Kawasaki 900

Model Coverage

Z1
Z1-A/B
KZ-900

Years 1973-1976

Index

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Maintenance

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

Lubrication

ENGINE

1. Change oil at 2,000 mile intervals or 60 days (summer)/30 days (winter); whichever comes first.
2. Use 20W–50 or 10W–40 oil, service rated "SE".
3. Engine oil capacity is 3.5 qts, minus filter. If oil *and* filter are being changed, capacity is 4.2 qts.
4. Run the engine until normal operating temperature is reached, and place the motorcycle on its center stand.
5. Remove the engine and oil filter drain plugs, and allow the oil to drain into a suitable receptacle.
6. Remove the oil filter, if it is to be replaced, at this time by removing the filter mounting bolt, and dropping out the filter.
7. Rotate the engine several times, with the key off, to assure complete drainage.
8. Wipe off any metal filings which may be stuck to the magnetic drain plug, and install the plug. Install the filter assembly, or filter drain plug only, as the case may be.
9. Torque the drain plug to 29 ft lbs (4.0 kg/m), the filter mounting bolt to 18 ft lbs (7.5 kg/m), and the filter drain plug to 16 ft lbs (2.2 kg/m).
10. Fill the engine with oil. The oil level should be between the two lines at the level window located on the right side crankcase clutch cover.
11. Check level after the engine has been running several minutes.

OIL FILTER (DISPOSABLE)

1. A disposable cartridge oil filter is fitted, and should be changed every 4,000 miles or every other oil change.
2. When installing a new filter, make sure that the spring and both O-rings are in good condition, and replace them as necessary. The filter mounting assembly should be cleaned with clean gasoline, and blown dry, before the new filter is installed.
3. After securing the bolt to 18 ft lbs (2.5 kg/m), replenish the oil supply, and run the engine to check for any possible oil leaks.
4. Note that engine oil capacity is 4.2 qts. when changing this filter.

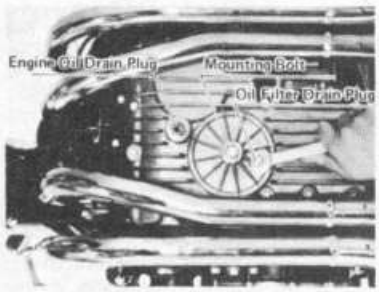
OIL FILTER (STRAINER)

The oil strainer is located at the oil pump pickup, and may be removed for cleaning after the oil pan is unbolted and lowered as described in the "Lubrication System" section. The strainer is secured to the pump body by 3 screws.

Clean the strainer in solvent, or replace it with a new one if it is damaged, then install the strainer and oil pan using a new pan gasket. After refilling the engine with oil, start the engine and check for oil leaks.

General Specifications

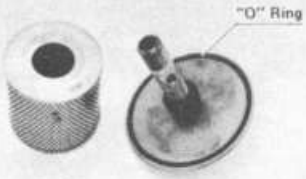
	Z1	Z1-A/B	KZ-900
Engine			
Bore x Stroke (mm/in.)	66 x 66/2.6 x 2.6		
Displacement (cc/ci.)	903/55.1		
Compression ratio (: 1)	8.5		
Transmission			
Type	5-speed, constant mesh		
Clutch	Wet, multi-plate		
Gear ratios			
1st	3.17 (38/12)		
2d	2.19 (35/16)		
3rd	1.67 (35/21)		
4th	1.38 (29/21)		
5th	1.22 (28/23)		
Primary reduction	1.73 (97/56)		
Final reduction	2.33 (35/15)		
Overall ratio	4.92 in. High		
Dimensions			
Overall length (mm/in.)	2205/86.8	2200/86.6	2200/86.6
Overall width (mm/in.)	800/31.5	865/34.1	865/34.1
Overall height (mm/in.)	1151/45.3	1176/46.3	1171/46.1
Wheelbase (mm/in.)	1490/58.7	1490/58.7	1490/58.7
Ground clearance (mm/in.)	160/6.3	165/6.5	165/6.5
Dry weight (kg/lbs)	230/506	232/511	233/514
Carburetion	VM-28SC	VM-28SC	VM-26SS
Chassis			
Tire Size			
front	3.25 x 19	3.25 x 19	3.25 x 19
rear	4.00 x 18	4.00 x 18	4.00 x 18



Engine and oil filter drain plug and filter mounting bolt locations



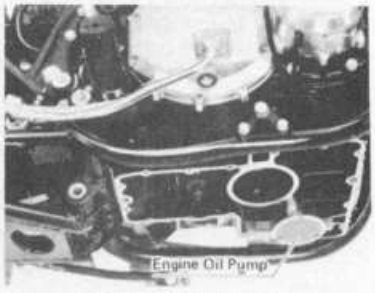
Removing the oil filter assembly



Oil filter O-ring

OIL PRESSURE

The engine oil pressure should be checked once a year, or whenever an oil pressure problem is suspected. Either the factory gauge (Part No. 57001-125), or a suitable substitute, can be connected at the oil gallery access hole at the right side of the engine after the plug has been removed. The gauge should read 2.8 lbs/in.^{2} (0.2 kg/cm^2) with the engine running at 3,000 rpm, and the engine oil temperature approximately 140° F (60° C), or operating temperature. If the reading proves unsatisfactory, determine and correct the fault (restricted oil passage, clogged filter, pressure relief valve failure, etc.). Consult the "Lubrication System" section for additional information.



Oil pump oil filter location

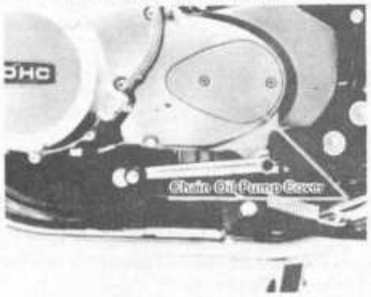
NOTE: *Apply Loctite® to the plug threads before installing it in the gallery access hole.*

CHAIN OILER (73-74 MODELS)

The 73 and 74 models are equipped with a drive chain oiler, which, in conjunction with hand lubrication using a

chain lubricant, is intended to keep chain wear to a minimum. The tank for the oiler is located under the seat, and has a dipstick and a filler cap. The tank should be kept filled with 30W or 40W oil.

The pump can be adjusted for oil flow. "0" or "1" supplies the least oil, and "5" is for maximum output. The chain should be kept wet, but not dripping.



Pump cover location



Pump output adjuster

Do not rely on the oiler to provide all the necessary chain lubrication these machines require. Every 200 miles, or more often if used in wet or dusty conditions, the chain should be hand lubricated.

FRONT FORKS

1. Change interval is 6,000 miles or 1 year.
2. Recommended oil is SAE 10W, non-detergent.
3. Fork capacity is 5.7 oz (170cc) per fork leg. Add an additional 0.6 oz (15cc) per leg if the forks have been disassembled.
4. To change the oil, remove the drain screw from the bottom of each slider and pump the slider up and down to expel the oil. Install the drain screw, and support the front wheel off the ground.
5. Loosen the upper triple clamp pinch bolts and remove the fork top bolts. Add the correct amount of oil to each fork leg.

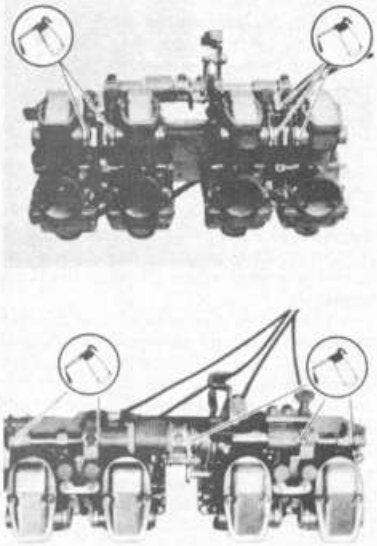
Correct oil level, with the wheel off the ground, is 17 15/16 in. (455 mm) measured from the top of the fork tube.

CHASSIS

1. Lubricate the swing arm pivot grease fitting at 2,000 mile intervals. Use a good grade of chassis grease.

CARBURETORS

1. The carburetor linkage should be lubricated with motor oil or a suitable substitute when necessary so that operation is smooth.

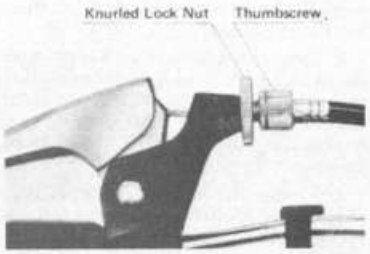


Carburetor linkage lubrication points

Service Checks and Adjustments

CLUTCH

1. Loosen the knurled locknut at the hand lever, turn the thumbscrew into its seat to provide maximum cable play, then secure the locknut.

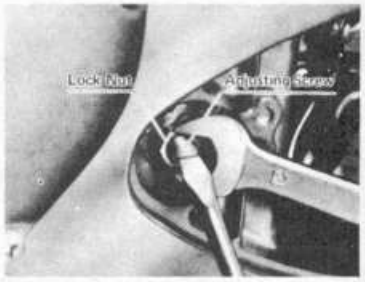


2. Loosen the locknut at the center of the cable, and screw in the adjuster to provide maximum cable play.

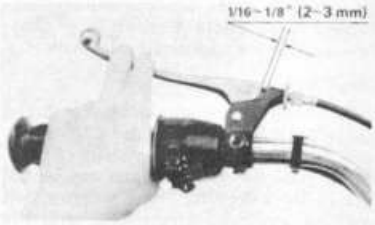


Cable adjusting points

3. Remove the chain oil pump cover to gain access to the pushrod adjusting screw.
4. Loosen the locknut, and back out the adjusting screw until it turns loosely.
5. Gently turn in the adjusting screw to the point where it suddenly becomes hard to turn, then back it out ½ turn from that point, and secure the locknut while holding the screw steady with a screwdriver.



6. Making sure that the cable sleeve ends do not catch on the edge of the cable seat, take up the cable play at the cable center until there is from 1/16-1/8 in. (2-3 mm) play at the hand lever, then secure the cable center adjuster locknut.

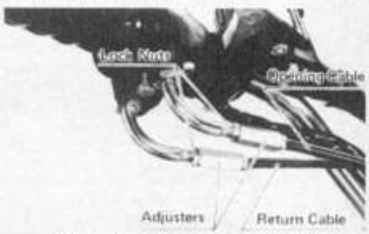


7. Make fine adjustments at the hand lever, if necessary, until the cable play is within its specified limits, then secure the thumbscrew locknut, and replace the oil pump cover.

THROTTLE CABLES

The 900 has a butterfly-type throttle linkage which is controlled by two cables; one for opening the throttle, and one for closing it down all the way. Rotating the throttle in the opposite direction from open, serves to lower the idle speed for a smoother shift into first gear.

Adjust the cables by loosening the locknut on the opening cable, and adjusting out any slack before securing the locknut again. Loosen the locknut on the closing cable, and adjust it so there is about 1/16 in. (2 mm) of play in the throttle grip, then secure the locknut. The adjustment may be varied according to personal preference and riding style, however, too tight an adjustment may cause the cables to stretch prematurely. Consult the "Tune-Up" section for additional information.



Always adjust the opening cable first

BRAKES

Front Disc Brake

The front disc brake is automatically adjusted when in use, and therefore the condition of the brake pads should be checked periodically for wear. When either pad is worn down to the red line, the pads should be replaced.

The brake lever is adjustable; however, the need for adjustment, other than to reduce vibration of the lever, indicates excessive wear of some of the brake components.

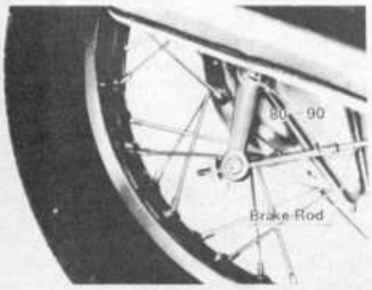
Adjust the lever by loosening the locknut, and turning the adjusting bolt a fraction of a turn so that the lever has less than 3/16 in. (5 mm) of play. Hold the adjusting bolt steady while securing the locknut, and make sure that there is still play in the lever after the locknut is tightened.

The brake fluid should be drained and refilled, along with a careful check of each component in the system once each year, or every 6,000 miles. Leaks or a spongy feel at the lever should be corrected immediately. Consult the "Chassis" section for additional information.

Rear Brake

1. Check the position of the brake pedal in relation to the right front foot rest. It should be about 1/16 in. (2 mm) lower than the foot rest, and can be adjusted by loosening the adjusting bolt locknut, and rotating the bolt until the desired adjustment is attained. Be sure to secure the locknut, once a suitable adjustment is arrived at.

2. Apply the brake and note the angle formed between the actuating lever and the brake rod. If the angle is not within 80–90°, remove the lever and reposition it to correct the angle.



CAUTION: *The brake linings must be checked for wear before the lever is repositioned to avoid damage to the drum caused by worn linings. Wear indicators are fitted to late models.*

3. Make the fine adjustment by screwing in the brake rod adjusting nut until the brake pedal travel is within 3/4-1 1/4 in. (20-30 mm) from the rest position to the fully applied position.

4. With the machine on the center stand, spin the rear wheel to check for dragging, and either readjust the brakes, or disassemble and repair the assembly to adjust for this.

NOTE: *An adjustment made with the machine on its center stand may not be the same once the machine is resting on both wheels.*

Brake Lamp Switch

The front brake lamp switch is hydraulically operated, and therefore needs no adjustment. The rear brake lamp switch is mechanical, and requires periodic adjustment to compensate for stretching of its spring, damage to the brake pedal, or to suit your preference for when the lamp comes on.

Adjust the switch by loosening the two mounting nuts, and moving the switch up or down so that the brake lamp will light after 1/2-3/4 in. (15-20 mm) of pedal movement. Secure the locknuts when a suitable adjustment has been attained.

CAUTION: *Do not rotate the switch body itself while performing the adjustment, as this may damage the wiring.*

DRIVE CHAIN

Chain slack, as measured at the center of the bottom run with the machine on its center stand, should be within 1–1 1/2 in. (25–40 mm). Otherwise, the chain must be adjusted as follows:

1. Place the machine on its center stand, then loosen the brake torque link nut, the axle nut (after removing the cotter pin), and the chain adjuster locknuts.

2. If the chain seems too tight, kick the wheel forward to loosen it. The tips of the adjusters must be firmly seated in their seats in the adjusting block at all times during adjustment.

3. Turn the adjusters in evenly until the chain has the correct amount of slack, then secure the locknuts. The chain adjuster marks on both sides must be even or the rear wheel will be out of alignment.

4. Torque the axle nut to 95-115 ft lbs (13-16 kg/m), install a new cotter pin, and recheck the adjustment.

5. Torque the brake torque link nut to 22-25 ft lbs (3-3.5 kg/m).

6. Check the rear brake and brake lamp adjustments.

AIR FILTER

The element should be cleaned every 2,000 miles.

To remove the filter element, open the seat, take the screen off the air cleaner, and pull the element out.

Clean the element with gasoline or some other volatile solvent, then blow it dry from the inside out with compressed air. Do not use any cleaner which will not evaporate completely.



Removing the filter element

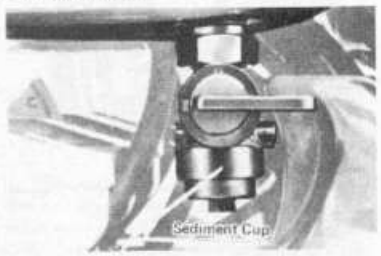
Inspect the element and sponge gaskets for signs of wear or damage, and replace the element if either are damaged. The gaskets can be glued on if they've come loose and are still in good condition. Be careful, when installing the element, not to crimp the gaskets.

Replace the element every 6,000 miles or after 5 cleanings.

FUEL SYSTEM

The fuel filter, located in the fuel tap, and the fuel lines, should be removed and cleaned at the prescribed intervals, or whenever fuel delivery problems are suspected. Simply turn the fuel tap to the stop ("S") position, and unscrew the cup to gain access to the filter. Fuel flow at both the on and reserve positions can be checked at this time.

If there is any indication of water in the gas, turn the tap to the reserve position, and allow the fuel to flow out into a suitable container until only pure gas comes out. Remove the drain plugs from the bottom of each carburetor, and drain the float bowls also.



The sediment cup must be removed to gain access to the filter

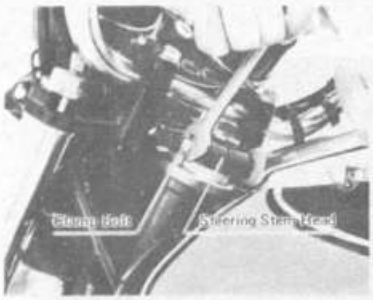
CAUTION: *Do not start the engine until any spilled gasoline has completely evaporated, or has been wiped up. If the tap allows any gas to pass while in the stop position, the tap should be replaced, or gas may leak into the crankcase and dilute the oil.*

Clean the filter screen and cup, and reinstall them on the tap using a new O-ring, if necessary. Inspect the fuel lines for cracks or damage, and replace them as necessary. Straighten out any kinks or sharp bends in the lines, and make sure that the filler cap vent is not plugged, as this can interfere with normal fuel delivery.

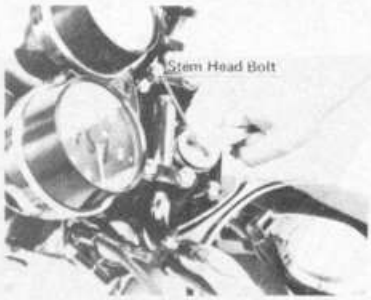
STEERING STEM BEARINGS

Check for proper adjustment by supporting the front wheel off the ground, grasping the fork sliders and pushing and pulling them in line with the motorcycle. No free-play should be felt. If it is, the bearings are too loosely adjusted.

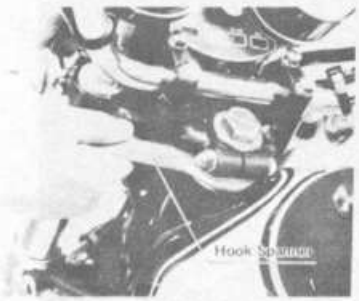
Turn the forks slowly from lock-to-lock. Movement should be free, smooth, and noiseless. When released from a position a few degrees off center, the forks should fall freely to the side. If they do not, the bearings are too tightly adjusted. If the bearing movement is rough or noisy, the bearings and races are probably worn.



Loosening the steering stem head clamp bolt



There are 4 clamp bolts to be attended to



Make the adjustment slightly snug if the bearings and races have just been replaced



Adjust the bearings in the following manner:

1. Loosen the steering stem head bolt, and the clamp bolt shown in the accompanying illustration.

2. Use a suitable hook spanner to turn the steering stem locknut down to tighten the steering, or up to loosen it.

3. Secure the head bolt and clamp, then loosen the two lower clamp bolts to let them reseat themselves, and retighten the bolts evenly. The upper clamp bolts should be torqued to 12-13 ft lbs (1.6-1.8 kg/m), and the two lower clamp bolts should be torqued to 40-43 ft lbs (5.4-6.0 kg/m).

Periodic Maintenance Intervals①

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

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

Every 2000 Miles
- Change engine oil
- Clean air filter
- General Lubrication
- Clean and gap plugs
- Adjust points and check timing
- Check chain wear
- Clean fuel system

Every 4000 Miles
- Replace oil filter
- Check valve clearance

Every 6000 Miles
- Renew brake fluid
- Change fork oil
- Replace air cleaner element

Every 12000 Miles
- Repack wheel bearings

① Based on normal usage after break-in is completed

Maintenance Data

Engine Capacity (qt/l)	
Oil change only	3.5/3.3
Oil and filter	4.2/4.0
Chain Oiler (qt/l)	0.95/0.9
Front forks (each leg)	
Normal change (oz/cc)	5.7/170
After disassembly	6.3/185
Tires	
Front pressure (psi)	26
Rear pressure (psi)	31
Rear pressure, high-speed or two-up (psi)	36
Wear limits (mm/in.)	
Front	1.0/0.04
Rear	2.0/0.08
Battery	
Type	Yuasa 12N-14-3A
Capacity	14 AH
Voltage	12
Max. charging rate	1.4 AH

Recommended Lubricants

Engine
- SAE 20W-50, "SE"
- SAE 10W-40, "SE"

Chain oiler
- SAE 30W
- SAE 40W

Front Forks
- SAE 10W, non-detergent

Control Cables
- Motor oil
- Graphite-based lubricant
- Molybdenum disulphide-base lubricant

Tach, Speedometer Cables
- Light-duty, lithium-base grease

Wheel Bearings, Steering Stem Bearings
- Waterproof, medium weight bearing grease

Grease Fittings
- Waterproof, medium-weight chassis grease

Chain
- Lubricant developed specifically for motorcycle drive chains

Tune-Up

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

Valve Clearance

An oil film can form between the adjusting shim and the top of the valve which can cause misleading measurements. You may find that the clearance isn't what you expected it to be after the correct shim is installed, and this film is the reason. To avoid this, do the following:

1. Measure the clearance as directed in the "Adjustment" Section.

2. Remove and measure the shim to determine what you need (i.e., if the clearance is 0.006 in., a 0.002 in. shim will result in a clearance of 0.004 in.).

3. Kick the engine through a couple dozen times with the spark plugs out and the ignition switch "Off" to remove the film, then measure the clearance again.

CAUTION: *Never rotate the engine with any of the adjusting shims removed as this may damage the cam and tappet.*

NOTE: *The type of valve tappets used in all models up to engine number Z1E-08979 have caused shim fracturing problems on some machines. If your machine is equipped with this type of tappet, consult the "Engine Disassembly; Camshafts" Section for additional information.*

ADJUSTMENT (1973 MODELS)

1. Open the seat all the way and remove the fuel tank, then remove the valve cover and cover gasket.

2. Rotate the engine so that the cam lobe (the highest portion of the cam) for the valve to be checked is pointing directly away from the valve lifter.

3. Measure the clearance between the cam and the valve shim using a thickness gauge. The clearance should be within 0.002-0.004 in. (0.05-0.10 mm) for both

Valve Adjustment Chart

		PART NUMBER PREFIX 12037-																								
	P/N SUFFIX	-001	-002	-003	-004	-005	-006	-007	-008	-009	-010	-011	-012	-013	-014	-015	-016	-017	-018	-019	-020	-021	-022	-023	-024	-025
		PRESENT SHIM SIZE																								
	INCHES	.079	.081	.083	.085	.087	.089	.091	.093	.094	.096	.098	.100	.102	.104	.106	.108	.110	.112	.114	.116	.118	.120	.122	.124	.126
	MILLIMETERS	2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20
INCHES	MILLIMETERS																									
.000-.001	0.00-0.04		2.00	2.05	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15
.002-.004	0.05-0.10	SPECIFIED CLEARANCE/ NO CHANGE REQUIRED																								
.005-.007	0.11-0.19	2.10	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20		
.008-.009	0.20-0.24	2.15	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20			
.010-.011	0.25-0.29	2.20	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20				
.012-.013	0.30-0.34	2.25	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20					
.014-.015	0.35-0.39	2.30	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20						
.016-.017	0.40-0.44	2.35	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20							
.018-.019	0.45-0.49	2.40	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20								
.020-.021	0.50-0.54	2.45	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20									
.022-.023	0.55-0.59	2.50	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20										
.024-.025	0.60-0.64	2.55	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20											
.026-.027	0.65-0.69	2.60	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20												
.028-.029	0.70-0.74	2.65	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20													
.030-.031	0.75-0.79	2.70	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20														
.032-.033	0.80-0.84	2.75	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20															
.034-.035	0.85-0.89	2.80	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20																
.036-.037	0.90-0.94	2.85	2.90	2.95	3.00	3.05	3.10	3.15	3.20																	
.038-.039	0.95-0.99	2.90	2.95	3.00	3.05	3.10	3.15	3.20																		
.040-.041	1.00-1.04	2.95	3.00	3.05	3.10	3.15	3.20																			
.042-.043	1.05-1.09	3.00	3.05	3.10	3.15	3.20																				
.044-.045	1.10-1.14	3.05	3.10	3.15	3.20																					
.046-.047	1.15-1.19	3.10	3.15	3.20																						
.048-.049	1.20-1.24	3.15	3.20																							
.050-.051	1.25-1.29	3.20																								

VALVE CLEARANCE

INSTALL THIS SHIM



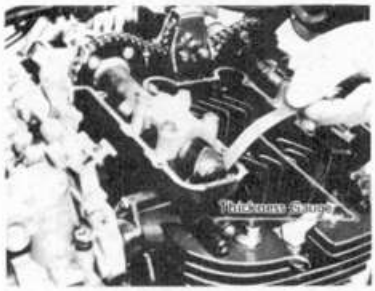
© KAWASAKI MOTORS CORP.
1973/Printed in U.S.A.

1. To use the chart, locate the measured gap on the vertical column on the left. Find the thickness of the old shim in the top horizontal column and look down that column to find the required new shim.
2. If the valve clearance is greater than 0.10mm (.004"), use a thicker shim to correct to the specified clearance.
3. If the valve clearance is less than 0.05mm (.002"), select a thinner shim. NOTE: If there is no clearance between the shim and the cam, select a shim which is several sizes smaller and then remeasure the gap.
4. Do not put shim stock under the shim. This may cause the shim to pop out at high rpm.
5. NOTE: Check the valve clearance with the cam lobe pointing directly away from the valve, as pictured. Checking the clearance at any other cam position may result in improper valve clearance.

the intake and exhaust valves. If the feeler gauge of the proper clearance will not fit between the cam and the shim, or if it slides through with little or no resistance, the clearance should be adjusted.

It should be noted that some of the valves may not require adjustment. Clearance is correct if the next size thinner gauge fits easily and if the next size thicker will not fit, or fits with great resistance.

4. If the clearance is in need of adjustment, rotate the engine so that the cam lobe presses the lifter down, install the special tool (Part No. 57001-109) as illustrated, then rotate the engine so that the cam lobe points directly away from the tappet, and remove the shim.



Be sure that the gauge is between the shim and the cam lobe

a. Rotate the engine so that the cam lobe presses the lifter down, install the special tool (Part No. 57001-109) as illustrated, then rotate the engine so that the cam lobe points directly away from the tappet, and remove the shim.



Using the special tool to remove the shim

NOTE: *The tappet is notched so that the shim can be grasped.*

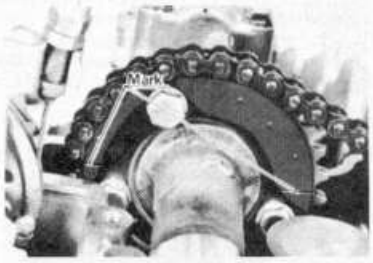
5. If the valve clearance was less than 0.002 in., use a thinner shim; if the clearance was greater than 0.004 in., use a thicker shim. Shims are available in 0.05 mm increments from 2.00 mm to 3.20 mm. Consult the accompanying Valve Adjustment Chart.

6. If the valve seat is worn to the point where the smallest shim will not provide the correct clearance, check for excessive wear or burning of the valve and seat. Bring the clearance within the specified limits by removing the valve and grinding down the top of the stem slightly while holding the valve in a V-block to keep it at right angles to the side of the grinder. There must be at least 0.16 in. (4.1 mm) of stem above the valve spring collar groove.

ADJUSTMENT (1974 AND LATER)

Marks are inscribed on the camshaft sprocket to facilitate the valve adjustment procedure.

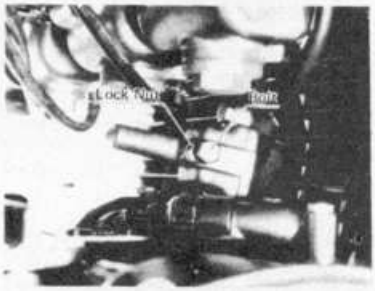
1. Check valves when the engine is cold.
2. Remove the gas tank and valve covers.
3. Check that the cam cap bolts are torqued to 8.8 ft lbs.
4. Working with one of the camshafts, turn the engine over until the marks on the cam sprocket align with the cylinder head mating surface.
5. Check the clearance at the two closed valves.
6. Turn the sprocket 180° until the marks align again, and check clearance at the other two valves.
7. Repeat the procedure with the other camshaft.
8. Clearance is adjusted in the same manner as outlined for 1973 models (see above), Steps 2–6.



Marks on the cam sprocket for valve adjustment (1974 and later)

Camshaft Chain

1. Turn the engine over and align the "T" mark for either set of pistons on the timing advancer with the crankcase cover mark.
2. Loosen the adjuster locknut and bolt.
3. Rotate the engine slowly a couple times to allow the spring loaded tensioner to take up the slack evenly, then secure first the bolt. Tighten the bolt to about 35–52 in. lbs. Secure the locknut.

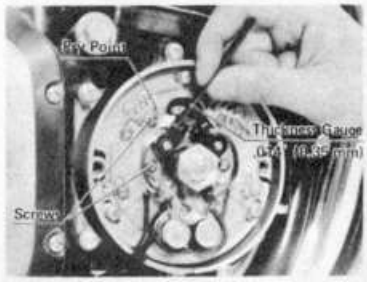


Cam chain adjuster

Ignition Timing

BREAKER POINT GAP ADJUSTMENT

1. Rotate the crankshaft until the points set to be adjusted is at its widest opening (the highest point of the cam lobe). Check the gap using a suitable thickness gauge. If the gap is not within the specified limits of 0.012-0.016 in. (0.3-0.4 mm), loosen the screws and use a screwdriver at the pry point to increase or decrease the gap as necessary. The optimal setting is 0.014 in. (0.35 mm), and the thickness gauge should move between the points with some slight resistance; the next larger and smaller sizes should be obviously too thin and too thick respectively. Recheck the adjustment after securing the screws, and run a business card through the points to remove any dirt from the thickness gauge.
2. Rotate the engine until the other points set is at its widest position, and adjust them in the same manner.



Adjusting the point gap

BREAKER POINT DWELL ADJUSTMENT

1. Although setting breaker point gaps with a feeler gauge as outlined above should produce fairly accurate results, the use of a dwell meter is even more accurate.
2. Connect the dwell meter: one lead to ground on the engine, the other lead to the points' wire terminal or spring.
3. Select the 8-cylinder or 4-cylinder scale.
4. Start and idle the engine at 800–1,000 rpm. Dwell should be 23° when read on an 8-cylinder scale, or 46° on a 4-cylinder scale.
5. If dwell is not correct, adjust the point gaps as outlined above so that the meter gives the correct reading.

IGNITION TIMING

The breaker points on the left fire cylinders 1 and 4. Those on the right fire cylinders 2 and 3. Timing is set for each pair of cylinders.

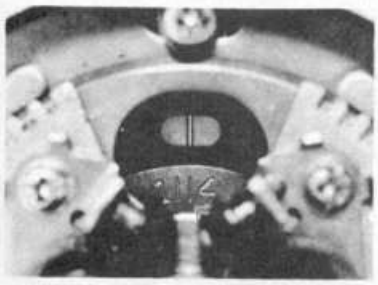
Timing marks "1.4" and "2.3" on the advancer are for the left and the right side points respectively.

Static Timing

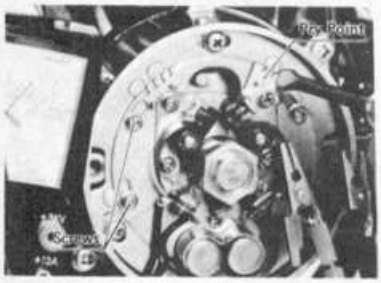
1. Clean and adjust the points.
2. Rotate the engine until either "F" mark on the timing advancer is slightly to the left of the timing mark located just above the advancer.
3. Connect a timing light or ohmmeter to the appropriate set of points with one lead on either the leaf spring or the points wire mounting bolt, and the other on a ground.
4. Rotate the engine until the "F" mark is aligned with the timing mark.

The light or meter should react as the marks align. If it does, the timing is correct and you should now do the other set of points; if not, go on to the next step.

5. Loosen the adjusting plate mounting screws, and use a screwdriver at the pry point to position the points so that they just begin to open as the timing

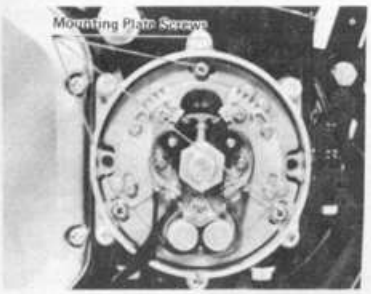


Aligning the timing mark



Adjusting the points adjusting plate

marks come into alignment. Always rotate the engine back past the point of alignment by a few degrees before trying again. If the adjusting plate will not travel far enough to arrive at a suitable adjustment, loosen the 3 mounting plate screws and rotate the plate to provide more room for adjustment. Secure the screws and recheck the timing before going on to the other set of points.



Mounting plate mounting screws

6. Check the timing of the other set of points by aligning the appropriate timing marks as above.

Dynamic Timing

1. Clean and adjust the points scribed in the "Contact Breaker Points" Section.

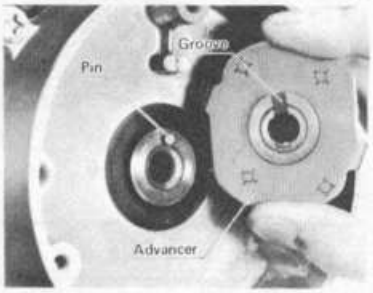
2. Run the engine until its normal operating temperature is reached, and adjust the idle, if necessary, to within 800-1,000 rpm as described in the "Carburetor Synchronization and Adjustment" Section.

3. Connect the strobe light according to the manufacturer's instructions, so that the impulses from cylinders 1 or 4 are monitored. Aim the light at the timing marks. The "F" 1.4 mark should be aligned with the timing index mark. If it isn't, loosen the mounting screws, and use a screwdriver at the pry point until the marks do line up.

4. Repeat the above steps on the "F" 2.3 mark, with the strobe connected to cylinder 2 or 3.

5. Advance the engine speed to about 2,900–3,100 rpm and check both sets of points. The timing advancer pin should align with the timing mark at this point. If the timing is off, the advance mechanism is probably at fault.

6. If the timing is unsteady, remove the contact breaker plate assembly and examine the advance unit. Look for weak or broken springs, or a bent advancer shaft. If either spring is defective, replace both of them. If the advancer shaft is bent (noticeable as the engine is turned over), remove the advancer unit and bend the shaft until total run-out is less than 0.004 in. (0.1 mm), or replace the assembly.



Installing the advance mechanism

When reinstalling the advance unit, make sure that the pin is located in the hole.

Carburetor Synchronization and Adjustment

PRELIMINARY ADJUSTMENT (1973 MODELS)

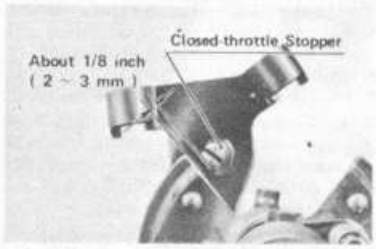
Perform the following operations as a prelude to the actual adjustment anytime the carbs are rebuilt or replaced, or if the engine idles especially rough.

1. Remove the carburetors

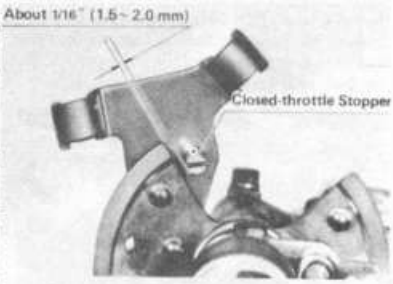
2. Turn the throttle stop screw in or out until there is about ⅜ in. (10 mm) between the bracket and the underside of the screw head.



Throttle stop screw adjustment



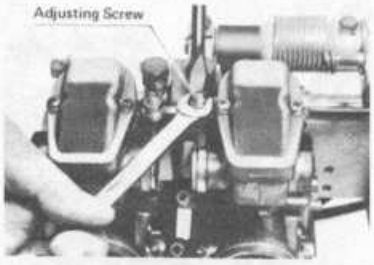
Closed-throttle stopper adjuster (1974 and later)



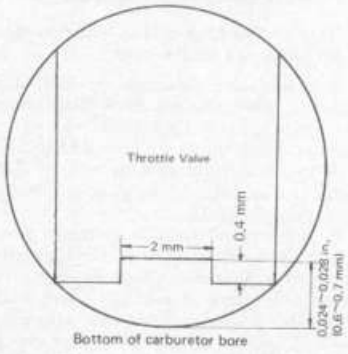
Closed-throttle stopper adjuster (1973)

3. Loosen the closed-throttle stopper locknut, and rotate the eccentric stopper screw until there is about 1/16 in. (1.5-2.0 mm) clearance between the stopper and the top of the pulley.

4. Locate the notch cut into the throttle valve, then loosen the locknut and rotate the adjusting screw until there is about 0.024-0.028 in. (0.6-0.7 mm) clearance between the notch and the bottom of the carburetor bore, and secure the locknut.

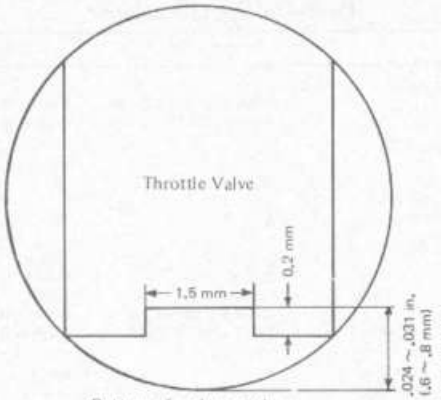


Throttle valve adjusting screw and locknut



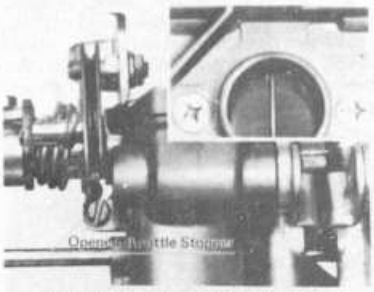
Throttle valve clearance (1973)

NOTE: *This is a very delicate operation which must be performed on each of the carbs, so that the adjustment is as close as possible for all 4.*

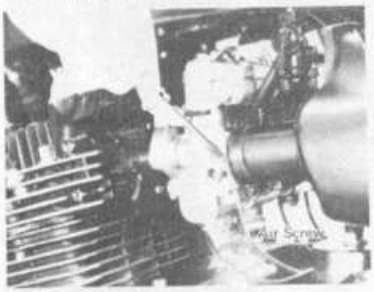


Throttle valve clearance (1974–75)

5. Open the throttle by rotating the pulley until the bottom edge of the lowest of the 4 throttle valves is even with the top of the carburetor bore, then rotate the open-throttle stopper screw so that the pulley is stopped at that point.



Adjusting the opened-throttle stopper



Adjusting the pilot mixture

6. Gently turn each of the carburetor pilot air screws into their seats, then back them all out 1½ turns.

7. Mount the carburetor bank onto the engine, and adjust the throttle cables as described in the "Maintenance" section.

PRELIMINARY ADJUSTMENT (1974 AND LATER)

1. The procedure is to be carried out anytime the carburetors have been rebuilt or replaced, or if the engine runs very roughly.

2. The procedure for 1974 and later models is essentially the same as for 1973 models as outlined above except for the following points:

a. The clearance between the closed throttle stopper and the top of the pulley (Step 3) should be 2–3 mm (about ⅛ in.).

b. The pilot air screws (Step 6) should be turned 1¼ turns off their seats.

ADJUSTMENT

1. Turn the pilot air screws in until they bottom lightly, then turn each of them out 1½ turns on 1973 models or 1¼ turns on 1974 and later machines. Run the engine for at least 5 minutes until normal operating temperature is reached, then adjust the engine idle speed using the throttle stop screw until the idle speed is about 800–1,000 rpm according to the tachometer.



Adjusting the throttle stop screw

2. Adjust the pilot air screw on each carburetor to that position where the highest idle speed is reached. If the idle speed exceeds the limits given in the previous step, lower the idle speed to within the limits using the throttle stop screw.

NOTE: *If any air screw can be turned to within ½ turn from its seat without any appreciable rise in idle speed, there is probably something wrong inside that carb.*

3. Turn in each air screw evenly some small arbitrary number of turns (i.e., ¼-½ turn), then readjust the idle speed to within the specified limits.

4. Adjust the manifold vacuum of each carburetor using one of the following methods, depending on the equipment available. The machine should be standing in a good airflow to keep the engine operating temperature down.

Without Vacuum Gauges

This procedure is very imprecise by its very nature and should not be attempted except in "emergency" situations. Vacuum gauges are virtually essential.

1. Pay careful attention to the exhaust noise, and place your hands behind the mufflers to feel the exhaust pressure.

2. Compensate for any variations in exhaust noise or pressure by making adjustments to the throttle valve adjusting screws for the carburetor(s) in question. Use either the special tool (Part No. 57001-120), or suitable substitutes to loosen the locknut and rotate the adjusting screws. Backing the screw(s) out will increase pressure, and turning it in will decrease it. Try to keep the idle speed as low as possible while maintaining a balanced pressure for all 4 carbs. Be sure to secure each locknut while holding the adjusting screw steady with a screwdriver.

CAUTION: *If the special tool is not available, you can use a screwdriver and a box-end wrench, but be careful not to bend or place excessive pressure on any of the adjusting screws while loosening or securing the locknuts as this may cause damage to the carburetor.*



Adjusting the throttle valves using the special tool

NOTE: *Adjusting the vacuum on one carb will cause changes in the pressure on all of the others, so be prepared to compensate for this.*

3. Readjust the air screws on any carburetors which have been readjusted, then readjust the idle speed to within 800-1,000 rpm by adjusting the throttle stop screw.

With Vacuum Gauges

1. Remove the rubber caps from the vacuum fittings on the cylinder head (Engine Nos. up to Z1E-01000) or carb holders (Engine Nos. from Z1E-02174), and attach the vacuum gauges.

2. With the engine running at idle speed, close down the vacuum gauge intake valve until the gauge needle flutters less than 2 cm Hg (0.8 in. Hg).

3. The normal manifold vacuum gauge reading is 20-23 cm Hg (8-9 in. Hg) for each cylinder. If any gauge reads less than 15 cm Hg (6 in. Hg), recheck the air screw adjustment, and make sure that the carb holder hose clamps and spark plugs are secure.

4. Balance the carbs by readjusting the throttle valve adjusting screws as de-

scribed in Step 2 of the "Without Vacuum Gauges" Section. All of the carbs should be adjusted to within 2 cm Hg (0.8 in. Hg) of each other. Read the Caution after Step 2.

5. Open the throttle and allow it to snap shut several times while watching to see if the vacuum gauge readings remain the same. Readjust any carburetor whose reading has changed.

6. Remove the vacuum gauges, replace the rubber covers, readjust the pilot air screws on any carbs which have been adjusted, and adjust the idle speed to about 800-1,000 rpm.

NOTE: *Inability to obtain synchronization or proper idling may be due to incorrect carburetor float levels, obstruction of air or fuel passages, etc. Refer to "Fuel Systems."*

Tune-Up Specifications

	1973	1974 and Later
Valve clearance (cold)		
Intake (mm/in.)	0.05–0.10/0.002–0.004	0.05–0.10/0.002–0.004
Exhaust (mm/in.)	0.05–0.10/0.002–0.004	0.05–0.10/0.002–0.004
Compression (psi)		
Standard	121	121
Serviceable limit	85	85
Max allowable variation between cylinders	14	14
Spark Plugs (NGK)		
Standard	B-5ES	B-5ES
Hot	B-7ES	B-7ES
Cold	B-9ES	B-9ES
Gap (mm/in.)	0.7–0.8/0.028–0.032	0.7–0.8/0.028–0.032
Breaker point gap (mm/in.)	0.3–0.4/0.012–0.016	0.3–0.4/0.012–0.016
Ignition timing		
deg BTDC @ 1500 rpm	5	20
deg BTDC @ 3000 rpm	40	——
deg BTDC @ 2350 rpm	——	40
Carburetors		
Idle speed (rpm)	800–1000	800–1000
Pilot air screws (turns out)	1½	1¼
Synchronization		
range (cm/in. HG)	20–23/8–9	20–23/8–9
max variation (cm/in. HG)	2/0.8	2/0.8

Engine and Transmission

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

Engine Removal and Installation

REMOVAL

1. Remove the engine and oil filter drain plugs, and allow the engine to drain thoroughly.

2. Remove the plastic side covers, open and unhook the seat, turn the fuel tap to the "S" position, disconnect the fuel lines, disengage the gas tank tang from the rubber retaining band, and pull the tank off from the back.

3. Disconnect the black and green ignition coil leads at the coils, then disconnect the spark plug leads at the plugs.

4. Unscrew the tachometer cable at the cylinder head, and place it out of the way.

5. Disconnect the blue connector at the electrical panel, then disconnect the starter wire at the starter relay terminal.

6. Remove the right footrest, then unbolt the battery ground wire (−) from the engine, and the regulator and rectifier leads (if fitted).



7. Loosen the 8 clamps which secure the carburetor assembly, then pull the assembly off to the rear. The throttle cables can now be disconnected at the pulley with greater ease.





Removing the carburetor assembly

8. Remove the screen from the top of the air cleaner, slide back the clamp on the oil breather hose, disconnect the hose, and remove the air cleaner assembly.

9. Remove the nuts which secure the exhaust pipe collars, free the collars from the cylinder head studs, and remove the split keepers.

NOTE: *Keep the keepers separate for installation in their original locations.*

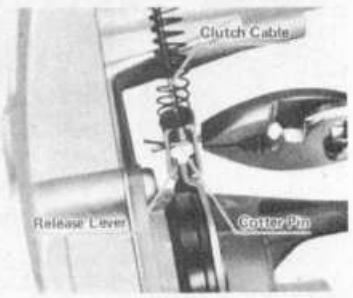
10. Remove the exhaust system rear mounting bolts, then push the two mufflers on either side forward to remove them.

11. Remove the left front footrest, shift lever, and starter cover and gasket.

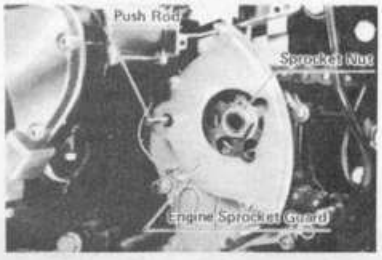
12. Remove the chain oiler pump cover, disconnect the inlet hose from the pump, and plug it with a screw as shown in the illustration.



Securing the intake hose



Disconnecting the clutch cable



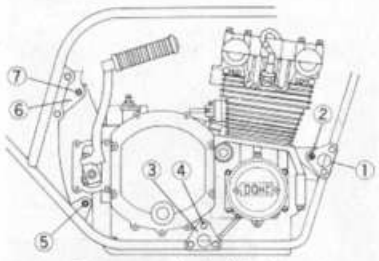
13. Remove the chain cover, pull the cotter pin out of the clutch release lever, disengage the clutch cable, remove the engine sprocket guard, and remove the clutch pushrod from the driveshaft.

14. Bend back the lockwasher locking tab, secure the sprocket with either the special tool (Part No. 57001-118), or a suitable substitute, and remove the sprocket nut and sprocket.

15. Remove the brake lamp switch and spring, back off the brake rod adjusting nut until maximum pedal play is reached, then loosen the brake pedal position adjusting bolt locknut, and back out the bolt so that the pedal is held down, out of the way.

16. Jack or lever the engine up to take the weight off the mounting bolts, then remove the nuts from the 3 long engine mounting bolts.

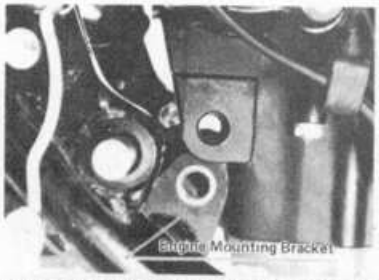
17. Remove the short engine mounting bolt from the lower center mounting on each side, the right rear engine mounting bracket bolts, the center and right side front mounting brackets, and the 3 long bolts.



Engine mounting bolt locations

1. Front bracket
2. Front bolt
3. Lower center bracket
4. Lower center bolt
5. Rear lower bolt
6. Rear upper bracket
7. Rear upper bolt

18. With the engine held level, slowly lift it up about 1 in., then move it to the right slightly until the rear of the engine slips over the lower right rear mounting.



The brackets must be clear before the engine can come free

19. Raise the front of the engine a little so that it will clear the frame, then drop down the left side, and pull the engine out diagonally and upwards to the right.

INSTALLATION

1. Mount, but do not secure, the 3 engine mounting brackets before inserting the engine bolts. Insert the engine bolts, secure the bracket mounting bolts, and then tighten the engine mounting bolts. The 3 long bolts are inserted from the left side of the machine. Two spacers go on the rear upper bolt; a long one on the left side of the engine, and a short one on the right side. Secure the bracket bolts to 14.5-16.5 ft lbs (2.0-2.3 kg/m), the 3 long (12 mm) bolts to 47-50 ft lbs (6.5-7.0 kg/m, and the two shorter bolts (10 mm) to 26-29 ft lbs (3.5-4.0 kg/m).

2. Install the engine sprocket with the chain already on it, and secure the sprocket nut to 87-108 ft lbs (12-15 kg/m). A new lockwasher should be used, and the chain adjustment can be loosened if the sprocket and chain will not go on the shaft.

3. An oil seal guide (Part No. 57001-130), or a suitable substitute, should be used when installing the chain cover in order to avoid damaging the rubber seal. The pin in the output shaft must be aligned with the groove in the chain oil pump shaft before the cover will go on.

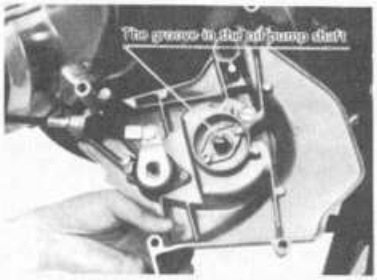
4. Install the carburetor assembly, taking care that the clamps are secured well enough to prevent any air leaks.

5. Install the inside mufflers first, and then the outside ones. The collar can be used to hold the split keeper while installing the pipe. Secure the muffler connecting hose clamp to prevent any exhaust leaks, then secure the rear mounting bolts and the bolts at the cylinder head, in that order.

6. Connect the spark plug wires to the plugs. The wires are numbered in accordance with their respective cylinders counting from left to right.



Using the guide to protect the cover oil seal



Lining up the pin and groove

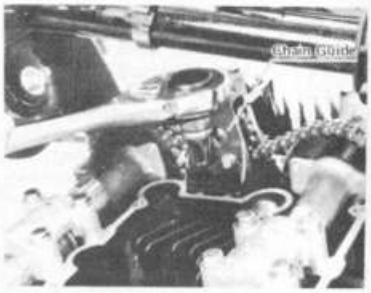
Top End

CAMSHAFTS

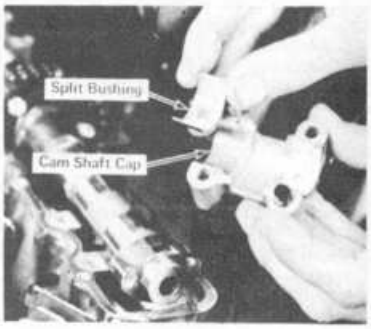
Removal

1. Remove the gas tank, disconnect the spark plug wires, and remove the valve cover and gasket.

2. Remove the chain guide sprocket, then unbolt the camshafts caps and separate the split bushing halves for installation in their original positions unless they are to be replaced. Remove the camshafts.



Removing the cam chain guide



Removing the bushings and caps



Removing the exhaust camshaft

3. Unscrew the tachometer cable, and remove the tach pinion to avoid any possible damage to the camshaft worm during the installation procedure.

Inspection

1. Measure the height of each cam lobe with a micrometer, and replace the cam as necessary if the lobes are worn past their serviceable limits as given below:

	Standard	*Service Limit*
Intake	1.4276 ~ 1.4307 in. (36.26 ~ 36.34 mm)	1.4236 in. (36.16 mm)
Exhaust	1.4079 ~ 1.4110 in. (35.76 ~ 35.84 mm)	1.4039 in. (35.66 mm)

2. Measure the diameter of each of the camshaft bearing surfaces with a micrometer, and replace the camshaft as necessary if either bearing surface is worn past its serviceable limit:

Standard	*Service Limit*
0.9633 ~ 0.9638 in. (24.467 ~ 24.480 mm)	0.9614 in. (24.420 mm)

3. Remove the cam chain sprocket from the camshafts, keeping them separate for replacement in their original locations, and place the shafts on V-blocks so that they ride on the bushing surfaces, or in a lathe. Rotate the shafts and use a dial indicator to check run-out along the sprocket mounting surface. Replace any cam whose run-out exceeds the service limit given below:

Standard	*Service Limit*
under 0.0008 in. (under 0.02 mm)	0.004 in. (0.10 mm)

4. Inspect the camshaft bushings for signs of wear, scoring, or damage, and replace them as a set per camshaft if worn past their serviceable limit of 0.0063 in (0.16 mm). The standard clearance between the bushings and the camshafts is 0.008-0.0025 in. (0.020-0.064 mm). Measure the clearance in the following manner:

a. Remove the camshafts and cut sections of Plastigage® to the width of the bushing, and place a strip on the lower half of each bushing, parallel to the camshaft, and so that the plastigage will be between the bushing and the shaft.

b. Fit the cam chain over the sprocket so that the cam is held stationary, and fit and secure the caps and bolts as directed in the "Camshaft Installation" Section.

c. Remove the camshaft and use a micrometer to measure the plastigage in order to determine the camshaft/bushing clearance. Excessive clearance in any of the 4 bushings for each of the camshafts will necessitate replacing all 4 bushings for that cam.

5. The cam chain is of the endless variety, and should not be removed unless replacement is necessary. In most cases excessive chain noise can be traced to wear of the guide rollers, in which case they should be replaced. Consult the "Crankshaft" Section for cam chain replacement information if this becomes necessary.



Check these for wear

NOTE: *On models with engine numbers before Z1E-04654, there have been instances of severe engine damage caused by the sprocket mounting bolts loosening and backing out. A new shouldered bolt (Part No. 92003-41) is available, and should be used to replace the original bolts. Use Liquid Lock-Super (Part No. K41012-014) or a suitable thread locking compound, and torque the bolts to 7 ft lbs (1.0 kg/m).*

Installation and Camshaft Timing

1. Installation is basically in the reverse order of removal. Use new gaskets whenever possible.

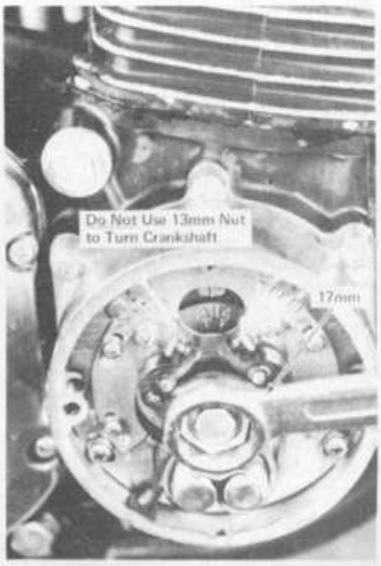
2. Remove the breaker point cover, then rotate the crankshaft, using a wrench on the large crankshaft nut while holding the cam chain up so that it doesn't get caught and so that the slack between the crankshaft and the exhaust cam sprocket is taken up, until the "T" alignment mark for cylinders 1 and 4 is aligned with the timing mark. This brings the number 1 and 4 pistons into the TDC (top dead center) position.

3. Slip the exhaust camshaft through the cam chain, and position it so that the mark on the sprocket is aligned with the cylinder head surface, then pull the chain taut and fit it onto the exhaust camshaft sprocket.

CAUTION: *The chain must be properly seated on the crankshaft and chain guide or the timing will not be accurate.*



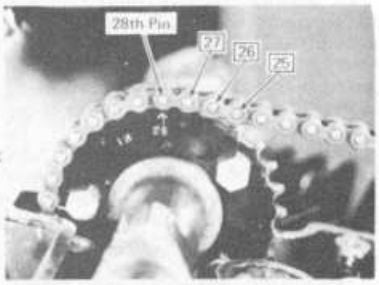
Lining up the sprocket mark



Rotate the engine forward

4. Starting with the next chain link pin above the one which coincides with the exhaust sprocket mark, count to the 28th, then slip the intake camshaft through the chain so the 28th pin and the "28" mark on the intake camshaft sprocket are aligned as illustrated.

NOTE: *Do not begin counting at the exhaust sprocket mark; start at the next pin above that point.*



Lining up the 28th pin and mark

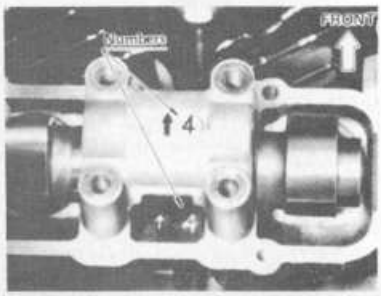


Start counting here

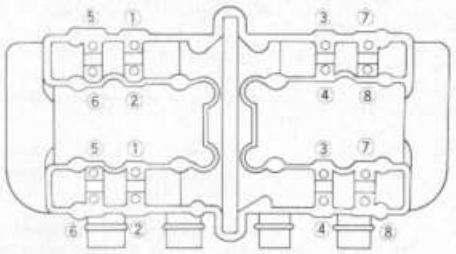
5. Position all the split bushing halves in their original locations unless they've been replaced.

6. Position the camshaft caps so that the arrow points toward the exhaust side, and so that the number on the cap matches the number on the head.

7. Seat the camshaft by partially tightening the left-side cap bolts, then fully torque all of the bolts to 105 in. lbs (1.2 kg/m) in the order shown in the accompanying illustration.



Install caps so that numbers match



Bolt tightening pattern

CAUTION: *If you are bench assembling the head without the cam chain installed, great care must be taken not to bend any valves by securing the bearing caps with the cams improperly positioned. Be sure that the cam lobes do not depress both valves of any one cylinder at the same time, and place styrofoam under the head to prevent bending the valves on the bench surface. Do not tighten both camshafts into place at the same time, and do not secure the caps until the valve timing is set (Step nos. 2-4) with the cam chain in position.*

8. Liberally oil the cam assembly, then install the chain guide sprocket assembly, and adjust the cam chain tension.

9. Rotate the crankshaft 2 or 3 complete revolutions until number 1 and 4 pistons are at TDC ("T" mark aligned with timing mark), then check that the marks on the exhaust and intake camshaft sprockets are properly aligned, as illustrated, indicating that the cam timing is correct.

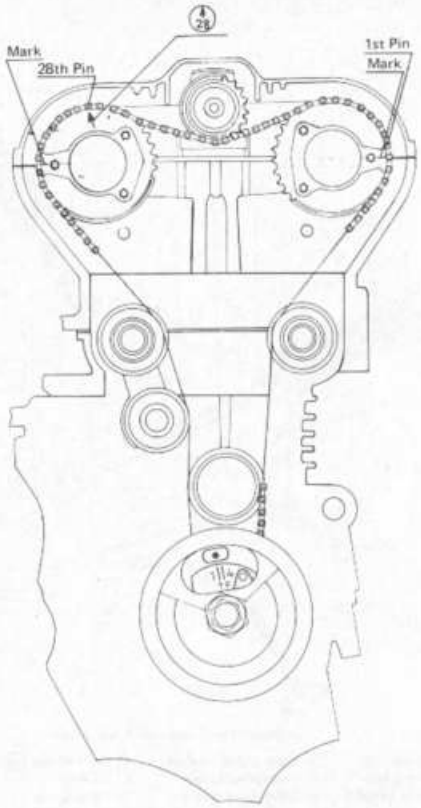


Securing the chain guide



Installing the tachometer pinion

CAUTION: *If any unusual resistance is felt when rotating the engine, stop immediately and make sure that the timing is correct or valve damage may occur.*



Valve timing alignment

10. Install the tachometer pinion and cable, then mount and secure the valve cover and cover gasket to 70 in. lbs (0.8 kg/m) torque.

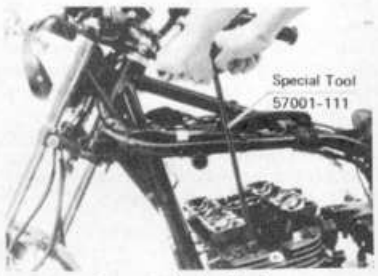
11. Adjust the valve clearances.

CYLINDER HEAD

Normal wear to the valve lifter and cam surfaces can be adjusted for up to 0.04 in. (1.0 mm). Once this limit has been exceeded through seat wear or grinding, the valve stem end can be ground down to increase clearance. The head will have to be replaced if the adjustment limit is exceeded again.

Removal and Disassembly

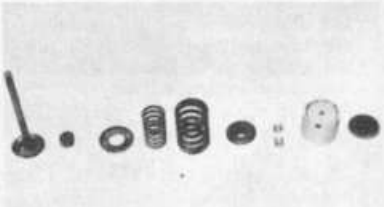
1. Fully open the seat, and remove the tank.
2. Remove the exhaust system.
3. Remove the carburetor assembly after loosening the 8 hose clamps which secure it.
4. Remove the camshafts as described in the "Camshafts Removal" section.
5. Disconnect the spark plug wires from the plugs, and remove the plugs.
6. Remove the bolt from either end of the head, and the 12 cylinder head nuts using either the special tool (Part No. 57001-111) or any suitable socket wrench.
7. Remove all of the valve tappets and shims, keeping them separate for installation in their original locations.



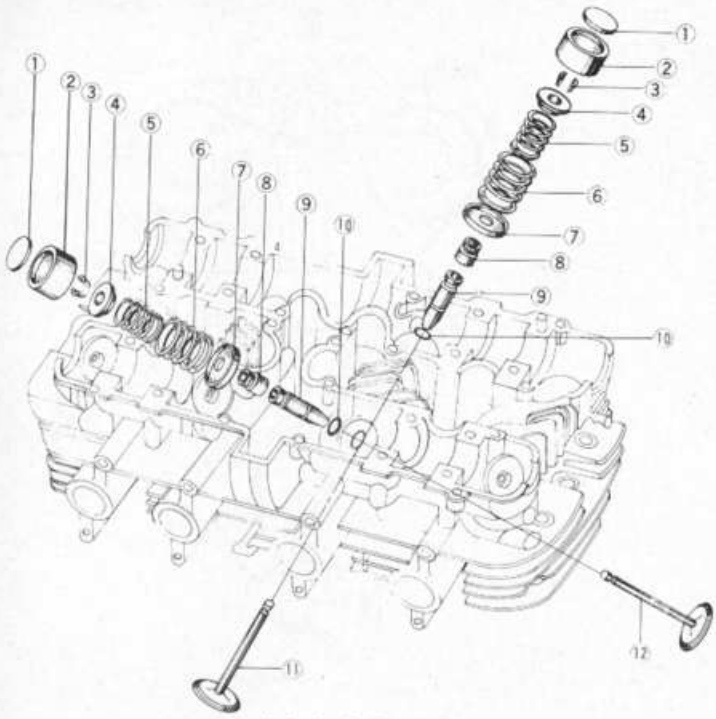
Removing the head bolts

8. Remove the cylinder head and head gasket. Tap the head with a soft mallet to break it free from its seat if necessary.

9. Compress the valve springs, using either the special tool (Part No. 57001-107) or a suitable substitute, until the split keepers can be removed, then remove the valve, springs, and spring retainer, keeping them separate for installation in their original locations.



One complete valve and tappet assembly

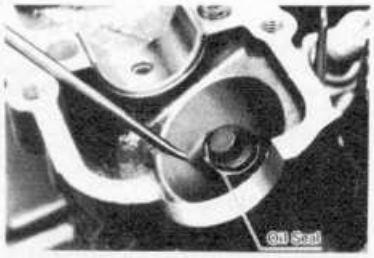


Cylinder head and valve assemblies

1. Shim
2. Valve lifter
3. Split keeper
4. Valve spring retainer
5. Inner valve spring
6. Outer valve spring
7. Valve spring seat
8. Oil seal
9. Valve guide
10. Circlip
11. Exhaust valve
12. Inlet valve

10. Remove the oil seal from the valve guide, then heat the area around the guide with a torch to about 250°-300° F (120°-150° C), and drift the guide out from the bottom of the head using either the special drift (Part No. 57001-108) or a suitable substitute.

NOTE: *Do not remove any guide which doesn't have to be replaced. Any guide oil seal which is damaged or removed should be replaced.*



Removing the oil seal

Inspection

1. Standard cylinder head warpage is under 0.002 in. (0.05 mm), and the serviceable limit is 0.10 in. (0.25 mm). If the warpage exceeds this limit, the head must be lapped.

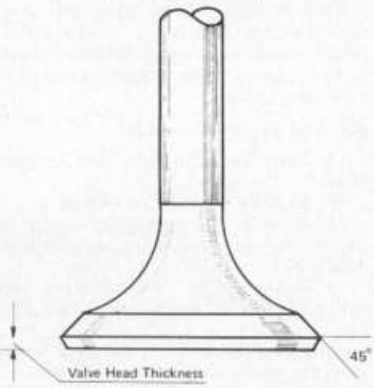
2. Measure the valve head thickness using vernier calipers, and replace the valve if the head is thinner than the service limit given below:

Standard	*Service Limit*
0.034 ~ 0.045 in.	0.020 in.
(0.85 ~ 1.15 mm)	(0.5 mm)

3. Carefully inspect the seating surface of the valve and the condition of the stem, and repair the valve if possible using a valve refacer. The valve seating surface angle is 45°.

4. The valve must be replaced if its run-out exceeds the service limit of 0.002 in. (0.05 mm).

5. Measure the valve stem in at least 4 places and replace the valve if it is worn past the service limits given below at any point:



Measure valve head thickness here

	Standard	*Service Limit*
Intake	0.2742 ~ 0.2748 in.	0.270 in.
	(6.965 ~ 6.980 mm)	(6.86 mm)
Exhaust	0.2738 ~ 0.2744 in.	0.270 in.
	(6.955 ~ 6.970 mm)	(6.85 mm)

6. Measure the bore of each valve guide in at least 4 places, using a small bore gauge and a micrometer, and replace the guide if any of the measurements exceed the service limits given below:

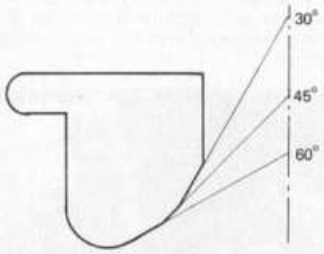
Standard	*Service Limit*
0.2756 ~ 0.2762 in.	0.280 in.
(7.000 ~ 7.015 mm)	(7.10 mm)

If a bore gauge and micrometer are not available, insert a new valve into the guide, set a dial indicator against the stem, and move the stem back and forth to measure valve/valve guide clearance, then do it again while moving the stem in a direction at right angles to the first measurement. The guide will have to be replaced if the valve/valve guide clearance exceeds the service limits given below:

	Standard	*Service Limit*
Intake	0.0008 ~ 0.0020 in.	0.004 in.
	(0.02 ~ 0.05 mm)	(0.10 mm)
Exhaust	0.0012 ~ 0.0024 in.	0.004 in.
	(0.03 ~ 0.06 mm)	(0.10 mm)

7. Inspect the valve seat for signs of wear, scoring, burning, or damage, then measure the width of the seat. The seat must be smooth and undamaged, and must measure 0.04-0.06 in. (1.0-1.5 mm). 30°, 45°, and two 60° cutters are available for valve seat repairs. Proceed in the following manner:

NOTE: *The following procedure will be of value only if the valve and seat are in good condition.*



Valve seat dimensions

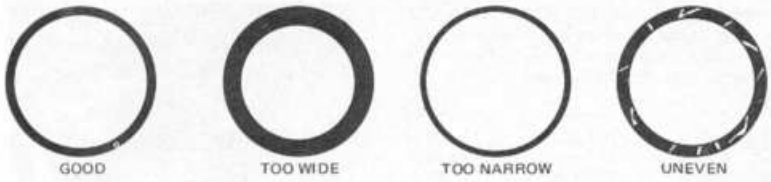
a. Remove the valve and apply machinist's dye to the valve seat, then use a lapper to tap the valve lightly into place. The dye pattern on the valve will give an indication of the condition of the seat. Compare it with the illustration.

b. Carefully cut the seating surface with the 45° cutter, taking care to remove only as much metal as is necessary to provide a good surface.

c. Carefully cut the area inside the seating surface with the 30° cutter, and cut the area outside the seating surface with the 60° cutter. If done properly, the seating surface should be within the specified limits all the way around.

8. Measure the valve spring free lengths using vernier calipers, and replace the springs as a complete set if any are shorter than the serviceable limits given below:

	Standard	*Service Limit*
Inner	1.42 in.	1.38 in.
	(36.0 mm)	(35.0 mm)
Outer	1.55 in.	1.50 in.
	(39.3 mm)	(38.0 mm)



Valve/valve seat contact patterns

9. Stand each spring up on a flat surface, and set a perpendicular reference point next to it. If any spring is tilted more than 0.075 in. (1.9 mm) replace it.

NOTE: *Valve springs should always be replaced as a complete set to assure efficient operation.*

10. Inspect the valve tappets and adjusting shims for signs of wear or damage and replace them as necessary.

NOTE: *The type of valve tappets used in all models up to engine number ZIE-08979 have caused shim fracturing problems on some machines. A new redesigned tappet (Part No. 12032-005) is available as a replacement for the old type (Part No. 12032-004). It is recommended that all old style tappets be replaced. The new type of tappet, recognizable by the lack of a navel in the tappet/shim mating area, can be used in conjunction with the shim already in use, however this is not recommended as the old shim may have begun to fracture.*

Assembly and Installation

1. Assembly is basically in the reverse order of disassembly, and installation is in the reverse order of removal. Use new gaskets, valve guide seals, O-rings, and valve split keepers.

2. Install the circlip in its groove in the valve guide, and liberally oil the guide. Heat the area around the guide hole with a torch to about 250°-300° F (120°-150° C), and drive the guide in from the top of the head using either the special tool (Part No. 57001-108) or a suitable drift, until the circlip reaches its seat.

3. Use a 7 mm reamer to ream the guides. This must be done even if the old guides are used. Always rotate the reamer to the right, and keep rotating it as it's withdrawn.

4. Lap the valve into its seat.

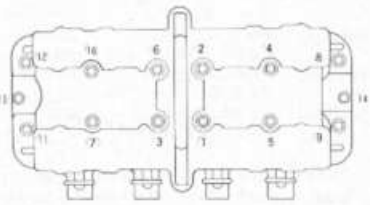
5. Install the tappets and shims to their original locations.

6. Use a new head gasket to prevent compression leakage, and install the gasket so the side with the wider folded-over metal edges is facing up.



Installing a new head gasket

7. Secure the cylinder head nuts to 25 ft lbs (3.5 kg/m) in the order shown in the accompanying illustration.



Cylinder head bolt tightening pattern

8. Secure the two end bolts to 105 in. lbs (1.2 kg/m).

9. Adjust the valve clearances before installing the valve cover, and use a new cover gasket.

CYLINDER AND PISTON

Removal and Disassembly

1. Remove the cylinder head as described in the previous Section, then remove the cam chain tensioner assembly and guide sprocket.



Removing the tensioner and guide sprocket assemblies

2. Loosen the cylinder block by gently tapping up on alternate ends with a soft mallet, then lift the cylinder and gasket off the crankcase studs.

CAUTION: *As you lift the cylinder block, stuff clean rags in the crankcase openings to prevent foreign matter, such as broken rings, from falling into the crankcase, and to prevent possible piston damage caused by pistons striking the crankcase studs.*

3. Remove the piston pin circlips with a sharp pointed instrument, then remove the piston pin with the special tool (Part No. 57001-114) or a suitable substitute. The pins can be removed also by heating the piston crown with a torch, and pushing the pin out while carefully supporting the connecting rod to prevent damage to it or the big end bearings. Keep the pins with their pistons, and mark the pistons for replacement in their original positions.



Removing the piston pin circlip



Removing the piston pin

4. Remove the piston rings using either the special tool (Part No. 57001-115), a suitable substitute, or by hand, taking care not to damage the piston. When removing rings by hand, spread the ring ends with your thumbs, and push up on the opposite side of the ring to remove it.

NOTE: *Do not remove the rings unless you are planning to replace them, as rings shouldn't be reused once they've been removed.*

Inspection

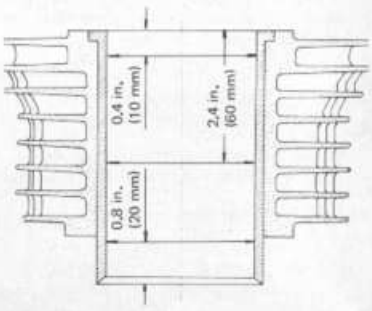
1. Check cylinder bore diameters:

Standard	*Service Limit*
2.5984 ~ 2.5992 in. (66.000 ~ 66.019 mm)	2.602 in. (66.10 mm)

2. Measure the piston diameter at a point about 0.2 in. (5 mm) up from the bottom of the piston skirt and at right angles from the piston pin holes. Replace the piston if the diameter is under the service limits:

Standard	*Service Limit*
2.5956 ~ 2.5965 in. (65.93 ~ 65.95 mm)	2.590 in. (65.80 mm)

3. Subtract the piston diameter from the cylinder measurement to arrive at the piston/cylinder clearance. The clearance



Cylinder bore measurement points

must be returned to standard whenever the cylinder is replaced or bored, however, if only the piston is replaced, clearance may exceed the limit, but must not be less than the minimum clearance of 0.0025-0.003 in. (0.060-0.079 mm).

4. When boring and honing the cylinders, adhere to the following rules:

a. The inside diameter of any cylinder must not vary by more than 0.0004 in. (0.01 mm) at any point along its bore.

b. Replacement pistons are avilable in 0.020 in. (0.5 mm) and 0.040 in. (1.0 mm) oversizes. If boring in excess of 1 mm over standard is ever necessary, the cylinder block must be replaced since replacement sleeves are not made available by the factory.

c. To avoid cylinder distortion due to unbalanced metal temperatures, bore the cylinders in either the 2-4-1-3 or 3-1-4-2 order.

d. Allow the metal to cool completely after boring before taking any measurements, as the diameter may change due to the temperature increase.

e. After the boring is completed, the piston/cylinder clearance should be returned to standard.

5. Inspect the piston rings and ring grooves for signs of wear or damage. Make the following measurements:

a. Measure the width of the ring grooves using a thickness gauge, and replace the piston if the grooves exceed the service limits:

	Standard	*Service Limit*
Top groove	0.059 ~ 0.060 in. (1.50 ~ 1.52 mm)	0.063 in. (1.60 mm)
Second groove	0.059 ~ 0.060 in. (1.50 ~ 1.52 mm)	0.063 in. (1.60 mm)
Bottom groove	0.098 ~ 0.099 in. (2.50 ~ 2.52 mm)	0.102 in. (2.60 mm)

b. Measure the thickness of the piston rings using a micrometer, and replace the rings if worn thinner than the service limits:

	Standard	*Service Limit*
Top ring	0.0567 ~ 0.0573 in. (1.440 ~ 1.455 mm)	0.0535 in. (1.36 mm)
Second ring	0.0579 ~ 0.0587 in. (1.470 ~ 1.490 mm)	0.055 in. (1.40 mm)
Oil ring	0.0973 ~ 0.0980 in. (2.470 ~ 2.490 mm)	0.0945 in. (2.40 mm)

c. Measure the clearance between the ring grooves and rings using a thickness gauge at various points around the piston, and replace the necessary components if the clearance exceeds the service limits:

	Standard	*Service Limit*
Top ring	0.0018 ~ 0.0031 in. (0.045 ~ 0.080 mm)	0.007 in. (0.18 mm)
Second ring	0.0004 ~ 0.0020 in. (0.010 ~ 0.050 mm)	0.006 in. (0.15 mm)
oil ring		

d. Measure ring end gap:

Standard	*Service Limit*
0.008 ~ 0.016 in. (0.2 ~ 0.4 mm)	0.028 in. (0.7 mm)

e. Determine ring tension by measuring the ring gap while the ring is free. If the free end gap is less than the service limits given below, the ring is weak and should be replaced.

	Standard	*Service Limit*
Top ring	0.354 in. (9 mm)	0.236 in. (6 mm)
Second ring	0.354 in. (9 mm)	0.236 in. (6 mm)
Oil ring	0.315 in. (8 mm)	0.197 in. (5 mm)

6. Check piston pin diameter and piston pin hole ID:

	Standard	*Service Limit*
Piston pin	0.6691 ~ 0.6693 in. (16.994 ~ 17.000 mm)	0.6677 in. (16.96 mm)
Piston pin hole	0.6694 ~ 0.6701 in. (17.0035 ~ 17.0115 mm)	0.6724 in. (17.08 mm)
Small end I.D.	0.6694 ~ 0.6698 in. (17.003 ~ 17.014 mm)	0.6713 in. (17.05 mm)

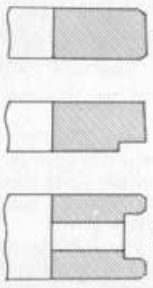
NOTE: *When a new piston or pin is used, check that the piston-to-pin clearance is within the limits of 0.0026-0.00057 in. (0.0066-0.0145 mm), and that the pin-to-small end bearing clearance is within the limits of 0.00012-0.00079 in. (0.003-0.020 mm), and replace any necessary parts.*

Assembly and Installation

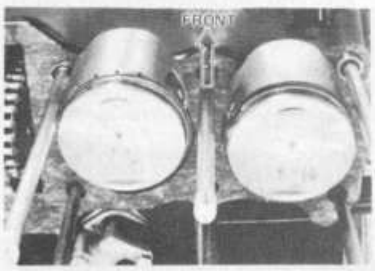
1. Install rings on the pistons with the side marked "N" facing upwards. Note that the two compression rings are not interchangeable. The stepped ring is installed in the second groove.

2. Liberally lubricate the piston pins and push them into the pistons, installing the pistons on the rods so that the arrows on the piston crowns point towards the front of the engine.

3. Always use new piston pin circlips, and when installing the circlips, be sure they are firmly seated, and that the circlip gap is not aligned with the cut-outs in the piston.



Piston ring profiles



The arrows on the piston crowns must point towards the front of the engine



Be sure the circlip opening is not aligned with the piston cut-outs

4. Place the two alignment pins into the forward tension stud hole on either side of the crankcase. **Do not put the pins into the rear holes.**



Alignment pin installation



Top compression and oil ring end-gaps positioned at the front of the piston; second compression ring end-gap at the rear

5. Rotate the top and bottom rings so that their end gaps are facing forward, and the center ring so that its gap faces the rear, then thoroughly lubricate the pistons and rings with fresh engine oil.

6. Lift up the cam chain so that it doesn't get caught, then rotate the crankshaft until all of the pistons are at about the same height, and install the positioning rods (Part No. 57001-112) to hold them level. Wooden slats can be used effectively in place of the special tool.

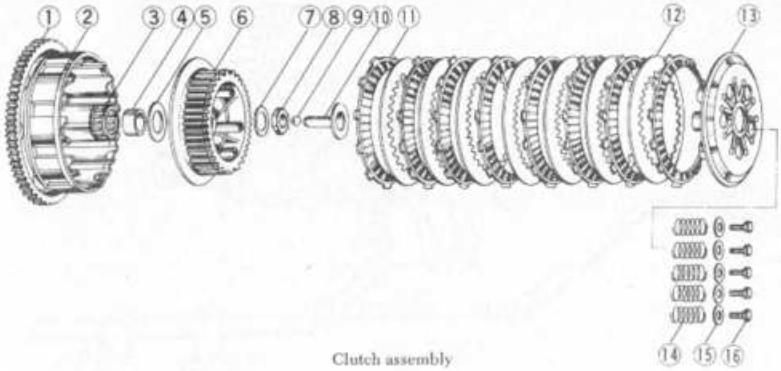
7. Lubricate the piston skirts and cylinder walls with motor oil.

8. Compress the piston rings and start the cylinder block down on the pistons. The ring compressors will have to be lowered and then removed as the rings enter the cylinder. Remove the positioning rod after the rings are in the bore.

Lower End and Transmission

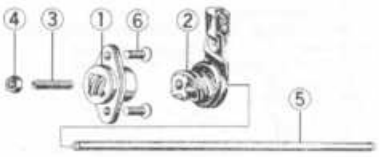
CLUTCH

Possible reasons for clutch drag trouble include:



Clutch assembly

1. Reduction drive gear
2. Clutch housing
3. Needle bearing
4. Bushing
5. Washer
6. Clutch hub
7. Washer
8. Nut
9. Steel ball
10. Pusher
11. Friction plate
12. Steel plate
13. Pressure plate
14. Clutch spring
15. Washer
16. Bolt



Clutch release mechanism assembly

1. Outer release gear
2. Inner release gear
3. Adjusting screw
4. Locknut
5. Pushrod
6. Screw

1. Too much clutch lever play.
2. Clutch plates are warped or too rough.
3. Clutch spring tension is uneven among the springs.
4. Transmission oil is old, or viscosity too high.
5. Clutch bearing is frozen.
6. Clutch release mechanism is defective.
7. Clutch hub or housing unevenly worn.

Some possible reasons for clutch slippage:

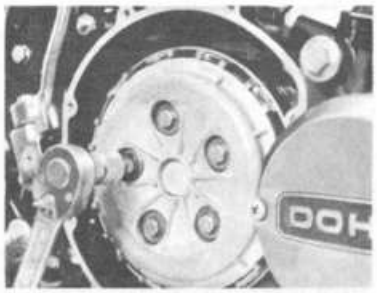
1. No clutch lever play.
2. Friction plates worn.
3. Clutch springs weak.
4. Clutch cable not sliding smoothly.
5. Clutch release mechanism is defective.

Clutch noise could be the result of:

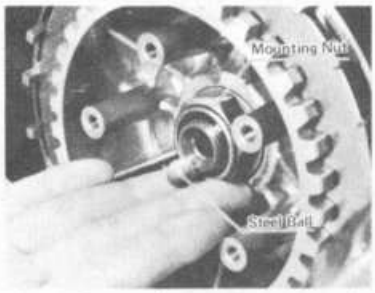
1. Too much backlash between the primary gear and the clutch gear.
2. Gear teeth damaged.
3. Too much clearance between the friction plate tangs and the clutch housing.
4. Needle bearing worn or damaged.
5. Damper rubber or springs bad.

Disassembly

1. Drain the engine oil. The oil in the oil filter, and the filter assembly, can be left as is.
2. Remove the clutch cover and cover gasket, then remove the pressure plate bolts, clutch springs, and the pressure plate.
3. Remove the clutch pushrod, and tilt the motorcycle so the steel ball (release bearing) will fall out.



Removing the pressure plate bolts



Removing the release bearing

NOTE: *The clutch assembly need not be further disassembled unless the clutch hub or housing is damaged.*

4. Remove the clutch plates by either tilting the bike or by lifting them out with a hooked piece of wire, then keep the clutch hub from turning by using either the special tool (Part No. 57001-119) or a suitable substitute, and remove the hub mounting nut.
5. Remove the outer washer, the hub, and the inner washer. Clutch housing removal will necessitate complete engine disassembly with the engine removed from the frame as described in the "Splitting the Crankcases" Section.
6. Remove the chain cover as described in the "Final Drive" Section of the "Chassis" section, then remove the clutch release inner gear by twisting it out, and the outer gear.

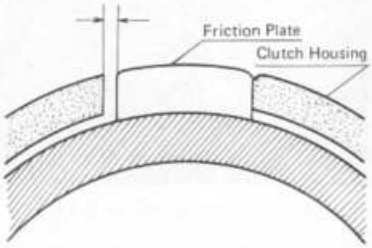
Inspection

1. Friction discs should be replaced as a complete set if any are damaged or worn past the serviceable limits given below:

Standard	*Service Limit*
0.146 ~ 0.154 in. (3.7 ~ 3.9 mm)	0.134 in. (3.4 mm)

2. Measure the clearance between the friction disc tangs and the fingers of the clutch housing using a thickness gauge. Excessive clearance will result in noisy operation. If you replace the discs check the clearance again, and if it still exceeds the service limit given below, replace the housing.

Standard	*Service Limit*
0.002 ~ 0.012 in. (0.04 ~ 0.30 mm)	0.020 in. (0.5 mm)



Measure clearance here

3. Replace any plate if it is warped more than the limits given below:

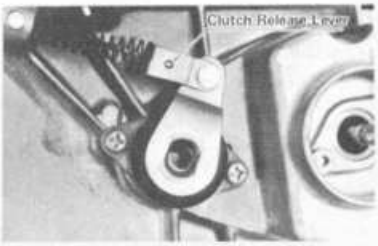
	Standard	*Service Limit*
Friction plate	under 0.006 in. (under 0.15 mm)	0.012 in. (0.30 mm)
Steel plate	under 0.008 in. (under 0.20 mm)	0.016 in. (0.40 mm)

4. Inspect the clutch springs for a worn, pitted, or collapsed condition, and replace the entire set if any are worn past the following free length limits:

Standard	*Service Limit*
1.33 in. (33.8 mm)	1.27 in. (32.3 mm)

Assembly

1. Assembly is basically in the reverse order of disassembly. Use new cover gaskets wherever applicable.
2. Keep the clutch hub from rotating as in the disassembly procedure, and secure the hub nut to 87-108 ft lbs (12-15 kg/m). Remember that the correct order is washer-hub-washer-hub nut.
3. Install the friction and steel plates, starting with a friction disc and then alternating them.



The release lever should be positioned like this

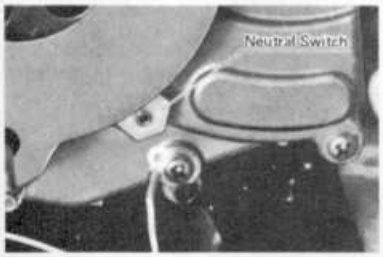
4. Install the release bearing and pushrod in the driveshaft, then install the pressure plate, springs, washers, and mounting bolts, securing them in a crossed pattern.

5. Liberally lubricate the two release gears with cup grease before installing them. The release lever should be positioned as illustrated.

6. Secure the outer gear mounting after applying Loctite® (which is recommended by the factory), or a suitable thread sealer, to the threads.

Removal

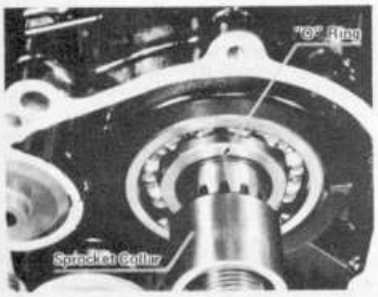
1. Remove the chain cover and drive-sprocket as described in the "Final Drive" Section of the "Chassis" section.



Disconnecting the neutral switch lead

2. Disconnect the neutral switch lead.

3. Remove the transmission cover, cover gasket, sprocket distance collar, and O-ring. A bearing puller may be used if the collar proves difficult to remove.



4. Remove the shift lever assembly and detent lever mounting bolt, then unhook the spring and remove the lever.

Inspection

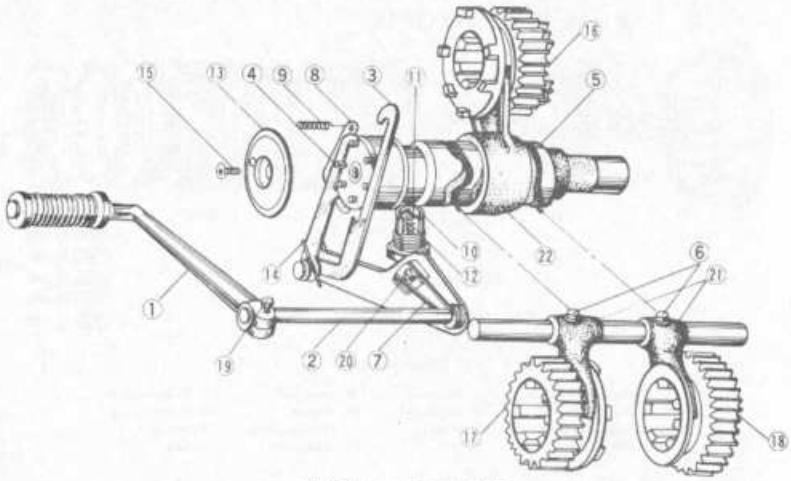
1. Measure the free length of the detent arm spring using vernier calipers, and replace it if it is longer than the service limits given below:

Standard	*Service Limit*
0.917 in. (23.3 mm)	0.984 in. (25.0 mm)

Installation

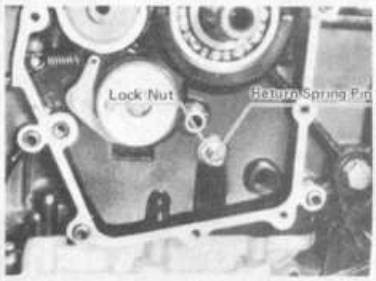
1. Check the return spring pin for a tight fit, and remove it and coat the threads with Loctite before installing it if it was loose.

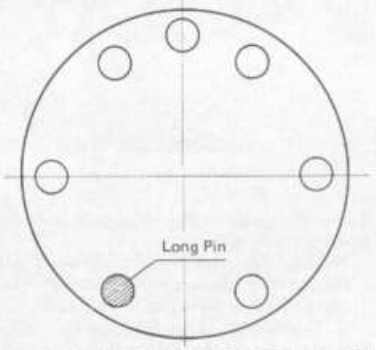
2. Make sure that the longest shift drum pin is in the position illustrated, if the pins were removed. Failure to properly position the long pin will keep the Neutral light from operating correctly.



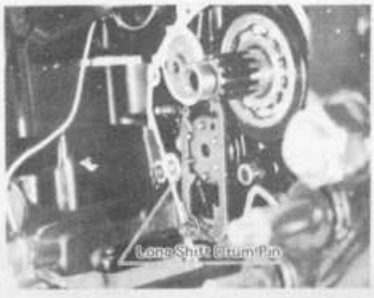
Shift mechanism assembly

1. Shift pedal
2. Shaft
3. Shift pawl
4. Shift drum pin
5. Shift drum
6. Shift fork pin
7. Return spring
8. Detent arm
9. Detent arm spring
10. Shift drum positioning pin
11. Neutral detent pin
12. Spring
13. Shift drum pin holder
14. Pawl spring
15. Screw
16. Drive 3rd gear
17. Output 5th gear
18. Output 4th gear
19. Bolt
20. Return spring pin
21. Shift fork
22. Shift fork

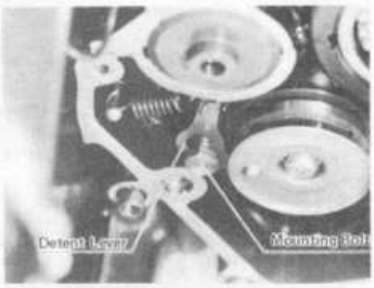




Correct positioning of the long pin is essential



3. Install the detent lever taking care to position it so that it rides on the shoulder of its mounting bolt, and so that it doesn't get caught between the bolt and crankcase.



The detent lever must be able to move freely

4. Install a new O-ring behind the sprocket to prevent oil leakage.

5. Use an oil seal guide (Part No. 57001-130) or a suitable substitute while installing the transmission cover so that the shift shaft seal isn't damaged.

6. Install the sprocket collar after the transmission cover is installed to avoid damaging the output shaft oil seal.

7. Grease the pushrod before installing it.

SPLITTING THE CRANKCASES

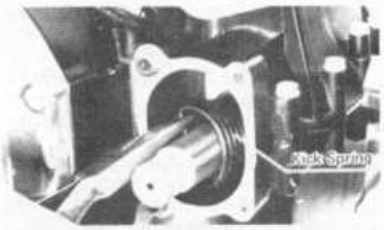
Disassembly

1. Remove the engine from the frame as described in the "Engine Removal and Installation" section.

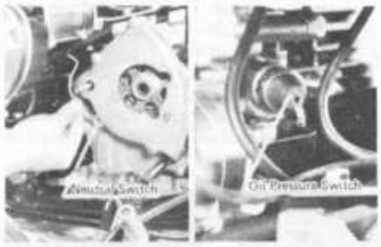
2. Remove the kickstarter pedal, spring cover, and cover gasket, then pull out the spring guide and unhook and remove the spring.

3. Remove the clutch hub as described in the "Clutch" section only if the clutch housing or ball bearing is to be removed from the driveshaft.

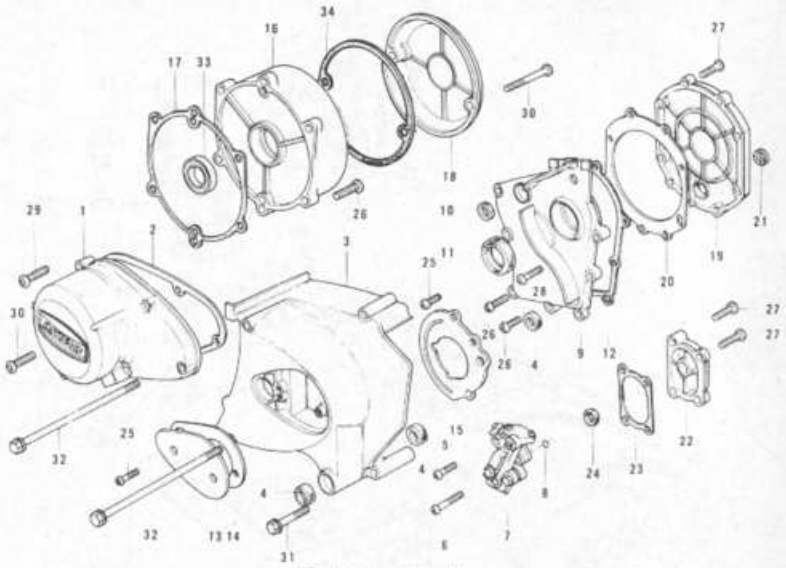
4. Remove the contact breaker cover,



Removing the kick starter spring



Disconnecting the switch leads



Engine cover assemblies

1. L.H. engine cover
2. L.H. engine cover gasket
3. Front chain cover
4. Oil seal
5. Pan head screw
6. Pan head screw
7. Oil pump assy
8. Oil pump O-ring
9. Transmission cover
10. Oil seal
11. Oil seal
12. Transmission cover gasket
13. Oil pump cover
14. Oil pump cover gasket
15. Engine sprocket cover
16. R.H. engine cover
17. R.H. engine cover gasket
18. Contact breaker cap .
19. Clutch cover
20. Clutch cover gasket
21. Oil level gauge
22. Kickshaft cover
23. Kickshaft cover gasket
24. Oil seal
25. Pan head screw
26. Pan head screw
27. Pan head screw
28. Pan head screw
29. Pan head screw
30. Pan head screw
31. Hex head bolt
32. Hex head bolt
33. Oil seal
34. Contact breaker cap gasket

breaker plate assembly, and advance mechanism as described in the "Electrical System" section, then remove the right-side engine cover.

5. Disconnect the leads from the Neutral light switch and the oil pressure switch.

6. Remove the dynamo wires from the clamps, then remove the dynamo cover and cover gasket.

7. Remove the transmission cover and cover gasket, then remove the sprocket distance collar and O-ring. A bearing puller may be used to remove the collar if necessary.

8. Remove the shift lever assembly.

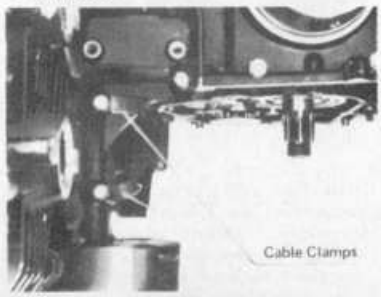
9. Remove the starter assembly as described in the "Electrical System" section.

10. Remove the 5 crankcase bolts from the top side of the crankcase. The two cable clamps will also come free, and these should be replaced in their original positions.

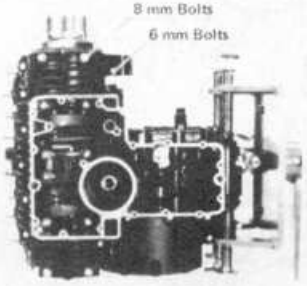
11. Invert the engine and remove the oil filter, oil pan, and pan gasket, then remove the oil pump as described in the "Lubrication System" section.

12. Remove the 17 6 mm crankcase bolts (two of which have cable clamps under them and both should be replaced in their original positions), and the 8 8 mm bolts.

CAUTION: *Do not accidentally remove the 4 bolts which hold down the crankshaft.*



Cable clamp locations

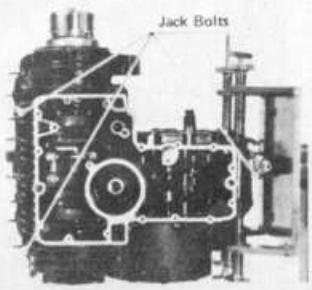


Remove the crankcase bolts evenly

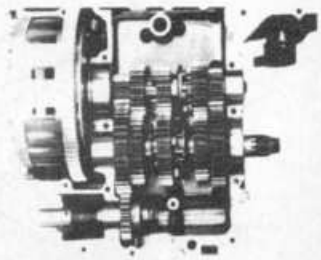
13. Screw 3 8 mm bolts into the jack bolt positions provided in the lower crankcase, and turn them in evenly to separate the crankcase halves. The cases can be gently tapped with a soft mallet to help loosen them.

CAUTION: *Do not attempt to pry the cases apart.*

14. Remove the driveshaft, clutch housing, output shaft, and kickstarter shaft.



Jack bolt positions



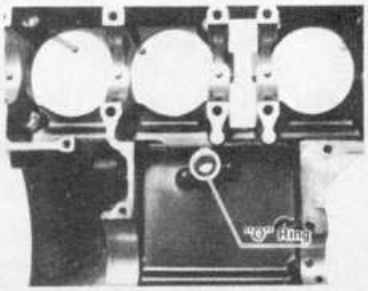
The assemblies ready for removal

Assembly

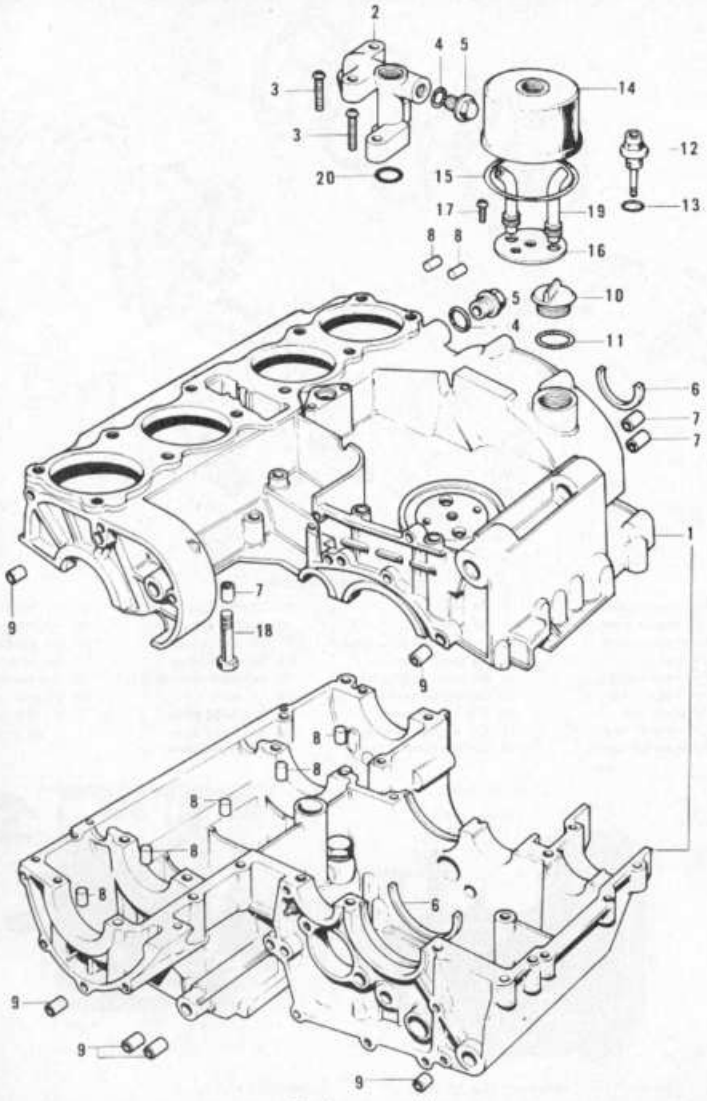
1. Assembly is basically in the reverse order of disassembly. Use all new gaskets, seals, and O-rings wherever applicable.

2. Install the O-ring for the main engine oil passage as illustrated.

3. When installing the output, drive, and kick starter shafts, the crankcase set pins must go into the holes in the respective bushings on the shafts, and the set ring for each ball bearing must be fit into its groove.

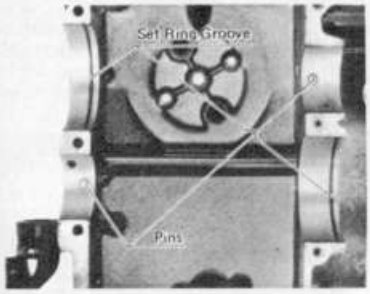


Main oil passage O-ring location

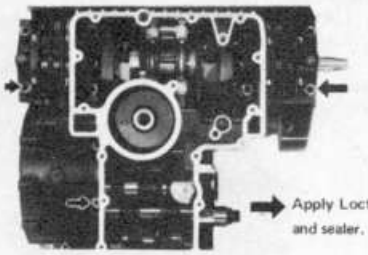


Crankcase assembly

1. Crank case set	6. Ring, bearing set	11. O-ring	16. Breather plate
2. Pipe	7. Dowel pin	12. Breather bolt	17. Pan head screw
3. Pan head screw	8. Dowel pin	13. O-ring	18. Hex head bolt
4. O-ring	9. Dowel pin	14. Breather body	19. Tube
5. Plug	10. Oil filler plug	15. Breather body O-ring	20. O-ring



Be sure to install all the pins



Bolts which must be sealed

4. Thoroughly clean the crankcase mating surfaces, and apply a liquid gasket compound to the surface of the lower case half. Be careful not to use so much compound that it runs down into the crankcase after the halves are joined.

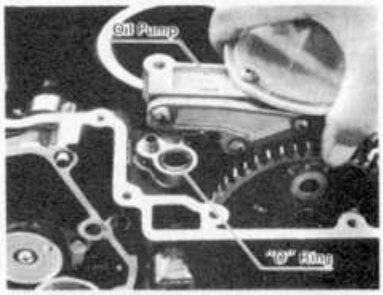
5. Secure the 8 8 mm bolts to 18 ft lbs (2.5 kg/m) torque, evenly following the order numbers on the lower case half. The threads of bolts 6 and 8 should be *coated with Loctite, and* #1 sealer (the hardening type) should be applied to the underside of the bolt heads.

6. Secure the 22 6 mm bolts to 70 in. lbs (0.8 kg/m). Coat the threads of the remaining bolt depicted in the accompanying illustration with Loctite, and apply #1 sealer (the hardening type) to the underside of the bolt head.

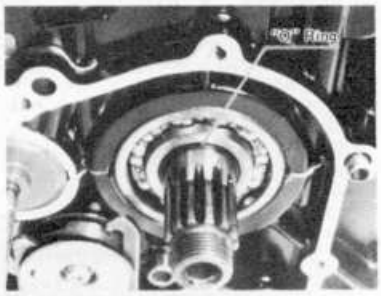
7. Install the O-ring depicted in the accompanying illustration, and check that the oil pump gear meshes correctly with the crankshaft gear when installing the pump. Apply Loctite to the pump mounting bolts, and secure them to 70 in. lbs (0.8 kg/m) torque.

8. To aid in installing the starter, lightly oil the O-ring.

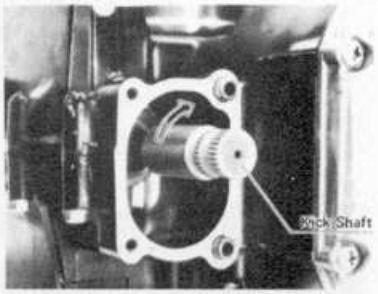
9. Install the O-ring on the output shaft before installing the transmission cover to prevent oil leaks.



Installing the oil pump

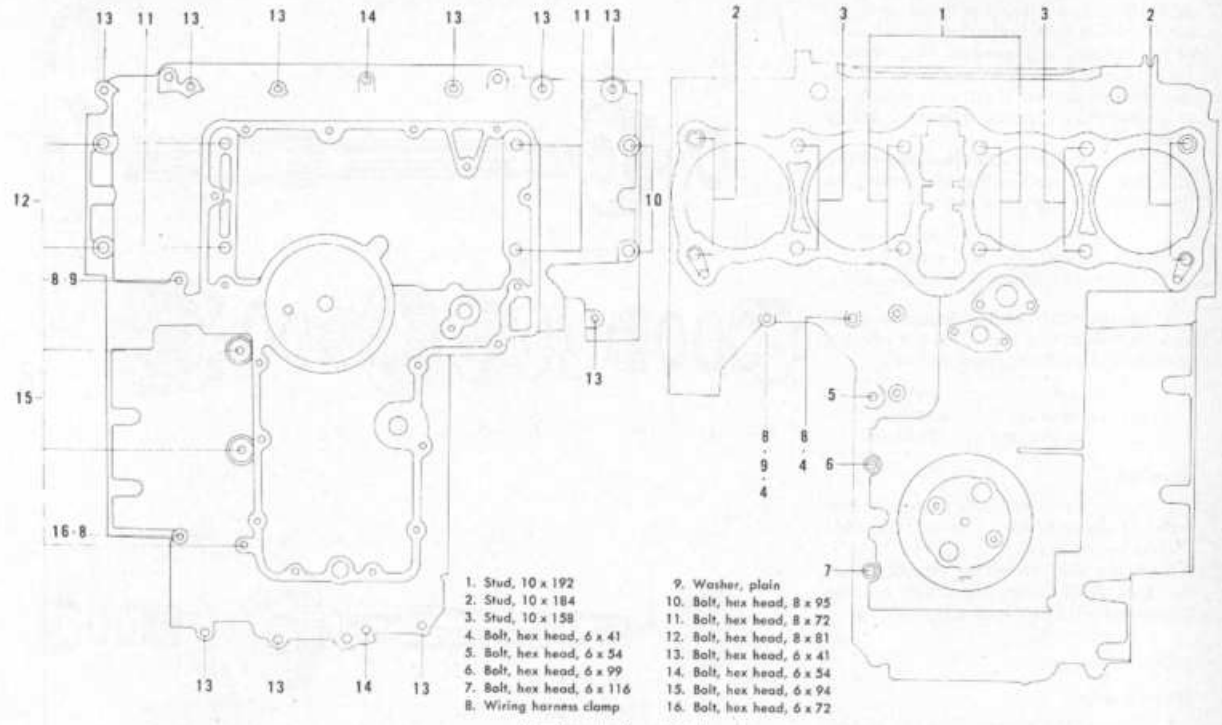


Output shaft O-ring



The kickstarter must be preloaded before the spring is installed

10. Use either the factory oil seal guide (Part No. 57001-130), or a suitable substitute, to protect the oil seal while installing the transmission cover, and install the sprocket distance collar after the cover is in place, otherwise the seal will be damaged.

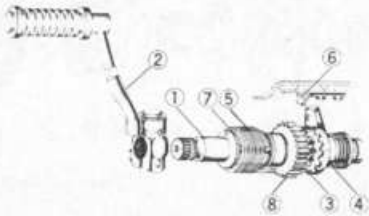


1. Stud, 10 x 192
2. Stud, 10 x 184
3. Stud, 10 x 158
4. Bolt, hex head, 6 x 41
5. Bolt, hex head, 6 x 54
6. Bolt, hex head, 6 x 99
7. Bolt, hex head, 6 x 116
8. Wiring harness clamp
9. Washer, plain
10. Bolt, hex head, 8 x 95
11. Bolt, hex head, 8 x 72
12. Bolt, hex head, 8 x 81
13. Bolt, hex head, 6 x 41
14. Bolt, hex head, 6 x 54
15. Bolt, hex head, 6 x 94
16. Bolt, hex head, 6 x 72

Crankcase bolt and stud locations

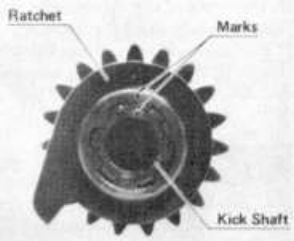


Installing the kick starter cover



Kick starter assembly

1. Kick shaft
2. Kick pedal
3. Ratchet gear
4. Spring
5. Kick spring
6. Stopper
7. Spring guide
8. Kick gear



These marks must be alignment

11. Apply Loctite to the 3 upper right engine cover mounting screws.

12. Align the pin and groove when installing the advance mechanism.

13. Rotate the kickstarter shaft all the way to the right before hooking the spring into the hole in the shaft.

14. Mount and secure the kick starter cover, using either the factory oil seal guide (Part No. 57001-131) or a suitable substitute, to protect the oil seal.

KICK STARTER

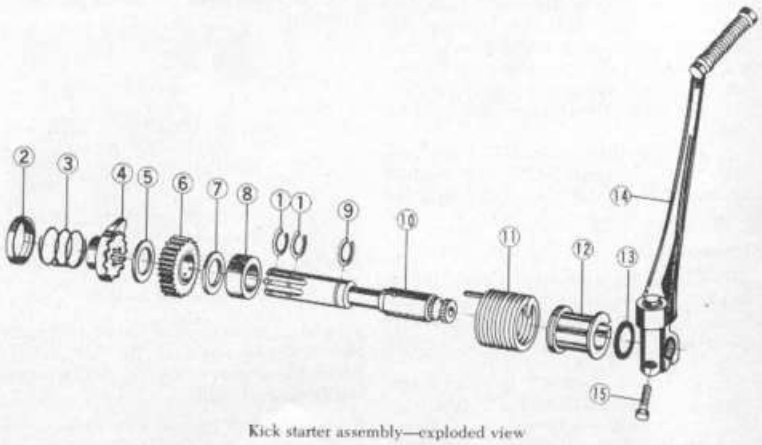
Disassembly

1. Remove the engine from the frame, and separate the crankcases as described previously.

2. Remove the circlip (1), cap (2), coil spring (3), ratchet (4), circlips (1), washer (5), kick gear (6), washer (7), and bushing (8) from the kick shaft (10).

Inspection

1. If the kick starter made a ratcheting noise while the engine was running, check the pedal return spring and the kick gear bushing and shaft for wear. Wear on these parts, and damage to the kick gear teeth are the most common kick



Kick starter assembly—exploded view

1. Retaining ring
2. Cap
3. Coil spring
4. Ratchet
5. Washer
6. Kick gear
7. Washer
8. Bushing
9. Retaining ring
10. Kick shaft
11. Kick spring
12. Spring guide
13. Oil seal
14. Kick pedal
15. Clamp bolt

starter problems. If any of these parts appear worn, pitted, collapsed (in the case of the spring), or damaged, they should be replaced. The ratcheting gears should be replaced as a set if either is damaged, as indicated by slipping of the kick starter pedal.

2. Measure the inside diameter of the kick gear, and replace it if it is worn past its service limit given below:

Standard	*Service Limit*
0.8653 ~ 0.8661 in. (21.979 ~ 22.000 mm)	0.8681 in. (22.05 mm)

3. Measure the outside diameter of the kick start shaft, and replace it if it is worn past its service limit given below:

Standard	*Service Limit*
0.8637 ~ 0.8646 in. (21.939 ~ 21.960 mm)	0.8626 in. (21.91 mm)

Assembly

1. Assembly is basically in the reverse order of disassembly. The oil seal (13) should be replaced.

2. When the ratchet is assembled to the kick shaft, align the mark on the ratchet with the mark on the shaft.

TRANSMISSION

Disassembly

1. Remove the engine from the frame, and separate the crankcases as described previously. Before removing the gear clusters from the crankcase, the gears should be checked for backlash.

2. Remove the bushing (1), circlip (2), shim (3), needle bearing (4), washers (5 and 6), Second gear (7), Fifth gear (8), Fifth gear bushing (9), and the toothed washer (10).

3. Remove the retaining ring (11), Third gear (12), the next retaining ring (11), the toothed washer (10), and Fourth gear (13), then pull the bearing (14) with a suitable bearing puller.

4. Remove the bushing (15), retaining ring (2), shim (3), needle bearing (4), washers (5 and 6), First gear (16), and shim (17).

5. Rotate the shaft while removing the Fourth gear (29) so that the 3 balls (30) will move, then pull the bearing (18) from the shaft using a suitable bearing puller, and remove the washer (19), Second gear (20), the Second gear bushing (21), and the toothed washer (22) from the shaft.

6. Remove the circlip (23), Fifth gear (24), the next circlip (23), the toothed washer (22), Third gear (25), and the washer (26).

Inspection

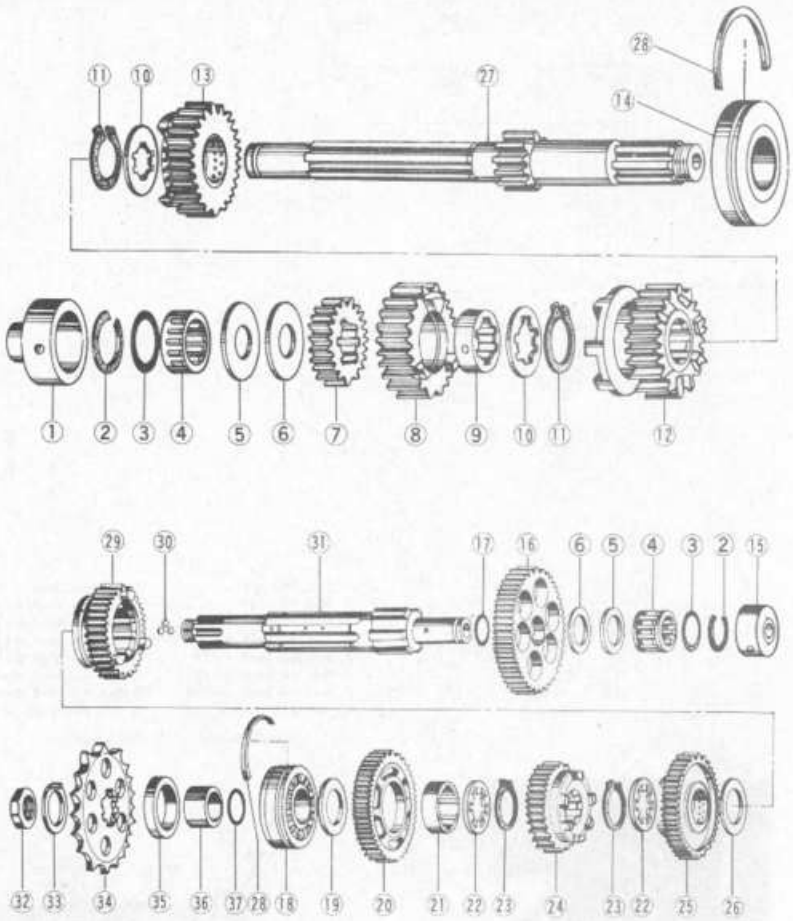
1. Check for excessive gear backlash in all 5 gears by holding one gear steady while rotating the gear it meshes with back and forth.

	Standard	*Service Limit*
1st gear	0.0008 ~ 0.0075 in. (0.02 ~ 0.19 mm)	0.0098 in. (0.25 mm)
2nd–5th gears	0.0024 ~ 0.0091 in. (0.06 ~ 0.23 mm)	0.0118 in. (0.30 mm)

2. Measure the inside diameter of each gear, then measure the outside diameter of the shafts, subtract the two, and replace any gear which exceeds the service limits given below:

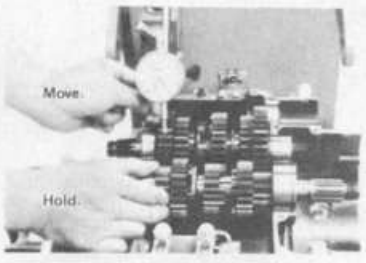
Gear	*Standard*	*Service Limit*
Drive 4th, output 3rd	0.0008 ~ 0.0024 in. (0.020 ~ 0.062 mm)	0.0064 in. (0.162 mm)
Drive 5th	0.0063 ~ 0.0096 in. (0.160 ~ 0.245 mm)	0.0136 in. (0.345 mm)
Output 1st	0.0011 ~ 0.0024 in. (0.027 ~ 0.061 mm)	0.0063 in. (0.161 mm)
Output 2nd	0.0118 ~ 0.0182 in. (0.300 ~ 0.463 mm)	0.0222 in. (0.563 mm)

3. Replace all circlips for assembly.



Transmission assembly—exploded view

1. Bushing	11. Retaining ring	21. 2nd gear bushing	31. Output shaft
2. Retaining ring	12. 3rd gear (D)	22. Toothed washer	32. Nut
3. Shim	13. 4th gear (D)	23. Retaining ring	33. Lockwasher
4. Needle bearing	14. Bearing	24. 5th gear (O)	34. Engine sprocket
5. Washer	15. Bushing	25. 3rd gear (O)	35. Oil seal
6. Washer	16. 1st gear (O)	26. Washer	36. Engine sprocket collar
7. 2nd gear (D)	17. Shim	27. Driveshaft	37. O-ring
8. 5th gear (D)	18. Bearing	28. Set ring	
9. 5th gear Bushing	19. Washer	29. 4th gear (O)	
10. Toothed washer	20. 2nd gear (O)	30. Steel balls	



Measuring gear backlash

Assembly

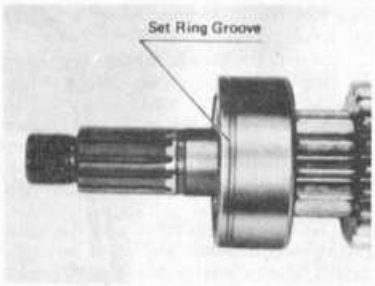
1. Assembly is basically in the reverse order of disassembly. Use plenty of fresh motor oil as an assembly lubricant.

2. Press on the ball bearings so that the set ring groove is toward the end of the shaft.

3. Make sure that the Third and Fifth gear driveshaft bushing oil holes are aligned with the holes in the shaft.

4. Make sure that the Second and Fifth gear (output shaft) oil holes are aligned with the holes in the shaft.

5. Do not grease the Fourth gear steel balls (30) during assembly, as the balls must be able to move freely.

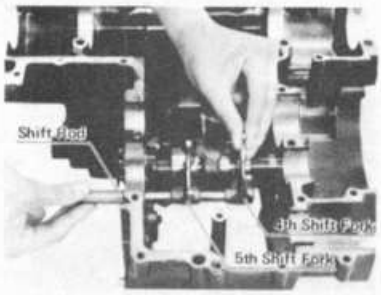


The set ring groove should be toward the end of the shaft

SHIFT MECHANISM

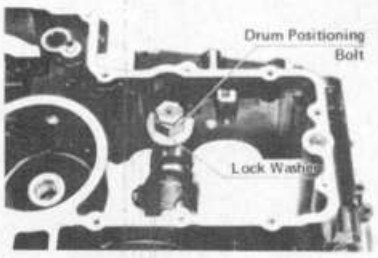
Disassembly

1. Remove the engine from the frame, and separate the crankcases as described previously.
2. Tap the shift rod from the clutch end and pull it out, then remove the two (Fourth and Fifth gear) shift forks.

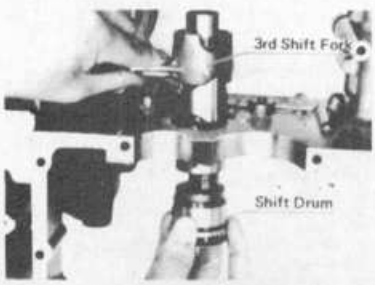


Removing the shift rod and forks

3. Remove the detent arm, bend back the locking tab of the lockwasher, and remove the shift fork pin.
4. Bend back the locking tab of the lockwasher, then unscrew and remove the drum positioning bolt. The cap bolt need not be removed from the top of the positioning bolt.
5. Pull the shift drum out of the crankcase along with the third gear shift fork.



Remove the positioning bolt, but do not loosen the cap bolt



Removing the shift drum

Inspection

1. If the thickness of the shift fork prongs is less than the service limit listed below, the fork will have to be replaced.

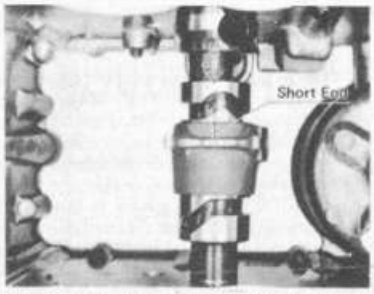
Standard	*Service Limit*
0.228 ~ 0.236 in. (5.80 ~ 6.00 mm)	0.224 in. (5.70 mm)

2. Measure the width of the shift fork grooves, and replace the drum if worn past the service limits given below:

Standard	*Service Limit*
0.238 ~ 0.242 in. (6.05 ~ 6.15 mm)	0.246 in. (6.25 mm)

Assembly

1. Assembly is basically in the reverse order of disassembly.
2. Rotate the shift drum to the Neutral position when installing the drum positioning bolt. The bolt should be coated with Loctite and torqued to 44-57 ft lbs (6.0-8.0 kg/m).
3. The Third gear shift fork is different from the other two, and should be installed so that the short end goes on the drum first, and so that it faces the Neutral switch.



Install the third gear shift fork with the short end as shown

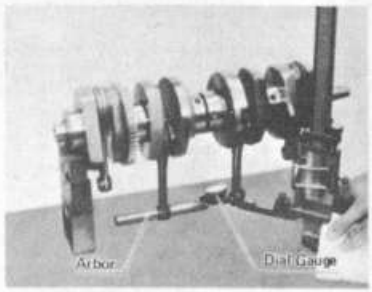
CRANKSHAFT AND CAM CHAIN

Removal

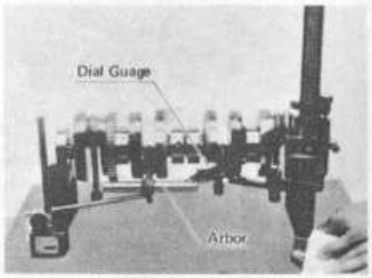
1. Remove the engine from the frame, and separate the crankcases as described previously.
2. Remove the crankshaft bearing cap, lift the crankshaft out of the upper case half, and slip the cam chain from it.
3. The crankshaft end bearings may now be removed by using a suitable puller.

Inspection

1. Remove the bearing from each end of the crank, and place it in a V-block. Place a suitable arbor into the connecting rod small end, and measure the difference in height over a 100 mm (4 in.) length, using a dial indicator, to determine the amount which a connecting rod is bent. The standard for this is under 0.002 in./100 mm (under 0.05 mm/100 mm), and the crankshaft assembly should be replaced if the measurement is over the service limit of 0.008 in. (0.20 mm).
2. Use the method described above to determine whether or not a rod is twisted by checking the amount in which the arbor varies from parallel over a 100 mm length of arbor. The standard for this is the same as that given in the previous step.



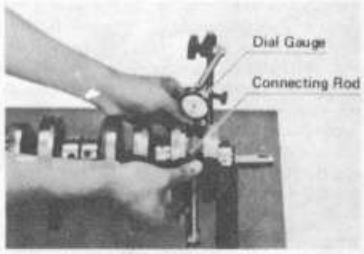
Checking the rods for a bent condition



Checking the rods for a twisted condition

3. Check for big end radial clearance by setting the crank, with the end bearings removed, in V-blocks with a dial indicator set against the connecting rod to be checked. Push the rod against the gauge, and then pull it away. The difference between the two readings is the radial clearance. If the clearance for any of the rods exceeds the service limit listed below, the crankshaft will have to be replaced.

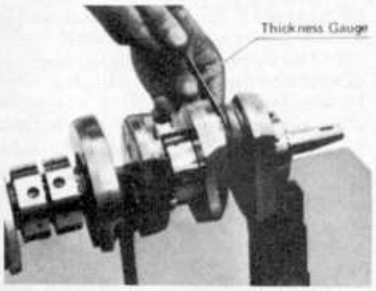
Standard	*Service Limit*
0.0006 ~ 0.0012 in. (0.016 ~ 0.030 mm)	0.0031 in. (0.08 mm)



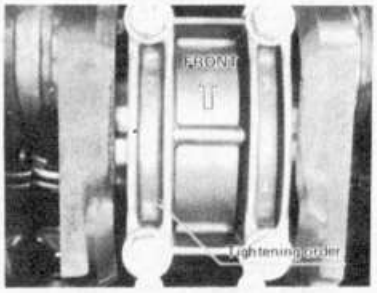
Measuring bearing radial clearance

4. Measure the connecting rod side clearance using a thickness gauge as shown in the illustration. If the clearance on any of the connecting rods exceeds the service limits given below, the crankshaft will have to be replaced.

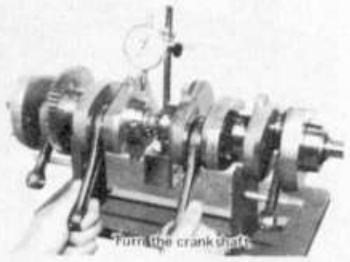
Standard	*Service Limit*
0.012 ~ 0.016 in. (0.3 ~ 0.4 mm)	0.024 in. (0.6 mm)



Measuring bearing side clearance



Bearing cap installed



Measuring crankshaft run-out

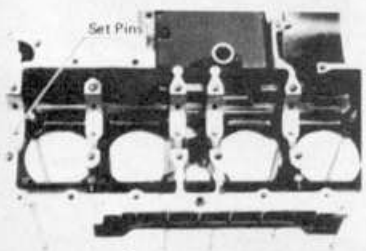
5. With the end bearings removed and the crankshaft in that old V-block setup once again, rotate the crank slowly with a dial indicator set against each of the bearings in order. The difference between the highest and lowest reading is the run-out. The crankshaft must be replaced if the run-out exceeds the service limit given below:

Standard	*Service Limit*
under 0.0012 in. (under 0.03 mm)	0.004 in. (0.10 mm)

6. Inspect the bearing cap for signs of wear or damage. Since it is machined along with the crankcase, it must be replaced in conjunction with the crankcase if it is damaged.

Installation

1. Installation is in the reverse order of removal.
2. Align each pin in the upper crankcase with the pin hole in each bearing before slipping the crankshaft into place.
3. The crankshaft bearing cap is bored along with the crankcase, so that it must be installed with the arrow pointing toward the front of the engine. Secure the bolts with 18 ft lbs (2.5 kg/m) torque in the numbered sequence.



Set pins installed

Lubrication System

Engine Lubrication

OPERATIONAL DESCRIPTION

The 900 has a wet sump, pressure fed, lubrication system which incorporates a gear driven oil pump, an oil filter, a safety by-pass valve, and an oil pressure switch. Oil vapors created in the crankcase are vented through an oil breather to the air cleaner box where they are recirculated to the crankcase, providing an oil-tight system.

The oil pump is a twin-shaft, dual rotor unit which is gear driven off the crankshaft. An oil strainer is fitted to the intake side of the pump, and it serves to protect the pump mechanism from impurities in the oil which might cause damage.

The oil filter unit which is housed in the sump is an alloy canister with a paper element. As the oil filter becomes clogged with impurities, its ability to operate efficiently is reduced, and when it becomes so clogged that it begins to impede the oil flow, the by-pass valve opens and routes the oil around the filter. This of course results in unfiltered oil being circulated throughout the engine; a condition which should be avoided.

The oil pressure switch serves to indicate when the oil pressure has dropped due to a pump malfunction, blockage in a passage, or too little oil available to the pump. It is not intended to be used as an indication of correct oil level.

An oil breather is incorporated in the top of the crankcase, and it serves to minimize crankcase pressure variations due to piston and crankshaft movement, and lower oil temperature, by venting the crankcase. The breather tube carries the crankcase vapors to the air cleaner housing where they become mixed with the air drawn into the carburetors.

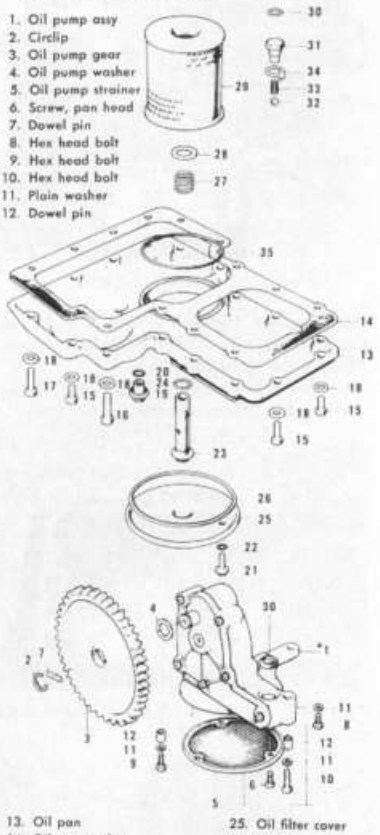
If the breather hose or the ports inside the breather become blocked, pressure may build up to such a level in the crankcase that oil leaks may occur. If the engine oil level is too high, it may result in oil misting severe enough to cause the air cleaner to become oil saturated, and this will result in poor carburetion.

Lubrication flow in the 900 engine is as follows: oil is drawn up from the sump through the oil strainer to the pump, then it passes through the oil filter (or around it if the by-pass valve is in operation) to the pipe in which the oil pressure switch is mounted, and then is routed through 3 branch systems.

The first system lubricates the crankshaft main bearings and crank pins. This oil is thrown by the crankshaft's rotating motion onto the cylinder walls, providing the splash lubrication for the piston assemblies. The oil then drips down into the sump to be recirculated.

The second system lubricates the head assembly. Oil flows up through passages in the cylinder block, through the camshaft bushings, down over the cams, down through the cam lifters, and back to the sump by way of either the holes in the cam lifter bases or the cam chain opening in the cylinder and head.

The third system feeds the transmission bearings and then drains back to the sump for recirculation.

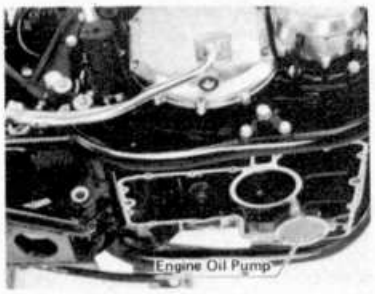


Lubrication system assembly

OIL PUMP

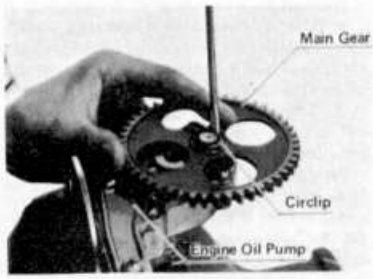
Removal and Disassembly

1. Drain the engine oil and remove the filter.
2. Remove the exhaust system.
3. Remove the bolts which secure the oil pan, then remove the oil pan and gasket.



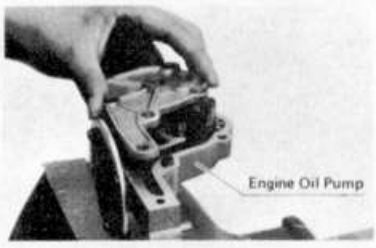
Engine with oil pan removed

4. Remove the bolts which secure the oil pump, then remove the oil pump.
5. Secure the pump in a wood-jawed vise, or take precautions to avoid deforming the pump body, then remove the circlip, main gear, alignment pin, and shim.



Removing the circlip and main gear

6. Remove the screws which secure the pump housing halves together, then gently tap the two shafts alternately until the halves can be separated without damaging the shafts.



Separating the pump body halves

Inspection

1. Clean the pump components thoroughly in a suitable solvent, then blow them dry.
2. Inspect all parts for a worn or damaged condition, and replace them as necessary. All gaskets and O-rings should be replaced as a matter of course.
3. Assemble the two internal gears in one side of the pump body, and check the clearance between each gear and the pump body with feeler gauges. The standard clearance is 0.0001-0.0014 in. (0.003-0.036 mm), and the pump must be replaced if it is worn past its serviceable limit of 0.004 in. (0.10 mm).



Checking gear/pump body clearance

4. Inspect the strainer screen for a damaged, worn, or permanently clogged condition, and replace it as necessary.

Assembly and Installation

1. Assembly is in the reverse order of disassembly, and installation is in the reverse order of removal.
2. Make sure that the gasket surface of both pump body halves is in perfect condition, and is absolutely clean, and always use a new gasket during assembly.
3. Use Loctite® or a suitable thread sealing compound, on all of the assembling screws and mounting bolts, and torque the mounting bolts to 70 in. lbs (0.8 kg/m).
4. Make sure that the pump and crankshaft gears mesh properly.
5. Make sure that the sump pan gasket surfaces are perfectly clean, use a new pan gasket, and tighten the pan securing bolts in a crossed sequence to avoid deforming the gasket.

OIL PRESSURE SWITCH

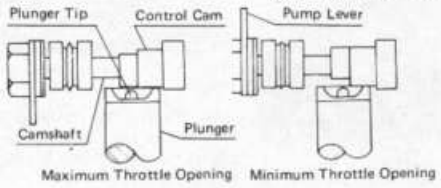
For information on oil pressure switch repair and troubleshooting, consult the "Electrical System" section.

DRIVE CHAIN OIL PUMP

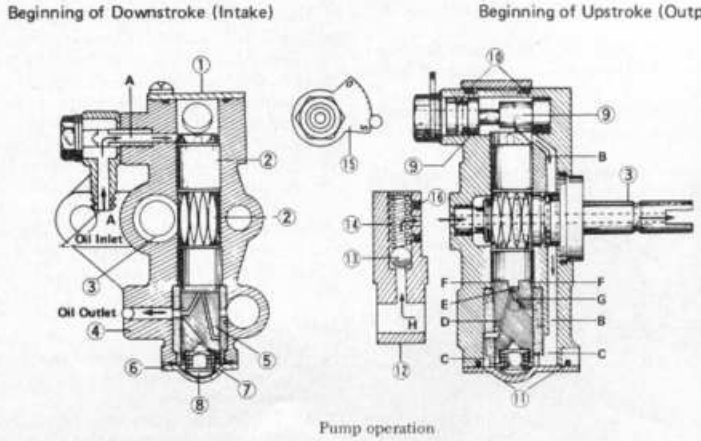
Operational Description

An output (countershaft) shaft-driven, plunger-type oil pump is fitted on the Z1 (1973–74 models) to provide lubrication for the drive chain. Oil flow is regulated by both the pump cam setting (which can be manually adjusted for rate of flow) and by engine rpm, since the output shaft drives both the pump and the rear wheel simultaneously. When the pump lever is adjusted for minimum (0 or 1) flow, the length of plunger travel is also at a minimum, and vice versa.

Oil for the pump is contained in a separate chain oiler tank located under the seat, and is gravity fed to the pump through a hose. A non-return check valve is mounted on the output side of the pump, and the oil flows through the hollow pump shaft to the output shaft where it exits through drillings near the drive sprocket. As the output shaft rotates, the oil is flung onto the chain. The accompanying illustration shows the details of the pump's operation. Oil flows into the pump at point A, and along passage B into chamber C. When the plunger



Pump adjustment



Pump operation

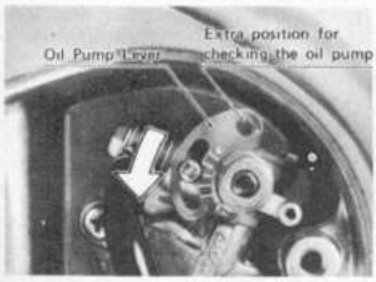
1. End cover
2. Plunger
3. Pump shaft
4. Pump body
5. Plunger follower
6. End cover
7. Plunger spring
8. Spring seat
9. Control cam
10. O-ring
11. O-ring
12. Check valve
13. Steel ball
14. Spring
15. Pump lever
16. O-ring

moves toward the camshaft on its intake stroke, some space (F) is left between the plunger follower and the cylinder wall. At this time the follower is so positioned that passage D in the follower is aligned with a hole in the valve sleeve, and the oil flows from chamber C through passage D through space E into the empty area F. As the plunger returns on its pumping stroke it rotates back to its original position, causing passage G to be aligned with the outlet hole in the sleeve instead of D being aligned with the inlet hole, and the plunger's motion decreases area F causing the oil to flow into the check valve inlet H. The pressure exerted by the oil presses the ball back, compressing the check valve spring, and allowing the oil to flow through the valve and eventually to the chain.

Output Test (1974 Models)

The drive chain oil pump on 1974 models has an extra position on the pump lever for checking output.

1. Remove the lever phillips screw, and rotate the pump lever until the extra position hole is aligned with the screw hole. Install and tighten the screw.
2. Start the engine and run it at 2,000 rpm in first gear.
3. The chain should be well lubricated after several minutes. If it is not, the pump is defective and must be replaced.



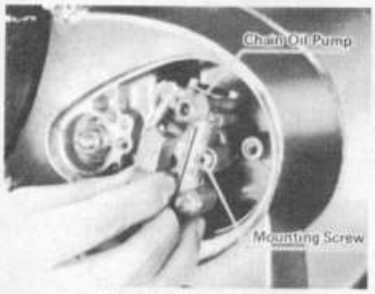
Oil pump (1974)

Pump Removal and Disassembly

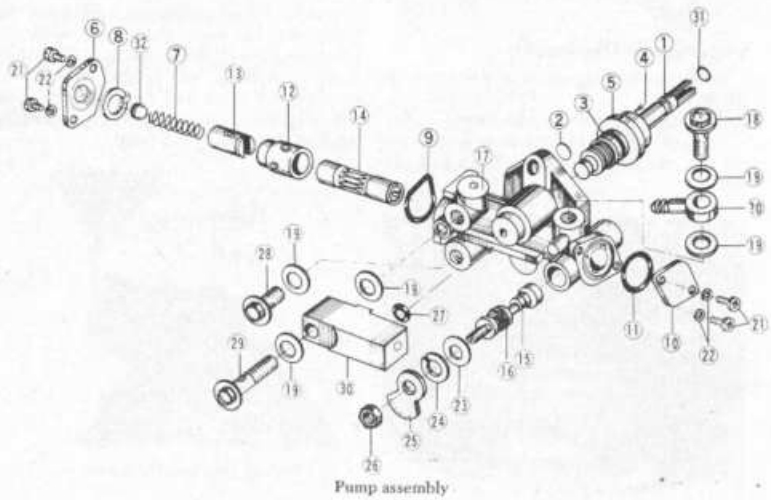
1. Remove the oil pump cover, slide back the hose clamp, and disconnect the hose.

NOTE: *Insert the cover screw into the hose, as illustrated, to prevent oil leakage.*

2. Remove the two pump mounting screws, and remove the pump.

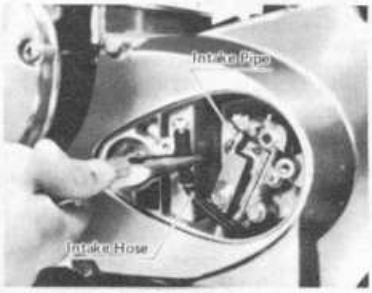


Removing the pump



Pump assembly

1. Pump shaft	9. O-ring	17. Oil pump body	25. Control lever
2. Spacer	10. Cap	18. Banjo bolt	26. Nut
3. O-ring	11. O-ring	19. Washer	27. O-ring
4. Oil seal	12. Plunger guide	20. Banjo	28. Bleeder bolt
5. Bushing	13. Plunger	21. Bolt	29. Bolt
6. Cap	14. Plunger	22. Lockwasher	30. Check valve
7. Plunger spring	15. Control cam	23. Washer	31. O-ring
8. Plunger guide stopper	16. V-ring	24. Lockwasher	32. Spring seat



Pliers can be used to stop flow until a screw is inserted

3. Wrap cloth around the pump shaft (1) to protect it, then pull it out with pliers. A spacer (2) should come out with the shaft.
4. Remove the shaft bushing (5), then remove the O-ring (3) and oil seal (4).
5. Remove the cap screws and top cap (6), then remove the plunger spring (7), plunger guide stopper (8), and O-ring (9).
6. Remove the cap screws and bottom cap (10), then remove the O-ring (11).
7. Gently press on the bottom of the plunger (14) with a thin rod to remove the top plunger (13), guide (12), and bottom plunger (14) from the pump body (17).
8. Remove the control cam (15) and V-ring (16).
9. Remove the banjo bolt (18) and banjo assembly, and the check valve securing bolt (29) and check valve housing (30).

Inspection

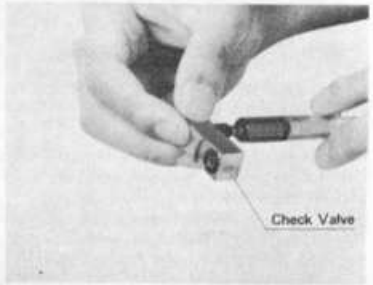
1. Clean all but the rubber parts in a suitable solvent, then blow all but the check valve assembly dry.

CAUTION: *The pressure exerted by compressed air may damage the check valve.*

2. Inspect all parts for a worn or damaged condition. The O-rings and the check valve are the only parts which are expected to wear, and consequently are the only available replacement components available. If other parts are worn or damaged, the entire pump assembly should be replaced.
3. Check that the check valve will pass oil in only one direction, and that it isn't clogged. The valve can be easily cleaned with gasoline or solvent in a syringe.
4. Whenever the pump is disassembled, or if the pump oil tank runs dry while the pump is in operation, air will enter the pump, which must then be bled. Do this by removing the bleeder bolt (28) until oil starts to run from the hole, then secure the bolt.



Bleeding the pump



Testing the check valve

Assembly and Installation

1. Assembly and installation are in the reverse order of removal and disassembly.
2. Lubricate the oil seal with clean oil before pressing it into position.
3. Lubricate the O- and V-rings, plungers, and plunger guide before assembly.
4. Rotate the rear wheel until the pin in the output shaft is brought into alignment with the groove in the oil pump shaft. This is essential for correct installation as otherwise the pump will not seat correctly.
5. Apply Loctite,® or some other suitable thread sealer, to the pump mounting screws before installing them.
6. Bleed the pump as directed in Step 4 of the preceding Section before securing the pump cover.
7. Check the oil level in the chain oiler pump tank.

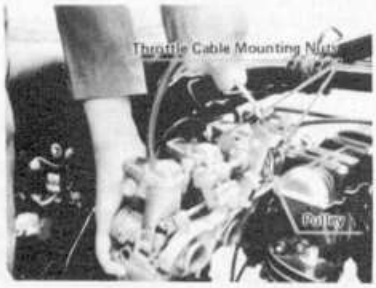
Fuel Systems

NOTE: *For carburetor theory, component inspection, and troubleshooting, refer to "Carburetors" in the "General Information" section.*

Carburetors

CARBURETOR BANK REMOVAL AND INSTALLATION

1. Disconnect the fuel lines at the gas tank, then remove the tank.
2. Loosen the 4 intake manifold clamps at the front, and the 4 air cleaner hose clamps at the back, then pull the carburetor bank off to the rear.

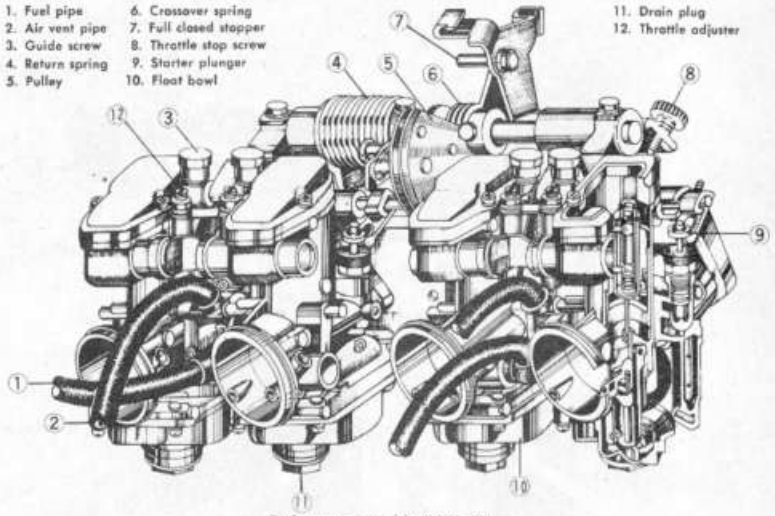


Removing the carburetor bank assembly

3. Loosen the throttle cable mounting nuts, and disconnect the cables from the pulley.
4. Installation is in the reverse order of removal. Note the following:
   a. All clamps must be secure enough to prevent air leaks, especially at the intake manifold.
   b. Adjust the throttle cables.

INDIVIDUAL CARBURETOR REMOVAL AND INSTALLATION

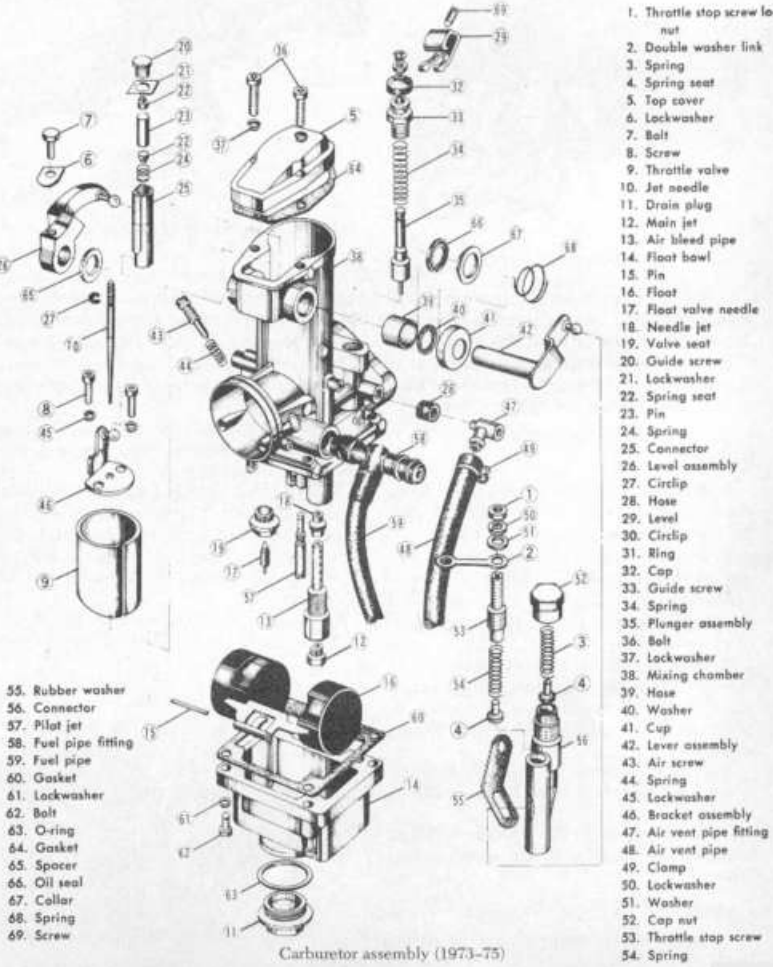
1. Remove the carburetor bank as described in the previous Section.



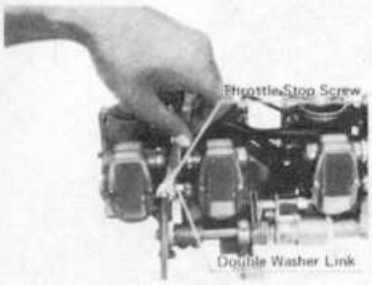
Carburetor assembly (1973–75)

2. Remove the throttle stop screw locknut (1) from both the carburetor to be removed and its companion, then remove the double washer link (2).
3. Remove the throttle stop screw (53), stop screw spring (54), and the spring seat (4).
4. Remove the cap nut (52) from the linkage of the carburetor which is to be removed, then remove the spring (3) and seat (4).

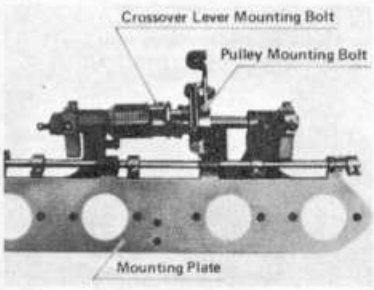
CAUTION: *Upon removal of the cap nut the spring may pop out. Be prepared to catch it.*



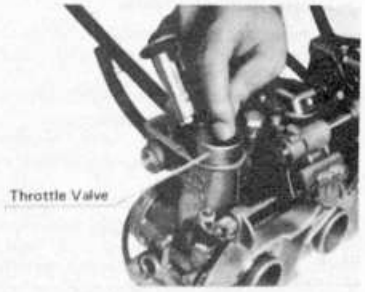
Carburetor assembly (1973–75)



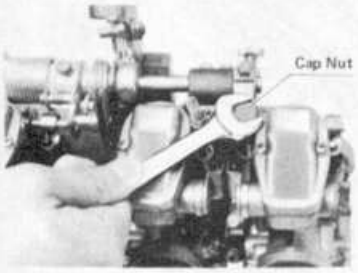
Removing the stop screw locknut



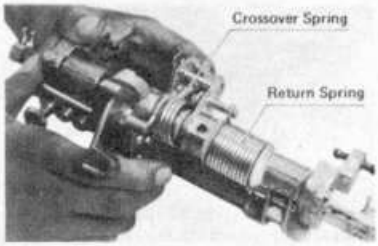
Mounting plate assembled



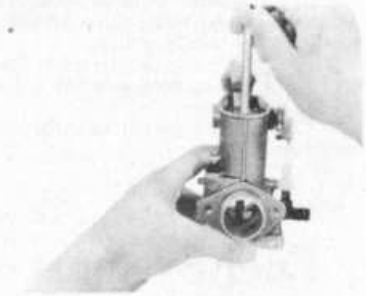
Removing the throttle valve



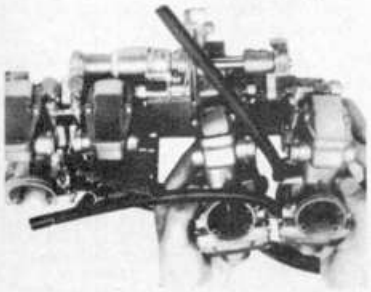
Removing the cap nut



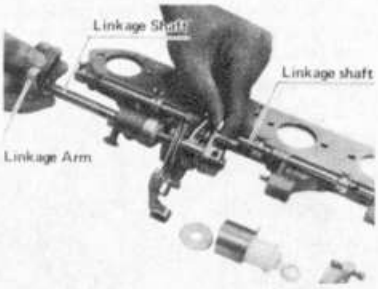
Removing the springs



Removing the needle jet



Removing a pair of carbs



Removing the linkage shaft



Removing the main jet

5. Remove the 4 mounting screws and swing the pair of carburetors you are working with away from the plate.

6. Installation is in the reverse order of removal. Use Loctite, or some other suitable sealer, on the mounting screws.

LINKAGE DISASSEMBLY AND ASSEMBLY

1. Remove all of the carburetors from the mounting plate as described in the previous Section.

2. Remove the crossover lever and pulley mounting bolts, then unhook the crossover spring from the pulley pin, and the throttle return spring from the crossover lever pin.

3. Remove the bolt which secures the linkage arm to the shaft from either of the arms, then pull the shaft out from the opposite end. The other arm need not be removed.

NOTE: *The starter (choke) linkage need not be removed unless it is defective.*

4. Assembly is in the reverse order of disassembly. Lubricate the shafts at this time.

CARBURETOR DISASSEMBLY

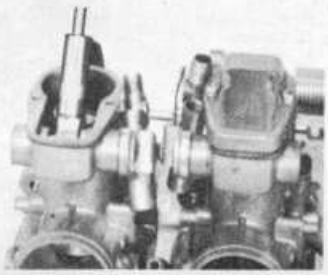
1. Remove the carburetor to be disassembled as described in the "Individual Carburetor Removal and Installation" Section. The fuel may be drained from the float bowl by removing the drain plug.

NOTE: *Consult the "Individual Carburetor Removal and Installation" Section for a labeled exploded view illustration.*

2. Remove the top cover mounting screws and washers, then remove the cover and cover gasket.

3. Bend flat the lockwasher tab, then remove the bolt. The lever assembly can now be removed along with its associated components. The connector assembly can now be further disassembled if so desired.

4. Remove the two screws which secure the bracket assembly to the throttle valve, and lift the bracket, complete with the lever assembly and connector assembly, out of the bore. The connector assembly may be further broken down by removing the guide screw and components.



Removing the lever assembly mounting bolt

5. Remove the throttle valve and needle from the bore, taking care not to damage the needle.

6. Remove the plunger assembly after removing the lever cap, and the guide screw.

7. Remove the float bowl securing screws, the float bowl, the bowl gasket, the float, float pivot, and the float valve needle.

8. Remove the main jet and air bleed pipe, then invert the carburetor and gently press out the needle jet with a wooden rod or some other suitable instrument.

9. Remove the valve seat, the pilot jet, the pilot air screw and spring, and any other remaining items such as the fuel lines and their hardware.

ASSEMBLY

1. Assembly is in the reverse order of disassembly. Use all new gaskets and O-rings.

2. Do not overtighten the jets when installing them in the carburetor body.

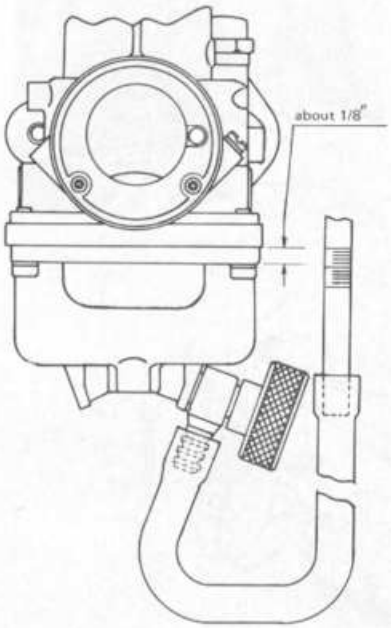
3. Make certain that the jet needle is installed in the same position as when it was removed. The clip should be in the third groove from the top.

4. Adjust the height of the float as described in the following Section if necessary.

FLOAT HEIGHT ADJUSTMENT

1. Turn the fuel tap to the "Off" position, remove the overflow vent tube (which will interfere with the knurled knob), and remove the float bowl drain plug. Be prepared to catch the fuel which will run out.

2. Install the fuel level measuring device in place of the drain plug.



Measuring float height

NOTE: *The original fuel level gauge hose (Part No. 99990-020) was incorrectly calibrated, and has been subsequently replaced with the part number given in the above Step. This new hose is provided free of charge by the factory.*

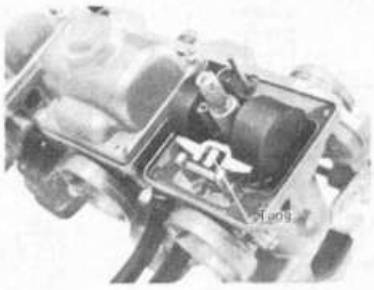
3. Hold the plastic tube against the carburetor body and turn the fuel tap to the "On" position. The gas level in the hose should come up to 0.10-0.18 in. (2.5-4.5 mm) below the edge of the carburetor body.

4. If the fuel level is incorrect, the float must be adjusted in the following manner:

a. Drain the fuel from the float bowl, then remove the bowl. Be prepared to catch the float, float pivot pin, and float needle.

b. Bend the tang on the float slightly to adjust the float height. Bending the tang up will lower the fuel level, and bending it down will raise it.

NOTE: *When checking the fuel level of the inside two carburetors, the outside carb base may be used as a reference point for the gauge.*



Bending the tang adjusts the float height

Fuel Tap

1. Turn the tap to the "Off" position, then disconnect the fuel lines.

2. Remove the tank, or raise and support the back of it.

3. Unscrew the sediment cup and remove the O-ring and strainer.

4. Remove the screw which secures the valve and lever, and remove those parts.

5. The tap may be removed from the tank by loosening the nut which secures it to the tank.

NOTE: *Removing the fuel tap body from the gas tank is not recommended unless replacement is necessary.*

6. When assembling the tap a suitable gas-resistant sealer should be used if new O-rings are not available. Leaks at the sediment bowl can be stopped with epoxy or some other sealer if necessary.

Electrical System

Charging System

Dynamo Output Test

Before checking the dynamo, make sure that the battery, rectifier, and regulator are all good, and be sure that the battery is fully charged. Dynamo failure can be traced to either a short, an open circuit (burned-out wire), or a loss of rotor magnetism.

Test the dynamo in the following manner:

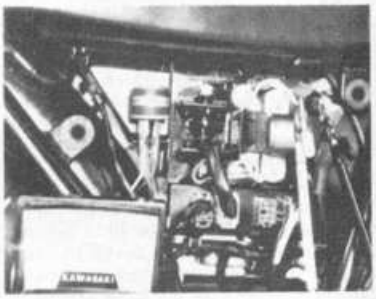
1. Remove the right-side plastic cover, and disconnect the green regulator lead from the connector panel. Be sure that all accessories are turned off.

2. Rotate the hand tester switch to the 30 VDC (from 0-30 volts of DC) scale, and connect it across the battery so that the negative (−) tester lead goes to the negative battery terminal, and the positive (+) tester lead goes to the battery positive terminal.

3. Start the engine and run it at 4000 rpm, taking note of the meter reading. A reading of 15-20 VDC is normal, and a lower reading indicates a defective dynamo.

4. Turn off the engine and disconnect the tester leads from the battery, then set the tester to the 12 amp DC range, and switch the tester leads to the appropriate meter sockets.

5. Disconnect the wire which runs from the fuse to the starter relay, and connect the positive (+) tester lead to the white wire on the fuse side, and the negative (−) tester lead to the white wire on the relay side. This puts the tester in series with the rectifier and battery so that battery charging current can be measured.



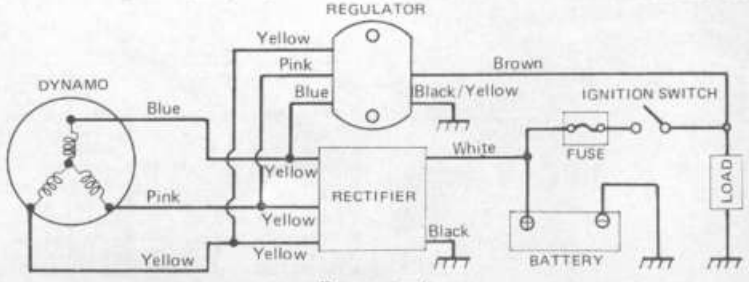
Measuring battery charging current

CAUTION: *Do not use the electric starter if the tester is connected in series directly at the battery terminal instead of as directed in the preceding Step, or the reverse starting current will damage the meter.*

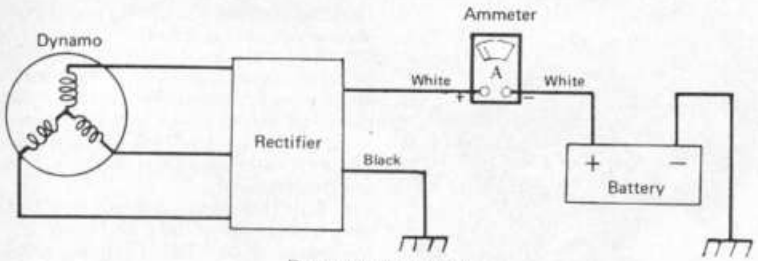
6. Start the engine and run it at 4000 rpm, taking note of the meter reading. A reading of 9.5 amps or more is normal, and a lower reading indicates a defective dynamo.

7. Determine whether the problem is in the windings or the rotor in the following manner:

a. Disconnect the blue plug from the connector panel, and use the R x 1 scale on the tester to determine the



Dynamo circuit



Dynamo test connections

resistance between each pair of wires going to the plug: blue/pink, blue/yellow, and pink/yellow.

b. The resistance between any two of the wires should be 0.45-0.6 ohms; less indicates shorted coils, and a higher resistance or none at all indicates open coils. If the coils are defective, the stator must be replaced.

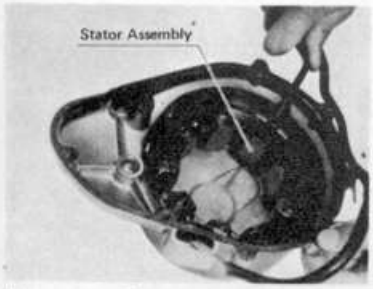
c. Measure the resistance between each dynamo wire and ground (the chassis, engine, etc.) using the highest resistance scale on the tester.

d. No reading (∞) is normal, and any reading indicates a short which means the stator must be replaced.

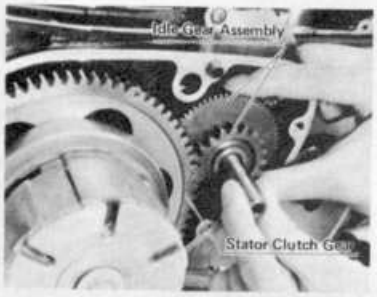
e. If the coils have normal resistance, but voltage and current checks indicate that the dynamo is defective, the rotor magnets are probably bad, and the rotor will have to be replaced.

Dynamo Removal and Installation

1. Remove the chain cover.
2. Remove the right-side plastic cover, and disconnect the blue dynamo wire, and the wires from the oil pressure and Neutral indicator switches, then release the wires from the cable clamps.
3. Remove the left-side engine cover, and remove the allen bolts which secure the stator to the cover.



The stator assembly is secured to the engine cover



Removing the idle gear assembly

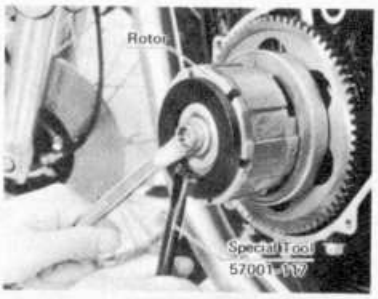
NOTE: *If only the rotor is to be removed, it is not necessary to disconnect the wiring or remove the stator.*

4. Remove the starter idle gear.
5. Keep the rotor from turning by holding it with either the special tool (Part No. 57001-117) or a suitable substitute, and remove the rotor mounting bolt.
6. Hold the rotor still as described above, and use either the special tool (Part No. 57001-116) or a suitable substitute to remove the rotor/starter clutch assembly.

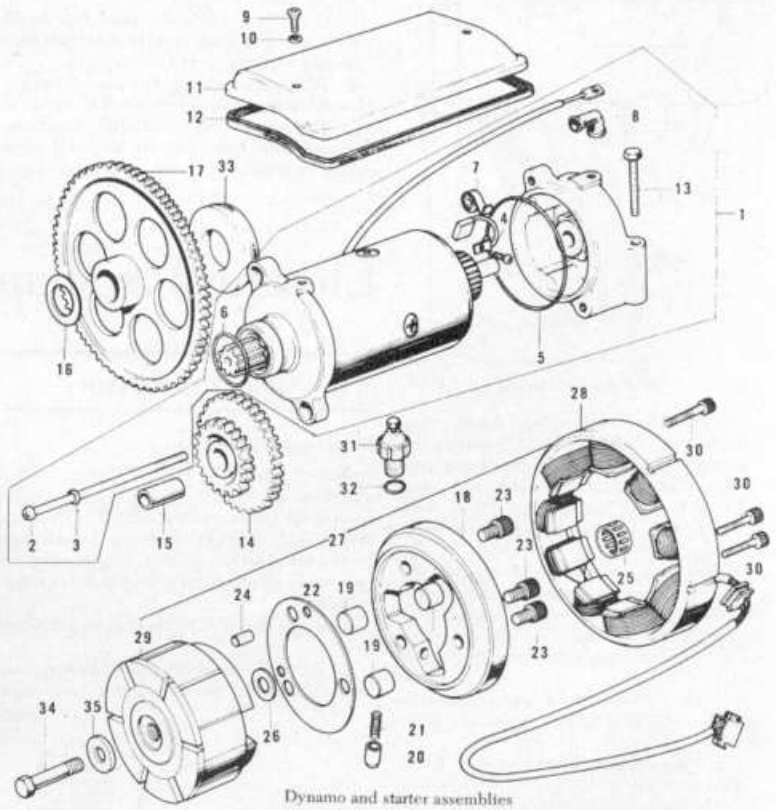
CAUTION: *Hammering on the rotor will demagnetize the magnets, leaving the rotor useless.*



Disassembling the starter clutch



Removing the rotor mounting bolt



Dynamo and starter assemblies

1. Starting motor assy
2. Pan head screw
3. Spring washer
4. Carbon brush
5. O-ring
6. O-ring
7. Carbon brush spring
8. Starting motor terminal cap
9. Hex head bolt
10. Plain washer
11. Starting motor cover
12. Starting motor cover gasket
13. Hex head bolt
14. Starting motor gear
15. Piston pin
16. Thrust washer
17. Starting clutch gear
18. Starting clutch
19. Roller
20. Plug
21. Spring
22. Clutch starting plate
23. Bolt
24. Dowel pin
25. Needle bearing
26. Plain washer
27. Dynamo assy
28. Stator assy
29. Rotor
30. Allen bolt
31. Oil pressure switch assy
32. Oil pressure switch O-ring
33. Damper rubber
34. Hex head bolt
35. Plain washer



Removing the rotor and starter clutch assembly

7. Remove the woodruff key, thin shim, starter clutch gear, needle bearing, gear damper, and thick shim, in that order, from the crankshaft, then remove the rollers, springs, and spring caps from the starter clutch.

8. Secure the rotor in a wood-jawed vise, or wrap it to protect it if a metal vise is to be used, and remove the allen bolts to separate the rotor and starter clutch.

9. Installation is in the reverse order of removal.

The correct damper rubber must be used, selection being made as follows:

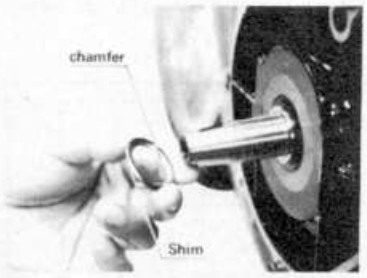
a. Install the thick shim, needle bearing, and starter clutch gear without installing the damper rubber.

b. Measure the clearance and select the damper rubber according to the following chart:

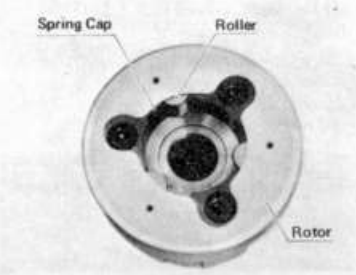
Clearance (mm)	*Damper Rubber Thickness (mm)*
5.05–6.05	6.3
6.06–7.05	7.3
7.06 and over	8.3

10. Place the thick shim onto the crankshaft with its chamfered side facing in before installing the starter clutch.

11. Spin the clutch gear so that the rollers will move enough to allow it to go on when installing the starter clutch.



Install the shim with the chamfered side in



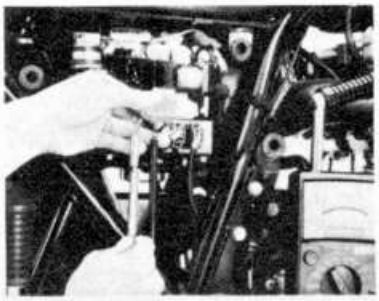
Starter clutch assembly

12. Apply Loctite, or another suitable sealer, to the rotor mounting bolt threads before installing it, and torque the bolt to 18 ft lbs (2.5 kg/m).

RECTIFIER

1. Disconnect the white rectifier plug from the connector panel, and the white lead going to the battery.

2. With the tester set on the R x 10, or the R x 100 range, check the resistance between the white recitifer lead and each of the yellow leads, the yellow leads and



Testing the rectifier

the white lead, the black lead and each yellow lead, and each yellow and black lead. This means a total of 12 measurements.

3. The resistance should be low in one direction, and about ten times as great in the other. If the readings are high or low in either direction for any pair of wires, the rectifier is defective and must be replaced.

NOTE: *The lower reading should be within ⅓ scale of zero ohms regardless of the type of tester used.*

CAUTION: *When removing or installing a rectifier, do not loosen or tighten the nut which holds the rectifier assembly together as this will damage the unit.*

REGULATOR

Regulator Operational Test

IN CIRCUIT

NOTE: *Make sure that the battery is in good condition, and is well charged before beginning the test.*

1. Set the tester to the 30 VDC range, and connect it across the battery (tester negative lead to battery negative terminal, and tester positive lead to battery positive terminal).

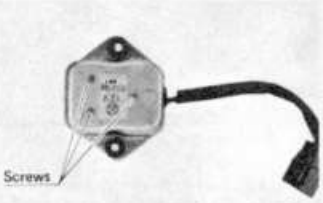
2. Run the engine, with all lights and accessories turned off, at 4000 rpm while checking the meter. If the meter reads between 15-16 volts, the regulator is functioning normally; if it reads over 16 volts the regulator is either improperly connected or defective; and if the reading is less than 15 volts either the dynamo, rectifier, or regulator needs to be replaced. Go on to the next Step if the reading was low.

3. Turn off the engine, but leave the tester connected as is. Disconnect the green regulator plug from the connection panel under the right-side plastic cover. Run the engine at 4000 rpm and check the meter reading. If the reading is within 15-20 volts the regulator is defective; if the reading is less, then either the dynamo or rectifier is defective.

4. Before replacing the regulator, make sure that all the connections are clean and snug, as poor connections could cause misleading test results.

OUT OF CIRCUIT

CAUTION: *When removing the regulator do not loosen or remove the screws in the regulator body. The screws aid in heat dissipation, and the unit will overheat if they are not properly installed.*



Do not remove these screws

1. Set the meter on the R x 10 or R x 100 scale. There should be 1,000-1,100 ohms resistance between the black and brown leads, and no reading (∞) between any other two leads, or between the black or brown and any other lead. Any other results indicate that the regulator is defective.

2. For this test a 14 VDC and a 16-17 VDC power source must be available. If the sources used cannot provide sufficient power, the tests will be inaccurate, and if more than 18 volts are passed through the regulator it may be damaged. Proceed as follows:

CAUTION: *If the voltage source and regulator are connected backwards for even a moment, the regulator will be damaged.*

a. Connect the regulator to the 14 VDC source as shown in the accompanying illustration.

b. Set the meter to either the R x 10 or the R x 100 range, and check that there is no reading (∞) between the black lead and the pink, yellow, or blue lead. If the meter gives any reading for any wire, the regulator is defective.

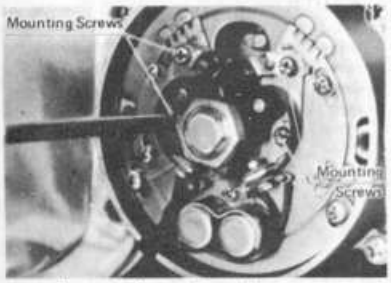
CAUTION: *When performing the next test, be sure that the black and brown leads never touch the meter leads at the same time or the meter will be damaged.*

c. Connect the regulator to the 16-17 VDC source in the same manner as in Step "a", and set the meter on the R x 1 scale. This should result in a very low reading when the meter is connected one at a time between the black lead and the blue, pink, or yellow leads. If there is no reading between any or all of the leads, or if any one reading is higher than the other two, the regulator is defective and must be replaced.

Ignition System

Contact Breaker Points

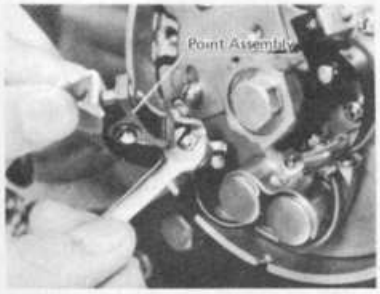
1. Remove the breaker point cover and cover gasket, then remove the two mounting screws for each set of points, and remove the points.



Removing the point mounting screws

NOTE: *You may remove the mounting plate with the points and condensers in place, and then install a new plate with the points and condensers already mounted on it.*

2. Loosen the nut at the leaf spring, and disconnect the condensers if they are to be reused. It is best to replace the points and condensers at the same time.

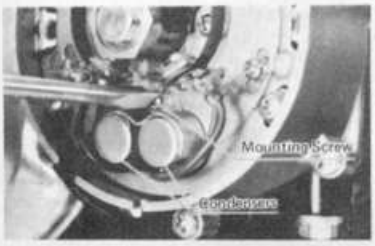


Disconnecting the condensers from the points

3. When installing the points make sure that the wire connectors are positioned on the outer part of the insulating washer. Do not overtighten the nuts as this may damage the washers causing electrical leakage.

Condensers

1. The condensers are secured to the mounting plate by a single mounting screw. If they are being removed in conjunction with the points, follow Step 1 in the previous section, then remove the condensers mounting screw and disconnect the lead wires.



Removing the condensers

2. If the condensers alone are to be removed, remove the mounting screw and loosen the nuts at the leaf spring to free the wires. Consult Step 3 in the previous procedure.

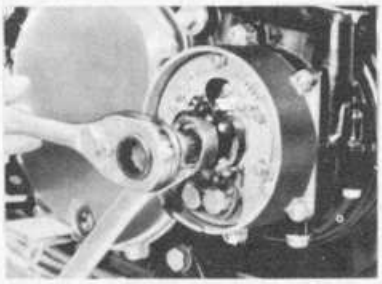
Testing Condensers

Arcing across the points when they are open, badly pitted or burned points, or damaged leads indicate the need for condenser replacement.

The condensers can be tested by replacing them and checking for improved performance, or by testing them with a capacitor tester. The condenser specifications are 0.25 ± 0.03 mfd., 1000 VDC.

Automatic Advance Mechanism

1. Remove the points cover and cover gasket.
2. Hold the crankshaft rotation nut steady with one wrench, then remove the bolt from the end of the shaft with another.

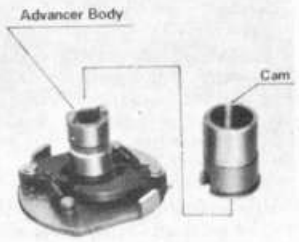


Removing the shaft nut

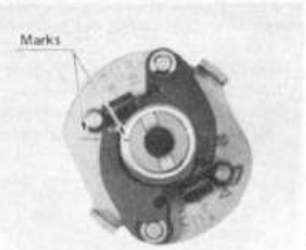
3. Remove the 3 mounting plate mounting screws to remove the plate, and remove the advance mechanism.
4. Disassemble the unit, replace any damaged parts (or the whole unit), assemble it so that the marks line up, and grease the shaft before installing the breaker cam.



Removing the plate mounting screws

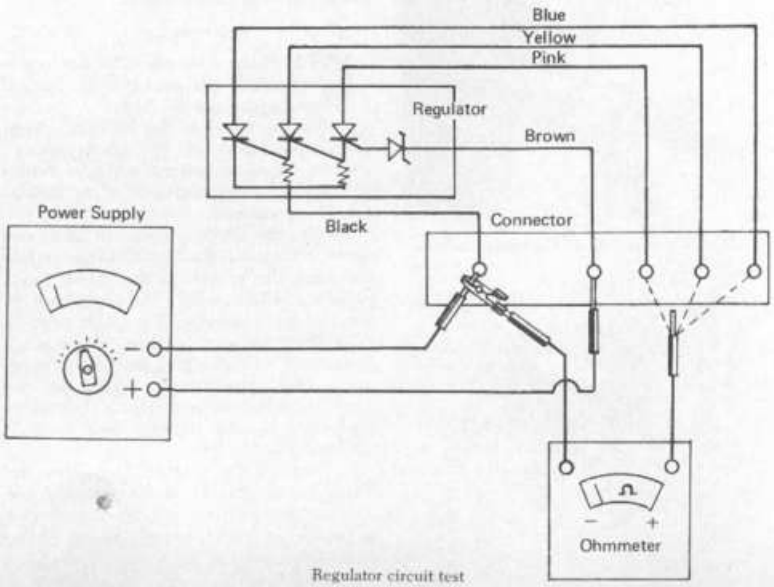


The cam slips right off the advancer body



Line up these marks when assembling the unit

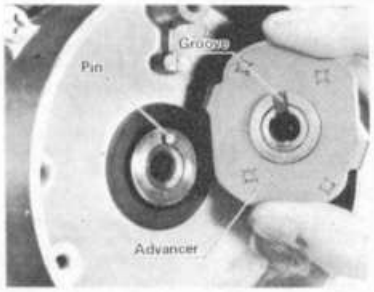
5. When installing the mechanism be sure that the pin on the crankshaft fits into the groove in the back of the advancer, and that the crankshaft rotation nut is properly seated.



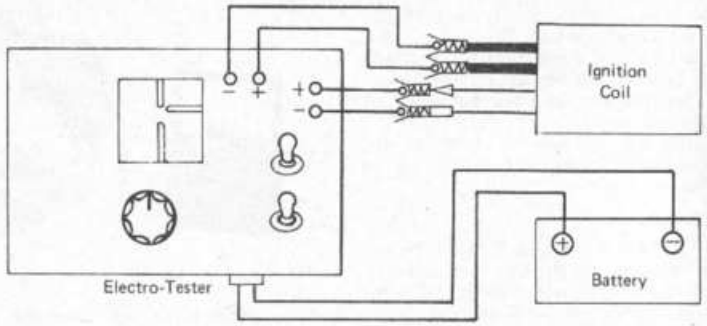
Regulator circuit test



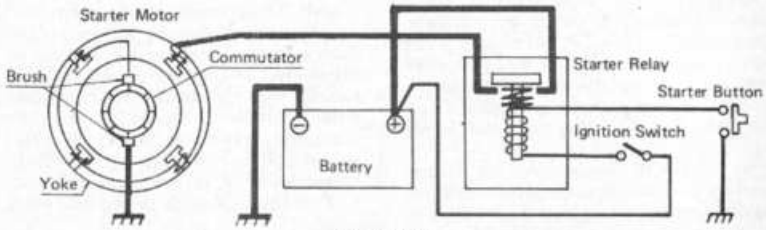
Greasing the shaft



Lining up the groove and pin



Coil test circuit



Starter circuit

Ignition Coils

1. Remove the fuel tank.
2. Disconnect the black or green wire (as the case may be), and the brown wire, remove the spark plug leads from the plugs, and unbolt and remove the coil(s).

NOTE: *The high tension leads cannot be removed from the coil.*

3. When installing coils match the color coded black and green wires. The brown wire goes with the yellow/red lead from the battery. Each plug lead is numbered for the appropriate cylinder.

TESTING COILS

Coils can be tested by replacing them and seeing if performance is enhanced, by testing them with an electro-tester, or by checking for a shorted or open condition using an ohmmeter.

Hook up the coil to the electro-tester as indicated in the accompanying illustration. Replace the coil if it won't produce a spark at least 7 mm (0.28 in.) long.

Test the coil using an ohmmeter in the following manner:

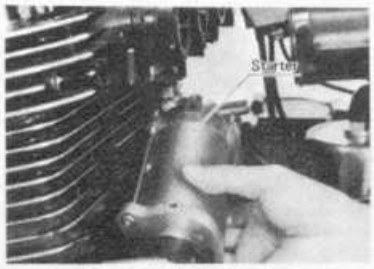
1. Check the primary winding resistance between the red/yellow lead and the green or black lead. If the results are not between 3.2-3.8Ω the coil must be replaced.
2. Check the secondary winding resistance between the two spark plug high tension wires. If the result is not about 30KΩ the coil must be replaced.
3. Set the ohmmeter on its highest scale and check the resistance between the brown wire and the plug wires or the coil core. If the reading is not infinity (∞), the coil must be replaced.

NOTE: *The test with an ohmmeter is not 100% accurate as it doesn't test for high voltage shorts (insulation breakdown).*

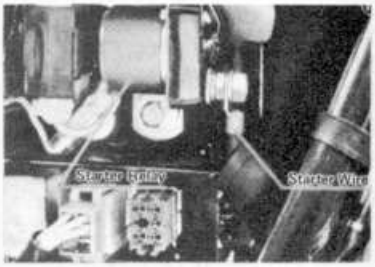
Starter Motor

REMOVAL AND DISASSEMBLY

1. Remove the fuel tank, carburetors, starter cover and cover gasket, and the chain cover.

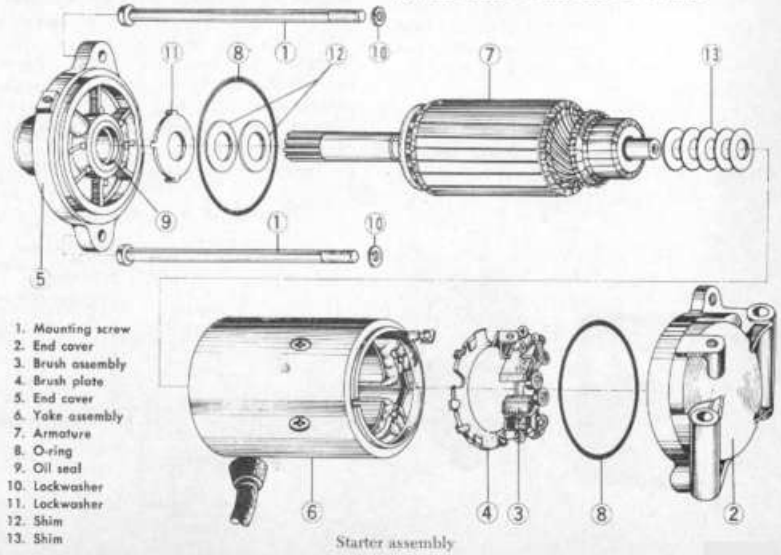


Removing the starter motor



Disconnecting the starter leads

2. Remove the right-side plastic cover, unscrew the starter wire from the starter relay terminal, and free the wire from the cable clamp.
3. Remove the two starter mounting bolts, and remove the starter.
4. Remove the two mounting screws (1), and remove the end cover (2).



Starter assembly

5. Disconnect the brush assembly (3) from the field coil lead, then remove the brush plates (4) and remove the brushes.

6. Remove the remaining end cover (5), and remove the yoke assembly (6) and armature (7).

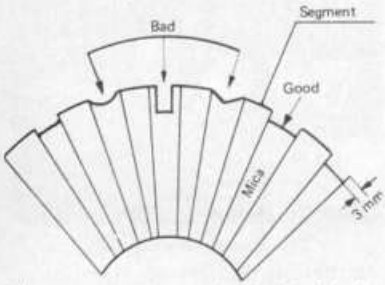
7. Remove the starter clutch as described in the "Dynamo Removal and Installation" Section.

Inspection

1. Inspect the carbon brushes for excessive wear or damage, and replace them if worn past the standard of ½ in. (12-13 mm) by ¼ in. (7 mm) or more. Always replace the brushes as a pair.

2. Inspect the brush springs for a worn, damaged, or collapsed condition and replace them as necessary. The spring tension should be 20-24 oz (560-680 g) as measured with a spring gauge, but the spring may be considered serviceable if it will snap the brush firmly into place.

3. Inspect the commutator for a worn, scored, or otherwise damaged condition, and turn it down or clean it up with fine emery paper if necessary. If brush dust is caught in the commutator grooves it must be cleaned out thoroughly, and the mica should be cut square as illustrated.

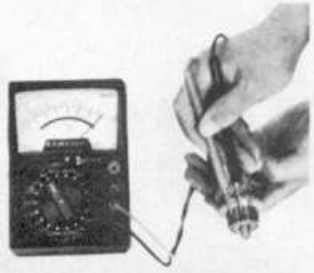


The commutator grooves should look like the "good" one

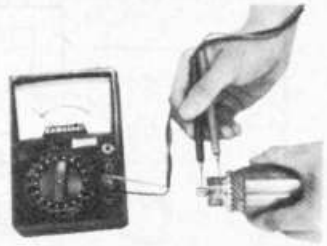
4. Test the commutator in the following manner:

a. Turn the meter switch to the R x 1 scale, and measure the resistance between each two segments of the commutator. High resistance or no reading at all between any two, indicates that wire is open and the armature must be replaced.

b. Turn the meter switch to the highest scale, and measure the resistance between the commutator and the shaft. Any reading at all indicates that the armature is grounded.



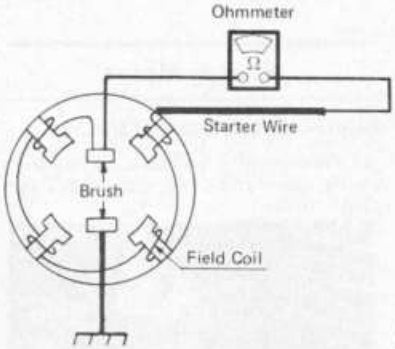
Testing resistance between segments



Testing resistance between the commutator and shaft

c. If the above checks do not reveal a problem, and after checking the other starter circuit components no fault is discovered, the nature of the problem may be such that it cannot be isolated with a meter. Therefore if after thoroughly checking the system the starter still fails to turn over, or only operates feebly, replace the armature.

5. Test the field coils in the following manner:



Field coil test circuit

a. Turn the meter switch to the R x 1 scale, and measure the resistance between the carbon brush on the positive side, and the starter lead. If the reading is not close to zero ohms, or if there is no reading, the field coils are open and the yoke assembly must be replaced.

b. Turn the meter switch to the highest scale, and measure the resistance between the positive side brush and the yoke (housing). Any reading indicates that the coils are shorted to ground, and the yoke must be replaced.

6. Test the starter relay in the following manner:

a. Disconnect the starter wires from the relay, and connect a meter set on the R x 1 scale, across the relay terminals.

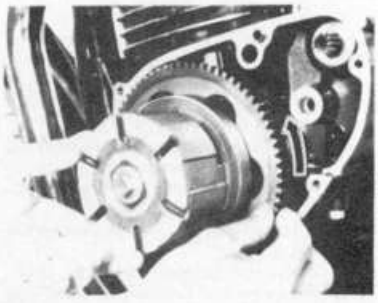


Testing the resistance between the positive brush and the yoke

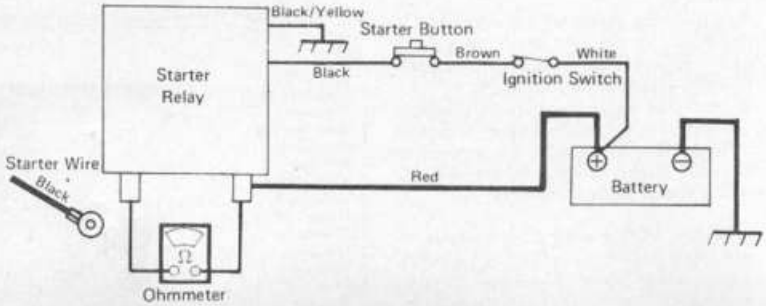
b. Press the starter button and see if the meter reads zero ohms. If the relay clicks once and the meter reads zero, the relay is good. If it clicks, but the meter does not read zero, the relay is defective and must be replaced. If the relay doesn't click at all, disconnect the black and yellow/black wires and measure the resistance across them. If the reading is not close to zero, the relay is defective.

c. If the reading is zero, the relay may be good, but there may be no current getting to it. Turn the tester switch to the 30 VDC scale and connect the negative (−) meter lead to the yellow/black relay lead, and the positive (+) tester lead to the black wire. When the starter button is pushed, the meter should read battery voltage. If it doesn't the problem is in the wiring. If the meter reads battery voltage, but the relay doesn't click, the relay is defective.

7. If the starter works, but doesn't disengage after the engine starts, the starter clutch rollers or gear may be damaged or worn. Such damage could also prevent



The clutch should not be able to rotate in the direction of the arrow



Starter relay contact test circuit

the starter from engaging properly, or could cause noisy operation while the engine is running.

Test the clutch by rotating the clutch gear by hand. It should not be able to turn in the direction of the arrow, but should turn freely in the opposite direction. If the clutch does not operate correctly, or if it operates noisily, disassemble and inspect all components for wear or damage, and replace those whose condition is even marginal.

NOTE: *Damage to either the starter clutch gear, the idle gear, or the starter gear may cause damage to the other gears. Inspect them all carefully if any are damaged or excessively worn.*

ASSEMBLY AND INSTALLATION

1. Assembly is in the reverse order of disassembly, and installation is in the reverse order of removal.
2. Carefully clean off any dust from the shaft as this may result in premature wear, and dampen the shaft felts with fresh oil.
3. Take care not to damage the O-rings and oil seals when installing the end covers, and align the marks on the covers and housing.
4. Lubricate the O-ring with a small amount of fresh oil before slipping the starter into place.



Make sure that the marks are aligned on both ends

5. Apply Loctite, or another suitable sealer, to the starter mounting bolts before installing them.

Electrical Equipment

SWITCHES

The switches used are not repairable, and must be replaced if defective. The switches can be disassembled and cleaned, but no replacement parts are available.

Use a meter to determine whether the connections given in the following charts are good. The meter should read zero ohms for any of these connections.

Intermittent loss of spark to either pair of cylinders may be caused by a shorted kill switch. The best way to test for this is to remove the switch from the circuit, and see whether or not the problem continues.

Ignition Switch

Lead	Batt	Ig	Tail 1	Tail 2
Off				
On	●	●	●	
Park	●		●	●
Color	White	Brown	Blue	Red

Kill Switch

On	●	
Off		●
Color	Brown	B/Y

Headlight Switch

Off			
CL	●		●
On	●	●	●
Color	Brown	Blue	Red

Dimmer Switch

High	●			
Low		●		
Pass	●			●
Color	R/Bk	Blue	R/Y	Brown



Testing the dimmer switch

Beam Adjustment

1. Adjust the horizontal (left to right) aim of the light by turning the small screw in the front of the rim.
2. Adjust the vertical (up and down) aim of the light in the following manner:
   a. Remove the two screws which secure the light in the housing, and remove the light.
   b. Loosen the turn signal mounting nuts, hold the light in place, loosen the mounting bolts under the light, and adjust the aim of the unit.
   c. Secure the bolt under the headlight, and tighten the turn signal nuts before reinstalling the unit.



Removing the headlight unit

BRAKE LIGHTS

Check the switches with a meter connected across the terminals. The meter should read zero ohms when the brake is applied, and the switch must be replaced if it doesn't.

Note the following when installing a new front switch:

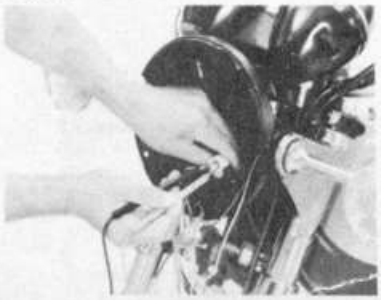
1. Clean up any spilled brake fluid immediately.
2. Apply Loctite, or another suitable sealer, to the switch threads, taking care not to get any in the switch itself.
3. Bleed the brake lines as directed in the "Chassis" section after the new switch is installed.

BRAKE LIGHT FAILURE CIRCUIT

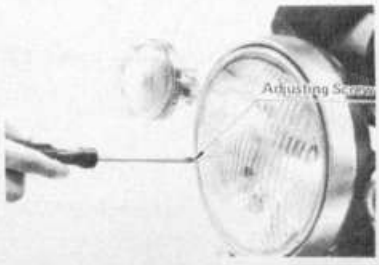
1. The brake light failure indicator bulb in the tachometer should go on when the brakes are applied.
2. If the brake light bulb is removed with the brake applied, the indicator bulb should stay on.
3. When the brake is released with the bulb removed, the indicator should flash.

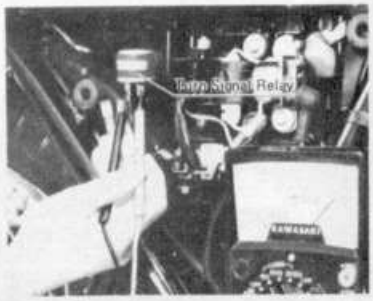
TURN SIGNALS

The turn signals are a complete circuit, and a loose connection, bad wiring, or a burned out bulb will incapacitate the entire system. Usually, if the trouble is common to both the left and right turn signals, the problem is in the relay, although it may be in the switch, wiring, or due to a poorly charged battery. If the problem is isolated in either the right or left sides, the problem is not in the relay, but may be in the switch, wiring, or bulbs.



Testing the ignition switch





Testing the turn signal relay

Troubleshoot the system in the following manner:

1. If neither the right or left signals come on, check the following:
   a. Check the state of battery charge.
   b. Disconnect the relay and use a meter to check for continuity through the relay terminals. If the reading is not close to zero ohms (i.e., no reading or one of several ohms), replace the relay.
   c. If the relay is good, turn the meter switch to the 30 VDC scale, and connect the positive (+) meter lead to the brown wire which goes to the relay, and the negative (−) tester lead to the orange wire. Turn on the ignition, and flip the turn signal switch from right to left. If the meter registers battery voltage but the lamps don't work, recheck the wiring and bulbs. If the meter doesn't register battery voltage, either the switch or wiring is bad.
2. If both the right or left signals come on and stay on, or blink too slowly, check the following:
   a. Check the state of battery charge.
   b. Check all of the wiring connections.
   c. Check that the bulbs, both the flasher and the indicator, are of the correct wattage.
   d. Replace the relay if the above Steps check out.
3. If one lamp on one side comes on, but the other doesn't, check the lamp that's out for a bad bulb or bad wiring.
4. If neither lamp on one side comes on, check both bulbs and the switch.
5. If the flashing rate is too fast, check the following:
   a. Check for an overcharged battery if this occurs on both sides. If the battery and dynamo check out, replace the relay.
   b. If this only occurs on one side, check that the wattage of the bulbs is correct.

OIL PRESSURE SWITCH

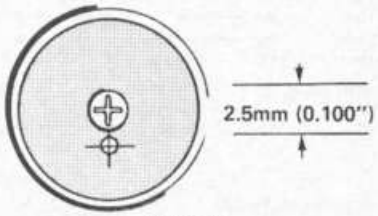
Switch Repair

If the oil pressure lamp comes on and stays on when the oil is hot and the motorcycle is being rapidly accelerated, the problem is probably in the switch. This can often be temporarily remedied by revving the engine up past 6000 rpm.

CAUTION: *If the switch comes on the engine oil flow is cut off. Stop the machine immediately if a quick high rev doesn't turn the light back off or engine damage may result.*

Correct this problem by relieving oil pressure at the switch in the following manner:

1. Disconnect the blue wire from the oil pressure switch, and remove the switch.
2. Mark and punch the plunger disc at a point 2.5 mm (0.1 in.) from the edge, as in the accompanying illustration.
3. Use a 1/16 in. (1.5 mm) drill to drill a hole at this point. Do not use a larger drill, and try to be as precise as possible.



Drill here

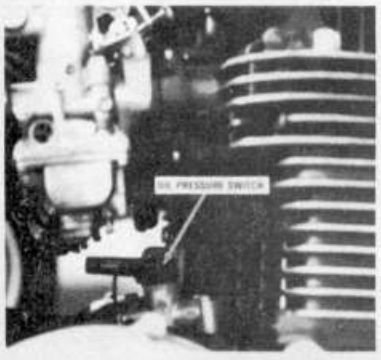
4. Reinstall the switch after applying Loctite, or another suitable sealer, to the threads, and connect the blue wire.

Switch Testing

The switch should turn on the indicator light when the key is on but the engine is not running. If the light doesn't come on, disconnect the lead from the switch and use an ohmmeter to check for continuity between the switch body and the switch terminal. A dead short indicates that the problem is either in the wiring or bulb. If the reading is not zero ohms, the switch is defective and must be replaced.

If the lamp stays on and you've already followed the instructions in the preceding Section, disconnect the lead from the switch, and connect an ohmmeter between the switch terminal and ground. With the engine off the meter should read zero ohms, and with the engine running the meter should indicate an open (∞) condition. If the meter still indicates a short when the engine is running, shut it down and run a pressure test as directed in the "Lubrication System" section. The switch is probably defective.

NOTE: *Always coat the switch threads with Loctite, or another suitable sealer, when installing it.*


Oil pressure switch location

HORN

Most horn troubles, unless caused by maladjustment, can be traced to the contacts. The contacts wear and must be periodically adjusted. If adjusting the contacts doesn't correct the problem, the contacts are probably dirty or pitted.

Adjustment

1. Remove the fuel tank, then disconnect the black horn wire, and connect a meter into the circuit so that the positive (+) tester lead goes to the black wire on the horn side, and the negative (−) tester lead goes to the remaining black wire.
2. Turn on the ignition, and depress the horn button while turning in the adjusting nut until the horn sounds its best. Keep the horn current between 1.8 and 2.5 amps.

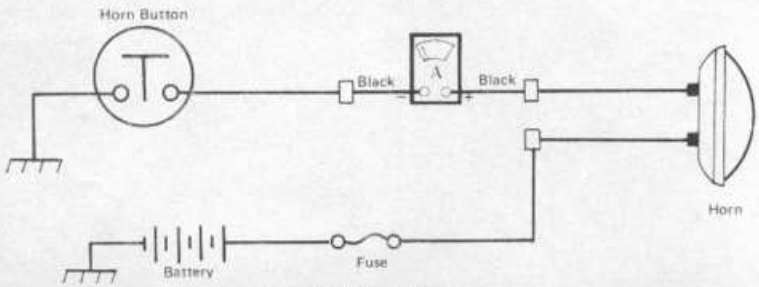
CAUTION: *Do not turn the adjusting nut in too far as this may damage the spring inside the horn, and increase the horn current to a point where the horn coil may be burned out.*

3. If the horn doesn't sound right, first make sure that no cables or other components are touching it, and if this doesn't help, clean the contacts as described in the following Section.

Repair

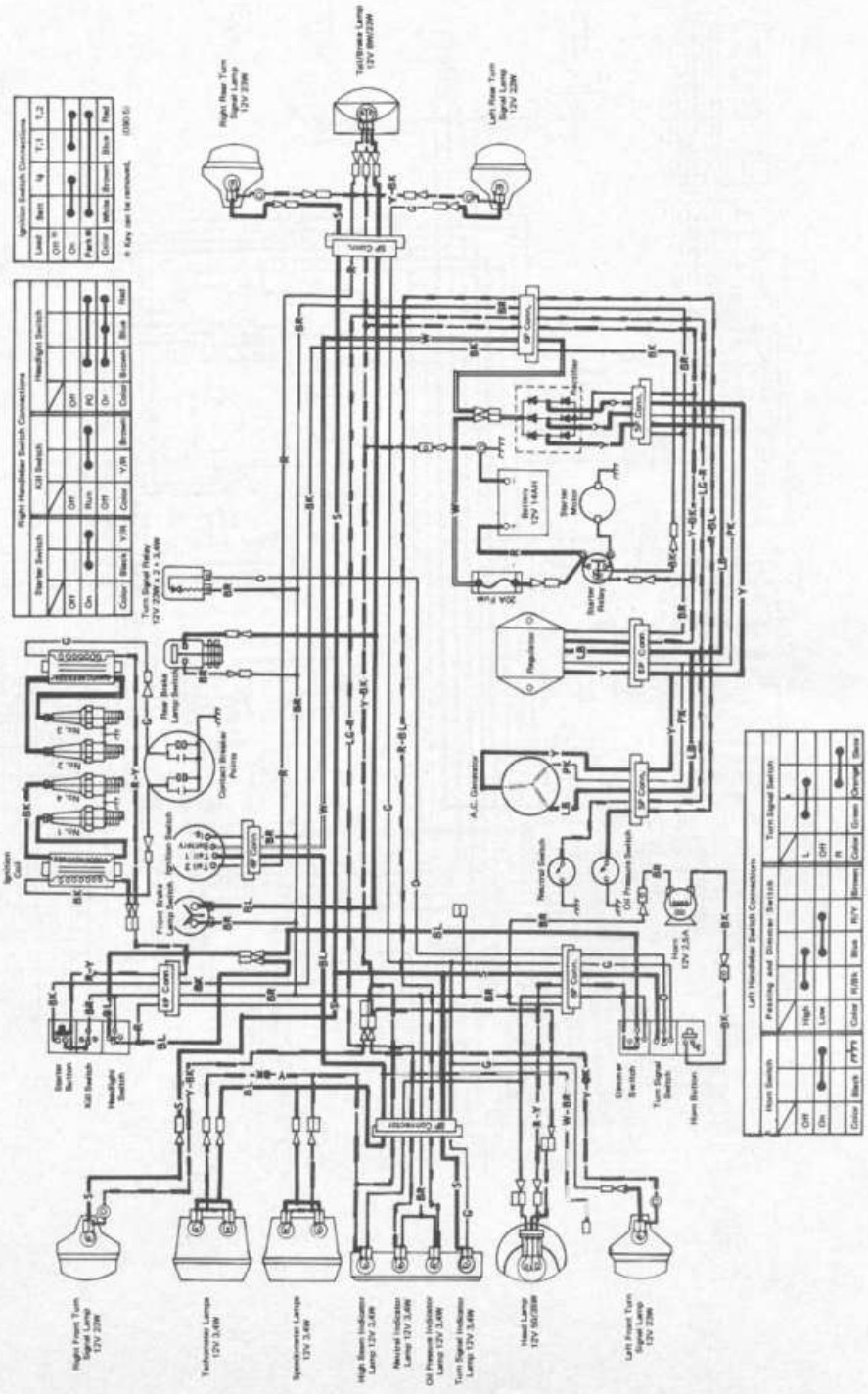
CAUTION: *Do not loosen the core or armature mounting as this will necessitate fine adjustments not given here.*

1. Check horn continuity with a meter connected to the black and brown leads. If the reading is close to zero ohms, the horn should be adjusted.
2. If the reading is several ohms, if there is no reading, or if adjustment will not correct the problem, remove the screws around the perimeter of the horn to disassemble it.
3. Clean the contacts with fine sandpaper or emery cloth until you get a reading of zero ohms resistance across the contacts.
4. If there is still high resistance, or if there is still no reading, the coil is burned out and the horn must be replaced.
5. Inspect the horn assembly for signs of water damage, and replace the gasket with a homemade one if it appears to be water damaged.



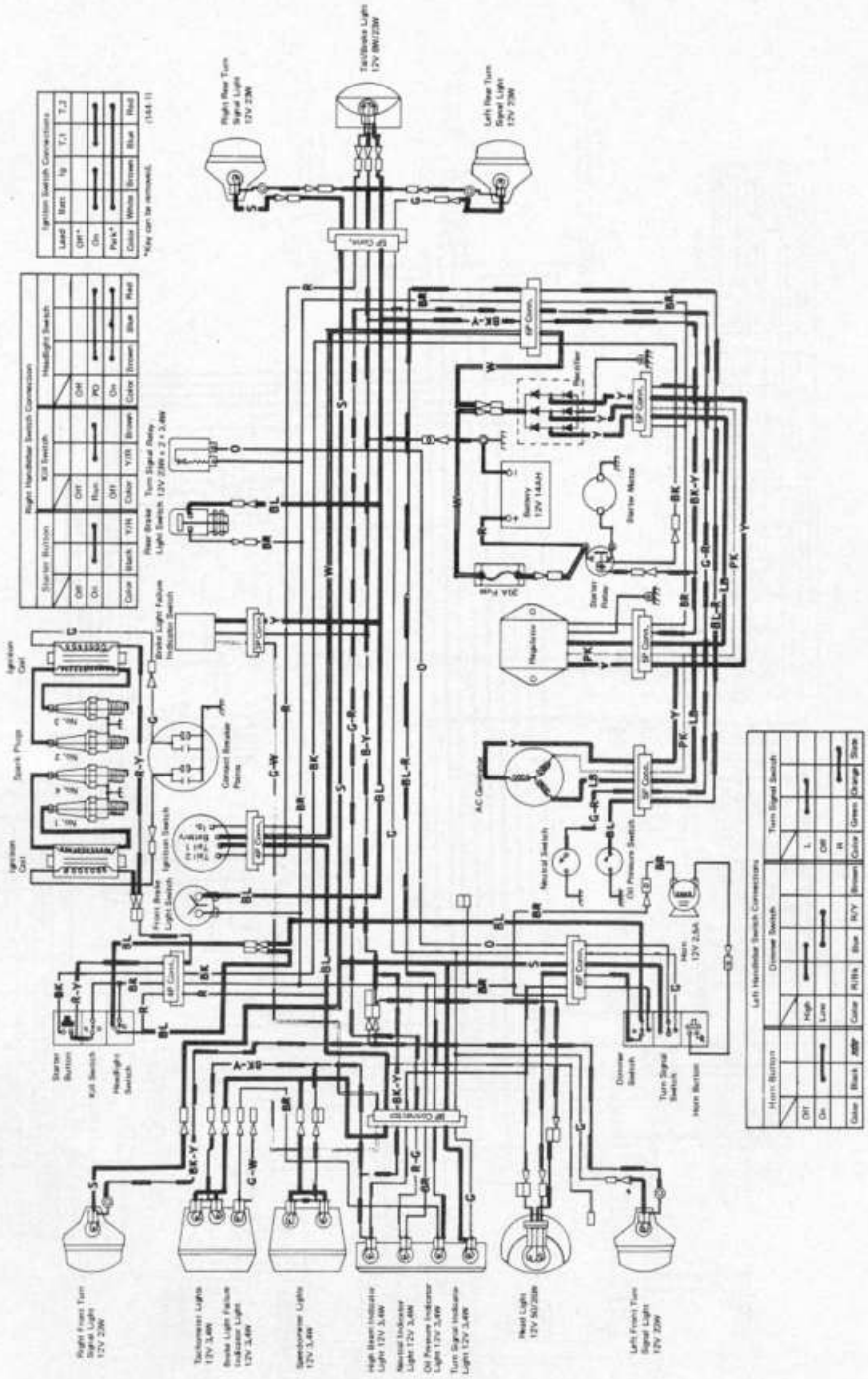
Horn test circuit

Wiring Diagrams



Z1

Wiring Diagrams



Z1-A/B

Chassis

Wheels

REMOVAL AND INSTALLATION

Front Wheel

1. Disconnect the speedometer cable at the front wheel.
2. Block up the motorcycle so that the front wheel is off the ground, or use a jack placed under the engine to raise the bike.
3. Remove the nuts which secure the axle clamps, then remove the clamps. The front wheel is now free to be removed.

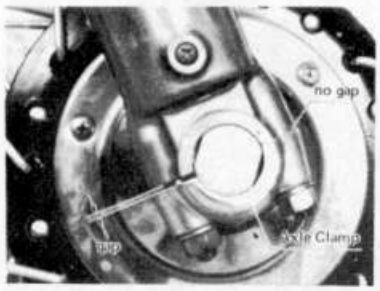
CAUTION: *Do not operate the front brake while the front wheel is removed or the caliper piston will be forced out of the cylinder.*

4. Installation is in the reverse order of removal. Note the following:

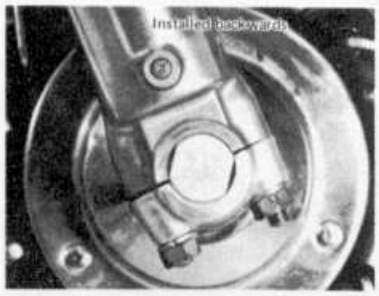
a. The axle clamp has a front and rear end, and must be installed so that the gap is at the rear.

b. Secure the front clamp nut first, and then the rear, to a specified torque of 13-14.5 ft lbs (1.8-2.0 kg/m). Check for a gap at the rear.

c. Rotate the front wheel while installing the speedometer cable until the speedometer drive shaft will seat in the grooved end of the cable, then secure the cable.



Axle clamp correctly installed



Rear Wheel

1. Place the motorcycle on its center stand, or block up the rear wheel of the machine so that it isn't resting on the ground.
2. Remove the axle nut cotter pin, and loosen the axle nut.
3. Remove the brake torque link cotter pin, nut, and washer at the brake hub, then disconnect the torque link.
4. Remove the brake adjuster nut from the brake rod.
5. Remove the bolts which secure the chain adjuster stoppers, pull back on the rear wheel to take up any slack in the chain, rotate the adjusters down out of the way, and remove the stoppers.
6. Push the rear wheel forward until the chain can be slipped off the sprocket to the left, then pull the wheel back and off the frame. It may be necessary to shift the top of the wheel to the right to get it past the rear fender.
7. Installation is basically in the reverse order of removal. Note the following:

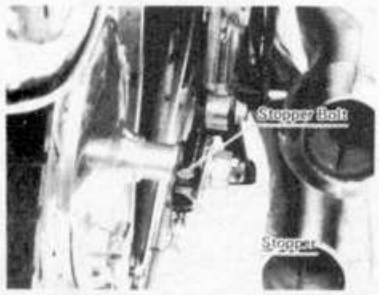
a. Start the chain onto the sprocket before slipping the wheel assembly onto the frame or it will get stuck on the nuts which secure the sprocket.

NOTE: *If this operation proves too difficult, loosen the left-side muffler mounting, and remove the chain guard to gain greater access.*

b. Adjust the chain, before securing the axle and torque link nuts.

c. Secure the torque link nut to 22-25 ft lbs (3-3.5 kg/m) and install a new cotter pin.

d. Center the brakes by spinning the rear wheel and sharply applying the brake, then secure the axle nut without releasing the brake. Secure the axle nut to 95-115 ft lbs (13-16 kg/m), and install a new cotter pin. Adjust the brakes.



Chain adjuster stopper location

Wheel Hubs and Brakes

FRONT HUB

Disassembly

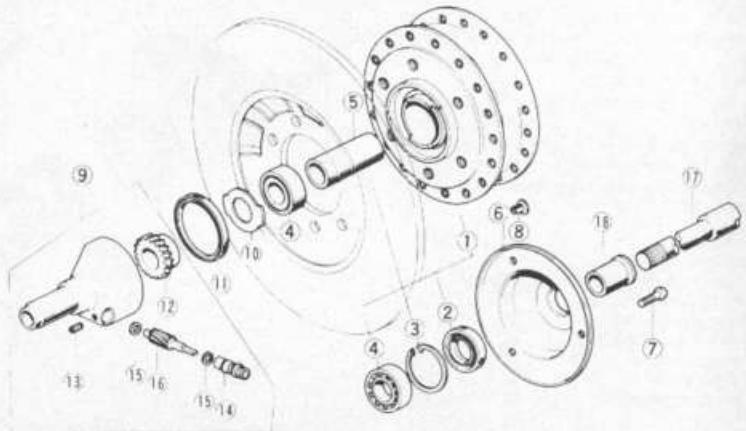
1. Remove the wheel.
2. Hold the gearbox (9) stationary, and unscrew the axle (17). The speedometer pinion (16) and bushing (14) are secured by the bushing set pin (13), and may be removed if necessary. The speedometer gears (12 and 10), and the oil seal (11) may be removed at this time.

CAUTION: *If the axle is held stationary and the gearbox is rotated, the speedometer drive gear will be damaged.*

3. Remove the collar (18), caps (8), and wheel cap (6). If you wish to remove the disc, remove the six bolts which secure it.
4. Use a suitable drift to knock the left-side bearing (4) free from its seat. Approach it from the right, and apply pressure only to the inner race.
5. Remove the distance collar (5) and oil seal (2).
6. Remove the retaining ring (3) from the left-side of the wheel, and tap evenly around the inner race of the right-side bearing until it comes out.

Assembly

1. Assembly is basically in the reverse order of disassembly.
2. Replace the oil seals with new ones, and install the bearings using either the special bearing driver holder and bearing driver (Part No. 57001-139 and 57001-140) or a suitable substitute.
3. Align the speedometer drive, as illustrated, during installation.
4. Remember to hold the gearbox stationary and screw in the axle to avoid damaging the speedometer gear drive.

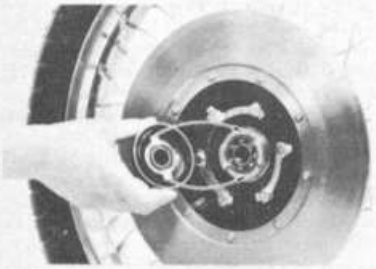


Front hub assembly

1. Drum assembly
2. Oil seal
3. Circlip
4. Bearing
5. Distance collar
6. Wheel cap
7. Screw
8. Cap
9. Gearbox
10. Speedometer gear
11. Oil seal
12. Speedometer gear
13. Pin
14. Bushing
15. Washer
16. Speedometer pinion
17. Axle
18. Collar



Installing a wheel bearing



DISC BRAKE

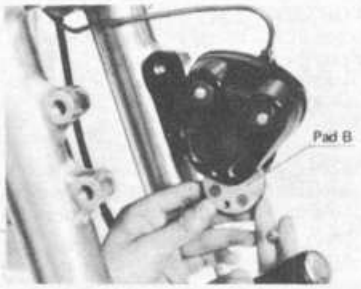
1. Never re-use old brake fluid.
2. Do not use fluid from a container that has been left unsealed, or that has been open a long time.
3. Do not mix two types of fluid for use in the brakes. Use DOT 3 brake fluid only.
4. Don't leave the reservoir cap off for any length of time as moisture may be absorbed into the fluid.
5. Use only disc brake fluid, isopropyl alcohol or ethyl alcohol for cleaning brake parts, but do not allow rubber parts to remain in contact with the alcohol for more than 30 seconds.
6. Brake fluid will damage painted surfaces; any spilled fluid should be wiped off immediately.
7. Do not use gasoline, motor oil, or any other mineral oils near disc brake parts; these oils cause deterioration of rubber brake parts. If oil spills on any brake parts it is very difficult to wash off and will eventually reach and break down the rubber.
8. If any of the brake line fittings or the bleeder valve is loosened at any time the air must be bled from the brake.
9. Prescribed torque values for tightening disc brake parts mountings are as follows:

Brake lever	45 ~ 60 in. lbs
Brake lever adjuster	70 ~ 100 in. lbs
Master cylinder clamp	55 ~ 75 in. lbs
Fitting (banjo) bolts	19 ~ 23 ft lbs
Brake pipe nipple	150 ~ 155 in. lbs
3-way fitting mounting	45 ~ 50 in. lbs
Pressure switch	135 ~ 170 in. lbs
Caliper shafts	22 ~ 26 ft lbs
Caliper mounting	19 ~ 23 ft lbs
Bleeder valve	70 ~ 85 in. lbs
Disc mounting bolts	140 ~ 190 in. lbs

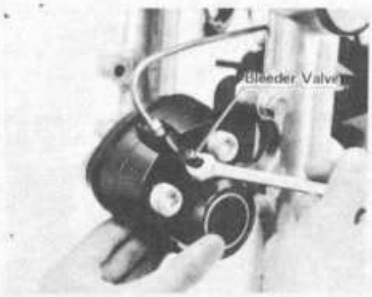
Brake Pads

1. Remove the front wheel.
2. Remove the mounting screw which secures pad B (see the illustration), and remove the pad.
3. Pump the brake lever several times until the piston forces pad A out, and remove the pad.
4. Loosen the bleeder valve slightly, press the piston in by hand as far as it will go, then close the valve.

CAUTION: *Some brake fluid will leak out of the bleeder during this operation. Be prepared to catch it with a rag.*



Removing pad B

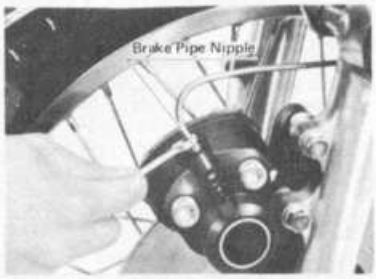


Opening the bleeder valve reduces the pressure in the caliper slightly

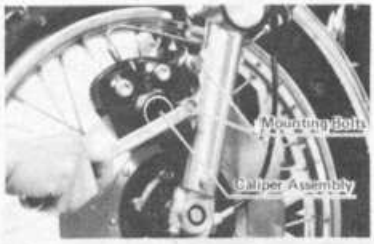
5. On 1975 and earlier models, align the groove in pad A with the ridge in the caliper, then insert the pad. On 1976 models, simply install the pad.
6. Install pad B in the caliper aligning the tongue on the pad with the groove in the caliper on 1976 models, and use either Loctite or some other suitable thread sealer on the mounting screw.

Caliper (1975 and Earlier)

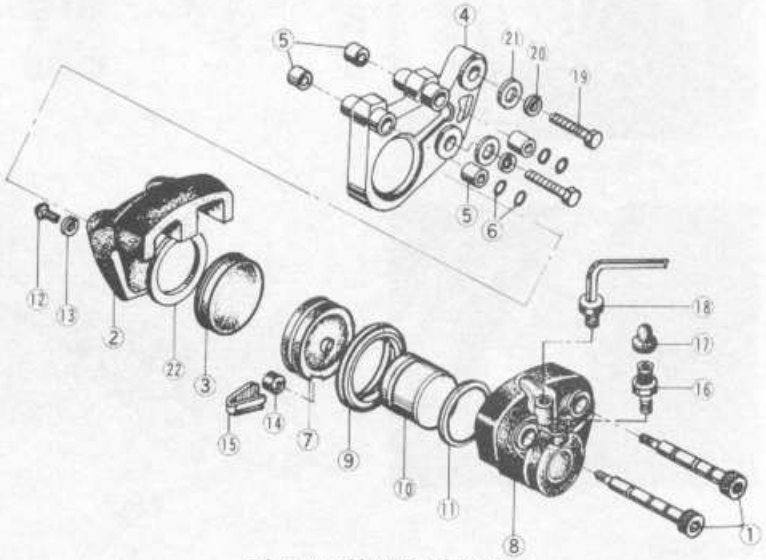
1. Remove the front wheel.
2. Unscrew the brake pipe nipple and disconnect the pipe.
3. If the caliper is to be disassembled, loosen the allen head shafts at this time.



Loosening the brake pipe nipple



Removing the caliper



Caliper assembly (1975 and Earlier)

1. Allen head shaft	7. Pad A	13. Lockwasher	19. Mounting bolt
2. Caliper B	8. Caliper A	14. Bushing	20. Lockwasher
3. Pad B	9. Piston dust seal	15. Stopper	21. Washer
4. Caliper holder	10. Piston	16. Bleeder valve	22. Ring
5. Boots	11. Seal	17. Bleeder valve cap	
6. O-ring	12. Screw	18. Nipple	



Blowing out the piston



Removing the seal

4. Remove the mounting bolts, then remove the caliper.

5. Unscrew the allen head shafts (1) evenly, alternating between the two a little at a time, then remove caliper B (2). Pad B (3) may be removed at this time by removing its securing screw (12).

6. Remove the bolts which secure the caliper holder (4), taking care not to damage the boots (5) or O-rings (6), then remove pad A (7).

7. Remove the two shafts (1) from caliper A (8), then remove the piston dust seal (9) and pull the piston (10) straight out without twisting it. The piston may also be blown out with compressed air through the brake line outlet, if it is reluctant to leave its seat.

8. Remove the seal (11), taking care not to damage the cylinder wall. A special tool (Part No. 56019-111) is available for this job, however a suitable substitute may be used.

Inspection

1. Inspect the brake pads for damage or excessive wear and replace them as necessary. If the surface of either pad is worn to the red warning line, the pads should be replaced, preferably as a pair. Grease or oil on the pads can be removed with triclorethylene or gasoline. If the pads are oil impregnated, they should be replaced.

2. Inspect the oil seals for a worn, damaged, or cracked condition and replace them as necessary. If the seal around the piston, which serves to maintain the proper pad/disc clearance, is bad, one pad will wear more rapidly than the other, and the constant friction caused by the dragging pad will cause a sharp increase in brake and brake fluid temperature which might result in damage to the various assemblies. Replace the seal if any of the following conditions exist:

a. Oil leakage around pad A.

b. The brake overheats under normal conditions.

c. Pad A and B wear unevenly.

d. The seal is stuck to the piston.

e. If the seal has been reused once already.

3. Inspect the caliper and piston for damage or wear past the following specifications, and replace them as necessary:

	Standard	*Service Limit*
Cylinder inside diameter	1.5031~1.5039 in. (38.180~38.200 mm)	1.5045 in. (38.215 mm)
Piston outside diameter	1.5006~1.5019 in. (38.180~38.200 mm)	1.5002 in. (38.105 mm)

4. If there is a mushy feeling at the hand lever when the brake is applied, it may be due to excessive clearance between the caliper halves. This is not a problem concerning braking efficiency, and has only to do with the feeling at the hand lever. Check on this in the following manner:

a. Assemble the caliper as described in the "Assembly and Installation" Section. Be sure that the caliper shafts are torqued to 22-26 ft lbs.

b. Check the clearance between the caliper halves using a 0.012 in (0.30 mm) feeler gauge. If the clearance is greater than this, the caliper must be replaced.

Assembly and Installation

1. Assembly is basically in the reverse order of disassembly. Use new O-rings and fluid seals whenever possible, and use the torque specifications given at the beginning of the "Disc Brake" Section.

2. Clean all of the caliper components with either brake fluid or alcohol, then coat them all liberally with fresh brake fluid.

3. Bleed the system thoroughly, after it is installed, as described in the "Bleeding the Brake System" Section.

Disc (1975 and Earlier)

Removal and Installation

1. Remove the front wheel.

2. Bend down the lockwasher locking tabs, and remove the disc mounting bolts to free the disc for removal.

3. When installing the disc, use new lockwashers whenever possible. Torque the mounting bolts to 140–190 in lbs. (1.6–2.2 kg/m), then bend the locking tab against the flat of the bolt.

Inspection

1. Clean any oil off the surface of the disc using either trichlorethylene or gasoline.

2. Inspect the disc for deep score marks or wear, and measure the disc with a micrometer at its most worn part. The disc can be cut safely up to 0.050 in. to remove score marks, but if the scoring, or wear, runs deeper than the disc's serviceable thickness of 0.217 in. (5.5 mm), the disc must be replaced. Standard thickness for the disc is 0.276 in. (7.0 mm).

3. Check the disc for a warped condition.

If the disc is warped, less than 0.004 in. (0.1 mm) it needn't be replaced, but if it is warped in excess of 0.012 in. (0.3 mm), it must be replaced.

Caliper (1976)

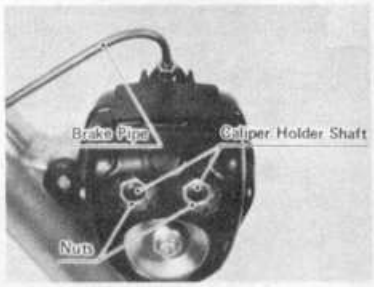
Removal

1. Remove the front wheel.

2. If the caliper is to be disassembled, loosen the caliper shaft nuts.

3. Disconnect the brake line at the caliper and plug the end with the bleeder valve cap.

4. Remove the caliper-to-fork slider mounting bolts. Remove the caliper.

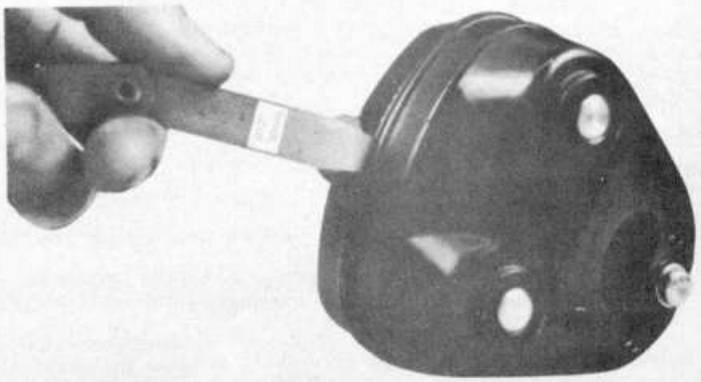


Caliper (1976)

Disassembly

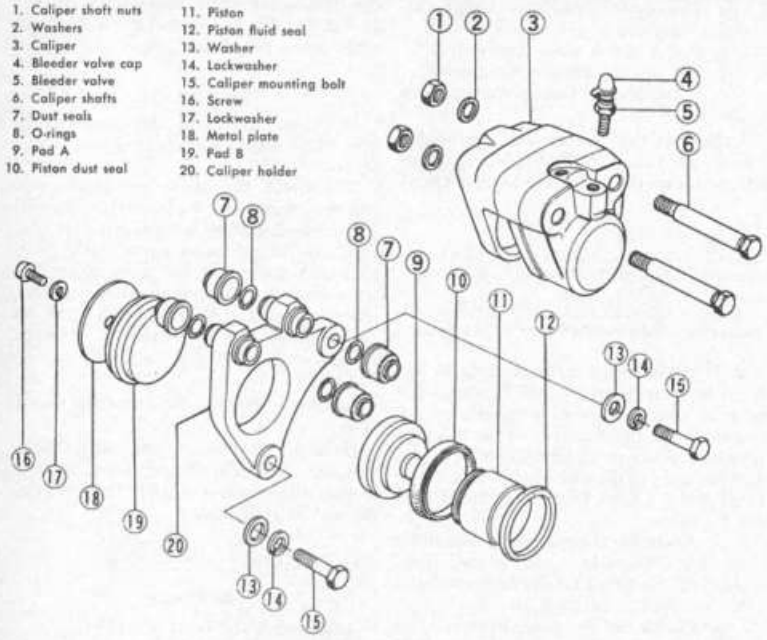
1. Remove the mounting screw for Pad B and remove the pad.

2. Remove the caliper shaft nuts. Carefully pull out the caliper shafts (unscrew-



Checking clearance between the caliper halves

1. Caliper shaft nuts
2. Washers
3. Caliper
4. Bleeder valve cap
5. Bleeder valve
6. Caliper shafts
7. Dust seals
8. O-rings
9. Pad A
10. Piston dust seal
11. Piston
12. Piston fluid seal
13. Washer
14. Lockwasher
15. Caliper mounting bolt
16. Screw
17. Lockwasher
18. Metal plate
19. Pad B
20. Caliper holder



Caliper assembly (1976)



Removing Pad B

ing each a little at a time) and spacers. Note the dust covers.

3. Remove the caliper holder. Remove Pad A.

4. Remove the piston dust seal. To remove the piston, apply compressed air at the brake line fitting. If not available, reconnect the brake line to the caliper and apply the brake to force out the piston.

5. Remove the fluid seal from the caliper, taking care not to scratch the walls.

Inspection

1. Check piston and caliper bore diameters against the following:

Bore ID	
Standard	42.850–42.900 mm/ 1.687–1.689 in.
Serviceable limit	42.92 mm/1.69 in.
Piston OD	
Standard	42.788–42.820 mm/ 1.685–1.686 in.
Serviceable limit	42.75 mm/1.68 in.

2. Clean all parts in clean brake fluid. The use of new seals is recommended.

Assembly

1. Lubricate all parts with new brake fluid during the assembly process.

2. Lubricate the caliper shafts with PBC (high-temperature, water-resistant) grease.

3. Assembly is the reverse of disassembly. Install the spacers with the protruding side facing in. Tighten caliper shaft nuts after mounting the caliper on the slider.

Installation

1. Tighten the mounting bolts to 25–33 ft lbs.

2. Tighten the caliper shaft nuts to 17.5–20.0 ft lbs.

3. Tighten the brake line fitting to 12–13 ft lbs.

4. Bleed the system after installation of pads and wheel.

Disc (1976)

Removal and Installation

1. To remove the disc, bend down the lockwashers and remove the mounting bolts.

2. To install, tighten the bolts to 25–33 ft lbs.

Inspection

1. Standard disc thickness is 6.9–7.1 mm (0.27–0.28 in.). Serviceable limit is 6 mm (0.24 in.).

2. Max. allowable run-out is 0.3 mm (0.012 in.).

Master Cylinder

Removal and Disassembly

1. Remove the right-side rear view mirror.

2. Open the bleeder valve on the caliper, and pump all of the brake fluid out of the system.

3. Remove the banjo bolt which secures the brake line to the master cylinder, then remove the rest of the brake line as desired.

4. Remove the clamp bolts which secure the master cylinder, and remove the cylinder.

5. Remove the reservoir cap (1), diaphragm plate (2), and diaphragm (3), then empty out any residual brake fluid.

6. Remove the brake lever (4), then use either the special tool (Part No. 56019-111) or a suitable substitute to remove the dust cover stopper (5). Remove the dust cover (6).

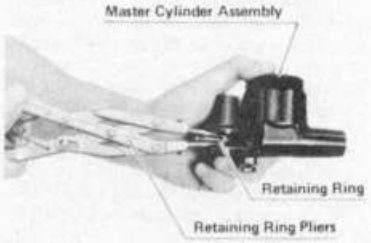
7. Remove the retaining ring (7) using retaining ring pliers, then remove the stopper (8), piston (9), primary cup (10), spring (11), and check valve (12) from the master cylinder body (22).

CAUTION: *Do not attempt to remove the secondary cup (13) from the piston as this will damage the cup.*

8. Any remaining components such as the pressure switch (29), the 3-way fitting (30), the brake lines (35) and pipe (31) may be removed at this time.



Removing the dust cover stopper



Removing the retaining ring

Inspection

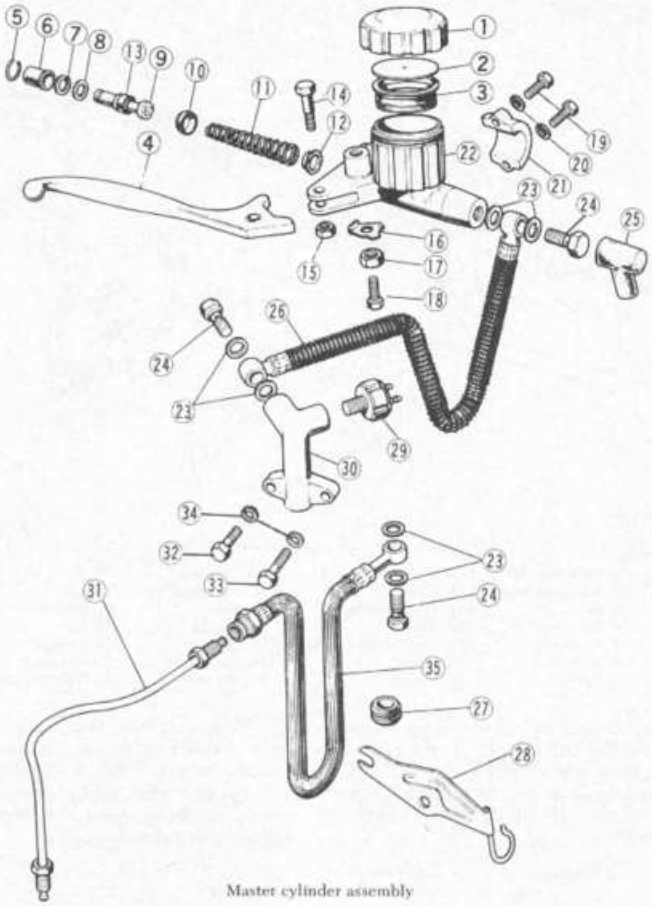
1. Clean all parts in clean brake fluid, then blow them dry. Use compressed air to blow out all passages. A clogged relief port will result in the pads dragging on the disc.

2. Inspect the master cylinder bore and piston for signs of wear. The master cylinder and piston must also be replaced if worn past their serviceable limit.

3. Inspect the primary and secondary cups for signs of wear, damage, rotting, or swelling, and replace them as necessary. Leaking at the brake lever is an indication of bad cups. The piston must also be replaced if the secondary cup is damaged, however, it's best to replace the cups as a set.

4. Inspect the spring for signs of wear or damage, and replace it as necessary.

5. Replace the rubber dust cover if it is damaged or aged.



Master cylinder assembly

1. Cap	10. Primary cup	19. Bolt	27. Grommet
2. Plate	11. Spring assembly	20. Washer	28. Bracket
3. Cap seal	12. Check valve assembly	21. Master cylinder mounting	29. Pressure switch
4. Brake lever	13. Secondary cup	22. Master cylinder body	30. 3-way fitting
5. Dust seal stopper	14. Bolt	23. Washer	31. Pipe
6. Dust seal	15. Nut	24. Banjo bolt	32. Bolt
7. Circlip	16. Lockwasher	25. Dust cover	33. Bolt
8. Piston stopper	17. Nut	26. Hose	34. Washer
9. Piston assembly	18. Bolt		35. Hose

6. Inspect the fittings, hoses, and pipes for signs of wear, cracking, rust, or other damage and replace them as necessary.

Assembly and Installation

1. Assembly is basically in the reverse order of disassembly. Make sure that all internal parts are perfectly clean, and liberally coat them all with clean brake fluid before installing.

2. Make sure that the primary cup and the check valve are not installed backwards, and make sure that they aren't distorted or turned sideways after insertion.

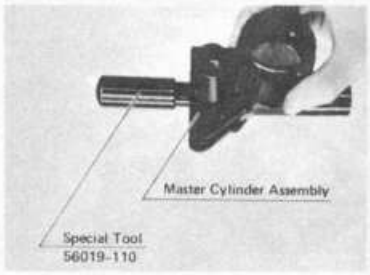
3. Use either the factory tool (Part No. 56019-110) or a suitable substitute to install a new retaining ring in its groove in the cylinder wall. The same tool can be used to install the boot and boot stopper.

4. Install the master cylinder so that the small projection is toward the throttle grip. Secure the lower camp bolts first, then secure the upper bolts. The bolts should be torqued to 55-75 in. lbs (0.63-0.88 kg/m).

5. Fill the master cylinder with brake fluid and bleed the system as described in the "Bleeding the Brake System" Section. Do not overtighten the master cylinder cap.

Disc Brake Specifications

Measurement	Standard: Single Disc	Standard: Dual Disc	Service Limit: Single	Service Limit: Dual
Cylinder inside diameter	0.5512~0.5529 in. (14.000~14.043 mm)	0.6248~0.6265 in. (15.870~15.913 mm)	0.5543 in. (14.080 mm)	0.6280 in. (15.950 mm)
Piston outside diameter	0.5495~0.5506 in. (13.957~13.984 mm)	0.6231~0.6242 in. (15.827~15.854 mm)	0.5472 in. (13.900 mm)	0.6209 in. (15.770 mm)
Primary, secondary cup diameter	0.5768~0.5965 in. (14.650~15.150 mm)	0.6476~0.6673 in. (16.450~16.950 mm)	0.5709 in. (14.500 mm)	0.6417 in. (16.300 mm)
Spring length (free)	2.008 in. (51.0 mm)	1.709 in. (43.4 mm)	1.890 in. (48.0 mm)	1.594 in. (40.5 mm)



Installing the retaining ring



Installing the master cylinder

Bleeding

1. Remove the reservoir cap and check that there is plenty of fluid in the reservoir. The fluid level must be checked several times during the bleeding operation, and replenished as necessary. If the fluid in the reservoir runs completely out at any time during the bleeding operation, air will enter the system, and the procedure will have to be begun again.

2. Slowly pump the brake lever until no air bubbles can be seen rising up through the fluid from the holes at the bottom of the reservoir. When no more bubbles appear, the master cylinder end of the brake system has been purged of all air.

3. Replace the reservoir cap, and run a clear plastic hose from the caliper bleeder valve into a container. Pump the brake lever until it becomes hard, then, while holding the lever squeezed, quickly open (turn counterclockwise) and close the bleeder valve. Repeat the operation until no more air can be seen coming out into the plastic hose. During this process repeatedly check the fluid level in the reservoir, and replenish it as necessary.

4. When the system has been bled, replace the rubber cap on the bleeder valve, and check the fluid level in the reservoir once more. The handlebars must be turned so that the reservoir is level, and the fluid must come up to the level line scribed inside the reservoir.

NOTE: *If twin brakes are used and it becomes difficult to get a firm feeling at the lever, bleed the brake closest to the master cylinder first. Stretching the brake hoses while pumping up the system will help eliminate air bubbles trapped in the system.*



Fill the reservoir to the level line

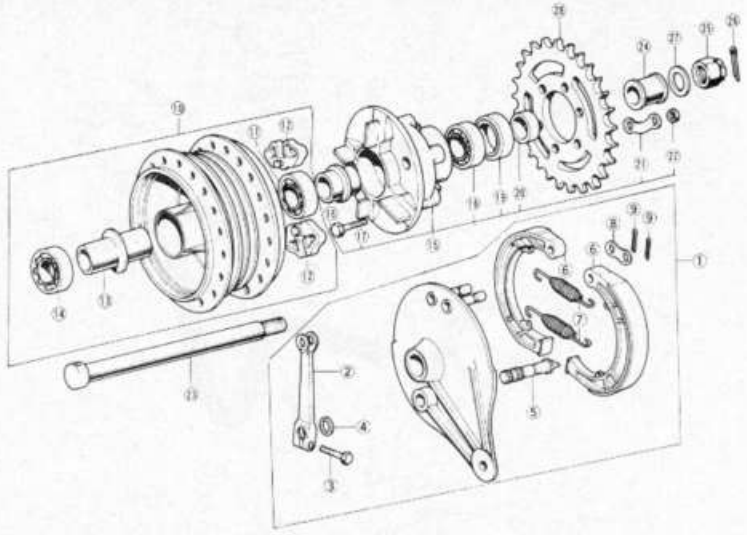
REAR HUB

Disassembly

1. Remove the rear wheel. Refer to the accompanying illustration.
2. Remove the axle nut (25), washer (27), and distance collar (24), then remove the axle (23) by withdrawing it through the left side.
3. Remove the panel assembly (1) from the hub (10) then disassemble the panel assembly in the following manner:
   a. Remove the two cotter pins (9) and double washer (8) which secure the brake shoes.
   b. Use a punch to mark the original position of the brake cam lever (2) and the brake cam (5), then remove the pinch bolt (3) and lever.
   NOTE: *Lever removal can be made easy by using a screwdriver to pry at the pinch bolt slot while pulling the lever off the cam.*
   c. Remove the dust seal (4), then remove the brake shoes (6) and cam (5) by prying the shoes up evenly and removing them along with the cam.
   d. Remove the brake return springs (7) from the shoes.
4. Separate the coupling assembly (15) from the hub (10), then disassemble it in the following manner:
   a. Remove the shock damper rubbers (12), distance collar (16), axle sleeve collar (20), and oil seal (19).
   b. Tap evenly around the bearing (18) inner race from the inside of the coupling assembly (15) with a suitable drift until the bearing comes out.
5. Tap evenly around the inner race of the panel side bearing (14) from the sprocket side until it comes out, remove the distance collar (13), then tap evenly around the inner race of the coupling assembly side bearing (11) from the panel side until it comes out.
6. The rear sprocket (28) can be removed by bending up the lockwasher locking tabs, and removing the mounting nuts and bolts.
   NOTE: *If just the sprocket is to be removed it is not necessary to disassemble the hub. Remove the left-side mufflers, the sprocket mounting bolts, the rear wheel, and then the sprocket.*

Inspection

1. Clean all parts, other than the brake shoes, seals, and rubber dampers in a suitable solvent, then blow them dry.
2. Inspect the brake drum for a warped, scored, or damaged condition, and replace it as necessary. Measurements should be taken in no less than two different places. If the drum is scored or worn out of round it can be turned down as long as turning it doesn't exceed the specified limits which are as follows:



Rear hub assembly

1. Panel assembly	8. Double washer	15. Coupling	22. Nut
2. Brake cam lever	9. Cotter pin	16. Distance collar	23. Axle
3. Bolt	10. Drum assembly	17. Bolt	24. Distance collar
4. Dust seal	11. Bearing	18. Bearing	25. Nut
5. Brake cam	12. Shock damper rubber	19. Oil seal	26. Cotter pin
6. Brake shoe	13. Spacer	20. Sleeve collar	27. Washer
7. Spring	14. Bearing	21. Washer	28. Rear sprocket

Standard	*Service Limit*
7.874 ~ 7.881 in. (200.00 ~ 200.185 mm)	7.904 in. (200.75 mm)

3. Inspect the brake shoes for excessive or uneven wear, or for oil or grease impregnation, and replace them as necessary. Surface glazing or high spots can be removed by sanding. The shoes should be measured in several spots, and they must be replaced if worn anywhere past their serviceable limits which are as follows:

Standard	*Service Limit*
0.1909 ~ 0.2146 in. (4.85 ~ 5.45 mm)	0.118 in. (3.00 mm)

4. The brake spring free length specifications are as follows:

Standard	*Service Limit*
2.62 in. (66.5 mm)	2.72 in. (69.0 mm)

5. Inspect the brake camshaft and backing plate for signs of wear or damage, and replace them individually or as a pair as necessary. The service limits for these items are as follows:

	Standard	*Service Limit*
Camshaft	0.6676 ~ 0.6687 in. (16.957 ~ 16.984 mm)	0.6626 in. (16.83 mm)
Shaft hole	0.6693 ~ 0.6704 in. (17.000 ~ 17.027 mm)	0.6764 in. (17.18 mm)

6. Measure the rear axle run-out in the manner indicated, and replace it if run-out exceeds 0.008 in (0.2 mm).
7. Inspect the rubber dampers for signs of cracking, damage, or rotting, and replace them as necessary.

Assembly

1. Assembly is in the reverse order of disassembly. Use new oil seals, locking tabs, and cotter pins whenever possible.
2. Use either the special factory tools (Part Nos. 57001-139 and 57001-140), or a suitable substitute, when installing the bearings and oil seals.
3. When installing the rear sprocket, torque the mounting nuts to 23-30 ft lbs (3.1-4.2 kg/m), and bend the locking tab up against a flat of the nut.
4. Lubricate the brake pivots, brake shoe anchor pins, brake return spring ends, and the brake camshaft surface and groove with grease. Be sure that the camshaft groove is filled, but take care not to overlubricate, as this may result in grease on the brake shoes and drum.

Final Drive

Removal

NOTE: *The drive chain may be cut or broken with a chain breaker if it is going to be discarded and replaced with a master link type chain. Otherwise, the chain must never be cut.*

1. Remove the chain cover in the following manner:
   a. Remove the chain oil pump cover screws and cover.
   b. Slide back the hose clamp and disconnect the inlet hose from the

pump. One of the cover screws can be used to plug the hose to prevent oil leakage.

c. Remove the left footrest and shift pedal. The clamp bolt must be completely removed before the shifter can be removed.

d. Remove the starter cover and cover gasket.

e. Remove the chain cover mounting bolts, then remove the cover.

f. Remove the cotter pin from the clutch release lever, and disconnect the clutch cable.

2. Loosen the cylinder exhaust flange bolts and the muffler mounting bolts for the two left-hand mufflers, and either remove or swing the pipes up out of the way.

3. Remove the lower mounting bolt from the left-side rear shock absorber.

4. Loosen the chain adjusters and back off the adjusting nuts so that the chain is as loose as possible.

5. Remove the rear axle cotter pin, loosen the axle nut, and push the rear wheel forward in the swing arm.

6. Remove the engine sprocket in the following manner:

a. Remove the clutch pushrod and sprocket guard.

b. Bend back the lockwasher locking tab.

c. Secure the sprocket so that it won't turn by using the special tool (Part No. 57001-118), a suitable substitute, or by engaging the transmission in Low gear, then remove the sprocket and disengage the chain.



Removing the engine sprocket

7. Disconnect the rear brake torque link at the rear hub, remove the brake rod adjusting nut and disconnect the rod from the lever by rotating the brake backing plate, and remove the two pinch bolts and stoppers at the swing arm chain adjusters.

NOTE: *Remove the spring and link pin from the brake lever and put them back on the rod to avoid losing them.*

8. Push the left shock absorber out of the swing arm, loop the chain over the swing arm, and slide the rear wheel out of the swing arm.

9. Remove the nut from the swing arm pivot shaft, and withdraw the shaft. Tilt the swing arm until the pivot section clears the frame, then drop the chain through the gap.

Inspection

1. Check the drive chain for signs of wear, cracks on the rollers, bushings, or roller links, or for kinking or binding, and replace it if any of these conditions exist. Thoroughly lubricating the chain may help free kinked or bound links.

2. Replace the chain if it is worn more than 2% of its original length. This can be determined by measuring the chain in either of the following manners:

a. Stretch the chain taut by using the chain adjusters, or by hanging a 20 lb (10 kg) weight on the bottom run of the chain.

b. Remove the chain guard and measure the length of 20 links along a straight line from the center of the first pin to the center of the twenty-first pin.

c. If the length of the chain exceeds the standard length of 15.0 in. (381 mm) by more than 5/16 in. (8 mm), the chain must be replaced.

3. Inspect both the drive (engine) and driven sprockets for signs of wear, damage, or a warped condition, and replace them as necessary if worn past the service limits given below:

a. Engine sprocket diameter:

Standard	*Service Limit*
3.376 ~ 3.384 in. (85.76 ~ 85.96 mm)	3.346 in. (85.0 mm)

b. Rear sprocket diameter and runout:

Diameter		*Runout*	
Standard	*Limit*	*Standard*	*Limit*
8.560 in. (217.4 mm)	8.484 in. (215.5 mm)	under 0.012 in. (under 0.3 mm)	0.020 in. (0.5 mm)

Installation

1. Installation is basically in the reverse order of removal.

2. Make sure that the chain adjustment is loose enough to allow the engine sprocket and chain to fit properly, then readjust it afterwards.

3. Make sure that the lockwasher tab seats in the hole in the sprocket, and bend up one side of the washer after securing the sprocket nut.

4. Secure the sprocket nut to 87-108 ft lbs (12-15 kg/m).

5. Use an oil seal guide (Part No. 57001-130) to prevent damage to the seal while installing the chain cover.

6. Rotate the rear wheel until the pin inside the output shaft and the groove in the chain oil pump shaft are in alignment before installing the cover.

Front Forks

REMOVAL AND DISASSEMBLY

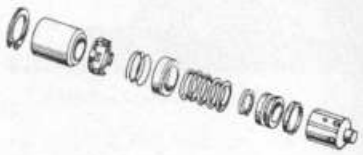
1. Remove the front wheel.

2. Remove the front fender mounting bolts and fender.

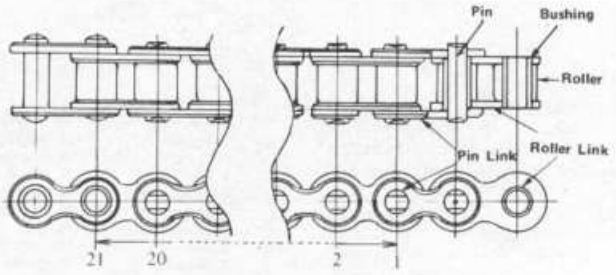
3. Remove the brake caliper and place it out of the way.

NOTE: *The caliper need not be disconnected from the brake line pipe, however the assembly should be tied to or rested on something to avoid bending the pipe.*

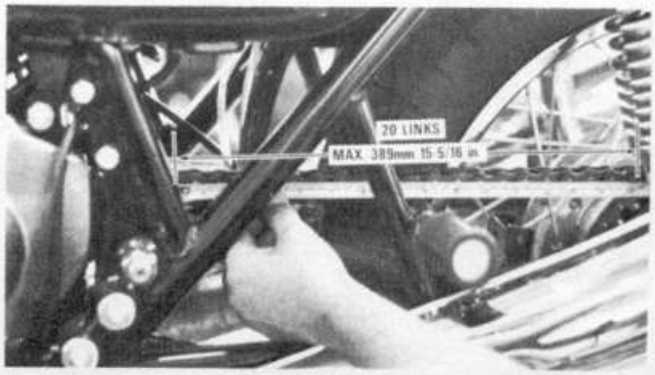
4. Remove the bolt (2) from the top of the tube if the fork is to be disassembled



Damper components (1974 and later)



Measure along here



Measuring the chain

once it's removed. If only the slider is to be removed, it may be done now by removing the allen bolt (30) from the bottom.

NOTE: *If you've removed or loosened the top bolt (2), the cylinder assembly (19) will rotate and you won't be able to remove the allen bolt without the assistance of the special factory tool (Part No. 57001-142).*

5. If you wish to remove the entire fork leg, remove the top bolt (2) and loosen the clamp bolts (6 and 16), and pull the assembly down and out. If you use screwdrivers to spread the clamps on the stem head (4) and stem (15) assemblies the legs will come out more easily.

6. Invert the assembly and dump out the spring (18) and fork oil. If the allen bolt (30) has been removed, the inner tube assembly will also come out.

7. Remove the circlip (36) from the inner tube using snap-ring pliers, and remove the cylinder assembly (20) from the tube.



Disassembling the fork tube and slider

8. Remove the dust seal (21) from the outer tube (25), then remove the circlip (22) and oil seal (24) using a sharp hook.

NOTE: *Once the oil seal has been disturbed it must be replaced.*

INSPECTION

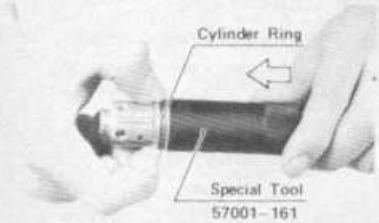
1. Inspect the spring for a collapsed or damaged condition, and measure it to check its free length. If the spring is shorter than 19 1/16 in. (485 mm) it must be replaced.

NOTE: *If one spring is shorter than its serviceable limit, and the other is only marginally above the limit, it's a good idea to replace them both at this time.*

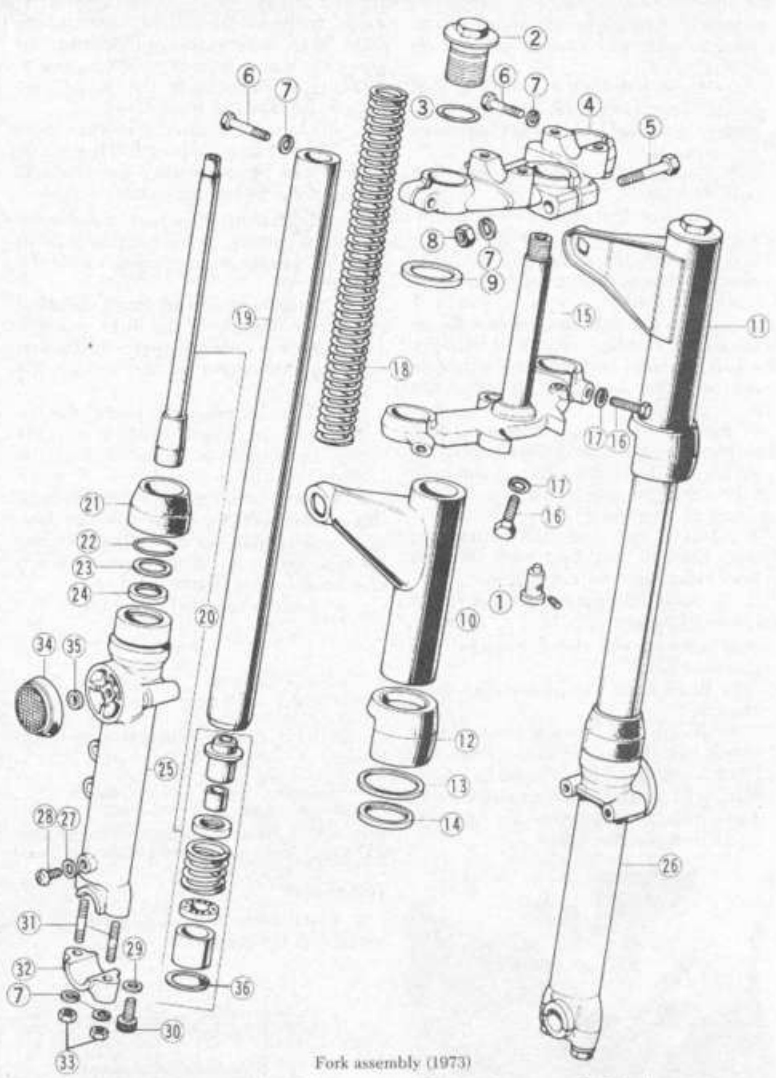
ASSEMBLY AND INSTALLATION

1. Assembly is basically in the reverse order of disassembly. Use new seals.

On 1974 and later forks, use the special tool for inserting the cylinder assembly into the inner tube.

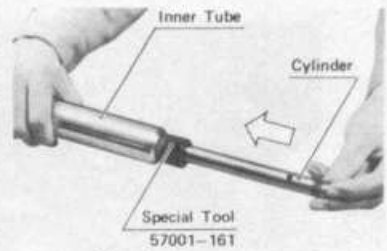


Assembling the damper components with the special tool (1974 and later)



Fork assembly (1973)

1. Lock assy	10. Headlight stay	19. Inner tube	28. Drain plug
2. Top bolt	11. Headlight stay	20. Cylinder	29. Gasket
3. O-ring	12. Stay guide	21. Dust seal	30. Allen bolt
4. Stem head	13. Washer	22. Circlip	31. Stud
5. Clamp bolt	14. Gasket	23. Washer	32. Axle
6. Clamp bolt	15. Steering stem	24. Oil seal	33. Nut
7. Lockwasher	16. Bolt	25. Outer tube	34. Reflector
8. Nut	17. Lockwasher	26. Outer tube	35. Rubber washer
9. Washer	18. Spring	27. Gasket	36. Circlip



Assembling the fork tube (1974 and later)

2. When installing new oil seals, use the special tool (Part No. 57001-141) to install the seal. Lubricating the seal will make installation easier.

If progressively-wound fork springs are fitted, install them with the close coils towards the top of the forks.

3. Before tightening the top clamp, make sure that the flange surface of the bolt in the top of the tube is level with the top of the steering stem.

4. Secure the upper clamp bolt to 140-155 in. lbs (1.6-1.8 kg/m), and the lower clamp bolt to 40-43 ft lbs (5.4-6.0 kg/m).

Steering Stem

REMOVAL

1. Remove the front wheel.

2. Remove the fender mounting bolts and fender.

3. Remove the bolt from the bottom of the headlight shell and the two screws from the sides, which serve to secure the beam assembly, and remove and unplug the beam assembly.

4. Unplug the turn signal wires, and disconnect the main wiring harness connectors.

5. Remove the turn signals and headlight shell after removing the mounting hardware.

6. Disconnect the tachometer cable at the cylinder head.

7. Remove the mounting bolts which secure the instrument and ignition switch cluster, and remove the assembly. Remove the gas tank.

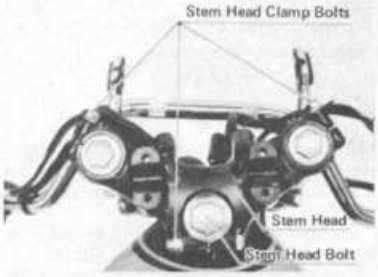
8. Remove the mirrors (if applicable), then disconnect the front brake pressure switch wires.



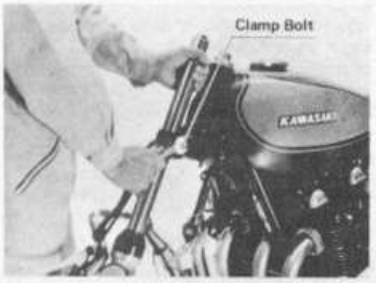
Removing the instrument cluster mounting bolts

9. Remove the mounting bolts for the master cylinder, the 3-way fitting, and the caliper, then remove the entire brake system while taking care not to damage the brake line pipe.

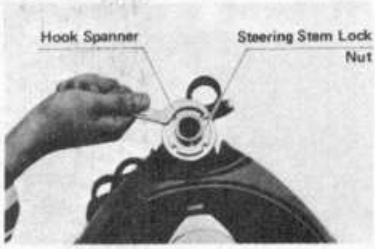
10. Unbolt the handlebars and allow them to rest on the tubes as illustrated, then loosen the 3 stem head clamp bolts, remove the stem head bolt, and remove the stem head.



Clamp bolt locations



Removing the lower clamp bolts



Removing the stem locknut



Removing the steering stem

11. Rest the handlebars on the frame, remove the two lower clamp bolts, the fork ears (headlight stay), and the fork tubes.

12. Remove the steering stem locknut using a suitable hook spanner, and drop the stem out from the bottom. Remove the stem cap, upper inner race, and the bearings.

CAUTION: *When withdrawing the stem, be prepared to catch the lower race bearings in a suitable receptacle. Always keep the two bearing groups separate for installation in their original locations.*

13. Remove the bearing races; only if they must be replaced, by drifting them out with a suitable soft face drift.

14. Pull off the lower race which is pressed onto the steering stem by using either the special tool (Part No. 57001-135) or a suitable substitute. Try not to damage the grease seal under the race, or stretch it and pull it off over the race.

INSPECTION

1. Clean all parts, other than gaskets and seals, in a suitable solvent, and blow them dry.

2. Inspect all parts for signs of wear, stripped threads, or damage, and replace them as necessary.

3. Visually inspect the stem for a tilted condition and replace it if not perpendicular to the clamp.

4. Inspect the bearings and races for signs of wear, scoring, or damage, and replace them as complete sets as necessary. Bright spots on the inner portion of the race indicate advanced wear, and may cause jerky steering.

INSTALLATION

1. Installation is basically in the reverse order of removal.

2. Liberally oil the outer races and drive them into the head pipe using either the special tools (Part Nos. 57001-139 and 57001-138) or a suitable substitute such as a soft-faced drift. Be sure that they seat evenly in the pipe.

3. Oil the lower inner race and drive it onto the stem using either the special tool (Part No. 57001-137) or a suitable substitute. The race can be driven on using the clamping edges of a vise if necessary, but this is hard on the bottom of the clamp.

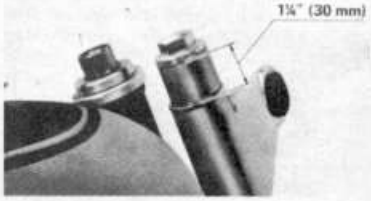
NOTE: *If the special tools are being used, install a new seal before driving on the race. If you are going to drive it on using the edges of a vise, it's best to drive on the race and then stretch the seal on over the race.*

4. Liberally grease the bearing races, and stick the bearing in the grease. The upper race takes 19 bearings, and the lower race takes 20. Placing the lower bearings on the stem race will make installation easier.

5. Insert the stem into the frame head, then install the upper inner race, cap, and locknut.

6. Use a suitable hook spanner to tighten the locknut until the stem moves smoothly and freely to either side, but no play exists in the bearings.

7. Position the fork ears and guides between the two halves of the stem assembly, then slide the fork tubes up through them so that they protrude about 1¼ in. (30 mm) at the top. Snugging up the lower clamp bolt will hold the tubes in position.



Fork tubes properly positioned

8. Position the handlebar assembly as illustrated, making sure that all the wires and cables are correctly routed.

9. Install the stem head, and secure the stem head bolt and the rear clamp bolt.

10. Loosen the lower clamp bolt, position the fork tube so that the flange surface of the fork top bolt is flush with the upper surface of the steering stem head, then secure the upper and lower clamp bolts. The 3 upper clamp bolts should be secured to 140-155 in lbs (1.6-1.8 kg/m), and the two lower clamp bolts should be torqued to 40-43 ft lbs (5.4-6.0 kg/m).

NOTE: *Secure the lower clamp bolts first, then the upper bolts.*

11. Mount and bleed the disc brake.

12. Mount and secure the ignition switch and instrument cluster, then mount, but do not secure the headlight shell and turn signals.

13. Start, but do not tighten, the bolt

which goes in the bottom of the headlight. Adjust the vertical height of the shell, then secure the shell, the bottom bolt, and the turn signals.

14. Connect the wiring harness connectors, then connect and install the headlight lamp unit.

NOTE: *The left turn signal lead goes to the green wire, and the right lead goes to the gray wire.*

15. Mount and secure the front fender, the brake hose clamp, and the front wheel.

Rear Shock Absorbers

Since the units are permanently sealed and cannot be rebuilt, they must be replaced if damaged in any way which renders them ineffective. The rubber bushings and springs can, however, be replaced.

1. Remove the mounting nut from the upper end, and the bolt from the lower end of each shock. If there is not sufficient clearance for the removal of the bottom mounting bolt, it will be necessary to loosen or remove the mufflers on the side in question.

2. Remove the mounting bolts for the chrome bar, and remove the bar, then pull the shock free of the mounting stud.

3. Disassemble the shock by compressing it until the upper keepers are free to be removed, then remove the keepers, cover, and spring. The upper mounting eye can now be unscrewed and removed if it or the rubber stopper is to be replaced.

NOTE: *The shock can be compressed in a vise or by pressing it against the floor while someone else removes the keepers.*

Swing Arm

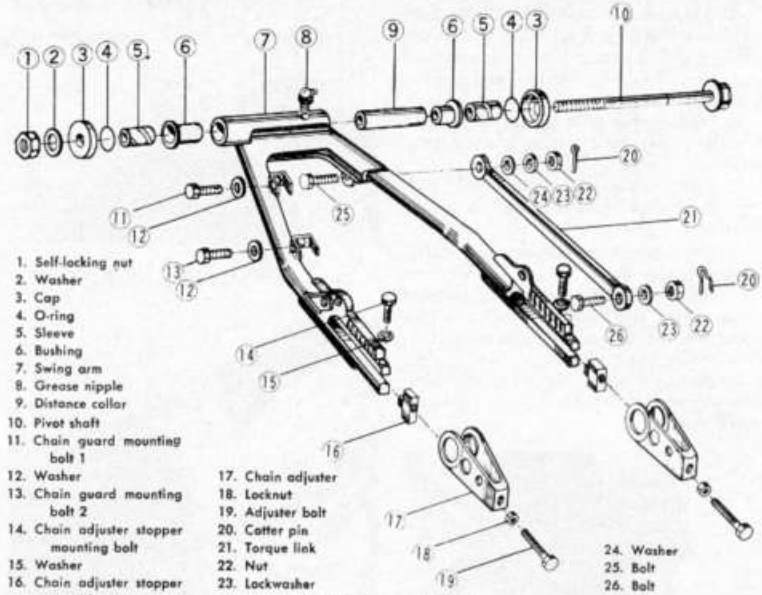
REMOVAL AND DISASSEMBLY

1. Remove the rear wheel.

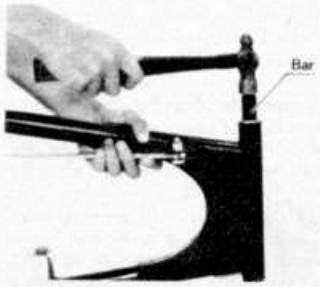
2. Remove the rear shock absorber lower mounting bolts, then unscrew the swing arm pivot shaft nut, withdraw the shaft, and remove the swing arm.

3. Pull the sleeve (5) out of each end of the swing arm.

4. Position the distance collar (9) so that it seats against either bushing (6), or at least so it's off center, then, using a



Swing arm—exploded view



Drifting out a bushing

suitable bar as a drift, gently drift out the opposite side bushing. Invert the swing arm and remove the remaining bushing.

Inspection

1. Clean all parts in a suitable solvent, then blow them dry.

2. Inspect the swing arm for stress signs, cracks, bends, or other damage, and have it repaired or replace it as necessary.

3. Inspect the sleeves for signs of wear or damage, and replace them as a set if either is in need of replacement. The standard outside diameter of a sleeve is 0.8653-0.8661 in. (21.979-22.171 mm), and the sleeve must be replaced if worn past its serviceable limit of 0.864 in. (21.95 mm).

4. Inspect the bushings for signs of wear or damage, and replace them as a set if either is in need of replacement. The standard inside diameter of a bushing is 0.8712-0.8729 in. (22.128-22.171 mm), and the bushing must be replaced if worn past its serviceable limit of 0.881 in. (22.37 mm).

5. Inspect the pivot shaft for signs of wear, scoring, excessive run-out, or other damage, and replace it as necessary. Check the run-out with a dial indicator and a pair of V-blocks as illustrated. If the run-out exceeds the standard allowance of under 0.004 in. (under 0.1 mm), the shaft must be straightened or replaced.

ASSEMBLY AND INSTALLATION

1. New O-rings and bushings should be used whenever possible, and the bushings should be oiled before being installed.

2. Thoroughly grease the swing arm by applying grease through the grease nipple until it runs out either end of the swing arm, then wipe off the excess.

3. Secure the pivot shaft to 87-108 ft lbs (12-15 kg/m).