

2002 FLT MODELS

SERVICE MANUAL

Part Number 99483-02

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Section 2: Chassis

Section 3: Engine

Section 4: Fuel System

Section 5: Starter

Section 6: Drive

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Section 8: Electrical

Section 9: Fuel Injection

Appendix

ELECTRICAL DIAGNOSTICS

Part Number 99497-02

Section 1: Starting & Charging

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GENERAL

The following check list of possible operating troubles and their probable causes will be helpful in keeping your motorcycle in good operating condition. More than one of these conditions may be causing the trouble and all should be carefully checked.

WARNING

The troubleshooting section of this manual is intended solely as a guide to diagnosing problems. Carefully read the appropriate sections of this manual before performing any work. Improper repair and/or maintenance could result in death or serious injury.

ENGINE

Starter Motor Does Not Operate or Does Not Turn Engine Over

1. Ignition/Light Key Switch not in IGNITION position.
2. Engine Stop switch in the OFF position.
3. Discharged battery, loose or corroded connections (solenoid chatters).
4. Bank Angle Sensor tripped and Ignition/Light Key Switch not cycled to OFF and then back to IGNITION.
5. Starter control circuit, relay or solenoid faulty.
6. Electric starter shaft pinion gear not engaging or over-running clutch slipping.

Engine Turns Over But Does Not Start

1. Fuel tank empty.
2. Fuel supply valve turned to OFF.
3. Fouled spark plugs.
4. Engine flooded with gasoline as a result of over use of enrichener.
5. Fuel valve or filter clogged.
6. Vacuum hose to automatic fuel supply valve disconnected, leaking or pinched.
7. Discharged battery, loose or broken battery terminal connections.
8. Loose wire connection at coil, battery or plug between ignition sensor and module.
9. Spark plug cables in bad condition and shorting, cable connections loose, or cables connected to wrong cylinders.

10. Ignition timing incorrect due to faulty ignition coil, ignition module or sensors (MAP, CMP, CKP and/or BAS).
11. Engine lubricant too heavy (winter operation).

NOTE

Always disengage clutch for cold weather starts.

12. Sticking or damaged valve or push rod wrong length.
13. Primary cam sprocket spline sheared or missing spacer.

Starts Hard

1. Spark plugs in bad condition, have improper gap or are partially fouled.
2. Spark plug cables in bad condition.
3. Battery nearly discharged.
4. Loose wire connection at one of the battery terminals, ignition coil or plug between ignition sensor and module.
5. Carburetor controls not adjusted correctly.
6. Water or dirt in fuel system and carburetor.
7. Intake air leak.
8. Fuel tank vent hose and vapor valve plugged, or carburetor fuel line closed off and restricting fuel flow.
9. Enrichener valve inoperative.
10. Engine lubricant too heavy (winter operation).

NOTE

Always disengage clutch for cold weather starts.

11. Ignition not functioning properly (possible sensor failure).
12. Faulty ignition coil.
13. Valves sticking.

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 or too wide.
4. Faulty ignition coil, module and/or sensor.
5. Battery nearly discharged.
6. Damaged wire or loose connection at battery terminals, ignition coil, or plug between ignition sensor and module.
7. Intermittent short circuit due to damaged wire insulation.
8. Water or dirt in fuel system, carburetor or filter.
9. Fuel tank vent system plugged or carburetor vent line closed off.
10. Carburetor controls misadjusted.
11. Damaged carburetor.
12. Loose or dirty ignition module connector at crankcase.

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13. Faulty MAP, CKP and/or CMP Sensors.
14. Incorrect valve timing.
15. Weak or broken valve springs.
16. Damaged intake or exhaust valve.

A Spark Plug Fouls Repeatedly

1. Fuel mixture too rich or enricher left out too long.
2. Incorrect spark plug for the kind of service.
3. Piston rings badly worn or broken.
4. Valve guides or seals badly worn.

Pre-Ignition or Detonation (Knocks or Pings)

1. Fuel octane rating too low.
2. Faulty spark plugs.
3. Incorrect spark plug for the kind of service.
4. Excessive carbon deposit on piston head or in combustion chamber.
5. Ignition timing advanced due to faulty sensor inputs (MAP, CKP, CMP).

Overheating

1. Insufficient oil supply or oil not circulating.
2. Insufficient air flow over engine.
3. Heavy carbon deposit.
4. Ignition timing retarded due to faulty MAP, CKP and/or CMP Sensors.
5. Leaking valve.

Valve Train Noise

1. Low oil pressure caused by oil feed pump not functioning properly or oil passages obstructed.
2. Faulty hydraulic lifters.
3. Bent push rod.
4. Incorrect push rod length.
5. Rocker arm binding on shaft.
6. Valve sticking in guide.
7. Chain tensioner spring or shoe worn.

Excessive Vibration

1. Wheels and/or tires worn or damaged.
2. Engine/transmission/vehicle not aligned properly.
3. Primary chain badly worn or links tight as a result of insufficient lubrication or misalignment.
4. Engine to transmission mounting bolts loose.
5. Upper engine mounting bracket loose.
6. Ignition timing incorrect/poorly tuned engine.
7. Internal engine problem.
8. Broken frame.

9. Stabilizer links worn or loose.
10. Rubber mounts loose or worn.
11. Rear fork pivot shaft nuts loose.
12. Front engine mounting bolts loose.

Check Engine Lamp Illuminates During Operation

1. Fault detected. Check for trouble codes.

LUBRICATION SYSTEM

Oil Does Not Return To Oil Pan

1. Oil pan empty.
2. Oil pump not functioning.
3. Restricted oil lines or fittings.
4. Restricted oil filter.
5. O-ring damaged or missing from oil pump/crankcase junction (also results in poor engine performance).

Engine Uses Too Much Oil Or Smokes Excessively

1. Oil pan overfilled.
2. Restricted oil return line to pan.
3. Restricted breather operation.
4. Restricted oil filter.
5. Piston rings badly worn or broken.
6. Valve guides or seals worn.
7. O-ring damaged or missing from oil pump/crankcase junction (also results in poor engine performance).

Engine Leaks Oil From Case, Push Rods, Hoses, Etc.

1. Loose parts.
2. Imperfect seal at gaskets, push rod cover, washers, etc.
3. Restricted oil return line to pan.
4. Restricted breather hose to air cleaner.
5. Restricted oil filter.
6. Oil pan overfilled.
7. Rocker housing gasket (bottom) installed upside down.

Low Oil Pressure

1. Oil pan underfilled.
2. Faulty low oil pressure switch.
3. Oil pump O-ring(s) damaged or missing.
4. Oil pressure relief valve stuck in open position.
5. Ball missing from cam support plate.

High Oil Pressure

1. Oil pan overfilled.
2. Oil pressure relief valve stuck in closed position.

ELECTRICAL SYSTEM

Alternator Does Not Charge

1. Module not grounded.
2. Engine ground wire loose or broken.
3. Faulty regulator-rectifier module.
4. Loose or broken wires in charging circuit.
5. Faulty stator and/or rotor.

Alternator Charge Rate Is Below Normal

1. Weak or damaged battery.
2. Loose connections.
3. Faulty regulator-rectifier module.
4. Faulty stator and/or rotor.

Speedometer Operates Erratically

1. Contaminated speedometer sensor (remove sensor and clean off metal particles).
2. Loose connections.

CARBURETOR

Carburetor Floods

1. Dirt or other foreign matter between valve and its seat.
2. Inlet valve sticking.
3. Inlet valve and/or valve seat worn or damaged.
4. Float misadjusted.
5. Leaky or damaged float.
6. Excessive "pumping" of hand throttle grip.
7. See TROUBLESHOOTING CHART in Section 4.

TRANSMISSION

Transmission Shifts Hard

1. Clutch dragging slightly.
2. Primary chaincase overfilled with lubricant.
3. Corners worn off shifter clutch dogs.
4. Shifter return spring bent or broken.
5. Bent shifter rod.
6. Shifter forks sprung.
7. Transmission lubrication too heavy (winter operation).

Jumps Out Of Gear

1. Shifter rod improperly adjusted.
2. Shifter drum improperly adjusted or damaged.
3. Shifter engaging parts (inside transmission) badly worn and rounded.
4. Shifter forks bent.
5. Damaged gears.

Clutch Slips

1. Clutch controls improperly adjusted.
2. Insufficient clutch spring tension.
3. Worn friction discs.

Clutch Drags Or Does Not Release

1. Clutch controls improperly adjusted.
2. Lubricant level too high in primary chaincase.
3. Primary chain badly misaligned.
4. Clutch discs warped.
5. Insufficient clutch spring tension.

Clutch Chatters

1. Friction discs or steel discs worn or warped.

BRAKES

Brake Does Not Hold Normally

1. Master cylinder reservoir low on fluid.
2. Brake system contains air bubbles.
3. Master or wheel cylinder piston worn or parts damaged.
4. Brake pads contaminated with grease or oil.
5. Brake pads badly worn- friction material 0.04 inch (1.02 mm) thick or less.
6. Brake disc badly worn or warped.
7. Brake fades due to heat build up – brake pads dragging or excessive braking.
8. Brake drags – insufficient brake pedal free play.

HANDLING

Irregularities

1. Improperly loaded motorcycle. Non-standard equipment on the front end such as heavy radio receivers, extra lighting equipment or luggage tends to cause unstable handling.
2. Incorrect air suspension pressure.
3. Damaged tire(s) or improper front-rear tire combination.
4. Irregular or peaked front tire tread wear.

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5. Incorrect tire pressure.
6. Shock absorber not functioning normally.
7. Loose wheel axle nuts. Tighten to recommended tightness.
8. Excessive wheel hub bearing play.
9. Improper vehicle alignment.
10. Steering head bearings improperly adjusted. Correct adjustment and replace pitted or worn bearings and races.
11. Tire and wheel unbalanced.
12. Rims and tires out-of-round or eccentric with hub.
13. Rims and tires out-of-true sideways.
14. Shock absorber improperly adjusted.
15. Worn engine stabilizer links.
16. Damaged rear engine isolation mounts.
17. Swing arm pivot shaft nut improperly tightened or assembled.

REPAIR NOTES

General maintenance practices are given in this section. All special tools and torque values are noted at the point of use and all required parts or materials can be found in the appropriate PARTS CATALOG.

Safety

Safety is always the most important consideration when performing any job. Be sure you have a complete understanding of the task to be performed. Use common sense. Use the proper tools. Don't just do the job – do the job safely.

Removing Parts

Always consider the weight of a part when lifting. Use a hoist whenever necessary. Do not lift heavy parts by hand. A hoist and adjustable lifting beam or sling are needed to remove some parts. The lengths of chains or cables from the hoist to the part should be equal and parallel, and should be positioned directly over the center of the part. Be sure that no obstructions will interfere with the lifting operation. Never leave a part suspended in mid-air.

Always use blocking or proper stands to support the part that has been hoisted. If a part cannot be removed, verify that all bolts and attaching hardware have been removed. Check to see if any parts are in the way of the part being removed.

When removing hoses, wiring or tubes, always tag each part to ensure proper installation.

Cleaning

If you intend to reuse parts, follow good shop practice and thoroughly clean the parts before assembly. Keep all dirt out of parts; the unit will perform better and last longer. Seals, filters and covers are used in this vehicle to keep out environmental dirt and dust. These items must be kept in good condition to ensure satisfactory operation.

Clean and inspect all parts as they are removed. Be sure all holes and passages are clean and open. After cleaning, cover all parts with clean lint-free cloth, paper or other material. Be sure the part is clean when it is installed.

Always clean around lines or covers before they are removed. Plug, tape or cap holes and openings to keep out dirt, dust and debris.

Disassembly and Assembly

Always assemble or disassemble one part at a time. Do not work on two assemblies simultaneously. Be sure to make all necessary adjustments. Recheck your work when finished. Be sure that everything is done.

Operate the vehicle to perform any final check or adjustments. If all is correct, the vehicle is ready to go back to the customer.

Checking Torques on Fasteners with Lock Patches

To check the torque on a fastener that has a lock patch:

1. Set the torque wrench for the lowest setting in the specified torque range.
2. Attempt to tighten fastener to set torque. If fastener does not move and lowest setting is satisfied (torque wrench clicks), then the proper torque has been maintained.

REPAIR AND REPLACEMENT PROCEDURES

Hardware and Threaded Parts

Install helical thread inserts when inside threads in castings are stripped, damaged or not capable of withstanding specified torque.

Replace bolts, nuts, studs, washers, spacers and small common hardware if missing or in any way damaged. Clean up or repair minor thread damage with a suitable tap or die.

Replace all damaged or missing lubrication fittings.

Use Teflon tape on pipe fitting threads.

Wiring, Hoses and Lines

Replace hoses, clamps, electrical wiring, electrical switches or fuel lines if they do not meet specifications.

Instruments and Gauges

Replace broken or defective instruments and gauges. Replace dials and glass that are so scratched or discolored that reading is difficult.

Bearings

Anti-friction bearings must be handled in a special way. To keep out dirt and abrasives, cover the bearings as soon as they are removed from the package.

Wash bearings in a non-flammable cleaning solution. Knock out packed lubricant inside by tapping the bearing against a wooden block. Wash bearings again. Cover bearings with clean material after setting them down to dry. Never use compressed air to dry bearings.

Coat bearings with clean oil. Wrap bearings in clean paper.

Be sure that the chamfered side of the bearing always faces the shoulder (when bearings installed against shoulders). Lubricate bearings and all metal contact surfaces before pressing into place. Only apply pressure on the part of the bearing that makes direct contact with the mating part.

Always use the proper tools and fixtures for removing and installing bearings.

Bearings do not usually need to be removed. Only remove bearings if necessary.

Bushings

Do not remove a bushing unless damaged, excessively worn or loose in its bore. Press out bushings that must be replaced.

When pressing or driving bushings, be sure to apply pressure in line with the bushing bore. Use a bearing/bushing driver or a bar with a smooth, flat end. Never use a hammer to drive bushings.

Inspect the bushing and the mated part for oil holes. Be sure all oil holes are properly aligned.

Gaskets

Always discard gaskets after removal. Replace with new gaskets. Never use the same gasket twice. Be sure that gasket holes match up with holes in the mating part.

If a gasket must be made, be sure to cut holes that match up with the mating part. Serious vehicle damage can occur if any flange holes are blocked by the gasket. Use material that is the right type and thickness.

Lip Type Seals

Lip seals are used to seal oil or grease and are usually installed with the sealing lip facing the contained lubricant. Seal orientation, however, may vary under different applications.

Seals should not be removed unless necessary. Only remove seals if required to gain access to other parts or if seal damage or wear dictates replacement.

Leaking oil or grease usually means that a seal is damaged. Replace leaking seals to prevent overheated bearings.

Always discard seals after removal. Do not use the same seal twice.

O-Rings (Preformed Packings)

Always discard O-rings after removal. Replace with new O-rings. To prevent leaks, lubricate the O-rings before installation. Apply the same type of lubricant as that being sealed. Be sure that all gasket, O-ring and seal mating surfaces are thoroughly clean before installation.

Gears

Always check gears for damaged or worn teeth.

Remove burrs and rough spots with a honing stone or crocus cloth before installation. Lubricate mating surfaces before pressing gears on shafts.

Shafts

If a shaft does not come out easily, check that all nuts, bolts or retaining rings have been removed. Check to see if other parts are in the way before using force.

Shafts fitted to tapered splines should be very tight. If shafts are not tight, disassemble and inspect tapered splines. Discard parts that are worn. Be sure tapered splines are clean, dry and free of burrs before putting them in place. Press mating parts together tightly.

Clean all rust from the machined surfaces of new parts.

Part Replacement

Always replace worn or damaged parts with new parts.

CLEANING

Part Protection

Before cleaning, protect rubber parts (such as hoses, boots and electrical insulation) from cleaning solutions. Use a grease-proof barrier material. Remove the rubber part if it cannot be properly protected.

Cleaning Process

Any cleaning method may be used as long as it does not result in parts damage. Thorough cleaning is necessary for proper parts inspection. Strip rusted paint areas to bare metal before repainting.

Rust or Corrosion Removal

Remove rust and corrosion with a wire brush, abrasive cloth, sand blasting, vapor blasting or rust remover. Use buffing crocus cloth on highly polished parts that are rusted.

Bearings

Remove shields and seals from bearings before cleaning. Clean bearings with permanent shields and seals in solution.

Clean open bearings by soaking them in a petroleum cleaning solution. Never use a solution that contains chlorine.

Let bearings stand and dry. Do not dry using compressed air. Do not spin bearings while they are drying.

AIR TOOLS

- Always use approved eye protection equipment when performing any task using air-operated tools.
- On all power tools, use only recommended accessories with proper capacity ratings.
- Do not exceed air pressure ratings of any power tools.
- Bits should be placed against work surface before air hammers are operated.
- Disconnect the air supply line to an air hammer before attaching a bit.
- Never point an air tool at yourself or another person.
- Protect bystanders with approved eye protection.

WRENCHES

- Never use an extension on a wrench handle.
- If possible, always pull on a wrench handle and adjust your stance to prevent a fall if something lets go.
- Never cock a wrench.
- Never use a hammer on any wrench other than a Striking Face wrench.
- Discard any wrench with broken or battered points.
- Never use a pipe wrench to bend, raise, or lift a pipe.

PLIERS/CUTTERS/PRYBARS

- Plastic or vinyl covered pliers handles are not intended to act as insulation; don't use on live electrical circuits.
- Don't use pliers or cutters for cutting hardened wire unless they were designed for that purpose.
- Always cut at right angles.
- Don't use any prybar as a chisel, punch, or hammer.

HAMMERS

- Never strike one hammer against a hardened object, such as another hammer.
- Always grasp a hammer handle firmly, close to the end.
- Strike the object with the full face of the hammer.
- Never work with a hammer which has a loose head.
- Discard hammer if face is chipped or mushroomed.
- Wear approved eye protection when using striking tools.
- Protect bystanders with approved eye protection.

PUNCHES/CHISELS

- Never use a punch or chisel with a chipped or mushroomed end; dress mushroomed chisels and punches with a file.
- Hold a chisel or a punch with a tool holder if possible.
- When using a chisel on a small piece, clamp the piece firmly in a vise, and chip toward the stationary jaw.
- Wear approved eye protection when using these tools.
- Protect bystanders with approved eye protection.

SCREWDRIVERS

- Don't use a screwdriver for prying, punching, chiseling, scoring, or scraping.
- Use the right type of screwdriver for the job; match the tip to the fastener.
- Don't interchange POZIDRIV®, PHILLIPS®, or REED AND PRINCE screwdrivers.
- Screwdriver handles are not intended to act as insulation; don't use on live electrical circuits.
- Don't use a screwdriver with rounded edges because it will slip – redress with a file.

RATCHETS AND HANDLES

- Periodically clean and lubricate ratchet mechanisms with a light grade oil. Do not replace parts individually; ratchets should be rebuilt with the entire contents of service kit.
- Never hammer or put a pipe extension on a ratchet or handle for added leverage.
- Always support the ratchet head when using socket extensions, but do not put your hand on the head or you may interfere with the action of its reversing mechanism.
- When breaking loose a fastener, apply a small amount of pressure as a test to be sure the ratchet's gear wheel is engaged with the pawl.

SOCKETS

- Never use hand sockets on power or impact wrenches.
- Select the right size socket for the job.
- Never cock any wrench or socket.

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- Select only impact sockets for use with air or electric impact wrenches.
- Replace sockets showing cracks or wear.
- Keep sockets clean.
- Always use approved eye protection when using power or impact sockets.

STORAGE UNITS

- Don't open more than one loaded drawer at a time. Close each drawer before opening up another.
- Close lids and lock drawers and doors before moving storage units.
- Don't pull on a tool cabinet; push it in front of you.
- Set the brakes on the locking casters after the cabinet has been rolled to your work.

SCHEDULED MAINTENANCE TABLE

The scheduled maintenance table beginning on this page lists the maintenance requirements for Touring model motorcycles. If you are familiar with the procedures, just reference the table for the recommended maintenance interval as well as the required specifications. On the other hand, if more information is needed, simply turn to page 14 for the start of more detailed service procedures. For your added convenience, the adjacent chart lists the part numbers of the required lubricants.

Lubricant	Part Number
Engine Oil	See Table 1-1.
Front Fork Oil	Hydraulic Fork Oil, Type "E", H-D Part No. 99884-80/16 oz.
Silicone Brake Fluid	D.O.T. 5 Hydraulic Brake Fluid, H-D Part No. 99902-77/12 oz.
Transmission Lubricant	Semi-Synthetic Transmission Lubricant, Part Nos. 98853-96/case qt., 98852-96/case gal.
Chaincase Lubricant	Primary Chaincase Lubricant, Part Nos. 99887-84/qt., 99886-84/gal.
Clutch and Throttle Cable Lubricant	Super Oil, Part No. 94968-85TV
Steering Head Bearing Lubricant	Special Purpose Grease, Part No. 99857-97/cartridge
Electrical Contact Lubricant	Electrical Contact Grease, Part No. 99861-90

SCHEDULED MAINTENANCE TABLE																							
Service Operation	P r e r i d e	1	2	5	7	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	Service Data
		mi	mi	mi	mi	mi	mi	mi	mi	mi	mi	mi	mi	mi	mi	mi	mi	mi	mi	mi	mi	mi	
Battery		I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	Visual inspection only.	
Engine Oil (*)		I	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	I	R	Oil level Separate HOT and COLD checks per procedure. Oil capacity 4 qt. (3.8 L) per chart in procedure.	
Engine Oil Filter (*)		R		R		R		R		R		R		R		R		R		R		Hand tighten 1/2-3/4 turn after gasket contact.	

R – Replace or change I – Inspect, and if necessary, adjust, clean or replace L – Lubricate with specified lubricant
 X – Perform T – Tighten to proper torque (*) – Also perform prior to storage or annually

Service Operation	Provide																				Service Data	
	1 0	2 5 0	5 0	7 5 0	1 0	1 2 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 5 0	1 7 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2 0	2 2 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2 5 0	2 7 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3 0	3 2 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3 5 0	3 7 0	4 0	4 2 5 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4 5 0	4 7 0		5 0
Steering Head Bearing Swing-By	X				X				X				X				X				X	See Section 2.
Lubricate Steering Head Bearings			L		L		L		L		L		L		L		L		L		L	Lubricate through neck fitting with <i>Special Purpose Grease</i> , Part No. 99857-97 (cartridge)
Disassemble, Inspect and Repack Steering Head Bearings																					X	<i>Lubricant</i> Part No. 99857-97 (cartridge) See Section 2.
Brake Fluid Reservoir Level and Condition (*)	I		I		I		I		I		I		I		I		I		I		I	<i>D.O.T. 5 Brake fluid</i> Part No.'s 99902-77 (12 oz), 99901-77 (gal)
Brake Pad Linings and Discs	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	<i>Minimum brake pad thickness</i> 0.04 in. (1.02 mm)
Drive Belt	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	<i>On ground without rider</i> 5/16-3/8 in. (7.9-9.5 mm) in bottom strand with 10 lb. (4.5 kg) upward force
Rear Shock Absorbers	I		I		I		I		I		I		I		I		I		I		I	See Section 2.
Air Cleaner	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	<i>Air cleaner cover screw torque</i> 36-60 in-lbs (4-7 Nm)
Fuel Lines	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	Check for leaks.
Fuel Tank Filter									I													<i>Hex fitting torque</i> 18 ft-lbs (24 Nm)
Enrichener Control	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	I	

R – Replace or change I – Inspect, and if necessary, adjust, clean or replace L – Lubricate with specified lubricant
X – Perform T – Tighten to proper torque (*) – Also perform prior to storage or annually

NOTES

BATTERY

At every scheduled service interval, inspect the battery as follows:

1. Battery top must be clean and dry. Dirt on the top of the battery may cause the battery to self-discharge at a faster than normal rate.
2. Inspect battery screws, clamps, and cables for breakage, loose connections and corrosion. Clean clamps. Coat terminals with grease.
3. Inspect battery for discoloration, raised top, or warped case which may indicate battery has been overheated or overcharged.
4. Inspect the battery case for cracks or leaks.

NOTE

For charging information, see Section 8.9 **BATTERY, BATTERY CHARGING**.

ENGINE OIL/ENGINE OIL FILTER

At the 1000 mile (1,600 km) service interval, and at every 5000 mile (8,000 km) service interval thereafter, change the engine oil and engine oil filter as follows:

NOTE

If the motorcycle is ridden hard, under dusty conditions, or in cold weather, the oil and filter should be changed more often.

1. Ride vehicle until engine is at normal operating temperature.
2. Locate oil filler plug/dipstick on right side of vehicle at top of transmission case. To remove the oil filler plug, pull steadily while moving plug back and forth.
3. Locate oil drain plug at front left side of the oil pan. Remove the oil drain plug and allow oil to drain completely.
4. Inspect the oil drain plug O-ring for cuts, tears or signs of deterioration. Replace as necessary.
5. Remove the oil filter as follows:
 - a. Obtain the OIL FILTER WRENCH (HD-42311). The tool allows easy removal of the oil filter without risk of damage to the crankshaft position sensor or cable.
 - b. Place the jaws of the wrench over the oil filter with the tool oriented vertically. See [Figure 1-1](#).
 - c. Using a 3/8 inch drive with a 4 inch extension, turn wrench in a counterclockwise direction. Do not use with air tools.
6. Clean the oil filter mount flange of any old gasket material.

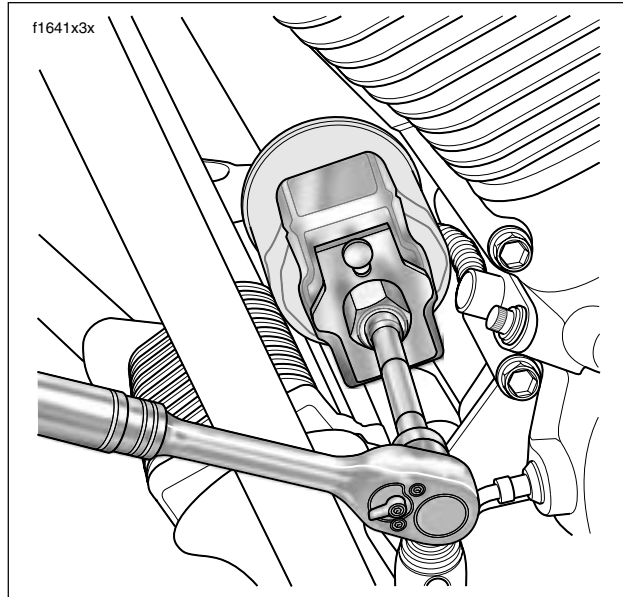


Figure 1-1. Remove Engine Oil Filter

7. Lubricate gasket with clean engine oil and install **new** oil filter on filter mount. Hand tighten oil filter 1/2-3/4 turn after gasket first contacts filter mounting surface. Do **NOT** use OIL FILTER WRENCH (HD-42311) for oil filter installation.

NOTE

Use of the Premium 10 micron synthetic media oil filter is highly recommended, Part No. 63798-99 (Chrome) or 63731-99 (Black).

8. Install engine oil drain plug and tighten to 14-21 ft-lbs (19-28 Nm).
9. With vehicle resting on jiffy stand, add 3-1/2 quarts (3.3 liters) engine oil as specified in [Table 1-1](#). Use the proper grade of oil for the lowest temperature expected before the next oil change.

Table 1-1. Recommended Engine Oils

Harley-Davidson Type	Viscosity	Harley-Davidson Rating	Lowest Ambient Temperature	Cold Weather Starts Below 50°F (10°C)
HD Multi-grade	SAE 10W40	HD 360	Below 40°F (4°C)	Excellent
HD Multi-grade	SAE 20W50	HD 360	Above 40°F (4°C)	Good
HD Regular Heavy	SAE 50	HD 360	Above 60°F (16°C)	Poor
HD Extra Heavy	SAE 60	HD 360	Above 80°F (27°C)	Poor

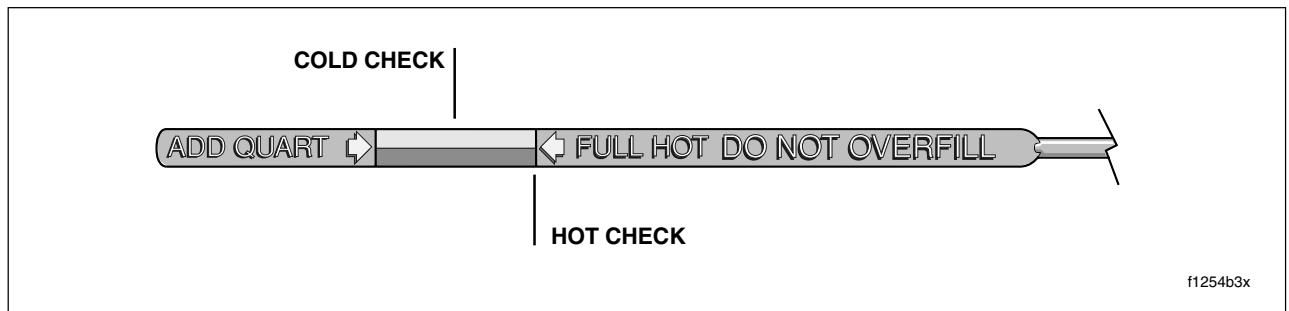


Figure 1-2. Engine Oil Dipstick

CAUTION

Oil level cannot be accurately measured on a cold engine. For preride inspection, with motorcycle leaning on jiffy stand on level ground, oil should register on dipstick between arrows when engine is cold. Do NOT add oil to bring the level to the FULL mark on a **COLD** engine.

10. Perform engine oil level **COLD CHECK** as follows:
 - a. With the vehicle resting on the jiffy stand on level ground, wipe off the dipstick and insert it back into the oil pan with the plug pushed completely into the fill spout.
 - b. Remove the dipstick and note the level of the oil. Oil level should register between the two arrows on the dipstick. See Figure 1-2. If oil level is at or below the lower arrow, add only enough oil to bring the level between the two arrows on the dipstick.
11. Perform engine oil level **HOT CHECK** as follows:
 - a. Ride vehicle until engine is at normal operating temperature.
 - b. With the vehicle resting on the jiffy stand on level ground, allow engine to idle for 1-2 minutes. Turn engine off.
 - c. Wipe off the dipstick and insert it back into the oil pan with the plug pushed completely into the fill spout.
 - d. Remove the dipstick and note the level of the oil. Add only enough oil to bring the level to the FULL mark on the dipstick. See Figure 1-2. Do not overfill.
12. Start engine and carefully check for oil leaks around drain plug and oil filter.

PRIMARY CHAIN

At the 1000 mile (1,600 km) service interval, and at every 5000 mile (8,000 km) service interval thereafter, inspect the primary chain tension and adjust if necessary.

Proceed as follows:

1. Remove seat. See Section 2.21 SEAT, REMOVAL.

WARNING

To protect against shock and accidental start-up of vehicle, disconnect the negative battery cable before proceeding. Inadequate safety precautions could result in death or serious injury.

2. Unthread bolt and remove battery negative cable (black) from battery negative (-) terminal.
3. See Figure 1-3. Using a T27 TORX drive head, remove four screws to free the primary chain inspection cover from the primary chaincase cover.
4. Check the primary chain tension. Push on the upper strand to verify that it has free up and down movement midway between the engine compensating sprocket (front) and the clutch sprocket (rear).

Table 1-2. Primary Chain Adjustment

(Free Play)	Inches	Millimeters
COLD ENGINE	5/8-7/8 inch	15.9-22.2 mm
HOT ENGINE	3/8-5/8 inch	9.5-15.9 mm

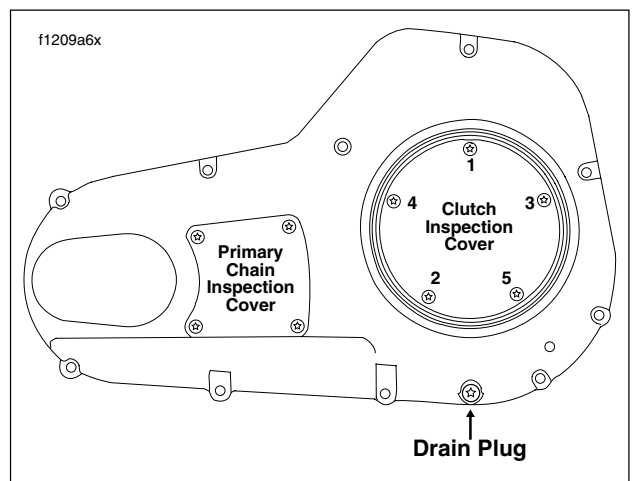


Figure 1-3. Primary Chaincase Cover

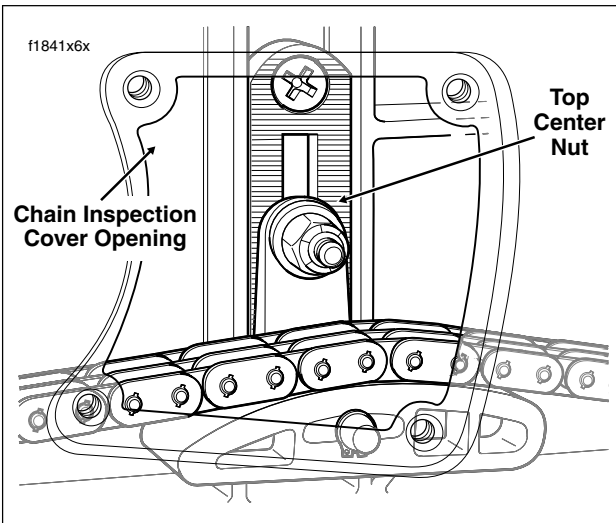


Figure 1-4. Primary Chaincase Cover

5. Measure the free play to be sure that it falls within the ranges specified for a hot or cold engine. See [Table 1-2](#).
6. If the chain is too tight or too loose, then adjustment is necessary. Proceed as follows:
 - a. Locate the chain tensioner assembly and loosen the top center nut a maximum of two turns. See [Figure 1-4](#).
 - b. Raise or lower the chain tensioner assembly as necessary to obtain the specified free play.

NOTE

As chains stretch and wear, they run tighter at one spot than another. Always adjust the free play at the tightest spot in the chain.

NOTE

Replace the primary chain if it is worn to the point where it cannot be properly adjusted.

CAUTION

Do not adjust the primary chain tighter than specified. Running a chain that is too tight will result in excessive wear.

NOTE

Allowing the chain to run loose will cause the motorcycle to jerk when running at low speed resulting in excessive chain and sprocket wear.

- c. Tighten the top center nut of the chain tensioner assembly to 21-29 ft-lbs (29-39 Nm).
7. Align holes in **new** gasket with holes in the primary chaincase cover. Using a T27 TORX drive head, install four screws to secure primary chain inspection cover to primary chaincase cover. Alternately tighten screws to 84-108 **in-lbs** (10-12 Nm) in a crosswise pattern.

PRIMARY CHAIN LUBRICANT

At the 1000 mile (1,600 km) service interval, and at every 5000 mile (8,000 km) service interval thereafter, replace the primary chain lubricant as follows:

1. Using a T40 TORX drive head, remove magnetic drain plug at bottom of primary chaincase cover. Drain lubricant into suitable container. See [Figure 1-3](#).
2. Clean drain plug. Apply Loctite Pipe Sealant with Teflon 565 to threads and install plug back into primary chaincase cover. If drain plug has accumulated a lot of debris, inspect the condition of chaincase components.
3. Using a T27 TORX drive head, remove five screws (with captive washers) to free clutch inspection cover from primary chaincase cover.
4. Pour 32 ounces (946 ml) of Harley-Davidson PRIMARY CHAINCASE LUBRICANT through the clutch inspection cover opening, Part No. 99887-84 (quart) or Part No. 99886-84 (gallon). See [Figure 1-5](#).

CAUTION

Do not overfill the primary chaincase with lubricant. Overfilling may cause rough clutch engagement, incomplete disengagement, clutch drag and/or difficulty in finding neutral at engine idle.

5. Remove quad ring from groove in primary chaincase cover. Wipe all lubricant from the quad ring and inspect for cuts, tears or signs of deterioration. Replace as necessary.

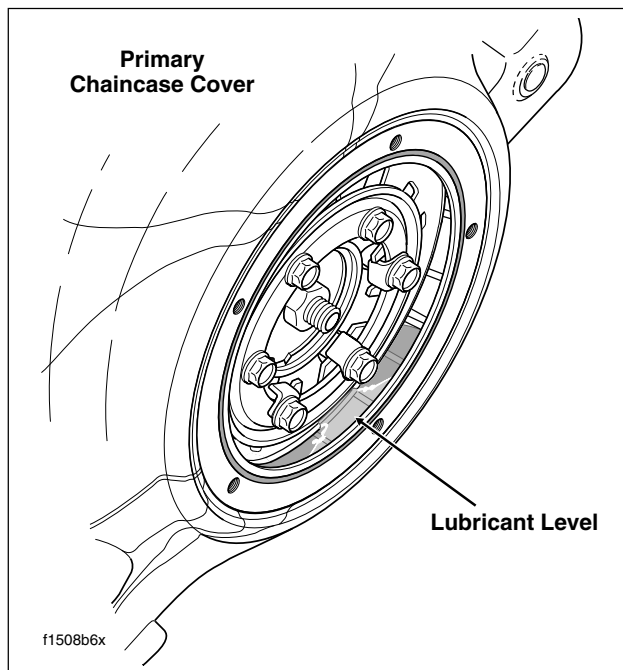


Figure 1-5. Fill Primary Chaincase With Lubricant

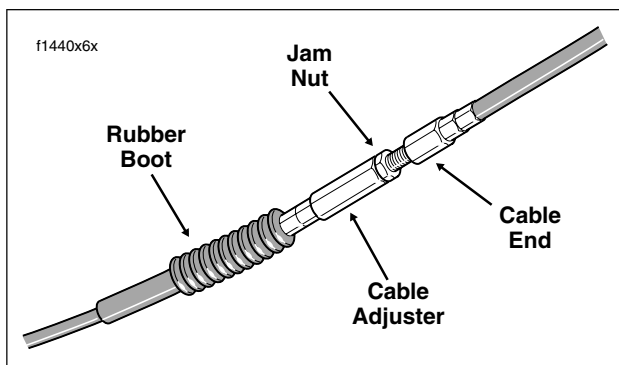


Figure 1-6. Clutch Cable Adjuster Mechanism

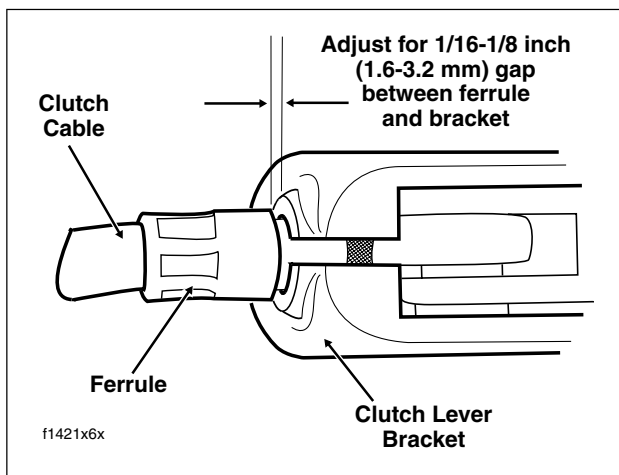


Figure 1-7. Adjust Clutch Free Play

- Swab all lubricant from the quad ring groove. Install quad ring in primary chaincase cover with the nubs contacting the ring groove walls.

NOTE

If lubricant is not thoroughly removed from both the quad ring and groove, compression of the ring during installation of the clutch inspection cover can cause lubricant to be squeezed to the outboard side of the ring groove, resulting in some temporary weepage around the inspection cover.

- Using a T27 TORX drive head, install five screws (with captive washers) to secure clutch inspection cover to the primary chaincase cover. Alternately tighten screws to 84-108 in-lbs (10-12 Nm) in the pattern shown in Figure 1-3.

WARNING

When adding lubricant, do not allow dirt, debris or other contaminants to enter the primary chaincase. Exercise caution so that lubricant does not contact rear wheel, tire and brake components. Such contact can adversely affect traction and may lead to loss of vehicle control, which could result in death or serious injury.

CLUTCH ADJUSTMENT

At the 1000 mile (1,600 km) service interval, and at every 5000 mile (8,000 km) service interval thereafter, adjust the clutch as follows:

CAUTION

Perform the clutch adjustment with the motorcycle at room temperature. The clearance at the adjuster screw will increase as the powertrain temperature increases. If adjuster screw is adjusted while the powertrain is hot, clearance at push rod bearing could be insufficient with powertrain cold and clutch slippage could occur.

NOTE

Perform adjustment procedure whenever clutch components are replaced during normal servicing. Repeat adjustment after 500 miles (800 km) of use.

- Stand vehicle upright and level.
- Using a T27 TORX drive head, remove five screws (with captive washers) to free clutch inspection cover from primary chaincase cover.
- See Figure 1-6. Slide rubber boot off cable adjuster. Holding cable adjuster with 1/2 inch wrench, loosen jam nut using a 9/16 inch wrench. Back jam nut away from cable adjuster. Move adjuster toward jam nut to introduce a large amount of free play at hand lever.
- See Figure 1-8. Loosen locknut on clutch adjuster screw. To take up all free play in push rods, turn screw inward (clockwise) until lightly seated.

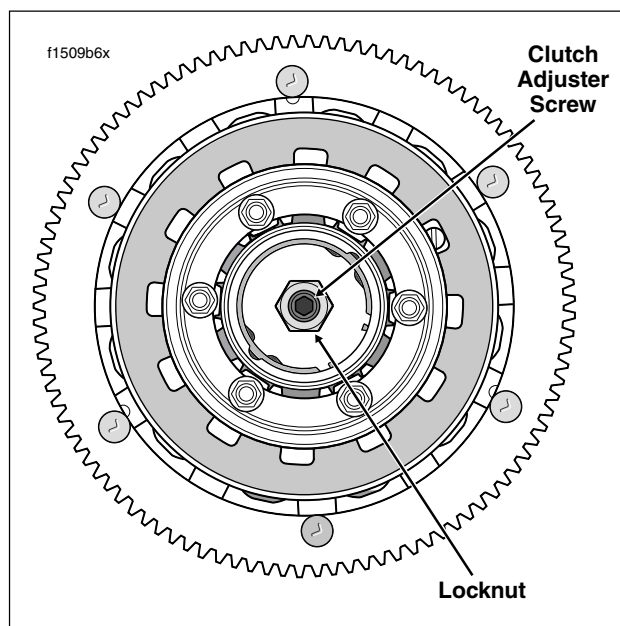


Figure 1-8. Clutch Assembly

5. Back out adjuster screw 1/2 to 1 turn. While holding adjuster screw with an allen wrench, tighten locknut to 72-120 **in-lbs** (8-14 Nm).
6. Squeeze clutch lever to maximum limit three times to set ball and ramp release mechanism.
7. Turn cable adjuster away from jam nut until slack is eliminated at hand lever. Pull clutch cable ferrule away from clutch lever bracket to check free play. Turn cable adjuster as necessary to obtain 1/16 to 1/8 inch (1.6 - 3.2 mm) free play between end of cable ferrule and clutch lever bracket, as shown in [Figure 1-7](#).
8. Hold adjuster with 1/2 inch wrench. Using 9/16 inch wrench, tighten jam nut against cable adjuster. Cover cable adjuster mechanism with rubber boot.
9. Remove quad ring from groove in primary chaincase cover. Wipe all lubricant from the quad ring and inspect for cuts, tears or signs of deterioration. Replace as necessary.
10. Swab all lubricant from the quad ring groove. Install quad ring in primary chaincase cover with the nubs contacting the ring groove walls.
11. Using a T27 TORX drive head, install five screws (with captive washers) to secure clutch inspection cover to the primary chaincase cover. Alternately tighten screws to 84-108 **in-lbs** (10-12 Nm) in the pattern shown in [Figure 1-3](#).

TRANSMISSION LUBRICANT

At the 1000 mile (1,600 km) service interval, and at every 5000 mile (8,000 km) service interval thereafter, replace the transmission lubricant as follows:

1. Remove the filler plug from the clutch release cover on the right side of the transmission case. See [Figure 1-9](#). Check the O-ring for tears, cuts or general deterioration. Replace as necessary. See [Figure 1-10](#).
2. Locate transmission drain plug on the right side of the oil pan. Remove the magnetic plug and drain the transmission lubricant into a suitable container.
3. Remove any foreign material from the drain plug. Check the O-ring on the drain plug for tears, cuts or general deterioration. Replace as necessary.
4. Install the transmission lubricant drain plug and tighten to 14-21 ft-lbs (19-28 Nm).

WARNING

When adding lubricant, do not allow dirt, debris or other contaminants to enter the transmission case. Exercise caution so that lubricant does not contact rear wheel, tire and brake components. Such contact can adversely affect traction and may lead to loss of vehicle control, which could result in death or serious injury.

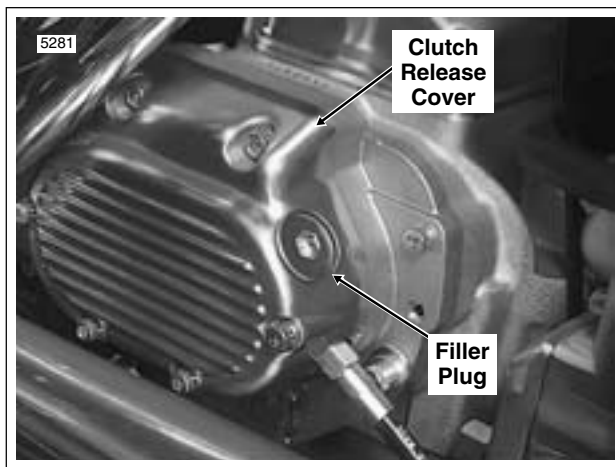


Figure 1-9. Transmission Case (Right Side)

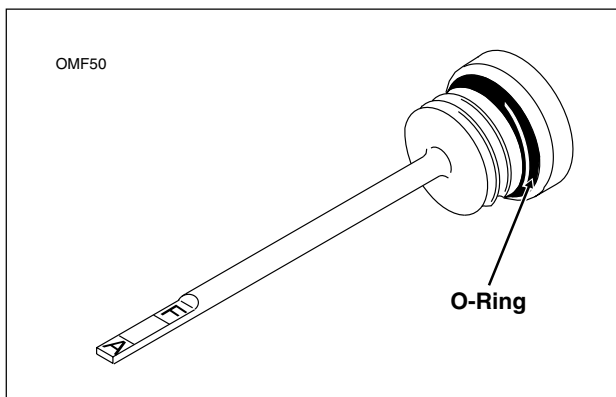


Figure 1-10. Transmission Lubricant Filler Plug/Dipstick

5. Fill the transmission with 20-24 oz. (590-710 ml) of transmission lubricant or until the lubricant level on the dipstick of the filler plug is at the F(ULL) mark with the motorcyle in a level, upright position and the filler plug resting on the threads. Use only Harley-Davidson TRANSMISSION LUBRICANT, Part No. 98853-96 (case/quarts), or Part No. 98852-96 (case/gallons).
6. Install the transmission filler plug/dipstick in the clutch release cover. Tighten the plug to 25-75 **in-lbs** (2.8-8.5 Nm).

TIRES

At every scheduled service interval, inspect the tires as follows:

1. Inspect each tire for punctures, cuts, breaks, and wear. Replace tires before they reach the tread wear indicator bars, which indicates that 1/32 inch (0.79 mm) tread pattern depth remains.

2. Check tire pressure.

Table 1-3. Tire Pressure (Cold)

DUNLOP TIRES ONLY	FRONT		REAR	
	PSI	BARS	PSI	BARS
Solo Rider	36	2.5	36	2.5
Rider & One Passenger	36	2.5	40	2.8

⚠ WARNING

Do not inflate tires beyond the maximum inflation pressure specified on tire sidewall. Overinflation can lead to tire failure while vehicle is in operation, which could result in death or serious injury.

WHEEL SPOKES

If vehicle has laced wheels, inspect spoke tightness at every 5000 mile (8,000 km) service interval. Proceed as follows:

1. Raise wheel off the ground.

CAUTION

If nipples require more than one full turn to tighten spoke, remove tire to check that spoke protrusion has not damaged tube.

2. Lightly tap each spoke with a spoke wrench. Loose spokes will sound dull and must be tightened. Tighten spokes to 40-50 **in-lbs** (4.5-5.6 Nm). If more than a few spokes are loose, true the entire wheel following the procedure under Section 2.6 [TRUING LACED WHEEL](#).

STEERING HEAD BEARINGS

At the 1,000 mile (1,600 km) service interval, and every 10,000 miles (16,000 km) thereafter, check the swing-by following the checking procedure under Section 2.15 [STEERING HEAD BEARINGS](#).

At every 5,000 mile (8,000 km) service interval, grease the steering head bearings using *Special Purpose Grease, Part No. 99857-97*. Turn handlebar full right to access the grease fitting at the left side of the steering head. Connect grease gun to fitting and inject grease until it exudes from top and bottom of steering head. See [Figure 1-11](#).

Disassemble the steering head every 50,000 miles (80,000 km) and inspect the bearings for burnelling, scoring, or other damage. Replace and/or repack the bearings as required. See Section 2 for more information.

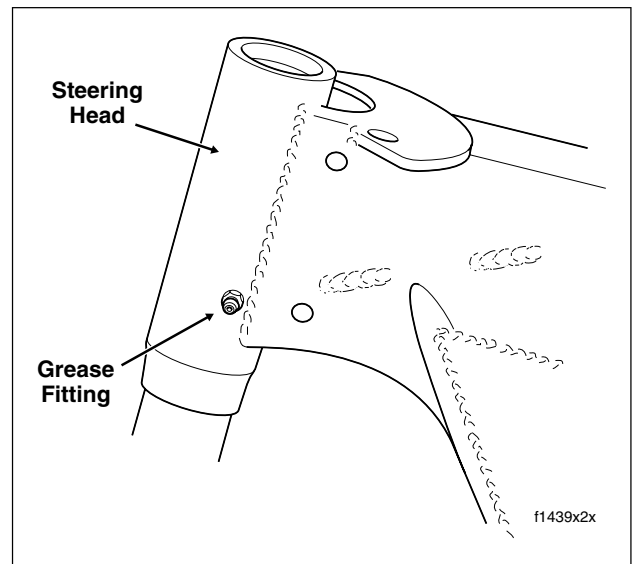


Figure 1-11. Steering Head Bearing Grease Fitting

BRAKE FLUID

At the 1000 mile (1,600 km) service interval, and at every 5000 mile (8,000 km) service interval thereafter, inspect the brake fluid condition and level. Proceed as follows:

CAUTION

To prevent dirt from entering the master cylinder reservoir, thoroughly clean the cover before removal.

1. Remove two Phillips screws from cover of master cylinder reservoir. Remove cover (with gasket).
2. Stand the vehicle upright so that the master cylinder reservoir is in a level position. Fluid level should be 1/8 inch (3.2 mm) from the top. Add fluid as necessary.

NOTE

Use only *D.O.T. 5 SILICONE HYDRAULIC BRAKE FLUID, Part No. 99902-77 (12 oz.) or Part No. 99901-77 (gallon)*.

3. Install cover (with gasket) on the master cylinder reservoir. Install two Phillips screws and tighten to 6-8 **in-lbs** (0.7-0.9 Nm).

⚠ WARNING

Whenever the brake system is serviced, it should be tested on dry, clean pavement at slow speeds before putting the motorcycle into regular service. Improperly serviced brakes can lead to an accident that could result in death or serious injury.

BRAKE PAD LININGS AND DISCS

At every scheduled service interval, inspect the brake pad linings and discs as follows:

Brake Pad Linings

If brake pad friction material is worn to 0.04 inch (1.02 mm) or less, replace the entire set of pads.

⚠ WARNING

For correct and safe brake operation, brake pads must be replaced in sets at the same time. Mismatched brake pads could lead to an accident resulting in death or serious injury.

Brake Discs

The minimum brake disc thickness is stamped on the side of the disc.

When checking the brake pads and discs, inspect the brake hoses for correct routing and any signs of damage.

DRIVE BELT

At every scheduled service interval, inspect the drive belt for damage and check belt adjustment as follows:

1. Remove left side saddlebag. See Section [2.22 SADDLEBAG, REMOVAL](#).
2. Check deflection at the tightest spot in the belt with the transmission in neutral and the motorcycle cold. Use the BELT TENSION GAUGE (Part No. HD-35381) to apply 10 lbs. (4.5 kg) of force at the midpoint of the bottom belt strand. See [Figure 1-12](#). Belt deflection should be within the range specified in [Table 1-4](#).

Table 1-4. Belt Deflection on the Ground

Orientation	Inches	Millimeters
On Ground Without Rider	5/16 - 3/8	7.9 - 9.5
On Ground With Rider 11.5 inches (292 mm) Between Shock Eyelets	1/4 - 5/16	6.4 - 7.9

If belt deflection is within specification, install left side saddlebag. If adjustment is necessary, proceed to step 3.

3. Remove right side saddlebag. See Section [2.22 SADDLEBAG, REMOVAL](#).
4. Remove right side muffler as follows:
 - a. Open worm drive clamps to remove heat shield from rear header pipe in front of muffler.

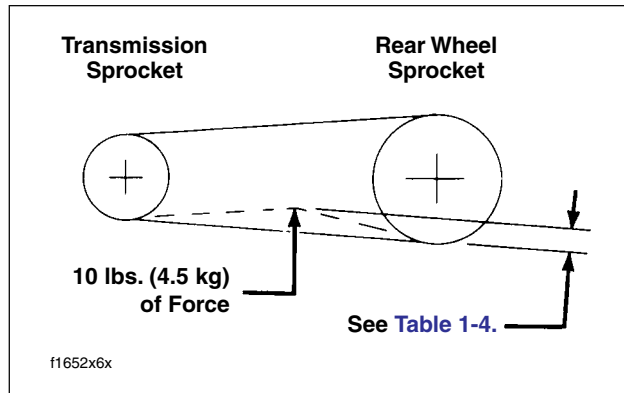


Figure 1-12. Check and Adjust Belt Deflection

- b. Using a bungee cord, tie the muffler to the lower saddlebag support rail.
 - c. Loosen TORCA clamp between rear header pipe and muffler.
 - d. Remove two bolts (with lockwashers) to detach muffler from the lower saddlebag support rail.
 - e. Remove bungee cord to release muffler from lower saddlebag support rail.
5. Standing on right side of vehicle, remove E-clip from groove at end of axle. Loosen cone nut, and then snug to 15-20 ft-lbs (20-27 Nm). See [Figure 1-13](#).
 6. If belt is too tight, move to step 7 to increase belt deflection. If belt is too loose, reduce belt deflection as described below:
 - a. Rotate weld nut on left side of axle in a clockwise direction.
 - b. Check belt deflection. Use the BELT TENSION GAUGE (Part No. HD-35381) to apply 10 lbs. (4.5 kg) of force at the midpoint of the bottom belt strand. Belt deflection should be within the range specified in [Table 1-4](#).
 - c. If belt is still too loose, repeat steps 6(a) through 6(b). If belt is now too tight, move to step 7.
 7. If belt is too tight, increase belt deflection as follows:
 - a. Using a hydraulic center stand, raise motorcycle so that the rear wheel is off the ground.
 - b. Rotate weld nut on left side of axle in a counter-clockwise direction.
 - c. Push wheel forward slightly so that adjuster cam just contacts weld nub on both sides of rear swing-arm. See [Figure 1-13](#).
 - d. Lower hydraulic center stand so that the motorcycle is on the ground.

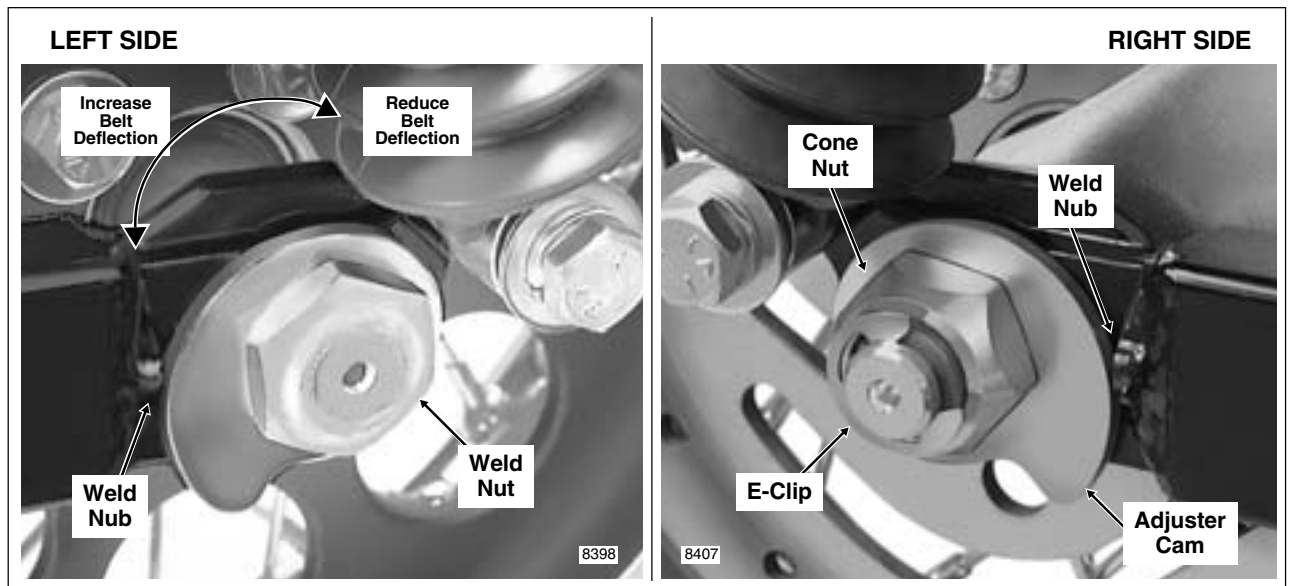


Figure 1-13. Move Rear Wheel Forward Until Adjuster Cams Just Contact Weld Nubs

- e. Check belt deflection. Use the BELT TENSION GAUGE (Part No. HD-35381) to apply 10 lbs. (4.5 kg) of force at the midpoint of the bottom belt strand. Belt deflection should be within the range specified in [Table 1-4](#).
 - f. If belt is still too tight, repeat steps 7(a) through 7(e). If belt is now too loose, move to step 6.
8. **Holding** weld nut on left side of axle, tighten cone nut on right side to 95-105 ft-lbs (128.8-142.4 Nm).

NOTE

If the axle moves during tightening of the cone nut, then the the belt deflection procedure must be restarted.

9. Recheck belt deflection to verify that it is still within specification.
If the belt deflection is not within specification, loosen cone nut and then snug to 15-20 ft-lbs (20-27 Nm) before returning to step 6.
10. With the flat side out, install **new** E-clip in groove on right side of axle.
11. Install right side muffler as follows:

NOTE

TORCA muffler clamps have eliminated the need for silicone or graphite tape during assembly. To ensure sealing integrity of muffler clamps and prevent the possibility of leakage, Harley-Davidson recommends that TORCA clamp assemblies be discarded and replaced each time they are removed.

- a. Slide **new** TORCA clamp onto free end of rear header pipe.

- b. Using a bungee cord, tie muffler to lower saddlebag support rail. Install muffler on rear header pipe. Place TORCA clamp into position between rear header pipe and muffler.
- c. Tighten the two bolts (with lockwashers) to fasten the muffler to the lower saddlebag support rail.

CAUTION

Verify that the exhaust pipes do not contact the vehicle frame or any mounted components. Contact will cancel the effect of the rubber isolation mounts and transmit vibration to the rider via the vehicle frame.

- d. Verify that exhaust pipes are in alignment and do not contact the vehicle frame or mounted components.
- e. Tighten the TORCA clamp to 45-60 ft-lbs (61-81 Nm).
- f. Open worm drive clamps and install heat shield on rear header pipe. Position clamp so that screw is on the outboard side in the most accessible position.

CAUTION

Verify that the heat shields do not contact the vehicle frame or any mounted components. Contact will cancel the effect of the rubber isolation mounts and transmit vibration to the rider via the vehicle frame.

- g. Remove bungee cord from muffler.

12. Install saddlebags. See Section [2.22 SADDLEBAG, INSTALLATION](#).



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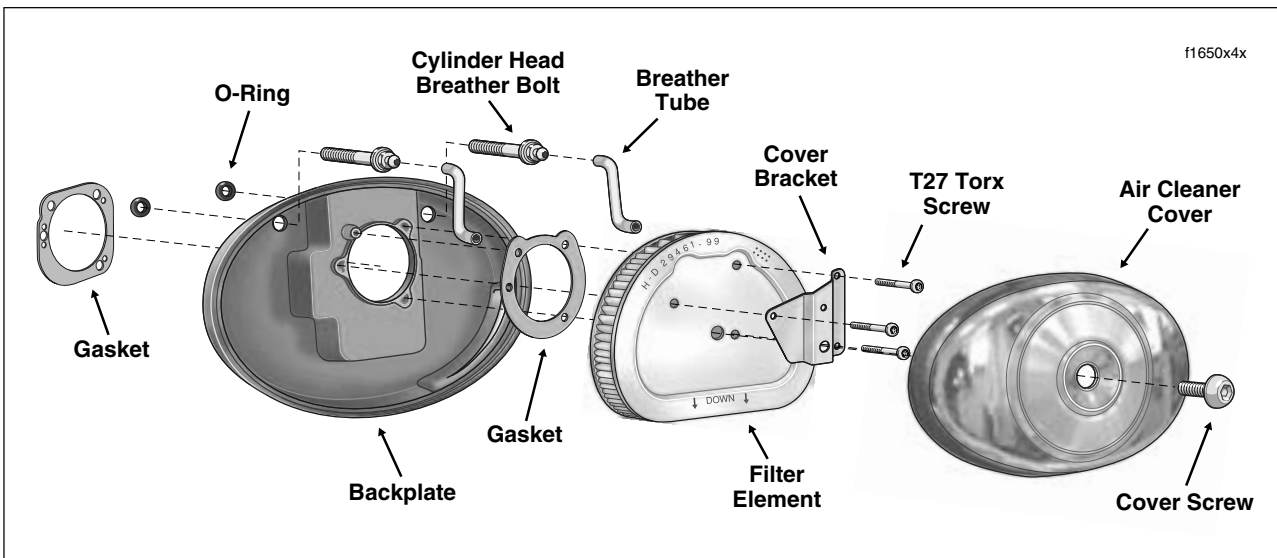


Figure 1-14. Air Cleaner Assembly

REAR SHOCK ABSORBERS

At the 1000 mile (1,600 km) service interval, and at every 5000 mile (8,000 km) service interval thereafter, inspect the rear shock absorbers for signs of leakage or damage, and replace if necessary.

AIR CLEANER

At every scheduled service interval, inspect and clean the air cleaner filter element as follows:

1. Remove large allen head socket screw in center of air cleaner cover. Remove air cleaner cover with rubber seal. See Figure 1-14.
2. Remove three T27 TORX screws to release cover bracket from filter element.

CAUTION

Never run the engine with the filter element removed. The filter prevents dirt and dust from entering the engine.

3. Remove filter element pulling two breather tubes from holes on inboard side.
4. Remove gasket from sleeve on inboard side of filter element. Discard gasket.
5. Remove breather tubes from fittings on two cylinder head breather bolts.
6. Remove two cylinder head breather bolts from backplate using a 7/16 inch deepwell socket.
7. Remove backplate from cylinder heads. On carbureted California models, pull clean air inlet tube (to charcoal canister) from hole on inboard side of backplate.

8. Remove two O-rings from grooves around breather bolt holes on inboard side of backplate. Discard O-rings.
9. Remove gasket from inboard side of backplate. Discard gasket.
10. Thoroughly clean air cleaner cover and backplate.
11. Replace the filter element if damaged or if filter media cannot be adequately cleaned.
12. Wash the filter element and breather tubes in warm, soapy water. To remove soot and carbon, soak element for 30 minutes in warm water with mild detergent.

WARNING

Do not use gasoline or solvents to clean the filter element. Volatile or flammable cleaning agents may cause an intake system fire, which could result in death or serious injury.

WARNING

Compressed air can pierce the skin and cause injury. Never use your hand to check for leaks or to determine air flow rates. Wear safety glasses to shield your eyes from flying dirt and debris. Failure to comply could result in death or serious injury.

13. Dry the filter element using low pressure compressed air (32 psi/221 kPa maximum). Rotate the element while moving air nozzle up and down the element interior. Do not rap the element on a hard surface.
14. Hold the filter element up to a strong light source. The element can be considered sufficiently clean if light is uniformly visible through the media.

15. Inspect the breather tubes for cuts, tears, holes or signs of deterioration. Replace as necessary. Direct compressed air through the breather tubes to verify that they are not plugged.
16. Install **new** O-rings in grooves around breather bolt holes on inboard side of backplate.
17. Aligning flat edge of gasket with molded tab, install **new** gasket on inboard side of backplate. On California models, install gasket by aligning small holes with plastic pins.
18. On California models, push clean air inlet tube (to charcoal canister) into hole on inboard side of backplate.
19. Align holes in backplate with those in cylinder heads and install cylinder head breather bolts. Using a 7/16 inch deepwell socket, alternately tighten bolts to 10-12 ft-lbs (13.6-16.3 Nm).
20. Slide **new** gasket over sleeve on inboard side of filter element. Be sure holes in gasket are aligned with those in filter.
21. Insert breather tubes about 1/4 inch (6.4 mm) into holes on inboard side of filter element.
22. Install breather tubes onto fittings of two cylinder head breather bolts.

NOTE

Air cleaner mounting without installation of the breather tubes allows crankcase vapors to be vented into the atmosphere in violation of legal emissions standards.

23. Place filter element onto backplate with the flat side down, so that hole on inboard side of element fits over molded boss in backplate.
24. Align holes in cover bracket with those in filter element and start three T27 TORX screws. Stamp on cover bracket points to downside. Alternately tighten screws to 20-40 **in-lbs** (2.3-4.5 Nm) in a crosswise pattern.
25. Verify that rubber seal is properly seated around perimeter of air cleaner cover. Replace seal if cut, torn or shows signs of deterioration.
26. Fit air cleaner cover into backplate. Apply a small dab of Loctite Medium Strength Threadlocker 243 (blue) to threads of large allen head socket screw. Install screw in center of air cleaner cover. Tighten screw to 36-60 **in-lbs** (4.1-6.8 Nm).

FUEL SYSTEM LINES AND FITTINGS

At every scheduled service interval, and after the fuel tank filter has been serviced (if scheduled), inspect the fuel system lines and fittings for leaks.

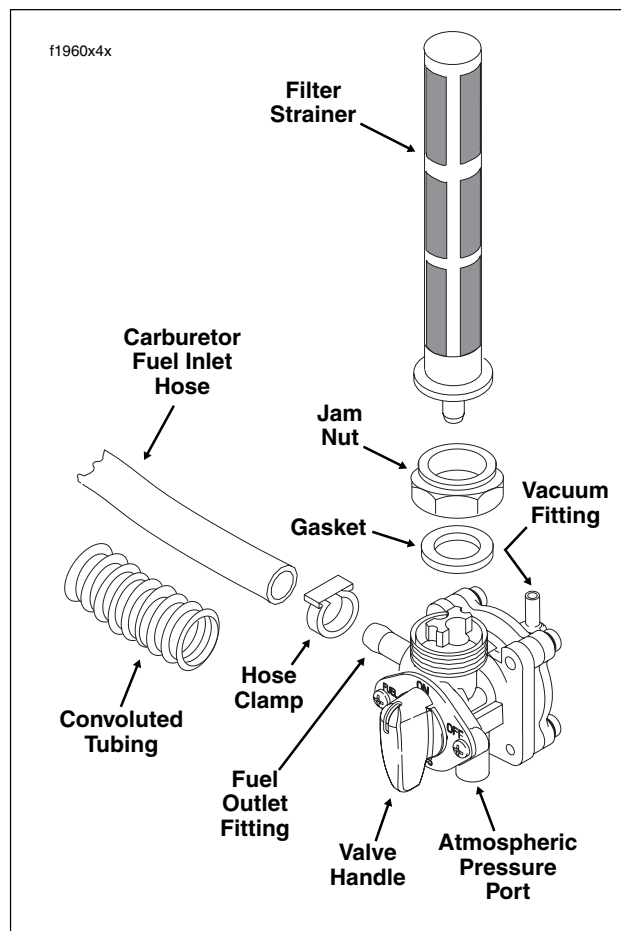


Figure 1-15. Vacuum Operated Fuel Valve

FUEL TANK FILTER (CARBURETED)

At every 20,000 mile (32,000 km) service interval, remove and inspect the fuel tank filter as follows:

WARNING

Gasoline is extremely flammable and highly explosive. When servicing the fuel system, do not smoke or allow open flame or sparks in the vicinity. Inadequate safety precautions could result in death or serious injury.

1. Turn the handle of the fuel valve to OFF.

WARNING

A small amount of gasoline may drain from the carburetor fuel inlet hose when disconnected from the fuel valve fitting. Thoroughly wipe up any spilled fuel immediately and dispose of rags in a suitable manner. Gasoline is extremely flammable and highly explosive. Inadequate safety precautions could result in death or serious injury.

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