# Kawasaki Triples

## Model Coverage

S1 (250)
KH250
S2 (350)
S3 (400)
KH400
H1 (500)
KH500
H2 (750)

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## General Specifications

| *Model* | *S1-B/C* | *S1-B* | *KH250* | *S2* | *S3* | *KH400* | *H1-A/D* | *H1-E/F* | *KH500* | *H2* | *H2-B/C* |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DIMENSIONS | | | | | | | | | | | |
| Dry weight (lbs) | 326.3 | 339.0 | 348.0 | 329.6 | 353.0 | 357.0 | 383.7① | 407.0 | 423 | 423.4 | 448.0 |
| Overall length (in.) | 79.1 | 79.5 | 79.7 | 79.1 | 79.7 | 79.7 | 82.5 | 82.1 | 82.1 | 82.5 | 83.1 |
| Overall width (in.) | 31.5 | 32.3 | 32.3 | 31.5 | 32.3 | 32.3 | 33.1 | 32.9 | 32.9 | 33.5 | 33.9 |
| Overall height (in.) | 43.1 | 41.0 | 43.1 | 43.1 | 44.5 | 44.5 | 42.5 | 44.9 | 44.9 | 45.1 | 46.5 |
| Wheelbase (in.) | 52.4 | 53.7 | 54.1 | 52.4 | 53.7 | 53.7 | 55.1 | 55.5 | 55.5 | 55.5 | 56.5 |
| Ground clearance (in.) | 5.9 | 6.0 | 6.1 | 6.3 | 6.0 | 5.9 | 5.3 | 5.7 | 5.7 | 6.9 | 6.3 |
| Tire size: | | | | | | | | | | | |
| Front | 3.00 x 18 | 3.00 x 18 | 3.25 x 18 | 3.00 x 18 | 3.25 x 18 | 3.25 x 18 | 3.25 x 19 | 3.25 x 19 | 3.25 x 19 | 3.25 x 19 | 3.25 x 19 |
| Rear | 3.25 x 18 | 3.25 x 18 | 3.50 x 18 | 3.50 x 18 | 3.50 x 18 | 3.50 x 18 | 4.00 x 18 | 4.00 x 18 | 4.00 x 18 | 4.00 x 18 | 4.00 x 18 |
| ENGINE | | | | | | | | | | | |
| Displacement (cc) | 249 | 249 | 249 | 346.2 | 400.4 | 400.4 | 498.0 | 498.0 | 498.0 | 748.0 | 748.0 |
| Bore x Stroke (mm) | 45 x 52.3 | 45 x 52.3 | 45 x 52.3 | 53 x 52.3 | 57 x 52.3 | 57 x 52.3 | 60 x 58.8 | 60 x 58.8 | 60 x 58.8 | 71 x 63 | 71 x 63 |
| Compression ratio (: 1) | 7.5 | 7.5 | 7.5 | 7.3 | 6.5 | 6.5 | 6.8 | 6.8 | 6.8 | 7.0 | 7.0 |
| Induction | piston-port | piston-port | piston-port | piston-port | piston-port | piston-port | piston-port | piston-port | piston-port | piston-port | piston-port |
| Lubrication | Superlube | Superlube | Superlube | Superlube | Superlube | Superlube | Injectolube | Injectolube | Injectolube | Injectolube | Injectolube |
| Carburetion (Mikuni) | VM22SC | VM22SC | VM22SC | VM24SC | VM26SC | VM26SC | VM28SC | VM28SC | VM28SC | VM30SC | VM30SC |
| TRANSMISSION | | | | | | | | | | | |
| Primary reduction | 2.22 | 2.22 | 2.22 | 2.22 | 2.22 | 2.22 | 2.41 | 2.41 | 2.41 | 1.88 | 1.88 |
| Final reduction | 3.29 | 3.43 | 3.43 | 3.07 | 2.96 | 2.73 | 3.00 | 3.00 | 3.00 | 3.13 | 3.13 |
| Overall reduction (5th) | 7.03 | 7.31 | 7.31 | 6.56 | 6.25 | 5.85 | 5.84 | 5.84 | 5.84 | 4.76 | 4.76 |
| Gearbox ratios | | | | | | | | | | | |
| 1st | 2.86 | 2.86 | 2.86 | 2.86 | 2.86 | 2.86 | 2.20 | 2.20 | 2.20 | 2.17 | 2.17 |
| 2nd | 1.79 | 1.79 | 1.79 | 1.79 | 1.79 | 1.79 | 1.40 | 1.40 | 1.40 | 1.47 | 1.47 |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 3rd | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.35 | 1.09 | 1.09 | 1.09 | 1.11 | 1.11 | | | | |
| 4th | 1.12 | 1.12 | 1.12 | 1.12 | 1.12 | 1.12 | 0.92 | 0.92 | 0.92 | 0.92 | 0.92 | | | | |
| 5th | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.96 | 0.81 | 0.81 | 0.81 | 0.81 | 0.81 | | | | |
| ELECTRICAL SYSTEM | | | | | | | | | | | | | | | |
| Ignition | battery/coil | battery/coil | battery/coil | battery/coil | battery/coil | magneto CDI | battery/coil or CDI | magneto CDI | magneto CDI | magneto CDI | magneto CDI | | | | |
| Generator | Alternator | Alternator | Alternator | Alternator | Alternator | Alternator | Alternator | Alternator | Alternator | Alternator | Alternator | | | | |
| System voltage | 12 | 12 | 12 | 12 | 12 | 12 | 12 | | | 12 | 12 | | | | |
| CHASSIS | | | | | | | | | | | | | | | |
| Frame type | Tubular, double-cradle | | | | | | | | | | | | | | |
| Steering angle (deg.) | 42 | 42 | 42 | 42 | 40 | 40 | 42② | 39 | 39 | 39 | NA | | | | |
| Caster (deg.) | 62 | 62 | 62 | 62 | 62 | 62 | 61 | 63 | 63 | 62 | 63.5 | | | | |
| Trail (in.) | 4.3 | 4.3 | 4.3 | 4.3 | 4.4 | 4.4 | 4.3 | 4.3 | 4.3 | 4.3 | 4.1 | | | | |

① Disc brake models—40.3
② Disc brake models—40
NA Not available

# Maintenance

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

## Lubrication

*ENGINE*

The crankshaft bearings, cylinders, and pistons are lubricated by the Kawasaki Superlube (250–400cc) or Injectolube (500 and 750cc) oil injection system.

The system does not require maintenance except for a periodic check on the oil pump cable adjustment provided that the oil tank is kept full of oil. Any good quality injected two-stroke oil recommended for air-cooled engines may be used in the oil tank.

NOTE: *If the tank ever runs out of oil, or if the feed line is disconnected for any reason, it will be necessary to bleed the system before operating the motorcycle. Refer to the "Lubrication System" for procedures.*

*TRANSMISSION*

The transmission and clutch are lubricated by an oil bath. The correct amount and grade of oil recommended for your model is listed in the "Maintenance Data" chart.

CAUTION: *SAE 10W30 or SAE 10W40 oil or ATF is recommended. However, this does not mean that the two can be mixed. Either one or the other should be used exclusively. If it is desired to change from one to the other the transmission must be flushed clean first.*

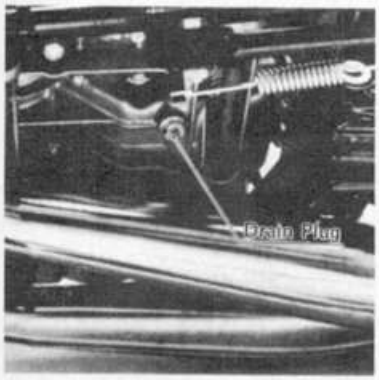
### Checking Oil

1. The machine should be on the center stand, preferably on a level surface when checking the transmission oil level.
2. The oil level should be checked with the engine warm.
3. A dipstick is provided in the rear of the right crankcase cover. To check the oil level unscrew it and wipe it off. Reinsert, screwing the dipstick cap in. The oil level should be between the maximum and minimum marks on the dipstick. If the level is too low, add oil until the level is correct. Do not overfill. Let the oil distribute itself for a minute or so, then recheck the level.

### Changing Oil

The transmission oil should be changed at least every 2,000 miles after break-in.

1. Oil should be changed when the engine is at or close to operating temperature.
2. The machine should be on the center stand and parked on a level surface.
3. Remove the dipstick.
4. Remove the drain plug and allow the oil to drain off for several moments.
5. Check the condition of the drain




Transmission drain plug location

plug gasket. Replace with a new one if damaged or cracked. Refit the drain plug and tighten firmly. Torque it to 36–52 ft lbs.

6. Fill the transmission with the correct type and quantity of oil. Capacities are given in the "Maintenance Data" chart. After filling, allow a moment or two for the oil to distribute itself, then check the level with the dipstick.

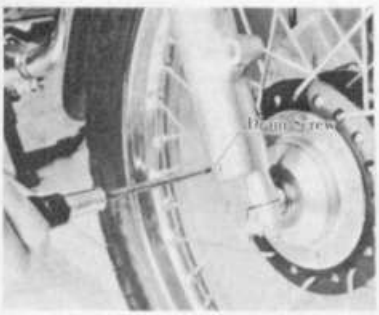
NOTE: *The use of oil additives is not recommended, since these may cause clutch slippage.*

*FRONT FORKS*

1. SAE 10W oil is recommended for the front forks. If slightly stiffer damping characteristics are desired use SAE 20W. If softer damping is needed use SAE 5W.

2. Fork oil should be changed every 4,000 miles.

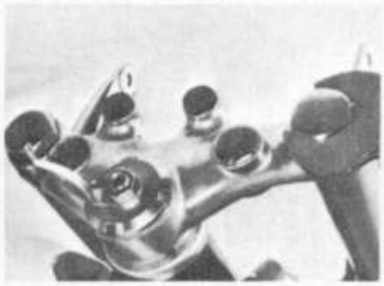
3. To drain the fork oil, remove the drain plug at the lower portion of one of the fork sliders. Allow the oil to drain into a suitable container; pump the slider up and down several times. After most of the oil is expelled, turn the forks all the way to the right to completely drain the right fork leg, or to the left for the left fork leg. Check the condition of the drain plug gasket. Replace it if necessary. Refit and tighten the drain plug.




Fork drain screw (H2 shown)

4. Repeat the procedure with the other fork leg.

5. Remove the fork filler caps from the top of each fork leg. The handlebar holders may have to be removed and the bars pulled back to allow access to the filler caps. Loosening the triple clamp pinch-bolts may make removal easier.



Removing the fork filler caps

6. Add the correct quantity and viscosity of oil to each fork leg. Capacities for each model are giving in the "Maintenance Data" chart.

*CHASSIS LUBRICATION*

1. Wheel and steering head bearings are lubricated with bearing grease. This should be accomplished every 4,000 miles. Refer to the "Chassis" section for procedures.

## Service Checks and Adjustments

*DRIVE CHAIN*

1. The chain should have about ¾ in. (20 mm) of total up-and-down free-play measured in the middle of the lower chain run.

2. *Before* checking or adjusting the chain slack, the following conditions should be met:

a. The machine should be off the center stand, and with a rider sitting on the seat;

b. The chain should be clean and well lubricated;

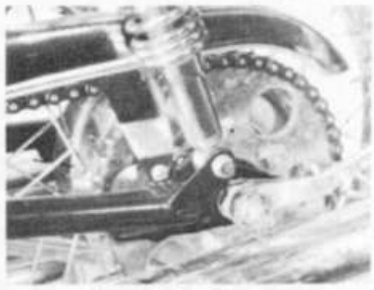
c. The chain should have been checked for any tight spots by slowly rotating the wheel and checking for variances in the chain tension at different points.

If a tight spot exists, the chain should be adjusted to the prescribed free-play at the tight spot.

3. To adjust the chain, first back off the rear brake adjuster nut if a rod-operated brake is fitted.

4. Remove the axle nut cotter pin and loosen the axle nut several turns. Loosen the sprocket hub securing nut (if fitted). Loosen the locknut on each adjuster bolt.

5. Turn each of the adjuster bolts in by equal amount until chain tension is approximately correct.



Loosening the axle nut

6. Check wheel alignment by means of the adjusting marks inscribed on both sides of the swing arm. Be sure that both adjusters are lined up with the same mark on each side. If not, turn one of the adjuster bolts in or out so that alignment is achieved.

7. Tighten the sprocket nut and the axle nut and check the chain tension. Correct it if necessary. After adjustment is correct, torque the axle nut to 42–50 ft lbs. Fit a new cotter pin. Tighten the adjuster locknuts. Readjust the rear brake.

*CLUTCH*

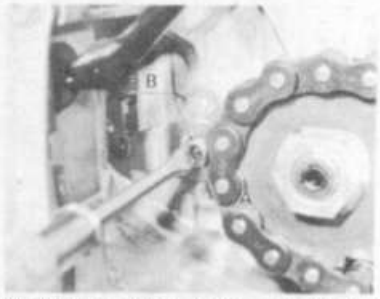
Two adjustments are made to the clutch: cable adjustment and the pushrod adjustment. Usually, the pushrod need not be adjusted unless the clutch malfunctions. Cable adjustment must always be maintained at the proper specification.

To adjust the clutch:

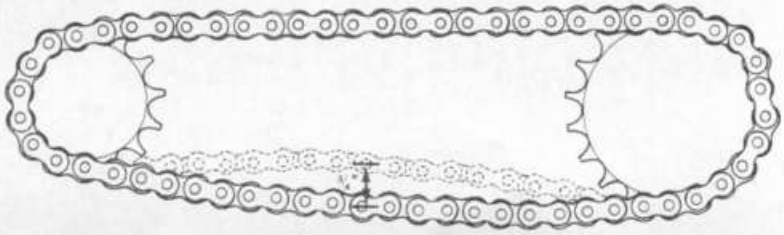
1. Loosen the clutch cable adjuster nut at the handlebar and screw in the adjuster to give a gap of 5–6 mm (0.20–0.24 in.) between the end of the adjuster and the locknut.

2. Loosen the locknut on the adjusting screw at the clutch release mechanism, and back the adjusting screw out 3 or 4 turns.

3. Turn the cable adjuster at the middle of the cable or on the engine cover in or




Adjusting the clutch: A, adjusting screw; B, locknut

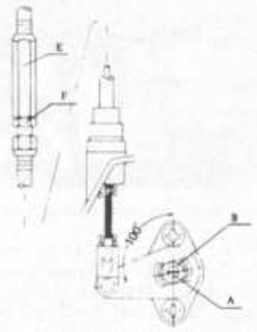


Measuring chain free-play

out until the centerline of the release lever is at a 100° angle from vertical.

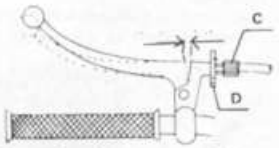
4. Screw the adjusting screw in until a resistance is felt, then tighten the locknut.

5. Using the cable adjuster on the handlebar, adjust the free-play of the cable until the hand lever can be moved 1/16–1/8 (2–3 mm) before the clutch starts to disengage.




Use the cable adjuster (E) to position clutch release lever as shown

6. The adjuster at the hand lever is used for minor adjustments and to maintain the cable free-play at the proper amount while riding.

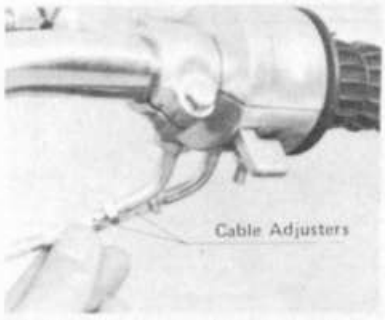



Clutch lever free-play is measured between the hand lever and the lever holder

*THROTTLE CABLES*

1. Using the adjuster at the twist-grip adjust the cable so that the twist-grip can be rotated 5°–10° before the throttle slides start to open.

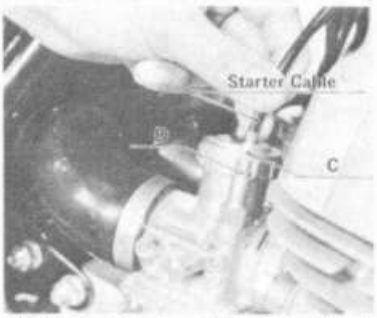
2. For other adjustments to the cables, refer to "Tune-Up."



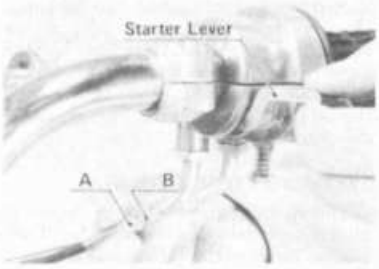

Throttle cable twist grip and starter lever adjusters

*STARTER CABLE ADJUSTMENT*

1. Hold the starter lever in the closed position, and pull up and down on the cable sheath at each carburetor while turning the adjuster in or out until you can move the sheath 1–2 mm (0.04–0.08 in.) then tighten the locknut.

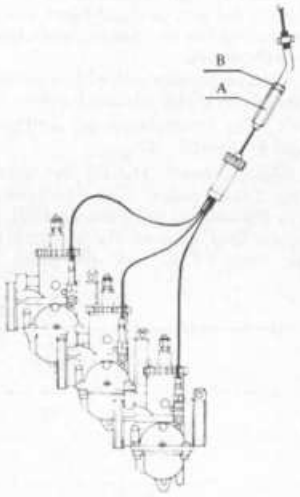



Adjusting the starter lever cable: adjuster, C; locknut, D




Starter lever handlebar adjuster

2. Using the adjuster at the twist-grip, set the starter cable free-play for 3–4 mm (0.12–0.16 in.)



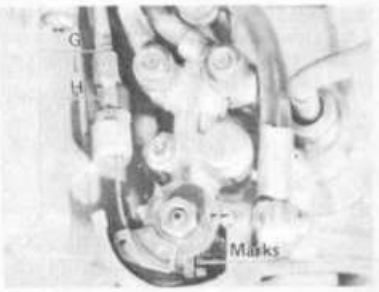

Starter lever cables and handlebar adjuster (A and B)

*OIL PUMP ADJUSTMENT*

1. The oil pump should be adjusted after the throttle cables. Refer to "Tune-Up."

2. The oil pump lever must start to move at the same time the throttle slides start to open.

3. Use the cable adjuster so that the marks on the oil pump control lever and the lever stopper are aligned at zero throttle opening.




Adjust the oil pump cable so that the marks align (H1 shown)

*BRAKES*

**Front Disc**

1. The brake lever is fitted with an adjusting screw on some models. The lever should have 5 mm (3/16 in.) of free-play, measured at the tip of the lever. To adjust, loosen the locknut and turn the adjusting screw in or out. Then tighten the locknut.




Adjusting disc brake lever free-play

2. Maintain the brake fluid level in the master cylinder at the level line inscribed on the inside of the master cylinder. Although the fluid level may drop slightly as the pads wear, this drop should not be significant.




Maintain brake fluid level at the marked line

3. Pads should be checked periodically for wear. Replace them when worn to or near the red limit line. Refer to "Chassis" for pad replacement procedures.

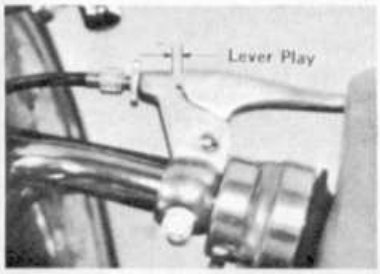
4. The brake hoses should be checked for seepage or abrasion damage often.

and should be replaced if they show wear or leakage of any kind. Make sure that the lines touch the frame or forks at the mounting points only.

5. Every 8,000 miles or 1 year, the brake system should be flushed and refilled with fresh fluid. Refer to "Chassis" for procedures.

**Front Drum**

1. Use the cable adjuster on the cable end to allow about ¼ in. (6 mm) of brake handlebar lever free-play before the shoes contact the drum. This free-play is to be measured between the lever and the lever holder.

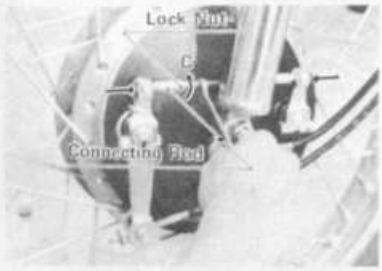



Adjust the brake cable so that the correct amount of play is available before the linings contact the drum

2. This free-play can be maintained as the shoes wear by using the adjuster at the handlebar lever.

3. The linkage of twin-leading shoe front brakes ordinarily does not need adjustment. If the backing plate has been disassembled, or adjustment is felt to be necessary because of weak brakes, proceed as follows:

a. Raise the front wheel off the ground so that the wheel can spin freely;




Adjusting the brake cam connecting rod

b. Loosen the locknut on the connecting rod and turn the connecting rod down one turn so that the rear brake lever is moved to the rear, increasing the distance between the levers. This allows the front shoe to be adjusted without interference from the rear one;

c. Turn the cable adjuster in until the front shoe just begins to contact the drum;

d. Turn the connecting rod up, decreasing the distance between the levers, until the rear shoe just begins to contact the drum; the connecting rod will no longer turn easily. At this point both shoes should begin to contact the drum at the same time. Tighten the locknut;

e. Adjust the brake cable free-play as previously described.

**Rear Brake**

Use the adjusting nut on the end of the cable or rod so that the brake pedal has 1 in. of free-play before the linings contact the drum.

NOTE: *If the angle between the brake cable or rod and the lever on the brake plate exceeds 90° when the brake is applied with all adjustment taken up, the lining thickness should be checked.*

**Brake Light Switch**

The switch should be checked for operation after the brake is adjusted. The rear brake light switch is mounted in a slotted bracket and secured by locknuts. Moving the light switch up on the bracket allows the brake light to turn on sooner. Moving it down allows it to come on later. Generally, the brake light should come on just as the linings contact the drum.

*STEERING STEM BEARINGS*

The steering stem bearings should be checked periodically and adjusted if necessary. Refer to the "Chassis."

## Fuel System

1. Fuel system maintenance involves cleaning the petcock and filter, cleaning or replacing the air cleaner, and cleaning the carburetors.

2. The carburetors should be removed, disassembled, and cleaned every 4,000 miles. The procedures are outlined in "Fuel Systems."

3. The petcock should be serviced every 2,000 miles. On H-series and newer 250–400cc, shut the fuel off, then unscrew and remove the petcock sediment bowl. Take out the fuel filter screen. On older S-series, disconnect the fuel lines at the carburetor and turn the petcock to "R" to drain the fuel tank. Unscrew the nut to remove the petcock. Clean the parts in solvent and install. Check for leaks.



Removing the petcock (standard type)

4. The air cleaner should be serviced or replaced every 2–3,000 miles, depending on conditions. If the air cleaner is the paper type, it should be kept free of water, solvents, etc.

5. To remove the air cleaner element:

250–400cc: remove the left sidecover and loosen the thumb screw on the air cleaner housing. Pull out the air cleaner housing along with the element. Remove the two screws which secure the element to the housing.

500cc: loosen the clamp screws securing the air cleaner hose to each carburetor




Removing the air cleaner (S-series)

### Maintenance Data

| Model | Fuel Tank Capacity (gal) | Oil Tank Capacity (qt) | Transmission Oil Capacity (qt) | Fork Oil① Capacity (cc/oz) | Tire Pressure (psi) Front/Rear |
|---|---|---|---|---|---|
| 250 | 3.7 | 1.6 | 1.16 | 210/7.1 | 24/31 |
| 350 | 3.7 | 1.6 | 1.16 | 210/7.1 | 24/31 |
| S3 | 3.7 | 1.6 | 1.16 | 155/5.3 | 24/31 |
| KH400 | 3.7 | 1.6 | 1.16 | 141–149/4.8–5.0 | 25/28 |
| H1/A-D | 4.0 | 2.5 | ② | ③ | 26/31 |
| H1-E/F, KH500 | 4.2 | 2.5 | 1.3 | 170/5.6 | 26/31 |
| H2 | 4.5 | 2.1 | 1.5 | 160/5.5 | 26/31 |
| H2-B/C | 4.5 | 2.1 | 1.5 | 175/5.9 | 26/31 |

① Each leg
② Front drum: 230/7.8
Front disc: 160/5.5
③ Front drum: 1.7
Front disc: 1.3

and the clamp screw at the air cleaner housing, and remove the hose assembly. Remove the left-side carburetor after loosening the clamp screw. Remove the air cleaner mounting screw and remove the housing and element together through the left-side of the frame.

750: remove the left sidecover. Remove the rubber silencer beneath the seat. Loosen the air hose clamp screw on the air cleaner housing. Remove the housing mounting screw. Remove the front mounting bracket for the left sidecover. Push the air hose out of the way and remove the air cleaner and housing complete from the left-side of the frame.

6. Inspect the condition of the air cleaner element and replace it if torn or otherwise damaged. The sponge gasket must also be in good condition. If damaged, the element must be replaced.

Wash the element in pure gasoline and blow it dry. The elements used on these motorcycles are the dry-type, and should therefore be kept free of oil, oily solvents, etc.

On the 750, clean the felt part of the air cleaner in solvent, and apply a small amount of oil to the felt portion only. Keep the oil away from the element. Glue the felt portion on securely if it is loose.

## Periodic Maintenance①

Daily (before each ride)
- Check lighting equipment and horn operation
- Check operation and adjustment of the brakes
- Tire condition
- Chain tension
- Cable adjustments
- Oil injection tank level

Weekly
- Transmission oil level
- Tire pressure (cold)
- Spoke tension
- Battery electrolyte level
- Chain condition
- Critical nuts and bolts

Monthly
- Trickle charge stored battery

Every 200 miles
- Lubricate chain

Every 2000 miles
- Change transmission oil
- Remove, clean and lubricate chain
- Lubricate control and instrument cables
- Check oil pump adjustment
- Clean fuel petcock
- Check brake fluid level (disc brake)
- Clean and gap spark plugs
- Clean points and check timing
- Clean or replace air filter
- Adjust brakes
- Decarbonize engine and exhaust system

Every 4000 miles
- Change fork oil
- Pack wheel and steering head bearings
- Check brake linings
- Check sprocket condition
- Grease speedometer drive mechanism
- Clean carburetors
- Replace spark plugs

Every 8000 miles
- Flush hydraulic disc brake system

① Based on normal usage after break-in is complete

## Recommended Lubricants

Oil Tank
- Any high quality two-stroke motorcycle oil for air-cooled engines

Transmission
- SAE 10W30, "SE"
- SAE 10W40, "SE"
- ATF
- SAE 30 (summer)
- SAE 20 (winter)

Forks
- SAE 10
- SAE 20
- SAE 5W

Drive Chain
- Any high quality chain lube specifically developed for motorcycle drive chains

Wheel and Steering Head Bearings
- Lithium or moly-based bearing grease

Cables
- Light motor oil
- Graphite-based lubricant
- Molybdenum disulphide-based lubricant

Grease Fittings
- Chassis grease

# Tune-Up

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

## Contact Breaker Points

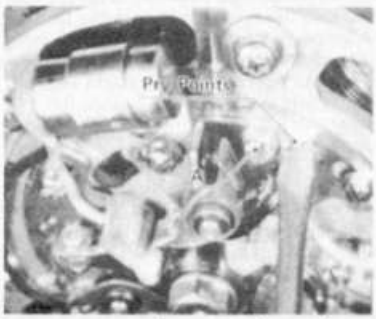
*LOCATION*

Breaker points are mounted on a plate beneath the cover on the left-side of the engine. The cover is secured by two screws.

*GAPPING*

**All Breaker Point Models**

Points should be filed (if necessary) and cleaned before gapping.




Loosen screw A and use a screwdriver at the pry point to adjust the gap

1. The breaker point set is secured to its plate by a single screw which is used to adjust the gap. This is not to be confused with the breaker point mounting screws which are used to adjust the ignition timing. A small pry slot for a thin screwdriver blade is also provided.

2. Turn the engine over slowly until one of the three sets of points is fully open. Check the gap for that set of points with the proper feeler gauge. Correct point gap for all models is 0.3–0.4 mm (0.12–0.16 in.).

3. If adjustment is needed, loosen the securing screw ("A" in the accompanying illustration), just enough to allow the gap to be varied, and increase or decrease the point gap with the aid of a small screwdriver applied to the pry slot.

4. Tighten the screw and recheck the gap. Note that the gap may change slightly when the screw is tightened.

5. Repeat the procedure with the two remaining point sets. Try to get the gaps of all three sets as close to one another as possible. That is, the feeler gauge blade should have the same amount of drag in all three point sets.

*REPLACEMENT*

**All Models**

1. Breaker points must always be replaced in sets. The contact surfaces of new points should be cleaned with a non-oily solvent to remove any preservative which may be present.

2. Loosen the breaker point terminal nut, disconnect the primary wire, remove the point securing screw, and remove the old point set.

3. Install the new set of points; connect the primary wire, and install the securing screw.

4. Repeat the procedure with the other two point sets. Set the gap on all three point sets and check the ignition timing.

*LUBRICATION*

1. A small dab of grease (high melting point is preferred) should be applied to each lubricating felt pad (there are three pads) so that the pad can distribute it onto the breaker cam. Be sure that each pad is adjusted so that it bears lightly on the breaker cam. A drop of light oil should be applied to the points pivot.

2. In any case it is imperative that care be taken to keep the lubricant away from the point contact surfaces.

## Ignition Timing

*BREAKER POINT IGNITION*

*250, 350, 400*

1. Remove the spark plugs and the breaker point cover. Clean and gap all three point sets.




Loosen screws B and move the points with a screwdriver to adjust ignition timing (S-series and KH250)

2. An inspection window is provided on the breaker point mounting plate through which can be seen the timing marks engraved on the alternator rotor. The marks are labeled "L," "R," "C," for the three cylinders. There is a corresponding mark on the breaker plate. In addition, each set of points is labeled for its cylinder.

3. Hook up the ohmmeter or light to any set of points. Turn the engine over slowly in the normal direction of rotation (counterclockwise), until the rotor timing mark for that set of points comes into view.

4. The light or meter should react indicating that the points have opened as soon as the rotor mark aligns with the mark on the breaker plate. If this happens, the ignition timing for that cylinder is correct. If the meter or light reacts before the marks align, the timing for that cylinder is too advanced; if the meter or light reacts after the rotor mark passes the breaker plate mark, the timing is too retarded.

5. To adjust the timing, loosen the two point set mounting screws ("B" in the accompanying illustration), and use a small screwdriver at the pry points indicated to move the points to the left or right as necessary so that the points will begin to open as soon as the timing marks align. Secure the mounting screws and recheck the timing.

6. Repeat the procedure with the two remaining sets of points.

It can be seen that in order to correct advanced timing, the points should be moved in the direction of crankshaft rotation. To correct retarded timing, move the points opposite the direction of crank rotation. All three cylinders must be timed correctly before the procedure can be considered complete.

NOTE: *If any of the points cannot be moved far enough to correct the timing, excessive wear of the heel is probably the cause, and all three of the point sets should be replaced.*

**H1**

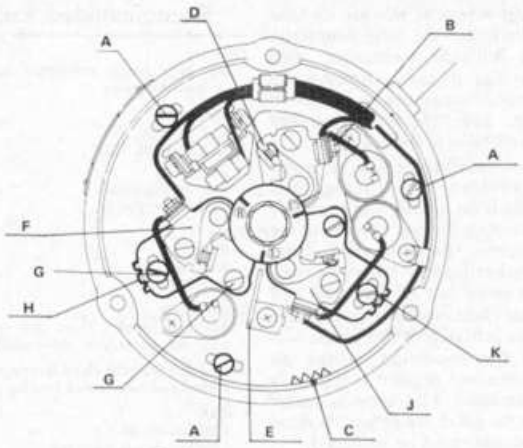
The ignition timing for the left cylinder *must* be set first. The points for the left cylinder are positioned at the top of the breaker mounting plate. It can be seen that these points are mounted directly on the breaker plate and rotating the entire plate is the only means of adjusting the timing for the left cylinder. This in turn will change the timing for the center and right cylinders.

Timing marks are provided on the rotor which can be used to set the timing under most circumstances. If the breaker plate has been removed from the engine or the timing pointer moved, timing must be reset with a dial indicator.

1. Remove the spark plugs and the breaker points cover. Clean and gap the three sets of points.

2. Attach the ohmmeter or test light to ground and to the terminal of the points for the left cylinder.

3. Slowly rotate the engine in the normal (counterclockwise) direction of rotation. At the instant that the "L" mark on the rotor aligns with the leading (left) edge of the timing pointer ("E" in the illustration), the meter or light should react indicating that the points have begun to open. If this is the case, the timing for the left cylinder is correctly adjusted. The other cylinders must still be checked, however.



Breaker point assembly (H1)

4. If the left cylinder timing was not correct, do not move the rotor; leave the marks aligned; loosen the three screws which secure the breaker plate to the engine. (These are lettered "A" in the illustration.) Using a small screwdriver at the pry point provided, rotate the breaker plate as necessary to correct the timing. Then tighten the screws.

CAUTION: *Do not move the rotor while the breaker plate screws are loose or timing may be lost.*

5. After tightening the breaker plate screws, move the pointer ("E") so that its leading edge is aligned with the "L" mark on the rotor. The position of the pointer will have changed when the breaker plate is moved.

6. Hook up the meter or test light to ground and to the terminal of the points for the right cylinder. Turn the crankshaft counterclockwise as before until the "R" mark on the rotor aligns with the leading edge of the timing pointer. The tester should indicate that the points have just begun to open when the marks align. If the points do not do so, loosen the two mounting screws for the right cylinder's points (lettered "G" in the illustration), and use a screwdriver and the pry point provided "H") to move the points in the direction necessary so that they will just begin to open when the timing marks are aligned. Tighten the mounting screws and recheck the timing.

7. Repeat the procedure (Step 6) for the remaining set of points (center cylinder).

If timing has been lost for any reason, or if a more accurate method of setting the timing is required, a dial indicator should be used.

1. After removing the spark plugs, cleaning and gapping the points, etc., fit the dial indicator into the left cylinder spark plug hole. Turn the engine over slowly until the gauge needle reaches a point and begins to reverse. This is piston top dead center. Turn the crankshaft a few degrees in either direction to confirm the finding, then place the piston at TDC and zero the gauge.

2. Turn the engine opposite to the normal direction of rotation (clockwise) until the dial gauge indicates about 4 mm (0.16 in.) before TDC. The breaker points for the left cylinder will be closed at this point.

3. Hook up the ohmmeter or test light to the points for the left cylinder. Check that they are closed. Slowly rotate the engine in the normal (counterclockwise) direction of rotation. When the dial gauge indicates that the piston is at the proper number of millimeters or inches before TDC, the points should begin to open as indicated by the reaction of the tester.

Proper timing specifications are as follows:

| | |
|---|---|
| H1 (drum front brake) | 0.136 in. (3.45 mm) (25°) BTDC |
| H1 (disc front brake) | 0.088 in. (2.23 mm) (20°) BTDC |

4. If timing is not correct, loosen the three screws which secure the breaker plate to the engine, and use a screwdriver at the pry point provided to rotate the plate so that the points for the left cylinder start to open when the piston is properly positioned at the correct distance before TDC.

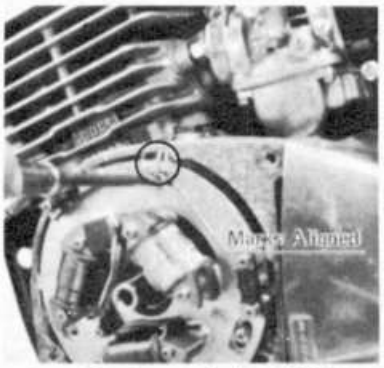
5. When correct timing of the left cylinder has been accomplished, and maintaining the left cylinder's piston at the timing specification given in Step 3, check the alignment of the rotor timing mark and the timing pointer. If the rotor mark is not aligned with the leading (left) edge of the pointer, move the *pointer* so that alignment is achieved. Do not move the rotor.

6. Timing of the right and center cylinders must still be accomplished. This can be done either with the dial gauge, or simply by aligning the rotor and pointer as outlined in the previous section.

*CDI IGNITION*

**KH400**

1. Remove the left engine cover.
2. The mark on the magneto stator




Stator and crankcase marks aligned (KH400)

plate should be aligned with the crankcase mark.

3. If the marks are not aligned, remove the magneto flywheel, loosen the three stator plate screws, and rotate the plate so that the marks are in alignement.

4. Tighten the screws securely and install the flywheel.

5. Timing is checked with a strobe light.

6. Connect the strobe light to the left cylinder.

7. Start and run the engine at 4,000 rpm. The timing mark on the flywheel should align with the crankcase mark at this engine speed.

8. If the marks do not align, rotate the stator plate as in Steps 3–4 above until alignment is achieved.

**H1**

A dial gauge should be used to set the timing.

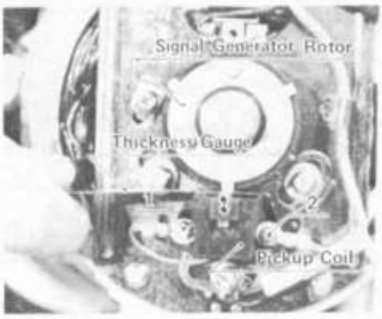
1. Remove the spark plugs, the rotor cover and the distributor cover.

2. Place the right cylinder at top dead center, and check that the timing mark on the distributor plate is aligned with "T" mark on the engine case.




Line up the timing mark on the distributor plate with the "T" mark on the engine case (H1 battery-CDI)

3. Slowly rotate the crankshaft so that one of the magnetic projections of the signal generator rotor is aligned with the pickup coil. Check the gap between the projection and the coil with a feeler gauge. Proper gap is 0.4–0.6 mm (0.016–0.024 in.). If adjustment is necessary, loosen the two coil mounting screws (1 and 2 in the illustration) and move the coil so that the gap is correct.




Checking rotor-to-pickup coil gap

4. Fit the dial gauge into the left spark plug hole and position the piston at 0.136 in. (3.45 mm) before top dead center.

5. Check that the timing marks on the rotor and the top of the pickup coil are aligned as shown in the illustration. If they are not, loosen the three pickup coil adjusting screws (3, 4, and 5 in the illustration), and move the coil so that the marks align. Secure the screws.




With the piston properly positioned, line up the timing marks after loosening screws 3, 4, and 5

6. Check that the timing pointer (No. 6 in the illustration) aligns with the mark on the rotor as shown. If it does not, loosen the pointer screw, and move it so that alignment is achieved. Note that the piston must remain at the correct distance BTDC during this operation.



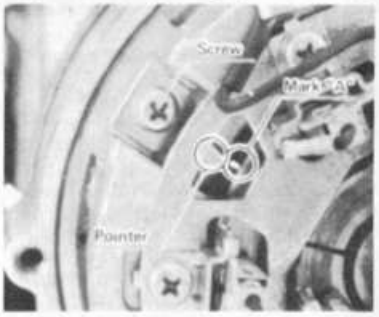

Timing pointer "6" can be used to check ignition timing after it is aligned with the rotor mark

NOTE: *Once this pointer is correctly aligned, it can be used to check the timing, or reset the timing whenever the pickup coil is removed.*

**H1-E/F, KH500**

The ignition system on the H1-E and following 500 models is somewhat different than the battery/CDI system found on early models.

1. Timing is checked with a strobe light. With the engine running at 4,000 rpm, and the strobe light connected to the left spark plug, the timing mark on the rotor ("A" in the illustration) should align with the stationary pointer.




The mark "A" should align with the pointer at 4000 rpm (H1-E, KH500)

2. If adjustment is necessary, proceed as follows:

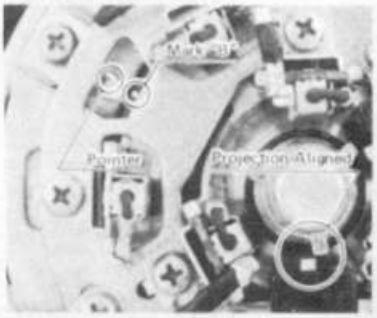
3. Remove the left cylinder's spark plug and install a dial gauge.

4. Turn the engine over using a 13 mm wrench on the Signal Generator rotor bolt until the left cylinder is at TDC. Zero the gauge.

5. Turn the engine *clockwise* until the gauge indicates that the left piston is 2.4 mm (0.1157 in.) or 23° before TDC.

6. With the piston in this position, the mark on the rotor ("A" in the illustration) should align with the stationary timing pointer. If it does not, loosen the pointer securing screw, and move the *pointer* (not the rotor) so that they align.

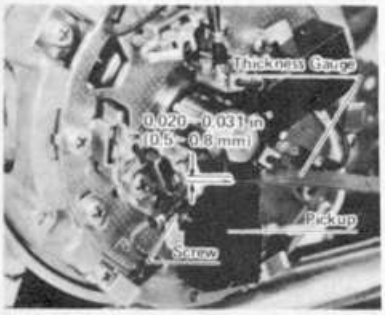
7. Tighten the pointer screw. Turn the crankshaft slowly in the normal direction of rotation (counterclockwise) until the next timing mark appears ("B" in the illustration). Align this mark with the pointer. With these marks aligned, the trailing edge of one of the rotor projections must align with the edge of the pickup coil projection.




Mark "B" aligned with the pointer as trailing edge of rotor projection aligns with edge of the pickup coil projection (H1-E, KH500)

8. If it does not, loosen the three stator mounting plate screws, and rotate the plate so that alignment is obtained. Tighten the screws securely.

9. Turn the rotor clockwise a few degrees until the rotor projection and the pickup coil projection are directly in line.




Pickup coil/rotor projection gap H1-E/F, KH500

Measure the gap between them with a feeler gauge. It should be 0.5–0.8 mm (0.020–0.031 in.). If not within specification, loosen the two pickup coil screws and move the coil up or down until the gap is correct. Tighten the screws securely.

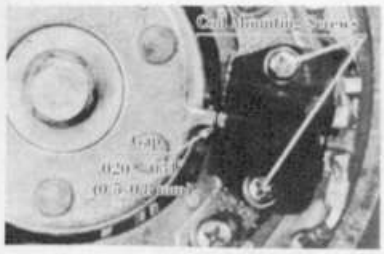
10. To check the timing, use a strobe light as outlined in Step 1. Mark "A" should align with the pointer at 4,000 rpm.

**H2**

1. Timing can be checked with a standard automotive stroboscopic timing light if one is available. Connect the light to the left cylinder plug lead. Start the engine. At 4,000 rpm, the rotor "L" mark should line up with the timing pointer. If it does not, timing must be adjusted.

2. Timing for each cylinder is adjusted independently; therefore, use the strobe light to check the right and center cylinder timing as well.

3. Turn the engine over so that the magnetic projection of the rotor is aligned with any one of the pickup coils. Check the gap between the two. Correct gap should be 0.5–0.8 mm (0.020–0.031 in.). If adjustment is necessary, loosen the two coil mounting screws and move the coil so that the gap is correct. Then secure the screws. Repeat the procedure with the other two pickup coils.

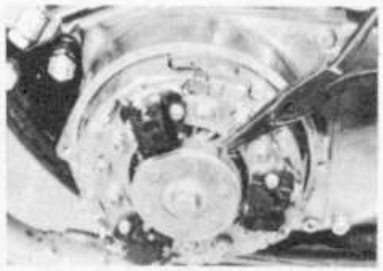


Rotor/pickup coil gap (H2)

CAUTION: *The coils must be moved by hand only. Do not pry the coil toward or away from the rotor, as this risks breaking the coil housing.*

4. Insert a dial gauge into the left cylinder. Set the piston to 3.13 mm (0.123 in.) before top dead center.

5. Check that the timing pointer is aligned with the "L" mark on the rotor. If it is not, bend the pointer so that alignment is achieved.



Aligning the timing pointer (H2)

6. Turn the rotor slightly so that the "S" mark for the left cylinder aligns with the timing pointer. When this is done, note that the trailing edge of the rotor's magnetic projection should be aligned with the mark on the pickup coil for the left cylinder. If these marks are not aligned, loosen the two pickup coil mounting plate screws, and move the coil in the direction necessary to align the marks. When the rotor "S" mark is aligned with the timing pointer and the trailing edge of the magnetic projection is aligned with the mark on the pickup coil, the timing is correct for the left cylinder.



With the "S" mark aligned, the trailing edge of the rotor projection must align with the pickup coil mark. If adjustment is necessary, loosen the mounting screws and move the coil (H2)

7. Timing for the remaining two cylinders must be checked as well. Since the timing pointer was set correctly in Step 5, it is only necessary to align the "S" mark for the right and center cylinders with the timing pointer and check the alignment of the trailing edge of the rotor projection and the timing mark atop each pickup coil. If adjustment is necessary, loosen the pickup coil mounting plate screws and move the coil as necessary to effect timing.

8. After checking timing on all three cylinders, check dynamic timing with a strobe light.

## Carburetors

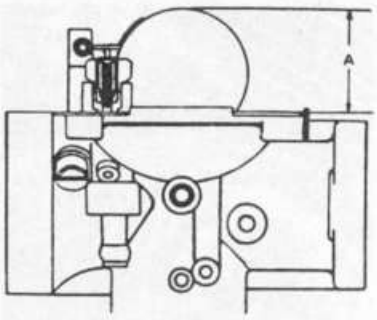
*ADJUSTING FLOAT LEVEL*

**Early Models**

1. Remove the carburetors.

2. Turn the carburetor upside down, and remove the four float bowl screws carefully lifting off the float bowl.

3. Remove the float bowl gasket.




Float level "A" is the distance from the float bowl gasket surface (gasket removed) to the top of the float

4. Float level can be measured with a steel rule or a vernier caliper. Float level is defined as the distance from the float bowl gasket surface (gasket removed) to the top of the float, when the tang of the float arm is just touching the float needle.

NOTE: *Lower the float down until the tang just contacts the float needle. Hold the float in this position, then measure the float level.*

5. Compare the value obtained with the correct specification for your machine. If the float level is too high or low, pull out the pin which holds the float in place, and bend the tang very slightly to correct the adjustment.

NOTE: *If float level is too high, bend the tang away from the carburetor body. If too low, bend it toward the carburetor body.*

6. Refit the float and recheck the adjustment.

CAUTION: *Bend only the float tang to make an adjustment. Do not bend the float arms. The floats must be level. If the floats show different heights, the float assembly should be replaced. This indicates that the float assembly has been mishandled. It is very important that all three carburetors have the same float level.*

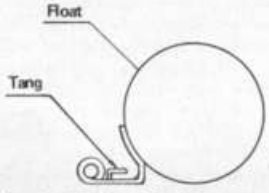
7. Float level will not be correct if the needle is worn or if there is foreign matter on the needle seat.

**Late Models**

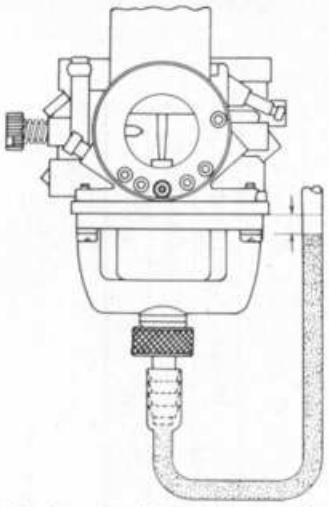
The following procedure may be used on later model machines provided that the special gauge is available. If it is not, check level as outlined for early models.

1. Remove the carburetor from the manifold with the feed line connected, but the fuel off.

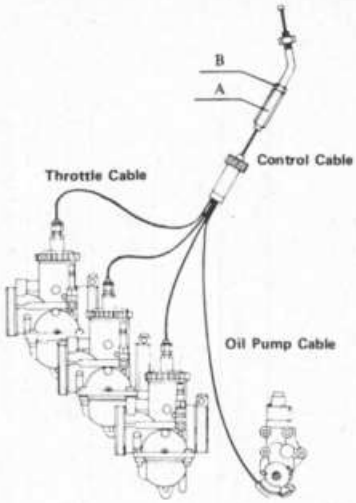
2. Remove the float bowl and fit the special gauge (see illustration) in its place.




To adjust float/fuel level, bend the tang only



Fuel level is measured from the bottom of the carburetor body if the bowl fitting is available




Throttle cable linkage

3. Keep the carburetor vertical. Hold the plastic line against the body and turn on the fuel.

4. The gas in the line should come up to a point 2–4 mm (0.08–0.16 in.) below the float bowl mating surface on 500 and 750s. Proper level for 250 to 400 machines is 4–6 mm (0.16–0.24 in.).

*CARBURETOR SYNCHRONIZATION*

Carburetor synchronization includes adjustments to the throttle cables, the idle speed, and the idle mixture. Cable adjustments are necessary to ensure that all three throttle slides move together.

Before attempting adjustment, the following conditions should be met:

a. The tank should have a good supply of gasoline;

b. The carburetors must be vertically aligned, not tilted to one side or the other;

c. Carburetor clamp screws should be tight;

d. The engine should be at normal operating temperature.

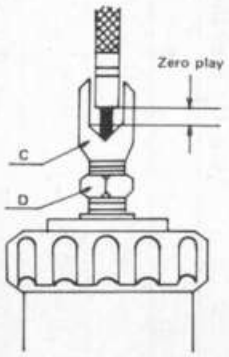
A cable adjuster is fitted to the top of each carburetor and another at the twist-grip. One throttle cable runs from the twist-grip to a junction box. There, it is connected to the oil pump cable and three throttle cables which run to the carburetors. Therefore, each cable must be adjusted.

When reading the following, note that some carburetors have the throttle stop rod (idle adjustment) screw located on the carburetor cap, while on others it is a wheel on the side of the body.

1. Loosen the locknut on the twist-grip throttle cable adjuster, and turn the adjuster in to provide a good amount of free-play in the cable.

2. Turn the throttle stop screw of each carburetor *in* (if rod-type), or *out* (if wheel-type) until all three throttle slides are fully closed.

3. Using the cable adjuster atop each carburetor, adjust for zero play in each of the carburetor cables. This is done by loosening the adjuster locknut, lifting the cable out of the adjuster as far as possible without lifting the slide, and turning the adjuster out until it meets the cable sheath. Check that it is not possible to lift the cable out of the adjuster without lifting the slide as well. But take care that the cable adjuster is not turned out so far as to partially lift the slide. The slide must remain in the fully closed position. Be sure to tighten the adjuster locknut.




Use the adjuster "C" to effect zero play between the adjuster and the cable sheath

4. Turn the pilot air screw on each carburetor in until lightly seated, then back each one out the prescribed number of turns as indicated for your model in the "Tune-Up Specifications" chart.




Adjusting the pilot air screw (KH400 shown)

5. Start the engine, running it for a minute or so. Then turn the throttle stop screw on each carburetor in or out in small, equal increments until the lowest smooth idle speed is obtained. It is critical that the throttle stop screws be turned the same amount for each of the three carburetors.




Throttle stop screw (S2 shown)



Throttle stop screw (S1 shown)

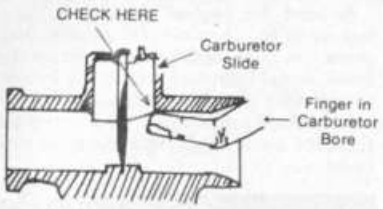
6. Place your hands over the ends of each muffler and check for equal pressure. If the pressure here is not equal for all three cylinders, either one cylinder is leading the others (idle speed too high), or is dragging (idle speed too low). Make fine adjustments to that cylinder by adjusting the pilot air screw or the throttle stop screw. It should not be necessary to turn either adjustment screw more than a small amount to equalize the backpressure. If it is, there has either been a mistake in settings, or there is a mechanical defect in the fuel system or engine, or ignition system.

7. After synchronization is complete, turn each of the throttle stop screws in or out in small, equal increments, until the recommended idle speed is reached.

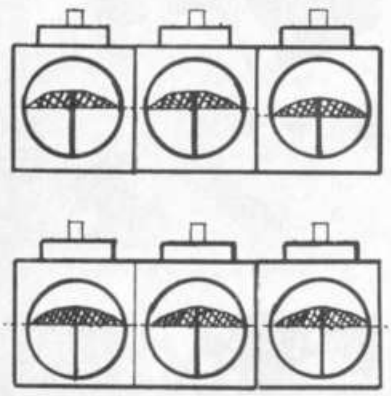
8. Turn the throttle twist-grip adjuster so that the twist-grip has 5–10° of free rotational movement before the throttle slides begin to lift.

9. Check the oil pump cable adjustment. Refer to "Maintenance."

A further check of slide synchronization can be accomplished after removing the air cleaner hoses from the carburetors. Turn the twist-grip slowly while observing the movement of the throttle slides. All three should begin to move at the same time. Turn the twist-grip until the cutouts in the slides just clear the upper portion of the carburetor bore. Slide a finger in along the upper surface of the bore to ensure that each cutout is just even with the top surface of the bore. All three slides must be in the




Checking throttle slide synchronization



Slide heights must be even as shown in the lower drawing

same position. If any one is too high or too low, use the cable adjusters atop each carburetor to effect adjustment. Allow the slides to close, and recheck cable adjustment.

NOTE: *After setting cable adjustments, turn the front forks slowly lock-to-lock with the engine idling. Any variation in idle speed as this is done would indicate that the throttle cable(s) are too tightly adjusted or are binding somewhere along the routing.*

## Tune-Up Specifications

| | S1 | S1-B, C; KH250 | S2, S3 | KH100 | III (Breaker Point Ignition) | H1 (CDI) | H1-E/F; KH500 | H2 |
|---|---|---|---|---|---|---|---|---|
| Standard spark plug (NGK) | B-9HCS | B-9HCS | B-9HCS | B-8HS | B-9HCS | BUHX | B-9HS-10 | B-9HS-10 |
| Spark plug installation torque (ft lbs) | 18–22 | 18–22 | 18–22 | 18–22 | 18–22 | 18–22 | 18–22 | 18–22 |
| Spark plug gap (in./mm) | 0.024–0.028/0.6–0.7 | 0.024–0.028/0.6–0.7 | 0.024–0.028/0.6–0.7 | 0.035–0.039/0.9–1.0 | 0.016–0.020/0.4–0.5 | — | 0.035–0.039/0.9–1.0 | 0.035–0.039/0.9–1.0 |
| Ignition timing (in./mm BTDC) | 0.102/2.60 (23°) | 0.102/2.60 (23°) | 0.102/2.60 (23°) | 0.102/2.60 (23°) | ② | 0.136/3.45 (25°) | 0.116/2.94 (23°) | 0.123/3.13 (23°) |
| Point gap (in./mm) | 0.012–0.016/0.3–0.4 | 0.012–0.016/0.3–0.4 | 0.012–0.016/0.3–0.4 | — | 0.012–0.016/0.3–0.4 | — | — | — |
| Carburetor pilot air screw (turns out) | 1½ | 1¼ | 1½ | 1¼ | 1½ | ③ | 1¼ | ④ |
| Idle speed (rpm) | 1300–1500 | 1300–1500 | 1300–1500 | 1200–1300 | 1150–1250 | 1150–1250 | 1150–1250 | 1150–1250 |
| Float level (in./mm) | 0.99/25.0 | 1.00/25.5 | 1.00/25.5 | ① | 0.94/24.0⑤ | 0.94/24.0⑤ | 0.94/24.0⑥ | 0.94/24.0⑥ |
| Compression (psi) ⑦ | 142 | 142 | 150 | 150 | 142 | 142 | 142 | 142 |

① 4–6 mm (0.16–0.24 in.) below edge of carburetor body
② Drum front brake: 0.136/3.45 (25°)
Disc front brake: 0.088/2.23 (20°)
③ Early CDI: 1¾
H1-B: 1½
H1-C, H1-D: 1¼
④ H2, H2-A: 1½
H2-B/C: 1⅝
⑤ 2–4 mm (0.08–0.16 in.) below edge of carburetor body
⑥ If variance is 45 psi or more overall or more than 15 psi between cylinders, a top end overhaul is needed.

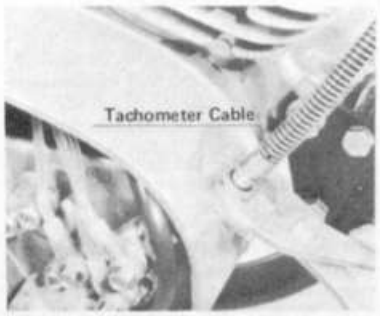
# Engine and Transmission

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

*ENGINE REMOVAL AND INSTALLATION*

Clean the engine thoroughly before removal to take away as much grease and road grime as possible. Be especially attentive to the cylinder base and the crankcase mating areas.

1. Warm the engine and drain off the transmission oil. Replace the drain plug hand-tight.
2. Remove the spark plugs.
3. Turn the fuel petcock to the "S" position (standard type petcock), disconnect the fuel lines from the carburetors and unbolt and remove the fuel tank.
4. Remove the complete exhaust system from the motorcycle.
5. Remove the three phillips head mounting screws from the oil pump cover and lift the cover up (500, 750) or remove it (250–400).
6. Unscrew the tachometer cable fitting and disconnect the cable from the engine.



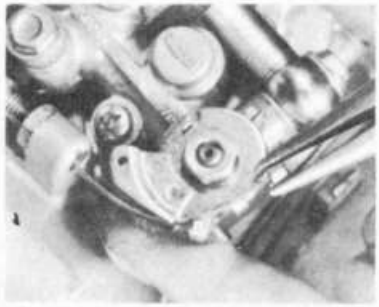

Disconnecting the tach cable (S-series)

7. Remove the distributor cap (early H1 battery-CDI only).




Removing the distributor cap (H1 battery-CDI)

8. Remove the air cleaner connecting tubes.
9. Remove the carburetors after loosening the clamps which secure them to the intake manifold. Tie them out of the way with the cables attached.
10. Remove the shift lever pinch-bolt and remove the shift lever and the shift lever pivot bolt.



Disconnecting the oil pump cable

11. Disconnect the oil pump control cable from the oil pump control lever and cable holder.
12. Disconnect the oil tank delivery line at the pump. Plug the end of the line to prevent the oil tank from draining.

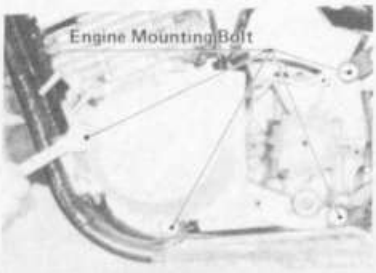


Plugging the oil delivery line

13. Remove the four phillips head screws from the countershaft sprocket cover and remove the cover.
14. Remove the masterlink (if fitted) from the drive chain. If no masterlink is fitted then loosen the rear axle nut and sprocket nut, loosen the chain adjusters and move the wheel forward and slip the chain off the countershaft sprocket.

NOTE: *If the sprocket is to be removed later, loosen the sprocket nut before disengaging the chain.*

15. Slacken the clutch cable; disconnect the cable from the clutch release mechanism after straightening the lever tongue, then disconnect the cable from the engine cover.
16. Disconnect the alternator leads from the main harness at the connectors under the seat.




Engine mounting bolts

17. Remove the engine mounting bolts and remove the engine from the frame.
18. Installation is basically the reverse of the removal procedure, but the following points should be noted:
19. Engine mounting bolts should be properly torqued. Refer to the "General Torque Specifications" chart.
20. Coat the threads of the engine case screws with anti-seize compound or a general purpose lubricant to prevent them from seizing in the engine cases. Install them with an impact driver.
21. Replace any worn or damaged exhaust pipe gaskets.
22. Make sure that all fuel and oil lines are properly seated and secured with circlips.
23. After refilling the transmission and bleeding the oil pump, check all points of adjustment: cables, chain, rear brake, ignition timing, carburetor synchronization, oil pump cable adjustment, etc.
24. Install the drive chain masterlink spring clip (if fitted) with the closed end facing the direction of rotation.
25. After starting the engine, check around the carburetor and air cleaner for air leaks.

## Top End

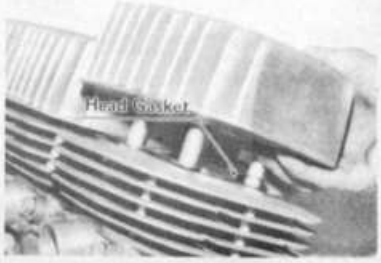
The components in the top end are the cylinder heads, cylinders, pistons, piston rings, wrist pins, and the connecting rod small end bearings. All of these can be removed for inspection and service with the engine in the frame. No special tools are needed to remove these components.

*CYLINDER HEAD, CYLINDER, AND PISTON*

**Removal**

Clean the engine thoroughly before beginning.

1. Remove the fuel tank and exhaust header pipes.
2. Loosen the carburetor connecting bands, and remove the carburetors from the intake manifolds.
3. Disconnect the spark plug leads and remove the spark plugs. Disconnect the oil lines at the cylinder on models so equipped.
4. Loosen the four cylinder head nuts from each cylinder ¼ turn at a time in an "X" pattern. When all of the nuts are



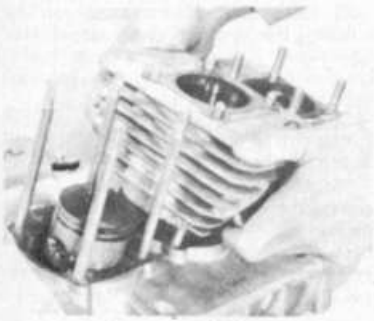

Removing the cylinder head

loose, remove them and their washers from the studs. Carefully lift off the cylinder head, and remove the head gasket beneath it as well.

NOTE: *If the cylinder head will not come off the cylinder, tap it at the bottom with a soft-faced mallet until it is free. Take care not to break the cooling fins.*

To remove the cylinder, place one of the outside pistons at top dead center.

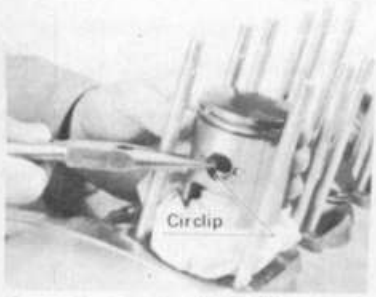
5. Lift that cylinder up and off the studs. When the cylinder spigot clears the crankcases, insert a clean, lint-free rag between the cylinder and crankcases. This will catch any piece of broken ring which may drop out when the piston comes out of the cylinder bore. Continue lifting up the cylinder until the piston clears the bore, then place it in a safe place with the lower end up to await service.



Removing a cylinder

NOTE: *Pistons must be reinstalled into their proper cylinder; therefore, mark the position of each piston before removal.*

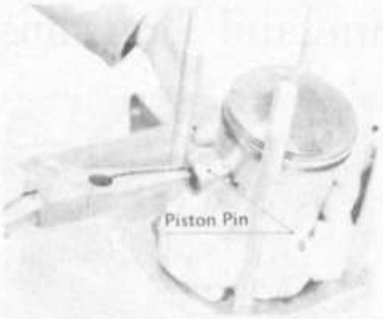
6. Remove the wrist pin circlips with needlenose pliers. The rag should remain in place while doing this to prevent one of the circlips from falling into the crankcase.




Removing a wrist pin circlip

IMPORTANT: *New circlips must be used on reassembly.*

Grasp the piston with one hand, and push out the wrist pin with a suitable drift. If the pin will not come out, the piston crown may be heated, evenly and gently, with a propane torch. If the pin still resists, it is advisable to use a special tool to remove it. This consists of a steel band or bands which fits around the piston while an attached screw device is used to push out the pin.




Removing the wrist pin

7. When the wrist pin is about ¾ in. out of the piston, grasp the exposed end with needlenose pliers, and pull it out until it is clear of the connecting rod. Remove the piston and small end needle bearing from the connecting rod.

CAUTION: *Never strike the wrist pin or attempt to use force to drive it out. The connecting rod may be bent in the attempt.*

*CYLINDER AND PISTON*

**Inspection**

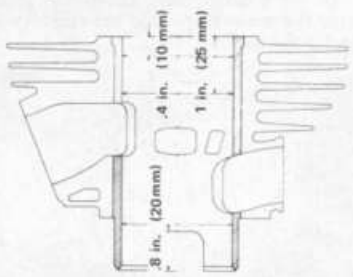
1. Inspect the surface of the cylinder walls for scoring or other damage. It is recommended that the cylinder be lightly honed.

2. After honing, inspect the cylinder walls again. If scores or scratches deeper than 0.001–0.002 in. (0.025–0.050 mm) remain in the walls, the cylinder should be rebored and the next oversize piston fitted.

3. Make a visual inspection of the piston. It should be free of scoring or signs of extreme wear. If any damage has occurred, it may be possible to save the piston by polishing the damaged area with an oilstone, or with #400 grit sandpaper or crocus cloth. However, if score marks are deeper than 0.002–0.003 in. (0.050–0.075 mm), or if the scored area is wider than 0.5 in., it is recommended that the piston be replaced.

If the piston is sanded, do so to yield a cross-hatch pattern.

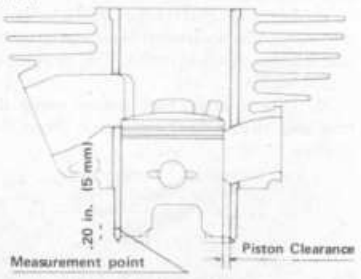
4. Check that the piston ring locating pins are not excessively worn. If they are, the piston should be replaced. Check the fit of the wrist pin in the piston; if the wrist pin is a very loose fit, the piston and wrist pin should be replaced.




Cylinder bore measurement points

5. Measure the cylinder bore diameter in three locations, as shown, in directions both parallel and perpendicular to the crankshaft (six measurements). If any of the measurements are greater than the service limit given at the end of this section or if any two measurements vary by more than 0.05 mm (0.002 in.), the cylinder should either be bored to an oversize or replaced. This checks cylinder wear, taper, and out-of-round. Oversized pistons are available in two sizes: 0.5 mm and 1.0 mm.

6. Measure the piston diameter at a point 5 mm (0.2 in.) from the bottom of the skirt and perpendicular to the wrist pin. Then measure the cylinder diameter at a point 5 mm (0.2 in.) up from the bottom of the cylinder also perpendicular to the wrist pin. The difference between the two measurements is the piston-to-cylinder clearance. If the clearance is greater than the service limit given at the end of the section, a new piston should be fitted. If this does not bring the clearance into specification, the cylinder will have to be bored and an oversize piston fitted.




Piston-to-cylinder clearance

7. After boring the cylinder, or whenever the rings are replaced, the cylinder should be honed so that a cross-hatched finish is produced. Also, it is important that the edges of the ports be bevelled slightly. This can be done with some emery cloth.

8. Be sure that the piston rings are free in the grooves, and that the grooves have not been closed up by having metal pushed into them as might occur if the piston has seized. The ring grooves should be cleaned of any carbon build-up after the rings have been removed.

9. With the rings installed in their grooves, measure the piston ring groove side clearance with a feeler gauge. If the clearance is greater than the service limit given at the end of this section, replace the rings as a set. If fitting new rings does not bring the side clearance into the proper tolerance, replace the piston as well.

If the side clearance is not sufficient, it is probable that the piston has suffered seizure damage (metal being pushed into the ring grooves). In this case, the piston must be replaced.

10. Remove the rings from the piston by carefully spreading the end-gap with your thumbs and moving the part of the ring opposite the end-gap off the piston. Place each ring on a flat surface such as a piece of plate glass to check for warpage. If either ring is warped or twisted, replace the rings as a set.

11. Assuming that the cylinder bore is

not excessively worn, measure the end-gap for both piston rings. Insert each ring into the bore about 5 mm (0.2 in.) from the bottom of the cylinder. Push the ring into the bore using the piston; this will ensure that the ring is perpendicular to the cylinder wall.

Check that the ring is contacting the cylinder wall at all points. Place the cylinder with the ring in it on a white paper under strong light. If you can see the paper between the ring and the cylinder wall, replace the rings, or check the cylinder bore diameter.

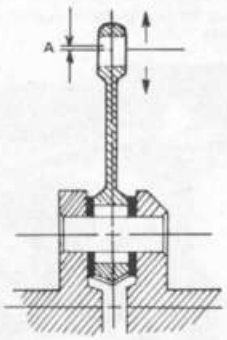
Measure the end-gap with a feeler gauge. If the end-gap of any ring is greater than the service limit given at the end of this section, replace all rings.

New rings should also be checked in this manner before installation. If the end-gap of a new ring is too small, use a fine file to remove as much material from the ring ends as necessary.

NOTE: *Be sure to check the gap often during this operation as it is easy to remove too much metal.*

12. Make a visual inspection of the small end bearing. If the rollers are worn, cracked, bind in the cage, are blued from overheating, or if the bearing cage is damaged, replace the bearing.

13. Check the bore in the connecting rod small end for scoring. If replacement of the rod is necessary, refer to the following "Crankshaft Assembly" section. Check the small end bearing for play. This is done by installing the bearing and wrist pin in the connecting rod and feeling for up-and-down play between the wrist pin and connecting rod. If play is noticeable, replace the bearing.




Check the con rod for vertical play which would indicate a worn big end bearing

14. If the wrist pin shows any blueing, which is indicative of overheating or lack of lubricant, it and the needle bearing should be replaced.

15. Check the connecting rod for radial (up-and-down) play on the crankpin. There must be absolutely none. If any play is evident, this indicates a badly worn big end bearing. Procedures for measuring the con rod radial and axial clearance and crankshaft service steps are given under "Crankshaft Assembly," which follows.

16. The connecting rod should be checked to ensure that it is not bent. This can be done without the need for special tools by installing the piston, minus the piston rings, onto the connecting rod, and then installing the cylinder.

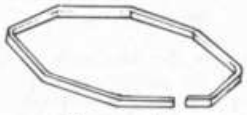
The piston should be seen to be in the center of the bore. If the piston is moved to either side, it should return to the center by itself.

If the piston is contacting one side of the cylinder and not the other, the connecting rod is probably bent.

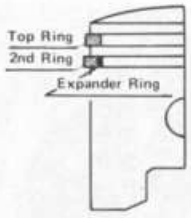
*CYLINDER HEAD, CYLINDER, AND PISTON*

**Installation**

1. Refit the piston rings to the piston; note that the top ring has a chrome outside edge and is also chamfered while the bottom ring is un-chamfered. If the bottom ring has a expander behind it, install this into the ring groove first. Install the rings, beginning with the bottom ring, by spreading them slightly and sliding them down over the piston and into their respective grooves. The rings must be installed with the number and letter facing up and the end-gap over the locating pins in the grooves.

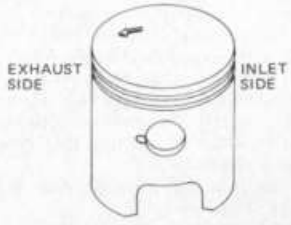


Ring expander




Piston ring location

2. Fit one of the *new* wrist pin circlips into the far side of the piston; the gap in the circlip should face either up or down. Install the wrist pin into the near side of the piston so that about ⅛ in. of the wrist pin is visible protruding from the inside of the piston. The wrist pin should be a push-fit, but gentle heat may be applied to facilitate installation as on removal.



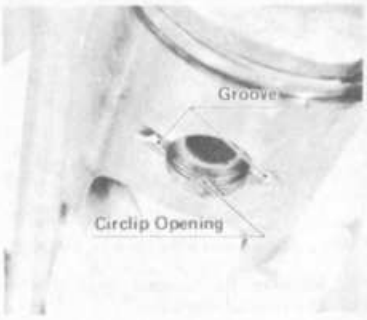

The arrow on the piston crown should point toward the exhaust port

3. Install the small end bearing into the connecting rod. Lubricate it with two-stroke oil.

4. Place the piston over the connecting rod with the arrow stamped on the top of the piston pointing to the exhaust side of the engine.

5. Carefully line up the wrist pin with the connecting rod small end bearing, and push the wrist pin through until it is centered between the circlip grooves.

6. Install a new circlip into the groove in the near side of the piston. Be sure that both circlips are firmly seated in their grooves with the gap in the circlip facing either up or down.




Make sure that the gap in the circlip is positioned downward and that the clip is firmly seated in its groove

7. Lightly lubricate the piston rings and the piston skirt with two-stroke oil.

8. Install a new cylinder base gasket, making sure that it is installed correctly.

9. Place the piston at top dead center. Align the piston rings so that the ring ends are directly over the locating pins.

10. Take up the cylinder, make sure that the cylinder walls are lightly coated with oil and fit the cylinder on the crankcase studs.

11. Lower the cylinder over the piston while compressing the piston rings with your fingers until the piston has fully entered the bore.

12. Make sure that the cylinder is properly seated in the crankcase. Install the cylinder head gasket; placing a thin coat of oil on both sides to ensure a good seal.

13. Refit the cylinder head, cylinder head washers and nuts and tighten the nuts in an "X" pattern in increments of about 5 ft lbs to the proper torque of 16 ft lbs for 250–500 models, 30 ft lbs for 750s.

14. The remainder of the assembly procedure is the reverse of disassembly.

## Crankcase Cover Components

The alternator, or magneto countershaft sprocket, and clutch release mechanism are found beneath the left crankcase covers; while beneath the right crankcase cover are the oil pump, tachometer drive, primary drive gears, and the clutch.

To remove the alternator or magneto assembly, a special puller is necessary, while a holder of some sort will be necessary to remove the clutch, primary gear, and the countershaft sprocket.

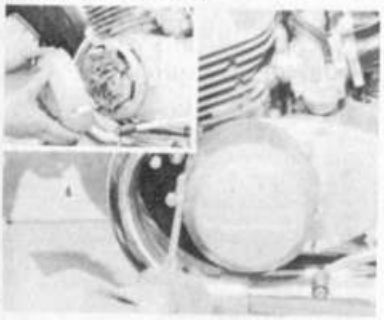
In all cases, these parts can be serviced with the engine in the frame.

*ALTERNATOR*

**S-Series, KH250**

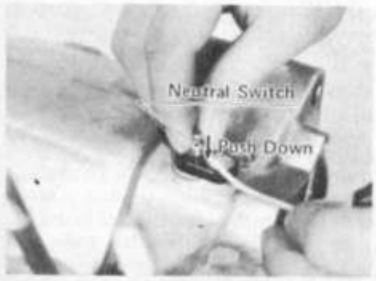
REMOVAL

1. Remove the two phillips head mounting screws from the points cover and remove the cover.



Removing the points cover (S-series, KH250)

2. Remove the neutral switch wire from the neutral switch.

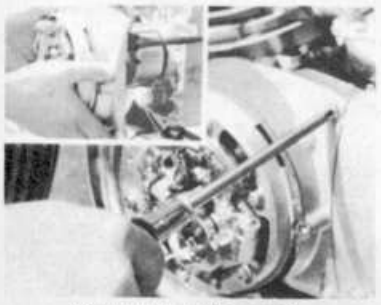



Disconnecting the neutral switch

3. Disconnect the point and alternator wiring from the wire harness at the connectors.
4. Remove the breaker cam bolt.



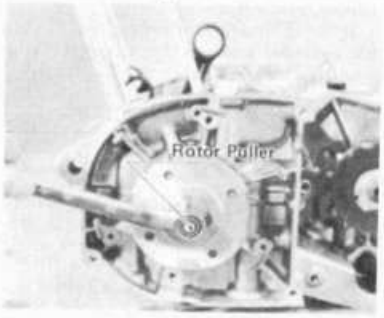
Removing the breaker cam bolt



Removing the stator assembly

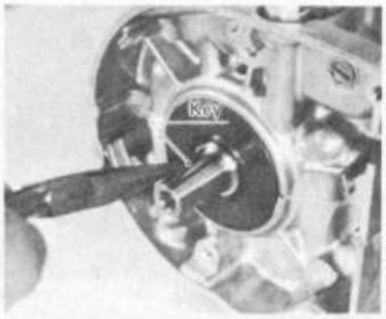
NOTE: *When removing the breaker cam bolt or using the rotor puller it will be necessary to keep the crankshaft from turning. Engage the transmission and apply the rear brake.*

5. Remove the four phillips head screws from the left crankcase cover and remove the cover, breaker plate, and stator as an assembly.




Removing the rotor

6. Remove the rotor with a rotor puller. Screw the puller into the center of the rotor to remove it from the tapered end of the crankshaft. Remove the woodruff key from the crankshaft.




Removing the woodruff key

INSPECTION

For inspection of the alternator components refer to the "Electrical System" section.

INSTALLATION

Assembly is the reverse of disassembly, however, note the following points.

1. Install the woodruff key in the slot in the end of the crankshaft.
2. Lubricate the tapered portion of the crankshaft with a thin coat of grease to make removal easier the next time.
3. Make sure that no metal objects have become attached to the rotor.
4. Draw the rotor down on the crankshaft with the mounting bolt. Do not attempt to drive the rotor onto the crankshaft by force as striking the rotor can affect its magnets.
5. Be sure that the rotor does not rub on the stator.
6. Check the ignition timing.

**KH400**

REMOVAL

1. Remove the gearshift lever. Remove the front and rear sections of the left crankcase cover. Remove the front section's gasket.
2. Engage the transmission, apply the rear brake, and remove the magneto rotor bolt.
3. Using the special puller, remove the rotor.
4. Disconnect the magneto/alternator wiring. Remove the three stator plate screws and take off the stator plate.

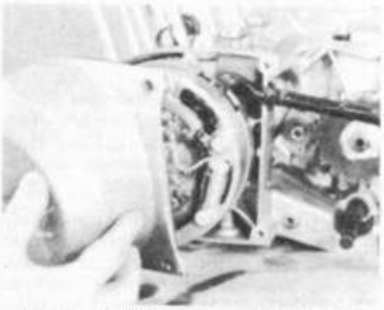
INSTALLATION

1. Installation is the reversal of removal. When installing the stator plate, be sure that the timing marks on the plate and the crankcase are aligned.

**H1-H1-D, H2**

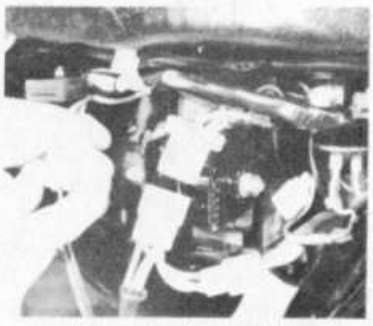
REMOVAL

1. Remove the shift lever and the sprocket cover.



Removing the left engine cover (H1-A/D H2)

2. Remove the three mounting screws (on H1 models) or two mounting screws (H2) and remove the left engine cover.
3. Remove the neutral switch wire from the neutral switch.
4. Disconnect the ignition and alternator wiring from the wire harness at the connectors.



Disconnecting the wiring (H2)

5. CDI models: Remove the signal generator rotor bolt and pull off the signal generator rotor.

NOTE: *When removing the signal generator bolt or using a rotor puller, it will be necessary to hold the crankshaft from turning. Engage the transmission and apply the rear brake.*

6. H1 without CDI: Mark the breaker plate so that it can be installed in the same position as it is removed from. Remove the breaker cam bolt, the three




Removing the rotor




Removing the breaker plate (H1, breaker point ignition)

mounting screws, and remove the breaker plate.

7. H2 models: Remove the three stator mounting screws and remove the stator.

8. Remove the alternator rotor with a rotor puller. Screw the puller into the center of the rotor to remove it from the tapered end of the crankshaft. Remove the woodruff key from the crankshaft.

INSPECTION

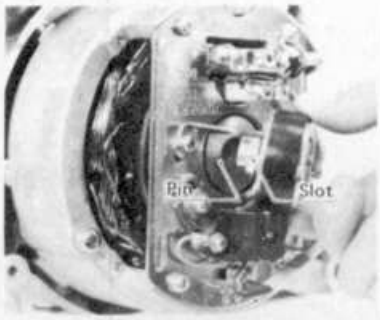
For inspection of the alternator components, refer to the "Electrical System."

INSTALLATION

Assembly is the reverse of disassembly. However, note the following points:

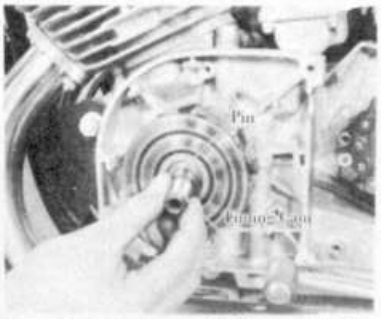
1. After installing the alternator woodruff key, push the alternator rotor onto the shaft. Do not strike the rotor while installing it as this may affect its magnetic properties.

A bit of lubricant applied to the crankshaft taper will make future removal of the rotor easier.




Align the slot in the rotor with the pin on the alternator rotor (H1, battery-CDI)

2. Align the slot in the signal generator rotor with the pin on the alternator rotor. On the H1 with breaker point ignition, align the slot in the breaker cam with the pin on the rotor.




Line up the slot in the cam with the pin on the alternator rotor (H1, breaker point ignition)

**H1-E/F, KH500**

REMOVAL

1. Proceed as for H1-H1D, H2 outlined above, Steps 1–4.

2. Remove the stator plate screws, and take off the plate complete with pick-up coils and carbon brushes. Remove the plate slowly as the brushes are spring-loaded.

3. Remove the screws which secure the stator windings.

4. Remove the signal generator rotor bolt, the signal generator rotor, and use the special puller to remove the alternator rotor.

INSPECTION

For inspection of the components, refer to "Electrical Systems."

INSTALLATION

Install components in the reverse of disassembly. Reset the ignition timing as outlined in "Tune-Up."

*COUNTERSHAFT SPROCKET*

**Removal**

1. Remove the shift lever and the sprocket cover.

2. Remove the sprocket nut from the end of the countershaft after bending back the locktab.

NOTE: *When removing the sprocket nut it will be necessary to hold the countershaft from turning. If the engine is in the frame this can be done by placing the transmission in High gear and applying the rear brake while removing the nut. If the engine has been removed from the frame, wrap a piece of old drive chain around the sprocket and lock the other end in a vise.*




Bending down the locking tab on the countershaft sprocket nut

3. Loosen the rear axle nut and the sprocket nut and move the rear wheel forward in the swing arm until the chain can be lifted off the countershaft sprocket.

4. Slide the sprocket off of the countershaft.

**Installation**

Installation is the reverse of the removal procedure. Ensure that the sprocket nut is firmly tightened and that the tab on the washer is bent up across one of the nut flats.

*RIGHT CRANKCASE COVER COMPONENTS*

**Right Crankcase Cover**

REMOVAL

NOTE: *On all models, the oil pump, tach and pump drive gears will remain in the cover when it is removed. They can be left undisturbed unless service is necessary.*

It will be necessary to bleed the pump before operating the machine, since the lines must be disconnected to remove the crankcase cover.

1. 250–400 only: Disconnect the tachometer cable from the oil pump cover. Remove the three mounting screws and remove the oil pump cover.

2. 500, 750 only: Remove the three mounting screws from the oil pump cover and slide the cover up the tachometer cable. Disconnect the tachometer cable and remove the oil pump cover.

3. Remove the three oil line banjo bolts and disconnect the oil lines from the pump and slip them out of the right crankcase cover. Be sure to keep track of the banjo bolt gaskets. Disconnect the oil pump cable from the control lever and remove it from the crankcase cover.




Removing the oil line banjo bolts (H1 shown)

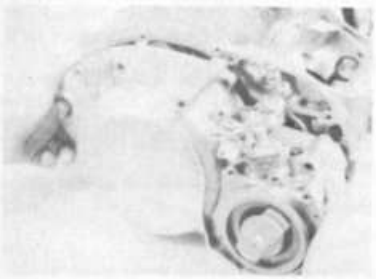
4. H1 battery-CDI only: Unclip the distributor cap and remove it.

5. Remove the oil tank line from the oil pump by unscrewing the banjo fitting. Remove the banjo fitting from the oil line and plug the end of the line with a small screw.

6. Remove the kick-starter lever

pinch-bolt and pull the lever off the kick-starter shaft.

7. Drain the transmission oil. Place a drip pan beneath the crankcase cover.



Removing the right crankcase cover (H1, battery-CDI)

8. Remove the mounting screws and remove the crankcase cover; tap it carefully with a plastic mallet to break the seal if stuck.

9. Remove the cover gasket.

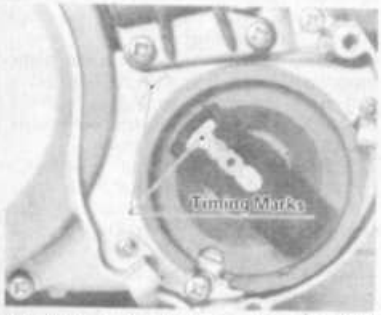
INSTALLATION

Installation is in the reverse order of disassembly, however note the following points:

1. A new cover gasket should always be used upon assembly.

2. H1 battery-CDI only: The ignition timing will have to be set when the cover is installed:

a. Use a dial gauge to set the right cylinder at TDC;




Line up the mark on the timing plate with the "T" mark on the engine case (H1, battery-CDI)

b. Turn the rotor until the mark on the rotor is pointing to the "T" mark on the crankcase cover;

c. Holding the rotor in this position mount the cover on the engine as described below. Be sure that the right cylinder is still at TDC.

3. Hold the cover in place and make sure that the oil pump gear and the distributor gear (H1 battery-CDI) are meshed with their drive gears. Install the mounting screws and tighten them in an "X" pattern a little at a time until they are all tight. Secure with an impact tool.

4. Refill the transmission with the correct amount of oil.

5. Bleed the oil pump and adjust the control cable.

**Oil Pump**

The pump is removed along with the right-side cover. For service to the oil pump refer to "Lubrication System."

**Tachometer and Oil Pump Drives**

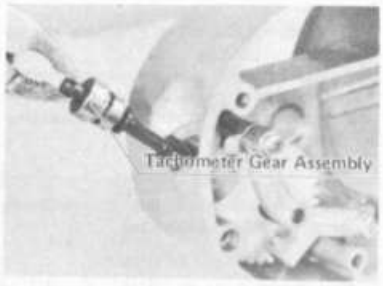
1. Remove the right crankcase cover as previously described.

2. Pull the tachometer gear assembly out of the cover from the outside with pliers. On 500 and 750s, the nylon tach gear and thrust washer can be removed from the inside of the cover at this time.




Removing the tach gear shaft (500, 750)

3. S-series: Remove the two phillips screws from the tachometer gear holder in the inside of the case. Remove the holder, gear shaft and nylon oil pump gear, noting the location of any thrust washers.




Removing the tach gear assembly (250–400)

4. Inspect the condition of all of the gears, replace any with badly worn, chipped, broken, or missing teeth.

5. Inspect the condition of the oil seal in the tachometer bushing. If the lips of the oil seal appear to be damaged, replace the seal with a new one.



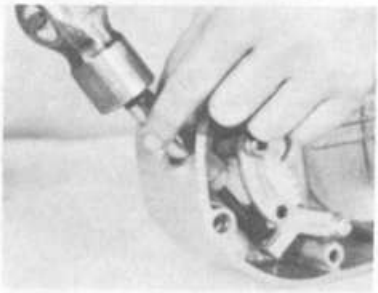

Left crankcase cover tach and pump gears (250–400)

6. Check the O-ring for condition, if it is torn or cracked it should be replaced.

7. To install the tachometer gear assembly, replace the gear shaft, oil pump gear, and gear holder (250–400). Be sure that the slot in the gear shaft is fitted to the tab on the oil pump drive. On 500–750, hold the driveshaft gear and thrust washer in place.




Check the tach oil seal and O-ring



Installing the tach gear assembly (250–400)

8. Slip the tachometer driveshaft through the bushing, and press the assembly into the case. Take care not to damage the O-ring or the oil seal. Check that the gears line up when pressing in the shaft. Note that a pin on the shaft must engage the slot in the tach gear (500–750).

9. Install the right crankcase cover.

**Distributor (H1 battery-CDI)**

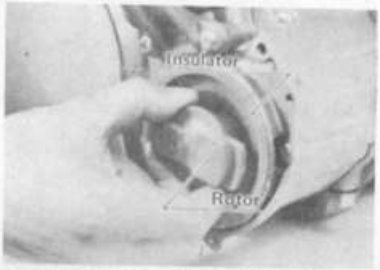
1. Remove the right crankcase cover as previously described.

2. While holding the rotor remove the pinion gear nut from the end of the distributor shaft. Remove the pinion gear from the shaft.



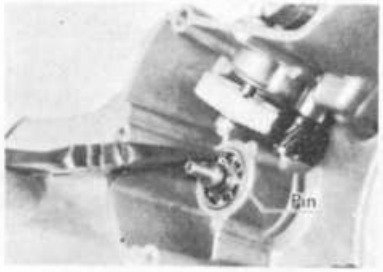

Removing the distributor pinion gear nut (H1, battery-CDI)

3. Pull the rotor off the shaft, and remove the insulator from the crankcase cover.




Removing the rotor (H1, battery-CDI)

4. To remove the distributor shaft from the crankcase cover, remove the pin from the inside end of the shaft, then, using a soft-faced mallet, tap the shaft out from the inside.




Remove the pin to remove the distributor driveshaft (H1, battery-CDI)

5. Check the condition of the oil seal in the cover, if it is torn or cracked it should be replaced.

6. Replace the rotor if it is cracked or chipped.

7. Inspect the pinion gear and replace it if any of the teeth are chipped or missing.

8. Inspect the shaft for bends and replace if bent. Check the bearing condition. Rotation must be smooth and effortless.

9. Inspect the condition of the threads on the end of the shaft. Replace the shaft if they are chipped or stripped.

10. Installation is the reverse of removal.

### Clutch

REMOVAL

1. Drain the transmission oil.

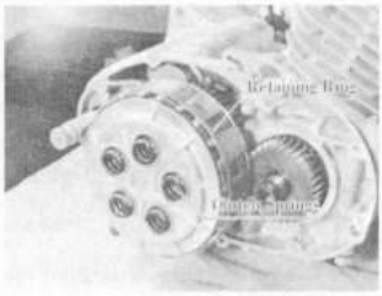
2. Remove the right crankcase cover as previously described.

NOTE: *If the primary drive (crankshaft) gear must be removed, it is advisable to loosen the primary drive gear nut with the clutch installed. Stuff a rag between the clutch and primary gears to lock them in place, then loosen the nut. Using impact (rather than steady pressure) on this nut will make removal easier.*

3. Loosen the five clutch spring plate bolts gradually and evenly, then remove them.

4. Remove the pressure plate with the clutch springs, and spring guides. On H2 models, remove the retaining ring from the clutch housing.

5. Remove the spring plate pusher from the center of the hub.



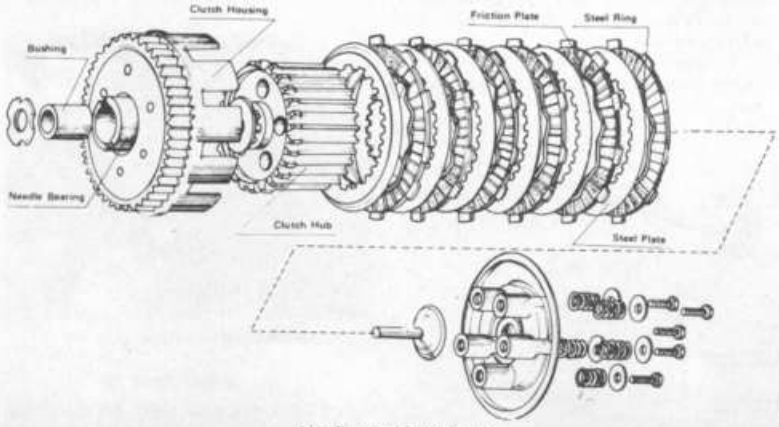

Clutch springs and retaining ring

6. Remove the clutch steel and friction plates. Note the steel bands fitted between each pair of friction and steel plates. Handle them carefully. Note the order of the plates and bands as they are removed. All components must be installed in the same order.




Removing the spring plate pusher

7. Remove the clutch hub nut. To remove the hub nut, either hold the hub stationary with the special tool, as shown, or engage the transmission and lock the countershaft sprocket in place.

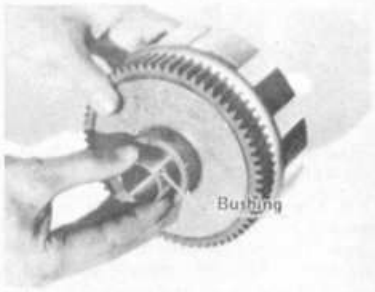



Clutch assembly (250–400)




Removing the clutch hub nut while the special tool keeps clutch from turning

8. Pull the clutch hub off the transmission mainshaft, and then remove the thrust washer behind the hub.



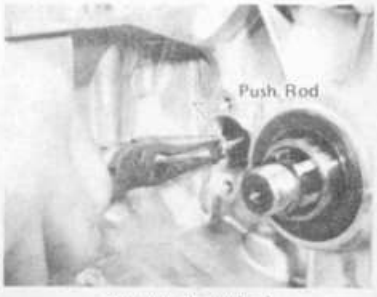

Checking the clutch housing bushing for play

9. Remove the clutch housing. The housing needle bearing will remain in the housing in most cases. Remove the bushing and thrust washer from the mainshaft.

10. To remove the clutch release mechanism and the pushrods: remove the countershaft sprocket cover, disconnect the clutch cable from the clutch release assembly, and unscrew the two mounting bolts. Remove the release mechanism and the pushrods.




Removing the clutch release assembly



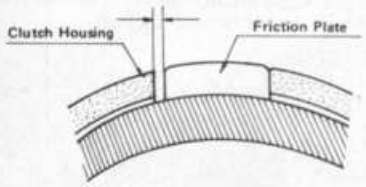

Removing the pushrod

### Inspection

1. Refer to the "Specifications" charts at the end of this section for individual models.

2. Check clutch spring free length, friction plate thickness, and steel plate warpage. If plate warpage exceeds 0.2 mm (0.008 in.), replace the plates as a set.

3. Check the clearance between the tabs on the friction plates and the slots in the clutch housing. If the clearance exceeds the service limit given in the "Specifications" chart, replace the housing. If replacing the housing does not bring the clearance into specification, the friction plates will also have to be replaced.




Check the clearance between the clutch housing and the friction plate tabs

4. Check the condition of housing gear. The gear teeth should be free of wear. If any of the gear teeth are broken or extremely worn, replace the clutch housing and check the condition of the gear with which the worn gear meshes (the primary drive gear). Minor imperfections of the teeth may be remedied with an oilstone. Any gear which is worn enough to necessitate replacement should have its mating gear replaced as well, since it, too, is undoubtedly worn.

5. Place the bushing on the mainshaft and check for play. If play is noticeable, replace the bushing. Be sure that the bushing is free of score marks.

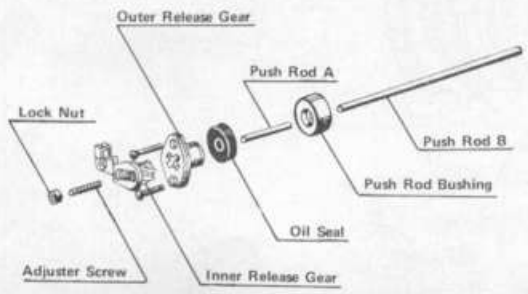
Check the bushing for excessive play in the clutch housing. If any is evident, check the condition of the housing needle bearing as well and replace both bushing and bearing if necessary.

6. Inspect the condition of the needle bearing; if the rollers are scored or discolored or the roller cage is damaged, the bearing should be replaced.

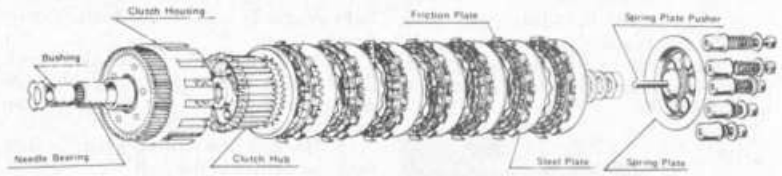



The inner and outer release gears should mesh smoothly

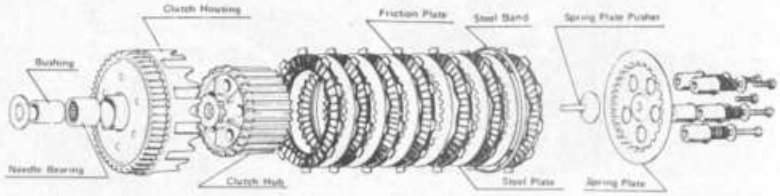
7. Check the general condition of the clutch release assembly pieces. The inner and outer release gears should mesh smoothly together. If they do not, check for damage and replace them.




Clutch release assembly (all models)




Clutch assembly (H1)




Clutch assembly (H2)

### Installation

1. Clean all metal parts in a solvent. Lubricate them with transmission oil before assembly.

2. Install the clutch components in the reverse of the removal procedure, referring to the accompanying illustrations if necessary. Be sure that all thrust washers are correctly installed.

3. Be sure that the steel bands are in place between the friction and steel plates.

4. Tighten the clutch hub nut securely.

5. Spring plate bolts should be tightened gradually and evenly.

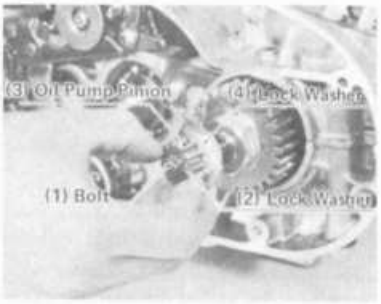
## Primary Gear

### Removal

1. As noted, the primary drive gear nut should be loosened with the clutch installed.

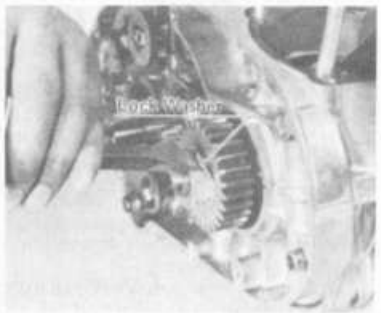
2. Stuff a rolled up rag between the primary and the clutch housing gears to lock them in place, then remove the oil pump drive gear bolt from the end of the crankshaft. Remove the oil pump drive gear and lockwasher.

3. Bend down the locktab on the primary gear nut washer and unscrew the nut.

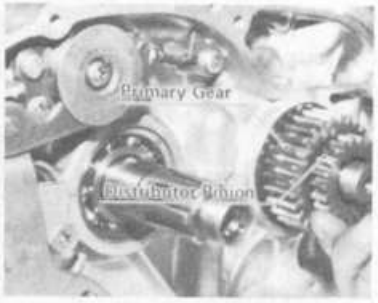



Removing the pump drive gear assembly

4. Remove the distributor drive gear (H1 battery-CDI), lockwasher, and the primary drive gear. Remove the key from the crankshaft.




Bending back the primary gear nut washer locktab




Distributor gear (H1, battery-CDI)

### Inspection

1. Check the gear teeth for wear. Replace if necessary. If the primary gear is

excessively worn, the clutch gear should be replaced as well. Minor defects of the teeth can be remedied with an oilstone.

2. Check the woodruff key for stepwear and replace it if it shows signs of wear or if it is a loose fit in the crankshaft keyway or the gear.

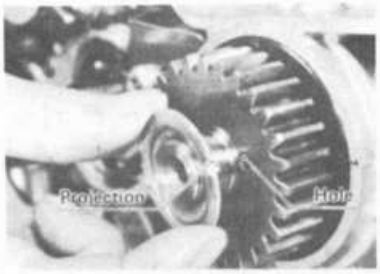
3. Inspect the oil pump drive gear for worn teeth and replace it if necessary. Inspect the pump driven gear in the case cover as well.

INSTALLATION

1. Installation is the reverse of the removal procedure.

2. The crankshaft should be smeared with some oil before installing the gears.

3. Do not forget to install the woodruff key.




The primary gear nut washer projection must be fitted into the hole in the primary gear

4. When installing the primary gear nut lockwasher be sure that the projection on the washer is fitted into the hole in the primary gear. Tighten the primary gear nut securely, and bend up the side of the washer against the flat on the nut.

### Shifter Mechanism

REMOVAL

On all models the shift arm and shaft can be removed and inspected with the engine in the frame.

1. Remove the right crankcase cover and clutch assembly.

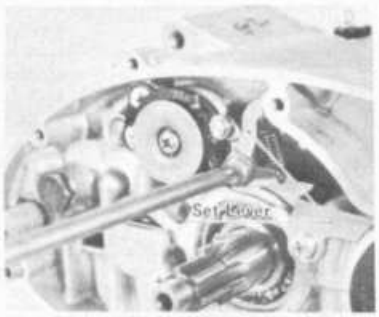
2. Remove the gearshift pedal and the countershaft sprocket cover.

3. Disengage the shifter arm from the shift drum and pull the shift lever out from the right-side.




Disengaging the fingers from the shift drum and pulling out the shifter shaft

4. Remove the mounting screws, and remove the set lever and its spring and the positioning plate.




Removing the set lever

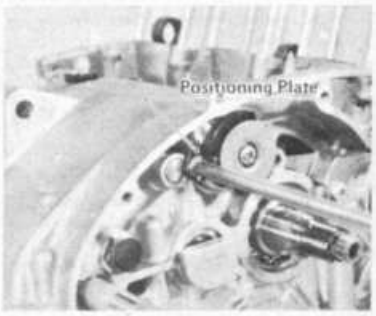
INSPECTION

1. Check the splines on the gearshift shaft for wear or splintering, and replace the shaft if they are too badly damaged to properly secure the gearshift pedal.

2. Check the shaft for a bent condition and replace it if bent.

3. Check the shift arm for straightness. Check the shift fingers for straightness, and especially for wear at the tips.

4. Inspect the shifter return spring and replace it if broken, or if the ends of the spring show signs of twisting or fatigue.




Removing the shift drum positioning plate




Check the shifter return spring for damage

5. Check the other springs in the shift linkage and replace any that are deformed, damaged, or weakened.

6. Inspect the set lever and replace it if worn.

INSTALLATION

1. Installation is the reverse of the removal procedures.

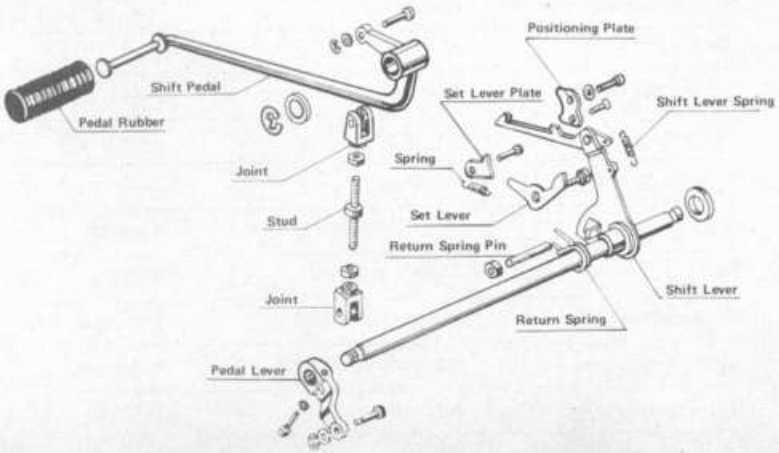
2. When installing the return spring, be sure that both ends of the spring bear tightly against the pin. The spring ends should be parallel to one another. This will provide the tension needed to keep the (foot) shift lever in position after each shift.

3. Be sure that the spring is secure in the crankcase.

4. When installing the positioning plate, stake the head of the mounting screws with a punch.




Staking the shift drum positioning plate screw




Gearshift assembly

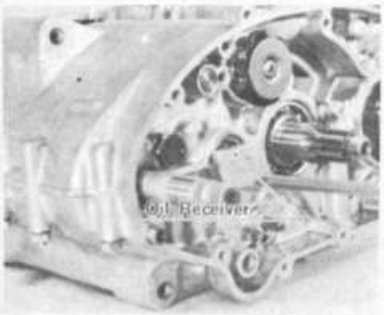
## Lower End and Transmission

The following section deals with service to the crankshaft, transmission, kick-

starter mechanism, shifter (drum) assembly, crankcase bearings, and seals. Removing the engine and splitting the crankcases is necessary to service these components.

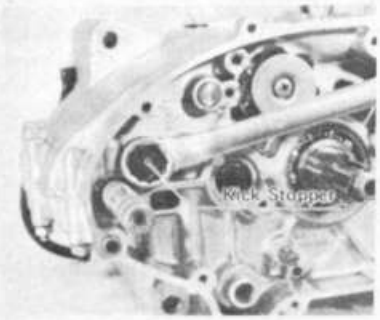
*SPLITTING THE CRANKCASES*

1. Remove the engine from the frame. Remove the top end assembly. Remove the side cover components: alternator, countershaft sprocket, clutch, primary drive gear, shifter mechanism, clutch release mechanism.
2. Remove the oil receiver on the right-side of the engine.



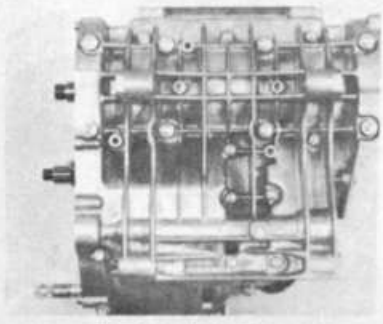

Removing the oil receiver plate

3. Remove the kick stopper bolt.




Loosen the kick stopper bolt

4. Turn the engine upside down and remove the mounting nuts. Turn each nut ¼ turn at a time until they are all loose and then remove them.
5. Tap all around the crankcase mating surface with a soft-face or a plastic mallet. When the lower case comes free, remove it. The crankshaft and gear clusters will remain in the upper crankcase half.



Lower crankcase nuts

## Engine Specifications

250

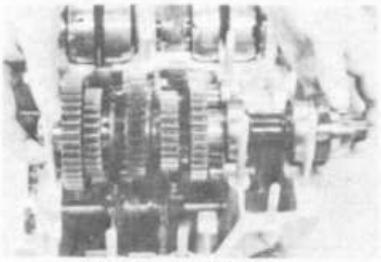
| Item | Standard (mm/in.) | Service Limit (mm/in.) |
|---|---|---|
| Bore (standard) | 45.016/1.772 | 45.15/1.778 |
| Piston clearance | 0.025/0.001 | 0.1/0.004 |
| Piston skirt diameter (standard) | 44.991/1.771 | — |
| Top ring groove width | 1.5/0.06 | — |
| Top ring groove depth | 2.5/0.1 | — |
| Second ring groove width | 1.5/0.06 | — |
| Second ring groove depth | 2.5/0.1 | — |
| Top ring end-gap | 0.2–0.3/0.008–0.012 | 0.8/0.031 |
| Second ring end-gap | 0.2–0.3/0.008–0.012 | 0.8/0.031 |
| Top ring side clearance | 0.09–0.13/0.003–0.005 | 0.17/0.007 |
| Second ring side clearance | 0.05–0.09/0.002–0.003 | 0.12/0.005 |
| Clutch spring free-length | 34.5/1.358 | 32.5/1.280 |
| Friction plate thickness | 3.0/0.118 | 2.7/0.106 |
| Friction plate-to-clutch housing clearance | 0.05–0.45/0.002–0.0217 | — |
| Small end bearing radial clearance | 0.003–0.022/0.00012–0.00088 | 0.1/0.004 |
| Big end bearing radial clearance | 0.025–0.035/0.00098–0.00138 | 0.1/0.0039 |
| Con rod side clearance | 0.4–0.5/0.0157–0.0197 | 0.7/0.0276 |
| Crankshaft run-out | 0.040–0.050/0.0016–0.0020 | 0.1/0.0039 |

350

| Item | Standard (mm/in.) | Service Limit (mm/in.) |
|---|---|---|
| Bore (standard) | 53.000–53.019/2.0866–2.0873 | 53.15/2.0925 |
| Piston clearance | 0.031/0.0012 | 0.1/0.004 |
| Piston skirt diameter (standard) | 52.975/2.0856 | — |
| Top ring groove width | 1.5/0.59 | — |
| Top ring groove depth | 2.5/0.0984 | — |
| Second ring groove width | 1.5/0.59 | — |
| Second ring groove depth | 2.5/0.0984 | — |
| Top ring end-gap | 0.2–0.3/0.008–0.012 | 0.8/0.031 |
| Second ring end-gap | 0.2–0.3/0.008–0.012 | 0.8/0.031 |
| Top ring side clearance | 0.09–0.13/0.0035–0.0051 | 0.17/0.0067 |
| Second ring side clearance | 0.05–0.09/0.0020–0.0035 | 0.12/0.0047 |
| Clutch spring free-length | 28.7/1.130 | 26.7/1.051 |
| Friction plate thickness | 3.0/0.118 | 2.7/0.106 |

6. To remove the crankshaft from the crankcase, tap upward on one end of the shaft with a plastic mallet. Lift out the crankshaft carefully.

7. Inspection of the transmission gears can be carried out with the gear clusters in place. Do not remove the gear clusters unless it is necessary to do so.



Removing the gear clusters

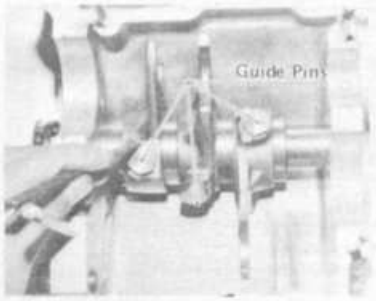
8. Lift out the mainshaft, complete with gears, by tapping upward on the clutch end of the shaft with a plastic mallet to free it if necessary.

9. Remove the countershaft and gears in the same manner.

10. Before removing the shift drum and forks, mark the location of each fork so that they may be installed in their proper locations.

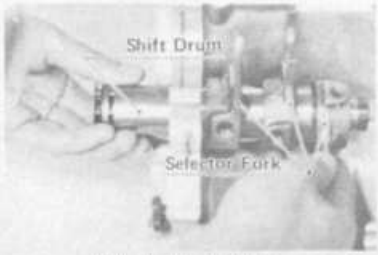
11. Remove the set lever and the positioning plate to remove the shift drum.

12. 500, 750 models: bend back the locktab on the drum guide pins and remove the pins. Slip the shift drum out from the right-side and remove the selector forks.




Remove the guide pins to remove the shift drum from the forks (H-series)

13. 250–400 models only: Remove the circlip from the selector fork rod and slip the rod out of the crankcase, remove the two selector forks. Remove the cotter pin from the selector fork on the shift drum and remove the guide pin. Slip the drum out of the crankcase and remove the remaining selector fork.




Removing the shift drum

## Engine Specifications (cont.)

350

| Item | Standard (mm/in.) | Service Limit (mm/in.) |
|---|---|---|
| Friction plate-to-clutch housing clearance | 0.05–0.45/0.002–0.022 | — |
| Small end bearing radial clearance | 0.003–0.022/0.0001–0.0008 | 0.1/0.004 |
| Big end bearing radial clearance | 0.025–0.035/0.0001–0.0014 | 0.1/0.004 |
| Con rod side clearance | 0.4–0.5/0.016–0.019 | 0.7/0.027 |
| Crankshaft run-out | 0.04–0.05/0.0016–0.0020 | 0.1/0.004 |

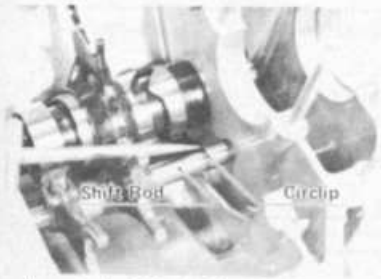
400

| Item | Standard (mm/in.) | Service Limit (mm/in.) |
|---|---|---|
| Bore (standard) | 57.0/2.24 | 57.1/2.244 |
| Piston clearance | 0.031/0.0012 | 0.1/0.004 |
| Piston skirt diameter (standard) | 56.12/2.209 | — |
| Top ring groove width | 1.5/0.59 | — |
| Top ring groove depth | 2.5/0.098 | — |
| Second ring groove width | 1.5/0.59 | — |
| Second ring groove depth | 2.5/0.098 | — |
| Top ring end-gap | 0.2–0.3/0.008–0.012 | 0.8/0.031 |
| Second ring end-gap | 0.2–0.3/0.008–0.012 | 0.8/0.031 |
| Top ring side clearance | 0.09–0.13/0.0035–0.0051 | 0.17/0.0067 |
| Second ring side clearance | 0.05–0.09/0.0020–0.0035 | 0.12/0.0047 |
| Clutch spring free-length | 28.7/1.130 | 26.7/1.051 |
| Friction plate thickness | 3.0/0.118 | 2.7/0.106 |
| Friction plate-to-clutch housing clearance | 0.05–0.45/0.002–0.022 | — |
| Small end bearing radial clearance | 0.003–0.022/0.0001–0.0008 | 0.1/0.004 |
| Big end bearing radial clearance | 0.025–0.035/0.0001–0.0014 | 0.1/0.004 |
| Con rod side clearance | 0.4–0.5/0.016–0.019 | 0.7/0.027 |
| Crankshaft run-out | 0.04–0.05/0.0016–0.0020 | 0.1/0.004 |

500

| Item | Standard (mm/in.) | Service Limit (mm/in.) |
|---|---|---|
| Bore (standard) | 60.015–60.040/2.3628–2.3638 | 60.15/2.3681 |
| Piston clearance | ① | 0.1/0.004 |
| Piston skirt diameter (standard) | 59.975/2.3612 | — |
| Top ring groove width | 1.5/0.06 | — |
| Top ring groove depth | 2.7/0.1063 | — |
| Second ring groove width | 1.5/0.06 | — |

14. Lift the kick-starter assembly out of the crankcase.
15. Remove the spring guide and return spring.
16. Remove the two circlips and the holder plate.
17. Remove the snap-ring from the shaft and remove the gear holder and gear from the shaft.



Removing the shift rod shaft circlip (250–400)



Remove the cotter pin and the shift fork guide pin to remove the shift drum



Removing the shift drum


Removing the kick-starter return spring


Removing the kick-starter shaft snap-ring

## Engine Specifications (cont.)

500

| Item | Standard (mm/in.) | Service Limit (mm/in.) |
|---|---|---|
| Second ring groove depth | 2.7/0.1063 | — |
| Top ring end-gap | 0.2–0.3/0.008–0.012 | 0.8/0.031 |
| Second ring end-gap | 0.2–0.3/0.008–0.012 | 0.8/0.031 |
| Free end-gap<br>Top<br>Second | <br>7.0/0.276<br>9.5/0.374 | <br>—<br>— |
| Top ring side clearance | 0.09–0.13/0.0035–0.0051 | 0.17/0.0067 |
| Second ring side clearance | 0.05–0.09/0.002–0.0035 | 0.12/0.0047 |
| Clutch spring free-length | 36.0/1.417 | 34.0/1.339 |
| Friction plate thickness | 2.7–2.9/0.106–0.114 | 2.5/0.098 |
| Friction plate-to-clutch housing clearance | 0.1–0.4/0.0039–0.0157 | — |
| Small end bearing radial clearance | 0.003–0.022/0.00012–0.00088 | 0.01/0.00039 |
| Big end bearing radial clearance | 0.025–0.035/0.001–0.0013 | 0.1/0.0039 |
| Con rod side clearance | 0.4–0.5/0.015–0.019 | 0.7/0.028 |
| Crankshaft run-out | 0.04/0.0016 | 0.1/0.0039 |

①73 and earlier: 0.062–0.070/0.0024–0.0028
74 and later: 0.057–0.065/0.0022–0.0026

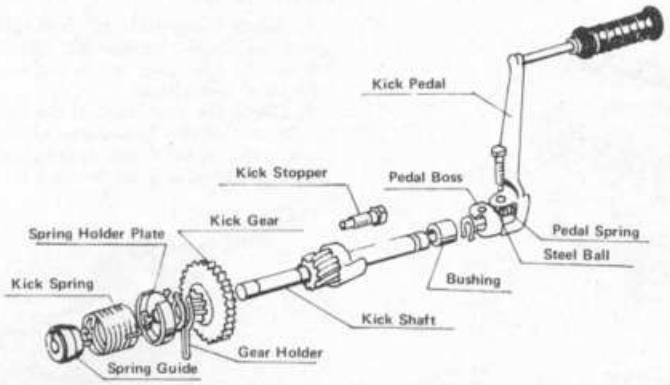
750

| Item | Standard (mm/in.) | Service Limit (mm/in.) |
|---|---|---|
| Bore (standard) | 71.000–71.019/2.795–2.796 | 71.15/2.8012 |
| Piston clearance | 0.074/0.0029 | 0.1/0.004 |
| Piston skirt diameter (standard) | 70.946/2.793 | — |
| Top ring groove width | 1.5/0.06 | — |
| Top ring groove depth | 3.23/0.1272 | — |
| Second ring groove width | 1.5/0.06 | — |
| Second ring groove depth | 3.23/0.1272 | — |
| Top ring end-gap | 0.2–0.4/0.008–0.016 | 0.8/0.031 |
| Second ring end-gap | 0.2–0.4/0.008–0.016 | 0.8/0.031 |
| Free end-gap | 8.0/0.315 | — |
| Top ring side clearance | 0.09–0.13/0.0035–0.0051 | 0.17/0.0067 |
| Second ring side clearance | 0.05–0.09/0.002–0.0035 | 0.12/0.0047 |
| Clutch-spring free-length | 32.0/1.26 | 30.0/1.18 |
| Friction plate thickness | 2.7–2.9/0.106–0.114 | 2.5/0.098 |
| Friction plate-to-clutch housing clearance | 0.09–0.4/0.0035–0.0157 | — |
| Small end bearing radial clearance | 0.003–0.022/0.00012–0.00088 | 0.01/0.00039 |

## Engine Specifications (cont.)

750

| Item | Standard (mm/in.) | Service Limit (mm/in.) |
|---|---|---|
| Big end bearing radial clearance | 0.023–0.041/0.001–0.0013 | 0.1/0.0039 |
| Con rod side clearance | 0.4–0.5/0.015–0.019 | 0.7/0.028 |
| Crankshaft run-out | 0.04/0.0016 | 0.1/0.0039 |



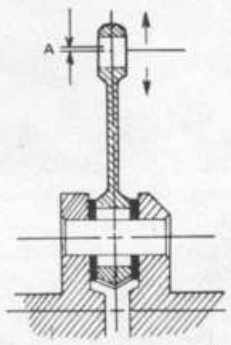

Kick-starter components

*CRANKSHAFT*

The crankshaft is a pressed together unit. Therefore, in the event of damaged crank, crank bearings, or connecting rods the crankshaft should be replaced as a unit.

1. Lubricate the big end bearings with two-stroke oil. Rotate the rod slowly around the crankpin. The movement should be smooth and noiseless.

2. With the crankshaft mounted in a jig, and a dial indicator mounted to bear against the small end of the connecting rod, check the vertical movement of the rod. It should not exceed the service limit given for big end bearing radial play in the "Specifications" chart at the end of this section. If the movement exceeds this figure, the con rod big end bearing is worn, and the crankshaft should be replaced.




Check for big end bearing radial play

3. Check the connecting rod side clearance with a feeler gauge placed between the rod big end and one of the flywheels. Side clearance should be 0.4–0.5 mm (0.0157–0.0197 in.), if the side clearance is more than 0.7 mm (0.0276 in.), the crankshaft should be replaced.



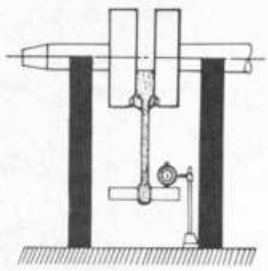

Checking connecting rod big end bearing-to-flywheel clearance

4. Mount the crankshaft in a set of V-blocks, and mount a dial guage to the main bearings. Rotate the crankshaft slowly and note the indicator readings. The maximum allowable run-out is 0.10 mm (0.0039 in.). If run-out exceeds this figure, replace the crankshaft.

5. With the crankshaft mounted in a jig, as shown, insert a shaft of the same diameter as the wrist pin into the small end bearing. Measure the distance between the base of the jig and the shaft on both sides of the rod, any difference in the two measurements indicates the con rod is bent. Also check that the shaft is parallel to the crankshaft; if not the con rod is twisted.

6. Clean and lubricate the main bearings. Check that each bearing rotates smoothly. If, in any bearing, play can be felt or rotation is other than smooth, the bearing is beyond its service life.

7. The crankshaft oil seals must be in good condition to maintain fuel transfer compression in the individual crankcase compartments. If the seal lips are damaged or worn, or if there is evidence of leaking (discoloration), the seals should be replaced. Scratches on the surface of the outer seals, caused by pinching when the crankcases are assembled, are not harmful.



Checking for a bent connecting rod

*TRANSMISSION*

1. The gears should not be removed from their shafts unless absolutely necessary. If the gears are being removed, be sure that each gear, thrust washer, shim, and snap-ring is laid out in the order of removal so that it can be installed in the proper location.

CAUTION: *Note the three steel balls inside the countershaft Fourth gear (S-series). If the transmission shafts are disassembled, refer to the exploded views of the transmissions as a guide to assembly. Note, however, that the number and location of the thrust washers fitted to individual transmissions may vary from the illustrations. These are used to adjust gear clearances (see below), and may differ from machine to machine.*

2. Check each of the gears for chipped, broken, or worn teeth. If any gear shows evidence of such damage, it should be replaced. In addition, the gear with which it meshes should be replaced as well, since it has undoubtedly been overstressed. Minor imperfections can be removed with an oilstone.

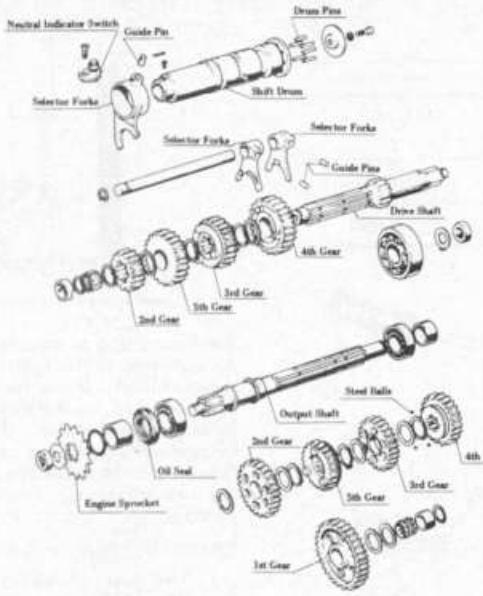
3. Check the inner splines on those gears so equipped, and replace the gear if the splines are worn or broken. Inspect the corresponding splines on the shafts. The shafts should be replaced if damaged.

4. Inspect the engaging dogs on gears which have them. The dogs must not be worn, chipped, or broken. Replace the gear if they are.

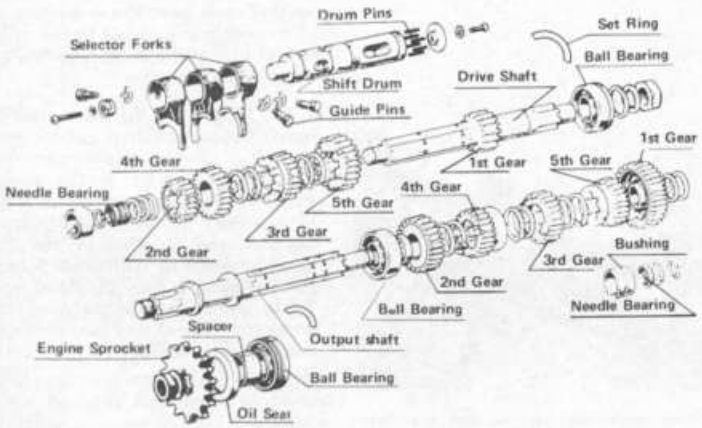
5. Inspect the transmission shafts for damage to the sprocket nut threads, and wear or damage to the clutch, gear, or sprocket splines. Make sure that the shafts are not bent.

6. Where applicable, check the transmission gears for smooth rotation on their shafts. If rotation is rough or noisy, replace the gear. Check that the inner surfaces of gears with plain bores are smooth.

7. Check the shaft bearings for condition. Replace any bearing if movement is balky or noisy, or if there is damage or




S-series transmission




H-series transmission

discoloration to the bearings or races.

8. With the gear clusters assembled in the cases, check the gear side clearances with a feeler gauge as follows:

a. Clearance between the mainshaft Second gear and the bearing;

b. Clearance between the countershaft First gear and the bearing;

c. Clearance between the countershaft Second gear and Fourth gear (500, 750) or Fifth gear (250–400) snapring.

In each case, clearance should be 0.020 in. (0.5 mm) or less. To bring the clearance to within the proper specification, add a transmission shaft thrust washer where shown in the exploded views of the transmissions.

CAUTION: *If the addition of the washer makes the shaft difficult to turn, delete it.*

*SHIFT DRUM*

1. The shift drum itself should be inspected for wear in the selector fork guide pin grooves, damaged guide pin lockwashers, and scoring or wear of the bearing surfaces.

2. The selector fork shaft (250–400) should be inspected for wear in those areas on which the selector forks ride. Roll the shaft along a flat surface to check it for a bent condition. Replace the shaft if bent.

3. Check the selector forks themselves. Note any wear to the fork bore. Check the fingers for bends, or for chipping or wear. Replace any fork on which such defects are noted.




Checking selector fork-to-gear clearance

4. Check the guide pins for wear, and replace them if damaged.

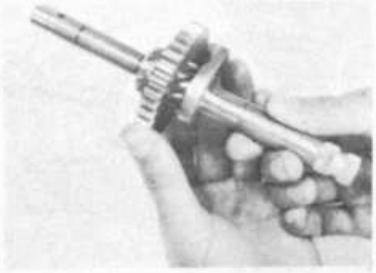
5. Check the shift drum pins. Replace any broken, worn or missing pins.

6. With a feeler gauge measure the clearance between the selector fork fingers and the groove in the gears. The standard clearance is 0.05–0.25 mm (0.002–0.01 in.); if the clearance exceeds 0.6 mm (0.024 in.), the gear and/or the selector fork should be replaced.

*KICK-STARTER*

1. Rotate the gear on its shaft splines; operation should be smooth. Check for damage to the gear teeth (inner and outer) and to the shaft.

2. Check the condition of the splines on the end of the kick-starter shaft and replace the shaft if the splines cannot maintain a good grip on the kick lever.



Checking the movement of the kick-starter gear on its shaft

3. Inspect the return spring and replace it if the ends are broken or deformed.

4. The gear holder should be a snug fit on the gear.

*ASSEMBLY OF CRANKCASES*

1. Check that the oil passages and the transmission breather hole are clear. Blow them out with compressed air if possible.



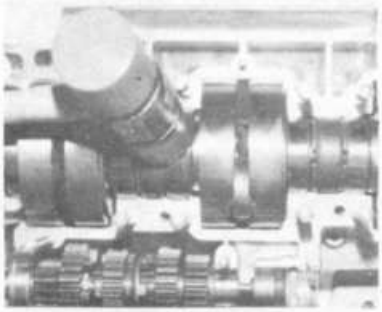

Be sure that the bearing set rings are properly installed

2. Clean the crankcase mating surfaces thoroughly.

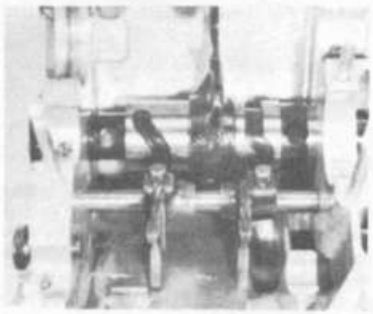
3. Make sure that the crankshaft main bearings set rings are properly installed in the upper crankcase and install the crankshaft. Seat the main bearings by tapping them lightly with a plastic mallet.

4. Fit the transmission shafts into the upper crankcase. Position the selector forks so that the center fork faces the front

of the engine and the outer fork faces the rear. Fit the countershaft first and then the mainshaft. Be sure that the selector forks are correctly fitted to the grooves in the proper gears. The center fork is fitted to the mainshaft 3rd gear and the left and right forks are fitted to the countershaft 5th and 4th gears, respectively.

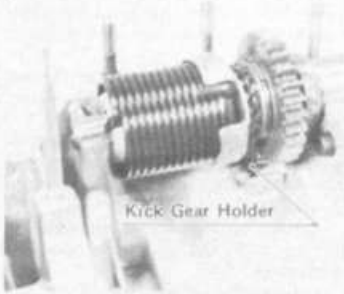


Seating crankshaft bearings



Position the selector forks as shown before installing the gears (250–400 shown)

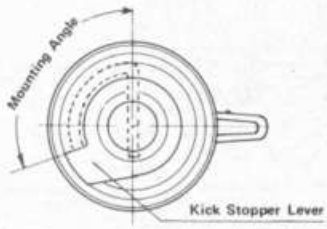
5. Assemble the kick-starter. Be sure that the circlips and snap-ring are properly seated in the shaft. Install the kick-starter assembly in the case, noting that the end of the gear holder should be fitted into the boss in the crankcases. After the cases are assembled the return spring must be preloaded and the kick stopper installed.

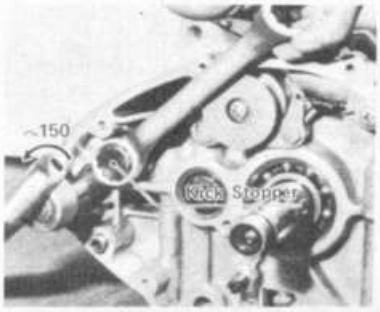



The kick-starter gear holder should be seated in the crankcase boss

6. Apply a thin coat of gasket sealer to the crankcase surfaces. Install the lower crankcase. Tighten the crankcase nuts in an X pattern in 3 ft lb increments starting from the center of the case. Torque the 8 mm nuts to 18 ft lbs and the 6 mm nuts to 11 ft lbs.

7. Install the kick-starter lever on the shaft and rotate it counterclockwise about 150° and holding the lever in this position install and tighten the kick stopper bolt. Release the lever and check that the spring has sufficient preload to return the lever to the stop.



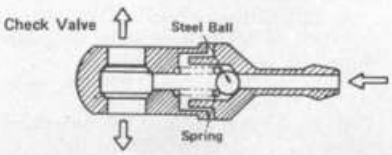




Rotate the kick-starter shaft about 150°, then install the stopper bolt to preload the spring

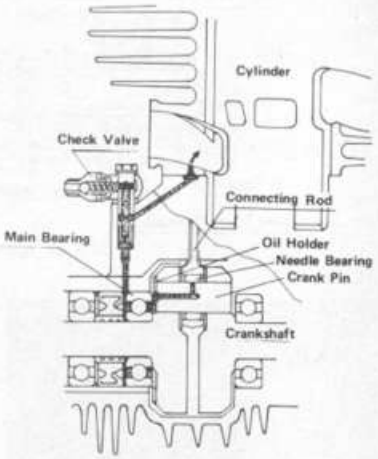
8. The remainder of the assembly procedure is in the reverse order of disassembly. Refer to the appropriate sections preceeding for assembly details on the remaining engine components. Pre-lube the crankcase oil passages with two-stroke oil.

# Lubrication System

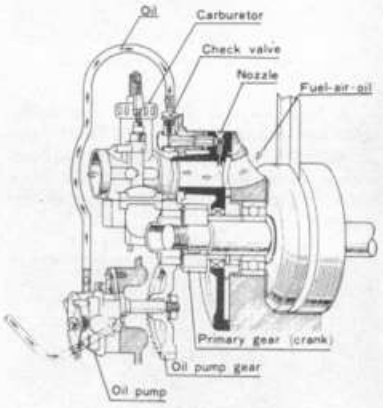
Both Superlube and Injectolube systems include an oil reservoir, oil feed line, oil pump, and oil delivery lines. The pumps are of the plunger type and are driven by the end of the crankshaft through reduction gears. The amount of oil fed to the induction passage delivery line and crankcase drillway (Injectolube) is determined by two variables: the speed of plunger operation and the length of plunger stroke. These variables are set by the engine rpm and the degree of throttle opening, respectively. The pump effectively meters the amount of oil according to engine speed and load and, as a result, no more and no less than the required amount is consumed. The pump also houses a check valve that keeps the oil output pressure constant and seals the delivery line when the engine is not operating.




The essential difference between the Superlube and Injectolube systems is the extra lubrication to the crankshaft main bearings and large end connecting rod bearings provided by the Injectolube type. An additional output port in the oil pump leads to a drillway in the crankcase, which in turn leads to smaller passages to these critical points.




Injectolube: the crankshaft bearings are lubricated directly by the pump



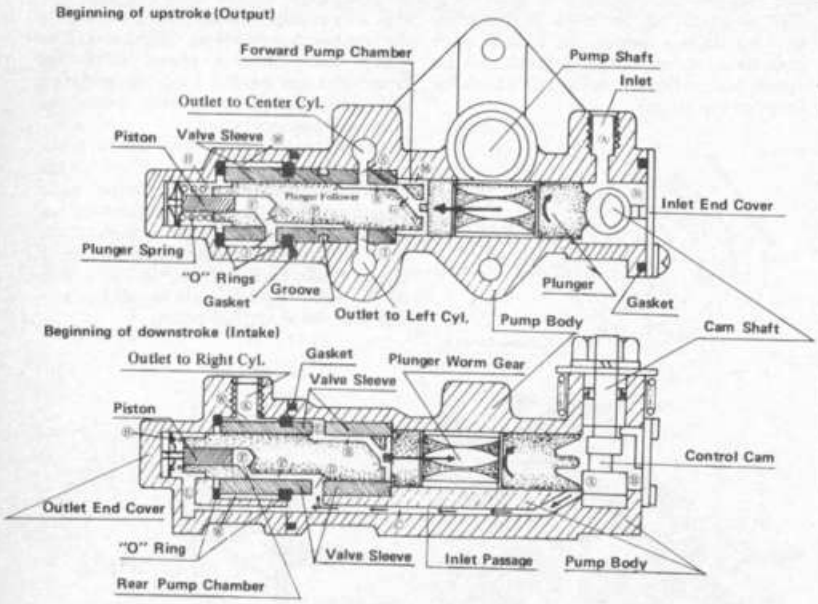

Superlube

## Oil Pump

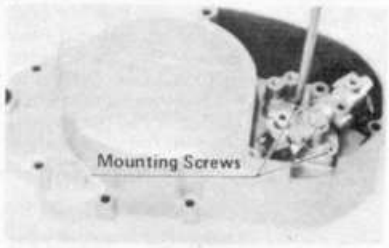
*REMOVAL AND INSTALLATION*

1. 250–400 only: Disconnect the tachometer cable from the oil pump cover. Remove the three mounting screws and remove the cover.

2. 500 and 750 only: Remove the three mounting screws from the oil pump cover and slide the cover up on the tachometer cable. Disconnect the tachometer cable and remove the oil pump cover.



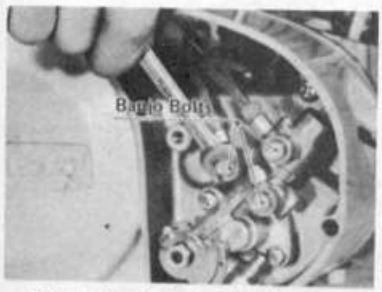

Oil pump operation (500, 750)




Oil pump mounting screws (250–400 and 750)




Oil pump mounting screws (500)




Disconnecting the banjo bolts (250–400)



Disconnecting the oil tank line (H1 shown)

3. Remove the three oil line banjo bolts and disconnect the oil lines from the pump. Cover the ends of the oil lines with a plastic bag secured with a rubber band to prevent dirt from entering the system.

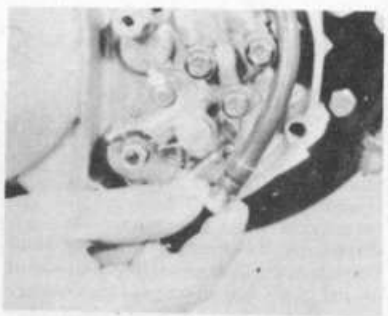



Disconnecting the banjo bolts (500)

4. Disconnect the oil pump cable from the pump control lever.

5. Remove the oil tank line from the oil pump by unscrewing the banjo fitting. Remove the banjo fitting from the oil line and plug the end of the line with a small screw.

6. Remove the two phillips head mounting screws and pull the pump off the right crankcase cover.



Plugging the delivery line

7. To install, mount the pump to the right crankcase cover with the two mounting screws. Be sure that the tab on the oil pump drive is fitted into the slot in the oil pump driveshaft.

8. Install the oil lines. Make certain that they are securely fastened, and that all gaskets are in place.

9. Connect the pump control cable and adjust it as described below.

10. Bleed the oil lines as described below.

*PUMP REPAIR*

The factory advises against attempting to disassemble and repair the oil pump. The internal parts are machined to very exacting tolerances and it is highly unlikely that the pump can be reassembled to factory specifications. In addition to this, oil pump failure is *very* seldom due to internal malfunction.

The condition of pump o-rings is critical. Replace the o-rings if in doubtful condition.

*PUMP OUTPUT*

**H2-B/C**

1. Drain the gas tank and refill it with a gas/two-stroke oil mixture in a ratio of 20:1.

2. Remove the oil pump cover. Detach the banjo bolt and oil line from the right-side carburetor and fit a 6 mm screw to the carburetor.

3. Loosen the banjo bolt at the oil pump and take out the check valve. Tighten the banjo bolt.

4. Check that the oil tank has plenty of oil. Run the free end of the disconnected oil line into a measuring cup or something similar.

5. Start the engine. While running it at 2,000 rpm, hold the oil pump open for three minutes.

6. Measure the amount of oil collected. Proper output is 0.17–0.20 oz. (4.9–5.9 cc).

7. If output is not within this amount, check oil pump o-ring condition. Replace them if damaged. If the problem is not rectified, replace the pump.

8. Flush out the gas tank; bleed the oil pump.

**Other Models**

1. Drain the gas tank and refill it with a gas/two-stroke oil ratio of 20:1.

2. Remove the oil pump cover. Disconnect the oil line for the right cylinder at the crankcase or carburetor.
3. Check that the oil tank has plenty of oil.
4. With the disconnected line emptying into a measuring cup or the like, start the engine and run it at 2,000 rpm for three minutes while holding the oil pump lever fully open.
5. Oil pump output should be as follows:
500: 0.17–0.20 oz. (5.1–5.8 cc)
H2: 0.23–0.26 ox. (6.8–7.5 cc)
250: 0.11–0.13 oz. (3.2–3.9 cc)
350, 400: 0.13–0.15 oz. (3.8–4.4 cc)
"S1," "S2-2" (pump marks): 0.11–0.13 oz. (3.8–4.4 cc)
6. If output is unsatisfactory, check oil pump o-rings and replace if in bad or doubtful condition. If this does not rectify the problem, replace the pump.
7. Flush the gas tank and bleed the pump.
after the throttle cables.

*PUMP BLEEDING*

The oil pump must be bled of air between the pump and check valve, and between the reservoir and pump whenever the pump is removed, the delivery lines are disconnected, or the reservoir has run dry.

1. Remove the oil pump access cover.
2. Start and run the engine at 2,000 rpm while holding the pump control lever in the fully open position.

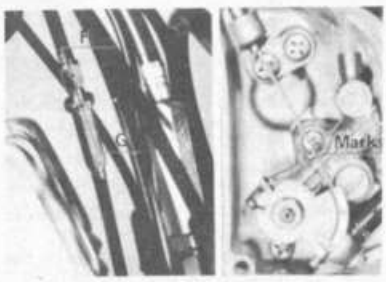



Hold the lever fully open while bleeding the pump (H1 shown)

3. Observe the output delivery line. Any air bubbles in the system should disappear quickly. If they do not, check the tightness of the input and output line banjo bolts.
4. If there are air bubbles in the reservoir oil delivery line, disconnect it at the pump and allow oil to flow through it until the bubbles are gone, then reconnect it and repeat Steps 2 and 3. The reservoir delivery line must not be disconnected while the engine is running.

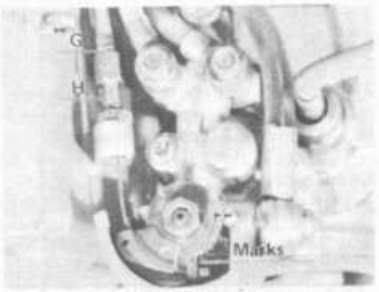
*OIL PUMP CABLE ADJUSTMENT*

1. The oil pump should be adjusted after the throttle cables. Refer to "Tune-Up."




Oil pump cable adjustment (250–400 and 750)

2. The oil pump lever must start to move at the same time the throttle slides start to open.
3. Use the cable adjuster so that the marks on the oil pump control lever and the lever stopper are aligned at zero throttle opening.




Oil pump cable adjustment (500)

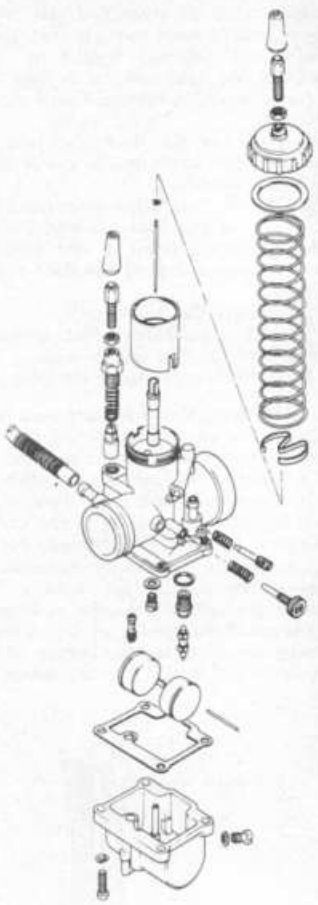
# Fuel System

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

*REMOVAL AND INSTALLATION*

Before disassembling the carburetors, have overhaul kits on hand. All gaskets and O-rings should be replaced.

1. Carburetors are removed one at a time. Before removing each carburetor from the manifold, loosen the carburetor cap ring nut and the starter cable fitting on the carburetor body.
2. Turn the petcock "off" if it is the standard type, and disconnect the fuel line at the carburetor.
3. Loosen the air cleaner hose clamp screw on either outside carburetor, and remove the air cleaner hose.
4. Loosen the carburetor clamp screw at the manifold and pull off the carburetor. Disconnect any breather or overflow lines.
5. Lift up the rubber cap cover, unscrew the cap ring nut, and pull out the throttle slide assembly. Unscrew the starter plunger unit. Drain the fuel from the float bowl.
6. Repeat the procedure for the two remaining carburetors.
7. Installation is the reverse of the above. Be certain that the carburetors are vertical on their manifolds. Secure the manifold and air cleaner hose screws. On machines with "diaphragm" petcocks, turn the petcock to the "prime" position to fill the float bowls with fuel.



Mikuni carburetor SC-series

*DISASSEMBLY*

If disassembly of the throttle slide assembly is desired, refer to the procedures below. If a throttle-stop rod is used to adjust the idle speed, as on some models, see Step 1 and following. On models with a body-mounted screw for idle adjustment, begin with Step 2.

1. The idle speed adjusting screw on the carburetor cap has a small cotter pin at the top. Removing this pin will allow the throttle stop rod to be removed from the bottom of the slide.
2. Compress the throttle slide against the cap until the end of the cable protrudes from the bottom of the slide. Slip the cable end free of the slide, then remove the spring and slide.
3. Remove the spring seat from the inside of the slide, then turn it upside down to remove the needle and clip.
NOTE: *Do not remove the clip from the needle unless making a tuning change.*
4. Turn the carburetor upside down, and remove the four float bowl screws. Remove the float bowl.
NOTE: *If the carburetor is old and has*

*never been disassembled, the float bowl may be stuck to the gasket. Use a soft-faced (plastic) mallet to tap around the bowl until it is free. Restraint should be exercised while doing this.*

5. Push out the float pivot pin by hand or with a small punch, and remove the float assembly.

CAUTION: *Carefully note or mark the top side of the float assembly, since damage could occur if the attempt were made to install the float incorrectly.*

6. Remove the float needle.

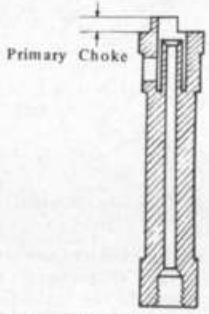
7. With a suitable socket, unscrew and remove the float needle seat.

8. Unscrew and remove the main jet.

CAUTION: *All fuel jets are very malleable and must be removed and installed with care to avoid damage.*

9. Unscrew and remove the pilot jet.

10. The needle jet is located above the main jet and is a press-fit in the carburetor body. Removal is not usually necessary unless the jet is to be replaced. To remove the needle jet, remove the washer press-fitted into the carburetor just beneath the needle jet. Use a small wooden dowel to tap the bottom of the needle jet and force it into the carburetor bore.




Install the primary choke of the needle jet facing the air cleaner side of the carburetor; the cutout faces the engine side

CAUTION: *When installing the needle jet note that it must be installed with the cutout at the top of the jet facing the ENGINE side of the carburetor.*

*ASSEMBLY*

1. All gaskets should be replaced when overhauling a carburetor.

2. On models with a rod-operated throttle slide, assemble by first fitting the carburetor cap onto the throttle cable. Install the stop rod through the bottom of the slide and secure it with the cotter pin to the top of the idle adjusting screw on the carburetor cap.

3. Install the needle, making sure that the needle clip is properly positioned, and that the clip position is the same for all three carburetors.

4. Install the spring seat, return spring, and engage the throttle cable on the slide in the reverse of the disassembly procedure.

5. Install the pilot jet, being careful when screwing the jet in that it is properly seated.

6. Install the needle jet, as on removal, with a wooden dowel drift, tapping it into its seat from the carburetor bore. Install the washer.

Be sure that the jet is installed with the cutout at the top facing the engine side of the carburetor.

7. Install the main jet.

8. Install the fiber gasket onto the float needle seat and screw the needle seat into the carburetor.

9. Insert the float needle into the seat, and position the float assembly over the needle, ensuring that the correct side faces up. Slip the float pivot pin into the holder.

10. Check the float level as outlined in "Tune-Up."

11. Fit a new float bowl gasket. Refit the float bowl, insert the four phillips head screws and tighten them gradually, and in an "X" pattern.

12. Refit the pilot air screw. Screw it in gently until seated, then back it out the prescribed number of turns given in the "Carburetor Specifications" chart at the end of this section. This is an approximate setting and may have to be readjusted after the engine is started.

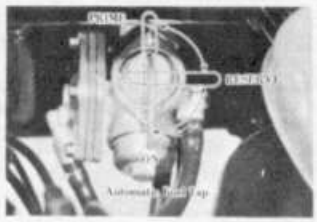
13. Install the throttle stop screw (if fitted) to the carburetor body.

14. Install the carburetor on the manifold, slip in the throttle slide and needle and secure the cap ring nut. Fit the plunger assembly to the carburetor body. Secure the manifold clamp screw.

15. Refer to the "Maintenance" and "Tune-Up" sections if necessary to adjust the pilot air and throttle adjustment stop screws, cables, and slide synchronization.

## Fuel Petcock

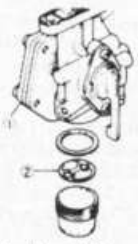
Two types of petcocks are in use: the standard three-position type, and a diaphragm type. The diaphragm petcock is left in the "on" position at all times except when switching to "reserve." Use the "prime" position to fill the carburetor float bowls if they have been emptied. No fuel should flow out of the petcock in the "on" and "reserve" positions unless the engine is running.



Diaphragm-type petcock (pre-1975)

1. The petcocks contain a wire mesh filter which should be removed and cleaned every few months, or at 2,000 mile intervals.

2. If a sediment bowl is fitted, turn the petcock lever so that fuel will not flow, and unscrew and remove the sediment bowl, O-ring, and filter screen. On petcocks without sediment bowls, the filter screens are fitted to the petcock intake pipes inside the tank. Remove and drain the gas tank, unscrew the petcock nut, and remove the petcock from the tank.




Petcock body (1), and filter screen (2)

3. Clean all metal parts in solvent. Be sure that the filter screens are clean.

4. Make sure that the petcock fully shuts off the gas (standard type), or does not leak gas in the "on" position (diaphragm type). If leakage is noted, the petcock should be replaced.

5. Check the condition of the sediment bowl O-ring, or petcock gasket, and replace it if damaged.

6. Replace the filter and sediment bowl. Do not overtighten the bowl. After installation, check for leaks.

7. If water has accumulated in the gas tank, some or most of it can be removed if the standard-type petcock is fitted by disconnecting the fuel lines at the petcock, placing a suitable container beneath it to catch the gasoline, and turning the petcock lever to the "Reserve" position. Letting the fuel flow for several seconds in this manner should remove any water present around the petcock pipe in the gas tank.

8. After extended periods of time, removal and thorough cleaning of the petcock is recommended. Remove the gas tank and drain off all the fuel. Unscrew and remove the petcock body from the gas tank. Unscrew and remove the sediment bowl and filter.

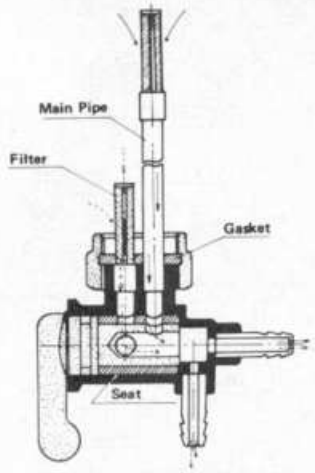
9. On diaphragm-type petcocks, remove the diaphragm plate securing screws, and remove the plate and diaphragm.




Removing the petcock (diaphragm-type)

10. Clean the fuel pipe filters and the petcock body thoroughly in gasoline. Be sure that all passages are clear.

11. Assembly is the reverse of disassembly. On diaphragm-type petcocks,




Standard-type petcock showing fuel filter screens

align the air vents in the petcock body, diaphragm, and plate as illustrated.

12. Check the condition of the sediment bowl O-ring and replace it if damaged. Check the mounting nut gasket and replace it if cracked or crushed.




On diaphragm-type petcocks, be sure that the air vents are aligned when assembling

## Carburetor Specifications①

| Model | Carburetor | Main Jet | Needle Jet | Needle | Pilot Jet | Slide Cut-away | Air Screw (turns out) |
|---|---|---|---|---|---|---|---|
| S1, KH250 | VM22SC | 75 | O—0 | 4EJ8—3 or 4EJ7—3 | 20.0 | 2.0 | 1½ |
| S2 | VM24SC | 85 | O—2 | 4EJ4—3 | 25.0 | 2.0 | 1½ |
| S3 | VM26SC | 85 | O—2 | 4EJ9—3 | 17.5 | 2.5 | 1¼ |
| KH400 | VM26SC | 77.5 | O—6/4 | 4EJ4—3 | 20 | 2.5 | 1¼ |
| Early H1 (with CDI) | VM28SC | 100 | O—2 | 5GL3—3 | 30.0 | 3.0 | 1¼ |
| Early H1 (without CDI) | VM28SC | 90 | O—2 | 5EH7—3 | 30.0 | 2.5 | 1½ |
| H1-B | VM28SC | 95 | O—4/8 | 5DJ19—4 | 30.0 | 2.0 | 1½ |
| H1-C | VM28SC | 100 | O—2 | 5GL3—3 | 30 | 3.0 | 1¼ |
| H1-D, H1-E/F | VM28SC | 92.5 | O—4/8 | 5DJ19—4 | 30 | 2.5 | 1¼ |
| KH500 | VM28SC | 90 | O—4/8 | 5DJ19—4 | 30 | 2.5 | 1¼ |
| H2, H2-A | VM30SC | 97.5 | O—6/8 | 5EJ15—3 | 35 | 2.5 | 1½ |
| H2-B/C | VM30SC | 102.5 | O—6/8 | 5EJ15—4 | 40 | 2.5 | 1¾ |

① Specifications may differ according to model year, manufacturing lot, etc.

13. After assembly, check for leaks.

14. On diaphragm petcocks, be sure that the vacuum line is airtight, or fuel flow will be cut off. The vacuum line should be completely free of cracks and should be firmly attached at both ends. Replace the line if damaged, or if the ends have stretched, resulting in loose fitting at the connection points.

# Electrical System

## Ignition System

*BREAKER POINT IGNITION*

### Breaker Points

1. The general condition of the breaker points should be checked as outlined in "General Information" and the points replaced if pitted or worn beyond repair.

### Condensers

1. Condensers are best checked with a capacitance tester. Capacitance should be 0.18 mf for 250–400 machines, and 0.22 mf for the H1. If less, replace the condenser.

2. If no special test equipment is available, the condenser(s) may be checked for a short circuit with a low voltage DC test light. Disconnect the condenser wire from the point terminal. Check for continuity between the condenser lead and the condenser body. There should be none. If continuity exists, the condenser must be replaced. Even if there is no continuity, however, this does not guarantee that the condenser is in working order, as there are other things which might be wrong with it, such as partial insulation breakdown.

3. Points which pit, burn, or rapidly wear out would indicate a bad condenser. Check point operation by observing them with the engine running. Noticeable sparking or arcing between the breaker point contact surfaces indicate a bad condenser.

### Ignition Coils

1. A defective ignition coil is most easily found by comparing the performance of the three coils.

2. Remove the spark plug leads from the plugs. Insert a metal pin or nail into each of the plug leads in turn and hold the nail about an eighth of an inch from the cylinder head while kicking over the engine. In each case a fat, blue spark should be produced. If one of the coils produces a spark noticeably weaker than the others, it must be replaced.

3. An ohmmeter or continuity light can be used to check the primary winding of the ignition coil. Disconnect the coil low tension terminals and connect the tester across them. There must be continuity. An ohmmeter should show a relatively low resistance, not more than a few ohms at most. If any one coil has a primary winding resistance higher or lower than the other two, it should be replaced.

4. An ohmmeter can be used to check the resistance of the ignition coil secondary winding. Resistance should be about 10K Ω. If any one coil shows a resistance different from the other two, it should be replaced. Secondary winding resistance is checked by connecting the meter leads to the high-tension lead and to a low-tension terminal. All coil leads should be disconnected while testing.

*CDI (H1/A-D)*

The following points should be noted on H1 models with battery/CDI:

a. If the battery is installed incorrectly (i.e., connections reversed), the CDI components will be burned out as soon as the ignition is switched on. Exercise extreme care when connecting the battery;

b. Do not connect or disconnect the battery at any time that the ignition switch is on or the engine is running. This will damage the rectifier. A burned-out diode will completely drain the battery if the machine is run;

c. Battery connections must be kept clean and tight at all times;

d. The wiring between CDI units "A" and "B" (refer to wiring diagram) must be properly connected, free of damaged insulation, loose connections, etc. If trouble is traced to the wiring between the units, the units must be checked since they may have been damaged;

e. The black ground wires from the CDI units must be well grounded, or a no-spark condition will arise;

f. The CDI units are sealed, and no repairs can be effected; if damaged, the units must be replaced;

g. The rubber mounts for the CDI units must be in good condition. The units are very susceptible to damage from vibration.

### Testing

1. Before attempting to troubleshoot a CDI system, first check the above points for possible causes.

2. If spark is absent from only one plug, the trouble is either a defective plug or plug lead.

3. Check the ignition timing and the signal generator rotor-to-pickup coil gap as directed in "Tune-Up."

4. Check the condition of the plug leads. Replace them if damaged, cracked, etc.

5. Check the condition of the distributor cap. If the cap is cracked or chipped in any way, it must be replaced.

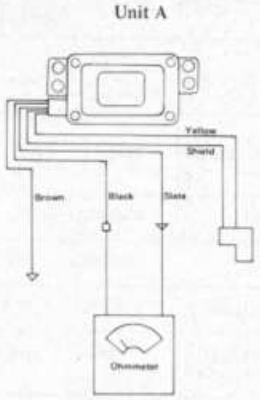
6. Disconnect the pickup coil leads at the connector and use an ohmmeter to measure the resistance between the leads. Resistance should be 300–400 Ω. If the correct resistance is not obtained, check the condition of the pickup coil wires, or replace the unit if necessary.




Checking the resistance of the pickup coil

7. To test the CDI "A" unit, an ohmmeter can be used. Disconnect the unit leads. Connect the positive ohmmeter lead to the "A" unit black lead, and the negative meter lead to the unit's gray (or slate) lead. The ohmmeter must show infinite resistance (no continuity).

Connect the positive lead of the meter to the gray unit lead, and the negative meter lead to black unit lead. Resistance must be infinite.




Testing unit "A" with an ohmmeter

These tests are checks for proper operation of the thyristor. If readings are not infinite in both cases, the "A" unit must be replaced.

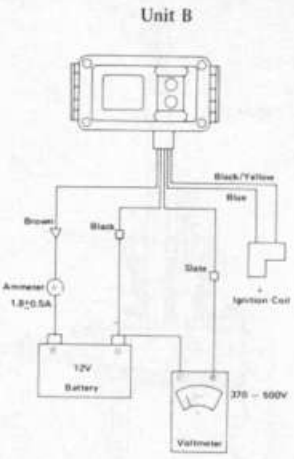
8. To check CDI unit "B," a voltmeter (at least 500v DC), a DC ammeter and a 12v battery are needed.

Make connections as shown in the illustration: one lead of the ammeter to the positive battery terminal and the other ammeter lead to the brown "B" unit lead. Black unit lead to the battery negative terminal, negative battery terminal to the negative voltmeter lead, and positive voltmeter lead to the slate colored "B" unit lead.

All of the following conditions must be met: the "B" unit must emit a high-pitched hum; the voltmeter must read 370–500v; the ammeter must read 1.8 ± 0.5A with no fluctuation of the ammeter needle.

If any one of these conditions is not met, the "B" unit must be replaced.

9. Check the units "A" and "B" together as shown in the illustration. All of the following conditions must be met:




Testing unit "B" with an ohmmeter

unit "B" must emit a high-pitched hum; the voltmeter must read 370–500v; the ammeter must read 2.0 ± 0.5A with no fluctuation of the meter needle.

### *CDI (H1-E/F, KH500)*

The CDI system used on these models is fundamentally different from the battery-CDI used on earlier 500s.

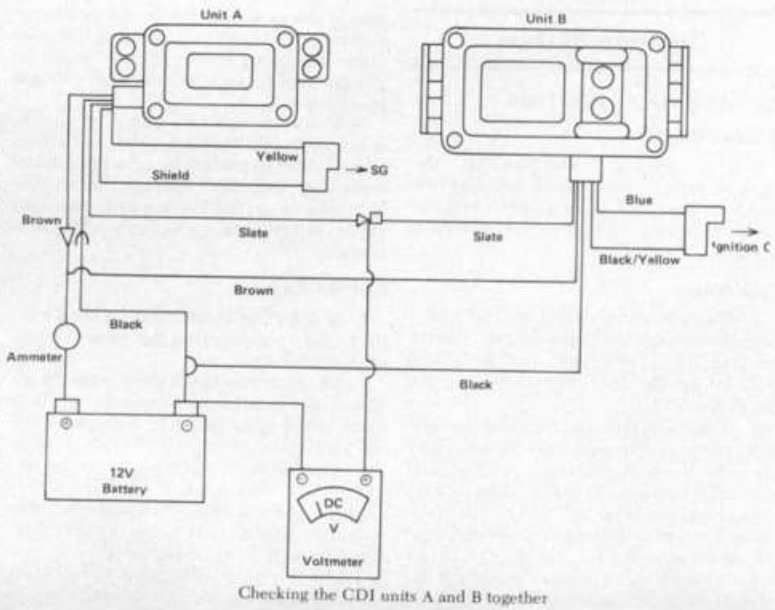
### Ignition Winding

1. Unplug the brown and orange leads at the connector and check the resistance between them on the alternator side.

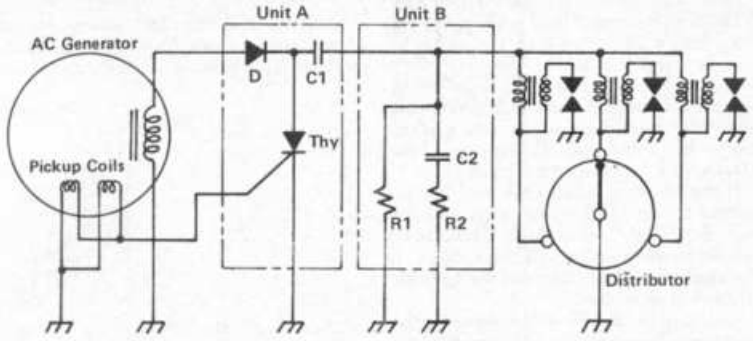
2. Resistance should be 115 ohms. If this reading is not obtained, replace the stator.

### Pickup Coils

1. The two pickup coils are connected in parallel. Disconnect the white wires' connector and check resistance between the white wire (alternator side) and ground on the frame.




Checking the CDI units A and B together




H1-E, KH500 electronic-CDI schematic



Testing the pickup coils

2. Resistance should be 130 ohms.

3. If this reading is not obtained, measure the resistance of each pickup coil separately. Unscrew the pick-up coil ground terminal and check resistance between the white wire and the ground wire of each coil. Resistance in each case should be 260 ohms. Replace any coil if resistance is not very close to this value.

**Distributor.**

Refer to "Charging System," following for distributor rotor tests.

**CDI Units**

1. There are two CDI units, designated "A" and "B" for test purposes. The units are located at the left rear of the battery, unit "A" being the larger of the two and on the bottom. Connectors are accessible beneath the seat.

2. To test unit "B," disconnect the yellow leads which connects it to unit "A". Check the resistance between the unit "B" yellow lead and the frame ground terminal.

3. Resistance should be 300 ohms. If not close to this reading, replace unit "B".

4. Unit "A" must be checked with a Kawasaki Electrotester. Unplug the brown and orange leads from the unit, and the red/white and white leads. Connect the tester harness to these leads as follows: tester yellow/red to orange; tester brown/red, to brown; tester white to white; tester red/white to red/white; tester black to ground. Turn on the tester (110AC) and turn the motorcycle's ignition to on and the stop switch to "run." The tester pilot light should flash on and off. If it does not, replace the unit.

*CDI (H2)*

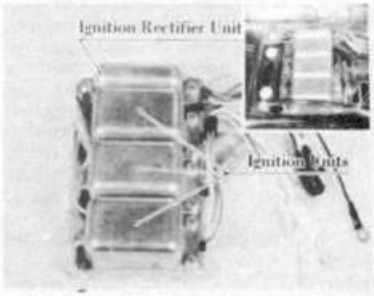
Before attempting to troubleshoot this system, the cause of the problem must be narrowed down as much as possible. Refer to the "Magneto CDI Troubleshooting" chart. Component test procedures are given below.

NOTE: *Do not run the motorcycle with the battery disconnected, as this may cause the ignition units to break down.*

1. Check for spark at each plug. A strong blue-white spark should be produced in each case. If there is no spark or weak spark at one plug, check that plug, its lead, and its ignition coil.

2. If there is strong spark at all three plugs, yet the engine will not start, check that the plug leads are connected to the correct plugs. If they are, the problem is not in the electrical system, unless the ignition timing is quite far off the mark.

3. A faulty ignition unit for any one cylinder may cause a no-spark condition at all three. To check the ignition units, disconnect the three light green wires going from the ignition rectifier unit to the ignition units. Connect one wire at a time to its proper ignition unit and check for spark at that cylinder. If spark is evident at two cylinders only, the ignition unit for the dead cylinder is defective.




Ignition and ignition rectifier units (H2)

4. If spark is absent from only one cylinder, and the plug and lead is in good condition, follow the procedure below to isolate the problem. The source of the problem must be one of the following: the ignition coil, the ignition unit, the ignition rectifier, or the signal generator:

a. Disconnect two of the green wires coming from the ignition rectifier and going to the ignition units, one for the bad cylinder, and one from either of the good cylinders. Reverse the connections. If the bad cylinder shows spark and the good cylinder is now without spark, the problem is a defective ignition rectifier;

## Magneto CDI Troubleshooting

| *Problem* | *Possible Causes* | *Inspection/Remedy* |
|---|---|---|
| No spark at any cylinder | Wiring connections broken; defective wiring | Check wiring connections and insulation. |
| | Defective ignition rectifier | Replace. |
| | AC generator defective | Replace. |
| | Defective ignition unit | Replace. |
| Weak spark at all three cylinders | AC generator defective | Replace. |
| | Ignition rectifier defective | Replace. |
| Weak spark at one cylinder | Defective plug lead | Replace. |
| | Defective ignition coil | Replace. |
| | Defective signal generator | Replace. |
| No spark at one cylinder | Wiring connection broken | Check wiring connections and insulation. |
| | Spark plug lead damaged or defective | Replace. |
| | Defective ignition coil | Replace. |
| | Defective ignition unit | Replace. |
| | Defective ignition rectifier | Replace. |
| | Defective signal generator | Replace. |
| High-speed misfire although strong spark shows at all cylinders while kicking engine over | Defective spark plug(s) | Replace. |
| | Ignition timing incorrect | Adjust. |
| | Carburetor settings wrong | Adjust. |
| | AC generator high-speed coil defective | Replace. |

b. If there is no spark at the bad cylinder, reverse the plug wires of the bad cylinder and either of the good cylinders. Disconnect the red wire from the ignition unit to the ignition coil for the bad cylinder and for the good cylinder whose plug lead you reversed, and reverse the connections. Check for spark. If spark shows at the bad cylinder, the problem is the ignition coil. If there is no spark, proceed to the next test;

c. Connect the plug leads in the normal way, but leave the coil wires reversed. Take the white wire coming from the bad cylinder's ignition unit and switch it with the white wire coming from the good cylinder's ignition unit. If the bad cylinder shows spark, its ignition unit is defective. If it does not, the signal generator coil is defective.

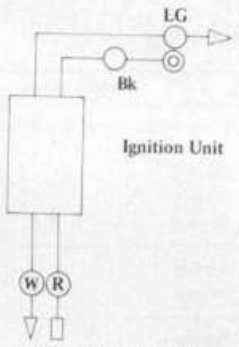
Be sure to connect all wiring in the proper manner after testing has been completed. Check ignition timing as described in Chapter 3 if a signal generator coil has been replaced.

**Ohmmeter Tests**

All CDI system components can be checked with an ohmmeter.

IGNITION UNIT

1. Using the R x 10 range of the ohmmeter, check the resistance between the black and the light green ignition unit leads. With the positive meter lead connected to the black lead, resistance should be infinite (no reading). With the positive meter lead connected to the light green lead, resistance should be infinite. If the readings are not correct, the ignition unit is defective and must be replaced.



Ignition unit leads (H2)

2. Using the R x 100 range of the ohmmeter, check the resistance between the light green and the red ignition unit leads. Connecting the positive meter lead to the light green unit lead and the negative meter lead to the red lead, the ohmmeter needle should jump and then indicate infinite resistance. Reversing the connections should show the same reaction. If the meter does not react properly, the ignition unit is defective.

IGNITION RECTIFIER

1. Using the R x 10 meter range, test the ignition rectifier by checking resistance between the black/white lead and the blue, white, and green leads in turn. If the positive meter lead is connected to the black/white wire and the negative lead is connected to the others one at a time, a resistance of about 35 Ω should be obtained between the black/white, the blue, and the green leads, and a resistance of about 90 Ω between the black/white and the white leads.

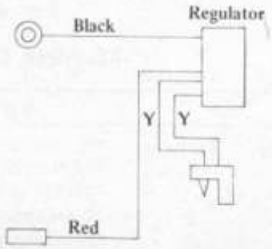
If the negative ohmmeter lead is connected to the black/white wire, and the test repeated, an infinite resistance should be obtained in all three cases. If the readings are not correct, the ignition rectifier is defective.

2. Using the R x 10 range, measure the resistance between the black/white lead and each of the light green leads one at a time. With the positive meter lead connected to the black/white lead and the negative to the light green leads, an infinite resistance should be indicated in all three cases. If the negative meter lead is connected to the black/white wire, and the positive to the light green wires, a resistance of about 35 Ω should be obtained in all three cases. If the readings are not correct, the ignition rectifier unit is defective.

REGULATOR/RECTIFIER

This unit accomplishes the dual purposes of voltage rectification (AC to DC) and voltage regulation. It functions in both ignition and charging circuits. The following tests may therefore determine the cause of a fault in either circuit.

1. To test this unit, use the R x 10 meter scale and measure the resistance across the black and the red leads. If the positive ohmmeter lead is connected to the black regulator lead, a resistance of



Regulator unit leads

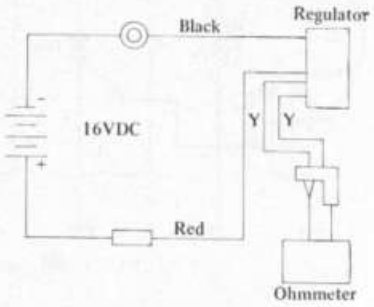
about 70 Ω should be obtained. If the connections are reversed, a resistance of about 1K Ω should be indicated.

2. Check the resistance between the black lead and each yellow lead, one at a time. If the positive meter lead is connected to the black regulator lead, a resistance of about 25 Ω should be obtained in each case. If the negative meter lead is connected to the black regulator lead, the resistance in each of the two cases should be about 1K Ω.

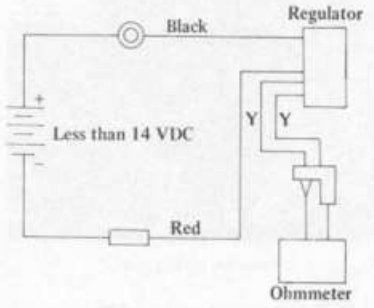
3. Check the resistance between the red lead and each of the yellow leads in turn (R x 10 range). Connecting the positive meter lead to the red wire should yield a resistance of 1K Ω at one yellow lead, and about 4K Ω at the other yellow lead.

Connecting the negative meter lead to the red wire should yield a resistance of about 25 Ω across each yellow lead.

4. Connect a 16v DC power source across the regulator black and red leads (positive battery terminal to the red lead).



Checking the regulator



Regulator test

Check the resistance across the yellow leads. Resistance should be infinite one way, and about 500 Ω when the ohmmeter leads are reversed.

5. Connect a DC source less than 14v across the black and the red regulator leads (positive battery terminal to the black lead), and connect the ohmmeter across the yellow regulator leads. Resistance should be infinite, and if the meter connections are reversed, an infinite resistance should also be obtained.

If the regulator fails any of the above tests, it is defective.

AC GENERATOR

The generator should be tested at normal operating temperature, but not when it is hot from operation.

1. Check the resistance between the two yellow leads. It should be 0.4 Ω.

2. Check the resistance between each yellow lead and ground. Resistance should be infinite.

3. Resistance between the blue and the green alternator leads should be about 5.0 Ω.

4. Resistance between the black generator wire and each of the white leads, in turn, should be 200 Ω. This tests the signal generator.

If readings are not correct, the alternator is defective.

IGNITION COIL

1. Resistance between the white coil lead and the coil core should be about 0.8 Ω.

## Charging System

*S-SERIES, KH 250*

The purpose of the charging system is to supply power to the battery to run the lights, horn, etc., as well as the ignition circuit, although the power required by the accessories is much greater than that used by the ignition coils and spark plugs.

The charging system consists of an AC generator (or alternator), a rectifier, and a voltage regulator.

The alternator consists of a permanently magnetized rotor, attached to the crankshaft, which turns inside a housing (or stator) to which three coils are attached, 120° apart. The coils are wired as shown in the illustration. As the magnetic rotor turns, a current is generated in the coils, the amount of which varies proportionally with the speed of rotation: the higher the rpm, the higher the output. This current is the alternating type. It is changed to direct current by the rectifier in order to charge the battery.

The output of the alternator must be controlled so that the battery is not overcharged when the machine is operated consistently at high rpm, or discharged when operated with a load on the system (lights, etc.). This control is accomplished by the voltage regulator, in this case a zener diode. When the output of the alternator exceeds the voltage required by the battery, the zener diode allows the excess to flow to ground.

1. In the event of charging system failure, the battery itself should be checked first. If the battery will not hold a charge or overcharges, test each cell with a hydrometer.
2. If the battery is in good condition, check that all electrical connections in the circuit are clean and tight.
3. If the battery overcharges, suspect the voltage regulator.
4. If the battery discharges, suspect the alternator, the rectifier, or the regulator.

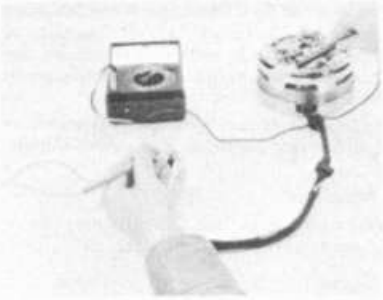
### Alternator

Alternator tests can be carried out with an ohmmeter.

1. Disconnect the alternator connectors at the voltage regulator and the rectifier. Check for continuity between the yellow, the pink, and the white leads testing two leads at a time. There should be continuity between all three because the coils are all connected. If there is no continuity between any two wires, the assembly must be replaced.



Checking for continuity between the stator leads



Checking for continuity between the stator leads and the housing

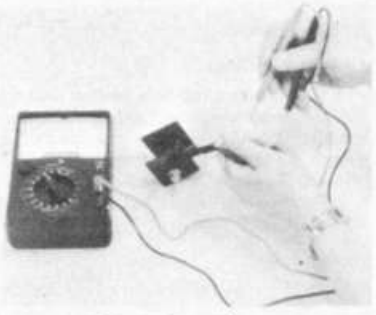
2. Check for continuity between each lead and the housing. There must be no continuity. If there is in any case, the assembly must be replaced.

### Rectifier

The rectifier can be checked with an ohmmeter or continuity light.

1. Disconnect the rectifier wiring at all points.
2. Hook up the negative tester lead to the black rectifier wire, and the positive lead to each yellow lead, one lead at a time. Note whether or not there is continuity. Current must either flow or not flow in all three cases. Now switch the tester leads so that the negative lead is connected to the yellow and the positive to the rectifier black lead and repeat the tests. In each case there must be continuity or no continuity all three times.

Now compare the two sets of tests. If there was current flow in the first series, there must be none in the second. If there was no current flow in the first series, there must be flow in the second. In other words, current must flow through the rectifier in one direction only. If both series showed continuity, or if neither of them did, the rectifier is defective.

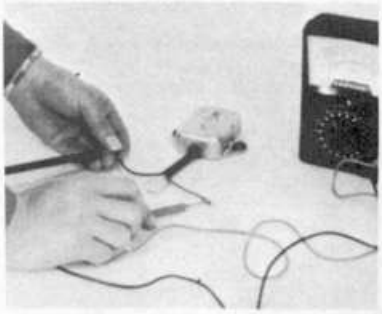


Testing the rectifier

### Regulator

The voltage regulator can be checked with an ohmmeter.

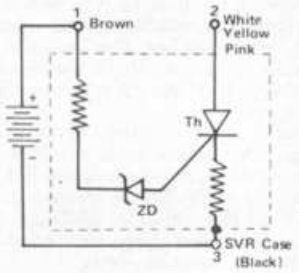
1. Disconnect the regulator wires and remove it from the motorcycle.
2. Check the resistance between the brown and the black lead. It should be more than 1K Ω.
3. Check for current flow in both directions between each of the regulator leads (white, yellow, pink) and the black lead.



Testing the voltage regulator

There should be no continuity shown in either direction.

4. Connect a 12v battery positive battery terminal to the brown lead, and negative battery lead to the black lead. Check that there is no current flow from the black to the brown lead.
5. Wire another battery in series with the first so that the total input is over 16v. Check for current flow from the brown to




Regulator test set-up

the black lead. If there is flow, the regulator is operating correctly.

When handling the voltage regulator, obey the following precautions:

1. Do not connect or disconnect the regulator unless the ignition switch is turned off.
2. The regulator mounting screws must be secure at all times, and all wiring must be correct.
3. A dead or almost dead battery will not allow the regulator to function properly. Check battery condition and charge or replace it as necessary.

*H1/A-D*

Both breaker point and CDI models are fitted with an alternator to charge the battery. The alternator consists of an electromagnetic rotor which turns inside a housing to which three sets of coils are attached. The movement of the magnetic field of the rotor through the coils generates an alternating current in them. The current is changed to direct current by the rectifier and used to charge the battery.

The amount of electrical power generated by the alternator is determined by the voltage regulator. This device maintains a voltage of 14.5 volts across the battery at high speed. The regulator varies the strength of the rotor's magnetic field. When field strength is high, alternator output is high, and vice versa, at a given rpm.

**Alternator**

The alternator can be tested with an ohmmeter.

1. Remove the alternator stator and rotor from the machine.



Checking for resistance between the alternator slip rings (H1)

2. Check the resistance between the rotor slip rings. Resistance should be 3.5–5.5 Ω. If resistance is lower than this amount, the rotor field coils are shorted. If infinite, there is an open circuit. In either event, the rotor must be replaced.

3. Check the condition of the rotor slip ring carbon brushes. The length of new brushes is 14 mm. If the length of the brushes is less than 9.5 mm, they should be replaced.

4. Check for continuity between each of the three yellow leads, two leads at a time. (If the leads were numbered, 1, 2, 3, check for continuity between 1–2, 1–3, and 2–3.) There must be continuity in all cases. If any test shows an open circuit, replace the stator assembly.



Checking for continuity between the stator leads

5. Check for continuity between the stator housing and each of the yellow leads. Resistance should be infinite. If there is current flow in any case, replace the stator assembly.

**Rectifier**

The rectifier can be checked with an ohmmeter or continuity light.

1. Check for continuity between each of the rectifier leads after removing it from the machine.

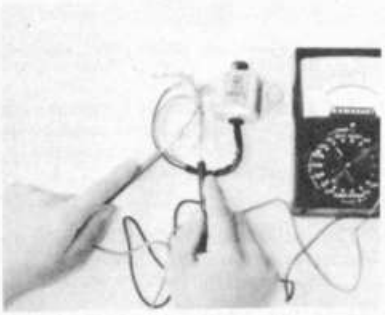
Yellow (3) to Black
Blue to Black
Red to Black
Blue to Yellow (3)
Red to Yellow (3)

In each case, there should be current flow when the tester leads are hooked up to each set of leads indicated above, but no current flow when the tester leads are reversed. Continuity in both directions or no continuity in either direction for the pairs of leads indicates a defective rectifier.

NOTE: *Be sure to test all three yellow leads and the other lead where shown.*

**Regulator**

An ohmmeter or a DC voltmeter can be used to check the regulator.



Checking the voltage regulator

1. After removing the regulator from the machine, measure the resistance between the brown and the black leads. Resistance should be 53–55 Ω. If the resistance is not within 10% of this value, replace the regulator.

2. Install the regulator on the motorcycle, secure it, and be sure that all connections are correct. Start the engine and rev to 5,000 rpm. At this point a voltmeter connected to the positive battery terminal and ground should indicate 14–15 volts. If voltage is incorrect, replace the regulator.

NOTE: *This test assumes that the battery and the alternator are in good condition. Check them first before replacing the regulator.*

*H1–E/F, KH500*

**Charge Windings**

1. Disconnect the two yellow wires at the two-lead plug, and check resistance (on the alternator side of the circuit) between the two yellow wires. It should be about 0.25 ohms.

2. If this reading is not obtained, the stator must be replaced.

**Distributor**

1. Remove the alternator cover and the plate for the brushes and pick-up coils.

2. Clean the slip rings thoroughly.

3. Check the resistance between the outer ring and the separated section of the inner ring. Resistance should be infinite. If not, replace the rotor.

4. Check resistance between the inner ring and the rotor shaft. Again, resistance must be infinite or replacement of the rotor is necessary.

**Brushes**

1. A wear-limit line is marked on each brush and they should be replaced when worn to this mark.



Checking resistance between the inner and outer slip-rings



Checking resistance between the inner ring and the rotor shaft

**Regulator**

1. The regulator may be checked in place on the motorcycle. For the test to be valid, the battery must have a charge of at least 13v.

2. The regulator is mounted inside of the left side cover. Disconnect the red lead from the regulator and connect the positive lead of an ammeter (12a range) to the red lead coming from the regulator and the negative tester lead to the red lead from the battery.

3. Connect a 30v DC voltmeter, positive lead to the battery positive terminal, negative lead to the battery negative terminal.

4. At idle, current should be less than 2a, and voltage 14.5–15.5v.

5. At 3,000 rpm, readings should be the same.

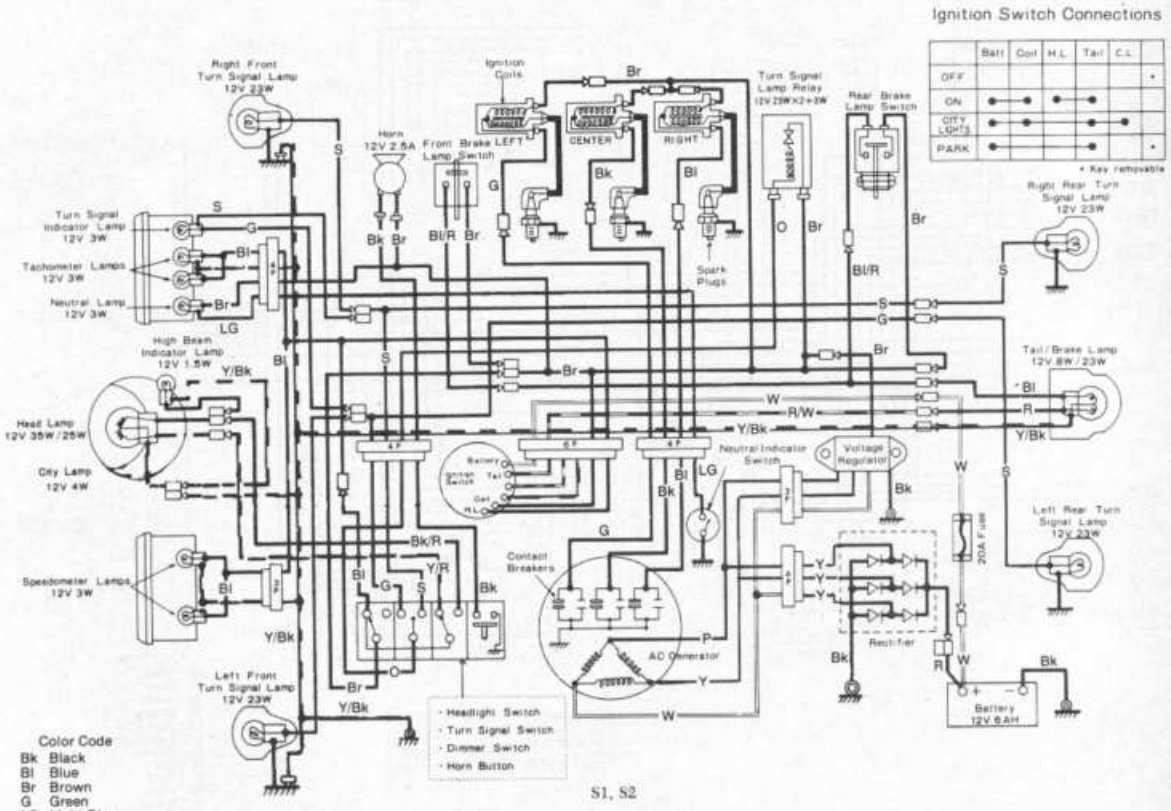
6. With the headlight on low-beam, and at idle, current should be less than 5a, voltage 12–13v. At 3,000 rom, current should be unchanged, and voltage 14.5–15.5v.

7. Assuming that the alternator, battery, etc., are in good condition, the regulator is defective if these readings are not obtained.

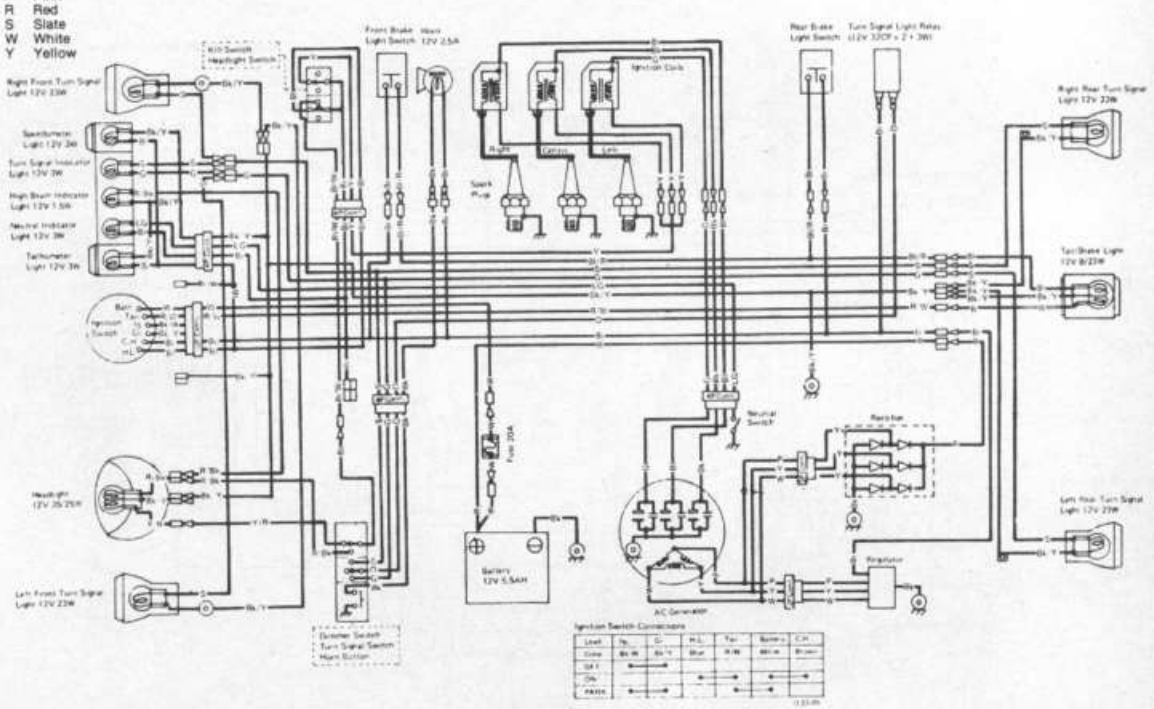
*H2*

Tests for the H2 charging system components are included in the preceding "CDI (H2)" section, due to the construction of this motorcycle's electrical system. The "magneto" or alternator which powers the ignition circuit also charges the battery after its output is changed to direct current by the rectifier. The rectifier also accomplishes voltage regulation. This is not to be confused with the "ignition rectifier" which functions only in the ignition circuit.

## Wiring Diagrams

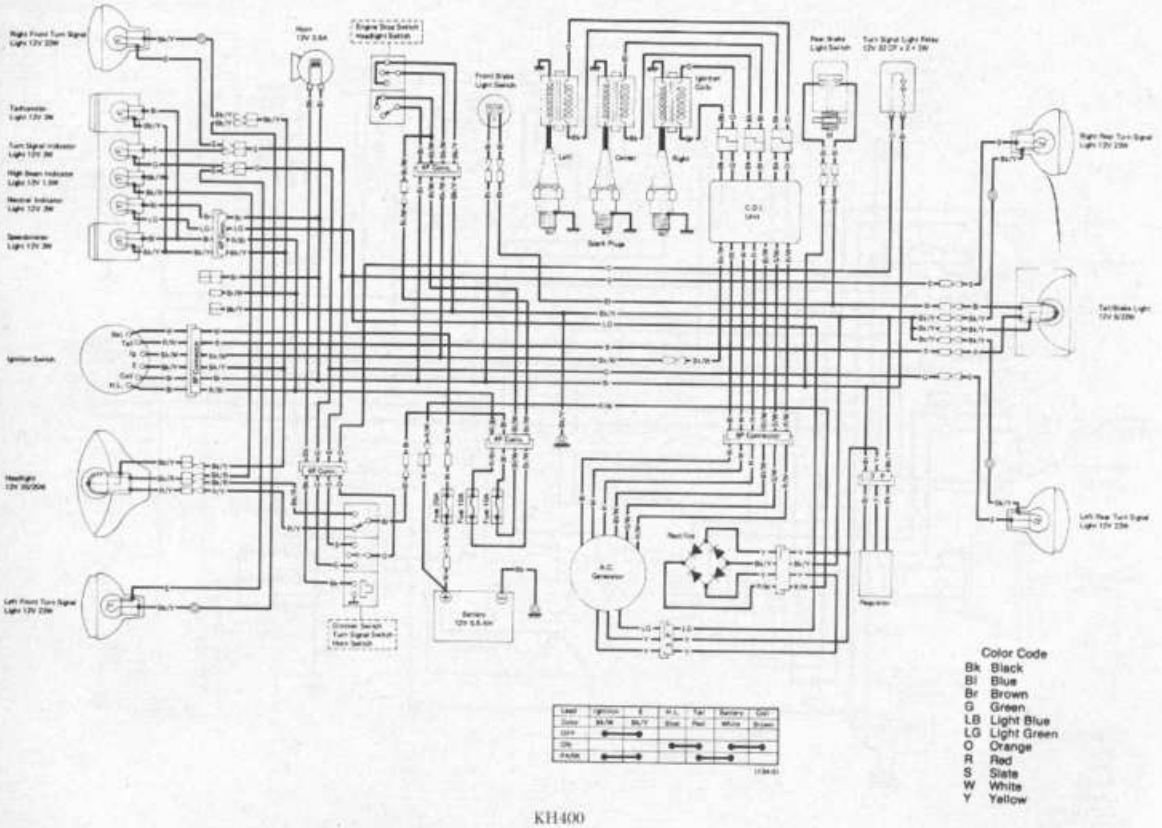



S1, S2

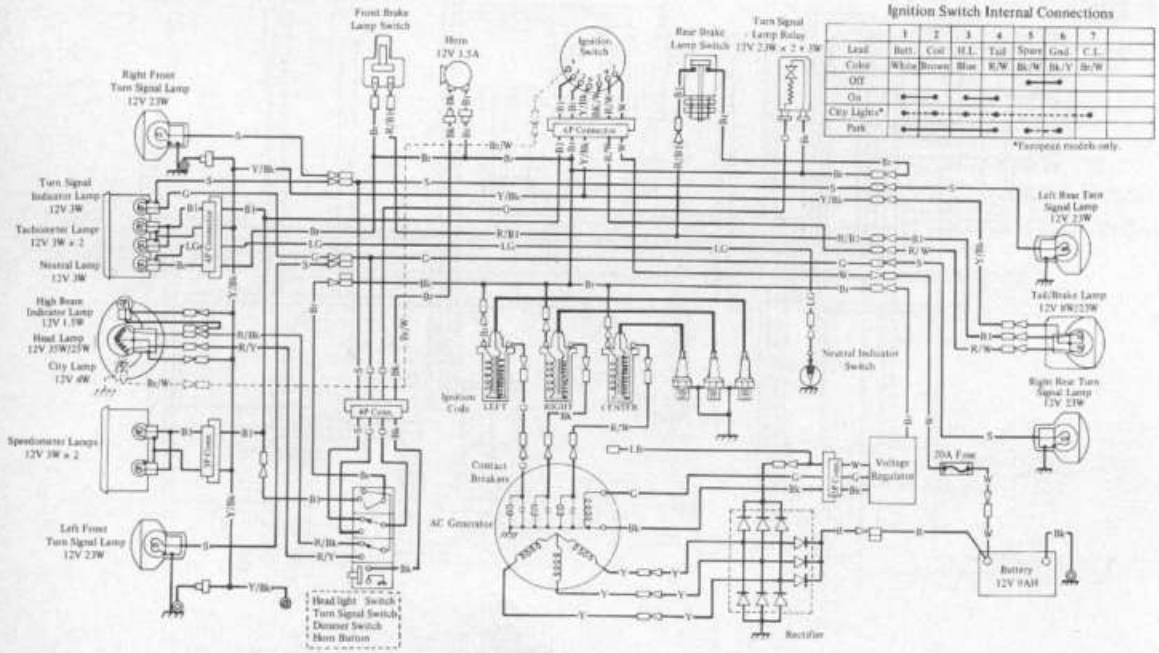


S1-R/C, KH250, S3

## Wiring Diagrams

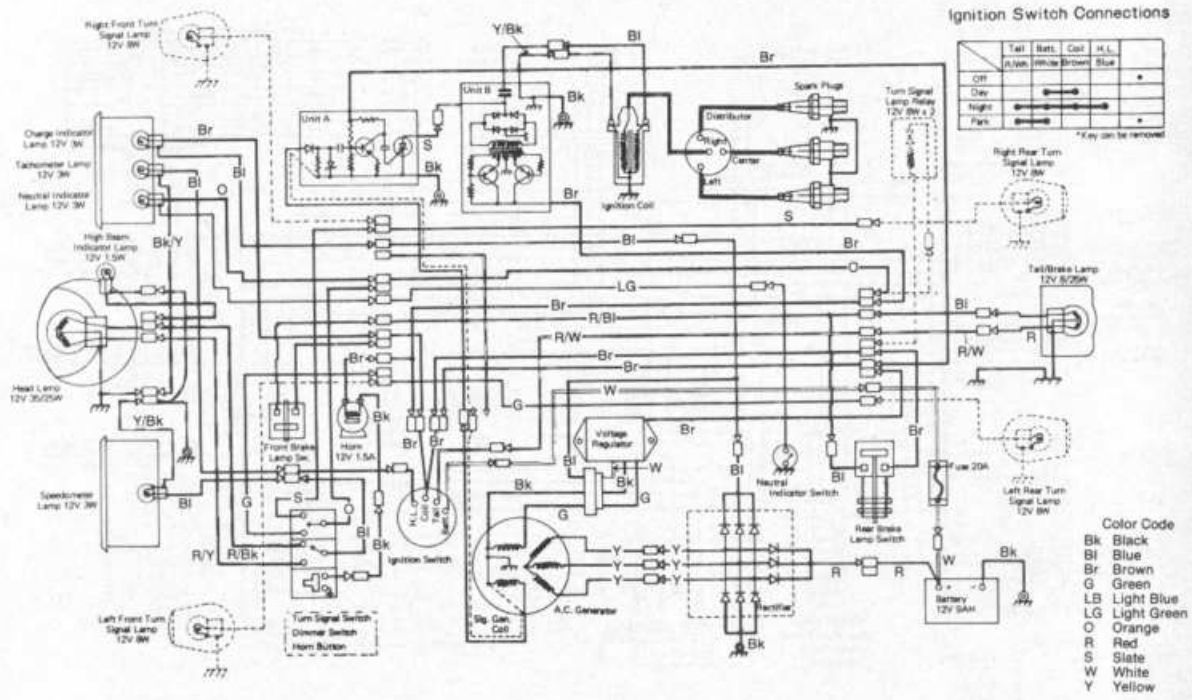



KH400

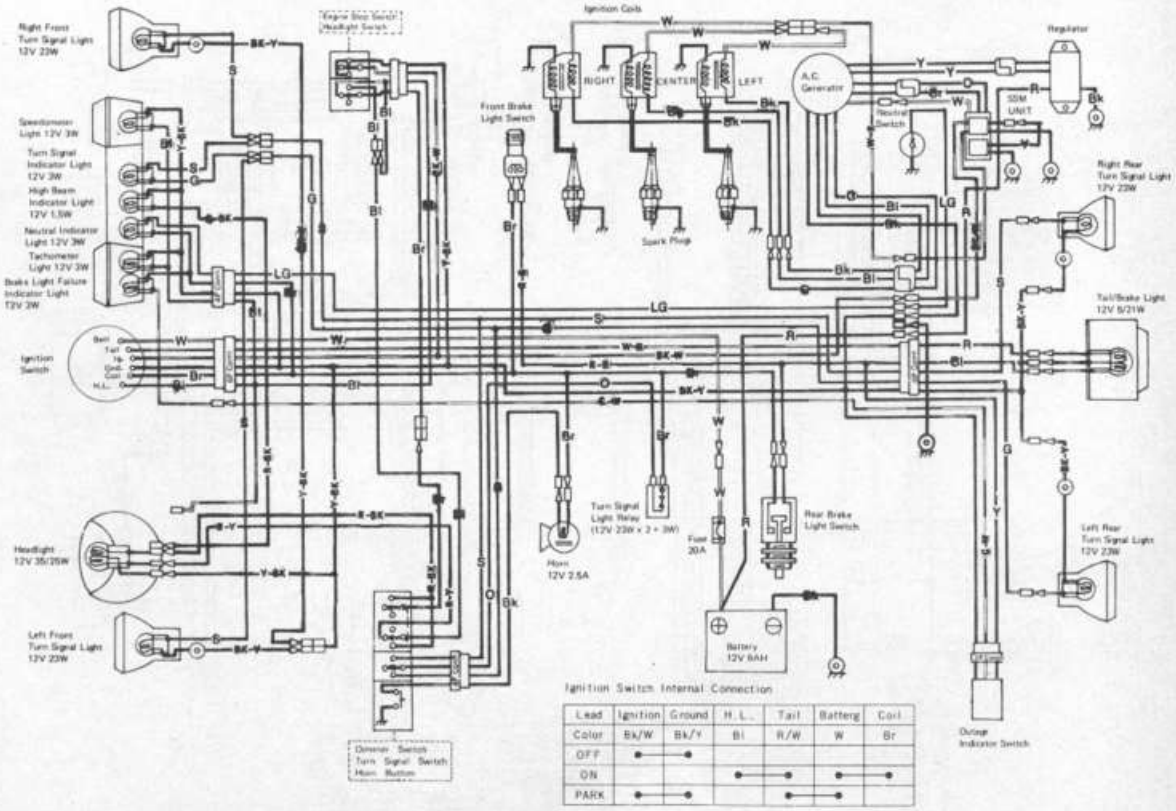



H1, Breaker point ignition

## Wiring Diagrams

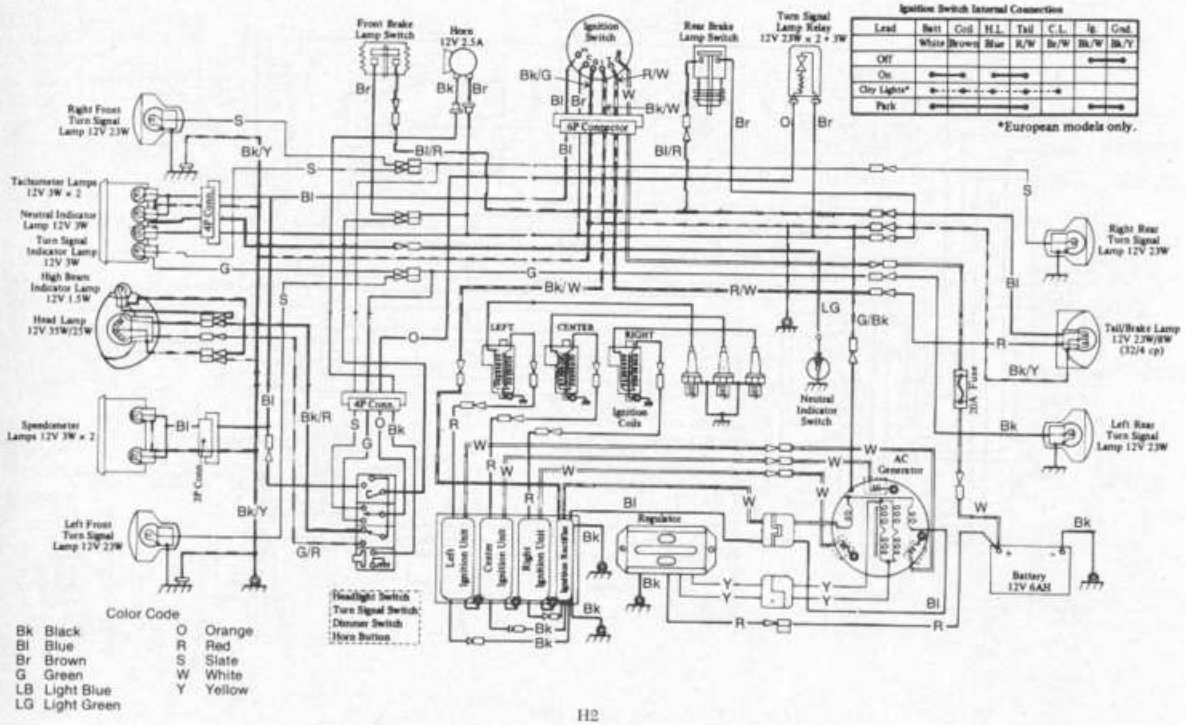



H1, Battery CDI

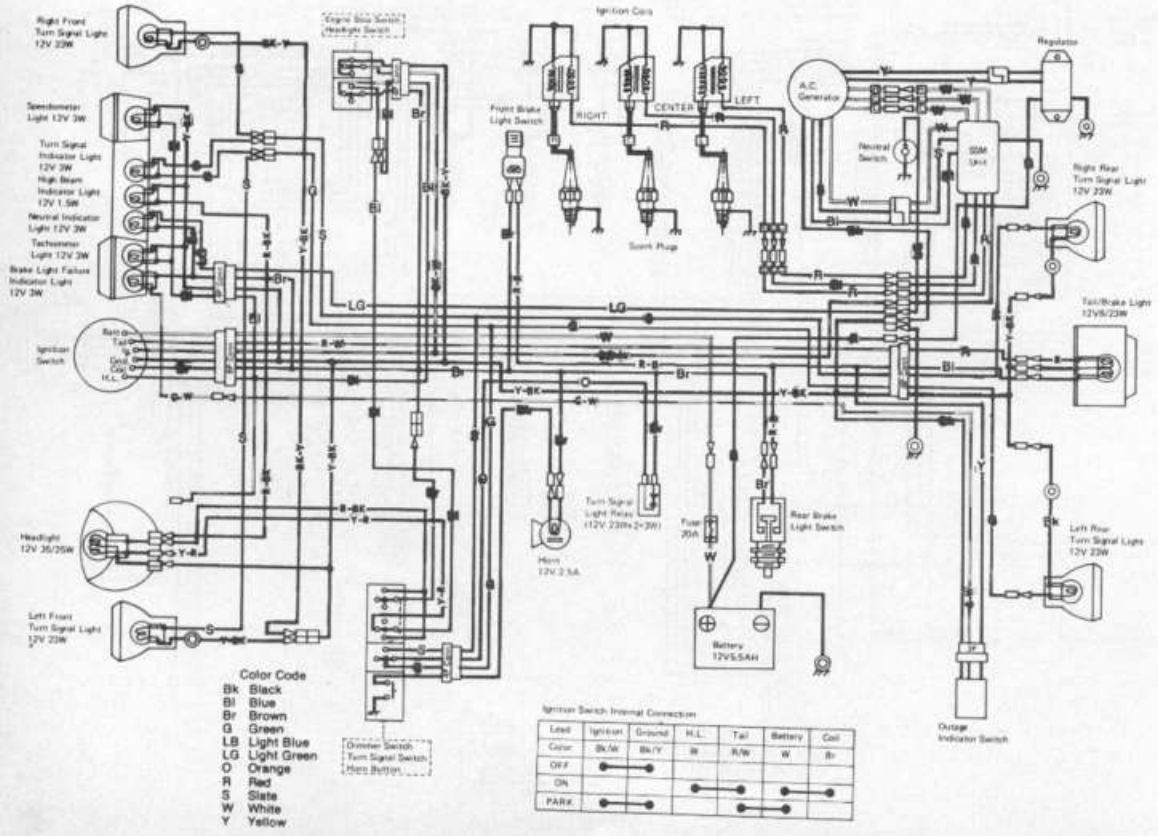



*H1-E/F*, KH500

## Wiring Diagrams




H2




H2-B/C

# Chassis

## Wheels, Brakes

*FRONT WHEEL REMOVAL AND INSTALLATION*

**Front Drum Brake**

1. Support the front wheel off the ground by placing a crate or another suitable object beneath the engine.
2. Disconnect the brake cable from the brake lever and the brake plate.




Disconnecting the speedometer cable

3. Remove the speedometer cable from the brake plate after removing the inner cable securing bolt.
4. Remove the cotter pin from the axle and remove the axle nut. Loosen the fork slider pinch-bolt.
5. Withdraw the axle, and remove the front wheel assembly.

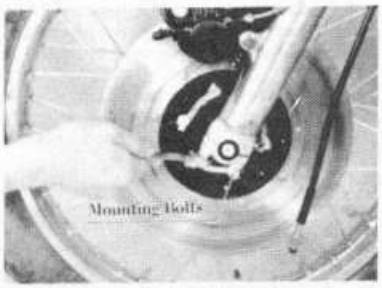



Loosening the axle pinch bolt

6. To install, hold the front wheel assembly between the fork legs with the slot in the brake plate engaged with the tab on the fork slider, and slip the axle into place.
7. Hold the axle from turning with a phillips head screwdriver, and install the flat washer and axle nut. Torque the axle nut to 48–61 ft lbs then back the nut off until a slot in the nut lines up with a hole in the axle. Install a new cotter pin to secure the axle nut.
8. Tighten the axle pinch-bolt located on the bottom of the fork slider.
9. Install the front brake cable and adjust the cable.

**Front Disc Brake**

1. Place a crate or another suitable object beneath the engine so that the front wheel is raised at least 2 in. off the ground.
2. Unscrew the speedometer cable from the drive housing on the brake plate.




Removing the axle capnuts

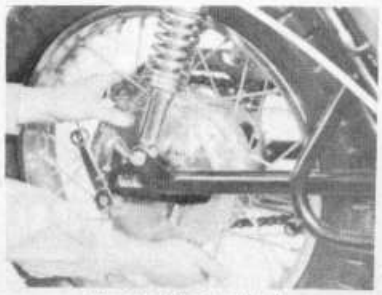
3. Remove the two bolts from each of the axle caps and remove the front wheel.
4. To install, hold the wheel in place and replace the axle caps. Do not tighten the caps at this time.
5. Fasten the speedometer cable to the drive housing, and position the drive housing so that the speedometer cable does not have any sharp bends. Then tighten the axle caps.

CAUTION: *The axle caps are machined unevenly (one side is slightly higher than the other) the high side MUST face the front. The front bolts should also be tightened first starting on the disc side so that a small even gap exists between the bottom of the fork slider and the rear of the axle cap. If in doubt which side is the high side, place a straightedge across the top of the cap; the high side should be apparent. On late models, the caps are marked with an arrow which must point towards the front of the motorcycle.*

*REAR WHEEL REMOVAL AND INSTALLATION*

**250–500**

1. Remove the right pair of mufflers by loosening the connection at the header pipe and removing the front muffler mounting bolt and the right rear footpeg.
2. Unscrew the brake adjuster nut. Depress the brake pedal and disconnect the brake cable or rod from the brake plate lever. On cable-operated brakes, disconnect the cable from the brake lever and disconnect the cable adjuster from the holder on the brake plate. Remove the spring (if fitted) and place it along with the adjuster nut and clevis pin in a safe place.

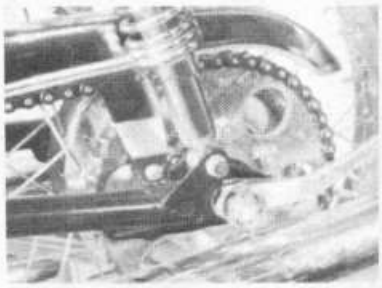


Removing the rear wheel

3. Loosen the chain adjuster locknut on each adjuster. Then back off the adjuster bolts to allow some free-play of the rear wheel. Remove the cotter pin from the axle. Disconnect the brake anchor from the brake plate.
4. Remove the axle nut, axle, and right chain adjuster. The wheel can now be removed leaving the sprocket in place.
5. To install, place the rear wheel in position and install the right chain adjuster and the axle.
6. Adjust the chain.
7. Connect the brake anchor to the brake plate, tighten the nut firmly and install a new cotter pin. Tighten the axle nut to a torque of 48–61 ft lbs.
8. Connect the brake cable or rod to the brake lever and brake plate, adjust the brake.

**750**

1. Remove the right pair of mufflers by loosening the connection at the header pipe, and removing the front muffler mounting bolt and the right footpeg.
2. Remove the cotter pin and nut from the brake anchor and separate the brake anchor from the brake plate.



Removing the axle nut (H2)

3. Remove the cotter pin and axle nut from the axle.
4. Loosen the chain adjusters so that the wheel can be moved forward and the chain lifted off the sprocket.
5. Remove the axle. The wheel assembly can now be removed.



Lifting the chain off the sprocket (H2)

6. To install the wheel assembly, wrap the chain around the sprocket. Hold the chain adjusters and wheel in place, and slip the axle through.
7. Adjust the chain free-play. Connect the brake anchor to the brake plate, and install a new cotter pin.
8. Tighten the axle nut to a torque of 83.2–90.4 ft lbs, then back it off until a

slot in the axle nut is in line with a hole in the axle. Install a new cotter pin.

9. Connect the brake rod to the brake lever, and adjust the brake pedal free-play.

*SPROCKET ASSEMBLY*

The rear sprocket assembly consists of the sprocket, sprocket hub, sprocket hub bearing, and the rubber dampers which will remain in the wheel when it is removed.

**Removal and Disassembly**

1. Disconnect the drive chain. Unscrew the large sprocket hub nut and remove the assembly from the swing arm.
2. Bend down the tabs on the sprocket nut locking plates. Unscrew the nut and remove the sprocket from the hub.



Removing the sprocket hub

3. To remove the hub bearing, first remove the sprocket shaft by tapping it out from the sprocket side of the hub. Use a plastic mallet or block of wood so that the sprocket shaft threads will not be damaged when struck.
4. Take off the sprocket shaft collar.
5. Use an elbow-shaped tool to pry out the oil seal. If the oil seal is damaged on removal, as is likely, a new one must be fitted.
6. Drive the bearing out toward the sprocket side of the hub with a suitable drift or bearing driver. Tap the bearing evenly around its circumference to avoid distorting the hub.

**Inspection**

1. For bearing inspection and lubrication, refer to "Wheel Bearings," below.
2. Check the condition of the sprocket. If the sprocket is warped, or if the sprocket teeth are worn or hooked, the sprocket should be replaced along with the chain and the countershaft sprocket.
3. Check the condition of the sprocket nuts, bolts, and locking plates. Replace any nuts or bolts with rounded flats, stripped threads, or those which are bent or cracked. Bolts must be tightened securely upon installation. It is also recommended that they be secured with a thread locking compound. The locking plates must not have fatigued or cracked edges, since these are used to lock the nuts in place. Replace the plates if damaged in any way.
4. Check the condition of the oil seal and replace it if the lips are damaged.
5. Inspect the sprocket shaft for broken or stripped threads.
6. Check the condition of the rubber dampers in the wheel hub. These take up any driveline shocks when the clutch is released and have an important effect on chain and sprocket life. Replace any damper which is hardened, crushed, or damaged.

In instances where the damper is a tight fit in the hub, some engine oil or dishwashing liquid can be used to facilitate removal and installation.

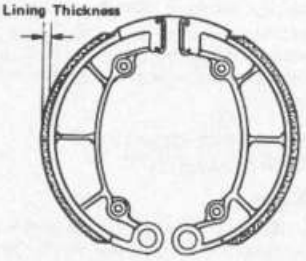
**Assembly**

1. Assembly is the reverse order of disassembly procedure.
2. Lubricate the bearing as described in "Wheel Bearings," below. The bearing should be driven into place with a bearing driver or a suitable substitute.
3. Grease the lips of the oil seal before installation. The seal should be pressed into the hub with care.
4. Tap the sprocket shaft into the hub from the wheel side.
5. When connecting the chain masterlink, install the spring clip closed end facing the direction of chain rotation. Tighten the sprocket hub nut securely.

*DRUM BRAKE SERVICE*

All models use a single-leading shoe rear brake, while, a twin-leading shoe is used on the front brake. Kawasakis use brakes in which the lining is bonded to the brake shoe, therefore, are purchased and replaced as a single unit.

1. Brakes can be inspected in place on the brake plate.

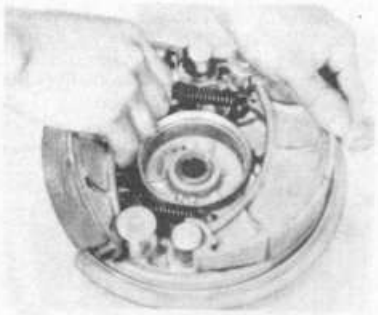



Check lining thickness

2. Inspect the shoes for wear. There should be at least 0.12 in. (3 mm) of lining material left (measured at the lining's thinnest point) or the shoes must be replaced.
3. Use a large vernier caliper to measure the inside diameter of the brake drum. If the diameter is found to be less than the service limit given in the "Chassis Specifications" chart, the hub should be replaced.
4. Inspect the linings for scoring or grooves. These may be caused by particles of dirt which have entered the drum. If badly scored, the shoes should be replaced. If scoring of the shoes is evident, it would be wise to inspect the brake drum for the same type of damage.

Be sure that there is no oil or grease present on the brake linings. Oil-impregnated linings must be replaced. If the linings do show this condition, determine the source of the lubricant: defective wheel bearing oil seals, excessive chain lube, etc.

5. If the linings are usable, rough up the surface with a piece of coarse sandpaper. Then clean the linings thoroughly with alcohol or laquer thinner. Clean the brake drum with the same solvent.
6. To disassemble the brake plate, simply grasp each shoe and fold them toward the center of the brake plate. They may be installed in the same manner.



Removing the brake shoes from the brake plate

7. Remove the brake lever pinchbolt(s) and pull the lever(s) off the splined brake camshaft(s).

NOTE: *The plurals refer to the twin-leading shoe brakes.*

8. Push the brake cam(s) out of the brake plate from the outside using hand-pressure or by tapping with a plastic mallet. Remove the dust seals (if fitted) from the brake plate.
9. Check that the brake lever pinchbolts are not bent. This can easily happen if they are overtightened. Replace any bolts which are in this condition. Inspect the brake lever splines and replace the lever(s) if these are worn or torn.
10. Inspect the splines on the brake cam(s). These should be in good condition. Check that the brake cams are not bent and that they can rotate freely in the brake plate passage. If it will not, use a fine grade of sandpaper on the camshaft and the surface of the brake plate passage.
11. Clean the cam(s) thoroughly in a solvent to remove any old grease, rust or corrosion. Use sandpaper or emery cloth to polish the cams. Clean off any residue; before reassembly, smear the cams with chassis grease.
12. Inspect the brake plate for cracks or fractures, and replace it if necessary.
13. On twin-leading shoe brakes, the brake plate linkage should be checked. The connecting rod is secured to each brake lever by a clevis pin and cotter pin. These pins can be removed after the cotter pin is taken off. They should be checked for wear, especially on high mileage machines, and replaced if necessary.
14. Check the condition of the brake springs, noting any twisted or fatigued hooks. Replace any broken, rusted, or old springs with new ones. Be sure that the lever springs are in good condition. Check the length of the brake springs against the specification given in the "Chassis Specifications" chart.

15. Clean all parts thoroughly with a suitable solvent, making a special effort to remove the dust and built-up dirt from the brake plate.

16. When reassembling the hub, note the following points:

a. Ensure that the brake cams are lubricated with chassis grease and that any shims which were on the cams are in place;

b. The use of new dust seals is recommended;

c. Lubricate the brake shoe pivot points with a little grease;

d. Install the shoes as on removal. Hook them together with the springs, and fold them down over the brake cam(s) and pivot(s).

On twin-leading shoe brakes, position the front brake lever so that it forms a 90° angle with the brake cable when the shoe begins to contact the drum. Position the rear lever parallel to the front lever. Adjust the linkage as described in "Maintenance."

*BRAKE DRUMS*

1. Upon disassembly of the hub, inspect the brake drum surface for condition. The drums must be clean and free from score marks or rust.

2. Rust can be removed from the drum surface with sandpaper. Polish the surface until it is shiny, then clean it thoroughly.

3. Alcohol or lacquer thinner can be used to remove dirt or deposits from the drum.

4. The drum should be checked for concentricity. An out-of-round condition is usually noticeable as an on-off-on feeling when the brake is applied while riding. With the wheel assembly mounted on the machine, spin the wheel while applying the brake very lightly. The rubbing noise of the brakes against the drum should be heard for the entire revolution of the wheel.

5. An out-of-round condition and most scoring can be removed by having the drum turned on a lathe. If the rim needs to be trued, have this done before any work on the drum is performed, as the action of the spokes while truing the rim may further aggravate the drum warpage.

*DISC BRAKE SERVICE*

When handling disc brake fluid, observe the following cautions:

a. Brake fluid absorbs moisture very quickly, and then becomes useless. Therefore, never use fluid from an old or unsealed container;

b. Brake fluid will quickly damage paint. Place a protective cover on the gas tank;

c. Use only DOT #3 or DOT #4 brake fluid.

**Flushing**

The brake system should be flushed out every 8,000 miles, or once a year.

1. Attach a length of vinyl tube to the bleed screw on the brake caliper, and put the other end into a small container.

2. Remove the master cylinder cap, and the diaphragm. Loosen the bleed screw. Pull the brake lever slowly to the handgrip. Repeat until the master cylinder is almost empty.

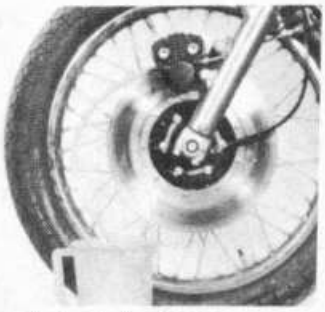
3. Add new brake fluid to the master cylinder and continue squeezing and releasing the brake lever until the new fluid begins to come out of the vinyl tube. Bleed the system as outlined below.

**Bleeding**

1. Needed for this operation are a torque wrench, a small cup, and a vinyl tube.

2. Be sure that the reservoir is topped up. After checking the reservoir level, replace the diaphragm.

3. Connect the vinyl tube to the bleed screw on the caliper, making sure that it is a tight fit; then insert the other end of the tube into a small container with several inches of brake fluid in it. Be sure that the end of the tube is below the level of the fluid in the container.



Bleeding the front disc brake

4. Apply the brake lever *slowly* several times, then hold it ON.

5. While holding the brake lever on, loosen the bleed screw. The brake lever will be pulled toward the handgrip. Close the bleed screw BEFORE the lever bottoms out on the handgrip.

6. Repeat the procedure until the fluid issuing from the lower end of the tube is completely free of air bubbles.

NOTE: *During the operation, keep a check on the reservoir fluid level, maintaining it near its normal position.*

7. Tighten the bleed screw to 4.5–6.7 ft lbs.

8. Top up the reservoir to the level line.

**Pad Replacement**

TWO-PIECE CALIPER

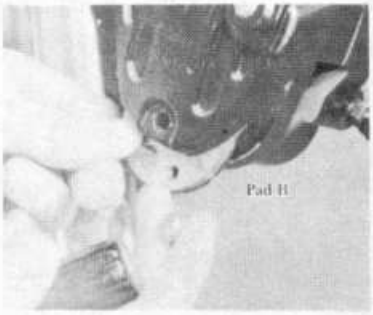
1. Remove the front wheel.

2. Remove the phillips head screw from the back of the inside caliper half, and remove the inside pad (pad B).

3. Squeeze the brake lever carefully until the outside pad (pad A) can be removed. Do not force the piston out more than is necessary.

4. Inspect the pads for wear. If either pad is worn past the red line, replace both pads as a set.

5. Inspect the pads for score marks.




Removing the inner brake pad

Minor scoring can be removed with sandpaper. Be sure that there is no oil or grease present on the pads. Fluid-impregnated pads must be replaced.

NOTE: *The pads should always be replaced as a set.*




Open the bleeder valve and push in the outer pad "A"

6. To install, open the bleeder valve slightly to relieve pressure, then push the piston in all the way and close the valve. Be prepared for brake fluid to exit the bleeder valve when the piston is forced in.

7. Install the outside pad (pad A), making certain that the groove in the pad is aligned with the positioning pin.

8. Install the inside pad (pad B), apply thread locking compound to the securing screw and install the screw.

9. Install the front wheel. Check the fluid level in the master cylinder. Note that fitting new pads in the place of a pair which were considerably worn will result in a rise in the reservoir fluid level. If it gets too high, drain off any excess fluid via the caliper bleed screw. If the brake lever feels soft or spongy, the brake should be bled.

10. Avoid hard application of the brake for about 50 miles until the new pads are seated.

ONE-PIECE CALIPER

1. Remove the front wheel.

2. Remove the mounting screw for the inner pad (pad B) and take off the metal plate. Remove the pad.

3. Push the caliper body to the right side of the motorcycle and take out the outer pad (pad A). If removal is difficult, gently apply the brake lever until the pad is forced out.

4. Check the pads for wear and replace them, as a set, if either is worn to the red wear limit line.




On one-piece calipers, remove the mounting screw to take out pad B

5. Check for score marks. Minor scoring can be removed with sandpaper. Be sure there is no oil or grease present on the pads. Fluid-impregnated pads must be replaced.

6. To install the pads, loosen the bleeder valve slightly and push in the piston as far as possible. Tighten the valve. Install pad A. Install pad B, aligning the pad tongue with the groove in the caliper. Fit the plate. Secure the screw with a thread locking compound (non-permanent).

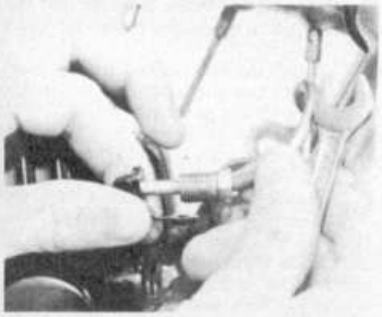
7. Check fluid level and bleed front brake.

8. If new pads are fitted, avoid hard application of the brake for about 50 miles.

### Two-Piece Caliper

#### Removal and Disassembly

1. Disconnect the brake line pipe from the caliper half, place the rubber cap from the bleeder valve over the end of the brake line to prevent dirt from entering the system.



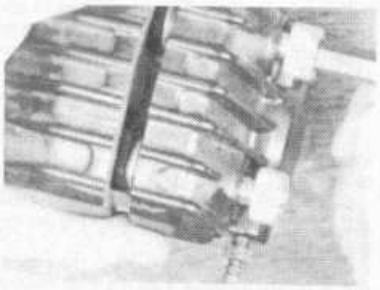
Plug the end of the brake line with the bleeder valve cap to prevent fluid loss

2. Loosen the two allen head shafts a few turns. Remove the two mounting bolts holding the caliper to the fork slider, and remove the caliper.




Loosen the allen bolt shafts before removing the caliper mounting bolts

3. Remove the pads from the caliper. Unscrew the two allen head shafts evenly, and then remove the inside caliper half and the caliper mounting bracket, pulling them straight off. Pull the allen head shafts from the outside caliper, being careful not to damage the shafts or the O-rings.



Unscrew the shafts evenly.

4. Remove the band and the dust seal from the piston in the outside caliper half.

5. The piston can be removed from the outside caliper half by blowing compressed air into the brake line inlet. If compressed air is not available, reconnect the brake line and pump the brake lever to force the piston out.

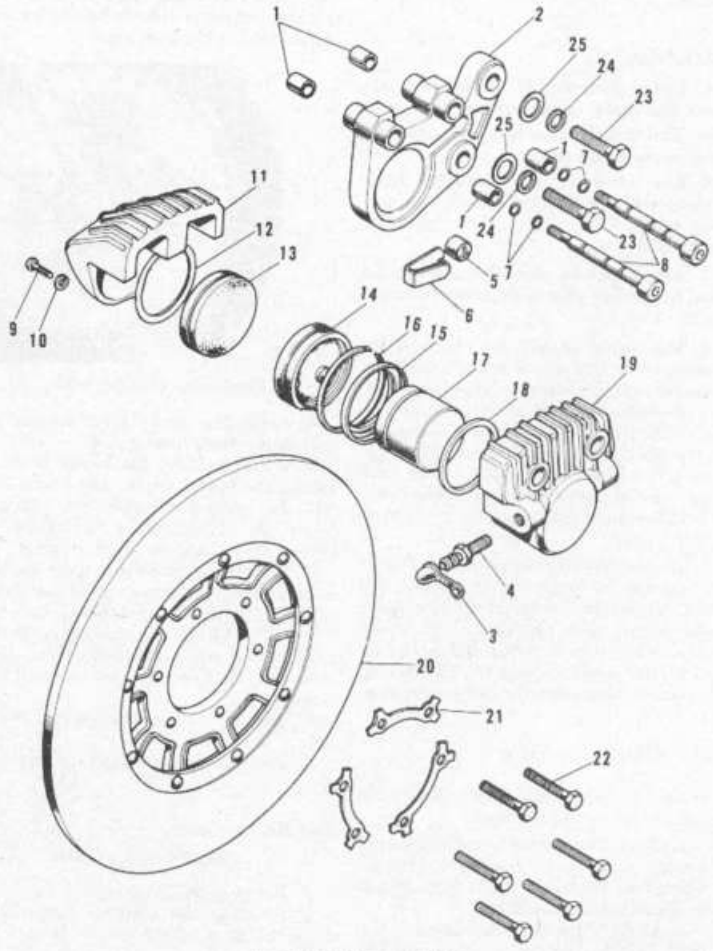
NOTE: *These are the only recommended methods for removing the piston.*

6. Remove the piston ring from the cylinder.

#### Inspection

NOTE: *Caliper components should be kept free of any solvent. Parts should be cleaned only in brake fluid.*

1. Inspect the piston for scoring along the sides or for other signs of wear. Replace as necessary.




Two-piece caliper assembly

1. Dust seal
2. Caliper mounting
3. Bleeder valve cap
4. Bleeder valve
5. Bushing
6. Stopper
7. O-ring
8. Shaft
9. Screw
10. Lockwasher
11. Caliper B (inner)
12. Ring
13. Pad B (inner)
14. Pad A (outer)
15. Dust seal
16. Band
17. Piston
18. Ring
19. Caliper A (outer)
20. Disc
21. Lockwasher
22. Bolt
23. Bolt
24. Lockwasher
25. Washer

2. Replace any damaged seals in the unit. All seals should be replaced every two years regardless of appearance.

3. Refer to the chart at the end of this section for specifications.

### Assembly and Installation

1. Clean the components in brake fluid, be sure to clean the ring groove inside the cylinder.

2. Lubricate the piston ring and piston with fresh brake fluid, and insert them into the cylinder in that order. Push the piston in as far as possible.




Removing the dust seal

3. Install the dust seal and band onto the piston. These parts should be kept free of oil or brake fluid.



Joining the caliper half and mounting bracket

4. Install two O-rings on each of the allen head shafts. Coat the area between the O-rings with PBC (PolyButyl-Cuprysil) grease before inserting the shafts into the outside caliper (caliper A).

5. Install two dust seals in the caliper mounting, and slide the mounting over the shafts. The dust seals should fit around the outside of the mounting as shown.

6. Install the other set of dust seals onto the shafts, then install the inside caliper while screwing the allen head shafts into it evenly to a torque of 22–26 ft lbs. Check that the caliper moves smoothly on the shafts. Install the pads.

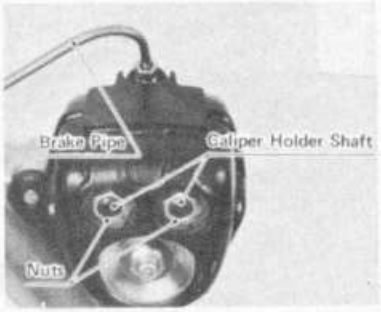
7. Mount the caliper on the fork slider, torque the mounting bolts to 18–24 ft lbs, then connect the brake line. Bleed the brake system as previously described.

## One-Piece Caliper

### Removal

1. Remove the front wheel.

2. If the caliper is to be disassembled, remove the two caliper holder shaft nuts on the wheel side of the caliper.




Loosen the caliper holder shaft nuts before removing the caliper mounting bolts

3. Disconnect the brake line from the caliper and cap the end with the bleeder valve cap to prevent fluid loss.

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

### Disassembly

1. Remove the screw, metal plate, and inner pad.

2. Remove the caliper holder shaft nuts which were loosened previously and take out the shafts carefully and equally to avoid damaging the dust covers.

3. Remove the caliper holder and the pad.

4. Remove the piston dust seal.

5. Block the caliper opening with a clean, heavy cloth. Apply compressed air to the brake line fitting to push out the piston. If not available, reconnect the brake line to the caliper and apply the brake lever to push out the piston. Be prepared for spilled fluid.

6. Remove the fluid seal with a hooked tool, taking care that the caliper bore is not damaged.

### Inspection

1. Clean caliper components in clean brake fluid only. Do not use solvents.

2. Check the piston for scuffing or imperfections and replace it if damaged.

3. Replace the piston seal as a matter of preventive maintenance, and dust covers and o-rings if damaged.

4. Refer to the chart at the end of this section for caliper specifications.

### Assembly

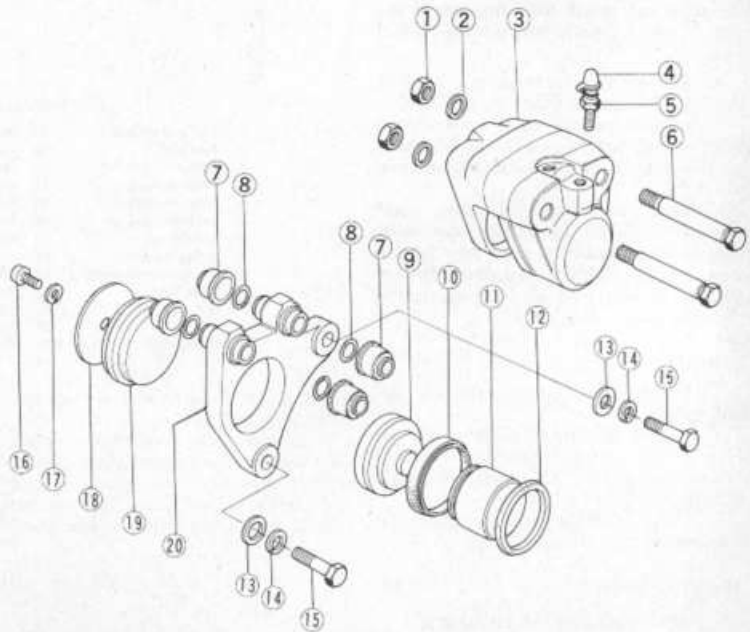
1. Fit the fluid seal into the caliper.

2. Lubricate the outsides of the piston with clean brake fluid and push it carefully into the caliper by hand as far as possible.

3. Fit the dust seal into its groove.

4. Apply a light coat of high-temperature waterproof grease (PBC) to the holder holes and caliper holder shafts. With the dust covers and o-rings and caliper holder in place, carefully insert the shafts, turning them as they are inserted.

5. Fit the spacers to the shafts, pro-



One-piece caliper assembly

1. Nut
2. Spacer
3. Caliper
4. Bleeder valve cap
5. Bleeder valve
6. Caliper holder shaft
7. Dust cover
8. O-ring
9. Pad A
10. Dust seal
11. Piston
12. Piston seal
13. Washer
14. Lockwasher
15. Caliper mounting bolt
16. Mounting screw
17. Lockwasher
18. Metal plate
19. Pad B
20. Caliper holder




Assembling the caliper components

truding side facing the caliper. Screw on the nuts, tightening them to the proper torque after installing the caliper on the fork slider.

6. Install the pads as outlined in "Pad Replacement" preceeding.

INSTALLATION

1. Tighten the caliper mounting bolts to 25–33 ft lbs.
2. Tighten the caliper holder shaft nuts to 17.5–20 ft lbs.
3. Connect the brake line to the caliper and tighten the fitting to 12–13 ft lbs.
4. Check fluid level in the master cylinder and bleed the brake.

### Brake Disc (Early)

1. Check the disc for run-out by securing a dial gauge to the fork slider. If run-out is 0.012 in. (0.3 mm) or more, remove the disc and check for warpage. If the disc is not warped, suspect the wheel bearings.

2. Measure the disc thickness. Replace the disc if less than 0.217 in. (5.5 mm).

3. To remove the disc, remove the front wheel, bend down the locking tabs on the disc securing bolts, and remove the bolts.

4. When installing the disc, care should be taken to tighten the bolts evenly and gradually until the proper torque of 12–16 ft lbs is reached. Ensure that the locking tabs are bent up against the flats on the disc bolts.

### Brake Disc (Later)

The "later" disc is used with the one-piece caliper.

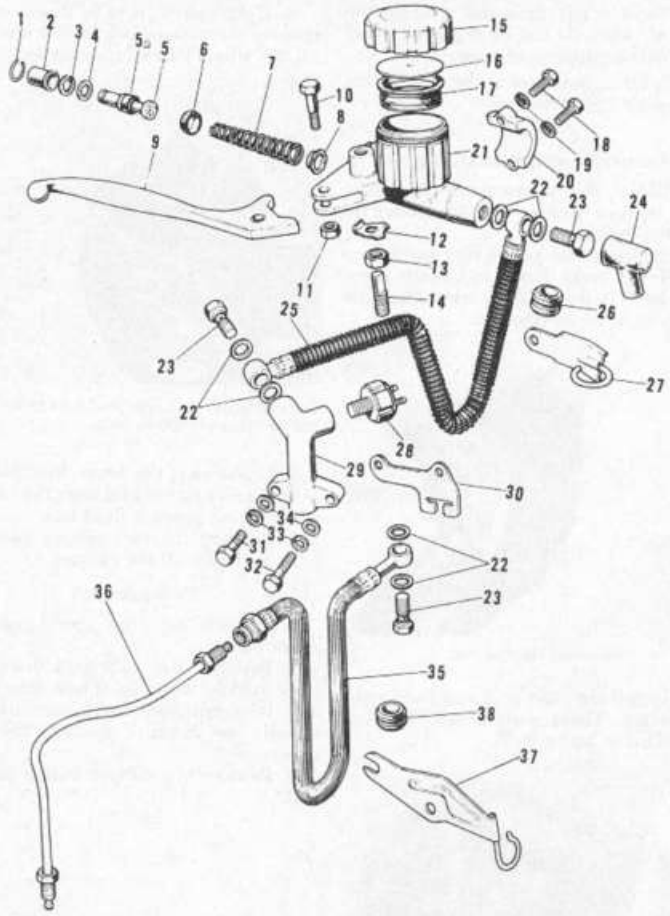
1. Inspect the disc as outlined for the "Early" type above. Maximum allowable run-out is 0.012 in. (0.3 mm). Minimum thickness is 0.24 in. (6.0 mm).

2. When installing the disc, tighten the bolts to 25–33 ft lbs.

### Master Cylinder

REMOVAL AND DISASSEMBLY

1. Disconnect the brake fluid line from the master cylinder.
2. Remove the two mounting bolts and the master cylinder assembly.
3. Remove the reservoir cap, seal, and plate. Drain the brake fluid.
4. Unscrew the mounting bolt and nut, then remove the brake lever.
5. Using a piece of heavy wire bent into a hook at the end, remove the securing ring and the dust seal. Be careful not to damage the seal.

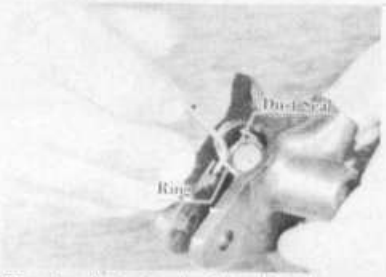


Disc brake master cylinder assembly

| | | | | | |
|---|---|---|---|---|---|
| 1. | Dust seal stopper | 14. | Bolt | 27. | Bracket |
| 2. | Dust seal | 15. | Cap | 28. | Pressure switch |
| 3. | Circlip | 16. | Plate | 29. | 3-way fitting |
| 4. | Piston stopper | 17. | Cap seal diaphragm | 30. | Guide |
| 5. | Piston assembly | 18. | Bolt | 31. | Bolt |
| 5a. | Secondary cup | 19. | Washer | 32. | Bolt |
| 6. | Primary cup | 20. | Master cylinder mounting | 33. | Lockwasher |
| 7. | Spring assembly | 21. | Master cylinder body | 34. | Washer |
| 8. | Check valve assembly | 22. | Washer | 35. | Hose |
| 9. | Brake lever | 23. | Banjo bolt | 36. | Pipe |
| 10. | Bolt | 24. | Dust cover | 37. | Bracket |
| 11. | Nut | 25. | Hose | 38. | Grommet |
| 12. | Lockwasher | 26. | Grommet | | |
| 13. | Nut | | | | |

6. Remove the securing snap-ring, then remove the stopper plate, piston assembly, primary cup, spring assembly, and check valve. Leave the secondary cup on the piston unless replacement is necessary. Do not remove the spring seat from the spring.

NOTE: *Do not clamp the master cylinder tightly in a vise, as distortion may result.*



Removing the dust seal and ring from the master cylinder

INSPECTION

1. Wash all parts in new brake fluid only.
2. Check the master cylinder port for clogging due to foreign matter.
3. Be sure that the reservoir is clean.
4. Check the walls of the master cylinder for grooves or score marks.
5. Check the outlet end for dents or other damage.

In the event of any permanent damage, replace the master cylinder body.

6. Check the piston for wear or rust and replace as necessary.
7. Check the condition of the cylinder cup noting any evidence of grooved

wear on the contact surface. Replace if any is evident.

8. Check all rubber parts for wear, damage, or swelling. Replace as necessary. Note that all rubber parts should be replaced every two years regardless of appearance.

9. Check the reservoir diaphragm for cracks or damage to the edges and the accordion pleats. Check the diaphragm for swelling.

These components should be replaced if damaged or worn, and replaced every two years regardless of appearance.

10. The master cylinder spring minimum length is 1.9 in. (48 mm). Replace it if it is shorter than this or if it shows signs of damage.

11. Check the brake hose and line for cracks or seepage. The brake hose should be replaced every four years regardless of condition.

12. When installing the hose and line, note that they should not contact the forks or frame at any point except where attachment clips are fitted.

### Assembly and Installation

1. Thoroughly lubricate the piston assembly, primary cup, and check valve with brake fluid prior to assembly.

2. Insert the primary cup and piston assembly into the master cylinder in that order.

NOTE: *Make sure that the primary cup and check valve do not turn sideways during installation.*

3. Install the stopper, then fit the snap-ring in its groove. Replace the snap-ring if it does not rotate smoothly in its groove.

4. Install the dust seal and seal stopper. Make absolutely certain that the seal seats properly in the piston groove.

5. Install the brake lever.

6. Hold the cylinder and squeeze the lever to make certain that it operates smoothly. Put a finger over the hose connection: you should be able to detect suction when the lever is released.

7. Fill the reservoir with brake fluid and install the cap.

8. Squeeze and release the lever several times until the fluid is pumped out the hose connection. Do not squeeze the lever to the limit of its travel or damage to the secondary cup may result.

9. Squeeze the lever, cover the hose connection with a finger, then release the lever: it should return to its original position quickly and smoothly.

10. Mount the assembly on the handlebar, and tighten the top mounting bolts first.

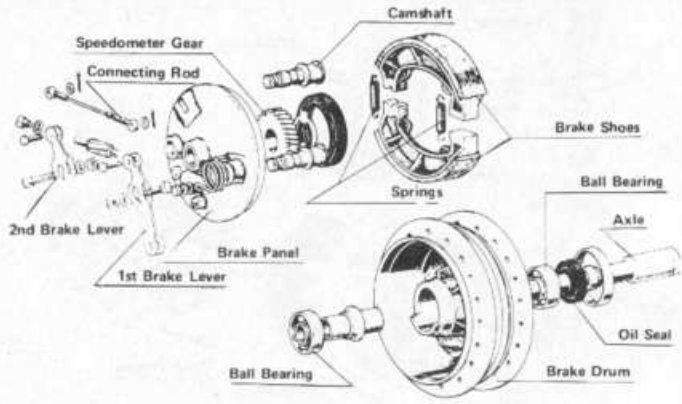
11. Adjust the brake lever to have less than 3/16 in. free-play.

12. Connect the brake hose, fill the reservoir, and bleed the system as previously described.

## *WHEEL BEARINGS*

### Removal

Removal of the wheel bearings necessitates removing the hub oil seals. These must be replaced with new ones upon reassembly. Clean the outside of the hub before removing the wheel bearings.




Front drum brake assembly

1. Remove the wheel and take out the brake plate. On disc brake models, unscrew the axle, and remove the speedometer drive mechanism.

2. Remove any dust covers, dust seals, or axle spacers fitted to either side of the hub.

3. Pry out the oil seals on either side of the hub using a small screwdriver, or, preferably, an elbow-shaped tool.

4. Remove the bearing retainer snap-ring (if fitted).

5. Remove the first bearing by tapping the bearing spacer tube; the spacer tube can be removed with the first bearing. To remove the remaining bearing, reach through the hub with a drift and tap the bearing evenly around its circumference. When removing the bearing, keep the bearing surface at a 90° angle to its seat in the hub.

NOTE: *On some models, especially high mileage machines, the hub should be heated gently with a propane torch in the vicinity of the bearing bosses to facilitate removal.*

### Inspection

NOTE: *The following bearing inspection checks refer to the sprocket hub bearing as well as the wheel bearings.*

1. Clean the bearings and spacer tube in a suitable solvent, removing all of the old grease. At this point, it would be wise to clean out the hub as well.

2. Check the bearing bosses in the hub for scuffs, cracks, or distortion. If they are in any way damaged, the hub must be replaced.

3. Check the condition of the spacer tube and replace if damaged.

4. Apply a few drops of light oil to the bearing, and spin it. The bearing must rotate smoothly and freely. Any roughness or binding in rotation will necessitate a new bearing.

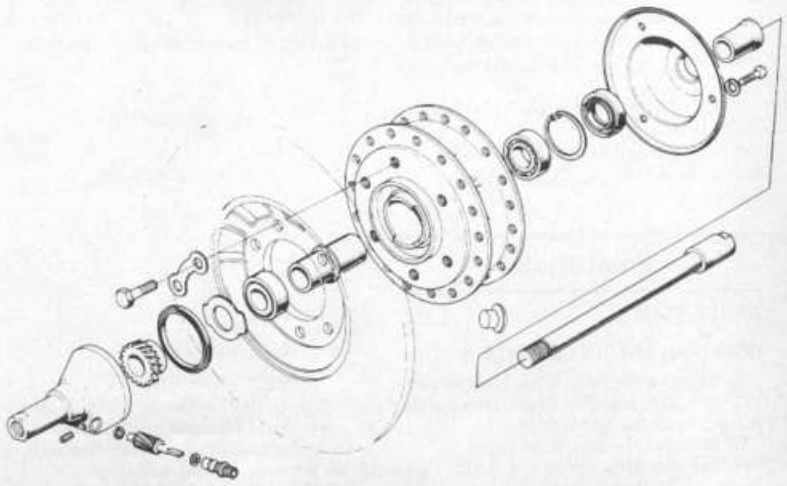
5. Place the bearing on a flat surface. Place your fingers on the outer bearing race to hold it steady. Try to move the inner race back and forth. In a good bearing, it will not be possible to move the inner race. If it is, the bearing must be replaced.

6. Note that bearings must be replaced in pairs.

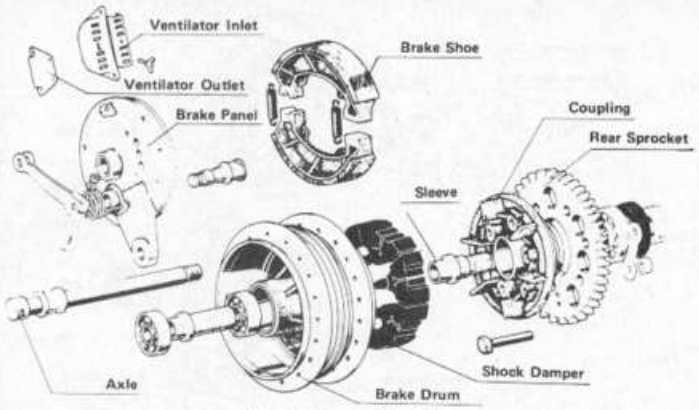
### Assembly

1. Obtain a good grade of wheel bearing grease to lubricate the wheel bearings.

2. Pack the grease in the bearing. A common method of doing this is to place a goodly amount of the grease in the palm of one hand. Taking the clean, dry, bear-

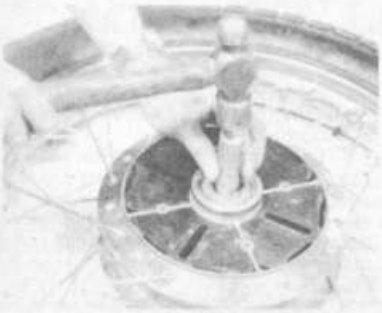


Front disc brake assembly




Rear brake assembly (H1)

ing, press one section of it into the grease. Turn the bearing until the grease has been deposited around the entire circumference. The packing process is complete when the grease begins to come out of the upper side of the bearing. Place an amount of grease in the hub as well.



Installing a wheel bearing

3. Heat either side of the wheel hub with a propane torch as on removal of the bearings. Place one of the bearings in the hub, and make sure that it is seated.

Any bearing to which a retainer is fitted should be installed first. On most machines the axle can be used as a drift to install the first bearing. Insert the axle into the bearing until the larger diameter end rests on the bearing. Center the bearing in the bearing boss, then strike the axle sharply until the bearing is seated.

4. Fit the spacer, and install the other wheel bearing.

5. Press in new oil seals on both sides of the hub.

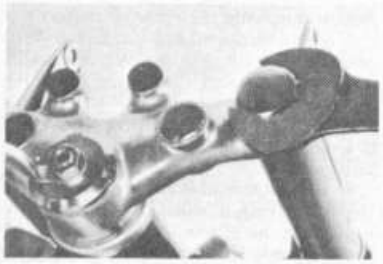
6. Tighten the axle to 51–80 ft lbs. on disc brake wheels.

## Front Forks

*EARLY TYPE*

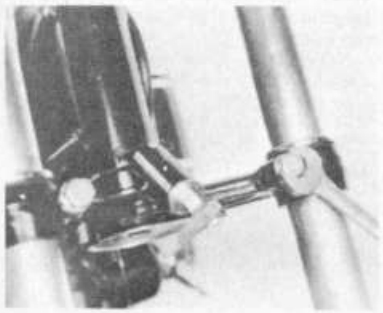
*REMOVAL AND DISASSEMBLY*

1. Remove the front wheel and fender.
2. If a disc brake is fitted, remove the caliper from the left fork leg.
3. Remove the fork filler caps.
4. Loosen the upper (if fitted) and lower triple clamp pinch-bolts.

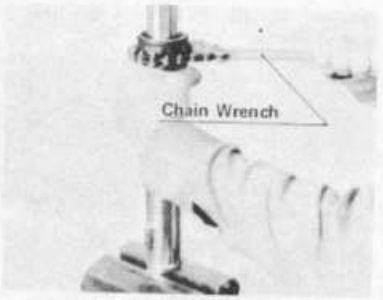


Removing the fork filler caps

5. Withdraw the fork legs one at a time from the steering stem.
6. Remove the spring from the top of the fork tube and invert the fork leg over a suitable container to pour out the oil.



Loosening the lower triple clamp pinch bolts




Removing the slider nut

7. Clamp the bottom of the fork slider in a wood jaw vise, lift up the slider dust seal, and unscrew the slider nut with a chain wrench or pipe wrench.

NOTE: *If neither of these tools are available, wrap the slider nut with a piece of old inner tube and tighten a heater hose clamp around the inner tube. With the clamp tightened securely, grasp the screw fitting with a pair of vise-grips and unscrew the nut.*

8. Grasp the fork tube with one hand and the slider with the other and pull them apart.
9. Remove the oil seal from the slider nut.

*INSPECTION*

1. Measure the free-length of the fork spring. Replace both if either is found to be less than the service limit given in the "Chassis Specifications" chart at the end of this section.
2. Install the fork tube and sliding bushing into the slider. Check that the tube slides smoothly, with a minimum of play.
3. Check the inside bore of the sliding bushing for score marks. Replace if scored.
4. Install the sliding bushing on the fork tube and check for play, if play is excessive replace the bushing.
5. Install the sliding bushing into the slider, it should be a light press fit. If it is a loose fit in the slider replace the bushing.
6. Check the fork tube for any dents, score marks or bends, replace if defective. The plating must be in good condition.
7. Inspect the slider and the slider nut for broken or stripped threads, and replace as necessary.
8. Inspect the filler cap O-ring and replace it if it is torn, cracked, or nicked.

*ASSEMBLY AND INSTALLATION*

1. Install a new oil seal into the slider nut and lubricate it before installing it on the fork tube.
2. Install the fork tube and sliding bushing into the slider and screw the slider nut onto the slider securely.
3. Slip the dust seal down over the slider nut.
4. Fill the forks with the correct amount and grade of oil and install the spring holder and the spring.
5. To install the fork legs, slip them up and through the steering stem. Replace the filler caps, and tighten the lower triple clamp pinch-bolts making sure that the top of the fork legs are even with the top of the upper triple clamp.
6. Check that the filler caps are tight and tighten the upper triple clamp pinch-bolts (if fitted). On models with a disc brake, refit the caliper to the left fork leg.
7. Install the front fender and wheel, and check the forks for smooth and proper operation.

*LATER TYPE*

The late-type forks are used on late model 400–750 machines.

**Removal and Disassembly**

1. Refer to Steps 1–5 under "Early Type" forks for removal procedures.
2. Remove the fork spring and pour out the oil.

3. Remove the dust cover from the top of the fork slider.

4. Remove the allen bolt from the bottom of the fork slider. The damper cylinder into which the allen bolt is threaded may turn with the bolt making removal impossible. If this happens, it may be possible to free the bolt using an impact driver. Alternately, a special tool is used which is threaded to the top of the cylinder, holding it in place while the allen bolt is removed.

5. After removing the allen bolt, separate the fork slider from the fork tube.




Using the special tool to remove the slider allen bolt

6. Remove the circlip from the bottom of the fork tube to remove the damper components.

7. Remove the slider oil seal circlip and pry out the slider. New seals must be used on assembly.

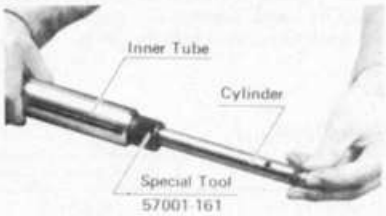
**Inspection**

1. Measure the free length of the fork springs and compare to the serviceable limit given in the "Chassis Specifications" chart.

2. Clean the damper components in a solvent and check for wear, especially of the cylinder ring. Lubricate all components before assembly.

**Assembly and Installation**

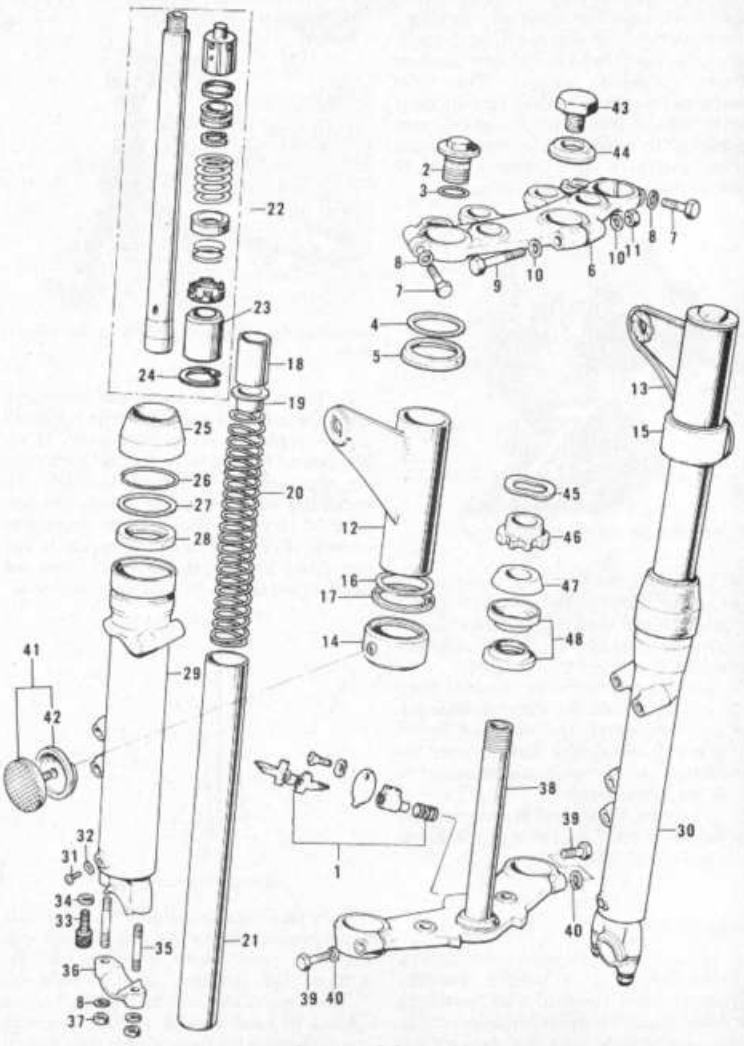
1. Assembly is the reverse of disassembly. A special tool is used to install the cylinder components into the fork leg.




Using the special tool to assemble the late type front fork

2. Press new oil seals into the sliders insuring that they are not tilted and are fully seated. Install the washer and circlip, being sure that it is seated in its groove. Lubricate the seal lips with fork oil before installing the slider on the tube.

3. Refer to Steps 3–7 under "Early Type" forks for remaining operations.




Later type fork assembly

1. Fork lock assembly
2. Filler cap
3. O-ring
4. Gasket
5. Washer
6. Upper triple clamp
7. Pinch bolt
8. Lockwasher
9. Pinch bolt
10. Lockwasher
11. Nut
12. Headlight bracket, left
13. Headlight bracket, right
14. Guide
15. Guide
16. Washer
17. Gasket
18. Spacer
19. Spring guide
20. Fork spring
21. Fork tube
22. Cylinder assembly
23. Piston
24. Circlip
25. Dust cover
26. Circlip
27. Washer
28. Oil seal
29. Fork slider, left
30. Fork slider, right
31. Drain plug
32. Gasket
33. Allen bolt
34. Lockwasher
35. Stud
36. Axle cap
37. Nut
38. Steering stem
39. Pinch bolt
40. Lockwasher
41. Reflector
42. Damper rubber
43. Steering stem bolt
44. Washer
45. Washer
46. Stem locknut
47. Cap
48. Bearing race

## Steering Stem Assembly

*BEARING ADJUSTMENT*

On models equipped with a friction steering damper, the damper should be loosened (counterclockwise) as much as possible so that it does not interfere with the bearing movement while checking or adjusting the bearings. If an oil damper is fitted, remove it from the steering stem.

1. The steering stem bearings are uncaged ¼ in. balls. They are adjusted by means of a ring nut beneath the upper triple clamp.

2. To check bearing adjustment, support the front wheel off the ground. Grasp the tip of the front fender, place your other hand beneath the lower triple clamp at the frame lug.

3. Attempt to move the fork by pulling up on the tip of the fender. If play or movement can be felt, at the lower triple clamp, the bearings are adjusted too loosely or worn.

4. Turn the forks slowly from lock-to-lock. Movement should be smooth, silent, and effortless. If any binding or uneven movement is felt, the balls and races are either too tightly adjusted or they are worn. If the steering feels uniformly stiff, the bearings are too tightly adjusted. If any noise is noted, the bear-

## Chassis Specifications

| Measurement | 250–400 Standard (in./mm) | 250–400 Service Limit (in./mm) |
|---|---|---|
| Swing arm pivot shaft run-out | 0.004/0.1 | 0.020/0.5 |
| Swing arm sleeve/bushing clearance | 0.0059/0.15 | 0.0217/0.55 |
| Rim run-out | 0.04/1.0 | 0.12/3.0 |
| Front (drum brake) drum ID | 7.087/180.0 | 7.116/180.75 |
| Rear drum ID | 7.087/180.0 | 7.116/180.75 |
| Brake lining thickness | 0.20/5.0 | 0.12/3.0 |
| Front drum brake spring free-length | 1.85/47.0 | 1.97/50 |
| Rear brake spring free-length | 2.20/56.0 | 2.32/59.0 |
| Front fork spring free-length | 14.21/361.0 | 13.78/350.0 |

| Measurement | 500–750 Standard (in./mm) | 500–750 Service Limit (in./mm) |
|---|---|---|
| Swing arm pivot shaft run-out | 0.004/0.1 | 0.020/0.5 |
| Swing arm sleeve/bushing clearance | 0.0059/0.15 | 0.0217/0.55 |
| Rim run-out | 0.04/1.0 | 0.12/3.0 |
| Front (drum brake) drum ID | 7.874/200.0 | 7.904/200.75 |
| Rear drum ID (H1) | 7.087/180.0 | 7.116/180.75 |
| Rear drum ID (H2) | 7.874/200 | 7.904/200.75 |
| Brake lining thickness | 0.20/5.0 | 0.12/3.0 |
| Rear brake spring free-length (H1) | 2.36/60.0 | 2.48/63.0 |
| Rear brake spring free-length (H2) | 2.62/66.5 | 2.74/69.5 |
| Front drum brake spring free-length | 2.62/66.5 | 2.74/69.5 |
| Front fork spring free-length | 13.58/345.0 | 13.19/335.0 |

## General Torque Specifications

Coarse Threads

| Diameter (mm) | Torque (ft lbs) |
|---|---|
| 5 | 2.5–3.5 |
| 6 | 4.6–6.4 |
| 8 | 11.6–15.9 |
| 10 | 22.4–30.4 |
| 12 | 39.1–54.2 |
| 14 | 60.0–83.2 |
| 16 | 94.0–130 |
| 18 | 130–181 |
| 20 | 188–253 |

Fine Threads

| Diameter (mm) | Torque (ft lbs) |
|---|---|
| 5 | 2.5–3.5 |
| 6 | 4.0–5.6 |
| 8 | 9.8–13.4 |
| 10 | 18.4–25.3 |
| 12 | 32.5–44.8 |
| 14 | 53.5–73.8 |
| 16 | 83.2–116 |
| 18 | 123–166 |
| 20 | 166–239 |

5. Tighten the adjuster nut until the steering stem turns freely, but has no play.
6. Install the fork tubes, headlight assembly, and upper triple clamp, flat washer, and steering stem nut. Check that the stem moves freely of its own weight when released from 5°–10° off center.
7. Install the front fender, front wheel, and handlebars.

## Swing Arm

*ALL MODELS*

### Inspection

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

The swing arm is most likely to be damaged if the machine is operated for any length of time with a broken or otherwise defective shock absorber.

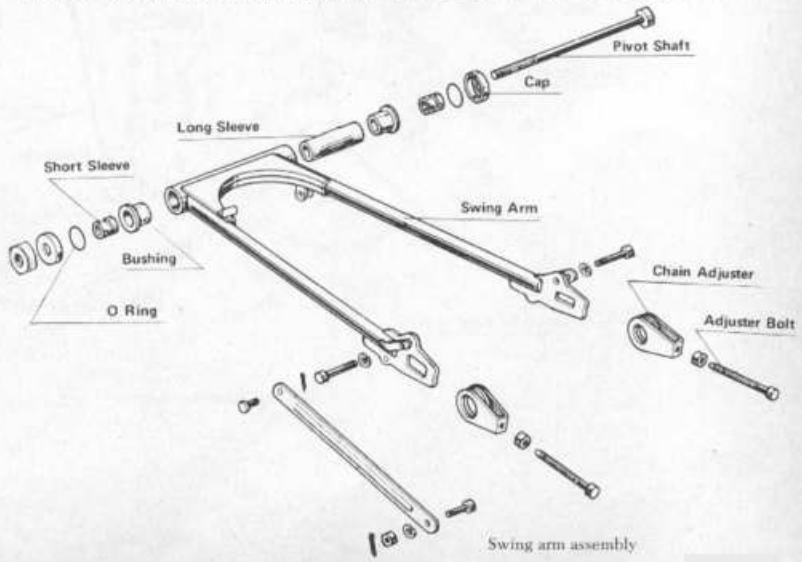
### Removal

1. Proceed as above. Then remove the swing arm pivot shaft nut, and pull out the pivot shaft.
2. Remove the swing arm. Note the dust caps and O-rings on either side of the swing arm.
3. The swing arm should be inspected for cracks or fractures, especially around the welds.

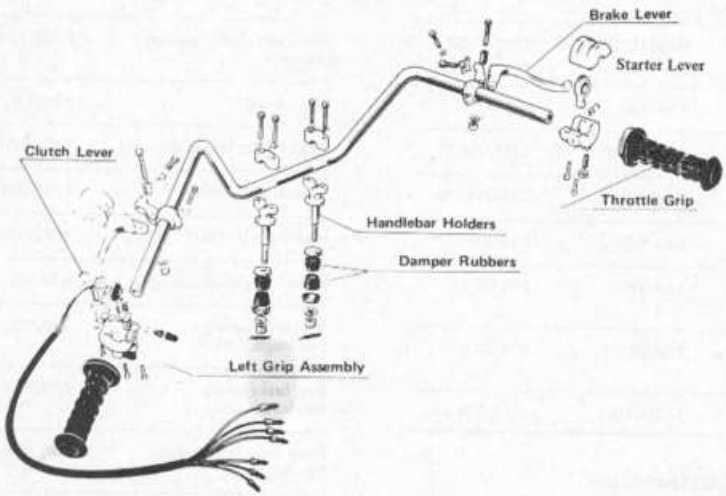
After removal of the swing arm, the short sleeves and steel bushings can be replaced. This should be done every 10,000 miles, or more often depending on how the machine is used, or if the bushings are worn (see "Inspection," above).

### Installation

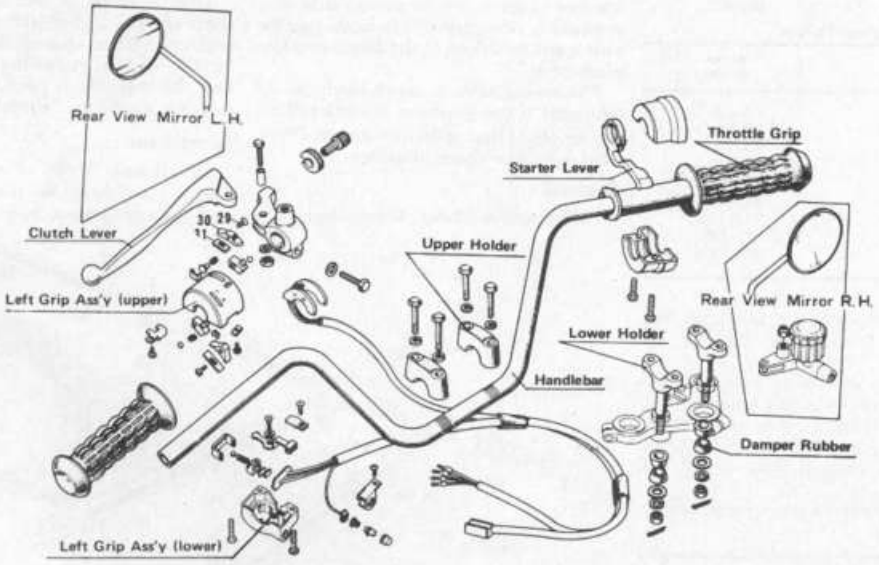
Installation is the reverse of the removal procedure. Be sure that all nuts and bolts are secure before operation.



Swing arm assembly




H1- Handlebar Assembly




H2- Handlebar Assembly