ABOUT THIS MANUAL

GENERAL

This Service Manual has been prepared with two purposes in mind. First, it will acquaint the user with the construction of the Harley-Davidson product and assist in the performance of basic maintenance and repair. Secondly, it will introduce to the professional Harley-Davidson Technician the latest field-tested and factory-approved major repair methods. We sincerely believe that this Service Manual will make your association with Harley-Davidson products more pleasant and profitable.

HOW TO USE YOUR SERVICE MANUAL

Refer to the table below for the content layout of this manual.

NO.	CHAPTER
1	Maintenance
2	Chassis
3	Engine
4	Fuel System
5	Drive
6	Transmission
7	Electrical
A	Appendix A Connector Repair
B	Appendix B Wiring
C	Appendix C Conversions
D	Appendix D Glossary

Use the TABLE OF CONTENTS (which follows this FOREWORD) and the INDEX (at the back of this manual) to quickly locate subjects. Sections and topics in this manual are sequentially numbered for easy navigation.

For example, a cross-reference shown as **2.1 SPECIFICATIONS** refers to chapter 2 CHASSIS, heading 2.1 SPECIFICATIONS.

For quick and easy reference, all pages contain a section number followed by a page number. For example, **page 3-5** refers to page 5 in section 3.

A number of acronyms and abbreviations are used in this document. See the D.1 GLOSSARY for a list of acronyms, abbreviations and definitions.

PREPARATION FOR SERVICE

⚠WARNING

Stop the engine when refueling or servicing the fuel system. Do not smoke or allow open flame or sparks near gasoline. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00002a)

Good preparation is very important for efficient service work. A clean work area at the start of each job will allow you to perform the repair as easily and quickly as possible, and will reduce the incidence of misplaced tools and parts. A motorcycle that is excessively dirty should be cleaned before work starts. Cleaning will occasionally uncover sources of trouble. Tools, instruments and any parts needed for the job should be gathered before work is started. Interrupting a job to locate tools or parts is a distraction and causes needless delay.

NOTES

- *To avoid unnecessary disassembly, carefully read all relative service information before repair work is started.*
- *In figure legends, the number which follows the name of a part indicates the quantity necessary for one complete assembly.*
- *When servicing a vehicle equipped with the Harley-Davidson Smart Security System (H-DSSS), you must first disarm the security system. Either keep the fob in close proximity to the vehicle, or use Digital Technician II to disable the security system while the vehicle is being serviced and re-enable the system after service is completed.*

SERVICE BULLETINS

In addition to the information presented in this Service Manual, Harley-Davidson Motor Company will periodically issue Service Bulletins to Harley-Davidson dealers. Service Bulletins cover interim engineering changes and supplementary information. Consult the Service Bulletins to keep your product knowledge current and complete.

USE GENUINE REPLACEMENT PARTS

⚠WARNING

Do not use aftermarket parts and custom made front forks which can adversely affect performance and handling. Removing or altering factory installed parts can adversely affect performance and could result in death or serious injury. (00001a)

To ensure satisfactory and lasting repairs, carefully follow the Service Manual instructions and use only genuine Harley-Davidson replacement parts. Behind the emblem bearing the words GENUINE HARLEY-DAVIDSON stand more than 100 years of design, research, manufacturing, testing and inspecting experience. This is your assurance that the parts you are using will fit right, operate properly and last longer.

WARNINGS AND CAUTIONS

Statements in this service manual preceded by the following words are of special significance.

⚠WARNING

WARNING indicates a potentially hazardous situation which, if not avoided, could result in death or serious injury. (00119a)

⚠CAUTION

CAUTION indicates a potentially hazardous situation which, if not avoided, may result in minor or moderate injury. (00139a)

CAUTION

CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in property damage. (00140a)

CHECKING AND ADDING OIL

See Figure 1-1. Checking engine oil level:

- As part of the pre-ride inspection.
- At every scheduled service interval.

Type of Oil

Refer to Table 1-2. Use the proper grade of oil for the lowest temperature expected before the next oil change. See 1.3 FUEL AND OIL for specific information regarding winter needs.

If it is necessary to add oil and Harley-Davidson oil is not available, use an oil certified for diesel engines. Acceptable diesel engine oil designations include CF-4, CG-4, CH-4, and CI-4. The preferred viscosities for the diesel engine oils, in descending order, are 20W-50, 15W-40 and 10W-40. At the first opportunity, see a Harley-Davidson dealer to change back to 100 percent Harley-Davidson oil.

Checking Oil Level

CAUTION

Oil level cannot be accurately measured on a cold engine. For pre-ride 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. (00185a)

Ride motorcycle until engine is warmed up to operating temperature, then do the following.

1. Idle motorcycle on jiffy stand for 1-2 minutes.
2. Shut motorcycle off and leave motorcycle **resting on jiffy stand**.
3. See Figure 1-2. Check oil level on dipstick. If necessary, add oil until oil registers at upper groove on dipstick. Do not overfill oil tank.

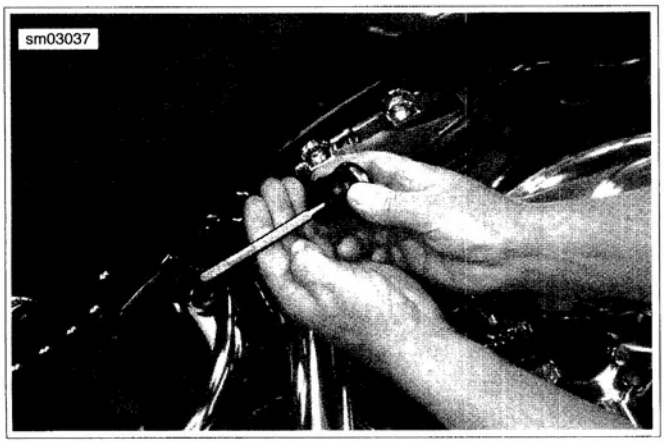


Figure 1-1. Checking Oil Tank Level

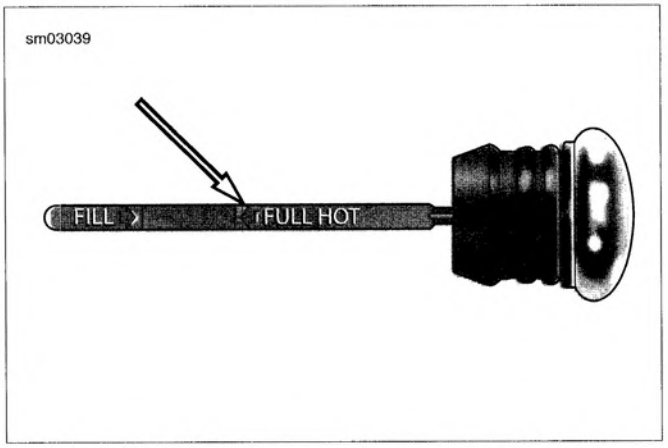


Figure 1-2. Oil Tank Dipstick Upper Groove

CHANGING OIL AND FILTER

PART NUMBER	TOOL NAME
HD-42311	OIL FILTER WRENCH
HD-44067	OIL FILTER WRENCH

NOTES

- *If the motorcycle is ridden hard, under dusty conditions, or in cold weather, the oil and filter should be changed more often.*
- *All Softail models are shipped from the factory with SAE 20W50 Harley-Davidson 360 Motor Oil.*
- *All Softail models come equipped from the factory with a premium 5 micron synthetic media oil filter, Part No. 63798-99 (Chrome) or 63731-99 (Black). These are the only recommended replacement filters.*

1. Ride motorcycle until engine is warmed up to normal operating temperature.
2. See Figure 1-1. Remove the engine oil filler plug/dipstick by pulling steadily while moving plug back and forth.
3. See Figure 1-3. Remove the engine oil drain plug with o-ring (2). Allow oil to drain into a suitable container.

CAUTION

Use Harley-Davidson oil filter wrench for filter removal. This tool can prevent damage to crankshaft position sensor and/or sensor cable. (00192b)

4. See Figure 1-4. Remove the oil filter using the OIL FILTER WRENCH (Part No. HD-42311) or OIL FILTER WRENCH (Part No. HD-44067). Clean the oil filter mounting surface of any old gasket material.
5. See Figure 1-5. Lube the gasket on **new** oil filter with engine oil and install **new** filter. Hand tighten oil filter 1/2 to 3/4 turn after gasket contacts filter mounting surface. DO NOT use oil filter wrench for oil filter installation.

GENERAL

⚠WARNING

Use denatured alcohol to clean brake system components. Do not use mineral-based solvents (such as gasoline or paint thinner), which will deteriorate rubber parts even after assembly. Deterioration of these components can cause brake failure, which could result in death or serious injury. (00291a)

⚠CAUTION

Direct contact of D.O.T. 4 brake fluid with eyes can cause irritation. Avoid eye contact. In case of eye contact flush with large amounts of water and get medical attention. Swallowing large amounts of D.O.T. 4 brake fluid can cause digestive discomfort. If swallowed, obtain medical attention. Use in well ventilated area. KEEP OUT OF REACH OF CHILDREN. (00240a)

CAUTION

D.O.T. 4 brake fluid will damage painted and body panel surfaces it comes in contact with. Always use caution and protect surfaces from spills whenever brake work is performed. Failure to comply can result in cosmetic damage. (00239b)

CAUTION

Do not allow dirt or debris to enter the master cylinder reservoir. Dirt or debris in the reservoir can cause improper operation and equipment damage. (00205c)

Front brake hand lever and rear brake foot pedal must have a firm feel when brakes are applied. If not, bleed system as described.

PROCEDURE

NOTE

Hydraulic brake fluid bladder-type pressure equipment can be used to fill brake master cylinder through the bleeder valve. Remove master cylinder reservoir cover so that system cannot pressurize. Do not use pressure bleeding equipment when the hydraulic system is sealed with master cylinder reservoir cover and gasket in place.

1. Remove bleeder valve cap. Install end of a length of clear plastic tubing over caliper bleeder valve; place other end in a clean container. Stand motorcycle upright.
   a. Front brake bleeder valve-see Figure 1-33.
   b. Rear brake bleeder valve-see Figure 1-34.
2. Add D.O.T. 4 BRAKE FLUID to master cylinder reservoir. Fluid level should be 1/4 ± 1/8 in. (6.35 ± 3.18 mm) below the gasket surface. Press and hold brake lever/pedal to build up hydraulic pressure.
3. Open bleeder valve slowly about 1/2-turn counterclockwise; brake fluid will flow from bleeder valve and through tubing. When brake lever/pedal has moved its full range of travel, close bleeder valve (clockwise). Allow brake lever/pedal to return slowly to its released position.

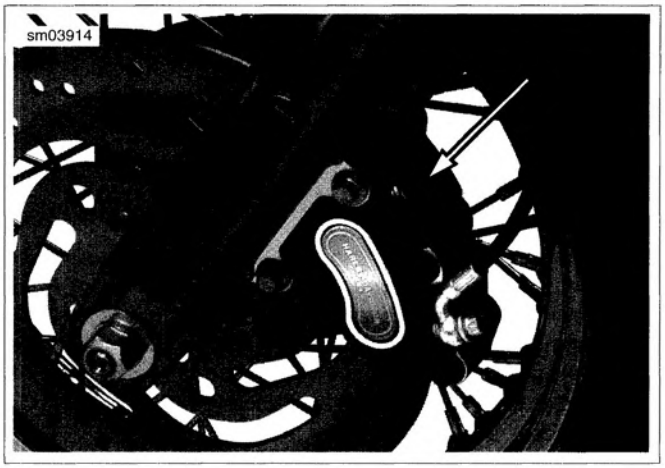


Figure 1-33. Front Brake Bleeder Valve (Typical)

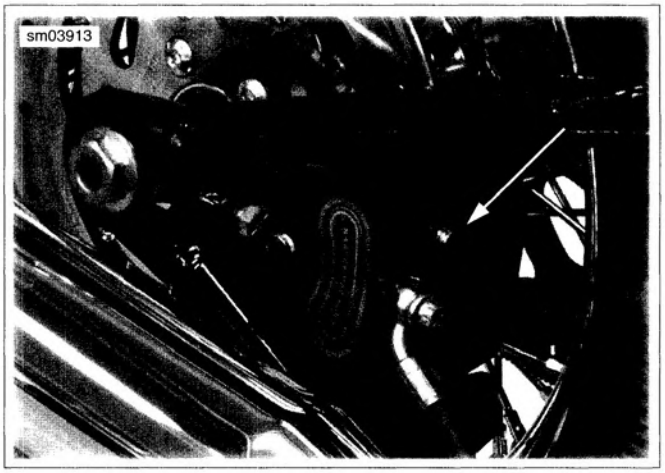


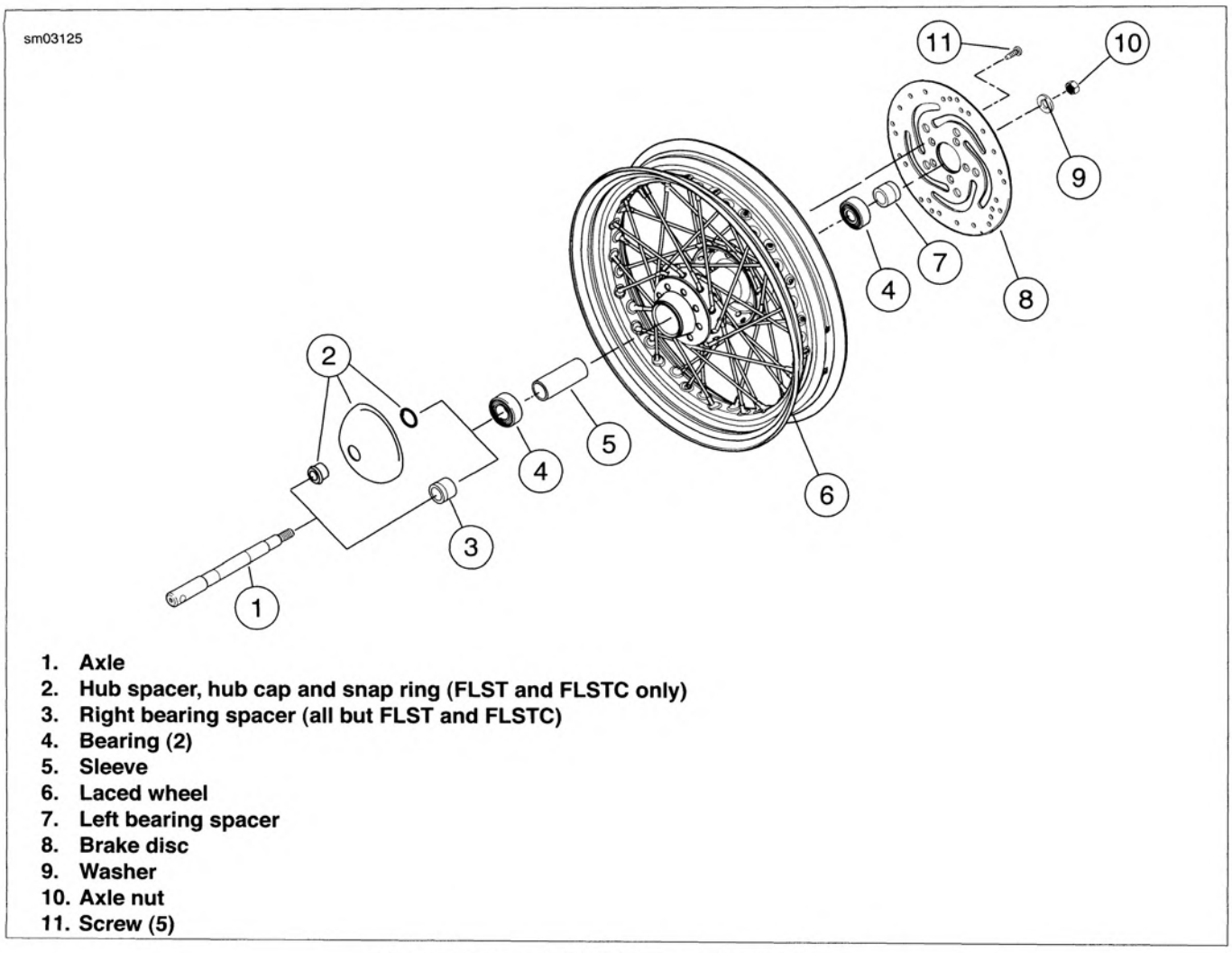
Figure 1-34. Rear Brake Bleeder Valve

4. Repeat two previous steps until all air bubbles are purged.
5. Tighten bleeder valve to 80-100 **in-lbs** (9.0-11.3 Nm). Install bleeder valve cap.
6. Verify master cylinder fluid level as described in previous step.

⚠WARNING

After repairing the brake system, test brakes at low speed. If brakes are not operating properly, testing at high speeds can cause loss of control, which could result in death or serious injury. (00289a)

7. Install gaskets and covers. Tighten reservoir cover screws to the following torques.
   a. Front cover screws: 12-15 **in-lbs** (1.4-1.7 Nm).
   b. Rear cover screws: 6-8 **in-lbs** (0.7-0.9 Nm).



1. **Axle**
2. **Hub spacer, hub cap and snap ring (FLST and FLSTC only)**
3. **Right bearing spacer (all but FLST and FLSTC)**
4. **Bearing (2)**
5. **Sleeve**
6. **Laced wheel**
7. **Left bearing spacer**
8. **Brake disc**
9. **Washer**
10. **Axle nut**
11. **Screw (5)**

Figure 2-6. Laced Front Wheel: All but FLSTF/B

CLEANING AND INSPECTION

1. Inspect all parts for damage or excessive wear. If sealed wheel bearings must be serviced, see 2.7 SEALED WHEEL BEARINGS.

⚠WARNING

Always replace brake pads in complete sets for correct and safe brake operation. Improper brake operation could result in death or serious injury. (00111a)

2. Inspect brake disc and pads. See 1.17 BRAKE PADS AND DISCS.

ASSEMBLY

⚠WARNING

Be sure that brake fluid or other lubricants do not contact brake pads or discs. Such contact can adversely affect braking ability, which could cause loss of control, resulting in death or serious injury. (00290a)

Disc Wheel

1. Verify that wheel and tire are true. See 2.10 CHECKING CAST WHEEL RUNOUT.

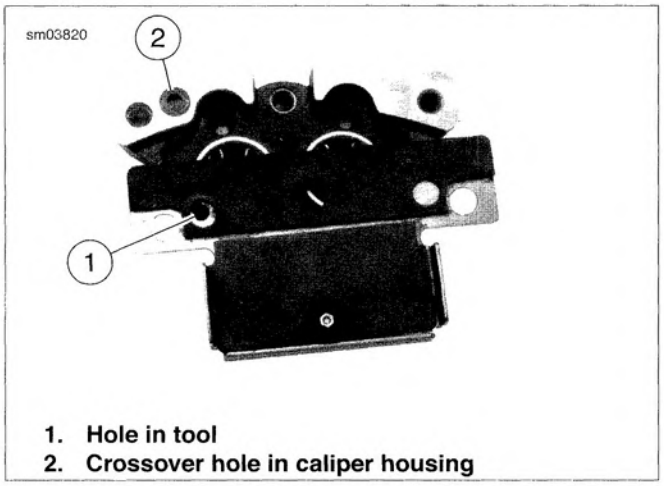
CAUTION

Do not re-use brake disc/rotor screws. Re-using these screws can result in torque loss and damage to brake components. (00319c)

2. See Figure 2-5. If removed, install brake disc (7). Verify that brake disc is clean. Install five **new** screws (8) to attach brake disc. Tighten screws to 16-24 ft-lbs (21.7-32.5 Nm).
3. Install spacers (2, 6) with largest chamfered end facing away from wheel.

Laced Wheel

1. If hub and rim were disassembled, see 2.8 WHEEL LACING, 2.8 WHEEL LACING, or 2.8 WHEEL LACING.
2. Verify that wheel and tire are true. See 2.9 TRUING LACED WHEELS.

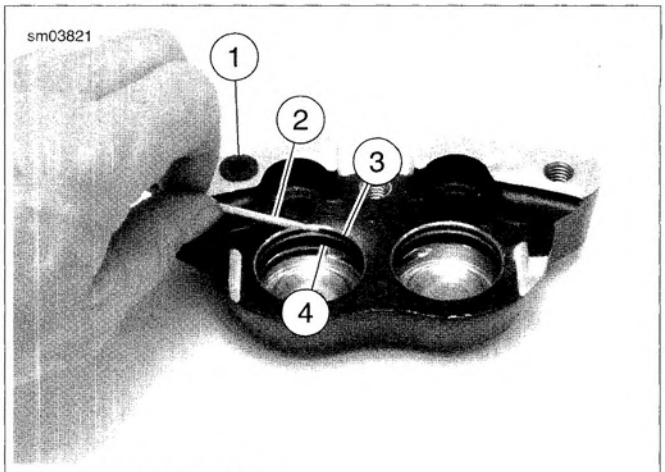


1. Hole in tool
2. Crossover hole in caliper housing

Figure 2-35. Installing Tool

1. Banjo bolt hole - apply low-pressure air
2. Bridge bolt (2)
3. Brake caliper piston remover

Figure 2-36. Removing Pistons



1. Crossover seal
2. Wooden toothpick
3. Wiper
4. Square seal

Figure 2-37. Wipers and Seals

CLEANING, INSPECTION AND REPAIR

⚠WARNING

Use denatured alcohol to clean brake system components. Do not use mineral-based solvents (such as gasoline or paint thinner), which will deteriorate rubber parts even after assembly. Deterioration of these components can cause brake failure, which could result in death or serious injury. (00291a)

⚠WARNING

Compressed air can pierce the skin and flying debris from compressed air could cause serious eye injury. Wear safety glasses when working with compressed air. Never use your hand to check for air leaks or to determine air flow rates. (00061a)

1. Clean all parts with denatured alcohol or D.O.T. 4 BRAKE FLUID. Do not contaminate with mineral oil or other solvents. Wipe parts dry with a clean, lint free cloth. Blow out drilled passages and bore with a clean air supply. Do not use a wire or similar instrument to clean drilled passages.
2. Carefully inspect all components. Replace any parts that appear damaged, worn, or corroded.
   a. Check pistons for pitting, scratches or corrosion on face and also on ground surfaces.
   b. Inspect caliper piston bore. Do not hone bore. If bore should show pitting or corrosion, replace caliper.
   c. Inspect pad pin for grooving and wear. Measure the pad pin diameter in an unworn area, and then in the area of any grooving or wear. If wear is more than 0.015 in. (0.38 mm), replace both pins.
   d. Always replace wipers, square seals and crossover seal after disassembly.

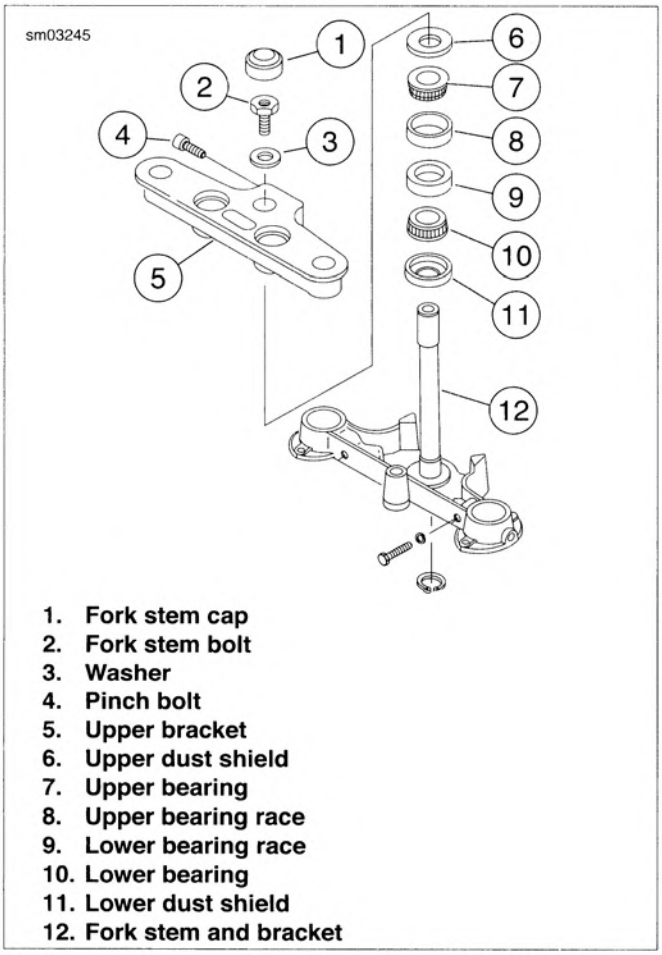
REMOVAL

NOTE

If bearing races are removed, the bearings cannot be reused-they must be replaced. See Removing Lower Bearings From Fork Stem under 2.20 STEERING HEAD, Disassembly, which follows.

FLST, FLSTC, FLSTF/B, FLSTN Models

1. Remove fork shrouds.
2. Remove the fork sides. See 2.18 FRONT FORK: TELESCOPIC.
3. Remove the headlamp and headlamp bracket.
4. See Figure 2-78. Remove the brake hose bracket from the bottom of the fork stem and bracket (12).
5. Remove the fork stem cap (1). Loosen pinch bolt (4) and remove fork stem bolt (2). Remove washer (3) with the handlebar and upper bracket (5) assembly.
6. Remove the fork stem and bracket (12) from the steering head. Remove the upper dust shield (6).
7. Remove upper bearing (7).

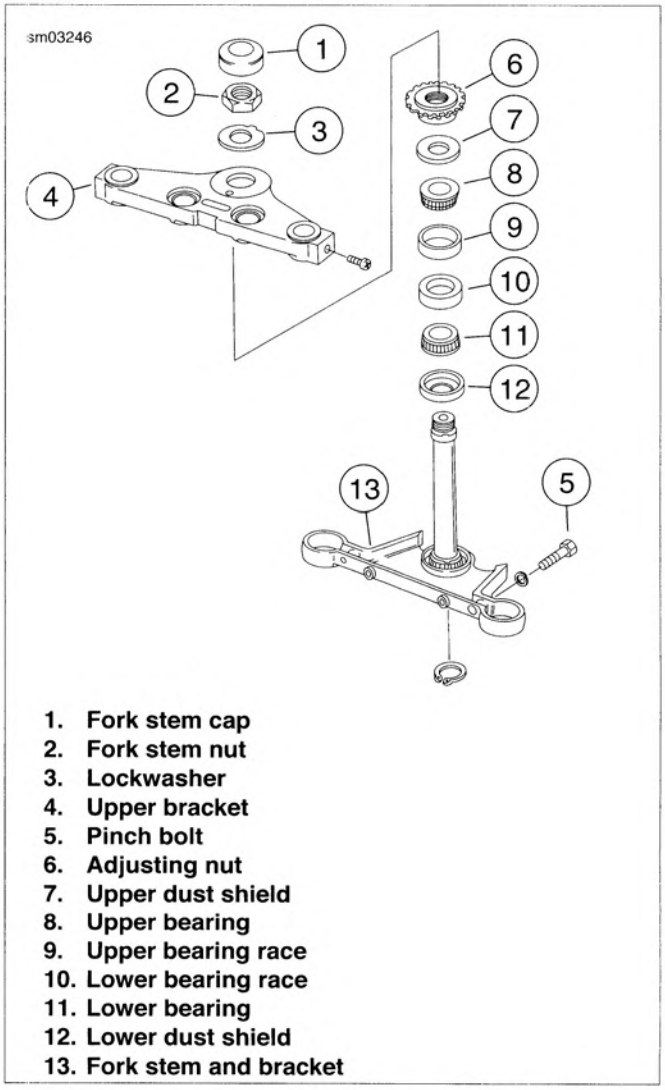


1. **Fork stem cap**
2. **Fork stem bolt**
3. **Washer**
4. **Pinch bolt**
5. **Upper bracket**
6. **Upper dust shield**
7. **Upper bearing**
8. **Upper bearing race**
9. **Lower bearing race**
10. **Lower bearing**
11. **Lower dust shield**
12. **Fork stem and bracket**

Figure 2-78. Steering Head: FLST, FLSTC, FLSTF/B, FLSTN

FXST, FXSTC Models

1. Remove the fork sides. See 2.18 FRONT FORK: TELESCOPIC.
2. Remove the headlamp and headlamp bracket.
3. See Figure 2-79. Remove the brake hose bracket from the bottom of the fork stem and bracket (13).
4. Remove the fork stem cap (1). Remove the fork stem nut (2) with the handlebar and upper bracket (4) as an assembly.
5. Remove the adjusting nut (6) and pull the fork stem and bracket (13) out of the steering head.
6. Remove the upper dust shield (7) and upper bearing (8) from steering head.



1. **Fork stem cap**
2. **Fork stem nut**
3. **Lockwasher**
4. **Upper bracket**
5. **Pinch bolt**
6. **Adjusting nut**
7. **Upper dust shield**
8. **Upper bearing**
9. **Upper bearing race**
10. **Lower bearing race**
11. **Lower bearing**
12. **Lower dust shield**
13. **Fork stem and bracket**

Figure 2-79. Steering Head: FXST/FXSTC

FXCWC Models

1. Remove the fork sides. See 2.18 FRONT FORK: TELESCOPIC.

PROCEDURE

NOTE

If top end service was performed (or both cam compartment and top end), follow all the steps listed. If only cam compartment components were serviced, start with step 5.

1. Install induction module. See 4.10 INDUCTION MODULE. Install induction module connectors.
2. Install horn bracket assembly to frame tab and cylinder heads.
   a. Tighten two cylinder head bracket bolts to 35-40 ft-lbs (47.5-54.2 Nm).
   b. Tighten the upper engine to frame mounting bolt to 45-50 ft-lbs (61.0-67.8 Nm).
3. Install spark plugs to cylinder heads. Connect spark plug cables to spark plugs. See 1.18 SPARK PLUGS.
4. Install throttle cables to induction module.
5. Install fuel tank, fuel gauge connector, fuel tank crossover tube and instrument console. See 4.6 FUEL TANK.
6. Fill fuel tank with fuel.
7. Install backplate and air cleaner cover. See 4.5 AIR CLEANER ASSEMBLY.
8. Install heat shields and exhaust. See 4.17 EXHAUST SYSTEM: ALL BUT FLSTF/FLSTFB/FLSTN/FLSTSB or 4.18 EXHAUST SYSTEM: FLSTF/FLSTFB/FLSTN/FLSTSB as appropriate.
9. Install right floorboard.
10. Fill engine oil to proper level. See 1.6 ENGINE OIL AND FILTER.
11. Connect negative battery cable.

⚠WARNING

After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

12. Install seat.
13. Remove motorcycle from lift.

REMOVAL OVERVIEW

1. See 3.16 TOP END OVERHAUL: DISASSEMBLY.
   a. Remove breather assembly.
   b. Remove rocker arm support plate.
   c. Remove push rods and push rod covers. Do not remove lifters or lifter covers.
2. Fashion lifter holding tool to prevent the hydraulic lifters from dropping into the cam compartment during cam support plate removal. See 3.26 CAM SUPPORT PLATE AND COVER.
3. To remove cover and cam support plate, see 3.18 BOTTOM END OVERHAUL: DISASSEMBLY. Remove oil pump after removing cam support plate.

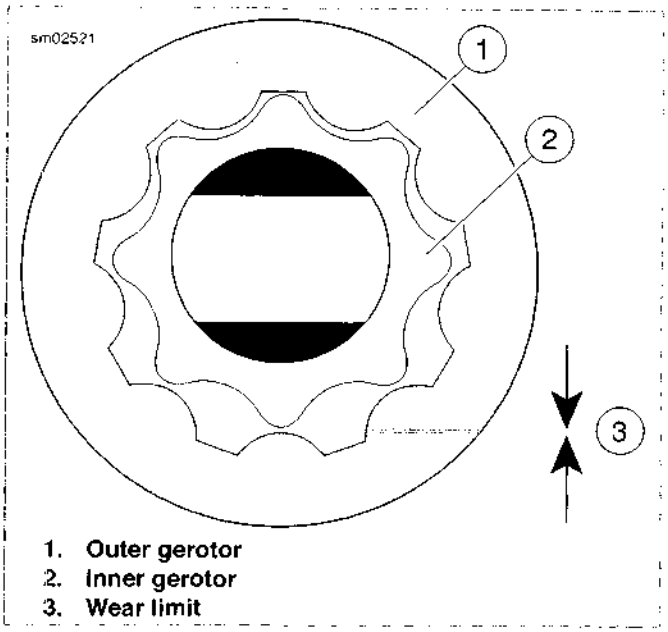
CLEANING AND INSPECTION

1. Clean all parts in a non-volatile cleaning solution or solvent.

⚠WARNING

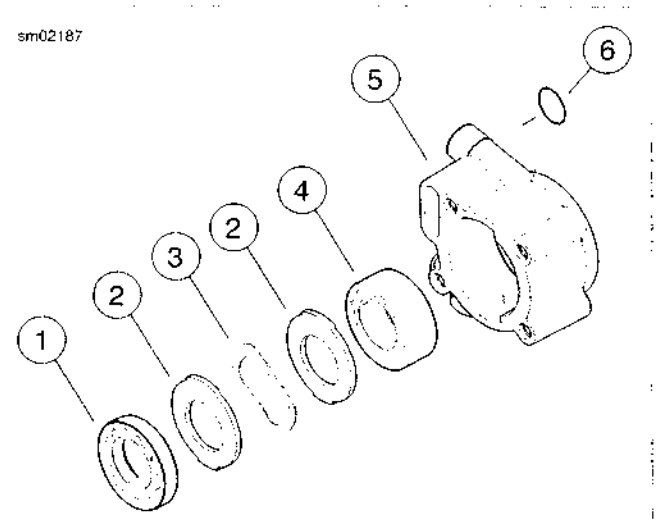
Compressed air can pierce the skin and flying debris from compressed air could cause serious eye injury. Wear safety glasses when working with compressed air. Never use your hand to check for air leaks or to determine air flow rates. (00061a)

2. Blow parts dry with low pressure compressed air. Verify that all oil passages are clean and open.
3. Look for scoring, gouging or cracking caused by foreign material that may have passed through the oil pump.
4. Look for grooves or scratches on the cam support plate, which serves as the outboard side of the oil pump.
5. Check for excessive wear or damage on lobes of outer gerotor gears and between lobes on inner gerotor gears.
6. See Figure 3-139. Check gerotor wear.
   a. Mesh pieces of one gerotor set together.
   b. Use a feeler gauge to determine clearance between tips of lobes on inner and outer gerotors.
   c. Replace gerotors as a set if clearance exceeds 0.004 in. (0.10 mm). Inspect second gerotor set in the same manner.
7. Measure thickness of inner gerotor of one set with a micrometer. Measure the outer gerotor of the same set. Replace the gerotor set if the difference exceeds 0.001 in. (0.025 mm). Inspect second gerotor set in the same manner.
8. See Figure 3-140. Assemble the oil pump. Verify that feed gerotors stand proud of the oil pump surface 0.015-0.025 in. (0.38-0.64 mm). If measurement is less than 0.015 in. (0.38 mm), remove feed gerotor set and reassemble using **new** wave washer. Repeat measurement and replace oil pump body if still not within specification.



1. **Outer gerotor**
2. **Inner gerotor**
3. **Wear limit**

Figure 3-139. Measure Gerotor Sets for Wear

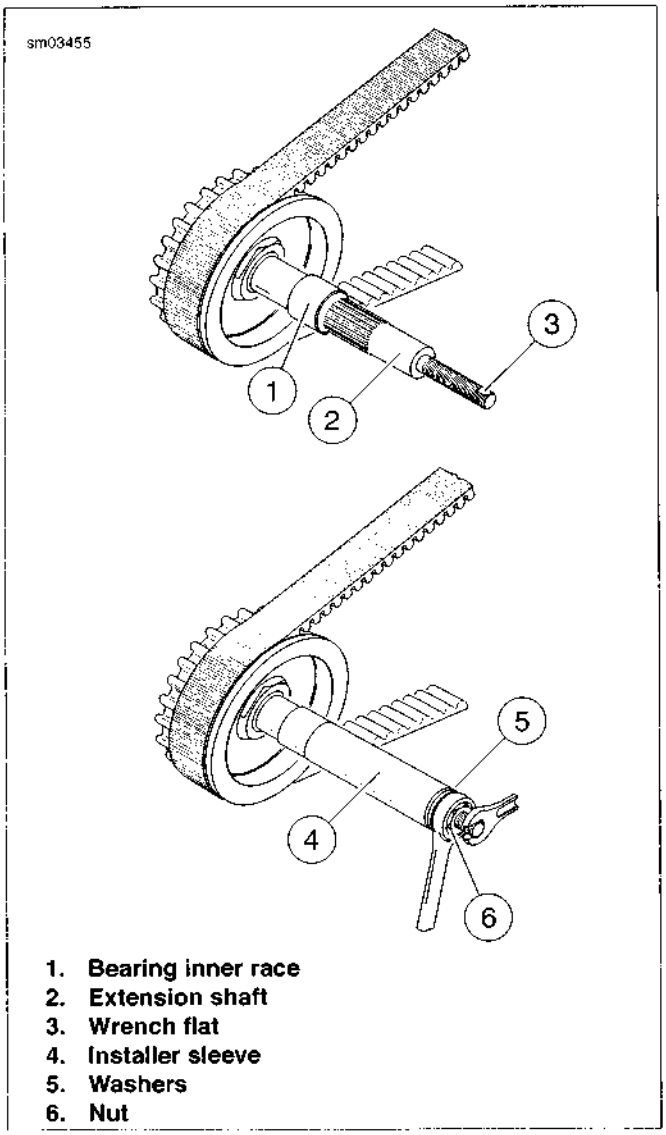


1. **Narrow gerotor set (feed)**
2. **Separator plate**
3. **Wave washer**
4. **Wide gerotor set (scavenge)**
5. **Oil pump housing**
6. **Scavenge port O-ring**

Figure 3-140. Assembling Oil Pump

INSTALLATION OVERVIEW

1. See 3.26 CAM SUPPORT PLATE AND COVER, Installation Overview.
2. Continue with 3.17 TOP END OVERHAUL: ASSEMBLY.



1. **Bearing inner race**
2. **Extension shaft**
3. **Wrench flat**
4. **Installer sleeve**
5. **Washers**
6. **Nut**

Figure 5-25. Installing Bearing Race

INSTALLATION

NOTES

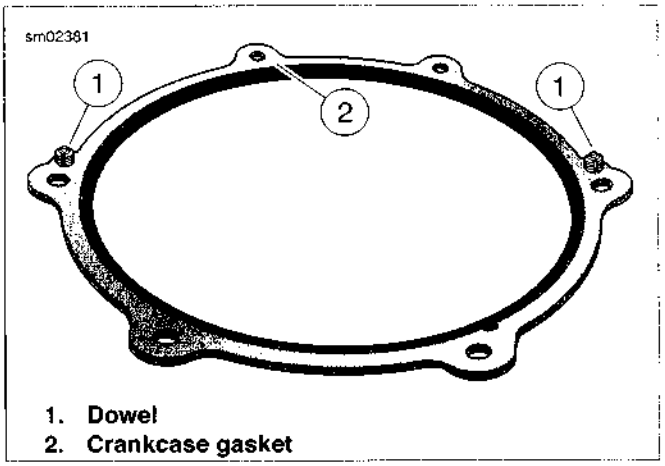
- *Cover mainshaft clutch hub splines with tape to prevent the splines damaging the inner primary cover oil seal.*
- *See Figure 5-26. In next step, be sure dowels (1) in crankcase gasket (2) engage holes in crankcase.*

1. See Figure 5-27. Place crankcase gasket in place on gasket surface (2). Be sure dowels in gasket engage dowel holes (3).
2. Spread a thin film of oil on mainshaft oil seal lip and rubber portion of crankcase gasket. Be careful not to damage mainshaft seal when installing chaincase over the primary bearing inner race on the mainshaft.
3. See Figure 5-28. Insert **new** sealing fasteners.
4. See Figure 5-29. Tighten fasteners in sequence shown to 26-28 ft-lbs (35.3-38.0 Nm).
5. Install the primary chain, clutch, and compensating sprocket as an assembly. See 5.4 DRIVE COMPONENTS, Installation.
6. Install chain tensioner assembly.
7. Install starter. See 7.13 STARTER, Installation.

NOTE

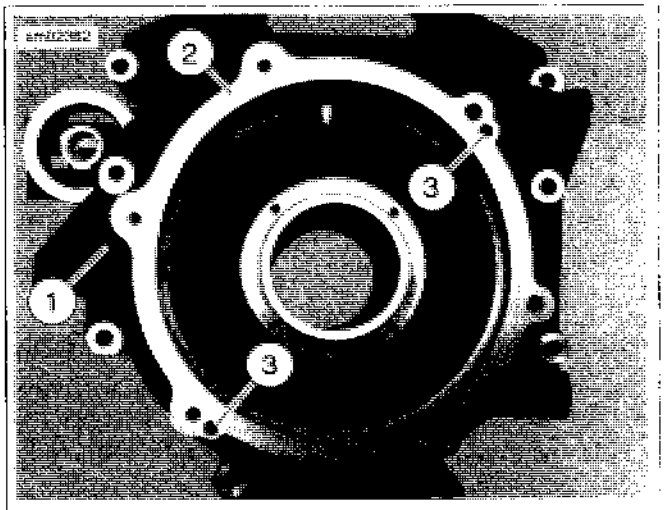
The gasket between the primary chaincase cover and chaincase must be replaced each time the cover is removed. Failure to replace this gasket may cause primary chaincase leaks .

8. Install primary chaincase cover. See 5.3 PRIMARY CHAINCASE COVER, Installation.
9. Fill primary chaincase with lubricant. See 1.9 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant.
10. Adjust drive belt tension.
11. Connect negative battery cable.



1. **Dowel**
2. **Crankcase gasket**

Figure 5-26. Crankcase Gasket



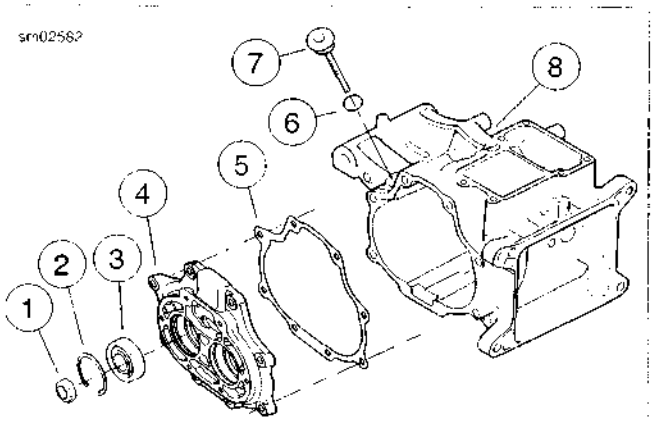
1. **Crankcase**
2. **Gasket surface**
3. **Dowel holes**

Figure 5-27. Crankcase

NOTES

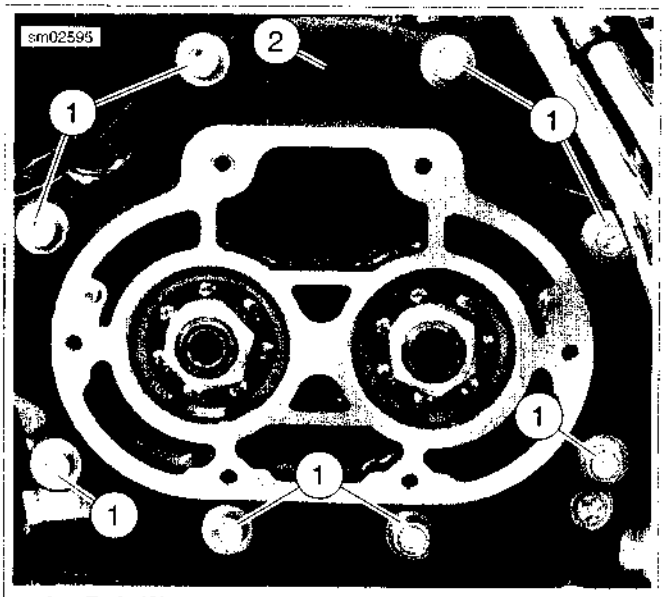
- *The main drive gear bearing and retainer must be replaced if the main drive gear is removed. The bearing will be damaged during the removal procedure.*
- *Do not attempt to remove shafts by tapping them out from opposite side. If you try to remove the shafts by tapping them with a hammer, you will damage the side door bearings. If the side door sticks or binds on the ring dowels, pry open using indents at each side of side door.*

11. Cover mainshaft clutch hub splines with tape to prevent the splines from damaging the main drive gear bearings.
12. See Figure 6-10. Remove the transmission side door mounting hardware. Remove exhaust bracket, if equipped. Pry the side door loose and remove side door, mainshaft, countershaft and shifter cam from transmission case as an assembly. Discard gasket.



1. **Locknut (2)**
2. **Retaining ring (2)**
3. **Bearing (2)**
4. **Side door**
5. **Side door gasket**
6. **O-ring**
7. **Transmission dipstick**
8. **Transmission case**

Figure 6-9. Side Door Bearings



1. **Bolt (8)**
2. **Side door**

Figure 6-10. Side Door Hardware

DISASSEMBLY

PART NUMBER	TOOL NAME
J-5586A	TRANSMISSION SHAFT RETAINING RING PLIERS

Shifter Cam/Shifter Forks

1. See Figure 6-11. With side door on end (shafts pointing upward), remove shift fork shafts using easy-out screw extractor (14) (non-flute design). Shafts have slight interference fit. Shafts can be reused, do not damage end of shaft. Mark end of shaft so same end can be reinserted during reassembly.

NOTE

Shifter shafts have a slight interference fit. Shifter shafts can be reused, so avoid damaging end of shaft. Mark shafts so they can be reinstalled in original position during assembly.

2. Remove shift forks from dog rings.
3. See Figure 6-12. Remove lock plate fasteners (3) from lock plate (2). Discard fasteners.
4. See Figure 6-13. Insert screwdriver and gently pry back detent arm (4) to remove detent spring (3) tension from shift cam (5). Remove shift cam.
5. If servicing detent assembly, remove detent screw (2), detent arm (4), sleeve and detent spring (3). Discard detent screw.

NOTE

Although many transmission parts can be installed in either direction, make sure used parts are installed in same direction as when removed to prolong usable life.

6. See Figure 6-14. Using dog rings, lock two gears in place. Temporarily place transmission assembly into transmission case.
7. Remove mainshaft and countershaft locknuts.

SOLENOID ASSEMBLY

Disassembly

1. Remove field coil. See 7.13 STARTER, Field Coil Assembly.
2. Pull field coil with end cap from solenoid housing. Hold end cap to field coil to avoid pulling armature out of brush holder. If armature is pulled from brush holder, further disassembly is required.
3. Remove two hex screws (metric) to release solenoid housing from drive housing.
4. Use a rubber mallet to separate solenoid and drive housings, if necessary.
5. Remove return spring from solenoid plunger shaft.

Assembly

1. Install return spring on solenoid plunger shaft.
2. Mate the solenoid and drive housings and install two hex screws (metric). Tighten hex screws until snug.
3. Lubricate armature bearing with LUBRIPLATE 110. Seating armature bearing in counterbore, mate field coil and solenoid housings. For proper assembly, a nub on the field coil housing flange must engage the slot on solenoid housing flange closest to the short (field wire) post on the solenoid housing.
4. Install field coil. See 7.13 STARTER, Field Coil Assembly.

SOLENOID PLUNGER

Disassembly

1. Remove three hex screws to release solenoid cover.
2. Remove rubber gasket from solenoid cover flange.
3. Remove plunger and return spring.

Assembly

1. Apply a light film of LUBRIPLATE 110 to plunger shaft and install return spring. Install plunger in solenoid.
2. Install **new** rubber gasket on solenoid cover flange.
3. Install three hex screws to secure solenoid cover. Alternately tighten hex screws until snug.

SOLENOID CONTACTS

Disassembly

1. Remove three hex screws to release solenoid cover.
2. Remove rubber gasket from solenoid cover flange.
3. Remove plunger and return spring.
4. Obtain Solenoid Contact Repair Kit.
5. Disassemble short post (field coil):
   a. See Figure 7-26. Remove hex nut from post, if still installed. Remove jam nut, wave washer, round bushing and O-ring from post.
   b. On inside of solenoid housing, remove post bolt, hold-in terminal, contact plate and square bushing.
6. Disassemble long post (battery):
   a. Remove hex nut from post, if still installed. Remove jam nut, wave washer, round bushing and O-ring from post.
   b. On inside of solenoid housing, remove post bolt, contact plate, square bushing and paper insulator washer.

REMOVAL

⚠WARNING

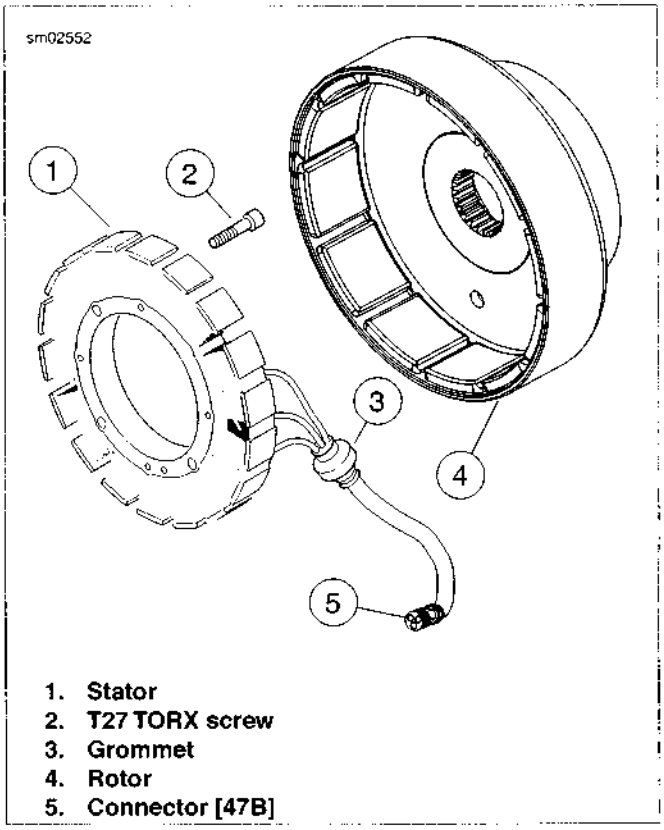
To prevent accidental vehicle start-up, which could cause death or serious injury, disconnect negative (-) battery cable before proceeding. (00048a)

1. Disconnect negative battery cable.
2. Remove primary cover, primary drive and clutch. See 5.4 DRIVE COMPONENTS.
3. Remove primary chaincase housing. See 5.5 PRIMARY CHAINCASE HOUSING.
4. Disconnect stator connector from voltage regulator. See 7.6 VOLTAGE REGULATOR.
5. See Figure 7-63. Remove alternator rotor (4). Two bolts can be inserted through the holes in the rotor face to aid during removal.

NOTE

See Figure 7-63. Contact cleaner, alcohol or glass cleaner sprayed on rubber grommet (3) will provide lubrication when pulling it through crankcase hole.

6. Move grommet (3) to one side and spray lubricant into gap to lubricate grommet and ease removal. Repeat for other side.
7. Remove T27 TORX screws (2).
8. Remove stator (1) while pulling rubber grommet (3) and wires through crankcase hole.



1. **Stator**
2. **T27 TORX screw**
3. **Grommet**
4. **Rotor**
5. **Connector [47B]**

Figure 7-63. Rotor and Stator

CLEANING AND INSPECTION

The rotor and stator can be replaced individually if either is damaged.

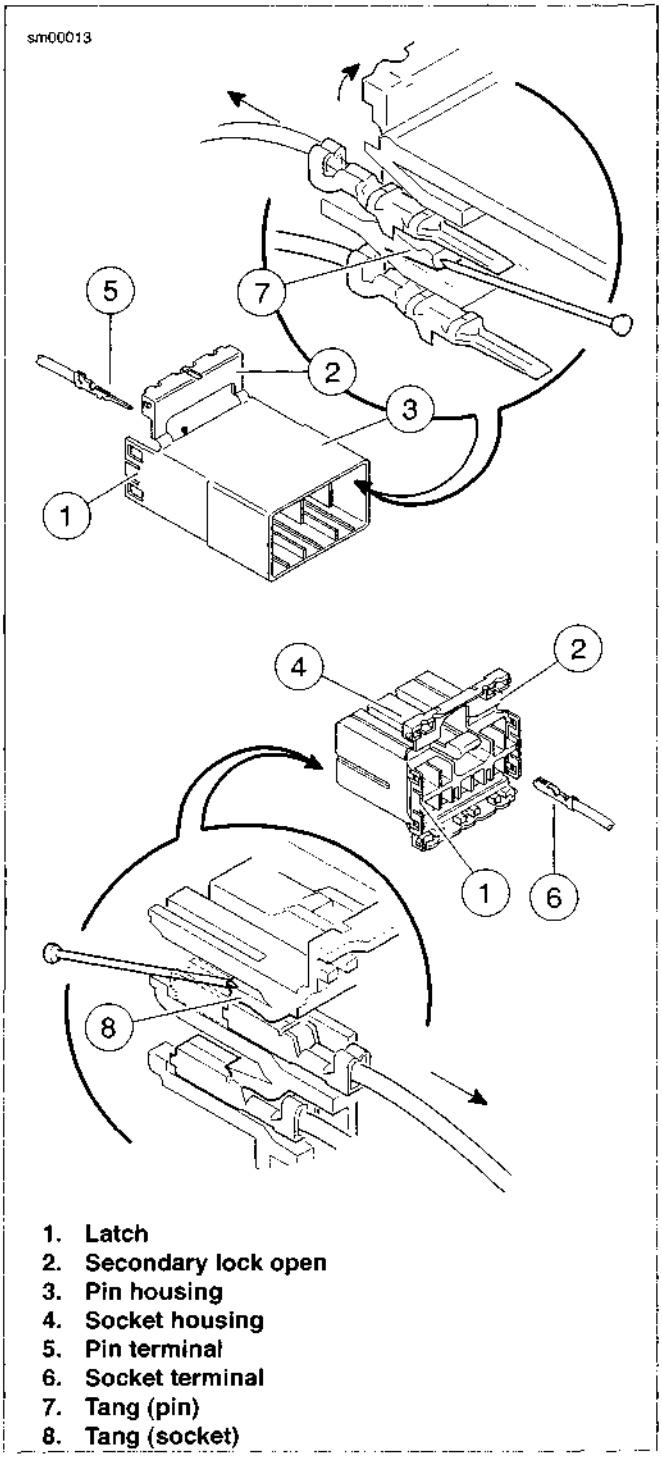
- Remove all foreign particles from the rotor magnets.
- Clean the rotor and stator using clean, soapy water.

INSTALLATION

NOTE

Stator Torx fasteners are not re-usable. They must be replaced.

1. Insert wires through crankcase hole.
2. See Figure 7-63. Push rubber grommet (3) with wires through crankcase hole. If necessary, apply the same lubricant used during removal.
3. Install the stator (1) on the crankcase and fasten in place using **new** TORX screws. Tighten to 55-75 **in-lbs** (6.2-8.4 Nm).
4. Mate connector [47] (5) onto voltage regulator and engage latch to secure. See 7.6 VOLTAGE REGULATOR.
5. Install rotor (4) on the sprocket shaft.
6. Install primary chaincase housing. See 5.5 PRIMARY CHAINCASE HOUSING.
7. Install clutch, primary drive and primary cover. See 5.4 DRIVE COMPONENTS.



1. **Latch**
2. **Secondary lock open**
3. **Pin housing**
4. **Socket housing**
5. **Pin terminal**
6. **Socket terminal**
7. **Tang (pin)**
8. **Tang (socket)**

Figure A-2. AMP Multilock Connector: Socket and Pin Housings

Inserting Terminals into Housing

NOTE

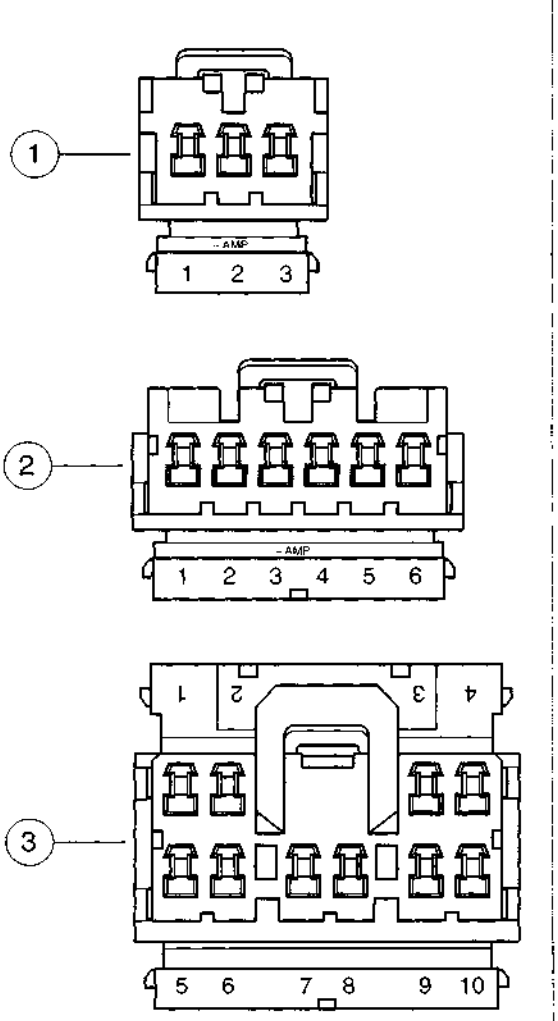
See Figure A-3. Cavity numbers are stamped into the secondary locks of both the socket and pin housings. Match the wire color to the cavity number found on the wiring diagram.

1. Hold the terminal so the catch faces the tang in the chamber. Insert the terminal into its numbered cavity until it snaps in place.

NOTES

- *Up and down can be determined by the position of the release button, the button is the top of the connector.*
- *On the pin side of the connector, tangs are positioned at the bottom of each cavity, so the slot in the pin terminal (on the side opposite the crimp tails) must face downward.*
- *On the socket side, tangs are at the top of each cavity, so the socket terminal slot (on the same side as the crimp tails) must face upward.*

2. Gently tug on wire end to verify that the terminal is locked in place.
3. Rotate the hinged secondary lock inward until tabs fully engage latches on both sides of connector.



1. **3-place housing**
2. **6-place housing**
3. **10-place housing**

Figure A-3. AMP Multilock Connector: Cavity Numbers on Secondary Locks (Socket Housings Shown)

Preparing Wire Leads for Crimping

1. Strip 5/32 in. (4.0 mm) of insulation from the wire lead.

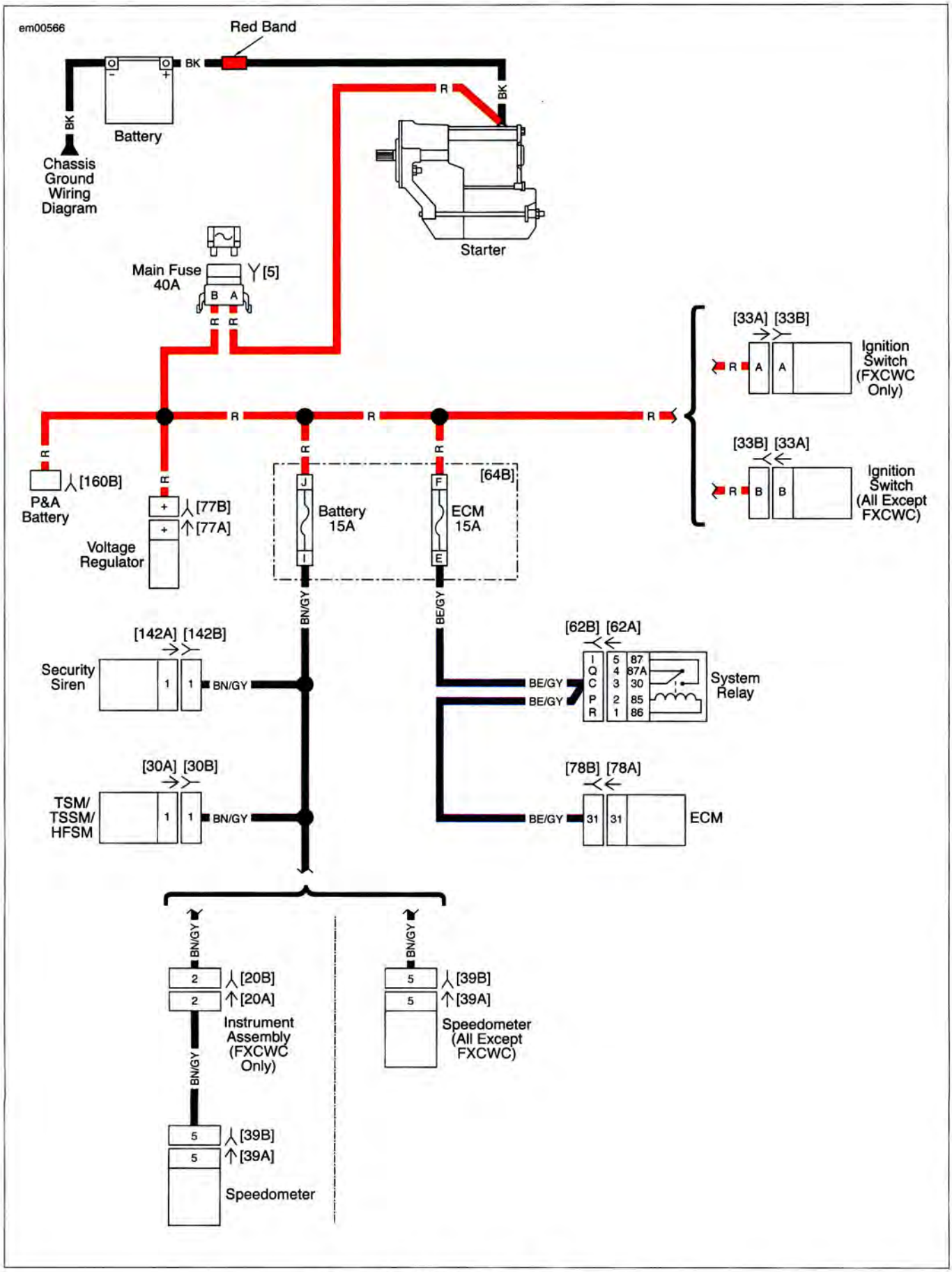


Figure B-3. Battery Power Distribution

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-48119	ELECTRICAL CRIMP TOOL	A.9 MOLEX CONNECTORS, Crimp Terminal to Lead
HD-48262	OXYGEN SENSOR SOCKET	4.13 OXYGEN SENSOR, Removal
HD-48283	CRANKSHAFT ROTATING WRENCH	3.16 TOP END OVERHAUL: DISASSEMBLY, Rocker Arm Support Plate
HD-48309	BALANCER SHAFT INSTALLER	3.30 COUNTERBALANCER ASSEMBLY, Cleaning, Inspection, and Repair
HD-48457	BALANCER SHAFT REMOVER	3.30 COUNTERBALANCER ASSEMBLY, Cleaning, Inspection, and Repair
HD-48474	BALANCE SHAFT SUPPORT BEARING REMOVER/INSTALLER	3.30 COUNTERBALANCER ASSEMBLY, Cleaning, Inspection, and Repair
HD-48498-A	ACR SOLENOID SOCKET	3.23 CYLINDER HEAD, Installation Overview
HD-48615	BALANCE SHAFT SPROCKET ALIGNMENT TOOL	3.19 BOTTOM END OVERHAUL: ASSEMBLY, Counterbalancer Assembly
HD-48648	BRAKE CALIPER PISTON REMOVER	2.16 REAR BRAKE CALIPER, Disassembly
HD-48649	FRONT BRAKE CALIPER PISTON REMOVER	2.13 FRONT BRAKE CALIPER: ALL BUT FLSTSB, Disassembly
HD-48650	DIGITAL TECHNICIAN II	7.42 H-DSSS ACTUATION, Fob Assignment
HD-48650	DIGITAL TECHNICIAN II	7.43 TSM/HFSM: PASSWORD LEARN, Password Learning
HD-48985	SPOKE TORQUE WRENCH	1.8 TIRES AND WHEELS, Wheel Spokes
HD-48985	SPOKE TORQUE WRENCH	2.9 TRUING LACED WHEELS, Truing Wheels
HD-94660-2	PILOT	5.7 TRANSMISSION SPROCKET, Removal
HD-94660-2	PILOT	5.7 TRANSMISSION SPROCKET, Installation
HD-94681-80	SPOKE NIPPLE WRENCH	1.8 TIRES AND WHEELS, Wheel Spokes
HD-94681-80	SPOKE NIPPLE WRENCH	1.8 TIRES AND WHEELS, Wheel Spokes
HD-94681-80	SPOKE WRENCH	2.9 TRUING LACED WHEELS, Setting Rim Offset
HD-94804-57	ROCKER ARM BUSHING REAMER	3.21 ROCKER ARM SUPPORT PLATE, Cleaning and Inspection
HD-95635-46	ALL-PURPOSE CLAW PULLER	3.30 COUNTERBALANCER ASSEMBLY, Cleaning, Inspection, and Repair
HD-95637-10	LONG BOLTS	6.7 MAIN DRIVE GEAR AND BEARING, Removal
HD-95637-46B	WEDGE ATTACHMENT	3.28 CRANKCASE, Sprocket Shaft Bearing Inner Race
HD-95637-46B	WEDGE ATTACHMENT	3.28 CRANKCASE, Sprocket Shaft Bearing Inner Race
HD-95637-46B	WEDGE ATTACHMENT	6.7 MAIN DRIVE GEAR AND BEARING, Removal
HD-95937-46B	WEDGE ATTACHMENT	3.30 COUNTERBALANCER ASSEMBLY, Cleaning, Inspection, and Repair
HD-95952-1	THREADED CYLINDERS	3.17 TOP END OVERHAUL: ASSEMBLY, Cylinder
HD-95952-33C	CONNECTING ROD CLAMPING TOOL	3.17 TOP END OVERHAUL: ASSEMBLY, Cylinder
HD-96333-51F	PISTON RING COMPRESSOR	3.17 TOP END OVERHAUL: ASSEMBLY, Cylinder
HD-96796-47	VALVE SPRING TESTER	3.23 CYLINDER HEAD, Inspection
HD-96921-52D	OIL PRESSURE GAUGE SET	3.7 OIL PRESSURE, Checking Oil Pressure
HD-97087-65B	HOSE CLAMP PLIERS	3.31 OIL TANK: ALL BUT FXCWC, Installation
HD-97087-65B	HOSE CLAMP PLIERS	3.32 OIL TANK: FXCWC, Installation
HD-97225-55C	SPROCKET SHAFT BEARING TOOL	3.19 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase