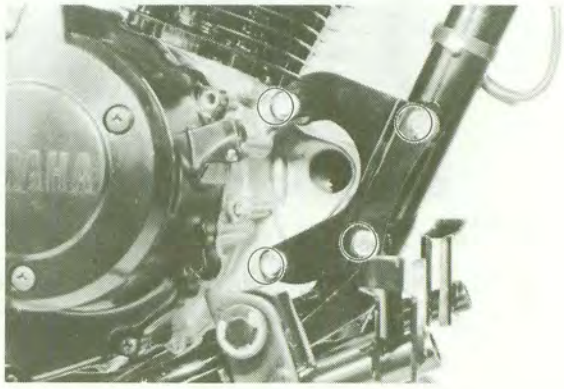
NOTE:

All mounting bolts should be installed from the right of the machine.

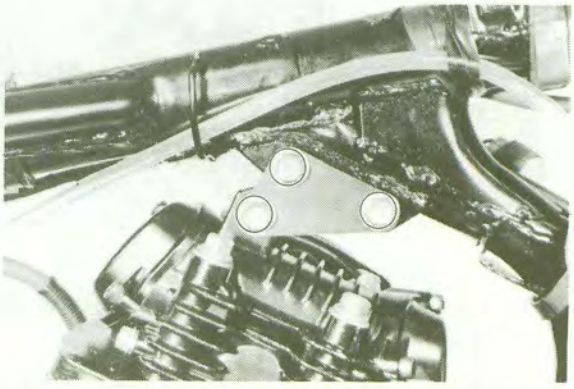


3. Install the front lower engine mounting brackets as shown in the photograph. Finger-tighten the nuts; do not torque them at this point.

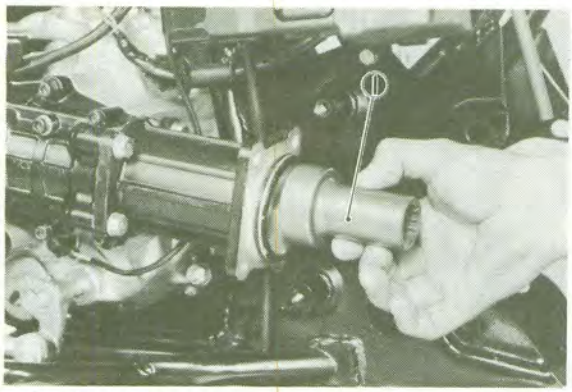




4. Install the engine stay at the cylinder head. Finger-tighten the nuts; do not torque them at this point.

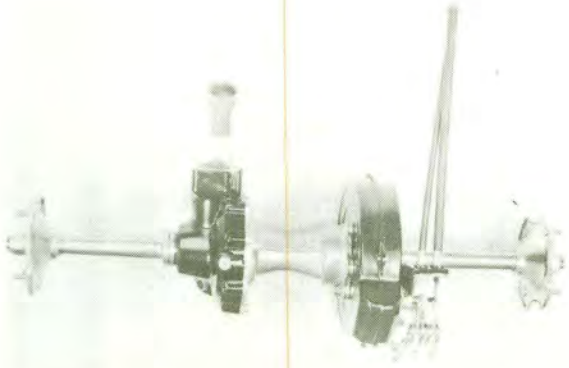


5. Install the coupling gear joint into the bearing housing. The coupling gear joint should engage the coupling gear.



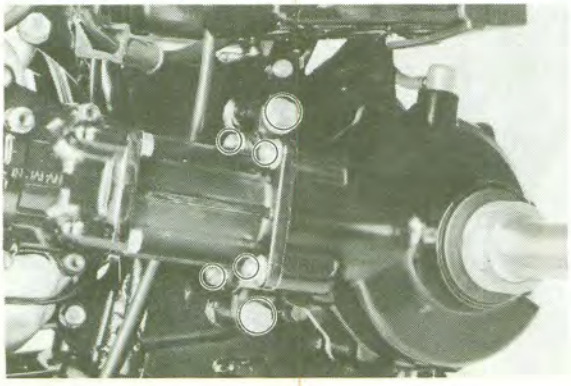
1. Coupling gear joint

6. Install the rear wheel assembly in the original position.

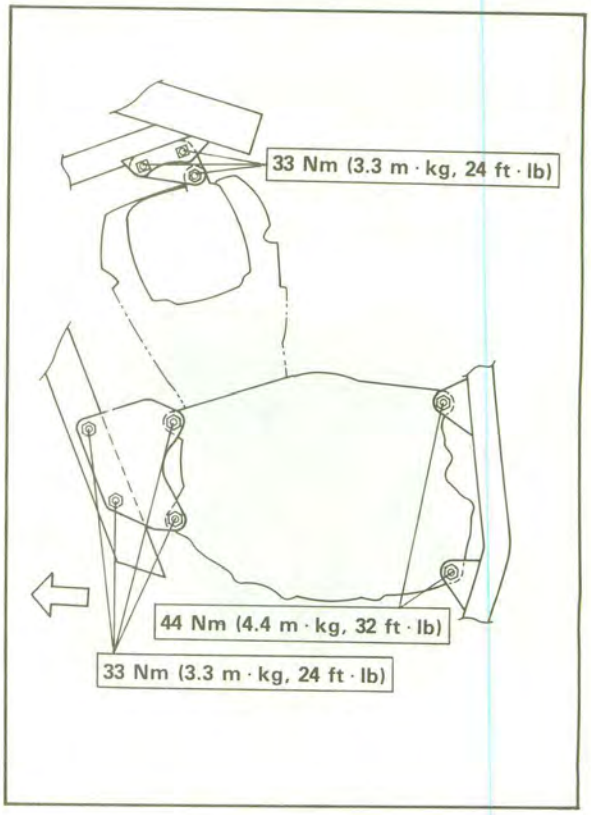


7. Install the nuts and bolts securing the final gear housing and the rear wheel hub. Finger-tighten the bolts and nuts; do not torque them at this position.
8. Evenly tighten all final gear housing securing bolts and nuts, then torque them.

TIGHTENING TORQUE:
NUT:
23 Nm (2.3 m · kg, 17 ft · lb)
BOLT:
45 Nm (4.5 m · kg, 32 ft · lb)

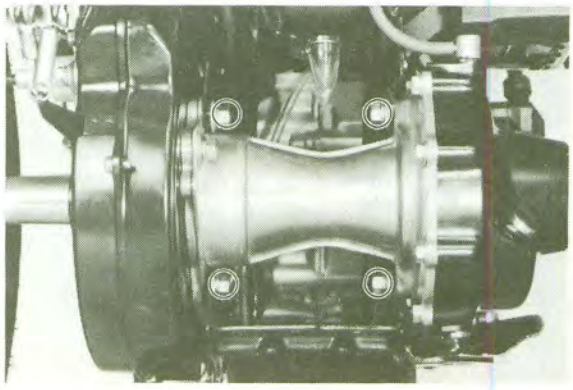


9. Evenly tighten all engine mounting bolts, then torque them to specification.



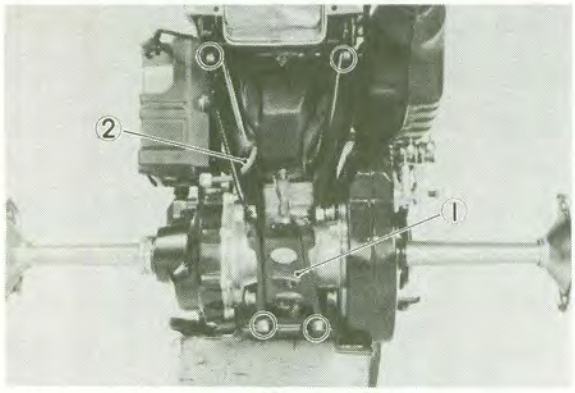
10. Evenly tighten all rear wheel hub bolts, then torque them to specification.

TIGHTENING TORQUE:
50 Nm (5.0 m · kg, 36 ft · lb)



11. Install the hitch bracket onto the frame. Torque the bolts to specification. Connect the final gear breather pipe.

TIGHTENING TORQUE:
UPPER (8MM):
15 Nm (1.5 m · kg, 11 ft · lb)
UNDER (10MM):
30 Nm (3.0 m · kg, 22 ft · lb)

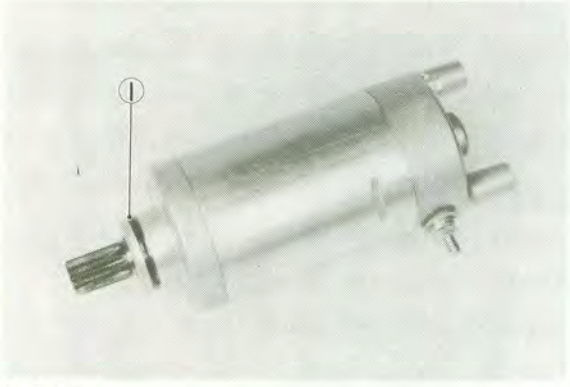


1. Hitch bracket 2. Breather pipe

12. Install the starter motor. Grease the O-ring and insert the starter into the crankcase.

NOTE:

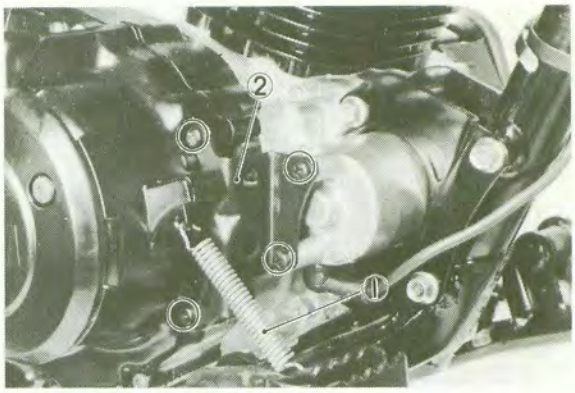
Be careful not to damage the O-ring during installation.



1. O-ring

13. Secure the starter motor in place with the four securing screws. Torque them to specification.

TIGHTENING TORQUE:
7 Nm (0.7 m · kg, 5.1 ft · lb)



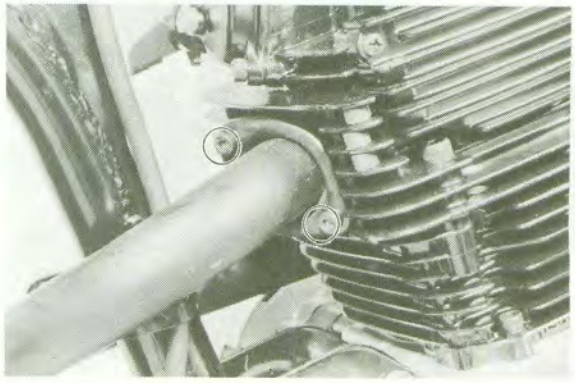
1. Return spring 2. Bracket

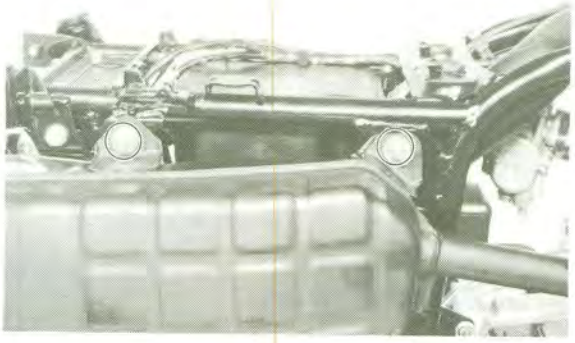
14. Connect the starter motor lead and the foot brake pedal return spring.
15. Install the carburetor joint with the new O-rings. Torque the bolts, nuts and the screw to specification.

TIGHTENING TORQUE:
Cylinder head & Joint:
12 Nm (1.2 m · kg, 8.7 ft · lb)
Joint & Carburetor:
8 Nm (0.8 m · kg, 5.8 ft · lb)
Carburetor & Hose:
2 Nm (0.2 m · kg, 1.4 ft · lb)

16. Install the muffler assembly. Use a new gasket, and finger-tighten the exhaust-pipe-flange bolts. Install the muffler securing bolts. Tighten all four bolts to specification.

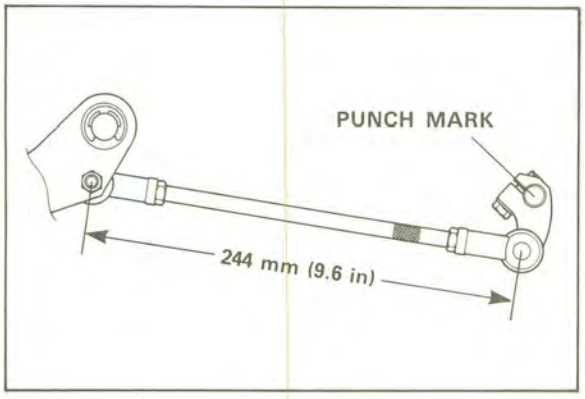
TIGHTENING TORQUE:
Exhaust-pipe-flange bolt:
10 Nm (1.0 m · kg, 7.2 ft · lb)
Muffler securing bolt:
27 Nm (2.7 m · kg, 19 ft · lb)





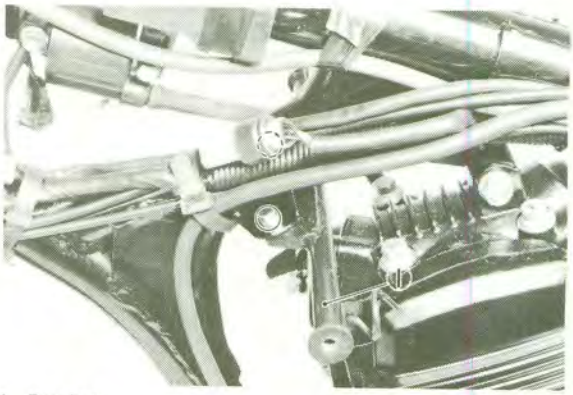
17. Install the shift linkage onto the shift shaft. Place the shift linkage as shown and torque the pinch bolt to specification.

TIGHTENING TORQUE:
10 Nm (1.0 m · kg, 7.2 ft · lb)



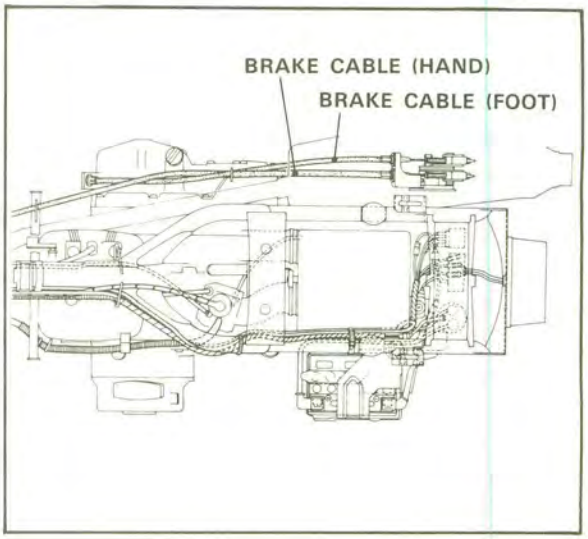
18. Connect the C.D.I. leads, spark plug lead, neutral switch lead, and crankcase ventilation pipe.
19. Connect the battery leads to the battery. Connect the positive lead first; then connect the negative lead.
20. Install the fuel tank cover bracket onto the frame. Torque the bolts to specification.

TIGHTENING TORQUE:
10 Nm (1.0 m · kg, 7.2 ft · lb)



1. Bracket

21. Install the fuel tank. Connect the fuel lines.
22. Connect the rear brake cables. Route the rear brake cables through the cable holders. Adjust the rear brake cables. See page 2-12.



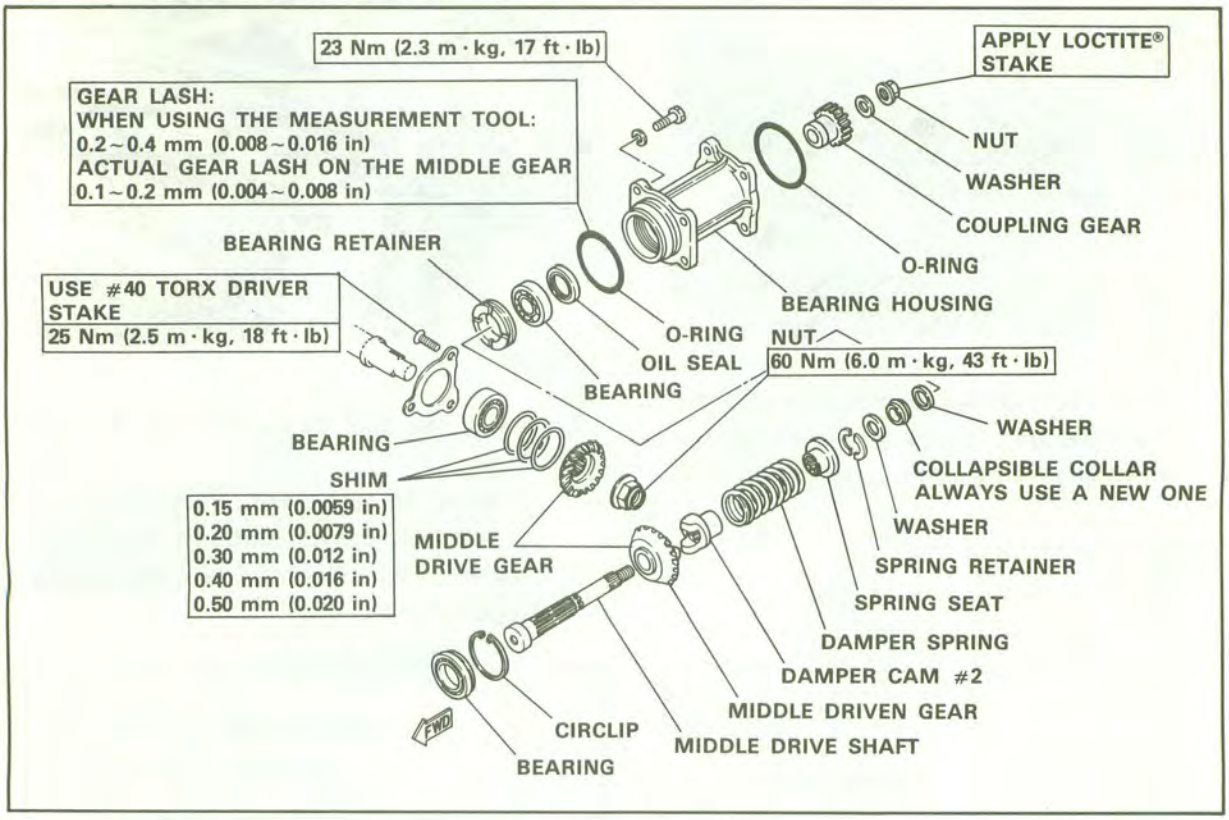
23. Install the rear wheels, fuel tank cover, and seat/rear cowling assembly.

TIGHTENING TORQUE:
Rear wheel panel:
28 Nm (2.8 m · kg, 20 ft · lb)

24. Add ENGINE oil.

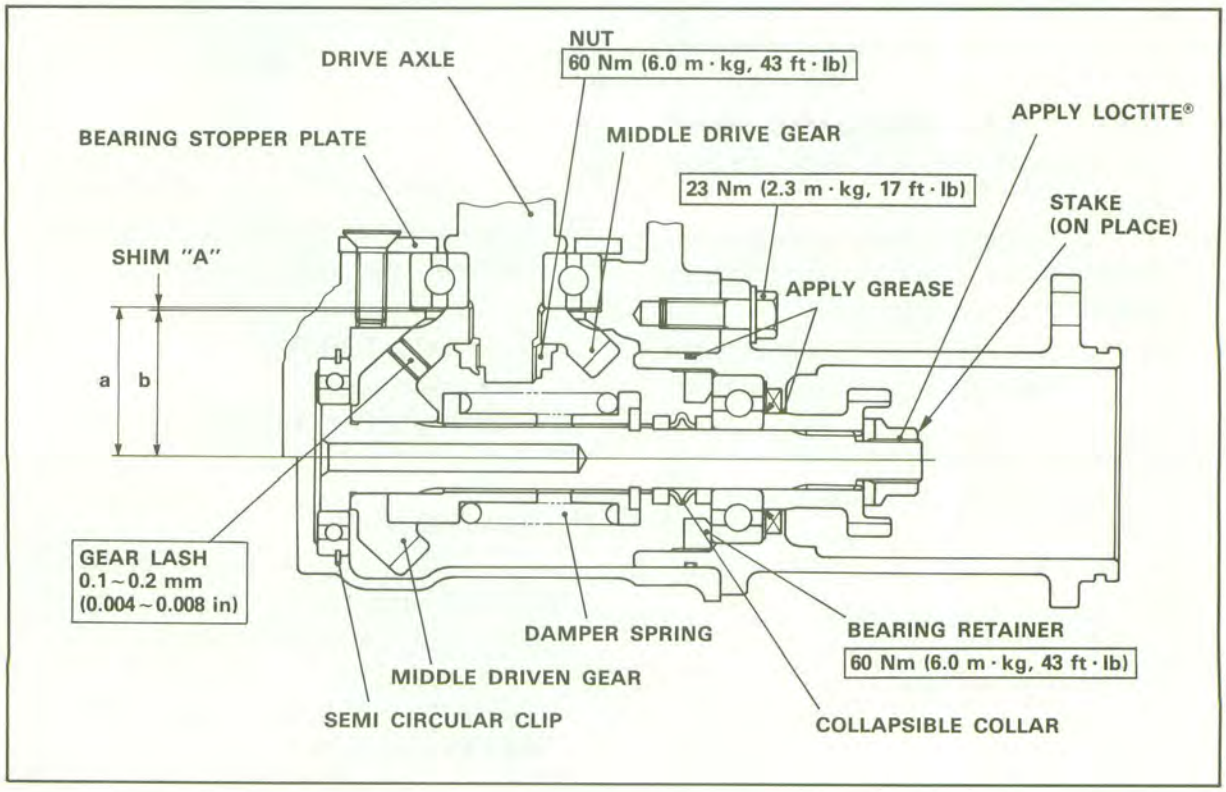
Engine oil capacity:
1.8 L (1.6 Imp qt, 1.9 US qt.)
Recommended oil:
Yamalube 4-cycle oil or SAE 20W40 type SE motor oil

MIDDLE GEAR SERVICE



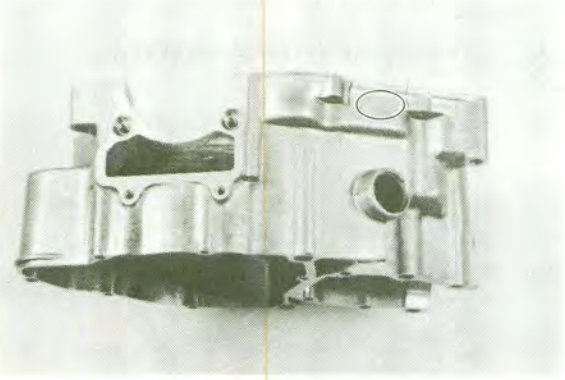
Drive Axle Positioning

When the left side crankcase and/or the drive axle are replaced, you must position the drive axle in place.



1. Calculate the shim thickness using the formula shown below.
   Shim thickness "A" = a − b
   a = 42 plus or minus numeral (in 1/100 unit) is marked on the middle drive gear.
   b = 41 plus numeral (in 1/100 unit) is marked on the left-side crankcase.
   For example:
   If the middle drive gear is marked "+03",
   a = 42 + 0.03
   a = 42.03

   If the crankcase is marked "45",
   b = 41 + 0.45
   b = 41.45



   A = a − b
   A = 42.03 − 41.45
   A = 0.58
   The shim thickness is 0.58 mm (0.0228 in)

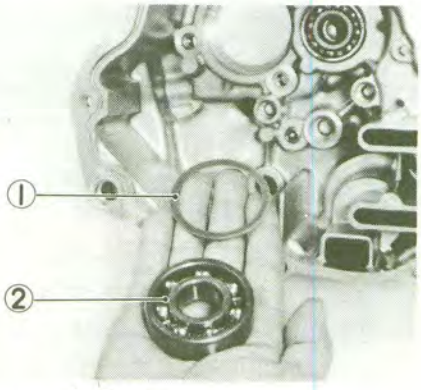
2. Shims are supplied in the following thicknesses:
   0.15 mm (0.0059 in), 0.20 mm (0.0079 in), 0.30 mm (0.0118 in), 0.40 mm (0.0157 in) and 0.50 mm (0.0197 in)

3. Because shims can only be selected in 0.05 mm (0.0020 in) increments, use the following chart to round off the hundredths digit of the calculated thickness and select the appropriate shim.

Hundredths digit	Rounded value
0, 1, 2	0
3, 4, 5, 6	5
7, 8, 9	10

   In the example from above, the calculated shim thickness is 0.58 mm (0.0228 in). The chart instructs you, however, to round off the 8 to 10. Thus you should use two 0.30 mm (0.0118 in) shims.

4. Install the drive axle bearing with the proper shims into the crankcase.

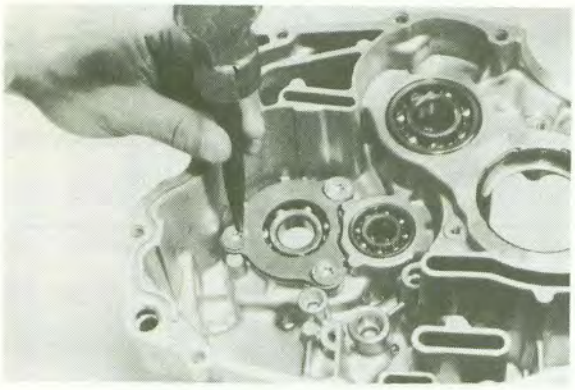


1. Shim 2. Bearing

5. Install the bearing stopper plate and tighten the bearing stopper bolts. Use the Torx driver (#40) and torque the bolts to specification.

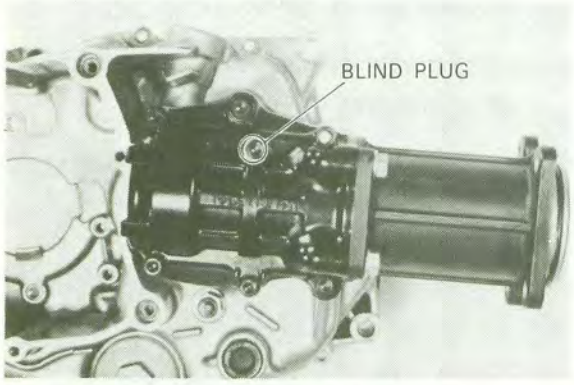
TIGHTENING TORQUE:
25 Nm (2.5 m · kg, 18 ft · lb)

6. Place a punch on the part of the stopper bolt head which covers the recess in the stopper plate and punch the head.



Gear Lash Measurement

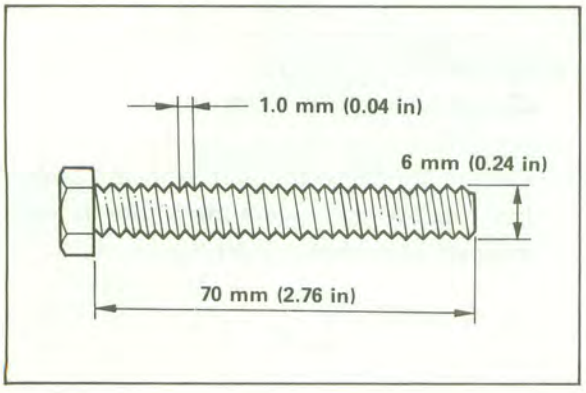
1. Remove the blind plug from the middle gear case cover.



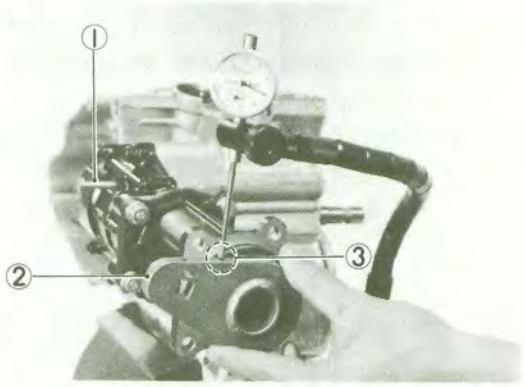
2. Install a specified size of bolt (as shown) into the blind plug hole. Finger-tighten the bolt until it hold the middle drive gear.

NOTE:

The bolt should not be over tightened, finger tight is sufficient.



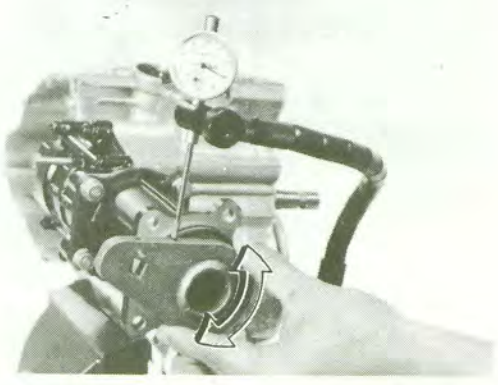
3. Install the coupling gear holder onto the coupling gear.
4. Mount a dial gauge against the coupling gear holder at the scribed mark.



1. Bolt 2. Coupling gear holder 3. Mark

5. Gently rotate the coupling gear holder back and forth. Note the lash measurement on the dial gauge. Check the gear lash four points.

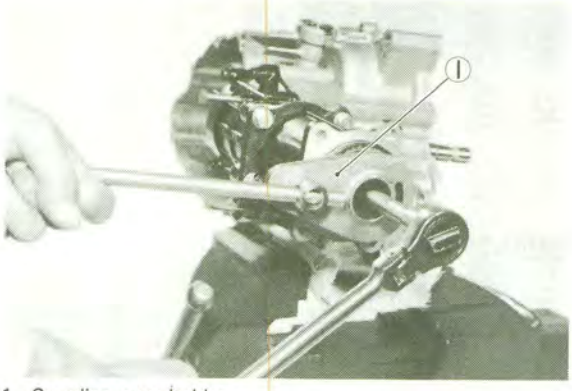
Middle gear lash:
When using the coupling gear holder tool:
0.2 ~ 0.4 mm (0.008 ~ 0.157 in)
Actual gear lash on the middle gear teeth:
0.1 ~ 0.2 mm (0.004 ~ 0.008 in)



6. If the measurement exceeds the specified gear lash at any of the four points, and the middle drive shaft assembly should be disassembled and adjusted.

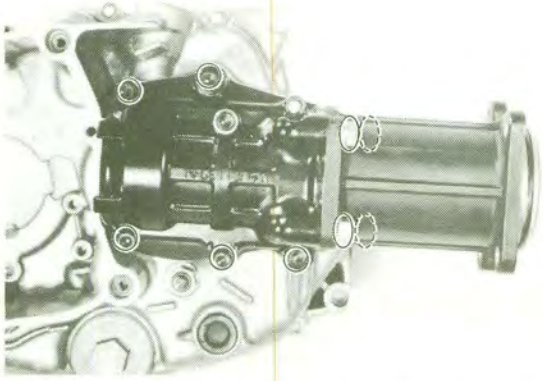
Disassembly (Middle Drive Shaft Assembly)

1. Install the coupling gear holder into the bearing housing. Loosen the coupling gear securing nut as shown.

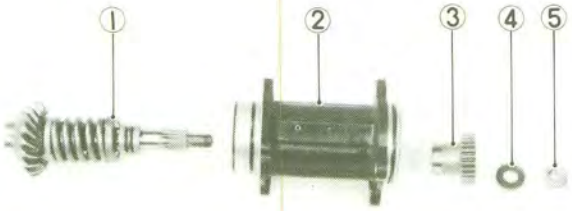


1. Coupling gear holder.

2. Remove the middle gear case cover and bearing housing securing bolts. Remove the middle drive shaft assembly and semi circular clip from the crankshaft.



3. Remove the coupling gear securing nut, washer, coupling gear, middle drive shaft sub-assembly from the bearing housing.

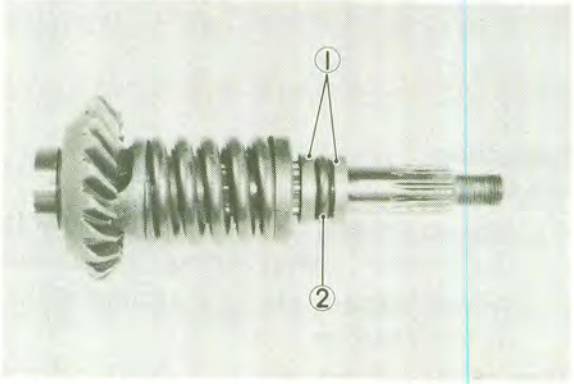


1. Drive shaft sub-assembly
2. Bearing housing
3. Coupling gear
4. Washer
5. Nut

4. Remove the washers and the collapsible collar from the middle drive axle.

CAUTION:

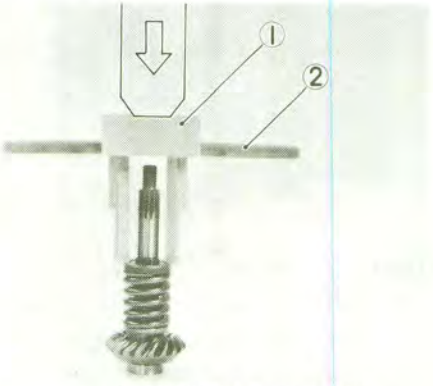
Discard the collasible collar whenever the middle gear is disassembled.



1. Washer
2. Collapsible collar

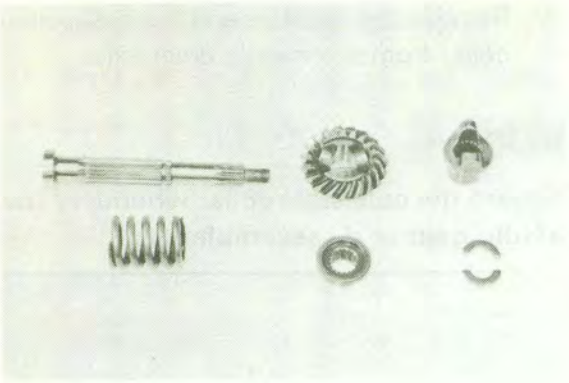
The following steps are necessary only if you must service the middle drive shaft, middle driven gear, dumper spring, and/or damper cam.

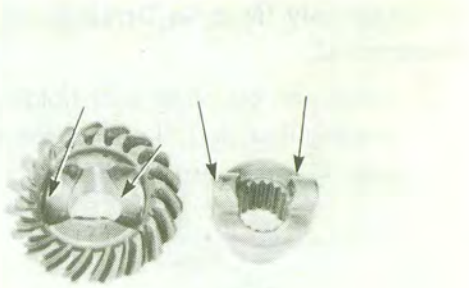
5. Place the middle drive shaft in a hydraulic press with the special tool in place as shown in the photograph.



1. Push plate
2. Middle-drive-gear holder

6. Remove the spring retainers, spring seat, damper spring, damper driven cam, and middle driven gear (damper drive cam) from the middle drive shaft.





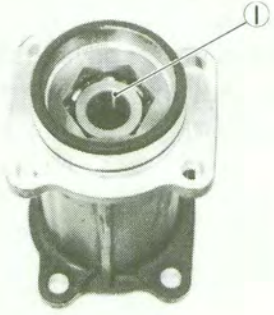
Inspection

Middle gears

1. Inspect the gear teeth on all the gears. If discoloration, galling, pitting, or excessive wear is found on any gear, replace all the middle gears as a set.

Bearings

1. Put your finger on the race, and check the bearing movement. If any bearing is rough, replace it.



1. Drive shaft bearing

Damper Cams

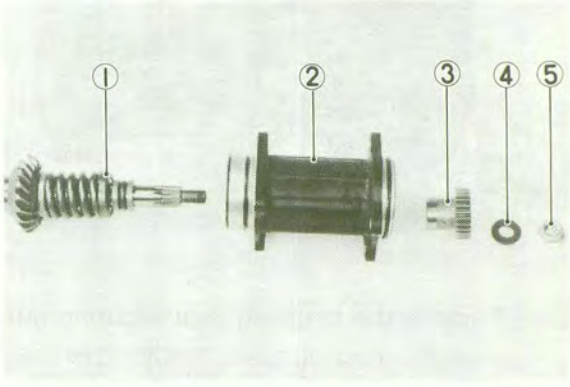
1. Inspect the damper cam surfaces. Check for smooth cam action and excessive wear on the cam surface. If cam surface is severely worn, replace damper assembly.

Damper Spring

1. Inspect the damper springs for fatigue, wear, and damage. Replace as necessary.

Assembly

1. Install the needle bearing inner race onto the middle drive shaft and install the ball bearing into the bearing housing.
2. Assemble the middle drive shaft as shown in the photograph. Finger-tighten the securing nut.



1. Drive shaft sub-assembly
2. Bearing housing
3. Coupling gear
4. Washer
5. Nut

Gear Lash Adjustment

1. Insert the semicircular clip into the crankcase.
2. Install the middle drive shaft assembly onto the crankcase.
3. Install the middle gear case cover and install the four bearing housing securing bolts and five cover bolts to specification.

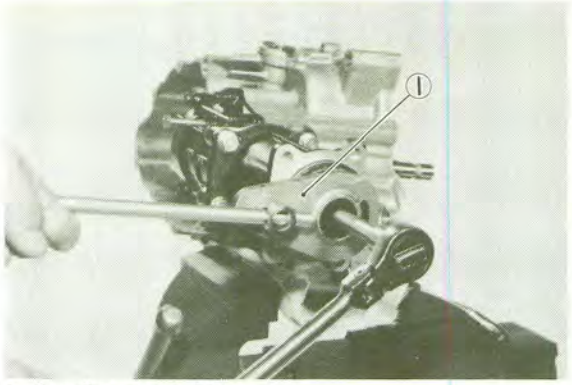
TIGHTENING TORQUE:
Bearing housing:
23 Nm (2.3 m · kg, 17 ft · lb)
Middle gear case cover:
10 Nm (1.0 m · kg, 7.2 ft · lb)

4. Place the coupling gear holder on the coupling gear.
5. Install the securing nut onto the middle drive shaft, and apply Loctite® Stud N'bearing Mount to the threads. Carefully tighten the securing nut, then check the gear lash. Tighten the nut a little more, and check the gear lash. Repeat this tighten-and-check procedure until the gear lash measurement is within specification. You must proceed slowly, however, so the collapsible collar will not be damaged. If you tighten the securing nut so that gear lash is less than 0.2 mm (0.008 in), you will have to disassemble the middle driven shaft and replace the collapsible collar.

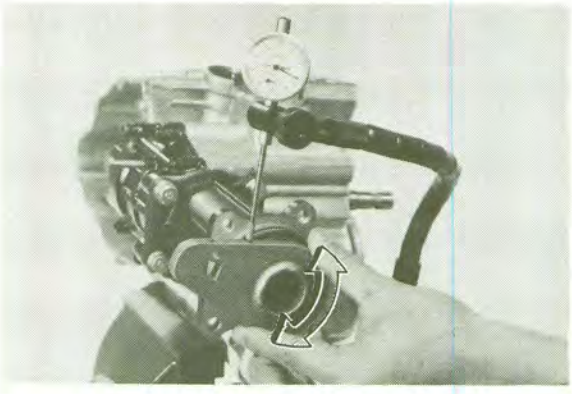
CAUTION:

Never loosen the securing nut when adjusting gear lash. There will be insufficient pressure on the collapsible collar.
Gear lash adjustment must be completed within five minutes, otherwise, the Loctite® will harden and inhibit gear lash adjustment.

Middle gear lash:
When using the coupling gear holder:
0.2 ~ 0.4 mm (0.008 ~ 0.0157 in)



1. Coupling gear holder



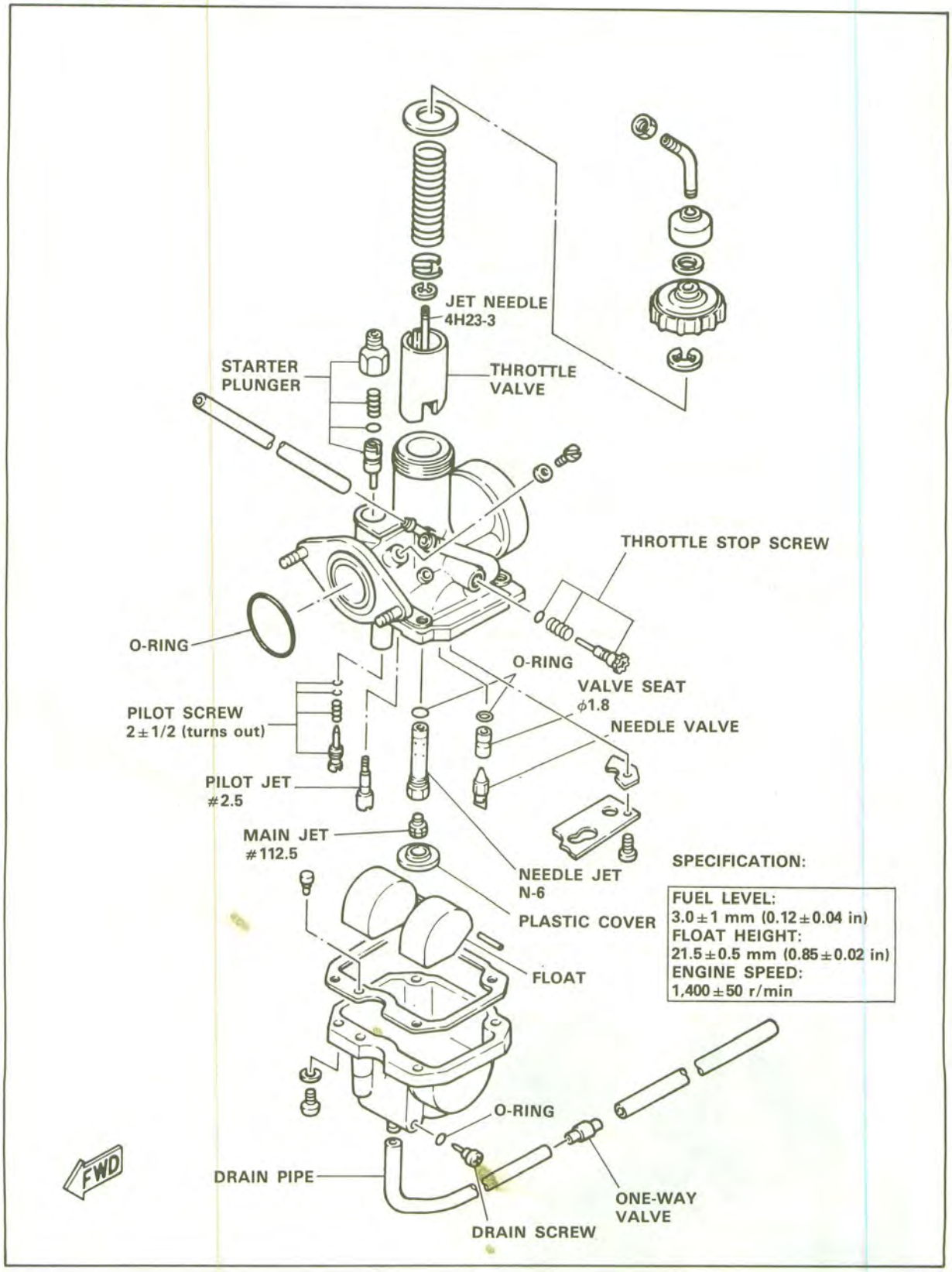
6. With a center punch, lock the threads on the securing nut.

CHAPTER 4.
CARBURETION

4

CAHPTER 4.
CARBURETION

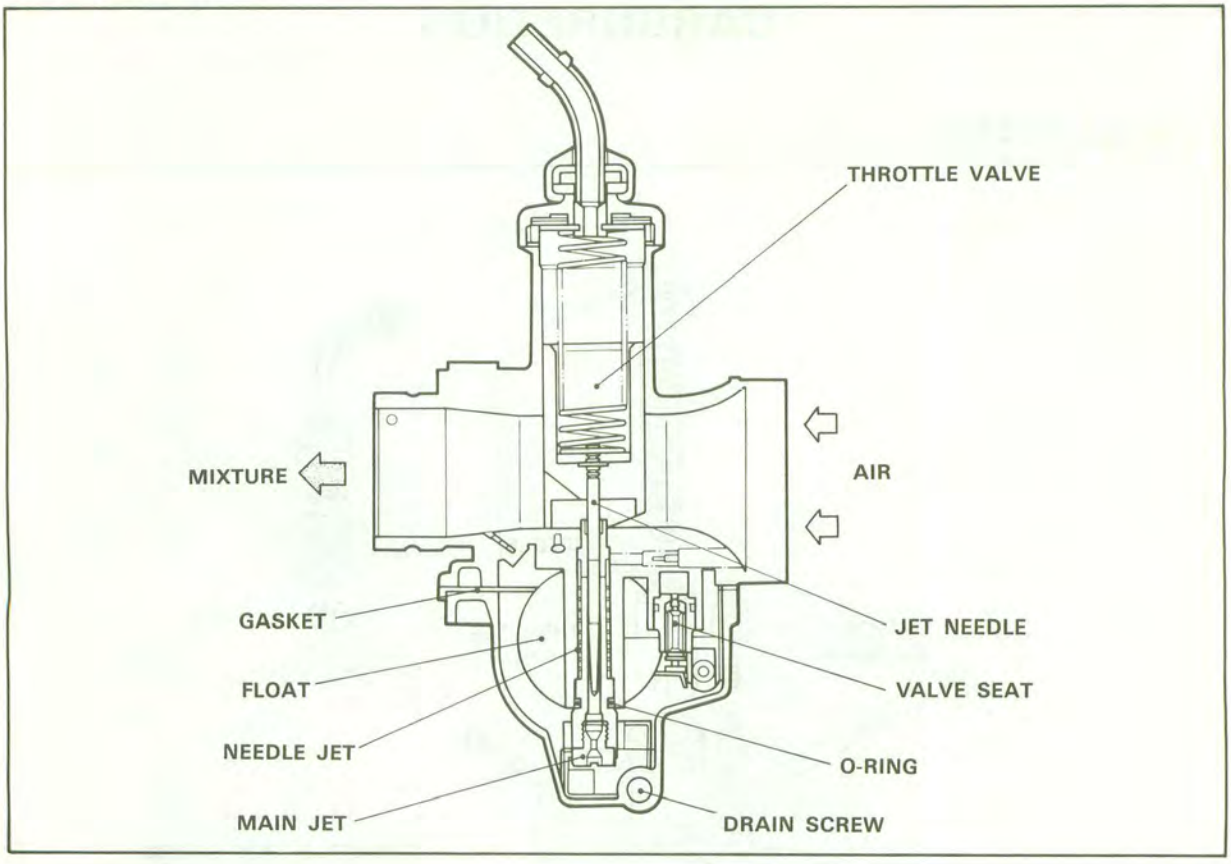
CARBURETOR



SPECIFICATION:

FUEL LEVEL:
3.0±1 mm (0.12±0.04 in)
FLOAT HEIGHT:
21.5±0.5 mm (0.85±0.02 in)
ENGINE SPEED:
1,400±50 r/min

Sectional View

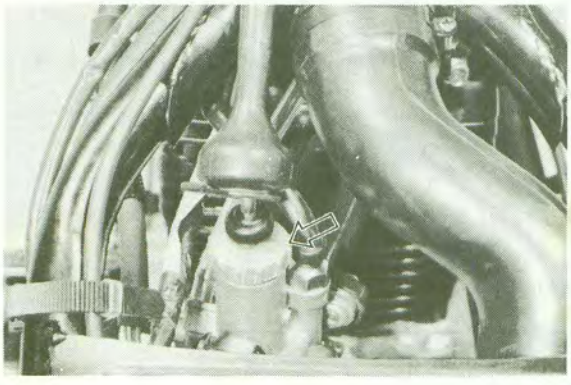


Specifications

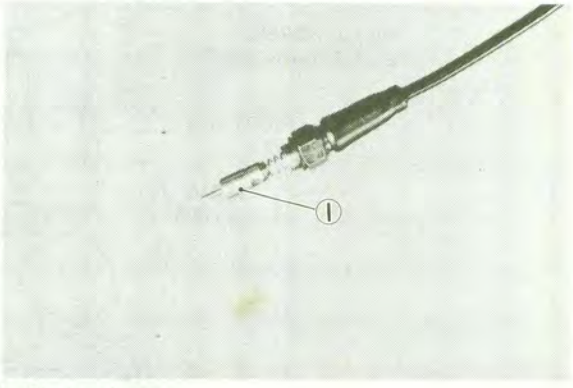
Main jet (Original)	#112.5
Jet needle	4H23-3
Pilot jet	#25
Pilot screw	2 ± 1/2 (turns out)
Float valve seat	ø1.8
Fuel level	3.0 mm (0.12 in)
Float height	21.5 mm (0.85 in)
Engine idle speed	1,400 ± 50 r/min

Disassembly

1. Remove the throttle valve assembly from the carburetor.

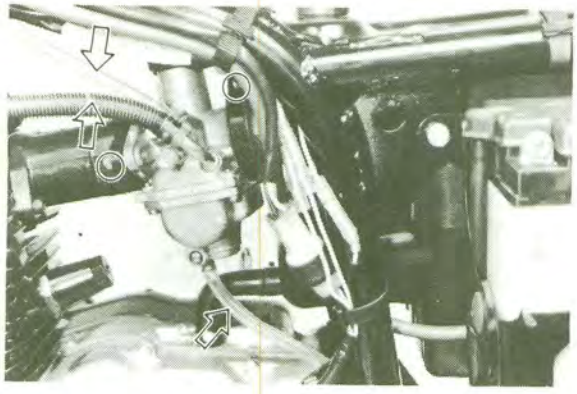


2. Remove the starter plunger from the carburetor body.



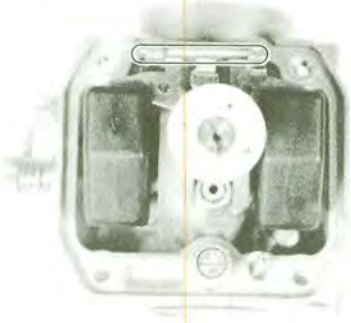
1. Starter plunger

3. Remove the carburetor assembly; remove the pipes and holding nuts, and loosen the inlet pipe clamp screw.

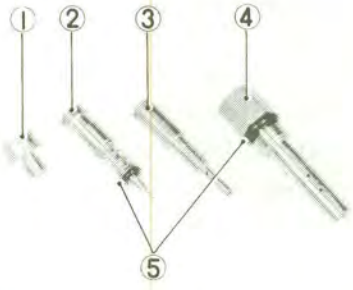


4. Remove the float chamber from the carburetor body.

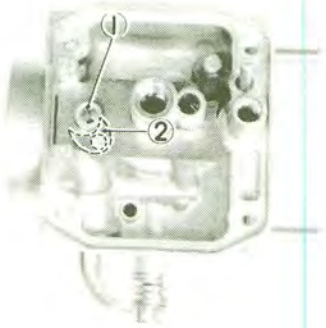
5. Remove the float pivot pin, and remove the float assembly. Be careful not to close the float valve which is under the float arm.



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



1. Main jet
2. Pilot screw
3. Pilot jet
4. Needle jet
5. O-ring

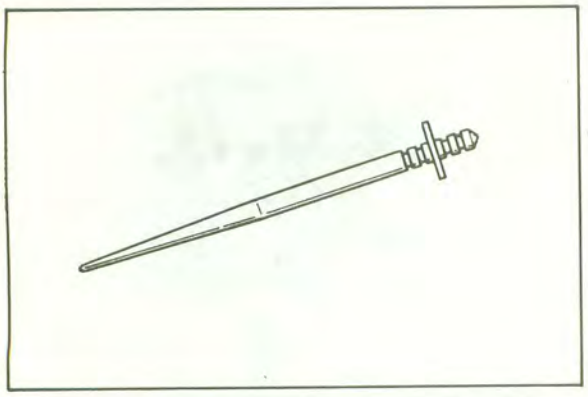


1. Float valve seat
2. Valve stopper

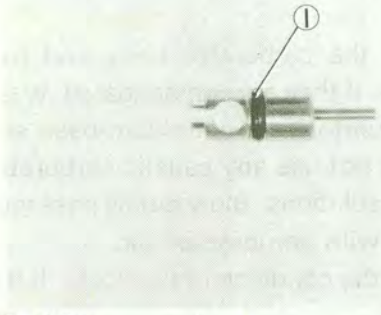
Inspection

1. Examine the carburetor body and fuel passages. If they are contaminated, wash the carburetor in a petroluem-base 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 needle valve and seat for wear or contamination. Replace these components as a set.

4. Inspect the jet needle for bends or wear. If the needle is bent or severely worn, replace it.



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



1. O-ring

Assembly

1. To assemble the carburetors, reverse the disassembly procedures. Pay close attention to the location of each jet.

Adjustment

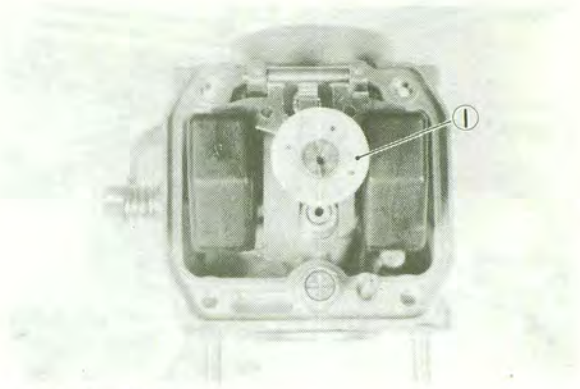
Fuel level

NOTE:

Before checking the fuel level, note the following:

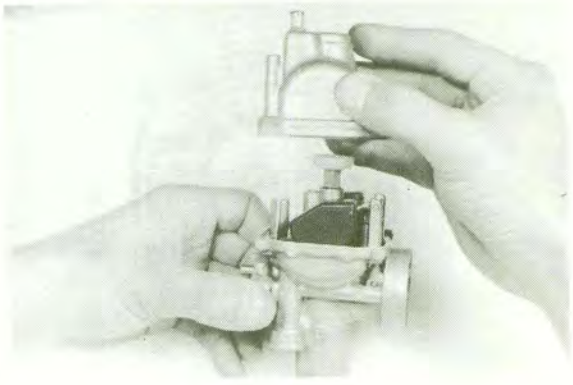
- Place the motorcycle on a level surface.
- Adjust the motorcycle position by placing a suitable stand or a garage jack under the engine so that the carburetor is positioned vertically.

1. Install the plastic cover over the main jet.



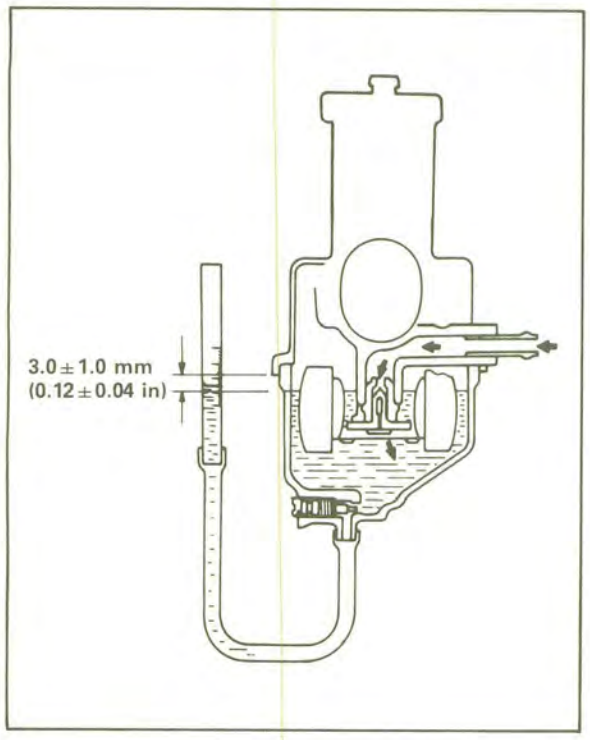
1. Plastic cover

2. Hold the main body first, then slowly install the float chamber to the main body. Be sure the float chamber and main body fitted snugly. Tighten the float chamber securing screws.



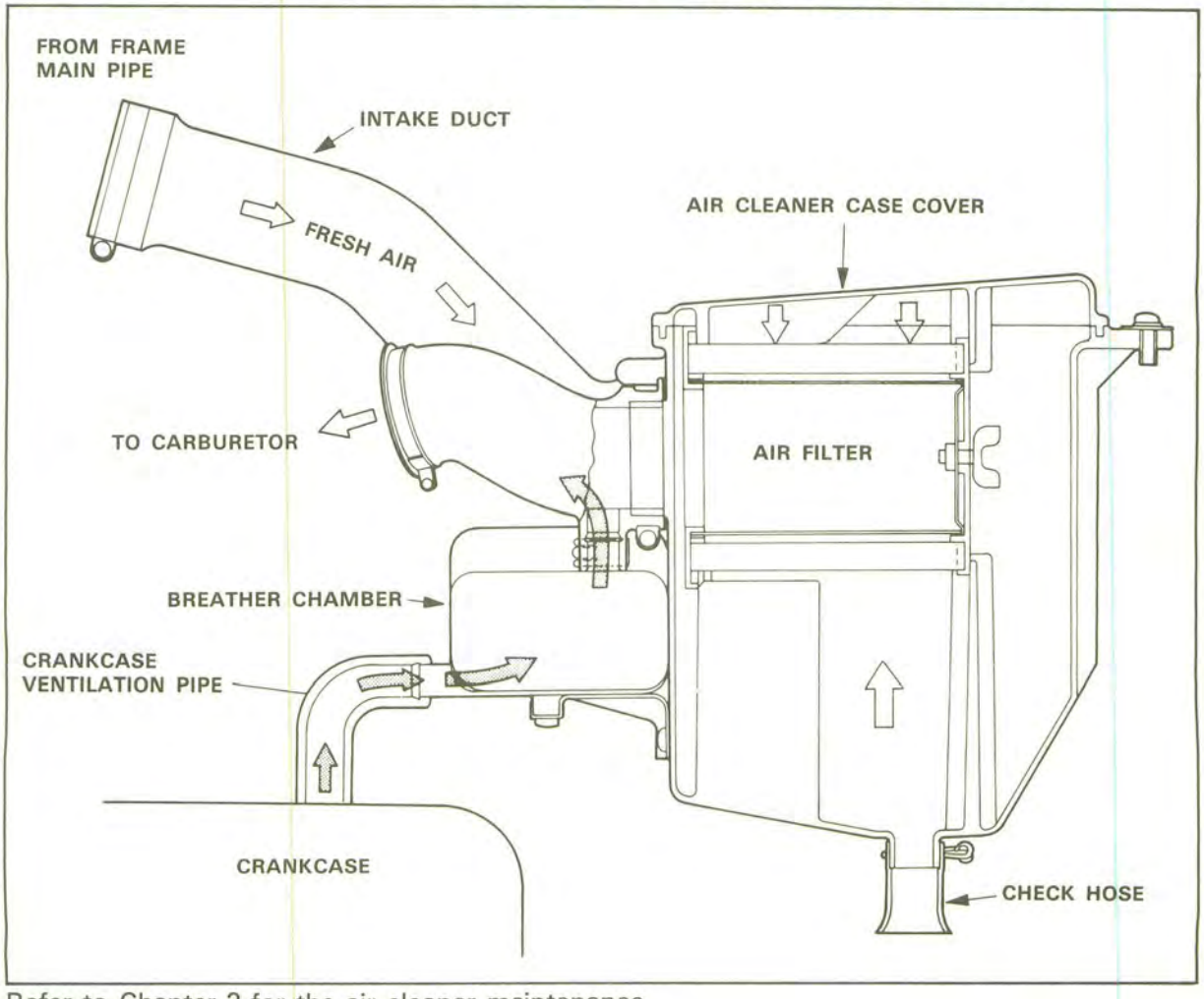
3. Install the carburetor to the machine.
4. Connect the fuel level gauge or a vinyl tube, 6 mm (0.24 in) inside diameter, to the float bowl nozzle on the carburetor.
5. Place the tube next to the throttle stop screw.
6. Set the fuel cock to "ON" and start the engine. Stop if after a few minutes.
7. Check the fuel level. It should be within the specified range.

Fuel level:
Carburetor:
3.0±0.1 mm (0.12±0.04 in)
Float height:
21.5±0.5 mm (0.85±0.02 in)
above the carburetor body



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

AIR CLEANER AND CRANKCASE VENTILATION SYSTEM



Refer to Chapter 2 for the air cleaner maintenance.

CHAPTER 5.
CHASSIS

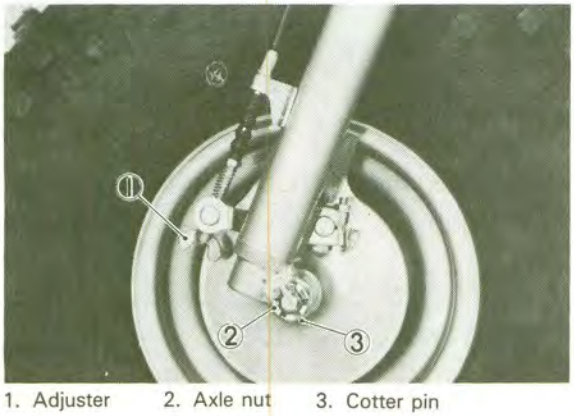
CHAPTER 5. CHASSIS

FRONT WHEEL

Removal

1. Elevate the front wheel by placing a suitable stand under the footrest.

2. Remove brake cable. Loosen all cable adjusters and remove cable from handle lever holder. Then remove cable from cam lever at front brake shoe plate.
3. Remove cotter pin from front wheel axle and remove axle nut.
4. Elevate the front wheel by placing a suitable stand under front fork.



1. Adjuster 2. Axle nut 3. Cotter pin

5. Remove the front wheel axle, collar, and front wheel assembly from the front fork.

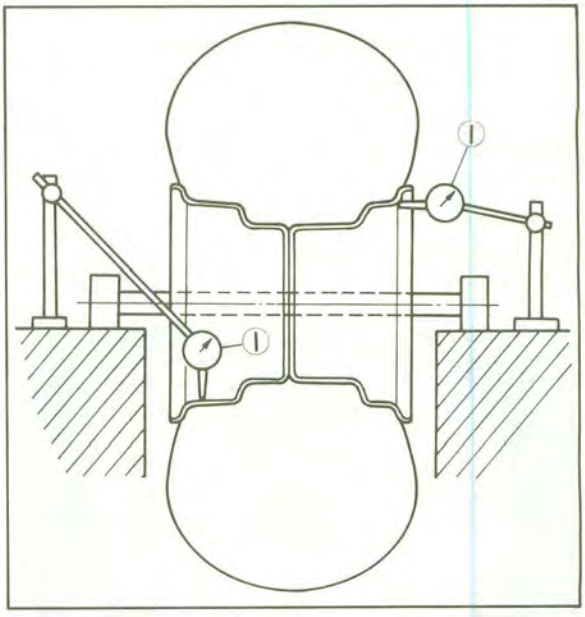
Front Axle Inspection

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

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 runout.
   If deflection exceeds tolerance below, check the wheel bearing or replace wheel as required.

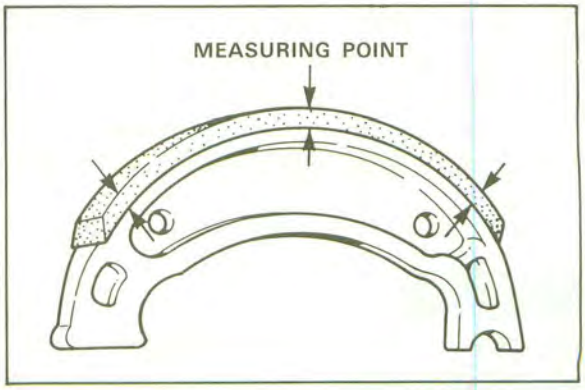
Rim runout limits:
Vertical — 2.0 mm (0.08 in)
Lateral — 2.0 mm (0.08 in)



1. Dial gauge

Checking Brake Shoe Wear

1. Check the brake linings for damage and wear. If the thickness is less than the specified value, replace the brake shoe as a set.



Wear limit: 2 mm (0.08 in)

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.

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.

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. Oil seal 2. Bearing

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.

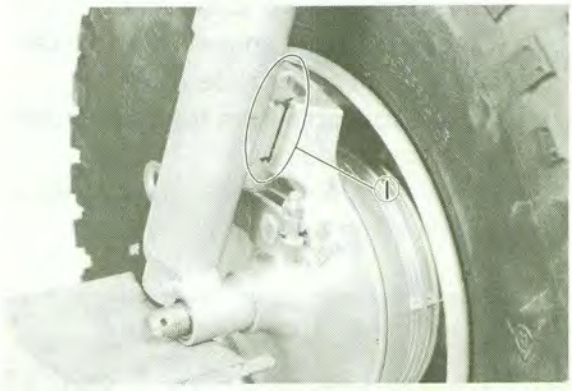
CAUTION:

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

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. Use lightweight lithium soap base grease.
2. Make sure the projecting portion (torque stopper) of the brake shoe plate is positioned correctly.



1. Torque stopper

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

TIGHTENING TORQUE:
50 Nm (5.0 m · kg, 36 ft · lb)

WARNING:

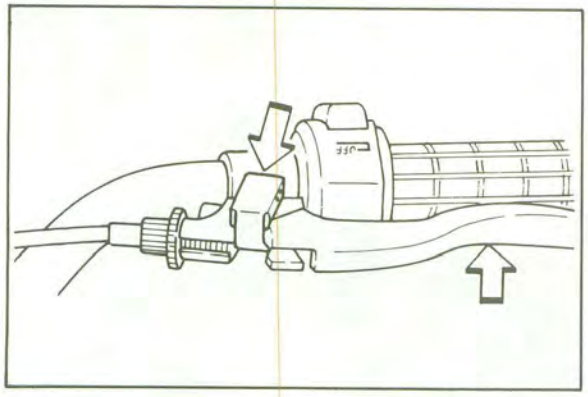
Always use a new cotter pin on the axle nut.

4. Install the brake cable.
5. Adjust the brake.
   Refer to "Front Brake Lever" on page 2-11.

REAR WHEEL

Removal

1. Block the front tire and jack up the rear of the vehicle. Apply the parking brake.



2. Remove the nuts from rear wheel panel.
3. Remove the rear wheel assembly.

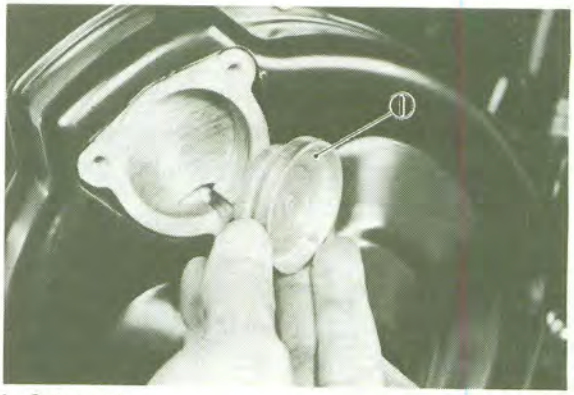
Rear Wheel Inspection

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

REAR BRAKE

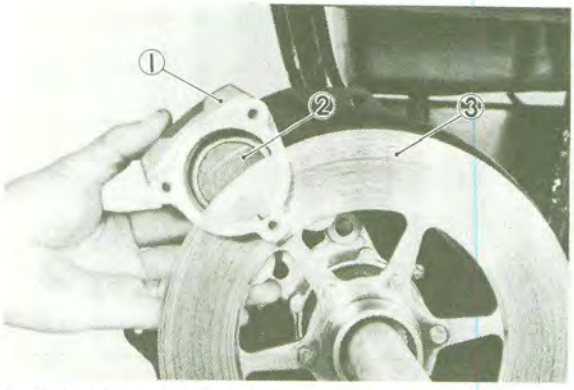
Brake Pads Removal

1. Block the front tire and raise the rear of the machine.
2. Disconnect the rear brake cables, pins and springs from the brake lever.
3. Remove the brake-caliper-outer-body securing nuts and the washer. Remove the outer pad from the outer body.



1. Outer pad

4. Remove the brake cover securing screws, remove the brake cover.
5. Remove the caliper with inner body securing bolts. Pull out the disc plate with inner body, and remove the inner pad from the inner body.

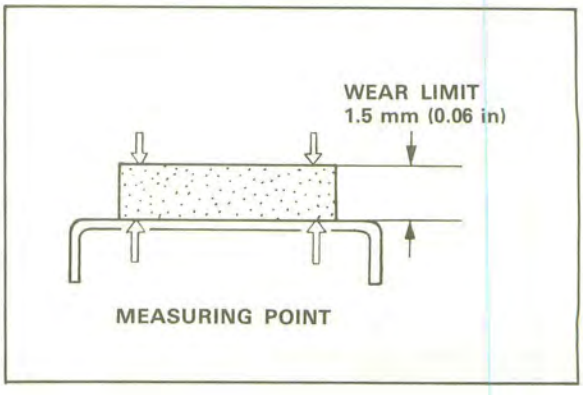


1. Caliper inner body 2. Inner pad 3. Disc plate

Rear Brake Inspection

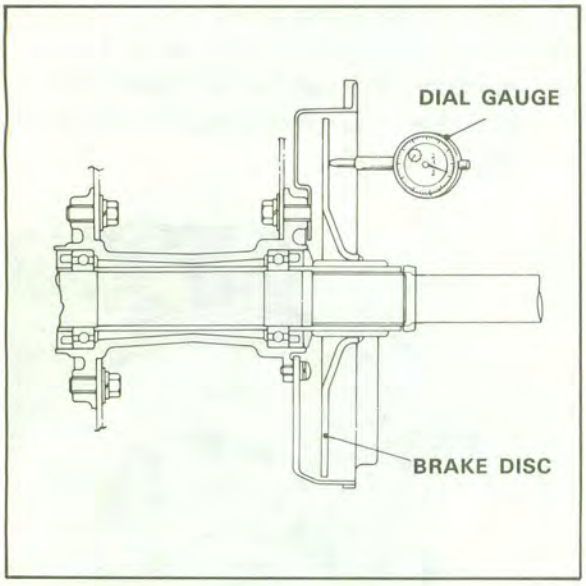
1. Replace any brake pad that is worn beyond limits. Always replace the brake pads as a set.

Wear limit: 1.5 mm (0.06 in)



2. Replace the caliper piston if it is rusty, frayed, or damaged.
3. 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 (0.02 in)
Minimum disc thickness:
3 mm (0.12 in)



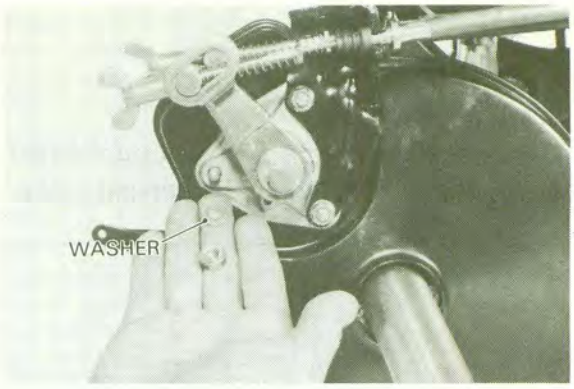
Assembly

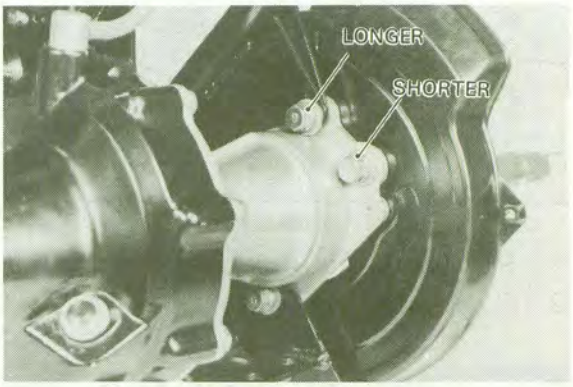
1. To assemble the rear brake, reverse the disassembly procedures. Torque the caliper securing bolts and nuts to specification.

TIGHTENING TORQUE:
Caliper body: Bolt
45 Nm (4.5 m · kg, 32 ft · lb)
Caliper: Nut
9 Nm (0.9 m · kg, 6.5 ft · lb)

CAUTION:

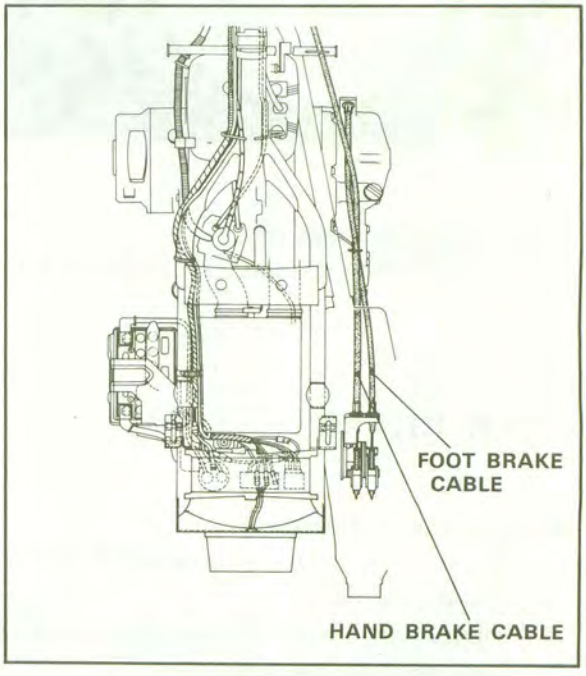
The caliper inner and outer body securing bolts and nuts must be installed at the proper position as shown in the photograph.





NOTE:

Route the brake cables through the cable clamp.

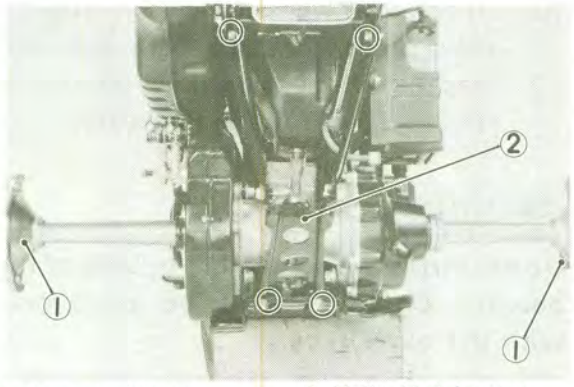


2. Adjust the rear hand brake and foot brake. Refer to "Brake Pedal and Rear Brake Lever Adjustment" on page 2-12.

Replacing the Wheel Bearings

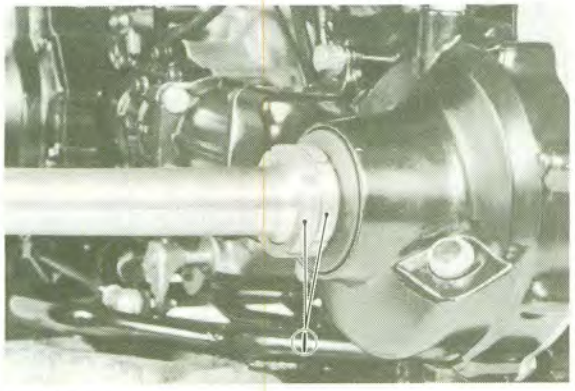
If the bearings allow play in the wheel hub or if the wheel does not turn smoothly, replace the bearings as follows:

1. Block the front tire and jack up the rear of the vehicle. **Apply the parking brake.**
2. Remove the rear wheels, axle nuts and rear wheel flanges from the rear axle.
3. Remove the trailer-hitch-bracket securing bolts and remove the bracket from the frame.



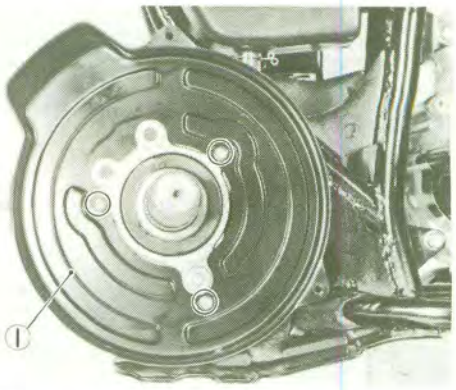
1. Rear wheel flange 2. Trailer hitch bracket

4. Remove the rear axle ring nuts: Use with the ring nut wrench.



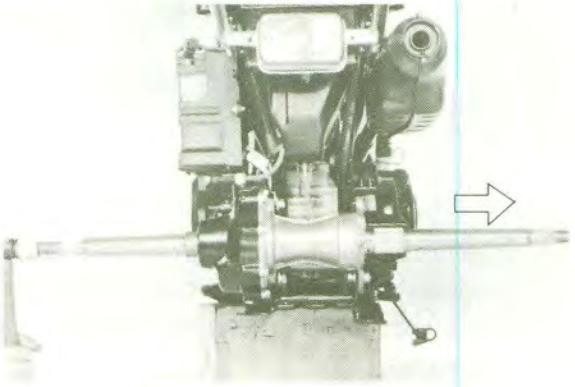
1. Ring nut

5. Release the parking brake, and disconnect the rear brake cables and return spring from the caliper lever. Remove the brake covers, rear brake assembly, and disc plate.

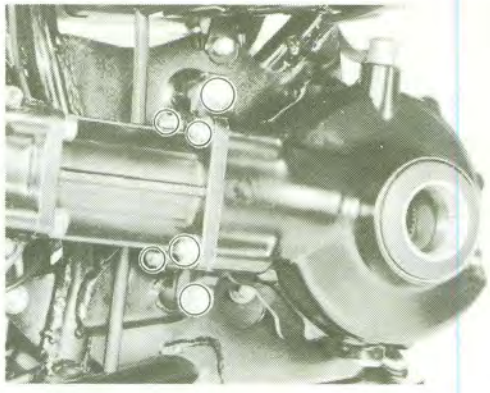


1. Brake cover

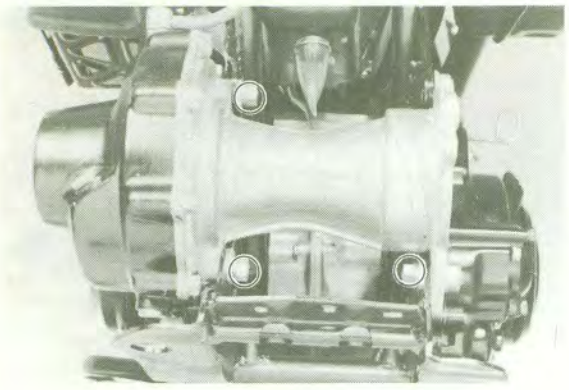
6. Remove the rear axle from the rear wheel hub by tapping the left end axle with a plastic hammer.

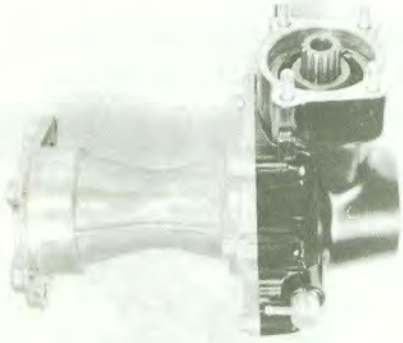


7. Remove the final gear housing securing bolts and nuts.



8. Remove the breather pipe and the rear wheel hub securing bolts. Remove the final gear assembly and the coupling gear.

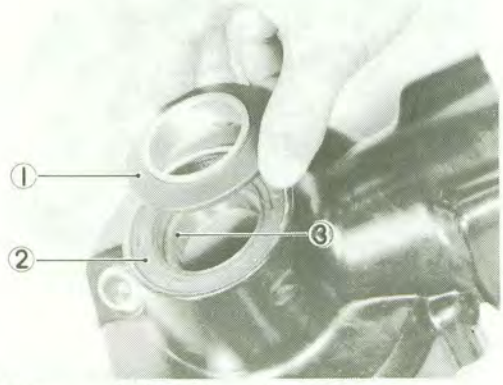




9. Drive the wheel bearing out by tapping around the perimeter of the bearing inner race with a soft metal drift punch and hammer.

WARNING:

Eye protection is recommended when using striking tools.



1. Dust seal 2. Oil seal 3. Bearing

1. Rear axle 2. Bearing

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

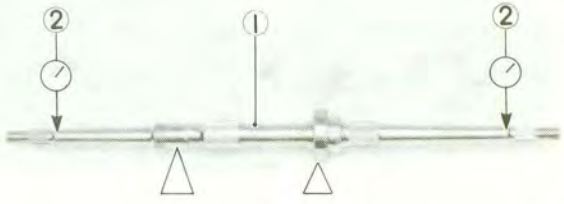
CAUTION:

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

11. Install the new oil seals and dust seals into the rear wheel hub.

Checking the Rear Axle

1. As shown below, support the rear axle by placing V-blocks under the bearing mounting positions and check for the rear axle at both ends.



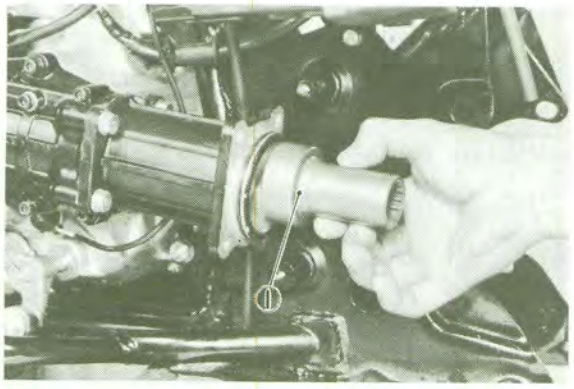
1. Rear axle 2. Dial gauge

Rear axle runout limit: 1.5 mm (0.06 in)

2. If the runout exceeds 1.5 mm (0.06 in), replace the rear axle with a new one.

Assembly

1. Install the coupling gear into the middle-gear-bearing housing.



1. Coupling gear

2. Install the final gear assembly, and finger tighten the final gear housing and rear wheel hub securing nuts and bolts.
3. Tighten the final gear housing securing nuts to specification.

TIGHTENING TORQUE:
23 Nm (2.3 m · kg, 17 ft · lb)

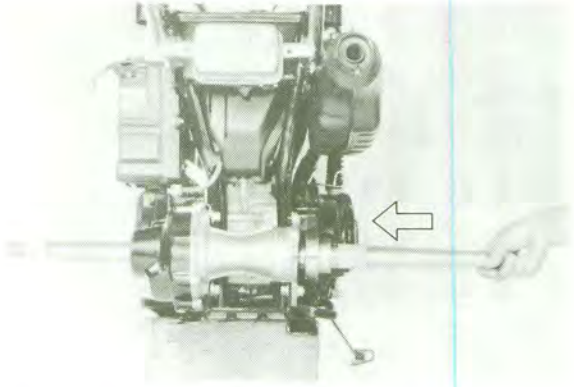
4. Tighten the final gear housing securing bolts to specification.

TIGHTENING TORQUE:
45 Nm (4.5 m · kg, 32 ft · lb)

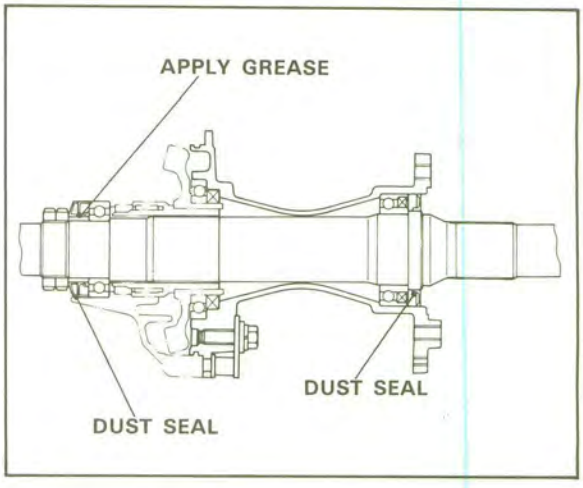
5. Tighten the three rear wheel hub securing bolts to specification.

TIGHTENING TORQUE:
50 Nm (5.0 m · kg, 36 ft · lb)

6. Install the rear axle from right-side of the wheel hub by tapping the right end axle with a plastic hammer.



7. Install the final gear and rear wheel hub dust seals. Lightly apply grease to the collar.

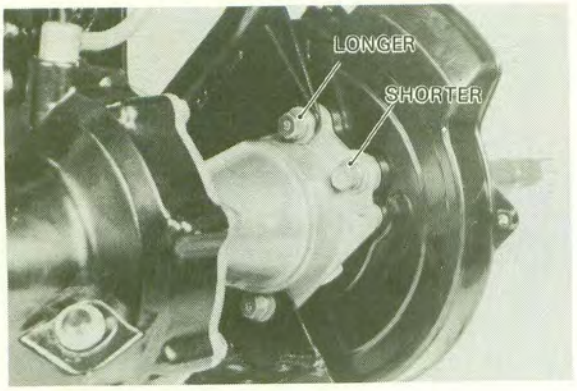


8. Install the ring nut over the rear axle and finger tighten the nut.
9. Install the rear brake assembly and adjust the rear hand brake and foot brake. Refer to "Brake Pedal and Rear Brake Lever Adjustment" on page 2-12.

TIGHTENING TORQUE:
Caliper inner body:
50 Nm (5.0 m · kg, 36 ft · lb)
Caliper outer body:
9 Nm (0.9 m · kg, 6.5 ft · lb)

CAUTION:

The caliper inner body securing bolts must be installed at the proper position as shown in the photograph.



10. Apply parking brake and torque the inside-ring nut to specification.

TIGHTENING TORQUE:
100 Nm (10 m · kg, 72 ft · lb)

11. Apply LOCTITE® to ring nut threads (outside-ring nut only) and tighten to specified torque.

NOTE:

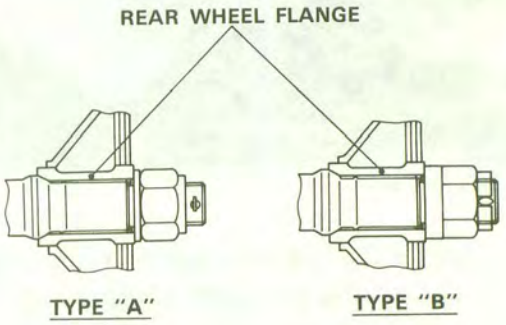
When tightening the outside-ring nut, hold the inside-ring nut with a ring nut wrench.

12. Install the rear wheel flanges and rear wheels. Torque the nuts to specification.

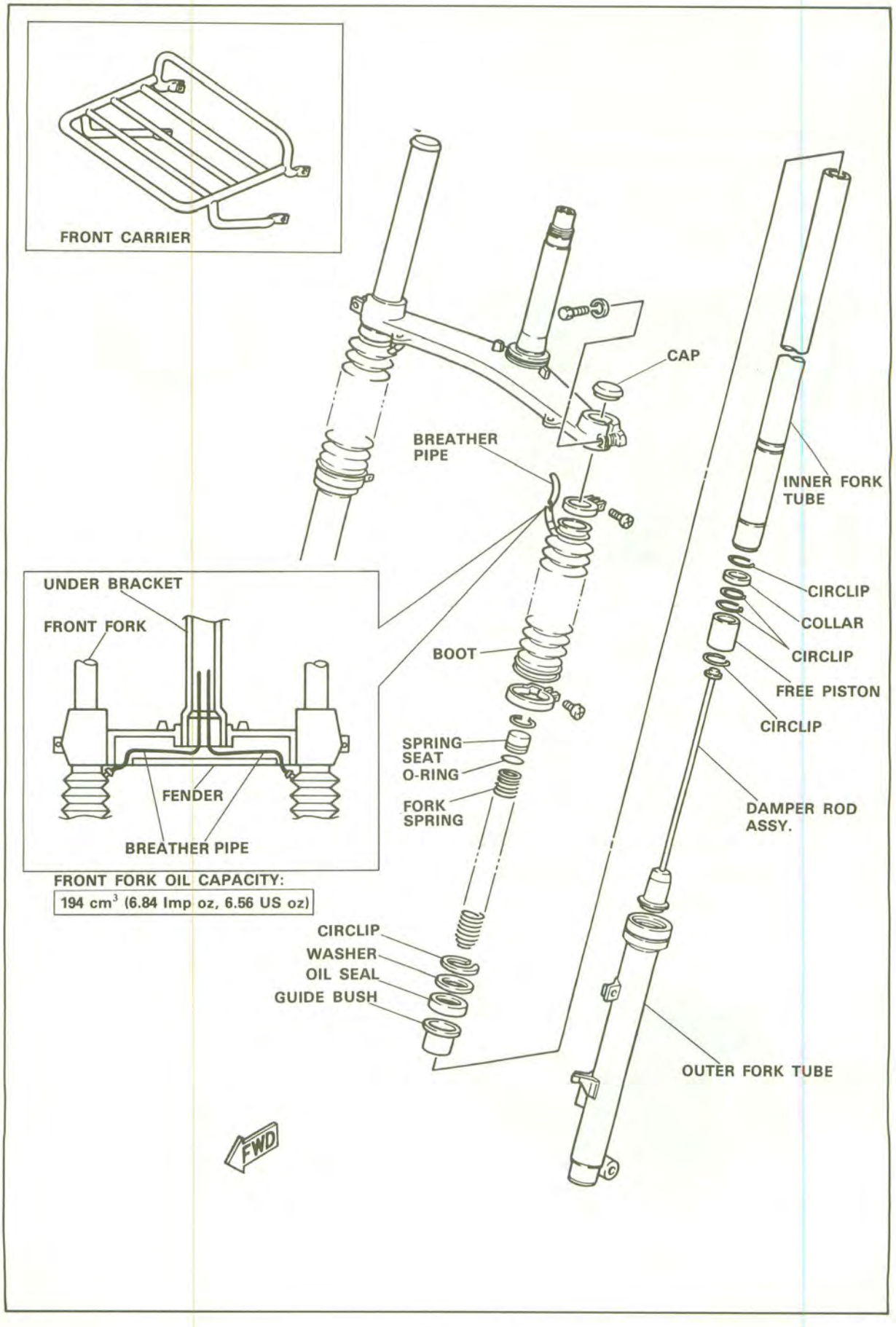
WARNING:

Always use the new cotter pin on the axle nut.

TIGHTENING TORQUE:
Rear wheel:
28 Nm (2.8 m · kg, 20 ft · lb)
Rear axle nut:
Type A:
210 Nm (21 m · kg, 150 ft · lb)
Type B:
145 Nm (14.5 m · kg, 105 ft · lb)

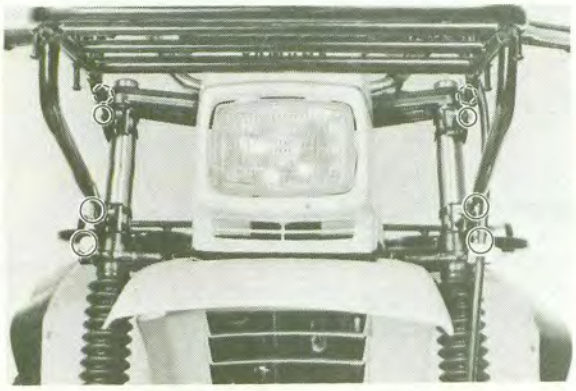


FRONT FORK


FRONT CARRIER
CAP
BREATHER PIPE
INNER FORK TUBE
UNDER BRACKET
FRONT FORK
BOOT
CIRCLIP
COLLAR
CIRCLIP
FREE PISTON
CIRCLIP
SPRING SEAT
O-RING
FORK SPRING
FENDER
BREATHER PIPE
DAMPER ROD ASSY.
FRONT FORK OIL CAPACITY:
194 cm³ (6.84 Imp oz, 6.56 US oz)
CIRCLIP
WASHER
OIL SEAL
GUIDE BUSH
OUTER FORK TUBE
FWD

Removal and Disassembly

1. Raise the front wheel by placing the suitable stand under each footrest.
2. Remove the front wheel assembly. Refer to "Removal" on page 5-1.
3. Remove the front brake cable holder securing screw and the front fender.
4. Loosen the front carrier securing bolts and pinch bolts. Remove the front fork(s) and the front carrier.



5. Loosen the dust-boot-clamp screws, and remove the dust boot from each fork.
6. Remove the rubber cap and stopper ring (Spring wire circlip) from the top of each fork.
7. The spring seat and fork spring are retained by a stopper ring (Spring wire circlip). It is necessary to depress the spring seat and fork spring to remove the stopper ring. Remove the stopper ring by carefully prying out one end with a small screwdriver.

1. Spring seat 2. Stopper ring

8. Remove the fork spring from the inner fork tube.

NOTE:

Do not drain the fork oil.

9. Remove the oil seal retaining clip and washer from the outer tube.

1. Clip

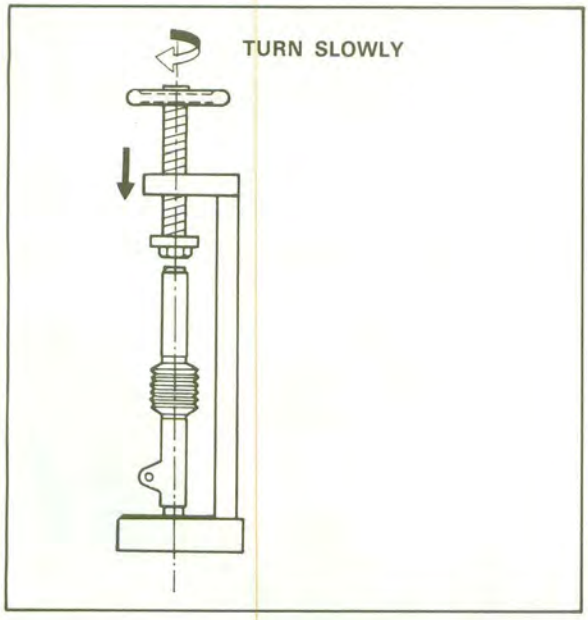
10. Set the inner fork tube with approximately 50 mm (2 in) travel at the end and completely fill with fork oil.

Front fork oil:
Yamaha Fork Oil 10wt or
SAE 10W30 type SE motor oil

11. Reinstall the spring seat and stopper ring into the inner tube.
12. Using a press, slowly press the inner tube into the outer fork tube until the oil seal comes out or until oil leaks from the outer portion of the oil seal, remove the oil seal, guide bush, and inner tube from the outer tube.

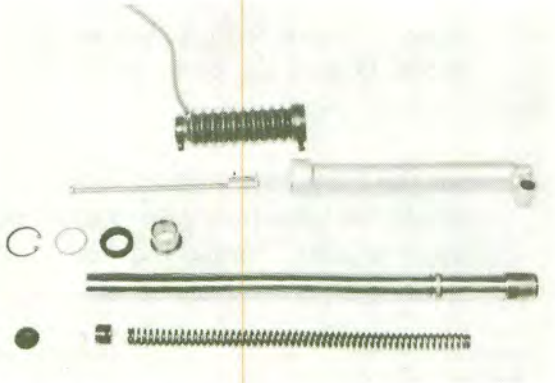
CAUTION:

If the inner fork tube is abruptly contracted, oil may spurt out or the oil seal may spring out. Wrap a rag around the end of the outer fork tube so oil will not spill all over the shop.



13. Remove the stopper ring and spring seat. Place an open container under the fork, turn the fork upside down and drain the oil.

Inspection



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

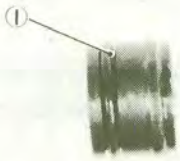
WARNING:

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 bends. Replace the tube if it is bent.
4. Check the free length of the springs.

Fork spring free length:
395.1 mm (15.56 in)

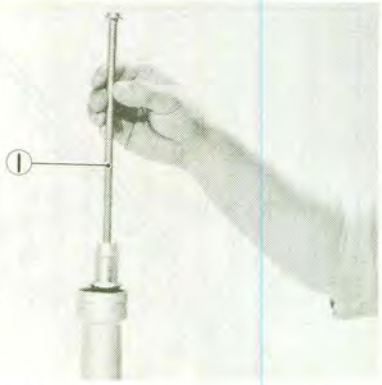
5. Check the O-ring on the spring seat. If it's damaged, replace it.



1. O-ring

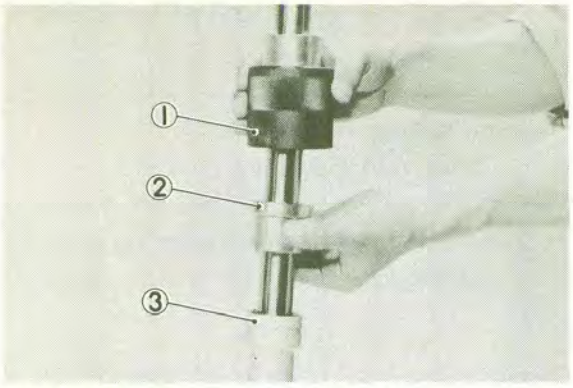
Assembly

1. Make sure all components are clean before assembly. Always install a new fork seal. Do not reuse a seal.
2. Insert the damper rod assembly and inner tube into the outer tube.



1. Damper rod assembly

3. Install the guide bush and oil seal onto the inner fork tube. Place the oil seal installer (Special tool) on the oil seal, and use the large part of the tool (Special tool) to drive in the oil seal.



1. P/N YM-08010 2. P/N YM-33281 3. Oil seal

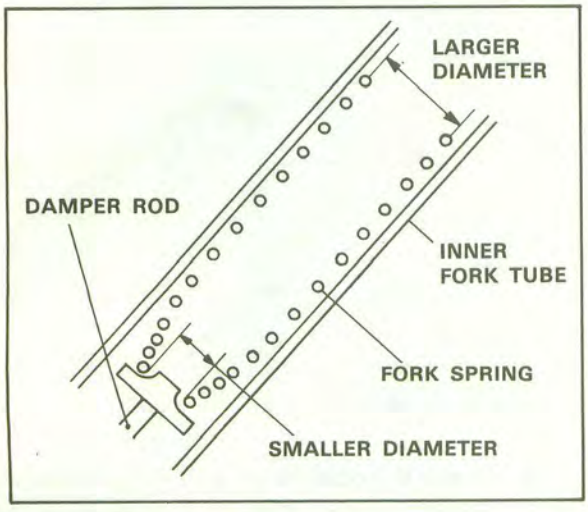
4. Install the washer and oil seal retaining clip.
5. Pour the specified amount of the recommended fork oil into the inner fork tube.

Fork oil capacity:
194 cm^3 (6.84 Imp oz, 6.56 US oz)
Recommended oil:
Yamaha Fork Oil 10wt or equivalent

6. Install the fork spring, spring seat, and stopper ring into the inner tube.

NOTE:

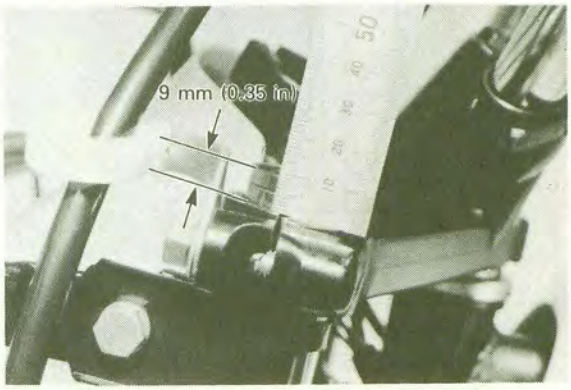
The fork spring must be installed with larger diameter upward as shown.



CAUTION:

- **Always use a new stopper ring (Spring wire circlip).**
- **Be sure the stopper ring is properly seated in the groove in the fork tube.**

7. Install the dust boots and the front carrier onto the forks. Do not tighten the clamp screws and carrier bolts at this point.
8. Install the fork into the brackets. Set the top of the inner fork tube 9 mm (0.35 in) above from the top of the steering crown.

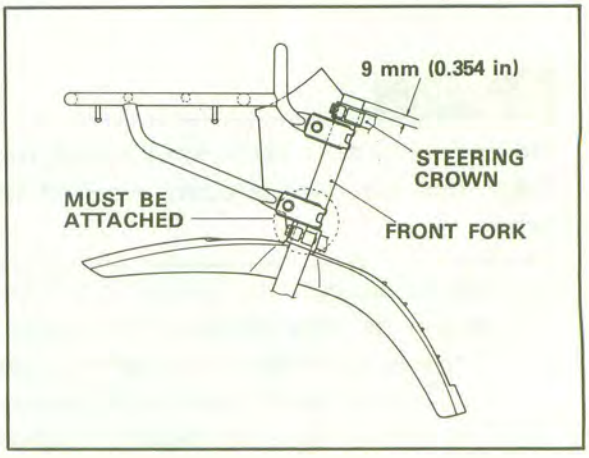


9. Tighten the pinch bolts to specification.

TIGHTENING TORQUE:
Under bracket & Inner fork tube:
30 Nm (3.0 m · kg, 22 ft · lb)
Steering crown & Inner fork tube:
20 Nm (2.0 m · kg, 14 ft · lb)

10. Set the front carrier under bracket end should be attached with the steering under bracket. Torque the front carrier securing bolts to specification.

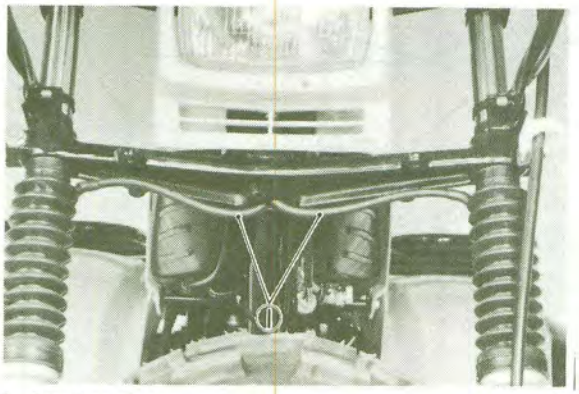
TIGHTENING TORQUE:
15 Nm (1.5 m · kg, 11 ft · lb)



11. Reinstall the front fender and front wheel. Refer to "Installing the Front Wheel" on page 5-2.

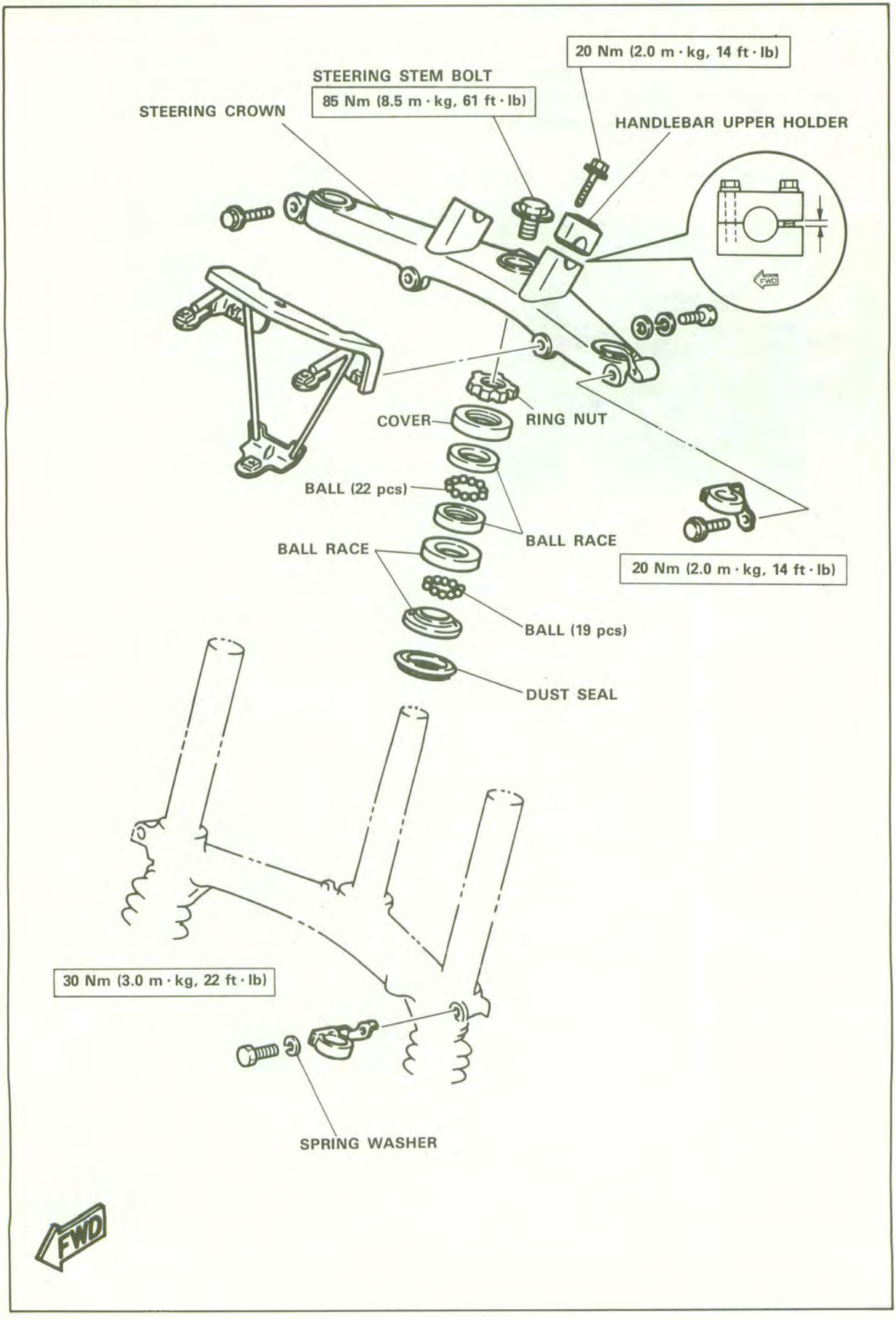
NOTE:

When installing the front fender, make sure the breather pipes are properly connected and routed.



1. Breather pipe

STEERING HEAD

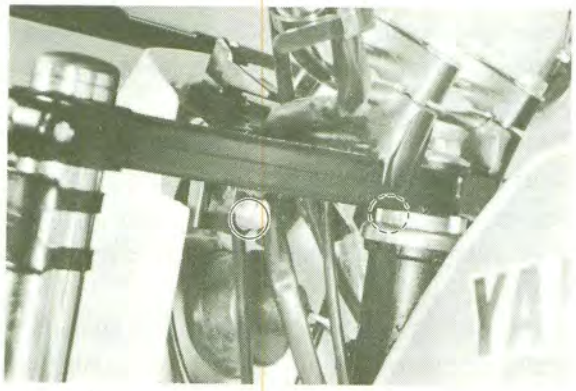


Adjustment

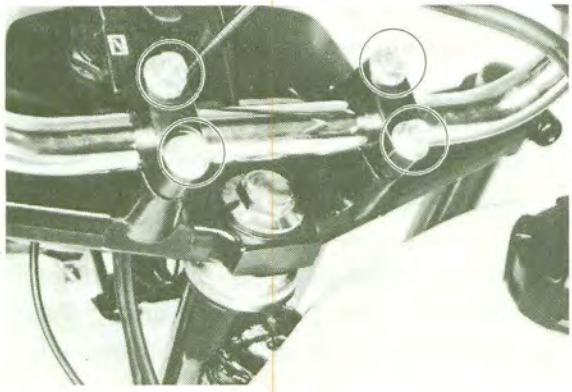
Refer to "Steering Head Adjustment" for steering head adjustment procedures on page 2-13.

Removal

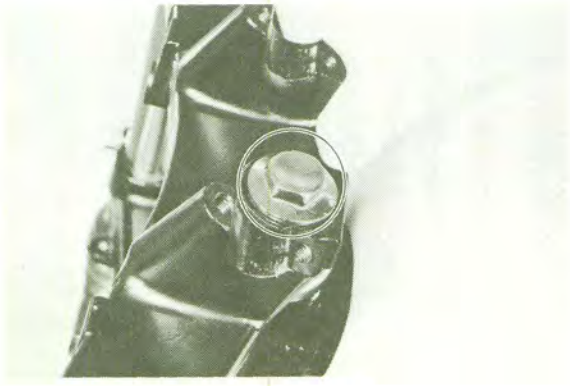
1. Remove the front panel/headlight unit assembly securing bolts. Disconnect the headlight connector.



2. Remove the front wheel, front fender, front carrier and forks.
3. Remove the handlebar holder bolts and handlebar.



4. Remove the steering stem bolt and remove the steering crown.



5. Support the steering stem, and remove the ring nut, ball race cover, ball race, and balls.

Ball quantity:
Upper: 22 pcs (1/4 in)
Lower: 19 pcs (3/16 in)

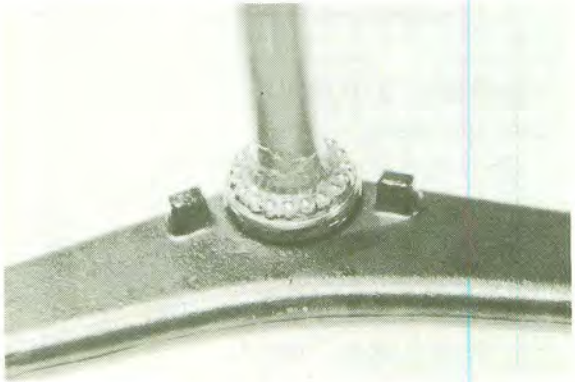
Inspection

Examine all the balls for pits or partial flatness. If any one is found defective, the entire set (including both races) shoud be replaced. If either race is pitted, shows rust spots, or is damaged in any way, replace both races and all balls.

Installation

1. If pressed-in races have been removed, tap in new races.

2. Grease the lower ball race of the bottom assembly and arrange the balls around it. Then apply more grease.



3. Grease the lower ball race of the upper assembly and arrange the balls around it. Then apply more grease and set the top race into place.

NOTE:

Use medium-weight wheel bearing grease of quality manufacture, preferably waterproof.

4. Carefully slip the under bracket stem up into the steering head. Hold the top bearing assembly in place so the stem does not knock any balls out of position.
5. Set the upper bearing cover on and install the ring nut. Tighten the ring nut approximately 38 Nm (3.8 m · kg, 27 ft · lb) and loosen it approximately 1/4 turn.
   Recheck for free play after the entire fork unit has been installed.
6. Install the front forks, front carrier, front fender, and front wheel. Refer to "FRONT FORK" on page 5-9.

WARNING:

Always use a new cotter pin on the axle nut.

TIGHTENING TORQUE:
Steering stem:
85 Nm (8.5 m · kg, 61 ft · lb)
Steering crown & inner tube:
20 Nm (2.0 m · kg, 14 ft · lb)
Under bracket & inner tube:
30 Nm (3.0 m · kg, 22 ft · lb)
Handlebars upper holder:
20 Nm (2.0 m · kg, 14 ft · lb)
Front carrier:
15 Nm (1.5 m · kg, 11 ft · lb)

CABLES AND FITTINGS

Cable Maintenance

NOTE:

See Maintenance and Lubrication Interval Charts for additional information.

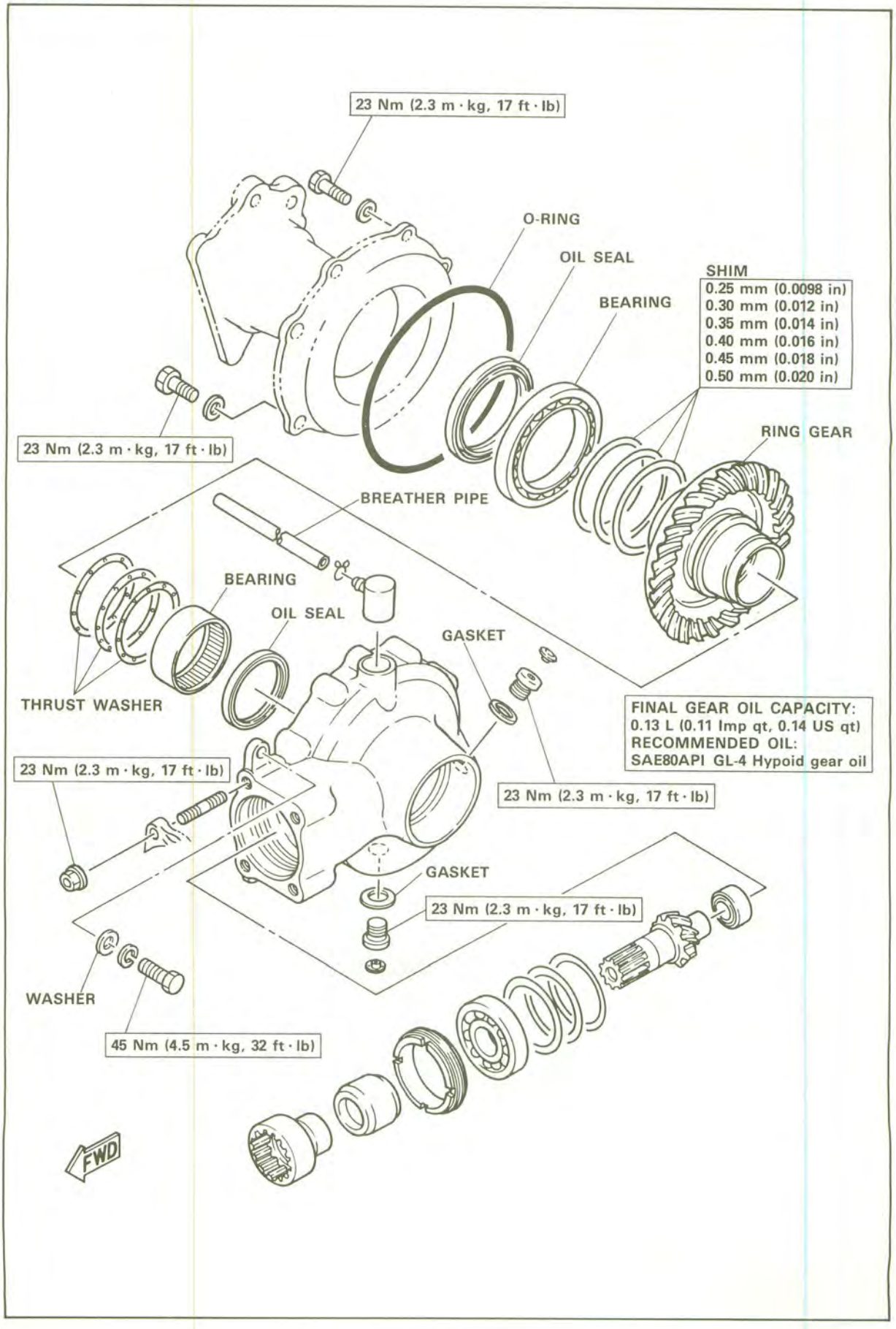
Cable maintenance is primarily concerned with preventing deterioration through rust and weathering; and assuring that the cable moves freely within its housing.
Cable removal is straightforward and uncomplicated. Removal will not be discussed within this section. For details, see the individual maintenance section for which the cable is an integral part.
Cable routing is very important however. For details of cable routing, see the cable routing diagrams at the end of this manual.

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

NOTE:

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

SHAFT DRIVE


23 Nm (2.3 m · kg, 17 ft · lb)
O-RING
OIL SEAL
BEARING
SHIM
0.25 mm (0.0098 in)
0.30 mm (0.012 in)
0.35 mm (0.014 in)
0.40 mm (0.016 in)
0.45 mm (0.018 in)
0.50 mm (0.020 in)
RING GEAR
23 Nm (2.3 m · kg, 17 ft · lb)
BREATHER PIPE
BEARING
OIL SEAL
GASKET
THRUST WASHER
FINAL GEAR OIL CAPACITY:
0.13 L (0.11 Imp qt, 0.14 US qt)
RECOMMENDED OIL:
SAE80API GL-4 Hypoid gear oil
23 Nm (2.3 m · kg, 17 ft · lb)
23 Nm (2.3 m · kg, 17 ft · lb)
GASKET
23 Nm (2.3 m · kg, 17 ft · lb)
WASHER
45 Nm (4.5 m · kg, 32 ft · lb)
FWD

Troubleshooting

The following conditions may indicate damaged shaft drive components:

Symptoms	Possible damaged areas
1. A pronounced hesitation or "jerky" movement during acceleration, deceleration, or sustained speed. (This must not be confused with engine surging or transmission characteristics.) 2. A "rolling rumble" noticeable at low speed; a high-pitched whine; a "clunk" from a shaft drive component or area.	A. Damage to bearings. B. Improper gear lash. C. Gear tooth damage.
3. A locked-up condition of the shaft drive mechanism; no power transmitted from engine to rear wheel.	D. Broken coupling gear. E. Broken gear teeth. F. Seizure due to lack of lubrication. G. Small foreign object lodged between moving parts.

NOTE:

Damage areas A, B, and C above may be extremely difficult to diagnose. The symptoms are quite subtle and difficult to distinguish from normal motorcycle operating noise. If there is reason to believe these components are damaged, remove the components for specific inspection.

Inspection notes:

1. During coasting, accelerating, or decelerating, the "rolling rumble" will increase with rear wheel speed, not engine or transmission gear speeds. However, such noise may also be due to damaged wheel bearings.
2. Noise that varies with acceleration and deceleration: following incorrect reassembly, a condition of too-little gear lash may produce a whine during deceleration.
3. A slight "thunk" must be distinguished from normal motorcycle operation. It will be most noticeable at low speed and could indicate broken gear teeth.

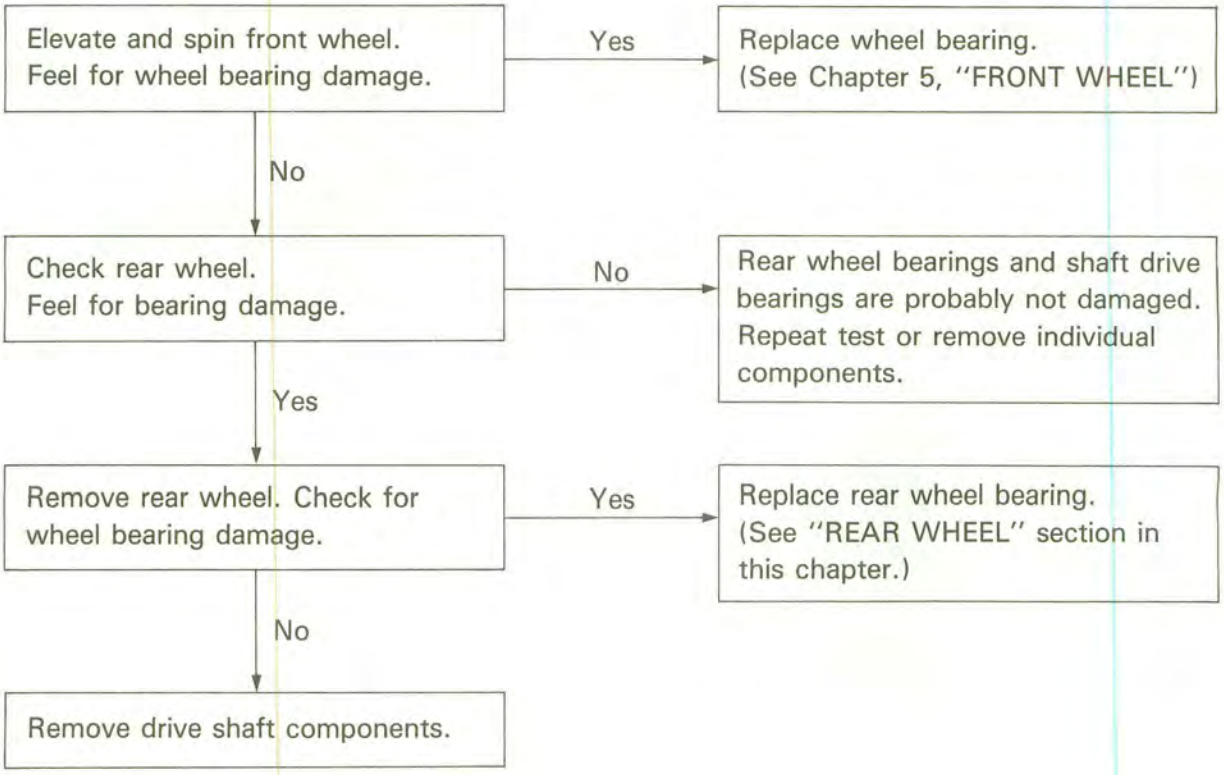
CAUTION:

Too-little gear lash is extremely destructive to the gear teeth. If a test ride following reassembly indicates this condition, stop riding immediately to minimize damage to the gears.

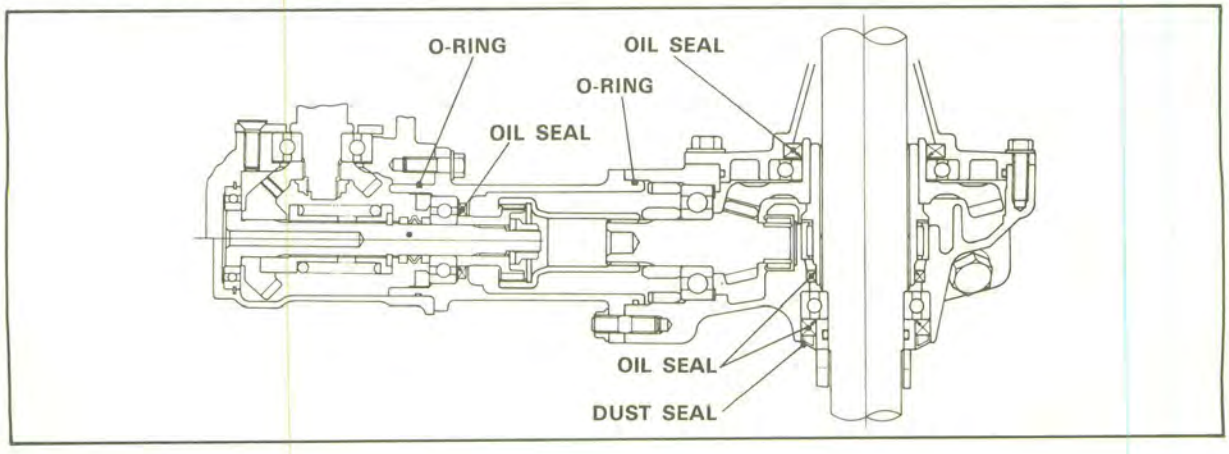
WARNING:

If broken gear teeth are suspected, stop riding immediately. This condition could lead to locking-up of the shaft drive assembly and result in harm to a rider.

4. Troubleshooting chart
   Where basic conditions "1" and "2" above exist, consider the following chart:



5. Oil leak inspection
   If a shaft drive component is suspected of leaking oil, first thoroughly clean the entire motorcycle. The apparent location of an oil leak on a dusty motorcycle may be misleading. Dry the motorcycle and apply a leak-localizing compound or a dry-powder spray that will limit the flow of any leaking oil. Operate the motorcycle prepared in this way for the distance necessary to locate precisely the leak. There is the possibility that a component housing may have been damaged by road debris or an accident, or a gasket or a seal may be cracked or broken. However, on a new or nearly new motorcycle, an apparent oil leak may be the result of a rust-preventive coating or excessive assembly lubrication of the seals. Always clean the motorcycle and recheck the suspected location of any apparent leakage.



6. Checking drained oil
   Whenever a problem is suspected in either the middle or final gear assemblies, drain and inspect the oil. Metal particles on the drain plug or in the oil could indicate a bearing seizure or other problem. However, a small amount of metal particles in the oil is normal.

Final Gear Removal

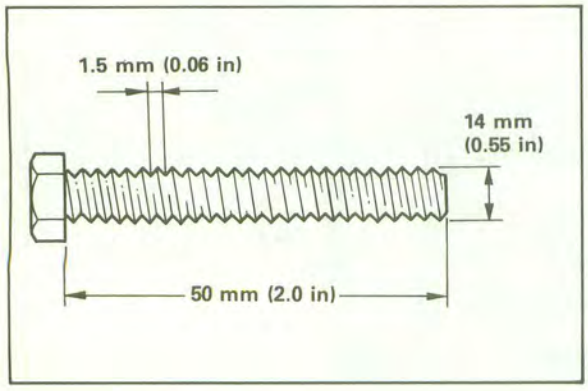
1. Remove the rear wheels, rear axle and final gear assembly. (see "Replacing the Wheel Bearings" section in this Chapter).

Gear Lash Check and Adjustment

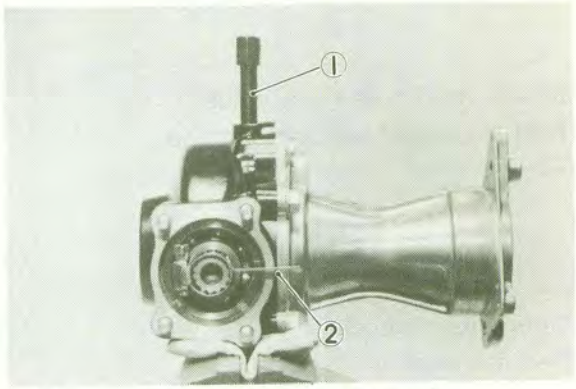
1. Secure the gear case in a vise or other support.
2. Remove the drain plug from the final gear case and drain the oil.
3. Install a specified size of bolt (as shown) into the drain plug hole. Finger tighten the bolt until it holds the ring gear.

NOTE:

The bolt should not be over tightened, finger-tight is sufficient.



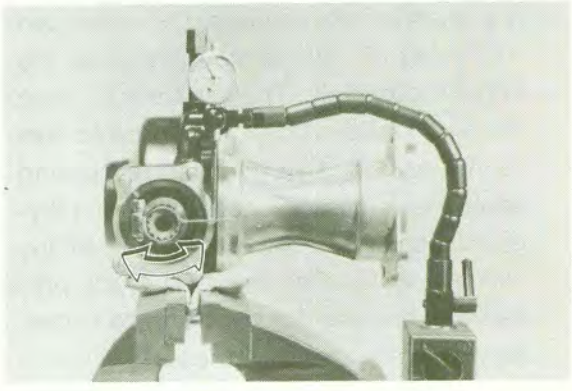
4. Install the final gear lash measurement tool on the drive shaft.



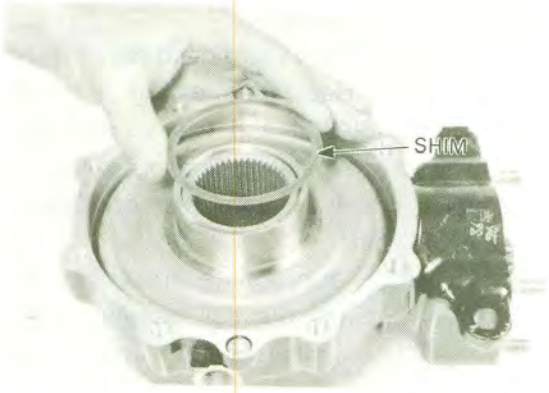
1. Bolt 2. Gear lash measurement tool

5. Mount a dial gauge against the lash measurement tool at the scribed mark from the center of the shaft.
6. Gently rotate the gear coupling back and forth. Note the lash measurement on the dial gauge.

Final gear lash:
0.1 ~0.2 mm (0.004~0.008 in):



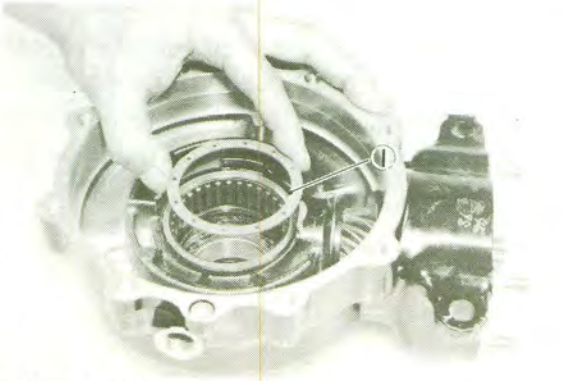
7. If the gear lash exceeds the specified limits, adjust as follows:
- To reduce gear lash, increase the ring gear shim.
- To increase gear lash, reduce the ring gear shim.



- If it is necessary to increase the ring gear shim by more than 0.1 mm (0.004 in), reduce the thrust washer thickness by 0.1 mm (0.004 in) for each 0.1 mm (0.004 in) of ring-gear-shim increase. If it is necessary to reduce the shim by more than 0.1 mm (0.004 in), reverse the above procedure.

Final Gear Disassembly

1. Remove the bolts holding the bearing housing.
2. Remove the ring gear assembly and thrust washer from the final gear case.

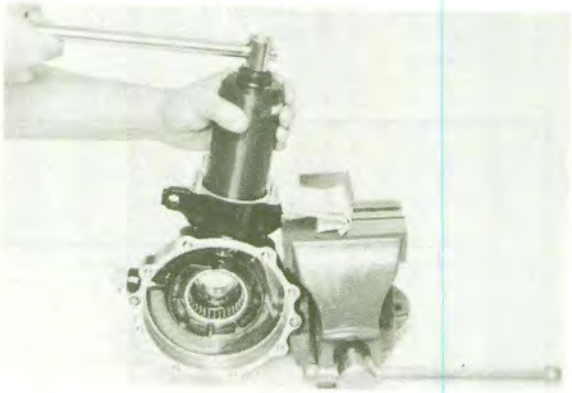


1. Thrust washer

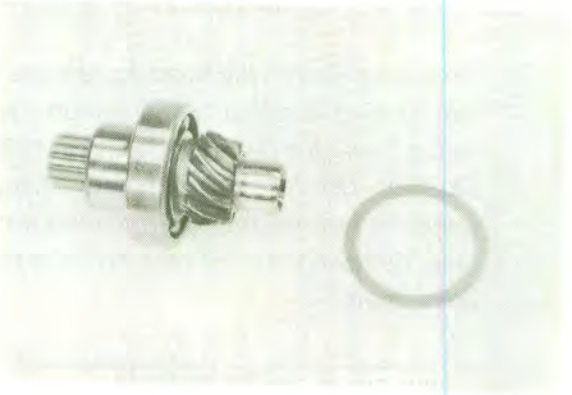
3. Remove the final-drive-shaft-bearing retainer with the final-drive-shaft-bearing-retainer wrench.

CAUTION:

The final-drive-shaft-bearing-retainer nut has left-hand threads. Turn the retainer nut clockwise to loosen it.



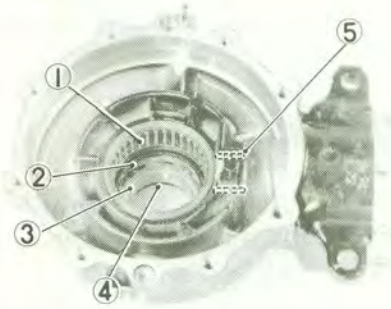
4. Remove final drive shaft assembly from the final gear case.



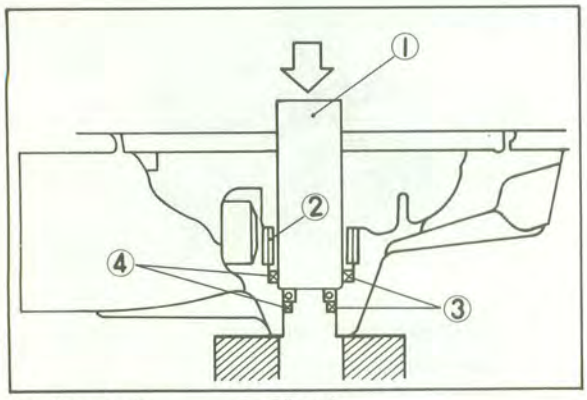
CAUTION:

Final drive shaft removal should be performed only if the gearing or damper cam replacement is necessary. Do not reuse the bearings or races after removal.

5. Remove the ball bearing, oil seals, and roller bearing from the main housing by using an appropriate press tool and a press. Use the appropriate supports for the main housing during this operation. The roller bearing may be reused if undamaged. Do not reuse the oil seal.

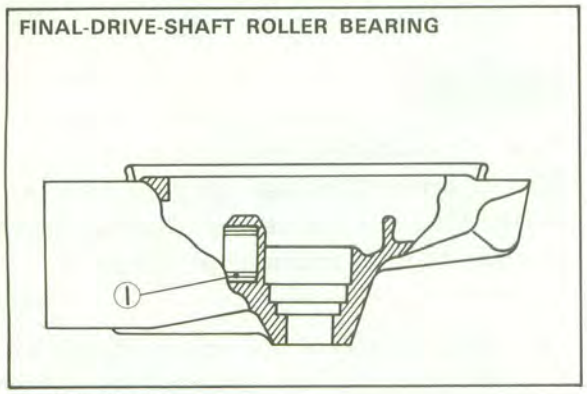


1. Roller bearing
2. Oil seal
3. Ball bearing
4. Oil seal
5. Roller bearing



1. Press tool
2. Roller bearing
3. Oil seal
4. Ball bearing

6. Final-drive-shaft roller bearing; removal of this bearing is difficult and seldom necessary. Heat the bearing housing to 150°C (302°F). Use an appropriately shaped punch to remove the roller bearing outer race. Remove the inner race from the final drive shaft.



1. Roller bearing

Final Gear Assembly

1. Install the new rear final drive shaft roller bearing. Heat the bearing housing to 150°C (302°F) and use an appropriate adapter to install the roller bearing outer race. Install the inner race onto the final drive shaft.
2. Using an appropriate press tool and a press, install the ball bearing, new oil seals, and roller bearing into the main housing.

NOTE:

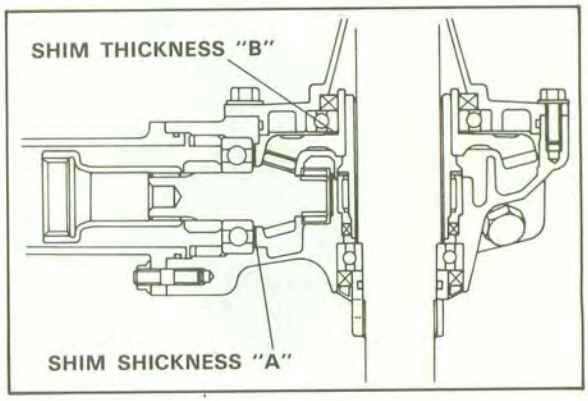
The removed roller bearing can be used if undamaged; however, we recommend replacement with a new one.

3. Final drive/ring gear positioning.

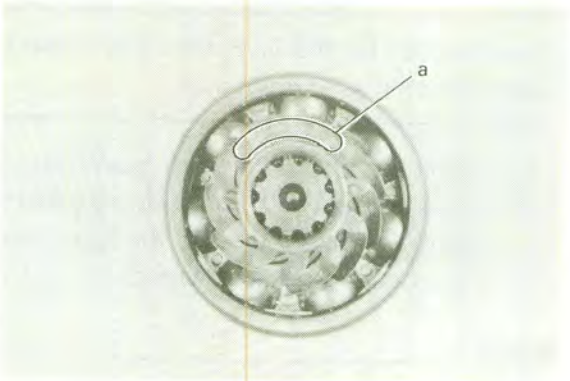
NOTE:

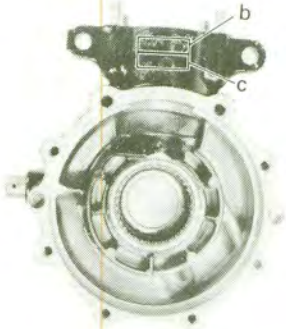
When any of the following parts are replaced, gear positioning is necessary:

- Final gear case
- Ring gear bearing housing
- Bearing(s)



a. The shim thickness, A, necessary for the final-drive-shaft gear positioning, can be calculated from the information found on the final gear case and on the drive gear end.





To find shim thickness, A, use the following formula:
A = a – b

Where:

a = a numeral (in 1/100 unit) on the gear is either added to or subtracted from 79.

b = a numeral (in 1/100 unit) on the gear case is either added to or subtracted from 79.

Example:
If the final-drive-shaft gear is marked "+01" or "0.01" "a" is 79.01.
If the gear case is marked "–50" "b" is 78.50.

A = 79.01 – 78.50
A = 0.51 (0.020 in)

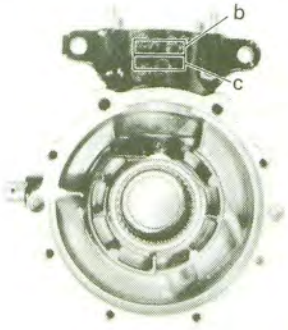
Then the necessary shim thickness is 0.51 mm (0.020 in).
Shim sizes are supplied in the following thicknesses:
0.15 mm (0.006 in), 0.30 mm, (0.012 in), 0.40 mm, (0.016 in), 0.50 mm (0.020 in), 0.60 mm (0.024 in)

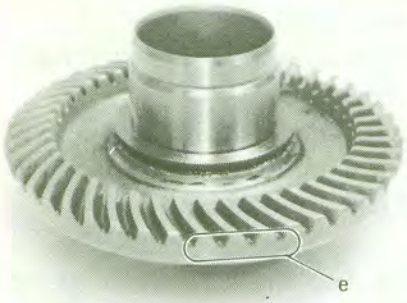
Because the shims can only be selected in 0.05 mm (0.002 in) increments, round off the hundredths digit and select the appropriate shim(s).

Hundredths	Round value
0, 1, 2	0
3, 4, 5, 6, 7	5
8, 9	10

In the example above, the calculated shim thickness is 0.51 mm (0.0201 in). The chart instructs you, however, to round off the 1 to 0. Thus you should use a 0.50 mm (0.0197 in) shim.

b. The shim thickness, B, necessary for the ring gear positioning, can be calculated from the information found on the final gear case, ring gear, and bearing.





To find shim thickness, B, use the following formula:

$B = c + d - (e + f)$

Where:

c = the numeral (usually a decimal number) on the gear case is either added to or subtracted from 42.

d = a numeral (usually a decimal number) on the bearing housing (rear wheel hub) and added to 2.

e = a numeral (usually a decimal number) on the outside of the ring gear either added to or subtracted from 33.00.

f = a bearing thickness (considered constant).

Bearing thickness
f = 11.00 mm (0.433 in)

Example:

- If the gear case is marked "03" . . . . . c is 42.03.
- If the ring gear bearing housing is marked 45 . . . . . d is 0.45 + 2 = 2.45.
- If the ring gear is marked "−5" or −0.05 . . . e is 33.00 − 0.05 = 32.95.
- f is 11.00.

$B = c + d - (e + f)$

$B = 42.03 + 2.45 - (32.95 + 11.00)$

$B = 44.48 - (43.95)$

$B = 0.53$

Then the necessary shim thickness is 0.53 mm (0.021 in).

NOTE:

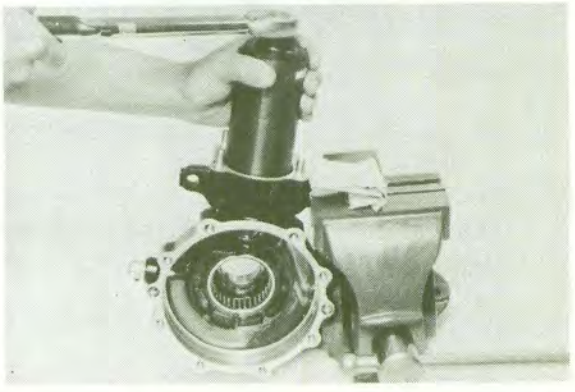
Use the chart for the final drive shaft shim to select the ring gear shim size.

4. Install the final drive shaft gear with the proper size shim(s), and secure it with the bearing retainer nut. Use the final-drive-shaft-bearing-retainer wrench.

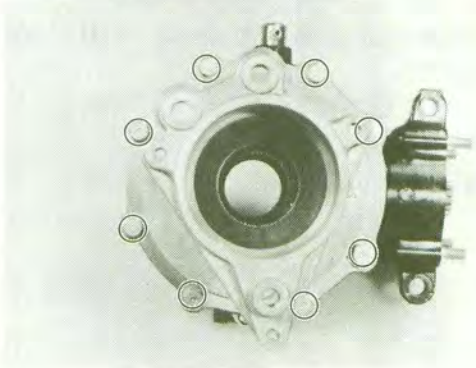
NOTE:

The bearing retainer nut has left-hand threads; turn the nut counterclockwise to tighten it.

TIGHTENING TORQUE:
100 Nm (10 m · kg, 72 ft · lb)



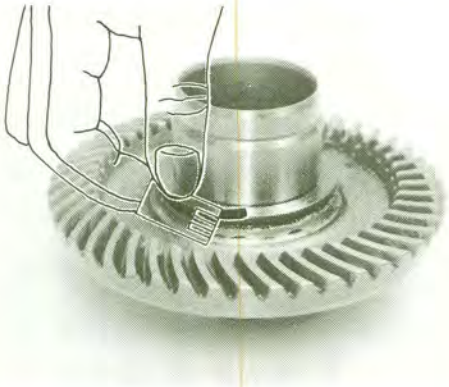
5. Install the ring gear assembly without the thrust washer. Adjust the gear lash (refer to "Gear Lash Check and Adjustment"). MENT").
6. Place four pieces of Plastigage® between the originally fitted thrust washer and the ring gear.
7. Install the ring gear into the gear case assembly, and tighten the nuts with the specified torque.



TIGHTENING TORQUE:
23 Nm (2.3 m · kg, 17 ft · lb)

NOTE:
Do not turn the drive pinion/ring gear when measuring clearance with Plastigage® .

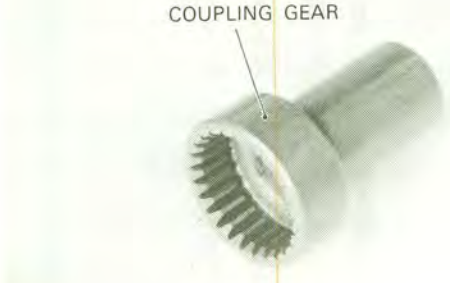
8. Remove the ring gear assembly and determine the clearance by measuring the width of the flattened Plastigage® .



Ring gear thrust clearance:
0.1 ~ 0.2 mm (0.004 ~ 0.008 in)

9. If the clearance exceeds the specified value, replace the thrust washer to obtain the proper clearance.

DRIVE SHAFT (COUPLING GEAR)



Removal

1. Remove the rear wheel. See "REAR WHEEL" in this chapter.
2. Remove the final gear case assembly. See "Replacing Wheel Bearings" in this chapter.

Inspection

1. Drive shaft (Coupling gear)
   Inspect the shaft splines for wear and/or damage. If wear is excessive, replace the drive shaft.

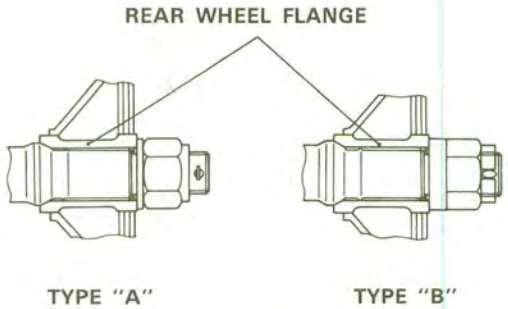
NOTE:
When installing the drive shaft, lubricate the splines with molybdenum disulfide grease.

Installation

When installing the drive shaft, reverse the removal procedure. Note the following points:

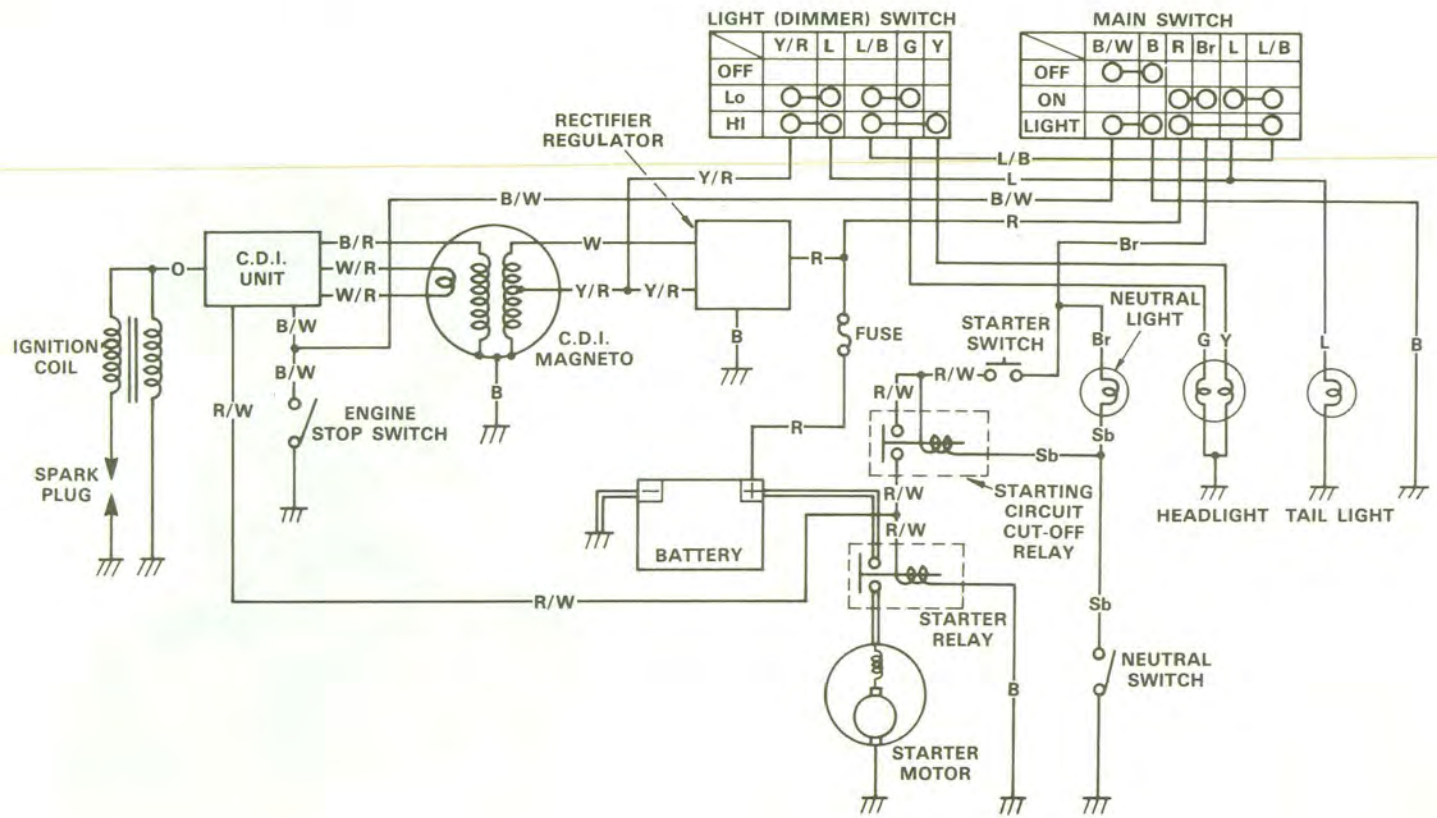
- Lubricate the shaft splines with molybdenum disulfide grease.
- Torque the final gear case nuts and bolts to specification.

TIGHTENING TORQUE
Rear wheel:
28 Nm (2.8 m · kg, 20 ft · lb)
Rear axle nut:
Type A:
210 Nm (21 m · kg, 150 ft · lb)
Type B:
145 Nm (14.5 m · kg, 105 ft · lb)



CHAPTER 6
ELECTRICAL

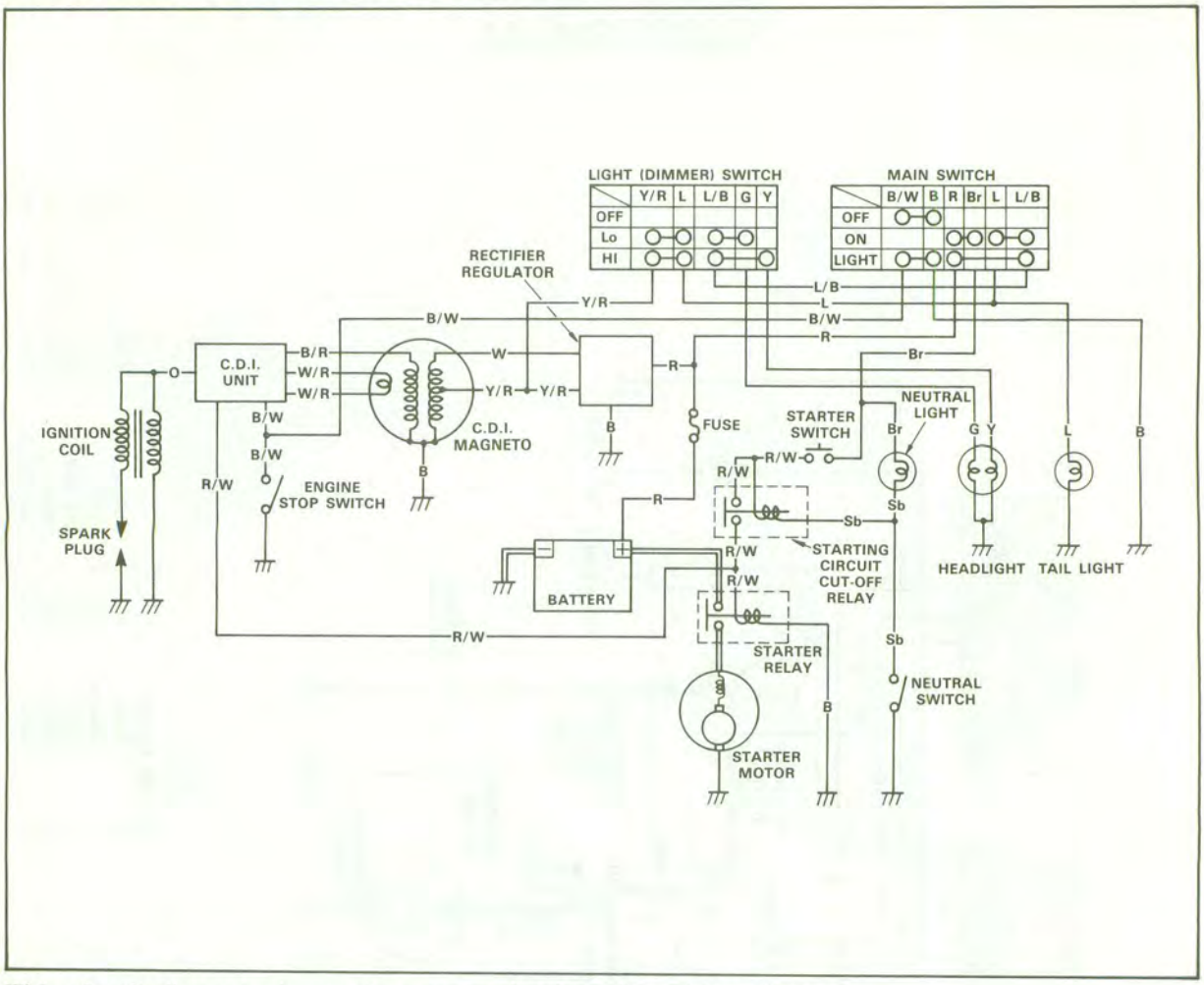
YTM200EK CIRCUIT DIAGRAM



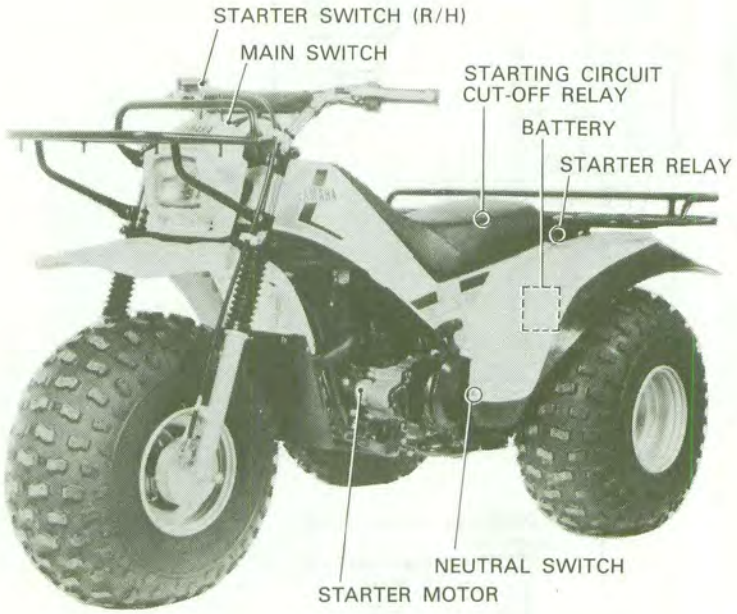
COLOR CODE

B .....Black	Y .....Yellow	Y/R .....Yellow/Red
O .....Orange	W.....White	R/W ....Red/White
L .....Blue	Sb .....Sky blue	W/R ....White/Red
R .....Red	Br.....Brown	B/R .....Black/Red
G .....Green	L/B .....Blue/Black	B/W ....Black/White

ELECTRIC STARTING SYSTEM



This circuit diagram shows the starter circuit in the wiring diagram.



STARTING CIRCUIT OPERATION

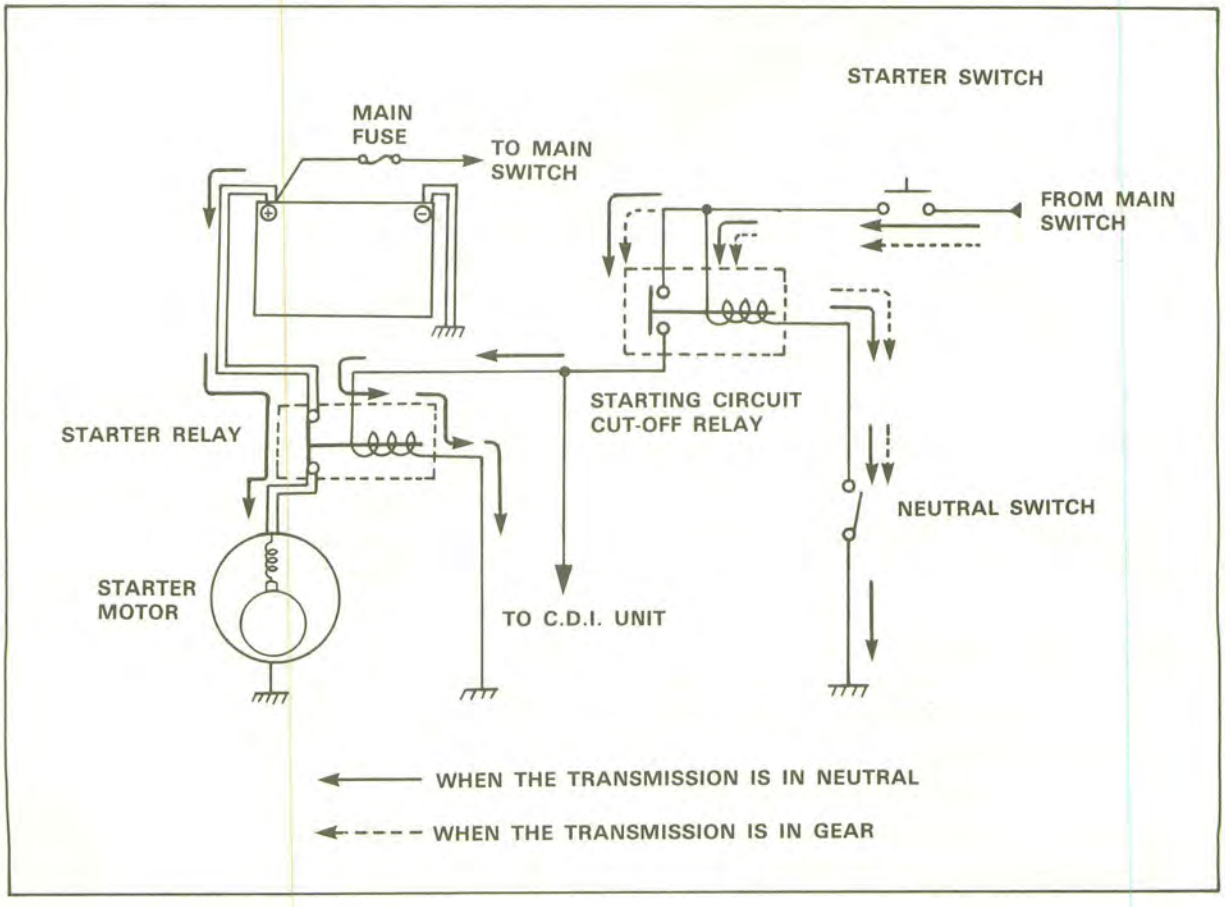
The starting circuit on this model consist of the starter motor, starter relay, neutral switch, and the starting circuit cut-off relay. If the main switch is on, the starter motor can be operate only if:

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

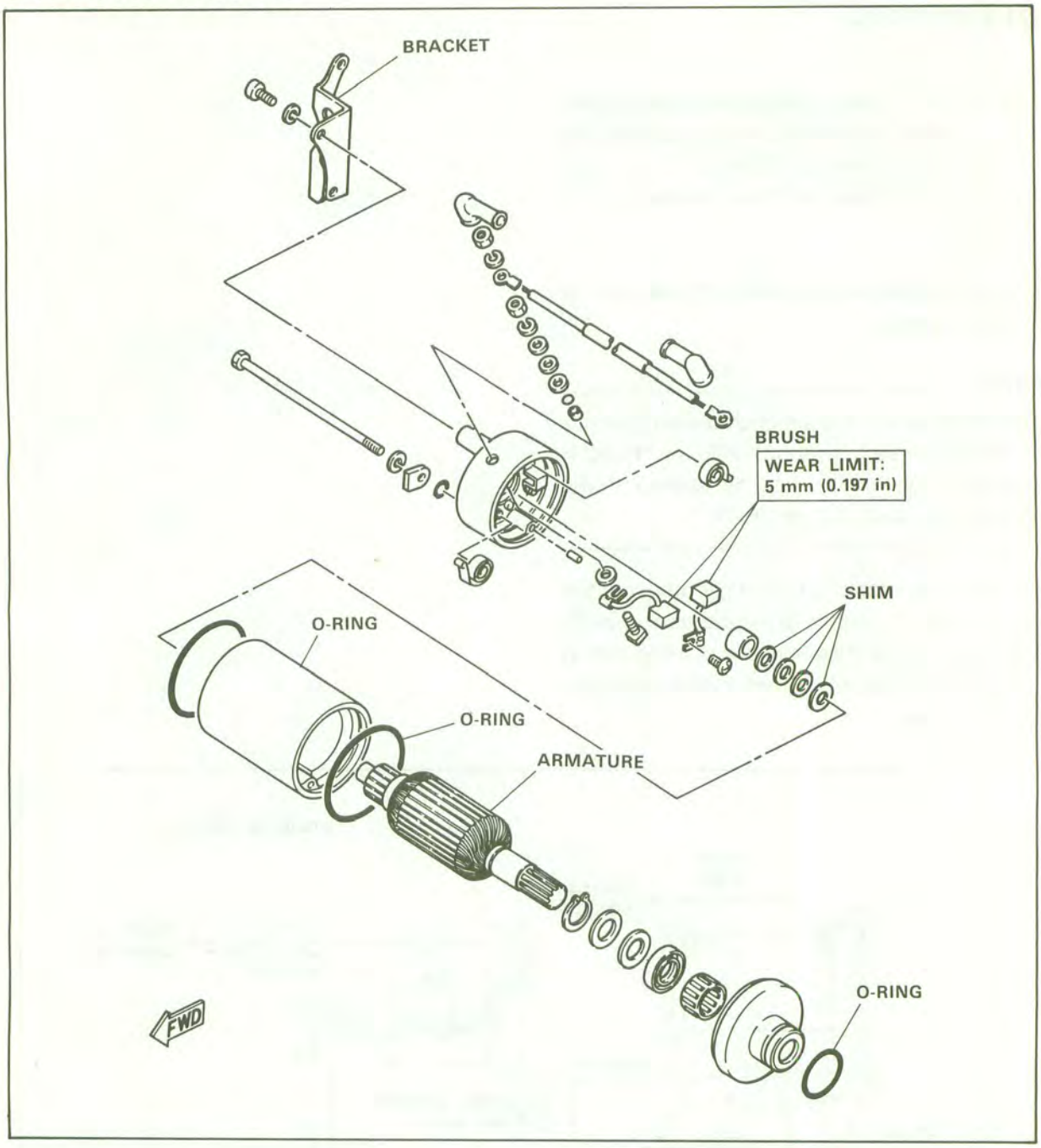
NOTE:

The starter motor can be operated irrespective of the engine stop switch ("OFF" or "RUN"); however, the engine can be started if the engine stop switch is at "RUN".

The starting circuit cut-off relay prevents the starter from operating when the transmission is in gear. In this instance, the starting circuit cut-off relay is off so current cannot reach the starter motor.



STARTER MOTOR



Removal

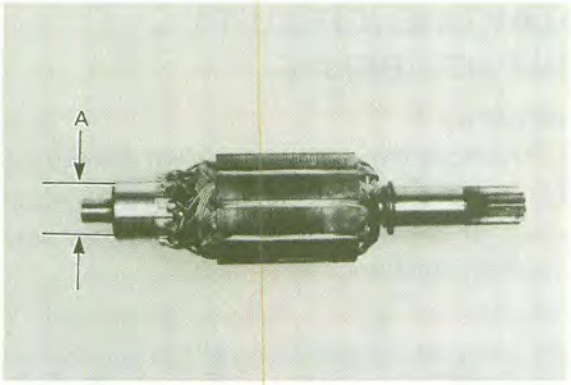
1. See Chapter 3. "ENGINE DISASSEMBLY."

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:

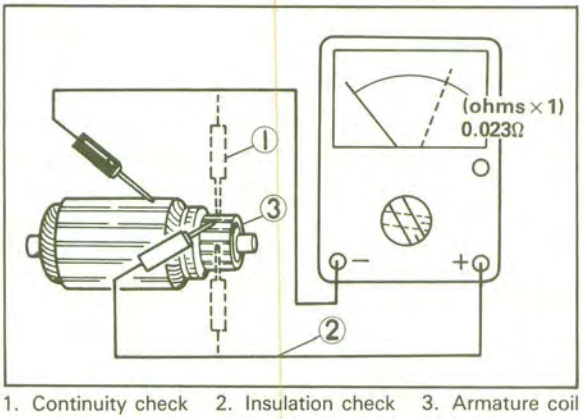
The mica insulation of the commutator must be under-cut to ensure proper operation of commutator.



Comutator dia limit "A":
22 mm (0.866 in)

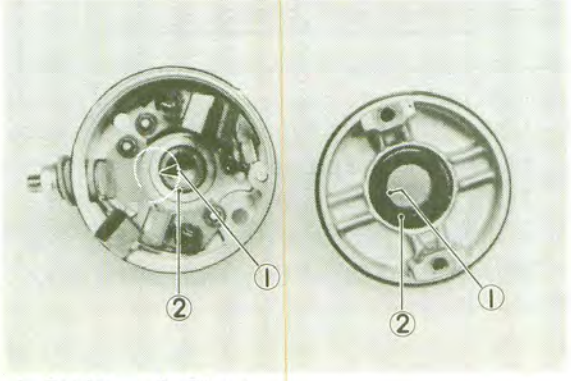
3. The armature coil should be checked for insulation breakdown (shorting to each other or to ground) and for continuity. Use a pocket tester.

Coil resistance:
Armature coil: 0.023Ω at 20°C (68°F)



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

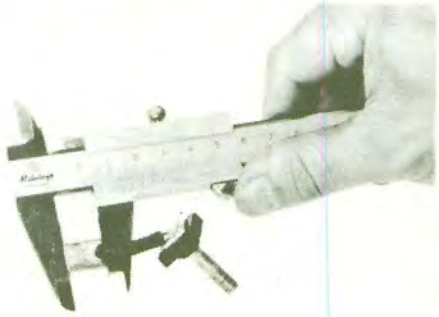
4. Check the bearing and bushing for damage. If either is damaged, the starter motor must be replaced.



1. Bearing 2. Oil seal

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

Minimum brush length:
5.0 mm (0.197 in)



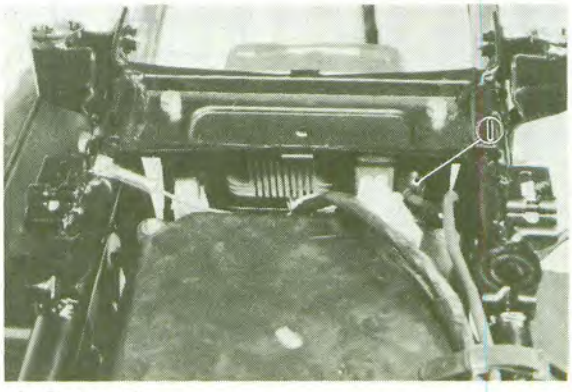
6. Check the brush spring pressure. Compare it with a new spring. Replace the old spring if it is weak.

Brush spring pressure:
400 ~ 660 g (14.120 ~ 23.298 oz)

STARTER RELAY

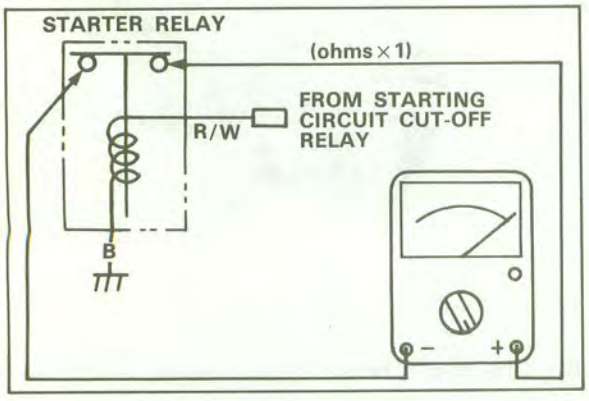
Inspection

1. Remove the seat/rear cowling assembly.
2. Disconnect the relay from the rubber clamp and disconnect the starter cables at the relay.



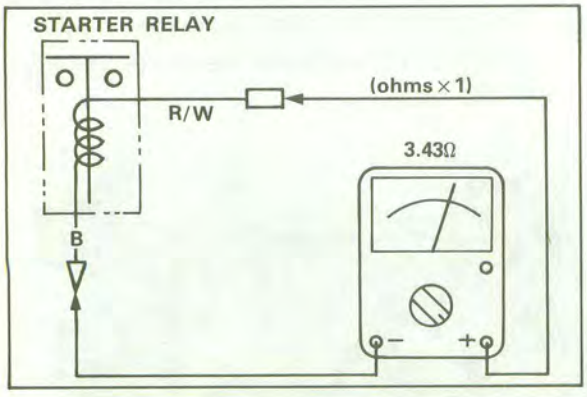
1. Starter relay

3. Connect the pocket tester leads to the relay terminals (ohms × 1 scale).
4. Turn the ignition to the "ON" position, the engine stop switch to "RUN".
5. 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.



6. If the relay does not click, check the leads from the starter switch and from the starting circuit cut-off relay (red/white). Turn the ignition off. Use the scale (ohms × 1) on the tester. The resistance between these wires should be no more than 3.4 ohms. If there is more resistance, the relay should be replaced.

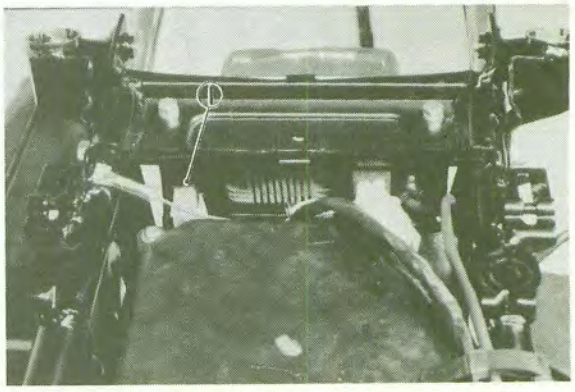
Starter relay resistance:
3.43Ω at 5°C (68°F)
(Red/White — Black)



STARTING CIRCUIT CUT-OFF RELAY

Inspection

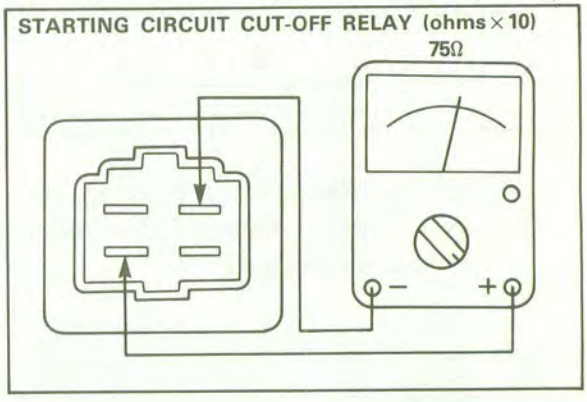
1. Remove the seat/rear cowling assembly.
2. Remove the starting circuit cut-off relay from the rubber clamp, and disconnect the connector.



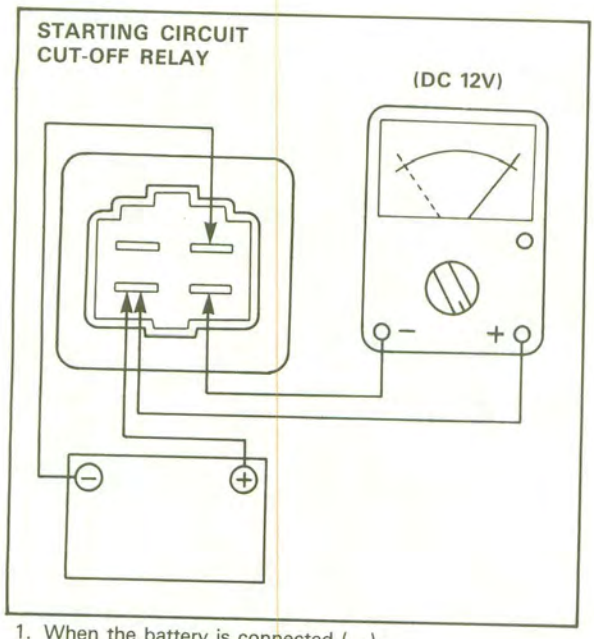
1. Starting circuit cut-off relay

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

Starting circuit cut-off relay resistance:
75Ω ± 10% at 20°C (68°F)

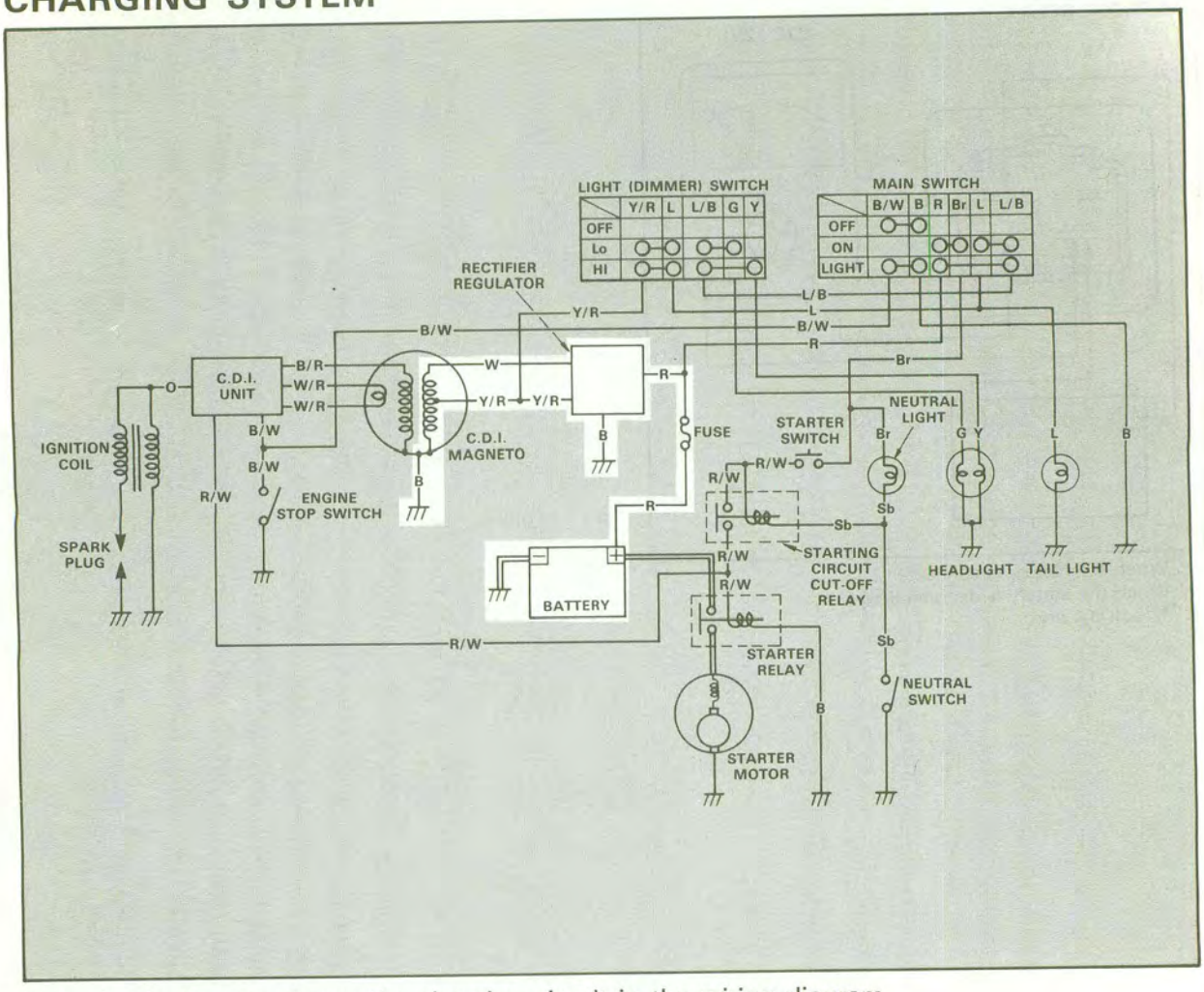


4. Check the relay function with a 12 volt battery and the pocket tester. Connect the leads as shown in the illustration. If the resistance readings do not equal those shown in the illustration, replace the relay.

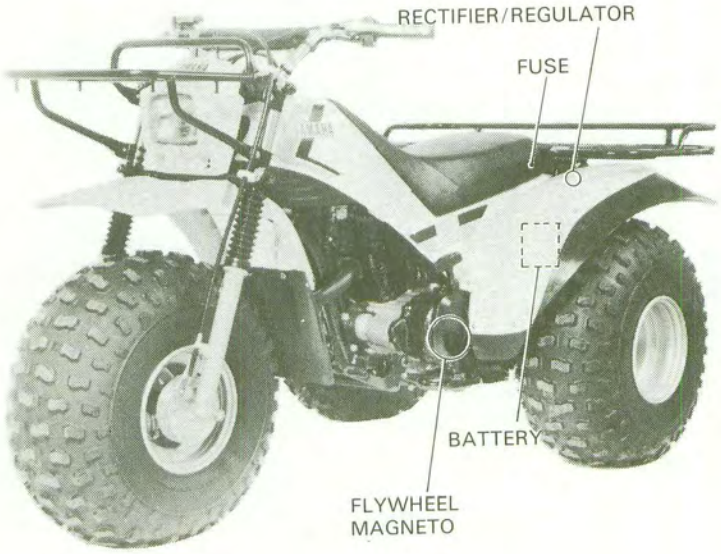


1. When the battery is connected (—)
2. When the battery is disconnedted (....)
3. 12 volt battery

CHARGING SYSTEM



This circuit diagram shows the charging circuit in the wiring diagram.

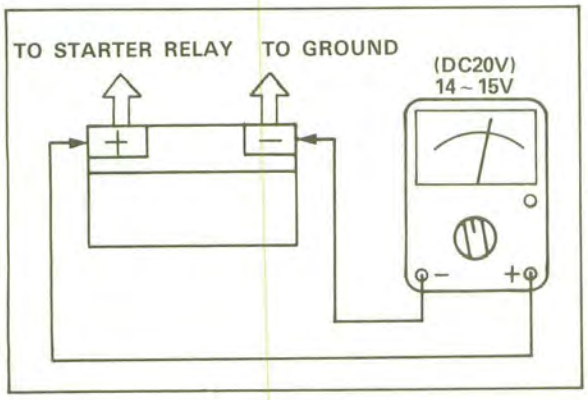


FLYWHEEL MAGNETO AND RECTIFIER

Inspection

1. Remove the seat/rear cowing assembly, and connect the pocket tester leads to the battery terminals.
2. Start the engine.
3. Accelerate the engine to approximately 5,000 r/min or more, and check the generator voltage.

Generator voltage:
14 ~ 15V at 5.000 r/min



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

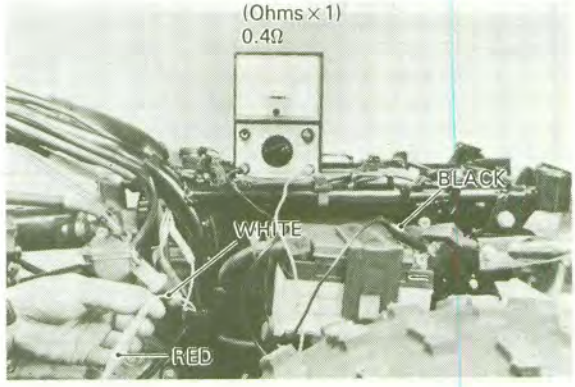
CAUTION:

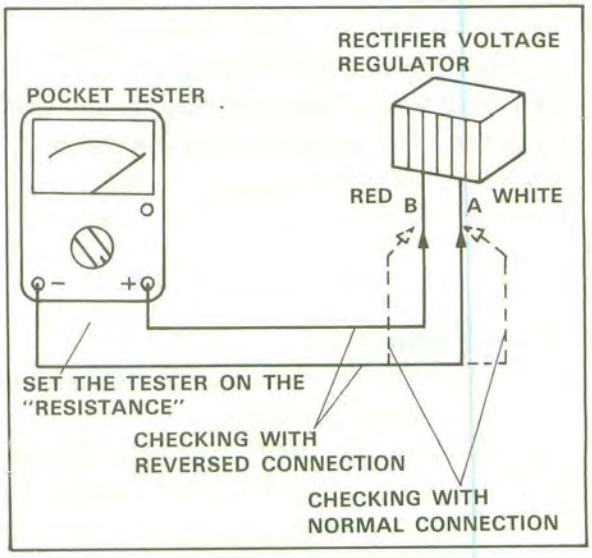
Never disconnect the wires from the battery while the generator is operating. If the battery is disconnected, the voltage across the generator terminals will increase and damage the semi-conductors.

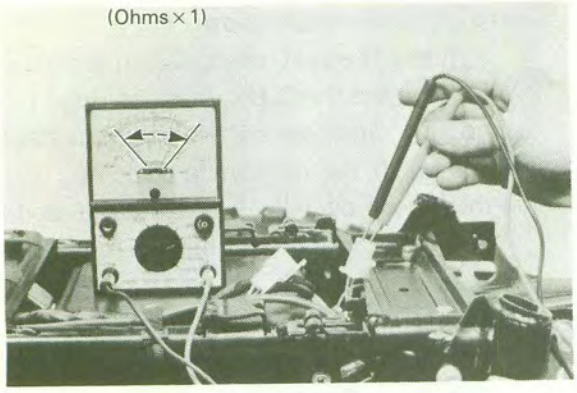
Charging Coil Inspection

1. Remove the seat/rear cowling assembly.
2. Disconnect the C.D.I. magneto lead connecteor, and connect the pocket tester as shown. If the resistance does not equal the specified value, the charge coil is defective and should be replaced.

Charging coil resistance:
0.4Ω ± 10% of 20°C (68°F)
(White — Black)







Result

Checking element	Pocket test connecting point		Good	Replace (element shorted)	Replace (element opened)
	(+) (red)	(−) (black)			
1	A	B	○	○	×
2	B	A	×	○	×

○ : Continuity
× : Discontinuity (∞)

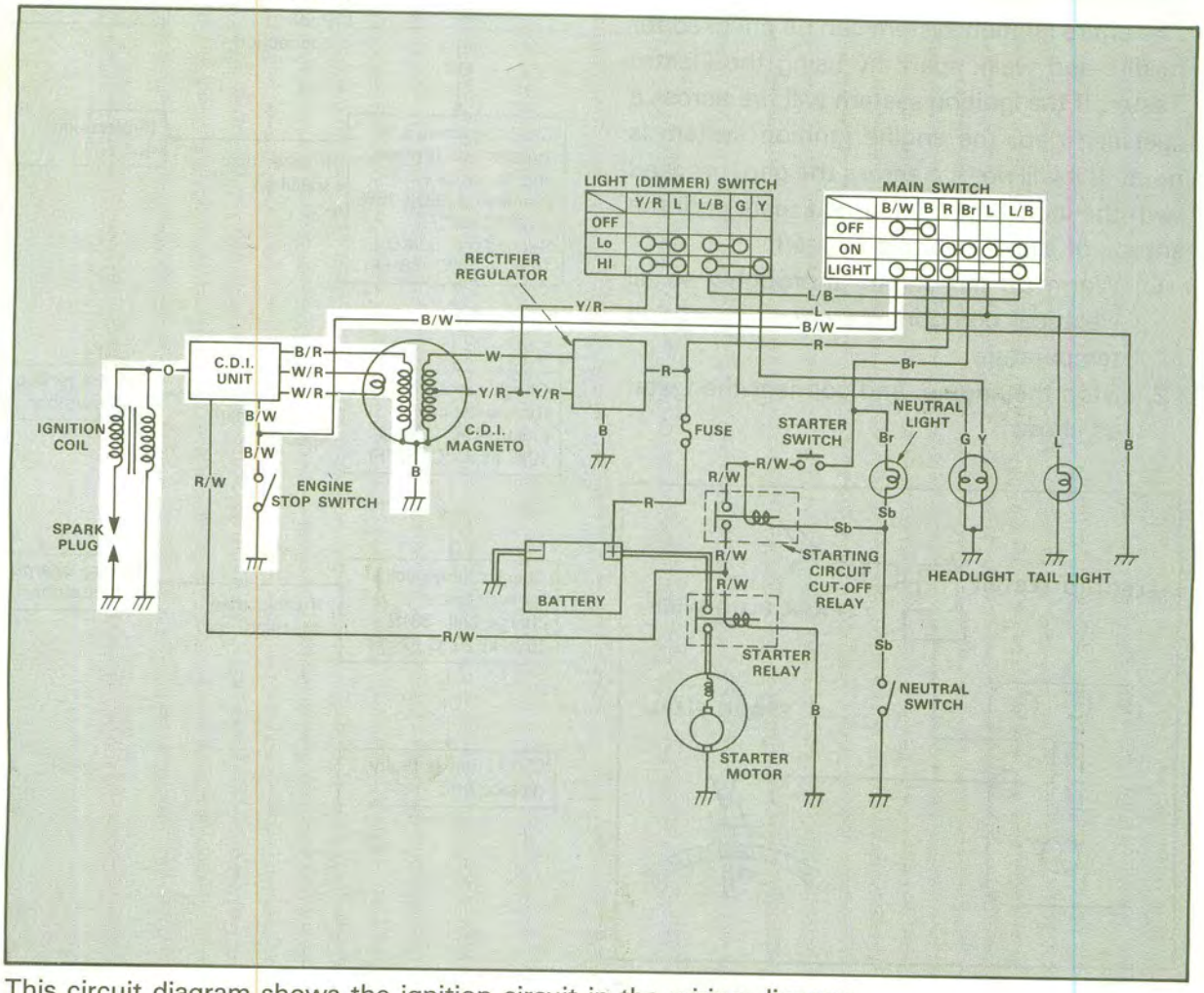
CAUTION:

The silicon rectifier can be damaged if subject 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.

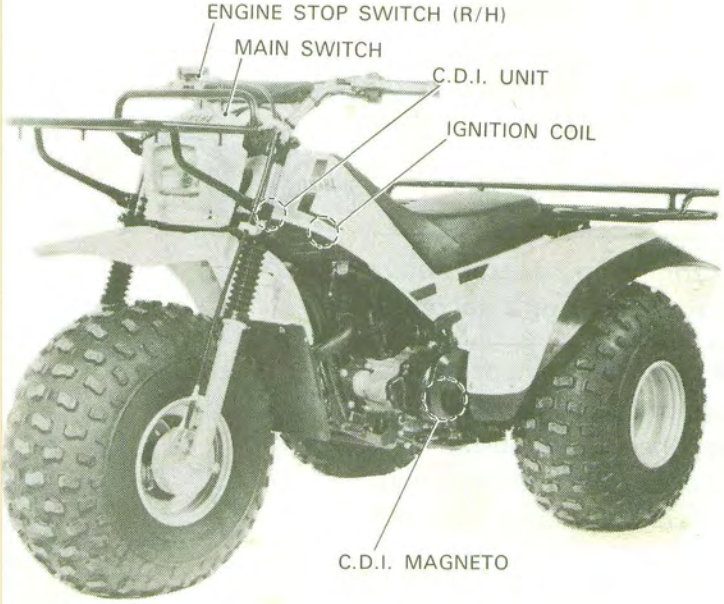
Battery Inspection

1. Check the battery terminals and couplers. They should be tight.
2. Measure the specific gravity of the battery. If it is less than 1.280, remove and charge the battery, until the specific gravity is greater than 1.280.

IGNITION SYSTEM



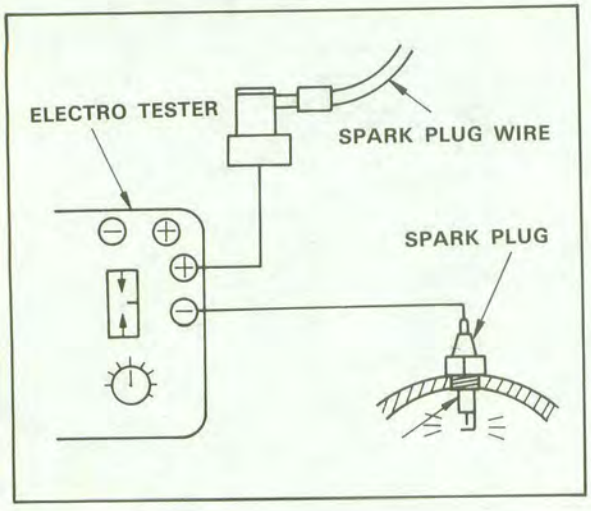
This circuit diagram shows the ignition circuit in the wiring diagram.



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 engine 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.



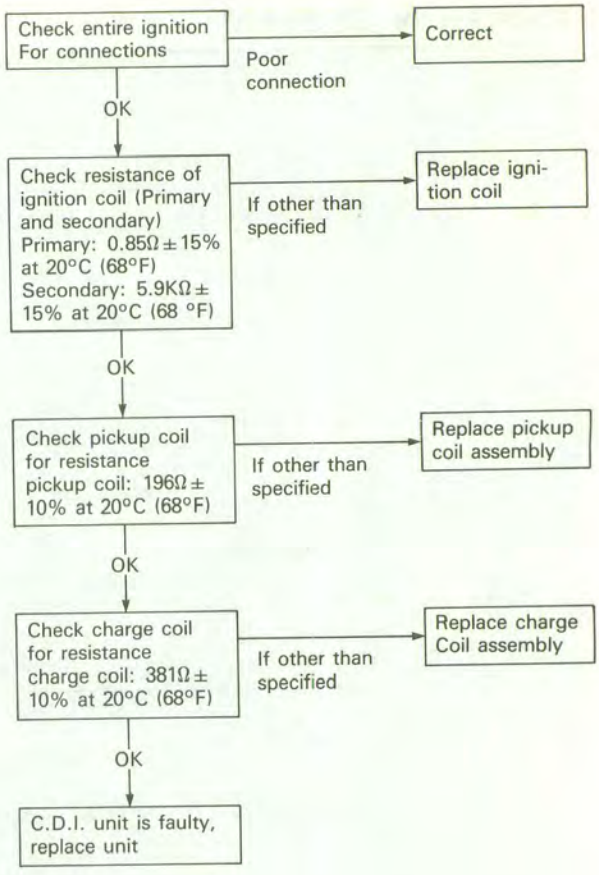
3. Start the engine, and increase the spark gap until misfire occurs. (Test at various rpm between idle and red line.)

Minimum spark gap: 6 mm (0.24 in)

CAUTION:

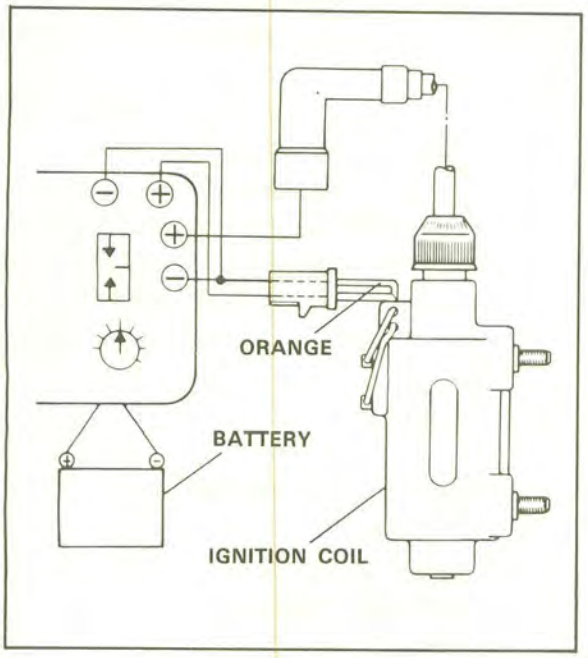
Do not run the engine in neutral above 6,000 rpm for more than 1 or 2 seconds.

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 engine-mounting-bracket cover from the front cylinder, and disconnect the ignition coil wires from the wiring harness and from the spark plugs.
2. Connect the Electro Tester as shown.

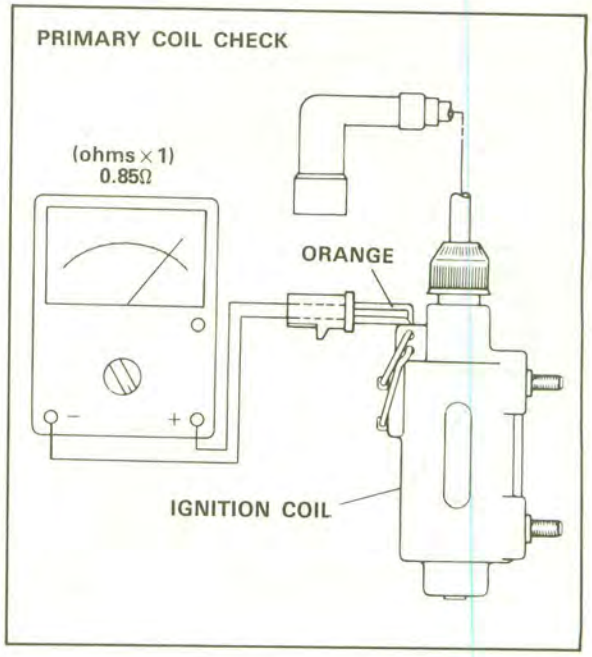


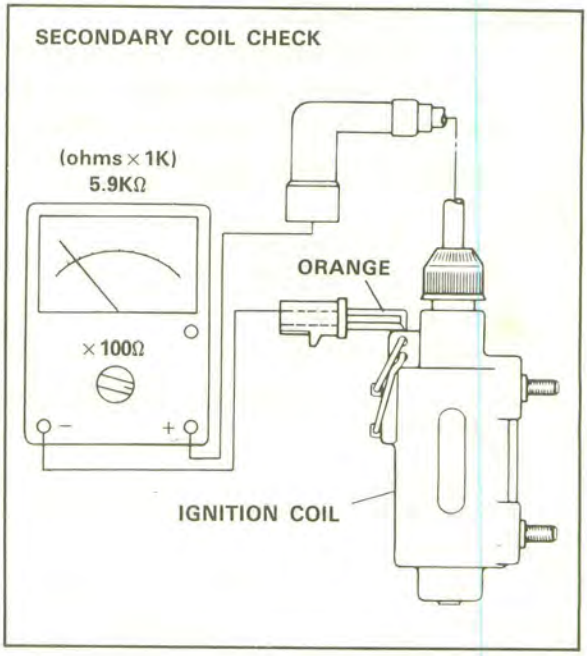
3. Connect a fully charged battery to the tester.
4. Turn on the spark gap switch, and increase the gap to maximum unless misfire occurs first.

Minimum spark gap: 6 mm (0.24 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:
0.85Ω ± 15% at 20°C (68°F)
Secondary coil resistance:
5.9KΩ ± 1.5% at 20°C (68°F)

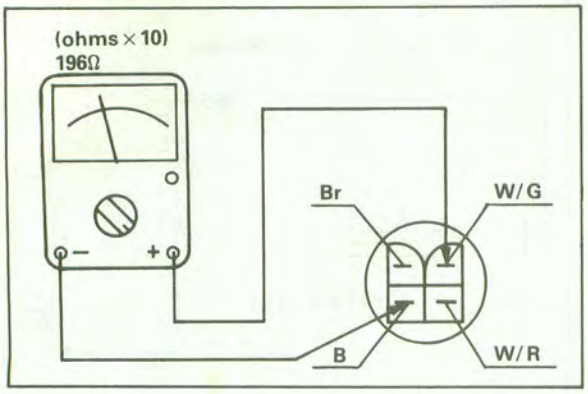




Pickup Coil Inspection

1. Remove the seat/rear cowling assembly.
2. Disconnect the C.D.I. magneto lead connector.
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.

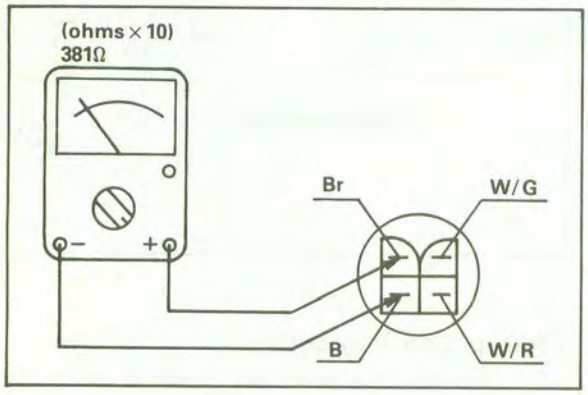
Pickup coil resistance:
196Ω ± 10% at 20°C (68°F)
(White/green — White/Red)



Charge Coil Inspection

1. Check the resistance of the charge coil windings with pocket tester. If the resistance is not within specification, replace the pickup coil assembly.

Charge coil resistance:
381Ω ± 10% at 20°C (68°F)
(Brown — Black)



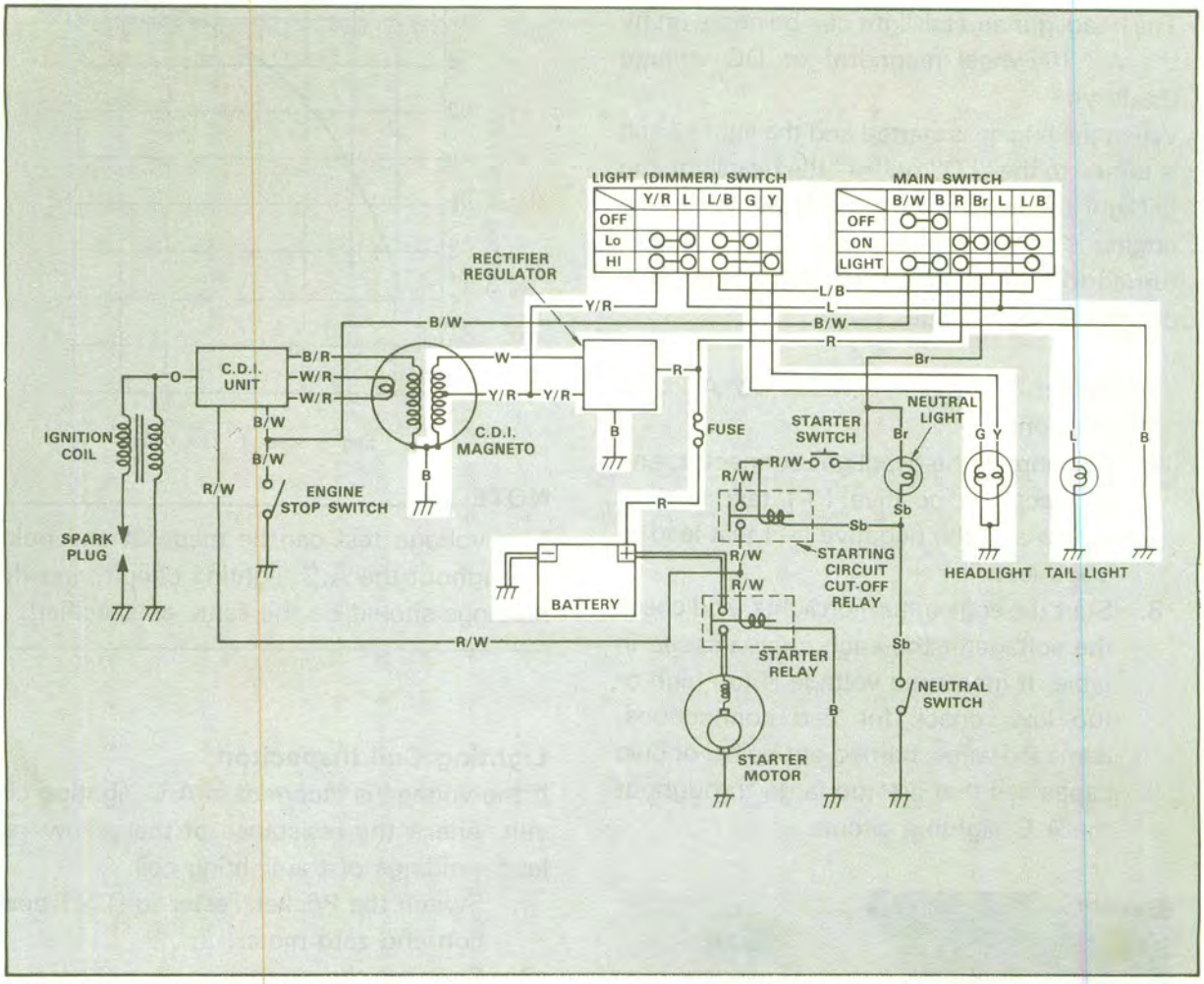
Spark Plug

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.

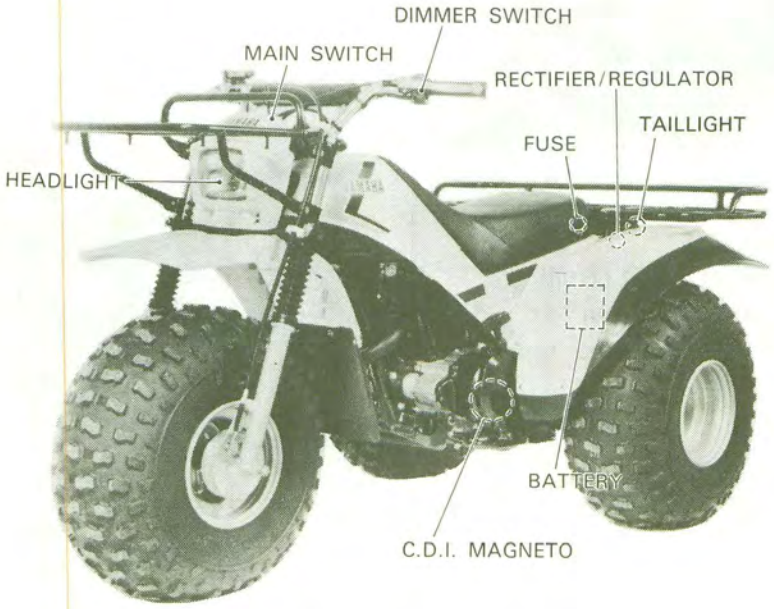
1. Inspect and clean the spark plug, and replace it as required.
2. Clean the electrodes of carbon, and adjust the electrode gap to the specification. Be sure to use the proper reach, type, and electrode gap plug as a replacement to avoid overheating, fouling, or piston damage.

Type:
D7EA (NGK) or X22ES-U (ND)
Electrode gap;
0.6 ~ 0.7 mm (0.02 ~ 0.03 in)
TIGHTENING TORQUE:
20 Nm (2.0 m · kg, 14 ft · lb)

LIGHTING SYSTEM



This circuit diagram shows only the lighting circuit in the wiring diagram.

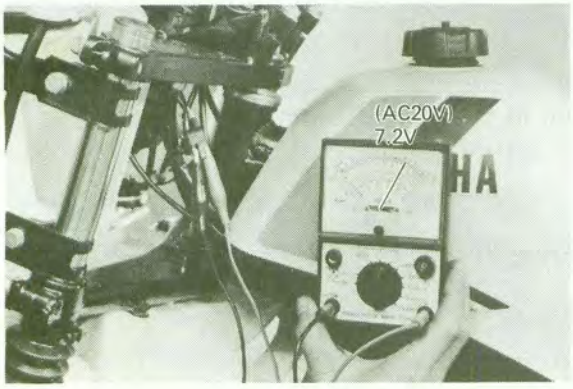


Lighting Voltage Test

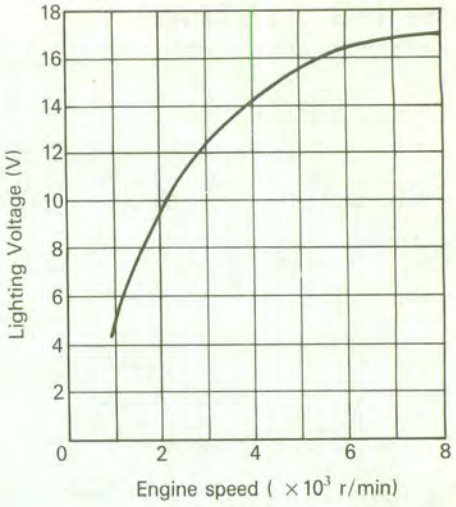
The headlight and tail light can be come on by the AC (flywheel magneto) or DC voltage (battery).

When the engine is started and the light switch is turned to the "LO" or "HI" the headlight and tail light come on by the AC voltage. When the engine is not started and the main switch is turned to the "LIGHT" the both lights come on by the DC voltage.

1. Switch the Pocket Tester to AC 20V position.
2. Disconnect the headlight connector, and connect the positive (+) test lead to yellow and the negative (−) test lead to black lead.
3. Start the engine, turn on lights, and check the voltage at the each engine speed in table. If measured voltage is too high or too low, check for bad connections, damaged wires, burned-out bulbs, or bulb capacities that are too large throughout the A.C. lighting circuit.



Lighting output:
11.3V or more at 3,200 r/min
18V or less at 8,000 r/min



NOTE:

This voltage test can be made at any point throughout the A.C. lighting circuit, and the readings should be the same as specified.

Lighting Coil Inspeciton

If the voltage is incorrect in A.C. lighting circuit, check the resistance of the yellow/red lead windings of the lighting coil.

1. Switch the Pocket Tester to Ω ×1 position and zero meter.
2. Connect the positive (+) test lead to yellow/red lead from the C.D.I. magneto and negative (−) test lead to a good ground on the engine. Read the resistance on the ohms scale.

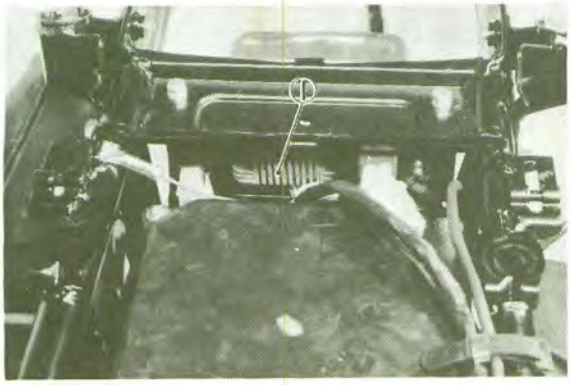
Lighting coil resistance:
0.34Ω ± 10% at 20°C (68°F)
Yellow/red — Ground)

3. If the A.C. lighting circuit components check out properly but circuit voltage is still excessive, go to the A.C. regulator check.

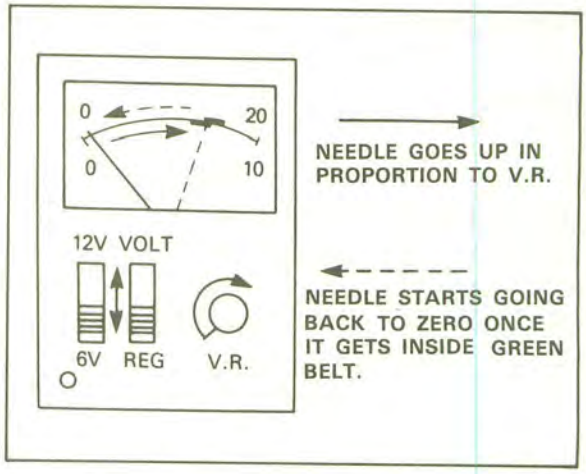
Voltage Regulator Inspection

1. Preparation for inspection
   a. Instruments required for inspection. A.C. regulator checker and 12V battery.
   b. Connect the red lead wire (for power) of the regulator checker to the positive side and connect the black lead wire to the negative side of the battery terminals.
   c. Checking the battery voltage
   First, set the switches, both right and left, to "12V, VOLT". If the checker needle points to 10 volts or more, the battery voltage is sufficient.
2. Checking the regulator
   a. Turn the volume (V.R.) of checker completely counterclockwise.
   b. Set the VOLT-REG switch for REG and the 6V-12V switch for 12V.
   c. Connect the pintipped lead wires to the A.C. regulator; black to the regulator body and red to the regulator lead (Yello/Red).
   d. As the volume (V.R.) is gradually turned clockwise, the meter needle goes up. This needle comes back to zero as the regulator begins to operate.
   The regulator functions all right if the needle starts back toward zero within the green range on the scale.

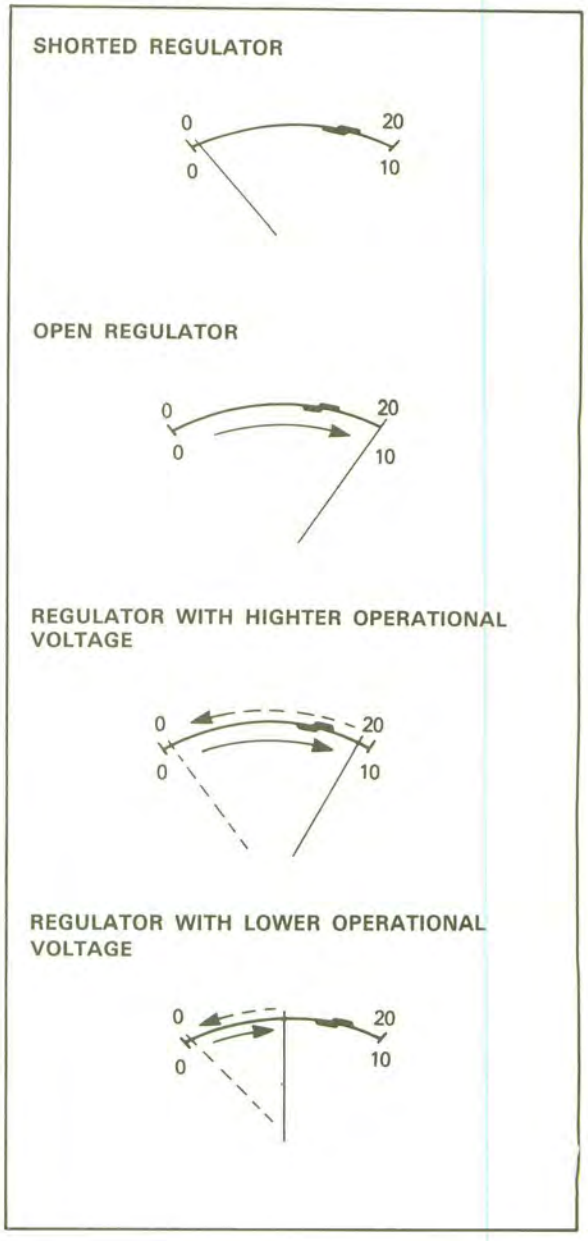
* Good regulator:
The meter needle begins to turn back within the green belt on the meter.



1. Voltage regulator



* **Bad regulator**



Headlight Check

NOTE:

- The headlight and taillight can be come on by the A.C. (flywheel magneto) or D.C. voltage (battery).
- Check the headlight bulb first before performing the following check.

A. A.C. Voltage (Flywheel magneto)

HEADLIGHT DOES NOT COME ON WHEN ENGINE IS RUNNING

- Lighting Voltage (11.3V or more at 3,200 r/min / 18V or less of 8,000 r/min)

Check resistance of lighting coil: 0.34Ω ± 10% at 20°C (68°F) (Yellow/red — Ground)
→ If other than specified → Lighting coil defective

Resistance OK

Check for lighting voltagbe on yellow/red lead at light switch
→ No voltage → An open or poor connection between flywheel magneto and light switch

Voltage OK

Check for lighting voltage on blue lead at main switch
→ No voltage → Light switch defective, or an open or poor connection between light switch and main switch

Voltage OK

Check for lighting voltage on blue/black lead at light switch
→ No voltage → Main switch defective, or an open or poor connection between main switch and light switch

Voltage OK

Check for lighting voltage at headlight high beam or low beam connector.
→ No voltage → Light switch defective

Voltage OK

Poor ground or poor connection of headlight wiring.

B. D.C. Voltage (Battery)

NOTE:

The battery provides power for operation of the headlight and taillight. If none of the above operates, always check battery voltage before proceeding further. Low battery voltage indicated either a faulty battery, low battery electrolyte, or a defective charging system. See "CHARGING SYSTEM" for checks of the battery and charging system. Also check fuse condition. Replace the fuse if necessary.

HEADLIGHT DOES NOT COME ON WHEN MAIN SWITCH IS TURNED "LIGHT" → No voltage → An open or poor connection between battery and main switch

* Battery voltage (12V)

Check for battery voltage on red lead between battery and main switch → No voltage → Main switch defective

Voltage OK ↓

Check for battery voltage on blue/black lead at main switch → No voltage → An open or poor connection between main switch and light switch

Voltage OK ↓

Check for battery voltage at headlight high beam or low beam connector → No voltage → Light switch defective

Voltage OK ↓

Poor ground or poor connection of headlight wiring

2. Taillight Check
- Check the bulb.
- Check the battery voltage.
- Check for 12V on the blue lead.
- Check for ground on black lead.

Switches

Switches may be checked for continuity with a pocket tester on the ohm × 1 scale.

1. Main switch

Switch position	Wire color					
	B/W	B	R	Br	L	L/B
OFF	○——	——○				
ON			○——	——○	○——	——○
LIGHT	○——	——○	○——			——○

2. Engine stop switch

Switch position	Wire color	
	B/W	B
RUN		
OFF	○——	——○

3. Starter switch

Switch position	Wire color	
	Br	R/W
OFF		
PUSH (ON)	○——	——○

4. Lights (dimmer) switch

Switch position	Wire color				
	Y/R	L	L/B	G	Y
OFF					
LO	○——	——○	○——	——○	
HI	○——	——○	○——		——○

Battery

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

1. The battery voltage will not rise to a specific value nor will 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	GM14AZ-4A
Electrolyte	Specific gravity: 1.280
Initial charging current	1.4 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

CHAPTER 7. APPENDICES

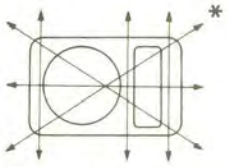
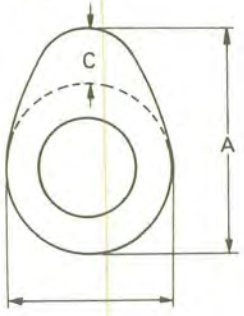
SPECIFICATIONS

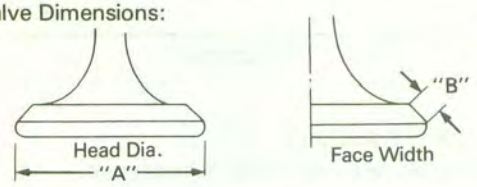
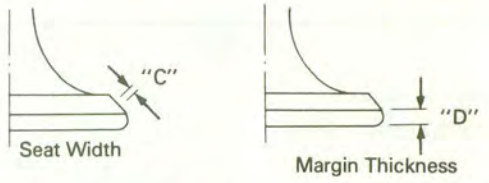
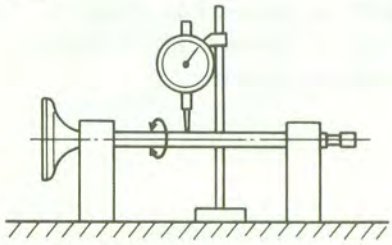
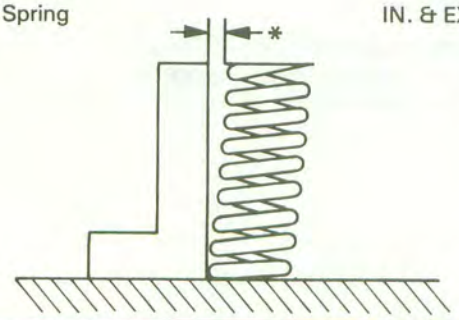
I. GENERAL SPECIFICATIONS

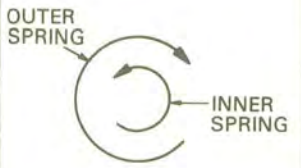
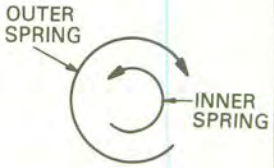
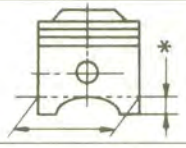
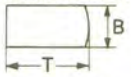
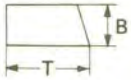
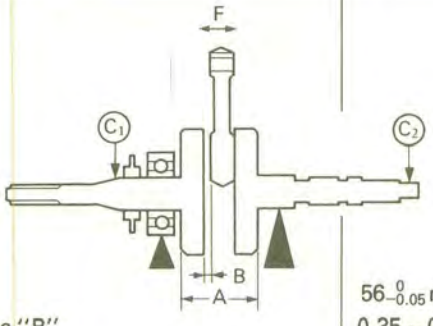
Model	YTM200EK
Model Code Number	24W
Frame Starting Number	24W-000101
Engine Starting Number	24W-000101
Dimensions:	
Overall Length	1,865 mm (73.4 in)
Overall Width	1,050 mm (41.3 in)
Overall Height	980 mm (38.6 in)
Seat Height	725 mm (28.5 in)
Wheelbase	1,150 mm (45.3 in)
Minimum Ground Clearance	140 mm (5.5 in)
Basic Weight:	
With Oil and Full Fuel Tank	161 kg (355 lb)
Minimum Turning Radius:	2,250 mm (88.6 in)
Engine:	
Engine Type	4-stroke, gasoline, SOHC
Cylinder Arrangement	Single cylinder, Forward inclined
Displacement	196.3 cm^3
Bore × Stroke	67.0 × 55.7 mm (2.6 × 2.2 in)
Compression Ratio	8.5 : 1
Compression Pressure	883 kPa (9 kg/cm^2, 128 psi)
Starting System	Recoil starter and Electric starter
Lubrication System:	Wet sump
Oil Type or Grade:	
Engine oil	Yamalube 4-cycle oil or SAE 20W 40 type SE motor oil
Final Gear Oil	SAE 80 API GL-4 Hypoid gear oil
Oil Capacity:	
Engine Oil	
Periodic Oil Change	1.5 L (1.3 Imp qt, 1.6 US qt)
Total Amount	1.8 L (1.6 Imp qt, 1.9 US qt)
Final Gear Case Oil	0.13 L (0.11 Imp qt, 0.14 US qt)
Air Filter	Wet type element
Fuel:	
Type	Regular gasoline
Tank Capacity	9.0 L (2.0 Imp gal, 2.4 US gal)
Reserve Amount	1.9 L (0.4 Imp gal, 0.5 US gal)
Carburetor:	
Type/Manufacturer	VM22SH/MIKUNI
Spark Plug:	
Type/Manufacturer	D7EA (NGK), X22ES-U (NIPPONDENSO)
Gap	0.6 ~ 0.7 mm (0.024 ~ 0.028 in)
Clutch Type:	Wet, multiple-disc, Centrifugal automatic

Model	YTM200EK
Transmission:	
Primary Reduction System	Gear
Primary Reduction Ratio	73/22 (3.318)
Secondary Reduction System	Shaft drive
Secondary Reduction Ratio	19/18 × 46/11 = 4.414
Transmission Type	Constant mesh, 5-speed
Operation	Left foot operation
Gear Ratio	
1st	35/11 (3.181)
2nd	31/15 (2.066)
3rd	30/21 (1.428)
4th	26/25 (1.040)
5th	23/28 (0.821)
Chassis:	
Frame Type	Semi double cradle
Caster Angle	17.5°
Trail	26 mm (1.02 in)
Tire:	
Type	Tubeless
Size (F)	25 × 12 – 9
Size (R)	25 × 12 – 9 × 2 pcs
Tire Pressure (Cold tire):	
Front and Rear:	
Standard	14.7 kPa (0.15 kg/cm², 2.2 psi)
Minimum	11.8 kPa (0.12 kg/cm², 1.8 psi)
Maximum	68.6 kPa (0.7 kg/cm², 10 psi)
Standard tire circumference	1.735 mm (68.3 in)
Minimum tire circumference	1.725 mm (67.9 in)
Brake:	
Front Brake Type	Drum brake
Operation	Right hand operation
Rear Brake Type	Single disc brake
Operation	Left hand operation, Right foot operation
Suspension:	
Front Suspension	Telescopic fork
Rear	Rigid
Shock Absorber:	
Front Shock Absorber	Coil spring, Oil damper
Wheel Travel:	
Front Wheel Travel	100 mm (4.0 in)
Rear	0 mm (0 in)
Electrical:	
Ignition System	C.D.I. Magneto
Generator System	A.C. generator
Battery Type/Capacity	GM14AZ – 4A/12V, 14AH
Headlight Type:	Bulb
Bulb Wattage/Quantity:	
Headlight	45 W/45W × 1
Taillight	8 W × 1
Indicator Light Wattage/Quantity	
"NEUTRAL"	3.4W × 1

II. MAINTENANCE SPECIFICATIONS
A. Engine

Model		YTM200EK
Cylinder Head:		
Warp Limit		<0.03 mm (0.0012 in)> *Lines indicate straightedge measurement.
Cylinder:		
Bore Size		$67^{+0.020}_{-0.030}$ mm ($2.64^{+0.0008}_{-0.0012}$ in)
Taper Limit		<0.005 mm (0.0002 in)>
Out-of-round Limit		<0.01 mm (0.0004 in)>
Camshaft:		
Drive Method		Chain
		Left
Camshaft Bearing (Cylinder)		$25^{+0.021}_{0}$ mm ($0.98^{+0.0008}_{0}$ in), $20^{+0.021}_{0}$ mm ($0.79^{+0.0008}_{0}$ in)
Camshaft Outside Diameter		$25^{-0.020}_{-0.040}$ mm ($0.98^{-0.0008}_{-0.0016}$ in), $20^{-0.020}_{-0.040}$ mm ($0.79^{-0.0008}_{-0.0016}$ in)
Shaft-to-cap Clearance		0.020 ~ 0.061 mm (0.0008 ~ 0.0024 in)
Cam Dimensions		
Intake		
	"A"	36.587 ± 0.05 mm (1.44 ± 0.002 in)
	"B"	31.181 ± 0.05 mm (1.23 ± 0.002 in)
	"C"	6.587 mm (0.26 in)
Exhaust		
	"A"	36.627 ± 0.05 mm (1.44 ± 0.002 in)
	"B"	30.264 ± 0.05 mm (1.19 ± 0.002 in)
	"C"	6.627 mm (0.26 in)
Camshaft Runout Limit		<0.03 mm (0.0012 in)>
Cam Chain Type/Number of Links		DID25SH/104 Links
Cam Chain Adjustment Method		Manual
Rocker Arm/Rocker Arm Shaft:		
Rocker Arm Inside Diameter		$12^{+0.018}_{0}$ mm ($0.47^{+0.0007}_{0}$ in)
<Limit>		<12.03 mm (0.474 in)>
Shaft Outside Diameter		$12^{-0.009}_{-0.015}$ mm ($0.47^{-0.0004}_{-0.0006}$ in)
<Limit>		<11.94 mm (0.470 in)>
Arm-to-shaft Clearance		0.009 ~ 0.037 mm (0.0004 ~ 0.0016 in)
Valve, Valve Seat, Valve Guide:		
Valve Clearance (Cold)		
	IN.	0.05 ~ 0.09 mm (0.002 ~ 0.004 in)
	EX.	0.11 ~ 0.15 mm (0.004 ~ 0.006 in)

Model		YTM200EK
Valve Dimensions: 		
"A" Head Dia.	IN.	34 ± 0.1 mm (1.34 ± 0.004 in)
	EX.	28.5 ± 0.1 mm (1.12 ± 0.004 in)
"B" Face Width	IN.	2.26 mm (0.09 in)
	EX.	2.26 mm (0.09 in)
"C" Seat Limit Width	IN.	1.0 ± 0.1 mm (0.04 ± 0.004 in)
	EX.	1.0 ± 0.1 mm (0.04 ± 0.004 in)
"D" Margin Thickness Limit		
	IN.	1 ± 0.2 mm (0.04 ± 0.008 in)
	EX.	1 ± 0.2 mm (0.04 ± 0.008 in)
Stem Outside Diameter	IN.	$6^{-0.010}_{-0.025}$ mm ($0.24^{-0.0004}_{-0.0010}$ in)
	EX.	$6^{-0.025}_{-0.040}$ mm ($0.24^{-0.0010}_{-0.0016}$ in)
Guide Inside Diameter	IN.	$6^{+0.012}_{0}$ mm ($0.24^{+0.0005}_{0}$ in)
	EX.	$6^{+0.012}_{0}$ mm ($0.24^{+0.0005}_{0}$ in)
Stem-to-guide Clearance	IN.	0.010 ~ 0.037 mm (0.0004 ~ 0.0015 in)
	EX.	0.025 ~ 0.052 mm (0.0010 ~ 0.0020 in)
Stem Runout Limit 		
Valve Seat Width Standard		1.0 ± 0.1 mm (0.039 ± 0.0039 in)
Valve Spring:		
Free Length		
Inner Spring	IN.	35.5 mm (1.40 in)
	EX.	35.5 mm (1.40 in)
Outer Spring	IN.	37.2 mm (1.46 in)
	EX.	37.2 mm (1.46 in)
Compressed Length (Valve Closed)		
Inner Spring	IN.	30.5 mm (1.20 in)
	EX.	30.5 mm (1.20 in)
Outer Spring	IN.	32.0 mm (1.26 in)
	EX.	32.0 mm (1.26 in)
Tilt Limit*:		
Inner Spring	IN. & EX.	2.5° or 1.6 mm (0.063 in)
Outer Spring	IN. & EX.	2.5° or 1.6 mm (0.063 in)
		

Model		YTM200EK	
Direction of Winding (Top view)		IN	EX
			
Piston: Piston Size/Measuring Point* Piston Clearance		$67^{-0.015}_{-0.065}$ mm ($2.6^{-0.0006}_{-0.0026}$ in)/7.5 mm (0.30 in) (From bottom line of piston skirt) 0.025 ~ 0.045 mm (0.0010 ~ 0.0018 in)	
Piston Ring: Sectional Sketch	Top Ring	Plain B = $1.2^{-0.01}_{-0.03}$ mm ($0.05^{-0.0004}_{-0.0012}$ in) T = 2.7 ± 0.1 mm (0.11 ± 0.004 in)	
	2nd Ring	Taper B = $1.2^{-0.01}_{-0.03}$ mm ($0.05^{-0.0004}_{-0.0012}$ in) T = 2.7 ± 0.1 mm (0.11 ± 0.004 in)	
	Oil Ring	B = $2.5^{+0.03}_{+0.01}$ mm ($0.10^{+0.0012}_{+0.0004}$ in) T = 2.8 ± 0.1 mm (0.11 ± 0.004 in)	
			
End Gap (Installed)	Top Ring	0.15 ~ 0.35 mm (0.0059 ~ 0.0138 in)	
	2nd Ring	0.15 ~ 0.35 mm (0.0059 ~ 0.0138 in)	
	Oil Ring	0.3 ~ 0.9 mm (0.0118 ~ 0.0354 in)	
<Limit>	Top Ring	<0.75 mm (0.0295 in)>	
	2nd Ring	<0.75 mm (0.0295 in)>	
	Oil Ring	<— mm (— in)>	
Side Clearance	Top Ring	0.03 ~ 0.07 mm (0.0012 ~ 0.0028 in)	
	2nd Ring	0.02 ~ 0.06 mm (0.0008 ~ 0.0024 in)	
	Oil Ring	0 mm (0 in)	
<Limit>	Top Ring	<0.1 mm (0.004 in)>	
	2nd Ring	<0.9 mm (0.035 in)>	
	Oil Ring	<— mm (— in)>	
Crankshaft: Crank Width "A" Big End Side Clearance "B" Runout Limit "C1" "C2" Small End Free Play "F" <Limit>		$56^{0}_{-0.05}$ mm ($2.20^{0}_{-0.002}$ in) 0.35 ~ 0.65 mm (0.014 ~ 0.026 in) <0.02 mm (0.0008 in)> <0.06 mm (0.0024 in)> <2.0 mm (0.08 in)>	
Balancer Drive Method:		Gear	

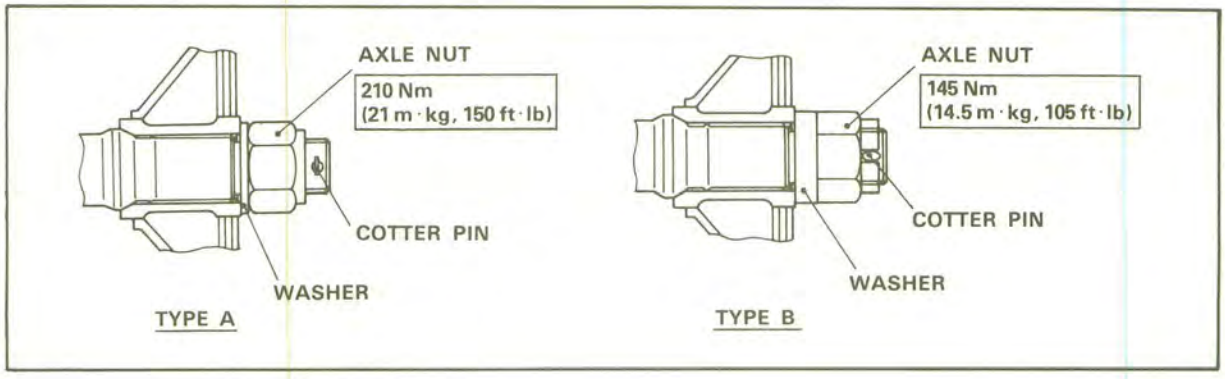
Model	YTM200EK
Primary Clutch:	
Shoe Thickness/Quantity	2.0 mm (0.079 in)/3
Wear Limit	1.5 mm (0.0591 in)
Secondary Clutch:	
Friction Plate Thickness/Quantity	3.0 mm (0.12 in)/5
Wear Limit	<2.8 mm (0.11 in)>
Clutch Plate Thckness/Quantiy	1.6 mm (0.06 in)/4
Warp Limit	<0.2 mm (0.008 in)>
Clutch Spring Free Length/Quantity	34.9 mm (1.37 in)/4
Clutch Release Method	Outer push
Clutch-In Revolution	1,850 ~ 2,150 r/min
Clutch-Stall Revolution	2,900 ~ 3,300 r/min
Transmission:	
Main Axle Deflection Limit	<0.08 mm (0.0031 in)>
Drive Axe Deflection Limit	<0.08 mm (0.0031 in)>
Shifter:	
Shifter Type	Guide bar
Decompression Device	
Type	Manual
Air Filter Oil Grade (Oiled Filter)	Foam-air-filter oil or SAE 10W30 type SE motor oil
Carburetor:	
Type/Manufacturer/Quantity	VM22/MIKUNI/1
I.D. Mark	24W00
Main Jet (M.J.)	#112.5
Main Air Jet (M.A.J.)	ø1.7
Jet Needle-clip Position (J.N.)	4H23-3
Needle Jet (N.J.)	N-6
Cutaway (C.A.)	#4.0
Pilot Jet (P.J.)	#25
Pilot Air jet (P.A.J.)	#130
Pilot Screw (P.S.)	1 and 1/2 ~ 2 and 1/2
Valve Seat (V.S.)	ø1.8
Starter Jet (G.S.)	ø65
Fuel Level (F.L.)	3.0 ± 1.0 mm (0.12 ± 0.04 in)
Float Height (F.H.)	21.5 ± 0.5 mm (0.85 ± 0.02 in)
Engine Idling Speed	1,400 ± 50 r/min
Lubrication System:	
Oil Filter Type	Wire mesh
Oil Pump Type	Trochoid pump
Tip Clearance	0.15 mm (0.0059 in)
Side Clearance	0.04 ~ 0.09 mm (0.0016 ~ 0.0035 in)
Bypass Valve Setting Pressure	98 ± 19.6 kPa (1.0 ± 0.2 kg/cm², 14 ± 2.8 psi)
Middle Gear Lash	
(Actual Gear Lash on the Gear Teeth)	0.1 ~ 0.2 mm (0.004 ~ 0.008 in)
(When Using the Measurement Tool)	0.2 ~ 0.4 mm (0.008 ~ 0.016 in)
Final Gear Lash	0.1 ~ 0.2 mm (0.004 ~ 0.008 in)

Tightening torque:		Size/Q'ty	Nm	m·kg	ft·lb	Remarks
Oil galley bolt	Bolt	M6 × 1	7	0.7	5.1	
Cylinder head	Bolt	M8 × 4	22	2.2	16.0	Apply engine oil to the washers
Cylinder head	Bolt	M8 × 2	20	2.0	14.0	
Cam sprocket cover	Screw	M6 × 2	7	0.7	5.1	
Tappet cover	Bolt	M6 × 5	10	1.0	7.2	
Rocker arm shaft stopper	Bolt	M6 × 2	8	0.8	5.8	Use lock washer
Spark plug	—	M12× 1	20	2.0	14.0	
Cylinder body	Bolt	M6 × 2	10	1.0	7.2	
Balancer shaft	Nut	M14× 1	50	5.0	36.0	Use lock washer
Recoil starter pulley	Bolt	M10× 1	50	5.0	36.0	
Valve adjuster lock	Nut	M6 × 2	14	1.4	10.0	
Sprocket cam	Bolt	M10× 1	60	6.0	43.0	
Chain tensioner	Nut	M14× 1	30	3.0	22.0	
Tensioner cap	Cap nut	M14× 1	5	0.5	3.6	
Chain guide #2 stopper	Bolt	M6 × 2	8	0.8	5.8	
Oil pump assembly	Screw	M6 × 3	7	0.7	5.1	
Drain plug	Plug	M35× 1	43	4.3	31.0	
Filter cover	Bolt	M6 × 2	10	1.0	7.2	
Filter cover drain	Bolt	M6 × 1	10	1.0	7.2	
Carburetor joint	Bolt	M6 × 2	12	1.2	8.7	
Carburetor	Nut	M6 × 2	8	0.8	5.8	
Exhaust pipe flange	Bolt	M6 × 2	10	1.0	7.2	
Muffler assembly	Bolt	M8 × 2	27	2.7	19.0	
Exhaust pipe protector	Screw	M6 × 2	7	0.7	5.1	Apply LOCKTITE®
Exhaust outlet pipe	Screw	M6 × 1	10	1.0	7.2	
Crankcase	Screw	M6 ×12	7	0.7	5.1	
Crankcase spacer (L/H)	Screw	M6 × 8	7	0.7	5.1	
Bearing retainer (L/H)	Screw	M5 × 3	7	0.7	5.1	Apply LOCTITE®
Crankcase spacer (R/H)	Screw	M6 × 3	7	0.7	5.1	
Bearing retainer (R/H)	Screw	M6 × 3	10	1.0	7.2	Apply LOCTITE®
Clutch cover	Screw	M6 × 9	7	0.7	5.1	
Clutch cover protector	Screw	M6 × 3	7	0.7	5.1	
Recoil starter	Screw	M6 × 6	7	0.7	5.1	
Primary clutch	Nut	M22× 1	78	7.8	56.0	Use lock washer
Clutch spring	Screw	M5 × 4	6	0.6	4.3	
Clutch boss	Nut	M14× 1	50	5.0	36.0	Use lock washer
Cam shift segment	Screw	M6 × 1	12	1.2	8.7	Apply LOCTITE®
Clutch adjuster	Nut	M8 × 1	15	1.5	11.0	
Middle gear case cover	Bolt	M6 × 6	10	1.0	7.2	Apply Yamabond #4 (2 bolts)
Bearing retainer (Drive axle)	Screw	M8 × 3	25	2.5	18.0	STAKE
Bearing retainer (Housing)	—	M50× 1	60	6.0	43.0	Left-hand threads
Bearing housing	Bolt	M8 × 4	23	2.3	17.0	
	Nut	M8 × 4	23	2.3	17.0	
Starter clutch	Screw	M8 × 3	30	3.0	22.0	STAKE
Neutral switch	—	M10× 1	20	2.0	14.0	
Starter motor bracket	Screw	M6 × 4	7	0.7	5.1	
Final gear housing & Frame	Bolt	M10× 2	45	4.5	32.0	
Bearing retainer	—	M63× 1	100	10.0		Left-hand thread
Rear wheel hub & Final gear housing	Bolt	M8 × 6	23	2.3	17.0	
Rear wheel hub & Final gear housing	Bolt	M10× 2	23	2.3	17.0	
Shift rod (Joint)	Bolt	M6 × 1	10	1.0	7.2	
CDI magneto base	Screw	M6 × 3	7	0.7	5.1	

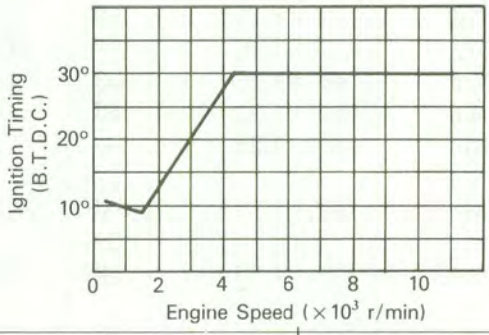
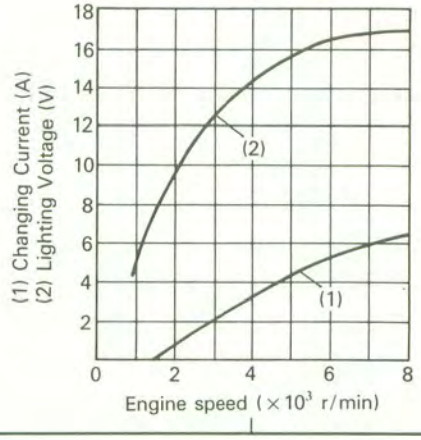
B. Chassis

Model		YTM200EK
Steering System:		
Steering Bearing Type		Ball Bearing
No./Size of Steel Balls	Upper	22 pcs/1/4 in
	Lower	19 pcs/3/16 in
Front Suspension:		
Front Fork Travel		100 mm (3.94 in)
Fork Spring Free Length		405.1 mm (15.95 in)
<Limit>		<395.1 mm (15.56 in)>
Spring Rate/Stroke		K_1 = 7.85 N/mm (0.8 kg/mm, 44.8 lb/in)
		0 ~ 70 mm (0 ~ 2.76 in)
		K_2 = 9.81 N/mm (1.0 kg/mm, 56.0 lb/in)
		70 ~ 120 mm (2.76 ~ 4.72 in)
Optional Spring		No.
Oil Capacity or		194 cm^3 (6.82 Imp oz, 6.56 Us oz)
Oil Level		311 mm (12.2 in)
		(From top of inner tube fully compressed without spring.)
Oil Grade		Yamaha fork oil 10 wt or equivalent
Wheel:		
Front Wheel Type		Disc Wheel
Rear Wheel Type		Disc Wheel
Front Rim Size/Material		10 × 9/Steel
Rear Rim Size/Material		10 × 9/Steel
Rim Runout Limit	Vertical	<2.0 mm (0.08 in)>
	Lateral	<2.0 mm (0.08 in)>
Drum Brake:		
Type	Front	Leading and trailing
Drum Inside Dia		
<Limit>		110 mm (4.33 in) <111 mm (4.37 in)>
Lining Thickness		
<Limit>		4.0 mm (0.16 in) <2.0 mm (0.08 in)>
Shoe Spring Free Length	Front	34.5 mm (1.36 in)
Disc Brake:		
Type	Rear	Single disc
Outside Dia × Thickness		224 × 4 mm (8.82 × 0.16 in)
Pad Thickness		
<Limit>	Inner	8.0 mm (0.31 in) <1.5 mm (0.06 in)>
	Outer	8.0 mm (0.31 in) <1.5 mm (0.06 in)>
Brake Lever & Brake Pedal:		
Brake Lever Free Play Limit		<10 mm (0.4 in)> at lever pivot
Brake Pedal Free Play Limit		<50 mm (2.0 in)>

Tightening torque:		Thread size	Q'ty	Nm	m·kg	ft·lb	Remarks
Front axle shaft	Nut	M14×1.5	1	50	5.0	36	
Wheel panel (Front and rear)	Nut	M8 ×1.25	12	28	2.8	20	
Front brake cam	Bolt	M6 ×1.0	1	9	0.9	6.5	
Under bracket & inner fork tube	Bolt	M8 ×1.25	2	30	3.0	22	
Steering crown & inner fork tube	Bolt	M8 ×1.25	2	20	2.0	14	
Steering stem	Bolt	M14×1.25	1	90	9.0	65	
Steering shaft ring nut	Nut	M25×1.0	1	38	3.8	27	
Handlebar upper holder	Bolt	M8 ×1.25	4	20	2.0	14	
Engine front bracket & Engine	Bolt	M8 ×1.25	2	33	3.3	24	
Engine front bracket & Frame	Nut	M8 ×1.25	2	33	3.3	24	
Upper engine bracket & Engine	Nut	M8 ×1.25	1	33	3.3	24	
Upper engine bracket & Frame	Nut	M8 ×1.25	2	33	3.3	24	
Engine rear upper and lower & Frame	Nut	M8 ×1.25	2	44	4.4	32	
Rear axle shaft (Type A)	Nut	M20×1.50	2	210	21.0	150	Refer to illust 1
(Type B)	Nut	M20×1.50	2	145	14.5	105	Refer to illust 2
Rear axle shaft	Ring nut	M40×1.50	2	100	10.0	72	Apply LOCTITE®
Rear hub & Frame	Bolt	M10×1.25	3	50	5.0	36	
Rear brake caliper body	Bolt	M10×1.25	2	50	5.5	36	
Rear brake caliper	Nut	M6 ×1.0	3	9	0.9	6.5	
Brake pad adjuster locknut	Nut	M8 ×1.25	1	15	1.5	11	
Footrest & Frame	Bolt	M8 ×1.25	4	33	3.3	24	
Fuel tank & Fuel cock	Screw	M6 ×1.0	2	5	0.5	3.6	
Frame & Rear bamper	Bolt	M8 ×1.25	4	23	2.3	17	



C. Electrical

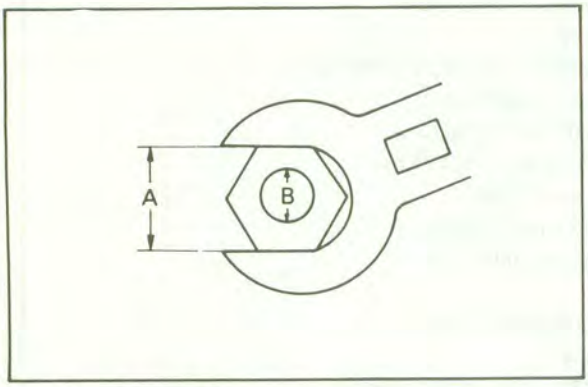
Model	YTM200EK
Voltage	12V
Ignition System:	
Ignition Timing (B.T.D.C.)	10° at 1,000 r/min
Advanced Timing (B.T.D.C.)	30° at 4,250 r/min
Advancer Type	Electrical
	
C.D.I.:	
Magneto-Model/Manufacturer	F3T16371/MITSUBISHI
Pickup Coil Resistance (Color)	196Ω ± 10% at 20°C (68°F) (W/R — W/G)
Charging Coil Resistance (Color)	381Ω ± 10% at 20°C (68°F) (Br — B)
C.D.I. Unit-Model/Manufacturer	F8T07272/MITSUBISHI
Ignition Coil:	
Model/Manufacturer	F6T50971/MITSUBISHI
Minimum Spark Gap	18kV or more at 500 r/min 17 kV or less at 8,000 r/min 6 mm (0.24 in)
Primary Winding Resistance	0.85Ω ± 15% at 20°C (68°F)
Secondary Winding Resistance	5.9KΩ ± 15% at 20°C (68°F)
Charging System/Type	Flywheel magneto
F.W. Magneto:	
Charging Current	0.7A or more at 3,000 r/min 4A or less at 8,000 r/min
Charging Coil Resistance (Color)	0.4Ω ± 10% at 20°C (68°F) (W — Ground)
Lighting Voltage	11.3V or more at 3,000 r/min 18V or more at 8,000 r/min
Lighting Coil Resistance (Color)	0.34Ω ± 10% at 20°C (68°F) (Y/R — Ground)
	

Model	YTM200EK
Voltage Regulator:	
-Type	Circuit
-Model/ Manufacture	SU230Y/ STANLEY
-No Load Regulated Voltage	12 ~ 16.5V
Rectifier:	
-Model/ Manufacturer	SU230Y/ STANLEY
-Capacity	4A
-Withstand Voltage	120V
Battery:	
Capacity	12V 14AH
Specific Gravity	1.260
Electric Starter System:	
Type	Constant mesh type
Starter Motor-Model/ Manufacturer	SM-7252/ MITSUBA
-Out put	0.4kW
Armature Coil Resistance	0.023Ω ± % at 20°C (68°F)
Brush-Overall Length	10.5 mm (0.41 in)
<Limit>	<5.0 mm (0.20 in)>
-Spring Pressure	400 ~ 600 g (14 ~ 21 oz)
Commutator Dia.	23 mm (0.901 in)
<Wear Limit>	< 22 mm (0.866 in) >
-Mica Undercut	1.8 mm (0.071 in)
Starter switch	
Model/ Manufacturer	I26/ HONDA LOCK
Amperage Rating	150A
Coil Winding Resistance	3.43Ω ± 5% at 20°C (68°F)
Starting Circuit Cut off Relay:	
Model/ Manufacturer	G4MW-121T/ TATEISHI
Coil Winding Resistance	75Ω ± 10% at 20°C (68°F)
Color Code	None
Diode	Yes
Circuit Breaker:	
Type	Fuse
Amperage for Individual Circuit/ Quantity	
Main	10A × 1
Reserve	10A × 1

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 crisscross 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)	General torque specifications		
		Nm	m·kg	ft·lb
10 mm	6 mm	6	0.6	4.3
12 mm	8 mm	15	1.5	11
14 mm	10 mm	30	3.0	22
17 mm	12 mm	55	5.5	40
19 mm	14 mm	85	8.5	61
22 mm	16 mm	130	13.0	94



A: Distance across flats
B: Outside thread diameter

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 × m/sec^{2}	Force
Nm m·kg	Newton meter Meter kilogram	N × m m × kg	Torque Torque
Pa N/mm	Pascal Newton per millimeter	N/m^{2} N/mm	Pressure Spring rate
L cm^{3}	Liter Cubic centimeter	———	Volume or Capacity
r/min	Rotation per minute	———	Engine Speed

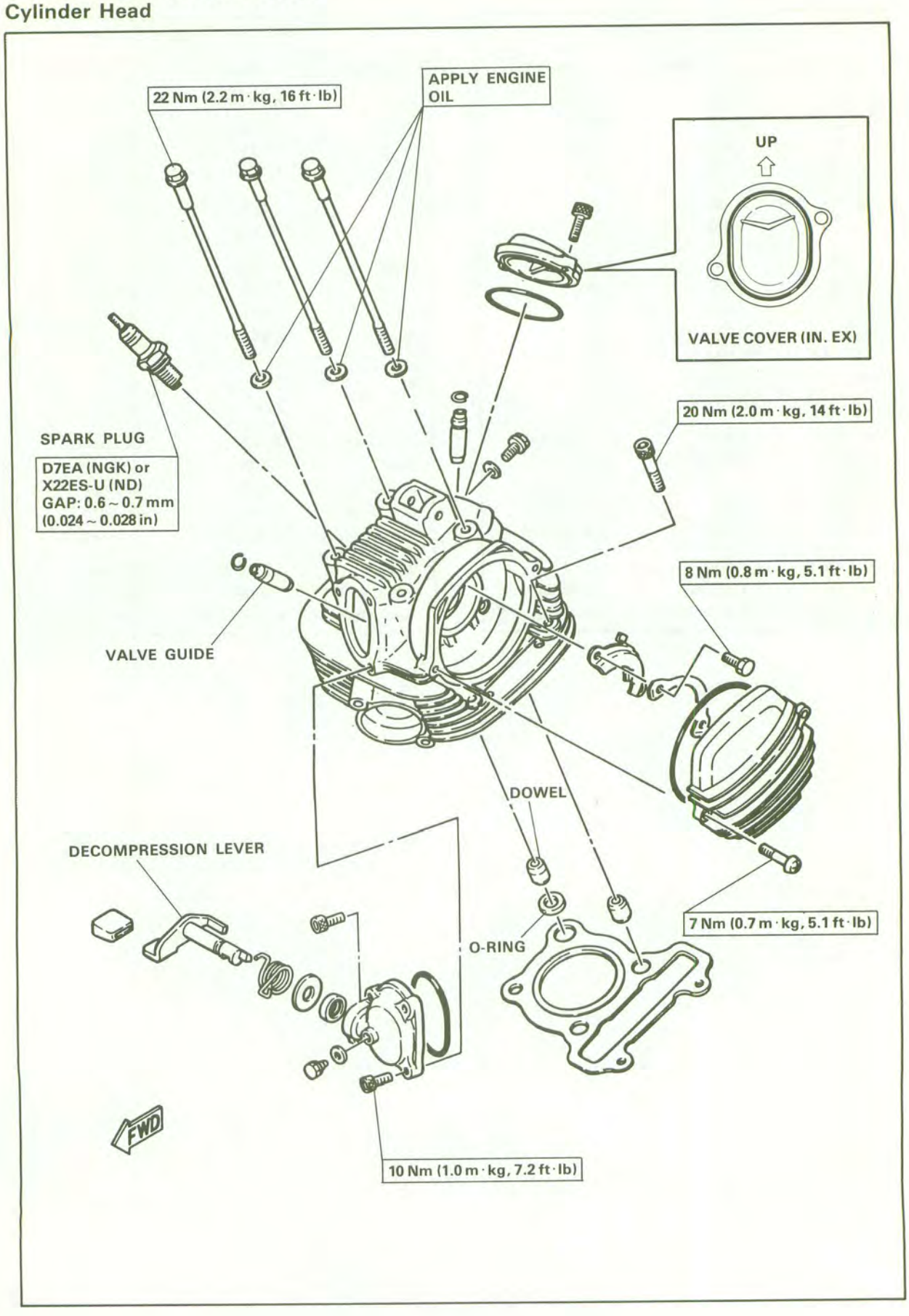
CONVERSION TABLES

Metric to inch system		
Known	Multiplier	Result
m · kg	7.233	ft · lb
m · kg	86.80	in · lb
cm · kg	0.0723	ft · lb
cm · kg	0.8680	in · lb
kg	2.205	lb
g	0.03527	oz
km/lit	2.352	mpg
km/hr	0.6214	mph
km	0.6214	mi
m	3.281	ft
m	1.094	yd
cm	0.3937	in
mm	0.03937	in
cc (cm^3)	0.03382	oz (US liq)
cc (cm^3)	0.06102	cu in
lit (liter)	2.1134	pt (US liq)
lit (liter)	1.057	qt (US liq)
lit (liter)	0.2642	gal (US liq)
kg/mm	56.007	lb/in
kg/cm^2	14.2234	psi (lb/in^2)
Centigrade (°C)	9/5 (°C) + 32	Fahrenheit (°F)

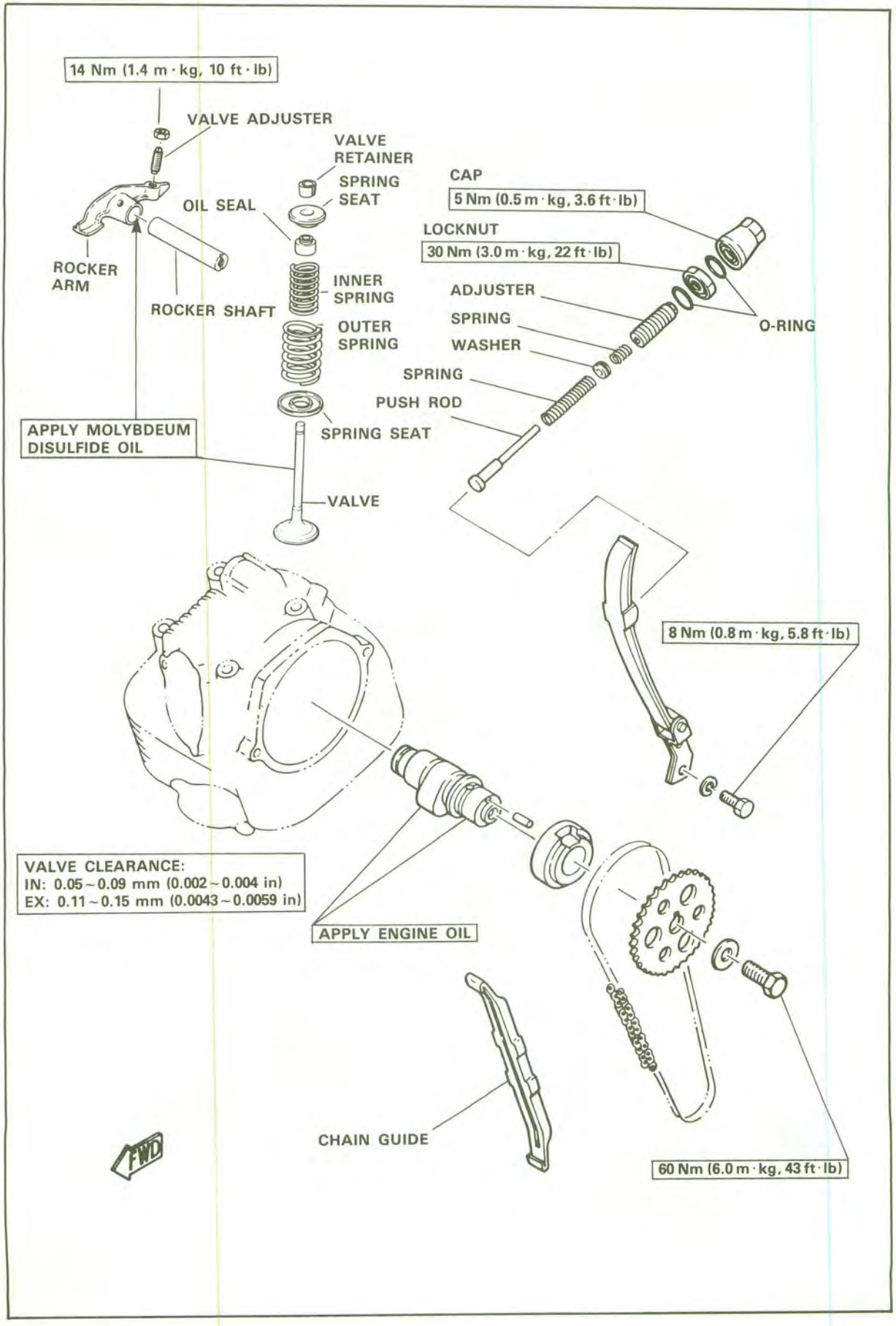
Inch to metric system		
Known	Multiplier	Result
ft · lb	0.13826	m · kg
in · lb	0.01152	m · kg
ft · lb	13.831	cm · kg
in · lb	1.1521	cm · kg
lb	0.4535	kg
oz	28.352	g
mpg	0.4252	km/lit
mph	1.609	km/hr
mi	1.609	km
ft	0.3048	m
yd	0.9141	m
in	2.54	cm
in	25.4	mm
oz (US liq)	29.57	cc (cm^3)
cu in	16.387	cc (cm^3)
pt (US liq)	0.4732	lit (liter)
qt (US liq)	0.9461	lit (liter)
gal (US liq)	3.785	lit (liter)
lb/in	0.017855	kg/mm
psi (lb/in^2)	0.07031	kg/cm^2
Fahrenheit (°C)	5/9 (°F − 32)	Centigrade (°F)

EXPLODED DIAGRAMS

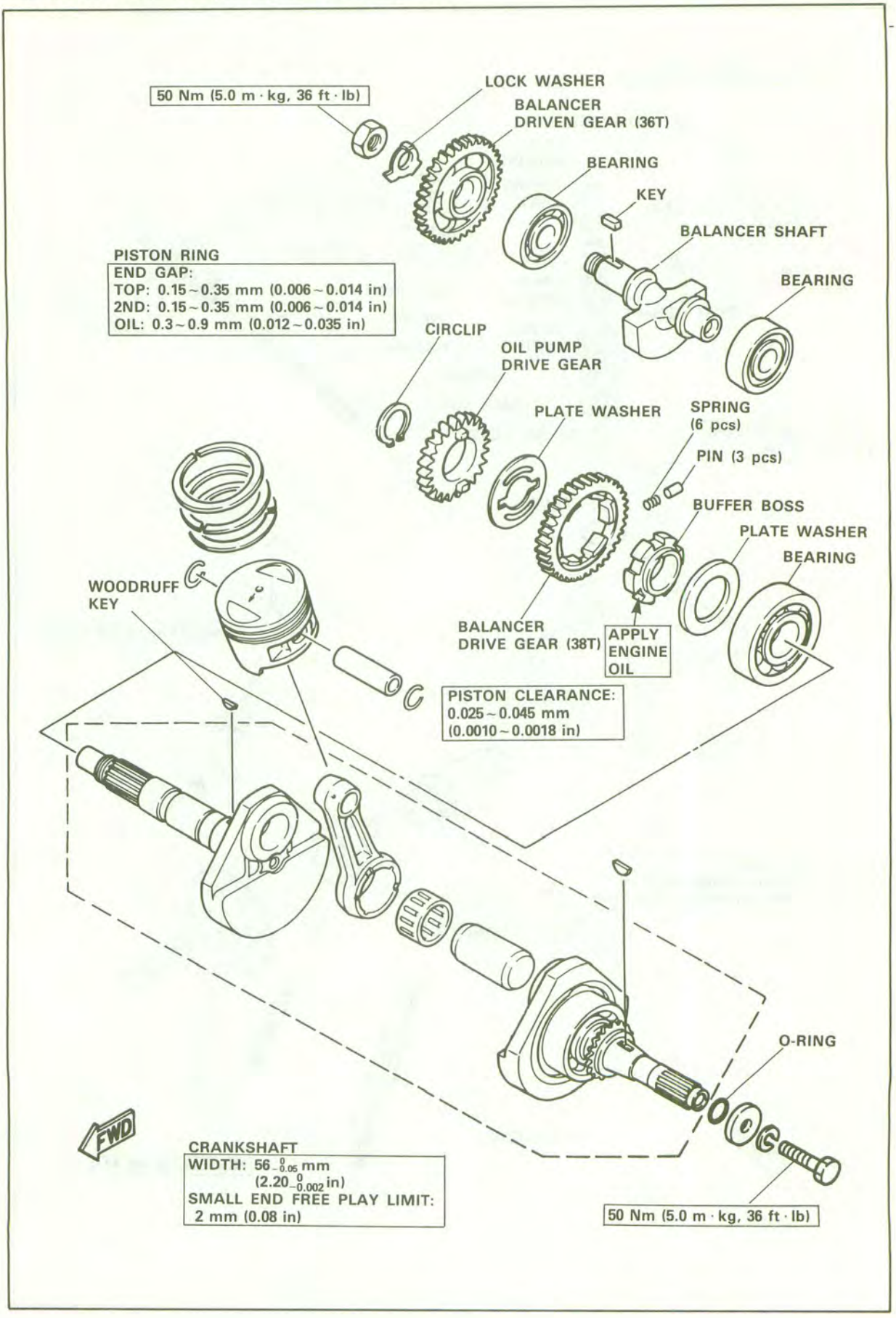
Cylinder Head

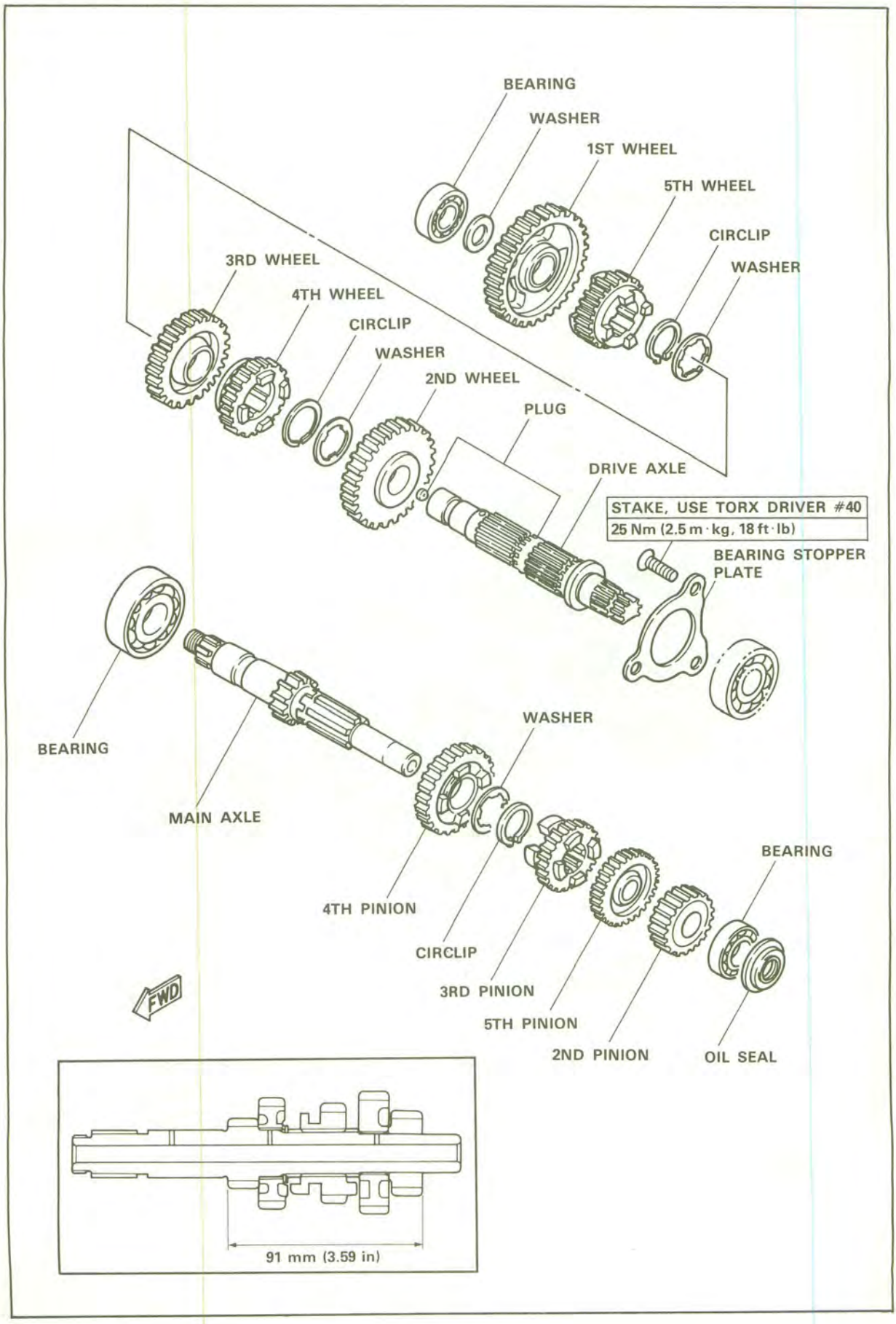


Valve/Cam Chain

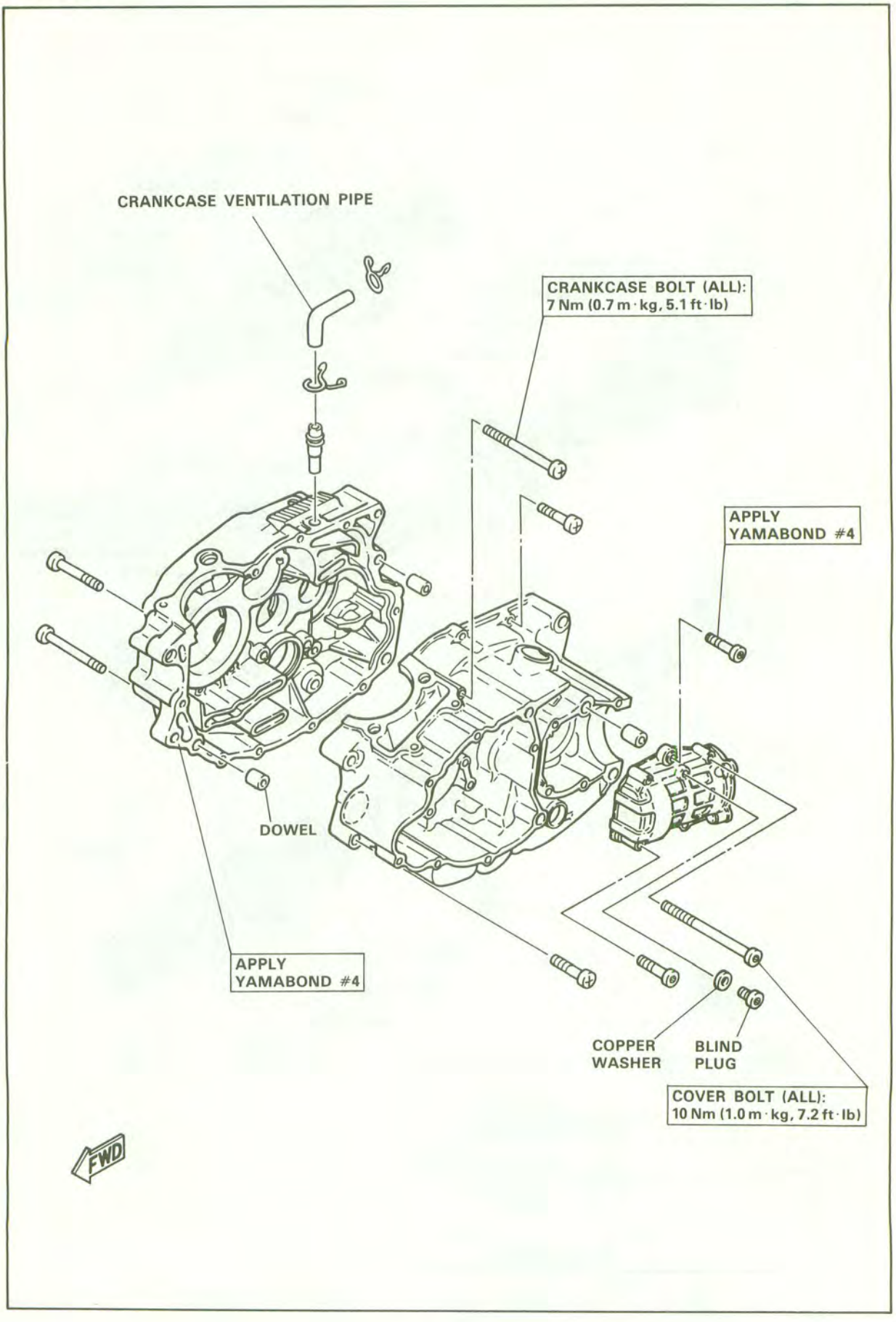


Crankshaft Assembly/Piston/ Balancer Shaft

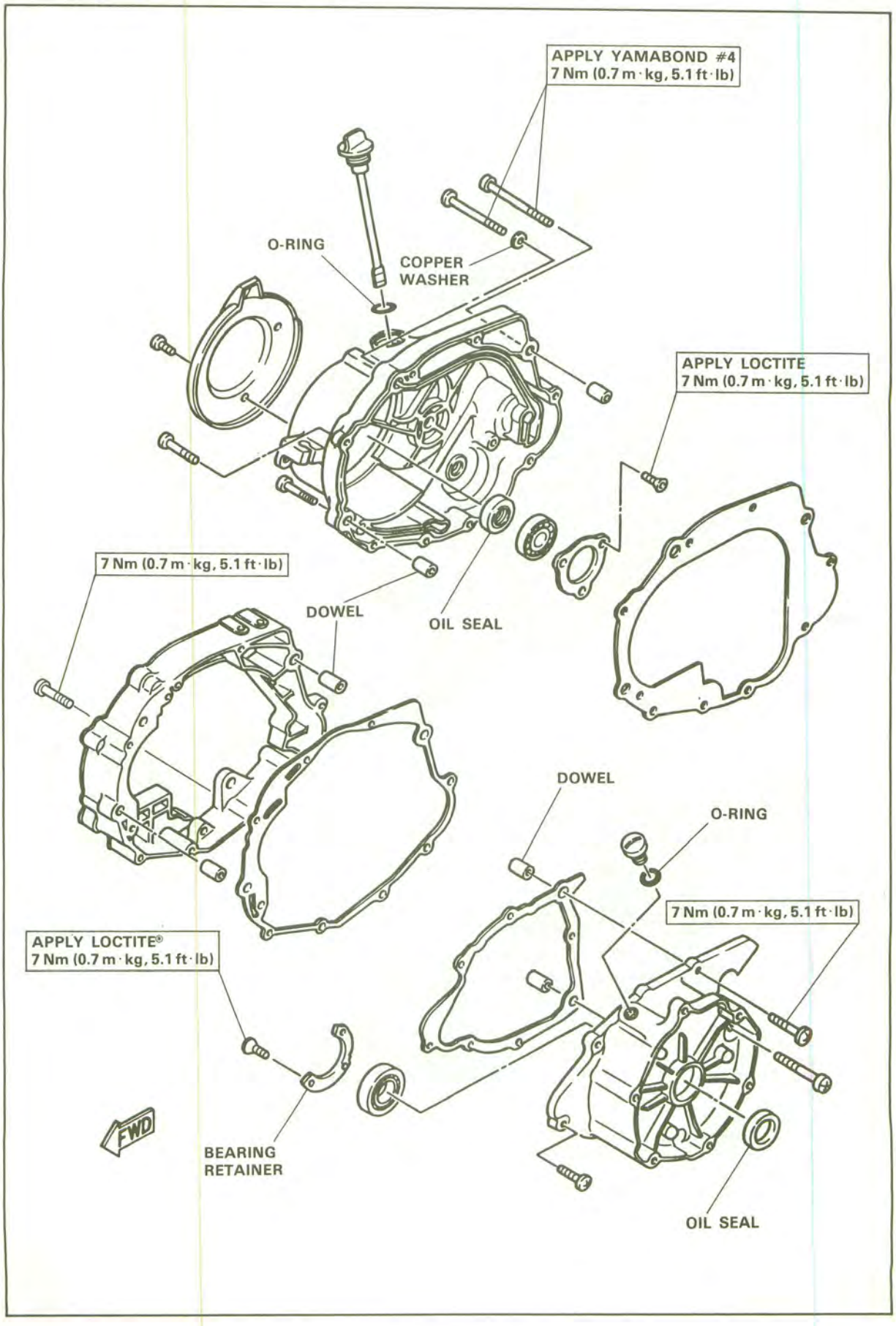



BEARING
WASHER
1ST WHEEL
5TH WHEEL
CIRCLIP
WASHER
3RD WHEEL
4TH WHEEL
CIRCLIP
WASHER
2ND WHEEL
PLUG
DRIVE AXLE
STAKE, USE TORX DRIVER #40
25 Nm (2.5 m·kg, 18 ft·lb)
BEARING STOPPER PLATE
BEARING
MAIN AXLE
WASHER
4TH PINION
CIRCLIP
3RD PINION
5TH PINION
2ND PINION
BEARING
OIL SEAL
FWD
91 mm (3.59 in)

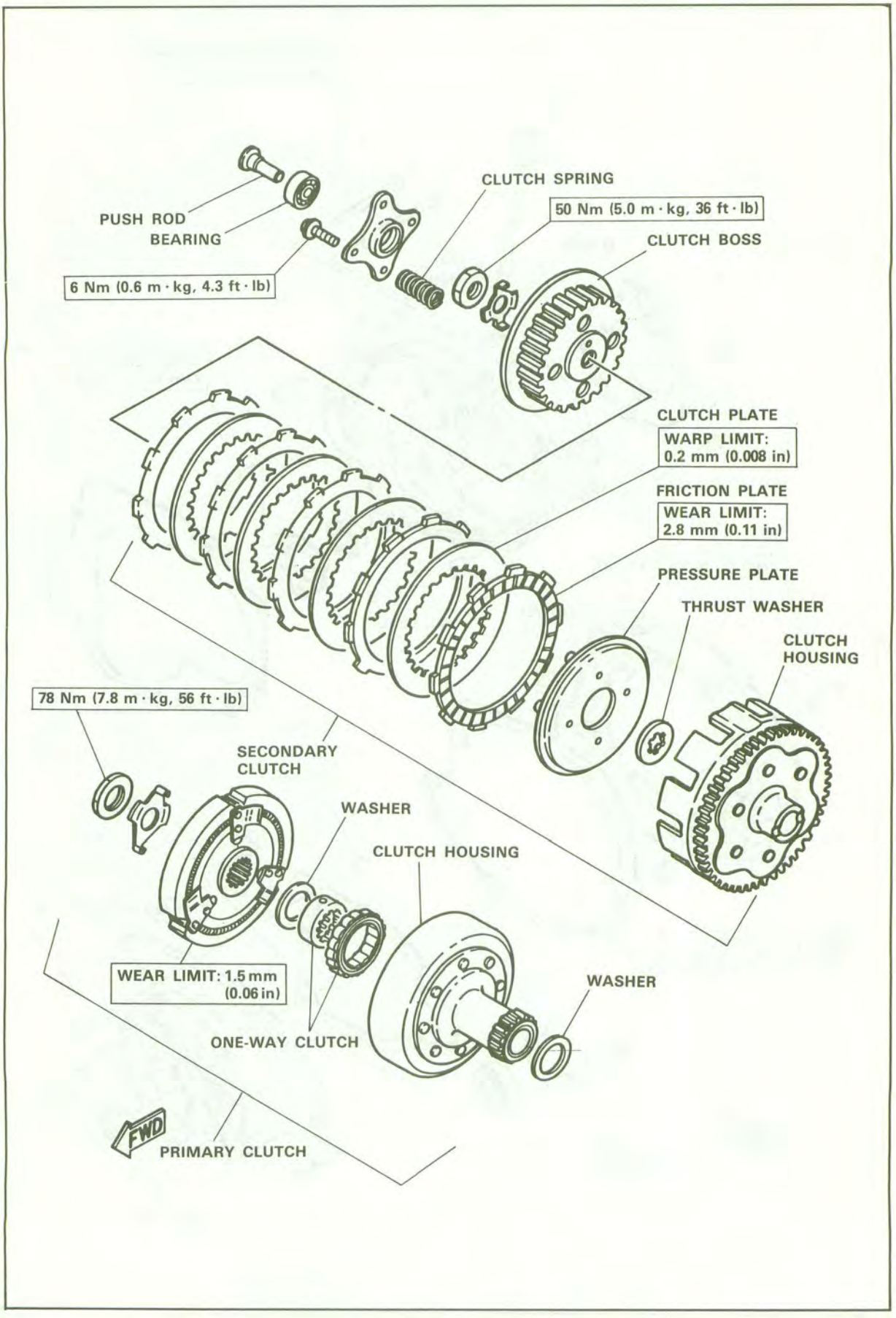
Crankcase


CRANKCASE VENTILATION PIPE
CRANKCASE BOLT (ALL):
7 Nm (0.7 m · kg, 5.1 ft · lb)
APPLY
YAMABOND #4
DOWEL
APPLY
YAMABOND #4
COPPER
WASHER
BLIND
PLUG
COVER BOLT (ALL):
10 Nm (1.0 m · kg, 7.2 ft · lb)
FWD

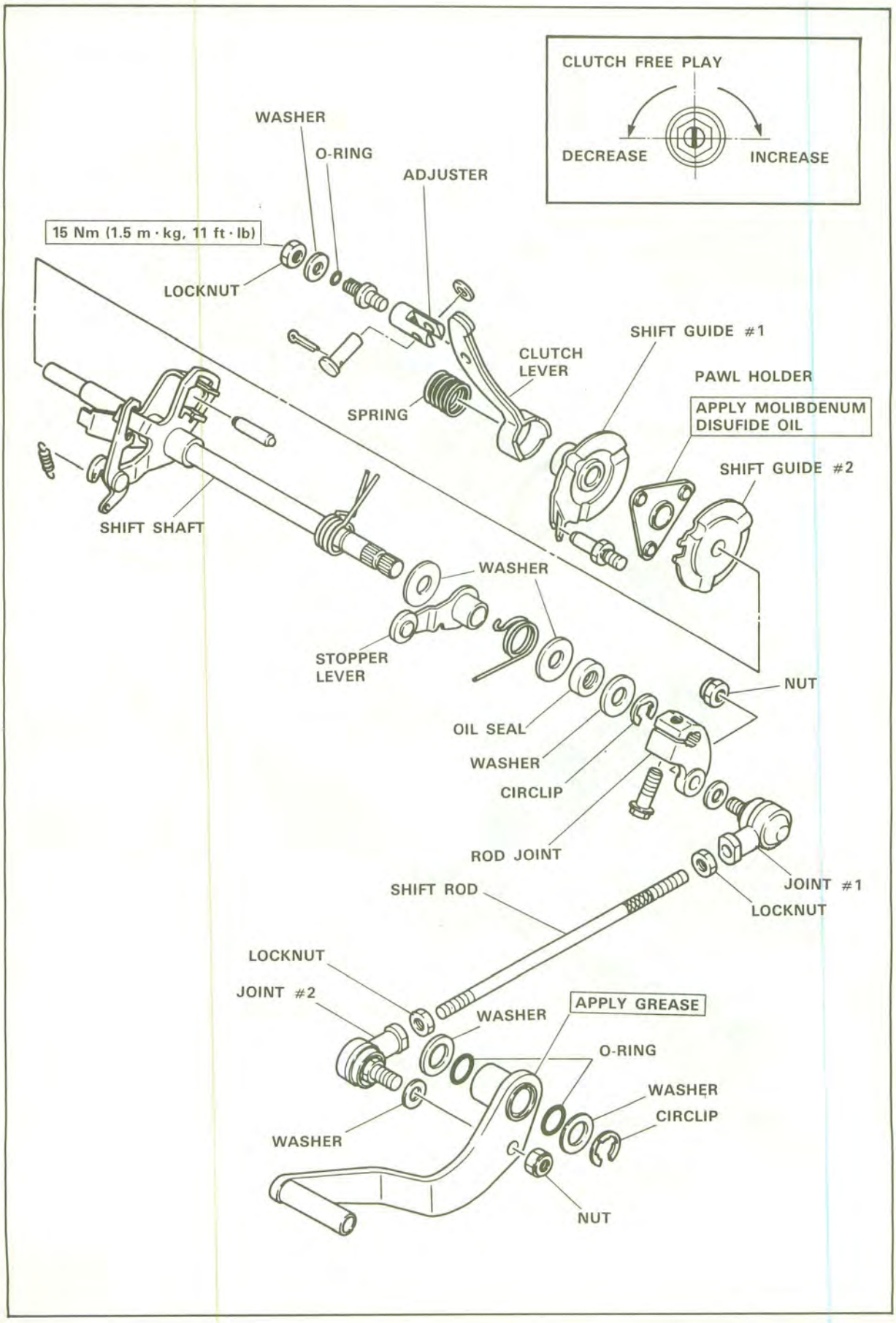
Crankcase Spacer/ Crankcase Covers



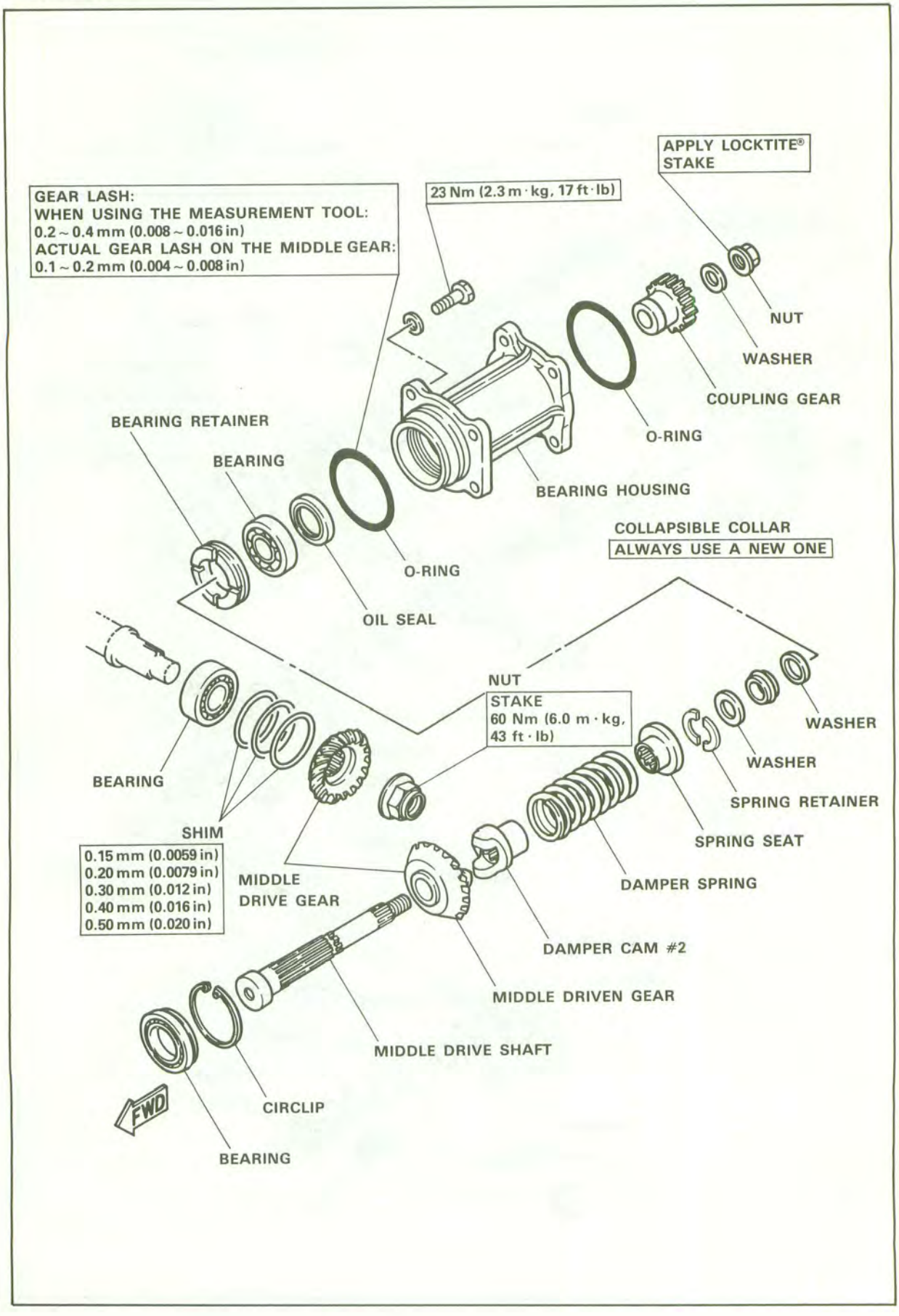
Clutch

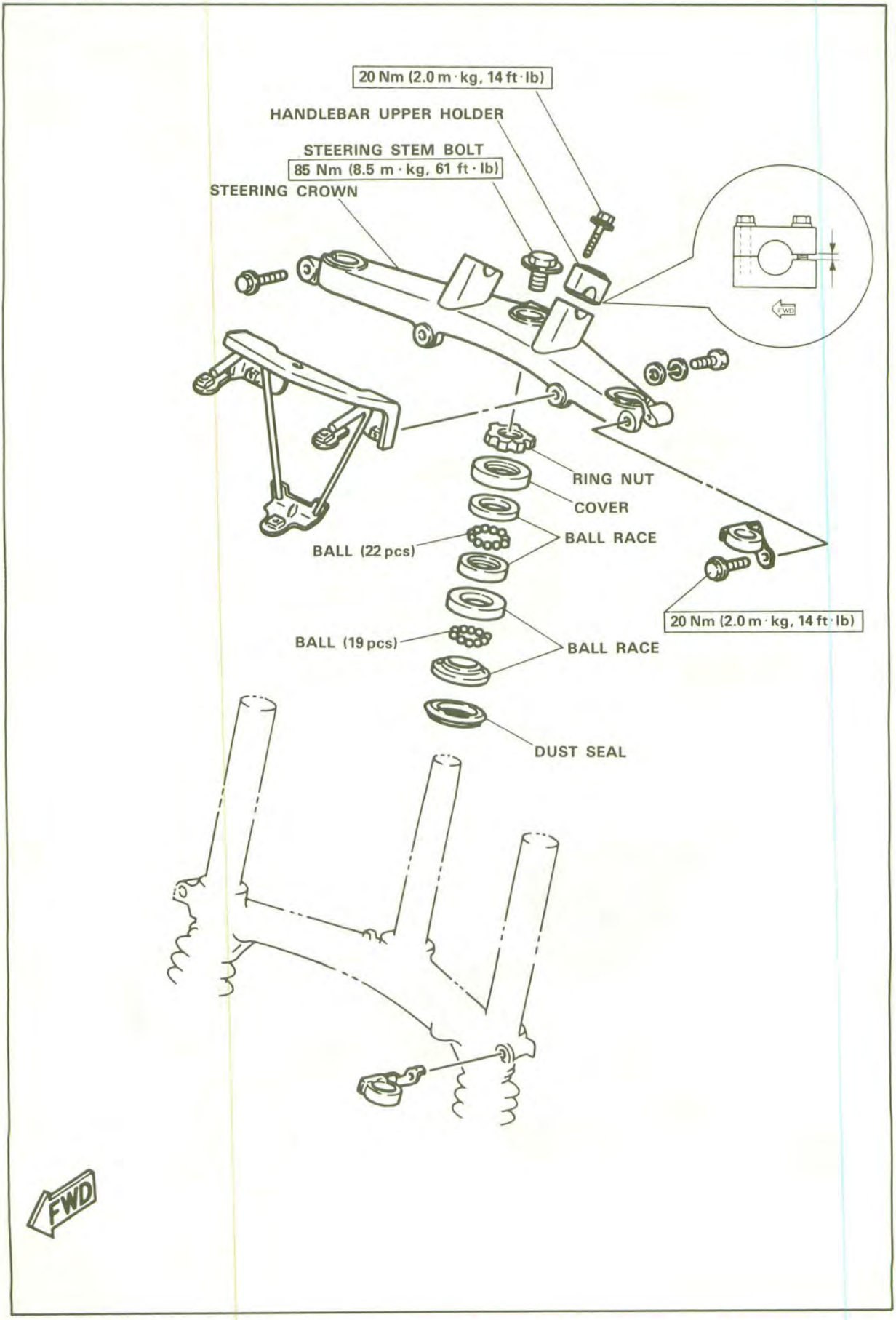

PUSH ROD
BEARING
6 Nm (0.6 m · kg, 4.3 ft · lb)
CLUTCH SPRING
50 Nm (5.0 m · kg, 36 ft · lb)
CLUTCH BOSS
CLUTCH PLATE
WARP LIMIT:
0.2 mm (0.008 in)
FRICTION PLATE
WEAR LIMIT:
2.8 mm (0.11 in)
PRESSURE PLATE
THRUST WASHER
CLUTCH HOUSING
78 Nm (7.8 m · kg, 56 ft · lb)
SECONDARY CLUTCH
WASHER
CLUTCH HOUSING
WEAR LIMIT: 1.5 mm (0.06 in)
WASHER
ONE-WAY CLUTCH
FWD
PRIMARY CLUTCH

Shift Shaft/Change Pedal

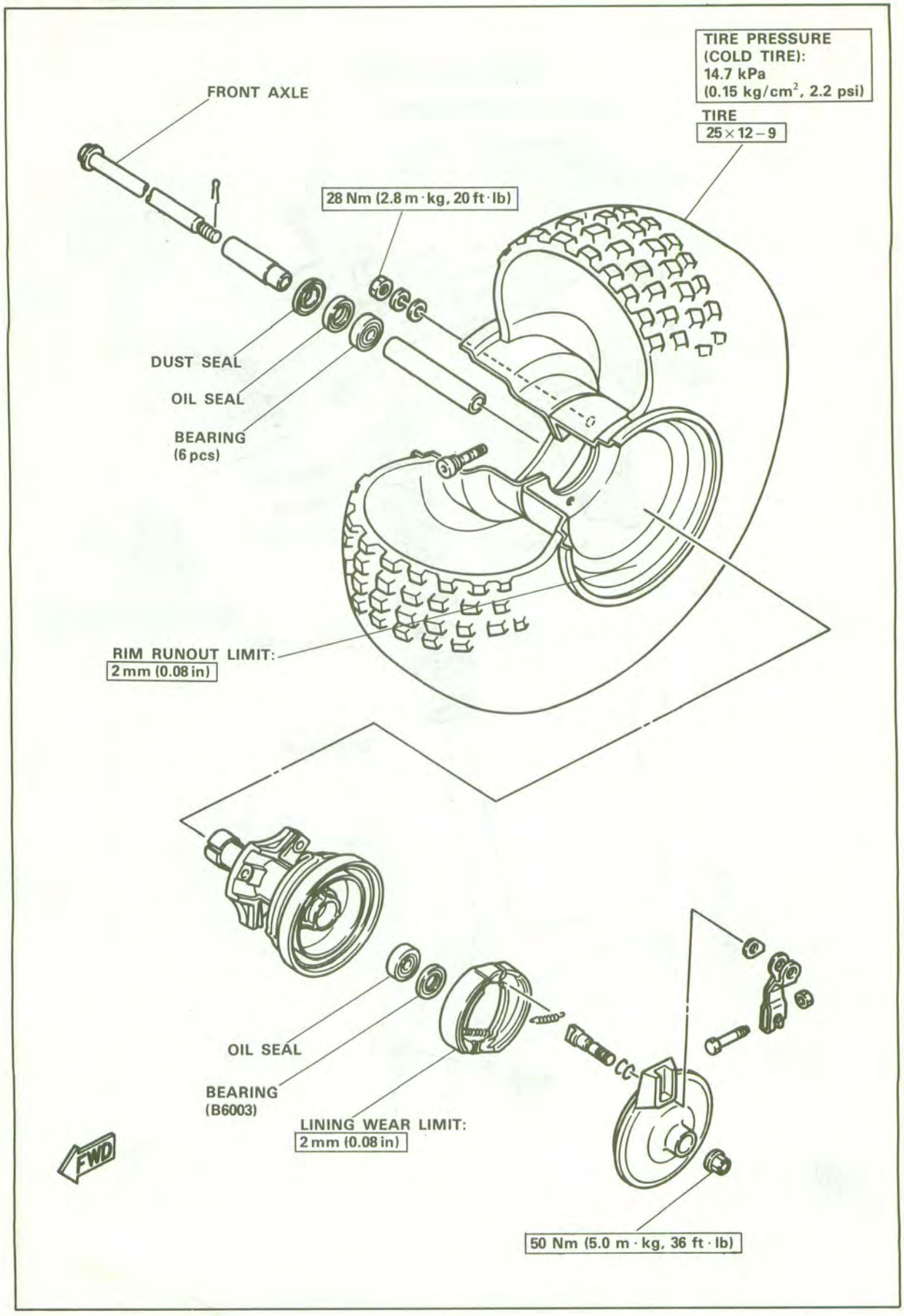


Middle Gear

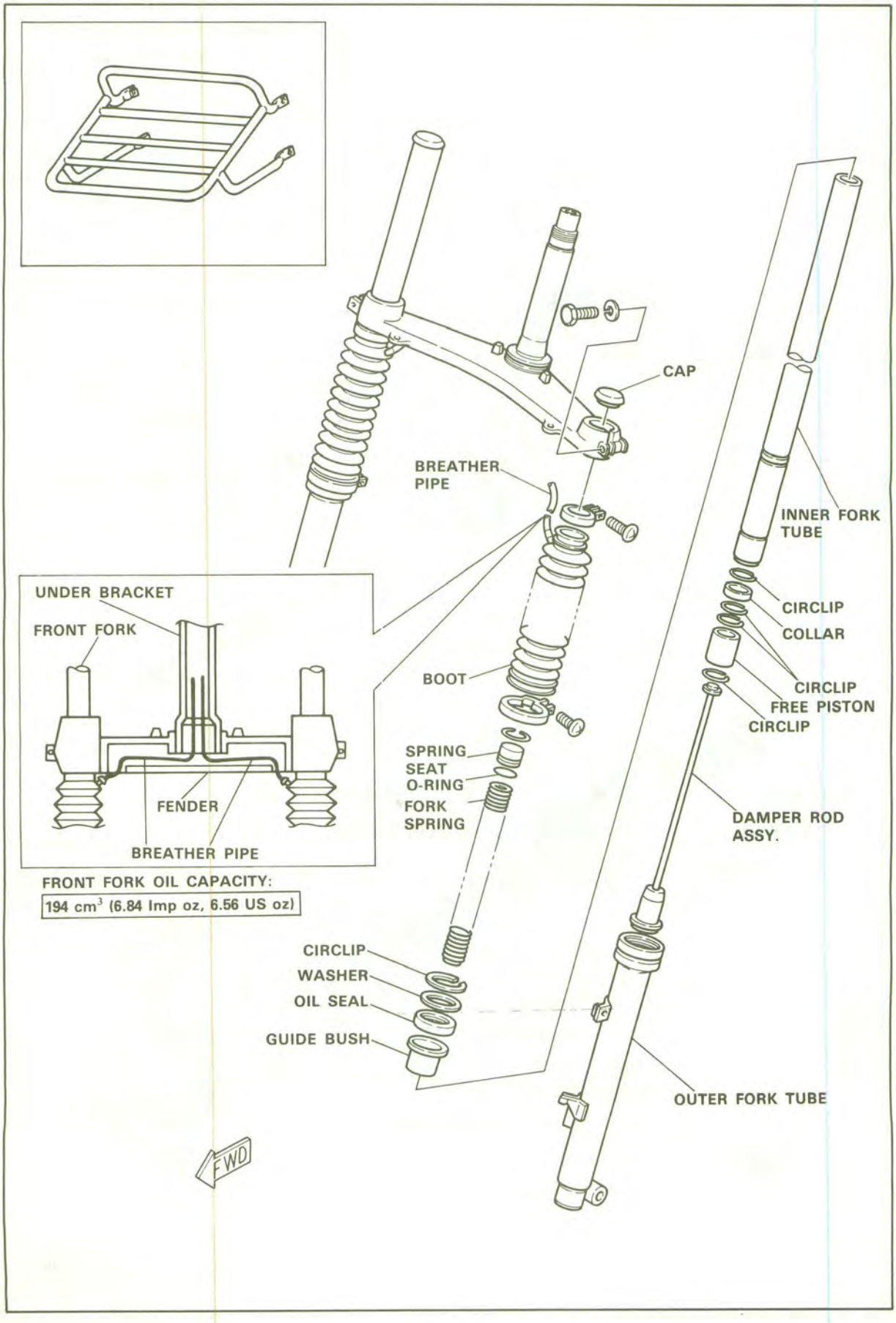

APPLY LOCKTITE®
STAKE
GEAR LASH:
WHEN USING THE MEASUREMENT TOOL:
0.2 ~ 0.4 mm (0.008 ~ 0.016 in)
ACTUAL GEAR LASH ON THE MIDDLE GEAR:
0.1 ~ 0.2 mm (0.004 ~ 0.008 in)
23 Nm (2.3 m · kg, 17 ft · lb)
NUT
WASHER
COUPLING GEAR
O-RING
BEARING HOUSING
BEARING RETAINER
BEARING
O-RING
OIL SEAL
COLLAPSIBLE COLLAR
ALWAYS USE A NEW ONE
NUT
STAKE
60 Nm (6.0 m · kg, 43 ft · lb)
WASHER
WASHER
SPRING RETAINER
SPRING SEAT
DAMPER SPRING
BEARING
SHIM
0.15 mm (0.0059 in)
0.20 mm (0.0079 in)
0.30 mm (0.012 in)
0.40 mm (0.016 in)
0.50 mm (0.020 in)
MIDDLE DRIVE GEAR
DAMPER CAM #2
MIDDLE DRIVEN GEAR
MIDDLE DRIVE SHAFT
CIRCLIP
FWD
BEARING


20 Nm (2.0 m · kg, 14 ft · lb)
HANDLEBAR UPPER HOLDER
STEERING STEM BOLT
85 Nm (8.5 m · kg, 61 ft · lb)
STEERING CROWN
RING NUT
COVER
BALL RACE
BALL (22 pcs)
20 Nm (2.0 m · kg, 14 ft · lb)
BALL (19 pcs)
BALL RACE
DUST SEAL
FWD

Front Wheel

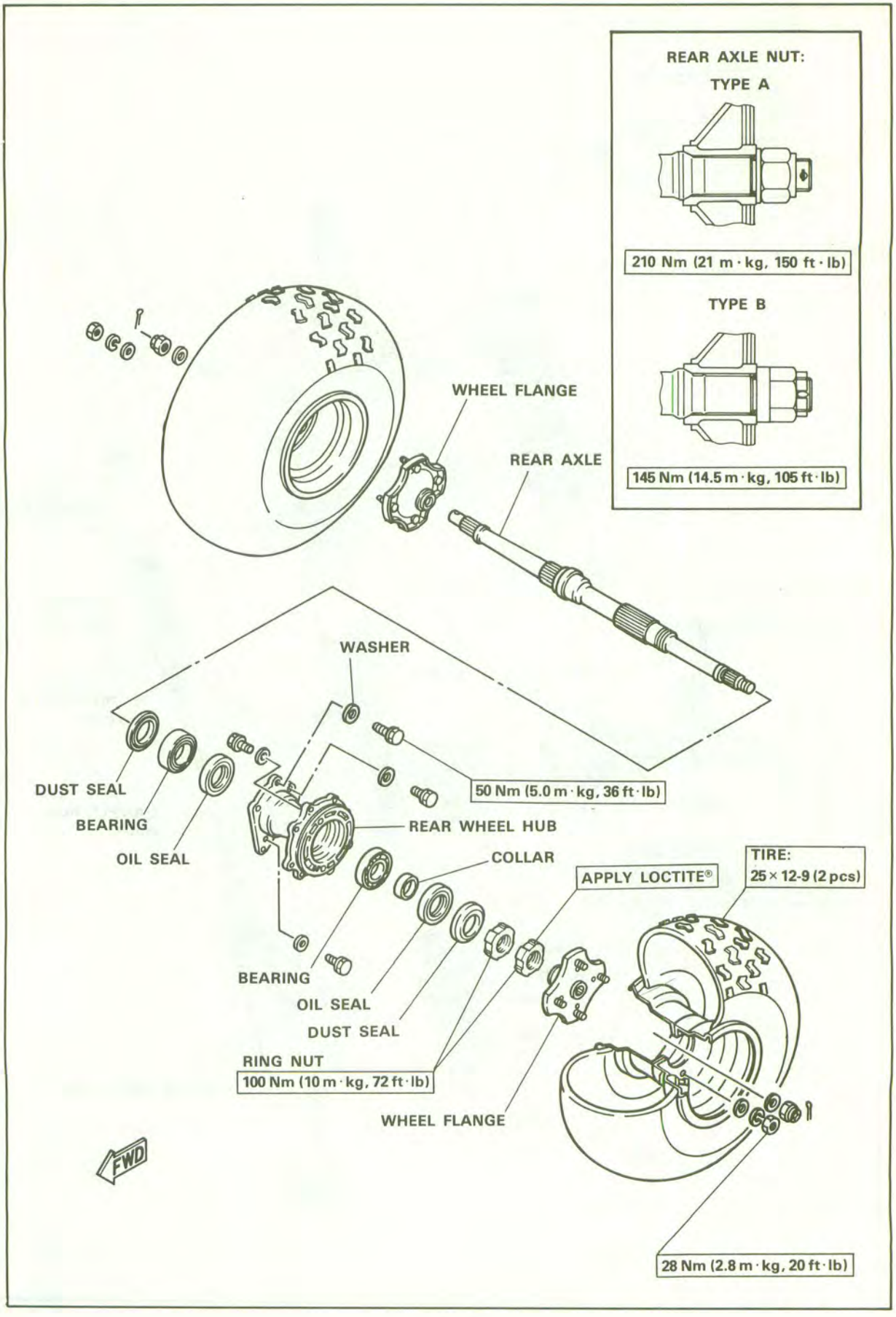

TIRE PRESSURE
(COLD TIRE):
14.7 kPa
(0.15 kg/cm², 2.2 psi)
FRONT AXLE
TIRE
25 × 12 – 9
28 Nm (2.8 m · kg, 20 ft · lb)
DUST SEAL
OIL SEAL
BEARING
(6 pcs)
RIM RUNOUT LIMIT:
2 mm (0.08 in)
OIL SEAL
BEARING
(B6003)
LINING WEAR LIMIT:
2 mm (0.08 in)
FWD
50 Nm (5.0 m · kg, 36 ft · lb)

Front Fork

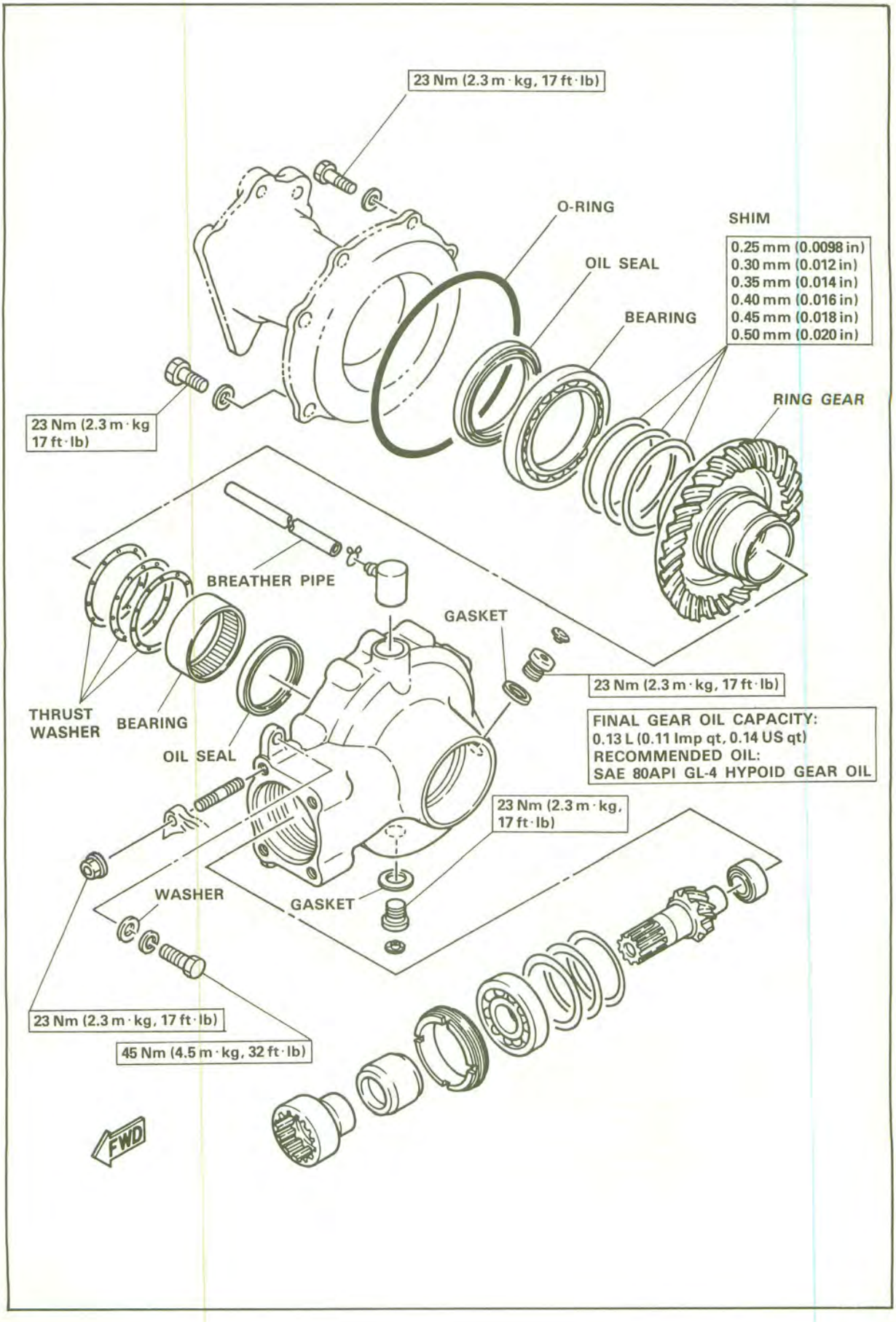


FRONT FORK OIL CAPACITY:
194 cm^3 (6.84 Imp oz, 6.56 US oz)

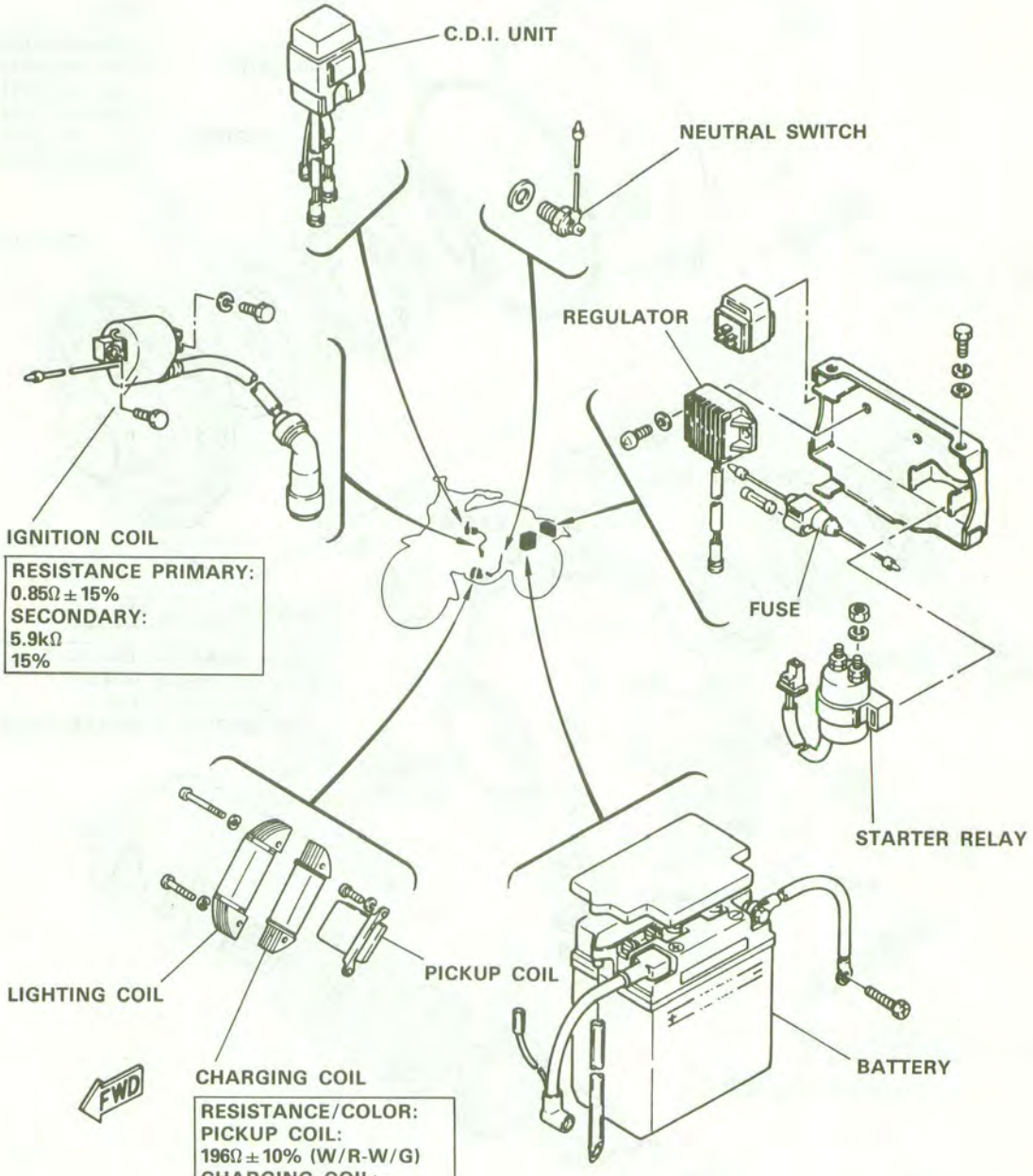
Rear Wheel


REAR AXLE NUT:
TYPE A
210 Nm (21 m · kg, 150 ft · lb)
TYPE B
145 Nm (14.5 m · kg, 105 ft · lb)
WHEEL FLANGE
REAR AXLE
WASHER
DUST SEAL
BEARING
OIL SEAL
50 Nm (5.0 m · kg, 36 ft · lb)
REAR WHEEL HUB
COLLAR
APPLY LOCTITE®
TIRE:
25 × 12-9 (2 pcs)
BEARING
OIL SEAL
DUST SEAL
RING NUT
100 Nm (10 m · kg, 72 ft · lb)
WHEEL FLANGE
FWD
28 Nm (2.8 m · kg, 20 ft · lb)

Final Gear

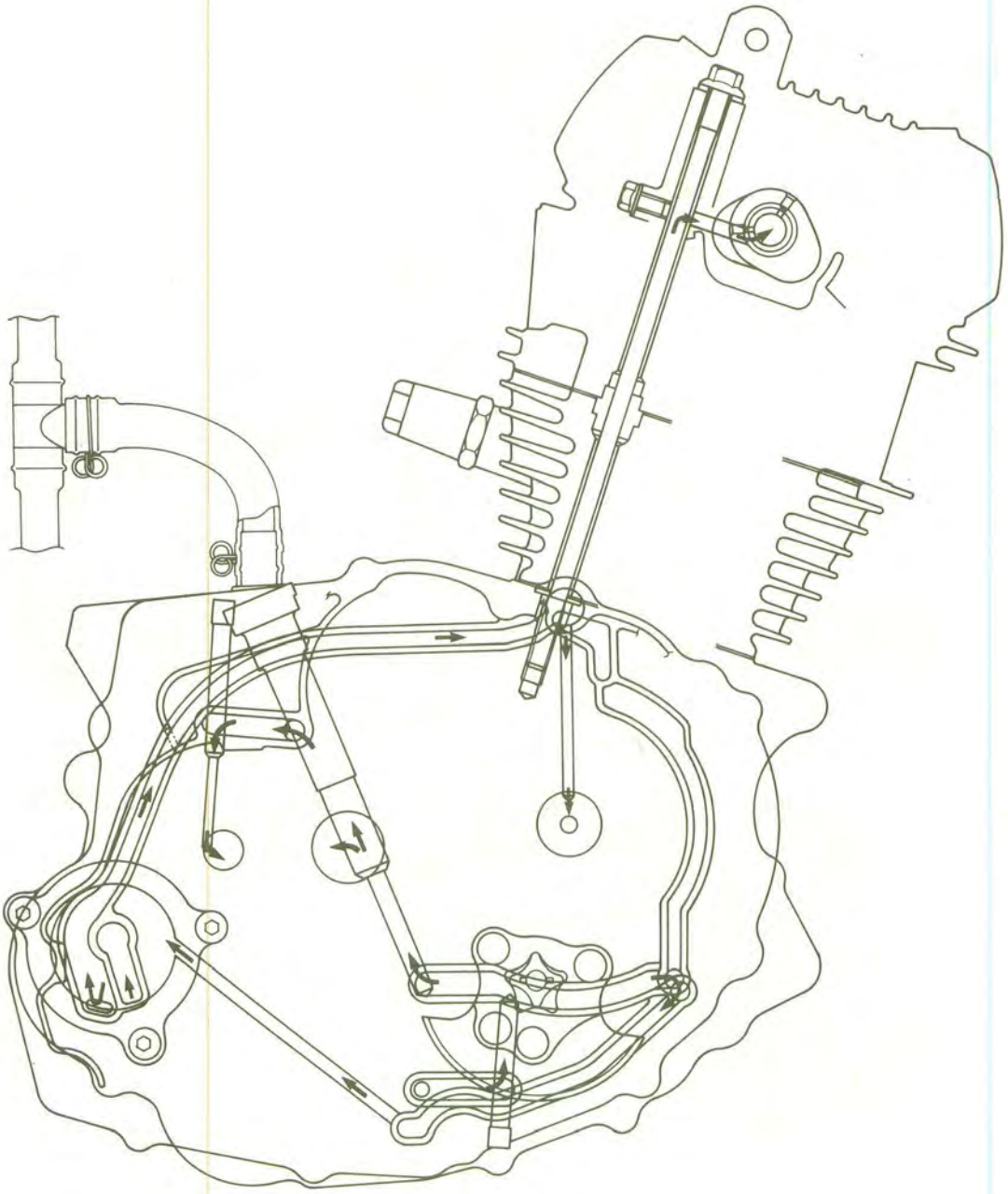

23 Nm (2.3 m · kg, 17 ft · lb)
O-RING
SHIM
0.25 mm (0.0098 in)
0.30 mm (0.012 in)
0.35 mm (0.014 in)
0.40 mm (0.016 in)
0.45 mm (0.018 in)
0.50 mm (0.020 in)
OIL SEAL
BEARING
RING GEAR
23 Nm (2.3 m · kg
17 ft · lb)
BREATHER PIPE
GASKET
23 Nm (2.3 m · kg, 17 ft · lb)
THRUST WASHER
BEARING
OIL SEAL
FINAL GEAR OIL CAPACITY:
0.13 L (0.11 Imp qt, 0.14 US qt)
RECOMMENDED OIL:
SAE 80API GL-4 HYPOID GEAR OIL
23 Nm (2.3 m · kg,
17 ft · lb)
WASHER
GASKET
23 Nm (2.3 m · kg, 17 ft · lb)
45 Nm (4.5 m · kg, 32 ft · lb)
FWD

Electrical Components

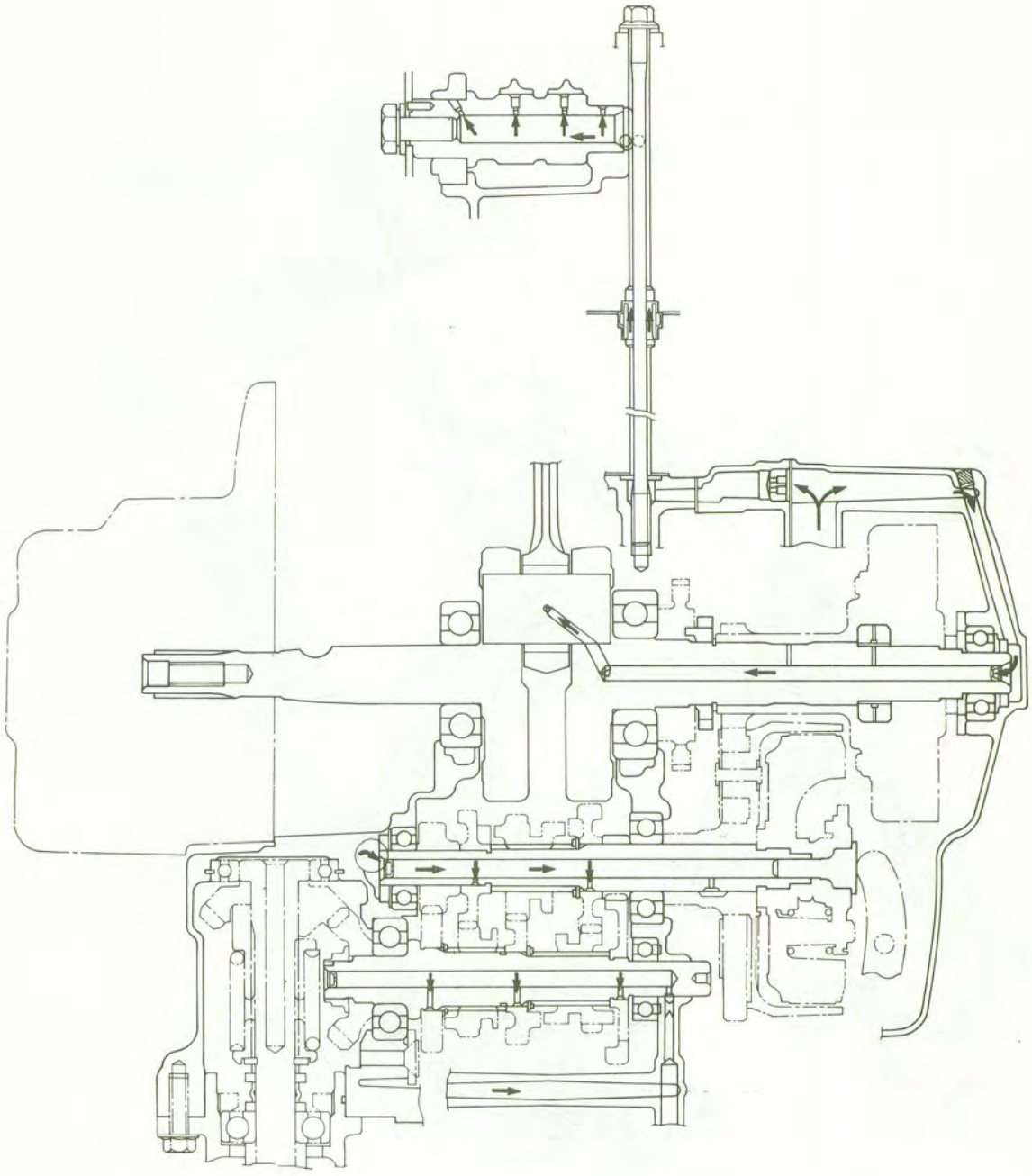


LUBRICATION DIAGRAMS

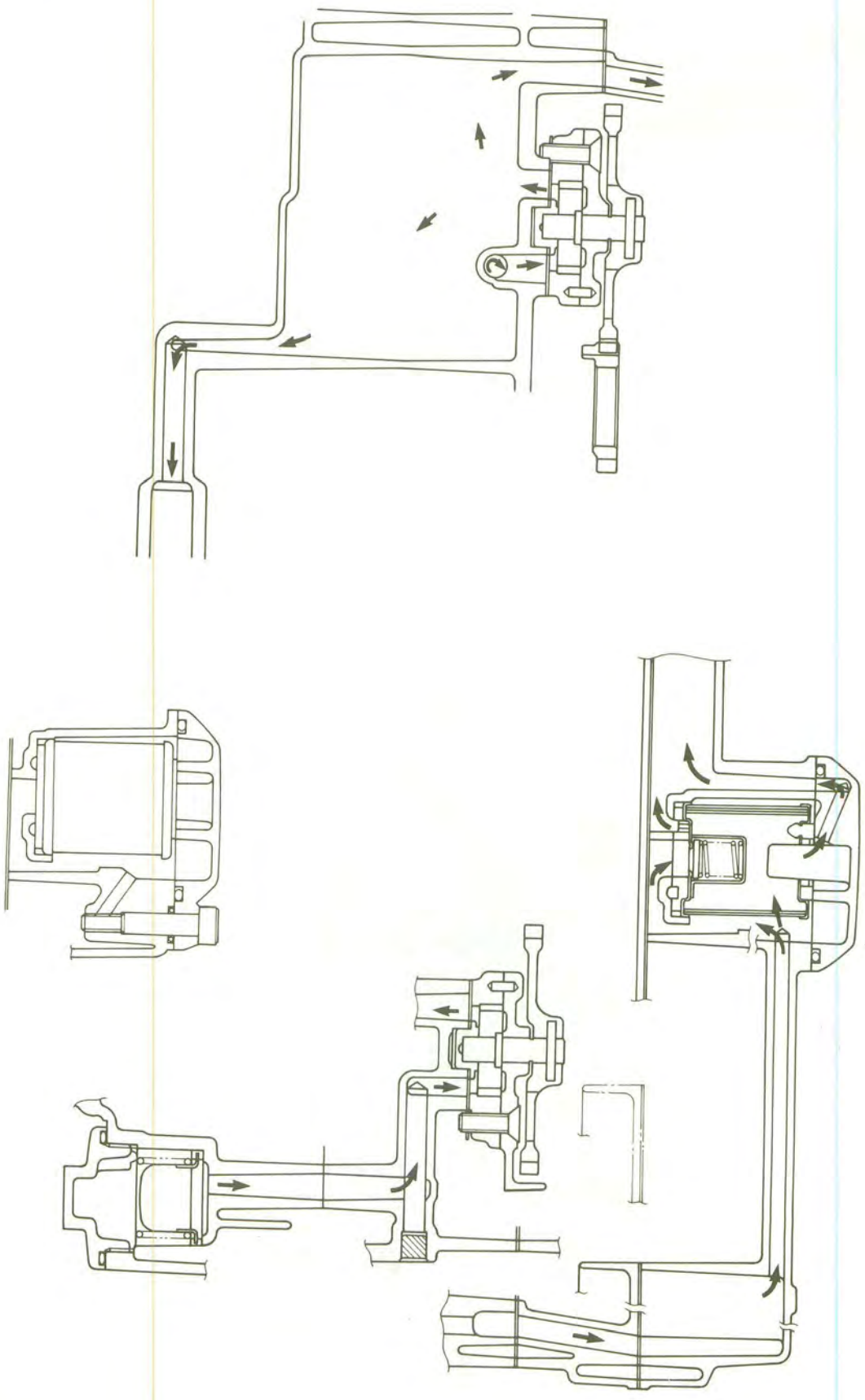
Lubrication Diagram (1)



Lubrication Diagram (2)



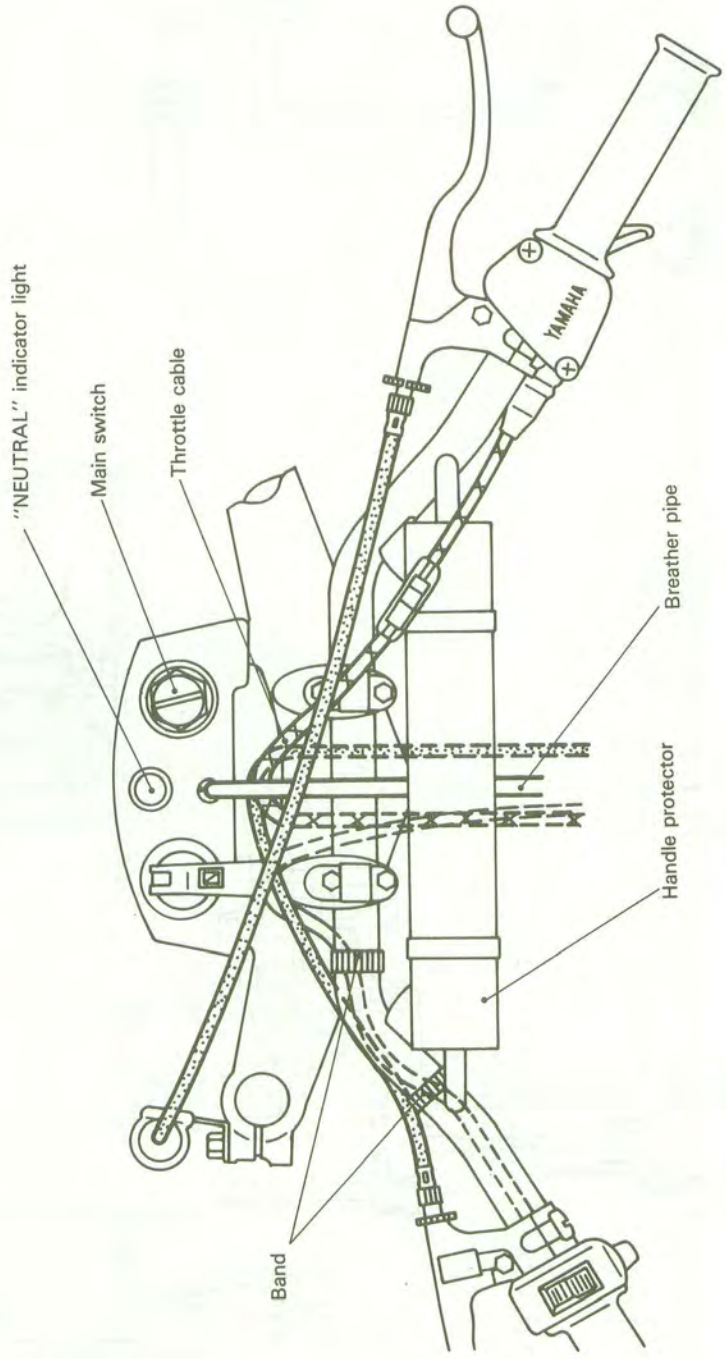
Lubrication Diagram (3)



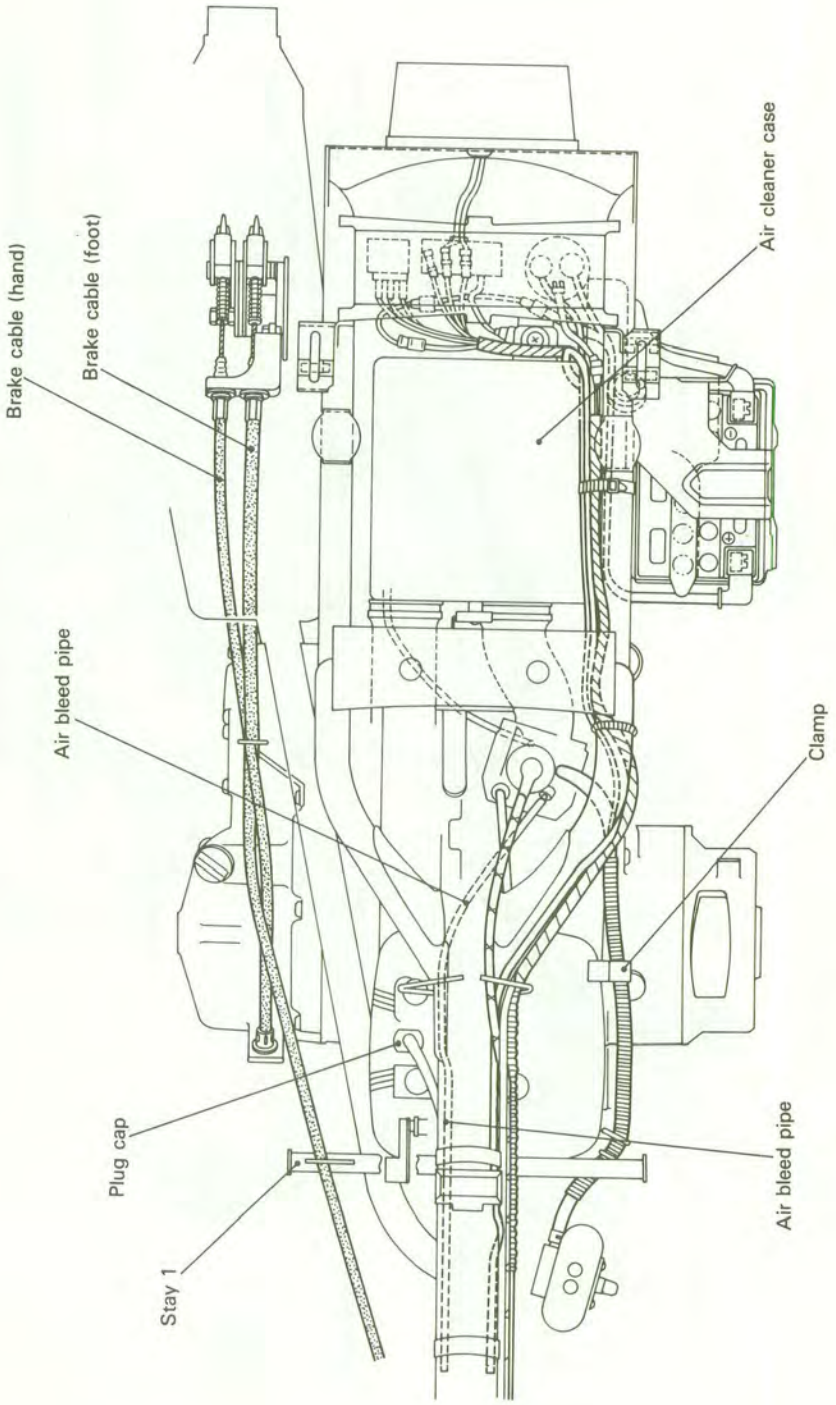
CABLE ROUTING

CAUTION:

Proper cable and lead routing is essential to insure safe vehicle operation.



Fuel cap
Breather pipe
Cable holder
Fuel tank
Starter cable
Rear gear case breather pipe
Main switch cord
C.D.I. unit
Cable holder
Ignition coil
Brake cable (front)
High-tension cord
Cable holder
Wire harness protective tube
Wire harness
Starter cable
Throttle cable
Band
Throttle cable
Level pipe
Band
Air bleed pipe
Clip
Band
Band
Starter motor lead
Lead
Band
Battery
Fuel pipe
Rear gear case breather pipe
Brake cable (hand)
Brake cable (foot)
Battery breather pipe
Air vent pipe
Clip
Lead
Overflow pipe
Clamp


Brake cable (hand)
Brake cable (foot)
Air cleaner case
Air bleed pipe
Clamp
Plug cap
Air bleed pipe
Stay 1

YTM200EK WIRING DIAGRAM