Kawasaki KZ400/440

MODEL COVERAGE

KZ400 D,S,A,B,C
KZ440 A,B,C,D

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MAINTENANCE

NOTE: *Common maintenance procedures are explained in detail in "General Information."*

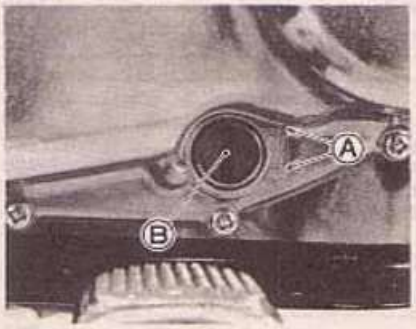
LUBRICATION

Checking Oil Level

1. To get an accurate oil level reading, the engine must be warm and the machine must be parked on the centerstand on a level surface.

2. Early moels have a dipstick fitted to the oil filter cap on top of the crankcase. The cap must be fully screwed in to get the reading. Maintain the oil level between the upper and lower level marks.

3. Other models have a sight glass on the side of the crankcase. Oil level should be maintained between the upper and lower level marks inscribed on the crankcase beside the glass.



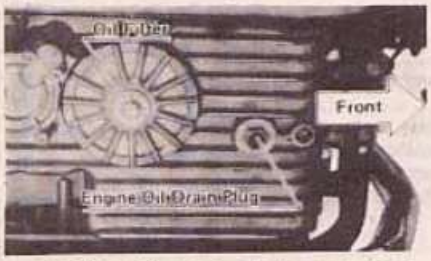
Oil level sight glass (B) and level lines (A)

Changing Oil

1. The oil change interval is 1,800 miles. SAE 10W-40, 10W-50, or 20W-50 service rating "SD" or "SE" is recommended.

2. Change oil when the engine is at operating temperature. The machine should be parked on the center stand and on a level surface to ensure full drainage of the oil.

3. Remove the filler cap. Remove the drain plug from the bottom of the crankcase and allow the oil to drain.



4. Clean off the plug (it is magnetic to trap metal particles). Check the condition of the O-ring. Refit, tightening the plug to 14.5-18 ft lbs. on 1974-77 models and 22 ft lbs. on newer machines.

5. If the filter is to be changed, refer to the following section.

6. Add the correct grade and quantity of oil. If the filter has been changed, add 3.0 1/3.2 qt. If the filter has not been changed, add 2.6 1/2.8 qt.

General Specifications

	KZ400D	KZ440S
ENGINE		
Displacement (cc)	389	
Bore x Stroke (mm)	64 x 62	
Compression ratio	9.0 : 1	
Lubrication	trochoid oil pump; wet sump system	
Carburetion	Twin Keihin constant velocity CVB 36	
Ignition	Battery and coil	
Starting	electric and kick	kick
TRANSMISSION		
Type	constant mesh	
No. speeds	5	
Clutch	wet, multi-disc	
Gear ratios (: 1)		
1st	2.751	
2nd	1.684	
3rd	1.273	
4th	1.040	
5th	0.889	
Primary reduction (: 1)	2.435	
Final reduction (: 1)	3.000	
Overall drive ratio (: 1)	6.493 (high gear)	
CHASSIS		
Dry weight (lbs)	375	366
Wheelbase (in.)	53.5	
Overall length (in.)	81.6	
Overall width (in.)	31.8	31.1
Ground clearance (in.)	4.93	
Brakes		
Front	Disc	Drum, twin-leading shoe
Rear	Drum, single-leading shoe	
Tires		
Front	3.25 x 18	
Rear	3.50 x 18	

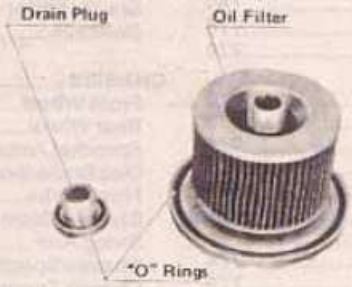
7. Allow the engine to idle for a few minutes, then check the oil level and top up if necessary.

Oil Filter

1. A cartridge-type oil filter is fitted to the bottom of the crankcases. The filter should be changed at every other oil change or at intervals of about 3,600 miles.

2. Drain the oil as described above. Unscrew and remove the oil filter.

3. Install the new filter element ensuring that the O-rings are in good condition and properly fitted. Tighten the filter to 11-14.5 ft lbs.



Oil filter and drain plug O-rings

4. Add 3.0 1/3.2 qts of oil to the engine, then check oil level as described above.

FRONT FORKS

Checking Oil

1. Front fork oil level should be checked about every 3,600 miles.

2. Support the front wheel off the ground.

3. Remove the filler cap from the top of each fork leg.



Checking fork oil level

4. On 1978 and later models, remove the fork springs from each leg.

5. Insert a suitable rod into the fork leg to check level which is measured from the top of the fork tube. Add oil, if necessary, to bring the level up to specification. Oil levels are:

1974-76	350mm/13.8 in.
1977 B, C	417mm/16.4 in.
1978, 1982-On	435mm/17.1 in.
1979-81 B, C	435mm/17.1 in.
1979-On A, D	475mm/18.7 in.

Changing Oil

1. Fork oil should be changed about every 6,200 miles.

2. SAE 5W-20 oil is recommended.

3. Remove the drain bolt from the bottom of one slider. Apply the front brake and push forward on the handlebars with the machine off its stand to pump out the oil. Repeat with the other fork leg.

4. After fitting the drain bolts, and with the machine on the center stand and the front wheel supported off the ground, remove the filler caps from the top of each fork leg and add the correct grade and quantity of oil.

5. Check the condition of the filler cap O-rings, then refit and tighten them to 18-22 ft lbs.

6. When changing fork oil, add about 130cc (4.5 oz.) to each fork leg.

CHASSIS LUBRICATION

1. The swing arm is fitted with a grease nipple and should be lubricated with a high-quality chassis grease about every 1,800 miles. Apply grease until some appears at either end of the swing arm.

2. At the same intervals, lightly oil brake lever fittings and carburetor linkage. Lubricate controls and cables.

3. Lubrication on the wheel bearings, brake cams, speedometer gear housing, and steering stem bearings is required every 2 years or about 12,000 miles. Use a high-quality bearing grease for these operations.

Refer to "Chassis" for procedures.



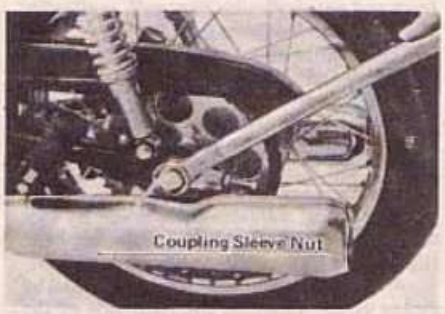
Swing arm grease fitting

SERVICE CHECKS AND ADJUSTMENTS

Drive Chain

1. The chain should have 20-25mm (3/4-1 in.) of total up and down movement. This is measured in the middle of the lower chain run and at the tightest point of the chain, if such a tight spot exists.

2. When checking chain slack, the machine should be parked on the center stand, and the chain must be clean and well-lubricated.



Loosening the coupling sleeve nut

3. If adjustment is necessary, remove the safety clip and loosen the brake anchor nut on the brake plate. Loosen the axle nut after removing the cotter pin.

4. Loosen the coupling sleeve nut.

5. Loosen the adjuster bolt or adjuster nut locknuts. Turn the adjuster bolts or nuts in or out until the proper chain slack is attained. Be sure that the index notch on the adjusters align with the same swing arm reference mark on both sides.



Adjusting the chain

6. Tighten the locknuts, the coupling sleeve nut, and the axle nut. Recheck chain slack. If correct, fully tighten the axle nut to 95-116 ft lbs. Tighten the brake anchor nut to 20-22 ft lbs. The use of the new cotter pin is recommended.

7. Check rear brake and brake light switch adjustments.

8. Periodically (1,800 miles) the chain should be checked for wear. Refer to "Chassis."

Drive Belt

With the motorcycle on the centerstand, the drive belt should give a deflection of 0.5 in. (13 mm) when a 10 lb. weight is applied to the middle of the bottom belt run.

2. Adjustment is done in the same way as with chain drives, by moving the rear wheel.

3. Before the axle nut is tightened following a belt adjustment, spin the wheel and apply the rear brake hard to center the drum. Then tighten the axle nut.

CAUTION: *Drive belts must be replaced when the nylon on the belt teeth is worn through at any point or if proper adjustment cannot be obtained.*

Clutch

1. Using the adjuster at the handlebar, maintain clutch cable free-play so that when the clutch lever is pulled, there is a gap of 2-3 mm (0.08-0.12 in.) between the lever and the lever bracket before the cluch begins to disengage.

If clutch operation is not satisfactory in spite of the above adjustment, or if new plates have been fitted, proceed as follows:

2. Slide back the dust cover from the cable adjuster located about halfway along the cable. Screw the adjuster in to put as much slack in the cable as possible.

3. Loosen the locknut at the handlebar cable adjuster and turn the adjuster so that there is a gap of 5-6mm (0.02-0.24 in.) between the adjuster and the locknut.

4. Remove the clutch adjusting cover. Loosen the locknut and back the adjusting screw out 3-4 turns.

5. Turn the screw in until resistance is felt.

On 1974-77 models, turn the screw *out* 1/2 turn and tighten the locknut.

On newer models, turn the screw *in* 1/4 turn and tighten the locknut.

6. Take up all of the cable slack with the main cable adjuster. Refit the adjuster dust cover.

7. Use the handlebar adjuster to give the correct amount of clutch cable free-play as in Step 1.



Adjusting the clutch



Proper clutch cable free-play

Throttle Cables (Dual)

1. Loosen the locknuts for the throttle cable adjusting nuts at the twist-grip, and screw both adjusting nuts in to yield as much cable free-play as possible.

2. Turn the adjusting nut for the decelerator cable out three turns. If this takes up all the play at the twist-grip, loosen the decelerator adjuster locknut (at the carburetors), and turn the adjuster to yield a small amount of free-play, then tighten the locknut.

3. Turn the accelerator cable adjusting nut at the twist-grip out until twist-grip play is almost gone, then tighten the locknut.

4. Turn the decelerator adjusting nut in



Turning the decelerator adjusting nut out



Decelerator cable adjuster at the carburetor

until the desired amount of twist-grip free-play is obtained, which should generally be about 10-15° of grip rotation.

5. Check the tightness of all locknuts. Check throttle operation before riding the motorcycle.

Throttle Cable (Single)

Later models have a single throttle cable in place of the "pull-pull" twin cable system. Adjust the cable to give 10-15° of grip rotation before the butterfly valves start to open.

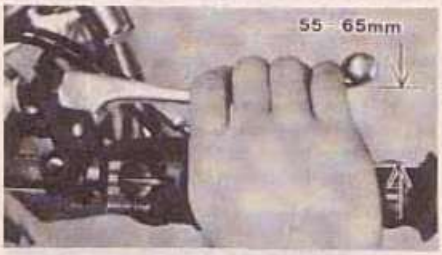
Front Drum Brake

1. Use the lower cable adjusting nut to maintain the proper adjustment. When the brake is fully applied, there should be 55-65mm (2.2-2.6 in.) between the brake lever and the twist-grip.

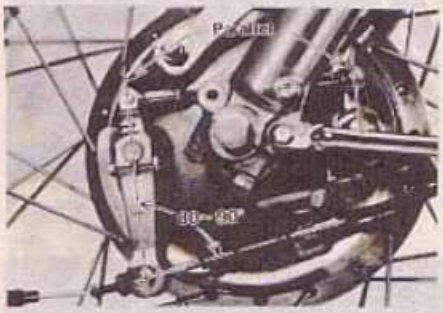
2. Make minor adjustments using the adjuster at the handlebar.

3. Check brake wear by means of the wear indicators fitted to the brake plate. The indicators must stay within the "Usable Range" when the brake is fully applied, or linings must be replaced.

4. When the brake is fully applied, the angle formed by the cable and the main brake lever at the brake plate must be within 80-90°. If the angle exceeds this amount, brake effectiveness will be reduced. Further, the main and secondary brake levers should be parallel. This adjustment can be made with the threaded connecting rod, but is usually not necessary unless the brake plate has been disassembled, or new shoes have been fitted. Refer to "Chassis" for this procedure.



Proper front drum brake lever free-play

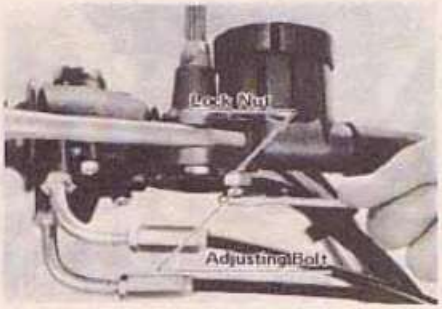


An angle in excess of 80-90° will result in reduced brake effectiveness

Front Disc Brake (1974-77)

1. Check pad wear. When either pad is worn down to the stepped portion, replace both as a set.

2. Check fluid level. A level line is inscribed on the inside of the master cylinder reservoir. The fluid level may drop very slightly as the pads wear. Before adding fluid, refer to the "Chassis" section which provides proper procedures for disc brake work.



Disc brake lever adjuster

The brake fluid should be changed each year or every 6,200 miles, whichever comes first. Refer to "Chassis" for procedures.

3. Check brake lever play. The tip of the lever should not move more than 5 mm (0.10 in.) before the brake is applied. If adjustment is necessary, an adjusting bolt is fitted to the underside of the lever bracket. Bend down the tab on the lockwasher, loosen the locknut while holding the adjusting bolt steady, then turn the bolt very slightly so that lever travel is corrected.

4. Tighten the locknut to 13-16.5 ft lbs. Bend down the lockwasher tab.

Front Disc Brake (1978 Later)

1. Check pad wear. When either pad is worn down to the stepped portion or to the notch, replace both as a set.

2. Check fluid level. A level sight glass is provided on the master cylinder reservoir. Maintain level at the scribed line. Fluid level may drop slightly as pads wear. Before adding fluid, refer to the "Chassis" section which provides proper procedures for disc brake work.

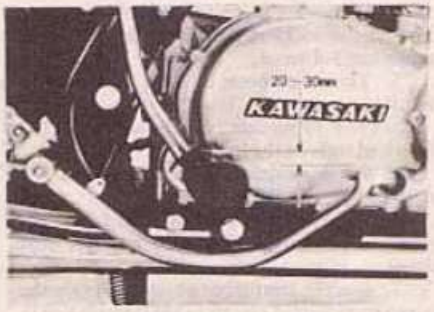
The brake fluid should be changed every year or every 6,200 miles, whichever comes first. Refer to "Chassis" for procedures.

Rear Brake

1. The brake pedal is adjustable for position. It should be set so that the knurled surface of the pedal is 20-30mm (0.8-1.2 in.) below the top of the footpeg rubber.

2. If adjustment is necessary, back off the brake adjusting nut. Loosen the locknut on the pedal height adjustment bolt, and turn the bolt so that pedal height is correct. Tighten the locknut. Adjust the rear brake.

3. The brake is correctly adjusted if the pedal is free to move 20-30mm (0.8-1.2 in.) before the linings contact the drum. Adjustment is made with an adjusting nut on the end of the brake rod.



Brake pedal free-play

4. When the brake is fully applied, the wear indicator must be within the "Usable Range" or the lining will have to be replaced. Further, the angle formed by the brake lever and rod when the brake is applied should be about 80-90°. If the angle exceeds this amount, braking effectiveness will be reduced. It is possible to remove the lever from the brake cam and reposition it so that the proper angle is not exceeded when the brake is applied.

5. After adjusting the brake, check the operation of the brake and the adjustment of the brake light switch.

Brake Light Switch

1. The front brake light switch for disc brakes is not adjustable. The front drum brake light switch does not need routine adjustment.

2. The rear brake light switch is fitted to a slotted bracket and secured by a locknut. The brake light should go on after about 15mm (0.6 in.) of pedal travel, or shortly before the linings contact the drum. Make the adjustment by loosening the locknut and moving the switch up or down as necessary. Moving the switch up will allow the light to go on sooner and vice versa.

CAUTION: *Do not turn the switch body itself during adjustment or the electrical connections may be damaged.*



Headlight Adjustment

1. Set the machine about 25 feet away from and perpendicular to a wall, preferably of a color which reflects light well.

The machine should be off the stand, and with a rider putting his weight on the machine as in operation.

2. Switch on the high beam. The headlight high beam should be parallel to the ground and should hit the wall directly in front of the machine.

3. Vertical adjustment is made by loosening the two headlight shell mounting bolts slightly and pivoting the shell up or down.

4. Lateral adjustment is accomplished by means of the screw on the right-side of the headlight.

Steering Stem Bearings

1. The bearing adjustment should be checked about every 3,600 miles. Refer to "Chassis" for inspection and adjustment procedures.

FUEL SYSTEM

1. Fuel system maintenance involves

cleaning the petcock filter, cleaning or replacing the air cleaner, and cleaning the carburetors.

This should be done about every 1,800 miles.

2. Shut off the fuel, and place a funnel or a channel-shaped piece of cardboard or heavy paper beneath one of the carbs. Remove the float bowl drain plug and allow the fuel to drain into a suitable container. Repeat with the other carb. Refit the drain plugs. Check for leaks before operating the machine.

At more frequent intervals, the carburetors should be removed, disassembled, and cleaned. Refer to "Fuel System" for procedures.

3. Be sure that the fuel petcock is "Off." Unscrew and remove the sediment cup. Reach into the petcock body and pull out the O-ring and filter screen strainer. Clean in solvent. If the screen is punctured, replace it.

4. Place a container beneath the petcock and turn it to the "Reserve" position which will serve to remove any water which may have accumulated in the bottom of the gas tank.

5. Check the condition of the O-ring, and replace it if damaged. Install the strainer, O-ring, and sediment cup, and tighten it securely. Check for leaks before operation.

Air Cleaner Service

REMOVAL

1. On 1974-76 models, the element is reached by removing the left side cover, removing the housing sidecover screw and taking out the element.

2. On later models, open the seat, remove the tool kit and tray and take out the (dry type) element, or open the seat, remove the air cleaner housing mounting bolts and take out the housing (wet type).

SERVICE

1. Two types of air cleaner element can be found on these motorcycles. Service procedures will vary for each.

2. Clean dry type elements by washing in a non-oily solvent. Dry by applying compressed air from the inside.

CAUTION: *Do not use solvents with a dangerously low flashpoint, or those which may leave and oily residue, like kerosene.*

1. Clean wet type elements by first removing it from the frame. Clean it by soaking in a safe, high flashpoint solvent. Squeeze dry. Soak the element in SAE 30 oil and squeeze out as much of the oil as possible.

CAUTION: *Handle the sponge element carefully. Do not wring it out, as the material may tear.*

4. Check the condition of the element and replace it if torn or punctured.

5. The maximum service life of the element is about 6,000 miles or 5 cleanings, whichever comes first. After this, a new element should be fitted.

INSTALLATION

1. Installation is the reverse of removal. Install the element so that the element holes match the air cleaner ducts.

RECOMMENDED LUBRICANTS

Engine	Molybdenum disulphide-base lubricant
SAE 10W-40, service rating "SD" or "SE"	Tach, Speedometer Cables
SAE 10W-50, service rating "SD" or "SE"	Light-duty grease
SAE 20W-50, service rating "SD" or "SE"	
Forks	Wheel Bearings, Steering Stem Bearings
SAE 5W-20	Waterproof, medium-weight bearing grease
Control Cables	
Motor oil	Grease Fitting
Graphite-base lubricant	Waterproof, medium-weight chassis grease

Periodic Maintenance Intervals ①

Daily
- Brake adjustment
- Engine oil level
- Cable adjustments
- Chain slack
- Lights and safety equipment

Weekly
- Battery electrolyte level
- Spokes for tightness
- Tire pressure (cold)

Every 150 Miles
- Lubricate drive chain

Every 1800 Miles
- Change engine oil
- Grease swing arm
- Lubricate controls and cables
- Check chain wear
- Adjust carburetors
- Clean fuel system
- Clean and gap spark plugs
- Adjust cam chain
- Check points and ignition timing
- Clean air filter

Every 3600 Miles
- Replace oil filter
- Checking steering head bearings
- Adjust valves
- Check brake wear
- Check fork oil level

Every 6200 Miles
- Replace air cleaner element
- Change fork oil
- Flush and renew brake fluid

Every 12,000 Miles or 2 Years
- Repack wheel bearings
- Repack steering stem bearings
- Lubricate brake cams
- Lubricate speedometer gear housing

① Based upon normal usage after break-in is complete

Tune-Up

NOTE: *Common tune-up procedures are explained in detail in "General Information."*

IMPORTANT: *In all relevant procedures, not that the normal direction of rotation of this engine's crankshaft is counterclockwise when viewed from the right-side.*

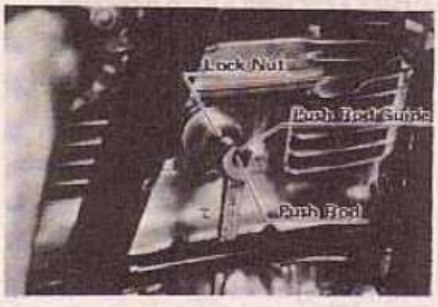
CAM CHAIN ADJUSTMENT

1. The cam chain adjuster is located between the cylinders at the front of the engine.

2. Remove the breaker point cover from the right-side of the engine. Remove the cam chain tensioner cap and O-ring.

3. Remove the spark plugs.

4. Turn the engine over using a 17 mm wrench on the crankshaft *nut* at the points compartment. Turn the crankshaft counterclockwise while observing the tensioner pushrod which is in the center of the pushrod guide.



Adjusting the cam chain

5. Continue turning the engine over until the pushrod reaches the innermost point, then stop.

NOTE: *Hold the crankshaft in place. Do not turn the engine backward.*

6. The end of the pushrod should be flush with the pushrod guide if adjustment is correct. If adjustment is necessary, loosen the large locknut on the tensioner, and turn the guide until the guide and pushrod are flush.

CAUTION: *If the pushrod protrudes even a small bit from the guide, the adjustment is too tight and damage may result.*

7. Tighten the locknut. Refit the tensioner O-ring and cap. Replace the point cover and spark plugs.

VALVE ADJUSTMENT (1974-76)

NOTE: *Valves must be adjusted when the engine is cold.*

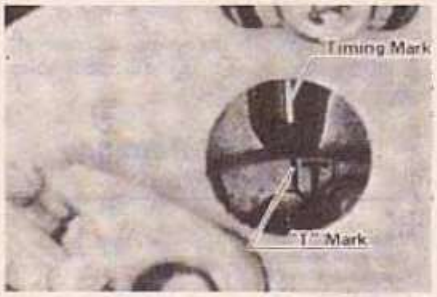
1. Remove the contact breaker point cover from the right-side of the engine.

2. Remove the spark plugs.

3. Remove the cylinder head cover caps from each side of the head. Remove the four valve clearance adjuster plugs.

4. Clearance for both intake and exhaust valves is 0.004-0.006 in./0.10-0.15mm.

5. Using a 17mm wrench on the crank-



Align the "T" mark for valve adjustment



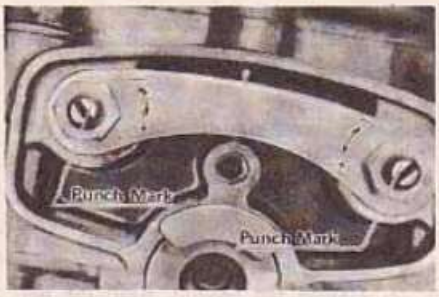
Checking valve adjustment

shaft nut at the points compartment, turn the engine over counterclockwise until the intake valve for the right cylinder opens and begins to close.

6. Continue turning the engine over in the same direction while observing the timing marks through the hole in the breaker plate. About 1/4 of a turn after the intake valve closes, the "T" mark will appear. Align the "T" mark with the stationary timing mark, as illustrated.

7. The right-side piston has now been positioned at top dead center (TDC) on its compression stroke. Both valves for the right cylinder should be closed.

8. Check the valve clearance by inserting the proper-sized feeler gauge between the valve stem and the rocker arm.



Turn the rocker arm shafts as shown to increase or decrease clearance

9. If adjustment is necessary, loosen the rocker arm shaft locknut, and turn the shaft carefully in either direction to increase or decrease the clearance as necessary. Refer to the illustration. Do not turn the shaft more than 180°. The punch mark on the shaft must continue to face inward toward the "+" and "−" marks.

To increase valve clearance, turn the shaft toward the "+" mark; to decrease it, turn it toward the "−" mark.

10. Hold the shaft in position, while tightening the locknut to 18-22 ft lbs. After tightening, recheck clearance.

11. Repeat the procedure for the other right cylinder valve.

12. Turn the crankshaft CCW 360° (one full turn) until the "T" mark again aligns. The left piston is now at TDC on its compression stroke and the left cylinder valves can now be adjusted.

VALVE ADJUSTMENT (1977 AND LATER)

NOTE: *Valves must be adjusted when the engine is cold.*

1. Remove the contact breaker point or pickup coil cover from the right side of the engine.
2. Remove the spark plugs.
3. Remove the four valve adjuster caps.
4. Clearance for the intake and the exhaust valves is the same. Clearances are:

1977 .....0.005-0.006 in./0.13-0.15mm
1978-On 0.007-0.009 in./0.17-0.22mm

5. Using a 17mm wrench on the crankshaft nut, turn the engine over counterclockwise until the intake valve for the right cylinder opens and begins to close.

6. Continue turning the engine over in the same direction while observing the timing marks through the hole in the breaker plate. About 1/4 turn after the intake valve closes, the "T" mark will appear. Align the "T" mark with the stationary timing mark.

7. The right-side piston has now been positioned at TDC on the compression stroke. Both valves for the right piston should now be adjusted.

8. Check the valve clearance by inserting a feeler gauge blade of the right size between the valve and adjuster. It should be a slip fit. If adjustment is required, loosen the locknut on the adjuster and turn the adjuster until there is a slight drag on the blade as it is pulled through. Tighten the locknut (11 ft. lbs.) while holding the adjuster in place.

9. Repeat the procedure for the other valve of the right side cylinder.

10. Turn the engine 360° CCW until the "T" mark again aligns with the timing mark and check the left-side valves.

CONTACT BREAKER POINTS

Location

1. The points are located beneath a cover on the right-side of the engine.

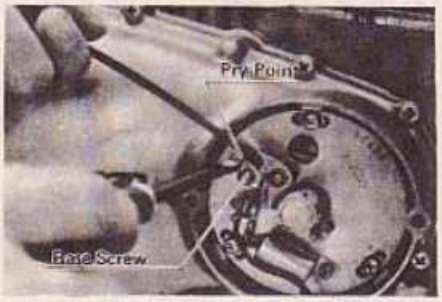
2. A single set of points is used and they are opened by a breaker cam fitted to the crankshaft.

Replacement

1. Replacement of the points is easily accomplished by loosening the wire terminal nut, and disconnecting the primary wire and condenser wire from the points terminal. Remove the points base screw and lift them off. Remove the condenser securing screw.

2. Clean the contact surfaces of new points with a non-oily solvent prior to fitting.

3. When connecting the primary wire and condenser lead, be sure that the insulating washers for the points terminal are all present and correctly installed. If there is continuity between the primary wire and the engine (ground) when the points are open, the engine will not run.



Loosen the base screw and move points with a screwdriver at the pry point to adjust gap

Gapping

1. Clean the points if necessary before gapping.

2. Remove the spark plugs. Using a 17 mm wrench on the crankshaft nut, turn the engine counterclockwise until the points are open to their maximum gap. Check with a feeler gauge. Proper point gap is 0.3-0.4mm (0.012-0.016 in.).

3. If adjustment is necessary, loosen the point base screw just enough to allow the points to be moved. Use a small slothead screwdriver at the pry point provided to adjust the gap. Tighten the screw and recheck.

4. Clean off the points to remove any foreign matter which may have been deposited by the feeler gauge.

Lubrication

1. A felt pad is positioned to bear against the breaker cam and distribute lubricant.

2. Periodically, apply a bit of high temperature grease to the left-side of the pad. Do not overlubricate as this risks fouling the points.

IGNITION TIMING (1974-80)

Dynamic Timing

1. Clean and gap the breaker points.

2. Hook up the strobe light according to the manufacturer's instructions. The timing marks are visible through the inspection hole in the breaker plate.



Full advance timing marks

3. Start the engine. At idle, the "F" mark on the timing advance mechanism must align with the stationary timing mark. At 3,000 rpm and above, the twin full-advance marks must align with the stationary timing mark.

4. If adjustment is necessary, loosen the

three breaker point base plate screws, and rotate the plate in either direction, as necessary, so that the marks align.

5. Once timing has been set for the full advance marks or for the "F" mark, the other should align as well. If only one of them can be brought into alignment, suspect trouble with the automatic timing advance mechanism.

6. When alignment is achieved, tighten the base plate screws and recheck.

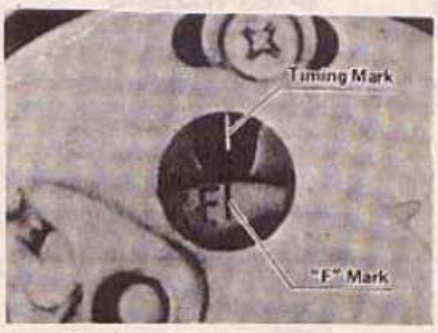
Static Timing

1. Clean and gap the points before checking the timing.

2. Hook up the test light or ohmmeter-one lead to ground, the other to the points wire terminal. Be sure that the ignition is off and the engine kill button is turned to an "Off" position.

3. Using a 17mm wrench on the crankshaft nut, turn the engine over in the normal (counterclockwise) direction, until the "F" mark on the timing advance mechanism (visible through the inspection hole in the breaker base plate) comes into view.

4. Continue turning the engine over. As the "F" mark aligns with the stationary timing mark, the test light or meter should react, indicating that the points have begun to open.



Stationary advance timing mark "F"

5. If the points do not begin to open as these marks align, loosen the three breaker base plate screws after aligning the "F" mark and rotate the base plate in the direction necessary so that the points just begin to open when the marks align.

IGNITION TIMING (1981-AND LATER)

Transistorized ignitions used on late models do not require adjustment.

CARBURETORS (1974-76)

Adjusting Float Level

Generally, float level need not be adjusted unless fuel delivery problems have been noted, or if the machine has covered considerable mileage.

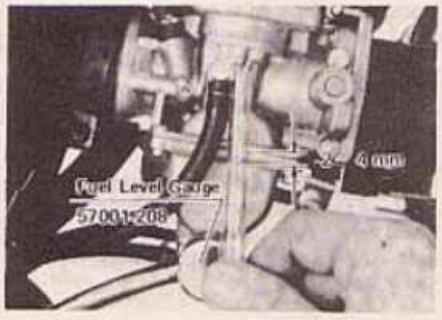
1. Drain the float bowls by removing the drain plugs.

2. Fit float level gauge No. 57001-208 to the float bowl. Turn on the fuel petcock.

3. The fuel level should be 2-4mm (0.08-0.16 in.) below the carburetor body-to-float bowl mating surface.

4. If adjustment is necessary, remove the carburetors, take off the float bowls, and remove the float assemblies.

5. Bend the float tang to correct the level.



Checking carburetor fuel level



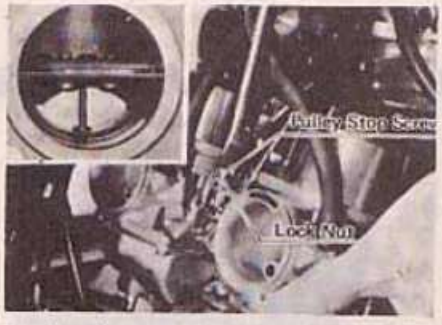
Bend the tang to adjust fuel level

Bending the tang toward the carburetor body will lower the float level. Bending it down, or away from the carburetor body, will raise the float level.

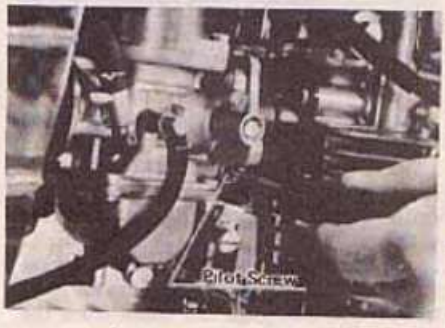
Idle Speed and Mixture

NOTE: *These adjustments must be made when the engine is at operating temperature.*

1. If engine idling is very poor, the following procedure may be necessary: remove the carburetors from the manifolds. Turn the pulley as far as possible and check that both butterfly valves are parallel to the carburetor bores. If they are not, loosen the pulley stop screw locknut and turn the stop screw so that this is achieved. Tighten the locknut. Install the carburetors and check cable free-play. This procedure will not ordinarily be necessary, and most routine tune-ups can start with Step 2.



Use the pulley stop screw if butterfly valves are not parallel to the bores when opened fully



Adjusting the pilot screw

2. With the engine at operating temperature, back out the throttle stop screw until the engine idles at the lowest rpm at which it can run smoothly.

3. Turn each pilot screw in or out until the highest idle speed is reached.

4. Adjust the idle with the throttle stop screw to 1,100-1,300 rpm.

5. Turn each pilot screw in and out after noting their positions. If the idle speed rises when this is done, repeat Steps 2-4.

6. After the correct setting for each pilot screw has been determined, turn each one *in* 1/16 turn.

7. Rev the engine a few times and ensure that idle speed does not change. Check for proper cable free-play and operation.

Throttle Synchronization

1. Throttle synchronization is made easy with vacuum gauges 57001-127 and adapters 57001-401. Balance adjuster 57001-167 is also used. If the gauges are not available, refer to Steps 7 and following, below.

2. Fit the vacuum gauges to the carburetors.

3. With the engine at operating temperature and idling at 1,100-1,300 rpm, adjust the gauges so that needle flutter is less than 3 cm Hg. Standard vacuum should be 22-27 cm Hg. If the difference between the two gauges' readings is more than 1 cm Hg, stop the engine and remove the fuel tank.



Using the balance adjuster

4. Use the balance adjuster on the balance adjuster screw so that vacuum is equalized. The motorcycle will run at this point on the gas left in the carburetors.

5. After equalizing vacuum, reinstall the tank, adjust both pilot screws by equal amounts so that vacuum is 22-27 cm Hg, then turn each in 1/16 turn.

6. Remove the gauges and adpaters and use the throttle stop screw to adjust idle speed to 1,100-1,300 rpm.

7. If vacuum gauges are not available, check synchronization by placing a hand over the end of each muffler. Check that there is no difference in pressure or noise between the cylinders.

8. If there is, remove the gas tank, and adjust the balance adjuster screw to equalize the pressure. The engine will run on the fuel left in the carburetors. After equalizing pressure, install the tank and adjust the idle speed to 1,100-1,300 rpm.

CARBURETORS (1977 AND LATER)

Adjusting Float Level

The procedure is the same as described for 1974-76 carburetors, above, with the following changes:

1. Float level gauge part number is 57001-1017.
2. Fuel level is 3-5mm (0.12-0.20 in.) below the carburetor body-to-float bowl mating surface.

Idle Speed and Mixture

1. Adjust idle speed when the engine is at operating temperature.
2. Idle speed should be 1,100-1,300 rpm and is adjusted with the knob between the carburetors.
3. The pilot screws are not adjustable. To tamper with them may violate clean air ordinances.
4. After idle speed is adjusted, rev the engine a few times to check the engine returns to set value. Turn the handlebars from side to side. If idle speed changes, check throttle cable free-play.

Throttle Synchronization

Butterfly valves are synchronized by means of the balance adjusting screw between the two carburetors. The procedures is the same as described for 1974-76 carburetors above.

Fast Idle Adjustment

1. Adjust idle speed with the knob until it is 1,100-1,300 rpm.
2. Check that there is 4-6mm (0.16-0.24 in.) clearance between the pin on the idling link cam and the fast idle cam when the choke lever is fully pushed down.
3. Open or close the gap on the idle link to meet the specification.

TUNE-UP SPECIFICATIONS

	1974-76	1977	1978-On
VALVE CLEARANCE			
Intake (mm/in.)	0.10-0.15/0.004-0.006	0.13-0.15/0.005-0.006	0.17-0.22/0.007-0.009
Exhaust (mm/in.)	0.10-0.15/0.004-0.006	0.13-0.15/0.005-0.006	0.17-0.22/0.007-0.009
IGNITION SYSTEM			
Point gap (mm/in.)	0.3-0.4/0.012-0.016	0.3-0.4/0.012-0.016	0.3-0.4/0.012-0.016①
Spark plugs (NGK/ND)			
Standard	B-8ES/W24ES	B-8ES/W24ES	B-7ES/W22ES-U
Hot	B-7ES/W22ES	B-7ES/W22ES	B-6ES/W20EP
Cold	B-9ES/W27E	B-9ES/W27E	B-8ES/W24ES
Spark plug gap (mm/in.)	0.7-0.8/0.028-0.032	0.7-0.8/0.028-0.032	0.7-0.8/0.028-0.032
CARBURETORS			
Idle speed (rpm)	1,100-1,300	1,100-1,300	1,100-1,300
Max. vacuum variation (cm Hg)	1.0	1.0	1.0
Vacuum at idle (cm Hg)	22-27	22-27	22-27
Pilot screw setting	1/16 turn from max rpm	—	—
COMPRESSION (psi)			
Standard	142-156	142-156	142-156
Service limit	107	107	107
Max. variation between cylinders	14	14	14

① Except transistorized ignition

ENGINE AND TRANSMISSION

NOTE: *For engine component inspection techniques and procedures, refer to "Engine Rebuilding" under the "General Information" section.*

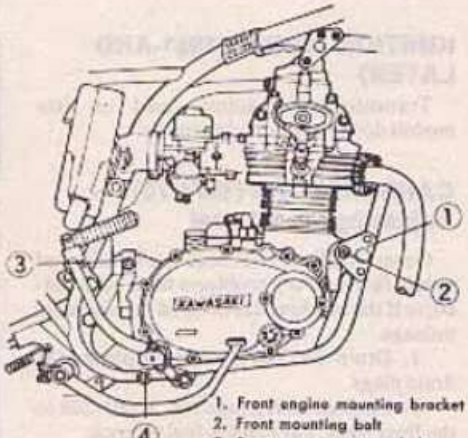
ENGINE REMOVAL AND INSTALLATION

NOTE: *Some models may have shims at the engine/frame mounting points. Note their locations when removing and be sure they are properly repositioned when the engine is installed.*

1. Drain the oil and filter.
2. Remove the gas tank. Disconnect the plug leads and loosen the spark plugs.
3. Disconnect the blue primary (breaker points) wire from the connector. Disconnect the tach cable.
4. Remove the left and right-side covers and disconnect the two electrical connectors. Disconnect the electric starter cable (if fitted) from the starter solenoid.



5. Remove the carburetors (refer to "Fuel System" if necessary for procedures).
6. Remove the exhaust system and passenger footpegs. Remove the left rider's footpeg and side stand spring. Remove the gearshift lever.
7. Remove the countershaft sprocket (left rear crankcase) cover. Remove the masterlink and disengage the chain from the countershaft sprocket.



1. Front engine mounting bracket
2. Front mounting bolt
3. Rear upper mounting bolt
4. Rear lower mounting bolt

Engine mounting bolts

8. Disconnect the rear brake light. Unscrew the switch adjusting nut until the portion beneath the mounting bracket can be squeezed, then push the switch out of the bracket.

9. Disconnect the tube from the breather. Remove the bracket bolts from the frame and breather cover (top engine mounting bolts). Unbolt and remove the breather cover.

10. Remove the engine mounting bolts. Raise the engine slightly as the bolts are removed to avoid thread damage. Note that the rear bolts are fitted with spacers and/or shims. Remove the left front engine mounting bracket. Move the clutch cable and sprocket cover out of the way.

11. Lift up the engine and remove it from the left-side of the frame, bringing the top out first.

12. Installation is the reverse of removal. Note the following points:

After installing the engine, fit the left front engine mounting bracket. Tighten the upper bolt and then the lower to 16-19 ft lbs.

13. Lift the engine slightly to install the mounting bolts. Note the rear bolts have spacers fitted between the frame and the left-side of the engine. The lower spacer may have shims added. After tightening the bolt to the proper torque (25-31 ft lbs), check to see if the spacer is tight. If not, add more shims to take up the clearance.

14. Install mounting bolt nuts with the spring side out, and tighten to 25-31 ft lbs.

15. Use a gasket sealer to hold the breather cover O-ring in place if necessary. Tighten cover bolts to 13-16.5 ft lbs.

16. When installing the sprocket cover, the oil guide seal guide should be used to avoid damage to the seal. Route wires in front of the upper mounting bolt spacer.

17. Use new exhaust pipe cylinder head gaskets. Install the shift lever so that it is aligned with the alternator cover lower right-hand screw.

18. When installing the carburetors, note that the cable should run along the right-hand side of the frame tube.

19. Adjust chain, brake light switch, etc.

CYLINDER HEAD

The cylinder head can be removed with the engine in the frame. On 1974-76 models, several special tools are needed for removal and installation.

The head assembly consists of the breather cover, cylinder head cover, head, camshaft, and valve train.

REMOVAL

1. Remove the gas tank. Remove the ignition coil and bracket. Remove the breather cover bracket (three bolts). Disconnect the breather tube. Unbolt and remove the breather cover. Tap with a plastic mallet to free it if necessary.

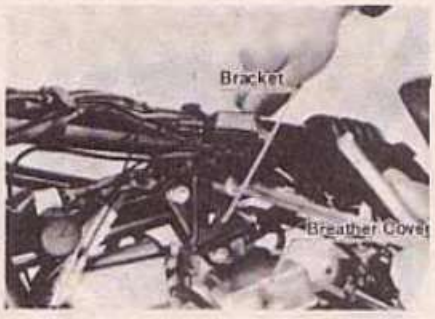
2. Disconnect the tach cable. Remove the head cover nuts or bolts, and remove the cylinder head cover. Note the O-rings.

3. Remove the cam chain tensioner as follows:

KZ400: Remove the cam chain tensioner cap and O-ring; remove the tensioner screws and pull out the tensioner assembly, complete.

KZ440: Loosen the tensioner lock bolt. Remove the tensioner mounting bolts and take off the tensioner body and O-ring.

CAUTION: *Once the mounting bolts on the KZ440 are loosened, they must be removed completely. Special installation procedures are required. Refer to the "Installation" section following. Failure to follow the procedures may result in engine damage.*



Removing the breather cover bracket



Removing the cam chain tensioner



Removing the cam sprocket bolts



Removing the cylinder head bolts

4. Remove the breaker point (or pickup coil) cover. Using a 17mm wrench on the crankshaft *nut*, turn the engine over, and unbolt the camshaft sprocket as the bolts become accessible. Disengage the cam chain from the sprocket. On 1977 and later models, remove the camshaft bearing caps.

5. Loop a length of wire or something similar through the cam chain and secure it to a fixed point to prevent the chain from falling into the cylinder when the camshaft is removed. Remove the cam sprocket and cam.

6. Remove the exhaust system. Remove the left and right-side covers, and remove the carburetors. Refer to "Fuel System" for procedures if necessary.

7. Remove the spark plugs.

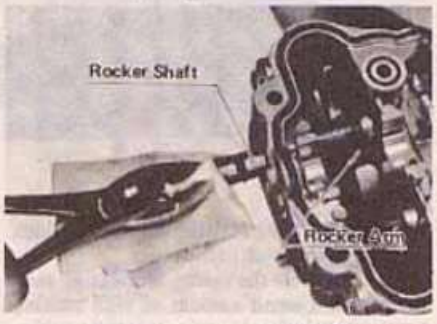
8. Remove the external oil line on models so equipped.

9. Remove the cylinder head bolts, loosening bolts gradually and in a cross pattern. Remove the cylinder head. Remove the head gasket.

Disassembly

1. To remove the rocker arms and shafts on 1974-76 models, remove the cap from each side of the cylinder head cover. Remove the nut from each rocker arm shaft, and remove the plate.

2. Pull out the rocker arm shafts with a pliers, protecting the shafts with a rag. Mark the shafts and rocker arms so that they will be installed in their original locations.



Extricating a rocker arm shaft

3. On 1977 and later models, the rocker arm shafts can be removed by simply unscrewing them from the head cover. Mark them for position to ensure correct installation.

4. Remove the valves by compressing the springs and taking out the keepers. Remove the oil seals from the guides after removing the retaining clip.

Inspection

1. Refer to the specification charts at the end of this section for standard and service limits.

2. If removal of the valve guides is required, heat the head to 250-300° F (120-150° C), and drive out the guide. To install, make sure that an O-ring is fitted to the head side of the guide, and drive it in, heating the head as before.

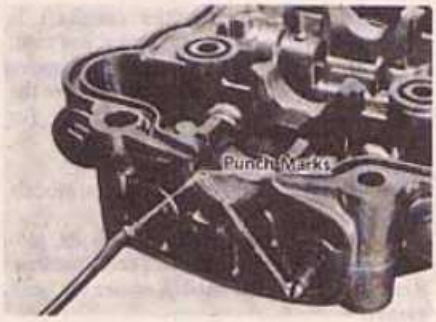
3. Ream the guide after installation.

Assembly

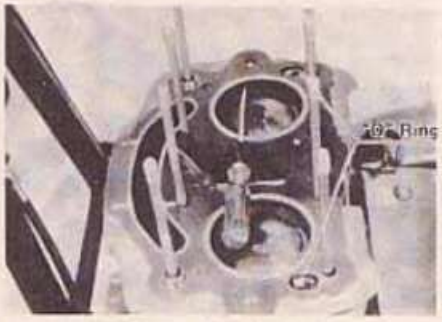
The use of new O-rings and gaskets is recommended.

1. Lightly lubricate each rocker arm shaft O-ring and push the shafts into place, securing their rocker arms in the process. On 1974-76 models, note that the larger contact pad of the rocker arms ride on the camshaft. Turn each shaft so that the punch mark faces the center of the head cover. Install, but do not tighten, the shaft nuts.

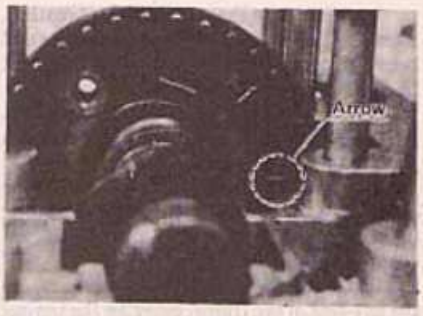
2. Check that all O-rings are in place in the head cover. Secure them with gasket sealer if necessary. Note that the large mat-



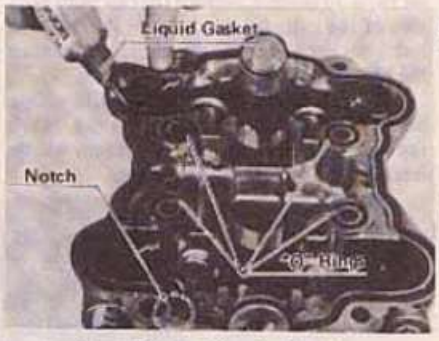
Be sure that the shafts are fitted with the punch marks facing the center of the head cover



Cylinder head gasket and O-rings



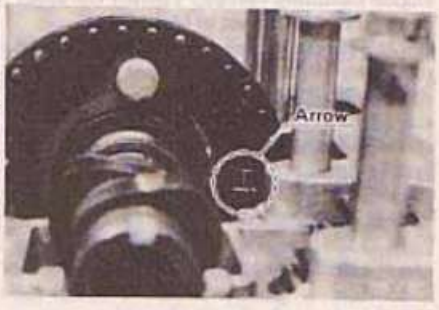
The unmarked arrow aligns with the head surface when the timing advancer edge is aligned with the timing mark



Cover O-ring and gasket location



Holding plates installed

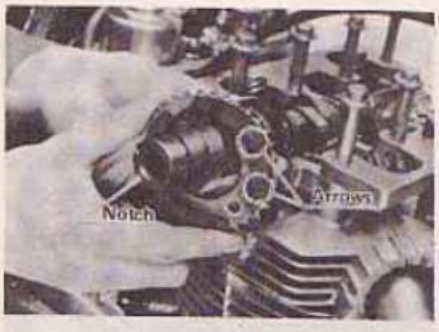


The "T" mark on the sprocket aligns with the head surface when the timing advance "T" mark aligns with the timing mark

ing surface O-ring is fitted with a tab which must fit into a notch in the cover.

3. Assemble the valves, lubricating each valve with a small amount of high melting point grease before inserting it into its guide.

4. When installing the valve springs, note that both inner and outer springs are progressively wound and are installed with the close coils toward the cylinder head.



The cam is installed with the notch on the right-side of the engine and the sprocket arrows face to the right as well

Installation

1. Fit a new head gasket. Be sure that the O-rings on either side are in place.

2. Install the head, bringing the cam chain up through the passage in the head as it is lowered on the studs.

3. Install the cylinder head holding plates (57001-165), and tighten the stud nuts.

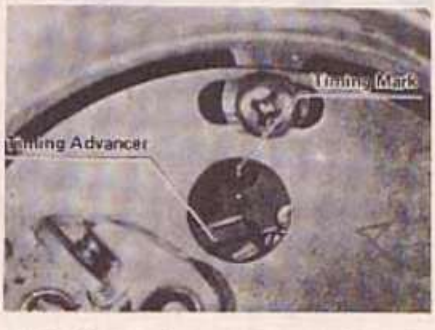
4. Place the cam sprocket on the camshaft. The notched end of the camshaft is located on the *right-side* of the engine, and the side of the cam sprocket with arrows also faces the right-side of the engine.

5. Lubricate the cam bearings and lobes, and slip the cam through the cam chain and fit the chain onto the sprocket.

6. Turn the engine over so that the "T" mark aligns with the timing mark. Turn the engine *counterclockwise* exactly 90° past this point until the timing advance mechanism aligns with the timing mark as illustrated.

7. Disengage the cam chain from the sprocket, and turn the camshaft until the notch on the right end faces directly upward.

8. On early models the cam sprocket has two arrows. One is marked with a "T," the other is unmarked. Turn the sprocket so that the unmarked arrow points toward the front of the engine and is parallel with the head cover mating surface. Fit the cam chain onto the sprocket. On later models, the cam sprocket has only one mark and this must be positioned towards the front of the engine with the cam notch 180° away.



Align the timing advancer as shown to effect valve timing

9. Position the sprocket up against the cam bolt holes. The bolt holes will not be aligned.

10. Hold the cam steady, and slowly turn the crankshaft until the bolt holes align. Fit the cam sprocket bolts which should be coated with a thread locking compound and tightened to 10.0-11.5 ft lbs.

11. Check that valve timing is correct. Turn the crankshaft so that the "T" mark on the timing advance mechanism is aligned with the stationary timing mark. At this position, the cam sprocket arrow marked "T" must be pointing toward the front of the engine and be parallel to the head cover mating surface. If it is not, valve timing is not correct, and must be done again.

12. Remove the cylinder head holding plates. Lubricate the components. Install the cam bearing caps, if fitted, with the arrows facing the front of the engine. Tighten the bolts in a cross pattern to 9 ft lbs.

13. Turn the crankshaft so that the "T" mark on the timing advance mechanism is aligned with the timing mark.

14. Install the cylinder head cover, which has been prepared for installation in Steps 1-2. Fit the eight cover nuts, tightening them in the order shown gradually until the proper torque of 18-22 ft lbs. is reached.

15. Install the four remaining head bolts and tighten them gradually and in the order shown to the proper torque: 8 mm bolts—18-22 ft lbs; 6 mm bolts—8-9.5 ft lbs.

16. Lubricate the tachometer gear with high melting-point grease, insert it, and connect the tach cable.

17. KZ400: refit the tensioner assembly. Assembly order is: pushrod, spring, gasket, holder, pushrod guide, and nut. KZ440: Tension installation is critical. Proceed as follows:

a. Back out the lock bolt a few turns.

b. Put the flat washer and long spring on the pushrod end with the flats.

c. Compress the spring and insert the pushrod into the tensioner body until the flattened end engages the recess at the bottom of the tensioner body.

d. Holding the pushrod in this position, turn in the lock bolt through the body into the rod to keep the rod in place.

CAUTION: *Do not use any bolt longer than 14mm, as it may cause damage. Never loosen the lock bolt before installing the tensioner.*

e. Put the balls and retainer and small spring on the pushrod. Fit the O-ring.

f. Place the assembled tensioner on the engine. Fit and secure the bolts.

g. Loosen the lock bolt several turns until it releases the pushrod. Tighten the lock bolt to 7 ft lbs.

18. Install the breather cover, holding the O-ring in place with gasket sealer if necessary. Tighten the breather bolts gradually and in a cross pattern until a torque of 13-16.5 ft lbs is reached.

19. The remainder of the procedure is the reverse of removal. Adjust the valves and cam chain after assembly is complete.

CYLINDER AND PISTON

Removal

1. Remove the cylinder head components and cam chain tensioner as outlined in the preceding section.

2. Pull up the cylinders, taking care that the pistons do not hit the crankcases when they come out of the bores.

3. Remove the cylinder base gasket, noting the positions of the oil passage O-rings.

4. Wrap a clean wrag around the base of the piston, and use a needlenose pliers to take out the wrist pin circlips.

5. Push out the wrist pin. If the pin resists removal, the piston crown may be heated slightly. Alternately, use special factory tools 57001-910 and 57001-913.

Mark each piston for position so that it can be reinstalled in its own bore.

Inspection

1. Refer to the specifications chart at the end of this section for service limits. Note the following points;

a. Pistons are available in two oversizes: 0.5mm and 1.0mm. Measure piston diameter 5mm (0.2 in.) from skirt bottom. Measure bore 10mm (0.4 in.) and 60mm (2.4 in.) from top; 25mm (1 in.) from bottom;

b. If boring is necessary, standard piston-cylinder clearance is 0.034-0.054 mm/0.001-0.002 in.;

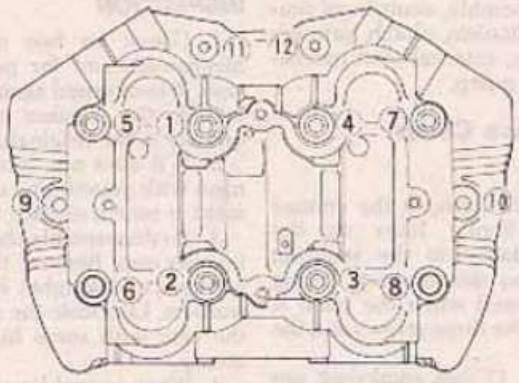
c. In addition to fitted end-gap and side clearance, used rings should be checked for free end-gap to check for loss of tension;

d. When fitting new parts, try to fit a marked piston pin to a piston with an "A" mark on the crown, and an unmarked pin with an unmarked piston.

Use pistons marked with "2" on the crown in cylinders marked in the same way, and fit unnumbered pistons into the unnumbered cylinders.

Installation

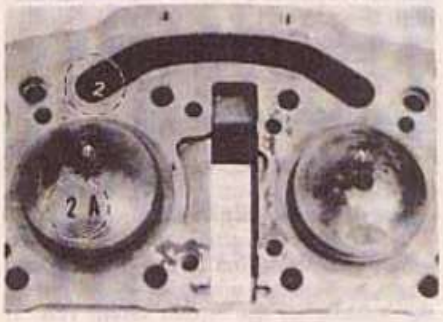
1. Top and bottom compression rings are not interchangeable and must be installed as illustrated, and with the manufacturer's mark near the end-gap facing *upward*.



Cylinder head and head cover bolt tightening sequence



Piston and pin marks



Piston and cylinder marks

2. The arrow on the piston crown must face the exhaust port.

3. Use new wrist pin snap-rings in all cases.

4. On models with a one-piece oil ring, arrange the end gaps so that the top compression and the oil ring gaps face the exhaust side and the second compression ring faces the intake side of the engine.

On models with a three-piece oil ring, arrangement should be the same except that the oil ring rails must be positioned about 30° on either side of the oil expander, whose gap should face the exhaust side of the engine.

5. Fit a new cylinder base gasket, ensuring that the O-rings are in place. Fit new O-rings to the cylinders, if necessary.

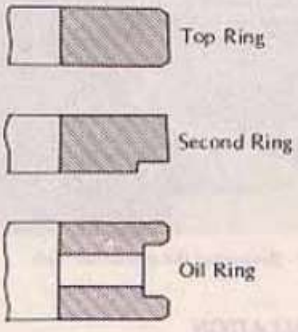
6. Lightly lubricate the rings and piston skirts with motor oil. Use piston base 57001-340 to hold the pistons in place, and ring compressor 57001-921 and adapter A/57001-924 to squeeze the rings so that the cylinders may be installed.

7. Pull the cam chain through the cylinders as they are lowered down on the studs. Secure the chain so that it will not fall into the engine.

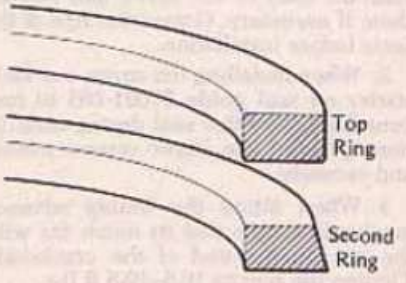
8. The rest of the procedure is the reverse of removal.



Install rings with the mark facing upward



Note that the two compression rings are not interchangeable



Compression ring profiles (1977-On)

CRANKCASE COVER COMPONENTS

Right Crankcase Cover Components

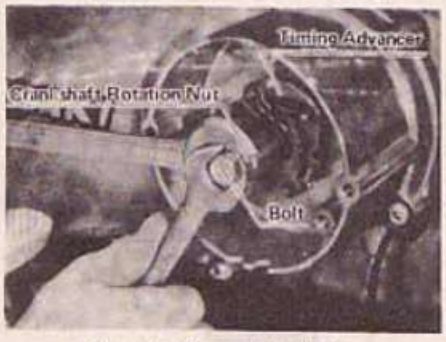
The right crankcase cover houses the

breaker points assembly, centrifugal timing advance mechanism, clutch, primary drive components, external shift mechanism, and the oil pump.

Right Crankcase Cover

REMOVAL

1. Drain the oil. Remove the contact breaker cover. Scribe lines on the breaker plate relative to the securing screw positions so that ignition timing can be approximated when the plate is refitted. Remove the three screws and the plate.
2. Holding the 17 mm crankshaft nut with a wrench, break loose the crankshaft bolt. Remove it, and the timing advance mechanism.
3. Remove the right footpeg. Scribe a mark across the kick-starter lever and its shaft to mark its position, then remove the bolt and pull off the kick-starter lever.
4. Placing a pan beneath the cover to catch any oil residue, remove the 12 cover screws and pull off the cover, using a plastic mallet to break it loose if necessary.



Removing the crankshaft bolt

INSTALLATION

1. Use a new cover gasket. Check the condition of the kick-starter and crankshaft oil seals in the cover, and replace them if necessary. Grease the lips of the seals before installation.
2. When installing the cover, use kick-starter oil seal guide 57001-265 to prevent damage to this seal during installation. Tighten the cover screws evenly and securely.
3. When fitting the timing advance mechanism, note that its notch fits with the pin on the end of the crankshaft. Tighten the bolt to 16.5–19.5 ft lbs.
4. The remainder of the procedure is the reverse of removal. Reset the ignition timing.

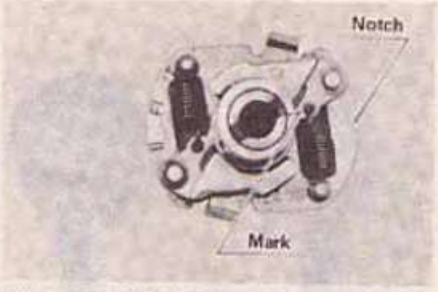
Timing Advance Mechanism

REMOVAL

1. Remove the contact breaker cover. Scribe lines on the breaker plate relative to the securing screw positions, so that ignition timing can be approximated when the plate is refitted. Remove the three screws and the plate.
2. Holding the 17 mm crankshaft nut with a wrench, break loose the crankshaft bolt. Remove it, and the timing advance mechanism.

INSPECTION

1. Check for free movement of the mechanism and for proper spring tension. When turned against its stop and released, the breaker cam must return quickly to the original position.
2. If it does not, lubricate the mechanism with penetrating oil. If no improvement is noted, replace the springs.
3. To disassemble the unit, pull off the breaker cam. Remove the two "C" rings, washers, and weights. Remove the thrust washers. Lubricate the shaft and inside of the cam with some high melting point grease.
4. When assembling, align the mark on the breaker cam with the cut-out notch on the mechanism body.



When assembling the timing advance mechanism, align the mark with the notch

INSTALLATION

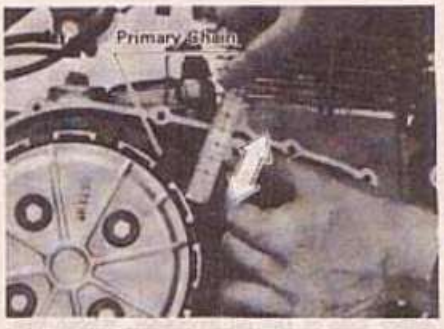
1. Installation is the reverse of removal. Align the notch in the mechanism with the pin on the crankshaft.
2. Tighten the crankshaft bolt to 16.5–19.5 ft lbs.

Clutch and Primary Drive

REMOVAL

Before removing the components, check primary chain wear.

The primary chain is allowed a maximum of 20 mm (0.8 in.) of total up and down movement which is measured in the middle of the upper chain run. If movement exceeds this amount, replace the chain.



Checking primary chain wear

If replacement is necessary, use "Tsubakimoto Hy-Vo" No. 3/8P-5/8W 74-link chain only.

1. Remove the right crankcase cover as outlined in the preceding procedure.
2. Remove the clutch spring bolts, washers, and springs. Remove the pressure plate. Remove the pusher. Tilt the motorcycle to the right so that the steel ball comes out of the clutch shaft.



Removing the oil pump drive gear

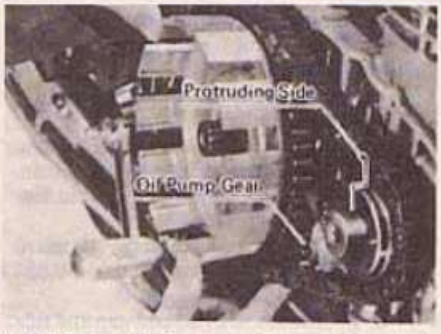
3. Remove the clutch hub circlip and the shims behind it. Remove the clutch plates and the clutch hub. Note the thrust washer behind the hub.
4. Remove the circlip from the crankshaft (primary) gear. Pull off the clutch housing, chain, and crankshaft gear together.
5. Remove the oil pump drive gear from the back of the clutch housing, if desired, by removing the circlip. Note the locating pin.

INSPECTION

1. Check the clutch and gears as outlined in "Engine Rebuilding" and by referring to the specifications at the end of this section.
2. Check chain guide thickness. Standard is 7.5 mm (0.3 in.). Serviceable limit is 3.5 mm (0.14 in.).

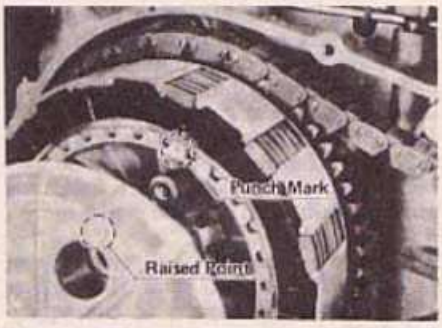
INSTALLATION

1. Fit the oil pump drive gear onto the clutch housing, noting that the protruding side of the gear faces the housing.
2. Assemble the crankshaft gear, chain, and clutch housing. Note that the protruding side of the crankshaft gear faces *out*. Fit the assembly, rotating the oil pump gear by hand if necessary so that it meshes with the drive gear. Install the crankshaft gear circlip.



Install the crankshaft primary gear with the protruding side outward

3. Fit the thick thrust washer to the clutch assembly, followed by the hub. Install the shims and the clutch hub circlip. There should be no axial play of the clutch hub on its shaft. If there is, remove the circlip, and add more shims until the play is taken up.
4. Install the clutch plates in the following order: friction plate, steel ring, steel plate, and alternating in this manner, fitting a steel ring last.
5. Install the steel ball and the pusher.
6. Install the pressure plate, aligning the marks on the plate and the clutch hub. Install the springs, washers, and



Align the marks on the pressure plate and clutch hub

spring bolts, tightening them evenly and in a cross pattern.

7. The remainder of the procedure is the reverse of removal.

Oil Pump

REMOVAL

1. Remove the right crankcase cover and the clutch and primary drive assembly. Refer to the preceding procedures.

2. Remove the four oil pump screws and pull off the pump. Note the O-rings in the crankcase.

INSPECTION

Refer to "Lubrication System."

INSTALLATION

1. Installation is the reverse of removal.

2. Lubricate the pump with motor oil before installation.

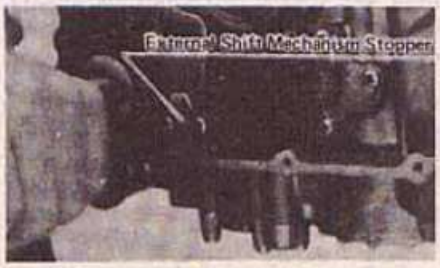
Shift Mechanism

The shift mechanism in the right crankcase cover consists of the shift shaft, return spring, and shift arm or pawl.

REMOVAL

1. Remove the right crankcase and the clutch and primary drive assembly. Refer to the preceding procedures.

2. Remove the left rider footpeg. Remove the side stand and spring. Remove the gearshift lever.



Removing the shift mechanism stopper

3. Remove the left rear crankcase (engine sprocket) cover.

4. Remove the shift mechanism stopper. Disengage the fingers of the shifter pawl from the shift drum and pull out the shaft.

INSTALLATION

1. Be sure that the shifter return spring is properly installed with the spring arms on either side of the return spring pin.

2. Use oil seal guide 57001-264 to protect the shift shaft oil seals in the crankcase and the engine sprocket cover when installing the shift shaft. Engage the pawl with the shift drum pins.

3. Use thread locking compound on the shift mechanism stopper screws.

Left Crankcase Cover Components

The left crankcase covers house the engine (countershaft) sprocket, the clutch release mechanism, the alternator, and the electric starter sprocket and chain (on "D" models).

Left Crankcase Covers

REMOVAL AND INSTALLATION

1. Remove the left rider's peg. Remove the sidestand and spring. Remove the shift lever.

2. Remove the four screws and take off the sprocket cover.

3. To remove the alternator cover, first remove the sprocket cover (Steps 1 and 2).

4. Remove the right-side frame cover and disconnect the alternator field coil leads from the connector.

5. Remove the wiring guide just above the countershaft sprocket.

6. Remove the starter motor cover and gasket. Remove the eight alternator cover screws and take off the cover. Disconnect the oil pressure and neutral indicator leads.

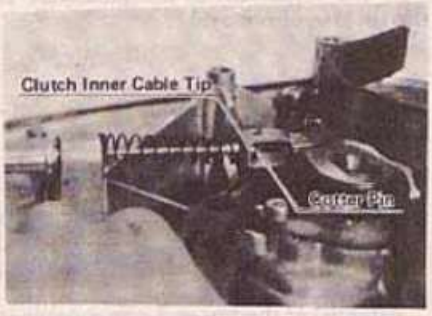
7. Installation is the reverse of removal. Use shift shaft oil seal guide 57001-264 when installing the countershaft sprocket cover. Be sure that the electrical wiring is correctly routed.

Clutch Release Mechanism

REMOVAL AND INSTALLATION

1. The clutch release mechanism is incorporated in the countershaft sprocket cover.

2. Remove the sprocket cover. Remove the cotter pin from the clutch cable fitting, and disengage the cable from the fitting, and from the cover.



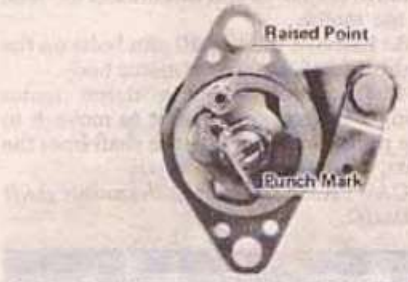
Disconnecting the clutch cable from the fitting

3. Remove the chain guide screws.

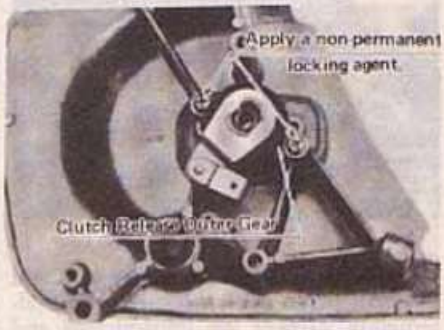
4. Remove the two clutch release outer gear screws and separate the two gears.

5. Clean the release mechanism in solvent, dry, and lubricate thoroughly with grease.

6. Assemble the release mechanism, fitting the worm gears together so that, as they begin to mesh, the raised point on the outer gear aligns with the punch mark on the inner gear.



The raised point and punch mark should align as the gears begin to mesh



Clutch release mechanism installation

7. Use thread locking compound on the outer gear screws. Install the mechanism as shown.

8. The remainder of installation is the reverse of removal.

Countershaft Sprocket

REMOVAL AND INSTALLATION

1. Remove the countershaft sprocket cover.

2. If special engine sprocket holder 56019-040 is available, disconnect the chain, bend down the tab on the sprocket nut lockwasher, and remove the nut.

3. If it is not available, place the transmission in gear, bend down the tab on the sprocket washer, and remove the sprocket nut, applying the rear brake if necessary to hold the sprocket.

4. To install, tighten the sprocket nut to 87–105 ft lbs and bend down the washer tab. If the chain was disconnected, be sure to install the masterlink spring clip with the closed end facing the direction of chain rotation.

Alternator and Starter Assembly

REMOVAL

1. Remove both left-side covers as outlined in the preceding procedures.



Removing the starter motor bolts

2. To remove the starter motor, first remove the cover and disconnect the lead at the motor.

3. Remove the two 10 mm bolts on the right-side of the starter motor body.

4. Tap lightly on the starter motor body with a plastic mallet to move it to the right and disengage the shaft from the gear.

CAUTION: *Do not tap the motor shaft itself.*



Tapping out the starter motor

5. To remove the alternator rotor, hold the rotor steady with the special tool (alternately, engage the transmission and apply the rear brake to lock the crankshaft, and remove the rotor bolt by turning it in a *clockwise* direction).

CAUTION: *The rotor bolt is a LEFT-HAND thread.*

6. Remove the rotor and starter clutch assembly using special puller 57001-254 while holding the rotor in place. Note the thrust washer behind the rotor.

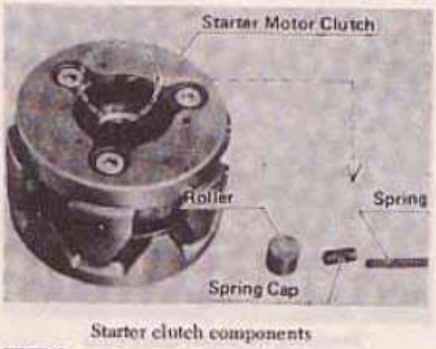
7. Pull off the starter chain and sprocket.

8. The field coil and alternator armature windings are in the cover. To remove them (not necessary for testing), remove the starter motor chain guide and sprocket guide. Remove the three armature allen bolts and remove the armature. Remove the three field coil allen bolts on the outer side of the cover and remove the field coil.

INSPECTION

1. For alternator and starter motor tests, refer to "Electrical System."

2. Disassembly of the starter clutch is not necessary unless it has been malfunctioning. To check operation of the starter clutch, fit the sprocket and rotor assembly to the crankshaft. When the rotor is turned, by hand, in a counterclockwise direction, the sprocket should turn as well. If the rotor is turned in the clockwise direction, the sprocket should not turn.



Starter clutch components

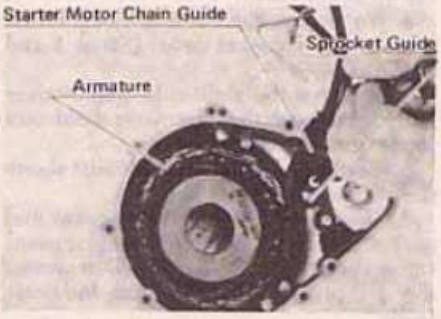
To disassemble the starter clutch, remove the three allen screws, and take out the springs, spring caps, and rotors. Check for wear of the rollers.

3. Check the starter motor chain by measuring its length. Extend the chain by stretching it with a force of about 10 lbs. A twenty-link length of chain (standard) measures 155.5 mm (6.1 in.); service limit is 157.8 mm (6.2 in.)

INSTALLATION

1. Fit the starter clutch to the rotor, using thread locking compound on the bolts and tightening to 24–27 ft lbs.

2. Install the field coil, use thread locking compound on the bolts and tighten to 5.1–5.8 ft lbs. Use the same procedure and torque on the armature bolts. Fit all wiring into their grommets and properly fit the grommets in the case.



Installing the sprocket guide

3. Use thread locking compound when installing the sprocket guide and starter motor chain guide. The sprocket guide bends outward.

4. Put a little oil on the starter motor O-ring, and install the starter motor. Install the sprockets and chain.

5. Put some high melting point grease on the rotor thrust washer and put it behind the rotor, installing the rotor assembly on the crankshaft. Install the rotor bolt (left-hand thread), and tighten it to 47–51 ft lbs while holding the rotor in place.

6. The remainder of the procedure is the reverse of removal.

Lower End and Transmission

Engine removal is required for these components: crankshaft, transmission, shift drum assembly, balancer assembly, and kick-starter.

Removal of the top end components is required for crankshaft service, but the top end may be left in place for service and inspection of the kick-starter, transmission, or balancer.

Splitting the Crankcase

1. Drain the oil and remove the filter. Remove the engine from the frame. If crankshaft service is required, remove the top end components. Refer to the preceding procedures.

2. Remove the crankcase covers and all of the components therein: clutch and primary drive, external shift mechanism, countershaft sprocket, starter motor, and alternator assembly.

3. Remove the six upper crankcase half bolts and the carburetor overflow/breather tube guide.

4. Turn the engine upside down and remove the fourteen lower crankcase half bolts. Remove the lower case half, tapping carefully with a plastic mallet to free it if necessary.

The lower case half will come away with the kick-starter shaft. The other components will remain in the upper case half.

Transmission

1. Check the gears in place. Check gear backlash. Standard is 0.06–0.23 mm (0.0024–0.0092 in.), while the serviceable limit is 0.3 mm (0.012 in.).

2. To remove the transmission, lift the shafts and gears together out of the case.

3. Disassembly of the transmission shafts must be done carefully. Lay out each component as it is removed for ease of assembly.

4. For the mainshaft, take out the clutch pushrod and oil seal. Remove the shaft needle bearing outer race. Remove the circlip and take off the needle bearing and any shims fitted.

5. Remove the 2d and 5th gears, the copper bushing and splined washer. Remove the circlip followed by 3rd gear.

6. Remove the circlip, splined washers, and 4th gear.

7. Remove the bushing and shaft ball bearing together using the special puller.

8. To disassemble the countershaft, remove the needle bearing outer race, circlip, needle bearing, and shim(s).

9. Remove the 1st and 4th gears, splined washer, 3rd gear, splined washer, circlip, and 5th gear.

10. Remove the circlip, splined washer, and 2d gear. Remove the oil seal, collar, and O-ring. Remove the shaft ball bearing with the special tool.

11. Check gear-shaft clearances.

12. Assembly is the reverse of disassembly. Refer to the exploded view for part locations. New circlips should be used, and special tool 57001-380 should be used to install circlips without damage.

13. After assembly of the shafts, check side play. If evident, use shims as necessary on the engine side of the needle bearings to eliminate play. Shaft ball bearings must be pressed into place.

Shift Drum

1. Remove the transmission shafts.

2. Remove the shift drum stopper.

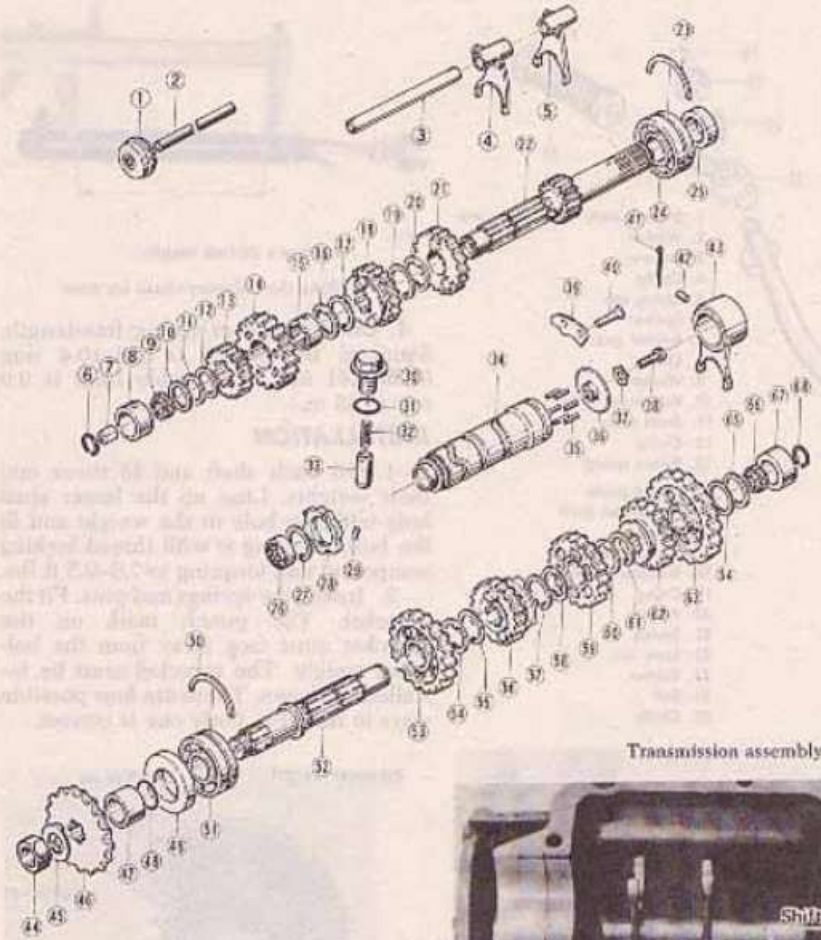
3. Remove the shift drum positioning bolt, O-ring, spring, and plunger on top of the upper crankcase half.

4. Remove the cotter pin and guide pin from the shift fork (3rd gear), which rides on the shift drum. Pull out the shift drum, and remove the operating plate circlip, operating plate, and shift fork.

5. Pull out the shift rod and the two remaining shift forks. They are not interchangeable. Note positions.

6. Check all parts for wear.

7. Insert the shift rod into the crankcase and through the two shift forks. The



1. Oil seal
2. Clutch pushrod
3. Shift rod
4. 5th gearshift fork
5. 4th gearshift fork
6. Circlip
7. Bushing
8. Needle bearing outer race
9. Needle bearing
10. Shim
11. Bronze shim
12. Shim
13. 2nd gear
14. 5th gear
15. Copper bushing
16. Splined washer
17. Circlip
18. 3rd gear
19. Circlip
20. Splined washer
21. 4th gear
22. Mainshaft
23. Set ring
24. Bearing
25. Bushing
26. Shift drum needle bearing
27. Circlip
28. Operating plate
29. Operating plate pin
30. Shift drum positioning bolt
31. O-ring
32. Spring
33. Pin
34. Shift drum
35. Pins
36. Drum pin plate
37. Lockwasher
38. Screw
39. Shift drum stopper
40. Screw
41. Cotter pin
42. Guide pin
43. 3rd gearshift fork
44. Countershaft sprocket nut
45. Toothed washer
46. Countershaft sprocket
47. Countershaft collar
48. O-ring
49. Oil seal
50. Set ring
51. Bearing
52. Countershaft
53. 2nd gear
54. Splined washer
55. Circlip
56. 5th gear
57. Circlip
58. Splined washer
59. 3rd gear
60. Splined washer
61. Circlip
62. 4th gear
63. 1st gear
64. Shim
65. Shim
66. Needle bearing
67. Needle bearing outer race
68. Circlip

Transmission assembly



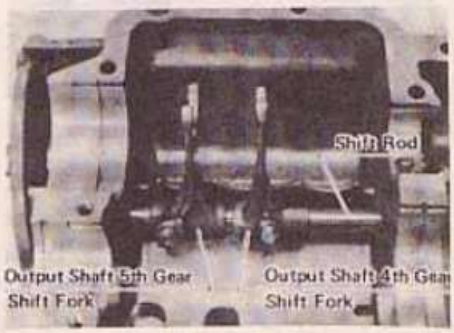
Removing the shift drum stopper



Removing the shift drum positioning bolt assembly



Removing the shift drum



Shift fork positions



Shift drum operating plate installation. The nub faces out.

shift forks are not interchangeable. Note that the fork on which the guide pin is located in the center of the fork is located on the clutch side of the engine.

8. Insert the shift drum into the crankcase fitting the shift fork as this is done. The pin housing on the shift fork faces the crankshaft.

9. Install the operating plate pin, if it was removed, and fit the operating plate, nub facing out. Install the circlip.

10. Insert the shift fork guide pin, cotter pin, and secure the cotter pin.

11. Fully install the shift drum and engage the guide pins for the other two shift forks with the drum grooves.

12. Install the shift drum stopper screws, which should be peened for security. Install the shift drum positioning bolt components after turning the drum, if necessary, so that the plunger is properly in place.

Kick-Starter

1. Bend up the tabs on the lockplate of the ratchet gear arm stopper bolts, and remove the bolts and stopper.

2. Remove the spring guide circlip.

3. Remove the spring guide. Remove the return spring.

4. Remove the kick-starter shaft collar circlip. Remove the shaft stopper and collar.

5. Remove the kick-starter shaft.

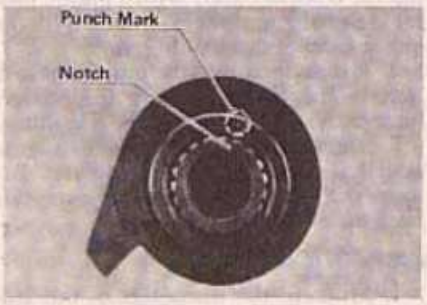
6. Remove the gear and thrust washer. Remove the spring side circlip, and take off the spring cap and spring.

7. Remove the ratchet gear and the other circlip.

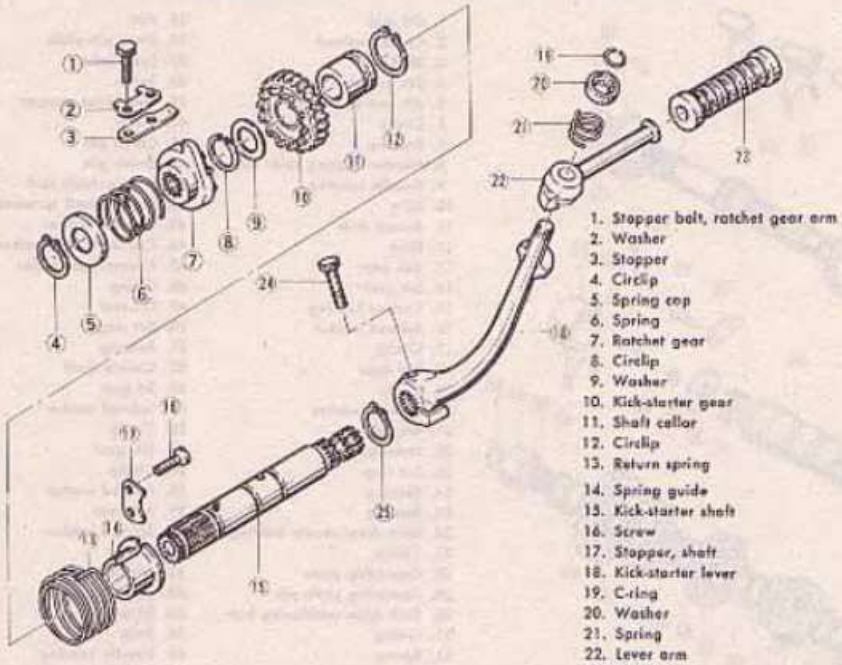
8. Check all parts for wear.

9. Assembly is the reverse of disassembly. When fitting the ratchet gear, align the punch mark on the gear with the notch on the shaft.

10. When fitting the return spring, turn the shaft as far as possible clockwise, insert one end of the return spring into the crankcase and the other end into the kick-



Align the notch and punch mark when assembling the ratchet gear onto the shaft



1. Stopper bolt, ratchet gear arm
2. Washer
3. Stopper
4. Circlip
5. Spring cap
6. Spring
7. Ratchet gear
8. Circlip
9. Washer
10. Kick-starter gear
11. Shaft collar
12. Circlip
13. Return spring
14. Spring guide
15. Kick-starter shaft
16. Screw
17. Stopper, shaft
18. Kick-starter lever
19. C-ring
20. Washer
21. Spring
22. Lever arm
23. Rubber
24. Bolt
25. Circlip

Kick-starter shaft assembly

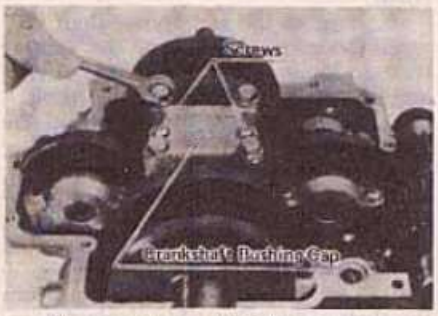
starter shaft. Hold the spring in this position, and fit the spring guide.

11. Use a bit of high melting point grease on the inside of the collar. Peen the shaft stopper screws for security. Bend down the tabs on the ratchet gear arm stopper bolt lockplate.

Balancer

REMOVAL

1. Remove the four bolts and two screws from the crankshaft bushing cap. Note that the cap has an arrow pointing toward the front of the engine, and it must be refitted in the same way.
2. Remove the balancer chain guide.



Removing the crankshaft bushing cap

3. Remove the balancer holder bolts, tap the holders lightly with a plastic mallet to free them, if necessary; then lift the entire balancer assembly away.
4. If disassembly of the unit is desired, remove the chain. Remove the holders from each balance weight and the shims.
5. Tap off the sprockets with a plastic mallet. Remove the springs and pins. Remove the bolts, and separate the weights from their shafts.

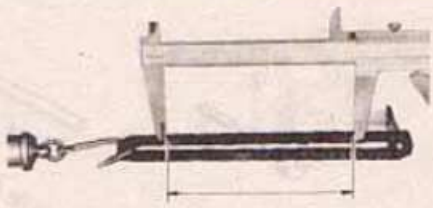
INSPECTION

1. Measure the diameters of the balancer shafts and the inside diameters of the holders. Compare to the serviceable limits.



Measuring balancer shaft diameter

2. Apply a force of about 10 lbs to stretch the balancer chain and measure a 20-link length. Standard length is 160 mm (6.30 in.). Serviceable limit is 162.4 mm (6.38 in.).
3. Check chain guide thickness. Each must be at least 1.0 mm (0.04 in.) or better.



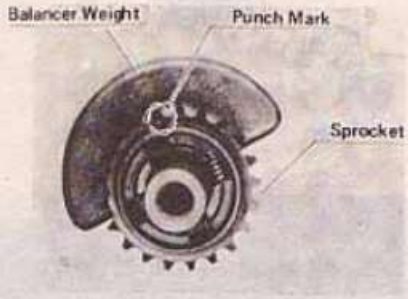
Measure a 20-link length.

Checking the balancer chain for wear

4. Check balancer spring free-length. Standard free-length is 9.8–10.4 mm (0.39–0.41 in.). Serviceable limit is 9.0 mm (0.35 in.).

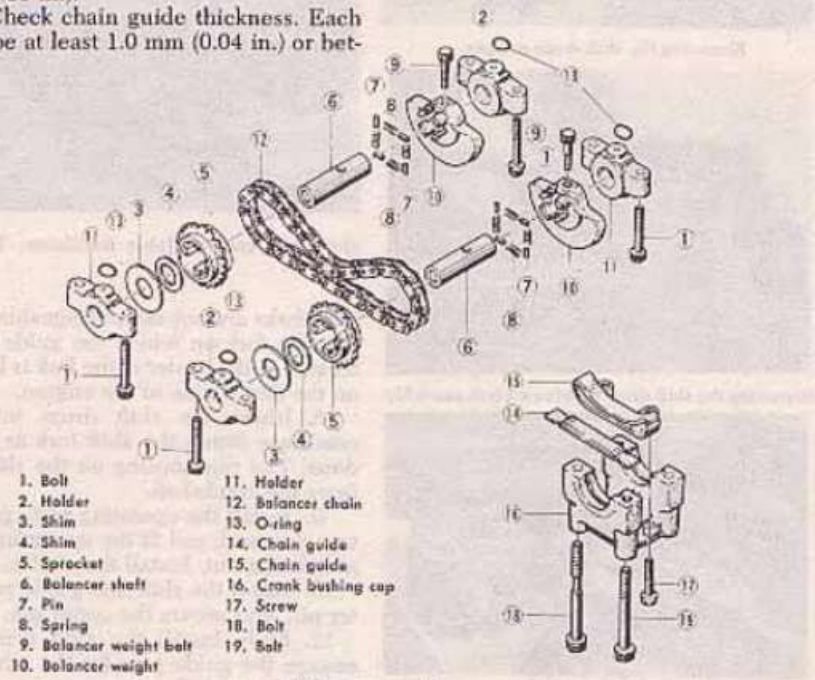
INSTALLATION

1. Oil each shaft and fit them into their weights. Line up the larger shaft hole with the hole in the weight and fit the bolt, securing it with thread locking compound and torquing to 7.9–9.5 ft lbs.
2. Install the springs and pins. Fit the sprocket. The punch mark on the sprocket must face away from the balancer weight. The sprocket must be installed as shown. There are four possible ways to install it. Only one is correct.



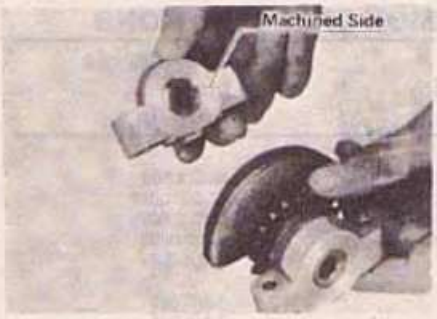
Sprocket installed correctly

3. Install the sprocket side shims. The smaller diameter shim is installed first. Fit the holders onto the shaft. Note that the machined side of each holder faces the weight.

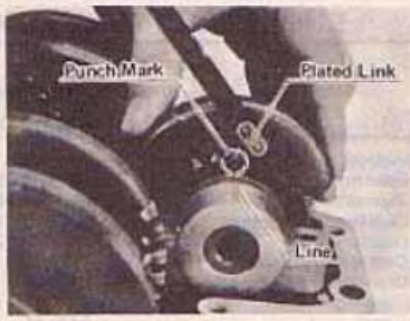


1. Bolt
2. Holder
3. Shim
4. Shim
5. Sprocket
6. Balancer shaft
7. Pin
8. Spring
9. Balancer weight bolt
10. Balancer weight
11. Holder
12. Balancer chain
13. O-ring
14. Chain guide
15. Chain guide
16. Crank bushing cap
17. Screw
18. Bolt
19. Bolt

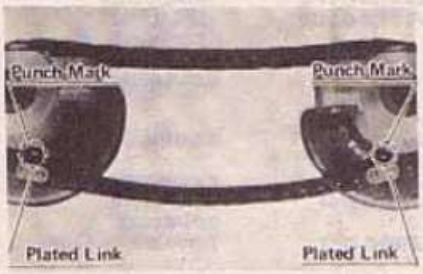
Balancer assembly



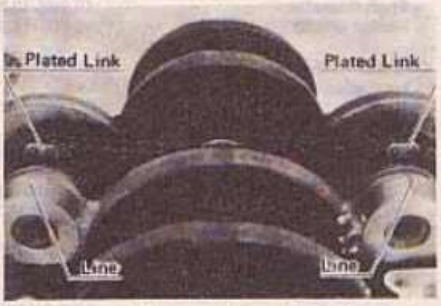
Install holders with the machined side facing the weight



Align the chrome-plated link, sprocket punch mark, and holder line



The chromed links must align with the sprocket punch marks



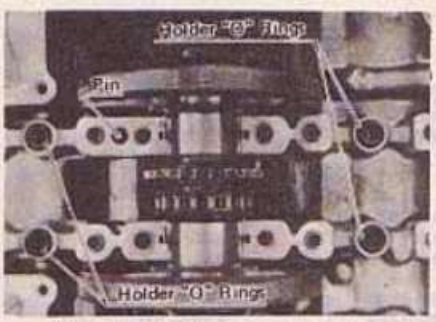
Balancer assembly correctly installed. The weights must be directly upright.



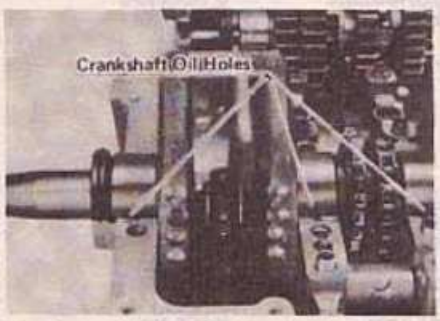
Install the assembly with the holder arrows pointing outward



The crankshaft bushing cap is installed with the arrow facing the front of the engine



The pin and O-rings must be in place



Turn the crankshaft so that the oil holes align with the crankcase mating surface

4. Install the chain on the balancer sprockets. The two chromed links on the chain must align with the punch marks on the sprocket tooth of each sprocket. Turn the holders so that the arrow on each holder points away from the crankshaft.

5. Check that the holder O-rings and the pin are in place in the crankcase.

6. Turn the crankshaft so that the oil holes are even with the upper crankcase mating surface, as shown, and facing the front of the engine.

7. Holding the balancer assembly taut after alignment (Step 4), place one unit in position in the crankcase. Turn the sprocket punch mark so that it aligns with the mark on the holders. Engage the balancer chain with the crankshaft sprocket, and install the remaining unit, aligning the marks as before.

8. With the balancer in place, check that each chrome chain link is aligned with the holder marks. The balance weights must be directly upright, not cocked to either side.

9. Make sure that each holder is well-seated in its locating pin. Install the holder bolts and tighten to 10–11.5 ft lbs.

10. Install the balancer chain guides: one under the upper chain run, one in the crankshaft bushing cap.

11. Oil the crankshaft bushing cap lightly, and install it with the arrow facing the front of the engine. Install the screws, securing them with thread locking compound. Tighten the bushing cap bolts in a cross pattern to 18–22 ft lbs.

Cranksahft

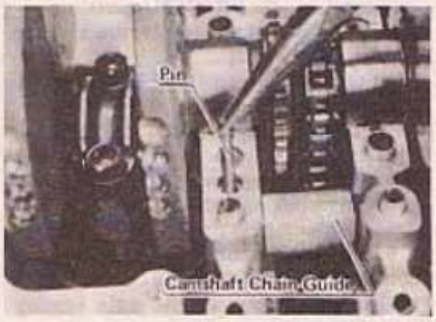
REMOVAL

1. Remove the top end components, including the pistons. Remove the crankcase cover components and split the crankcases. Remove the transmission and the balancer assembly. Refer to the preceding sections for procedures.

2. Remove any balancer holder O-rings which are loose to prevent loss. Remove the pin in the crankcase which secures the camshaft chain guide locating pin.

3. Remove the crankshaft and cam chain. Remove the chain guide, if desired, by pulling out the locating pin.

4. Remove the connecting rods, noting the alignment of the cap and rod marks. The caps must be installed correctly.

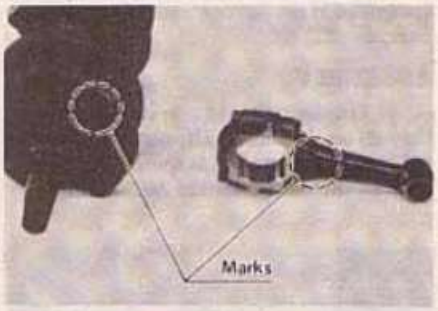


Removing the chain guide pin

INSPECTION

1. Check that the rods are not bent or twisted.

2. Check the condition of the rod bearings. Use Plastigage® to measure rod-crankshaft journal clearance which is set at 0.041–0.071 mm (0.0016–0.0027 in.). Serviceable limit is 0.1 mm (0.0039 in.).



Con rod and crankshaft marks

3. Rods and crankshaft journals are "sized." A mark, or a lack of a mark, on the rods is significant. Crankshaft journals will also have a mark or no mark—but this is not significant, since they refer to factory dimensions. Since the journals wear, they must be measured, and marked accordingly. Proceed as follows:

a. Measure the diameter of the rod journals. If diameter is 35.994–36.000 mm (1.4171–1.4173 in.), mark the journal ("1").

If diameter is 35.984–35.994 mm (1.4167–1.4171 in.), leave the journal unmarked.

NOTE: *Ignore any marks already present on the crankshaft.*

b. Note the mark or lack of mark on the rods. An unmarked rod has a big end diameter of 39.000–39.010 mm (1.5354–1.5358 in.). A marked rod has a diameter of 39.010–39.016 mm (1.5358–1.5361 in.).

This diameter is measured with the rod cap in place and properly torqued. It does not include the bearing inserts;

c. Bearing inserts are color coded, and are available in three thicknesses:

Blue 1.485-10490mm (0.05846-0.05866 in.)

Black 1.480-1.485mm (0.05827-0.05846 in.)

Brown 1.475-1.480mm (0.5856-0.05827 in.)

d. After measuring and marking the crankshaft and noting the con rod marks, select the proper bearing insert according to the following:

If the crank journal is marked, and the rod is not, use the BROWN inserts.

If both journal and rod are marked, use the BLACK inserts.

If the crank is unmarked, but the rod is, use the BLUE inserts.

If neither is marked, use the BLACK inserts.

4. After fitting new bearing inserts, check connecting rod side clerance.

5. Check crankshaft run-out.

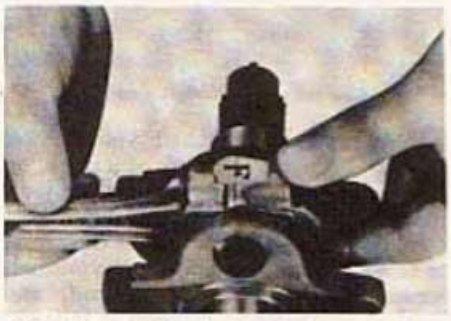
6. Measure crankshaft main bearing diameter. Check main bearing clearance with Plastigage® and replace the main bearing inserts if excessive.

7. Install the bushing cap and tighten the bolts to the proper torque (18-22 ft lbs). Measure crankshaft thrust clearance as shown. Mesure between the bushing cap and center portion of the flywheel. Standard is 0.10-0.20 mm (0.0039-0.0078 in.). If greater than 0.45 mm (0.0177 in.), the crankcases and the bushing cap must be replaced together.

NOTE: *Cap and cases are line-bored when assembled at the factory, and must therefore be replaced in sets.*

ASSEMBLY

1. Lubricate the rod bearings, and install the rods on the crankshaft, ensuring that the rod and cap marks align as shown. Oil the rod bolts and tighten the nuts to 24-27 ft lbs.



The rod caps must be fitted so that the marks align

Crankcase Assembly

1. Clean the case mating surfaces thoroughly. Blow out oil passages.

2. Install the main bearings inserts. Be sure that these and all other components are oiled during assembly.

3. Check that the transmission shaft locating pins and bearings set rings are in place.

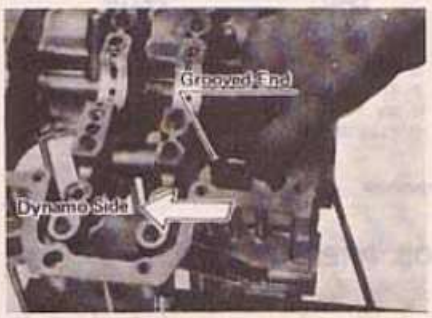
4. If the camshaft chain guide was removed, install it. The grooved end of the guide pin goes toward the alternator side of the engine.

ENGINE AND TRANSMISSION SPECIFICATIONS

	Standard (mm/in.)	Serviceable Limit (mm/in.)
CAMSHAFT		
Lobe height	38.39-38.47/1.511-1.515	38.3/1.508
Journal diameter	27.94-27.96/1.010-1.101	27.90/1.098
Cam bearing clearance	0.043-0.101/0.0017-0.0040	0.19/0.0075
Cam run-out	less than 0.02/0.0008	0.1/0.0039
Cam chain (20 links)	160.0/6.30	162.4/6.39
Chain guide thickness		
front	3.3/0.13	1.5/0.059
rear	4.5/0.15	2.0/0.079
ROCKER ARMS		
Shaft diameter	12.966-12.984/0.5105-0.5112	12.940/0.5095
Rocker arm ID	13.000-13.018/0.5118-0.5125	13.05/0.5138
CYLINDER HEAD		
Max. allowable warpage	—	0.25/0.0098
VALVES		
Head thickness	0.75-1.25/0.030-0.050	0.5/0.020
Stem diameter		
Intake	6.965-6.980/0.2742-0.2748	6.860/0.2701
Exhaust	6.955-6.970/0.2738-0.2744	6.850/0.2700
Run-out	—	0.05/0.0020
Valve guide ID	7.000-7.015/0.2756-0.2762	7.10/0.280
Valve-to-guide clearance		
Intake	0.02-0.05/0.0008-0.0020	0.1/0.0394
Exhaust	0.03-0.06/0.0012-0.0024	0.1/0.0394
Valve spring free-length		
Inner	32.4/1.28	31.0/1.22
Outer	37.3/1.47	36.0/1.42
Valve spring tilt		
Inner	0.85/0.034	1.5/0.060
Outer	0.98/0.039	1.5/0.060
PISTONS AND CYLINDERS (400)		
Cylinder diameter (standard)	63.984-64.004/2.5191-2.5198	64.08/2.521
Piston diameter (standard)	63.94-63.96/2.517-2.518	63.8/2.512
Piston-cylinder clearance	0.034-0.054/0.0013-0.0021	—
Piston pin diameter	14.994-15.000/0.5903-0.5906	14.96/0.589
Piston pin hole ID	15.004-15.011/0.5907-0.5910	15.08/0.594
Con rod small end ID	15.003-15.014/0.5907-0.5911	15.05/0.593
PISTONS AND CYLINDERS (440)		
Cylinder diameter	—	67.60/2.661
Piston diameter	—	67.30/2.650
Piston-cylinder clearance	—	0.035-0.062/0.0014-0.0024
Piston pin diameter	14.994-15.000/14.96/0.589	0.5903-0.5906
Piston pin hole ID	15.004-15.011/0.5907-0.5910	15.08/0.594
Con rod small end ID	15.003-15.014/0.5907-0.5911	15.05/0.593
PISTON RINGS		
Ring thickness		
top	1.460-1.475/0.0575-0.0581	1.38/0.0543
second	1.475-1.490/0.0581-0.0587	1.40/0.0551
oil	2.475-2.490/0.0974-0.0980	2.40/0.0945
Groove width		
top, second	1.50-1.52/0.059-0.060	1.60/0.063
oil	2.50-2.52/0.098-0.099	2.60/0.102
Ring side clearance		
top	0.025-0.060/0.0010-0.0024	0.160-0.0063
second, oil	0.010-0.045/0.0004-0.0018	0.145-0.0057
Fittend end-gap		
all	0.2-0.4/0.008-0.016	0.7/0.028
Free end-gap		
top	6.0/0.31	5.0/0.20
second	10.5/0.41	7.5/0.30
oil	9.0/0.35	6.0/0.24
LOWER END		
Rod misalignment	less than 0.05/0.002 per 100 mm	0.2/0.008
Rod bearing-to-journal clearance	0.041-0.071/0.0016-0.0030	0.1/0.0039
Rod big end side clearance	0.15-0.25/0.006-0.0010	0.45/0.177
Crankshaft run-out	less than 0.02/0.0008	0.05/0.0020
Main bearing clearance	0.036-0.078/0.0014-0.0031	0.11/0.0043
Main bearing journal diameter	35.984-36.000/1.4167-1.4173	35.94/1.415
Crankshaft thrust clearance	0.10-0.20/0.004-0.008	0.45/0.018
BALANCER		
Shaft diameter	19.967-19.980/0.7861-0.7866	19.93/0.7846
Holder ID	20.007-20.028/0.7877-0.7885	20.08/0.7905
Chain length (20 links)	160.0/6.30	162.4/6.39
Chain guide thickness		
upper	2.0/0.079	1.0/0.039
lower	2.5/0.098	1.0/0.039
Spring free-length	9.8-10.4/0.39-0.41	9.0/0.35



Check that the set rings and locating pins are in place



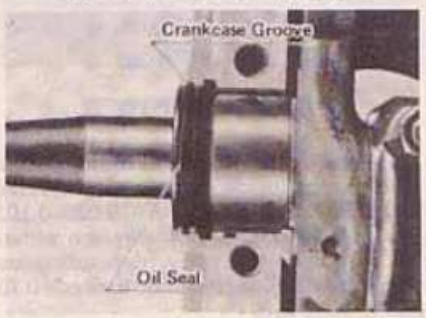
The grooved end of the chain guide locating pin must be on the dynamo (alternator) side



Lower crankcase half components



Upper crankcase half components



The alternator side oil seal is installed with the spring side facing the crankshaft. The ridge on the seal fits into the groove.

5. Install the crank and cam chain. Note that the alternator side of the crankshaft is fitted with an oil seal which must be installed with the spring side facing toward the crank. The ridge on the seal must fit into the groove in the crankcase.

6. Install the cam chain guide pin.

7. Check that the oil passage O-ring and the balancer assembly holder O-rings are in place. Install the balancer assembly.

8. Install the crankshaft bushing cap with chain guide, arrow pointing toward the front of the engine. Install the capscrew, securing them with thread locking compound. Install the capbolts, tightening to 18–22 ft lbs in a cross pattern.

9. Install the shift drum and forks. Install the transmission shafts and gears. Check that the pushrod oil seal is in place. Be sure that the output (countershaft), oil cup is in place on the right-side of the shaft (lower crankcase half). Install the kick-starter assembly.

10. Apply a liquid gasket compound to the upper case half. Install the lower case half. Tighten the lower case 8 mm bolts in the order shown. Proper torque is 18–22 ft lbs. Tighten the bolts gradually and evenly until the proper torque is reached. Tighten the 6 mm bolts gradually and in the order shown to 5.8–7.3 ft lbs.

11. Tighten the upper crankcase bolts to 5.8–7.3 ft lbs.

12. The remainder of the procedure is the reverse of disassembly. Refer to the preceding sections.

ENGINE AND TRANSMISSION SPECIFICATIONS

	Standard (mm/in.)	Serviceable Limit (mm/in.)
CLUTCH AND TRANSMISSION		
Clutch spring free-length	33.8/1.33	32.3/1.27
Friction plate thickness	2.9-3.1/0.11-0.12	2.5/0.10
Max allowable warpage		
steel plate	under 0.15/0.006	0.30/0.012
friction plate	under 0.20/0.008	0.40/0.016
Friction plate-to-clutch housing clearance	0.15-0.40/0.006-0.016	0.60/0.024
Clutch-to-shaft clearance	0.020-0.062/0.0008-0.0024	0.162/0.006
Primary chain max. play	—	20/0.8
Chain guide thickness	7.5/0.30	3.5/0.14
Shifter pawl spring free-length	29.4/1.16	31.0/1.22
Gear backlash	0.06-0.23/0.002-0.009	0.3/0.012
Shifter fork finger thickness	4.9-5.0/0.19-0.20	4.7/0.185
Gear fork groove width	5.05-5.15/0.200-0.203	5.25/0.207

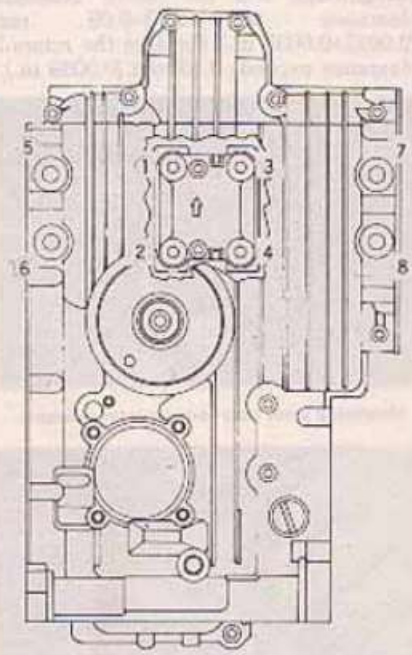
General Torque Specifications①

Thread Diameter (mm)	Torque (ft lbs)
Coarse	
5	2.5–3.5
6	4.5–6.5
8	11.5–16.0
10	22–30
12	39–54
14	60–83
16	94–130
18	130–181
20	188–253
Fine	
5	2.5–3.5
6	4.5–5.5
8	10–13.5
10	19–25
12	33–45
14	54–74
16	83–116
18	123–166
20	166–239

① Unless otherwise noted

Engine Torque Specifications

Part	Torque (ft lbs)
Engine mounting bolts	25–31
Engine mounting bracket bolts	
front	16–19
rear	11.5–14.5
Breather cover bolts	13–14.5
Cylinder head cover nuts	18–22
Cylinder head bolts, 8 mm	18–22
Cylinder head bolts, 6 mm	7.9–9.4
Cam sprocket bolts	10–11.5
Rocker arm shaft nuts	18–22
Alternator rotor bolt	47–51
Starter clutch bolts	24–27
Field coil bolts	5.1–5.8
Armature bolts	5.1–5.8
Countershaft sprocket nut	87–108
Crankcase bolts, 8 mm	18–22
Crankcase bolts, 6 mm	5.8–7.3
Balancer holder bolts	10–11.5
Balancer weight bolts	7.9–9.4
Crankshaft bushing capbolts	18–22
Connecting rod bolts	24–27
Timing advance mechanism bolt	18.5–19.5
Neutral indicator	11–14.5
Oil pressure indicator	10–11.5
Oil filter bolt	11–14.5
Drain plug	14.5–18



Crankcase bolt tightening order

LUBRICATION SYSTEM

OIL PRESSURE

1. Remove the oil pressure indicator switch, and connect the oil pressure gauge adapter (57001-400).
2. At engine operating temperature, pressure should be 57 psi at 4,000 rpm.
3. If pressure is low, check the oil pump.



Checking oil pressure

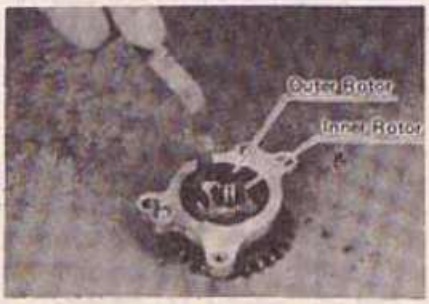
OIL PUMP

Removal

1. The pump is located on the right-side of the lower crankcase half. Access to the pump is obtained by removing the clutch. Refer to "Engine and Transmission" for procedures, if necessary.

Inspection

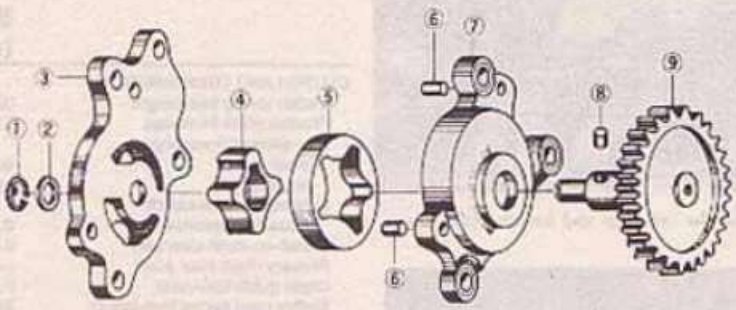
1. Measure inner-to-outer rotor clearance. Standard is 0.025–0.115 mm (0.0010–0.0045 in.). Replace the rotors if clearance exceeds 0.21 mm (0.0083 in.).
2. Check wear to the sides of the rotors by laying a straightedge across the pump and checking clearance between the straightedge and the rotors. Standard clearance is 0.03–0.09 mm (0.0012–0.0035 in.). Replace the rotors if clearance exceeds 0.15 mm (0.0059 in.).



Measuring inner rotor-to-outer rotor clearance

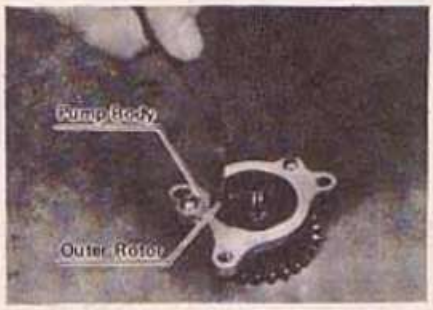


Checking rotor side wear



1. C-ring
2. Washer
3. Body inner half
4. Inner rotor
5. Outer rotor
6. Pin
7. Body outer half
8. Pin
9. Pump drive gear

Oil pump components



Checking outer rotor-to-pump body clearance

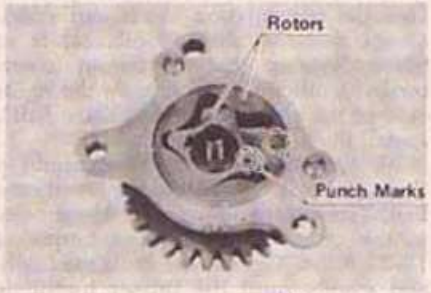
3. Check the clearance between the outer rotor and the pump body. Standard clearance is 0.10–0.15 mm (0.004–0.006 in.). Replace either the outer rotor or the pump body (depending on which is worn), if clearance exceeds 0.25 mm (0.0098 in.).

Disassembly

1. Remove the C-ring and washer from the gear shaft.
2. Separate the body halves and remove the rotors.
3. Remove the shaft pin to remove the gear from the body half.

Assembly

1. Assembly is the reverse of disassembly. Note that the sides of the rotors with the punch marks face away from the gear when installed.



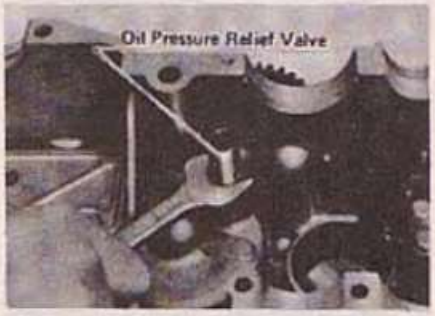
Install rotors with the punch marks facing outward

Installation

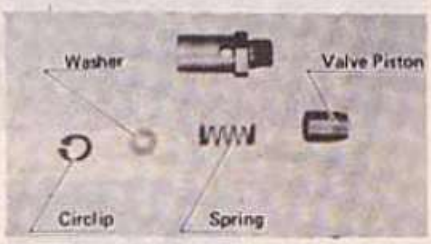
1. Oil the pump internals thoroughly before installation. Use new O-rings if necessary. Be sure that the O-rings are in place.

OIL PRESSURE RELIEF VALVE

1. The oil pressure relief valve is located in the lower crankcase half.
2. To remove the valve, separate the case halves as outlined in "Engine and Transmission." Unscrew the valve from the case.
3. To disassemble the valve, remove the circlip, and take out the washer, spring, and valve piston.



Removing the oil pressure relief valve



Pressure relief valve components

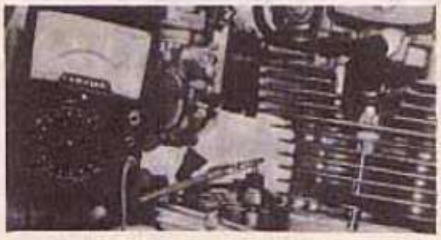
4. Measure the diameter of the piston. Measure the inside diameter of the valve body. Standard clearance is 0.020–0.103 mm (0.0008–0.0041 in.). Replace either the piston or the body (depending on which is worn), if clearance exceeds 0.13 mm (0.0051 in.).
5. Measure the free-length of the spring. Standard value is 20.6 mm (0.811 in.). Serviceable limit is 19.0 mm (0.748 in.).
6. Assembly is the reverse of disassembly. Use thread locking compound when installing the valve in the crankcase.

OIL PRESSURE INDICATOR SWITCH

1. If the bulb fails to light when the ignition switch is turned on, disconnect the wire from the pressure switch.

2. Check for continuity between the switch terminal and the switch body. If resistance is noted, or if there is no continuity, the switch is defective. If there is continuity (no resistance), check the bulb and wiring.

3. The warning buld should go off when the engine passes 1,500 rpm. If it does not, stop the engine and disconnect the switch lead. Connect an ohmmeter or continuity light between the switch lead and the engine (ground). There should be no resistance when the engine is off, and infinite resistance (no continuity) when rpm is above 1,500.



Checking the oil pressure indicator switch

4. If continuity is noted with the engine turning over 1,500 rpm, check oil pressure. If oil pressure is satisfactory, replace the indicator switch. Use thread locking compound when installing the switch. Tighten it to 10.0-11.5 ft lbs.

FUEL SYSTEM

Refer to "Carburetors" in the "General Information" section for carburetor theory, inspection, and troubleshooting.

GAS TANK

Removal

1. Turn off the fuel petcock. Slide the fuel line clamps off the petcock fitting, and disconnect the two fuel lines from the petcock.

2. Open the seat. Unhook the rubber tank strap, and pull the tank backward and off the machine.

Installation

1. Installation is the reverse of removal.

2. Secure all fuel line connections. Check for leaks before operation.

CARBURETORS (1974-76)

Removal

The carburetors are removed together.

1. Remove the gas tank.

2. Remove the left and right sidecovers.

3. Loosen the rubber intake manifold clamp screws and the air cleaner duct clamp screws and move the duct clamps away from the carburetors.

4. Pull the carburetors out of the intake manifolds and move them as far as possible to the right-side of the motorcycle.

5. Adjust the cable adjusters at the twistgrip to yield the maximum amount of throttle cable free-play. Unscew each of the cable adjusters at the carburetors from its bracket



Loosening the carburetor clamp screws



Cable adjusters are detached from their brackets to remove carburetors

and disengage each throttle cable from the pulley.

6. Remove the carburetors from the machine, taking care to pull the overflow and breather tubes out of their guide.

Disassembly

1. Drain the fuel from each float bowl. Although not necessary for disassembly, the carbs may be removed from their mounting plate by removing the two screws which secure each one, and disconnecting the choke linkage and balance screw connection.



Removing the main jet and keeper spring

2. Remove the carburetor caps. Pull out the throttle slide and remove the slide gasket. To remove the needle, remove the retaining screw.

3. Remove the screw securing the cover plate made accessible by removal of the slide. Unscrew and remove the main and slow air jets.

4. Remove the float bowl screws, and take off the float bowl.

5. Lift out the jet keeper spring. Push out the float pivot pin. Remove the float and float needle.

6. Unscrew the float needle seat retainer, and pull out the seat.

7. Pull out the main jet. Turn the carb right side up and allow the needle jet to drop out.

8. Unscrew and remove the starter jet. Remove the pilot passage plug, and unscrew the pilot jet and slow jet.

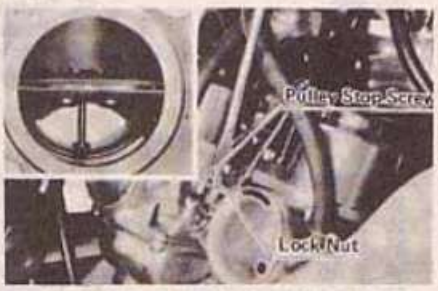
Assembly

1. Reverse the disassembly procedure. Use new gaskets and O-rings.

Installation

1. Check that the butterfly valves are parallel to the carburetor bores when the pulley is rotated fully. If not, loosen the pulley stop screw locknut and turn the screw to make the adjustment. Tighten the locknut.

2. Engage the accelerator throttle cable with the pulley, and screw the cable adjuster all the way into its bracket. Install the decelerator cable in the same manner. Screw both cable adjusters out about halfway of their length.



Use the pulley stop screw, if necessary, so that the butterfly valves are parallel to their bores when the pulley is opened as far as possible



Attaching the accelerator cable to the pulley

3. The remainder of the procedure is the reverse of removal. Be sure that all lines are correctly routed and properly secured. Adjust the throttle cables.

Check for proper operation before riding the machine.

CARBURETORS (1977 AND LATER)

Removal

1. Remove the gas tank. Remove the left and right side covers.

2. Disconnect the lead from the oil pressure switch to avoid damage during removal.

3. Loosen the carburetor clamp screws. Some models have springs on the air cleaner side. Roll the springs away from the carburetors.

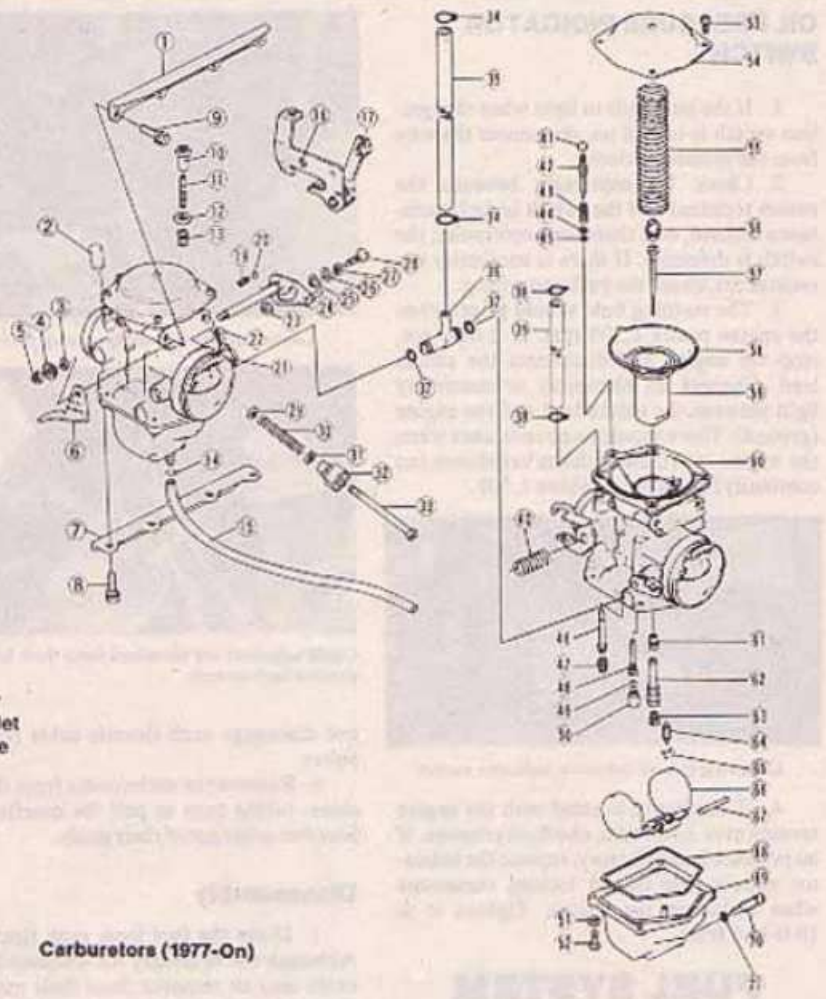
4. Disconnect throttle cables and hoses at the carburetors.

5. Pull the carburetors out of the intake manifold hoses and then the air cleaner hoses and take them out to the right side.

Disassembly

Refer to the exploded view of the carburetor assembly for disassembly and assembly

1. Upper Bracket
2. Cap
3. Lockwasher
4. Washer
5. Nut
6. Choke Lever
7. Lower Bracket
8. Bolt
9. Bolt
10. Locknut
11. Balance Adjusting Screw
12. Washer
13. Spring
14. Clip
15. Overflow Tube
16. Cable Bracket
17. Fast Idle Link
18. Screw
19. Spring
20. Ball
21. Choke Link Spring
22. Choke Link
23. Flat Washer
24. Fast Idle Cam
25. Flat Washer
26. Flat Washer
27. Wave Washer
28. Bolt
29. Washer
30. Spring
31. Washer
32. Knob
33. Idle Adjusting Screw
34. Clip
35. Fuel Line
36. 3-way Joint
37. O-Ring
38. Clip
39. Vacuum Hose
40. Spring
41. Plug
42. Pilot Screw
43. Spring
44. Washer
45. O-Ring
46. Bleed Pipe
47. Primary Main Jet
48. Pilot jet
49. O-Ring
50. Plastic Plug
51. Lockwasher
52. Screw
53. Screw
54. Cap
55. Spring
56. Holding Screw
57. Needle
58. Diaphragm
59. Throttle Slide
60. Carburetor Body
61. Needle Jet
62. Needle Jet Holder
63. Secondary Main Jet
64. Float Valve Needle
65. Needle Clip
66. Float
67. Float Pin
68. Gasket
69. Float Bowl
70. Drain Screw
71. O-Ring



Carburetors (1977-On)

information. Carburetors may have minor variations depending on model and year.

1. Drain the gasoline from each float bowl and dispose of it safely.

2. Remove the carburetor caps. Remove the spring. Carefully pull out the diaphragm and throttle slide assembly taking care not to puncture or otherwise damage the rubber diaphragm.

3. Remove the float bowl screws. Carefully take off the bowl. If it is stuck, tap around the sides with the screwdriver handle until it is free. Do not pry or use excessive force.

4. Push out the float pin. Take out the float and needle assembly.

5. Unscrew the secondary main jet, needle jet holder, primary main jet and bleed pipe.

6. Remove the plastic plug and O-ring and unscrew the pilot jet.

7. Turn the carburetors right side up and push out the needle jet with a wooden dowel.

NOTE: *Pilot jet removal may violate emissions regulations.*

Assembly

1. Clean all metal parts in a safe solvent. Use low pressure compressed air to blow out passages in jets and carburetor bodies.

2. The use of new gaskets and O-rings is recommended.

3. Assembly is the reverse of disassembly. Do not overtighten jets.

4. When fitting the throttle slides, engage the diaphragm tab with the cutout provided.

Installation

1. Check that both butterfly valves open and close smoothly with no binding.

2. Check the clearance of each valve relative to the carburetor bore. If they differ, loosen the locknut and turn the balance adjusting screw until clearance is the same for both.

3. The remainder of the installation procedure is the reverse of removal. Adjust throttle cable(s) after installation. Be sure that all lines and connections are secure.

4. Check for gas leaks before riding the motorcycle.

CARBURETOR SPECIFICATIONS

	KZ400 (1974-76)	KZ400 (1977-On)	KZ440A, D	KZ440B, C
Type	CVB36	CV32	CV36	CV36
Primary Main Jet	125	70	62 (1980) 65 (1981-On)	68
Secondary Main Jet	—	90R	88	90
Jet Needle	—	003001	N02A	N03A
Main Air Jet	60	120	130	130
Secondary Air Jet	90	50	50	50
Pilot Air Jet	—	130	125	125
Pilot Fuel Jet	35	35	35	35
Pilot Screw (turns out)	1½	pre-set	pre-set	pre-set
Fuel Level (mm/in.)	33.5/1.32	3-5/0.12-0.20	3-5/0.12-0.20	3-5/0.12-0.20
Butterfly Angle	10°30′	—	—	—

ELECTRICAL SYSTEMS

IGNITION SYSTEM (1974-80)

1. The ignition system consists of a single set of points, a condenser, and the ignition coil. The coil has two leads—one for each plug—and the cylinders therefore fire at the same time. However, since only one cylinder is on the compression stroke at any time, there is a waste spark at the other cylinder.

2. Since the two plug leads are interdependent (one connected to each end of the secondary coil), disconnecting one lead will result in a lack of spark at both cylinders. Therefore, if one plug is dirty, fouled, or defective, neither cylinder will have spark.

3. If there is no spark, and common items such as fuse, plugs, points, and wiring connections have been checked, remove the plug caps and check for spark by grounding the leads against the cylinder head. If there is spark, one or both of the caps is defective. Replace both.

4. Check the condenser. If the proper test equipment is available, the condenser should rate 0.22 mfd. Alternately, check the condition of the points. Pitting, a burned-looking condition, or mounds and matching depressions are signs of arcing which is caused by a defective condenser. Replace both points and condenser if these conditions are noted.

5. Check the condition of the ignition coil primary winding by disconnecting the two primary winding leads and checking resistance across them (blue and red/yellow). Resistance should be 3.8-4.2 ohms.

6. If the primary winding is within these limits, check the secondary winding by measuring resistance across the two spark plug leads. It should be approximately 13K ohms.

7. If either of these tests indicates a resistance not within the given specifications, replace the coil.

IGNITION SYSTEM (1981 AND LATER)

These models use a transistorized ignition system replacing the breaker points of earlier years.

1. If ignition problems arise, first be sure that all wiring is in good order, connections tight and clean, etc.

2. Ignition timing is not adjusted, but the mechanical timing advance mechanism behind the pickup coil is the same as on earlier models. Be sure that the mechanism is clean and free to move the balance weights. Check that the springs are in good condition.

3. To check the pickup coil, remove the gas tank and disconnect the leads. Check that there is infinite resistance between either lead and the chassis. Check the resistance between the leads is 360-540 ohms.

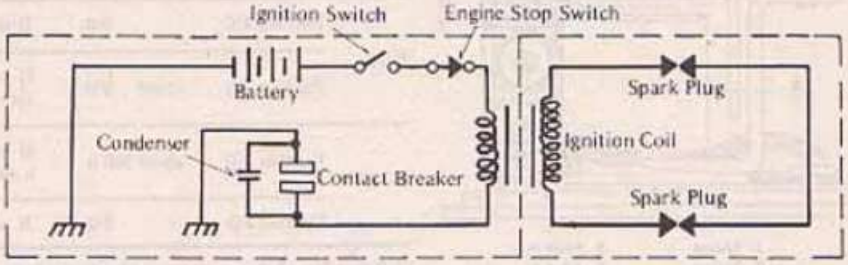
4. The ignition coil can be checked as outlined for 1974-80 models, above.

CHARGING SYSTEM

The charging system consists of the alternator, rectifier, and regulator.

Alternator

1. Before carrying out the following alternator output test, be sure that the battery is fully charged. A low or defective battery will cause misleading readings. If the battery will not hold a full charge, replace it.



Ignition circuit wiring

2. Remove the left sidecover and the headlight. Disconnect the 6-wire connector beneath the sidecover and the 9-wire connector in the headlight shell. Disconnect the white rectifier lead from the battery positive lead.

3. Set a DC voltmeter to the 30v range. Connect the positive meter lead to the rectifier white lead and the negative meter lead to ground on the frame.

4. Remove the right sidecover. Disconnect the green and the brown regulator leads from terminals "F" and "L." Connect these two leads together.

NOTE: *Carry out the test as quickly as possible and disconnect the green and brown leads from each other as soon as the test is finished. Be sure that the leads are insulated from the frame.*

5. Start the engine and allow it to idle at 1,100-1,300 rpm. The voltmeter should read 14v DC or more. If less than this amount, either the alternator or the rectifier is defective.

CAUTION: *Do not let the engine turn above idle speed or the electrical components may be damaged.*

6. If the proper voltage reading was not obtained, check the rectifier as outlined in the following procedure. If the rectifier is satisfactory, check the alternator current output as follows.

7. Connect a 1 ohm-200W variable resistor, one lead to the rectifier white lead and the other to ground on the frame. Set the resistor at its maximum resistance and start the engine. Adjust the resistor to maintain a voltmeter reading of 14.5v, while gradually raising rpm to 5,000.

8. Stop the engine. Disconnect the voltmeter and the resistor lead to the rectifier white wire.

9. Connect an ammeter, set to the 30a DC range, to the variable resistor and to the rectifier white wire. This will put the meter, resistor, and rectifier in series. Be sure that all connections are tight. Start and run the engine at 5,000 rpm. The meter should read 13a DC. If the current reading is lower, the alternator is defective.

To determine which alternator component is faulty, proceed as follows:

10. Remove the right sidecover and disconnect the plug just below the regulator. With an ohmmeter, check the resistance between each of the three leads. Resistance should be 0.4-0.6 ohms. If any measurement shows infinite resistance, the armature has an open circuit and must be replaced.

11. With the highest meter range set to operate, measure resistance between each of the three leads and the frame (ground). Resistance should be infinite in each case. If a reading less than this is noted, the armature must be replaced as there is a short circuit.

12. Using the low range on the ohmmeter, check resistance between the field coil leads: green and black. It must be 4.8 ohms. An infinite reading indicates a break in the field coil, while a lower one indicates a short. In either case, replace the coil.

Rectifier

1. A full-wave rectifier with six diodes is used. An ohmmeter is used to check the rectifier.

2. Remove the left sidecover, disconnect the white rectifier lead from the battery and disconnect the rectifier black lead. The engine must be off.

3. Remove the right sidecover and disconnect the plug below the regulator.

4. Using the 10 or 100 ohm meter range, check resistance between the white lead and each yellow lead in turn, and then between the black lead and each yellow lead. Resistance measurements must be taken in both directions: that is, reverse the meter probes after each reading and take another.

Note the readings. If there is low resistance in one direction, there must be 10 times the amount when the leads are reversed. If any set of readings are either low or high in both directions, the rectifier must be replaced.

Regulator (Mechanical)

1. Remove the left sidecover and disconnect the 6-wire connector. Remove the headlight and disconnect the 9-wire connector in the shell.

2. Set a voltmeter to the 30v DC range and connect it across the battery. Start the engine and run it at 1,600 rpm. The meter should read 14-15v.

NOTE: *As in the alternator test, the battery must be fully charged.*

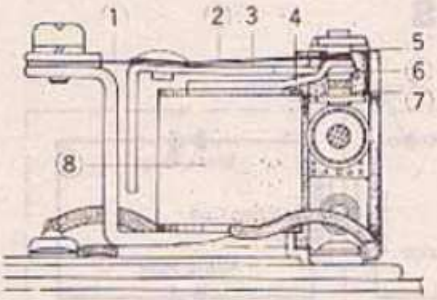
3. Increase engine speed. At 4,000 rpm, the meter reading should gain be 14-15v.

NOTE: *Proceed to 4,000 rpm from a starting point of 1,600. If rpm returns to idle speed, increase it gradually to 1,600 and then to 4,000.*

4. If voltage was not correct in both cases, proceed with the following checks:

NOTE: *If the machine is still under warranty, the regulator should be replaced at this point.*

5. Remove the right sidecover; disconnect the black, green, and brown regulator



1. Spring
2. Spring
3. Armature
4. Adjuster arm
5. Point P_1
6. Point P_0
7. Point P_2
8. Relay coil

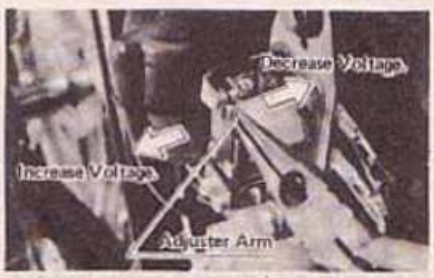
Voltage regulator components

leads from terminals "E," "F," and "I." Remove the regulator cover.

6. With the ohmmeter set to the low range, check the resistance according to the chart:

7. Clean points with solvent if necessary. If badly pitted, use emergy cloth. If the points cannot be cleaned to achieve zero ohms resistance, replace the regulator.

8. Press down on the armature and check



Bending the adjuster arm to correct regulator output



Bending the P_2 holder to correct regulator output

the gap. It should be 0.3 mm (0.012 in.). If not correct, bend the P_2 holder.

9. Check the gap between P and P_0. It should be 0.30-0.45 mm (0.012-0.018 in.). If adjustment is needed, bend the holder for P_1.

10. Assemble the regulator and make all connections. Recheck regulator output as described previously. If voltage was too high, or too low, adjust by bending the adjusting arm. Bending the arm out away from the machine will increase the output voltage and vice versa.

11. Recheck output. At 2,000 rpm, output should be 14-15v. Adjust again, if necessary as in Step 10.

12. Check output at 4,000 rpm. If voltage was too high or too low, bend the P_2 holder. Bend it toward the machine to increase voltage, and vice versa.

13. Recheck at 2,000 and 4,000 rpm.

Regulator Resistance

Terminal	Point P_2	Resistance	Results
F—I	Position 1①	0 Ω	If more than 0 Ω, points P_0 and P_1 are dirty or fouled.
	Position 2②	about 9 Ω	If no reading, resistor Rf is open. If no resistance, there is a short. Replace regulator.
F—E	Position 1①	about 100 Ω	If no reading, the relay coil is open. If no resistance, there is a short. Replace regulator.
	Position 2②	0 Ω	If more than 0 Ω, points P_0 and P_1 are dirty or fouled.

① Points P_0 and P_1 are in contact by spring force.
② Points P_0 and P_1 are in contact by pressing on the armature with a finger.

Regulator/Rectifier

This solid-state component is not adjustable. When the engine is running above idle, the regulator should develop about 14.5v across the battery terminals. The battery must be in a good state of charge for an accurate reading. If voltage is not within this range, the unit must be replaced.

The rectifier section of this unit can be checked for resistance as described for earlier types, above.

STARTER MOTOR

1. Refer to "Engine and Transmission" for removal and installation procedures. See "Left Crankcase Cover Components, Alternator, and Starter Assembly."

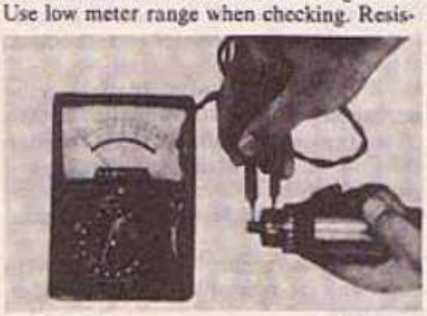
2. Disassemble the starter motor by removing the body screws.

3. Carbon brush length is 11.0-12.5 mm (0.4-0.5 in.) new. Serviceable limit is 6.0 mm (0.24 in.).

4. Clean the commutator surface with a solvent, polishing with fine emery cloth if necessary.

5. Clean out the commutator grooves and check their condition. Standard groove depth is 0.5-0.8 mm (0.02-0.03 in.), while the serviceable limit is 0.2 mm (0.008 in.).

6. There must be little or no resistance between each of the commutator segments. Use low meter range when checking. Resistance between the segments and the armature shaft must be infinite. Use high range when checking.



Checking the starter motor armature for continuity between segments

7. Check resistance between the positive carbon brush and the starter motor lead. There must be no or very little resistance. If considerable resistance is noted, the field coils must be replaced. Use the lowest meter range when making this check.

8. Check resistance between the positive carbon brush and the starter motor body. It must be infinite, or there is a short necessitating replacement of the field coils. Use the highest meter range when making this check.

Solenoid

1. After disconnecting the motor lead from the solenoid, connect an ohmmeter, set on the low scale, across the solenoid terminals. Push the starter button. Resistance when the button is pushed must be zero. If higher, replace the solenoid.

2. If the solenoid does not click when the starter button is pushed, disconnect the black and yellow/red solenoid leads and check resistance across the terminals. It must be close to zero ohms. If higher, replace the solenoid.

3. Check that voltage is getting to the solenoid from the battery. If so, replace the solenoid if it failed any of the above tests.

SWITCHES

Ignition Switch

1. In the "Off" position, all four switch leads must be insulated (no continuity) from each other.

2. In the "On" position, there must be continuity between the white and brown leads and between the blue and red leads.

3. In the "Park" position, there must be continuity betwen the white and red leads; none between the others.

Headlight Dimmer Switch

1. In the "high beam" position, there must be continuity between the blue and red/black leads.

2. In the "low beam" position there must be continuity between the red/yellow and blue leads.

Brake Light Switches

DISC BRAKE

1. Disconnect the leads from the switch which is just above the lower triple clamp. Continuity should exist when the brake lever is pulled. If not, replace the switch.

2. Protect plated or painted surfaces from possible brake fluid spillage when removing the switch.

3. Apply thread locking compound to the threads of the new switch, but not on the lower quarter of the threads to avoid contamination of the brake fluid.

4. Bleed the brake lines.

DRUM BRAKE

1. Front drum brake light leads are in the headlight shell (blue and brown).

2. Rear brake light switch leads are accessible at the rear of the gask tank.

3. Continuity between the leads must be present when the brake lever or pedal is applied, or the switch must be replaced.

CHASSIS

FRONT WHEEL

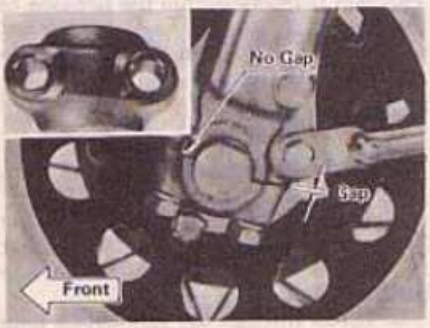
Removal and Installation

DISC BRAKE

1. Support the front wheel off the ground.
2. Remove the axle nut cotter pin. Remove the nut and washer.
3. Remove the axle clamp nuts from the slider. Remove the clamp.
4. Support the wheel and pull out the axle to remove the wheel.

To install the wheel:

5. Be sure that the speedometer cable is located on the inside of the fender bracket. Fit the speedometer gear housing to the wheel.
6. Install the wheel, slipping the axle through from the disc side.
7. Install the axle clamp. Note that the arrow on the bottom of the clamp must point toward the front of the motorcycle. The clamp is machined unevenly so that there will be a gap between the clamp and the slider at the rear of the slider. Install the washers and nuts, but do not tighten them.



Install the axle clamp as shown

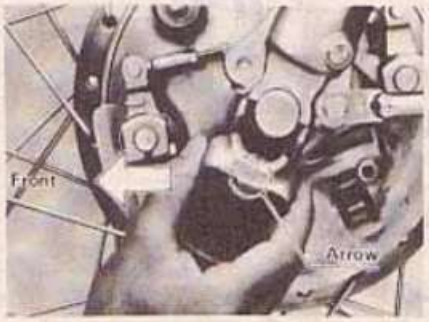
8. Install and tighten the axle nut to 72–94 ft lbs. Check that the speedometer gear housing does not move when this is done. Use a new cotter pin.
9. Tighten the front axle clamp nut to 13.0–14.5 ft lbs, then tighten the rear nut to the same torque.

DRUM BRAKE

1. Support the front wheel off the ground.
2. Remove the brake cable cotter pin and unscrew the adjusting nut to disconnect the cable from the brake plate. Take out the brake lever fitting.
3. Disconnect the speedometer cable from the brake plate after removing the securing bolt.
4. Unbolt the brake anchor from the slider and the brake plate.
5. Remove the axle nut. Remove the axle clamp nuts and the clamp.
6. Lift the wheel slightly, and pull out the axle, then remove the wheel from the machine.

To install the wheel:

7. Put the wheel into position between the sliders. Insert the axle from the brake plate side. Install the axle clamp.



The axle clamp arrow points toward the front of the motorcycle

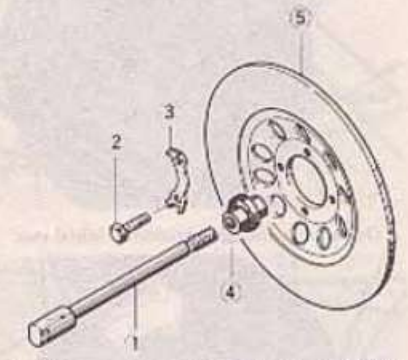
Install, but do not tighten, the clamp nuts. Note that the arrow stamped on the clamp points toward the front of the motorcycle. The clamp is machined unevenly. When installed, there will be a gap between the clamp and the slider at the rear of the slider.

8. Fit, but do not tighten, the axle washer and nut.
9. Install the brake anchor, tightening the nuts to 19.5–22.0 ft lbs.
10. Tighten the axle nut to 72–94 ft lbs. Tighten the forewardmost clamp nut to 13.0–14.5 ft lbs, and then tighten the rear one to the same torque.
11. The remainder of the procedure is the reverse of removal.

Disassembly

DISC BRAKE

1. To disassemble the speedometer gear housing, disconnect the cable. Pull out the gear drive with snap-ring pliers. Remove the bush and pinion after drilling out the locating pin. Pack the assembly with grease prior to assembly.
2. Unbolt and remove the disc. Remove the disc-side hub cap.
3. Pry out the disc side grease seal. Remove the bearing retainer circlip.
4. Using a drift, tap around the outer race of the speedometer gear side wheel bearing until the disc side bearing is driven out.



1. Axle
2. Bolt
3. Lockplate
4. Cap
5. Brake disc
6. Wheel hub
7. Grease seal
8. Circlip
9. Wheel bearing
10. Spacer
11. Grease seal
12. Speedometer gear housing
13. Pin
14. Washer
15. Speedometer pinion
16. Bush
17. Gear drive
18. Speedometer gear
19. Axle nut
20. Cotter pin
21. Wheel bearing

5. Remove the remaining grease seal and speedometer drive. Remove the remaining wheel bearing by tapping out from the inside.

DRUM BRAKE

1. Remove the brake linings from the brake plate by pulling them apart until free of their cams.
2. To remove the brake levers and linkage from the brake cams, first mark the positions of the levers relative to the cams. Remove the pinch-bolts. Remove the levers, return spring, wear indicator, etc. Push the cams out of the brake plate noting the dust seals.
3. Remove the speedometer pinion gear by unscrewing the bushing.
4. Remove the hub cap (axle nut side).
5. Pry out the grease seal. With a suitable drift, tap around the race of the right-side wheel bearing until the left-side bearing is free. Remove the remaining bearing in the same manner.
6. Remove the speedometer gear using a gear puller. Remove the remaining grease seal.

Inspection

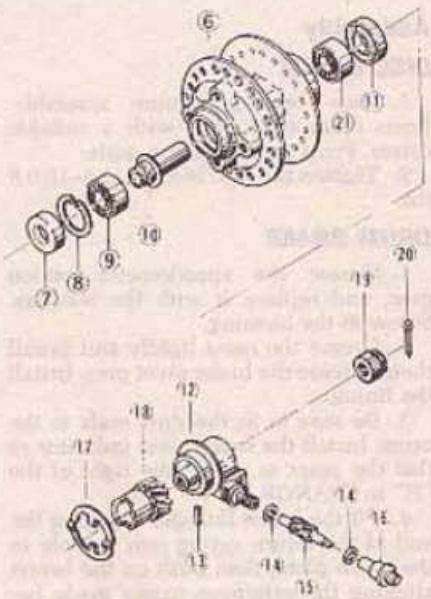
1. Axle run-out (max. standard) is 0.1 mm (0.004 in.). Serviceable limit is 0.2 mm (0.008 in.). Although it may be possible to straighten slightly bent axles, those with a run-out which exceeds 0.7 mm (0.028 in.) must be replaced.

Measured run-out is the total gauge variation.

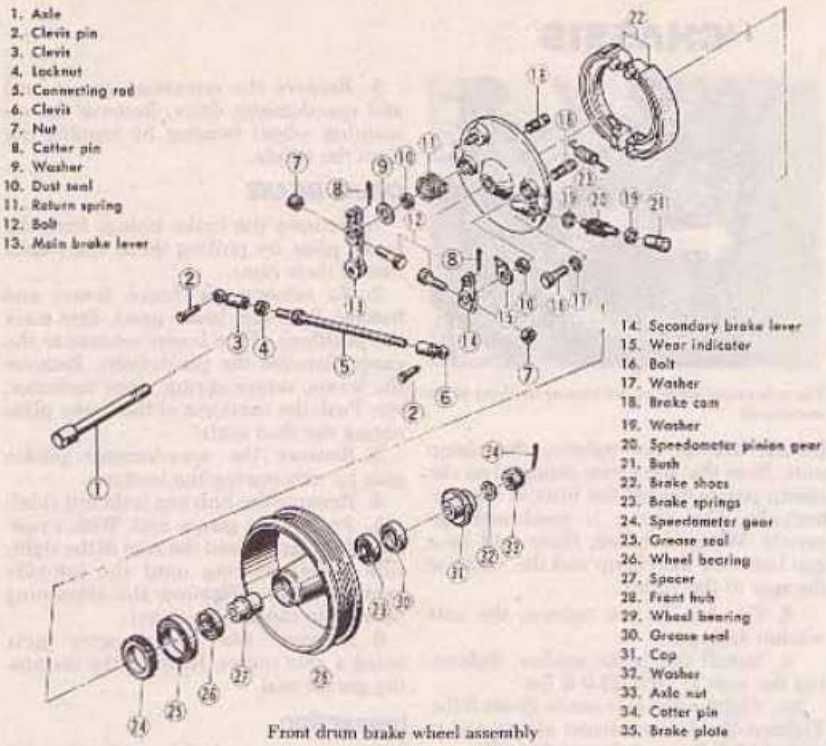
2. Check wheel bearings for rough rotation, binding, looseness, etc., after removing old grease and oiling lightly.
3. Grease seals which have been removed must be replaced with new ones.

If the seals are still in place, check for obvious damage, hardening, etc.

4. For brake disc inspection, refer to the "Disc Brake" section, following.
5. Check brake lining thickness. Standard is 4.75–5.20 mm (0.19–0.20 in.). Serviceable limit is 2.5 mm (0.10 in.).



Front disc brake wheel assembly



Front drum brake wheel assembly

6. Check brake drum inside diameter. Standard is 180.0–180.2 mm (7.086–7.094 in.). Serviceable limit is 180.75 mm (7.116 in.).

7. Check brake spring free-length. Standard is 46.7–47.3 mm (1.84–1.86 in.). Serviceable limit is 48.5 mm (1.91 in.).

8. Brake cam diameter (standard) is 14.957–14.984 mm (0.5889–0.5899 in.). Serviceable limit is 14.83 mm (0.584 in.). Cam hole diameter is 15.000–15.027 mm (0.5906–0.5916 in.). Serviceable limit is 15.18 mm (0.598 in.).

9. Wheel bearing numbers are as follows:

Disc brake: #6302
Drum brake:
left #6302Z
right #6302

Assembly

DISC BRAKE

1. Pack bearings before assembly. Press them into place with a suitable driver. Press in new grease seals.

2. Tighten the disc bolts to 11.5–16.0 ft lbs.

DRUM BRAKE

1. Grease the speedometer pinion gear, and replace it with the washers. Screw in the bushing.

2. Grease the cams lightly and install them. Grease the brake pivot pins. Install the linings.

3. Be sure to fit the dust seals to the cams. Install the brake wear indicator so that the point is just to the right of the "E" in "RANGE."

4. Fit the brake linkage, engaging the end of the return spring into its hole in the brake plate, then push on the levers aligning the reference marks made before removal.

5. Assemble the hub, packing the bearings with grease and pressing them in with a suitable drift. If the speedometer gear was removed, peen it in four places for security after pressing it on.

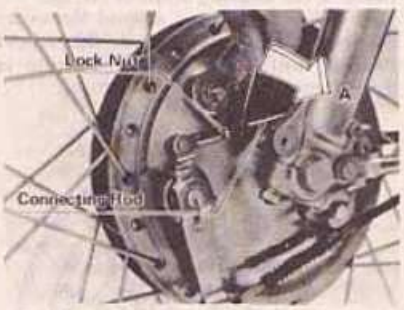
6. The remainder of the procedure is the reverse of disassembly.

LINKAGE ADJUSTMENT

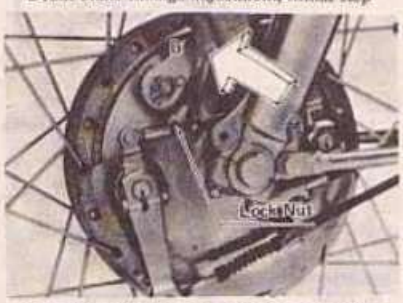
1. Fit the wheel to the motorcycle and secure it at all points.

2. Support the front wheel off the ground.

3. Loosen the connecting rod locknut and turn the rod one turn in the direction shown.



Drum brake linkage adjustment, initial step



Drum brake linkage adjustment, second step

4. Spin the wheel slowly and turn in the cable adjusting nut until the shoe controlled by the main brake lever just touches the drum.

5. Continue turning the wheel, and turn the connecting rod in the direction "B" shown until the secondary shoe just touches the drum.

6. The brakes are now synchronized. Tighten the connecting rod locknut. Adjust the cable as outlined in "Maintenance."

REAR WHEEL

Removal and Installation

1. Disconnect the brake anchor from the brake plate.

2. Disconnect the brake light switch spring from the brake pedal. Remove the brake adjusting nut from the brake rod. Disconnect the rod from the brake lever.

3. Remove the axle nut. Take out the axle.

4. Remove the axle spacer from the right-side of the wheel. Move the wheel as far as possible to the right to detach it from the coupling and remove it from the motorcycle.

To install the wheel:

5. Reverse the removal procedure. The axle is inserted from the left-side of the wheel. Tighten the brake anchor nut to 19.5–22 ft lbs. Then tighten the axle nut to 94–116 ft lbs.

Disassembly

1. Mark the position of the lever relative to the brake cam. Remove the pinch-bolt, wear indicator, and dust seal.

2. Remove the brake lever. Pull the brake shoes, complete with the cam, out of the brake plate. Spread the shoes to disassemble.

3. Reach through the hub with a long punch and tap out the right-side wheel bearing. Remove the spacer and tap out the left-side bearing from the inside of the hub.

Inspection

1. Axle run-out (max. standard) is 0.05 mm (0.002 in.). Serviceable limit is 0.2 mm (0.008 in.). Although it may be possible to straighten slightly bent axles, those with a run-out which exceeds 0.7 mm (0.028 in.) must be replaced.

Measured run-out is the total gauge variation.

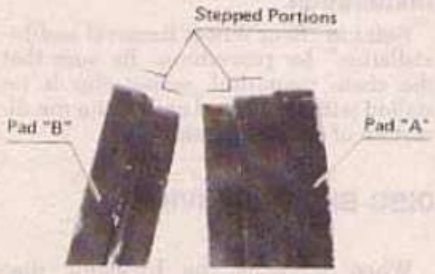
2. Check wheel bearings for rough rotation, binding, looseness, etc., after removing old grease and oiling lightly.

3. Check brake lining thickness. Standard is 5.35–6.05 mm (0.21–0.24 in.). Serviceable limit is 2.5 mm (0.10 in.).

4. Check brake drum inside diameter. Standard is 180.0–180.2 mm (7.086–7.094 in.). Serviceable limit is 180.75 mm (7.116 in.).

5. Check brake spring free-length. Standard is 56.0 mm (2.20 in.), while serviceable limit is 58.0 mm (2.28 in.).

6. Brake cam diameter (standard) is 16.957–16.984 mm (0.6676–0.6687 in.). Serviceable limit is 16.83 mm (0.663 in.). Cam hole diameter is 17.000–17.027 mm (0.6693–0.6704 in.). Serviceable limit is



Replace pads when either is worn to the stepped portion



Removing pad B

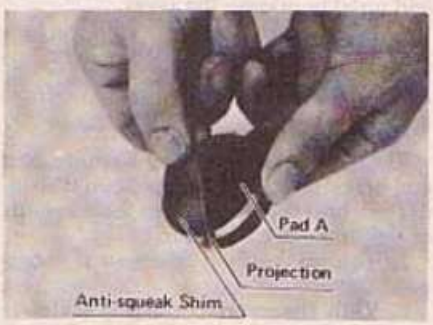
ing off its washer and the metal plate. Remove the inner pad ("B").

3. Apply the brake lever until the outer pad ("A") is pushed out.

4. Loosen the bleed nipple slightly, push the piston in as far as possible, then tighten the nipple.

5. Place the shim on the rear of the outer pad, shim projection over pad projection, align the pad projection with the slot in the bottom of the caliper, and insert the pad.

6. Install the "B," metal disc, and screw. Use thread locking compound on the screw.



Fit the shim projection over the pad projection

7. Check reservoir fluid level.

NOTE: *After fitting new pads, avoid hard application of the brake for at least 50 miles. Replace the dust seal and piston fluid seal every other time the pads are replaced. Refer to "Caliper" for procedures.*

Disc

1. The disc may be checked in place.

2. Measure thickness. Standard is 6.95–7.05 mm (0.27–0.28 in.). Serviceable limit is 5.5 mm (0.22 in.).

3. Check run-out. Standard is 0.1 mm (0.004 in.) or less. Serviceable limit is 0.3 mm (0.012 in.).

NOTE: *If run-out is excessive, check that the reading is not being caused by bad wheel bearings before replacing the disc.*

4. The disc is easily removed by unbolting it from the wheel after the wheel is removed. Tighten the nuts to 11.5–16.0 ft lbs for installation.

Caliper

CAUTION: *Caliper parts (except disc and pads) are cleaned with new brake fluid, isopropyl alcohol, or ethyl alcohol ONLY. Do not use anything else.*

REMOVAL

1. Disconnect the brake line at the caliper and plug the end to prevent fluid spillage.

2. If the caliper holder is to be removed loosen the two allen bolts.

3. Remove the two mounting bolts and take off the caliper.

DISASSEMBLY

1. Remove the pads. Apply compressed air to the brake line fitting to force out the piston. If the piston cannot be removed, replace the caliper.

2. Being very careful of the caliper walls, remove the dust seal and the fluid seal from the caliper.

3. Remove the allen bolts previously loosened and pull out the caliper holder.



Removing the piston from the caliper with compressed air

INSPECTION

1. Check the dimensions of all parts against the specifications given in the "Chassis Specifications" chart at the end of this section.

2. Replace the fluid seal if leakage around the pad is noted, if there is a large difference in wear between the pads, or if the seal is stuck to the piston.

ASSEMBLY

1. Clean caliper internals (except pads) with new brake fluid, isopropyl alcohol, or ethyl alcohol.

2. Assembly is the reverse of disassembly. Be sure that the caliper holder dust cover is properly secured. Coat the sides of the piston with brake fluid before inserting it into the caliper.

INSTALLATION

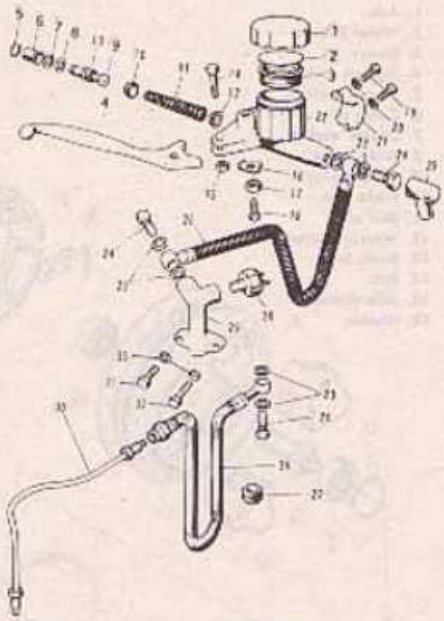
1. Installation is the reverse of removal. Tighten allen bolts to 22–26 ft lbs, and mounting bolts to 18–24 ft lbs. Tighten banjo bolts to 18–24 ft lbs.

2. Bleed the system.

Master Cylinder

REMOVAL

1. Remove the right-side mirror.



1. Cap
2. Plate
3. Diaphragm
4. Brake lever
5. Dust seal stopper
6. Dust seal
7. Retaining ring
8. Piston stopper
9. Piston assembly
10. Primary cup
11. Spring assembly
12. Check valve assembly
13. Secondary cup
14. Bolt
15. Nut
16. Lockwasher
17. Nut
18. Bolt
19. Bolt
20. Washer
21. Master cylinder clamp
22. Master cylinder body
23. Washer
24. Banjo bolt
25. Dust cover
26. Hose
27. Grommet
28. Brake light switch
29. 3-way joint
30. Pipe
31. Bolt
32. Bolt
33. Washer
34. Hose

Master cylinder assembly

2. Slip off the banjo fitting dust cover and disconnect the brake line from the master cylinder; note the washer on either side of the banjo.

3. Remove the two clamp bolts, taking care that fluid is not spilt, and remove the master cylinder.

Disassembly

1. Remove the reservoir cap and diaphragm and pour out the brake fluid.

2. Remove the brake lever. Use the special master cylinder stopper remover to remove the dust seal stopper and then take out the dust seal.

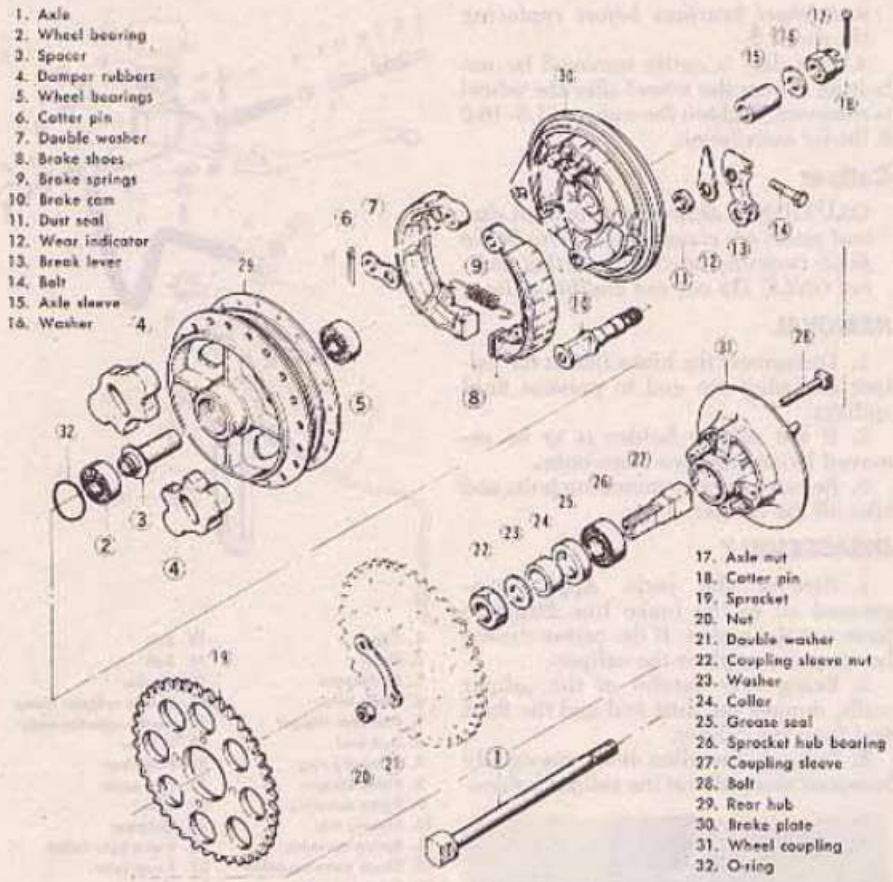
3. Remove the retaining ring and remove the stopper, piston, primary cup, spring, and check valve out of the master cylinder. Do not remove the secondary cup from the piston.

Inspection

1. Check the master cylinder components against the standard specifications given in the "Chassis Specifications" chart at the end of this section.

2. Check for obvious defects to the master cylinder bore and the piston body.

3. Inspect the rubber parts for damage or rotting and swelling. The cups should be slightly larger than the cylinder bore. If leakage at the master cylinder has occurred, replace both cups. Replacement of the secondary cup requires replacement of the piston as well.



Rear wheel and sprocket assembly

17.18 mm (0.676 in.).

7. Wheel bearing numbers are as follows:
Left: #6303
Right: #6303Z

Assembly

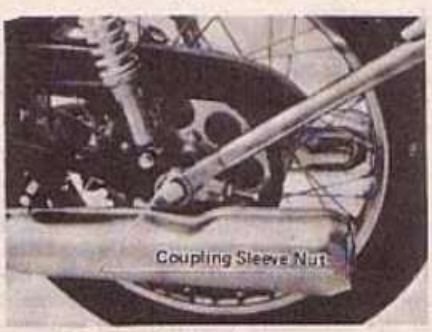
1. Grease the cam lightly before installation. Grease the brake plate pins as well.

2. Assembly is the reverse of disassembly. When fitting the brake wear indicator, have it point just to the right of the "E" in "RANGE."

SPROCKET ASSEMBLY

Removal

1. Disconnect the drive chain. Follow the rear wheel removal procedure as previously outlined, and in addition, remove the coupling sleeve nut and washer. The wheel and sprocket assembly can then be removed from the motorcycle together.



Loosening the coupling sleeve nut

Disassembly

1. Bend down the locking tabs on the sprocket nuts. Remove the nuts and the sprocket. Detach the coupling from the rear wheel.

2. Pull out the sleeve and collar.

3. Remove the grease seal by prying it out.

4. Use a suitable drift to tap out the coupling bearing. The bearing is driven out of the sprocket side of the coupling.

Inspection

1. Check condition of the coupling rubber dampers in the wheel hub. Replace any which are damaged.

2. Check the condition of the coupling bearing in the same manner as wheel bearings. Repack with new grease before installation.

3. Check the sprocket teeth for condition. Check diameter. Standard is 217.4 mm (8.56 in.). Serviceable limit is 215.5 mm (8.48 in.).

4. Sprocket run-out is less than 0.3 mm (0.012 in.); replace the sprocket if it is warped more than 0.5 mm (0.020 in.).

5. Chain condition can be checked by stretching the chain with about 25 lbs pressure and measuring the length of a 20-pin section of chain. Standard length is 317.5 mm (12.50 in.); replace the chain if the measurement is over 323 mm (12.7 in.).

Assembly

1. Reverse the disassembly procedure. Repack the bearing with grease. Tighten sprocket nuts to 25-31 ft lbs.

Installation

Refer to "Rear Wheel Removal and Installation" for procedures. Be sure that the chain masterlink spring clip is installed with the closed end facing the direction of chain rotation.

DISC BRAKE SERVICE

When servicing the hydraulic disc brake system, observe the following precautions:

a. Brake fluid absorbs moisture. Therefore, never add fluid from an old or an unsealed container;

b. Do not add fluid which has been pumped out of the system. Add new fluid only;

c. Protect all plated and painted surfaces from possible contact with spilled brake fluid;

d. Do not mix types of brake fluid. Use DOT 3 brake fluid only. The following types are recommended:
Atlas Extra Heavy-Duty
Shell Super Heavy-Duty
Texaco Super Heavy-Duty
Wagner Lockheed Heavy-Duty
Girling Amber

Flushing

1. Attach a clear plastic hose which will fit snugly to the caliper bleed nipple and put the other end in a quantity of brake fluid in a suitable container.

2. Open the bleed nipple and apply the brake lever in slow, even strokes until all of the old fluid is pumped out.

3. Close the bleed nipple. Refill the reservoir with fresh fluid. Open the nipple, apply the lever, and, holding it against the handgrip, close the nipple and quickly release the lever.

4. Repeat this procedure until the new fluid begins to come out of the hose.

5. Bleed the air from the system.

Bleeding

This should be done after flushing, or if any brake line junction has been disconnected, or if the brake lever feels spongy or the brake is inefficient.

1. Top up the fluid reservoir if necessary.

2. With the reservoir cap off, slowly pump the lever several times until no air bubbles can be seen rising from the passages at the bottom.

3. Replace the cap. Fit a length of plastic hose which will fit snugly to the caliper bleed nipple, immersing the other end of the hose in a quantity of brake fluid in a suitable container.

4. Apply the brake lever several times until it becomes hard. Hold it tightly and loosen the bleed nipple, then close it quickly.

5. Release the lever. Repeat this procedure until brake fluid only comes out of the hose, and no air bubbles.

Pad Replacement

1. When either pad is worn down to the stepped portion, replace both as a set.

2. Remove the front wheel. Remove the screw from the inner caliper half, tak-



Removing the dust seal stopper

ASSEMBLY

1. Clean all parts in new brake fluid or isopropyl or ethyl alcohol.

CAUTION: *Do not use anything else to clean brake parts.*

2. Smear the parts and the inner walls of the master cylinder with brake fluid.

3. Check that the primary cup and check valve are installed facing the right direction, and are not misaligned during installation.



Installing the retaining ring

4. Install the check valve, spring, primary cup, and piston. Fit the piston stopper.

5. Install a new retaining ring, ensuring that it is properly seated in its groove. Install the dust seal and stopper.

6. The remainder of the procedure is the reverse of disassembly.

INSTALLATION

1. When installing the master cylinder, note that the small projection on the clamp goes on the twist-grip side.

2. Tighten the upper bolt first to 4.3–6.5 ft lbs, then the lower bolt to the same torque. Tighten the banjo bolt to 18–24 ft lbs and bleed the system.

FRONT FORKS

Removal

1. Remove the front wheel. Remove the fender.

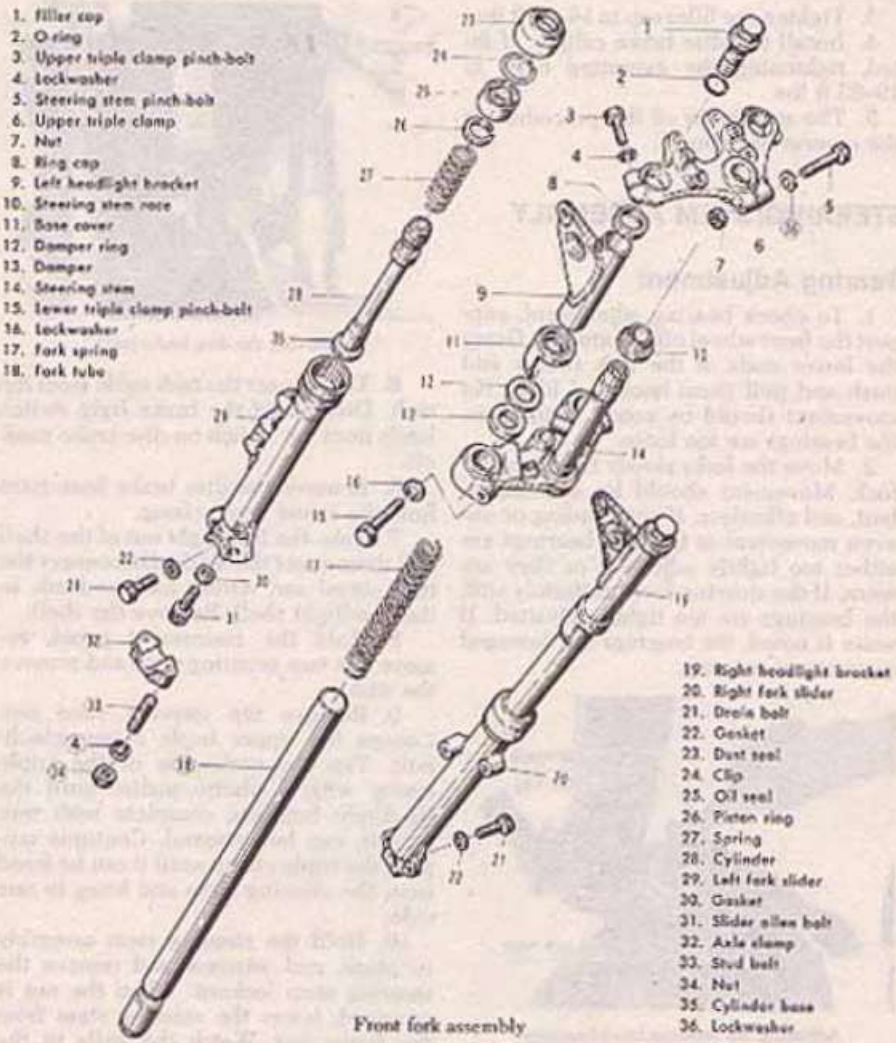
2. On disc brake models, unbolt the caliper, supporting it out of the way to avoid bending the pipe.

3. If disassembly of the fork leg is required, loosen the filler cap(s) at this point.

4. Loosen the upper and lower triple clamp pinch-bolts.

5. Pull out the fork leg twisting it as necessary until it is free of the triple clamps.

6. Remove the remaining fork leg in the same manner.



Front fork assembly

Disassembly

1. Remove the filler cap and take out the fork spring. Pour the fork oil out, pumping the slider to remove it all.

2. Pry up the dust seal from the top of the slider.

3. Insert the special piston holder to secure the cylinder and remove the allen bolt from the bottom of the slider. It may be possible to remove the allen bolt without the tool, but if the cylinder assembly begins to turn as the bolt is loosened, the tool will be necessary.

4. Pull the fork slider from the fork tube. Remove the cylinder components from the top of the fork tube.

5. Remove the slider oil seal clip and pull out the oil seal. Remove the cylinder base from the slider.

Inspection

1. Check spring free-length. Standard is 475 mm (18.7 in.). If either spring is compressed below 465 mm (18.3 in.), both springs should be replaced to ensure equal damping characteristics.

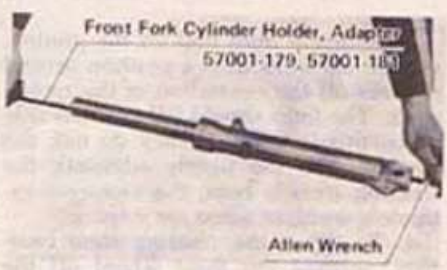
2. Check damper components for wear. Replace as necessary.

Assembly

1. Use new fork slider oil seals.

2. Install the cylinder base in the slider.

3. Press a new oil seal into the slider after lubricating the seal's outer side to facilitate assembly. Install the clip.



Removing the slider allen bolt with the special tool

4. Install the cylinder assembly in the fork tube inserting it so that the end protrudes from the bottom of the fork tube.

5. Oil the inner lips of the slider seal, fit the bottom of the cylinder into the cylinder base, sliding the slider all the way onto the fork tube.

6. Use thread locking compound on the allen bolt and tighten it.

7. Install the slider dust seal. Refill the forks with the correct grade and quantity of oil (refer to "Maintenance"). Fit the spring (close coils toward the top of the fork) and the filler cap.

Installation

1. Install the fork leg into the triple clamps until the edge of the top of the tube is flush with the upper triple clamp surface.

2. Tighten the upper triple clamp pinch-bolt to 11.5–13.0 ft lbs, and then the lower triple clamp pinch-bolt to 14.5–22.0 ft lbs.

3. Tighten the filler cap to 18–22 ft lbs.
4. Install the disc brake caliper, if fitted, tightening the mounting bolts to 19–23 ft lbs.
5. The remainder of the procedure is the reverse of removal.

STEERING STEM ASSEMBLY

Bearing Adjustment

1. To check bearing adjustment, support the front wheel off the ground. Grasp the lower ends of the fork sliders and push and pull them back and forth. No movement should be noted. If there is, the bearings are too loose.
2. Move the forks slowly from lock-to-lock. Movement should be smooth, silent, and effortless. If any binding or uneven movement is felt, the bearings are either too tightly adjusted, or they are worn. If the steering feels uniformly stiff, the bearings are too tightly adjusted. If noise is noted, the bearings are damaged or some are missing.

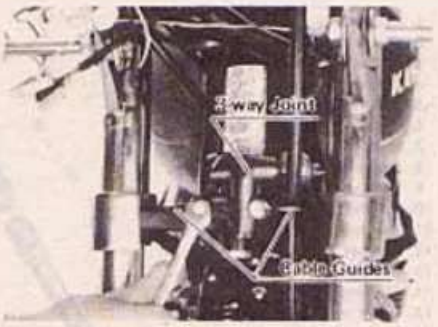


Adjusting the steering head bearings

3. With the front end off the ground, release the forks from a position several degrees off the centerline of the motorcycle. The forks should fall to either side when this is done. If they do not, the bearings are too tightly adjusted, the steering stem is bent, the races are extremely worn, or some are missing.
4. To adjust the steering stem bearings, support the front wheel off the ground, loosen the steering stem bolt and the pinch-bolt. Use the special wrench to tighten or loosen the steering stem locknut (just under the upper triple clamp), until bearing action conforms to those standards in Steps 1–3.
5. Tighten the steering stem nut to 40 ft lbs. Tighten the pinch-bolt to 11.5–13.0 ft lbs. Momentarily loosen the lower triple clamp pinch-bolts, and then tighten them to 14.5–22.0 ft lbs. Recheck bearing adjustment. If proper adjustment is not possible, the bearings and races may be worn and in need of replacement.

Removal

1. Drain the disc brake fluid, if applicable.
2. Remove the front wheel. Unbolt the master cylinder from the handlebar, disconnecting the brake line from the joint on the lower triple clamp.
3. Remove the caliper and the lower brake hose.
4. Remove the front fender. Remove the forks.



Removing the disc brake joint

5. Disconnect the tach cable from the tach. Disconnect the brake light switch leads from the switch on disc brake models.
6. Remove the disc brake hose joint from the lower triple clamp.
7. Take the headlight out of the shell and disconnect the leads. Disconnect the turn signal and wiring harness leads in the headlight shell. Remove the shell.
8. Hold the instrument panel, remove the two securing nuts and remove the unit.
9. Remove the steering stem nut. Loosen the upper triple clamp pinch-bolt. Tap the underside of the triple clamp with a plastic mallet until the headlight brackets, complete with turn signals, can be removed. Continue tapping the triple clamp until it can be freed from the steering stem and hung to one side.
10. Hold the steering stem assembly in place, and unscrew and remove the steering stem locknut. When the nut is removed, lower the steering stem from the frame lug. Watch the balls in the lower race as they will fall out as the stem is lowered. The upper balls are accessible after removing the cap.

Inspection

1. The bearing balls are standard ¼ in. in size, and 19 are used in each race.
2. Clean balls in solvent. Wipe old grease off races. Check the balls for rust, dents, pitting, and other damage. Check that the race surfaces are perfectly smooth and without dents, cracks, or ripples.
3. If any parts are damaged, replace bearings and races as a set.
4. Remove races from the frame by punching them out. Drive new races straight in.
5. Remove the steering stem race, if necessary, with a hammer and punch. The race is pressed onto the stem.

Installation

1. Lubricate the races with bearing grease and press 19 balls into the frame race and the steering stem race. Raise the stem carefully into position and screw on the stem locknut.
2. The remainder of installation is the reverse of removal. When fitting the headlight brackets, note that the ring cap goes on the top and the damper, damper ring, and stem base cover are at the bottom.

SHOCK ABSORBERS

Removal

1. To remove one of the shock absorbers, remove the grab bar mounting nuts, loosen the top shock nuts, and remove the grab bar. Lifting up the rear wheel to avoid damage to the shock bolt threads, remove the lower shock bolt. Remove the capnut and washers and remove the shock absorber.
2. To remove the other shock, repeat the procedure.

Inspection

1. Check for damping by compressing the shock absorber as much as possible, then releasing. If the shock springs quickly back to full length, the damping unit is defective.

Replace shocks in pairs even if only one is bad.

2. Shock absorber dampers are sealed units and cannot be disassembled.

Installation

1. Reverse the removal procedure. Mounting point torque is 19.5–24.0 ft lbs for both upper and lower mounts.

SWING ARM

Inspection

1. Remove the rear wheel, sprocket assembly, and shock absorbers.
2. Measure the distance between the top and bottom shock absorber mounts on both sides. The two measurements must be identical, or the swing arm will have to be replaced.
3. Check that the rear wheel mounting plates are parallel.
4. Grasp the swing arm and attempt to move it from side to side. Any noticeable side play indicates worn bushings which will need replacement.

Removal

1. Proceed as above (Step 1).
2. Remove the swing arm pivot shaft nut and pull out the shaft. Remove the swing arm noting the dust cap on each end which will come off.
3. Remove the chain guard and brake anchor from the swing arm.

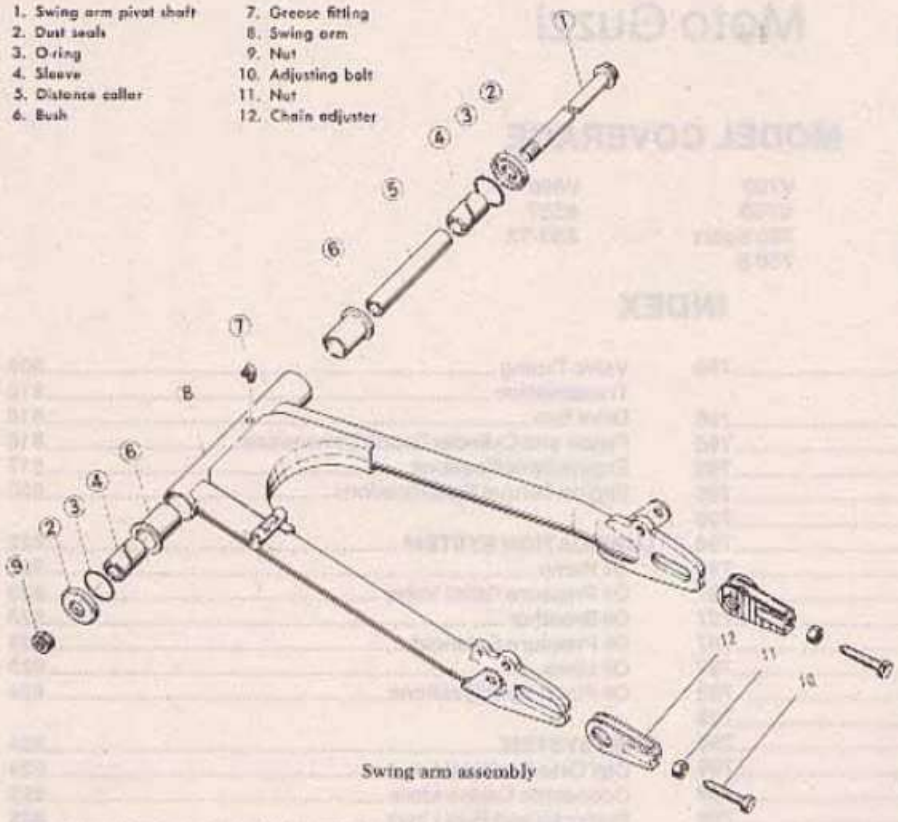
Disassembly

1. Pull out the sleeve from each side of the swing arm. Remove the distance collar.
2. Measure bush inside diameter. Tap out the bush from each side, if worn. If bushes are removed, they must be replaced with new ones.

Inspection

1. Measure the outside diameter of the sleeves. Standard is 21.979–22.000 mm (0.8653–0.8661 in.). Serviceable limit is 21.95 mm (0.864 in.). Replace sleeves as a set of either is worn.
2. Check the inside diameter of each bush. Standard is 22.030–22.063 mm (0.8673–0.8686 in.). Serviceable limit is

1. Swing arm pivot shaft
2. Dust seals
3. O-ring
4. Sleeve
5. Distance collar
6. Bush
7. Grease fitting
8. Swing arm
9. Nut
10. Adjusting bolt
11. Nut
12. Chain adjuster



Swing arm assembly

22.26 mm (0.876 in.). Replace the bushes as a set if either is worn.

3. Check pivot shaft run-out. Standard is 0.1 mm (0.004 in.) or less. Replace the shaft if run-out exceeds 0.2 mm (0.008 in.).

Assembly

1. Oil new bushes and press them into place.

2. Lubricate the sleeves with chassis grease before installation.

Installation

1. Installation is the reverse of removal. Insert the pivot shaft into the frame from the right. Ensure that the dust caps are in place. Tighten the shaft nut to 72–94 ft lbs. Check that the swing arm pivots freely.

General Torque Specifications①

Thread Diameter (mm)	Torque (ft lbs)
Coarse	
5	2.5–3.5
6	4.5–6.5
8	11.5–16.0
10	22–30
12	39–54
14	60–83
16	94–130
18	130–181
20	188–253
Fine	
5	2.5–3.5
6	4.5–5.5
8	10–13.5
10	19–25
12	33–45
14	54–74
16	83–116
18	123–166
20	166–239

① Unless otherwise noted

Chassis Torque Specifications

Part	Torque (ft lbs)
Axle nuts	
front	72–94
rear	94–116
Front axle clamp nuts	13.0–14.5
Fork filler caps	18–22
Upper triple clamp pinch-bolts	12–13
Lower triple clamp pinch-bolts	14.5–22.0
Steering stem nut	40
Steering stem nut clamp bolt	11.5–13.0
Handlebar clamp bolts	14.5–18.0
Drum brake anchors	19.5–22.0
Sprocket nuts	25–31
Shock absorber mounts	19.5–24.0
Swing arm pivot shaft nut	72–94
Spokes	1.8–2.2

Disc Brake Torque Specifications

Part	Torque (ft lbs)
Disc mounts	11.5–16.0
Caliper shafts	22–26
Caliper mounts	18–24
Bleed nipple	5.7–7.2
Brake pipe nipple	12–13
Banjo bolts	18–24
Hose joint	3.6–4.3
Master cylinder clamp	4.3–6.5
Brake lever	3.6–5.0
Lever adjuster locknut	13.0–16.5

Chassis Specifications

Part	Standard (mm/in.)	Serviceable Limit (mm/in.)
Axle run-out		
front	0.1/0.004	0.2/0.008
rear	0.05/0.002	0.2/0.008
Drum brake lining thickness		
front	4.75–5.20/0.19–0.20	2.5/0.10
rear	5.35–6.05/0.21–0.24	2.5/0.10
Drum brake inside diameter		
front and rear	180.0–180.2/7.086–7.094	180.75/7.116
Brake spring free-length		
front	46.7–47.3/1.84–1.86	48.5/1.91
rear	58.0/2.20	58.0/2.28
Brake cam diameter		
front	14.957–14.984/0.5889–0.5899	14.83/0.584
rear	16.957–16.984/0.6676–0.6687	16.83/0.663
Cam hole diameter		
front	15.000–15.027/0.5906–0.5916	15.18/0.598
rear	17.000–17.027/0.6693–0.6704	17.18/0.676
Rear wheel sprocket		
diameter	217.4/8.56	215.5/8.48
run-out	0.3/0.012	0.3/0.020
Drive chain		
20-pin length	317.5/12.50	323/12.7
Disc brake disc		
thickness	6.95–7.05/0.270.28	5.5/0.22
run-out	0.1/0.004	0.3/0.012
Disc brake caliper		
cylinder ID	38.10–38.15/1.500–1.502	38.17/1.503
piston OD	37.97–38.02/1.495–1.497	37.90/1.492
Disc brake master cylinder		
cylinder inside diameter	14.000–14.043/0.5512–0.5529	14.08/0.5543
piston outside diameter	13.957–13.984/0.5495–0.5506	13.90/0.5472
cup diameters	14.65–15.15/0.577–0.596	14.50/0.571
spring free-length	51.0/2.01	48.0/1.89
Front fork spring free-length	475/18.7	465/18.3
Swing arm		
sleeve OD	21.979–22.000/0.8653–0.8661	21.95/0.864
bush ID	22.030–22.063/0.8673–0.8686	22.26/0.876