

SERVICE MANUAL

APPLYING TO
THE FOLLOWING
HARLEY-DAVIDSON
MOTORCYCLES—
1940 to 1947 INCLUSIVE

O.H.V. Engine Models

61 Cu. In. (1000 c.c.)

74 Cu. In. (1200 c.c.)

Side Valve Engine Models

74 Cu. In. (1200 c.c.)

80 Cu. In. (1300 c.c.)



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FOREWORD

This Service Manual is dedicated to attaining for Harley-Davidson motorcycle owners the highest degree of performance and satisfaction.

Except when a particular model or year model is indicated, the information in this manual applies to both, O.H.V. and Side Valve Models, 1940 to 1947, and in a general way to Big Twin Models back to 1937.

To others than Harley-Davidson dealers and their mechanics. If you have any questions pertaining to service information in this manual, or special tools mentioned, see your Harley-Davidson dealer.

GENERAL SPECIFICATIONS

MODEL	E and EL	F and FL	U and UL	UH and ULH
Type of Engine	61 Cu. In. O.H.V. Twin	74 Cu. In. O.H.V. Twin	74 Cu. In. Side Valve Twin	80 Cu. In. Side Valve Twin
Cylinder Bore	3 $\frac{5}{16}$ "	3 $\frac{7}{16}$ "	3 $\frac{5}{16}$ "	3 $\frac{7}{16}$ "
Stroke	3 $\frac{1}{2}$ "	3 $\frac{31}{32}$ "	4 $\frac{9}{32}$ "	4 $\frac{9}{32}$ "
Piston Displacement	60.32 Cu. In.	73.66 Cu. In.	73.79 Cu. In.	78.75 Cu. In.
Compression Ratio (Low compression engine)	E Model 6.5 to 1	F Model 6.6 to 1	U Model 5.0 to 1	UH Model 5.2 to 1
Compression Ratio (High compression engine)	EL Model 7.0 to 1	FL Model 7.0 to 1	UL Model 5.5 to 1	ULH Model 5.7 to 1
Horsepower (N.A.C.C. Rating)	8.77	9.44	8.77	9.44
Wheelbase	59 $\frac{1}{2}$ "	59 $\frac{1}{2}$ "	59 $\frac{1}{2}$ "	59 $\frac{1}{2}$ "

ENGINE (SERIAL) NUMBER

In identifying a motorcycle as to its year and model, do not trust simply to knowledge of original differences in equipment and general appearance of one year's model as compared with another. Always identify by Engine (Serial) Number.

Example: 46 EL 2222

46
Year

EL
Model

2222
Serial Number

TIRE INFLATION PRESSURES

	FRONT	REAR	SIDECAR	PACKAGE TRUCK
Solo—Rider Only 4.00" x 18" Tire 5.00" x 16" Tire	14 lbs. 12 lbs.	16 lbs. 14 lbs.		
Solo—Rider and One Passenger 4.00" x 18" Tire 5.00" x 16" Tire	18 lbs. 12 lbs.	26 lbs. 16 lbs.		
Sidecar—Rider and One Sidecar Passenger or 150 lb. Sidecar Load 4.00" x 18" Tire 5.00" x 16" Tire	20 lbs. 14 lbs.	24 lbs. 16 lbs.	14 lbs. 14 lbs.	
Package Truck—Rider and 150 lb. Truck Load 4.00" x 18" Tire 5.00" x 16" Tire	22 lbs. 14 lbs.	30 lbs. 20 lbs.		16 lbs. 14 lbs.

Tire inflation pressures are based on rider and passenger weight of approximately 150 lbs. each; Package Truck load 150 lbs.

When these loads are exceeded by 50 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; sidecar or package truck tire, 1 lb.

STANDARD GEAR RATIOS

MODEL	SOLO OR SIDECAR	TYPE OF TRANSMISSION	ENGINE SPROCKET	HIGH GEAR RATIO
E and EL	Solo	3 Speed	22	3.90 to 1
		4 Speed	23	3.73 to 1
	Sidecar	3 Speed—Reverse	18	4.76 to 1
		4 Speed	20	4.29 to 1
F and FL	Solo	3 Speed	23	3.73 to 1
		4 Speed	23	3.73 to 1
	Sidecar	3 Speed—Reverse	20	4.29 to 1
		4 Speed	21	4.08 to 1
U and UL	Solo	3 Speed	21	4.08 to 1
		4 Speed	22	3.90 to 1
	Sidecar	3 Speed—Reverse	18	4.76 to 1
		4 Speed	20	4.29 to 1
UH and ULH	Solo	3 Speed	22	3.90 to 1
		4 Speed	23	3.73 to 1
	Sidecar	3 Speed—Reverse	19	4.51 to 1
		4 Speed	20	4.29 to 1

GASOLINE AND OIL CAPACITIES

MODEL	74" AND 80" SIDE VALVE	61" AND 74" O.H.V.
Left Gasoline Tank	2 U.S. Gallons	2 U.S. Gallons
Right Gasoline Tank	2 U.S. Gallons	1¼ U.S. Gallons
Reserve Gasoline Supply (included above)	Approximately 1 U.S. Gallon	Approximately 1 U.S. Gallon
Oil Tank	1 U.S. Gallon	1 U.S. Gallon
Transmission	1½ U.S. Pints	1½ U.S. Pints

Memoranda

INSTRUMENT PANEL SIGNAL LIGHTS

1946 and Earlier Models: Green light in left side of instrument panel indicates whether or not generator is charging.

Red light in right side of instrument panel indicates whether or not oil is circulating.

1947 Models: Red light marked "GEN" in center of instrument panel indicates whether or not generator is charging.

Red light marked "OIL" in center of instrument panel indicates whether or not oil is circulating.

All Models: When switch is turned "ON" preparatory to starting engine, both lights should go "ON." (Exception: When switch is turned "ON" immediately after engine has been primed by cranking, oil pressure signal may not light, but will light after a few seconds. This is due to oil pressure built up by cranking and is most likely to be noticed in cold weather.)

With engine started and running at a fair idling speed, both lights should go "OFF." At slow idling speed or under about 20 miles per hour road speed in high gear, generator signal will normally flash "ON" and "OFF" because at that speed generator output is very low and unsteady.

Should generator signal fail to go "OFF" at speeds above approximately 20 miles per hour, generator is either not charging at all or its output is not up to normal and it should be inspected at once.

Should oil circulation signal fail to go "OFF" at speeds above idling, it is most likely due to: empty oil tank; oil supply badly diluted, or using very light grade of oil and pump not building up normal pressure; if freezing weather, oil feed pipe may be clogged with ice or sludge. However, it may be: grounded oil signal switch wire, faulty signal switch; or oil pump in bad order. Give due attention to oil supply and, if signal still does not operate normally, check to see if oil returns to tank. To do this, remove oil tank cap and, with engine running, look for pulsating return of oil. A small flashlight is an aid in making this check. If oil is returning, motorcycle can be driven slowly, but no further than absolutely necessary before checking and servicing oiling system. If oil is not returning, do not drive further before having the fault corrected; as engine is likely to be damaged.

STARTING ENGINE

When starting engine, gear shifter handle must be in neutral and clutch fully engaged. Spark should be fully advanced or nearly so.

Note: Choke lever positions are as follows:

O.H.V. Engine: Choke lever all the way down, choke is "closed"; choke lever all the way up, choke is "open."

Side Valve Engine: Choke lever all the way up, choke is "closed"; choke lever all the way down, choke is "open."

All Models: Starting Cold Engine: Set choke lever in fully-closed position, open throttle wide, and with ignition switch "OFF," prime cylinders by operating starter crank once or twice.

Then, with choke lever set $\frac{1}{4}$ or $\frac{1}{2}$ closed in mild weather, $\frac{3}{4}$ or fully closed in extremely cold weather, and throttle slightly open, turn ignition switch "ON" and start engine with vigorous strokes of starter.

CAUTION: It is only in extremely cold weather that engine may start best with choke fully closed, and even then, it will have to be moved from this position immediately after engine starts. Under no conditions will engine continue to run with full choke.

As soon as engine starts, set throttle for moderate idling speed while warming up or until ready to set motorcycle in motion.

As engine warms up and misfires due to an over-rich mixture, gradually move choke lever toward open position. After engine has thoroughly warmed up, move choke lever to fully open position.

Starting Warm Engine: This applies to engine half way between hot and cold. Move choke lever to $\frac{1}{4}$ closed position and with throttle closed, operate starter once or twice. Then, with throttle $\frac{1}{4}$ to $\frac{1}{2}$ open, turn ignition switch "ON" and operate starter. Soon after engine starts, choke lever should be moved back to fully open position. Remember: This procedure calls for having throttle part way open during starting strokes after switch has been turned "ON."

Starting Hot Engine: If engine has been shut off for only a brief period and is at about normal running temperature, it is not necessary to use choke lever. Simply close throttle, turn ignition switch "ON" and operate starter. With some engines, depending on carburetor adjustment, hot starting is more dependable if starter is given one stroke before turning ignition switch "ON."

When a hot engine does not start readily, that is, with two or three starter strokes, it is usually due to an over-rich (flooded) condition, and the proper procedure then is to open throttle wide so more air can enter, closing it quickly as engine starts.

TO STOP ENGINE

Stop engine by turning ignition switch "OFF." If engine should be stalled or stopped in any other way than with switch, turn switch "OFF" at once to prevent battery from being discharged through circuit breaker points.

Don't idle engine unnecessarily with motorcycle standing.

RUNNING IN NEW ENGINE

Don't run new motorcycle faster than 35 miles per hour the first 250 miles; 40 miles per hour the second 250 miles; 45 miles per hour (sidecar) or 50 miles per hour (solo) the next 500 miles. Avoid running at or near top speed for long distances below 2000 miles.

After a new motorcycle has been run 500 to 1000 miles it needs to be thoroughly checked over and any loose screws and nuts tightened. Particular attention must be given to those that secure engine and transmission; also to wheel mounting socket screws. See that this attention is given.

Both chains should be checked for ample lubrication.

HIGH SPEED TIPS

Develop the habit of frequently snapping throttle shut for an instant when running at high speed. This draws additional lubrication to pistons and cylinders and helps cooling.

In cold weather run engine slowly until it is thoroughly warmed up, to avoid possible damage to piston rings, pistons and other parts before oil is warm enough to circulate freely.

A motorcycle run long distances at high speed must be given closer than ordinary attention to avoid overheating and possible consequent damage. Engine must be kept well tuned, especially as concerns valve seating, good compression, spark plugs and ignition timing. Carburetor should be adjusted moderately rich, rather than too lean. This applies particularly when motorcycle is equipped with handlebar windshield and legshields.

TROUBLE CHART

Engine

Note: Too frequently, spark plugs and or ignition coil are thought to be defective when engine starts hard, runs irregularly, or fails to start.

Sometimes when a spark plug fails to function normally, it is the result of an accumulation of dirt on plug core which becomes a conductor when damp or wet, allowing spark to jump from cable terminal to plug base, instead of across electrodes in combustion chamber. Under such a condition, wiping plug core clean with a dry rag will allow plug to function normally.

An ignition coil suspected of being defective may only need new spark plug cables installed. Cable insulation eventually deteriorates and sometimes cracks at the point where cable enters coil case. Spark may then jump from cable to cable packing nut (on coil case) instead of across electrodes in combustion chamber, especially if cables are damp or wet.

If engine starts hard:

1. Spark plugs in bad condition, or partially fouled.
2. Spark plug cables in bad condition and "leaking."
3. Circuit breaker points out of adjustment or in need of cleaning.
4. Battery nearly discharged.
5. Loose wire connection at one of battery terminals or at coil or circuit breaker.
6. Carburetor not adjusted correctly.

7. Defective ignition coil.
8. Defective condenser.

If engine starts but runs irregularly or misses:

1. Spark plugs in bad condition, or partially fouled.
2. Spark plug cables in bad condition and "leaking."
3. Spark plug gap too close.
4. Circuit breaker points out of adjustment or in need of cleaning.
5. Condenser connections loose.
6. Defective ignition coil.
7. Defective condenser.
8. Battery nearly discharged.
9. Loose wire connection at one of battery terminals or at coil or circuit breaker.
10. Intermittent short circuit due to damaged wiring insulation.
11. Water or dirt in fuel system and carburetor.
12. Gasoline tank cap vent plugged and tank air bound.
13. Carburetor not adjusted correctly.
14. Weak or broken valve springs.

If engine fails to start, it may be due to one or more of the following conditions:

1. Gasoline tank empty.
2. Gasoline valve shut off.
3. Gasoline line clogged.
4. Discharged battery or loose or broken battery terminal connection. Check by turning light switch "ON."
5. Fouled spark plugs.
6. Spark plug cables in bad condition and "leaking."
7. Badly oxidized ignition circuit breaker points.
8. Circuit breaker points badly out of adjustment.
9. Loose wire connection at one of battery terminals or at coil or circuit breaker.
10. Defective ignition coil.
11. Defective condenser.
12. Clutch slipping and starter not turning engine over.
13. Sticking valves, or tappets too tight.
14. Engine flooded with gasoline as a result of over-choking.

If a spark plug fouls repeatedly:

1. Too cold a plug for the kind of service or for type of engine.
2. Piston rings badly worn or in bad condition otherwise.
3. Oil pump improperly adjusted—oil pressure too high.
4. O.H.V. Engine—intake valve spring cover oil return line clogged with carbon or sludge. One or more push rod cover cork washers in bad condition or push rod covers not seating properly against cork washers.

If engine preignites:

1. Excessive carbon deposit on piston head or in combustion chamber.

2. Too hot a spark plug for the kind of service or for type of engine.
3. Defective spark plugs.

If engine overheats:

1. Insufficient oil supply, or oil not circulating.
2. Leaking valves.
3. Heavy carbon deposit.
4. Carburetor high speed adjustment too lean.
5. Ignition timing too late.

If engine detonates:

1. Unsuitable fuel (octane rating too low).
2. Heavy deposit of carbon on piston head and in combustion chamber (decreases combustion space, thereby increasing compression ratio. The higher the compression ratio, the higher the octane rating of fuel required).

If oil does not return to oil tank:

1. Oil tank empty.
2. Scavenger pump gear key sheared.
3. Oil feed pump not functioning.

If engine uses too much oil:

1. Breather valve incorrectly timed.
2. Oil pressure too high—readjust oil pump.
3. Piston rings badly worn or in bad condition otherwise.
4. O.H.V. Engine—intake valve spring cover oil return line clogged with carbon or sludge. One or more push rod cover cork washers in bad condition or a push rod cover not seating properly against its washer.
5. Chain oiler adjusting screw adjusted for an excessive amount of oil.

Excessive vibration:

1. Cylinder bracket loose or broken.
2. Engine mounting bolts loose.
3. Broken frame.
4. Front chain badly worn, or links tight as a result of insufficient lubrication.
5. Transmission and/or transmission sub-mounting plate loose in chassis.

Generator

If generator does not charge:

1. Brushes badly worn.
2. Brushes sticking in holders.
3. Relay, or current and voltage regulator, not grounded.
4. Defective relay or current and voltage regulator.
5. Commutator dirty or oily.
6. Positive brush holder grounded.
7. Generator "relay" terminal grounded.
8. Loose or broken wire in generator-battery circuit.
9. Broken field coil wire or loose terminal (both coils).

10. Commutator shorted.
11. Defective armature.

If generator charging rate is below normal:

1. Regulating brush not properly adjusted.
2. Current and voltage regulator not properly adjusted.
3. Broken field coil wire or loose terminal (one coil).
4. Commutator worn and not turning true with shaft—throws brushes at high speed.
5. Commutator dirty or oily.
6. Brushes gummy and sluggish in holders.
7. Defective armature.

Carburetor

If carburetor floods:

1. Float set too high.
2. Float valve sticking.
3. Float valve and/or valve seat worn or damaged.
4. Dirt or other foreign matter between float valve and its seat.
5. Carburetor float not located correctly in bowl—may be binding.

Transmission

If transmission shifts hard:

1. Bent shifter rod.
2. Clutch dragging slightly.
3. Transmission oil too heavy (winter operation).
4. Shifter forks (inside transmission) sprung as a result of using too much force when shifting.
5. Corners worn off shifter clutch dogs (inside transmission)—makes engagement difficult.

If transmission jumps out of gear:

1. Shifter rod improperly adjusted.
2. Shifter forks (inside transmission) improperly adjusted.
3. Shifter engaging parts (inside transmission) badly worn and rounded.

If clutch slips:

1. Clutch controls improperly adjusted.
2. Insufficient clutch spring tension.
3. Worn and/or oil soaked friction discs.

If clutch drags or does not release:

1. Clutch controls improperly adjusted.
2. Clutch spring tension too tight.
3. Friction discs gummy.
4. Clutch key ring badly worn.

If clutch chatters:

1. Clutch disc rivets loose.
2. Clutch sprung disc too flat.

(Continued on next page)

Brakes

If brake does not hold normally:

1. Brake improperly adjusted.
2. Brake controls binding as result of improper lubrication, or being damaged.
3. Brake linings impregnated with grease as result of overgreasing wheel hub and/or brake operating shaft.
4. Brake linings badly worn.
5. Brake drum badly worn and/or scored.

GENERAL LUBRICATION

Refer to Lubrication Chart

Special Instructions

Note: If predominating service conditions are either wet or muddy, or very dusty, the 750 and 1500 mile greasing intervals should be reduced to 500 and 1000 miles respectively.

- 15—Every 5000 miles, or at least once a year, pack generator commutator end bearing with high melting point grease (Harley-Davidson grade "A" grease). See "Lubricating Commutator End Armature Bearing," Page 105.
- 16—Lubricate front wheel brake handlever and control cable every 750 miles or whenever operation of brake indicates lubrication is necessary.
- 17-21—Twice a year, or whenever operation of grips indicates lubrication is necessary, remove grips and clean parts, then apply grease (Harley-Davidson "Chassis" grease) and reassemble. See "Servicing Handlebar Controls," Page 25.
- 18—If engine is equipped with air cleaner, wash with gasoline or solvent, and reoil, at least each time engine oil tank is drained and refilled. Service more frequently under dusty conditions; daily under extremely dusty conditions. See "Servicing Air Cleaner," Page 10.
- 19—Drain engine oil tank and refill with fresh oil at least every 2000 miles. In dusty service, and in winter weather, change oil oftener. See "Engine Lubrication," Page 33, and very carefully read complete information given.
- 20—Pack steering head bearings with high melting point grease (Harley-Davidson grade "A" grease) every 50,000 miles, or whenever there is occasion to remove rigid fork for repair or replacement of parts. See "Removing and Installing Forks," Page 153.
- 22—Remove filler plug and check transmission oil level every two weeks or every 1000 miles, whichever comes first, and add oil if necessary. Fill to level of filler opening. See "Transmission Lubrication," Page 144.

CONTROLS: To keep controls working freely, all control joints which are not provided with grease fitting should be oiled regularly with oil can, particularly after washing motorcycle or operating in wet weather. Spark, throttle and front brake control wires should also be oiled at ends of control wire housings near circuit breaker, carburetor and front brake respectively.

DRIVE CHAINS: (See "Lubricating Drive Chains," Page 12).

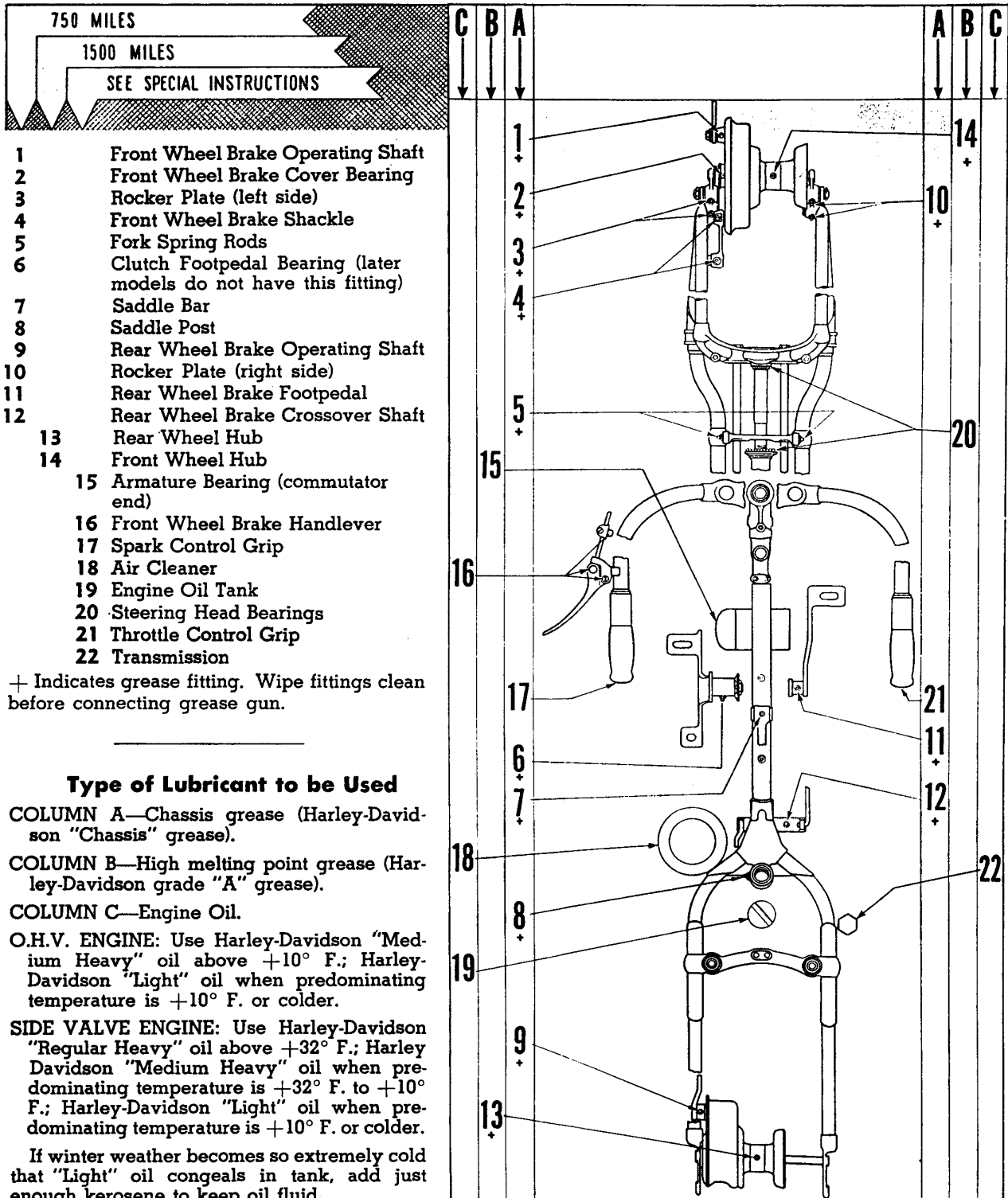
CIRCUIT BREAKER CAM: Apply a very light coating of grease to cam every 1000 miles.

SPEEDOMETER: Every 15,000 miles lubricate speedometer core. This necessitates removing speedometer head, disconnecting core housing from transmission and removing core. Place about a tablespoonful of special speedometer core lubricant in one hand and feed core through the grease and into the housing. Under no circumstances should housing be filled with grease. See "Removing and Installing Speedometer Head and Drive Core," Page 161.

SIDECAR: Four grease fittings are provided. One at each end of frame rear cross tube (brake cross shaft bearings); one on brake side cover (brake operating shaft); one on wheel hub. Lubricate hub at 1500 mile intervals; other bearings at 750 mile intervals. Oil sidecar brake linkage regularly with oil can.

Be careful about over-greasing wheel hubs, brake operating shafts and front wheel brake cover bushing, as excess grease working out of these bearings or bushings not only develops a messy condition, but is also likely to get onto brake linings, which will greatly reduce efficiency of brakes.

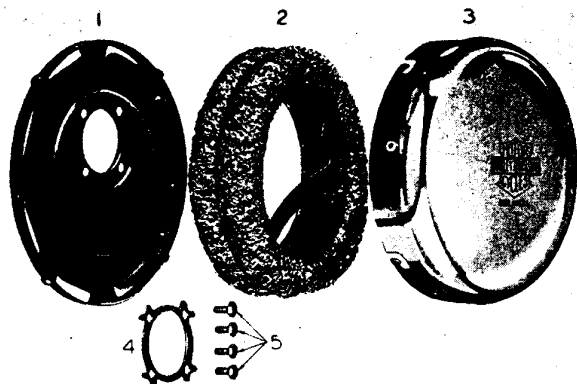
LUBRICATION CHART



ILLUS. 1

SERVICING AIR CLEANER

Mesh Pack Type Cleaner



ILLUS. 2
AIR CLEANER DISASSEMBLED (MESH PACK TYPE)

1. Air cleaner back plate.
2. Air cleaner mesh with support.
3. Air cleaner cover.
4. Air cleaner mounting screw lock.
5. Air cleaner mounting screws.

In normal service on hard surface roads, it is important that the air cleaner metal mesh be removed, washed thoroughly in gasoline or kerosene (or solvent), and then saturated with same grade of new oil as used in engine at least once every 1000 miles. In dusty service this attention should be given more frequently and in extremely dusty service every 100 miles or at least once a day.

To remove air cleaner cover, press inward and turn counter-clockwise. After mesh pack has been cleaned in gasoline or kerosene (or solvent), dip it in engine oil and allow excess oil to drain off, then reassemble and attach mesh pack assembly and cover by reversing removal operations. Cover must be attached with drain hole at bottom.

Oil Bath Type Cleaner

A few motorcycles are in service equipped with an oil bath type air cleaner.

Clean and refill air cleaner oil cup at least each time engine oil tank is drained and refilled. Service frequently under dusty conditions.

Remove oil cup and baffle, thoroughly clean them and refill to indicated level with same grade of new oil as used in engine. Do not fill oil cup above indicated oil level as a higher level will restrict passage of air through cleaner and upset carburetion to the extent that engine may not start at all, or at best run very irregularly. The effect is the same as running with choke partially or fully closed.

When reassembling, observe that oil cup gasket is in place and make sure oil cup and baffle are properly seated against gasket and secured to cleaner housing. Careless assembly is likely to result in an oil leak between cup and cleaner housing and possibly a lost cup.

Occasionally, at time of servicing oil cup, complete cleaner should be removed from motorcycle and immersed for a time in a bucket of gasoline or kerosene (or solvent). Cleaner element, which cannot be removed from housing, must be thoroughly flushed to wash out accumulated dirt. After flushing, dry thoroughly (use an air hose if available) and apply a few squirts of engine oil to inside of cleaner element, using oil can.

Note: Observe instructions on air cleaner body.

INITIAL SERVICING OF NEW MOTORCYCLE

At First 250 Miles

1. At the first 250 miles, check front chain to make sure it is receiving required amount of oil for ample lubrication. If necessary, readjust chain oiler. See "Lubricating Drive Chains," Page 12. Note: If motorcycle is equipped with rear chain oiler, instructions that apply to checking front chain lubrication, also apply to rear chain.
2. Check adjustment of chains. Readjust if needed.

At First 750 Miles

1. Drain oil tank and refill with fresh oil. Thereafter, in average service change oil at intervals not exceeding 2000 miles. In extremely dusty serv-
- ice, or when service is exceptionally hard, also in winter weather, oil must be changed at much shorter than normal intervals. See "Engine Lubrication," Page 33.
2. Check level of oil in transmission and add oil if needed. Use same grade of oil used in engine. See "Transmission Lubrication," Page 144.
3. Lubricate all points indicated for 750 mile attention on Lubrication Chart.
4. Oil all control joints, namely, clutch, gear shifter, brakes, front brake control wire, and spark and throttle control wires at ends of their respective housings.
5. If motorcycle is equipped with air cleaner, inspect and service if needed. See "Servicing Air Cleaner."

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