

**YFM200N/DXS/DXT/U
SERVICE MANUAL**

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CHAPTER 1.

GENERAL INFORMATION

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CHAPTER 1. GENERAL INFORMATION

MACHINE IDENTIFICATION

Vehicle Identification Number

The vehicle identification number is stamped into the left-side of the frame.



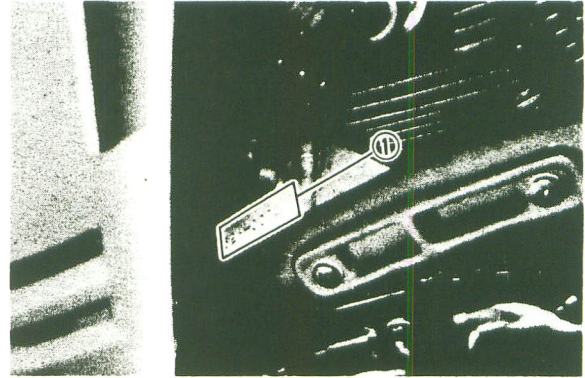
1. Vehicle identification

Starting Serial Number:

YFM200N . . . JY452H00 * FC000101

Engine Serial Number

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



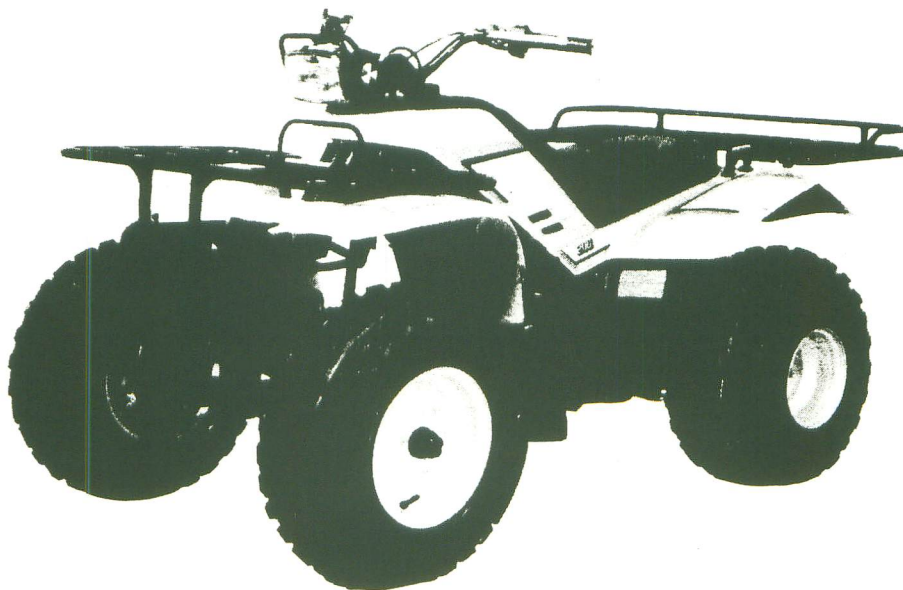
1. Engine serial number

NOTE:

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

Starting Serial Number:

YFM200N . . . 52H-000101



SPECIAL TOOLS

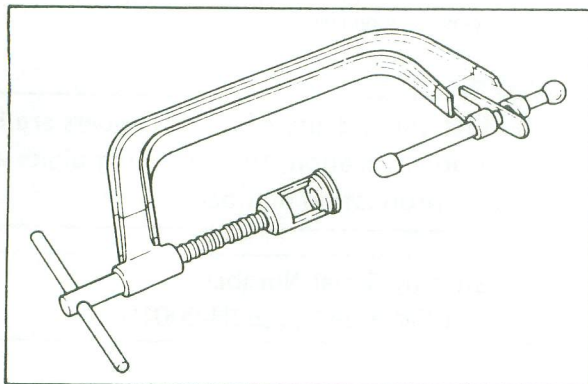
The proper special tools are necessary for complete and accurate tune-up and assembly. Using the correct special tool will help prevent damage caused by the use of improper tools or improvised techniques.

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

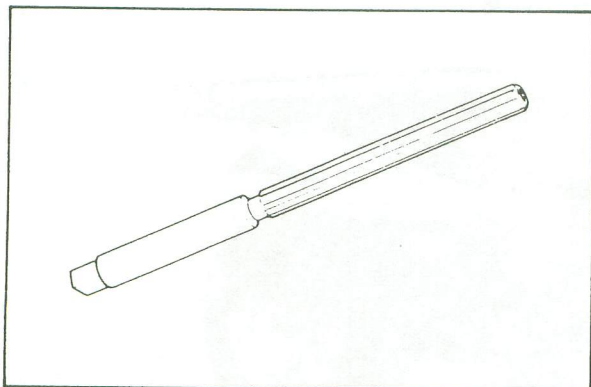
For Engine Service

1. Valve spring compressor
P/N YM-04019



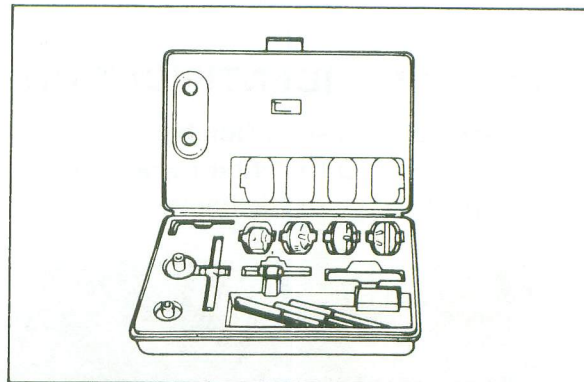
This tool must be used for removing and installing the valve assemblies.

2. Valve guide reamer
P/N YM-04066



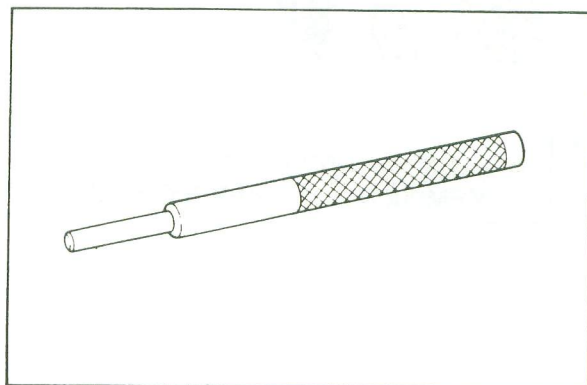
This must be used when replacing the valve guide.

3. Valve seat cutter
P/N YM-91043



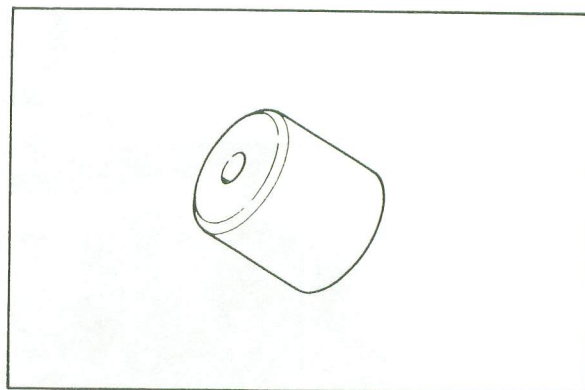
This tool is needed to resurface the valve seat.

4. Valve guide remover
P/N YM-04064



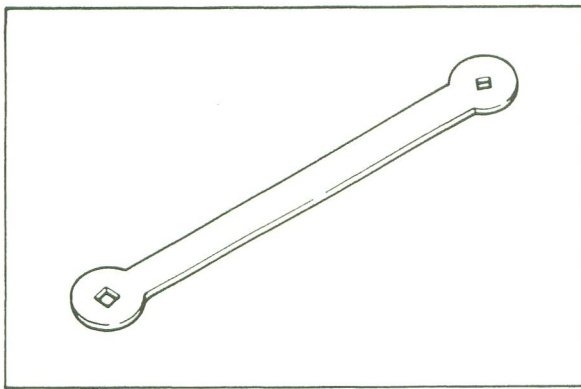
This must be used to remove the valve guides.

5. Valve guide installer
P/N YM-04065



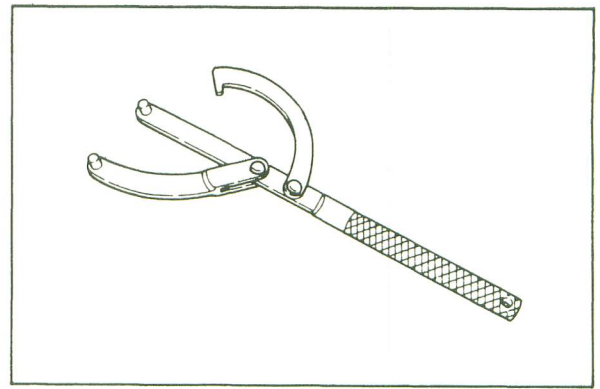
This tool is needed for proper installation of the valve guides.

6. Valve adjusting tool
P/N YM-08035



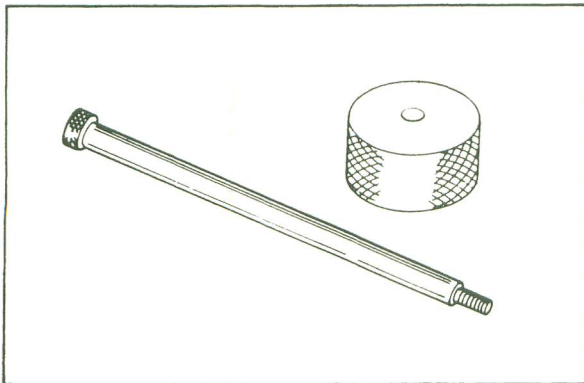
This tool is used when adjusting the valve clearance.

9. Universal rotor holder
P/N YU-01235



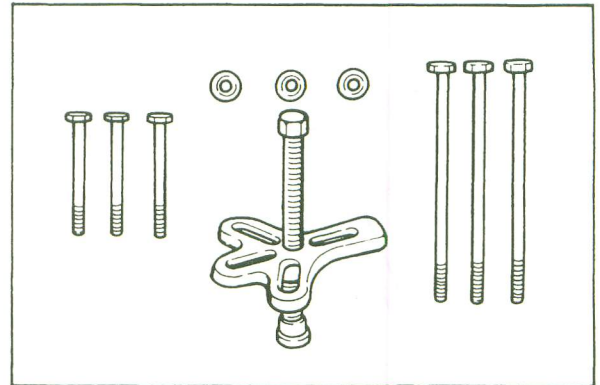
This tool is used to hold the clutch when removing or tightening the clutch boss securing nut, etc.

7. Slide hammer
P/N YU-01083



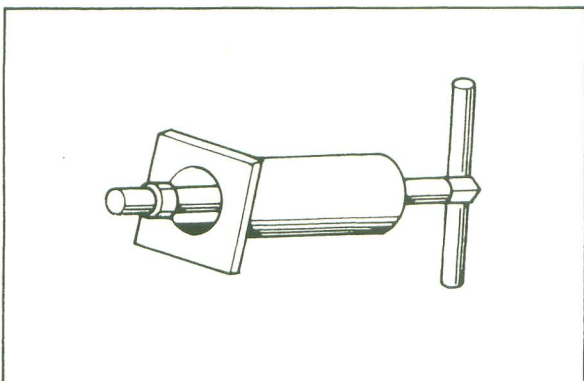
These tools are used when removing the rocker arm shaft.

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



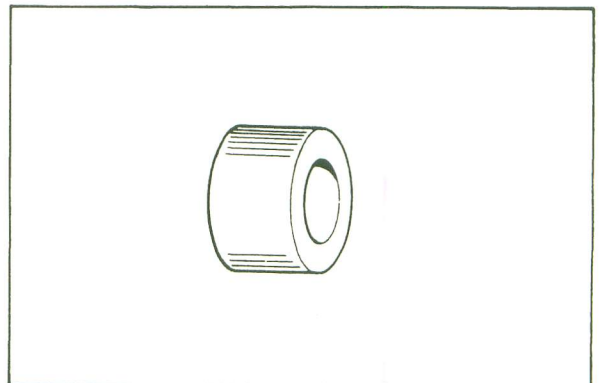
This tool is used for removing the flywheel.

8. Piston pin puller
P/N YU-01304



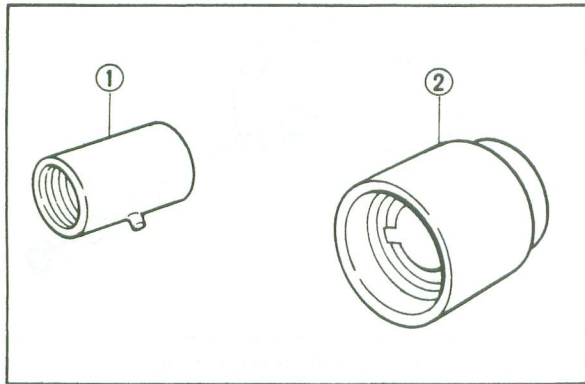
This tool is used when removing the piston pin.

11. Flywheel puller attachment
P/N YM-33278

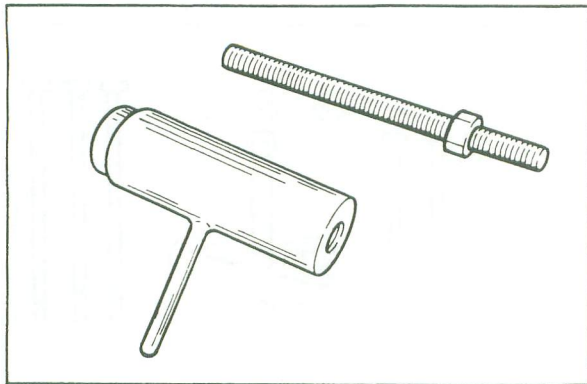


This tool is used to protect the end of the crankshaft when removing the flywheel.

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

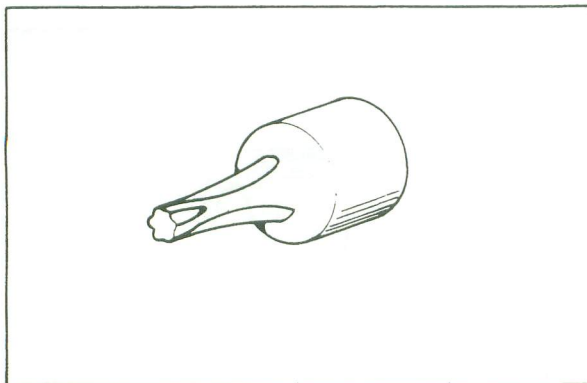


13. Crankshaft installer
 P/N YU-90050



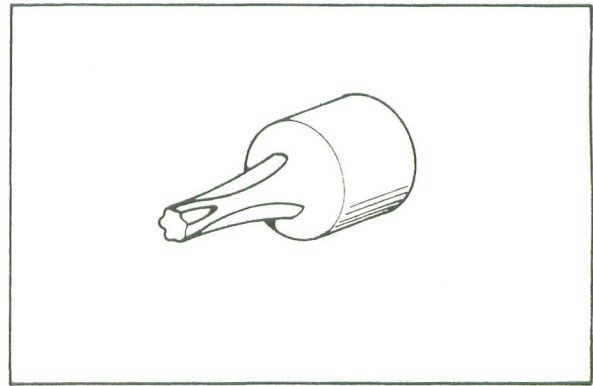
These tools are used to install the buffer boss.

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



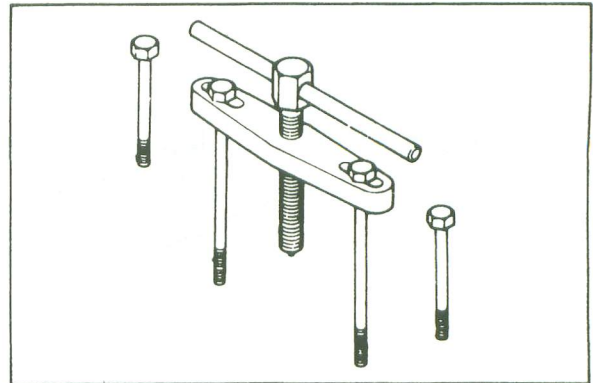
This tool is used to loosen or tighten the shift cam segment securing bolt.

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



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

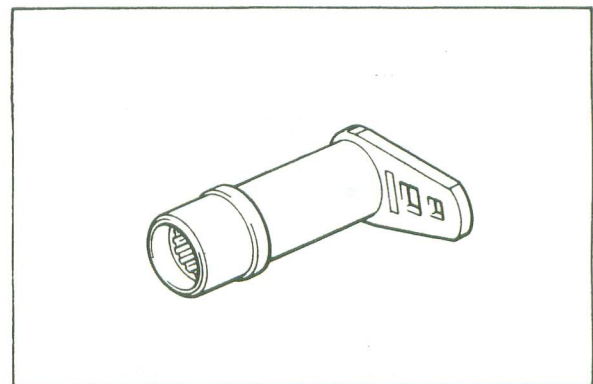
16. Crankshaft separator
 P/N YU-01135



This tool is used when separating the crankshaft.

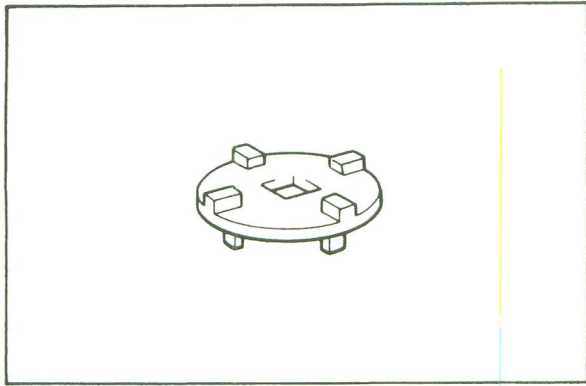
For Middle Gear Service

1. Coupling gear holder
 P/N YM-1393



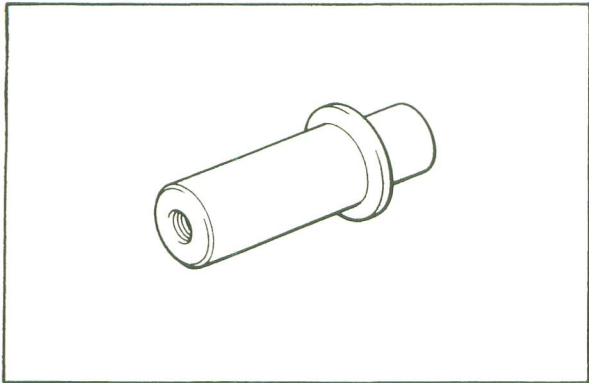
This tool is used when adjusting gear lash in the middle gear.

2. Ring nut wrench
P/N YM-1391



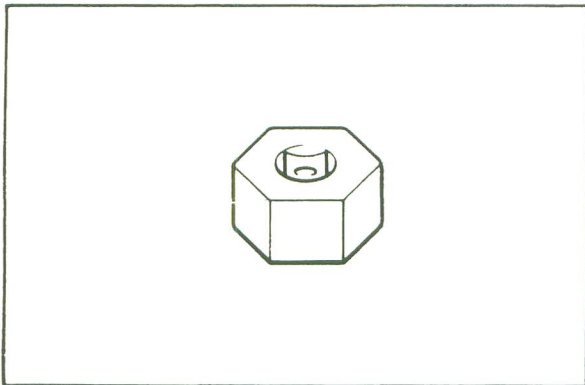
This tool is used to remove and install the ring nuts which hold the bearing in the middle gear housing.

3. Middle gear lash tool
P/N YM-1392



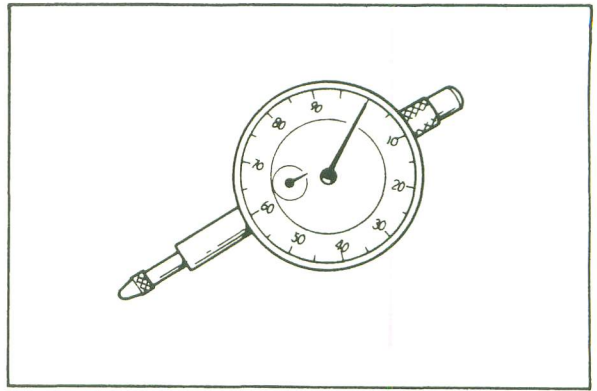
This tool is used to measure the middle gear backlash.

4. Bearing retainer wrench
P/N YM-33289



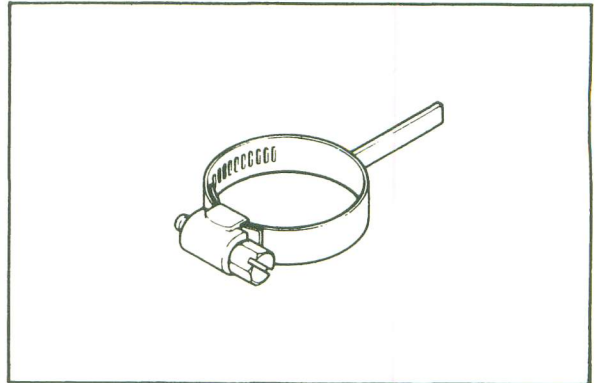
This tool is used to remove and install the bearing retainer nut in the middle gear housing.

5. Dial indicator
P/N YU-03097



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

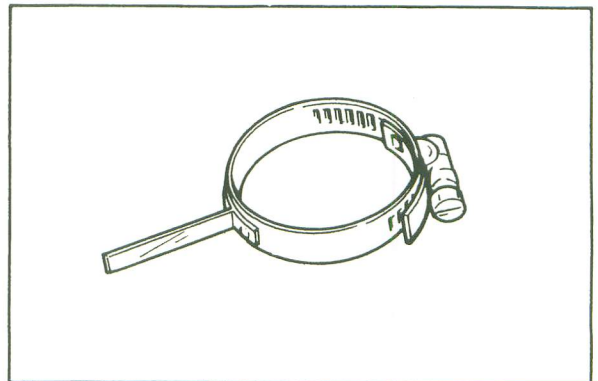
6. Gear lash tool
P/N YM-01230



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

For Final Gear Service

1. Gear lash tool
P/N YM-01231

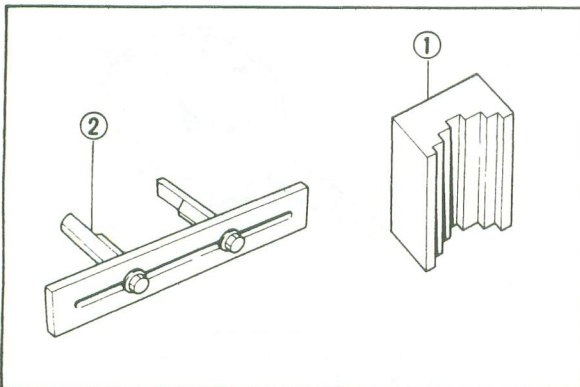


This tool is needed when measuring gear lash for final gear.

2. 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 Electrical Components

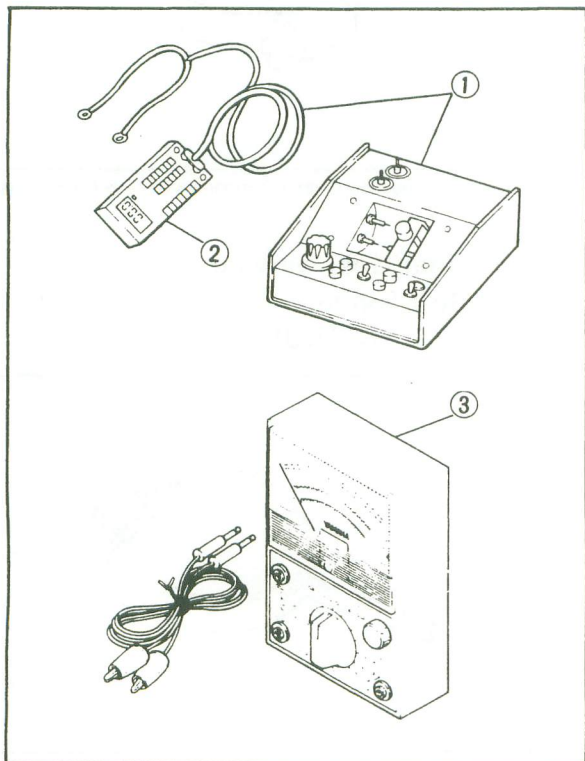
Electro tester set

P/N. YU-33260 ①

Pocket tester

P/N. YU-33263 ②

or P/N. YU-03112 ③



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 the 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 than shown on the chart to avoid damage caused by water to metal parts.

Periodic Maintenance/Lubrication

Item	Remarks	Initial			Every	
		1 month	3 months	6 months	6 months	1 year
Valve(s)*	Check valve clearance. Adjust if necessary.	○		○	○	○
Cam chain*	Check chain tension. Adjust if necessary.	○		○	○	○
Spark plug(s)	Check condition. Clean or replace if necessary.	○	○	○	○	○
Air filter	Clean. Replace if necessary.		○	○	○	○
Carburetor*	Check idle speed/starter operation. Adjust if necessary.		○	○	○	○
Fuel line*	Check fuel hose for cracks or damage. Replace if necessary.			○	○	○
Engine oil	Replace (Warm engine before draining).	○		○	○	○
Engine oil filter	Clean	○		○		○
Engine oil strainer	Clean	○		○		○
Final gear oil	Check oil level/oil leakage. Replace every 12 months.	○				○
Brake*	Check operation. Adjust if necessary.	○	○	○	○	○
Clutch*	Check operation. Adjust if necessary.	○		○	○	○
Decompression system*	Check operation. Adjust if necessary.			○	○	○
Wheels*	Check balance/damage/runout. Repair if necessary.	○		○	○	○
Wheel bearings*	Check bearings assembly for looseness/damage. Replace if damaged.	○		○	○	○
Steering system*	Check operation/replace if damaged. Check toe-in/adjust if necessary.	○	○	○	○	○
Knuckle shaft*	Lubricate every 6 months.**			○	○	○
Fittings/Fasteners*	Check all chassis fittings and fasteners. Correct if necessary.	○	○	○	○	○
Battery*	Check specific gravity. Check breather pipe for proper operation. Correct if necessary.	○	○	○	○	○

* It is recommended that these items be serviced by a Yamaha dealer.

** Lithium soap base grease.

ENGINE

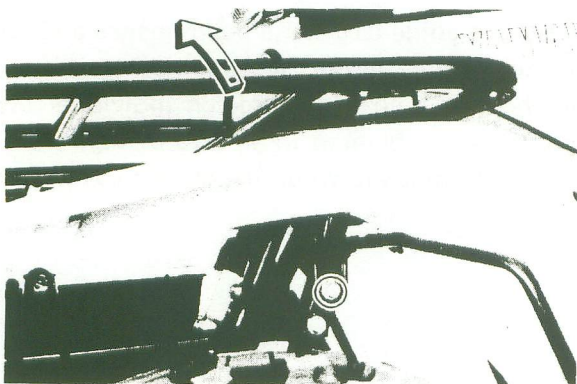
Valve Clearance

Adjust the valve clearance as follows:

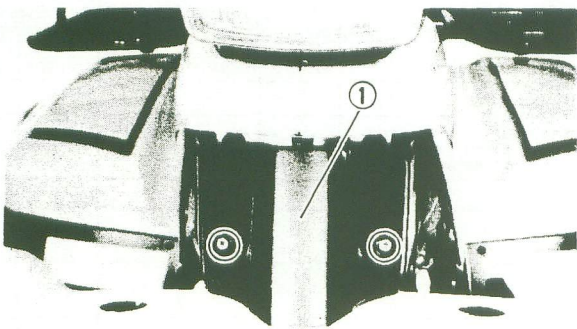
NOTE:

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

1. Remove the front carrier securing bolts and pull the carrier forward.



2. Remove the front panel.



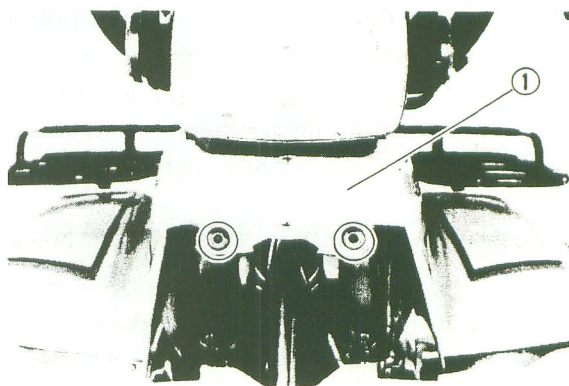
1. Front panel

3. Remove the seat and fuel tank cover.



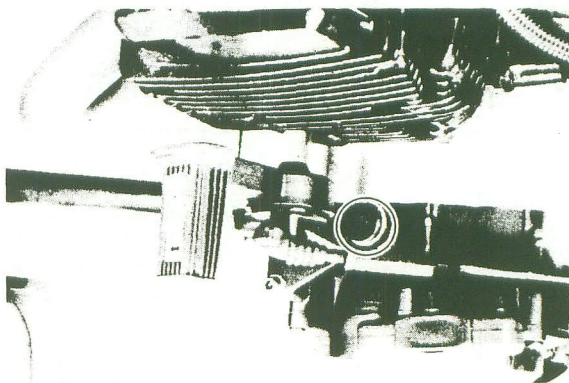
NOTE:

Unhook the fuel tank cover first, then carefully pull the cover toward the front.



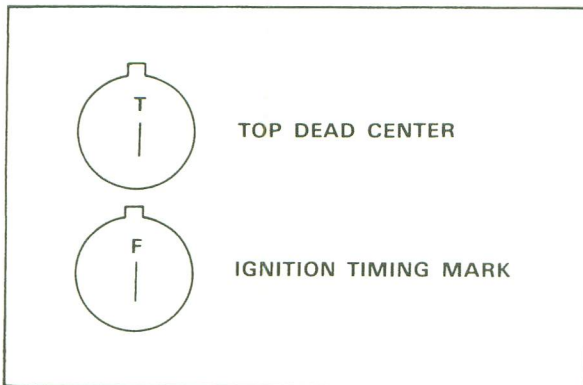
1. Fuel tank cover

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



6. 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 aligned 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:



7. Use a feeler gauge to determine the clearance.

Intake valve (cold):

0.05 ~ 0.09 mm (0.002 ~ 0.004 in)

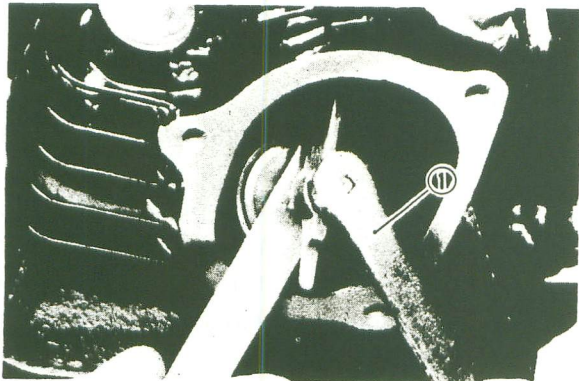
Exhaust valve (cold):

0.11 ~ 0.15 mm (0.004 ~ 0.006 in)

8. 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.

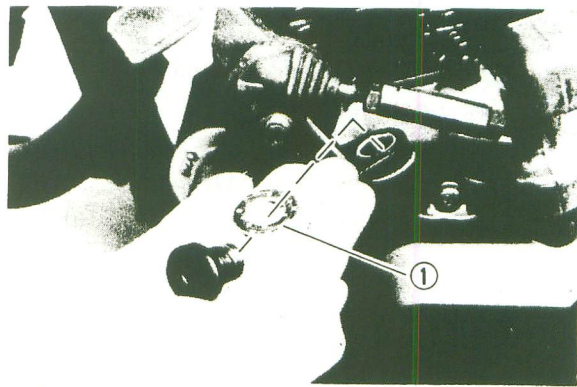
TIGHTENING TORQUE:

14 Nm (1.4 m·kg, 10 ft·lb)



1. Valve adjusting tool

9. Check the valve cover O-rings and timing window plug gasket for damage. If damaged, replace.



1. Gasket

10. Install the valve covers and the timing window plug.

TIGHTENING TORQUE:

Valve cover:

10 Nm (1.0 m·kg, 7.2 ft·lb)

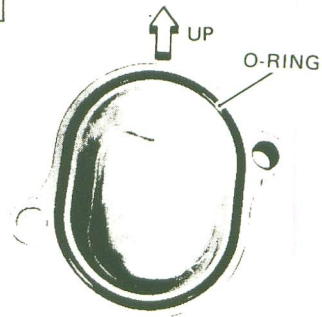
Timing window plug:

15 Nm (1.5 m·kg, 11 ft·lb)

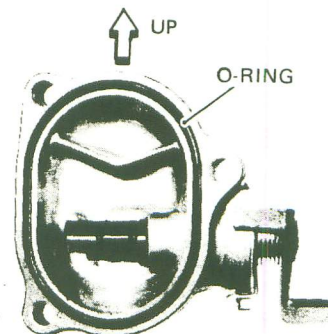
CAUTION:

Install the valve cover with its ridge facing upward as shown.

INLET



EXHAUST

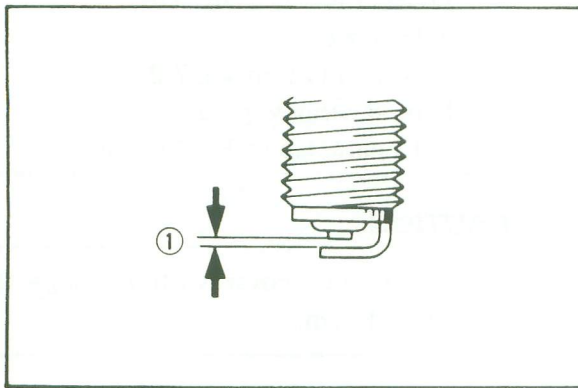


11. Install the fuel tank cover, front panel, and seat.
12. Reinstall the front carrier in the original position.

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

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 specification.



1. Spark plug gap

3. If the electrodes become too worn, replace.
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:
17.5 Nm (1.75 m·kg, 12.5 ft·lb)

Fuel Line

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

Exhaust System

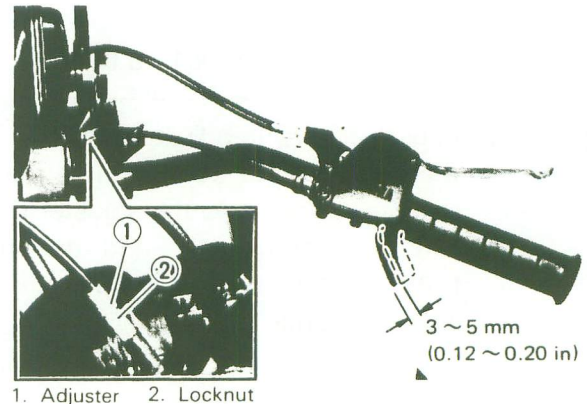
1. Tighten the exhaust pipe flange and muffler securing bolts.

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 reaching the specified free play at the throttle lever.

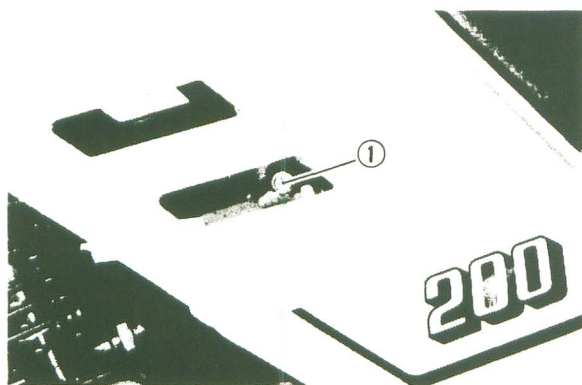


1. Adjuster 2. Locknut

Throttle lever free 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

Engine idle: $1,400 \pm 50$ r/min
Pilot screw (turns out): 1 ~ 2

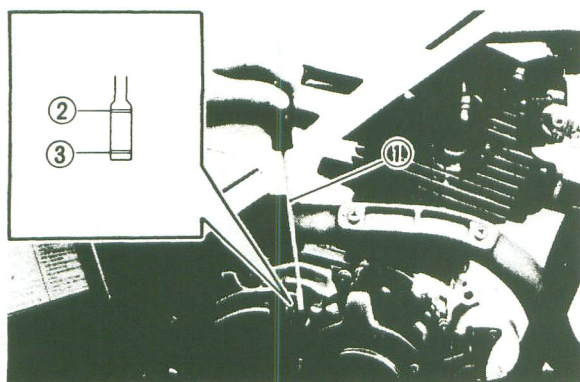
Engine Oil

Oil level measurement

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

NOTE:

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



1. Dipstick 2. Maximum level 3. Minimum level

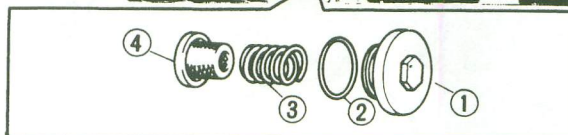
2. The dipstick has a minimum and a maximum mark, and the oil level should be between the two. If the level is lower, then add sufficient oil to raise it to the proper level.

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 plug 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:

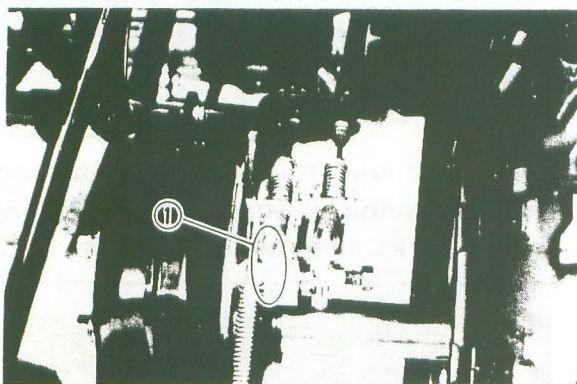
The oil filter cover is secured by two filter cover bolts and the drain bolt. The drain bolt should be loosened until the threaded portion comes out completely.



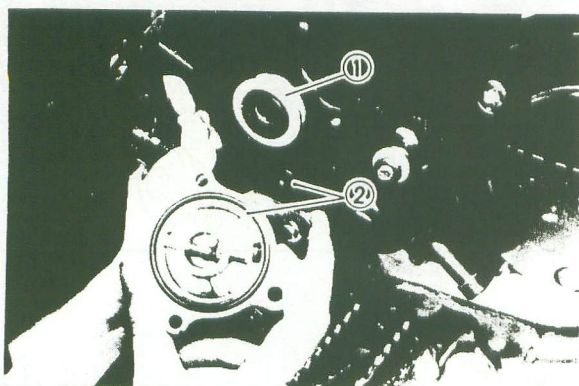
1. Filter cover bolt 2. Drain bolt

Oil filter removal

1. Loosen the foot brake adjuster, and remove the oil filter cover and filter element.



1. Foot brake adjuster



1. Oil filter element

2. O-ring

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:

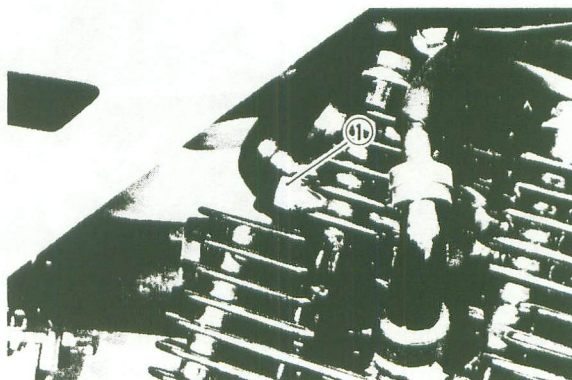
Yamalube 4 cycle oil or SAE 20W40 type SE motor oil

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:

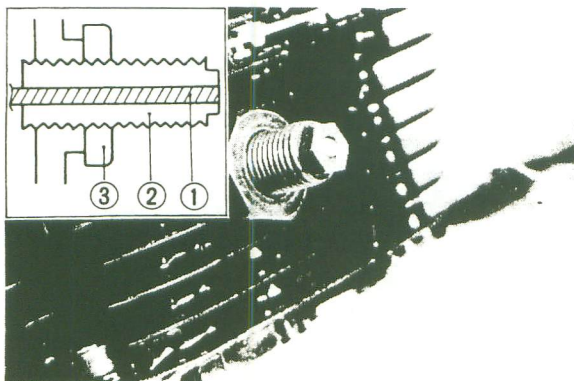
7 Nm (0.7 m·kg, 5.1 ft·lb)

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 tensioner 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 tensioner cap and timing window plug.

TIGHTENING TORQUE:

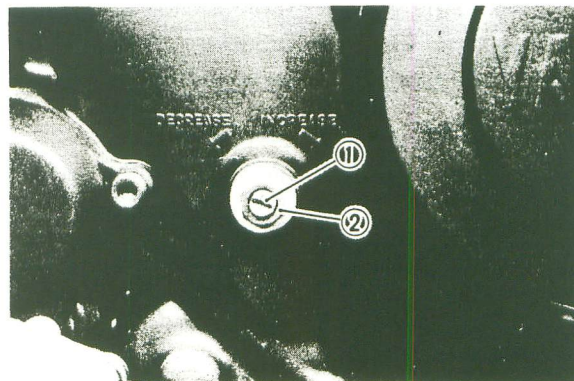
Adjuster locknut:

30 Nm (3.0 m·kg, 22 ft·lb)

Tensioner cap:

5 Nm (0.5 m·kg, 3.6 ft·lb)

Clutch Adjustment

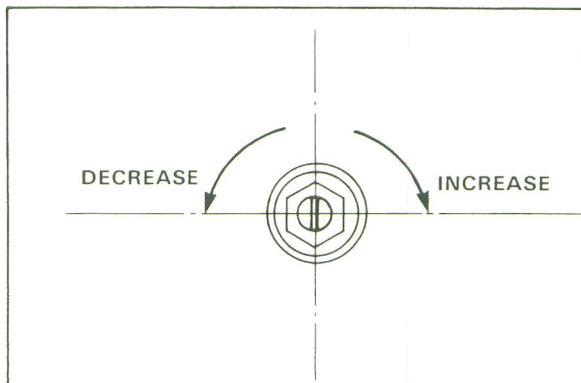


1. Adjuster 2. Locknut

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)

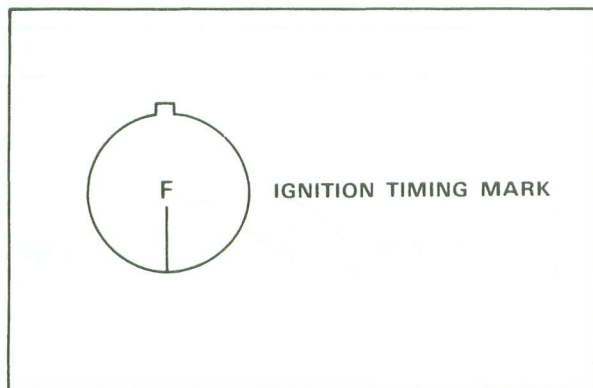
Checking Ignition Timing

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: $1,400 \pm 50$ 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 stabilizes. The compression should be within the specified levels.

Compression pressure (at sea level):

Standard:

883 kPa (9 kg/cm², 128 psi)

Minimum:

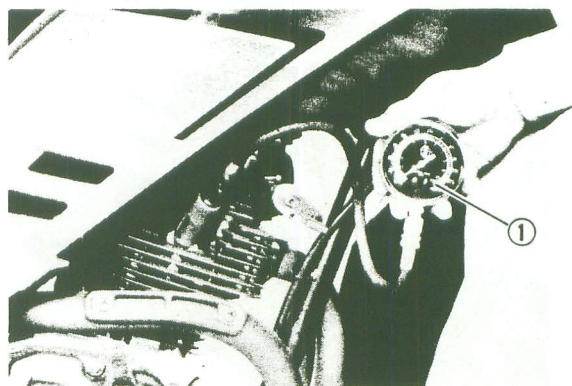
785 kPa (8 kg/cm², 114 psi)

Maximum:

981 kPa (10 kg/cm², 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

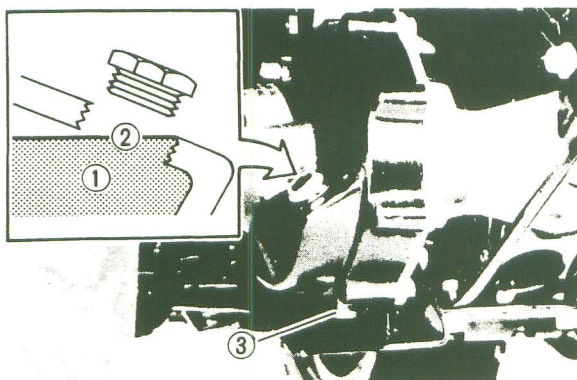
Final Gear Oil

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 whether the oil level is up 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 3. Drain plug

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 element which consists of foam rubber moistened with oil. When this filter element becomes dirty, it should be cleaned.

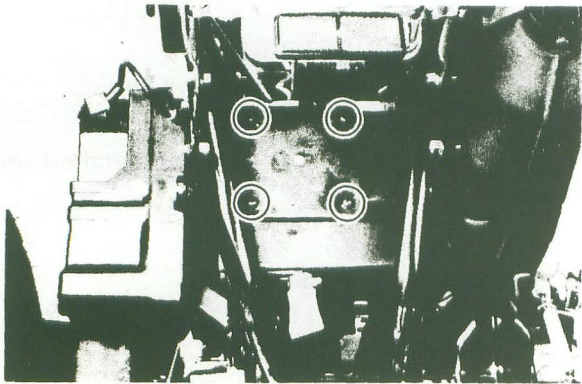
NOTE:

- 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.
- Wash the machine with fresh water if driven in sea water.

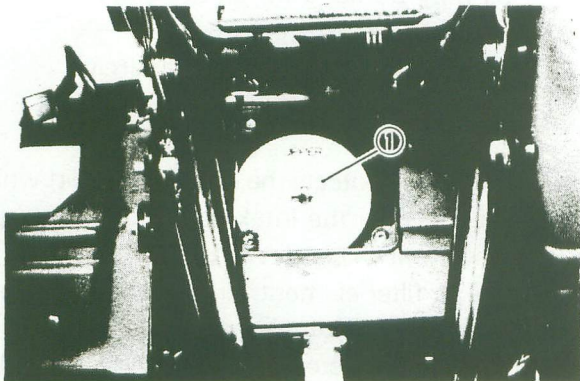


1. Check hose

1. Remove the filter case cover by removing the four screws.



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

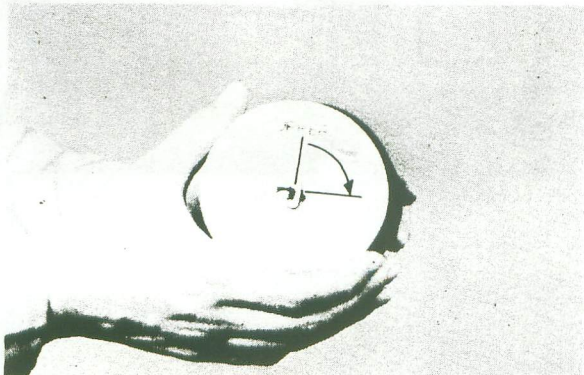


1. Air filter element

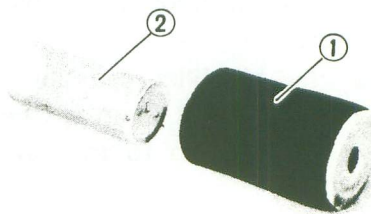
CAUTION:

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.

3. Remove the element plate from the guide.



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



1. Air filter element

2. Element guide

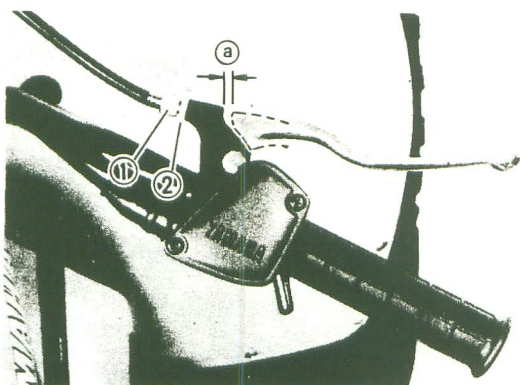
5. Then apply foam-air-filter oil, Yamalube 2 cycle engine oil or equivalent to the entire surface and squeeze out the excess oil. Elements should be wet but not dripping.
6. When installing the air filter element assembly in its case, be sure its sealing surface matches perfectly the sealing surface of the case so there is no air leakage.
7. The air filter element should be cleaned at the specified intervals (every 20 ~ 40 hours). 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 on the carburetor and manifold fittings for an air-tight seal. Tighten all fittings thoroughly to avoid the possibility of unfiltered air entering the engine.

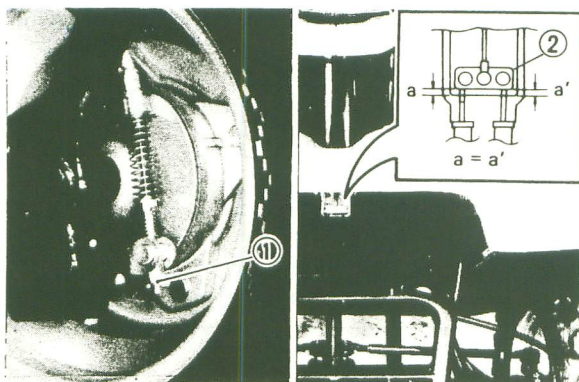
Front Brake Lever

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 the handle bar lever and brake shoe plate.



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

1. Loosen the locknut and screw in the adjuster on the brake lever side so as to bring the largest play to the brake lever.
2. Make adjustment by means of the adjuster on the brake hub so that the cable joint is horizontal as shown.

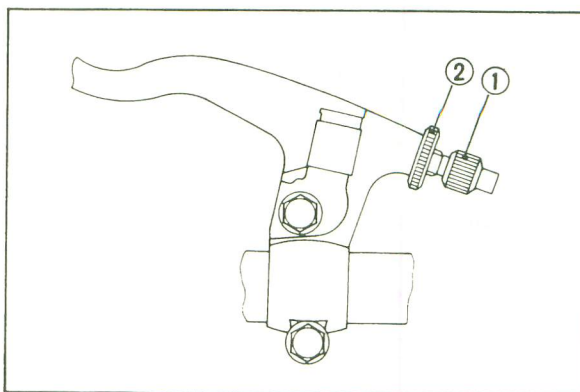


1. Adjuster
2. Cable joint

3. Make adjustment by means of the brake lever adjuster so as to bring a play of 5 ~ 8 mm (0.2 ~ 0.3 in) to the brake lever pivot.

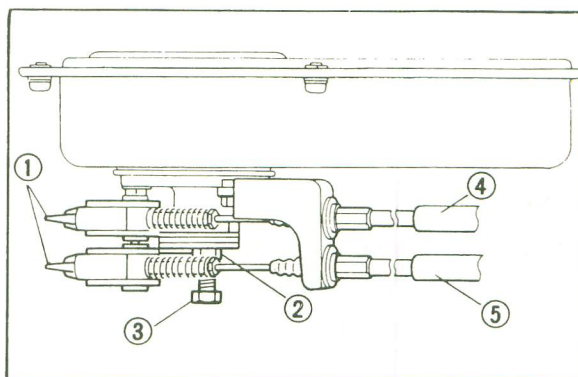
Brake Pedal and Rear Brake Lever Adjustment

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



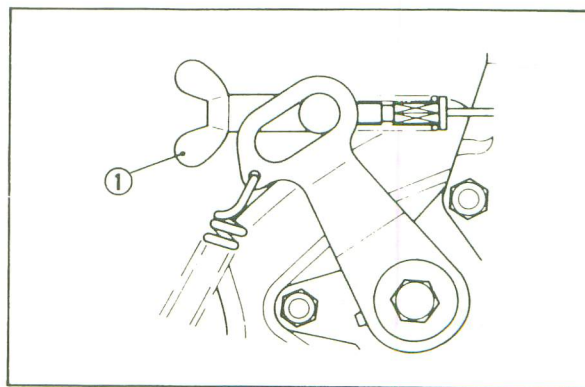
1. Adjuster
2. Locknut

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.

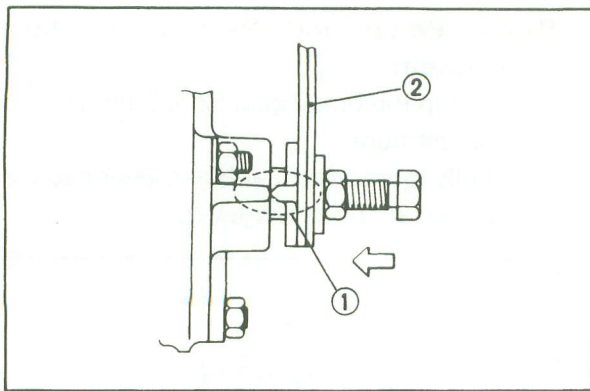


1. Adjuster
2. Locknut
3. Adjusting bolt
4. Brake pedal cable
5. Rear brake lever cable

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

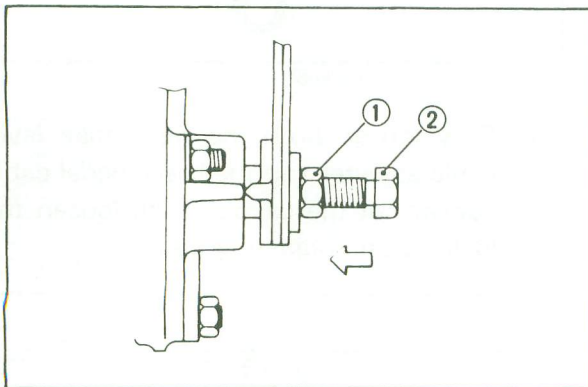


1. Adjuster



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.

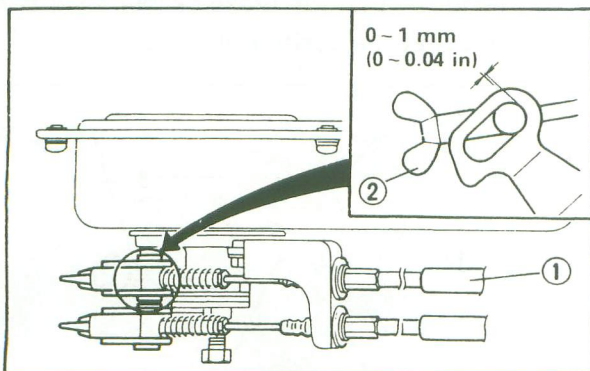


1. Locknut 2. Adjusting bolt

CAUTION:

When tightening the locknut, hold the adjusting bolt with a wrench 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.

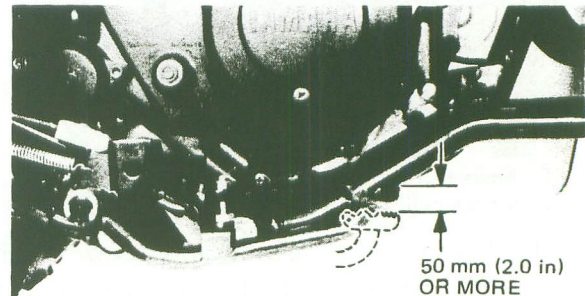
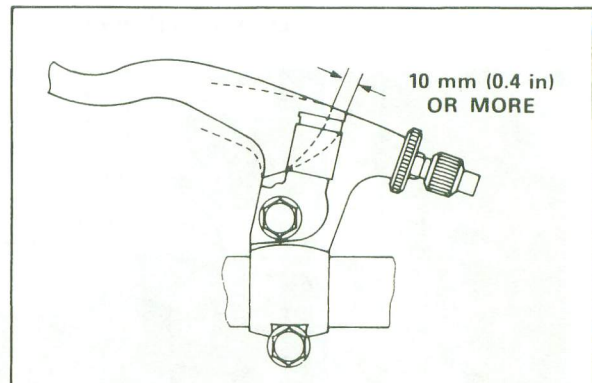


1. Brake pedal cable 2. Adjuster

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).

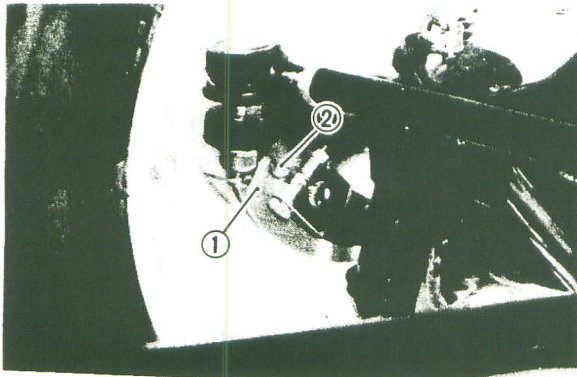


WARNING:

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

Brake Lining Inspection

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

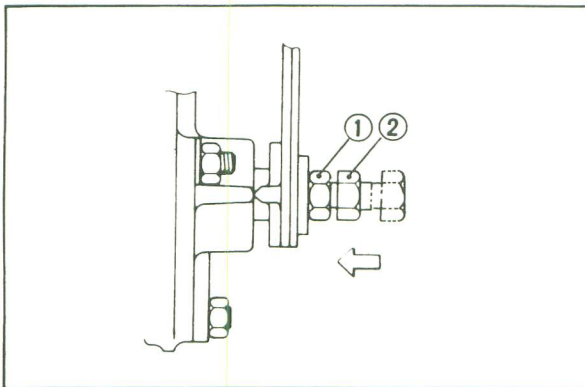


1. Wear limit

2. Wear indicator

Brake Pads Inspection

If the adjusting bolt comes close to touching the locknut due to use, replace the both pads in the caliper.



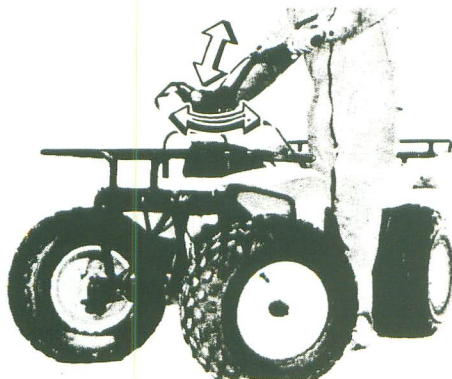
1. Locknut

2. Adjusting bolt

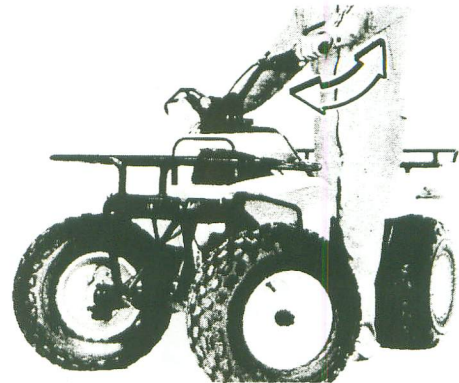
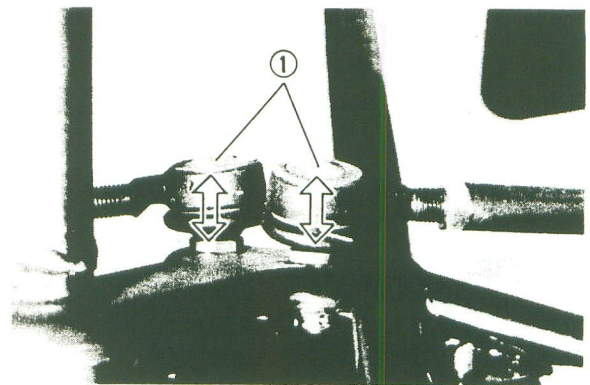
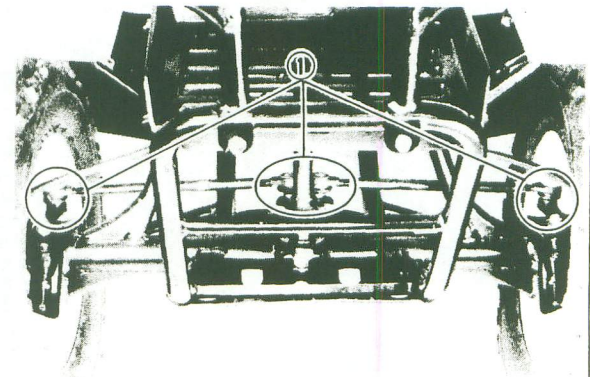
Steering System Inspection

The steering system should be checked periodically for looseness or damage. Refer to CHAPTER 5 for more details.

1. Try to move the handlebar up and down, and/or back and forth. If excessive play is found, replace the steering shift bushings.

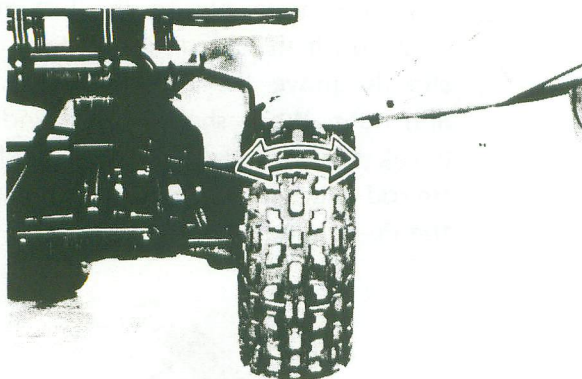
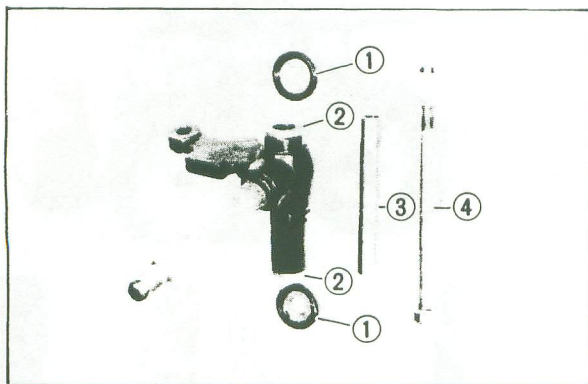


2. Turn the handlebar to the left and/or right until it stops completely, then slightly move the handlebar from left and right. While shaking the handlebar, check the tie-rod ends for wear. If the tie-rod end has any vertical play, replace the tie-rod end(s).



1. Tie-rod end

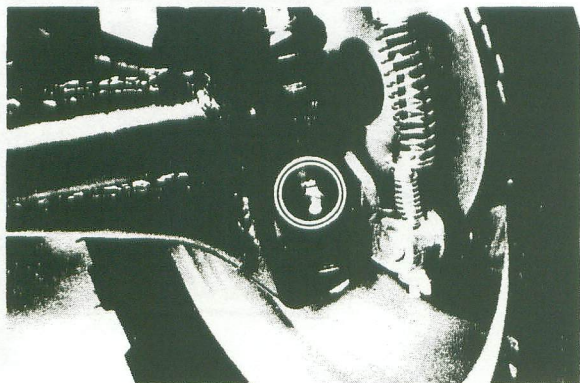
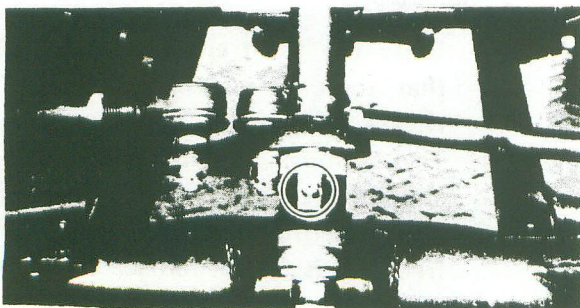
3. Raise the front end of the machine so that there is no weight on the front wheels.
4. Try to move the wheels laterally back and forth to check the knuckles and/or wheel bearings for looseness. If excessive free play is found, replace the following parts:
 - Wheel bearings and/or
 - Collar(s)
 - Knuckle bushings
 - Cotter pin(s)
 - Thrust covers
 - Knuckle shaft(s)



1. Thrust cover
2. Bushing
3. Collar
4. Knuckle shaft

5. Lubricate the knuckle and steering shafts.

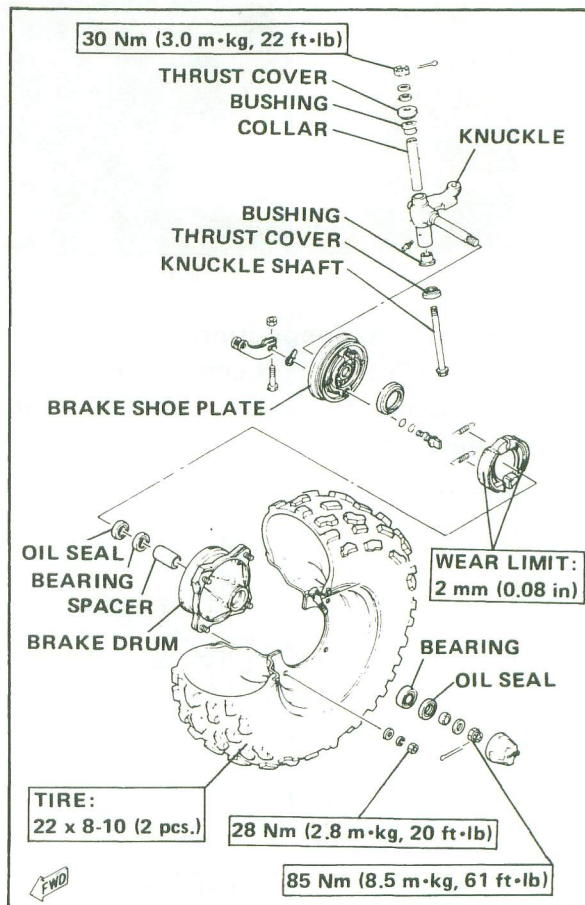
Recommended lubricant:
Lithium soap base grease



Wheel Bearings

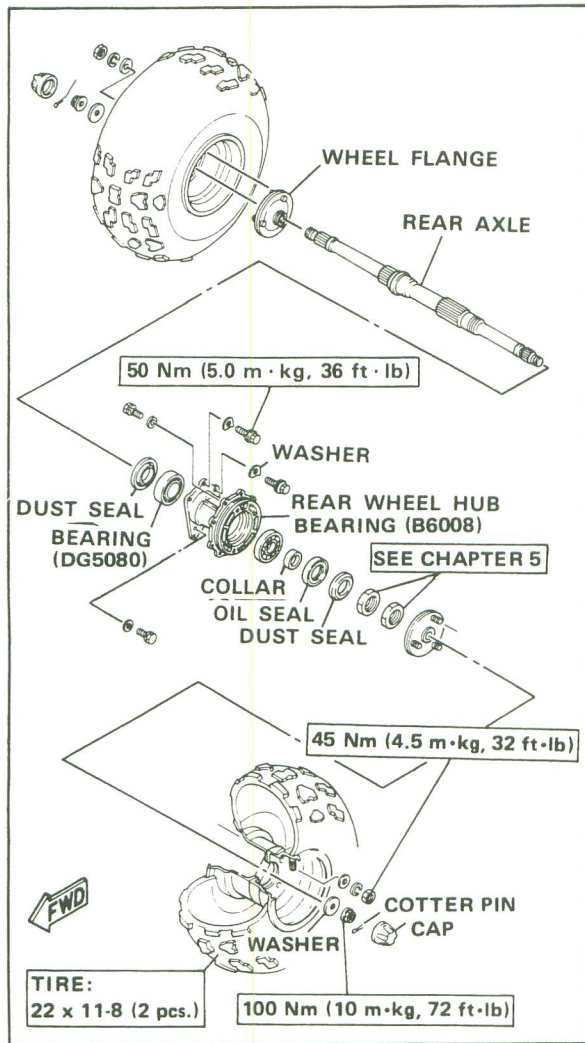
If a rolling rumble is noticed and increases with increasing wheel speed (not engine or transmission speed), the wheel bearings may be worn. Check the wheel bearings for both the front and rear wheels.

Front wheel



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

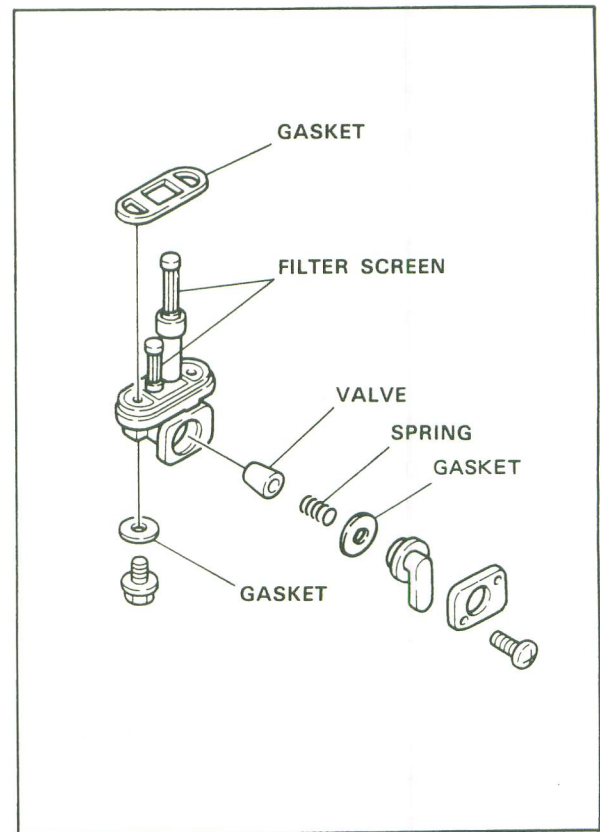
Rear wheel



1. Block the front tire and raise the rear of the machine.
2. Spin the wheel by hand and touch 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 hose and drain the fuel completely from the fuel tank.
2. Remove the fuel cock and inspect the filter screen. Replace the fuel cock if filter screen is badly contaminated.
3. Remove the screws on the front and rear of the fuel cock; remove the plate, gasket, 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 hose.

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/cm², 2.2 psi)

Vehicle load limit: 100 kg (220 lb)

Tire size: Front: 22 x 8 – 10

Rear: 22 x 11 – 8

1. Excessive tire pressure (over 68.6 kPa (0.7 kg/cm², 10 psi)) may cause the 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/cm², 1.8 psi)) will cause the rim to dislodge from the tire.
3. Inflate the same pressure in both rear tires. Uneven tire pressure will severely affect the handling.
4. Set pressures when tires are 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/cm², 2.2 psi)

Minimum tire pressure:

11.8 kPa (0.12 kg/cm², 1.8 psi)

If the appropriate low-pressure tire gauge is not available, use the following temporary procedure:

Measure the tire's circumference on top of the tread blocks using an inelastic but flexible strip.

Standard tire circumference:

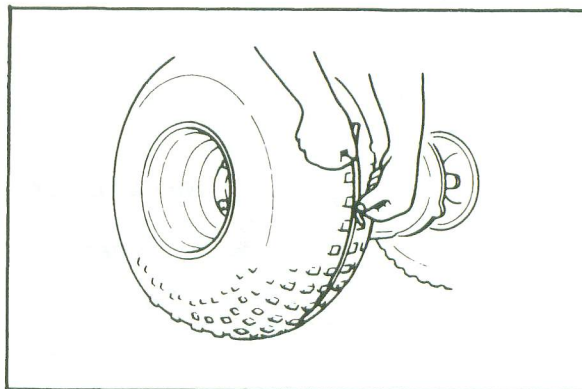
Front: 1,754 mm (69.1 in)

Rear: 1,773 mm (69.8 in)

Minimum tire circumference:

Front: 1,747 mm (68.8 in)

Rear: 1,762 mm (69.4 in)



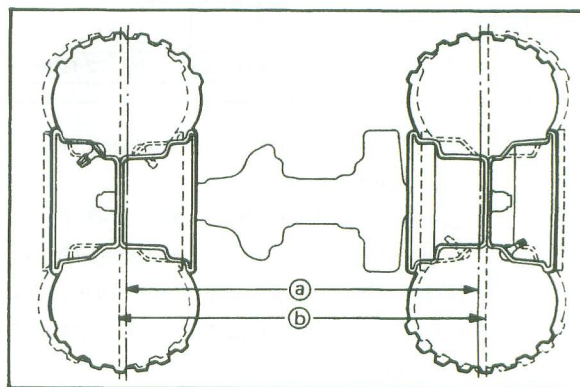
Tire Tread

The rear wheels can be mounted in two ways to suit different riding conditions.

- Standard mounting (Face the air valve towards the outside): This is for normal riding conditions.
- Reversed mounting (Face the air valve towards the inside): This is for high-performance competition use.

NOTE:

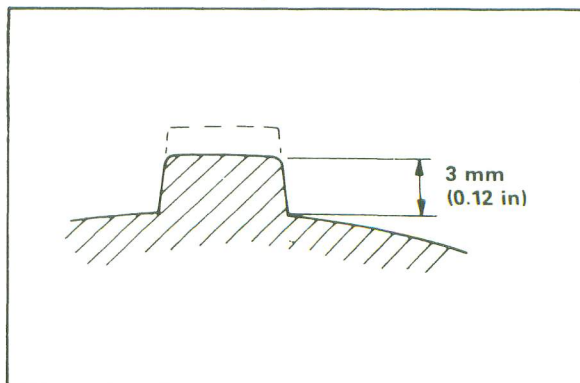
Cornering performance is diminished on reversely mounted rear wheels than on the standard mounting. Thus, the standard mounting is recommended for normal riding.



a. Standard position b. Reversed position

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.

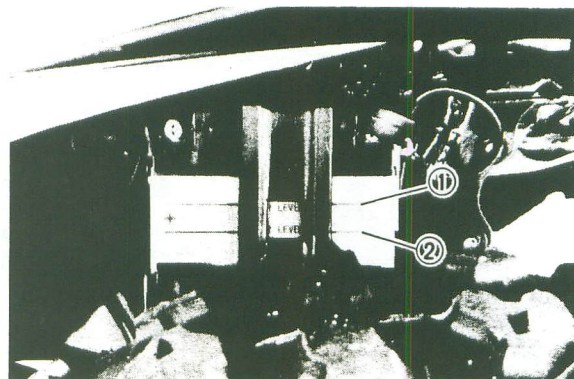
Recommended lubricant:

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.



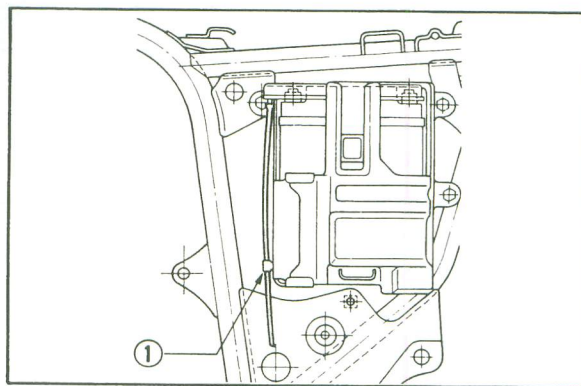
1. Upper level

2. Lower level

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.



1. Clamp

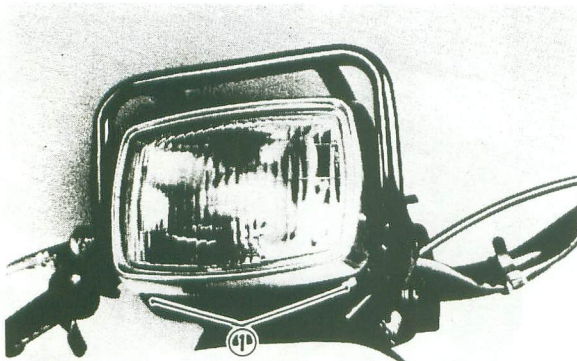
CAUTION:

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

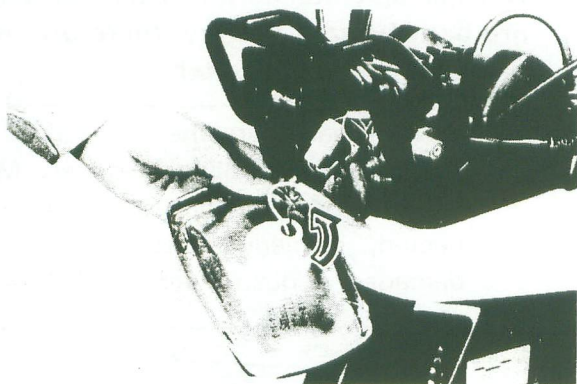
If the headlight bulb burns out, replace the bulb as follows:

1. Remove the two screws holding the light unit assembly to the headlight body.



1. Screws

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

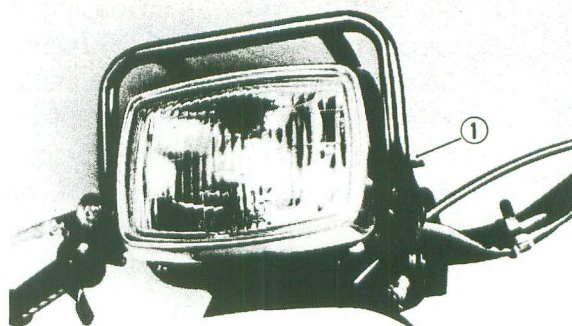


3. Slip a new bulb into position and secure it with the bulb holder.
4. Reinstall the light unit assembly onto the headlight body.
5. Adjust the headlight unit if necessary.

Headlight Beam Adjustment

When necessary, adjust the headlight beam as follows:

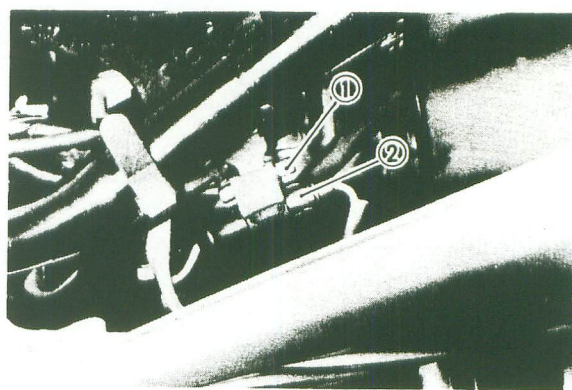
1. Vertical adjustment
Loosen the headlight body mounting nuts, and adjust the beam vertically by moving the headlight body up or down.



1. Headlight body mounting nut

Fuse

1. The fuse block is located under the rear fender.



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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CHAPTER 3. 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 rear wheel drive assembly in order to remove the engine assembly.

Preparation for Removal

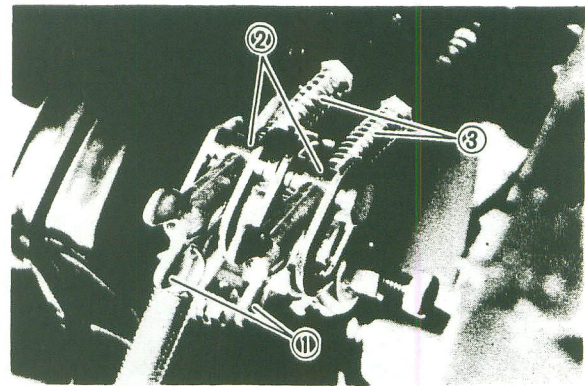
1. All dirt, mud, dust, and foreign material should be thoroughly removed from the exterior of the engine before removal and disassembly. This will prevent any harmful foreign material from entering the interior of the engine assembly.
2. Before engine removal and disassembly, be sure you have proper 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. Remove the rear brake cable adjusters at the brake caliper levers.
2. Disconnect the brake cables from the cable holder.

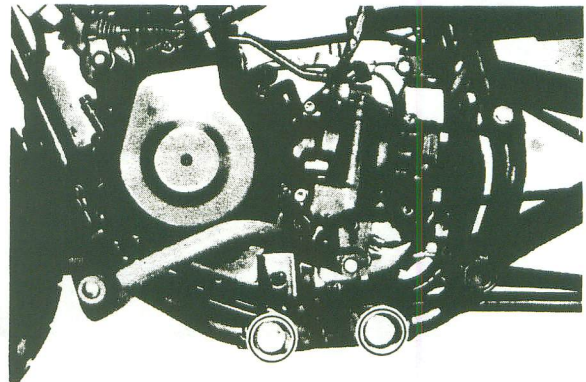
NOTE: _____

- Note the order of brake cable routing for reassembly.
- Do not lose the springs and pins.



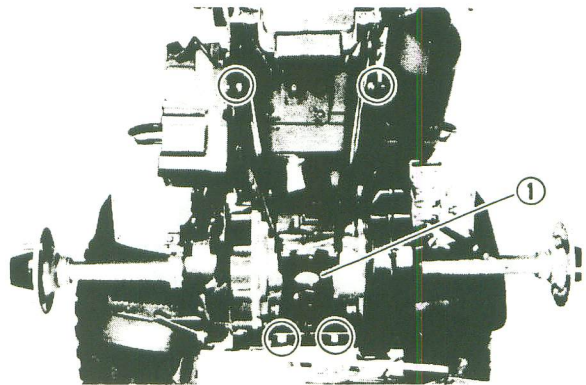
1. Adjuster 2. Pin 3. Spring

3. Remove the left side footrest.



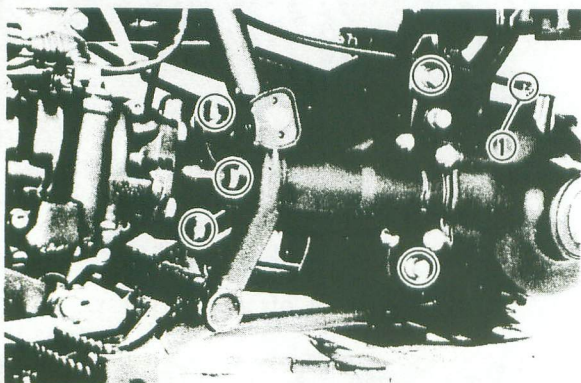
Rear Wheel Drive Assembly

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



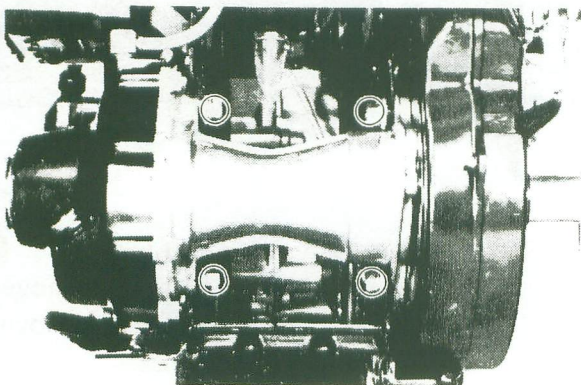
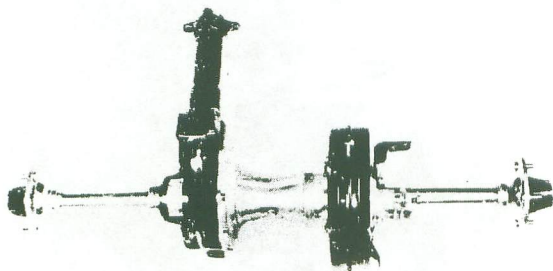
1. Hitch bracket

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



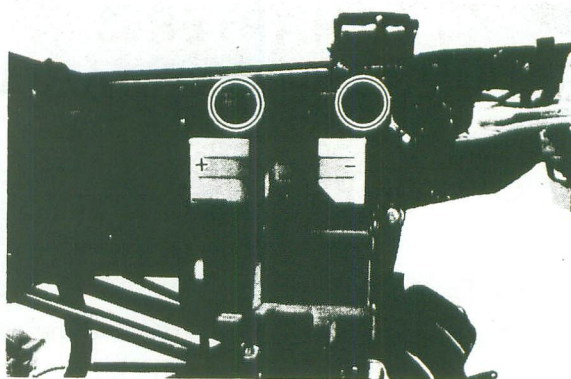
1. Breather pipe

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



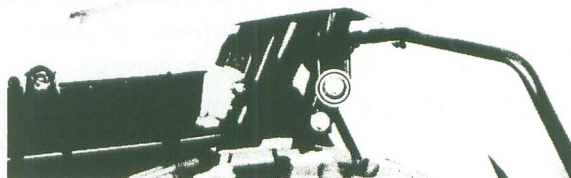
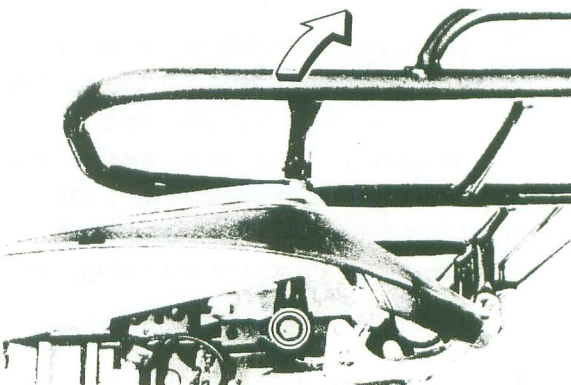
Battery

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

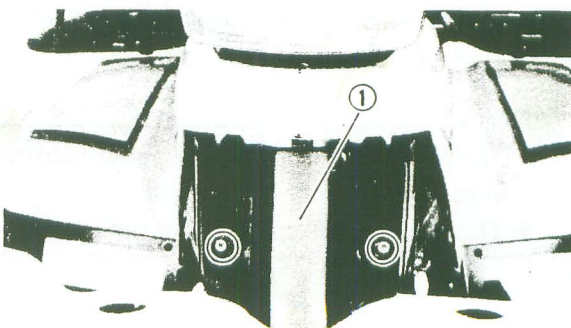


Fuel Tank and Rear Fender

1. Remove the front and rear carrier securing bolts. Pull up the carriers.

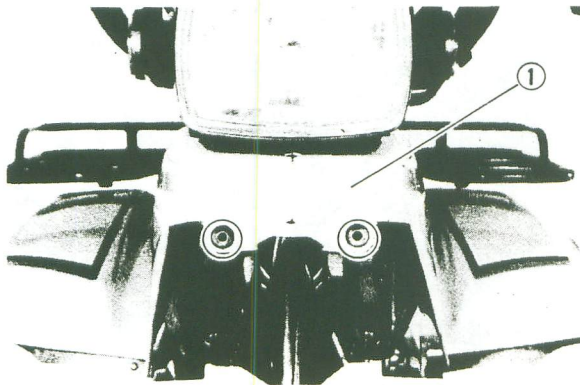


2. Remove the front panel.



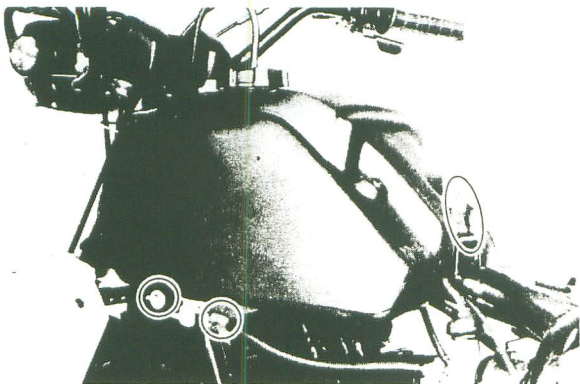
1. Front panel

3. Remove the fuel tank cover securing screws, washers, and collars.
4. Remove the fuel tank cover; unhook the cover from the fuel tank first, then pull the cover forward.



1. Fuel tank cover

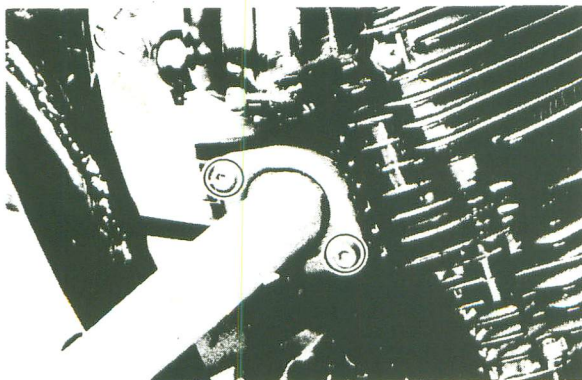
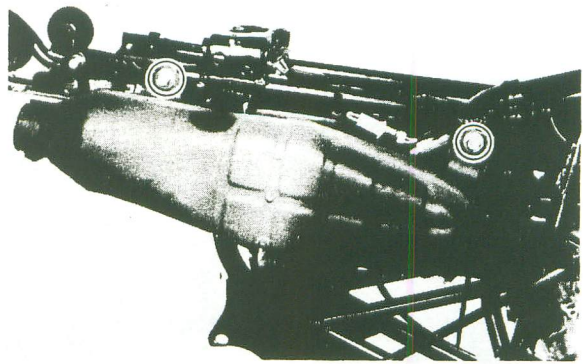
5. Turn the fuel cock to "OFF".
6. Disconnect the fuel hose at the fuel cock and rubber retaining band, and remove the fuel tank.
7. Remove the fuel tank holding bolts and remove the fuel tank.



8. Remove the rear fender securing screws and remove the fender.

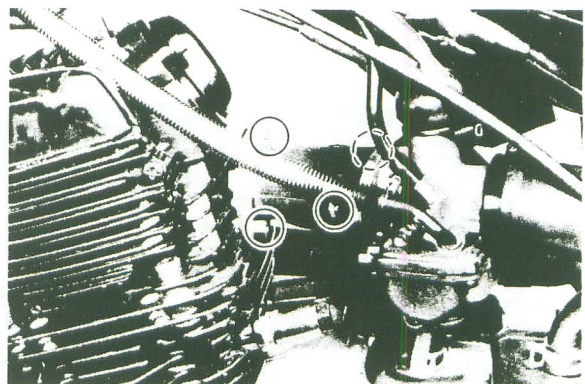
Muffler Assembly

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



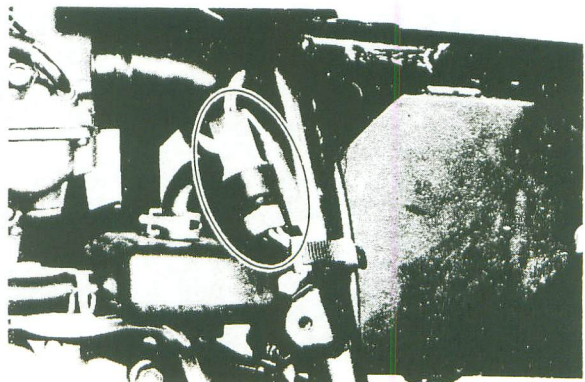
Carburetor

1. Remove the carburetor securing nuts and carburetor joint securing bolts. Remove the carburetor joint.

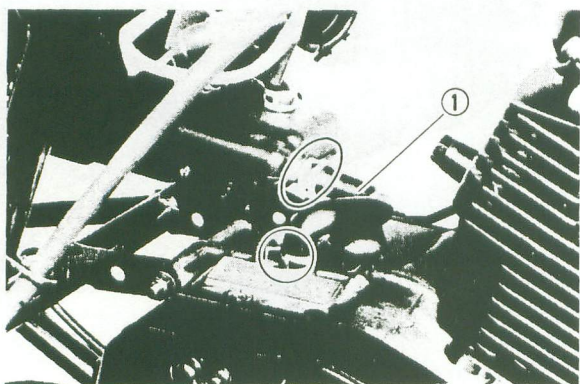


Wires and Pipe

1. Disconnect the spark plug lead.
2. Disconnect the CDI 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.



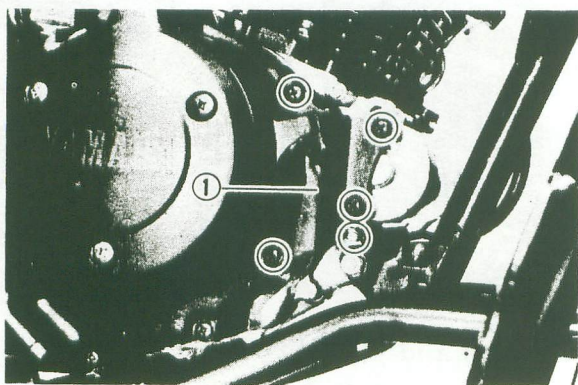
3. Remove the crankcase ventilation pipe from the crankcase.



1. Crankcase ventilation pipe

Starter Motor Bracket and Starter Motor

1. Disconnect the starter motor lead.
2. Remove the starter motor securing screws and the bracket.

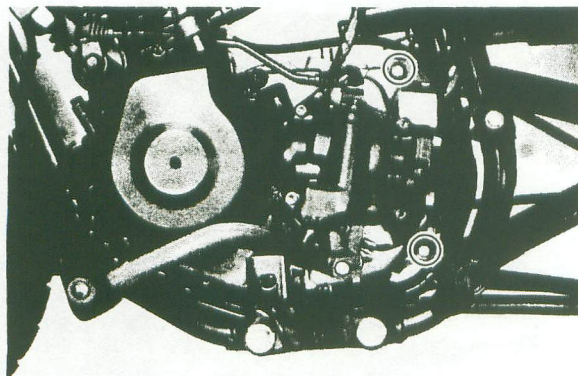


1. Starter motor bracket

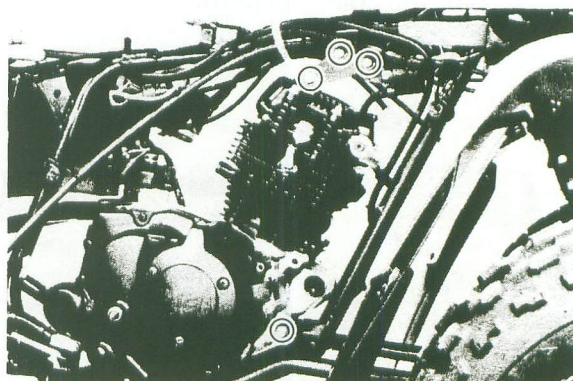
3. Remove the starter motor assembly.

Engine Removal

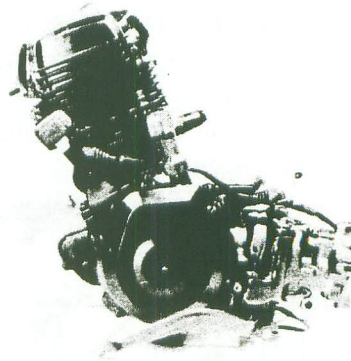
1. Remove the rear lower and upper engine mounting bolts.



2. Remove the front lower engine mounting bolt.
3. Remove the engine stay at the cylinder head.



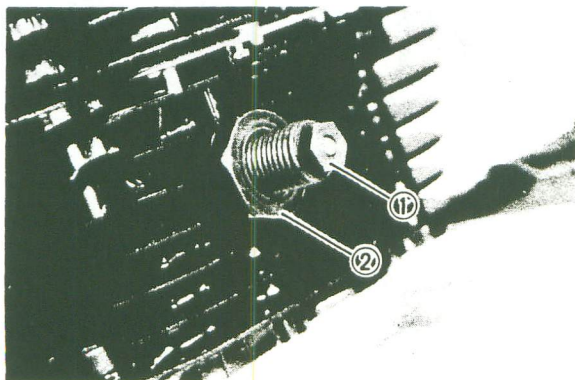
4. Remove the engine from the left side of the chassis.



ENGINE DISASSEMBLY

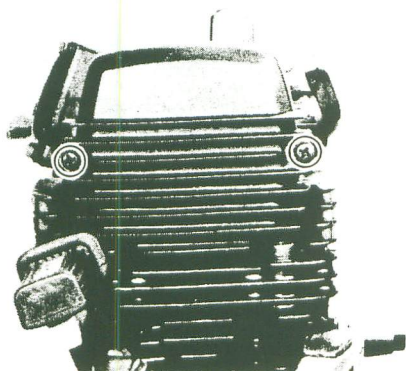
Cylinder Head and Cylinder

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

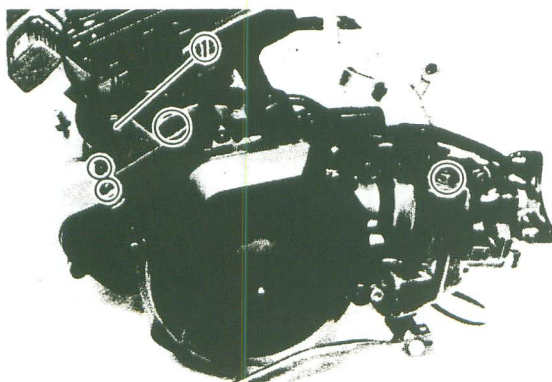


1. Tensioner assembly 2. Locknut

4. Remove the cam sprocket cover securing bolts and remove the cover.



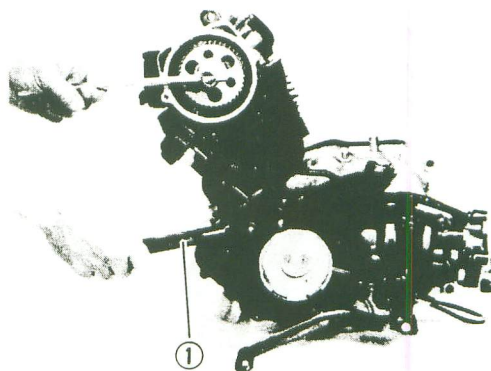
5. Remove the drive select lever assembly.



1. Drive select lever

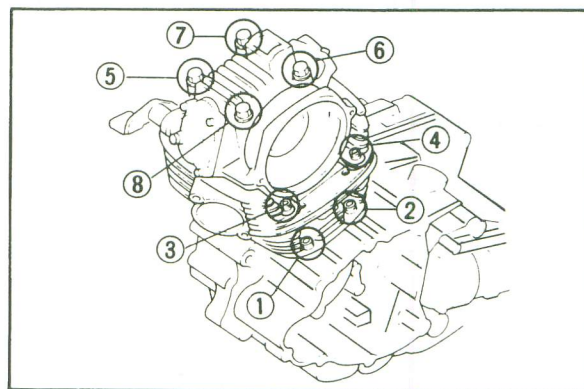
6. Remove the starter assembly, change pedal and spark plug.

7. Remove the cam sprocket securing bolt from the left side cylinder head. Hold the recoil starter pulley with the universal rotor holder.

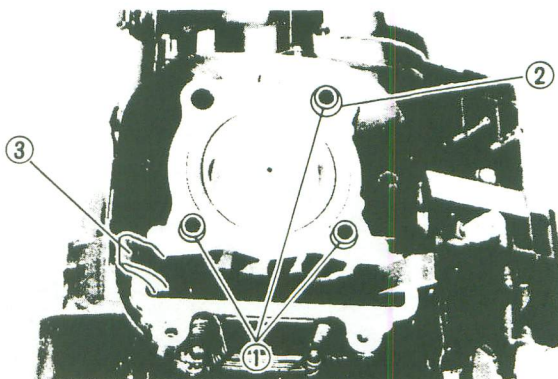


1. Universal rotor holder

8. 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.



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



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

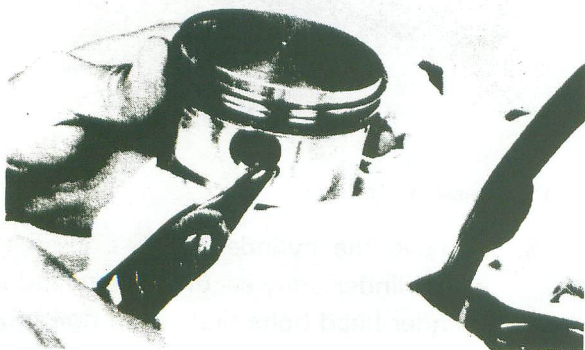
10. Remove the cylinder securing bolts and remove the cylinder, gasket, two dowels, and O-ring.

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:

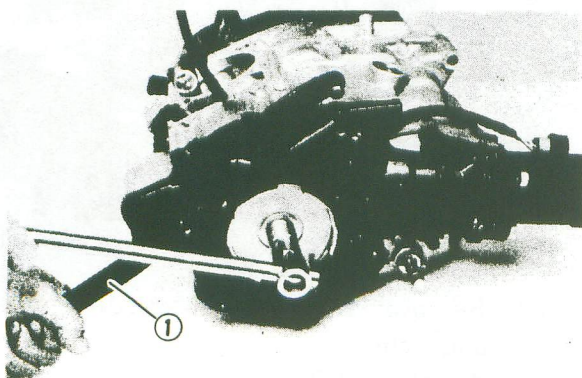
Do not use a hammer to drive the piston pin out.

NOTE:

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

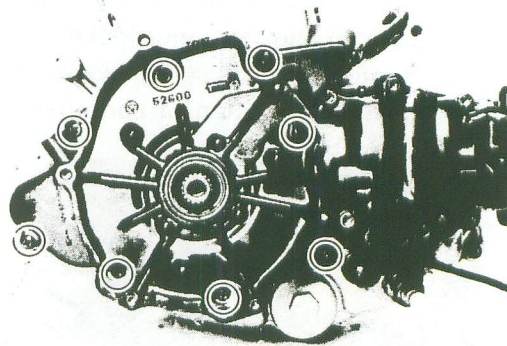
Crankcase Spacer (Left Side)

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



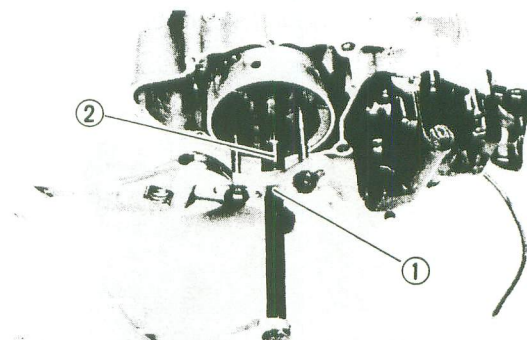
1. Universal rotor holder

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



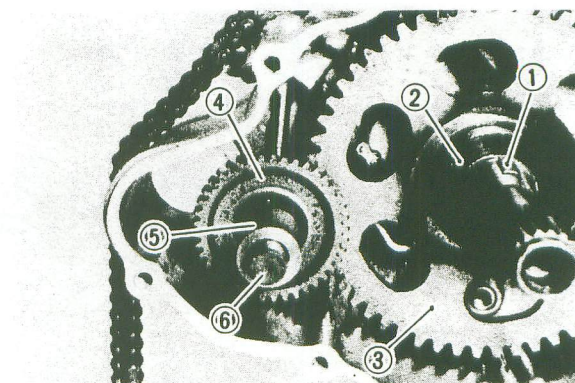
Flywheel Magneto

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, washer, starter idle gears, shaft, and collar.



1. Woodruff key 4. Starter idle gear #1
2. Washer 5. Collar
3. Starter idle gear #2 6. Shaft

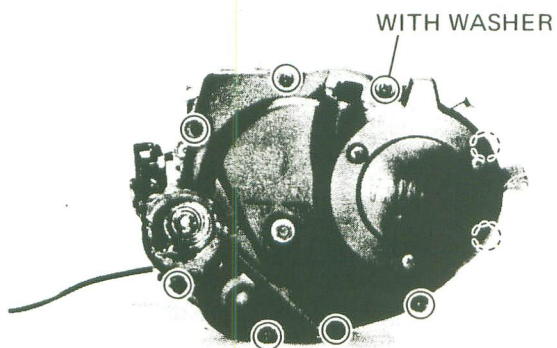
3. Remove the cam chain guide #2 securing bolts and remove the cam chain guide #2 and cam chain.



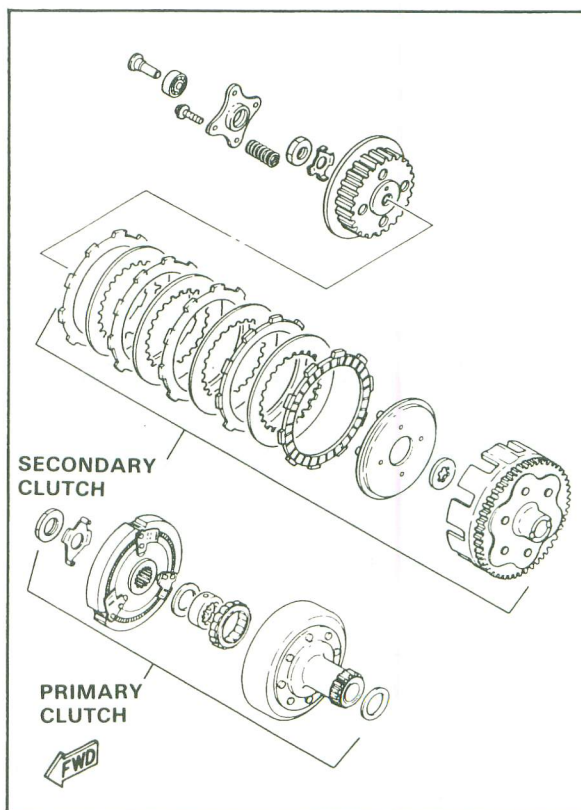
1. Cam chain guide #2

Clutch Cover

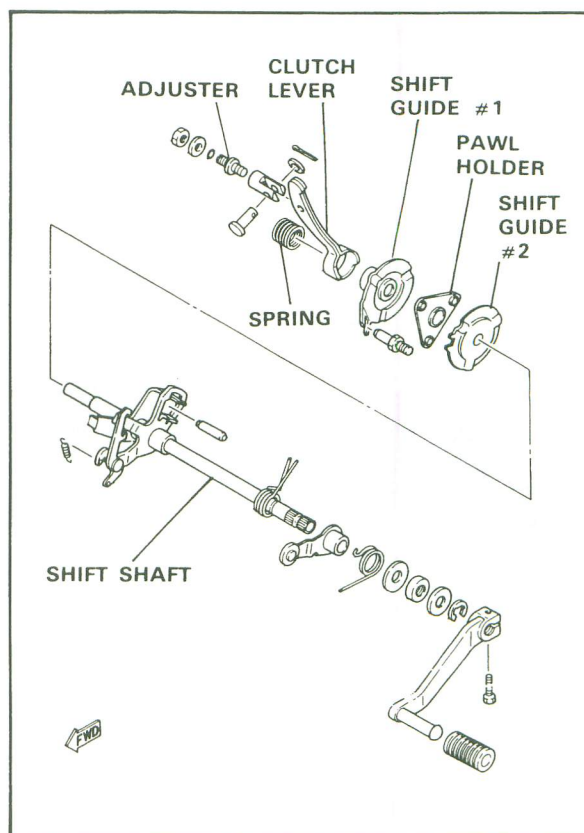
1. Remove the oil filter cover securing bolts and remove the filter cover, filter, and O-rings.
2. Remove the clutch cover securing bolts and remove the cover and two dowels from the right-side spacer.



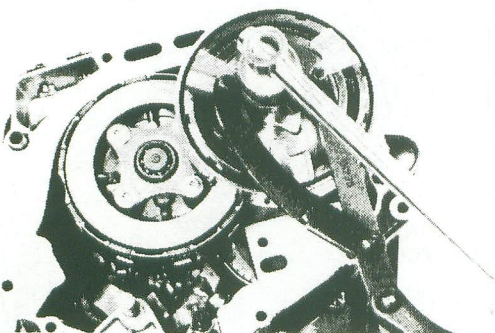
Primary Clutch and Secondary Clutch



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

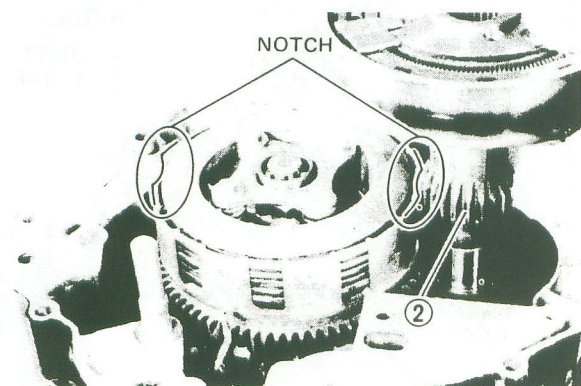


2. Flatten the lock tab on the primary clutch securing nut. Hold the clutch shoe assembly with the universal rotor holder and remove the securing nut, lock washer, and primary clutch assembly.

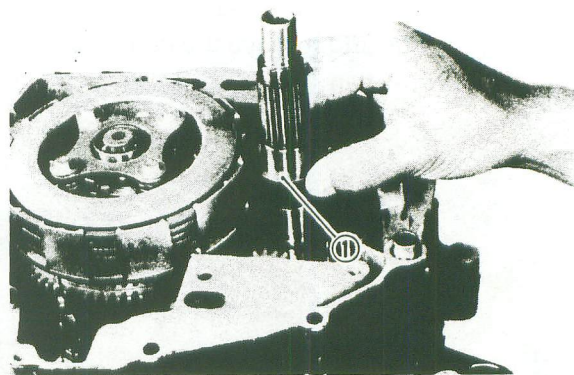


NOTE:

- 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.

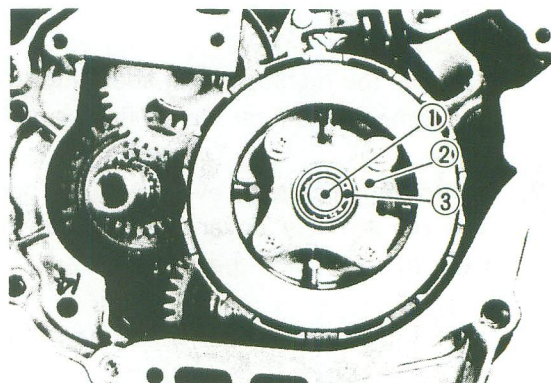


1. Secondary clutch housing 2. Primary drive gear



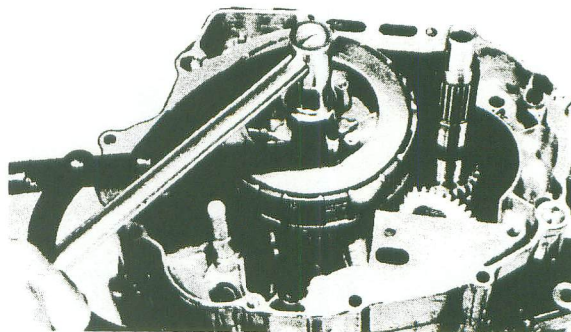
1. Washer

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



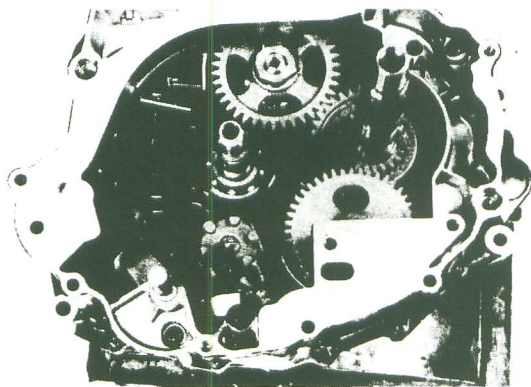
1. Push rod 2. Clutch spring plate 3. Bearing

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.

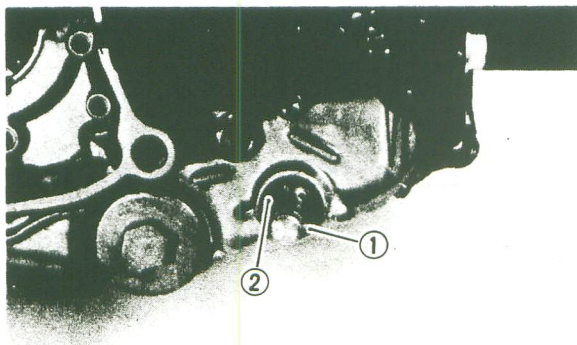


Oil Pump and Shifter

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



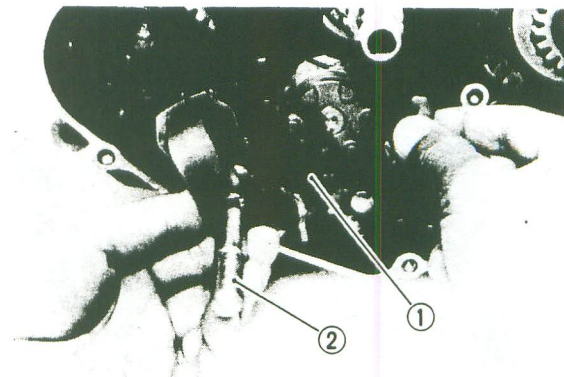
2. Remove the circlip and washer from the shift shaft.



1. Circlip

2. Washer

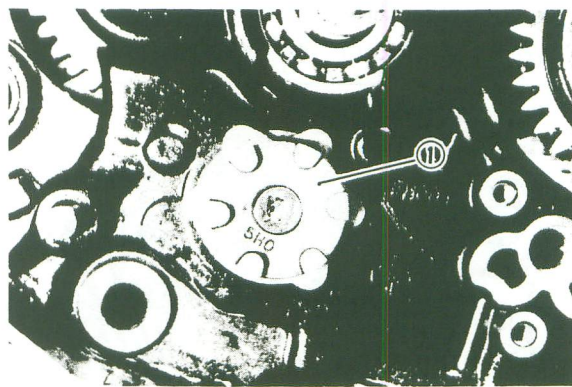
3. Pull the shift shaft out from the right-hand side.
4. Remove the shift lever assembly, and then remove the stopper-lever assembly with the torsion spring.



1. Stopper lever

2. Shift shaft

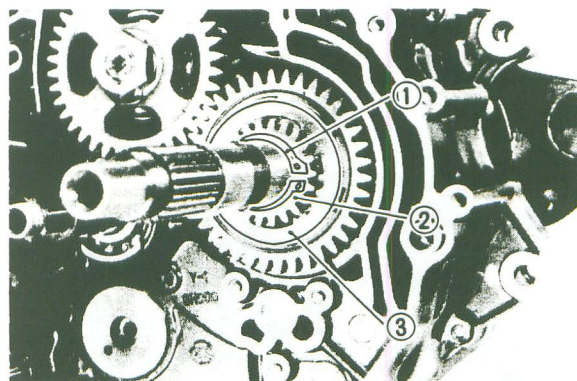
5. Remove the segment from the shift cam. Use the torx driver.



1. Segment

Balancer Drive and Driven Gears

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

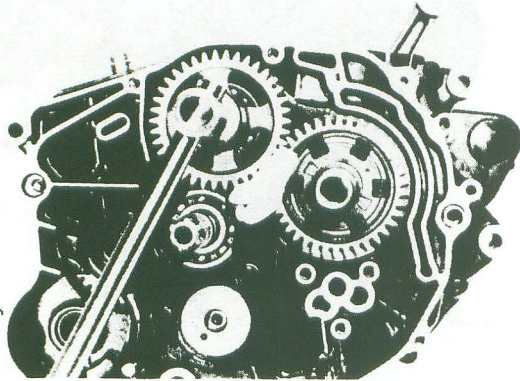


1. Circlip

2. Oil pump drive gear

3. Plate washer

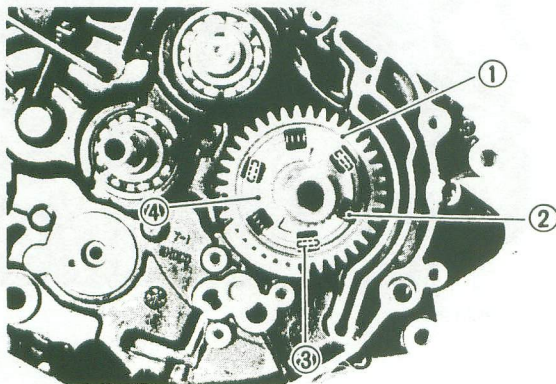
2. Flatten the lock tab on the balancer shaft and remove the securing nut.
3. Place a piece of rolled rag or a piece of lead between the drive and driven gears, and remove the securing nut, lock washer, and straight key.



4. Remove the balancer drive gear.

NOTE:

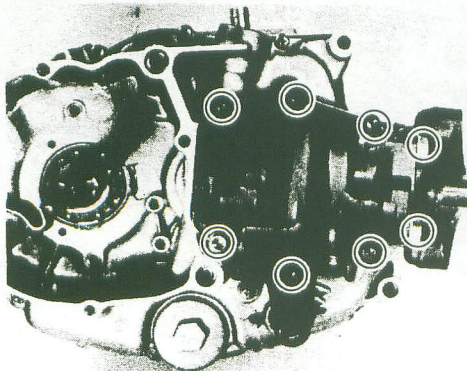
The balancer drive gear has six springs and three pins. Use care so that they don't fall out when removing the balancer drive gear.



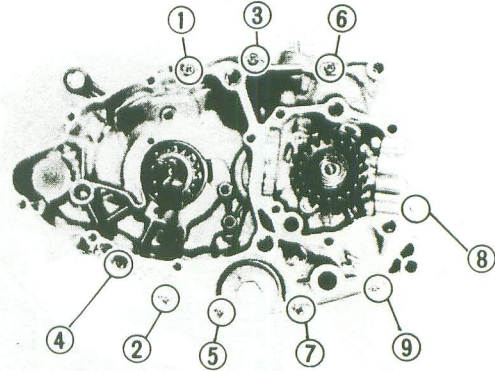
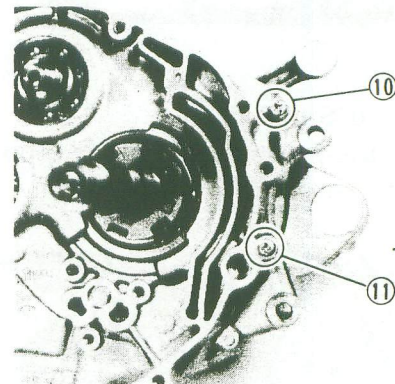
- | | |
|------------------------|---------|
| 1. Balancer drive gear | 3. Pin |
| 2. Spring | 4. Boss |

Crankcase

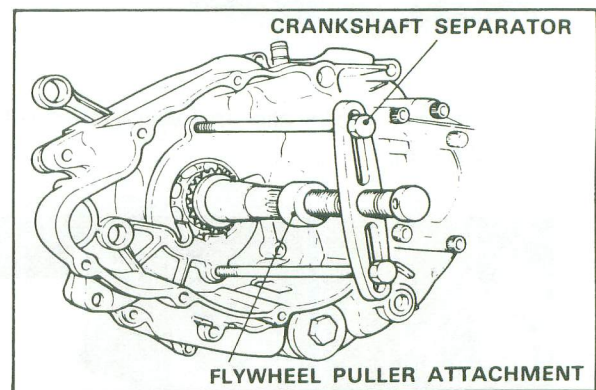
1. Disconnect the neutral and reverse switch leads.
2. Remove the middle gear case cover and middle gear assembly.



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



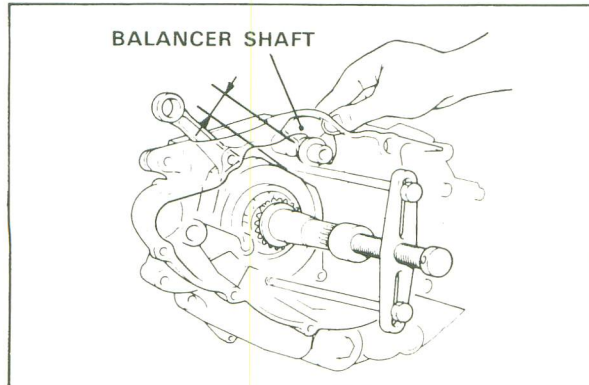
4. Install the flywheel magneto puller attachment onto the crankshaft, and install the crankcase separating tool as shown.



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

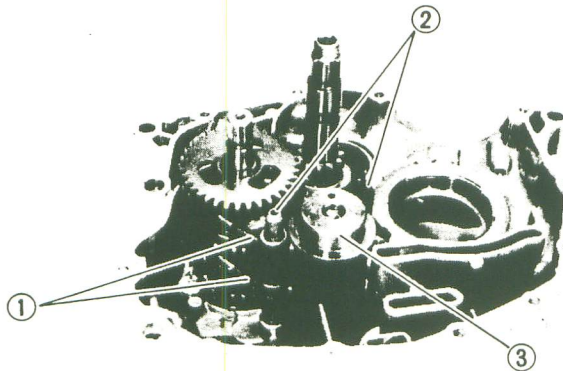
NOTE: _____

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.



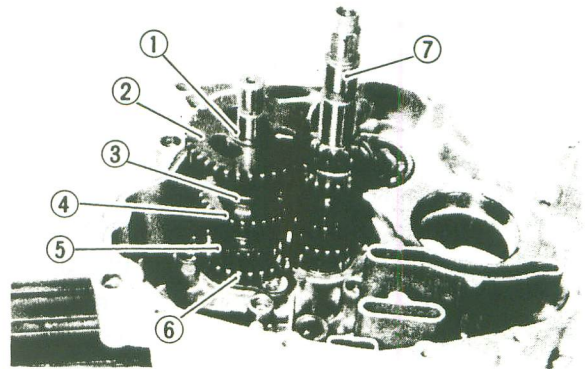
Transmission, Crankshaft, and Balancer Shaft

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

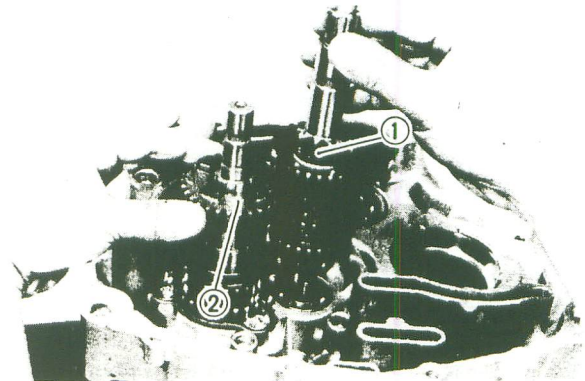


1. Shift fork
2. Shift fork guide
3. Shift cam

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.

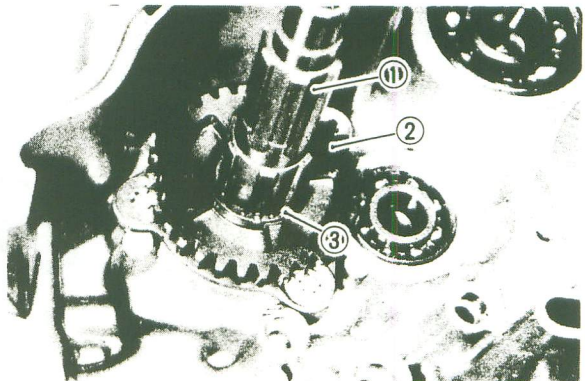


1. Washer
2. 1st wheel
3. 4th wheel
4. 3rd wheel
5. 5th wheel
6. 2nd wheel
7. Main axle



1. Sub-assembly
2. 3rd wheel

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

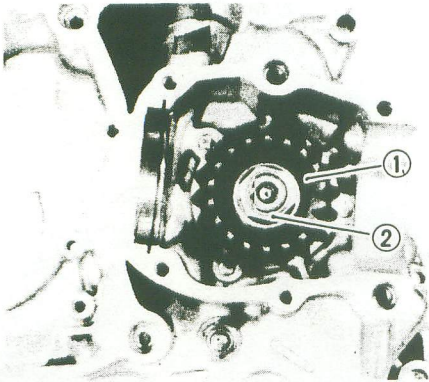


1. Drive axle
2. 2nd wheel
3. Circlip

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

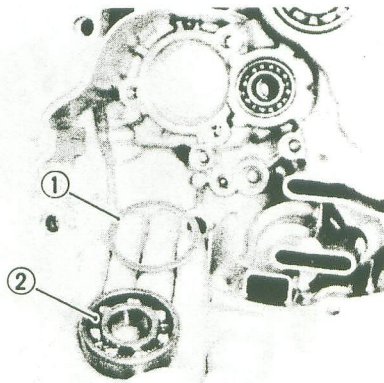
The following steps are necessary only if you must service the middle gears or replace the crankcase.

6. Secure the drive axle in a vice or other support.
7. 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. Remove the drive gear securing nut.



1. Middle drive gear 2. Nut

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

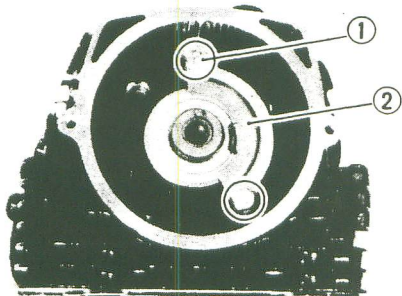


1. Shim 2. Bearing

INSPECTION AND REPAIR

Cylinder Head Disassembly

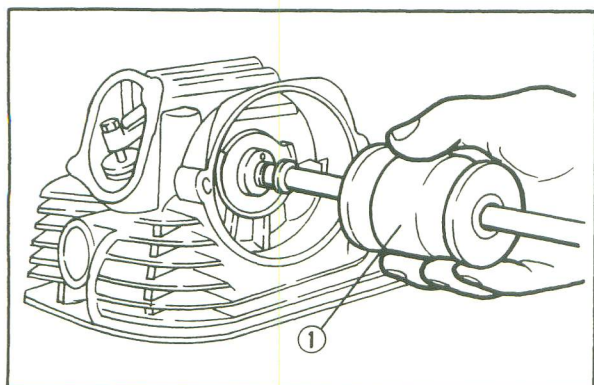
1. Remove the intake and exhaust valve covers from the cylinder head.
2. Loosen the valve adjuster on both valves, and flatten the lock washer.



1. Lock washer

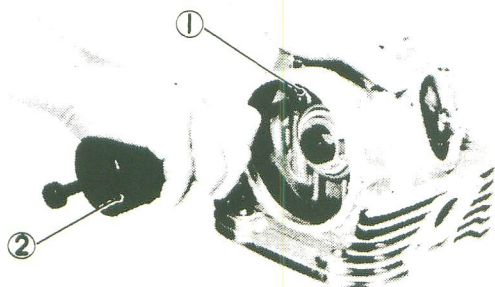
2. Plate

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

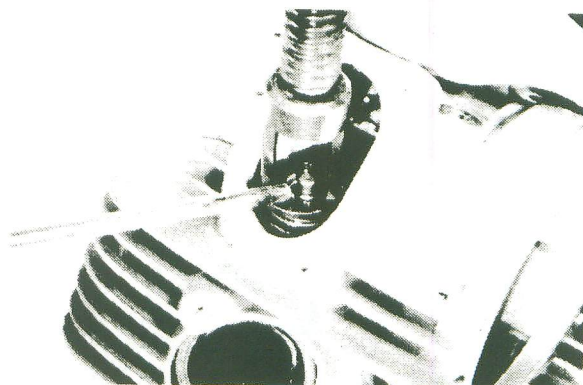
5. Remove each rocker arm shaft with a slide hammer, then remove the rockers.



1. Rocker shaft

2. Slide hammer

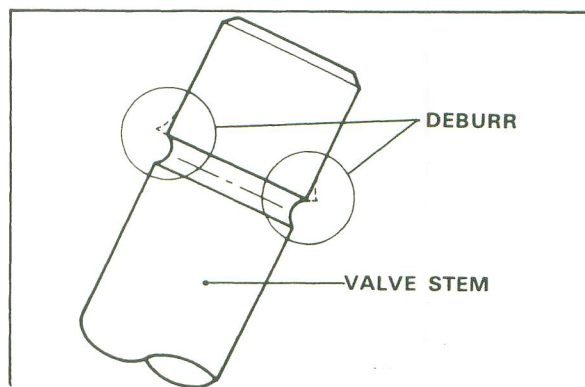
6. Mount the valve spring compressor on the head and depress each valve spring. Remove the valve retainers with a magneto or tweezers, remove the valve springs.



7. Remove the valves.

NOTE:

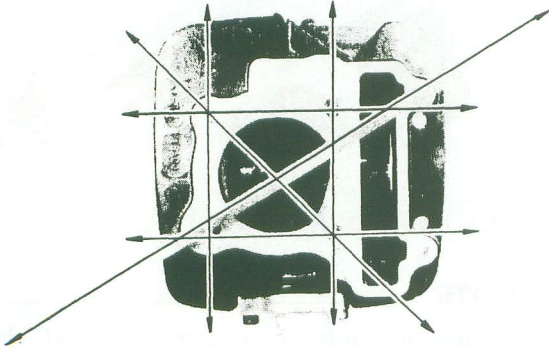
Deburr any deformed valve stem end. Use an oil stone to smooth the stem end. This will help prevent damage to the valve guide during valve removal.



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.

- 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)

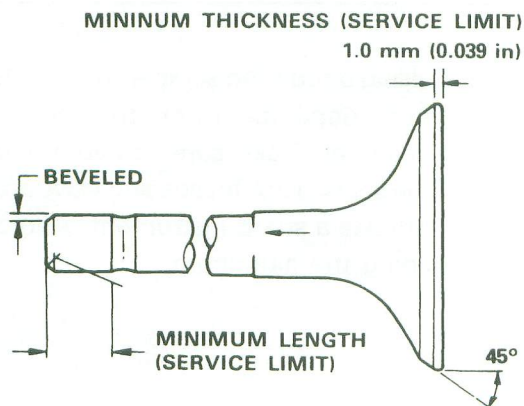


Valves, Valve Guides, Valve Seats, and Valve Springs

Valves

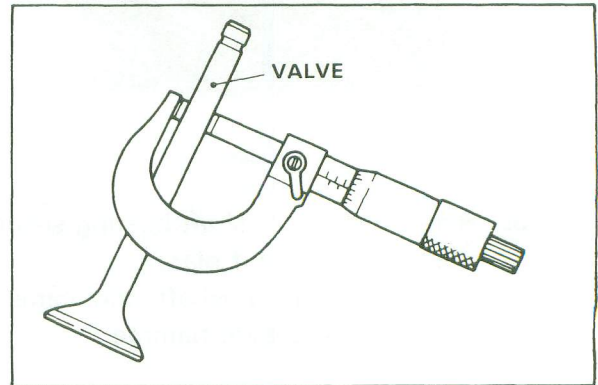
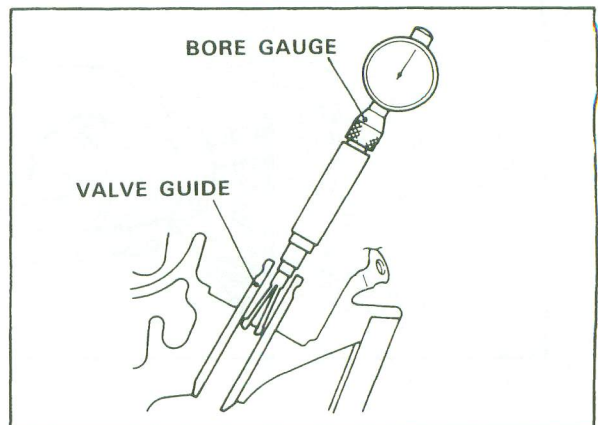
- Check the valve face and the stem end for wear. If the valve face and/or the stem end are pitted or worn, regrind the valve with a valve refacer. Replace the valve if any dimension exceeds the specifications in the illustration.

INTAKE/EXHAUST VALVE



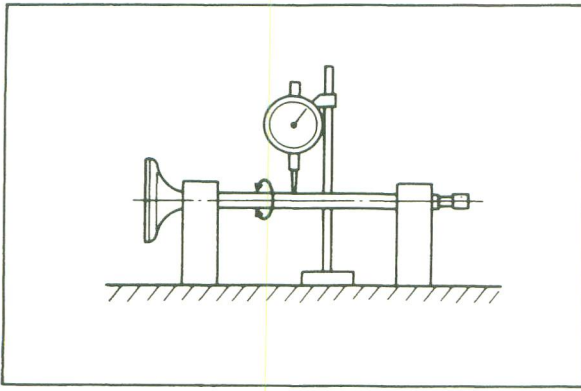
- Valve stem wear must be measured and then combined with valve guide measurements to obtain guide clearance. This clearance must be within tolerances. If it exceeds the maximum limit, then replace either or both valve and guide, as necessary.

	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)



- 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.
- 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:

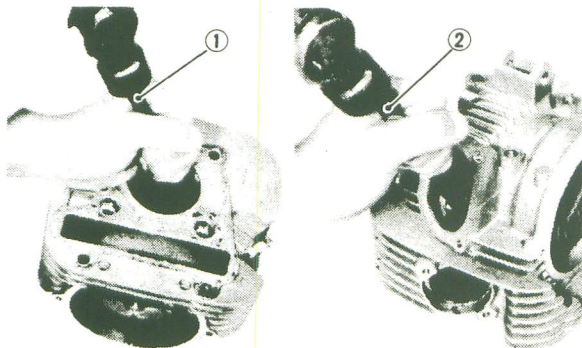
The valve oil seal should be replaced whenever a valve is removed or replaced.

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.



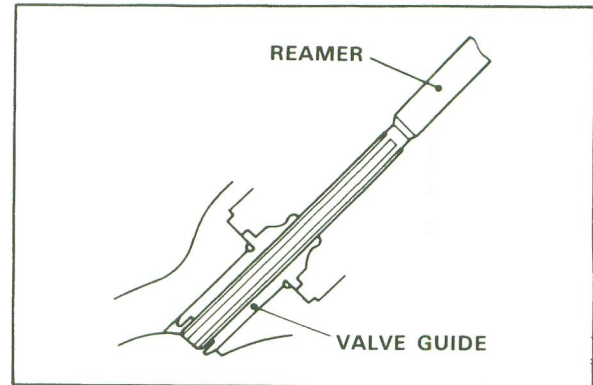
1. Valve guide remover

2. Valve guide installer

NOTE:

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

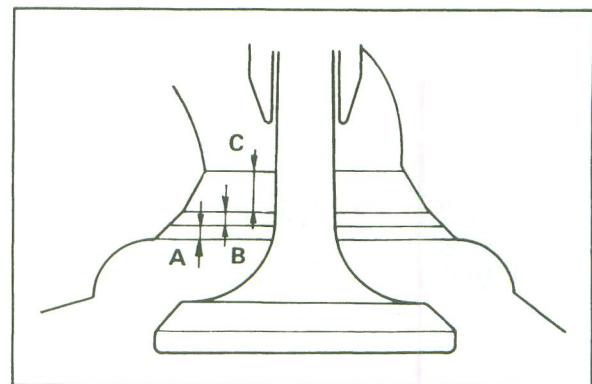
4. After installing the valve guide, use the 6 mm (0.24 in) reamer (special tool) to obtain the proper valve-guide-to-valve-stem clearance.



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.



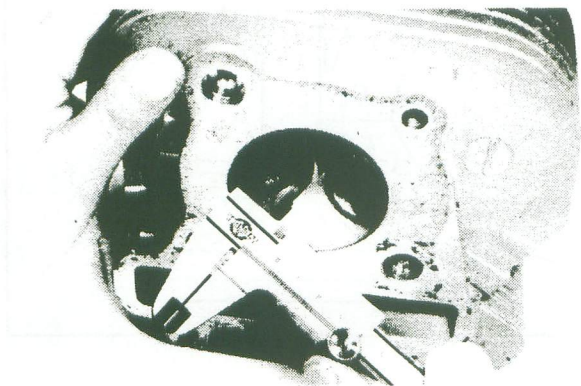
CAUTION:

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.

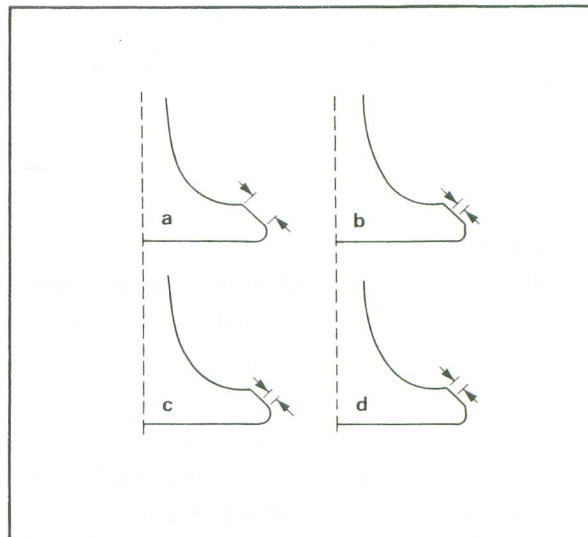
If cutting section A of the valve seat, use a 30° cutter. If cutting section B, use the 45° cutter. If cutting section C, use the 60° cutter.

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.

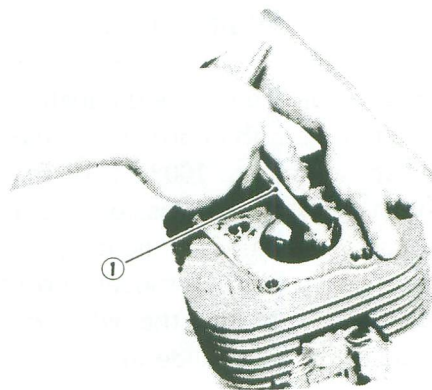
	Standard Width	Wear Limit
Seat Width	1.0 ± 0.1 mm (0.039 ± 0.0039 in)	1.6 mm (0.063 in)



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.

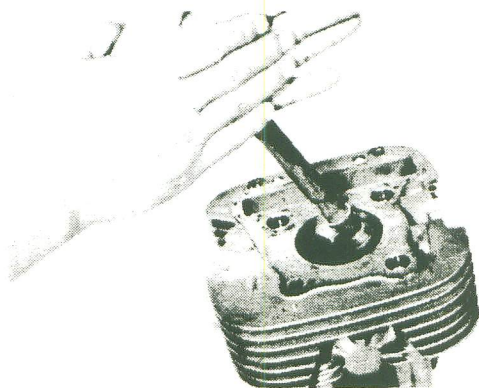
- d. If the seat is too narrow and down near the bottom edge of the valve face, first use the 60° cutter and then the 45° cutter.

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.

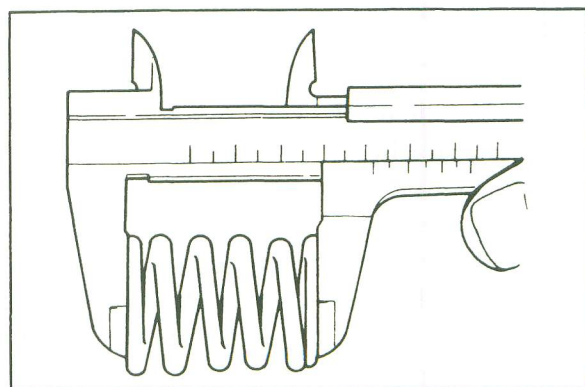


2. After all work has been performed on the valve and valve seat and all head parts have been assembled, check for proper valve/valve seat sealing by pouring solvent into each of the intake ports, then the exhaust ports. There should be no leakage past the seat. If fluid leaks, disassemble and continue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

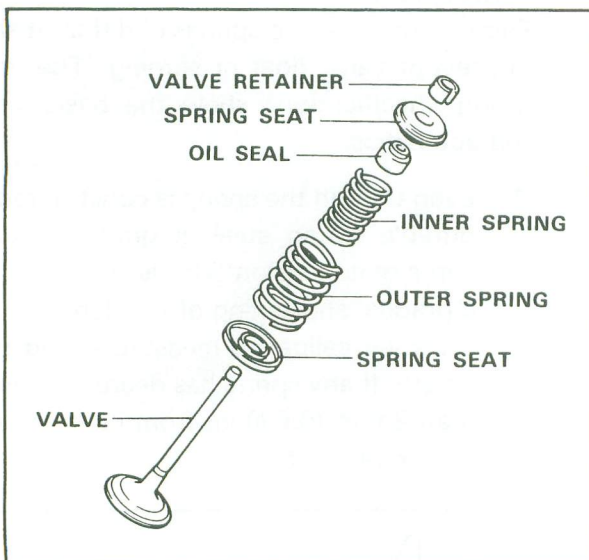
1. Even though the spring is constructed of durable spring steel, it gradually loses some of its tension. This is evidenced by a gradual shortening of free length. Use a vernier caliper to measure spring free length. If any spring has decreased more than 2 mm (0.080 in) from its specification, replace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

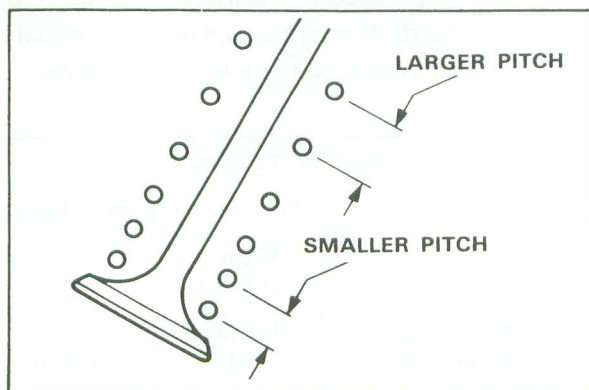
Valve installation



1. Lubricate the valve stem and the oil seal with a high-quality molybdenum disulfide motor oil or molybdenum 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.

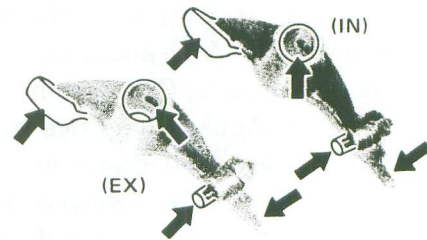
WARNING:

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

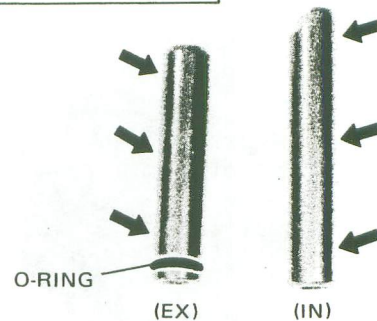
8. Gently tap the end of the valve stem with a plastic mallet. This will ensure that the retainers are properly seated in the collar.

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 ~ 0.0015 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.

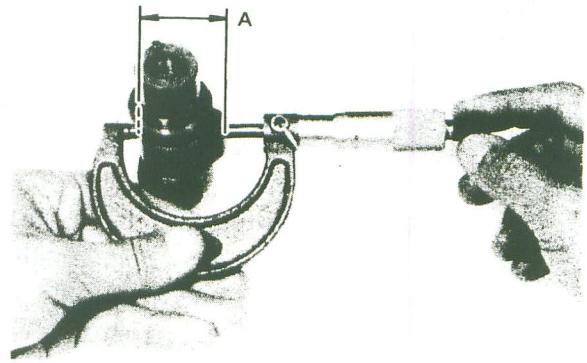
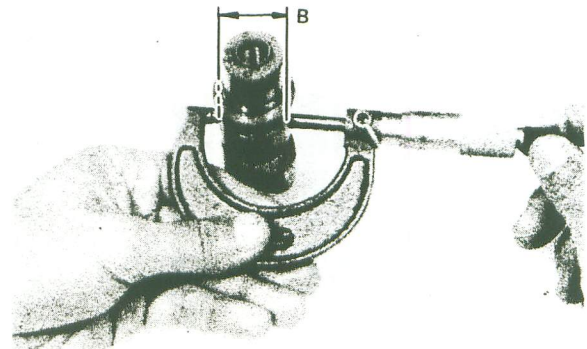
Camshafts, Cam Chains, and Cam Sprockets

Camshaft

The cam lobe metal surface may have a blue discoloration due to excessive friction. The metal surface could also start to flake off or become pitted.

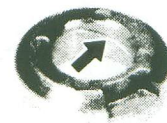
1. If any of the above wear conditions are readily visible, the camshaft should be replaced.
2. Even though the cam lobe surface appears to be in satisfactory condition, the lobes should be measured with a micrometer. Cam lobe wear can occur without scarring the surface. If this wear exceeds the wear limit, valve timing and lift are affected. Replace the camshaft if wear exceeds the limit.

Wear Limit	A	B
Intake	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.

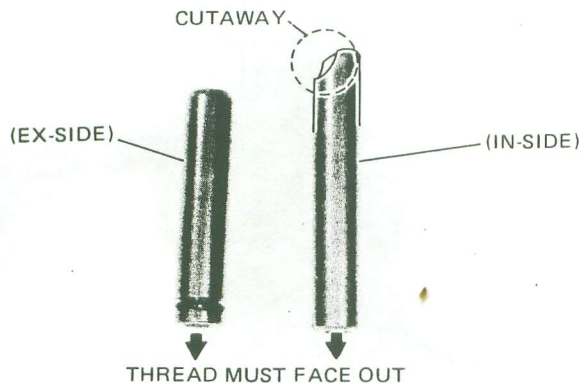


Cylinder Head Assembly

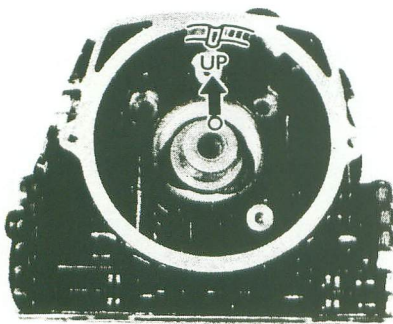
1. Install each rocker arm through the valve cover hole. Install the shorter rocker arm shaft (with O-ring) on the exhaust side and the longer shaft (with cutaway) on the intake side.

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.



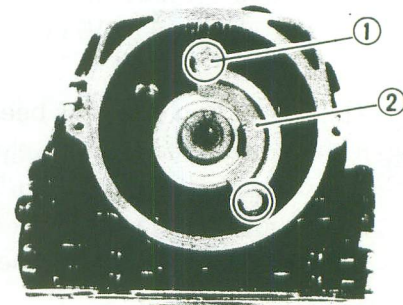
3. Install the camshaft bushing onto the camshaft. Be sure the bushing is completely seated in the cylinder head. The cut-out portion of the bushing must be flush with the cylinder head. Secure the bushing in the head with the securing plate. Torque the securing-plate bolt to specification, and bend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

8 Nm (0.8 m·kg, 5.8 ft·lb)

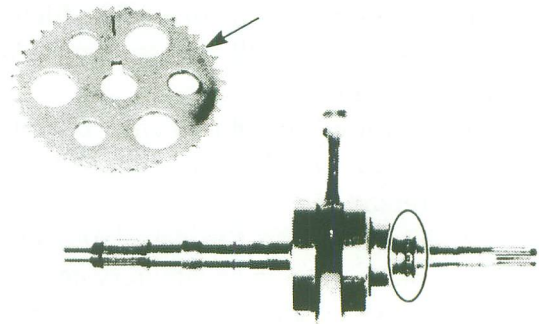


1. Lock washer

2. Plate

Cam Sprocket and Cam Drive Sprocket

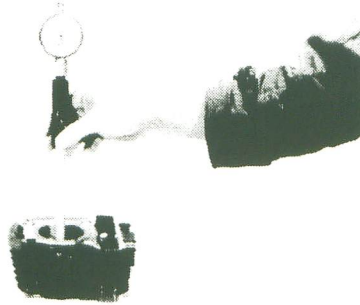
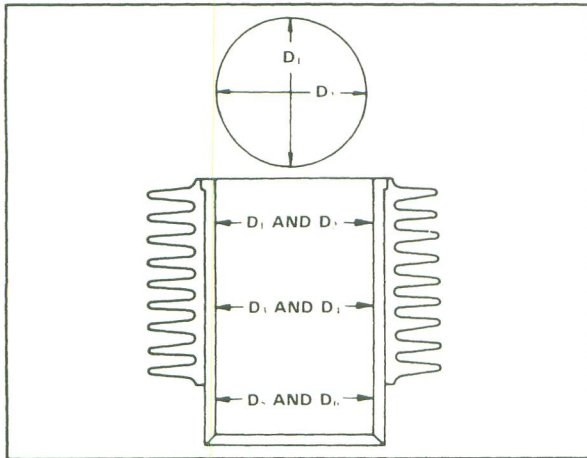
1. Check the cam sprocket and cam drive sprocket for wear.



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.

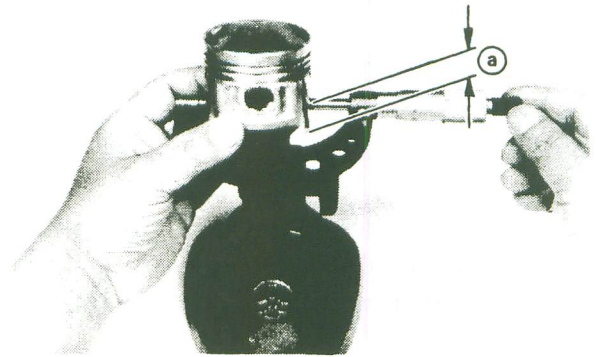


	Standard	Wear Limit
Cylinder bore	$67^{+0.020}_{-0.030}$ mm ($2.64^{+0.0008}_{-0.0012}$ mm)	67.1 mm (2.64 in)
Cylinder taper	—	0.005 mm (0.0002 in)

Piston and Piston Rings

Piston

1. Visually check the piston for scratches. 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.

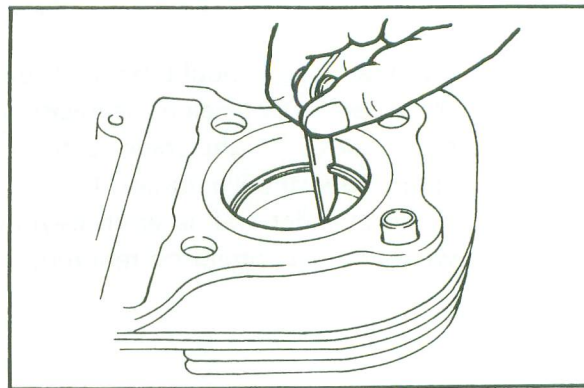
Size	Color
Oversize 2	Blue
Oversize 4	Yellow

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:

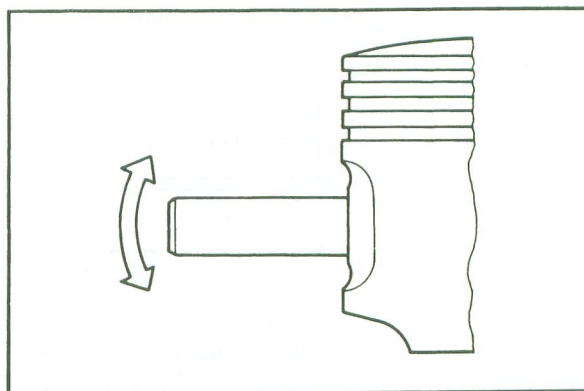
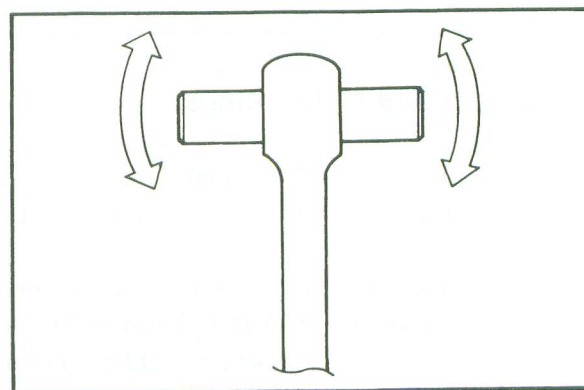
You cannot measure the end gap on the expander spacer of the oil control ring. If the oil-control-ring rails show excessive gap, replace all three rings.

	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.



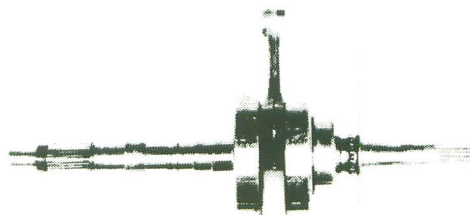
Crankshaft and Connecting Rod

Crankshaft bearing

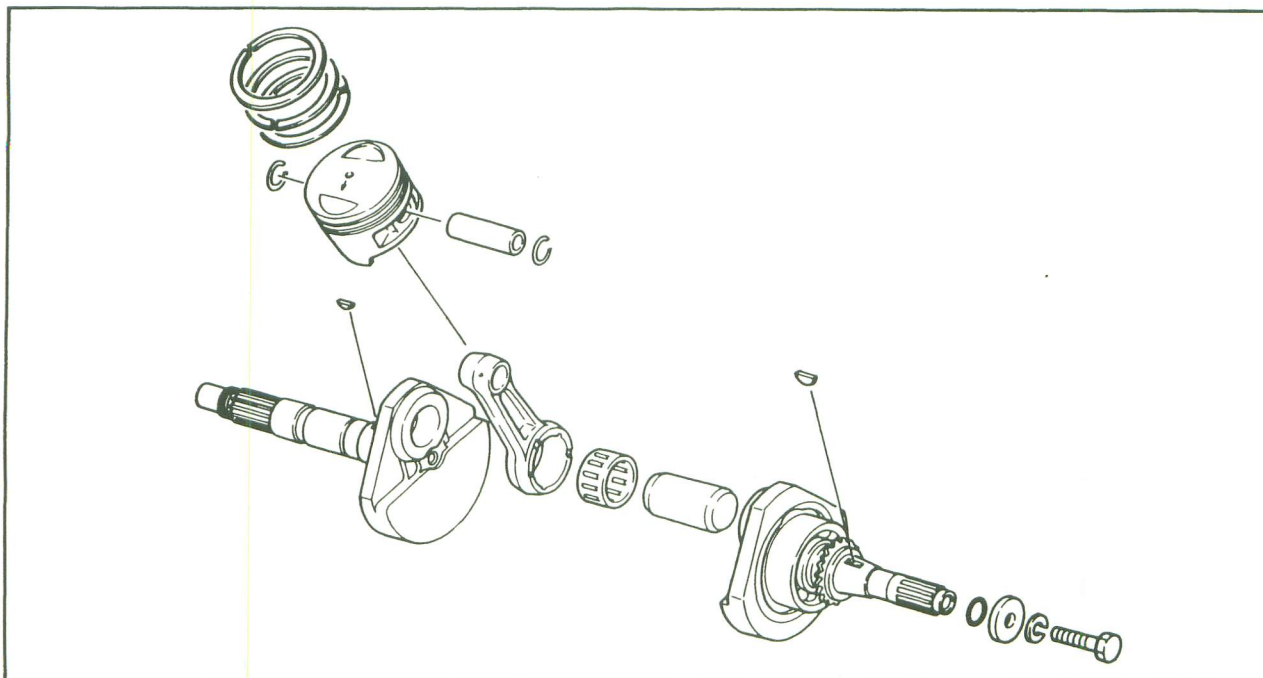
1. Bearings should be cleaned, dried, and the races visually checked for pits, rust spots, or chatter marks where the balls have dragged. If any of these conditions exist, the bearings should be replaced.

NOTE: _____

Lubricate the bearings immediately after examining them to prevent rust.



Crankshaft and connecting rod



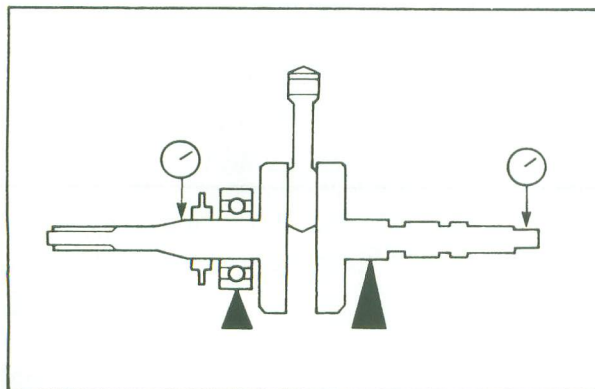
1. Check crankshaft components per chart.

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)	55.95 ~ 56.00 (2.203 ~ 2.205)	0.8 ~ 1.0 (0.03 ~ 0.04)	2.0 (0.08)	0.3 (0.0118)	0.65 (0.0256)



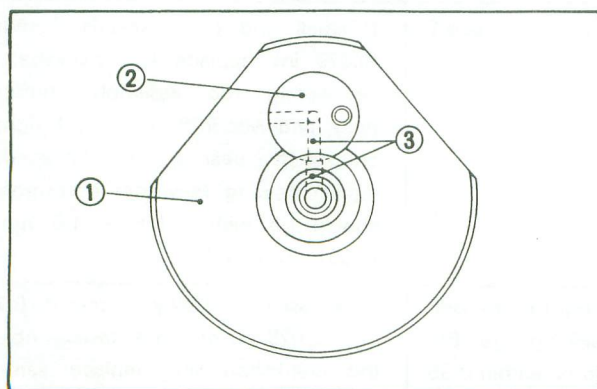
- To disassemble and reassemble the crank, follow the illustration.

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

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

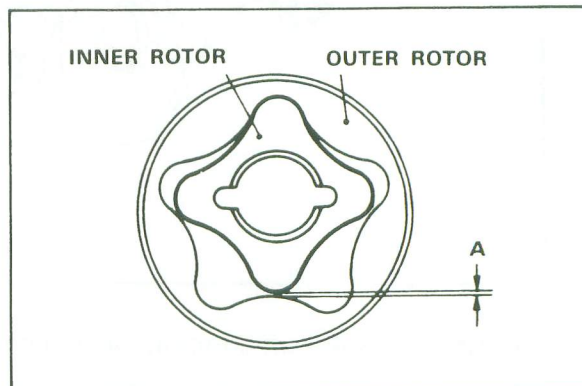
Rotor width:

Crankshaft pump: 6 mm (0.236 in)

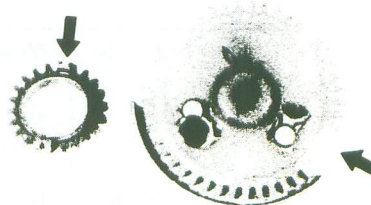
- Measure the inner-outer clearance of each rotor. Replace the pump if the clearance exceeds specifications.

Inner-outer clearance (A):

0.15 mm (0.0059 in)

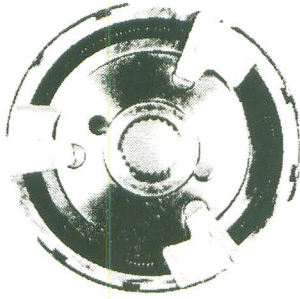


- Check the drive gear and the driven gear for obvious signs of wear or damage. Replace the gear(s) as required.



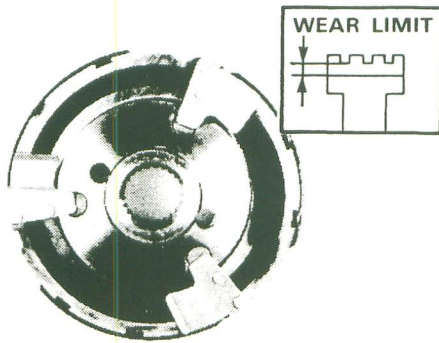
Primary Clutch

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

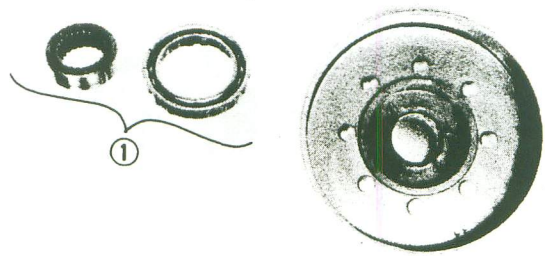


2. Replace clutch shoe assembly if any is faulty or beyond wear limit.

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

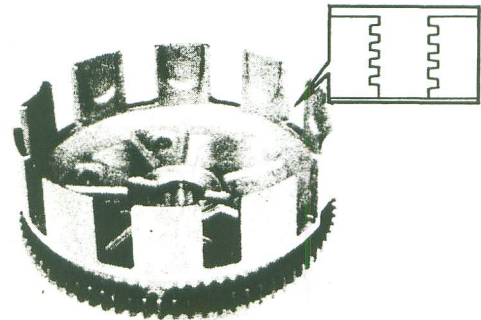
Secondary Clutch

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.



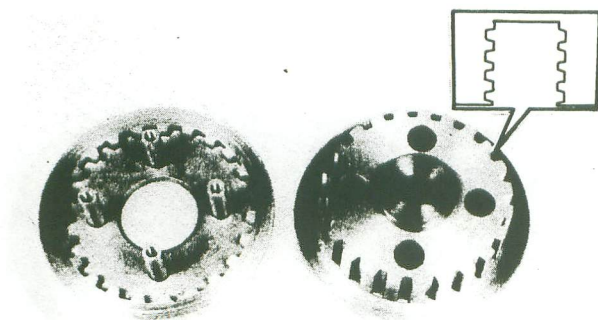
2. Check the clutch housing bearing for damage. If damaged, replace the bearing.

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.



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.

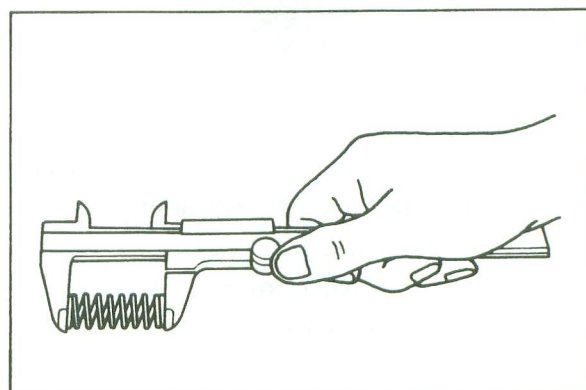
Clutch spring specifications

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

Friction and clutch plates

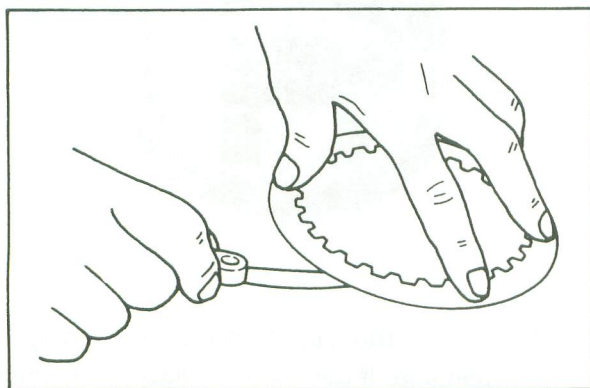
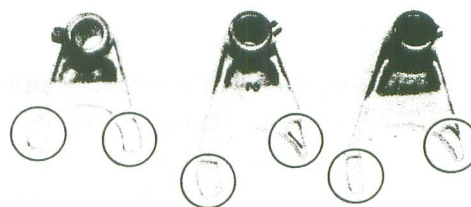
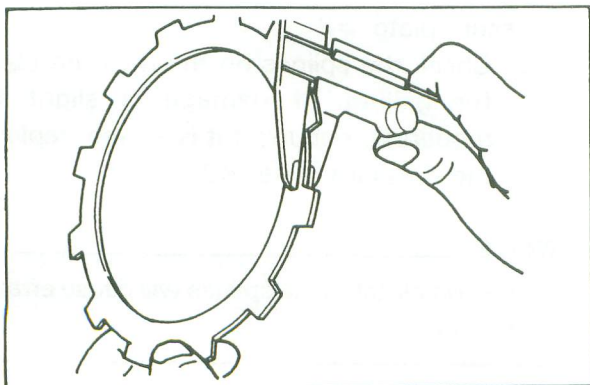
1. Check the clutch plates and friction plates for heat damage. Measure friction plate thickness at 3 or 4 points. Measure the clutch plates for warpage with a feeler gauge and surface plate. Replace clutch plates or friction plates as a set if any is faulty or beyond wear limits.

	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)



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.



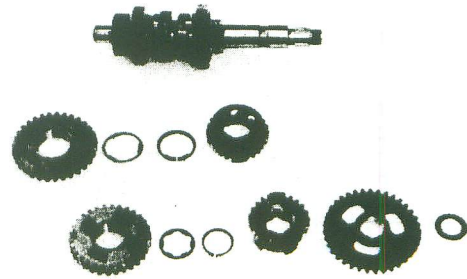
4. Check the cam followers on each shift fork for wear. Check the ends that ride in the grooves in the shift cam. If they are worn or damaged, replace the shift fork.



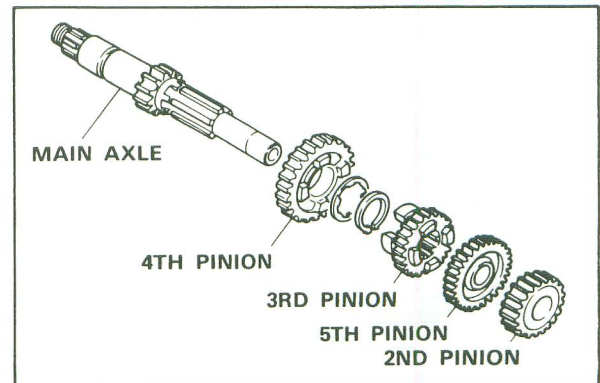
5. Check the shift cam dowel and side plate for looseness, damage, or wear. Replace as required.
6. Check the transmission shafts using a centering device and dial gauge. If any shaft is bent beyond the specified limit, replace the shaft.

Maximum runout: 0.08 mm (0.0031 in)

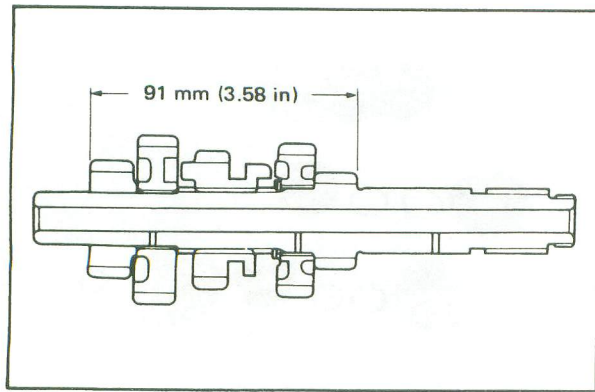
7. Carefully inspect each gear. Look for signs of obvious heat damage (blue discoloration). Check the gear teeth for signs of pitting, galling, or other extreme wear. Replace as required.



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.

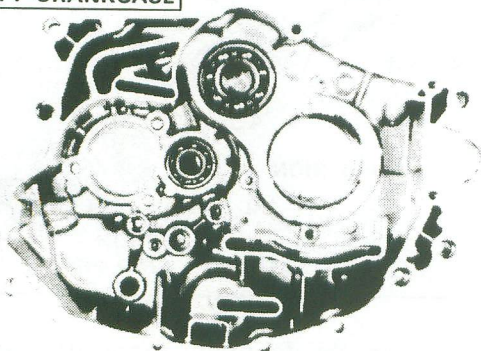


- c. After installing the pinions onto the main axle, make sure the 4th and 5th pinions turn freely around the main axle.

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.

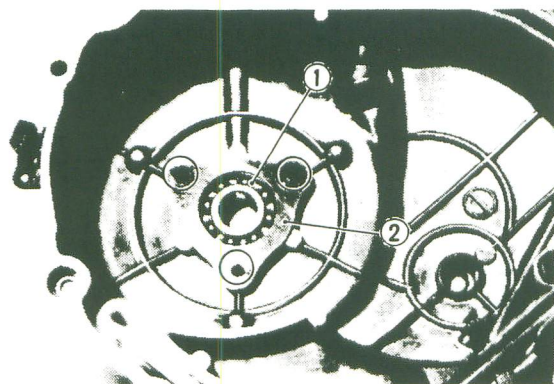
NOTE:

Bearing(s) are most easily removed or installed if the cases are first heated to approximately 95° ~ 125° C (203° ~ 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:

10 Nm (1.0 m·kg, 7.2 ft·lb)

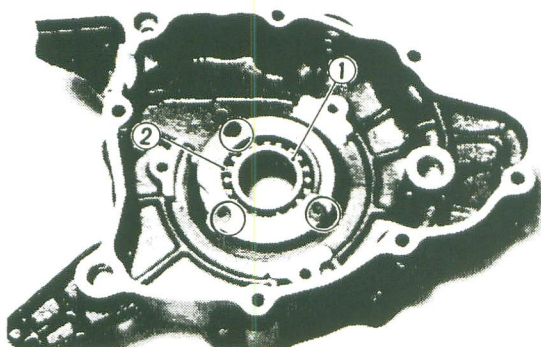


1. Bearing 2. Bearing retainer

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)

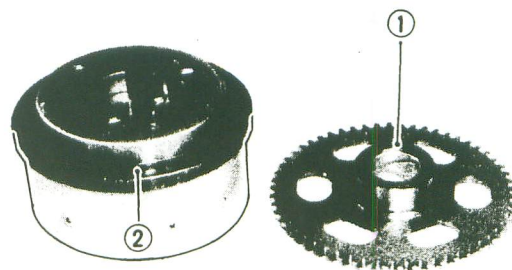


1. Bearing 2. Bearing retainer

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.

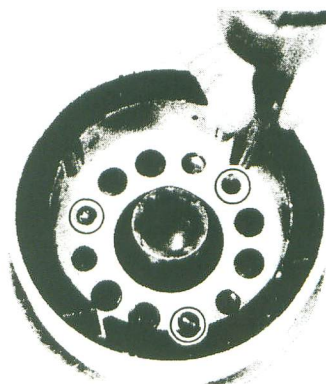


1. Idle gear #2 2. Starter clutch

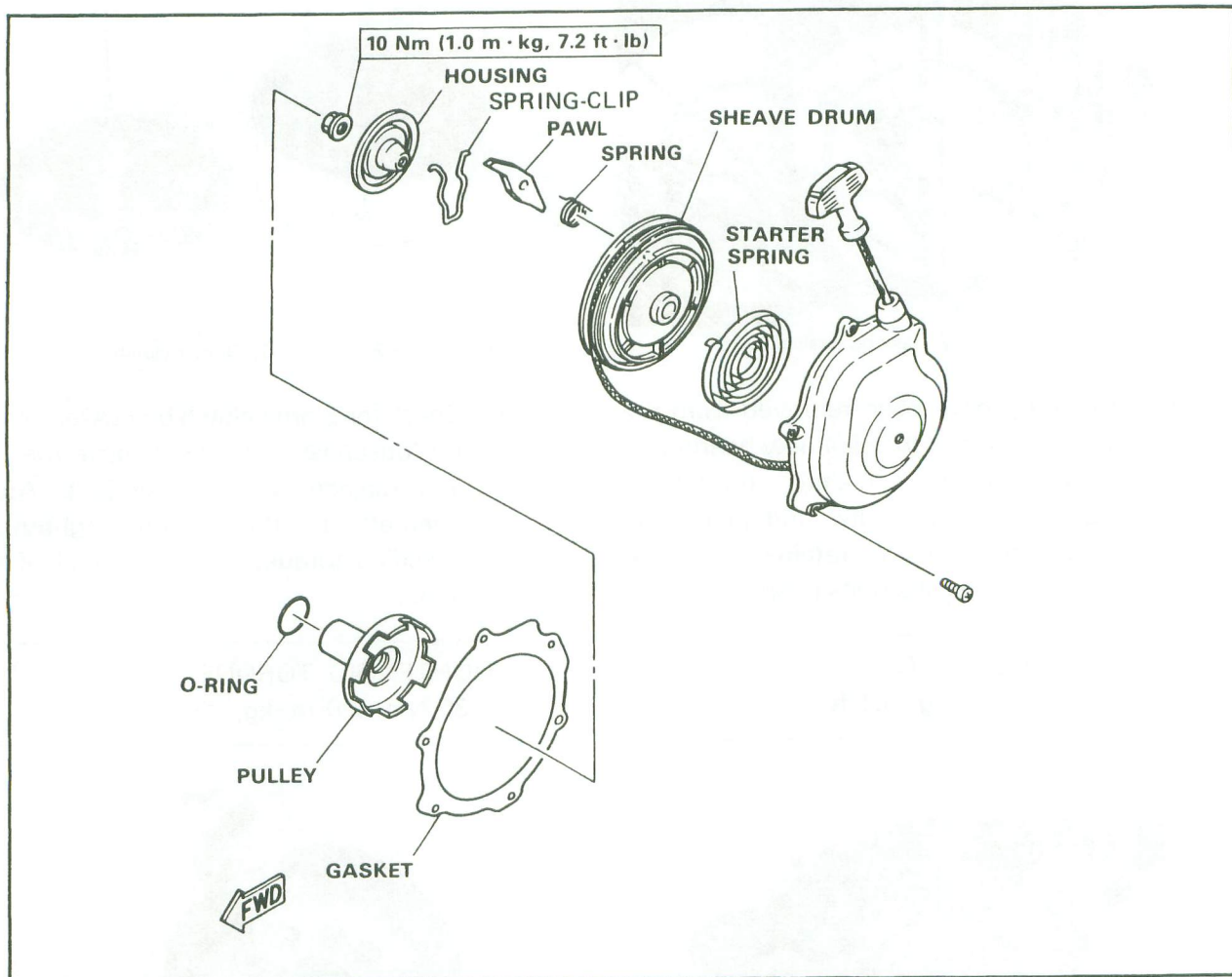
3. Check the starter clutch bolt (Allen screw) for looseness. If loose, remove the bolt and replace with a new bolt. Apply Loctite® to threads and tighten to specified torque. Clinch the end of the bolts.

TIGHTENING TORQUE:

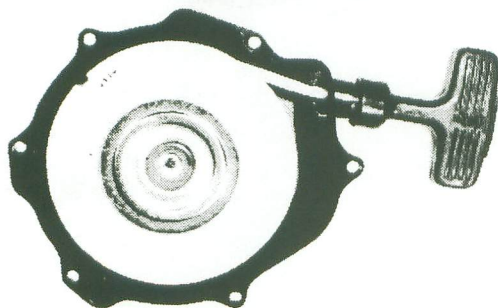
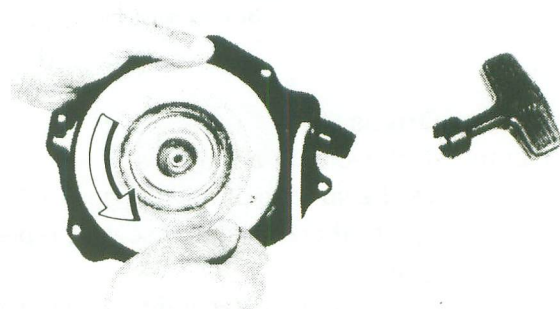
30 Nm (3.0 m·kg, 22 ft·lb)



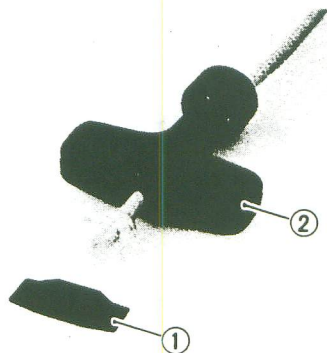
Recoil Starter



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

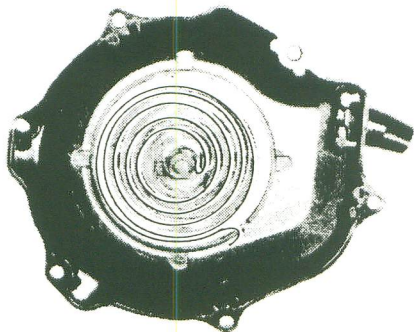
4. Remove the drive housing securing nut. Remove the drive housing, drive pawl, and drive-pawl spring in that order, then slowly remove the sheave drum from the starter case.
5. Carefully remove the starter spring from the case.

NOTE:

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

Assembly

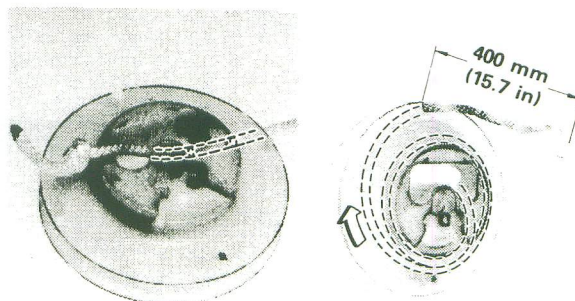
1. Install the starter spring in the starter case.



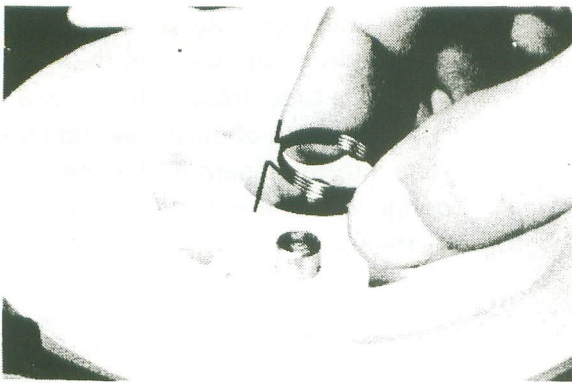
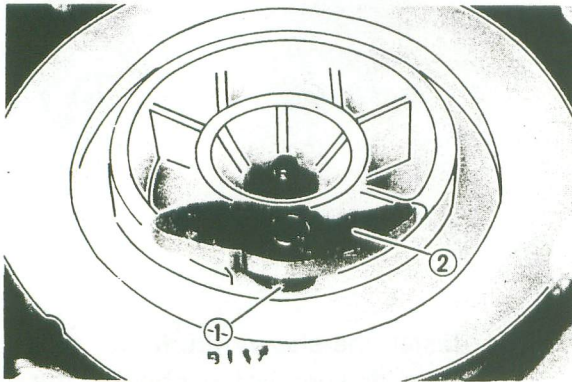
NOTE:

- 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.



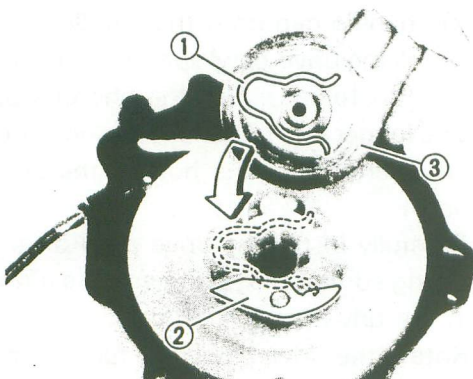
1. Drive-pawl spring

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)

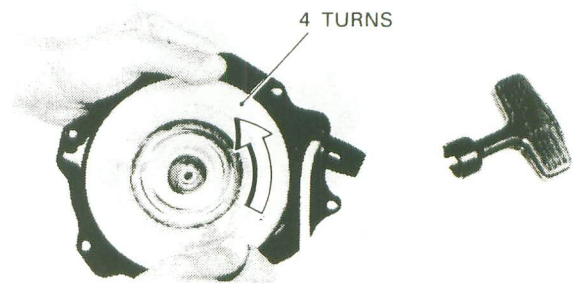


1. Spring-clip

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

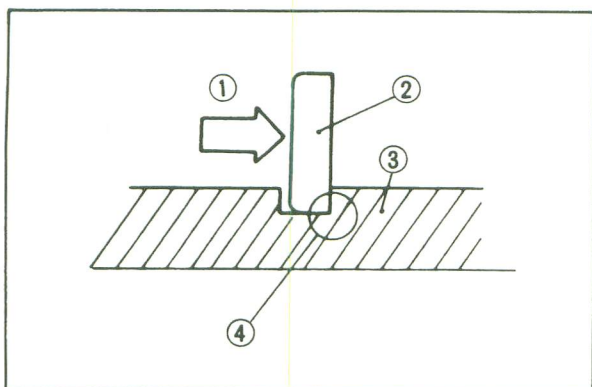
Gaskets and seals

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.

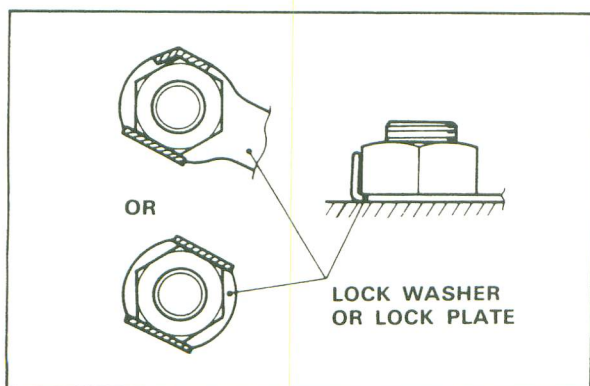
When installing a circlip, make sure that the sharp edged corner is positioned away from the thrust it receives. See the sectional view below.



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

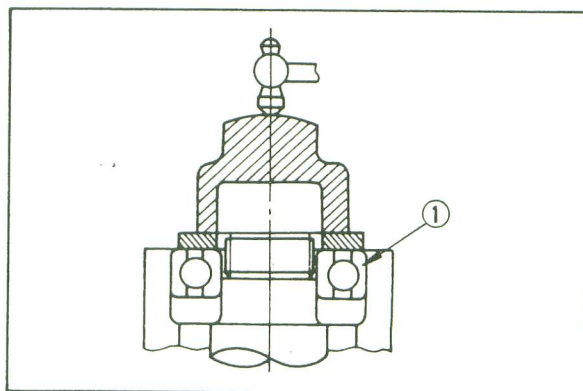
Lock washers/plates and cotter pins

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.

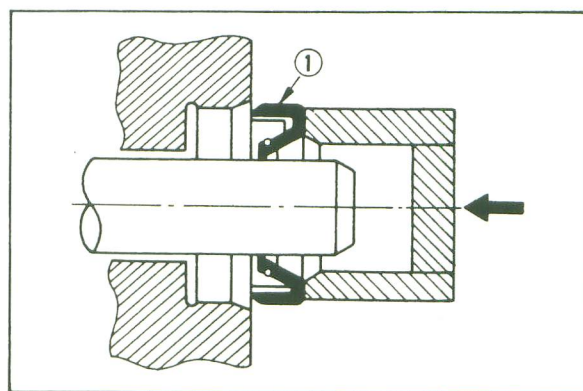


Bearings and oil seals

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.

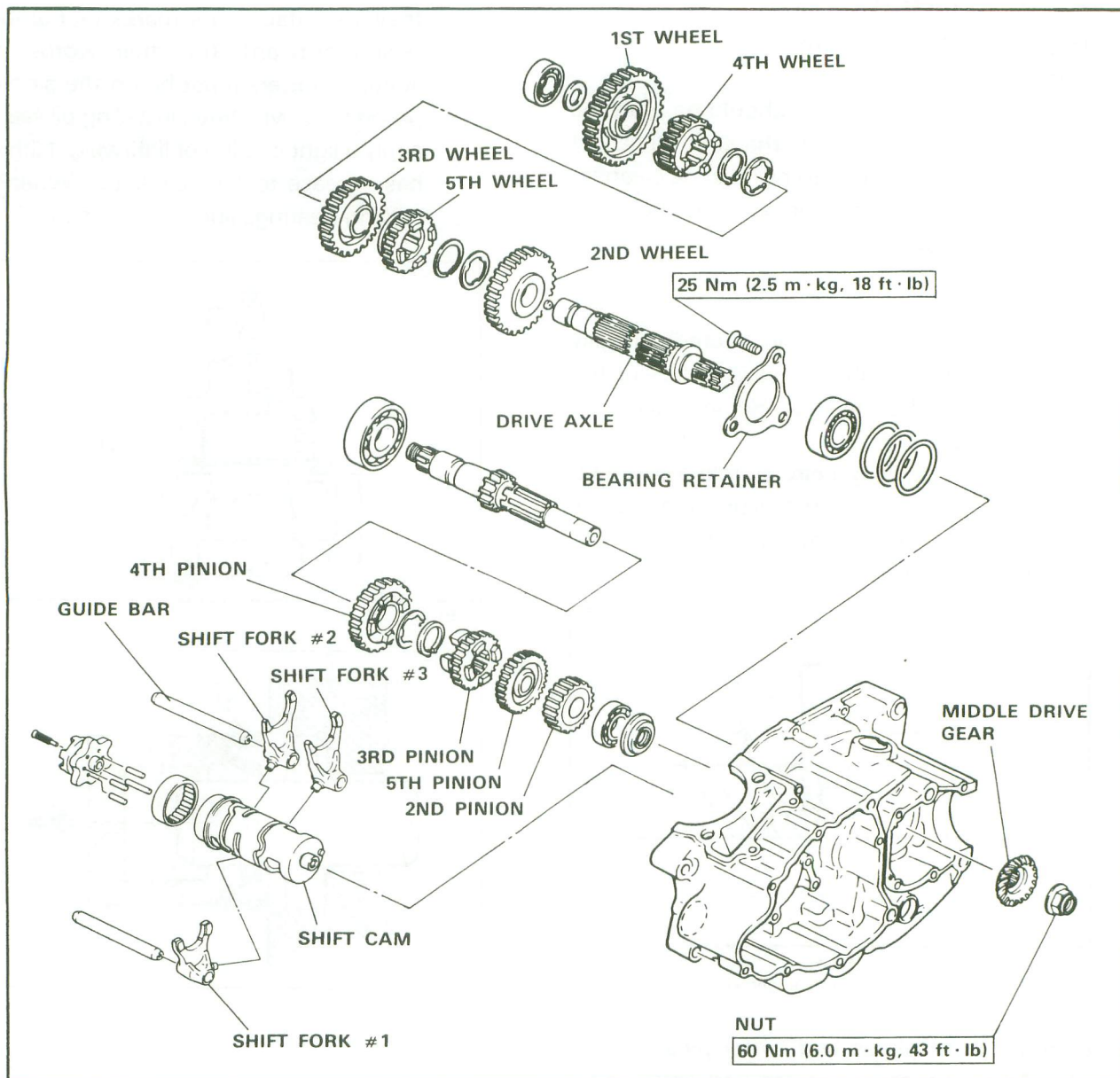


1. Bearing

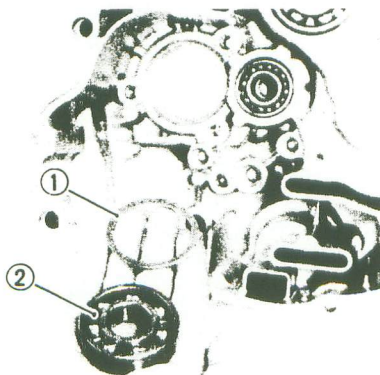
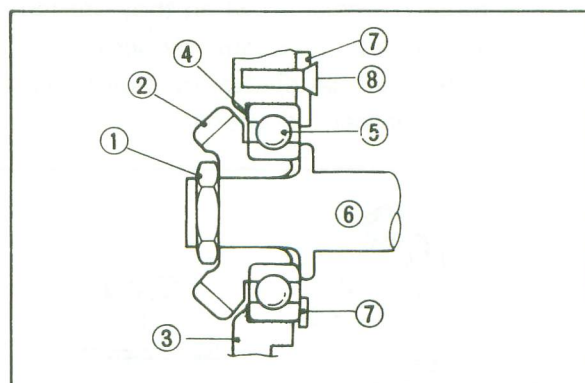


1. Oil seal

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 3-56.



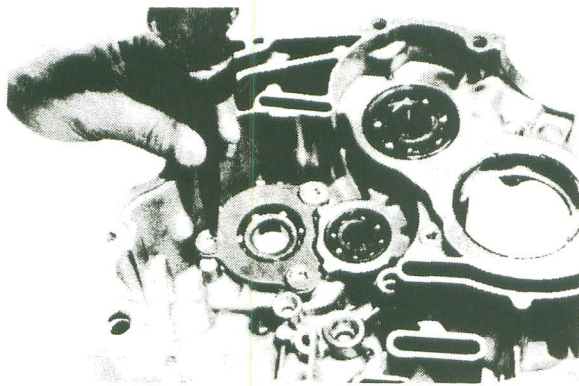
1. Nut
2. Middle drive gear
3. Crankcase
4. Shim
5. Bearing
6. Drive axle
7. Bearing retainer
8. Screw

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:

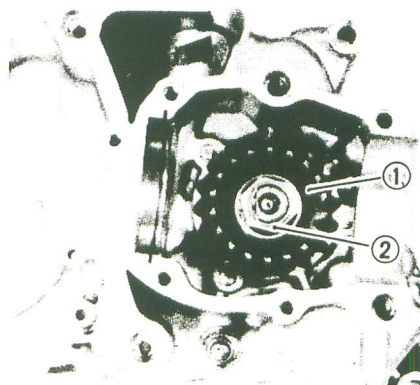
- Liberally oil the bearings before installation.
- The bearing i.d. marks should face the inside of the crankcase. Push the outer, not the inner race.

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:

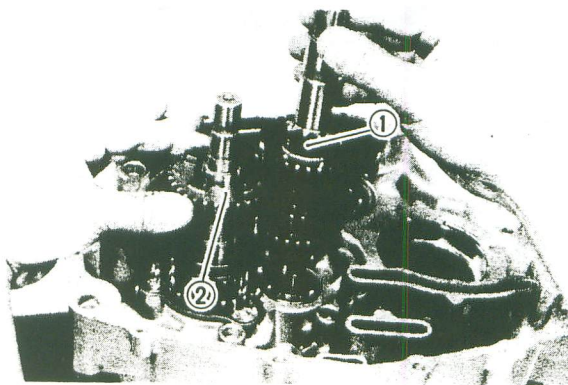
60 Nm (6.0 m · kg, 43 ft · lb)

8. Bend the nut flange 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.

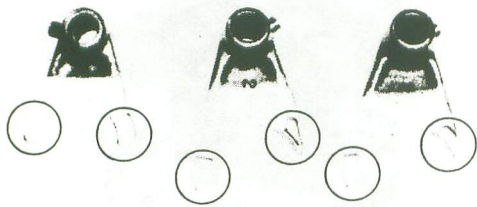
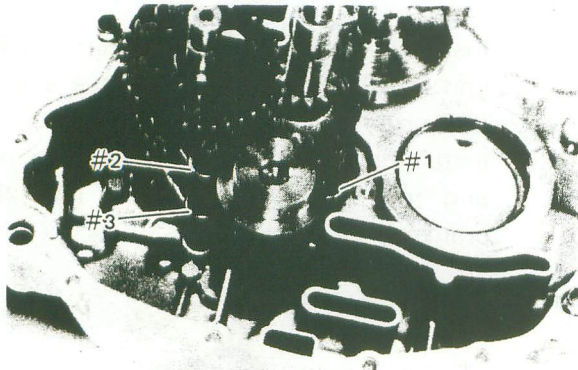


1. Sub-assembly 2. 3rd wheel

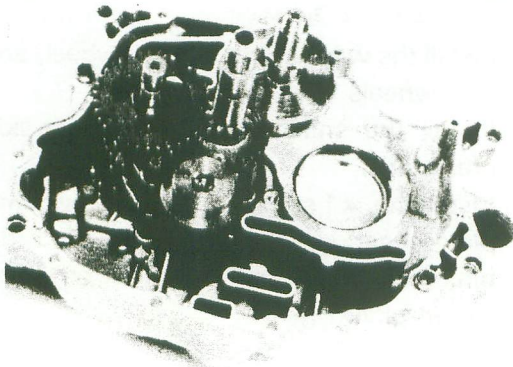
11. Install the washer, circlip, fifth wheel, and first wheels onto the drive axle.
12. Install the shift cam into the left-side crankcase.
13. Install the #1 shift fork onto the second-pinion gear, #2 shift fork onto the fifth-pinion gear, and #3 shift fork onto the fourth-pinion gear.

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.

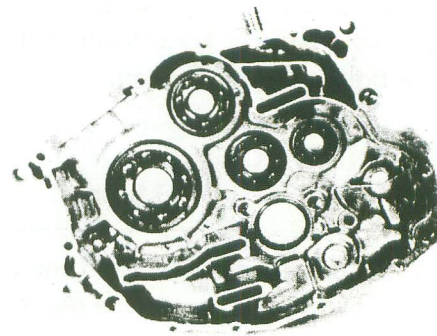


14. Install the guide bars through the shift fork(s).
15. Install the balancer shaft with the non threaded end onto the left-side of the crankcase.



Right-Side Crankcase

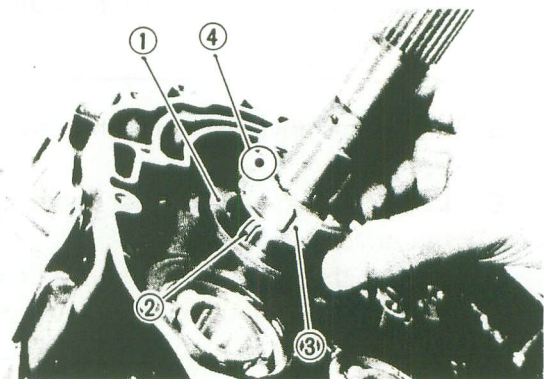
1. Press the bearings into the left-side crankcase. Liberally oil the bearings before installation. The bearing i.d. marks should face the inside of the crankcase. Push the outer, not the inner race.



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:

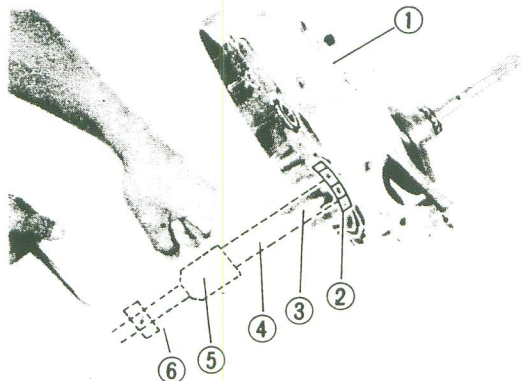
Align the connecting rod with the cylinder sleeve hole. The rod must be in this hole when the boss is properly installed.



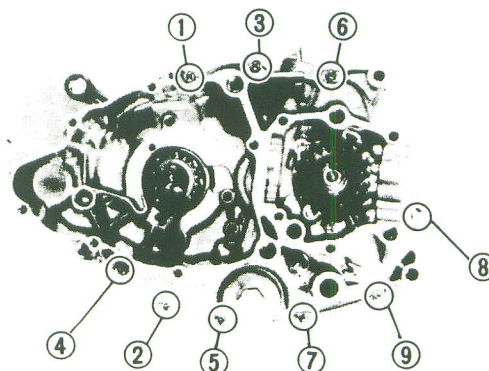
- | | |
|-----------------|----------------|
| 1. Plate washer | 3. Buffer boss |
| 2. Woodruff key | 4. Punch mark |

NOTE:

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

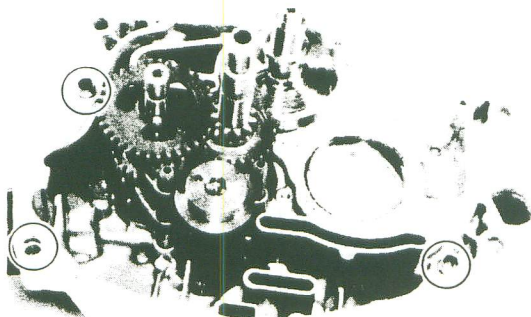


- | | |
|----------------|-------------------------|
| 1. Crankcase | 4. Pot extension |
| 2. Buffer boss | 5. Adapter #11 |
| 3. Crankshaft | 6. Crankshaft installer |



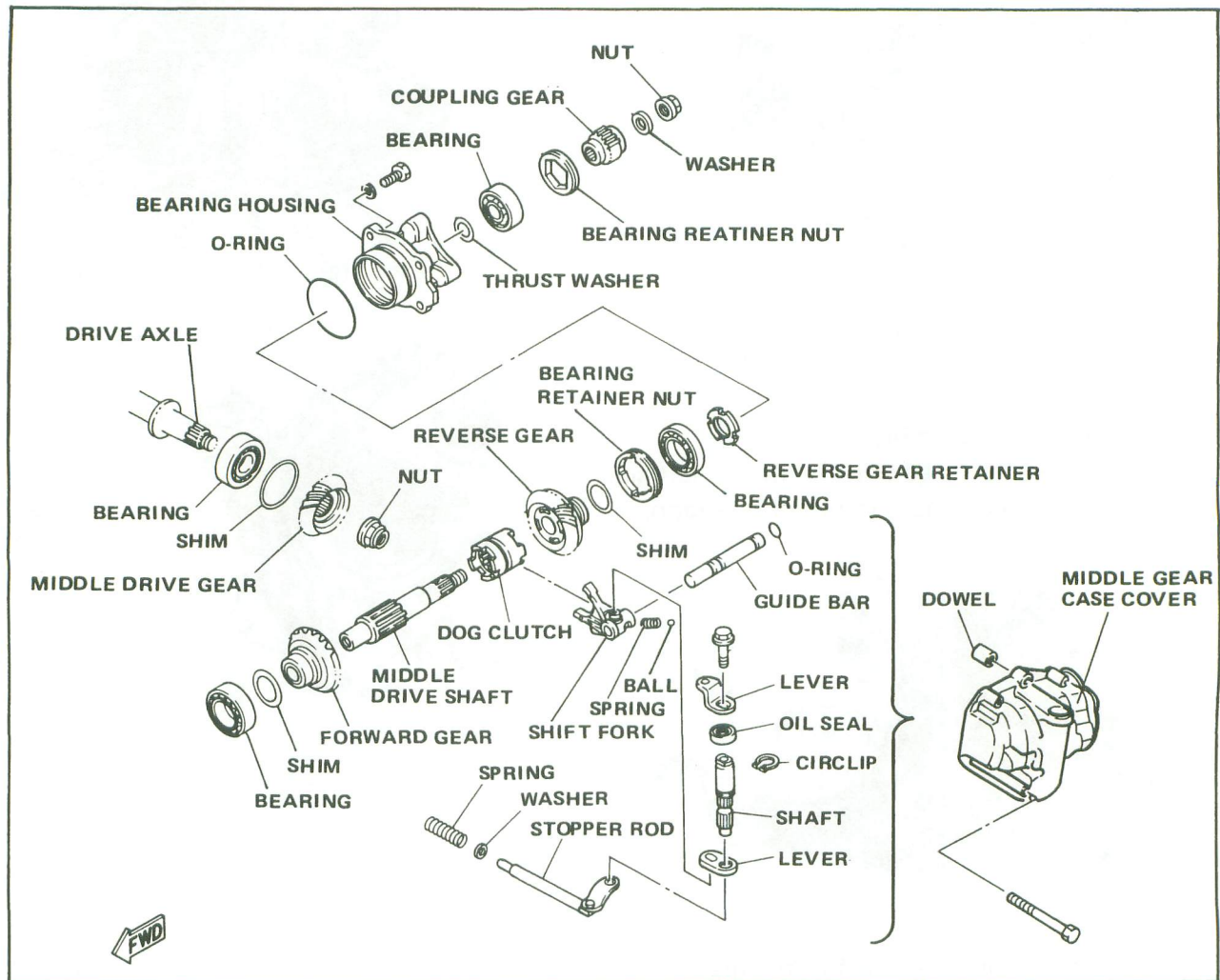
Crankcase Assembly

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

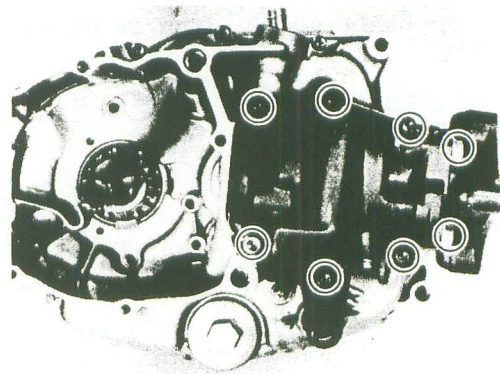


2. Apply Yamabond #4 to the mating surfaces of both case halves. Apply thoroughly, over all mating surfaces.
3. Install the right-side crankcase onto the left-side crankcase.
4. Install the crankcase bolts. Tighten the bolts in the tightening sequence shown in the photograph. After all the bolts are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

Middle Gear Assembly



1. Install the two dowels into the middle gear case cover.
2. Install the middle gear assembly onto the crankcase.
3. Move the dog clutch to the left so that the dog clutch can be engaged with the forward gear.
4. Apply Yamabond #4 to the mating surfaces of the cover and crankcase.
5. Apply molybdenum disulfide oil to the shift fork and dog clutch splines.
6. Install the washer and spring onto the stopper rod.
7. Install the middle gear case onto the crankcase. Note the following points.

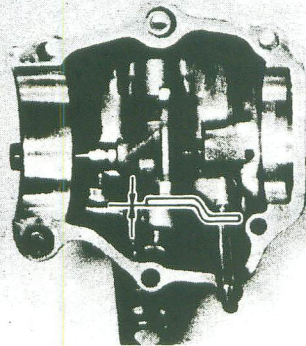


NOTE:

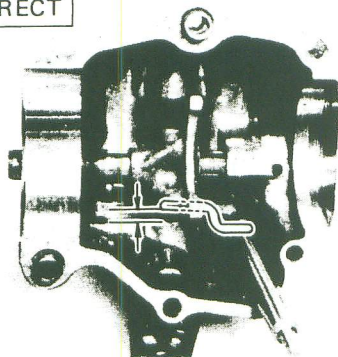
Before installing the middle gear case, the stopper rod lever should be in contact with the cover as shown.

If not, the middle drive shaft and dog clutch may be stuck and the drive select lever does not move smoothly.

CORRECT



IN CORRECT



- The shift fork must be engaged in the dog clutch groove.

8. Tighten the case cover securing bolts to specification.

TIGHTENING TORQUE:

10 Nm (1.0 m·kg, 7.2 ft·lb)

NOTE:

After installing the cover, make sure the drive shaft turns smoothly.

9. Install the neutral and reverse switches with the new gasket. Connect the switch leads.

TIGHTENING TORQUE:

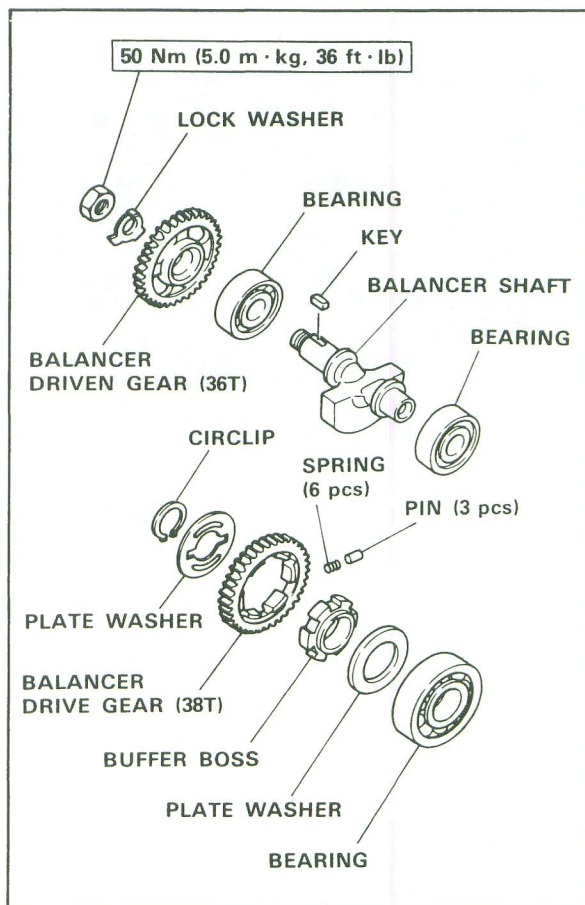
Neutral Switch:

20 Nm (2.0 m·kg, 14 ft·lb)

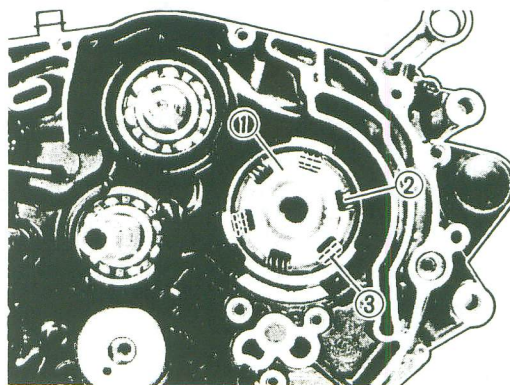
Reverse Switch:

4 Nm (0.4 m·kg, 2.9 ft·lb)

Balancer Drive Gear and Driven Gear

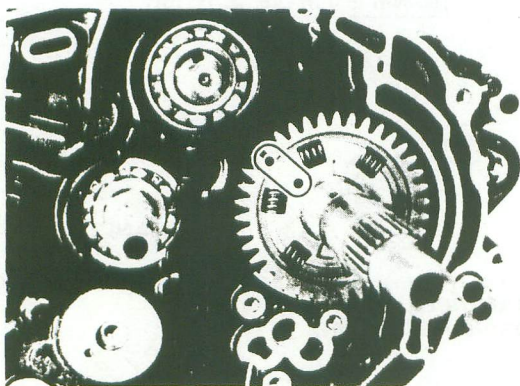


1. Install the balancer drive gear in the following way:
 - a. The balancer drive gear damper assembly is composed of 6 springs and 3 pins. Insert a spring into the buffer boss, then insert a spring with a pin in it.



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

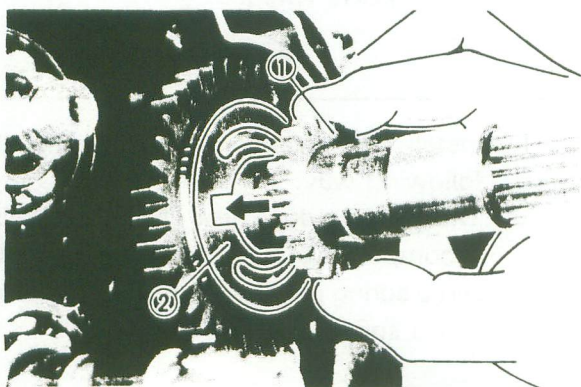
- b. Align the punch marks on the buffer boss and drive gear, and install the drive gear.



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.



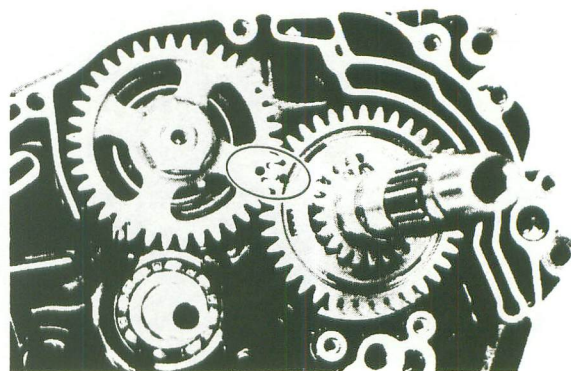
1. Oil pump drive gear

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. Fingertighten the securing nut.

NOTE:

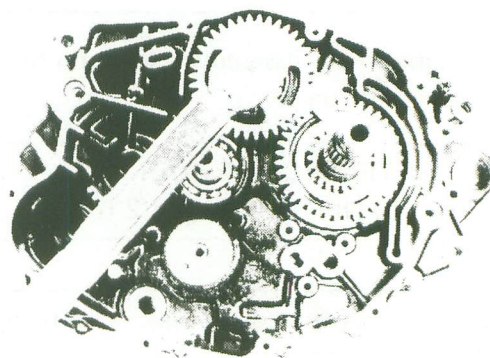
Be sure the tab of the lock washer engages the slot in the balancer shaft.



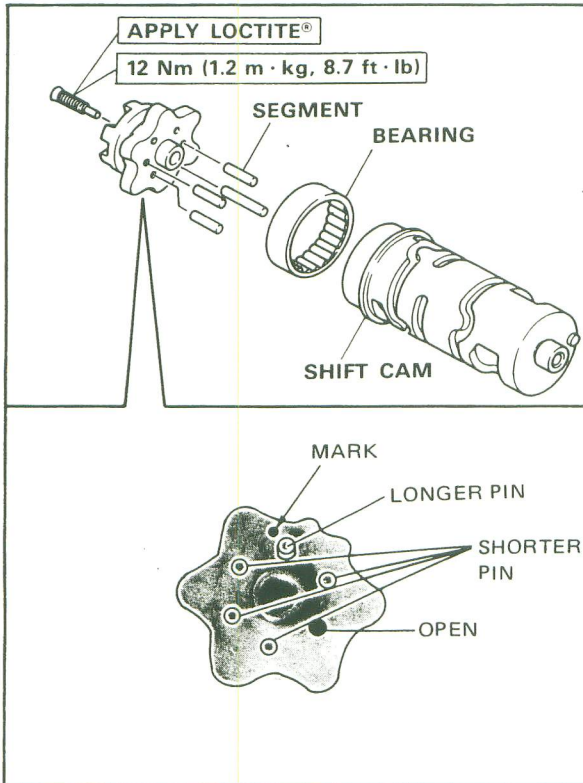
4. Place a small piece of rolled rag or a piece of lead between the drive and driven gears as shown in the photograph. It will hold the gears so you can tighten the balancer driven gear securing nut. Torque the nut to specification, and bend the lock tab against a nut flat.

TIGHTENING TORQUE:

50 Nm (5.0 m · kg, 36 ft · lb)

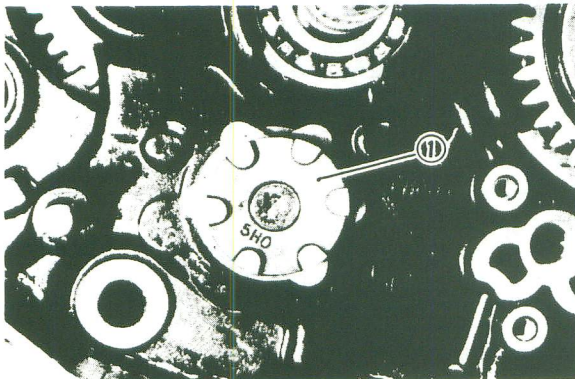


Shifter

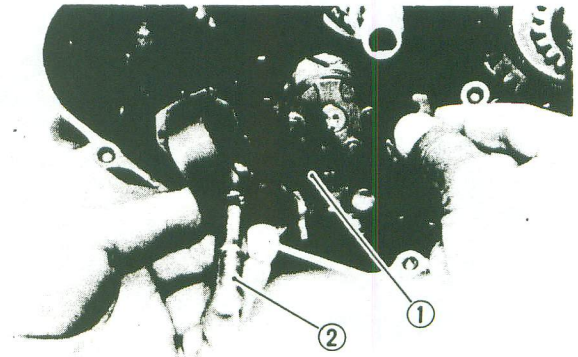


1. Install the segment. Apply Loctite® (red) to the segment securing bolt. Use the torx driver #30 when tightening the bolt.

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

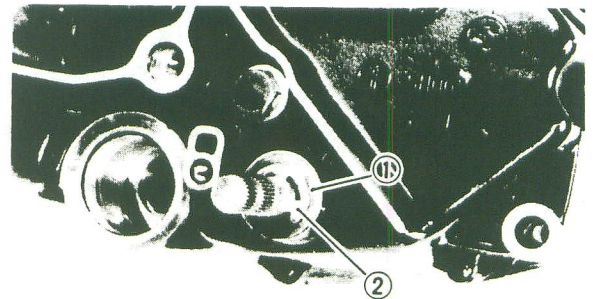


1. Segment
2. Lightly grease the lips of the shift shaft oil seal at the left-side crankcase.
3. Install the shifter into the right-side crankcase. Hook the shift shaft spring beneath the projection in the crankcase. Be sure the shift lever correctly engages the cam shift pins.



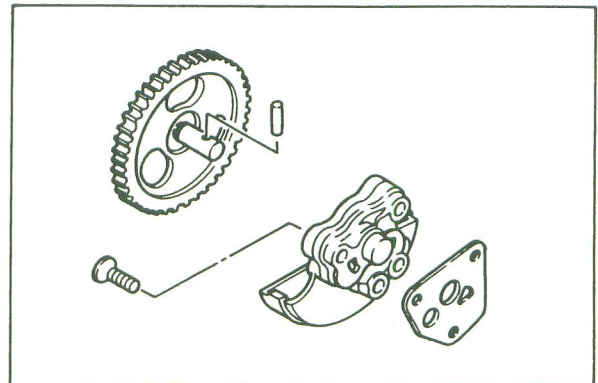
1. Stopper lever
2. Shift shaft

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



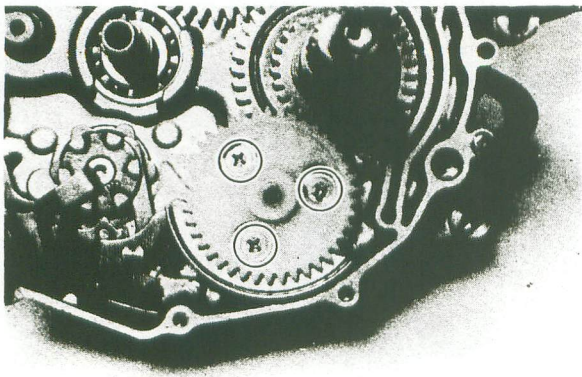
1. Washer
2. Circlip

Oil Pump

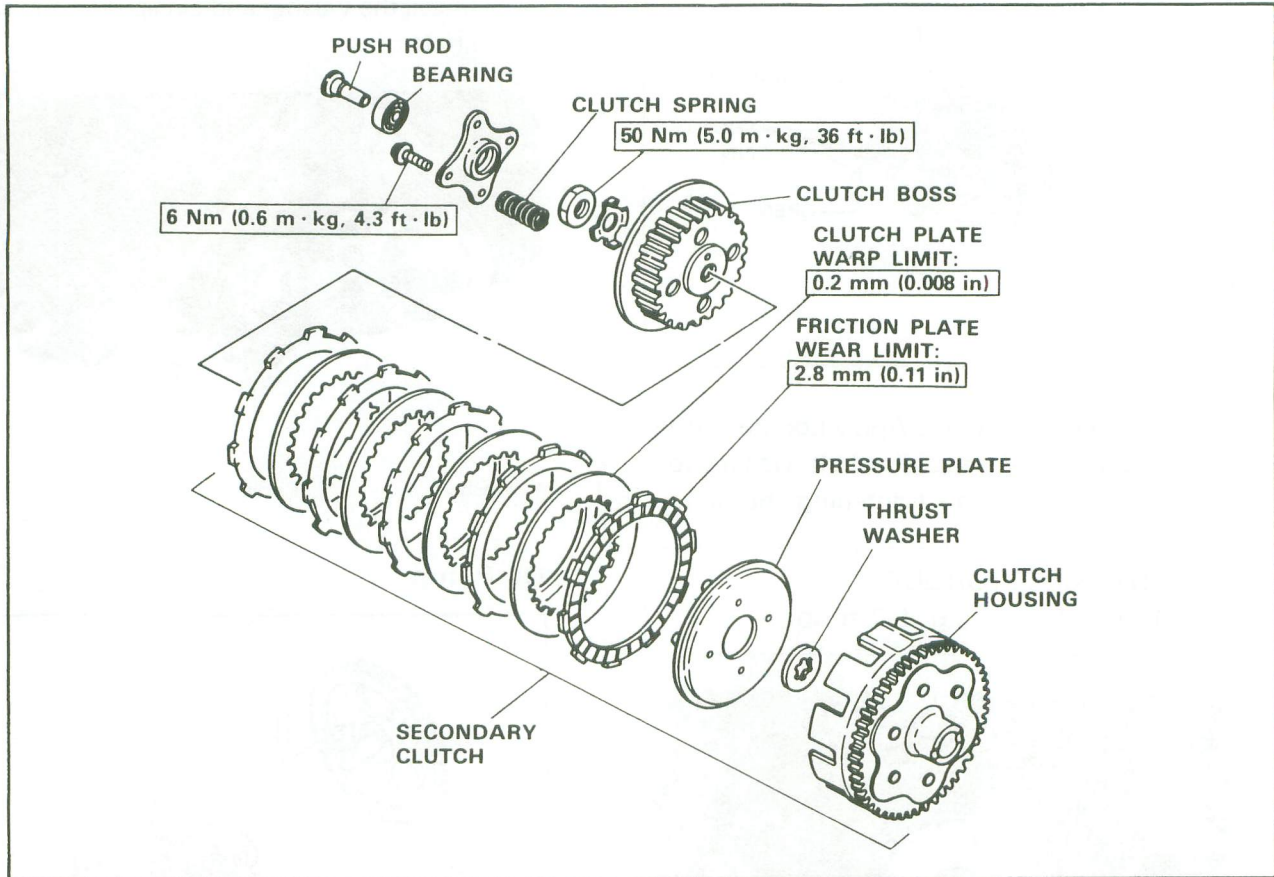


1. Reassemble the oil pump.
2. Install the oil pump assembly with a new gasket onto the right-side crankcase. Torque the bolts to specification.

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.

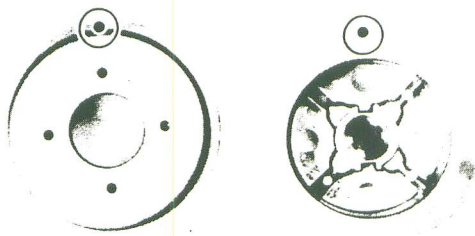


1. Thrust washer

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.

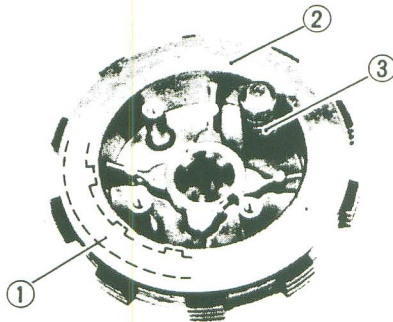


7. Remove the clutch spring holding bolt. Install the three clutch springs and clutch spring plate. Torque the clutch spring holding bolts to specification.

TIGHTENING TORQUE:

6 Nm (0.6 m · kg, 4.3 ft · lb)

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

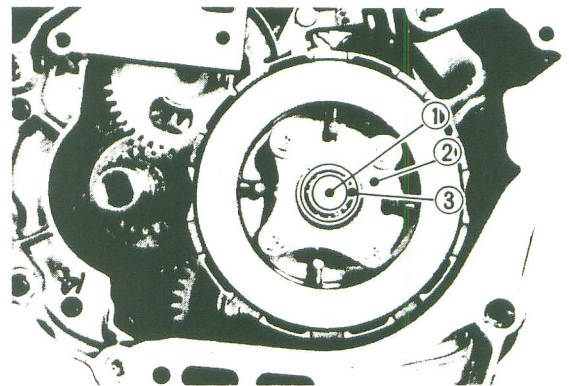


1. Pressure plate 2. Clutch boss 3. Clutch spring

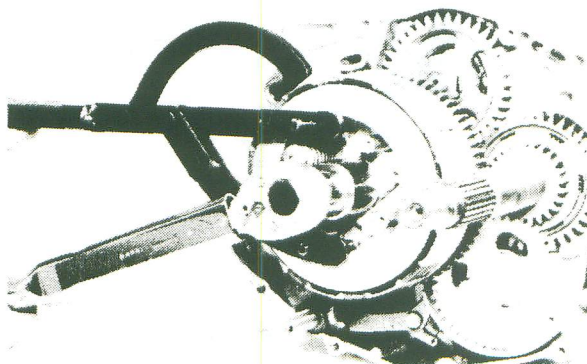
4. Install the clutch subassembly into the clutch housing.
5. Install a new lock washer onto the transmission main axle. Be sure the tab of the washer engages the slots in the clutch boss.
6. Install the clutch-boss securing nut. Using the universal rotor holding tool, tighten the clutch-boss nut and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

TIGHTENING TORQUE:

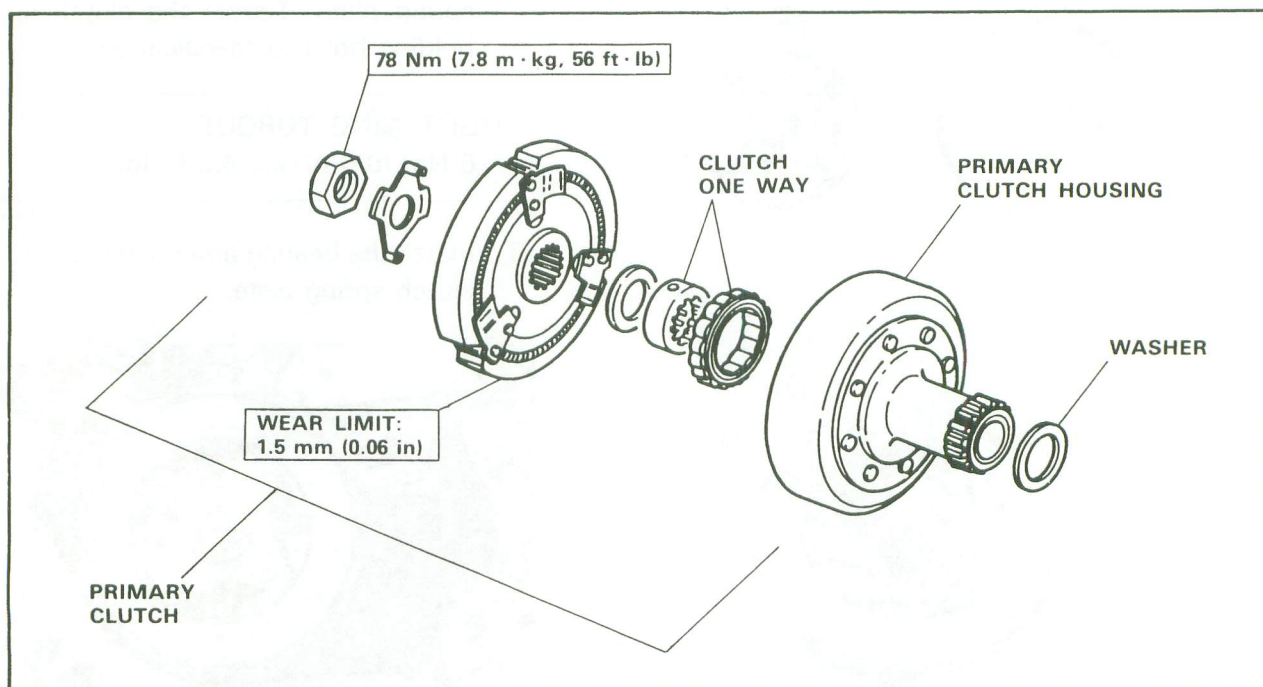
50 Nm (5.0 m · kg, 36 ft · lb)



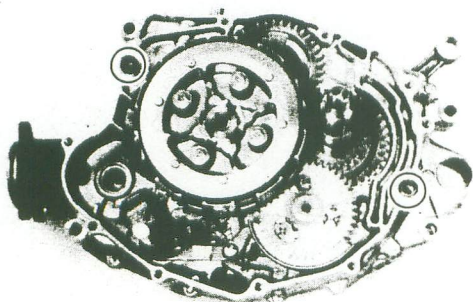
1. Push rod 2. Clutch spring plate 3. Bearing



Crankcase Spacer (Right Side) and Primary Clutch

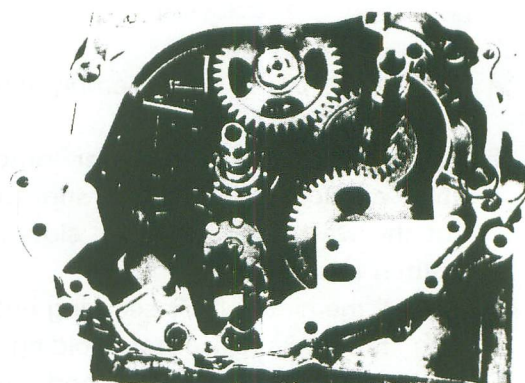


1. Install the two dowels into the right-side crankcase where shown in the photograph.

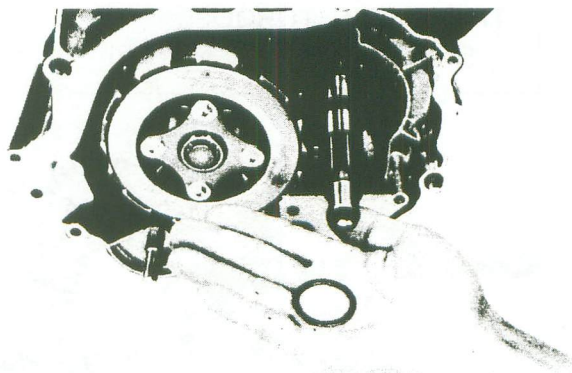


2. Install a new crankcase spacer gasket to the crankcase, and install the right-side crankcase spacer onto the right-side crankcase.
3. Install the three spacer bolts. Tighten the bolts to specification.

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



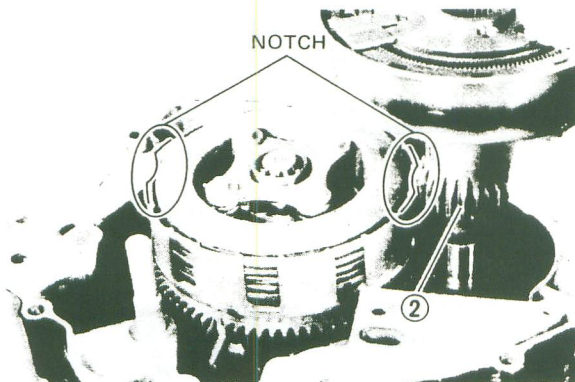
4. Install the washer onto the right-side crankshaft.



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

NOTE: _____

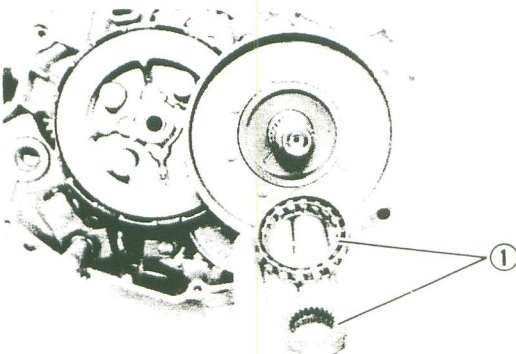
The secondary clutch housing has two notches machined into it to permit the primary drive gear behind the primary clutch housing to clear the secondary clutch. Align one of these notches with the primary gear before installing the primary housing.



1. Clutch housing

2. Primary drive gear

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



1. Clutch one-way assembly

NOTE: _____

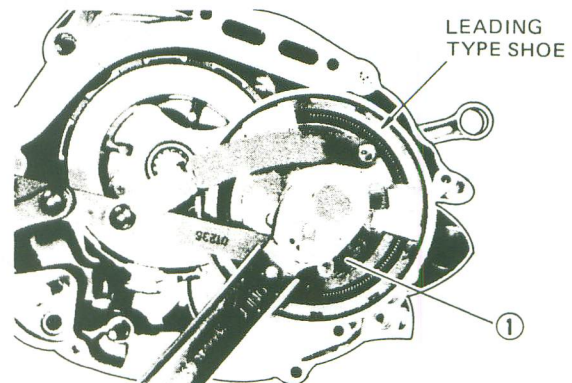
The flange side of one-way must face inward, away from the clutch shoe.



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.

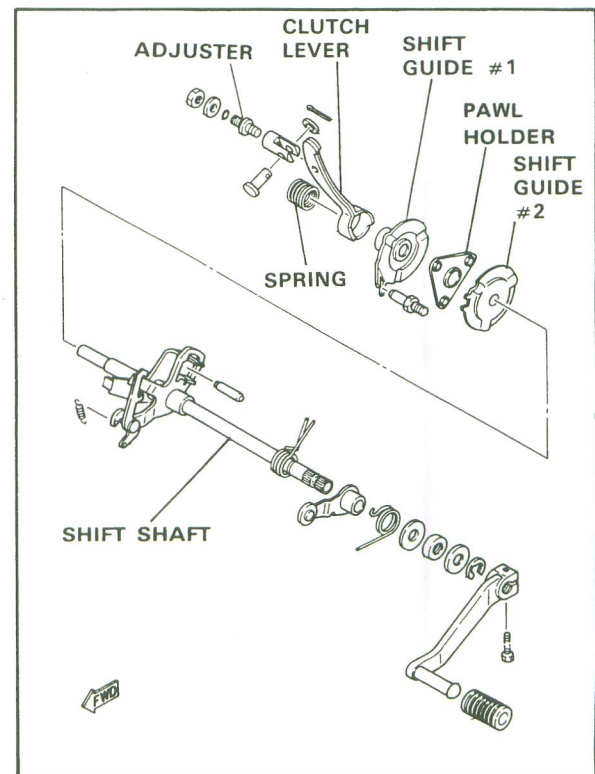
TIGHTENING TORQUE:

78 Nm (7.8 m·kg, 56 ft·lb)

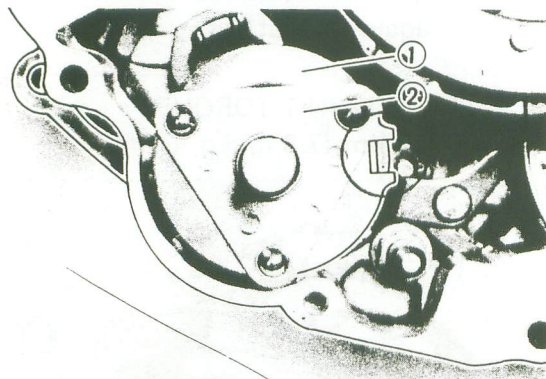


1. Clutch shoe assembly

Clutch Lever, Clutch Cover and Oil Filter

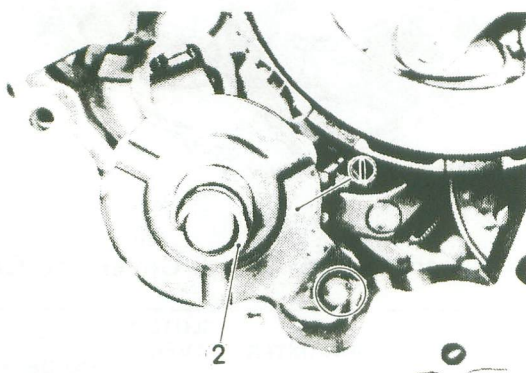


1. Install onto the shift shaft the shift guide #2, pawl holder, shift guide #1, clutch lever, and clutch lever spring. The slot in the shift guide #1 must engage the shift shaft projection, and the shift guide #2 slot must engage the projection of the right-side spacer as shown in the photograph.



1. Shift guide #2

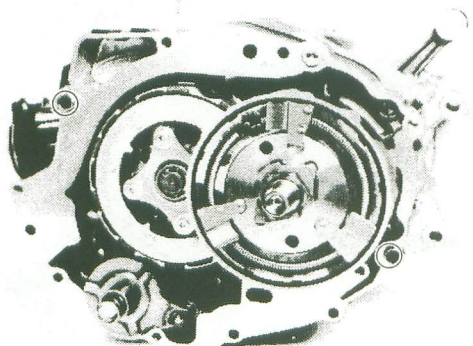
2. Pawl holder



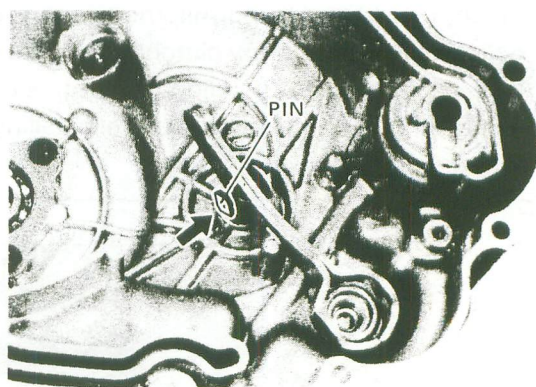
1. Shift guide #1

2. Spring

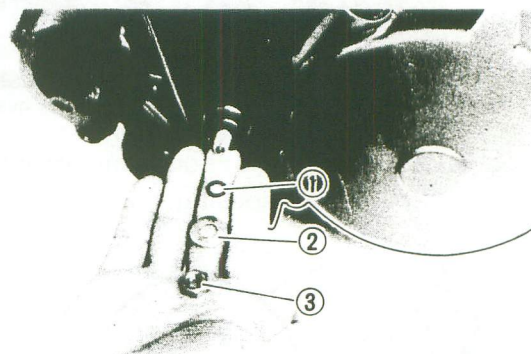
2. Install the two dowels into the right-side spacer.



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

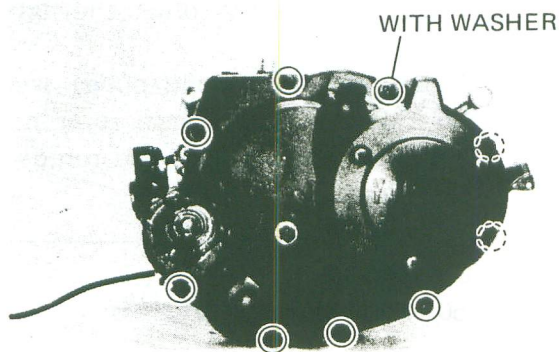
5. Install the clutch cover with a new gasket, and torque the securing bolts to specification.

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.

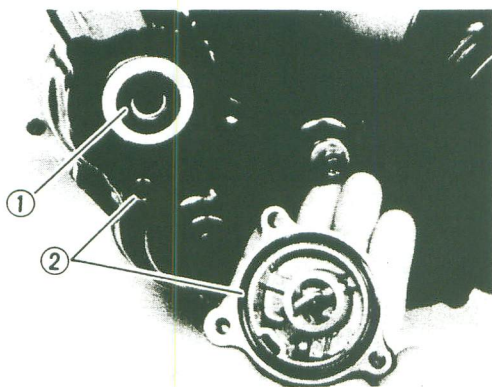
TIGHTENING TORQUE:

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)

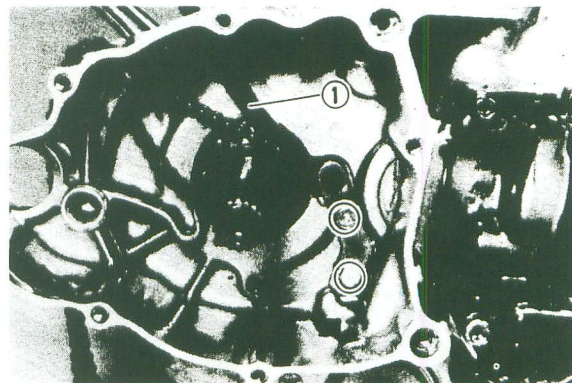


1. Oil element
2. O-ring

Crankcase Spacer (Left Side) and Flywheel

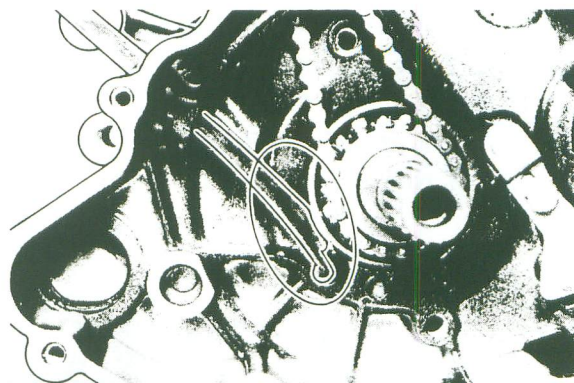
1. Attach a proper length of wire to the cam chain, and place the cam chain around the timing gear sprocket.
2. Install the cam chain guide #2 to the left-side crankcase. Torque the bolts to specification.

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



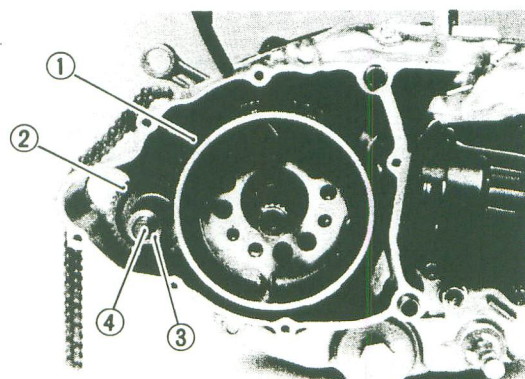
1. Cam chain guide #2

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.



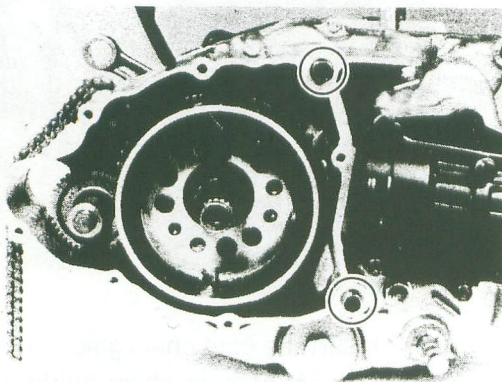
1. Cam chain guide #1

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.



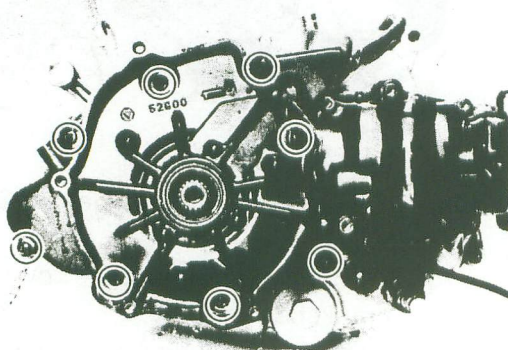
1. Idle gear #2
2. Idle gear #1
3. Collar
4. Idle gear shaft

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

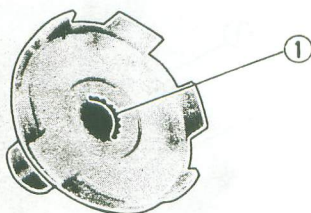


9. Install the left side crankcase spacer. Use a new gasket and torque the securing bolts to specification.

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



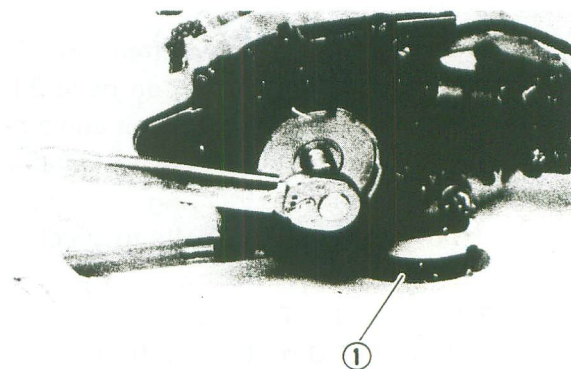
10. Insert a new O-ring into the recoil starter pulley.



1. O-ring

11. Install the pulley onto the left-side crankshaft.
12. 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.



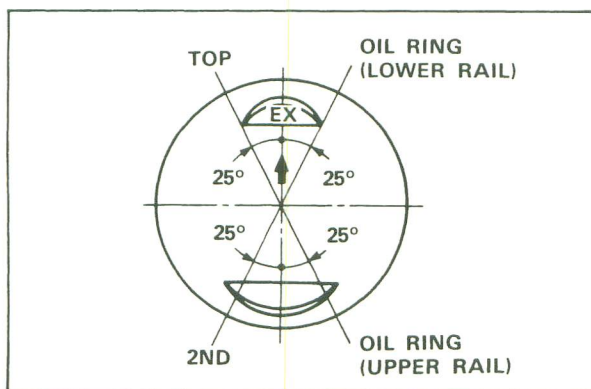
- Align the piston rings as shown.

CAUTION:

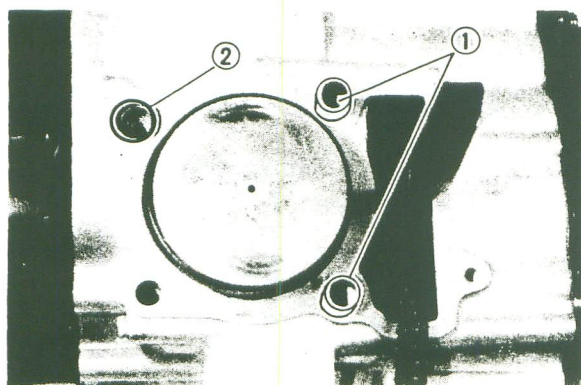
Be sure the ends of the oil ring expanders do not overlap.

NOTE:

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



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

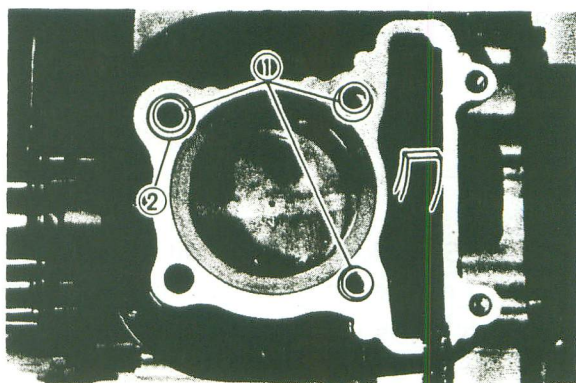


1. Dowels 2. O-ring

- Install a new cylinder-base gasket to the cylinder.
- 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 compressor to install the cylinder liner. Simply compress the piston rings with your fingers.
- Install the cylinder to the crankcase with the two cylinder-base bolts. Finger tighten the bolts.



- Install the three dowels and O-ring onto the cylinder.



1. Dowel 2. O-ring

Cylinder Head

- 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.

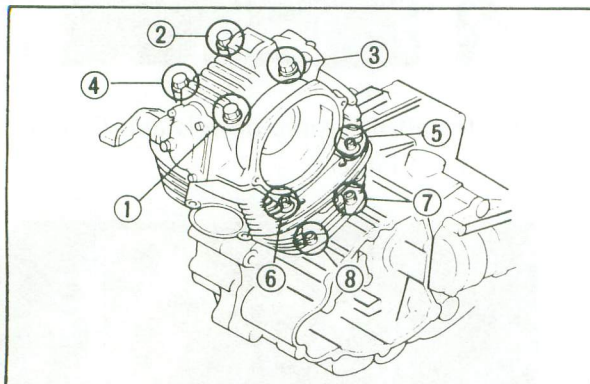


- Apply engine oil to the copper washers and to the area of decompression bracket to which the cylinder head bolt is attached.

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)

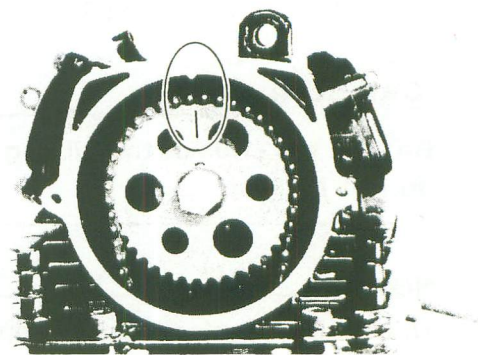


Cam Sprocket and Recoil Starter

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



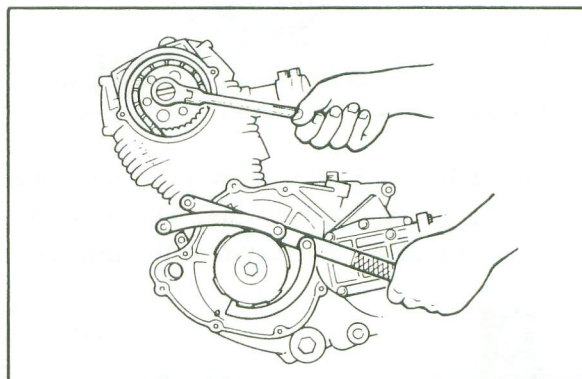
3. Install the cam sprocket onto the cam-shaft. The timing mark on the sprocket must align with the timing mark on the cylinder head. Pull all the slack from the front side of the cam chain. The front side of the cam chain **must** be taut when the cam chain sprocket is installed.



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)

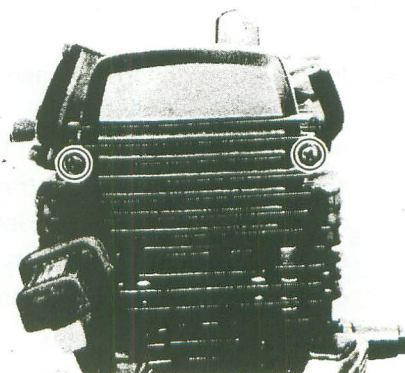


1. Universal rotor holder

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

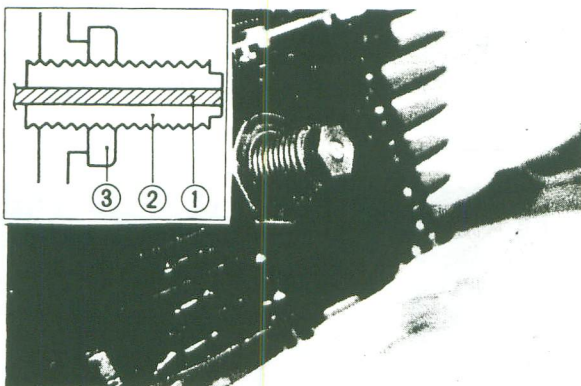
TIGHTENING TORQUE:

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)

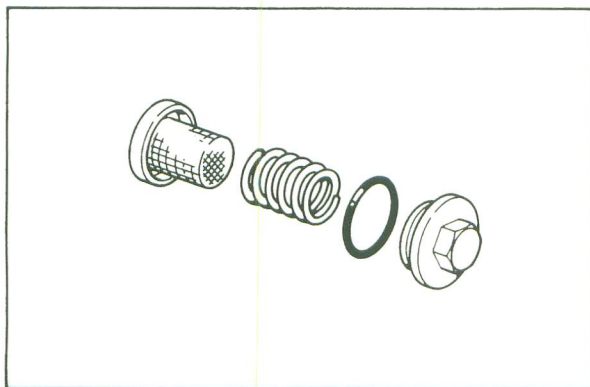
8. Install and tighten the drain plug before filling the engine with oil.

CAUTION:

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

TIGHTENING TORQUE:

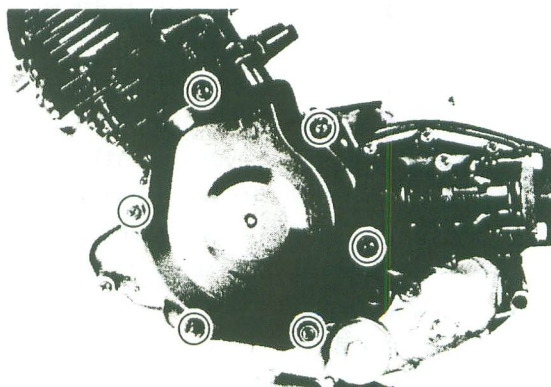
43 Nm (4.3 m·kg, 31 ft·lb)



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)



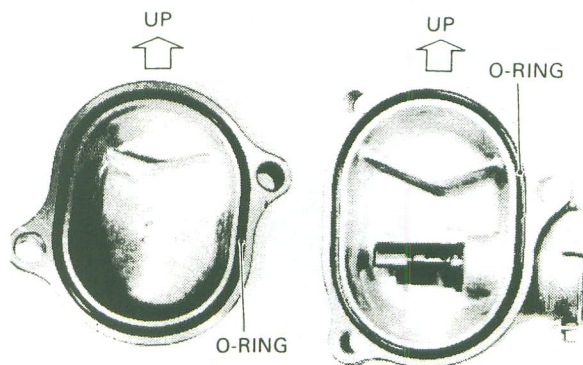
10. Adjust the valve clearance. See page 3-14.
11. Apply engine oil to the camshaft, rocker arms, valve assemblies, and rocker arm shafts.
12. Install the intake and exhaust valve covers. Torque the bolts to specification.

TIGHTENING TORQUE:

10 Nm (1.0 m·kg, 7.2 ft·lb)

CAUTION:

Install the valve cover with its ridge as shown upward.



13. Install the change pedal onto the shift shaft. Torque the bolt to specification.

TIGHTENING TORQUE:

10 Nm (1.0 m·kg, 7.2 ft·lb)

14. Install the drive select lever with the new gaskets. Torque the bolts to specification.

TIGHTENING TORQUE:

Drive Select Lever (Front):

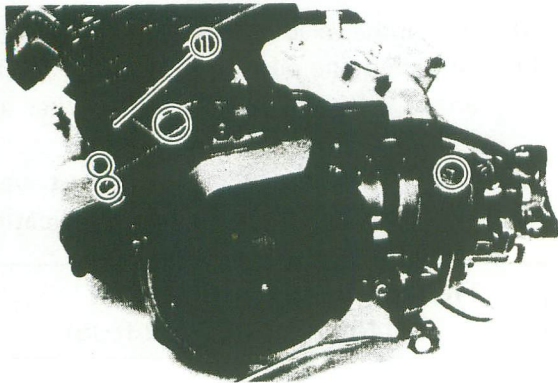
7 Nm (0.7 m·kg, 5.1 ft·lb)

Drive Select Lever (Rear):

15 Nm (1.5 m·kg, 11 ft·lb)

Middle Gear Case:

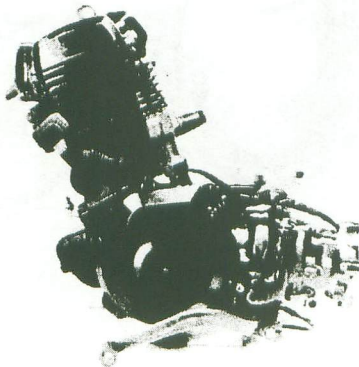
10 Nm (1.0 m·kg, 7.2 ft·lb)



1. Drive select lever

Mounting the Engine

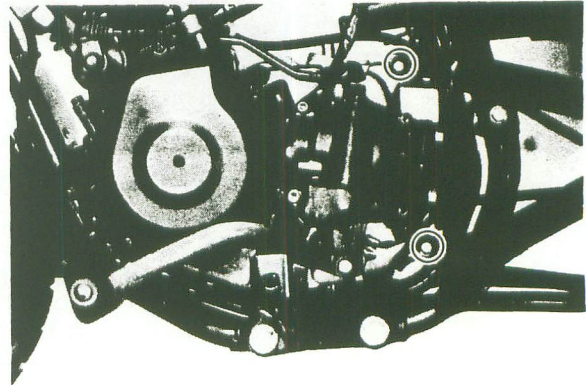
1. Place the engine on a block or other suitable engine stand, and lower the frame over the engine. If is easier if you approach the engine from the left-hand side.



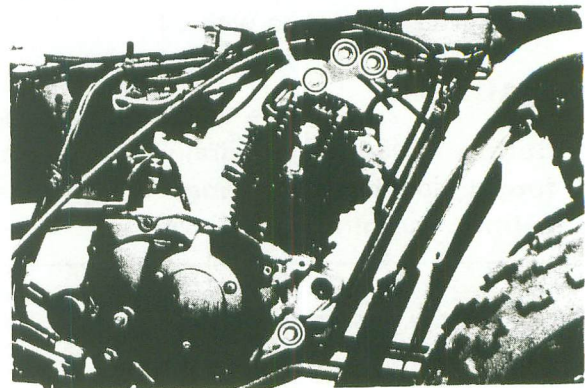
2. Install the rear upper and lower engine mounting bolts. Finger-tighten the mounting nuts; do not torque them at this point.

NOTE:

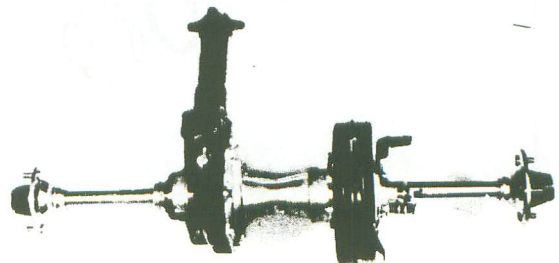
All mounting bolts should be installed from the right of the machine.



3. Install the front lower engine mounting bolt. Finger-tighten the nut; do not torque the nut 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 drive shaft.
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.

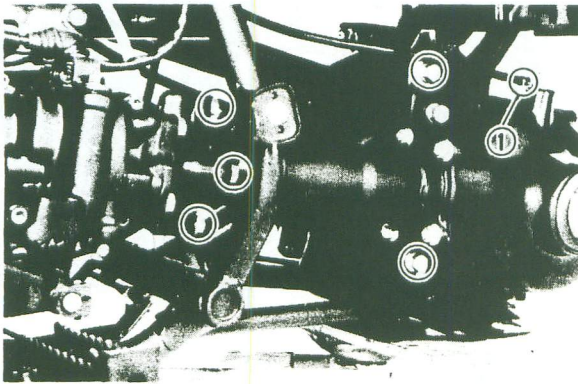
TIGHTENING TORQUE:

NUT:

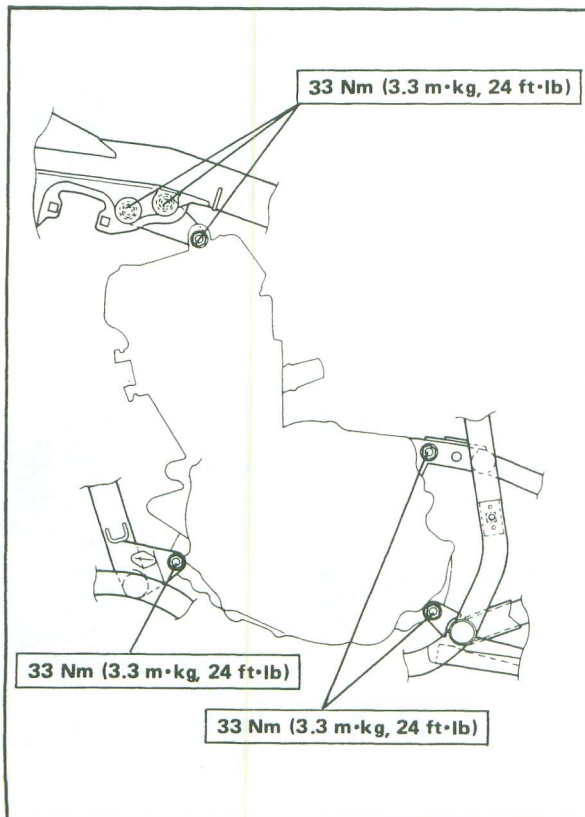
23 Nm (2.3 m·kg, 17 ft·lb)

BOLT:

45 Nm (4.5 m·kg, 32 ft·lb)



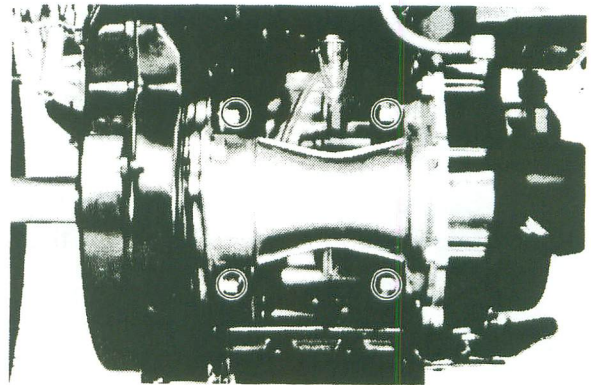
9. Evenly tighten all engine mounting bolts, then torque them to specification.



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.

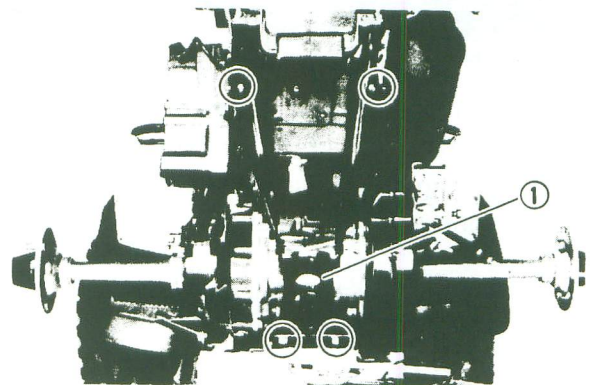
TIGHTENING TORQUE:

UPPER (8MM):

15 Nm (1.5 m·kg, 11 ft·lb)

UNDER (10MM):

30 Nm (3.0 m·kg, 22 ft·lb)

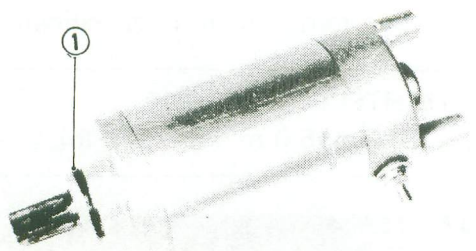


1. Hitch bracket

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.
- The starter terminal should face downward.

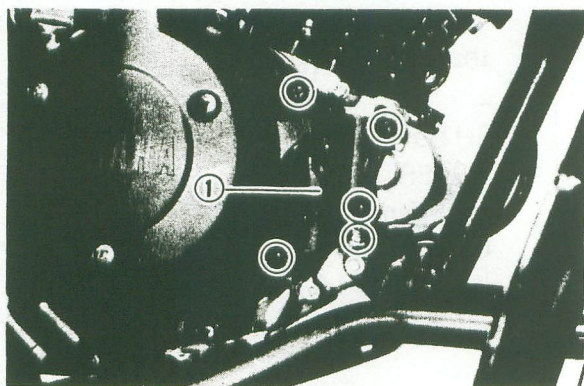


1. O-ring

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. Bracket

14. Connect the starter motor lead.
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.

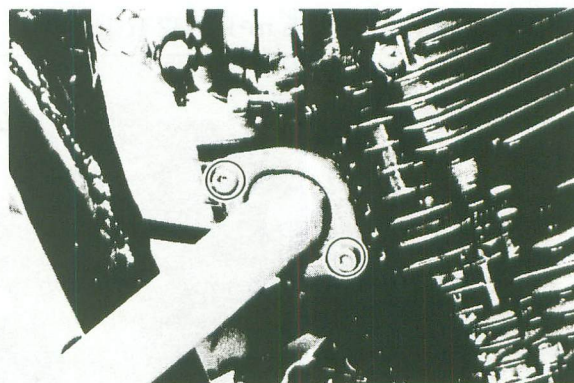
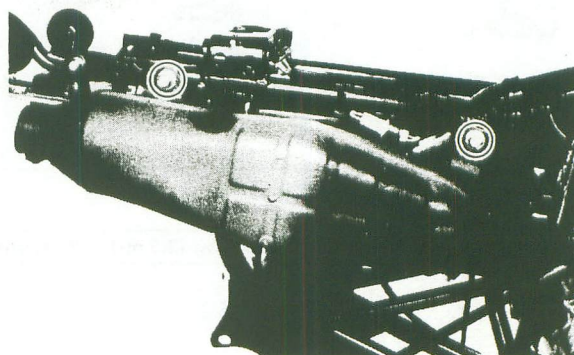
TIGHTENING TORQUE:

Exhaust-pipe-flange bolt:

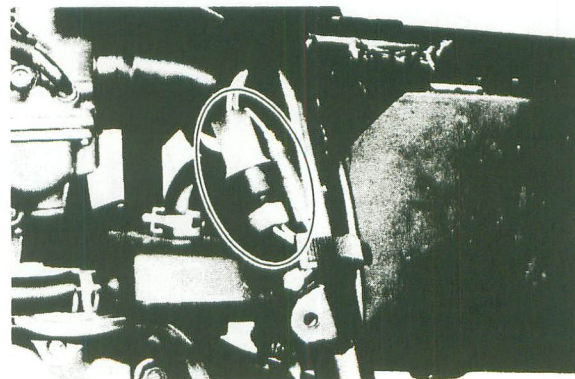
10 Nm (1.0 m · kg, 7.2 ft · lb)

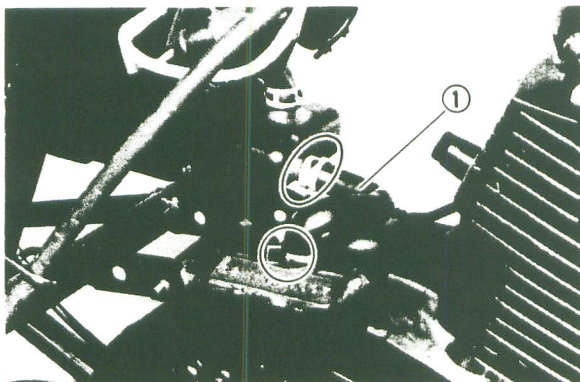
Muffler securing bolt:

27 Nm (2.7 m · kg, 19 ft · lb)



17. Connect the CDI leads, spark plug lead, neutral and reverse switch leads, and crankcase ventilation pipe.



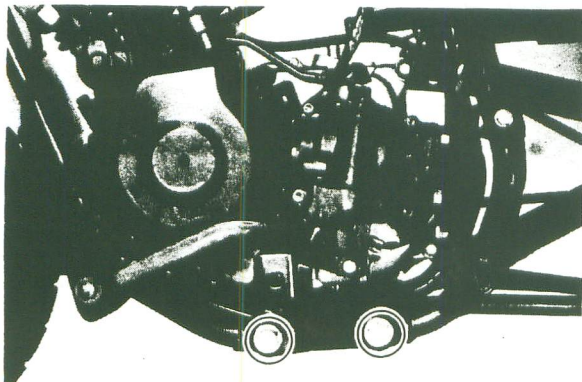


1. Ventilation pipe

18. Connect the battery leads to the battery. Connect the positive lead first; then connect the negative lead.
19. Install the left-side footrest and torque the bolts to specification.

TIGHTENING TORQUE:

80 Nm (8.0 m·kg, 58 ft·lb)



20. Install the fuel tank. Connect the fuel hose.
21. Connect the rear brake cables. Route the rear brake cables through the cable holders. Adjust the rear brake cables. See CHAPTER 2 Brake Pedal and Rear Brake Lever Adjustment and CHAPTER 7 CABLE ROUTING.
22. Install the rear wheels, fuel tank cover, rear fender, and carriers.

TIGHTENING TORQUE:

Rear wheel panel:

45 Nm (4.5 m·kg, 32 ft·lb)

23. Add ENGINE oil.

Engine oil capacity:

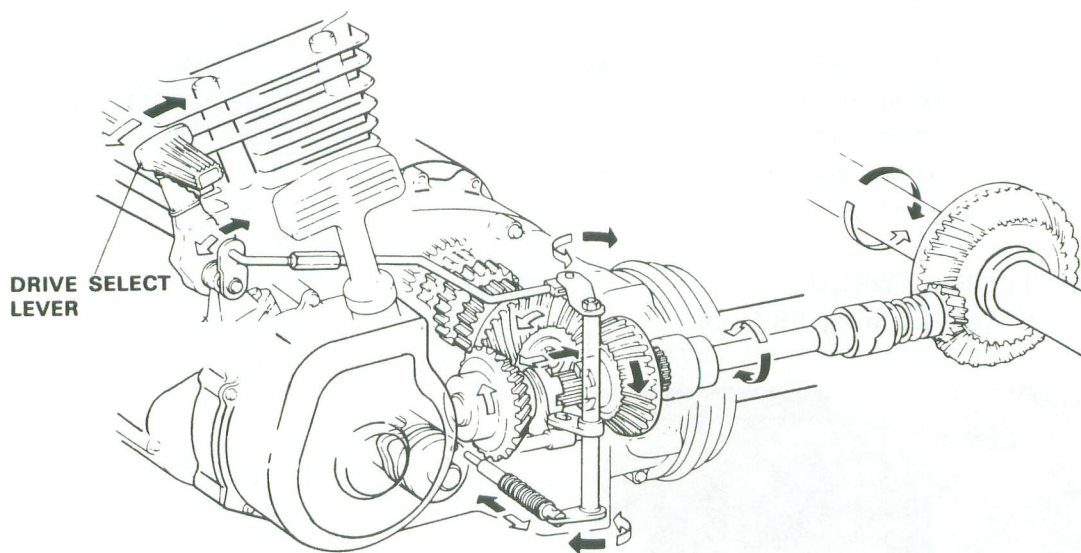
1.8 L (1.6 Imp qt, 1.9 US qt)

Recommended oil:

Yamalube 4-cycle oil or SAE 20W40 type SE motor oil

MIDDLE GEAR SERVICE

Reverse System



POWER FLOW



REVERSE



FORWARD

Transmission

Forward5 speeds

Reverse1st speed only

STAKE
60 Nm (6.0 m·kg, 43 ft·lb)

60 Nm (6.0 m·kg, 43 ft·lb)

23 Nm (2.3 m·kg, 17 ft·lb)

BEARING HOUSING

SHIM D

BEARING (DG174717C2)

BEARING RETAINER 1

COUPLING GEAR

WASHER

NUT (STAKE)

O-RING

BEARING

SHIM A

DRIVE PINION GEAR

REVERSE GEAR

DOG CLUTCH

REVERSE GEAR SECURING NUT

60 Nm (6.0 m·kg, 43 ft·lb)

BEARING (6028)

BEARING RETAINER 2

SHIM C

LEFT-HAND-THREADS

60 Nm (6.0 m·kg, 43 ft·lb)

SHIM B

DRIVEN PINION GEAR

BEARING (6006C3)

MIDDLE DRIVEN SHAFT

SHIFT FORK

SPRING

BALL

O-RING

GUIDE BAR

10 Nm (1.0 m·kg, 7.2 ft·lb)

LEVER

CIRCLIP

SHIFT LEVER SHAFT

SHIFT LEVER

STOPPER SHAFT

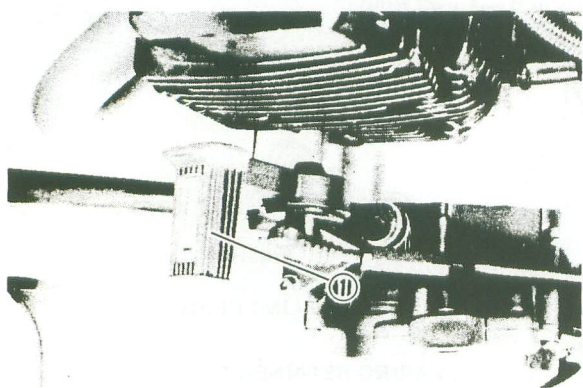
WASHER

SPRING

FWD

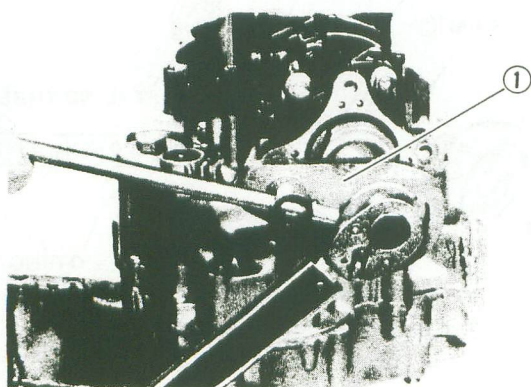
Disassembly

1. Remove the drive select lever assembly, recoil starter assembly, and crankcase cover (L).



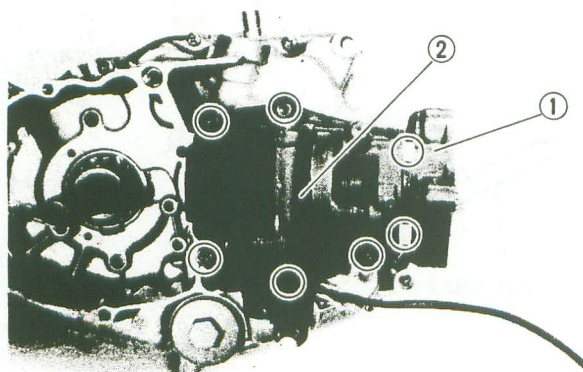
1. Drive select lever

2. Remove the right side cover, primary and secondary clutch assemblies, starter idle gear, and crankcase spacer.
3. Using the special tool, remove the coupling gear securing nut, washer, coupling gear.



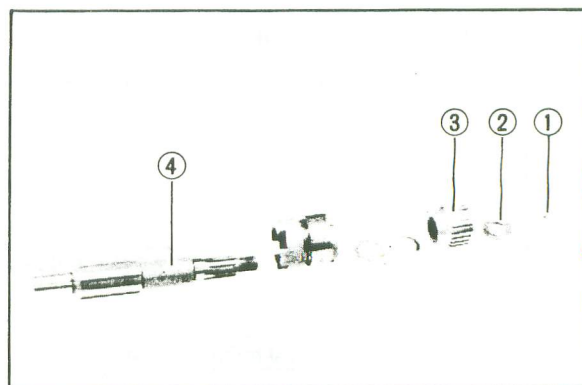
1. Special tool

4. Remove the bearing housing securing bolts and middle gear case cover securing bolts.
Remove the middle gear assembly.



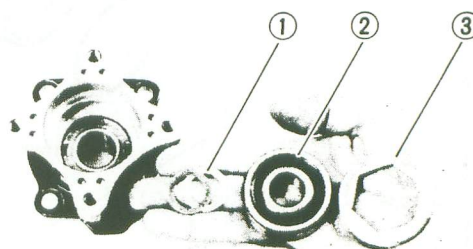
1. Bearing housing

2. Middle gear case cover



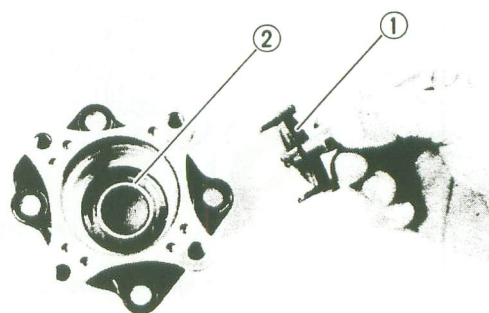
1. Nut
2. Washer
3. Coupling gear
4. Middle drive shaft

5. Using the special tool, remove the bearing retainer nut 1, bearing, and thrust washer(s) P.

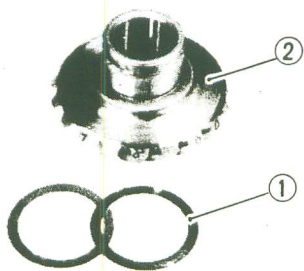


1. Thrust washer 2. Bearing 3. Nut

6. Using the special tool, remove the reverse gear securing nut [Left-hand-Threads], shim [C], and reverse gear.

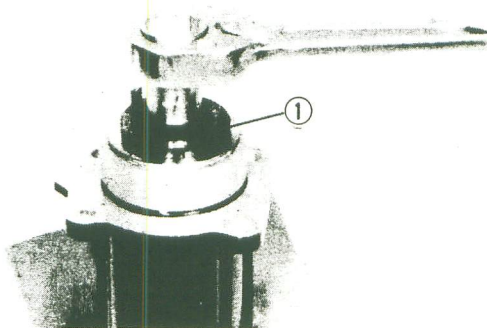


1. Special tool 2. Nut



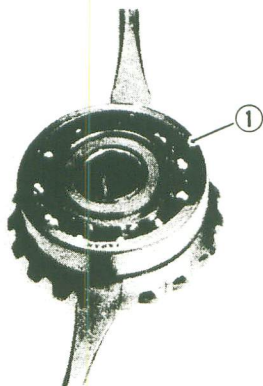
1. Shim C 2. Reverse gear

7. Using the special tool, remove the bearing retainer nut 2 and bearing.

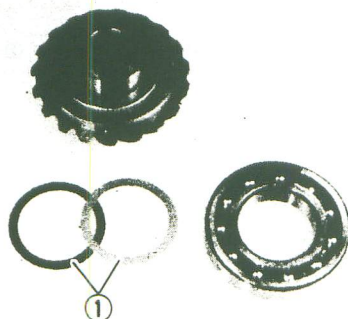


1. Special tool

8. Driven pinion gear (Forward gear) bearing can easily removed as shown.

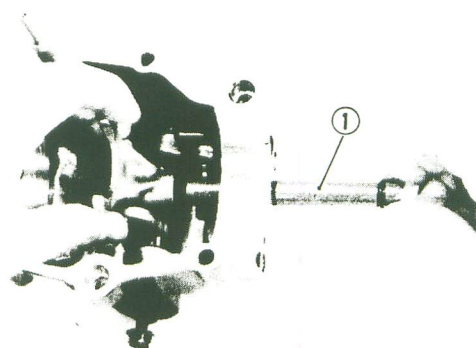


1. Bearing

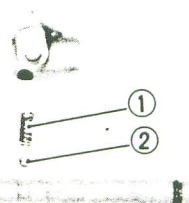


1. Shim B

9. Remove the shift fork guide bar and the shift fork. At this time, take care not to lose the stopper spring and ball in the shift fork.

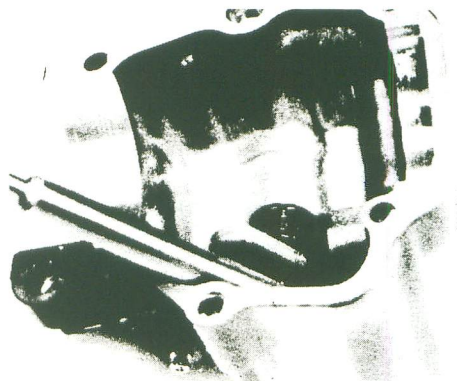


1. Shift fork guide bar

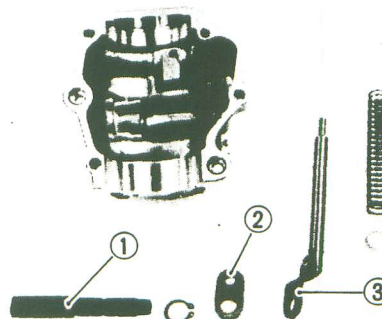


1. Spring 2. Ball

10. Remove the circlip and then pull out the shift lever shaft.



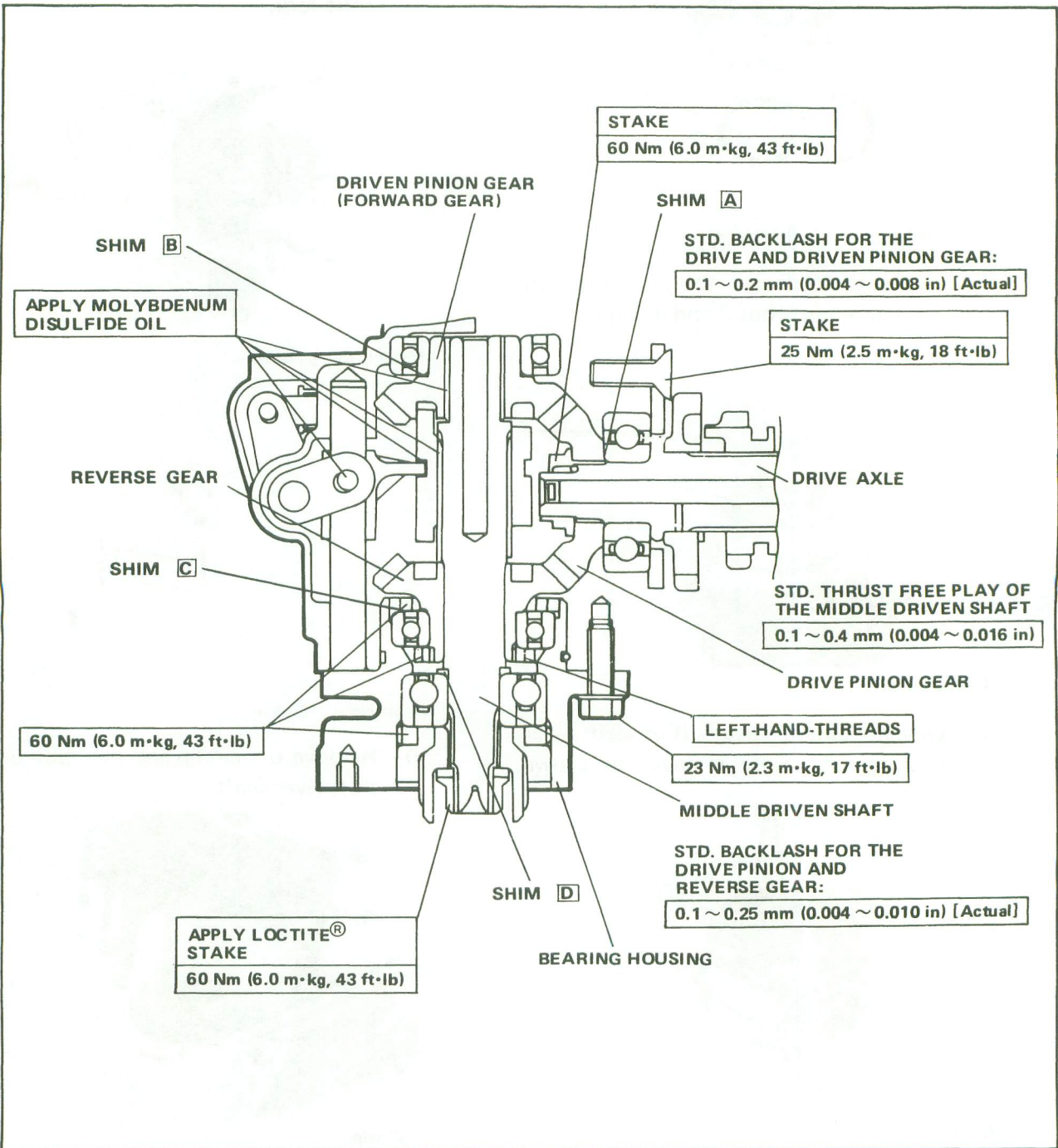
1. Circlip



1. Shift lever shaft 2. Shift lever 3. Stopper lever

Gears Positioning

When the crankcase and/or the drive axle are replaced, you must position the drive pinion gear [Shim A], driven pinion gear [Shim B], reverse gear [Shim C] and middle driven gear [Shim D].;



1. Calculate the shim thickness using the formula shown below.

$$\text{Shim [A]} = a - b$$

$$\text{Shim [B]} = c - d - e - f$$

$$\text{Shim [C]} = d - g - h - i$$

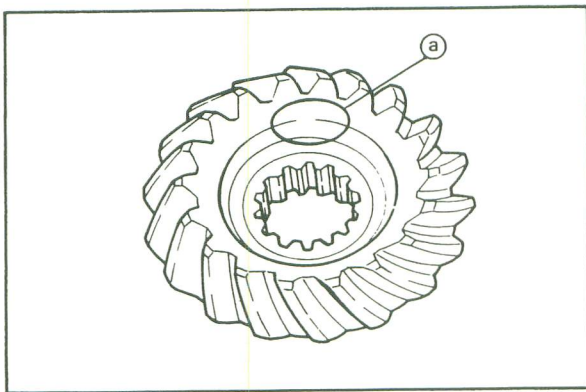
$$\text{Shim [D]} = j + c - e - \text{Shim B} - k - \ell 0.25$$

NOTE: Adjust the shims in the sequence of A, B, C and D.

a = 42 plus or minus the number found on the drive pinion gear.

(ex) If number is "+ 02",

$$a = 42 + 0.02 = 42.02$$



b = 41 plus the number found on the crankcase.

(ex) If number is "45",

$$b = 41 + 0.45 = 41.45,$$

c = 110 plus or minus the number found on the crankcase.

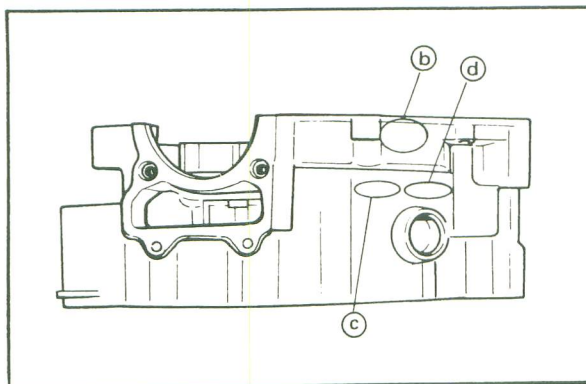
(ex) If number is "45",

$$c = 110 + 0.45 = 110.45$$

d = 59 plus or minus the number found on the crankcase.

(ex) If number is "- 02",

$$d = 59 - 0.02 = 58.98$$

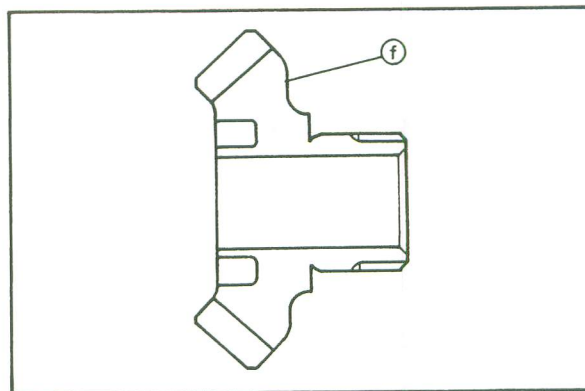


e = 13.00 [Constant]

f = 37.5 plus or minus the number found on the driven pinion gear (forward gear).

(ex) If number is "+ 02",

$$f = 37.5 + 0.02 = 37.52$$



g = 7.5 plus or minus the number found on the bearing housing.

(ex) If number is "- 01",

$$g = 7.5 - 0.01 = 7.49$$

h = 12.00 [Constant]

i = 39 plus or minus the number found on the reverse gear.

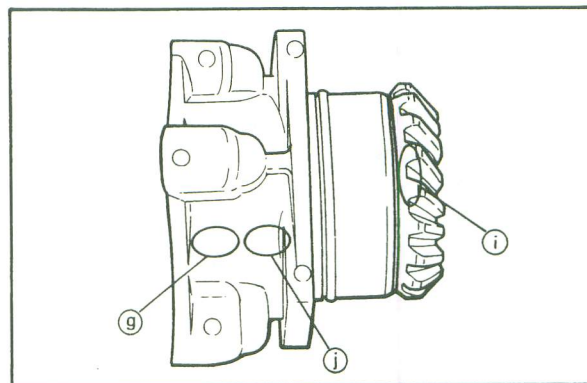
(ex) If number is "- 02",

$$i = 39 - 0.02 = 38.98$$

j = 1 plus or minus the number found on the bearing housing.

(ex) If number is "- 03",

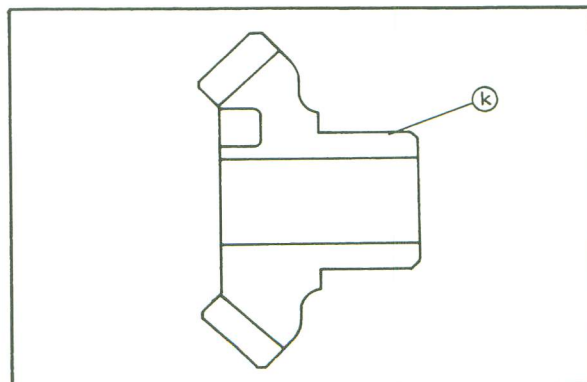
$$j = 1 - 0.03 = 0.97$$



k = 14.5 plus or minus the number found on the driven pinion gear (forward gear).

(ex) If number is "- 02",

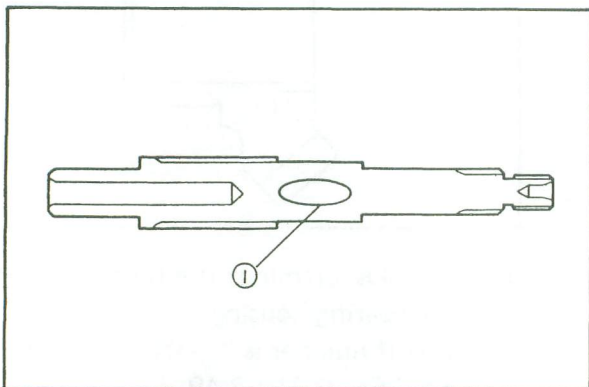
$$k = 14.5 - 0.02 = 14.48$$



I = 80.5 plus or minus the number found on the middle drive shaft.

(ex) If number is "+ 03",

$$I = 80.5 + 0.03 = 80.53$$



$$A = a - b = 42.02 - 41.45 = 0.57$$

$$B = c - d - e - f = 110.45 - 58.98 - 13.00 - 37.52 = 0.95$$

$$C = d - g - h - i = 58.98 - 7.49 - 12.00 - 38.98 = 0.51$$

$$D = j + c - e - \text{Shim B}^* - k - l - 0.25 \\ = 0.97 + 110.45 - 13.00 - 0.95^* - 14.48 + 80.53 - 0.25 = 2.21$$

* Use the rounded number
(= actual shim thickness).

2. Shims are supplied in the following thickness.

Shim A B C

0.15 mm (0.0059 in)

0.20 mm (0.0070 in)

0.30 mm (0.0118 in)

0.40 mm (0.0157 in)

0.50 mm (0.0197 in)

Shim D

1.0 mm (0.0394 in) 1.1 mm (0.0433 in)

1.2 mm (0.0472 in) 1.3 mm (0.0512 in)

1.4 mm (0.0551 in) 1.5 mm (0.0591 in)

1.6 mm (0.0630 in) 1.7 mm (0.0669 in)

1.8 mm (0.0709 in) 1.9 mm (0.0748 in)

3. Use the following chart to round off the hundredths digit of the calculated thickness and select the appropriate shims.

Shim A, B, C

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

[EX]

$$A = 0.57 \rightarrow 0.55 = 0.15 + 0.40$$

$$B = 0.59 \rightarrow 0.95 = 0.15 + 0.40 + 0.40$$

$$C = 0.51 \rightarrow 0.50 = 0.50$$

Shim D

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

[EX]

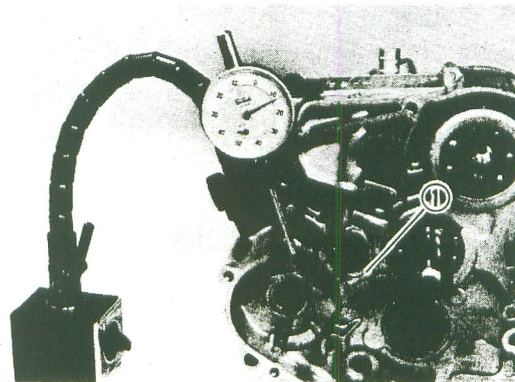
$$D = 2.21 \rightarrow 2.20 = 1.0 + 1.2$$

Backlash Measurement

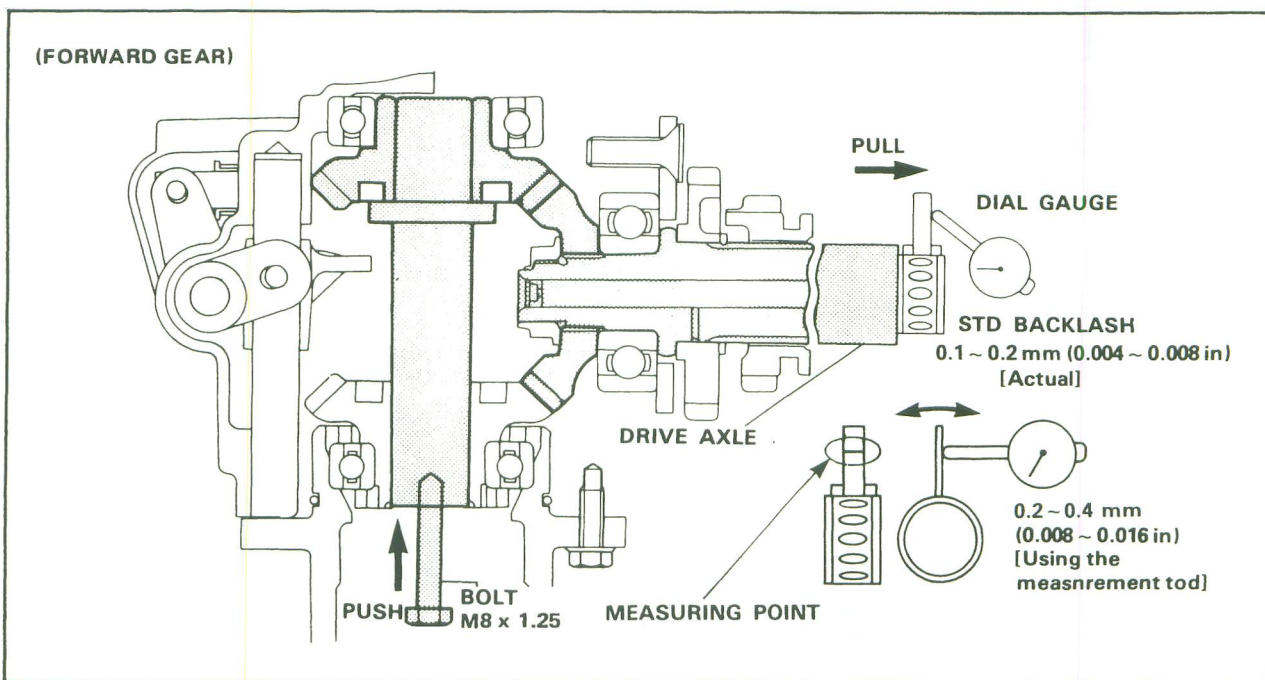
NOTE:

When measuring backlash, tighten all securing bolts (middle gear case cover, bearing housing) with specified torque.

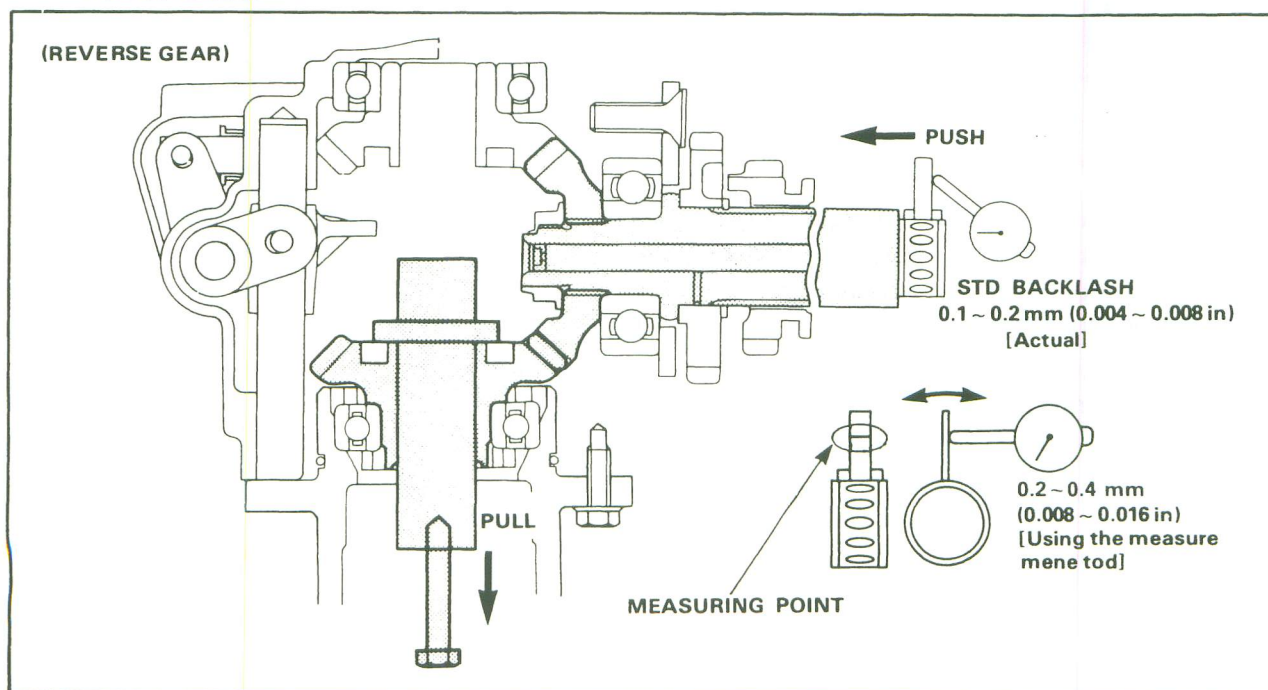
1. While pushing the tool and pulling the drive axle, measure the backlash at the drive axle end.



1. Measurement tool

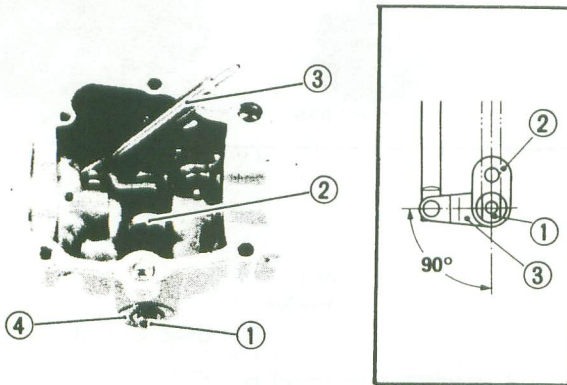


2. While pulling the tool and pushing the drive axle, measure the backlash at the drive axle end.



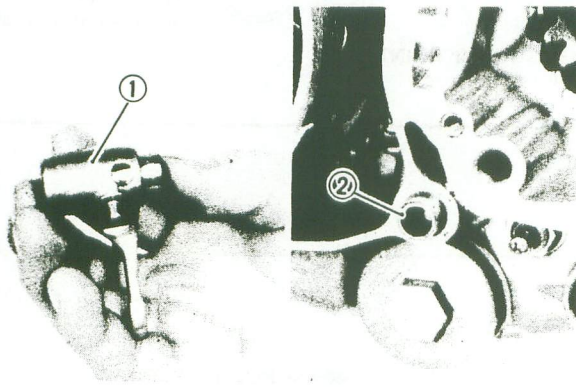
Assembly

1. Apply grease to the oil seal lips and insert the shift lever shaft into the cover. Then install the shift lever and stopper rod onto the shift lever shaft paying attention to the fitting angle as shown. Install the circlip.



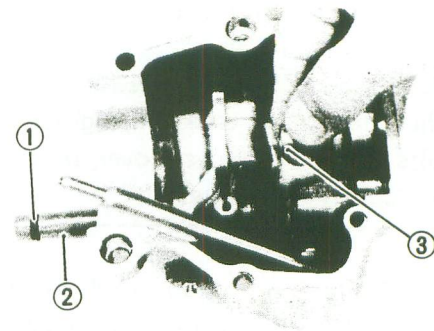
1. Shift lever shaft
2. Shift lever
3. Stopper rod
4. Oil seal

2. Apply molybdenum disulfide oil to the shift fork inner diameter and to the pin. Secure the spring and ball to the shift fork using the dowel knock pin of the middle driven gear case cover.



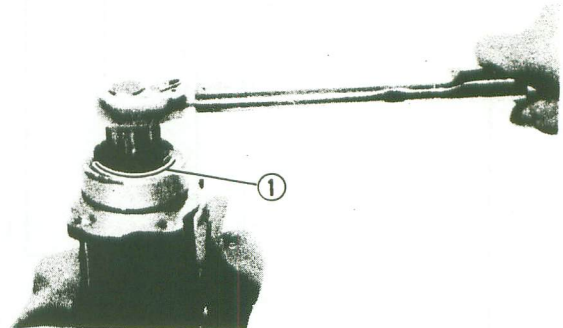
1. Shift fork
2. Dowel knock pin

3. Install the washer and spring onto the stopper rod. Apply molybdenum disulfide oil to the stopper rod.
4. Apply grease to the O-ring of the shift fork guide bar. Insert the shift fork guide bar into the cover and shift fork.



1. O-ring
2. Shift fork guide bar
3. Dowel knock pin

5. Install the bearing. Apply LOCTITE® to the nut threads and tighten with specified torque.



1. Apply LOCTITE®

Tightening torque:

60 Nm (6.0 m·kg, 43 ft·lb)

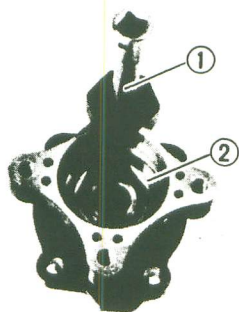
6. Install the shim(s) and reverse gear. Apply LOCTITE® to the reverse gear tightening nut and tighten with specified torque.

TIGHTENING TORQUE:

[LEFT-HAND-THREADS]

60 Nm (6.0 m·kg, 43 ft·lb)

7. Install the thrust washer(s), bearing and tighten the bearing retainer nut with specified torque.



1. Special tool 2. Nut

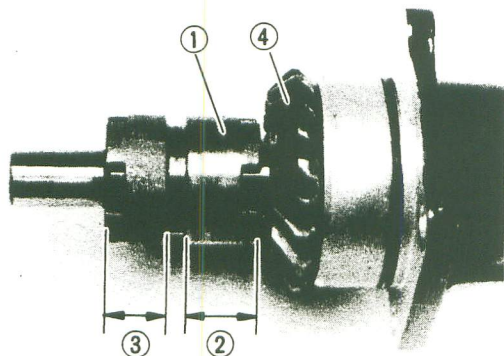
TIGHTENING TORQUE:

60 Nm (6.0 m·kg, 43 ft·lb)

8. Apply molybdenum disulfide oil to dog clutch splines and groove. Taking care of the dog clutch direction, install the dog clutch onto the middle drive shaft.
9. Install the middle drive shaft, coupling gear and washer. Then after applying LOCTITE®, tighten the nut with specified torque.

TIGHTENING TORQUE:

60 Nm (6.0 m·kg, 43 ft·lb)



1. Dog clutch 2. Longer
3. Shorter 4. Reverse gear

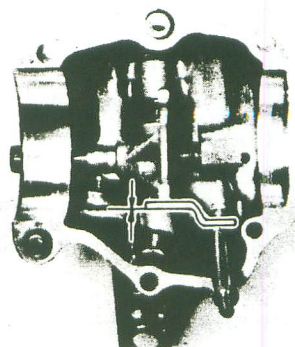
10. Install the two dowels into the middle gear case cover.
11. Install the middle gear assembly onto the crankcase.
12. Move the dog clutch to the left so that the dog clutch can be engaged with the forward gear.

13. Apply Yamabond #4 to the mating surfaces of the cover and crankcase.
14. Install the middle gear case onto the crankcase. Note the following points.

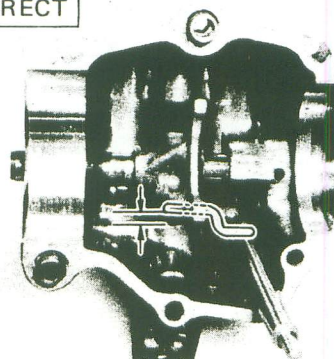
NOTE:

Before installing the middle gear case, the stopper rod lever should be in contact with the cover as shown. If not, the middle drive and dog clutch may be stuck and the drive select lever does not move smoothly.

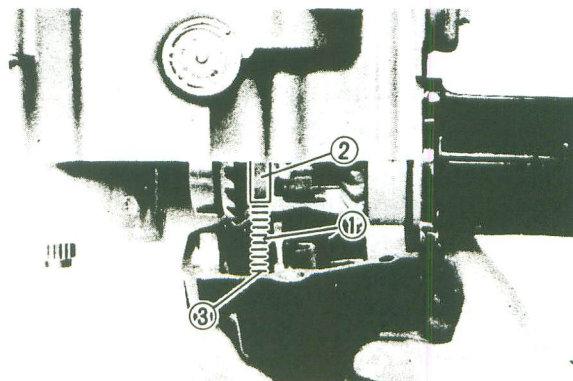
CORRECT



IN CORRECT



* The shift fork must be engaged in the dog clutch groove.



1. Stopper rod 2. Dog clutch 3. Spring

15. Tighten the case cove securing bolts to specification.

TIGHTENING TORQUE:

Cover-Crankcase:

10 Nm (1.0 m·kg, 7.2 ft·lb)

Housing-Crankcase:

23 Nm (2.3 m·kg, 17 ft·lb)

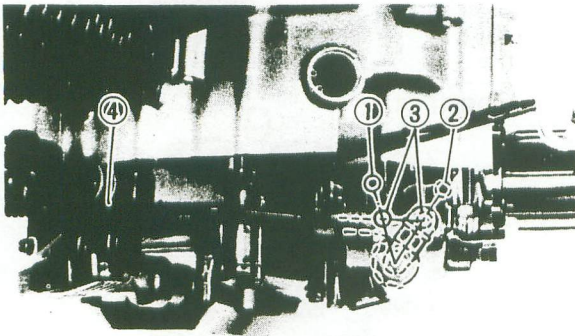
NOTE:

After installing the cover, make sure the drive shaft turns smoothly.

16. Install the selector rod. Align the match mark on the crankcase with the match mark on the lever cover.

Drive selector rod (Locknut):

15 Nm (1.5 m·kg, 11 ft·lb)



1. Match mark (F.W.D.) 2. Match mark (Reverse)
3. Match mark on the lever cover 4. Adjuster

17. Install the crankcase spacer, starter idle gear, secondary and primary clutch assemblies, and crankcase cover. Refer to CHAPTER 3.

TIGHTENING TORQUE:

Secondary Clutch Boss:

50 Nm (5.0 m·kg, 36 ft·lb)

Primary Clutch:

78 Nm (7.8 m·kg, 56 ft·lb)

Crankcase Spacer:

7 Nm (0.7 m·kg, 5.1 ft·lb)

Crankcase Cover:

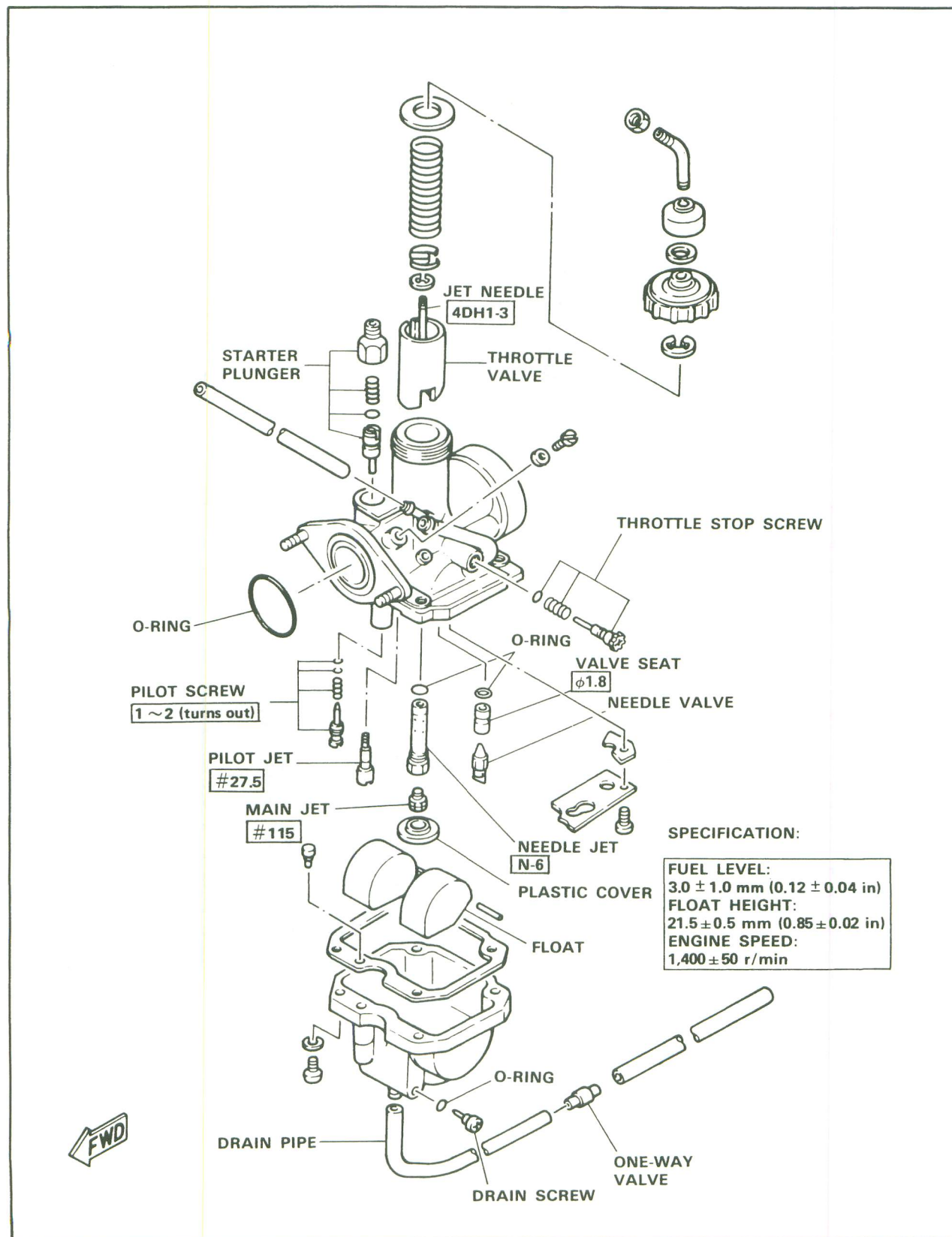
7 Nm (0.7 m·kg, 5.1 ft·lb)

CHAPTER 4. CARBURETION

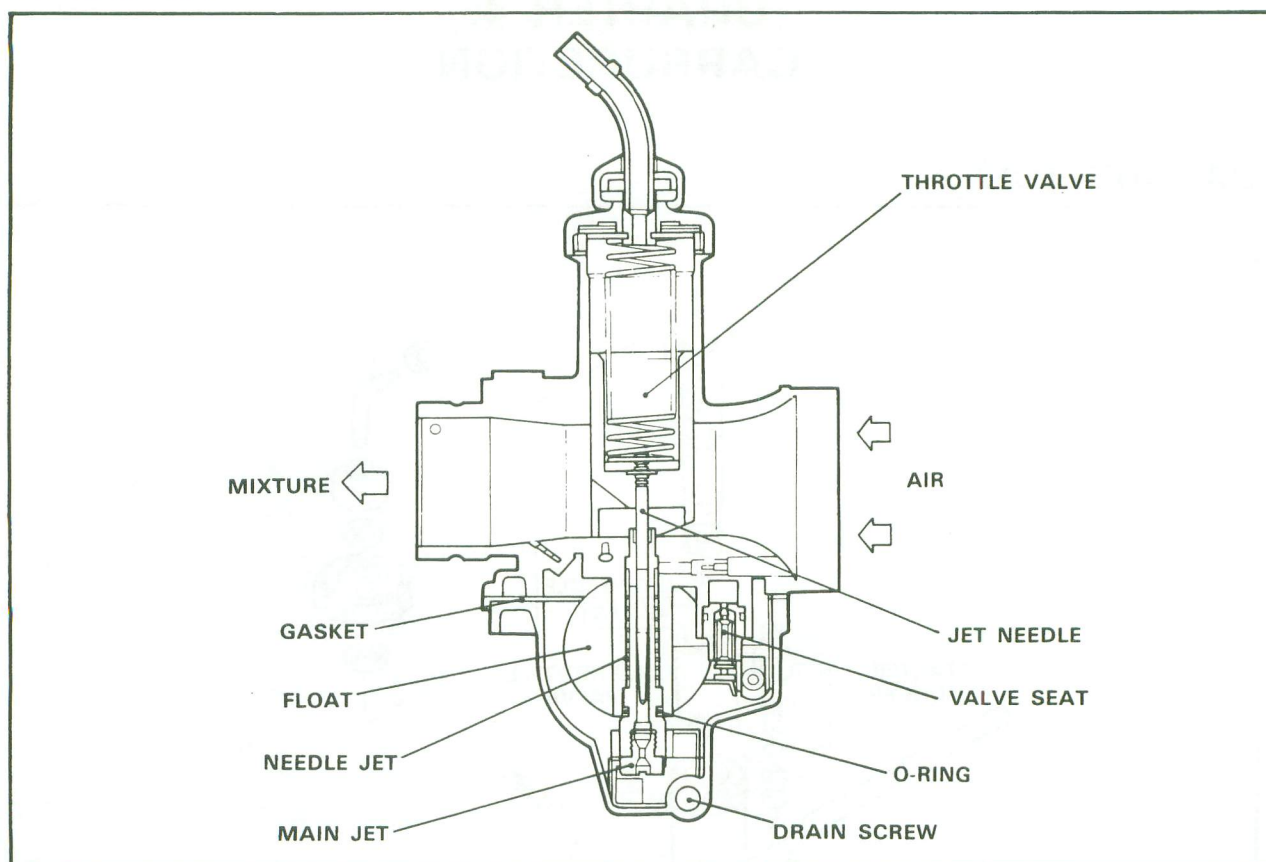
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CHAPTER 4. CARBURETION

CARBURETOR



Sectional View

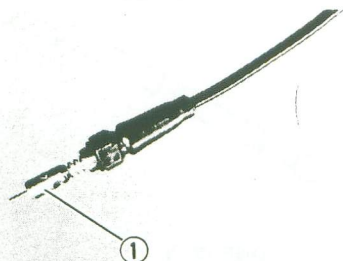


Specifications

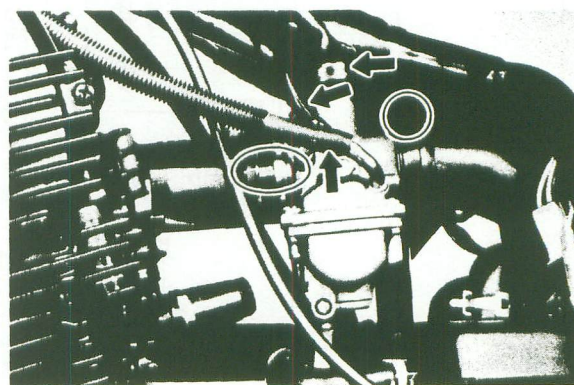
Main jet (Original)	#115
Jet needle	4DH1-3
Pilot jet	#27.5
Pilot screw	1 ~ 2 (turns out)
Float valve seat	$\phi 1.8$
Fuel level	3.0 ± 1.0 mm (0.12 ± 0.04 in)
Float height	21.5 ± 0.5 mm (0.85 ± 0.02 in)
Engine idle speed	$1,400 \pm 50$ r/min

Removal

1. Remove the seat, front carrier securing bolts, front panel, and fuel tank cover.
2. Remove the throttle valve assembly and starter plunger from the carburetor.

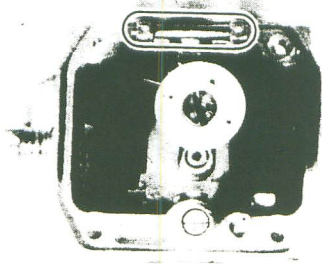


3. Disconnect the fuel and air bleed hoses from the carburetor.
4. Remove the carburetor assembly; remove the hoses and holding nuts, and loosen the inlet pipe clamp screw.

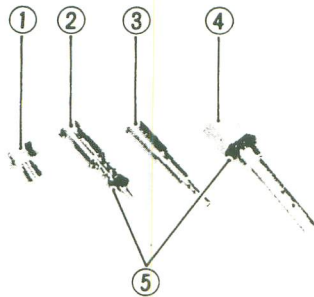


Disassembly

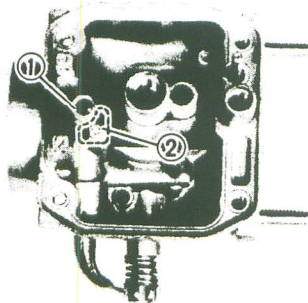
1. Remove the float chamber from the carburetor body.
2. Remove the float pivot pin, and remove the float assembly. Be careful not to close the float valve located under the float arm.



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



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



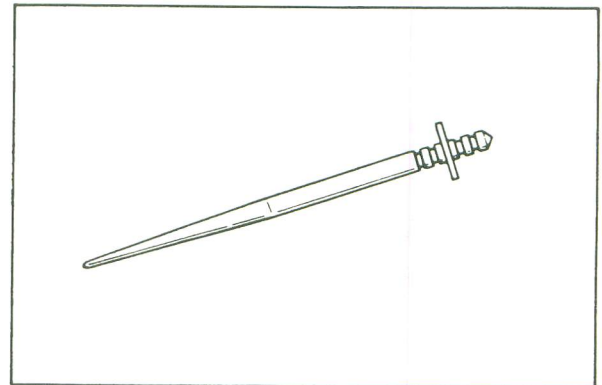
- | | |
|---------------------|------------------|
| 1. Float valve seat | 2. Valve stopper |
|---------------------|------------------|

Inspection

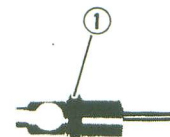
1. Examine the carburetor body and fuel passages. If they are contaminated, wash the carburetor in a petroleum-base solvent. Do not use any caustic carburetor cleaning solutions. Blow out all passages and jets with compressed air.
2. Examine the condition of the floats. If the floats are damaged, they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

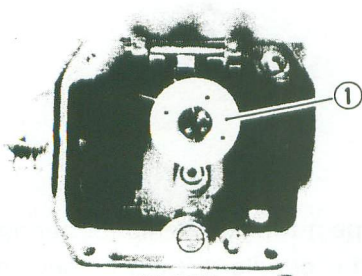
Fuel level

NOTE:

Before checking the fuel level, note the following:

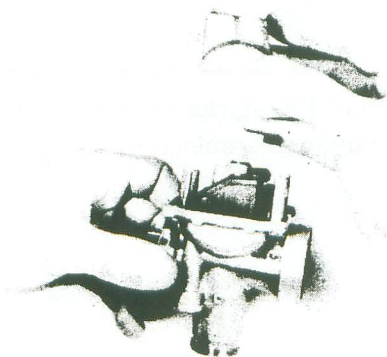
- Place the motorcycle on a level surface.
- Adjust the motorcycle position by placing a suitable stand or a garage jack under the engine so that the carburetor is positioned vertically.

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.

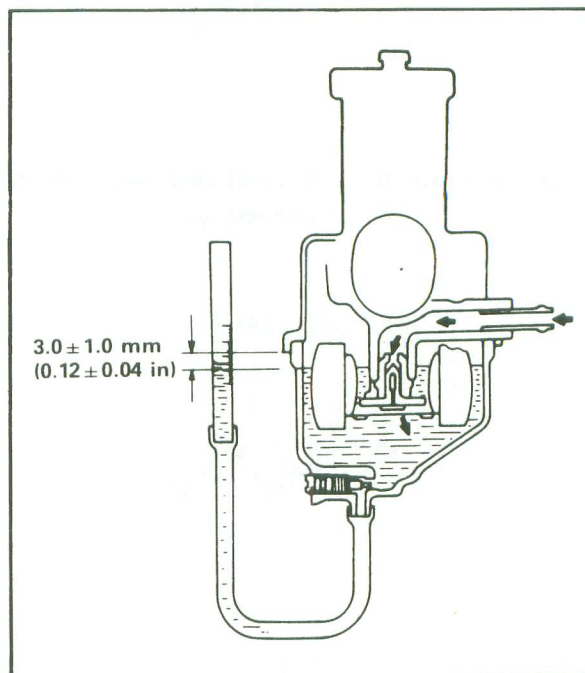
Fuel level:

Carburetor:

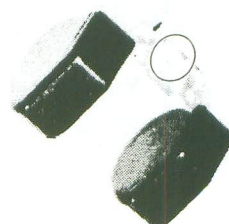
3.0 ± 1.0 mm (0.12 ± 0.04 in)

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.



CHAPTER 5. CHASSIS

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CHAPTER 5. CHASSIS

FRONT WHEEL

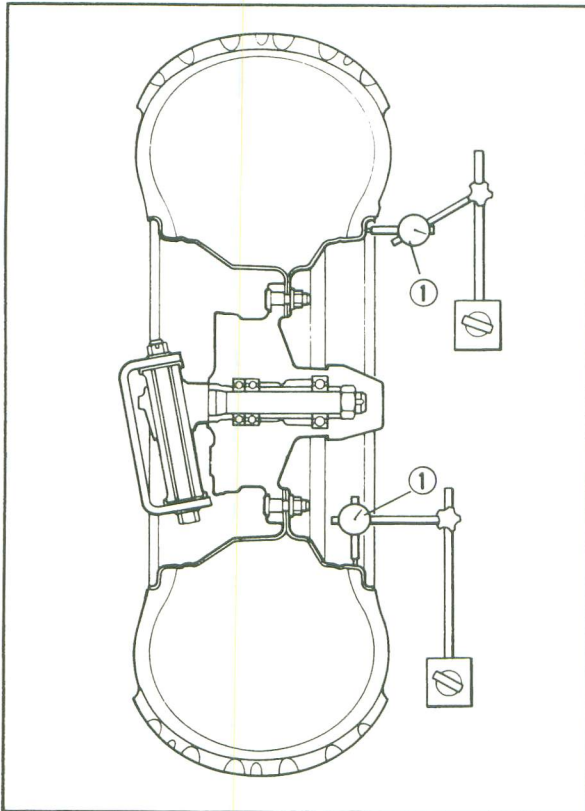
Front wheel inspection

1. Elevate the front wheels by placing the suitable stand under the frame.
2. Check for cracks, bends or warpage of the wheels. If a wheel is deformed or cracked, it must be replaced.
3. 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)

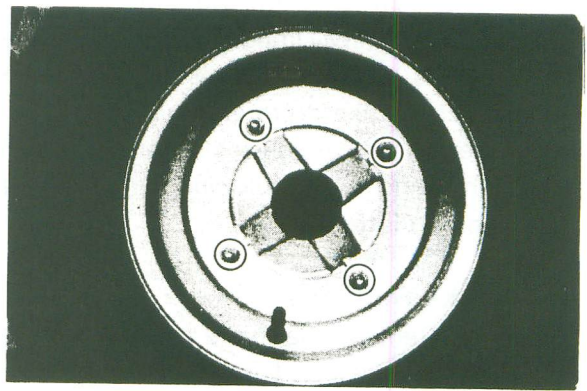
Lateral — 2.0 mm (0.08 in)



1. Dial gauge

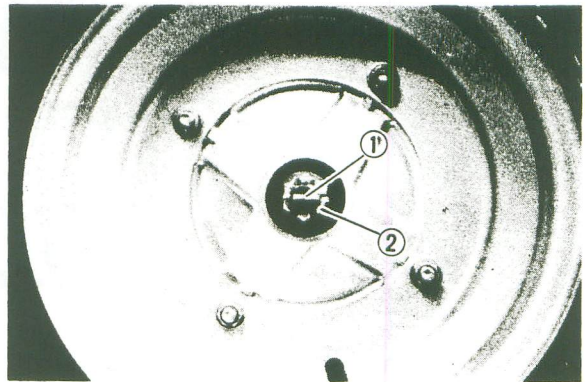
Front Wheel Removal

1. Apply front brake and loosen the wheel securing nuts.
2. Elevate the front wheels by placing the suitable stands under the frame.
3. Remove the wheel nuts and wheels.



Wheel Hub Removal

1. Remove the the wheel caps, cotter pins, and axle nuts.



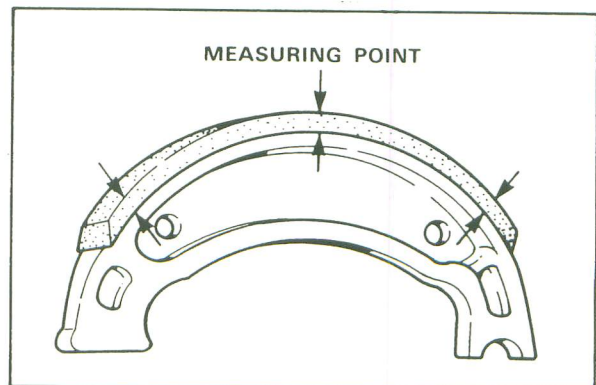
1. Cotter pin

2. Axle nut

2. Remove the wheel hubs from the knuckles.

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.



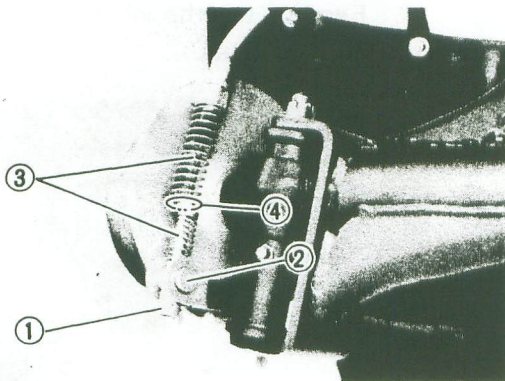
Wear limit: 2 mm (0.08 in)

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

1. Remove the brake adjuster, pin, springs, and washer. Disconnect brake cable from the calb holder.



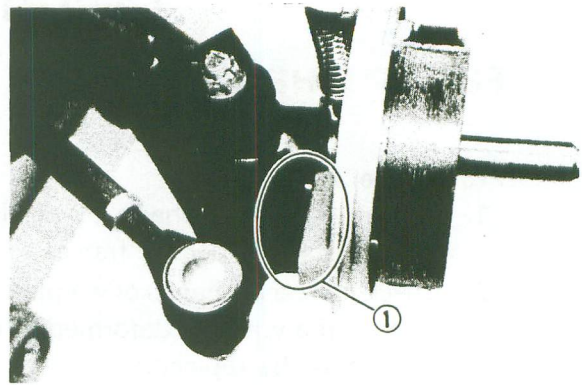
1. Adjuster 2. Pin 3. Spring 4. Washer

2. Remove the brake shoe plate from the knuckle.
3. Remove the brake linings from the brake shoe plate.
4. 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.

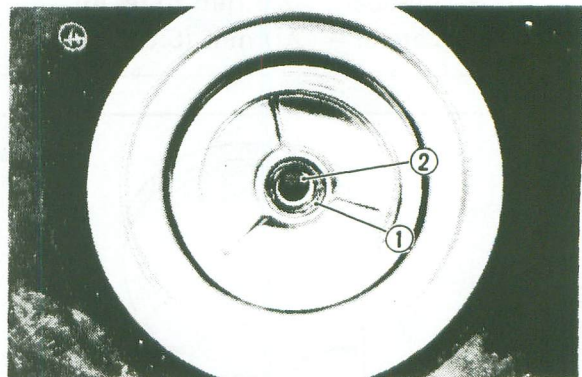
5. When installing the brake shoe plate, make sure the projecting portion (torque stopper) of the brake shoe plate is positioned correctly.



1. Torque stopper

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. Tighten the axle nut and wheel nuts to specification.

TIGHTENING TORQUE:

Axle Nut:

85 Nm (8.5 m·kg, 61 ft·lb)

Wheel Nut:

28 Nm (2.8 m·kg, 20 ft·lb)

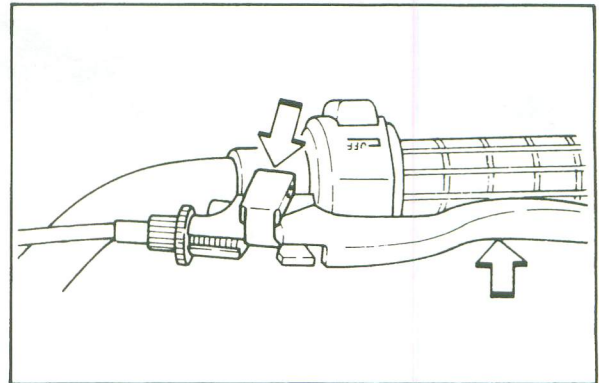
WARNING:

Always use a new cotter pin on the axle nut.

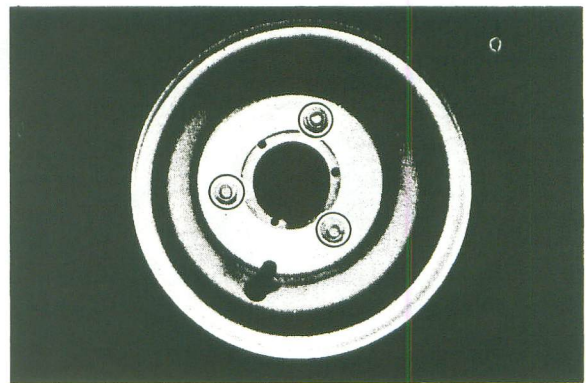
3. Install the brake cable.
4. Adjust the brake.
Refer to "Front Brake Lever" on page 2-11.

REAR WHEEL**Removal**

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



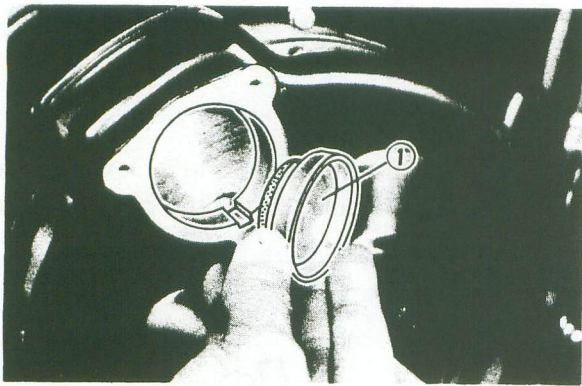
2. Remove the nuts from rear wheel panel.
3. Remove the rear wheel assembly.

**Rear Wheel Inspection**

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

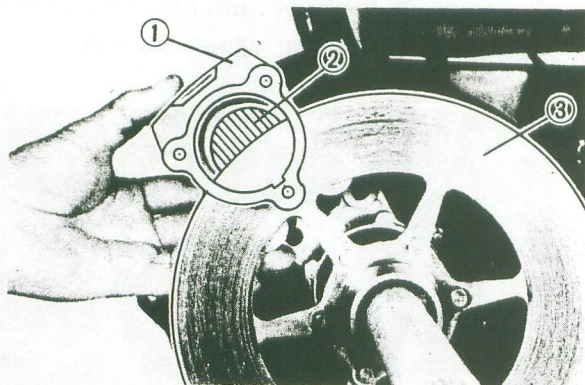
REAR BRAKE**Brake Pads Removal**

1. Block the front tires 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.

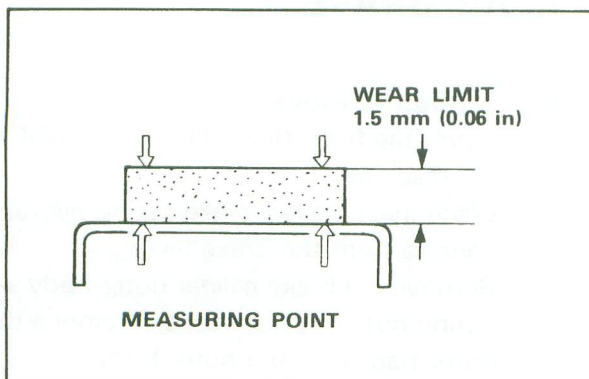


1. Caliper inner body 2. Inner pad 3. Disc plate

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)

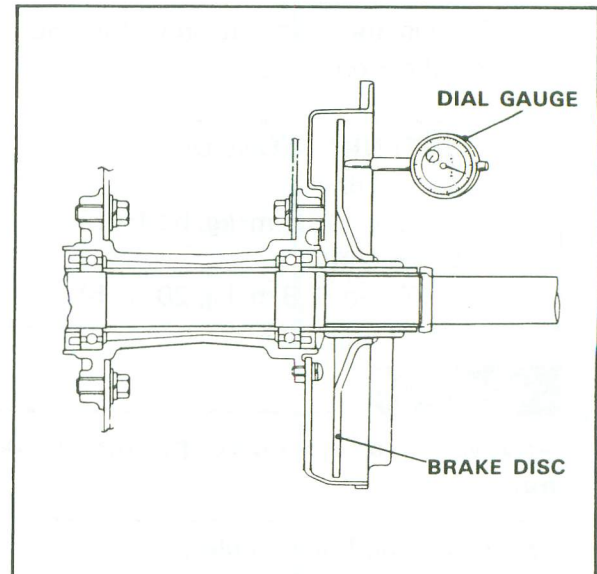


2. Replace the caliper piston if it is rusty, frayed, or damaged.
3. Check for wear and deflection of the disc. If the disc is worn beyond minimum thickness or if deflection exceeds the specified amount, replace the disc.

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

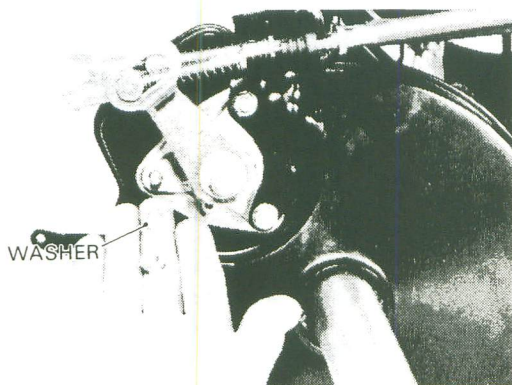
50 Nm (5.0 m·kg, 36 ft·lb)

Caliper: Nut

9 Nm (0.9 m·kg, 6.5 ft·lb)

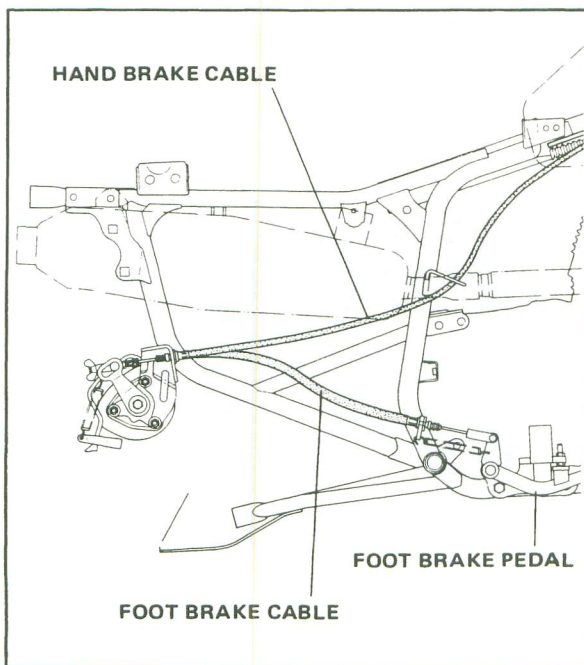
CAUTION:

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 left hand brake cable through the cable clamp.

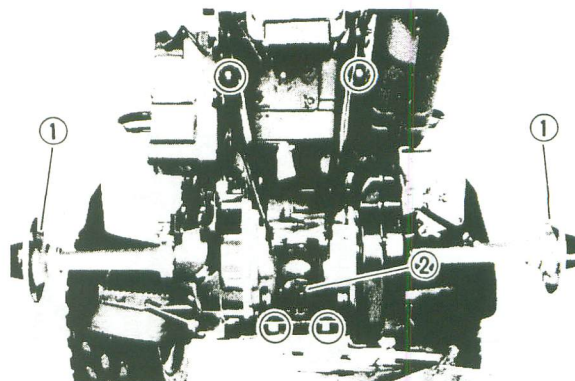


2. Adjust the rear hand brake and foot brake. Refer to "Brake Pedal and Rear Brake Lever Adjustment" on page 2-11.

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:

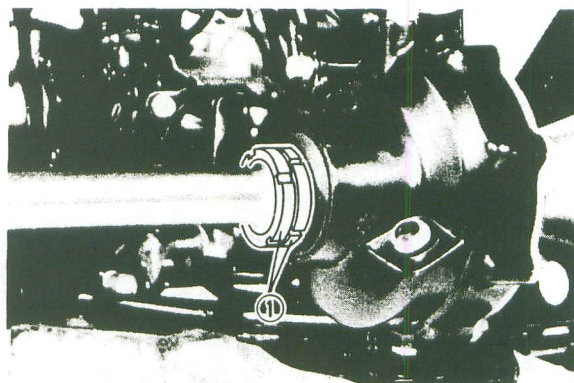
1. Block the front tire and jack up the rear of the vehicle. **Apply the parking brake.**
2. Remove the rear wheels, axle nuts and rear wheel flanges from the rear axle.
3. Remove the trailer-hitch-bracket securing bolts and remove the bracket from the frame.



1. Rear wheel flange

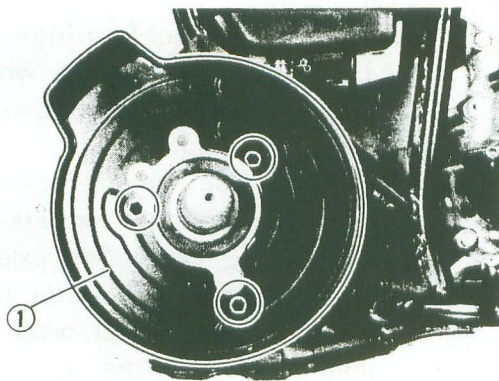
2. Trailer hitch bracket

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



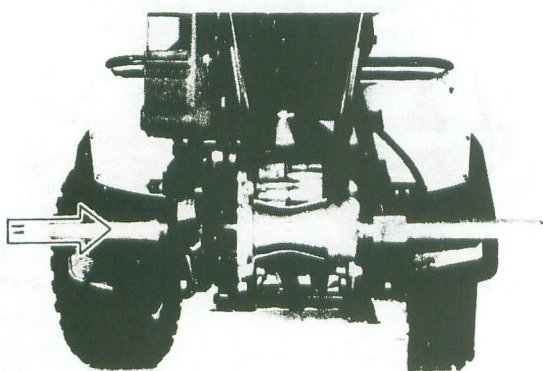
1. Ring nut

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.

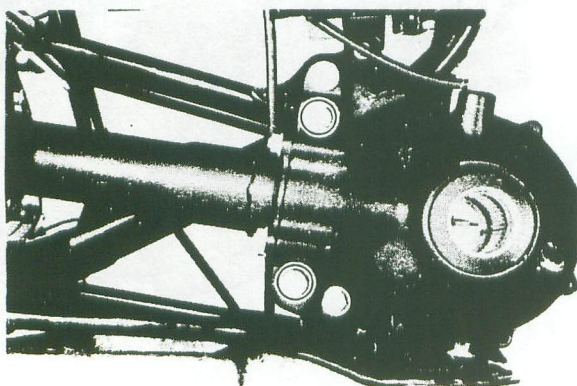


1. Brake cover

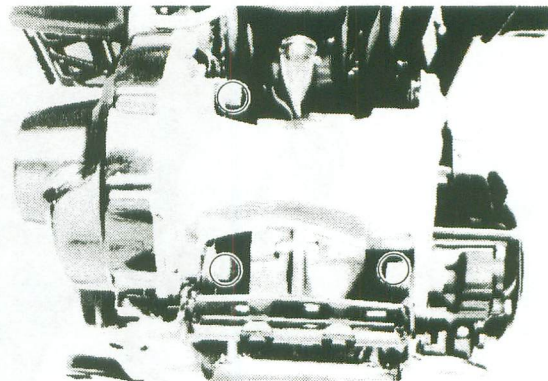
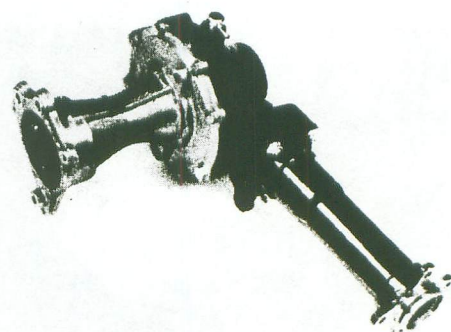
6. Remove the rear axle from the rear wheel hub by tapping the left end axle with a plastic hammer.



7. Remove the final gear housing securing bolts and the drive shaft housing nuts from the bearing housing.



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



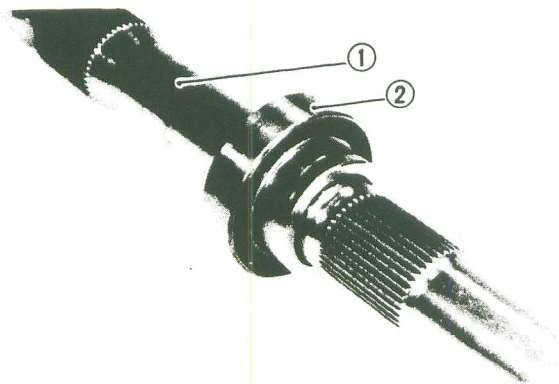
9. Drive the wheel bearing out by tapping around the perimeter of the bearing inner race with a soft metal drift punch and hammer.

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.

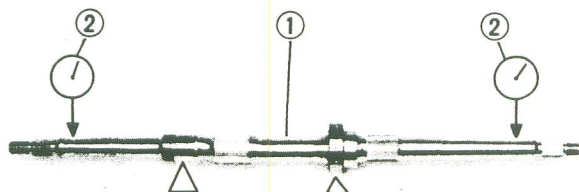
CAUTION:

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. Insert the coupling gear into the drive shaft.
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:

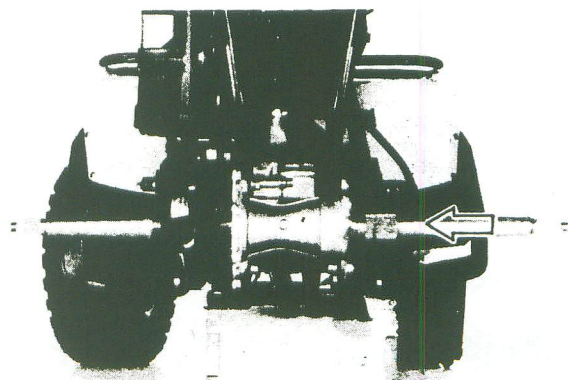
45 Nm (4.5 m · kg, 32 ft · lb)

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

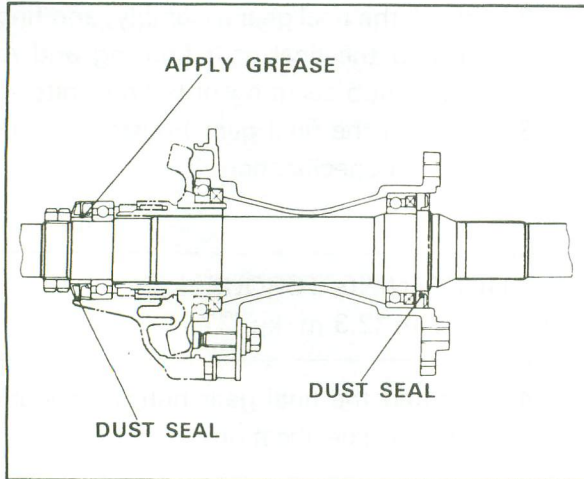
TIGHTENING TORQUE:

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.



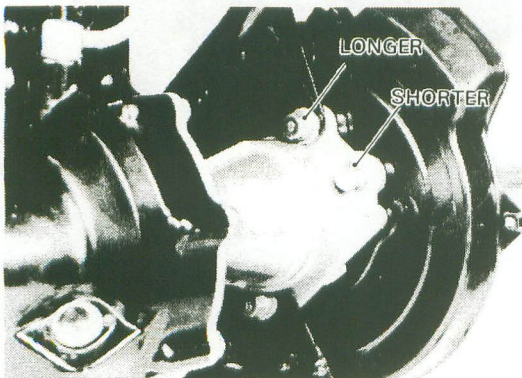
8. Install the inside-ring nut over the rear axle and **finger tighten the nut**.
9. Install the rear brake assembly and adjust the rear hand brake and foot brake. Refer to "Brake Pedal and Rear Brake Lever Adjustment" on page 2-12.

TIGHTENING TORQUE:

Caliper body: Bolt
50 Nm (5.0 m·kg, 36 ft·lb)
Caliper: Nut
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. Install the outside-ring nut over the rear axle and finger tighten the ring nut.
11. Tighten the outside-ring nut to specification.

NOTE:

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

TIGHTENING TORQUE:

190 Nm (19 m·kg, 140 ft·lb)

12. Tighten the inside-ring nut to specification.

NOTE:

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

TIGHTENING TORQUE:

240 Nm (2.4 m·kg, 170 ft·lb)

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

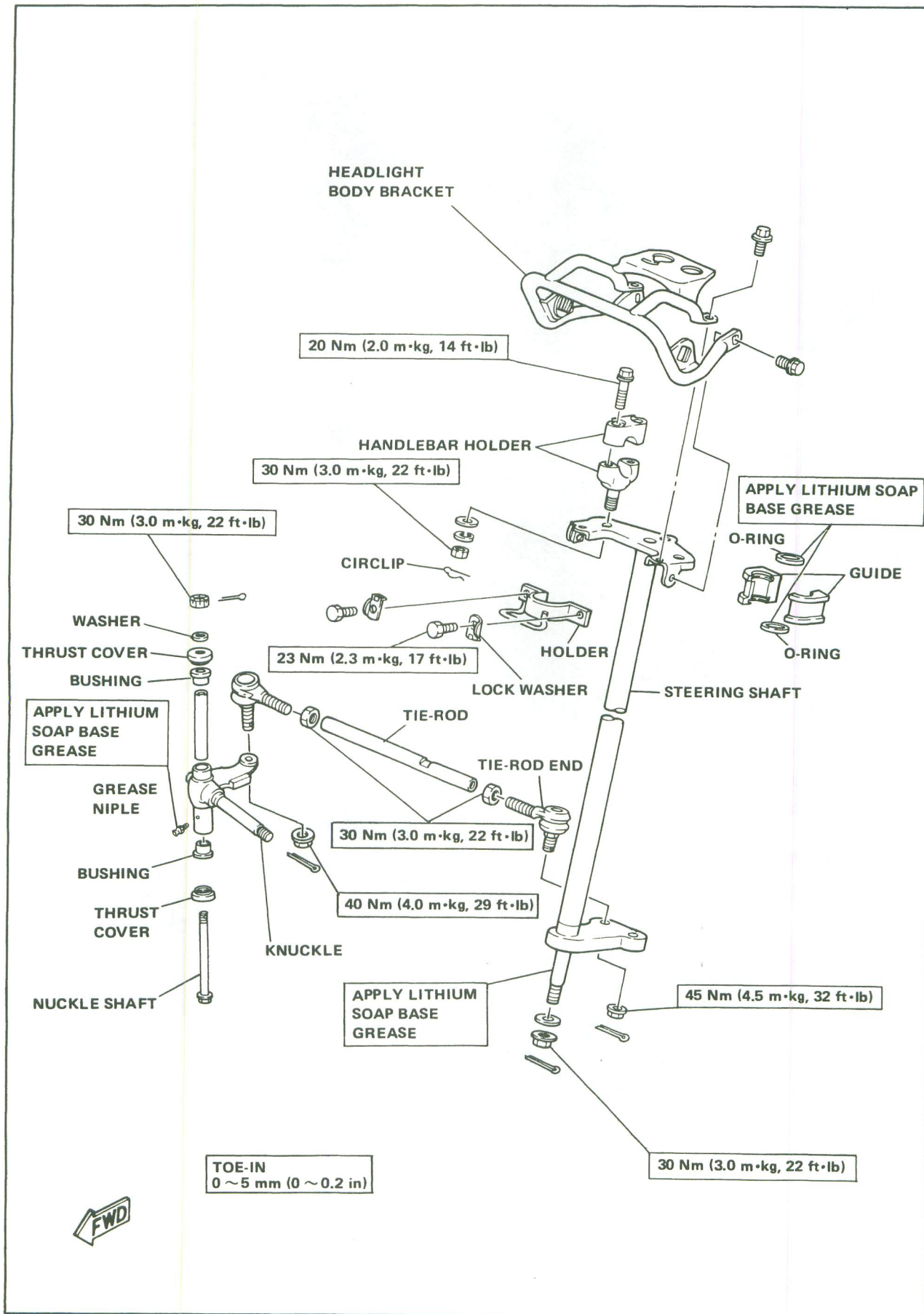
WARNING:

Always use the new cotter pin on the axle nut.

TIGHTENING TORQUE:

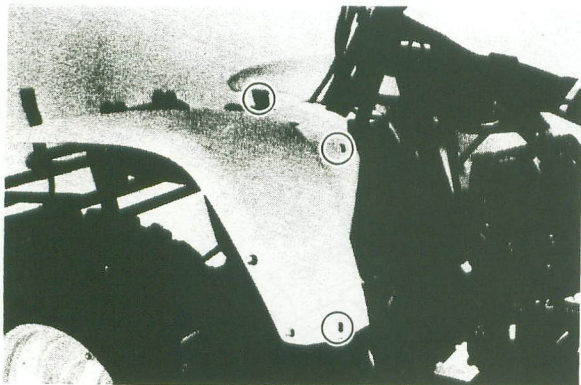
Rear wheel:
45 Nm (4.5 m·kg, 32 ft·lb)
Rear axle nut:
100 Nm (10 m·kg, 72 ft·lb)

STEERING

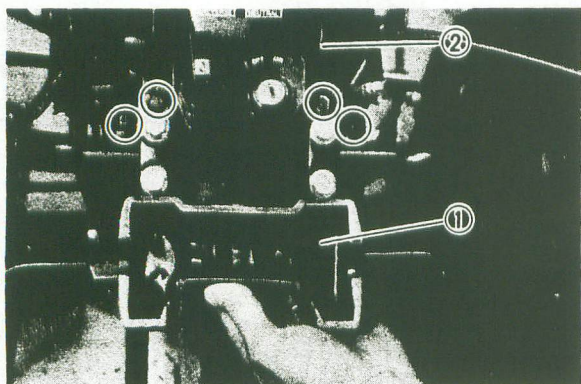


Steering Shaft Removal

1. Remove the seat, front carrier, fuel tank cover.
2. Remove the front fender.

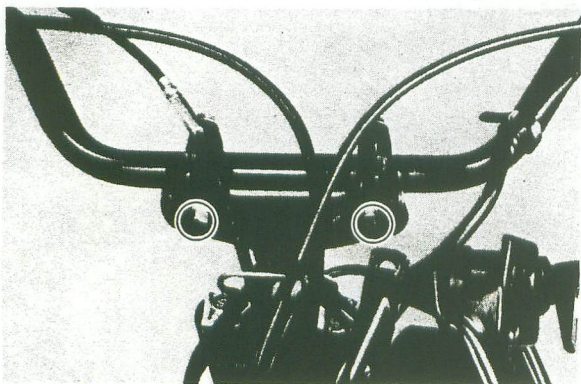


3. Remove the handlebar cover and headlightbody-bracket securing bolts.

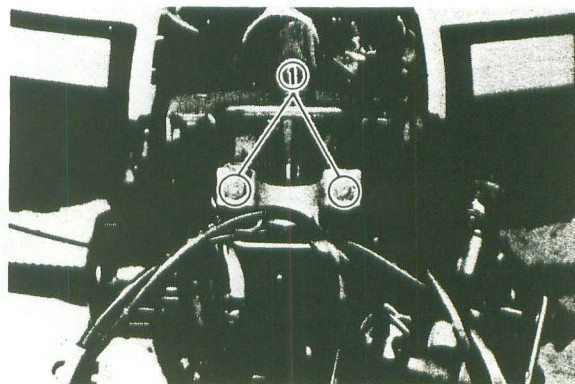


1. Handlebar cover 2. Bracket

4. Remove the circlip and handlebar holder securing nuts. Remove the handlebar.

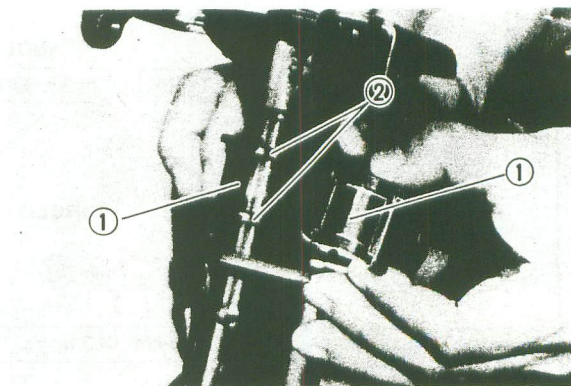


5. Flatten the lock tab, and remove the guide holder securing bolts.



1. Lock tab

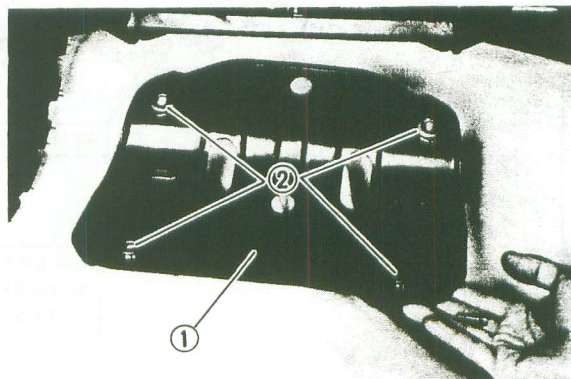
6. Remove the steering shaft guides and O-rings.



1. Guide

2. O-ring

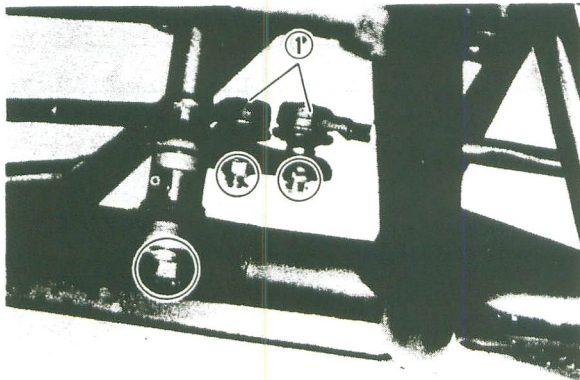
7. Remove the under guard from the frame. Do not lose the washers.



1. Under guard

2. Washer

8. Remove the cotter pins, and remove the tie-rod end and steering shaft securing nuts.



1. Tie-rod end

9. Remove the steering shaft from the frame.

NOTE:

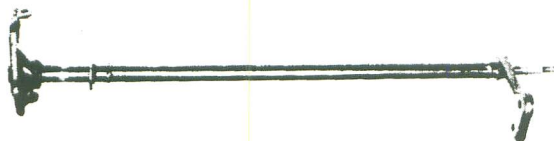
Note the order of cable routing for re-assembly.

Inspection

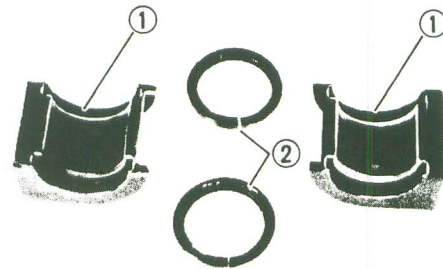
1. Examine the steering shaft. If the steering shaft is severely bent, it should be replaced.

WARNING:

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



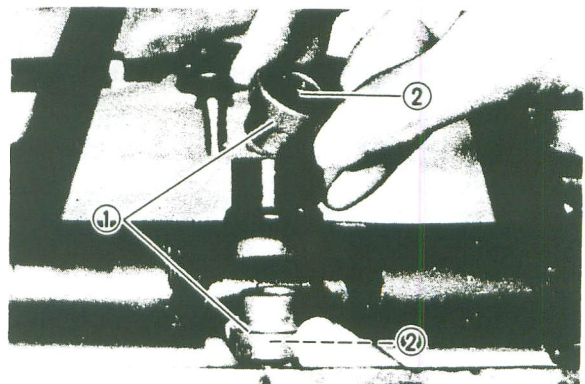
2. Check the O-rings and steering shaft guides for damage; replace them if they are damaged.



1. Guide

2. O-ring

3. Insert the steering shaft in the frame, and check the free play. There should be no noticeable free play when the shaft is in loose, replace the shaft is loose, replace the bushings and O-rings as required.



1. Bushing

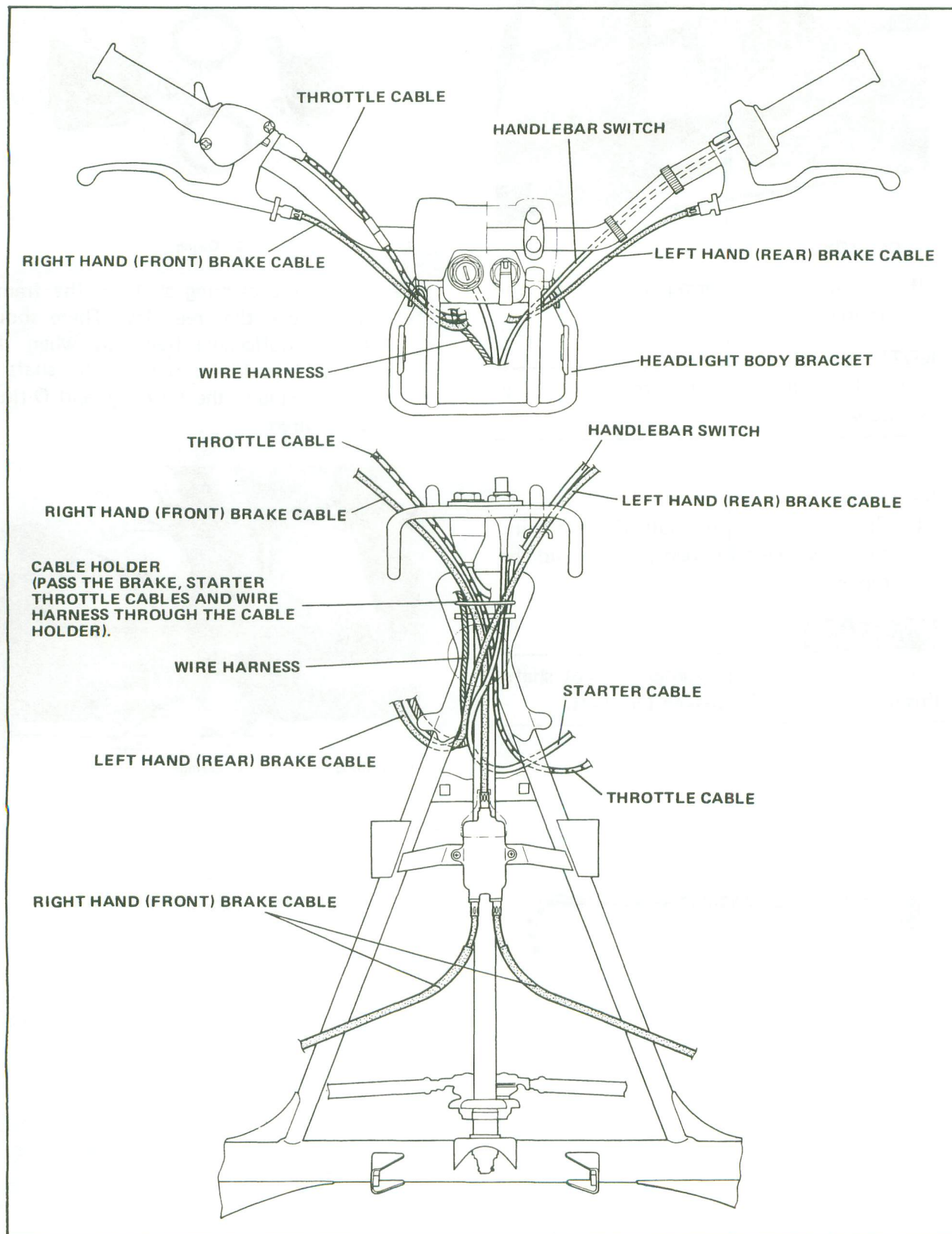
2. O-ring

Assembly

1. Apply lithium soap base grease to the bushings and O-rings.
2. Install the steering shaft onto the frame.

WARNING:

Make sure the brake cables and leads are properly routed, and are not damaged or twisted.



3. Install the steering shaft and tie-rod ends. Torque the nuts to specification.

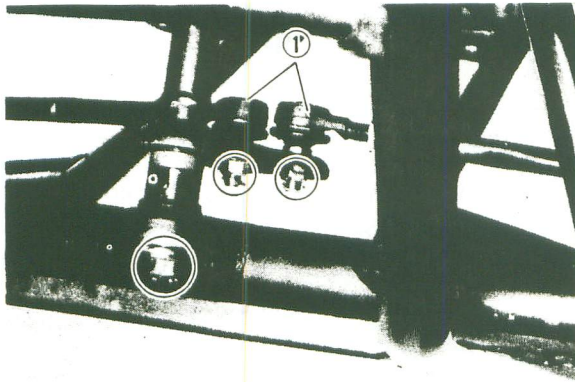
TIGHTENING TORQUE:

Steering Shaft:

30 Nm (3.0 m·kg, 22 ft·lb)

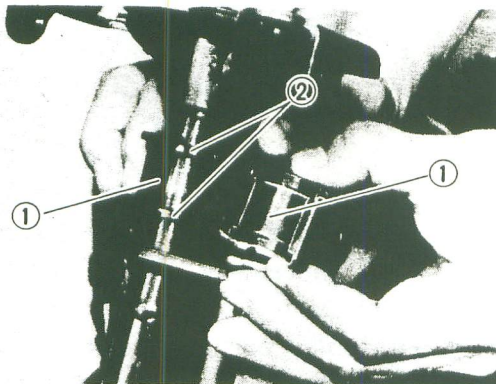
Tie-Rod End:

45 Nm (4.5 m·kg, 32 ft·lb)



1. Tie-rod end

4. Install the new cotter pins.
5. Install the O-rings and guides onto the steering shaft.



1. Guide 2. O-ring

NOTE:

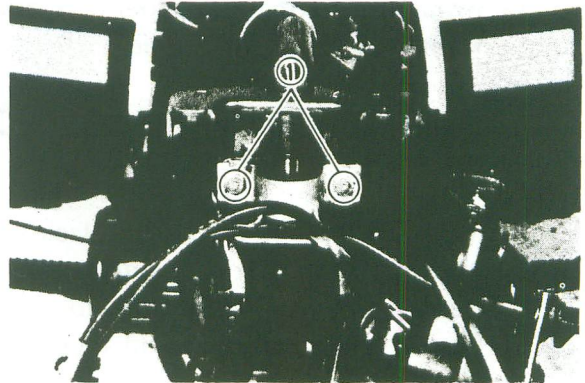
- Lightly apply lithium soap base grease to the O-rings.
- Be careful not to damage the O-rings during installation.

6. Install the guide holder and the new lock washers. Tighten the holder securing bolts to specification.

TIGHTENING TORQUE:

23 Nm (2.3 m·kg, 14 ft·lb)

7. Bend a lock tab against a bolt flat.



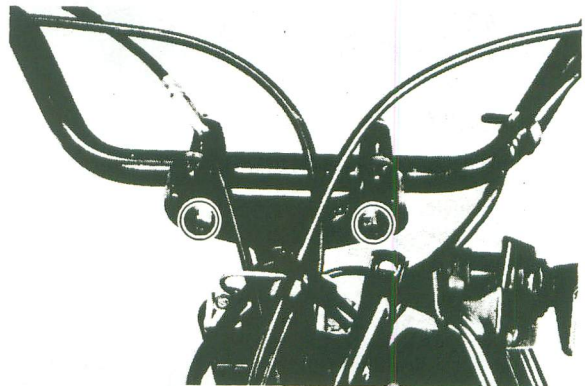
1. Lock tab

8. Install the handlebar onto the steering shaft. Tighten the nuts to specification.

TIGHTENING TORQUE:

30 Nm (3.0 m·kg, 22 ft·lb)

9. Install the new circlips.

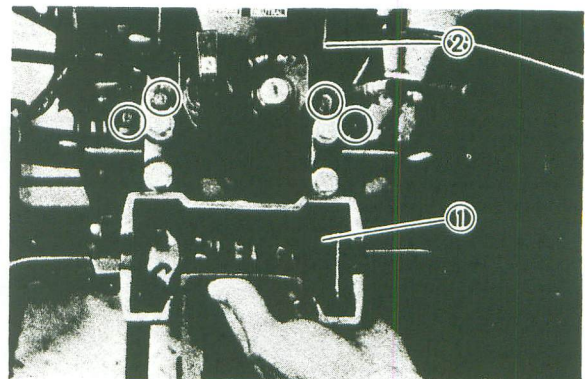


10. Install the headlightbody-bracket. Torque the bolts to specification.

TIGHTENING TORQUE:

10 Nm (1.0 m·kg, 7.2 ft·lb)

11. Install the handlebar cover.



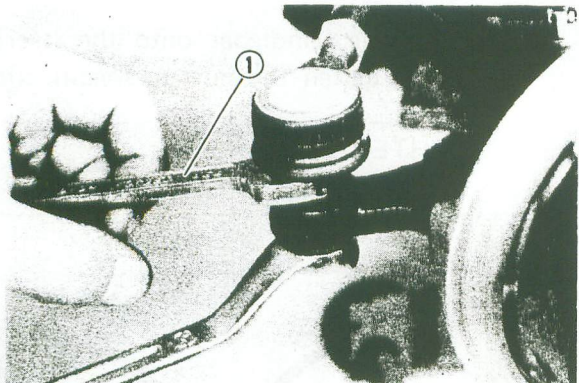
1. Handlebar cover 2. Bracket

12. Install the under guard under the frame.
13. Install the front fender, fuel tank cover, front panel, and front carrier.

KNUCKLES AND TIE-ROD ENDS

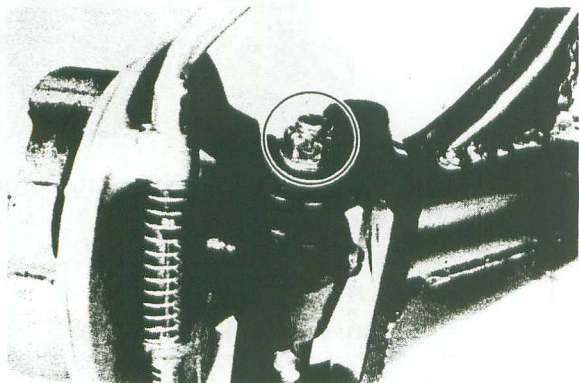
Removal

1. Elevate the front wheels by placing the suitable stand under the frame.
2. Remove the front wheel and hub.
3. Remove the cotter pin and tie-rod end securing nut.

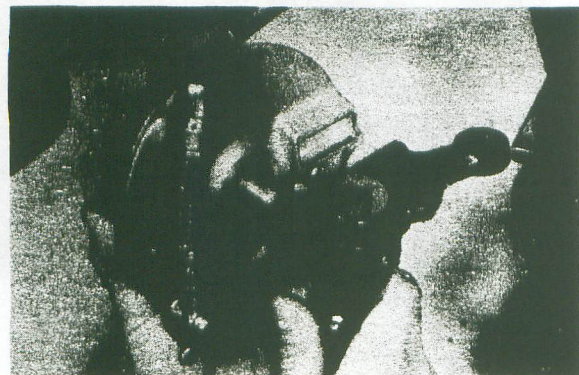


1. 14 mm wrench

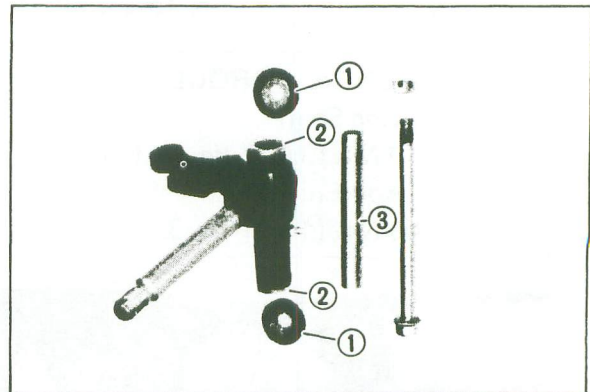
4. Remove the cotter pin and knuckle securing nut.



5. Disconnect the knuckle from the frame first, then remove the knuckle(s) from the brake shoe plate.

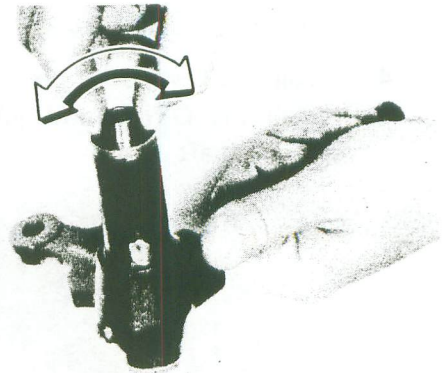


Inspection

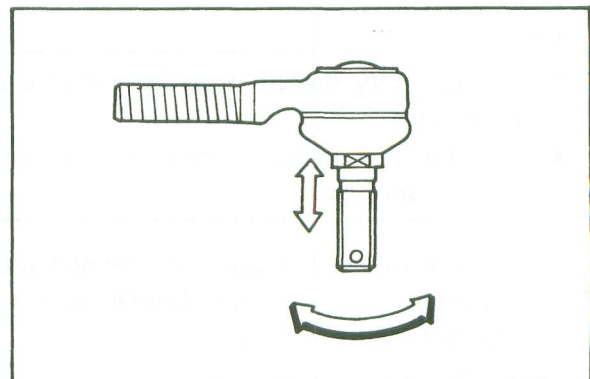


1. Thrust cover 2. Bush 3. Collar

1. Insert the collar into the knuckle, and check the free play. There should be no noticeable free play when the collar is in place. If the collar is loose, replace the collar and bushings as a set.



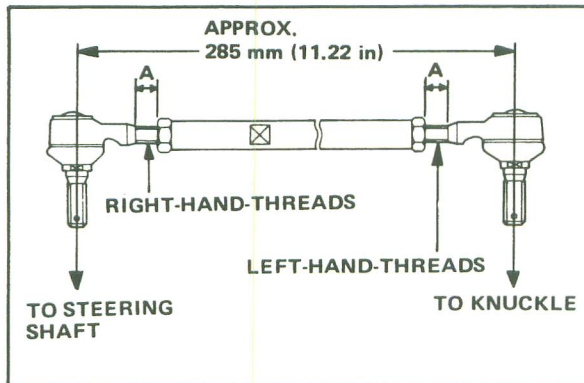
2. Check the tie-rod ends for free play and movement. There should be no noticeable vertical free play. If any free play exists and/or rough spots are noticed replace the tie-rod end(s).



3. Inspect the thrust cover for wear and damage. If they are worn or damaged, replace them.

Assembly

1. Install the tie-rod ends into the tie-rod as shown. Note the following points.

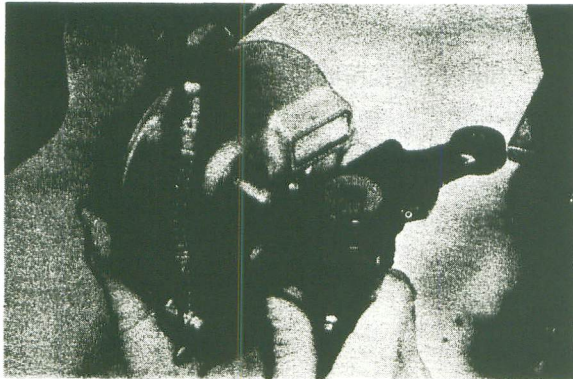


NOTE:

- Before installing the tie-rod assembly, adjust its length by turning both tie-rod ends.

Tie-Rod Assembly Length:
Approx. 285 mm (11.22 in)

- The threads(A) on both tie-rod ends must be of the same length.
2. Apply lithium soap base grease to the bushes, collar, and thrust covers.
 3. Insert the axle into the brake shoe plate first, then install the knuckle onto the frame.



4. Install the knuckle shaft and tighten the shaft to specification.

CAUTION:

Do not over tighten the nut.

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

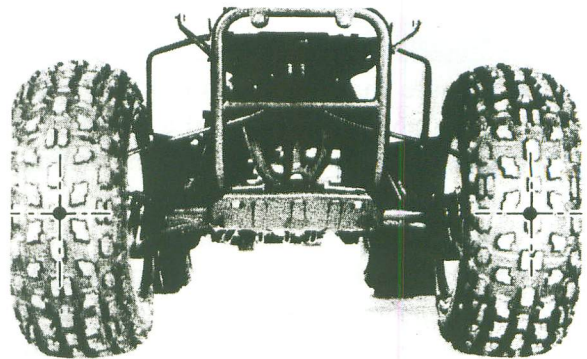
5. Install a new cotter pin on the nut.
6. Install the tie-rod end onto the knuckle. Torque the nut to specification.

TIGHTENING TORQUE:
40 Nm (4.0 m·kg, 29 ft·lb)

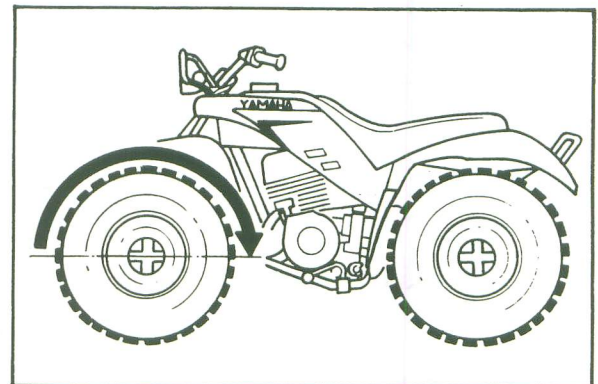
7. Install a new cotter pin on the nut.

Adjustment

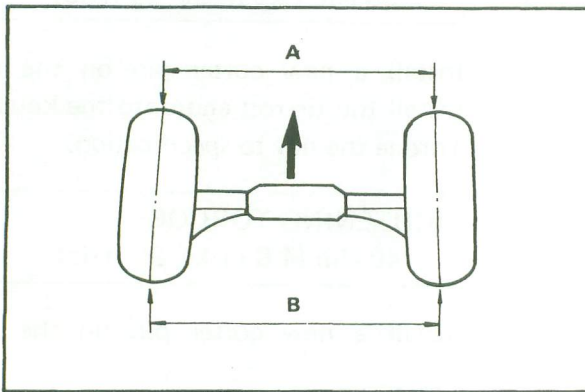
1. Make sure the machine is at a flat level.
2. Mark both front tire tread centers and measure the width between the marks.



3. Move the front tires 180 degrees either forward or backward until the marks come exactly opposite.



4. Measure the width between the marks.



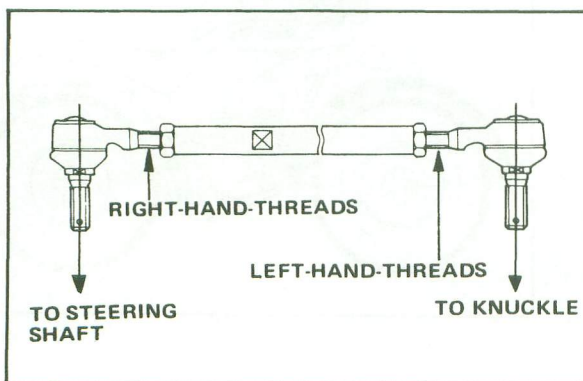
Tie-in:

$$B - A = 0 \sim 5 \text{ mm } (0 \sim 0.2 \text{ in})$$

WARNING:

- Be sure that both tie-rod are turned by the same amount. If not, the machine will go right or left even though the handlebar is positioned straight and it may lead to mishandling and accident.
- After setting the toe-in to specification, run the machine slowly for some distance with the hands lightly on the handlebar and check that the handlebar responds correctly. If not, turn either the right or left tie-rod within the toe-in specification.

5. Tighten the tie-rod locknuts with both tie-rod end heads flash with each other.



TIGHTENING TORQUE:

$$30 \text{ Nm } (3.0 \text{ m} \cdot \text{kg}, 22 \text{ ft} \cdot \text{lb})$$

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.

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

9 Nm (0.9 m · kg, 6.5 ft · lb)

23 Nm (2.3 m · kg, 17 ft · lb)

FINAL GEAR OIL CAPACITY:
0.13 L (0.11 Imp qt, 0.14 US qt)
RECOMMENDED OIL:
SAE80API GL-4 Hypoid gear oil

GASKET

23 Nm (2.3 m · kg, 17 ft · lb)

LEFT-HAND-THREADS

BEARING

DRIVE SHAFT (PINION GEAR)

SHIM

BEARING

RETAINER

100 Nm (10 m · kg, 72 ft · lb)

45 Nm (4.5 m · kg, 32 ft · lb)

DANGER CAM

DAMPER SPRING

WASHER

RETAINER

DAMPER CAM

O-RING

BEARING

OIL-SEAL

23 Nm (2.3 m · kg, 17 ft · lb)

HOUSING

SPRING

DRIVE SHAFT

O-RING

WASHER

CIRCLIP

COUPLING GEAR

O-RING

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. D. Cam damper damage.
3. A locked-up condition of the shaft drive mechanism; no power transmitted from engine to rear wheel.	E. Broken coupling gear. F. Broken gear teeth. G. Seizure due to lack of lubrication. H. Small foreign object lodged between moving parts.

NOTE:

Damage areas A, B, C and D 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.

WARNING:

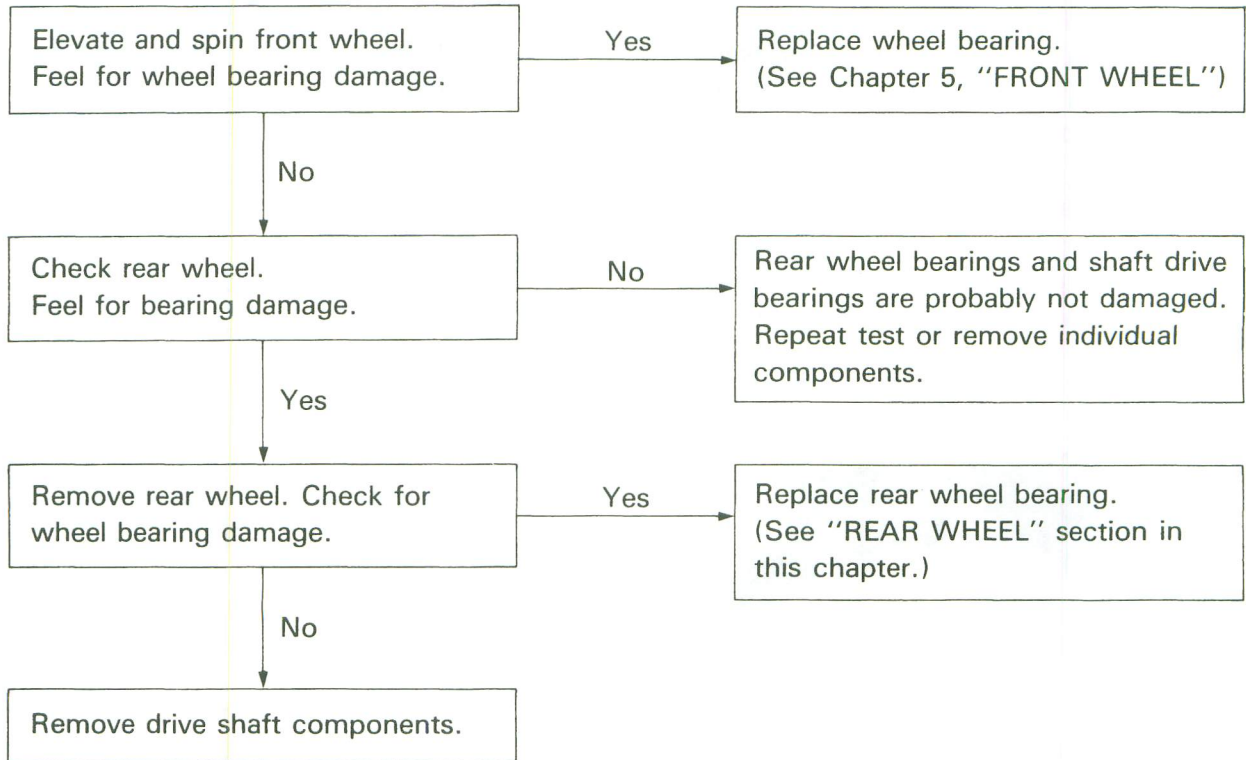
If broken gear teeth are suspected, stop riding immediately. This condition could lead to locking-up of the shaft drive assembly and result in harm to a rider.

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.

4. Troubleshooting chart

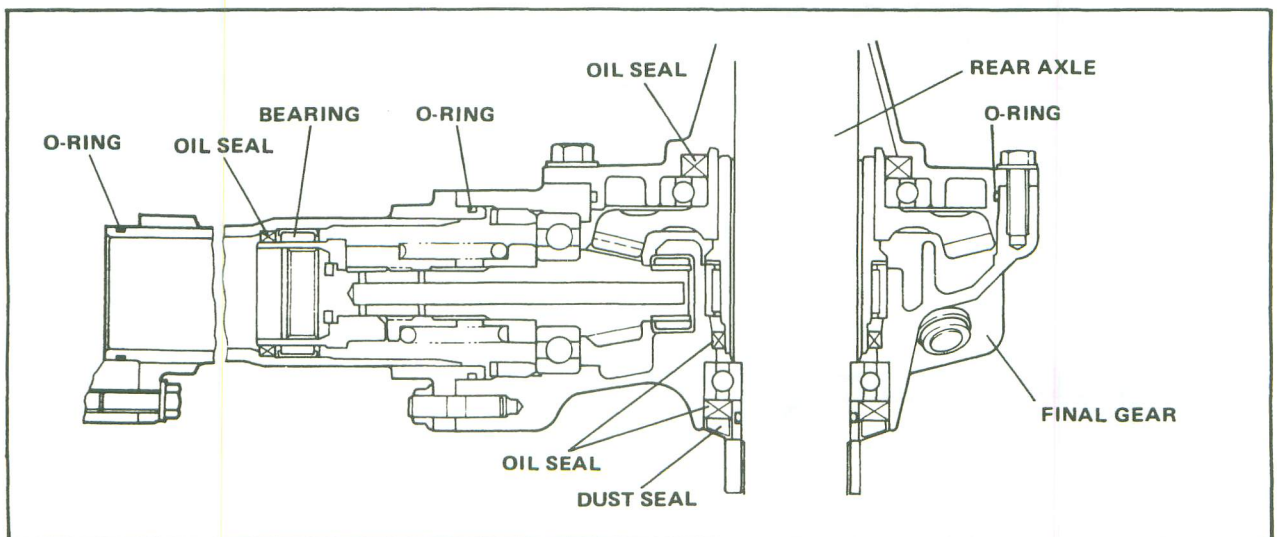
Where basic conditions "1" and "2" above exist, consider the following chart:



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.

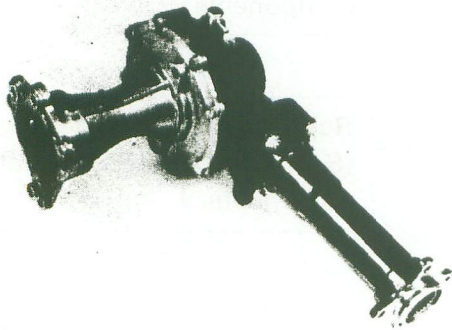


6. Checking drained oil

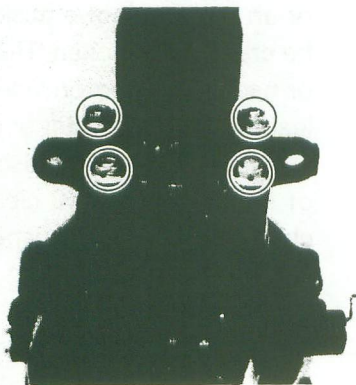
Whenever a problem is suspected in either the middle or final gear assemblies, drain and inspect the oil. Metal particles on the drain plug or in the oil could indicate a bearing seizure or other problem. However, a small amount of metal particles in the oil is normal.

Final Gear Removal

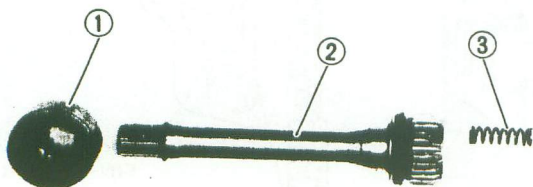
1. Remove the rear wheels, rear axle and final gear assembly. (see "Replacing the Wheel Bearings" section in this Chapter).



2. Remove the drive shaft housing securing nuts, and remove the housing from the final gear.



3. Pull out the coupling gear, drive shaft, and spring.



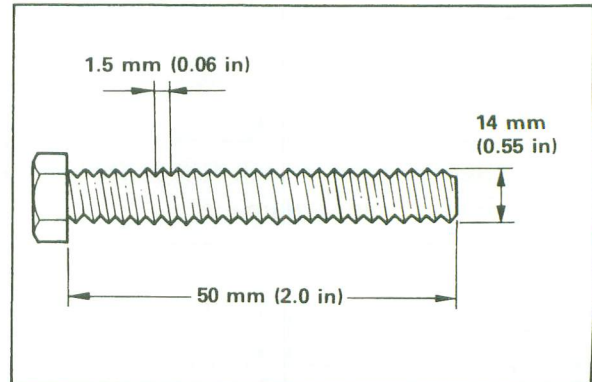
1. Coupling gear 2. Drive shaft 3. Spring

Gear Lash Check and Adjustment

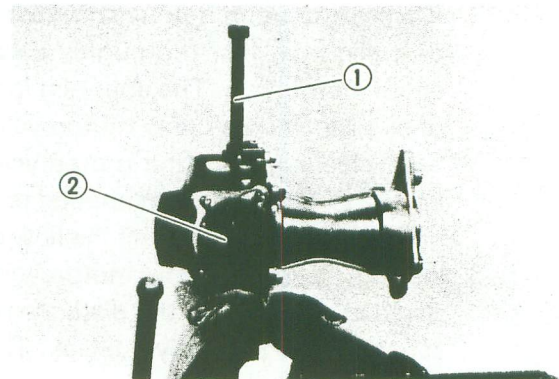
1. Secure the gear case in a vise or other support.
2. Remove the drain plug from the final gear case and drain the oil.
3. Install a specified size of bolt (as shown) into the drain plug hole. Finger tighten the bolt until it holds the ring gear.

NOTE:

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



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



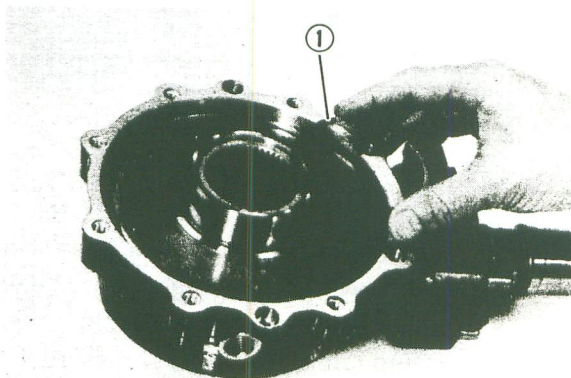
1. Bolt 2. Gear lash measurement tool

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.

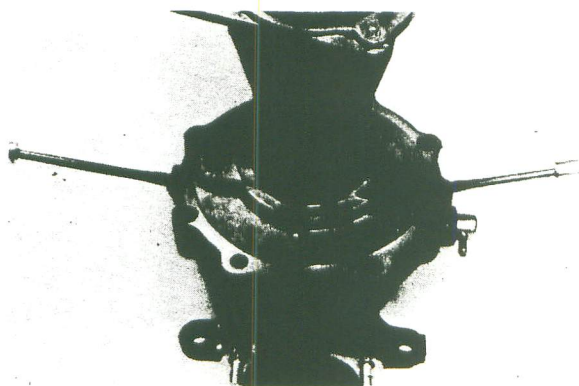
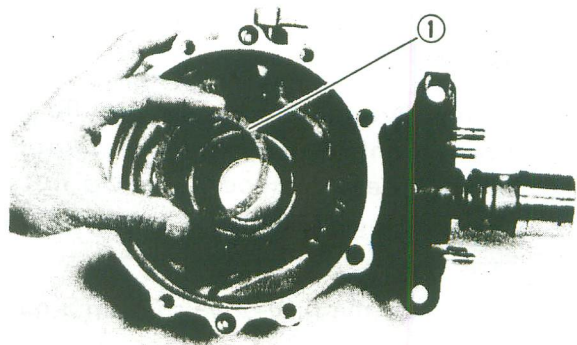


1. Shim

- 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.

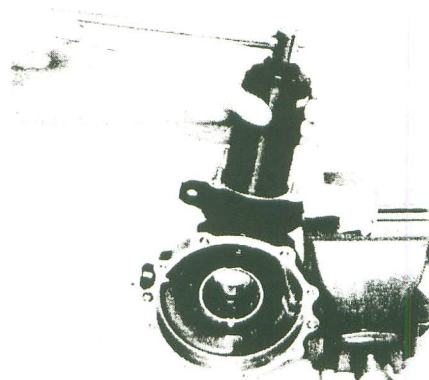


1. Thrust washer

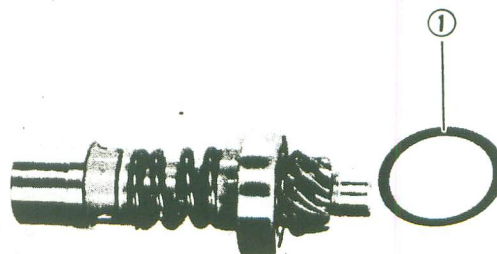
3. Remove the final-drive-shaft-bearing retainer with the final-drive-shaft-bearing-retainer wrench.

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.

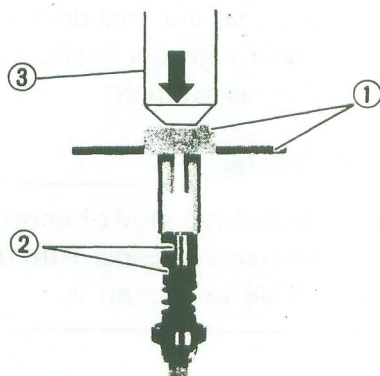


1. Shim

CAUTION:

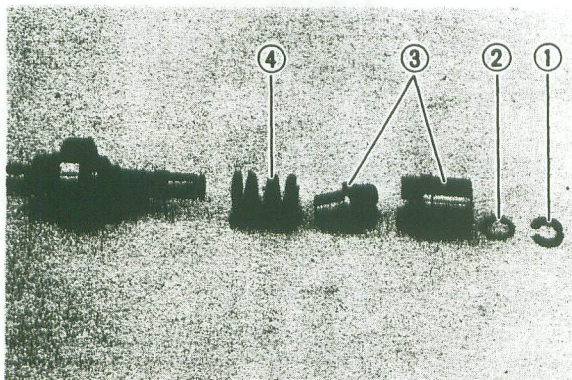
Final drive shaft removal should be performed only if the gearing or damper cam replacement is necessary. Do not reuse the bearings or races after removal.

5. Place the final drive shaft in a hydraulic press with the damper compressor in place as shown in the photograph.



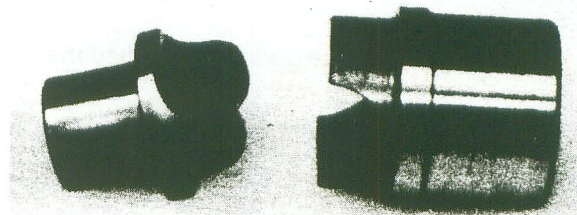
1. Damper compressor 2. Cam damper
3. Hydraulic press

6. Press the damper cam, and remove the spring retainers.
7. Remove the retainer, washer, damper cams, and spring, from the drive shaft.

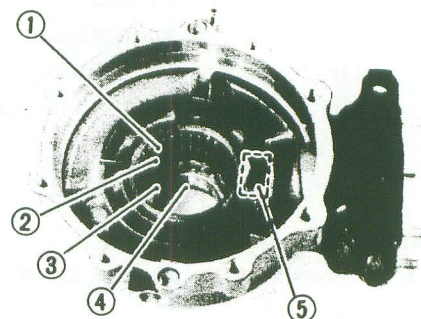


1. Retainer 2. Washer 3. Damper cam 4. Spring

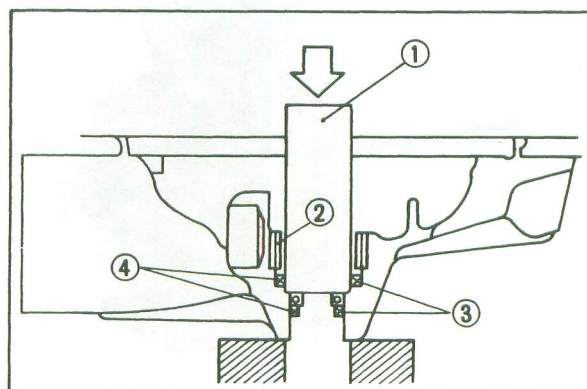
8. Inspect the damper cam surfaces. Check for smooth cam action and excessive wear on the cam surface. If cam surface is severely worn, replace damper assembly.



9. Inspect the damper springs for fatigue, wear, and damage. Replace as necessary.
10. 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.



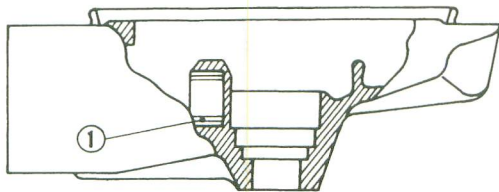
1. Roller bearing 4. Oil seal
2. Oil seal 5. Roller bearing
3. Ball bearing



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

11. 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.

FINAL-DRIVE-SHAFT ROLLER BEARING



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:

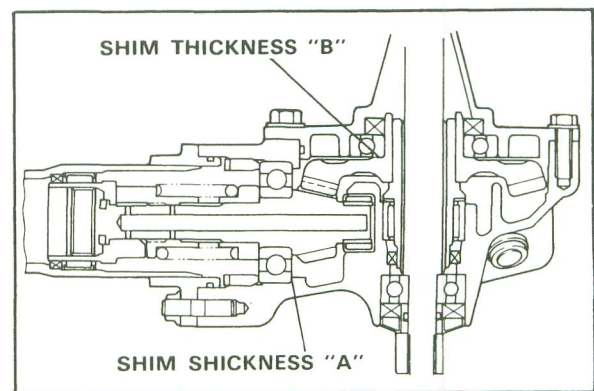
The removed roller bearing can be used if undamaged; however, we recommend replacement with a new one.

3. Final drive/ring gear positioning.

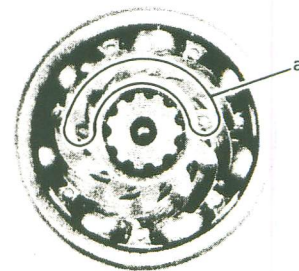
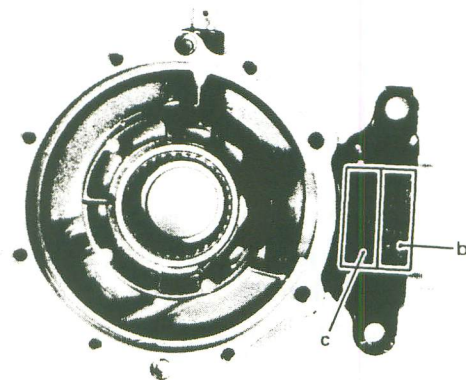
NOTE:

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.

$$A = 79.01 - 78.50$$

$$A = 0.51 \text{ (0.020 in)}$$

Then the necessary shim thickness is 0.51 mm (0.020 in).

Shim sizes are supplied in the following thicknesses:

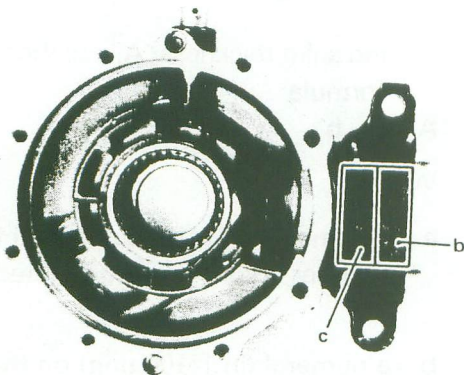
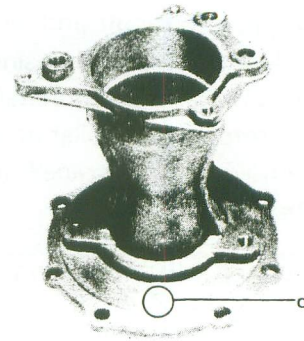
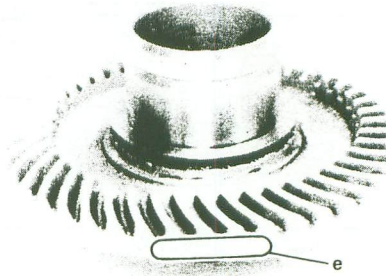
0.15 mm (0.006 in), 0.30 mm, (0.012 in),
0.40 mm, (0.016 in), 0.50 mm (0.020 in),
0.60 mm (0.024 in)

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

$$f = 11.00 \text{ mm (0.433 in)}$$

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.

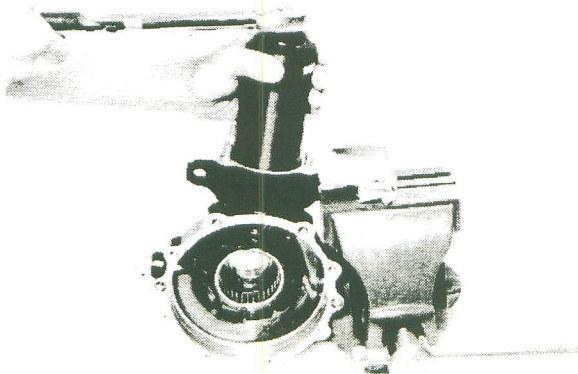
4. Install the final drive shaft gear with the proper size shim(s), and secure it with the bearing retainer nut. Use the final-drive-shaft-bearing-retainer wrench.

NOTE: _____

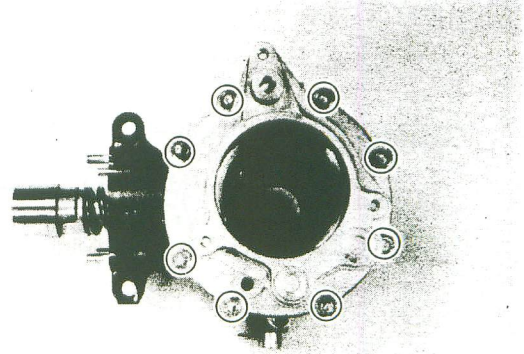
The bearing retainer nut has left-hand threads; turn the nut counterclockwise to tighten it.

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").
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.



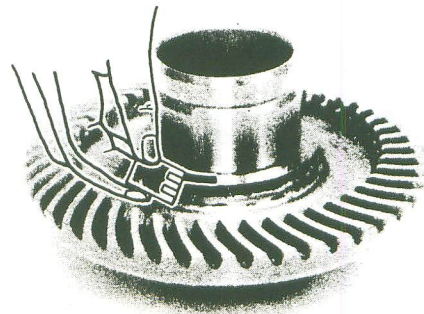
TIGHTENING TORQUE:

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®

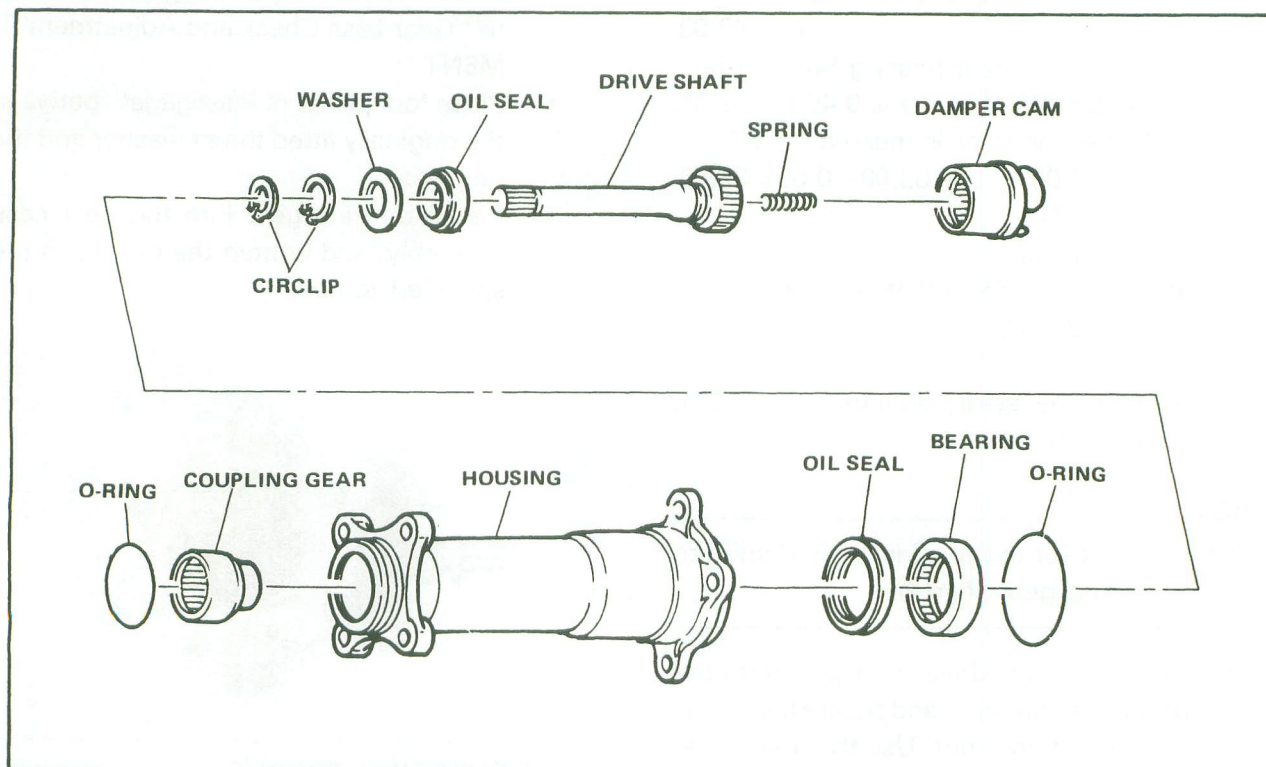


Ring gear thrust clearance:

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



Removal

1. Remove the rear wheels, rear axle, and final gear assembly. (See "Replacing the wheel bearings" section in this chapter).
2. Remove the drive shaft housing, coupling gear, drive shaft, and spring.

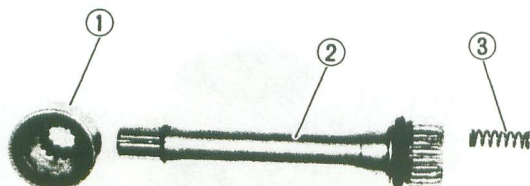
Inspection

1. Drive shaft

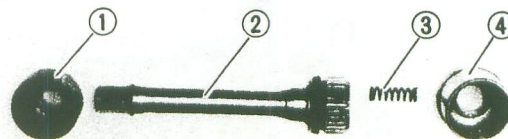
Inspect the shaft splines for wear and/or damage. If wear is excessive, replace the drive shaft, coupling gear, and damper cam as required.

NOTE:

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



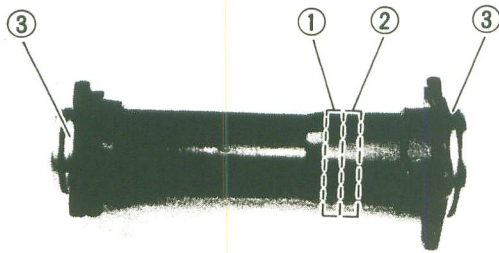
1. Coupling gear 2. Drive shaft 3. Spring



1. Coupling gear 2. Drive shaft 3. Spring
4. Damper cam

2. Housing

Inspect the housing O-rings, bearing and oil seal for wear and damage. If they are worn or damaged, replace them.



1. Oil seal 2. Bearing 3. O-ring

Installation

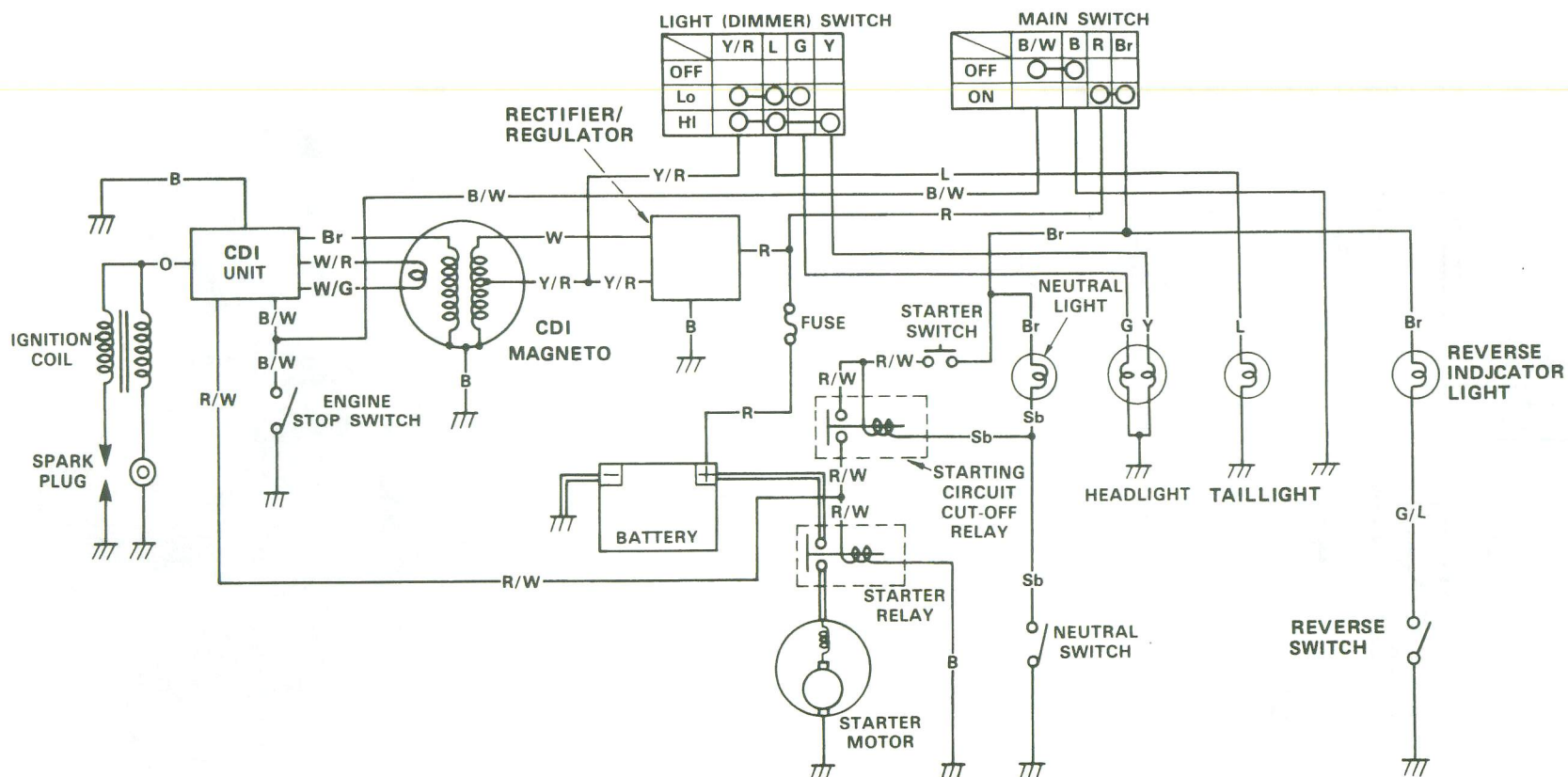
When installing the drive shaft, reverse the removal procedure. Note the following points:

- Lubricate the shaft splines with molybdenum disulfide grease.
- Torque the final gear case nuts and bolts to specification. See "Chapter 3" Engine Mounting.
- Adjust the rear brake. See "Chapter 2" Brake Adjustment.

CHAPTER 6 ELECTRICAL

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YFM200N WIRING DIAGRAM



COLOR CODE

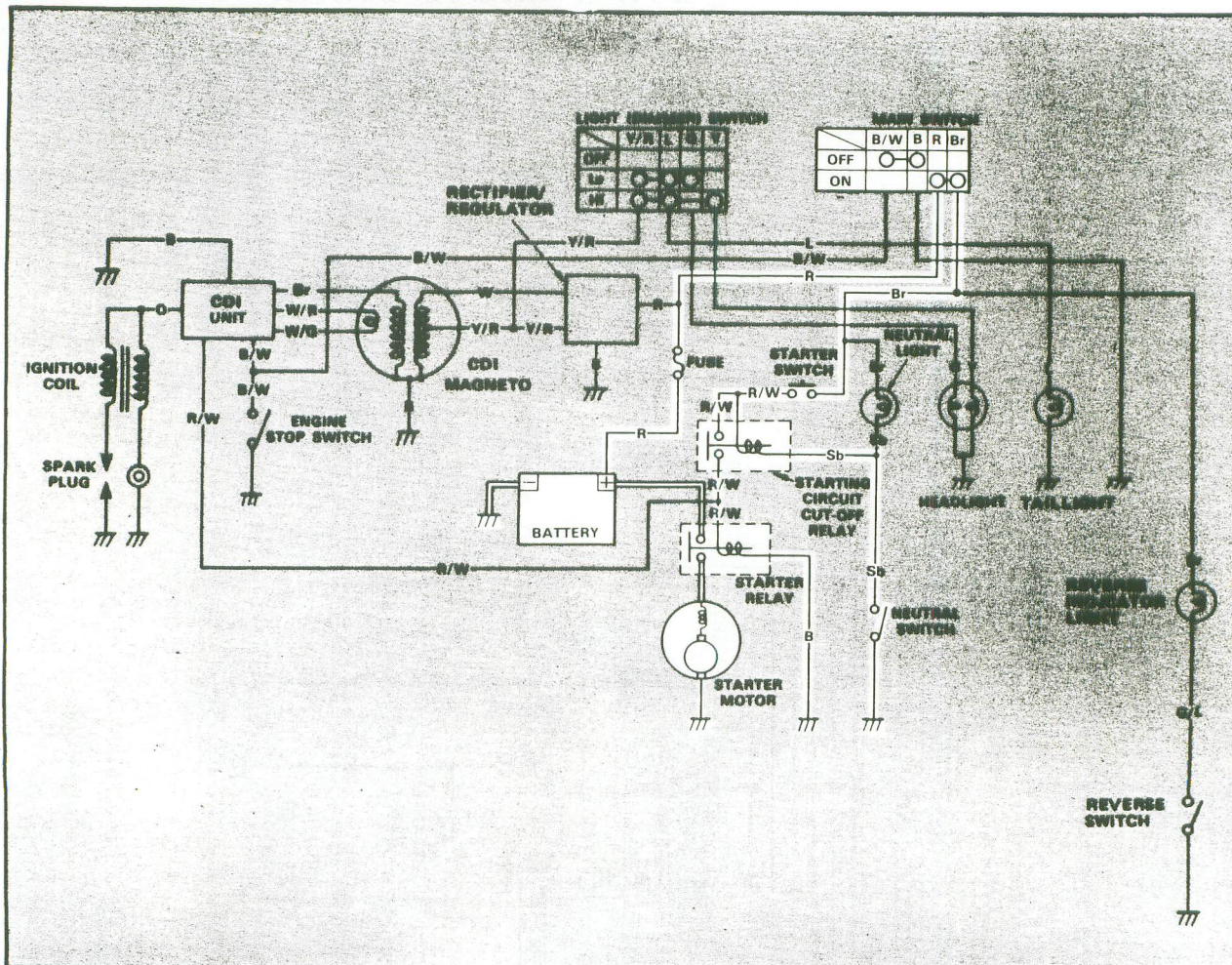
B Black
O Orange
L Blue
R Red
G Green

Y Yellow
W White
Sb Sky blue
Br Brown
W/G White/Green

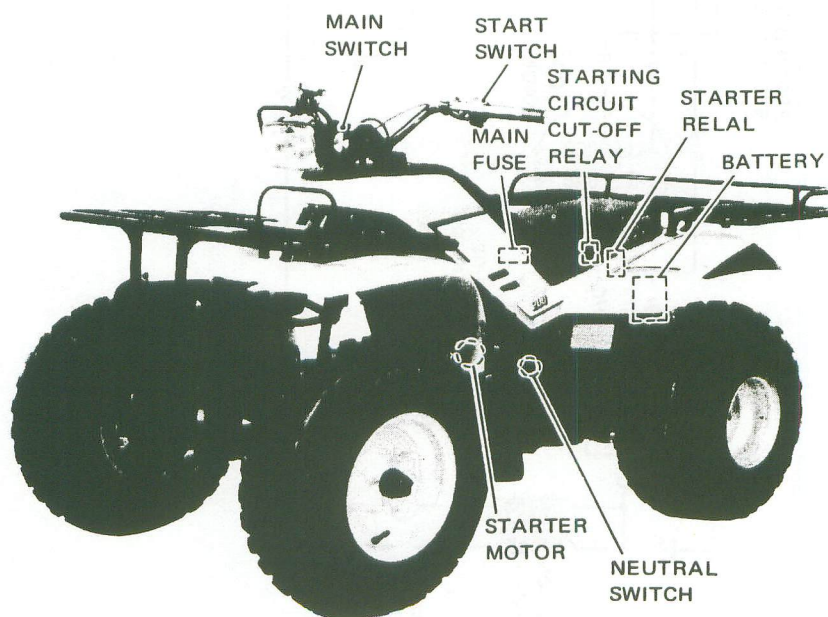
Y/R Yellow/Red
R/W Red/White
W/R White/Red
G/L Green/Blue
B/W Black/White

CHAPTER 6. ELECTRICAL

ELECTRIC STARTING SYSTEM



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



STARTING CIRCUIT OPERATION

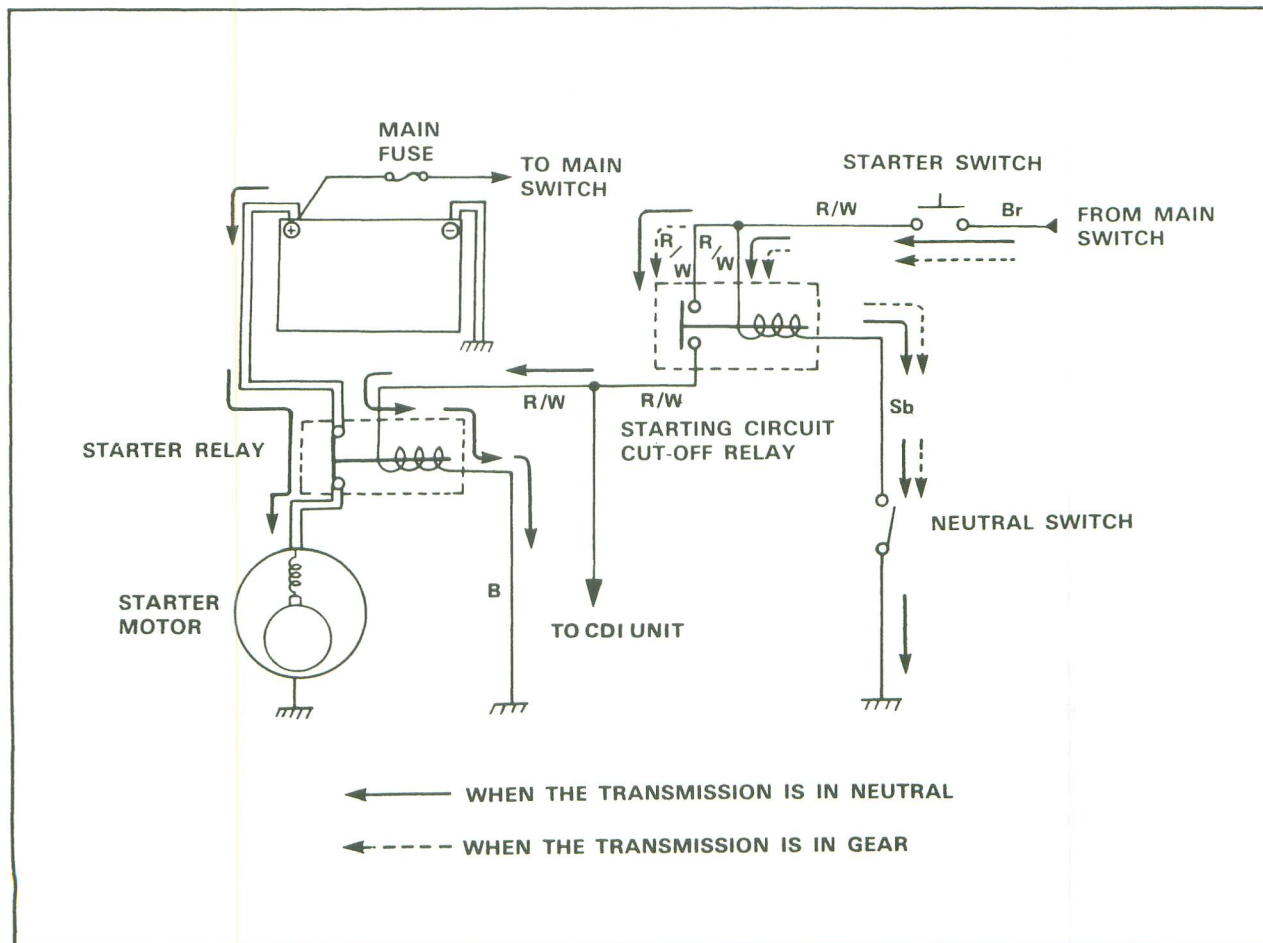
The starting circuit on this model consist of the starter motor, starter relay, neutral switch, and the starting circuit cut-off relay. If the main switch is on, the starter motor can be operated only if:

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

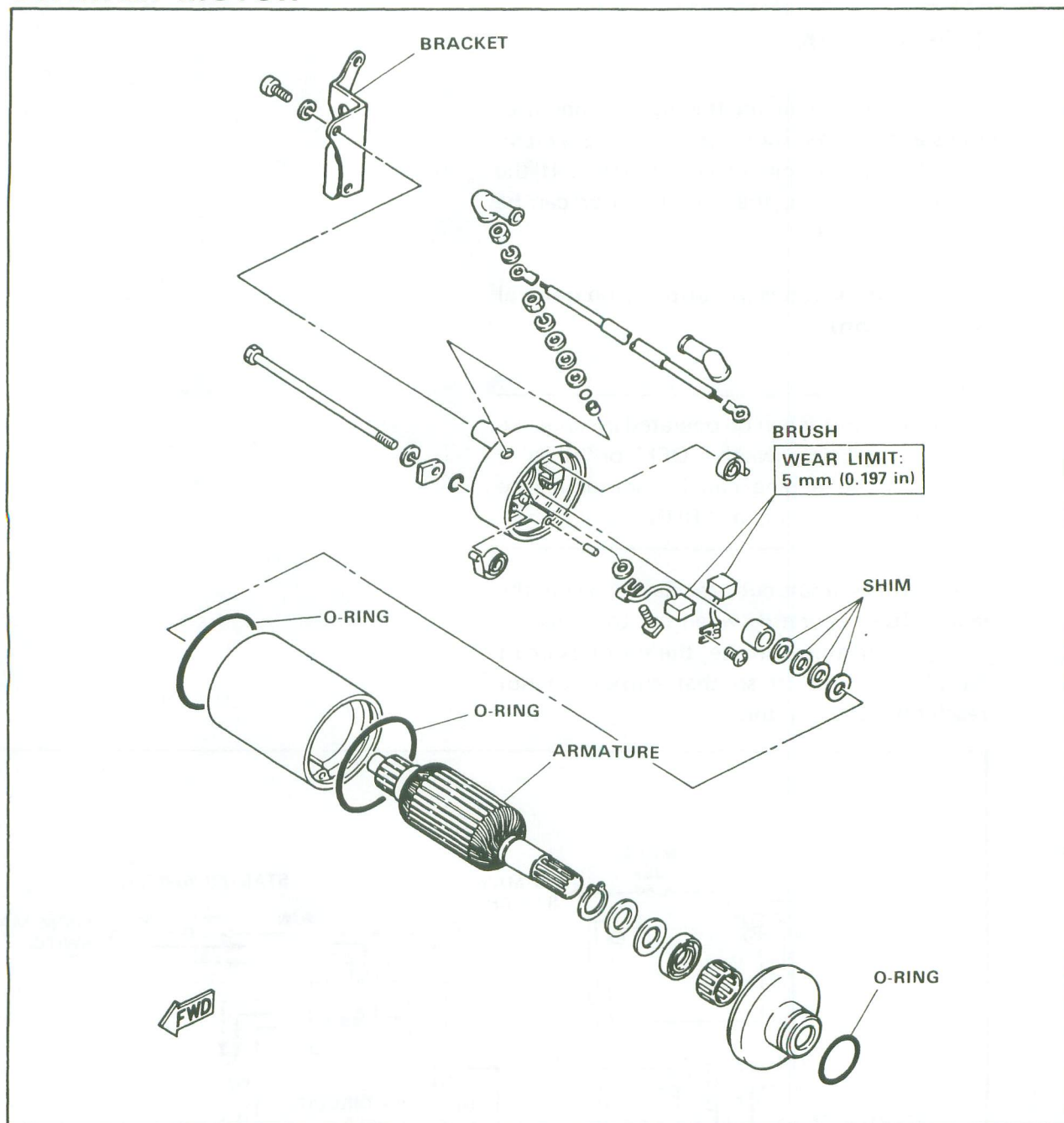
NOTE: _____

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 that current cannot reach the starter motor.



STARTER MOTOR



Removal

1. See Chapter 3. "ENGINE DISASSEMBLY."

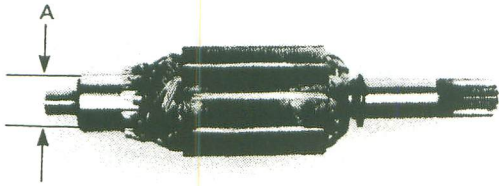
Inspection and Repair

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:

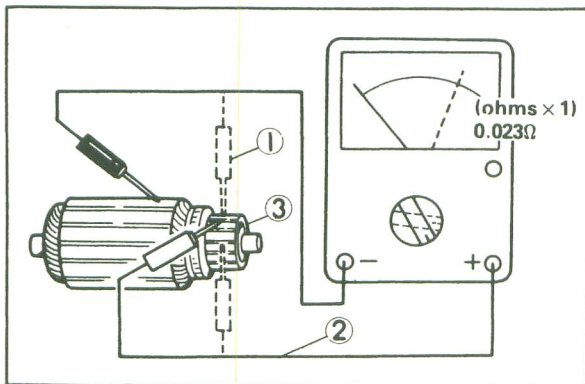
The mica insulation of the commutator must be undercut to ensure proper operation of commutator.



Commutator dia. limit "A":
22 mm (0.866 in)

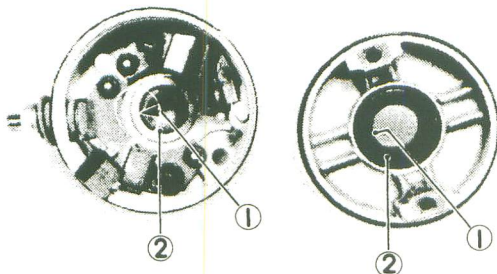
3. The armature coil should be checked for insulation breakdown (shorting to each other or to ground) and for continuity. Use a pocket tester.

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)



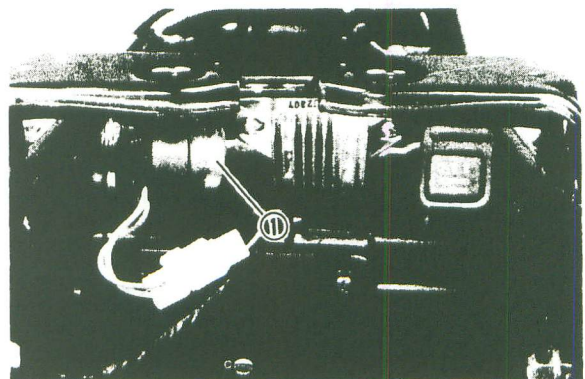
6. Check the brush spring pressure. Compare it with a new spring. Replace the old spring if it is weak.

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

STARTER RELAY

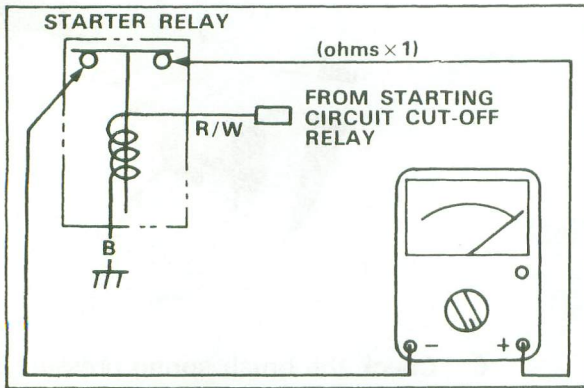
Inspection

1. Remove the seat, rear carrier securing bolts, and rear fender.
2. Disconnect the relay from the rubber clamp and disconnect the starter cables at the relay.



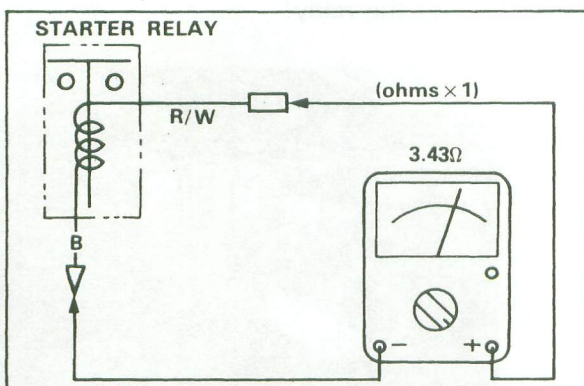
1. Starter relay

3. Connect the pocket tester leads to the relay terminals (ohms $\times 1$ scale).
4. Turn the ignition to "ON" with the transmission in neutral.
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 (black) and from the starting circuit cut-off relay (red/white).
7. Check the resistance of the relay coil windings with the pocket tester. If the resistance is not within specification, replace the relay.

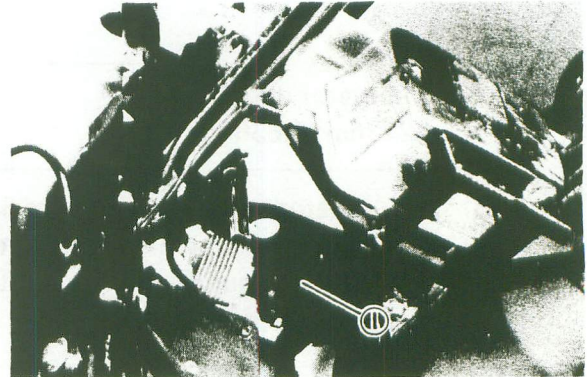
Starter relay resistance:
 3.43Ω at 5°C (68°F)
 (Red/White — Black)



STARTING CIRCUIT CUT-OFF RELAY

Inspection

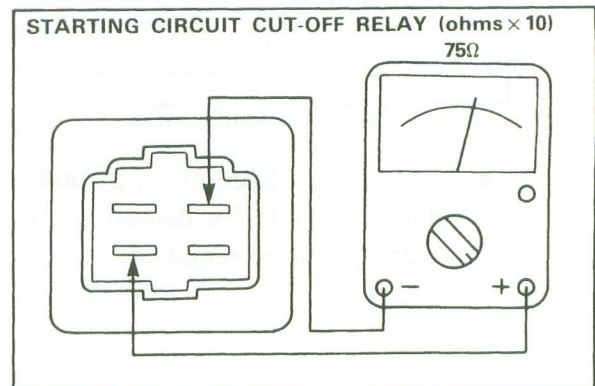
1. Remove the seat, rear carrier securing bolts, and rear fender.
2. Remove the starting circuit cut-off relay from the rubber clamp, and disconnect the connector.



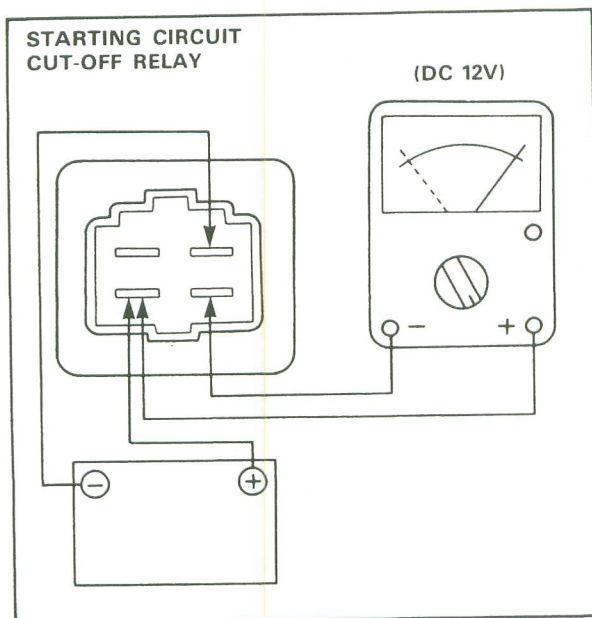
1. Starting circuit cut-off relay

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:
 $75\Omega \pm 10\%$ at 20°C (68°F)

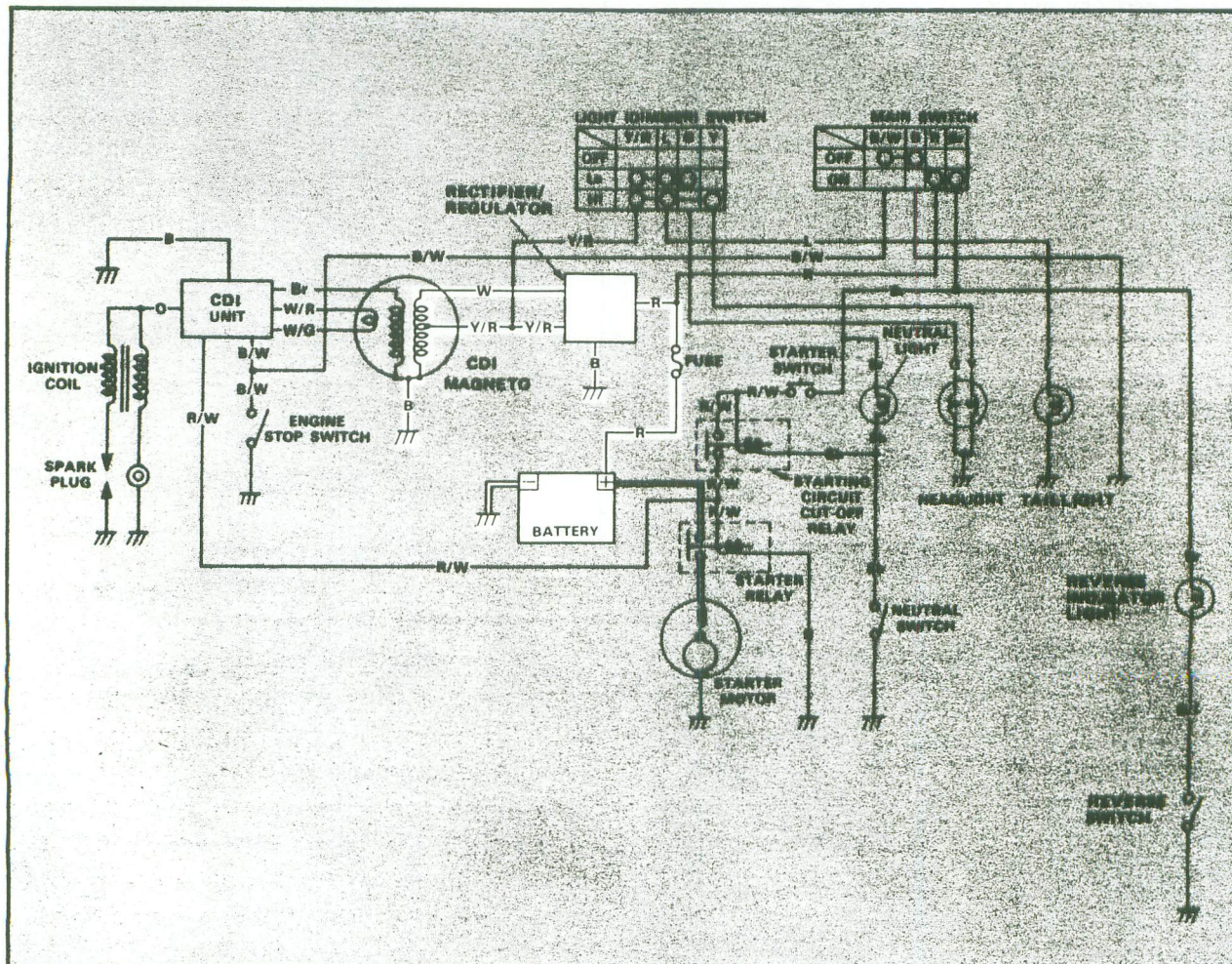


4. Check the relay function with a 12 volt battery and the pocket tester. Connect the leads as shown in the illustration. If the resistance readings do not equal those shown in the illustration, replace the relay.

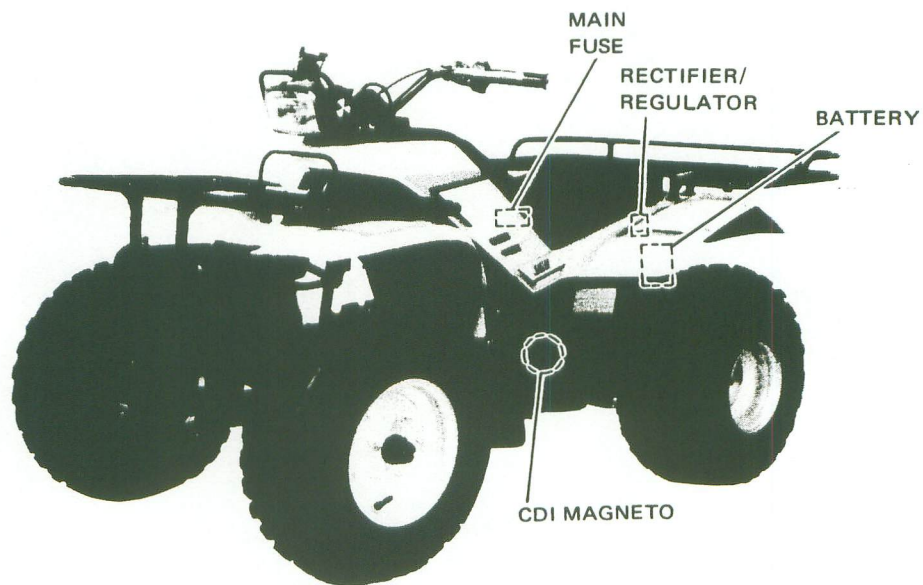


1. When the battery is connected (—)
2. When the battery is disconnected (....)
3. 12 volt battery

CHARGING SYSTEM



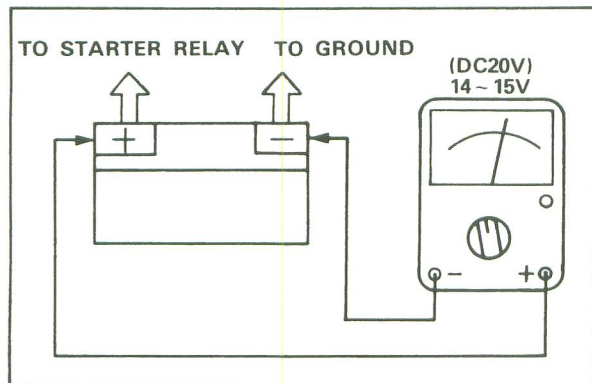
This circuit diagram shows the charging circuit in the wiring diagram.



FLYWHEEL MAGNETO AND RECTIFIER/REGULATOR

Inspection

1. 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:
12.0 ~ 16.5V 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 rectifier/regulator. If both the battery and charging coil are in working order, the regulator is defective and should be replaced.

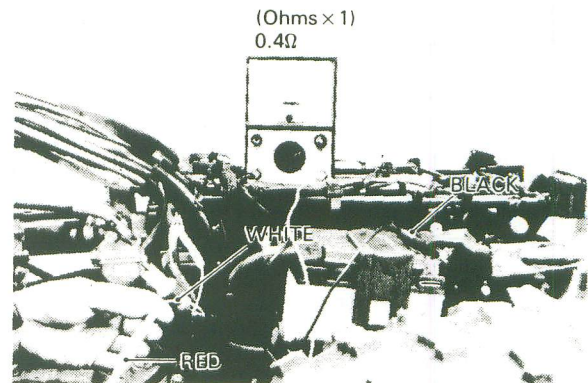
CAUTION:

Never disconnect the leads 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.

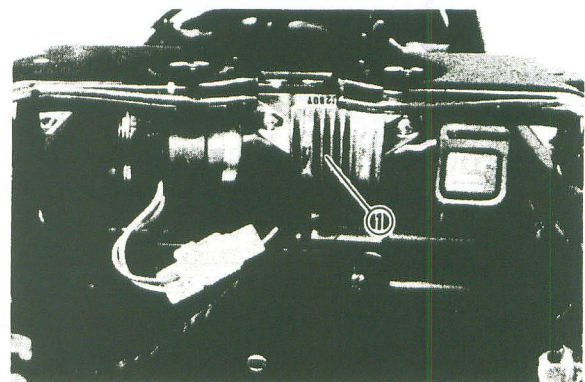
Charging Coil Inspection

1. Remove the seat, rear carrier securing bolts, and rear fender.
2. Disconnect the CDI magneto connector, 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.

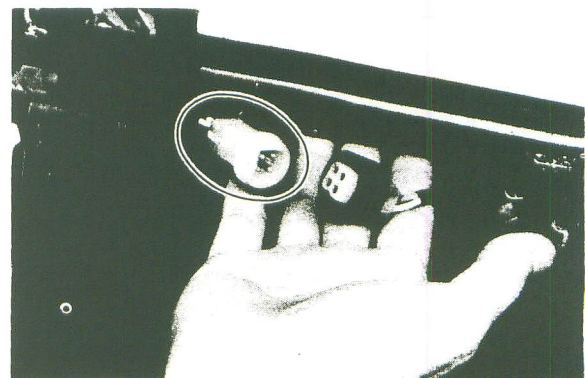
Charging coil resistance:
 $0.4\Omega \pm 10\%$ of 20°C (68°F)
(White — Black)

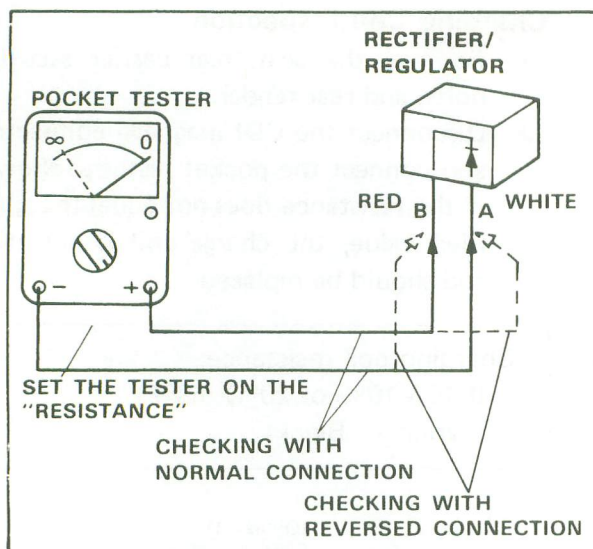


3. Check the silicon rectifier as specified using the pocket tester.



1. Rectifier





Checking element	Pocket tester connecting point		Good
	(+) (red)	(-) (black)	
1	A	B	○
2	B	A	X

○ : Continuity
 × : Discontinuity (∞)

CAUTION:

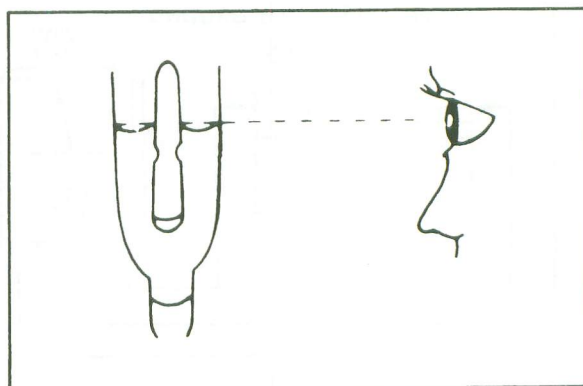
The silicon rectifier can be damaged if subject to overcharging. Special care should be taken to avoid a short circuit and/or incorrect connection of the positive and negative leads at the battery. Never connect the rectifier directly to the battery to make a continuity check.

NOTE:

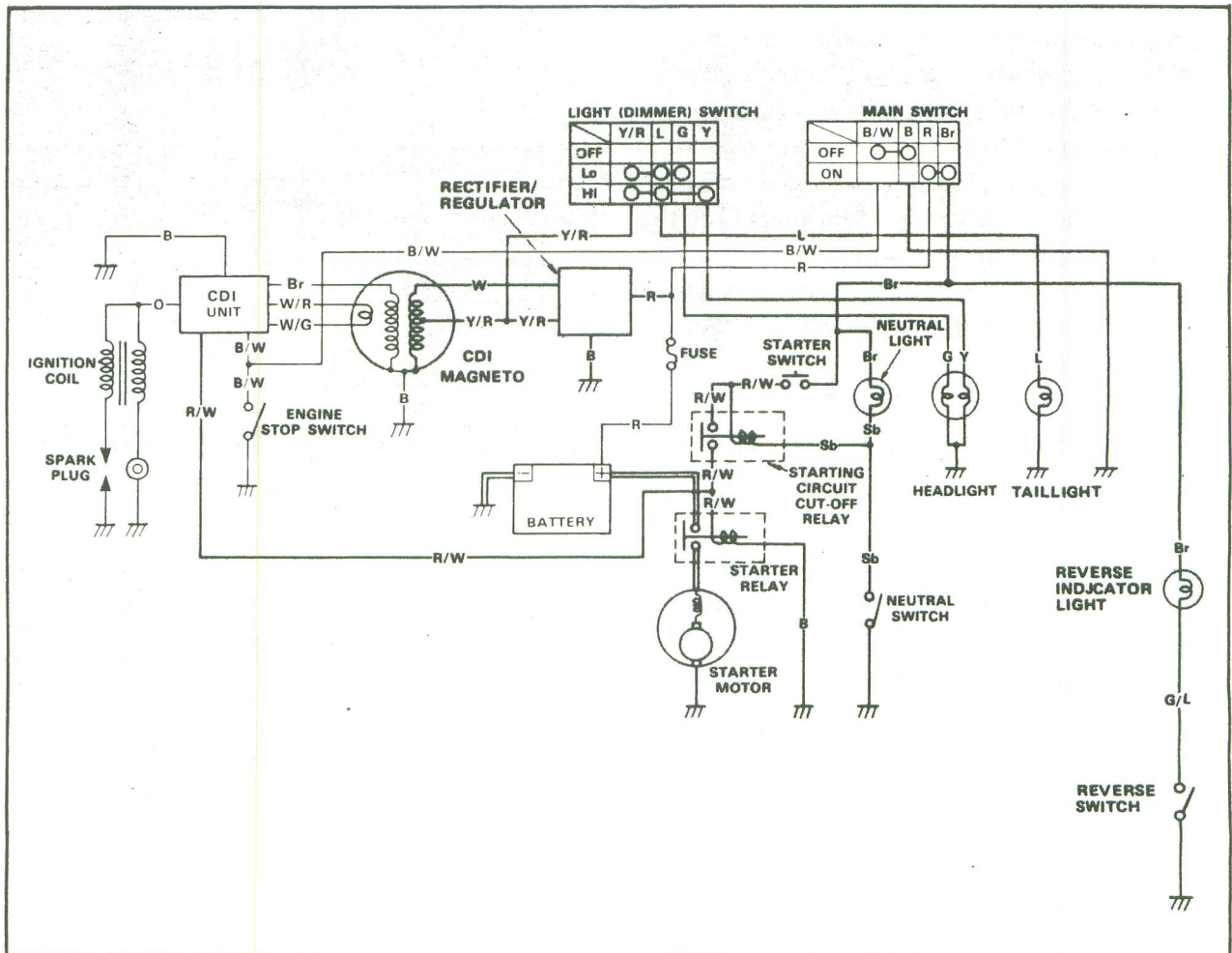
The results "○" and "X" should be reversed according to the polarity of the specific pocket tester used.

Battery Inspection

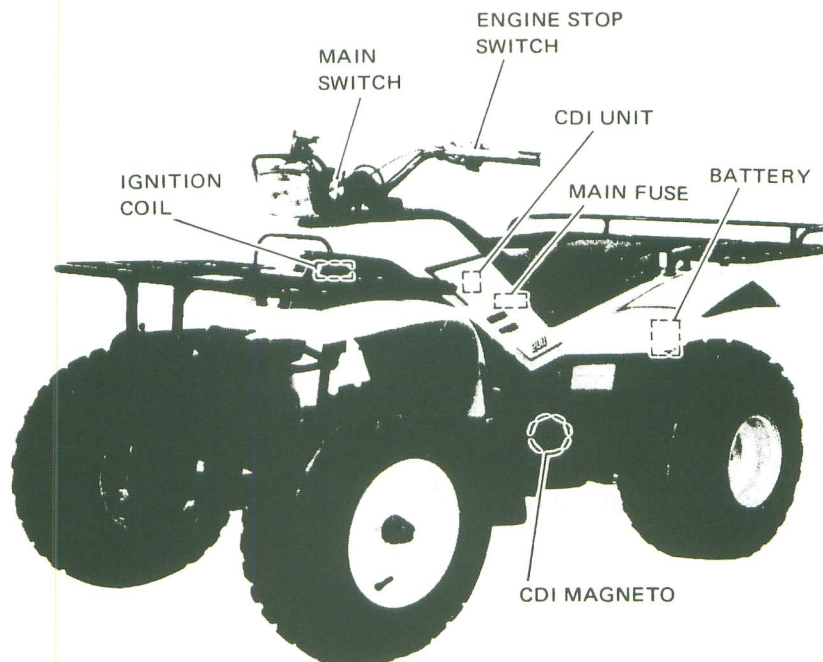
1. Check the battery terminals and couplers. They should be tight.
2. Measure the specific gravity of the battery. If it is less than 1.280, remove and charge the battery, until the specific gravity is 1.280.



IGNITION SYSTEM



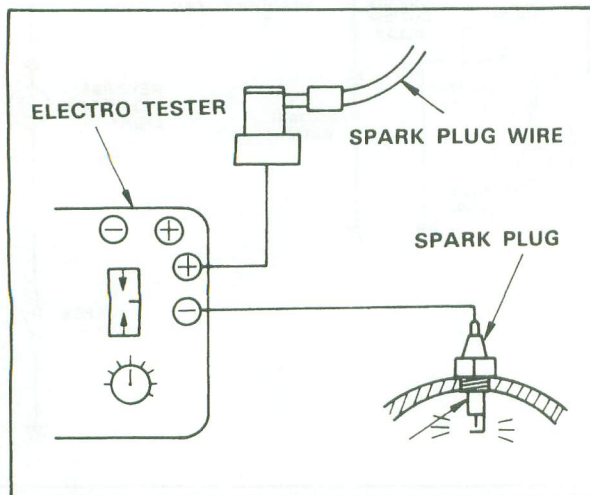
This circuit diagram shows the ignition circuit in the wiring diagram.



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.



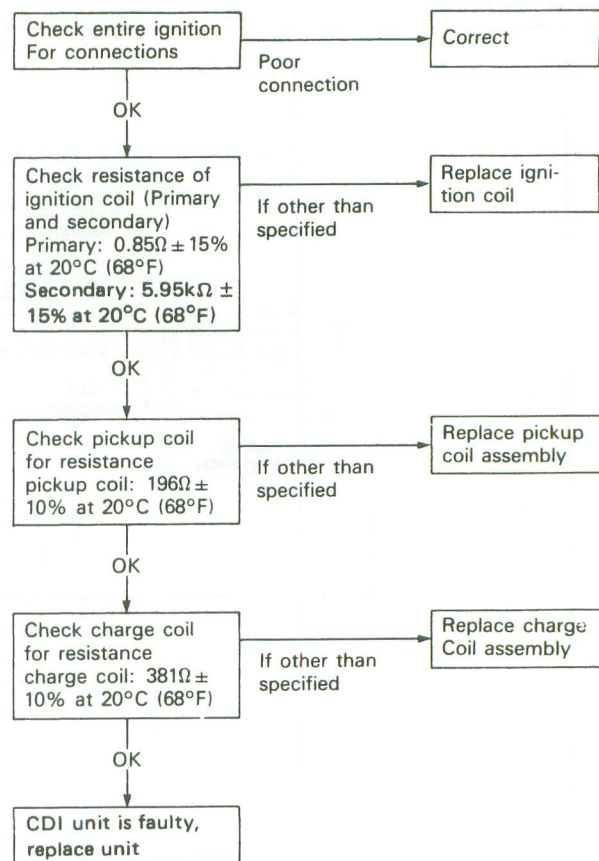
3. Start the engine, and increase the spark gap until misfire occurs. (Test at various rpm between idle and red line.)

Minimum spark gap: 6 mm (0.24 in)

CAUTION:

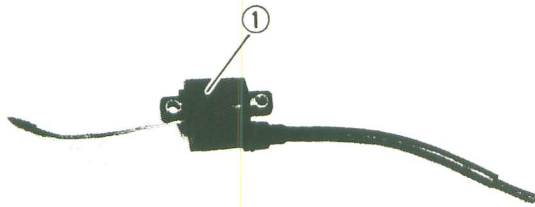
Do not run the engine in neutral above 6,000 rpm for more than 1 or 2 seconds.

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.



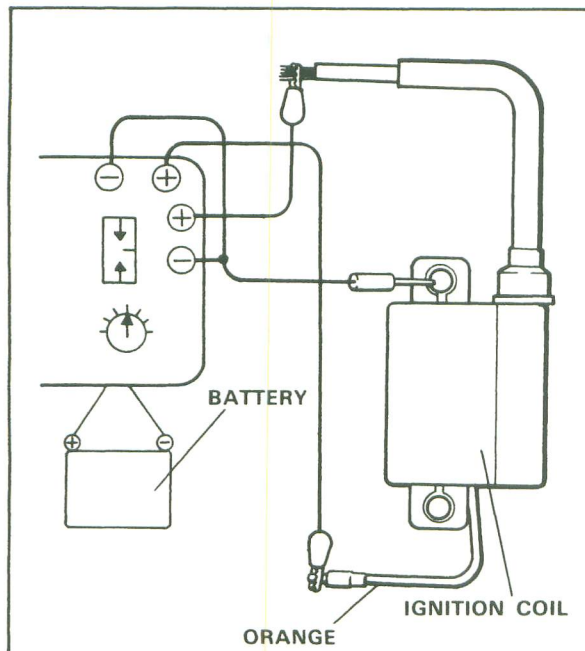
Ignition Spark Gap Test

1. Remove the seat, front carrier securing bolts, front panel, fuel tank cover, and fuel tank.
2. Disconnect the ignition coil and spark plug leads.



1. Ignition coil

3. Connect the Electro Tester as shown.



4. Connect a fully charged battery to the tester.
5. 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:

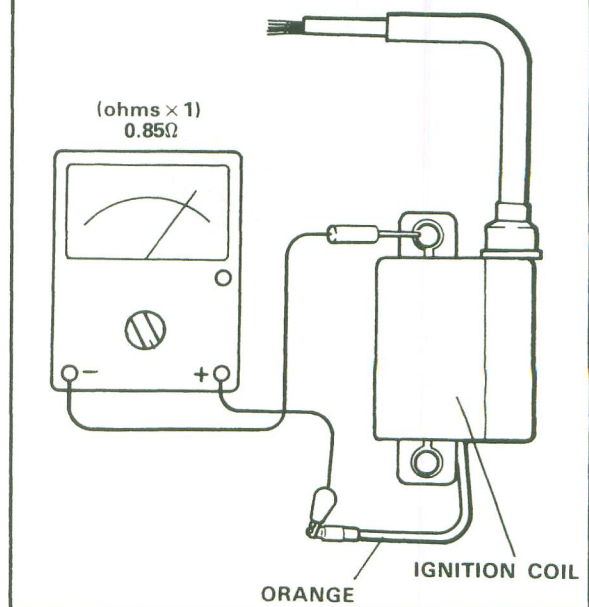
Primary coil resistance:

$0.85\Omega \pm 15\%$ at 20°C (68°F)

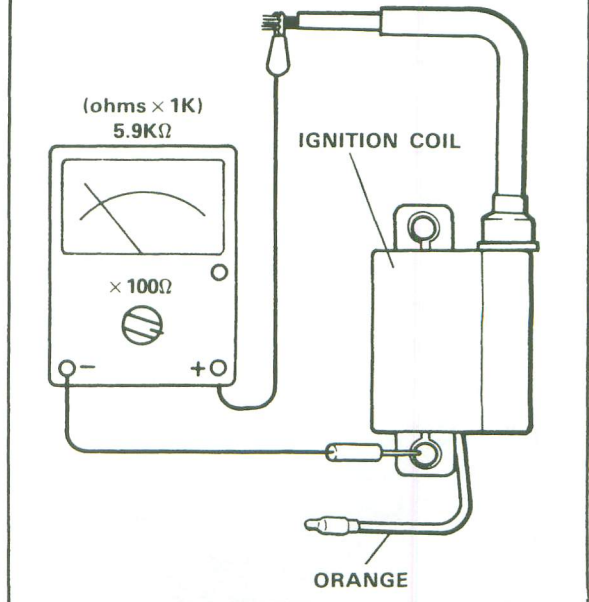
Secondary coil resistance:

$5.95\text{K}\Omega \pm 1.5\%$ at 20°C (68°F)

PRIMARY COIL CHECK

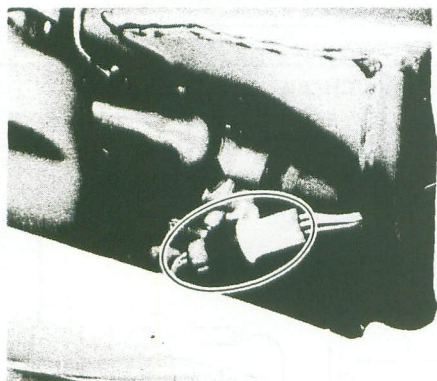


SECONDARY COIL CHECK



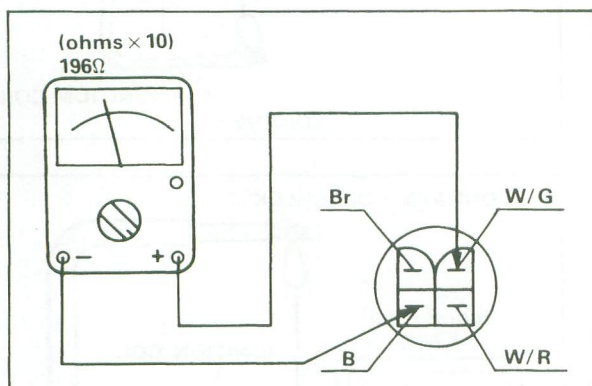
Pickup Coil Inspection

1. Remove the seat, rear carrier securing bolts, and rear fender.
2. Disconnect the CDI 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.



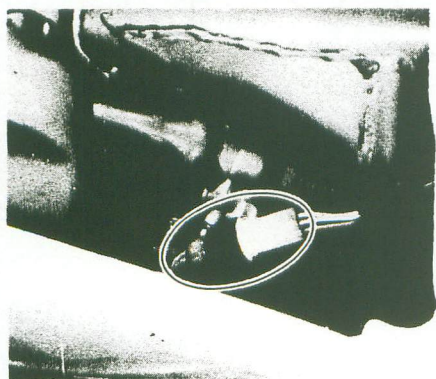
Pickup coil resistance:

$196\Omega \pm 10\%$ at 20°C (68°F)
(White/green — White/Red)



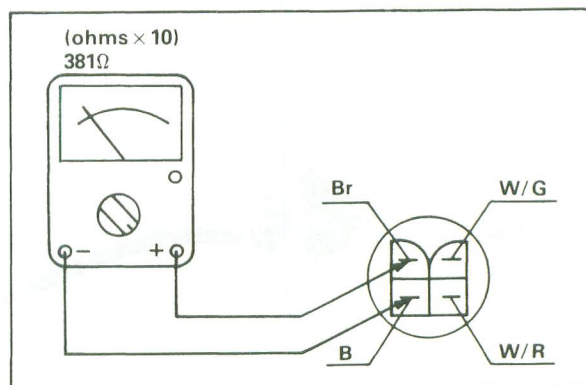
Source Coil Inspection

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



Source coil resistance:

$381\Omega \pm 10\%$ at 20°C (68°F)
(Brown — Black)



Spark Plug

The life of a spark plug and its discoloration 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 plugs of the proper reach, type, and electrode gap as a replacement to avoid overheating, fouling, or piston damage.

Type:

D7EA (NGK) or X22ES-U (ND)

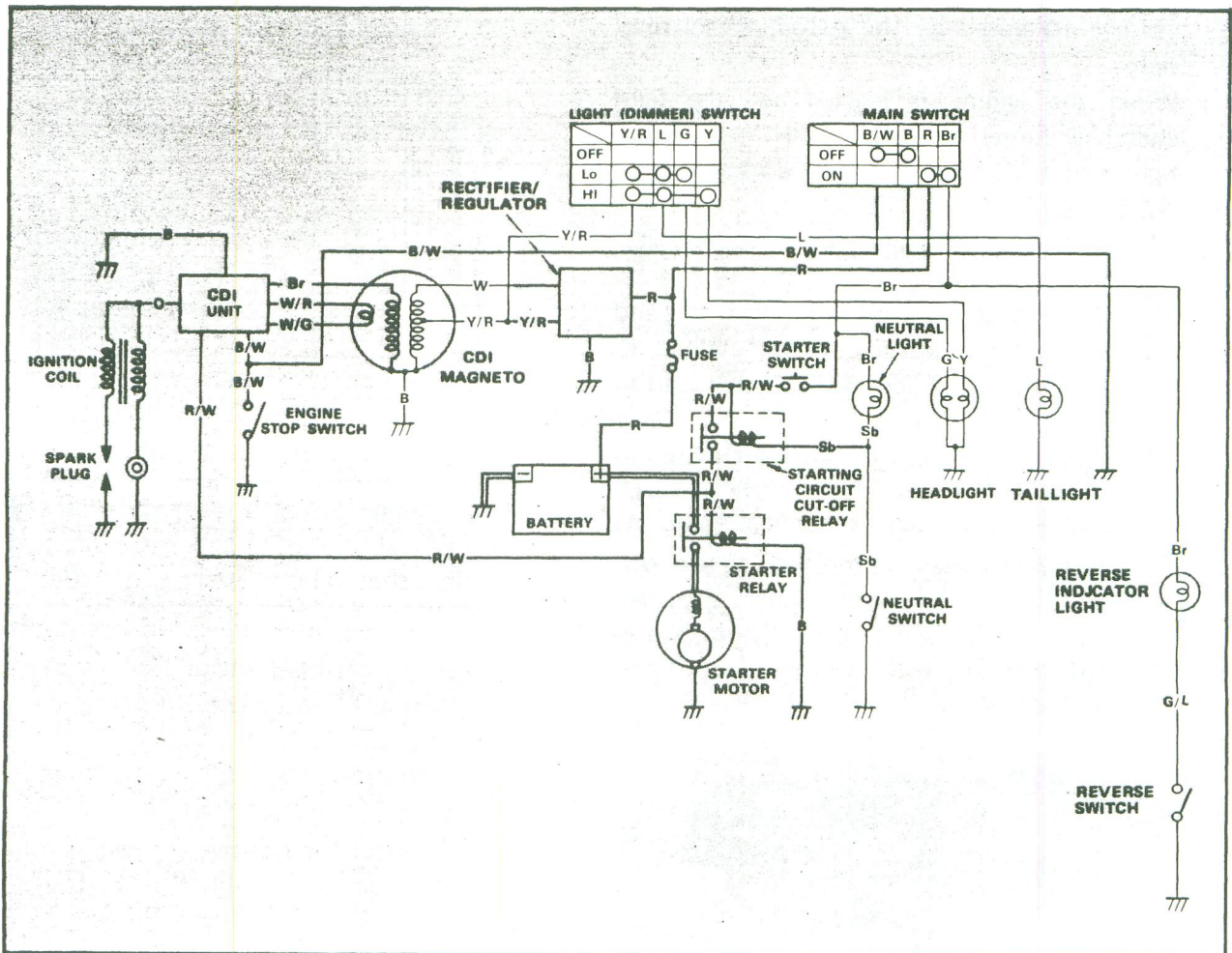
Electrode gap;

0.6 ~ 0.7 mm (0.02 ~ 0.03 in)

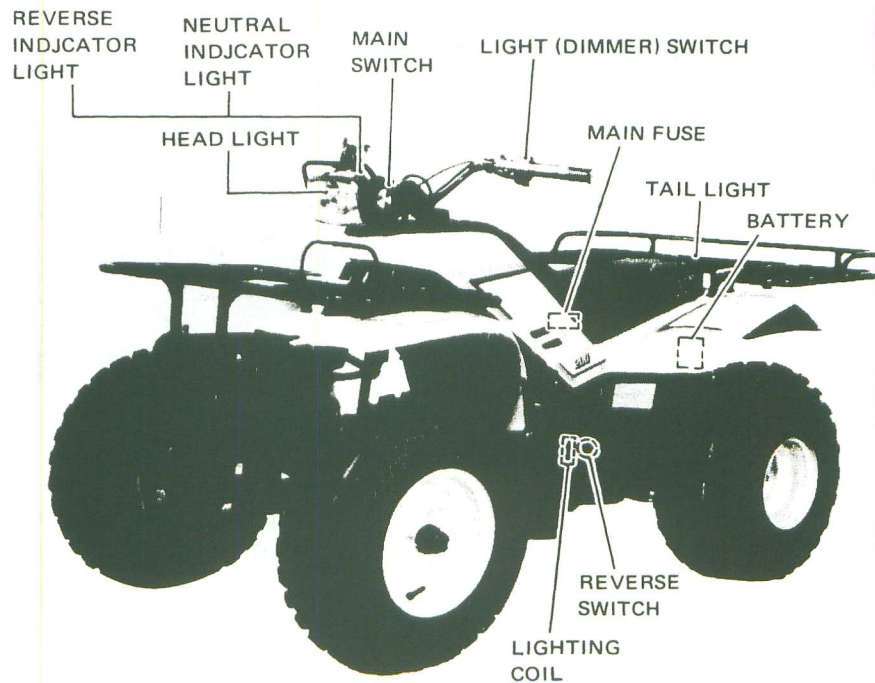
TIGHTENING TORQUE:

20 Nm (2.0 m·kg, 14 ft·lb)

LIGHTING SYSTEM



The above diagram shows only the lighting circuit in the wiring diagram.

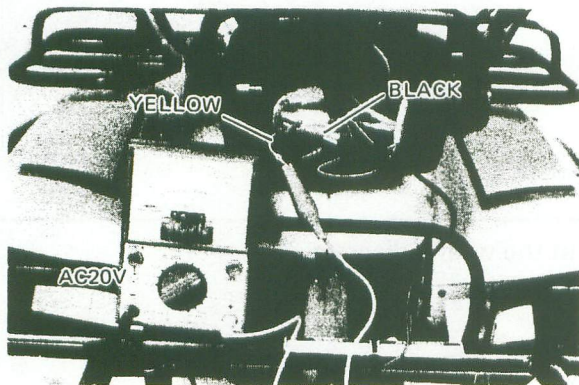


Lighting Voltage Test

The headlight and taillight come on through voltage generated by the AC (flywheel magneto).

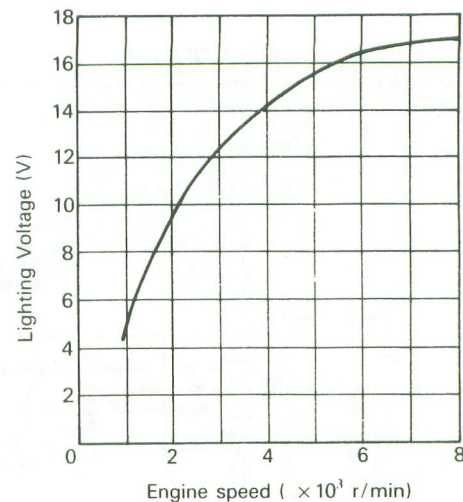
When the engine is started and the light switch is turned to "LO" or "HI", the headlight and taillight come on as a result of the AC voltage.

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 the light switch to "HI", and check the voltage at each engine speed shown in the table. If measured voltage is too high or too low, check for bad connections, damaged leads, burned-out bulbs, or bulb capacities that are too large throughout the AC lighting circuit.



Lighting output:

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



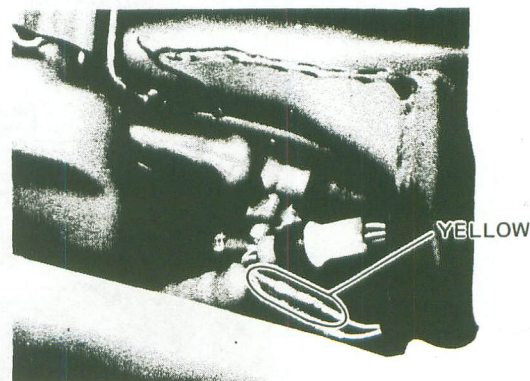
NOTE:

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

Lighting Coil Inspection

If the voltage is incorrect, check the resistance of the lighting coil.

1. Switch the Pocket Tester to $\Omega \times 1$ position.
2. Connect the positive (+) test lead to yellow lead from the CDI magneto and negative (-) test lead to a good ground on the engine. Read the resistance on the ohms scale. If the resistance is not within specification, replace the lighting coil assembly.



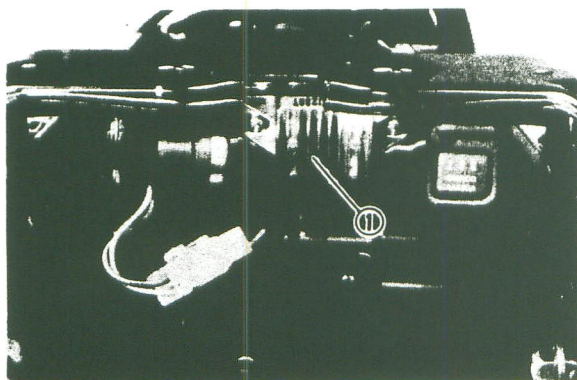
Lighting coil resistance:

$0.34\Omega \pm 10\%$ at 20°C (68°F)
(Yellow – Ground)

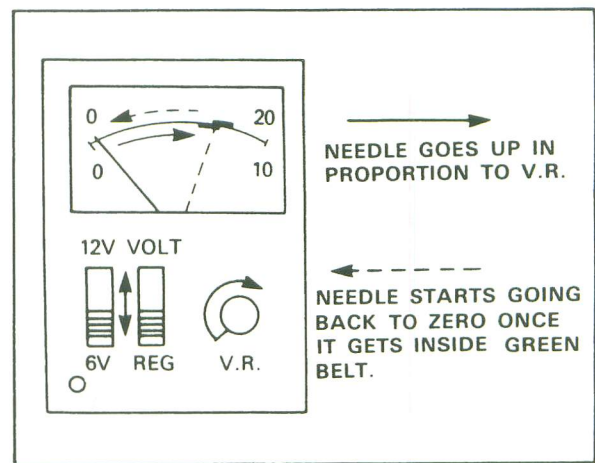
3. If the AC lighting circuit components check out properly but circuit voltage is still excessive, check the AC regulator.

Voltage Regulator Inspection

1. Preparation for inspection
 - a. Instruments required for inspection. AC regulator checker and 12V battery.
 - b. Connect the red lead wire (for power) of the regulator checker to the positive side and 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 regulator checker needle points to 10 volts or more, the battery voltage is sufficient.
2. Checking the regulator
 - a. Turn the volume (V.R.) of regulator checker completely counterclockwise.
 - b. Set the VOLT-REG switch for REG and the 6V-12V switch for 12V.
 - c. Connect the pin-tipped lead wires to the AC regulator; black to the regulator body and red to the regulator lead (Yellow/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 fall back within the green belt on the meter.



1. Voltage regulator

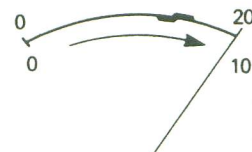


* Bad regulator

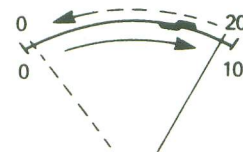
SHORTED REGULATOR



OPEN REGULATOR



REGULATOR WITH HIGHTER OPERATIONAL VOLTAGE



REGULATOR WITH LOWER OPERATIONAL VOLTAGE

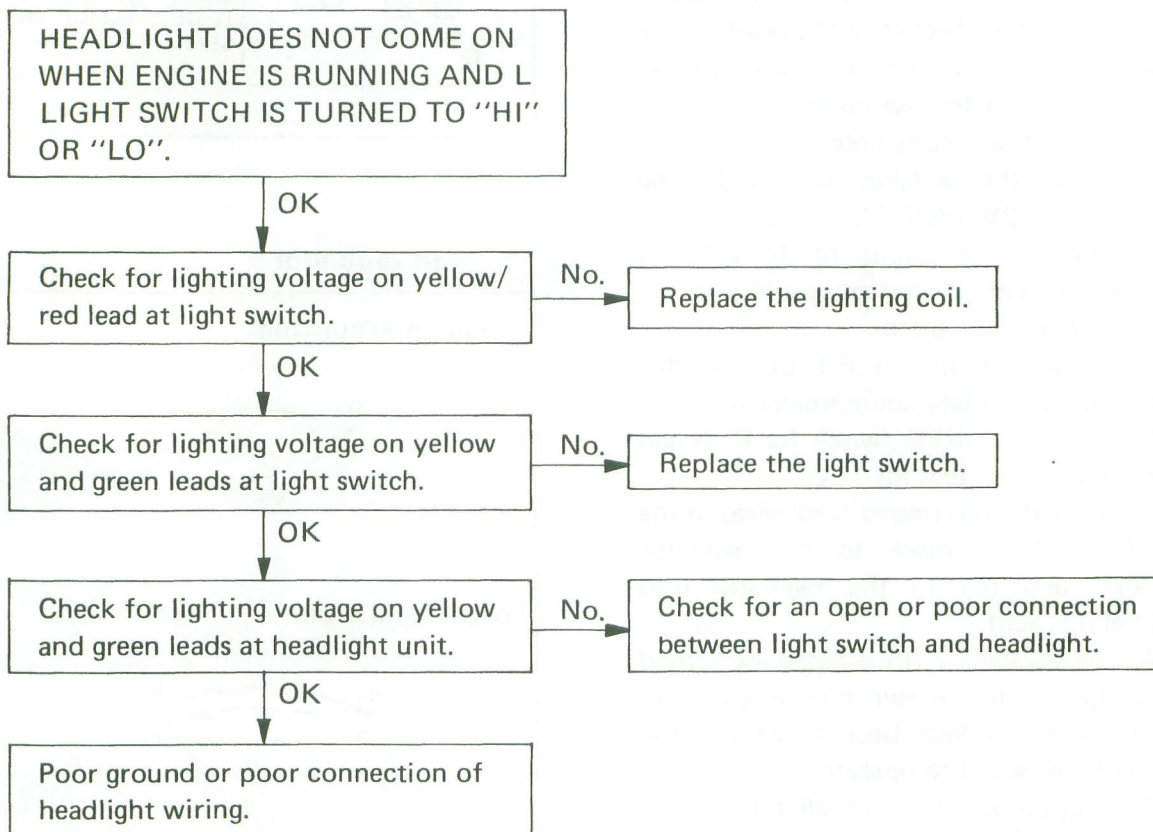


Troubleshooting

1. Headlight Check

NOTE:

Check the headlight bulb and fuse first before performing the following check.



2. Taillight Check

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