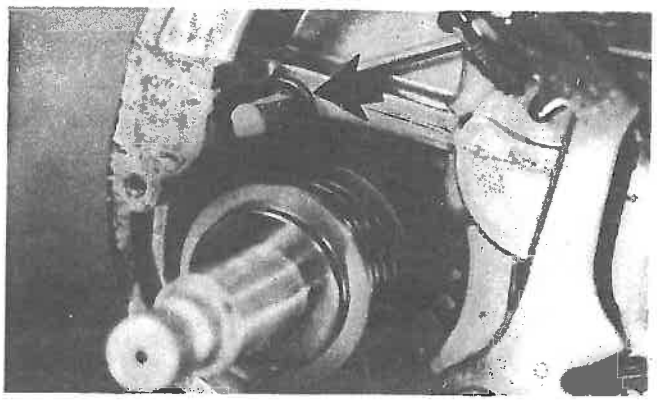
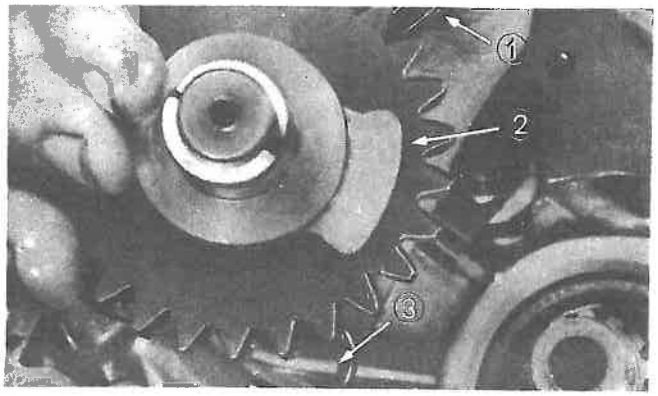
a) Slip the bent spring end off its anchor point and pull the kick starter assembly out of the case.



Anchor point of kick spring

b) To install the kick assembly, partially insert the assembly until the return spring (#3) can be slipped over its anchor point, then rotate the kick clip (#1) until it slips into the appropriate recessed area in the case. Attach the kick lever and rotate the kick axle 1/2–3/4 revolution in a counter-clockwise direction. Push the axle in. The kick stopper (#2) will slip into its recessed area in the case. The kickstarter is now pre-loaded to achieve positive kick return.

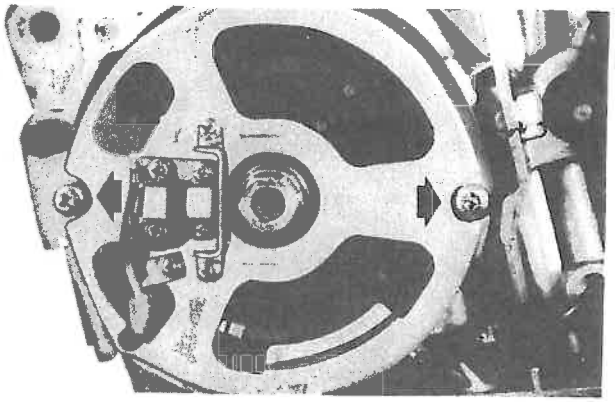


1. **Kick clip**
2. Kick stopper
3. Return spring

H) Alternator Case Cover

1) Stator Removal and Installation

a) The stator is held in place by two bolts. Remove the bolts and slide off the stator assembly. Take care that the wiring loom does not catch on any corners.

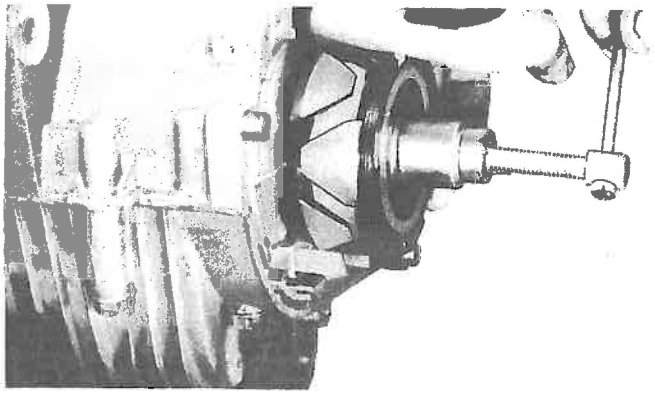


Two screws holding stator in place

b) Reverse these steps to install.

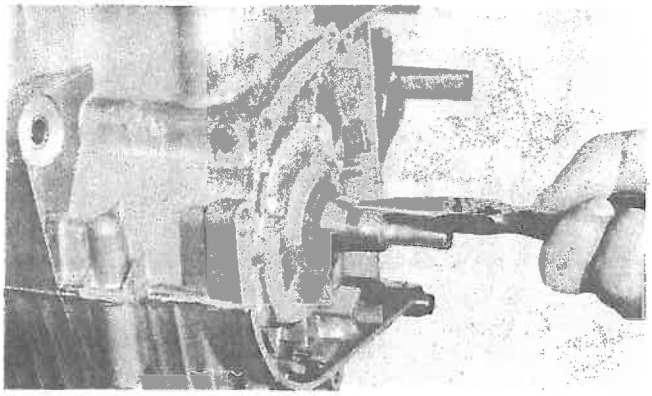
2) Rotor Removal and Installation

a) Remove the rotor securing nut and lock washer. Mount the rotor pulling tool (found in Special Tool Kit) onto the rotor and pull the rotor off.



b) Immediately after pulling the rotor, remove the rotor shaft key so that it cannot be lost.

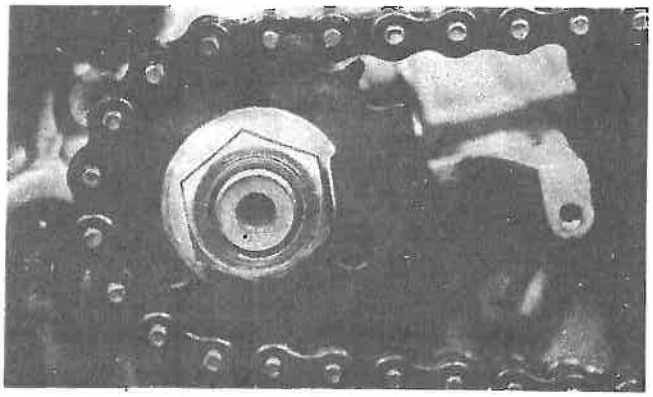
c) Installation: Slide the key into the keyway, lubricate the shaft taper with a light grease, line up the key slot on the rotor with the key and push the rotor on. Always lube the end of the shaft to make future disassembly easier.



Removing rotor shaft key

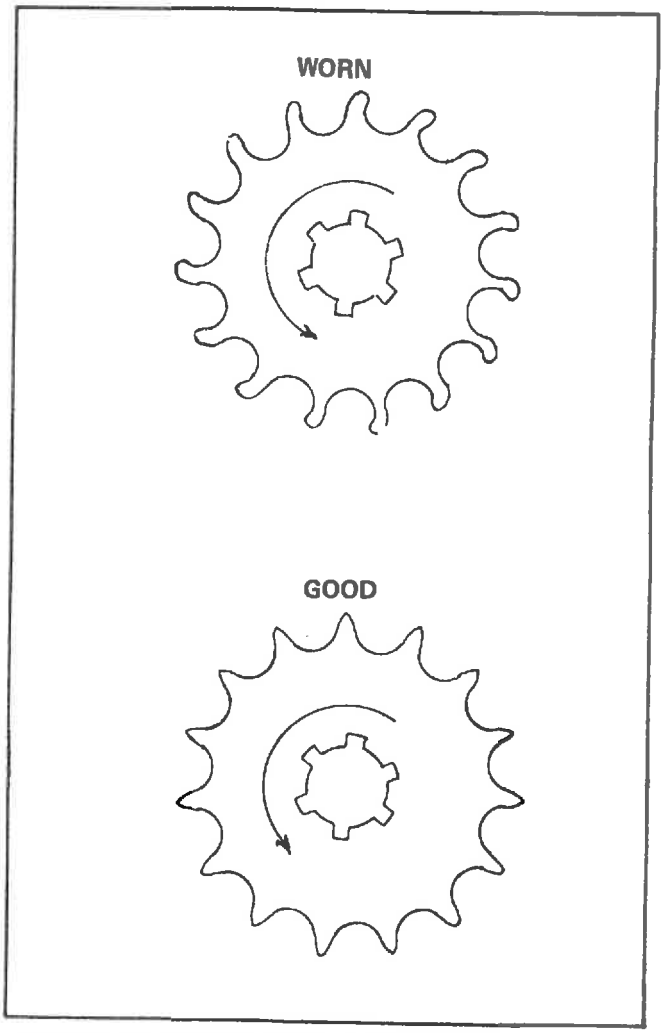
3) Drive Sprocket

a) Flatten the bent lock tab. Place the transmission into gear (to keep the shaft from rotating) and remove the lock nut. The drive sprocket need only be removed if transmission repair is necessary. In addition, it can be removed prior to removing the engine from the frame. Reverse the above procedures to install the sprocket. Be sure to bend the lock tab back up.



Drive sprocket

b) Constant tension and friction from the drive chain eventually wears away the base of the sprocket teeth. The weakened teeth bend and do not mesh correctly with the chain. Replace an excessively worn sprocket.



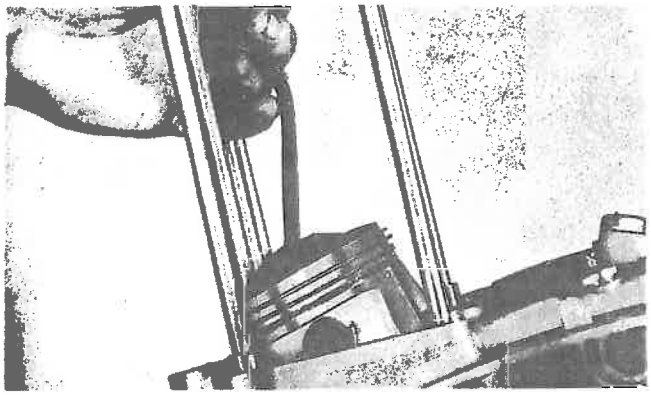
NOTE: If the sprocket shows sufficient wear to warrant replacement, check the drive chain and rear wheel sprocket. Replace as necessary.

I) Crankcases

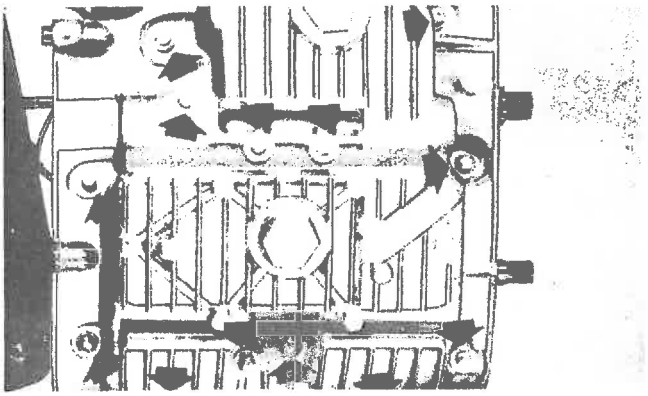
The XS 650 unit construction crankcase contains the transmission, crankshaft, oil sump, and associated parts such as oil strainer (in crankcase sump), etc.

1) Separating Crankcases

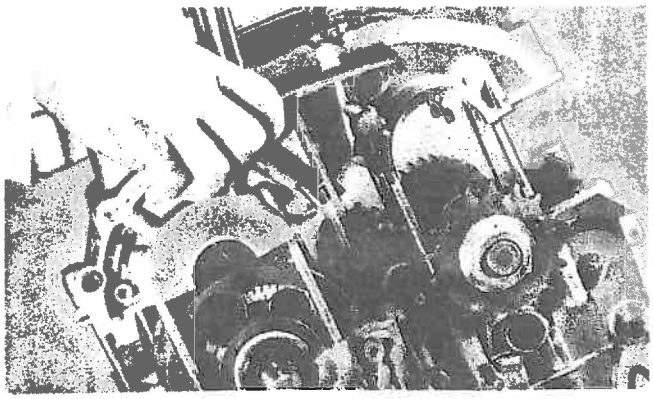
a) Pull out the cam chain (if not already removed).



b) Loosen and remove all case securing bolts located on the bottom of the case plus the case bolts around the dip stick on top. Start with #18 and loosen each bolt to #1. Loosen each bolt 1/4 turn at a time to avoid case warpage.

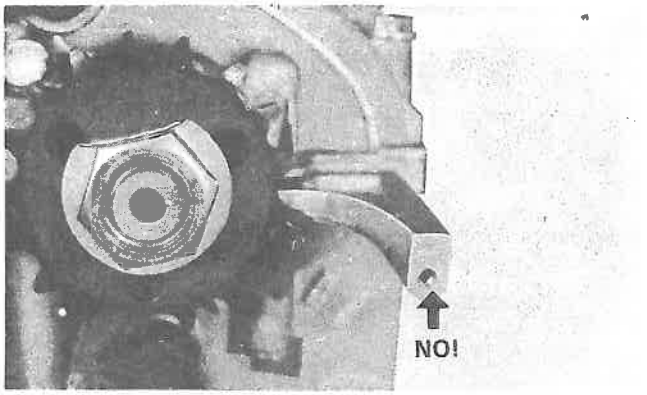


c) Separate the cases by lifting the top case. It might be necessary to tap the top case loose with a rubber hammer.

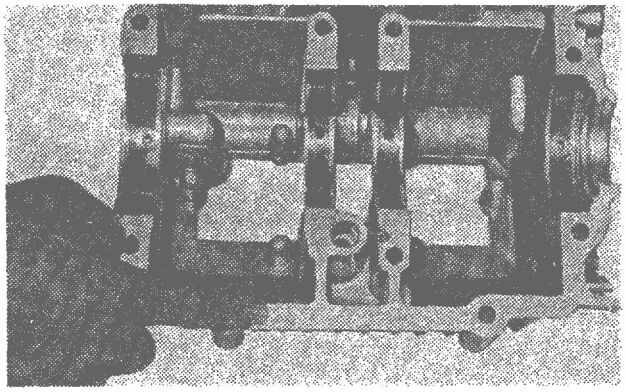


CAUTION

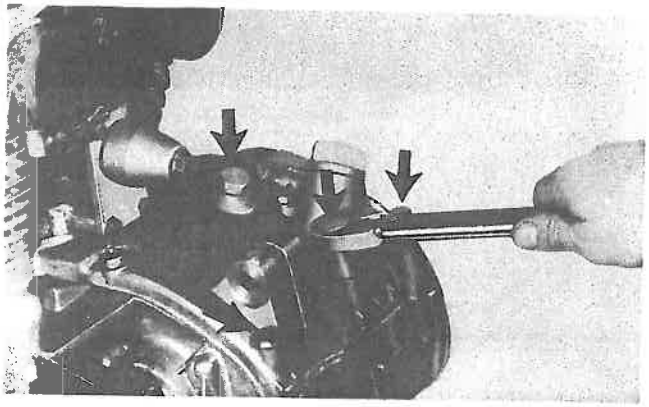
Do not hammer on the case cover mounting flange; it could easily break off.

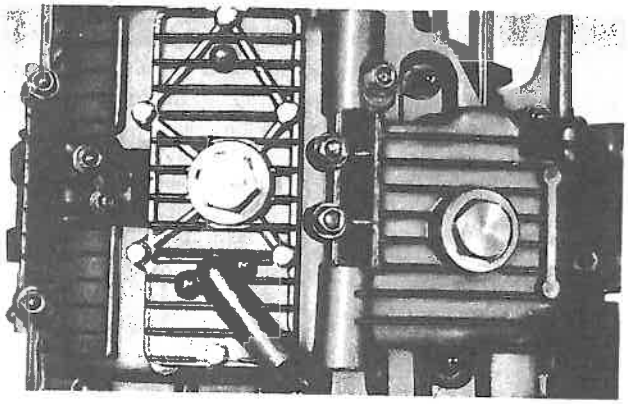


d) Assembling top and bottom cases:
The shifting mechanism, transmission, and crankshaft have already been installed in the top case. Make sure both case mating surfaces are clean, then apply Yamaha Bond #5 (non-drying, rubber base sealer) to the gasket surfaces. Slide the cases together.

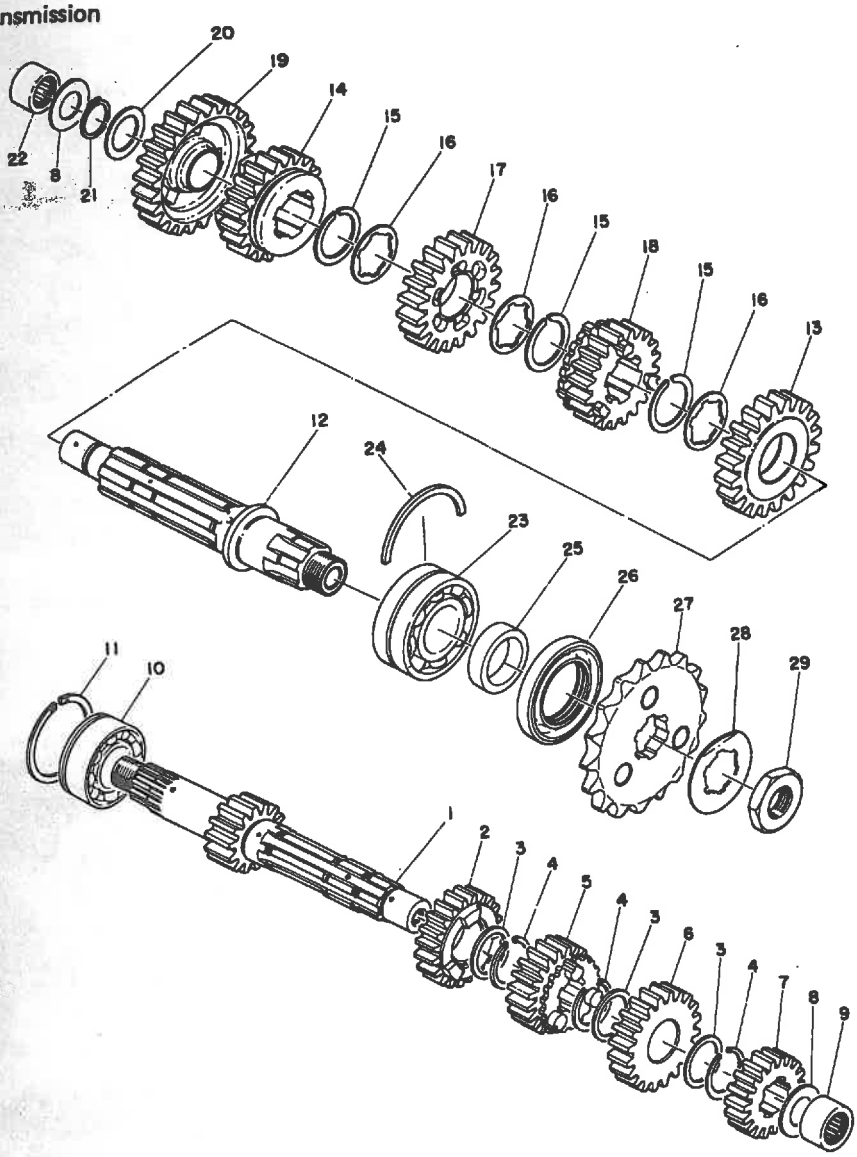


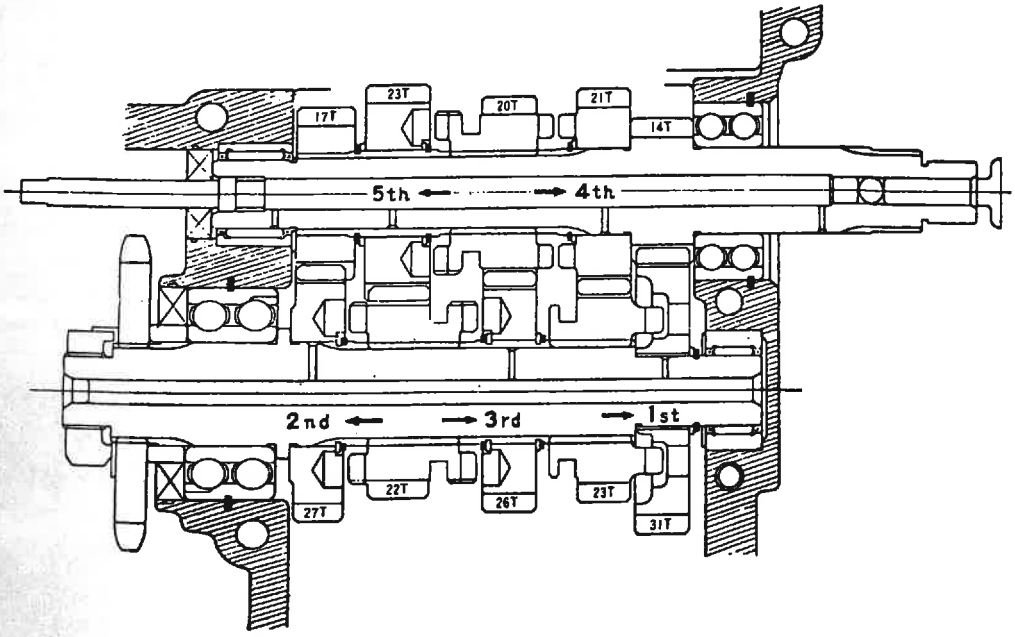
e) Complete the crankcase assembly by installing and tightening all crankcase securing nuts and bolts to 2 kg/m (14 ft/lbs), following the tightening sequence numbers stamped on the case next to each nut. (1 through 18; tighten in 3 gradual stages.).





2) Transmission

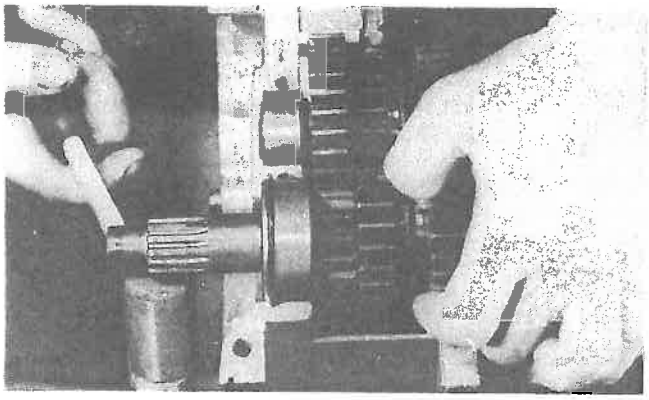




1. Main axle (Low2 13 t
2. 4th pinion gear 21 t
3. Gear hold (5) washer (25.2-30-1.X)
4. Circlip (C-25) or (S-25)
5. 3rd pinion gear 20 t
6. 5th pinion gear 23 t
7. 2nd pinion gear 17 t
8. Drive axle shim (20.2-33-X.X)
9. Bearing
10. Bearing (5205)
11. Circlip (C-52)
12. Drive axle
13. 2nd wheel gear 27 t
14. 4th wheel gear 23 t
15. Circlip (C-30)
16. Gear hold (3) washer (26.2-34-1.X))
17. 3rd wheel gear 26 t
18. 5th wheel gear 22 t
19. 1st wheel gear 31 t
20. Gear hold washer (20-25-1.0)
21. Circlip (S-20)
22. Bearing
23. Bearing (5206)
24. Circlip
25. Distance collar
26. Oil seal (SD0-40-62-9)
27. Drive sprocket
28. Lock washer
29. Lock nut

3) Transmission Removal

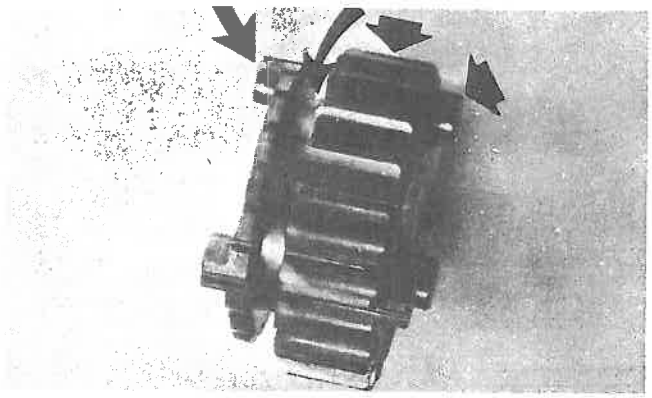
a) Tap lightly with a rubber hammer to loosen the transmission, then lift it out.



Removing transmission

b) Check the gears for chipped teeth.
Check engagement dogs and slots for rounded edges. Check the sliding gear fork grooves for a blue discoloration. If any of the above mentioned conditions are obviously noticeable, replace the gear(s).

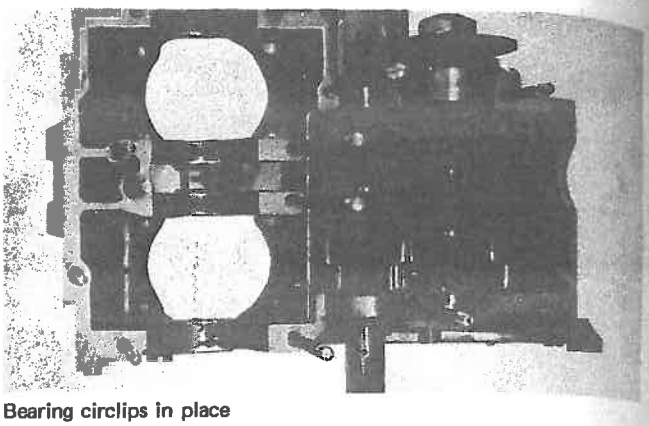
NOTE:
Especially in the case of damaged engagement dogs, check the mating gear for damage or excessive wear. It is sometimes necessary to replace the parts as a set.



Gear wear points

c) Installation
With both shafts assembled, including all bearings and seals, fit the transmission into the TOP CASE. This permits the shift forks to slip over the sliding gears easily. Be sure both transmission shaft circlips are fitted to the bearings and the circlips have been positioned in the circlip grooves.

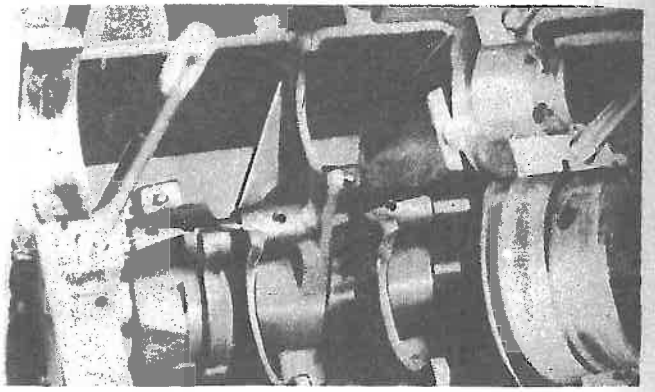
NOTE: Transmission installation is easier if the shift drum is rotated to the neutral position.



Bearing circlips in place

VERY IMPORTANT
Check for smooth and complete shifting through all gears after installing the shift drum, shift forks, guide bar, and transmission. At the same time check for complete engagement of all engaging dogs into the appropriate gear slots.

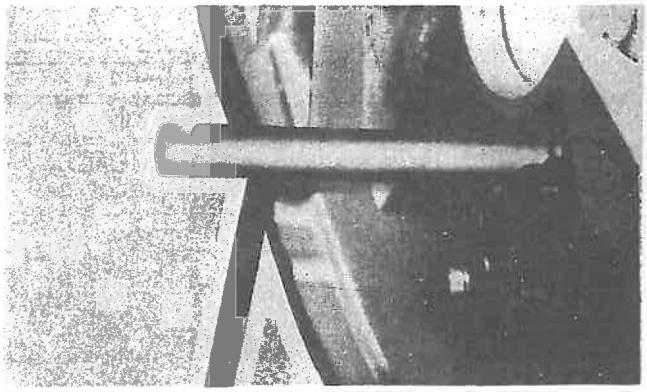
4) Shift Drum Assembly



Shift forks and drum in position

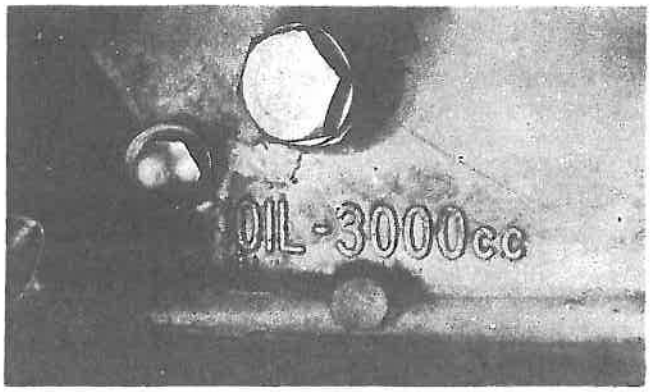
a) Fork Guide Bar Removal and Installation
The fork guide bar is held in place by the shift drum stopper plate. With the plate removed, the bar can be pulled out.

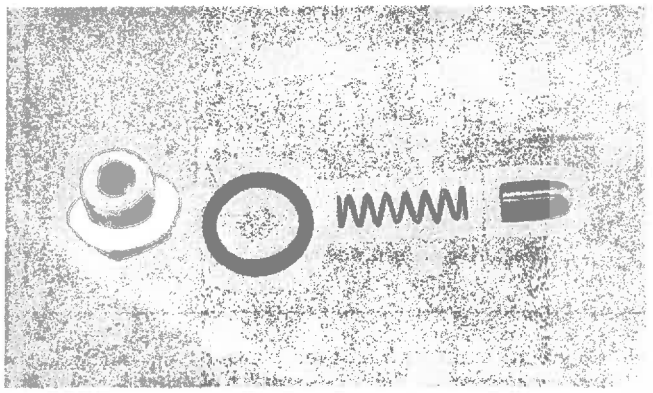
CAUTION
Note that the stopper plate has a locking tab to secure the two bolts holding the plate in place. During reassembly, always make sure the locking tabs are bent up firmly around the securing bolt heads.



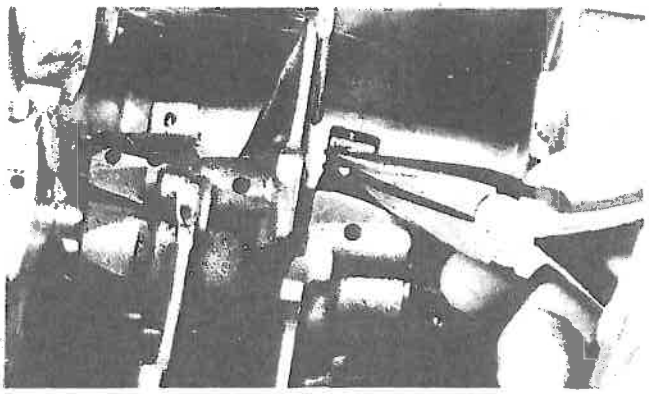
b) Check the guide bar for alignment. Roll it over a surface plate and check for bends. If it is bent, replace it.

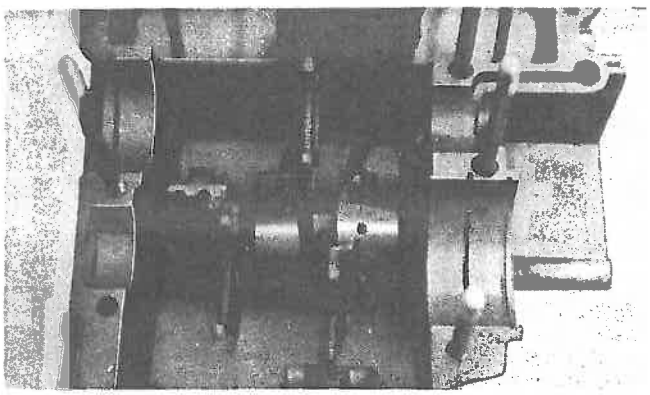
c) Shift Drum Removal
Remove the neutral detent unit.



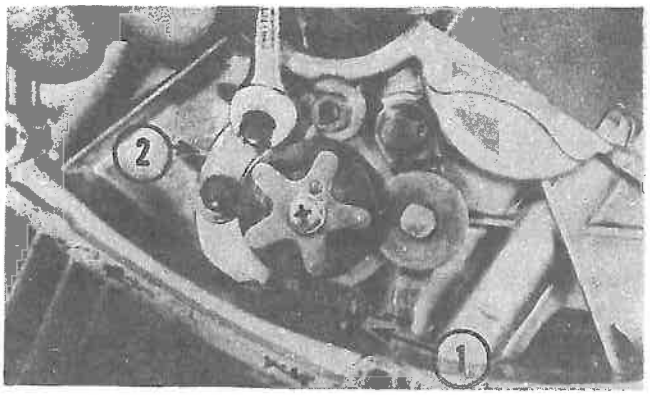


d) A cam follower pin and cam follower roller mounted in each fork is held in place by cotter pin.

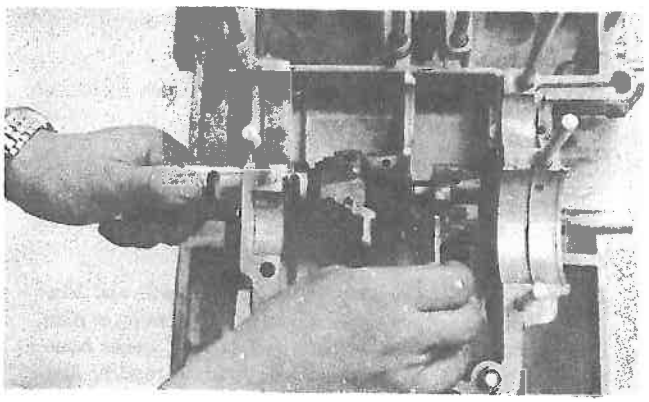




e) On the exterior section of the right-hand case is the shift drum stopper. Release the stopper spring (#1) and remove the stopper unit. Bend the lock tabs down on the locating plate bolts and remove the plate (#2).



f) Pull out the shift drum and remove all three shift forks from the case. Take care, when removing the shift drum to catch all three cam follower rollers that rest in the grooves in the drum.

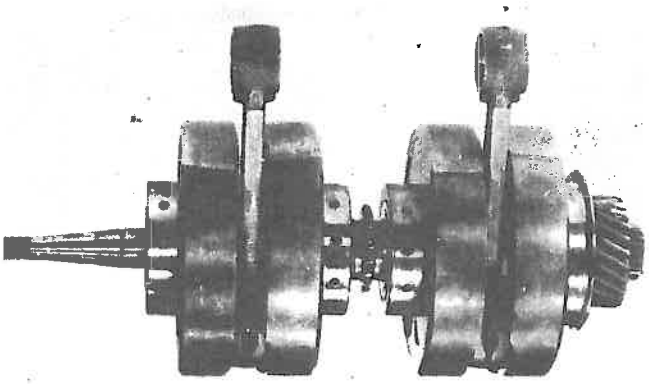


g) Shift Drum and Shift Fork Installation:
Installation of this unit is a reversal of the previous steps. Be sure to lubricate the shift drum and forks before installation. When installing the cam follower pin, always use new cotter pins. After bending the cotter pins, make sure the bent pin ends do not drag. Check for smooth fork movement on the shift drum after assembly.

h) Pay particular attention to the direction and order of fork installation. Fifth gear wheel shift fork has a clearance notch machined into one side to allow clearance for the neutral light button. Fourth gear wheel shift fork is also notched on one side to provide clearance for the neutral position stopper. If these shift forks are incorrectly installed, the neutral stopper and neutral light button will not fit into position.

5) Crankshaft

The crankshaft is built up of pressed together parts. It has four full circle crank wheels. The entire unit runs in four main bearings, three roller and one ball bearing (the ball bearing is the outer right-hand bearing). The rods run parallel (360° crank) on needle bearings over hollow center crank pins. The left and right crank halves are pressed together with the cam chain drive sprocket between the halves.



Completely assembled crankshaft

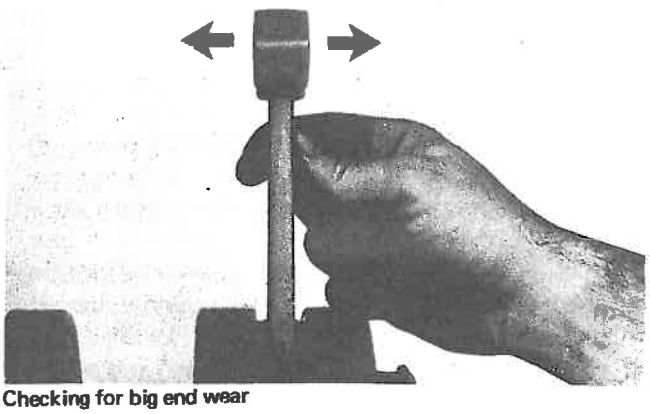
a) Crankshaft removal:
Tap the crankshaft with a rubber hammer to loosen it, then lift it out.

b) Crankshaft main bearing wear
Though the crankshaft main bearings are heavy duty and will withstand much abuse, they should still be checked for wear.

c) Clean the bearing in solvent and dry it with air. Visually inspect all friction surfaces for obvious pits, scratches, chatter marks, or rust. Any of these bearing conditions that are bad enough to be readily seen should be sufficient cause for bearing replacement. Immediately oil the bearing after inspection.

d) Measure connecting rod axial looseness at the small end to determine the amount of wear in the big end (crank pin and big end bearing). Hold the big end stable to prevent it from sliding, then rock the small end.

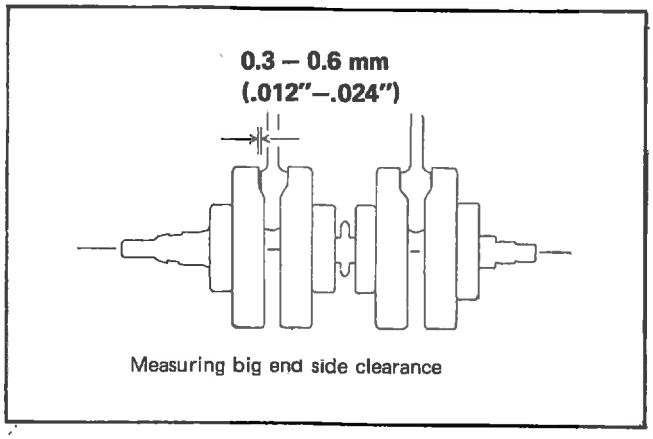
Maximum Allowable Tolerance: 2 mm Small End Play



Checking for big end wear

e) If small end side play exceeds 2mm, disassemble the crankshaft and check the connecting rod, crank pin, and needle bearing for wear. Replace worn parts and recheck small end play. It should measure no more than 1.0mm with new parts.

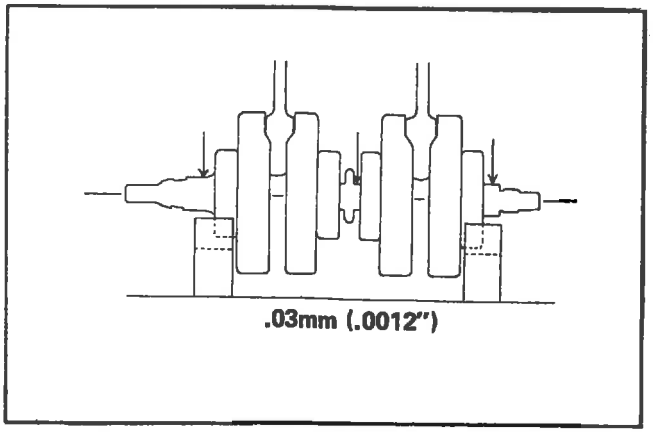
f) Check for correct connecting rod big end side play. Slide the big end to one side and insert a feeler gauge between the crankwheel and rod big end. It should measure between .3mm (.012") and .6mm (.024"). If it exceeds .65mm (.026"), the connecting rod big end should be closely checked for excessive wear. In addition, total crankshaft width should be measured.



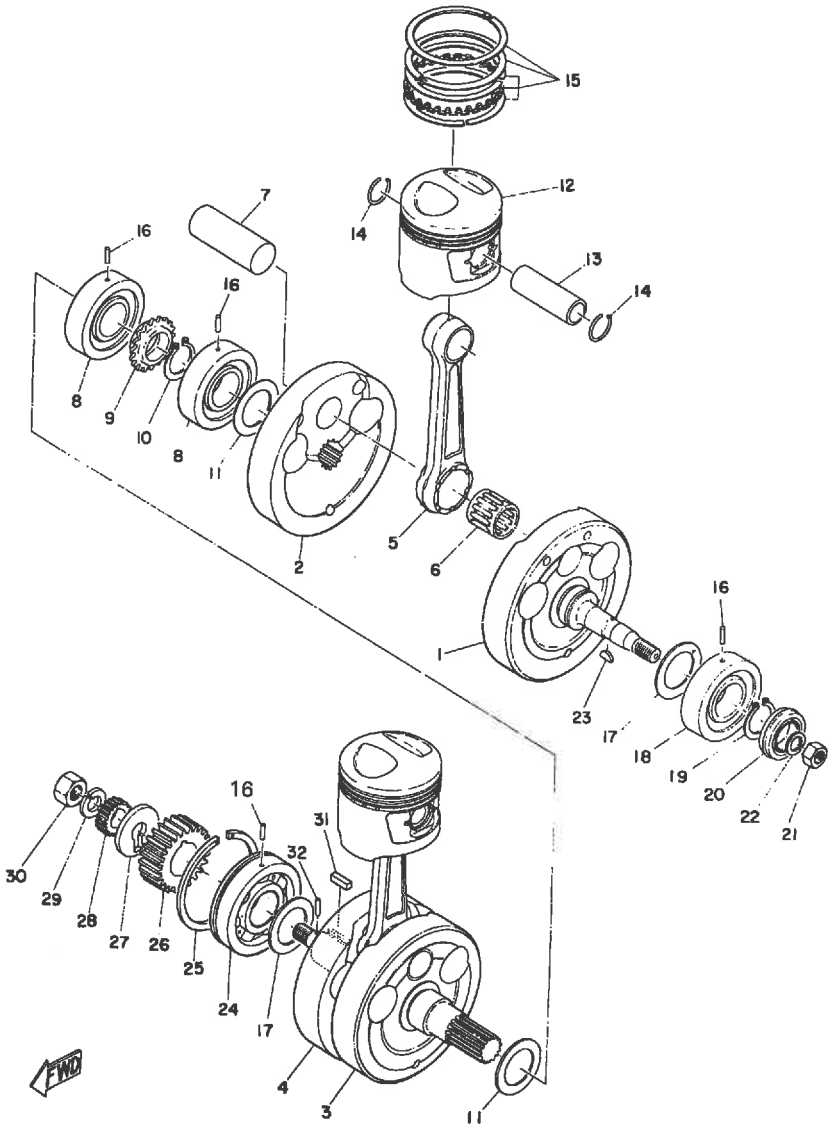
Measuring big end side clearance

g) Check the crankshaft unit for excessive run out. Mount the crankshaft in live centers and check for run out using a dial indicator. Run out at all measurement points should not exceed .0012" (.03mm).

Circlip Crankshaft nut



6) Crankshaft Repair



1. Crank (1) left
2. Crank (1) right
3. Crank (2) left
4. Crank (2) right
5. Connecting rod
6. Connecting rod big end bearing
7. Crank pin
8. Bearing
9. Cam chain sprocket
10. **Circlip (S-32)**
11. Crank shim **(32.2-44-1.0)**
12. Piston
13. Piston pin
14. Piston pin clip
15. Piston ring set
16. Dowel pin **(4.5-11.8)**
17. Crank shim **(32.2-44-1.0)**
18. Bearing
19. Circlip **(S-32)**
20. Oil seal **(SW-25-40-10.1)**
21. Crank shaft nut
22. Spring washer
23. **Woodruff key**
24. **Bearing (6306C3)**
25. Circlip **(C-78)**
26. Primary drive gear
27. Lock washer
28. Drive gear
29. Spring washer
30. Crankshaft (1) nut
31. Primary drive gear key
32. Pump gear locating pin **(3-16.8)**

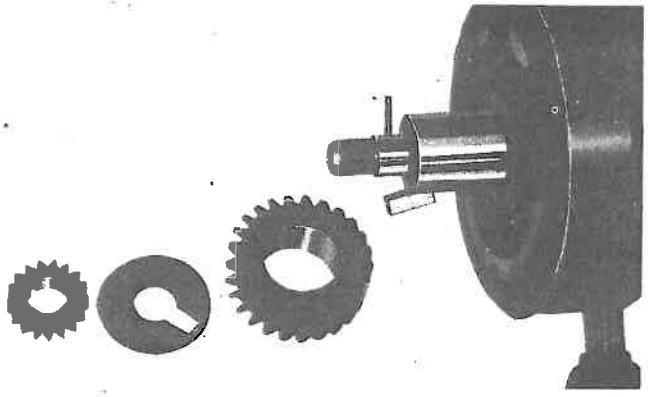
NOTE: EARLY XS1 USED NEEDLE WRIST PIN BEARING SINCE DISCONTINUED.

NOTE:

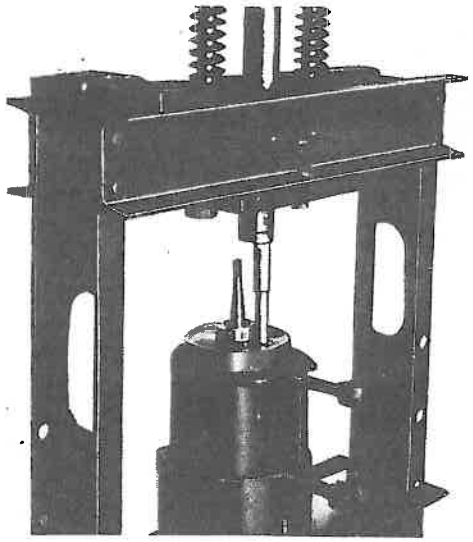
Unless the roller main bearings are to be replaced, do not remove them from the crankshaft as the aluminum roller cage can be damaged. The crankshaft can be disassembled with bearings in place; just remove the outer race to provide pressing clearance.

If removing the bearings, use a guillotine type bearing puller.

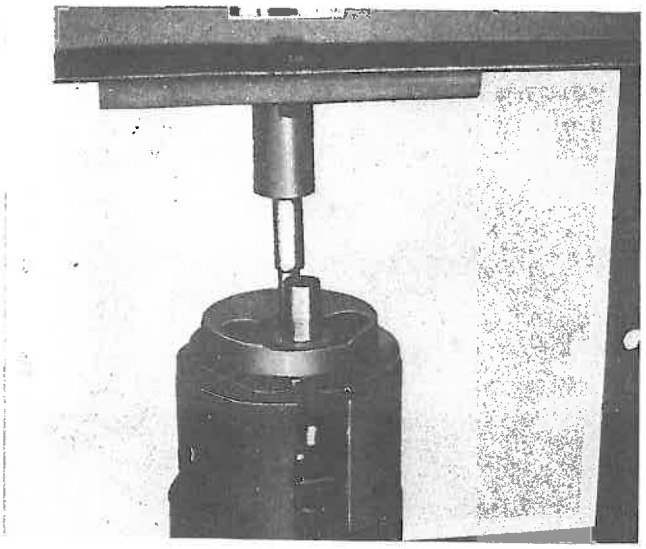
a) Remove (in order): the pump drive gear; pump gear locating pin (located in a hole in the shaft), thick washer, primary drive gear, and square primary drive gear key. Both gears are a slip fit on the crankshaft end, but the gear puller could be used to aid in their removal. DO NOT use a screwdriver or chisel to pry them off as gear teeth can be chipped.



b) Press off the LEFT-HAND OUTER crank wheel (mounting point for the alternator). This pressing procedure, and those to follow, require a crankshaft support fixture (available from Yamaha International Corp.). A length of pipe with an inside diameter wide enough to slip the crank into and squared at both open ends can be used. Cut a slot the entire length of the pipe wide enough for the connecting rod to fit through. Drop the crank into the fixture, place support plates beneath the left-hand outer crank wheel, and push the crank pin out of this wheel.

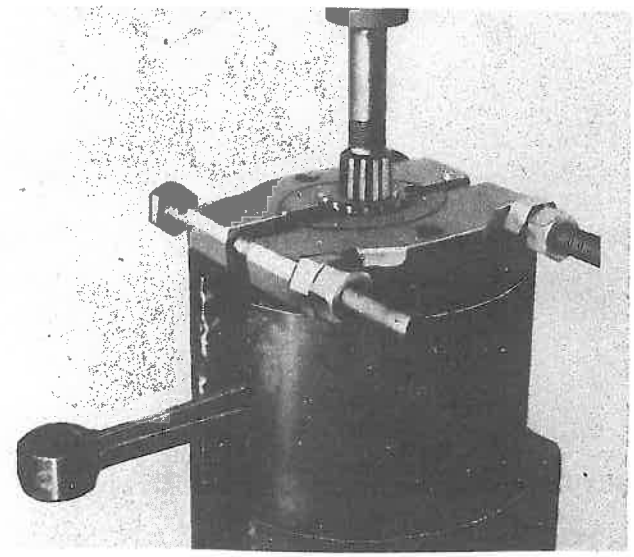


c) Remove the connecting rod and rod bearing, lift the remaining crankshaft section up, place support plates beneath the LEFT-HAND INNER crank wheel, and press the center male splined end out of the supported wheel.



d) Support the left-hand inner wheel and press out the crank pin.

e) If desired, the cam chain sprocket can be pressed off the right-hand crank half. Support the sprocket as shown, using the bearing puller flat side, and press down on the splined end. Do not remove the cam sprocket unless the special assembly tool is on hand to use during reinstallation.

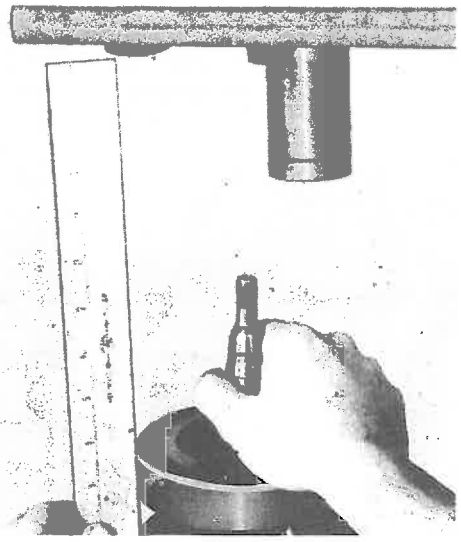


f) To disassemble the crankshaft right half, repeat steps b, c, and d.

7) Crankshaft Assembly Procedures

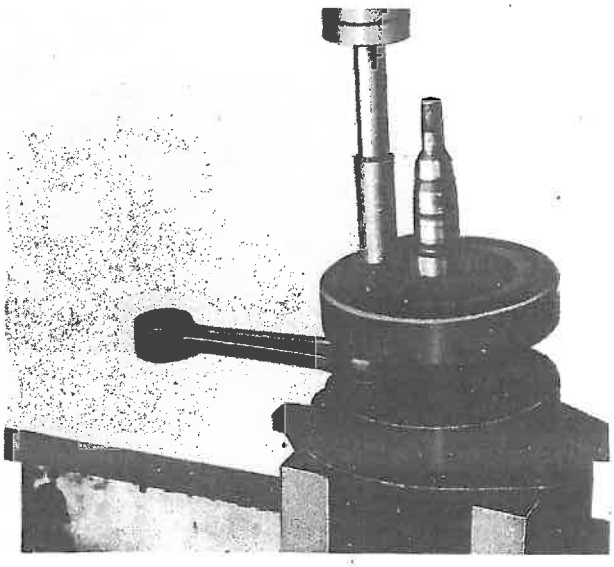
NOTE: First assemble the right crank half, then the left half, and finish by pressing the two halves together.

a) Support the right-hand outer crank wheel pin installed; then install the rod bearing and connecting rod, crank pin pointing up. Position the right hand inner wheel over the pin, use a machinist's square or straight edge to accurately line up both wheels, and tap the inner wheel down onto the pin to prevent the wheel moving from out of alignment.



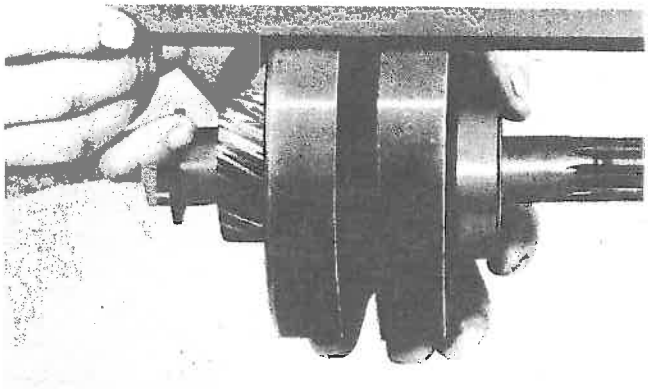
b) Press the right-hand inner wheel straight down onto the pin until each set of wheels measure 66mm total width (the wheel must be pressed straight down or the pin will enter the hole on a slant, resulting in damage).

NOTE:
Measure across the machined surfaces of each set.



c) Repeat steps 1 & 2 to assemble the left-hand crank half.

d) Lay a straight edge across both wheels of each crank half at two points 90° opposite the crank pin. Both wheels must be parallel to each other. If they are not, tap the high wheel with a brass hammer. Align each crank half before pressing both halves together.



NOTE: CAM CHAIN DRIVE SPROCKET REINSTALLATION

If the cam chain drive sprocket was previously removed, perform the following sprocket installation procedure before pressing both crank halves together.

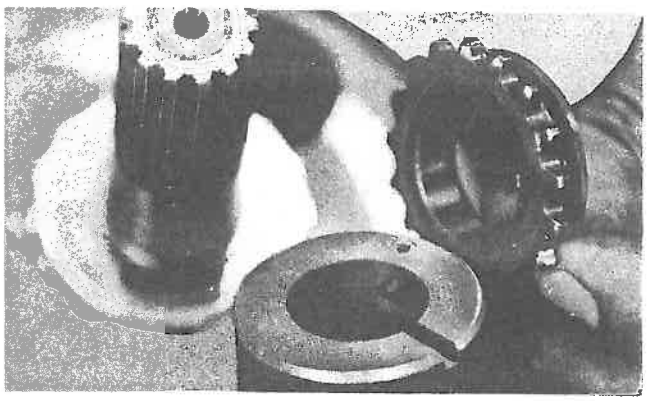
1) Support the right-hand crank half and drop the sprocket down over the splined end, the locating pin sticking out (will slide only to end of splines).

2) A sprocket alignment tool found in the XS650 Crankshaft Rebuilding kit is next dropped down over the splined end. The tool is notched; locate the sprocket locating pin in this notch.

3) Match the alignment pin (jutting out inside the special tool) with the center of the crankpin.

4) Press down on the special tool until it "bottoms" (sprocket now aligned and partially installed), then remove the tool and continue with crankshaft reassembly.

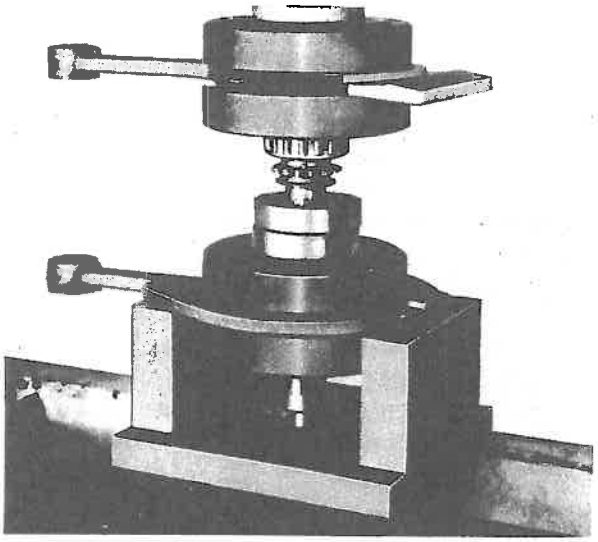
As the halves are pressed together, check that the sprocket locating pin does correctly slip into the notch in the left-hand female splined end.



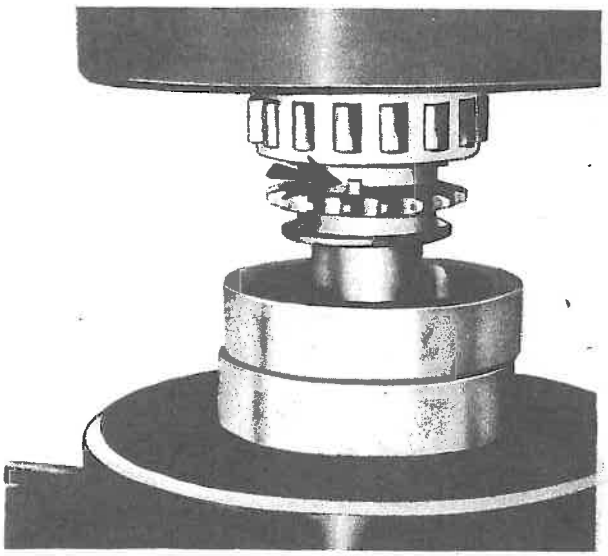
e) Press both crank halves together. Make sure both inner bearings are in place. If the cam chain sprocket has not been removed, line up both crank pins (360° crankshaft) and slip the splined shaft into the splined hole. Lightly force a metal wedge (#1) between both wheels of the top crankshaft half, 180° opposite the crank pins, to prevent the wheels from collapsing when pressure is applied. Finally, place support plates (#2) beneath the bottom inner crank wheel.

f) With the wedge in place, press the left-hand half onto the splined shaft until total crankshaft width is 186mm, +0mm, –0.3mm (measured across all wheels).

IMPORTANT NOTE
To avoid possible damage, do not press directly down on the crankshaft threads. Fit a bearing installation tool over the shaft and press down on this.



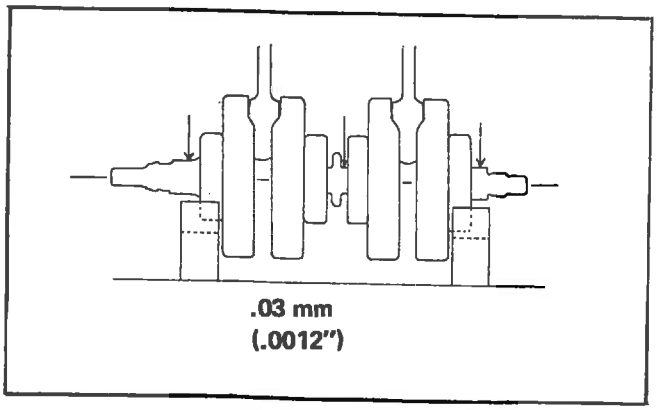
g) As the halves near final width, check that the cam chain sprocket locating pin lines up exactly with its notch in the left-hand crank female end.



8) Crankshaft Alignment

See 5g, page 58

O.A. Width = 186, + 0-0.3
Each half = 66 + .0
–.5



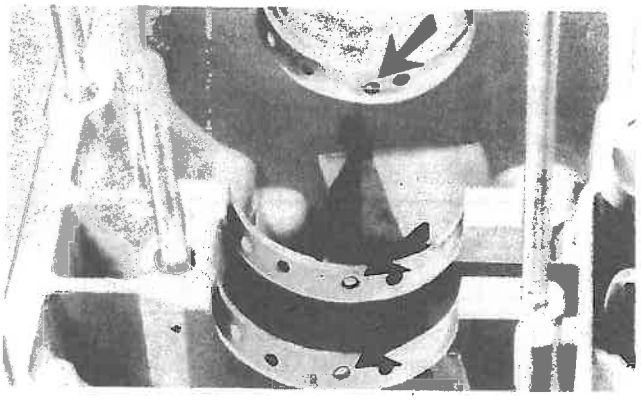
9) Primary Drive Gear and Pump Gear Installation

a) Slide the primary drive gear onto the right-hand shaft, recessed surface facing out. Line up the gear and shaft keyways and tap the square key into place. Fit the 2.5mm thick washer into the recessed gear area. Insert the locating pin and push the pump gear into place against the primary drive gear.

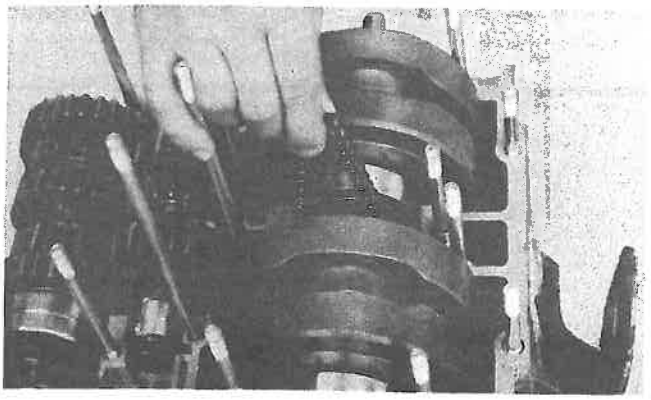
10) Crankshaft Installation (including cam chain)

NOTE:
Prior to crankshaft installation, make sure the left-hand crank seal is mounted on the crankshaft, teflon lip facing out.

a) Lubricate all crank bearings, then install the crankshaft into the top case. Make sure that each main bearing outer race fits in place over its locating pin in the case. DO NOT STRIKE THE CRANKSHAFT OR MAIN BEARINGS WITH A HAMMER TO SEAT THE CRANKSHAFT but rather fit each bearing over each locating pin and push the crankshaft into position by hand. Each bearing outer race has a punch mark, and lining this mark up with the crankcase mating surface helps the bearing race to fit in the locating pin.

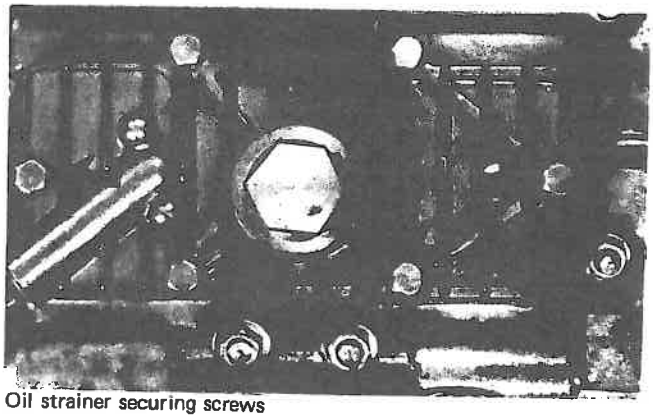


b) Fit the chain over the crankshaft cam sprocket so that it drops into the center slot. Attach safety wire to each end of the cam chain and tie it off to prevent the chain from dropping back into the cases during further engine assembly.



11) Oil Strainer in Bottom Case

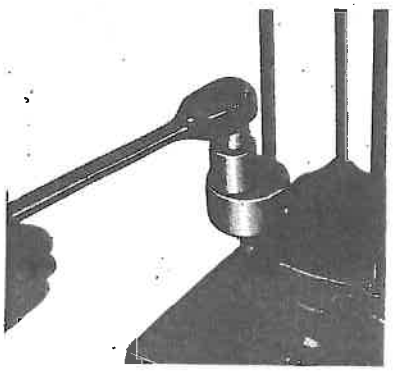
a) A wire mesh oil strainer mounts on a removable plate at the bottom of the lower engine case. The strainer can be removed for cleaning. The oil strainer mounting plate is held to the case by six bolts. When the plate is removed the gasket surfaces must be thoroughly cleaned. A new gasket must be used when the plate is installed back on the lower case. Apply Yamaha bond #4 to both gasket surfaces prior to reassembly.



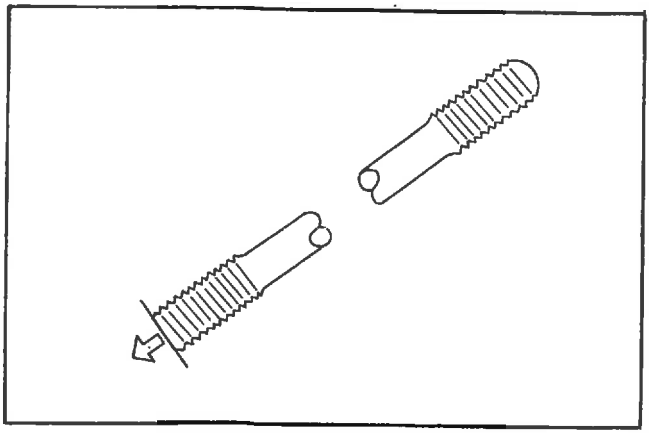
Oil strainer securing screws

12) Replacing Cylinder Mounting Studs

a) The studs are replaceable. They can be removed with a standard stud puller.



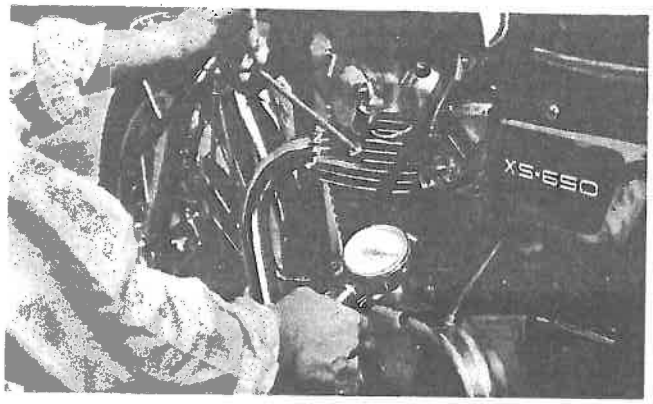
b) If a cylinder stud must be replaced, be sure the flat stud end is screwed into the case.



J) Service Checks/Adjustments

1) Cylinder Compression Check

a) Low cylinder compression means the combustion area is not sealing correctly. A leakage exists at one of the following points: Past one of the valves; out a defective gasket; through a warped head; down past the rings.



b) Remove both spark plugs and screw the compression gauge adaptor tightly into either spark plug hole.

c) Twist the throttle grip FULLY OPEN and kick the engine over several times.

d) With 5 or 6 full kicks the gauge should register 10.5-11.5kg/cm² (145-160 lbs./in²), but it could measure as low as 9.5 kg/cm² 135 lbs./in²) and still be considered adequate. If compression reads lower than 9.5 kg/cm² (135 lbs/in²), then a failure has occurred to one of the parts directly associated with the combustion chamber. The compression figures above apply to all models including XS1-B and XS2 machines utilizing the newer "low-dome" pistons. See M/C PNB #313 in Appendix D for further information.

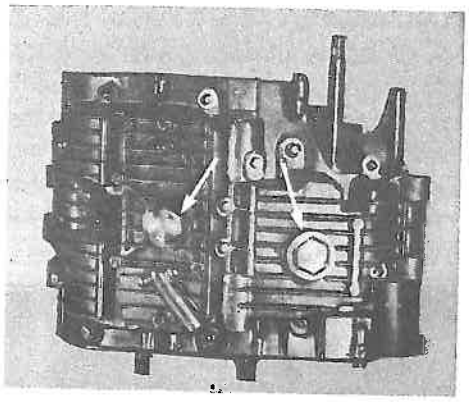
e) If cylinder compression reads more than 11.5 kg/cm² (160 lbs/in²), then carbon has built up on the combustion chamber or piston crown, reducing combustion chamber volume. This in turn creates a higher compression ratio. This situation must be corrected by decarbonizing or excessive heat will develop.

f) Perform steps c) through e) on the other cylinder.

2) Changing or Adding Engine/Transmission Oil

a) Engine and transmission oil is contained in a single reservoir in the bottom engine case.

b) Remove both oil drain plugs on the bottom of the engine. Immediately reinstall and tighten both plugs after the compartments have drained.



c) Remove the oil dip stick and add oil.

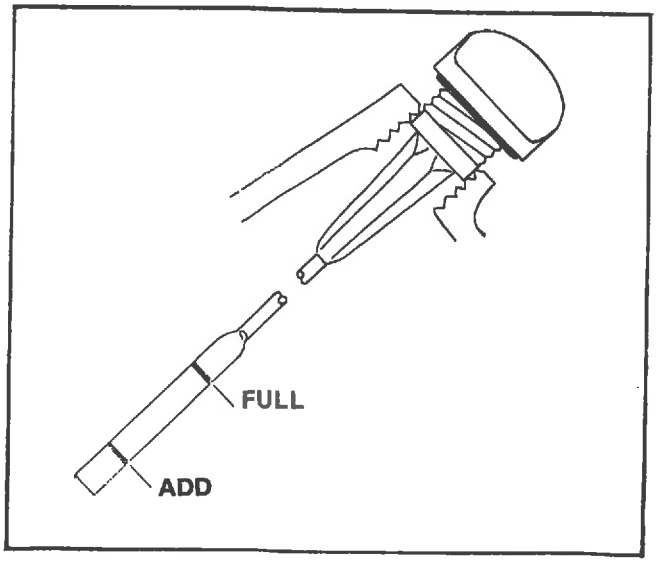
	XS1 - XS1B	XS2 - TX650
SUMP CAPACITY	3.2 qts. (3.0 liters)	2.6 qts. (2.5 liters)

d) If oil is merely being added, use the dip stick to measure existing oil level. Then add sufficient oil to bring the oil up to its proper level, as indicated by the mark on the dip stick. (Machine on center stand to measure.)

e) Finally, let the engine run for several minutes. Stop, let set for one minute, and recheck oil level. Check level with machine on mainstand and level.

f) Recommended oil: Motor oil SAE "SE" or simular quality.

Viscosity: For all seasons = SAE 20W-40
Summer (55°F or higher) = SAE #40
Winter (below 55°F) = SAE #20

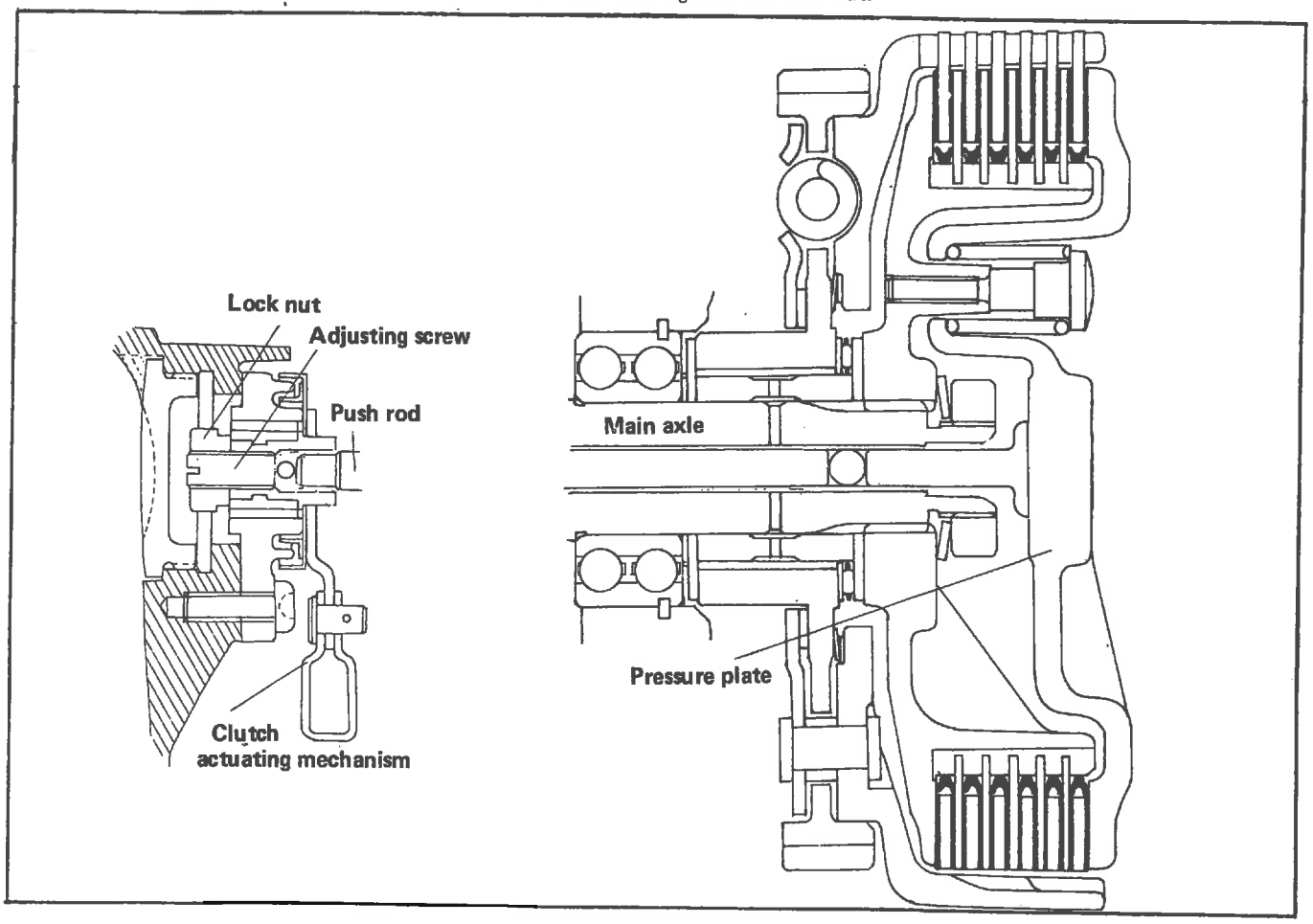


3) Clutch Adjustment

a) Two clutch adjustments are possible, depending on the action of the clutch and clutch lever. If clutch slippage or incomplete clutch disengagement occurs, adjustment is required at the clutch actuating mechanism.

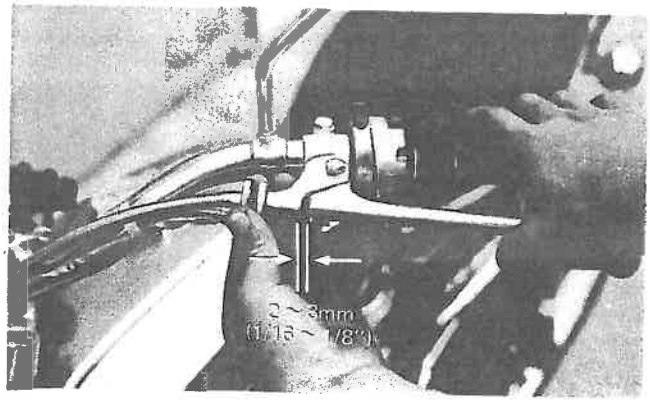
b) The clutch adjustor is situated behind the large threaded plug located in the center of the left-hand engine case cover. Remove the plug.

c) The adjustor consists of an adjustment screw and a lock nut. Loosen the lock nut. Turn the adjustment screw in until the screw lightly touches bottom. Back off 1/4 turn and tighten the lock nut.



d) Reinstall and tighten the adjustor plug.

e) The second adjustment at the clutch lever controls the amount of cable free play. Loosen the adjustor lock nut and turn the adjustor to obtain 2 – 3 mm (1/16" – 1/8") cable slack at the lever Pivot Point.



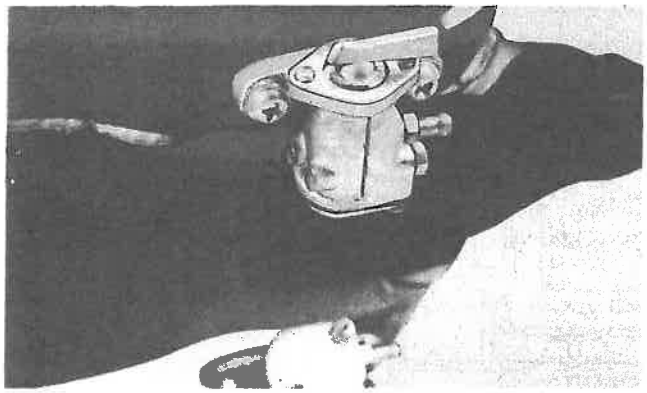
CHAPTER 2. FUEL SYSTEM

The fuel system consists of fuel tank, (petcock with integral filter), fuel delivery lines, and two constant vacuum carburetors. Each section of the fuel system should be checked for possible incorrect operation. Trace for fuel flow from the tank, through the petcock, and through the carburetor. Also check for possible air restrictions or leaks.

A) Petcock

1) Removal and Installation

a) The two petcocks are bolted to the rear underside of the fuel tank. Remove the two screws holding each petcock.

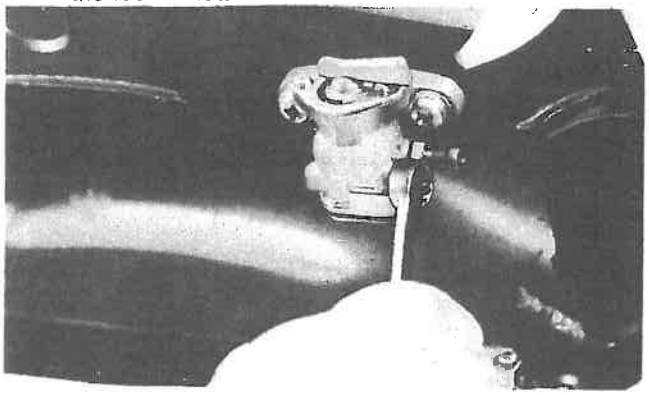


b) A neoprene O-ring fitted into a groove in the petcock mating surface seals the petcock to the fuel tank Check the condition of this O-ring and replace it if it is broken, flattened, or chipped.

c) Petcock installation is accomplished by fitting the O-ring in position and securing the petcock with the two screws.

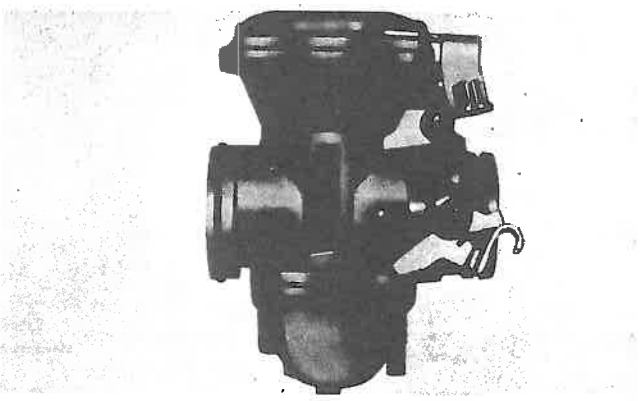
2) Cleaning

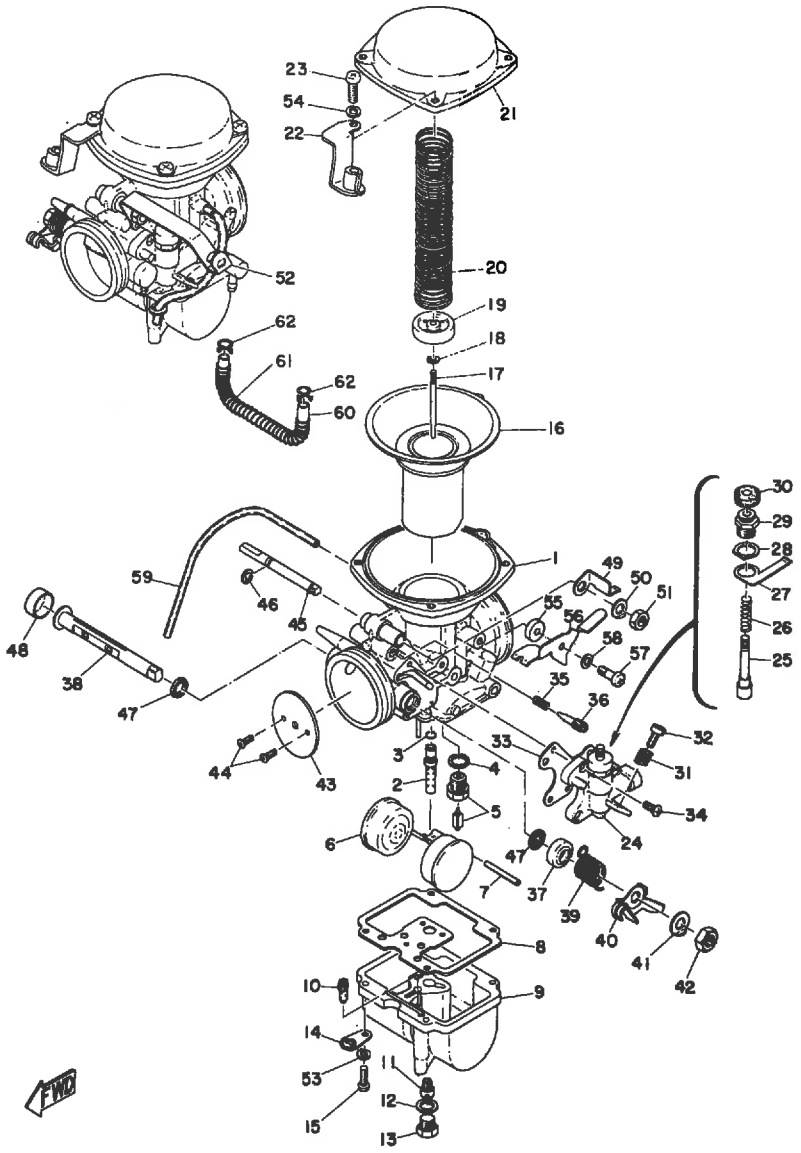
a) Sediment from the fuel tank (including water) can collect in the petcock chamber. A bolt beneath the fuel outlet can be removed to drain the petcock chamber. Larger obstructions can be removed by removing the screw-held plate at the opposite side of the fuel outlet.



B) Carburetor

The XS650 is equipped with two "constant vacuum" carburetors (design is similar in operation to the SU type carburetor) mounted on rubber intake manifolds. Air flow through the venturi is controlled by a throttle slide (vacuum piston). The slide is lifted and lowered by engine vacuum rather than a cable directly linked to the throttle grip.





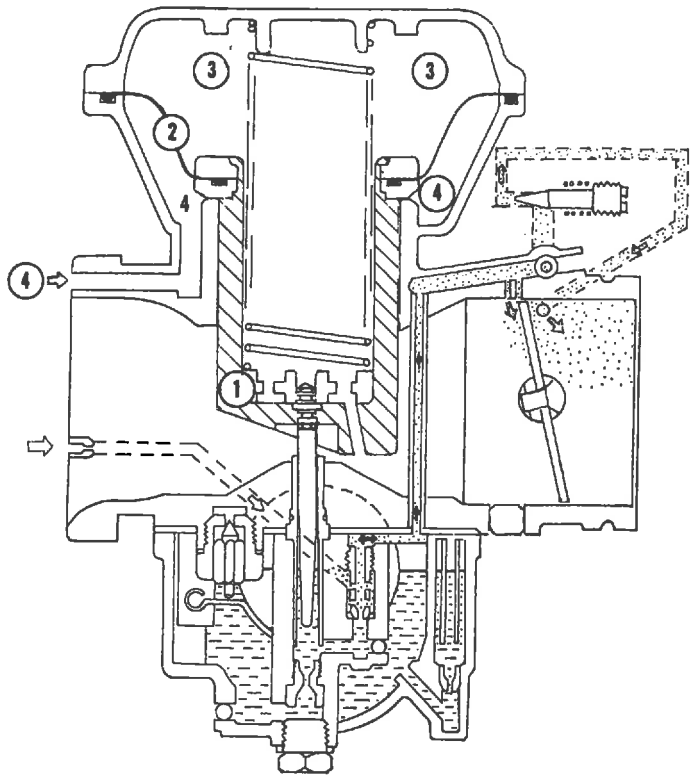
1. Body assembly (left)
2. Main nozzle
3. "O" ring
4. Washer
5. Valve seat assembly
6. Float
7. Float pin
8. Float chamber packing
9. Float chamber body
10. Pilot jet
11. Main jet
12. Washer
13. Plug screw
14. Plate
15. Pan head screw
16. Diaphragm assembly
17. Needle
18. Clip
19. Needle set plate
20. Diaphragm spring
21. Diaphragm cover
22. Throttle bracket (left)
23. Pan head screw
24. Starter body assembly
25. Starter plunger
26. Plunger spring
27. Set lever starter spring
28. Washer
29. Plunger cap
30. Plunger cap cover
31. Throttle stop spring
32. Throttle stop screw
33. Starter packing
34. Flat head screw
35. Pilot screw spring
36. Pilot screw
37. Cap
38. Throttle assembly shaft
39. Throttle spring
40. Throttle lever
41. Washer
42. Nut
43. Throttle valve
44. Oval head screw
45. Starter shaft
46. Clip
47. Seal
48. Cap
49. Starter lever
50. Washer
51. Nut
52. Connector lever
53. Spring washer
54. Spring washer
55. Ring
56. Lever assembly
57. Pan head screw
58. Spring washer
59. Over flow pipe
60. Fuel pipe
61. Spring
62. Pipe clip

Carburetor Specifications (SEE APPENDIX 'C')

Type	
Manufacturer	
Venturi Size	30.6 mm
Main Jet	130
Jet Needle	4JN19-4
Needle Jet	Z-6
Pilot Jet	42.5
Butterfly (throttle) valve	125
Starter Jet	0.6
Float Level	25 mm
Pilot Screw (turns out)	1
Fuel Valve Seat	2.5
ID Mark	E.3
Pilot Outlet	0.7ϕ
Pilot Outlet Bypass #1	0.8ϕ
Pilot Outlet Bypass #2	1.0ϕ
Air Jet	1.2ϕ
Cutaway	Θ
Air Vent	4.0ϕ

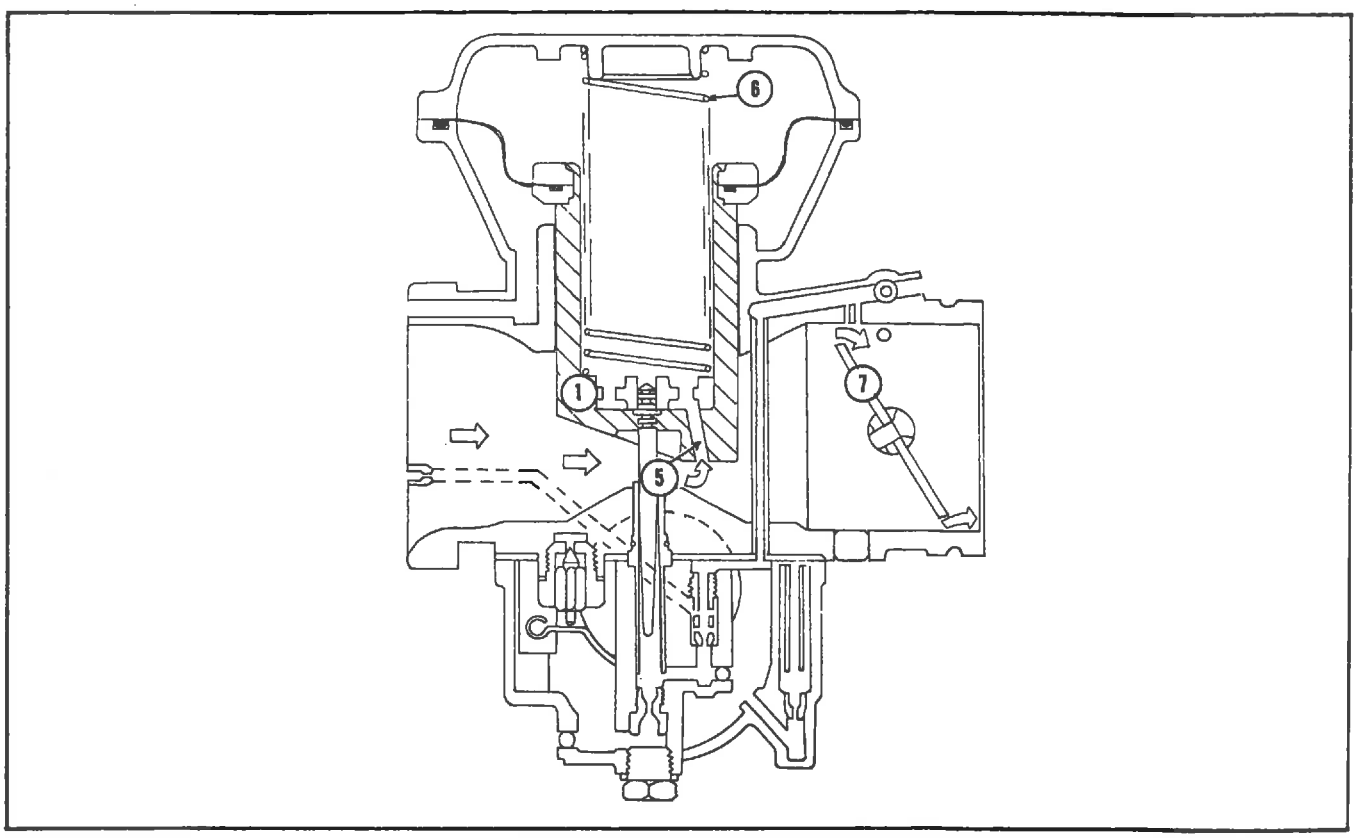
1) Method of Operation

a) Vacuum piston actuation:
The vacuum piston (#1) is lifted by engine vacuum. A flexible rubber diaphragm (#2) is attached to the piston top and to the housing. This diaphragm divides the top part of the carburetor into a vacuum chamber (#3) above the diaphgragm, and an atmospheric pressure chamber (#4) below the diaphragm.



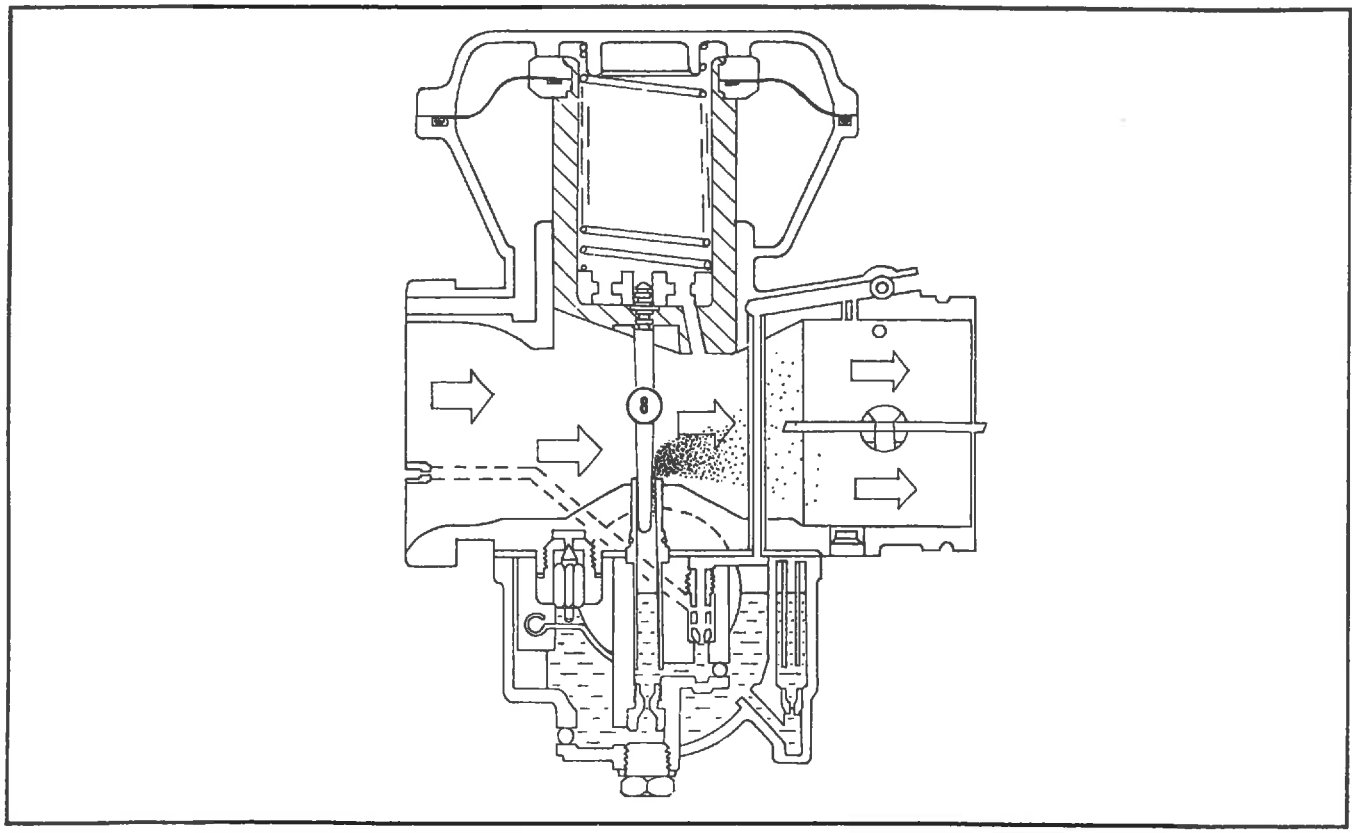
b) Atmopheric air pressure (approximately 15 lbs/in^2) passes through the air passage #4 and occupies the space below the diaphragm. A drilled hole in the vacuum piston (#5 next page) provides an unobstructed path up to the vacuum chamber. As air is pulled past the vacuum piston by engine vacuum--creating a low pressure area at this point – the piston hole permits this low pressure to fill the vacuum chamber. Unequal air pressure exists on either side of the diaphragm.
Atmospheric pressure pushes up on the diaphragm, lifting the vacuum piston (#1) as well. The diaphragm (and piston) continue to lift until the vacuum piston return spring (#6 next page) and the low air pressure match the pushing atmospheric pressure below.

c) Air speed through the venturi, which controls the amount of low pressure in the vacuum chamber, is controlled by a butterfly valve (#7 next page). A cable connects the throttle grip directly to this butterfly valve. Twisting the grip opens the butterfly valve.



d) As the butterfly valve opens, engine vacuum sucks air through the venturi at a greater speed. Faster air speed causes a greater air pressure drop. This dropping pressure immediately occupies the vacuum chamber, lifting the vacuum piston higher. The vacuum piston will continue to lift as the butterfly is opened further.

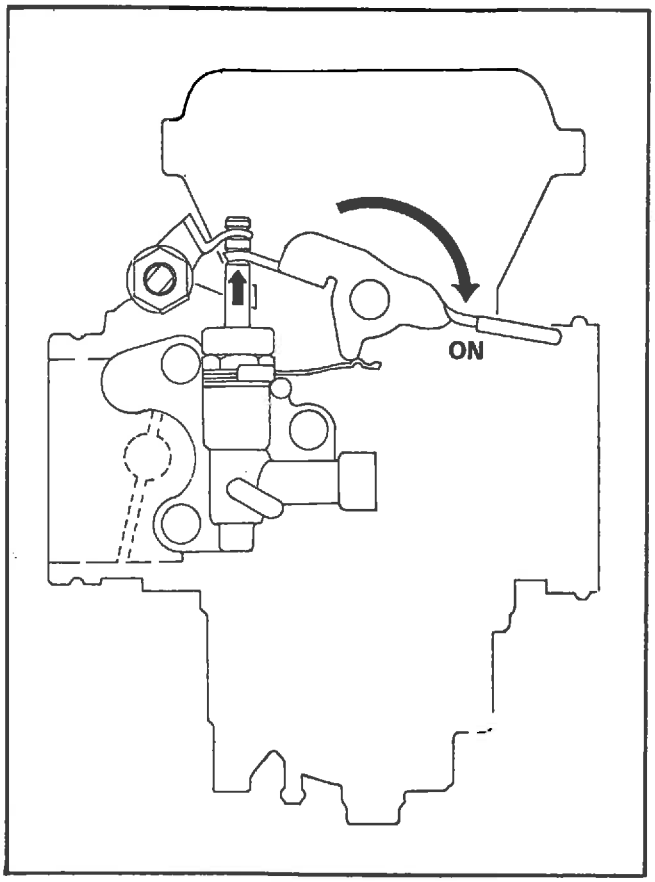
e) When the vacuum piston lifts it also lifts the jet needle (#8 below). This permits additional fuel to flow up the fuel outlet nozzle and to the engine in the standard method.



2) Starter System

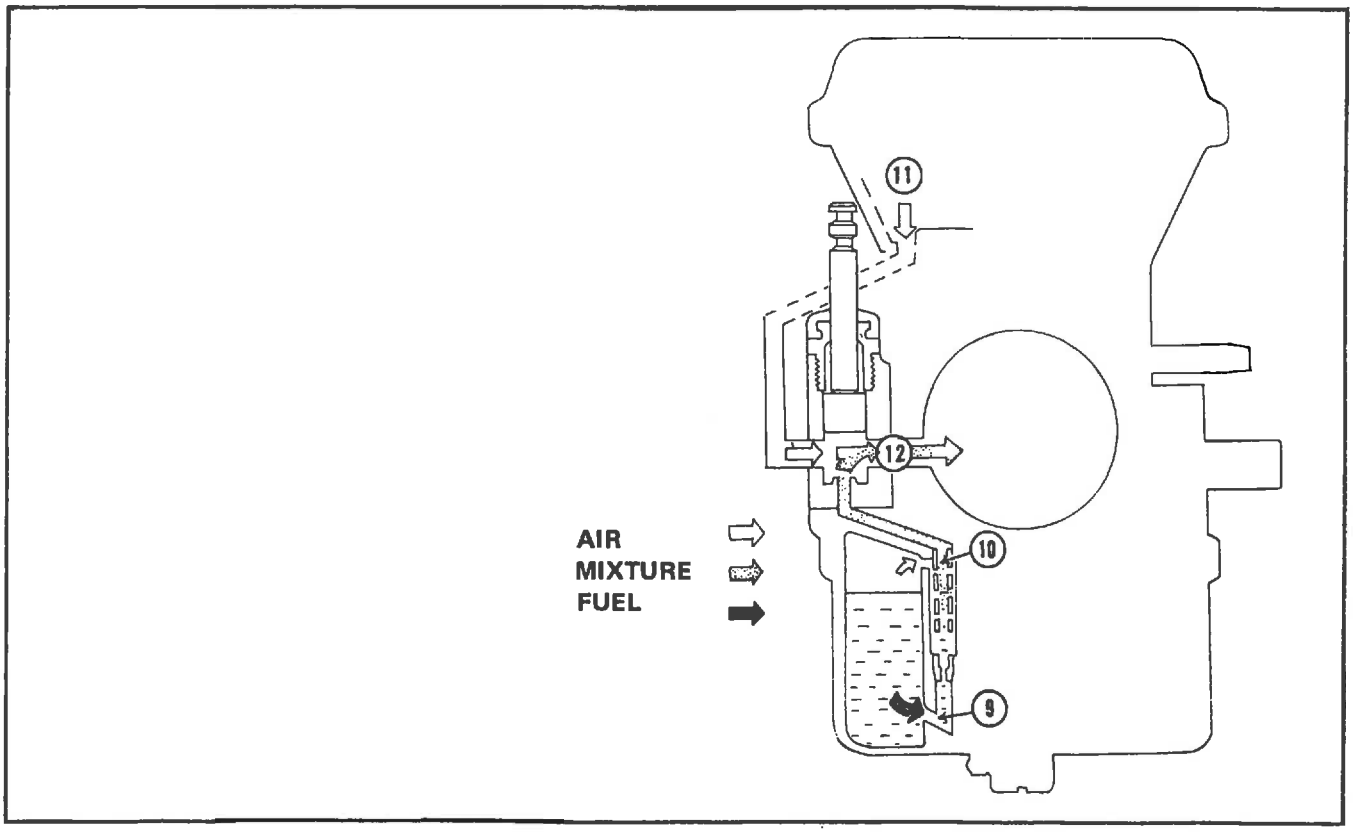
a) This system is identical to the starter system used on all our two-stroke Yamahas. It consists of a separate fuel/air circuit that enriches the fuel/air mixture for easier starting. The starter housing, however, can be removed from the main carburetor body.

When the starter lever is pushed down, a rich starting mixture ratio of approximately 9 : 1 enters the engine.



b) Fuel for this starter system comes from the float bowl, through a drilled passage (#9) through the starter jet. The fuel continues up through a mixing chamber (#10) where air begins to mix with the fuel. Air for the starter system is drawn down through a passage (#11) from the atmospheric chamber below the diaphragm.

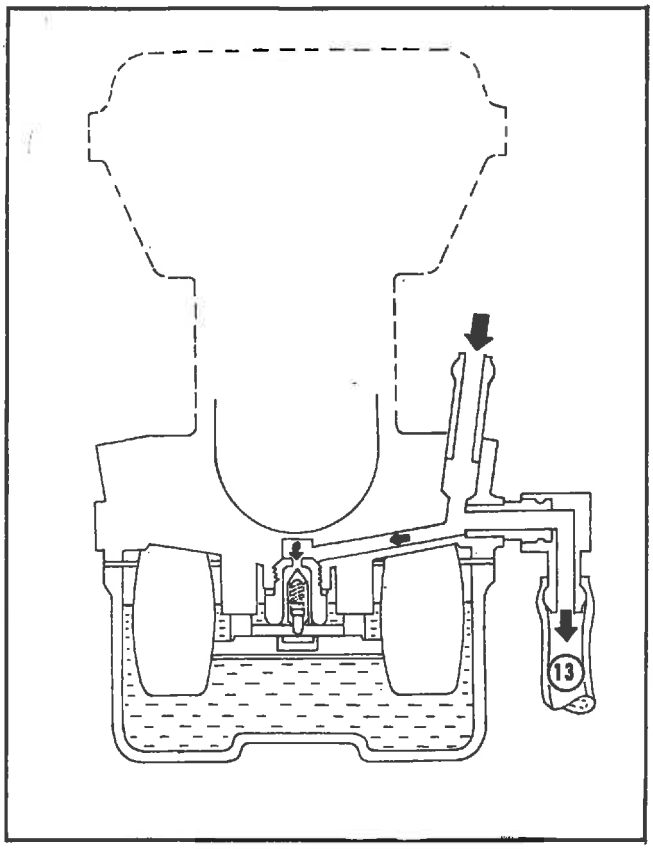
c) The fuel and air meet and mix at the starter plunger chamber and are sucked out through the outlet passage (#12) into the venturi.



3) Float System

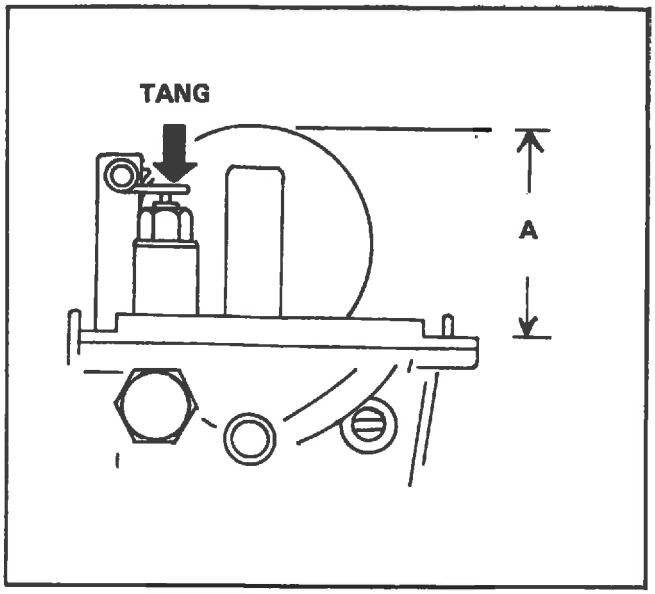
a) Proper fuel level is maintained in the float bowl via the standard method. Two interconnected floats pivot when the level of fuel rises until float/fuel level is high enough to force the inlet valve firmly against its seat. This shuts off the fuel supply from the gas tank.

b) An interconnecting fuel equalizer tube (#13) between both carburetors permits fuel to flow between them.



c) Gas flows from the tank, through both petcocks, and then to each carburetor. If fuel should cease to flow from one petcock, due to any sort of stoppage, fuel will still continue to flow to both carburetors through the equalizer tube. This eliminates the danger of one cylinder running lean due to lack of fuel.

d) Float level adjustment
The float level may change because of a worn needle valve or a bent float arm. If the fuel level rises above a specified level, the air/fuel mixture becomes rich. If the fuel level drops, the mixture becomes lean.



e) Remove the float chamber body and float bowl gasket. Invert the mixing chamber body. Slowly lower the float with your fingers until the float just contacts the top of the float needle; do not compress the spring in the float needle.

f) Measure height "A" from the top of the float to the chamber gasket seat (gasket removed).
Standard measurement: 25 mm (0.98 in.)

g) Bend the tang (which contacts the inlet needle) so that a correct measurement is obtained.

CAUTION

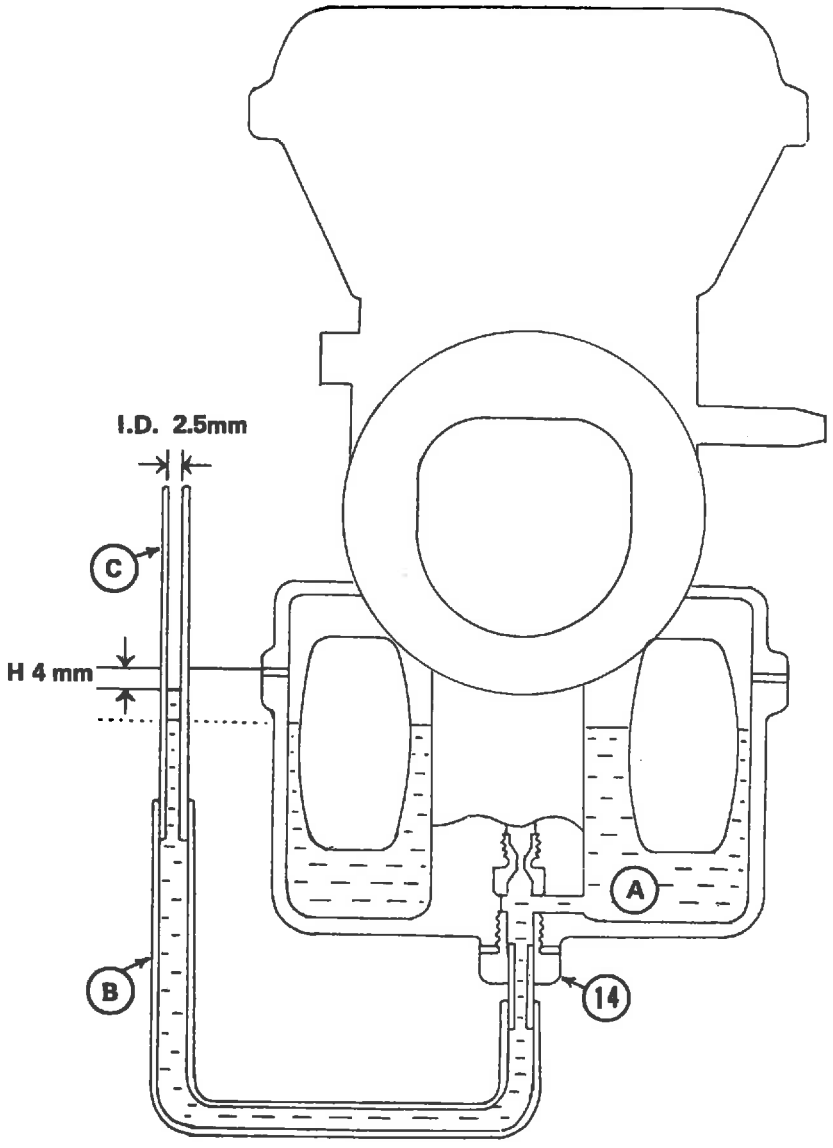
Both floats must be identical in height. If they are not, carefully bend the interconnecting bar between both floats until they have identical heights.

h) Carburetor fuel level can also be checked without removing the float bowl. Construct a special tool using a spare main jet cover nut (#14), rubber tubing (B), and a short length of clear plastic tubing (C). It MUST have an inside diameter of 2.5 mm (.100").

i) After constructing and installing the special tool, hold the clear tubing to the float bowl gasket surface on the main body (see drawing). The fuel level in the tubing must be 4 mm (.160") below the main body gasket surface (can be checked with the engine stopped).

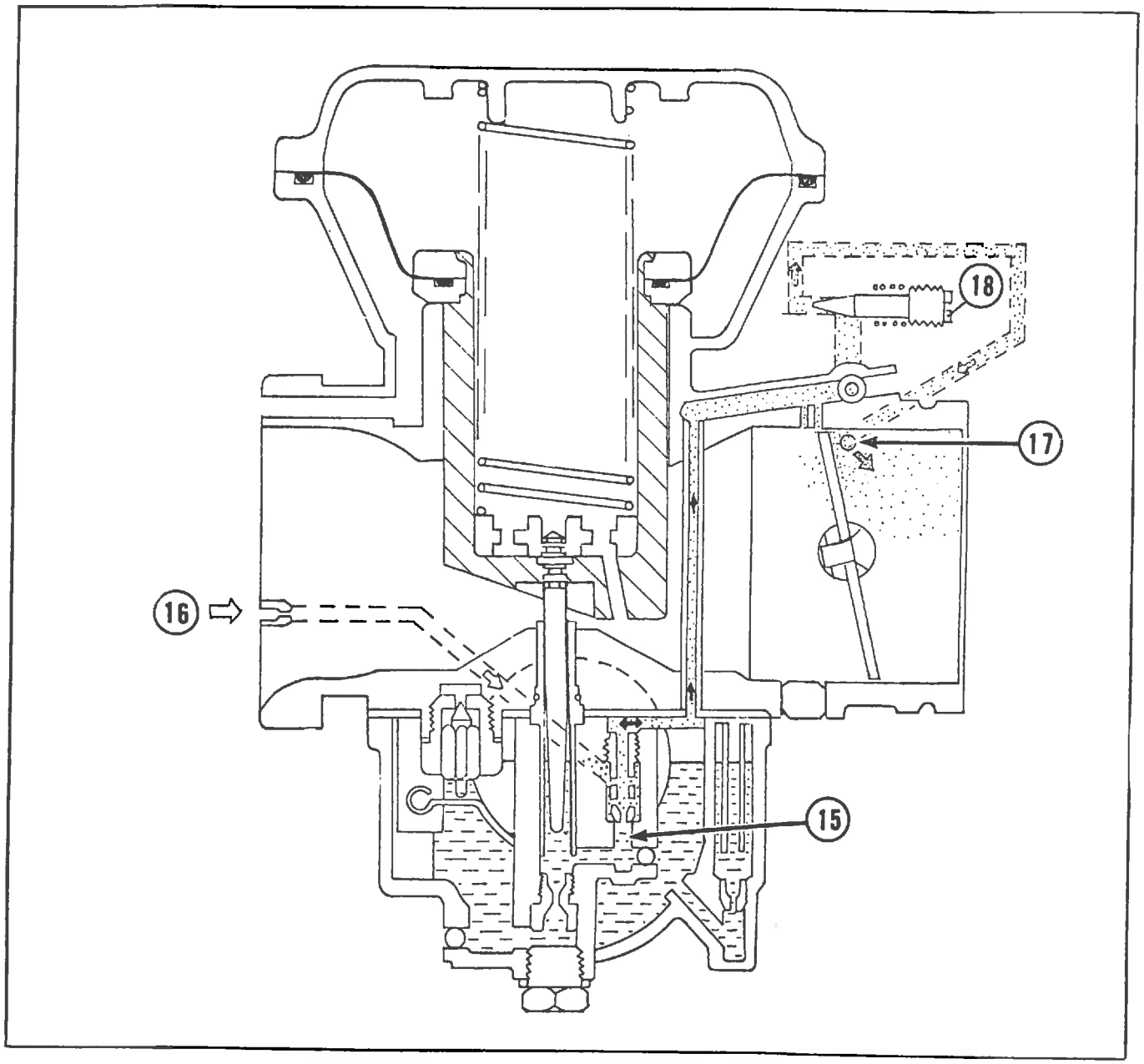
NOTE:

The carburetor must be positioned straight up (not tilted to one side, forward, or backward) to obtain an accurate reading. Also, if the clear tubing inside diameter is other than 2.5 mm (.100"), the fuel level shown will not be accurate.



14. Adaptor A. Fuel B. Flexible tubing C. Clear plastic tubing

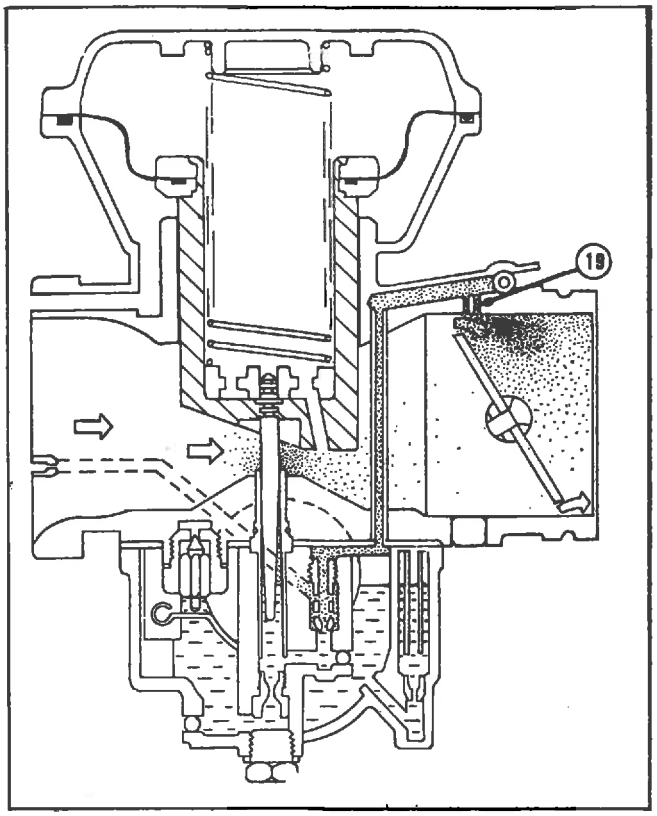
4) Idle Circuit



a) At idling rpm, air pressure in the venturi is not sufficiently low enough to draw fuel flow up through the needle jet nozzle. Fuel travels up through the main jet to the pilot jet (#15). At the same time air passes through the pilot air jet (#16) down through a drilled passage to the pilot jet, where it mixes with the fuel. This mixture passes up through a drilled passage to the pilot outlet (#17) at the upper edge of the venturi, just in front of the butterfly. The amount of fuel/air mixture to the engine is controlled by the pilot screw (#18).

b) To increase engine rpm the butterfly valve is opened further. The top edge of the butterfly uncovers first one bypass outlet (#19) (next page) and then a second bypass outlet. This permits more fuel to progressively enter the venturi and to mix with the additional air that begins to flow past the partially opened butterfly valve. In addition, fuel still flows out the pilot outlet.

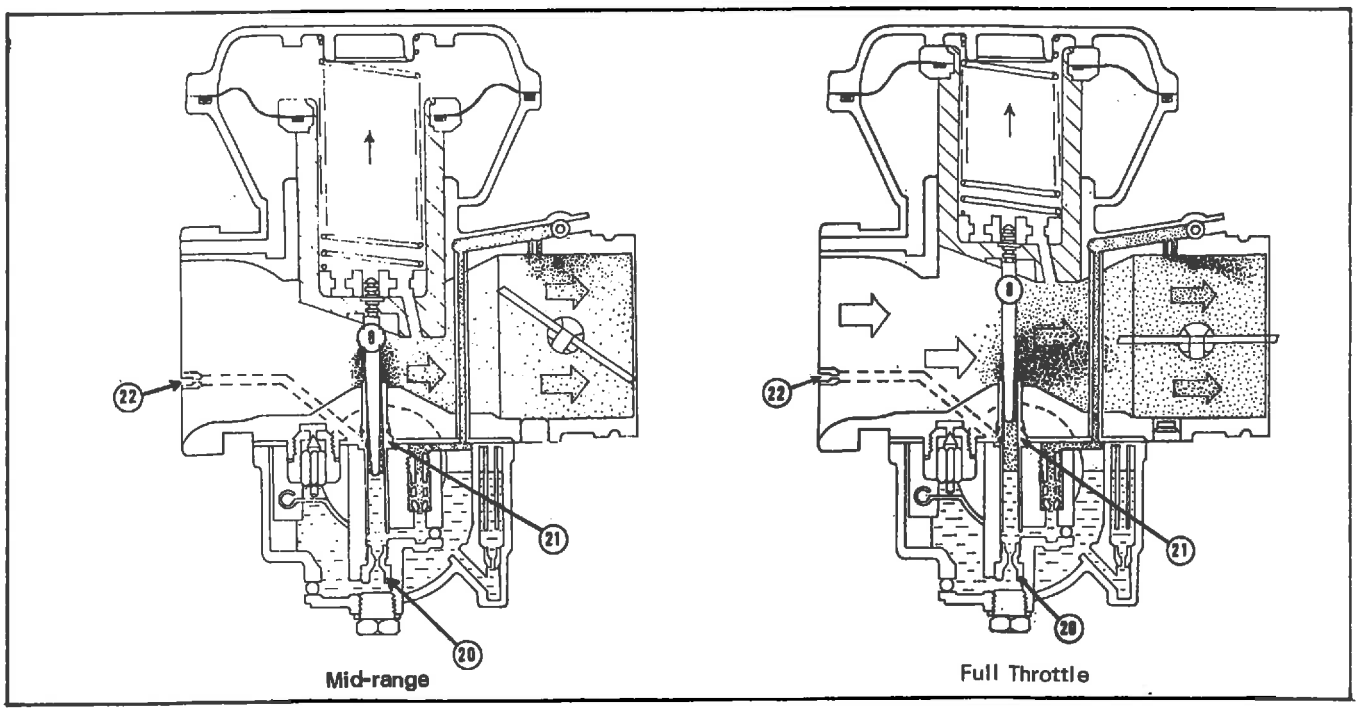
c) Fuel quantity through both bypass outlets is controlled by the diameter of the drilled passages. Both bypass outlets are drilled from the venturi straight into the pilot fuel/air mixture delivery passage.



5) Mid and High Speed System

a) Fuel flow for mid-range and high speed operation comes through the main jet (#20), through the needle jet (#21), and around the jet needle (#8) into the venturi. As engine rpm increases, (the butterfly valve is opened further), venturi vacuum also increases. This causes the vacuum piston to lift, which in turn lifts the tapered jet needle. More fuel flows past the needle and to the engine.

b) Air enters the primary air jet (#22) and travels down a drilled passage to the needle jet. It mixes with the fuel at this point. Final air/fuel mixing is accomplished when this primary air/fuel mixture enters the venturi and mixes with the air passing through.



Mid-range

Full Throttle

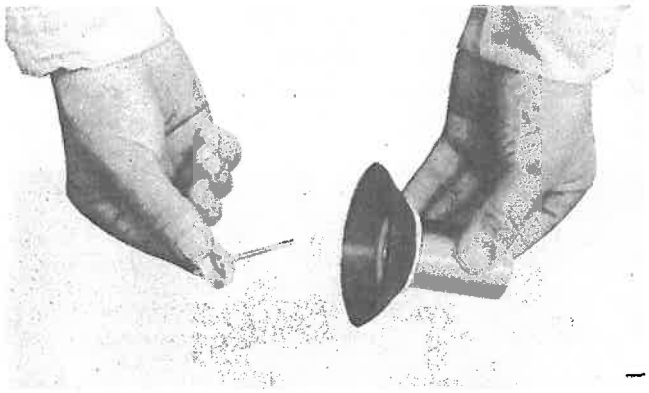
6) Disassembly and Assembly Procedure
(for replacement or cleaning)

a) The vacuum chamber cover on top is held in place by four screws. Remove these screws and lift off the chamber cover.

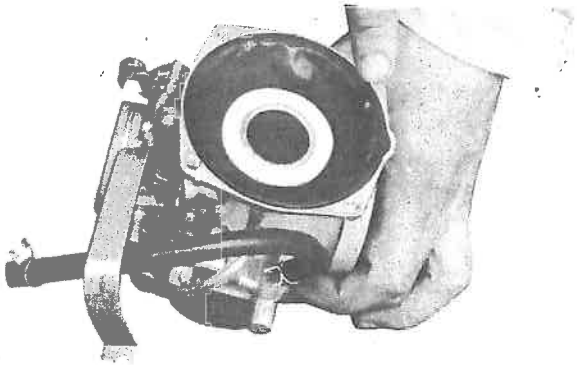
NOTE:
When installing the set screws, be sure to correctly position the throttle cable anchor bracket.

Cover securing screws

b) Once the cover has been removed, the spring, jet needle retainer, jet needle, and vacuum piston can be removed.

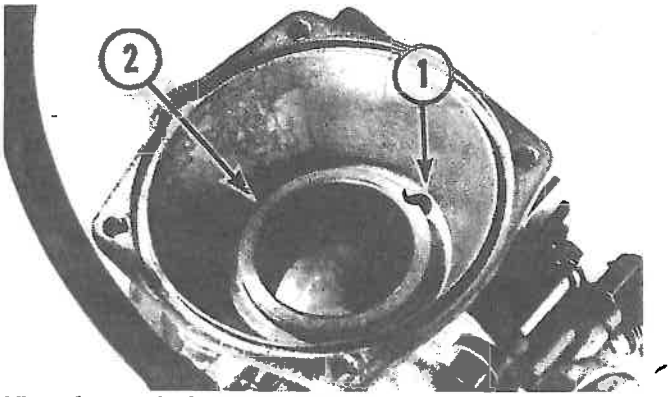


c) Installation of the vacuum piston is accomplished by inserting it into the carburetor body and lining up the small projection on the outer edge of the rubber diaphragm with the corresponding notch in the outer edge of the carburetor top mating surface.



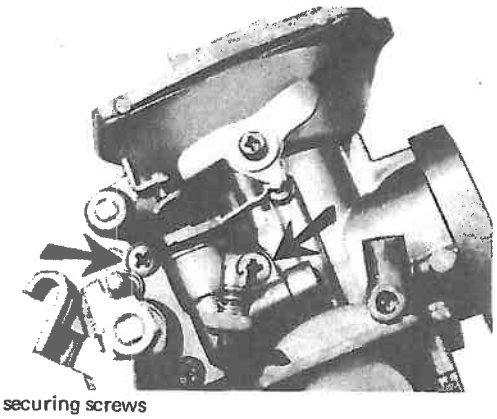
Vacuum piston and associated parts

d) With the top removed, the inlet passage (#1) and air passage to the starter jet (#2) are visible.



View of atmospheric pressure chamber

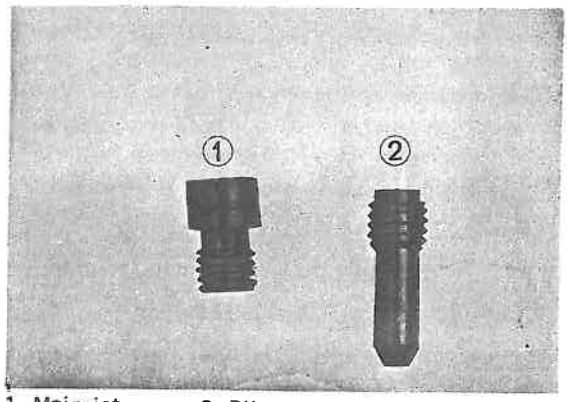
e) The starter jet housing mounts to the left side of the carburetor. It is held by three screws. A gasket fits between the starter jet housing and main housing.



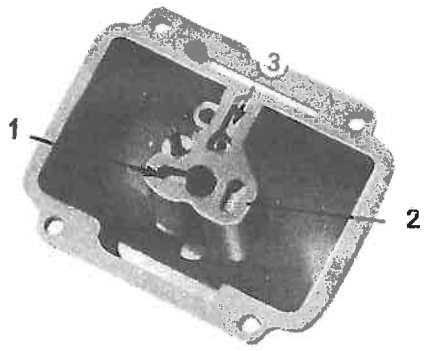
Starter housing securing screws

f) The float bowl mounts to the bottom of the main housing. Remove the four retaining screws and then remove the float bowl.

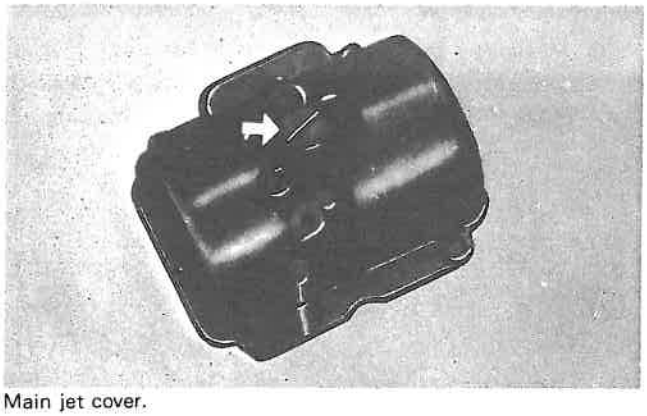
g) Both the pilot jet and the main jet are screwed into orifices in the float bowl. The pilot jet is removed from the inside, the main jet is removed from the bottom, after first removing the cover screw.



1. Main jet 2. Pilot jet

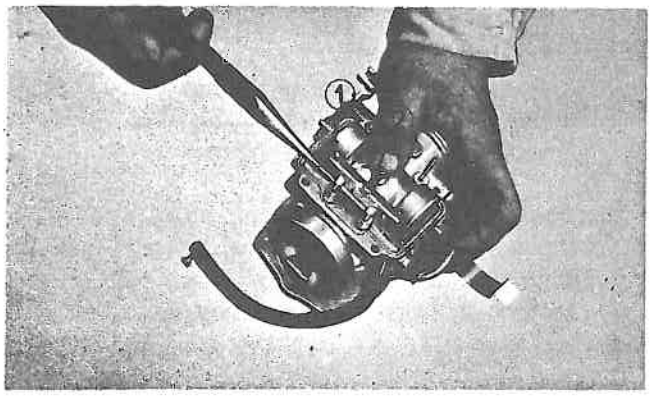


1. Primary air passage to needle jet
2. Pilot air passage to pilot jet
3. Pilot jet.



Main jet cover.

h) Turn the carburetor upside down, pull out the float pivot pin, and remove the float.

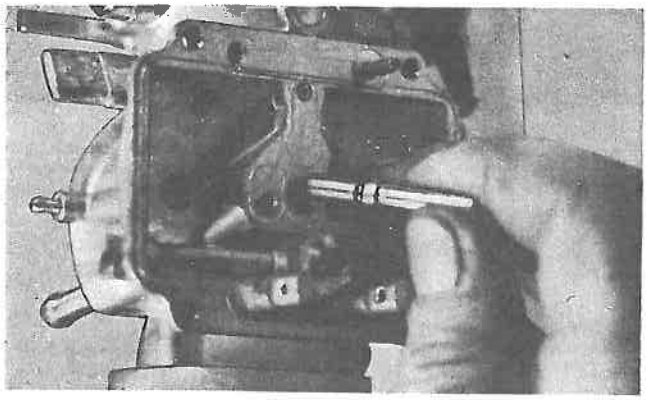


1. Pivot pin
2. Float level adjustment tang

CAUTION

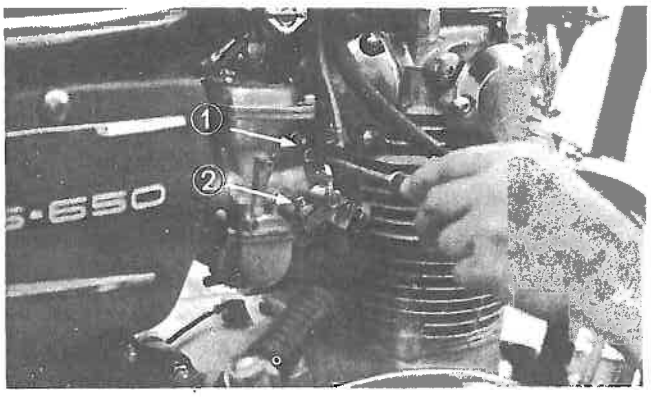
Directly beneath the float adjustment tang is the float valve. Remove this part immediately to prevent its loss.

i) The needle jet fits into the main housing from the bottom. If removal is required, pull it down and out by hand. Reverse this procedure to install the needle jet.



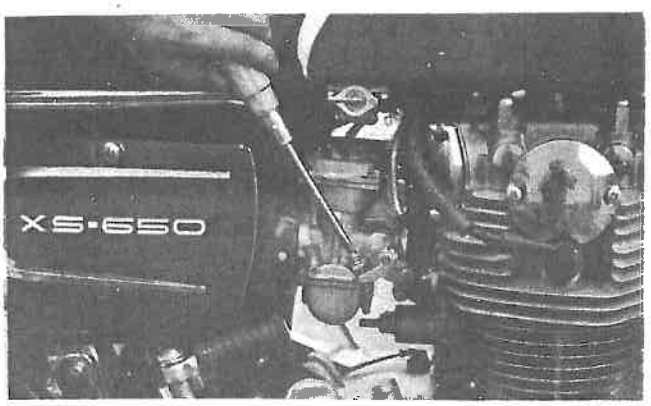
7) Adjustments

a) Idle mixture: turn the idle mixture screw in until it lightly seats, then back it out 1 turn.

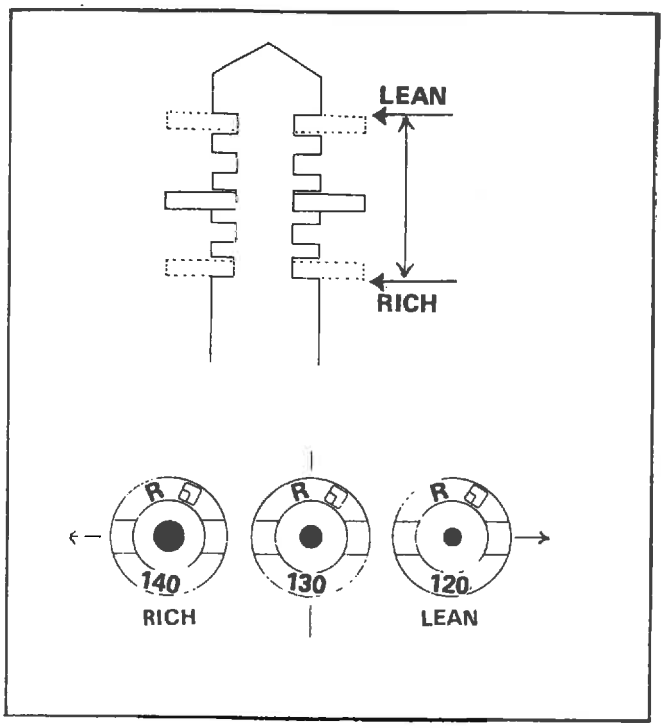


1. Pilot mixture adjusting screw.
2. Idle speed adjusting screw.

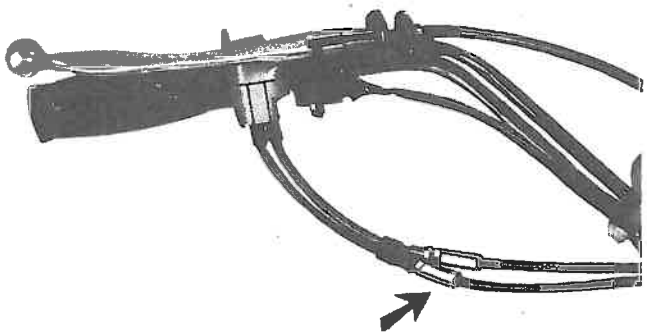
b) Idle speed:
Set both idle screws so the engine idles fast. Pull off one spark plug high tension lead. Back out the idle speed screw on the running cylinder until the engine dies. Hook up the spark plug lead, start the engine, and pull off the opposite spark plug lead. Slowly back off the idle speed screw of the running cylinder until the engine dies. Attach the loose spark lead and start the engine. Both cylinders should be idling at the same speed, pulling evenly. If engine rpm is too high, back off both idle speed screws an even amount until idle is 1,000~1,200 rpm.



c) Jet needle (mid-range): Mid-range fuel supply is controlled by the position of the needle in the needle jet. The needle clip comes standard in the 4th groove from the top (4th stage). To lean out the mid-range mixture, move the clip one groove higher (dropping the needle). To richen the mixture, place the clip one groove lower (raising the needle).



d) Main jet (high speed): The carburetor comes equipped with a #130 main jet. Install a one step larger main jet (#140) to richen the high speed mixture. Install a one step smaller main jet (#120) to lean out the mixture.



e) Butterfly synchronization: Both butterfly valves must be adjusted to open and close simultaneously. Fully close the throttle grip so that both butterfly valve actuator mechanisms rest against their throttle stop screws. Slowly twist the throttle grip and note whether both butterfly valves start to open at the same time. If this does not occur simultaneously, use the cable adjustor to lengthen or shorten one cable until correct action is achieved. In addition, with the throttle fully closed, both throttle cables should have approximately 1 mm free play before both butterfly valves start to lift simultaneously.

NOTE:

Idle speeds on both carburetors MUST BE SET before synchronizing butterfly operation.

8) Troubleshooting

a) Fuel overflowing out of carburetor:
This condition is due to dirt holding the fuel valve open or a defective fuel float filling with gasoline and not shutting the fuel valve. Dirt can be quickly cleaned out of the fuel valve and valve seat. A punctured float, however, must be replaced.

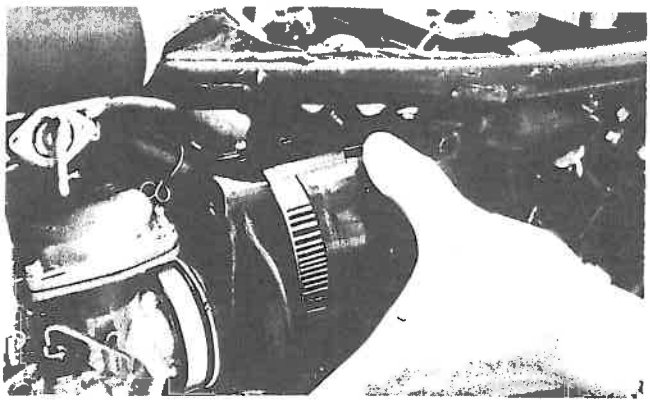
b) Vacuum slide lifting slowly or not at all:
If the throttle cable is properly opening the butterfly valve, but the vacuum slide still does not lift during engine operation, check the vacuum slide diaphragm. If this diaphragm is cracked or punctured, no vacuum will develop above the diaphragm as it should. Replace the vacuum slide/diaphragm unit.

c) Fuel flowing to carburetor but not to engine:
First, water droplets can block up the main jet. Secondly, an improperly adjusted float level holds the fuel level too low to be picked up by vacuum over the fuel outlet nozzle. Third, if the jet needle clip slips off, the jet needle drops down into the needle jet. This prevents any fuel from entering the venturi.

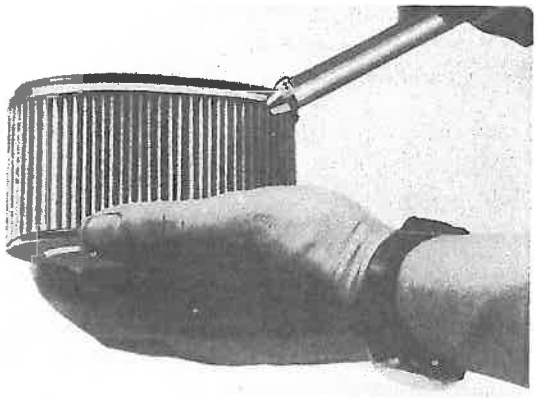
CAUTION
If a passage is blocked, and high pressure air must be used to clear it, it is absolutely necessary that the float bowl be removed first. If this is not done, high pressure air can enter the float bowl and crush both floats.

C) Air Filter

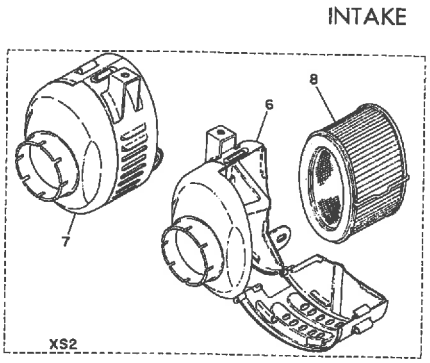
1) Two, dry paper-type air filters are housed in separate metal containers located under the seat. Remove both frame side covers. Push down on the spring clip on the top of the filter container and the cover will pivot down, permitting removal.

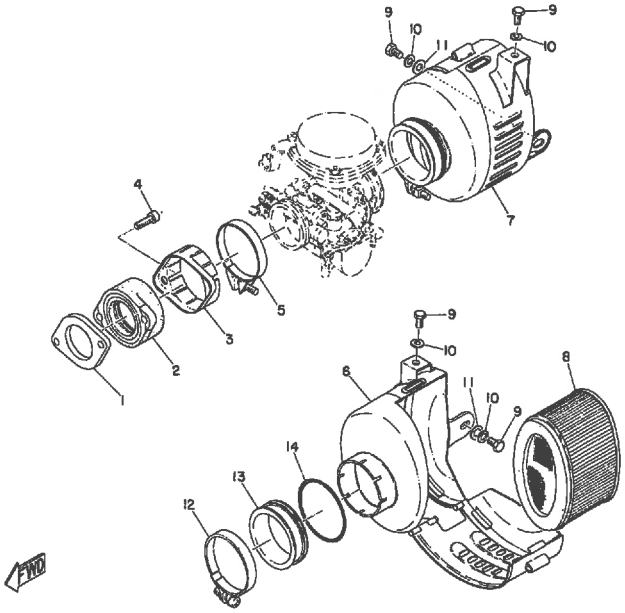


2) The air cleaner is the dry paper type and it must not be cleaned with any type solvent. High pressure air removes most dust and grit. If the contamination adheres to the filter element, use a soft brush to dislodge the particles, then blow the filter with air.



(TX650A: See page 163)



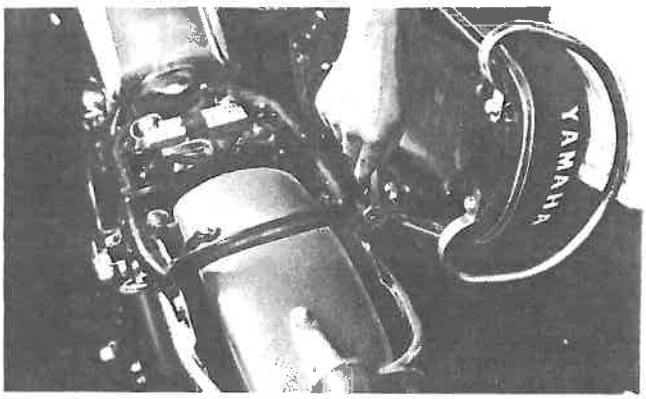


CHAPTER 3. FRAME

1. The basic frame design consists of double down tubes and a single large top tube. The engine is fully enclosed in the frame.

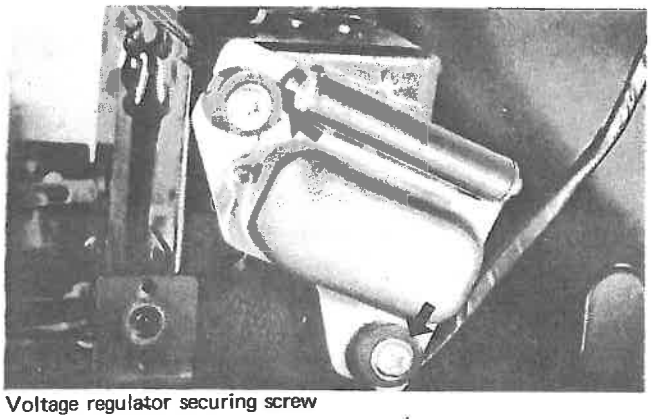
A) Seat Removal

Lift the seat and disconnect the seat support bracket. Next, remove the rear pivot pin nut and slide the seat forward until the pivot pins slide clear of the bushings.



B) Voltage Regulator Removal

The unit is mounted to the right side of the battery box. Disconnect the multiple wiring connector and remove both mounting screws.



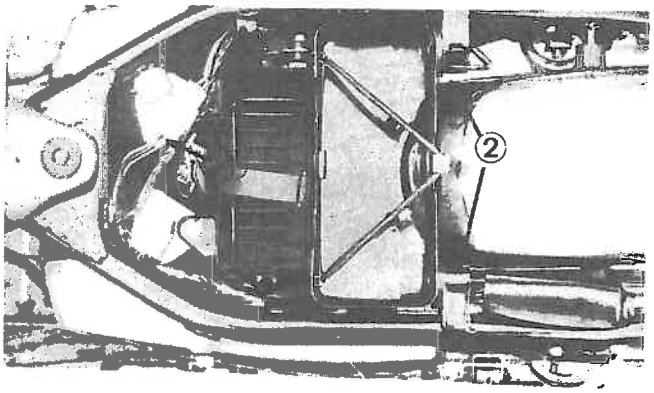
Voltage regulator securing screw

C) Battery Box (and tool box combined) Removal

CAUTION

Disconnect flasher unit wiring (bottom of box) before removing the box.

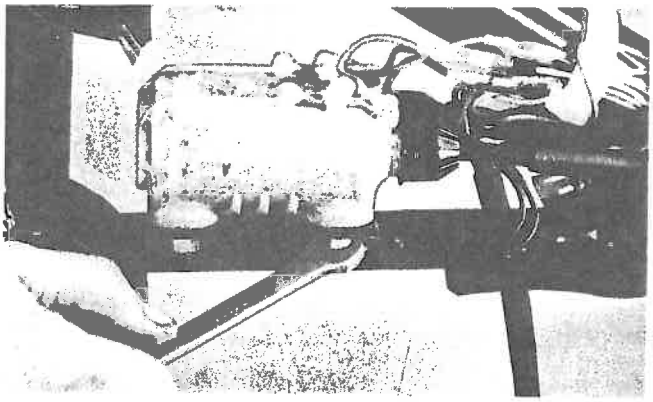
The battery box is held in place by two anchor pins (2) and two securing bolts (1). Remove the two retaining bolts, slide the unit forward until both anchor pins clear the bushings, then lift the box up.



1. Battery/tool box securing screws
2. Anchor pins

D) Secondary Ignition Coil Removal

Each of the two secondary ignition coils is mounted to a frame bracket by two nuts. Remove the gas tank wire loom connections and two 10 mm nuts.

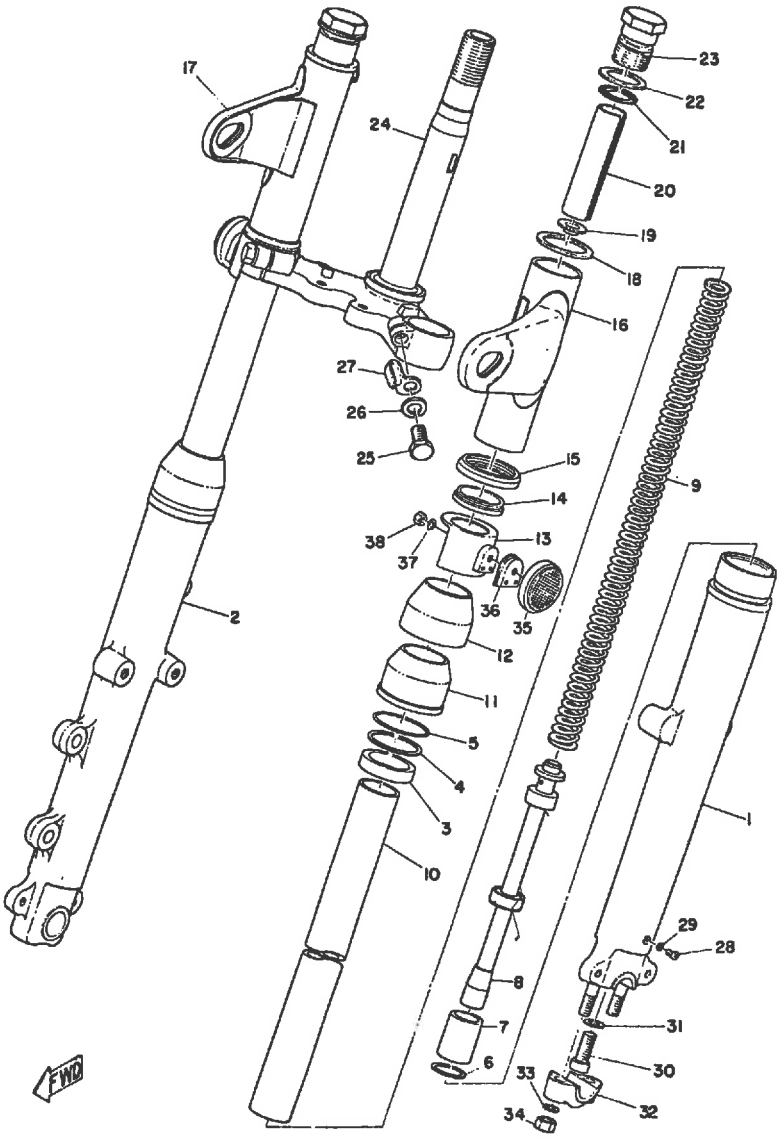


E) Front Forks

The front forks consist of two individual fork legs, each one having a two-way hydraulic dampening action and an internal spring to extend the fork leg during operation. In addition, the forks are held solidly in place by an underbracket and top bracket commonly called the triple clamp.

(See page 164 for TX650A fork information.)

FRONT FORK (XS2)

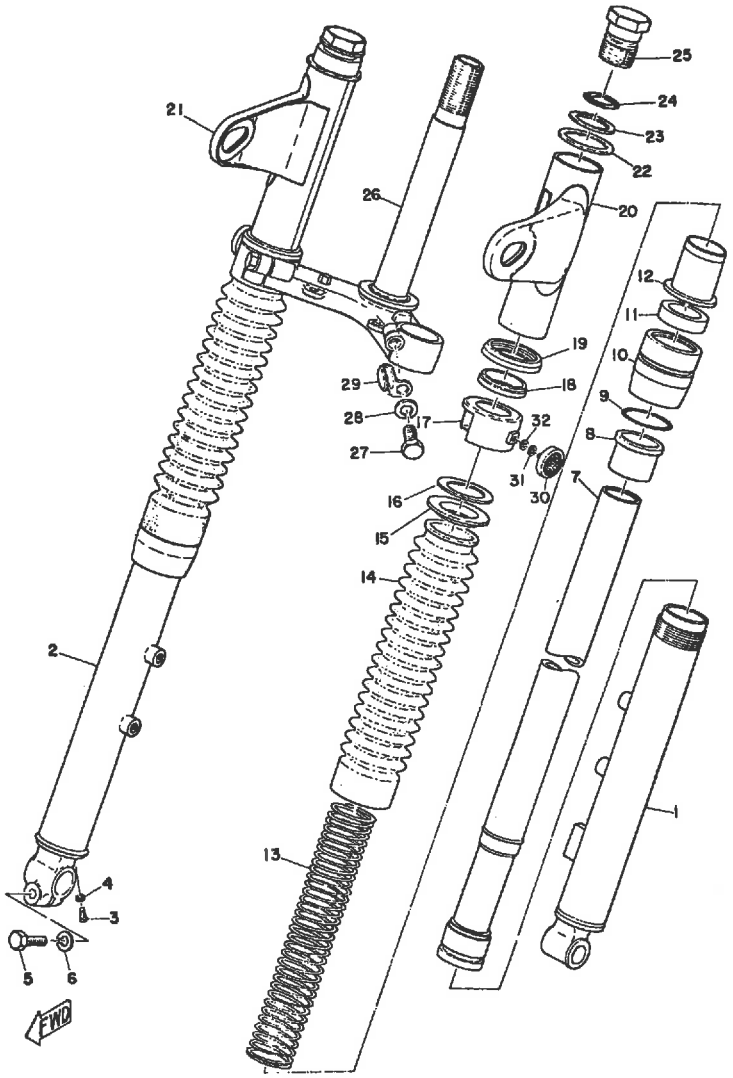


XS2

1. TUBE, outer left
2. TUBE, outer right
3. OIL SEAL
4. WASHER, oil seal
5. CLIP, oil seal
6. CIRCLIP (R-28)
7. PISTON, front fork
8. CYLINDER COMP.
9. SPRING, fork
10. TUBE, inner
11. SEAL, dust
12. COVER, dust seal
13. COVER, outer
14. PACKING
15. GUIDE, cover under
16. COVER, upper left
17. COVER, upper right
18. GUIDE, cover upper
19. SEAT, spring upper
20. SPACER
21. PACKING
22. WASHER, cap
23. BOLT, cap
24. UNDER BRACKET COMP.
25. BOLT, under bracket
26. WASHER, spring
27. HOLDER, wire
28. PLUG, drain
29. GASKET, drain plug
30. BOLT
31. PACKING
32. HOLDER, axle
33. WASHER, spring
34. NUT
35. REFLECTOR
36. COVER, reflector stay
37. WASHER, spring
38. NUT

NOTE: Typical for TX650-RGF. 1, outer tube, left has fittings cast on for optional dual disc brake.

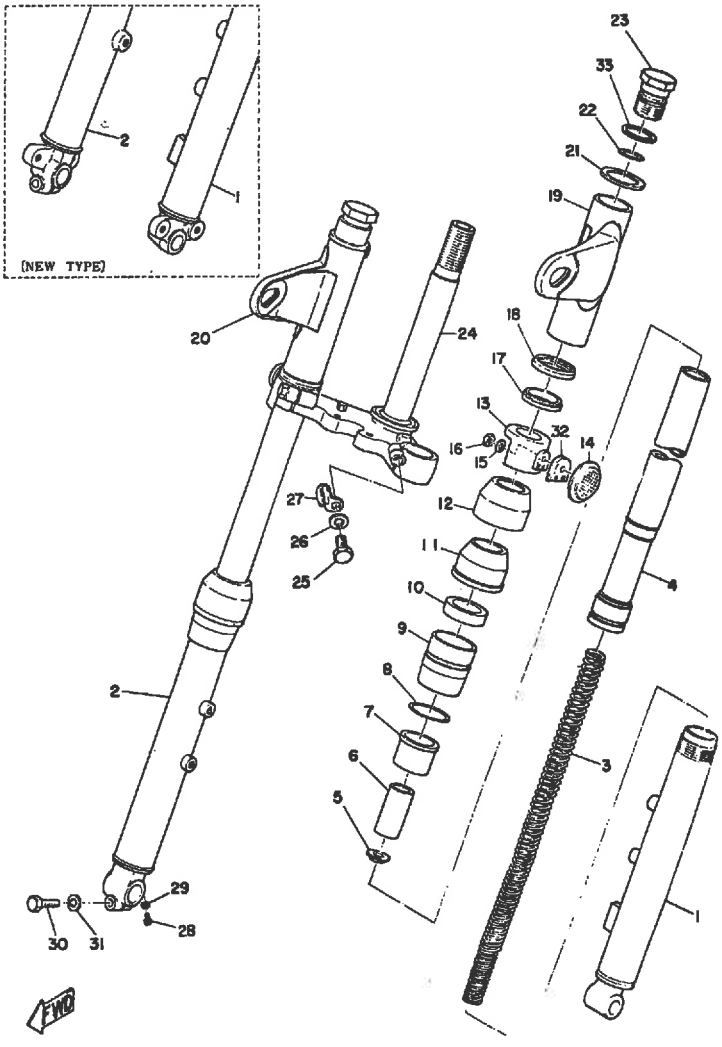
FRONT FORK (XS1)



XS1

1. TUBE, outer left
2. TUBE, outer right
3. PLUG, drain
4. GASKET, drain plug
5. BOLT
6. WASHER, spring
7. TUBE, inner
8. METAL, slide
9. O-RING
10. OUTER NUT COMP.
11. OIL SEAL
12. SEAT, spring under
13. SPRING, fork
14. BOOT
15. SEAT, spring upper
16. WASHER, oil seal
17. COVER, outer
18. PACKING, lamp stay
19. GUIDE, cover under
20. COVER, upper left
21. COVER, upper right
22. GUIDE, cover upper
23. WASHER, cap
24. O-RING
25. BOLT, cap
26. UNDER BRACKET COMP.
27. BOLT, under bracket
28. WASHER, spring
29. HOLDER, wire
30. REFLECTOR 1
31. WASHER, spring
32. WASHER, plain

FRONT FORK (XS1B)



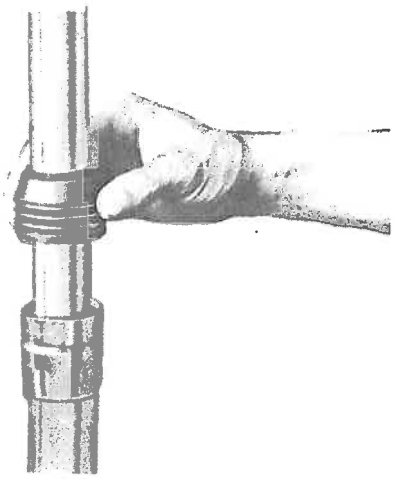
XS1B

1. TUBE, outer left
2. TUBE, outer right
3. SPRING, fork
4. TUBE, inner
5. SEAT, spring upper
6. SPACER
7. METAL, slide
8. O-RING
9. OUTER NUT COMP.
10. OIL SEAL
11. SEAL, dust
12. COVER, dust seal
13. COVER, outer
14. REFLECTOR
15. WASHER, spring
16. NUT
17. PACKING, (lamp stay)
18. GUIDE, cover under
19. COVER, upper left
20. COVER, upper right
21. GUIDE, cover upper
22. PACKING
23. BOLT, cap
24. UNDER BRACKET COMP.
25. BOLT, under bracket
26. WASHER, spring
27. HOLDER, wire
28. PLUG, drain
29. GASKET, drain plug
30. BOLT
31. WASHER, spring
32. COVER, reflector stay
33. WASHER, cap

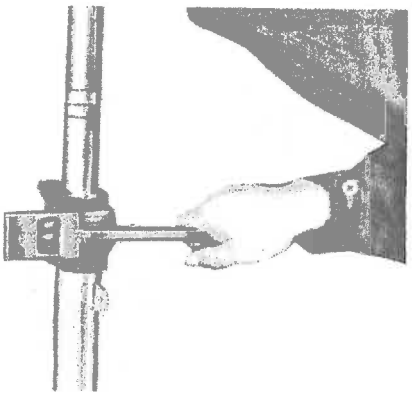
1) Outer Fork Leg Removal

NOTE: Remove the front wheel and front fender before starting this procedure. The forks need not be removed from the machine.

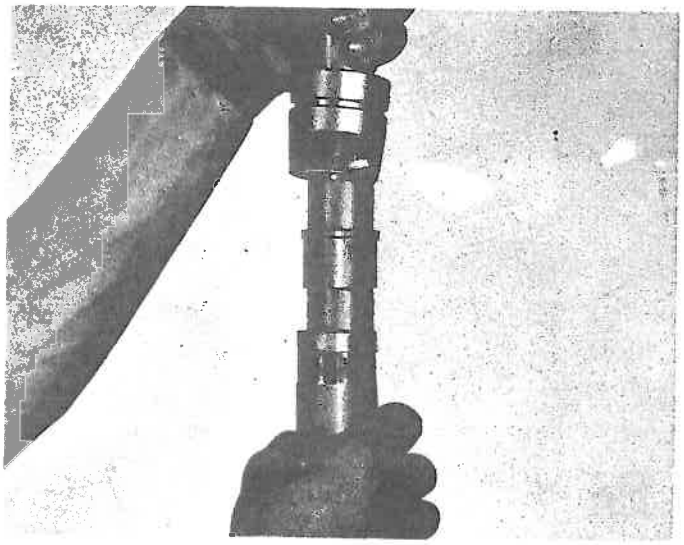
a) Pull up the dust seal.



b) Unscrew the outer nut. To do this, grip the nut with a strap wrench, (if a metal strap wrench is used, first place a thick sheet of rubber around the nut to protect the chrome). Hold the outer tube to prevent it from spinning, (reinstalling the axle helps), then unscrew the outer nut (right hand thread).



c) The outer tube can now be pulled down and off the fork leg unit. After the tube has been removed, drain the oil.

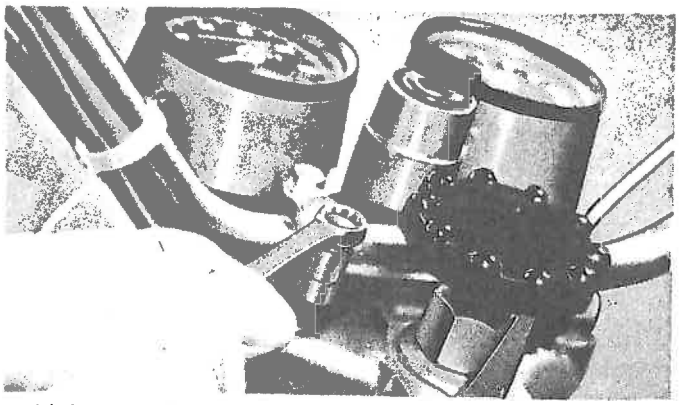


2) Inner Fork Leg Removal

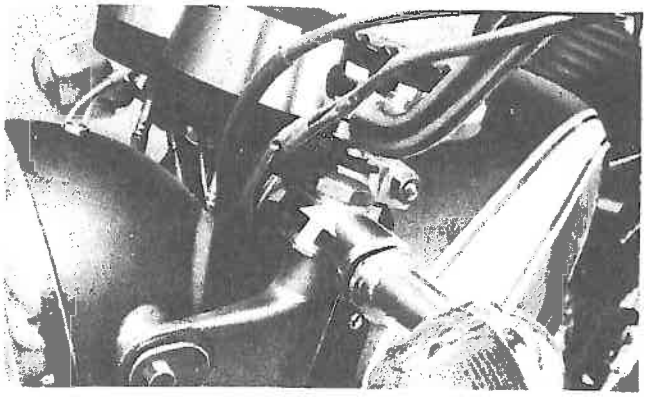
NOTE:

If fork leg disassembly is not necessary, these steps can be followed to remove the entire fork leg (inner and outer tubes) from the machine.

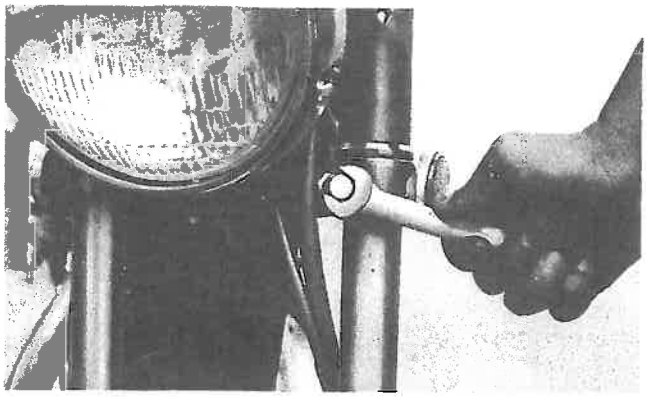
a) Loosen the handlebar mounting bolts, and pull the handlebar downward.



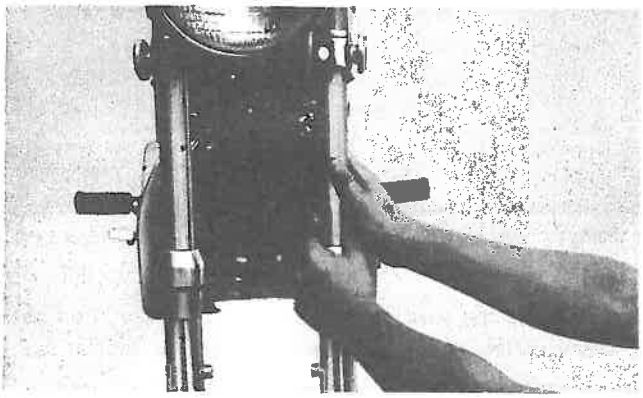
b) Remove the cap bolt.



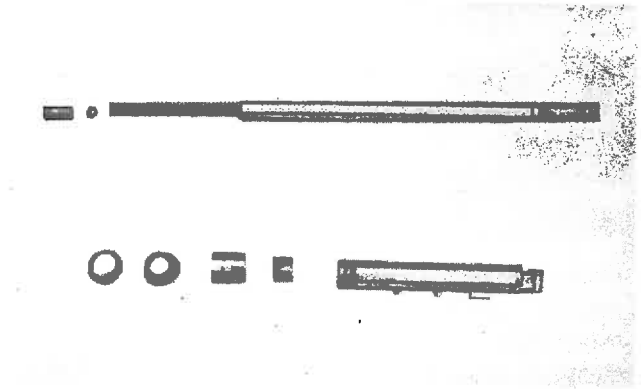
c) Loosen the underbracket bolt.



d) Pull the inner fork tube out of the mounting brackets.



e) Remove the outer nut, dust seal and cover, spring, top spring seat, and metal spacer from the inner fork tube.



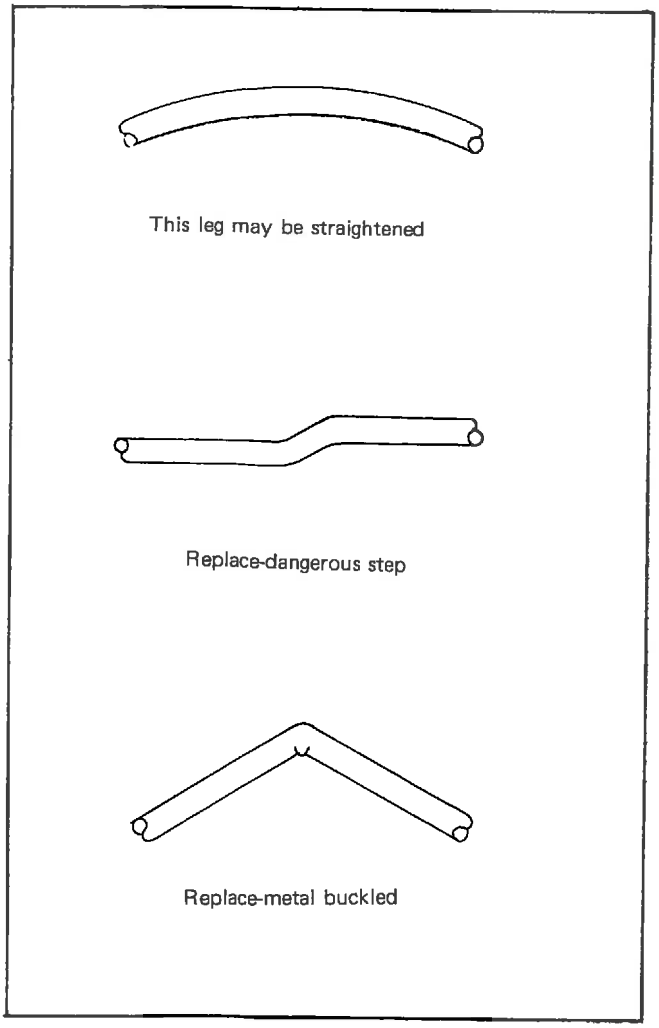
3) Fork Wear

a) Inner fork tube:

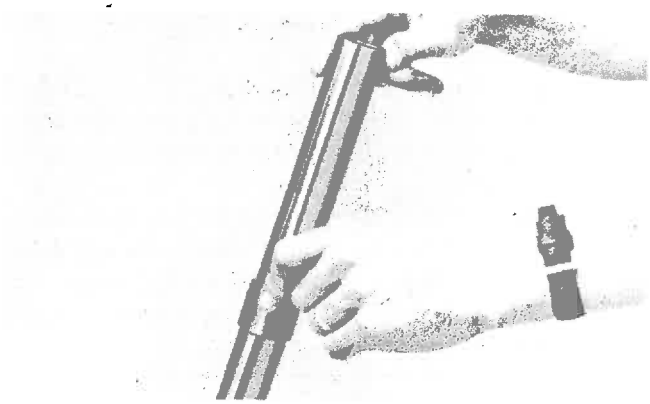
1) The inner fork tube must be checked for surface wear and bends. The tube gets scratched from dirt working past the seal and continually rubbing against the tube. In addition, the tube can become deeply grooved if it is bent.

2) Deep grooves, or nicks, can quickly wear out the seal lips and permit oil to blow past the seal. Replace the tube if these deep grooves are evident.

3) Also check for a bent tube. If the tube is found to be bent for any reason, the safest procedure is to **replace it. Slightly bowed tubes may be straightened but there is no way of knowing if the metal has weakened.**

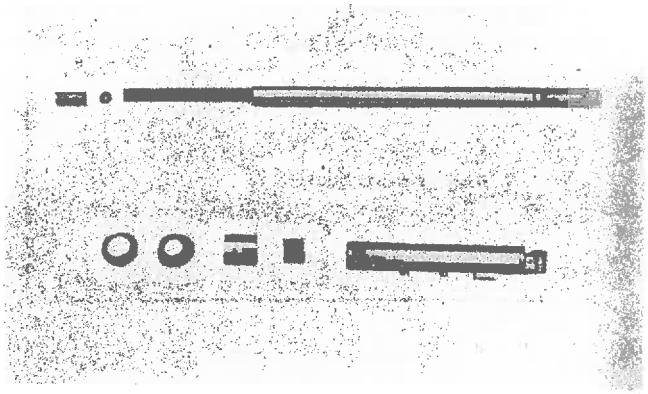


b) Slide Metal (inner fork tube)
Check for a sliding fit of this bushing over the inner fork tube. These parts when new have approximately .2 mm (.008") clearance. If this clearance is found to be more than .5 mm (.020"), the slide bushing should be replaced. Check the inner fork tube for wear due to the friction developed by this excessive clearance.



c) Oil Seal
The oil seal that is pressed into the top of the outer nut should be replaced whenever the forks are disassembled.

d) Rubber Spring Protector
Replace the rubber boot if it is cracked or torn.

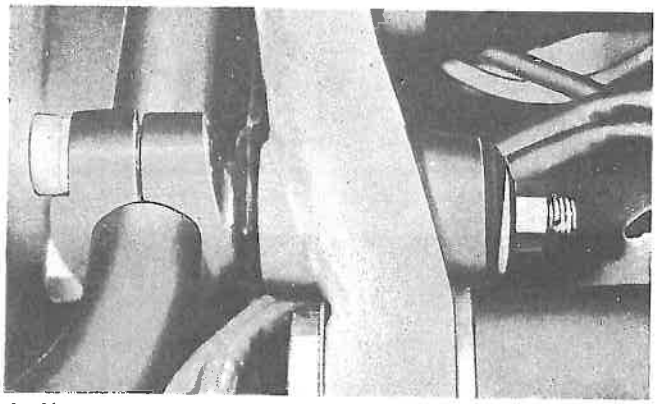


d) O-RING
The O-Ring fitted to the outer nut should also be replaced.

4) Handle Crown/Underbracket

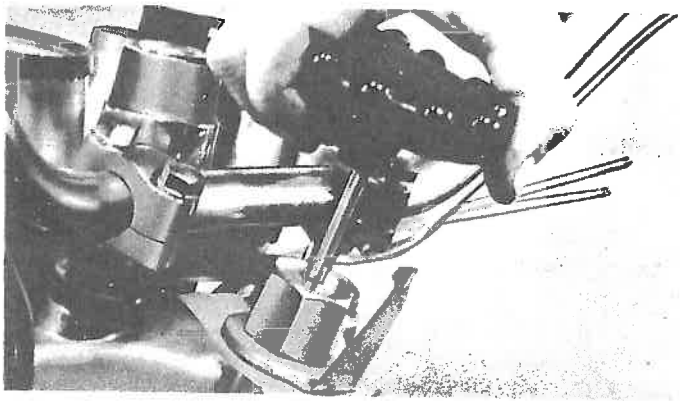
NOTE:
The following procedures can be performed with the entire fork unit still attached.

a) The handlebar holders are rubber mounted in the top handle crown. Remove the handlebar holder retaining nuts (1), then pull out the holders and rubber cushions (2).



1. Nut
2. Rubber cushion

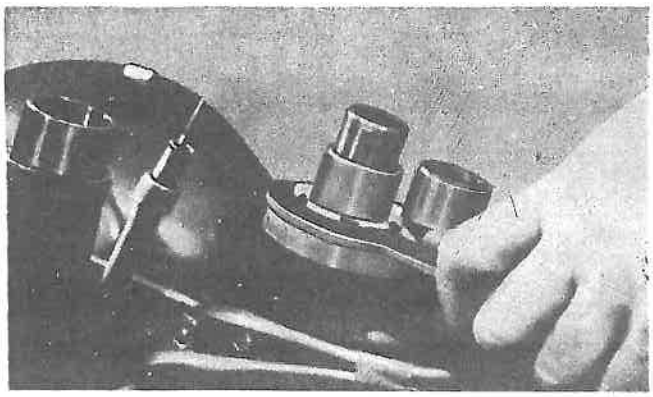
b) Remove the steering friction dampener unit. Pull out the cotter key. Completely remove the damper rod.



c) Loosen the handle crown lock bolt and unscrew the steering stem nut. Remove the front fork bolts. The handle crown can now be removed.

Removing the handle crown

d) Beneath the handle crown is one stem ring nut that holds the underbracket in place. Remove it.



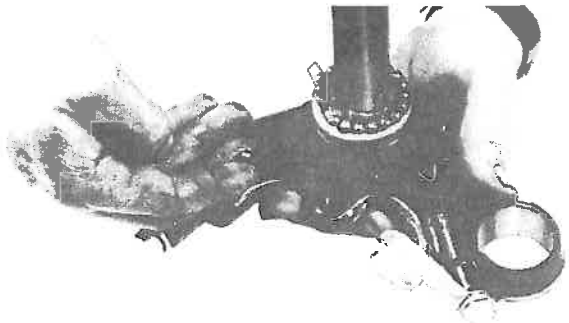
e) Take care when removing the ring nut as the underbracket will begin to drop down, away from the steering head.

CAUTION

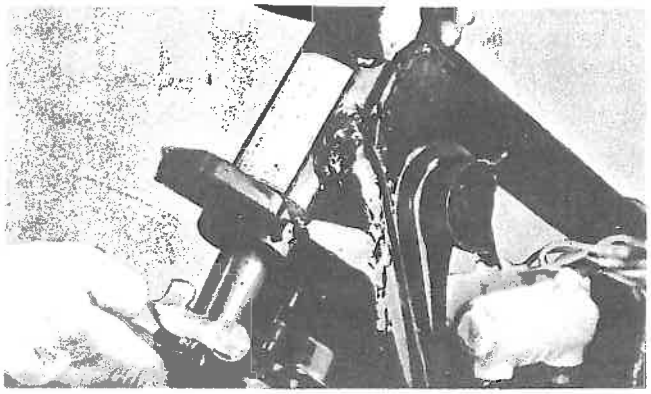
The top and bottom steering head balls (including top and bottom races for each set of balls) are held in place by the underbracket and ring nut. Take care when removing the underbracket that none of the balls drop out and become lost.

f) Examine the balls for pits or partial flattening. If one is found defective, the entire set (including both races) should be replaced. If either race is pitted, shows rust spots, or is damaged in any way, replace both races and all balls.

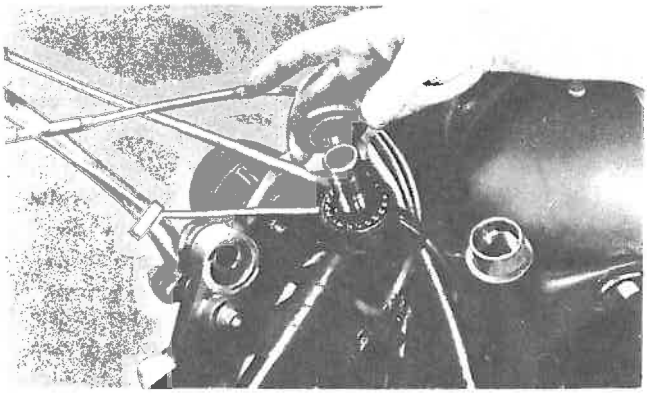
g) Mount both bottom races and the balls onto the underbracket (balls completely greased).



h) Carefully slip the underbracket stem up into the steering head.



i) Install both top races and balls into the top of the steering head. Be sure the balls are completely greased during installation.



j) Thread the ring nut down over the stem to hold the underbracket in place.

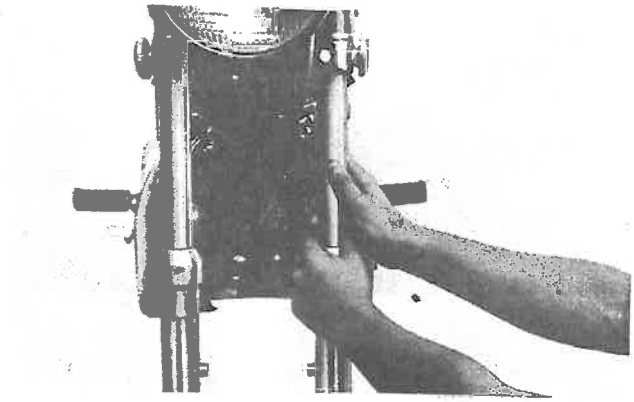
IMPORTANT

Tighten this ring nut so that all free play is taken up, but so the bracket can still pivot freely from lock to lock. Recheck for free play after the entire fork unit has been reassembled. Front end wobble could result from loose steering head bearings.

k) Set the handle crown into position over the ring nut. Locate both crown arms over the upper covers and lock in place by threading on and tightening the stem lock nut.

5) Fork Installation

a) Install the slide bushing, outer nut (oil seal installed), bottom spring retainer, spring, rubber protector, top spring retainer and flat metal washer over the inner tube.



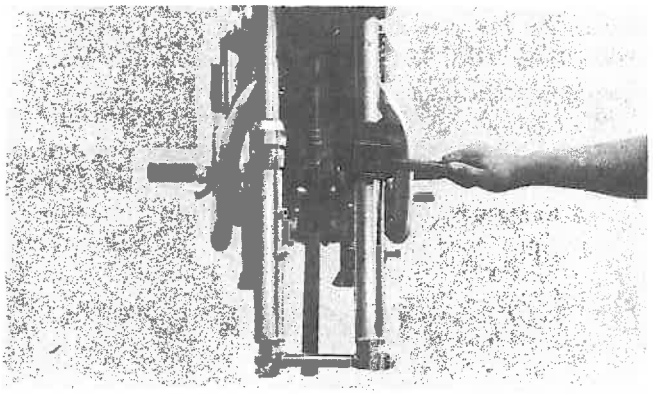
b) Slide the inner fork leg up through the underbracket and handle crown. Thread in and fully tighten the fork cap bolt into the inner fork tube. If may be necessary to use the DS3 fork tube installing tool with the XS1 adaptor.

c) Tighten the underbracket bolt. This firmly locks the inner tube in place.

CAUTION

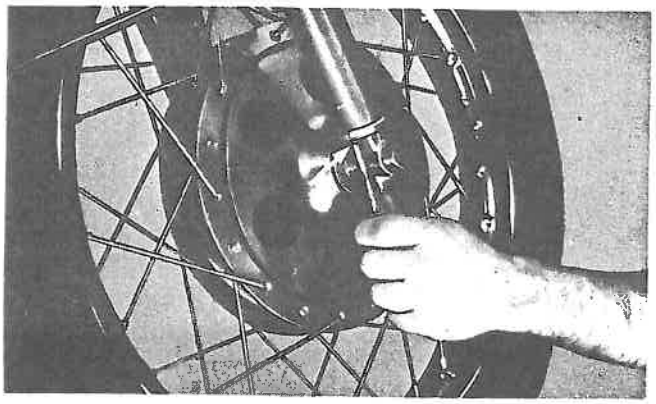
Always tighten the fork cap bolt and THEN the underbracket bolt, in that order. If the inner tube wants to turn during fork cap bolt tightening — hold the inner tube with a strap wrench.

d) Slide the outer tube up over the inner tube until the outer nut and tube can be threaded together. Thoroughly tighten this outer nut with a strap wrench.



6) Changing Fork Oil

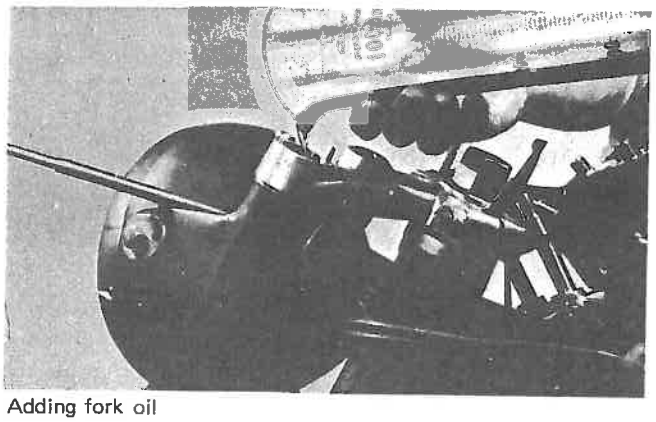
a) Remove the drain screw from the bottom of both forks and allow the oil to drain out. Push down on the handlebar a few times to compress the forks and pump out any remaining oil.



b) Install both drain screws, then unscrew both fork cap screws. Pour (7.5 fl. oz.) of 30 wt. oil (20 wt. below + 40°F) into each fork leg. See table below for quantity. Install both cap screws.

Front Fork Oil Capacity:

XS1, XS1B	223cc – 7.5 fl. oz.
XS2, TX650	135cc – 4.6 fl. oz.



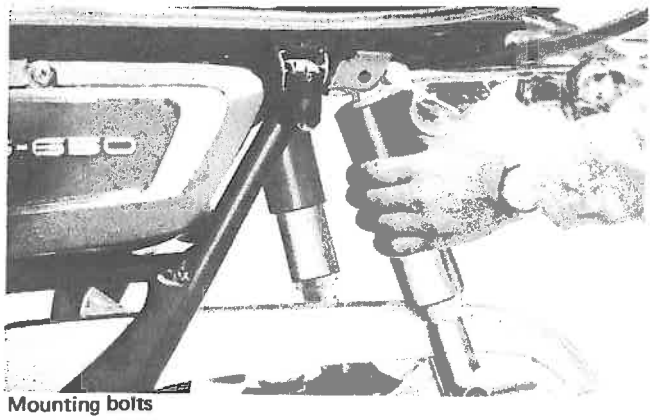
Adding fork oil

c) Special, non-foaming fork oil is available commercially and is recommended if approximately 30 wt.

F) Rear Suspension

1) Removing Both Mounting Bolts

Remove both mounting bolts and pull the suspension unit out of the frame and swing arm mounts.



Mounting bolts

2) Wear

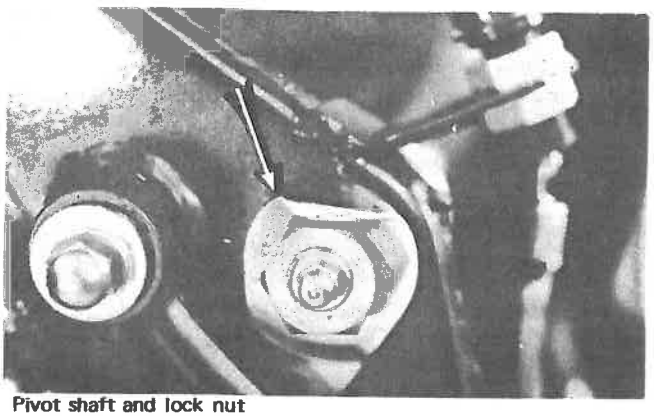
A unit that has lost its suspension qualities will compress quite easily and rebound quickly. To test the effectiveness of the unit, compress it as far as possible and then immediately take all weight off the shock. A suspension unit that is working properly will rebound quickly half-way and then slowly expand the second half. A defective shock will rebound to its fullest length without hesitation.

3) Swing Arm Removal

NOTE:

The rear wheel assembly must be removed before the swing arm can be removed.

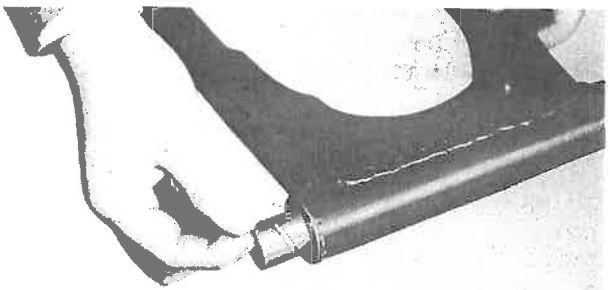
The swing arm is held to the frame by a pivot shaft. Bend the shaft lock tab down, remove the lock nut, and pull out the pivot shaft. The swing arm can now be removed from the frame.



Pivot shaft and lock nut

4) Wear

Wear of the swing arm pivot shaft bushings can cause wheel hop and wobble. With the swing arm installed (rear shocks and wheel removed) grasp the swing arm, twist slightly to feel for excessive shaft play in the bushings. There should be virtually no play at all for the bushings to be useable. If play exists, the bushings are worn. Drive them out of the swing arm and install new ones.



5) Lubrication

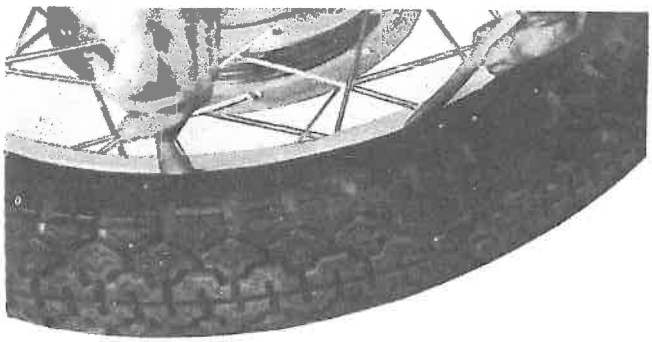
The swing arm pivot shaft end is fitted with a grease zerk fitting. Pressure feed a small amount of grease into this fitting after the first 1,000 miles and thereafter every 2,000 miles.

G) Wheels

1) Tire and Tube Removal and Installation

a) Whether it is the front tire or the rear tire to be changed, the procedure of tire and tube removal is identical. The explanation that follows is the proper method for both wheels.

b) Remove the valve cap, valve stem, and valve stem lock nut. Use two tire irons (with rounded edges) and begin to work the tire bead over the edge of the rim, starting opposite the tube stem. Take care to avoid pinching the tube. After one bead of the tire has been completely worked off the rim, slip the tube out. Be very careful not to damage the stem as it is pushed back out of the rim hole.

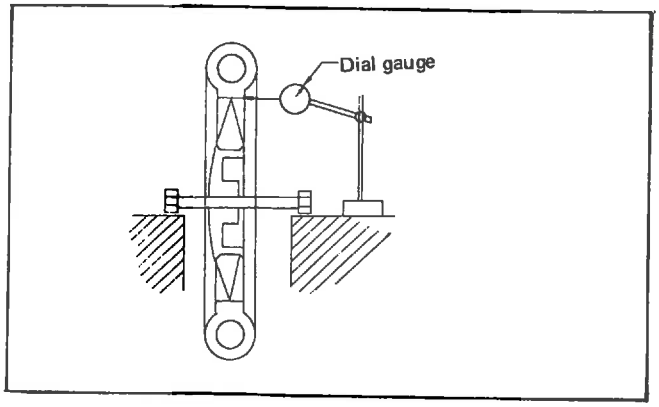


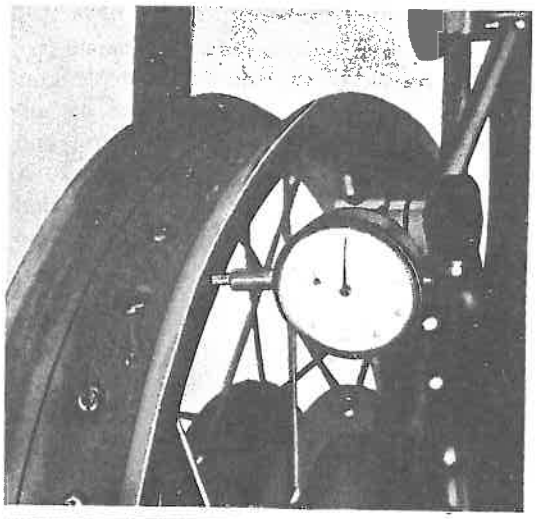
c) If the tire is to be completely removed, then work the remaining bead off the same rim edge.

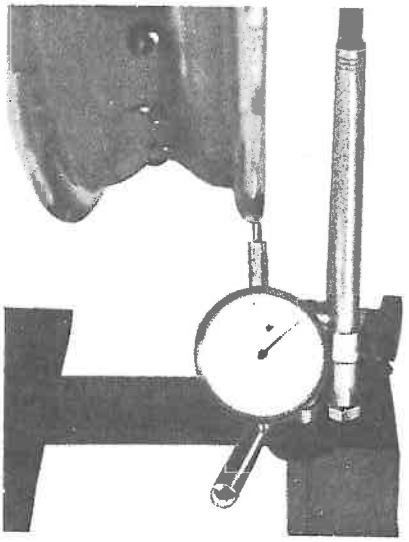
d) Installing the tire can be accomplished by reversing the disassembly procedure. The only difference in procedure would be to inflate the tube momentarily before both tire edges have been completely slipped onto the rim. This removes any creases that might exist. After the tire has been completely slipped onto the rim, check to make sure that the stem is squarely in the center of the hole in the rim. Then inflate the tube to 40 + psi several times. Check for leaks, and set at prescribed pressure.

2) Rim and Spokes

a) A rim can develop warpage. It is due to (1) running the wheel into an object and bending the outer rim, or (2) one or more spokes loosening.





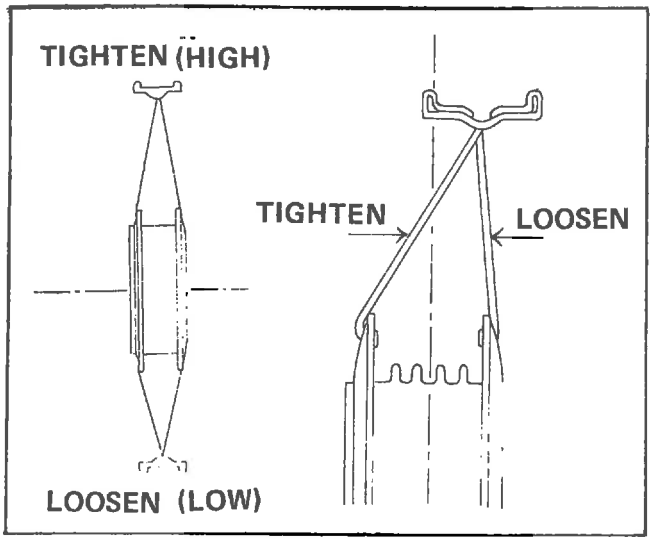


b) Check for warpage by mounting the wheel on a stand (or, if the wheel is attached to a motorcycle, it can be blocked up and held in place). Use some device to measure or detect movement then slowly spin the wheel and note the amount of rim "run-out". It should not exceed 1/16".

c) If all the spokes are tight, and the rim shows no obvious signs of damage, and yet run out is still excessive, do the following:

1) If the run out is up and down, loosen the spokes opposite the high spot and tighten the spokes at the high spot.

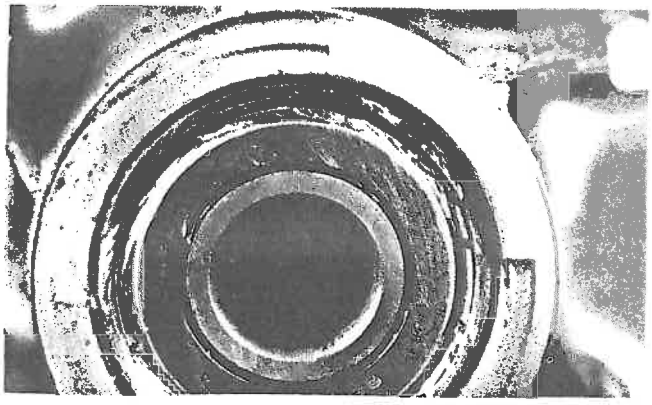
2) If the run out is sideways, loosen the spokes at the high spot, and tighten the spokes opposite the high spot.



3) Seals and Bearings

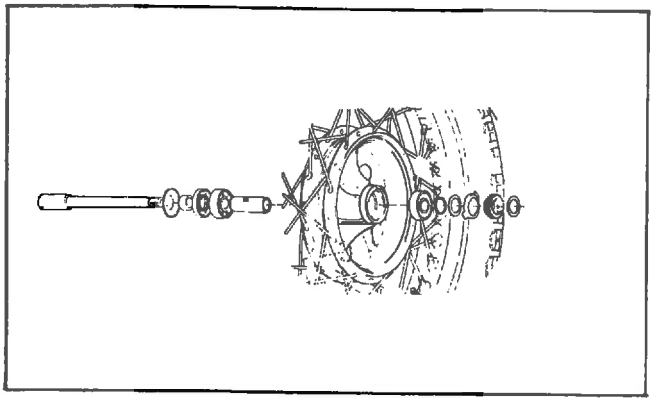
a) Wheel hub seals should be replaced every time they are pried out during repair, or if broken, cracked, or damaged in any way.

b) Check for smooth wheel bearing rotation. Dirt, rust spots, or any irregular surfaces will cause the bearing to hang up (will not spin smoothly). Remove the bearing, clean it, and check again. If the bearing still does not spin freely, replace it.

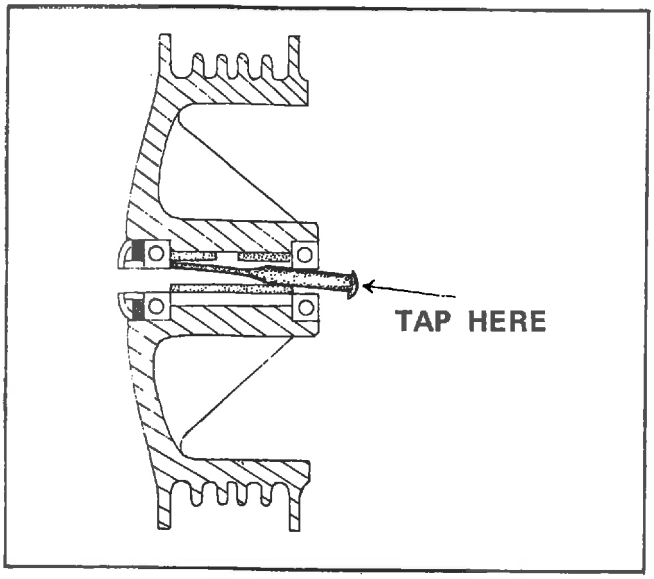


NOTE ON BEARING INSTALLATION: Be sure to grease the bearing before installation, using a quality bearing grease. In addition, during installation, protect the bearing to prevent dirt or contamination of any sort from entering the bearing.

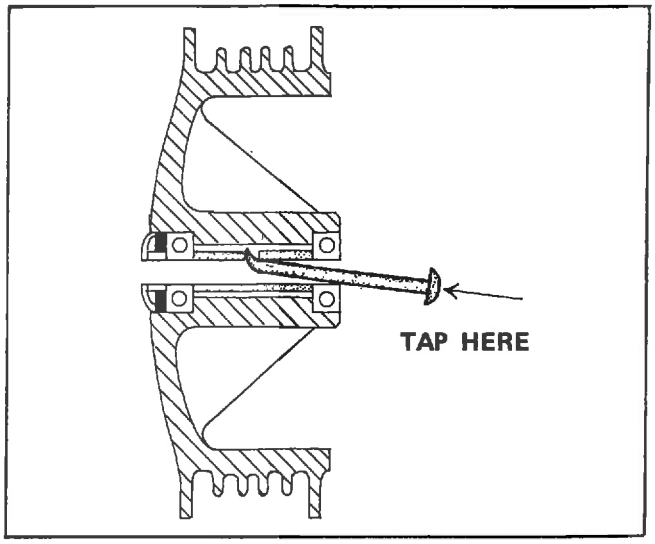
c) The wheel hub houses both bearings, a spacer between the bearings, an outer seal, and a metal cap outside the seal. Removal of the outer bearings requires that the seal be pried out.



d) Drive the bearing out by pushing the spacer to one side (the spacer "floats" between the bearings) and tapping around the perimeter of the bearing inner race with a soft metal drift pin and hammer. Either or both bearings can be removed in this manner.



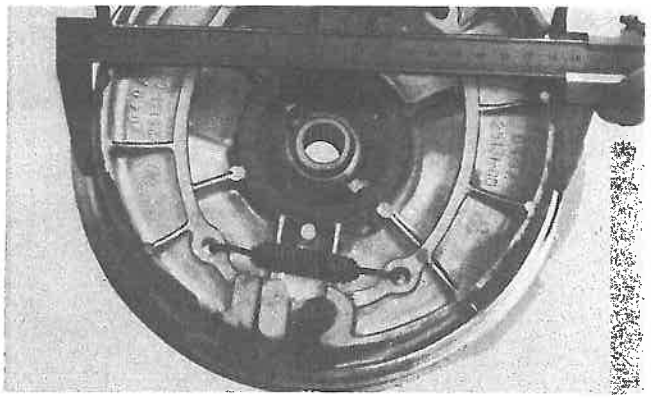
e) An alternative method of removing the bearings is to use a rod with a bent end. Insert the bent end into the hole drilled in the middle of the spacer and tap the other rod end with a hammer, driving the spacer (and bearing in front of it) out of the hub.



NOTE ON BEARING AND SEAL INSTALLATION: Be sure to use the special bearing installing tool which helps to prevent the bearing from going into the hub crooked and the seal from being bent during installation.

4) Brake Shoes

a) Use a vernier caliper to measure the outside diameter of the installed brake shoes and individual shoe linings. If either measurement proves any part of the brake unit to be excessively worn, replace both shoes with a new set.



	FRONT WHEEL		REAR WHEEL	
	STD.	Wear Limit	STD.	Wear Limit
Shoe Outside Diameter	192mm (7.556")	188mm (7.400")	172mm (6.772")	168mm (6.612")
Lining Thickness	4mm (.160")	2mm (.080")	4mm (.160")	2mm (.080")

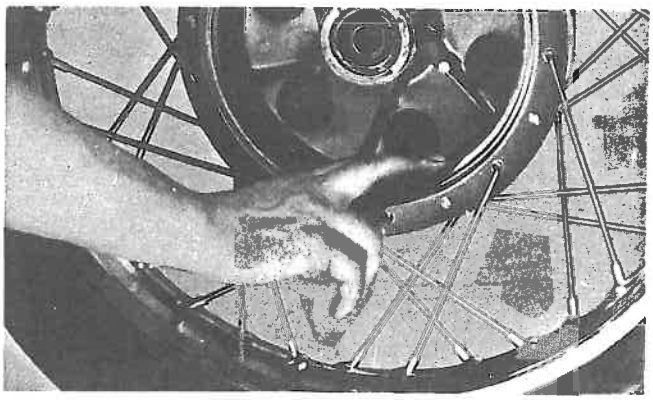
c) Check for brake shoe high spots that cause uneven contact with the brake drum. Remove these high spots with a file or emery cloth.

b) Friction heat can glaze the brake shoe surface. This causes less than maximum stopping efficiency. Use a file or rough emery cloth to evenly rough up the surface.

5) Brake Drum

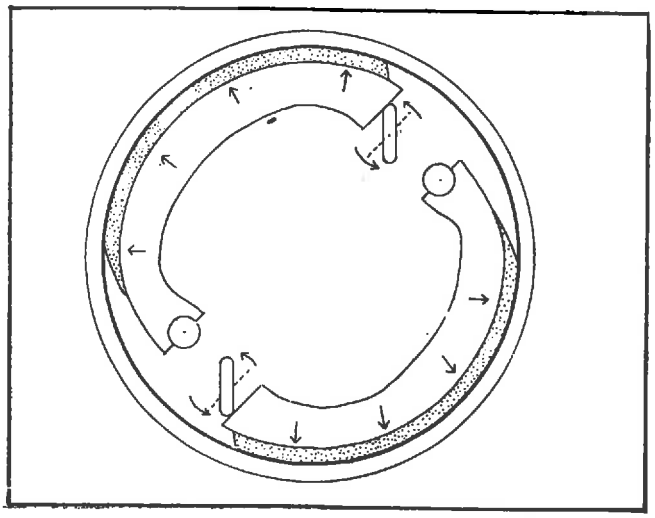
a) Grease on the brake drum causes improper braking performance. Thoroughly clean the surface with a rag soaked in solvent if any grease is found on the drum.

b) Any ridges or glazing that might exist on the brake drum surface can impair the operation. Use emery cloth to lightly sand out any ridges.

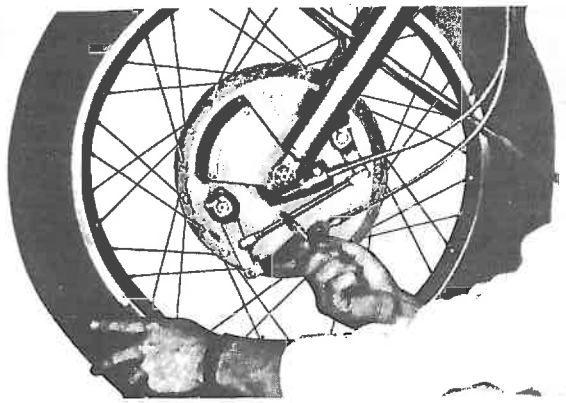


6) Brake Adjustment

a) The front brake utilizes a double leading shoe design. It has two brake shoe actuating cams interconnected by an adjustable length rod. When adjusted properly, this rod forces both brake cams to push the brake shoes out simultaneously. Yamaha double leading shoe brakes have a "crisp" feel during actuation. If actuation is hesitant or "spongy", it is probably due to one shoe being out of adjustment and operating first.

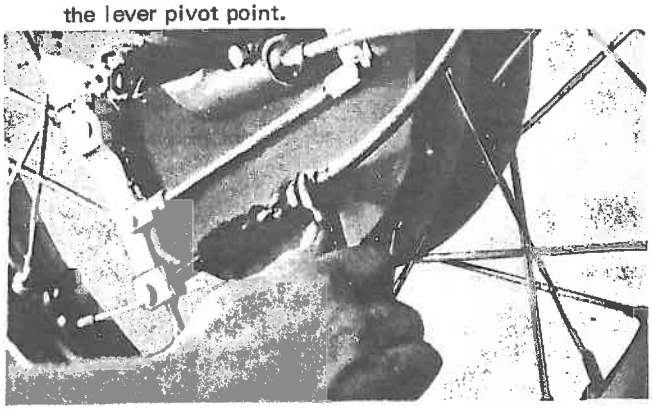


b) Unhook the brake cable at the handle lever. Next, loosen the interconnecting rod lock nut. The rod is threaded with a left-hand thread on one end, a right-hand thread on the other. If the rod is turned, this threading will pull both brake cam actuating arms together or spread them apart. Twist the rod so that both arms spread away from each other until all free play has been taken up, but no more. Tighten down the lock nut. Now both brake shoes will start to spread simultaneously when actuated. Complete this adjustment by rehooking the cable to the lever.



c) Check the adjustment by spinning the wheel while turning out on the cable adjustor. Eventually, the brake shoes will start to contact the drum. You should be able to hear each shoe (front and rear) scrape the drum. If not, the inter-connecting rod is **incorrectly adjusted. Loosen adjust rod — adjust front shoe with cable adjuster until shoe just begins to contact drum — turn rod until rear shoe contacts drum. Lock jam nuts on rod, make final adjustment with cable adjuster.**

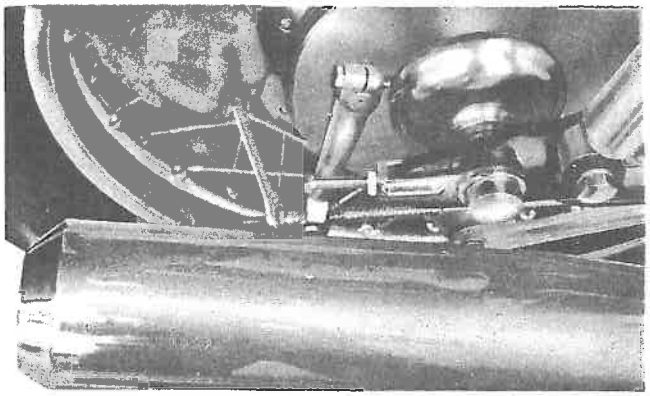
d) When the adjustment is correct, back in on the cable adjustor until there is approximately 6 mm (1/4") cable slack. Final adjustment (according to rider preference) can be made with the adjustor at the **lever. Lever adjustment should allow 2–3 mm slack at the lever pivot point.**



e) The single leading shoe rear brake is actuated by the right-side foot pedal. A rod connects the pedal to the brake. The adjustor is at the end of this rod. Spin the adjustor in or out, whichever direction is required to obtain approximately 1" (25 mm) of pedal free play.

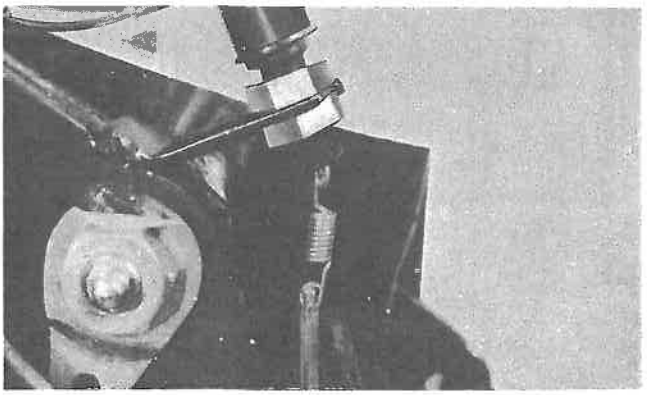
NOTE:

Rear brake adjustment should be checked any time the rear wheel is removed or the drive chain is adjusted.



7) Rear Stoplight Switch Adjustment

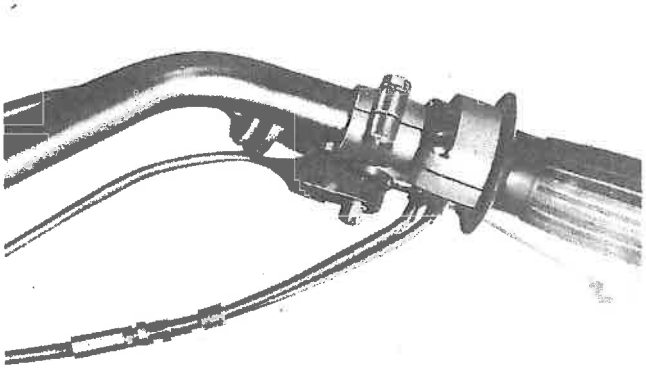
a) The rear brake stoplight switch mounts to the frame just behind the right-hand case cover. A thin rod connects the switch to the brake pedal.



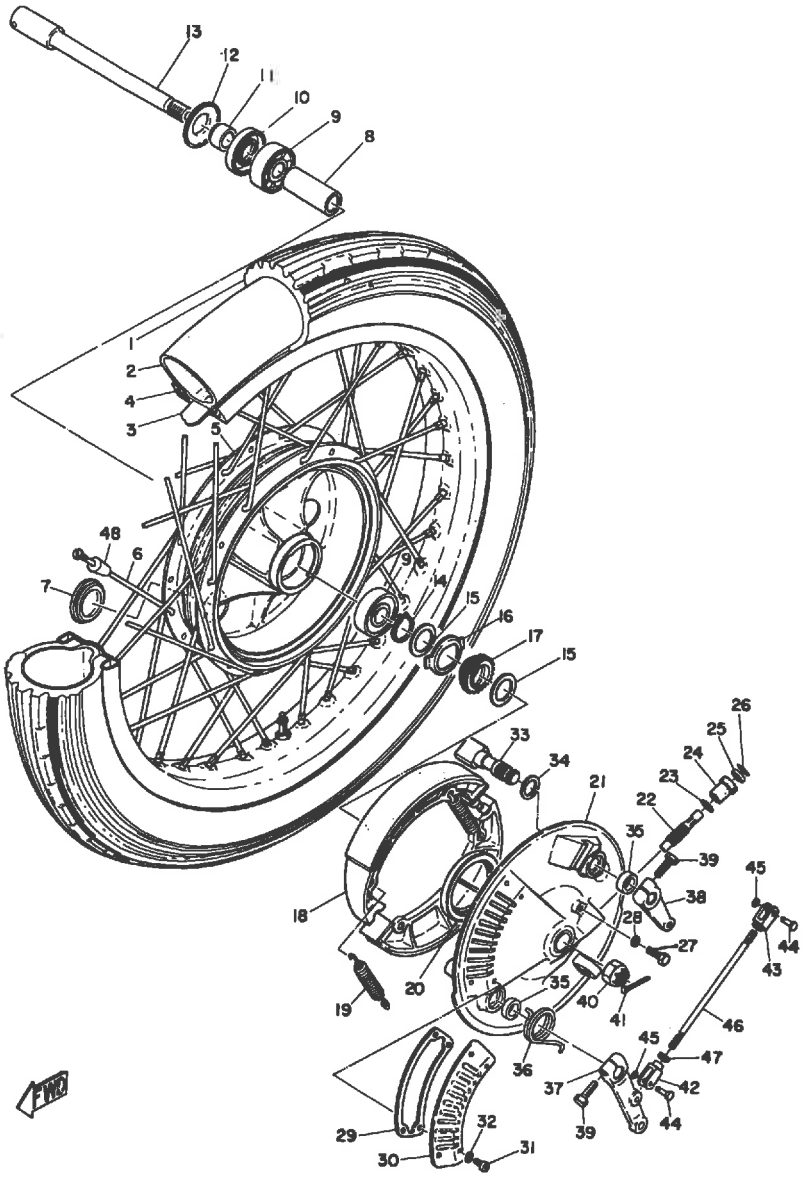
b) To make an adjustment, loosen one lock nut and spin the other nut. To raise the switch, loosen the bottom nut. To lower the switch, loosen the top nut.

c) Check rear stoplight switch adjustment whenever the rear brake is adjusted or the rear wheel is moved.

d) The stoplight is also actuated by a front brake switch at the handle lever. Lever movement must be far enough to close the contacts on this switch.



H) Front Wheel XS1 — XS1B

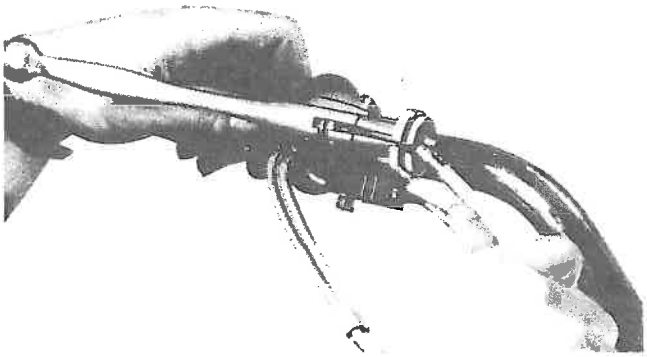


SEE ALSO XS2, TX650 SUPPLEMENTS.

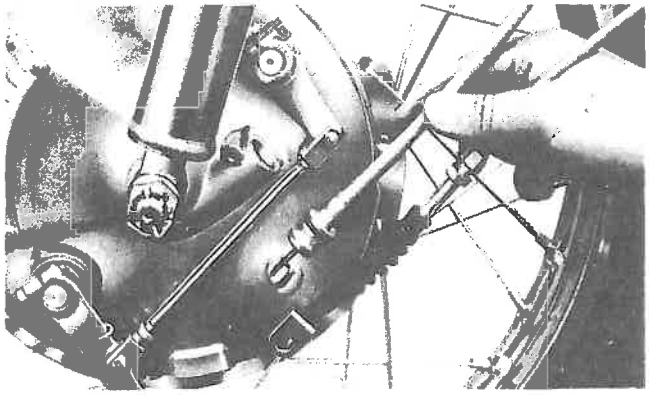
1 TIRE
2 TUBE
3 BAND, rim
4 RIM (1.85B-19)
5 HUB
6 SPOKE SET
7 PLUG, blind
8 SPACER, bearing
9 BEARING (6303Z)
10 OIL SEAL (SD-25-47-7)
11 COLLAR, wheel shaft
12 COVER, hub dust
13 SHAFT, wheel
14 CIRCLIP (S-25)
15 WASHER, thrust (25-32-1.0)
16 CLUTCH, meter
17 GEAR, drive
18 BRAKE SHOE COMP.
19 SPRING, shoe return
20 OIL SEAL (SD-60-72-7)
21 PLATE, brake shoe
22 GEAR, meter
23 WASHER, thrust (7-12-0.8)
24 BUSHING
25 OIL SEAL (SO-7-14-4)
26 O-RING (2.4-13.8)
27 BOLT
28 WASHER, spring
29 SEAL, plate dust
30 COVER, plate dust
31 SCREW, pan head
32 WASHER, spring
33 CAM SHAFT
34 SHIM, cam shaft (14.2-24-0.5)
35 SEAL, cam shaft
36 SPRING, lever return
37 LEVER, cam shaft (1)
38 LEVER, cam shaft (2)
39 BOLT
40 NUT, shaft
41 PIN, cotter
42 END, rod (1)
43 END, rod (2)
44 PIN, rod end
45 CIRCLIP (E-4)
46 ROD, connecting
47 NUT
48 BALANCER, wheel

1) Removal

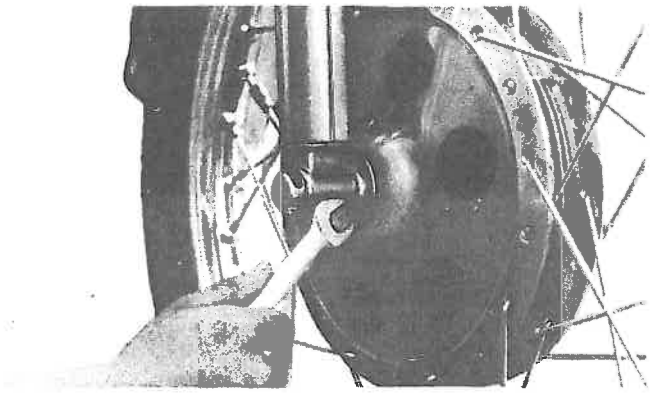
a) Disconnect the brake cable at the front brake lever.



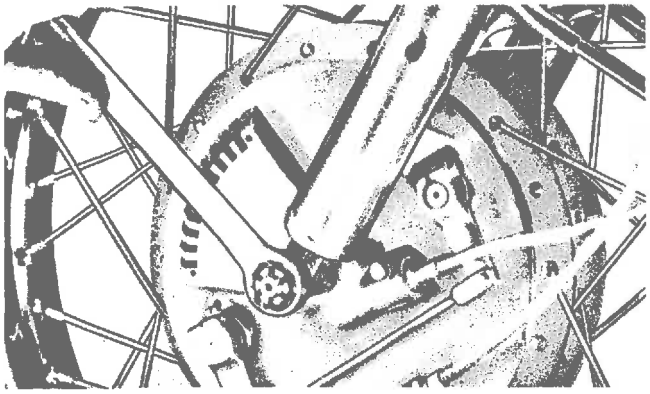
b) Disconnect both the brake cable and speedometer cable from the front wheel hub plate.



c) Loosen the front wheel axle lock bolt.

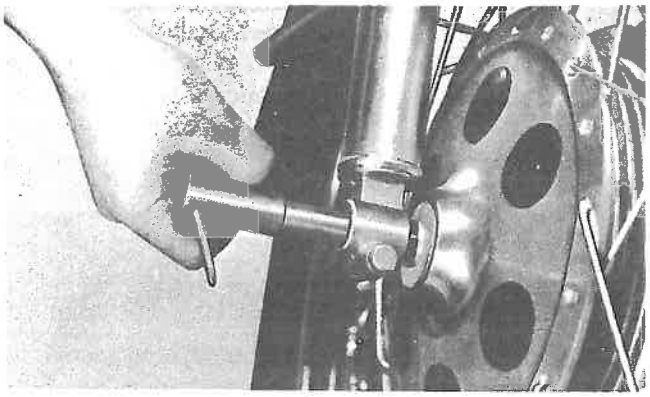


d) Remove the front wheel nut.

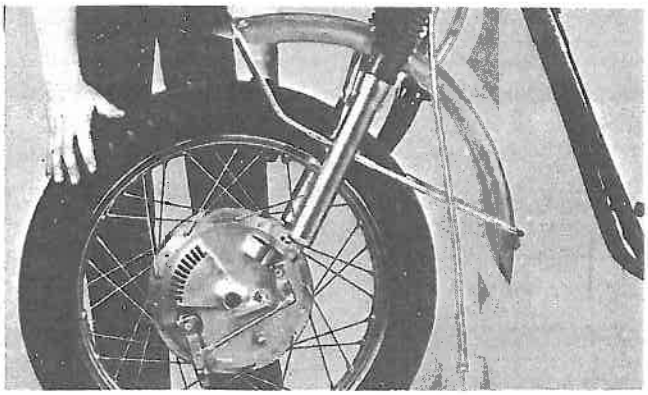


e) Brace the front of the machine off the ground.

f) Remove the front axle by simultaneously twisting and pulling out on the axle.

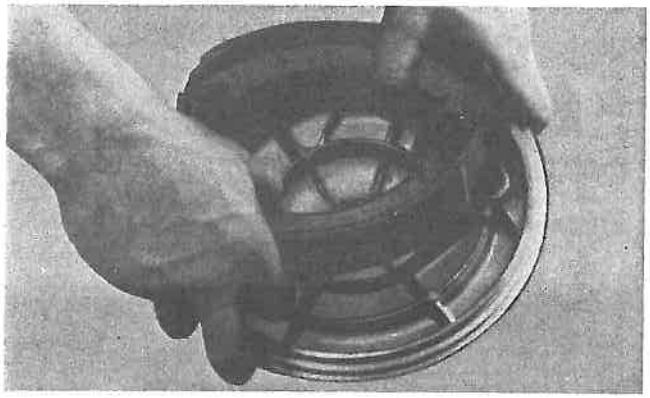


g) Remove the wheel assembly.

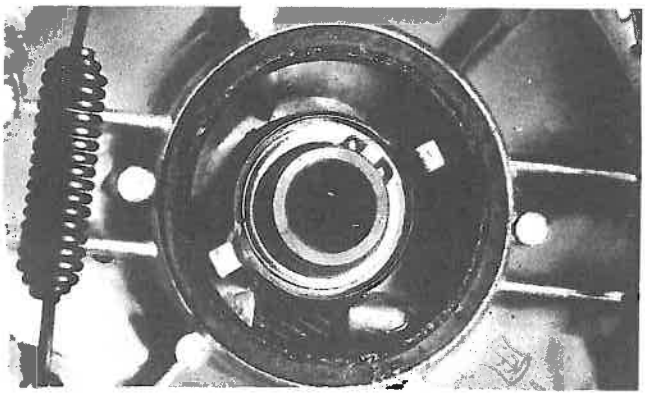


2) Disassembly and Assembly

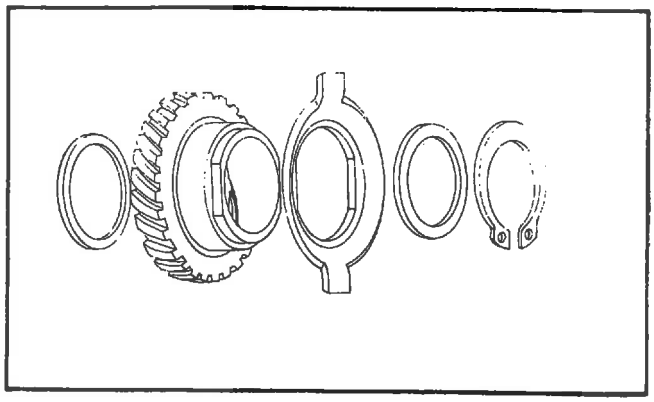
a) With the front wheel assembly out of the frame, the brake plate can be slipped out. Both brake shoes of the double leading shoe unit are mounted to the brake plate. They can be removed with the return springs intact by lifting up and out on the brake shoe outer edge.



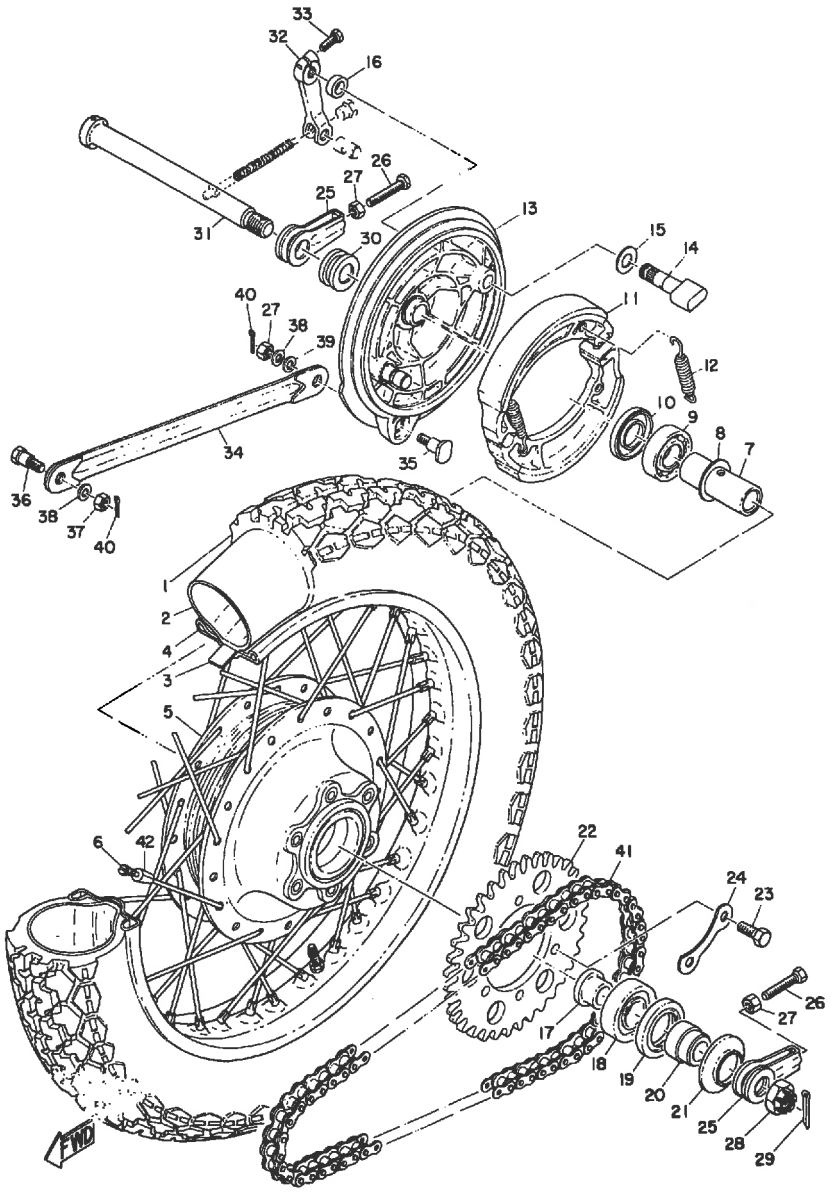
b) The brake plate also houses the speedometer drive gear. It is held in place by a cup shaped washer with two projecting tangs, a flat washer, and a circlip. Remove the circlip, pull off the two washers and slide out the gear.



NOTE ON SPEEDOMETER GEAR INSTALLATION: The cup-shaped washer must be installed with the inside of the cup visible. Then install the flat washer at the base of the cup.



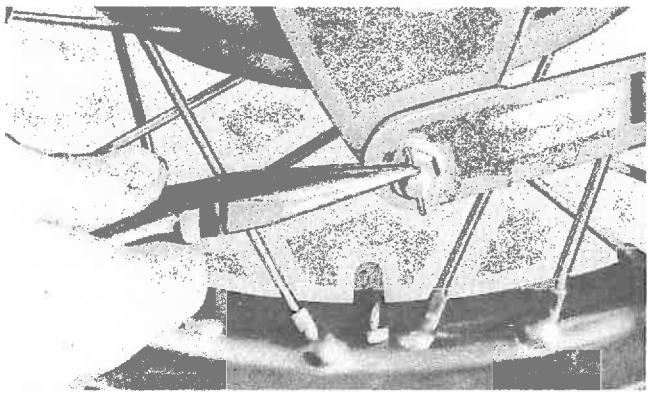
I) Rear Wheel

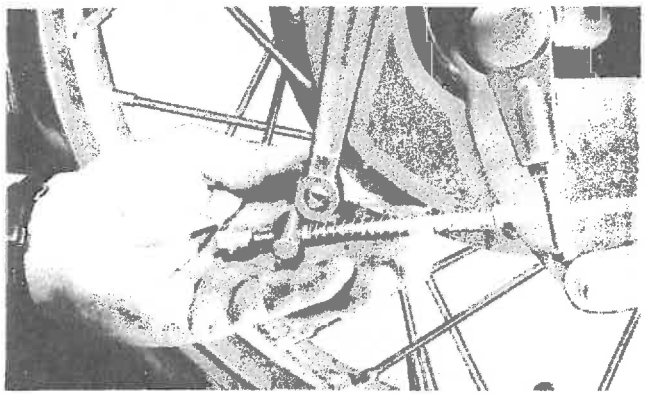


1	TIRE (4.00-18-4PR)
2	TUBE (4.00-18)
3	BAND, rim (4.00-18)
4	RIM (2.15B-18)
5	HUB
6	SPOKE SET
7	SPACER, bearing
8	FLANGE, spacer
9	BEARING (6304Z)
10	OIL SEAL (SO-27-52-5)
11	BRAKE SHOE COMP.
12	SPRING, return
13	PLATE, brake shoe
14	CAM SHAFT
15	SHIM, cam shaft (14.2-24-0.5)
16	SEAL, cam shaft,
17	COLLAR,
18	BEARING (6305Z)
19	OIL SEAL (SD-35-62-9)
20	COLLAR, shaft
21	COVER, dust
22	GEAR, sprocket wheel
23	BOLT, fitting
24	WASHER, lock
25	PULLER, chain
26	BOLT, chain puller
27	NUT
28	NUT, shaft
29	PIN, cotter
30	COLLAR, wheel shaft
31	SHAFT, wheel
32	LEVER, cam shaft
33	BOLT
34	BAR, tension
35	BOLT, tension bar (2)
36	BOLT, tension bar (1)
37	NUT
38	WASHER, spring
39	WASHER, plain
40	PIN, cotter
41	CHAIN
42	BALANCER, wheel

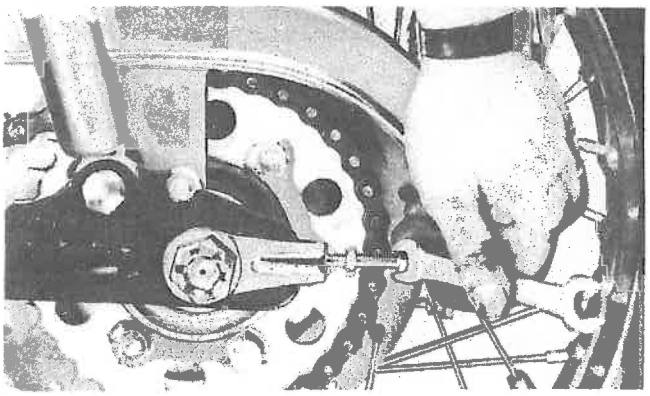
1) Removal

a) Disconnect the tension bar and the brake rod from the rear shoe plate. Pay strict attention to the presence and location of the tension bar lock washer and cotter key. These are safety parts and must be included during assembly.

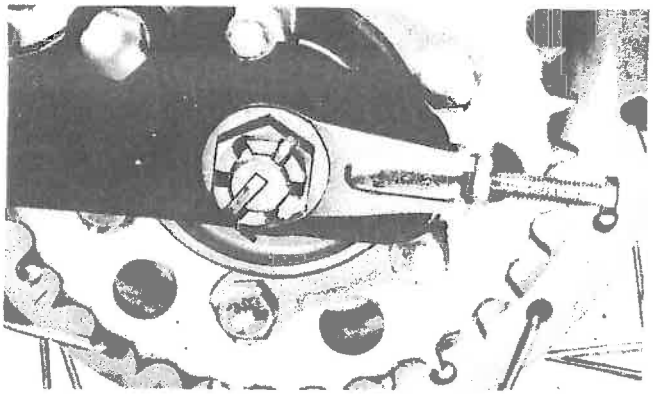




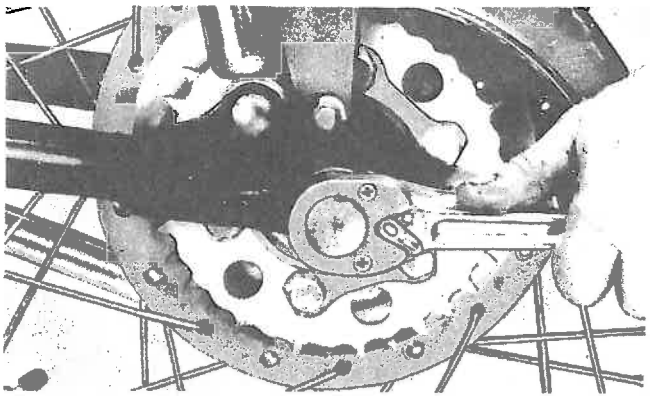
b) Loosen the chain tension adjusting nuts and bolts on both right and left sides.



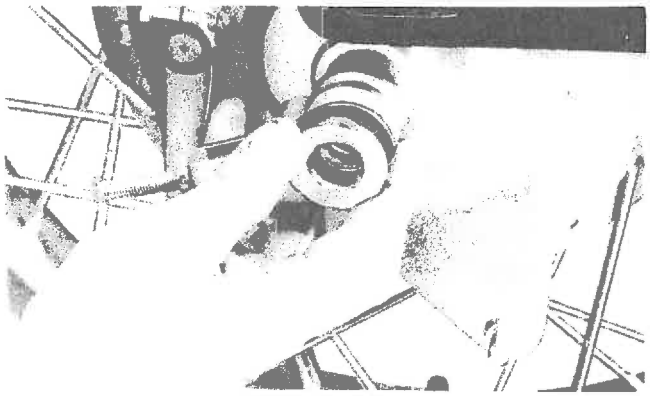
c) Remove the rear axle cotter pin.



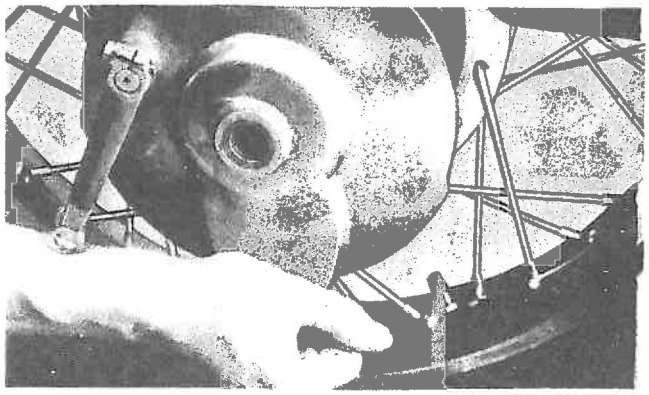
d) Remove the rear axle securing nut.



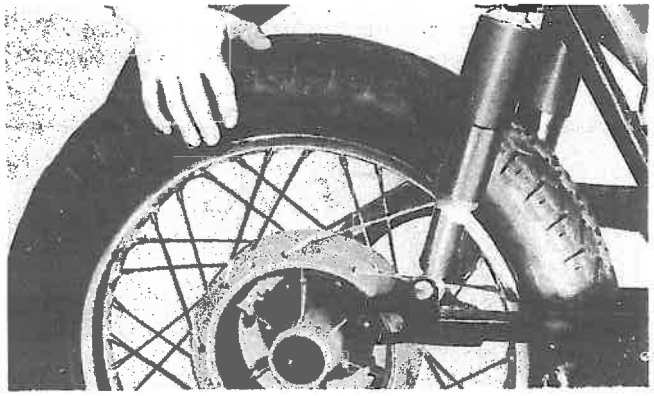
e) Remove the right-hand chain adjustor and distance collar.



f) Remove the rear brake plate.

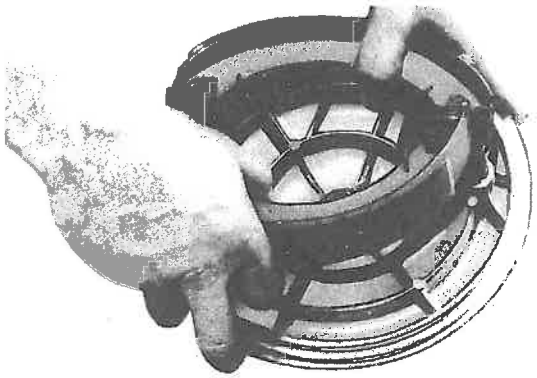


g) Lean the machine to the left, slip the chain off the sprocket and remove the rear wheel assembly.



2) Disassembly and Assembly

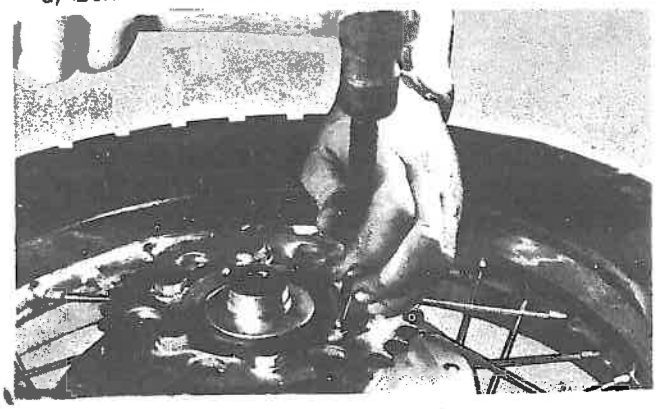
a) Both sides of the single leading shoe unit are mounted on the brake plate. To remove the shoes, pull them out and away from the anchor pin and brake actuating cam.



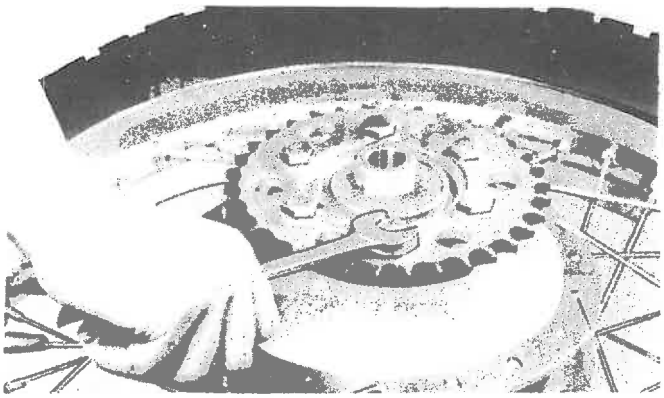
b) Both wheel bearings are mounted in the hub. Their removal can be completed by following the removal procedures explained just previously in the "Seals and Bearings" section, except that the rear wheel has two seals, located one outside each bearing.

3) Rear Wheel Sprocket

a) Bend the lock washer ears flat.

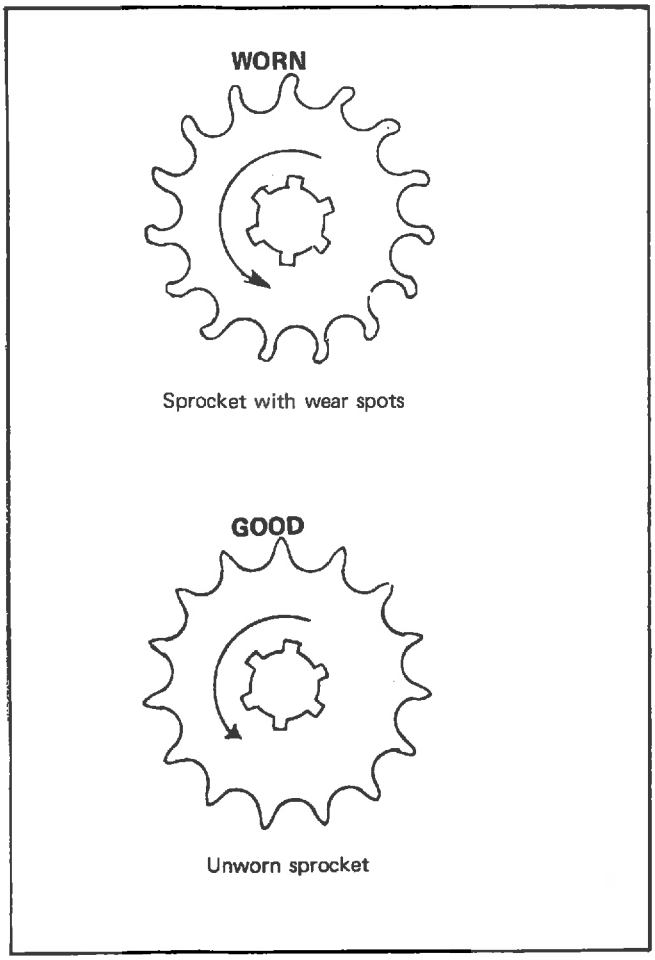


b) Remove the sprocket mounting bolts. Check the lock washer and bolt for damage. If the lock washer is not bent over the hexagon bolt head, or is broken, or the bolt is loose, the sprocket can come loose.



NOTE ON INSTALLATION: Check that all bolts are fully tightened. Be sure that all lock tabs are not cracked or broken and that they are all bent up against the bolts.

c) Constant friction and force from the chain creates wear on the sprocket teeth. If wear has progressed to the extent shown in this illustration, replace the sprocket.



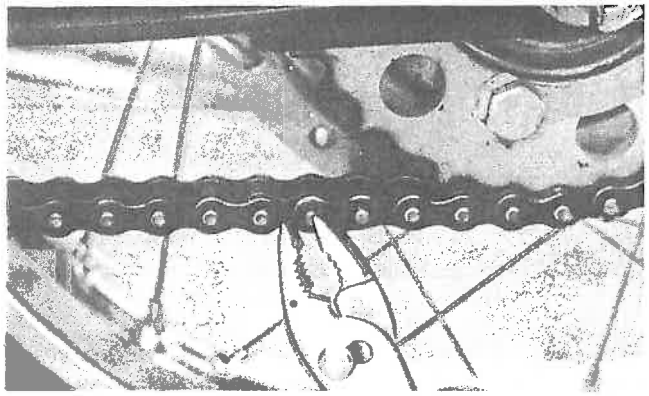
Sprocket with wear spots

Unworn sprocket

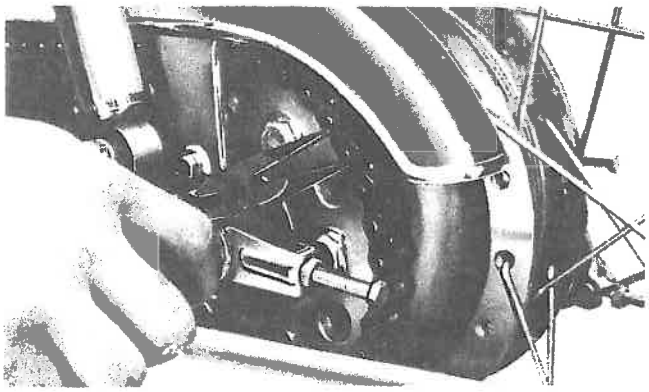
J) Drive Chain

1) Removal and Installation

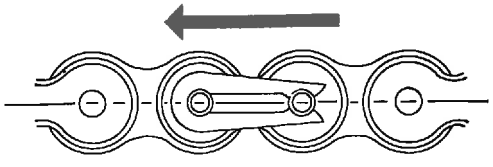
a) Rotate the rear wheel unit the master link is on the sprocket then pry off the master link clip and pull out the master link.



b) To aid in installation lay the chain free ends over the rear wheel sprocket. This holds both chain ends solidly to permit master link insertion. Complete the installation by installing the master link clip.



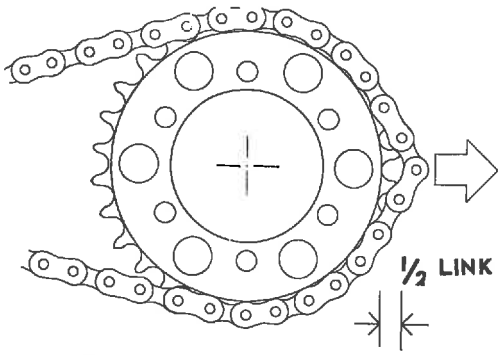
c) Whenever installing the chain, always install the master link retaining clip so that the rounded closed end faces the direction of travel.



DIRECTION OF TRAVEL

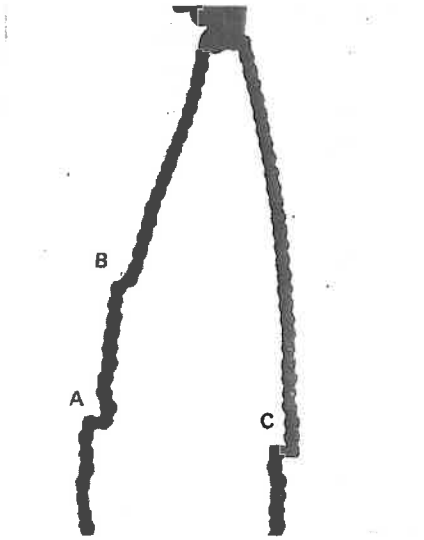
2) Wear

a) With the chain still on the motorcycle, lift the chain away from the rear wheel sprocket. A chain is defective if it can be pulled away from the sprocket more than half the length of a link.



Checking for excessively worn chain

c) Check the chain for binding caused by dirt or rust. Hang the chain straight down and check all links for indications of binding (A, B & C in the picture). If soaking in a strong solvent does not remove the binding situation then replace the chain.



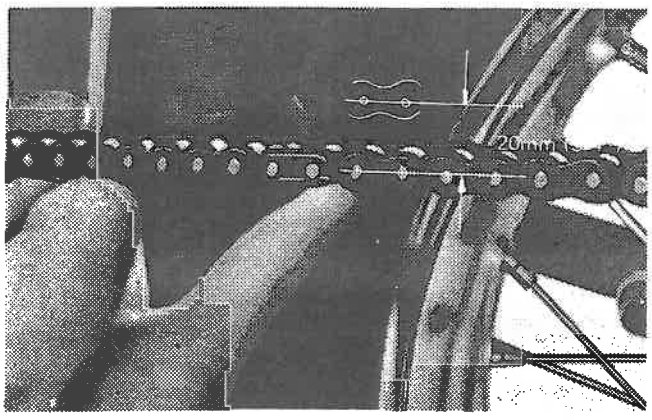
3) Maintenance

a) Lubrication: There are several pressure can lubricants available. Use a rag to wipe off any accumulation of dirt, then spray a liberal amount of lubricant on the chain at least every 200 miles. **See lube chart.**

b) Cleaning: The chain has to be periodically removed from the machine and soaked in cleaning solvent. Drain and dry the chain. Immediately after the chain has dried completely, lubricate to prevent any rust from forming.

4) Adjustment

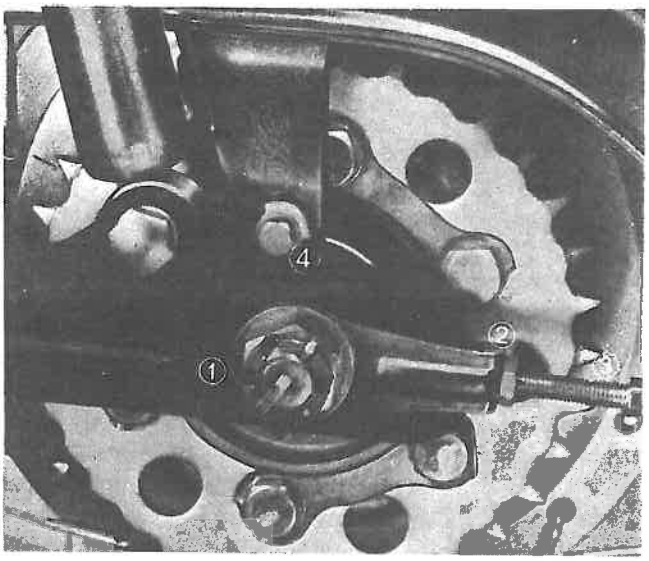
a) Proper drive chain up and down free play with the rider in position and both wheels on the ground should equal 20 mm (3/4") when measured at the center of the lower section of chain. Follow these steps to obtain the correct free play:



b) Remove the cotter pin and loosen the rear wheel nut (1).

c) Loosen the chain adjusting bolt lock nut (2) on each side.

d) Rotate both adjusting bolt (3) to obtain the correct free play, and at the same time make sure that both ends of the axle are positioned evenly. This can be done by matching the marks on the sides of the swing arm (4) just above and to the rear of the rear wheel nuts.



1. Lock nut
2. Adjustor lock nut
3. Adjustor
4. Alignment marks

e) After completing the adjustment, retighten all lock nuts and install a new cotter pin.

f) Finally, check for correct brake pedal and stoplight operation as they could have changed due to the chain adjustment.

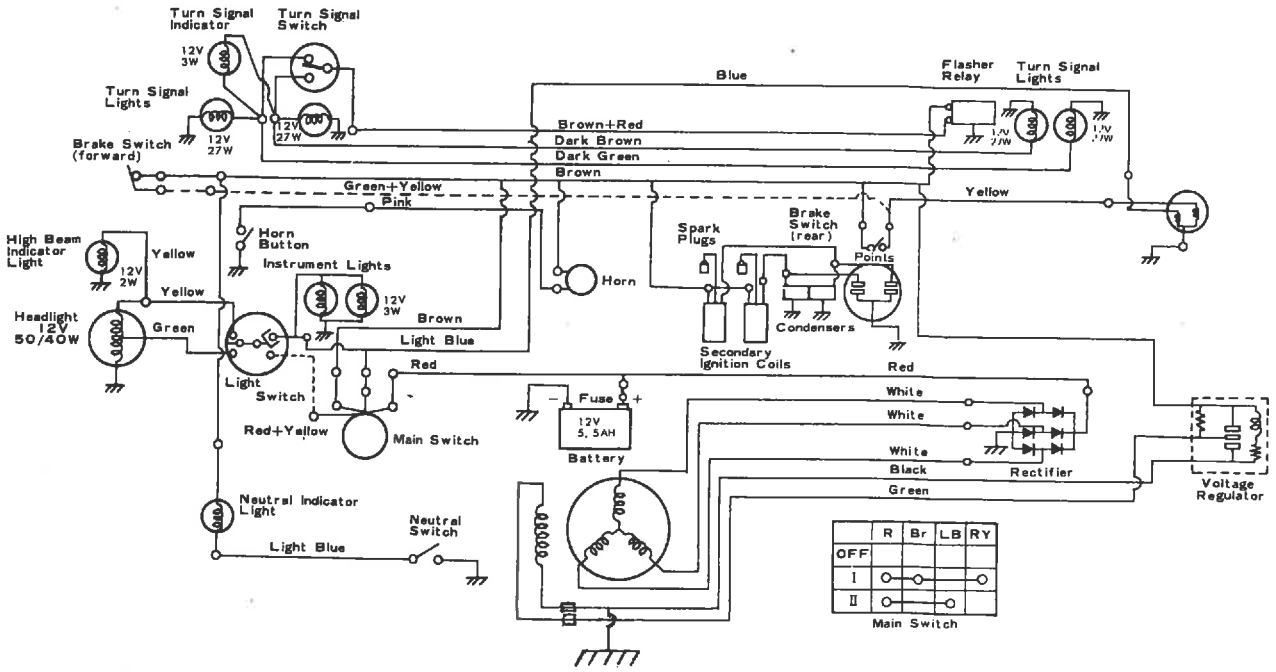
NOTE:
A worn chain causes wear to both sprockets. If either sprocket is excessively worn, it can cause a new chain to wear out prematurely. Strict attention should be paid to the condition of all three components if any one is replaced. Possibly two or all three components might require replacement if wear is excessive.

CHAPTER 4. ELECTRICAL

The XS650 electrical system uses an alternator to generate voltage which is then rectified to direct current. This direct current voltage is controlled by a voltage regulator which is set to maintain a 14~15V DC constant.

When the engine is stopped, DC current to energize the lighting and ignition circuits is supplied by the battery; when running, it is supplied by the alternator/rectifier/regulator circuit. Excess output is shunted to the battery, if necessary, for recharging. If unneeded, the voltage regulator will decrease alternator output.

XS1 – XS1B



A) Battery

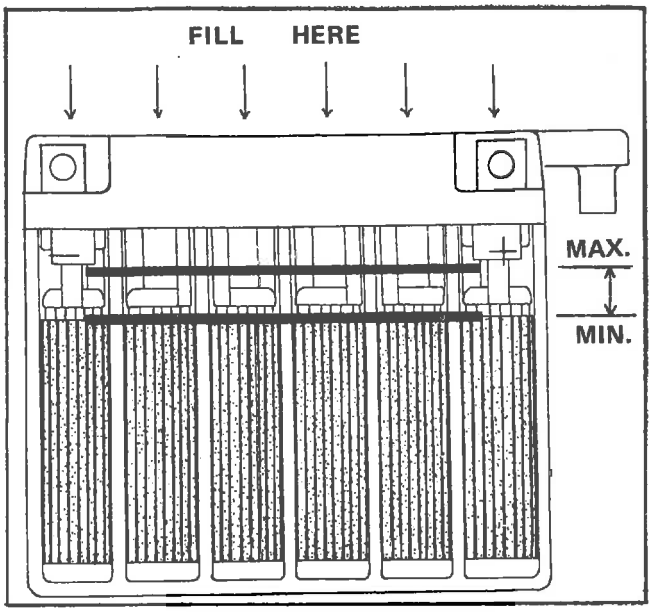
1) Servicing a new battery

a) Check the housing for cracks or other damage. Fill the battery with electrolyte and let set for an hour. This allows the acid to soak into the plates. With the caps off, hook up a trickle charger to the battery and charge it at 1 amp/hour rate or less. Check the specific gravity. A fully charged battery should have a rating of 1.260~1.280. If the electrolyte has dropped below minimum level after charging, add electrolyte (rating of 1.260~1.280).

2) Battery maintenance

a) Periodic inspection can determine the condition of the battery housing and the condition of the internal parts. Check for cracks or holes in the housing. Check for broken plates, sulfation, low fluid level, or corroded terminals.

b) The battery housing is marked with a minimum and maximum fluid level. If any cell fluid level drops below the minimum level, fill with distilled water to correct height. Check once a month or more often in hot weather. DO NOT use tap water.



3) Charging

a) Remove the battery and check the specific gravity of the battery fluid. A fully charged battery reads between 1.260~1.280. If the rating is less than 1.260, the battery needs charging.

b) Fill the battery to the proper level with distilled water. Leave the fill caps off until battery charging has finished. Use a battery charger that has a maximum output of 1 amp. The XS650 battery uses a 5.5 amp/hour battery. DO NOT exceed a one amp input as excessive heat may be generated within the battery.

NOTE:

Battery fluid level sometimes drops during charging. Refill if necessary, using distilled water. Always charge battery in a well ventilated area. Keep open flame away from vents and cap holes.

4) Troubleshooting

a) Excessive fluid evaporation from cells: Normal battery operation requires fluid to be added to the cells approximately once a month. If distilled water must be added every week or two, the battery is possibly being overcharged. Check voltage input from the alternator.

b) Low fluid level in one cell: If one cell continuously loses more fluid than others, check for a shorted cell. A shorted cell creates abnormal fluid evaporation. Check with a hydrometer for excessive difference in specific gravities between the cells.

c) Won't hold a charge:

1) First check the alternator output to eliminate the possibility of a low charging rate. Next, check for loose terminal connections (creating high resistance), or a build up of material in the bottom of the housing that could short the plates. Nothing can be done about loose terminals themselves except to replace the battery.

Sediment at the bottom of the housing can sometimes be removed by flushing the battery out several times with distilled water, if the cell is discharged, flush with electrolyte if fully charged. Dry the battery off and recharge for a few hours. If enough loose sediment is flushed out, the battery could hold a charge. If the battery still cannot hold a full charge, replace it.

d) Sulfation: Sulfation, in the form of a white, scaly material, gradually forms on the plates and at the bottom of the housing. It is created over a period of time as the sulfuric acid combines with the lead plates to produce lead sulfate (white particles of **sulfation). It** is a product of age and use. The battery usually needs to be replaced when sulfation reaches the point of shorting out the plates.

e) Make sure that the wires are hooked to the proper battery terminals. The red wire must be hooked to the "positive" terminal, the black lead must be hooked to the "negative" terminal. If the wires are reversed, the battery will quickly loose its charge. Very likely the battery will be destroyed if the reversed hook-up is left connected for any length of time.

5) Storage

a) Whether it is a new battery or one that has been in service, preparation for storage of either one is almost identical. When new, the battery is dry charged (no electrolyte). Keep it away from moisture and heat. A stored dry-charged battery can last several months without losing a great deal of its **charge.**

b) A used battery should be filled to the maximum level with distilled water, given a complete charge and stored in a cool area (coldness slows the process of battery discharge). It should be given a booster charge every two months. When preparing to place a stored battery back into service, check for sufficient electrolyte and fully charge the battery. Never store a "wet" battery in an area where temperatures of 32° or less will occur.