SHOP MANUAL

H1 (1969~1975)
KH500 (1976~1977)
H2 (1972~1975)

Kawasaki

H Series

©Kawasaki Heavy Industries, Ltd. 1972, 1973, 1974, 1975, 1976, 1977

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Foreword

This shop manual covers maintenance and repair of all models in the H Series. Before starting to service a motorcycle, careful reading of the applicable section is recommended to eliminate unnecessary work.

Wiring diagrams, and an alphabetical index can be found at the rear of the manual. (KH500 is not a new model, but model name was changed from H1 to KH500 in the 1976 model.)



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H1 US Model



H1 European Model



H2 US Model



H2 European Model



I . Specifications

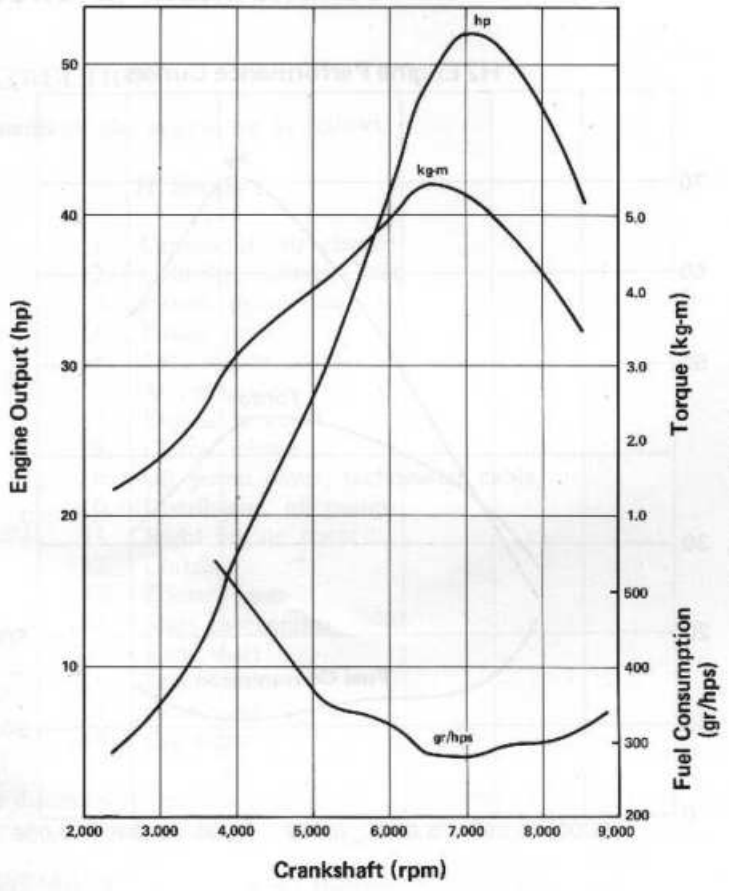
	KH500	H2-C
Dimensions		
Overall length	82.1 in. (2,085 mm) *2,125 mm	83.1 in. (2,110 mm) *2,175 mm
Overall width	32.9 in. (835 mm) *825 mm	32.7 in. (831 mm)
Overall height	44.9 in. (1,140 mm) *1,100 mm	46.5 in. (1,180 mm)
Wheelbase	55.5 in. (1,410 mm)	57.0 in. (1,448 mm)
Road clearance	5.7 in. (145 mm)	5.5 in. (139 mm)
Dry weight	423 lbs. (192 kg) *194 kg	452 lbs. (205 kg) *208 kg
Fuel tank capacity	4.2 U.S. gal. (16 liters)	4.5 U.S. gal. (17.0 liters)
Oil tank capacity	2.5 U.S. qt. (2.3 liters)	2.1 U.S. qt. (2.0 liters)
Performance		
Climbing ability	27°	40°
Braking distance	41 ft.@31 mph (12.5 m@50 kph)	39.4 ft. @31 mph (12 m@50 kph)
Minimum turning radius	94.5 in. (2,400 mm)	94.5 in. (2,400 mm)
SS 1/4 mile	14.1 sec.	12.0 sec.
Engine		
Type	2-stroke, 3 cylinder, piston valve	2-stroke, 3 cylinder, piston valve
Bore and stroke	2.36 x 2.31 in. (60 x 58.8 mm)	2.80 x 2.48 in. (71 x 63 mm)
Displacement	30.4 cu.in. (498.0 cc)	45.6 cu.in. (748.0 cc)
Compression ratio	6.8 : 1	7.0 : 1
Maximum horsepower	52 hp/7,000 r.p.m.	71 hp/6,800 r.p.m.
Maximum torque	39.1 ft-lb (5.4 kg-m)/6,500 rpm	57.1 ft-lb (7.9 kg-m)/6,500 rpm
Port timing		
Inlet – Open	76° BTDC	75° BTDC
– Close	76° ATDC	75° ATDC
Scavenge– Open	59.5° BBDC	58° BBDC
– Close	59.5° ABDC	58° ABDC
Exhaust – Open	89° BBDC	89° BBDC
– Close	89° ABDC	89° ABDC
Carburetor type	Mikuni VM28SC	Mikuni VM30SC
Lubrication system	Injectolube oil injection	Injectolube oil injection
Engine oil	2-stroke engine oil	2-stroke engine oil
Starting system	Kick starter	Kick starter
Ignition system	Electronic CDI	Electronic CDI
Firing order	Left, right, center	Left, right, center
Ignition timing	23° BTDC @4,000 rpm	23° BTDC @4,000 rpm
Spark plugs	NGK B-9HS-10	NGK B-9HS-10
Transmission		
Type	5-speed, constant mesh, return shift	5-speed, constant mech, return shift
Clutch	Wet, multi-disc	Wet, multi-disc
Gear ratio		
1st	2.20 (33/15)	2.17 (26/12)
2nd	1.40 (28/20)	1.47 (28/19)
3rd	1.09 (25/23)	1.11 (20/18)
4th	0.92 (23/25)	0.92 (23/25)
5th	0.81 (21/26)	0.81 (17/21)

	KH500	H2-C
Primary reduction ratio	2.41 (65/27)	1.88 (60/32)
Final reduction ratio	3.00 (45/15) *2.81 (45/16) Ⓘ 3.00 (45/15)	3.13 (47/15) ——
Overall drive ratio	5.83 (5th) *5.47 (5th) Ⓘ 5.83 (5th)	4.76 (5 th) ——
Transmission oil	SAE 10W30 or 10W40	SAE 10W30 or 10W40
Transmission oil capacity	1.3 U.S. qt. (1.2 liters)	1.5 U.S. qt. (1.4 liters)
Electrical Equipment		
Generator	Mitsubishi F005T10271 Minimum output 5.5A-12V @1,800 rpm	Mitsubishi F-6061DL Minimum output 4.0A-12V @1,800 rpm
Regulator	Mitsubishi X009T30471	Mitsubishi X009T30171
Ignition coil	Diamond TU-29M-125	Mitsubishi F006T40871
Battery	Yuasa 12N9-3B 12V-9AH	Furukawa 12N5.5-4A 12V-5.5AH
Headlamp type	Sealed beam *Semi-sealed beam	Sealed beam *Semi-sealed beam
Headlamp	12V 50/35W *12V 45/40W	12V 35/25W *12V 35/35WⒻ12V 36/36W
Tail/Brake lamp	12V 27/8W *12V 21/5W	12V 23/8W *12V 21/5W
Speedometer lamp	12V 3W	12V 3W
Tachometer lamp	12V 3W	12V 3W
Neutral indicator lamp	12V 3W	12V 3W
Brake light failure indicator lamp	12V 3W	12V 3W
High beam indicator lamp	12V 1.5W	12V 1.5W
Turn signal lamps (four)	12V 23W *12V 21W	12V 23W *12V 21W
Turn signal indicator lamp	12V 3W	12V 3W
Frame		
Type	Tubular, double cradle	Tubular, double cradle
Steering angle	39°	39°
Caster	63°	63.5°
Trail	4.3 in. (108 mm)	4.1 in. (104 mm)
Tires: Front	3.25H-19 4PR	3.25H-19 4PR
Rear	4.00H-18 4PR	4.00H-18 4PR
Suspension		
Front	Telescopic fork	Telescopic fork
Rear	Swing arm	Swing arm
Suspecsion stroke		
Front	5.5 in. (140 mm)	5.5 in. (140 mm)
Rear	2.8 in. (70 mm)	3.1 in. (80 mm)
Front fork oil capacity, (for each fork)	5.75 U.S. oz. (170 cc)	5.92 U.S. oz. (175 cc)
Front fork oil type	SAE 10W	SAE 10W
Brakes		
Type Front	Disc brake	Disc brake
Rear	Internal expansion, leading-trailing	Internal expansion, leading-trailing
Rear brake drum inside dia.	7.1 x 1.4 in. (180 x 35 mm)	7.9 x 1.4 in. (200 x 35 mm)
Effective disc diameter	9.7 in. (245 mm)	9.7 in. (245 mm)

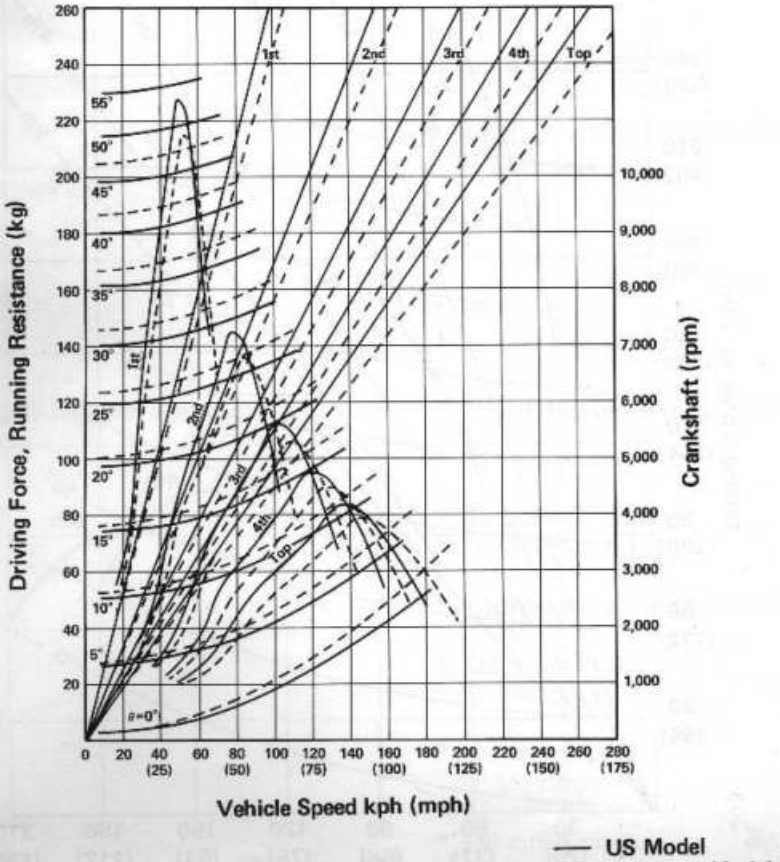
* : European Model
Ⓕ : French Model
Ⓘ : Italy Model

Specifications subject to change without notice, and may not apply to every country.

KH500 Engine Performance Curves

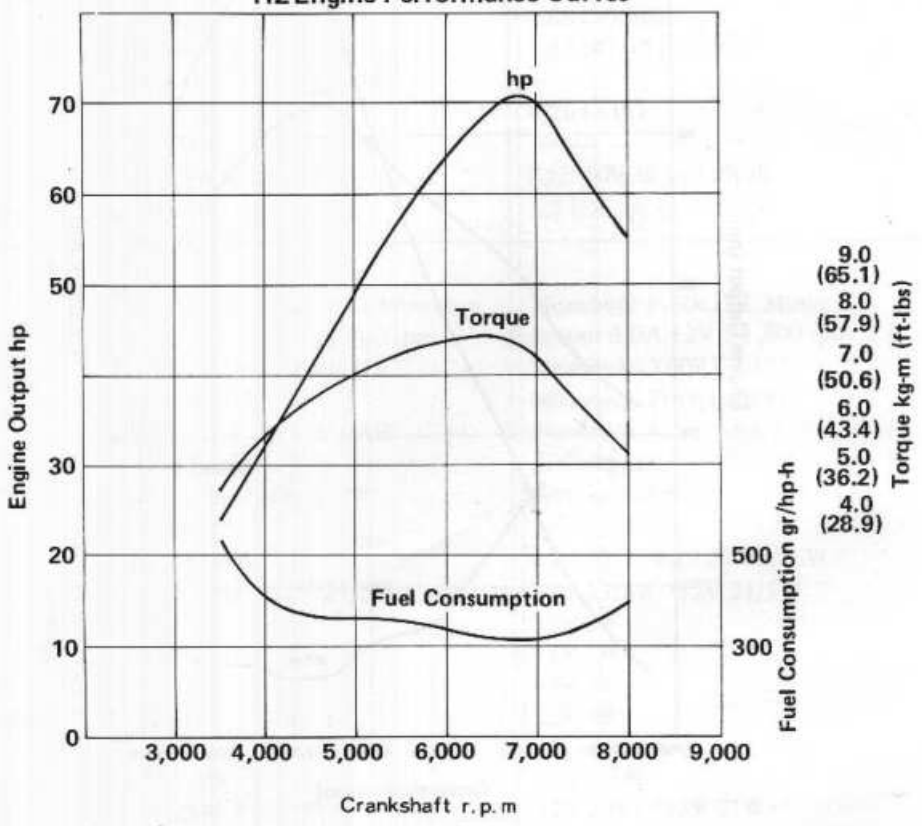


KH500 Running Performance Curves

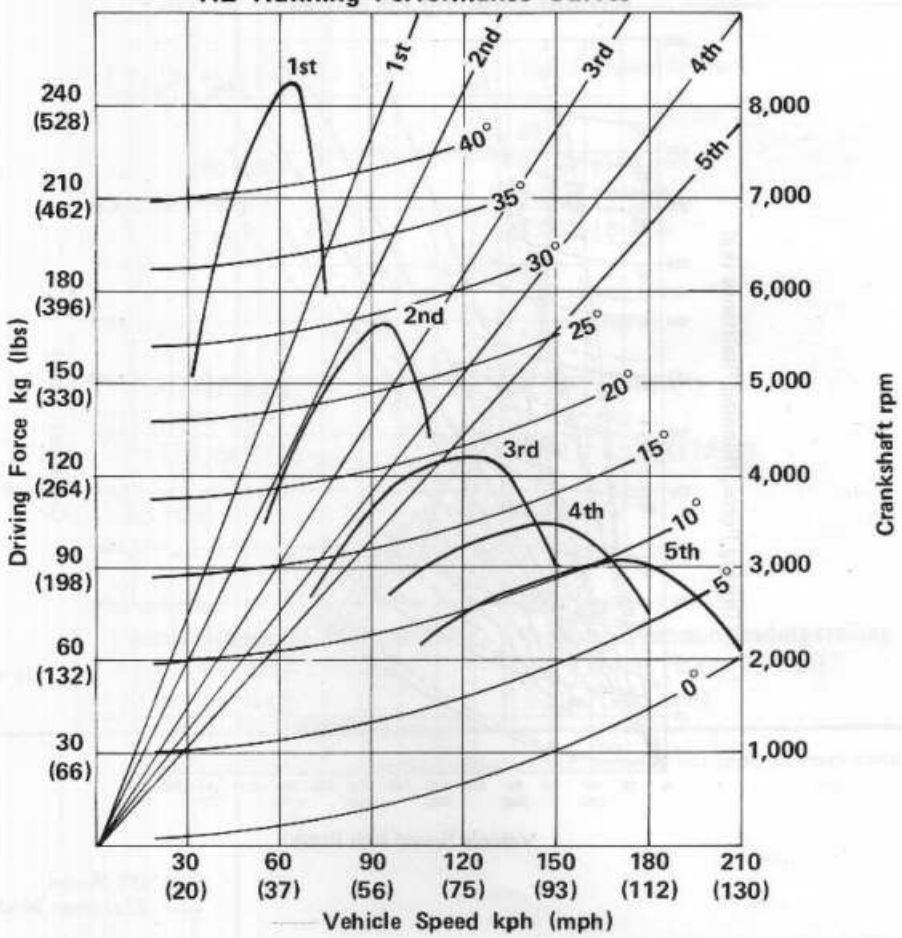


—— US Model
----- European Model

H2 Engine Performance Curves



H2 Running Performance Curves



II. Engine : General Maintenance

1. ENGINE CONSTRUCTION

The major components of the engine are as follows:

H Series

1. Carburetor, air cleaner
2. Cylinder, cylinder head
3. Piston, piston pin
4. Piston rings
5. Left engine cover
6. AC generator
7. Engine sprocket
8. Clutch release
9. Oil pump cover, tachometer cable
10. Distributor, oil pump
11. Right engine cover
12. Clutch
13. Primary gear
14. Shift mechanism
15. Kick shaft
16. Transmission
17. Crankshaft
18. Crankcase

During engine disassembly, remove parts in the order listed. This will make disassembly easy and avert unnecessary steps. Reassemble the engine in the reverse order.

2. MINOR DISASSEMBLY

The engine can be disassembled to a certain extent without removing it from the frame.

1) Air Cleaner

* Left side cover
* Air inlet pipes
* Air cleaner (See page 13.)

2) Carburetors

* Air inlet pipes
* Carburetors

3) Clutch Cable and Engine Sprocket

* Gear shift pedal
* Front chain cover
* Clutch cable (See page 8.)
* Chain (See page 94.)
* Engine sprocket (See page 22.)

4) AC Generator

* Left engine cover
* AC generator wires
* Signal generator rotor (CDI models only) (See page 22.)
* Stator (See page 23.)
* Rotor (See page 23.)

5) Right Engine Cover and Oil Pump

* Oil pump cover
* Tachometer cable (See page 6.)
* Distributor cap and rotor (H1 CDI only)
* Oil pump cable (See page 7.)
* Oil inlet pipe (See page 7.)
* Oil outlet pipes (See page 24.)

* Right engine cover

NOTE: Before removing right engine cover, first drain transmission oil.

* Oil pump
  (See page 26.)

6) Clutch and Primary Gear

* Spring plate, friction plates, clutch plates, spring plate pusher
  (See page 29.)

* Oil pump pinion
  (See page 31.)

* Primary gear
  (See page 31.)

* Clutch hub
  (See page 29.)

* Clutch housing
  (See page 29.)

7) Pistons

* Exhaust pipes

* Cylinder heads

* Cylinders

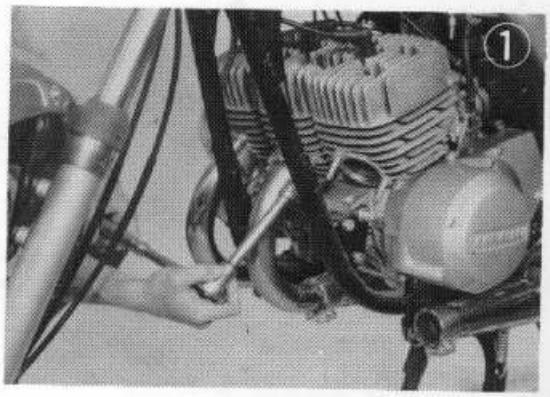
* Piston pins, pistons, small end needle bearings
  (See page 19.)

* Piston rings
  (See page 21.)

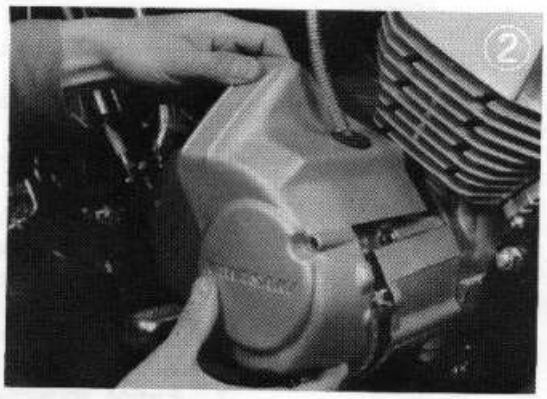
3. ENGINE REMOVAL

To remove the engine from the frame for replacement or disassembly, the order given shows the minimum amount of parts that it is necessary to remove. Any other order than that given here will involve more work and a greater number of parts to be removed.

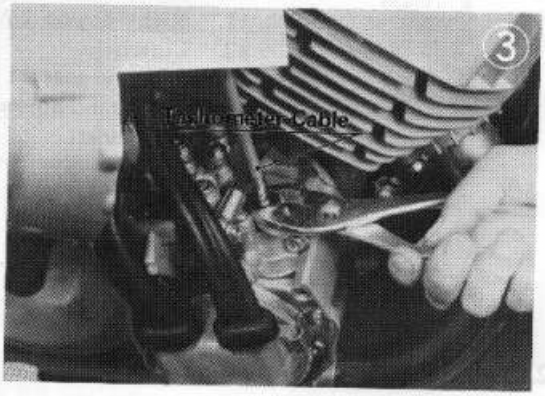
Exhaust pipes



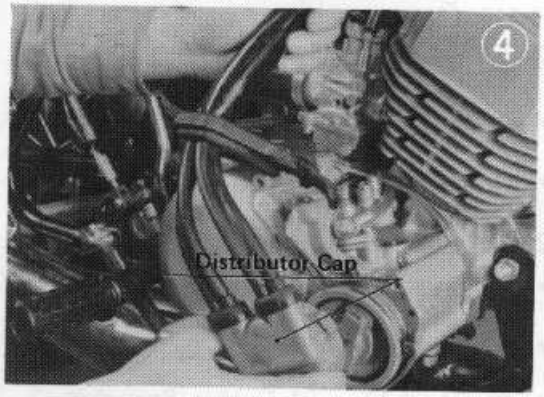
Oil pump cover



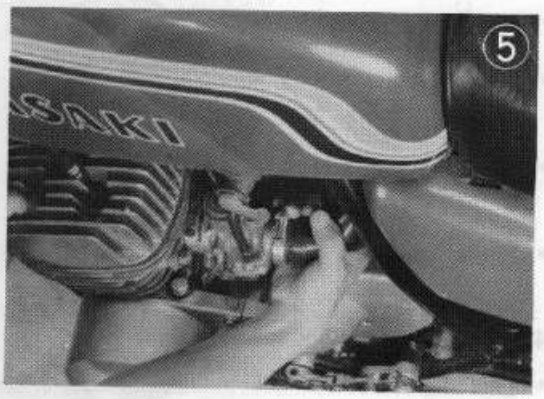
Tachometer cable



Distributor cap **(H1 CDI only)**

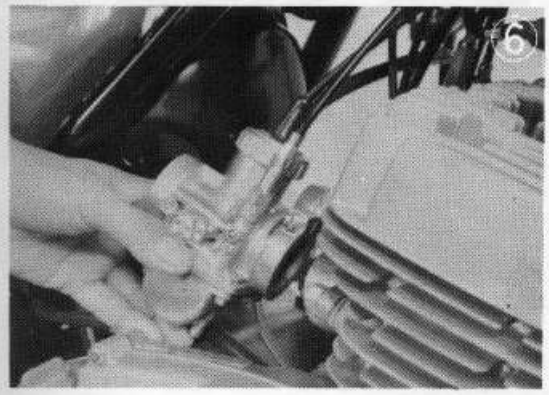


Air inlet pipes (See page 13.)

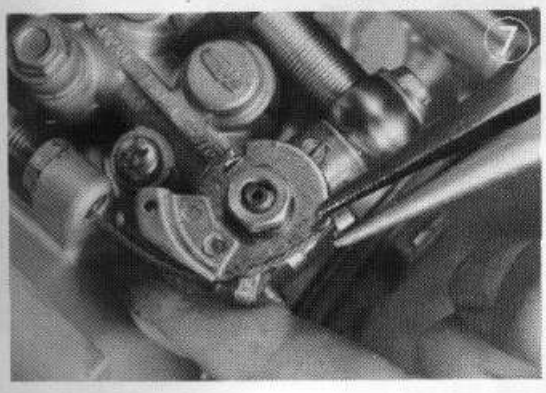


Carburetors

NOTE: First close the fuel tap and remove the fuel pipe.

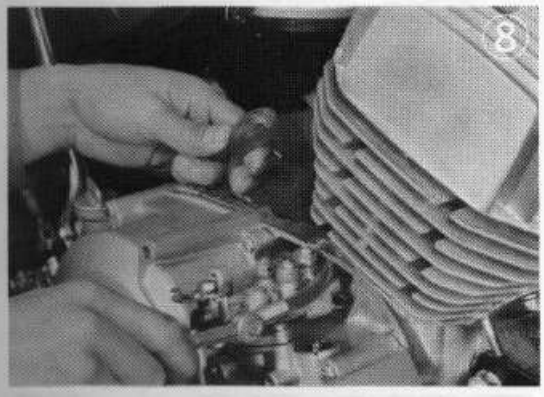


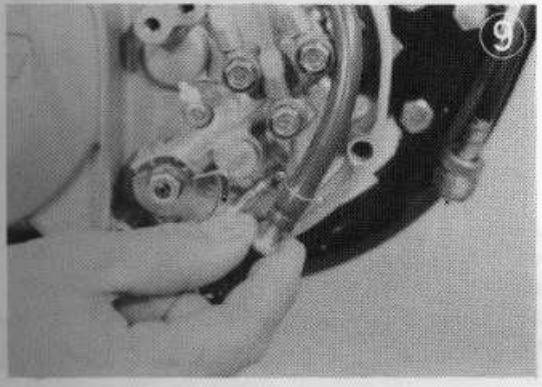
Oil pump lever cover (H1) and oil pump cable



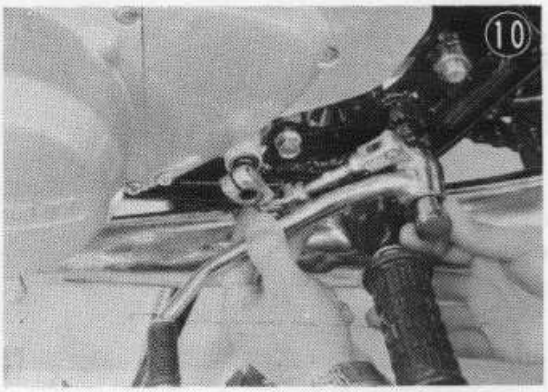
Oil inlet pipe

To prevent oil from leaking, remove the banjo bolt, take the banjo fitting out of the oil pipe, and insert a screw into the end of the pipe as illustrated.

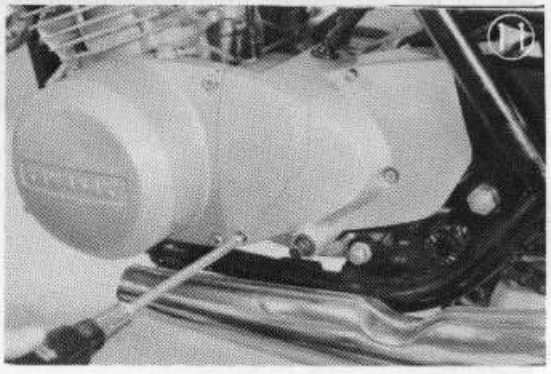




Shift pedal



Front chain cover

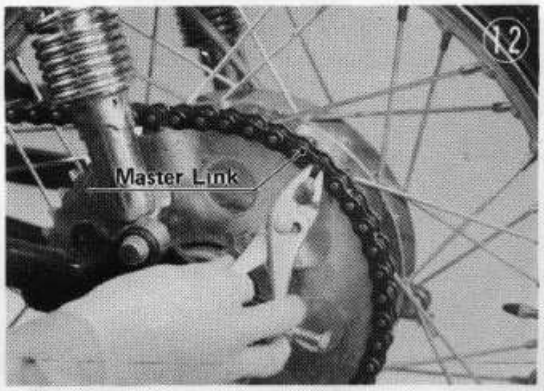


Drive chain

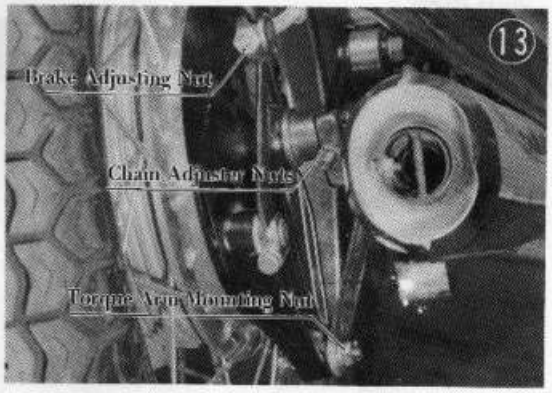
The H1 drive chain comes off after removing the clip and taking out the master link.

The H2, because of its high power, has no master link. To take the chain off the sprockets, loosen the rear torque arm mounting, brake adjusting nut, rear axle nut and chain adjusters. Then move the rear wheel forward to give the chain play.

H1

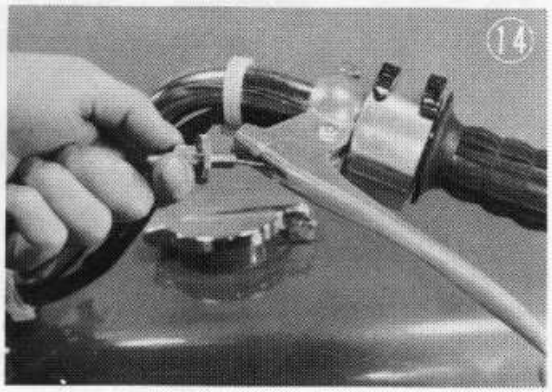


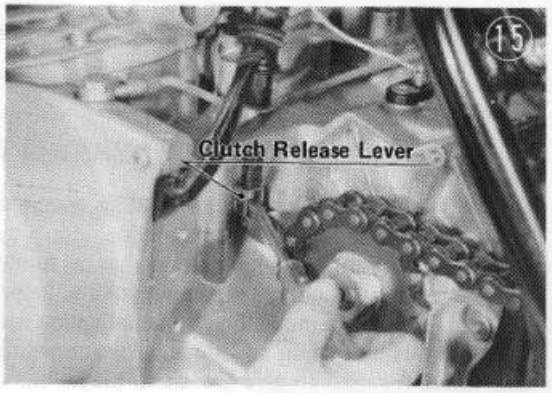
H2



Clutch cable

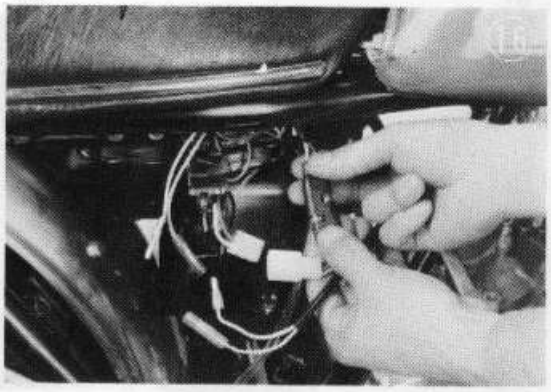
To remove the clutch cable, loosen the clutch release lock nut, and giving the cable plenty of play with the adjusting screw, remove the inner wire of the clutch cable from the clutch release lever after straightening the lever tongue.



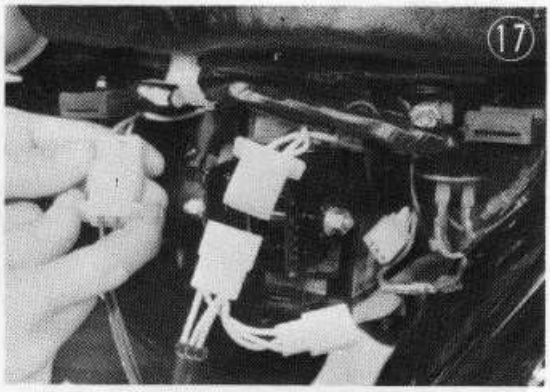


AC generator wiring

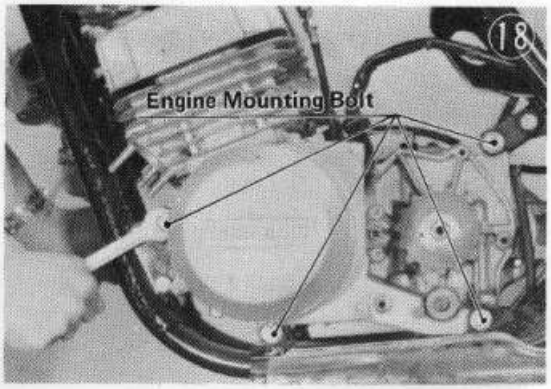
H1



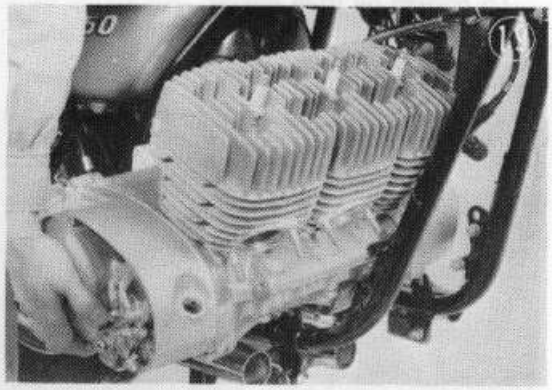
H2



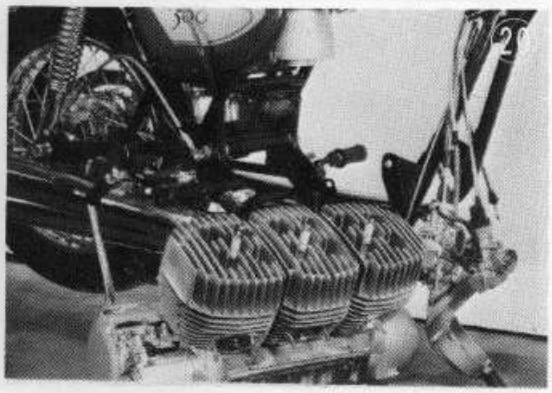
Engine mounting bolts



Engine



Completed disassembly



4. ENGINE MOUNTING

Engine mounting is in the reverse order of removal.

When mounting the engine, be especially careful of the following items:

*Tightening torque link, axle and chain adjuster nuts

* The open end of the clip on the chain master link must face in the opposite direction of chain movement.

* The wiring connections of the AC generator and high voltage cables. HV cable connections are marked on the distributor cap: R=Right cylinder; L=Left cylinder; C=Center cylinder; IC=Ignition Coil.

* Tightening of the engine mounting bolts

When starting up the engine again, double check the following:

*Engine oil

*Transmission oil

*Engine adjustments

a. Idle	(This page)
b. Starter cable	(See page 11.)
c. Oil pump cable	(See page 11.)
d. Clutch	(See page 12.)
e. Ignition timing	(See page 100, 103, 107, 109, 118.)

* Frame adjustments

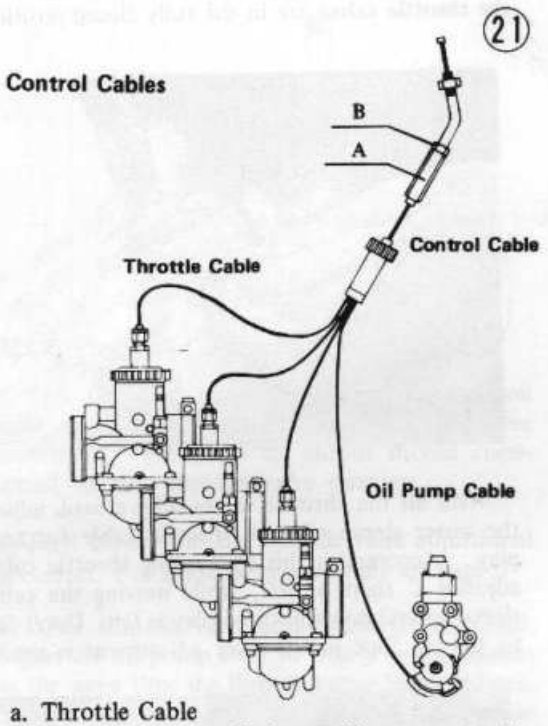
a. Brake and brake lamp switch	(See page 67.)
b. Drive chain	(See page 94.)

*Tightening of all nuts, bolts and screws.

5. ENGINE ADJUSTMENTS

1) Idling Adjustment

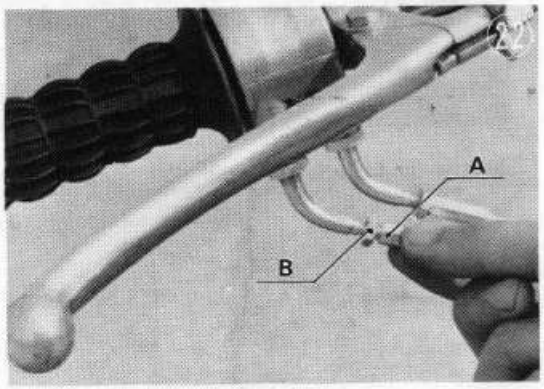
In engines of more than one cylinder, the carburetors must be adjusted evenly to achieve the correct idle adjustment. Especially with these 3 cylinder machines, be careful to adjust each carburetor to the same point by following the order given.



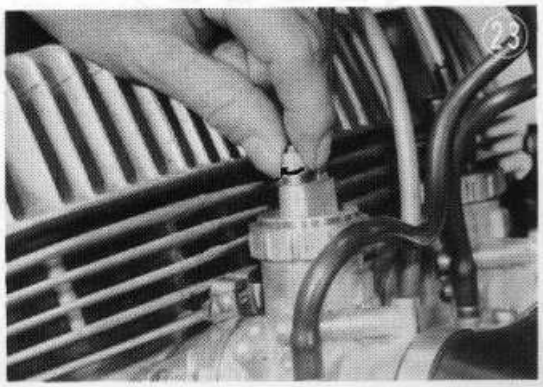
a. Throttle Cable

In order to have all three cables move together, the cables must all be adjusted for zero play with the throttle in the fully closed position. Adjust them as follows:

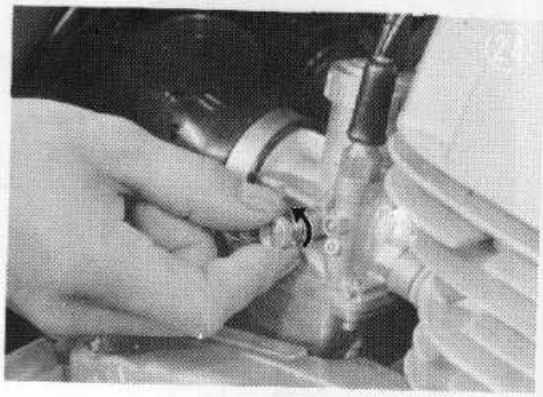
Loosen lock nut B and screw in control cable adjuster A to give the throttle grip ample play.



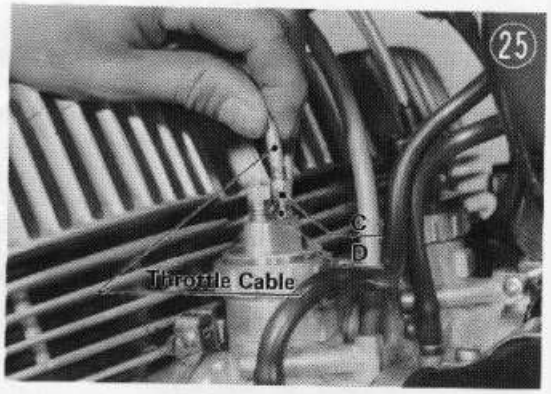
H1: Turn each throttle stop screw in until the throttle valves are in the fully closed position.



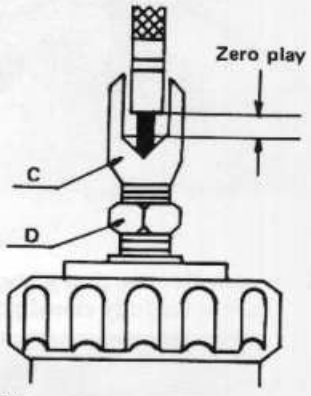
H2: Back out each throttle stop screw until the throttle valves are in the fully closed position.



With all the throttle valves fully closed, adjust the outer sleeve of each throttle cable for zero play. Accomplish this by turning throttle cable adjuster C right or left, while moving the cable sleeve up and down until no play is felt. Don't fail to tighten lock nut D after adjustment is made.



Throttle Cable Adjustment



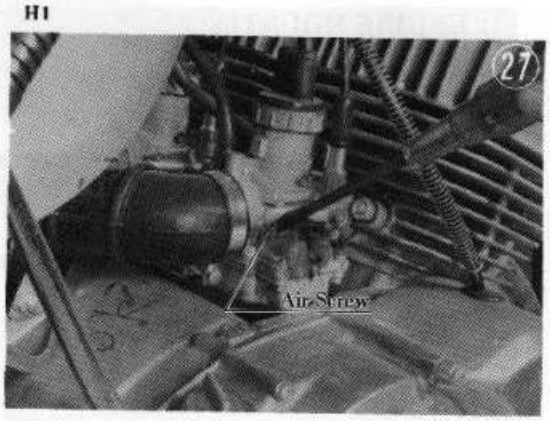
b. Air Screw

Turn each carburetor air screw fully in and back it out the number of turns called for in the table 1 and 21 (See Page 52).

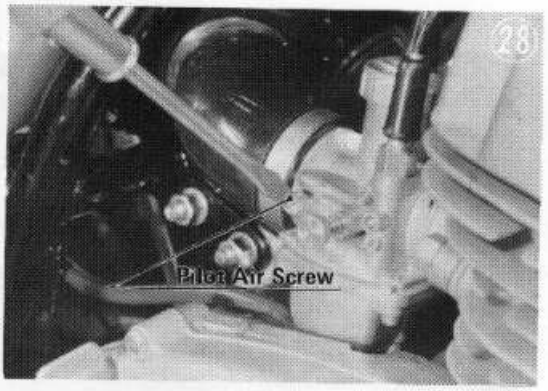
Table 1 Screw Settings

Model	Air Screw	Idle r.p.m.
H1 (CDI)	1¼ turns out	1,150 – 1,250
H1 (no CDI)	1½ turns out	1,150 – 1,250
H2, H2-B	1½, 1¾ turns out	1,150 – 1,250

H1



H2



c. Throttle Stop Screws

Warm up the engine for one or two minutes to bring engine up to normal temperature, where the gasoline will atomize properly.

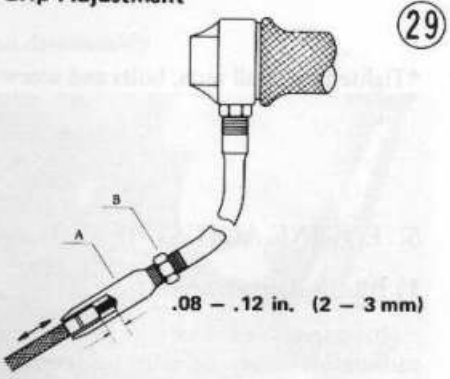
Turn the individual throttle stop screws to bring the engine to the lowest stable rotational speed obtainable.

Hold your hands in back of the mufflers to check that the three exhaust pressures are equal. Make fine adjustments with the stop screws and/or air screws if this is necessary to obtain even exhaust pressure and stable idling.

d. Throttle Grip

Last, adjust the throttle grip play. To adjust the grip for the standard amount of play as shown in the diagram, turn throttle grip adjuster A and lock it in place with lock nut B.

Throttle Grip Adjustment



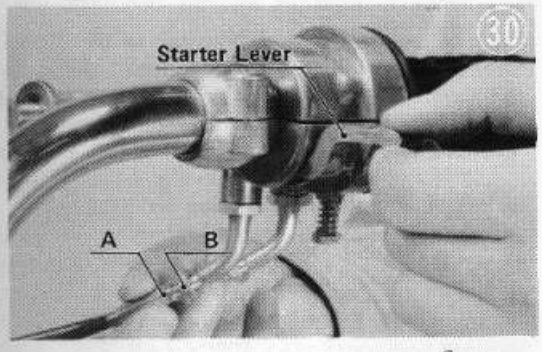
e. Oil Pump

After these adjustments are completed, it is necessary to adjust the oil pump lever for simul-

taneous movement with the throttle.
See Oil Pump Adjustment, this page.

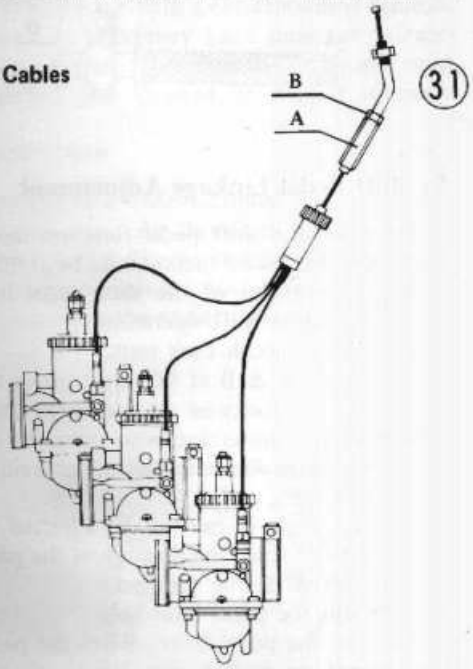
2) Starter Lever Adjustment

a. First give the starter lever sufficient play. Lever play is varied with starter lever adjuster A.



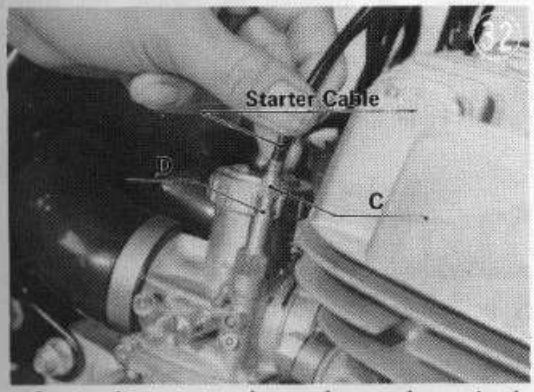
30

Starter Cables



31

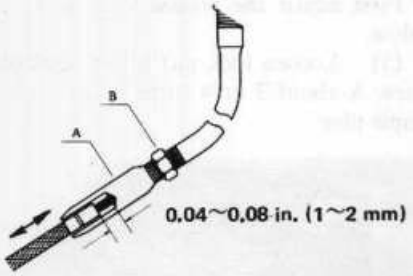
b. With the starter plungers in the fully closed position, adjust the outer sleeve of all starter cables for 0.04~0.08" (1~2 mm) play, in order to have all plungers start moving together. Adjustment is made with adjuster C while moving the cable sleeve up and down until only slight play is felt. Fix adjustment in place with lock nut D.



32

c. Last, adjust starter lever play as shown in the diagram. Turn starter lever adjuster A, locking it in place with lock nut B.

Starter Lever Adjustment



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3) Oil Pump Adjustment

The oil pump must increase and decrease oil flow rate simultaneously with throttle valve movement. Minimum oil output should correspond to zero throttle valve opening.

a. First check that the throttle valve adjustment is correct. For adjustment procedure see page 9.

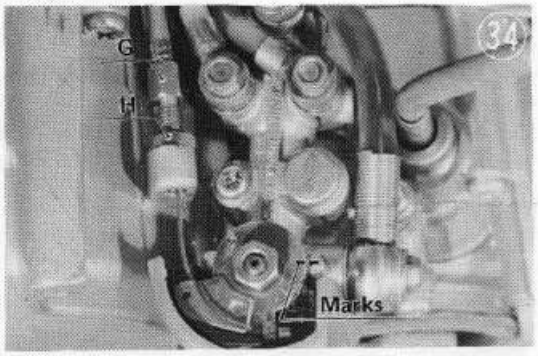
b. After throttle valve adjustment is completed. adjust the oil pump lever so that it begins moving at the same time the throttle valves begin to open. With oil pump cable adjuster G, set the lever so that the mark on the oil pump lever and the mark on the lever stopper are aligned when the throttle valves just start to move. In other words, the marks must coincide at zero throttle opening.

CAUTION:

1. Do not fail to tighten lock nut H after adjustment is made.

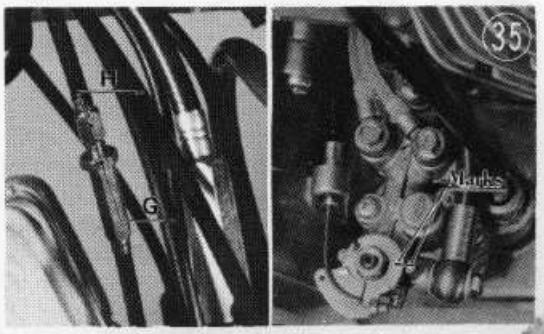
2. Be especially careful with this adjustment as improper adjustment may lead to piston seizure. [See illustration next page.]

H1



34

H2

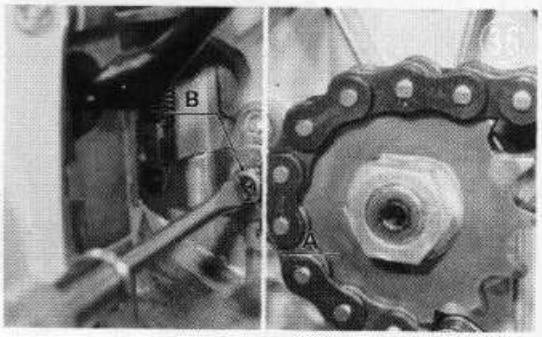


35

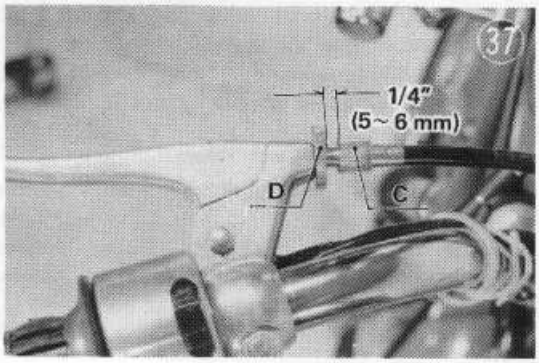
4) Clutch Adjustment

a. First adjust the release lever angle as outlined below.

(1) Loosen lock nut B and back out grooved screw A about 3 or 4 turns to give release lever C ample play.

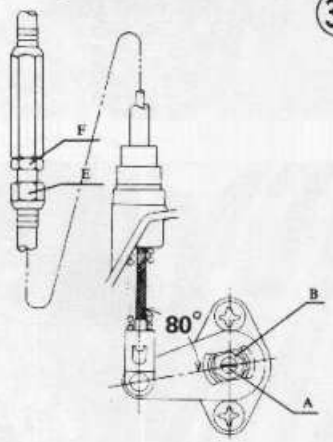


(2) Give the clutch hand lever play by loosening lock nut D and turning adjuster C, until the lever conforms with the measured position in the illustration.



(3) Loosen lock nut F and turn clutch cable adjuster E until the release lever is at the 80° angle shown in the illustration. Hold the adjustment with lock nut F.

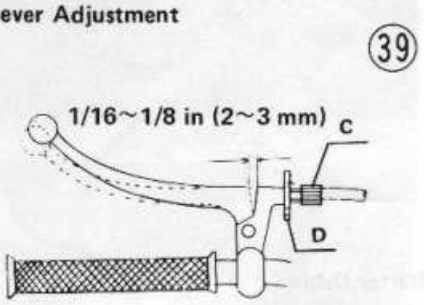
Release Lever Adjustment



b. Next adjust the clutch itself. Turn in grooved screw A slowly until it suddenly becomes very hard to turn. This is where the clutch starts pushing on the screw and clutch operation begins. Hold the adjustment at this position with lock nut B.

c. Last adjust clutch lever play to the standard given in the illustration, by turning clutch lever adjuster C and locking it in place with lock nut D.

Clutch Lever Adjustment



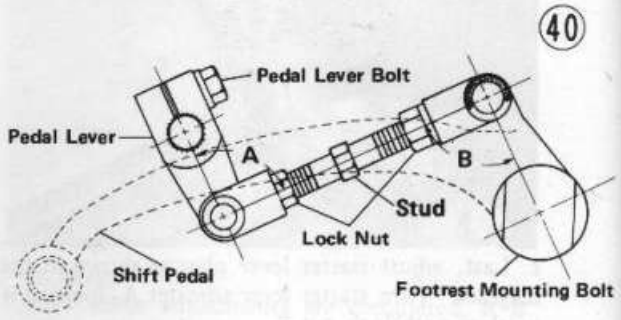
5) Shift Pedal Linkage Adjustment

To make the shift pedal function most effectively, the shift pedal links should be at 90° angles.

Improper angles of the shift pedal links may cause inaccurate shift operation.

a. First loosen both lock nuts.
b. Set angles A & B at 90° by turning the stud. Turning it clockwise decreases the angle, and turning it counterclockwise increases it.
c. After making the necessary adjustment, tighten the lock nuts.
   In case angle B can not be adjusted by only turning the stud, the position of the pedal lever serration should be changed.
d. Take out the pedal lever bolt.
e. Pull out the pedal lever. When the pedal lever can not be pulled out, loosen the footrest mounting bolt.
f. Reset the pedal lever so that angle B will be at 90°.
g. Screw in the pedal lever bolt, and tighten the footrest mounting bolt.
h. After making angle B adjustment, angle A should be adjusted by turning the stud as explained above.

Shift Pedal Linkage



III. Engine : Detailed Maintenance

1. AIR CLEANER

In order for gasoline to burn efficiently, it requires about 15 times its own weight in air. If this air is supplied directly from the dust-filled atmosphere, cylinder, piston and piston rings wear rapidly, carburetor air passages become dirt plugged, and carbon may build up in the combustion chamber and cause various troubles.

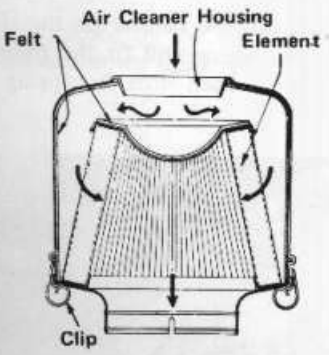
This dusty air must first be filtered by the air cleaner so that only clean air passes through the carburetor to the combustion chamber. If the air cleaner element becomes dirty or stopped up, its filtering efficiency is reduced and the engine air intake is hampered, with a corresponding decrease in combustion efficiency (and thus gas mileage) and output power. Therefore the air cleaner must be inspected and cleaned at regular intervals.

1) Construction

Figure 41 is a cross-sectional view of the H Series air cleaner. Air flow is in the direction of the arrows and is filtered by the element in the center. Some models are equipped with a silencer to reduce noise at the engine intake side.

Air Cleaner

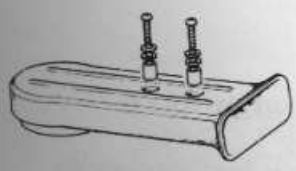
(41)



Silencer

(42)

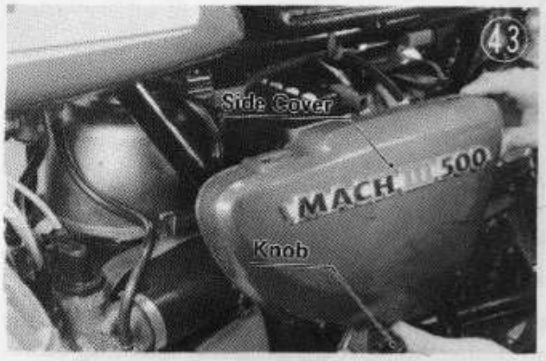
H1 H2



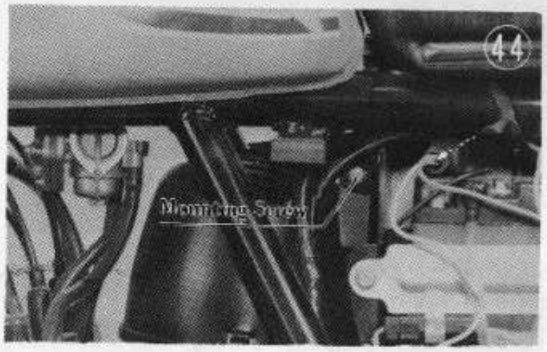


2) Disassembly

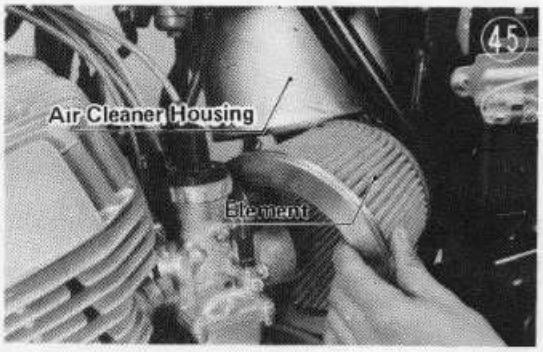
a. H1
Remove side cover.



Loosen air duct clamps. Remove air cleaner mounting screw. Remove air ducts.



Undo clips and pull element out through left side of frame.

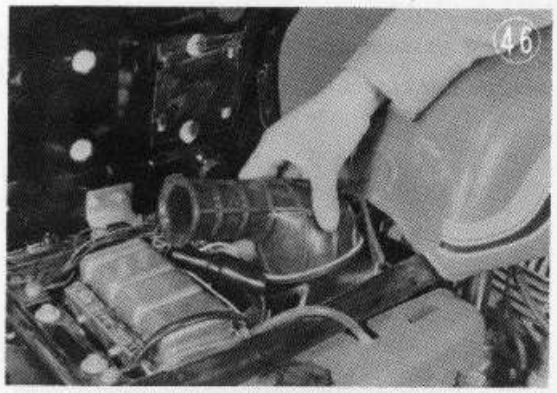


The air cleaner housing of the H1 cannot be removed without first unmounting the left carburetor.

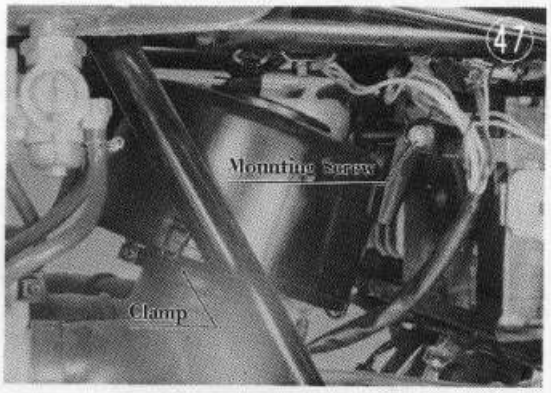
The H2 air cleaner element alone can be removed, but the easiest method is to remove the element and housing together after first taking off the front mounting bracket for the left side cover. This procedure is illustrated on the following page.

b. H2

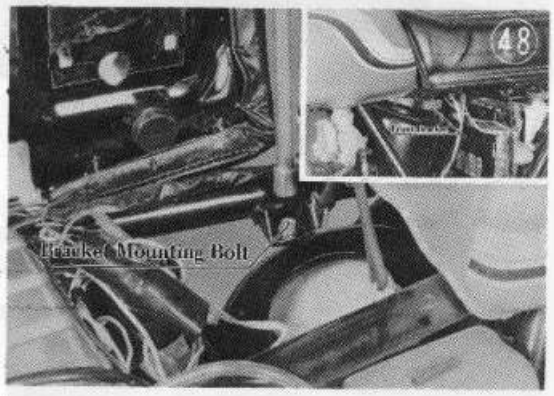
Remove the left side cover. Open the seat and pull off the rubber silencer.



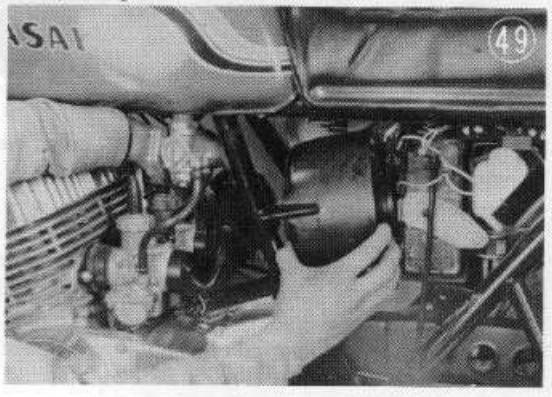
Unscrew the air duct clamp at the bottom of the air cleaner. Remove the air cleaner mounting screw.



Unscrew and take off the front mounting bracket for the left cover.



Push the air ducts forward (or take them off altogether) and pull out the air cleaner.

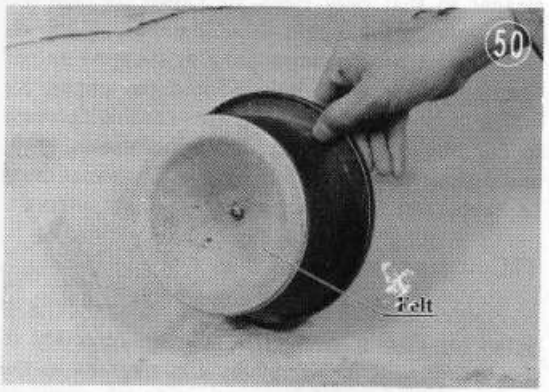


3) Overhaul

About every 2,000 miles, check the air cleaner element and clean it with gasoline. If the element is damaged, replace it.

CAUTION: The air cleaner element is a dry type; oil or gasoline/oil mixture should not be used to clean it.

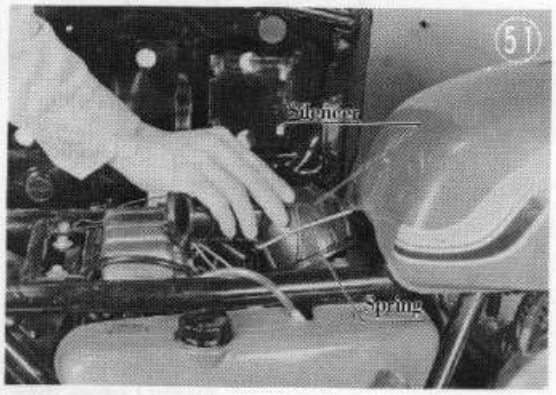
Clean the **felt** portions with gasoline, and wet them with a small amount of oil, keeping oil off the element. If the felt is loose, glue it back on securely.



4) Assembly

Assembly is the reverse of disassembly. After assembly make sure all clamps are tight.

To remount the silencer on the H2 air cleaner, take off the spring and fit the rubber on the air cleaner first. Then slide the spring clamp down into place.



2. CYLINDER · CYLINDER HEAD

The cylinder and cylinder head constitute the combustion chamber, and are exposed to extremely high temperatures while the engine is running. To prevent piston seizure; to prevent heat transformation of the shape or molecular structure of the cylinder, cylinder head, piston,

piston ring, connecting rods, etc.; and to prevent preignition due to overheating, the cylinder and cylinder head are made of an aluminum alloy with good conductivity, and fins are provided on the exterior to further increase cooling efficiency.

If carbon formed by incomplete combustion accumulates heavily on the inner surface of the cylinder head, not only does this hinder heat radiation, but the carbon becomes red hot and causes overheating and preignition.

Compression in the combustion chamber has a direct relationship with engine output power; if the cylinder head is tightened down with less than normal torque, or if the head bolts are not tightened evenly, the head will warp and leaks will develop, with a resultant lowering of compression. Again, cylinder, piston and piston ring wear will cause a decrease in compression and consequently limit engine performace.

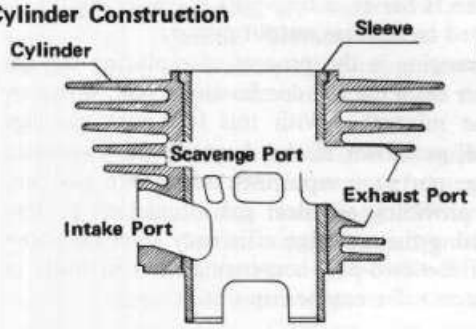
In the case of cylinder wear or piston seizure, restoration is possible with boring and honing.

1) Construction

The cylinder itself is light – made of aluminum alloy with a high cooling coefficient – and its inner surface is made wear resistant by casting into it a surface-hardened cast iron sleeve. The special fusion process by which the sleeve is bonded to the aluminum, averts the formation of any air pockets which might reduce heat conduction and decrease cooling efficiency.

In the inner surface of the cylinder, exhaust, scavenge and intake ports are provided, and these are opened and closed by the sides of the piston as it moves up and down inside the cylinder.

Cylinder Construction (52)



Port Timing (53)

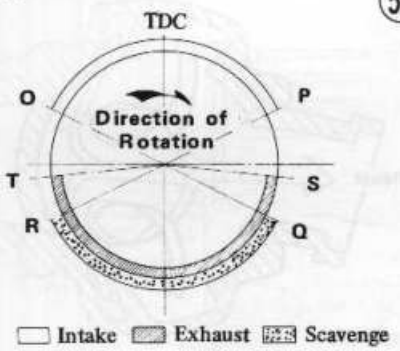


Table 2 Port Timing

Model		H1	H2
Intake	Open O°	76° BTDC	75° BTDC
	Close P°	76° ATDC	75° ATDC
Scavenge	Open Q°	59°30′ BBDC	58° BBDC
	Close R°	59°30′ ABDC	58° ABDC
Exhaust	Open S°	89° BBDC	89° BBDC
	Close T°	89° ABDC	89° ABDC

Port Measurements (54)

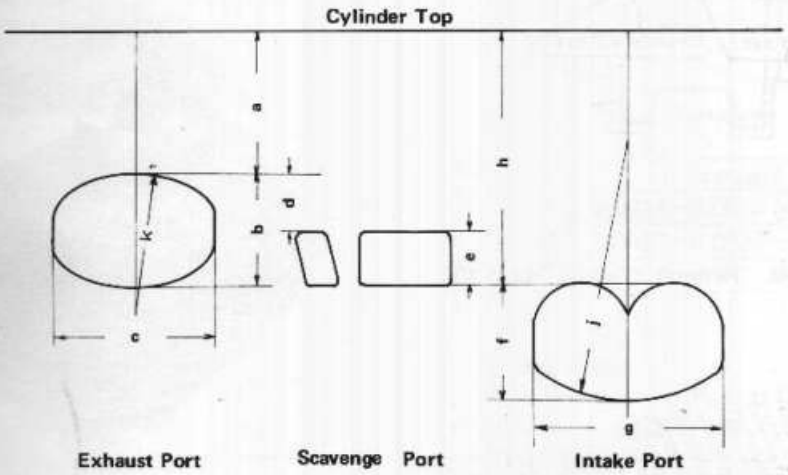


Table 3 Port Measurements [mm (inch)]

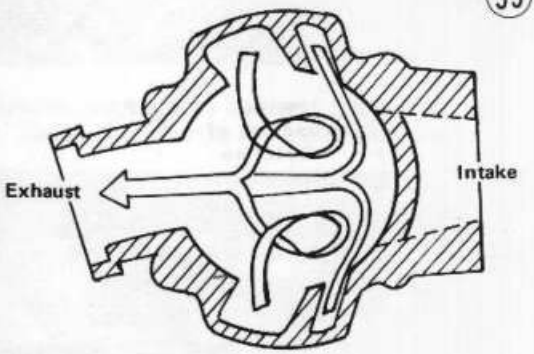
Model	A	B	C	D	E	F	G	H	J	K
H1	35.4 (1.394)	26.8 (1.055)	39.0 (1.535)	13.4 (.528)	12.6 (.496)	27.5 (1.083)	41 (1.614)	65.4 (2.575)	100 (3.937)	60 (2.362)
H2	36.8 (1.449)	29.3 (1.154)	43 (1.693)	14.9 (.587)	14.1 (.555)	29.8 (1.173)	48.5 (1.909)	66.1 (2.602)	100 (3.937)	65 (2.559)

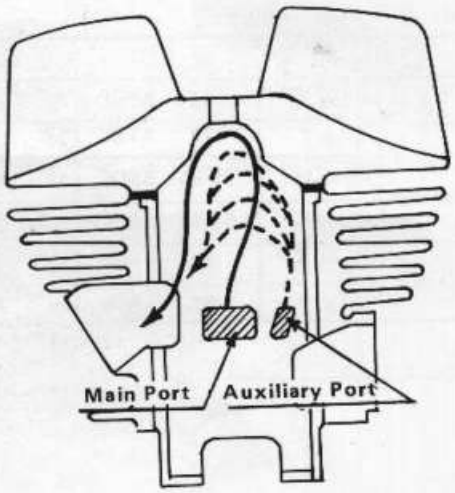
In the H Series, a four-port scavenge method is employed to increase output power.

Scavenging is the process of replacing the gas left over from the last combustion cycle, with new gasoline mixture. With this four-port scavenge method, as shown in the diagram, the two main scavenge ports are supplemented by two auxiliary ports, providing an ideal gas circulation pattern and raising the scavenge efficiency level far above that of the two-port scavenging used in most of the piston valve engines up until now.

Scavenge Gas Flow Pattern (Four port system)

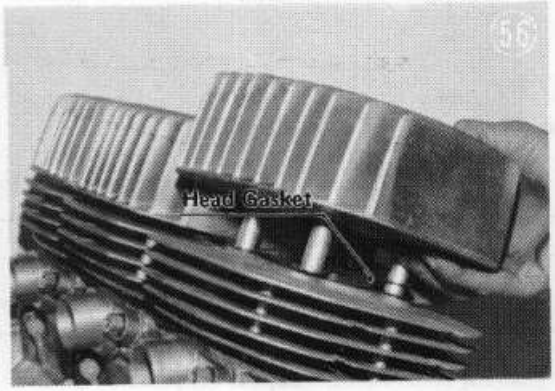
(55)



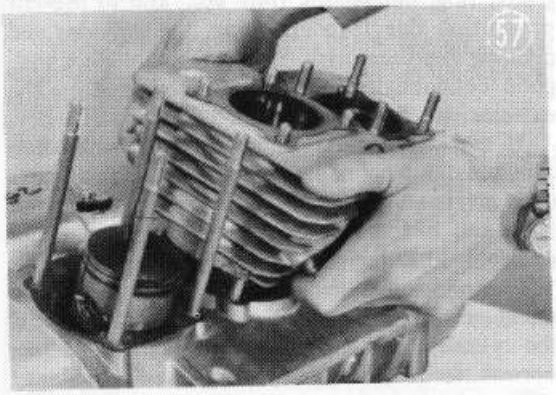


2) Disassembly

Remove head bolts. Remove cylinder heads and head gaskets.



Pull the cylinder off the studs.

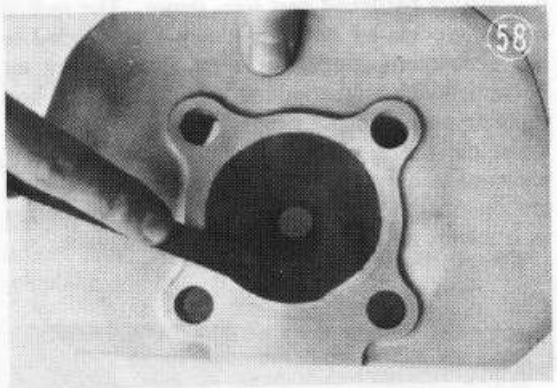


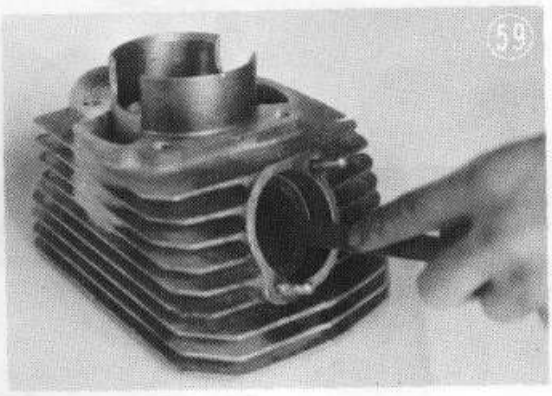
3) Overhaul

a. Carbon Removal

The cylinder head and the cylinder exhaust ports are very easy places for carbon to build up. Check the condition of these parts and carefully scrape off any accumulated carbon.

CAUTION: When removing carbon, take ample care not to scratch the head gasket surfaces or the cylinder walls.





b. Cylinder Damage

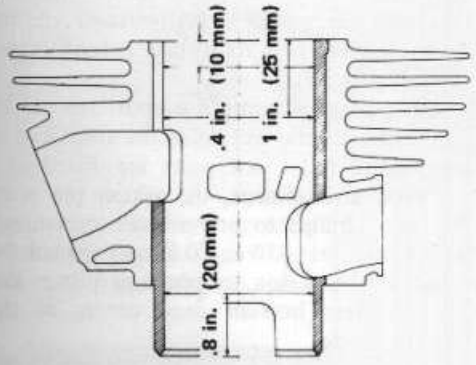
Inspect the cylinder walls for damage due to piston seizure. Correct any minor scratches or damage with fine emery cloth. If the cylinder is badly damaged, if must be bored and honed, or replaced.

c. Cylinder Wear

Pressure from the piston, the piston rings and combustion, causes heavy wear at the points shown to be measured.

Using an inside micrometer or cylinder gauge, take two measurements (front to back, side to side) at each of the three points indicated. If any of the six measurements is out of tolerance, or if any two measurements vary by more than .0020 in. (0.05 mm) bore and hone the cylinder, or replace it.

Cylinder Measurement



60



61

Table 4 Cylinder Diameter

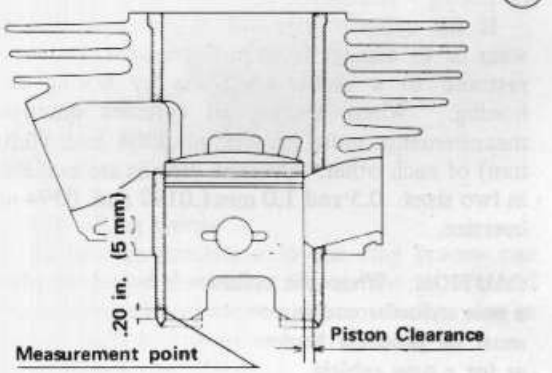
Model	Standard Diameter	Service Limit
H1	$60\ ^{+0.019}_{-0}$ mm	60.15 mm
	2.3622 $^{+0.0007}_{-0}$ in	2.3681 in
H2	$71\ ^{+0.019}_{-0}$ mm	71.15 mm
	2.7953 $^{+0.0007}_{-0}$ in	2.8012 in

d. Piston/Cylinder Clearance

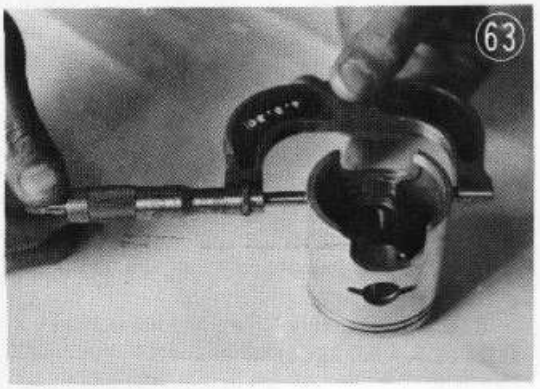
While the engine is running, the piston is subjected to constant high temperature and expands much more than the cylinder which can radiate a certain amount of its heat. Therefore, the piston and cylinder are made with a certain amount of clearance between them. Piston seizure, slap, lubrication oil consumption, compression, etc., are all closely related to this clearance.

When the cylinder is honed or if the cylinder is replaced, the piston clearance must be measured and the standard value maintained. Measure the cylinder inside diameter and the piston diameter at the points indicated in Fig. 62; the difference between these two measurements is the piston/cylinder clearance. Compare the measured clearance with standard values in Table 5 .

Piston Clearance



62



63

Table 5 Piston Clearance

Model	Standard Clearance
~'73 H1	0.0024~0.0028 in. (0.062~0.070 mm)
~'74 H1	0.0022~0.0026 in. (0.057~0.065 mm)
H2	0.0028~0.0031 in. (0.070~0.078 mm)

e. Compression

Confirm that the head is tightened down with the standard torque, and that there is no compression leadage at the head gasket. Standard torque is 14.5 – 17.5 ft-lbs (2.0 – 2.4 kg-M) for the H1, and 30 ft-lbs (4.2 kg-M) for the H2. Then thoroughly warm up the engine to bring piston clearance to normal, and to be sure of sufficient lubrication oil between the piston and cylinder.

Next remove all spark plugs and insert a compression gauge firmly into one spark plug opening at a time, allowing no compression

leakage. Then kick the engine over hard several times for maximum compression gauge reading. If there is more than 14 lbs/sq in (1.0 kg/cm^2) difference between any two cylinders, or if compression is less than 70% of the specified value, piston, piston rings or cylinder is worn.

Table 6 Compression

Model	Standard	
H1, H2	142 lb/sq in (10 kg/cm2)	engine kicked hard several times

f. Boring · Honing

If the cylinder gets out of tolerance due to wear or to damage from piston seizure, it can be restored to a usable condition by boring and honing. When honing, all cylinder diameter measurements must be within .0004 inch (0.01 mm) of each other. Oversize pistons are available in two sizes: 0.5 and 1.0 mm (.0197 and .0394 in.) oversize.

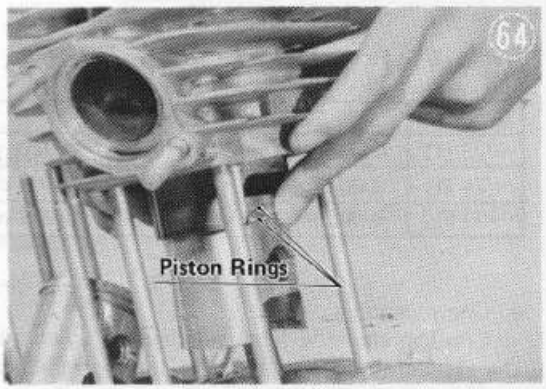
CAUTION: When the cylinder is bored, or when a new cylinder and piston are installed, the engine must be properly broken in, in the same manner as for a new vehicle.

4) Assembly

This is the reverse of disassembly.

NOTE:

1. When inserting the piston into the cylinder, align the ring opening with the knock pin in the ring groove, and hold the ring down in the groove to prevent its hanging up on the edge of the cylinder.
2. Spark plug installation torque is 18.0 – 22.0 ft.lbs (2.5 – 3.0 kg-M).



3. PISTON · PISTON PIN

While the engine is running, the piston is constantly subjected to the high temperature of the burning gasoline, and being a difficult part to cool, becomes extremely hot. Due to differences in temperature, there is a difference in the amount of expansion of the piston top as compared to the skirt portion, and again a difference between front/rear expansion and side to side expansion.

Calculating these expansion differences beforehand, the piston is made elliptical in shape with an inward taper toward the top (Fig. 65.), so that under normal running conditions its shape becomes almost perfectly cylindrical, and thus piston seizure due to piston expansion is averted.

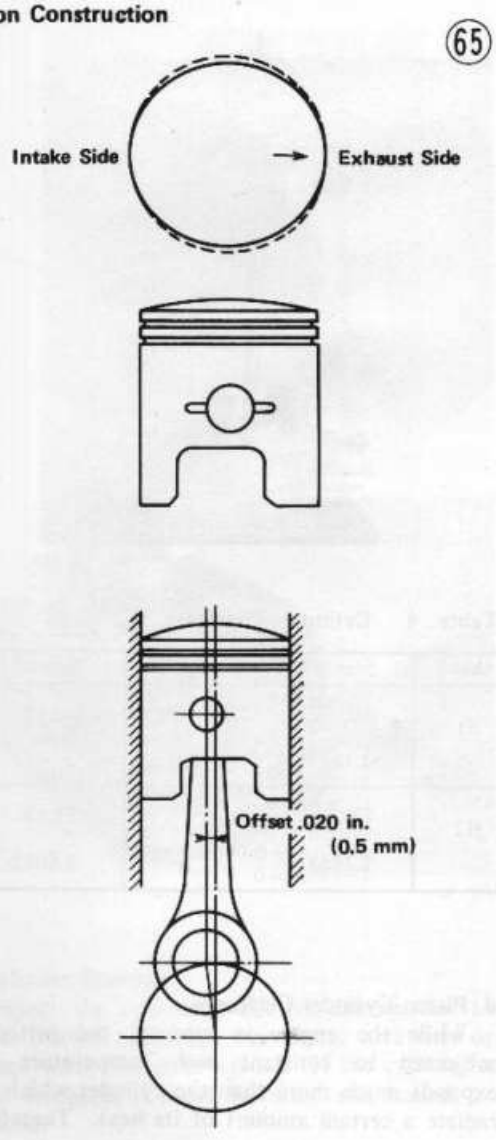
The piston is cast of light-weight, high-strength aluminum/silicon alloy with an extremely low heat expansion coefficient, and high resistance to heat and wear.

The piston pin is made of high-strength chrome molybdenum steel, and its surface is heat-treated for hardening.

The ends of the piston pin support the piston, and the center of the pin holds the small end of the connecting rod. All parts are fitted in a floating type arrangement, the piston pin being held by two circlips to prevent side movement.

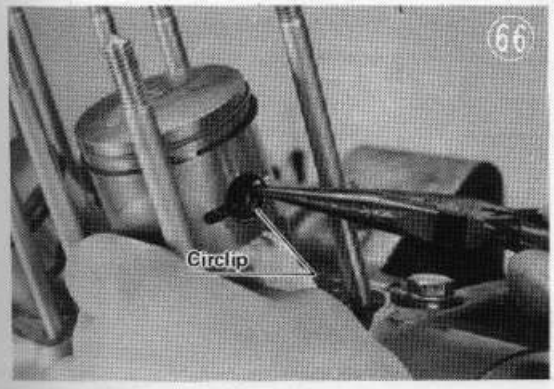
The pin is offset .020 in. (0.5 mm) toward the inlet side of the piston to minimize piston slap that occurs near bottom dead center of the combustion cycle.

Piston Construction

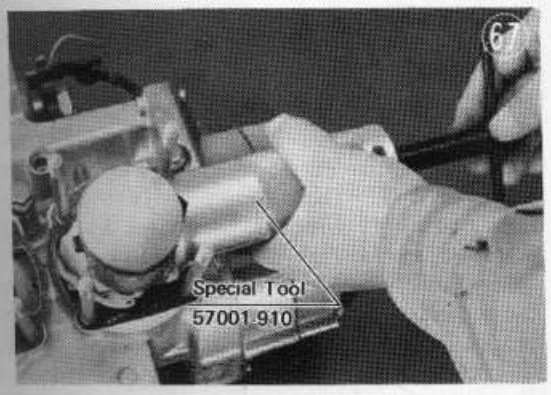


1) Disassembly

Cover the crankcase opening with a rag to keep parts and dirt from falling into it. Pull a circlip off either end of the piston pin.



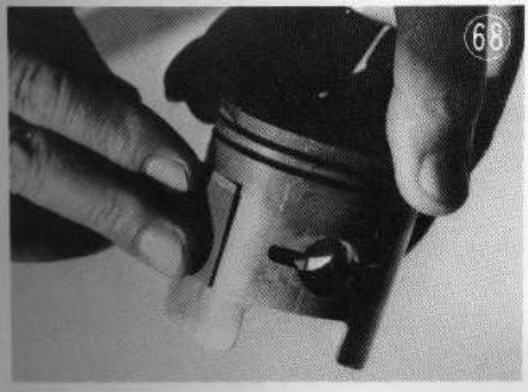
Remove each piston by pushing its piston pin out the side that snap ring was removed. Use the piston pin puller and adapter "A" (special tools) if necessary.



2) Overhaul

a. Piston Seizure Damage

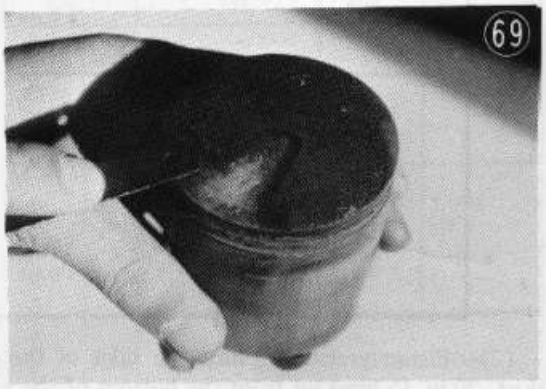
If light damage due to piston seizure or other causes is found, smooth the affected area of the piston with fine emery cloth. In the event of heavy damage, the piston must be replaced. Attempting to repair a badly damaged piston would only invite another piston seizure or cause engine noise.



b. Carbon Removal

(1) Piston top

Check the top of the piston for carbon, and scrape off any accumulation with a screwdriver or hacksaw blade. This carbon reduces the cooling capacity of the piston, and as the carbon turns red hot, causes the piston to overheat and possibly melt.



(2) Ring groove

Carbon accumulation in the ring groove can cause the ring to stick. Check the groove and remove any carbon with a piece of broken ring or other thin tool.



c. Piston wear

(1) As the diagram shows, the piston ring grooves become worn due to ring movement. Since this leads to compression leakage and a drop in output power, replace the piston if groove measurement indicates excessive wear. Also if either of the ring grooves is worn unevenly, or if the groove has changed in shape, the piston must be .replaced.

Piston Ring Movement

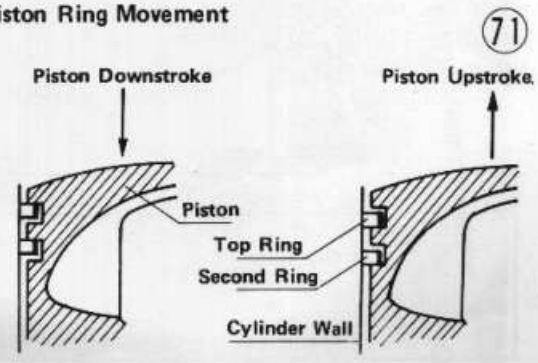


Table 7 Piston Specifications

Model		Skirt Dia.	Top Groove width x depth				Second Groove width x depth			
H1	inch	2.36122	.0591	+.0039 +.0031	x .1063	±.0039	.0591	+.0024 +.0016	x .1063	±.0039
	mm	59.975	1.5	+0.10 +0.08	x 2.7	±0.1	1.5	+0.06 +0.04	x 2.7	±0.1
H2	inch	2.79314	.0591	+.0039 +.0031	x .1272	±.0039	.0591	+.0024 +.0016	x .1272	±.0039
	mm	70.946	1.5	+0.10 +0.08	x 3.23	±0.1	1.5	+0.06 +0.04	x 3.23	±0.1

(2) Piston pressure against the sides of the cylinder causes piston wear. Measure piston diameter at the skirt .20 in. (5 mm) up from the bottom of the piston, at right angles to the piston pin.

d. Piston Clearance

If the piston is replaced, piston clearance of the new piston must be measured. See page 17 .

e. Connecting Rod Small End Play

Insert the piston pin and the needle bearing into the small end of the connecting rod, and measure the play with a dial gauge. If play exceeds the service limit, replace the needle bearing and piston pin.

Standard play: .00012-.00088 in. (0.003-0.022 mm)
Service limit: .0039 in. (0.10 mm)

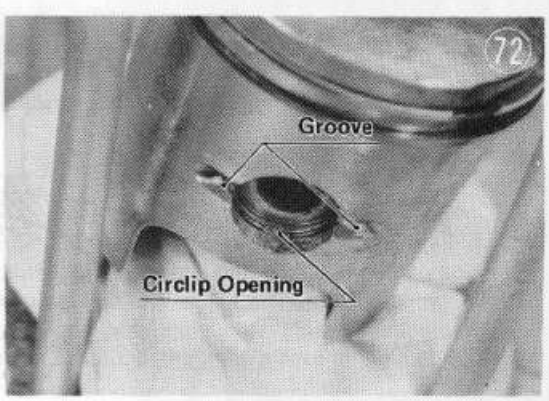
3) Assembly

This is the reverse of disassembly.

CAUTION:

1. Insert the piston so that the arrow stamped on the top points to the exhaust side.

2. Use a new piston pin circlip in place of the one removed during disassembly. Align the circlip so that its opening does not face either groove in the piston.

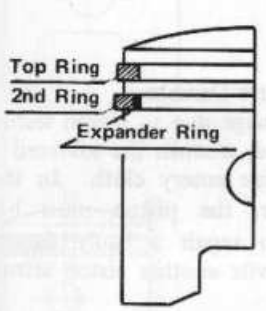


4. PISTON RINGS

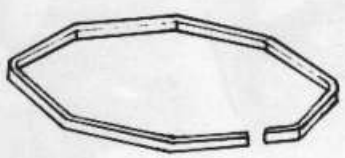
There are two piston rings, the main function of which is to prevent compression leakage. The top ring, also called the compression ring, has chamferred outer edges, while the second ring is un-chamferred. The top ring can also be easily identified by its chromed outer edge, designed to minimize wear at high temperatures.

In the H Series, an expander ring is installed in the second ring groove between the ring and the piston. The elasticity of this octagonal expander ring helps check piston slap.

Ring Position

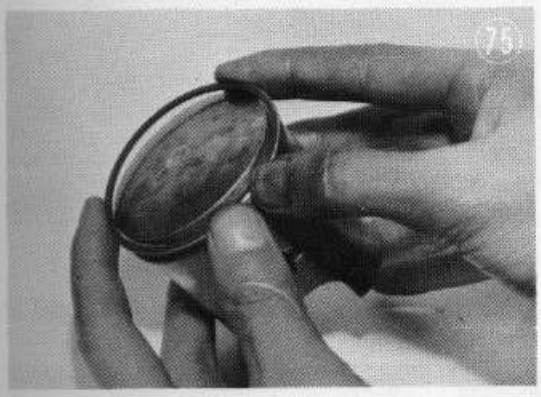


Expander Ring



1) Disassembly

Spread the opening of the piston ring with both thumbs, and push up the opposite side of the ring. To remove the expander ring, spread the opening with a small screwdriver.

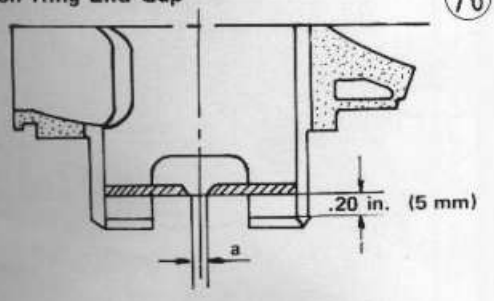


2) Overhaul

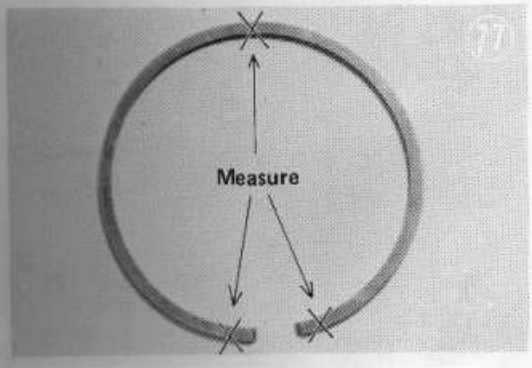
a. Piston Ring Wear

(1) As the ring wears, the end gap grows larger, allowing compression leakage. Following the illustration, insert the ring .20 inch (5 mm) into a cylinder with a standard inside diameter. With the ring in a horizontal position with respect to the bottom of the cylinder, measure the end gap with a thickness gauge. The standard gap is .008-.012 in. (0.2-0.3 mm) for the H1 and .008-.016 in. (0.2-0.4 mm) for the H2. If the gap exceeds .031 in. (0.8 mm) replace the ring.

Piston Ring End Gap (76)



(2) There is a difference in tension between the ends of the ring and the center, and consequently a difference in wear. Therefore, measure "A" and "B" with vernier calipers or a micrometer at the three points indicated.



Ring Measurement

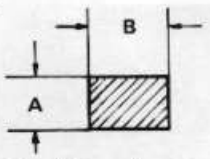


Table 8 Piston Ring Dimensions

Model			A	B
H1	Top	inch	.0591 $^{-.0004}_{-.0012}$	.0984 ±.004
		mm	1.5 $^{-0.01}_{-0.03}$	2.5 ±0.1
	2nd	inch	.0591 $^{-.0004}_{-.0012}$	.0748 ±.004
		mm	1.5 $^{-0.01}_{-0.03}$	1.9 ±0.1
H2	Top	inch	.0591 $^{-.0004}_{-.0012}$	.118 ±.004
		mm	1.5 $^{-0.01}_{-0.03}$	3.0 ±0.1
	2nd	inch	.0591 $^{-.0004}_{-.0012}$	.106 ±.004
		mm	1.5 $^{-0.01}_{-0.03}$	2.7 ±0.1

b. Piston Ring Tension

The piston rings must have a certain amount of spring tension so that they will ride snuggly against the inside cylinder wall and prevent compression leakage. However, too much tension will cause abnormally fast wear, and may possibly bring about piston seizure. Confirm correct ring tension by measuring the gap between the ends of the ring, with the ring sitting free from any restrictions.

Table 9 Ring End Gap (free)

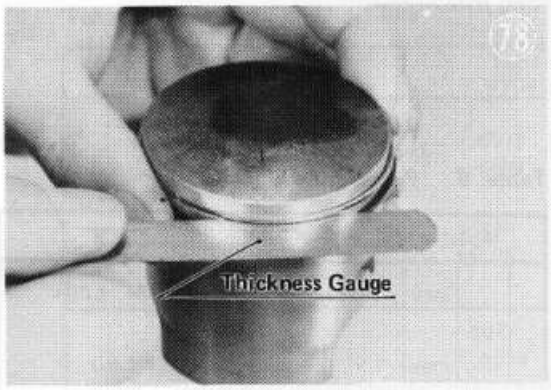
Model		Top	2nd
Hi	inch	about .276	.374
	mm	about 7.0	9.5
H2	inch	about .315	.315
	mm	about 8.0	8.0

c. Piston Ring/Groove Clearance

This clearance is to allow room for piston ring expansion. But too much clearance will allow compression leakage, and too little clearance will cause the ring to stick to the piston and invite piston seizure. Measure clearance "A" at several points around the piston to determine the extent of piston or ring wear.

Table 10 Ring/Groove Clearance

Model	Groove		Standard	Service Limit
H1, H2	Top	inch	.0035 – .0051	.0067
		mm	0.09 – 0.13	0.17
	2nd	inch	.0020 – .0035	.0047
		mm	0.05 – 0.09	0.12



3) Assembly

Assembly is the reverse of disassembly.

NOTE:

1. Be sure the opening in the expander ring is aligned with the knock pin before inserting the second ring.
2. Make certain that the first and second rings are in their correct grooves.

5. ENGINE, LEFT SIDE

On the left side of the engine are located the left cover, the front chain case cover, and inside are the AC generator, engine sprocket and the clutch release mechanism.

The engine sprocket, which transmits motion to the rear wheel via the chain, collects dirt and sand easily and is therefore made of special wear-resistant steel to minimize damage from this dirt.

NOTE: Regarding the AC generator, removal and remounting only are explained here. For generator construction, overhaul and adjustment see page101. Also, for clutch release mechanism removal and overhaul, see the clutch section.

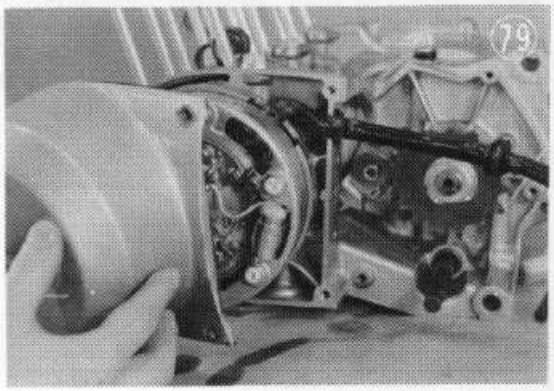
1) Disassembly

Remove front chain case cover and gear shift pedal. (Page 7)

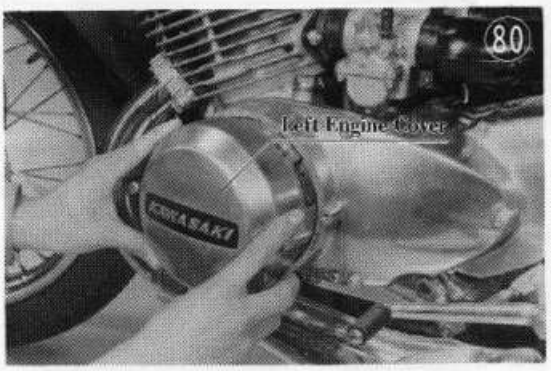
a. Left Cover

Remove the three mounting screws and pull off the left cover.

H1

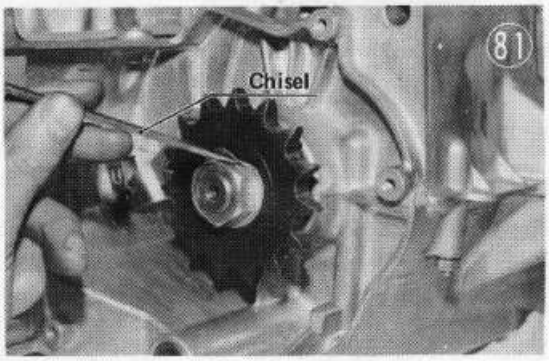


H2 (H2 has only two screws.)

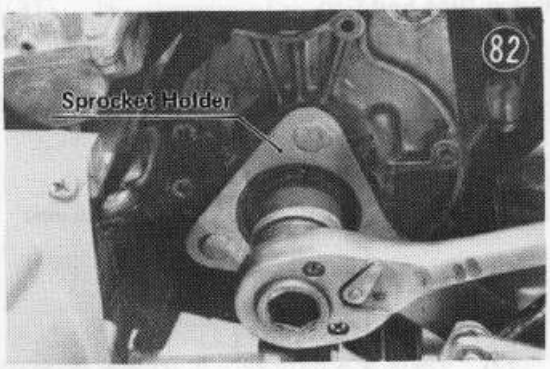


b. Engine Sprocket

Straighten the bent washer with a cold chisel or similar tool.



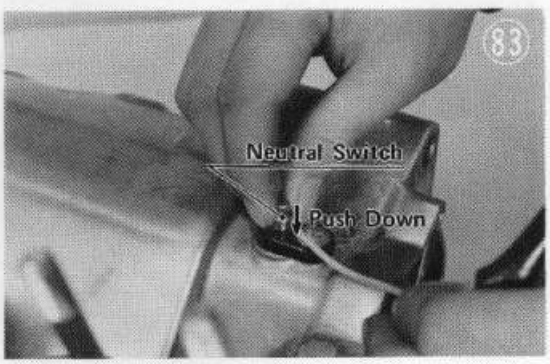
Hold the sprocket with a sprocket holder (special tool) to remove the sprocket nut, and then remove the sprocket.



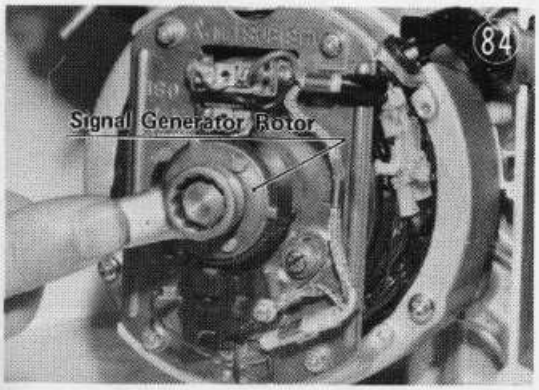
c. AC Generator

Stop the crankshaft from turning and follow these steps:

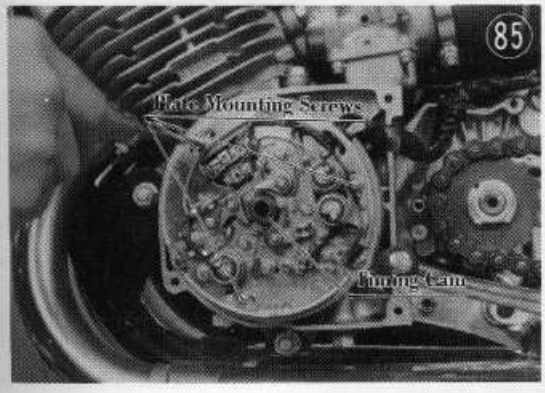
Remove neutral indicator switch wire.



Remove the mounting bolt and pull off the signal generator rotor. **(CDI models)**

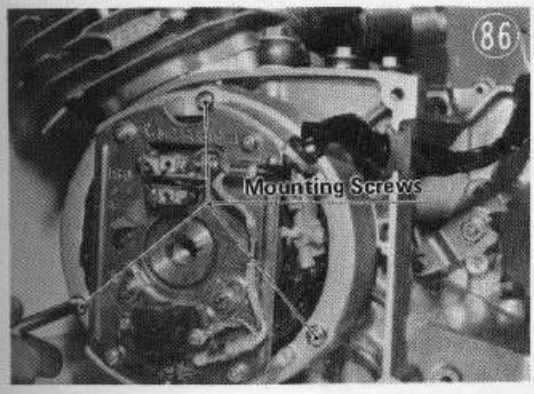


Remove the timing cam bolt and timing plate.
(H1 without CDI)

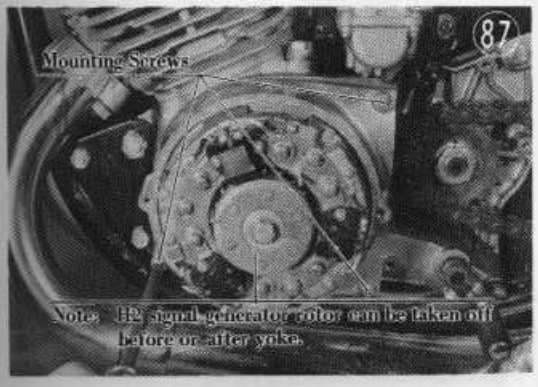


Remove the mounting screws and pull off the yoke assembly and cam.

H1 (all models)

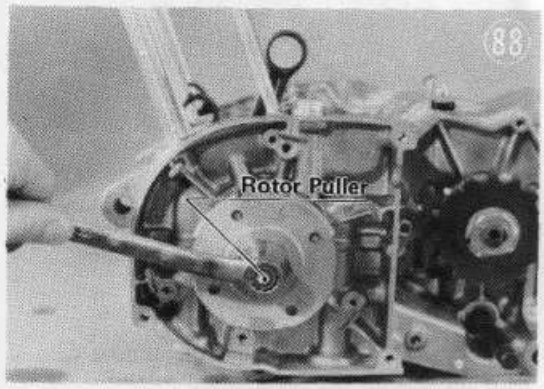


H2



With a rotor puller (special tool), remove the rotor.

CAUTION: Do not hit the rotor to pull it off.



Remove the key from the crankshaft.

2) Overhaul

Inspect the sprocket teeth for wear. If the teeth are badly worn, they will not mesh properly with the chain, and the chain will be noisy and soon wear out.

Measure the diameter of the sprocket at the base of the teeth, according to the diagram. If the sprocket is worn out of tolerance, or if it is badly worn on one side of the teeth, replace the sprocket and chain together. (See page 94.)

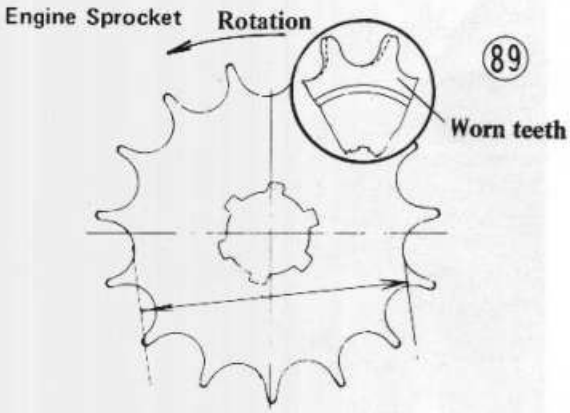


Table 11 Sprocket Diameter [inch (mm)]

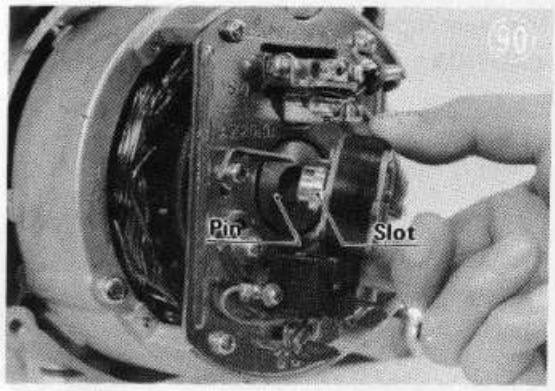
Teeth	Standard	Service Limit
14	2.4087 (61.18)	2.3779 (60.4)
15	2.5898 (65.78)	2.5591 (65.0)
16	2.8035 (71.21)	2.7716 (70.4)

3) Assembly

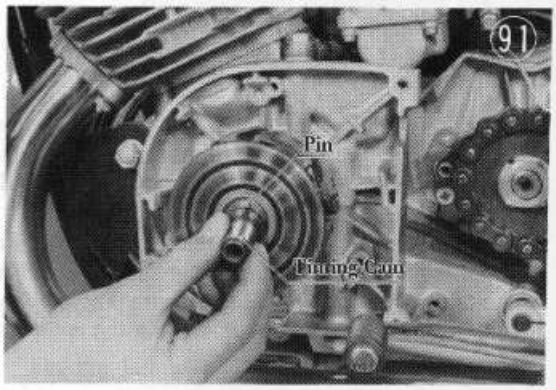
Assembly is the reverse of disassembly.

NOTE:

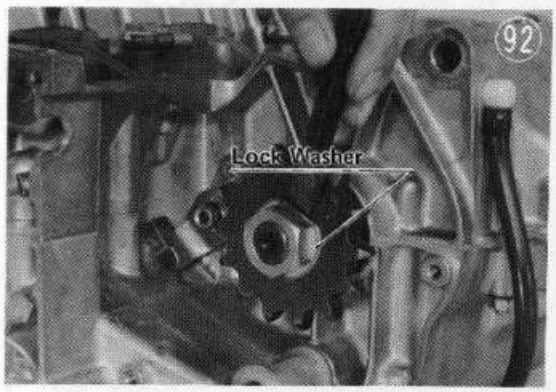
1. CDI models – Before mounting the rotor, first make sure the key slot is aligned with the crankshaft key. Also, align the signal generator rotor slot with the alignment pin on the generator rotor, then tighten down the mounting bolt.



2. H1 (no CDI) – Align the timing cam slot with the pin on the rotor when mounting it.



3. Align the projection on the engine sprocket lock washer with the hole in the sprocket, tighten down the mounting nut, and bend up one side of the lock washer.



6. RIGHT COVER

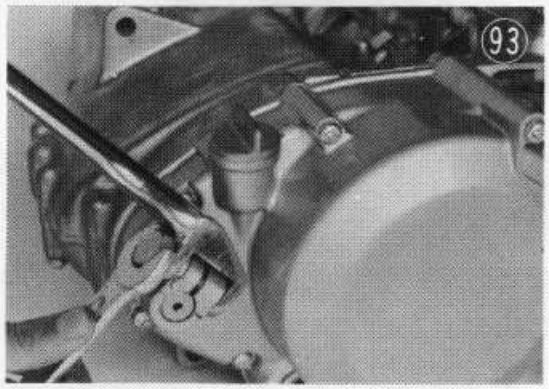
The right cover includes the distributor (H1 with CDI), oil pump, tachometer cable, and the pinions for these parts.

In addition, the right cover, together with the crankcase, forms the clutch housing, and contains the oil for lubrication and cooling of the clutch and the various gears. Consequently, if the packing is bad or if the cover is not tightened down with the correct torque, oil will leak out from between the right cover and the crankcase. So assemble this portion very carefully, and after assembly, check that there is sufficient oil in the crankcase.

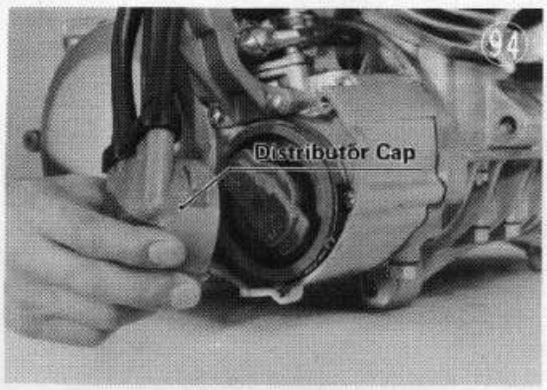
1) Disassembly

See page 7 for removal of the oil pump cover, oil pump cable, oil inlet pipe, and tachometer cable.

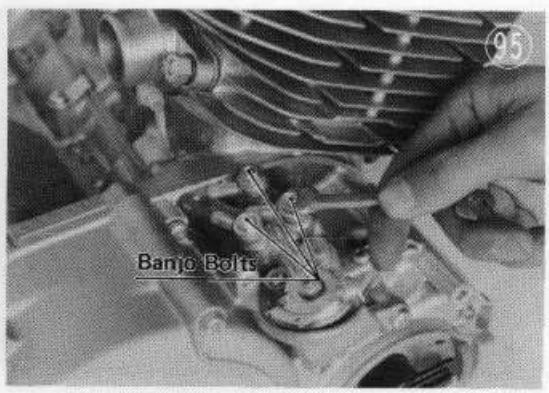
a. Right Engine Cover
Remove the kick pedal.



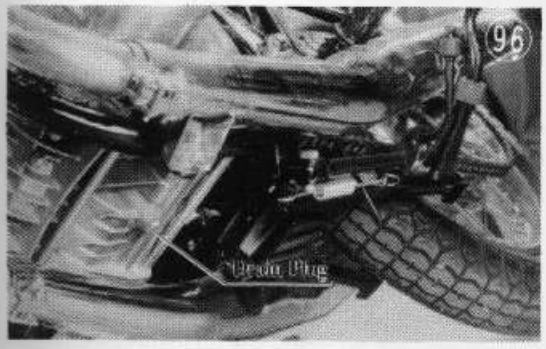
Remove the distributor cap mounting clamp, and the distributor cap. **(H1 CDI only)**



Remove the oil pump banjo bolts and take off the three outlet oil pipes.

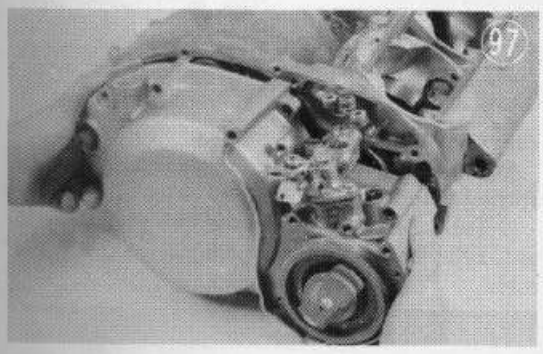


Drain the transmission oil.



Remove the mounting screws and take off the right cover.

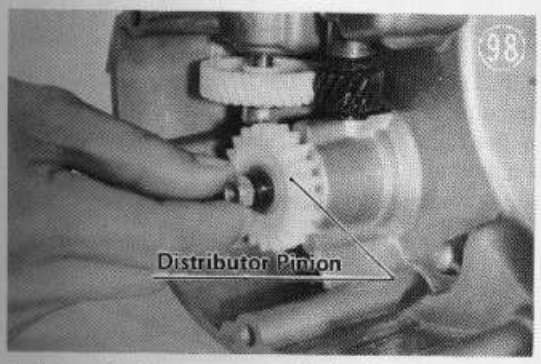
H1 (CDI)



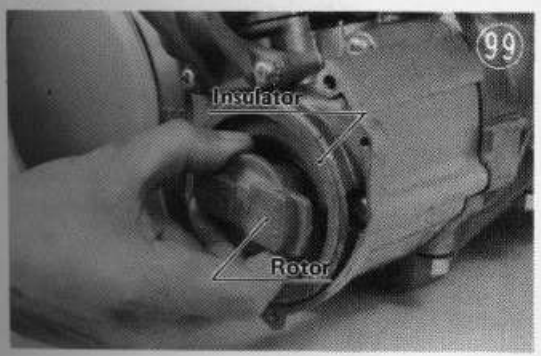
CAUTION: If the kick shaft or gear change shaft oil seal is removed, it must be replaced. Remove them only if they appear to be damaged.

b. Distributor (H1 CDI)

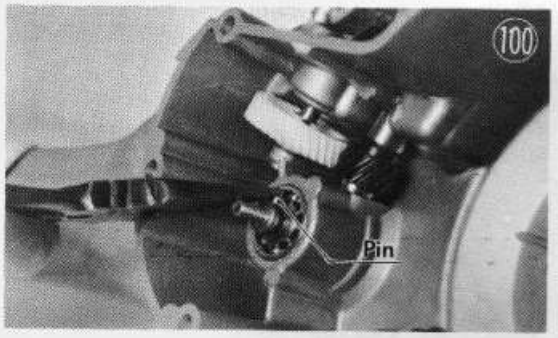
Hold the rotor to stop the distributor shaft from turning, remove the pinion gear mounting nut and take the gear off the shaft.



Pull the distributor rotor off the distributor shaft. Then remove the distributor insulator from the right cover.



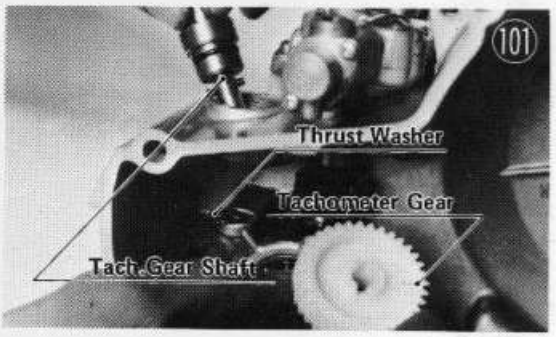
Remove the pin from the distributor shaft. With a mallet, lightly strike the distributor shaft on the inside end to remove it.



CAUTION: Do not remove the oil seal unless it is damaged.

c. Tachometer Gear

Take the shaft and the guide bushing from the cable opening, and the gear and thrust washer can be removed.

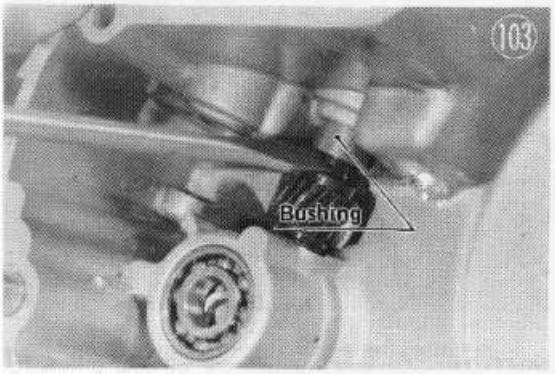


d. Oil Pump

Remove the mounting screws and take off the oil pump.



Push the end of the guide bushing with a screwdriver to remove it from the oil pump mounting opening.



Remove the gear shaft and thrust washer.

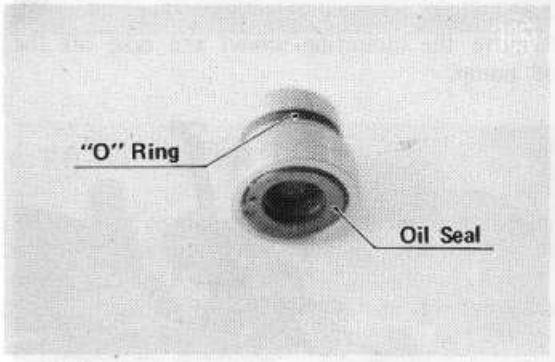


2) Overhaul

a. Distributor
See page 108.

b. Bushings

An "O" ring and an oil seal are fitted on the oil pump and tachometer bushings. Inspect the O ring and the lips of the oil seals, and replace any damaged parts to prevent oil leakage.



c. Oil Seals

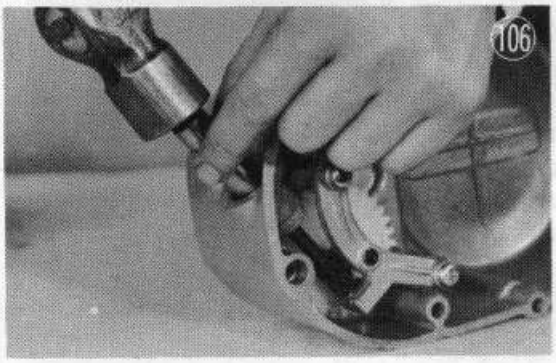
Inspect the kick shaft, gear change shaft and distributor shaft oil seals, and replace any damaged ones.

3) Assembly

Assembly is the reverse of disassembly.

a. Bushings

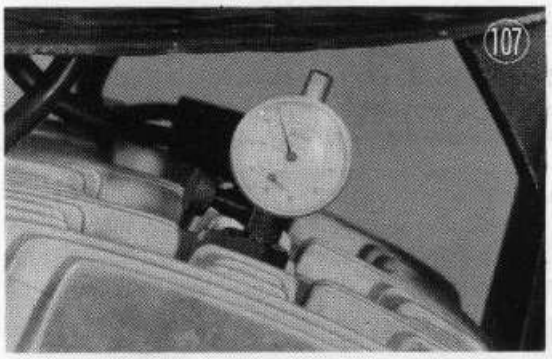
When pressing on the oil pump and tachometer bushings, be careful not to damage the lip part. Press them on as far as they will go, following the illustration.



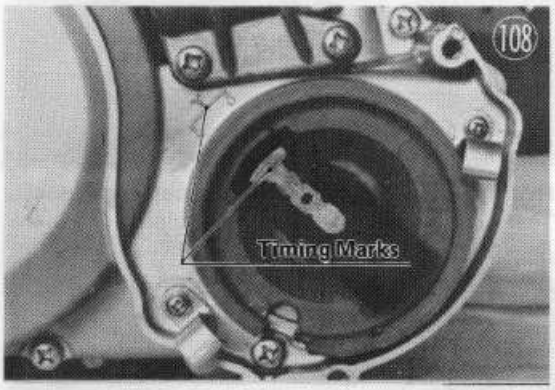
b. H1 distributor timing

As the right cover is replaced, timing must be adjusted as follows:

1. Turn the crankshaft until the piston of the right cylinder (distributor side) is at top dead center.



2. Turn the distributor rotor until the mark on the rotor is aligned with the head of the "T" mark on the right cover, and mount the cover with the two marks as centered as possible.



3. Before tightening down the cover mounting screws, ascertain that the distributor and oil pump gear are properly meshed with thier respective gears.

c. Transmission oil drain plug installation torque 37 – 52 ft.lbs. (5.1 – 7.2 kg-M).

7. CLUTCH · CLUTCH RELEASE

The clutch enables the transmission of engine power to the rear wheel to be interrupted at any time for smooth starting, stopping and gear shifting If the clutch does not disengage well, gear shifting becomes difficult and the transmission will incur damage. On the other hand, if the clutch slips, power transmission efficiency is reduced and the engine and clutch may overheat.

Depending on the crankcase oil viscosity, oil level, and oil lubricating capacity (which decreases with long use), a wet-type clutch may not disengage properly or may slip. Therefore, the crankcase should be filled with the correct quantity of the specified oil, and the oil should be changed at regular intervals.

The clutch engages and disengages engine power transmission by friction between the clutch plates and friction discs, which are forced together by the tension of the clutch springs. Accordingly, attention must be given to possible weak springs, uneven tension among the various springs, and friction disc wear.

In the case of sudden clutch engagement, which makes driving extremely dangerous, check for poor sliding of the clutch cable, seizure of the clutch push rod with the drive shaft etc.

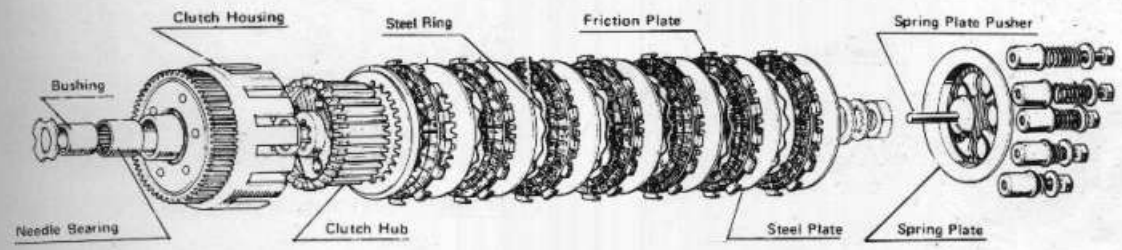
1) Construction

a. Clutch

Figures 109 and 110 are breakdown diagrams of the H1 and H2 clutches. The clutch is a wet-type, multiple-plate with 7 friction plates and 8 steel plates. To increase clutch disengagement effectiveness, steel rings are installed between the steel and friction plates. The clutch housing is fixed to the reduction spur gear with rubber-cushioned rivets. The H2 clutch has a steel band which is located beneath the first friction plate around the outside of the clutch housing. Its purpose is to prevent the housing "fingers" from spreading.

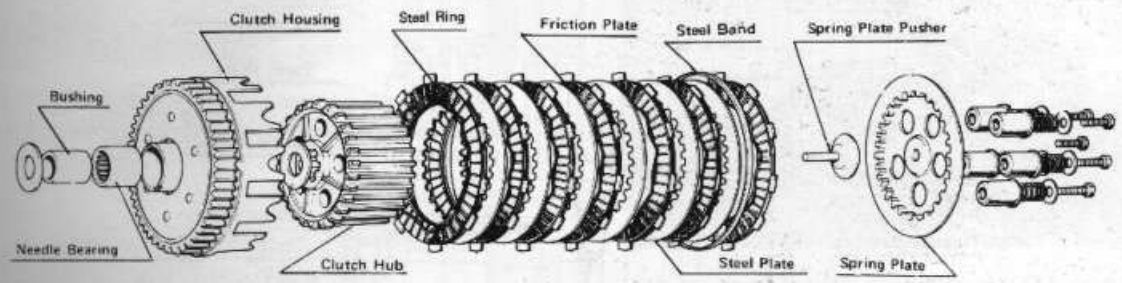
(109)

H1 Clutch



(110)

H2 Clutch



b. Clutch Release

Fig. 111 is a breakdown diagram of the H1 clutch release mechanism. The toothed portions of the inner and outer clutch release gears are made of nylon. The inside of the inner release gear is partially threaded and an adjusting screw is screwed into it. The end of the screw transfers motion to push rod A, which is inserted into the opposite end of the inner release gear, and extends into the drive shaft. This rod in turn moves push rod B and the clutch spring plate pusher, also inside the drive shaft.

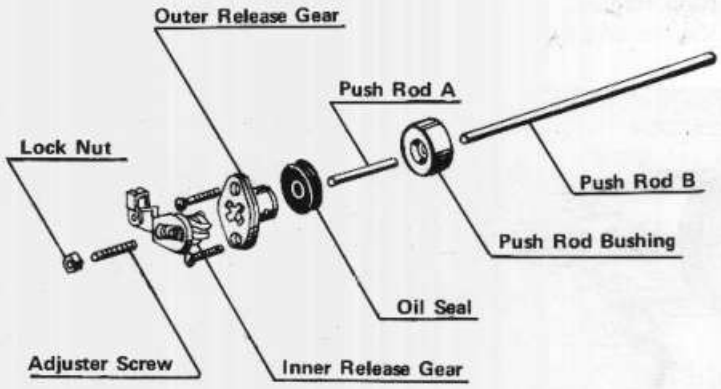
2) Operation

The transfer of motion from the crankshaft to the transmission is interrupted by the action of the friction plates and clutch steel plates. When the clutch is engaged, the spring plate, by clutch spring tension received via the spring guides, forces the friction and clutch plates together. And by friction between the two sets of plates, the rotation of the clutch housing is transmitted to the clutch hub. Thus, the drive train is as follows: crankshaft → primary gear → clutch housing → friction plates → steel plates → clutch hub → transmission drive shaft.

Going back to the clutch lever, the inner release gear is turned via the clutch cable and release lever, and push rod A, push rod B, clutch spring plate pusher and spring plate are pushed against the spring tension. Because of this, tension holding clutch and friction plates together is relaxed, friction is reduced so the plates turn freely of each other, and consequently power transmission between the clutch housing and the clutch hub is interrupted.

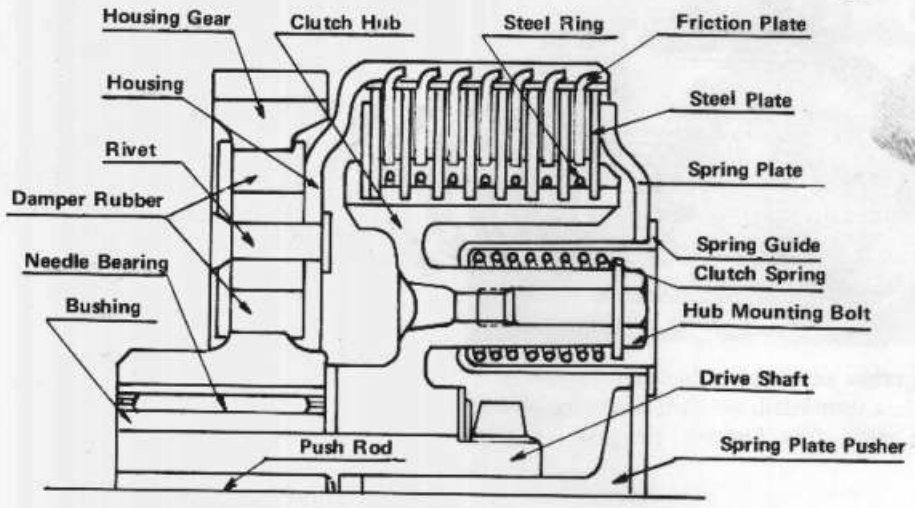
H1 Clutch Release

(111)



Clutch

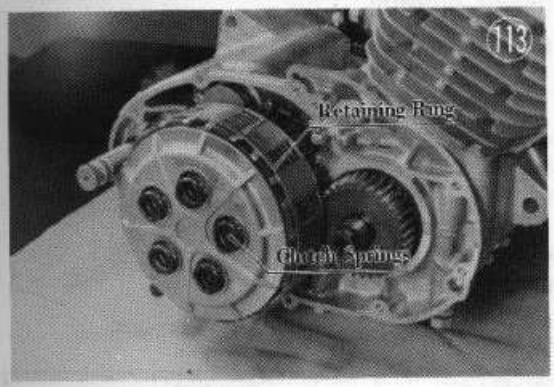
(112)



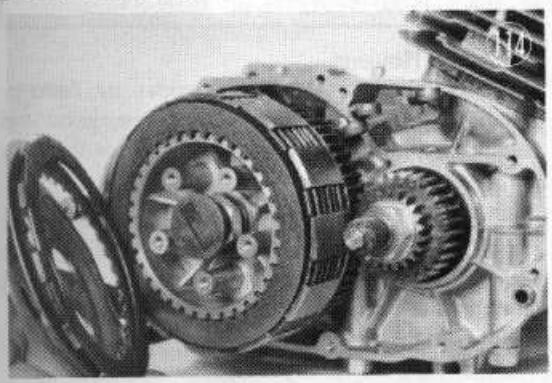
3) Disassembly

a. Clutch

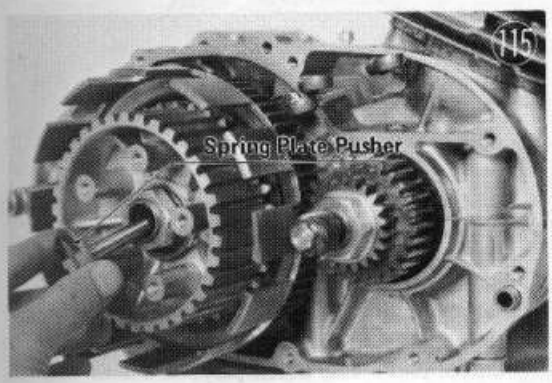
Take out the 5 mounting bolts, and remove the clutch springs (and H2 retaining ring).



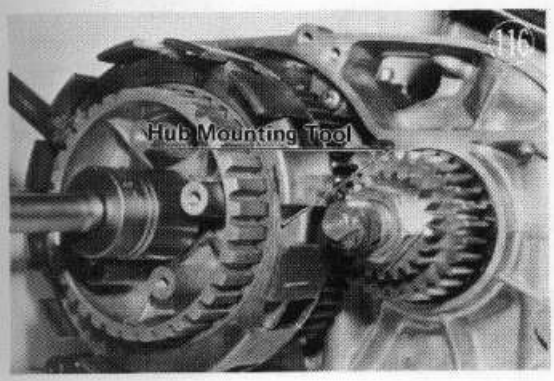
Remove the spring guides, spring plate, steel plates, friction plates and steel rings.



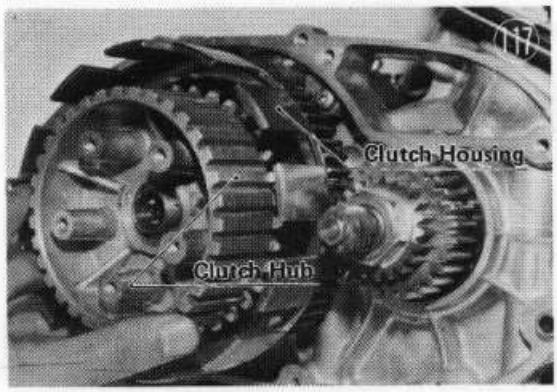
Take out the spring plate pusher (and ball – H2).



Using a clutch hub mounting tool (special tool), hold the clutch hub and housing and remove the mounting nut.



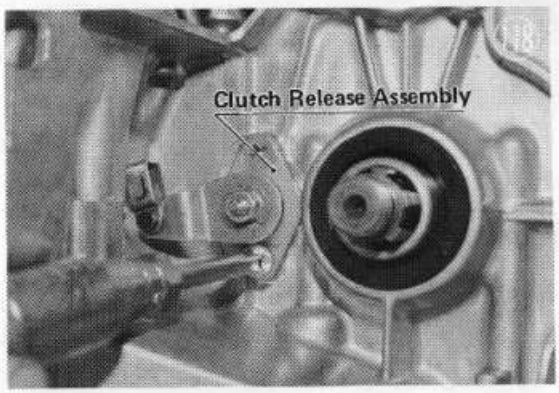
Take off the lock washer and flat washer. Remove the clutch hub, thrust washer and clutch housing from the drive shaft in that order.



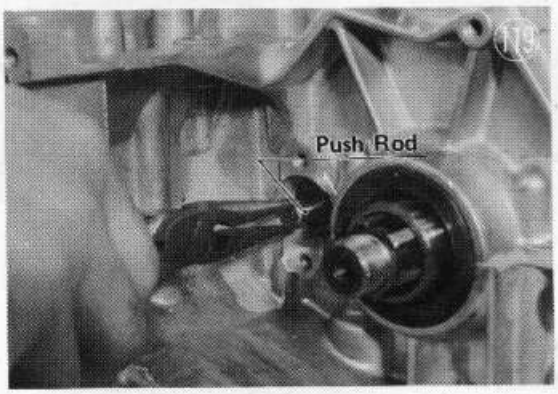
Last, pull off the bushing and the other thrust washer.

b. Clutch Release

Take out the mounting screws and remove the clutch release assembly from the crankcase.



Remove A and B push rods.



NOTE: Removal of the oil seal or push rod bushing necessitates disassembly of the crankcase.

4) Overhaul

a. Clutch Springs

If the free length of the clutch springs becomes shorter, spring tension is reduced and the clutch

may slip. Furthermore, if the lengths of the springs differ, the clutch will be difficult to disengage. Measure the free length of each spring and replace any one not in tolerance.

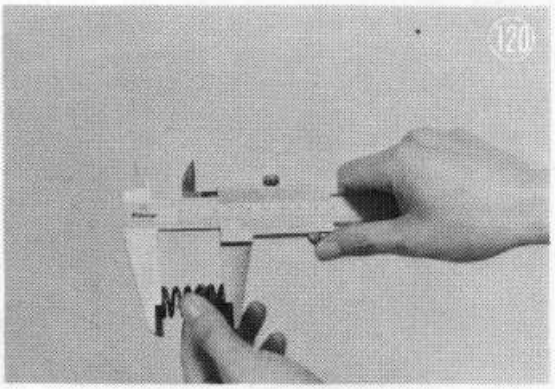
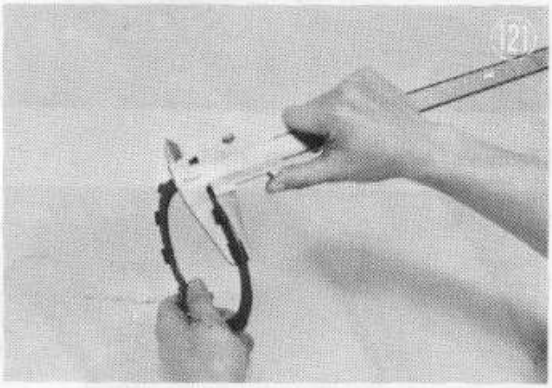


Table 12 Spring Length

Model	Standard	Service Limit
H1	1.417 in. (36.0 mm)	1.339 in. (34.0 mm)
H2	1.26 in. (32 mm)	1.18 in. (30 mm)

b. Friction Plates

Check the cork portion for wear or damage. Measure the thickness of the plates and replace any worn out of tolerance, or where uneven wear or damage is evident.



Friction Plate Thickness

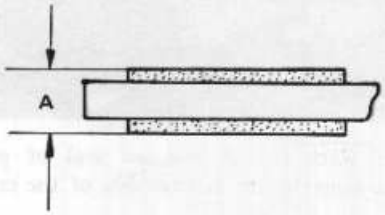


Table 13 Friction Plate Thickness

Model	Standard	Service Limit
H1, H2	.110 $\pm$ .004 in. (2.8 $\pm$ 0.1 mm)	.098 in (2.5 mm)

c. Clutch Housing and Friction Plates

Check gap B between the projections on the friction plates and the clutch housing. Too wide a clearance will cause clutch noise, and too narrow a clearance will prevent the clutch from disengaging properly.

Friction Plate Clearance

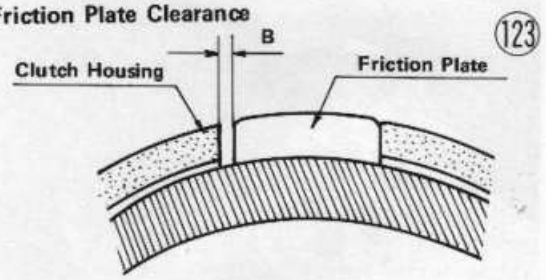


Table 14 Clutch Housing/Plate Clearance

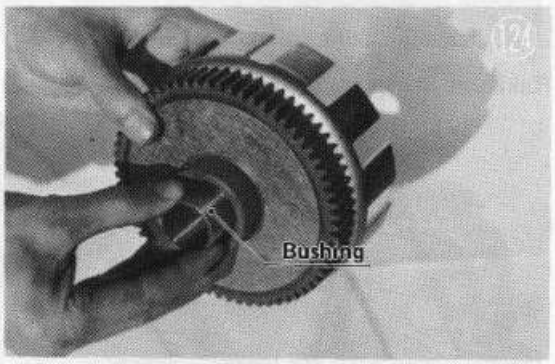
Model	Standard
H1	.0039 – .0157 in. (0.10 – 0.40 mm)
H2	.0035–.0157 in. (0.09–0.40 mm)

d. Clutch Housing

Check the gear teeth for nicks or damage. Depending on the extent of damage, grind the teeth smooth with an oilstone, or replace the gear.

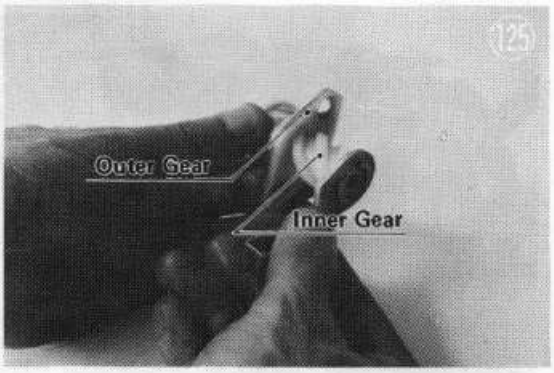
c. Needle Bearing

Check the needle bearing and bushing in the clutch housing for play as illustrated. Too much play, or damage to the bearing or bushing will cause clutch noise.



f. Clutch Release

(1) Put the inner and outer clutch release gears together and move them back and forth to check for play. Too much play, or cracks or other damage will prevent smooth operation of the clutch. If this is the case, replace the two gears as a set.



(2) Check push rods A and B, and depending on the extent of any damage, correct it or replace the rods. Check the adjustment screw for wear; when there is no more room for adjustment, the clutch will fail to disengage.

5) Assembly

This is the reverse of disassembly.

NOTE: Assemble the inner and outer release gears and then mount them in the crankcase, being careful of the release lever angle. If the outer release gear is mounted in the crankcase beforehand, the inner release gear cannot be fitted into it. Also take ample care to tighten the two mounting screws evenly.

On the H2, be sure to insert the steel ball into the drive shaft before replacing the spring plate pusher.

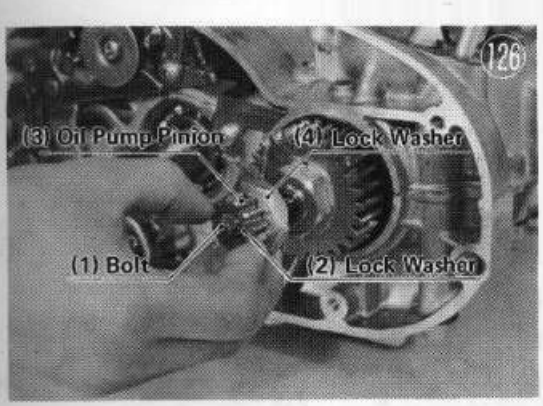
When mounting the H2 spring plate into the clutch hub, point the arrow on the spring plate to the mark on the clutch hub.

8. PRIMARY GEAR

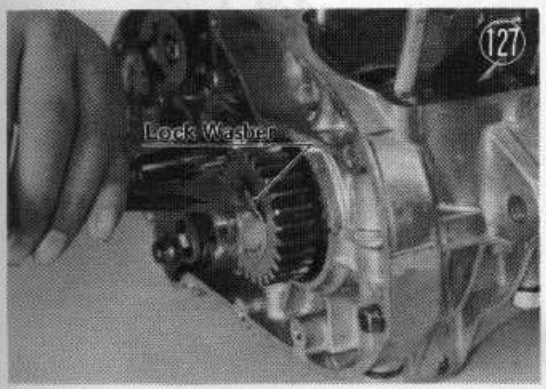
The primary gear is mounted on the left and of the crankshaft, and together with the clutch housing gear, performs the primary reduction.

1) Disassembly

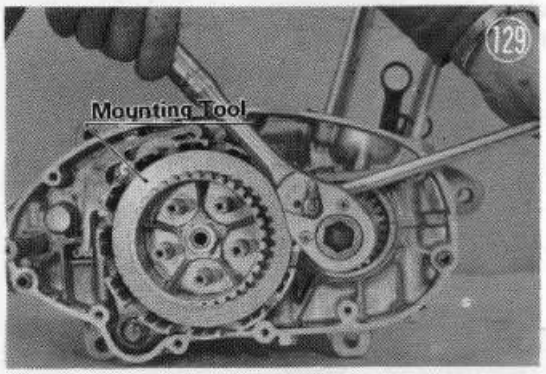
Remove the mounting bolt and lock washer, and take off the oil pump pinion and lock washer.



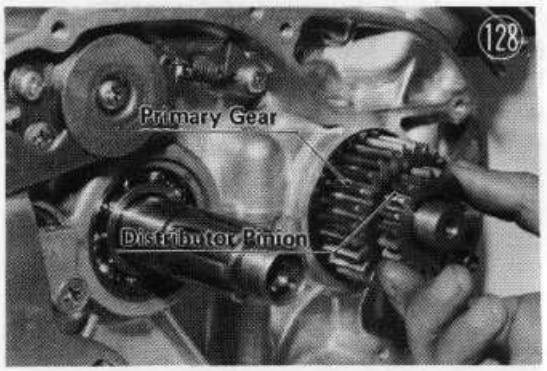
Straighten out the lock washer.



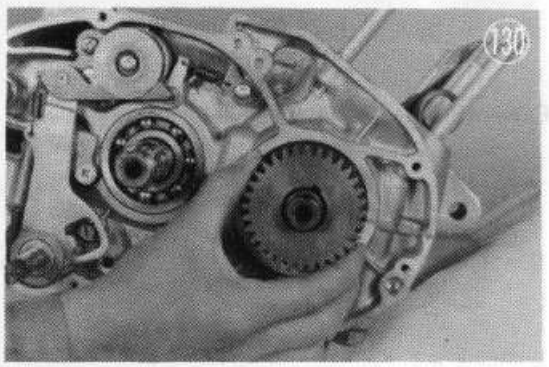
Temporarily mount the clutch housing and clutch hub, and holding the crankshaft stationary with a clutch hub mounting tool (special tool), remove the nut.



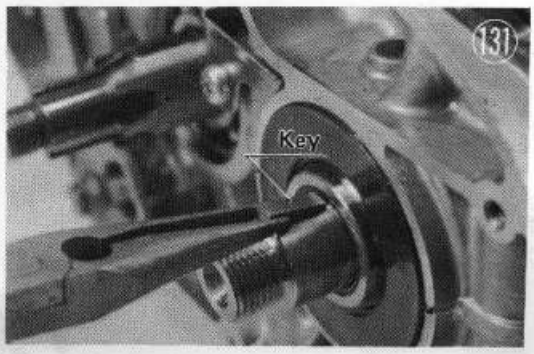
Remove the lock washer, distributor pinion and primary gear. **(H1)**



Remove the lock washer and primary gear. **(H2)**

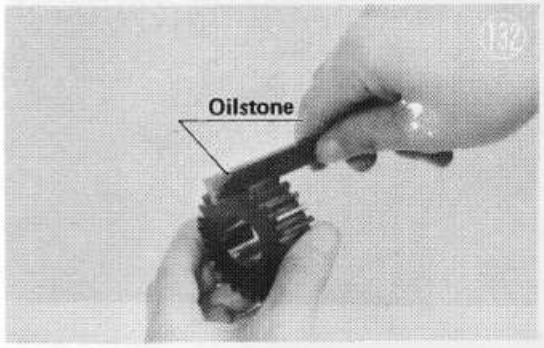


Remove the key.



2) Overhaul

Inspect the gear tooth surfaces for damage. To prevent gear noise, correct any minor faults with an oilstone. If the gear is badly damaged, replace it.



3) Assembly

Assembly is the reverse of disassembly.

NOTE: Align the primary gear with the key slot before mounting it on the crankshaft. Align the projection on the lock washer with the hole in the gear, and after tightening the mounting nut, bend up one side of the washer.



9. EXTERNAL GEAR SHIFT MECHANISM

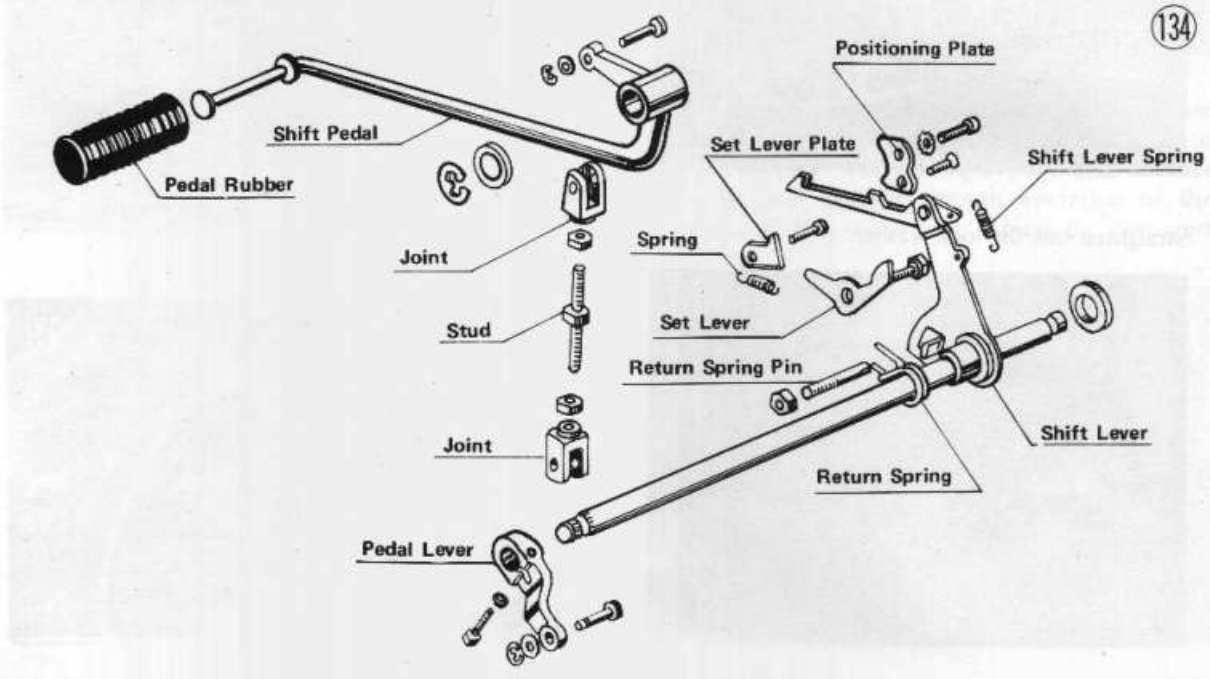
The external shift mechanism turns the shift drum to change gears.

When the shift pedal is operated, the shift drum is turned by the shift lever pushing on the drum pins. The shift drum pins inserted in the drum are spaced at equal intervals so that the pins (and thus the drum) are moved an equal amount for each operation. To keep the drum from over-turning, the return spring pin protrudes through a window in the shift lever, and when the drum has rotated sufficiently, one or the other side of the window strikes the pin and the lever is stopped from further movement. If the drum is not turned the correct interval each time, overshift or misshifting may result, the transmission gears will be damaged, and the engine may overrun and incur general overall damage.

After gears are shifted, the set lever, held against the pins by spring tension, holds the drum in position. If this lever is not set correctly, the transmission may jump out of gear.

In addition, to prevent lateral movement of the drum due to thrust, a positioning plate is fitted into the shift drum and fixed to the case.

External Shift Mechanism



1) Operation

By stepping down or kicking up the shift pedal, the shift lever turns the shift shaft, and the shift lever pawl transmits this motion to the shift drum. As the shift drum turns, the selector forks follow the grooves in the drum, and their lateral movement shifts the gears at their opposite ends to new positions.

When the shift pedal is released, the shift pedal and shift lever assembly are returned to their original positions by the force of the return spring.

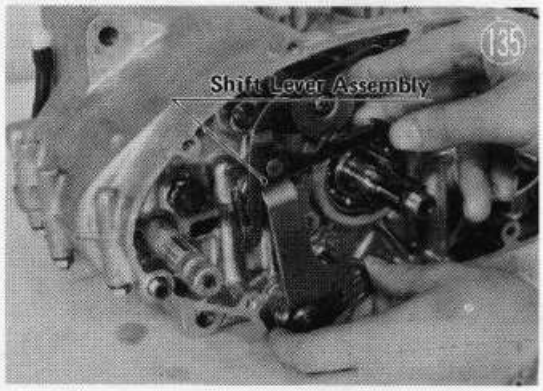
The H Series motorcycles have a "return" type shift with neutral at the lowest position (~ '75 model).

Only on '76 KH500 model, the transmission neutral position is located halfway between 1st and 2nd gears, and shifting into neutral is done by moving the shift pedal a half-stroke from either 1st or 2nd gear.

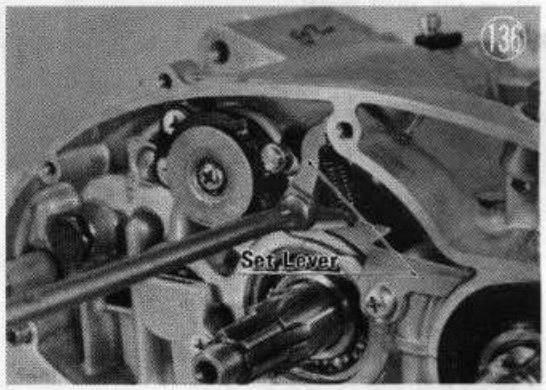
H Series (~'75 model)	KH500
5th	5th
↑↓	↑↓
4th	4th
↑↓	↑↓
3rd	3rd
↑↓	↑↓
2nd	2nd
↑↓	↑↓
1st	Neutral
↑↓	↑↓
Neutral	1st

2) Disassembly

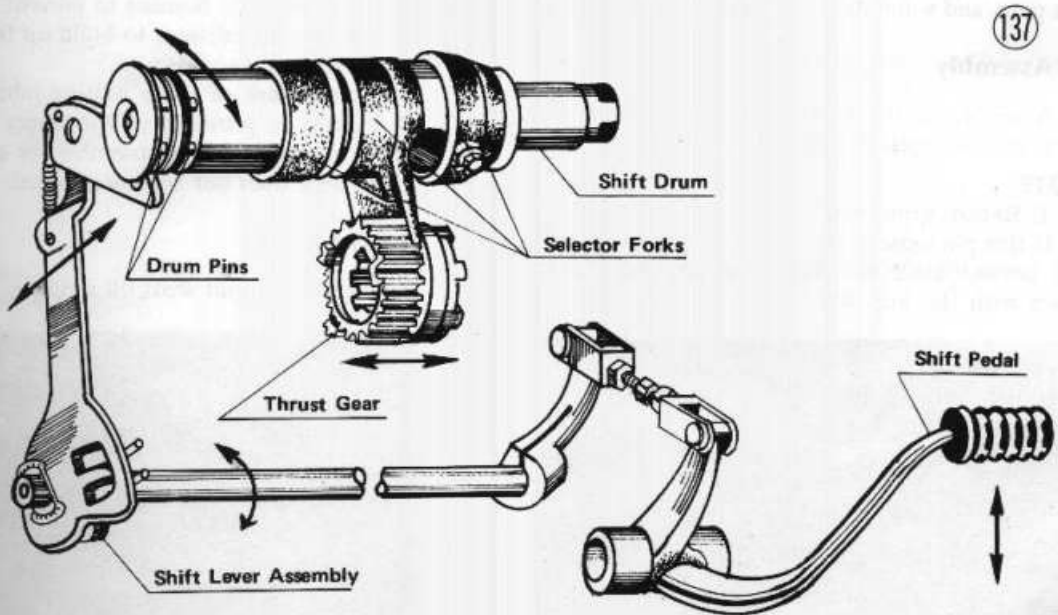
Disengage the shift lever pawl from the shift drum pins, and remove the shift lever assembly from the crankcase.



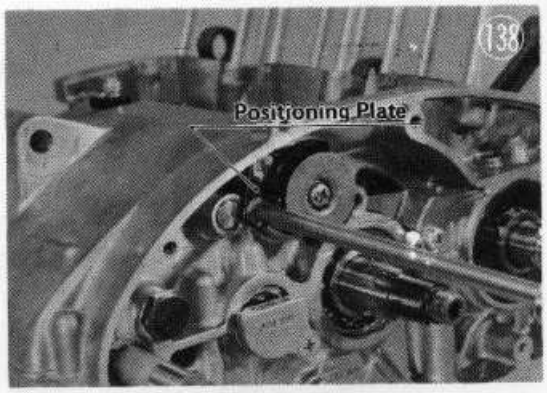
Take out the hex-head mounting bolt, and remove the set lever and spring



Shift Operation



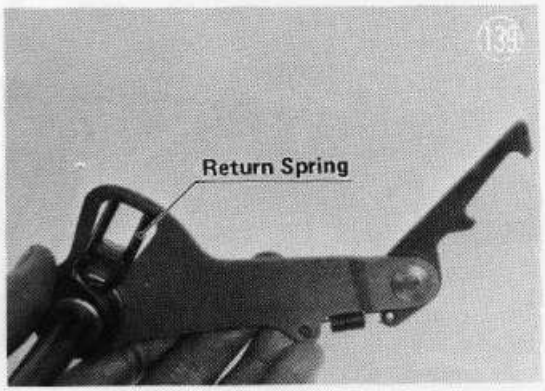
Take out the mounting screws, and remove the positioning plate.



3) Overhaul

a. Return Spring

Check the spring tension, and replace the spring if it is weak or damaged; a bad spring will not return the shift pedal.



b. Set Lever Spring

Replace the spring if it is weak or damaged, as such a spring will not hold the set lever against the pins, and will reduce the stability of the drum.

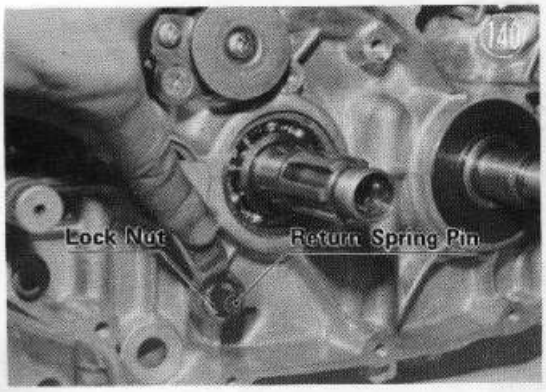
4) Assembly

Assembly is the reverse of disassembly. Be sure that all springs are installed correctly.

NOTE:

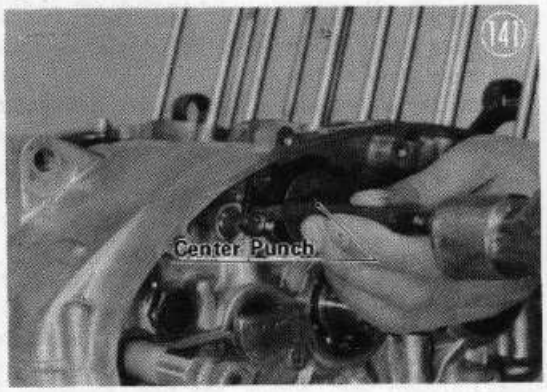
1. Return spring pin

If this pin loosens, the shift lever will not travel the correct distance. Lock the pin securely in place with the lock nut.



2. Positioning plate

To prevent the positioning plate from loosening and allowing drum movement along the shaft, punch the head of the mounting screw after tightening it.



10. CRANKCASE

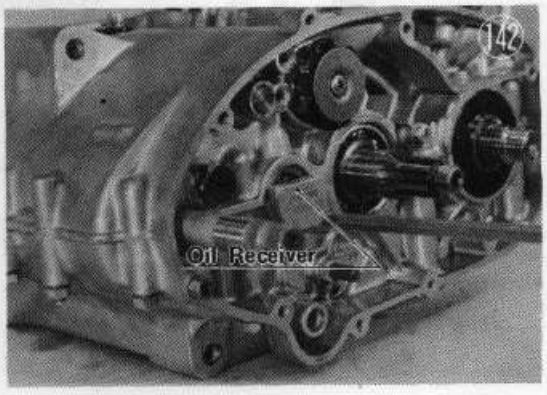
The crankcase, which is divided into an upper and lower section, is made of die cast aluminium alloy. Two pins align the upper and lower sections, which are held together with studs and nuts, and the joint is sealed with liquid gasket (Kawasaki Bond).

Gasoline/air mixture from the carburetor is drawn into the crankcase, where it undergoes preliminary compression prior to entering the combustion chamber. For that reason each crank chamber in the crankcase is partitioned from the next by oil seals on the crankshaft, making each chamber independently pressure tight. To prevent leakage of the oil used for lubrication of the transmission gear, change drum, etc., oil seals are also pressed onto the left ends of the output and drive shafts. In addition, there is a breather hole in the transmission housing to prevent oil leakage by not allowing pressure to build up from the oil expansion as it warms up.

To take care of main bearing lubrication, an oil passage is provided in the upper crankcase. During assembly and disassembly, be careful that this passage does not become clogged.

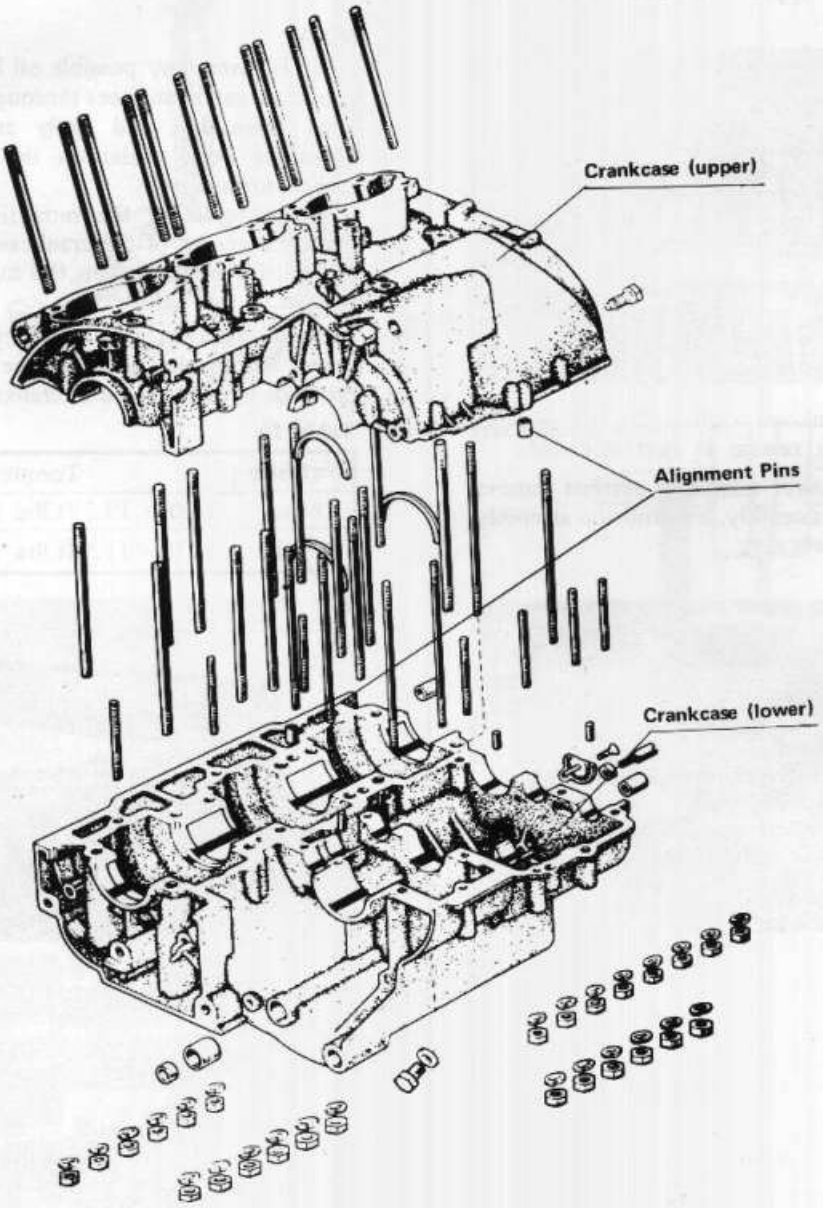
1) Disassembly

Remove the output shaft oil receiver.

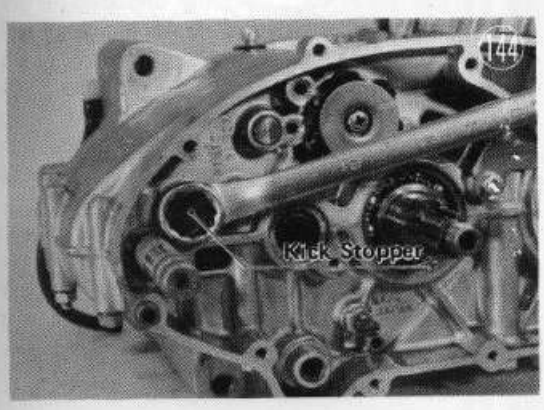


Crankcase Assembly

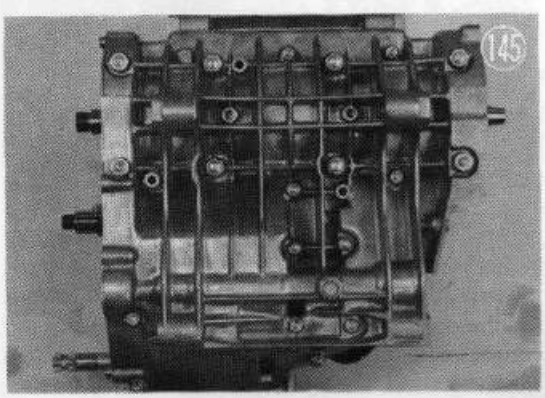
(143)



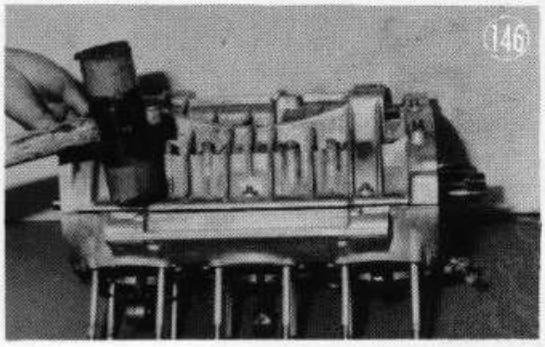
Loosen the kick stopper.



Turn the crankcase assembly upside down and remove the mounting nuts.

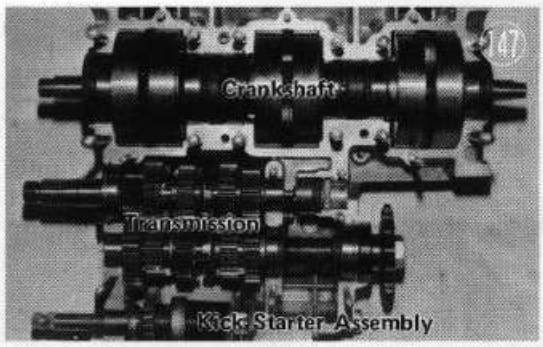


Tap the lower crankcase and shift shaft mounting lightly with a mallet, so that all the shafts, etc. remain in the upper crankcase when it is disassembled.



NOTE: The crankcase cannot be disassembled unless the clutch release is first removed.

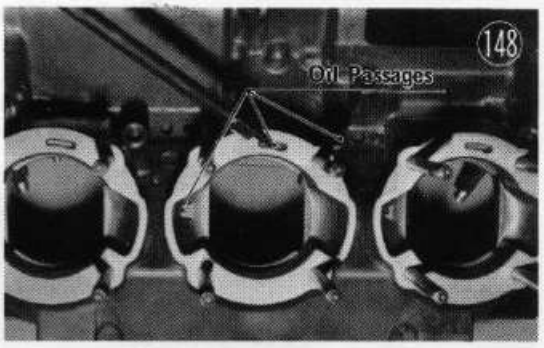
Taking off the lower crankcase permits removal of the crankshaft assembly, transmission assembly, kick shaft, drum, etc.



2) Overhaul

a. Oil Passages

Inspect the oil passages for clogging, and blow them out with compressed air.



b. Breather Hole

Inspect and clean this in the same manner as for the oil passages. If this hole becomes clogged, oil pressure will build up and cause oil to leak from between the crankcase and the left cover.

3) Assembly

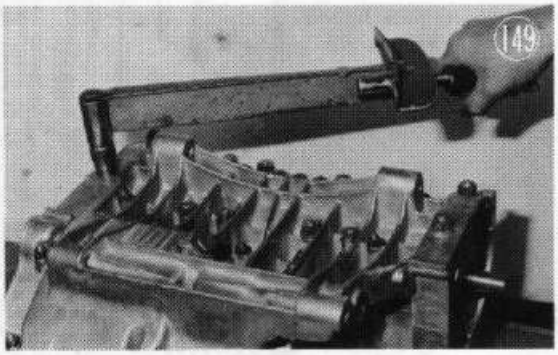
Assembly is the reverse of disassembly.

NOTE:

1. To avert any possible oil leakage, clean the crankcase gasket surfaces thoroughly with gasoline, wipe them dry, and apply an even layer of Kawasaki Bond sealer on the lower crankcase gasket surface.
2. When replacing the mounting nuts, starting from the center of the crankcase and working to the outside ends, tighten the nuts with a torque wrench to this tightness:
3. Be careful that the oil seals are installed at right angles to the crankcase, and see that they do not protrude beyond the outer crankcase surface.

Table 15

Nut Size	Torque
8 mm	16.0 – 19.5 ft.lbs. (2.2 – 2.7 kg.M)
6 mm	11.0 – 11.5 ft.lbs. (1.5 – 1.6 kg.M)



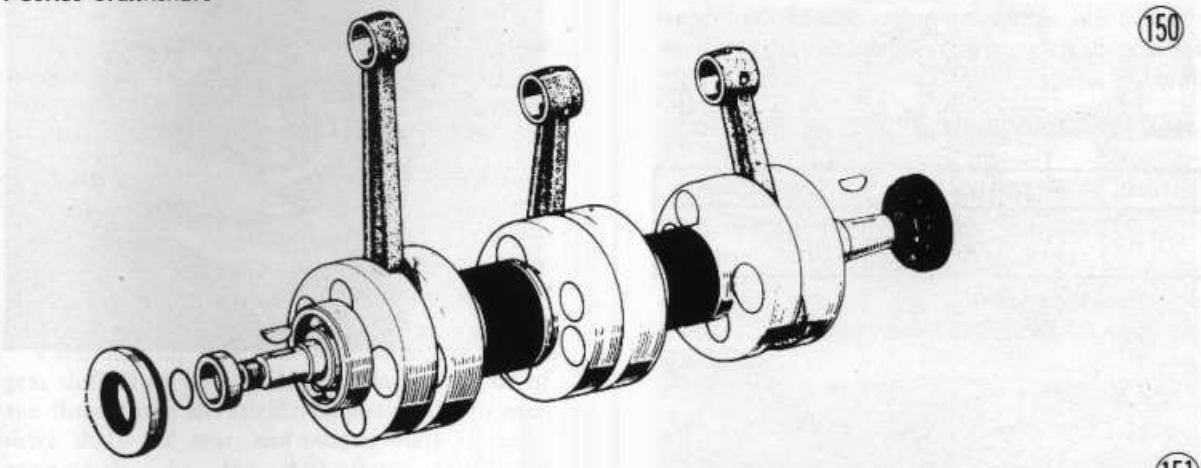
11. CRANKSHAFT

The intermittent force of exploding gasoline hammers on the pistons, and the resultant up and down motion of the pistons is received by the crankshaft and changed into shaft rotation. Due to the powerful force involved, crankshaft play or runout will cause damage to the crankcase, bearings, etc., and will produce noise, vibration, and result in a loss of power. It is therefore of critical importance to overall engine life to make necessary repairs as early as possible.

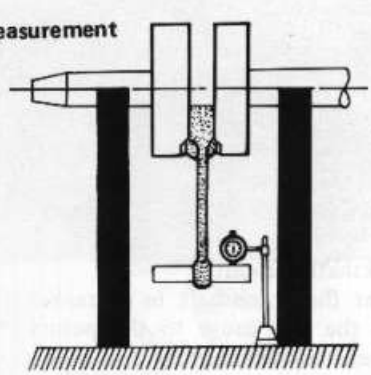
However, crankshaft assembly demands precise measurement of rotational balance, big end clearance, the exact mounting angle of each connecting rod, and the force by which the press-fitted crank pins are being compressed. It follows that for crankshaft repair and assembly, a hydraulic press and other specialized equipment plus a high degree of technical skill is necessary.

This manual deals only with common crankshaft troubles, and the manner in which the various checks are performed. If any parts are out of tolerance, or if inspection indicates that repair is necessary, it is recommended that the crank shaft be replaced as an assembly.

H Series Crankshaft

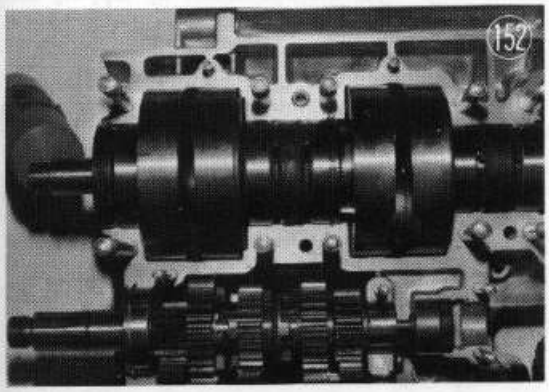


Warp Measurement



1) Disassembly

Lightly tap both ends of the crankshaft with a mallet, and remove it from the upper crankcase.



2) Inspection

a. Connecting Rod Warp

When the piston, piston rings or cylinder is worn unevenly, or there is a strong slapping sound, the connecting rod is becoming bent at the same time.

To measure rod warp, insert a shaft (arbor) whose diameter is as close as possible to the inside diameter of the connecting rod small end, into the small end of the connecting rod. Set this assembly on blocks over a surface plate, and measure the distance between the plate and each end of the rod with a dial gauge. The difference between the two readings gives an indication of the amount the rod has bent. Also check that the rod has not twisted, by visually ascertaining that the inserted rod and the crankshaft are parallel.

b. Connecting Rod Big End Wear

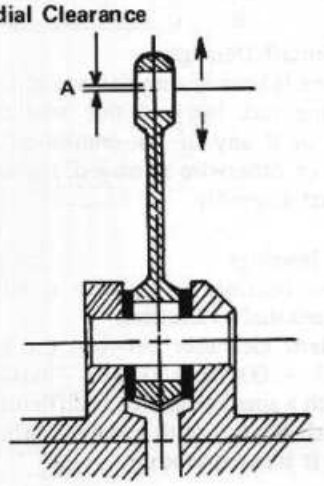
To ensure smooth rotation of the connecting rod, a certain amount of radial and side clearance is provided at the big end. As the connecting rod, crank pin needle bearing or side washers wear, these clearances increase.

Move the connecting rod up and down as illustrated; the amount of movement equals radial clearance. Note that H2 standard clearance is slightly different (.023-.041 mm) from the table.

Table 16 Radial Clearance

Model	Standard	Limit
H1, H2	.00098 – .00138 in. (0.025 – 0.035 mm)	.0039 in. (0.10 mm)

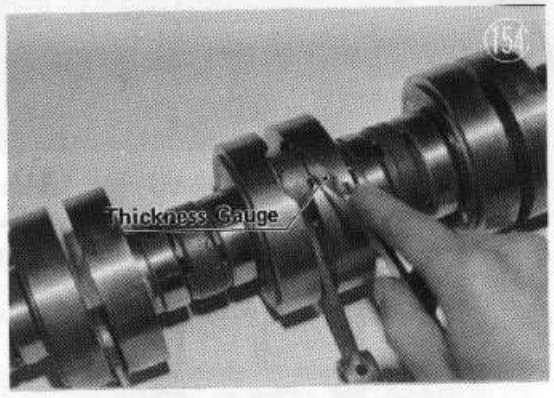
Big End Radial Clearance



Move the connecting rod to one side and measure side clearance with a thickness gauge as illustrated.

Table 17 Side Clearance

Model	Standard	Service Limit
H1, H2	.0157 – .0197 (0.40 – 0.50 mm)	.0276 in. (0.70 mm)

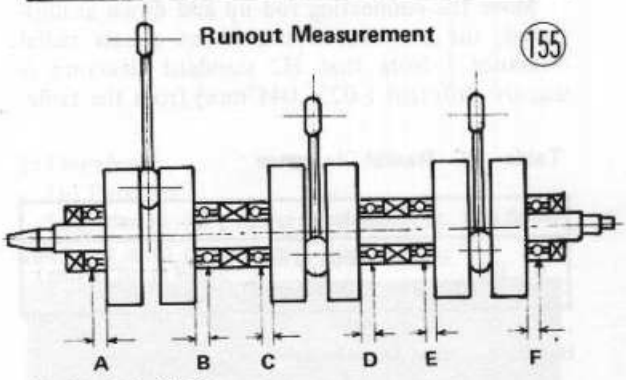


c. Crankshaft Runout

Center the crankshaft in a crankshaft aligner and set the dial gauge to the points indicated. Turn the crankshaft lightly and note the reading variation, which is crankshaft runout.

Table 18 Crankshaft Runout

Model	Standard	Maximum
H1, H2	Under .0016 in. (Under 0.040 mm)	.0039 in. (0.10 mm)



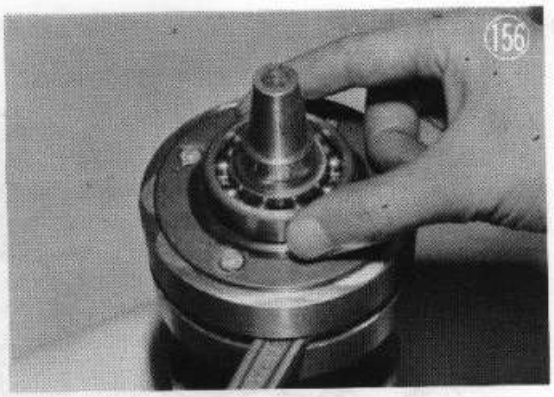
d. Crankshaft Damage

If there is heat seizure damage to the crank pin, connecting rod, big end side washers or needle bearing, or if any of the crankshaft journals are cracked or otherwise damaged, replace the entire crankshaft assembly.

e. Main Bearings

As the bearings wear, play develops and can cause crankshaft vibration.

Standard clearance between the ball and race is .00047 – .00087 in. (0.012 – 0.022 mm). But since such a small clearance is difficult to measure, clean each bearing with gasoline, lubricate it, and see that it turns smoothly.



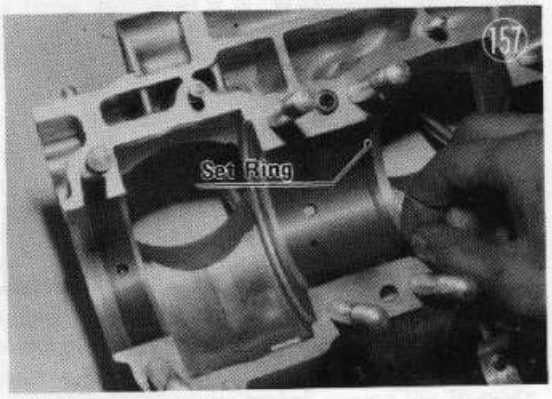
f. Crankshaft Oil Seals

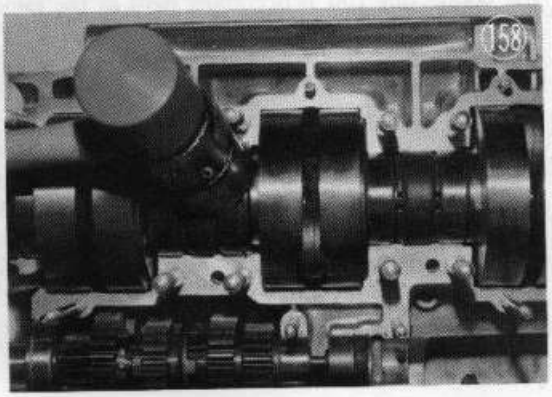
The four oil seals, one on either side of each crank chamber, maintain the pressure differences among the chambers. If by any chance any of these oil seals should be damaged, primary compression leakage will occur and cause a reduction in engine performace.

Carefully inspect the oil seals for damage to the lip, and check the outer edge for dirt that might allow compression leakage.

3) Assembly

Place the bearing set rings in the upper crankcase and align the groove in each ball bearing to its ring. Seat the crankshaft by tapping each bearing lightly with a mallet.





12. TRANSMISSION

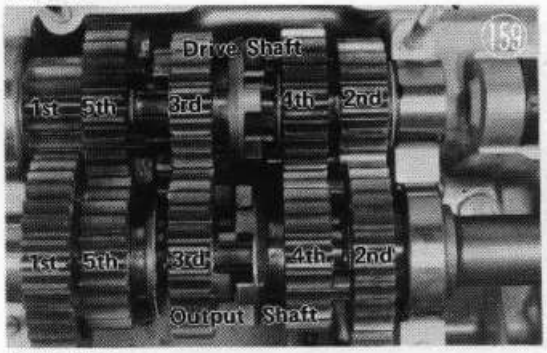
In order to use engine power effectively, the transmission allows selection of the appropriate reduction ratio for the various riding conditions – starting out, accelerating, decelerating, climbing, etc.

1) Operation

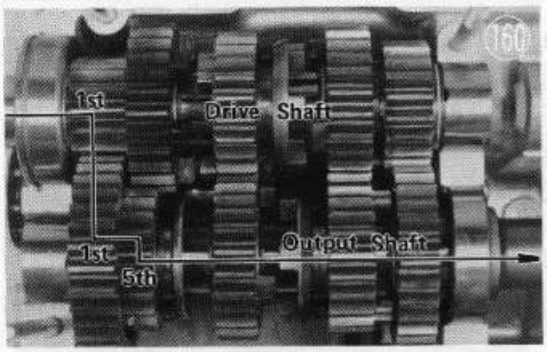
The diagrams below show the 5-speed, constant-mesh, return change type transmission of the H Series.

Each selector fork is kept in its groove on the gear shift drum by a guide pin. The other ends of the three forks sit astride output shaft 4th gear, drive shaft 3rd gear, and output shaft 5th gear, respectively. As the shift drum turns, the selector forks follow their slots, moving to the right and left and sliding the gears into different meshing arrangements.

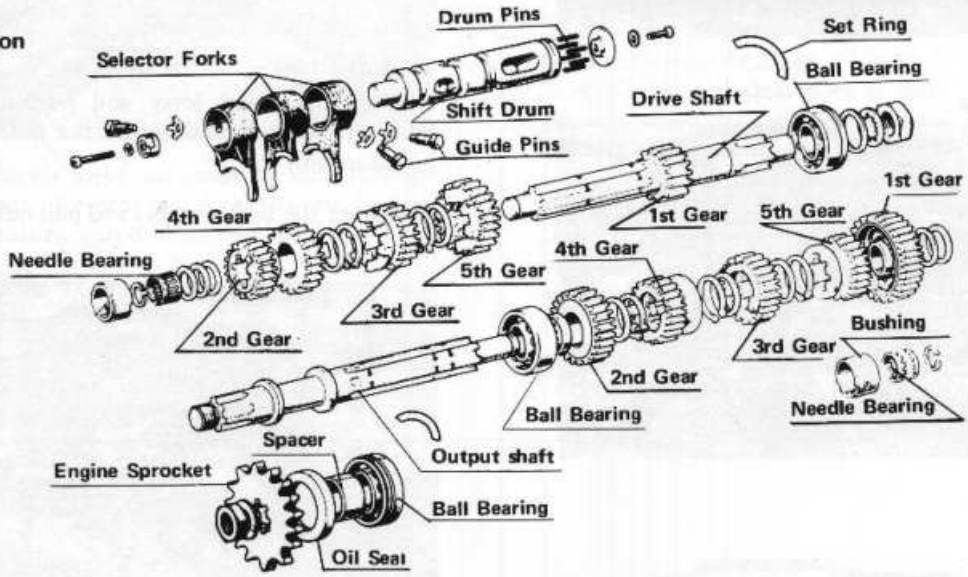
Neutral



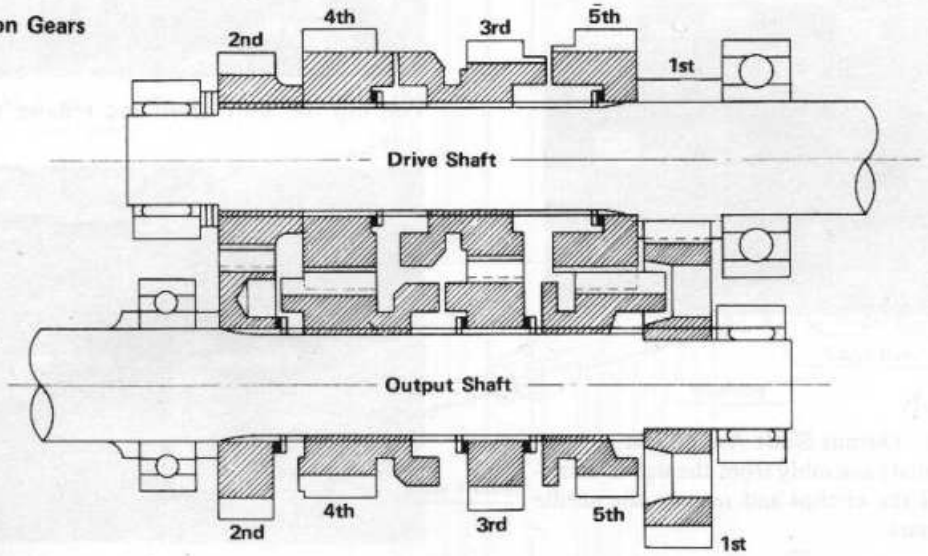
First Gear



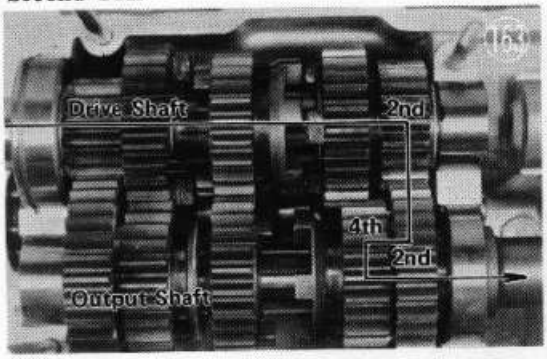
Transmission



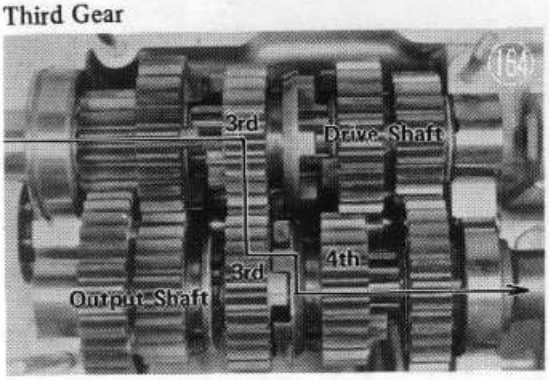
Transmission Gears



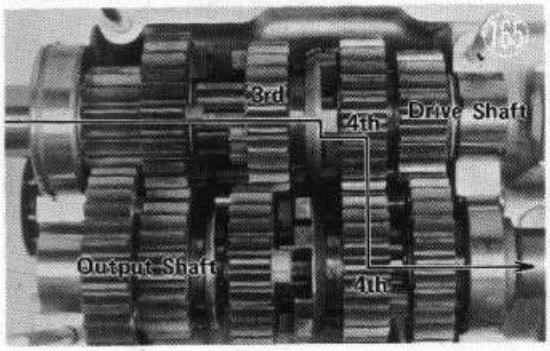
Second Gear



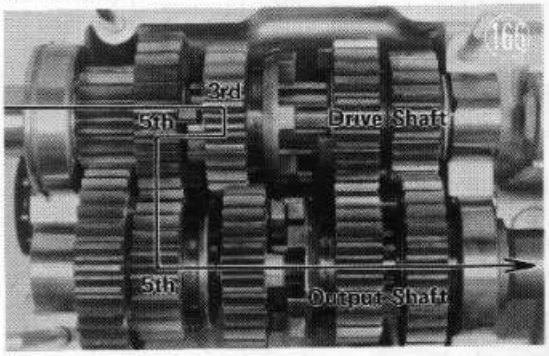
Third Gear



Fourth Gear



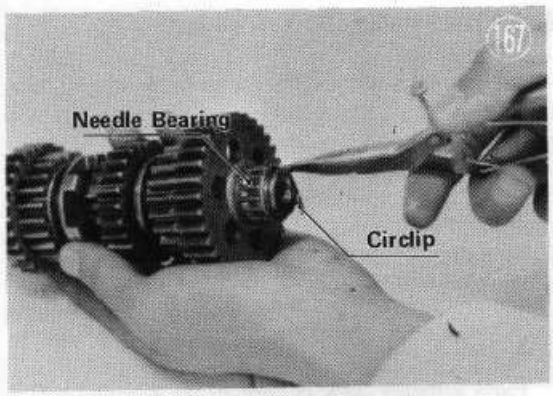
Fifth Gear



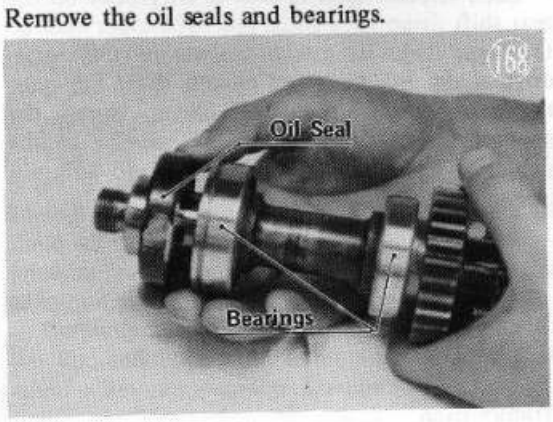
2) Disassembly

a. Drive Shaft · Output Shaft Assemblies

Remove each shaft assembly from the upper crankcase. Take off the circlips and remove the needle bearings and gears.



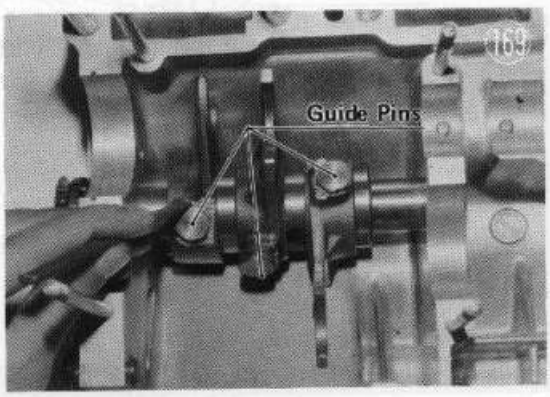
Remove the oil seals and bearings.



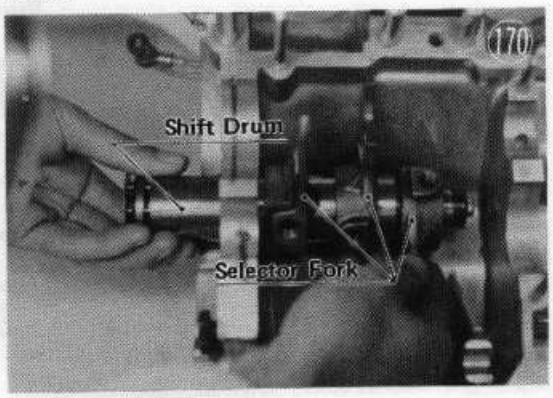
b. Shift Drum

NOTE: The drum lever and positioning plate must first be removed before the shift drum can be taken out.

Straighten the lock washers and pull out the guide pins.



Pull out the shift drum and remove the selector forks.



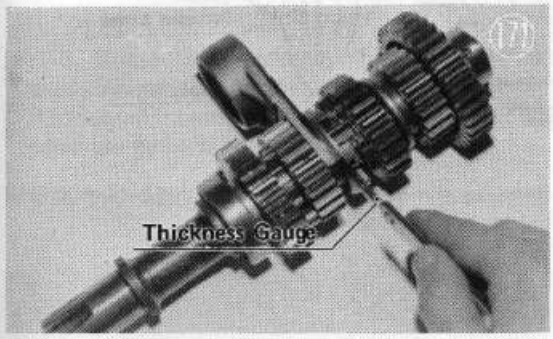
3) Overhaul

a. Selector Forks · Gears

From wear of the selector fork prongs and the gear groove in which they sit, play develops and the gears either fail to position properly, or jump out of mesh while running. This wear should be measured by inserting a thickness gauge into the space between the selector fork prong and the walls of the groove. If the clearance exceeds the service limit, replace the fork and/or gear.

Table 19 Groove/Fork Clearance

Model	Standard	Service Limit
H1, H2	.0020 – .0098 in. (0.05 – 0.25 mm)	.024 in. (0.6 mm)



Bent selector forks can cause the same troubles as worn ones. Replace any forks that are bent, or that have turned purple from overheating.

b. Gear Teeth

Gear teeth with nicks or rough edges will not only cause noise, but will wear down other gears. Inspect the gears and grind smooth any damaged portions, or replace the gear if damage is bad.

c. Oil Seals

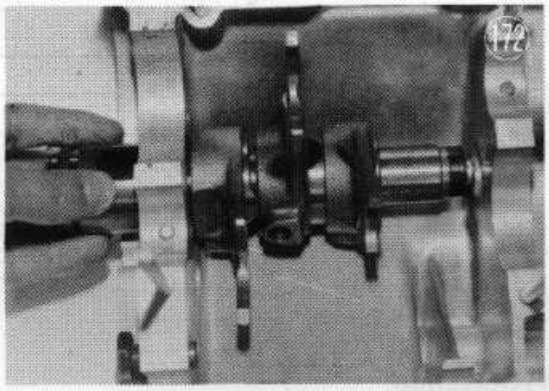
Since there is a constant supply of oil in the transmission, cracked or damaged oil seals will allow leakage. Inspect the lips of the seals and replace any damaged ones.

4) Assembly

Assembly is the reverse of disassembly.

NOTE:

1. Arrange the selector forks as illustrated.



2. Be certain to replace the bearing set rings.

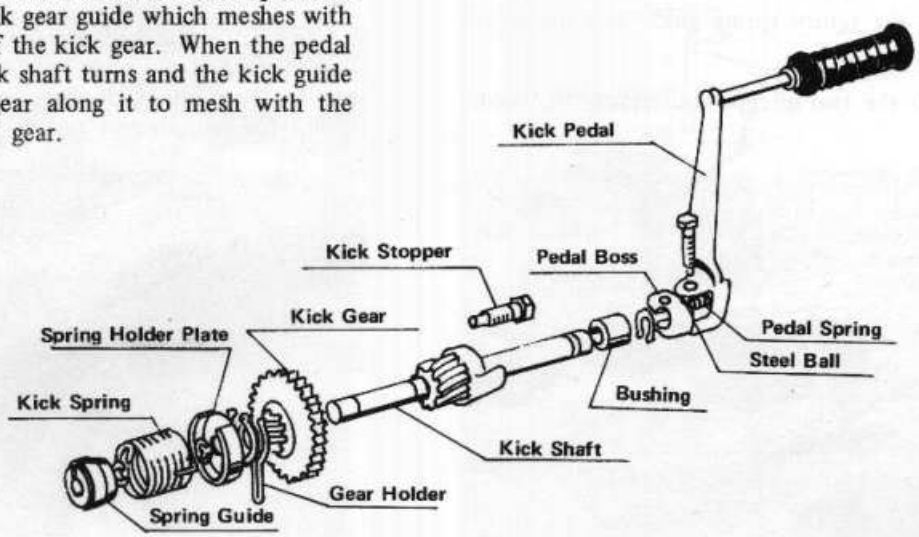
3. Be sure to install all the circlips to the various gears and needle bearings.

4. Check gear clearances at three points: (a) between drive shaft second gear and the bearing; (b) between output shaft first gear and the bearing; (c) between output shaft second gear and the fourth gear C ring. If the measurement is much over .020 inch (.5 mm), insert a .5 mm shim washer to take up the play. Do not insert the washer if it will make the shaft hard to turn or if it will make the dogs of any two gears hit. Part number is 92022-225 for the washer between second and fourth gears, and 92022-144 for the other two shims.

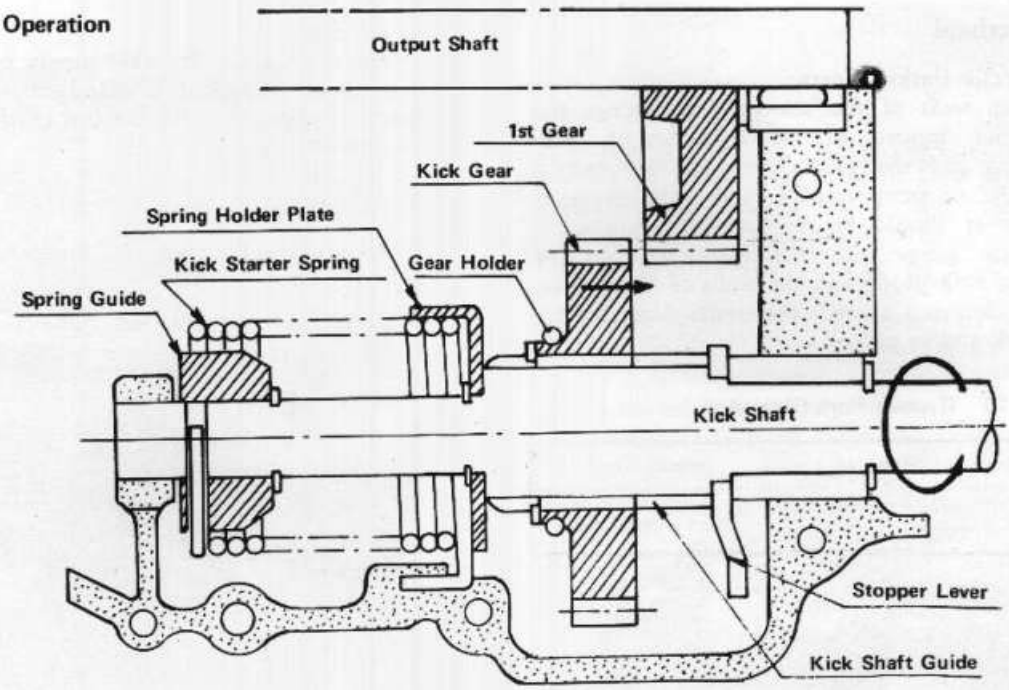
13. KICK STARTER

The middle portion of the kick shaft is provided with a helical kick gear guide which meshes with the inner teeth of the kick gear. When the pedal is kicked, the kick shaft turns and the kick guide slides the kick gear along it to mesh with the output shaft low gear.

Kick Mechanism



Kick Starter Operation



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1) Operation

Following the diagram, when the kick pedal is pushed down, the kick guide on the shaft turns in the direction of arrow A, and the kick gear turns around the kick shaft and slides in the direction of arrow B, meshing with the output shaft low gear.

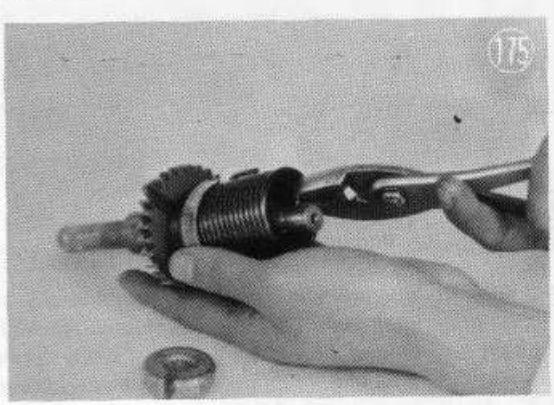
Consequently, motion transfer is in this order: kick shaft → kick gear → output shaft low gear → drive shaft low gear → drive shaft → clutch → crankshaft primary gear → crankshaft.

When the engine starts, the kick gear is turned by low gear and slides back to its original position, out of mesh with low gear. And when the pedal is released, the tension of the kick spring turns the kick shaft and the pedal returns to its original position. At this point the kick shaft stopper lever hits the kick stopper on the crankcase and prevents the kick shaft from turning any further.

2) Disassembly

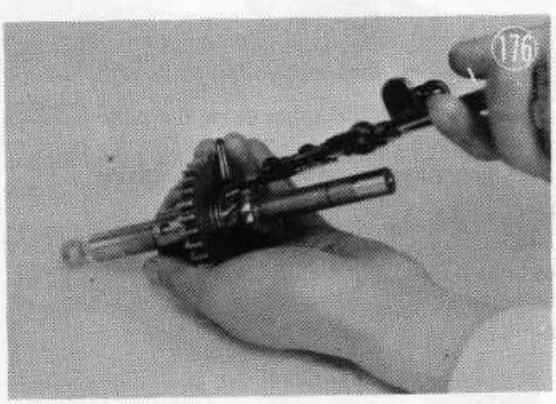
Remove the return spring guide and the return spring.

Take off the two circlips and remove the holder plate.



175

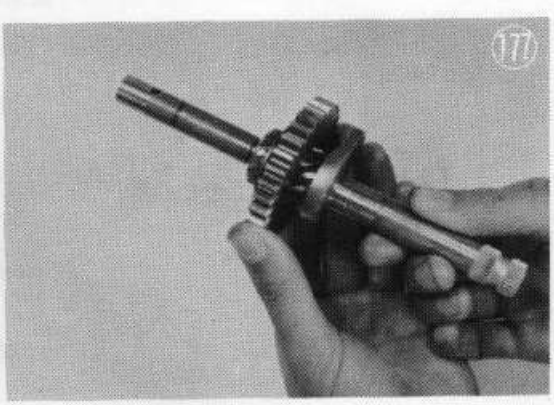
Remove the snap ring and take the kick gear and holder off the kick shaft guide.



176

3) Overhaul

Check for play between the inner teeth of the kick gear and the kick gear on the kick guide shaft. Turn the kick shaft back and forth and check for smooth gear operation.



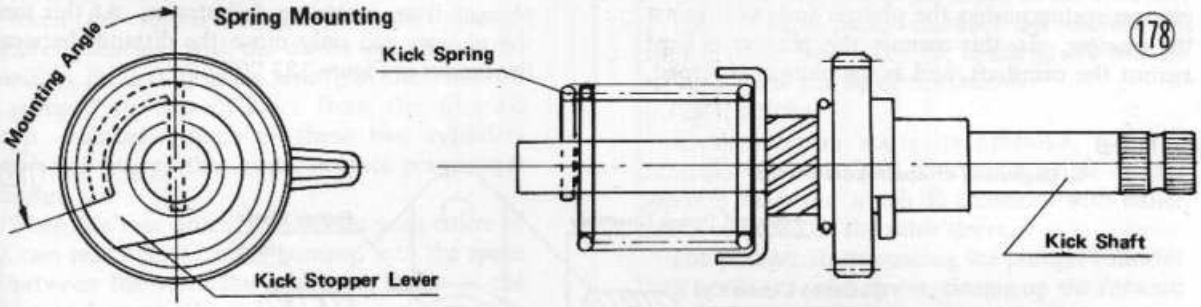
177

4) Assembly

Assembly is the reverse of disassembly.

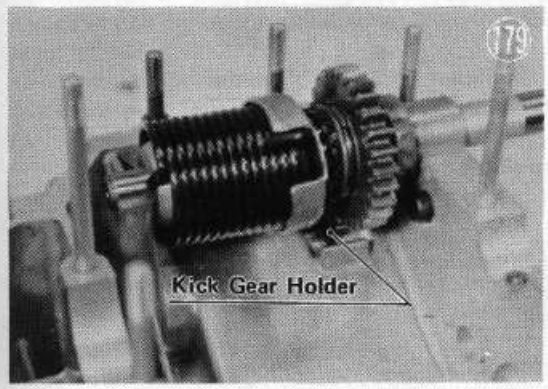
NOTE:

1. Be sure the circlips and snap ring are seated properly.
2. When replacing the kick spring on the kick shaft be careful of the angle it makes with the kick stopper lever.



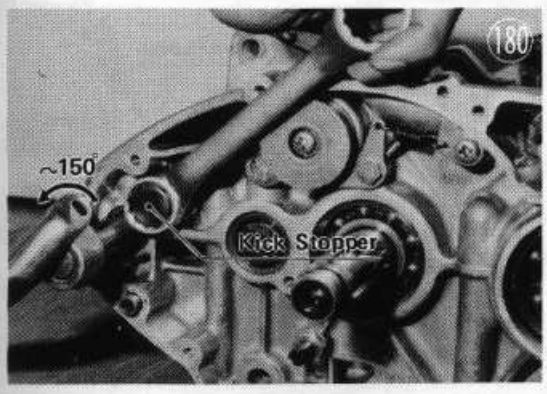
178

3. Mount the kick gear holder into the crankcase properly as the illustration shows. If it is mounted incorrectly, the kick gear will not slide when the pedal is kicked.



179

4. Screw in the kick stopper after assembling the crankcase. In order to give the kick spring enough tension to raise up the kick pedal, put on the kick pedal and screw in the kick stopper about 150° back in the direction of the arrow.



180

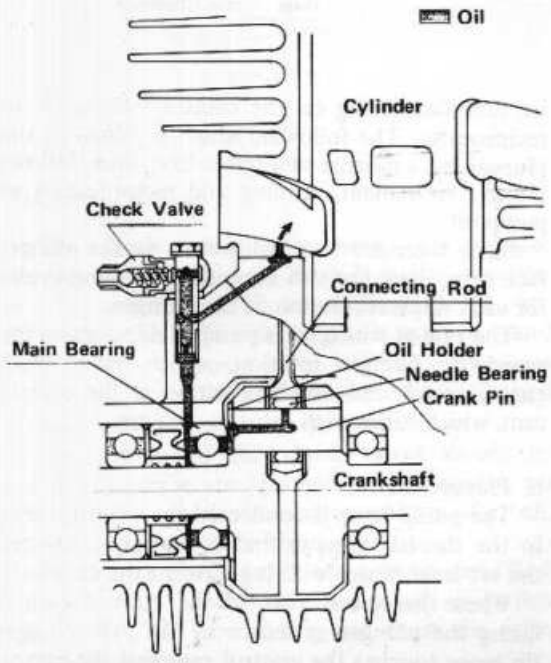
14. LUBRICATION SYSTEM

The lubrication system used in the H Series machines is Injectolube. In this system, oil is kept in a separate tank from the gasoline, from which it is pumped to the engine by the oil pump and mixed with the gasoline there. The rate at which the oil is pumped, which varies with the needs of the engine, is controlled by engine rotational speed and throttle opening. With the ideal lubrication that results engine performance is vastly improved, and the fresh, high viscosity oil supplied directly to the main bearings and crankshaft big ends, raises engine durability one notch higher.

1) Oil Passages

Figure 181 is a diagram of the Injectlube oil passages. The oil pump pumps the oil through check valves to the three banjo bolts behind the engine. One path is for oil injection into the cylinder intake port to be mixed with gasoline, and the other passage leads to the crankcase beneath the banjo bolt where the oil lubricates the connecting rod big end via the crank bearing, oil holder and crank pin, in that order.

Oil Passages



181

2) Oil Pump

a. General Construction and Operation

Crankshaft rotational speed is reduced by the oil pump pinion on the right end of the crankshaft, meshing with the oil pump gear on the oil pump shaft. The other end of the shaft turns the pump worm, which meshes with the worm gear teeth cut into the center portion of the plunger. The plunger spring pushes the plunger follower against the plunger. In this manner the plunger is kept against the camshaft, and as the plunger is turned, its cam face riding on the camshaft causes it to reciprocate. The follower, which is joined to the plunger by a mortise-and-tenon-like joint, follows plunger movement, turning and reciprocating to pump oil.

Since there are two high points on the plunger face cam, there are two complete pumping cycles for each single revolution of the plunger.

The rate at which oil is pumped depends on the speed of plunger rotation, which varies with engine speed, and on the position of the control cam, which varies with throttle opening.

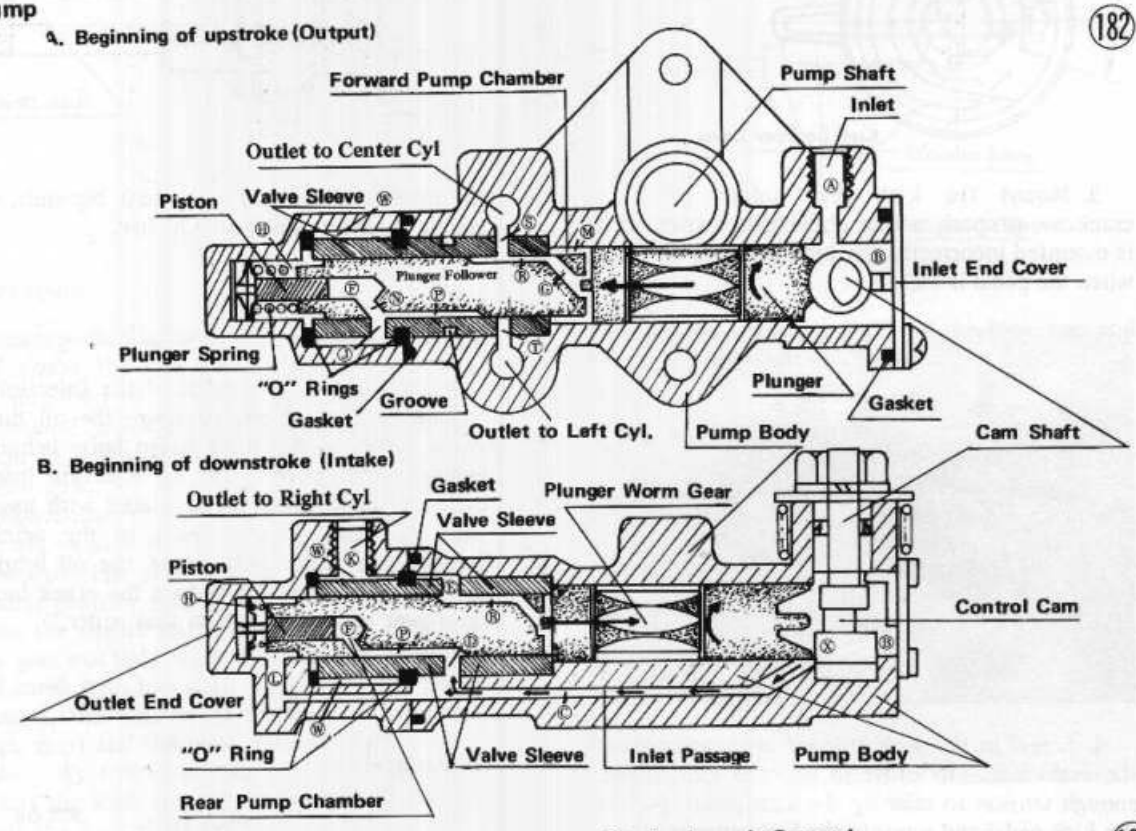
b. Plunger/Cam

The pump lever is connected by a control wire to the throttle grip, so that as the grip is twisted the set lever moves with it and turns the camshaft.

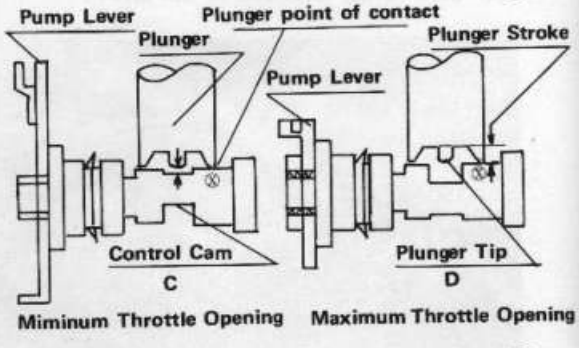
When the lowest part of the control cam is facing the plunger as shown in "D", the plunger tip never touches the control cam and the cam on the plunger face can ride at point Ⓧ from its highest to lowest point – the distance between the arrows. Accordingly, maximum plunger stroke occurs at maximum throttle opening.

In Fig. 183 "C" the motorcycle is idling with the throttle grip fully closed, and the highest part of the control cam is toward the plunger. When the plunger moves down, the plunger tip hits the control cam and stops the plunger before it reaches the bottom of its cam, thus preventing the plunger from making a full stroke. At this time the plunger can only move the distance between the arrows in Figure 183 "C".

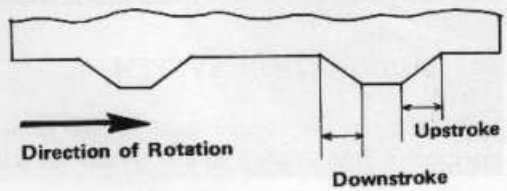
Oil Pump (182)



Stroke Length Control (183)



Plunger Cam Face (184)



c. Valve Sleeve

The opening and closing of oil inlet and outlet ports are controlled by the movement of the plunger follower inside the valve sleeve.

The valve sleeve, which is prevented from turning by a pin in one side, contains three sets of two holes, a total of six holes. The two holes in each set are spaced opposite each other 180° apart to conform with the plunger operation and complete one cycle for each half rotation.

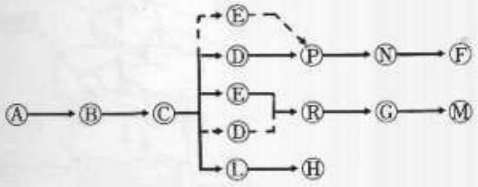
When the forward notch Ⓡ in the plunger follower coincides with the center cylinder outlet hole Ⓢ or the left cylinder hole Ⓣ in the valve, oil is pumped to that cylinder from the forward pump chamber. Each of these two cylinders receives oil every other cycle, or once per plunger rotation.

When the rear notch Ⓟ coincides with either of the two rear holes Ⓙ oil is pumped into the space Ⓦ between the valve sleeve and the inside of the outlet end cover. From space Ⓦ the oil travels around to outlet Ⓚ and from there to the right cylinder. This part of the pump supplies oil to the right cylinder once every cycle, i.e. twice per plunger rotation, but the capacity of the rear pump chamber is only half that of the front, so that each engine cylinder is supplied with the same amount of oil.

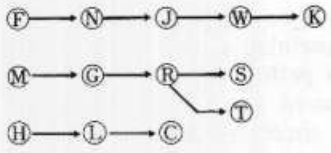
Center hole Ⓓ is aligned with the inlet passage Ⓒ and connected to hole Ⓔ by a groove cut into the outer circumference of the valve sleeve. Once each cycle when the plunger follower notches Ⓟ and Ⓡ coincide with holes Ⓓ and Ⓔ, oil is drawn into the two pump chambers Ⓕ and Ⓜ.

Oil Flow Chart

Intake Storke (Downstroke)



Output Stroke (Upstroke)



d. Pump Cycle

(1) Downstroke

During the plunger upstroke, space Ⓑ between the plunger cam face and the inlet end cover enlarges, drawing in new oil through the inlet at Ⓐ.

As the plunger and plunger follower move toward the camshaft on the downstroke, space Ⓑ grows smaller and three other spaces open: (1) Void Ⓗ containing the piston and the plunger spring enlarges; (2) The piston moving out of the rear pump chamber Ⓕ increases the volume of this space; (3) The plunger follower moves out of the valve sleeve into the plunger cylinder, but since the cylinder inside diameter is larger than the follower outside diameter, a void (the forward pump chamber) is developed between the follower and the cylinder wall.

Suction from these expanding spaces, in conjunction with pressure from the oil at the pump inlet and the oil being compressed in space Ⓑ, draws oil into the inlet passage Ⓒ, and moves it in the direction of the arrows.

Oil enters chamber Ⓗ at point Ⓛ.

The rear pump chamber Ⓕ is supplied via valve hole Ⓓ (or Ⓔ on the other half rotation), follower notch Ⓟ and hole Ⓝ into the inside of the follower.

The forward pump chamber Ⓜ receives oil through valve hole Ⓔ (or Ⓓ), notch Ⓡ and hole Ⓖ cut through to the tip of the follower.

(2) Upstroke

As the plunger starts its upstroke, notch Ⓟ coincides with hole Ⓙ or its matching hole on the opposite side; and notch Ⓡ coincides with either hole Ⓢ or hole Ⓣ in the valve sleeve.

The plunger starts pushing the plunger follower back inside the valve sleeve, closing up the forward pump chamber Ⓜ. This forces oil back out passage Ⓖ, and by way of notch Ⓡ into either Ⓢ or Ⓣ to the center or left cylinder outlet.

At this same time, the plunger pushes onto the piston, and the piston entering the rear pump chamber Ⓕ, decreases its capacity and forces out the oil. Oil leaves the chamber via hole Ⓝ and flows into space Ⓦ to the engine right cylinder outlet at Ⓚ.

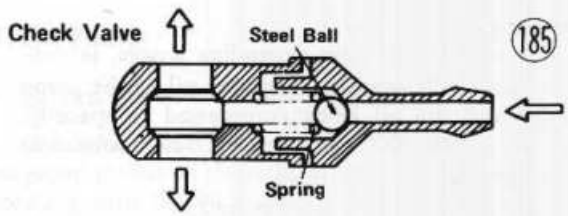
Oil in chamber Ⓗ flows back into the inlet passage at point Ⓛ. This oil serves only to prevent unwanted low pressure areas inside the pump, and ensure smooth pump operation and oil flow.

3) Check Valves

The check valves open when oil pressure exceeds 0.3 kg/cm² (4.3 lbs/in²) in the direction of the arrow, and allow oil flow in the one direction only. When the engine is stopped – and therefore the oil pump is also stopped – the check valves stop oil flow, and any oil that has passed a check valve is prevented from returning.

Disassembly of the check valves should be avoided; if these are reassembled incorrectly, oil will not flow in the correct quantities, if at all, and the engine will be damaged.

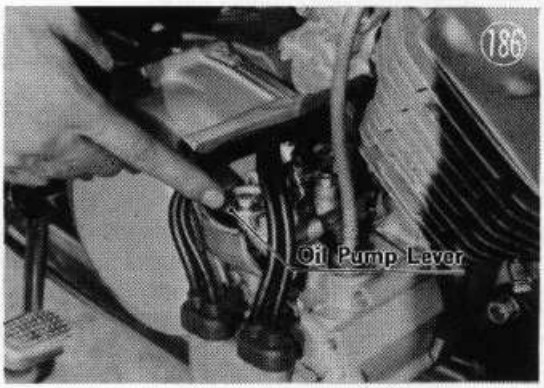
To clean a check valve, use a squirt can filled with solvent. Never use compressed air as this will distort the valve spring and cause the valve to malfunction.



4) Inspection and Adjustment

a. Bleeding the Oil Pump

When the oil pump or oil pipes are removed, air becomes trapped inside the pipes and obstructs the flow of oil. See ithat oil flows from the inlet pipe before connecting it to the pump. Bleed air from the outlet pipes by idling the engine (below 2,000 r.p.m.), and holding the oil pump control lever full open by hand, i.e. to maximum plunger stroke. Keep the engine idling until the air is completely pumped out. If air bubbles continue to appear in an outlet pipe, check the oil pipe inlet and outlet connections, oil pipe connections to the banjo bolts, and banjo bolt fittings.



b. Control Lever Adjustment

See the oil pump paragraph, page 11-12.

c. Oil Pump Check

The oil pump is a carefully assembled precision device, and disassembly should be avoided. To check oil pump performance, the oil flow rate should be measured for a given engine speed.

Detach the check valve from the upper crankcase. Start the engine and set the speed of rotation at 2,000 r.p.m. Holding the oil pump lever full open by hand, measure the amount of oil pumped from the pump outlet for a single cylinder. If the amount of oil pumped over a three-minute period corresponds to the amount in the table below, the oil pump is operating correctly.

CAUTION: While checking the oil pump, a 20:1 gasoline/oil mixture should be used in place of the pure gasoline normally used.

Table 20 Oil Pump Output

Model	Output/3 minute period @ 2,000 r.p.m.
H1	.171 – .197 oz. (5.05 – 5.83 cc)
H2	.228–.255 oz. (6.75–7.53 cc)

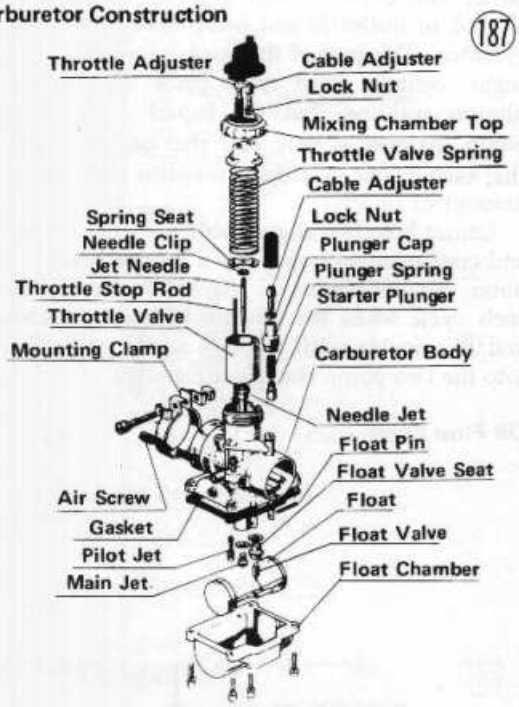
5) Injectolube Oil

Use any good quality 2 cycle engine oil that is recommended for air-cooled engines. Ordinary motor oil, transmission oil, etc. are not acceptable as replacements for the correct oil. Poor quality oil or the wrong type of oil will cause engine damage.

15. CARBURETORS

Each carburetor is comprised of a main system used for gasoline supply during high and medium speed operation, a pilot system for low speed operation, a float mechanism for maintaining the fuel level in the float chamber, and a starter system to supply a rich fuel mixture for starting.

Carburetor Construction



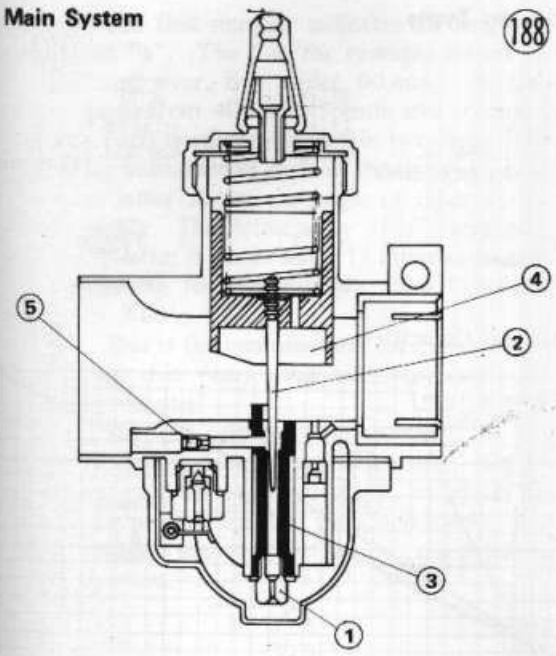
1) Construction and Operation

a. Main System

As Fig. 188 shows, the main system consists of the main jet ①, jet needle ②, needle jet ③, throttle valve ④, and the air jet ⑤.

When the throttle valve is more than 1/4 open, air is taken in principally through the main bore, flowing beneath the throttle valve. Due to this air flow, a low pressure area is produced around the jet needle, and fuel is drawn up through the main jet through the opening between the needle jet and jet needle and toward the main bore. Air coming in through the air jet mixes with the fuel inside the needle jet and expedites the atomizing process. When the mixture reaches the main bore, it is combined with and further atomized by the main stream of air, and then drawn into the engine.

Main System

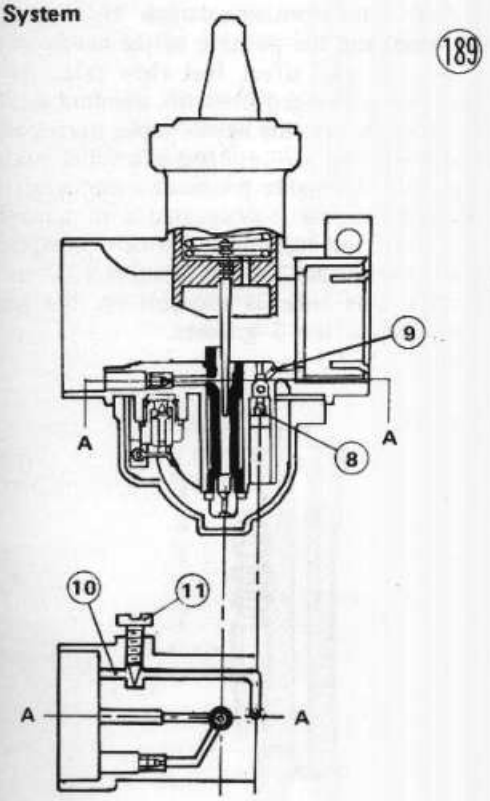


b. Pilot System

Fig. 189 shows the pilot system which includes the pilot jet ⑧, pilot ⑨, and pilot air screw ⑪.

When the engine is idling or running at low speed, the throttle valve is almost completely closed, and the principal air intake is through the pilot air inlet as controlled by the tapered pilot air screw. This air mixes with the fuel drawn up through the pilot jet and is spewed from the pilot outlet into the main bore, where it further mixes with the small current of air flowing there, and is finally drawn into the engine.

Pilot System

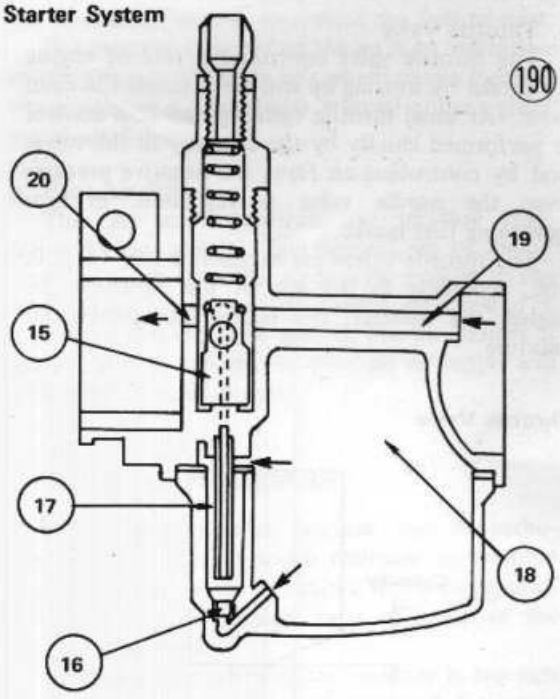


c. Starter System

The purpose of this system is to enable easy starting when the engine is cold, and replaces the choke system found on 4 cycle or old style 2 cycle engines.

The engine is started with the throttle fully closed and the starter lever pushed completely down. With the lever pushed, starter plunger ⑮ is pulled up. Fuel is drawn up through the starter jet ⑯ by the negative intake pressure, and mixes with air that comes from the float chamber ⑱ via the air bleed opening ⑰. It is then mixed with the air from the starter primary air passage, and jetted through the hole in the rear of the throttle valve into the main bore. Here it supplements the main fuel mixture supply from the pilot system and is drawn into the engine.

Starter System



d. Float Mechanism

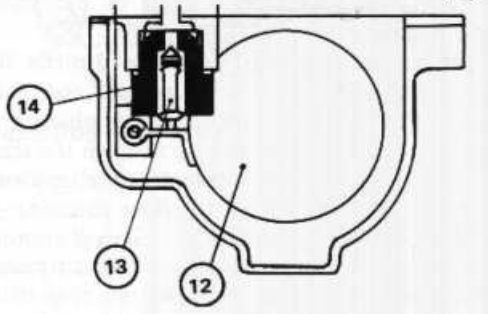
The float ⑫, needle valve ⑬ and valve seat ⑭ make up the float mechanism, whose purpose is to maintain a constant fuel level in the float chamber by metering the gasoline from the fuel tank.

As in the case of a hand pumped bug sprayer, when the fluid level in the sprayer reservoir (or float chamber) is low, the same amount of pumping will not yield the same amount of spray out as when the reservoir is full. Therefore to retain the same fuel flow rate for a given set of conditions, the fuel level in the float chamber must be kept constant.

When the fuel level in the float chamber rises, the float also rises and closes the float valve, stopping fuel intake from the tank. When the level dips below normal the float lowers and opens the float valve more than normal, temporarily increasing fuel flow from the tank until the standard level is regained.

Float Mechanism

(191)



2) Functional Parts

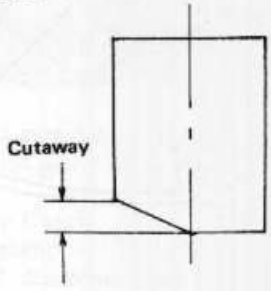
a. Throttle Valve

The throttle valve controls the rate of engine air intake by moving up and down inside the main bore. At small throttle openings air flow control is performed chiefly by the cutaway in the valve, and by controlling air flow, the negative pressure over the needle valve is regulated, in turn governing fuel intake.

The throttle valves are numbered 1.0, 1.5, 2.0, etc., according to the size of the cutaway; the higher the number, the leaner the gasoline/air mixture.

Throttle Valve

(192)



b. Air Jet

The air jet measures the air sent to the needle jet for mixing.

NOTE: The air jet, which is driven into the carburetor body, cannot be removed without damaging the carburetor, and is therefore not a replaceable part.

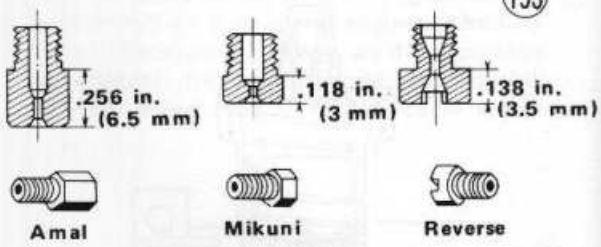
c. Main Jet

The fuel necessary for making the proper mixture is measured by the main jet, and as the throttle opening grows larger, has a great influence on mixture ratio.

The number stamped on the jet indicates the amount of fuel in cc's that passes through the jet in one minute under a given set of conditions. Since the numbers vary with the type of jet, the table shows equivalent jets for the three types used on various models.

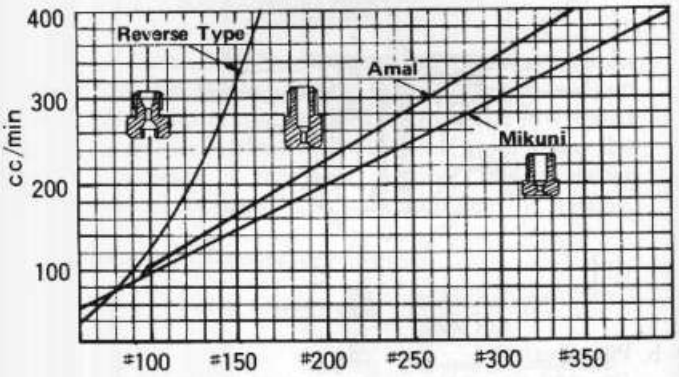
Main Jet Types

(193)



Main Jet Capacity

(194)



d. Jet Needle

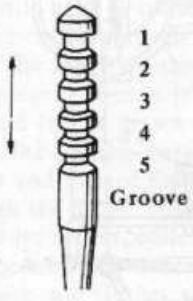
The jet needle has 5 grooves for adjustment cut in the upper portion, and is tapered from approximately the middle of the needle to the lower end. The top is fixed to the center of the throttle valve by the needle clip, and the tapered end extends into the needle jet. Fuel flows through the space between the needle jet and jet needle, which space is unvarying until the throttle reaches the 1/4 open point. At this time the tapered portion of the needle begins to move out of the jet and affect fuel flow as the opening enlarges. It follows that taper wear, and the position of the needle clip in the grooves also affect fuel flow rate. If the needle clip is changed from the standard position to a lower groove, the needle taper starts coming out of the jet sooner, resulting in a richer mixture; moving the clip higher produces a leaner mixture.

Each jet needle is designated with a number/letter code, the meaning of which is explained below. Except for the last number ("3" in this example), this code is stamped on the needle directly below the 5 grooves.

Example: 5GL3-3

Jet Needle

(195)



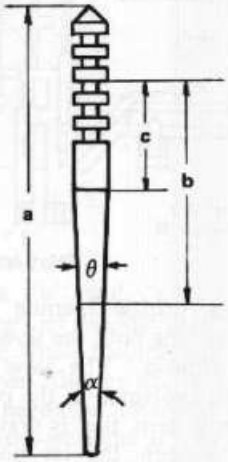
(1) The first number indicates the length of dimension "a". The 5 in the example stands for 50 mm and over, but under 60 mm. A four would mean from 40 up to 50 mm and so on.

(2) Each needle is tapered in two steps. The first letter indicates the angle of the upper taper θ; the next letter shows the angle of taper α, the lower taper. The letter A = 0°15′, and each successive letter is for an angle 15 minutes greater. By calculating for the example, then, G= 1°45′, and L = 3°00′.

(3) This is the manufacturer lot number (Lot No. 3, in this case), and will vary with the individual needle.

(4) The last number (the second 3 in this example) is not stamped on the needle. This is the number of the standard groove in which the needle clip is fixed for that particular model. A 3 shows that the standard setting is in the third, or middle, groove.

Jet Needle (196)



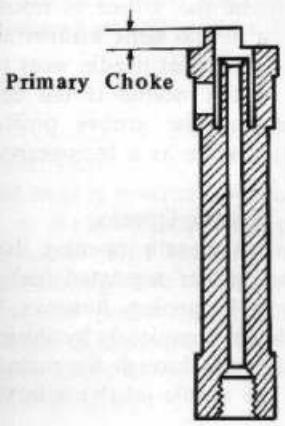
e. Needle Jet

As explained earlier, the needle jet works in conjunction with the jet needle to regulate fuel flow rate.

In the side of the needle jet, there is an air bleed opening which brings in air measured by the air jet. This air initiates the mixing and atomizing process inside the needle jet, and mixing is augmented by a projection at the needle jet outlet, called the primary choke.

The letter number code stamped on the jet indicates jet inside diameter. A "0-2" code, for example, means the inside diameter of the needle jet is 2.61 mm.

Needle Jet (197)



Needle Jet Inside Diameter

	0	1	2	3		9
N	2.550	2.555	2.560	2.565	–	2.595
O	2.600	2.605	2.610	2.615	–	2.645
P	2.650	2.655	2.660	2.665	–	2.695
Q	2.700	2.705	2.710	2.715	–	2.745

f. Pilot Jet

From idling to low speeds, the fuel supply is measured out chiefly by the pilot jet. In the sides of the pilot jet, there are several air bleed openings which serve the same purpose as the air bleed in the needle jet, that is, to reduce the fuel to mist.

The number stamped on the jet is an indication of the amount of fuel in cc's which passes through the jet during a one minute interval under a given set of conditions.

g. Pilot Air Screw

This air screw controls the mixture from idling to low speeds. The tapered tip of the air screw projects into the air passage leading to the pilot jet air bleeds, and by turning the screw in or out, the cross-sectional area of the air passage is varied, in turn varying the pilot jet air supply and changing the mixture ratio.

3) Troubles · Adjustment

When the gasoline/air mixture from the carburetor is incorrect, a rough estimate of possible carburetor failure can be limited to the clogging of some air or fuel passage, wear of parts, or the wrong float level.

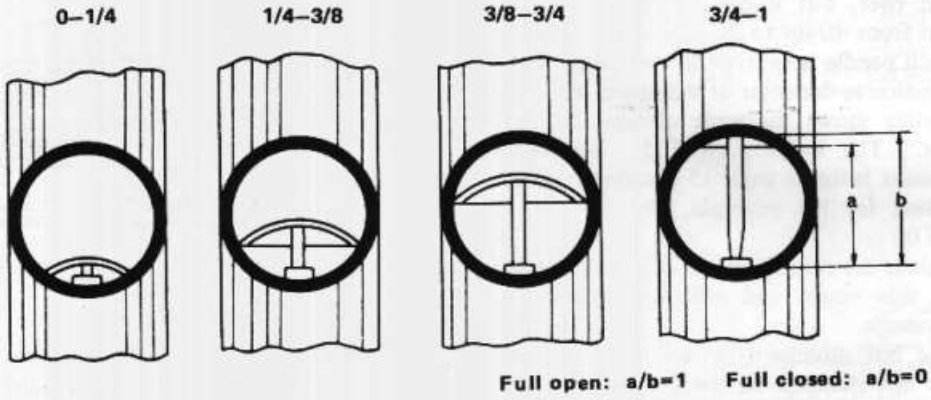
First ascertain whether the mixture is too rich or lean, then use the throttle grip and determine at what degree of throttle valve opening the malfunction is apparent.

Mixture too rich
Runs rough. Misses. Heavy exhaust. Engine runs worse after warming up. Spark plugs fouled with carbon. Runs better without air cleaner.

Mixture too lean
Engine overheats. Runs better with the starter pushed. Spark plug electrodes burn away. Fluctuations in engine speed. No power.

Throttle Opening

198



a. 0 – 1/4 Throttle Opening

At this throttle opening, the fuel measured by the pilot jet (A) mixes with air adjusted by pilot air screw (B), producing a rich mixture output from pilot outlet (C). This rich mixture is then further blended with the small air flow in the main air flow in the main bore and fed into the engine. This pilot system is generally called the "slow system".

Pilot jet (A) is of a fixed size, and overall mixture strength is varied by increasing or decreasing air intake with the air screw (B). Therefore the most important point is to achieve correct air screw adjustment.

If the mixture is too rich, causes of this trouble might be clogging of the pilot air intake, or of the pilot jet air passage or air bleed opening. Possible causes of a lean mixture might be obstruction of the pilot jet or jet outlet. Other possible failures are included in the following table.

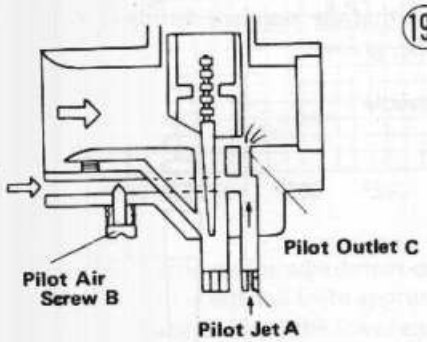
Too rich
Pilot jet mounting loose. Starter lever is not completely returned. Starter lever returned but starter plunger not fully closed.

Too lean
Throttle valve has worn and developed play. Carburetor mounting is loose, allowing air to leak in.

In the case of passage or jet clogging, clean the affected parts with pure gasoline and blow them out with compressed air. Under no circumstances should wire or other hard objects be used for cleaning. Never use compressed air to clean an assembled carburetor as this can damage the float and cause a rich fuel mixture.

0 – ¼ Throttle Opening

199



b. 1/4 – 3/8 Throttle Opening

At this opening both the slow and main systems are being utilized. The slow system, i.e. pilot system, is as explained in the previous paragraph. In the main system, fuel is drawn up through the clearance between the jet needle (E) and the needle jet (F), the rate of flow being decided by the throttle valve cutaway (G) and the jet/needle clearance. Since fuel intake is from two systems at this throttle opening, both systems must be investigated for the source of any trouble. Check the slow system as already explained.

Dirt collecting in the main jet (H), or in the needle jet would block the fuel flow and cause a lean mixture. Sources of trouble resulting in a rich mixture might be a blocked air passage, air jet (I), or the air bleed opening of needle jet (F); or an abnormally large needle jet/jet needle clearance due to needle jet wear; or a loose needle jet (F) or main jet (H). If a blocked passage or jet is found to be the source of trouble, remove the obstruction in the same manner as explained in paragraph "a". If jet needle wear is indicated, replacement of the needle is the best remedy, although changing the groove position of the needle clip may serve as a temporary expedient.

c. 3/8 – 3/4 Throttle Opening

At 1/4 to 3/8 throttle opening the main and slow systems together regulated fuel flow.

At 3/8 to 3/4 opening, however, flow rate is determined almost completely by the main system.

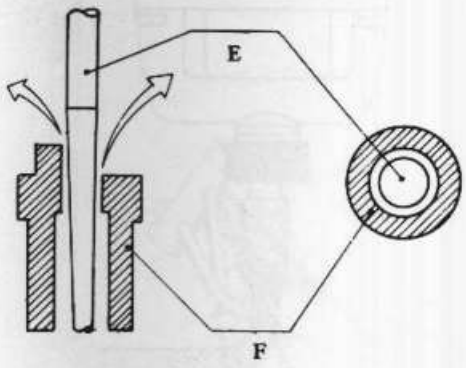
Fuel is drawn up through the main jet (H) and mixed inside the needle jet (F) with air from the

air jet (I). This rich mixture passes up between the needle jet and the tapered portion of the jet needle into the main bore.

Among possible causes of faulty functioning would be obstruction or loose mounting of the main jet or needle jet, clogging of the air jet or needle jet, and jet needle wear.

1/4 – 3/8 **Throttle Opening**

(200)



d. 3/4 – Full Throttle

In paragraphs "b" and "c" fuel flow was governed by the jet needle/needle jet (E/F) opening, but the when throttle valve (G) is this close to fully open, the jet needle is also pulled up high and the needle/jet clearance (R) becomes larger than the cross-sectional area (X) of the main jet (H) opening, and consequently fuel flow is controlled only by the main jet.

As in paragraph "c", any trouble might be due to clogging or loose mounting of the main jet, or blocking of the air jet, air passages, or needle jet, If after ascertaining the absence of clogging or loose mounting, the carburetor still does not function properly, the main jet must be adjusted by replacement. It should be kept in mind that the main jet is used during lower speeds as well as at open throttle, so there are limits to the amount of adjustment that can be made.

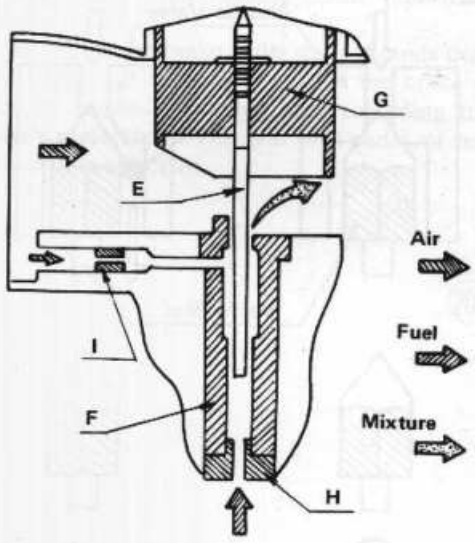
With the reversible type jet, the standard jet can be varied #2.5 at a time. To make the mixture leaner use the next lower numbered jet; the next higher numbered jet will produce a richer mixture.

e. Float Mechanism

The fuel level is governed by the projection of the float, so the most important point is correct float adjustment. Dirt between the needle valve and seat preventing valve closing, wear or damage in the needle valve area, float puncture, etc. may cause overflowing. On the other hand, if the needle sticks to the seat, no fuel will flow into the float chamber.

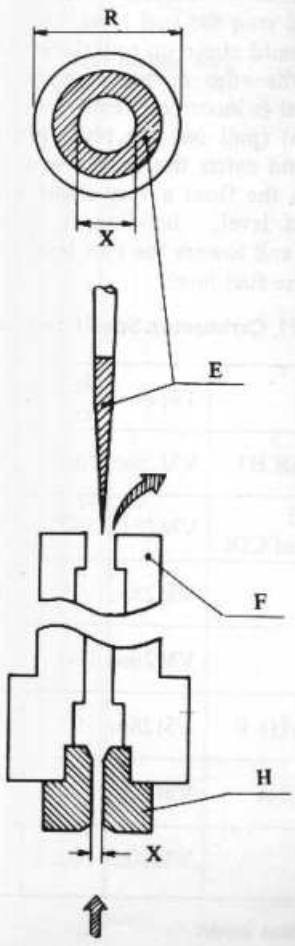
3/8 – 3/4 **Throttle Opening**

(201)

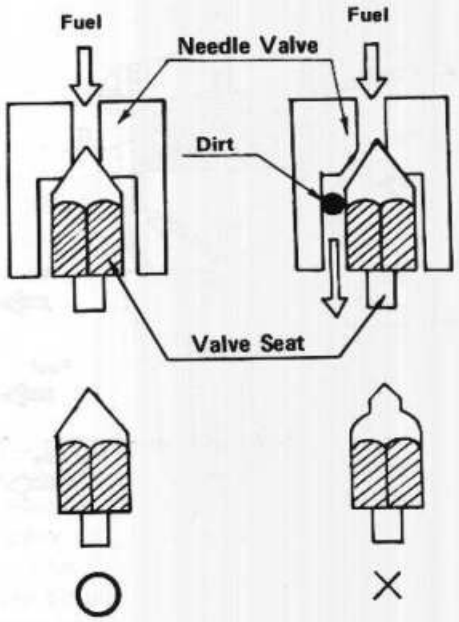


¾ – **Full Throttle Opening**

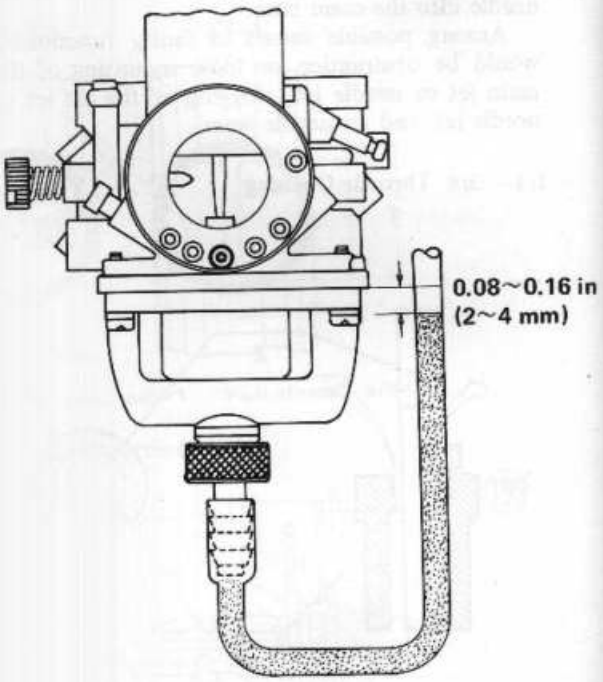
(202)



Needle and Seat (203)



Fuel Level Measurement (189)



Turn the fuel tap off, and remove the carburetor from the intake manifold with the fuel hose left in place. Remove the float bowl, and install the fuel level measurement device (special tool) in its place.

Keeping the carburetor vertical, hold the plastic tube against the carburetor body, turn on the fuel tap, and read the fuel level. The fuel level in the hose should come up to 0.08~0.16 in. (2~4 mm) below the edge of the carburetor body. If the fuel level is incorrect, remove the special tool and the float (pull out the pivot pin to drop out the float, and catch the needle as it falls). Bend the tang on the float a very slight amount to change the fuel level. Bending it up closes the valve sooner and lowers the fuel level; bending it down raises the fuel level.

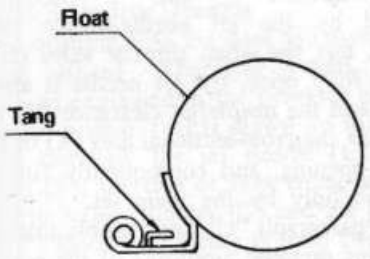


Table 21 Carburetor Specifications

Model	Type	Main Jet	Air Jet	Needle Jet	Jet Needle	Pilot Jet	Cut-Away	Air Screw	Fuel Level
old CDI H1	VM28sc	100	0.5	0–2	5GL3-3	30	3.0	1¼ turns out	30±1 mm (1.18±0.04 in)
old H1 without CDI	VM28sc	90	0.5	0–2	5EH7-3	30	2.5	1½ turns out	30±1 mm (1.18±0.04 in)
H1-B	VM28sc	95	0.5	0–4/8 *0–4	5DJ19-4	30	2.0 *2.5	1½ turns *1¼ out	30±1 mm (1.18±0.04 in)
H1-C	VM28sc	100	0.5	0–2	5GL3-3	30	3.0	1¼ turns out	30±1 mm (1.18±0.04 in)
H1-D/H1-E	VM28sc	92.5	0.5	0–4/8	5DJ19-4	30	2.5	1¼ turns out	30±1 mm (1.18±0.04 in)
H2/H2-A	VM30sc	97.5	0.5	0–6/8	5EJ15-3	35	2.5	1½ turns out	30±1 mm (1.18±0.04 in)
H2-B	VM30sc	102.5	0.5	0–6/8	5EJ15-4	40	2.5	1¾ turns out	30±1 mm (1.18±0.04 in)

*European model

IV. Frame

1. FRAME

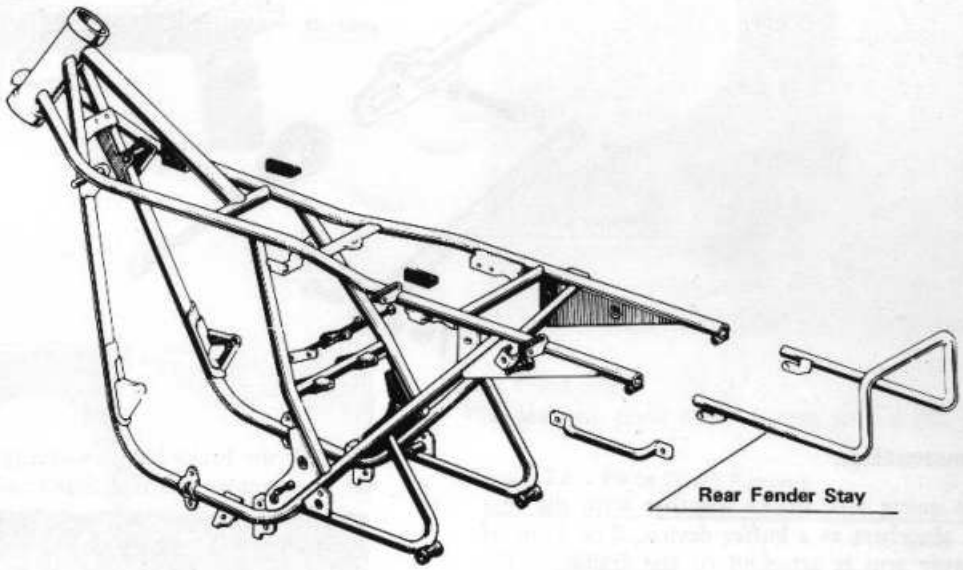
1) Construction

Two types of frames are generally used in motorcycle manufacture, the pipe frame and the pressed steel frame. In the H Series machines, a rigid, light-weight double cradle pipe frame is used.

In the H1 the brake pedal shaft extends through the frame out both sides so that the brake pedal can be located on either side according to the rider's preference. The gear shift pedal, of course, can also be relocated.

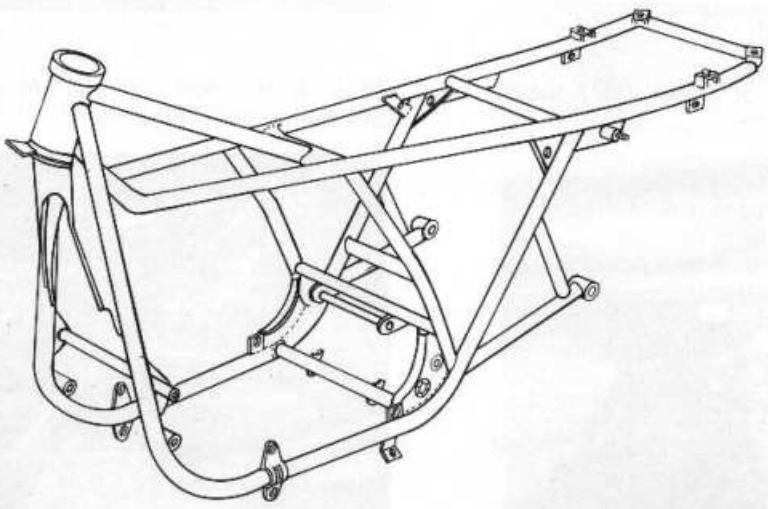
H1 Frame

(205)



H2 Frame

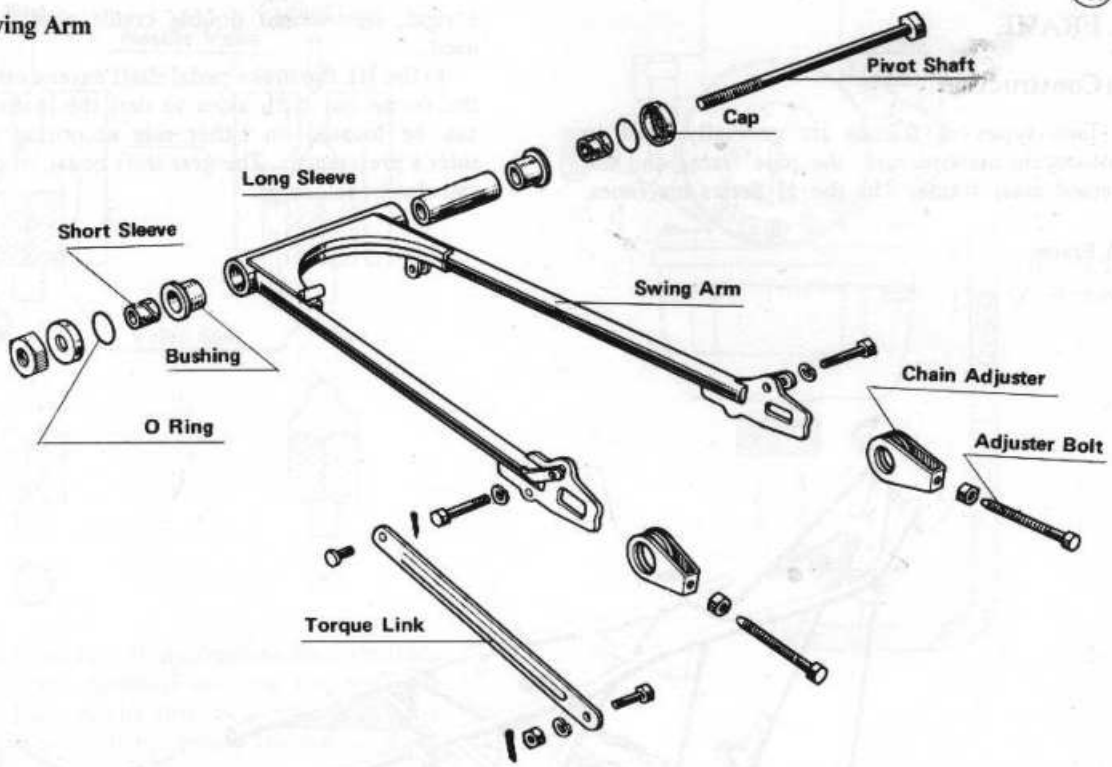
(206)



2. SWING ARM

(207)

H1 Swing Arm



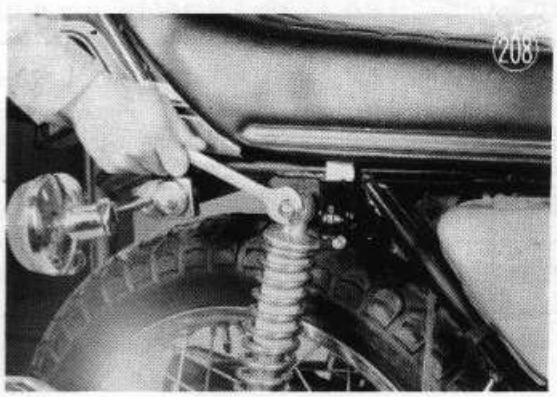
1) Construction

The swing arm works together with the rear shock absorbers as a buffer device. The front of the swing arm is attached to the frame by the pivot shaft, and the rear part through the shock absorber, moving up and down with the pivot shaft as a reference.

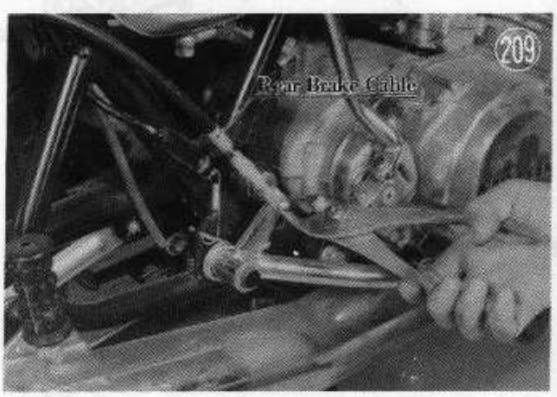
2) Disassembly

First remove the rear wheel and coupling. For removal procedure see page 58.

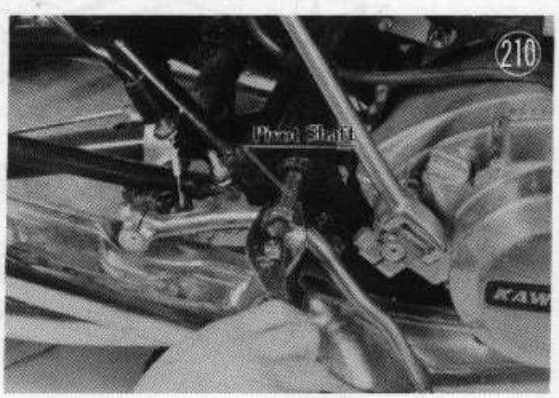
Unbolt the lower (H1) or upper (H2) shock absorber mountings.



Unhook the brake lamp switch spring, and on the H1 also remove the rear brake cable.



Take off the lock nut, pull out the pivot shaft and remove the swing arm.

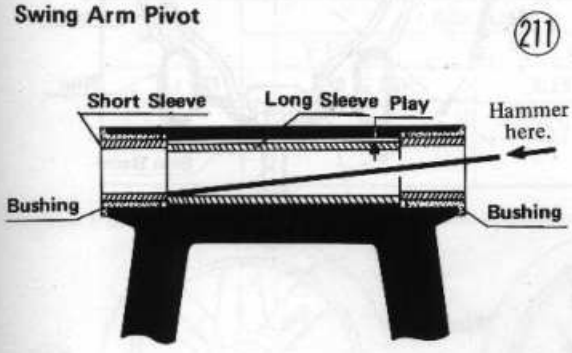


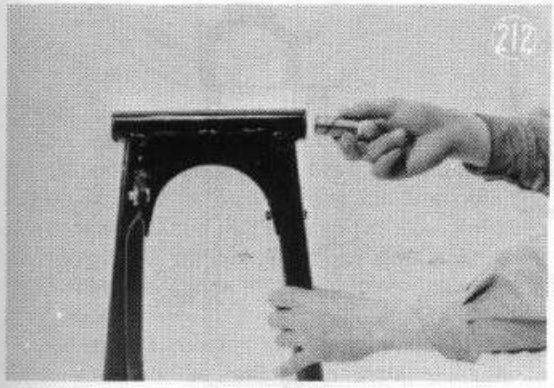
Remove the short sleeves by inserting a rod or starting punch into the pivot shaft and hammering it lightly.

The long sleeve comes out easily after either short sleeve is removed.

Remove the bushing from the swing arm only if it requires replacement, since it cannot be reused once removed.

Swing Arm Pivot





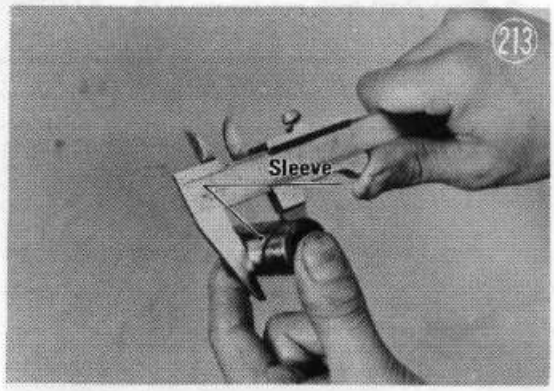
3) Overhaul

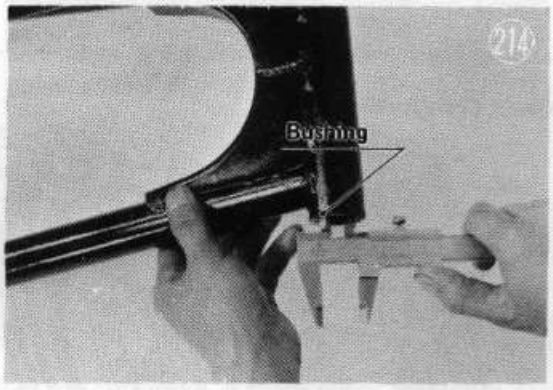
a. Sleeve and Bushing

The swing arm pivot point is continually moving due to vibration from the road, and this causes sleeve and bushing wear and works the nut loose. Inspect these parts for looseness or excessive wear, and replace any out of tolerance. Be especially attentive to wear of the bushing on the chain side, as this bushing wears more than the other. Play in either bushing will cause wheel vibration.

Table 22 Sleeve, Bushing Wear

	Standard	Service Limit
Sleeve outer dia.	.8661″ (22.00 mm)	.8602″ (21.85 mm)
Bushing inner dia.	.8720″ (22.15 mm)	.8819″ (22.40 mm)
Sleeve/Bushing clearance	.0059″ (0.15 mm)	.0217″ (0.55 mm)



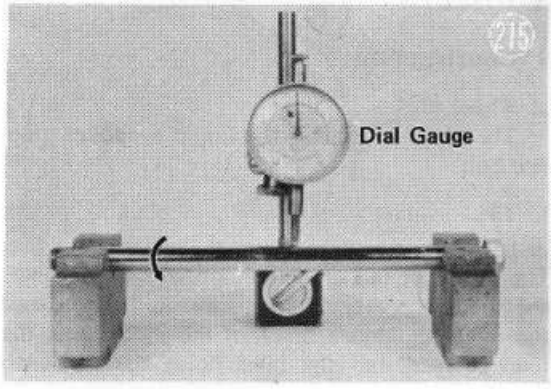


b. Pivot Shaft

Measure pivot shaft runout with a dial gauge.

Table 23 Pivot Shaft Runout

Standard	Service Limit
Under .004″ (.1 mm)	.0055″ (.14 mm)



c. Swing Arm Warp

Swing arm warp or bending will cause the front and rear wheels to go out of alignment, resulting in steering difficulty and handlebar oscillation. If the swing arm is warped, replace it.

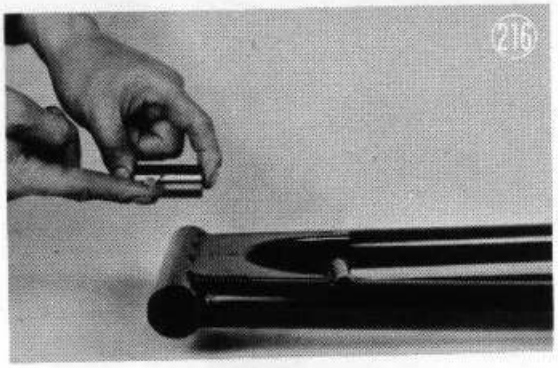
4) Assembly

Assembly is in the reverse order of disassembly.

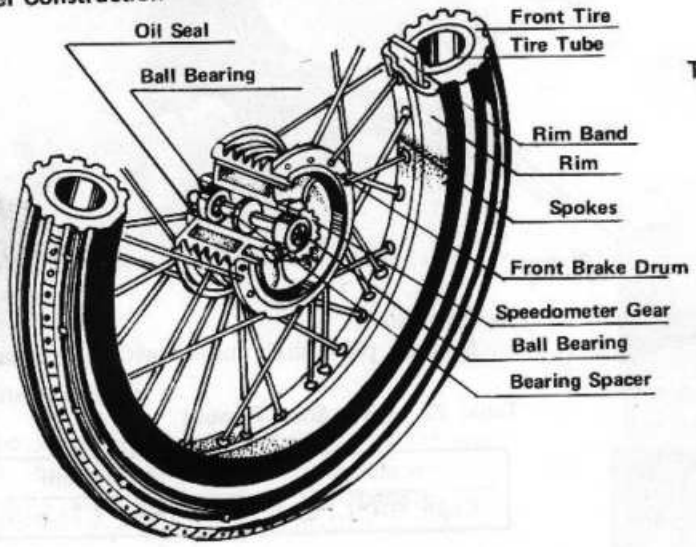
Caution:

1. Use a good quality grease on the sleeve when inserting it, to prevent seizure from overheating.

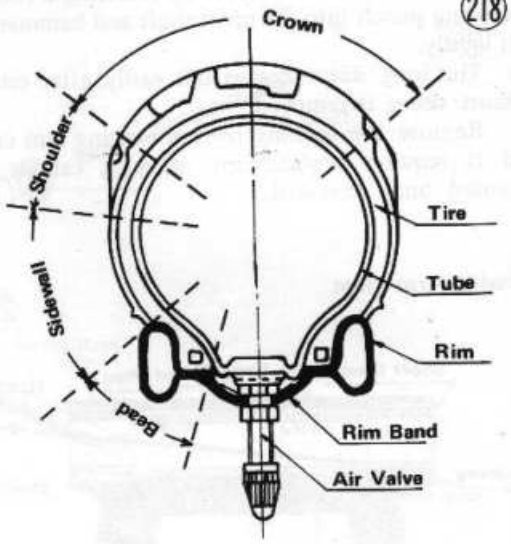
2. Pivot shaft lock nut torque is 58 – 87 ft-lbs. (8 – 12 kg-M).



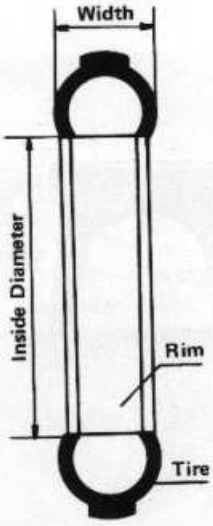
Wheel Construction



Tire Cross Section



Tire Size



3. WHEELS

1) Construction

a. Wheel

The wheel consists of the tire, rim, spokes tube, and hub.

b. Tire

Fig. 218 is a cross-sectional diagram of a tire. The crown of the tire is the normal riding surface; the shoulder portion holds the road during turns; the sidewalls absorb much of the shock from the road surface, and the bead holds the tire onto the rim.

Various tread patterns are manufactured into tires to allow selection of a tire suitable for its intended use. A rib pattern resists side slippage, and is desirable on a front tire. A tire with a block pattern tread has greater friction with the road surface and so is employed chiefly on the rear to improve braking and acceleration efficiency.

The tire size marking shows tire dimensions in inches. For example a 3.00–18 tire has an overall width of 3.00 inches, and fits on an 18 inch rim, i.e. its inside diameter is 18 inches. An "S" after the width number indicates a tire for high speed use.

Tire Construction

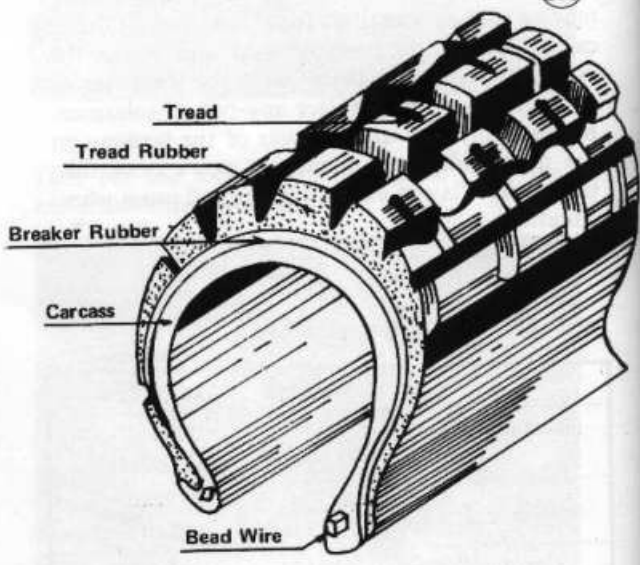


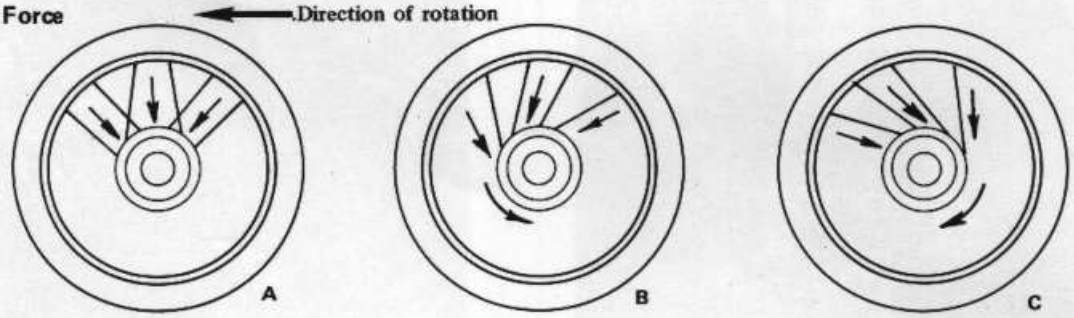
Table 24 Tires

Model	Tire Size		Air Pressure	
	Front	Rear	Front	Rear
H1	3.25–19 4PR	4.00–18 4PR	26psi (1.8 kg/cm²)	31psi (2.2 kg/cm²)
H2	3.25S19 4PR	4.00S18 4PR	26psi (1.8kg/cm²)	31psi (2.2kg/cm²)

Table 25 Wheels

Model	Rim Size		Spoke Size	
	Front	Rear	Front	Rear
H1	1.85B X 19W	2.15B X 18W	9(3.5 mmϕ)	9(3.5 mmϕ)
H2	1.85B × 19W	2.15B × 18W	9 (3.5 mmϕ) (.138 in. radius)	9 (3.5 mmϕ) (.138 in. radius)

Spoke Force ← Direction of rotation



(221)

c. Rim

The outside edge of the rim is curved toward the center so that the tire bead will catch on it, staying in place by outward tension from the tire air pressure. Since this type of tire does not keep the tube from sitting against the rim, a rim band is provided to guard the tube from damage.

d. Spokes

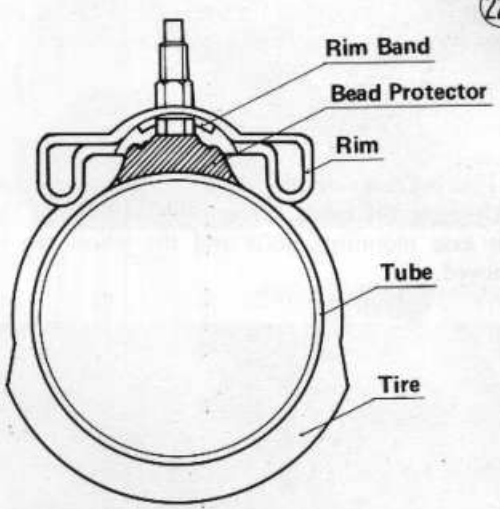
The spokes connect the rim and the hub, and being fixed to the hub at an angle, are able to support the vehicle and load force under any conditions. Figure 221 shows the force applied to the spokes: Spokes A support the standing weight of the vehicle and receive the force of road shocks; spokes B work during acceleration and normal forward movement; spokes C receive their heaviest load during braking.

e. Bead Protectors

The rear wheel on the H Series is equipped with bead protectors which prevent damage to the tube during high speed braking, by keeping the bead from slipping on the rim.

Bead Protector

(222)



f. Wheel Balance

Inertia of the wheel increases as the square of the angular speed of the wheel, which means that the faster the wheel turns, the more that even a small difference of weight around the wheel will affect stability. To maintain wheel stability and prevent vibration at high speeds, wheel balancing weights are fixed to the outer end of the spokes.



(223)

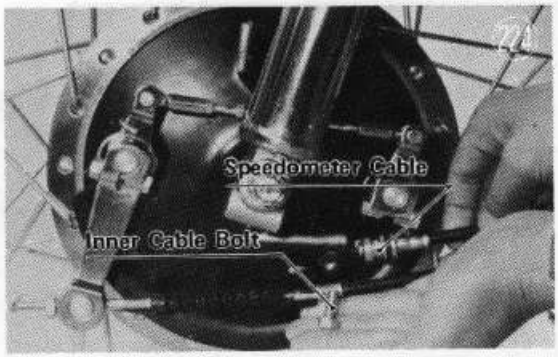
2) Disassembly

a. Front Wheel

(1) Expansion brake models

Remove the front brake cable.

Remove the inner cable bolt and pull the speedometer cable from the brake panel.



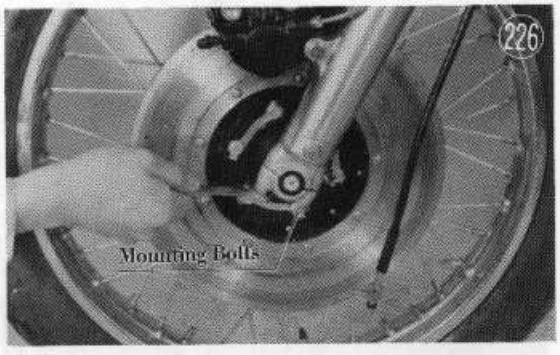
Remove the front axle bolt.



Place a stand under the engine to raise the front wheel off the ground. Unscrew the axle, and remove the wheel and brake panel as an assembly.

(2) Disc brake models

Unscrew the speedometer cable. Take out the four axle mounting bolts and the wheel can be removed.

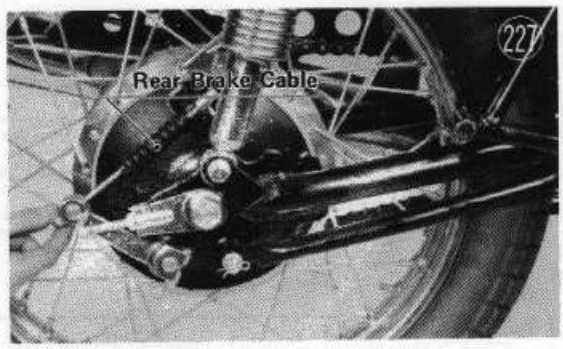


The axle can be removed by unscrewing it.

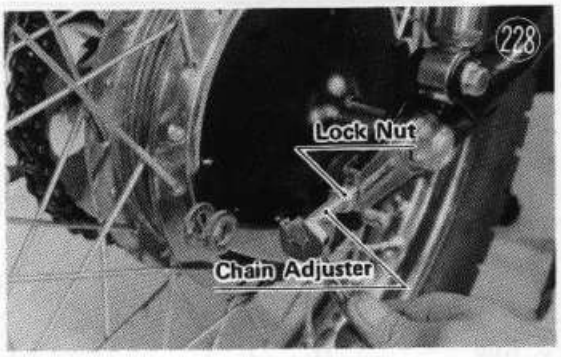
b. Rear Wheel and Coupling

(1) H1

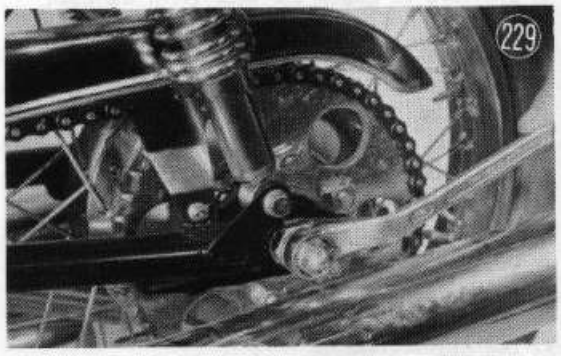
Remove right mufflers (page 99). Remove the rear brake cable or rod, and unbolt the rear torque link mounting.



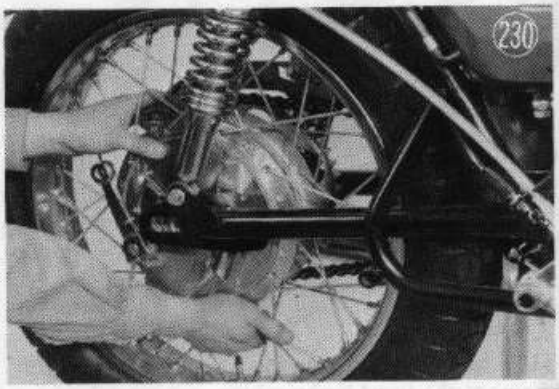
To make reassembly easy, loosen the chain adjuster lock nut and back off the adjuster screw 2 or 3 turns.



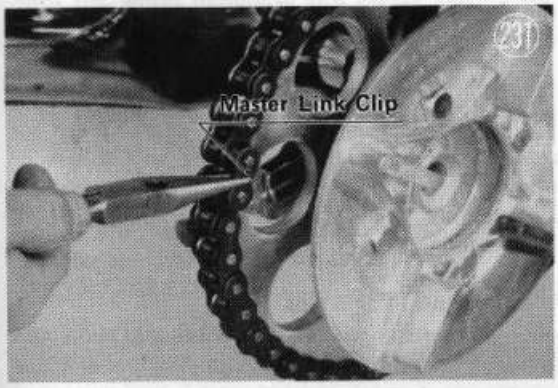
Pull out the cotter pin and take out the axle The right chain adjuster collar will come off at the same time.



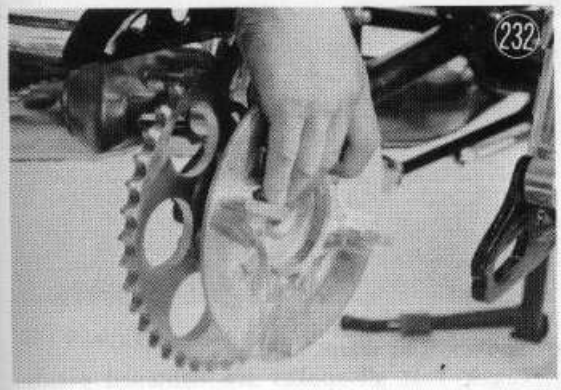
When the wheel is removed, the coupling remains.



Remove the master link clip from the master link with pliers. Take out the master link and remove the chain.

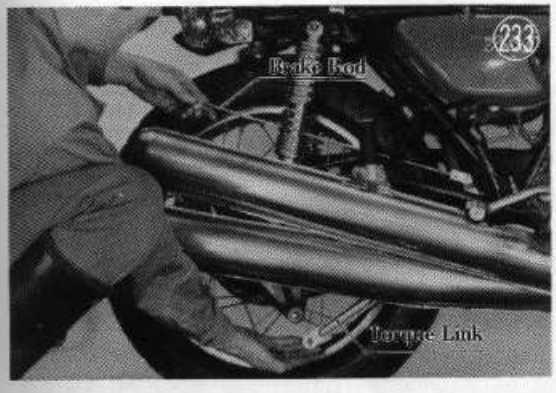


Remove the sleeve nut, and take off the coupling as assembled with the rear sprocket, and take off the left chain adjuster.

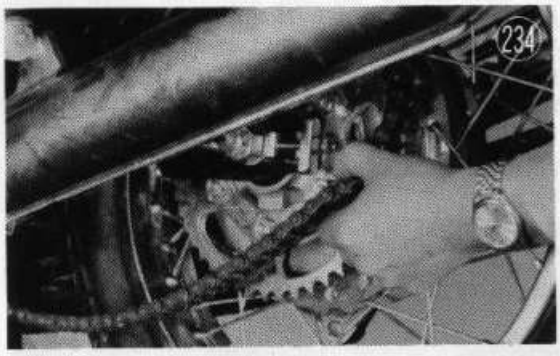


(2) H2

Take out the cotter pin, unscrew the nut and pull the torque link off the stud. Unscrew the rear brake rod nut.



Loosen the axle nut and loosen both chain adjusters. Push the rear wheel forward to slip the chain off the sprocket, and pull the chain up over the chain guard out of the way. The wheel can now be pulled off together with the sprocket.

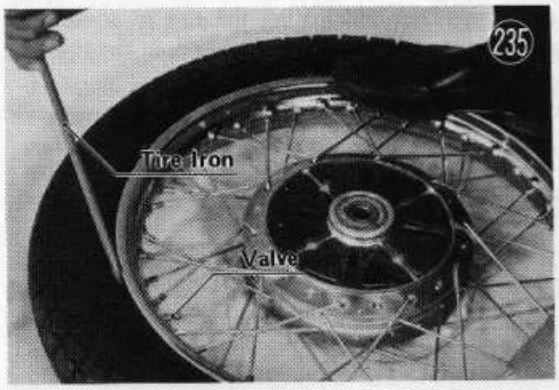


c. Tube and Tire Removal, Mounting

Take out the valve core and let out all the air.

Remove the tube valve nut, and for those models with bead protectors, loosen the bead protector nuts.

Stand on the side of the tire opposite the valve stem and push the bead to the center of the rim to give the tire play. Use tire irons to pry the tire off the rim, starting at the valve.



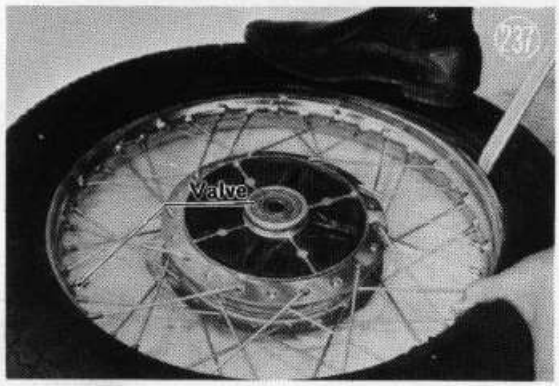
Remove the tube.



NOTE:

1. When removing the tube, spread cardboard or rags on the ground to prevent hub or rim damage and to keep dirt from getting into the bearings.
2. Lay the wheel with the drum side down to make it more stable and easy to work with.
3. It is only necessary to pry one side of the tire off the rim to remove the tube.

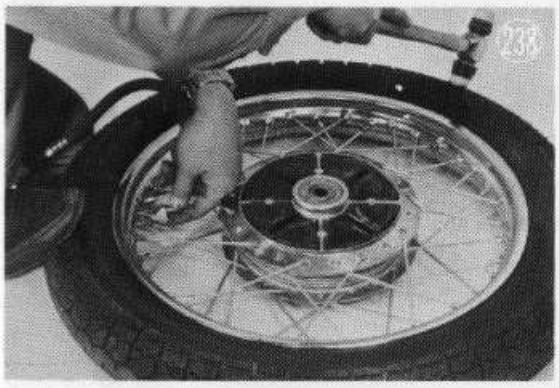
When mounting the tire/tube, first push the tube valve through the valve opening and hold it in place by turning its nut down two or three turns. Put a small amount of air in the tube to straighten it out and pry the tire back onto the rim in the reverse order of unmounting, starting at the side opposite the valve.



NOTE: If the valve stem nut is put on tightly at first, the tube may get pinched between the tire and rim when the tire is mounted.

After the tire is completely mounted on the rim, put air in a little at a time, stopping every so often and hitting the tire to make sure the tube does not get caught between the tire and rim.

Tighten the valve nut and the bead protector nuts.



3) Inspection

a. Tire

For running stability and long tire life, tires should be chosen to match their use and riding conditions, and tire air pressure set to the correct level. If tire pressure is too high the center of the tire will wear excessively, the tire will get damaged easily, it may slip on the road, and every small irregularity in the road surface will be transmitted to the rider. If tire pressure is too low the sides of the tire crown will wear badly, the cord may be damaged and the tire may crack. Steering will be difficult, gas mileage will drop, and the tire may slip on the rim and damage the tube (in the case of the front tire, which has no bead protector).

(1) Wear

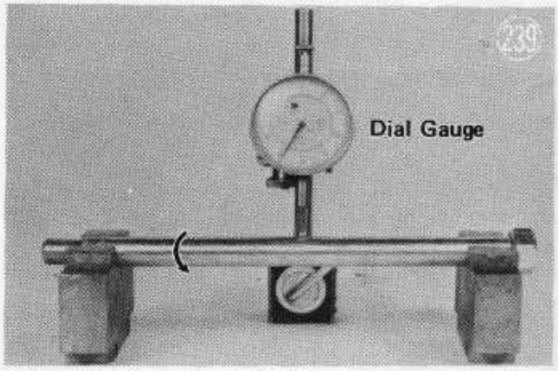
A worn tire is very dangerous in that it will slip easily during sudden braking or on curves, and becomes punctured easily. Judge tire wear by the depth and condition of the tread at the center of the tire.

(2) Cuts

Even small cuts in the tire can cause a blowout if they are deep. Wash the tire and check it for cuts, at the same time removing any stones or other foreign objects imbedded in the tire surface. If there are any deep cuts in the tire, it should be replaced.

b. Front and Rear Axles

A bent axle will cause wheel vibration and unstable handling. Check axle runout with a dial gauge. If runout is over .028" (0.7 mm) and cannot be corrected to within this tolerance, replace the axle. A new axle has under .008" (0.2 mm) runout.

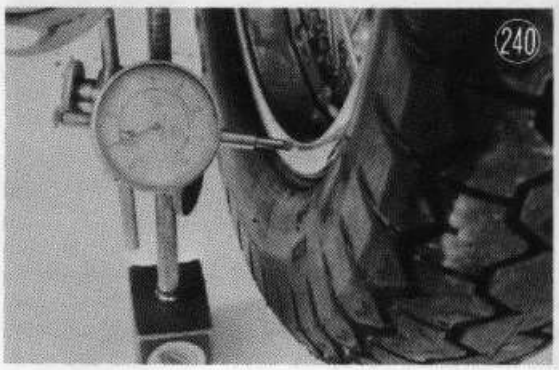


c. Spokes, Rim Warp

Check that all spokes are tightened evenly. Generally loose or unevenly tightened spokes will not only hasten spoke and spoke nipple wear, but will cause the rim to warp and spokes to break. Conversely, a certain degree of rim warp can be corrected by tightening the spokes properly. As illustrated, spin the wheel and check runout with a dial gauge. If runout exceeds the service limit and is not correctable, replace the rim. Also replace any bent spokes.

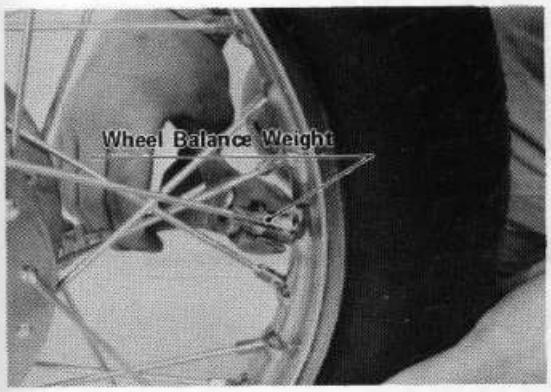
Table 26 Rim Runout

Standard	Service Limit
Less than .04 in. (1 mm)	.08 in. (2 mm)



d. Wheel Balance

Wheels out of balance will vibrate and cause handlebar oscillation. The balance is checked with the wheel mounted, and in the case of the rear wheel, with the chain removed. Spin the wheel lightly and see if it will stop in any position of its own accord. If it will not, attach a balance weight to the lightest side and spin the wheel again. Repeat the process as necessary until the difference between the lightest and heaviest side is less than 1/3 ounce (10 grams). Then attach the weights firmly with pliers. Balance weights are available in 10, 20 and 30 gm. sizes (1/3, 2/3 and 1 ounce)



4) Assembly

Assembly is in the reverse order of disassembly.

NOTE:

1. When mounting the rear wheel, align the wheels and adjust the chain. Wheel alignment is accomplished by adjusting the right and left chain adjuster marks to coincide with the alignment marks on the swing arm. At this time also adjust chain length. (See page 94 .)

2. Be sure the torque link is firmly fastened to the brake panel.

3. On the H1 1969 – 71 models tightening torque for the front axle is 51 – 65 ft-lbs (7 – 9 kg-M), and on the H1 and H2 from 1972 model, tightening torque for the front axle clamp nuts is 11.5 – 16 ft-lbs (1.6 – 2.2 kg-M). Rear axle torque is 72 – 101 ft-lbs (10 – 14 kg-M).

4. Ensure that the brakes are adjusted properly as outlined in the next section.

4. HUBS · BRAKES · SPROCKET

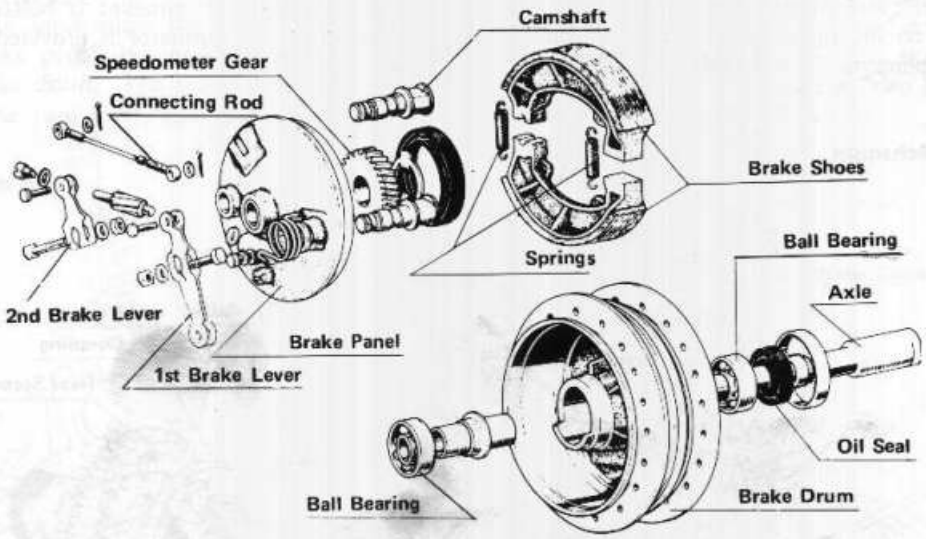
All front hub and front brake information for the H2 and for H1 models with disc brakes is covered in the disc brake section beginning on page 69.

1) Construction

a. Front Hub

The front hub includes the brake drum and brake mechanism – the brake panel, brake shoes, etc. A bearing is pressed into either side of the brake drum, and on the inner surface of the drum is cast a steel sleeve, which serves as the braking surface for the brake shoes. The speedometer gear and pinion are mounted on the inside of the brake panel, and these transmit the rotation of the front wheel to the speedometer via the speedometer cable.

H1 Front Hub Mechanism



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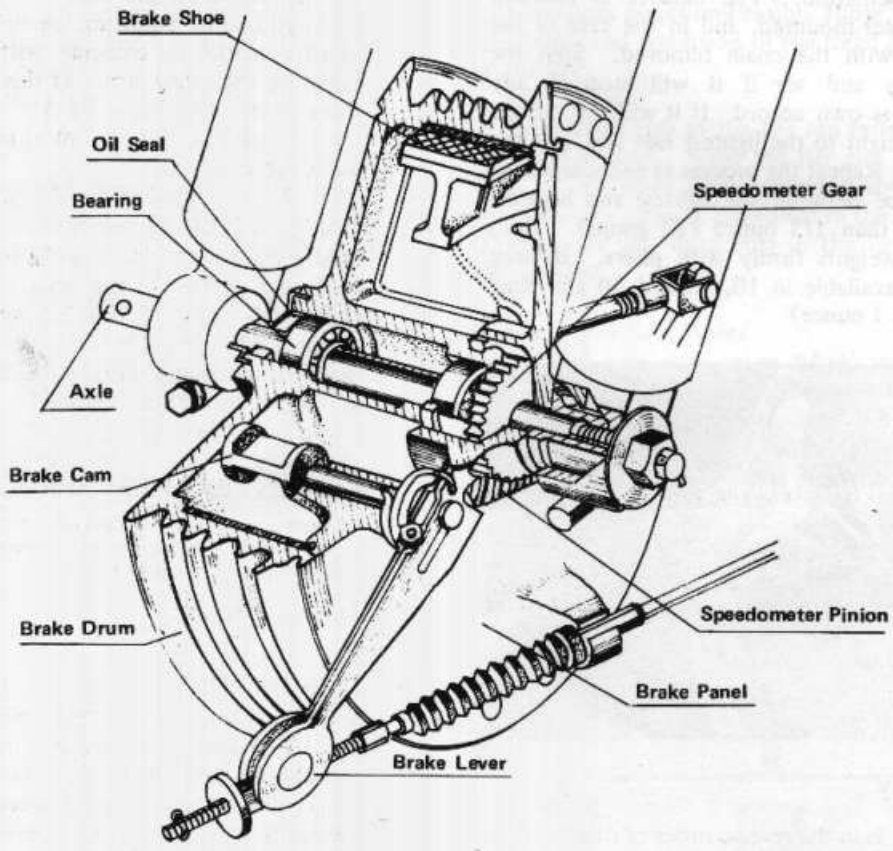
Table 27 Front Wheel

Model	Bearing		Oil Seal	
	Drum	Panel	Drum	Panel
H1	6303	6303Z	25 47 8	BJN58 72 6
H1,* H2	6203	6203	BJN25406	BJN54656

*Disc brake models

Front Brake Drum Assembly

(243)



b. Rear Hub

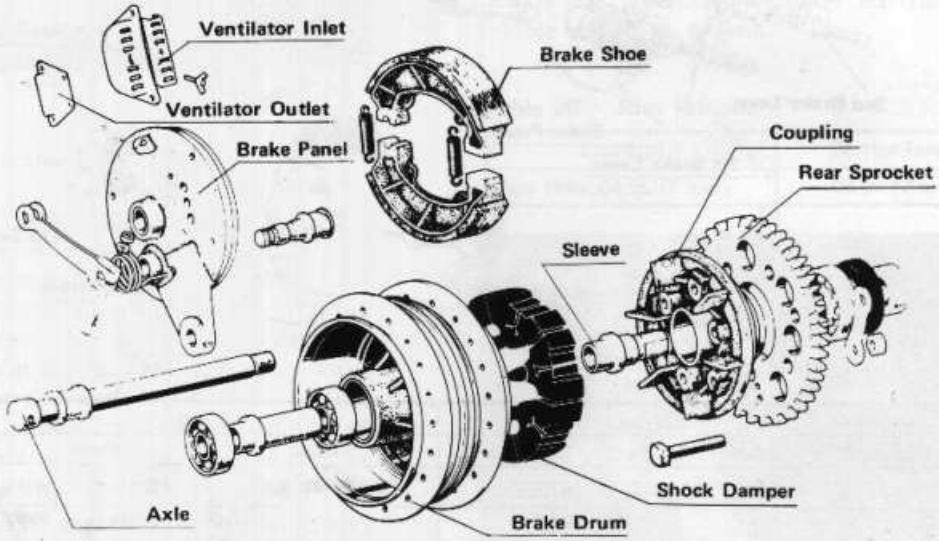
The rear hub consists of the brake drum; rear brake mechanism – brake panel, brake shoes; the sprocket which receives engine power and turns the rear wheel; and the coupling. The brake panel is mounted on the right side of the brake drum, and the coupling on the left side. The rear brake drum, which is of the same construction as the front drum, fits against the coupling separated by rubber shock dampers that buffer torque changes.

A bearing and oil seal are pressed into the coupling, and the sprocket is bolted against it.

In the H1 a ventilator is provided in the rear brake panel.

Rear Hub Mechanism

(244)



Rear Brake Drum Assembly

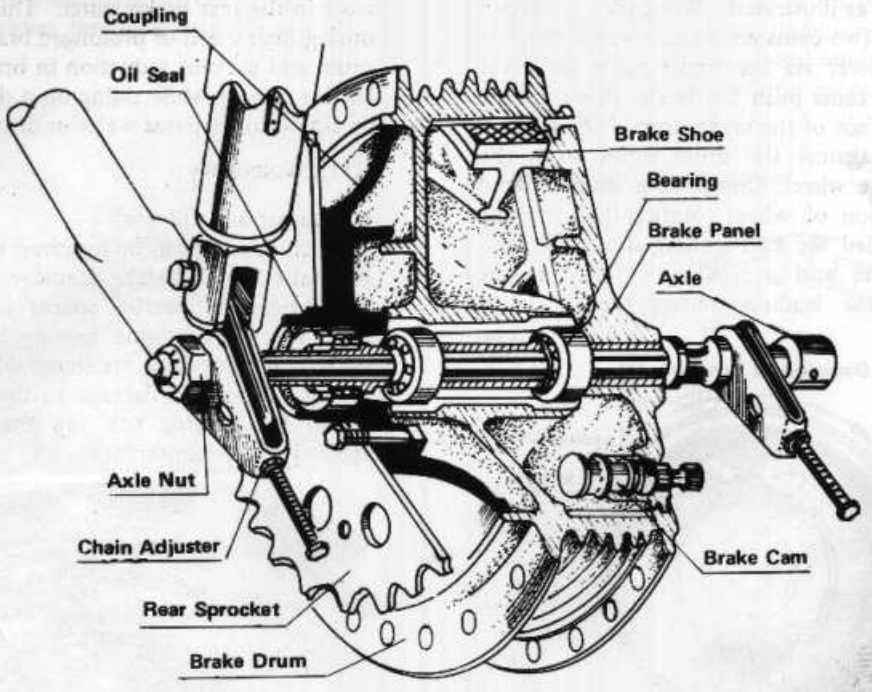


Table 28 Rear Wheel

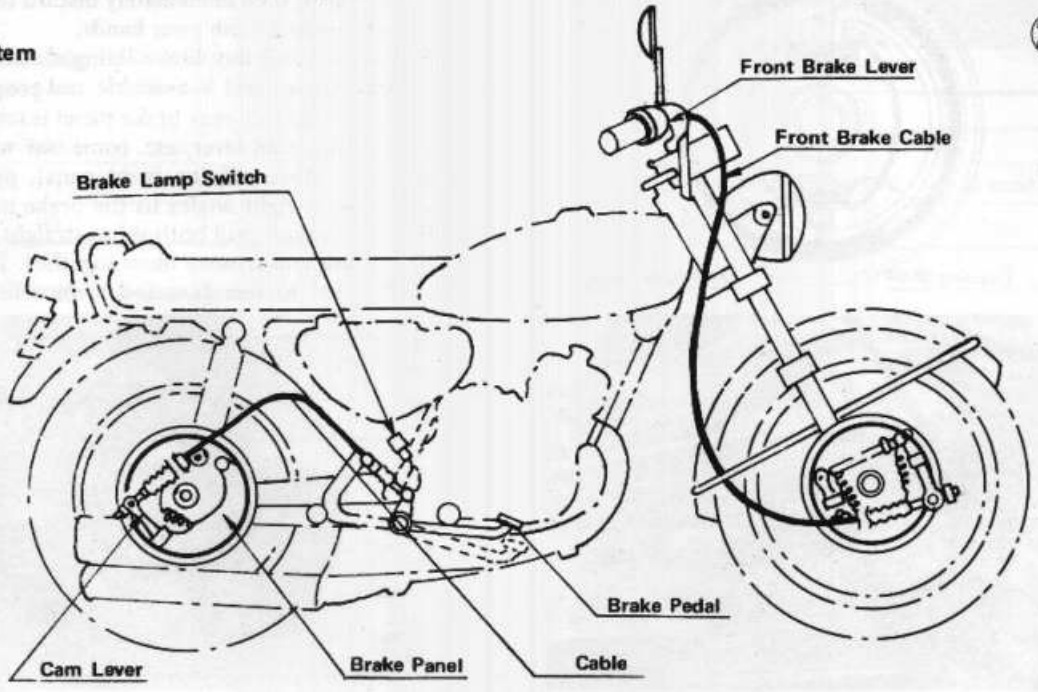
Model	Bearing			Oil Seal
	Drum	Coupling	Panel	Coupling
H1	6303Z	6305	6205Z	AJN40 62 7
H2	6304Z	6206	6304	AJN40 62 7

c. Brake Mechanism

The brake mechanism consists of the brake lever or brake pedal, the brake panel assembly, and the brake drum. The brake panel assembly comprises the cam lever, cam shaft (two levers and shaft for the front brake), brake shoes, brake shoe springs, and the brake panel itself.

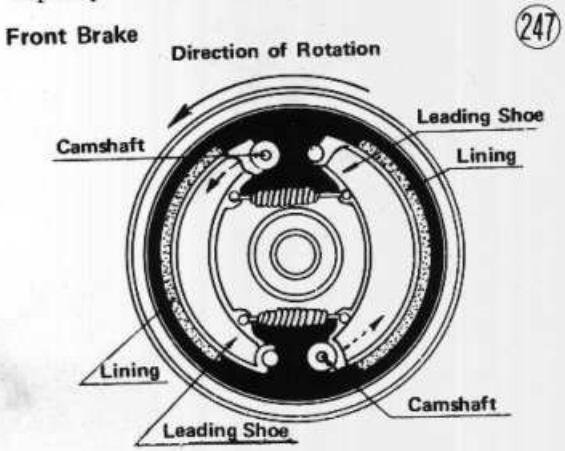
Both the front and rear brakes are the expansion type: the front is "two leading shoe", and the rear is "leading trailing".

Brake System



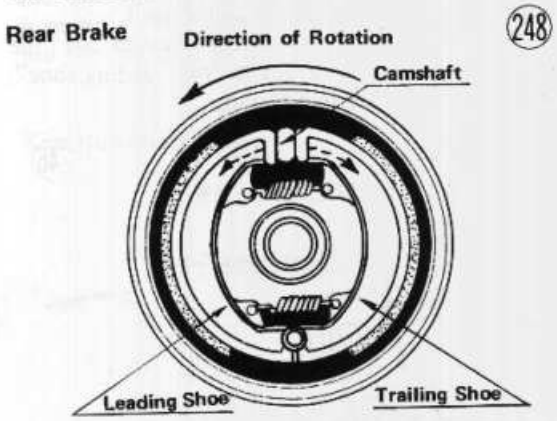
(1) Two leading shoe (front brake)

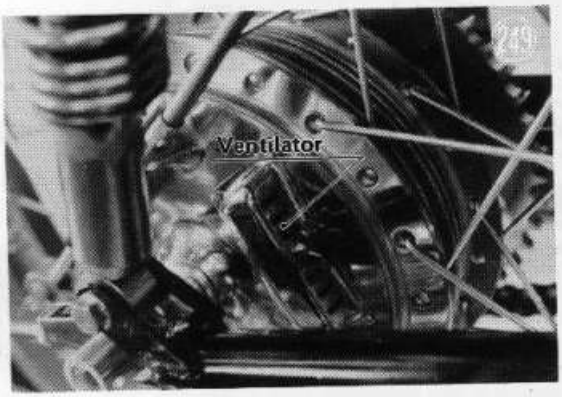
The two brake shoes fit symmetrically against the two cams as illustrated. When the brake lever is pulled, the two cams are turned simultaneously by the cam lever via the brake cable and lever link, and the cams push the brake shoes against the inside surface of the brake drum. The friction of the shoe against the drum slows down the rotation of the wheel. Since both shoes expand in the direction of wheel rotation this braking method is called the two leading shoe type, and has about one and a half times the braking capacity of the leading trailing type.



(2) Leading trailing (rear brake)

When the pedal is stepped on, the brake cable pulls the cam lever, which turns the cam shaft that forces the shoes to expand against the drum. At this time one shoe (trailing shoe), expands in direction B opposite drum rotation, and the other shoe (leading shoe) expands in direction A, the direction of drum rotation.





(3) Ventilator

H1 models are equipped with a closable ventilator in the rear brake panel. This can be opened during high speed or prolonged braking to cool the drum and prevent reduction in braking efficiency. During rain or while riding on a dusty road it can be closed to keep out water or dust.

2) Disassembly

a. Bearing and Oil Seals

Each bearing can be removed together with its oil seal (if applicable). Remove the first bearing by hitting the bearing spacer to knock it out. Remove the remaining bearing by setting a rod or starting punch to its inner side and knocking it out. To avoid damage to the surface against which the bearing sits, tap the bearing evenly around its circumference.

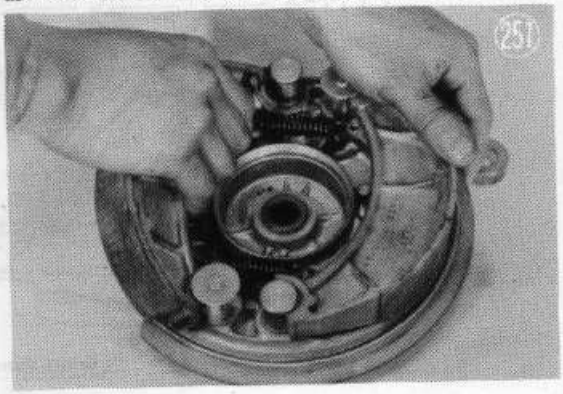


b. Brake Shoes

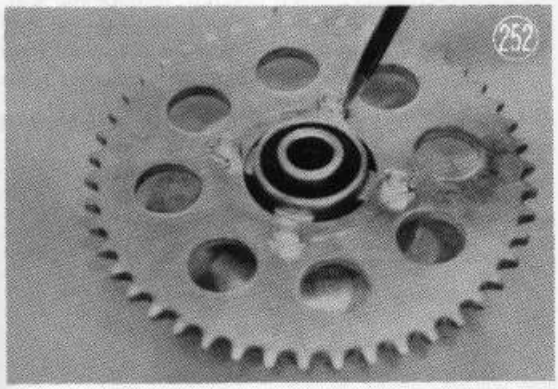
WARNING:Brake linings contain asbestos fiber. Inhalation of asbestos may cause serious scarring of the lungs and may promote other internal injury and illness, including cancer. Observe the following precautions when handling brake linings:

1. **Never blow brake lining dust with compressed air.**
2. **If any components are to be cleaned, wash with detergent, then immediately discard the cleaning solution and wash your hands.**
3. **Do not grind any brake lining material unless a ventilation hood is available and properly used.**

If the front or rear brake panel is removed, the shoes, cam, cam lever, etc. come out with it. To take the shoes off the front panel, pull up one side first, at right angles to the brake panel. With the rear brakes, pull both shoes straight up off the pivot studs and remove them together. The linings are bonded to the shoe and cannot be removed.

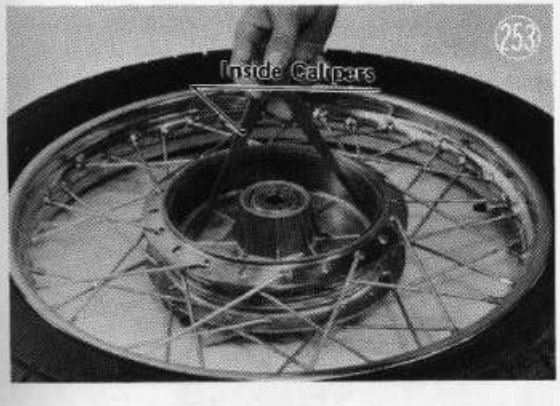


c. Rear Sprocket
(1) Remove the rear wheel.
(2) Take the coupling off the wheel.
(3) Straighten the lock washers and unbolt the sprocket.



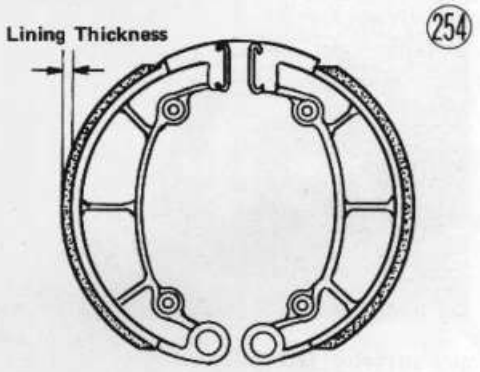
3) Overhaul

a. Brake Drum
After long use, the inner surface of the brake drum wears down from friction with the brake shoes. Measure the inside diameter of the drum and replace it if it is worn out of tolerance.



b. Brake Linings
Measure the thickness of the brake linings and replace them if they are worn down to less than the service limit. If the linings are worn unevenly, correct the high spots with emery cloth. With a wire brush, remove any foreign particles imbedded in the lining surface.

Brake Lining Measurement



c. Brake Shoe Springs
Check the free length of the brake shoe springs with vernier calipers. If the springs are stretched out of tolerance they will not return the shoes properly, causing them to continually drag on the drum. Replace the springs if they are excessively stretched.

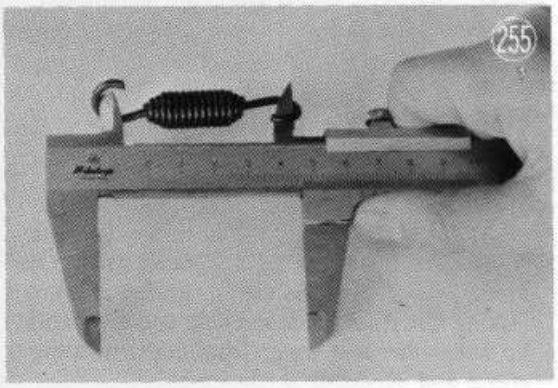


Table 29 Inside Drum Diameter

Model	Standard		Service Limit	
	Front	Rear	Front	Rear
H1	7.874" (200 mm)	7.087" (180 mm)	7.904" (200.75 mm)	7.116" (180.75 mm)
H2	—	7.874"(200 mm)	—	7.904"(200.75 mm)

Table 30 Lining Thickness

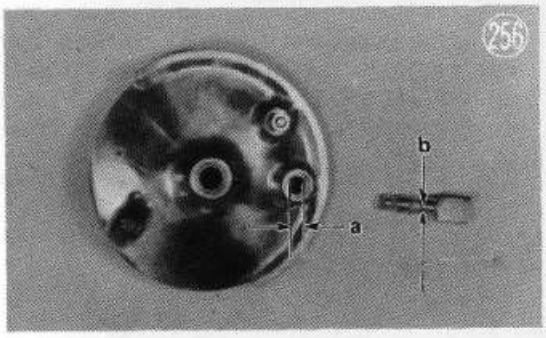
Model	Standard		Service Limit	
	Front	Rear	Front	Rear
H1, H2	.20 in. (5 mm)	.20 in. (5 mm)	.12 in. (3 mm)	.12 in. (3 mm)

Table 31 Spring Length

Model	Standard		Service Limit	
	Front	Rear	Front	Rear
H1	2.36 in. (60 mm)	2.62 in. (66.5 mm)	2.48 in. (63 mm)	2.74 in. (69.5 mm)
H2	—	2.62 in. (66.5 mm)	—	2.74 in. (69.5 mm)

d. Brake Cam Shaft Play

As the cam shaft and cam shaft hole wear, play develops, the brake shoes are not expanded effectively, and positive braking action is not ensured. Measure the diameter of the cam shaft and the inside diameter of the cam shaft hole in the brake panel. If clearance is excessive, replace the cam shaft and brake panel as a set.



e. Ventilator (H1 only)

Dust and dirt entering through the ventilator opening, in addition to dust produced from brake shoe/drum friction, reduces braking efficiency and scratches the braking surface it if gets between the shoes and drum. Remove any foreign matter that has collected.

f. Bearings

Excessive bearing clearance or damage will cause wheel vibration and bearing noise. Clean the bearing with gasoline and check that there is no rust on the race or balls; ascertain that clearance is not excessive; oil the bearing and spin it to check that it turns smoothly.

g. Oil Seals

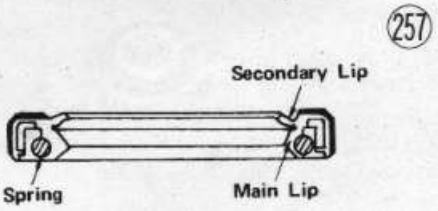
As Fig. 277 shows, the oil seal is constructed from a metal ring, spring and packing. The main lip of the seal prevents the lubrication grease from leaking out from inside the hub, and the auxilliary lip keeps dirt and water from contaminating the grease and damaging the bearing.

(1) Replace the oil seal if the lips are misshapen or otherwise damaged.

(2) If the seal lips have hardened and developed clearance, dust will be allowed to reach the bearing. If the lips have hardened, or deteriorated and changed in color, replace the seal.

(3) If the metal ring is misshapen or cut, replace the seal.

Oil Seal



h. Shock Dampers

Inspect the shock damper rubber and replace it if it is shrunken or cracked. If the rubber is shrunken, a gap is formed between the damper and brake drum; when power is transmitted to the rear wheel it is received with a jolt due to the gap, and thus buffering action is lost.

i. Rear Sprocket

Worn sprocket teeth will cause the chain to slip off under power, or break. Measure the sprocket diameter at the base of the teeth and if it is worn out of tolerance, replace the sprocket together with the chain. Also replace the sprocket and chain if the teeth are badly worn on one side.

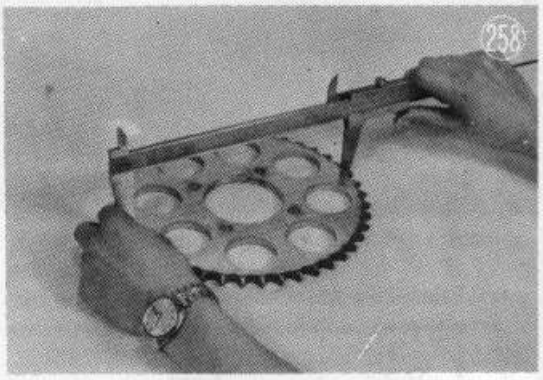


Table 32 Brake Cam Shaft Clearance*

*Same values apply to front and rear.

Measurement	H1 Standard	H1 Maximum	H2 Standard	H2 Maximum
Shaft hole dia.	.5906"–.5916" (15.000–15.027 mm)	.6004" (15.25 mm)	.6693"–.6704" (17.000–17.027 mm)	.6791" (17.25 mm)
Cam shaft dia.	.5899"–.5889" (14.984–14.957 mm)	.5807" (14.75 mm)	.6687"–.6676" (16.984–16.957 mm)	.6594" (16.75 mm)
Clearance	.0008"–.0028" (0.02–0.07 mm)	.0197" (0.50 mm)	Same as H1	

Table 33 Rear Sprocket Diameter

Model	No. of Teeth	Dia. at base of teeth	
		Standard	Limit
H1	45	8.56 in. (217.4 mm)	8.48 in. (215.5 mm)
H2	47	8.96 in. (227.5 mm)	8.88 in. (225.5 mm)

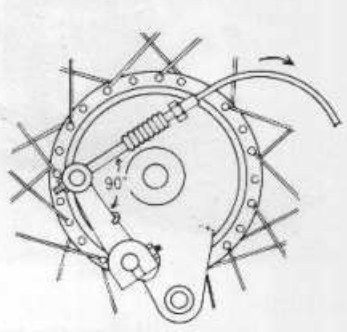
4) Assembly

Assembly is the reverse of disassembly.

NOTE:

1. When assembling the brake cam lever to the cam shaft, mount it so that when the brakes first start to take effect the brake cable will be at about right angles to the cam lever.

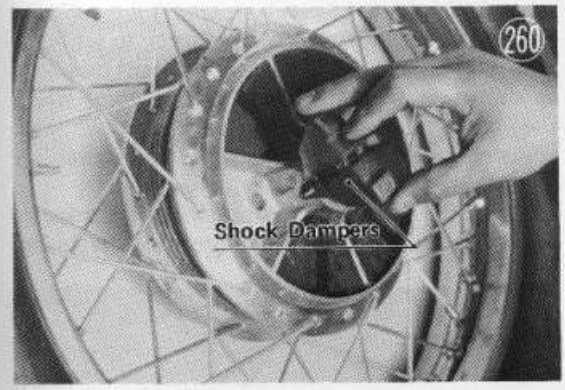
Brake Lever Adjustment



2. When pressing the bearings and oil seals into the brake drums, use a press or other means to ensure that the bearings/seals are at right angles to the drum hole, and therefore with the axle.

3. After cleaning the brake drum replenish the grease at the bearing, oil seal, front panel speedometer pinion gear, and any other surfaces where friction must be reduced. Do not allow grease on the brake linings or drum braking surface as this will prevent the brakes from holding and make driving dangerous. If any grease should get on these parts, clean it off thoroughly with gasoline or an oil-free solvent.

4. On the H Series shock dampers there is a projection in the center. Align this projection with the corresponding hole in the rear brake drum.



5) Adjustment

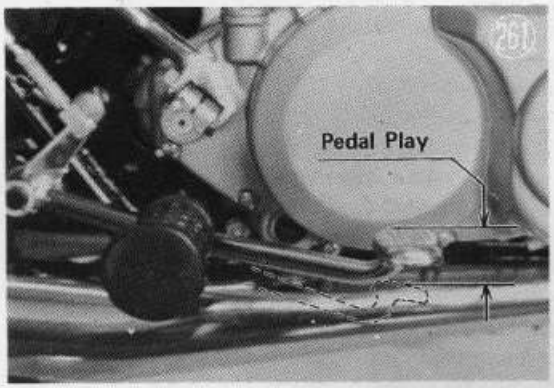
a Rear Brake

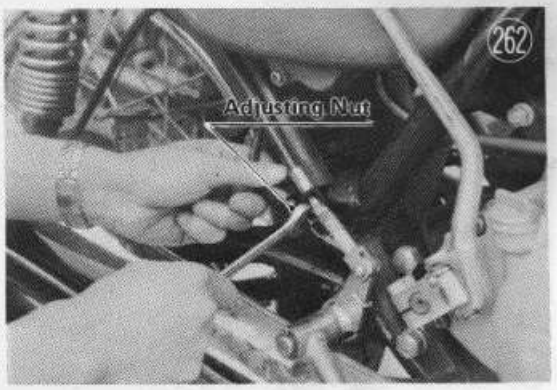
(1) H1

Adjust the rear brake with the adjuster nut on the brake panel so that the brake starts to take effect after ¾ to 1¼ inch (20-30 mm) of brake pedal travel. At this time also set the rear brake lamp to light after 5/8-3/4 inch (15-20 mm) – depending on the brake adjustment – of pedal movement, using the two mounting nuts on the switch body. Do not turn the switch body as the wires may break off.

(2) H2

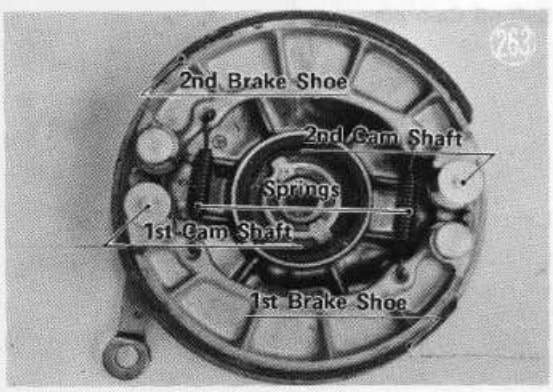
The method for H2 rear brake and brake lamp adjustment is the same as for the H1, except that adjustment values differ. Set the brake pedal play to 1/8 to 5/8 inch (12-15 mm), and the brake light to come on after 3/8 inch (10 mm) of travel.





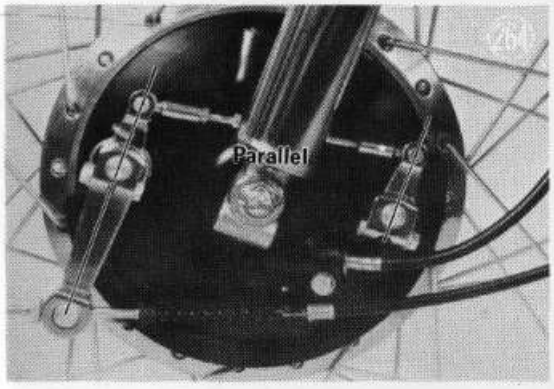
b. Front Brake

The two leading shoe type front brake must be adjusted so that both shoes contact the drum at the same time. When the brake cam, brake shoes or related parts are replaced, the brake should be completely readjusted according to the following procedure to avoid uneven shoe contact and realize good braking performance.



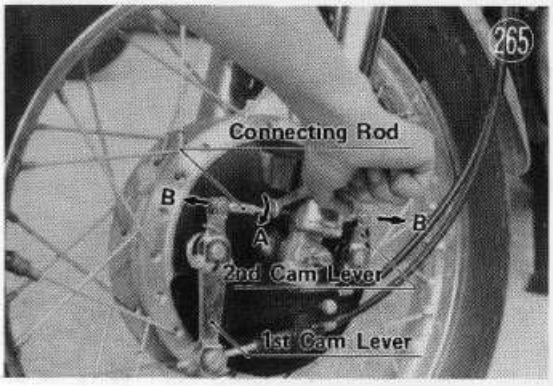
(1) Brake cam levers

Align the first cam lever with the serrations in the cam shaft, and mount it so that it is at a 90° angle to the brake cable when the brake first starts to take effect. Install the second cam lever on its cam shaft parallel to the first lever.



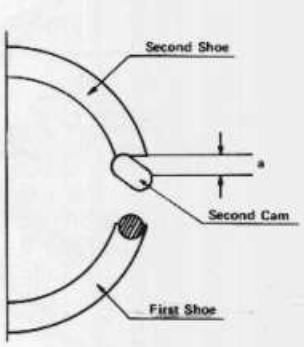
(2) Second cam play

(i) With the connecting link free (so that it turns easily with the touch of a finger), turn the rod with an 8 mm wrench about one turn in direction A. This results in the second cam lever being pushed in direction B, the direction opposite in which it moves when the brake is applied. This procedure backs off the second brake shoe so that it will not operate when the first shoe is adjusted in paragraph (3).



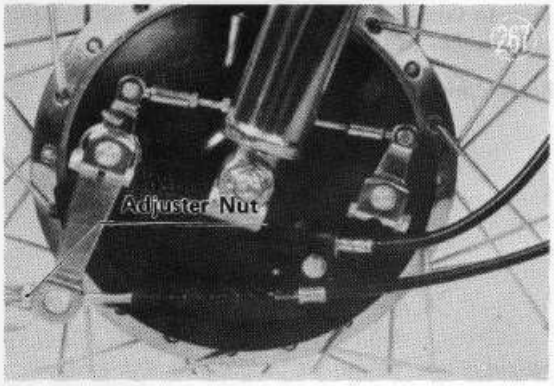
(ii) The second cam is now in the position shown in Fig. 266. Measurement "a" is the second cam's play, this amount being sufficient to avert second shoe contact with the drum when the front brake is operated.

Second Cam play



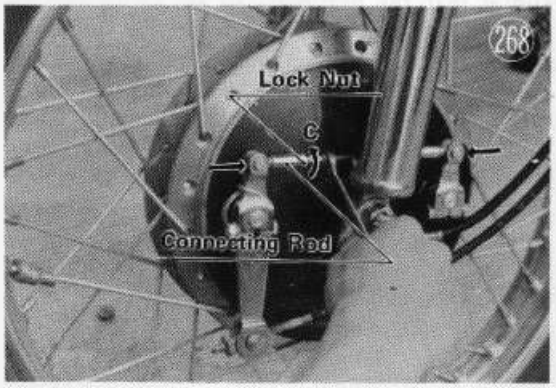
(3) First brake shoe

Raise the front wheel off the ground and spin it lightly. Tighten the brake cable adjuster nut on the first cam lever side to the point where the first shoe starts touching the drum and there is a slight drag on the wheel.



(4) Second brake shoe

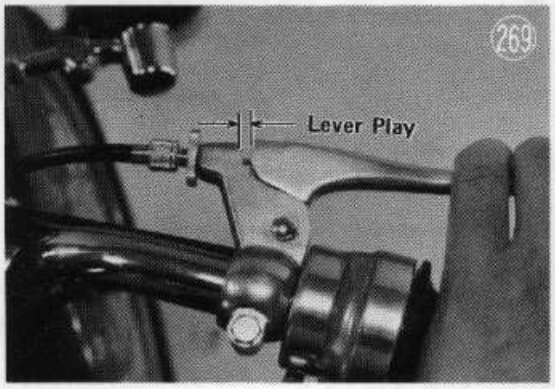
Spin the front wheel and turn the connecting rod in direction C until the second brake shoe just starts dragging on the drum. Fix the rod securely in this position with the lock nut.



(5) Brake lever play

Use the brake panel cable adjuster to set brake lever play at 1/4 – 3/8 inch (7–10 mm) measured as shown in the illustration at the point where the brake first starts to take effect. Fine adjustment can be made with the adjuster on the handlebar.

Since the front brake lamp switch is contained inside the brake cable, it requires no adjustment.



4a. DISC BRAKE

This section is laid out as follows:

Construction and Operation

Disassembly – Assembly

Master Cylinder
1. Disassembly
2. Assembly

Brake Pads
1. Disassembly
2. Assembly

Caliper
1. Disassembly
2. Assembly

Brake Line

Maintenance

Adjustment

Bleeding the Brake

Brake Fluid
1. Specifications
2. Changing the Brake Fluid

Master Cylinder

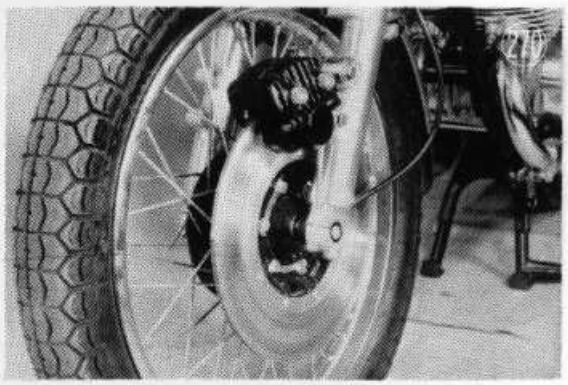
Caliper

Brake Line

Construction and Operation

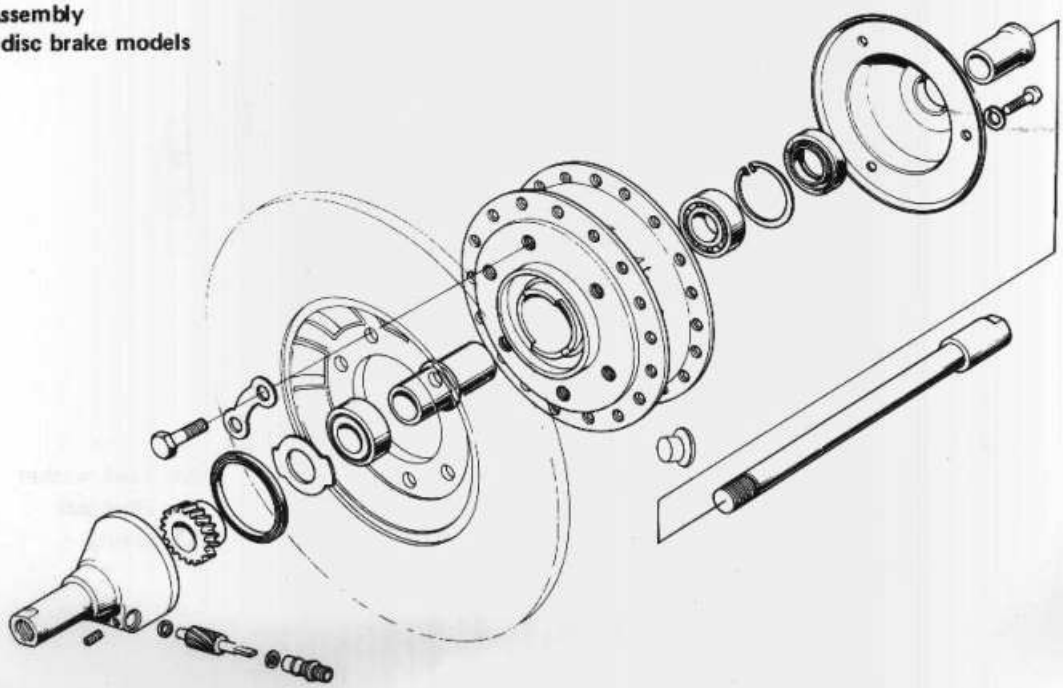
Hydraulic disc brakes are used for their superior braking performance and high reliability. The major components of the disc brake are the brake lever, master cylinder, brake fluid pressure switch, brake line, caliper assembly and disc. The brake lever is pulled to move a piston in the master cylinder and pressurize the brake fluid. Fluid pressure operates the brake lamp pressure switch and is transmitted by the brake line to operate the calipers. The switch turns on the brake lamp, and the calipers grip the disc attached to the front wheel, thereby stopping wheel rotation.

The brake fluid is an extra heavy duty type with a high boiling point, to withstand the heat produced from friction of the caliper pads on the disc. Since the fluid's performance and boiling point could be reduced by contamination with water vapor or dirt from the air, the reservoir is sealed with a rubber diaphragm under the cap. This cap seal also prevents fluid evaporation, and spillage should the motorcycle fall over. The fluid is further protected by dust covers in the caliper assembly and at the master cylinder brake line fitting.



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Hub Assembly
for disc brake models



The caliper assembly comprises the piston, A and B pads, and A and B calipers. The calipers are held together by two shafts, on which the caliper mountings are also fitted to hold the assembly onto the front fork. When the calipers move, the shafts slide back and forth through the holder and keep the brake pads parallel with the disc.

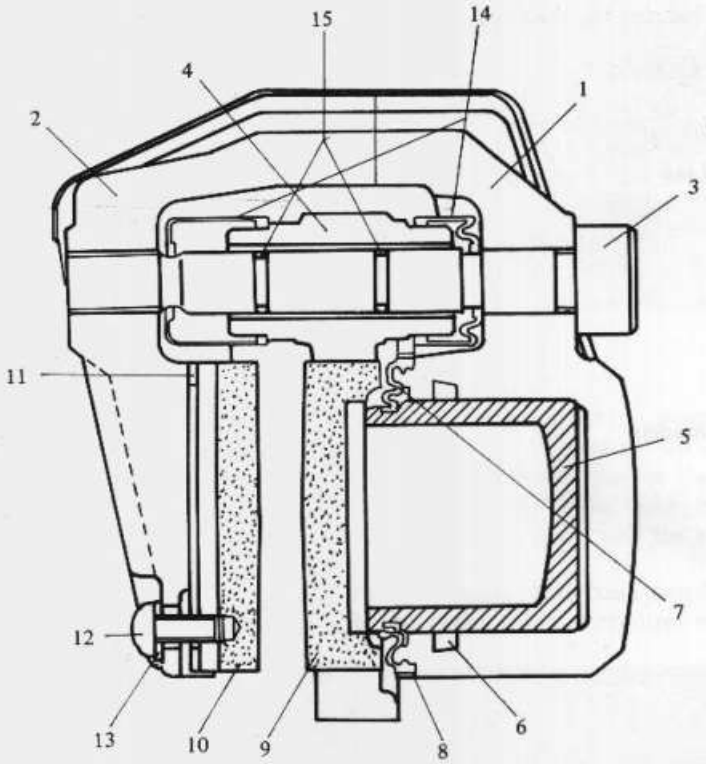
Unlike drum-type brakes, the components of the disc brake which perform the actual braking action, i.e. the disc and pads, are open to direct contact with the air flow past the motorcycle. This provides for excellent dissipation of the heat from brake friction, and reduces the possibility of brake fade common to drum brakes.

When oil pressure is developed inside caliper A's cylinder, the piston is pushed and exerts pressure against the brake pad which in turn presses against the brake disc. The pressurized oil is prevented from leaking by a rubber seal fitted into the cylinder wall. The seal presses against the piston, and instead of sliding when the piston moves, the seal only bends, allowing no oil leakage at all. When the brake lever is releases and oil pressure lowers, the elasticity of the seal returns the piston to its original position. After the brakes are used for awhile and the pads wear slightly, the rubber seal will no longer be able to bend the additional amount to conform with piston travel. Instead, when piston travel forces the seal past its limit, the seal slips slightly on the piston, and now returns the piston to a new rest position a little further out. A small amount of oil from the reservoir supplements the oil in the brake line to compensate for the difference in piston position, so that the length of the brake lever stroke remains unchanged, and the brake never needs adjustment.

The caliper A oil seal and the cup at the head of the master cylinder piston are made of an oil and heat resistant rubber composition for best performance and to prevent their contaminating the brake fluid by deterioration. For this reason, only standard parts should be used.

Caliper Assembly

(272)



1. Caliper A
2. Caliper B
3. Shaft
4. Caliper mounting
5. Piston
6. Ring
7. Dust seal
8. Band
9. Pad A
10. Pad B
11. Ring
12. Screw
13. Lock washer
14. Dust seal
15. O ring

Braking Stroke

When the brake lever is pulled, the piston in the master cylinder is pushed and moves forward against the force of the return spring. At this time, the primary cup at the head of the piston closes the 1/64 inch (0.4 mm) relief port which connects the pressure chamber and the reservoir. Until this port is fully closed, the brake fluid does not start being pressurized, in spite of the forward movement of the piston.

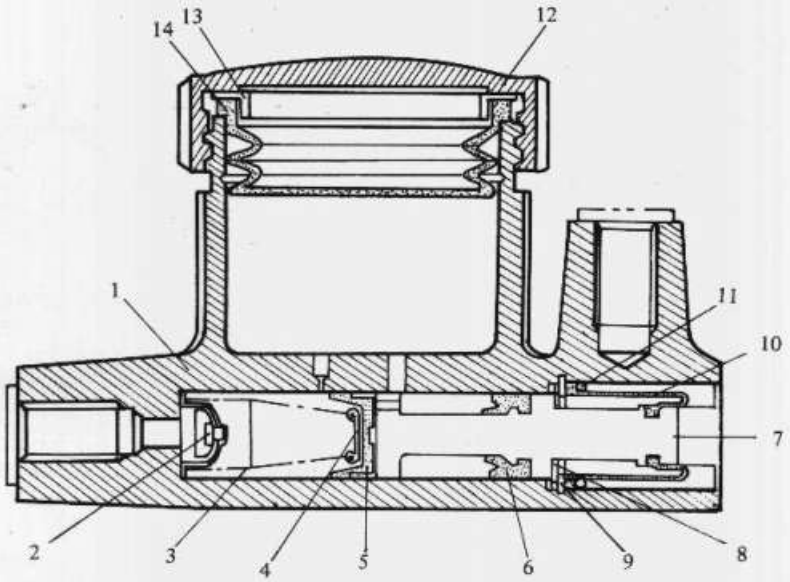
The pressure stroke starts as soon as the relief port is closed. Brake fluid being used as a pressure medium, the piston compresses the fluid and forces it through the check valve and out into the brake line. Pressure from the line is felt in the cylinder of caliper A and pushes the piston toward the disc. Pad A at the end of the piston is pushed against the disc, but since the disc is immovable, further pressure cannot move the pad any further. Instead, the cylinder and entire caliper assembly move in the reverse direction so that pad B is pulled toward the disc. In this manner the disc is pinched between the two pads and braking action is performed.

Braking Release Stroke

When the brake lever is released, the piston in the master cylinder is quickly returned toward its rest position and brake fluid pressure in the line and in the caliper master cylinder suddenly drops. The elasticity of the oil seal in caliper A's cylinder then pulls back the piston. This leaves no pressure against either pad A or B so that slight friction against the disc pushes them both a hairbreadth away from the disc.

As the master cylinder piston moves back further the brake fluid in the line, which still has some pressure, rushes to fill the low pressure area in front of the primary cup at the piston head. But the fluid is prevented from moving too fast by the check valve and the pressure in front of the piston drops lower. At this time, fluid from the reservoir flows through the large supply port into the space between the primary and secondary cups and escapes around the edges of the primary cup to fill the vacuum. When the piston finally returns to its rest position, the small relief port is uncovered and the brake fluid still returning from the line pushes any excess fluid through the relief port back into the reservoir until pressure in the line is again normal.

Master Cylinder (273)



1. Master cylinder body
2. Check valve
3. Spring
4. Spring seat
5. Primary cup
6. Secondary cup
7. Piston
8. Stopper, piston
9. Circlip
10. Dust seal
11. Stopper, dust seal
12. Cap
13. Plate
14. Cap seal

Disassembly/Assembly

To ensure safe brake operation, observe the recommended torque during disc brake assembly.

Table 34 Disc Brake Assembly Torque

	Torque	
Brake lever	43–61 in-lbs	0.5–0.7 kg-M
Brake lever adjuster	13.0–16.5 ft-lbs	1.8–2.3 kg-M
Master cylinder clamp	52–78 in-lbs	0.6–0.9 kg-M
Fitting (banjo) bolts	21–22 ft-lbs	2.9–3.1 kg-M
Brake pipe nipple	12.0–13.5 ft-lbs	1.7–1.9 kg-M
3-way fitting mounting	61–78 in-lbs	0.7–0.9 kg-M
Front brake light switch	19–22 ft-lbs	2.6–3.0 kg-M
Caliper shafts	17.5–20 ft-lbs	2.4–2.8 kg-M
Caliper mounting	25–33 ft-lbs	3.4–4.6 kg-M
Bleeder valve	61–87 in-lbs	0.7–1.0 kg-M
Disc mounting bolts	25–33 ft-lbs	3.4–4.6 kg-M

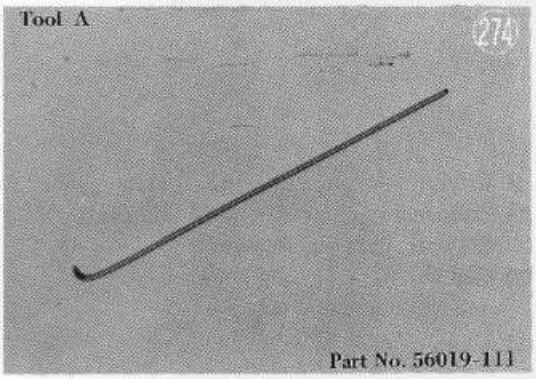
CAUTION:

1. Do not use gasoline or any other type of mineral base oil when cleaning disc brake parts, as it cannot be properly cleaned off again and will cause deterioration of the brake components. Brake parts are made resistant to the glycol base brake fluid, but are harmed by a mineral base oil. Use ONLY brake fluid, ethyl alcohol or isopropyl alcohol for cleaning.

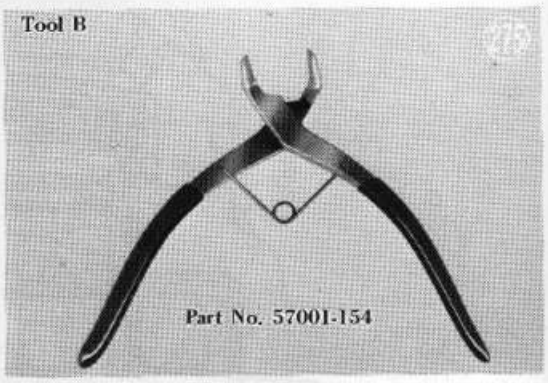
2. Do not leave any rubber parts in contact with alcohol for more than 30 seconds.

The following special tools are necessary for disc brake maintenance:

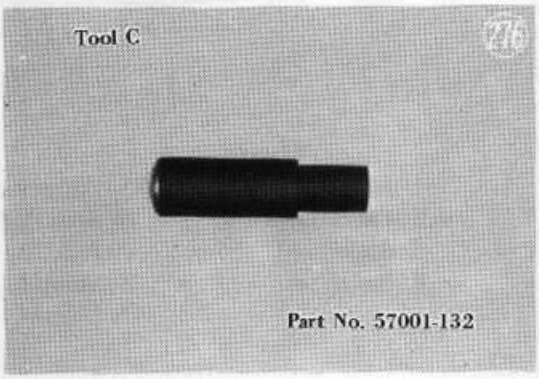
A. A hooked shaft for working with oil and dust seals. (Part No. 56019-111)



B. Retaining ring pliers for removing inside circlip.



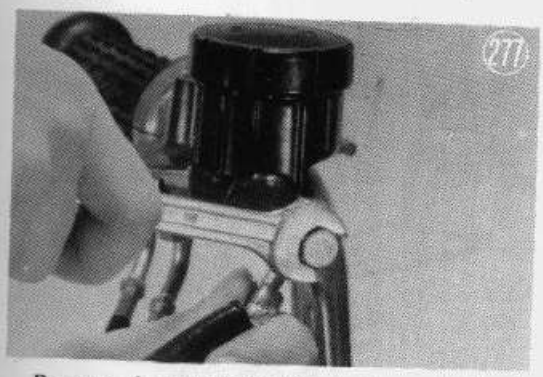
C. A mounting tool for pushing seals, O rings, etc. into place. (Part No. 57001-132)



Master Cylinder

1. Disassembly

Take the brake line off the master cylinder assembly.

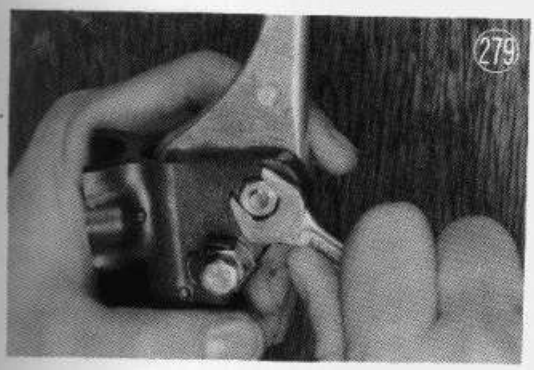


Remove the two mounting bolts, and take the cylinder assembly off the handlebars.

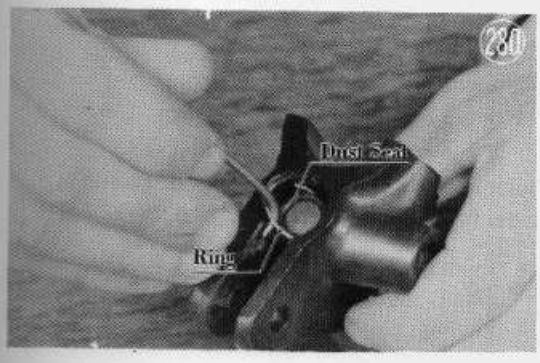


Take off the reservoir cap and remove its cap seal and plate. Empty the brake fluid from the reservoir.

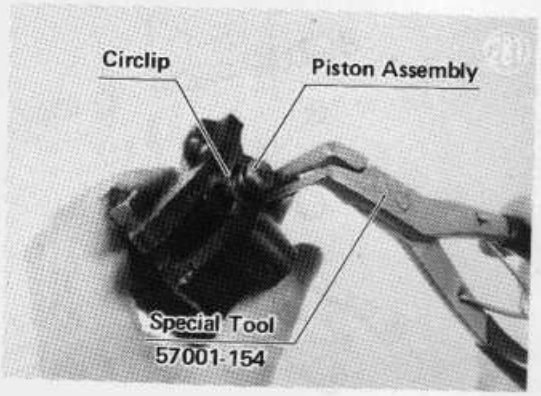
Unscrew the nut and bolt and take off the brake lever.



Use special tool A to remove the ring, and take out the dust seal. Take care not to damage the seal.



Take out the circlip using retaining ring pliers. This allows removal of the stopper plate piston assembly, primary cup, spring assembly and check valve. If these parts do not come out, blow lightly into the hose end of the cylinder.



NOTE:

1. Do not remove the secondary cup from the piston.
2. Do not remove the spring seat from the spring.
3. Do not clamp the cylinder body tightly in a vise as it may become misshapen.

2. Assembly

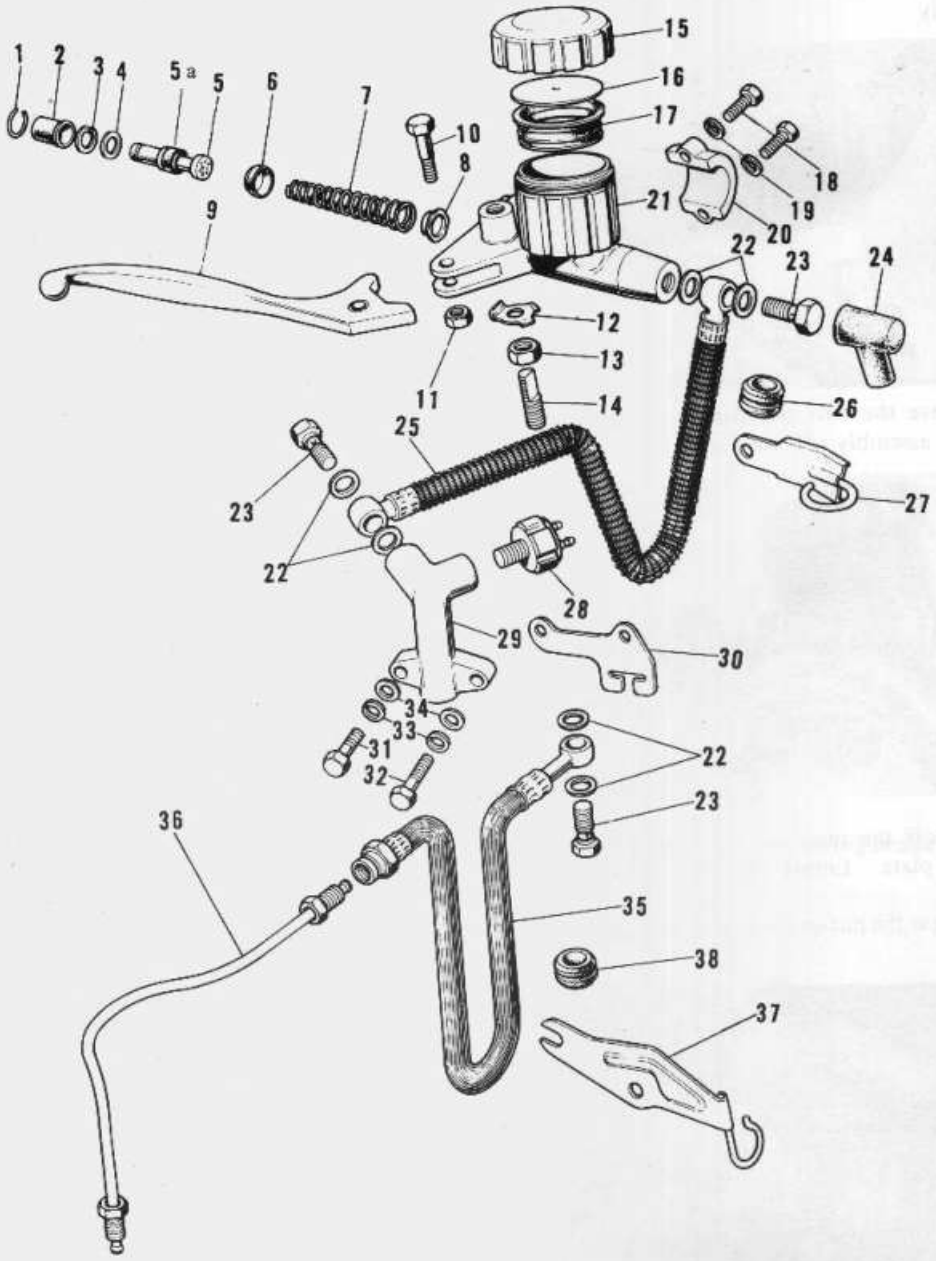
- Before reinserting the piston assembly, primary cup and check valve, dip them in brake fluid, and apply brake fluid to the cylinder walls.
- Insert the primary cup and piston assembly into the cylinder body in that order.

CAUTION: During assembly, be sure that the check valve and primary cup do not turn sideways or backwards.

- First insert the stopper and then put the snap ring into the groove in the cylinder body. Make sure that the ring is properly in place by sliding it around the groove after insertion. If the snap ring is misshapen, replace it.
- Use tool A to fit the flange on the inside of the dust seal into the groove in the piston.
- Use tool C and push in the dust seal stopper as far as the tool will allow.
- Fit the brake lever to the master cylinder.
- Hold the cylinder and squeeze the brake lever to see if it operates smoothly. Put a finger over the hose connection opening and see if there is suction when the lever is released.

Master Cylinder and Brake Line Assembly

(282) a

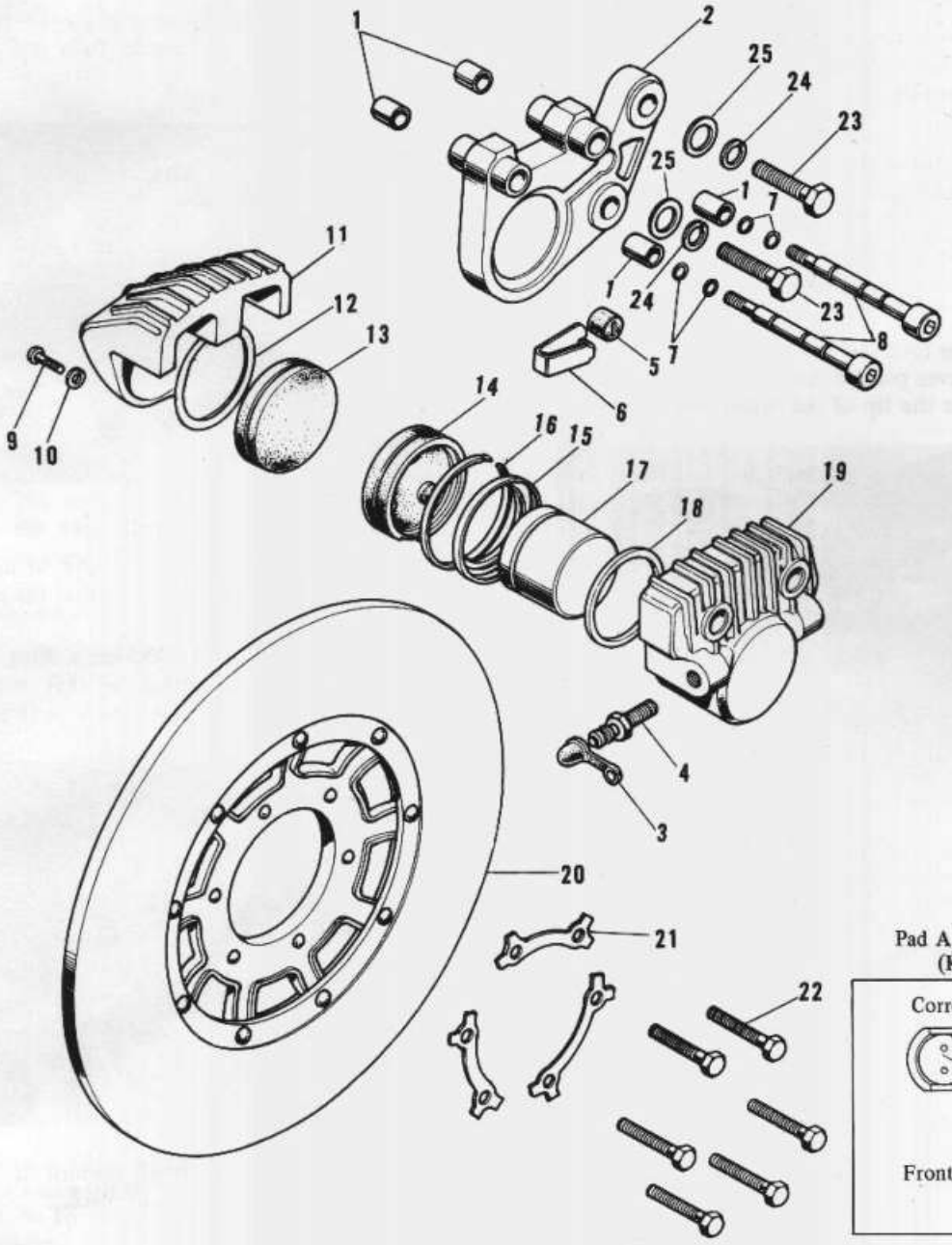


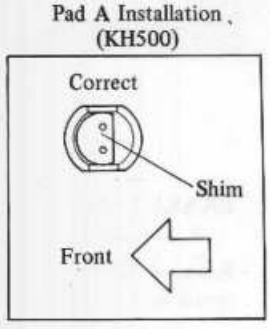
1	Stopper, dust seal	13	Nut	26	Grommet
2	Dust seal	14	Bolt	27	Bracket
3	Circlip	15	Cap	28	Pressure switch
4	Stopper, piston	16	Plat	29	3-way fitting
5	Piston assembly	17	Cap seal	30	Guide
5a	Secondary cup	18	Bolt	31	Bolt
6	Primary cup	19	Washer	32	Bolt
7	Spring assembly	20	Master cylinder mounting	33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

Disc and Caliper assembly

(282) a

(282) b





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

•Fill the reservoir with brake fluid, screw on the cap and check the following.

(a) Squeeze and release the lever several times and see if fluid starts being pumped from the outlet opening.

(b) Squeeze the lever, cover the outlet with a finger and release the lever suddenly. The lever should return quickly and smoothly to its original position.

CAUTION: Do not squeeze the lever as far as it will go as the secondary cup will be damaged.

•Mount the assembly on the handlebars, tightening the top mounting bolts first.

•Loosen the lock nut and turn the adjuster bolt to set brake lever play to less than 3/16 inch (5 mm), measured at the tip of the brake lever.

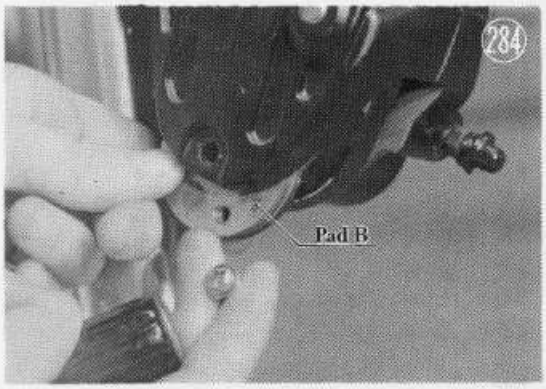


•Attach the brake line to the cylinder assembly fill the reservoir with brake fluid and bleed the line (page 78).

BRAKE PADS

1. Disassembly

Remove the front wheel (page 58). Remove the screw and take out pad B.

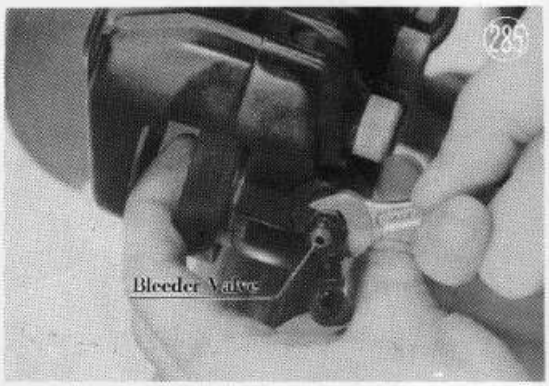


Squeeze the brake lever to push out pad A and remove the pad.

2. Assembly

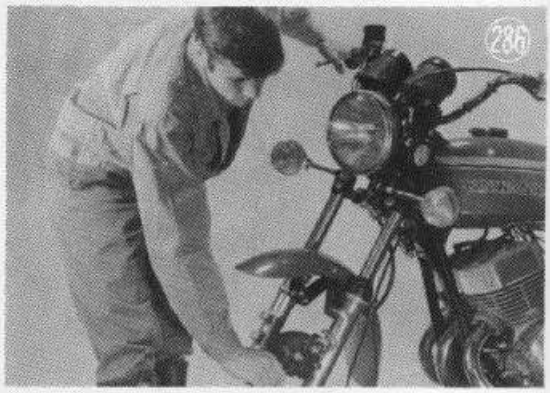
•Wipe off the pads and clean them with alcohol.

•Open the bleeder valve slightly to release oil pressure, push in the piston fully and close the valve.



•Insert pad A, aligning its groove with the positioning pin to insert it. Check that the pad moves in and out easily.

NOTE: If pad A of KH500 has a shim, fit pad A into the caliper mounting so that the shim is toward the front of the motorcycle (Fig. 282 b).



•Insert pad B, apply a small amount of "loc-tite" to the screw and screw it into place.

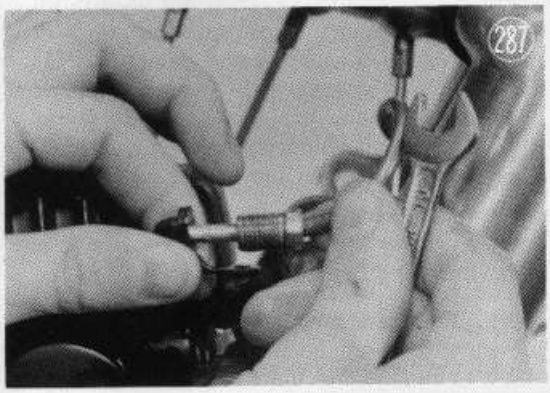
•Remount the front wheel. Because the bleeder valve was opened check whether or not air has entered the brake line by squeezing the brake lever. If it pulls too easily, bleed the air from the line (page 78).

•Spin the front wheel lightly and make sure the pads are not rubbing against the disc. If they are, it is possible that (a) pad A has not been fully pushed into place; (b) the oil seal around the piston has been damaged or knocked out of place; or (c) the disc is warped.

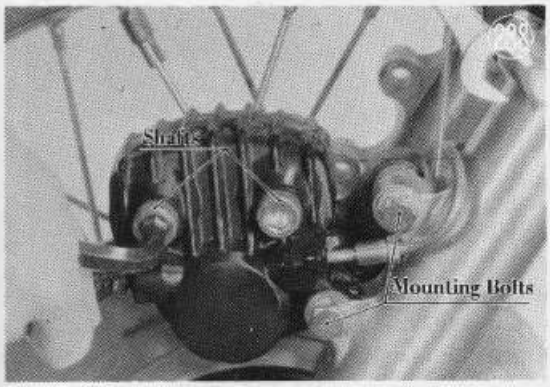
Caliper

1. Disassembly

Remove the caliper end of the brake line pipe and cap it with the rubber cap from the bleeder valve to prevent the fluid from leaking.

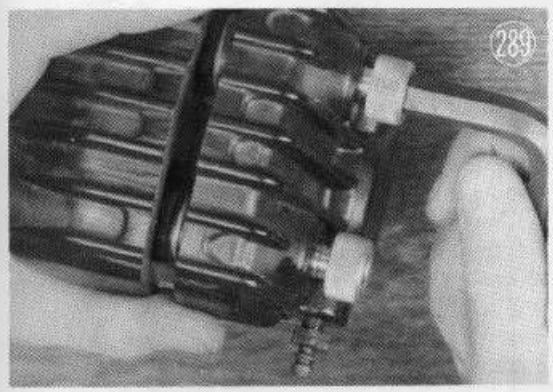


Loosen the two allen head shafts (10 mm allen wrench) as they will be difficult to loosen once the calipers are taken off the fork. Remove the two mounting bolts and take off the caliper assembly.



Remove the pads. Unscrew the two allen head shafts and take off one side of the calipers.

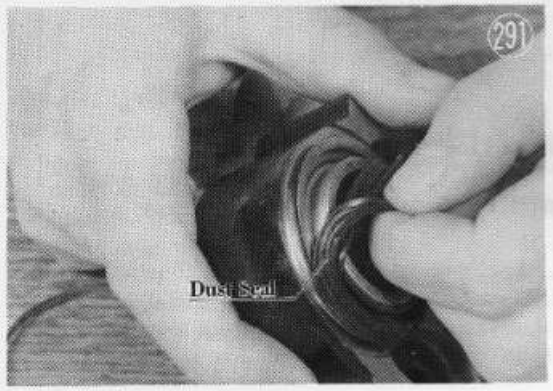
CAUTION: To avoid damage to the seals and O rings, unscrew each shaft in turn a little at a time to remove them evenly.



Pull the caliper mounting off the shafts evenly, being careful not to damage the shafts, O rings or seals. Take out the shafts.



Take the band and dust seal off the piston. Blow compressed air into the caliper inlet to push out the piston. If compressed air is not available, reconnect the brake line and pump the piston out with the brake lever.

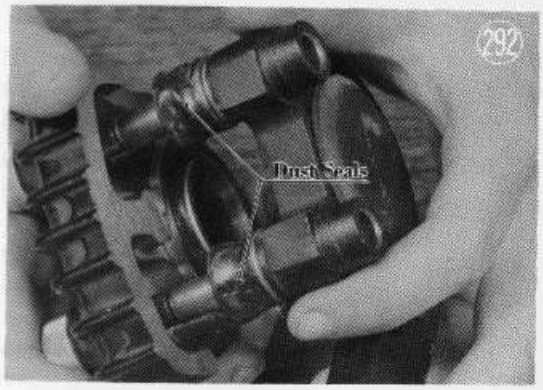


Remove the oil seal from the cylinder.

2. Assembly

- Clean all the parts, especially the seal groove inside the cylinder, and the shaft holes in the caliper mounting.
- Apply brake fluid to the oil seal and piston, and insert them in that order. Push the piston fully in.
- Fit the dust seal and band onto the piston, without getting oil on them.
- Mount the two O rings on each shaft and apply a thin layer of PBC (PolyButulCuprysil) grease to the shaft between the rings. (PBC grease is a special high-temperature, water-resistant grease.)

•Insert the two shafts into caliper A, put the first two dust seals onto the caliper mounting, and slide the mounting onto the shafts. Make sure the dust seals are in place around the outside of the mounting.



•Fit the next of dust seal onto each shaft and screw on caliper B.
•Move the caliper mounting back and forth on the shafts to see that it moves smoothly.
•Remove the caliper onto the fork, fit on the brake line pipe, and bleed the line.

Brake Line

When replacing or inspecting the brake line parts, be careful of the following points:

1. The metal pipe should not touch the front fork or frame. Leave at least 5/16-3/8 inch (8-10 mm) clearance to allow for pipe movement with the calipers.

2. When screwing on the hose and pipe fittings hold the pipe or hose so that it does not turn with the screw. Don't mount them so that there are any sharp bends in the line at any point.

3. Use "loc-tite" on the threads when screwing in the pressure switch, but do not use so much that the excess may clog the switch intake.

Maintenance

Adjustment

As explained earlier, the disc brakes are self adjusting, so brake adjustments are neither necessary nor possible.

If brake lever play develops, use the adjuster screw to set it at less than 3/16 inch (5 mm). See Figure 283.

The brake lamp switch for the front brake is a pressure switch and no adjustment is necessary. If the switch will not turn on the brake light with light pressure on the brake lever, it is defective and should be replaced.

Bleeding the Brake

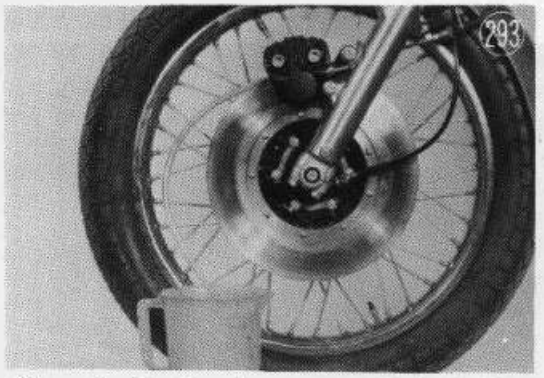
The air must be bled from the brakes:

(a) Any time the brake line is opened at any point (including the bleeder valve).

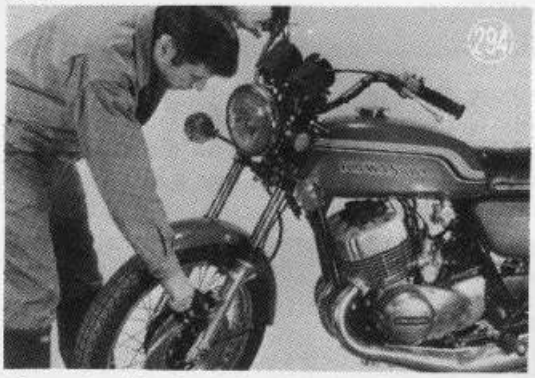
(b) If the brake lever feels soft (easy to pull).

(c) If the fluid in the reservoir gets too low or becomes empty.

•Fill the reservoir and keep the level high at all times during the air bleeding operation.
•Pull off the rubber cap and fit a clear plastic hose onto the bleeder valve. Put the other end of the hose into an open container holding some brake fluid.



•Open the bleeder valve, squeeze the brake lever, close the valve, release the lever. Repeat this sequence several times until the hose is full of fluid.



•Open the bleeder valve, leave it open and keep pumping the brake lever until no air bubbes appear in either the reservoir brake fluid or in the brake fluid from the bleeder valve. During this time, add brake fluid as necessary to maintain the level in the reservoir.
•Close the valve, replace the rubber cap, and fill the reservoir up to the line.

Brake Fluid

1. Specifications

Viscosity

The brake fluid must have a suitable viscosity throughout the operating temperature range. Brake fluid temperature may rise as high as 300°F (150°C) during heavy usage. In colder regions the brakes are expected to operate at -25°F (-30°C) or lower.

Even at those temperatures the brake fluid must operate the piston and lubricate internal moving parts.

Boiling Point

When the brakes are applied, the braking surfaces may be as hot as 500°-650°F (250°-350° C) although a part of this is radiated before it reaches the fluid. While the brakes are being applied the fluid will not boil because of the 300-600 lbs/sq.in. (20-40 kg/cm^2) pressure in the line. As soon as the brake lever is released, however, the effects of the temperature are felt and a fluid with a low boiling point will turn to gas and cause a yapor lock in the brake line.

Care must be taken that no moisture is absorbed into the fluid, or introduced into the fluid through the reservoir since this will lower the boiling point.

Ignition Point

The brake fluid should have a high ignition point to minimize the possibility of fire in the event of brake line leakage.

A fluid with a high boiling point can be expected to have a high ignition point.

Non-Corrosive

The brake fluid must not have a corrosive or deleterious effect on either the metal or rubber parts of the brake mechanism. If the fluid deteriorates or swells the rubber, corrodes metal parts or causes the formation of sludge, it is not suitable for use in disc brakes.

2. Changing the Brake Fluid

Change the brake fluid completely –

(a) After one year or 6,000 miles (10,000 km)
(b) If water or moisture becomes mixed with the fluid.
(c) When the fluid appears dirty or cloudy.

CAUTION:

1. **Never re-use old brake fluid.**
2. **Do not mix two types of fluid for use in the brakes. This lowers the brake fluid boiling point and could cause the brake to be ineffective.**
3. **Don't leave the reservoir cap off for any length of time as moisture may be absorbed into the fluid.**
4. **Don't change the fluid in the rain, or when a strong wind is blowing.**

To change the fluid:

- Attach a hose to the bleeder valve, inserting the other end of the hose into a container.
- Open the bleeder valve and pump the brake lever until all the fluid is drained and only air comes out of the hose.
- Fill the reservoir with new brake fluid and pump the brake lever until the brake line is completely filled with fluid, and no more air bubbles come out of the hose. Do not let the fluid in the reservoir run out at any time during this operation.
- Close the bleeder valve and fill the reservoir up to the line.
- Check that the lever pulls hard.

Master Cylinder

- Check that there are no scratches, rust or pitting on the inside of the master cylinder, and that it is not unduly worn.
- Check the piston for these same faults.
- Inspect the primary and secondary cups. If a cup is worn, damaged or softened (rotted), or swollen, replace it. When inserting the cup into the cylinder see that it is slightly larger than the cylinder (standard values given in the table). If oil leakage is noted at the brake lever, the cups should be replaced. (The secondary cup is part of the piston assembly).
- Check that the spring is not damaged and is not shorter than the service limit.
- Inspect all other rubber parts and replace any that are worn, damaged, etc.

Table 35 Master Cylinder Parts

Measurement	Standard	Service Limit
Cylinder inside diameter	.5512-.5529 inch (14.000-14.043 mm)	.5543 inch (14.080 mm)
Piston outside diameter	.5495-.5506 inch (13.957-13.984 mm)	.5496 inch (13.960 mm)
Primary, secondary cup diameter	.577-.596 inch (14.65-15.15 mm)	.571 inch- (14.50 mm)
Spring length (free)	2.01 inch (51 mm)	1.89 inch (48 mm)

Caliper

Pads

Inspect the pads for wear. If the surface of either pad is worn down through the red line, replace both pads as a set.

NOTE: 1. Use only Kawasaki parts for pad replacement.

2. If any oil is spilled on the pads, clean them with trichlorethylene or gasoline. If the oil cannot be thoroughly cleaned off, replace the pads.

Oil Seal

The oil seal around the piston maintains the proper pad/disc clearance. If this seal is bad, pad wear will increase, and constant pad drag on the disc will raise brake and brake fluid temperature.

Replace the oil seal under any of the following conditions: (a) oil leakage near pads; (b) brakes overheat; (c) there is a large difference in A and B pad wear; (d) the seal is stuck to the piston. Also replace the seal every other time the pads are changed.

Piston, Cylinder

Replace the cylinder or piston if it is worn out of tolerance, if it is badly scratched, or if rust has set in.

Seals

Check that the oil and dust seals and O rings are not cracked, worn, swollen or otherwise damaged. Replace as necessary.

Brake Line

The high pressure inside the brake line can cause oil to leak or the pipe to burst if the pipe is not properly maintained.

Bend and twist the rubber hose while examining it. Replace it if any cracks or bulges are noted.

The pipe is made of plated steel, so if the plating is scratched through it will rust. Check the pipe for badly scratched plating, rust, or cracking, especially at the fittings.

Disc

Measure disc thickness and replace the disc if it is worn out of tolerance.

Check runout (warp) as illustrated, replacing the disc if indicated. If the disc is warped it will cause the brake to drag and wear down the pads and disc, and overheat.

If there is any oil on the disc, clean it off with trichloroethylene or gasoline.

Table 36 Caliper Parts

Model	Part	Standard	Service Limit
H1 H2	Cylinder inside diameter	1.5031 – 1.5039 inch (38.180 – 38.200 mm)	1.5045 inch (38.215 mm)
	Piston outside diameter	1.5006 – 1.5019 inch (38.180 – 38.200 mm)	1.5002 inch (38.105 mm)
KH500	Cylinder inside diameter	1.6870 – 1.6890 inch (42.850 – 42.900 mm)	1.690 inch (42.92 mm)
	Piston outside diameter	1.6846 – 1.6858 inch (42.788 – 42.820 mm)	1.683 inch (42.75 mm)

Table 37 Disc

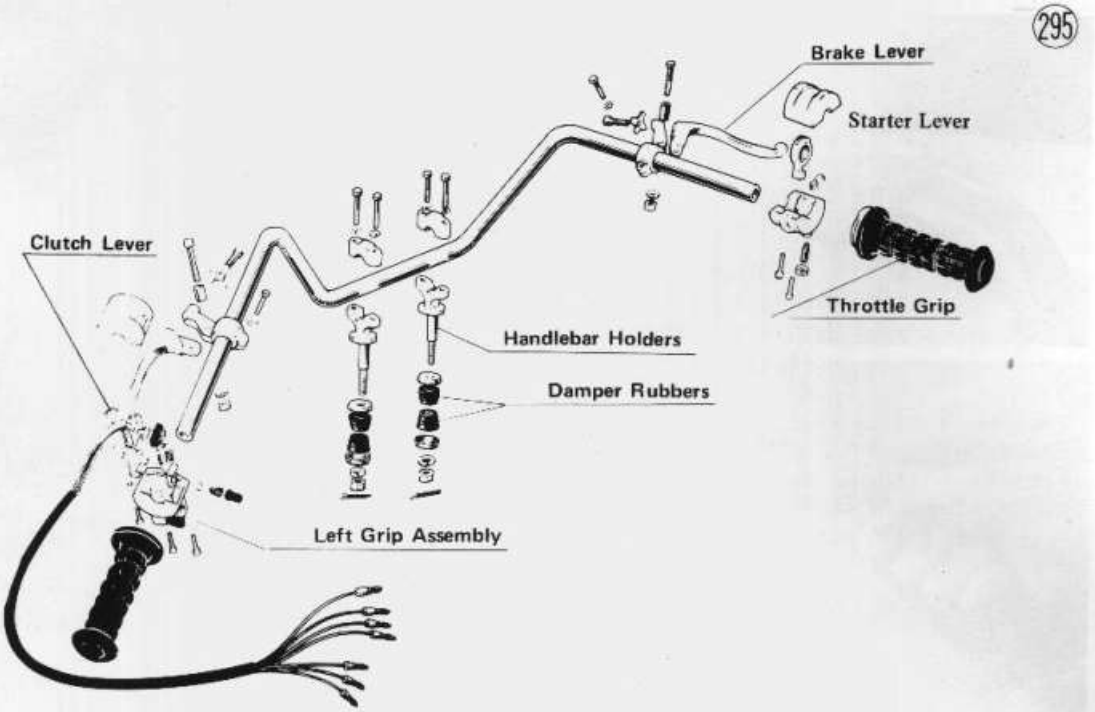
Measurement	Standard	Service limit
Thickness	0.276 inch (6.9–7.1 mm)	0.217 inch (6.0 mm)
Runout	less than 0.004 inch (less than 0.1 mm)	0.012 inch (0.3 mm)

5. HANDLEBARS

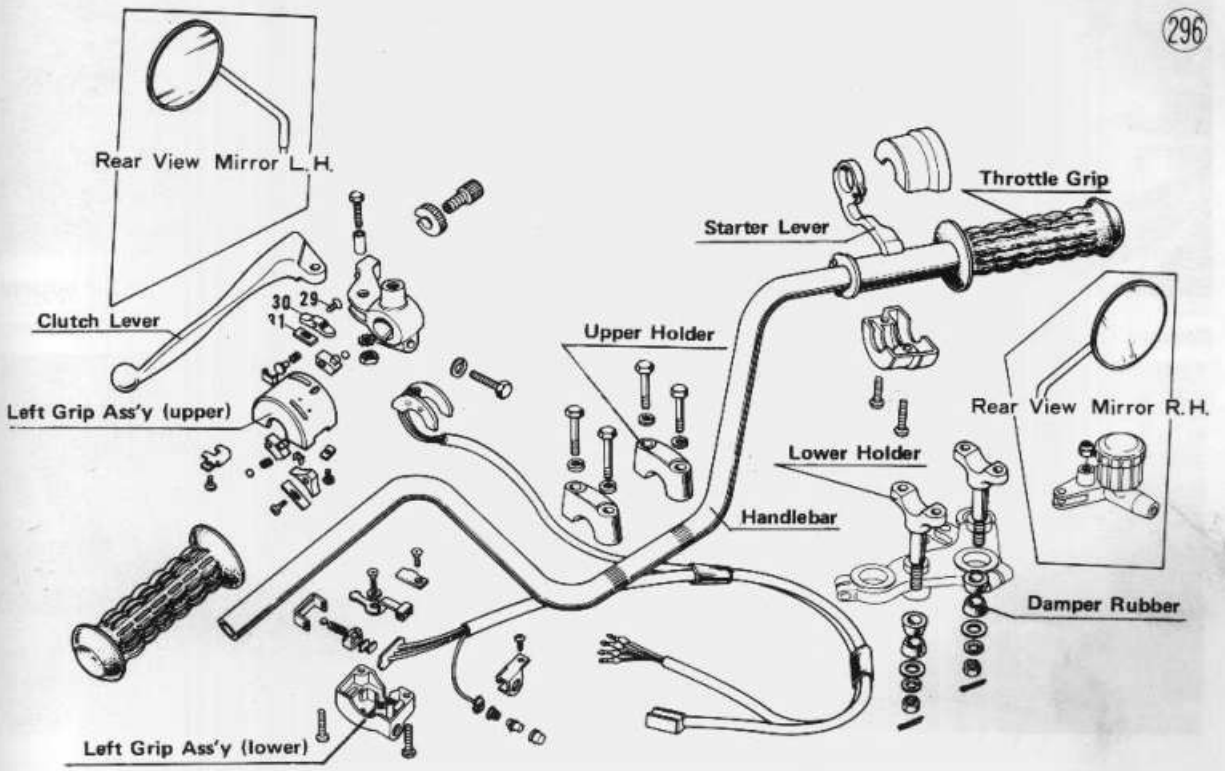
1) Construction

The handlebars are manufactured from drawn steel pipe, the shape of which is designed with consideration to rider comfort during long rides, to high speed riding, and to general riding safety. On the right side of the handlebars are the starter lever, throttle grip assembly, and front brake lever. For disc brake models, the brake fluid reservoir is also located on the right side. Mounted on the left side are the turn signal, horn and headlight switches in the left grip assembly, and the clutch lever.

H1 Handlebar Assembly

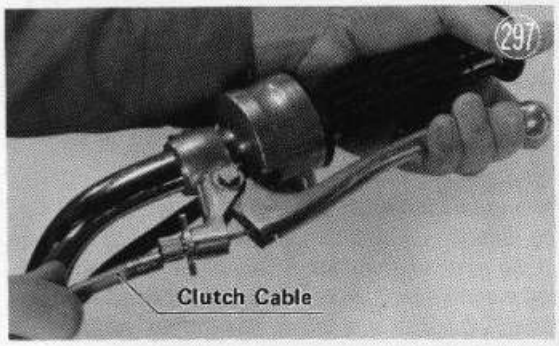


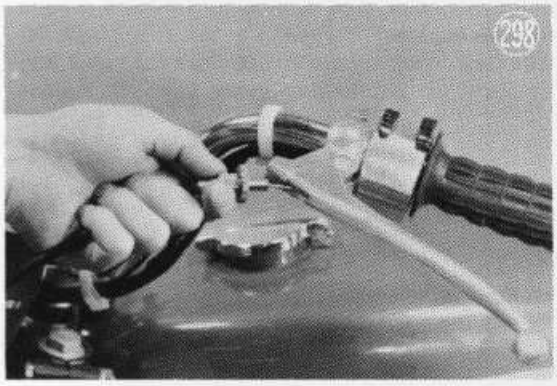
H2 Handlebar Assembly



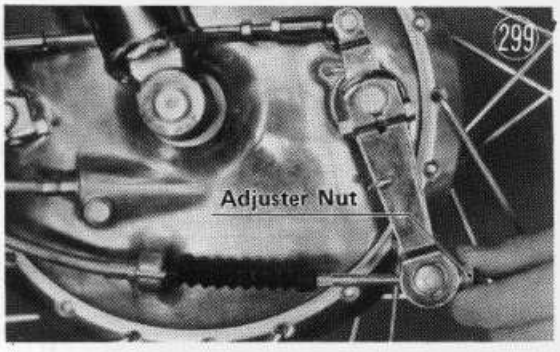
2) Disassembly

Loosen the clutch cable lock nut, and screw in the clutch cable adjusting bolt. This gives the cable sleeve enough play to enable removal of the cable from the clutch lever. To take off the cable, grab the cable outer sleeve with one hand and pull in the clutch lever with the other. While pulling on the cable, release the lever slowly, and pull the cable out of its slot.

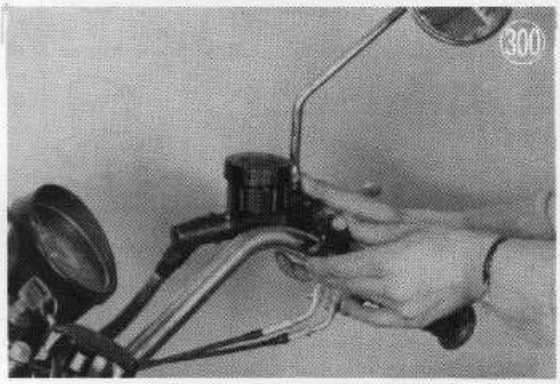




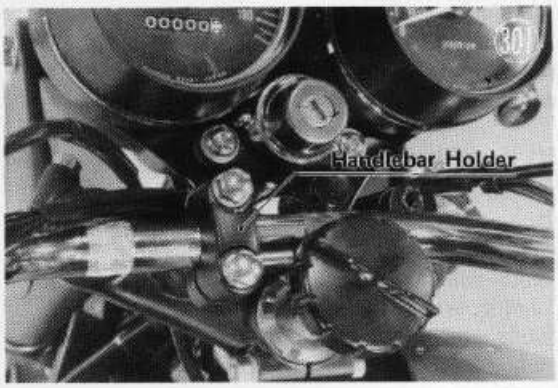
Loosen the front brake adjusting nut and pull the cable off the brake lever. (Expansion brake models)



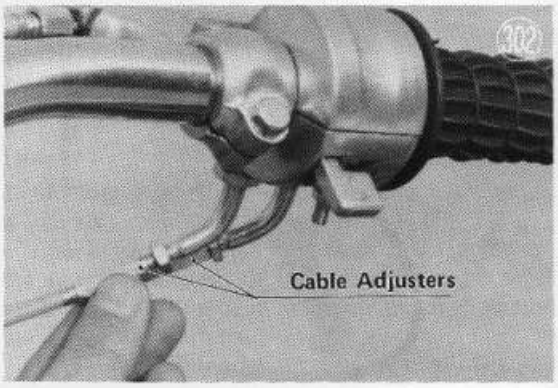
Remove the disc brake master cylinder assembly.



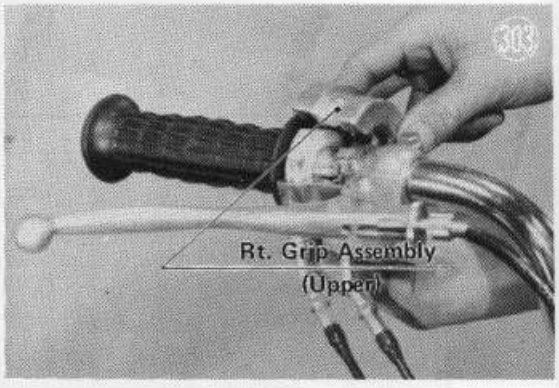
Loosen the handlebar mountings, remove the right upper mount, move the handlebar to the left for easy cable removal, and tighten the left mounting.



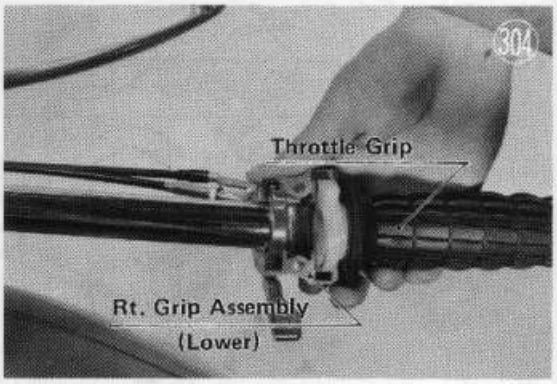
Screw in the throttle and starter cable adjusters completely to give the cables plenty of play.



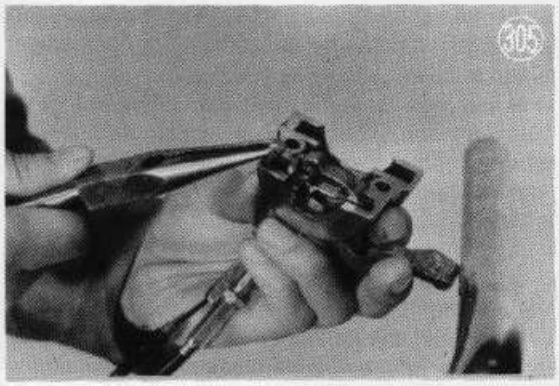
Take off the upper half of the right grip assembly.



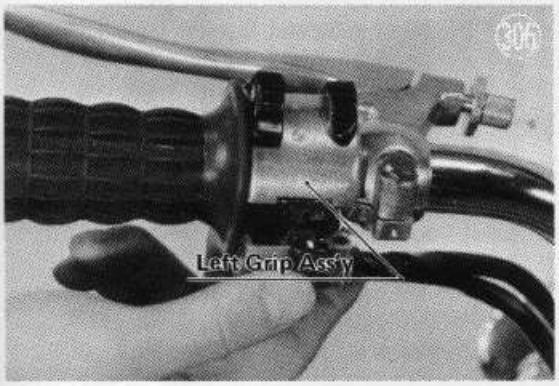
Pull the throttle grip off together with the bottom half.



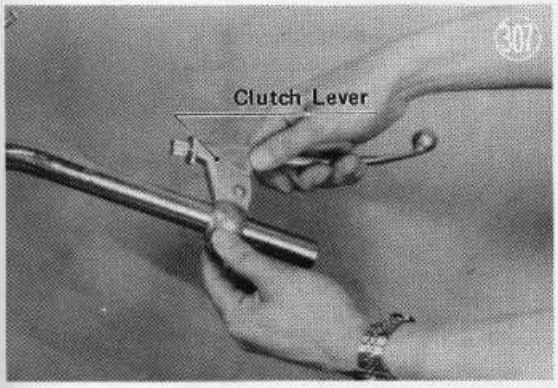
Remove the throttle and starter cable wires.



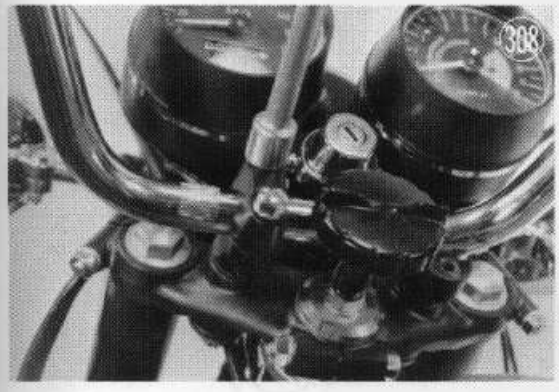
Remove the left grip assembly.



Remove the clutch and brake lever assembly.



Unbolt the upper half of the left mounting and remove the handlebar.



3) Inspection

a. Handlebar
Check that the handlebar is not bent or cracked.
b. Bushings
Inspect the rubber bushings and replace any bushing that has deteriorated, cracked or become worn. Such a bushing will not effectively perform its function of dampening shock and vibration to the handlebar.

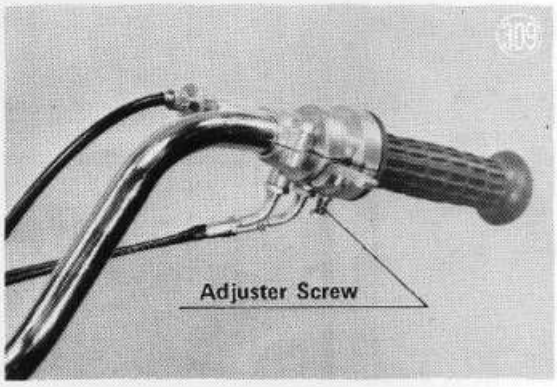
4) Assembly

Assembly is in the reverse order of disassembly.

NOTE: The handlebar is usually mounted at an angle conforming to that of the front fork. For mounting bolt torque, see the appendix.

5) Adjustment

a. Throttle Cable (Page 9)
b. Starter Lever (Page 11)
c. Clutch Lever (Page 12)
d. Front Brake Lever (Expansion brakes only- page 68)
e. Throttle Grip: Adjust throttle grip stiffness to individual preference by turning the adjuster screw under the right grip assembly. (only on '69~'73 model)



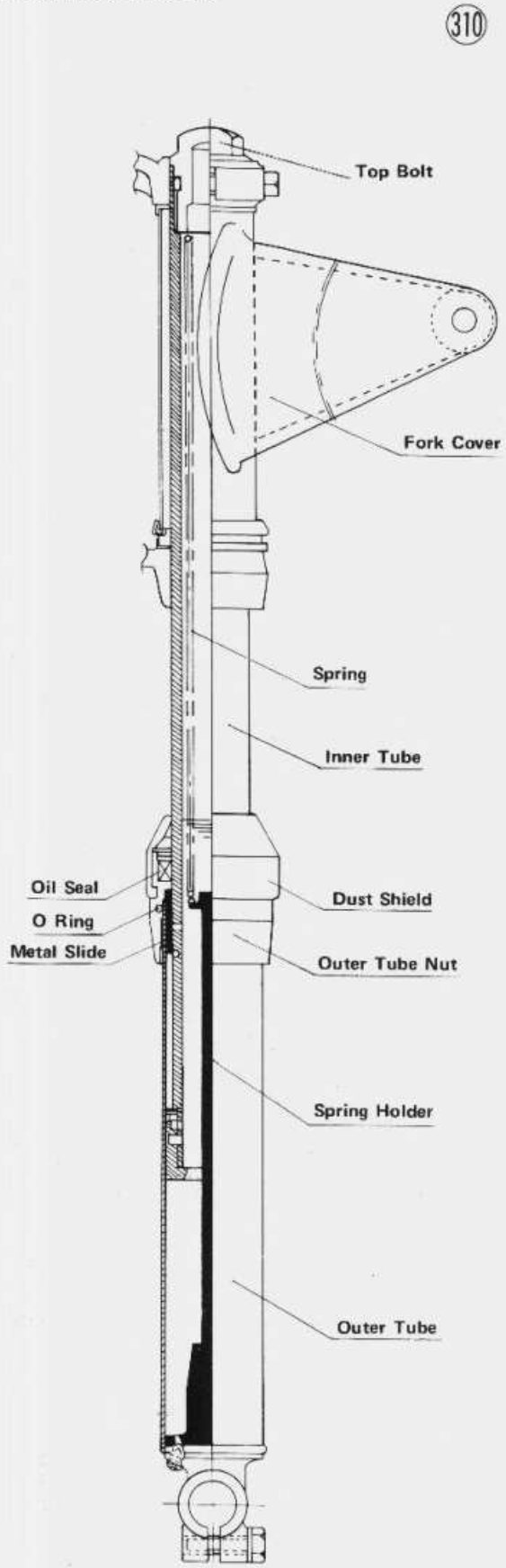
6. FRONT FORK · STEERING STEM

On disc brake models, details of front shock absorber construction and operation differ from that shown here. However, both types of shocks damper movement by oil flow resistance, which is greater on the extension stroke, and oil locks occur at the ends of the stroke. Disassembly, inspection and assembly is generally the same.

1) Construction · Operation

a. Fork
The front fork serves as the shock absorbing device for the front wheel. The fork consists of two telescopic tubes mounted to the frame head pipe with brackets via the steering stem.
The shock absorbing telescopic tubes include the inner tube, outer tube, spring holder and spring, damping action being provided by the spring tension and by the resistance of the flow of oil inside the tube.

Front Shock Absorber



As illustrated, the inner tube is fitted into the outer tube, and the spring is positioned between the seat on the upper part of the spring holder (which is fixed to the outer tube) and the inner tube top bolt.

A nut containing an oil seal is screwed onto the outer tube, and this nut serves as the seal between the inner and outer tubes.

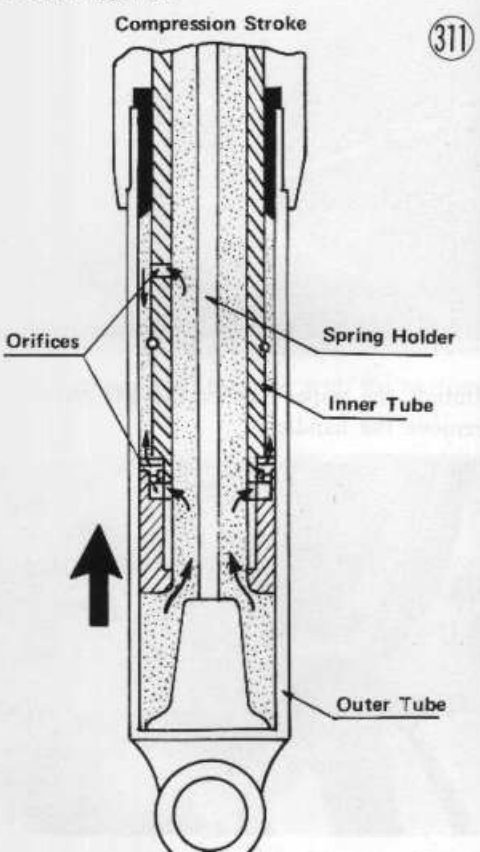
b. Fork Operation

(1) Compression

When the front fork receives a load and is compressed, the spring inside it is also compressed. At this time, due to the outer tube being pushed up, the air in the top of the inner tube is compressed, while oil in the outer tube is forced to flow up into the inner tube through the piston orifice in the bottom of the inner tube. A small amount of oil also flows through the hole in the side of the inner tube and through the non-return valve openings in the side of the lower end of the tube, into the space between the inner and outer tubes.

The resistance to the flow of oil through these apertures, in addition to the air and the spring resistance to compression, constitutes the buffering action until just before the end of the compression stroke. At this time the tapered portion of the spring holder begins to enter the bottom orifice of the inner tube, cutting down the cross-sectional area of the opening and causing a sharp increase in flow resistance. The taper gradually fills the opening until just before the stroke end when the opening is completely closed, forming an oil lock and stopping all movement.

Front Shock Absorber



(2) Extension

Spring tension returns the outer tube to its original position, the return dampened by the flow resistance of the returning oil through the upper side aperture in the inner tube, and out through the bottom opening. The non-return valve is closed during extension and does not allow oil passage. If the fork extends further, the side orifice reaches the metal slide which covers it and stops oil flow. This results in an oil lock, and fork extension ceases.

NOTE: In a badly worn or defective fork where the metal slide will not close the upper hole, or where the non-return valve does not close, the oil lock will not occur and a metal-striking-metal sound will be heard as the stopper ring of the inner tube hits the metal slide.

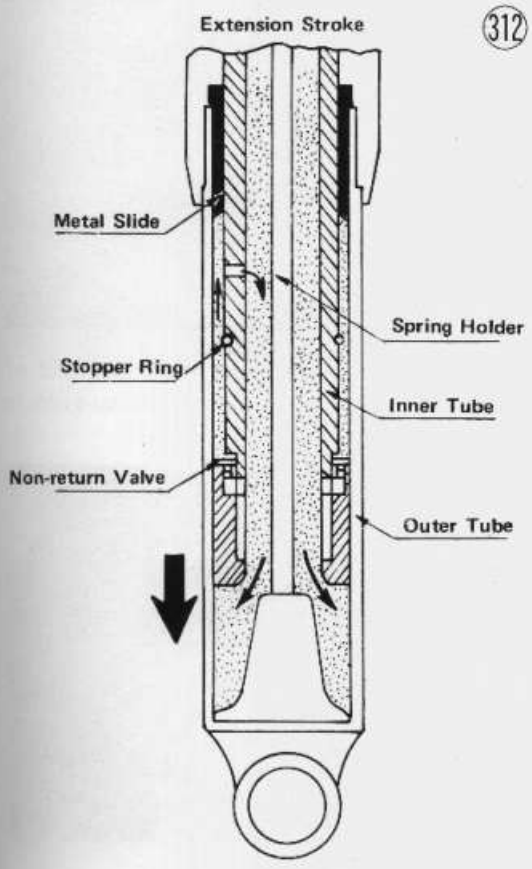
c. Steering Stem

The steering stem supports the front fork, and acts as its pivot. When the handlebars are turned, the stem turns inside the frame head pipe, friction being reduced by the ball bearings at its upper and lower ends.

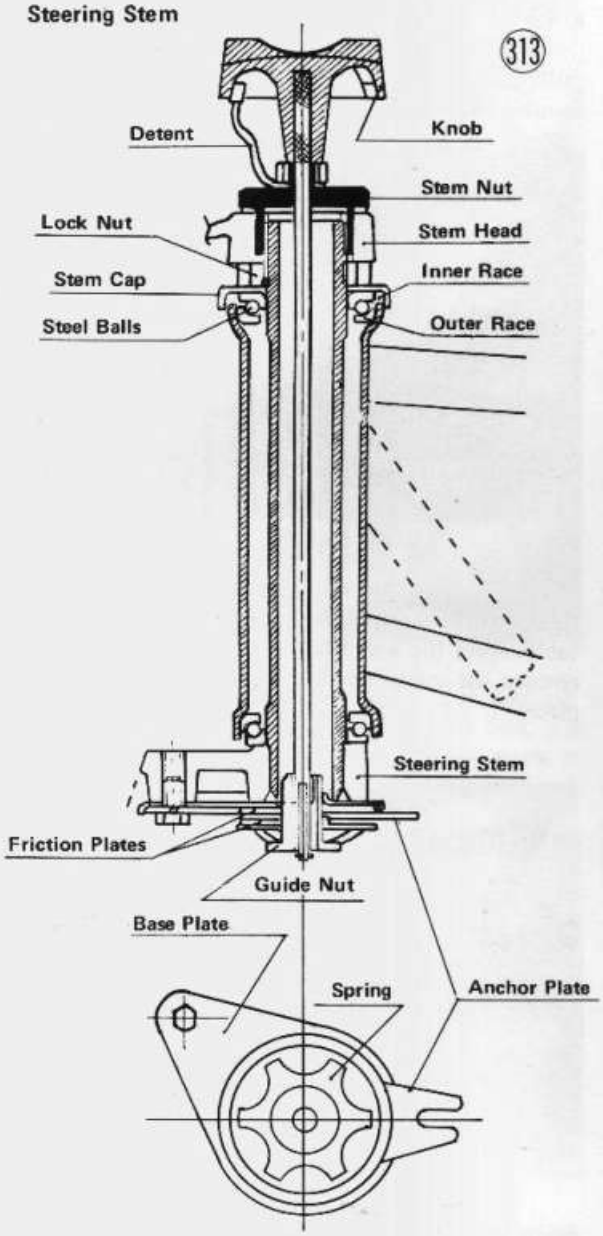
Steering stiffness can be adjusted by turning the damper knob at the top of the steering stem. Stiffness results from friction between the upper and lower steel plates and the anchor plate between them, friction being transmitted indirectly by the friction plates. The anchor plate is held stationary with respect to the frame, by a projection of the frame that fits into the plate notch; the steel plates turn with the handlebars.

When the knob is turned in, the damper spring is pulled up, increased spring tension forces the steel, friction and anchor plates harder together, and the increased friction stiffens steering.

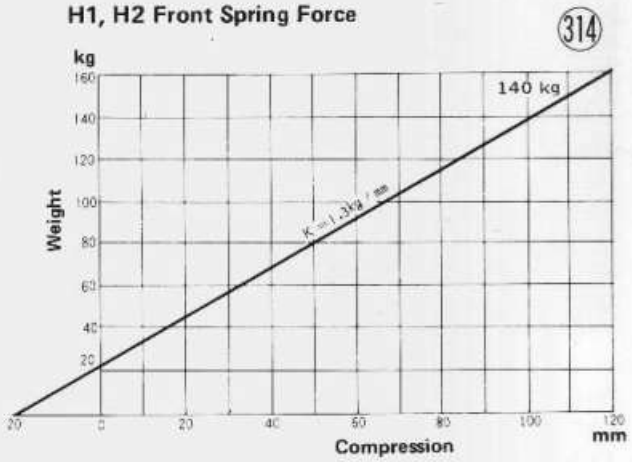
Front Shock Absorber



Steering Stem



H1, H2 Front Spring Force

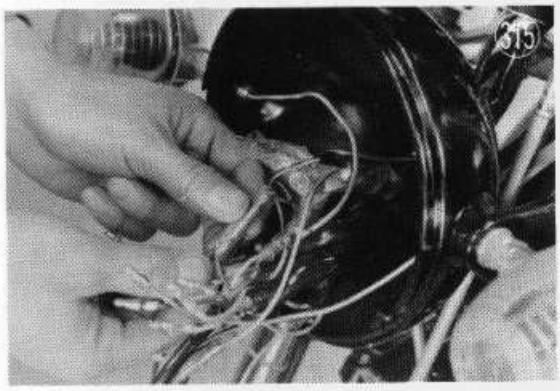


2) Disassembly

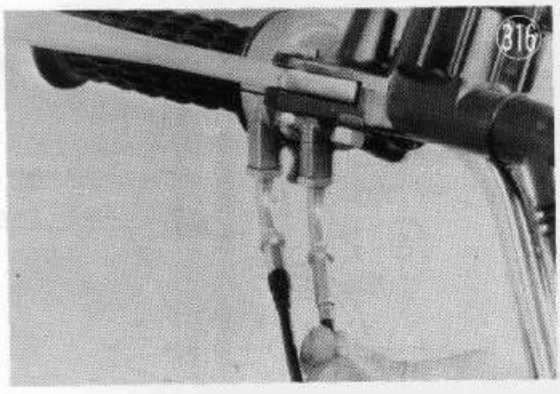
The front fork and steering stem are removed after first taking off the front wheel and fender.

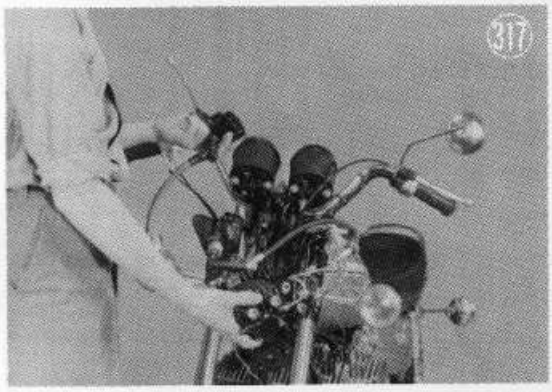
a. Front Fork

Disconnect the wiring inside the headlight and pull the wires out of the headlight body, then remove the headlight.

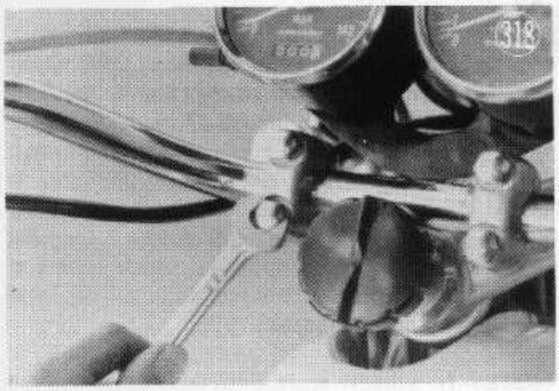


Remove the starter, throttle, clutch and front brake cables from the handlebar. On disc brake models, remove the complete disc brake assembly in one piece.

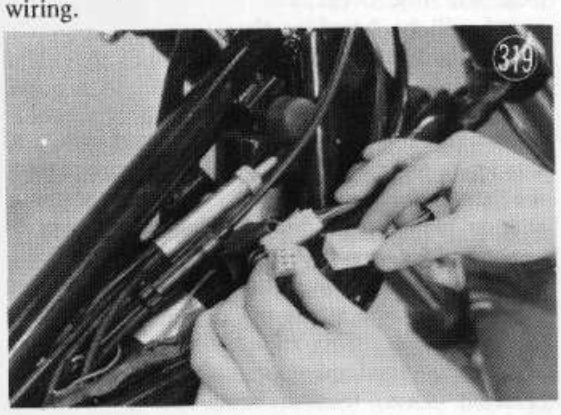




Unbolt the handlebar and remove it.



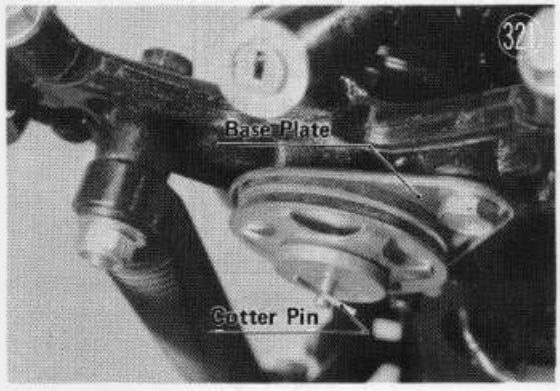
On disc brake models, remove the fuel tank and undo the ignition switch and left handlebar switch wiring.

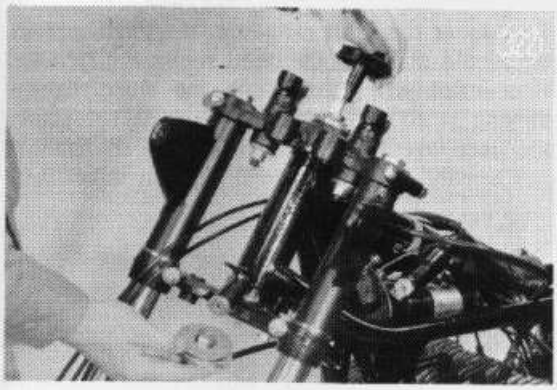


Take off the speedometer and tachometer cables and remove the meters, bracket and ignition switch as an assembly.

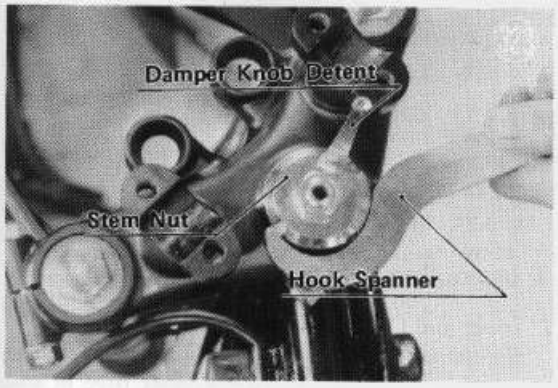


Pull out the cotter pin from the lower end of the steering damper and turn the damper knob to the left to remove it.

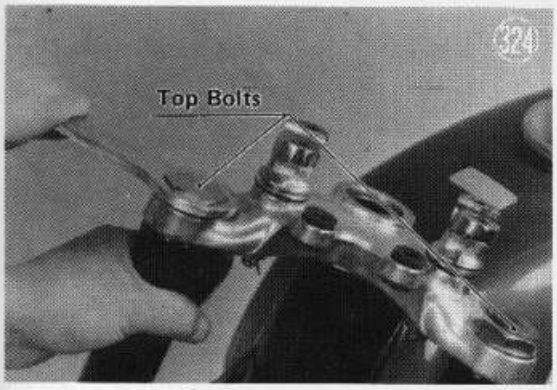




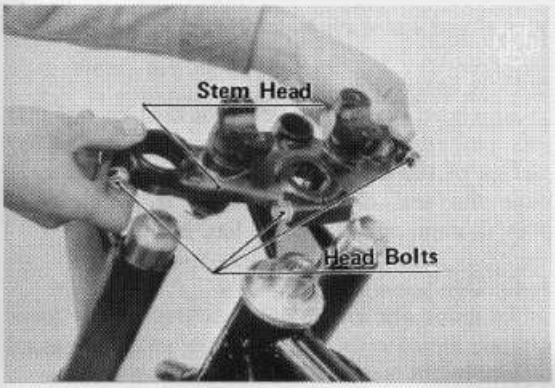
Using a hook spanner (special tool), loosen the steering stem nut and remove it. It is not necessary to remove the damper knob stopper and nut from its top.



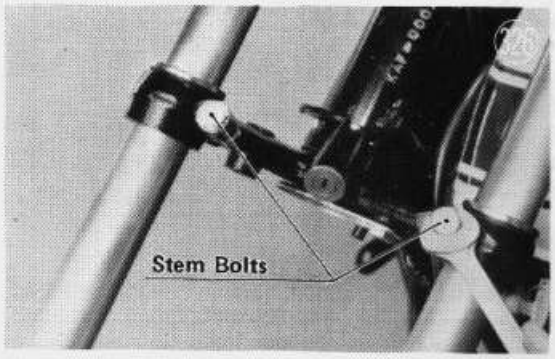
Unscrew the top bolts and take off the steering stem head. **(Expansion brake models)**

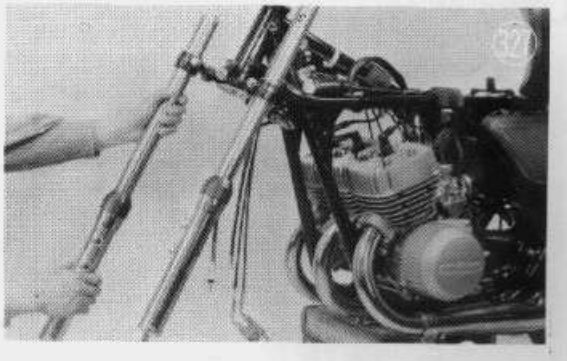


Take out the steering stem head bolts and remove the stem head. **(Disc brake models)**

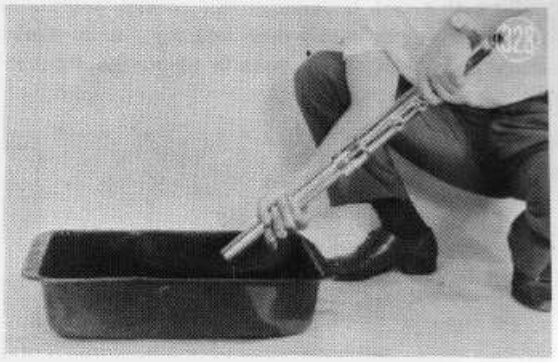


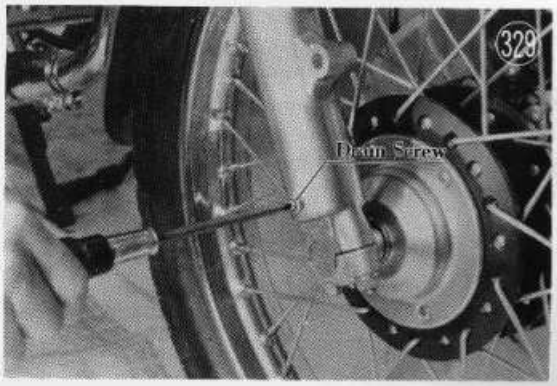
Remove the steering stem bolts and pull out the front forks and covers.





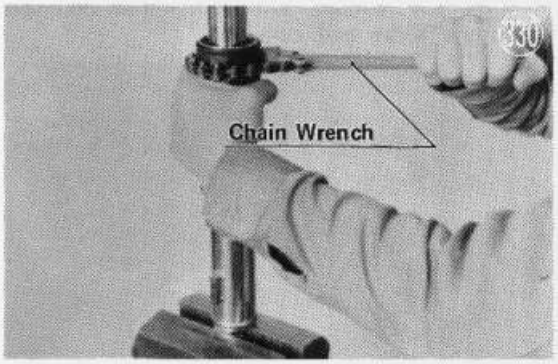
Take out the spring and pour out the oil. The oil can also be removed with the fork still attached to the frame, by removing the screw at the bottom of the fork and draining the oil.



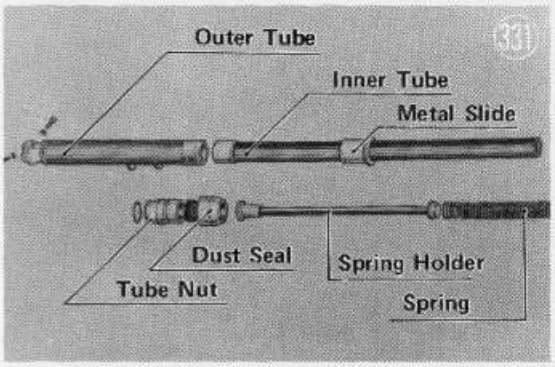


Clamp the lower end of the fork in a vise. Wrap it with a piece of tire tube or other rubber to prevent scratching, and loosen it with a chain wrench or pipe wrench.

H1

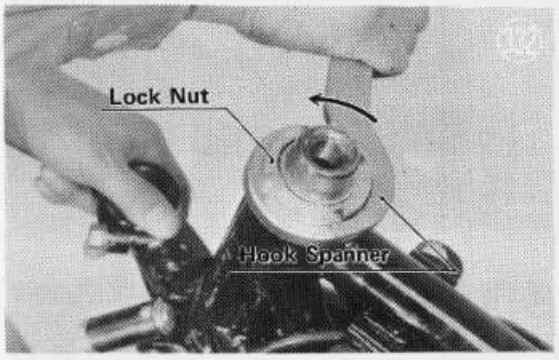


H1



b. Steering Stem

(If it is installed, first remove the hydraulic steering damper.) Remove the steering stem lock nut with a hook spanner (special tool) and pull the steering stem out of the head pipe. When pulling this out be careful not to lose the balls from the upper and lower bearings, since their inner and outer races separate when the stem is pulled.

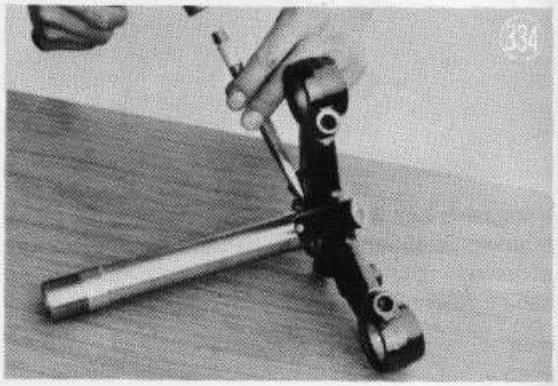


When removing the upper and lower outer races from the head pipe, insert a bar or starting punch into the pipes, as shown in the illustration, and knock them out.

Race Removal



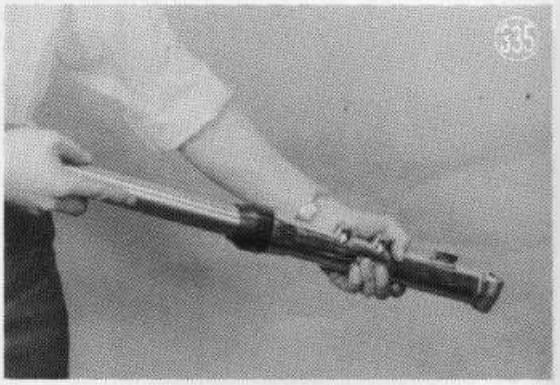
To remove the inner race from the steering stem, set a cold chisel to the point where the race and stem meet and hammer on the chisel lightly, moving it to different points so as to remove the race evenly. Be careful not to hammer too heavily as the stem will become misshapen.



3) Inspection

a. Inner and Outer Tubes

Fit the outer and inner tubes together with the metal slide in place. Move the inner tube in and out, checking for smooth movement.



b. Inner Tube

If the sliding surface of the inner tube is dented, scratched or bent, it must be repaired or replaced as the uneven surface will damage the lip of the oil seal and cause oil leakage.

c. Dust Seal

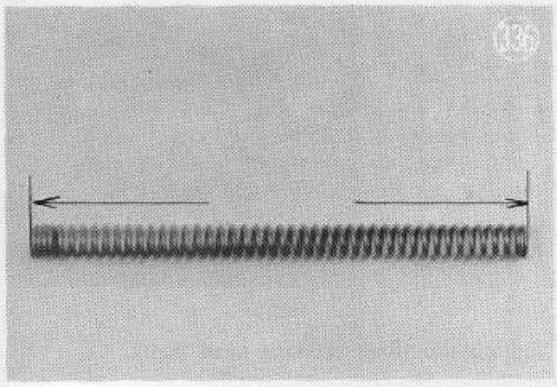
Any hard foreign particles, or dust or dirt that gets past the dust seal will scratch the sliding surface of the inner tube and damage the oil seal. Wipe the seal clean and check it, replacing it if it is damaged, worn or has hardened.

d. Spring

As shock absorbing ability is impaired by weak springs, measure the free length of each spring and replace it if it is out of tolerance.

Table 37 Spring Length

Model	Standard	Service Limit
H1	13.58" (345 mm)	13.19" (335 mm)
H2	"	"



e. Fork Oil

The forks must be filled with the correct amount of clean, good quality oil to ensure effective operation. Dirty, oxidized oil loses its lubricating capacity and speeds up wear and breakdown of the fork. If the oil level is low, the fork will be noisy; a high oil level will make the cushion harder.

Measure the fork oil level with no weight on the fork (front wheel raised off the ground). Unscrew the top bolt, insert a rod into the inner tube, and measure the distance from the top of the inner tube to the surface of the oil. This measurement, along with the amount of oil to pour into an empty fork, is given in the table below.

Table 38 Front Fork Oil

Model	Standard Quantity	Level from Top	Oil
H1*	7.8 oz. (230 cc)	15" (380 mm)	SAE 10
H2	5.4 oz. (160 cc)	175/8 in. (448 mm)	SAE 10

*For H1 disc brake models, use H2 figures in above table.

f. Steering Stem

Inspect the steering stem and straighten it or replace it if it is bent.

g. Ball Bearings

Check the inner and outer races for wear or pitting. This will cause uneven pressure on the balls and make the steering stiff. Check the balls for wear, pitting or cracks. If any damage or wear is apparent in either the balls or races, it is recommended that balls and races be replaced as a set.

4) Assembly

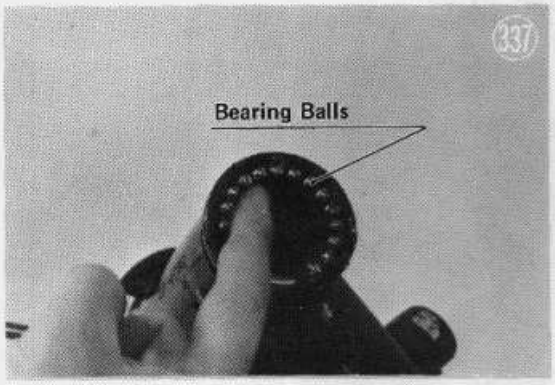
a. Steering Stem

Press in the upper and lower outer races and the lower inner race with a press or similar means, taking care to exert even pressure around the race circumference.

Spread grease on the upper and lower outer races in the head pipe, and set the balls in place in them. Insert the steering stem up through the bottom of the head pipe, fit the upper race in from the top and temporarily hold the assembly in place with the lock nut. Then move the steering stem back and forth while tightening the lock nut. The nut should be tight enough to take all play out of the steering, but loose enough to allow smooth, easy steering movement.

Table 39 Bearing Balls

Model	Size	Quantity
H1, H2	¼ inch	19 each bearing



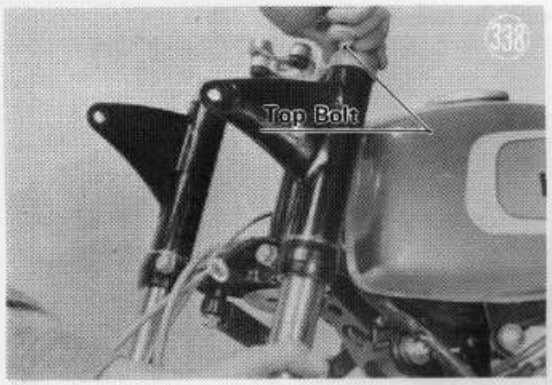
b. Fork

Whenever the front fork is disassembled, the oil seal and O ring in the outer tube must be replaced.

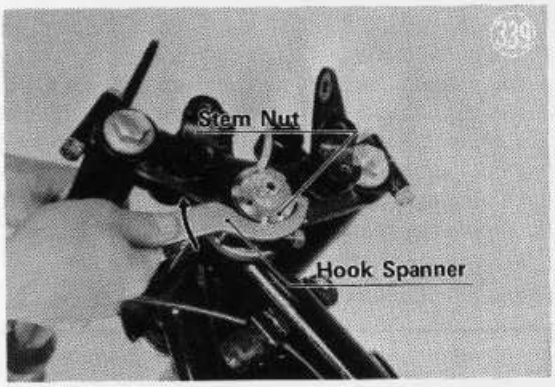
Mount the steering stem head on the head pipe and hold it in place with stem nut. Leave the nut loose for easy fork assembly.

(1) Expansion brake models

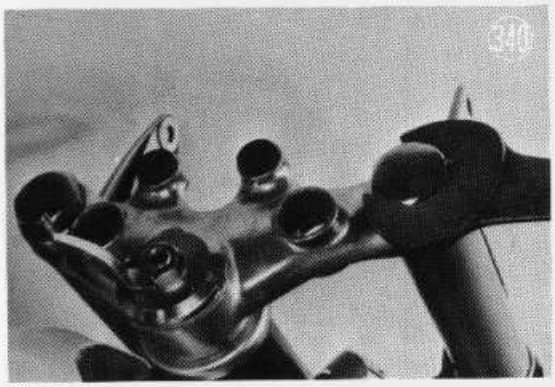
Put on the fork covers and insert each fork up through the bottom of the steering stem, screwing in the top bolt loosely.



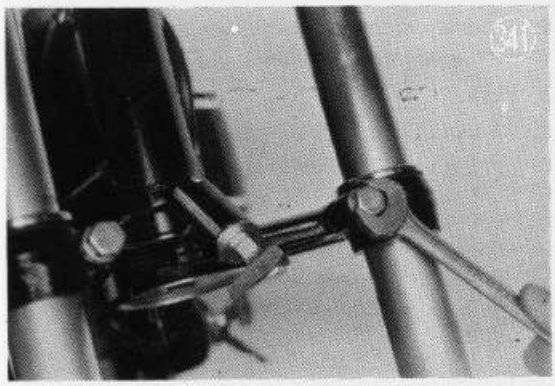
Tighten down the steering stem nut.



Push the inner tube into the stem hole until the top of the tube hits the step in the hole, and tighten the top bolt.

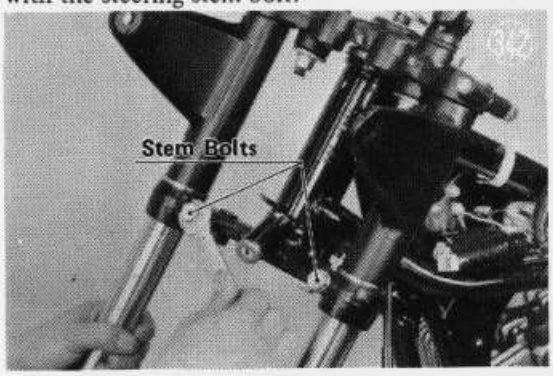


Tighten the steering stem bolts.

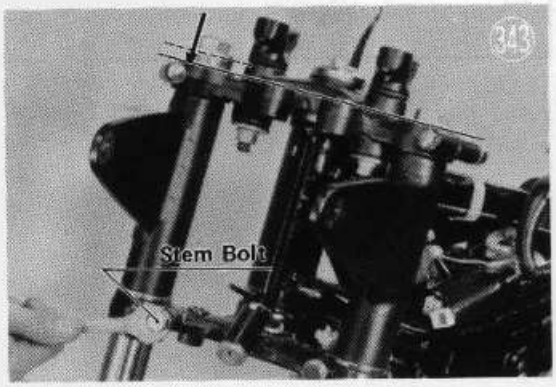


(2) Disc brake models

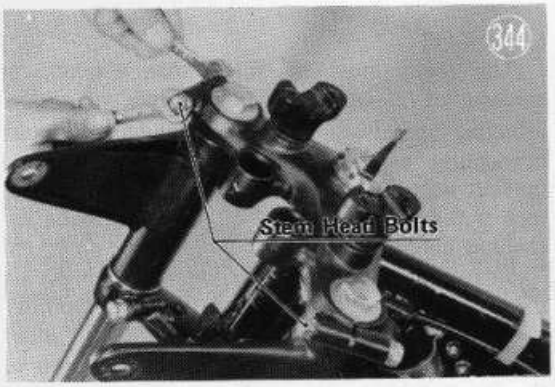
Put on the fork covers; insert each fork up through the stem until it is even with the upper surface of the stem, holding it in place temporarily with the steering stem bolt.



Tighten down the steering stem nut. Align the tops of the tubes evenly with the upper surface of the stem head and tighten the stem bolts.



Tighten the three steering head bolts.

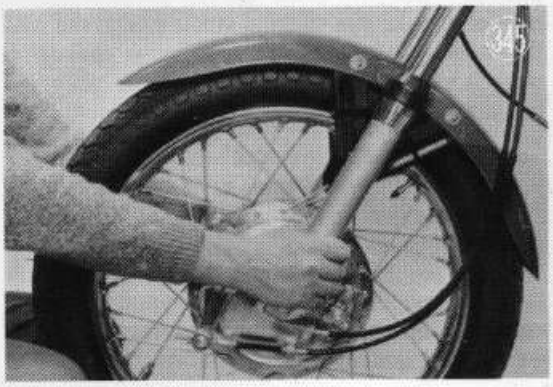


c. Fork Assembly Inspection

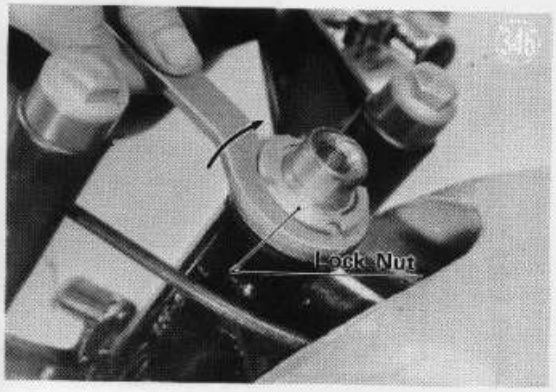
The lower bracket must have no play, and steering must be smooth and easy. After assembling the front fork and wheel to the frame, check this in the following manner:

Move the forks back and forth to see that there is no play in the stem.

With the front wheel lifted up off the ground, give the handlebars a light push and see if they will move to the right and left smoothly under their own momentum.



If the preceding inspection revealed play in the steering stem, the lock nut is not tightened sufficiently; if the steering was stiff, the lock nut is too tight and must be loosened.



7. REAR SHOCK ABSORBERS

1) Construction

The shock absorbers constitute the rear suspension, protecting the rider and vehicle from road shock and vibration, and thereby increasing riding comfort and lengthening vehicle life. To further absorb vibration from small irregularities in the road surface, the shock absorbers are mounted with rubber bushings at the top and bottom.

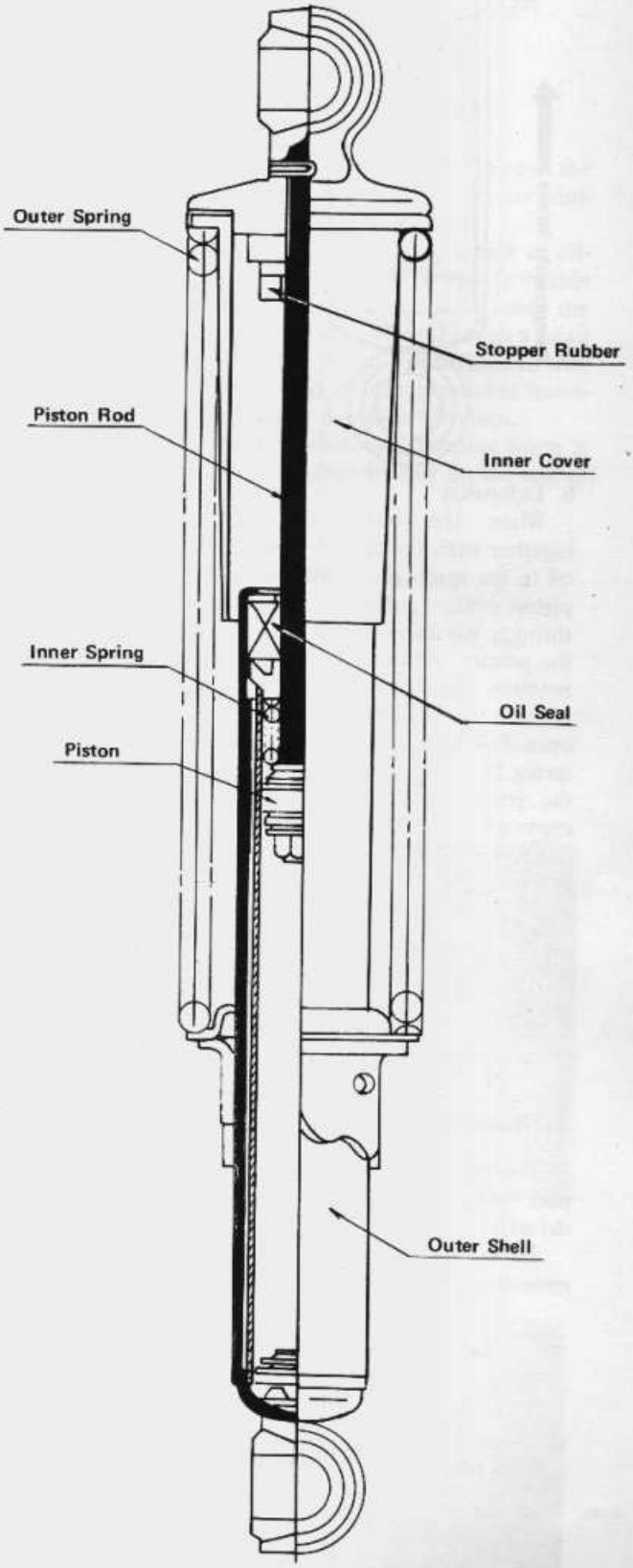
The shock absorber consists of springs, an inner cover, outer shell, cylinder, piston rod, piston, and shock absorbing oil. The basic tension of the spring (the initial load) is adjustable in three steps to comform with road and loading conditions, and rider comfort.

2) Operation

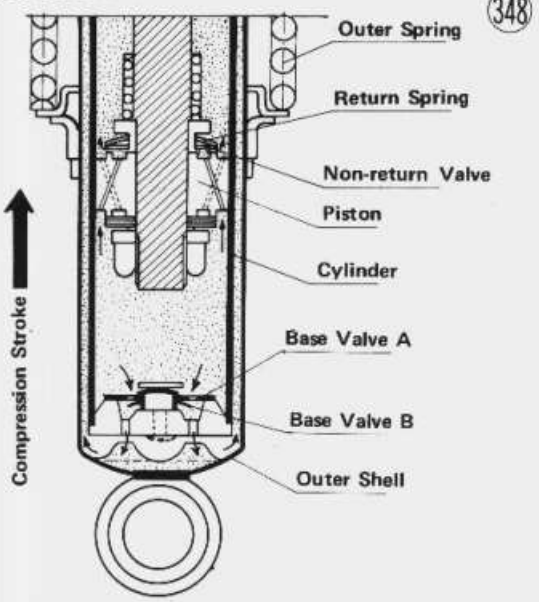
a. Compression

When the rear shock absorber receives a load, the outer spring is compressed, and at the same time the cylinder rising in the outer shell causes pressure on the oil underneath the piston. The oil flows through the piston orifice, pushes up the non-return valve held down by valve spring C, and enters the space above the piston. A small amount of oil also flows through the opening of base valve A, pushes down base valve B and enters the oil chamber between the cylinder and the outershell. The resistance to this oil flow, in addition to spring tension, constitutes buffering action. The compression stroke is terminated when the cylinder strikes the rubber at the top end of the piston rod.

Rear Shock Absorber



Rear Shock Absorber



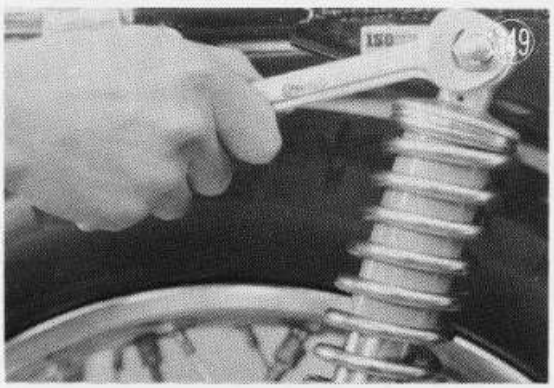
b. Extension

When the outer shell moves downward together with the cylinder due to spring force, the oil in the space above the piston goes through the piston orifice, pushes down the piston valve, goes through the valve and back into the space under the piston. At this same time, the oil in the space between the cylinder and the outer shell also returns to underneath the piston by pushing open base valve A normally held shut by valve spring D. The resistance of the flowing oil checks the tendency of the outer spring to suddenly expand to its full length. The extension stroke is completed when the inner spring hits the stopper at the top of the cylinder.

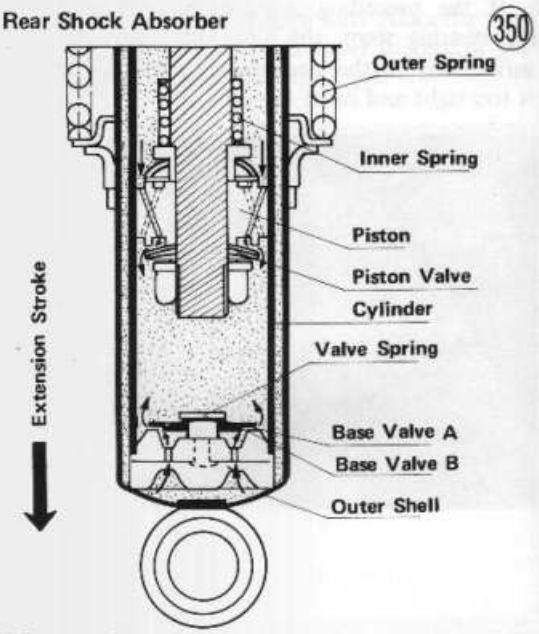
3) Disassembly

The rear shock absorbers are a non-disassembly part and must be replaced as an assembly if defective.

To remove the shock absorbers, take out the mounting bolts.



Rear Shock Absorber



4) Inspection

a. Check the shock absorbers for leaking oil. A leaking unit should be replaced.

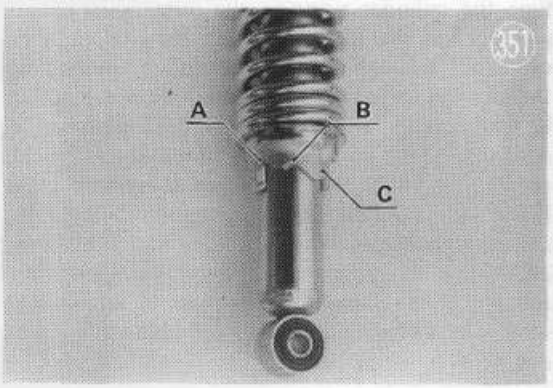
b. Since during compression the spring force is much greater than the oil damping force, this damping force is very difficult to check. The damping force during expansion can be easily inspected, however. Compress the shock absorber and release it. If it does not return smoothly without jerking or snapping back, or if other abnormalities are noted, replace it.

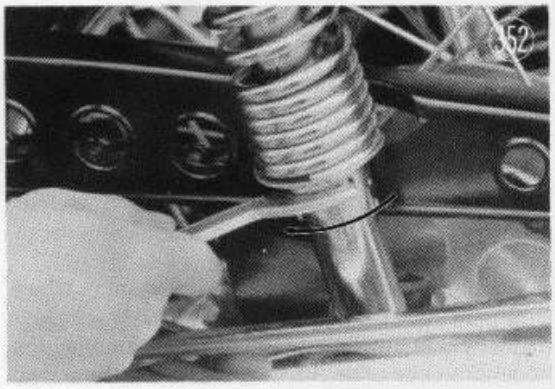
NOTE: Riding with one bad shock absorber will soon cause the other one to break down. If inspection reveals a defective shock, replace it as soon as practicable.

c. Check that the rubber shock absorber mountings are not worn, cracked or hardened.

5) Adjustment

By turning the outer spring seat, the spring seat is raised or lowered, increasing or decreasing minimum spring tension and changing the length of the spring stroke. Use a spanner (special tool) or screwdriver to turn the seat. Turning from A to B to C increases tension; turning in the opposite direction decreases tension. Minimum spring force for each position is given in the graphs.





8. HYDRAULIC STEERING DAMPER

[Optional on all H2 models and on some U.S. H1 models]

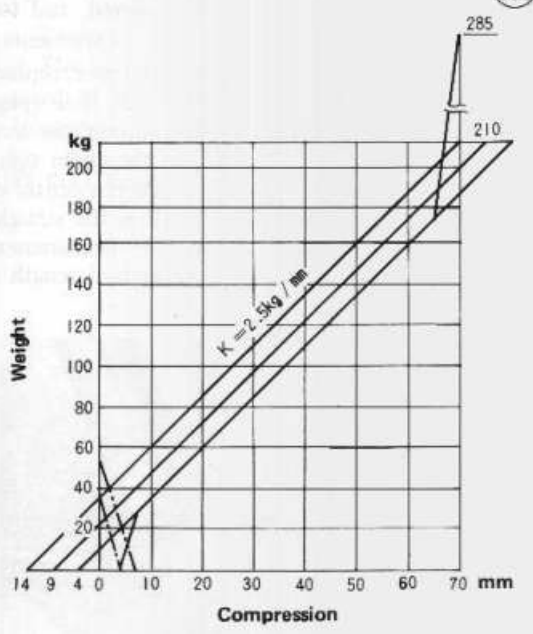
1) Construction and Operation

This steering damper is connected between the steering stem and the frame, and serves to minimize handlebar vibration at high speeds.

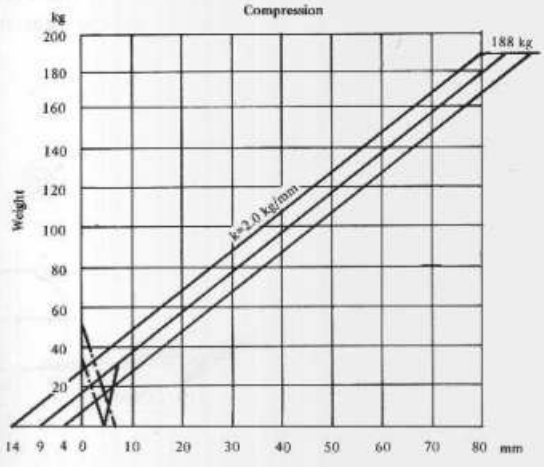
It consists mainly of a piston rod inside an oil-filled cylinder. As the handlebars move from side to side, the piston moves back and forth inside the cylinder, and oil is forced to flow through a small hole in the head of the piston. Resistance to that flow of oil prevents too sudden handlebar movement and in this manner dampens vibration.

On some newer models the damping force is adjustable by turning a thumbscrew on the end of the damper.

H1 Rear Spring Force

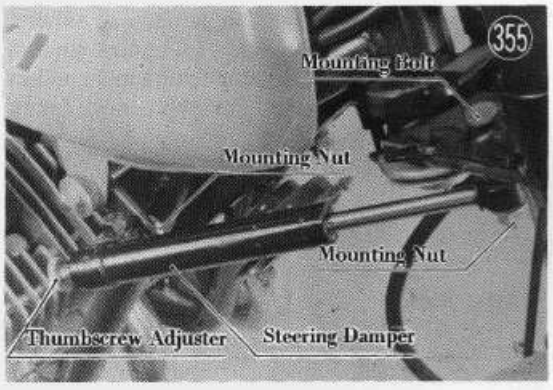


H2 Rear Spring Force



2) Disassembly

Remove the two mounting nuts and take off the damper.



3) Inspection

Inspect the steering damper for oil leakage. If it is leaking, it must be replaced as a unit since it is a non-disassembly part.

9. DRIVE CHAIN

1) Construction · Operation

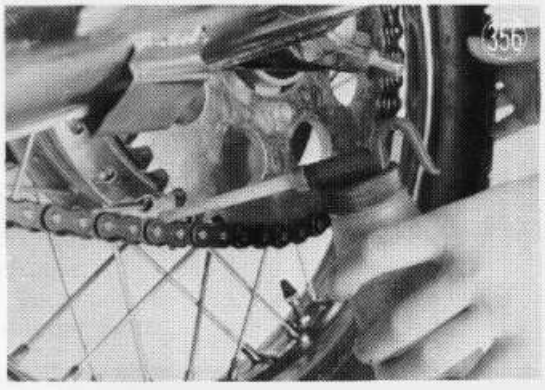
The drive chain transmits engine power to the rear wheel and, together with the front and rear sprockets, performs secondary reduction. Chain construction is illustrated below. Wear occurs between the pin and bushing, and bushing and roller due to chain movement and tension, and causes the chain to lengthen. Chain slack is also produced from wear of the roller surfaces against the sprockets. If chain play becomes great enough it can cause the chain to snap or come off the sprocket, so this play should be checked and adjustment made at regular intervals. And along with chain adjustment, wheel alignment must also be taken into consideration. Misalignment will cause the chain to snap or slip off the sprocket, and cause abnormal chain and sprocket wear, reducing power transmission efficiency.

Table 40 Chain Specifications

Model	No. of Links	Type
H1	102	EK530 SH-T1G
H2	110	EK530 SH-T2G

2) Inspection · Adjustment

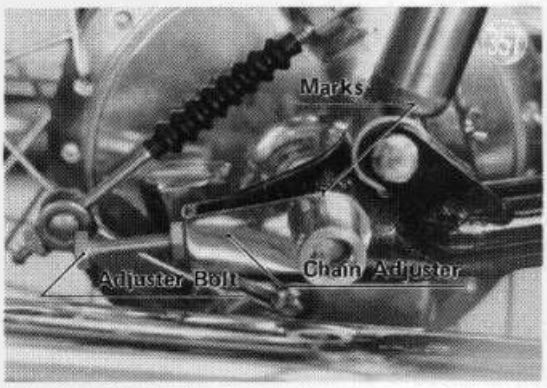
a. Lack of lubrication will greatly hasten chain wear, as will dirt sticking to the chain and grinding against it. Wash the chain in gasoline or solvent, and lubricate it just enough to ensure smooth operation, but do not use so much oil as to collect dirt or to be flung off as the chain turns.



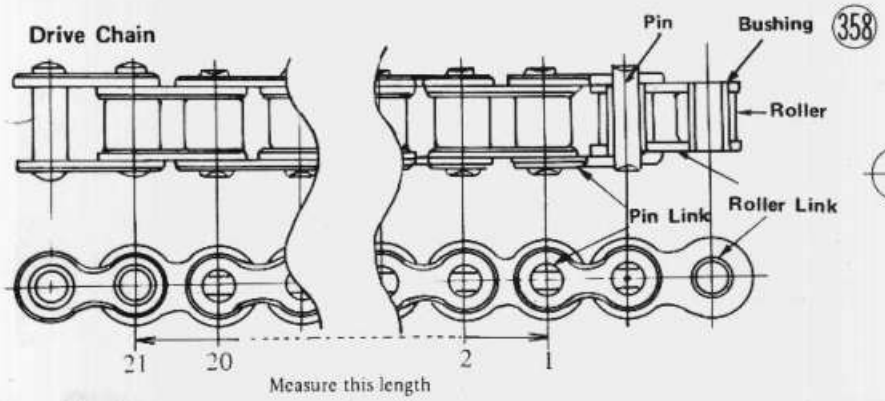
With the motorcycle in its normal standing position on the front and rear wheels, check chain play at the center of the chain as illustrated. Play must be more than 3/8" (10 mm) and should never be allowed to exceed 1 1/2" (40 mm). Adjust the chain using the chain adjusters if it is out of tolerance. Standard adjustment is 3/4" (20 mm).

Chain alignment corresponds to wheel alignment; if the wheels are properly aligned. correct chain alignment is automatic. To align the wheels, loosen the torque link mounting nut, axle nut, axle sleeve nut (H1 only), and adjuster bolt lock nuts, is that order; turn the chain adjuster bolts (or nuts) seeing that the adjuster marks coincide with the same swing arm marks on both sides of the wheel. After adjustment do not fail to tighten all the parts that were loosened, and to check rear brake and brake light adjustments.

If the chain is stretched out of tolerance, replace it, also checking sprocket wear at this time (page 23, 66). To measure chain wear, loosen the nuts as for chain adjustment, and adjust the chain tight. Measure the length of 20 links (from pin center of first pin to pin center of 21st pin) on the straight part of the chain, replacing the chain if measurement is over 12¾ inch (324 mm). (Standard length is 12½ inch 317.5 mm.)



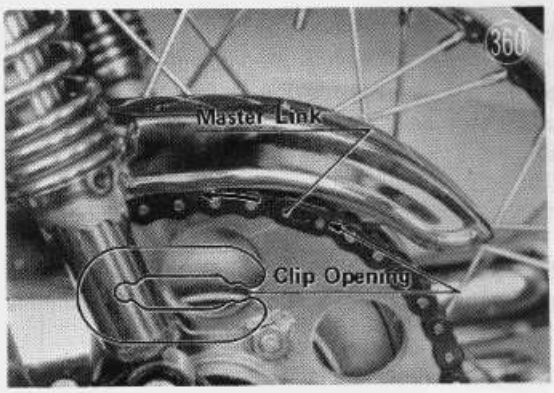
Oil the chain with SAE 90 gear oil at least every 200 miles (300 km). The H2 has a chain oil tank for this purpose, with a hose running down to drip oil on the chain. To oil the H2 chain, spin the rear wheel backward while pulling up on the oiler valve knob (attached to the frame at the rear of the engine oil tank).



3) Disassembly · Assembly

This is accomplished by removing or inserting the master link. It is helpful to give the chain some slack to make assembly/disassembly easier. When replacing the master link clip, the open end should face in the opposite direction to chain movement, to keep the clip from coming off and causing the chain to break.

The H2 chain has no master link. To remove it take off the rear wheel (page 59), the left rear foot rest, the left shock lower mount, chain guard, left engine cover, and swing arm shaft. Drop down the front of the swing arm and remove the chain.



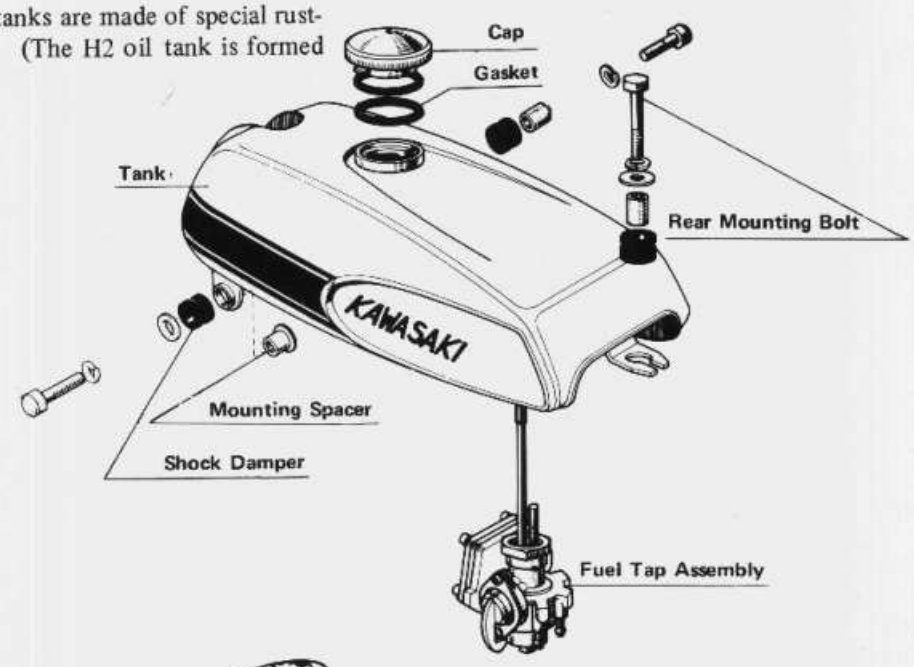
10. FUEL, OIL TANKS

1) Construction

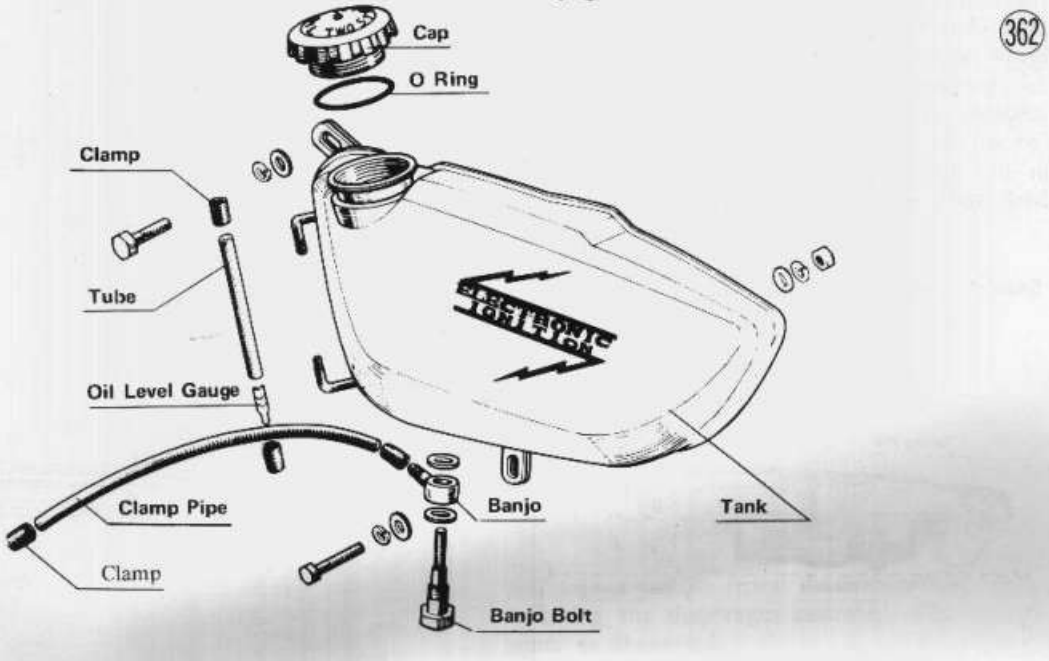
a. Tanks

The fuel and oil tanks are made of special rust-resistant steel plate. (The H2 oil tank is formed from polyethylene.)

H1 Fuel Tank



H1 Oil Tank



b. Automatic Fuel Tap

When the H Series automatic fuel tap is turned to the **ON** or **RES** position, gasoline flows to the carburetor only when the engine is running, and shuts off when the engine stops. In the **PRI** (Prime) position the automatic shut-off valve is bypassed, allowing continuous gasoline flow.

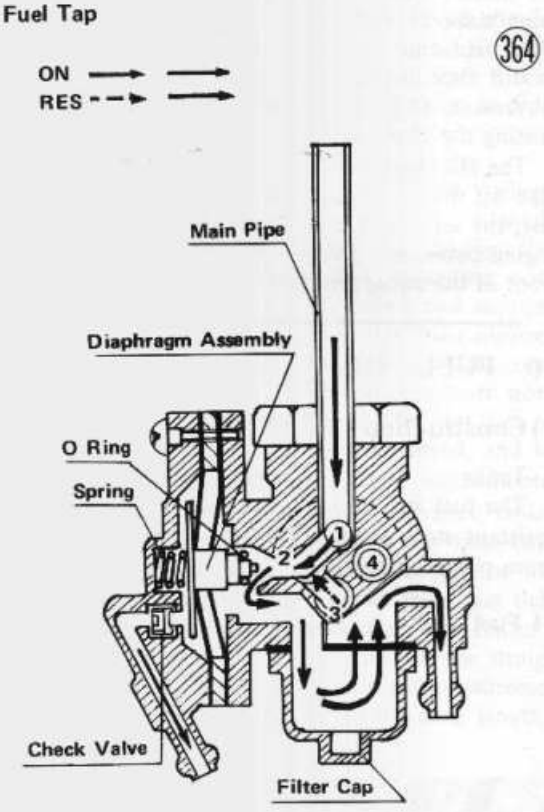
Fuel flow the from main pipe to the filter bowl follows different paths, depending on the position of the fuel tap lever.

ON 1 → 2 diaphragm fuel passage → filter bowl
RES 3 → 2 diaphragm fuel passage → filter bowl
PRI 3 → 4 filter bowl

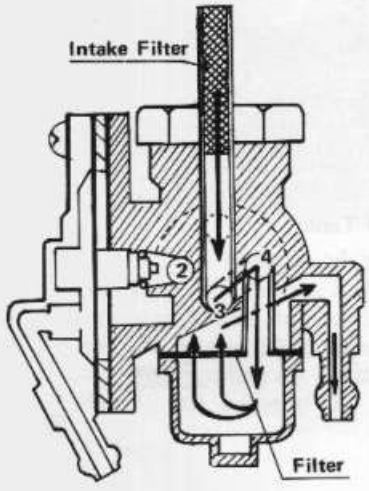
The gasoline that enters the filter bowl, or sediment bowl, is filtered and sent through the fuel pipe connections to each carburetor.
The automatic valve in the fuel tap operates as follows: When the engine is started, negative pressure (vacuum) is created at the carburetor due to engine intake. A vacuum line is connected from the carburetor to the diaphragm cover, so that vacuum is felt at the outside of the diaphragm transmitted through the check valve. The vacuum pulls the diaphragm against its spring pressure, and the O ring at the other end of the diaphragm assembly is pulled out of its seat, allowing fuel passage between the O ring and seat. When the engine stops and vacuum is lost, air enters the diaphragm vacuum chamber through an air vent to the outside of the fuel tap, bringing chamber pressure back up to atmospheric pressure and allowing the diaphragm spring to push the diaphragm back into place and hold the O ring against the seat. This air vent is open at all times but due to its small size, the vacuum line keeps pumping a negative pressure in the chamber faster than the air vent can let air in to equalize it.

At different fuel tap lever positions, the fuel from the tank is taken from different places. With the lever is the **ON** position, fuel is taken out of the tank through a pipe extending up into the tank from the fuel tap. When the gasoline level drops below the level of the top of the pipe, fuel can no longer enter the tap and the remaining gasoline in the tank forms the reserve supply (about 3/4 U.S. gal, or 3 liters). With the lever in the **PRI** (prime) or **RES** (reserve) positions. fuel intake to the tap is from the bottom of the tank and gasoline can be used until the tank is completely empty.

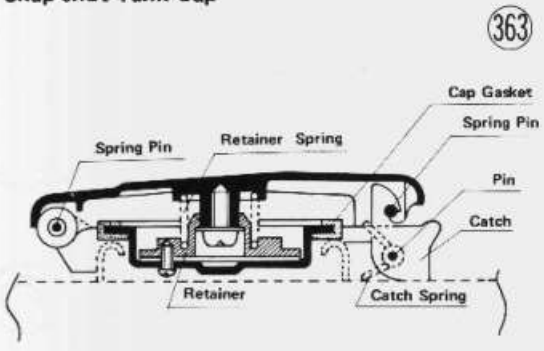
Fuel Tap



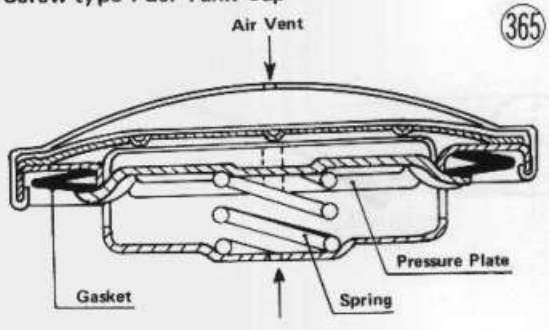
PRI Position



Snap-shut Tank Cap



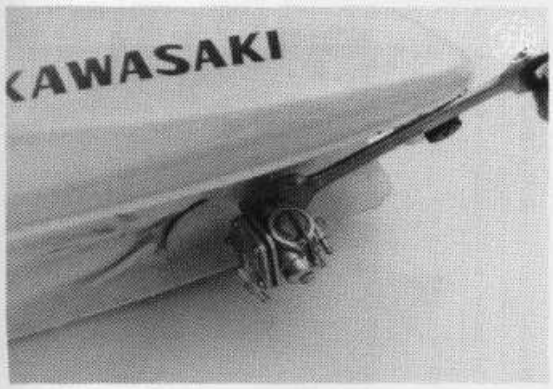
Screw-type Fuel Tank Cap



2) Disassembly

a. Fuel Tap

Remove the fuel and vacuum pipes and turn the tap to PRI to drain the gasoline. Remove the tap.

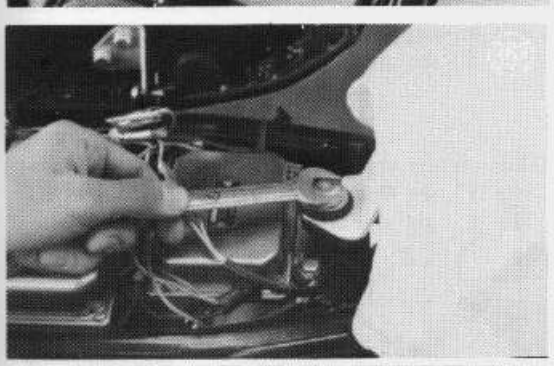


b. Fuel Tank

CAUTION: The main wiring harness is located under the fuel tank between the tank and the frame. When removing the tank be careful not to catch it on the wiring.

Turn the fuel tap to ON or RES to stop the flow of gasoline, and remove the fuel and vacuum pipes. Then remove the tank.

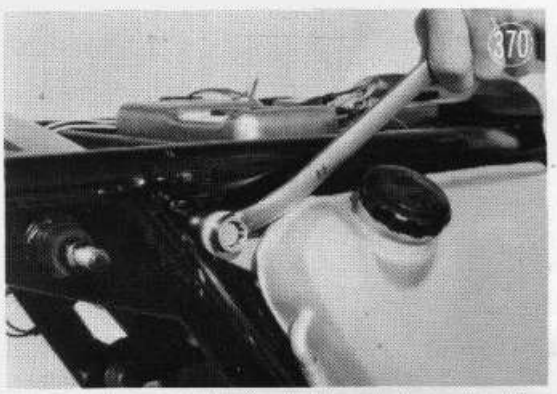


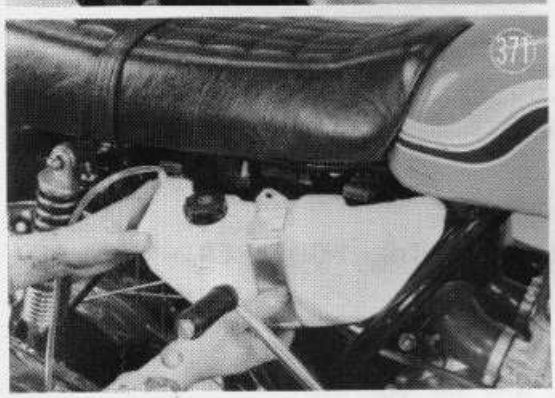




c. Oil Tank

Before removing the oil tank, plug the oil pipe to prevent spillage.





3) Inspection

a. Fuel, Oil Tanks

After the fuel and oil tanks are used for a long period, sediment collects in them and should be cleaned out to keep it out of the fuel tap and oil pump.

b. Fuel, Oil Tank Caps

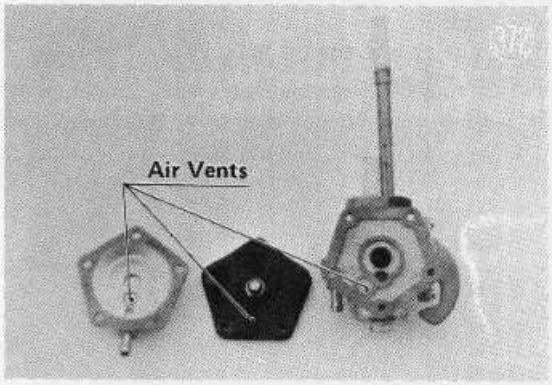
The caps not only keep the gasoline and oil from spilling, but allow air to enter the tanks through a vent hole in the cap. If air does not enter the tank, a partial vacuum will form at the top of the tank and prevent the oil or gas from flowing out the bottom. Clean the caps and check that the hole is not plugged.

c. Oil Tank Cap O Ring and Banjo Bolt Gasket

Check these parts for damage which may cause oil leakage.

d. Fuel Tap

Periodically remove the sediment bowl and empty out any collected sediment and water. Check that the filter is not clogged. Remove the diaphragm assembly and clean the parts and the air passage. Make sure the O ring and seat are clean and undamaged; if the O ring is prevented from seating properly or if it is damaged, gasoline flow will not stop when the engine is stopped, and may overflow from the carburetors. When replacing the diaphragm assembly, align the air vents as illustrated.



4) Assembly

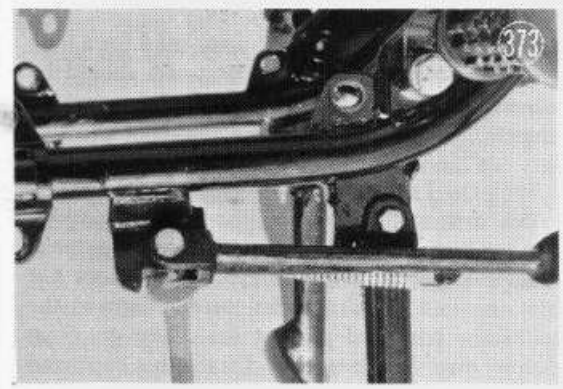
Assembly is in the reverse order of disassembly.

NOTE: Be sure there is no air leakage at the vacuum pipe connections, as this will stop gasoline from flowing.

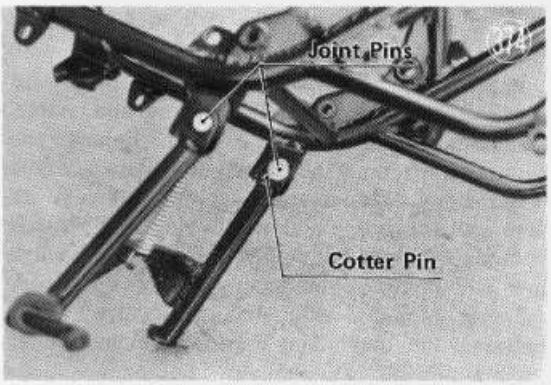
11. STANDS · FOOT RESTS

Disassembly

a. With the side stand kicked up, remove its mounting bolts, being careful not to damage the threads, and then remove the spring and stand.

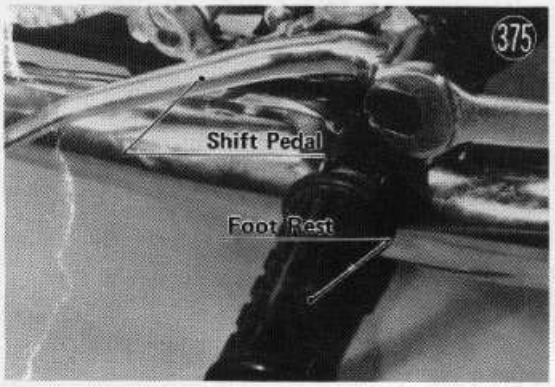


b. Take the spring off the center stand, pull out the cotter and joint pins, and remove the stand.



c. Footrests

All the footrests unbolt easily. The H2 front left footrest is taken off together with the shift pedal assembly.



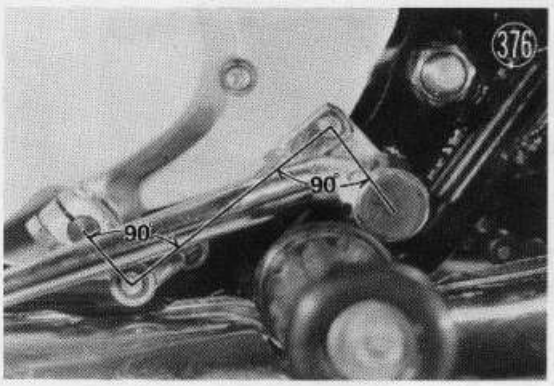
Inspection

Replace the side or center stand spring if it is stretched. If the springs do not keep the stands up properly, they may lower from vibration and cause an accident. Replace the footrest rubber if it is worn or chewed up.

Assembly

Assembly is in the reverse order of disassembly.

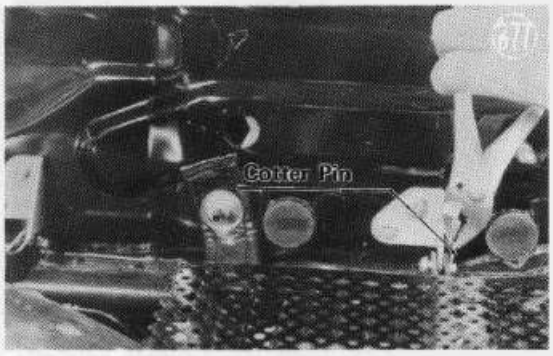
NOTE: When replacing the left front foot rest on the H2, see that the shift pedal links are at 90° angles, making any adjustment with the adjusting bolt.



12. SEAT

1) Construction

The dual seat is packed with sponge rubber for riding comfort. It is held in place by pins on one side, and a catch on the other.

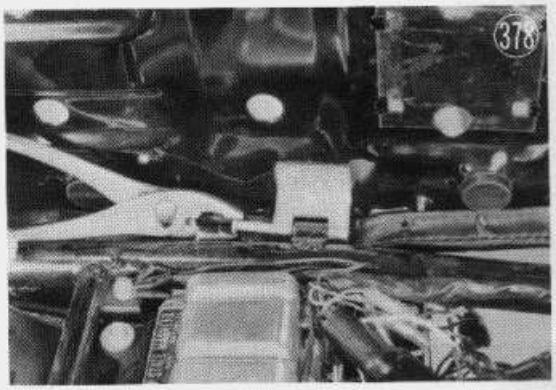


2) Removal

Remove the cotter pins and pull out the pivot pins.

3) Assembly

Assembly is in the reverse order of disassembly.

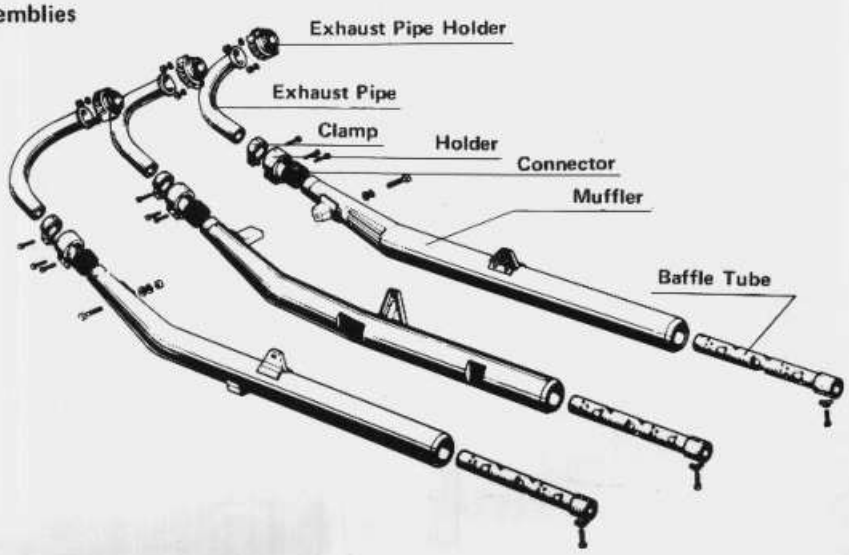


13. MUFFLERS · EXHAUST PIPES

1) Construction

The exhaust pipes conduct the exhaust gases from the engine to the muffler. Gas leakage is averted by a gasket mounting at the engine, and a heat-resistant rubber sleeve at the exhaust pipe/muffler connection. The mufflers, which are mounted by a bolt at the front end and by the foot rest stud at the rear, consist of an outer pipe with baffle plate projections inside, and a baffle tube inserted in and running most of the length of the muffler. The exhaust gases from the engine are conducted to each muffler by the exhaust pipe. Inside the muffler the gas hits a baffle plate and enters the baffle tube through its many holes. When the gas strikes a baffle inside the tube, it exits into the muffler until it next hits one of the muffler baffles, then back into the baffle tube and so on until the gas reaches the muffler opening. During all this moving back and forth from baffle tube to each silencing chamber of the muffler, the gas is gradually expanding and the exhaust sound being muffled.

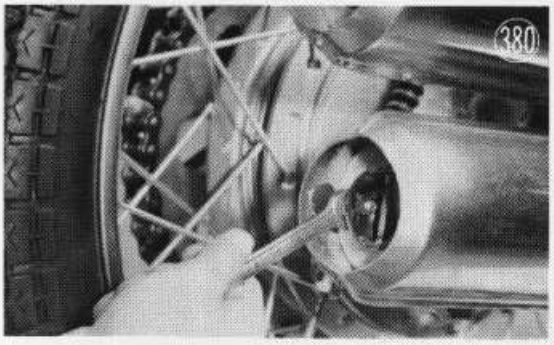
H Series Muffler Assemblies

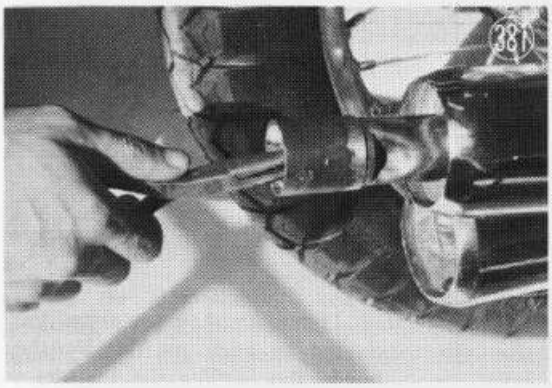


2) Removal

a. Baffle Tube

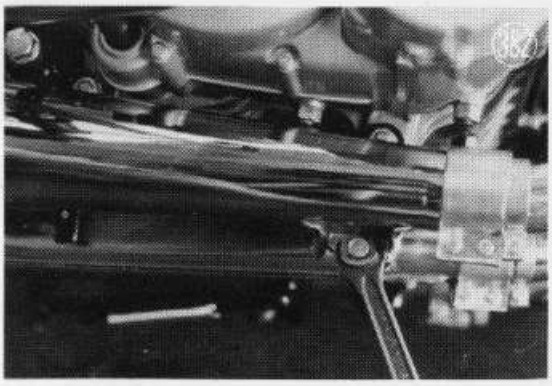
To remove the baffle tube for periodic cleaning, take out the mounting bolt inside the rear of the muffler and pull the tube out with pliers.

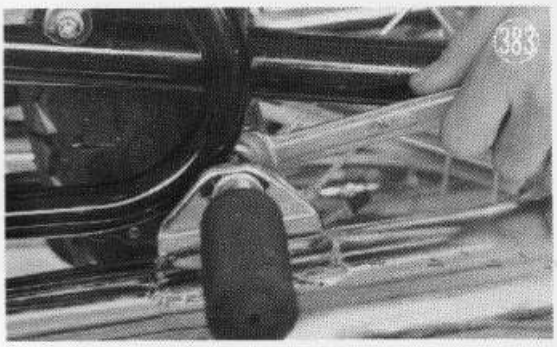




b. Muffler

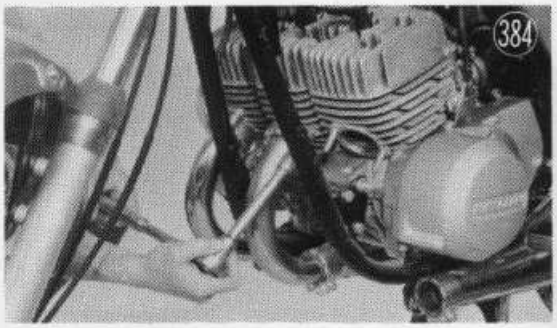
To remove the muffler alone, loosen the clamp at the exhaust pipe connection, take out the front and rear mounting bolts (rear bolt is the foot rest), and remove the muffler.





c. Exhaust Pipe

To remove the exhaust pipe alone, first loosen the muffler mountings and the clamp at the muffler/pipe connection. Then remove the exhaust pipe mounting nuts and pull off the pipe.

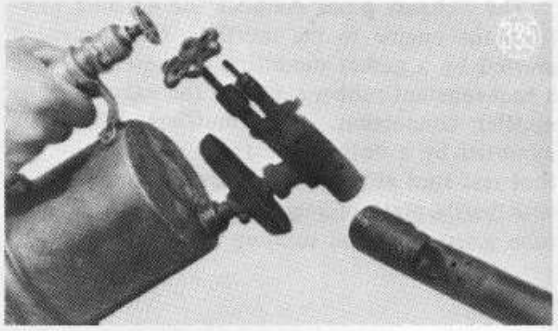


3) Inspection

a. Carbon build-up inside the exhaust pipe and muffler reduces exhaust efficiency and lowers engine output power.

(1) Remove carbon from the baffle tube with a wire brush. If the carbon is too thick to remove properly with the brush, burn it off with a torch or by setting the tube in a fire. After burning, the carbon will come off by striking the tube gently.

(2) To remove carbon from the exhaust pipe, use a long screwdriver to scrape it out, or run a chain through the pipe.



b. Check the rubber muffler connector sleeve and if it is hard, cracked or has deteriorated, replace it to avert exhaust leakage.

c. Replace the exhaust pipe if it is cracked, or if the surface that mounts to the cylinder is bent or damaged.

4) Assembly

Assembly is the reverse of disassembly.

NOTE: When the exhaust pipes are removed for inspection, repair, etc., it is recommended that the gasket at the cylinder end be replaced to prevent any possible exhaust gas leakage.

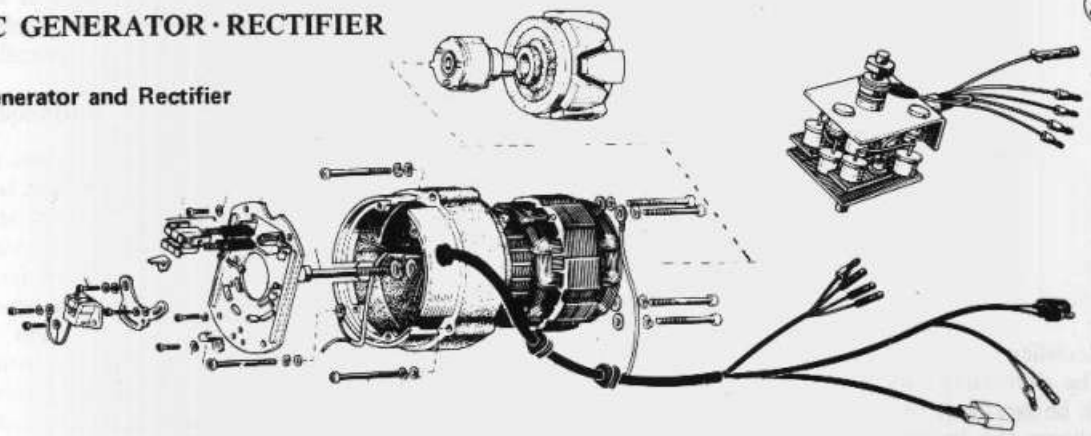
V-a H1 Electrical System

[H2 information begins on page 113.]

1. AC GENERATOR · RECTIFIER

H1 Generator and Rectifier

386

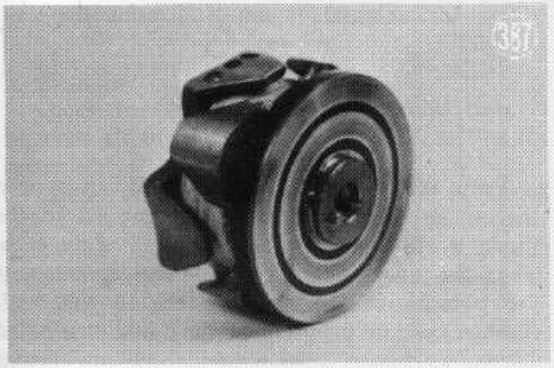


1) Construction and Operation

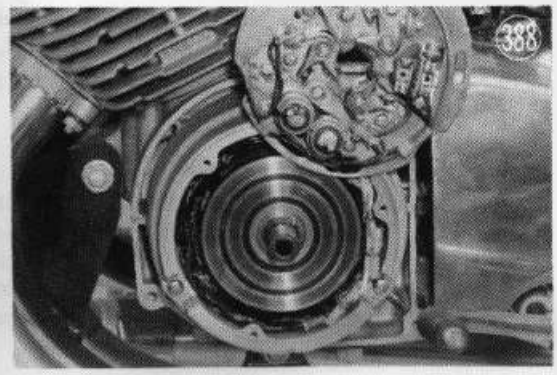
In the H1 an AC generator supplies all power for the ignition, lighting, charging circuits, etc. This AC generator differs from a DC generator in that it requires a rectifier, but its merit lies in its small size, light weight, and lack of parts liable to failure. In this generator, a magnetic field rotates inside the armature windings, and as the field cuts through the windings it induces voltage in them.

a. Field

The H1 generator has an electromagnetic field, and current to magnetize it is brought to the coils by two brushes which ride on the rotor's slip rings. When starting the engine and during periods of low engine rotation, field current is supplied by the battery. But when generator rotation increases and generated voltage exceeds battery voltage, the generator supplies its own field current (self-excitation method).



387

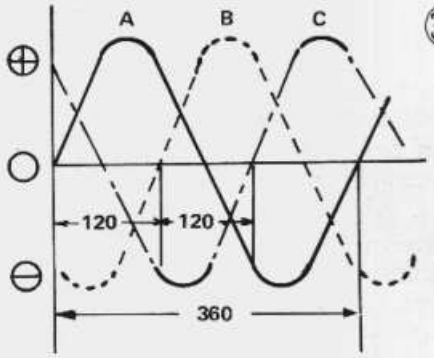


388

b. Armature

The armature, which is constructed as part of the generator housing, consists of three sets of coils wound on laminated cores. Each of the three coils, and therefore each phase of the three-phase generator output, is set 120° ahead of the next, and the relationship of the three waveform resultants is illustrated in Fig. 399.

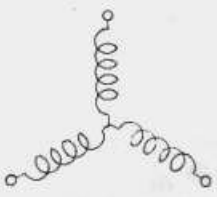
389



The three windings are "wye" connected for greater voltage output.

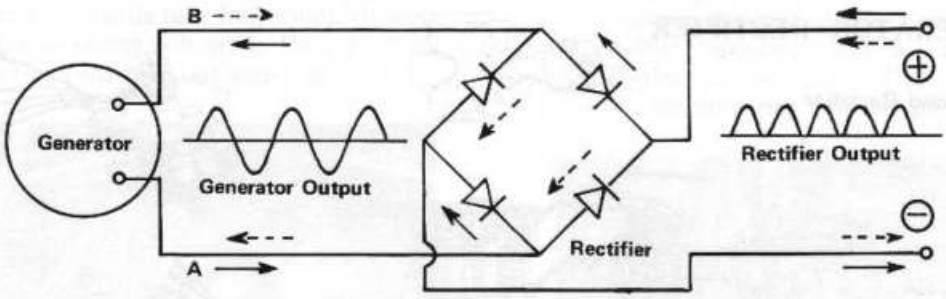
Wye Connected Armature

390



Full-wave Rectification

391



c. Rectifier

The alternating current output of the generator must be rectified, i.e. changed to direct current, to charge the battery and supply field current. Fig. 391 is a simplified diagram of the circuit used for efficient full-wave rectification (rectification of both positive and negative halves of the AC generator output. Only one of the three phases is shown in the diagram, but with slightly additional wiring, all three phases can be rectified with this circuit.

The diodes used (four shown here) conduct current in only one direction, and the two different current paths for the first and second halves of each cycle are shown in Fig. 391. The A arrows indicate current flow during the first half of the cycle when the top generator lead is + and the bottom lead is −; the B arrows show current flow for the other half cycle.

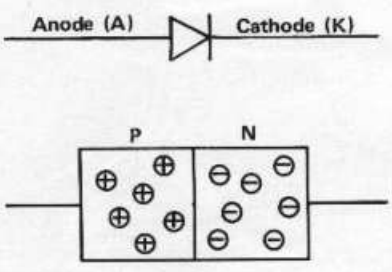
The diodes are manufactured by fitting together two pieces of silicon material. Each of the two pieces is impregnated with a different type of impurity, so that one piece always has a surplus of electrons (the N, or negative piece), and the other has a constant shortage of electrons (the P, or positive piece).

When a voltage is applied to the diode in the direction of the battery in Fig. 393, the surplus, or free, electrons are repelled by the negative voltage and attracted toward the positive voltage, and current flows.

In Figure 394 the voltage source is connected in the reverse direction, but since there are no free electrons in the P material to flow in the reverse direction, no current flows.

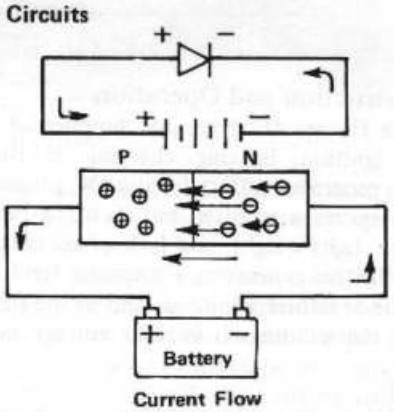
Diode

392



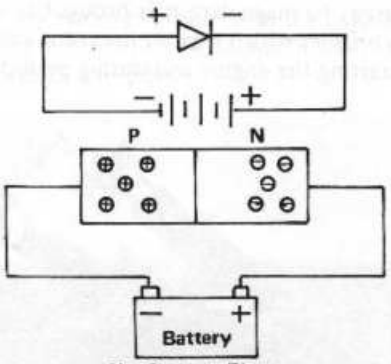
Diode Circuits

393



Current Flow

394



No Current Flow

From the preceding explanation it can be seen that if an alternating current is applied to the diode, it will conduct only on the half of the cycle when the polarity of the voltage corresponds with the polarity of the diode. Due to this half-conduction-only property of the diode, it is called a "semiconductor", and is used to change current flowing in both directions (AC) to single-directional current (DC). Other examples of semiconductors are transistors and thyristors, which are made from three or four pieces of a different type of semiconductor material.

NOTE:

1. Excessive heat or current in a semiconductor will cause it to break down, and current will then flow through it in either direction. Once a semiconductor has broken down it will not return to its former semiconductor state, and must be replaced.

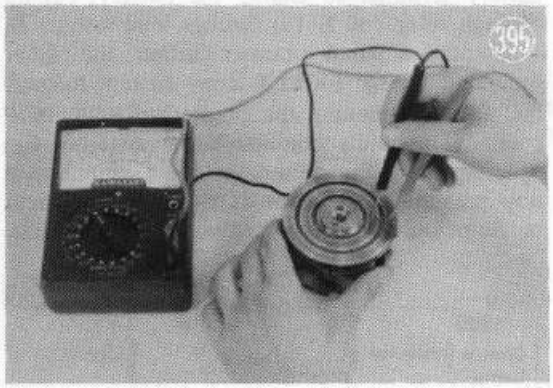
2. When testing diodes or other semiconductors, a very small amount of current may be noted in the reverse direction. This is leakage current and does not usually indicate that the diode is defective.

2) Inspection

To completely test the generator and rectifier, various equipment is required; the tests given here include only those practical with a hand tester, and are usually sufficient for the purpose.

a. Field Windings

As demonstrated in Fig. 395, touch the tester leads one to each slip ring to measure the resistance of the field windings. A resistance of between 3.5 and 5.5 Ω is standard. Less than 3.5 Ω indicates a short somewhere in the windings; no reading indicates an open circuit (a wire in the windings is broken).

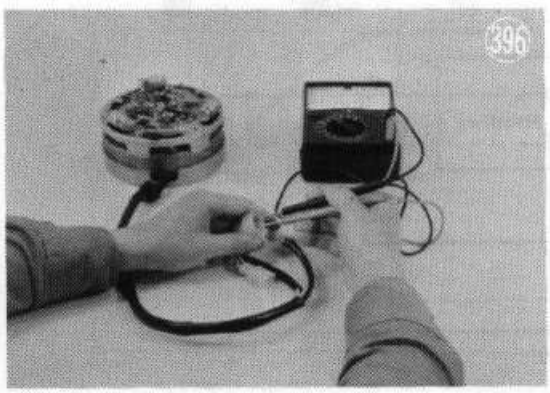


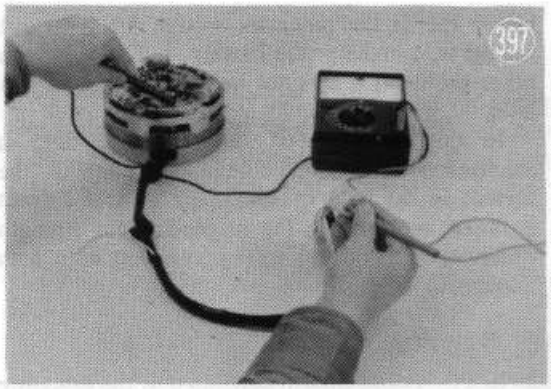
Although the carbon brushes in this AC generator last much longer than those in a DC generator, they should be checked periodically for wear. If the brushes are worn down more than 1/3 (2/3 remaining), they should be replaced. The length of a new brush is 14 mm (9/16 in.)

b. Armature

Check for continuity – i.e. current flow – between all three of the yellow leads, setting the tester leads to two wires at a time.

Check that none of these leads is grounded out to the generator housing by touching one tester lead to the housing and the other to each lead. The ohmmeter should give no reading at all.



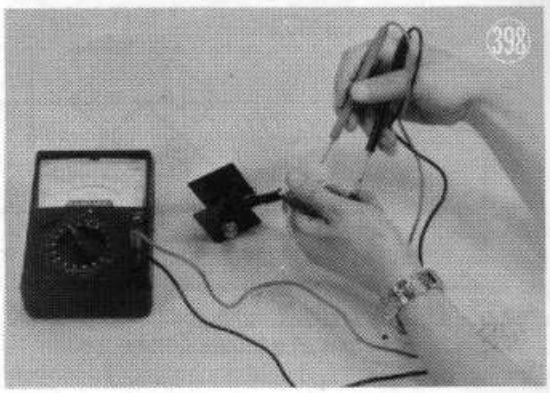


c. Rectifier

The rectifier assembly has three yellow leads, one red, one black and one blue lead, a total of six leads.

Use an ohmmeter as in Fig. 398 and check for continuity in the direction of the arrows only. If there is no continuity, or if there is low resistance in both directions, the rectifier is defective. Where "Yellow" is indicated, three checks must be made each time, one for each yellow wire.

+ Meter leads –
Yellow → Black
Blue → Black
Red → Black
Blue → Yellow
Red → Yellow



NOTE: In many ohmmeters (multi-testers) the batteries in the tester are reversed so that the negative lead is actually the positive side of the batteries inside. If this is not the case with your meter, the direction of current flow will appear to be opposite that shown in the table.

2. VOLTAGE REGULATOR

1) General

As generator speed increases with engine speed, the magnetic field cuts through the armature windings faster, and generated voltage increases. In the H1 this increased voltage supplies field current, so the magnetic field becomes stronger and raises voltage even more. If follows that at

higher speeds the generator voltage will burn out the lights, overcharge the battery, and raise various other problems if it is not held down to a certain level.

In the H1 with its electromagnetic field, a mechanical contact type regulator controls the current in the field windings, and as field current is raised or lowered, the magnetic field strength varies, keeping output voltage constant even with changes in speed.

2) Operation

In the H1 the current generated in the armature is regulated by limiting the exciter current flow in the rotor field windings with a mechanical contact-type regulator.

Figure 399 is a diagram of the circuit including the regulator. The generated voltage causes current to flow in the relay coil B, magnetizing its iron core. Depending on the amount of this current flow, movable contact C_c is pulled by the magnet away from fixed contact C_1 and toward C_2, changing the resistance in the field current path and thereby regulating armature voltage.

(1) Low Speed

During periods of slow engine rotation when the generator voltage is lower than the battery terminal voltage, no current flows from the generator to the regulator or the field windings. Instead, field current is supplied by the battery, flowing from the battery negative terminal through ground, up through the field coils, and via contacts C_0 and C_1 and resistor A back to the battery. A small amount of current also flows from the battery through relay coil B, but not enough to move relay contact C_0.

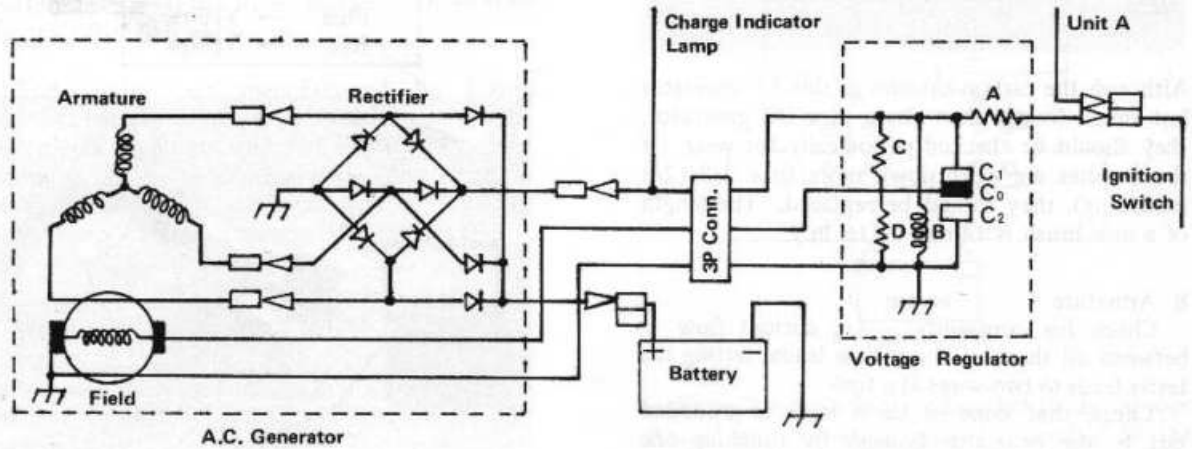
(2) Medium speed

As engine speed increases, there is a corresponding increase in generator rotation and the generator terminal voltage rises above that of the battery. Battery current stops flowing through the field coil and is replaced by generator current. Generator current also flows (a) into the negative battery terminal to charge the battery; (b) up through relay coil B; (c) through load resistor D.

If rotation speed increases further, the higher generated voltage forces a larger current through coil B, strengthening the magnetism of the coil core. This pulls contact C_0 away from C_1, opening the field current path. Field current must now pass through resistor C, causing field current to drop and thus generated voltage to decrease.

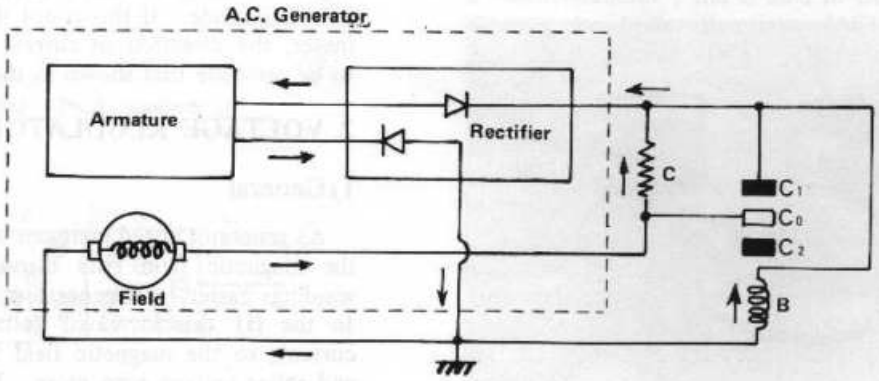
Low Speed

399



Medium Speed

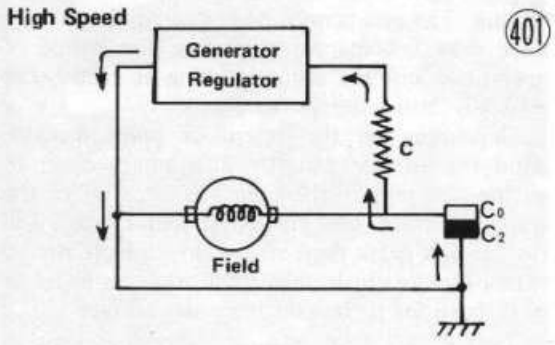
400



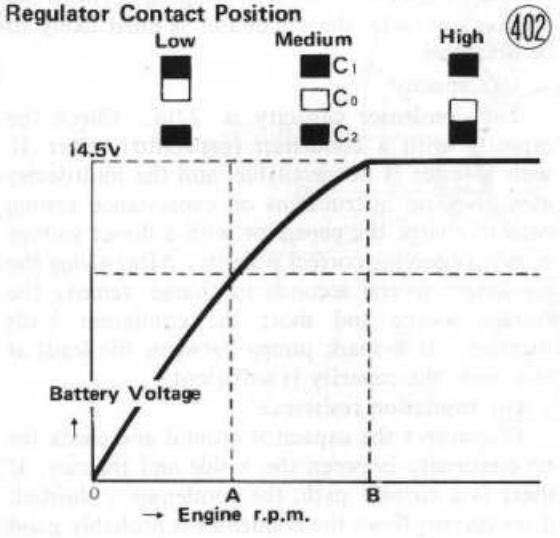
(3) High speed

When rpm increases to the point where generator voltage exceeds 14.5 volts, the increased current through relay coil B magnetizes the coil core enough to pull contact C_0 against C_2. This places a direct short across the field coil and current flows through C_2 and C_0, bypassing the coil. With this sudden loss of field current, there is a corresponding sudden drop in armature voltage, since the armature windings no longer have a magnetic field to cut through.

As soon as the voltage drops below 14.5 volts, current through coil B lowers enough to allow contact C_0 to pull away from C_2. This now lets field current start flowing again, and if high speed continues, the whole operation is repeated again and again. Movement of contact C_0 is fast enough so that for all practical purposes, the generator output voltage is a steady 14.5 volts at high speed.

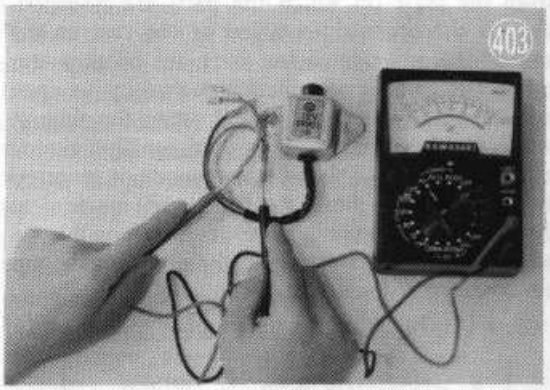


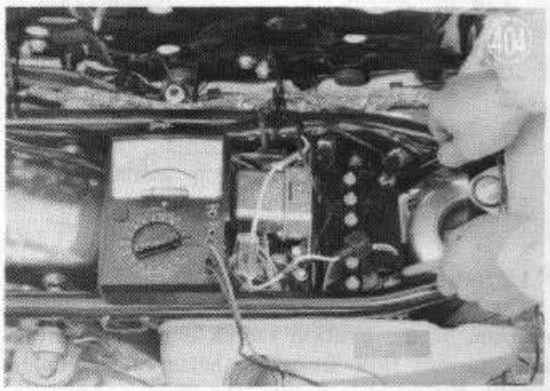
The graph in Fig. 402 shows the relationship among engine speed, generator voltage, and the position of the movable relay contact.



3) Inspection

(1) Measure the resistance between the battery lead (brown) and ground (black lead). A good regulator will read between 53 and 55Ω. A lower reading may indicate a short in coil B.





(2) Since this is a non-disassembly part, check the contact setting under actual circuit conditions by measuring regulated output voltage. Connect a voltmeter between the battery lead and ground, and raise engine rotation to 5,000 rpm. If output voltage is 14–15 volts, the regulator is good. A higher or lower reading indicates the regulator is defective and should be replaced.

NOTE: Check the generator before replacing a supposedly defective regulator.

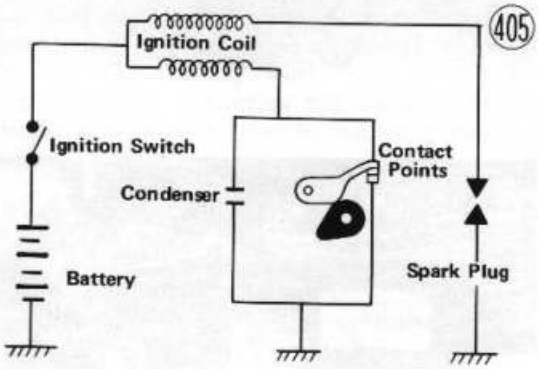
3. IGNITION SYSTEM

This system supplies the spark to ignite the gasoline mixture that is drawn into each cylinder. To enable efficient use of the exploding gas, the ignition system must supply a strong enough spark at the correct moment.

1) Contact Breaker Type Ignition

a. Construction

As the diagram shows, this ignition system consists mainly of the breaker arm, breaker cam, points, spring and condenser. The rubbing end of the breaker arm is formed from bakelite, electrically insulating the points on the other end of it, from the plate on which the parts are mounted. Due to the eccentric rotation of the cam on the end of the generator rotor shaft, the breaker arm riding the cam is periodically pushed up to open and close the contacts. By adjusting the time at which the breaker arm is pushed, ignition timing can be changed. The points are made of tungsten steel, which has both electrical and mechanical durability. However, since it is impossible to completely avoid wearing of the points, they too are designed to be adjustable.



b. Operation

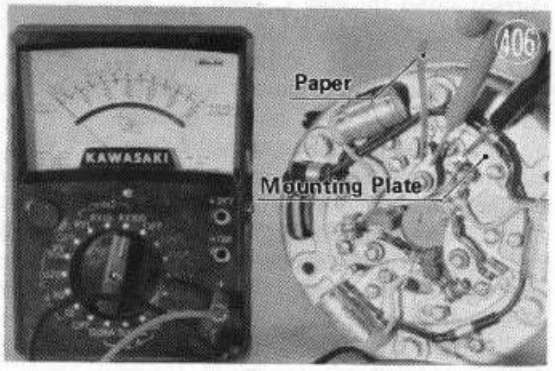
The contact points in Fig. 405 are in the closed position. If the ignition switch is closed at this time, current flow from the battery is through ground, the breaker points, the primary winding of the ignition coil, and via the switch back to the battery.

Current through the primary winding of the coil creates a magnetic field, strengthened by the iron core. As the generator rotor turns, the breaker cam rotating with it pushes against the breaker arm and opens the contacts, suddenly cutting off current through the primary winding. The magnetic field then collapses, and as a result of the high turns ratio between the secondary and primary ignition coil windings, an extremely high voltage is induced in the secondary winding. This high voltage is introduced to the spark plug via the plug cable, and causes a spark to jump across the spark plug point gap and ignite the gasoline mixture in the combustion chamber.

Besides the voltage induced in the secondary winding, self-induction also causes current to continue to flow in the primary winding even after the contacts have opened. This current builds up to a pressure of several hundred volts which, without the condenser, would jump across the breaker contacts and gradually burn them away. To avoid this, a condenser is connected in parallel with the contacts, and the self-induced current charges the condenser instead of sparking at the contacts.

c. Inspection

(1) Check that the breaker arm is insulated from the mounting plate when the points are open. If the breaker arm is not insulated due to poor mounting or damage, it will not be possible to interrupt primary current to produce the spark.



(2) Check the contact points for wear or fouling. The points must be inspected periodically since they become worn after a long period of operation, and the slight sparking at each break gradually burns the surface.

Depending on the extent of point damage, grind the surface smooth with emery cloth or oilstone, or replace the points as set. Oil on the contact surface will prevent proper contact and the ignition spark may be lost, so wipe off any oil with paper or cloth, taking care that no paper or cloth particles remain on the point surface.

The contact point gap, and therefore ignition timing, change due to point wear or grinding down, and must be adjusted. For gap adjustment procedure, see the paragraph on ignition timing adjustment.

(3) Condenser

When the condenser can or the internal insulation deteriorates or becomes punctured, the ignition spark may become weakened or the contacts might not break electrically. If a long blue-white spark can be seen jumping between the breaker contacts, the condenser is most likely to be defective.

(i) Capacity

The condenser capacity is .22μf. Check the capacity with a condenser (capacitor) tester. If such a tester is not available, and the multitester used gives no instructions on capacitance testing with it, charge the capacitor with a direct voltage source, observing correct polarity. After giving the condenser several seconds to charge, remove the voltage source and short the condenser leads together. If a spark jumps between the leads at this time, the capacity is sufficient.

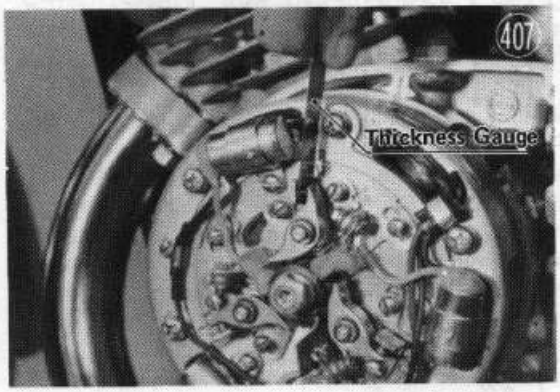
(ii) Insulation resistance

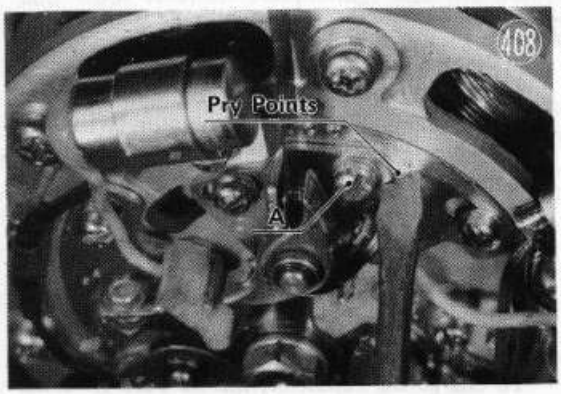
Disconnect the capacitor ground and check for no continuity between the + side and the can. If there is a current path, the condenser is shorted, if no current flows the condenser is probably good.

d. Ignition Timing Adjustment

(1) Point gap

First use a thickness gauge to see if the maximum contact opening for each of the three sets of contacts, is between .012″ and .016″ (0.3-0.4 mm). If the gap is incorrect, loosen screw A and adjust the gap to that value, as illustrated in Fig. 408.





(2) Ignition timing

*Remove the spark plug from the left cylinder and mount a dial gauge in its place.

*Set the left cylinder piston at .1358 inch before top dead center (3.45 mm or 25°). For disc brake H1's, the setting is 20° (.0878″ or 2.23 mm) BTDC.

*Loosen the stator base plate mounting screws A.

*Connect an ohmmeter between ground and the left cylinder contact wire B.

*Insert the blade of a screwdriver into pry points C and move the stator base plate to that the contacts D are just at the point of opening (i.e. where the ohmmeter needle just flicks back to ∞).

*Tighten the mounting screws.

*Align the pointer E with the Ⓛ mark on the rotor by moving the pointer only. Do not turn the rotor.

*Turn the rotor to align the Ⓡ mark with the pointer.

*Connect the ohmmeter across points F in the same manner as above.

*Loosen screws G and set timing with a screwdriver inserted in slots H prying them against the screw.

*Tighten the screws.

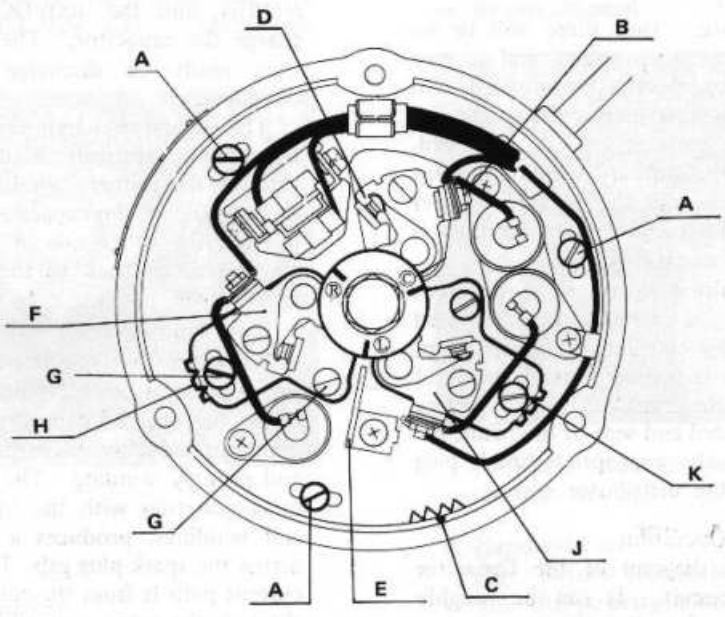
*Turn the rotor to align mark Ⓒ with the pointer and adjust the center cylinder timing using points J and a screwdriver in pry points K.

*Set spark plug gap to .020 in. (.5 mm).

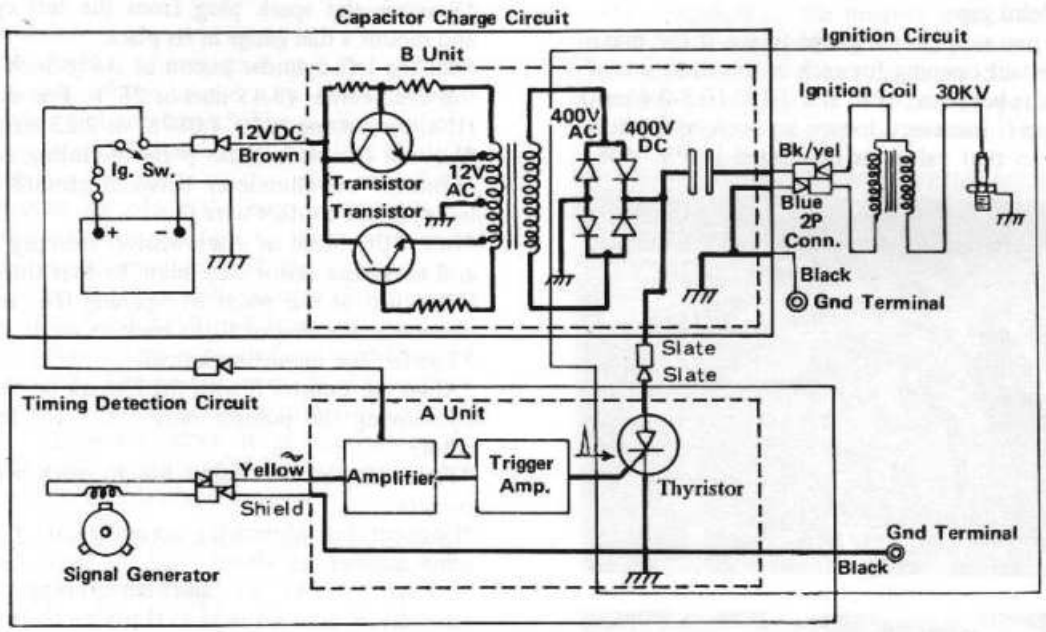
NOTE: During periodic inspection of ignition timing, apply a good quality grease to the felt. Use the grease sparingly, as excessive grease will be thrown off the cam onto the points, causing burning and pitting.

409

H1 Stator (without CDI)



Capacitor Discharge Ignition System



2) Capacitor Discharge Ignition

a. General

The Capacitor (or Condenser) Discharge Ignition, the CDI, is different in several respects from the contact-type ignition. With the contact breaker ignition, the ignition spark is produced from the high voltage induced in the secondary winding of ignition coil when primary winding current is suddenly interrupted. With the CDI a thyristor is used in place of the contact breaker points. When the thyristor is gated with a signal sent from the signal generator rotor, the thyristor suddenly conducts and sends a pulse to the primary circuit. From then on action is similar to the mechanical ignition in that a high voltage is induced in the coil secondary winding and the ignition spark results.

It can be seen then, that there will be no trouble with fouled or worn points, and no way for ignition timing to become maladjusted. In this manner misfiring, low spark voltage, etc. are avoided, and stable ignition can be achieved. Furthermore, since the primary winding current is cut in and out electrically, the rise time is faster and a stronger voltage and better ignition is provided by the secondary winding.

To send the ignition spark to a different cylinder each time, a distributor is located between the secondary coil and the spark plugs. The rotor distributor is turned through gear and shaft connection to the crankshaft, so that every time a spark is produced and sent to the rotor, the rotor is pointing to the appropriate spark plug wire connection in the distributor cap.

b. Construction and Operation

Figure 410 is a diagram of the Capacitor Discharge Ignition circuit. It can be roughly divided into the timing detection circuit, capacitor charge circuit, and the actual ignition spark producing circuit.

(1) Ignition timing detection

Ignition timing is determined by a voltage signal produced by the signal generator. When the magnet projections on the signal generator rotor pass the pickup coil as they rotate, each magnetic field cuts through the coil windings and induces a voltage in them. This voltage is sent to the A Unit, amplified, the waveform shaped by the trigger amplifier, and the resultant sent to trigger, or gate, the thyristor.

(2) Capacitor Charge Circuit

To charge the capacitor, the 12 VDC from the battery is changed to 400VDC in the DC-DC Converter. To accomplish this, the 12 volts direct current is first changed to AC by a two-transistor oscillator, the AC is stepped up to 400 volts by a transformer, changed back to DC by a full wave rectifier, and the 400VDC resultant is used to charge the capacitor. The charged capacitor is then ready to discharge when the thyristor conducts.

The capacitor charging current path is from the transformer through a diode to ground, up through the primary winding of the ignition coil to one side of the capacitor; and the return path is from the other side of the capacitor through another diode back to the opposite side of the transformer.

(3) Ignition

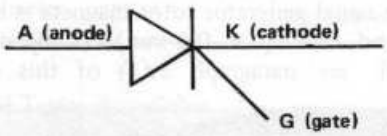
When the thyristor is triggered, i.e. receives a gating pulse, it conducts and acts as a short circuit across the charged capacitor. Consequently, the capacitor suddenly discharges through the ignition coil primary winding. The fast rate of discharge in conjunction with the high turns ratio of the coil windings, produces a 30KV ignition spark across the spark plug gap. The capacitor discharge current path is from the coil side of the capacitor, through the primary winding to ground, and up through the thyristor back to the other side of the capacitor.

(4) Thyristor

The thyristor is made of four pieces of semiconductor material (see page102for an explanation of semiconductors). Current will flow from the cathode to anode but will not flow in the reverse direction. The thyristor differs from a diode in two respects: (a) even though a voltage of the correct polarity – negative to cathode – may be applied, the thyristor will not conduct until a signal is received at the gate input load; (b) once started, it will not stop conducting (even if the gate lead signal voltage stops) until the anode to cathode voltage is removed or reversed.

In the H1 CDI capacitor discharge circuit not only does the capacitor discharge to zero, but self-induction in the coil primary (roughly equivalent to inertia of the moving current) causes current to continue flowing until the capacitor charges to more than 400 volts in the opposite direction. When the reverse charge reaches its peak and stops, the charge puts a reverse voltage on the thyristor and stops it from conducting, and the normal charge cycle begins again.

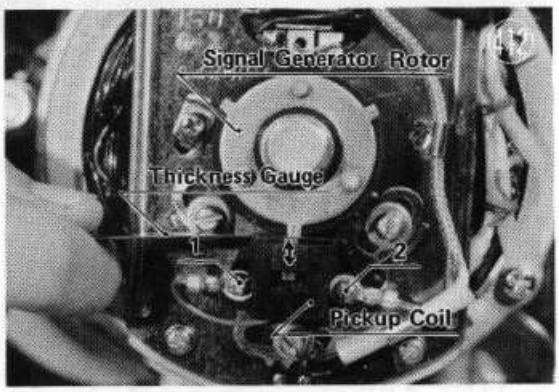
Thyristor (411)



c. Adjustment

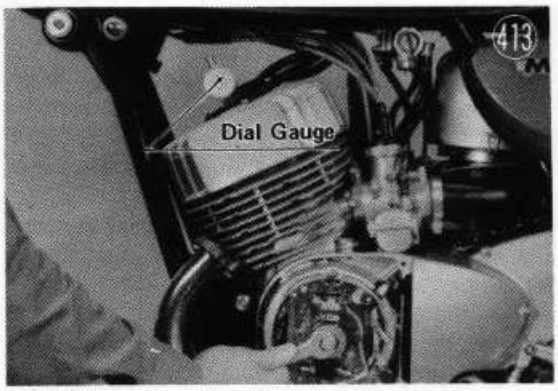
(1) Gap adjustment

Loosen the two pickup coil mounting screws① and②. Move the coil so that all three of the magnet projections from the signal generator rotor are between .016″ and .024″ (0.4–0.6 mm)from the coil.

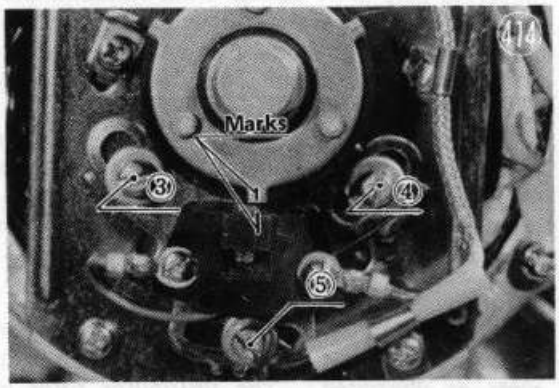


(2) Timing adjustment

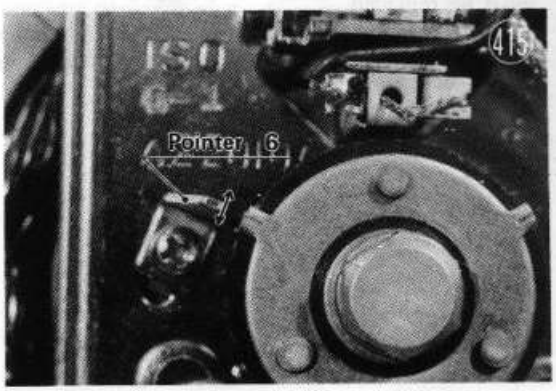
(i) Using an adapter (special tool) to mount a dial gauge in the spark plug hole, set the piston at .1358″ (3.45mm, or 25°) BTDC.



(ii) In this position, loosen the three pickup coil base plate mounting screws③④⑤. Align the mark on the SG magnet projection with the mark on top of the pickup coil housing, and tighten the screws back down.



(iii) Align pointer⑥with the next mark on the rotor, and turn the rotor to check that any two points will coincide with the pickup mark and the pointer, respectively. Once the pointer is set correctly, it can be used as a reference mark to restore timing any time the pickup coil is removed or the gap adjusted.



(iv) Last, ascertain that the pickup coil/magnet gap has not changed.

d. Handling Care

(1) Before connecting the battery leads, be certain the polarity is correct. If the battery is installed backwards, the moment the key is turned on, the CDI and the rectifiers will suffer damage, and general wiring damage may also result.

(2) Avoid connecting or disconnecting the battery while the engine is running or any time the key is turned on. Current surges may damage semiconductor components and burn out the rectifier diodes. Running with the rectifier in this condition will cause the battery to completely discharge.

(3) Be especially careful of the wiring between the A and B ignition units. Wrong wiring, voltage leaks, partial contact only, etc., will not only reduce the capability of the units, but may cause them to break down. If the black ground wires are not properly connected, no spark will be produced.

(4) To maintain high performance, the battery and ignition coil should be replaced with standard parts only.

(5) The A and B units are cushioned with rubber to help avert damage from vibration and shock. When replacing the units, be sure to replace these shock mountings with the standard parts in the correct places. To further increase the ability of the delicate parts to withstand shock, all internal wiring and parts are held in place with epoxy, and attempts should be not made to disassemble these units. If disassembly is undertaken during the warranty period, no claim on these parts will be considered.

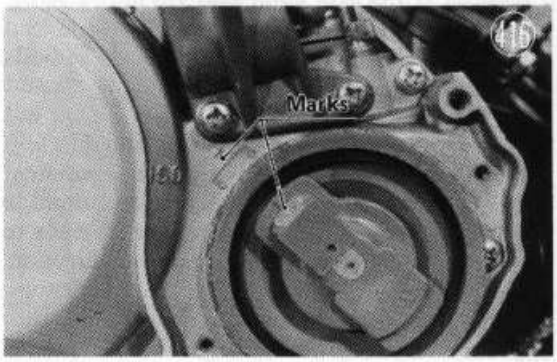
e. Inspection · Testing

(1) Distributor

The distributor is mounted on top of the right cover as illustrated. The distributor rotor is turned by the crankshaft distributor pinion, which meshes with the gear on the distributor shaft. Only the best insulation in good condition can be used to contain the 30KV present in the distributor and high voltage cable. Therefore if the cables or distributor cap are nicked or otherwise damaged and weakened, tape, etc., will not serve as a corrective measure. The damaged part must be replaced.

Whenever the spark to only a single cylinder is weak or nonexistent, the trouble can usually be traced to the area between the distributor and plug. Inspect the insulation minutely to determine the cause.

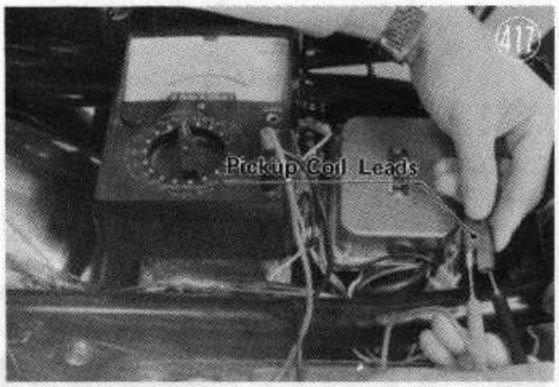
NOTE: When assembling the right cover, the distributor timing must be set as shown in Fig. 416. The rotor alignment mark should coincide with the timing mark, falling as close to its center possible. For more detailed timing information see page 26.



(2) Pickup coil

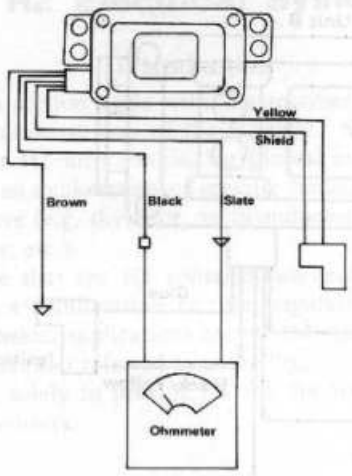
Touch the tester leads to the pickup coil leads at the connector and measure coil resistance. Standard resistance is 280 – 420 Ω.

Check that the gap between the pickup coil and the signal generator rotor magnets is between .016" and .024" (0.4–0.6 mm). If adjustment is required, see paragraph c.(1) of this section.



CDI Test

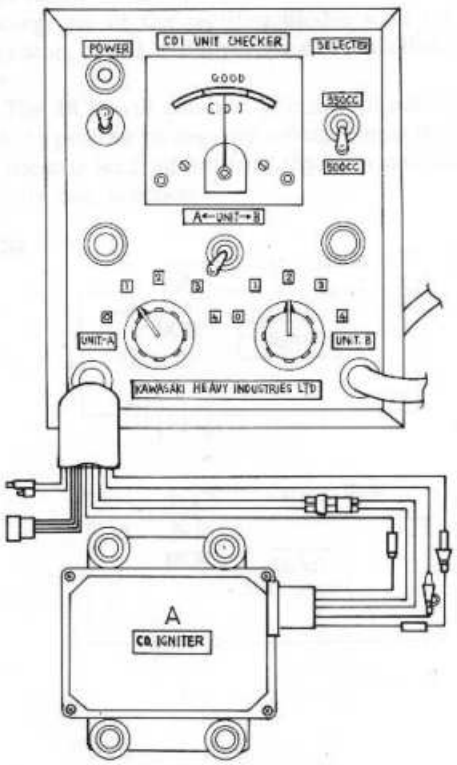
Unit A



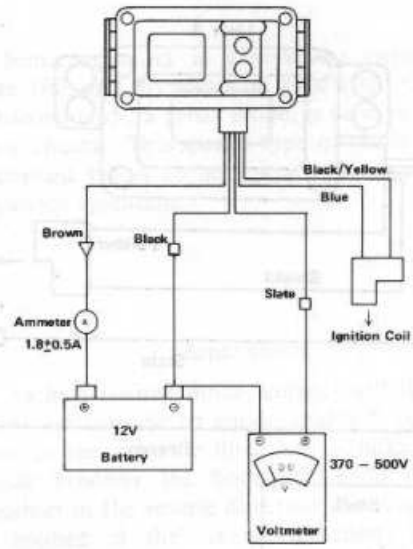
Connection	Reading
Black lead to meter +, gray lead to –	Infinity (No current flow)
Black to meter -, gray to +	Infinity (No current flow)

If a CDI Tester is available:

Connect Unit A to the tester as shown in the diagram and turn the Unit A dial from 1 to 4. Normal meter reading is within the green area for all positions. Position one is a line voltage check only, and does not indicate the condition of the A Unit.



Unit B

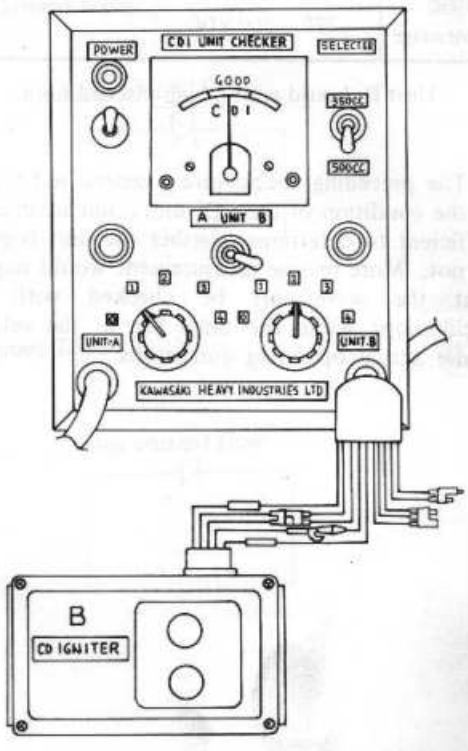


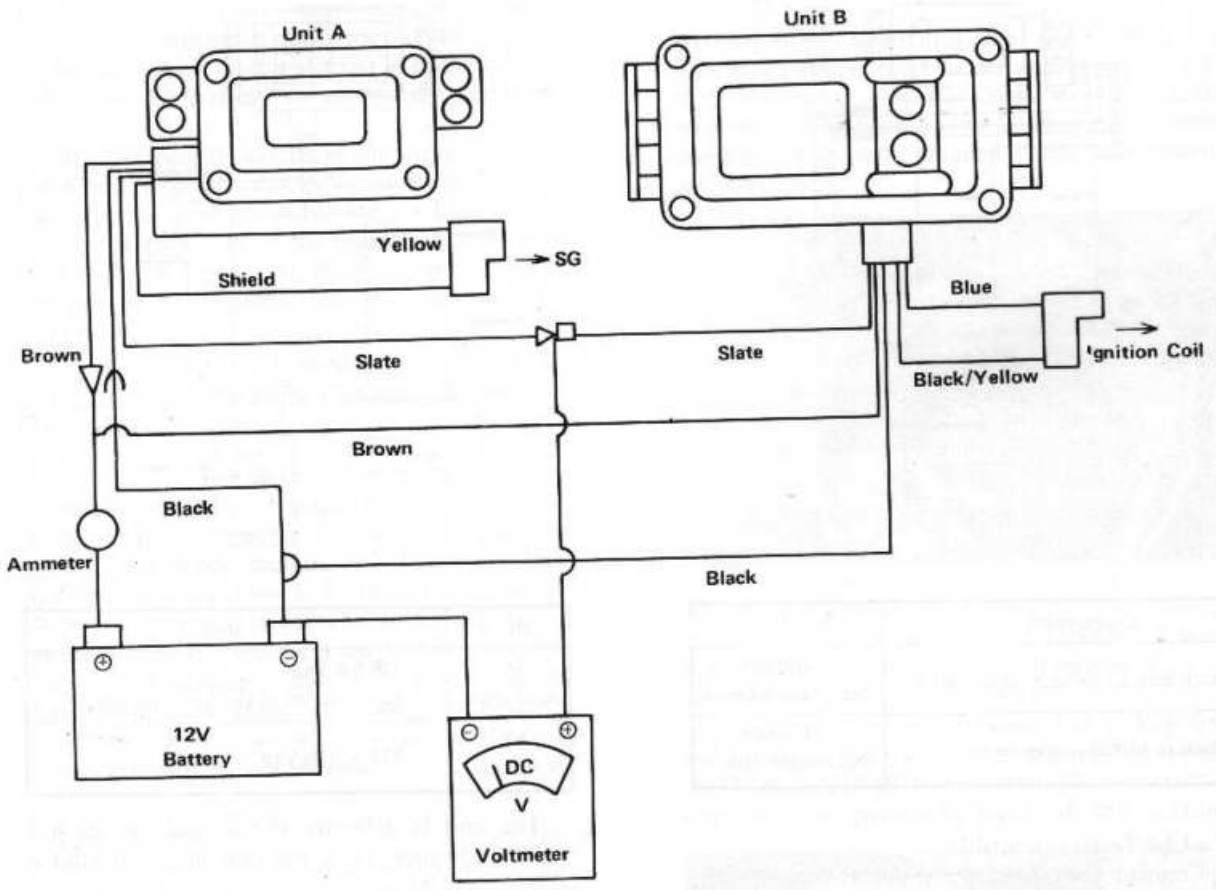
Meter	Reading
DC Ammeter	1.8 ± 0.5A no ocillation of the ammeter needle
DC Voltmeter	370 – 500 VDC

The unit is defective if the readings are not within tolerance, or if the unit does not emit a high-pitched hum.

If a CDI Tester is available:

Connect Unit B to the tester as illustrated, and turn the Unit B dial from 1 to 4. Normal reading is within the green area. Position 1 checks line voltage only.





Meter	Reading
DC Ammeter	2.0 ± o.5A with no meter needle oscillation
DC Voltmeter	370 – 500 VDC

Unit B should emit a high-pitched hum.

The preceding checks give a general indication of the condition of the CDI units, and are usually sufficient to determine whether the unit is good or not. More precise measurement would require that the waveforms be checked with an oscilloscope while the units are in the vehicle under actual operating conditions.

V-b H2 Electrical System

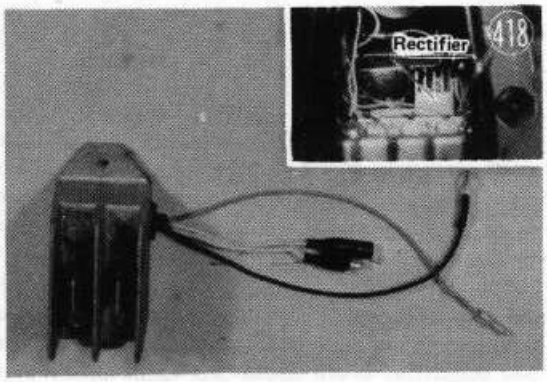
Introduction

This section deals with the rectifier, regulator and ignition system of the H2 only. See Section V-a for H1 information, for general information, or for an explanation of specific terms not explained here (e.g. thyristor, semiconductor, full-wave rectifier, etc.).

Note that the H2 contains two rectifier units. One is a combination rectifier/regulator used for all electrical applications except the ignition. The other rectifier referred to as the "ignition rectifier" is used solely to provide DC for the Magneto CDI ignition units.

1. RECTIFIER & VOLTAGE REGULATOR

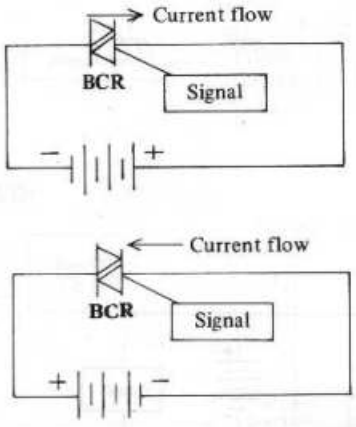
The H2 rectifier unit (Figure 418) performs the dual functions of current rectification and voltage



regulation. This has been made possible by replacing one of the rectifier diodes with a special thyristor, called a Bidirectional Controlled Rectifier.

The BCR will conduct in either direction after either a positive or negative voltage signal is applied to the gate lead; an ordinary thyristor will conduct in only one direction.

BCR (419)

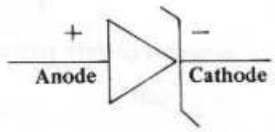


Semiconductors in general are explained on page 102, and thyristors on page 109. One other semiconductor, a zener diode, is used in the regulator circuit. This special type of diode is briefly explained below to help you understand the H2 regulator operation.

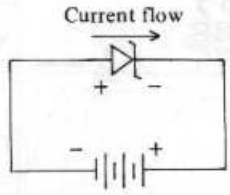
Zener Diode

As in a normal diode, current will flow easily from the cathode to anode, and will not usually flow in the opposite direction. Unlike a normal diode, however, the diode will "break down", or conduct in the reverse direction, if enough voltage is applied in the reverse direction; when the voltage is lowered or removed, the diode will stop conducting and return to its normal state. The voltage at which the diode begins reverse conduction, is called the breakdown voltage, and can be set at the desired level when the diode is manufactured. This property of the zener diode makes it very useful in voltage regulator circuits.

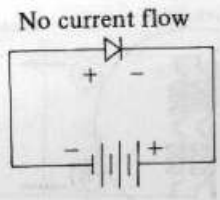
Zener Diode (420)



ZD Current Flow (421)



Ordinary Diode (422)



Operation

a. Rectification

When the Ⓐ generator lead is - and Ⓑ is +, current flows from Ⓐ through D_1 to ground, up through the battery to charge it and up through the load circuits, through D_2 and back to the generator at Ⓑ.

When Ⓑ is - and Ⓐ is +, the positive voltage is felt at the gate of the BCR through R_3 and D_3. (A small gate current flows from Ⓑ → BCR → BCR gate lead → D_3 → R_3 → Ⓐ.) This starts the BCR thyristor conducting and current from Ⓑ goes through the BCR to ground, the battery and load, and Via D_4 back to Ⓐ.

b. Regulation

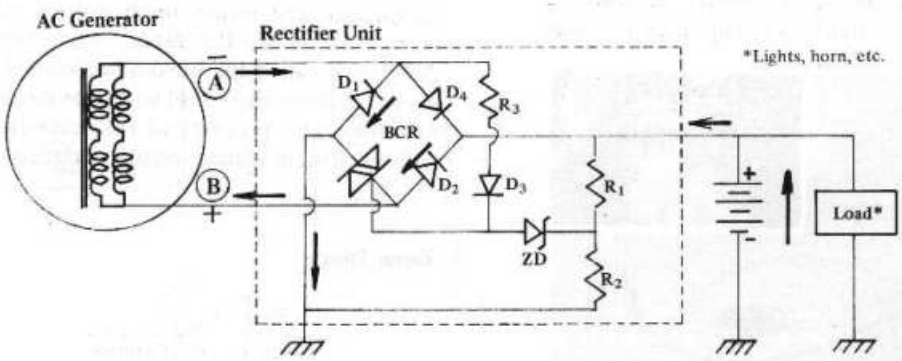
Voltage regulation at high speed occurs only on the half cycle when the generator Ⓐ lead is negative and the Ⓑ lead is positive. As the sine wave voltage rises from zero, current starts out normally through D_1, the load, and back through D_2. A small amount of current also flows through R_2 and R_1.

When 15 volts is reached, a portion of this voltage at the junction of R_1 and R_2 causes the Zener Diode to break down and gate the BCR. A small gate current* flows through the ZD to start the BCR conducting and current from Ⓐ is returned to the generator at Ⓑ via D_1 and the BCR.

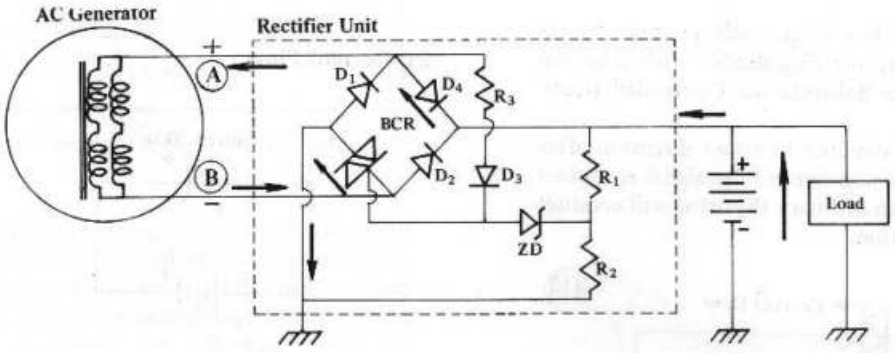
In this manner average voltage is held down to 15 ± .5 volts.

*In the actual circuit the ZD turns on a transistor which gives the thyristor a negative gate from ground.

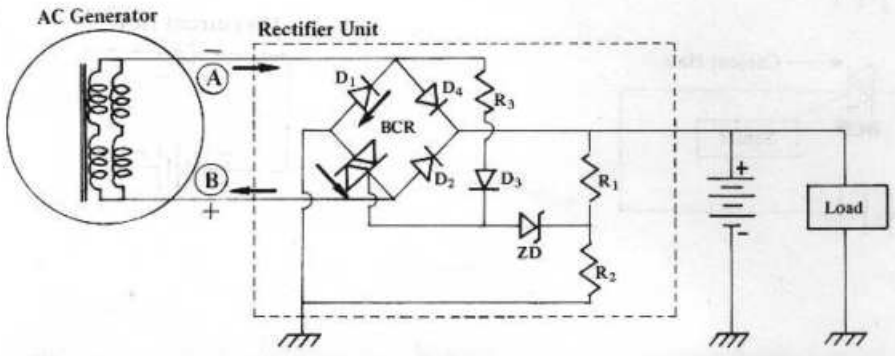
Rectification when A is negative (423)



Rectification when B is negative (424)



Voltage Regulation (425)



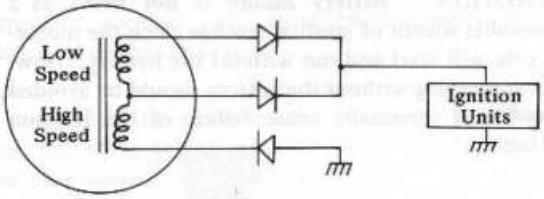
2. IGNITION SYSTEM

The H2 has a Magneto CDI ignition system. This ignition method has been developed for higher performance and greater reliability than other CDI systems.

As shown in Fig. 428-429 both types of CDI ignitions produce the ignition spark as a result of capacitor discharge. But while the CDI takes the low battery voltage and changes it to 370-500 VDC with a converter, the MCDI takes high voltage directly from a special generator winding and rectifies it. The Magneto CDI has another advantage in that it can use the signal generator voltage directly without amplification.

The AC generator contains two high voltage ignition windings. One is used at low speeds, and the other takes over during high speed.

Ignition Windings (426)



AC Generator

The low speed windings have a large number of turns so high voltage can be generated at relatively low r.p.m. When speed rises, however, these windings cannot supply charge current fast enough, so the high speed coil takes over.

At this point, where low speed winding voltage starts dropping, the voltage of the high speed windings rises sufficiently to supply the high capacitor charge voltage. The high speed windings have fewer turns and much lower resistance and consequently do not become loaded down when supplying charge current.

The two coils are matched so that a steady voltage is supplied to the ignition units at all speeds.

Operation

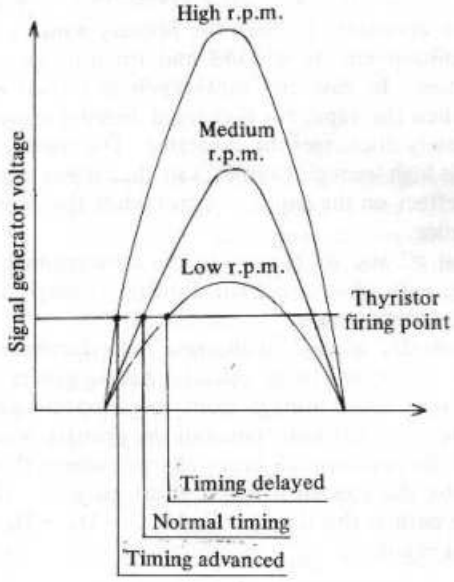
Figure 429 is a simplified diagram of one of the three identical Magneto CDI Units; each unit produces the spark for one cylinder.

Capacitor charge current flows from the rectifier through ground, up through the primary winding of the ignition coil, and charges the capacitor - to + in the direction indicated. When the thyristor receives a signal at the gate lead as sent from the signal generator, it begins to conduct. This completes a current path for capacitor discharge through the ignition coil primary, ground, and up through the thyristor. The sudden discharge in combination with the high turns ratio of the ignition coil, cause a high voltage to be induced in the secondary winding of the coil, and consequently a spark jumps across the spark plug gap.

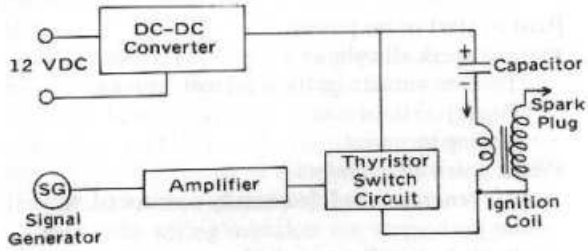
Spark voltage ranges up to 36KV but a minimum of 20KV is always available, more than sufficient to supply the 13 kilovolts necessary to fire the spark plug.

The SSM ignition system also incorporates automatic timing advance. The thyristor is turned on at the same voltage level regardless of engine speed. But as speed increases, the voltage from the signal generator rises faster and the thyristor switch voltage point is reached sooner, thereby advancing ignition timing.

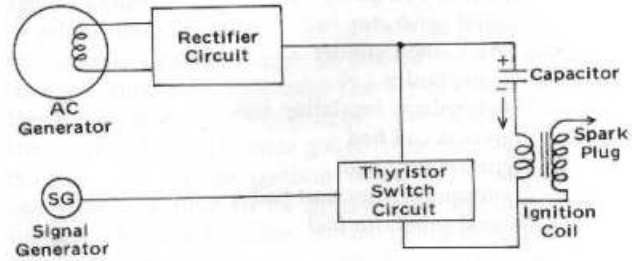
Magneto CDI Timing Advance (427)



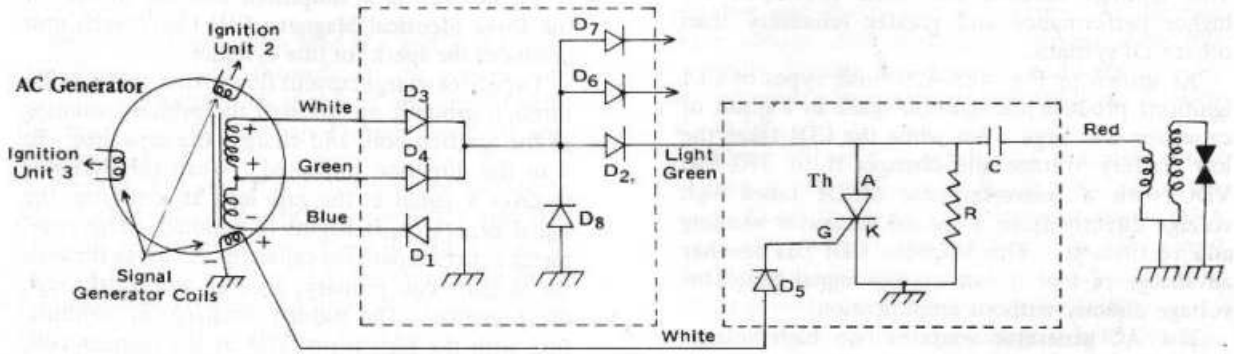
Battery CDI (428)



Magneto CDI (429)



Magneto CD Ignition System (430)



Detailed Operation

When the ignition winding voltage is at the polarity indicated in Fig. 430, capacitor charge current flows through D_1, ground, up through the ignition coil primary, and to the capacitor (C). Return current is from the other side of the capacitor is through D_2 and through either D_3 or D_4 (depending on r.p.m.) back to the generator.

When the signal generator winding is at the indicated polarity, signal voltage is felt at the gate of the thyristor and the thyristor starts conducting to discharge the capacitor. Signal current is from the signal generator winding through ground, from cathode (K) to gate (G) of the thyristor (Th), and via D_5 back to the generator.

After the thyristor starts conducting, the capacitor discharges through the primary winding of the ignition coil to ground and up through the thyristor. In case the motorcycle is turned off just when the capacitor is charged, bleeder resistor (R) slowly discharges the capacitor. The resistance of R is high enough (390KΩ) so that it has negligible effect on the ignition circuit while the engine is running.

Unit #2 and #3 operate in the same manner as above, with charge current flowing through D_6 and D_7 respectively.

Diode D_8 is used to increase the effectiveness of the capacitor charge circuit. As the generator turns and charge voltage from the armature goes back to zero, the inductance of the primary winding of the ignition coil keeps charge current flowing into the capacitor for a short period. The charge path at this time is: Coil → C → D_2 → D_8 → ground → coil.

Troubleshooting

The first step in troubleshooting is to narrow down the failure to the smallest possible area. The following short guide is divided into three main categories, and each category can be broken down by, further testing until the possible trouble area is traced to the defective part. Testing of the Magneto CDI components is explained after the guide.

CAUTION: Battery failure is not listed as a possible source of ignition trouble since the motorcycle will start and run without the battery. However, running without the battery should be avoided as it will eventually cause failure of the Ignition Units.

H2 Ignition Troubleshooting Guide

Engine will not start at all

First pull off the spark plug wires and use a good plug to test the spark for each cylinder.

★Strong spark all cylinders
- ☆Trouble outside ignition system
- ☆Plugs firing in wrong order due to wrong wiring
- ☆Plugs bad

★Weak spark all cylinders
- ☆AC generator bad
- ☆Ignition rectifier unit bad

★No spark any cylinder
- ☆AC generator bad
- ☆Ignition unit bad
- ☆Ignition rectifier unit bad
- ☆Wiring faulty

Hard to start or no power

★Strong spark all cylinders
- ☆Trouble outside ignition system
- ☆Plug(s) dirty or bad
- ☆Timing incorrect

★Weak spark all cylinders
- ☆AC generator bad (especially low-speed winding)
- ☆Ignition rectifier unit bad

★Weak spark one cylinder only
- ☆High voltage insulation leak
- ☆Ignition coil going bad
- ☆Signal generator bad

★No spark one cylinder
- ☆Wiring faulty
- ☆High voltage insulation leak
- ☆Ignition coil bad
- ☆Ignition unit bad
- ☆Ignition rectifier unit bad
- ☆Signal generator bad

No power or missing at high speed
★Strong spark all cylinders
☆Trouble outside ignition system
☆Spark plug(s) dirty or bad
☆Timing maladjusted
☆AC generator high speed coil bad
★Weak or no spark one cylinder
☆AC generator bad
☆Ignition unit bad
☆Ignition coil bad
☆Wiring bad
☆Signal generator bad

3. TEST PROCEDURES

PART I

Part One outlines tests that can be made without test equipment. To check the ignition units, generator, regulator, etc. using test equipment, see Part Two of this section.

Spark

To check the ignition spark, pull off the plug wire and fit it to a plug known to be good. Rest the plug against the engine to ground it, and kick the engine over. If a strong blue-white spark jumps across the plug gap, the ignition spark is good.

Spark Plug

If you suspect a spark plug to be bad, first check the spark as above then substitute the suspect plug and check its spark. If there is no spark or if the spark is weak, visually inspect the plug. Dirt or oil around the electrodes or on the ceramic insulation inside the electrode end of the plug will prevent a good spark from jumping. Clean off the plug well or replace it.

Wiring

The engine will not start if the plug wires are connected to the wrong spark plug, or if one of the ignition unit red or white wires is reversed with another of the same color. These wires are clearly marked as to left, right or center cylinder connection.

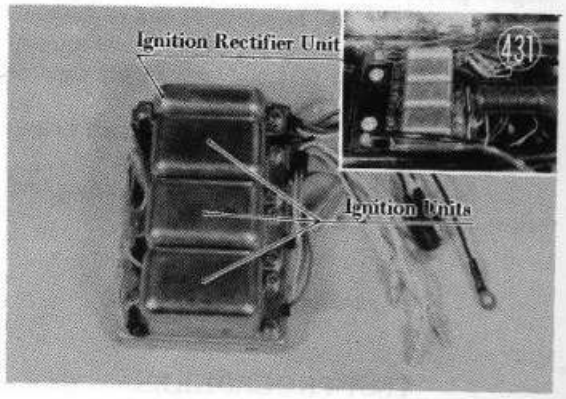
If the spark appears to be grounding out somewhere, examine the high voltage wires and replace any that have broken or cracked insulation. If no cracks are visible, run the engine in a dark place to see where the spark is jumping. **But don't run the engine inside a closed area!**

Any time wiring mistakes are suspected, in the ignition system or otherwise, check the wiring against the H2 wiring diagram in the back of this manual.

Ignition Units

When there is no spark for any of the cylinders, the trouble can sometimes be caused by a single ignition unit. In this case the trouble can be located without test equipment: (a) Disconnect the three light green wires going from the ignition rectifier unit to the ignition units; (b) Connect one wire at a time to its ignition unit and check the spark for that cylinder. If two of the cylinders will spark when connected alone, the ignition unit for the non-sparking cylinder is bad.

When there is no spark for one of the cylinders or when the spark is weak the first step, of course, is to make sure the spark plug is good and that the wiring is not at fault. Proceeding from that point, there are only four possible places for the trouble to be: the coil, the ignition unit, the ignition rectifier unit, or the signal generator. By following the steps below it will be easy to pinpoint the defective part. "BC" means the cylinder that is bad; "GC" means either one (pick one) of the two remaining good cylinders.



1. (a) There are three light green wires coming from the ignition rectifier unit, and one goes to each ignition unit. Take the two of these which go to the BC ignition unit and the GC ignition unit and reverse them.
   (b) Check the spark for the two cylinders. If the trouble has shifted from the BC to the GC, the ignition rectifier unit is bad. If the trouble remains in the BC, go on to Step 2.

2. (a) Reverse the BC and GC plug wires so that the BC wire goes to the GC plug, and the GC wire goes to the BC plug.
   (b) There are three red wires, one from each ignition unit to each coil. Reverse the BC and GC red wires. This can be done at either the junction near the coil or near the ignition unit.
   (c) Now check the spark for both cylinders. If the trouble has switched to the GC, the BC ignition coil is bad. If the trouble is still in the BC go on to the next step.

3. (a) Return the spark plug wires to normal but leave the red wires reversed.
   (b) Each ignition unit has a white wire coming from it. Reverse the BC unit and GC unit white wires.
   (c) Check the spark for both cylinders. If the trouble is now in the GC, the BC ignition unit is bad. If the trouble remains in the BC, the BC signal generator coil is bad.

Once the defective part has been located, return all wiring to normal.

Timing

After replacing a signal generator coil, or if you suspect timing of one of the cylinders is incorrect, check it as follows.

Remove the **two** screws to take off the left engine cover. There are three sets of marks on the outside of the rotor: an **L** (Left) and an **S** mark for the left cylinder timing, **R** and **S** marks for the right cylinder, and **C** and **S** marks for the center.

Check timing by aligning the pointer with the **S** mark, and seeing if the trailing edge of the rotor magnet projection coincides with the timing mark on the top of the coil housing. If one of the coils is out of line, loosen the two coil base plate mounting screws and move that coil base to the right or left.

CAUTION: Do not pry on the coil itself as this may break the coil housing.

To completely recheck and adjust timing, see below.

TEST PROCEDURES

PART II

Part Two covers detailed test and adjustment procedure.

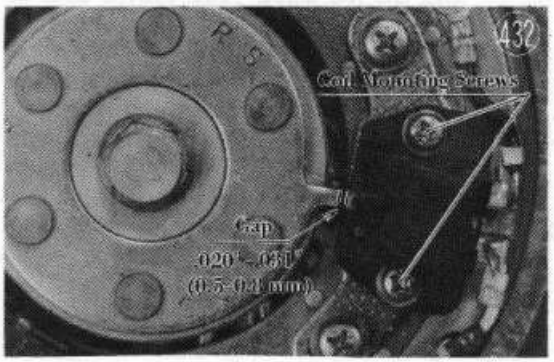
Timing

To completely readjust the timing follow these steps:

1. Set the spark plug gap to .035-.039 in. (.9-1.0 mm). The standard plug is an NGK B-9HS-10. Plug installation torque is 18.0 - 22.0 ft-lb (2.5-3.0 kg-M).

2. Take out the **two** screws and remove the left cover.

3. Using a feeler gauge, check the gap between each signal generator pickup coil and the magnet projection on the rotor. The correct gap is .020-.031 in. (0.5-0.8 mm). If the gap is incorrect, loosen the two mounting screws and move the coil by hand to set it.

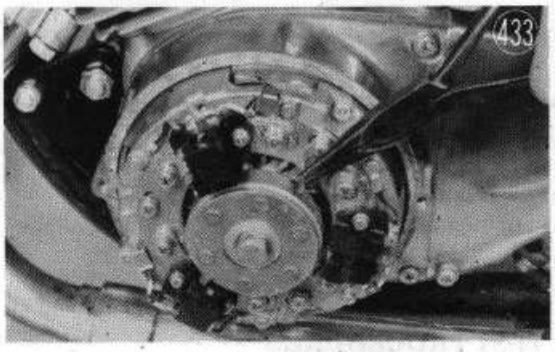


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CAUTION: Do not pry on the coil with a screwdriver or any other tool since this may break the coil housing.

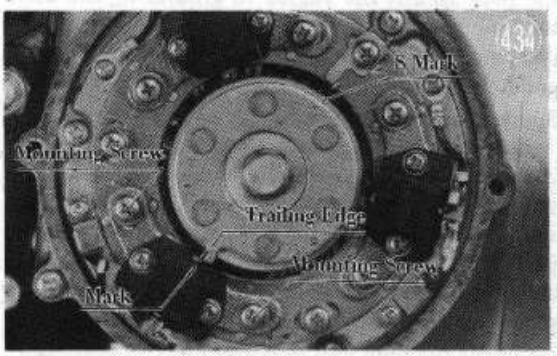
4. Remove the spark plugs and insert a dial gauge into the left cylinder. Set the piston to .1231 in. (3.13 mm) BTDC.

5. Bend the pointer on the generator stator to coincide with the **L** mark on the rotor.


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6. Turn the rotor slightly to align the **S** mark with the pointer.

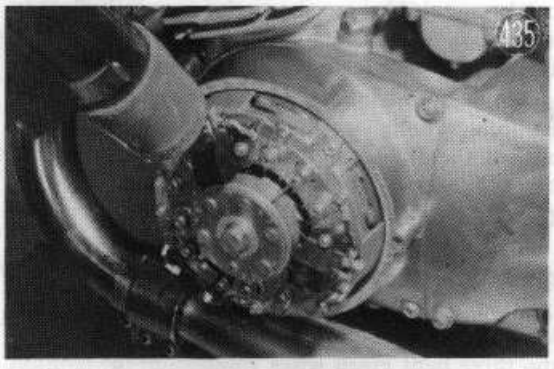
7. See if the trailing edge of the rotor magnet projection coincides with the mark on top of the left cylinder signal generator coil housing. If it does not, loosen the two coil base plate mounting screws and move the base plate right or left, again taking care not to pry on the coil itself.



434

8. Repeat steps and for the right and center cylinders, aligning the right and center **S** marks with the pointer.

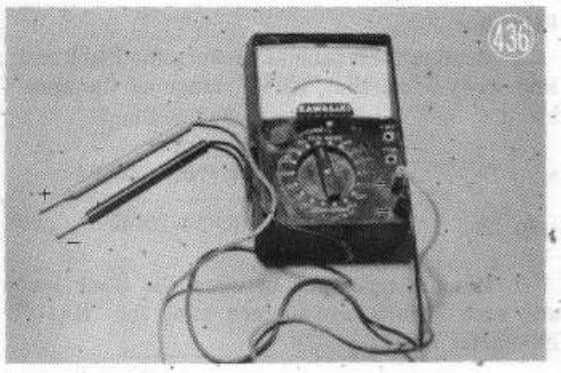
9. Reinsert the spark plugs, connect a strobe to the left cylinder plug, start the engine and see if the rotor **L** mark coincides with the pointer at 4,000 r.p.m. If it does not, readjust left cylinder timing.


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10. Repeat step 9 for the right and center cylinders, seeing that the **R** and **C** marks coincide with the pointer.

NOTE:

1. In the following tests using an ohmmeter, some meters will have to be connected in reverse to obtain the correct readings.
2. "+" and "-" indicate the positive and negative meter leads, respectively.
3. All resistance measurements where an ohms (Ω) valve is indicated are approximate. This is especially in the case of the Ignition Rectifier Unit and the Regulator, the resistance reading varies with each unit and also varies with different ohmmeters.



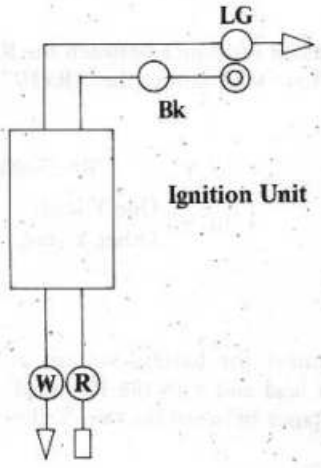
Ignition Unit

1. Check resistance between the Black and Light Green wires using the "Rx10" range of the ohmmeter.

+ to Bk,	- to LG	R=infinity (no reading)
- to Bk,	+ to LG	R=infinity

2. Check resistance between the Light Green and Red wires using the "Rx100" range of the ohmmeter.

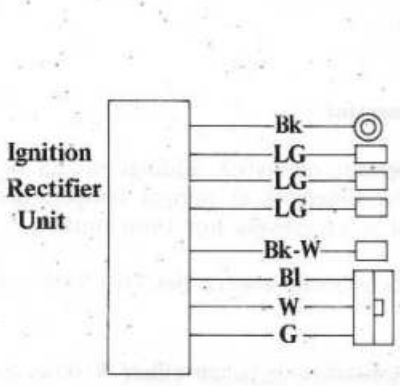
+ to LG,	- to R	For either measurement the meter needle should jump and then return to infinity (no reading).
- to LG,	+ to R	



Ignition Rectifier Unit

1. Measure resistance between the Black-White lead and the Blue, White and Green leads, one at a time, using the "Rx10" ohmmeter range.

+ to Bk-W,	- to Bl	R=20-35Ω
	- to G	R=20-35Ω
	- to W	R=70-250Ω
- to Bk-W,	+ to Bl	R=infinity, all three readings
	+ to G	
	+ to W	



2. Measure the resistance between the Black-White lead and each Light-Green wire in turn, using the "Rx10" ohmmeter range.

+ to Bk-W,	- to LG	R=infinity (no reading)
- to Bk-W,	+ to LG	R=25-250Ω

Regulator

1. Measure the resistance between the Black and Red leads using the "Rx10" range of the ohmmeter.

+ to Bk,	- to Red	R=700-1,000Ω
- to Bk,	+ to Red	R=70-200Ω

2. Measure resistance between the Black lead and each Yellow lead in turn using the "Rx10" ohmmeter range.

+ to Bk,	- to Y	R=1,000-1,200Ω
- to Bk,	+ to Y	R=25-100Ω

3. Measure resistance between the Red lead and each Yellow lead using the "Rx10" ohmmeter range.

+ to R,	- to Y	R=25-90Ω
- to R,	+ to Y	One Y lead: R = under 2KΩ Other Y lead: R = under 6KΩ

4. Connect the battery voltage indicated - to the Black lead and + to the Red lead. Then measure resistance between the two Yellow leads.

Fig. 440 –
R = infinity (no reading)
with test leads reversed R = 500Ω

Fig. 441 –
R = infinity (no reading) either direction

AC Generator

Generator resistance readings should be taken with the generator at normal temperatures, not when it is excessively hot from running.

1. Resistance between the Two Yellow leads is 0.4 Ω

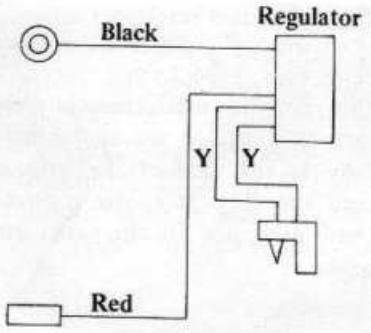
2. Resistance between either Yellow lead and ground should be infinite (no reading).

3. Resistance between the Blue and Green leads is 5.0 Ω.

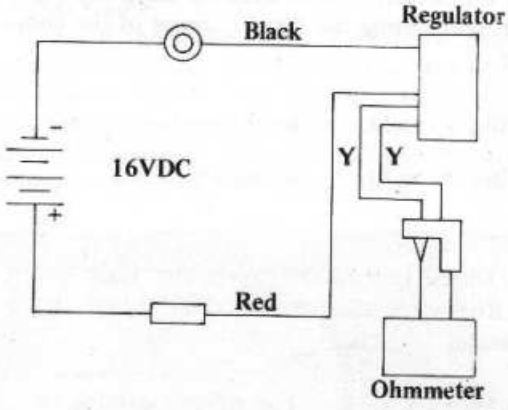
4. Resistance between the White and Green leads is 200 Ω.

5. Resistance between the Black lead and each White lead is 200 Ω. (Signal generator test)

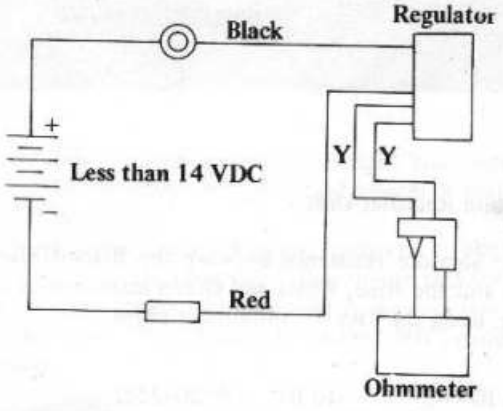
439



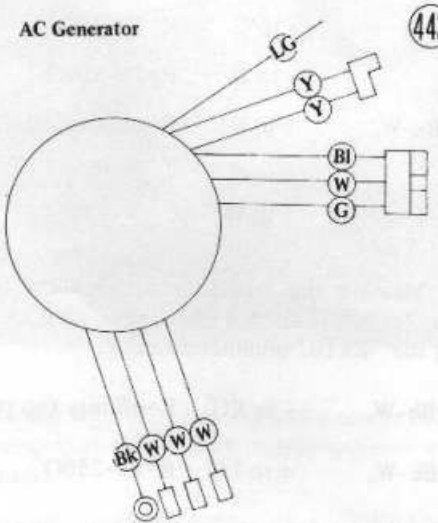
440



441



442



Ignition Coil

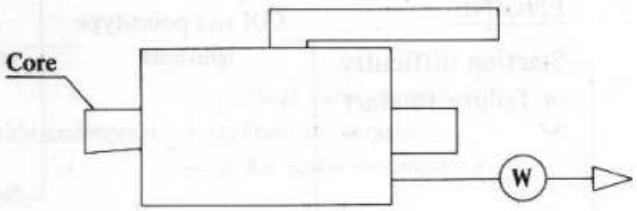
1. Resistance between the White lead and the core is 0.64~0.96Ω.

2. If an inductance tester is available, inductance between the White lead and the core is 2.5 mh, and between the plug wire and core it is 14h.

The preceding tests are usually sufficient to locate a defective part. Further tests, however necessitate the use of an oscilloscope and other electronic equipment and are not explained in this manual.

(443)

Ignition Coil



VI. Troubleshooting

See page 116 for a specific trouble-shooting guide for the H2 ignition.

ENGINE

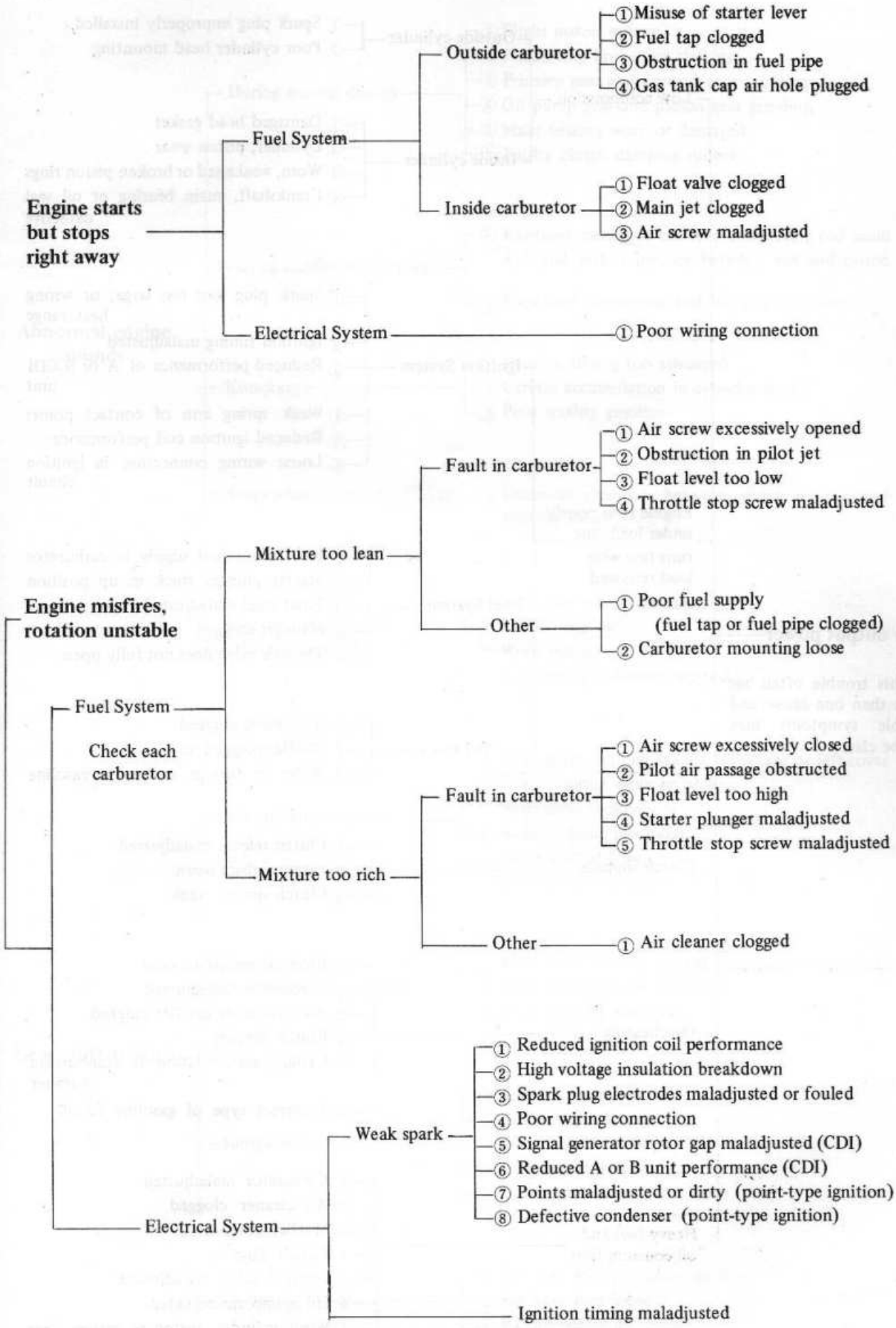
Starting difficulty or failure to start

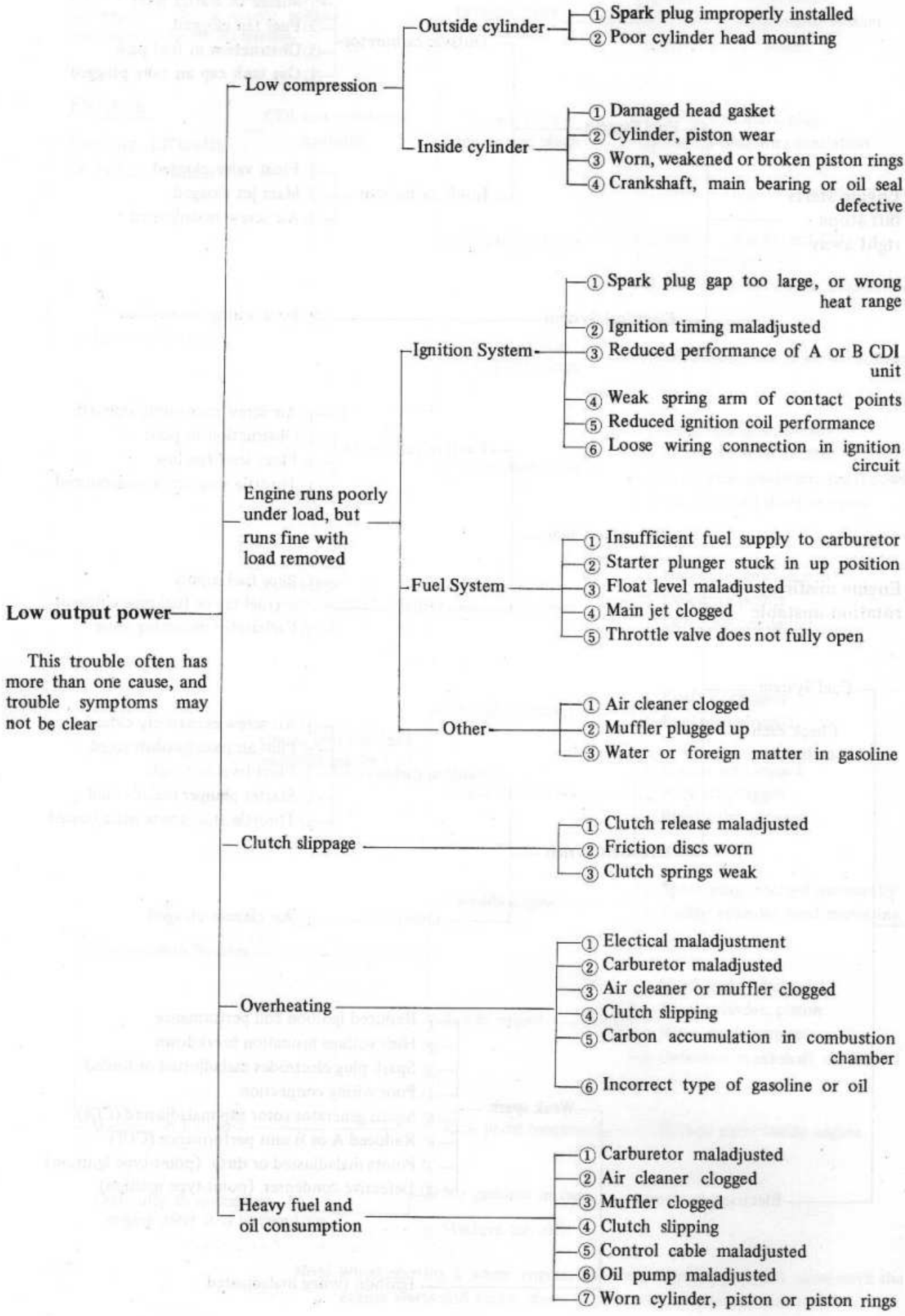
- Ignition System
  - CDI and point-type ignitions
    - Ignition spark present
      - ① Fault in fuel system
      - ② Fault in compression system
      - ③ Mechanical failure
    - No spark for one or two plugs
      - ① Defective spark plug
      - ② Faulty plug wire insulation
    - No ignition spark
      - ① Bad wiring or connection, or short
      - ② Battery discharged (H1)
      - ③ Fuse blown (H1)
      - ④ Bad ignition switch connection
  - CDI
    - No spark for one or two plugs
      - ① Distributor insulation breakdown
    - No ignition spark
      - ① Defective ignition coil
      - ② Defective A or B unit
      - ③ Coil wire insulation breakdown
      - ④ Sig.Gen. coil short or open
  - Point-type ignition
    - No spark for one or two plugs
      - ① Defective ignition coil
      - ② Defective points
      - ③ Defective condenser
- Fuel System
  - Check that fuel tank contains gasoline
    - Outside carburetor
      - ① Fuel tap clogged
      - ② Fuel pipe clogged
    - Inside carburetor
      - ① Starter jet clogged
      - ② Pilot jet clogged
      - ③ Float valve clogged
- Compression System
  - Outside engine
    - ① Spark plug inserted incorrectly
    - ② Faulty cylinder head mounting
  - Inside engine
    - ① Head gasket damaged
    - ② Worn cylinder, piston
    - ③ Worn, broken rings
    - ④ Defective crankshaft oil seal
- Mechanical Failure
  - Kick pedal inoperative
    - ① Broken parts inside engine

Difficulty in re-starting engine after it is warmed up

- ① No gasoline in tank
- ② Mixture too rich

Note: When starting a warm engine, hold the throttle grip full open until the engine starts and r.p.m. starts to rise. Do not use the starter lever.


Engine starts but stops right away
Fuel System
Outside carburetor
① Misuse of starter lever
② Fuel tap clogged
③ Obstruction in fuel pipe
④ Gas tank cap air hole plugged
Inside carburetor
① Float valve clogged
② Main jet clogged
③ Air screw maladjusted
Electrical System
① Poor wiring connection
Engine misfires, rotation unstable
Fuel System
Check each carburetor
Mixture too lean
Fault in carburetor
① Air screw excessively opened
② Obstruction in pilot jet
③ Float level too low
④ Throttle stop screw maladjusted
Other
① Poor fuel supply (fuel tap or fuel pipe clogged)
② Carburetor mounting loose
Mixture too rich
Fault in carburetor
① Air screw excessively closed
② Pilot air passage obstructed
③ Float level too high
④ Starter plunger maladjusted
⑤ Throttle stop screw maladjusted
Other
① Air cleaner clogged
Electrical System
Weak spark
① Reduced ignition coil performance
② High voltage insulation breakdown
③ Spark plug electrodes maladjusted or fouled
④ Poor wiring connection
⑤ Signal generator rotor gap maladjusted (CDI)
⑥ Reduced A or B unit performance (CDI)
⑦ Points maladjusted or dirty (point-type ignition)
⑧ Defective condenser (point-type ignition)
Ignition timing maladjusted


Low output power
This trouble often has more than one cause, and trouble symptoms may not be clear
Low compression
Outside cylinder
① Spark plug improperly installed
② Poor cylinder head mounting
Inside cylinder
① Damaged head gasket
② Cylinder, piston wear
③ Worn, weakened or broken piston rings
④ Crankshaft, main bearing or oil seal defective
Engine runs poorly under load, but runs fine with load removed
Ignition System
① Spark plug gap too large, or wrong heat range
② Ignition timing maladjusted
③ Reduced performance of A or B CDI unit
④ Weak spring arm of contact points
⑤ Reduced ignition coil performance
⑥ Loose wiring connection in ignition circuit
Fuel System
① Insufficient fuel supply to carburetor
② Starter plunger stuck in up position
③ Float level maladjusted
④ Main jet clogged
⑤ Throttle valve does not fully open
Other
① Air cleaner clogged
② Muffler plugged up
③ Water or foreign matter in gasoline
Clutch slippage
① Clutch release maladjusted
② Friction discs worn
③ Clutch springs weak
Overheating
① Electical maladjustment
② Carburetor maladjusted
③ Air cleaner or muffler clogged
④ Clutch slipping
⑤ Carbon accumulation in combustion chamber
⑥ Incorrect type of gasoline or oil
Heavy fuel and oil consumption
① Carburetor maladjusted
② Air cleaner clogged
③ Muffler clogged
④ Clutch slipping
⑤ Control cable maladjusted
⑥ Oil pump maladjusted
⑦ Worn cylinder, piston or piston rings

Abnormal engine sounds

- During normal driving
  - ① Slight piston seizure
  - ② Piston ring broken or sticking
  - ③ Primary gear and housing gear grinding
  - ④ Oil pump gear and pinion gear grinding
  - ⑤ Main bearing worn or damaged
  - ⑥ Faulty clutch damping rubber
- During sudden acceleration
  - ① Excessive clearance between connecting rod small end and piston pin, or between pin and piston
  - ② Excessive connecting rod big end clearance
- Knocking
  - ① Ignition timing too advanced
  - ② Carbon accumulation in cylinder head
  - ③ Poor quality gasoline
- Stops when clutch disengaged
  - ① Excessive clearance between clutch housing and friction plates
- When the engine is idling while cold
  - ① Excessive piston clearance
  - ② Piston rings worn
  - ③ Worn piston
  - ④ Connecting rod bent, warped

Gear shift trouble

- Doesn't go into gear
  - ① Shift shaft rubbing against crankcase or left cover
  - ② Return spring weak or broken
  - ③ Shift lever broken
  - ④ Return spring pin loose
  - ⑤ Bent selector fork
  - ⑥ Clutch will not release
- Shift pedal doesn't return
  - ① Shift shaft rubbing against crankcase or left cover
  - ② Return spring weak or broken
  - ③ Return spring pin loose
- Jumps out of gear
  - ① Set lever spring weak or broken
  - ② Set lever pin loose
  - ③ Worn selector fork pin
  - ④ Worn selector fork
  - ⑤ Drum positioning plate loose
- Overshifts
  - ① Set lever spring weak or broken
  - ② Set lever bolt loose
  - ③ Return spring pin loose

Clutch malfunction

- Doesn't disengage
  - ① Clutch release maladjusted
  - ② Friction or steel plates warped
  - ③ Tension uneven among clutch springs
  - ④ Transmission oil old or too heavy
  - ⑤ Too much transmission oil
  - ⑥ Seized clutch bushings
- Slips
  - ① Clutch release maladjusted
  - ② Friction plates worn
  - ③ Clutch steel plates worn
  - ④ Clutch springs weak

FRAME

Poor steering control

Special care must be taken in this area since faulty steering is dangerous.

- Handlebars hard to turn
  - ① Steering stem lock nut too loose
  - ② Bearings damaged or cracked
  - ③ Steering stem bent
  - ④ Front tire air pressure low
- Front or rear wheel wobbles
  - ① Worn front or rear wheel bearings
  - ② Spokes loose
  - ③ Front or rear wheel rim warped
  - ④ Swing arm bushing, sleeve worn
- Handlebars pull to one side
  - ① Front or rear shock absorbers unbalanced
  - ② Front and rear wheel misaligned
  - ③ Front or rear fork bent
  - ④ Frame twisted

Shock absorbing bad

- Too soft
  - ① Front fork springs weak
  - ② Front fork oil level low, or oil too light
  - ③ Rear shock absorbers maladjusted, springs weak, or oil leaking
- Too hard
  - ① Front fork oil too heavy, old, or oil level too high
  - ② Fork bent
  - ③ Rear shock absorbers maladjusted or defective
  - ④ Tire air pressure too high
  - ⑤ Seat cushions bad

Brakes don't hold

- ① Brakes maladjusted
- ② Brake linings worn, or only one side touching
- ③ Foreign matter, oil, water between brake lining and drum
- ④ Brake cam worn
- ⑤ Brake drum worn
- ⑥ Brake panel bushing worn
- ⑦ Brake cable defective
- ⑧ Air in brake line (disc brakes)
- ⑨ Disc brake fluid low or leaking

See disc brake section for more information.

Periodic Maintenance Guide

Operation \ Frequency	After initial 800 km	After initial 5,000 km	Every subsequent 5,000 km	Every subsequent 10,000 km
Check, adjust brakes	•	•	•	
Check, adjust clutch	•	•	•	
Check, adjust carburetors and oil pump	•	•	•	
Check spoke tightness and rim runout	•	•	•	
Clean fuel system	•	•	•	
Clean, set spark plug gaps	•	•	•	
Check brake fluid level	•	•	•	
Check tire pressure and tread wear	•	•	•	
Change transmission oil	•		•	
Check points, timing	•		•	
Check steering play	•			•
Tighten bolts and nuts	•			•
Check drive chain wear		•	•	
Clean air cleaner element		•	•	
Perform general lubrication		•	•	
Lubricate drive chain	Every 300 km			
Check, adjust drive chain	Every 800 km			
Check brake wear	Every 10,000 km			
Change front fork oil	Every 10,000 km			
Change air cleaner element	*Every 10,000 km or after cleaning 5 times			
Change brake fluid	*Every year or 10,000 km			
Regrease wheel bearings	*Every 2 years or 20,000 km			
Regrease speedometer gear housing	*Every 2 years or 20,000 km			
Regrease brake camshaft	*Every 2 years or 20,000 km			
Lubricate steering stem bearings	*Every 2 years or 20,000 km			

* Whichever occurs first

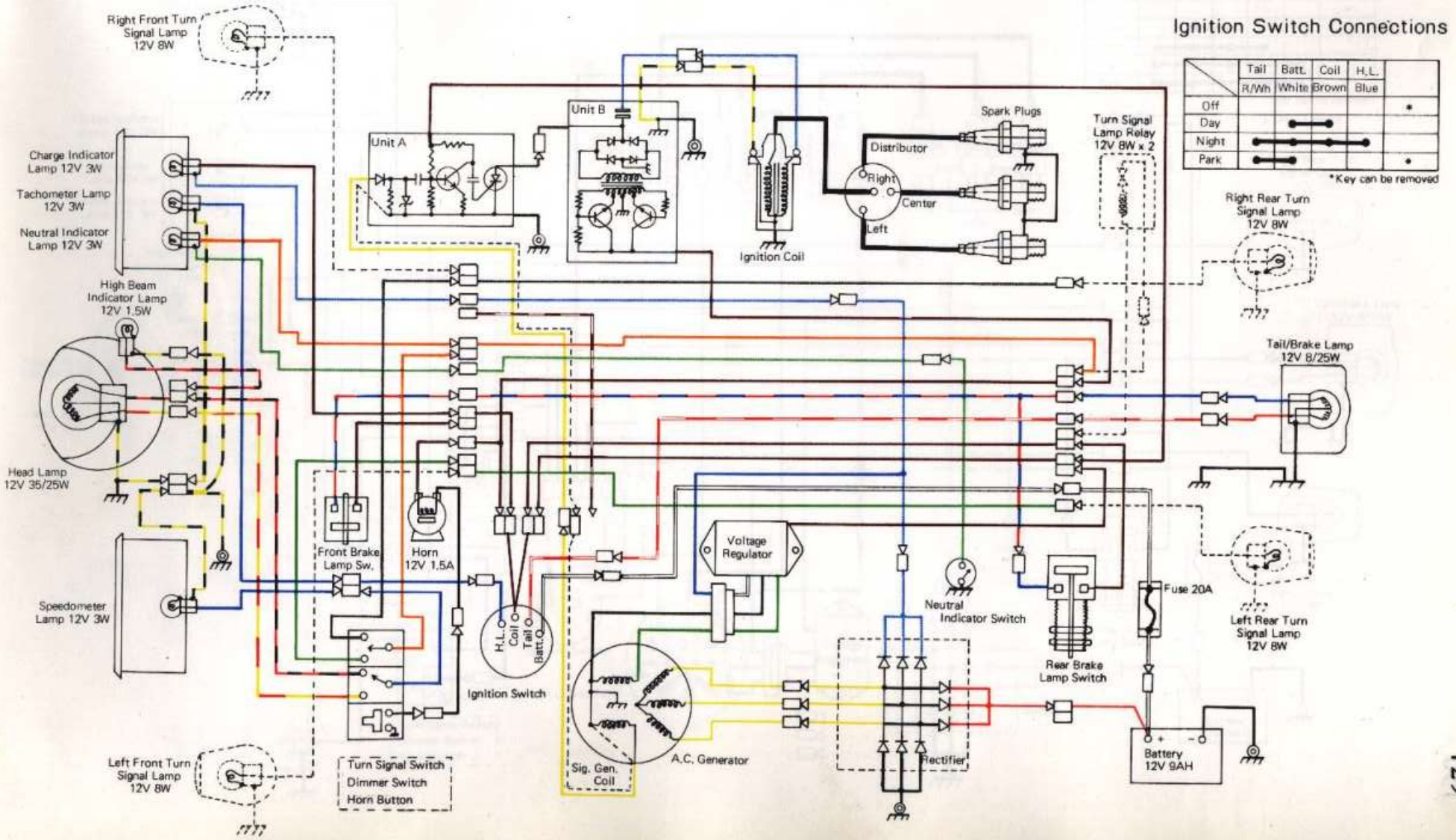
Torque Table

Torque values listed below should be used in tightening all nuts and bolts. Where a different value is prescribed in the shop manual text, the text supersedes this table. All of these values are for use with dry solvent cleaned threads.

	Nominal dia. (mm)	Pitch (mm)	Torque [ft-lb (kg-m)]
Coarse Threads	5	0.80	2.5 – 3.5 (0.35 – 0.50)
	6	1.00	4.5 – 6.5 (0.6 – 0.9)
	8	1.25	11.5 – 16.0 (1.6 – 2.2)
	10	1.50	22 – 30 (3.1 – 4.2)
	12	1.75	39 – 54 (5.4 – 7.5)
	14	2.00	60 – 83 (8.3 – 11.5)
	16	2.00	94 – 130 (13 – 18)
	18	2.50	130 – 181 (18 – 25)
	20	2.50	188 – 253 (26 – 35)
Fine Threads	5	0.50	2.5 – 3.5 (0.35 – 0.50)
	6	0.75	4.5 – 5.5 (0.6 – 0.8)
	8	1.00	10.0 – 13.5 (1.4 – 1.9)
	10	1.25	19.0 – 25 (2.6 – 3.4)
	12	1.50	33 – 45 (4.5 – 6.2)
	14	1.50	54 – 74 (7.4 – 10.2)
	16	1.50	83 – 116 (11.5 – 16)
	18	1.50	123 –166 (17 – 23)
	20	1.50	166 – 239 (23 – 33)

H1 Wiring Diagram

CDI Model



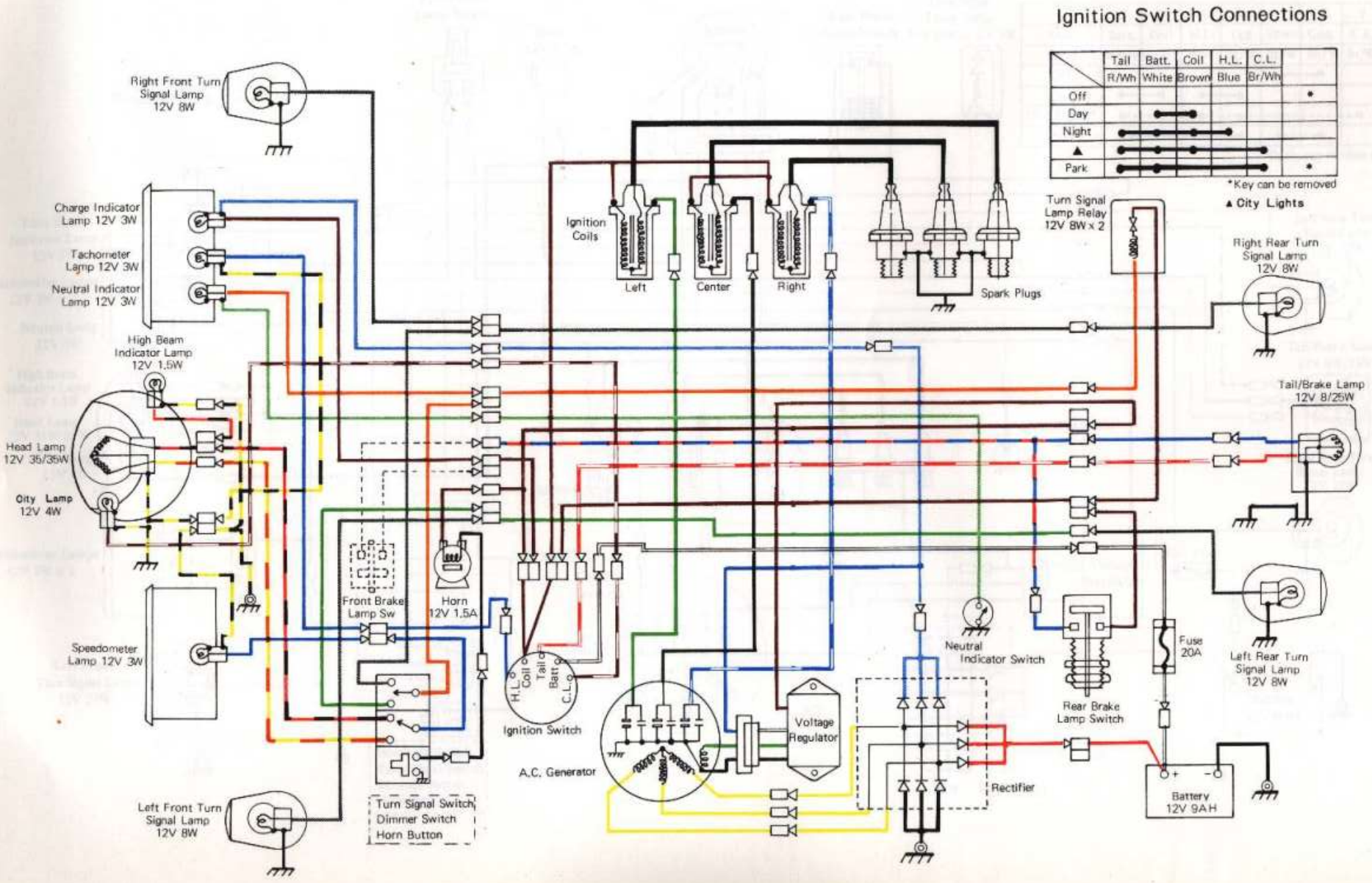
Ignition Switch Connections

	Tail R/Wh	Batt. White	Coil Brown	H.L. Blue	
Off					*
Day		●	●		
Night	●	●	●	●	
Park	●	●			*

*Key can be removed

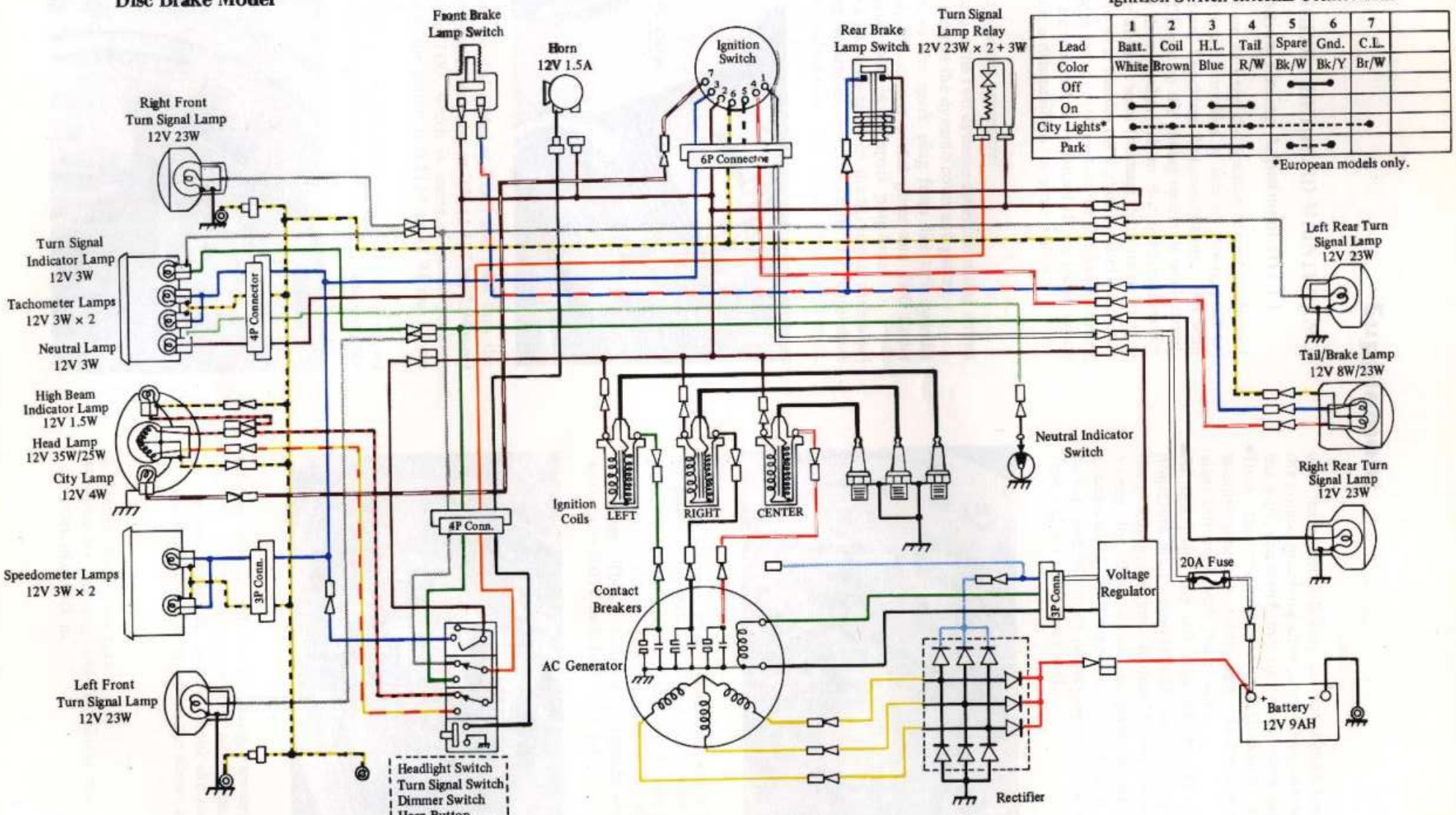
H1 Wiring Diagram

European Model, through 1971



H1 Wiring Diagram

Disc Brake Model



Ignition Switch Internal Connections

	1	2	3	4	5	6	7
Lead	Batt.	Coil	H.L.	Tail	Spare	Gnd.	C.L.
Color	White	Brown	Blue	R/W	Bk/W	Bk/Y	Br/W
Off					●	●	
On	●	●	●	●			
City Lights*	●	●	●	●			●
Park	●			●	●	●	

*European models only.

Supplement

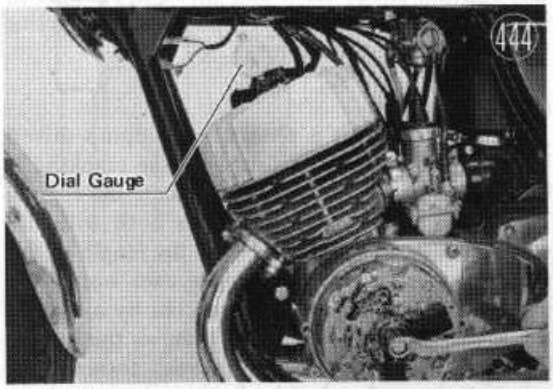
1. ENGINE : DETAILED MAINTENANCE

1) Ignition Timing Adjustment (H1-E)

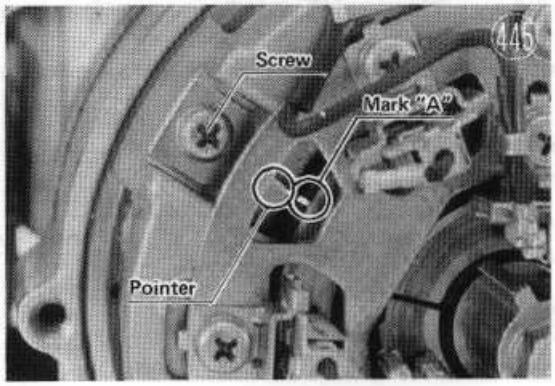
Failure to keep the ignition correctly adjusted leads to such troubles as loss of power, poor acceleration, knocking, and overheating. But with the CDI system the timing operation is electrical, rather than mechanical, so that ignition does not change as parts wear (because there are no moving parts to wear besides the carbon brushes), and once timing is set it never needs to be re-adjusted unless parts are replaced, screws should come loose, or the ignition is disassembled for some reason.

a. Adjustment procedure:

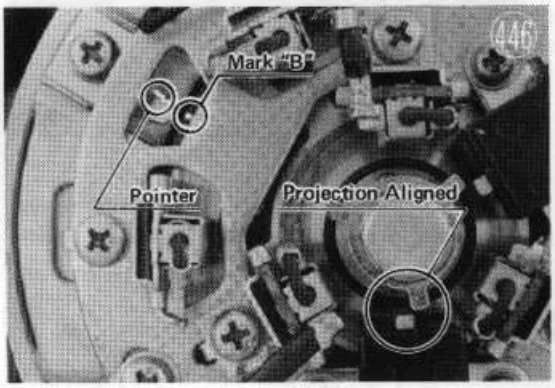
- Take out the two dynamo cover mounting screws and remove the dynamo cover and gasket.
- Remove the spark plug from the left cylinder head, and mount a dial gauge and TDC finder (special tool) in the spark plug hole.
- Use a 13 mm wrench on the SG (signal generator) rotor mounting bolt to turn the crankshaft counterclockwise, and find top dead center.



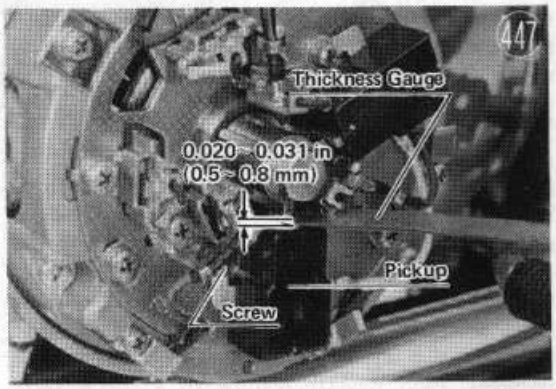
- Zero the dial gauge at TDC, and then turn the crankshaft clockwise to 23° (1.157 in, 2.94 mm) before TDC, which in terms of piston position means the piston is 0.1157 in. (2.94 mm) from TDC.
- At the 23° BTDC point, the mark (A) stamped on the end of the generator rotor should coincide with the pointer. If they are not aligned, loosen the pointer mounting screw, align the pointer with the mark, and then firmly tighten the screw again.



- Turn the crankshaft counterclockwise until another generator rotor mark (B) appears, and align this mark with the pointer.
- At this point the left edge of the SG rotor projection must coincide with the right edge of the pickup projection. If these do not coincide, loosen the three mounting plate screws, set a screwdriver to the pry points and align the pickup and SG rotor projections properly, and then tighten the screws well.



- Turn the SG rotor back counterclockwise a little to line up the SG rotor projection with the pickup projection so they are in a straight line, and measure the gap between them with a thickness gauge. The gap is correctly adjusted when it is 0.020 ~ 0.031 inch (0.5 ~ 0.8 mm).

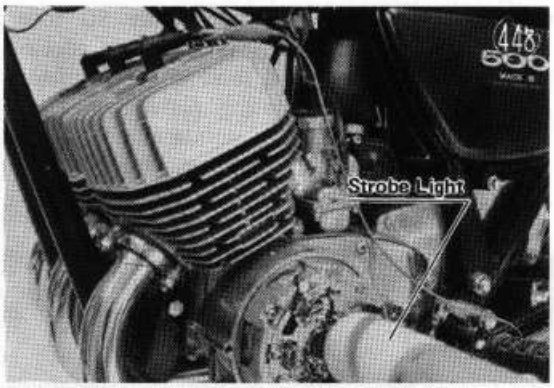


- If the gap is outside this range, loosen the mounting screw on either side of the pickup, move the pickup up or down until the correct gap is obtained, and then tighten the screws again.

b. Timing check procedure:

- Remove the dial gauge and TDC finder, and screw the spark plug back in.

- Set up a strobe light, connecting the two leads to the battery and the single lead to the left spark plug.
- Open the fuel tap and turn the ignition to the ON position.
- Kick start the engine and set it to 4,000 rpm.
- Check that under the strobe light the pointer is pointing to mark (A).



NOTE: The (A) & (B) marks refer to the letters in the illustration and do not appear on the vehicle itself.

2) Lubrication System (H2-B)

The lubrication system used is the Kawasaki Injectlube. In this system, oil is kept in a separate tank, from which it is pumped to the engine by the oil pump and mixed with the gasoline. The rate at which the oil is pumped, which varies with the needs of the engine, is controlled by engine rotational speed and throttle opening. With the idle lubrication that results, engine performance is vastly improved, and the fresh, high viscosity oil supplied directly to the crankshaft bearings and connecting rod big ends increases engine durability.

(1) Oil passage

Fig. 450 is a diagram of the H2 Injectlube oil passages. The oil input to the pump is supllied by a hose from the engine oil tank, and the oil output of the pump goes to the carburetor and the cylinder. There are three outlet passages for oil injection via check valve into each carburetor froat chamber to mix the oil with the fuel. The oil from the last outlet is divided among three passages, each passage leading to a check valve installed at the rear side of a cylinder from where the oil goes to lubricate the connecting rod big end via the crankshaft bearings, oil holder and crank pin, in that order. A notch cut into the big end of the connecting rod enables the fuel/oil mixture to reach the crank pin and crankshafts bearings.

In order to lubricate the main bearing at the right end, there is a small hole in the scavenge passage in the right side of the crankcase, and this goes through to the right main bearing.

On the scavenge stroke a small portion of the fuel-oil (plus air) mixture being drawn in through the scavenge port, goes through this hole to the main bearing for lubrication. In addition, after the engine is stopped the gasoline volatizes from the fuel-oil mixture still adhering to the scavenge port wall, and the oil that remains runs down the scavenge port wall and into the hole to the bearing.

Of the vaporized fuel mixture that is drawn into the crank chamber, the small portion of it that is not well mixed with air and vaporized (that is, some of the oil) clings to the crankcase walls, crank web, and so on, and from there runs down to collect in the bottom of the crankcase as a liquid pool. Left like this, when engine rpm is raised the oil would be thrown around and find its way into the combustion chamber, where the gas mixture now made excessively rich in oil would cause such problems as white smoke in the exhaust.

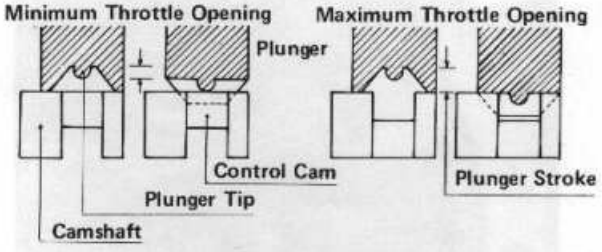
To solve this problem before it occurs, a check valve is provided in the bottom of the crank chamber. The check valve not only lets oil be discharged, but it sends it back to the main bearings on the crankshaft. In other words, when the crank web rotates, the fuel-oil adhering to it is flung outward and hits the collected in the bottom of the crankcase. This pushes the oil down there through the check valve and through passages to lubricate the main bearings, and the connecting rod big-end needle bearings.

(2) Oil Pump

The oil pump is a plunger type pump driven by the oil pump gear mounted on the crankshaft, and it is used to supply oil to lubricate the engine. The amount of oil pumped varies both with the engine rotational speed and with the length of the plunger stroke, controlled by a cam inside the pump. The pump lever is ocnnected by a control cable to the throttle grip so that, as the grip is twisted, the pump lever moves, turning the camshaft and thereby increasing the oil flow.

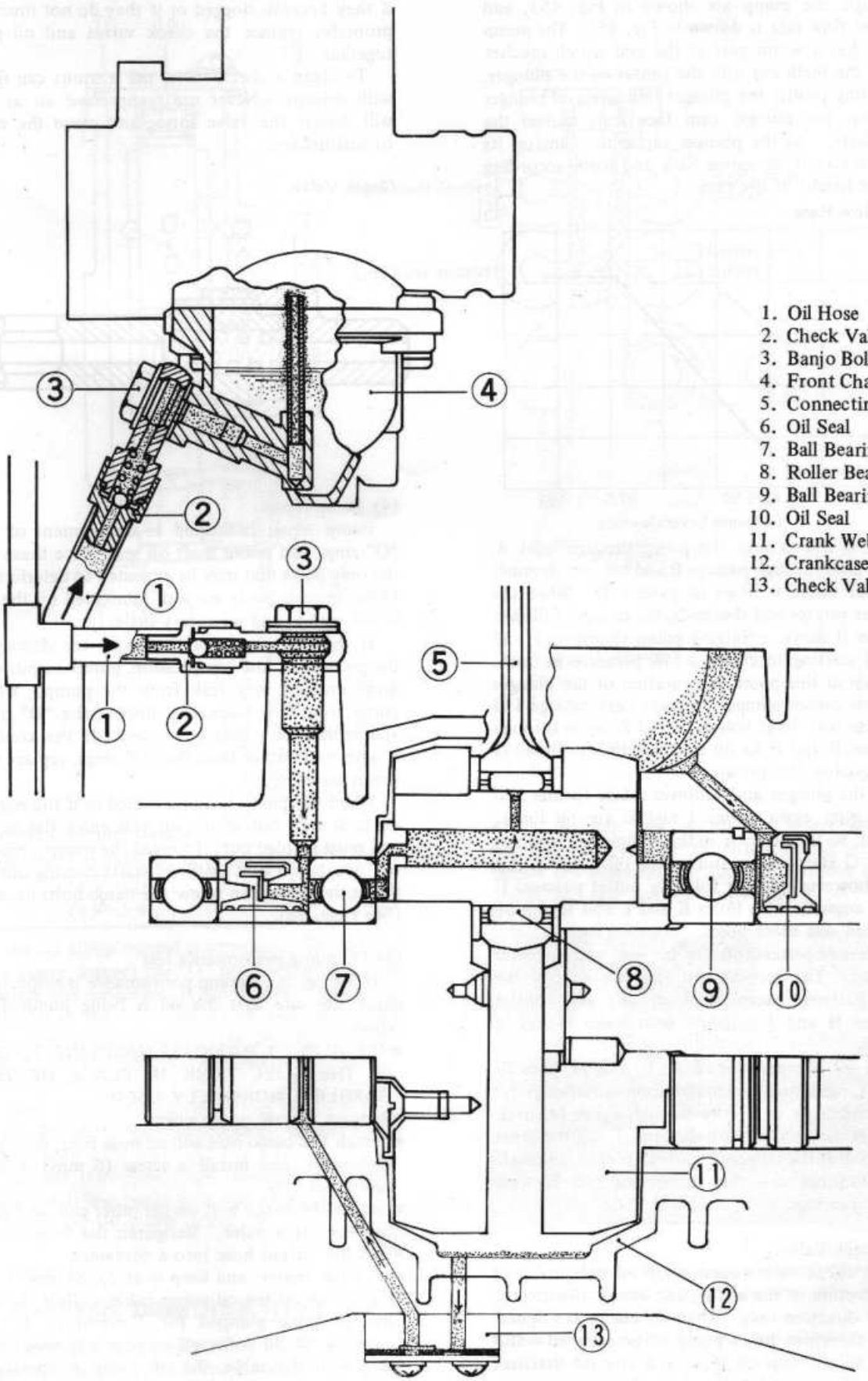
Fig. 449 shows that when the cam is turned from the maximum flow to the minimum flow position, the plunger tip will strike the cam with less travel, thereby pumping less oil. Since there are two high points on the plunger cam face, there are two complate pumping cycle for each revolution of the pulnger.

Stroke Length Control (449)



Oil Passage

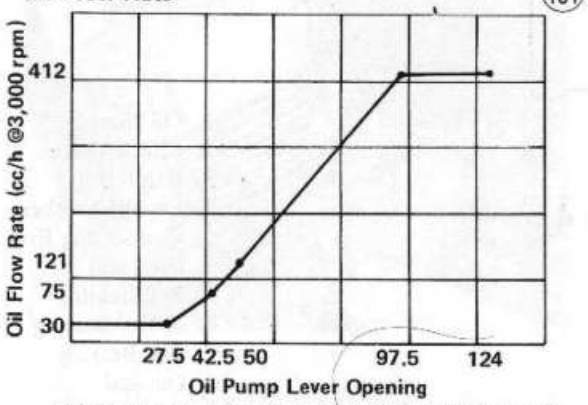
(450)



1. Oil Hose
2. Check Valve
3. Banjo Bolt
4. Front Chamber
5. Connecting Rod
6. Oil Seal
7. Ball Bearing
8. Roller Bearing
9. Ball Bearing
10. Oil Seal
11. Crank Web
12. Crankcase
13. Check Valve

Pump operation and the path for oil flow through the pump are shown in Fig. 453, and the oil flow rate is shown in Fig. 451. The pump shaft has a worm gear at the end which meches with the teeth cut into the center of the plunger. A spring pushes the plunger follower and plunger so that the plunger cam face rests against the camshaft. As the plunger turns, the cam on its face causes it to moves back and forth according to the height of the cam.

Oil Flow Rate (451)



Oil is drawn into the pump through inlet A, and it goes through passage B and into oil chamber C, from where it flows to passage D. When the plunger rotates and descends, the plunger follower follows it down, enlarging pump chambers F and G and starting to create a low pressure in them. But just at this point, the rotation of the plunger follower causes plunger follower inlet passage I to coincide with inlet hole E, so oil flows in through passages B and P to fill pump chambers F and G and equalize the pressure.

As the plunger and follower rotate further and start rising again, holes I and E are no longer aligned, so the decrease in the volume of chambers F and G starts to pressurize the oil. Just at this time, however, plunger follower outlet passages H and J coincide with holes K and L and so the oil is forced out these holes.

This completes 180° of plunger and follower rotation. The second 180° follows exactly the same pattern, except that at the end, outlet passages H and J coincide with holes N and M instead.

The oil pumped out of K, L, and M, goes to the left, right, and center carburetors, respectively, while the oil from N goes through a pipe to check valves at the back of the cylinders. From the three check valves the oil goes to lubricate the crankshaft main bearings and the connecting rod big end needle bearings.

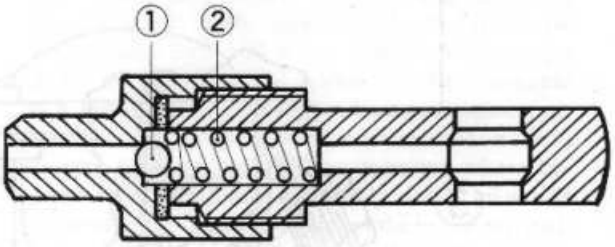
(3) Check Valves

The check valves open when oil pressure is in the direction of the arrow, and arrow oil arrow in the oil direction only. When the engine is stopped – and therefore the oil pump is also stopped – the check valves stop oil flow, and any oil that has passed a check valve is prevented from returning.

As the check valves can not be disassembled, if they become clogged or if they do not function properly, replace the check valves and oil pipe together.

To clean a check valve, use a squirt can filled with solvent. Never use compressed air as this will distort the valve spring and cause the valve to malfunction.

Check Valve (452)



(4) Pump repair

Pump repair is limited to replacement of the "O" rings and pump shaft oil seal, since these are the only parts that may be expected to deteriorate. Other moving parts are well lubricated by the oil in the pump, and wear very little.

If the "O" rings deteriorate or are damaged, the pump will lose compression, pump output will drop, and oil may leak from the pump. When pump trouble is suspected, inspect the "O" rings and replace any defective ones. If the trouble is with parts other than the "O" rings, replace the pump assembly.

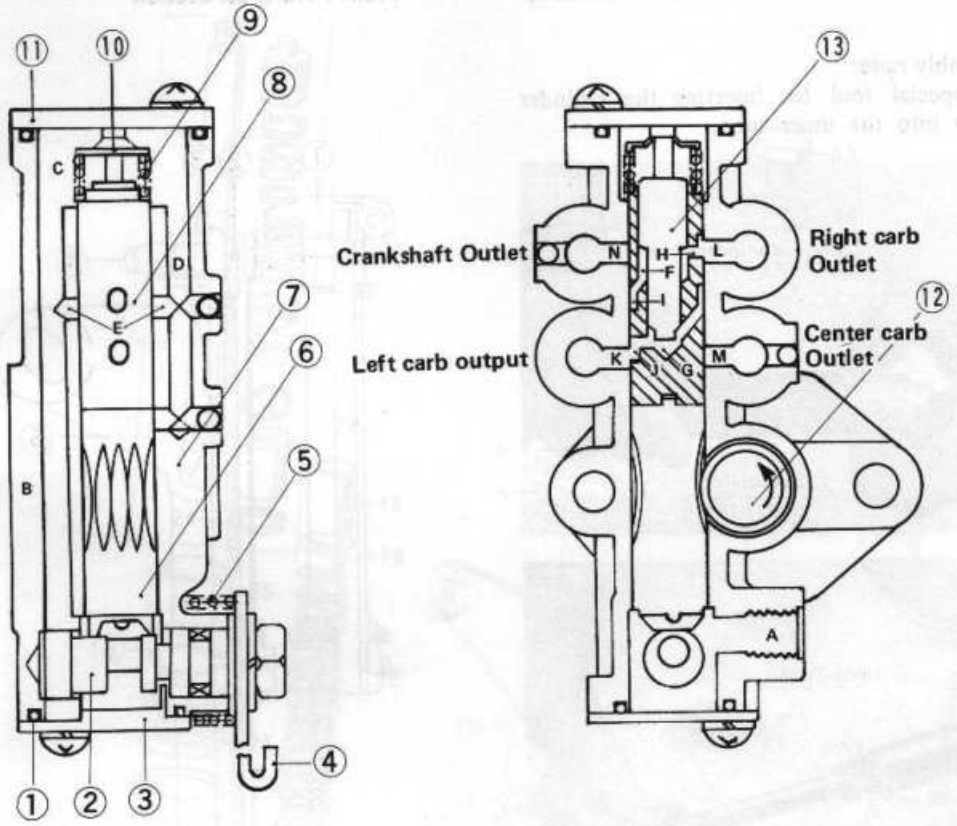
When the pump is disassembled or if the engine oil tank runs out of oil, air will enter the pump and must be bled out. To bleed the pump, remove the two banjo bolt until oil starts coming out of the outlet, and then screw the banjo bolts back in (See Page. 46).

(5) Oil pump performance test

If a drop in oil pump performance is suspected, check the rate that the oil is being pumped as follows.

- **USE A 20 : 1 RATIO OF GASOLINE TO OIL IN THE FUEL TANK IN PLACE OF THE GASOLINE NORMALLY USED.**
- Remove the oil pump cover.
- Detach the banjo bolt and oil hose from the right carburetor, and install a screw (6 mm) in the carburetor.
- Loosen the banjo bolt on the other end, and pull out the check valve. Retighten the banjo bolt.
- Run the output hose into a container.
- Start the engine, and keep it at 2,000 rpm.
- Pulling up on the oil pump cable, collect the oil that is being pumped for 3 minutes. If the quantity of oil collected corresponds with that shown in the table, the oil pump is operating properly.

Oil pump



1. O Ring
2. Control Cam
3. Cap
4. Pump Lever
5. Spring
6. Plunger
7. Pump Body
8. Plunger Follower
9. Spring
10. Spring Seat
11. Cap
12. Pump Shaft
13. Piston

Table 41 Oil Pump Output

Output/3 minutes @2,000 rpm
0.166~0.199 oz. (4.9~5.9 cc)

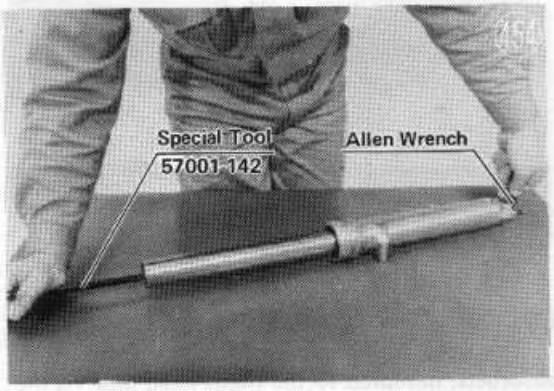
- If the oil pump output is subnormal, disassemble the pump, inspect the "O" rings and oil seal, and replace any defective. If the trouble is with parts other than the "O" rings or oil seal, replace the oil pump as an assembly. The pump is precision made with no allowance for replacement of individual parts.
- Loosen the banjo bolt on the oil pump, and push back the check valve in its place. Retighten the banjo bolt.
- Take out the screw from the right carburetor, and install the banjo bolt and oil hose.
- Replace the oil pump cover.

2. FRAME

1) Front Fork Tubes (H2-B, H1-E)

(1) Fork tube disassembly

- Remove the top bolt ② and dump out the spring ⑳ and the fork oil.
- Take the dust seal ㉕ off the outer tube ㉙.
- Holding the cylinder ㉒ with a special tool, remove the Allen bolt ㉝ from the bottom of the tube, and pull out the inner tube ㉑.

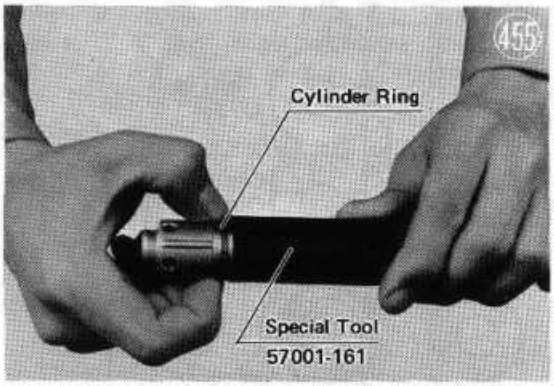


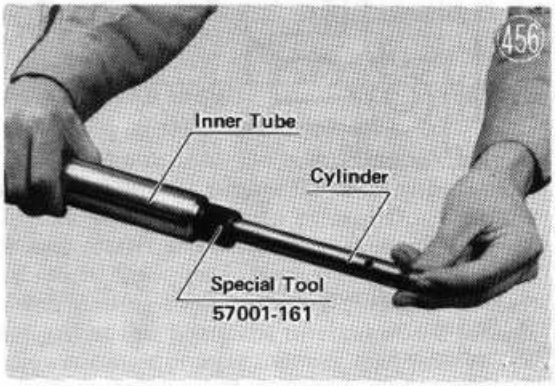
- Remove the circlip ㉔ inside the inner tube, using circlip pliers, and the cylinder assembly ㉒ will come out of the tube.
- Remove the circlip ㉖ from the outer tube with a sharp hook.
- Also pull the oil seal ㉘ out with a hook.

NOTE: If the oil seal is removed, it must be replaced.

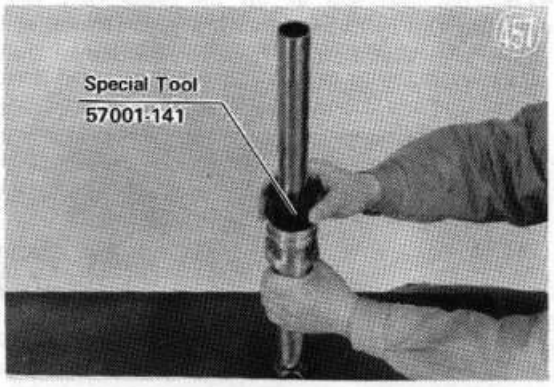
(2) Assembly note:

- Use a special tool for inserting the cylinder assembly into the inner tube.





- Install the cylinder assembly in proper order as shown in Fig. 459.
- Use a special tool for installing the oil seal.

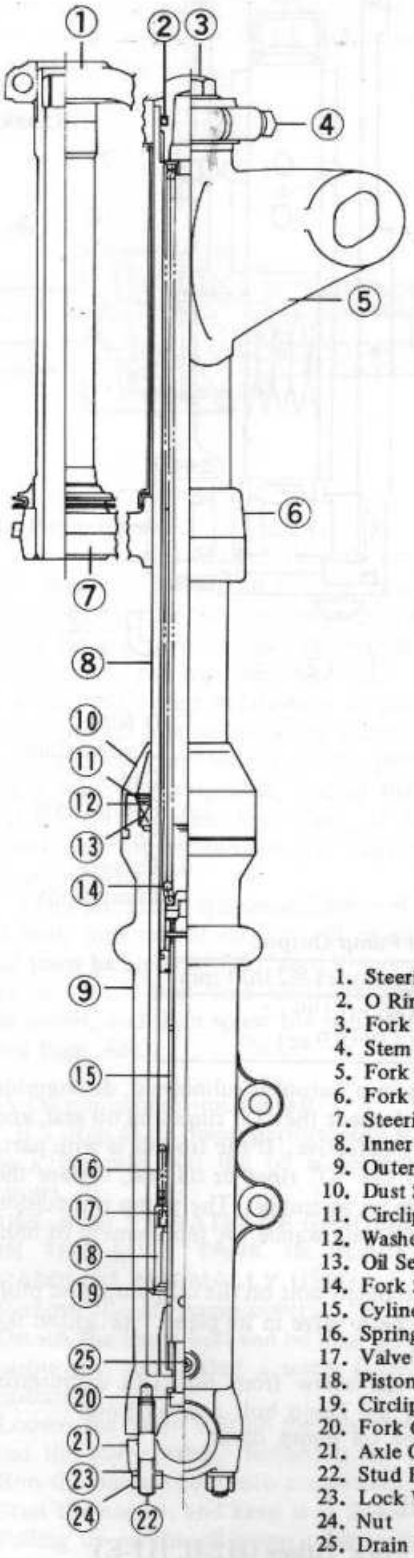


(3) Construction, Operation

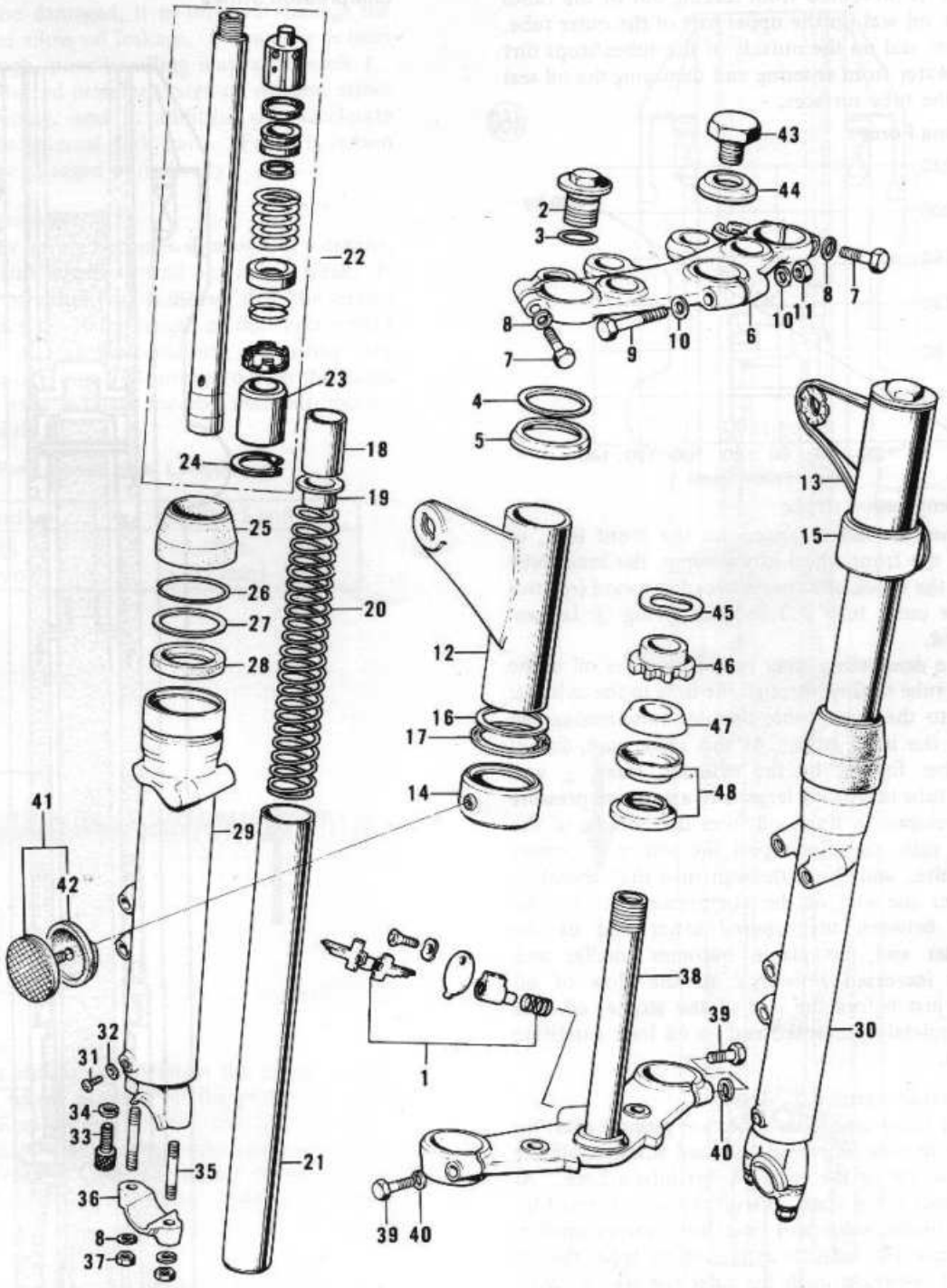
The front fork consists of the two front shock absorbers, mounted to the frame head pipe via the steering stem and stem head.

Each shock absorber is a telescopic tube made up of an inner tube, outer tube, springs, cylinder, piston and valve. Shock damping is accomplished by the springs, by air being compressed in the tubes, and by the flow resistance of the fork oil flowing between the inner and outer tubes.

Front Fork Cross Section (458)



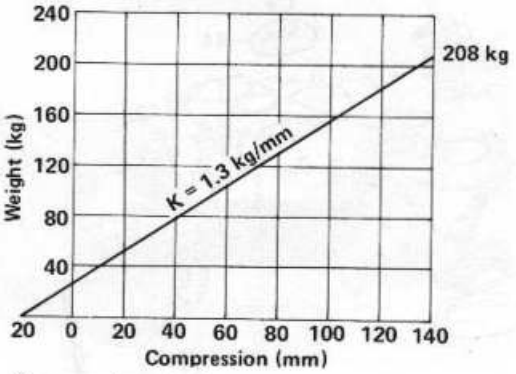
1. Steering Stem Head
2. O Ring
3. Fork Top Bolt
4. Stem Head Clamp Bolt
5. Fork Cover
6. Fork Cover Guide
7. Steering Stem
8. Inner Tube
9. Outer Tube
10. Dust Seal
11. Circlip
12. Washer
13. Oil Seal
14. Fork Spring
15. Cylinder Assembly
16. Spring
17. Valve
18. Piston
19. Circlip
20. Fork Cylinder Bolt
21. Axle Clamp
22. Stud Bolt
23. Lock Washer
24. Nut
25. Drain Screw



1. Lock Ass'y
2. Top Bolt
3. O Ring
4. Gasket
5. Washer
6. Stem Head
7. Clamp Bolt
8. Lock Washer
9. Stem Head Clamp Bolt
10. Lock Washer
11. Nut
12. Headlight Stay
13. Headlight Stay
14. Stay Guide
15. Stay Guide
16. Washer
17. Gasket
18. Spacer
19. Spring Guide
20. Spring
21. Inner Tube
22. Cylinder Assembly
23. Piston
24. Circlip
25. Dust Seal
26. Circlip
27. Washer
28. Oil Seal
29. Outer Tube
30. Outer Tube
31. Drain Plug
32. Gasket
33. Allen Bolt
34. Lock Washer
35. Stud
36. Axle
37. Nut
38. Steering Stem
39. Clamp Bolt
40. Lock Washer
41. Reflector
42. Dumper Rubber
43. Stem Head Bolt
44. Washer
45. Washer
46. Stem Lock Nut
47. Stem Cap
48. Bearing Race

Oil is prevented from leaking out of the tubes by an oil seal on the upper part of the outer tube. A dust seal on the outside of the tubes stops dirt and water from entering and damaging the oil seal and the tube surfaces.

Spring Force (460)



a. Compression stroke

When a load is placed on the front fork, or when the front wheel hits a bump, the inner tube ① of the shock absorber moves downward (relative to the outer tube ②) and the spring ③ is compressed.

The descending inner tube forces the oil in the outer tube to flow through the hole in the cylinder ④ into the inner tube, thereby compressing the air in the inner tube. At this same time, the oil chamber formed by the cylinder, valve ⑤ and inner tube is growing larger and a negative pressure is developed in it, so oil from the bottom of the outer tube also flows past the piston ⑥, opens the valve, and flows through into that chamber.

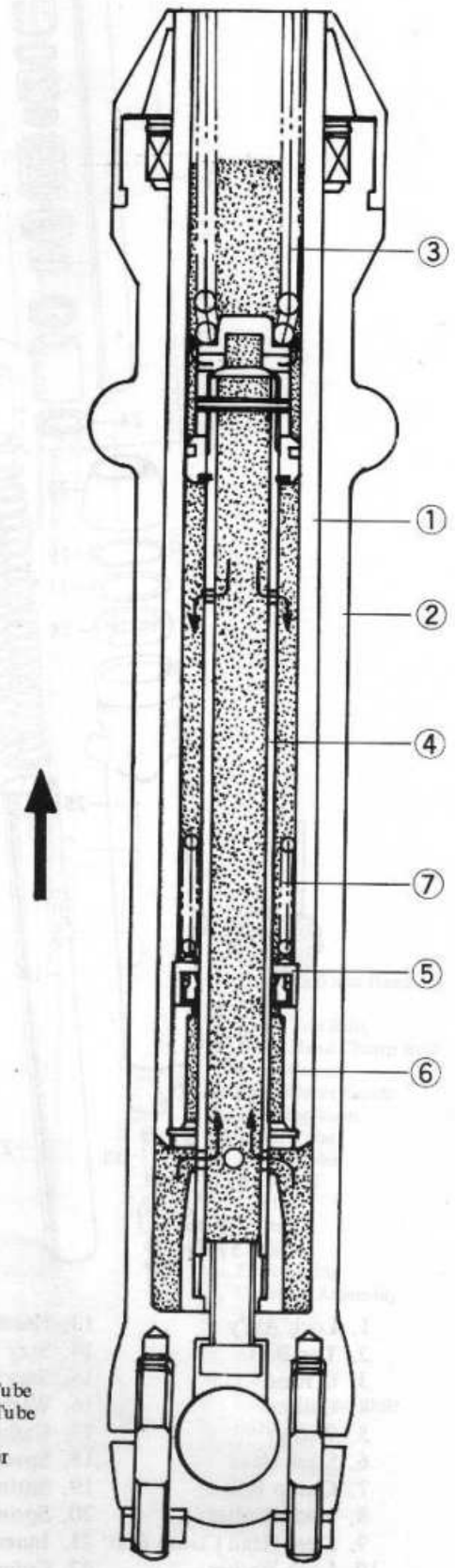
Near the end of the compression stroke, the space between the tapered lower end of the cylinder and the piston becomes smaller and offers increased resistance to the flow of oil until, just before the end of the stroke, oil flow is completely prevented and an oil lock condition occurs.

b. Extension stroke

The outer and inner tubes are pushed apart by spring tension whenever the load is taken off the front wheel or the wheel drops into a hole. As the tubes move apart, the oil chamber formed by the cylinder, valve and inner tube grows smaller, but since the valve is a non-return type, the oil cannot return through the valve the way it came. Instead, it flows through a hole in the upper part of the cylinder, and the resistance to this flow through the hole dampens the fork extension. Near the end of the extension stroke, the cylinder spring starts being compressed and further slows fork extension so that it does not suddenly top out.

Either too much or too little oil in the forks will adversely affect their shock damping ability. If there is too much oil or if the oil is too heavy, the shock absorbers will be too hard; too little oil or to light an oil will make the fork soft and decrease damping ability, and may cause the fork to be noisy during operation.

Compression Stroke (461)



1. Inner Tube
2. Outer Tube
3. Spring
4. Cylinder
5. Valve
6. Piston
7. Spring

If the inner tube becomes bent, dented, scored or otherwise damaged, it in turn will damage the oil seal and allow oil leakage. If the tube is bent badly enough, poor handling may also result.

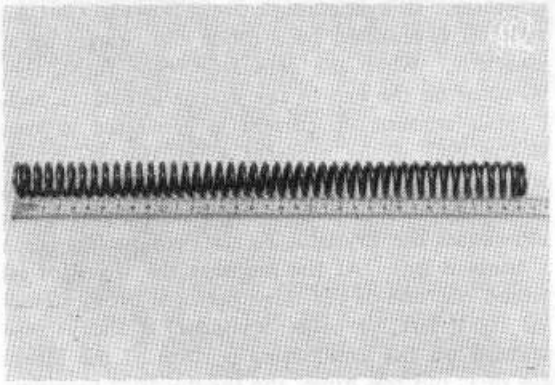
Contaminated or deteriorated oil will also affect shock damping, and in addition will accelerate wear of the internal fork parts. For this reason it should be changed periodically.

c. Spring tension

Since the spring becomes shorter as it weakens, check its free length to find out if it is weak. If the spring of either fork is shorter than the service limit, replace it. If the length of the replacement spring and that of the remaining old spring vary greatly, replace both old springs to keep the shock absorbers balanced and thereby maintain motorcycle stability.

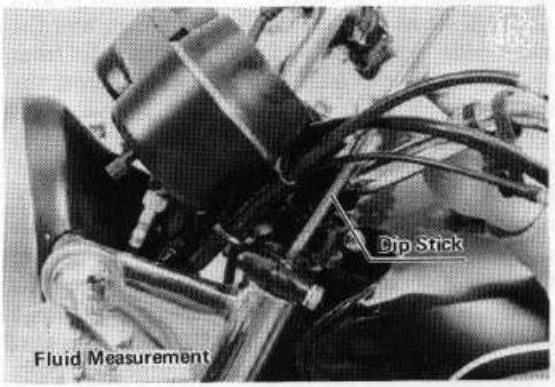
Table 42 Fork Spring Free Length

Standard	Service Limit
13.58 in. (345 mm)	13.19 in. (335 mm)

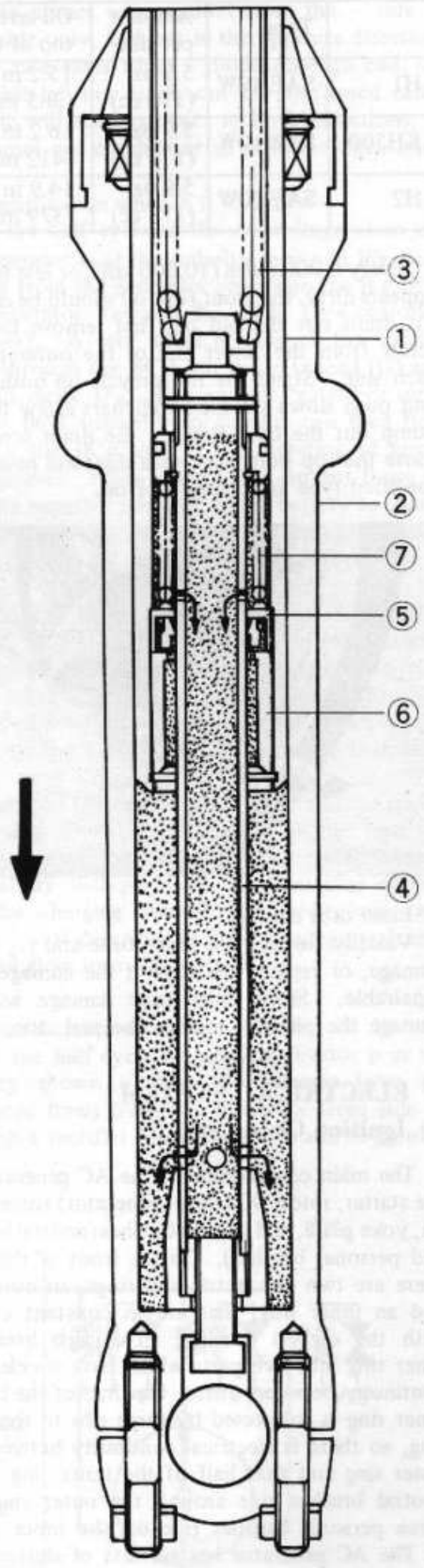


d. Fork oil

Place a jack or stand under the engine to that the front wheel is raised off the ground to check fork oil. Remove the top bolt from the inner tube. Insert a rod down into the tube and measure the distance from the top of the tube to the oil level. If the oil is below the correct level, add enough oil to bring it up to standard, but do not overfill the fork.



Extension Stroke (464)

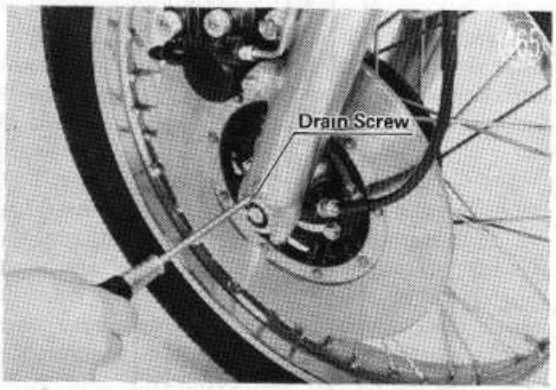


1. Inner Tube
2. Outer Tube
3. Spring
4. Cylinder
5. Valve
6. Piston
7. Spring

Table 43 Fork oil

	Type	Amount per side	Oil level from top of tube
H1	SAE 10W	5.7 oz (170 cc)	15.2 in (385 mm)
KH500	SAE 10W	5.9 oz (175 cc)	16.2 in (412 mm)
H2	SAE 10W	5.9 oz (175 cc)	14.9 in (379 mm)

Every 6,000 miles (10,000 km), or less if the oil appears dirty, the front fork oil should be changed. To drain out the old oil, first remove the drain screw from the lower end of the outer tube on each side. Stand the motorcycle on both wheels and push down on the handlebars a few times to pump out the oil. Replace the drain screws, remove the top bolt from each side, and pour in the specified type and amount of oil.



e. Inner tube damage

Visually inspect the inner tube and repair any damage, or replace the tube if the damage is not repairable. Since inner tube damage will also damage the oil seal, replace the seal, too.

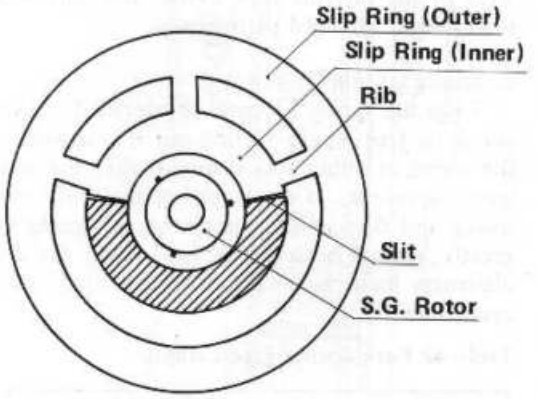
3. ELECTRICAL SYSTEM

1) Ignition Circuit (H1-E)

The main components of the AC generator are the starter, rotor, SG (signal generator) rotor, pick-up, yoke plate, and carbon brushes (neutral brushes and personal brushes). On the front of the rotor there are two concentric slip rings, an outer ring and an inner ring, that are in constant contact with the carbon brushes. Two slits break the inner ring into two parts which have no electrical continuity between them. One half of the broken inner ring is connected by three ribs to the outer ring, so there is electrical continuity between the outer ring and that half of the inner ring. Two neutral brushes ride around the outer ring, and three personal brushes ride on the inner ring.

The AC generator has six sets of starter coils. Five of these are connected in series-parallel for battery charging, and the sixth winding is mounted on the inner part of the starter and is used alone for the ignition system. A yoke plate is fixed to the starter, and on the plate are mounted pickups (N and S), the two neutral brushes, and the three personal brushes.

AC generator Rotor (466)



When the engine is kicked over, the AC generator rotor on the end of the crankshaft rotates and a current is generated in the ignition winding of the generator. This generated current flows to Unit A, where it is rectified by a diode and charges up a capacitor. When the generator rotor turns, the SG rotor on the end of the shaft also rotates, and a small amount of current is generated in the pickup coil at the moment when the SG rotor projection passes the pickup projection. This current goes to Unit A to the thyristor gate lead, and causes the thyristor to start conducting (i.e., it turns it on). At the moment the thyristor is turned on, one of the three personal brushes (for the right, left, or center cylinder) is always positioned on the conducting portion of the inner slip ring, and this brush and the thyristor together complete the path for discharging the capacitor. The capacitor's current goes first through the primary winding of the ignition coil corresponding to the personal brush aligned on the inner ring, then next through the personal brush to the inner ring, through the three ribs to the outer ring, from the outer ring through the neutral brush to ground, up through the thyristor, and finally back to the other side of the capacitor. The sudden current flow through the ignition coil, in combination with the high turns ratio of the coil windings, and the spark plug gap, make the original 300 volts from the capacitor into a 30,000-volt spark across the spark plug electrodes.

The mechanism that distributes the current to the correct ignition coil is called a distributor, but in the AC generator the rotor is doing the work of a distributor. So actually, the "distributor" in this case consists of the AC generator rotor, the neutral brushes, and the personal brushes. Since this distributor operates with the relatively low voltage of the primary side of the ignition coils, it is also referred to as a low-voltage distributor.

The capacitor in Unit A is connected in series with the ignition coils, so whether it is charging or discharging, all its current must pass through the distributor. This is why the arc-suppression circuit of Unit B is used; any arcing voltages that may occur during capacitor charging (due to brush jumping, a broken lead, etc.) are absorbed by C_2, R_1, and R_2, while any arcing tendency during discharging (firing) is taken care of by R_1.

2) Regulator/Rectifier (H1-E)

The faster that the AC generator rotates, the faster that the lines of magnetic flux cut through the stator coils, and due to this the higher the voltage that is generated. If the generator output is sent to the load circuits under these conditions, when the engine is turning at high rpm the battery would overcharge, light bulbs would burn out, and there would be various other electrical problems. To avoid this, a device is installed to always keep the generator voltage below a certain level, and this device is the regulator.

Permanent magnets are used in the generator rotor, and for this reason the magnetic flux itself can not be controlled, so in this motorcycle the generated voltage is controlled directly with a Silicon Voltage Regulator (SVR) that uses transistors, diodes, and special-purpose semiconductors to form an electronic relay. For physical strength and to best withstand ambient conditions, the regulator is sealed and can not be disassembled, but this is no disadvantage since the regulator is electronic and contains no moving parts to wear, and therefore never needs adjustment or parts replacement.

Besides holding the generated voltage down to a maximum of 15 ~ 16 volts, the regulator also rectifies the generator voltage and provides a DC output directly, thus eliminating the need for a separate rectifier. The rectifier performs full-wave rectification (that is, it changes both halves of the AC cycle to DC in order to obtain a smoother DC output) with silicon diodes in a bridge circuit (see Fig. 391, page 102), based on the principle that the diodes will conduct from the – side to the + side only, and not in the opposite direction. In the rare cases when a diode does go bad, the condition of the diode can be confirmed easily since it will then conduct in both directions, or sometimes not conduct at all in either direction.

(1) Rectification when A is +, B is –

On the half cycle of the AC voltage when the AC generator is at the polarity shown in Fig. 468, current from the generator goes from the B side of the generator toward the BCR (Bi-Controlled Rectifier). A very small portion of the current flows through the BCR out the gate lead (G) and through diode D_2. This current "gates" or turns on the BCR instantly so current can then flow through the BCR and in the direction of arrow 2 to ground. From ground, the current flows up into the negative terminal of the battery to charge it, then through diode D_1, through a rectifier diode (arrow 5), and back to the generator at side A.

Diode D_1 is not actually a part of the rectifier circuit. This diode is used to allow charging current to go through the battery, but to stop any current from flowing in the opposite direction out of the battery and through R_1 and R_2 to discharge the battery while the engine is running slowly or is stopped.

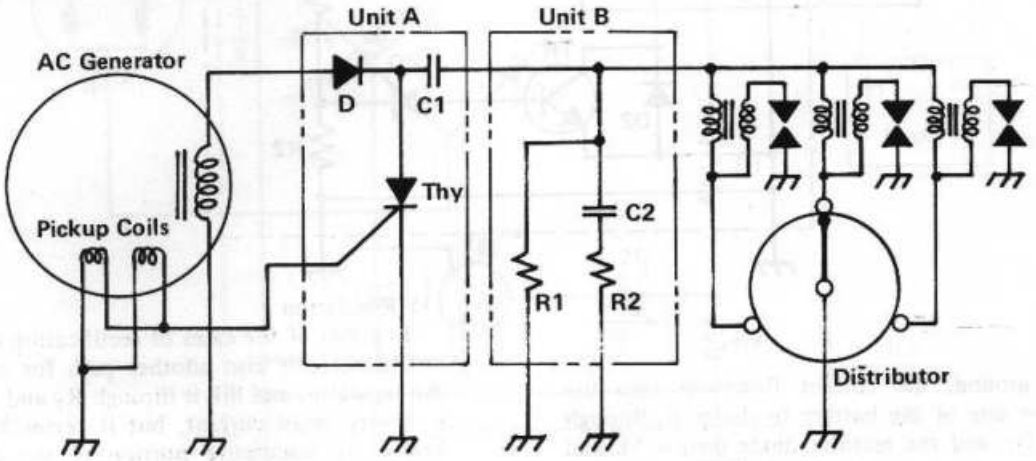
When the battery is well charged and the engine is running slowly or is stopped, or any time the battery voltage is higher than generator voltage, the battery voltage bucks the generator voltage and the charging current described above (and likewise that described in the following paragraph) will not flow into the battery.

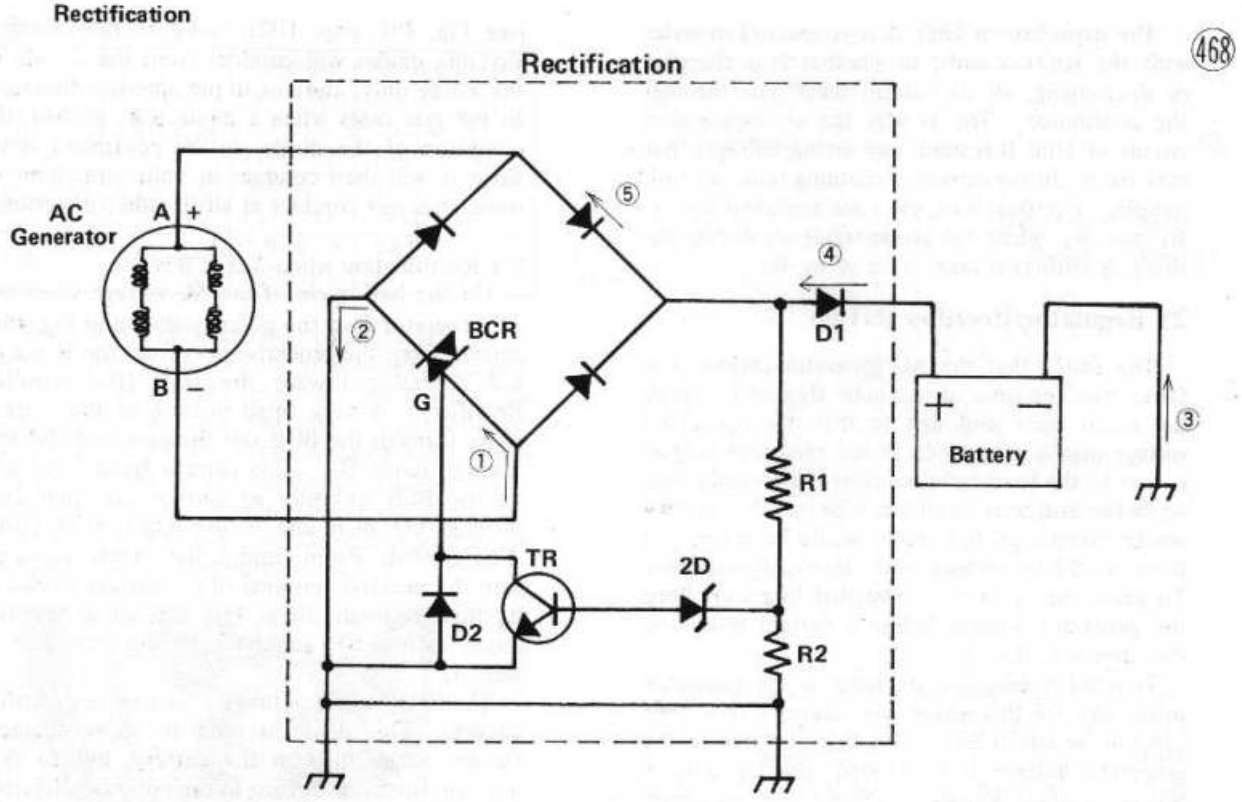
(2) Rectification when A is–, B is +

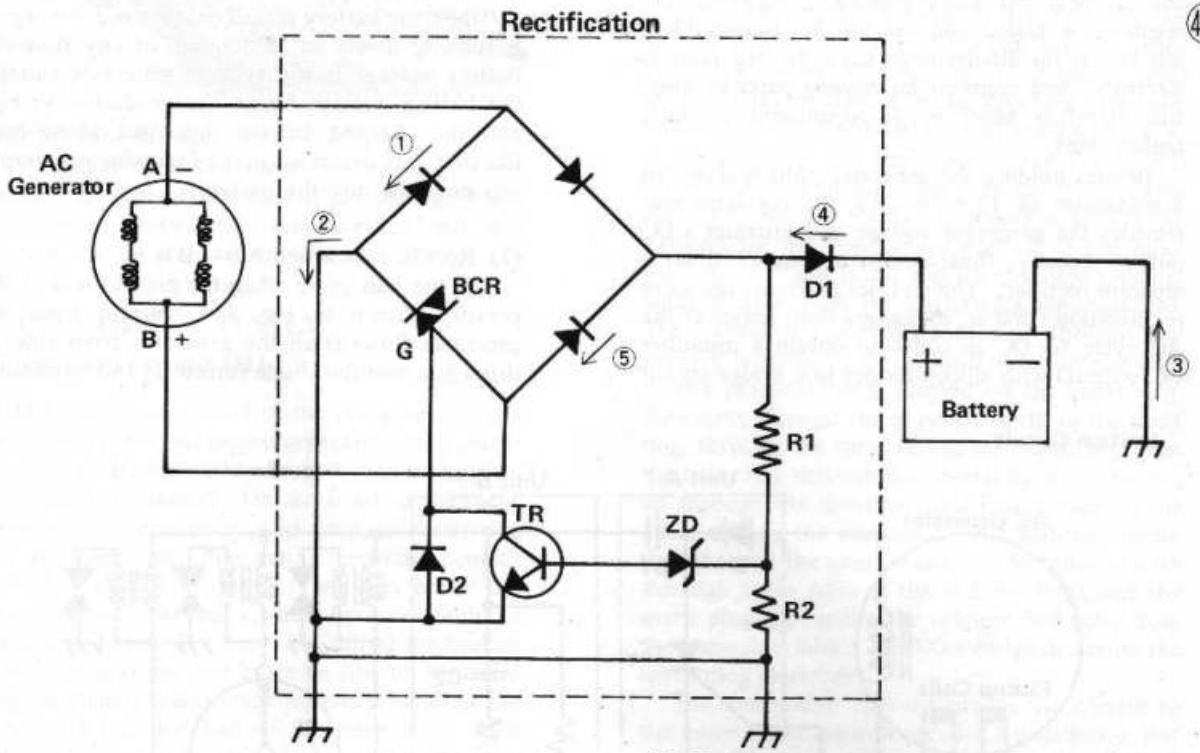
On the half cycle when the generator is at the polarity shown in Fig. 469, current from the generator flows from the generator from side A, through a rectifier diode (arrow 1) and to ground.

Ignition Circuit

(467)







From ground, the current flows up into the negative side of the battery to charge it, through diode D_1 and the rectifier diode (arrow 5), and back into the generator on side B.

(3) Regulation

In either of the cases of rectification explained above, there is also another path for current in the regulator, and this is through R_2 and R_1. This is a very small current, but it serves to always keep a representative portion of the generator voltage at the cathode of the Zener diode (ZD).

The Zener diode "monitors" this voltage and signals the transistor (TR) any time too high a voltage is generated. The transistor then conducts to turn on the BCR and regulate the voltage. At this point, though, you will notice that the BCR in para. (1) above is already being turned on by a current through D_2, and is serving as an integral part of the battery charging circuit. So it can be seen that the regulator circuit operates only on the half of the AC cycle when the generator polarity is as shown in Fig. 468 or 469.

Looking at Fig. 470 then, here is how the regulator works when the generator voltage is too high. Current from A starts to flow through the path shown by arrows 1, 2, 3, 4, and 5 to charge the battery, and a small current also flows up through R_2 and R_1 for ZD to monitor. As the voltage on this half cycle continues to rise excessively, Zener diode ZD breaks down and starts conducting in the direction of arrow 6. This starts the transistor (TR) conducting (arrow 7) to gate the BCR. As soon as the BCR turns on, the current coming through the first rectifier (arrow 1) suddenly finds a short circuit path back to the other side of the generator (arrow 8 and 9), and so the excess current is effectively returned to the generator and the voltage is kept from becoming too high.

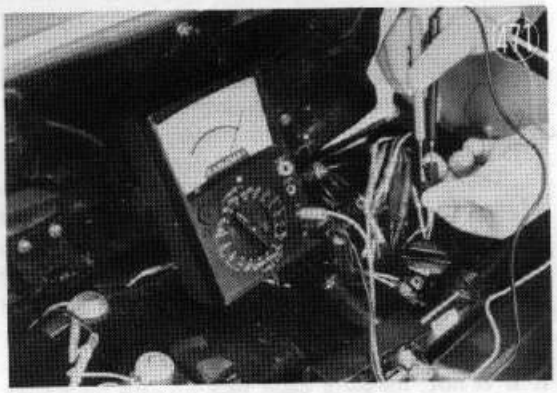
3) Dynamo Test

Open the seat and use a hand tester to measure the resistance of the charge windings, ignition windings, and pick-up coils.

(1) Charge windings

The charge windings consist of five armature coils connected in a series-parallel arrangement. To test them unplug the 2-pin connector connecting the two yellow wires, and using the meter on the R x 1 scale, touch one tester lead to each of the two terminals on the dynamo side. At this time the meter should give a reading between 0.20~0.30Ω. If the reading is less than this there is probably a (layer) short, and if there is more than 0.30Ω resistance or if the meter gives no indication at all, then there is an open wire in the dynamo leads or windings.

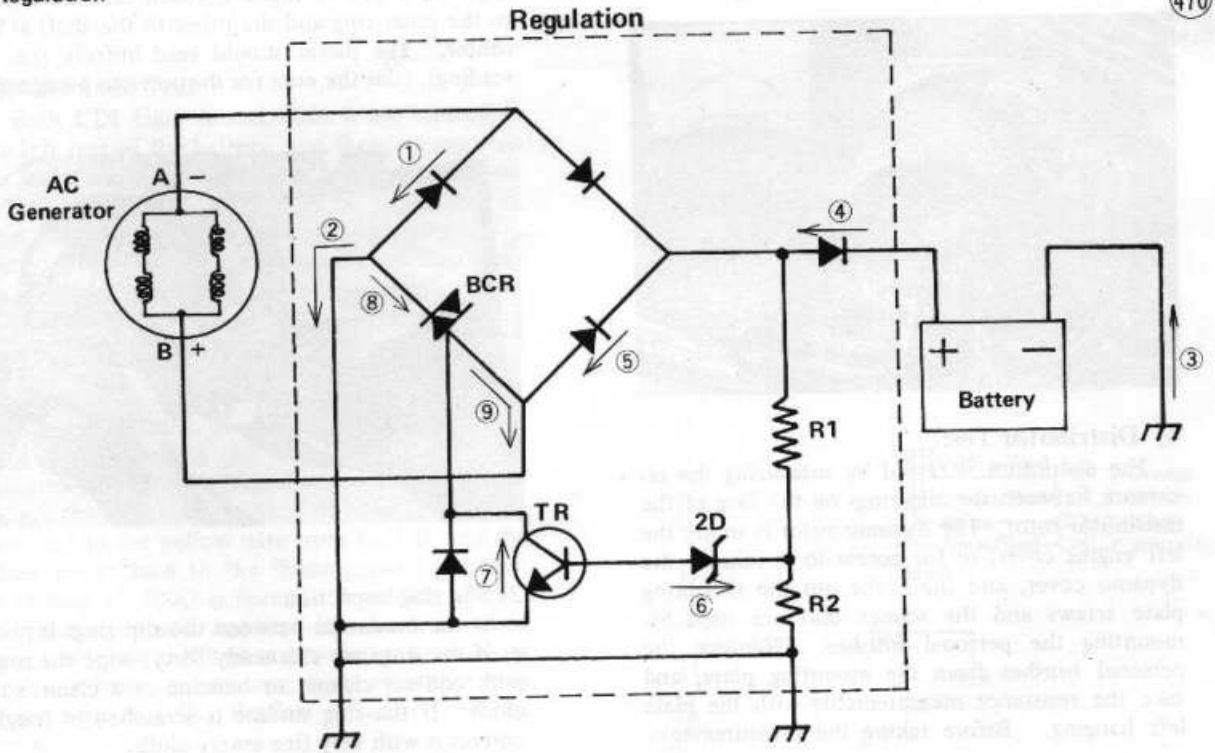
If the dynamo is found to be bad with this resistance check, replace the stator.



(2) Ignition winding

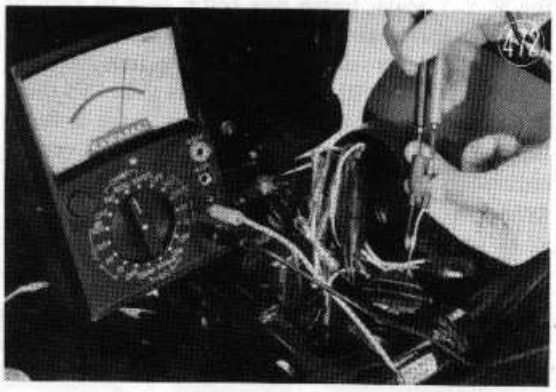
There is only one ignition winding. To test it unplug the 2-pin connector that connects the brown leads and the orange leads, and using the meter on the R x 10 resistance range, touch one

Regulation



470

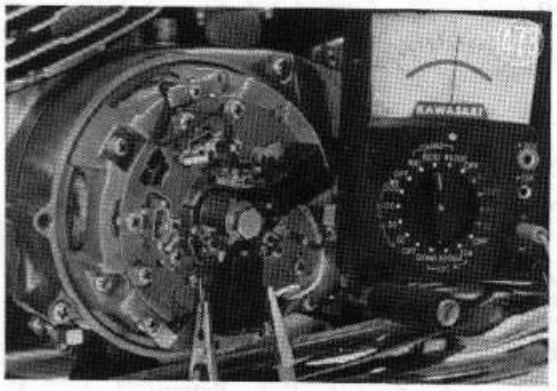
meter lead to each of the connector terminals on the dynamo side and measure the resistance of the winding. There should be a reading between 92 ~ 140Ω. If the dynamo is found to be bad with this resistance check, replace the stator.



(3) Pick-up coils

There are two pick-up coils connected in parallel. To test them, unplug the connector that connects the white wires, and using the meter on the R x 10 range, touch one meter lead to the white wire on the dynamo side and the other meter lead to frame ground terminal.

The reading at this time should be 100~160Ω. If it is not, measure each pick-up coil separately to determine which is bad. This is done by unscrewing the pick-up coil ground terminal and measuring the resistance between the white wire and the ground wire of the coil. The resistance of each coil should be 210~310Ω. If the pick-up coils is found to be bad with this resistance check, replace the pick-up coils.



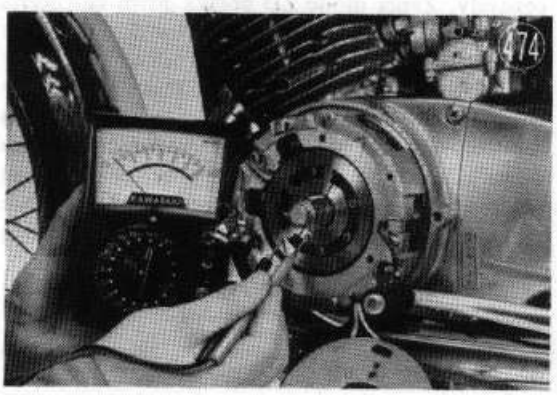
4) Distributor Test

The distributor is tested by measuring the resistance between the slip rings on the face of the distributor rotor. The dynamo rotor is inside the left engine cover, so for access to it remove the dynamo cover, and then take out the mounting plate screws and the screws that are used for mounting the personal brushes. Remove the personal brushes from the mounting plate, and take the resistance measurements with the plate left hanging. Before taking the measurements, clean the slip ring slits and remove any foreign matter that may affect the resistance.

(1) Resistance between outer and inner rings

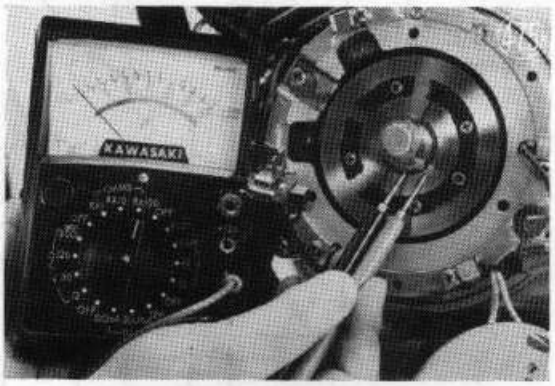
Measure the resistance between the rings by touching one meter lead to the outer ring, and the other meter lead to the separated half of the inner ring. With the meter set to the highest resistance scale (R x 100 or higher), there should be a reading of infinity (i.e. no reading) if the distributor is good. If the meter needle moves at all, the dynamo rotor is bad and must be replaced.

NOTE: Do not touch the metal part of the meter leads with bare hands during measurement, as this will affect the reading.



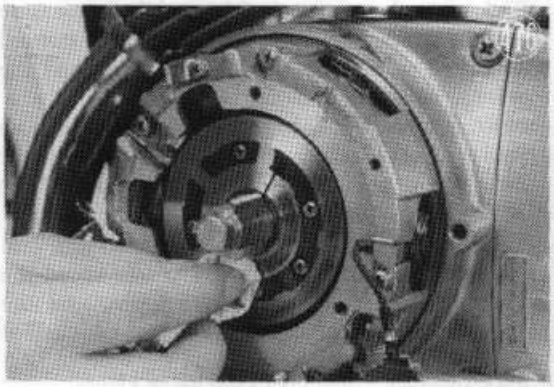
(2) Resistance between inner ring and shaft

With the meter set to the highest resistance scale (R x 100 or higher), touch one meter lead to the inner ring and the other to the shaft at the center. The meter should read inifnity (i.e. no reading). (See the note for the previous paragraph.)



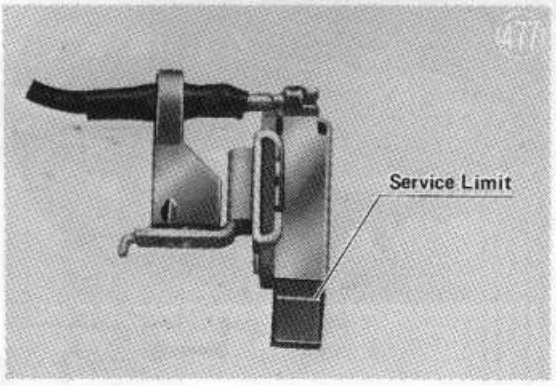
(3) Slip ring inspection

If the insulation between the slip rings is poor or if the rings are extremely dirty, wipe the rings with contact cleaner or benzine or a clean, soft cloth. If the ring surface is scratched or rough, correct it with very fine emery cloth.



(4) Carbon brushes

There are two neutral and three personal carbon brushes, which gradually wear down in time. A line marked in the side of each brush indicates the limit to which the brush can be safely used, and the brush must be replaced when it wears down to this line.

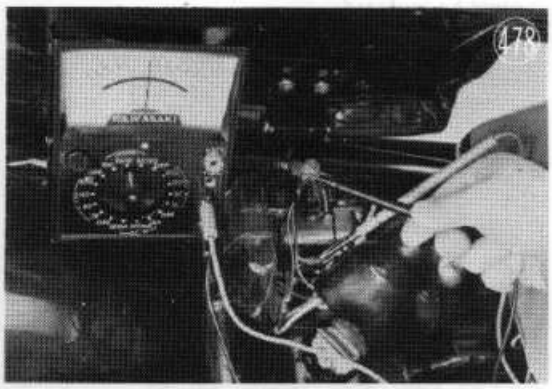


5) CDI Unit Test

Both CDI Unit A and Unit B are located at the left rear of the battery, and their connections are under the seat. The larger unit on the bottom is Unit A, and the smaller one on top is Unit B. Unit B consists only of resistors and capacitors so testing with a hand tester is usually sufficient, but Unit A contains thyristors, diodes, and other semiconductors and so must be tested with the Electrotester (special tool).

(1) Unit B

The construction of Unit B is as shown in Fig. 467. When making resistance tests of this unit, disconnect the yellow lead that connects it to Unit A, set the tester to the R x 10 range, and touch one lead to the yellow wire from Unit B, and the other meter lead to the frame ground terminal. A reading of 300Ω is normal. A reading of 30Ω indicates a probable bad capacitor, while a reading of infinity (no reading) means that resistor R_1 is probably bad. In any case, if the resistance read is not close to 300Ω, the unit is bad and must be replaced.

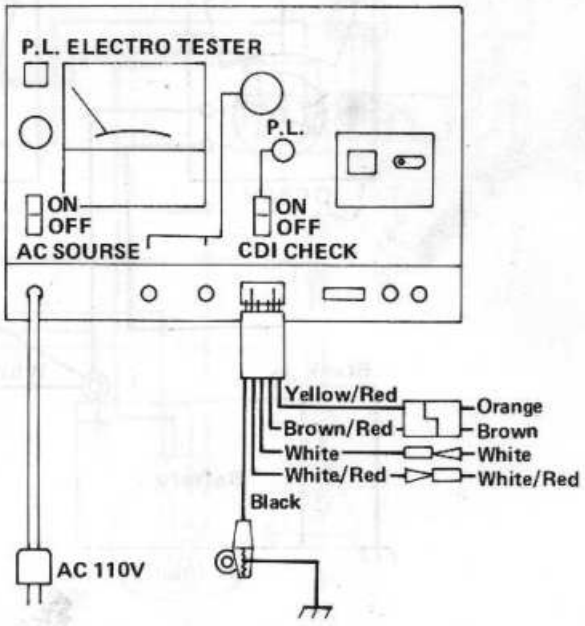


(2) Unit A

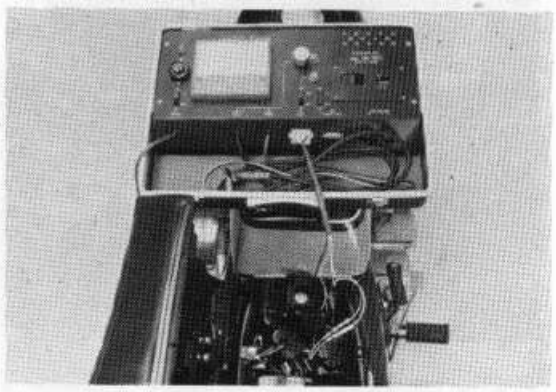
To test Unit A, the Electrotester must be used; the hand tester will not test it properly.

- Unplug the 2-pin connector that connects the brown and the orange leads from Unit A.
- Unplug the connectors the white/red and the white leads from Unit A.
- As shown in Fig. 479, connect the harness provided with the Electrotester between the connectors from the unit, and the CDI-CHECK of the Electrotester.
- Plug the Electrotester into a 110VAC outlet, and put the tester AC POWER switch in the ON position. The pilot light (PL) indicates that the power is on.
- Set the motorcycle ignition switch to the ON position and the engine stop switch to the RUN position.
- Set the CDI-CHECK switch of the Electrotester to the ON position.
- The ignition unit is good if the pilot light stays on. If the light does not come on, the unit is bad and

CDI Unit Test (479)



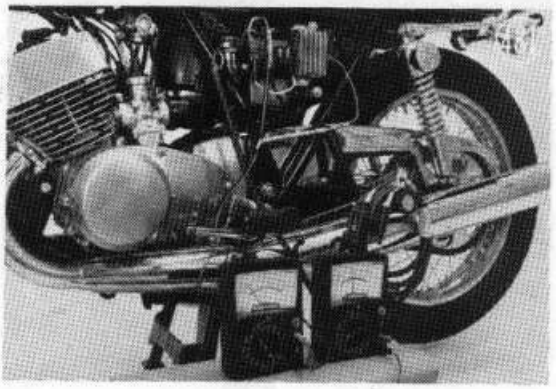
must be replaced.



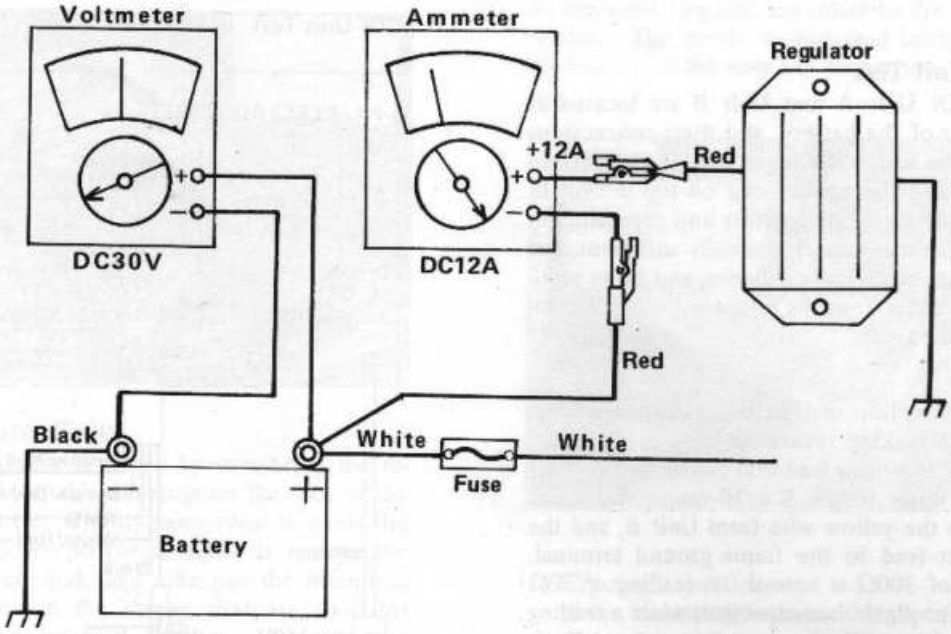
6) Regulator Test

The regulator is located inside the left side cover. It is tested using two hand testers while still mounted on the motorcycle. Before starting regulator testing, check the battery voltage and make usre the battery is charged up to at least 13 volts.

- Unplug the connector of the red lead that comes out of the regulator, and connect the positive (+) tester lead to the wire on the regulator side, and the negative (–) meter lead to the wire on the battery side. Set the tester to the 12 amp DC range so that current can be measured with this meter.
- Set the other tester to the 30VDC range, and connect the positive (+) tester lead to the plus terminal of the battery, and connect the negative (–) meter lead to the minus side of the battery.
- Kick start the engine and let it idle to measure current and voltage. At idling, the current measured should be less than 2 amps, and the voltage between 14.5 and 15.5 volts.
- Next raise engine speed to 3,000 rpm and note the readings again. At this time the current should still be 2 amps or less, and the voltage between 14.5 and 15.5 volts.
- Now turn the headlight on to low beam, and read the current and voltage. At idle speed the current should be less than 5 amps, and the voltage 12 ~ 13 volts. At 3,000 rpm the current should be less than 5 amps, and the voltage 14.5 ~ 15.5 volts.
- If the readings specified above can not be obtained, and provided that the generator, battery, etc. are good, the regulator is bad and must be replaced.

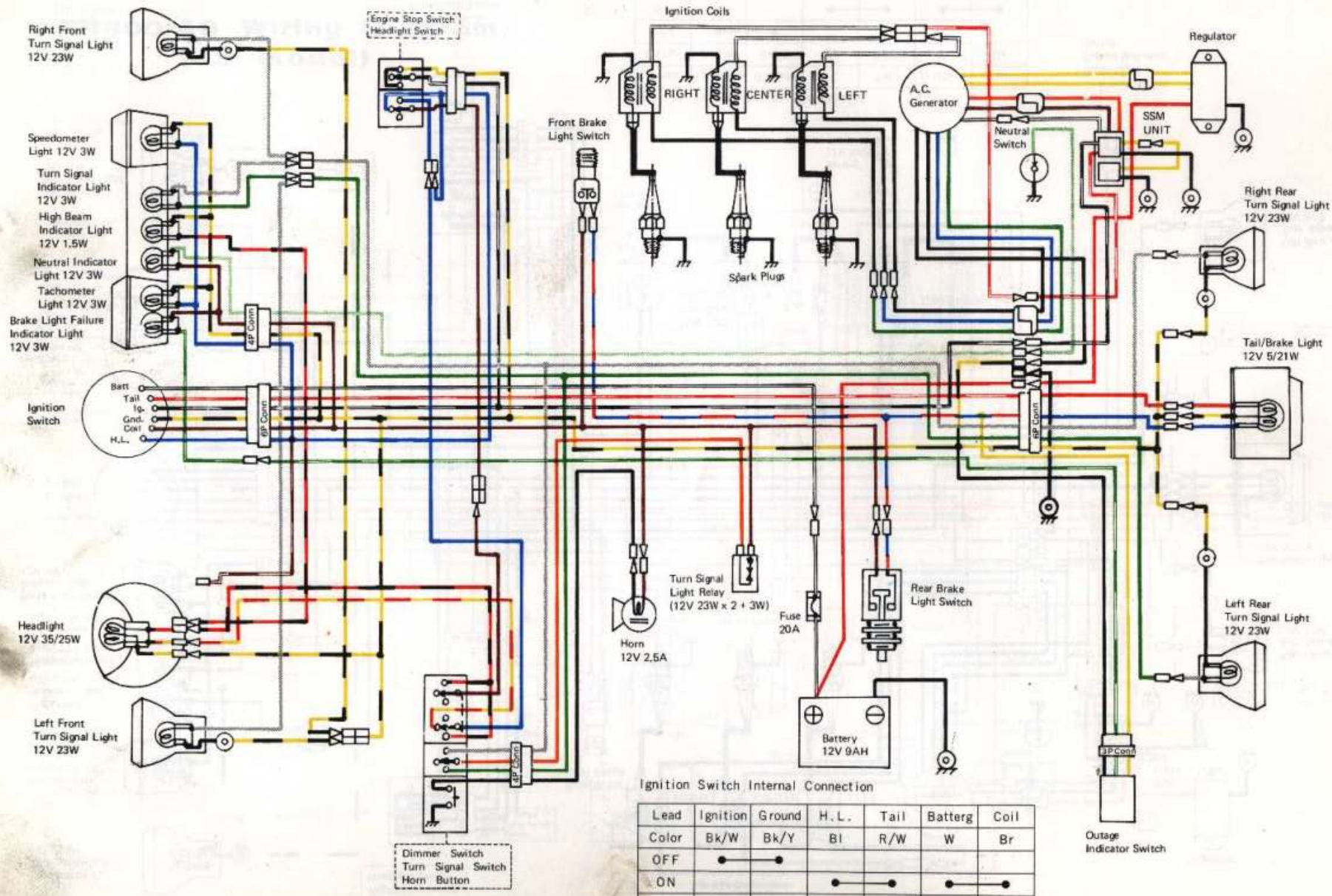


Regulator Test



(482)

H1-E Wiring Diagram (US Model)

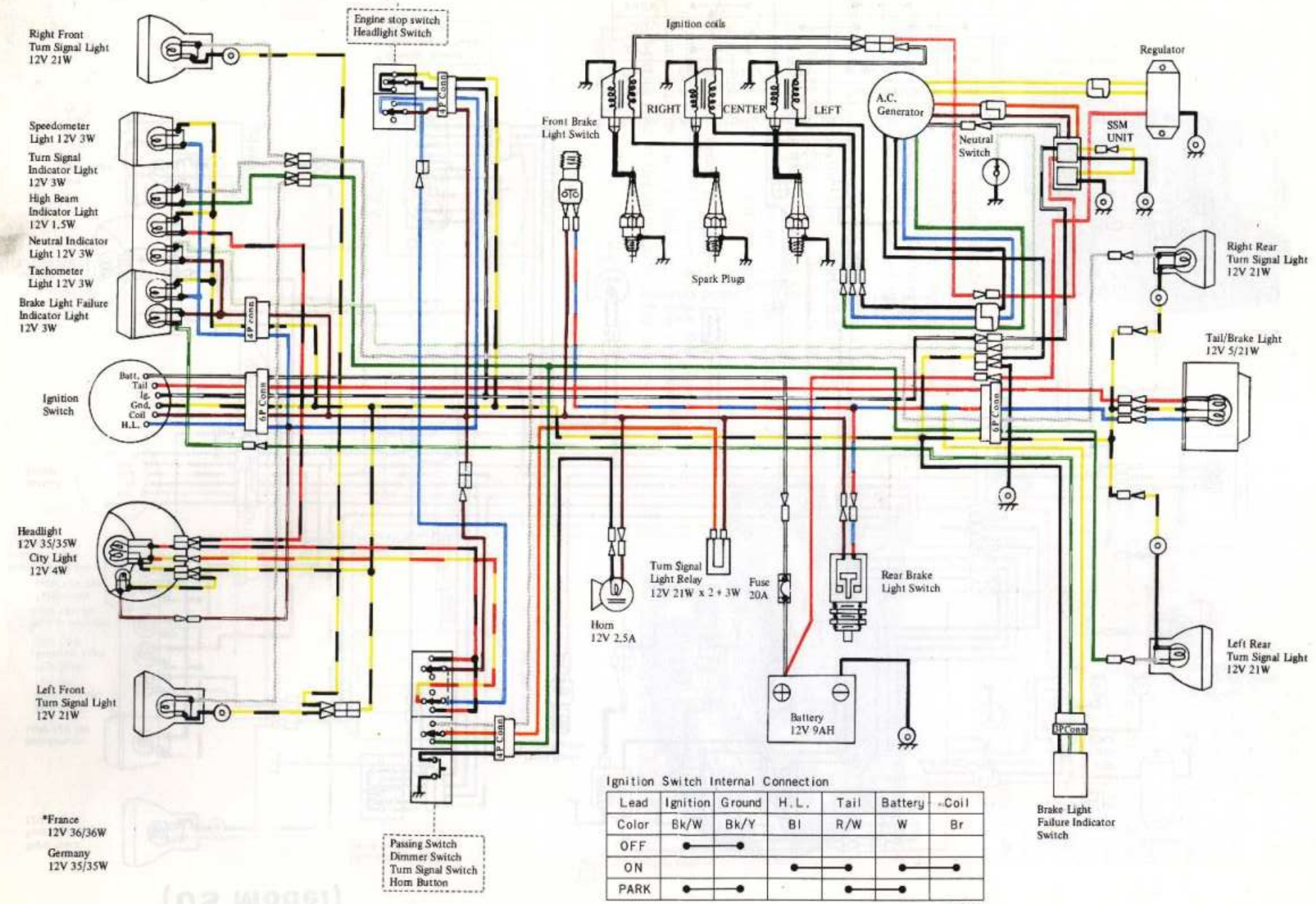


Ignition Switch Internal Connection

Lead	Ignition	Ground	H.L.	Tail	Batterg	Coil
Color	Bk/W	Bk/Y	Bl	R/W	W	Br
OFF	●	●				
ON			●	●	●	●
PARK	●	●		●	●	

(136-3)

H1 E Wiring Diagram (European Model)

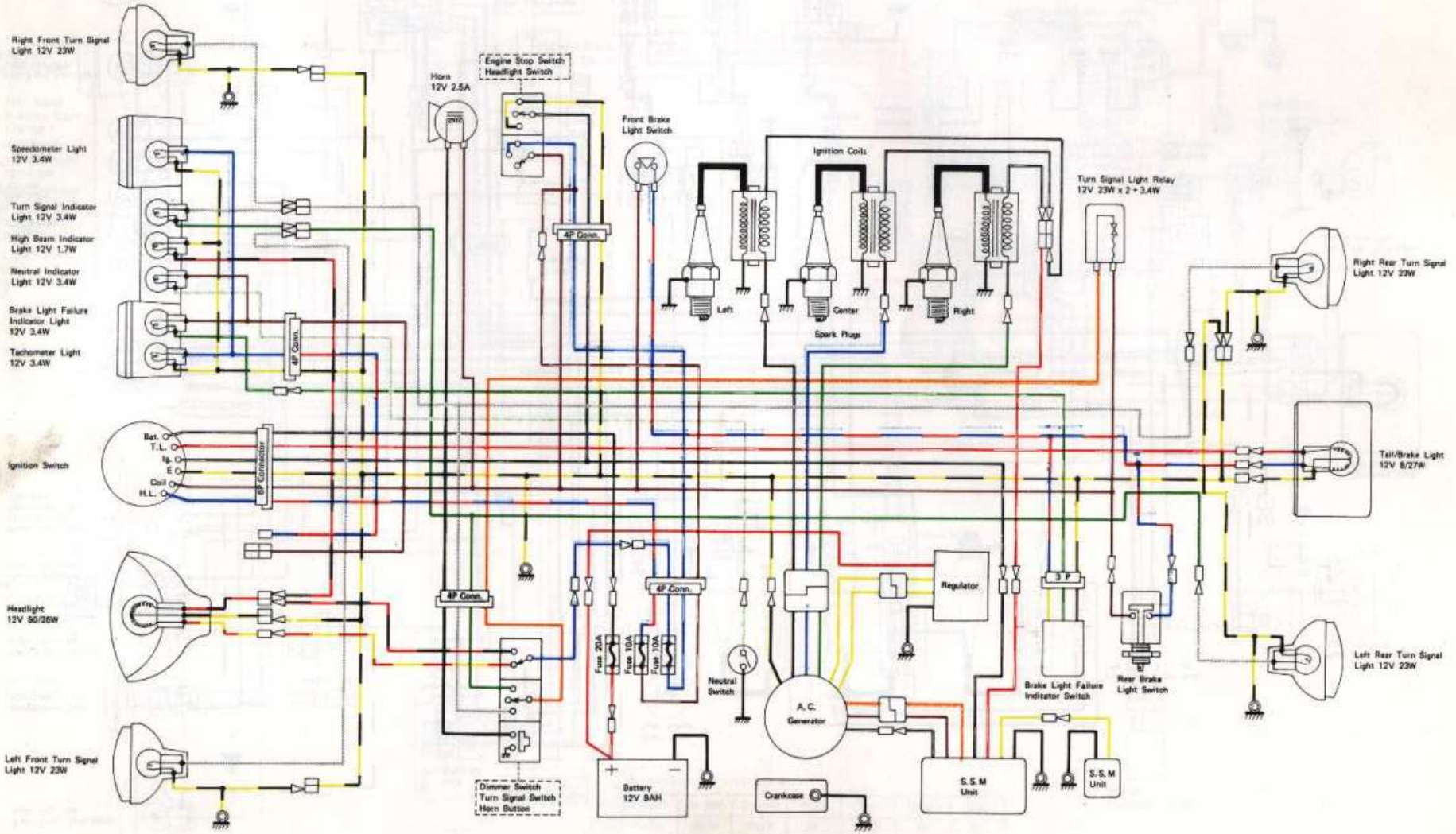


Ignition Switch Internal Connection

Lead	Ignition	Ground	H.L.	Tail	Battery	Coil
Color	Bk/W	Bk/Y	Bl	R/W	W	Br
OFF	●	●				
ON			●	●	●	●
PARK	●	●		●	●	

(138-2)

KH500-A8 Wiring Diagram (US Model)

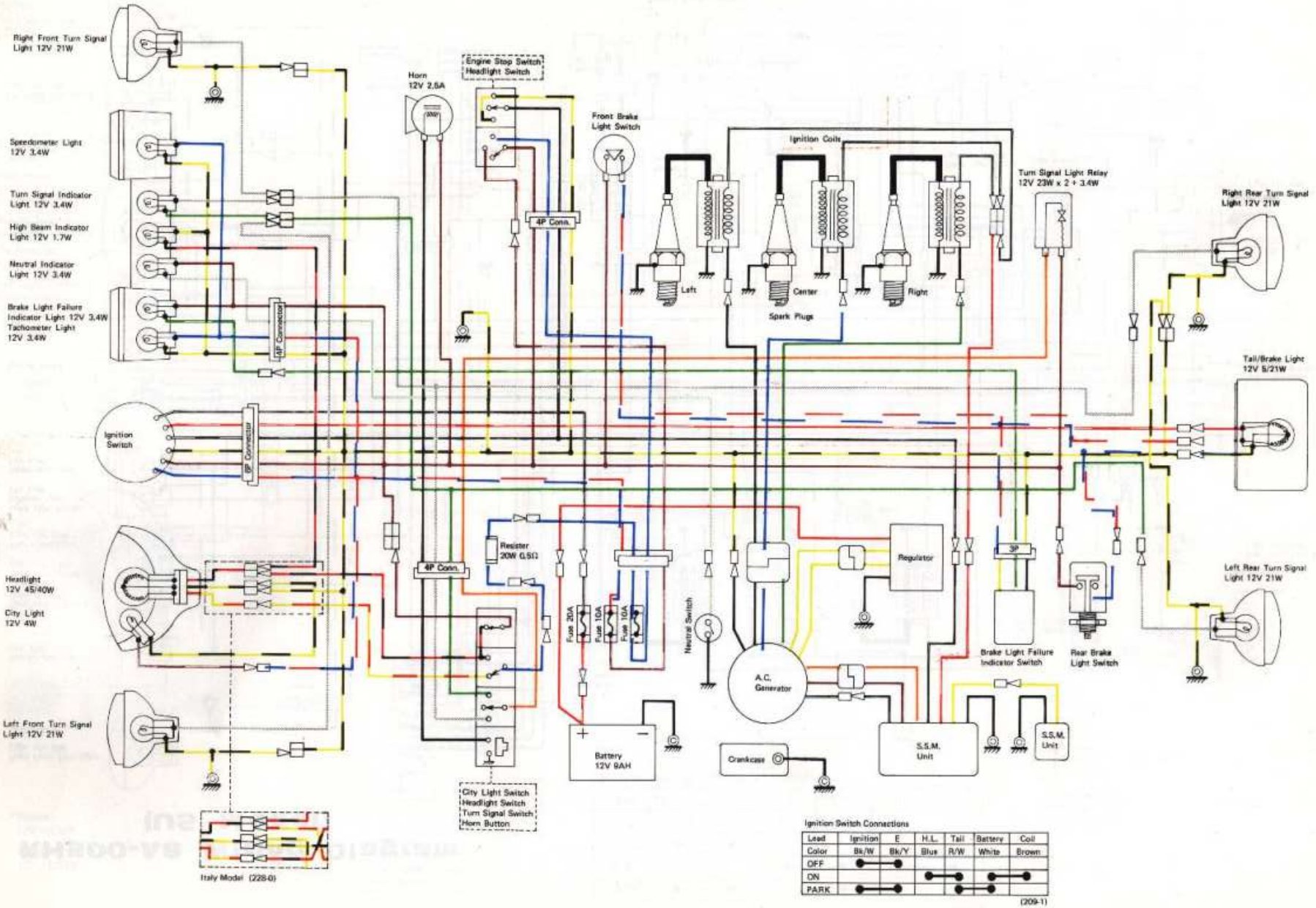


Ignition Switch Connections

Lead	Ignition	E	H.L.	Tail	Battely	Coil
Color	Bk/W	Bk/Y	Blue	R/W	White	Brown
OFF	●	●				
ON			●	●	●	
PARK	●	●		●	●	

(191-3)

KH500-A8 Wiring Diagram (European Model)

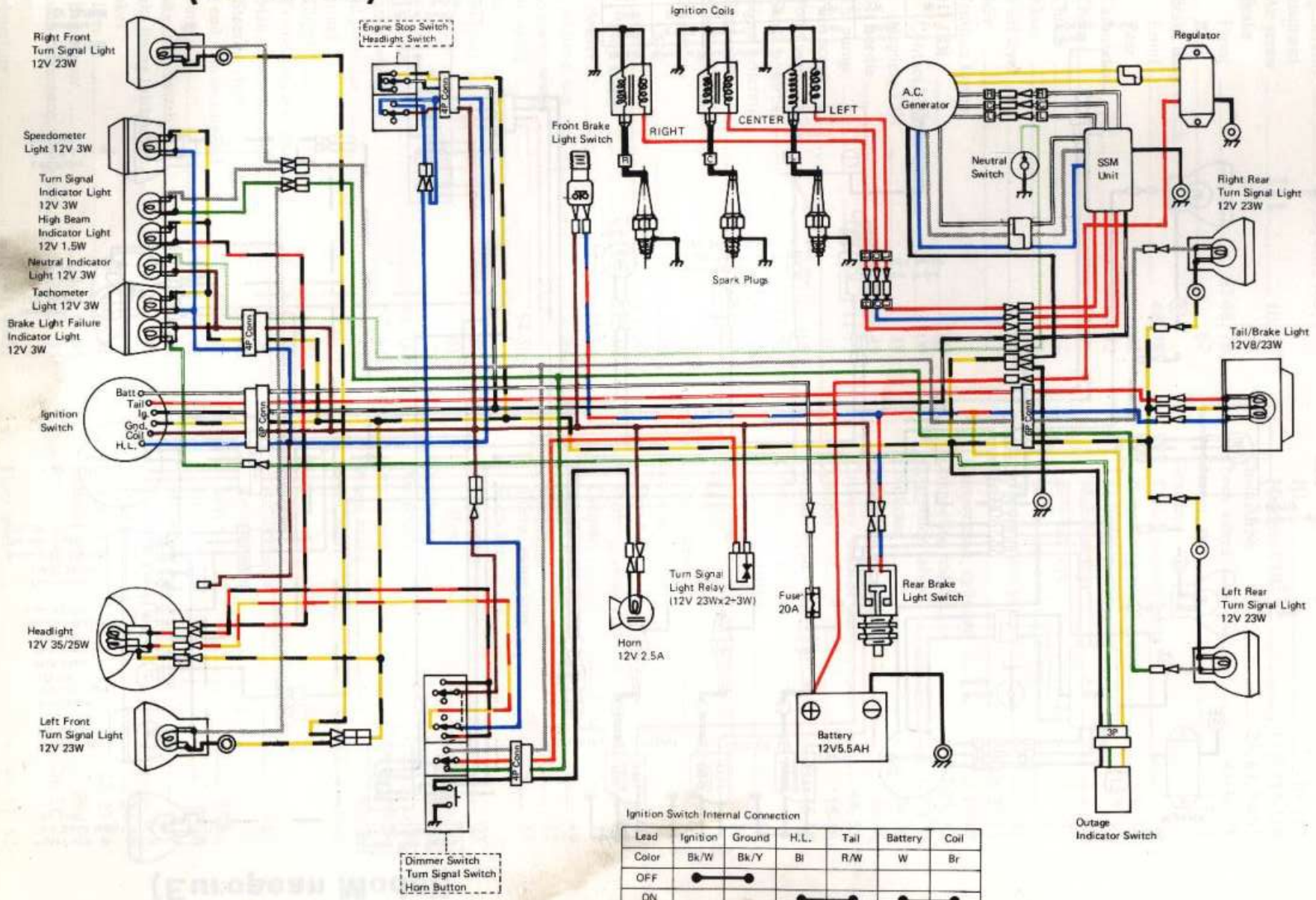


Ignition Switch Connections

Lead	Ignition	E	H.L.	Tail	Battery	Coil
Color	Bk/W	Bk/Y	Blue	R/W	White	Brown
OFF	●	●				
ON			●	●	●	
PARK	●	●		●		

(209-1)

H2-B Wiring Diagram (US Model)

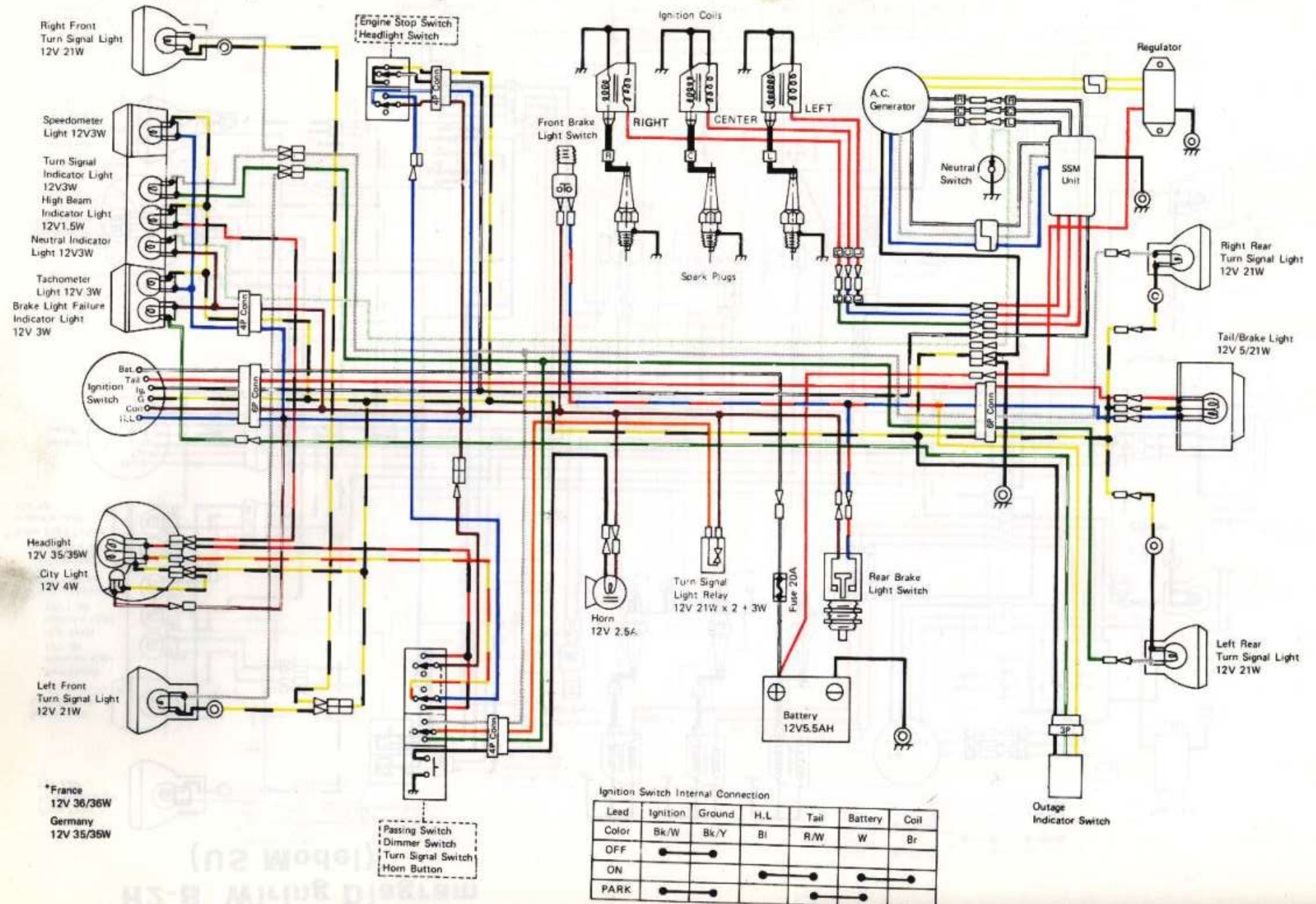


Ignition Switch Internal Connection

Lead	Ignition	Ground	H.L.	Tail	Battery	Coil
Color	Bk/W	Bk/Y	Bl	R/W	W	Br
OFF	●	●				
ON			●	●	●	●
PARK	●	●		●	●	

(147-2)

H2-B Wiring Diagram (European Model)



Ignition Switch Internal Connection

Lead	Ignition	Ground	H.L	Tail	Battery	Coil
Color	Bk/W	Bk/Y	Bl	R/W	W	Br
OFF	●	●				
ON			●	●	●	
PARK	●	●		●		

(156-1)

Decimal Equivalents

INCH					MM INCH
1/64				.015625	
	1/32			.03125	1mm= .03937 inch
3/64				.046875	
		1/16		.0625	
5/64				.078125	2mm= .07874 inch
	3/32			.09375	
7/64				.109375	3mm= .11811 inch
			1/8	.125	
9/64				.140625	
	5/32			.15625	4mm= .15748 inch
11/64				.171875	
		3/16		.1875	5mm= .19685 inch
13/64				.203125	
	7/32			.21875	
15/64				.234375	6mm= .23622 inch
			1/4	.25	
17/64				.265625	7mm= .27559 inch
	9/32			.28125	
19/64				.296875	
		5/16		.3125	8mm= .31496 inch
21/64				.328125	
	11/32			.34375	9mm= .35433 inch
23/64				.359375	
			3/8	.375	
25/64				.390625	10mm= .39370 inch
	13/32			.40625	
27/64				.421875	11mm= .43307 inch
		7/16		.4375	
29/64				.453125	
	15/32			.46875	12mm= .47244 inch
31/64				.484375	
			1/2	.5	13mm= .51181 inch

INCH					MM INCH
33/64				.515625	
	17/32			.53125	
35/64				.546875	14mm= .55118 inch
		9/16		.5625	
37/64				.578125	15mm= .59055 inch
	19/32			.59375	
39/64				.609375	
			5/8	.625	16mm= .62992 inch
41/64				.640625	
	21/32			.65625	17mm= .66929 inch
43/64				.671875	
		11/16		.6875	
45/64				.703125	18mm= .70866 inch
	23/32			.71875	
47/64				.734375	19mm= .74803 inch
			3/4	.75	
49/64				.765625	
	25/32			.78125	20mm= .78740 inch
51/64				.796875	
		13/16		.8125	21mm= .82677 inch
53/64				.828125	
	27/32			.84375	
55/64				.859375	22mm= .86614 inch
			7/8	.875	
57/64				.890625	23mm= .90551 inch
	29/32			.90625	
59/64				.921875	
		15/16		.9375	24mm= .94488 inch
61/64				.953125	
	31/32			.96875	25mm= .98425 inch
63/64				.984375	
			1	1.	

Unit Conversion Table

cc	x	.0610	=	cu in
cc	x	.02816	=	oz (imp)
cc	x	.03381	=	oz (US)
cu in	x	16.39	=	cc
ft-lbs	x	12	=	in lbs
ft-lbs	x	.1383	=	kg-m
gal (imp)	x	4.546	=	litres
gal (imp)	x	1.201	=	gal (US)
gal (US)	x	3.7853	=	liters
gal (US)	x	.8326	=	gal (Imp)
grams	x	.03527	=	oz
in	x	25.40	=	mm
in lbs	x	.0833	=	ft-lbs
in lbs	x	.0115	=	kg-m
kg	x	2.2046	=	lbs
kg	x	35.274	=	oz
kg-m	x	7.233	=	ft-lbs
kg-m	x	86.796	=	in-lbs
kg/cm^2	x	14.22	=	lbs/in^2
km	x	.6214	=	mile
lb	x	.4536	=	kg
lb/in^2	x	.0703	=	kg/cm^2
litre	x	28.16	=	oz (imp)
litre	x	33.81	=	oz (US)
litre	x	.8799	=	qt (imp)
litre	x	1.0567	=	qt (US)
metre	x	3.281	=	ft
mile	x	1.6093	=	km
mm	x	.03937	=	in
oz (imp)	x	35.51	=	cc
oz (US)	x	29.57	=	cc
oz (weight)	x	28.35	=	grams
qt (imp)	x	1.1365	=	litre
qt (imp)	x	1.201	=	qt (US)
qt (US)	x	.9463	=	litre
qt (US)	x	.8326	=	qt (imp)
kg/cm^2	x	98.07	=	kPa
lbs/in^2	x	6.896	=	kPa
kPa	x	.1450	=	lbs/in^2

$°C \rightarrow °F: \frac{9\,(°C + 40)}{5} - 40 = °F$

$°F \rightarrow °C: \frac{5\,(°F + 40)}{9} - 40 = °C$

List of Abbreviations

ABDC	after bottom dead center
ATDC	after top dead center
BBDC	before bottom dead center
BDC	bottom dead center
BTDC	before top dead center
cc	cubic centimeters
cu in	cubic inches
ft	foot, feet
ft-lbs	foot-pounds
gal	gallon, gallons
hp	horsepower
in	inch, inches
in-lb	inch-pounds
kg	kilogram, kilograms
kg/cm^2	kilograms per square centimeter
kg-m	kilogram meters
km	kilometer
kph	kilometers per hour
lb, lbs	pound, pounds
lbs/in^2	pounds per square inch
ltr	liter, litre
m	meter, meters
mi	mile, miles
mm	milimeters
mph	miles per hour
oz	ounce, ounces
psi	pounds per square inch
qt	quart, quarts
rpm	revolutions per minute
sec	second, seconds
SS	standing start
TDC	top dead center
"	inch, inches
r/min	revolutions per minute
ℓ	liter, litre
kPa	kilo-Pascals

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