

Harley-Davidson

SERVICE MANUAL

Sportster

1969
1959 to

Part No. 99484-69

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GENERAL

SPECIFICATIONS

DIMENSIONS

	<u>XL, XLH</u>	<u>XLCH</u>
Wheel Base		
(to 1966)	56-1/2 in.	57 in.
(1967)	58-1/2 in.	
Overall Length		
(to 1966)	87 in.	83-1/4 in.
(1967)	89 in.	
Overall Width	34 in.	(to 1966) 29-1/2 in. (1967) 34 in.
Overall Height	40-1/2 in.	42 in.
Road Clearance		
(1966 & earlier)	2-1/2 in. Min.	4-1/8 in. Min.
(1967)	5-1/2 in.	6-7/8 in.
	6-3/4 in.	6-1/2 in.

CAPACITIES

	<u>XL, XLH</u>	<u>XLCH</u>
Gasoline Tank (U.S. Gallons)	4.0	2.2
Oil Tank (Quarts)	3	3
Transmission (Pints)	1-1/2	1-1/2

ENGINE

Model Designation Letters	XL, XLH, XLCH
Type of Engine	4 Cycle OHV
Number of Cylinders	2
Placement of Cylinders	45 Degree, V Type
Horsepower	XL 42 HP at 5,500 R.P.M. XLCH, XLH 55 HP at 6,300 R.P.M.
Taxable Horsepower	7.2
Weight	XLCH 188 lbs. XL, XLH 204 lbs.
Bore	(76.2 mm) 3.000 in.
Stroke	(96.8 mm) 3.8125 in.
Piston Displacement	(883 c.c.) 53.9 cu. in.
Torque	XL 48 lb-ft at 3,600 R.P.M. XLCH, XLH 52 lb-ft at 3,800 R.P.M.
Compression Ratio	XL 7.5 to 1 XLCH, XLH 9.0 to 1

Spark Plugs (Heat Range for Average Use) No. 4

NOTE

After break-in period, No. 5 plug is recommended for hard service - XLCH and XLH Models.

The engine (serial) number is stamped on the left side of the engine crankcase. Always give this number when ordering parts or making an inquiry.

TRANSMISSION

Type Constant Mesh - Foot Shift
Speeds 4 Forward

	1966 & Earlier XL-XLH 1967 XLH- XLCH (Optional)	1966 & Earlier XLCH 1967 & Later XLH-XLCH (Standard)
Number of Sprocket Teeth		
Engine	34	34
Clutch	59	59
Transmission	21	20
Rear Wheel	51	51
Gear Ratios	1966 & Earlier XL-XLH 1967 XLH- XLCH (Optional)	1966 & Earlier XLCH 1967 & Later XLH-XLCH (Standard)
First (Low) Gear	10.63 to 1	11.16:1
Second Gear	7.69 to 1	8.08:1
Third Gear	5.82 to 1	6.11:1
Fourth (High) Gear	4.21 to 1	4.42:1

TIRE DATA

Tire Size	
XLCH, 1967 & Later XLH	Front - 3.25/3.50 x 19 Rear - 4.00 x 18
1966 & Earlier XL, XLH	3.50 x 18
Tire Pressure	
XLCH, 1966 & Earlier XLH	Front - 14 lbs. Rear - 18 lbs.
1967 & Later XLH	Front - 16 lbs. Rear - 20 lbs.

NOTE

The tire inflation pressures given are based on a rider weighing approximately 150 lbs. or more, increase tire pressure as follows: For each 50 lbs. of overload, increase pressure of rear tire 2 lbs., front tire 1 lb.

DRIVE

CHAINS

FRONT CHAIN ADJUSTMENT (Fig. 2B-3)

The front chain should be checked every 2000 miles for correct adjustment. Check chain adjustment through oil filler opening located near the top of the chain cover. A correctly adjusted front chain should have free up-and-down movement in the upper stand midway between engine and clutch sprockets as follows: Front chain adjustment: 5/8 to 7/8 in. chain slack with cold engine; 3/8 to 5/8 in. chain slack with hot engine. To adjust chain, disconnect battery cable from starter motor, remove left footrest, and rear brake foot lever. Place an oil drain pan under clutch and remove front chain cover screws, chain cover and gasket.

The front chain is adjusted by means of a shoe underneath the chain which can be raised to tighten or lowered to loosen the chain. The chain adjuster is secured to the inner surface of the chain compartment by 3 bolts (XLH) or two bolts (XLCH). Simply loosen bolts and raise or lower chain adjuster. When chain is correctly adjusted tighten bolts securely and reassemble remaining parts.

FRONT CHAIN LUBRICATION

There is an opening between the front chain and transmission compartments, and the same oil supply automatically lubricates moving parts in both compartments. For complete lubrication service on the front chain see "Gear Box," Section 4D.

REPLACING A WORN FRONT CHAIN

Since the front chain is automatically lubricated by running in oil, little service will be required other than checking chain adjustment every 2000 miles. However, if through hard usage the front chain does become worn, it is essential to replace chain rather than trying to repair it. This will avert chain breakage and possible damage to the crankcases. To remove front chain, see "Disassembling Clutch," Section 4B.

REAR CHAIN ADJUSTMENT (Fig. 2B-3A)

The rear chain should be checked every 1000 miles for correct adjustment. A correctly adjusted rear chain should have 1/2 in. free up-and-down movement midway between mainshaft and rear wheel sprocket. As chains stretch and wear in service, they will run tighter at one point on the sprockets than another; therefore always rotate rear wheel and check adjustment at tightest point of chain.

To adjust rear chain, loosen axle nut (1) on right side of motorcycle. Loosen lock nut (2) from adjusting

nut (3), on both sides of motorcycle. Turn adjusting nut (3) clockwise to move rear wheel back, tightening chain; turn adjusting nut (3) counterclockwise, and at the same time, tap each end of the axle to move the wheel forward, loosening the chain. Turn adjusting nut (3) on either side exactly the same number of turns to maintain alignment of wheel. With lock nut (2) tight against adjusting nut (3), the distance from lock nut to outer end of adjusting stud (4) should be the same on both sides. Check correct alignment of wheel by observing that tire runs about midway between rear frame tubes and rear wheel sprocket runs centrally in the chain. When readjustment is completed, be sure to securely retighten rear axle nut (1) and rear wheel adjusting stud lock nut (2).

After adjusting rear chain, the rear brake may be too tight. Readjust brake rod, if necessary, as described in "Adjusting Rear Wheel Brake," Section 2G.

REAR CHAIN OILER (Fig. 2B-4)

At regular service intervals (1000 miles) make a close inspection of rear chain. If it does not appear to be getting sufficient lubrication, or if there is evidence of an over-supply of oil, adjust rear chain oiler.

To adjust rear chain oiler, proceed as follows. Loosen lock nut (2) and turn screw (1) outward for more oil, and inward for less oil. Turn screw only a fraction of a turn at a time; lock adjusting screw in place with lock nut.

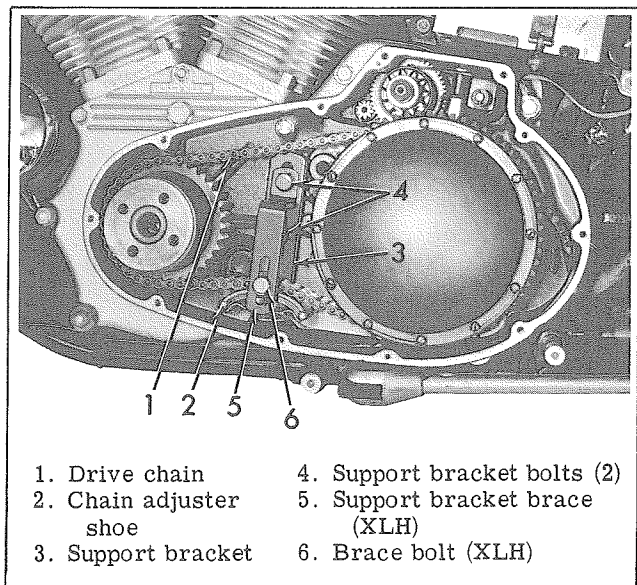


Figure 2B-3. Front Chain Tensioner Adjustment

Carefully remove all dust and dirt, particularly hard particles from tire which might chafe an inflated tube. Wipe tube and inside of tire thoroughly with clean, dry cloth. If rim is dirty or rusty, clean it with a stiff wire brush. Be sure to examine a used tire carefully for fabric injuries which if neglected will damage tube.

Position rubber rim strip (for front wheel only) in rim-well with valve holes correctly registered. Swab thoroughly all around base of tube, between tube and side walls of tire with tire mounting compound. Place valve at tire balance mark, and inflate tube just enough to round it out. A tube flap (for rear wheel only) should be inserted between the tube and tire beads as shown in figure 2C-20. Install tube flap with hole over valve stem first. Tuck in remainder of flap carefully underneath tire beads all the way around both sides of tires. **DO NOT ALLOW ANY FOLDS IN FLAP AND BE VERY CAREFUL TO SEE THAT POSITION OF FLAP IS NOT DISTURBED WHEN INSTALLING TIRE ON RIM AS FOLLOWS:** With wheel lying flat, place tire on rim and align valve with hole in rim. Push bottom bead into rim-well near valve, and hold in well while forcing remaining portion of bead over rim flange with a tire tool. Spread tire and insert valve through hole in rim. Force upper bead over rim flange and into well at point opposite valve. Stand or kneel at this point to hold bead in well and pry remaining portion of tire over rim flange. While forcing bead over rim flange, keep as much bead as possible in rim-well. Be careful not to damage beads or pinch tube.

Inflate tire to recommended pressure and reinstall bead anchor screws in rim sides (if used). Then, completely deflate tire to smooth out any wrinkles in tube and allow tube to find its place, free from strain or stress. Again, inflate to recommended pressure and check valve for leak. See "Specifications," Section 1A, for correct tire pressure.

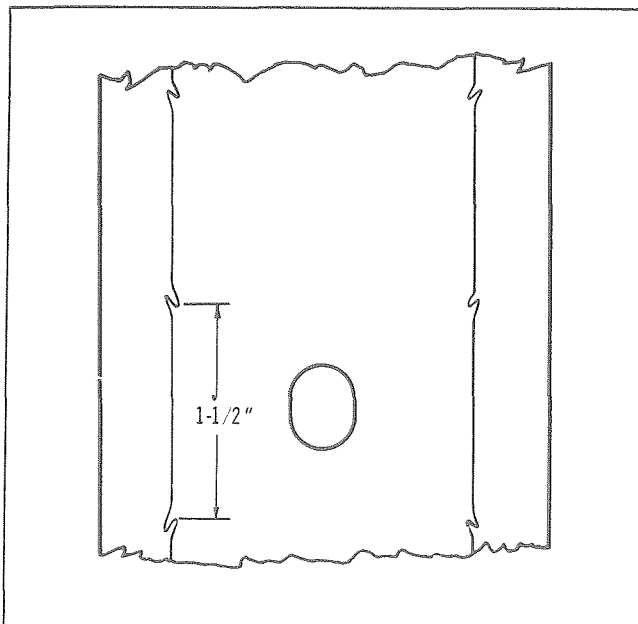


Figure 2C-19B. Rear (Steel) Wheel Barbs

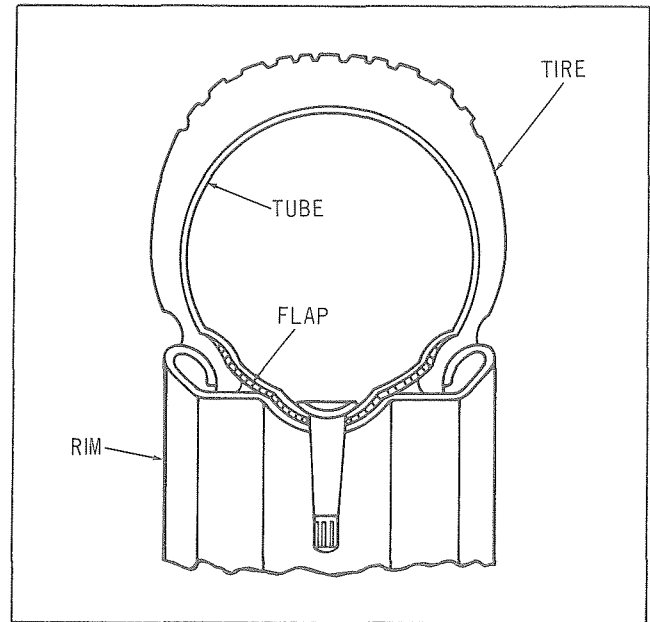


Figure 2C-20. Rear Wheel Tire Flap Installation

CHECKING TIRE TRUENESS SIDEWAYS (LATERAL RUNOUT)

Check runout by turning wheel on axle, measuring amount of sideways displacement from a fixed point near the tire (see Fig. 2C-20A).

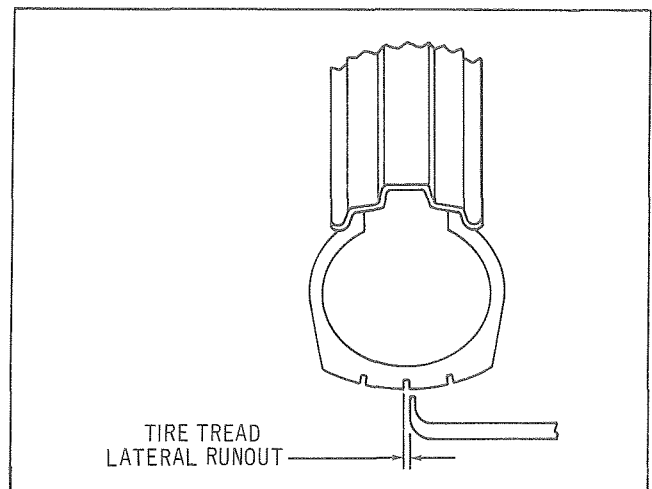


Figure 2C-20A. Checking Tire Lateral Runout

Tire tread runout should be no more than $3/64$ in. If tire tread runout is more than $3/64$ " , remove tire from rim and check rim bead side runout to see if rim is at fault (see "Truing Wheel").

If rim side runout is less than $1/32$ " , tire is at fault and should be replaced. If rim side runout is more than $1/32$ " , correct by tightening selected spoke nipples as outlined previously, reinstall old tire and recheck tire tread lateral runout.

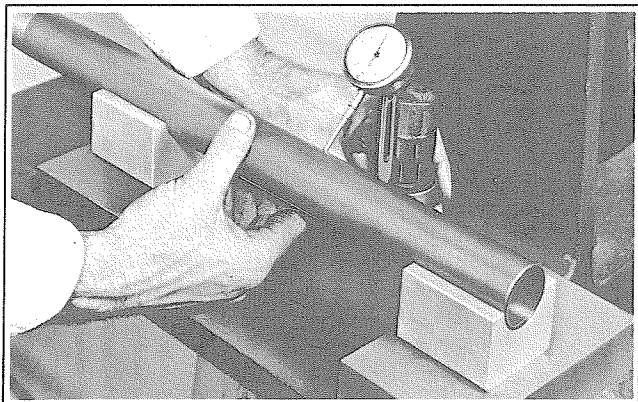


Figure 2F-25. Indicating High Point

arc pliers, Part No. 96215-49, and remove lower valve body (2), washer (3) and upper valve body (4). Remove shock absorber tube (7) and remove retaining ring (5) and piston (6).

REMOVING FORK STEM AND BRACKET ASSEMBLY FROM STEERING HEAD (Fig. 2F-21)

Disconnect wires from panel. Remove front wheel and brake assembly as described in "Removing and Installing Front Wheel." Remove front fender and headlamp housing. Remove fork tube cap (1). Loosen fork tube pinch bolt (4) and loosen fork boot (5) from upper retainer (15) lip. Remove fork side (6) complete. Remove handlebar clamp cover. Remove fork panels.

Remove headlamp and bracket as a unit. Disconnect speedometer cable from speedometer head.

Remove fork stem sleeve end (19) and loosen fork upper bracket pinch bolt (20). Lift handlebar assembly from steering head with fork upper bracket (21) attached. Carefully position assembly away from working area. Be careful not to bend control cables and wires more than necessary.

It is not necessary to disconnect clutch and brake levers from handlebar, wiring from ignition switch and wiring panel, or throttle and spark cables from carburetor and circuit breaker, unless handlebar assembly is to be removed from motorcycle.

Remove washer (22) and fork stem sleeve (23). Free fork stem and bracket assembly (24) and at the same time carefully remove bearing cones (25 and 26) and 28 ball bearings (27) from steering head. Inspect bearings, cones and cups for wear. If worn or pitted, replace. If necessary to remove head cups (28), insert a piece of bar stock through upper cup to drive against lower cup. Reverse operation to remove upper cup.

STRAIGHTENING FORK TUBES

Straightening fork tubes requires several special tools including a hydraulic or arbor press, dial indicator and straightening blocks. If facilities are not available locally for straightening fork tubes, they may be returned to the factory through any authorized Harley-Davidson dealer.

NOTE

Do not attempt to straighten a fork tube that has a sharp angle bend. These tubes should be scrapped because the metal is stretched.

Before beginning the straightening operation, clean the fork tube. Locate bends with a dial indicator as shown in Fig. 2F-25. (A fork tube is usually bent in two or three places - seldom one place.) Then, place fork tube on straightening blocks. Using an arbor or hydraulic press, straighten tube as much as possible as shown in Fig. 2F-26.

See Fig. 2F-25. With a dial indicator find the highest point out of round and mark with chalk. Press on high point of fork tube as shown in Fig. 2F-26. Repeat pressing operations until fork tube is within .003 to .004 in. of being straight. Always check with a dial indicator after each pressing operation.

Sometimes a fork tube is out of round, especially at the point it is clamped to the fork brackets. Place tube in straightening blocks as shown in Fig. 2F-27. Press until perfectly round and check with dial indicator or micrometer. Check fork tube by inserting into a new fork slider. Work tube up and down in slider, if it does not bind, it is straight.

STRAIGHTENING FORK STEM AND BRACKET ASSEMBLY (Fig. 2F-28)

Straightening a fork stem and bracket assembly not only requires a great deal of practice to become proficient, but also several special tools and fixtures, including an arbor press, surface plate or suitable heavy metal plate that is perfectly smooth, bending bar, four straightening blocks (W), two improvised steel gauging bars or legs 1-5/16 in. diameter x 12 in. length (X, Fig. 2F-29), two steel support blocks (Y), and several steel press blocks (Z).

If facilities are not available locally for straightening fork stem and bracket assemblies, they may be sent

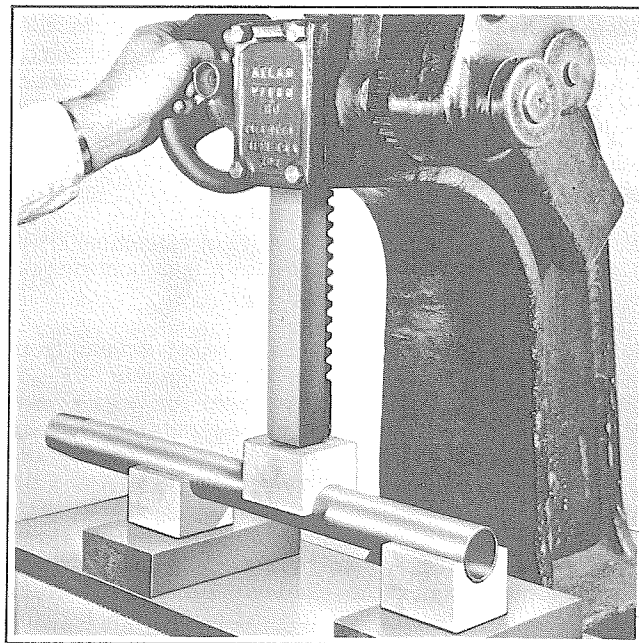


Figure 2F-26. Pressing High Point

BRAKES

SERVICING BRAKES

The front wheel brake is operated by a hand lever on the right handlebar side, and the rear wheel brake is operated by a foot pedal on the left side of the motorcycle. Both hand lever and foot lever controls are connected to their respective brake shoe operating shafts independently through mechanical linkage. Compressing the front wheel brake hand lever and depressing the rear wheel brake foot lever actuates the operating shaft cam, moving brake shoes against the brake drum. To keep brakes in proper operating condition, it is essential to check adjustment of brakes at regular service intervals of 5000 miles, or sooner, depending on wear of brake linings and drums. See adjustment of brakes and centering brake shoes. If brakes do not operate satisfactorily after adjustment of linkage and re-centering brake shoes in drums, disassemble and service brakes and connecting linkage.

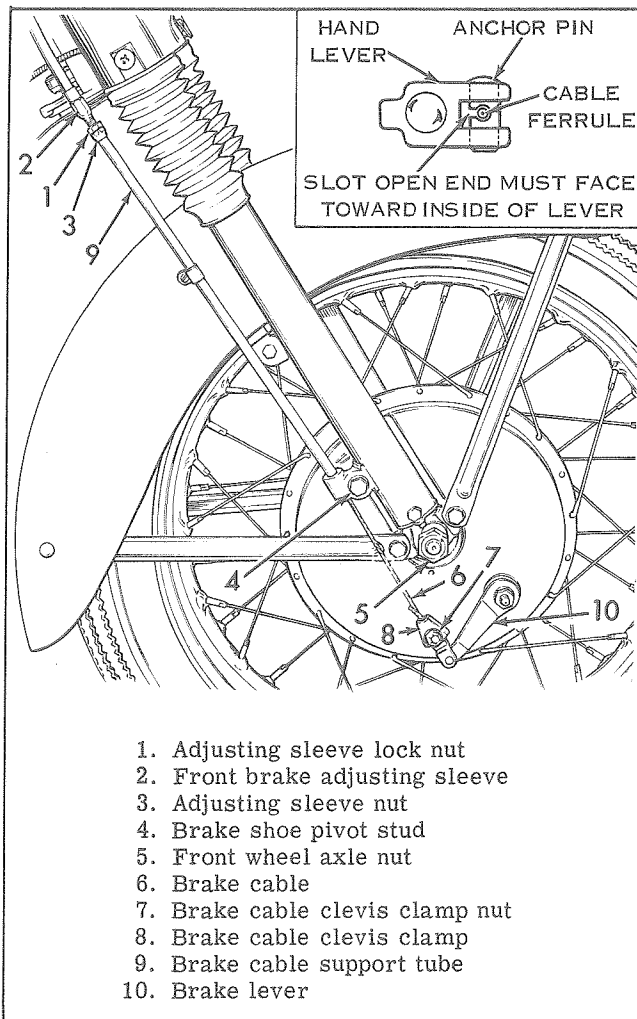


Figure 2G-8. Front Wheel Brake

ADJUSTING FRONT WHEEL BRAKE (Fig. 2G-8)

When the front wheel brake is properly adjusted, the hand lever will move freely about one-quarter of its full movement before the brake starts to take effect. If adjusted tighter the brake may drag. To adjust brake, loosen lock nut (1) on adjusting sleeve (2) and turn sleeve nut (3) in toward the cable support tube to decrease the free movement of hand lever and tighten the brake. Turn sleeve nut (3) away from the cable support tube to increase the free movement of hand lever and loosen the brake. When free movement of the hand lever is about one-quarter of its full movement, tighten lock nut (1) against adjusting sleeve nut (3). Rotate the wheel to make sure brake is not too tight and dragging. If brake should drag with correct free movement in hand lever, re-center brake shoes in brake drum as follows:

Loosen, but do not remove, front brake shoe pivot stud (4) and axle nut (5). Spin front wheel. While wheel is turning apply brake and tighten pivot stud (4) and then axle nut (5). Recheck brake for correct adjustment as described above.

ADJUSTING REAR WHEEL BRAKE (Fig. 2G-9)

To adjust rear wheel brake turn adjusting nut (1) to change the effective length of the brake rod (2). The adjusting nut has a notch which fits against the clevis pin in the operating lever (3). Thus, it is locked in place on the rod, but may be turned down or backed off the rod by half turns as required. Set the adjusting nut so that the brake begins to take effect when

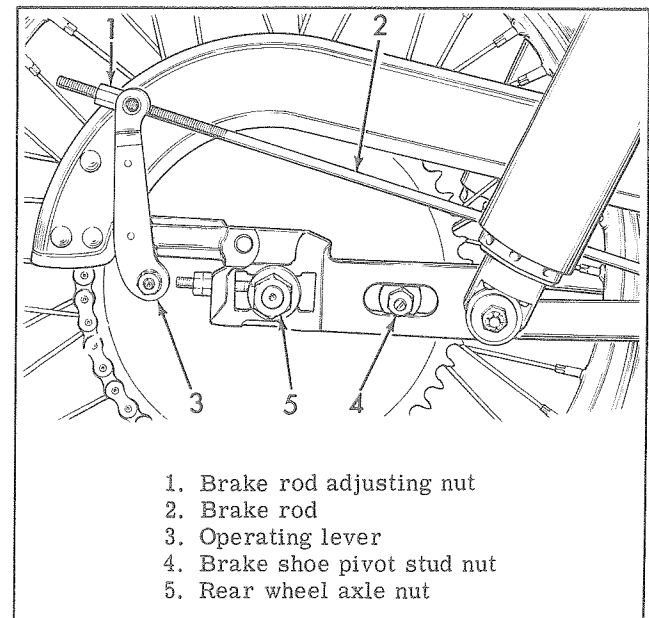


Figure 2G-9. Rear Wheel Brake

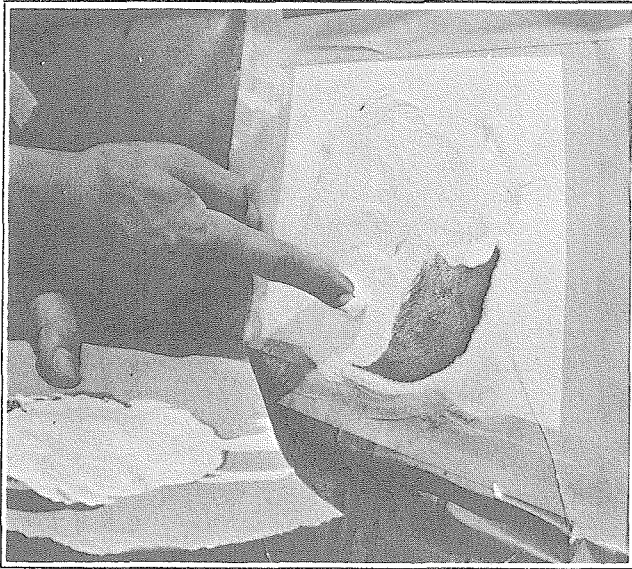


Figure 2J-14. Working Gel Coat into Patch

13. Sand the patch with 220-grit wet sandpaper; then use 600-grit for finish sanding. On painted type surface, paint can be applied at this time. Buff with polishing compound and wax.

NOTE

On Gel Coat finish, it may be necessary to repeat Steps 12 and 13 to insure a smooth, even gel coat surface. See Figure 2J-15.

For large areas the gel coat can also be sprayed.

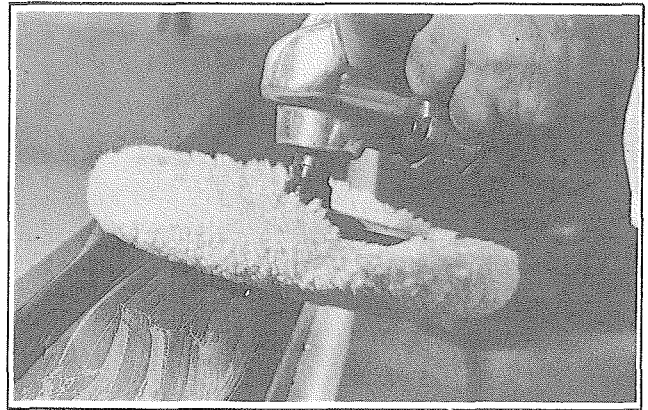


Figure 2J-15. Buffing Finish

Where surface color of part has changed due to weathering, color match of patch may not be satisfactory. In this case, entire panel must be sprayed.

Thin Gel coat with acetone (1 to 1 ratio) and spray panel, blending sprayed area into a radius or corner on the part. Use a touch-up spray gun such as the Binks Model 15. After Gel coat is hard, buff and polish sprayed area.

Heat lamps may be used if working conditions are cold. CAUTION: Do not place lamp bulb closer than 14 inches to surface or the resin may blister.

creased, oil pressure is raised a sufficient amount to counteract the diaphragm spring and open the circuit (indicator light "off"). Oil signal light switch cannot be repaired. Defective switches must be replaced.

OIL PRESSURE

The oil pump is non-regulatory and delivers its entire volume of oil under pressure to the engine. When a cold engine is started, engine oil will be thick or viscous, restricting circulation through the oiling system and causing high oil pressure; as engine becomes hot and oil thins, pressure will correspondingly drop. Similarly, when an engine is operated at high speeds, the volume of oil circulated through the oiling system increases, resulting in higher oil pressure; as engine speed is reduced, volume of oil pumped is also reduced resulting in lower oil pressure.

To check oil pressure, use Oil Pressure Gauge, Part No. 96921-52. Remove oil pressure switch from motorcycle as described in "Disassembling Oil Pump Check Valve," Section 3E. Insert pressure switch hose fitting in oil switch connection of pump nipple.

Run the engine until oil becomes hot. Under normal riding conditions oil pressure will vary from 10-14 lbs. Idle down, retard spark and check the gauge. Oil pressure will vary from 3 to 7 lbs.

SERVICING OIL FILTER (Fig. 3A-5)

Thoroughly wash filter element (3) in clean gasoline or solvent at least every 2000 miles or whenever engine oil is changed. Renew filter element every 5000 miles. To disassemble filter, follow order of disassembly under Fig. 3A-5. Assembly is essentially the reverse order of disassembly. Be sure "O" ring (8) is positioned in filter cup (7) flange.

SERVICING OIL TANK CAP AND FILLER OPENING (Fig. 3A-5)

Clean and inspect all parts replacing any that are worn or damaged. Pay particular attention to the oil tank cap gasket (10) and the cap washer (13). To disassemble tank cap follow order of disassembly under Fig. 3A-5. Assembly is the reverse order of disassembly.

If oil leakage should occur between the tank cap and the filler opening, (and the cap and gasket are in good condition), check the lip of the filler opening. A tank cap drawn too tight will bend the lip of the filler opening resulting in a poor seat between gasket and lip.

Using a mallet as a driver and a piece of wood as a cushion, bend the lip down until flush with sealing surface of tank cap. Use emery cloth to remove any nicks or rough spots from lip.

IMPORTANT

Before refilling oil tank, thoroughly flush and clean tank with kerosene to remove any foreign material that may have fallen into tank.

ENGINE OILING AND BREATHER SYSTEM (Fig. 3A-6)

1. Gravity feed to oil pump.
2. Feed section of oil pump.
3. Check valve prevents gravity oil drainage from tank to engine. Builds up oil pressure to operate oil signal switch.
4. Oil is forced through pinion gear shaft to lubricate lower connecting rod bearings from which oil splashes to cylinder walls, piston, piston pin and main bearings.
5. Oil is forced through oil lines to lubricate rocker arm bearings and rods, valve stems, valve springs and push rod sockets.
6. Oil drains from cylinder head through passages in each cylinder, then flows through two holes in the base of each cylinder, lubricating cylinder walls, piston, piston rings and main bearings.
7. Oil flows from the rocker arm boxes into the gearcase compartment, lubricating push rods, tappets, tappet-guides and tappet rollers.
8. Oil accumulated in crankcase base is scavenged by the flywheels to the breather oil trap.
9. The rotary breather valve is timed to open on the downward stroke of pistons, allowing crankcase exhaust air pressure to expel scavenge oil from crankcase breather oil trap into timing gearcase. Breather valve closes on upward stroke of pistons, creating vacuum in crankcase.
10. Oil blown and drained into timing gearcase (steps 7 and 9), lubricates generator drive gear, timing gears and gear shaft bearings.
11. Crankcase exhaust air escapes from timing gearcase through outside breather tube. Any oil still carried by exhaust air is separated from the air by an oil slinger on the generator drive gear.
12. Gearcase oil flows through fine mesh oil strainer preventing foreign particles from entering scavenge section of pump.
13. Scavenge (return) section of oil pump.
14. Engine oil returns to tank and also supplies oil to the rear chain oiler.
15. Vent line from oil tank.

ENGINE REPAIR PROCEDURE

GENERAL

When an engine needs repair, it is not always possible to definitely determine beforehand whether repair can be made with only cylinder head, cylinders and pistons removed from engine or whether engine must be completely disassembled for crankcase repair.

CYLINDER

CYLINDER AND PISTON

REMOVING CYLINDER AND PISTON (Fig. 3C-16)

See "Stripping Motorcycle For Engine Repair," Section 3A, steps 1-5, 7, 24-27 and "Removing Cylinder Head Assembly From Engine," Section 3E.

See Fig. 3C-16, and proceed as follows: Clean crankcase around cylinder base to prevent dirt from falling into crankcase when lifting cylinders. Remove cylinder base stud nuts (1). Raise cylinder and piston just high enough to permit placing a rag over crankcase opening; this will prevent dirt and possibly pieces of broken ring from falling into crankcase. With piston at bottom of stroke, remove cylinder (2), discard cylinder base gasket (3). Spring piston rings (4) outward until they clear grooves in piston (7) and lift off. Pry piston pin lock rings (5) from piston (7) groove using two sharp pointed instruments such as awls. Support piston and tap out piston pin (6) with a suitable drift.

Remove piston pin bushing (8) if necessary (see "Cleaning and Inspection") using Piston Pin Bushing Tool, Part No. 95970-32. Do not drive bushing out with a drift unless rod (9) is disconnected and well supported around piston pin hole.

CLEANING AND INSPECTION

Place piston and cylinder in "Gunk Hydro-Seal" or other carbon and gum dissolving agent until deposits are soft. Then thoroughly scrub piston and cylinder in gasoline or solvent to remove deposits. Where carbon deposit is thick or hard, it is advisable to scrape carbon before cleaning. Use a putty knife-type scraper or a ground tip from an old file. Use extreme care to avoid scraping into aluminum of pistons.

After parts are thoroughly washed, blow dry with compressed air. Force air through oil holes in cylinder. Clean piston ring grooves with a tool for cleaning ring grooves; if not available, sharpen end of a broken ring to a chisel edge. Avoid scratching or damaging sides of ring grooves.

Examine piston pin to see that it is not loose in connecting rod, grooved, pitted or scored. If necessary, remove bushing as described in "Disassembling Cylinder and Piston."

A piston pin, properly fitted, is a light hand press fit in piston and has .001 in. clearance in connecting rod upper bearing.

If difference in diameter of hole in piston pin bushing and diameter of piston pin exceeds a .002 in. fit, replace worn parts.

Replace piston pin lock ring whenever it is removed from piston groove. If opposite side ring has not been removed and is undamaged, it is not necessary to disturb it.

Examine piston and cylinder for cracks, burrs, burned spots on piston dome, grooves and gouges.

Check rods for up-and-down play and upper end side shake (see Fig. 3C-17). To make this check with accuracy, pistons should first be removed. When appreciable up-and-down play is found and side shake (rod tip) at extreme upper end is 11/64 in. or more for front rod or 3/64 in. or more for rear rod, lower bearing should be refitted. This requires removing and disassembling engine crankcase. See "Crankcase," Section 3E.

REFINISHING CYLINDERS

Pistons and cylinders must be gauged to see if they are worn to the point where cylinders must be refinished and oversize pistons installed.

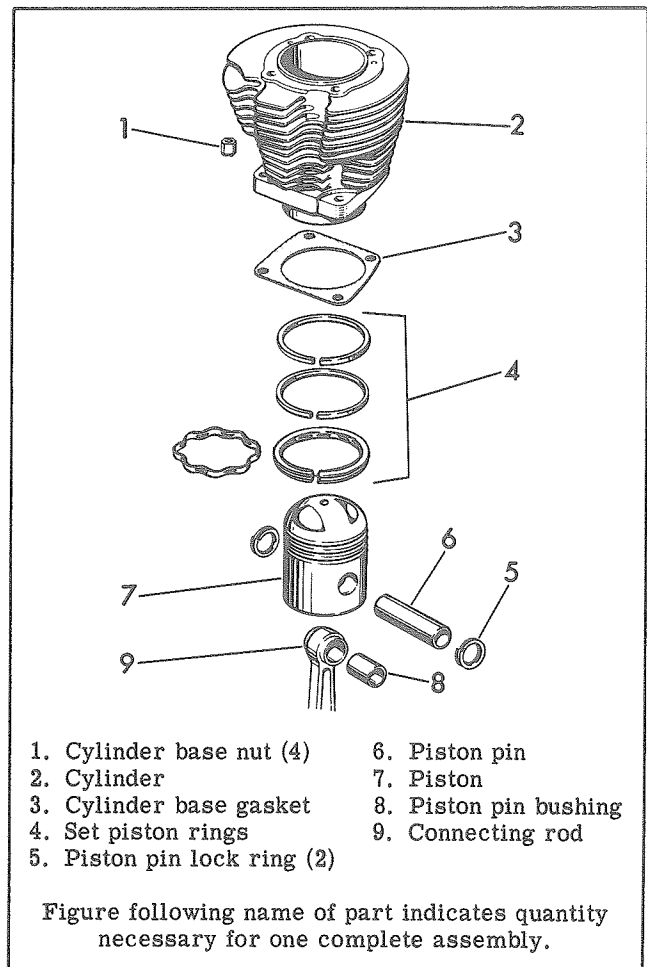


Figure 3C-16. Cylinder and Piston - Exploded View

If end of valve tappet adjusting screw is worn hollow from action of push rod, it should be replaced to ensure accurate tappet-valve stem adjustment.

Inspect tappet guide rubber "O" ring (5, Fig. 3D-11) for wear or damage.

ASSEMBLY (Fig. 3D-11)

Assembly is essentially the reverse order of disassembly. Apply a light coat of oil to the tappet and in particular, the tappet roller assembly. If tappet is not located correctly in guide, tappet roller will be crosswise to guide and cam, and serious damage may result when pressed into crankcase.

Pull tappet out to limit of travel and hold in place with a clip or other means to prevent tappet from dropping into crankcase when installing the assembly.

Insert "O" ring (5) on guide (3). Assemble adjusting screw and nut (2) in tappet (4) and then insert tappet into guide (3). Align screw holes in tappet assembly with screw holes in crankcase and press assembly into position using a piece of tubing or a block of soft wood. Tappet guides are a soft malleable cast iron, therefore, be extremely careful not to damage the guide during the pressing operation. With screw (1) in place, recheck free movement of tappet in guide.

GEARCASE AND TIMING GEARS

DISASSEMBLY (Fig. 3D-13)

Thoroughly clean area around gearcase cover and tappets. Blow all loose dirt from crankcase with compressed air. Loosen exhaust pipe port clamps (1) and muffler clamps and lower exhaust pipe free of gearcase cover. Remove footrest (2), gear shift foot lever (3) and breather pipe (4).

Remove circuit breaker (5) or magneto (see Section 5F).

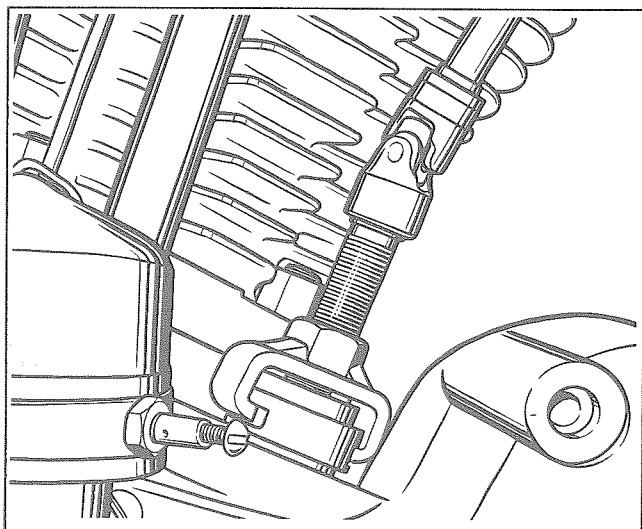


Figure 3D-12. Removing Tappet Guide

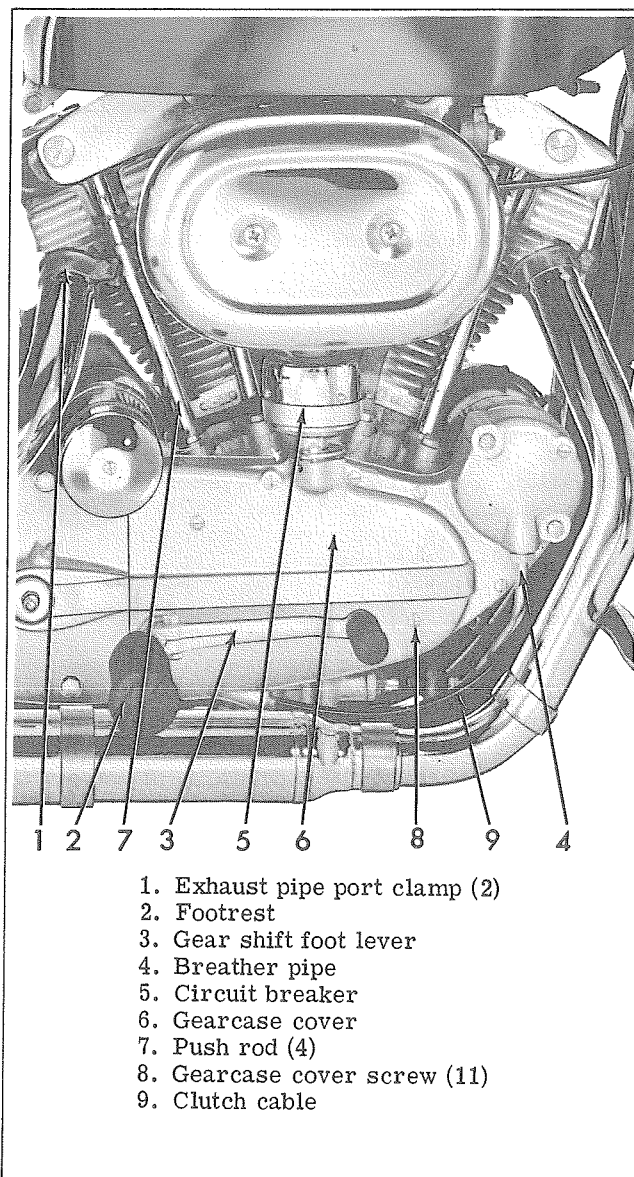


Figure 3D-13. Removing Gearcase Cover

Remove push rods (7) as described in "Removing and Installing Push Rods," Section 3B.

Place a pan under gearcase to collect oil when cover is removed. Remove gearcase cover screws (8) and free cover from crankcase. Cover is located on dowel pins which fit rather snugly. The cover must be worked off these pins carefully to avoid damage to joint faces. Do not pry off with screwdriver inserted between joint faces. Use a hammer and a block of wood, and tap lightly at the end where the cover projects beyond the gearcase.

Remove valve tappets and valve tappet guides only to establish correct cam gear end play. See "Valve Tappets and Valve Tappet Guides." Pull clutch cable (9) forward (as positioned on motorcycle), at the

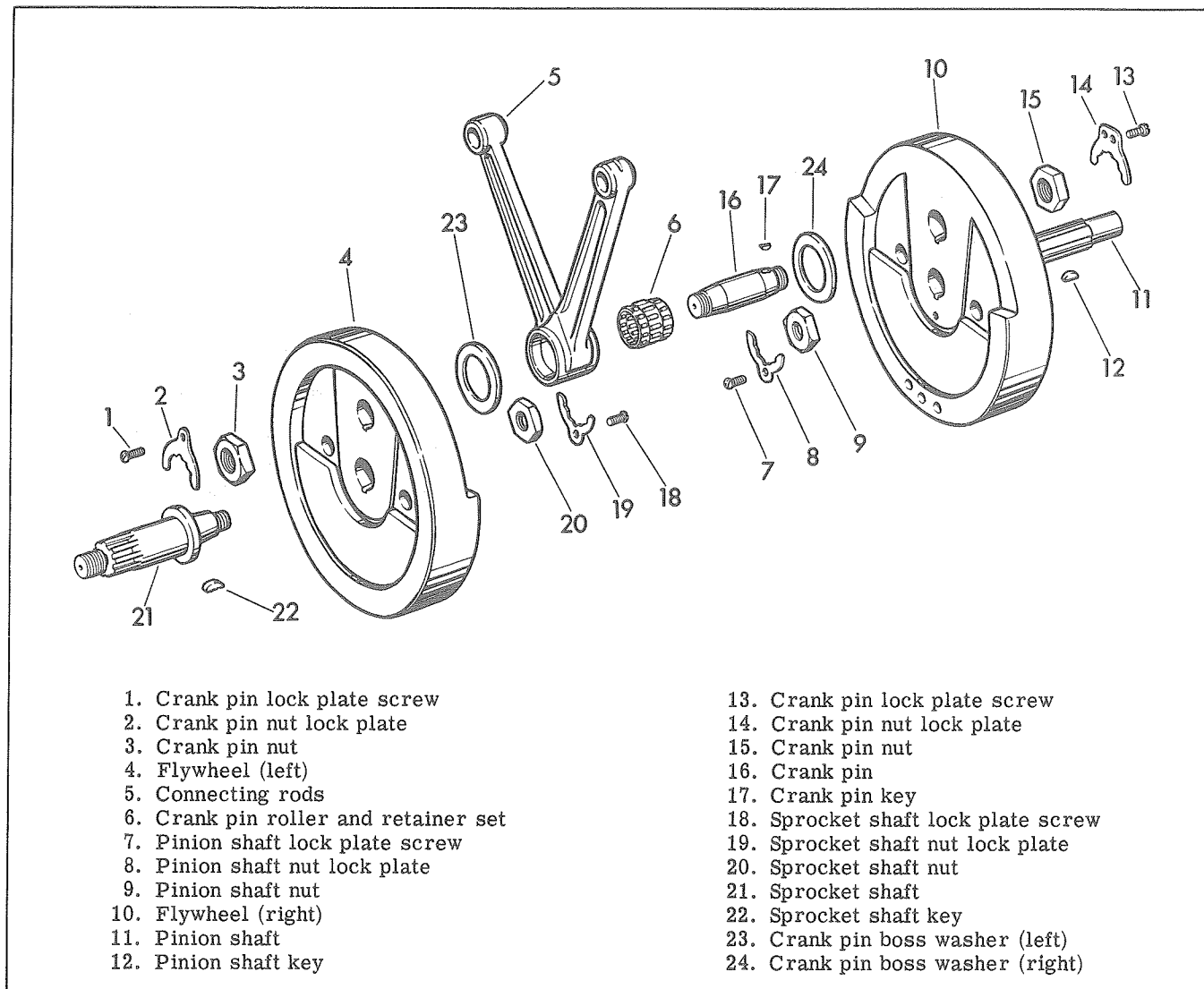


Figure 3E-22. Flywheel and Connecting Rod Assembly - Exploded View

If lower end race of one rod is found to be slightly larger than the other, select rollers to fit the larger rod race and lap smaller rod race to same size as larger race rather than fitting rollers of two sizes.

When rods are correctly fitted with required bearing clearance, extreme upper end of the male rod will have .025 in. to 1/32 in. (.031 in.) side shake. All fitting and checking must be made with bearings, rods and crank pin free of oil and clean.

Fitting bearings tighter than described is likely to result in seizing and bearing damage when heat expands parts.

Check overall width of roller retainer assembly. It must be less than width of female rod end.

ASSEMBLING FLYWHEELS

After correct connecting rod bearing fit has been attained, clean all parts and lubricate bearings with engine oil. Install connecting rods on crank pin bear-

ing so female rod is to rear cylinder. Assemble key and sprocket shaft to left flywheel with sprocket shaft nut, lock plate and lock plate screw.

Position right flywheel assembly in vise. Wipe crank pin taper and crank pin hole in left flywheel clean and dry. Install left flywheel and tighten nut lightly. Hold steel straight edge along outer face of wheel rim at 90 degrees from crank pin as shown in Fig. 3E-24. Tap outer rim of top wheel until rim faces of both wheels are in alignment. Tighten nut. Recheck with straight edge at frequent intervals. Use soft metal hammer to realign wheels. To prevent flywheel assembly from turning in vise while tightening nut, insert a rod 5 in. long and about 1/2 in. in diameter through holes in flywheels and between vise jaws so that rod bears against some part of the vise.

When nut is fairly tight, install flywheel assembly in Flywheel Truing Device, Part No. 96650-30 as shown in Fig. 3E-25. Adjust so centers are just snug.

CHECK LIST

The following check list should be used to correct the most common carburetor defects.

1. Check accelerator pump operation.
2. Blow out passages through high speed screw plug hole.
3. Tighten cover screws and pressure-test inlet valve.
4. Check intermediate adjustment spring, needle, and needle seating.
5. Test main nozzle ball check valve with tool.
6. Inspect idle needle and seat.
7. Inspect choke relief disc.
8. Inspect and clean discharge ports, diaphragms and gaskets, screens and passages. Diaphragm plate must not turn.
9. Check inlet lever setting - must be flush to 1/64 inch above floor of casting. Lever and needle must be the shackled type.
10. Test economizer ball check valve with tool.
11. Check assembly order - gasket next to body, then diaphragm, last cover.

NOTE

A more detailed guide is given at the end of this Section.

TESTS (checks and tests for carburetor performance)

ALL TESTS SHOULD BE PERFORMED, IN THE SEQUENCE SHOWN BELOW, BEFORE FURTHER DISASSEMBLY OR REPAIRS ARE MADE.

PRIOR TO REMOVAL OF CARBURETOR FROM ENGINE

1. The accelerator pump should be inspected for proper operation first. Remove air cleaner, prime carburetor by inserting a toothpick through small hole in bottom of plastic pump cover and gently working diaphragm several times. Operate the throttle lever both rapidly and slowly several times, with the fuel valve turned on. The pump should deliver a strong and constant jet of fuel with each stroke. Failure to do so indicates diaphragm valves or pump plunger as being defective.

2. In cleaning of high, intermediate and low speed channels, the following procedure, most likely, will dislodge any loose dirt lodged in the passages.

Remove high speed screw plug located on rear side of carburetor, opposite intermediate adjustment

needle. Lightly seat intermediate needle and apply air hose pressure (90 pounds maximum) to screw plug hole. Open intermediate and idle needles three or four turns and again apply 90 pounds maximum air pressure. Reset both adjustment screws (see ADJUSTING CARBURETOR). Evaluate carburetor's performance by road testing.

3. Check inlet needle and seat for leakage, as follows:

See that all plastic cover screws are tight. Remove fuel and vent lines, install bulb tester, Part No. 94750-68, to carburetor fuel inlet fitting, plug vent fitting with finger and pressurize tester noting any leakage. A moistened needle and seat should hold 1 to 1-1/2 pounds approximately, and release at approximately 3 to 5 pounds. A dry needle and seat will not hold as well as a moist one. See Fig. 3F-7A.

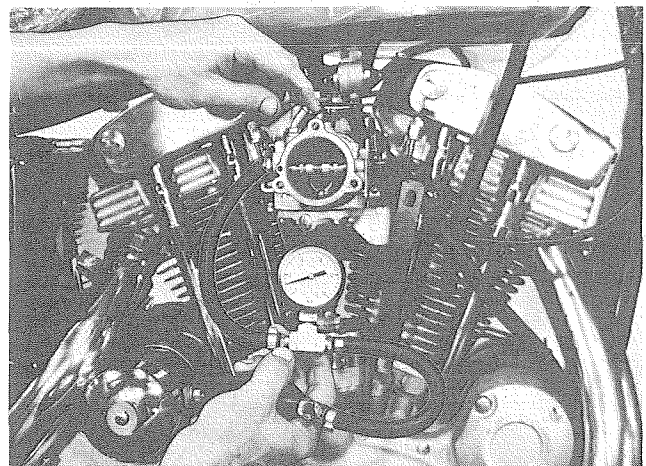


Figure 3F-7A. Checking Inlet Needle and Seat for Leakage

REMOVE CARBURETOR BUT DO NOT DISASSEMBLE

4. Inspect intermediate adjustment needle and spring to see if spring coils are binding before needle seats. If needle does not seat grind a small amount of material from each end of spring. You can check to see if needle is seating by applying blue dye to needle taper and screwing down lightly into seat and noting mark on needle taper.

5. Check main nozzle ball check valve for leakage, as follows:

Seal one side of venturi with finger and apply alternate pressure and vacuum by mouth using grommet end of tool, Part No. 96960-68, seated in venturi as shown in Fig. 3F-7B.

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MODEL DC CARBURETOR

DESCRIPTION

The model DC carburetor is a plain tube carburetor; that is, its main fuel-air mixture passage consists of a venturi section and discharge nozzle. A fixed jet and adjustable high-speed needle valve of limited size meter the high-speed fuel supply as it is fed into the venturi section of the throttle barrel. The low-speed needle valve meters the low-speed fuel-air mixture supply as it is fed into the throttle barrel near the throttle disc. There are no moving parts except the throttle shaft and disc and the bowl float mechanism.

ADJUSTING CARBURETOR (Fig. 3F-9D)

A properly adjusted carburetor requires little readjustment. It should not be necessary to change the adjustment of the low-speed needle more than 1/8 turn and the high-speed needle more than 1/4 turn, richer or leaner, to obtain correct mixture for a change in weather conditions.

Before attempting to correct faulty engine performance through carburetor adjustment, eliminate other possible causes for poor engine performance such as bad spark plugs, improper spark timing, misadjusted tappets, dirty air cleaner, or leaky carburetor and manifold connections.

The air-fuel mixture for low engine speed is regulated by the low-speed needle. The fuel supply for high engine speed is regulated by a combination fixed

jet and adjustable needle. The fixed jet dominates the regulation of high-speed fuel supply. The high-speed needle provides a means of supplementing, to a limited degree, the fuel supplied by the fixed jet, when it is found that slightly enriching the mixture improves engine performance.

Both the high-speed needle (1) and low-speed needle (2) turn inward (clockwise) to make mixture leaner at the respective speeds for which they adjust. Backing them out (counterclockwise) makes mixture richer.

A carburetor may be adjusted as follows:

1. Make sure carburetor control wire is adjusted so throttle lever (3) fully closes and opens with handle-bar grip movement.
2. Turn both the high- and low-speed needle (1 and 2) all the way in (clockwise). Do not close off either needle too tightly or damage to needle and seat may result.
3. Turn low-speed needle (2) (counterclockwise) about 1-1/2 turns. With needle in this position, engine will start, but low-speed mixture will probably be too rich.
4. Start the engine and after it has reached operating temperature and the choke has been moved to the open position, correct the adjustment of low-speed needle. Turn low-speed needle (2) in (clockwise) 1/8 turn at a time until mixture becomes so lean that engine misses and is inclined to stop; then, back needle out (counterclockwise) 1/8 turn, or until engine hits regularly with spark advanced and throttle closed and engine running at idle speed. Starting and all around carburetion will be better with low-speed adjustment slightly rich, rather than too lean.
5. Adjust throttle lever stop screw (4) as necessary, to make engine idle at proper speed with throttle fully closed. Turn screw clockwise to make engine idle faster and counterclockwise to make engine idle slower. Do not idle an engine at the slowest possible speed because an extremely slow idling adjustment causes hard starting. Changing the idle speed with throttle stop screw is likely to change the low-speed mixture slightly. It will, therefore, be necessary to again check and correct low-speed needle adjustment by the same procedure followed in making the initial adjustment.
6. Check high-speed adjustment, after low-speed adjustments have been completed. Run motorcycle or Servi-Car on the road at various speeds between 20 miles per hour and maximum speed. Have spark fully advanced. Best all-around engine performance can usually be found with the high-speed needle (1) set from 3/4 to 1-1/4 turns open.

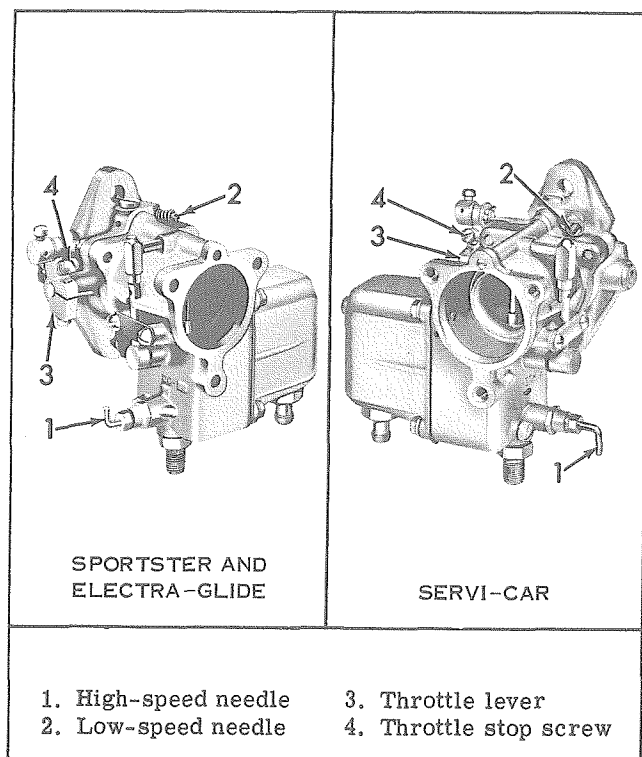


Figure 3F-9D. Model DC Carburetor

DISASSEMBLING CARBURETOR

Disconnect carburetor from motorcycle as follows:

FUEL STRAINER

MODEL M CARBURETOR

The fuel strainer, located underneath the carburetor float bowl, contains a fine mesh screen through which the fuel is forced to pass, trapping bits of dirt and any water that find their way into the fuel system. The unit should be cleaned and flushed at 2,000 mile intervals unless more frequent cleaning is indicated by irregular carburetion.

To clean the strainer, turn off fuel supply, turn off lower knurled cap and clean strainer. Washers need not be replaced unless they are faulty. The cap is replaced fingertight.

AIR CLEANER

The air cleaner consists of a back plate, filter element and cover, arranged so all air drawn into carburetor passes through the filter. A mesh element traps all air borne dust to keep it from entering carburetor and engine.

METAL MESH TYPE FILTER ELEMENT

In normal service on hard surfaced roads, remove air cleaner mesh, wash in gasoline, and saturate with engine oil at least every 1,000 miles, or oftener under dusty service conditions. In extremely dusty service, clean and oil filter mesh every 100 miles or at least once a day.

DRY CORRUGATED TYPE FILTER ELEMENT

In normal service on hard surfaced roads, remove air cleaner cartridge every 1,000 miles, and shake cartridge by tapping lightly to remove loose dirt. If surfaces of element are oily or sooted, wash in gasoline. In extremely dusty service, both cleaning and cartridge replacement should be done more often.

FUEL TANK

GENERAL

The fuel tanks are of welded steel construction.

Fuel tanks are treated to resist rusting. However, when motorcycle stands unoperated for any reasonable length of time, tanks should be drained and the tank interior bathed with an oil-fuel mixture of equal proportions. The fuel will evaporate leaving a protective oil film on tank walls. Moisture formation and subsequent damage may also be avoided by using only "good grade" anti-knock ethyl fuels with moisture absorbing additives.

REPAIRING LEAKING TANKS

Tank leaks may be arc welded, gas welded or soldered. However, only firms or persons qualified to

make such repairs should be entrusted with the operation.

WARNING

If ALL traces of fuel are not purged, an open flame repair may result in a tank explosion. Extreme caution in all tank repair is recommended.

FUEL SUPPLY VALVE

DIAPHRAGM TYPE WITH STRAINER (Fig. 3F-16)

The supply valve is located under the fuel tank. The valve has two handles; one is marked "reserve" and the other is unmarked. Fuel to carburetor is shut off when both handles are in horizontal position.

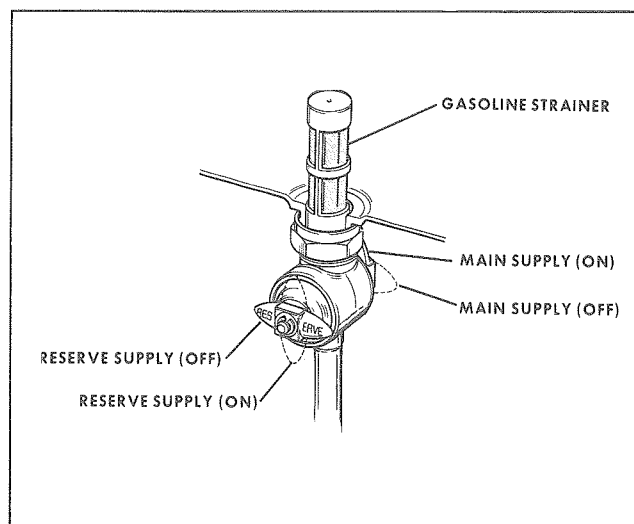


Figure 3F-16. Diaphragm Type Fuel Supply Valve and Strainer

Turning the unmarked handle to vertical position turns on main fuel supply; turning "reserve" handle to vertical position turns on reserve supply.

The fuel strainer is located on top of the supply valve inside the fuel tank. If the supply of fuel is impeded, as indicated by irregular carburetion, remove the supply valve from the tank and thoroughly clean the strainer. Be sure to drain the tank before removing the supply valve.

Before installing supply valve, coat threads with a fuel sealer.

CLUTCH

DIAGNOSIS CHART

Effect	Cause (Check in following order)	Remedy
Clutch slips	Incorrect clutch release adjustment	Check and adjust clutch release mechanism as described under "Adjusting Clutch Release Mechanism."
	Sticking release worm and lever	Check for binding clutch control cable, binding release worm and lever or broken lever spring. See "Replacing Clutch Control Cable and Coil" and assembling Clutch Release Mechanism."
	Insufficient clutch spring tension	Check and adjust clutch spring tension as described under "Adjusting Clutch Spring Tension."
	Worn or oil-soaked friction discs	Replace friction discs. See "Inspecting and Repairing Clutch."
Clutch drags	Incorrect clutch release adjustment	Check and adjust clutch release mechanism as described under, "Adjusting Clutch Release Mechanism."
	Worn clutch release worm and lever	Replace release worm and lever cover. See "Inspecting Clutch Release Mechanism."
	Excessive clutch spring tension	Check and adjust clutch spring tension as described under "Adjusting Clutch Spring Tension."
	Gummy clutch friction plates	Replace or clean friction plates. See "Inspecting and Repairing Clutch."
	Warped clutch steel plates	Replace clutch steel plates. See "Inspecting and Repairing Clutch."
	Badly worn or damaged clutch sprocket keys	Replace clutch sprocket. See "Inspecting and Repairing Clutch."

ADJUSTING CLUTCH RELEASE MECHANISM (Fig. 4B-6)

Loosen clutch release rod adjusting screw lock nut (6) and back off (counterclockwise) clutch release rod adjusting screw (7). Clutch release worm (4) inside transmission sprocket cover (2) should seat against its stop (13) when clutch hand lever is in its fully extended position. If lever does not fully seat, check to see if cable is binding in housing.

Adjust cable length by turning clutch cable adjusting sleeve (hand lever end of cable housing) so that clutch releasing worm does not quite return against its stop. This will hold clutch hand lever in its fully extended position at all times. Turn clutch release rod adjusting screw (7) inward until clutch hand lever has 1/8 of its full movement free before clutch starts to release. This can be checked by a slight increase in tension on the clutch hand lever as it is being moved to the released position. Tighten clutch release rod adjusting screw lock nut (6), without disturbing the setting of the adjusting screw.

ADJUSTING CLUTCH SPRING TENSION



On Electric Start XLH Models, remove battery cover and disconnect ground wire from battery (-) terminal to prevent accidental starter operation.

See Fig. 4B-7 and proceed as follows. Remove left footrest (1), stoplight switch (2) and rear brake foot lever (3). Secure stoplight switch out of working area without disconnecting wires. Place an oil drain pan under clutch and remove front chain cover screws (4), cover (5) and gasket (not shown).

NOTE

Sportster Model XLCH has a steel chain cover secured with 9 screws. See Fig. 4B-7.

fit in crankcase. Washer is locked in place by peening stop pin end.

ASSEMBLY (Fig. 4C-2)

Install oil seal (13) in left crankcase. Slip thrust washer (15) on starter crankshaft (11), flat side of washer up as positioned on motorcycle. Insert steel shims (14) on crankshaft if needed, as described under "Inspection and Repair," and install crankshaft in left case engaging notched thrust plate (15) with stop pin washer (22) using grease to hold in place (see Fig. 4C-3).

Turn starter crankshaft until notch (A, Fig. 4C-2) is upright as positioned on motorcycle. Place starter crank gear on squared end of shaft, recessed portion of cam plate facing down, end of slot against stop pin as shown in Fig. 4C-4. When positioning crank gear (12) on shaft (11) be extremely careful that thrust washer does not become dislocated from stop pin washer (see Fig. 4C-3).

Slip lock washer (10) over crankshaft end (11) engaging prong of washer with hole in crank gear face. Install and securely tighten crank nut (9), with flat side of nut against washer.

Slip starter clutch gear (6) over spacer (7), grooved side of gear bushing against lip of spacer collar. Position small end of spring (8) in clutch gear bushing groove.

Press starter clutch gear assembly over clutch gear, compressing spring (8) and at the same time turning starter crank gear to permit meshing of gear teeth.

Return starter crank gear to original position as shown in Fig. 4C-4, with clutch gear held against cam plate by spring tension.

CAUTION

If clutch sprocket spacer only (7), is replaced, the new spacer must be exactly the same length as the old spacer. Spacers are available in two lengths, 1.025 and 1.047 in. If starter clutch gear (6), starter clutch (18), clutch sprocket hub or clutch gear are replaced it is absolutely necessary to check the clearance between teeth on starter clutch gear (6) and starter clutch (18) as follows:

1. Measure distance from end of clutch sprocket spacer to top of starter clutch gear teeth.
2. On clutch sprocket assembly, measure distance from top of starter teeth to clutch sprocket thrust washer.
3. Subtract the sprocket reading (2) from the clutch gear reading (1) to obtain clearance.

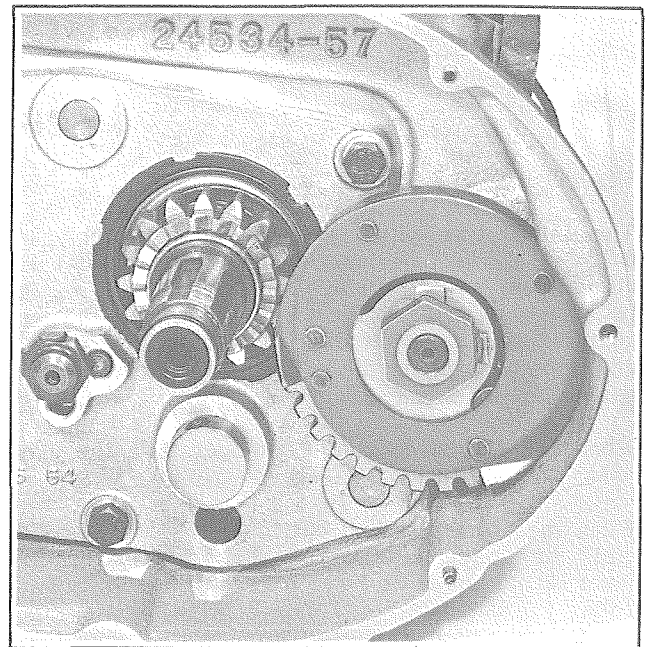


Figure 4C-4. Positioning Starter Crank Gear on Starter Shaft

4. If resulting clearance is less than .040 in. using short spacer (7), length 1.025 in., install long spacer, length 1.047 in., to obtain .040 in. minimum clearance.

The following alternate method may also be used:

Using a discarded Clutch Sprocket Assembly, Part No. 37701-57, improvise a gauge to measure clearance between clutch teeth on starter gear (6) and clutch (18). Cut a "pie-shaped" section from the clutch shell to permit measurement between teeth with feeler gauge. Temporarily slip improvised clutch shell gauge over clutch gear and hold firmly against spacer (7). With a feeler gauge measure clearance between clutch teeth. If measured clearance is less than .040 in. using short spacer (7), length 1.025 in., install long spacer, length 1.047 in., to obtain .040 in. minimum clearance. See "Transmission Specifications," Section 4A.

Reassemble clutch as described in "Assembling Clutch," Section 4B.

Engage clutch cable end with clutch release lever and install transmission sprocket cover (5) and bolts (4). Install exhaust pipe and muffler.

Slip spring (3) over squared end of shaft (11), end of spring and notch (A, Fig. 4C-2) up as positioned on motorcycle. Using a screwdriver rotate spring clockwise and engage with stud (17). Install bolt, lock washer and nut (1).

**ESTABLISHING MAINSHAFT AND COUNTERSHAFT
END PLAY**

Temporarily select the thinnest variable low gear washer (Fig. 4D-20) and mainshaft third gear washer (3) and install in their respective positions. Install washer (3), ear of washer down as positioned in transmission compartment, using grease to hold in place.

Temporarily install access cover to crankcase with all transmission parts. Carefully align cover on dowel pins and with a rawhide mallet, gently tap cover into position. Secure access cover with four cap screws (2, Fig. 4D-15).

Using a dial indicator, check end play of mainshaft (2), gauging from sprocket side of shaft. Move shaft back and forth and measure end play. With access cover still in place, measure end play of countershaft from access cover side using a dial indicator. Bend a discarded spoke and wedge in countershaft (17) end hole. Pull and push countershaft and at the same time, measure amount of end play. If end play of either transmission mainshaft (2) or countershaft (17) is not within .004 to .009 in. limits, it is necessary to remove access cover and install correct size variable thickness washers (3 and 19) to obtain correct fit. Variable size washers are available in .050, .055, .060, .065, .070 and .075 in. thickness.

With mainshaft and countershaft end play established, center the gear shifter lever arm shaft (17, Fig. 4D-19), so that it will engage with gear shifter pawl yoke when access cover is in place. Make sure lever arm is correctly engaged with shifter pawl yoke by lightly rotating countershaft (17) and testing for engagement.

With transmission and access cover assembled, install 23 mainshaft rollers (4, Fig. 4D-20) in bearing race using grease to hold in position. Install roller bearing washer and roller bearing retainer ring (32 and 31).

**INSTALLING MAINSHAFT SPROCKET, STARTER
AND CLUTCH ASSEMBLIES**

Install foot shift lever and shift transmission into fourth gear. See Fig. 4D-15. Install gasket (6), oil seal and retainer (5) and screws (4). Do not tighten screws (4). Temporarily position sprocket (3) on mainshaft to correctly locate retainer (5). Remove sprocket (3) and securely tighten screws (4). Re-assemble sprocket, lock washer (2) and mainshaft nut (1). Bend ears of lock washer (2) against head of nut (1). Install release rod end, and chain. Tighten nut (1).

Install starter as described in "Starter," Section 4C.

Install clutch as described in "Clutch," Section 4B.

Fill transmission compartment with engine oil as described in "Lubrication," paragraph following.

**CRANKCASE AND TRANSMISSION ASSEMBLY
PROCEDURE**

The following assembly procedure should be followed only if the crankcases have been separated, an operation normally performed in conjunction with a complete engine overhaul.

Position left crankcase side on workbench with transmission compartment facing up. Proceed to assemble transmission shifter mechanism, mainshaft and countershaft groups as described in "Assembling Transmission."

To establish correct transmission mainshaft and countershaft end play, temporarily assemble right and left crankcase sides together, less flywheel assembly with two upper and two lower case bolts. Then, follow the procedure for establishing correct end play as described in "Establishing Mainshaft and Countershaft End Play." Disregard instructions pertaining to removing and installing access cover.

When transmission is completely reassembled and correct tolerances established, continue to reassemble crankcase as described in "Assembling Crankcase," Section 3E. Fill transmission compartment with engine oil as described below.

LUBRICATION

With motorcycle standing straight up, remove oil filler plug and oil level plug. The oil filler plug is located near the top of the chain case cover and the oil level plug is located near the bottom of the chain case cover.

Refill transmission with same grade of oil used in engine. Add oil until it begins to overflow through oil level hole. Permit excess oil to flow from oil level hole until it ceases to run. This is correct oil level. Re-insert and tighten oil level and oil filler plug.

Drain transmission and refill to correct level with fresh, clean oil once each year or every 5000 miles, whichever comes first. If transmission should become submerged in water, drain immediately and refill with clean oil to the correct level.

WIRING

1963-64 SPORTSTER CH

WIRING DIAGRAM KEY

- | | |
|---|--|
| A. Conduit (One wire) - Black | 6. Light Switch - 2 Red and 1 Green wire |
| B. Conduit (One wire) - Black | 7. Ignition ground switch lock |
| C. Conduit (Two wires) - Red and green wires | 8. Voltage Regulator - |
| D. Conduit (One wire) - Red | "F" Terminal - Black wire |
| E. Conduit (Two wires) - Red and green wires | "GEN" Terminal - Red wire |
| F. Conduit (Two wires) - Red and green wires | "BAT" Terminal - Red wire |
| G. Conduit (Three wires) - 2 Red and 1 Black wire | 9. Magneto - Black wire |
| 1. Horn Switch - Black wire | 10. Stop Light Switch - Two red wires |
| 2. Headlamp - Black and red wires | 11. Tail and Stop Lamp - Red and green wires |
| 3. Dimmer Switch - 2 Red and 1 Black wire | 12. Horn - |
| 4. Ignition Cut-out Switch - Black wire | Upper Terminal - Black wire |
| 5. Generator | Lower Terminal - Three red wires and
capacitor wire |
| "F" Terminal - Black wire | 13. Capacitor |
| "A" Terminal - Red wire | |

WIRING

LATE 1969 SPORTSTER H

WIRING DIAGRAM KEY

- | | |
|--|--|
| A. Handlebar (five wires) - red wire with black tracer, black wire with red tracer, red wire with yellow tracer, and 2 black wires | 14. Battery |
| B. Conduit (two wires) - green and red | 15. Stoplight rear switch |
| C. Conduit (one wire) - red | 16. Ignition coil |
| D. Conduit (two wires) - red and green | 17. Circuit breaker |
| E. Conduit (one wire) - red | 18. Ignition - light switch |
| F. Conduit (one wire) - red | 19. Oil signal light switch |
| G. Conduit (one wire) - black | 20. Starter button |
| H. Conduit (two wires) - red | 21. Horn |
| I. Conduit (one wire) - black | 22. Terminal plate |
| J. Conduit (one wire) - green | 23. Terminal |
| K. Handlebar (5 wires) - red, brown, green and 2 black wires | 24. Speedometer light |
| L. Conduit (five wires) - brown, yellow, black, red and green | 25. Terminal |
| M. Conduit (2 wires) - red and green | 26. Terminal - not used with standard wiring |
| 1. Headlamp dimmer switch | 27. Terminal - not used with standard wiring |
| 2. Horn switch | 28. Terminal |
| 3. Generator "F" and "A" terminals | 29. Terminal - not used with standard wiring |
| 4. Regulator | 30. Terminal |
| "BAT" terminal | 31. Terminal |
| "GEN" terminal | 32. Oil signal light |
| "F" terminal | 33. High beam indicator light |
| 5. Overload circuit breaker | 34. Generator indicator light |
| 6. Tail lamp | 35. Headlamp |
| 7. Terminal | 36. Left direction signal pilot lamp |
| 8. Terminal | 37. Right direction signal pilot lamp |
| 9. Junction terminal board | 38. Tachometer light |
| 10. Starter motor | 39. Direction signal switch |
| 11. Terminal - not used with standard wiring | 40. Direction signal flasher |
| 12. Terminal | 41. Left front direction lamp |
| 13. Starter solenoid | 42. Right front direction lamp |
| | 43. Left rear direction lamp |
| | 44. Right rear direction lamp |
| | 45. Stoplamp front switch (Late 1969) |
| | 46. Connector (Late 1969) |

GENERATOR

STANDARD GENERATOR

The standard generator is a direct current two pole-, two-brush unit with charging rate governed entirely by a voltage regulator. The regulator functions to increase charging rate when the battery charge is low or current is used, and to decrease charging rate when no current is being used and the battery is nearing full charge.

CHECKING GENERATOR

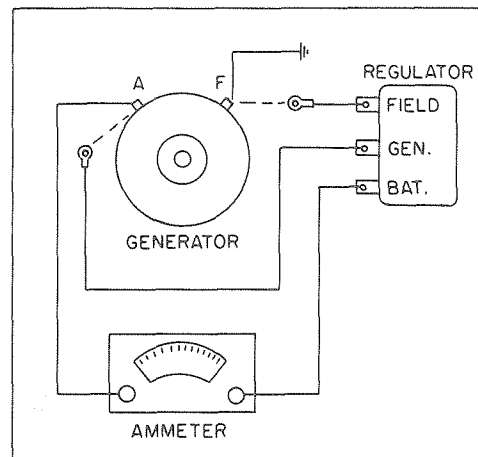
It is possible to trouble shoot faulty generator without removing the generator from the engine or, if necessary to remove it, without completely disassembling the generator. When a generator stops charging or not charging at a satisfactory rate as evidenced by a "dead" battery or signal light on switch panel remaining lighted, it is recommended that unless the trouble is known definitely, the following checking sequence be used:

On installations employing a fuse in the generator field circuit, remove fuse at regulator and examine it to see if it has blown. When replacing fuse be sure insulating sleeve is in good condition and covers fuse properly.

Make certain the generator signal light circuit is not grounded. Remove the wire or wires from the generator "A" terminal and position so contact is not made with motorcycle. Turn ignition on. If generator light on instrument panel goes on, light circuit is grounded and may be reason for the generator not charging. If this circuit is grounded this condition must be corrected. If the generator signal light circuit tested O.K. or if a grounded condition has been corrected, proceed to testing generator output.

TESTING GENERATOR OUTPUT (See wiring diagram following)

Remove wire from "F" terminal of generator. Connect a short jumper wire from generator "F" terminal to ground on motorcycle. Remove wire or wires from generator "A" terminal and connect the positive lead of a 0-30 ampere ammeter. Start engine and run at a speed of 2000 RPM (approximately 40 MPH). Then momentarily connect negative lead of ammeter to motorcycle battery positive terminal. (Battery should be known to be good.) If the ammeter reads 15 amperes or more for a 6-volt generator or 10 amperes or more for a 12-volt generator, generator is not at fault. Therefore, the difficulty is in the regulator or wiring circuit. (See Voltage Regulator Section 5I). If generator shows no charge or charge below minimum rate, it must be removed for further checking.



Generator Output Test Wiring Diagram

IMPORTANT

Avoid running with generator field grounded for extended periods. Disconnect ammeter lead from battery before stopping engine to avoid discharging battery through generator.

CAUTION

It is advisable to "Flash" field coils whenever wires have been removed from generator or regulator; or after generator or battery has been removed and is reinstalled. This is done to make sure generator has correct polarity. If polarity of generator is reversed, relay points will vibrate and burn. "Flash" field coils by momentarily touching a jumper wire between "BAT" terminal and "GEN" terminal on regulator, after all wires have been properly connected and before starting engine. The momentary surge of current from battery to generator will correctly polarize generator.

REMOVING GENERATOR

DUO-GLIDE. Disconnect wires from generator "F" and "A" terminals. Remove two long screws through timing gearcase cover that secure generator to gearcase. Move generator to left side of motorcycle and remove, gear end first, between frame members.

SPORTSTER. Disconnect red wire from "BAT" terminal on voltage regulator. On standard Sportster, disconnect black wire from "GEN" terminal.

Remove two long screws through timing gearcase cover that secure generator to gearcase.

CIRCUIT BREAKER

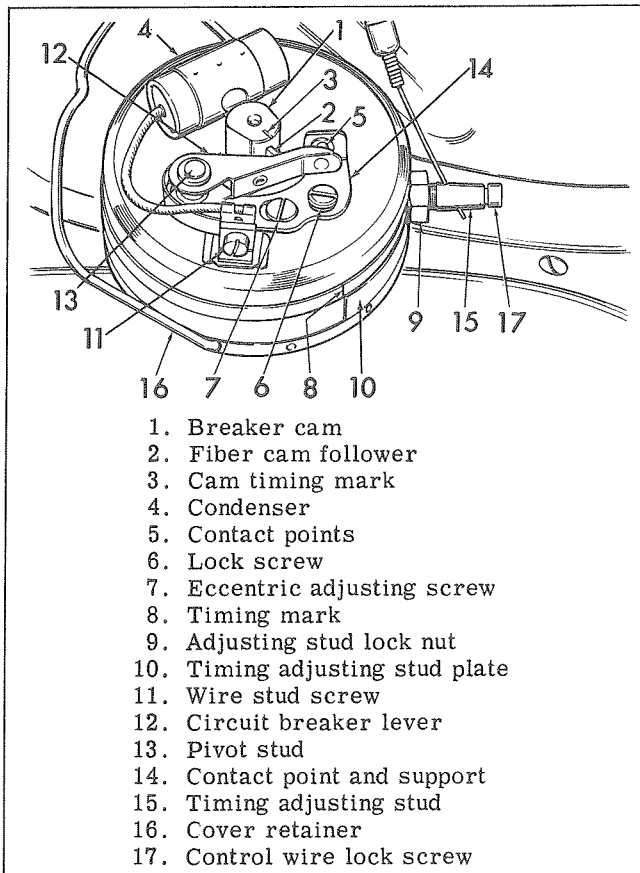
DESCRIPTION

The ignition system has two circuits, the primary circuit and the secondary circuit. The primary circuit consists of the battery, switch, primary coil, breaker points, condenser and associated wiring. The secondary circuit consists of the secondary coil, the spark plugs and associated wiring.

The circuit breaker has two functions. First, the breaker cam and contact points open and close the low tension circuit between the battery and ignition coil causing the coil to produce high voltage discharge to the spark plugs. Second, the circuit breaker times discharge for proper engine firing. The following three types of circuit breakers are in use:

SINGLE CONTACT POINT CIRCUIT BREAKER WITH MANUAL ADVANCE (Fig. 5F-1).

The breaker points are operated by a cam with a narrow and wide lobe. The narrow lobe times the front cylinder and the wide lobe times the rear cylinder. A single ignition coil fires both spark plugs at the same time, but one spark occurs in the exhaust stroke of one cylinder and the other spark fires the combustible gases in the other cylinder to produce the power stroke. Timing is advanced or retarded by manual rotation of circuit breaker base in relation to cam.



- 1. Breaker cam
- 2. Fiber cam follower
- 3. Cam timing mark
- 4. Condenser
- 5. Contact points
- 6. Lock screw
- 7. Eccentric adjusting screw
- 8. Timing mark
- 9. Adjusting stud lock nut
- 10. Timing adjusting stud plate
- 11. Wire stud screw
- 12. Circuit breaker lever
- 13. Pivot stud
- 14. Contact point and support
- 15. Timing adjusting stud
- 16. Cover retainer
- 17. Control wire lock screw

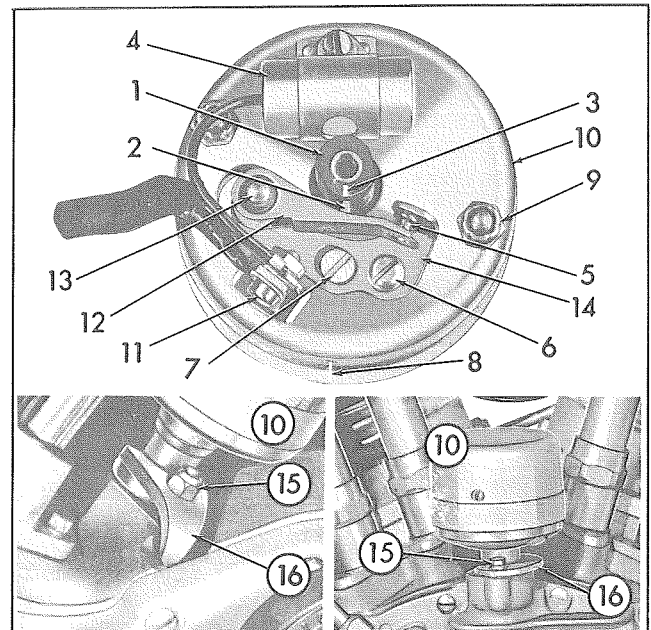
Figure 5F-1. Single Contact Point Circuit Breaker - Manual Advance

SINGLE CONTACT POINT CIRCUIT BREAKER WITH AUTOMATIC ADVANCE (Fig. 5F-1A).

Automatic advance circuit breaker functions the same way as the manual advance circuit breaker except that the spark timing cam is advanced automatically as engine speed increases through action of the flyweights in the circuit breaker base. This insures correct spark timing to suit both starting and running requirements.

DOUBLE CONTACT POINT CIRCUIT BREAKER (Fig. 5F-1B).

Ignition spark is produced by operation of separate circuit breaker contact points and ignition coils for each spark plug. The breaking of each set of breaker points by a single-lobe cam on the timer shaft determines the spark timing. The single-lobe cam opens the breaker points, individually firing alternate cylinders every crankshaft revolution.



1966 Electra-Glide 1966 Sportster and Servi-car

- 1. Breaker cam
- 2. Fiber cam follower
- 3. Cam timing mark
- 4. Condenser
- 5. Contact points
- 6. Adjustable point lock screw
- 7. Eccentric adjusting screw
- 8. Timing marks (1965 model)
- 9. Circuit breaker head nut (2)
- 10. Circuit breaker head
- 11. Wire stud screw
- 12. Circuit breaker lever
- 13. Pivot stud
- 14. Contact point and support
- 15. Stem clamp nut
- 16. Stem clamp

Figure 5F-1A. Single Contact Point Circuit Breaker - Automatic Advance

MAGNETO

SPORTSTER CH MAGNETO

GENERAL

The magneto produces a high voltage discharge to the spark plug which is timed for proper engine firing. It consists of an induction coil with primary and secondary circuits, a rotating magnet (rotor), condenser, circuit breaker, and circuit breaker cam. A grounding circuit is connected to a button on the right handlebar which is used to cut out the ignition and stop the engine.

The magneto is mounted in two ways:

- (1) On 1964 and earlier models the magneto is mounted in a fixed position to produce advanced spark timing only.
- (2) On 1965 models a movable mounting plate allows the magneto to be turned to a retarded timing position for starting engine. Magneto is advanced and retarded manually by turning the left handlebar grip.

Improper functioning of the magneto is often believed to be the cause of engine difficulty arising from other sources, such as flooded carburetor, insufficient fuel or air, loose ignition connections, or a defective spark plug. Since a brief engine inspection will often locate the trouble before the magneto is reached, this should be done first. The magneto should be opened only when it is certain that the ignition spark produced is unsatisfactory. This condition may be determined by ignition spark tests which are easily made in the field.

With a properly adjusted spark plug in good condition, the ignition spark should be strong enough to bridge a short gap in addition to the actual spark plug discharge. This may be determined by holding the end of the ignition cable not more than 1/8 inch away from the spark plug terminal with the engine running. The engine should not misfire when this is done. However, ignition tests made while any part of the system is wet are useless.

To test the magneto spark when the engine is not running, remove the two ignition wires from the spark plug terminals and hold the end of each wire, in turn, not more than 1/4 inch from the spark plug terminal, or the wires may be attached to a spark plug and the plug body grounded on the engine.

Crank the engine and watch carefully for the spark discharge which should occur twice during the cycle. If a strong spark is observed when each wire is tested, it is recommended that the magneto be eliminated as the source of difficulty. If no spark occurs, the shorting button and circuit should be examined to make certain it has not accidentally been closed.

ADJUSTING CIRCUIT BREAKER POINTS (Fig. 5F-6)

Breaker points should be checked for gap and contact surface condition initially at 1500 miles and every 2000 miles thereafter. Remove carburetor and air cleaner. Remove the magneto cover.



On early models having safety gap, be careful not to bend points (5) since they are positioned to give correct safety gap of 3/8 in. with magneto cover installed. Use a spare cover with a 1-1/2 by 1-1/4 in. opening and a 3/8 in. diameter rod to set safety gap. See figure 5F-6.

Starting with late 1964 magnetos, safety gap points (5) have been eliminated. With starter crank, turn engine to the position where the cam follower (8) is on either high point of cam (9). Check the gap between the contact points (4) with a .015 in. wire feeler gauge. If it is not exactly .015 in. when cam follower (8) is on either of highest points of cam (9) adjustment should be made because incorrect gap changes ignition timing.

To adjust the points, slightly loosen pivot screw (10) and adjustment screw (11). With a screwdriver adjust point gap by prying at location (12) to shift point base as necessary to change gap. When correct gap has been obtained, tighten screws (10) and (11). Again check the gap to be sure it remains correct.

Points that have undergone considerable use may not appear bright and smooth. However, this should not be interpreted as meaning points are worn out.

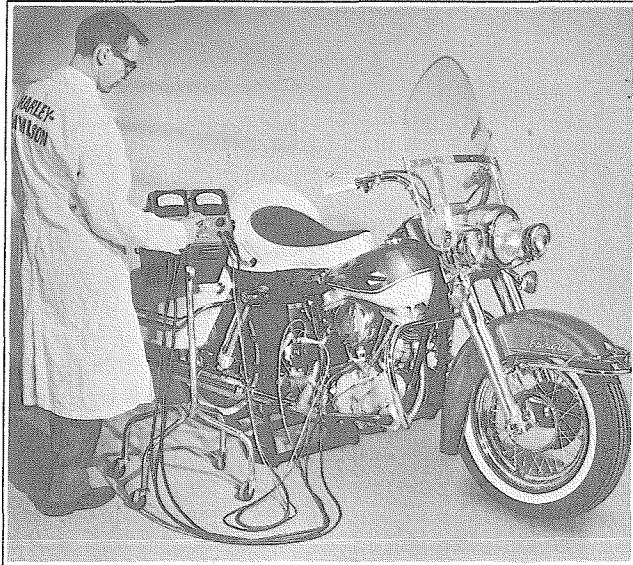
Points that are burned or pitted should be dressed or renewed as described in "Inspection and Replacement of Parts."

TIMING IGNITION (Fig. 5F-6)

Ignition is timed in the advanced position to occur when the front cylinder piston is 11/16 in., (45 degrees) before top dead center.

The ignition timing should be checked in relation to piston position or timing mark on flywheel each time circuit breaker parts are replaced or at least once a year. Timing is adjusted by rotating magneto housing clockwise, or counterclockwise after loosening front and rear mounting bolt nuts (14 or 14A, Fig. 5F-6) holding magneto drive housing to adapter plate. On 1965 to early 1967 models, minor spark adjustment can be made with adjusting screw (15). Fully advanced timing setting can be retarded by turning screw clockwise or advanced by turning screw counterclockwise.

REGULATOR



GENERAL INFORMATION

This section covers testing and servicing of regulators for all Harley-Davidson motorcycle models, except Sprint.

Two unit voltage regulators and three unit current and voltage regulators are used to control generator output to the electrical system.

Normally the regulator does not require attention at regular service intervals; however, point cleaning, point setting and air gap adjustments may be necessary if regulator is not functioning correctly.

Four basic tests are required:

1. Test the generating system to determine whether the generator or regulator is at fault.
2. Test the cutout unit closing voltage.
3. Test the voltage control unit setting.
4. Test the current control unit setting.

Voltage and current settings for all regulators are listed in following table of specifications, Figure 5I-1.

Before making any checks or adjustments, the charging circuit must be operated approximately 15 minutes to bring regulator to normal operating temperature. Regulator cover and gasket must be in place.

Two methods are used for making regulator tests, the method used depending upon the type of equipment available.

METHOD I employs separate voltmeter, ammeter, fixed resistances of 1/4 ohm and 1-1/2 ohm, and 25 watt variable field resistor. This is the method outlined in detail in the Delco-Remy Service Bulletins.

METHOD II employs single test instrument incorporating the same components as Method I, and in addition has a variable load resistance. The equipment used is a VAT 26 voltage-ampere tester manufactured by the Sun Equipment Corporation.

METHOD I

TESTING DELCO - REMY REGULATORS

GENERATOR-BATTERY SYSTEM (6 or 12 VOLT)

Covers all models except Sportster XLCH

A. TESTING THE GENERATING SYSTEM (SEE FIGURE 5I-2)

1. Disconnect battery wire from regulator "BAT" terminal and connect this wire to the negative lead of an ammeter (0-30 amperes). Connect positive ammeter lead to regulator "BAT" terminal.
 2. Connect the positive lead of a voltmeter (0-20 volts) to the regulator "GEN" terminal. Connect voltmeter negative lead to ground on motorcycle.
 3. Disconnect the wire from the regulator "F" terminal and connect this wire to a lead of a field control variable resistor. Connect other lead of field control variable resistor to ground on motorcycle. Set field control knob to open position.
 4. Operate engine at 2000 RPM (approximately 40 MPH).
 5. Slowly turn field control knob toward direct position until the ammeter reads:
 - 15 amperes for 6 volt systems using standard equipment generators (Models 58 and 61 generators)
 - 20 amperes for heavy duty fan-cooled generators (Models 51 and 58R generators)
 - 10 amperes for 12 volt generators (Models 64 and 65 generators)
- If ammeter reading is as specified, generator is not faulty and difficulty is in regulator. Make regulator tests B, C and D.
6. If there is no ammeter reading or reading is low, observe voltmeter reading. If voltmeter reading is below 6 volts on 6 volt systems, or below 12 volts on 12 volt systems, generator requires service.

BATTERY

GENERAL

The battery serves as a storage place for current used in starting the motorcycle; to operate accessories when the engine is not running and to provide additional current, when necessary, over the amount being generated. For a battery to remain in good condition, the current draw must be balanced by a current input. All Harley-Davidson batteries have lead plates and sulphuric acid electrolyte units of capacities suitable for load requirements under intended use.

BATTERY CARE

Prompt and correct battery care determines the life span of the unit. Therefore, for a longer useful life, the battery solution level must be checked at weekly intervals. Add only pure distilled or approved water to recommended level above plates and separators. Be careful not to overfill. Overfilling will result in some of the electrolyte being forced out through cap vent holes, diluting or weakening the solution strength. An overflow of battery solution will cause cables to corrode and motorcycle parts near the battery to be damaged.

Clean battery and terminals when necessary with a baking soda-water solution. Be careful to avoid getting any of the solution into the cap vent holes. When solution stops bubbling, flush off battery with clean water.

Coat terminals with grease or oil felt terminal post washers after wires have been attached to retard corroding.

CHARGING BATTERY

Never allow a battery to stand in a discharged condition. Start charging it at once at the recommended continuous charge rate.

To determine the amount or condition of a battery charge, check solution in each cell with a battery hydrometer. When hydrometer reading is 1.200 or less, battery is considered discharged and should be removed from motorcycle and charged at the following maximum continuous charge rate; using appropriate 6 or 12 volt charger.

- 12 volt 53 Ampere hour battery - 10 amperes
- 12 volt 32 Ampere hour battery - 4 amperes
- 6 volt 51 Ampere hour battery - 3-1/2 amperes
- 6 volt 22 Ampere hour battery - 1-1/2 amperes
- 6 volt 10 Ampere hour battery - 1/2 ampere
- 2-6 volt 8 Ampere hour batteries
(Series connected - 12 volts) - 1/2 Ampere

A higher battery charge rate will heat and damage the battery. For this reason, do not allow the small motorcycle battery to be charged in the same line with large batteries. Hydrometer reading of a fully charged battery in good condition, with full strength electrolyte will be 1.270 or higher.

WARNING

Hydrogen gas, formed when charging, is explosive. Avoid open flame or electrical spark near battery.

Allowing a battery to remain in a discharged condition will shorten its life. It is important that a battery be kept well charged during below freezing weather.

RECLAIMING SULPHATED BATTERY

If a battery has been allowed to stand in a discharged condition for a period of time, the lead sulphate in the plates will crystalize and not take a charge at normal rates. Such batteries should be charged at half the specified continuous rate for twice the computed time. A longer charging time at a slower rate will many times break down the crystalline structure into active materials and restore the battery.

CHANGING ELECTROLYTE

In normal service with average care, it is never necessary to change electrolyte for the lifetime of the battery. However, if the battery solution is spilled, diluted as a result of careless water addition, or neutralized by the addition of an alkaline substance, the battery solution may be changed and in some cases near full capacity restored.

A weak acid solution may be detected by charging the battery until all cells gas freely and the gravity has not shown a rise for three successive readings taken at hourly intervals. "Gassing" is evidenced by a bubbling action in the electrolyte that may be detected by sight or sound. Do not change electrolyte in a battery with one or more cells that fail to gas. Such a condition indicates a structural failure.

Pour solution out of charged battery and fill with water. Charge battery again until maximum specific gravity is reached. Pour out this solution and add prepared battery electrolyte to specified level and charge again for a short length of time for full capacity.

Check specific gravity and add a little water if necessary to bring solution down to desired maximum limits.

The value of changing electrolyte in a fairly old battery is questionable. By tipping over such a battery to drain the solution, the sloughed-off waste materials accumulated by repeated charging and discharging actions might be dislodged from the sediment chambers in the bottom of the battery and deposited in the separators. This material is an electrical conductor and thus may "tree" or catch in the separators and cause a short circuit.

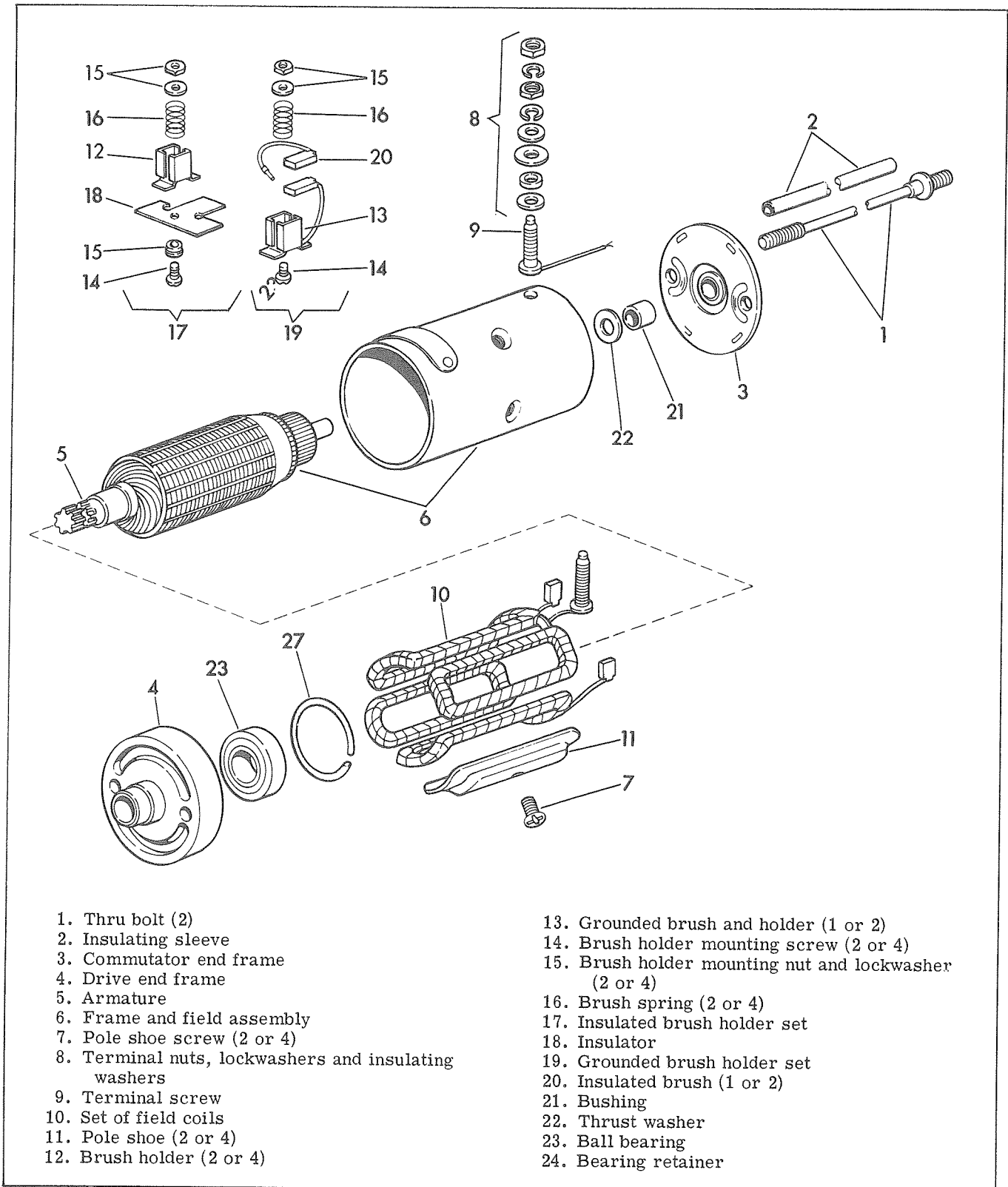


Figure 5L-9. Delco Remy 4 Pole Starter Motor - Exploded View

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