KAWASAKI 900CC FOUR CYLINDER MODELS

MODEL	Z1 Z1A
Displacement—cc	903
Bore—mm	66
Stroke—mm	66
Number of cylinders	4
Ignition—	
Spark plug (NGK type)	B-8ES
Electrode gap—mm	0.7-0.8
Inch	0.028-0.031
Point gap—mm	0.3-0.4
Inch	0.012-0.016
Firing order	1-2-4-3
Valve clearance (cold)-mm	0.05-0.10
Inch	0.002-0.004
Electrical system voltage	12
Battery terminal grounded	Negative
Tire size—front	3.25 x 19
Rear	4.00 x 18
Tire pressure—	
Front-kg/cm²	1.8
Psi	26
Rear-kg/cm²	2.2†
Psi	31†
Rear chain free play-mm	45*
Inch	1¾*
Number of speeds	5

†Rear tire pressure should be increased to 2.5 kg/cm² (36 psi) when carrying passenger.
*Drive chain free play is checked with motorcycle on center stand.
Illustrations courtesy Kawasaki Motors Corporation

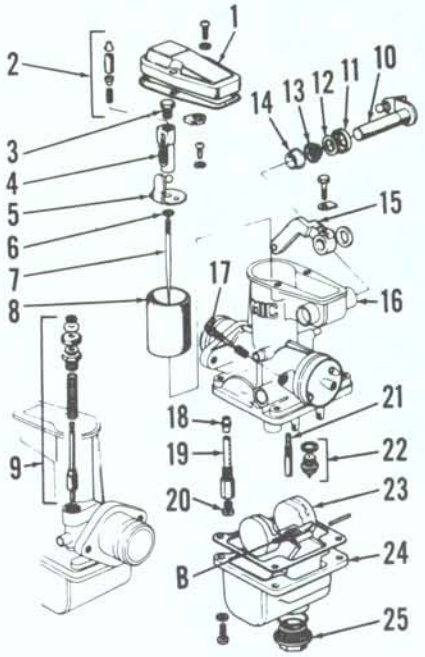


Fig. K13-3–Exploded view of carburetor used on 903cc Kawasaki.

B. Float arm tab
1. Cover
2. Shaft holder & spring
3. Screw
4. Throttle slide shaft
5. Set plate
6. Jet needle clip
7. Jet needle
8. Throttle slide
9. Starting valve
10. Lever arm
11. Collar
12. Washer
13. Spring
14. Collar
15. Lever arm
16. Throttle body
17. Pilot air screw
18. Needle jet
19. Needle jet holder
20. Main jet
21. Pilot jet
22. Inlet needle & seat
23. Floats
24. Float bowl
25. Drain plug

MAINTENANCE

SPARK PLUG. Recommended spark plug for normal operation is NGK type B-8ES or equivalent. Spark plug electrode gap should be set to 0.7-0.8mm (0.028-0.031 inch).

CARBURETORS. Four Mikuni type VM28SC carburetors are used. It is important that all carburetors be adjusted exactly alike for smooth engine performance. Before disturbing carburetor adjustments, make sure that none of the following conditions are causing poor engine performance: valves out of adjustment, worn or dirty spark plugs, dirty air filter, incorrect ignition timing, uneven or low engine compression.

When carburetor adjustments are necessary, adjustments should be made with engine at normal operating temperature. Initial setting for pilot air screws (17—Fig. K13-1) is 1½ turns out from a lightly seated position. Idle speed should be set to approximately 1000 rpm and is adjusted by turning screw (33).

Carburetors and mount plate should be removed as an assembly. Dismount fuel tank then loosen clamps on intake manifolds and air cleaner outlets. Pull carburetors back, away from intake manifolds then disconnect throttle control cables. Carburetors are removed from mounting plate in pairs. Remove cap nuts (37—Fig. K13-2), lock nuts (38) and throttle stop screws (40) from pair of carburetors to be removed. Remove dual lock washer (39). Remove screws securing carburetors to plate (45—Fig. K13-4) and pull carburetors away.

Refer to Fig. K13-3 and the following standard carburetor specifications:

Main jet (20) ..... #112.5
Needle jet (18) P-9
Jet needle (7) ..... 5 J 9
Pilot jet (21) ..... #20
Throttle slide (8) 2.5

Clip (6) in third groove from top of needle (7). Float level (A—Fig. K13-6) should be 24mm (0.9449 inch).

When assembling, use throttle stop screws (40—Fig. K13-4) to position throttle slides alike. A small notch in the base of each throttle slide (8—Fig. K13-3) may be used to gage distance of slide from bottom of bore. Adjust throttle stop screws so that top of notch in slide is 0.6-0.7mm (0.024-0.028 inch)

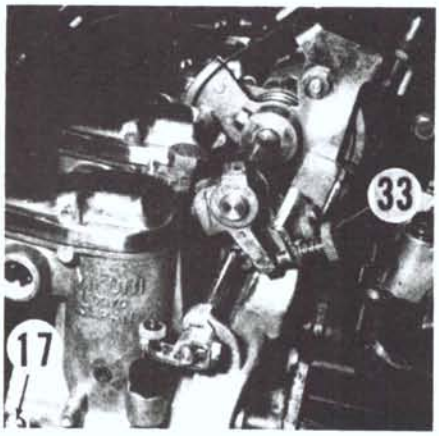


Fig. K13-1–Pilot air screws (17) should be 1½ turns out from a lightly seated position. Idle speed is adjusted by turning screw (33).

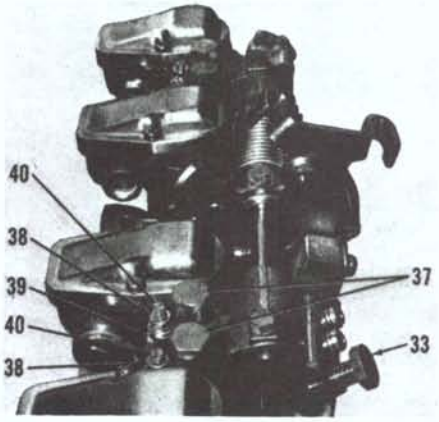


Fig. K13-2–Individual carburetors are adjusted by turning throttle stop screws (40). Refer to text for adjustment procedure.

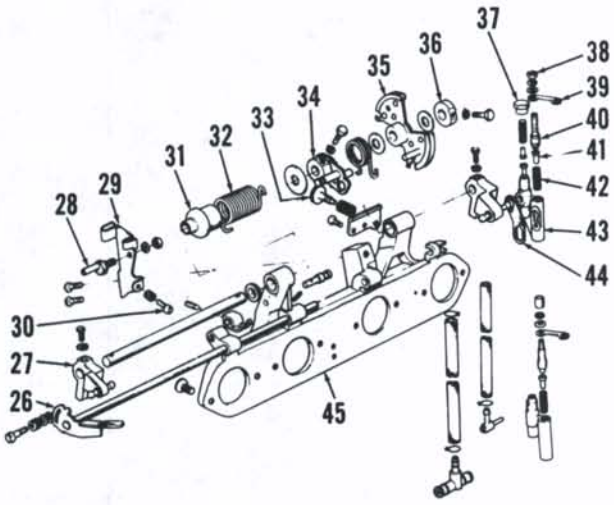


Fig. K13-4–View of carburetor control linkage.

26. Starting valve lever
27. Throttle lever
28. Closed throttle stop pin
29. Control pulley bracket
30. Open throttle stop screw
31. Spring collar
32. Throttle return spring
33. Idle speed screw
34. Lever
35. Pulley
36. Collar
37. Cap nut
38. Lock nut
39. Lock washer
40. Stop screw
41. Spring seat
42. Spring
43. Holder
44. Bracket
45. Carburetor plate

from bottom of throttle bore. Turn throttle control pulley to wide open position and observe throttle slides, adjust pulley stop screw (30—Fig. K13-4) so that bottom edge of lowest slide just clears throttle bore.

Install carburetors, start engine and allow it to reach normal operating temperature. Set engine idle speed to approximately 1000 rpm by adjusting idle speed screw (33).

A set of vacuum gages should be used to synchronize carburetors for best performance. Remove rubber caps from fittings on intake manifold and attach vacuum gages. Start engine and adjust restrictors (R—Fig. K13-5) on gages to minimize needle flutter. Vacuum for each cylinder should be equal and at approximately 20-23 cm Hg (8-9 inch Hg). Adjust throttle stop screws (40—Fig. K13-2) so that vacuum reading for each cylinder is in recommended range and all readings are within 2.0 cm Hg (0.8 inch Hg) of each other. Be sure to tighten all lock nuts when adjustments are completed.

If vacuum gages are not available, place hands behind exhaust pipes to gage exhaust pressure. Adjust throttle stop screws (40) to obtain equal pressure from all four exhausts. Readjust idle speed screw (33) if necessary.

Fuel level may be checked without removing carburetors by using a fuel level sight gage. A sight gage may be fabricated from a length of clear fuel line and a plug or Kawasaki tool #57001-122 may be used. Move fuel tank control valve to "OFF" position. Remove drain plug (25—Fig. K13-3) from one carburetor and attach sight gage to drain plug hole. Hold clear fuel line up, next to carburetor and turn fuel tank valve "ON". Fuel in sight gage should be 3.5mm (0.137 inch) below edge of throttle body (16). Each carburetor must be checked individually. Remove float bowl and bend tang (B) on float arm to adjust. If carburetors are removed, float level may be checked by measuring distance from throttle body to bottom of float assembly with unit inverted. Distance (A—Fig. K13-6) should be 24mm (0.9449 inch) with needle valve closed and spring not compressed. Adjust by bending tang (B) on float arm.

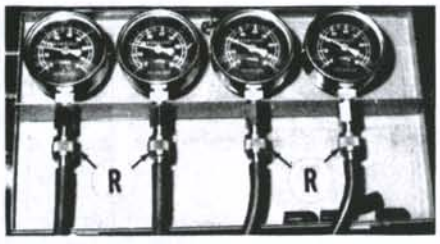


Fig. K13-5–Adjust vacuum gage restrictors (R) to minimize needle flutter before adjusting carburetors.

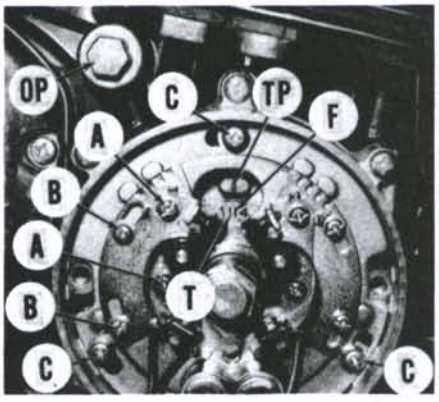


Fig. K13-7–Aft set of breaker points should just open as "F" mark (F) on "1.4" side of advancer aligns with timing pointer (TP). Lubrication system is inspected by removing oil gallery plug (OP) and installing a low reading oil pressure gage.

IGNITION AND ELECTRICAL. A battery and coil type ignition system is used. Breaker points are mounted beneath round inspection cover at right end of crankshaft. A three phase alternator is mounted at left end of crankshaft. An electronic voltage regulator and a full wave rectifier are mounted beneath seat with the battery. Standard battery is 12V 14AH. Electrical system is protected by a 20 A fuse.

Ignition timing may be adjusted as follows: Remove breaker point inspection cover and set breaker point maximum gap to 0.3-0.4mm (0.012-0.016 inch) on both sets of breaker points. Loosen screws (A—Fig. K13-7) to adjust point gap. Loosen screws (B) to set breaker point base plate so that appropriate set of breaker points just open as "F" mark on advancer aligns with timing pointer (TP). Both sets of breaker points must be timed. Entire base plate may be repositioned after loosening screws (C). A power timing light should be used to check ignition timing. When timing light is connected to #1 or #4 spark plug, "F" mark, next to "1-4" mark on advancer should be aligned with pointer (TP) at idle speed.

To check full ignition advance, first determine if engine has early or late type advancer mechanism (Fig. K13-7A). Since no full advance timing marks are provided, it is necessary to estimate 40 degrees BTDC on advancer plate. Timing pointer aligns differently

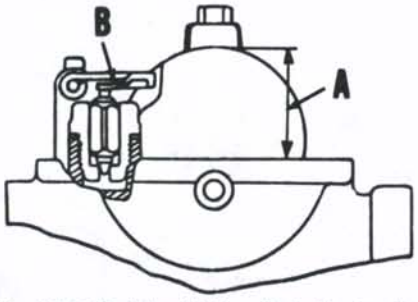
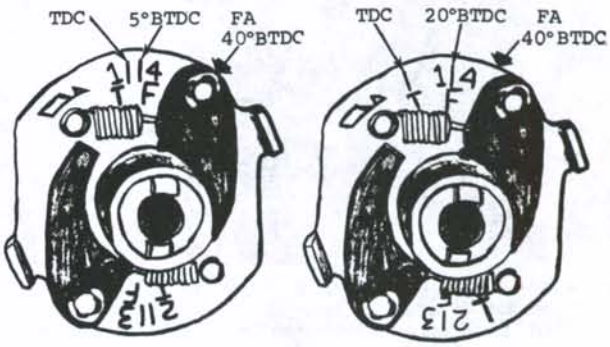


Fig. K13-6–Float level (A) is adjusted by bending tang (B) on float arm.

Fig. K13-7A–View of early (left) and late (right) type ignition advancer mechanisms. Ignition occurs 5 degrees BTDC on early type and 20 degrees BTDC on late type. Full advance is 40 degrees BTDC on all models. Full advance arrow (FA) points to area of each advance mechanism that may be used to approximate 40 degrees BTDC for dynamic timing check.



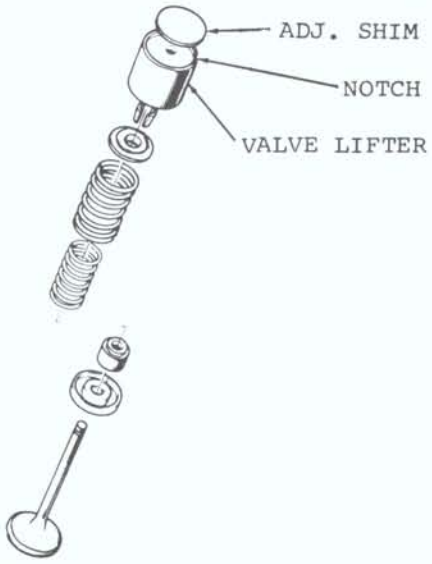


Fig. K13-8–Valve clearance is adjusted by installing shims of various thicknesses on top of valve lifters.

on late type advancer mechanism than on early type at full advance. Refer to Fig. K13-7A for approximate full advance timing position. Engines equipped with early type advance mechanism should reach full advance at approximately 3000 rpm. Engines equipped with late type advance mechanism should reach full advance at approximately 2350 rpm.

VALVE SYSTEM. Dual overhead camshafts are timed and driven by a roller drive chain running between two center cylinders to the crankshaft. Camshaft lobes bear directly on valve lifter shims to operate valves. Valve clearance is measured between valve lifter shim and camshaft with cam lobe pointing directly away from valve. Recommended clearance is 0.05-0.10mm (0.0019-0.0039 inch) for all valves with engine cold. Valve clearance is adjusted by installing different thickness shims (Fig. K13-8) on top of valve lifters. Shims are available in thicknesses ranging from 2.00-3.20mm in increments of 0.05mm (0.0019 inch). NOTE: Manufacturer recommends that shim stock not be used beneath adjustment shims to set valve clearance. A Kawasaki special tool #57001-109, may be used to hold lifter down (Fig. K13-9) for access to adjustment shim. To use special tool, turn crankshaft so that lifter to be adjusted is fully depressed by camshaft lobe. Position tool so that leg of tool is bearing against lifter, then carefully turn crankshaft until cam lobe is out of the way and tool is holding valve open. A small notch is provided in top of lifter to aid in removal of adjustment shim. If special tool is not available, record all clearances and remove camshaft for access to adjustment shims. NOTE: Refer to CYLINDER HEAD AND VALVES paragraphs of REPAIRS section for cam timing procedure if camshafts are removed. Valves may be damaged by incorrect assembly procedure.

Cam chain tension should be adjusted at regular intervals or when chain is making excessive noise. To adjust cam chain tension, loosen lock nut and set bolt (A—Fig. K13-10), then turn engine through several revolutions. Spring inside tensioner will properly set chain tension. Retighten set bolt and lock nut.

LUBRICATION. Engine and gearbox are lubricated by 4000cc of motor oil contained in crankcase. Oil should be maintained at level of top level mark near sight glass on right side of engine. Oil should be drained and renewed every 2000 miles. Oil filter, located in lower crankcase half, should be renewed at every other oil change. Recommended lubricants are SAE 10W/40, 10W/50 or 20W/50 motor oils graded for service SE or SD.

A wet sump lubrication system is used. Oil is drawn from sump, through a filter screen, by the oil pump. Pressurized oil from pump goes through renewable oil filter and to main oil gallery in top crankcase half. Passages leading from oil gallery direct pressurized oil to crankshaft main bearings, camshaft bearing holders and to transmission shaft bearings.

Engine oil pressure may be checked by removing oil gallery plug (OP—Fig. K13-7) and installing an oil pressure gage. Standard engine oil pressure is approximately 0.2 kg/cm² (2.84 psi) @ 3000 rpm with oil temperature at about 60 degrees C. (140°F.). Engine oil pump should be removed and inspected if oil pressure is too low. Coat threads of oil gallery plug with a locking compound before installing.

A small oil pump driven by transmission output shaft is used to lubricate rear drive chain. Drive chain lubricant tank is mounted on left side of motorcycle and should be serviced with SAE 90 gear oil. Pump output may be varied by moving pump adjuster arm (PA—Fig. K13-11).

CLUTCH CONTROLS. Clutch may be adjusted as follows: Remove clutch adjuster cover on left side of engine and turn cable adjusters to obtain maximum slack in control cable. Loosen lock nut (B—Fig. K13-11) and back adjusting screw (A) out until it is loose. Turn adjusting screw in until a resistance is felt then back out ½ turn from point of resistance. Tighten lock nut on adjusting screw. Use cable adjusters to obtain 2-3mm (0.08-0.12 inch) free play at gap of handlever pivot.

SUSPENSION. Each front suspension unit contains 169cc of oil. Recommended oil for front forks is SAE 10W motor oil. Quantity of oil in front forks may be checked by measuring distance from top of fork tube to oil level. Place motorcycle on a support so that front wheel is held off ground. Remove fork top bolt (13—Fig. 13-12) and insert a dowel rod or other suitable device to gage oil level. Oil in fork should be 455mm (17.91 inch) from top of fork tube. Front fork lubricant may be drained by removing drain screw (30), holding front brake on and pumping front of motorcycle up and down.

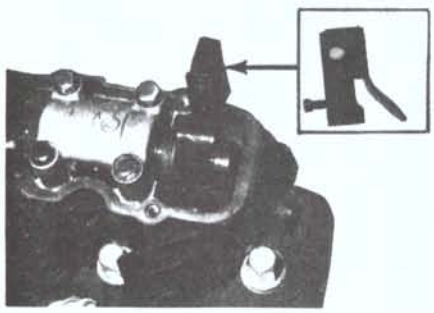


Fig. K13-9–Kawasaki special tool, #57001-109, is used to hold lifter down so that adjustment shim can be removed.

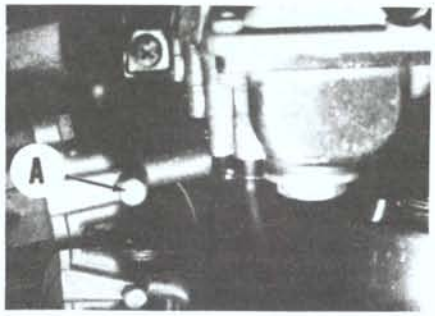


Fig. K13-10–Cam chain tension is adjusted by loosening set bolt (A), turning engine through several revolutions and retightening set bolt.

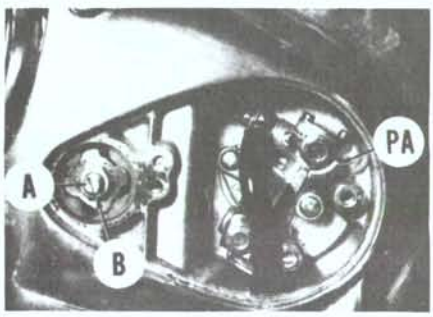


Fig. K13-11–View of clutch adjuster and rear drive chain oil pump.

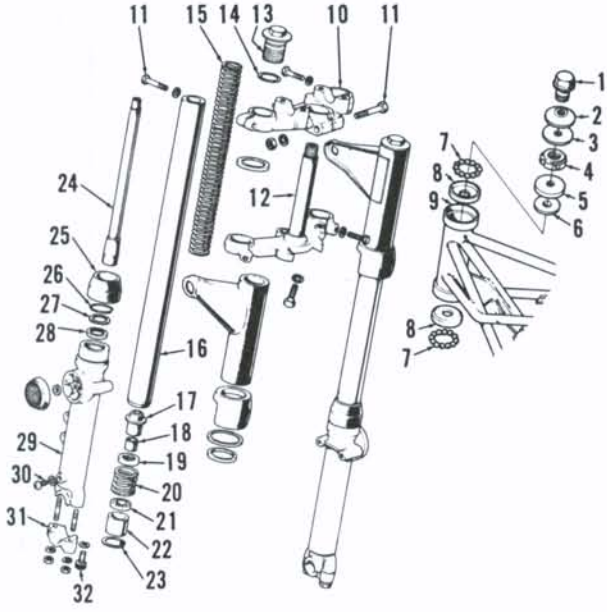


Fig. K13-12–Exploded view of steering stem and front fork assembly used.

1. Stem bolt
2. Washer
3. Wave washer
4. Stem nut
5. Cover
6. Bearing cone
7. Bearing balls (39 total)
8. Bearing cup
9. Frame head
10. Top crown
11. Pinch bolts
12. Steering stem
13. Top bolt
14. "O" ring
15. Fork spring
16. Inner fork tube
17. Spring seat
18. Spacer
19. Nut
20. Rebound spring
21. Valve
22. Piston
23. Snap ring
24. Damper rod
25. Dust cover
26. Snap ring
27. Washer
28. Oil seal
29. Outer fork tube
30. Drain screw
31. Axle cap
32. Damper holding bolt

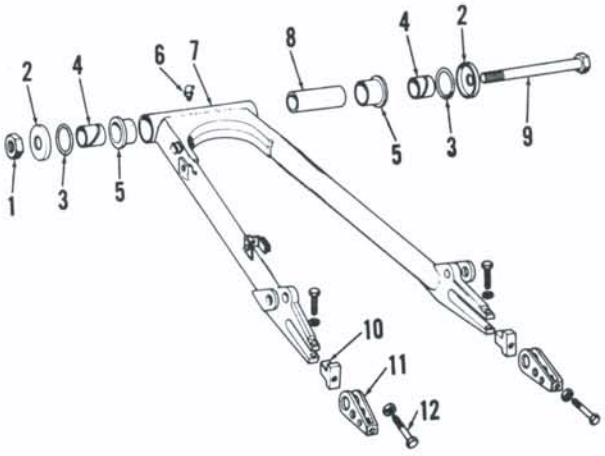


Fig. K13-13–View of rear swing arm assembly.

1. Nut
2. Cap
3. "O" ring
4. Sleeve
5. Bushing
6. Grease fitting
7. Swing arm
8. Spacer
9. Pivot bolt
10. Stop
11. Chain adjuster
12. Adjuster bolt

To disassemble front forks, remove front wheel, fender and disc brake caliper assembly. Loosen fork top bolt (13), then loosen fork tube pinch bolts (11) and pull fork assembly from triple clamps. Remove top bolt (13), fork spring (15) and pour oil out of fork tube. Use an Allen wrench to remove damper holding bolt (32) then pull inner fork tube (16) from outer fork tube (29). Damper assembly (17 through 24) may be removed from inner fork tube after removal of snap ring (23). When installing front wheel, note that axle caps (31) are not symmetrical. Install caps so that no space exists between fork tube and axle cap in front of axle and there is a small, even gap (G—Fig. K13-15) between fork tube and cap behind axle. Tighten front axle cap stud nut to 1.8-2.0 kg-m (156-174 inch-pounds) torque then tighten rear stud nut to same specification.

Steering stem may be serviced after removal of front forks. Loosen stem pinch bolt (11) and remove stem bolt (1). Remove top crown (10). Hold stem (12) up, into frame head as stem nut (4) is loosened. Be prepared to catch bearing balls (7) as stem is lowered from frame head. There should be 19 (nineteen) balls in top race and 20 (twenty) balls in lower race. When reassembling, use wheel bearing grease to lubricate and hold bearing balls in position. Tighten stem nut (4) only enough to remove play. Excessive tightening can damage bearing balls and races.

Rear swing arm bushings (5—Fig. K13-13) and sleeves (4) are renewable. When reassembling, tighten nut (1) to 12-15 kg-m (86.8-108.5 Ft.-Lbs.) torque. Rear suspension units are not repairable and should be renewed if leaking or otherwise damaged.

DISC BRAKE. Front wheel on all models is fitted with a hydraulic disc brake unit. Master cylinder assembly is handlebar mounted.

NOTE: The following precautions should be observed whenever working with the hydraulic system.

Do not allow brake fluid to contact painted parts as finish will be damaged.

Use only specified type of brake fluid and never reuse brake fluid.

Do not allow brake pads to absorb brake fluid or any other lubricant.

Do not allow motor oil or gasoline to come in contact with brake parts as rubber components of system will be damaged.

Fluid level in master cylinder reservoir should be maintained at level of line scribed inside reservoir. Only brake fluid classified DOT 3 should be used in the system.

Brake hydraulic system must be bled of air if any fitting has been loosened or if fluid level was allowed to drop below limits. Fill reservoir with prescribed fluid and slowly work brake lever until no air bubbles are evident rising in reservoir. Attach a length of clear plastic tubing to bleeder valve (B—Fig. K13-14) and place other end of tube in a waste container. Pump brake lever until it is holding pressure; then loosen bleed fitting and retighten it before releasing brake lever. Repeat this operation, being careful not to empty reservoir, until **pure** (no air) brake fluid is visible in plastic tube. Both brake cylinders must be bled if dual discs are fitted.

REPAIRS

CYLINDER HEAD AND VALVES. Cylinder head may be removed without dismounting engine from frame. Remove fuel tank, carburetor assembly and exhaust system. Remove camshaft cover and cam chain idler sprocket in center of cylinder head. Remove camshaft bearing caps (3—Fig. K13-15). NOTE: Camshaft bearing inserts (4) should be marked so they can be reinstalled in original position. Attach a length of wire to cam chain to prevent it from falling into crankcase and remove camshafts. Disconnect tachometer cable and remove tachometer

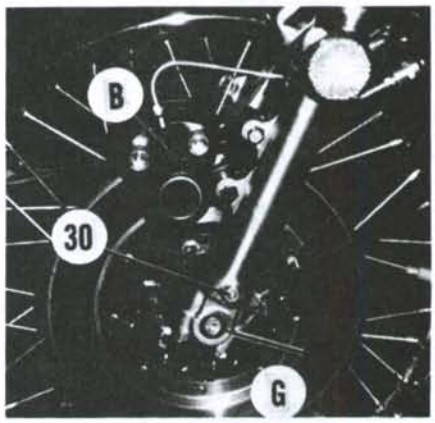


Fig. K13-14–Axle cap should be installed with gap (G) toward rear and arrow on cap toward front of motorcycle.

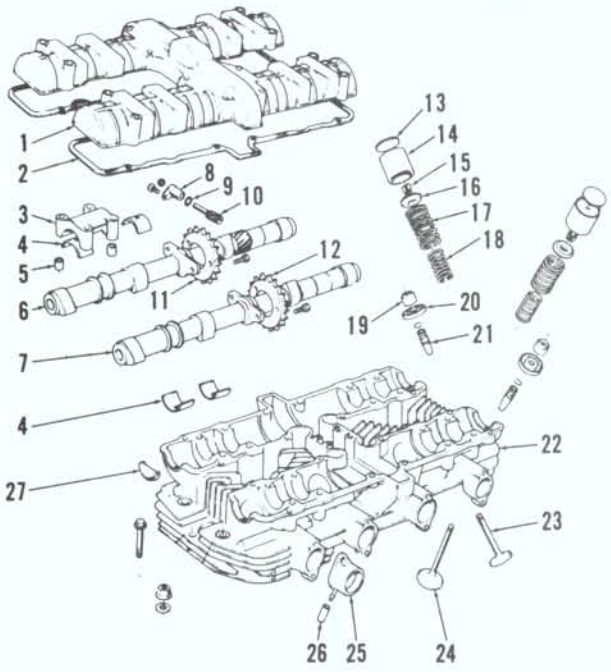


Fig. K13-15–When removing cylinder head, mark camshaft bearing inserts (4) so they can be reinstalled in their original positions.

1. Camshaft cover
2. Gasket
3. Cam bearing cap
4. Bearing inserts
5. Dowel
6. Exhaust camshaft
7. Intake camshaft
8. Retainer
9. "O" ring
10. Tachometer pinion
11. Exhaust camshaft sprocket
12. Intake camshaft sprocket
13. Adjustment shim
14. Valve lifter
15. Valve keepers
16. Spring retainer
17. Outer valve spring
18. Inner valve spring
19. Valve stem seal
20. Valve spring seat
21. Valve guide
22. Cylinder head
23. Exhaust valve
24. Intake valve
25. Intake manifold
26. Rubber plug
27. Camshaft cover plug

pinion (10) from cylinder head. Remove cylinder head. Keep track of valve lifters and valve adjustment shims so they can be reinstalled in original position. Refer to the following repair specifications:

Valve seat and face angle ..... 45°
Valve seat width .....1.0-1.5mm (0.039-0.059 inch)
Valve stem diameter—
Intake ..... 6.925-6.980 inch (0.2742-0.2748 inch)
Wear limit ..6.86mm (0.270 inch)
Exhaust ..... 6.955-6.970mm (0.2738-0.2744 inch)
Wear limit .6.85mm (0.2696 inch)
Valve guide inside diameter-
All ..... 7.000-7.015mm (0.2755-0.2761 inch)
Wear limit .7.10mm (0.2795 inch)
Valve stem to guide clearance—
Intake ..... 0.02-0.05mm (0.0008-0.0019 inch)
Wear limit .0.10mm (0.0039 inch)
Exhaust ..... 0.03-0.06mm (0.0012-0.0023 inch)
Wear limit .0.10mm (0.0039 inch)
Valve spring free length—
Inner .....36.0mm (1.417 inch)
Wear limit ..35.0mm (1.378 inch)
Outer .....39.3mm (1.547 inch)
Wear limit ..38.0mm (1.496 inch)
Valve spring deviation from perpendicular—
maximum ..... 1.9mm (0.075 inch)
Maximum allowable cylinder head warpage 0.25mm (0.0098 inch)
Camshaft lobe height—
Intake ..... 36.25-36.34mm (1.427-1.430 inch)
Wear limit .36.16mm (1.423 inch)
Exhaust ..... 35.76-35.84mm (1.407-1.411 inch)
Wear limit .35.66mm (1.404 inch)
Camshaft bearing clearance ..... 0.020-0.064mm (0.0008-0.0025 inch)
Wear limit ...0.16mm (0.0063 inch)
Camshaft journal diameter ..... 24.467-24.480mm (0.9633-0.9637 inch)
Wear limit . 24.42mm (0.9614 inch)
Maximum camshaft runout .....0.10mm (0.0039 inch)

Check camshaft runout with a dial gage positioned at sprocket mount boss and camshaft journals resting on "V" blocks. Camshaft bearing inserts should be renewed as an entire set if any are worn beyond limits. Worn valve guides are removed by driving them out from inside combustion chamber after heating cylinder head to 120-150 degrees C. (250-300 degrees F.). Install new valve guides with cylinder head at 120-150 degrees C. then allow head to cool before reaming guides for proper stem to guide clearance.

If valves have been ground or seats recut several times, it may be necessary to grind end of valve stem a small amount to make valve clearance adjustment possible. Distance from retainer groove to end of valve stem must be at least 4.1mm (0.161 inch).

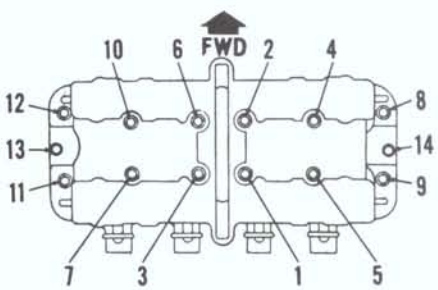


Fig. K13-16–Cylinder head tightening sequence for 903cc Kawasaki.

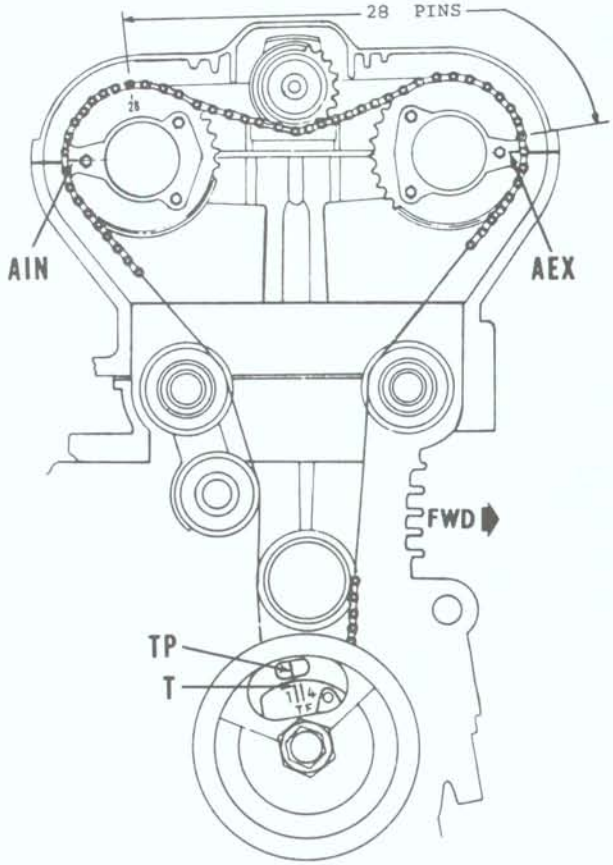


Fig. K13-17–View of camshaft timing marks. "T" mark on "1.4" side of advancer mechanism is aligned with timing pointer (TP) in engine case. Aligning marks (AIN & AEX) on camshaft sprockets are aligned with mating surface of cylinder head and camshaft cover. Camshafts are positioned in drive chain so there are twenty eight (28) pins between aligning mark on exhaust camshaft sprocket (AEX) and "28" mark on intake camshaft sprocket.

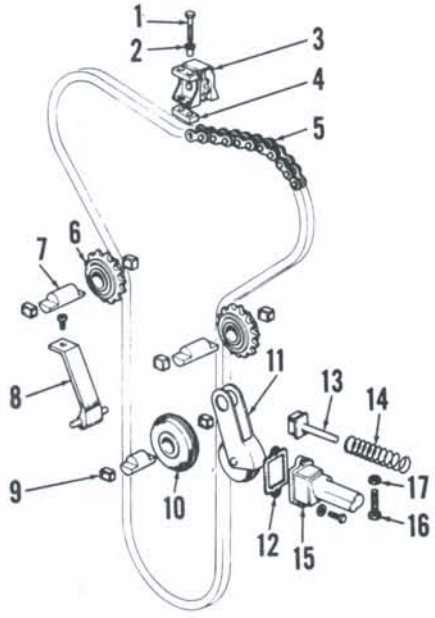


Fig. K13-18–View of cam chain tensioner and chain guide components.

1. Bolt
2. Collar
3. Idler sprocket assembly
4. Rubber cushion
5. Cam drive chain
6. Idler sprocket
7. Sprocket shaft
8. Chain guide
9. Rubber block
10. Chain roller
11. Tensioner wheel
12. Gasket
13. Pusher piece
14. Spring
15. Housing
16. Tensioner set bolt
17. Lock nut

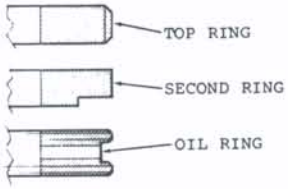


Fig. K13-19–Piston rings should be installed in correct groove and with markings toward top.

Valve clearance may be adjusted before cylinder head is installed. DO NOT install both camshafts to adjust valves. If camshafts are bolted in position, timed improperly or if one camshaft is turned and other remains still, valves may strike each other and be bent.

To reassemble, position new head gasket and install cylinder head. Use sequence shown in Fig. K13-16 to tighten cylinder head stud nuts to 3.5 kg-m (25.3 Ft.-Lbs.) torque. Tighten bolts (13 & 14) to 1.2 kg-m (8.7 Ft.-Lbs.) torque. Remove breaker point inspection cover and turn crankshaft to align "T" mark on 1.4 side of advancer mechanism with timing mark in crankcase. Pistons in #1 and #4 cylinder will be at TDC. Place exhaust camshaft in position with aligning mark (AEX—Fig. 13-17) on sprocket toward front of engine and aligned with mating surface of cylinder head and cam cover. Pull cam chain tight on front side of engine and place it on exhaust camshaft sprocket. Make sure that crankshaft is still at TDC. Position intake camshaft with aligning mark (AIN) toward rear and aligned with mating surface of cylinder head and cam cover. Count number of cam chain link pins between aligning mark (AEX) on exhaust camshaft sprocket and "28" mark on intake camshaft sprocket. There should be 28 pins between the two marks.

Check to see that all inserts are in place then install camshaft bearing caps. Note numbers and arrows on bearing caps and in cylinder head. Draw bearing cap bolts down evenly to prevent warping camshaft. Cap bolts should be tightened to 1.2 kg-m (104 In.-Lbs.) torque. Install cam chain idler sprocket and adjust cam chain tension. Lubricate camshaft and lifters then turn engine through several revolutions and recheck cam timing.

PISTONS, RINGS AND CYLINDERS. Pistons and cylinders may be serviced in frame after removal of cylinder head. Remove cam chain tensioner and idler sprockets (6—Fig. K13-18). Use a soft faced hammer to break cylinder loose from engine then lift cylinder away. Cover crankcase openings when removing piston pin retaining clips. Mark pistons according to location then use a suitable puller to remove pistons pins. Refer to the following repair specifications:

Standard cylinder bore diameter ..... 66.000-66.019mm (2.5984-2.5992 inch)
Wear limit . 66.10mm (2.6023 inch)
Standard piston skirt diameter ..... 65.93-65.95mm (2.5956-2.5964 inch)
Wear limit . 65.80mm (2.5905 inch)
Maximum cylinder bore taper or out of round 0.05mm (0.0019 inch)
Recommended piston skirt to cylinder clearance .. 0.060-0.079mm (0.0023-0.0031 inch)
Piston ring end gap .....0.2-0.4mm (0.0078-0.0157 inch)
Wear limit ....0.7mm (0.0275 inch)
Piston ring clearance in groove—
Top ring ..... 0.045-0.080mm (0.0017-0.0031 inch)
Wear limit .0.18mm (0.0070 inch)
Second & oil ring ... 0.010-0.050mm (0.004-0.0019 inch)
Wear limit .0.15mm (0.0059 inch)

Fig. K13-20–Maximum connecting rod side clearance is 0.6mm.

Measure pistons for cylinder clearance check at a point 5mm (0.19 inch) from bottom of skirt at a right angle to piston pin hole. Pistons and rings are available in oversizes. Install piston rings in correct groove (Fig. K13-19) and with markings on rings toward top. Install pistons with arrow on dome toward exhaust (front of engine). Use new piston pin retaining clips on each reassembly of engine and install clips with open end either toward top or bottom of piston. Install new cylinder base "O" rings and a new base gasket. Make sure that aligning dowels are installed on right front and left front cylinder hold down studs. Lubricate pistons and rings before installing cylinder.

CRANKSHAFT AND CONNECTING RODS. Engine must be removed from frame and disassembled to remove crankshaft assembly. Refer to CRANKCASE AND GEARBOX section for disassembly procedure. Crankshaft and connecting rods are available only as an assembly. If damaged or excessively worn, unit should be renewed. Standard side clearance between large end of connecting rod and crankshaft (Fig. K13-20) is 0.3-0.4mm (0.0118-0.0157 inch). Maximum allowable side clearance is 0.6mm (0.0236 inch). Maximum allowable radial clearance of connecting rod on crankshaft is 0.08mm (0.0031 inch). Maximum crankshaft runout, with crankshaft mounted on "V" blocks, is 0.10mm (0.0039 inch).

Center crankshaft main bearing cap must be installed with arrow on cap toward front of engine. Tighten bearing cap bolts (Fig. K13-21) using sequence shown on cap to 2.5 kg-m (18 Ft.-Lbs.) torque.

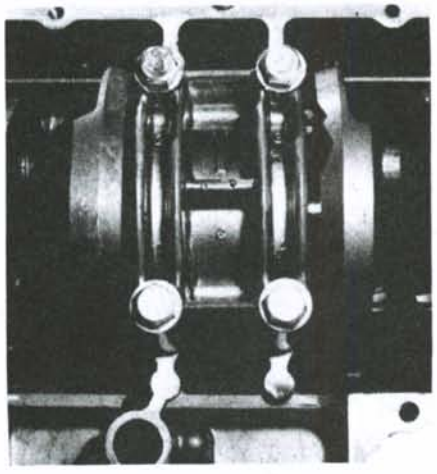


Fig. K13-21–Center main bearing cap should be installed with arrow toward front and bolts should be tightened in sequence marked on cap.

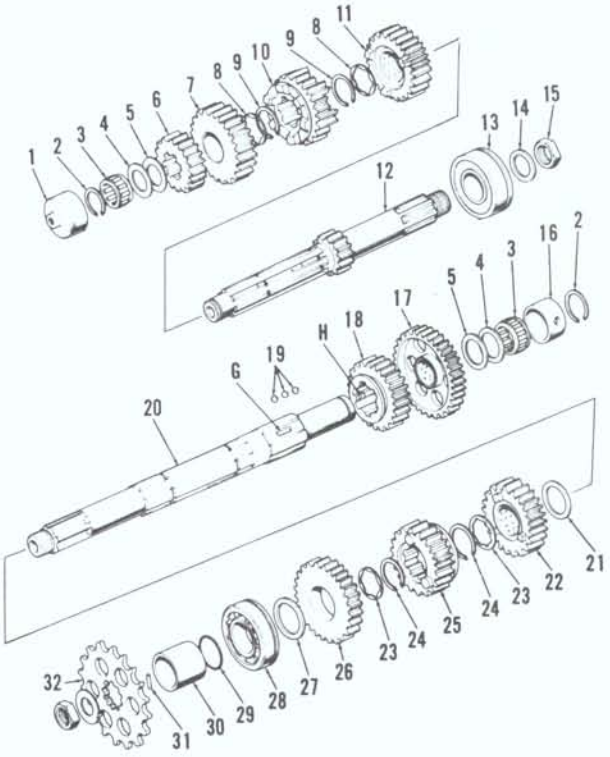


Fig. K13-23–Exploded view of transmission used in Kawasaki Z1. Second output shaft gear (26) and fifth input shaft gear (7) have renewable bushings.

G. Grooves
H. Holes
1. Bearing housing
2. Clip
3. Needle bearing
4. Thrust washer (thick)
5. Thrust washer (thin)
6. Second gear
7. Fifth gear
8. Spline washer
9. Snap ring
10. Third gear
11. Fourth gear
12. Input shaft
13. Ball bearing
14. Spring washer
15. Nut
16. Bearing housing
17. First gear
18. Fourth gear
19. Steel balls
20. Output shaft
21. Thrust washer
22. Third gear
23. Spline washer
24. Snap ring
25. Fifth gear
26. Second gear
27. Thrust washer
28. Ball bearing
29. "O" ring
30. Collar
31. Chain oil pump drive pin
32. Drive sprocket

CRANKCASE AND GEARBOX. The engine must be removed from frame and crankcase sections separated to service gearbox. Engine oil pump, electric starter and clutch may be serviced without removing engine. When removing engine, place a small floor jack beneath engine to ease removal of engine mounting hardware. Lift engine straight up approximately 25mm then move it to the right. Lower left side of engine then remove it from right side of frame.

Remove cylinder head, cylinder assembly and pistons. NOTE: Cylinders and head may be left in place if no crankshaft work is intended. Remove breaker point inspection cover, breaker point base plate, advancer mechanism and breaker point housing. Be careful not to loose advancer mechanism drive pin. Remove kickstarter lever and kickstarter return spring. Remove alternator cover, starter drive mechanism and electric starter. Remove drive sprocket cover and left side of transmission cover. Remove gear shift linkage. Remove five bolts from top of crankcase then turn engine upside down. Remove oil filter, oil pan and oil pump assembly. Remove bolts securing crankcase sections together. Lower crankcase half is threaded in three locations, two in front and one in rear of engine, so that 8mm jack screws may be used to separate the case halves.

A neutral finder mechanism is built into transmission output shaft. Three steel balls (19—Fig. K13-23) ride in holes (H) of fourth gear (18). When transmission is at rest, one or two of the steel balls will fall into grooves (G) in output shaft (20) and prevent gear movement except to neutral or first gear position. When transmission is turning, centrifugal force holds steel balls into holes (H) where they cannot affect gear movement. To remove fourth gear (18) from output shaft, insert a magnetized pin punch through a hole in shift fork groove of gear. Manipulate gear off shaft while using the magnet to hold one of the steel balls out of engagement. Reassemble in same manner. Make sure that gear splines with holes are aligned with grooves in shaft. Do not use grease to hold balls in position during assembly.

Inspect transmission gears for obvious damage such as cracked or broken teeth. Gear wear may be inspected by checking backlash. Maximum allowable backlash for first gear (Fig. K13-24) is 0.25mm (0.0098 inch). Maximum allowable backlash for all other gears is 0.30mm (0.0118 inch). Gear shift forks should be renewed if bent, discolored or excessively worn. Minimum allowable thickness of shift fork thrust pads is 5.70mm (0.224 inch). Sliding gear should be renewed if groove for shift fork is wider than 6.25mm (0.246 inch).

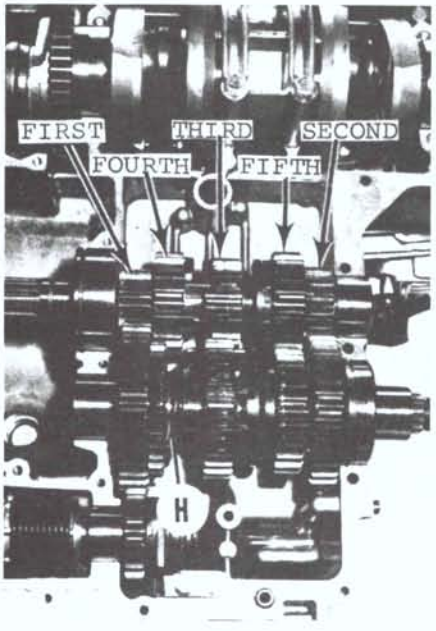


Fig. K13-24–View of assembled transmission. Clutch housing/primary gear assembly must be installed before assembling engine.

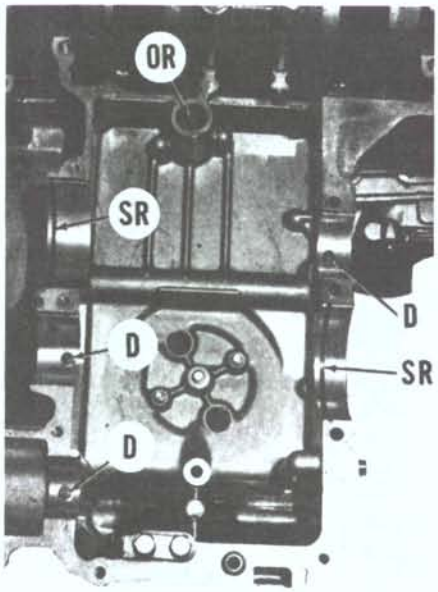


Fig. K13-25–Be sure that set rings (SR) and dowels (D) are installed. "O" ring (OR) seals passage between oil filter and main oil gallery.

Engine oil pump may be inspected by measuring clearance between pump housing and each of the pump gears. Standard clearance between housing and gears is 0.003-0.0036mm (0.0001-0.00014 inch). Maximum allowable clearance is 0.100mm (0.0039 inch). Oil pump housing and gears should be renewed as assembly if excessively worn or damaged.

When reassembling, make sure that all bearings are correctly seated over dowel pins and set rings in upper crankcase half (Fig. K13-25) and then "O" ring (OR) is installed. Apply a thin, even coating of a non-hardening type gasket sealer to mating surfaces of crankcase sections. Kickstarter ratchet (12—Fig. K13-28) should be positioned on kick shaft (5) so that marks on each piece are aligned. Clutch housing/primary gear assembly must be installed before assembling cases.

Shift forks may be installed after case halves are assembled. Shift drum pins (3 & 4—Fig. K13-26) must be installed correctly for proper operation of neutral light switch. Long shift drum pin (4) must be installed as shown in Fig. K13-27.

Clearance between starting clutch gear (13—Fig. K13-29) and left side crankshaft main bearing should be checked if any damaged components have been renewed outboard of left bearing. Proper thickness of rubber damper (14) is determined by clearance between gear (13) and left main bearing. To measure clearance, assemble components, minus rubber damper (14), on crankshaft with a piece of clay positioned between main bearing and starting clutch gear (13). Tighten rotor bolt (1), then remove assembly and measure thickness of clay. Three different thicknesses of rubber damper (14) are available; 6.3mm, 7.3mm and 8.3mm. If clearance is 5.05-6.05mm (0.1988-0.2381 inch), install damper 6.3mm thick. Install damper 7.3mm thick if clearance measures 6.06-7.05mm (0.2385-0.2775 inch). If clearance measures more than 7.06mm (0.2779 inch) install 8.3 damper. Install thrust washer (15) with beveled inside edge next to crankshaft main bearing.

CLUTCH. The multiple disc, wet type clutch may be serviced without removing engine from frame. Drain crankcase lubricant and remove clutch cover on right side of engine. Remove clutch screws (20—Fig. K13-30), springs (18) and pressure plate (17). Remove pusher piece (16) and steel ball (15). Clutch plates (11 & 12) may be removed at this point. Use an appropriate holding tool to prevent clutch hub (10) from turning while removing nut (14). Clutch housing/primary gear assembly (6) cannot be removed unless crankcase sections are separated. Standard thickness of friction discs (11) is 3.7-3.9mm (0.1456-0.1535 inch). Friction discs should be renewed if damaged or worn to a uniform thickness of less than 3.4mm (0.133 inch). Steel plates should be checked for distortion

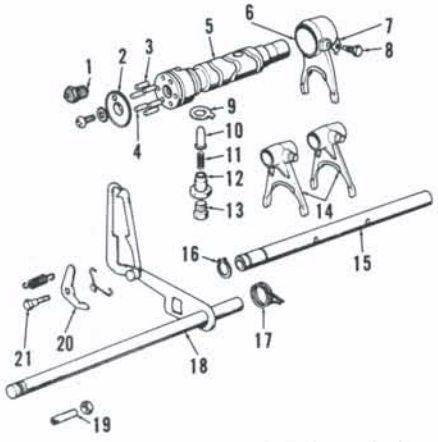


Fig. K13-26–Exploded view of shaft mechanism components.

1. Neutral light switch
2. Plate
3. Short pin (5 each)
4. Long pin (1 each)
5. Shift drum
6. Center shift fork
7. Lock washer
8. Guide bolt
9. Lock washer
10. Detent plunger
11. Detent spring
12. Drum bolt
13. Plug
14. Right & left shift forks
15. Shift fork axle
16. Snap ring
17. Return spring
18. Gear change arm
19. Stopper pin
20. Change drum stopper
21. Pivot bolt

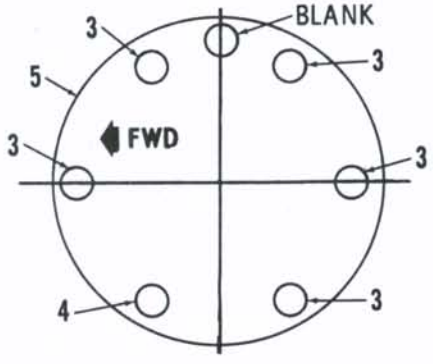
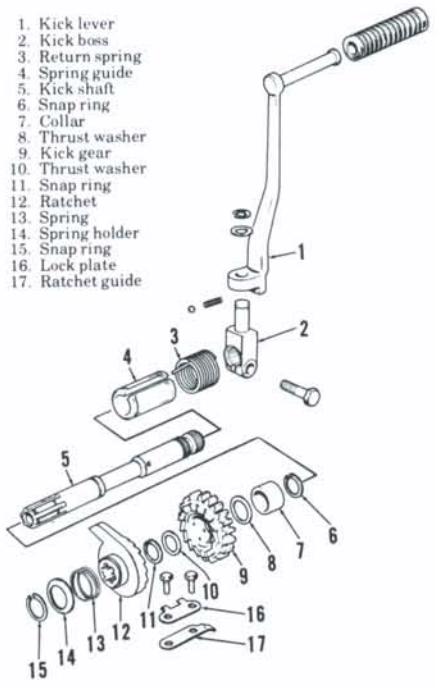
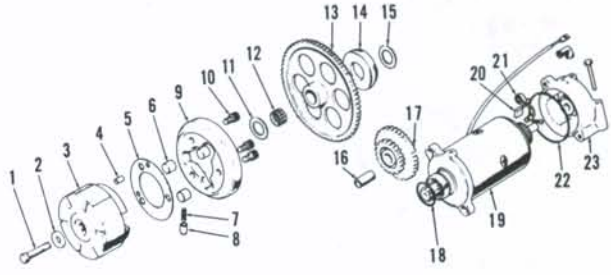


Fig. K13-27–Long shift drum pin (4) must be installed in hole shown for neutral light to work properly. Refer to Fig. K13-26 for legend.



1. Kick lever
2. Kick boss
3. Return spring
4. Spring guide
5. Kick shaft
6. Snap ring
7. Collar
8. Thrust washer
9. Kick gear
10. Thrust washer
11. Snap ring
12. Ratchet
13. Spring
14. Spring holder
15. Snap ring
16. Lock plate
17. Ratchet guide

Fig. K13-28–Exploded view of kickstarter mechanism used. Assemble ratchet (12) and kick shaft (5) with index marks aligned.



1. Rotor bolt
2. Washer
3. Alternator rotor
4. Dowel pin
5. Plate
6. Clutch roller
7. Spring
8. Plug
9. Starting clutch
10. Capscrews
11. Thrust washer
12. Needle bearing
13. Starting clutch gear
14. Rubber damper
15. Thrust washer
16. Shaft
17. Gear
18. "O" ring
19. Starting motor
20. Brush
21. Brush spring
22. "O" ring
23. End cover

Fig. K13-29–View of electric starter and drive clutch assembly.

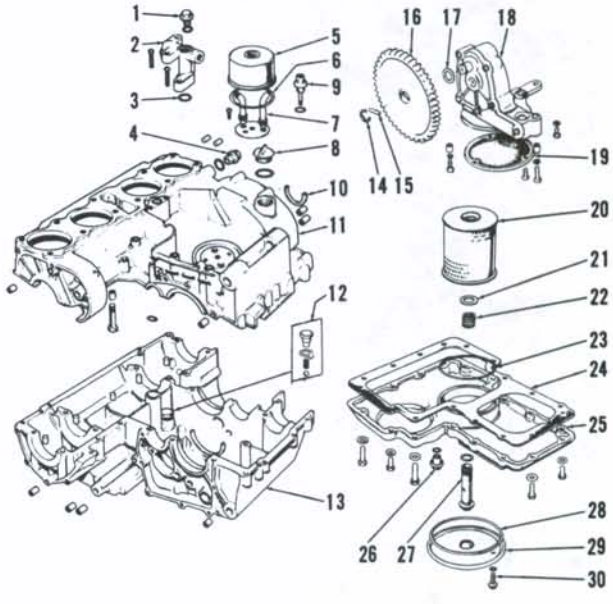


Fig. K13-30–View of crankcase, oil pump and related components.

1. Plug
2. Oil pressure switch holder
3. "O" ring
4. Oil gallery plug
5. Crankcase breather cover
6. "O" ring
7. Breather tubes
8. Fill plug
9. Breather holding bolt
10. Set ring
11. Upper crankcase half
12. Oil pressure relief valve
13. Lower crankcase half
14. "C" clip
15. Pin
16. Oil pump drive gear
17. Washer
18. Oil pump assembly
19. Screen
20. Filter element
21. Washer
22. Spring
23. "O" ring
24. Gasket
25. Oil pan
26. Pan drain plug
27. Filter holding bolt
28. "O" ring
29. Oil filter cover
30. Oil filter drain plug

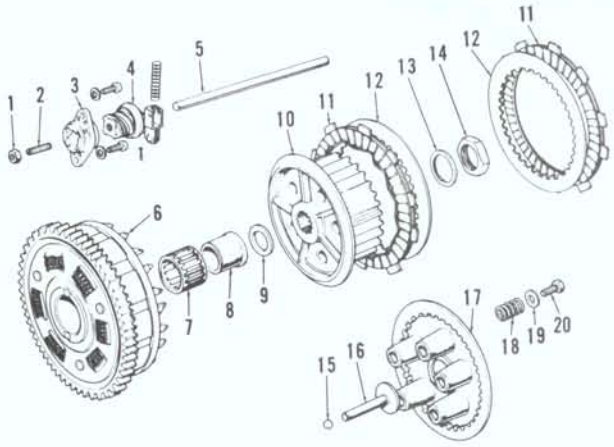


Fig. K13-31–Exploded view of clutch assembly.

1. Lock nut
2. Adjusting screw
3. Release holder
4. Release screw
5. Push rod
6. Clutch housing/primary gear
7. Needle bearing
8. Collar
9. Thrust washer
10. Clutch hub
11. Friction discs (8 each)
12. Steel plates (7 each)
13. Spring washer
14. Nut
15. Steel ball
16. Pusher piece
17. Pressure plate
18. Clutch spring
19. Washer
20. Screw

from overheating. Renew plates if warped from flat by more than 0.40mm (0.015 inch). Inspect clutch housing/primary gear assembly (6) for wear at contact points of external lugs on friction discs (11). Clearance between clutch housing and lugs on friction discs should be no more than 0.5mm (0.019 inch). Standard free length of clutch springs (18) is 33.8mm (1.330 inch). All clutch springs should be renewed if any have a free length of less than 32.3mm (1.271 inch).

Make sure that thrust washer (9) is installed and that spring washer (13) is installed with marking "OUTSIDE" showing. Install nut (14) and tighten to 12-15 kg-m (86.8-108.5 Ft.-Lbs.) torque.

DISC BRAKE. Caliper pads (3 & 11 —Fig. K13-32) may be renewed after removing front wheel assembly. Remove screw (1) and "B" pad (3). Squeeze brake lever to push "A" pad (11) out of caliper assembly. Loosen bleeder valve (10) and push piston (14) back into "A" caliper (16). A waste container should be available to catch brake fluid coming from bleeder valve as piston is pushed in. Install new "A" pad and new "B" pad. A locking compound should be used on threads of screw (1). Reinstall front wheel and bleed hydraulic system. Make sure that lugs on speedometer drive gear holder (9—Fig. K13-33) are properly meshed with front wheel hub (12), when reassembling.

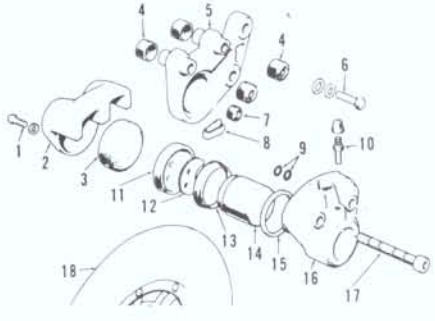


Fig. K13-32–View of front brake caliper assembly.

1. Screw
2. "B" caliper
3. "B" pad
4. Dust seal
5. Caliper holder
6. Mounting bolt
7. Bushing
8. Pad stopper
9. "O" rings
10. Bleeder valve
11. "A" pad
12. Shim
13. Dust seal
14. Piston
15. Piston seal
16. "A" caliper
17. Caliper holding bolts
18. Brake disc

NOTE: All precautions described in DISC BRAKE paragraphs of MAINTENANCE section should be observed.

To disassemble caliper unit, disconnect and cap hydraulic line to caliper. Loosen caliper bolts (17—Fig. K13-32) and remove mount bolts (6). Remove caliper bolts (17), being careful not to damage dust seals and "O" rings (19). Piston (14) may be removed by forcing compressed air into hydraulic line hole or by reattaching "A" caliper to brake line and squeezing hand lever. All parts should be thoroughly cleaned with alcohol. Standard internal diameter of "A" caliper is 38.180-38.200mm (1.5032-1.5039 inch). Caliper should be renewed if scratched excessively or worn to more than 38.215mm (1.5047 inch) internal diameter. Standard diameter of piston (14) is 38.115-38.148mm (1.5006-1.5019 inch). Piston should be renewed if pitted, scratched or worn to less than 38.105mm (1.5002 inch) in diameter. Internal parts should be coated with clean brake fluid prior to reassembly. Use heat resistant grease, recommended for use on disc brakes, on caliper bolt "O" rings. Caliper holder (5) should move freely on caliper bolts when unit is assembled. Bleed hydraulic system of air after reinstalling caliper assembly.

Maximum allowable runout of brake disc is 0.3mm (0.0118 inch). Disc should be renewed if badly scored or if worn to a uniform thickness of less than 5.5mm (0.2165 inch).

Master cylinder may be serviced as follows: Remove cylinder and drain brake fluid. Remove hand lever and

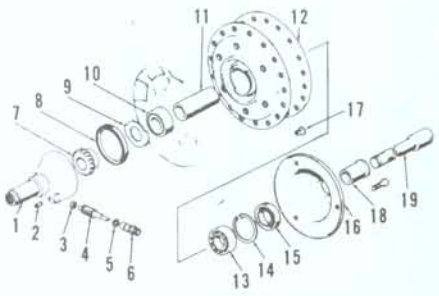


Fig. K13-33–View of front wheel hub.

1. Speedometer drive housing
2. Set screw
3. Thrust washer
4. Speedometer pinion
5. Thurst washer
6. Bushing
7. Speedometer gear
8. Gear receiver
9. Gear holder
10. Ball bearing
11. Spacer
12. Hub
13. Ball bearing
14. Snap ring
15. Seal
16. Cover
17. Cap
18. Collar
19. Axle

clip (1—Fig. K13-34). Remove dust cover (2) and snap ring (3). Stopper (4) and piston assembly (5) may now be removed from cylinder. Clean all parts with alcohol and relubricate with clean brake fluid. Standard inside diameter of cylinder is 14.000-14.043mm (0.5512-0.5529 inch). Maximum allowable inside diameter is 14.080mm (0.5543 inch). Piston assembly should be renewed if scratched, pitted or worn to less than 13.960mm (0.5496 inch) in diameter. Rubber parts should be renewed if swollen, cracked or rotted. Minimum free length of return spring (7) is 48mm (1.889 inch). All parts should be thoroughly lubricated with clean brake fluid during reassembly.

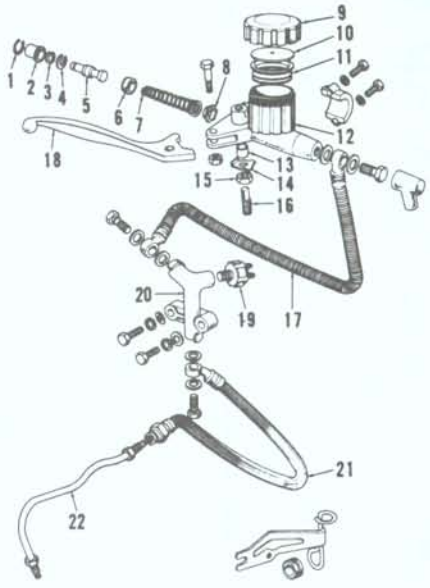


Fig. K13-34–Exploded view of master cylinder and hydraulic lines.

1. Clip
2. Dust cover
3. Snap ring
4. Stopper
5. Piston assembly
6. Primary cup
7. Spring
8. Check valve
9. Cap
10. Plate
11. Diaphragm
12. Master cylinder
13. Collar
14. Lock plate
15. Jam nut
16. Adjusting screw
17. Hose
18. Lever
19. Brake light switch
20. Three way union
21. Hose
22. Tube