

2011 Harley-Davidson Touring Models
Service Manual

99483-11

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IMPORTANT NOTICE

Harley-Davidson motorcycles conform to all applicable U.S.A. Federal Motor Vehicle Safety Standards and U.S.A. Environmental Protection Agency regulations effective on the date of manufacture.

To maintain the safety, dependability, and emission and noise control performance, it is essential that the procedures, specifications and service instructions in this manual are followed.

Any substitution, alteration or adjustment of emission system and noise control components outside of factory specifications may be prohibited by law.

Harley-Davidson Motor Company



2011 Harley-Davidson Touring Models Service Manual

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2011 Harley-Davidson Touring Models Service Manual (99483-11)

Please clip out and mail to:
Service Communications Department
Harley-Davidson Motor Company
P.O. Box 653
Milwaukee, WI USA 53201

NOTES

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 ABS
D	Appendix D Conversions
E	Appendix E Glossary

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

For example, a cross-reference shown as **2.2 SPECIFICATIONS** refers to chapter 2 CHASSIS, heading 2.2 SPECIFICATIONS.

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

A number of acronyms and abbreviations are used in this document. See the E.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 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

Harley-Davidson parts and accessories are designed for Harley-Davidson motorcycles. Using non-Harley-Davidson parts or accessories can adversely affect performance, stability or handling, which could result in death or serious injury. (00001b)

To achieve 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 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)

NOTICE

NOTICE indicates a potentially hazardous situation which, if not avoided, may result in property damage. (00140b)

NOTE

Refers to important information, and is placed in italic type. It is recommended that you take special notice of these items.

Proper service and repair is important for the safe, reliable operation of all mechanical products. The service procedures recommended and described in this manual are effective methods for performing service operations.

⚠WARNING

Always wear proper eye protection when using hammers, arbor or hydraulic presses, gear pullers, spring compressors, slide hammers and similar tools. Flying parts could result in death or serious injury. (00496b)

Some of these service operations require the use of tools specially designed for the purpose. These special tools should be used when and as recommended. It is important to note that some warnings against the use of specific service methods, which could damage the motorcycle or render it unsafe, are stated in this manual. However, remember that these warnings are not all-inclusive. Inadequate safety precautions could result in death or serious injury.

Since Harley-Davidson could not possibly know, evaluate or advise the service trade of all possible ways in which service might be performed, or of the possible hazardous consequences of each method, we have not undertaken any such broad evaluation. Accordingly, anyone who uses a service procedure or tool which is not recommended by Harley-Davidson must first thoroughly satisfy himself that neither his nor the operator's safety will be jeopardized as a result. Failure to do so could result in death or serious injury.

PRODUCT REFERENCES

⚠WARNING

Read and follow warnings and directions on all products. Failure to follow warnings and directions can result in death or serious injury. (00470b)

When reference is made in this manual to a specific brand name product, tool or instrument, an equivalent product, tool or instrument may be substituted.

Kent-Moore Products

All tools mentioned in this manual with an "HD", "J" or "B" preface must be ordered through SPX Kent-Moore. For ordering information or product returns, warranty or otherwise, visit www.spx.com.

Loctite Sealing and Threadlocking Products

Some procedures in this manual call for the use of Loctite products. If you have any questions regarding Loctite product usage or retailer/wholesaler locations, please contact Loctite Corp. at www.loctite.com.

PRODUCT REGISTERED MARKS

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All photographs, illustrations and procedures may not necessarily depict the most current model or component, but are based on the latest production information available at the time of publication.

Since product improvement is our continual goal, Harley-Davidson reserves the right to change specifications, equipment or designs at any time without notice and without incurring obligation.

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NOTES

FASTENER TORQUE VALUES 1.1

FASTENER TORQUE VALUES IN THIS CHAPTER

The table below lists torque values for all fasteners presented in this chapter.

FASTENER	TORQUE VALUE		NOTES
Air cleaner cover bracket screws	108-132 **in-lbs**	12.2-14.9 Nm	1.5 MAINTENANCE SCHEDULE, General
Air cleaner cover bracket screws	108-132 **in-lbs**	12.2-14.9 Nm	1.7 AIR CLEANER AND EXHAUST SYSTEM, Installation
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	1.5 MAINTENANCE SCHEDULE, General
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	1.7 AIR CLEANER AND EXHAUST SYSTEM, Installation/Use Loctite Medium Strength Threadlocker 243 (Blue)
Auxiliary lamp flange nut	15-18 ft-lbs	20.3-24.4 Nm	1.21 HEADLAMP ALIGNMENT, Auxiliary Lamp Alignment
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm	1.5 MAINTENANCE SCHEDULE, General
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm	1.23 BATTERY MAINTENANCE, Battery
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm	1.23 BATTERY MAINTENANCE, Battery
Brake caliper (front) mounting screws	28-38 ft-lbs	37.9-51.5 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement/metric
Brake caliper (rear) mounting screws	43-48 ft-lbs	58.3-65.1 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement/metric
Brake caliper pad pin	75-102 **in-lbs**	8.5.-11.5 Nm	1.5 MAINTENANCE SCHEDULE, General
Brake caliper pad pin	75-102 **in-lbs**	8.5-11.5 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement/Always use new pin
Brake caliper pad pin	75-102 **in-lbs**	8.5-11.5 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement/Always use new pin
Clutch adjuster screw jam nut	72-120 **in-lbs**	8.1-13.6 Nm	1.5 MAINTENANCE SCHEDULE, General
Clutch adjuster screw jam nut	72-120 **in-lbs**	8.1-13.6 Nm	1.11 CLUTCH, Adjustment
Clutch cable adjustment jam nut	120 **in-lbs**	13.6 Nm	1.11 CLUTCH, Adjustment
Clutch inspection cover screw	84-108 **in-lbs**	9.5-12.2 Nm	1.9 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant
Clutch inspection cover screws	84-108 **in-lbs**	9.5-12.2 Nm	1.5 MAINTENANCE SCHEDULE, General
Clutch inspection cover screws	84-108 **in-lbs**	9.5-12.2 Nm	1.11 CLUTCH, Adjustment
Engine oil drain plug	14-21 ft-lbs	19.0-28.5 Nm	1.5 MAINTENANCE SCHEDULE, General
Engine oil drain plug	14-21 ft-lb	19.0-28.5 Nm	1.6 ENGINE OIL AND FILTER, Changing Oil and Oil Filter
Engine to front engine mounting bracket	36-40 ft-lbs	49-54 Nm	1.24 ENGINE MOUNTS, Inspection
Fork bracket pinch bolt	53-57 ft-lbs	71.9-77.3 Nm	1.20 STEERING HEAD BEARINGS, Adjustment
Fork stem nut	70-80 ft-lbs	94.9-108.4 Nm	1.20 STEERING HEAD BEARINGS, Adjustment
Fork stem nut	70-80 ft-lbs	94.9-108.4 Nm	1.20 STEERING HEAD BEARINGS, Adjustment
Front engine mount end cap fastener	42-48 ft-lbs	56.9-65.0 Nm	1.24 ENGINE MOUNTS, Inspection
Front master cylinder reservoir cover screws	10-12 **in-lbs**	1.1-1.4 Nm	1.5 MAINTENANCE SCHEDULE, General
Front master cylinder reservoir cover screws	10-12 **in-lbs**	1.1-1.4 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement
Handlebar switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	1.5 MAINTENANCE SCHEDULE, General
Primary chaincase drain plug	14-21 ft-lbs	19.0-28.5 Nm	1.5 MAINTENANCE SCHEDULE, General

FASTENER	TORQUE VALUE		NOTES
Primary chaincase drain plug	14-21 ft-lbs	19.0-28.5 Nm	1.9 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant
Rear axle cone nut (final)	95-105 ft-lbs	128.8-142.4 Nm	1.12 DRIVE BELT AND SPROCKETS, Setting Belt Deflection
Rear axle cone nut (preliminary)	15-20 ft-lbs	20-27 Nm	1.12 DRIVE BELT AND SPROCKETS, Setting Belt Deflection/For belt adjustment only
Rear frame-to-main frame fastener	40-50 ft-lbs	54.2-67.8 Nm	1.24 ENGINE MOUNTS, Inspection
Rear master cylinder reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	1.5 MAINTENANCE SCHEDULE, General
Rear master cylinder reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement
Rear muffler fastener	96-144 **in-lbs**	10.9-16.3 Nm	1.12 DRIVE BELT AND SPROCKETS, Setting Belt Deflection
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	1.5 MAINTENANCE SCHEDULE, General
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	1.17 SPARK PLUGS, Inspection
Spoke nipple	55 **in-lbs**	6.2 Nm	1.5 MAINTENANCE SCHEDULE, General
Spoke nipple	55 **in-lbs**	6.2 Nm	1.8 TIRES AND WHEELS, Wheel Spokes
Top caddy mounting screw	72-96 **in-lbs**	8.1-10.9 Nm	1.5 MAINTENANCE SCHEDULE, General
Top caddy mounting screw	72-96 **in-lbs**	8.1-10.9 Nm	1.23 BATTERY MAINTENANCE, Battery
Top stabilizer link bolt	18-22 ft-lbs	24.4-29.9 Nm	1.24 ENGINE MOUNTS, Inspection
Top stabilizer link bolt	18-22 ft-lbs	24.4-29.9 Nm	1.24 ENGINE MOUNTS, Inspection
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	1.5 MAINTENANCE SCHEDULE, General
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	1.10 TRANSMISSION LUBRICANT, Transmission Lubrication
Transmission filler/check plug	25-75 **in-lbs**	2.8-8.5 Nm	1.5 MAINTENANCE SCHEDULE, General
Transmission filler/check plug	25-75 **in-lbs**	2.8-8.5 Nm	1.10 TRANSMISSION LUBRICANT, Transmission Lubrication
Transmission filler/check plug	25-75 **in-lbs**	2.8-8.5 Nm	1.10 TRANSMISSION LUBRICANT, Transmission Lubrication
Turn signal lamp to mounting bracket screws	36-60 **in-lbs**	4.1-6.8 Nm	1.21 HEADLAMP ALIGNMENT, Auxiliary Lamp Alignment

GENERAL 1.2

SERVICING A NEW MOTORCYCLE

⚠WARNING

Perform the service and maintenance operations as indicated in the regular service interval table. Lack of regular maintenance at the recommended intervals can affect the safe operation of your motorcycle, which could result in death or serious injury. (00010a)

Service operations to be performed before customer delivery are specified in the applicable model year predelivery and set-up instructions.

The performance of new motorcycle initial service is required to keep warranty in force and to verify proper emissions systems operation. See 1.5 MAINTENANCE SCHEDULE.

SAFE OPERATING MAINTENANCE

NOTES

- *Do not attempt to tighten engine head bolts or engine damage may result.*
- *During the initial break-in period, use only Harley-Davidson 20W50 engine oil. Failure to use the recommended oil will result in improper break-in of the engine cylinders and piston rings.*

A careful check of certain equipment is necessary after periods of storage, and frequently between regular service intervals, to determine if additional maintenance is required.

Check:

1. Tires for abrasions, cuts and correct pressure.
2. Drive belt tension and condition.
3. Brakes, steering and throttle for responsiveness.
4. Brake fluid level and condition. Hydraulic lines and fittings for leaks. Also, check brake pads and discs for wear.
5. Cables for fraying, crimping and free operation.
6. Engine oil and transmission fluid levels.
7. Headlamp, auxiliary lamp, tail lamp, brake lamp, horn and turn signal operation.

SHOP PRACTICES

Repair Notes

General maintenance practices are given in this section.

NOTES

- *Repair = Disassembly/Assembly.*
- *Replacement = Substitute a **new** part for existing component.*

All special tools and torque values are noted at the point of use.

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. Protect yourself and bystanders with approved eye protection. 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 multiple 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.

⚠WARNING

Be sure to check capacity rating and condition of hoists, slings, chains and cables before use. Exceeding capacity ratings or using lifting devices that are in poor condition can lead to an accident, which could result in death or serious injury. (00466c)

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 verify proper installation.

Cleaning

If parts are to be reused, follow good shop practice and thoroughly clean the parts before assembly. Keep all dirt out of parts to promote better component operation and longer life. Seals, filters and covers are used in this vehicle to keep out extraneous dirt and dust. These items must be kept in good condition to guarantee satisfactory operation.

When instructed to clean fastener threads or threaded holes, proceed as follows: Clean all threadlocking material from fastener threads and threaded holes. Use a wire brush to clean fastener threads. Use a thread chaser or other suitable tool to clean threaded holes. Use PJ1 cleaner or equivalent to remove all traces of oil and contaminants from threads. Clean all threaded holes with low pressure compressed air.

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.

Always verify cleanliness of blind holes before assembly. Tightening a screw with dirt, water or oil in the hole can cause castings to crack or break.

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. Check your work when finished to 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

Attempt to turn the fastener using a torque wrench set to the minimum torque specification for that fastener. If the fastener does not rotate, the fastener torque has been maintained. If the fastener rotates, remove it to determine if it has a threadlocking agent.

If it has a threadlocking agent, clean all threadlocking material from the threaded hole. Replace the fastener with a **new** one or clean the original fastener threads and apply the appropriate threadlocking product (see the specific procedure). Install and tighten the fastener to specification.

If the fastener does not use a threadlocking agent, install and tighten it to specification.

Magnetic Parts Trays

Magnetic parts trays are common in the service facility because they are convenient and can keep parts from becoming lost during a repair procedure.

However, hardened steel parts can become magnetized when held in magnetic parts trays. Metal fragments that would ordinarily be washed away in the oil and trapped in the oil filter or magnetic drain plug during vehicle operation could be captured by magnetized parts in the engine, potentially causing accelerated engine wear and damage.

Parts that will be returned to service inside the vehicle's powertrain such as gears, thrust washers and especially bearings should never be kept in magnetic parts trays.

REPAIR AND REPLACEMENT PROCEDURES

Hardware and Threaded Parts

Install thread repair inserts when threaded holes 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 damaged. Clean up or repair minor thread damage with a suitable tap or die.

Replace all damaged or missing lubrication fittings.

Use Teflon pipe sealant or LOCTITE 565 THREAD SEALANT on pipe fitting threads.

Threadlocking Agents

Always follow specific service manual procedures when working with fasteners containing preapplied threadlocking agents when fastener replacement is recommended. When re-using fasteners containing threadlocking agents, be sure to completely remove all existing threadlocking agent from fastener threads with a wire brush or wire wheel. Also, be sure to remove residual threadlocking agent from fastener hole using an appropriate thread chasing device and compressed air. Always use the recommended threadlocking agent for the specific procedure.

Wiring, Hoses and Lines

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

Instruments and Gauges

Replace damaged or defective instruments and gauges.

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.

When bearings are installed against shoulders, be sure that the chamfered side of the bearing always faces the shoulder. 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. Install bearings with numbered side facing out.

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

Only remove bearings if necessary. Removal usually damages bearings requiring them to be replaced with **new** parts.

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 mating parts for oil holes before installation, and be sure all oil holes are properly aligned during installation.

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. But be aware that sections of a gasket may be used to seal passages.

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 (Pre-Formed Packings)

Always discard O-rings after removal. Replace with **new** O-ring. 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 to remove.

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.

Exhaust System Leakage

In the event of an exhaust system leak at a muffler or header pipe connection location, disassemble and clean all mating surfaces. Replace any damaged components. If the leak still exists, disassemble and repair the leak by applying a bead of Permatex Ultra Copper or LOCTITE 5920 Flange Sealant (or an equivalent oxygen sensor/catalyst-safe alternative). Assemble components, wipe off any excess sealant and allow adequate curing time following sealant product instructions before operating vehicle.

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 priming and 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

Wash bearings in a non-flammable petroleum cleaning solution. Never use a solution that contains chlorine. Knock out packed lubricant by tapping the bearing against a wooden block. Wash bearings again.

⚠WARNING

Using compressed air to "spin dry" bearings can cause bearing to fly apart, which could result in death or serious injury. (00505b)

Cover bearings with a clean shop towel and allow to air dry. Do not spin bearings while they are drying. Never use compressed air to dry bearings.

When dry, coat bearings with clean oil. Wrap bearings in clean paper.

TOOL SAFETY

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 suddenly releases.
- Always keep the wrench squarely installed on the fastener.
- 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/Pry Bars

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

Hammers

- Never strike a 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 or cracked handle.
- 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 grinder.
- 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.
- Always wear approved eye protection when using these tools.
- Protect bystanders with approved eye protection.

Screwdrivers

- Do not 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.
- Do not interchange POZIDRIV, PHILLIPS or REED AND PRINCE screwdrivers.
- Screwdriver handles are not intended to act as insulation. Do not use them on live electrical circuits.
- Do not use a screwdriver with rounded edges because it will slip. Redress with a grinder.

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 on a ratchet or put a pipe extension on a ratchet 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 a fastener loose, 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 only impact sockets for use with air or electric impact wrenches.
- Select the right size socket for the job.
- Always keep the wrench or socket squarely on the fastener.
- Replace sockets showing cracks or wear.
- Keep sockets clean.
- Always use approved eye protection when using power or impact sockets.

Storage Units

- Do not open more than one loaded drawer at a time. Close each drawer before opening another to prevent the cabinet from unexpectedly tipping over.
- Close lids and lock drawers and doors before moving storage units.
- Do not pull on a tool cabinet; push it in front of you.
- Set the brakes on the locking casters after the cabinet has been rolled into position.

DIGITAL TECHNICIAN HARLEY-DAVIDSON

FUEL AND OIL 1.3

FUEL

Always use a good quality unleaded gasoline. Octane ratings are usually found on the pump. Refer to Table 1-1.

⚠WARNING

Avoid spills. Slowly remove filler cap. Do not fill above bottom of filler neck insert, leaving air space for fuel expansion. Secure filler cap after refueling. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00028a)

⚠WARNING

Use care when refueling. Pressurized air in fuel tank can force gasoline to escape through filler tube. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00029a)

Modern service station pumps dispense a high flow of gasoline into a motorcycle fuel tank making air entrapment and pressurization a possibility.

Table 1-1. Octane Ratings

SPECIFICATION	RATING
Pump Octane (R+M)/2	91 (95 RON)

GASOLINE BLENDS

Your motorcycle was designed to get the best performance and efficiency using unleaded gasoline. Most gasoline is blended with alcohol and/or ether to create oxygenated blends. The type and amount of alcohol or ether added to the fuel is important.

NOTICE

Do not use gasoline that contains methanol. Doing so can result in fuel system component failure, engine damage and/or equipment malfunction. (00148a)

- Gasoline containing METHYL TERTIARY BUTYL ETHER (MTBE): Gasoline/MTBE blends are a mixture of gasoline and as much as 15% MTBE. Gasoline/MTBE blends can be used in your motorcycle.
- ETHANOL is a mixture of 10% ethanol (Grain alcohol) and 90% unleaded gasoline. Gasoline/ethanol blends can be used in your motorcycle if the ethanol content does **not** exceed 10%.
- REFORMULATED OR OXYGENATED GASOLINES (RFG): Reformulated gasoline is a term used to describe gasoline blends that are specifically designed to burn cleaner than other types of gasoline, leaving fewer tailpipe emissions. They are also formulated to evaporate less when you are filling your tank. Reformulated gasolines use additives to oxygenate the gas. Your motorcycle will run normally using this type of gas and Harley-Davidson recommends you use it when possible, as an aid to cleaner air in our environment.
- Do not use race gas or octane boosters. Use of these fuels will damage the fuel system.

Some gasoline blends might adversely affect the starting, driveability or fuel efficiency of the motorcycle. If any of these problems are experienced, try a different brand of gasoline or gasoline with a higher octane blend.

ENGINE LUBRICATION

⚠CAUTION

Prolonged or repeated contact with used motor oil may be harmful to skin and could cause skin cancer. Promptly wash affected areas with soap and water. (00358b)

⚠CAUTION

If swallowed, do not induce vomiting. Contact a physician immediately. In case of contact with eyes, immediately flush with water. Contact a physician if irritation persists. (00357c)

NOTICE

Do not switch lubricant brands indiscriminately because some lubricants interact chemically when mixed. Use of inferior lubricants can damage the engine. (00184a)

Engine oil is a major factor in the performance and service life of the engine. Always use the proper grade of oil for the lowest temperature expected before the next scheduled oil change. Your authorized dealer has the proper oil to suit your requirements. Refer to Table 1-2.

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: CH-4, CI-4 and CJ-4.

The preferred viscosities for the diesel engine oils in descending order are: 20W50, 15W40 and 10W40.

At the first opportunity, see an authorized dealer to change back to 100 percent Harley-Davidson oil.

TECHNICIAN II HARLEY-DAVIDSON

Table 1-2. Recommended Engine Oils

H-D TYPE	VISCOSITY	H-D RATING	LOWEST AMBIENT TEMPERATURE	COLD WEATHER STARTS BELOW 50 °F (10 °C)
H-D Multi-grade	SAE 10W40	HD 360	Below 40 °F (4 °C)	Excellent
Screamin' Eagle SYN3 Synthetic Motorcycle Lubricant	SAE 20W50	HD 360	Above 40 °F (4 °C)	Excellent
Screamin' Eagle Synthetic Blend Motorcycle Engine Oil	SAE 20W50	HD 360	Above 40 °F (4 °C)	Good
H-D Multi-grade	SAE 20W50	HD 360	Above 40 °F (4 °C)	Good
H-D Regular Heavy	SAE 50	HD 360	Above 60 °F (16 °C)	Poor
H-D Extra Heavy	SAE 60	HD 360	Above 80 °F (27 °C)	Poor

WINTER LUBRICATION

In colder climates, the engine oil should be changed often. If motorcycle is used frequently for short trips, less than 15 mi (24 km), in ambient temperatures below 60 °F (16 °C), oil change intervals should be reduced to 1500 mi (2400 km). Motorcycles used only for short runs must have a thorough tank flush-out before **new** oil is put in. The tank flush-out should be performed by an authorized dealer or qualified technician.

NOTE

The further below freezing the temperature drops, the shorter the oil change interval should be.

Water vapor is a normal by-product of combustion in any engine. During cold weather operation, some of the water vapor condenses to liquid form on the cool metal surfaces inside the engine. In freezing weather this water will become slush or ice and, if allowed to accumulate too long, may block the oil lines and cause damage to the engine.

If the engine is run frequently and allowed to thoroughly warm up, most of this water will become vapor again and will be blown out through the crankcase breather.

If the engine is not run frequently and allowed to thoroughly warm up, this water will accumulate, mix with the engine oil and form a sludge that is harmful to the engine.

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BULB REQUIREMENTS 1.4

GENERAL

Use the table to identify the bulb location and part number. Refer to Table 1-3.

NOTE

The speedometer, tachometer, odometer and indicator lamps are illuminated with LEDs. LEDs are non-repairable. The entire assembly must be replaced if an LED fails.

Table 1-3. Bulb Chart

LAMP	DESCRIPTION (ALL LAMPS 12 VOLT)	BULBS REQUIRED	CURRENT DRAW AMPERAGE	HARLEY-DAVIDSON PART NUMBER
Headlamp	FLHTC/U, FLHR/C, FLHX, FLHTK	1	4.58/5.0	68329-03
	FLTRX, FLTRU	2	4.58/5.0	68329-03
	Position lamp, international	1	0.32	53436-97
Tail and stop lamp	Tail/stop lamp, FLHX, FLTRX	1	0.59/2.10	68167-04
Turn signal lamp	Front/running	2	2.25/0.59	68168-89A
	Front international	2	1.75	68572-64B
	Front, FLHX (HDI)	2	1.75	68163-84
	Rear, FLHR, FLHRC, FLHTC, FLHTCU, FLHTK, FLTRU (all)	2	2.25	68572-64B
	Rear, FLHX, FLTRX (domestic)	2	2.25/0.59	68168-89A
	Rear, FLHX, FLTRX (international)*	LED	N/A	N/A
	Rear, FLHX, FLTRX (Canadian)	2	1.75	68163-84
Additional lighting	Tour-Pak side lamps* FLHTCU, FLHTK, FLTRU	N/A	0.14 0.14	53788-06 (right side) 53789-06 (left side)
	Tour-Pak tail/stop lamps	2	0.59/2.10	68165-64
	Fender tip lamps, front	1	0.30	68193-95
	Fender tip lamps, rear*	N/A	N/A	69375-06 (FLHX, FLTRX) 59672-09 (all but FLHX, FLTRX)
	License plate lamp international	1	0.37	53436-97
	License plate lamp FLHX, FLTRX domestic	2	0.35	52441-95
	Auxiliary lamps	2	2.1	68453-05
	Fog lamps international	2	2.7	68851-98
Instrument panel lamps	High beam indicator	Instrument panel is illuminated with LEDs. Replace entire assembly upon failure.		
	Oil pressure indicator			
	Neutral indicator			
	Turn signal indicator			
Gauge lamps FLHR/C	Speedometer	N/A	N/A	N/A
	Odometer	N/A	N/A	N/A
	Fuel gauge*	Illuminated with LEDs. Replace assembly upon failure.		
	Engine	N/A	N/A	N/A

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Table 1-3. Bulb Chart

LAMP	DESCRIPTION (ALL LAMPS 12 VOLT)	BULBS REQUIRED	CURRENT DRAW AMPERAGE	HARLEY-DAVIDSON PART NUMBER
Gauge lamps FLHTC/U FLTRX FLTRU FLHX FLHTK	Speedometer	N/A	N/A	N/A
	Tachometer	N/A	N/A	N/A
	Voltmeter	1	0.24	67445-00
	Oil pressure gauge FLHTC/U, FLHTK, FLHX, FLTRX, FLTRU	1	0.24	67445-00
	Air temperature gauge FLHTC/U, FLHTK, FLHX, FLTRX, FLTRU	1	0.24	67445-00
	Fuel gauge	1	0.24	67445-00
Items with *	Illuminated with LEDs. Replace entire assembly upon failure.			

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MAINTENANCE SCHEDULE 1.5

GENERAL

The table below lists the periodic maintenance requirements for Touring model motorcycles. If you are familiar with the procedures, just refer to the table for the recommended service interval. If necessary, see the quick reference table (Table 1-5.) for the required specifications.

If more detailed information is needed, turn to the sections which follow for step-by-step instructions.

Also, throughout this manual, you will be instructed to use various lubricants, greases and sealants. Refer to Table 1-6. for the correct part numbers of these items.

Table 1-4. Regular Service Intervals: 2011 Touring Models

ITEM SERVICED	PROCEDURE	1000 MI 1600 KM	5000 MI 8000 KM	10000 MI 16000 KM	15000 MI 24000 KM	20000 MI 32000 KM	25000 MI 40000 KM	30000 MI 48000 KM	35000 MI 56000 KM	40000 MI 64000 KM	45000 MI 72000 KM	50000 MI 80000 KM	NOTES
Engine oil and filter	Replace	X	X	X	X	X	X	X	X	X	X	X	
Oil lines and brake system	Inspect for leaks, contact or abrasion	X	X	X	X	X	X	X	X	X	X	X	1, 3
Air cleaner	Inspect, service as required		X	X	X	X	X	X	X	X	X	X	
Tires	Check pressure, inspect tread	X	X	X	X	X	X	X	X	X	X	X	
Wheel spokes (if equipped)	Check torque	X	X			X			X			X	1, 5
Primary chaincase lubricant	Replace	X		X		X		X		X		X	
Transmission lubricant	Replace	X				X				X			
Clutch	Check adjustment	X	X	X	X	X	X	X	X	X	X	X	1
Drive belt and sprockets	Inspect, adjust belt	X	X	X	X	X	X	X	X	X	X	X	1
Compensator sprocket isolators	Inspect for wear												7
Brake and clutch controls	Check and lubricate	X	X	X	X	X	X	X	X	X	X	X	1
Jiffy stand	Inspect and lubricate	X	X	X	X	X	X	X	X	X	X	X	1
Fuel lines and fittings	Inspect for leaks, contact or abrasion	X	X	X	X	X	X	X	X	X	X	X	1, 3
Fuel tank filter	Replace						X					X	1
Brake fluid	Inspect sight glass	X	X	X	X	X	X	X	X	X	X	X	4
Brake pads and discs	Inspect for wear	X	X	X	X	X	X	X	X	X	X	X	
Spark plugs	Inspect		X	X	X		X	X	X		X	X	
	Replace					X				X			
Electrical equipment and switches	Check operation	X	X	X	X	X	X	X	X	X	X	X	
Front fork oil	Replace											X	1, 6
Steering head bearings	Lubricate	X		X		X		X		X			
	Adjust						X					X	1, 2
Air suspension	Check pressure, operation and leakage	X	X	X	X	X	X	X	X	X	X	X	1
Windshield bushings (if applicable)	Inspect			X		X		X		X		X	1
Fuel door, Tour-Pak, saddlebags (if equipped)	Lubricate hinges and latches	X	X	X	X	X	X	X	X	X	X	X	
Critical fasteners	Check tightness	X		X		X		X		X		X	1
Battery	Check battery and clean connections												3
Exhaust system	Inspect for leaks, cracks, and loose or missing fasteners or heat shields	X	X	X	X	X	X	X	X	X	X	X	3

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Table 1-4. Regular Service Intervals: 2011 Touring Models

ITEM SERVICED	PROCEDURE	1000 MI 1600 KM	5000 MI 8000 KM	10000 MI 16000 KM	15000 MI 24000 KM	20000 MI 32000 KM	25000 MI 40000 KM	30000 MI 48000 KM	35000 MI 56000 KM	40000 MI 64000 KM	45000 MI 72000 KM	50000 MI 80000 KM	NOTES
Road test	Verify component and system functions	X	X	X	X	X	X	X	X	X	X	X	
NOTES:	1. Should be performed by an authorized Harley-Davidson dealer, unless you have the proper tools, service data and are mechanically qualified. 2. Disassemble, lubricate and inspect every 50,000 miles (80,000 kilometers). 3. Perform annually or at specified intervals, whichever comes first. 4. Change D.O.T. 4 brake fluid and flush system every two years. 5. Perform spoke tension check at the 1000, 5000, 20,000 mile (1600, 8000, 32000 kilometer) services and every 15,000 mile (24000 kilometer) interval thereafter. Not all vehicles are equipped with spoke wheels. Consult appropriate topic in service manual. 6. Replace fork oil and inspect every 50,000 miles (80,000 kilometers). 7. Perform at each rear tire change.												

Table 1-5. Quick Reference Maintenance Chart

ITEM SERVICED	SPECIFICATION	DATA
Engine oil and filter	Drain plug torque	14-21 ft-lbs (19.0-28.5 Nm)
	Oil capacity *	4 qt. (3.8 L)
	Filter	Hand tighten 1/2-3/4 turn after gasket contact
	Chrome filter part number	63798-99A
	Black filter part number	63731-99A
Primary chain lubricant	Lubricant type and capacity	FORMULA+ TRANSMISSION AND PRIMARY CHAIN LUBRICANT (Part No. 99851-05) or SYN3 20W50 OIL (Part No. 99824-03/00QT) Wet: 38 oz. (1124 ml) Dry: 45 oz. (1331 ml)
	Primary chaincase drain plug torque	14-21 ft-lbs (19.0-28.5 Nm)
Clutch adjustment	Adjuster screw free play	1/2-1 turn
	Adjuster screw locknut torque	72-120 **in-lbs** (8.1-13.6 Nm)
	Free play at hand lever	1/16-1/8 in. (1.6-3.2 mm)
	Clutch inspection cover torque	84-108 **in-lbs** (9.5-12.2 Nm)
Transmission lubricant	Lubricant level	Dipstick at FULL with motorcycle on jiffy stand and filler plug resting on threads.
	Lubricant type and capacity	FORMULA+ TRANSMISSION AND PRIMARY CHAIN LUBRICATION (Part No. 99851-05) or SYN3 20W50 OIL (Part No. 99824-03/00QT) 32 oz (0.95 liters)
	Transmission drain plug torque	14-21 ft-lbs (19.0-28.5 Nm)
	Transmission filler plug/dipstick torque	25-75 **in-lbs** (2.8-8.5 Nm)
Tire pressure and wear	Pressure: solo rider or with passenger	Front: 36 psi (248 kPA) Rear: 40 psi (276 kPA)
	Wear	Replace if less than 1/32 in. (0.8 mm) of tread pattern
Wheel spokes	Spoke nipple torque	55 **in-lbs** (6.2 Nm) minimum
Brake fluid level (Check sight glass. If fluid is low, remove reservoir cover and re-check.)	D.O.T. 4 hydraulic brake fluid part number	99953-99A (12 oz.)
	Fluid level (from top of master cylinder reservoir)	Front: 0.20 in. (5.0 mm) Rear: 0.26 in. (6.5 mm)
	Master cylinder reservoir cover screw torque	Front: 10-12 **in-lbs** (1.1-1.4 Nm) Rear: 12-15 **in-lbs** (1.4-1.7 Nm)

Table 1-5. Quick Reference Maintenance Chart

ITEM SERVICED	SPECIFICATION	DATA
Brake pads and discs	Minimum brake pad thickness	0.016 in. (0.4 mm)
	Brake caliper pad pin torque	75-102 **in-lbs** (8.5.-11.5 Nm)
	Minimum brake disc thickness	Front: 0.18 in. (4.5 mm) Rear: 0.25 in. (6.3 mm)
	Maximum brake disc lateral runout (warpage)	0.008 in. (0.20 mm)
Drive belt deflection	Upward force applied at midpoint of bottom belt strand	10 lb. (4.5 kg)
	FLHR/C, FLHTC/U, FLHTK, FLTRU	3/8-7/16 in. (9.5-11.1 mm)
	FLHX, FLTRX	1/4-5/16 in. (6.4-7.9 mm)
Air cleaner	Air cleaner cover bracket screw torque	108-132 **in-lbs** (12.2-14.9 Nm)
	Air cleaner cover screw torque	36-60 **in-lbs** (4.1-6.8 Nm)
	Air cleaner cover screw Threadlocker	LOCTITE MEDIUM STRENGTH THREADLOCKER 243 (BLUE) Part No. 99642-97 (6 ml)
Clutch cable	Lubricant part number	Harley® Lube Part No. 94968-09
	Handlebar switch housing screw torque	35-45 **in-lbs** (4.0-5.1 Nm)
Spark plugs	Type	HD-6R12
	Gap	0.038-0.043 in. (0.97-1.09 mm)
	Torque	12-18 ft-lbs (16.3-24.4 Nm)
Front fork oil	Amount	See 2.17 FRONT FORK.
	Type and part number	HYDRAULIC FORK OIL (TYPE E) Part No. 99884-80 (16 oz.)
Battery	Terminal bolt torque	60-70 **in-lbs** (6.8-7.9 Nm)
	Top caddy screw torque	72-96 **in-lbs** (8.1-10.9 Nm)
* Capacity is approximate. When changing oil, initially add 3.5 qt. (3.3 L). Run engine until warm. Check and fill as necessary.		

Table 1-6. Lubricants, Greases, Sealants

ITEM	PART NUMBER	PACKAGE
SILVER GRADE ANTI-SEIZE	98960-97	1 oz squeeze tube
CCI #20 Brake Grease	42830-05 (included in master cylinder rebuild kit)	squeeze packet
D.O.T. 4 Brake Fluid	99953-99A	12 oz. bottle
Electrical Contact Lubricant	99861-02	1 oz squeeze tube
Genuine Harley-Davidson Formula+ Transmission and Primary Chaincase Lubricant	99851-05	1 qt bottle
Genuine Harley-Davidson H-D 360 20W50 Oil	99816-2050/00QT	1 qt bottle
Screamin' Eagle 20W50 Synthetic Blend Motorcycle Engine Oil	99813-09	1 qt bottle
SYN3 20W50 Full Synthetic Oil	99824-03/00QT	1 qt bottle
G40M Brake Grease	42820-04	squeeze packet
Gray High Performance Sealant	99650-02	1.9 oz squeeze tube
HYLOMAR Gasket and Thread Sealant	99653-85	3.5 oz tube

Table 1-6. Lubricants, Greases, Sealants

ITEM	PART NUMBER	PACKAGE
Loctite Pipe Sealant With Teflon 565	99818-97	6 ml squeeze tube
Loctite Prism Primer (770)		
Loctite Prism Superbonder (411)		
Loctite Superbonder 420 Adhesive		
Loctite Threadlocker 243 (blue)	99642-97	6 ml squeeze tube
Loctite Threadlocker 262 (red)	94759-99	6 ml squeeze tube
Loctite Threadlocker 272	98618-03	10 ml bottle
Screamin' Eagle Assembly Lube	94971-09	4 oz. bottle
Special Purpose Grease	99857-97	14 oz. cartridge
Harley® Lube	94968-09	1/4 fl. oz
Type "E" Hydraulic Fork Oil	99884-80	16 oz bottle

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

ENGINE OIL AND FILTER 1.6

CHECKING OIL LEVEL

Check engine oil level at each complete fuel refill.

NOTICE

Do not allow hot oil level to fall below Add/Fill mark on dipstick. Doing so can result in equipment damage and/or equipment malfunction. (00189a)

NOTICE

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)

NOTICE

Do not overfill oil tank. Doing so can result in oil carryover to the air cleaner leading to equipment damage and/or equipment malfunction. (00190a)

Oil Level Cold Check

1. For pre-ride inspection, place vehicle on level ground and rest the vehicle on its jiffy stand (unless sidecar is attached).
2. See Figure 1-1. Remove filler plug/dipstick and wipe off the dipstick. Insert the dipstick and tighten into the fill spout.

NOTE

The oil level marks for checking with motorcycle upright or on jiffy stand are on the same side of the dipstick. Be sure to use the correct portion of dipstick when checking oil level.

3. See Figure 1-2. Remove the dipstick and verify the level of the oil. The correct oil level should register midway (2) between the FULL and ADD marks on the dipstick.

NOTE

If oil level is at or below the ADD mark, add only enough oil to bring the level to the middle of the two marks on the dipstick.

Oil Level Hot Check

NOTES

- *The engine will require a longer warm up period in colder weather.*
- *Engine oil level hot check should be performed only when engine is at normal operating temperature.*

1. Ride motorcycle until engine is at normal operating temperature.
2. Place vehicle on level ground and rest the vehicle on its jiffy stand (unless sidecar is attached). Allow engine to idle for 1-2 minutes. Turn engine off.
3. See Figure 1-1. Remove filler plug/dipstick and wipe off the dipstick. Insert the dipstick and tighten into the fill spout.

NOTE

The oil level marks for checking with motorcycle upright or on jiffy stand are on the same side of the dipstick. Be sure to use the correct portion of dipstick when checking oil level.

4. See Figure 1-2. Remove the dipstick and note the level of the oil. The level should be between the ADD (1) and FULL (3) marks. Add oil as necessary to bring the level to the FULL mark on the dipstick. Do not overfill.

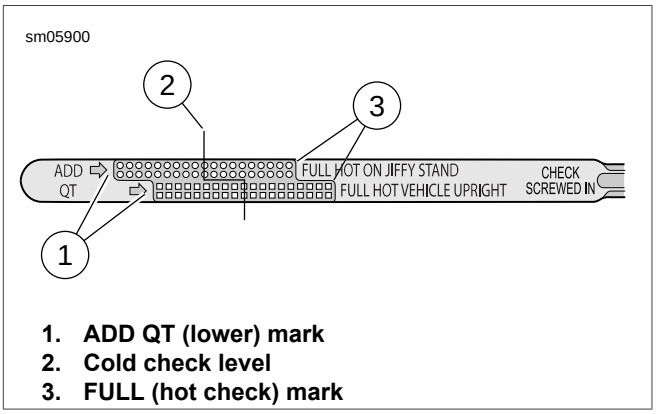
NOTE

Refer to Table 1-2. Use only recommended oil specified in 1.3 FUEL AND OIL, Engine Lubrication.

5. Start engine and carefully check for oil leaks around drain plug and oil filter.



Figure 1-1. Engine Oil Filler Cap



1. **ADD QT (lower) mark**
2. **Cold check level**
3. **FULL (hot check) mark**

Figure 1-2. Engine Oil Dipstick

CHANGING OIL AND OIL FILTER

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

Refer to Table 1-4. Oil should be changed after the first 1000 miles (1600 kilometers) for a **new** engine and at regular intervals in normal service at warm or moderate temperatures.

Oil change intervals should be more frequent in cold weather or severe operating conditions. See 1.3 FUEL AND OIL, Winter Lubrication.

Twin Cam equipped vehicles require the premium oil filter (Part No. 63798-99A Chrome or Part No. 63731-99A Black).

NOTICE

Do not switch lubricant brands indiscriminately because some lubricants interact chemically when mixed. Use of inferior lubricants can damage the engine. (00184a)

⚠WARNING

Be sure that no lubricants or fluids get on tires, wheels or brakes when changing fluid. Traction can be adversely affected, which could result in loss of control of the motorcycle and death or serious injury. (00047d)

1. Ride motorcycle until oil is at normal operating temperature. Turn engine off.
2. Remove filler plug/dipstick.
3. See Figure 1-3. Remove the oil drain plug (2). Do not remove hex plug (3) or transmission drain plug (1). Allow oil to drain completely.
4. Inspect the oil drain plug O-ring for cuts, tears or signs of deterioration. Replace as necessary.

NOTICE

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

5. Remove the oil filter using OIL FILTER WRENCH (Part No. HD-42311) or OIL FILTER WRENCH (Part No. HD-44067A) and hand tools. Do not use with air tools.
6. Clean the oil filter mount flange of any old gasket material.

NOTE

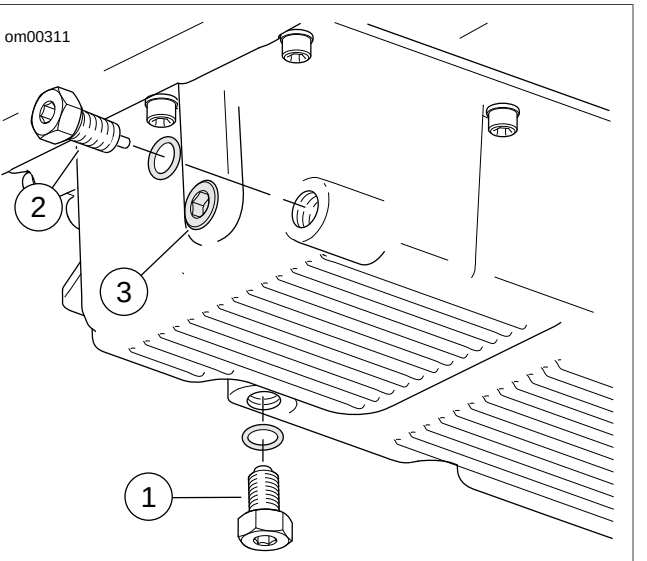
Dispose of oil and oil filter in accordance with local regulations.

7. See Figure 1-4. Lubricate gasket with clean engine oil and install **new** oil filter on filter mount. Hand-tighten oil filter one-half to three-quarters of a turn after gasket first contacts filter mounting surface. Do NOT use oil filter wrench for installation.
8. Install engine oil drain plug and tighten to 14-21 ft-lb (19.0-28.5 Nm).

NOTE

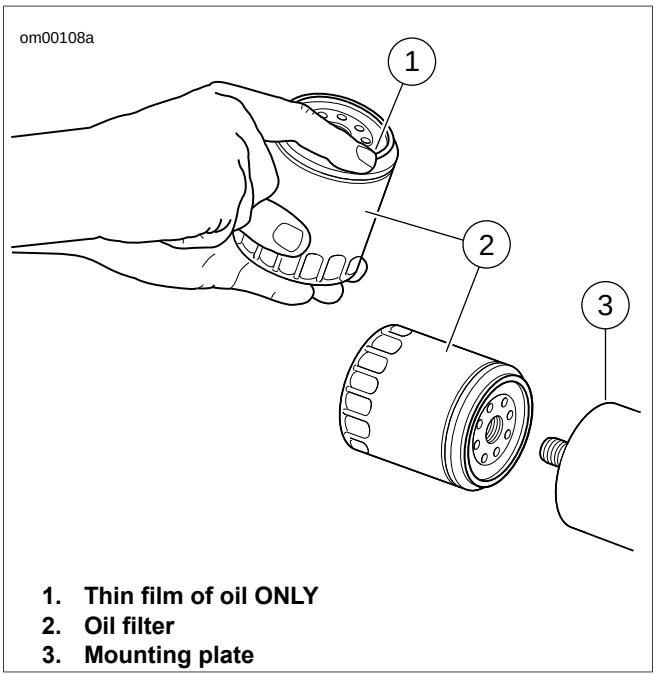
Use the proper grade of oil for the lowest temperature expected before the next oil change. Refer to Table 1-2 for recommended oil.

9. Initially add 3.5 quarts (3.3 liters) of engine oil.
10. Verify proper oil level. See 1.6 ENGINE OIL AND FILTER, Checking Oil Level.
    a. Check engine oil level using **COLD CHECK** procedure.
    b. Start engine and carefully check for oil leaks around drain plug and oil filter.
    c. Check engine oil level using **HOT CHECK** procedure.



1. **Transmission drain plug (right side)**
2. **Engine oil drain plug and O-ring**
3. **Hex plug (do not remove)**

Figure 1-3. Oil Pan



1. **Thin film of oil ONLY**
2. **Oil filter**
3. **Mounting plate**

Figure 1-4. Applying Thin Oil Film

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

AIR CLEANER AND EXHAUST SYSTEM 1.7

REMOVAL

1. See Figure 1-5. Remove screw (1) and air cleaner cover with rubber seal (3).
2. Remove three screws (4) to release cover bracket (5) from filter element.
3. Remove filter element (6) pulling two breather tubes (8) from holes on inboard side.
4. Remove and discard gasket (7).
5. Remove breather tubes from breather bolts.
6. Inspect the breather tubes and rubber seal for cuts, tears, holes or signs of deterioration. Replace as necessary.

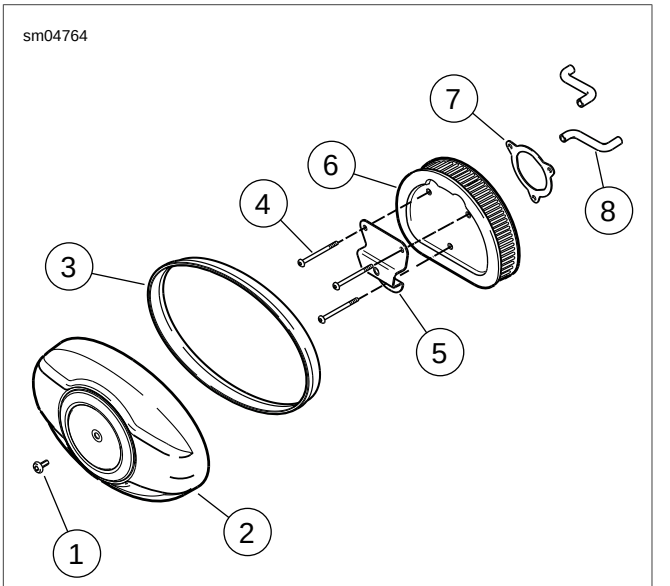
⚠WARNING

Do not use gasoline or solvents to clean filter element. Flammable cleaning agents can cause an intake system fire, which could result in death or serious injury. (00101a)

⚠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)

7. Clean filter element.
   a. Wash the paper/wire mesh filter element (and breather tubes) in lukewarm water with a mild detergent. Do not strike filter element on a hard surface to dislodge dirt.
   b. Allow filter element to either air dry or blow it dry, from the inside, with low pressure air. Do NOT use air cleaner filter oil on the Harley-Davidson paper/wire mesh air filter element.
   c. Hold the filter element up to a strong light source. The element is sufficiently clean if light is uniformly visible through the media.
   d. Replace the filter element if damaged or if filter media cannot be adequately cleaned.



1. **Cover screw**
2. **Air cleaner cover**
3. **Rubber seal**
4. **Cover bracket screw (3)**
5. **Cover bracket**
6. **Filter element**
7. **Gasket**
8. **Breather tube (2)**

Figure 1-5. Air Cleaner Assembly

INSTALLATION

1. Install **new** gasket (7) on air filter element.
2. Insert breather tubes into holes on inboard side of filter element approximately 0.25 in (6.4 mm).

NOTE

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

3. Install breather tubes onto breather bolts.
4. Place filter element onto backplate with the flat side down.
5. Install cover bracket and tighten screws (4) to 108-132 **in-lbs** (12.2-14.9 Nm).
6. Verify that rubber seal is properly seated around perimeter of air cleaner cover.
7. Fit air cleaner cover into backplate. Apply a small dab of LOCTITE MEDIUM STRENGTH THREADLOCKER 243 (BLUE) to threads of cover screw. Install screw and tighten to 36-60 **in-lbs** (4.1-6.8 Nm).

EXHAUST SYSTEM LEAK CHECK

Check the exhaust system for leaks at every scheduled service interval as follows:

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1. Check entire exhaust system for loose or missing fasteners, broken pipe clamps or brackets, and obvious signs of leakage (carbon tracks at pipe joints, etc.).
2. Check for loose or broken heat shields. Repair or replace as necessary.
3. Start engine, cover muffler ends with clean, dry shop towels and listen for audible signs of exhaust leakage.
4. Correct any leaks detected. See 4.19 EXHAUST SYSTEM for exhaust system removal and installation procedures.

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TIRES AND WHEELS 1.8

GENERAL

Use only tires listed in Table 1-7.

ABS equipped motorcycles must always use tires and wheels that are the same as the original equipment. The ABS system monitors rotational speed of the wheels through individual wheel speed sensors to determine the application of ABS. Changing to different diameter wheels or different size tires can alter the rotational speed and upset the calibration of the ABS, resulting in an adverse effect on its ability to detect and prevent lockups. Tire inflation pressure that is significantly low can also have an adverse effect.

TIRES

⚠WARNING

Match tires, tubes, rim seals, air valves and caps to the correct wheel rim. Contact a Harley-Davidson dealer. Mismatching can result in damage to the tire bead, allow tire slippage on the rim or cause tire failure, which could result in death or serious injury. (00023b)

⚠WARNING

Use only Harley-Davidson approved tires. See a Harley-Davidson dealer. Using non-approved tires can adversely affect stability, which could result in death or serious injury. (00024a)

NOTES

- *Tubeless tires are used on all Harley-Davidson cast and disc wheels.*
- *Tire sizes are molded on the tire sidewall. Inner tube sizes are printed on the tube.*
- *New tires should be stored on a horizontal tire rack. Avoid stacking new tires in a vertical stack. The weight of the stack compresses the tires and closes down the beads.*

Check tire pressure and tread:

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

1. Inspect each tire for punctures, cuts and breaks.
2. Inspect each tire for wear. Replace tires before they reach the tread wear indicator bars.

NOTE

Missing indicator wear bars represent less than 1/32 in. (0.8 mm) tread pattern depth remaining.

3. Check for proper front and rear tire pressures when tires are cold. Compare results against Table 1-7.

Table 1-7. Tires

MODEL	MOUNT	SIZE	APPROVED TIRE	PRESSURE (COLD)	
				PSI	kPa
All models except FLHRC, FLTRX, FLHX	front	17 in.	Dunlop D408F 130/80B17 65H	36	248
FLHRC	front	16 in.	Dunlop D408F 130/90B16 67H	36	248
FLTRX, FLHX	front	18 in.	Dunlop D408F 130/70B18 63H	36	248
All models	rear	16 in.	Dunlop D407 180/65B16	40	276

TIRE REPLACEMENT

Inspection

⚠WARNING

Harley-Davidson tires are equipped with wear bars that run horizontally across the tread. When wear bars become visible and only 1/32 in. (0.8 mm) tread depth remains, replace tire immediately. Using a worn tire can adversely affect stability and handling, which could result in death or serious injury. Use only Harley-Davidson approved replacement tires. (00090b)

Arrows on tire sidewalls pinpoint location of wear bar indicators.

Tread wear indicator bars will appear on tire tread surfaces when 1/32 in (0.8 mm) or less of tire tread remains. Always replace tires before the tread wear indicator bars appear.

When To Replace Tires

New tires are needed if any of the following conditions exist:

1. Tread wear indicator bars become visible on the tread surfaces.
2. Tire cords or fabric become visible through cracked sidewalls, snags or deep cuts.
3. A bump, bulge or split in the tire.
4. Puncture, cut or other damage to the tire that cannot be repaired.

When installing tires on rims, do not rely on tread design to determine direction of rotation. Always be sure the rotational arrows molded into the sidewalls point in the direction of rotation when the vehicle is moving forward.

Refer to Table 1-7 for approved tires.

WARNING

Use only Harley-Davidson approved tires. See a Harley-Davidson dealer. Using non-approved tires can adversely affect stability, which could result in death or serious injury. (00024a)

WHEEL BEARINGS

Service wheel bearings:

1. Check wheel bearings as outlined in 2.10 SEALED WHEEL BEARINGS. Replace wheel bearings if end play exceeds 0.002 in. (0.051 mm).
2. If wheel is already removed, check wheel bearings as follows:
   a. See Figure 1-6. Insert finger into wheel bearing and rotate the inner race in both directions. Repeat step on opposite side of wheel.
   b. Replace the wheel bearings if there is drag, rough rotation, abnormal noise or anything unusual.
3. Check axle spacers for wear and corrosion. Replace as necessary.

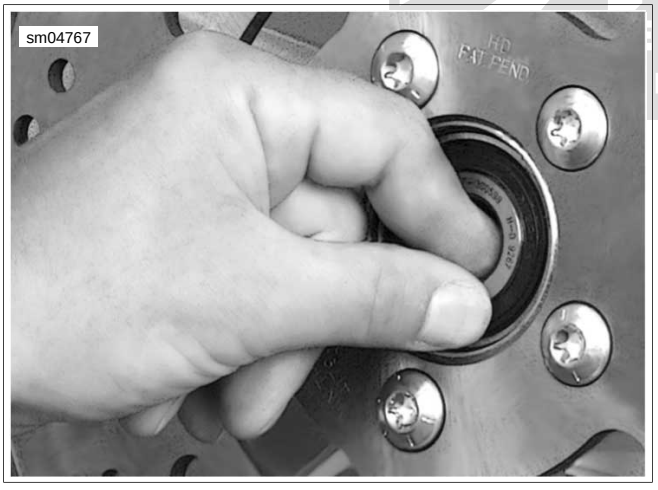


Figure 1-6. Inspect Wheel Bearings

WHEEL SPOKES

PART NUMBER	TOOL NAME
HD-48985	SPOKE TORQUE WRENCH
HD-94681-80	SPOKE NIPPLE WRENCH

WARNING

Spokes that are too tight can draw nipples through the rim or distort hub flanges. Spokes that are too loose can continue to loosen when put in service. Either condition can adversely affect stability and handling, which could result in death or serious injury. (00286a)

WARNING

Do not over tighten spoke nipples. Protruding spoke nipples can damage tube, resulting in rapid tire deflation, which could cause death or serious injury. (00526d)

NOTICE

When lifting a motorcycle using a jack, be sure jack contacts both lower frame tubes where down tubes and lower frame tubes converge. Never lift by jacking on crossmembers, oil pan or other housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586c)

Identify Wheel Spoke Groups

NOTE

Spokes are grouped in sets of four.

1. Raise wheel with a suitable lifting device.
2. See Figure 1-7. Starting at the valve stem, identify the first group of four spokes (1-4).
3. Using a different color for each spoke in the group, draw an alignment mark across the spoke nipple and onto the rim.
4. Continue around the wheel marking the rest of the spokes the same as they were marked in the previous step.

Wheel Spoke Adjustment

NOTES

- *Do not tighten spoke more than 1/4 turn past alignment mark. If more tension is needed, label spoke and check after completing rest of wheel.*
- *Do not use the torque spoke wrench to loosen spokes. Use SPOKE NIPPLE WRENCH (Part No. HD-94681-80) to loosen spokes.*

1. See Figure 1-7. Starting with the first group of spokes, loosen spoke (1) using SPOKE NIPPLE WRENCH (Part No. HD-94681-80) 1/4 turn.

2. Using SPOKE TORQUE WRENCH (Part No. HD-48985) tighten spoke (1) to the value listed in Table 1-8.
   a. While tightening, if the torque wrench clicks before the alignment marks align, continue to turn the spoke nipple until the marks align.
   b. If the alignment marks align and the torque specification has not been reached, continue to tighten the spoke nipple until the correct torque is achieved, but do not turn spoke nipple more then 1/4 turn past alignment mark.
3. Repeat previous two steps for spoke (4) in the same group.
4. Continue around the wheel checking spokes 1 and 4 until all groups are done.
5. Repeat procedure for spokes (2, 3) in each group.

NOTE

When checking any spokes that were labeled, make sure to use the original alignment mark.

6. Check spokes, if any, that were labeled as not reaching the proper torque value after tightening 1/4 turn past alignment mark.
   a. Loosen spoke 1/4 turn past original alignment mark using SPOKE NIPPLE WRENCH (Part No. HD-94681-80).
   b. While tightening, if the torque wrench clicks before the alignment marks align, continue to turn the spoke nipple until the marks align.
   c. If the alignment marks align and the torque specification has not been reached, continue to tighten the spoke nipple until the correct torque is achieved, but do not turn spoke nipple more then 1/4 turn past alignment mark.
7. True the wheel. See 2.9 CHECKING AND TRUING WHEELS.

Table 1-8. Spoke Nipple Torque Specification

RIM TYPE	MINIMUM TORQUE
All	55 **in-lbs** (6.2 Nm)

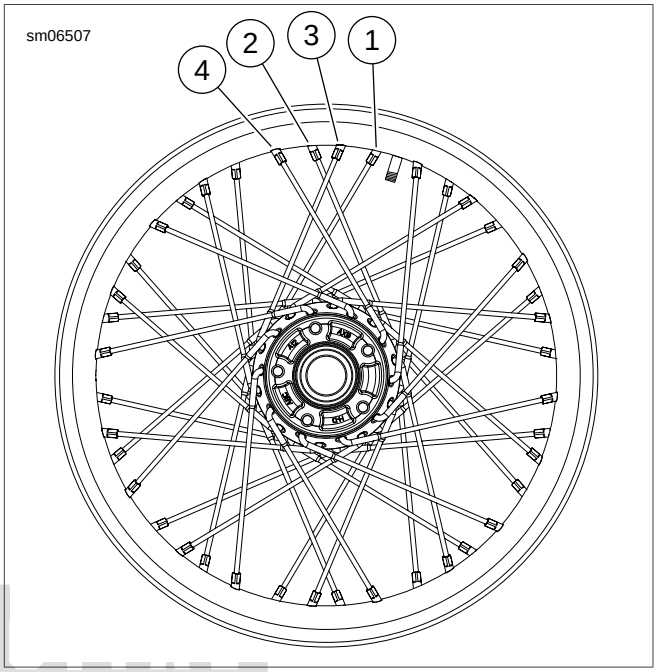


Figure 1-7. Tightening Laced Wheels (typical)

PRIMARY CHAINCASE LUBRICANT 1.9

GENERAL

All models have an automatic chain tensioner. For primary chain service procedures, see 5.4 DRIVE COMPONENTS.

CHANGING PRIMARY CHAINCASE LUBRICANT

1. Run motorcycle until engine is warmed up to normal operating temperature.

NOTICE

When draining or adding lubricant, do not allow dirt, debris or other contaminants to enter the engine. (00198a)

⚠WARNING

Be sure that no lubricants or fluids get on tires, wheels or brakes when changing fluid. Traction can be adversely affected, which could result in loss of control of the motorcycle and death or serious injury. (00047d)

2. See Figure 1-8. Remove magnetic drain plug at bottom of primary chaincase. Drain lubricant into suitable container.

NOTE

Dispose of lubricant in accordance with local regulations.

3. Clean drain plug. If plug has accumulated a lot of debris, inspect the condition of chaincase components.
4. Install **new** O-ring on drain plug.
5. Install drain plug back into primary chaincase cover. Tighten plug to 14-21 ft-lbs (19.0-28.5 Nm).
6. See Figure 1-9. Remove five TORX screws with captive washers (3) to detach clutch inspection cover (2) from primary chaincase cover.
7. Remove the seal (1). Wipe oil from groove in chaincase cover and mounting surface.

NOTICE

Do not overfill the primary chaincase with lubricant. Overfilling can cause rough clutch engagement, incomplete disengagement, clutch drag and/or difficulty in finding neutral at engine idle. (00199b)

8. Refer to Table 1-9. Pour the specified amount of GENUINE Harley-Davidson FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT (Part No. 99851-05, quart) in through the clutch inspection cover opening.

Table 1-9. Primary Chaincase Lubricant Refill Capacity

ITEM	CAPACITY
Primary chaincase lubricant	38 oz (1.12 L) wet
	45 oz (1.33 L) dry

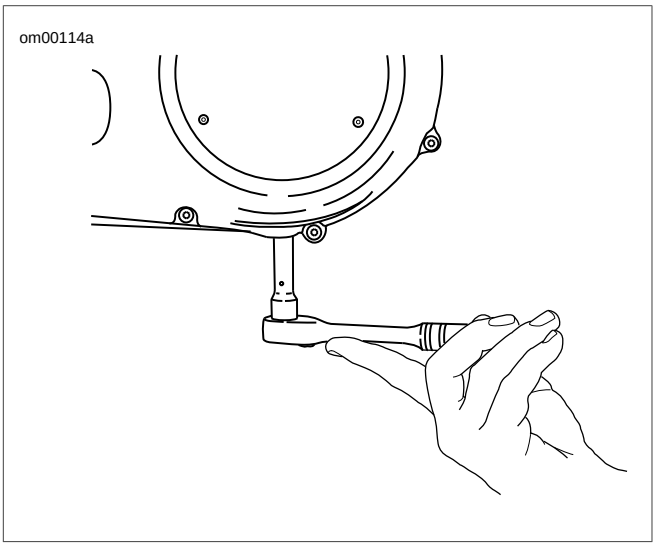
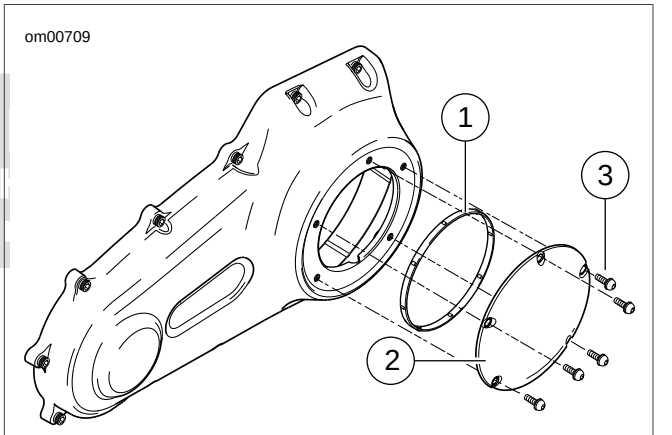


Figure 1-8. Removal/Installation of Chaincase Drain Plug



1. **Seal**
2. **Clutch inspection cover**
3. **Screws with captive washer**

Figure 1-9. Clutch Cover

9. Install clutch inspection cover and **new** seal as follows:
   a. Thoroughly wipe all lubricant from cover mounting surface and groove in chaincase.
   b. See Figure 1-9. Position **new** seal (1) in groove in clutch inspection cover and press each of the nubs on seal into the groove. The nubs will retain seal in position.
   c. See Figure 1-10. Insert screw (with captive washer) through clutch inspection cover and carefully thread it into the top cover screw hole.
   d. Start the remaining four screws (with captive washers).
   e. Alternately tighten screws to 84-108 **in-lbs** (9.5-12.2 Nm) following torque sequence shown in Figure 1-10.

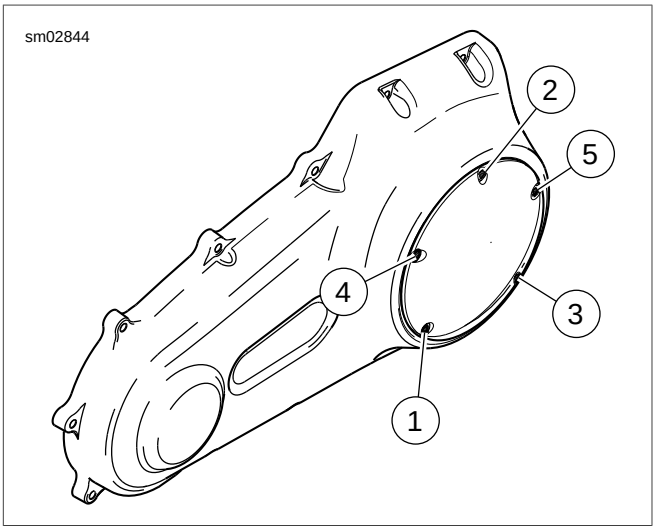


Figure 1-10. Clutch Cover Torque Sequence

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TRANSMISSION LUBRICANT 1.10

TRANSMISSION LUBRICATION

General

The transmission lubricant level should be checked monthly.

Refer to Table 1-4. The transmission should be drained and refilled with fresh lubricant at specified intervals.

NOTE

When checking the transmission lubricant level, the motorcycle should be leaning on the jiffy stand. If the motorcycle was recently moved or ridden, allow a short period of time to equalize lubricant level in the transmission compartments.

Check Lubricant Level

1. Park motorcycle on its jiffy stand.
2. See Figure 1-11. Remove the filler plug/dipstick and wipe off dipstick.
3. See Figure 1-12. Place back in filler hole but do not thread in. (Filler plug/dipstick should rest on top of threaded hole.) Remove filler plug/dipstick and observe lubricant level. Level should be between the full and low marks on the dipstick.

⚠WARNING

Be sure that no lubricants or fluids get on tires, wheels or brakes when changing fluid. Traction can be adversely affected, which could result in loss of control of the motorcycle and death or serious injury. (00047d)

NOTICE

When draining or adding lubricant, do not allow dirt, debris or other contaminants to enter the engine. (00198a)

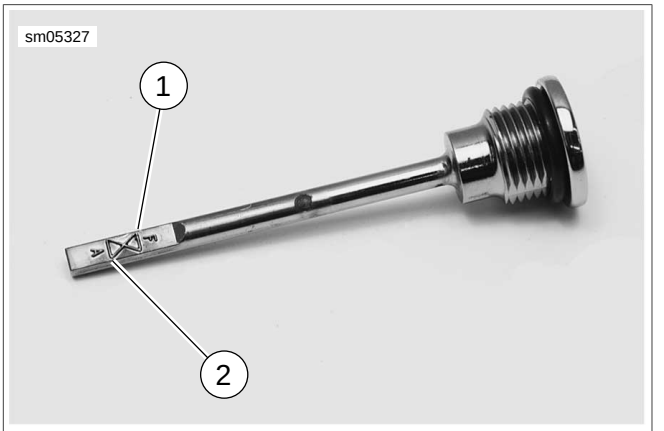
4. Add the recommended GENUINE Harley-Davidson lubricant as necessary. Refer to Table 1-10. Do not overfill or leakage may occur. The transmission fluid capacity is approximately 32 fluid ounces (0.95 liters).
5. Inspect O-ring for tears or damage. Replace if required. Wipe any foreign material from plug.
6. Install filler plug/dipstick and tighten to 25-75 **in-lbs** (2.8-8.5 Nm).

Table 1-10. Recommended Lubricant

MODEL	LUBRICANT
All	FORMULA+ TRANSMISSION AND PRIMARY CHAIN LUBRICANT (Part No. 99851-05) or SYN3 20W50 OIL (Part No. 99824-03/00QT quart)



Figure 1-11. Transmission Filler Plug/Dipstick Location



1. **FULL**
2. **ADD**

Figure 1-12. Transmission Filler Plug/Dipstick Lubricant Level

Changing Transmission Fluid

1. See Figure 1-11. Remove the threaded filler plug/dipstick.

NOTICE

When draining or adding lubricant, do not allow dirt, debris or other contaminants to enter the engine. (00198a)

⚠WARNING

Be sure that no lubricants or fluids get on tires, wheels or brakes when changing fluid. Traction can be adversely affected, which could result in loss of control of the motorcycle and death or serious injury. (00047d)

2. See Figure 1-3. Remove transmission drain plug (1) and drain lubricant into a suitable container.

NOTE

Dispose of transmission lubricant in accordance with local regulations.

3. Inspect the drain plug O-ring for tears or damage. Replace if required. Wipe any foreign material from plug.
4. Install drain plug and tighten to 14-21 ft-lbs (19.0-28.5 Nm). Fill the transmission with 32 fl. oz. (0.95 liters) of the recommended GENUINE Harley-Davidson lubricant. Refer to Table 1-10.

NOTE

Do not overfill or leakage may occur. The transmission fluid capacity is approximately 32 fl. oz. (0.95 liters).

5. Install filler plug/dipstick and tighten to 25-75 **in-lbs** (2.8-8.5 Nm).
6. Start engine and carefully check for oil leaks around drain plug.

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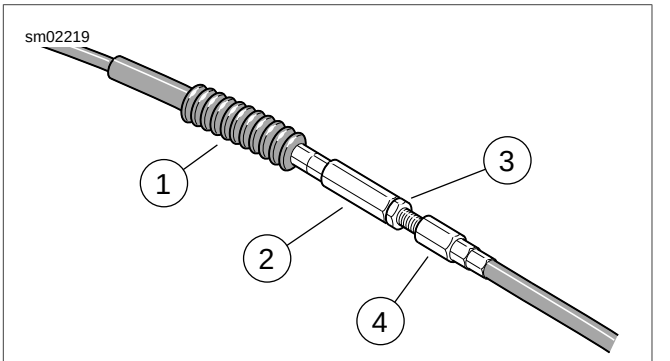
CLUTCH 1.11

ADJUSTMENT

NOTE

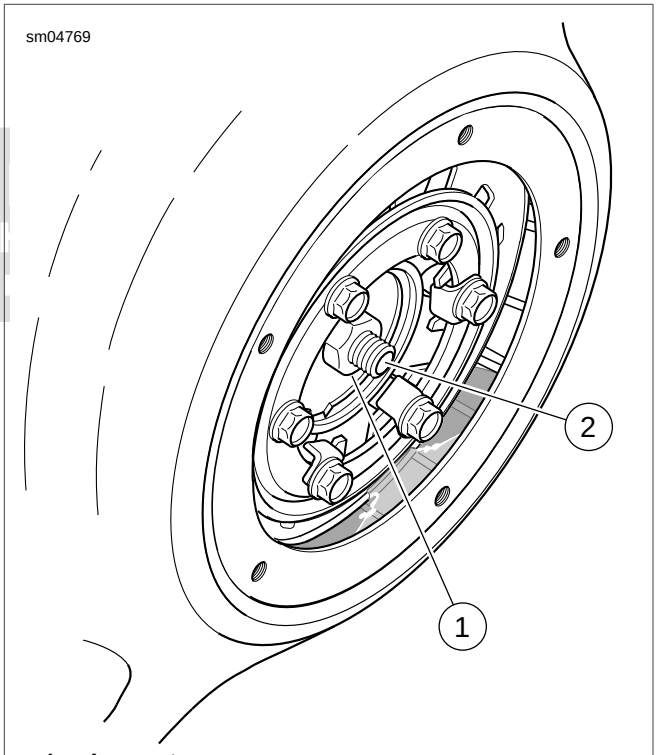
Perform the clutch adjustment with the motorcycle at room temperature. The clearance at the adjuster screw will increase as the powertrain temperature increases. If adjuster screw is adjusted with powertrain hot, clearance at push rod bearing could be insufficient with powertrain cold and clutch slippage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

1. Stand motorcycle upright and level.
2. Remove clutch inspection cover from primary chaincase cover.
3. Remove seal ring from clutch inspection cover and discard.
4. See Figure 1-13. Add freeplay to cable.
   a. Slide rubber boot (1) off cable adjuster.
   b. Loosen jam nut (3) and back away from cable adjuster.
   c. Move adjuster (2) toward jam nut to introduce a large amount of free play at hand lever.
5. See Figure 1-14. Loosen jam nut (1) on clutch adjuster screw. Turn adjuster screw (2) inward (clockwise) until lightly seated.
6. Back out adjuster screw 1/2 to 1 full turn. While holding adjuster screw, tighten jam nut to 72-120 **in-lbs** (8.1-13.6 Nm).
7. Squeeze clutch lever to maximum limit three times to set ball and ramp release mechanism.
8. See Figure 1-13. Check freeplay.
   a. Turn cable adjuster (2) away from jam nut (3) until slack is eliminated at hand lever.
   b. See Figure 1-15. Pull clutch cable ferrule (2) away from clutch lever bracket to check free play. Turn cable adjuster as necessary to obtain 1/16-1/8 in. (1.6-3.2 mm) free play between end of cable ferrule and clutch lever bracket.
9. Hold adjuster and tighten jam nut to 120 **in-lbs** (13.6 Nm). Cover cable adjuster mechanism with rubber boot.
10. Swab all lubricant from seal ring groove in clutch inspection cover. Install **new** seal ring in groove with nubs contacting ring groove walls.
11. Fasten clutch inspection cover to primary chaincase cover. Alternately tighten screws to 84-108 **in-lbs** (9.5-12.2 Nm) in the sequence shown in Figure 1-10.



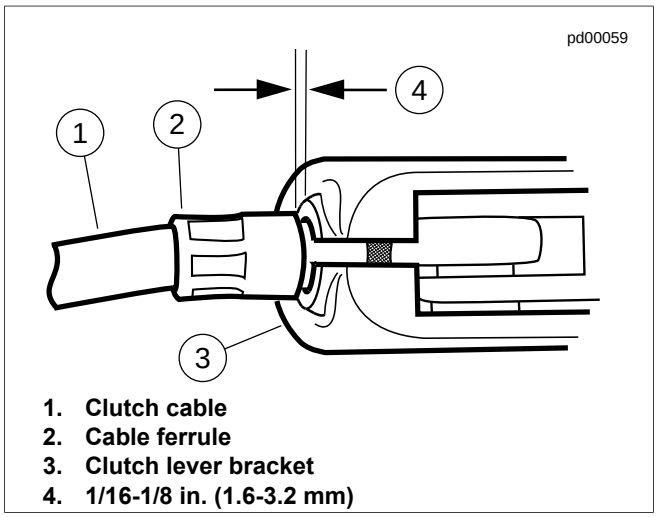
1. Rubber boot
2. Cable adjuster
3. Jamnut
4. Cable end

Figure 1-13. Clutch Cable Adjuster



1. Jam nut
2. Clutch adjuster screw

Figure 1-14. Clutch Adjuster Screw



1. Clutch cable
2. Cable ferrule
3. Clutch lever bracket
4. 1/16-1/8 in. (1.6-3.2 mm)

Figure 1-15. Clutch Hand Lever

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DRIVE BELT AND SPROCKETS 1.12

GENERAL

When a drive belt is replaced for any reason other than stone damage, it is recommended that both the transmission sprocket and rear sprocket also be replaced to increase the longevity of the **new** drive belt. In the case of stone damage, inspect sprockets for damage and replace as required.

⚠WARNING

Never bend belt forward into a loop smaller than the drive sprocket diameter. Never bend belt into a reverse loop. Over bending can damage belt resulting in premature failure, which could cause loss of control and death or serious injury. (00339a)

CLEANING

Keep dirt, grease, oil, and debris off the drive belt and sprockets. Clean the belt with a rag slightly dampened with a light cleaning agent.

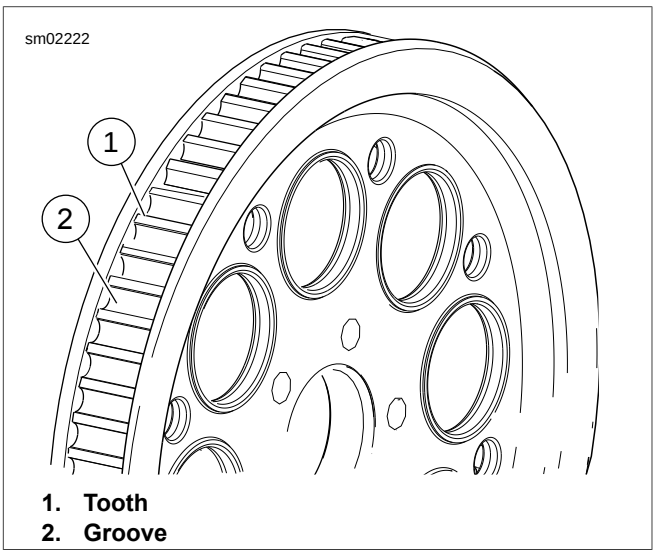
INSPECTION

Sprockets

NOTE

If chrome chips or gouges to rear sprocket are large enough to be harmful, they will leave a pattern on the belt face.

1. See Figure 1-16. Inspect each tooth (1) of rear sprocket for:
   a. Major tooth damage.
   b. Large chrome chips with sharp edges.
   c. Gouges caused by hard objects.
   d. Excessive loss of chrome plating (see next step).
2. To check if chrome plating has worn off, drag a scribe or sharp knife point across the bottom of a groove (2) (between two teeth) with medium pressure.
   a. If scribe or knife point slides across groove without digging in or leaving a visible mark, chrome plating is still good.
   b. If scribe or knife points digs in and leaves a visible mark, it is cutting the bare aluminum. A knife point will not penetrate the chrome plating.
3. Replace rear sprocket if major tooth damage or loss of chrome exists.



1. **Tooth**
2. **Groove**

Figure 1-16. Rear Sprocket

Drive Belt

See Figure 1-17. Inspect drive belt for:

- Cuts or unusual wear patterns.
- Outside edge bevelling (8). Some bevelling is common, but it indicates that sprockets are misaligned.
- Outside ribbed surface for signs of stone puncture (7). If cracks/damage exists near edge of belt, replace belt immediately. Damage to center of belt will require belt replacement eventually, but when cracks extend to edge of belt, belt failure is imminent.
- Inside (toothed portion) of belt for exposed tensile cords (normally covered by nylon layer and polyethylene layer). This condition will result in belt failure and indicates worn transmission sprocket teeth. Replace belt and transmission sprocket.
- Signs of puncture or cracking at the base of the belt teeth. Replace belt if either condition exists.
- Replace belt if conditions 2, 3, 6 or 7 (on edge of belt) exist.

NOTE

Condition 1 may develop into 2 or 3 over time. Condition 1 is not grounds for replacing the belt, but it should be watched closely before condition 2 develops which will require belt replacement.

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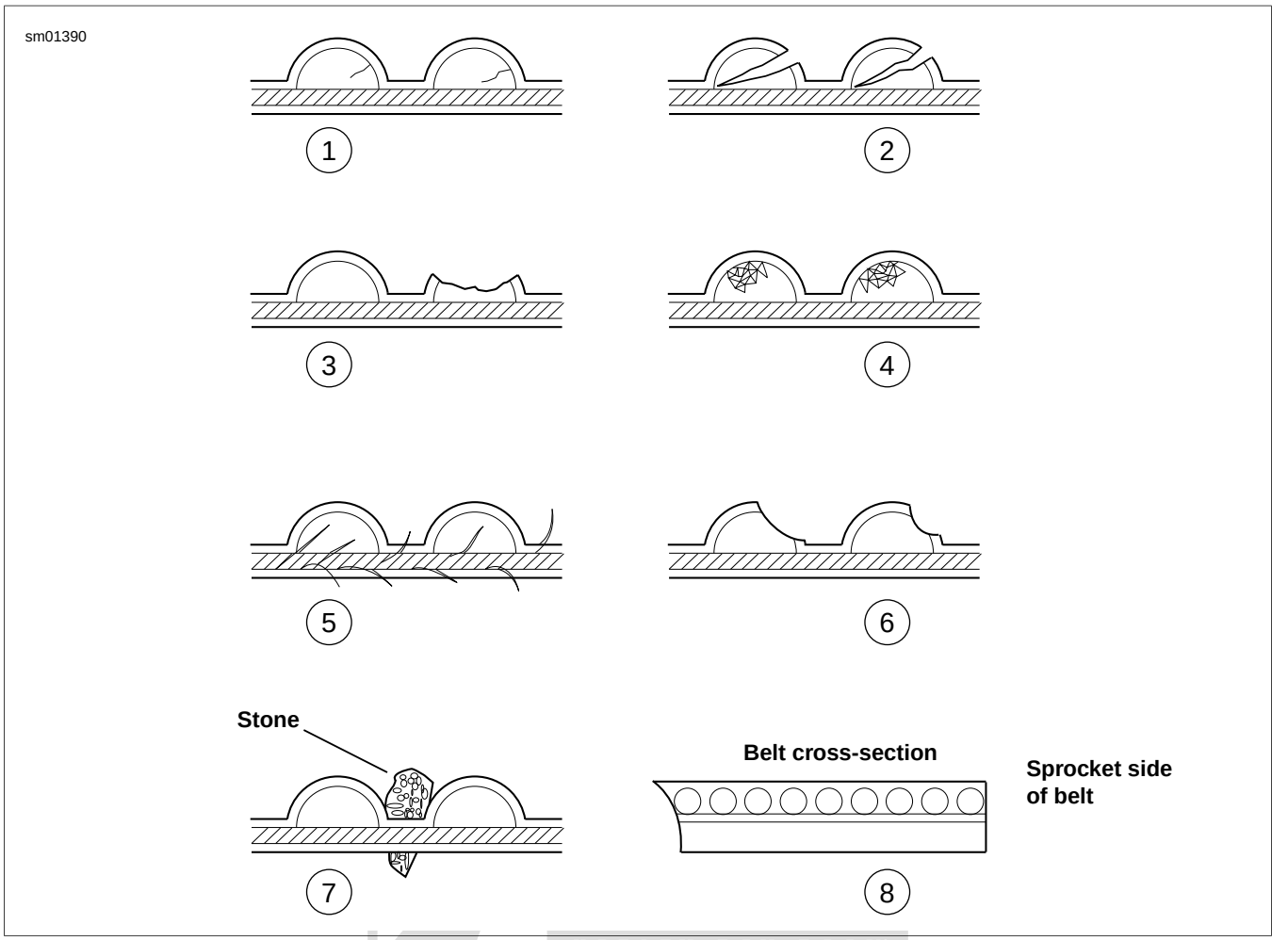


Figure 1-17. Drive Belt Wear Patterns

Table 1-11. Drive Belt Wear Analysis

PATTERN	CONDITION	REQUIRED ACTION
1	Internal tooth cracks (hairline)	OK to run, but monitor condition.
2	External tooth cracks	Replace belt.
3	Missing teeth	Replace belt.
4	Chipping (not serious)	OK to run, but monitor condition.
5	Fuzzy edge cord	OK to run, but monitor condition.
6	Hook wear	Replace belt and sprocket.
7	Stone damage	Replace belt if damage is on the edge.
8	Bevel wear (outboard edge only)	OK to run, but monitor condition.

CHECKING DRIVE BELT DEFLECTION

PART NUMBER	TOOL NAME
HD-35381A	BELT TENSION GAUGE

NOTE

Always use BELT TENSION GAUGE (Part No. HD-35381A) to measure belt deflection. Do not rely on "feel" as this can result in belts that are under tensioned. Loose belts will fail due to "ratcheting" (jumping a tooth).

Check deflection:

- As part of pre-ride inspection.
- At every scheduled service interval.
- With transmission in neutral.
- At loosest spot in belt.
- With motorcycle at room temperature.
- With motorcycle upright and rear wheel off the ground or on jiffy stand without rider or luggage.

1. Remove left side saddlebag.
2. Slide O-ring on gauge toward 0 lbs (0 kg) mark.
3. See Figure 1-18. Fit cradle against bottom of belt midway between transmission sprocket and rear sprocket.
4. Push upward on knob until O-ring slides to the 10 lbs (4.5 kg) mark on the tool and compare belt deflection to scale on debris deflector.

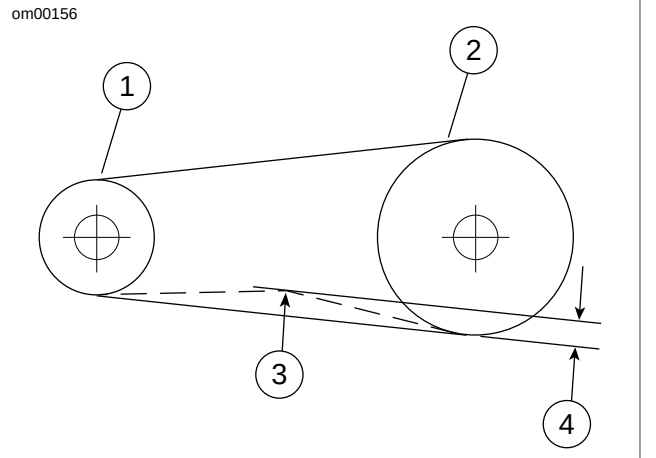
NOTE

Each graduation on the scale represents 1/8 in (3.2 mm) of belt deflection.

5. Measure deflection at several locations around the belt. Select the loosest measurement and compare with specifications in Table 1-12. Adjust belt as necessary.

Table 1-12. Belt Deflection

MODEL	INCHES	MILLIMETERS
FLHX, FLTRX	1/4-5/16	6.4-7.9
Other models	3/8-7/16	9.5-11.1



1. **Transmission sprocket**
2. **Rear wheel sprocket**
3. **10 lbs (4.5 kg) of force**
4. **Amount of deflection**

Figure 1-18. Checking Belt Deflection

SETTING BELT DEFLECTION

PART NUMBER	TOOL NAME
HD-35381A	BELT TENSION GAUGE
HD-47925	AXLE NUT TORQUE ADAPTER

Adjustment

1. Remove both saddlebags.
2. Remove and discard E-clip from groove at end of axle.

NOTE

The AXLE NUT TORQUE ADAPTER simplifies the belt adjustment procedure by allowing the cone nut to be loosened and tightened without having to remove the right side muffler. The tool also can be used to rotate the weld nut on the left side.

3. See Figure 1-19. Install AXLE NUT TORQUE ADAPTER (Part No. HD-47925) on 1/2 inch breaker bar, perpendicular to breaker bar. For best clearance with muffler, install torque adapter on the outboard side.

NOTE

In order to provide adequate room to install tools on the cone nut and weld nut, it may be necessary to remove bolts fastening each muffler to the rear of the saddlebag frame and pulling each muffler away from the end of the axle.

4. Insert tool up between rear wheel and muffler and onto cone nut. Loosen cone nut.

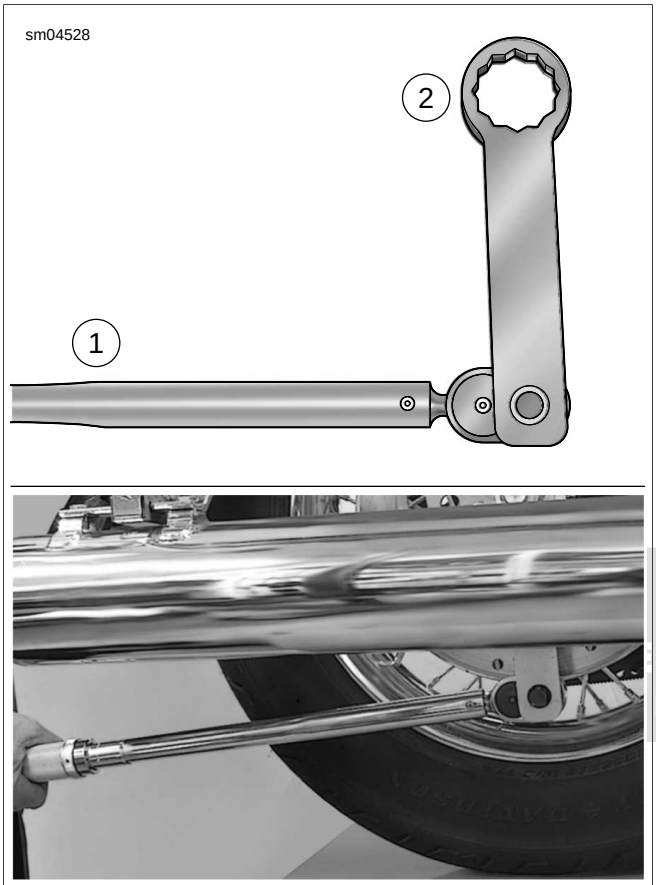
NOTE

Since any added length can act as a torque multiplier, the torque wrench must be perpendicular to the torque adapter.

5. Install AXLE NUT TORQUE ADAPTER (Part No. HD-47925) on torque wrench, perpendicular to torque wrench.
6. Insert tool up between rear wheel and muffler to capture cone nut.

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7. See Figure 1-20. Push wheel forward and verify that cam (5) contacts boss (4) on both sides of rear fork.
8. For purposes of adjustment only, snug the cone nut (6) to 15-20 ft-lbs (20-27 Nm).
9. Use BELT TENSION GAUGE (Part No. HD-35381A) to check belt deflection as adjustment is made. See 1.12 DRIVE BELT AND SPROCKETS, Checking Drive Belt Deflection.



1. **Torque wrench**
2. **Axle nut torque adapter (HD-47925)**

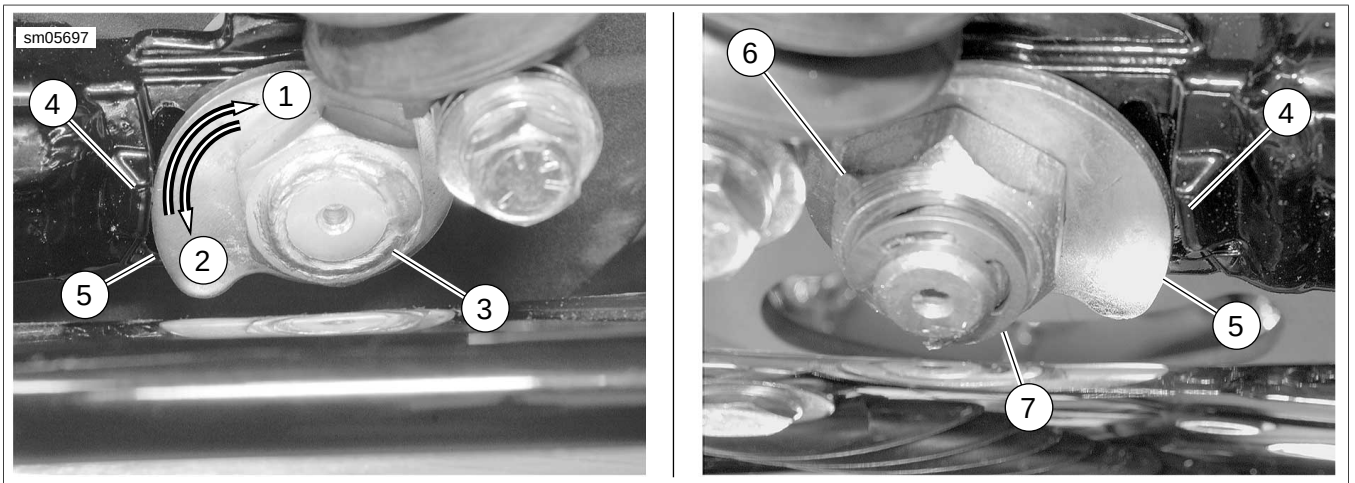
Figure 1-19. Install Tool Perpendicular to Torque Wrench

NOTE

It may be beneficial to use a second AXLE NUT TORQUE ADAPTER (Part No. HD-47925) and breaker bar or ratchet to rotate and hold the weld nut. The position of the breaker bar or ratchet in relation to the tool is not important and can be mated in any position that will make use easy.

10. See Figure 1-20. Adjust belt tension by rotating weld nut (3) on left side of axle; clockwise to tighten the belt or counterclockwise to loosen the belt. If loosening the belt tension, push the wheel forward and verify both cams (5) touch the bosses (4) on both sides after the weld nut is rotated.
11. When correct tension is obtained, verify the cams touch the bosses on both sides of the rear fork.

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1. **Increase belt deflection**
2. **Reduce belt deflection**
3. **Weld nut**
4. **Boss**
5. **Adjuster cam**
6. **Cone nut**
7. **E-clip**

Figure 1-20. Rear Wheel Adjuster Cams

Assembly

NOTE

It is important that the weld nut does not rotate once belt tension is correct. If the axle moves during tightening of the cone nut, the belt deflection procedure must be restarted.

1. Hold weld nut and tighten cone nut to 95-105 ft-lbs (128.8-142.4 Nm).
2. Again, verify the cams touch the bosses on both sides of the rear fork. Check belt deflection to verify that it is still within specification.
3. With the flat side out, install **new** E-clip in groove on right side of axle.
4. If removed, install fasteners that attach mufflers to the saddlebag frames and tighten to 96-144 **in-lbs** (10.9-16.3 Nm).
5. Install saddlebags.

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COMPENSATOR SPROCKET ISOLATOR 1.13

INSPECTION

1. Support the vehicle in an upright position in neutral, and in a fashion that will not allow the rear wheel to rotate. Do not lift the wheels off the ground.
2. Remove left saddlebag.
3. See Figure 1-21. Hang a weighted string (1) on the left axle spacer as close as possible to, but not touching, the rear sprocket.

NOTE

A piece of masking tape on the face of the sprocket will protect the finish.

4. Place a piece of masking tape on the face of the sprocket where the marks will be drawn.

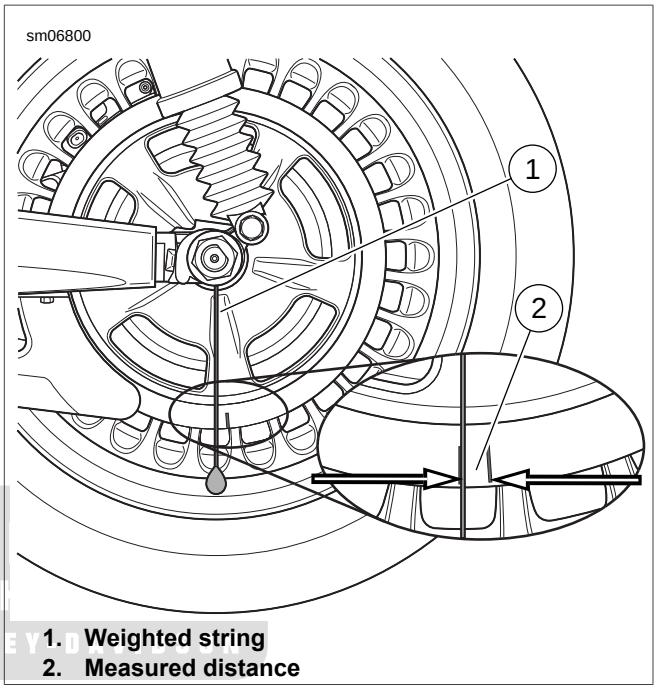
NOTE

Do not allow the rear wheel to rotate when rotating the sprocket. A false measurement will occur.

5. Rotate the rear sprocket by hand in one direction until it stops. Hold in place.
6. While holding the sprocket, carefully mark the masking tape along the edge of the sprocket in line with the string.
7. Rotate the rear sprocket in the opposite direction until it stops and again hold it in place.
8. Make a second mark in line with the string.
9. Measure the distance (2) between the marks along the edge of the sprocket. If the measurement exceeds 0.400 in (10.2 mm) the rubber isolator must be replaced.

NOTE

Components can be visually inspected when disassembled. Excessive play in the compensator components are caused by deteriorated, crumbling, or flaking of the rubber segments. Wear on the raised "nubs" or small amounts of rubber debris are normal and do not indicate a worn out isolator. See 2.6 REAR WHEEL COMPENSATOR if the rear wheel compensator needs to be serviced.



1. Weighted string
2. Measured distance

Figure 1-21. Check Compensator Wear

CABLE AND CHASSIS LUBRICATION 1.14

GENERAL

Inspect and lubricate the following at scheduled service intervals as specified in 1.5 MAINTENANCE SCHEDULE.

- Front brake hand lever.
- Clutch hand lever.
- Clutch cable.
- Foot shift lever pivot (if applicable).
- Rear brake lever pivot.
- Steering head bearings.
- Jiffy stand.

If motorcycle is operated on muddy or dusty roads, clean and lubricate more frequently.

Use Harley® Lube (Part no. HD-94968-09) for hand levers and cables.

STEERING HEAD BEARINGS

Lubricate the steering head bearings with HARLEY-DAVIDSON SPECIAL PURPOSE GREASE. See 1.20 STEERING HEAD BEARINGS for procedure.

JIFFY STAND

Clean and lubricate the jiffy stand. For more information, see 2.50 JIFFY STAND.

MISCELLANEOUS LUBRICATION

Hinges, Latches, Etc.

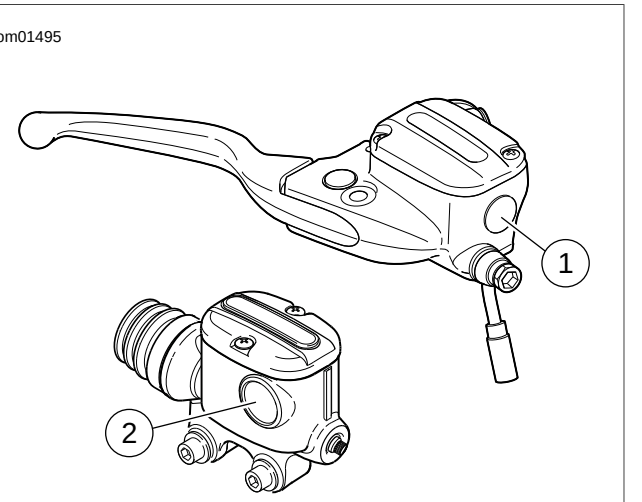
Lubricate the rub points of latches and hinges using Harley® Lube (Part No. 94968-09) as required.

Lubricate the fingers on the saddlebag latches where they engage the hinge.

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FLUID INSPECTION

1. Position vehicle for inspection.
   a. **Front brake:** Position vehicle on a flat level surface. Turn handlebar so front brake master cylinder is approximately level.
   b. **Rear brake:** Have an assistant hold vehicle upright on a level surface.
2. See Figure 1-22. View reservoir sight glass and verify fluid presence.
3. If fluid is not visible through sight glass, check brake system for fluid leaks. Check that brake pads are properly installed and not worn beyond service wear limits. Perform any necessary repairs. See 1.16 BRAKE PADS AND DISCS.
4. If fluid is still not visible through sight glass, remove cover and verify fluid level. If necessary, add HARLEY-DAVIDSON D.O.T. 4 BRAKE FLUID (Part No. 99953-99A) to reservoir. Replace cover. See 2.16 BLEEDING BRAKES.
5. Front brake hand lever and rear brake foot pedal must have a firm feel when applied. If not, bleed system using only HARLEY-DAVIDSON D.O.T. 4 BRAKE FLUID (Part No. 99953-99A). See 2.16 BLEEDING BRAKES.



1. **Sight glass, front master cylinder reservoir**
2. **Sight glass, rear master cylinder reservoir**

Figure 1-22. Brake Fluid Sight Glass (typical)

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BRAKE PADS AND DISCS 1.16

INSPECTION

Check brake pads and discs:

- At every scheduled service interval.
- Whenever the components are removed during service procedures.

Brake Pads

⚠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)

NOTICE

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)

⚠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)

Replace both rear brake pads if the friction material of either pad is worn to 0.016 in. (0.4 mm) or less above the backing plate.

Replace all front brake pads (inner and outer pads of both the left and right side calipers) if the friction material of any single pad is worn to 0.016 in. (0.4 mm) or less above the backing plate.

NOTE

Refer to the wear indicator lines for a general indication of pad wear. See Figure 1-24.

Always install a **new** pad pin (provided in brake pad service kit) whenever the brake pads are replaced.

Inspect the brake lines and hoses for damage or wear.

Brake Disc Thickness

The minimum front brake disc thickness is 0.18 in. (4.5 mm) and is stamped on the side of the disc.

The minimum rear brake disc thickness is 0.25 in. (6.3 mm) and is stamped on the side of the disc.

Replace any disc that is excessively worn or badly scored.

Brake Disc Lateral Runout

Measure brake disc runout using a dial caliper mounted to a stationary surface. Maximum brake disc lateral runout or warpage is 0.008 in. (0.2 mm) when measured near the outside diameter of the disc.

BRAKE PAD REPLACEMENT

Rear Brake Caliper

1. Remove right side saddlebag. See 2.26 SADDLEBAGS, Removal.
2. If ABS equipped, release rear wheel speed sensor cable from retainer clip on brake hose.
3. Remove two screws to release brake caliper from caliper bracket.
4. Remove brake caliper from brake disc.

NOTE

Do not operate the brake pedal with the rear brake caliper removed or the caliper pistons may be forced out. The caliper contains no serviceable components and will require replacement.

5. Stand motorcycle upright, so that rear master cylinder reservoir is level. Wrap a clean shop cloth around the outside of the reservoir to protect paint from brake fluid spills.
6. Remove cover from master cylinder reservoir.

NOTE

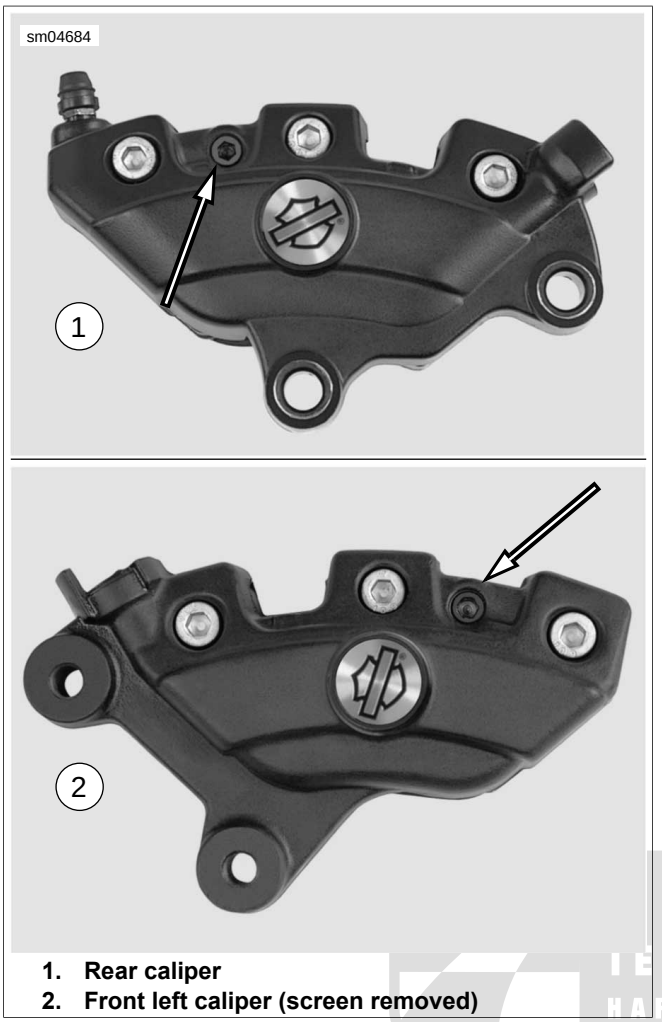
Fluid level will rise as pistons are pushed into the caliper, possibly overflowing the master cylinder reservoir. Remove fluid from the reservoir if necessary.

7. Push each pad back until pistons are fully seated in the bores.
8. See Figure 1-26. Pull retaining clip (3) from groove in pad pin.
9. See Figure 1-23. Remove pad pin (metric).
10. Pull on pad pin side of brake pads to release from caliper.
11. See Figure 1-26. Remove pad spring (1) if damaged or worn.
12. If removed, seat **new** pad spring on flat in caliper, so that clips on spring engage indentations in caliper. Be sure that forked end of pad spring is on the pad pin side of the caliper.

⚠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)

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1. **Rear caliper**
2. **Front left caliper (screen removed)**

Figure 1-23. Brake Caliper Pad Pin

13. Install **new** brake pads as follows:
    a. See Figure 1-24 and Figure 1-25. Insert brake pad into caliper engaging square corner of pad in slot of caliper.
    b. Push pad pin tab of brake pad into caliper until seated.
    c. Verify that brake pad friction material faces brake disc gap in caliper.
    d. Repeat step to install remaining brake pad.
14. Verify that pad pin tabs are centered under forks of pad spring. Adjust pads if necessary.
15. Install **new** pad pin and tighten to 75-102 **in-lbs** (8.5-11.5 Nm).
16. See Figure 1-26. Install retaining clip in groove of pad pin, so that lip overhangs caliper housing.
17. Install brake caliper onto brake disc and install two screws. Tighten screws to 43-48 ft-lbs (58.3-65.1 Nm).
18. If ABS equipped, secure sensor cable with clip on brake hose.

WARNING

After servicing brakes and before moving motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00279a)

19. Operate brake pedal several times to set brake pads to proper operating position.
20. See Figure 1-27. Check brake fluid level in master cylinder reservoir. If necessary, add D.O.T. 4 BRAKE FLUID until level is flush with ledge cast at front of reservoir.
21. Install master cylinder reservoir cover and tighten to 12-15 **in-lbs** (1.4-1.7 Nm).
22. Install right side saddlebag. See 2.26 SADDLEBAGS, Installation.

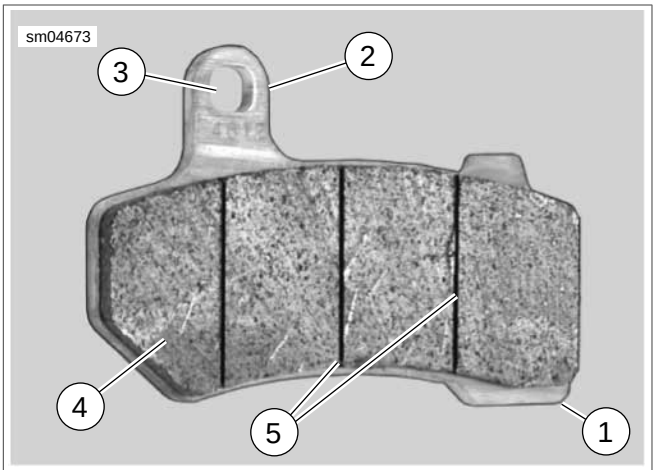
WARNING

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)

23. Test brake system.
    a. Turn ignition switch ON. Depress brake pedal to verify operation of brake lamp.
    b. Test ride motorcycle. Bleed the system if brakes feel spongy. See 2.16 BLEEDING BRAKES.

NOTE

*Avoid making hard stops for the first 100 miles (160 km). This allows the **new** pads to become conditioned to the brake discs.*

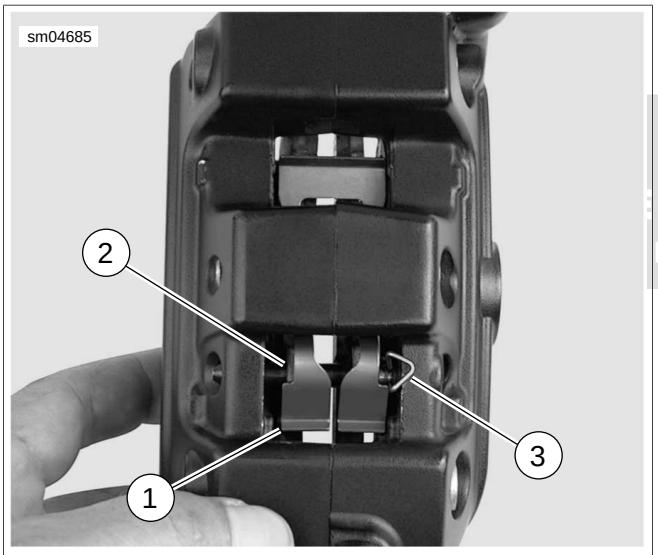


1. **Square corner**
2. **Pad pin tab**
3. **Pad pin hole**
4. **Friction material**
5. **Wear indicator lines**

Figure 1-24. Brake Pad



Figure 1-25. Brake Caliper (Bottom View)



1. **Pad spring (forked end)**
2. **Pad pin tab**
3. **Pad pin retaining clip**

Figure 1-26. Brake Caliper (Top View)

Front Brake Calipers

1. If present, carefully cut cable straps to release front wheel speed sensor cable and front fender tip lamp wires from brake hose to left brake caliper.
2. On ABS equipped motorcycles, release front wheel speed sensor cable from clip as follows:
   a. Push on lip at rear of clip to disengage from bracket.
   b. Rotate tab (stamped ABS) rearward until clip is perpendicular to bracket and remove cable.
3. Remove two brake caliper mounting screws. Slide brake caliper straight down off from brake disc. Allow the brake caliper to hang by the brake hose.

NOTE

Do not operate the brake lever with the front brake caliper removed or the caliper pistons may be forced out. The caliper contains no serviceable components and will require replacement.

4. Turn front wheel to left until front master cylinder reservoir is level. Wrap a clean shop cloth around the outside of the reservoir to protect paint from brake fluid spills.
5. Remove cover from master cylinder reservoir.

NOTE

Fluid level will rise as pistons are pushed back into the caliper, possibly overflowing the master cylinder reservoir. Remove fluid from the reservoir if necessary.

6. Push each pad back until pistons are fully seated in the bores.
7. Remove screen from caliper.
8. See Figure 1-26. Pull retaining clip from groove in pad pin.
9. See Figure 1-23. Remove pad pin (metric).
10. Pull on pad pin end of brake pads to release from caliper.
11. Remove pad spring if damaged or worn.
12. If removed, seat **new** pad spring on flat in caliper, so that clips on spring engage indentations in caliper. Be sure that forked end of pad spring is on the pad pin side of the caliper.

⚠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)

13. Install **new** brake pads as follows:
    a. See Figure 1-24 and Figure 1-25. Insert brake pad into caliper engaging square corner of pad in slot of caliper.
    b. Push pad pin tab of brake pad into caliper until seated.
    c. Verify that brake pad friction material faces brake disc gap in caliper.
    d. Repeat step to install remaining brake pad.
14. Verify that pad pin tabs are centered under forks of pad spring. Adjust pads if necessary.
15. Install **new** pad pin and tighten to 75-102 **in-lbs** (8.5-11.5 Nm).
16. See Figure 1-26. Install retaining clip in groove of pad pin, so that lip overhangs caliper housing.
17. Engage two prongs on screen beneath forked end of pad spring and push on single prong side of screen until engaged.

18. Install brake caliper as follows:
    a. Install caliper with bleeder at top (and cable clip/bracket if ABS equipped and secure with two mounting screws).

NOTE

Be sure that tab (stamped ABS) on clip is installed in slot of bracket from inboard side. Clip cannot be installed once mounting screws are started.

    b. Tighten mounting screws to 28-38 ft-lbs (37.9-51.5 Nm).

⚠WARNING

After servicing brakes and before moving motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00279a)

19. Install **new** cable straps to secure brake hose and wheel speed sensor if equipped.
20. If ABS equipped, install front wheel speed sensor cable in clip. See C.3 WHEEL SPEED SENSORS.

⚠WARNING

After servicing brakes and before moving motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00279a)

21. Operate brake lever several times to set brake pads to proper operating position.
22. See Figure 1-27. Check brake fluid level in master cylinder reservoir. If necessary, add D.O.T. 4 BRAKE FLUID until level is flush with step (marked MAX) cast at rear of reservoir.
23. Verify gasket and sealing surfaces are free of debris and install master cylinder reservoir cover. Orient the cover with the vent holes facing the rear. Install cover screws and tighten to 10-12 **in-lbs** (1.1-1.4 Nm).

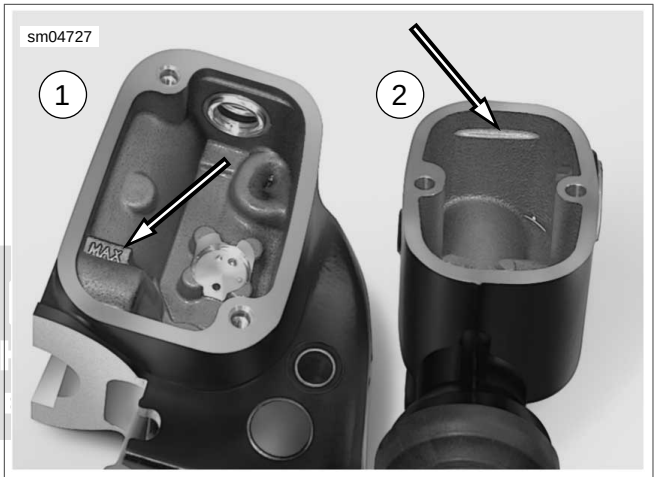
⚠WARNING

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)

24. Test brake system.
    a. Turn ignition switch ON. Depress brake lever to verify operation of brake lamp.
    b. Test ride motorcycle. Bleed system if brakes feel spongy. See 2.16 BLEEDING BRAKES.

NOTE

*Avoid making hard stops for the first 100 miles (160 km). This allows the **new** pads to become conditioned to the brake discs.*



1. Front master cylinder reservoir
2. Rear master cylinder reservoir

Figure 1-27. Brake Fluid Level

SPARK PLUGS 1.17

INSPECTION

⚠WARNING

Disconnecting spark plug cable with engine running can result in electric shock and death or serious injury. (00464b)

NOTE

Allow the engine to cool to room temperature before servicing spark plugs.

1. Disconnect spark plug cables and remove spark plugs.
2. See Figure 1-28. Inspect the spark plug and compare your observations with the descriptions provided below.
   a. If a spark plug has eroded electrodes, heavy deposits or a cracked insulator, discard it.
   b. A wet, black and shiny deposit on base, electrodes and ceramic insulator tip indicates an oil fouled spark plug. The condition may be caused by one or more of the following: worn pistons, worn piston rings, worn valves, worn valve guides, worn valve seals, a weak battery or a faulty ignition system.
   c. A dry, fluffy or sooty black deposit indicates an air-fuel mixture that is too rich.
   d. A light brown, glassy deposit indicates an overheated spark plug. This condition may be accompanied by cracks in the insulator or by erosion of the electrodes and is caused by an air-fuel mixture that is too lean, an overheated engine, valves not seating or improper ignition timing. The glassy deposit on the spark plug is a conductor when hot and may cause high-speed misfiring. A spark plug with eroded electrodes, heavy deposits or a cracked insulator must be replaced.
   e. A spark plug with a white, yellow, tan or rusty brown powdery deposit indicates balanced combustion. Clean off spark plug deposits at regular intervals.

⚠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)

3. If the spark plugs require cleaning between tune-ups, proceed as follows:
   a. Degrease firing end of spark plug using electrical contact cleaner. Dry with compressed air.
   b. Use a thin file to flatten the electrodes. A spark plug with sharp edges on its electrodes requires 25-40% less firing voltage than one with rounded edges.
   c. If the spark plugs cannot be cleaned, replace with **new** spark plugs.
4. Check electrode gap with a wire-type feeler gauge. Bend the outside of the electrode so only a slight drag on the gauge is felt when passing it between electrodes. Proper gap measurement is 0.038-0.043 in. (0.97-1.09 mm).
5. Check condition of threads on cylinder head and spark plug. If necessary to remove deposits, apply penetrating oil and clean out with a thread chaser.
6. Apply a light coat of SILVER GRADE ANTI-SEIZE (Part No. 98960-97) to the spark plug threads. Install and tighten to 12-18 ft-lbs (16.3-24.4 Nm).
7. Connect spark plug cables. The rear cylinder spark plug cable attaches to the right coil terminal. Verify that the cables are securely connected to the coil and spark plugs, and secured to any anchor clips.

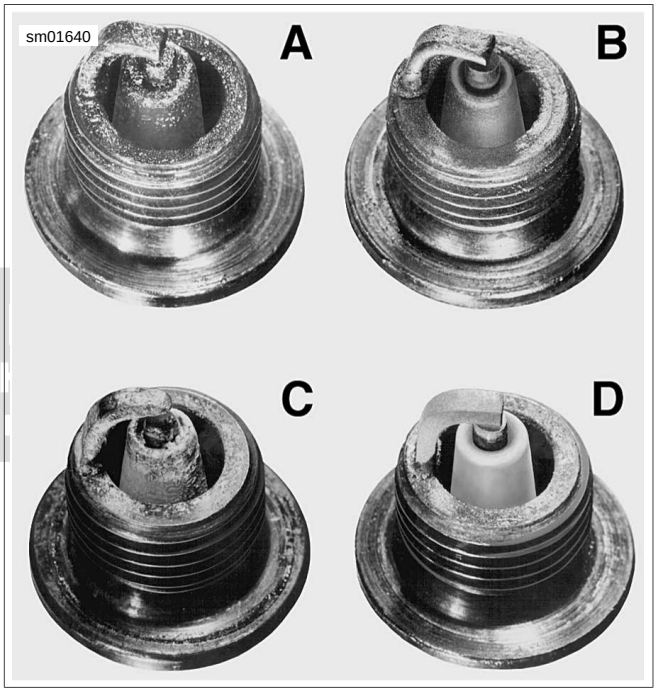


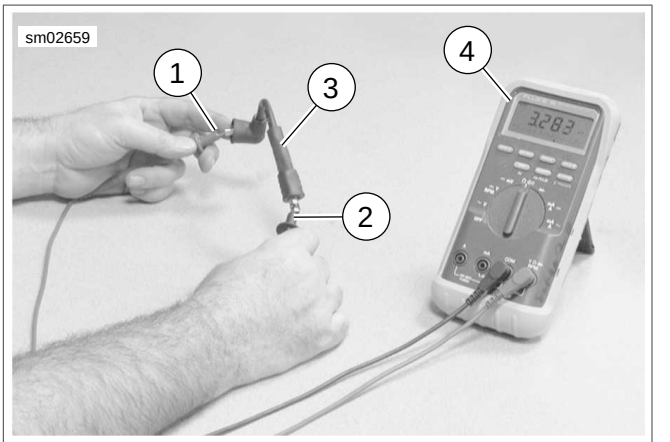
Figure 1-28. Typical Spark Plug Deposits

SPARK PLUG CABLE INSPECTION

1. Inspect spark plug cables. Replace cables that are worn or damaged.
   a. Check for cracks or loose terminals.
   b. Check for loose fit on ignition coil and spark plugs.
2. Check cable boots/caps for cracks or tears. Replace boots/caps that are worn or damaged.
3. See Figure 1-29. Check spark plug cable resistance with an ohmmeter. Replace cables not meeting resistance specifications. Refer to Table 1-13.

Table 1-13. Spark Plug Cable Resistance Values

DESCRIPTION	LENGTH		RESISTANCE VALUE (OHMS)
	In.	mm	
Front cable	34.75	883	8688-23,178
Rear cable	16.75	425	4188-11,172



1. **Ohmmeter positive lead**
2. **Ohmmeter negative lead**
3. **Spark plug cable**
4. **Ohmmeter**

Figure 1-29. Testing Resistance

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FRONT FORK OIL 1.18

REPLACING FORK OIL

Fork assemblies must be removed to drain fork oil. See 2.17 FRONT FORK. While removed, inspect fork assemblies. Look for oil leakage past seals and excessive wear on slider tubes. Disassemble, clean and repair or replace components as necessary.

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SUSPENSION ADJUSTMENTS 1.19

GENERAL

PART NUMBER	TOOL NAME
HD-34633A	AIR SUSPENSION PUMP AND GAUGE

See Figure 1-30. Adjust the rear air suspension pressure by adding or removing air from the air valve located near the left upper shock absorber mount. Always adjust pressures with the motorcycle on the jiffy stand.

⚠WARNING

Do not exceed the motorcycle's Gross Vehicle Weight Rating (GVWR) or Gross Axle Weight Rating (GAWR). Exceeding these weight ratings can affect stability and handling, which could result in death or serious injury. (00016e)

Air pressure may be varied to suit load conditions, riding style and personal comfort. Less initial pressure does not necessarily result in a softer ride. Use Table 1-14 or Table 1-15 as a starting point in determining suitable rear air suspension pressures. Do not exceed maximum GVWR when loading vehicle and do not pressurize system in excess of 50 psi (345 kPa).

NOTICE

Do not exceed maximum air pressure for rear suspension. Air components fill rapidly. Therefore, use low air line pressure. Failure to do so may result in possible damage to components. (00165a)

NOTES

- *Use AIR SUSPENSION PUMP AND GAUGE (Part No. HD-34633A) to adjust suspension air pressure.*
- *Use a no-loss air gauge to check air pressure. Check pressure in shock absorbers weekly if used daily or before each trip if used occasionally.*
- *Improper inflation of rear air suspension components can result in a reduction of available suspension travel, reduced rider comfort and possible damage to shock absorbers.*

⚠WARNING

Use caution when bleeding air from the suspension. Moisture combined with lubricant may leak onto the rear wheel, tire and/or brake components and adversely affect traction, which could result in death or serious injury. (00084a)

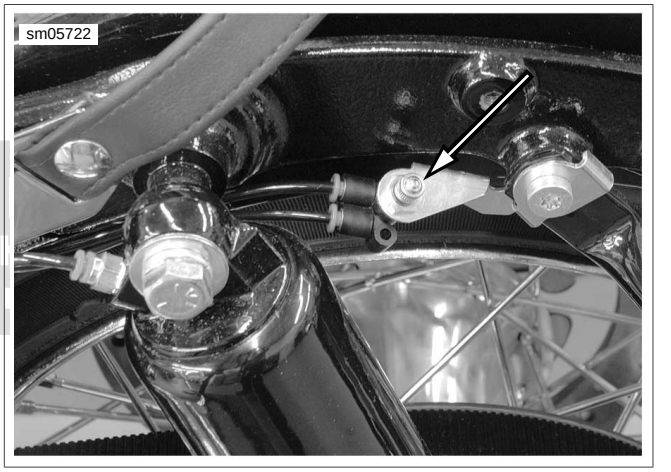


Figure 1-30. Rear Air Suspension Air Valve

Table 1-14. Recommended Suspension Air Pressure: FLHX, FLTRX, FLHR/C

SHOCK LOAD	TOTAL WEIGHT		PRESSURE	
	LB.	KG	PSI	kPa
Solo rider	up to 150	up to 68	0	0
	150-200	68-91	0-10	0-69
	200-250	91-113	10-20	69-138
	250-300	113-136	20-30	138-206
	over 300	over 136	30-50	206-345
Solo rider with capacity luggage of 40 lbs (18 kg)	up to 150	up to 68	10-20	69-138
	150-200	68-91	20-30	138-206
	200-250	91-113	30-40	206-276
	250-300	113-136	40-50	276-345
	over 300	over 136	50	345
Rider plus passenger	ALL	ALL	40-50	276-345
Maximum GVWR	ALL	ALL	50	345
If Tour-Pak is installed, add 5-10 psi (34-69 kPa) to shock pressure. Do **not** exceed 50 psi (345 kPa) suspension pressure.				

Table 1-15. Recommended Suspension Air Pressure: FLHTC, FLHTCU, FLHTK, FLTRU

SHOCK LOAD	TOTAL WEIGHT		PRESSURE	
	LB.	KG	PSI	kPa
Solo rider	up to 150	up to 68	5-10	34-69
	150-200	68-91	10-20	69-138
	200-250	91-113	20-30	138-206
	250-300	113-136	30-40	206-276
	over 300	over 136	40-50	276-345
Solo rider with capacity luggage of 70 lbs (32 kg)	up to 150	up to 68	25-30	172-206
	150-200	68-91	30-40	206-276
	200-250	91-113	40-50	276-345
	over 250	over 113	50	345
Rider plus passenger	ALL	ALL	50	345
Maximum GVWR	ALL	ALL	50	345
Do **not** exceed 50 psi (345 kPa) suspension pressure.				

STEERING HEAD BEARINGS 1.20

LUBRICATION

1. See Figure 1-31.Turn handlebar to the right fork stop to access grease fitting at the left side of the steering head.
2. Inject Special Purpose Grease, (Part No. 99857-97) until it exits from the top and bottom of the steering head.



Figure 1-31. Steering Head Bearing Grease Fitting

CHECKING

NOTICE

When lifting a motorcycle using a jack, be sure jack contacts both lower frame tubes where down tubes and lower frame tubes converge. Never lift by jacking on crossmembers, oil pan or other housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586c)

1. Raise the motorcycle so that the front and rear tires are the same distance from the floor.
2. Verify that motorcycle is in stock configuration. Remove all non-factory accessories, since they can influence front end swing momentum (and lead to improper adjustment).
3. See Figure 1-32. Turn the front wheel to the left fork stop and then let go. The wheel should swing from side to side, finally stopping in the swing specified in Table 1-16. If it stops in the lesser number swing, it should be at or after the straight-forward position.
4. If the clutch cable or main harness appears to be influencing swing momentum, proceed as follows and repeat the previous step:
   a. **Clutch cable:** Disconnect clutch cable from hand lever. Release cable from P-clamp, remove from inner fairing, or release from cable clip on instrument nacelle depending on model. See 2.22 CLUTCH CABLE.
   b. **Main harness:** Remove the rivet and P-clamp to release main harness from steering head. Secure P-clamp with a **new** rivet when procedure is complete.

NOTE

A steering head that is too tight can interfere with the vehicle's ability to absorb a weave. A steering head that is too loose can interfere with the vehicle's ability to absorb a wobble.

5. To correct a swing pattern, see 1.20 STEERING HEAD BEARINGS, Adjustment.

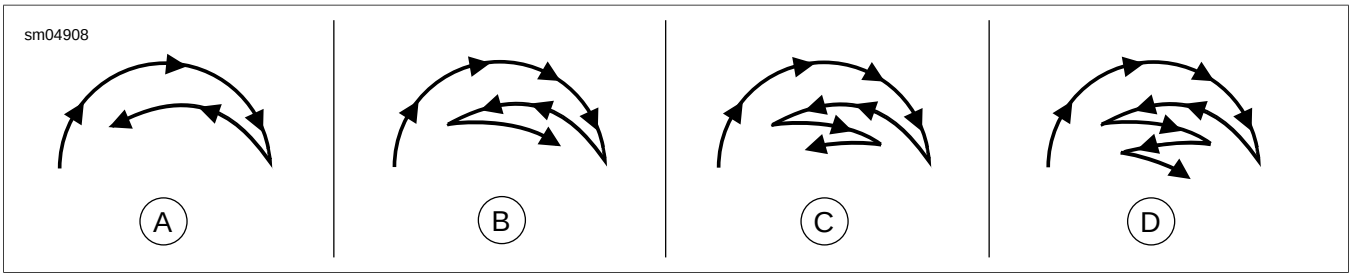


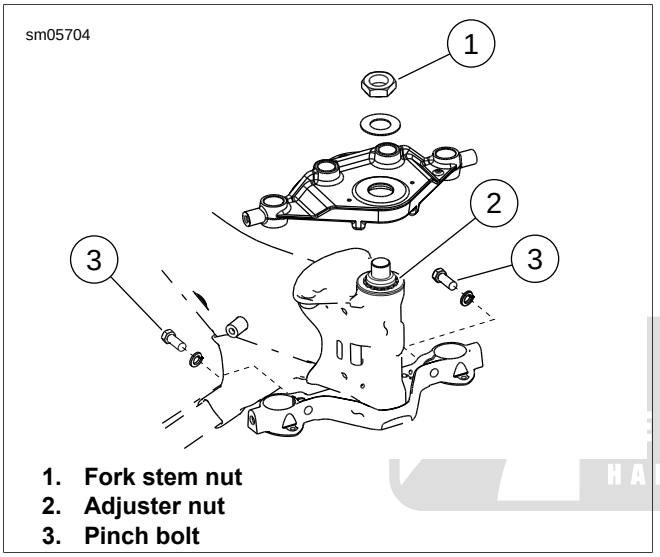
Figure 1-32. Steering Head Bearing Swing Count

Table 1-16. Steering Head Bearing Swing Count

Model	Minimum	Maximum	Art Reference
FLTRX, FLTRU	1	2	(A)
FLHR, FLHRC	2	3	(A-B)
FLHX, FLHTC, FLHTCU, FLHTK	3	4	(B-C)
TOO LOOSE	More than 4		(D)

ADJUSTMENT

1. Disassemble motorcycle as follows:
   a. **Road Glide models:** Remove headlamp nacelle. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.
   b. **Fork mounted fairing models:** Remove outer fairing and radio or storage box as equipped. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS and 7.33 ADVANCED AUDIO SYSTEM, respectively.
   c. **Frame mounted fairing models:** Remove instrument bezel. See 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS.
2. See Figure 1-33. Loosen pinch bolts (3) on lower fork bracket.



1. **Fork stem nut**
2. **Adjuster nut**
3. **Pinch bolt**

Figure 1-33. Fork Stem and Brackets

3. Loosen the fork stem nut (1).
4. See Figure 1-34. Fashion a bearing adjuster tool using a drill rod 1/4 in. (6.4 mm) in diameter and 16 in. (406.4 mm) long.

NOTES

- *See Figure 1-33. Turning the bearing adjuster nut (2) as little as one notch will make a noticeable difference in the swing pattern.*
- *Tap forks with a rubber hammer while turning adjuster nut to prevent forks from binding in lower bracket bores.*

5. Turn bearing adjuster nut (2) as follows:
   a. To decrease the number of swings, rotate nut **clockwise**.
   b. To increase the number of swings, rotate nut **counterclockwise**.

NOTE

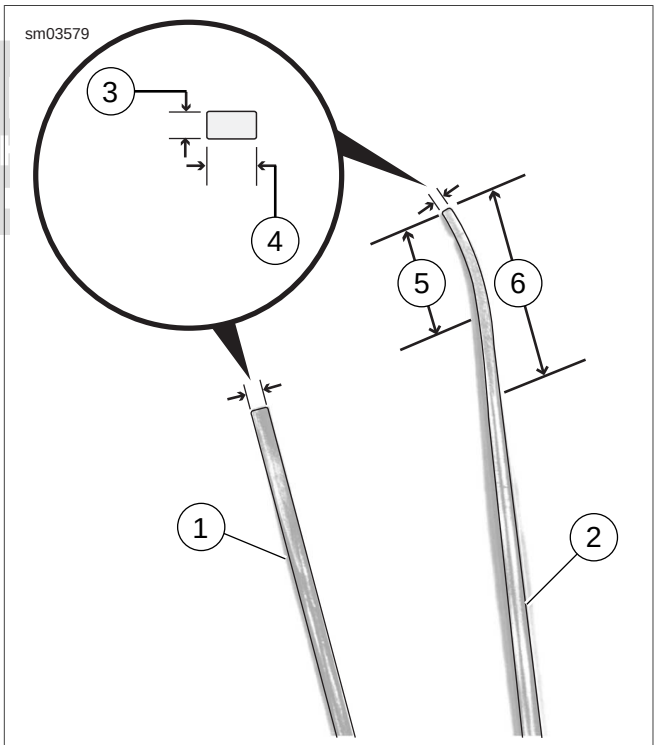
Original equipment fork stem nut has a blue dye coating. If a replacement nut is being installed, the replacement nut will not have the blue coating.

6. Tighten stem nut to 70-80 ft-lbs (94.9-108.4 Nm).

NOTE

Torque of the stem nut will affect the swing pattern.

7. Recheck the swing pattern and adjust as necessary.
8. Tighten pinch bolts to 53-57 ft-lbs (71.9-77.3 Nm).
9. Verify that the fork stem nut is tightened to 70-80 ft-lbs (94.9-108.4 Nm).
10. Recheck the swing pattern and adjust if necessary.
11. Assemble motorcycle as follows:
    a. **Road Glide models:** Install headlamp nacelle. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.
    b. **Fork mounted fairing models:** Install radio or storage box (as equipped) and outer fairing. See 7.33 ADVANCED AUDIO SYSTEM and 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS, respectively.
    c. **Frame mounted fairing models:** Install instrument bezel. See 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS.
12. Install any accessories that were removed during the checking procedure.



1. **All models except FLTRX**
2. **FLTRX**
3. **1/8 in (3.2 mm)**
4. **5/32 in (4.0 mm)**
5. **5/32 in (4.0 mm) goes back for 1-1/4 in (31.8 mm)**
6. **2 in (50.8 mm) to start of bend**

Figure 1-34. Fashion Bearing Adjuster Tool

HEADLAMP ALIGNMENT 1.21

HEADLAMP ALIGNMENT

⚠WARNING

The automatic-on headlamp feature provides increased visibility of the rider to other motorists. Be sure headlamp is on at all times. Poor visibility of rider to other motorists can result in death or serious injury. (00030b)

NOTE

Vehicles with multiple beam headlamps that are individually aimed should be adjusted so both lamps converge into one pattern.

1. Verify that front and rear tire inflation pressures are correct and that suspension is adjusted to the weight of the principal rider. See 1.8 TIRES AND WHEELS.
2. Fill fuel tank or add ballast to equal the weight of the fuel needed.

NOTE

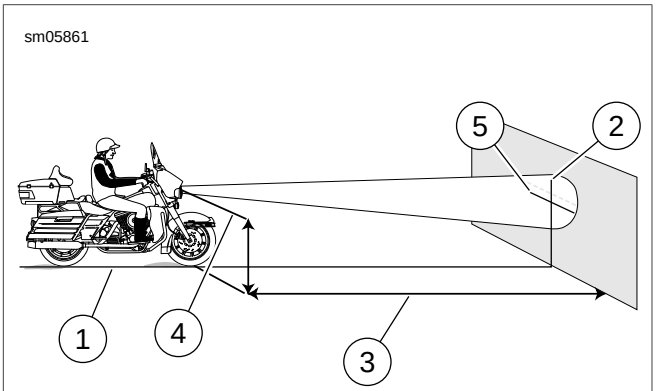
See Figure 1-35. To aid in properly placing the motorcycle, a perpendicular line (1) can be drawn on the floor. For best results, choose an area with minimum light.

3. Draw a vertical line (2) on the wall.
4. Position motorcycle so that front axle is 25 ft (7.6 m) from wall.

NOTE

As the weight of the rider will compress the suspension slightly, have a person whose weight is approximately the same as that of the principal rider sit on the motorcycle.

5. With the vehicle laden and upright, point the front wheel straight forward at wall and measure the distance (4) from the floor to the center of the HIGH BEAM bulb.
6. Draw a horizontal line (5) through the vertical line on the wall that is 2.1 in (53.3 mm) lower than the measured bulb centerline.
7. Verify headlamp alignment. With the motorcycle on, set the headlamp switch to HIGH beam.
   a. The center of the hot spot (brightest area of light beam) should be centered where the two lines intersect.
   b. Adjust headlamp alignment if necessary.



1. **Perpendicular line**
2. **Vertical line**
3. **25 feet (7.6 meters)**
4. **High beam bulb centerline**
5. **Horizontal line 2.1 in. (53.3 mm) lower than bulb centerline**

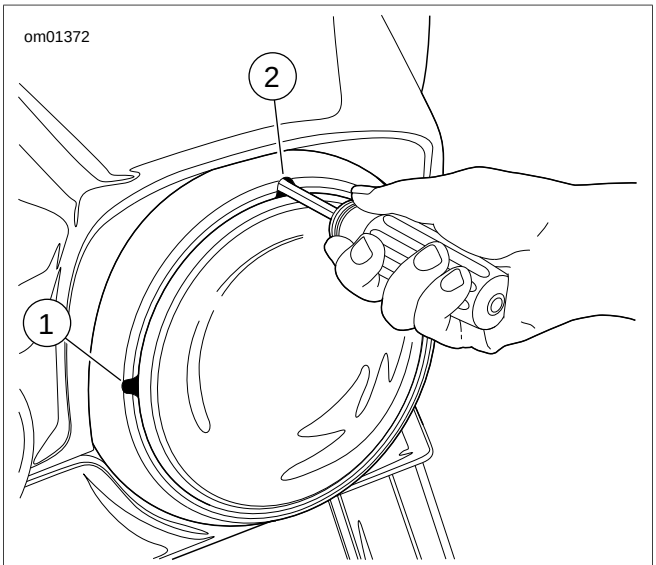
Figure 1-35. Check Headlamp Alignment

HEADLAMP ADJUSTMENT: SINGLE HEADLAMP MODELS

NOTE

Headlamp adjustment can be performed without removing the headlamp trim ring.

1. See Figure 1-36. Using adjuster slots in trim ring, insert Phillips screwdriver between headlamp trim ring and rubber gasket.
   a. **Horizontal:** Turn the horizontal adjusting screw to adjust light beam left and right.
   b. **Vertical:** Turn the vertical adjusting screw to adjust light beam up and down.
2. Adjust the light beam until it is centered as shown in Figure 1-35.



1. **Horizontal adjuster**
2. **Vertical adjuster**

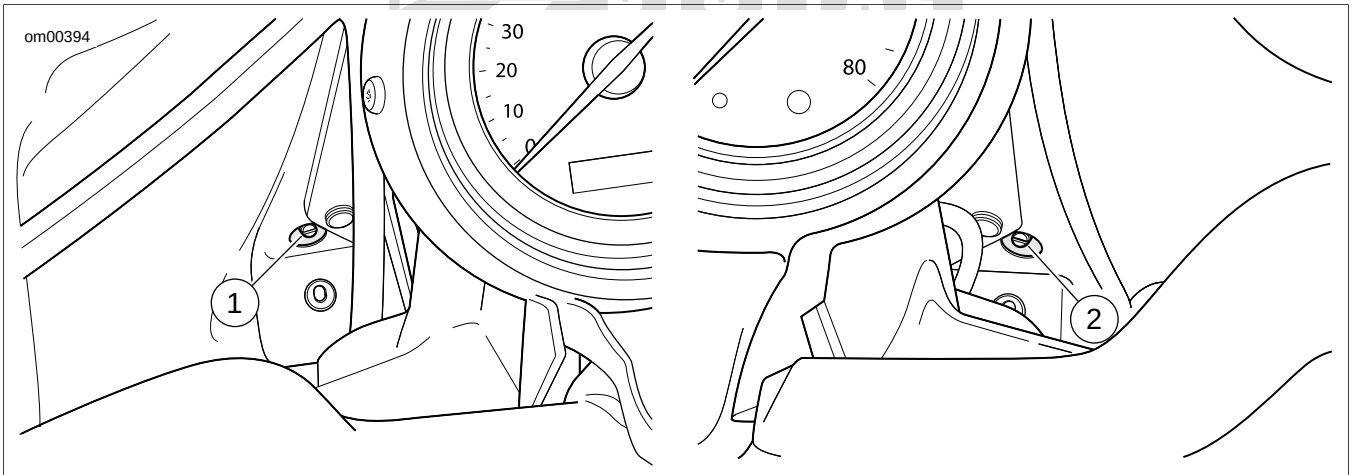
Figure 1-36. Headlamp Adjusters (typical)

HEADLAMP ADJUSTMENT: DUAL HEADLAMP MODELS

1. See Figure 1-37. Rotate the hex adjusters (metric) located near the bottom edge of the inner fairing. Refer to Table 1-17 for adjuster rotation.
   a. **Horizontal:** Turn either the left or right adjuster to adjust the light beam left and right.
   b. **Vertical:** Turn both adjusters equally to adjust the light beam up and down.
2. Adjust the light beam until it is centered as shown in Figure 1-35.

Table 1-17. Adjuster Rotation, Dual Headlamp Models

Hex Adjuster	Rotation	Beam Movement
Left Only	CW	To the right
Right Only	CCW	
Left Only	CCW	To the left
Right Only	CW	
Left and Right Equally	CW	Upward
Left and Right Equally	CCW	Downward
CW = Clockwise CCW = Counter-clockwise		



1. **Left side adjuster**
2. **Right side adjuster**

Figure 1-37. Headlamp Adjusters: Dual Headlamp Models

AUXILIARY LAMP ALIGNMENT

PART NUMBER	TOOL NAME
SNAP-ON® FRX181	FLARE NUT SOCKET

1. Place the vehicle facing a target wall as described in 1.21 HEADLAMP ALIGNMENT, Headlamp Alignment.

NOTE

As the weight of the rider will compress the suspension slightly, have a person whose weight is roughly the same as that of the principal rider sit on the motorcycle.

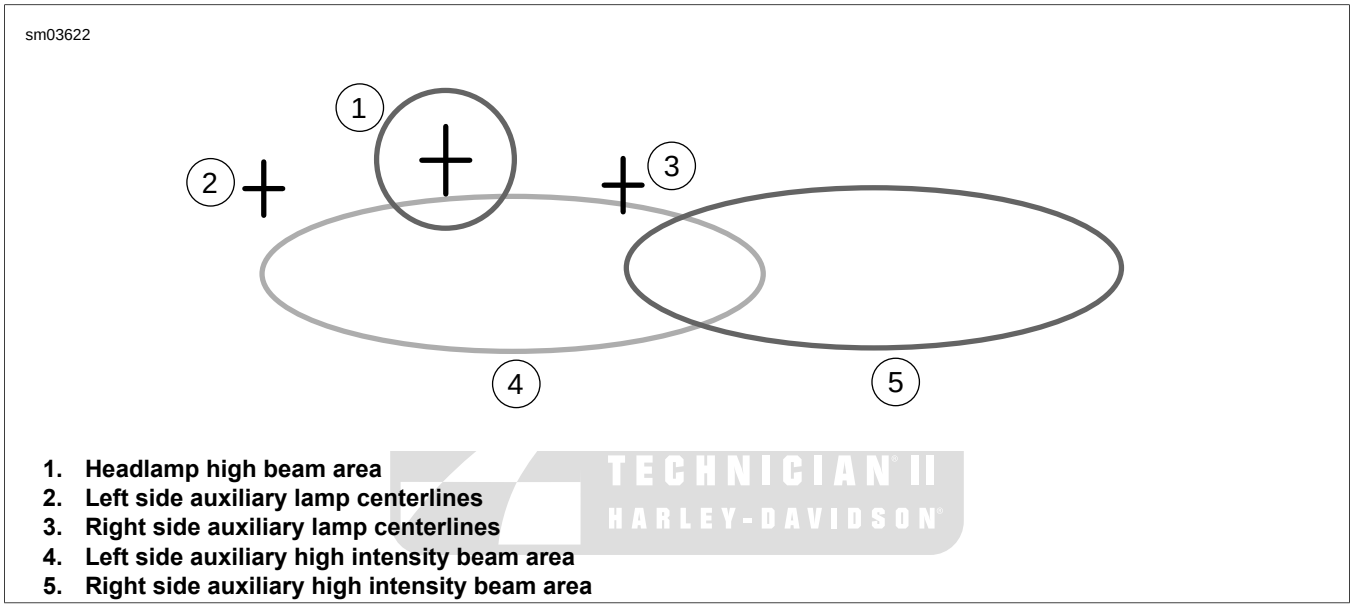
2. With the vehicle upright and a rider seated on the motorcycle, measure the distance from the floor to the centerline of each auxiliary lamp.
3. Measure the distance from the headlamp vertical centerline to the vertical centerline of each auxiliary lamp.

4. See Figure 1-38. Mark the auxiliary lamp horizontal and vertical centerlines (2, 3) on the wall.
5. Remove two screws to release the turn signal lamp from the mounting bracket.
6. Using FLARE NUT SOCKET (Part No. Snap-on® FRX181), loosen the auxiliary lamp flange nut only enough to allow movement of the lamp.

NOTE

Figure 1-38 depicts the light pattern for vehicles driven on the right side of the road. In countries where travel is on the left side of the road, shift the auxiliary lamp high intensity patterns (4, 5) to the left of center.

7. Turn on the headlamp low beam and cover both the headlamp and the right side auxiliary lamp. Adjust the left side auxiliary lamp as necessary so that the entire high intensity zone (4) is below and to the right of the left side auxiliary lamp centerlines as shown in Figure 1-38.
8. Cover the headlamp and left side auxiliary lamp. Adjust the right side auxiliary lamp as necessary so that the entire high intensity zone (5) is both below and to the right of the right side auxiliary lamp centerlines as shown in Figure 1-38.
9. Tighten auxiliary lamp flange nut to 15-18 ft-lbs (20.3-24.4 Nm).
10. Start two screws to secure turn signal lamp to mounting bracket. Verify that conduit fits in slot at back of bracket and is not pinched. Tighten screws to 36-60 **in-lbs** (4.1-6.8 Nm).



1. **Headlamp high beam area**
2. **Left side auxiliary lamp centerlines**
3. **Right side auxiliary lamp centerlines**
4. **Left side auxiliary high intensity beam area**
5. **Right side auxiliary high intensity beam area**

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Figure 1-38. Properly Aim Auxiliary Lamps

CRITICAL FASTENERS 1.22

INSPECTION

Inspect critical fasteners at the scheduled service intervals. Replace any fasteners that are damaged or missing.

Checking Torques on Fasteners

1. Refer to Table 1-18. Attempt to turn the fastener using a torque wrench set to the minimum torque specification for that fastener.
   a. If the fastener does not rotate, the fastener torque has been maintained. No further attention is necessary at this time.
   b. If the fastener rotates, remove it to determine if it has a locking agent.
   c. If it has a locking agent, clean all locking material from the threaded hole. Replace the fastener with a **new** one or clean the original fastener threads and apply the appropriate locking agent (see appropriate procedure).
   d. Install and tighten the fastener to specification.
2. If the fastener does not have a locking agent, install and tighten to specification.

Table 1-18. Critical Fasteners

SYSTEM	FASTENER	TORQUE	
Hand controls	Switch housing screws	35-45 **in-lbs**	4.0-5.1 Nm
	Clutch lever bracket handlebar clamp screws	72-108 **in-lbs**	8.1-12.2 Nm
	Master cylinder reservoir handlebar clamp screws	72-108 **in-lbs**	8.1-12.2 Nm
Brakes	Brake caliper banjo bolts	17-19 ft-lbs	23.0-25.8 Nm
	Master cylinder banjo bolts	12.5-14.5 ft-lbs	17.0-19.7 Nm
	ABS module banjo bolts	12.5-14.5 ft-lbs	17.0-19.7 Nm
	Front brake disc screws	16-24 ft-lbs	21.7-32.5 Nm
	Rear brake disc screws	30-45 ft-lbs	40.7-61.0 Nm
	Front master cylinder reservoir cover screws	10-12 **in-lbs**	1.1-1.4 Nm
	Rear master cylinder reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm
	Rear master cylinder to frame screws	126-150 **in-lbs**	14.2-16.9 Nm
	Front brake caliper mounting screws	28-38 ft-lbs	38.0-51.5 Nm
	Rear brake caliper to caliper bracket screws	43-48 ft-lbs	58.3-65.1 Nm
	Brake caliper pad pin	75-102 **in-lbs**	8.5-11.5 Nm
Axle nuts	Front	60-65 ft-lbs	81.3-88.1 Nm
	Rear	95-105 ft-lbs	129.0-142.0 Nm
Front forks	Front axle holder nuts	132-180 **in-lbs**	14.9-20.3 Nm
Pivot shaft	Fasteners	55-65 ft-lbs	74.6-88.1 Nm
	Rear fork bracket bolts	55-65 ft-lbs	74.6-88.1 Nm

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Table 1-18. Critical Fasteners

SYSTEM	FASTENER	TORQUE	
Other	Transmission to engine bolts	34-39 ft-lbs	46.1-52.9 Nm
	Engine mount bolts	See 1.24 ENGINE MOUNTS.	
	Top stabilizer link bolts		
	Rear frame bolts	40-50 ft-lbs	54.2-67.8 Nm

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

BATTERY MAINTENANCE 1.23

GENERAL

⚠WARNING

Batteries contain sulfuric acid, which could cause severe burns to eyes and skin. Wear a protective face shield, rubberized gloves and protective clothing when working with batteries. KEEP BATTERIES AWAY FROM CHILDREN. (00063a)

⚠WARNING

Never remove warning label attached to top of battery. Failure to read and understand all precautions contained in warning, could result in death or serious injury. (00064a)

⚠WARNING

Batteries, battery posts, terminals and related accessories contain lead and lead compounds, and other chemicals known to the State of California to cause cancer, and birth defects or other reproductive harm. Wash hands after handling. (00019e)

All AGM batteries are permanently sealed, maintenance-free, valve-regulated, lead/calcium and sulfuric acid batteries. The batteries are shipped pre-charged and ready to be put into service. Do not attempt to open these batteries for any reason.

NOTE

For charging information, see 1.23 BATTERY MAINTENANCE, Charging Battery. For testing information, see the electrical diagnostic manual.

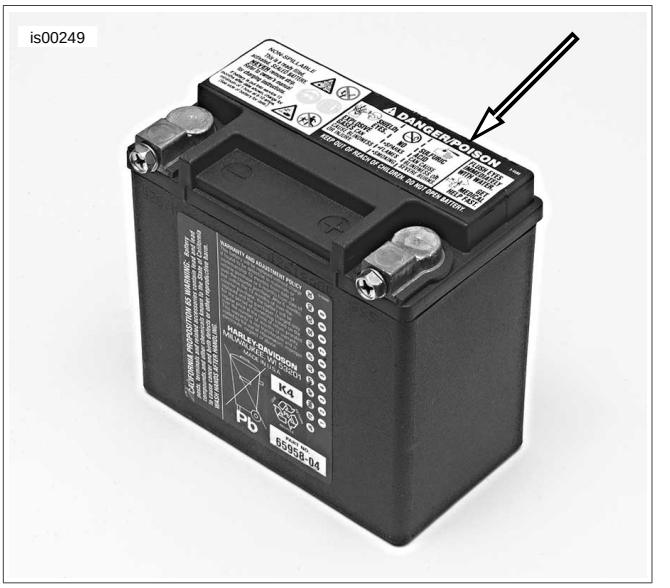
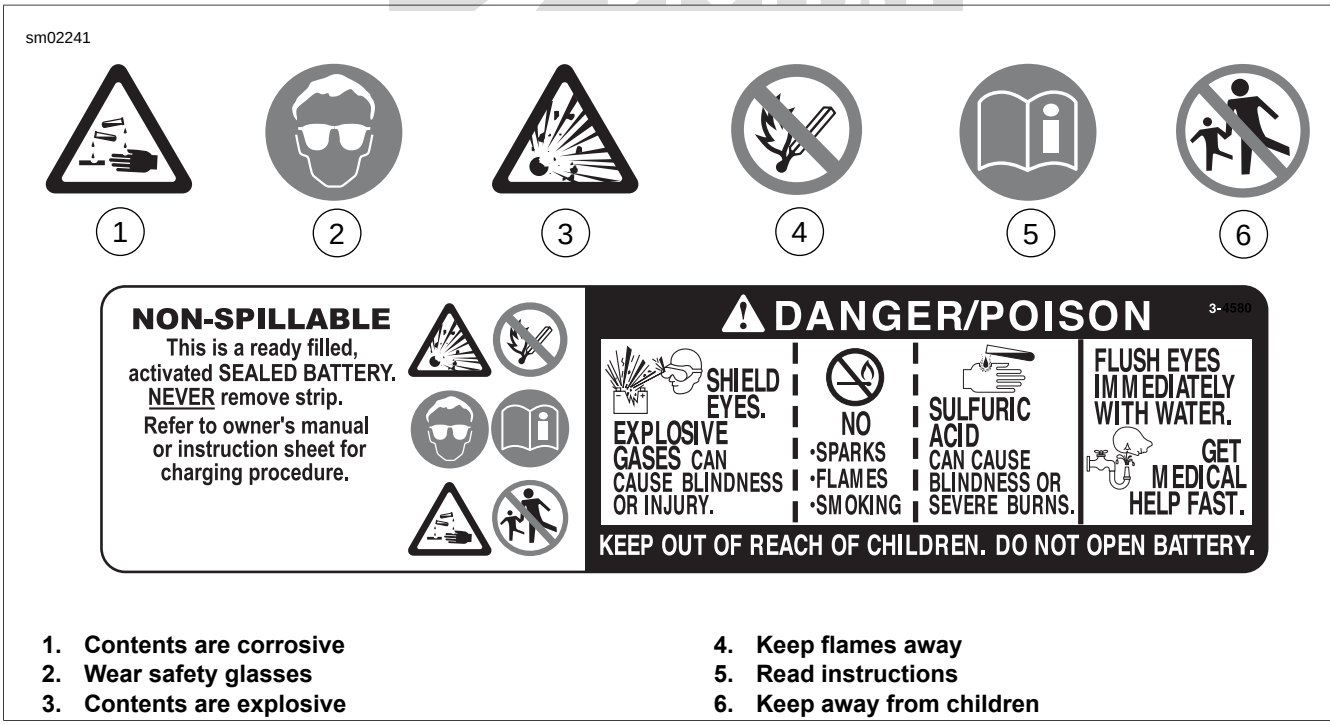


Figure 1-39. AGM Battery with Warning Label



1. Contents are corrosive
2. Wear safety glasses
3. Contents are explosive
4. Keep flames away
5. Read instructions
6. Keep away from children

Figure 1-40. Battery Warning label

Table 1-19. Antidotes for Battery Acid

CONTACT	TREATMENT
External	Flush with water.
Internal	Drink large quantities of milk or water, followed by milk of magnesia, vegetable oil or beaten eggs. Get immediate medical attention.
Eyes	Flush with water. Get immediate medical attention.

CLEANING AND INSPECTION

1. Battery top must be clean and dry. Dirt and electrolyte on top of the battery can cause battery to self-discharge. Clean battery top with a solution of baking soda (sodium bicarbonate) and water (5 teaspoons baking soda per quart or liter of water). When the solution stops bubbling, rinse off the battery with clean water.
2. Clean cable connectors and battery terminals using a wire brush or sandpaper. Remove any oxidation.
3. Inspect the battery screws, clamps and cables for breakage, loose connections and corrosion. Clean clamps.
4. Check the battery posts for melting or damage caused by overtightening.
5. Inspect the battery for discoloration, raised top or a warped or distorted case, which might indicate that the battery has been frozen, overheated or overcharged.
6. Inspect the battery case for cracks or leaks.

BATTERY

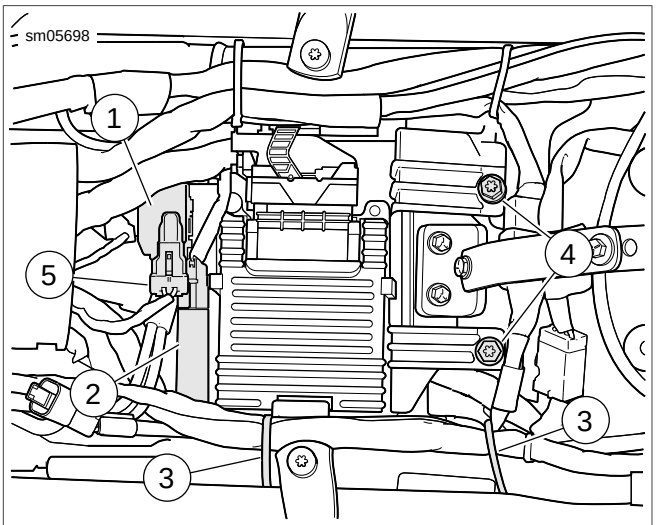
Disconnection and Removal

1. Remove seat.
2. See Figure 1-41. If present, move purge solenoid (1) forward to release from top caddy. Release HFSM antenna (2) from top caddy and move out of the way.
3. Remove fasteners (4).
4. Cut cable ties (3) and move harnesses to allow more clearance for the top caddy.
5. See Figure 1-42. Release top caddy from front hold-down bracket and rotate top caddy (1) out of the way.
6. If equipped with security system siren, turn the ignition switch ON with the hands-free fob present to disarm the security system.

⚠ WARNING

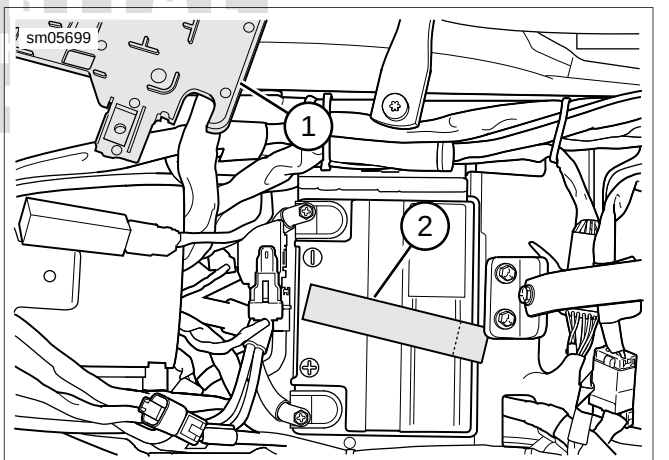
Disconnect negative (-) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00049a)

7. Remove battery negative cable (black) from the battery negative (-) terminal.
8. Remove battery positive cable (red) from the battery positive (+) terminal.
9. Grasp lifting strap (2) and pull up to raise battery. When battery is extracted far enough to get a good grip, grasp battery and remove the rest of the way.



1. **Purge solenoid**
2. **HFSM antenna**
3. **Cable ties**
4. **Fastener**
5. **Hold-down (not visible)**

Figure 1-41. Top Caddy



1. **Top caddy**
2. **Lifting strap**

Figure 1-42. Move Top Caddy Aside

Installation and Connection

1. Run lifting strap rearward, first down the center of the battery tray, then up and across the frame crossmember.
2. Place the battery into the battery tray, terminal side forward.

NOTICE

Connect the cables to the correct battery terminals. Failure to do so could result in damage to the motorcycle electrical system. (00215a)

WARNING

Connect positive (+) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00068a)

NOTICE

Do not over-tighten bolts on battery terminals. Use recommended torque values. Over-tightening battery terminal bolts could result in damage to battery terminals. (00216a)

3. Connect battery positive cable (red) to battery positive (+) terminal. Tighten bolt to 60-70 **in-lbs** (6.8-7.9 Nm).
4. Connect battery negative cable (black) to battery negative (-) terminal. Tighten bolt to 60-70 **in-lbs** (6.8-7.9 Nm).

NOTICE

Keep battery clean and lightly coat terminals with petroleum jelly to prevent corrosion. Failure to do so could result in damage to battery terminals. (00217a)

5. Apply a light coat of petroleum jelly or ELECTRICAL CONTACT LUBRICANT, (Part No. 99861-02) (1 oz tube), to both battery terminals.
6. See Figure 1-42. Fold lifting strap (2) forward over top of battery.
7. See Figure 1-41. Rotate top caddy into position above battery and engage latch on hold-down bracket.
8. If equipped, engage HFSM antenna (2) and purge solenoid (1) on top caddy. Verify all other connectors and harnesses are routed below the purge solenoid mounting tongue.
9. Fasten top caddy to frame crossmember. Tighten screws (4) to 72-96 **in-lbs** (8.1-10.9 Nm).
10. Secure harnesses to frame with cable ties (3).

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)

11. Install seat.

VOLTMETER TEST

WARNING

Batteries contain sulfuric acid, which could cause severe burns to eyes and skin. Wear a protective face shield, rubberized gloves and protective clothing when working with batteries. KEEP BATTERIES AWAY FROM CHILDREN. (00063a)

WARNING

Never remove warning label attached to top of battery. Failure to read and understand all precautions contained in warning, could result in death or serious injury. (00064a)

Voltmeter Test

The voltmeter test provides a general indicator of battery condition. Check the voltage of the battery to verify that it is fully charged. If the open circuit (disconnected) voltage reading is below 12.6V, charge the battery and check the voltage after the battery has set for one to two hours. If the voltage reading is 12.7V or above, perform a load test. See the electrical diagnostic manual for the load test procedure. Refer to Table 1-20.

Table 1-20. Voltmeter Test For Battery Charge Conditions

VOLTAGE (OCV)	STATE OF CHARGE
12.7 V	100%
12.6 V	75%
12.3 V	50%
12.0 V	25%
11.8 V	0%

CHARGING BATTERY

Safety Precautions

Never charge a battery without first reviewing the instructions for the charger being used. In addition to the manufacturer's instructions, follow these general safety precautions:

- Always wear eye, face and hand protection.
- Always charge batteries in a well-ventilated area.
- Turn the charger off before connecting or disconnecting the leads to the battery to avoid dangerous sparks.
- Never try to charge a visibly damaged or frozen battery.
- Connect the charger leads to the battery; red positive (+) lead to the positive (+) terminal and black negative (-) lead to the negative (-) terminal. If the battery is still in the vehicle, connect the negative lead to the chassis ground. Be sure that the ignition and all electrical accessories are turned off.
- Make sure that the charger leads to the battery are not separated, frayed or loose.
- If the battery temperature exceeds 110 °F (43 °C) during charging, discontinue charger and allow the battery to cool.

Using a Battery Charger

Charge the battery if any of the following conditions exist:

- Vehicle lights appear dim.
- Electric starter sounds weak.
- Battery has not been used for an extended period of time.

⚠WARNING

Explosive hydrogen gas, which escapes during charging, could cause death or serious injury. Charge battery in a well-ventilated area. Keep open flames, electrical sparks and smoking materials away from battery at all times. KEEP BATTERIES AWAY FROM CHILDREN. (00065a)

NOTICE

If battery releases an excessive amount of gas during charging, decrease the charging rate. Overheating can result in plate distortion, internal shorting, drying out or damage. (00413b)

1. Perform a voltmeter test to determine the state of charge. See the electrical diagnostic manual. If battery needs to be charged, proceed to the next step.

NOTE

The figures listed in the table below show typical charging times. Charge times may vary. When using an appropriate automatic charger, allow the charger to determine when charging is complete.

Table 1-21. 28 Amp-Hour Battery Charging Rate/Times (Approximate)

READING (VOLTS)	PERCENT OF CHARGE	5 AMP CHARGER	2 AMP CHARGER	1.5 AMP CHARGER	0.75 AMP CHARGER
12.7	100	-	-	-	-
12.6	75	2 hours 24 minutes	4 hours 30 minutes	5 hours 42 minutes	10 hours 18 minutes
12.3	50	3 hours 48 minutes	8 hours	10 hours 18 minutes	19 hours 42 minutes
12.0	25	5 hours 12 minutes	11 hours 30 minutes	15 hours	29 hours
11.8	0	6 hours 36 minutes	15 hours	19 hours 42 minutes	38 hours 18 minutes

NOTE

Do not use battery chargers that produce excessively high voltage designed for flooded batteries or excessively high current designed for much larger batteries. Charging should be limited to no more than 5 amps at no more than 14.6 volts.

⚠WARNING

Unplug or turn OFF battery charger before connecting charger cables to battery. Connecting cables with charger ON can cause a spark and battery explosion, which could result in death or serious injury. (00066a)

NOTICE

Do not reverse the charger connections described in the following steps or the charging system of the motorcycle could be damaged. (00214a)

2. Connect red battery charger lead to the positive (+) terminal and black battery charger lead to the negative (-) terminal of the battery.

NOTE

If the battery is still in the vehicle, connect the negative lead to the chassis ground. Be sure that the ignition and all electrical accessories are turned off.

3. Step away from the battery and turn on the charger. Refer to Table 1-21.

⚠WARNING

Unplug or turn OFF battery charger before disconnecting charger cables from battery. Disconnecting clamps with charger ON can cause a spark and battery explosion, which could result in death or serious injury. (00067a)

4. After the battery is fully charged, turn the charger OFF and disconnect the black battery charger lead to the negative (-) terminal of the battery.
5. Disconnect the red battery charger lead to the positive (+) terminal of the battery.
6. Mark the charging date on the battery.
7. Perform either a conductance test or load test to determine the condition of the battery. See the electrical diagnostic manual.
8. If charging a battery because voltmeter test reading was below 12.6 V, perform voltmeter test. See the electrical diagnostic manual.

STORAGE

PART NUMBER	TOOL NAME
99863-01A	GLOBAL BATTERY CHARGER

⚠WARNING

Batteries contain sulfuric acid, which could cause severe burns to eyes and skin. Wear a protective face shield, rubberized gloves and protective clothing when working with batteries. KEEP BATTERIES AWAY FROM CHILDREN. (00063a)

If the motorcycle is to be stored with the security system armed, connect a GLOBAL BATTERY CHARGER (Part No. 99863-01A) to maintain battery charge.

If the motorcycle is to be stored with the battery installed, without a GLOBAL BATTERY CHARGER, and with the security system **not** armed, remove the main fuse.

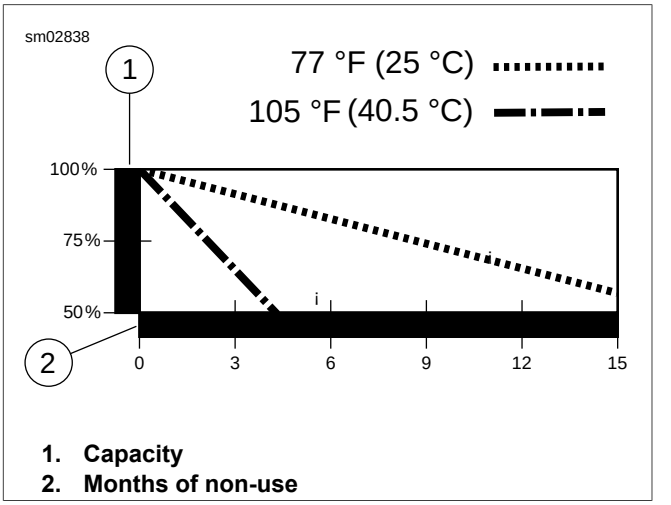
If the motorcycle will not be operated for several months, such as during the winter season, remove the battery from the motorcycle and fully charge.

See Figure 1-43. A battery that is removed from the vehicle is affected by self-discharge. A battery that is stored in the vehicle is affected by self-discharge and, more significantly, by parasitic loads. A parasitic load is generated by such things as diode leakage or maintaining computer memory with the vehicle turned off. Batteries self-discharge at a faster rate at higher ambient temperatures. To reduce the self-discharge rate, store battery in a cool, dry place.

Charge the battery once per month if stored in the vehicle. Charge the battery every three months if stored out of the vehicle.

NOTES

- *The GLOBAL BATTERY CHARGER (Part No. 99863-01A) may be used to maintain battery charge for extended periods of time without risk of overcharging or boiling.*
- *When returning a battery to service after storage, see the electrical diagnostic manual.*



1. **Capacity**
2. **Months of non-use**

Figure 1-43. Battery Self-Discharge Rate

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

ENGINE MOUNTS 1.24

INSPECTION

General

Inspect the condition and tightness of the stabilizer links and engine mounts. Replace fasteners if damaged. To properly check fastener torque, see information in 1.22 CRITICAL FASTENERS

Stabilizer Link

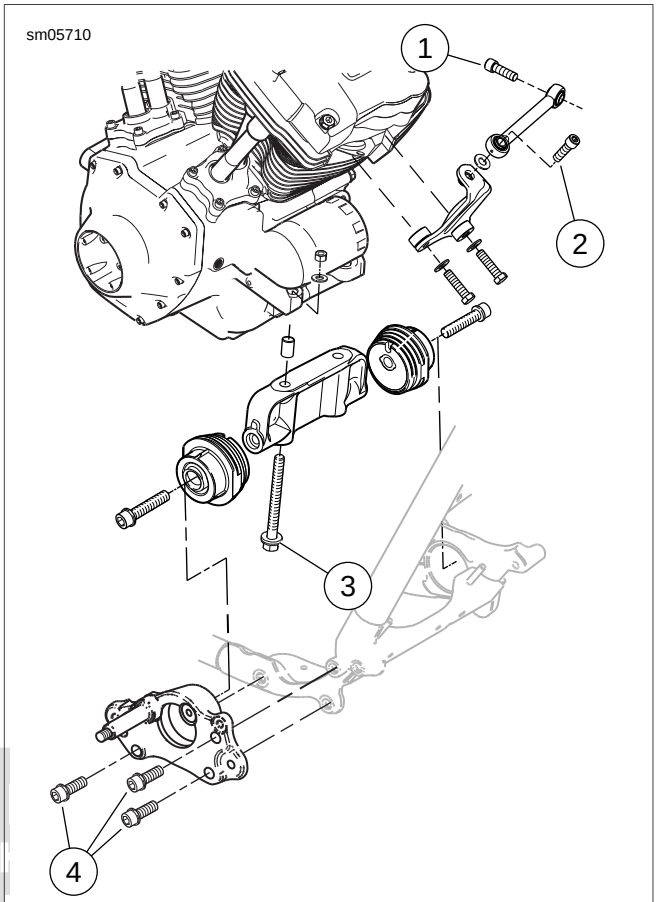
1. See Figure 1-44. Check top stabilizer link eyelet to frame weldment bolt (1): 18-22 ft-lbs (24.4-29.9 Nm).
2. Check top stabilizer link eyelet to top engine mounting bracket bolt (2): 18-22 ft-lbs (24.4-29.9 Nm).
3. Check for lateral movement at each end of the stabilizer link. Any lateral movement indicates the need to replace the stabilizer link. Rotational movement does not indicate excess wear.

Front Engine Mount

1. See Figure 1-44. Check two engine to front engine mounting bracket bolts (3): 36-40 ft-lbs (49-54 Nm).
2. Check three front engine mount end cap bolts (4): 42-48 ft-lbs (56.9-65.0 Nm).

Rear Frame Fasteners

See Figure 1-45. Check three fasteners on each side that attach the rear frame to the main frame. The correct torque is 40-50 ft-lbs (54.2-67.8 Nm).



1. **Link-to-frame weldment fastener**
2. **Link-to-engine mounting bracket fastener**
3. **Engine mount fastener (2)**
4. **Engine mount end cap fastener**

Figure 1-44. Front Mount and Stabilizer

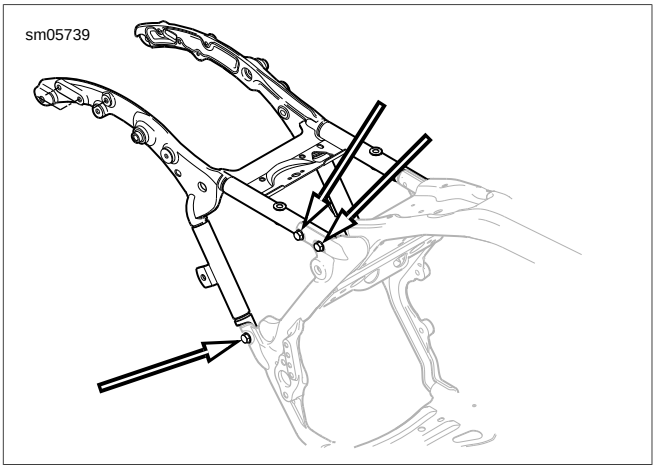


Figure 1-45. Rear Frame Fasteners

STORAGE 1.25

GENERAL

If the motorcycle will not be operated for several months, such as during the winter season, there are several things which should be done to protect parts against corrosion, to preserve the battery and to prevent the buildup of gum and varnish in the fuel system.

This work should be performed following service manual procedures.

PLACING IN STORAGE

PART NUMBER	TOOL NAME
98716-87A	STORAGE COVER

WARNING

Do not store motorcycle with gasoline in tank within the home or garage where open flames, pilot lights, sparks or electric motors are present. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00003a)

WARNING

Avoid spills. Slowly remove filler cap. Do not fill above bottom of filler neck insert, leaving air space for fuel expansion. Secure filler cap after refueling. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00028a)

WARNING

Use care when refueling. Pressurized air in fuel tank can force gasoline to escape through filler tube. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00029a)

1. Prepare the fuel system by filling fuel tank and adding a gasoline stabilizer. Use one of the commercially available gasoline stabilizers following the manufacturer's instructions.
2. Run motorcycle until engine is at normal operating temperature. Stop the engine and change the engine oil and filter. Check the transmission lubricant level.
3. Remove the spark plugs, inject a few squirts of engine oil into each cylinder and crank the engine 5-6 revolutions. Install spark plugs.
4. Inspect drive belt deflection. See 1.12 DRIVE BELT AND SPROCKETS.
5. Inspect drive belt and sprockets.
6. Inspect air cleaner filter. See 1.7 AIR CLEANER AND EXHAUST SYSTEM.
7. Lubricate controls. See 1.14 CABLE AND CHASSIS LUBRICATION.
8. Inspect operation of all electrical equipment and switches.
9. Check tire inflation and inspect tires for wear and/or damage. See 1.8 TIRES AND WHEELS. If the motorcycle will be stored for an extended period of time, securely support the motorcycle under the frame so that all weight is off the tires.
10. Wash painted and chrome-plated surfaces. Apply a light film of oil to exposed unpainted surfaces.

WARNING

Unplug or turn OFF battery charger before connecting charger cables to battery. Connecting cables with charger ON can cause a spark and battery explosion, which could result in death or serious injury. (00066a)

WARNING

Explosive hydrogen gas, which escapes during charging, could cause death or serious injury. Charge battery in a well-ventilated area. Keep open flames, electrical sparks and smoking materials away from battery at all times. KEEP BATTERIES AWAY FROM CHILDREN. (00065a)

11. Remove the battery from the vehicle. Charge the battery until the correct voltage is obtained. Charge the battery every other month if it is stored at temperatures below 60 °F (16 °C). Charge battery once a month if it is stored at temperatures above 60 °F (16 °C). See 1.23 BATTERY MAINTENANCE.

WARNING

Unplug or turn OFF battery charger before disconnecting charger cables from battery. Disconnecting clamps with charger ON can cause a spark and battery explosion, which could result in death or serious injury. (00067a)

12. If the motorcycle is to be covered, use a material that will breathe, such as STORAGE COVER (Part No. 98716-87A) or light canvas. Plastic materials that do not breathe promote the formation of condensation, which leads to corrosion.

REMOVAL FROM STORAGE

WARNING

The clutch failing to disengage can cause loss of control, which could result in death or serious injury. Prior to starting after extended periods of storage, place transmission in gear and push vehicle back and forth several times to assure proper clutch disengagement. (00075a)

1. Charge and install the battery.
2. Remove and inspect the spark plugs. Replace if necessary.
3. Clean the air cleaner element.
4. If fuel tank was drained, fill fuel tank with fresh gasoline.
5. Start the engine and run until it reaches normal operating temperature.

6. Check engine oil level. Check the transmission lubricant level. Fill to proper levels with correct fluids, if required.
7. Perform all of the checks in the PRE-RIDING CHECKLIST in the owner's manual.

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

TROUBLESHOOTING 1.26

GENERAL

⚠WARNING

The Troubleshooting section of this manual is a guide to diagnose problems. Read the appropriate sections of this manual before performing any work. Improper repair and/or maintenance could result in death or serious injury. (00528b)

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

NOTE

For further troubleshooting information, see the electrical diagnostic manual.

ENGINE

Starter Motor Does Not Operate or Does Not Turn Engine Over

1. Ignition switch not in IGNITION position.
2. Engine run switch in OFF position.
3. Discharged battery, loose or corroded connections (solenoid chatters).
4. Starter control circuit, relay, or solenoid faulty.
5. Electric starter shaft pinion gear not engaging or overrunning clutch slipping.
6. TSM/TSSM/HFSM Bank Angle Sensor tripped and ignition/light key switch not cycled OFF then back to IGNITION.
7. Security system activated.
8. Motorcycle in gear and clutch not pulled in.
9. Jiffy stand down and transmission in gear (HDI models only).
10. Main fuse not in place.

Engine Turns Over But Does Not Start

1. Fuel tank empty.
2. Fouled spark plugs.
3. Discharged battery, loose or damaged battery terminal connections.
4. Engine lubricant too heavy (winter operation).

NOTE

For cold weather starts, always disengage clutch.

5. Spark plug cables in bad condition and shorting, cable connections loose or cables connected to incorrect cylinders.
6. Damaged wire or loose wire connection at ignition coil, battery, or ECM connector.
7. Ignition timing incorrect due to faulty ignition coil, ECM or sensors.
8. Bank Angle Sensor tripped and ignition switch not cycled OFF then back to IGNITION.
9. Fuel filter clogged.
10. Sticking or damaged valve(s) or wrong length push rod(s).
11. Plugged fuel injectors.

Starts Hard

1. Spark plugs in bad condition or have improper gap or are partially fouled.
2. Spark plug cables in poor condition.
3. Battery nearly discharged.
4. Damaged wire or loose wire connection at one of the battery terminals, ignition coil or ECM connector.
5. Water or dirt in fuel system.
6. Intake air leak.
7. Fuel tank vent hose, filler cap vent or vapor valve plugged, or fuel line closed off, restricting fuel flow.
8. Engine lubricant too heavy (winter operation).

NOTE

For cold weather starts, always disengage clutch.

9. Ignition not functioning properly (possible sensor failure).
10. Faulty ignition coil.
11. Valves sticking.
12. Partially plugged fuel injector(s).

Starts But Runs Irregularly or Misses

1. Spark plugs in poor condition or partially fouled.
2. Spark plug cables in poor condition and shorting or leaking.
3. Spark plug gap too close or too wide.
4. Faulty ignition coil, ECM, or sensor.
5. Battery nearly discharged.
6. Damaged wire or loose connection at battery terminals, ignition coil or ECM connector.
7. Intermittent short circuit due to damaged wire insulation.
8. Water or dirt in fuel system.
9. Fuel tank vent system plugged.
10. Air leak at intake manifold or air cleaner.
11. Loose or dirty ECM connector.
12. Faulty Sensor(s): Temperature Manifold Absolute Pressure (TMAP), Crank Position (CKP) or Oxygen (O2).
13. Incorrect valve timing.
14. Weak or damaged valve springs.

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15. Damaged intake or exhaust valve.
16. Partially plugged fuel injector(s).

A Spark Plug Fouls Repeatedly

1. Fuel mixture too rich.
2. Incorrect spark plug for the kind of service.
3. Piston rings badly worn or damaged.
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 (TMAP and/or CKP).
6. Ignition timing advanced due to ECM or sensors (CKP, ET or TMAP) defective.
7. Intake manifold vacuum leak.

Overheating

1. Insufficient oil supply or oil not circulating.
2. Insufficient air flow over engine.
3. Heavy carbon deposits.
4. Ignition timing retarded due to defective ECM or faulty sensor(s) (TMAP and/or CKP).
5. Leaking valve(s).

Valve Train Noise

1. Low oil pressure caused by oil feed pump not functioning properly or oil passages obstructed.
2. Faulty hydraulic lifter(s).
3. Bent push rod(s).
4. Incorrect push rod length.
5. Rocker arm binding on shaft.
6. Valve sticking in guide.
7. Chain tensioning spring or shoe worn.
8. Cam(s), cam gear(s) or cam bushing(s) worn.
9. Cam timing incorrect.

Excessive Vibration

1. Wheels bent or damaged and/or tires worn or damaged.
2. Engine/Transmission/Rear Wheel 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/damaged or mounting bracket pre-loaded.
6. Ignition timing advanced due to faulty sensor inputs (TMAP and/or CKP)/poorly tuned engine.
7. Internal engine problem.
8. Damaged frame.
9. Stabilizer links worn or loose, or stabilizer link brackets loose or damaged.
10. Rubber mount (front) snubbers not centered and contacting side of mount.
11. Rubber mounts (front or rear) loose or worn.
12. Rear fork pivot shaft fasteners loose.
13. Front engine mount bracket bolts loose.
14. Exhaust system binding and causing unnecessary side loads.

Check Engine Light Illuminates During Operation

Fault detected. See the electrical diagnostic manual for more information.

LUBRICATION SYSTEM

Oil Does Not Return To Oil Reservoir

1. Oil reservoir 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 reservoir overfilled.
2. Restricted oil return line to oil reservoir.
3. Restricted breather operation.
4. Restricted oil filter.
5. Oil pump misaligned or in poor condition.
6. Piston rings badly worn or broken.
7. Valve guides or seals worn or damaged.
8. O-ring damaged or missing from oil pump/crankcase junction (also results in poor engine performance).
9. Plugged crankcase scavenge port.
10. Oil diluted with gasoline.

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

1. Loose parts.
2. Imperfect seal at gaskets, push rod covers, washers, etc.

3. Restricted breather passages or hose to air cleaner.
4. Restricted oil filter.
5. Oil reservoir overfilled.
6. Lower rocker housing gasket installed incorrectly (upside down).
7. Restricted oil return line to oil reservoir.
8. Porosity.

Low Oil Pressure

1. Oil reservoir underfilled.
2. Faulty low oil pressure switch.
3. Oil pump O-ring damaged or missing.
4. Bypass valve stuck in open position.
5. Ball missing or leaking in cam support plate.
6. Worn oil pump gerotor(s).
7. Oil diluted with gasoline.

High Oil Pressure

1. Oil reservoir overfilled.
2. Bypass valve stuck in closed position.

ELECTRICAL SYSTEM

NOTE

For diagnostic information see the electrical diagnostic manual.

Alternator Does Not Charge

1. Voltage regulator module not grounded.
2. Engine ground wire loose or damaged.
3. Faulty voltage regulator module.
4. Loose or damaged 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 voltage regulator module.
4. Faulty stator and/or rotor.

Speedometer Operates Erratically

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

TRANSMISSION

Shifts Hard

1. Primary chaincase overfilled with lubricant.
2. Clutch not fully disengaging.
3. Transmission lubricant too heavy (winter operation).
4. Shifter return spring (inside transmission) bent or broken.
5. Bent shifter rod.
6. Shifter forks (inside transmission) sprung.
7. Corners worn off shifter clutch dog rings (inside transmission).

Jumps Out Of Gear

1. Shifter rod improperly adjusted.
2. Shifter drum (inside transmission) improperly adjusted or damaged/worn.
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. Lubricant level too high in primary chaincase.
2. Clutch controls improperly adjusted.
3. Primary chain badly misaligned or too tight.
4. Insufficient clutch spring tension.
5. Clutch discs warped.

Clutch Chatters

Friction discs or steel discs worn or warped.

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. Damaged tire(s) or improper front-rear tire combination.
3. Irregular or peaked front tire tread wear.
4. Incorrect tire pressure.
5. Shock absorber not functioning normally.
6. Incorrect air suspension pressure.
7. Loose wheel axle nuts. Tighten to recommended torque specification.
8. Excessive wheel hub bearing play.
9. Rear wheel out of alignment with frame and front wheel.
10. Steering head bearings improperly adjusted. Correct adjustment and replace pitted or worn bearings and races.
11. Loose spokes (laced wheel vehicles only).
12. Tire and wheel unbalanced.

13. Rims and tires out-of-round or eccentric with hub.
14. Rims and tires out-of-true sideways.
15. Rear fork pivot assembly: improperly tightened or assembled, or loose/pitted or damaged pivot bearings.
16. Engine mounts and/or stabilizer links loose, worn or damaged.

BRAKES

Brake Does Not Hold Normally

1. Brake fluid reservoir low, system leaking or pads worn.
2. Brake system contains air bubbles.
3. Master cylinder/caliper piston seals worn or parts damaged.
4. Brake pads contaminated with grease or oil.
5. Brake pads badly worn.
6. Brake disc badly worn or warped.
7. Brake drags - insufficient brake pedal or hand lever freeplay, caliper piston worn or damaged, or excessive brake fluid in reservoir.
8. Brake fades due to heat build up - brake pads dragging or excessive braking.
9. Brake fluid leak when under pressure.

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NOTES

FASTENER TORQUE VALUES 2.1

FASTENER TORQUE VALUES IN THIS CHAPTER

The table below lists torque values for all fasteners presented in this chapter.

FASTENER	TORQUE VALUE		NOTES
2 inch diameter gauge nuts	10-20 **in-lbs**	1.1-2.3 Nm	2.36 INNER FAIRING: FORK MOUNTED FAIRING MODELS, Installation
Air deflector bolts	25-35 **in-lbs**	2.8-4.0 Nm	2.37 AIR DEFLECTORS, Mid-Frame Air Deflectors
Air deflector screws	25-30 **in-lbs**	2.8-3.4 Nm	2.37 AIR DEFLECTORS, Air Deflectors
Air valve mount hex nut	40-50 **in-lbs**	4.5-5.6 Nm	2.19 REAR AIR SUSPENSION, Check for Air Leaks
Auxiliary lamp bracket to fork bracket screws (FLHT/C/U)	15-20 ft-lbs	20-27 Nm	2.36 INNER FAIRING: FORK MOUNTED FAIRING MODELS, Installation
Banjo bleeder bolt to front caliper	17-19 ft-lbs	23.1-25.8 Nm	2.12 FRONT BRAKE MASTER CYLINDER, Front Brake Line: Non-ABS Equipped
Banjo bleeder bolt to front caliper	17-19 ft-lbs	23.1-25.8 Nm	2.13 FRONT BRAKE CALIPER, Installation
Banjo bolt to front master cylinder	12.5-14.5 ft-lbs	16.9-19.7 Nm	2.12 FRONT BRAKE MASTER CYLINDER, Assembly and Installation
Banjo bolt to front master cylinder	12.5-14.5 ft-lbs	16.9-19.7 Nm	2.12 FRONT BRAKE MASTER CYLINDER, Front Brake Line: Non-ABS Equipped
Banjo bolt to rear caliper	17-19 ft-lbs	23.1-25.8 Nm	2.14 REAR BRAKE MASTER CYLINDER, Rear Brake Line: Non-ABS Equipped
Banjo bolt to rear caliper	17-19 ft-lbs	23.1-25.8 Nm	2.15 REAR BRAKE CALIPER, Installation
Banjo bolt to rear master cylinder	12.5-14.5 ft-lbs	16.9-19.7 Nm	2.14 REAR BRAKE MASTER CYLINDER, Assembly and Installation
Banjo bolt to rear master cylinder	12.5-14.5 ft-lbs	16.9-19.7 Nm	2.14 REAR BRAKE MASTER CYLINDER, Rear Brake Line: Non-ABS Equipped
Battery tray screws	72-96 **in-lbs**	8.1-10.8 Nm	2.48 REAR FRAME, Rear Frame
Brake caliper (front) mounting screws	28-38 ft-lbs	37.9-51.5 Nm	2.13 FRONT BRAKE CALIPER, Installation/metric
Brake caliper (rear) mounting screws	43-48 ft-lbs	58.3-65.1 Nm	2.5 REAR WHEEL, Installation/metric
Brake caliper (rear) mounting screws	43-48 ft-lbs	58.3-65.1 Nm	2.15 REAR BRAKE CALIPER, Installation/metric
Brake caliper bleeder valve	80-100 **in-lbs**	9.0-11.3 Nm	2.16 BLEEDING BRAKES, Procedure
Brake disc (front) screws	16-24 ft-lbs	21.7-32.5 Nm	2.4 FRONT WHEEL, Installation/Always use new screws
Brake disc (rear) screws	30-45 ft-lbs	41-61 Nm	2.5 REAR WHEEL, Installation/Always use new screws
Brake light switch bracket fastener	80-100 **in-lbs**	9.0-11.3 Nm	2.14 REAR BRAKE MASTER CYLINDER, Rear Brake Line: Non-ABS Equipped
Brake line bracket-to-lower fork bracket screw	120-180 **in-lbs**	13.6-20.3 Nm	2.12 FRONT BRAKE MASTER CYLINDER, Front Brake Line: Non-ABS Equipped
Brake line bracket-to-lower fork bracket screw	120-180 **in-lbs**	13.6-20.3 Nm	2.18 STEERING HEAD BEARINGS, Installation
Brake pedal shaft locknut	15-20 ft-lbs	20.3-27.1 Nm	2.14 REAR BRAKE MASTER CYLINDER, Assembly and Installation
Brake pedal shaft locknut	15-20 ft-lbs	20.3-27.1 Nm	2.14 REAR BRAKE MASTER CYLINDER, Rear Brake Line: Non-ABS Equipped
Engine guard screws	15-20 ft-lbs	20.3-27.1 Nm	2.33 LOWER FAIRING AND ENGINE GUARD, Engine Guard

FASTENER	TORQUE VALUE		NOTES
Engine mount bracket fasteners	36-40 ft-lbs	48.8-54.2 Nm	2.51 FRONT ENGINE MOUNT, Installation
Engine mount end cap fasteners	42-48 ft-lbs	56.9-65.0 Nm	2.51 FRONT ENGINE MOUNT, Installation
Fairing bracket-to-steering head locknuts (frame mounted fairing)	20-30 ft-lbs	27.1-40.7 Nm	2.41 INNER FAIRING: FRAME MOUNTED FAIRING MODELS, Installation
Fairing cap screws	25-30 **in-lbs**	2.8-3.4 Nm	2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS, Fairing Cap
Fairing speaker lower screw (FLHX, FLHTC/U)	22-28 **in-lbs**	2.5-3.2 Nm	2.36 INNER FAIRING: FORK MOUNTED FAIRING MODELS, Installation
Fairing speaker upper screws (FLHX, FLHTC/U)	35-50 **in-lbs**	4.0-5.7 Nm	2.36 INNER FAIRING: FORK MOUNTED FAIRING MODELS, Installation
Fork bracket pinch bolt	53-57 ft-lbs	71.9-77.3 Nm	2.17 FRONT FORK, Installation
Fork cap bolt	60-70 ft-lbs	81.4-94.9 Nm	2.17 FRONT FORK, Installation
Fork damper tube screw (metric)	132-216 **in-lbs**	14.9-24.4 Nm	2.17 FRONT FORK, Assembly
Fork oil drain plug	72-96 **in-lbs**	8-11 Nm	2.17 FRONT FORK, Changing Fork Oil
Fork tube plug	60-70 ft-lbs	81.4-94.9 Nm	2.17 FRONT FORK, Changing Fork Oil
Frame cover fastener, rear	15-20 ft lbs	20.3-27.1 Nm	2.28 TOUR-PAK, Luggage Rack/Tour-Pak Support
Frame cover fastener, rear	15-20 ft-lbs	20.3-27.1 Nm	2.46 REAR FENDER, Installation
Front axle holder nuts	132-180 **in-lbs**	14.9-20.3 Nm	2.4 FRONT WHEEL, Installation/metric
Front axle nut	60-65 ft-lbs	81.4-88.1 Nm	2.4 FRONT WHEEL, Installation/metric
Front engine mount fasteners	40-50 ft-lbs	54.2-67.8 Nm	2.51 FRONT ENGINE MOUNT, Installation
Front fender mount screws	16-20 ft-lbs	22-27 Nm	2.45 FRONT FENDER, Installation
Front master cylinder reservoir cover screws	10-12 **in-lbs**	1.1-1.4 Nm	2.16 BLEEDING BRAKES, Procedure
Front turn signal lamp acorn nuts, frame mounted fairing	60-84 **in-lbs**	6.8-9.5 Nm	2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS, Outer Fairing
Guard to frame screws	32-36 ft-lbs	43.4-48.8 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Handlebar clamp to clutch lever bracket screws	72-108 **in-lbs**	8.1-12.0 Nm	2.22 CLUTCH CABLE, Installation
Handlebar clamp to clutch lever bracket screws	72-108 **in-lbs**	8.1-12.0 Nm	2.23 HANDLEBARS, Adjustment
Handlebar clamp to master cylinder screws	72-108 **in-lbs**	8.1-12.2 Nm	2.12 FRONT BRAKE MASTER CYL-INDER, Assembly and Installation
Handlebar lower clamp bolts (risers)	30-40 ft-lbs	40.7-54.2 Nm	2.23 HANDLEBARS, Rubber Mounts
Handlebar upper clamp screws	16-20 ft-lbs	21.7-27.1 Nm	2.23 HANDLEBARS, Adjustment
Handlebar upper clamp screws	16-20 ft-lbs	21.7-27.1 Nm	2.23 HANDLEBARS, Installation
Handlebar upper clamp screws	16-20 ft-lbs	21.7-27.1 Nm	2.23 HANDLEBARS, Installation
Headlamp housing screws	9-18 **in-lbs**	1.0-2.0 Nm	2.44 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp housing screws	9-18 **in-lbs**	1.0-2.0 Nm	2.44 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp nacelle handlebar chrome strip flange nut	15-20 **in-lbs**	1.7-2.3 Nm	2.44 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp nacelle handlebar clamp shroud screws	10-20 **in-lbs**	1.1-2.3 Nm	2.44 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp nacelle handlebar clamp shroud screws	10-20 **in-lbs**	1.1-2.3 Nm	2.44 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp nacelle to fork bracket stud acorn nuts	72-108 **in-lbs**	8.1-12.2 Nm	2.44 HEADLAMP NACELLE: ROAD KING MODELS, Installation

FASTENER	TORQUE VALUE		NOTES
Instrument bezel screws (frame mounted fairing models)	25-35 **in-lbs**	2.8-4.0 Nm	2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS, Bezel
Instrument nacelle to fork bracket screws (frame mounted fairing models)	15-20 ft-lbs	20.3-27.1 Nm	2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS, Instrument Nacelle
Jiffy stand bracket fasteners	36-42 ft-lbs	48.8-57.0 Nm	2.50 JIFFY STAND, Jiffy Stand Bracket
Jiffy stand interlock sensor fastener	96-120 **in-lbs**	10.8-13.6 Nm	2.50 JIFFY STAND, Jiffy Stand Interlock Sensor/Use Loctite Medium Strength Threadlocker 243 (blue) if reusing screw
Jiffy stand leg stop hex screw	15-20 ft-lbs	20.3-27.1 Nm	2.50 JIFFY STAND, Leg Installation
Left electrical caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm	2.48 REAR FRAME, Rear Frame
Lower fairing clip stud flange nuts	35-40 **in-lbs**	4.0-4.5 Nm	2.33 LOWER FAIRING AND ENGINE GUARD, Lower Fairing
Lower fairing glove box tray screws	20-25 **in-lbs**	2.3-2.8 Nm	2.33 LOWER FAIRING AND ENGINE GUARD, Lower Fairing
Lower fairing glove box tray screws	20-25 **in-lbs**	2.3-2.8 Nm	2.33 LOWER FAIRING AND ENGINE GUARD, Lower Fairing
Lower fairing to engine guard clamp screws	90-100 **in-lbs**	10.2-11.3 Nm	2.33 LOWER FAIRING AND ENGINE GUARD, Lower Fairing
Luggage rack screws	15-20 ft lbs	20.3-27.1 Nm	2.28 TOUR-PAK, Luggage Rack/Tour-Pak Support
Luggage rack screws	15-20 ft-lbs	20.3-27.1 Nm	2.46 REAR FENDER, Installation
Mirror flange nut (FLHX)	30-40 **in-lbs**	3.4-4.5 Nm	2.24 MIRRORS, FLHX/metric
Mirror stem acorn nut	60-96 **in-lbs**	6.8-10.8 Nm	2.24 MIRRORS, All Models Except FLHX/metric
Outer fairing long screws, frame mounted fairing	10-15 **in-lbs**	1.1-1.7 Nm	2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS, Outer Fairing
Outer fairing screws (fork mounted fairing)	20-30 **in-lbs**	2.3-3.4 Nm	2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS, Outer Fairing and Windshield
Outer fairing short screws, frame mounted fairing	6-12 **in-lbs**	0.7-1.4 Nm	2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS, Outer Fairing
Passenger footboard/footrest fastener	36-42 ft-lbs	48.8-56.9 Nm	2.49 FOOTBOARDS AND FOOTRESTS, Passenger Footrest: FLHX, FLTRX
Passenger footboard/footrest lower fastener	48-72 **in lbs**	5.4-8.1 Nm	2.49 FOOTBOARDS AND FOOTRESTS, Passenger Footboard
Passenger footboard/footrest upper fastener	36-42 ft-lbs	48.8-56.9 Nm	2.49 FOOTBOARDS AND FOOTRESTS, Passenger Footboard
Passenger footrest pad screw (FLHX, FLTRX)	15-20 ft-lbs	20-27 Nm	2.49 FOOTBOARDS AND FOOTRESTS, Passenger Footrest: FLHX, FLTRX/Use Loctite Medium Strength Threadlocker 243 (blue)
Radio bracket-to-fairing bracket locknuts (frame mounted fairing)	96-144 **in-lbs**	10.9-16.3 Nm	2.41 INNER FAIRING: FRAME MOUNTED FAIRING MODELS, Installation
Rail clamp screws	30-50 **in-lbs**	3.4-5.6 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Rear axle cone nut (preliminary)	15-20 ft-lbs	20-27 Nm	2.5 REAR WHEEL, Installation/metric
Rear brake light switch	12-15 ft-lbs	16.3-20.3 Nm	2.14 REAR BRAKE MASTER CYLINDER, Rear Brake Line: Non-ABS Equipped/Use Loctite Pipe Sealant with Teflon 565
Rear fascia flange nuts	30-45 **in-lbs**	3.4-5.1 Nm	2.47 REAR FASCIA, Installation
Rear fascia lamp screws	18-22 **in-lbs**	2.0-2.5 Nm	2.47 REAR FASCIA, Installation
Rear fascia lamp screws	18-22 **in-lbs**	2.0-2.5 Nm	2.47 REAR FASCIA, Rear Fascia Lamp
Rear fender mounting boss	15-20 ft-lbs	20.3-27.1 Nm	2.46 REAR FENDER, Fender Repair
Rear fender mounting screws	15-20 ft-lbs	20.3-27.1 Nm	2.46 REAR FENDER, Installation

FASTENER	TORQUE VALUE		NOTES
Rear fender support-to-fender nut	45-85 **in-lbs**	5.1-9.6 Nm	2.47 REAR FASCIA, Installation
Rear fender support-to-fender nut	45-85 **in-lbs**	5.1-9.6 Nm	2.47 REAR FASCIA, Stud Plate
Rear fender support -to-saddlebag support fastener	15-20 ft-lbs	20.3-27.1 Nm	2.46 REAR FENDER, Installation
Rear fender support-to-saddlebag support fastener	15-20 ft-lbs	20.3-27.1 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Rear fender support-to-saddlebag support fastener	15-20 ft-lbs	20.3-27.1 Nm	2.47 REAR FASCIA, Stud Plate
Rear fork bracket screws	55-65 ft-lbs	74.6-88.1 Nm	2.21 REAR FORK, Installation/Apply two drops of Loctite Medium Strength Threadlocker 243 (blue) to threads
Rear fork pivot shaft fasteners	55-65 ft-lbs	74.6-88.2 Nm	2.21 REAR FORK, Installation/Apply two drops of Loctite Medium Strength Threadlocker 243 (blue) to threads
Rear frame-to-main frame fastener	40-45 ft-lbs	54.2-61.0 Nm	2.48 REAR FRAME, Rear Frame
Rear master cylinder reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	2.16 BLEEDING BRAKES, Procedure
Rear master cylinder-to-frame screws	126-150 **in-lbs**	14.2-17.0 Nm	2.14 REAR BRAKE MASTER CYLINDER, Assembly and Installation
Rear master cylinder-to-frame screws	126-150 **in-lbs**	14.2-17.0 Nm	2.14 REAR BRAKE MASTER CYLINDER, Rear Brake Line: Non-ABS Equipped
Rear muffler fastener	96-144 **in-lbs**	10.8-16.3 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Rider footboard bracket screws	36-42 ft-lbs	48.8-57.0 Nm	2.49 FOOTBOARDS AND FOOTRESTS, Rider Footboards
Rider footboard pivot bolt nut	60-80 **in-lbs**	6.8-9.0 Nm	2.49 FOOTBOARDS AND FOOTRESTS, Rider Footboards
Saddlebag latch/check strap screws	20-25 **in-lbs**	2.3-2.8 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Hardware
Saddlebag latch/check strap screws	20-25 **in-lbs**	2.3-2.8 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Hardware
Saddlebag lid check strap screws	18-20 **in-lbs**	2.0-2.3 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Hardware
Saddlebag mounting bracket screw	60-96 **in-lbs**	6.8-10.8 Nm	2.25 SEAT, Seat: Road King Models
Saddlebag mounting bracket screw	12-15 ft-lbs	16.3-20.3 Nm	2.26 SADDLEBAGS, Installation
Saddlebag mounting bracket screw	12-15 ft-lbs	16.3-20.3 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Saddlebag mounting bracket screw	12-15 ft lbs	16.3-20.3 Nm	2.28 TOUR-PAK, Luggage Rack/Tour-Pak Support
Saddlebag mounting bracket screw	12-15 ft-lbs	16.3-20.3 Nm	2.46 REAR FENDER, Installation
Saddlebag side guard to front guard screw	72-120 **in-lbs**	8.1-13.6 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Saddlebag support rail to front guard screw	70-100 **in-lbs**	7.9-11.3 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Saddlebag support to fender support fastener	15-20 ft-lbs	20.3-27.1 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Saddlebag support to fender support fastener	15-20 ft-lbs	20.3-27.1 Nm	2.46 REAR FENDER, Installation
Seat bumper fastener	80-120 **in-lbs**	9.0-13.6 Nm	2.25 SEAT, Seat Bumper
Seat mounting screw	48-72 **in-lbs**	5.4-8.1 Nm	2.25 SEAT, Seat: Models without Tour-Pak
Seat mounting screw	48-72 **in-lbs**	5.4-8.1 Nm	2.25 SEAT, Seat: Models with Tour-Pak
Seat mounting screw	48-72 **in-lbs**	5.4-8.1 Nm	2.25 SEAT, Seat: Road King Models
Seat strap screw	48-72 **in-lbs**	5.4-8.1 Nm	2.25 SEAT, Seat: Models without Tour-Pak
Seat strap screw	48-72 **in-lbs**	5.4-8.1 Nm	2.25 SEAT, Seat: Models with Tour-Pak

FASTENER	TORQUE VALUE		NOTES
Shock absorber compression fitting	12-17 ft-lbs	16.3-23.0 Nm	2.19 REAR AIR SUSPENSION, Check for Air Leaks
Shock absorber compression fitting	12-17 ft-lbs	16.3-23.0 Nm	2.20 REAR SHOCK ABSORBERS, Disassembly and Assembly
Shock lower mounting bolt	35-40 ft-lbs	47.5-54.2 Nm	2.20 REAR SHOCK ABSORBERS, Installation/Use LOCTITE MEDIUM STRENGTH THREADLOCKER 243 (blue)
Shock lower mounting bolt	35-40 ft-lbs	47.5-54.2 Nm	2.21 REAR FORK, Installation/Apply two or three drops of Loctite Medium Strength Threadlocker 243 (blue) to threads
Shock upper mounting bolt	35-40 ft-lbs	47.5-54.2 Nm	2.20 REAR SHOCK ABSORBERS, Installation/Use LOCTITE MEDIUM STRENGTH THREADLOCKER 243 (blue)
Side rail to saddlebag support screws	15-20 ft-lbs	20.3-27.1 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Speaker box fasteners	25-35 **in-lbs**	2.8-4.0 Nm	2.32 TOUR-PAK SPEAKER BOX, Speaker Box
Speaker box mounting screws	25-35 **in-lbs**	2.8-4.0 Nm	2.28 TOUR-PAK, Removal/Installation
Speedometer/tachometer bracket screws	10-20 **in-lbs**	1.1-2.3 Nm	2.36 INNER FAIRING: FORK MOUNTED FAIRING MODELS, Installation
Spoke nipple	55 **in-lbs**	6.2 Nm	2.9 CHECKING AND TRUING WHEELS, Truing Laced Wheels
Top caddy mounting screw	72-96 **in-lbs**	8.1-10.8 Nm	2.48 REAR FRAME, Rear Frame
Tour-Pak latch screw	20-25 **in-lbs**	2.3-2.8 Nm	2.29 TOUR-PAK SERVICE, Latches/Lockset Catch/Use Loctite Medium Strength Threadlocker 243 (blue)
Tour-Pak lockset hex nut	25-35 **in-lbs**	2.8-4.0 Nm	2.29 TOUR-PAK SERVICE, Lockset
Tour-Pak lockset jam nut	30-45 **in-lbs**	3.4-5.1 Nm	2.29 TOUR-PAK SERVICE, Lockset
Tour-Pak luggage rack fastener	60-84 **in-lbs**	6.8-9.5 Nm	2.29 TOUR-PAK SERVICE, Luggage Rack
Tour-Pak metal plate flange nuts	65-70 **in-lbs**	7.3-7.9 Nm	2.30 TOUR-PAK LIGHTS, Tour-Pak Lights Harness
Tour-Pak mounting bolts	96-120 **in-lbs**	10.8-13.6 Nm	2.30 TOUR-PAK LIGHTS, Tour-Pak Lights Harness
Tour-Pak mounting screws	96-120 **in-lbs**	10.8-13.6 Nm	2.28 TOUR-PAK, Removal/Installation
Tour-Pak mounting screws	96-120 **in-lbs**	10.8-13.6 Nm	2.28 TOUR-PAK, Adjustment
Tour-Pak passenger backrest flange nuts	40-60 **in-lbs**	4.5-6.8 Nm	2.29 TOUR-PAK SERVICE, Tether Brackets
Tour-Pak passenger backrest flange nuts	40-60 **in-lbs**	4.5-6.8 Nm	2.31 TOUR-PAK BACKREST, Passenger Backrest
Tour-Pak passenger backrest flap screws	21-24 **in-lbs**	2.4-2.7 Nm	2.31 TOUR-PAK BACKREST, Passenger Backrest Flap
Tour-Pak side marker lights screws	20-25 **in-lbs**	2.3-2.8 Nm	2.30 TOUR-PAK LIGHTS, Side Marker Lights (if equipped)
Tour-Pak tether screw	20-25 **in-lbs**	2.3-2.8 Nm	2.29 TOUR-PAK SERVICE, Hinges/Use Loctite High Strength Threadlocker 262 (red)
Tour-Pak tether screw	20-25 **in-lbs**	2.3-2.8 Nm	2.29 TOUR-PAK SERVICE, Tether/Use Loctite High Strength Threadlocker 262 (red)
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	2.22 CLUTCH CABLE, Installation
Valve stem nut	12-15 **in-lbs**	1.4-1.7 Nm	2.11 TIRES, Installation
Windshield screws (fork mounted fairing)	25-30 **in-lbs**	2.8-3.4 Nm	2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS, Outer Fairing and Windshield
Windshield wellnut screws (frame mounted fairing)	6-13 **in-lbs**	0.7-1.5 Nm	2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS, Windshield
Windshield window screws (Road King Models)	20-25 **in-lbs**	2.3-2.8 Nm	2.43 WINDSHIELD: ROAD KING MODELS, Windshield Window

SPECIFICATIONS 2.2

SPECIFICATIONS

Chassis Specifications

Table 2-1. Dimensions: FLHTC, FLHTCU, FLHTK, FLTRU

ITEM	FLHTC		FLHTCU		FLHTK		FLTRU	
	IN.	MM	IN.	MM	IN.	MM	IN.	MM
Wheel base	63.5	1613	63.5	1613	63.5	1613	63.5	1613
Overall length (Tour-Pak in rear-most position)	98.3	2497	98.6	2504	98.6	2504	98.7	2507
Overall width	38.0	965	38.0	965	38.0	965	36.2	919
Road clearance	5.1	130	5.1	130	5.1	130	5.1	130
Overall height	61.0	1549	61.0	1549	61.0	1549	55.0	1397
Saddle height*	27.3	693	27.3	693	27.3	693	27.3	693
*With 180 lb. (81.7 kg) rider on seat								

Table 2-2. Dimensions: FLHR, FLHRC, FLTRX, FLHX

ITEM	FLHR		FLHRC		FLTRX		FLHX	
	IN.	MM	IN.	MM	IN.	MM	IN.	MM
Wheel base	63.5	1613	63.5	1613	63.5	1613	63.5	1613
Overall length	95.0	2413	94.2	2393	95.0	2413	95.0	2413
Overall width	37.4	950	37.5	953	35.8	909	38.0	965
Road clearance	5.1	130	5.1	130	5.1	130	4.7	119
Overall height	55.1	1400	55.1	1400	50.0	1270	52.2	1326
Saddle height*	26.5	673	26.7	678	26.1	663	26.1	663
*With 180 lb. (81.7 kg) rider on seat								

Table 2-3. Capacities

ITEM	U.S.	LITERS
Fuel tank (total)	6.00 gal	22.71
Low fuel warning light on	1.00 gal	3.79
Engine oil with filter	4.00 qt.	3.79
Transmission (approximate)	1.00 qt.	0.95
Primary chaincase (approximate)	1.40 qt.	1.32

Table 2-4. Weights: FLHTC, FLHTCU, FLHTK, FLTRU

ITEM	FLHTC		FLHTCU		FLHTK		FLTRU	
	LB.	KG	LB.	KG	LB.	KG	LB.	KG
Weight as shipped from factory	827	375.1	852	386.5	857	388.7	850	385.6
GVWR	1360	616.9	1360	616.9	1360	616.9	1360	616.9
GAWR front	500	226.8	500	226.8	500	226.8	500	226.8
GAWR rear	927	420.5	927	420.5	927	420.5	927	420.5

Table 2-5. Weights: FLHR, FLHRC, FLTRX, FLHX

ITEM	FLHR		FLHRC		FLTRX		FLHX	
	LB.	KG	LB.	KG	LB.	KG	LB.	KG
Weight as shipped from factory	775	351.5	773	350.6	772	350.2	785	356.1
GVWR	1360	616.9	1360	616.9	1360	616.9	1360	616.9
GAWR front	500	226.8	500	226.8	500	226.8	500	226.8
GAWR rear	927	420.5	927	420.5	927	420.5	927	420.5

NOTES

- *Gross vehicle weight rating (GVWR) (maximum allowable loaded vehicle weight) and corresponding gross axle weight rating (GAWR) are given on a label located on the frame steering head.*
- *For important information regarding tire data and tire inflation, see 1.8 TIRES AND WHEELS.*

Tire Specifications

⚠WARNING

Use only Harley-Davidson approved tires. See a Harley-Davidson dealer. Using non-approved tires can adversely affect stability, which could result in death or serious injury. (00024a)

Tire sizes are molded on the sidewall. Refer to the tire fitment tables below. Rim size and contour are cast or stamped into the exterior surface of the rim.

Example: T19 x 2.15 MT DOT. "T" indicates that the rim conforms to Tire and Rim Association standards. The "19" is the normal diameter of the rim in inches, measured at the bead seat diameter. The "2.15" is the width of the bead seat measured in inches. "MT" designates the rim contour. "DOT" means that the rim meets Department of Transportation Federal Motor Vehicle Safety Standards.

Table 2-6. Tire Fitment - Tubeless Cast Wheels

WHEEL SIZE AND POSITION	RIM SIZE AND CONTOUR	RIM VALVE HOLE DIA.	APPROVED TIRE
18 in. - Front	T18 x 3.50 MT	0.45 in. (11.4 mm)	**Dunlop D408F** 130/70B18 63H
17 in. - Front	T17 x 3.00 MT	0.45 in. (11.4 mm)	**Dunlop D408F** 130/80B17 65H
16 in. - Rear	T16 x 5.00 MT	0.45 in. (11.4 mm)	**Dunlop D407** 180/65B16 81H

Table 2-7. Tire Fitment - Tube Type Steel Laced Wheels

WHEEL SIZE & POSITION	RIM SIZE & CONTOUR	TUBE SIZE	APPROVED TIRE
16 in - Front	T16 x 3.00D	MT90-16/MU85-16 130/90-150/80-16	**Dunlop D408F** 130/90-B16 67H
16 in - Rear	T16 x 5.00 MT	180/65-16	**Dunlop D407** 180/65-16 81H

Table 2-8. Tire Fitment - Tube Type Chrome Aluminum Profile Laced Wheels

WHEEL SIZE & POSITION	RIM SIZE & CONTOUR	TUBE SIZE	APPROVED TIRE
16 in - Front	T16 x 3.00 MT	MT90-16/MU85-16 130/90-150/80-16	**Dunlop D408F** 130/90B16 67H
17 in - Front	T17 x 3.00 MT	130/80-17	**Dunlop D408F** 130/80-B17 65H
16 in - Rear	T16 x 5.00 MT	180/65-16	**Dunlop D407** 180/65-16 81H

Table 2-9. Tires

MODEL	MOUNT	SIZE	APPROVED TIRE	PRESSURE (COLD)	
				PSI	kPa
All models except FLHRC, FLTRX, FLHX	front	17 in.	Dunlop D408F 130/80B17 65H	36	248
FLHRC	front	16 in.	Dunlop D408F 130/90B16 67H	36	248
FLTRX, FLHX	front	18 in.	Dunlop D408F 130/70B18 63H	36	248
All models	rear	16 in.	Dunlop D407 180/65B16	40	276

VEHICLE IDENTIFICATION NUMBER (V.I.N.) 2.3

VEHICLE IDENTIFICATION NUMBER: TOURING MODELS

The full 17-digit serial or Vehicle Identification Number (V.I.N.) is stamped on the right frame down tube below the steering head. A label bearing the V.I.N. code is also affixed on the right side of the motorcycle on the front downtube.

An abbreviated V.I.N. (Motor Identification Number) is stamped on the left side crankcase at the cylinder base.

NOTE

Always give the full 17-digit Vehicle Identification Number when ordering parts or making any inquiry about your motorcycle.

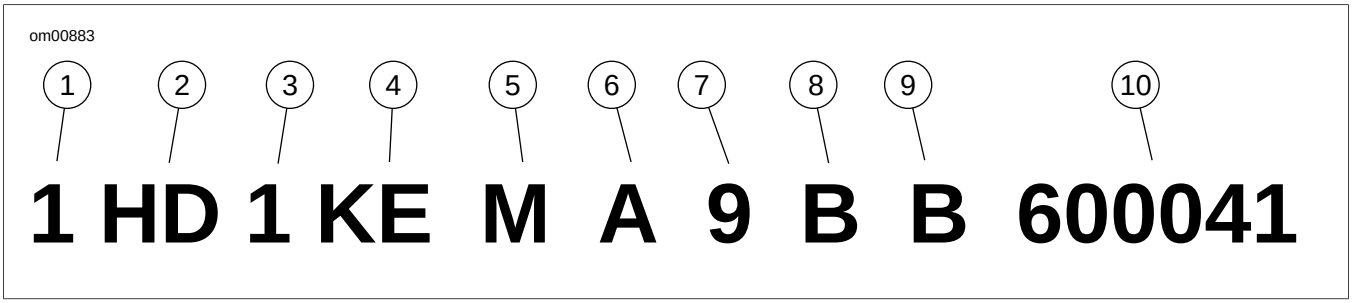


Figure 2-1. Typical Harley-Davidson V.I.N.: 2011 Touring Models

Table 2-10. Harley-Davidson V.I.N. Breakdown: 2011 Touring Models

POSITION	DESCRIPTION	POSSIBLE VALUES	
1	Market designation	1=Originally manufactured for sale **within** the United States 5=Originally manufactured for sale **outside** of the United States	
2	Manufacturer/vehicle type	HD=Harley-Davidson motorcycle	
3	Motorcycle type	1=Heavyweight motorcycle (901 cc or larger)	
4	Model	See V.I.N. model code table	
5	Engine type	4=Twin Cam 96™, 1584 cc air-cooled, fuel-injected M=Twin Cam 103™, 1690 cc air-cooled, fuel-injected	
6	Introduction date/calibration	**Normal Introduction** 1=Domestic 3=California A=Canada C=HDI E=Japan G=Australia J=Brazil L=Asia Pacific N=India	**Mid-year or Special Introduction** 2, 4=Domestic 5, 6=California B=Canada D=HDI F=Japan H=Australia K=Brazil M=Asia Pacific P=India
7	V.I.N. check digit	Can be 0-9 or X	
8	Model year	B=2011	
9	Assembly plant	B=York, PA U.S.A.	
10	Sequential number	Varies	

Table 2-11. V.I.N. Model Codes: 2011 Touring Models

CODE	MODEL	CODE	MODEL
FB	FLHR Road King®	KB	FLHX Street Glide®
FR	FLHRC Road King® Classic	KE	FLHTK Electra Glide® Ultra Limited™
FW	FLHR Road King® Shrine	FF	FLHTC Electra Glide® Classic
KH	FLTRX Road Glide® Custom	FC	FLHTCU Ultra Classic® ElectraGlide®
KG	FLTRU Road Glide® Ultra	FL	FLHTCU Ultra Classic® Electra Glide®Shrine

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FRONT WHEEL 2.4

REMOVAL

NOTICE

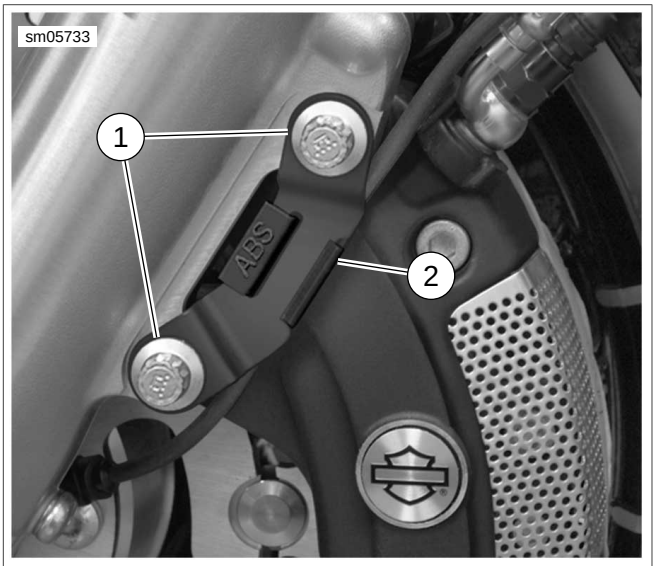
When lifting a motorcycle using a jack, be sure jack contacts both lower frame tubes where down tubes and lower frame tubes converge. Never lift by jacking on crossmembers, oil pan or other housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586c)

1. Raise the wheel with a suitable lifting device.
2. Inspect the wheel bearings. See 2.10 SEALED WHEEL BEARINGS.
3. If present, cut cable straps to release front wheel speed sensor cable and front fender tip lamp wires from left caliper brake hose.
4. See Figure 2-2. Remove two brake caliper mounting fasteners (1). Slide brake caliper straight down to remove from brake disc. Secure caliper to rail of engine guard using a cable strap.
5. If necessary, remove retainer (2) to release wheel speed sensor harness from bracket.
6. Remove right side brake caliper.

NOTE

Do not operate the front brake hand lever with the front wheel removed or the caliper pistons may be forced out. The caliper contains no serviceable components and would require replacement.

7. See Figure 2-3. Hold the axle stationary with a screwdriver or steel rod through hole in axle (10) on right side and remove the axle nut (1) and flat washer (2).
8. Loosen the two axle holder nuts at bottom of right side fork slider.



1. Caliper fasteners
2. Wheel speed sensor cable retainer

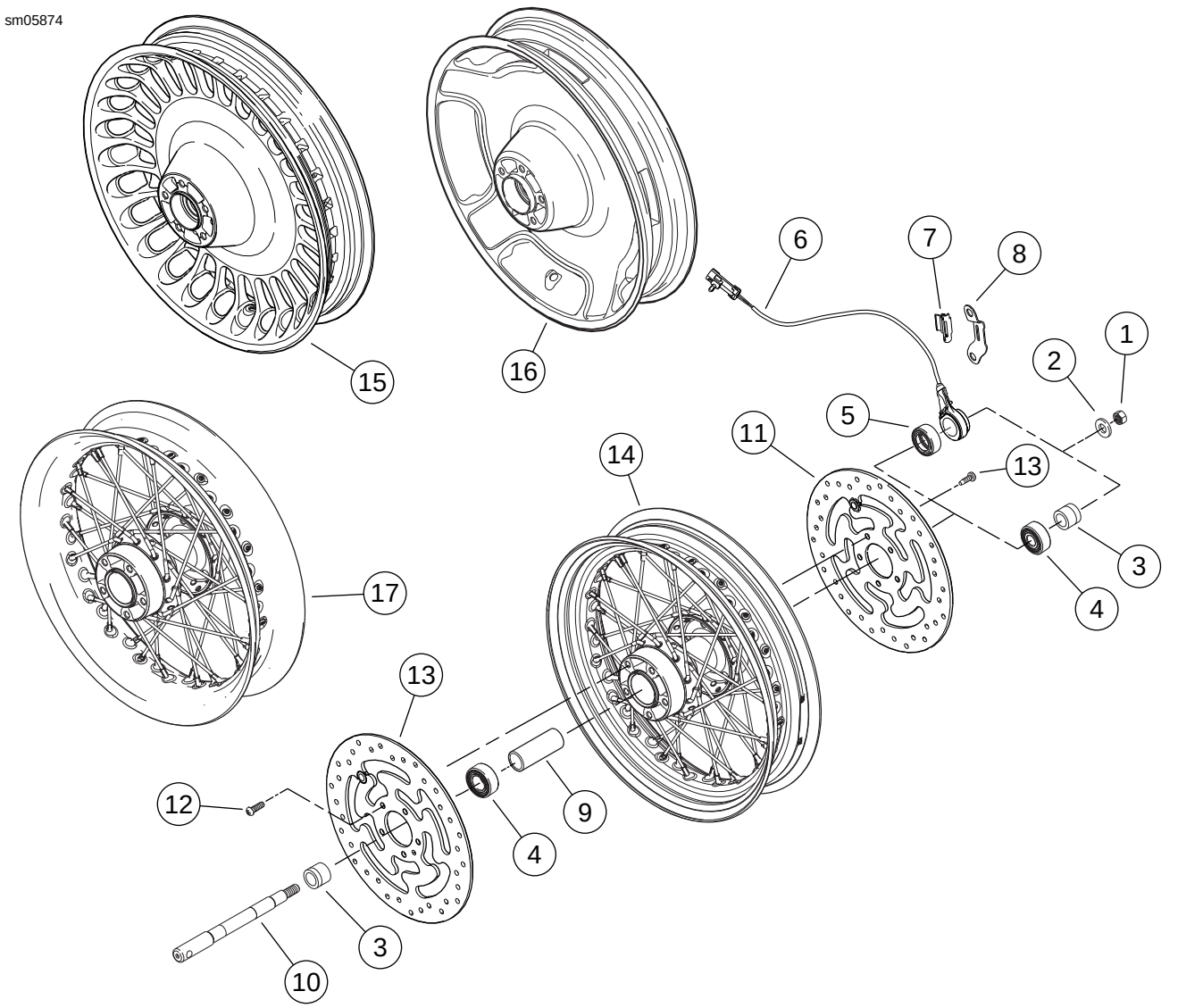
Figure 2-2. Remove Front Caliper

9. Remove the axle from right side of motorcycle. Catch external spacer(s) and front wheel speed sensor (if ABS equipped) as the axle is removed.

NOTE

If ABS equipped, never pull wheel speed sensor cable taut or use to retain wheel, axle or other components. Always keep wheel speed sensor and ABS encoder bearing away from magnetic fields such as magnetic parts trays, magnetic base dial indicators, alternator rotors, etc. or damage will occur.

10. If necessary, remove five screws (12) to release brake discs from hub.



1. **Axle nut**
2. **Flat washer**
3. **External spacer**
4. **Standard bearing**
5. **ABS encoder bearing**
6. **Front wheel speed sensor**
7. **Cable clip**
8. **Clip bracket**
9. **Spacer sleeve**
10. **Axle**
11. **Brake disc (left side)**
12. **Screw (10)**
13. **Brake disc (right side)**
14. **Laced wheel, chrome**
15. **Cast wheel**
16. **Slotted cast wheel**
17. **Laced wheel, profile**

Figure 2-3. Front Wheel (Exploded View)

CLEANING AND INSPECTION

1. Thoroughly clean all parts in solvent (wheel speed sensor and bearings excepted) and inspect for damage or excessive wear.
2. Replace brake discs if warped or badly scored. Measure disc thickness for excessive wear. Minimum acceptable thickness is stamped on side of disc.

INSTALLATION

NOTE

When installing front brake discs, align the rivets with the rivets on the opposite disc.

NOTICE

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

1. See Figure 2-3. If removed, install brake discs using **new** screws (12). Tighten screws in a crosswise pattern to 16-24 ft-lbs (21.7-32.5 Nm).
2. Place wheel into position between fork sliders with the valve stem on the right side of the motorcycle.
3. Apply a light coat of SILVER GRADE ANTI-SEIZE (Part No. 98960-97) to axle, bearing bores and bore of spacer sleeve.
4. Slide axle through right fork slider and external spacer into wheel hub.

NOTE

Be sure that grooves on external spacer(s), or index pin on front wheel speed sensor (if ABS equipped), are on the outboard side. If motorcycle is not ABS equipped, external spacers on left and right side of wheel hub are interchangeable.

5. Push axle through front wheel speed sensor (if ABS equipped) or second external spacer, and left fork slider.
6. Install flat washer and axle nut.
7. See Figure 2-4. If ABS equipped, rotate front wheel speed sensor in a counter-clockwise direction until index pin makes contact with shoulder on left fork slider.
8. Hold axle stationary and tighten axle nut to 60-65 ft-lbs (81.4-88.1 Nm).

NOTE

When securing the axle holder, equally tighten the nuts so the gaps, front and rear, are approximately the same.

9. Push and hold right fork slider inboard until it contacts external spacer and equally tighten axle holder nuts to 132-180 **in-lbs** (14.9-20.3 Nm).

NOTE

See Figure 2-3. If removed, secure wheel speed sensor cable in bracket (8). Be sure that tab (stamped ABS) on clip is installed in slot of bracket from inboard side. Clip cannot be installed once mounting fasteners are started.

10. Install left side brake caliper and sensor cable retainer (if equipped). See 2.13 FRONT BRAKE CALIPER.

WARNING

After servicing brakes and before moving motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00279a)

11. Operate front brake hand lever several times to set brake pads to proper operating position.
12. If ABS equipped, install three **new** cable straps as follows:
    a. On the brake hose lower crimp capturing front wheel speed sensor cable and brake hose.
    b. Approximately midway between the upper and lower brake hose crimps capturing front wheel speed sensor cable, brake hose and front fender tip lamp wires, if equipped.
    c. Approximatels 2.5 in. (63.5 mm) below the brake hose upper crimp capturing front wheel speed sensor cable, brake hose and front fender tip lamp wires, if equipped.

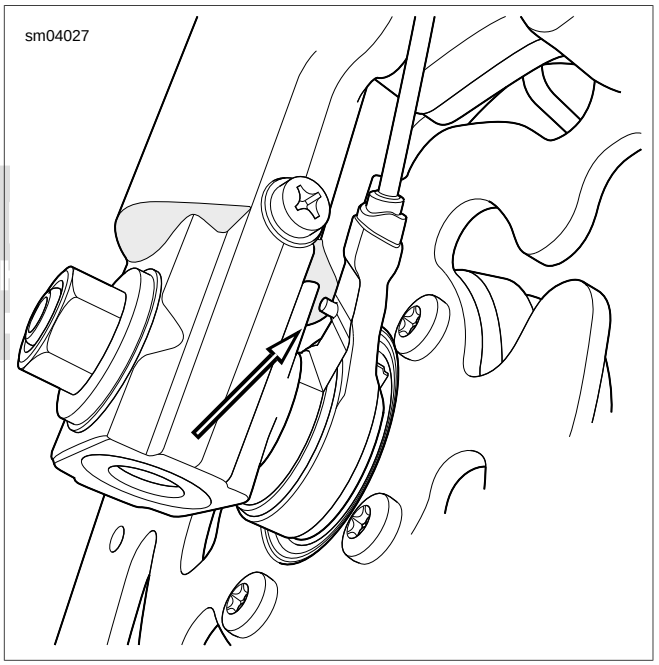


Figure 2-4. Front Wheel Speed Sensor Index Pin (ABS Equipped)

REAR WHEEL 2.5

REMOVAL

PART NUMBER	TOOL NAME
HD-47925	AXLE NUT TORQUE ADAPTER

1. Remove saddlebags. See 2.26 SADDLEBAGS.

NOTICE

When lifting a motorcycle using a jack, be sure jack contacts both lower frame tubes where down tubes and lower frame tubes converge. Never lift by jacking on crossmembers, oil pan or other housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586c)

2. Raise the wheel with a suitable lifting device.
3. Inspect wheel bearings. See 2.10 SEALED WHEEL BEARINGS.
4. Remove left side muffler. See 4.19 EXHAUST SYSTEM.
5. On models equipped with low profile shock absorbers (FLHX, FLTRX), remove left side lower saddlebag support rail. See 2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail.
6. **ABS equipped:** Cut cable strap to release rear wheel speed sensor cable from rear brake hose.
7. Remove rear brake caliper but do not disconnect the brake hose. Set brake caliper on passenger footboard. See 2.15 REAR BRAKE CALIPER.

NOTE

Do not operate the rear brake pedal with the caliper removed or the caliper pistons may be forced out. The caliper contains no serviceable components and would require replacement.

8. See Figure 2-5. Remove E-clip (1) from the groove at the end of the axle.
9. See Figure 2-6. Hold weld nut on left side and loosen cone nut using AXLE NUT TORQUE ADAPTER (Part No. HD-47925).
10. Remove cone nut and adjuster cam from axle.
11. Rotate weld nut on opposite side of axle counterclockwise until wheel is loose.

NOTE

If ABS equipped, never pull wheel speed sensor cable taut or use to retain wheel, axle or other components. Always keep wheel speed sensor and ABS encoder bearing away from magnetic fields such as magnetic parts trays, magnetic base dial indicators, alternator rotors, etc. or damage will occur.

12. Remove the axle from the left side of the motorcycle. Catch external spacer(s), caliper bracket, and rear wheel speed sensor (if ABS equipped) as the axle is removed.
13. Remove caliper bracket from anchor weldment on rear fork.

NOTE

To protect belt on vehicles with a hot exhaust, place a shop towel over exhaust crossover.

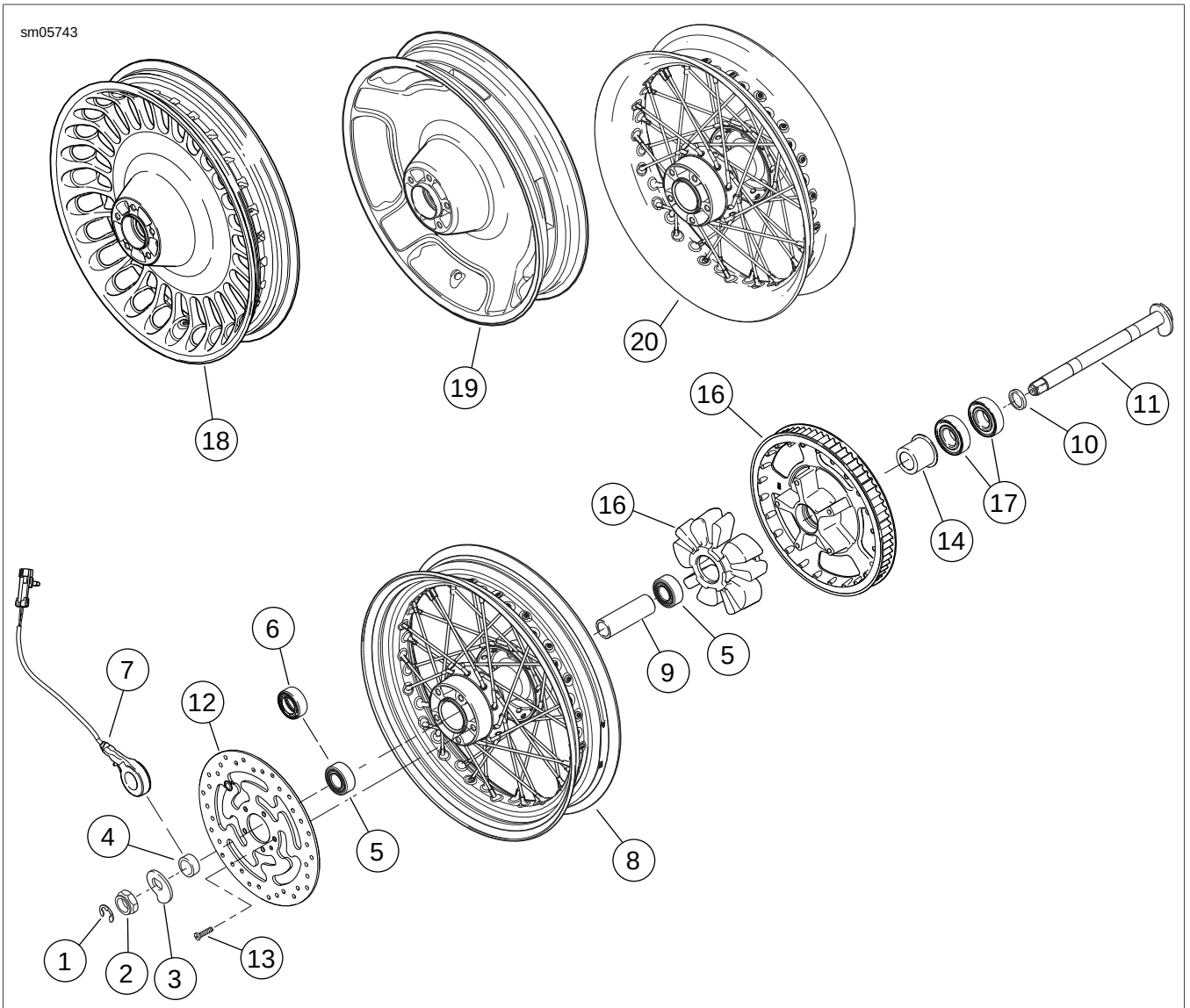
14. Move wheel forward and slip belt off compensator sprocket.

NOTE

Hold sprocket while removing rear wheel. Sprocket may drop from wheel if isolators are excessively worn.

15. If necessary, remove brake disc from hub. If wheel is to be assembled with the same disc, mark both the wheel and disc, so that it can be installed in its original position.

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1. **E-clip**
2. **Cone nut**
3. **Adjuster cam**
4. **External spacer (thick)**
5. **Standard bearing**
6. **ABS encoder bearing**
7. **Rear wheel speed sensor**
8. **Laced wheel, chrome**
9. **Spacer sleeve**
10. **External spacer (thin)**
11. **Axle**
12. **Brake disc**
13. **Screw (5)**
14. **Spacer, compensator**
15. **Isolator**
16. **Compensator sprocket**
17. **Sprocket bearing (2)**
18. **Cast wheel**
19. **Slotted cast wheel**
20. **Laced wheel, profile**

Figure 2-5. Rear Wheel (Exploded View)

CLEANING AND INSPECTION

1. Thoroughly clean all parts in solvent (wheel speed sensor and bearings excepted) and inspect for damage or excessive wear.
2. Replace brake disc if warped or badly scored. Measure disc thickness for excessive wear. Minimum acceptable thickness is stamped on side of disc.
3. Check the compensator sprocket for wear, tooth damage, cracks or pitting. Check isolator for crumbling, flaking, excessive wear or general deterioration. Replace parts as necessary.

INSTALLATION

PART NUMBER	TOOL NAME
HD-35381A	BELT TENSION GAUGE

NOTE

Always install brake disc in its original position.

NOTICE

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

1. If removed, install brake disc in its original position using **new** screws. Tighten screws in a crosswise pattern to 30-45 ft-lbs (41-61 Nm).
2. Verify that sprocket is square and fully seated in bowl area of wheel.
3. Place wheel in rear fork. Install belt over sprocket and slide the wheel back.

⚠WARNING

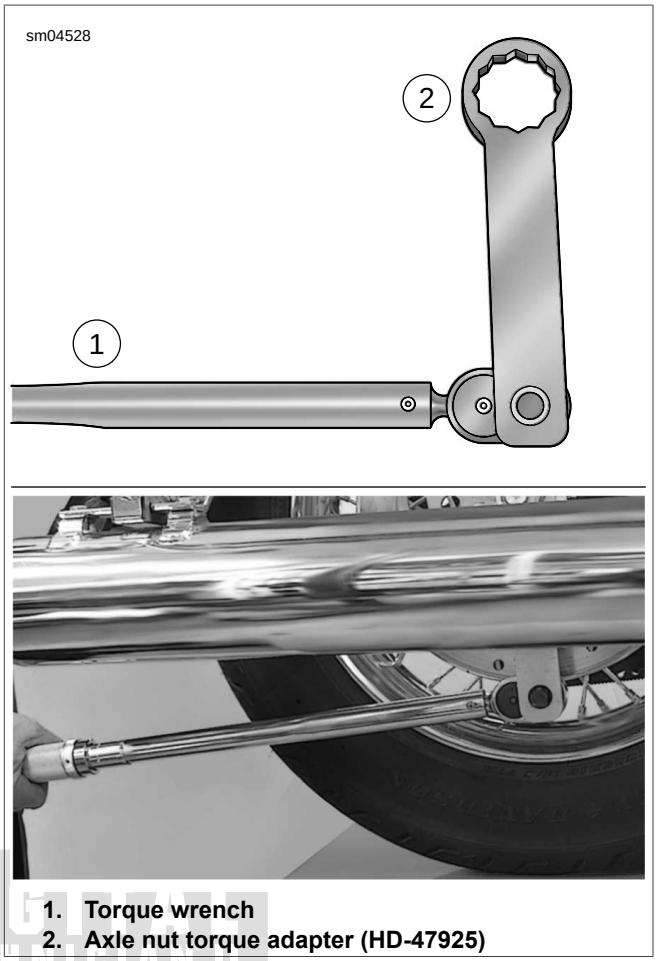
Never bend belt forward into a loop smaller than the drive sprocket diameter. Never bend belt into a reverse loop. Over bending can damage belt resulting in premature failure, which could cause loss of control and death or serious injury. (00339a)

4. Seat the caliper bracket on the anchor weldment of the rear fork.
5. Apply a light coat of SILVER GRADE ANTI-SEIZE (Part No. 98960-97) to axle, bearing bores and bore of spacer sleeve.
6. Slide axle through left side of rear fork, external spacer (thin), sprocket and into wheel hub.

NOTE

Be sure that grooves on external spacer, or index pin on rear wheel speed sensor (if ABS equipped), are on the outboard side.

7. Push axle through rear wheel speed sensor (if ABS equipped) or external spacer (thick), caliper bracket, and right side of rear fork.
8. Rotate axle so that the flat on the threaded end is topside. With the cam forward, install adjuster cam on the end of the axle.
9. Apply a light coat of SILVER GRADE ANTI-SEIZE (Part No. 98960-97) to the inboard side of the cone nut avoiding contact with threads. Install cone nut on axle. Finger tighten only.



1. **Torque wrench**
2. **Axle nut torque adapter (HD-47925)**

Figure 2-6. Install Tool Perpendicular to Torque Wrench

10. **ABS equipped:** route sensor cable forward and outboard of caliper bracket. Continue forward following the top of the rear fork. Rotate rear wheel speed sensor in a counter-clockwise direction until index pin makes contact with caliper bracket at point shown in Figure 2-7.
11. Tighten the cone nut to a preliminary torque of 15-20 ft-lbs (20-27 Nm). The final torque will be done during the belt adjustment procedure.
12. Install the brake caliper and tighten screws to 43-48 ft-lbs (58.3-65.1 Nm).
13. Secure rear wheel speed sensor cable to the brake hose with the conduit clip located approximately 1.25 in. (31.8 mm) in front of the brake hose crimp.
14. Adjust drive belt using BELT TENSION GAUGE (Part No. HD-35381A). See 1.12 DRIVE BELT AND SPROCKETS.
15. Install a **new** E-clip with the flat side out in groove on right side of axle.
16. On models equipped with low profile shock absorbers, install the left side lower saddlebag support rail. See 2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail.

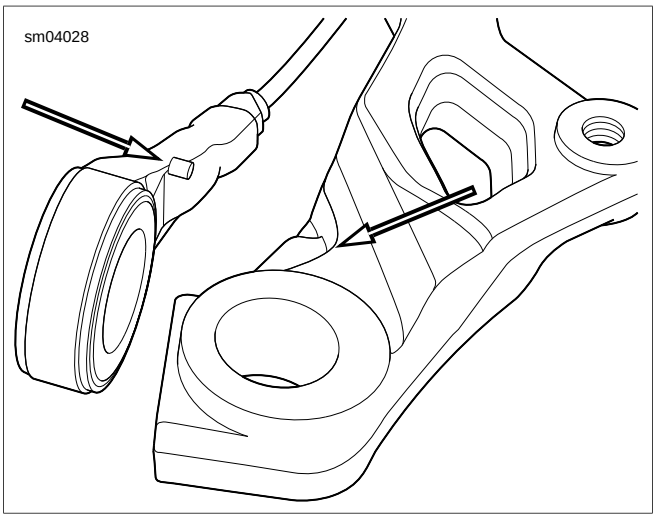


Figure 2-7. Rear Wheel Speed Sensor Index Pin (ABS Equipped)

17. Install the left side muffler. See 4.19 EXHAUST SYSTEM.

WARNING

After servicing brakes and before moving motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00279a)

18. Operate the rear brake pedal several times to set brake pads to the proper operating position.
19. Install saddlebags. See 2.26 SADDLEBAGS.

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REAR WHEEL COMPENSATOR 2.6

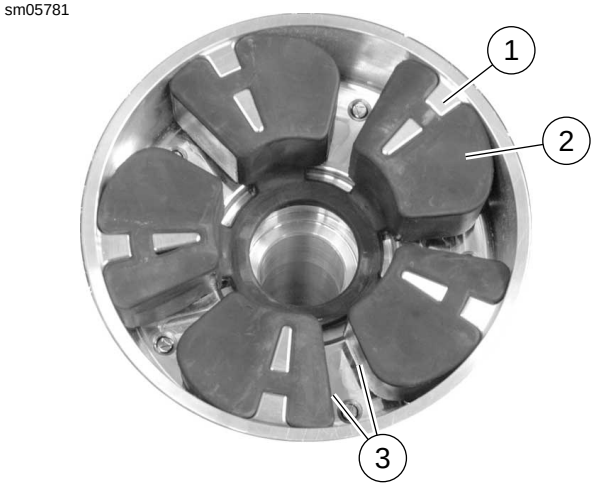
ISOLATOR REPLACEMENT

Removal

1. Remove rear wheel. See 2.5 REAR WHEEL.
2. Pull sprocket from wheel.
3. Remove isolator from wheel.

Installation

1. See Figure 2-8. Lubricate each segment (2) of **new** isolator with 50/50 mix of isopropyl alcohol and water. Do not use a petroleum based lubricant.
2. Push isolator into wheel. Verify that each isolator segment bottoms in bowl area of wheel and that each segment is flush against side walls of rib (1).
3. Using a 50/50 mix of isopropyl alcohol and water, lubricate sides of each isolator segment sprocket lug gaps (3).
4. Aligning lugs on sprocket with gaps between isolator segments, push sprocket onto wheel.
5. Install rear wheel. See 2.5 REAR WHEEL.



1. **Rib**
2. **Isolator segment**
3. **Sprocket lug gap**

Figure 2-8. Install Isolator in Wheel

SPROCKET BEARING REPLACEMENT

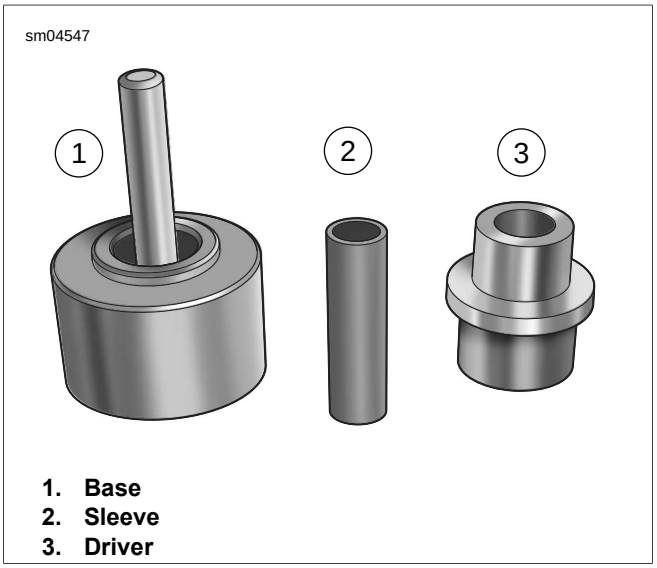
PART NUMBER	TOOL NAME
HD-48921	REAR WHEEL COMPENSATOR SPROCKET BEARING REMOVER/INSTALLER

Removal

1. Remove the rear wheel. See 2.5 REAR WHEEL.
2. Pull the sprocket from the wheel.
3. See Figure 2-9 and upper frame of Figure 2-10. Support the base (1) of REAR WHEEL COMPENSATOR SPROCKET BEARING REMOVER/INSTALLER (Part No. HD-48921) on a press with the large OD topside and the long pin (3) down.
4. Slide sleeve (2) over the short pin.
5. See lower frame of Figure 2-10. With the inboard side facing up, slide the sprocket over the sleeve until it rests on the base.
6. Slide the small OD of driver (6) over the sleeve until it contacts spacer (5).
7. Apply pressure to the driver until bearings drop into base. Disassemble the tool and discard the bearings.

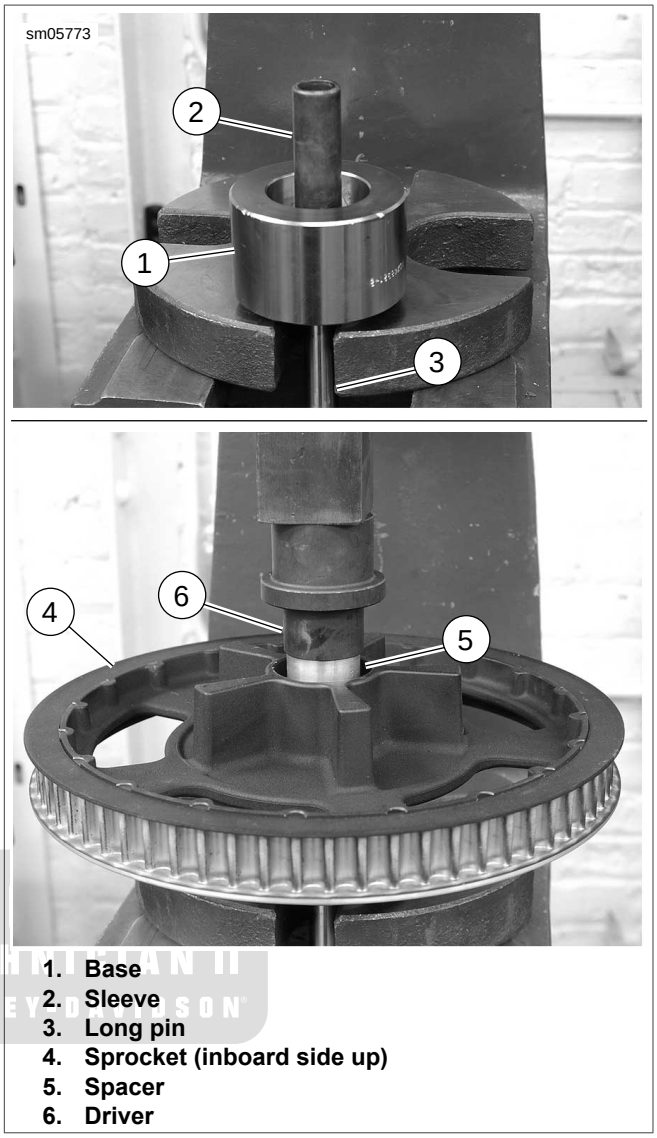
Installation

1. See upper frame of Figure 2-10. Support the base (1) of REAR WHEEL COMPENSATOR SPROCKET BEARING REMOVER/INSTALLER (Part No. HD-48921) on the deck of an arbor press with the large OD topside and long pin (3) down.
2. Slide sleeve (2) over the short pin.
3. Verify that the sprocket bearing bore is clean and dry.
4. See upper frame of Figure 2-11. With the outboard side facing up, slide the sprocket over the sleeve until it rests on the base.
5. Place spacer (1) in the sprocket with the small diameter facing down.
6. Set bearing in place.
7. See lower frame of Figure 2-11. Center the large OD of driver (3) on the bearing. Verify the driver contacts the outer bearing race (4) all the way around.
8. Apply pressure to the driver until the bearing makes firm contact with the counterbore in the sprocket.
9. Repeat with the second bearing.
10. Using a 50/50 mix of isopropyl alcohol and water, lubricate the sides of each isolator segment where contact occurs with the sprocket lugs.
11. Install the sprocket onto wheel.
12. Install rear wheel. See 2.5 REAR WHEEL.



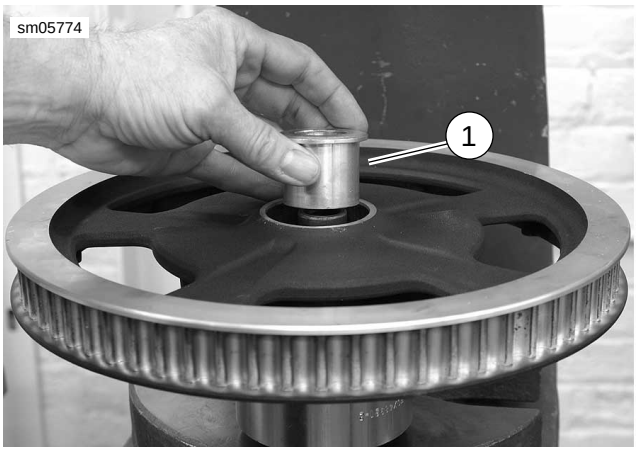
1. Base
2. Sleeve
3. Driver

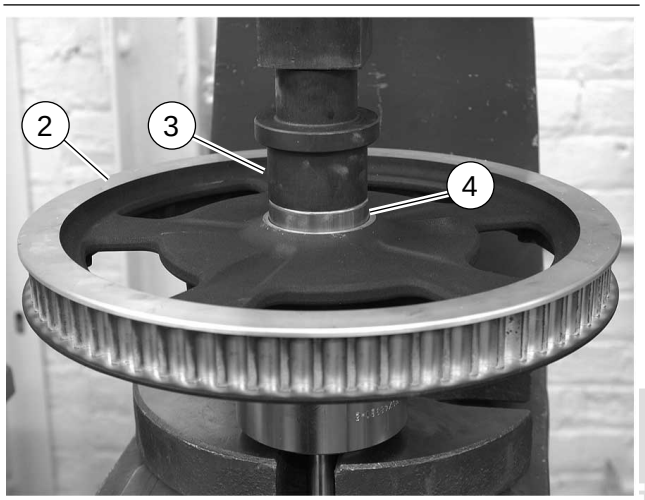
Figure 2-9. Rear Wheel Compensator Bearing Remover/Installer (HD-48921)



1. Base
2. Sleeve
3. Long pin
4. Sprocket (inboard side up)
5. Spacer
6. Driver

Figure 2-10. Remove Compensator Sprocket Bearing





1. Spacer
2. Sprocket (outboard side up)
3. Driver
4. Bearing outer race

Figure 2-11. Install Compensator Sprocket Bearing

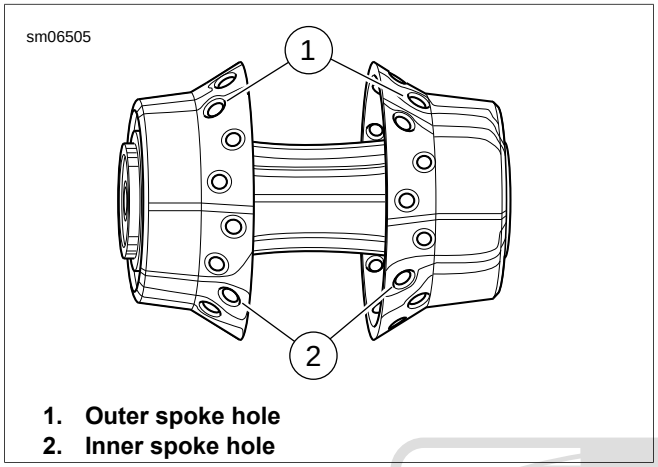
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WHEEL LACING: FRONT RIM 2.7

WHEEL LACING: ANGLE FLANGE HUB

NOTES

- *See Figure 2-12. The following procedure is valid for 40-spoke wheels that use an angle flange hub regardless of rim style or diameter.*
- *The primary brake side of the hub can be identified as having one or two grooves cut into the disc mounting surface.*



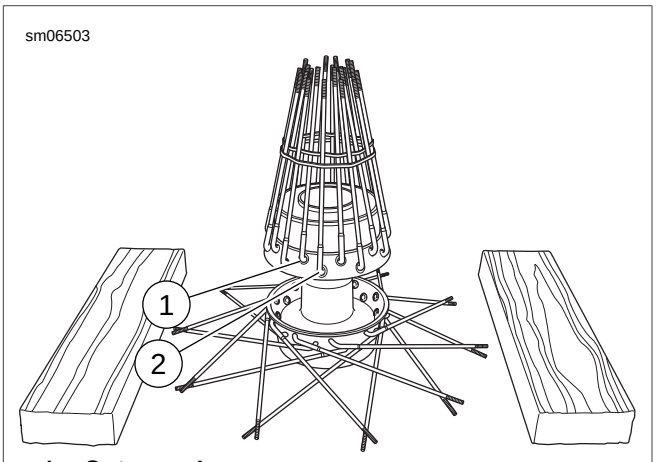
1. **Outer spoke hole**
2. **Inner spoke hole**

Figure 2-12. Angle Flange Hub

1. Place hub on workbench:
   a. Front: primary brake side up.
   b. Rear: brake side down.
2. Lubricate all spoke threads and nipple shoulders with tire mounting lubricant.
3. Install all spokes in the lower flange.
4. See Figure 2-13. Flip hub over. Gather all outer spokes and hold upright with a rubber band. Repeat with the inner spokes using a second rubber band.
5. Install spokes in remaining flange.
6. Rotate the lower flange spokes as far as they will go:
   a. Outer spokes clockwise.
   b. Inner spokes counterclockwise.
7. Center the rim over the hub and spokes assembly and support on wooden blocks approximately 1.5 in (38.1 mm) thick.
   a. If valve is not located in the center of the rim, place valve hole facing up.
   b. 19 in. and 21 in. with the valve located in the center of the rim can be placed either side up.

NOTE

Install nipples until approximately 1/8 in (3.2 mm) of spoke thread shows.



1. **Outer spoke**
2. **Inner spoke**

Figure 2-13. Spokes Gathered

8. Install lower flange outer spokes and loosely install spoke nipples:
   - See Figure 2-14. Rim with side valve hole: start at the valve stem hole (1).
   - See Figure 2-15. Rim with center valve hole: start at the first hole counterclockwise (1) from valve stem hole.
9. Install remaining outer spokes in every 4th hole.
10. Install lower flange inner spokes and loosely install spoke nipples:
    a. Starting at the 2nd hole counterclockwise (2) from first spoke installed, install inner spoke.
    b. Install remaining inner spokes in every 4th hole.
11. Carefully release upper flange inner spokes and fan out around rim, rotating them clockwise.
12. Starting at the first hole counterclockwise (3) from first spoke installed, install inner spoke. Install all remaining inner spokes in every 4th hole.
13. Carefully release upper flange outer spokes and fan out around rim, rotating them counterclockwise.
14. Install outer spokes in remaining holes (4).
15. Verify spoke heads are seated. Evenly hand-tighten spoke nipples until snug. Only tighten until slack is removed. Proper torque will be applied when the wheel is trued. Adjust offset and true the wheel. See 2.9 CHECKING AND TRUING WHEELS.

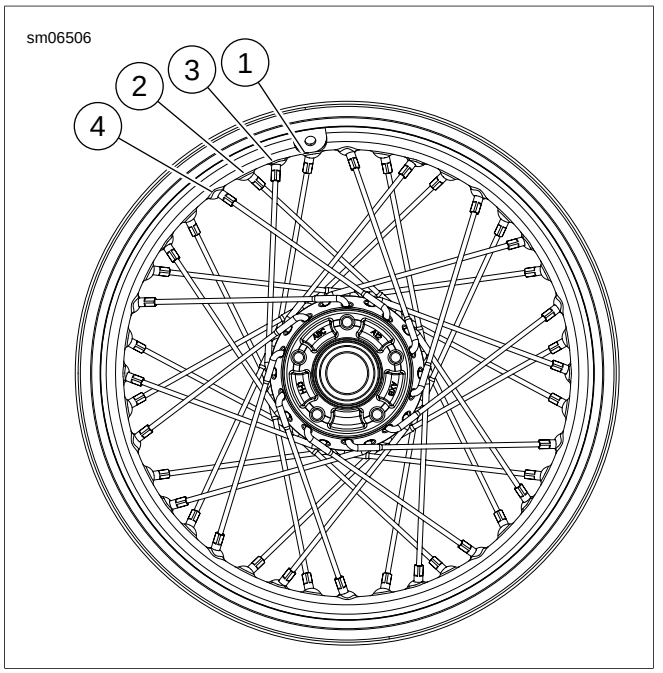


Figure 2-14. Side Valve Rim

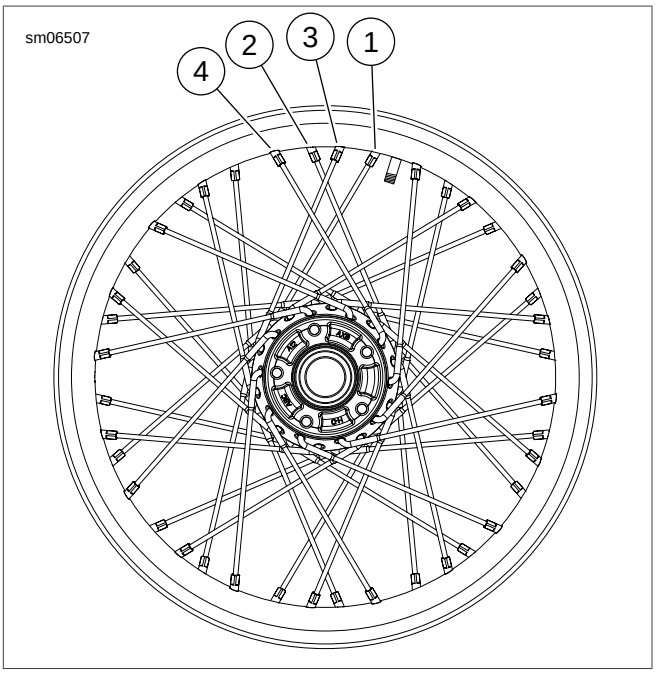


Figure 2-15. Center Valve Rim

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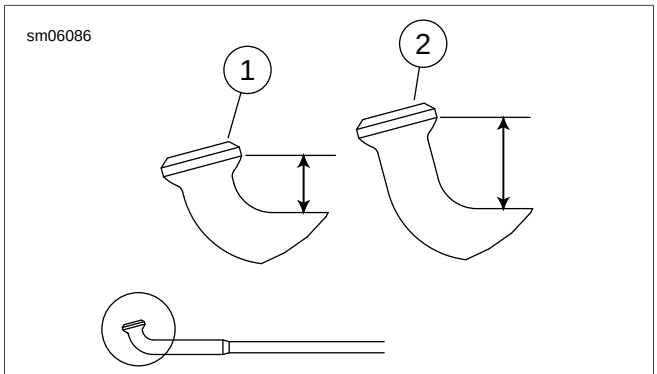
WHEEL LACING: 16 INCH REAR RIM 2.8

WHEEL LACING: 16 IN. REAR WHEEL

1. See Figure 2-16. Divide spokes into two groups.
   a. Outer spokes (short heads) (1).
   b. Inner spokes (long heads) (2).

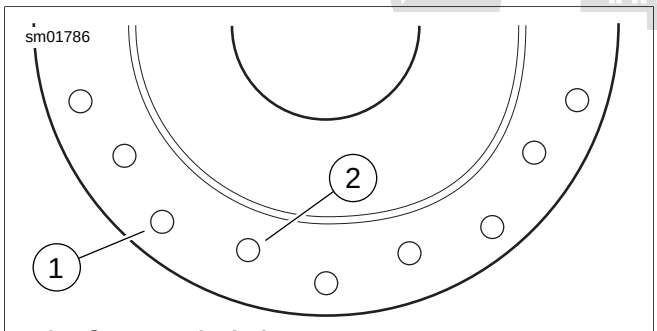
NOTE

See Figure 2-17. The spoke holes in the wheel hub are staggered, alternating between inner holes (2) (nearer hub center) and outer holes (1) (nearer hub edge).



1. **Short head (outer spoke)**
2. **Long head (inner spoke)**

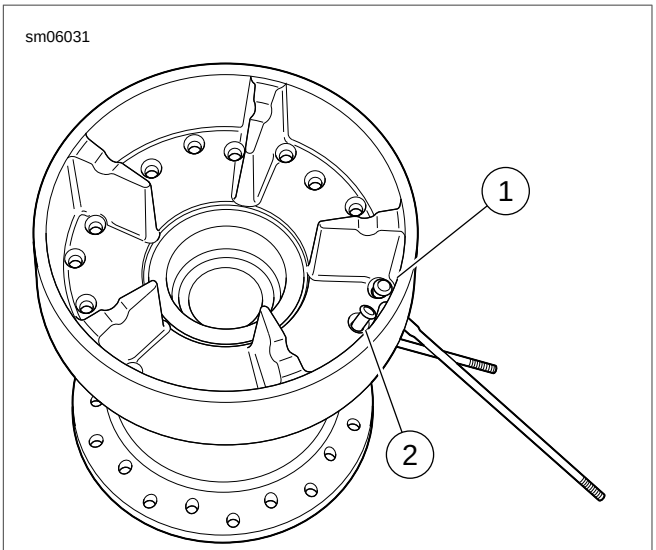
Figure 2-16. Spoke Heads



1. **Outer spoke hole**
2. **Inner spoke hole**

Figure 2-17. Spoke Hole Pattern

2. Lubricate all spoke threads and nipple shoulders with tire mounting lubricant.
3. See Figure 2-18. Place hub on bench with the brake disc side down. Insert outer spokes (1) (short-head) into the outer holes and inner spokes (2) (long-head) in the inner holes.
4. See Figure 2-19. After spokes are installed, flip wheel hub over. Swing outer spokes counterclockwise and inner spokes clockwise as shown. Each inner spoke should cross four outer spokes, and each outer spoke should cross four inner spokes.
5. Install all outer spokes, then all inner spokes on brake-side flange. Swing inner spokes counterclockwise and outer spokes clockwise on brake-side flange, each crossing four of the opposite type.



1. **Outer spoke (short head)**
2. **Inner spoke (long head)**

Figure 2-18. Lacing Wheel Hub

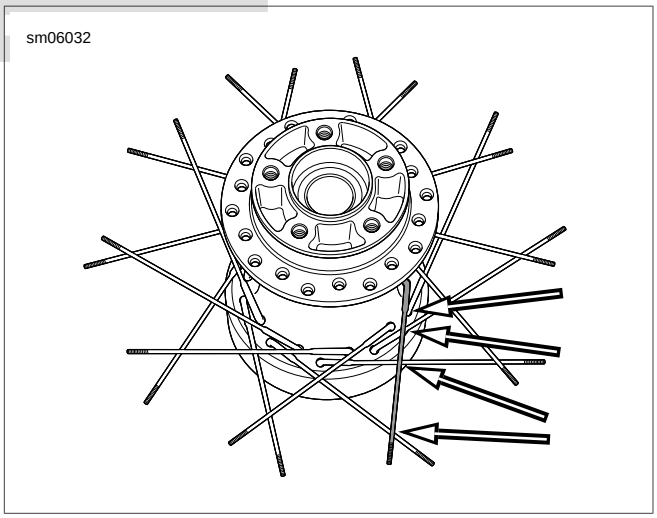


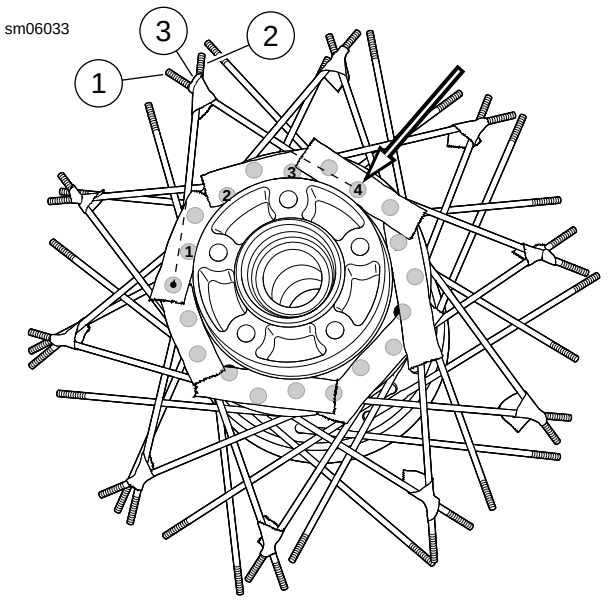
Figure 2-19. Arrange Spokes

NOTE

See Figure 2-20. Tape placed across brake disc flange and spoke heads will hold spokes up away from lower row of spokes, making it easier to gather upper spokes.

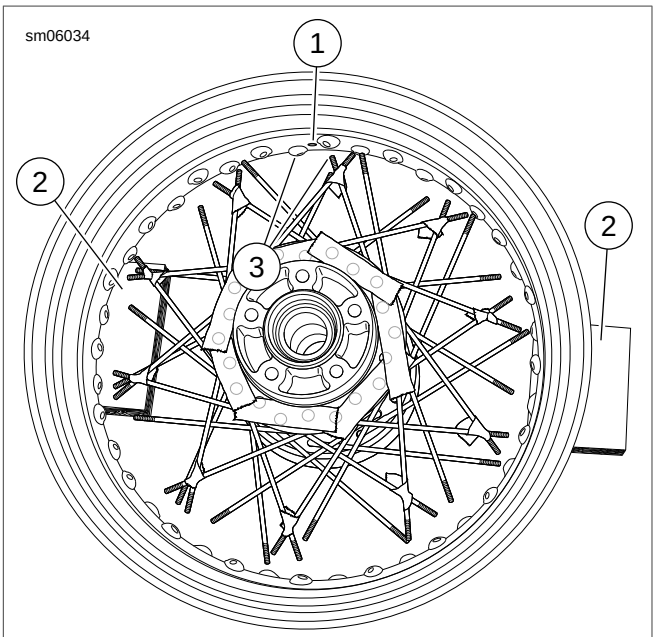
6. See Figure 2-20. Group upper spokes (brake-side) into bundles of two as shown. Join an outer spoke (1) with the inner spoke (2) that is located four places clockwise and

secure with tape (3) approximately 1 in. (25 mm) from threaded end.



1. **Outer spoke (short head)**
2. **Inner spoke (long head)**
3. **Tape**

Figure 2-20. Bundling Spokes



1. **Valve stem location**
2. **Wooden blocks**
3. **Beginning spoke location**

Figure 2-21. Place Rim

7. Make sure all spokes on compensator-side flange are still arranged properly and pointing in the correct direction:
   a. All outer spokes (short-head) point counterclockwise, crossing four inner spokes.
   b. All inner spokes (long-head) point clockwise, crossing four outer spokes (short-head).
   c. Angle all spokes as far as they will go without overlapping the next LIKE spoke.

NOTES

- *Verify all inner spokes lay inboard and outer spokes lay outboard.*
- *See Figure 2-21. The valve stem hole location (1) is centered on the rim so rim orientation is not important.*

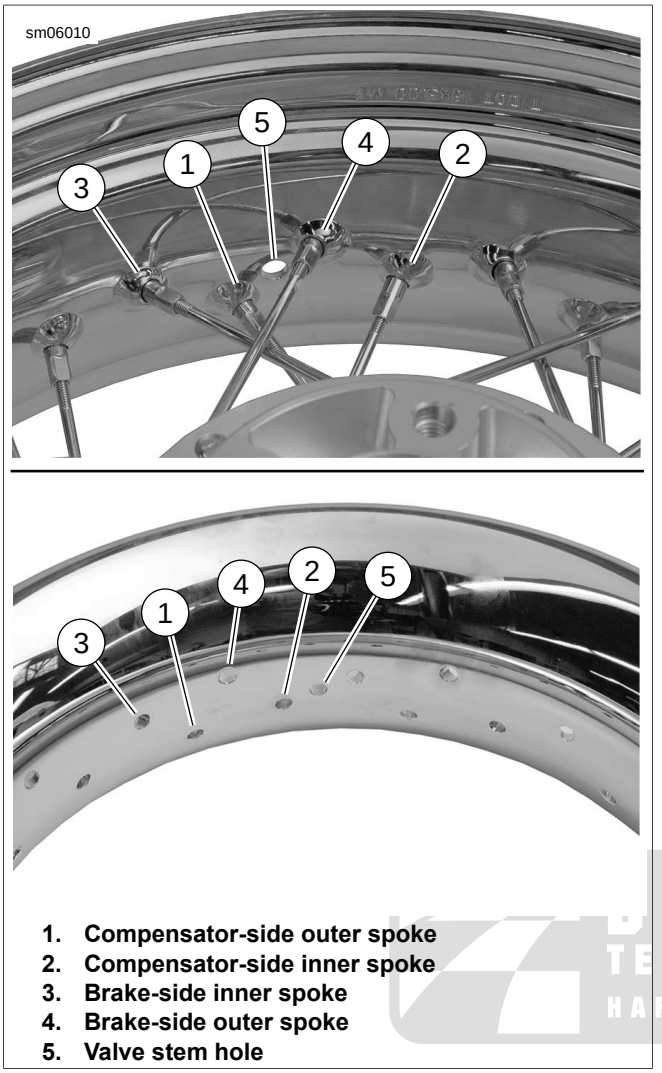
8. See Figure 2-21. Center the rim over the hub/spoke assembly and support on wooden blocks (2) approximately 1.5 in (38.1 mm) thick. Rotate so valve stem hole (1) is near a pair of taped spokes.

NOTE

See Figure 2-22. It is recommended that the first spoke be installed near the valve stem hole (5). Place spoke nipples through several rim holes to determine the hole direction. Only one spoke will fit into the spoke nipple correctly. When connecting the spoke to the spoke nipple, finger tighten two to three threads.

9. See Figure 2-22. Begin with the outer spokes (short-head) of the lower (compensator) flange. Using the spoke alignment method discussed previously, locate a spoke hole (1) just left of the valve stem hole (5) that points toward an outer spoke.
   a. Secure spoke to nipple. Skip three rim holes and repeat with the next outer spoke. Follow pattern to complete lower (compensator) flange outer spokes (short-head).
   b. Once completed, check for three empty holes between each spoke.

10. Install the lower (compensator) flange inner spokes (long-head) next. Choose a beginning spoke (2) near the valve stem hole (5).
    a. Each inner spoke (long-head) points clockwise and crosses four outer spokes (short-head).
    b. Secure spoke to nipple. Complete installing lower flange inner spokes (long-head).



1. **Compensator-side outer spoke**
2. **Compensator-side inner spoke**
3. **Brake-side inner spoke**
4. **Brake-side outer spoke**
5. **Valve stem hole**

Figure 2-22. Begin Lacing

NOTE

Use care not to move outer spokes (short-head) under inner spokes (long-head) when removing the tape or they will become trapped underneath the inner row of spokes.

11. See Figure 2-21. Remove tape from each upper bundle and fan the spokes out toward the rim.

NOTE

All upper flange inner spokes (long-head) should point counter-clockwise and outer spokes (long-head) clockwise.

12. See Figure 2-22. Choose a beginning spoke near the valve stem hole (5). Start with a top flange inner spoke (3) (long-head) first.
    a. Secure spoke to nipple. Follow pattern to complete upper (brake-side) flange inner spokes (long-head).
    b. Once completed, check for one empty hole after every third spoke.
13. Install upper flange outer spoke (4) (short-head).
14. Secure spoke to nipple. Complete upper flange outer spokes (short-head).

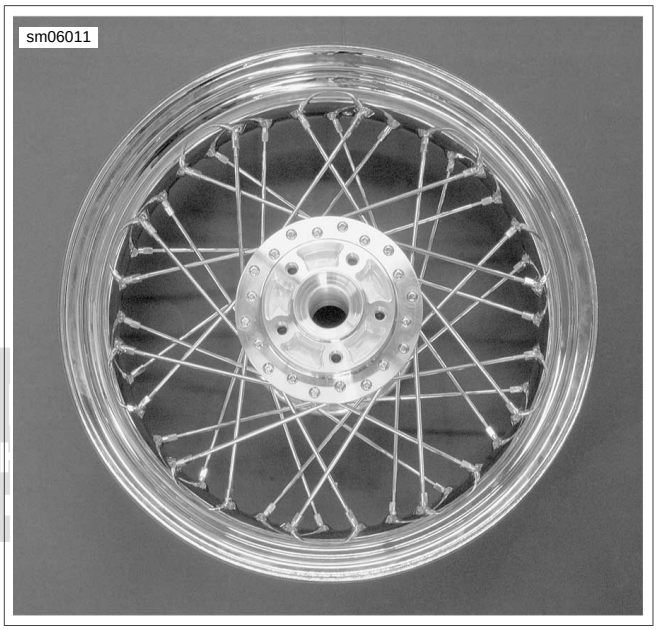


Figure 2-23. Completed 16 Inch Rear Wheel

15. Verify that completed wheel resembles Figure 2-23.
16. Verify spoke heads are seated. Evenly hand-tighten spoke nipples until snug. Only tighten until slack is removed. Proper torque will be applied when the wheel is trued. Adjust offset and true the wheel. See 2.9 CHECKING AND TRUING WHEELS.

CHECKING AND TRUING WHEELS 2.9

GENERAL

Wheels should be checked for lateral and radial runout before installing a **new** tire or tube. Checking cast or laced wheels is performed using the same procedure.

Laced wheels having excess runout can be trued however, cast wheels must be replaced. Never attempt to straighten cast wheels.

Always check condition of the wheel bearings before checking or adjusting wheel runout. See 1.8 TIRES AND WHEELS, Wheel Bearings.

CHECKING WHEEL RUNOUT

PART NUMBER	TOOL NAME
HD-99500-80	WHEEL TRUING AND BALANCING STAND

Checking Lateral Runout

See Figure 2-24. Mount wheel in WHEEL TRUING AND BALANCING STAND (Part No. HD-99500-80).

NOTE

To more accurately measure runout, use a dial indicator in place of the gauge rod.

To check lateral runout, place a gauge rod near, or dial indicator on the rim bead flange and measure distance at several locations. Lateral runout must not exceed 0.030 in (0.76 mm).

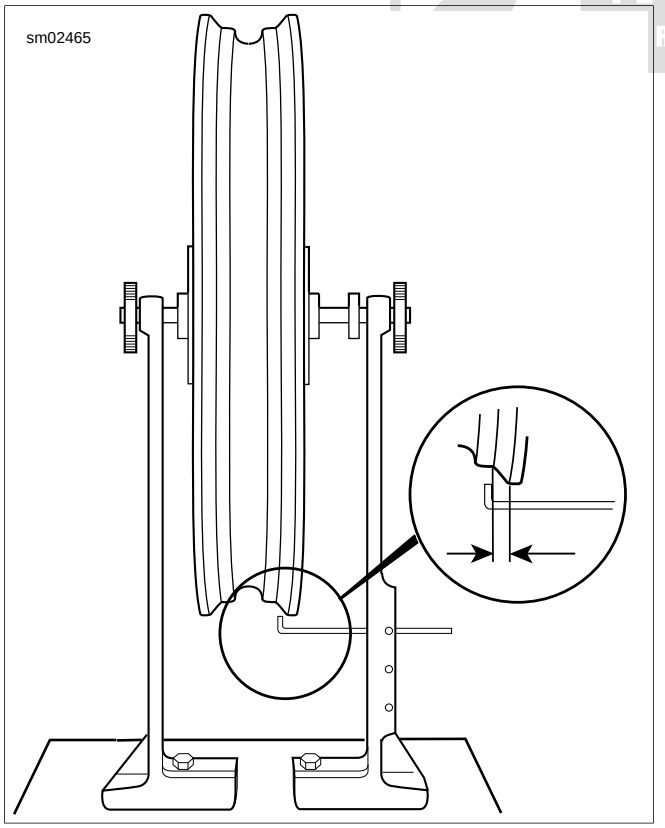
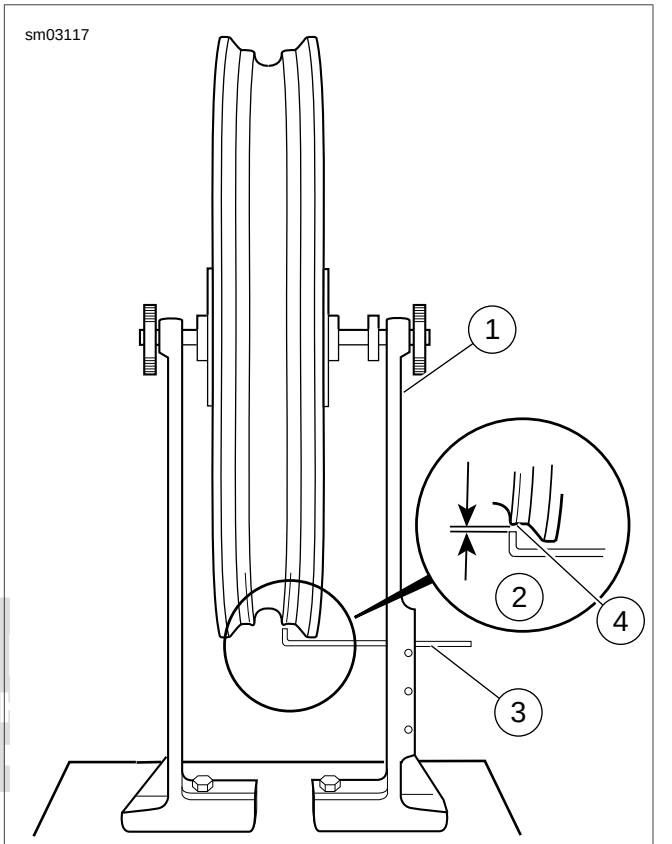


Figure 2-24. Checking Lateral Runout

Checking Radial Runout

See Figure 2-25. Adjust truing stand gauge to the rim's tire bead safety hump. Rotate wheel and measure distance at several locations. Runout must not exceed 0.030 in (0.76 mm).



1. **Wheel truing and balancing stand**
2. **Radial runout**
3. **Gauge rod**
4. **Bead safety hump**

Figure 2-25. Checking Radial Runout

If either measurement is not within specification:

- Cast wheel: Replace the wheel.
- Laced wheel: Adjust spokes to true the wheel. See steps in this section.

LACED WHEEL RIM OFFSET

PART NUMBER	TOOL NAME
HD-94681-80	SPOKE WRENCH
HD-99500-80	WHEEL TRUING STAND

1. See Figure 2-26. Place a piece of tape to mark the center of each group of four spokes as shown. The groups should be directly opposite one another and approximately 90 degrees apart. Using different colors of tape or numbering each group is helpful.

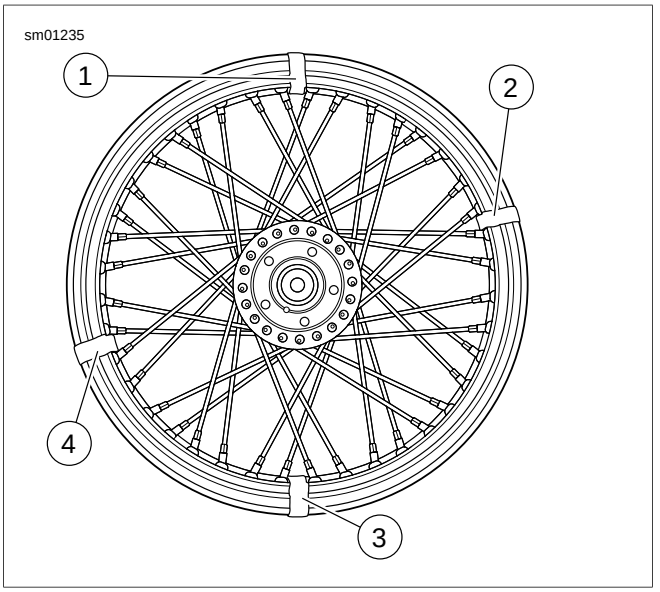


Figure 2-26. Marking Spoke Groups

2. See Figure 2-27. Mount wheel in WHEEL TRUING STAND (Part No. HD-99500-80) using truing arbor. Tighten arbor nuts so hub will turn on its bearings.

NOTE

The primary brake disc side of the hub can be identified by having one or two grooves cut into the disc mounting surface.

3. Lay a straightedge across the primary brake disc mounting surface of hub and one of the marked spoke groups.
4. See Figure 2-28. Measure the distance from the straightedge to the location shown, based on rim design, to determine distance A. Refer to Table 2-12.

NOTES

- *Always loosen the appropriate spokes before tightening the other two. Reversing this procedure will cause the rim to become out-of-round.*
- *Tighten or loosen spokes one flat at a time and recheck measurement.*
- *Always work on groups that are opposite each other to maintain radial runout.*

5. If the dimension is not correct, adjust the four spokes using SPOKE WRENCH (Part No. HD-94681-80). For example, If the measurement on the rim **right** side is **less** than it should be, **loosen** the two spokes attached to the hub **right** side and **tighten** the two spokes attached to the hub **left** side. Turn all four spokes an equal number of turns until offset dimension is correct.
6. Repeat the previous step for all groups on the wheel.
7. Once offset is verified, proceed to 2.9 CHECKING AND TRUING WHEELS, Truing Laced Wheels.

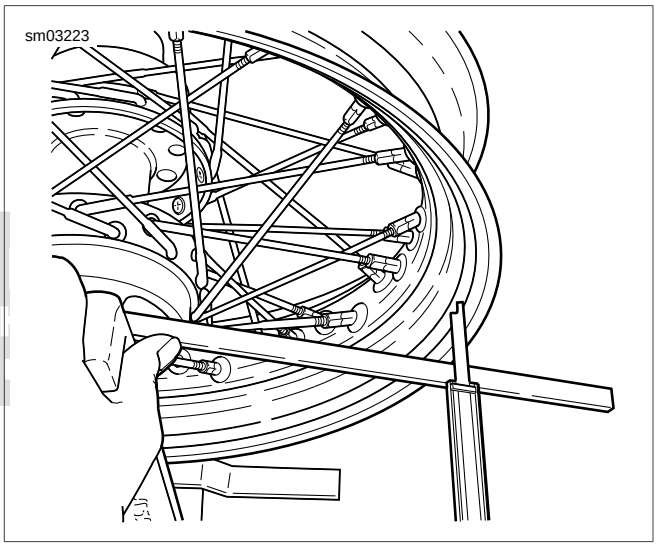
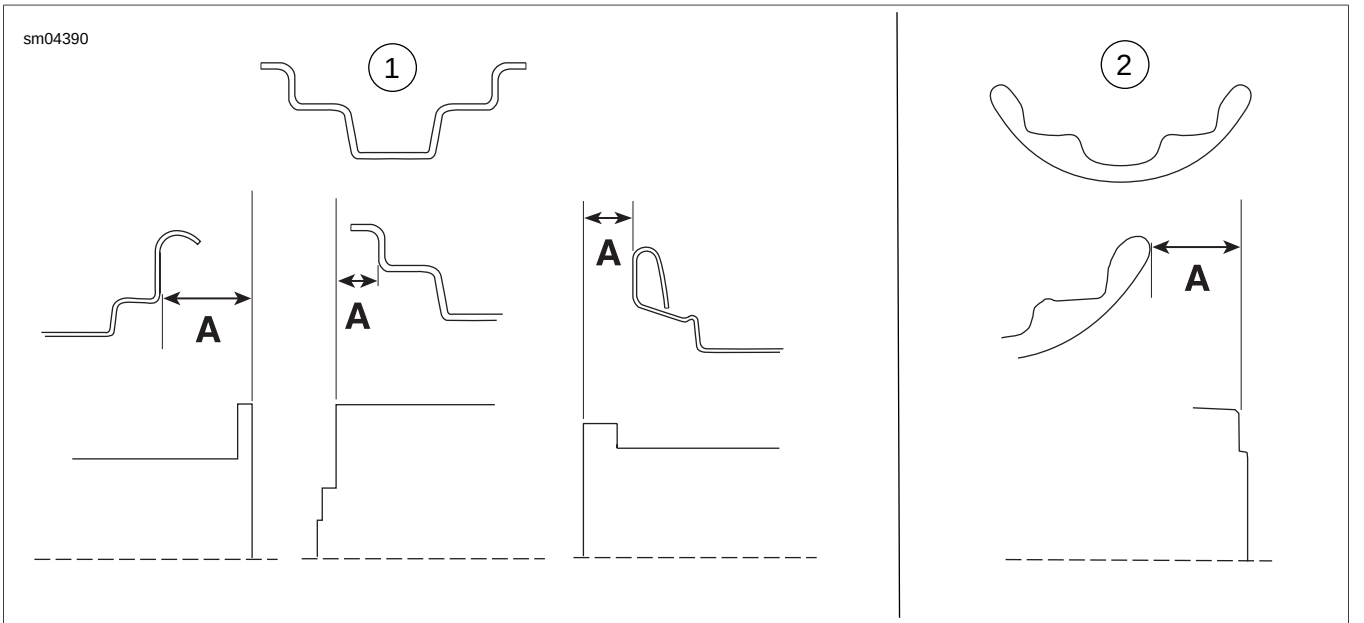


Figure 2-27. Checking Wheel Hub Offset Dimension (typical)

Table 2-12. Offset Dimensions

Rim Type	Rim Size	OFFSET (A)	
		IN.	MM.
Steel Laced (1)			
Front	16 x 3	1.551-1.571	39.4-39.9
Rear	16 x 5	1.098-1.118	27.9-28.4
Chrome Aluminum Laced Profile (2)			
Front	16 x 3	1.267-1.287	32.19-32.69
Front	17 x 3	1.267-1.287	32.19-32.69
Rear	16 x 5	0.831-0.850	21.1-21.6



1. **Steel rim**
2. **Chrome aluminum profile rim**

Figure 2-28. Laced Wheel Hub Offset Dimensions

TRUING LACED WHEELS

PART NUMBER	TOOL NAME
94681-80	SPOKE NIPPLE WRENCH
HD-48985	SPOKE TORQUE WRENCH
HD-99500-80	WHEEL TRUING STAND

NOTES

- *To more accurately measure runout, a dial indicator can be used in place of the gauge rod.*
- *Radial truing should be performed before lateral truing.*

Radial Runout

1. See Figure 2-29. With the wheel mounted in WHEEL TRUING STAND (Part No. HD-99500-80), adjust the truing stand gauge (3) near to the rim's tire bead safety hump (4). If using a dial indicator, place the tip on the safety bead hump.
2. If working with a straight flange hub, seat each spoke head in the hub flange using a flat nose punch and mallet.

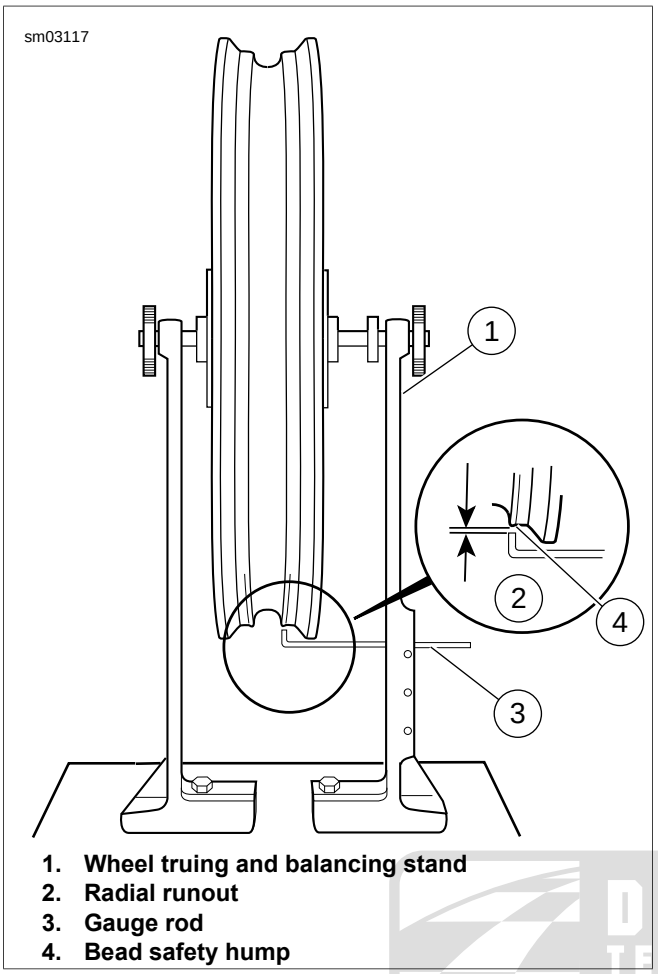
NOTES

- *Always loosen the appropriate spokes, using SPOKE NIPPLE WRENCH (Part No. 94681-80), before tightening the other two. Reversing this procedure will cause the rim to become out-of-round.*
- *Tighten or loosen spoke, one flat at a time, and recheck measurement. Small changes in the spokes can make large changes in the runout.*
- *Always work on groups that are opposite each other to maintain radial runout.*

3. Spin the rim slowly and check distance (2). The rim should be true within 0.030 in (0.76 mm).
   a. If the rim contacts the gauge on or near a marked group of spokes, loosen the spokes in the group on the opposite side of the rim. Then tighten the spokes in the group where the rim makes contact an equal number of turns.
   b. If the rim contacts the gauge between two marked groups, loosen the spokes in both groups on the opposite side of the rim. Then tighten the spoke groups on the side of the rim that makes contact an equal number of turns.
4. When the wheel is centered and trued, start at the valve stem hole and tighten any loose spoke nipples one turn at a time until they are snug.
5. Working alternately across the wheel, use SPOKE TORQUE WRENCH (Part No. HD-48985) evenly tighten all spokes to specification listed in Table 2-13.
6. If working with a straight flange hub, verify each spoke head is seated in the hub flange using a flat nose punch and mallet.
7. Verify radial runout is still within specification.
8. After you have verified that radial runout is still within specification, proceed to lateral runout.

⚠WARNING

Spokes that are too tight can draw nipples through the rim or distort hub flanges. Spokes that are too loose can continue to loosen when put in service. Either condition can adversely affect stability and handling, which could result in death or serious injury. (00286a)



1. **Wheel truing and balancing stand**
2. **Radial runout**
3. **Gauge rod**
4. **Bead safety hump**

Figure 2-29. Checking Radial Runout

Table 2-13. Spoke Nipple Torque Specification

RIM TYPE	MINIMUM TORQUE
All	55 **in-lbs** (6.2 Nm)

Lateral Runout

NOTE

To more accurately measure runout, a dial indicator can be used in place of the gauge rod.

1. See Figure 2-30. With the wheel mounted in WHEEL TRUING STAND (Part No. HD-99500-80), adjust the gauge rod (3) near the rim bead flange.
2. Rotate the rim slowly and check lateral runout (2). If runout exceeds 0.030 in (0.76 mm), adjust spokes as follows.

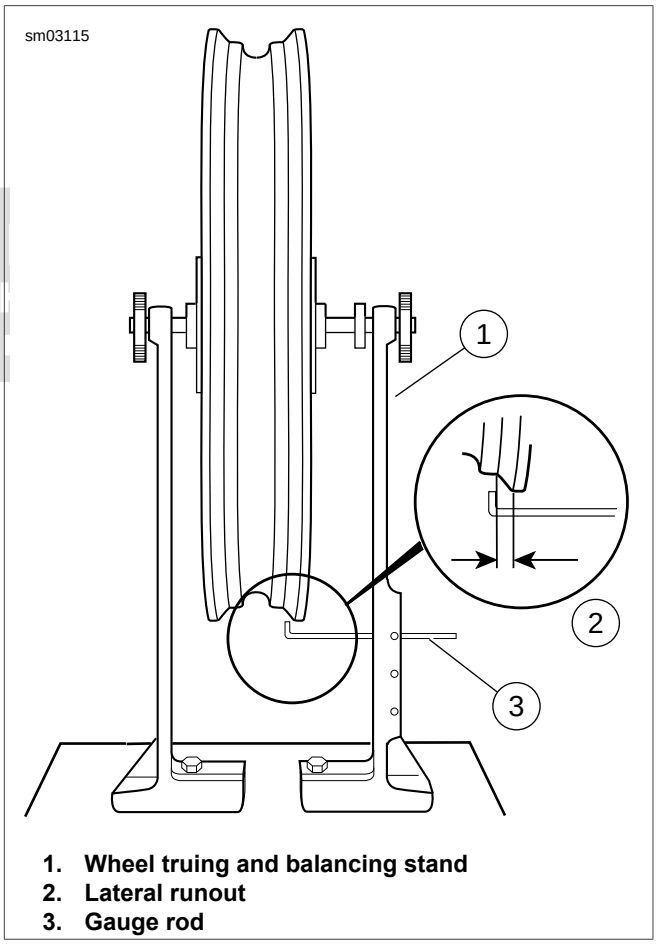
NOTES

- *Always loosen the appropriate spokes before tightening the other two. Reversing this procedure will cause the rim to become out-of-round.*
- *Tighten or loosen spoke, one flat at a time, and recheck measurement. Small changes in the spokes can make large changes in the runout.*

3. Again working in groups of four, loosen two spokes on the tight side and tighten the two spokes on the loose side.
4. Repeat with each group until wheel is within specification.
5. Verify all spoke nipples are tightened to the specification. Refer to Table 2-13.
6. If the tire is removed from the rim, file or grind off ends of spokes that protrude through the nipples to prevent puncturing tube when tire is mounted.

NOTE

After installation of the front wheel, visually check that it is approximately centered between the fork fender bosses.



1. **Wheel truing and balancing stand**
2. **Lateral runout**
3. **Gauge rod**

Figure 2-30. Checking Lateral Runout

SEALED WHEEL BEARINGS 2.10

INSPECTION

1. Turn the wheel through several rotations.

NOTE

If ABS equipped, keep magnetic base dial indicator as far away from wheel speed sensor and ABS encoder bearing as possible, or damage will occur.

2. Check end play as follows:
   a. See Figure 2-31. Mount a magnetic base dial indicator to the brake disc. Set the indicator contact point on the end of the axle.
   b. Firmly push the wheel to one side and zero the dial indicator gauge.
   c. Firmly pull the wheel back as far as it will go and note the reading of the dial indicator.
   d. Repeat the procedure to verify the reading.
   e. Bearings pass end play inspection if the reading is less than 0.002 in. (0.051 mm).
   f. Replace the bearings if end play exceeds specification, or if there is drag, rough rotation, abnormal noise or anything unusual.

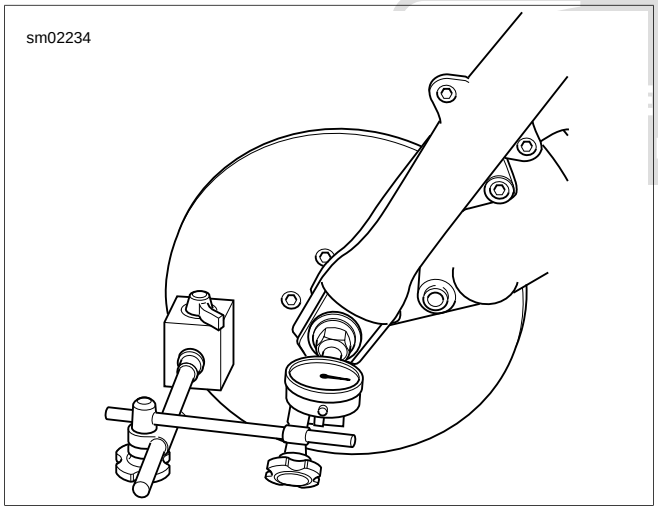
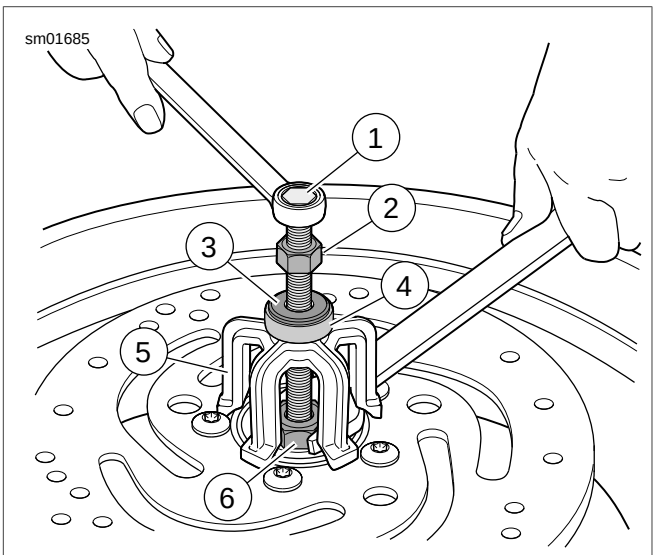


Figure 2-31. Wheel Bearing Inspection (Front Wheel Shown)

REMOVAL

PART NUMBER	TOOL NAME
HD-44060C	WHEEL BEARING REMOVER/INSTALLER

1. Remove wheel. See 2.4 FRONT WHEEL or 2.5 REAR WHEEL.



1. **Forcing screw**
2. **Nut**
3. **Washer**
4. **Bearing**
5. **Bridge**
6. **Collet with ball bearing inside**

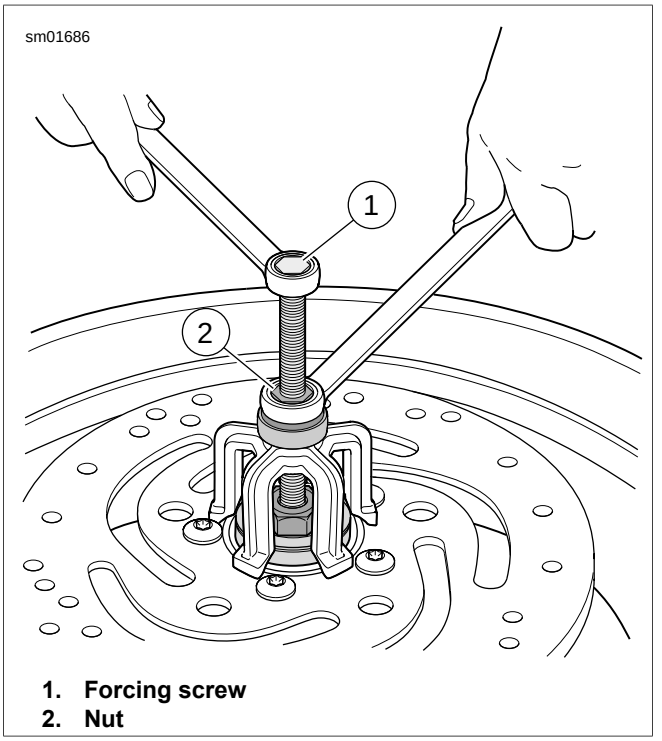
Figure 2-32. Wheel Bearing Removal Tool

2. If servicing rear wheel, remove the sprocket.

NOTES

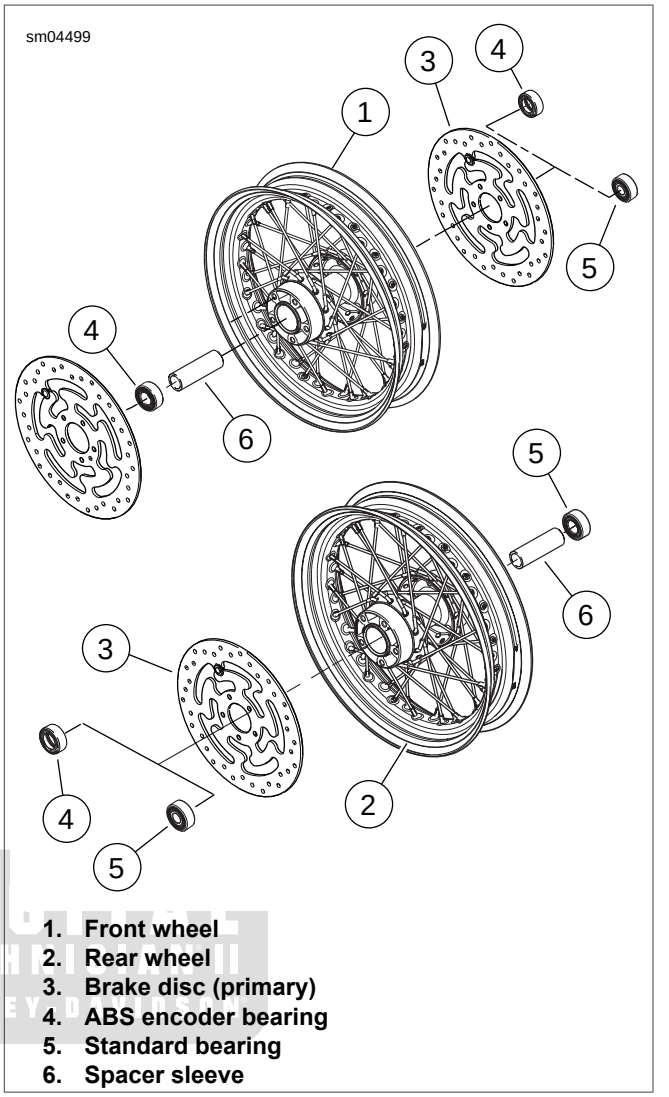
- *On front wheel, remove the primary brake disc side (left) bearing first.*
- *ABS equipped motorcycles use both a special encoder bearing (greenish tan in color) on the primary brake disc side and a standard bearing (black) on the opposite side. Select (Part No. HD-44060-11) if the motorcycle is ABS equipped, or (Part No. HD-44060-10) for non-ABS equipped motorcycles.*

3. See Figure 2-32. Sparingly apply graphite lubricant to threads of forcing screw (1) of WHEEL BEARING REMOVER/INSTALLER (Part No. HD-44060C).
4. Install nut (2), washer (3) and bearing (4) on forcing screw. Insert assembly through hole in bridge (5).
5. Place steel ball inside collet and install collet at end of forcing screw.
6. Insert collet into bearing. Hold forcing screw (1) and turn hex on collet (6) until lip makes firm contact with inside edge of bearing.
7. See Figure 2-33. Turn hex nut (2) until bearing is free. Discard bearing.
8. See Figure 2-34. Remove spacer sleeve (6) from hub.
9. Repeat steps to remove remaining bearing from opposite side of wheel.



1. **Forcing screw**
2. **Nut**

Figure 2-33. Removing Bearing



1. **Front wheel**
2. **Rear wheel**
3. **Brake disc (primary)**
4. **ABS encoder bearing**
5. **Standard bearing**
6. **Spacer sleeve**

Figure 2-34. Wheel Bearing Assemblies

INSTALLATION

PART NUMBER	TOOL NAME
HD-44060C	WHEEL BEARING REMOVER/INSTALLER

NOTES

- *Keep ABS encoder bearings away from magnetic fields (such as magnetic parts trays, magnetic base dial indicators, alternator rotors, etc.) or damage will occur.*
- *Always replace both bearings as a complete set.*

1. See Figure 2-35. Sparingly apply graphite lubricant to threads of threaded rod (1) of WHEEL BEARING REMOVER/INSTALLER (Part No. HD-44060C).

NOTE

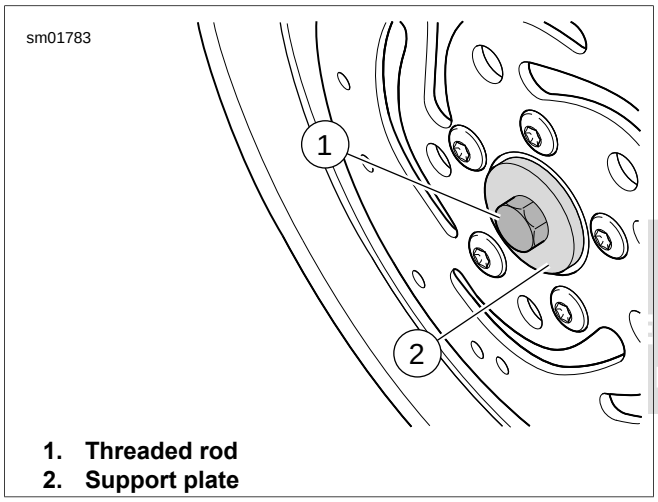
Install the primary brake disc side bearing first. ABS equipped motorcycles use a special encoder bearing (greenish tan in color) on the primary brake disc side and a standard bearing (black) on the opposite side.

2. Install support plate (2) onto rod (1) and slide rod through hub from the side opposite the primary brake side.

NOTE

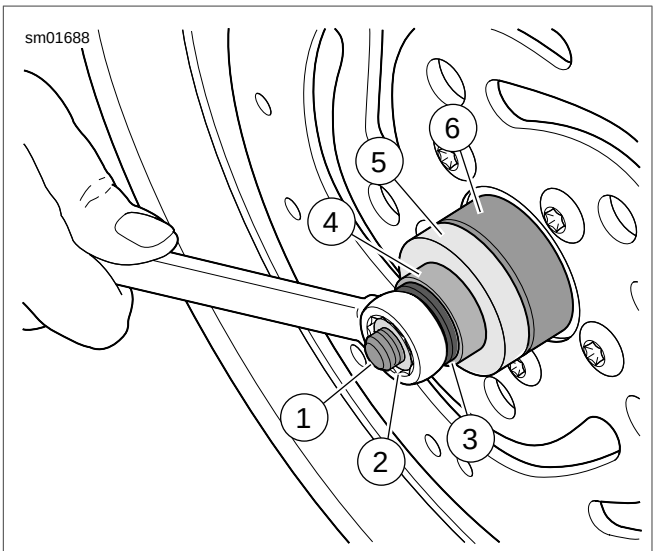
Bearing orientation is important.

3. See Figure 2-36. Place the bearing on the rod.
   a. Standard bearing with the lettered side against installer (5).
   b. ABS bearing with greenish tan side against installer (5).
4. Install 1 inch installer (Part No. HD-44060-8) (5), bearing (4), flat washer (3) and nut (2) onto rod.
5. Hold hex on rod and turn nut (2) until bearing is fully seated.
6. Install spacer sleeve in hub.
7. Reverse tool and install opposite side bearing until bearing contacts spacer sleeve.
8. Install wheel. See 2.4 FRONT WHEEL or 2.5 REAR WHEEL.



1. **Threaded rod**
2. **Support plate**

Figure 2-35. Assembling Installation Tool



1. **Threaded rod**
2. **Nut**
3. **Washer**
4. **Bearing**
5. **Installer**
6. **Wheel bearing**

Figure 2-36. Installing Bearing

IGITAL
CHNICIAN II
RLEY-DAVIDSON

TIRES 2.11

GENERAL

⚠WARNING

Use only Harley-Davidson approved tires. See a Harley-Davidson dealer. Using non-approved tires can adversely affect stability, which could result in death or serious injury. (00024a)

⚠WARNING

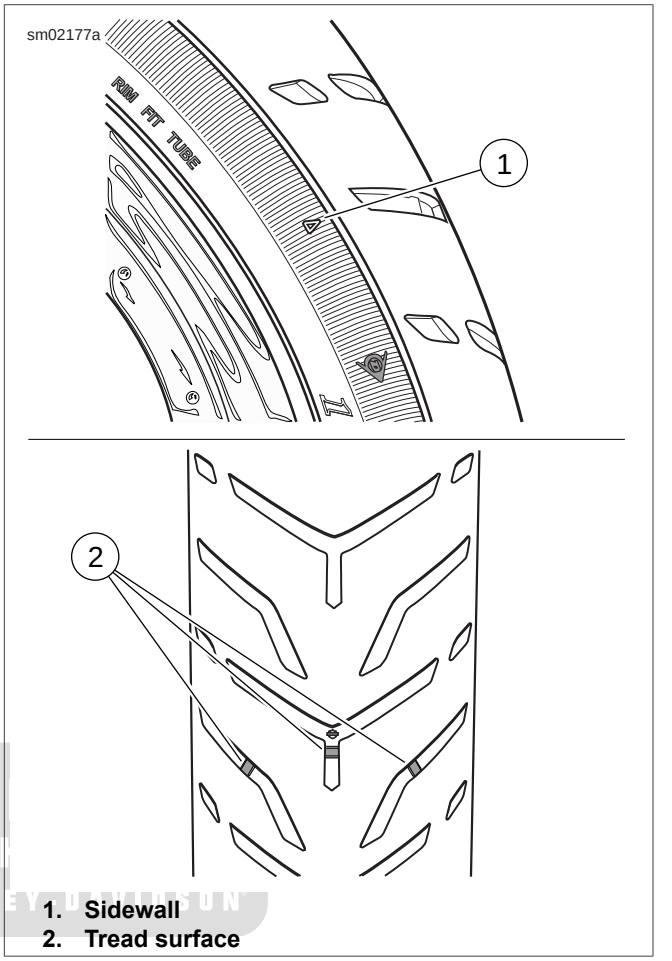
Be sure tires are properly inflated, balanced and have adequate tread. Inspect your tires regularly and see a Harley-Davidson dealer for replacements. Riding with excessively worn, unbalanced or under-inflated tires can adversely affect stability and handling, which could result in death or serious injury. (00014a)

NOTES

- *Check runout on all cast or spoke wheels before installing a **new** tire. See 1.8 TIRES AND WHEELS.*
- *Store **new** tires on a horizontal tire rack. Avoid stacking **new** tires in a vertical stack. The weight of the stack compresses the tires and closes down the beads.*
- *Inspect tires for punctures, cuts, breaks and wear at least weekly.*
- *See Figure 2-37. The tread wear indicator bars will appear on tire tread surfaces when 1/32 in (0.8 mm) or less of tread remains. Always remove tires from service before they reach the tread wear indicator bars.*

***New** tires are needed if any of the following conditions exist. See 1.8 TIRES AND WHEELS.*

1. Tire wear indicator bars are visible on the tread surfaces.
2. Tire cords or fabric are visible through cracked sidewalls, snags or deep cuts.
3. A bump, bulge or split in the tire.
4. Puncture, cut or other damage to the tire that cannot be repaired.



1. **Sidewall**
2. **Tread surface**

Figure 2-37. Tread Wear Indicators (Typical)

REMOVAL

NOTE

Care must be taken when removing and installing tire to prevent cosmetic damage to wheel. This is especially true with wheels that feature painted surfaces.

1. Remove wheel from motorcycle:
   a. **Front wheel:** See 2.4 FRONT WHEEL, Removal.
   b. **Rear wheel:** See 2.5 REAR WHEEL, Removal.
2. Deflate tire.

NOTE

On tube type wheels, it is not necessary to completely remove tire from rim to replace the tube only. Removing one side allows the tube to be replaced and allows for inspection of tire.

3. Loosen both tire beads from rim flange. In most cases, a bead breaker machine will be required to loosen the beads from the rim.
4. Remove tire.

CLEANING, INSPECTION AND REPAIR

1. Clean the inside of tire and outer surface of tube.
2. If rim is dirty or rusty, clean with a stiff wire brush.
3. Check wheels for lateral and radial runout before installing a **new** tire. See 2.9 CHECKING AND TRUING WHEELS.
4. Inspect the tire for wear and damage. Inspect tread depth. Replace worn tires. Replace tube prior to reinstalling tire.

⚠WARNING

Replace punctured or damaged tires. In some cases, small punctures in the tread area may be repaired from within the demounted tire by a Harley-Davidson dealer. Speed should NOT exceed 50 mph (80 km/h) for the first 24 hours after repair, and the repaired tire should NEVER be used over 80 mph (130 km/h). Failure to follow this warning could result in death or serious injury. (00015a)

5. Tubeless tires may be repaired in the tread area only if the puncture is 1/4 in (6.4 mm) or smaller. All repairs must be made from inside the tire.
6. Acceptable repair method involves the use of a patch and plug combination.

INSTALLATION

⚠WARNING

Harley-Davidson front and rear tires are not the same. Interchanging front and rear tires can cause tire failure, which could result in death or serious injury. (00026a)

⚠WARNING

Do not exceed manufacturer's recommended pressure to seat beads. Exceeding recommended bead seat pressure can cause tire rim assembly to burst, which could result in death or serious injury. (00282a)

⚠WARNING

Do not inflate tire beyond maximum pressure as specified on sidewall. Over inflated tires can blow out, which could result in death or serious injury. (00027a)

For tire pressures, see 1.8 TIRES AND WHEELS, Tires.

Some tires have arrows molded into the tire sidewall. These tires should be mounted on the rim with the arrow pointing in the direction of forward rotation. The colored dot on the sidewall is a balance mark and should be located next to the valve stem hole.

Tube Type Tires

⚠WARNING

Match tires, tubes, rim seals, air valves and caps to the correct wheel rim. Contact a Harley-Davidson dealer. Mismatching can result in damage to the tire bead, allow tire slippage on the rim or cause tire failure, which could result in death or serious injury. (00023b)

⚠WARNING

Use inner tubes on laced (wire spoked) wheels. Using tubeless tires on laced wheels can cause air leaks, which could result in death or serious injury. (00025a)

NOTES

- *For correct tire and tube types, see 2.2 SPECIFICATIONS.*
- *Whenever a tube type tire is replaced, the tube should also be replaced. Inner tubes should be patched only as an emergency measure. Replace a damaged or patched tube as soon as possible. Rim bands must be used on all laced wheels.*

1. See Figure 2-38. On laced wheels, install a rim strip into the rim well. Make sure no spokes protrude through nipples, and be sure to align the valve stem hole in rim strip with valve stem hole in rim.
2. Install tube and tire.



Figure 2-38. Installing Rim Strip

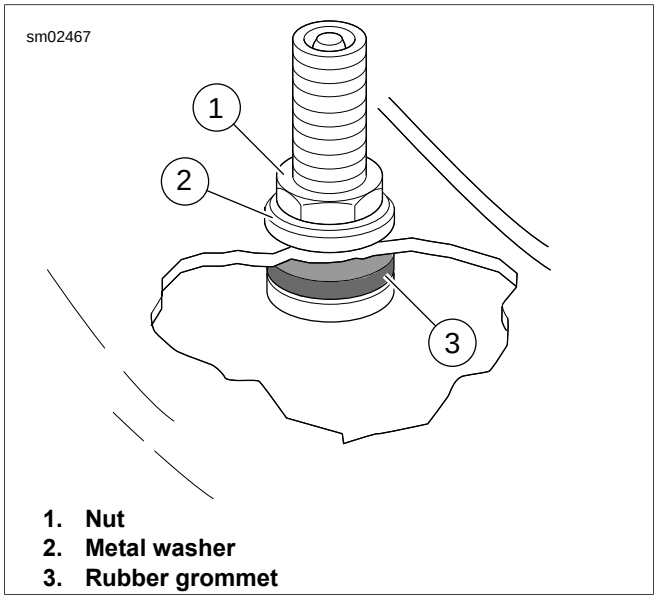
Tubeless Tires

⚠WARNING

Only install original equipment tire valves and valve caps. A valve, or valve and cap combination, that is too long or too heavy can strike adjacent components and damage the valve, causing rapid tire deflation. Rapid tire deflation can cause loss of vehicle control, which could result in death or serious injury. (00281a)

1. See Figure 2-39. On tubeless wheels, damaged or leaking valve stems must be replaced. Install rubber grommet (3) on valve stem.
2. Insert valve stem into rim hole.

3. Install metal washer (2).
4. Install nut and tighten to 12-15 **in-lbs** (1.4-1.7 Nm).
5. Install tire.



1. **Nut**
2. **Metal washer**
3. **Rubber grommet**

Figure 2-39. Tubeless Tire Valve Stem

CHECKING TIRE RUNOUT

Lateral Runout

1. Verify that the tire is inflated to the proper pressure.
2. See Figure 2-40. Turn the wheel on the axle and measure tire lateral runout from a fixed point to a smooth area on the tire sidewall. Avoid measuring on raised letters or vents.
3. Tire lateral runout should not exceed 0.090 in (2.29 mm). If tire runout exceeds specification, remove tire from rim and check rim lateral runout. See 2.9 CHECKING AND TRUING WHEELS. If necessary, replace cast wheel.
4. If rim lateral runout is within specification, the tire is at fault and must be replaced. If rim lateral runout is not within specification, correct by adjusting selected spokes on laced wheels (see 2.9 CHECKING AND TRUING WHEELS) or replace cast wheels.
5. Install the tire and recheck tire lateral runout.

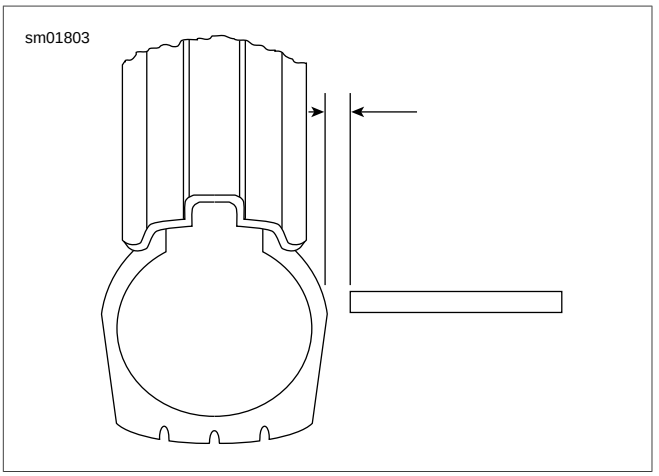


Figure 2-40. Checking Tire Lateral Runout

Radial Runout

1. Verify that the tire is inflated to the proper pressure.
2. See Figure 2-41. Turn the wheel on the axle and measure tire radial runout at the tread centerline.
3. Tire radial runout should not exceed 0.090 in (2.29 mm). If tire runout exceeds this specification, remove tire from rim. and check rim radial runout. See 2.9 CHECKING AND TRUING WHEELS. If necessary, replace cast wheel.
4. If rim radial runout is within specification, the tire is at fault and must be replaced. If rim bead radial runout is not within specification, correct by adjusting selected spokes on laced wheels (see 2.9 CHECKING AND TRUING WHEELS) or replace cast wheels.
5. Install the tire and recheck tire radial runout.

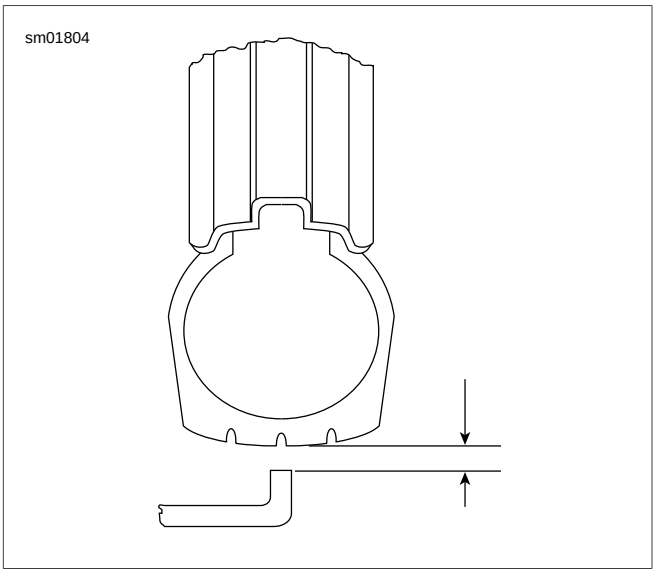


Figure 2-41. Checking Tire Radial Runout

WHEEL BALANCING

PART NUMBER	TOOL NAME
HD-99500-80	WHEEL TRUING STAND

Wheel balancing is recommended to improve handling, and to reduce vibration, especially at high road speeds.

Static balancing using WHEEL TRUING STAND (Part No. HD-99500-80) will produce satisfactory results for normal highway speeds. Dynamic balancing can produce better results for high speed operation but is not typically required.

The maximum weight permissible to accomplish balance is 3.5 oz (99.2 g) (total weight applied to the rim). If more than 3.5 oz (99.2 g) of weight is required to accomplish balance, rotate the tire 180 degrees on the rim and again balance the assembly. Wheels should be balanced to within 0.5 oz (14 g).

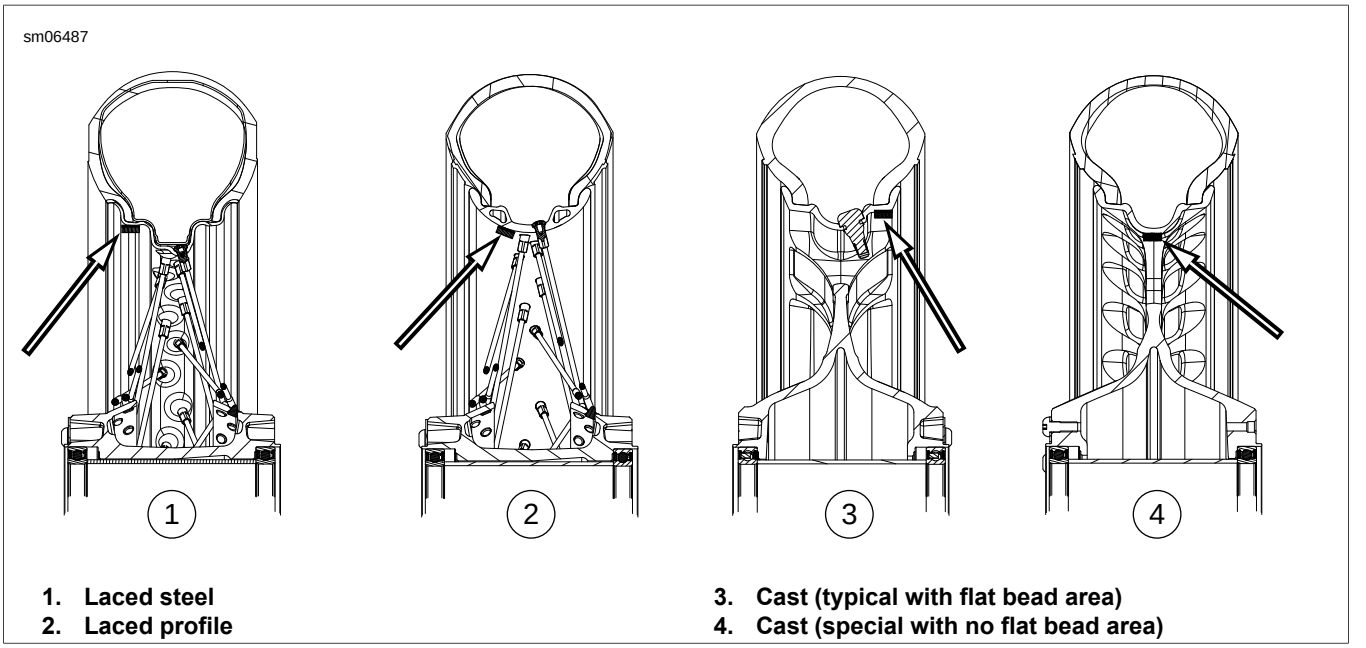
Weights

Use self-adhesive wheel balance weights for all Harley-Davidson wheels, placed as indicated in Figure 2-42 depending on wheel style.

NOTES

- *If 1.5 oz (43 g) or more of weight must be added at one location, divide the amount so that half is applied to each side of rim.*
- *See Figure 2-42. On cast wheels without a flat area near the bead, it is acceptable to place them crosswise through the opening.*

1. See Figure 2-42. Place weights on a smooth surface of the wheel rim such that centrifugal force will help keep them in place. Make sure the area of application is completely clean, dry, and free of oil and grease.
2. Remove paper backing from the weight. Press firmly in place and hold for ten seconds.



1. **Laced steel**
2. **Laced profile**
3. **Cast (typical with flat bead area)**
4. **Cast (special with no flat bead area)**

Figure 2-42. Wheel Weight Placement

FRONT BRAKE MASTER CYLINDER 2.12

GENERAL

NOTICE

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)

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)

NOTICE

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)

NOTE

Immediately wipe up any brake fluid spillage with a clean, dry, soft cloth. Follow up by thoroughly wiping affected area with a clean, damp, soft cloth (small spills) or washing with a large quantity of soapy water (large spills).

REMOVAL AND DISASSEMBLY

Removal

1. Turn front wheel to the left until the master cylinder reservoir is level.
2. Thoroughly clean the master cylinder cover before removal to prevent contamination.
3. Remove cover from master cylinder reservoir.

NOTE

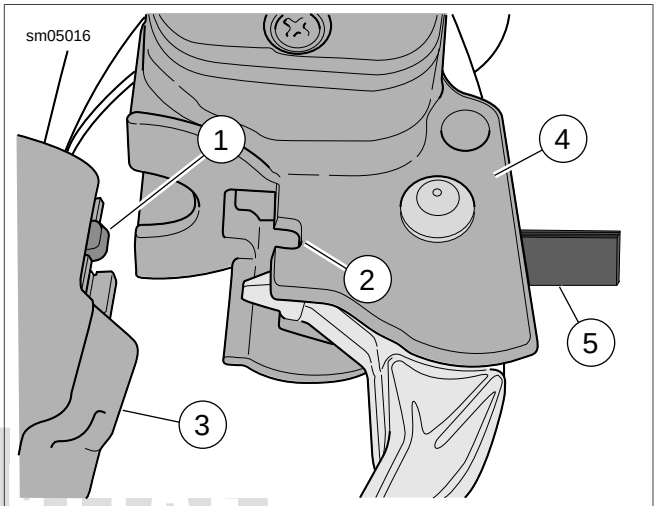
Wrap banjo fitting with a shop towel to absorb any loss of brake fluid.

4. Remove banjo bolt. Hold suitable container under banjo bolt bore to allow reservoir to drain. Discard copper washers.
5. Wipe out remaining fluid in the master cylinder reservoir using a clean shop cloth.

NOTICE

Do not remove or install the master cylinder assembly without first positioning a 5/32-inch (4 mm) thick insert between the brake lever and lever bracket. Removing or installing the master cylinder assembly without the insert in place may result in damage to the rubber boot and plunger on the front stoplight switch. (00324a)

6. Place a 5/32 in. (4 mm) thick cardboard insert between brake lever and lever bracket. Use the eyelet of a small cable strap if the cardboard insert is not available.
7. See Figure 2-43. Remove clamp and master cylinder reservoir/brake lever assembly from handlebar.
8. Remove cardboard insert.
9. Remove retaining ring from pivot pin groove and discard.
10. Remove pivot pin and brake lever from brake lever bracket.



1. **Tab**
2. **Groove**
3. **Switch housing assembly**
4. **Brake lever bracket**
5. **Cardboard insert**

Figure 2-43. Remove Master Cylinder/Brake Lever Assembly

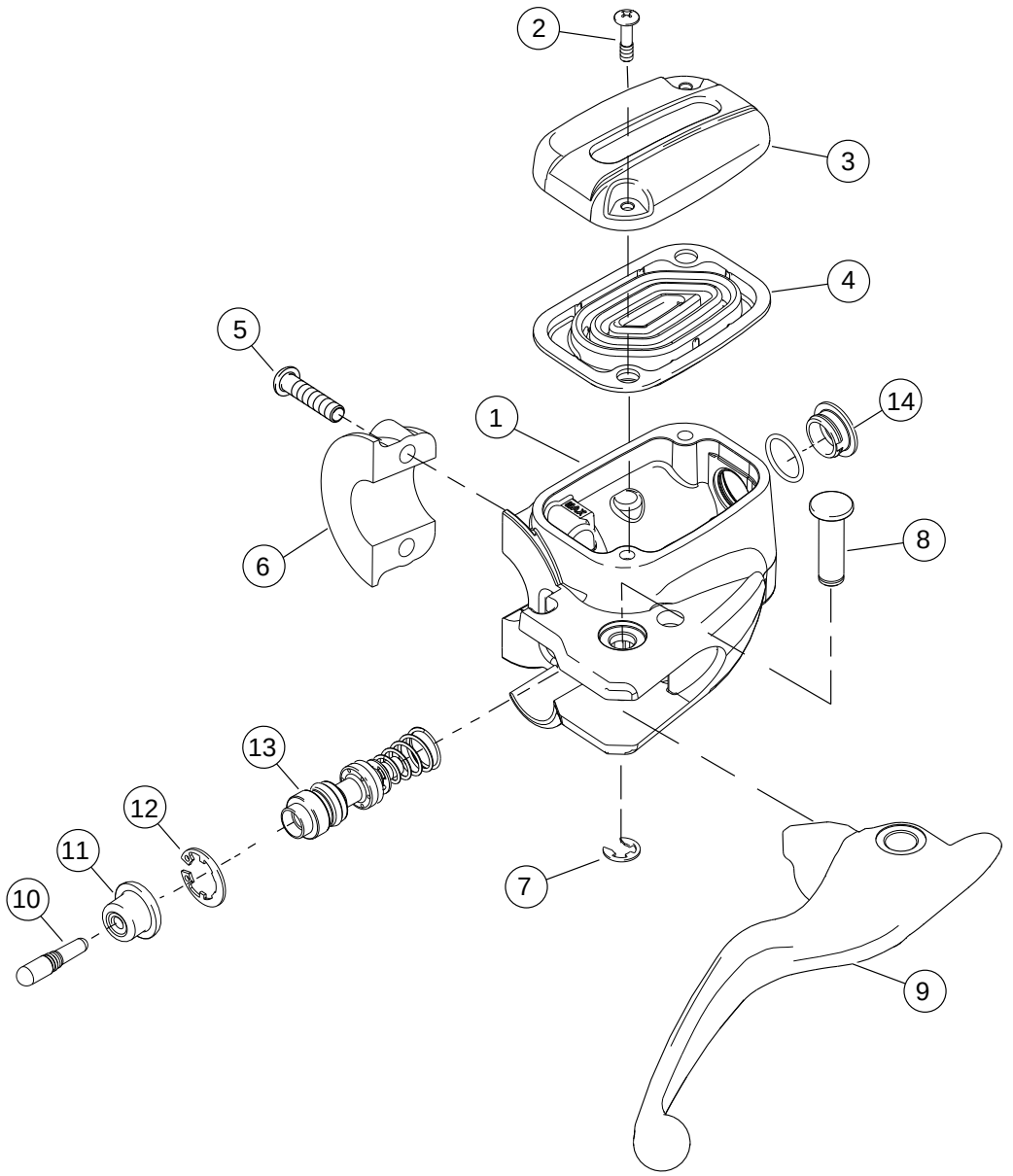
Disassembly

NOTE

Exercise care to avoid scratching or nicking banjo sealing surface during handling. Damage to the sealing surface requires replacement of the master cylinder reservoir.

1. See Figure 2-44. Remove dust boot (11) and pushrod (10) from piston bore. Remove dust boot from pushrod.
2. Hold pressure against piston assembly (13) and remove retaining ring (12).
3. Remove piston assembly and spring from piston bore and discard.

sm05012



1. Master cylinder reservoir
2. Cover screw (2)
3. Cover
4. Gasket
5. Clamp screw (2)
6. Handlebar clamp
7. Retaining ring
8. Pivot pin
9. Brake hand lever
10. Pushrod
11. Dust boot
12. Retaining ring
13. Piston assembly
14. Sight glass/O-ring

Figure 2-44. Front Brake Master Cylinder Assembly

CLEANING AND INSPECTION

⚠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. Wipe dry with a clean, lint free cloth.
2. Inspect banjo seating surface for scratches or nicks.
3. Verify that reservoir is completely free of dust, dirt or residue.
4. Using a clean air supply, blow out piston bore and other drilled passages. Do not use a wire or similar instrument.
5. Inspect piston bore for scratches, nicks, scoring, pitting, corrosion or other damage.
6. Inspect retaining ring for wear or distortion. Inspect retaining ring groove for damage.
7. Inspect piston seals, dust boot and reservoir cover gasket for cuts, tears or general deterioration.

ASSEMBLY AND INSTALLATION

Assembly

1. See Figure 2-44. Lightly lubricate piston bore and OD of piston seals with D.O.T. 4 brake fluid.

NOTE

*Never install a used piston assembly or spring because unexpected failure can occur. Always install **new** parts.*

2. Insert spring end of **new** piston assembly (13) into piston bore.
3. Push on piston assembly to compress spring and install retaining ring (12) with the flat side in. Verify that retaining ring is completely seated in groove.
4. Install dust boot (11) onto pushrod (10) until it engages groove in pushrod.
5. Install pushrod into piston socket and engage dust boot into piston bore. Verify that collar on OD of dust boot is secure in lip of piston bore.

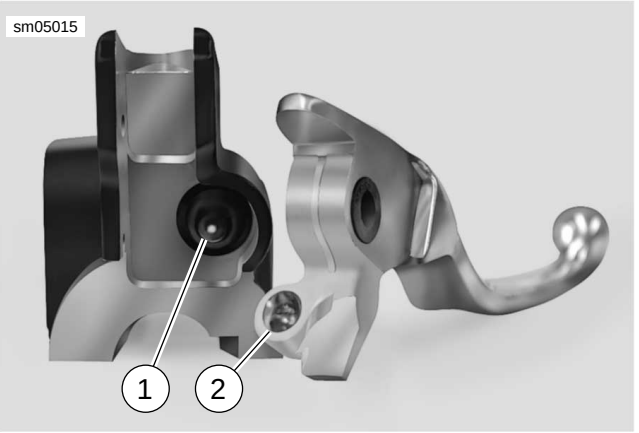
Installation

1. See Figure 2-45. Place a dab of G-40M grease (Part No. 42820-04) into pocket of hand lever.
2. Install brake hand lever and secure with pivot pin.
3. Install **new** retaining ring in pivot pin groove. Verify that retaining ring is completely seated in groove.
4. Place cardboard insert between brake lever and brake lever bracket. Use the eyelet of an ordinary cable strap if the cardboard insert is not available.
5. See Figure 2-43. Position brake lever/master cylinder reservoir assembly, engaging tab (1) in groove (2) at top of brake lever bracket.
6. Install two screws (with flat washers). Position for rider comfort. Beginning with the top screw, tighten screws to 72-108 **in-lbs** (8.1-12.2 Nm).
7. Secure brake line to master cylinder reservoir using **new** copper washers. Tighten banjo bolt to master cylinder to 12.5-14.5 ft-lbs (16.9-19.7 Nm).

⚠WARNING

Any time the ABS module, either master cylinder, or any line between a master cylinder and the ABS module is disconnected or replaced, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to do so could result in air in the hydraulic brake system, reducing brake efficiency, which could result in death or serious injury. (00585b)

8. Fill and bleed brake system. See 2.16 BLEEDING BRAKES.



1. **Pushrod**
2. **Lever pocket**

Figure 2-45. Apply Grease to Lever Pocket

FRONT BRAKE LINE: NON-ABS EQUIPPED

Removal

NOTE

For service of ABS equipped vehicles, see C.4 ABS BRAKE LINES.

1. **Road King models:**
   a. Remove right side headlamp nacelle. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.
   b. See Figure 2-46. Cut cable strap from right handlebar riser.
   c. See Figure 2-47. Cut cable strap from brake hose.
2. **Fork mounted fairing models:**
   a. Remove outer fairing and fairing cap. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS and 2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS.
   b. Cut cable strap to release right handlebar switch conduit and brake line from right handlebar.
   c. See Figure 2-47. Cut cable strap.
3. **Frame mounted fairing models:**
   a. Remove right side instrument nacelle. See 2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS.
   b. If present, remove P-clip securing brake line to front right side of upper fork bracket.
4. Remove front brake line bracket from bottom of lower fork bracket.
5. Turn handlebars until the master cylinder reservoir is level.

NOTE

Thoroughly clean the cover before removal to prevent contamination.

6. Remove cover from master cylinder reservoir.

NOTE

Wrap banjo fittings with a shop towel to absorb any loss of brake fluid.

7. Remove banjo bolt from master cylinder. Hold suitable container under banjo bolt bore and allow reservoir to drain. Discard copper washers.
8. Wipe out remaining fluid in the master cylinder reservoir using a clean shop cloth.
9. Disconnect brake lines from both front brake calipers. Discard copper washers.
10. Remove front brake line from motorcycle.

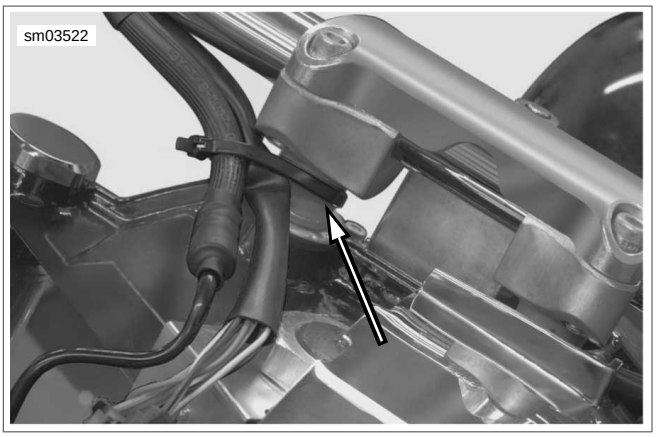


Figure 2-46. Capture Brake Hose and Right Handlebar Riser (FLHR/C)

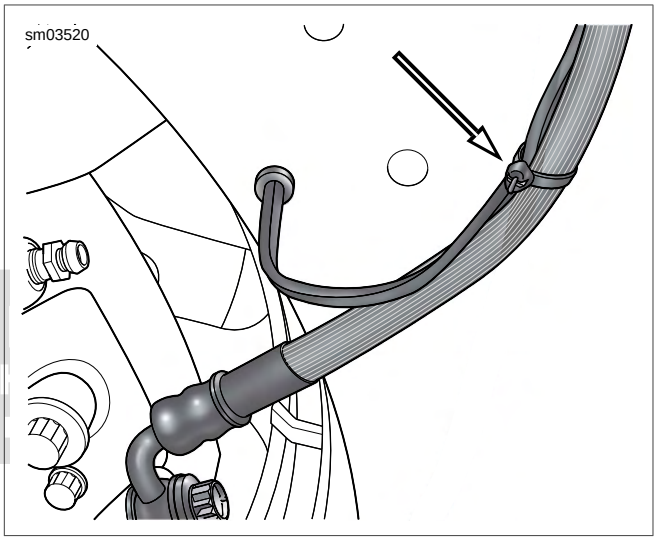


Figure 2-47. Capture Brake Hose and Front Fender Tip Lamp Wires

Installation

1. Position the front brake line bracket at the bottom of the lower fork bracket and loosely attach with screw.
2. Verify that brake lines are equal distance from the left and right fork sliders, and tighten screw to 120-180 **in-lbs** (13.6-20.3 Nm).
3. Secure brake line to master cylinder reservoir using **new** copper washers. Tighten banjo bolt to 12.5-14.5 ft-lbs (16.9-19.7 Nm)
4. Secure brake lines to brake calipers using **new** copper washers. Tighten banjo/bleeder bolts to 17-19 ft-lbs (23.1-25.8 Nm).
5. Fill and bleed brake system. See 2.16 BLEEDING BRAKES.

6. **Road King models:**
   a. See Figure 2-46. Secure right handlebar switch harness and brake hose to right handlebar riser with **new** cable strap.
   b. Install right side headlamp nacelle. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.
   c. See Figure 2-47. Secure front fender tip lamp wires to left brake caliper hose with **new** cable strap.
7. **Fork mounted fairing models:**
   a. Just outboard of fairing cap opening, install **new** cable strap to secure right handlebar switch harness and brake line to right handlebar.
   b. Install fairing cap and outer fairing. See 2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS and 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
   c. See Figure 2-47. Secure front fender tip lamp wires to left brake caliper hose with **new** cable strap.
8. **Frame mounted fairing models:**
   a. If present, capture brake line in P-clip and secure with hex screw to upper fork bracket.
   b. Install right side instrument nacelle. See 2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS.

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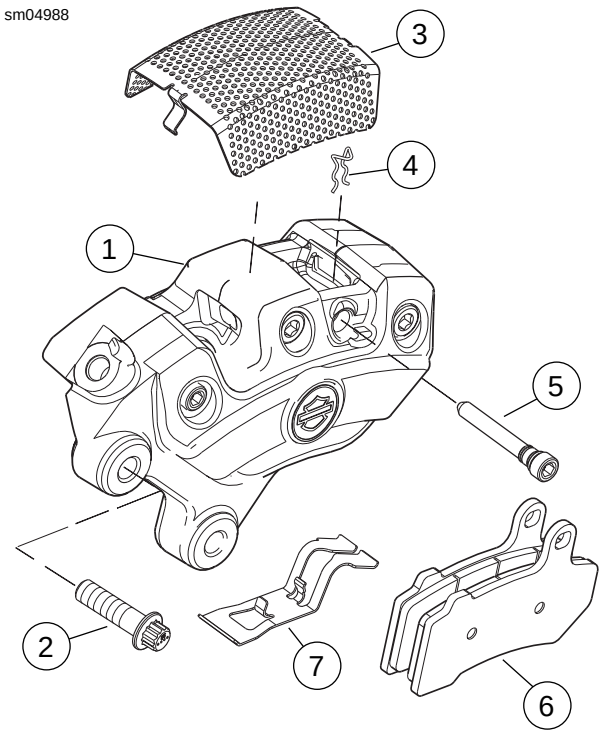
FRONT BRAKE CALIPER 2.13

REMOVAL

NOTES

- *If only replacing brake pads, see 1.16 BRAKE PADS AND DISCS.*
- *Wrap banjo fitting with a shop towel to absorb any loss of brake fluid.*

1. Remove banjo bleeder bolt. Discard copper washers.
2. See Figure 2-48. Remove two caliper mounting screws (2) and remove caliper from brake disc.



1. **Caliper**
2. **Caliper mounting screw**
3. **Screen**
4. **Retaining clip**
5. **Pad pin**
6. **Brake pads**
7. **Pad spring**

Figure 2-48. Front Brake Caliper Assembly

INSTALLATION

1. If necessary, assemble caliper installing pad spring, brake pads, pad pin, retaining clip and screen. See 1.16 BRAKE PADS AND DISCS.
2. Install caliper, with cable clip/bracket on left side if ABS equipped, and start two mounting screws. Tighten to 28-38 ft-lbs (37.9-51.5 Nm).
3. If ABS equipped, verify wheel speed sensor is secure in clip.
4. If ABS equipped, install two **new** cable straps as follows:
   a. Install cable strap 2.5 in. (63.5 mm) above the bottom brake hose crimp capturing front wheel speed sensor cable and brake hose.
   b. Install cable strap 2.5 in. (63.5 mm) below the top brake hose crimp capturing front wheel speed sensor cable, brake hose and front fender tip lamp wires, if equipped.
5. Secure brake line to caliper with banjo bleeder bolt and **new** copper washers. Tighten bolt to 17-19 ft-lbs (23.1-25.8 Nm).

NOTE

When removing or replacing a bleeder valve or banjo bleeder bolt, an O-ring might be present that is used during manufacturing. Remove the O-ring from the bleeder valve groove or bore and discard. If care is not taken to remove and discard the O-ring, it may become lodged in the bleeder bore during valve installation and prevent proper torquing or sealing.

6. Fill and bleed brake system. See 2.16 BLEEDING BRAKES.

REAR BRAKE MASTER CYLINDER 2.14

GENERAL

⚠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)

NOTICE

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)

NOTICE

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)

NOTE

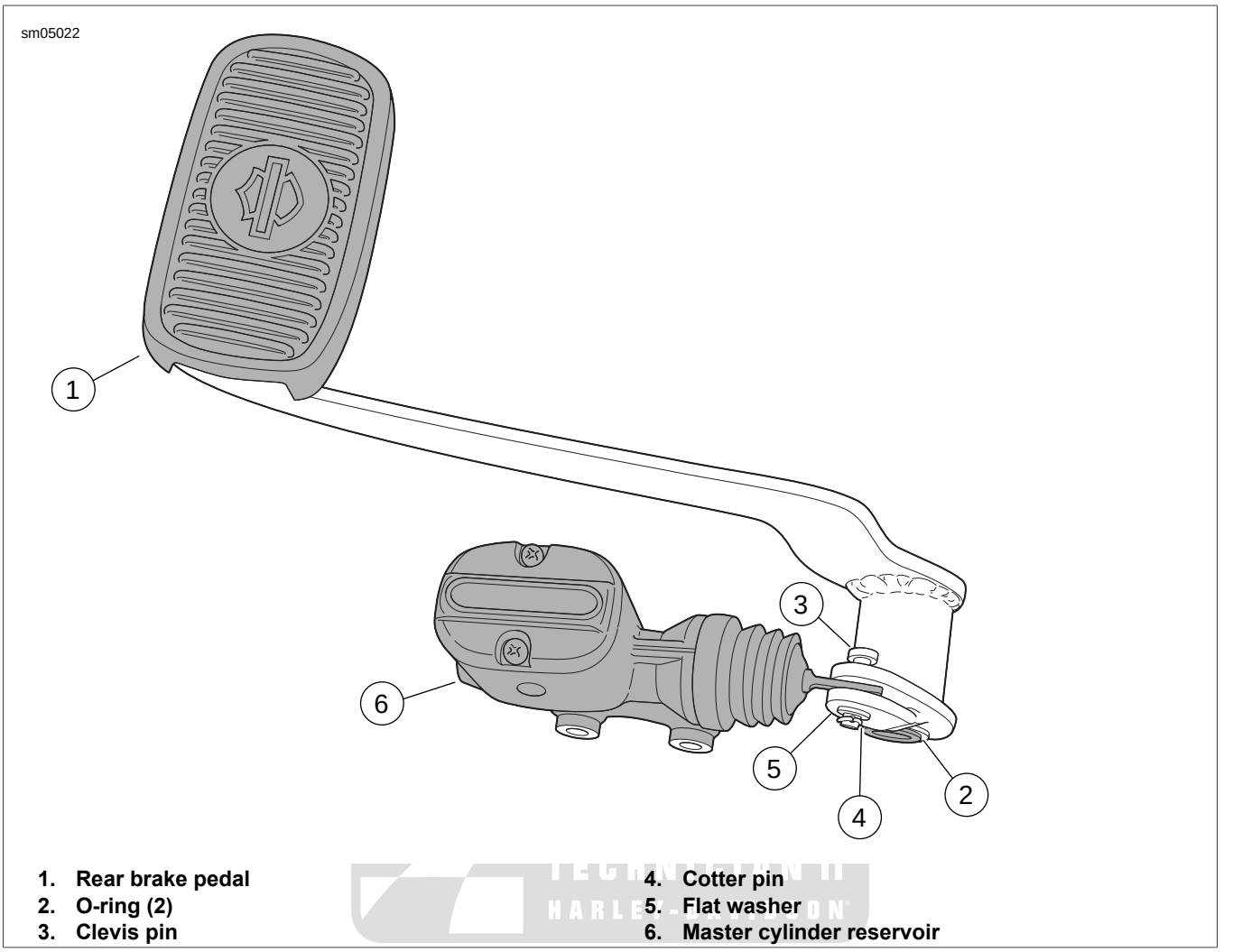
Immediately wipe up any brake fluid spillage with a clean, dry, soft cloth. Follow up by thoroughly wiping affected area with a clean, damp, soft cloth (small spills) or washing with a large quantity of soapy water (large spills).

REMOVAL AND DISASSEMBLY

Removal

1. Remove right lower fairing, if present. See 2.33 LOWER FAIRING AND ENGINE GUARD.
2. Remove right side rider footboard. See 2.49 FOOTBOARDS AND FOOTRESTS.
3. Stand motorcycle upright, so that rear master cylinder reservoir is level.
4. To prevent dirt and other contaminants from entering the master cylinder reservoir, thoroughly clean the cover before removal.
5. Remove cover from master cylinder reservoir.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Rear brake pedal**
2. **O-ring (2)**
3. **Clevis pin**
4. **Cotter pin**
5. **Flat washer**
6. **Master cylinder reservoir**

Figure 2-49. Rear Master Cylinder/Brake Pedal Assembly

NOTE

Wrap banjo fitting with piece of shop towel to absorb any loss of brake fluid.

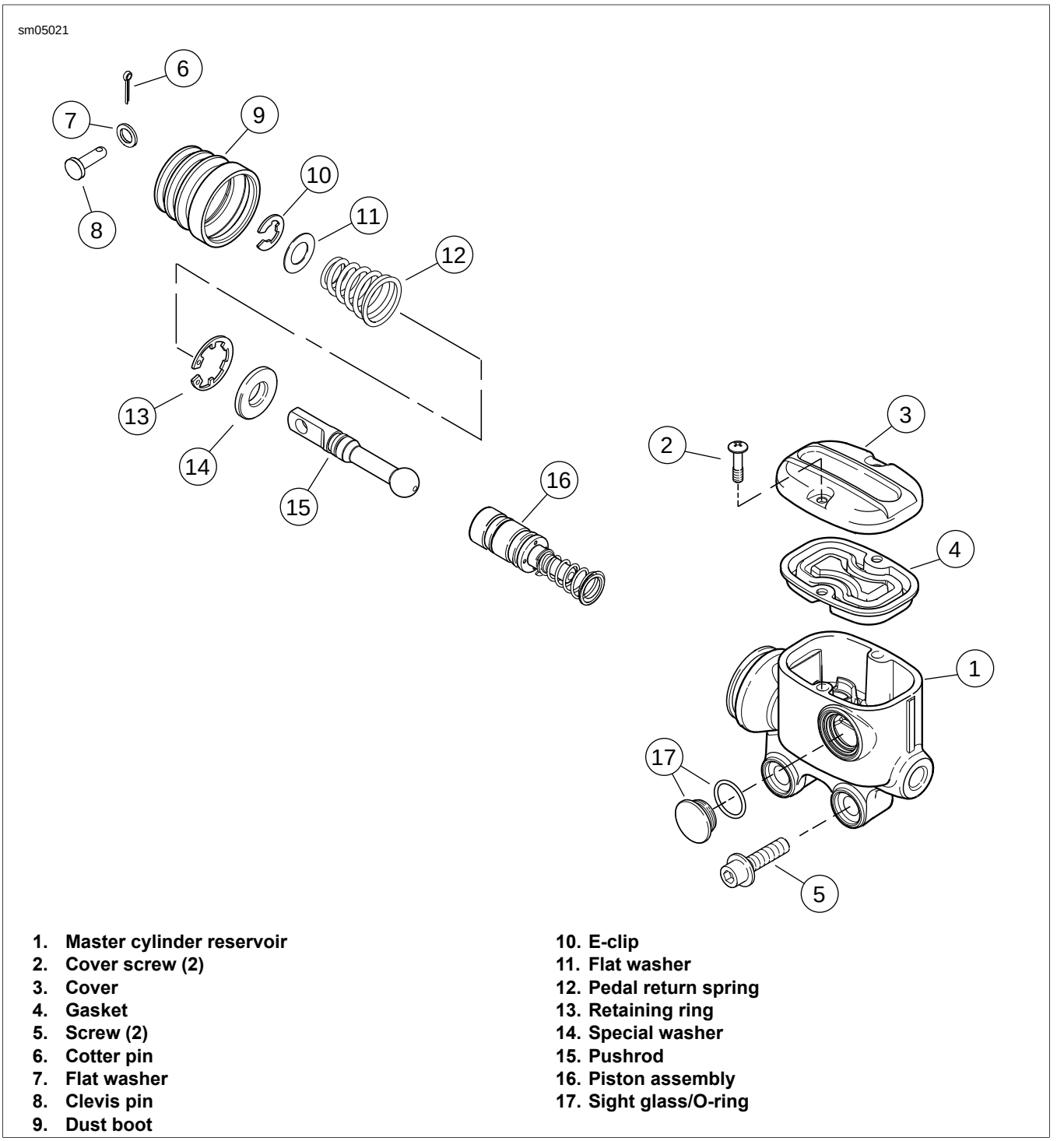
6. Remove brake line from master cylinder reservoir. Hold suitable container under banjo bolt bore to allow reservoir to drain. Discard copper washers.
7. Using a clean shop cloth, wipe out any remaining fluid in the master cylinder reservoir.
8. Remove master cylinder from engine mount end cap.
9. Remove locknut with flat washer and pull brake pedal/master cylinder assembly from pedal shaft. Remove and discard O-ring on each side of brake pedal shaft bore.
10. See Figure 2-49. Remove cotter pin and flat washer from clevis pin. Remove clevis pin to separate master cylinder assembly from brake pedal flange.

Disassembly

NOTE

Exercise care to avoid scratching or nicking banjo sealing surface during handling. Damage to the sealing surface requires replacement of the master cylinder reservoir.

1. See Figure 2-50. Remove dust boot (9) from reservoir pulling it over slotted end of pushrod.
2. Pushing down on flat washer (11) to compress pedal return spring (12), remove E-clip (10) from groove in pushrod, and then carefully release spring.
3. Remove flat washer and pedal return spring from pushrod.
4. Push on end of piston to remove tension and remove retaining ring (13) from groove in piston bore.
5. Remove pushrod (15) and special washer (14).
6. Pull piston assembly from piston bore.



1. **Master cylinder reservoir**
2. **Cover screw (2)**
3. **Cover**
4. **Gasket**
5. **Screw (2)**
6. **Cotter pin**
7. **Flat washer**
8. **Clevis pin**
9. **Dust boot**
10. **E-clip**
11. **Flat washer**
12. **Pedal return spring**
13. **Retaining ring**
14. **Special washer**
15. **Pushrod**
16. **Piston assembly**
17. **Sight glass/O-ring**

Figure 2-50. Rear Brake Master Cylinder Assembly

CLEANING AND INSPECTION

⚠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. Wipe dry with a clean, lint free cloth.
2. Inspect banjo seating surface for scratches or nicks.
3. Verify that reservoir is completely free of dust, dirt or residue.
4. Using a clean air supply, blow out piston bore and other drilled passages. Do not use a wire or similar instrument.
5. Inspect piston bore for scratches, nicks, scoring, pitting, corrosion or other damage.
6. Inspect retaining ring and E-clip for wear or distortion. Inspect retaining ring and E-clip grooves for damage.
7. Inspect springs for stretching, distortion, kinks, cracks or broken coils.
8. Inspect piston seals, dust boot and reservoir cover gasket for cuts, tears or general deterioration.

ASSEMBLY AND INSTALLATION

Assembly

1. Lightly lubricate piston bore and OD of piston seals with D.O.T. 4 brake fluid.
2. Insert spring end of piston assembly into piston bore.
3. Slide special washer and retaining ring over pushrod. Collar on ID of special washer should face slotted end of pushrod, while flat side of retaining ring should face ball end.
4. Use ball end of pushrod to compress spring and install retaining ring in groove of piston bore. Verify that retaining ring is completely seated in groove.
5. Slide pedal return spring over pushrod until larger diameter coil is seated on retaining ring in piston bore.
6. Slide flat washer over pushrod until seated on smaller diameter coil of pedal return spring.
7. Using a suitable spring compressor, compress pedal return spring and install E-clip in inboard groove of pushrod.
8. Slide open end of dust boot over pushrod and onto reservoir until ID on closed end is captured in outboard groove of pushrod.

Installation

1. Install master cylinder assembly onto brake pedal flange. Install clevis pin from the outboard side. Install flat washer and cotter pin on clevis pin.
2. Apply a light coat of Wheel Bearing Grease (Part No. 99855-89) to the brake pedal shaft and bore. Install **new** O-ring on each side of bore.
3. Install brake pedal/master cylinder assembly on the pedal shaft. Install flat washer and **new** locknut on pedal shaft.
4. Install two screws to secure master cylinder. Tighten screws to 126-150 **in-lbs** (14.2-17.0 Nm).
5. Tighten brake pedal shaft locknut to 15-20 ft-lbs (20.3-27.1 Nm).
6. Start banjo bolt (with **new** copper washers) to secure brake line to master cylinder reservoir. Tighten banjo bolt to 12.5-14.5 ft-lbs (16.9-19.7 Nm).

⚠WARNING

Any time the ABS module, either master cylinder, or any line between a master cylinder and the ABS module is disconnected or replaced, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to do so could result in air in the hydraulic brake system, reducing brake efficiency, which could result in death or serious injury. (00585b)

7. Fill and bleed brake system. See 2.16 BLEEDING BRAKES.
8. Install right side rider footboard. See 2.49 FOOTBOARDS AND FOOTRESTS.

REAR BRAKE LINE: NON-ABS EQUIPPED

Removal

1. Remove right side saddlebag. See 2.26 SADDLEBAGS.
2. Remove right side cover.
3. Remove right lower fairing, if present. See 2.33 LOWER FAIRING AND ENGINE GUARD.
4. Remove right side rider footboard. See 2.49 FOOTBOARDS AND FOOTRESTS.
5. See Figure 2-51. Free rear brake line from electrical harness conduit clips (6).
6. Remove socket terminals from rear brake light switch (4) spade contacts. Cut cable strap to free rear brake light switch wires from lower frame tube, if necessary.
7. Remove fastener (5) and brake light switch bracket from frame.
8. Free rear brake line hose from cable clips (3) on rear fork.
9. Stand motorcycle upright, so that rear master cylinder reservoir is level.

NOTE

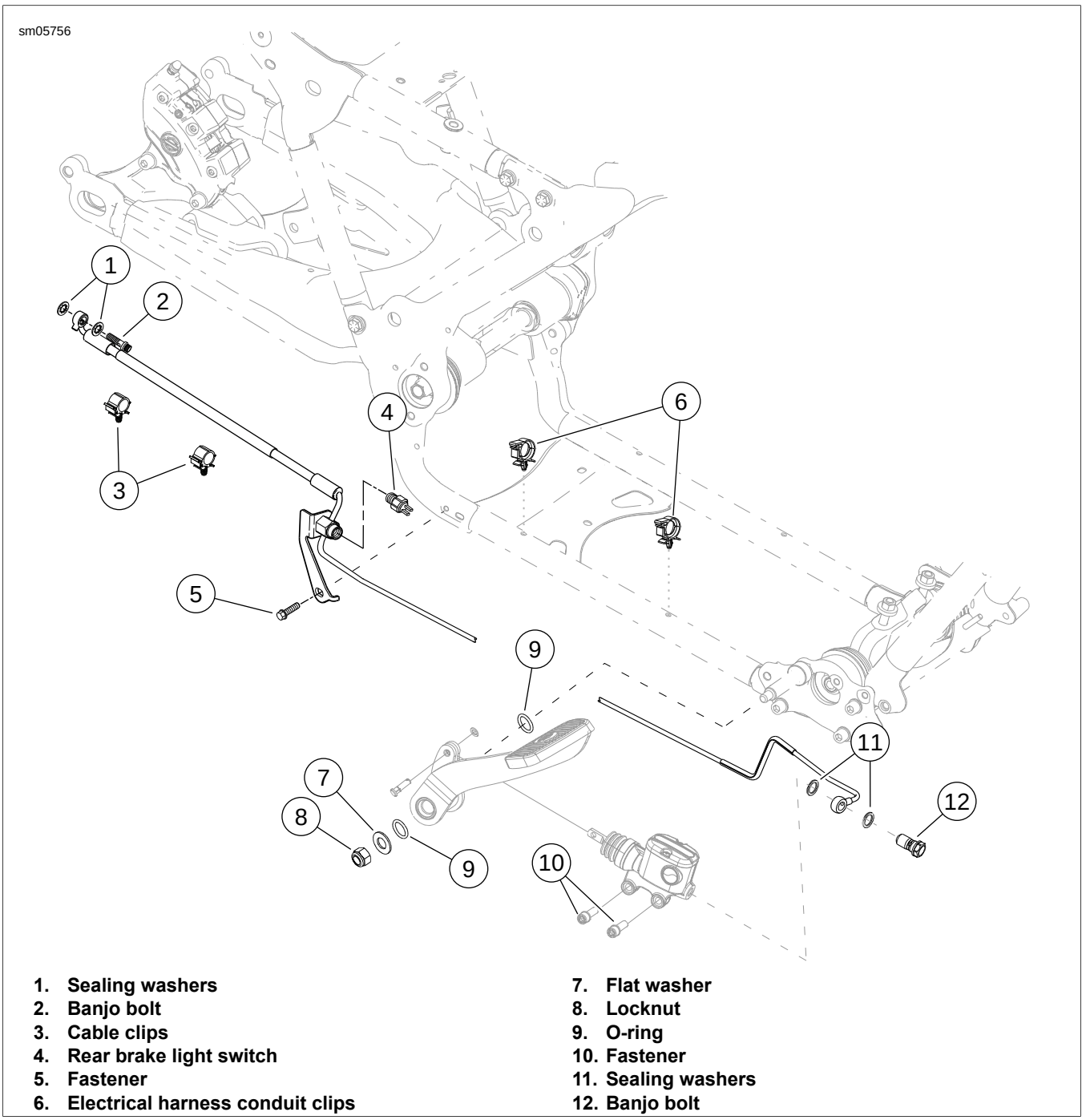
To prevent dirt and other contaminants from entering the master cylinder reservoir, thoroughly clean the cover before removal.

10. Remove cover from master cylinder reservoir.

NOTE

Wrap banjo fittings with pieces of shop towel to absorb any loss of brake fluid.

11. Remove banjo bolt (12) from master cylinder reservoir. Hold suitable container under banjo bolt bore to allow reservoir to drain. Discard sealing washers (11).
12. Using a clean shop cloth, wipe out any remaining fluid in the master cylinder reservoir.
13. Remove screws (10) securing master cylinder to frame.
14. Remove locknut (8) with flat washer (7) and pull brake pedal/master cylinder assembly from pedal shaft. Remove and discard O-rings (9).
15. Remove banjo bolt (2) from rear brake caliper. Discard sealing washers (1).
16. Feed rear brake line hose forward to area in front of rear fork bracket. Remove rear brake line from motorcycle.



1. **Sealing washers**
2. **Banjo bolt**
3. **Cable clips**
4. **Rear brake light switch**
5. **Fastener**
6. **Electrical harness conduit clips**
7. **Flat washer**
8. **Locknut**
9. **O-ring**
10. **Fastener**
11. **Sealing washers**
12. **Banjo bolt**

Figure 2-51. Rear Brake Line Assembly

Installation

1. Place rear brake line into approximate position along top of lower right frame tube. From area in front of rear fork bracket, feed brake line hose rearward following top of rear fork.
2. Move front section of brake line inboard of frame at bottom of front frame downtube.
3. See Figure 2-51. Secure brake line to caliper using **new** sealing washers.
4. Capture rear brake line hose in two cable clips (3) on rear fork.

NOTE

*If installing **new** rear brake light switch, apply Loctite Pipe Sealant with Teflon 565 to threads and start switch into rear brake line. Using flats on switch, tighten to 12-15 ft-lbs (16.3-20.3 Nm).*

5. Index locating tab on brake light switch bracket in slot of frame. Install fastener (5) and tighten to 80-100 **in-lbs** (9.0-11.3 Nm).
6. Install terminals onto rear brake light switch (4). If removed, install **new** cable strap to secure rear brake light switch wires.
7. Capture rear brake line to electrical harness conduit clips (6).
8. Apply a light coat of Wheel Bearing Grease (Part No. 99855-89) to the brake pedal shaft and bore. Install **new** O-rings (9) on each side of bore.
9. Install brake pedal/master cylinder assembly on the pedal shaft. Install flat washer (7) and **new** locknut (8) on pedal shaft.
10. Fasten master cylinder to frame. Tighten screws to 126-150 **in-lbs** (14.2-17.0 Nm).
11. Tighten brake pedal shaft locknut to 15-20 ft-lbs (20.3-27.1 Nm).
12. Secure brake line to master cylinder reservoir using **new** sealing washers. Tighten banjo bolt to 12.5-14.5 ft-lbs (16.9-19.7 Nm).
13. Tighten banjo bolt to brake caliper to 17-19 ft-lbs (23.1-25.8 Nm).
14. Fill and bleed brake system. See 2.16 BLEEDING BRAKES.
15. Install right side rider footboard. See 2.49 FOOTBOARDS AND FOOTRESTS.
16. Install right lower fairing, if present. See 2.33 LOWER FAIRING AND ENGINE GUARD.
17. Install right side cover.
18. Install right side saddlebag. See 2.26 SADDLEBAGS.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

REAR BRAKE CALIPER 2.15

REMOVAL

NOTE

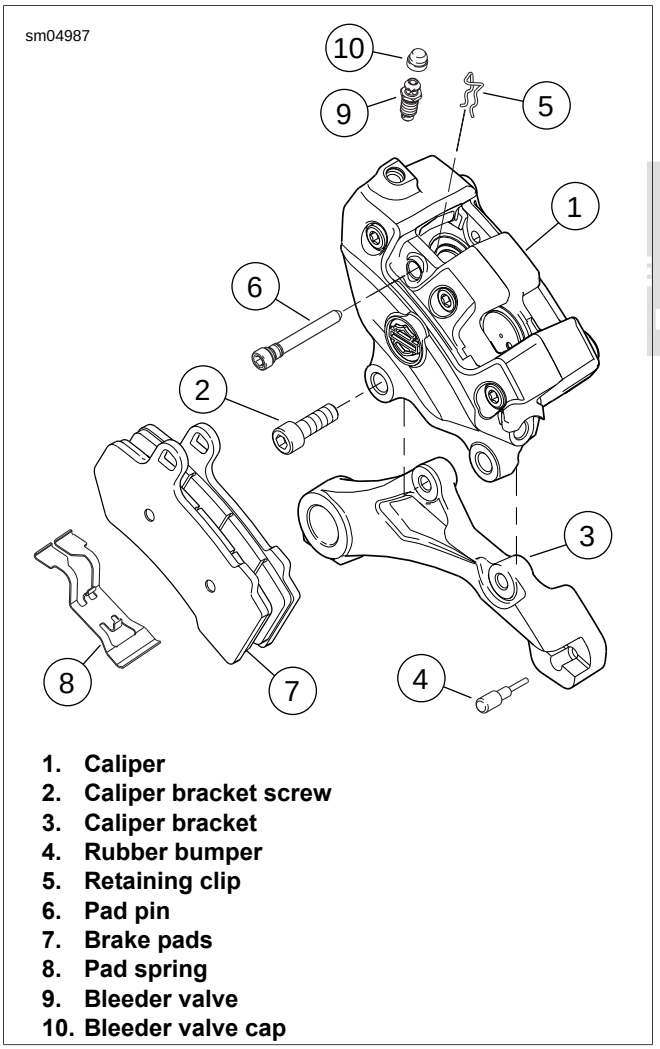
If only replacing brake pads, see 1.16 BRAKE PADS AND DISCS.

1. Remove right side saddlebag. See 2.26 SADDLEBAGS.

NOTE

Wrap banjo fitting with piece of shop towel to absorb any loss of brake fluid.

2. Remove banjo bolt to release brake line from caliper. Discard copper washers.
3. See Figure 2-52. Remove two screws (2) to release caliper from caliper bracket.
4. Remove caliper from brake disc.
5. If necessary, retract rear axle to remove caliper bracket (3). See 2.5 REAR WHEEL.



1. **Caliper**
2. **Caliper bracket screw**
3. **Caliper bracket**
4. **Rubber bumper**
5. **Retaining clip**
6. **Pad pin**
7. **Brake pads**
8. **Pad spring**
9. **Bleeder valve**
10. **Bleeder valve cap**

Figure 2-52. Rear Brake Caliper Assembly

INSTALLATION

1. Install caliper bracket, if removed. Proceed as follows:
   a. Replace rubber bumper if damaged, worn or missing. Lubricate anchor of **new** bumper with isopropyl alcohol or glass cleaner and pull rubber bead through hole to the inboard side of the caliper bracket.
   b. Seat caliper bracket on anchor weldment of rear swingarm.
   c. Complete installation of rear wheel. See 2.5 REAR WHEEL.
2. If necessary, assemble caliper by installing pad spring, brake pads, pad pin and retaining clip. See 1.16 BRAKE PADS AND DISCS.

NOTE

When removing or replacing a bleeder valve or banjo bleeder bolt, an O-ring might be present that is used during manufacturing. Remove the O-ring from the bleeder valve groove or bore and discard. If care is not taken to remove and discard the O-ring, it may become lodged in the bleeder bore during valve installation and prevent proper torquing or sealing.

3. Install caliper and secure with two screws. Tighten screws to 43-48 ft-lbs (58.3-65.1 Nm).
4. Secure brake line to caliper. Tighten banjo bolt to 17-19 ft-lbs (23.1-25.8 Nm).
5. Fill and bleed brake system. See 2.16 BLEEDING BRAKES.
6. Install right side saddlebag. See 2.26 SADDLEBAGS.

BLEEDING BRAKES 2.16

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)

NOTICE

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)

NOTICE

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

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER

NOTES

- *For best results, use the BASIC VACUUM BRAKE BLEEDER (Part No. Snap-On BB200A) or equivalent tool, particularly if the brake system was completely drained. Refer to the instructions provided with the tool. If a vacuum brake bleeder is not available, use the procedure which follows.*
- *ABS equipped motorcycles require the use of DIGITAL TECHNICIAN II (Part No. HD-48650) to confirm that the brake lines are properly connected and that air is adequately bled from ABS unit.*
- *When removing or replacing a bleeder valve or banjo bleeder bolt, an O-ring might be present that is used during manufacturing. Remove the O-ring from the bleeder valve groove or bore and discard. If care is not taken to remove and discard the O-ring, it may become lodged in the bleeder bore during valve installation and prevent proper torquing or sealing.*

1. Remove bleeder valve cap. Install end of clear plastic tubing over bleeder valve and place free end in a clean container.
2. If bleeding rear brake system, position motorcycle so that rear master cylinder reservoir is level. If bleeding front brake system, turn handlebars until front master cylinder reservoir is level.

NOTE

Wrap a clean shop cloth around the outside of the master cylinder reservoir to protect paint from brake fluid spills.

3. Remove cover from master cylinder reservoir.
4. See Figure 2-53. If necessary, add D.O.T. 4 BRAKE FLUID to master the cylinder reservoir until full:
   a. Front master cylinder reservoir: flush with step (marked MAX) cast at rear of reservoir or 0.20 in. (5.0 mm) from the top.
   b. Rear master cylinder reservoir: flush with ledge cast at front of reservoir or 0.26 in. (6.5 mm) from the top.

⚠WARNING

Any time the ABS module, either master cylinder, or any line between a master cylinder and the ABS module is disconnected or replaced, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to do so could result in air in the hydraulic brake system, reducing brake efficiency, which could result in death or serious injury. (00585b)

5. Pump the brake lever or pedal to build up hydraulic pressure.
6. While holding the brake lever or pedal, open bleeder valve about 3/4 turn. Close bleeder valve as soon as a loss of hydraulic pressure is detected or when the lever or pedal has moved 1/2 to 3/4 of its full range of travel. Allow brake lever or pedal to return slowly to its released position.
7. Repeat steps until all air bubbles are purged and a solid column of fluid is observed in the bleeder tube. Pay careful attention to the level of the fluid in the master cylinder reservoir and add fluid before it empties to avoid drawing air into the brake lines.
8. Tighten bleeder valve to 80-100 **in-lbs** (9.0-11.3 Nm). Install bleeder valve cap.

NOTE

If bleeding the front brake system, repeat applicable steps to bleed the line to the second brake caliper.

⚠WARNING

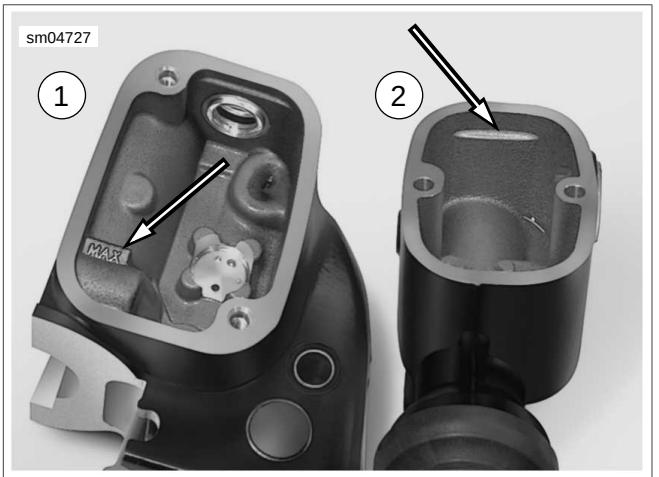
A plugged or covered relief port can cause brake drag or lock-up, which could lead to loss of control, resulting in death or serious injury. (00288a)

9. Add brake fluid as necessary and verify proper operation of the master cylinder relief port by actuating the brake pedal or lever. A slight spurt of fluid will break the fluid surface in the reservoir if all internal components are working properly.
10. Verify that the master cylinder cover gasket bellows is not extended or brake fluid will be ejected from the reservoir. Verify gasket and sealing surfaces are free of debris and install master cylinder reservoir cover as follows:
    a. Front master cylinder reservoir: Orient the cover with the vent holes facing the rear. Install cover screws and tighten to 10-12 **in-lbs** (1.1-1.4 Nm).
    b. Rear master cylinder reservoir: Install cover screws and tighten to 12-15 **in-lbs** (1.4-1.7 Nm).
11. If vehicle is ABS equipped, connect DIGITAL TECHNICIAN II (Part No. HD-48650) and follow the brake bleeding procedure.
12. With the ignition/light key switch turned to IGNITION, alternately apply front and rear brakes to verify operation of the brake lamp.

⚠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)

13. Test ride motorcycle. Repeat the bleeding procedure if brakes feel spongy.



1. Front master cylinder reservoir
2. Rear master cylinder reservoir

Figure 2-53. Brake Fluid Level

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

FRONT FORK 2.17

CHANGING FORK OIL

PART NUMBER	TOOL NAME
HD-41177	FORK HOLDING TOOL
HD-59000B	FORK OIL LEVEL GAUGE

NOTE

If changing oil at a routine service interval, or if fork is leaking or fails visual inspection, complete disassembly and inspection of the fork is required. See 2.17 FRONT FORK, Disassembly. However, if only replacing the fork oil, see procedure below.

Draining

1. Remove fork. See 2.17 FRONT FORK, Removal.

NOTICE

Exercise caution to avoid scratching or nicking fork tube. Damaging tube can result in fork oil leaks after assembly. (00421b)

2. Clamp FORK HOLDING TOOL (Part No. HD-41177) in vise in a horizontal position.
3. See Figure 2-56. With the fork cap bolt topside, clamp fork tube securely in tool.
4. See Figure 2-57. Remove fork cap bolt (1). Remove and discard quad ring seal (2).
5. Carefully remove fork tube plug (3) from fork tube. Fork tube plug is under spring pressure, so have a firm grasp on plug as the last thread is turned. Remove and discard O-ring (4) from fork tube plug.
6. Remove fork spring (5) from fork tube.
7. Remove fork assembly from fork holding tool.

NOTE

Be aware that damper valve (6), if equipped, may fall out of inverted fork tube while draining.

8. Turn fork upside down to drain fork oil into drain pan. Slowly pump fork tube and slider at least ten times. Allow approximately about 10-15 minutes for fork to thoroughly drain.
9. With the fork tube right-side-up, clamp fork slider (not the fork tube) into fork holding tool.
10. Install the drain plug at the bottom of the fork slider, if removed. Tighten plug to 72-96 **in-lbs** (8-11 Nm).

NOTE

All touring models, with the exception of Road King, have a damper valve type fork on both the left and right sides. Road King uses the conventional type fork on both sides. Be sure to follow the correct step for the fork type being serviced.

Table 2-14. Fork Oil Requirements

MODEL	FORK TYPE	AMOUNT			
		OZ.	ML	IN.	MM
All models **except** FLHR/C	Damper Valve	10.7	317	4.92	125
FLHR/C	Conventional	11.0	325	4.92	125

Filling

1. Pour slightly more Harley-Davidson Type E Fork Oil directly into the fork tube than is specified in Table 2-14.
2. Slowly pump fork tube until some resistance is felt and then pump a few more times.
3. **All models except FLHR/C** (damper valve type fork):
   a. See Figure 2-57. Install **new** wear ring (7) in groove of damper valve (6). With the wear ring at the bottom (spring side up), slide damper valve into fork tube.
   b. Install fork spring (5) into fork tube. Use fork spring to push damper valve to bottom of fork tube. Remove fork spring from fork tube.
   c. Slowly pump fork tube a few more times to discharge air from damper valve.

⚠WARNING

Incorrect amount of fork oil can adversely affect handling and lead to loss of vehicle control, which could result in death or serious injury. (00298a)

4. Adjust metal ring of FORK OIL LEVEL GAUGE (Part No. HD-59000B) to specification in Table 2-14.
5. See Figure 2-54. With the fork tube bottomed in the fork slider, insert tube of gauge until metal ring rests flat on top of fork tube.
6. Use oil level gauge plunger to draw oil from fork. If no oil is drawn out, add a small amount to the fork tube and repeat.
7. Install fork spring into fork tube with the tighter wound coils at the bottom.
8. Remove fork slider from fork holding tool. Clamp fork tube into fork tube holder.
9. See Figure 2-57. Install **new** O-ring (4) onto fork tube plug (3). Install fork tube plug and tighten to 60-70 ft-lbs (81.4-94.9 Nm).
10. Install **new** quad ring seal (2) onto fork cap bolt (1) and install into fork tube plug to prevent loss of fork oil while handling.
11. On right side fork, loosely install axle holder with flat washers, lockwashers and nuts.
12. Install fork and assemble motorcycle. See 2.17 FRONT FORK, Installation.

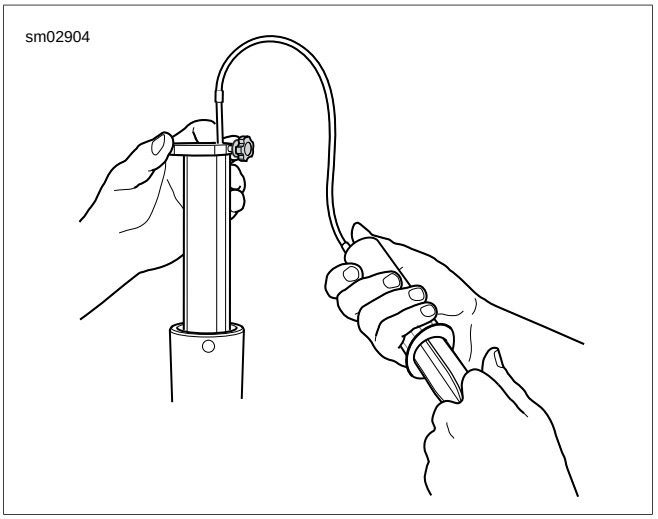
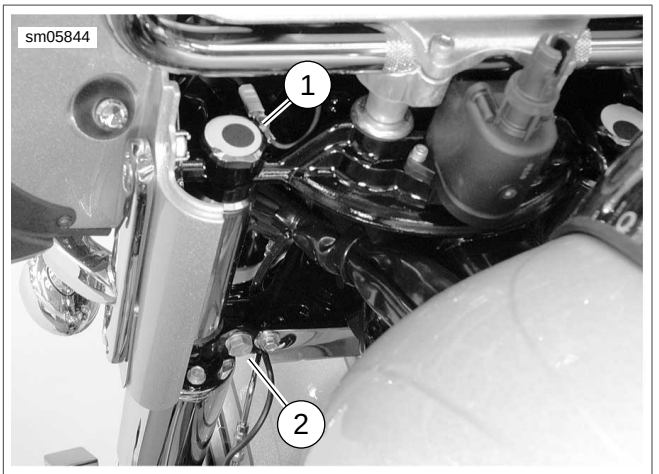


Figure 2-54. Remove Excess Fork Oil



1. **Fork cap bolt**
2. **Pinch bolt**

Figure 2-55. Front Fork Attachment (FLHR/C Shown)

REMOVAL

NOTICE

When lifting a motorcycle using a jack, be sure jack contacts both lower frame tubes where down tubes and lower frame tubes converge. Never lift by jacking on crossmembers, oil pan or other housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586c)

1. Raise the front wheel with a suitable lifting device.
2. Remove the front wheel and fender. See 2.45 FRONT FENDER and 2.4 FRONT WHEEL.
3. **Road King Models:** Remove headlamp nacelle. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.
4. **Fork Mounted Fairing Models:** Remove inner fairing cap. See 2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS.
5. **Frame Mounted Fairing Models:** Remove instrument nacelle. See 2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS.
6. See Figure 2-55. Loosen fork cap bolt (1), but do not remove.
7. Loosen pinch bolt (2), but do not remove.
8. Holding fork slider to prevent fork from dropping, remove fork cap bolt from fork tube plug. Slide fork tube down to remove.
9. Loosely install fork cap bolt to prevent loss of fork oil while handling.

DISASSEMBLY

1. Remove the fork assembly. See 2.17 FRONT FORK, Removal.
2. On right side fork, remove axle holder from end of fork slider.

NOTICE

Exercise caution to avoid scratching or nicking fork tube. Damaging tube can result in fork oil leaks after assembly. (00421b)

3. Drain fork. See 2.17 FRONT FORK, Changing Fork Oil.
4. Install fork spring into fork tube.
5. See Figure 2-57. Place a shop cloth on the floor and turn fork assembly upside down, pressing end of spring against rag to prevent rotation of damper tube. Remove screw (22) (metric) from end of fork slider. Use an air impact wrench for best results. Discard screw and copper washer (21).
6. Remove fork spring (5), damper valve (6) (if equipped) and damper tube (9) from fork tube.
7. Remove wear ring (8) and rebound spring (10) from damper tube. Remove wear ring (7) from damper valve, if equipped.

NOTE

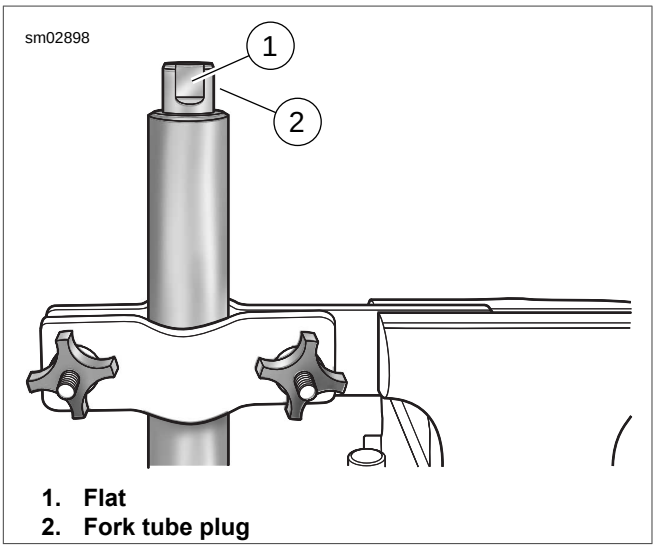
Do not expand or stretch retaining clip to remove from fork tube or clip may become bent or distorted.

8. Remove retaining clip (12) using a pick tool.
9. Remove fork tube from fork slider.

NOTE

Use the fork tube as a slide hammer to aid in fork tube removal.

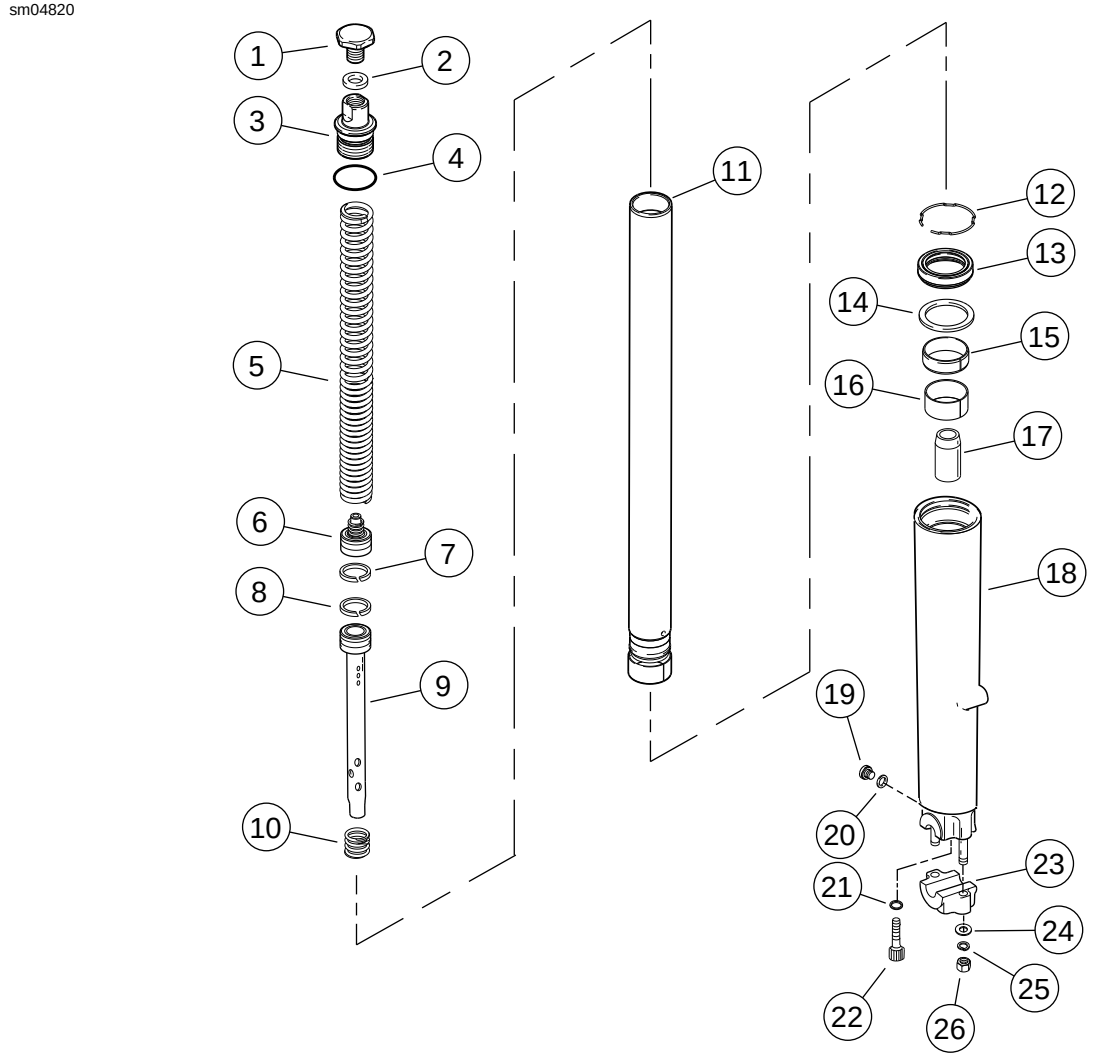
10. Slide fork oil seal (13), slider spacer (14) and slider bushing (15) off end of fork tube. Discard fork oil seal and slider bushing.
11. Gently pry at split line to expand fork leg bushing (16) and remove from groove at end of fork tube. Discard fork leg bushing.
12. Remove lower stop (17) from fork slider.



1. **Flat**
2. **Fork tube plug**

Figure 2-56. Install Fork Tube Into Fork Holder

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Fork cap bolt**
2. **Quad ring seal**
3. **Fork tube plug**
4. **O-ring**
5. **Spring**
6. **Damper valve (Fairing equipped only)**
7. **Wear ring (Fairing equipped only)**
8. **Wear ring**
9. **Damper tube**
10. **Rebound spring**
11. **Fork tube**
12. **Retaining clip**
13. **Lip seal**
14. **Slider spacer**
15. **Slider bushing**
16. **Fork leg bushing**
17. **Lower stop**
18. **Fork slider**
19. **Plug**
20. **Flat washer**
21. **Copper washer**
22. **Screw (6mm)**
23. **Axle holder**
24. **Flat washer (2)**
25. **Lockwasher (2)**
26. **Nut (2)**

Figure 2-57. Right Side Fork

CLEANING AND INSPECTION

1. Thoroughly clean and inspect all parts. Replace any parts that are bent, inoperative or obviously damaged.
2. Inspect fork cap bolt quad ring seal and fork tube plug o-ring for cuts, tears or signs of deterioration. Replace if necessary.
3. Replace retaining clip if bent or distorted.
4. Check slider and fork leg bushings for scratches or excessive wear. Always replace bushings in a set if either bushing is damaged or worn.

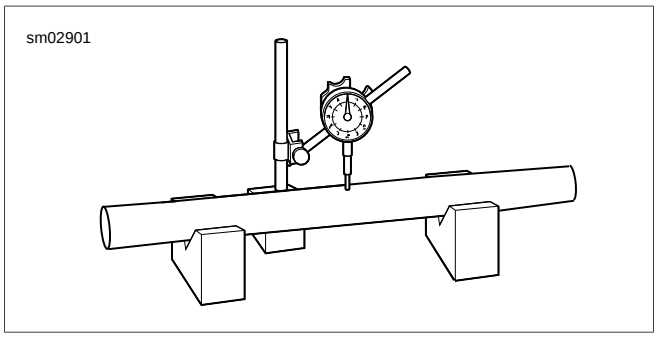


Figure 2-58. Measure Fork Tube Runout

5. See Figure 2-58. Check fork tube and slider for scoring, scratches and excessive or abnormal wear. Replace parts as necessary. Set fork tube on V-blocks and measure runout using a dial indicator gauge. Replace fork if runout exceeds 0.008 in. (0.2 mm).
6. Inspect upper fork spring and rebound spring for damage or distortion. Replace upper fork spring if free length is less than:
   a. **Non-Fairing Models:** 19.27 in. (489.4 mm).
   b. **Fairing Models:** 18.73 in. (475.7 mm).

   Replace rebound spring if free length is less than 0.938 in. (23.8 mm) or any time the upper fork spring is replaced.

ASSEMBLY

PART NUMBER	TOOL NAME
HD-34634	FORK OIL SEAL INSTALLER
HD-41177	FORK HOLDING TOOL

NOTICE

Exercise caution to avoid scratching or nicking fork tube. Damaging tube can result in fork oil leaks after assembly. (00421b)

1. See Figure 2-57. Coat ID of fork leg bushing (16) with clean fork oil. Expand fork leg bushing at split line only enough to slip over end and into groove of fork tube.
2. Install **new** wear ring (8) in groove at top of damper tube (9). Install rebound spring (10) on opposite end.
3. With the wear ring topside, slide damper tube into fork tube, so that tube end drops through hole at bottom of fork tube. Install lower stop (17) at end of damper tube.
4. Install fork slider in FORK HOLDING TOOL (Part No. HD-41177). Slide fork tube into fork slider.
5. Coat ID of slider bushing (15) with clean fork oil. Slide slider bushing down fork tube.
6. Slide FORK OIL SEAL INSTALLER (Part No. HD-34634) down the fork tube, and using the tool like a slide hammer, drive slider bushing into the counterbore of the fork slider. Remove tool.

NOTE

Place masking tape over edge of fork tube to avoid damaging lip of fork oil seal during installation.

7. See Figure 2-57. Coat ID of **new** fork oil seal (13) with clean fork oil. With the lip garter spring side facing down (toward the fork slider), slide seal down fork tube until it contacts slider spacer (14). Remove masking tape from edge of fork tube.
8. See Figure 2-59. Using the tool like a slide hammer, drive fork oil seal down fork tube until retaining clip groove is visible in fork slider ID. Remove tool.

NOTE

Do not expand or stretch retaining clip to install on fork tube or clip may become bent or distorted.

9. See Figure 2-57. Install retaining clip (12) in the fork slider groove.
10. Install fork spring (5) into fork tube.
11. Remove fork assembly from fork holding tool.

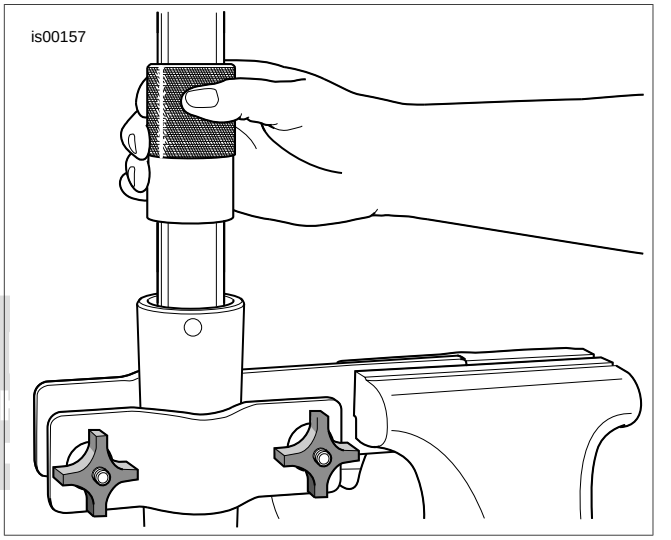


Figure 2-59. Install Fork Oil Seal

12. Place a shop cloth on the floor. Turn fork assembly upside down and press end of spring against rag to prevent rotation of damper tube.
13. Install **new** screw (22) with **new** copper crush washer (21) at bottom of fork slider.
14. While compressing spring, tighten screw to 132-216 **in-lbs** (14.9-24.4 Nm).
15. Remove fork spring from fork tube.
16. Fill fork and complete assembly. See 2.17 FRONT FORK, Changing Fork Oil.
17. On right side fork, loosely install axle holder with flat washers, lockwashers and nuts on fork slider.

INSTALLATION

1. Remove fork cap bolt.
2. Slide fork tube up and into slider cover, lower fork bracket, fork stop, and upper fork bracket. Install fork cap bolt.

3. See Figure 2-55. Install pinch bolt (2) (with lockwasher) in lower fork bracket. Tighten pinch bolt to 53-57 ft-lbs (71.9-77.3 Nm).
4. Tighten fork cap bolt (1) to 60-70 ft-lbs (81.4-94.9 Nm).
5. Repeat previous steps on other fork, if removed.
6. Install the front fender and wheel. See 2.45 FRONT FENDER and 2.4 FRONT WHEEL.
7. **FLHR/C:** Install headlamp nacelle. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.
8. **FLHX, FLHTC/U, FLHTK:** Install fairing inner cap. See 2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS.
9. **FLTRX, FLTRU:** Install instrument nacelle. See 2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS.

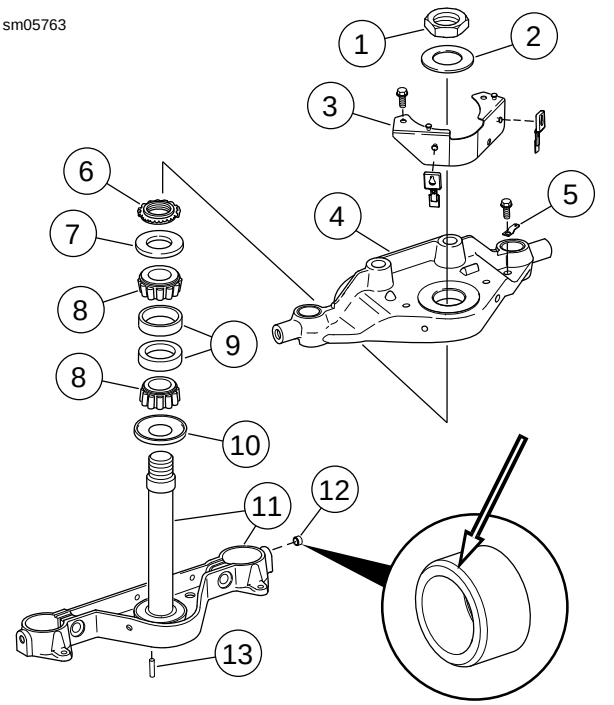
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

STEERING HEAD BEARINGS 2.18

REMOVAL

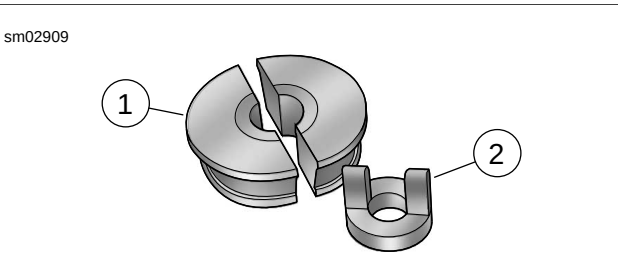
PART NUMBER	TOOL NAME
HD-33416	UNIVERSAL DRIVER
HD-39301A	STEERING HEAD BEARING CUP REMOVER

1. Disassemble motorcycle as follows:
   a. **FLHR/C:** Remove headlamp nacelle. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.
   b. **FLHX, FLHTC/U, FLHTK:** Remove the auxiliary lamp bracket, outer fairing and radio. See 7.13 AUXILIARY LAMPS AND BRACKETS, 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS and 7.33 ADVANCED AUDIO SYSTEM, respectively.
   c. **FLTRX, FLTRU:** Remove instrument nacelle. See 2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS.
2. Remove front forks. See 2.17 FRONT FORK.



1. **Fork stem nut**
2. **Hardened flat washer**
3. **Bracket**
4. **Upper fork bracket**
5. **Spade contact**
6. **Bearing adjuster nut**
7. **Dust shield**
8. **Bearing cone**
9. **Bearing cup**
10. **Dust shield**
11. **Lower fork bracket and stem assembly**
12. **Bushing (2) (FLHTC/U, FLHTK, FLHX)**
13. **Roll pin**

Figure 2-60. Steering Head/Fork Bracket Assembly



1. **Remover**
2. **Collet**

Figure 2-61. Steering Head Bearing Cup Remover (Part No. HD-39301A)

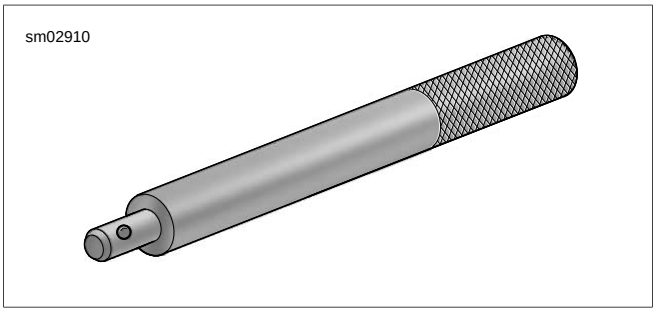


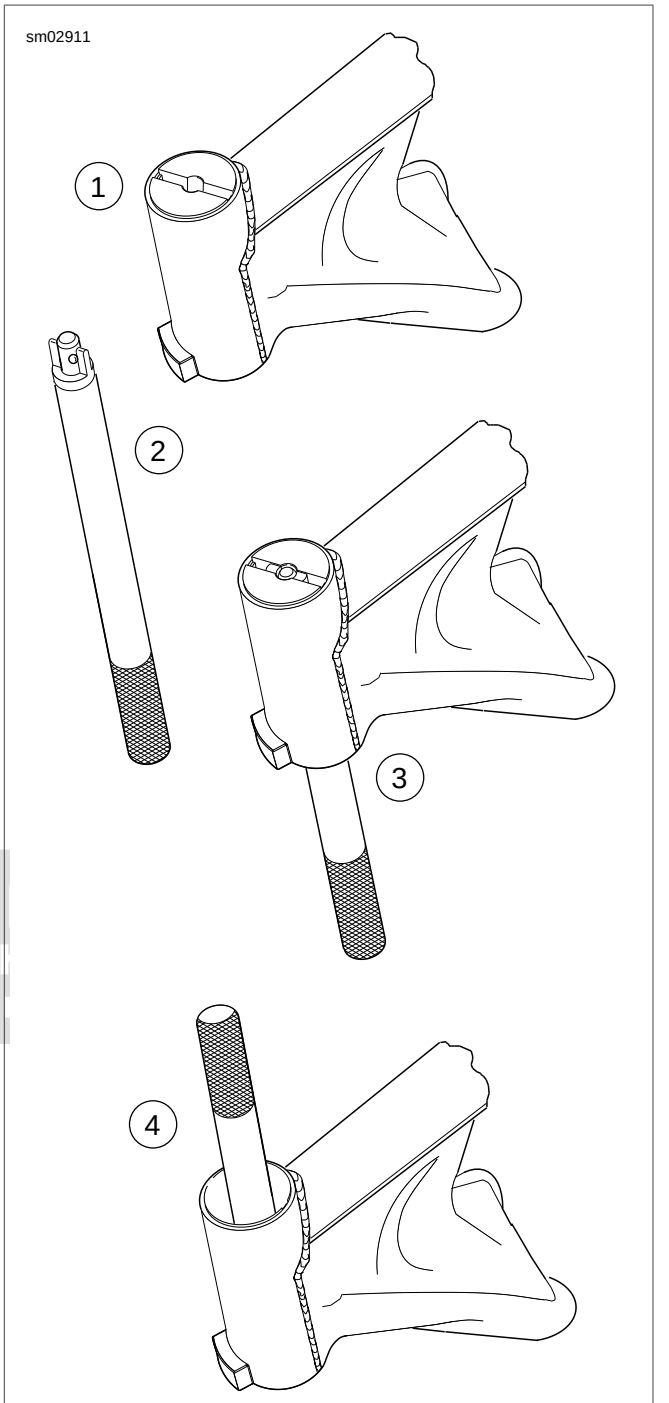
Figure 2-62. Universal Driver (Part No. HD-33416)

3. Release brake line bracket from lower fork bracket.
4. See Figure 2-60. Remove fork stem nut (1) and hardened flat washer (2).

NOTE

Bracket (3) does not need to be removed unless it or the upper fork bracket are to be replaced.

5. Disconnect ignition switch [33], left handlebar switch [24], right handlebar switch [22] and twist grip sensor jumper harness [204] connectors. On fairing equipped motorcycles, remove interconnect harness ground socket terminal from spade contact at front of upper fork bracket (left side).
6. Remove upper fork bracket (4).
7. Remove bearing adjuster nut (6).
8. Using a rubber mallet, tap on stem of lower fork bracket (11) and remove lower fork bracket.
9. Remove dust shield (7) and upper bearing cone (8).
10. Remove lower bearing cone (8) and dust shield (10) from stem of lower fork bracket.
11. See Figure 2-63. With the tapered side down, seat STEERING HEAD BEARING CUP REMOVER (Part No. HD-39301A) on the upper bearing cup leaving a gap in the middle.
12. See Figure 2-61. Install collet (2) on driver.
13. Insert UNIVERSAL DRIVER (Part No. HD-33416) driver up through bottom of steering head, and while holding remover tool on upper bearing cup, center collet in gap. Tap driver to remove upper bearing cup.
14. Reverse tool and repeat procedure to remove lower bearing cup.



1. **Install remover on upper cup**
2. **Install collet on driver**
3. **Install driver in remover and remove upper cup**
4. **Remove lower cup**

Figure 2-63. Remove Steering Head Bearing Cups

INSPECTION

1. Check the bearing races in the steering head. If pitted or grooved, replace both the bearings and races.
2. Turn bearings in races. Replace the bearings if they do not move freely and smoothly. Always replace both races and bearings even if one race and bearing appears good.

INSTALLATION

PART NUMBER	TOOL NAME
HD-39302	STEERING HEAD BEARING CUP INSTALLER

⚠WARNING

Properly seat bearing cups in steering head bore. Improper seating can loosen fork stem bearings adversely affecting stability and handling, which could result in death or serious injury. (00302a)

NOTE

If bearing races are replaced, the bearing cones must also be replaced.

1. See Figure 2-64. If removed, install **new** bearing cups using STEERING HEAD BEARING CUP INSTALLER (Part No. HD-39302).
2. See Figure 2-60. If installing a **new** bracket and stem assembly (11), press in **new** roll pin (13) and guide bushings (12) (FLHTC/U, FLHTK, FLHX models only) as shown. Be sure to install bushings with outer chamfer toward bracket.
3. Pack **new** bearing cones with Harley-Davidson SPECIAL PURPOSE GREASE (Part No. 99857-97).
4. Install **new** dust shield and bearing cone on fork stem (both are installed on **new** bracket and stem assembly). Be sure both are securely seated.
5. Insert stem of lower fork bracket into steering head.
6. Install upper bearing cone and **new** dust shield until flush with top of steering head.
7. Install bearing adjuster nut and snug until bearing play is taken up and stem turns freely. Overtightening nut will cause excessive bearing wear.
8. Install upper fork bracket.

NOTE

The washer under the fork stem nut is a special hardened material. Never replace this washer with a common flat washer. Doing so may allow the fork stem nut to loosen resulting in loss of steering control.

9. Install hardened flat washer and stem nut. Do not tighten stem nut at this time.

⚠WARNING

Properly adjust fork stem bearings. Improper adjustments affect stability and handling, which could result in death or serious injury. (00301a)

10. Adjust bearings. See 1.20 STEERING HEAD BEARINGS.

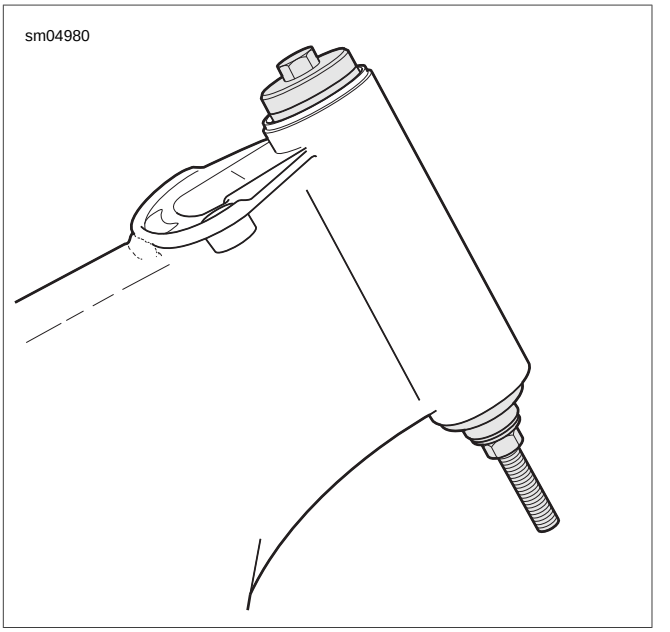


Figure 2-64. Install Steering Head Bearing Cups

11. Connect ignition switch [33], left handlebar switch [24], right handlebar switch [22] and twist grip sensor jumper harness [204] connectors. On fairing equipped motorcycles, connect interconnect harness ground socket terminal to spade contact at front of upper fork bracket (left side).
12. Install front forks. See 2.17 FRONT FORK.
13. Attach brake line bracket to bottom of lower fork bracket. Verify that brake lines to calipers are equal distance from the left and right fork sliders. Tighten screw to 120-180 **in-lbs** (13.6-20.3 Nm).
14. Assemble motorcycle as follows:
    a. **FLHR/C:** Install headlamp nacelle. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.
    b. **FLHX, FLHTC/U, FLHTK:** Install radio, outer fairing and auxiliary lamp bracket. See 7.33 ADVANCED AUDIO SYSTEM, 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS and 7.13 AUXILIARY LAMPS AND BRACKETS, respectively.
    c. **FLTRX, FLTRU:** Install instrument nacelle. See 2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS.

DIGITECHNICIAN II HARLEY-DAVIDSON

REAR AIR SUSPENSION 2.19

CHECK FOR AIR LEAKS

PART NUMBER	TOOL NAME
HD-34633A	AIR SUSPENSION PUMP AND GAUGE

⚠WARNING

Use caution when bleeding air from the suspension. Moisture combined with lubricant may leak onto the rear wheel, tire and/or brake components and adversely affect traction, which could result in death or serious injury. (00084a)

NOTES

- *Remove and replace components as necessary to access air suspension system components.*
- *Always release air pressure from system before removing any component from the suspension system. To purge tubes of any oil, add 3-5 psi (20.7-34.5 kPa) before releasing air.*

1. Verify that valve core is properly tightened and not leaking.
2. Adjust air pressure using AIR SUSPENSION PUMP AND GAUGE (Part No. HD-34633A). See 1.19 SUSPENSION ADJUSTMENTS.
3. Apply a light film of soapy water on all compression fittings at the top of each shock absorber and around the air valve including the core area. Pressurize system.
   a. If leakage is evident, repair or replace damaged components as necessary.
   b. If no leaks were evident at the fittings, inspect the air tubes for damage that may result in air leaks. Apply soapy water to the suspect area and look for leakage.
   c. If the tubes show no evidence of leakage, a damaged shock absorber is likely the fault. Allow the motorcycle to set overnight. If a loss of 5-10 psi (34.5-68.9 kPa) is noted, replace the shock absorbers, one at a time, and retest.
4. Pressurize system and check for leaks when repairs are completed.
5. Install protective cap on air valve.

Compression Fitting

1. Disconnect air tube and remove compression fitting from shock absorber.
2. Apply PIPE SEALANT WITH TEFLON to the threads of a **new** compression fitting and install. Tighten to 12-17 ft-lbs (16.3-23.0 Nm).
3. Insert the air tube and gently tug on tube to verify that it is secure in fitting.

Air Valve Assembly

1. See Figure 2-65. Remove hex nut (2).
2. Remove Air inlet tee assembly (4).
3. Install the air valve assembly and secure with hex nut (2) (flat side facing inboard). Tighten nut to 40-50 **in-lbs** (4.5-5.6 Nm).

Air Tubes

1. Remove the seat. See 2.25 SEAT.

NOTE

Take note of air tube routing.

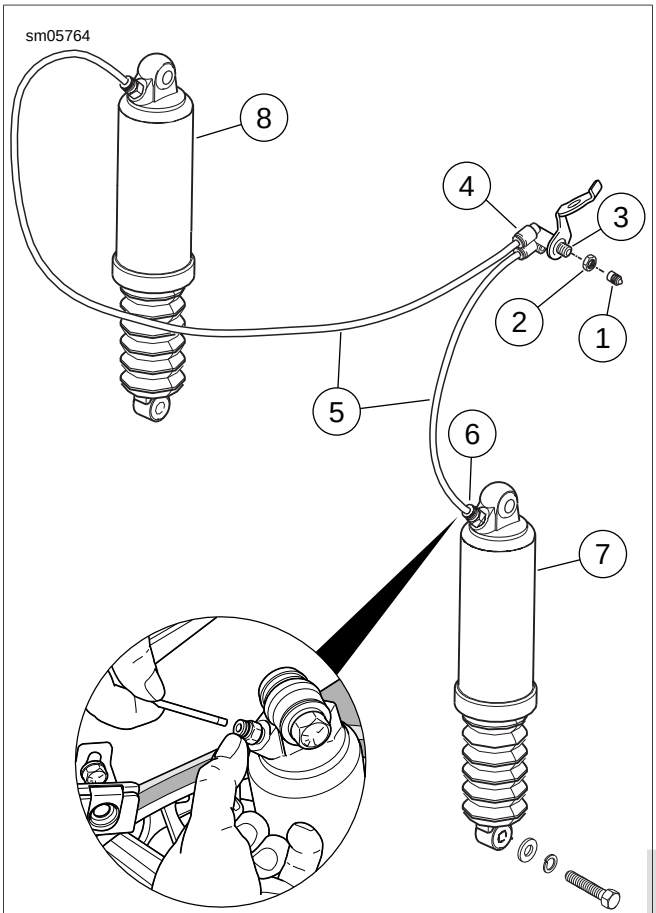
2. Remove tubes from air valve assembly and shock absorbers.
3. Cut bulk tubing to proper length.
4. Install **new** tubes into fittings following the original routing. Gently tug on tube to verify that it is secure in fitting.

⚠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)

5. Install the seat. See 2.25 SEAT.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Protective cap**
2. **Hex nut**
3. **Air valve and mounting bracket**
4. **Air inlet tee**
5. **Shock air inlet tube**
6. **Air tube fitting**
7. **Left shock**
8. **Right shock**

Figure 2-65. Rear Air Suspension System

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

REAR SHOCK ABSORBERS 2.20

REMOVAL

PART NUMBER	TOOL NAME
HD-34633	AIR SUSPENSION PUMP AND GAUGE

NOTE

If replacing both shock absorbers, remove and install one at a time.

NOTICE

When lifting a motorcycle using a jack, be sure jack contacts both lower frame tubes where down tubes and lower frame tubes converge. Never lift by jacking on cross-members, oil pan or other housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586c)

1. Raise the motorcycle with a suitable lifting device until the rear tire is just touching.
2. Remove saddlebags. See 2.26 SADDLEBAGS.

⚠WARNING

Use caution when bleeding air from the suspension. Moisture combined with lubricant may leak onto the rear wheel, tire and/or brake components and adversely affect traction, which could result in death or serious injury. (00084a)

3. Bleed air from the system and remove the air tube from the air tube fitting. To purge lines of any oil, add 3-5 psi (20.7-34.5 kPa) using the no-loss AIR SUSPENSION PUMP AND GAUGE (Part No. HD-34633) before releasing air.
4. Remove the upper shock absorber mounting bolt, lockwasher and flat washer.
5. Remove the lower mounting bolt, lockwasher and flat washer. Remove the shock absorber assembly from the motorcycle.

NOTE

Never lay the shock absorber down. Always keep the shock absorber upright to prevent oil from draining out through the compression fitting. Any loss of oil requires replacement of the shock absorber.

CLEANING AND INSPECTION

1. Examine the rubber mounting bushings for cracks or wear. Examine the shock for leaks. The unit should not leak and should compress slightly easier than it extends. Compare the action of the shock with a **new** one to judge if it is worn. Replace the shock if necessary.
2. Clean and examine the shock mounting hardware. Replace parts that are worn or damaged.

DISASSEMBLY AND ASSEMBLY

NOTE

Other than air tube fittings, air shocks are not repairable. Replace the shocks if damaged, worn or any sign of leakage is observed.

1. If necessary, remove the air tube fitting form the shock absorber.
2. Apply PIPE SEALANT WITH TEFLON to the threads of a **new** air tube fitting and install. Tighten to 12-17 ft-lbs (16.3-23.0 Nm).

INSTALLATION

NOTE

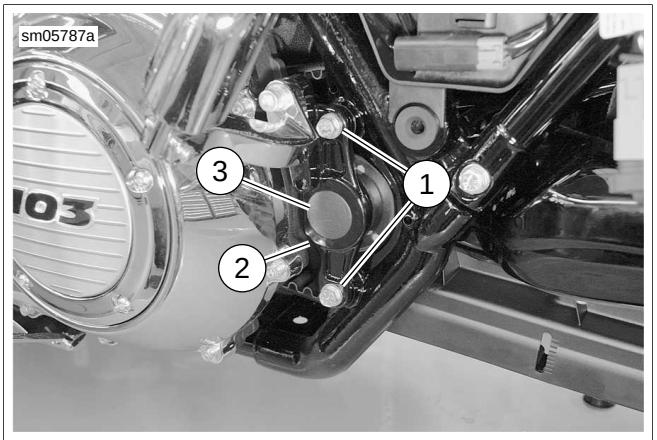
Never lay the shock absorber down. Always keep the shock absorber upright to prevent oil from draining out through the compression fitting. Any loss of oil requires replacement of the shock absorber.

1. Apply two or three drops of LOCTITE MEDIUM STRENGTH THREADLOCKER 243 (blue) to threads of each mounting bolt.
2. Install lower shock mounting bolt, lockwasher and flat washer. Tighten bolt to 35-40 ft-lbs (47.5-54.2 Nm).
3. Install upper shock mounting bolt, lockwasher and flat washer. Tighten bolt to 35-40 ft-lbs (47.5-54.2 Nm).
4. Insert air tube into air tube fitting until it bottoms. Gently tug on tube to verify that it is locked in place.
5. Pressurize rear air suspension system and check for leaks. See 1.19 SUSPENSION ADJUSTMENTS and 2.19 REAR AIR SUSPENSION.
6. Install saddlebags. See 2.26 SADDLEBAGS, Installation.

REAR FORK 2.21

REMOVAL

1. Raise the motorcycle with a suitable lifting device. Support the rear of the transmission with a second jack or slide a block of wood between the oil pan and frame cross member to support the weight of the transmission once the pivot shaft is removed.
2. Remove rear wheel. See 2.5 REAR WHEEL.
3. Remove caliper and bracket from anchor weldment on rear fork.
4. Remove belt guard from bottom of left side fork.
5. Loosen both lower shock absorber mounting bolts but do not remove at this time.
6. See Figure 2-66. Remove two screws (1) to free rear fork bracket (2) with foot rest from left side of motorcycle frame.
7. Release rear brake line hose and rear wheel speed sensor (if ABS equipped) from cable clips on right side of rear fork.
8. Remove plug from right side.
9. See Figure 2-67. Hold left side screw and remove right side screw from end of pivot shaft. Remove outer spacer.
10. Using a suitable drift, tap pivot shaft toward left side of motorcycle.
11. See Figure 2-68. Pull pivot shaft assembly with screw, outer spacer, rubber mount and middle spacer out of transmission mount and left side fork.
12. Remove lower shock absorber bolts and work rear fork free of transmission mount and rear fork brackets.
13. Remove middle spacer from right side fork tube.
14. Remove rubber mount from right side.



1. **Screws**
2. **Fork bracket**
3. **Plug**

Figure 2-66. Rear Fork Mount Bracket

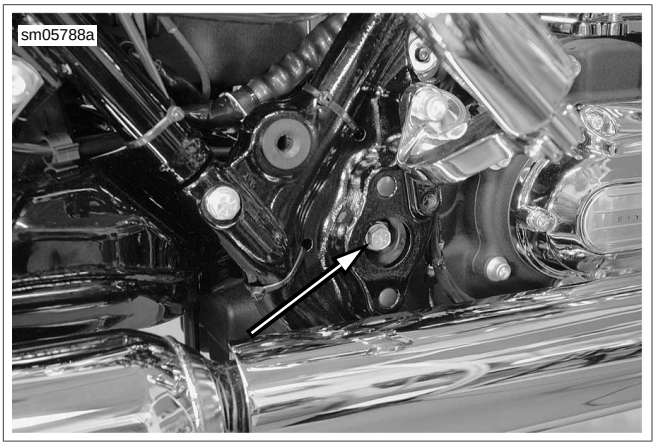
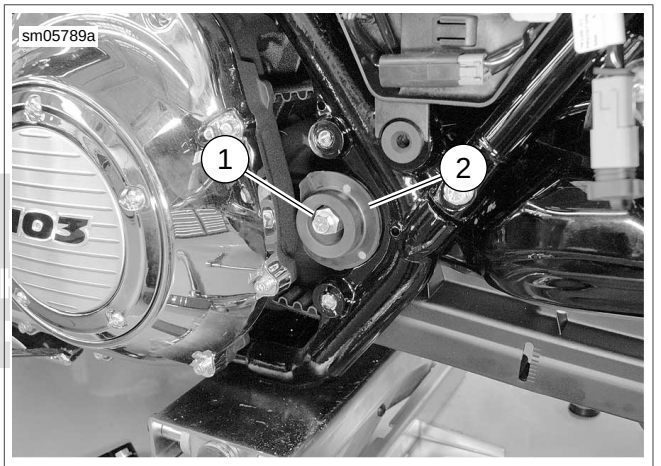


Figure 2-67. Right Side Mount



1. **Screw, pivot shaft**
2. **Left mount**

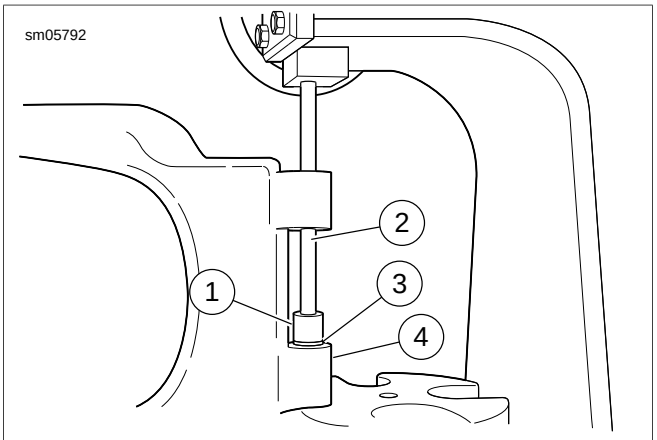
Figure 2-68. Left Side Mount and Pivot Shaft Assembly

DISASSEMBLY AND ASSEMBLY

PART NUMBER	TOOL NAME
HD-45327	REAR FORK BEARING INSTALLER

Bearing Removal

1. See Figure 2-69. Select a driver (1) slightly smaller than the bearing spacer and a rod (2) long enough to allow pressing through upper bearing. Slide socket extension through the brake side bearing and install socket on extension.
2. Support the fork (4) in a press with brake anchor weldment on top. Verify that assembly is square and the bearing bore is completely vertical.



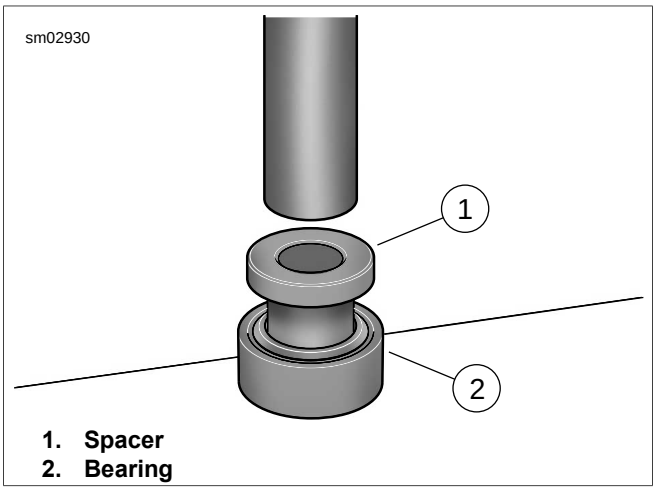
1. **Driver**
2. **Rod**
3. **Bearing/spacer assembly**
4. **Rear fork**

Figure 2-69. Remove Rear Fork Bearing

3. Center rod under ram and press bearing/spacer assembly (3) from rear fork.
4. Remove tools from rear fork. Turn fork over and press out brake side bearing in same manner.
5. If bearings are to be replaced with **new**, press bushings out and retain for later use.

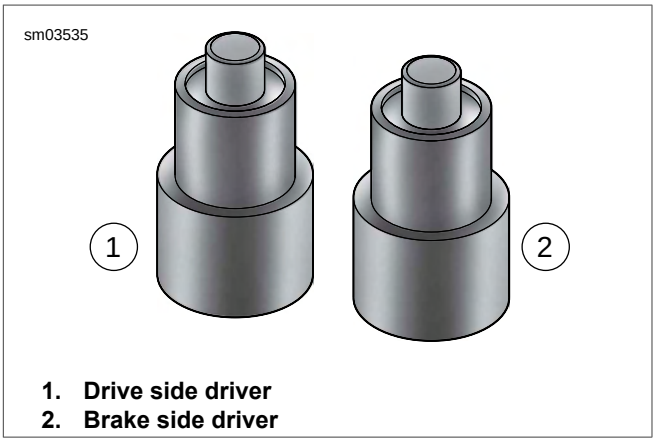
Bearing Installation

1. Assemble **new** rear fork bearings as follows:
   a. Place bearing flat on suitable press plate.
   b. See Figure 2-70. With the collar topside, start spacer into bearing.
   c. Press spacer until it bottoms against press plate.



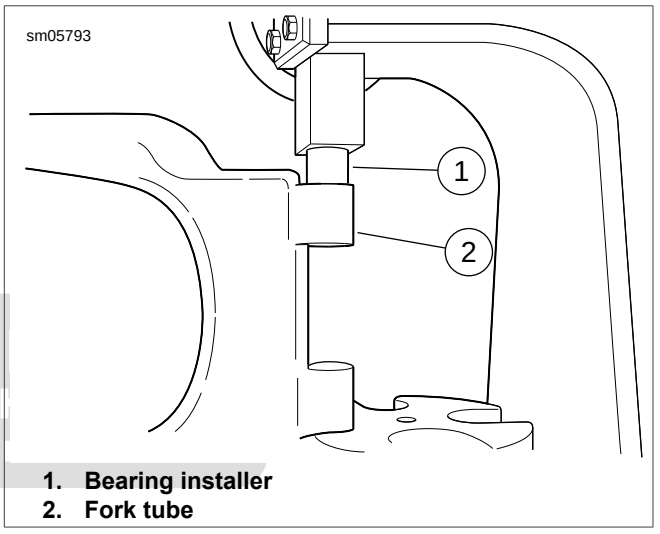
1. **Spacer**
2. **Bearing**

Figure 2-70. Press Spacer into Bearing



1. **Drive side driver**
2. **Brake side driver**

Figure 2-71. Rear Fork Bearing Installer



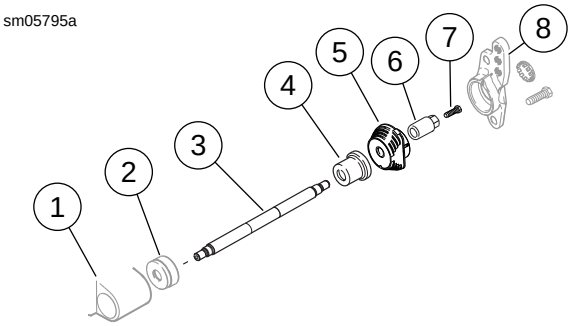
1. **Bearing installer**
2. **Fork tube**

Figure 2-72. Install Rear Fork Bearing (typical)

2. Coat the bearing bores in the rear fork with a light coat of Special Purpose Grease (Part No. 99857-97).
3. See Figure 2-72. Support fork squarely on press bed with the brake anchor weldment on top.
4. Insert bearing into fork assembly with spacer down.
5. Using REAR FORK BEARING INSTALLER (Part No. HD-45327) (1) stamped "Brake Side", center driver under ram and press on bearing until shoulder on tool makes contact with fork tube (2).
6. Remove tool and turn rear fork over. Repeat process with remaining bearing using tool stamped "Drive Side". Press bearing until it bottoms. Shoulder on tool will **not** make contact with fork tube.

Pivot Shaft/Mount Disassembly

1. See Figure 2-73. Remove screw (7).
2. Remove outer spacer (6), rubber mount (5) and middle spacer (4).



1. **Rear fork assembly**
2. **Bearing/spacer assembly**
3. **Pivot shaft**
4. **Middle spacer**
5. **Mount**
6. **Outer spacer**
7. **Screw**
8. **Fork bracket**

Figure 2-73. Pivot Shaft Components

INSTALLATION

1. See Figure 2-74. With the slot on the outboard side between the twelve and one o'clock positions, install rubber mount on inner-right side of frame. Be sure that index tab in mount cavity fully engages slot in rubber mount.
2. Place middle spacer into right side fork tube.
3. Hold middle spacer in fork tube and move the fork into approximate position. Loosely install lower shock absorber screws.
4. Work the rear fork into position between the transmission mount and the right-rear fork mount. If necessary, carefully tap fork into position using a rubber mallet.
5. Coat pivot shaft with SILVER GRADE ANTI-SEIZE (Part No. 98960-97). Avoid getting anti-seize on threads of pivot shaft.
6. See Figure 2-68. Slide pivot shaft from left side of motorcycle through left side fork and transmission mount. Guide end of pivot shaft through hole in right rubber mount.
7. See Figure 2-73. Slide middle spacer (4) onto left end of pivot shaft (3) until seated on shoulder of shaft.
8. Install left rubber mount (5) with the flat side inboard toward outer spacer.
9. Install outer spacer (6).
10. See Figure 2-66. Rotate the left rubber mount so the slot is between the eleven and twelve o'clock positions. Install left side fork bracket (2) fitting index tab into rubber mount slot.
11. Apply two drops of Loctite Medium Strength Threadlocker 243 (blue) to threads of fork bracket screws (1) and secure left side fork bracket. Tighten screws to 55-65 ft-lbs (74.6-88.1 Nm). Remove plug (3) from left side.
12. See Figure 2-67. Apply two drops of Loctite Medium Strength Threadlocker 243 (blue) to threads of both pivot shaft screws and install.
13. Tighten both screws to 55-65 ft-lbs (74.6-88.2 Nm).
14. Verify that rear fork assembly moves freely.
15. Install plugs.
16. Remove lower shock mounting bolts and apply two or three drops of Loctite Medium Strength Threadlocker 243 (blue) to threads. Install bolts and tighten to 35-40 ft-lbs (47.5-54.2 Nm).
17. Install belt guard.
18. Seat caliper bracket on anchor weldment of rear fork.
19. Capture rear brake line hose in two cable clips at top of right side fork. Rear cable clip also captures rear wheel speed sensor cable on ABS equipped motorcycles.
20. Install rear wheel. See 2.5 REAR WHEEL.



Figure 2-74. Right-Side Mount

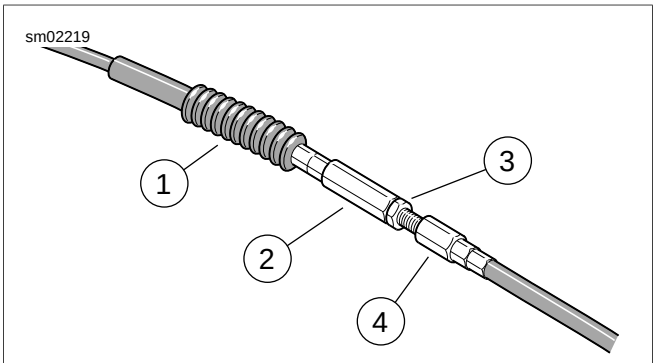
CLUTCH CABLE 2.22

REMOVAL

WARNING

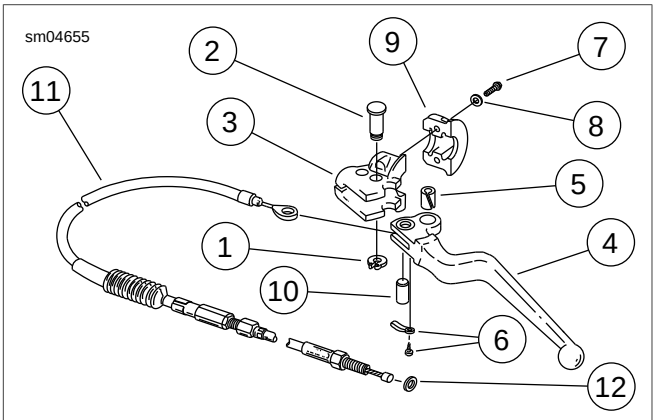
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove the main fuse.
2. Remove right side exhaust system. See 4.19 EXHAUST SYSTEM.
3. See Figure 2-75. Slide rubber boot off clutch cable adjuster. Loosen jam nut. Back away from cable adjuster. Move adjuster toward jam nut to introduce free play at hand lever.
4. See Figure 2-76. Remove retaining ring from pivot pin groove at bottom of clutch lever bracket. Remove pivot pin.
5. Remove clutch hand lever from clutch lever bracket. If necessary, remove handlebar clamp from clutch lever bracket.
6. Remove anchor pin and clutch cable eyelet from clutch hand lever.
7. Remove the magnetic drain plug at the bottom right side of the oil pan and drain the transmission lubricant into a suitable container. Remove the filler plug/dipstick.
8. Remove and disassemble clutch release cover. Remove and discard gasket. See 6.5 CLUTCH RELEASE COVER.



1. **Rubber boot**
2. **Cable adjuster**
3. **Jamnut**
4. **Cable end**

Figure 2-75. Clutch Cable Adjuster



1. **Retaining ring**
2. **Pivot pin**
3. **Clutch lever bracket**
4. **Hand lever**
5. **Bushing**
6. **Anti-rattle spring and screw**
7. **Screw**
8. **Flat washer**
9. **Handlebar clamp**
10. **Anchor pin**
11. **Clutch cable**
12. **O-ring**

Figure 2-76. Clutch Hand Lever Assembly

9. See Figure 2-79. Cut cable strap to free clutch cable from right frame downtube. Continue as follows:
   a. **Road King models:** See Figure 2-77. Remove acorn nut to release P-clamp from stud in upper fork bracket. Remove clutch cable from P-clamp.
   b. **Fork mounted fairing models:** See Figure 2-78. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS. Cut cable strap to release clutch cable from left fairing bracket.
   c. **Frame mounted fairing models:** Release clutch cable from cable clip anchored in hole on left side of instrument nacelle.
10. Remove clutch cable from motorcycle.

INSTALLATION

1. See Figure 2-76. Insert clutch cable eyelet into groove of clutch hand lever aligning eyelet with hole without bushing. Insert anchor pin through lever and eyelet.
2. Insert lever into groove of clutch lever bracket fitting sleeve at end of cable housing into bore on inboard side of bracket.
3. Align hole in hand lever with hole in bracket and install pivot pin. Install retaining ring in pivot pin groove.

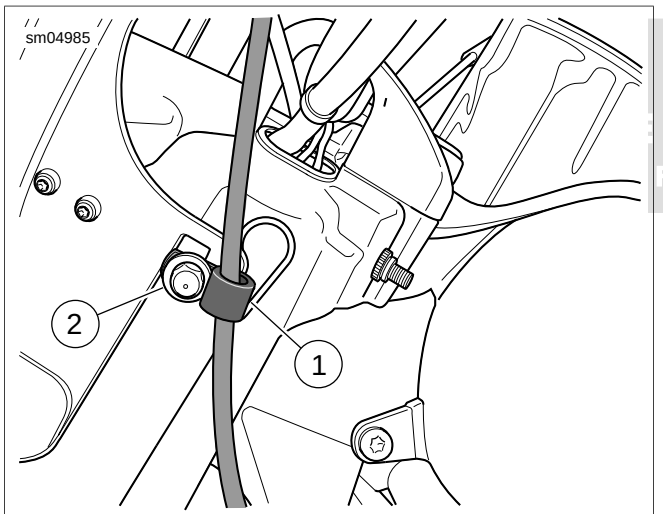
4. If removed, secure handlebar clamp to clutch lever bracket. Starting with the top screw, tighten screws to 72-108 **in-lbs** (8.1-12.0 Nm).

5. Start clutch cable routing as follows:

   a. **Road King models:** See Figure 2-77. Capture clutch cable in P-clamp (1) and secure to upper fork bracket with acorn nut (2). Route cable downward between engine guard and front of left frame downtube.

   b. **Fork mounted fairing models:** See Figure 2-78. Feed clutch cable through grommet on left side of inner fairing. Route cable on inboard side of left fairing bracket between upper and lower wings of radio (or storage box) support bracket. Secure cable to the oblong hole of left fairing bracket using a cable strap. Route cable downward between engine guard and front of left frame downtube. Install the outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.

   c. **Frame mounted fairing models:** Capture clutch cable in cable clip and anchor clip in hole on left side of instrument nacelle. Route cable forward and then rearward beneath instrument nacelle following left side of the steering head. Route cable downward between engine guard and front of left frame downtube.



1. **P-clamp**
2. **Acorn nut**

Figure 2-77. FLHR/C Clutch Cable Routing (Left Side View)

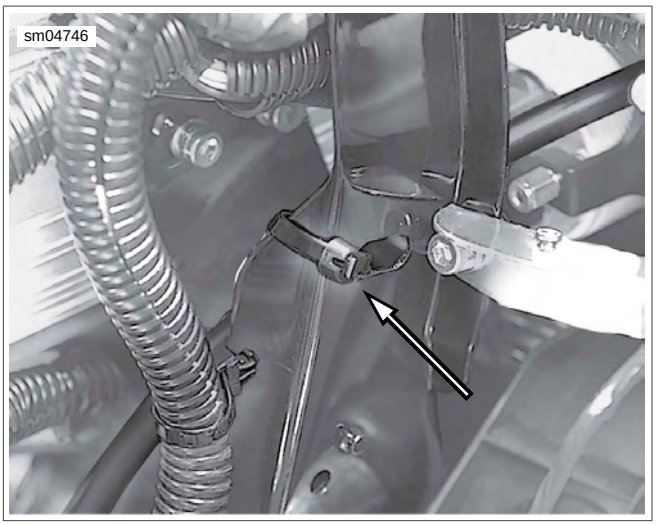
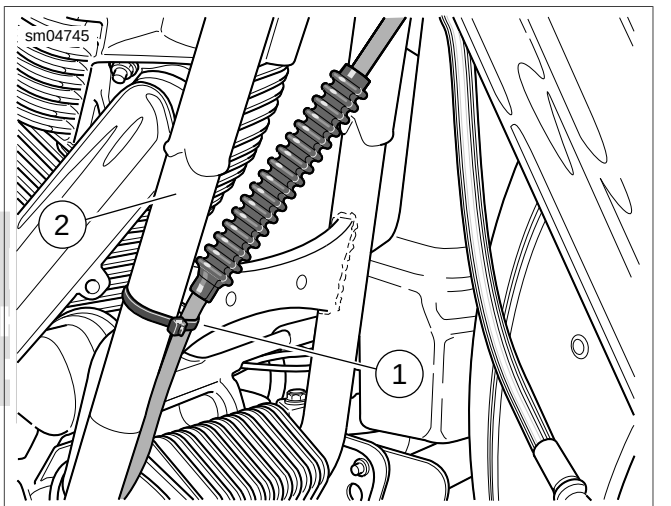


Figure 2-78. Secure Clutch Cable to Fairing Bracket



1. **Cable strap**
2. **Right frame downtube**

Figure 2-79. Clutch Cable Routing (Right Side View)

6. See Figure 2-79. Route the cable down and between voltage regulator and right frame downtube. Secure cable to downtube using a cable strap through the hole in the crossbrace. Follow the inboard side of the frame downtube, between the cam cover and the lower frame tube.

7. Assemble and install clutch release cover with **new** gasket. See 6.5 CLUTCH RELEASE COVER.

8. Check O-ring on the transmission drain plug for tears, cuts or general deterioration. Replace as necessary.

9. Install transmission drain plug. Tighten to 14-21 ft-lbs (19.0-28.5 Nm).

10. Fill transmission. See 1.10 TRANSMISSION LUBRICANT.

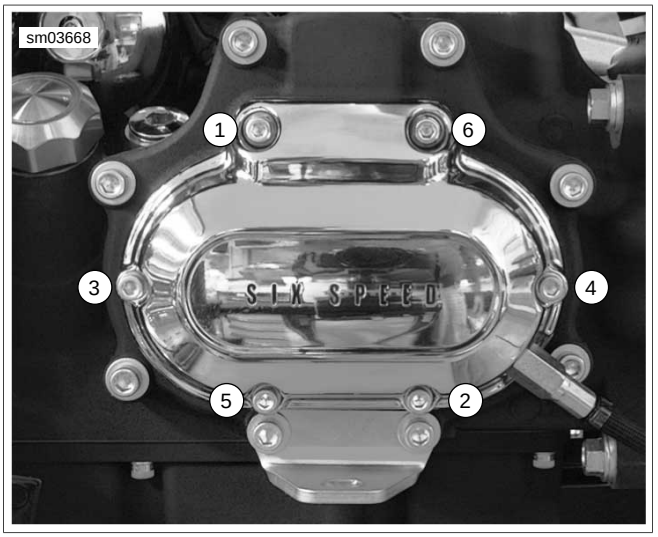


Figure 2-80. Clutch Release Cover Torque Sequence (Short Screws at Locations 1 and 6)

11. Adjust the clutch cable. See 1.11 CLUTCH.
12. Install right side exhaust system. See 4.19 EXHAUST SYSTEM.
13. Install the main fuse.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

ADJUSTMENT

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove the main fuse.
2. Gain access to upper handlebar clamp:
   a. **Road King models:** See Figure 2-81 and Figure 2-82. Remove decorative plate from handlebar clamp shroud.
   b. **Fork mounted fairing models:** Remove fairing cap. See 2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS.
   c. **Frame mounted fairing models:** Remove instrument bezel. See 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS.
3. Loosen rear screws on the upper handlebar clamp. On frame mounted fairing models, loosen the front screws instead.
4. Position handlebars for rider posture and comfort.
5. Verify that the knurled area on the outboard side of the left side handlebar clamp is equal to that on the right side.
6. Snug upper handlebar clamp screws.
7. Slowly turn handlebars to the full right fork stop and full left fork stop to be sure there is no contact with the fuel tank and adjust as necessary.
8. Tighten the upper handlebar clamp screws to 16-20 ft-lbs (21.7-27.1 Nm).
9. Reassemble:
   a. **Road King models:** See Figure 2-81. Install decorative plate onto handlebar clamp shroud.
   b. **Fork mounted fairing Models:** Install fairing cap. See 2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS.
   c. **Frame mounted fairing Models:** Install instrument bezel. See 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS.
10. If necessary, reposition the controls for rider comfort. Beginning with top screw, tighten clamp screws to 72-108 **in-lbs** (8.1-12.0 Nm).
11. Install the main fuse.



Figure 2-81. Remove Decorative Plate (FLHR/C)



Figure 2-82. Loosen Upper Handlebar Clamp Screws (FLHR/C)

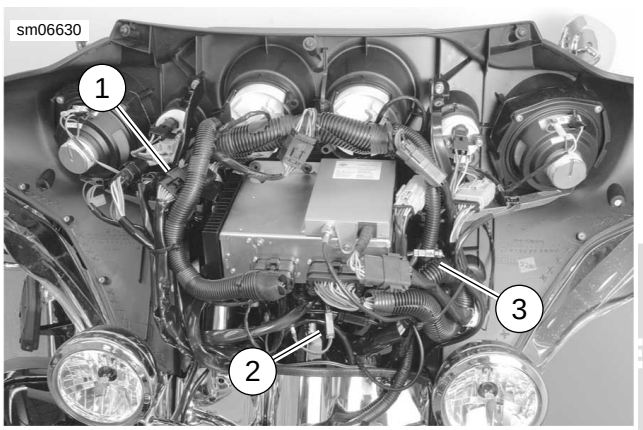
REMOVAL

1. Remove the main fuse.
2. Remove outer fairing or headlamp nacelle to gain access to harness connectors.
3. Disconnect twist grip sensor jumper harness. See 4.10 TWIST GRIP SENSOR.
4. See Figure 2-83. Disconnect heated handgrip harness (3) if equipped. It is not necessary to disconnect the handgrip interconnect harness (2).

NOTE

Cover painted surfaces to prevent scratches or other damage.

5. Gain access to upper handlebar clamp:
   a. **Road King models:** Remove handlebar clamp shroud. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.
   b. **Fork mounted fairing models:** Remove fairing cap. See 2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS. Remove radio (or storage box). See 7.33 ADVANCED AUDIO SYSTEM.
   c. **Frame mounted fairing models:** Remove instrument nacelle. See 2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS.
6. Remove right and left handlebar switch controls. See 7.40 HANDLEBAR SWITCH ASSEMBLIES.
7. Cut cable straps as necessary.
8. Remove upper handlebar clamp screws, upper handlebar clamp and handlebar.



1. **TGS jumper harness**
2. **Heated handgrip interconnect harness**
3. **Heated handgrip power**

Figure 2-83. Handlebar Harness Connectors (FLHTK)

INSTALLATION

1. Place handlebars on lower handlebar clamps. Install upper handlebar clamp and loosely install clamp screws.
2. Verify that the handlebars are centered, and snug upper handlebar clamp screws.
3. Slowly turn handlebars to the full right fork stop and full left fork stop to be sure there is no contact with the fuel tank and adjust as necessary.
4. Tighten handlebar clamp front screws until upper and lower handlebar clamps make contact.
5. Tighten clamp rear screws to 16-20 ft-lbs (21.7-27.1 Nm).
6. Tighten clamp front screws to 16-20 ft-lbs (21.7-27.1 Nm).

NOTE

A slight gap will exist between the upper and lower clamps at the rear of the handlebars after tightening.

7. Install right and left handlebar switch controls. See 7.40 HANDLEBAR SWITCH ASSEMBLIES.
8. Reassemble:
   a. **Road King models:** Install handlebar clamp shroud. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.
   b. **Fork mounted fairing models:** Install fairing cap. See 2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS. Install radio (or storage box). See 7.33 ADVANCED AUDIO SYSTEM.
   c. **Frame mounted fairing models:** Install instrument nacelle. See 2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS.
9. Connect twist grip sensor jumper harness. See 4.10 TWIST GRIP SENSOR.
10. See Figure 2-83. Connect heated handgrip harness (3), if equipped.
11. Secure harnesses as necessary with **new** cable straps.
12. Install outer fairing or headlamp nacelle.
13. Install the main fuse.

⚠WARNING

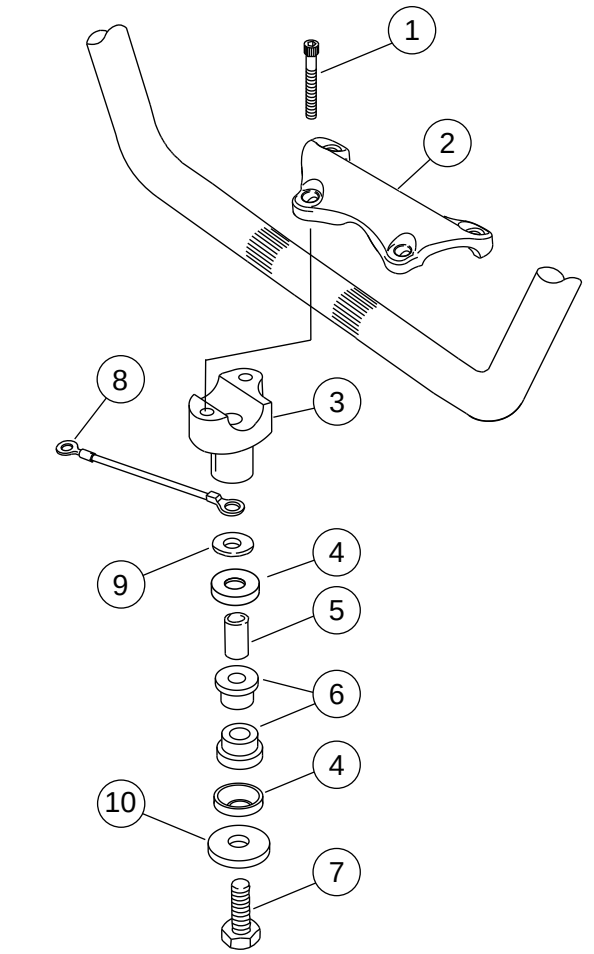
Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

14. Turn ignition/light key switch to IGNITION and test each handlebar switch for proper operation.

⚠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)

15. Apply front brake hand lever to test operation of brake lamp.



1. **Screw**
2. **Upper clamp**
3. **Lower clamp**
4. **Cup washer**
5. **Spacer**
6. **Rubber bushing**
7. **Bolt**
8. **Ground cable (left clamp only)**
9. **Flat washer (right clamp only)**
10. **Large flat washer (right clamp only)**

Figure 2-84. Handlebar Clamp Assemblies

LEFT HANDGRIP

Removal

NOTE

The following procedure is for a conventional left handgrip. If equipped with heated handgrips, see 2.23 HANDLEBARS, Heated Handgrips.

1. Remove left handlebar switch controls. See 7.40 HANDLEBAR SWITCH ASSEMBLIES.
2. Use a sharp blade to cut rubber and peel off handlebar.
3. Thoroughly clean handlebar to remove all residual adhesive.

Installation

1. Apply a coat of Harley-Davidson Adhesive (Part No. 99839-95) to the inside surface of the **new** grip 1.0 in. (25.4 mm) from the open end. Apply a coat to the end of the handlebar.

NOTE

Align the pattern with the pattern on the right grip (with the throttle fully closed).

2. Immediately push grip completely onto end of handlebar using a twisting motion. Do not hesitate when installing grip or adhesive may set before installation is complete.
3. Allow adhesive to cure for 6-8 hours at 70 °F (21 °C).
4. Install left handlebar switch controls. See 7.40 HANDLEBAR SWITCH ASSEMBLIES.

HEATED HANDGRIPS

Remove Left Handgrip

1. Remove main fuse.
2. Remove outer fairing.
3. See Figure 2-85. Disconnect and remove terminals from heated handgrip interconnect (1) and power (2) connectors.

NOTE

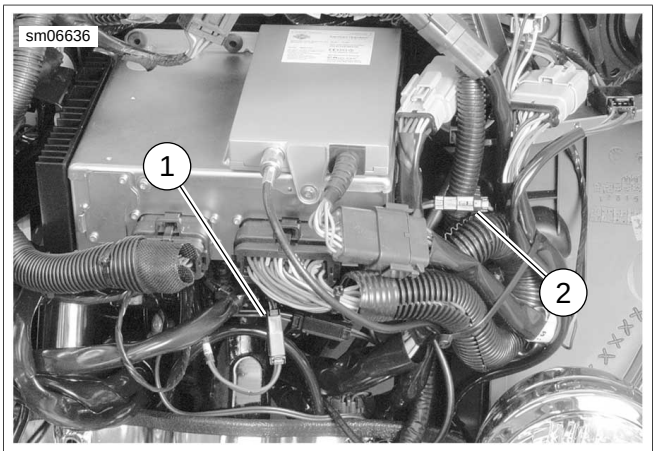
For connector service, see A.12 DEUTSCH DT SEALED CONNECTORS, Deutsch DT Sealed Connector Repair.

4. Fabricate a chaser wire made of mechanic's wire, approximately 3 ft (91.4 cm) long, and attach to the harnesses. Wrap two or three turns of chaser wire around terminals and wire leads of the harnesses, and wrap junction with electrical tape, covering terminals and end of chaser wire.
5. Bend last few inches of free end of chaser wire into an "L" shape to prevent it from being pulled too far into the handlebar.
6. Remove left handlebar switch housing and clutch lever. Allow to hang. See 7.40 HANDLEBAR SWITCH ASSEMBLIES.
7. Apply glass cleaner to harnesses to act as a lubricant.

NOTE

When pulling harnesses, feed opposite end of harnesses and mechanic's wire into handlebar.

8. Slide handgrip off end of handlebar. Grasp harnesses and gently pull from handlebar until they can be detached from chaser wire.



1. **Heated handgrip interconnect harness**
2. **Heated handgrip power**

Figure 2-85. Heated Handgrip Connectors

Install Left Handgrip

1. Attach chaser wire to harnesses. Make sure electrical tape wrap extends over end of harness conduit.
2. Lubricate wire harness conduits with glass cleaner.
3. Carefully feed harnesses into handlebar with one hand as they are pulled with the other.
4. Slide handgrip onto end of handlebar and pull slack from wiring harnesses. Remove chaser wire from harnesses.
5. Install terminals into connector housing cavities. Refer to Table 2-15.

NOTE

For connector service, see A.12 DEUTSCH DT SEALED CONNECTORS, Deutsch DT Sealed Connector Repair.

6. Mate connectors and secure harnesses with **new** cable straps.
7. Install left handlebar switch housing and clutch lever. See 7.40 HANDLEBAR SWITCH ASSEMBLIES. Make sure rim of handgrip fits into grooves in switch housings.
8. Install outer fairing. Install main fuse.

Table 2-15. Left Heated Grip Connectors

CONNECTOR	CAVITY	COLOR
Power	1	Red
	2	Black
Interconnect	1	Black/white
	2	Black/white

Remove Right Handgrip

NOTE

This procedure covers only removal and installation of the handgrip. For service of the TGS, see 4.10 TWIST GRIP SENSOR.

1. Remove main fuse.
2. Remove outer fairing.

NOTICE

Do not remove or install the master cylinder assembly without first positioning a 5/32-inch (4 mm) thick insert between the brake lever and lever bracket. Removing or installing the master cylinder assembly without the insert in place may result in damage to the rubber boot and plunger on the front stoplight switch. (00324a)

3. Remove right switch housing and master cylinder from handlebar. See 7.40 HANDLEBAR SWITCH ASSEMBLIES. Suspend out of the way.
4. Pry end cap from handgrip and pull connector out through end of handgrip.

NOTE

To remove the throttle handgrip, a slight tug may necessary.

5. Pull handgrip off end of handlebar.

Install Right Handgrip

1. Verify twist grip sensor is properly installed in end of handlebar.
2. Seat handgrip onto twist grip sensor.
3. Using needle nose pliers, insert prongs of connector into connector holes located in end of twist grip sensor.
4. Pull handgrip off until it disengages TGS and rotate handgrip to allow wires to wrap around connector. Engage handgrip on TGS and rotate handgrip to verify proper engagement. Install end cap.
5. Install right switch control housing and front brake master cylinder. See 7.40 HANDLEBAR SWITCH ASSEMBLIES.
6. Install outer fairing. Install main fuse.

RUBBER MOUNTS

Removal

1. See Figure 2-84. Before removing handlebars, loosen bolts (7) securing lower clamps (3) to upper fork bracket.
2. Remove the handlebars. See 2.23 HANDLEBARS, Removal.
3. See Figure 2-84. Remove bolts (7), washer (10) and cup washers (4).
4. Remove lower handlebar clamp (3), flat washer (9) and cup washer from top of upper fork bracket.
5. Pull bushings (6) from fork bracket bore and spacers (5).
6. Discard bushings.

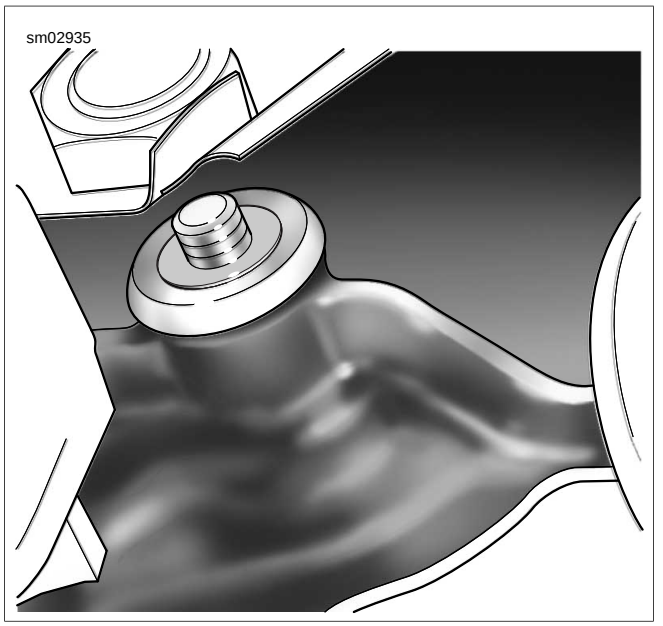


Figure 2-86. Remove Flat Washer and Upper Cup Washer (Right Side)

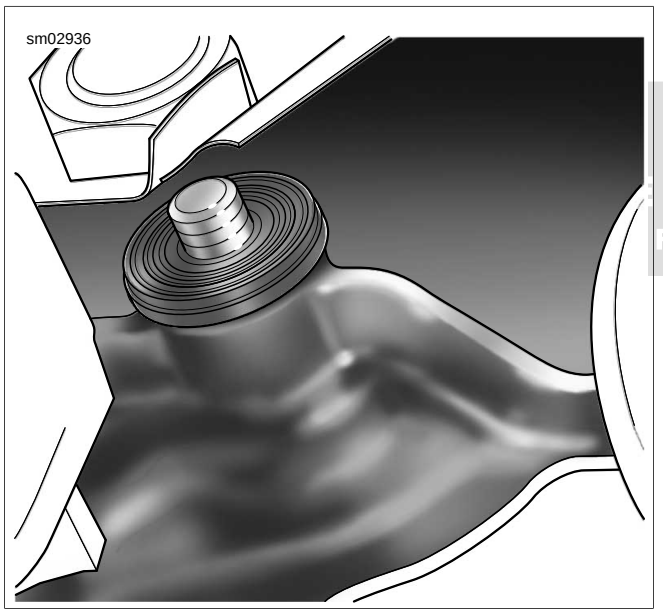


Figure 2-87. Remove Upper Bushing (Right Side)

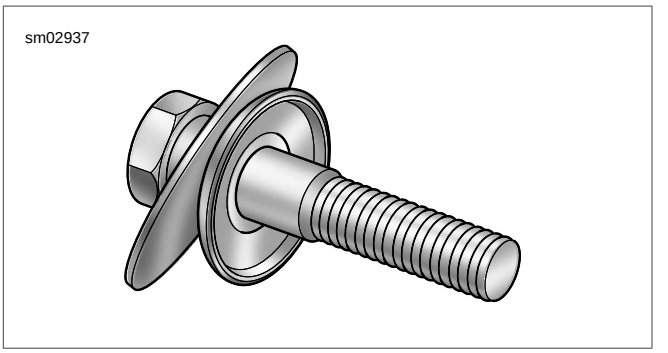


Figure 2-88. Remove Bolt, Large Washer, and Lower Cup Washer (Right Side)

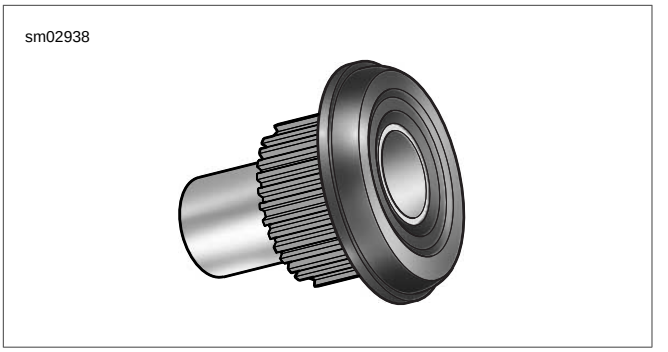


Figure 2-89. Remove Spacer from Lower Bushing

Installation

1. See Figure 2-89. Insert spacers into **new** bushings until flush with outboard side of collar.
2. Insert bushing into bore at bottom of upper fork bracket fitting collar of bushing over lip of boss.
3. See Figure 2-87. Insert bushing into bore.
4. Install large flat washer (right only) and cup washer on bolt. Insert bolt into bushing fitting concave side of cup washer over collar of bushing.
5. Install cup washer over threaded end of bolt fitting concave side over collar of bushing. Install ground wire ring terminal (left side) or small flat washer (right side).
6. Apply two or three drops of Loctite Medium Strength Threadlocker 243 (blue) to threads of bolt. Install lower handlebar clamp and turn bolt until snug.
7. Install handlebars and upper handlebar clamp. See 2.23 HANDLEBARS, Installation.
8. Tighten lower clamp bolts to 30-40 ft-lbs (40.7-54.2 Nm).
9. Complete assembly of motorcycle. See 2.23 HANDLEBARS, Installation.

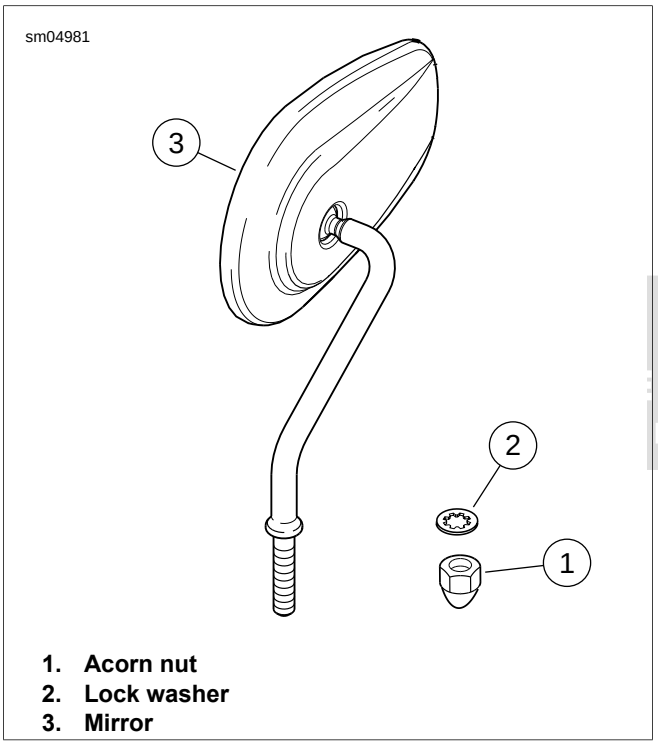
ALL MODELS EXCEPT FLHX

Removal

1. See Figure 2-90. Remove acorn nut (1) and lock washer (2).
2. Remove mirror (3).

Installation

1. Insert threaded stem of mirror into hole in clutch or brake lever bracket.
2. Install lock washer (2) and acorn nut (1).
3. Adjust mirror as necessary and tighten acorn nut to 60-96 **in-lbs** (6.8-10.8 Nm).



1. **Acorn nut**
2. **Lock washer**
3. **Mirror**

Figure 2-90. Mirror Assembly (All Models Except FLHX)

FLHX

Removal

1. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
2. See Figure 2-91. Remove flange nut and plastic washer. Remove mirror.

Installation

1. See Figure 2-92. With the bar and shield logo right side up, insert threaded stud and align index pin (2) on swivel block with hole in inner fairing.

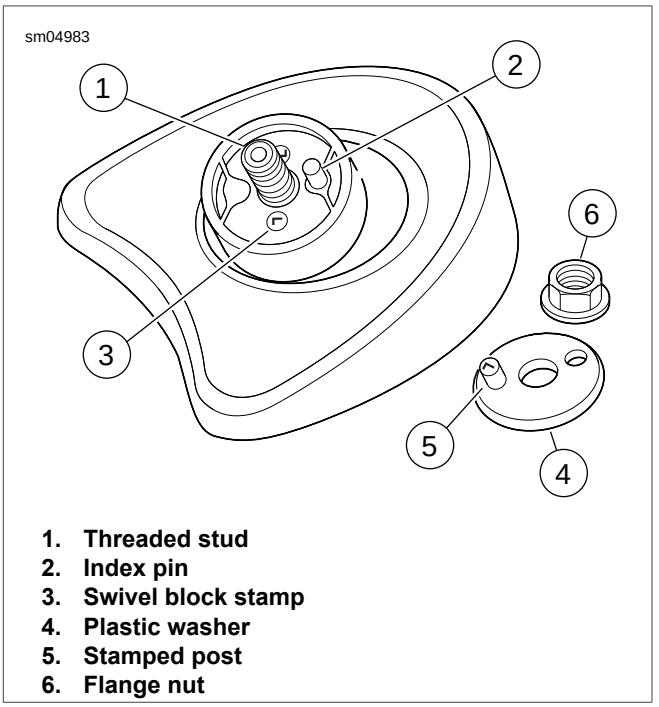
NOTE

The letters "L" or "R" are stamped on the swivel blocks and posts of the washers to identifyn left and right side installation.

2. Install the plastic washer (4) engaging the small hole in washer with index pin (2).
3. Install flange nut (6) and tighten to 30-40 **in-lbs** (3.4-4.5 Nm).
4. Adjust mirror as necessary.
5. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.



Figure 2-91. Remove Outer Fairing (FLHX)



1. **Threaded stud**
2. **Index pin**
3. **Swivel block stamp**
4. **Plastic washer**
5. **Stamped post**
6. **Flange nut**

Figure 2-92. Left Side Mirror Assembly (FLHX)

SEAT: MODELS WITHOUT TOUR-PAK

Removal

NOTICE

Detach passenger seat strap before removing seat. Failure to do so can result in damage to rear fender paint. (00225a)

1. Open left side saddlebag.
2. See Figure 2-93. Remove screw and release passenger seat strap from seat strap bracket.
3. Remove screw to release seat from top of rear fender.
4. See Figure 2-94. Push seat rearward to free slot from tongue on rear fuel tank bracket.

Installation

1. Place seat in position.
2. See Figure 2-94. Firmly push front of seat downward and then forward until slot (1) engages tongue (2).
3. Secure seat to fender with screw and tighten to 48-72 **in-lbs** (5.4-8.1 Nm).

NOTE

If seat retention nut is damaged or lost, see 2.25 SEAT, Seat Retention Nut Replacement for instructions.

4. See Figure 2-93. Start screw to fasten passenger seat strap to seat strap bracket. Feed end of strap into slot of seat strap bracket and tighten screw to 48-72 **in-lbs** (5.4-8.1 Nm).
5. Close left side saddlebag.

⚠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)

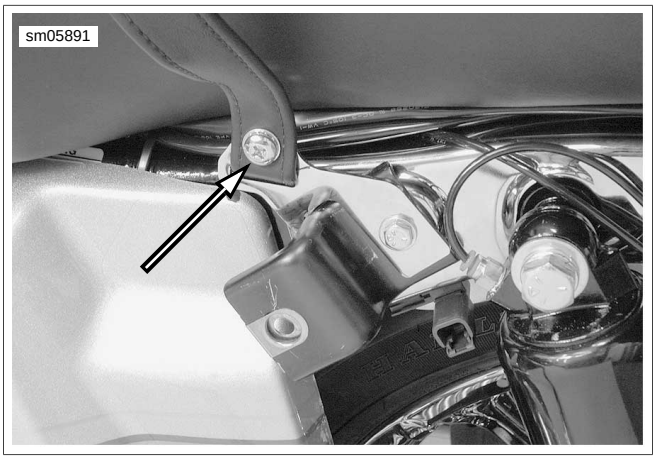
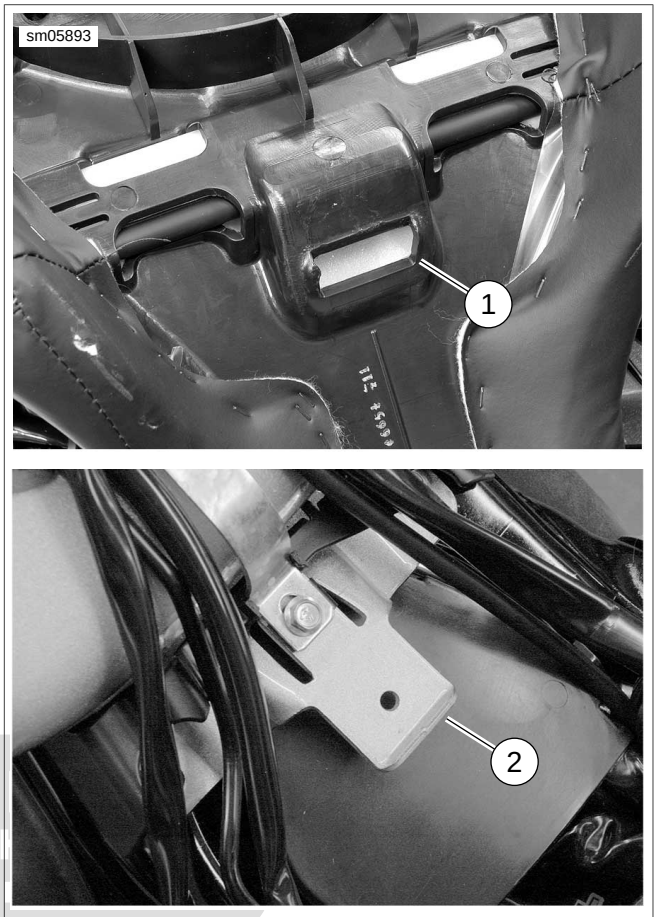


Figure 2-93. Seat Strap Bracket Screw



1. **Seat bottom slot**
2. **Fuel tank rear bracket tongue**

Figure 2-94. Seat Mounting

SEAT: MODELS WITH TOUR-PAK

Removal

1. Open left side saddlebag.
2. See Figure 2-93. Remove screw to release passenger seat strap from seat strap bracket.
3. Open Tour-Pak to move passenger seat backrest out of the way.

NOTE

The seat mounting screw can not be accessed with the Tour-Pak mounted in the forward position. If installed in the forward position, temporarily install in the rearward position. Install back in the original position after installing seat. See 2.28 TOUR-PAK for more information.

4. Remove screw to release seat from top of rear fender.
5. See Figure 2-94. While pushing seat forward, raise rear of seat until bracket clears Tour-Pak. Push seat rearward to free slot from tongue on rear fuel tank bracket.
6. Remove seat.

Installation

1. See Figure 2-94. Place seat in position.

NOTE

To protect finish of Tour-Pak, cover rear seat mounting bracket with palm of hand.

2. Hold rear of seat approximately 3 in. (76.2 mm) above fender and use the other hand to push front of seat downward and forward until slot (1) engages tongue (2).
3. Secure seat to fender with screw and tighten to 48-72 **in-lbs** (5.4-8.1 Nm).

NOTE

If seat retention nut is damaged or lost, see 2.25 SEAT, Seat Retention Nut Replacement for instructions.

4. See Figure 2-93. Start screw to fasten passenger seat strap to seat strap bracket. Feed end of strap into slot of seat strap bracket and tighten screw to 48-72 **in-lbs** (5.4-8.1 Nm).
5. Close left side saddlebag.

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)

SEAT: ROAD KING MODELS

Removal

1. Remove left side saddlebag.
2. Remove screw securing passenger seat strap and saddlebag front mounting bracket.
3. See Figure 2-95. Draw passenger seat strap to right side of motorcycle, passing through slots in seat on FLHRC models.
4. Remove screw to release seat from top of rear fender.
5. See Figure 2-94. Push seat rearward to free slot (1) from tongue (2).
6. Remove seat.

Installation

1. Place seat in position.
2. See Figure 2-94. Firmly push front of seat downward and then forward until slot (1) engages tongue (2).
3. Secure seat to fender with screw and tighten to 48-72 **in-lbs** (5.4-8.1 Nm).

NOTE

If seat retention nut is damaged or lost, see 2.25 SEAT, Seat Retention Nut Replacement for instructions.

4. See Figure 2-95. Draw free end of passenger seat strap to left side of motorcycle, passing through slots in seat on FLHRC models.

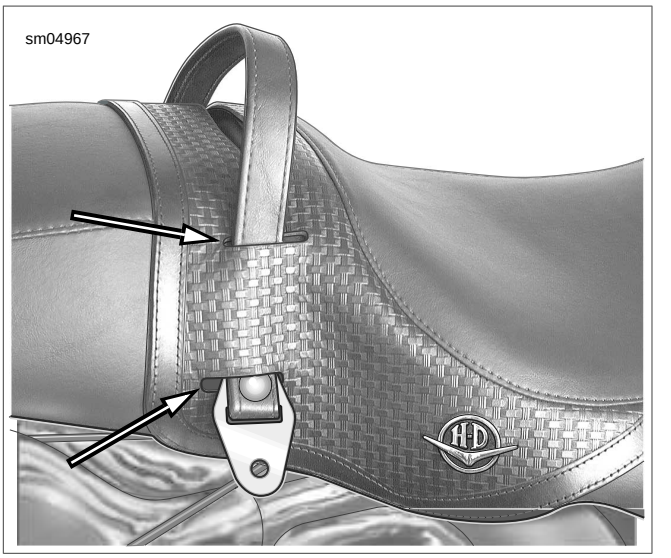


Figure 2-95. Route Passenger Seat Strap Through Slots (FLHRC)

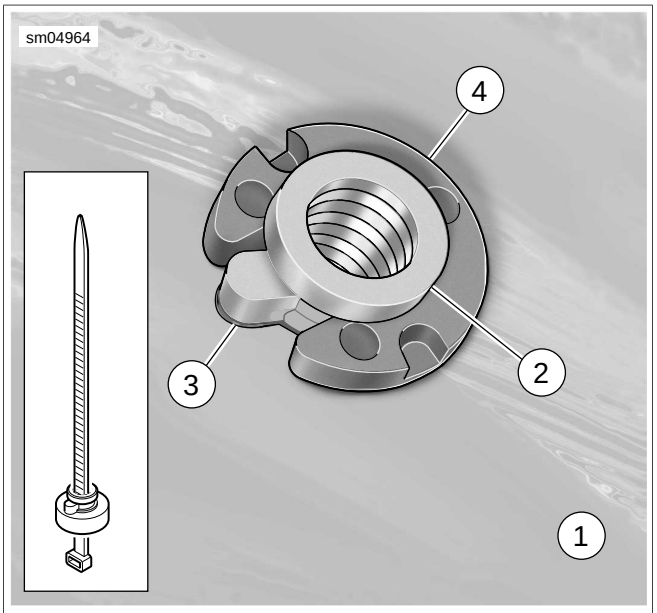
5. Install passenger seat strap and saddlebag front mounting bracket. Do not tighten screw at this time.
6. Install left side saddlebag.
7. Tighten saddlebag front mounting bracket screw to 60-96 **in-lbs** (6.8-10.8 Nm).

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)

SEAT RETENTION NUT REPLACEMENT

1. See Figure 2-96. Remove retention washer (4) and remove retention nut from fender.
2. See inset of Figure 2-96. Slide **new** retention nut onto a cable strap as shown. Insert into fender hole and hold with cable strap.
3. Align tab (3) on retention nut and hold nut snug against underside of rear fender. Orient the retention washer (4) and install as shown. Remove cable strap.



1. **Rear fender**
2. **Retention nut**
3. **Tab**
4. **Retention washer**

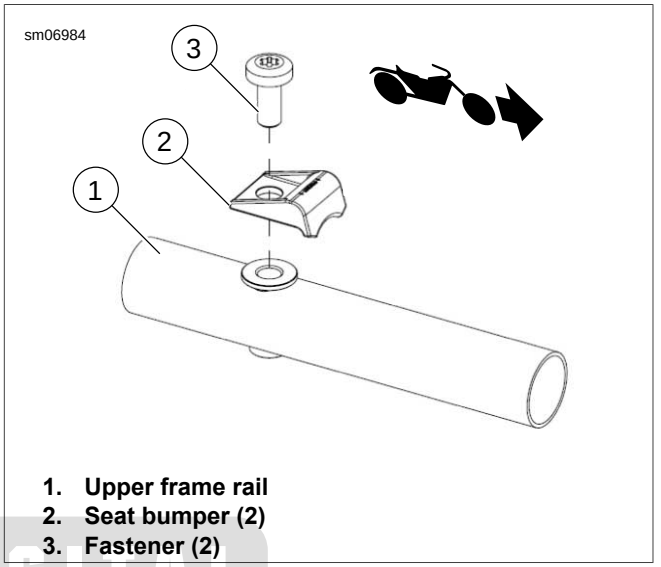
Figure 2-96. Install Seat Retention Nut

SEAT BUMPER

NOTE

FLHX, FLTRX and FLTRU models utilize a seat bumper to minimize seat movement.

1. See Figure 2-97. Install a seat bumper to each upper frame rail (1), in the orientation shown (arrows forward).
2. Install a fastener (3) in each bumper and tighten to 80-120 **in-lbs** (9.0-13.6 Nm).



1. **Upper frame rail**
2. **Seat bumper (2)**
3. **Fastener (2)**

Figure 2-97. Seat Bumper Installation

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SADDLEBAGS 2.26

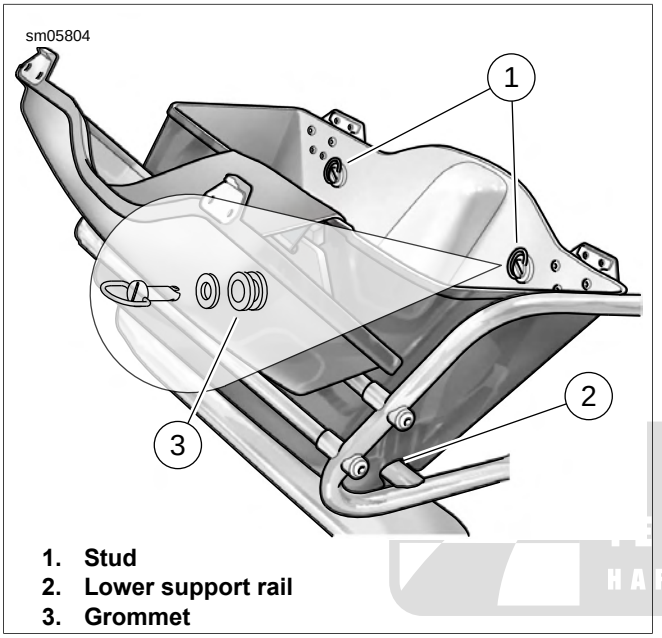
REMOVAL

1. Open saddlebag.
2. See Figure 2-98. Rotate each stud (1) 1/4 turn counterclockwise. Remove studs and flat washers from grommets.

NOTE

Some HDI motorcycles have the bail wire removed from the stud. Turn the stud with a screwdriver.

3. Remove saddlebag.



1. Stud
2. Lower support rail
3. Grommet

Figure 2-98. Saddlebag Quick-Release Fasteners

INSTALLATION

1. Position saddlebag on motorcycle aligning holes in grommets with those in front and rear mounting brackets.

NOTE

*Replace grommets if torn or deteriorated. Moisten **new** grommet with glass cleaner or soapy water and work smaller OD through hole into saddlebag.*

2. Place flat washers on studs.
3. Hold groove at end of stud horizontal and insert stud through grommet. When groove engages wire form spring in mounting bracket, turn stud clockwise 1/4 turn until it locks in place.

NOTES

- *Some HDI motorcycles have the bail wire removed from the stud. Turn the stud with a screwdriver.*
- *See Figure 2-98. Molded rubber insert at bottom of saddlebag must fit snugly on lower saddlebag support rail (2). If saddlebag is not fully seated, loosen bolt securing front mounting bracket and adjust saddlebag fit. Tighten mounting bracket bolt to 12-15 ft-lbs (16.3-20.3 Nm).*

4. Close saddlebag.

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SADDLEBAG HARDWARE

Removal

1. Lay clean pad or blanket on work bench to protect painted surfaces of saddlebag.
2. Remove saddlebag from motorcycle leaving lid open. See 2.26 SADDLEBAGS.
3. Lay saddlebag flat on pad with the inboard side facing up and the lid closest to you.
4. Remove two screws to release check strap from lid.
5. Remove two screws to release check strap from saddlebag.
6. Remove two remaining screws to remove latch from saddlebag.

NOTE

This procedure assumes that the latch is NOT removed from the saddlebag lid. If there is doubt as to whether the procedure can be accomplished without scratching painted surfaces of the lid, then remove the five remaining screws to completely remove latch.

7. Position lid right side up with latch closest to you.
8. See upper frame of Figure 2-99. Raise latch slightly and rotate hinge on inboard side so that it is topside with the two plastic rub bars pointed upward.
9. See lower frame of Figure 2-99. Rotate rub bar section of hinge to expose hinge pin and spring. Using a flat tip screwdriver, carefully bend crimped end link outward.

NOTE

The end link on opposite side of hinge has a weld spot that prevents pin removal.

10. Reposition lid so that it is upside down with the latch farthest from you. Rotate hinge so that plastic rub bars are positioned beneath latch and spring is topside.
11. See upper frame of Figure 2-100. Using a needle nose pliers, grasp pin through opening just outboard of the spring and push toward the crimped link side. Work pin in this manner until end can be seen exiting crimped link. If necessary, pry crimped link outward a little more to achieve the desired result.
12. See lower frame of Figure 2-100. Grasping end with needle nose pliers, slowly pull pin from links until spring can be slid off opposite end. Only pull pin as far as necessary to remove spring.

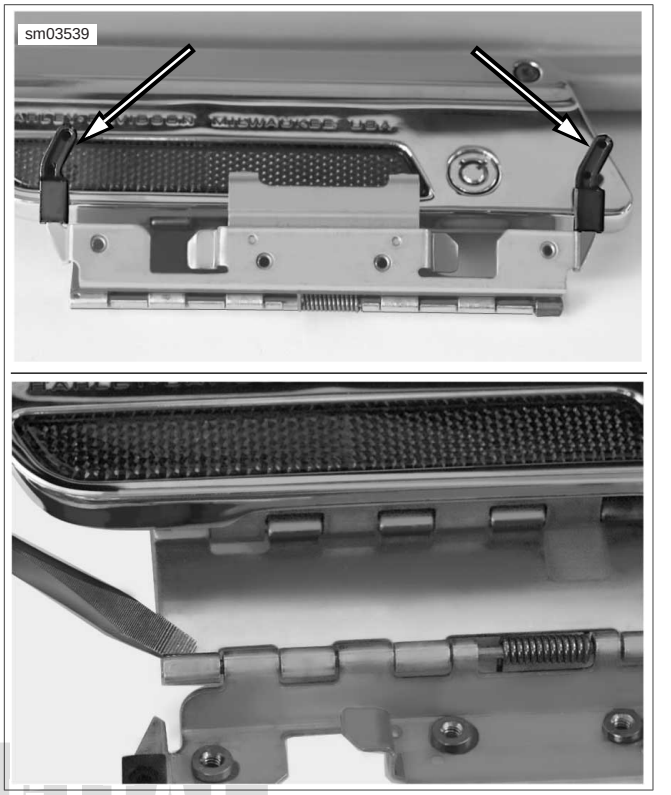


Figure 2-99. Lid Right Side Up With Latch on Near Side

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

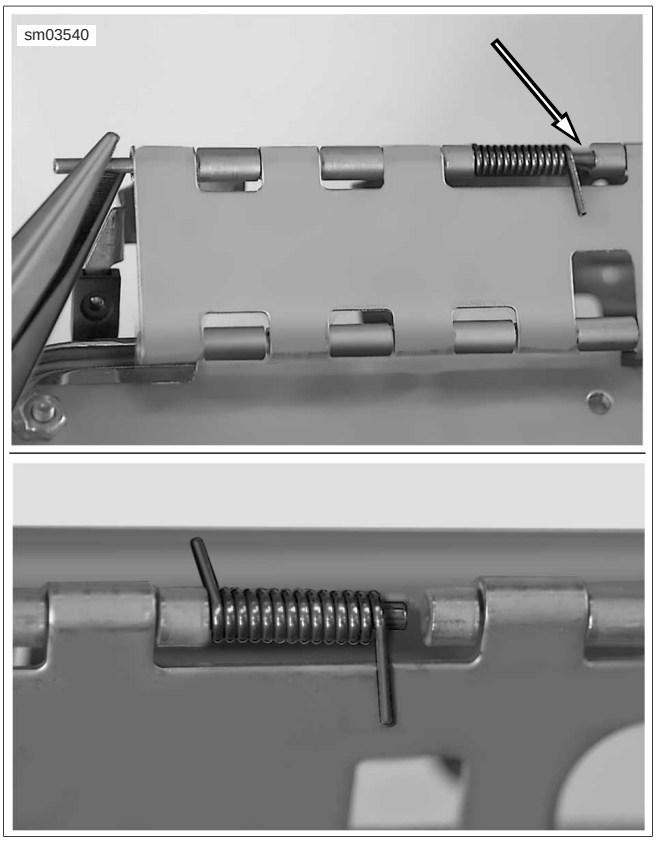


Figure 2-100. Lid Up Side Down With Latch on Far Side

Installation

1. See lower frame of Figure 2-100. Slide **new** spring onto end of pin and orient spring.
2. Slide pin back through links. Using tapered end of needle nose pliers, push end of pin into crimped link.
3. See Figure 2-99. Reposition lid so that it is right side up with latch closest to you. As before, raise latch slightly and rotate hinge on inboard side so that it is topside with plastic rub bars pointing upward. Now rotate rub bar section of hinge to expose hinge pin and spring.
4. Holding lid down with elbow, if necessary, use a pliers to bend crimped link back into its original position, so that pin is captured and will not back out of hinge.
5. Reposition lid so that it is upside down with the latch farthest from you. Move saddlebag forward for reinstallation of lid. Align four holes in saddlebag with those in latch.
6. Install two inboard screws to fasten latch to saddlebag. Alternately tighten screws to 20-25 **in-lbs** (2.3-2.8 Nm).
7. Align holes in check strap with those in lid and saddlebag. Orient check strap so that logo is topside with the bottom of the bar and shield on the lid side.
8. Install two screws to fasten check strap and latch to saddlebag. Alternately tighten screws to 20-25 **in-lbs** (2.3-2.8 Nm).
9. Install two screws to fasten check strap to lid. Alternately tighten screws to 18-20 **in-lbs** (2.0-2.3 Nm).
10. Close saddlebag and install on motorcycle. See 2.26 SADDLEBAGS.

SADDLEBAG GUARD/SUPPORT RAIL

Removal

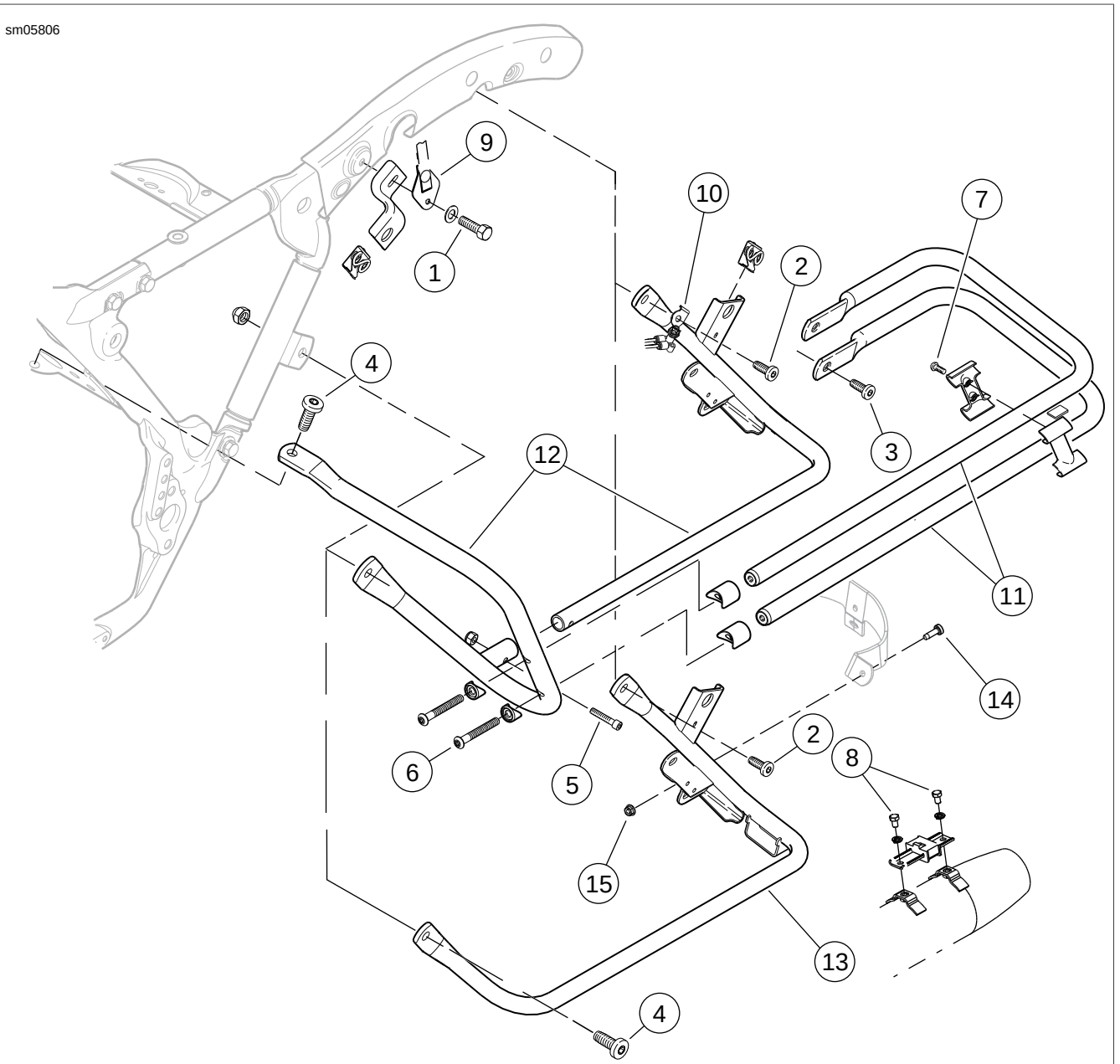
1. Remove saddlebag. See 2.26 SADDLEBAGS.
2. See Figure 2-101. Remove fasteners (8) that secure muffler mount to muffler.
3. Disassemble saddlebag guard, support and/or rails as necessary.

Installation

1. See Figure 2-101. Assemble saddlebag guard, support and/or rails as necessary. Install grab strap (9) along with forward mounting bracket. Air suspension fitting (10) is also secured on left side by fastener (2). Refer to Table 2-16 for the correct fastener torque specifications.
2. Secure muffler to lower rail (12 or 13). Install screws (8) and tighten to 96-144 **in-lbs** (10.8-16.3 Nm).
3. Install saddlebag. See 2.26 SADDLEBAGS.

Table 2-16. Saddlebag Support/Guard Fastener Torque Specifications

ITEM	TORQUE
1	12-15 ft-lbs (16.3-20.3 Nm)
2	15-20 ft-lbs (20.3-27.1 Nm)
3	15-20 ft-lbs (20.3-27.1 Nm)
4	32-36 ft-lbs (43.4-48.8 Nm)
5	70-100 **in-lbs** (7.9-11.3 Nm)
6	72-120 **in-lbs** (8.1-13.6 Nm)
7	30-50 **in-lbs** (3.4-5.6 Nm)
14	15-20 ft-lbs (20.3-27.1 Nm)



1. Forward mounting bracket fastener
2. Support-to-fender fastener
3. Side rail-to-support fastener
4. Guard-to-frame fastener
5. Support rail-to-guard fastener
6. Side guard-to-front guard fastener
7. Rail clamp fasteners
8. Muffler mount fasteners
9. Grab strap
10. Air suspension fitting
11. Side rails (FLHTC, FLHTCU)
12. Front and lower rails (All except FLTRU, FLHX, FLTRX)
13. Support assembly (FLTRU, FLHX, FLTRX)
14. Rear fender support-to-saddlebag support fastener
15. Flange locknut

Figure 2-101. Saddlebag Support

REMOVAL/INSTALLATION

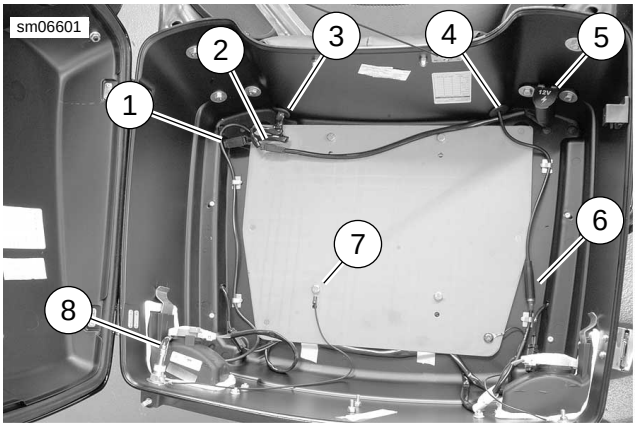
Removal

1. Remove map pouch and inner liner or mat from Tour-Pak, as equipped.
2. See Figure 2-102. Separate radio antenna cable connector (8), Tour-Pak lights connector (1), and accessory power outlet connector (2) if equipped.
3. Pull grommet (3) into Tour-Pak and remove from harness.
4. Feed harness and antenna cable through hole in Tour-Pak.
5. Release rear headset receptacle from bracket at bottom of left side speaker box.
6. Disconnect CB antenna cable connector (6).
7. Pull right side grommet (4) into Tour-Pak and remove from antenna cable. Feed CB antenna cable through hole in Tour-Pak.
8. **Models with rear speakers:** See Figure 2-103. Remove three fasteners (1) and flat washers to release each speaker box (2). Lay speakers on the seat.

NOTE

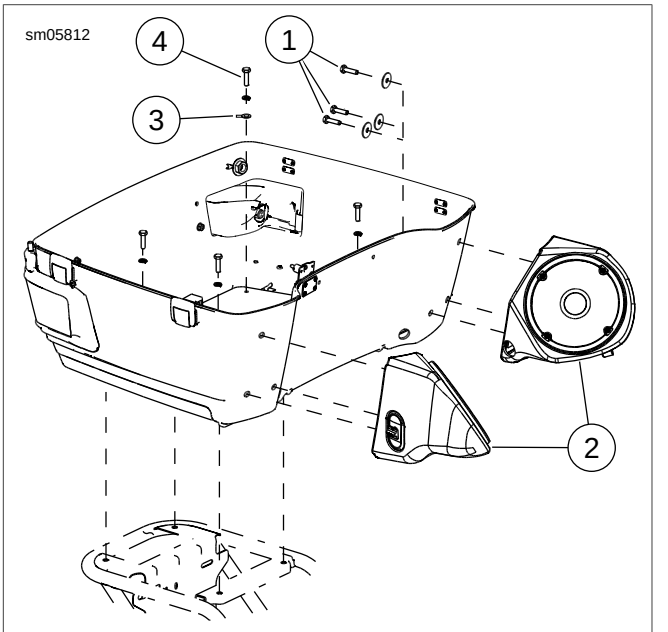
Make note of which set of locating holes are used to mount Tour-Pak.

9. Remove four screws and lock washers (4). Hold the Tour-Pak as the bolts are removed to prevent it from accidentally tipping. Remove Tour-Pak.



1. **Tour-pak lights connector**
2. **Power outlet connector (if equipped)**
3. **Grommet**
4. **Grommet**
5. **Power outlet (if equipped)**
6. **CB antenna connector**
7. **Radio antenna ground**
8. **Radio antenna connector**

Figure 2-102. Tour-Pak Connectors



1. **Speaker box fasteners**
2. **Speakers**
3. **Ground ring terminal**
4. **Screws and lock washers (4)**

Figure 2-103. Tour-Pak Mounting Bolts

Installation

1. Place Tour-Pak on luggage rack and open lid. Hold the Tour-Pak to prevent it from accidentally tipping.
2. See Figure 2-103. Install four screws (4) with radio antenna ground ring terminal (3) under lock washer of left-rear bolt.
3. Tighten screws in a crosswise pattern to 96-120 **in-lbs** (10.8-13.6 Nm).

NOTE

The lower screws that secure the right speaker box also secure the power outlet (if equipped).

4. Install speaker boxes and secure with screws and flat washers (1). Tighten fasteners to 25-35 **in-lbs** (2.8-4.0 Nm).
5. **FLHTCU:** See Figure 2-102. Pass CB antenna cable through right hole in Tour-Pak and install grommet (4) with the larger OD facing inside.
6. Install CB antenna cable connector (6). Capture cable in clips at bottom of Tour-Pak.
7. Capture rear headset receptacle in bracket at bottom of left side speaker box.
8. Feed Tour-Pak harness through left hole in Tour-Pak and install grommet (3) with the larger OD facing inside.
9. Mate connectors (1, 2).
10. Mate radio antenna cable connector (8) to antenna. Capture cable in clips at bottom of Tour-Pak.

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11. Install molded liner and map pouch or rubber mat, as equipped.

ADJUSTMENT

NOTE

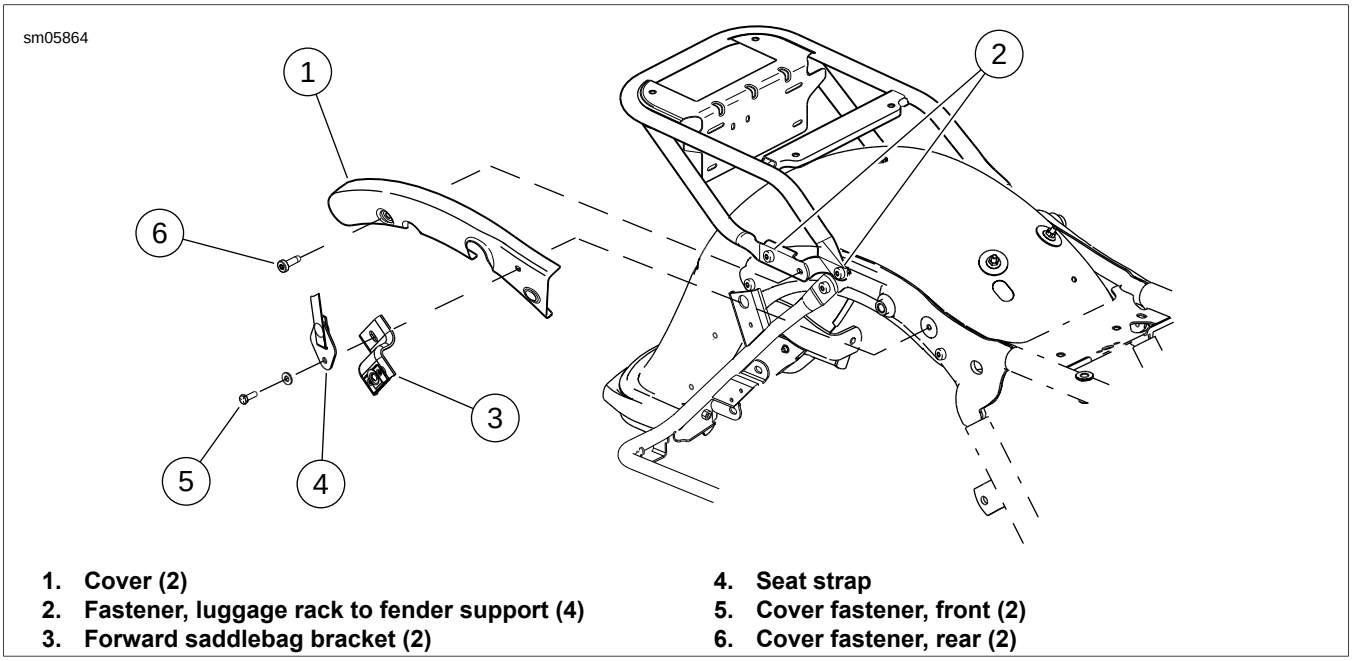
The Tour-Pak can be moved forward or rearward approximately 1 in. (25.4 mm) for best passenger comfort.

1. Remove map pouch and molded liner or rubber mat, as equipped.
2. See Figure 2-103. Remove four screws and lock washers (4) from inside Tour-Pak. Hold the Tour-Pak to prevent it from accidentally tipping.
3. Move Tour-Pak to the desired position.
4. Install four screws (4) with radio antenna ground ring terminal (3) under lock washer of left-rear screw.
5. Tighten screws in a crosswise pattern to 96-120 **in-lbs** (10.8-13.6 Nm).
6. Verify that wire harness to Tour-pak is not bunched or stretched at any point. Rearrange wire harness if necessary and install **new** cable straps.
7. Install molded liner and map pouch or rubber mat as equipped.

LUGGAGE RACK/TOUR-PAK SUPPORT

Removal

1. Remove cable straps as required to free harnesses from luggage rack. Take note of cable strap locations for reassembly.
2. See Figure 2-104. Remove fastener (5), seat strap (4), and forward saddlebag bracket (3).
3. Remove fastener (6) and remove cover (1).
4. Remove two fasteners (2) from each side and remove luggage rack.



1. **Cover (2)**
2. **Fastener, luggage rack to fender support (4)**
3. **Forward saddlebag bracket (2)**
4. **Seat strap**
5. **Cover fastener, front (2)**
6. **Cover fastener, rear (2)**

Figure 2-104. Luggage Rack

Assembly and Installation

1. See Figure 2-104. Install luggage rack and start fasteners (2 and 6).
2. Tighten fasteners (2) to 15-20 ft lbs (20.3-27.1 Nm).
3. Remove fastener (6) and install cover (1). Secure cover, front saddlebag bracket (3), and seat strap (4) with fastener (5) and flat washer. Do not tighten at this time.
4. Install fastener (6) and tighten to 15-20 ft lbs (20.3-27.1 Nm).
5. Secure harnesses as necessary to the luggage rack.
6. Secure saddlebags, rotating brackets (3) as necessary to align with forward saddlebag fastener. Verify saddlebag is securely engaged with lower support and tighten fastener (5) to 12-15 ft lbs (16.3-20.3 Nm).

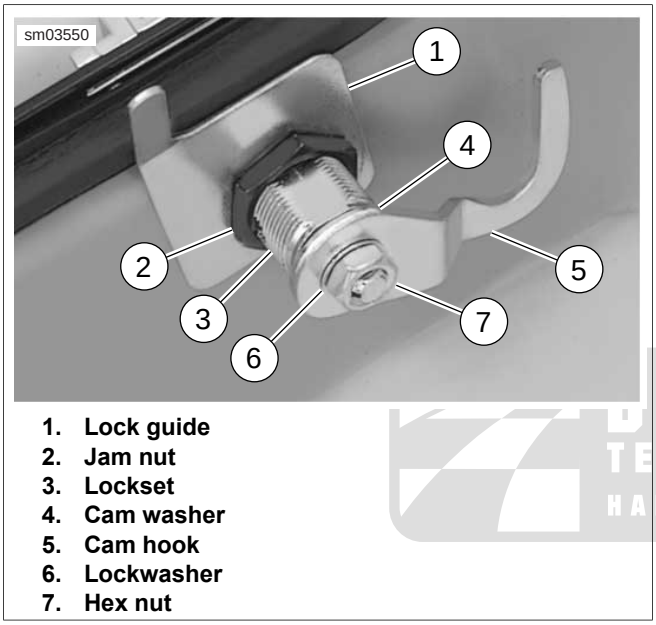
LOCKSET

Removal

NOTE

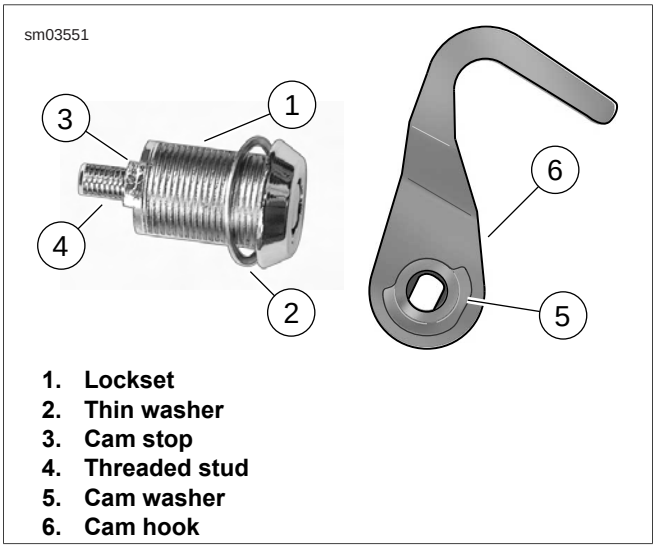
For replacement of the lockset catch, see 2.29 TOUR-PAK SERVICE, Latches/Lockset Catch.

1. See Figure 2-105. Remove hex nut (7), internal tooth lockwasher (6), cam hook (5) and cam washer (4). Remove jam nut and lock guide.
2. See Figure 2-106. Remove lockset. Remove thin washer (2) from threaded body of lockset.



1. **Lock guide**
2. **Jam nut**
3. **Lockset**
4. **Cam washer**
5. **Cam hook**
6. **Lockwasher**
7. **Hex nut**

Figure 2-105. Lockset Assembly



1. **Lockset**
2. **Thin washer**
3. **Cam stop**
4. **Threaded stud**
5. **Cam washer**
6. **Cam hook**

Figure 2-106. Lockset Mechanism

Installation

1. See Figure 2-106. Slide thin washer (2) down threaded body of lockset.
2. With cam stop (3) facing toward front of Tour-Pak lid, install lockset into hole.
3. See Figure 2-105. Install lock guide (1) as shown.
4. Install jam nut and tighten to 30-45 **in-lbs** (3.4-5.1 Nm).
5. Verify that groove in threaded stud of lockset is facing rear of Tour-Pak lid. Use key to rotate threaded stud, if necessary.
6. See Figure 2-106. Align cam hook (6) and cam washer (5) as shown. With the cam hook toward the front of Tour-Pak lid and cam washer on the inboard side, slide assembly down threaded stud.
7. Install internal tooth lockwasher and hex nut onto threaded stud. Tighten hex nut to 25-35 **in-lbs** (2.8-4.0 Nm).

HINGES

PART NUMBER	TOOL NAME
HD-39787A	RIVET TOOL

Removal

1. Remove tether. See 2.29 TOUR-PAK SERVICE, Tether.
2. Remove screw.
3. Remove hinge pin.
4. Repeat previous steps to remove second hinge pin. Remove Tour-Pak lid.
5. Drill out rivets from inside Tour-Pak.
6. Remove hinge and backplates.

Installation

1. With the head of the **new** rivet on the outboard side of the Tour-Pak, slide rivet through holes in hinge, Tour-Pak and backplate.
2. See Figure 2-107. Obtain RIVET TOOL (Part No. HD-39787A).
3. Orient tool so that head of rivet is seated in depression of drive head. Turn adjuster thumbscrew in or out of handle until both ends of rivet are captured.
4. Slowly squeeze handle of tool to compress rivet. Turn adjuster thumbscrew slightly in a clockwise direction and then squeeze handle again to further compress rivet. Repeat step as necessary until rivet is fully installed.

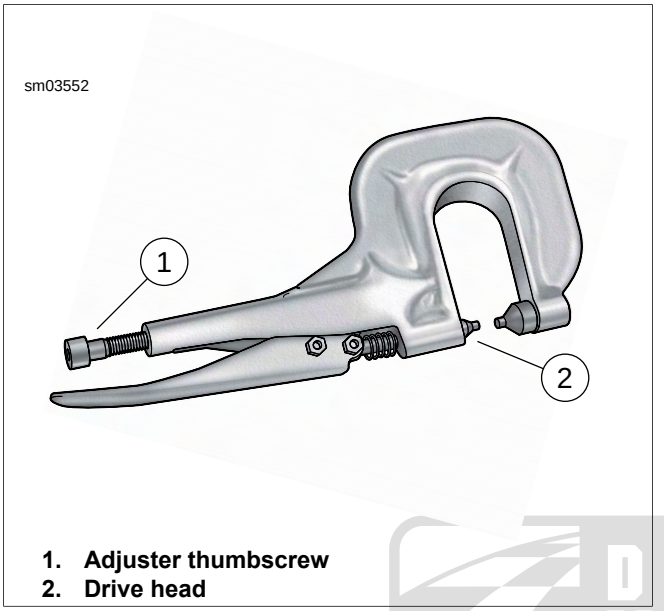
NOTE

Compress rivet in small increments only to provide best retention and alignment of parts, and avoid possible damage to tool and painted surfaces of Tour-Pak.

5. Repeat previous steps to install remaining rivets.
6. Install lid onto Tour-Pak engaging upper and lower hinges.

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7. Install hinge pin with the tool bit recess on the inboard side of the hinge.
8. Apply a small dab of Loctite High Strength Threadlocker 262 (red) to threads of screw.
9. Install screw into hinge pin and tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
10. Repeat previous steps to install second hinge pin.
11. Install tether. See 2.29 TOUR-PAK SERVICE, Tether.



1. **Adjuster thumbscrew**
2. **Drive head**

Figure 2-107. Rivet Tool (HD-39787A)

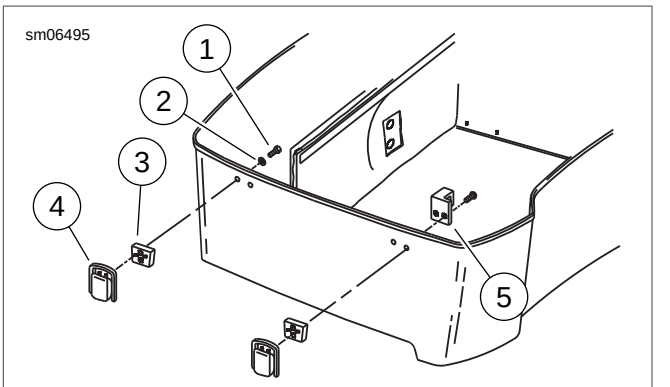
LATCHES/LOCKSET CATCH

Removal

1. See Figure 2-108. Remove screws (1) and washers (2) (rear only).
2. Remove latch (4), spacer (3) and catch (5) (front only).

Installation

1. Insert two short screws (with flat washers) through rear holes or long screws through catch (5) and front holes.
2. Slide spacer (3) onto screws with open side toward Tour Pak.
3. Apply a dab of Loctite Medium Strength Threadlocker 243 (blue) to threads of screws and install latch (4).
4. Tighten screws to 20-25 **in-lbs** (2.3-2.8 Nm).



1. **Screw (2 each latch)**
2. **Washer, rear only (2)**
3. **Spacer**
4. **Latch**
5. **Catch, front only**

Figure 2-108. Tour Pak Latches

CATCHES

Removal

1. Drill out rivets from inside Tour-Pak lid.
2. Remove catch and backplate.

Installation

1. With the head of the **new** rivet on the outboard side of the Tour-Pak, slide rivet through holes in catch, Tour-Pak lid and backplate.
2. Install rivets. See 2.29 TOUR-PAK SERVICE, Hinges.

TETHER

Removal

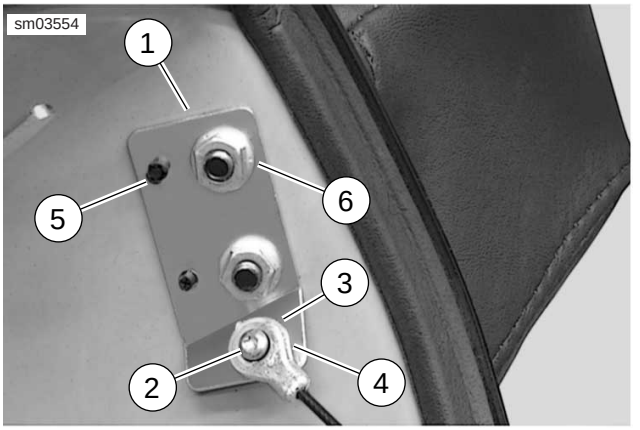
NOTE

Exercise caution to keep lid from opening beyond the normal travel.

1. See Figure 2-109. Remove screw (2).
2. Remove tether eyelet (3) and wave washer from threaded boss.
3. Remove opposite end of tether from second tether bracket.

Installation

1. See Figure 2-109. With the concave side toward the tether bracket, install wave washer (4) onto threaded boss and install tether eyelet.
2. Apply a dab of Loctite High Strength Threadlocker 262 (red) to threads of screw.
3. Install screw (2) and tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
4. Repeat steps to secure opposite end of tether.



1. **Tether bracket (lid)**
2. **Screw**
3. **Tether eyelet**
4. **Wave washer (not visible)**
5. **Black nylon rivet**
6. **Flange nut (2)**

Figure 2-109. Tour-Pak Tether Bracket Assembly

TETHER BRACKETS

PART NUMBER	TOOL NAME
HD-39787A	RIVET TOOL

Removing Tether Bracket from Tour-Pak

1. Remove tether. See 2.29 TOUR-PAK SERVICE, Tether.
2. Drill out rivets from inside Tour-Pak.
3. Remove tether bracket and backplate.

Removing Tether Bracket from Tour-Pak Lid

1. Remove tether. See 2.29 TOUR-PAK SERVICE, Tether.
2. See Figure 2-109. From inside Tour-Pak lid, gently tap pin out of rivet. Remove rivet. Repeat step to remove second nylon rivet.
3. Remove two flange nuts from studs of passenger backrest bracket and remove tether bracket.

Installing Tether Bracket on Tour-Pak Lid

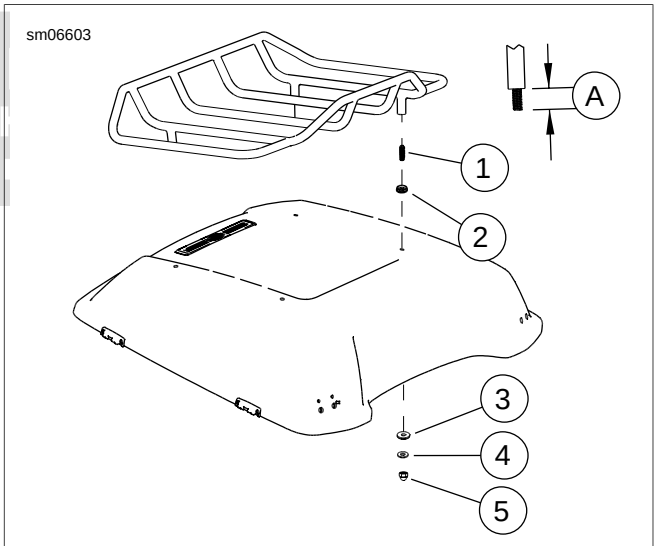
1. See Figure 2-109. From inside Tour-Pak lid, install tether bracket on studs of passenger backrest bracket and start flange nuts.
2. Insert nylon rivets. Push pin into head of rivet until flush.
3. Tighten flange nuts to 40-60 **in-lbs** (4.5-6.8 Nm).
4. Install tether. See 2.29 TOUR-PAK SERVICE, Tether.

Installing Tether Bracket on Tour-Pak

1. Install **new** rivets through the backplate, Tour-Pak and tether bracket.
2. Compress rivets using RIVET TOOL (Part No. HD-39787A). See 2.29 TOUR-PAK SERVICE, Hinges.
3. Install tether. See 2.29 TOUR-PAK SERVICE, Tether.

LUGGAGE RACK

1. See Figure 2-110. Hold the luggage rack while removing nuts (5) and washers (4, 3). Remove luggage rack.
2. If necessary, remove mounting studs (1).
3. If removed, install mounting studs to installed height (A) of 0.630 ± 0.020 in (16.0 ± 0.51 mm).
4. Verify the mounting pads (2) are in place on the mounting studs of the luggage rack.
5. Hold the luggage rack in place on the Tour-Pak cover and apply a small bead of silicone sealant around the studs where they pass through the inside of the cover.
6. Install one nylon washer, one flat washer and nut on each stud.
7. Tighten in a criss-cross pattern to 60-84 **in-lbs** (6.8-9.5 Nm).



1. **Stud (4)**
2. **Mounting pad (4)**
3. **Nylon washer (4)**
4. **Flat washer (4)**
5. **Nut (4)**

Figure 2-110. Luggage Rack

TOUR-PAK LIGHTS 2.30

GENERAL

All domestic model Ultra Tour-Paks are equipped with side marker lights. Ultra models also have rear wrap-around lights, each of which contains a 2-filament lamp. One filament is a supplemental brake light and the other a supplemental tail lamp.

SIDE MARKER LIGHTS (IF EQUIPPED)

Removal

1. Remove map pouch and molded liner from Tour-Pak.
2. See Figure 2-112. Disconnect side marker lights connector (4 or 5).
3. Remove two screws and remove side marker lights.

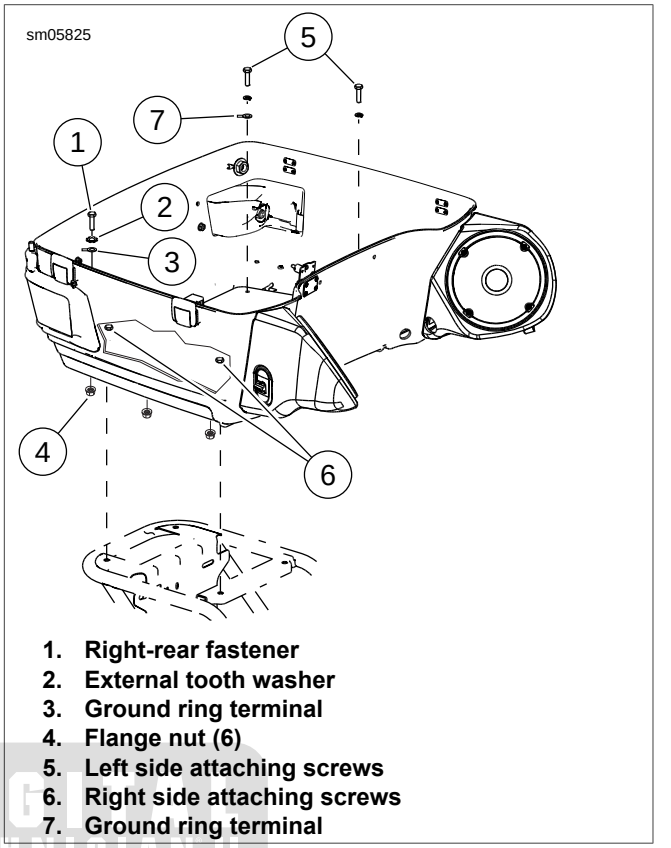
Installation

1. See Figure 2-112. Feed socket through hole in Tour-Pak and place side marker lights into position.
2. Install two screws and tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
3. Connect side marker lights connector (4 or 5).
4. Install molded liner and map pouch. Close Tour-Pak.

TOUR-PAK LIGHTS HARNESS

Removal

1. See Figure 2-111. Remove right-rear fastener (1), external tooth lockwasher (2) and flange nut (4) to release harness ground ring terminal (3).
2. See Figure 2-112. Remove tail lamp bulb socket from both wrap-around lights.
3. Disconnect two side marker lights connectors. Release harness from adhesive clips.
4. See Figure 2-111. Remove five remaining flange nuts (4) from bottom of Tour-Pak.
5. Remove two left side attaching screws (5) and lock washers.
6. Loosen two right side attaching screws (6) several turns but do not remove.
7. Lift left side of metal plate enough to remove harness from underneath it.
8. Remove Tour-Pak lights harness.



1. **Right-rear fastener**
2. **External tooth washer**
3. **Ground ring terminal**
4. **Flange nut (6)**
5. **Left side attaching screws**
6. **Right side attaching screws**
7. **Ground ring terminal**

Figure 2-111. Tour-Pak

Installation

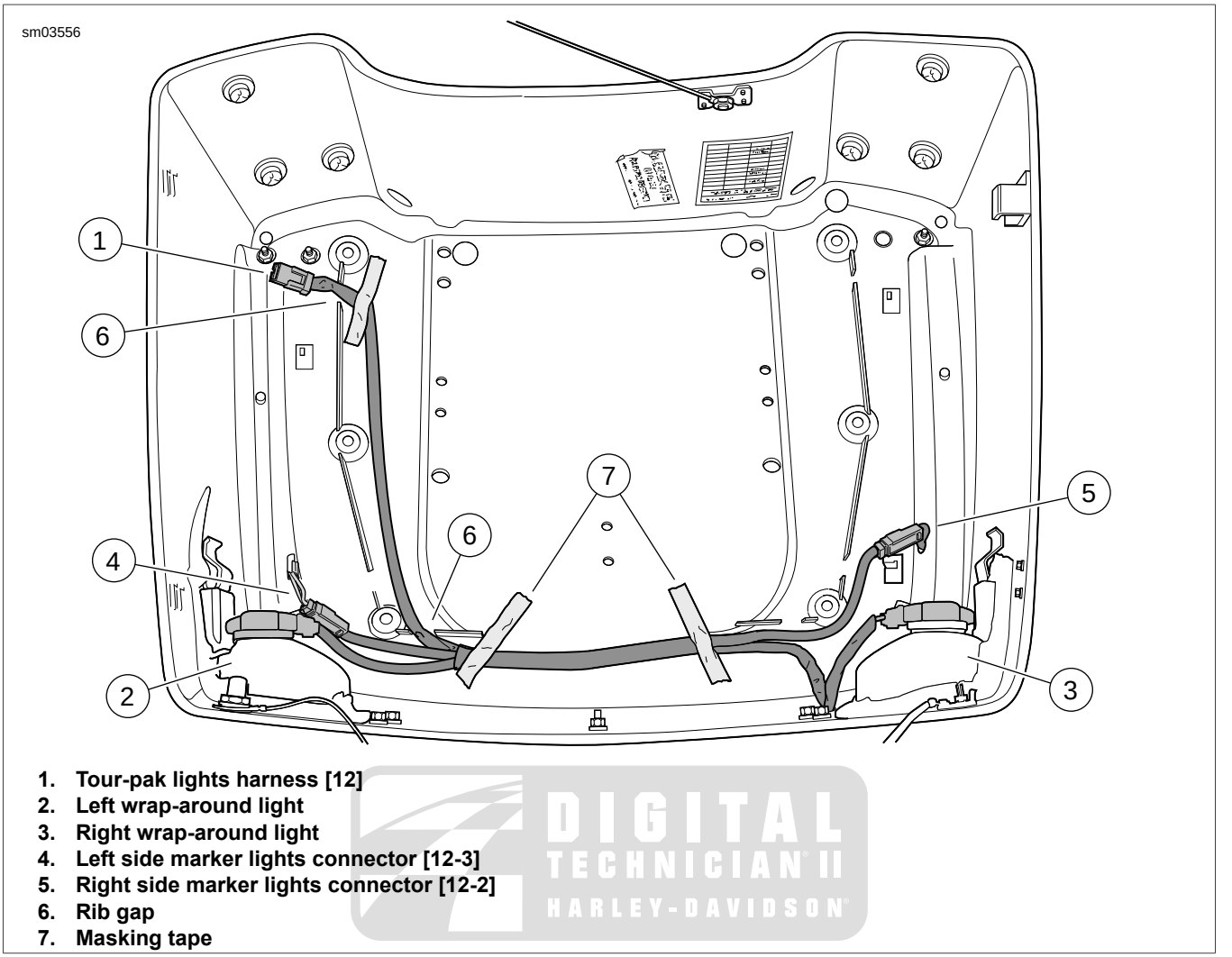
1. Place Tour-Pak lights harness at bottom of Tour-Pak as shown in Figure 2-112.

NOTE

Tour-Pak lights harness is the only one routed under the metal plate.

2. Lift metal plate and route lights harness inboard of bosses as shown, with connector (1) outboard of the metal plate. Use masking tape as necessary to fix position.
3. See Figure 2-111. Install two left side fasteners (5) with lock washers. Verify radio antenna ground ring terminal (7) is installed under left rear fastener.
4. Tighten fasteners (5, 6) to 96-120 **in-lbs** (10.8-13.6 Nm).
5. Install hex head screw (1), external tooth lockwasher (2) and harness ground ring terminal (3). Install flange nut (4).
6. Install five remaining flange nuts (4) on threaded studs of metal plate. Tighten all flange nuts to 65-70 **in-lbs** (7.3-7.9 Nm).
7. Connect two side marker lights connectors. Capture harness in two adhesive clips at rear of Tour-Pak.
8. Install tail lamp bulb socket in both wrap-around lights.

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1. **Tour-pak lights harness [12]**
2. **Left wrap-around light**
3. **Right wrap-around light**
4. **Left side marker lights connector [12-3]**
5. **Right side marker lights connector [12-2]**
6. **Rib gap**
7. **Masking tape**

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Figure 2-112. Tour-Pak Lights Harness

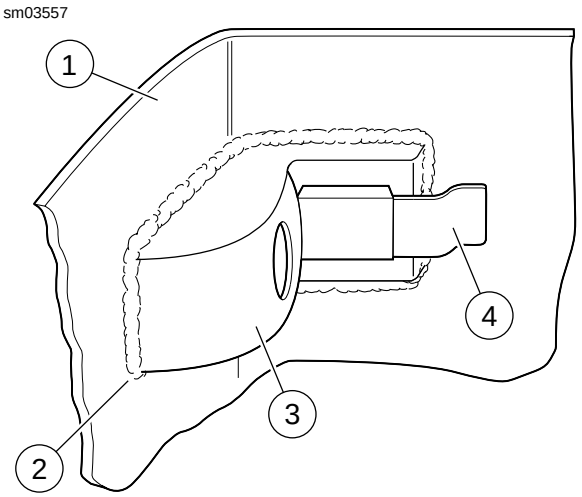
WRAP-AROUND LIGHTS (IF EQUIPPED)

Bulb Replacement

1. Remove map pouch and molded liner from Tour-Pak.
2. Remove bulb socket from wrap-around light and replace bulb.
3. Install bulb socket in wrap-around light.
4. Install molded liner and map pouch in Tour-Pak.

Removal

1. Remove map pouch and molded liner from Tour-Pak.
2. Remove both antenna masts from lamp housing.
3. Remove bulb sockets from wrap-around light.
4. If equipped, remove nut, tooth washer and ring terminal from CB antenna stud. Remove stud and remove base from housing.
5. Disconnect radio antenna cable connector.
6. Remove nut, ring terminal and large flat washer from radio antenna connector.



1. **Tour-pak**
2. **Caulking**
3. **Bulb housing**
4. **Metal clip**

Figure 2-113. Wrap-around Light Assembly

7. Using the original nut and a 1/2 in.-20 UNF nut as a jam nut, remove connector stud from radio antenna base. Remove base from lamp housing.
8. See Figure 2-113. Remove caulking from around light bar. Remove four flange nuts and metal clips to free light bar from Tour-Pak.

Installation

1. See Figure 2-113. Install light bar and secure with metal clips and flange nuts. Seal perimeter of light bar with RTV silicone sealer (Part No. 99710-88).
2. Install radio antenna base into lamp housing and tighten stud securely. Remove nuts.
3. Install large flat washer and ring terminal onto antenna connector. Install nut and tighten securely.
4. Connect radio antenna cable.
5. If equipped, install CB antenna base into lamp housing. Install stud and tighten with hex key.
6. Install ring terminal, tooth washer and nut onto CB antenna stud. Tighten nut securely.
7. Install bulb socket of both left and right side wrap-around lights.
8. Install both antenna masts.
9. Install molded liner and map pouch.

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TOUR-PAK BACKREST 2.31

PASSENGER BACKREST

Removal

1. See Figure 2-114. Remove two flange nuts and backplate (1). Remove center backrest from Tour-Pak lid.
2. Remove two flange nuts (2) to release left side backrest.

NOTE

Hold the Tour-Pak lid as flange nuts (3) are removed. Unexpected release of the tether bracket can allow the Tour-Pak lid to swing fully open, resulting in damage.

3. Remove two flange nuts (3) to release right side backrest.
4. Carefully remove backrest from the Tour-Pak lid.



1. **Center flange nuts and backplate**
2. **Left side flange nuts**
3. **Right side flange nuts**
4. **Passenger backrest**

Figure 2-114. Passenger Backrest

Installation

1. See Figure 2-114. Locate backrest in place on Tour-Pak lid. Install plastic cushion plate and backplate on studs and start flange nuts (1).
2. Start flange nuts (2) on left side studs.
3. Start flange nuts (3) on right side studs.
4. Tighten flange nuts to 40-60 **in-lbs** (4.5-6.8 Nm).

RUBBER ISOLATORS

Removal

1. Remove passenger backrest. See 2.31 TOUR-PAK BACKREST, Passenger Backrest.
2. **Center isolator:** See Figure 2-115. Remove flange nut with lockwasher to release cushion plate from rubber isolator stud. Remove flange nut with lockwasher to release other stud from backrest support bracket.
3. **Outside isolator:** See Figure 2-116. Remove flange nut with lockwasher to release "L" bracket from rubber isolator stud. Rotate rubber isolator to remove other stud from threaded hole in backrest.

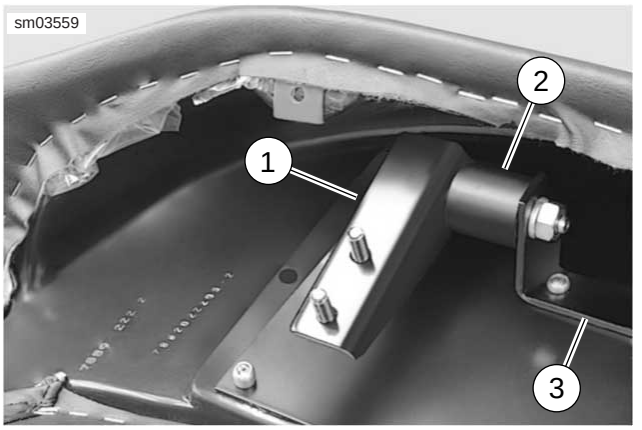
Installation

1. **Center isolator:** See Figure 2-115. Insert stud of **new** rubber isolator into hole of backrest support bracket and install lockwasher and flange nut. Tighten flange nut until snug. Install cushion plate, lockwasher and flange nut on other stud. Orient cushion plate so that it is parallel to backrest and then finger tighten flange nut only.
2. **Outside isolator:** See Figure 2-116. Install stud of **new** rubber isolator into threaded hole in backrest until snug. Install "L" bracket, lockwasher and flange nut on other stud. Finger tighten flange nut only.

NOTE

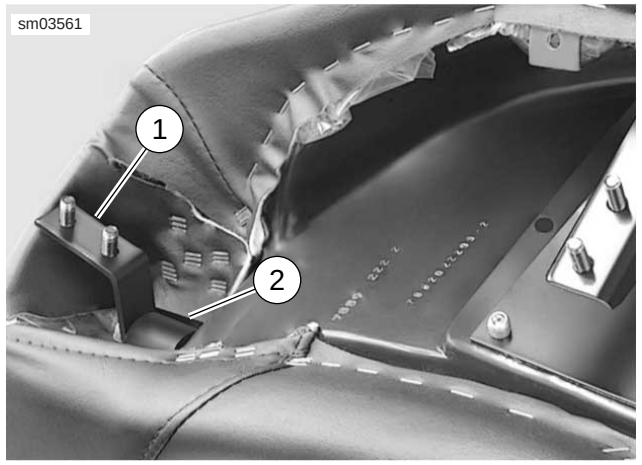
Always hold rubber isolator on end to be installed. Do not grasp middle of rubber isolator or opposite end as excessive twisting can result in separation of molded parts or other damage.

3. Install passenger backrest. See 2.31 TOUR-PAK BACKREST, Passenger Backrest.
4. Gently pull back cover material of backrest to expose underside and final tighten flange nuts previously finger tightened.
5. Verify that each side of rubber isolator is not twisted or under any torsional load. Loosen flange nuts and adjust rubber isolator if necessary.



1. Cushion plate
2. Rubber isolator
3. Backrest support bracket

Figure 2-115. Center Isolator



1. "L" bracket
2. Rubber isolator

Figure 2-116. Outside Isolator

PASSENGER BACKREST FLAP

Removal

1. Remove map pouch and molded liner from Tour-Pak.
2. Remove two screws with flat washers.
3. Remove backrest flap.

Installation

1. Secure backrest flap with two screws (with flat washers) and acorn nuts. Tighten to 21-24 **in-lbs** (2.4-2.7 Nm).
2. Install molded liner and map pouch in Tour-Pak.

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TOUR-PAK SPEAKER BOX 2.32

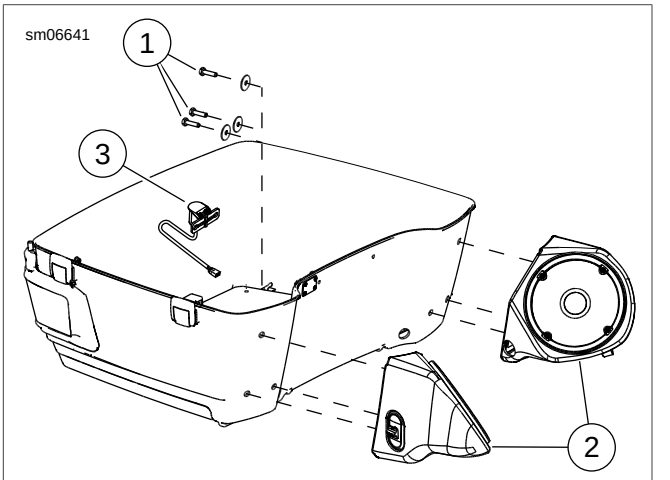
SPEAKER BOX

Removal

1. Remove map pouch and molded liner from Tour-Pak.
2. Remove grommet and draw rear speaker/passenger controls connector out of speaker box. Separate connector halves.
3. Remove three screws with flat washers to free speaker box from Tour-Pak.

Installation

1. See Figure 2-117. Install three screws with flat washers to secure speaker box to Tour-Pak. Tighten bolts to 25-35 **in-lbs** (2.8-4.0 Nm).
2. Install molded liner and map pouch in Tour-Pak.
3. Mate rear speaker/passenger controls connector. Push connector into speaker box and install grommet.



1. **Speaker box fasteners**
2. **Speakers**
3. **Power outlet (if equipped)**

Figure 2-117. Speaker Boxes

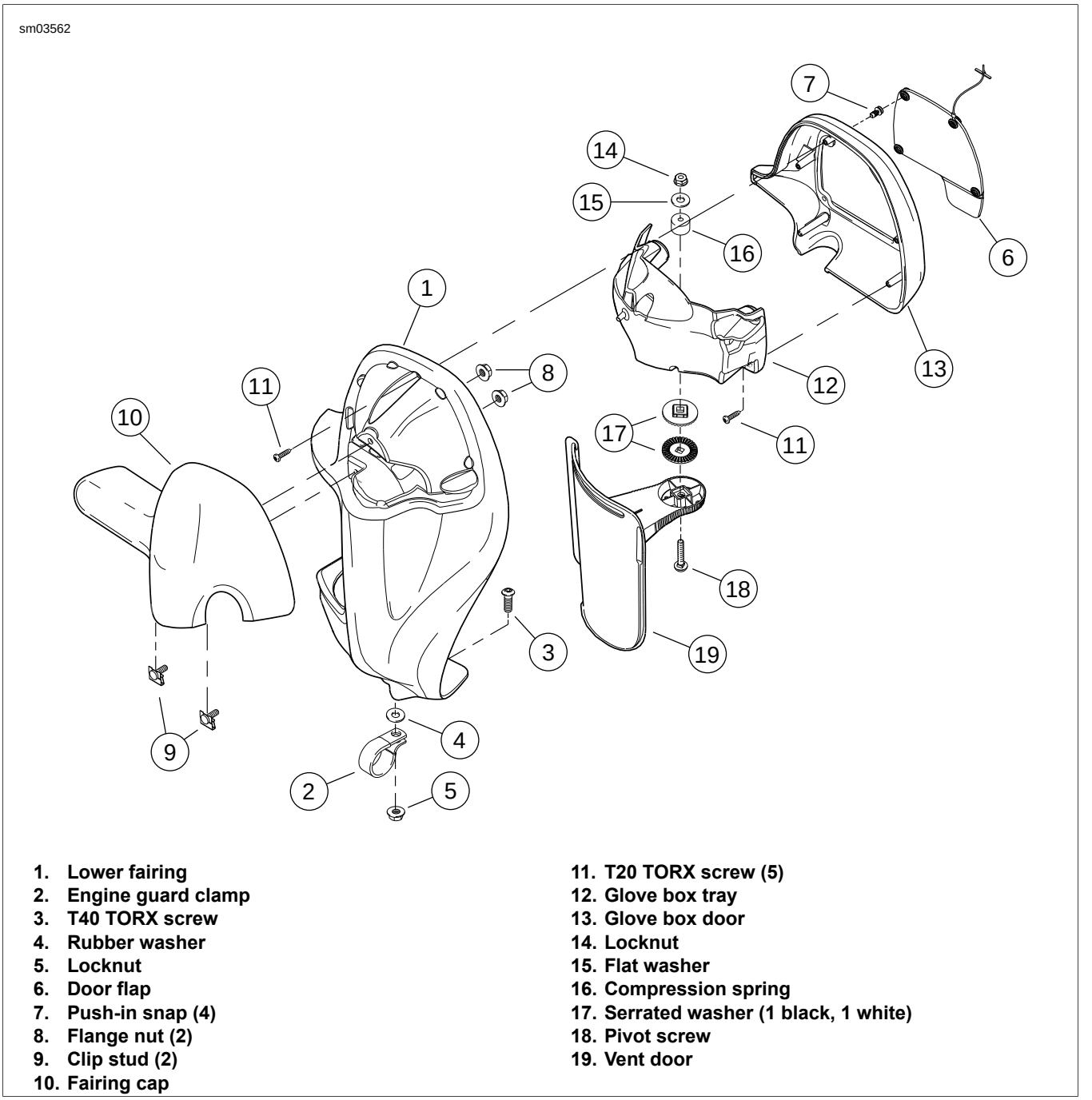
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

LOWER FAIRING AND ENGINE GUARD 2.33

LOWER FAIRING

Removal

1. See Figure 2-118. Remove glove box door flap (6).
2. Remove two flange nuts (8) from clip studs and remove fairing cap (10). Do not twist or rotate fairing cap or damage may result.
3. Remove locknut (5) and screw (3) to free assembly. Discard rubber washer (4).



1. **Lower fairing**
2. **Engine guard clamp**
3. **T40 TORX screw**
4. **Rubber washer**
5. **Locknut**
6. **Door flap**
7. **Push-in snap (4)**
8. **Flange nut (2)**
9. **Clip stud (2)**
10. **Fairing cap**
11. **T20 TORX screw (5)**
12. **Glove box tray**
13. **Glove box door**
14. **Locknut**
15. **Flat washer**
16. **Compression spring**
17. **Serrated washer (1 black, 1 white)**
18. **Pivot screw**
19. **Vent door**

Figure 2-118. Lower Fairing Assembly

Disassembly

1. See Figure 2-118. Remove three screws (11) to release glove box door (13) and glove box tray (12).
2. Remove two screws (11) to release glove box door from glove box tray.

3. Remove locknut (14), flat washer (15), compression spring (rubber sleeve) (16), glove box tray and two serrated washers (17).
4. Remove pivot screw from vent door arm.

Assembly

1. Slide pivot screw up through hole in vent door arm.
2. With the teeth facing upward, install serrated washer. Square shaped boss at bottom of serrated washer should engage square recess in vent door arm.

NOTE

Use one black and one white serrated washer. Using two washers of the same color may result in a chirping noise when the lower fairings are adjusted.

3. Slide second serrated washer over pivot screw so that teeth engage those on first serrated washer.
4. Engage square shaped boss at top of second serrated washer with square hole on glove box tray.
5. Install compression spring (rubber sleeve), flat washer and locknut on pivot screw. Verify that pin at front of glove box tray engages slot at top of vent door.
6. Tighten locknut only until flat washer is snug (does not rotate) and then tighten an additional 1-1/2 turns. Verify proper vent door operation.

NOTE

For best results, the 0.50 in. (12.7 mm) compression spring must be compressed to a height of 0.420 to 0.460 in. (10.7-11.7 mm).

7. Secure glove box tray to glove box door with two screws (11). Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
8. Secure glove box tray to lower fairing with three screws. Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
9. Install glove box door flap.

Installation

1. Place lower fairing into position at front of engine guard.
2. See Figure 2-118. Install **new** rubber washer (4), clamp (2) and locknut (5) to attach bottom of lower fairing to engine guard. Do not tighten locknut.
3. Verify that two clip studs (9) are fully installed on fairing cap.
4. Position fairing cap (10) against lower fairing and start two flange nuts (8) on clip studs.
5. Verify that lower fairing is square. Tighten flange nuts (8) to 35-40 **in-lbs** (4.0-4.5 Nm).
6. Hold locknut (5) and tighten screw (3) to 90-100 **in-lbs** (10.2-11.3 Nm).

SERRATED WASHER REPLACEMENT

Removal

1. Remove glove box door flap.
2. Remove locknut, flat washer and compression spring (rubber sleeve) from pivot screw in vent door arm. Remove pivot screw.
3. Carefully extract serrated washers. Discard washers.

Installation

NOTE

Use one black and one white serrated washer. Using two washers of the same color may result in a chirping noise when the lower fairings are adjusted.

1. With the teeth up, install **new** serrated washer at top of vent door arm. Be sure that square shaped boss on washer engages square recess in arm.
2. With the teeth down, install **new** serrated washer at bottom of glove box tray. Be sure that square shaped boss on washer engages square hole in tray.
3. Slide pivot screw up through hole in center of vent door arm.
4. Install compression spring (rubber sleeve), flat washer and locknut on pivot screw.
5. Tighten locknut only until flat washer is snug (does not rotate) and then tighten an additional 1-1/2 turns. Verify proper vent door operation.

NOTE

For best results, the 0.50 in. (12.7 mm) compression spring must be compressed to a height of 0.420 to 0.460 in. (10.7-11.7 mm).

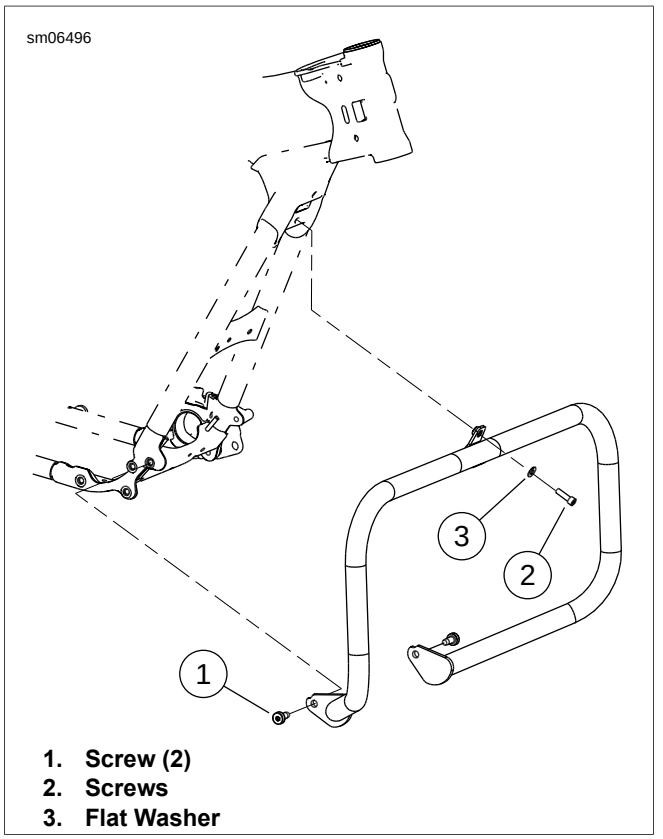
ENGINE GUARD

Removal

1. Remove lower fairings, if present. See 2.33 LOWER FAIRING AND ENGINE GUARD, Lower Fairing. Remove lower fairing clamps from engine guard.
2. See Figure 2-119. Remove two screws (1) to release ends of engine guard from frame weldments.
3. Remove screw (2) and flat washer (3) and remove engine guard.

Installation

1. See Figure 2-119. Insert tab at top of engine guard into slot at base of steering head. Start screw (2) with flat washer (3).
2. Secure lower ends of engine guard to frame weldments with screws (1).
3. Tighten all three screws to 15-20 ft-lbs (20.3-27.1 Nm).
4. Install lower fairing clamps on each side of engine guard. Install lower fairings, if present. See 2.33 LOWER FAIRING AND ENGINE GUARD, Lower Fairing.



1. Screw (2)
2. Screws
3. Flat Washer

Figure 2-119. Engine Guard

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS 2.34

OUTER FAIRING AND WINDSHIELD

Removal

1. Remove the main fuse.
2. See Figure 2-120. Loosen but do not remove three screws (1) (with flat washers) securing the windshield.
3. Raise and remove the windshield.
4. Remove two screws (2).
5. Remove two screws (3).

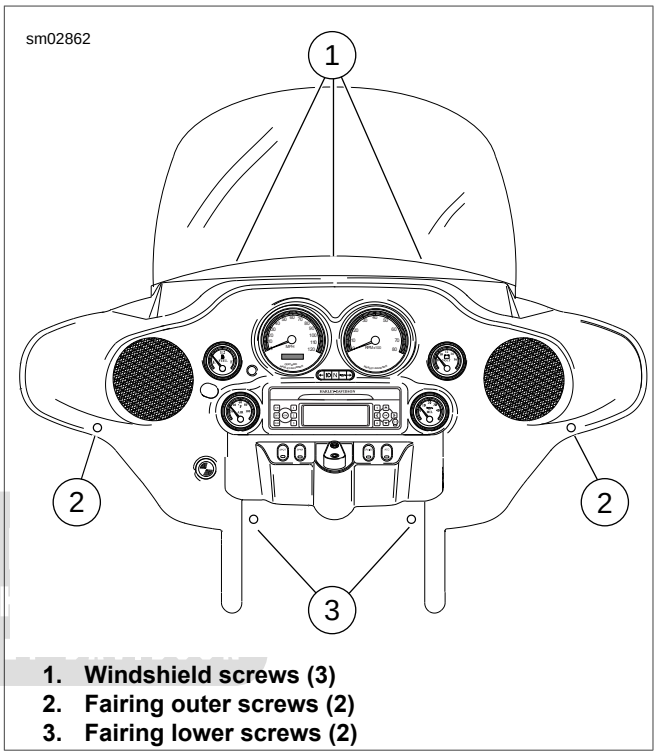
NOTE

On models without auxiliary lamps, be sure to hold the outer fairing in position as the last screw is removed.

6. Remove the three screws (1).
7. Tilt the outer fairing forward and separate headlamp connector [38].
8. Lift the outer fairing off the motorcycle.

Installation

1. Place the outer fairing on the motorcycle and mate headlamp connector [38] to the headlamp assembly.
2. See Figure 2-120. Start three screws (1) (with flat washers).
3. Start two screws (2).
4. Start two screws (3).
5. Tighten screws (2, 3) to 20-30 **in-lbs** (2.3-3.4 Nm).
6. Place the windshield into position between the inner and outer fairings engaging the slotted holes in the windshield with the threaded bosses on the inner fairing.
7. Tighten three screws (1) to 25-30 **in-lbs** (2.8-3.4 Nm).
8. Install the main fuse.



1. **Windshield screws (3)**
2. **Fairing outer screws (2)**
3. **Fairing lower screws (2)**

Figure 2-120. Outer Fairing Screws

FAIRING CAP: FORK MOUNTED FAIRING MODELS 2.35

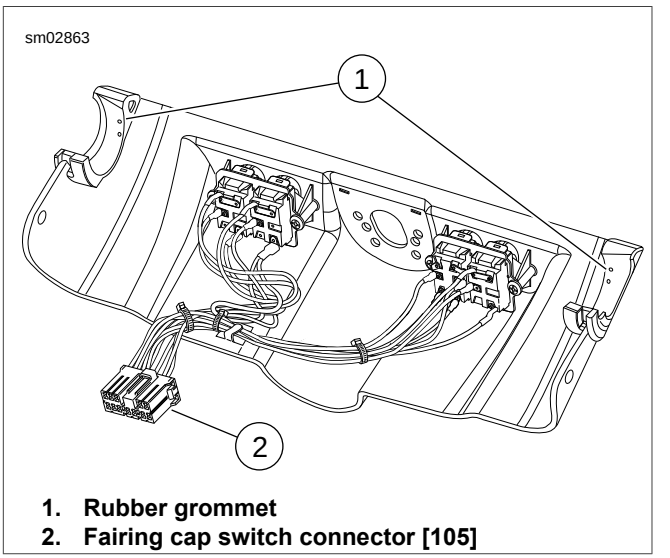
FAIRING CAP

Removal

1. Remove ignition switch knob, spring, nut, collar, spacer and switch position plate from key switch. See 7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK.
2. Remove two screws (with flat washers) to release fairing cap from left and right sides of inner fairing.
3. See Figure 2-121. With the front forks turned to the left fork stop, disconnect fairing cap switch connector [105] (2), 12-place Multilock (black).
4. Remove fairing cap from motorcycle.

Installation

1. See Figure 2-121. Verify that rubber grommets (1) are installed on each side of fairing cap. Barbs on cap fit into holes in grommets.
2. Mate switch connector [105] (2), 12-place Multilock (black).
3. Install fairing cap over ignition switch housing. Verify that grommets in fairing cap fully capture handlebar, handlebar switch conduit, and brake line from front master cylinder reservoir (right side).



1. Rubber grommet
2. Fairing cap switch connector [105]

Figure 2-121. Fairing Cap Assembly

4. Install two screws (with flat washers) to secure fairing cap. Tighten screws to 25-30 **in-lbs** (2.8-3.4 Nm).
5. Assemble key switch. See 7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

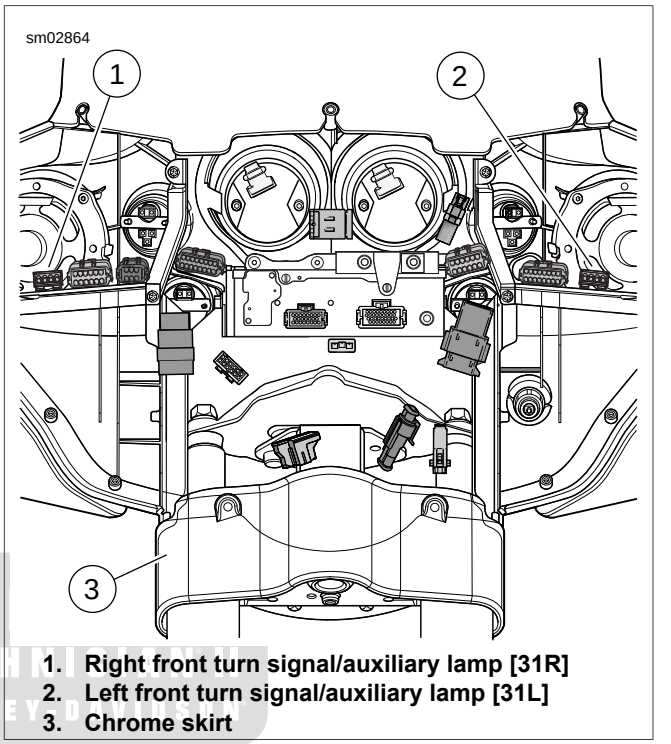
INNER FAIRING: FORK MOUNTED FAIRING MODELS 2.36

REMOVAL

NOTE

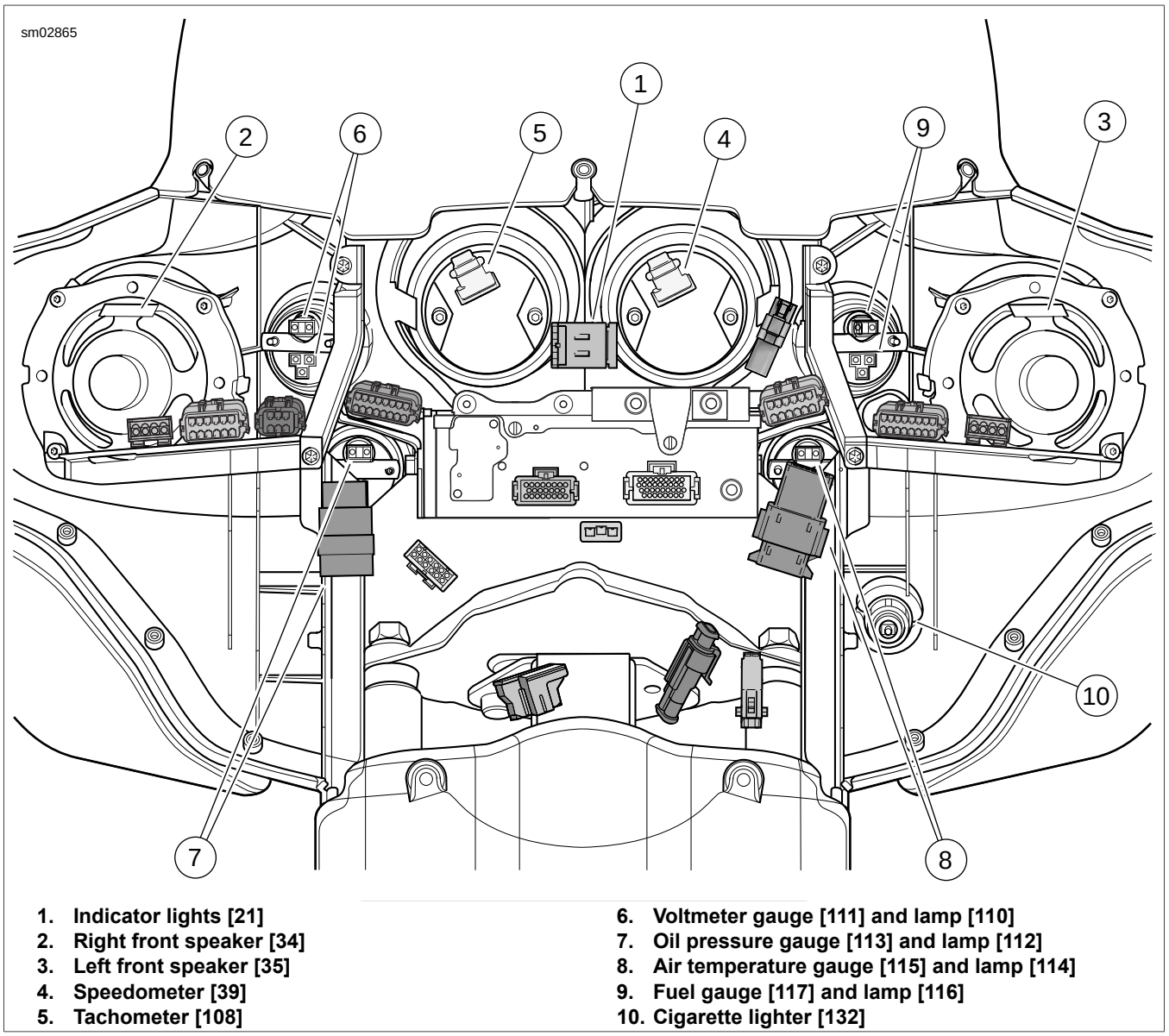
To avoid scratches or other damage, place protective material over front fender, fuel tank and lower fairings, if present.

1. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS, Outer Fairing and Windshield.
2. See Figure 2-122. Disconnect left (2) and right (1) front turn signal/auxiliary lamp connectors [31L/R] (4-place Multilocks).
3. Remove four screws to release auxiliary lamp bracket from upper and lower fork brackets.
4. Remove fairing cap. See 2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS, Fairing Cap.
5. See Figure 2-122. Remove chrome skirt (3) from inner fairing.
6. Remove clutch cable from clutch hand lever. See 2.22 CLUTCH CABLE.
7. Pull the clutch cable through inner fairing grommet toward the front of the motorcycle.
8. See Figure 2-123. Remove cigarette lighter socket (10) from inner fairing.
9. Disconnect speaker connector terminals [35] and remove three screws securing each speaker. Remove speakers.
10. Remove rubber boot from odometer reset switch. Remove switch from inner fairing.
11. Disconnect speedometer (4) [39] and tachometer (5) [108] connectors. Leaving interconnect harness anchored to brackets, remove brackets from gauges. Remove gauges from inner fairing.



1. Right front turn signal/auxiliary lamp [31R]
2. Left front turn signal/auxiliary lamp [31L]
3. Chrome skirt

Figure 2-122. Inner Fairing (Front View)



1. **Indicator lights [21]**
2. **Right front speaker [34]**
3. **Left front speaker [35]**
4. **Speedometer [39]**
5. **Tachometer [108]**
6. **Voltmeter gauge [111] and lamp [110]**
7. **Oil pressure gauge [113] and lamp [112]**
8. **Air temperature gauge [115] and lamp [114]**
9. **Fuel gauge [117] and lamp [116]**
10. **Cigarette lighter [132]**

Figure 2-123. Inner Fairing Connectors

12. Remove indicator lamps (1) from inner fairing. See 7.30 INDICATOR LAMPS: FAIRING MODELS.
13. See Figure 2-123. Disconnect voltmeter gauge [111] and lamp [110] connectors (6). Disconnect fuel gauge [117] and lamp [116] connectors (9).
14. See Figure 2-124. Remove four screws to free inner fairing from fairing bracket.
15. Spread bottom of inner fairing and fairing bracket to free from threaded dowels in lower fork bracket. Raise inner fairing and fairing bracket slightly to prevent re-engagement with dowels.
16. **Classic and Ultra models:** See Figure 2-123. Disconnect oil pressure gauge [113] and lamp [112] connectors (7). Disconnect air temperature gauge [115] and lamp [114] connectors (8).
17. Raise inner fairing and fairing bracket together and then separate by pulling fairing bracket toward the front and inner fairing toward the rear.
18. When inner fairing comes free of the radio, remove from motorcycle.
19. Install fairing bracket (with radio and interconnect harness) back onto motorcycle and loosely install screws.
20. Remove mounting brackets from voltmeter and fuel gauges and remove gauges from inner fairing. On Classic and Ultra models, repeat step to remove oil pressure and air temperature gauges.
21. Remove clutch cable grommet from inner fairing.

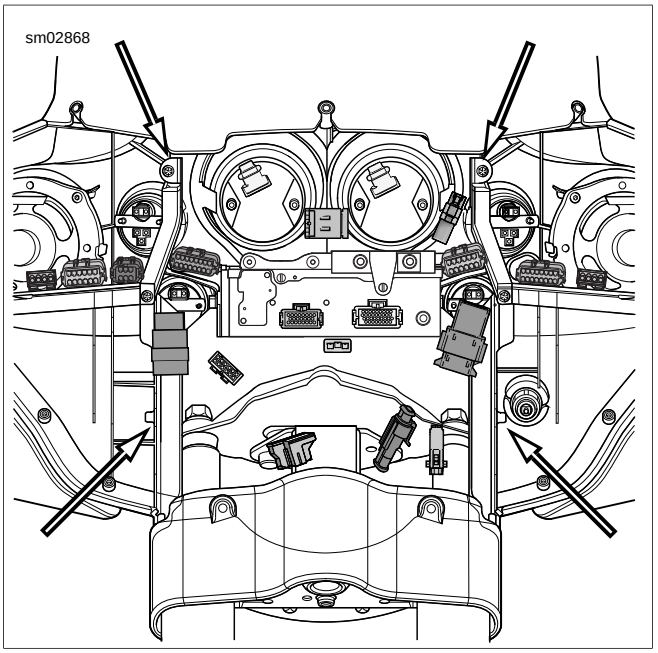


Figure 2-124. Remove Fairing Bracket Screws

INSTALLATION

1. Install clutch cable grommet in inner fairing.
2. See Figure 2-125. Install voltmeter and fuel gauges. Install brackets and verify that tabs on top and bottom of brackets engage slots in inner fairing. Loosely install hex nuts on studs. Verify that gauge is properly aligned and tighten nuts to 10-20 **in-lbs** (1.1-2.3 Nm).
3. **Classic and Ultra models:** Repeat last step to install air temperature and oil pressure gauges.

NOTE

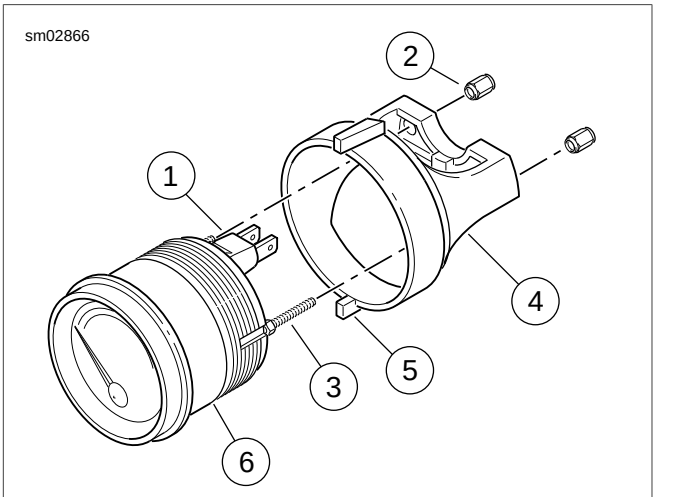
To avoid scratches or other damage, place protective material over front fender, fuel tank and lower fairings, if present.

4. Remove fairing bracket (with radio and interconnect harness) from lower fork bracket. Raise fairing bracket and then tilt forward at a 45 degree angle.
5. Position inner fairing at rear of fairing bracket. Align upper and lower fork bracket through-holes with those in fairing bracket. Draw fairing bracket and inner fairing together fitting radio into slot of inner fairing.
6. Install four screws to secure fairing bracket and inner fairing to upper and lower fork brackets. Tighten screws until snug.
7. See Figure 2-124. Install four screws to fasten inner fairing to fairing bracket.
8. See Figure 2-123. Connect voltmeter gauge and lamp connectors (6). Connect fuel gauge and lamp connectors (9).
9. **Classic and Ultra models:** Connect oil pressure gauge and lamp connectors (7). Connect air temperature gauge and lamp connectors (8).
10. Install indicator lights assembly and mate connector (1). See 7.30 INDICATOR LAMPS: FAIRING MODELS.
11. Install speedometer and tachometer gauges in inner fairing. Install brackets and start screws. Rotate brackets until top and bottom tabs engage slots in inner fairing. Verify that gauges are properly aligned and tighten screws to 10-20 **in-lbs** (1.1-2.3 Nm). Connect speedometer (4) and tachometer (5) gauge connectors.
12. Slide odometer reset switch through hole in inner fairing and install rubber boot.
13. Install the speakers with the thickest edge of the adaptor at the top. Install two long screws at top of speaker adapter. Capturing fairing support brace, install short screw in lower outboard hole (positioning flat washer between adapter and support brace). Tighten lower screw to 22-28 **in-lbs** (2.5-3.2 Nm). Tighten two upper screws to 35-50 **in-lbs** (4.0-5.7 Nm).

NOTE

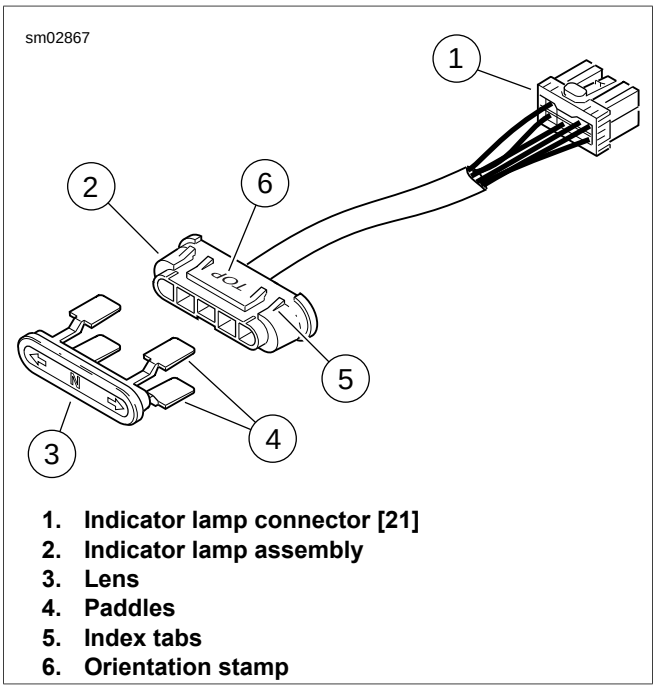
The screw hole on the lower inboard side of the speaker adapter is not used.

14. Connect speaker spade contacts.
15. Install cigarette lighter and tighten outer shell securely. Connect the orange/white wire terminal to the socket spade contact and the black wire terminal to the outer shell contact.
16. Route clutch cable through inner fairing grommet and connect to hand lever. See 2.22 CLUTCH CABLE.
17. Adjust clutch. See 1.11 CLUTCH.
18. Install fairing cap. See 2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS.
19. See Figure 2-122. Remove two screws from lower fork bracket and install chrome skirt.
20. Loosen two screws in upper fork bracket.



1. **Pin housing**
2. **Hex nut**
3. **Stud**
4. **Mounting bracket**
5. **Tab**
6. **Gauge**

Figure 2-125. 2 Inch Diameter Gauges



1. **Indicator lamp connector [21]**
2. **Indicator lamp assembly**
3. **Lens**
4. **Paddles**
5. **Index tabs**
6. **Orientation stamp**

Figure 2-126. Indicator Lamp Assembly

21. Slide slots of auxiliary lamp bracket onto upper and lower fork bracket screws. Tighten four screws to 15-20 ft-lbs (20-27 Nm) in a crosswise pattern.
22. See Figure 2-122. Mate left and right front turn signal/auxiliary lamp connectors (1,2). Install on T-studs at top of left and right fairing support braces (outboard side). Verify that conduit is routed inboard using relief in upper outboard corner of chrome skirt.
23. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

AIR DEFLECTORS 2.37

AIR DEFLECTORS

Removal

1. See Figure 2-127. Remove four screws to release air deflector at side of inner fairing.
2. Repeat step to remove air deflector on opposite side of motorcycle.

Installation

1. Install four screws to fasten air deflector at side of inner fairing. Alternately tighten screws to 25-30 **in-lbs** (2.8-3.4 Nm).
2. Repeat step to install air deflector on opposite side of motorcycle.

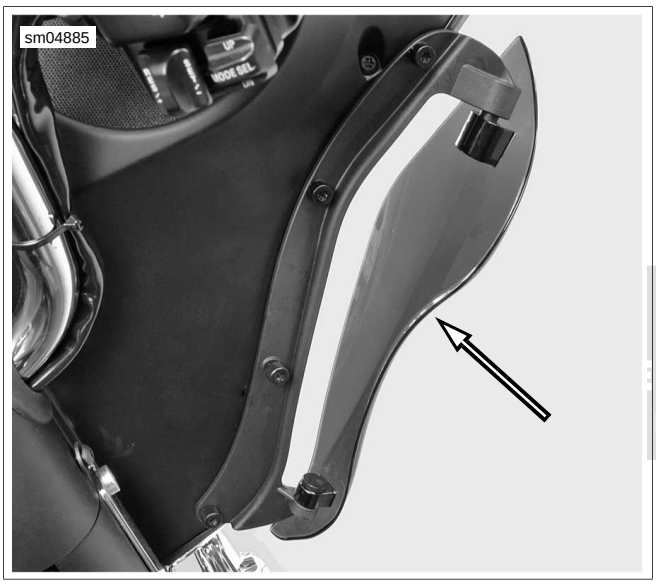


Figure 2-127. Air Deflector (Adjustable)

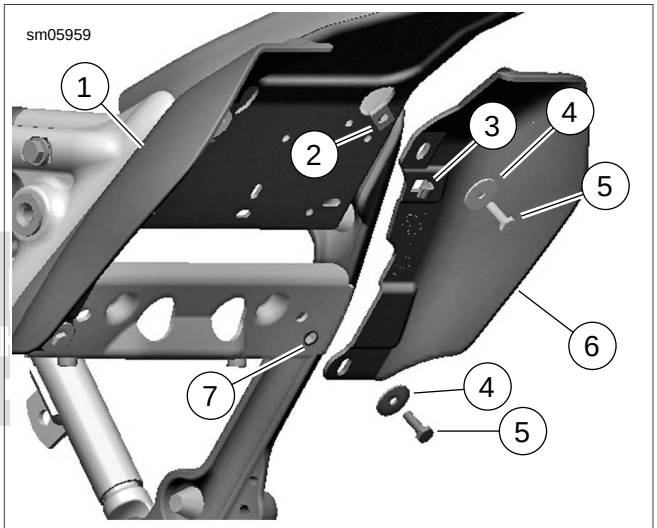
MID-FRAME AIR DEFLECTORS

Removal

1. See Figure 2-128. Release spark plug wire from retainer (3) (left deflector only).
2. Remove bolts (5) and washers (4).
3. Remove deflector (6) from frame.

Installation

1. See Figure 2-128. Verify clip nut (2) is installed in frame hole.
2. Install left air deflector (6) with washers (4) and bolts (5). Tighten bolts to 25-35 **in-lbs** (2.8-4.0 Nm).
3. Secure spark plug wire in retainer (3).



1. **Right air deflector**
2. **Clip nut (2)**
3. **Rear spark plug wire retainer**
4. **Washer (4)**
5. **Bolt (4)**
6. **Left air deflector**
7. **Clinch nut (2)**

Figure 2-128. Air Deflectors

UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS 2.38

WINDSHIELD

Removal

1. Remove five screws (with plastic flat washers) at base of windshield.
2. Remove windshield from outer fairing.

NOTE

*The rubber trim at the bottom of the windshield is secured with adhesive and is not intended to be removed. A **new** lower trim is included with the replacement windshield. Follow the instructions included with the replacement windshield to attach the **new** lower trim.*

3. See Figure 2-129. Carefully remove wellnuts (with rubber flat washers) from holes in outer fairing.

NOTE

Exercise caution to avoid pushing wellnuts into fairing during removal. Inspect wellnuts and rubber flat washers for cuts, tears or signs of deterioration. Replace as necessary.

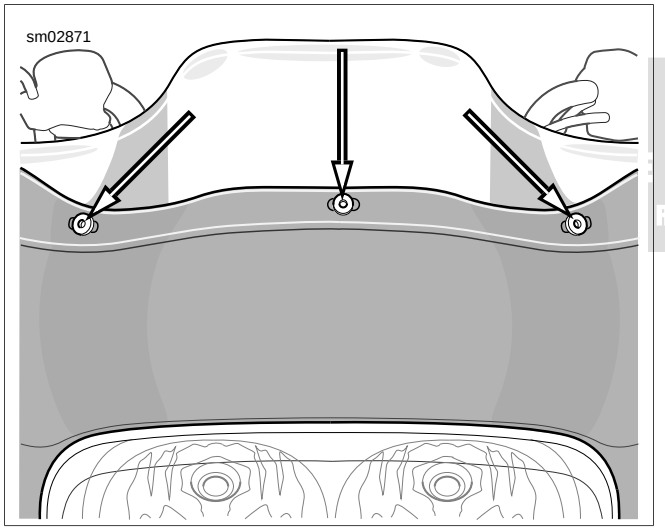
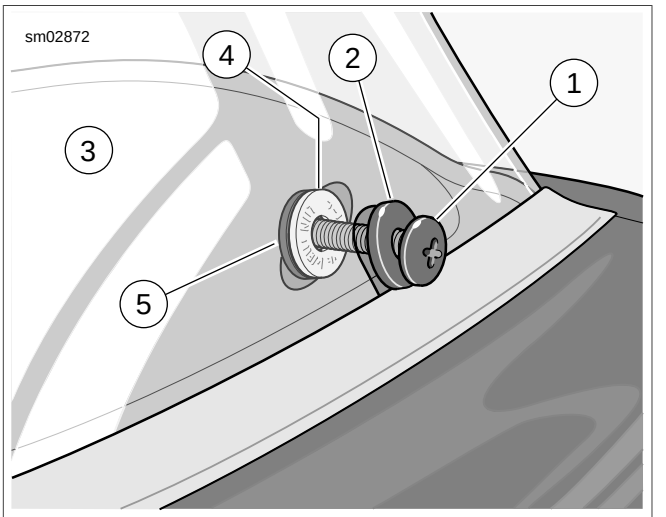


Figure 2-129. Remove Wellnuts from Outer Fairing

Installation

1. **Preinstall** hardware on windshield as follows:
   a. Slide plastic flat washers onto screws.
   b. Slide screws through slots in windshield.
   c. Slide rubber flat washers onto wellnuts.
   d. Start wellnuts onto screws.
2. See Figure 2-130. Push wellnuts into holes in outer fairing.
3. Starting with center screw, alternately tighten five screws to 6-13 **in-lbs** (0.7-1.5 Nm).



1. **Screw**
2. **Plastic flat washer**
3. **Windshield**
4. **Wellnut**
5. **Rubber flat washer**

Figure 2-130. Install Windshield

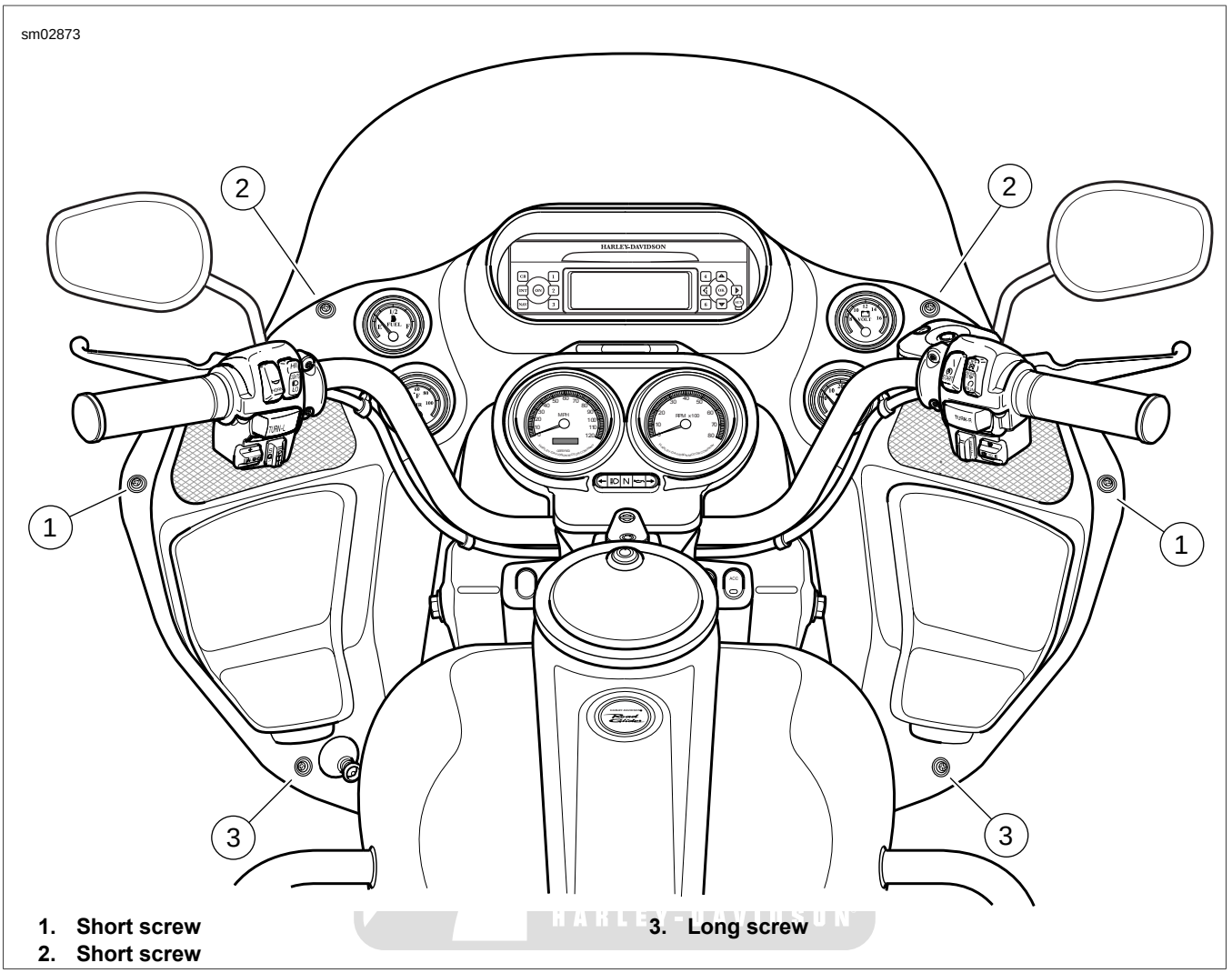
OUTER FAIRING

Removal

NOTE

Windshield may be left in place during outer fairing removal.

1. Place protective material on top of front fender to protect paint.
2. See Figure 2-131. Remove screws (1).
3. **Loosen** screws (2).
4. Remove screws (3).
5. See Figure 2-132. Remove acorn nuts (with flat washers) and remove front turn signal lamp assemblies. Allow to hang from wires.



1. **Short screw**
2. **Short screw**
3. **Long screw**

Figure 2-131. Fairing Screw Torque Sequence

6. Raise outer fairing slightly and then rest on protective fender pad and separate headlamp harness connector.
7. To avoid possible wire damage, separate front turn signal lamp connectors and remove lamps.

Installation

1. Place protective material on top of front fender to protect paint.

NOTE

The front turn signal lamp assemblies are not interchangeable. Note that the letters R(ight) or L(eft) are stamped on the inboard side of the turn signal lamp bracket to help verify proper assembly.

2. Mate front turn signal lamp connectors. Capture harnesses in adhesive clips on inner fairing. Allow front turn signal lamp assemblies to hang until outer fairing installation is complete.
3. Verify that trim strips are installed inboard of hooks on radio bracket.
4. Rest outer fairing on front fender pad and mate headlamp harness connector.

NOTE

If windshield is attached during outer fairing installation, exercise caution to avoid scratching or damaging inner fairing with windshield screws and wellnuts.

5. Place outer fairing against inner fairing with two slots in outer fairing engaged in hooks on radio bracket. Verify full engagement between outer and inner fairings.
6. Verify that inner fairing alignment tabs are properly engaged and positioned outboard of those on the outer fairing.

NOTE

*Install the first screw on the side that does **not** have the best fit.*

7. Loosely install screws (1).
8. Loosely install screws (2).
9. Loosely install screws (3).

10. Tighten screws in sequence shown in Figure 2-131. Tighten screws (1, 2) to 6-12 **in-lbs** (0.7-1.4 Nm). Tighten screws (3) to 10-15 **in-lbs** (1.1-1.7 Nm).
11. Install turn signal lamps and secure with acorn nuts and flat washers. Tighten acorn nuts to 60-84 **in-lbs** (6.8-9.5 Nm).

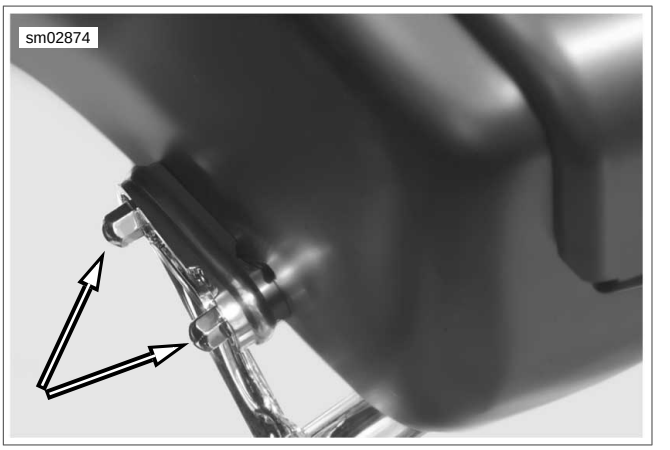


Figure 2-132. Remove Acorn Nuts to Release Turn Signal Lamp and Bracket

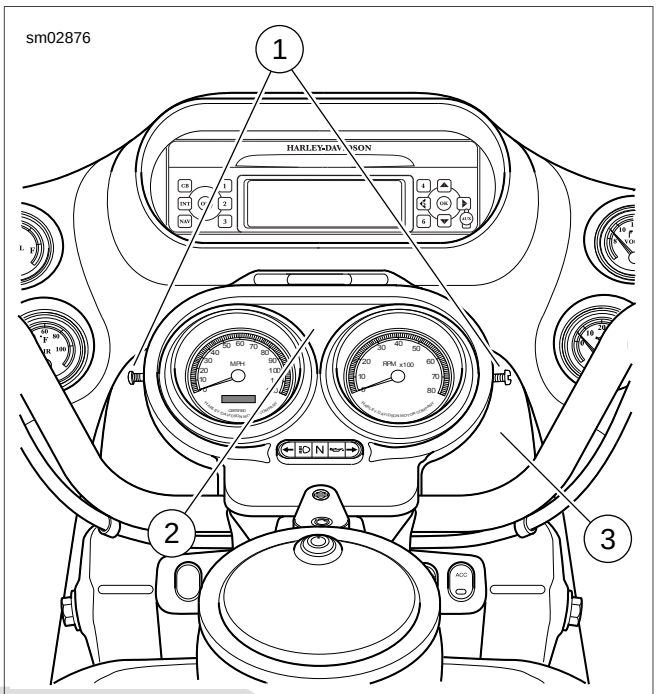
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS 2.39

BEZEL

Removal

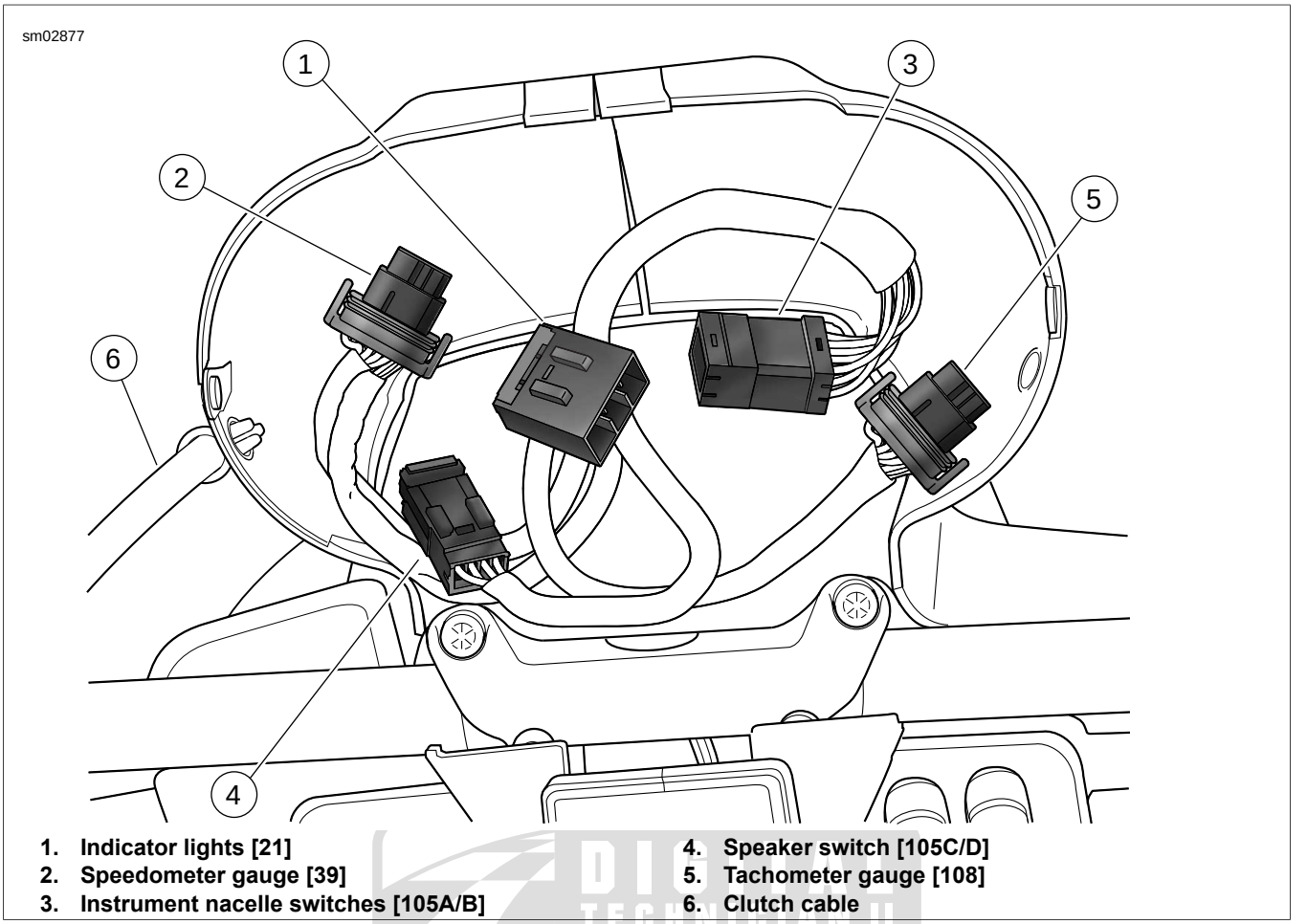
1. See Figure 2-133. Remove screws (1) on each side of bezel.
2. Push forward to release tab at rear of bezel from slot in front of ignition switch. Raise free side of bezel until front tabs are disengaged.



1. Screw (2)
2. Bezel
3. Instrument nacelle

Figure 2-133. Remove Bezel Screws

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Indicator lights [21]**
2. **Speedometer gauge [39]**
3. **Instrument nacelle switches [105A/B]**
4. **Speaker switch [105C/D]**
5. **Tachometer gauge [108]**
6. **Clutch cable**

Figure 2-134. Frame Mounted Fairing Models: Instrument Nacelle (Bezel Removed)

3. See Figure 2-134. Raise bezel slightly and disconnect instruments and indicator lights from interconnect harness as follows:
   a. Speedometer connector (2).
   b. Tachometer connector (5).
   c. Indicator lights connector (1).
4. Remove bezel from motorcycle.

Installation

1. See Figure 2-134. Connect instruments and indicator lights to interconnect harness as follows:
   a. Speedometer connector (2).
   b. Tachometer connector (5).
   c. Indicator lights connector (1).
2. Verify that left and right sides of instrument nacelle are properly mated.
3. Insert tab at rear of bezel into slot of instrument nacelle. Hold left and right sides of nacelle together and place bezel over instrument nacelle flange. When properly mated, tabs at front of instrument nacelle engage lip in slot at front of bezel.

NOTE

*If tabs do not properly engage slot at front of bezel, remove decorative adhesive strip by gently prying up outer edges using a flat bladed screwdriver and carefully raise tabs so that they engage lip in slot. If damaged, install **new** decorative adhesive strip.*

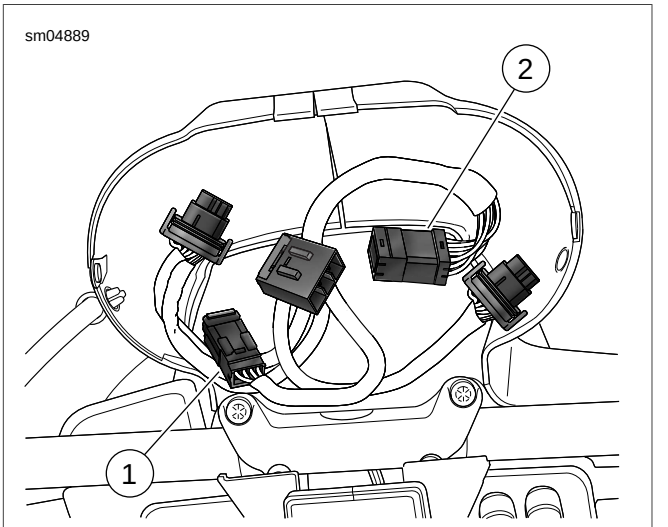
4. See Figure 2-133. Install screws (1) on each side of bezel. Alternately tighten screws to 25-35 **in-lbs** (2.8-4.0 Nm).

INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS 2.40

INSTRUMENT NACELLE

Removal

1. Remove key switch knob, spring, nut, collar, spacer and switch position plate. See 7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK.
2. Remove bezel. See 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS.
3. See Figure 2-135. Disconnect speaker switch connector (1) from instrument nacelle switch harness.
4. Remove clutch cable clip from hole on left side of instrument nacelle.
5. See Figure 2-136. Remove two screws (with flat washers) to release left side of instrument nacelle from upper and lower fork brackets.
6. Remove rubber boot from odometer reset switch and pull odometer reset switch from hole while removing left side instrument nacelle from motorcycle, .
7. See Figure 2-135. Disconnect instrument nacelle switch connector (2) from interconnect harness.
8. See Figure 2-136. Remove two screws (with flat washers) to release right side of instrument nacelle from upper and lower fork brackets.



1. **Speaker switch [105C/D]**
2. **Instrument nacelle switches [105A/B]**

Figure 2-135. Instrument Nacelle Connectors

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Left side nacelle**
2. **Clutch cable clip hole**
3. **Speaker switch connector [105D]**
4. **Right side nacelle**
5. **Speaker switch connector [105C]**
6. **Instrument nacelle switch connector [105B]**

Figure 2-136. Instrument Nacelle Halves

Installation

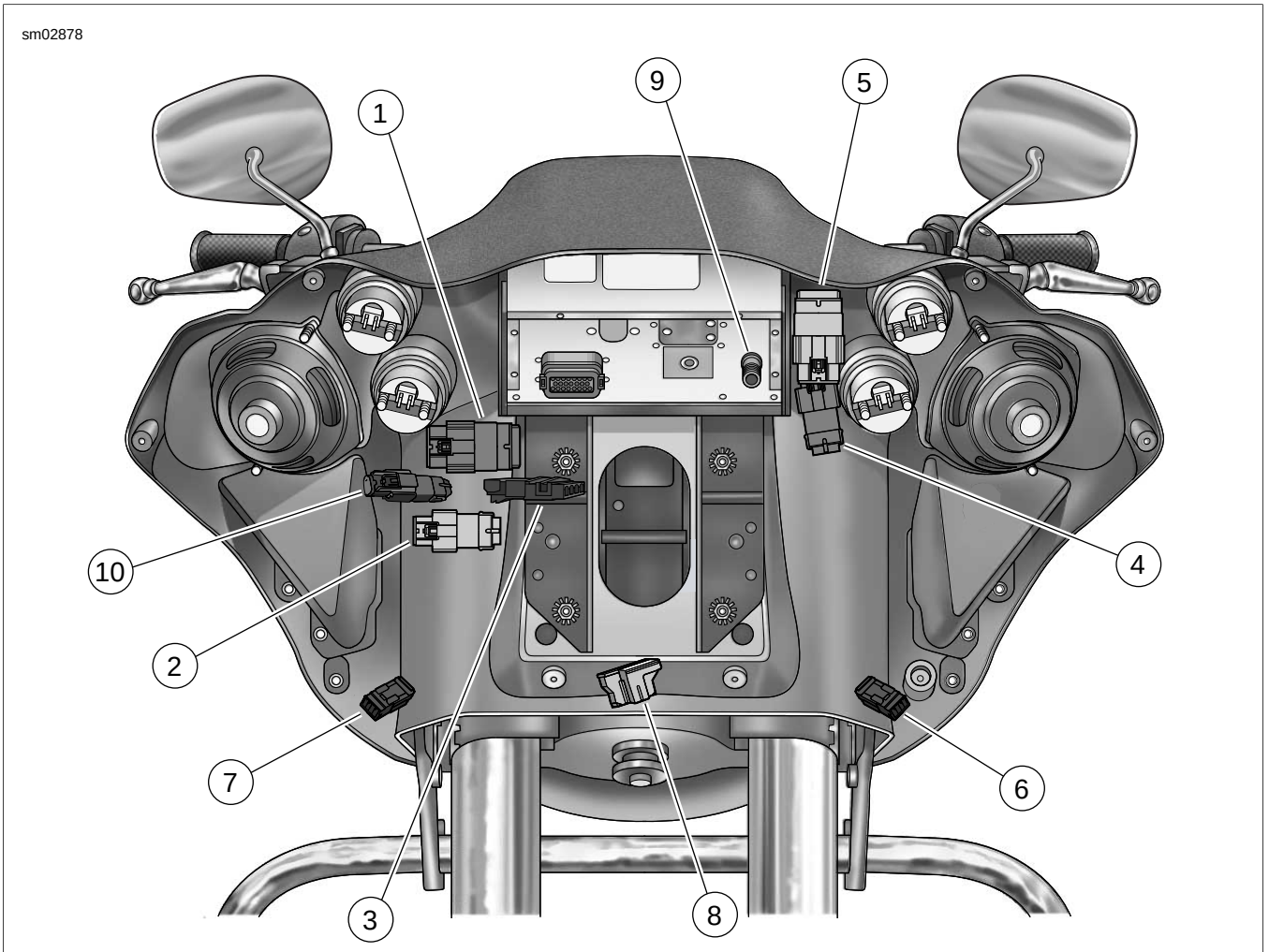
1. Install right side of instrument nacelle on motorcycle.
2. See Figure 2-135. Connect instrument nacelle switch connector (2) to interconnect harness.
3. While carefully placing left side of instrument nacelle on motorcycle, slide odometer reset switch through hole and install rubber boot.
4. Connect speaker switch connector (1) to instrument nacelle switch harness.
5. Verify that left and right sides of nacelle are properly mated and that pins are fully engaged in holes on right nacelle.
6. Install screws (with flat washers) to fasten left and right side instrument nacelle to upper and lower fork brackets. Tighten screws to 15-20 ft-lbs (20.3-27.1 Nm).
7. Capture clutch cable in cable clip. Insert cable clip into hole in left side of instrument nacelle.
8. Install bezel. See 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS.
9. Assemble ignition switch. See 7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK.

INNER FAIRING: FRAME MOUNTED FAIRING MODELS 2.41

REMOVAL

PART NUMBER	TOOL NAME
HD-45961	IGNITION SWITCH CONNECTOR REMOVER

1. Place protective material on top of front fender to protect paint.
2. Remove outer fairing. See 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.
3. Cut two cable straps to free wire bundles from interconnect harness.
4. See Figure 2-137. Separate interconnect harness connector (1), interconnect harness connector (2), and interconnect harness connector (3).
5. Remove antenna cable connector (9) from radio.
6. Separate twist grip sensor jumper harness connector (10) from main harness.

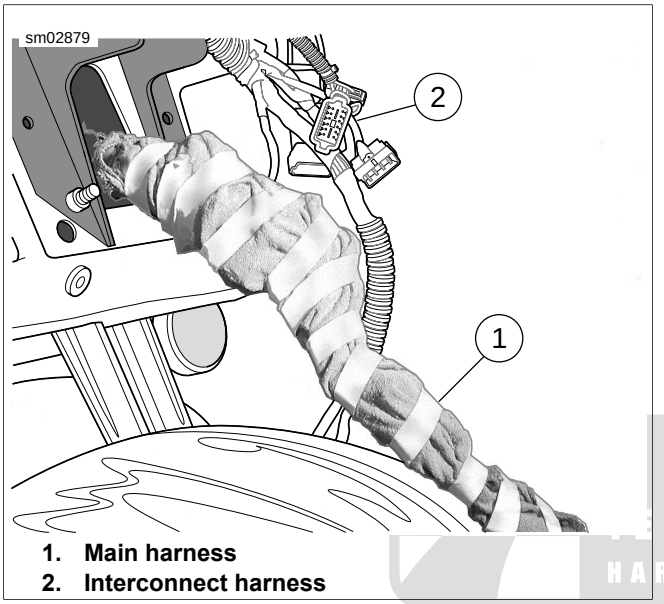


1. **Main to interconnect harness [1]**
2. **Main to interconnect harness [2]**
3. **Main to interconnect harness [15]**
4. **Right handlebar switches [22]**
5. **Left handlebar switches [24]**
6. **Left turn signal [31L]**
7. **Right turn signal [31R]**
8. **Headlamp [38]**
9. **Radio antenna [51]**
10. **Twist grip sensor jumper harness [204]**

Figure 2-137. Inner Fairing Connectors (FLTR)

7. See Figure 2-137. Separate left handlebar switch connector (5) and right handlebar switch connector (4).
8. Remove interconnect harness ground socket terminal from spade contact at front of upper fork bracket (left side).

9. Draw the main harness, radio antenna cable, twist grip sensor jumper harness, and handlebar switch harness as far forward as possible. Rest the connectors of the longer harnesses on the front fender.
10. Remove left side of instrument nacelle. See 2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS.
11. Separate ambient temperature sensor connector [107], 3-place Multilock, from sensor and feed harness through opening on left side of fairing bracket.
12. See Figure 2-138. Draw branches of interconnect harness through tunnel of fairing bracket to front of inner fairing.



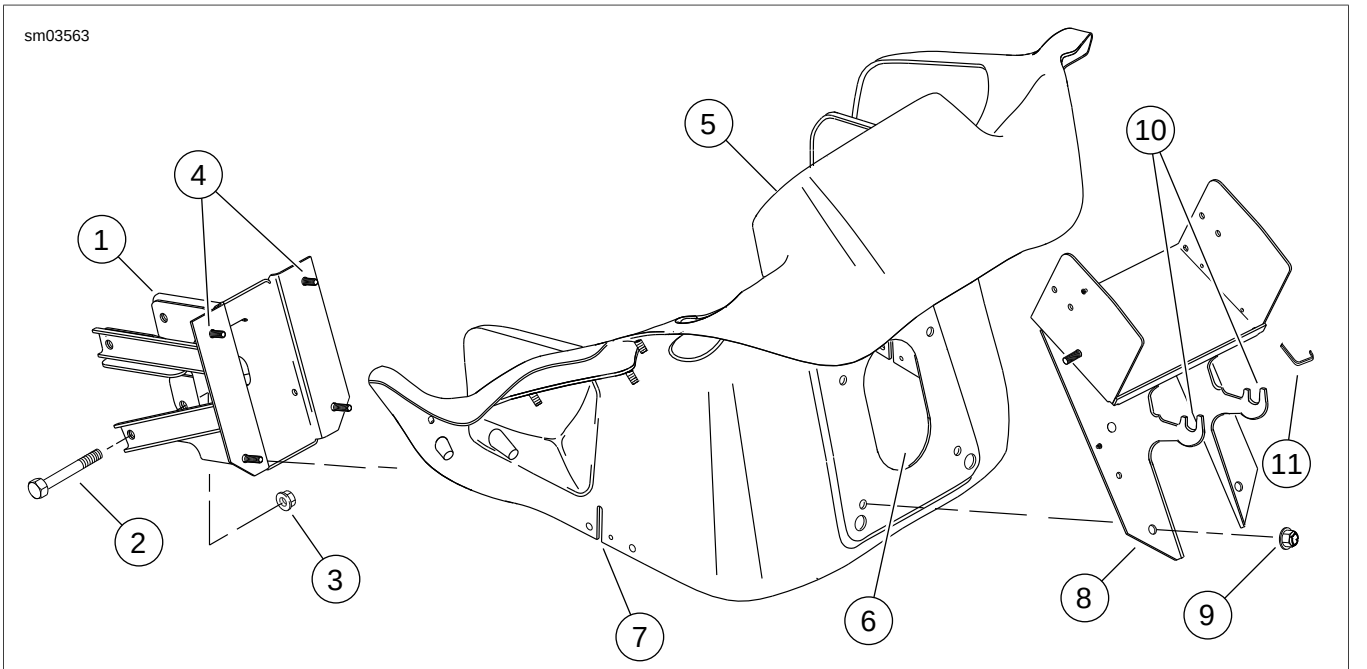
1. **Main harness**
2. **Interconnect harness**

Figure 2-138. Wrap Main Harness in Shop Towels

13. Disconnect ignition switch connector [33], 3-place Packard, at front of ignition switch housing. Proceed as follows:
    a. Gently insert end of IGNITION SWITCH CONNECTOR REMOVER (Part No. HD-45961) into slot in ignition switch housing until it stops.
    b. Pull both the main harness and the tool at the same time to release connector housing from ignition switch housing.
14. Draw branch of main harness with ignition switch connector through tunnel of fairing bracket to front of inner fairing.
15. Separate any branches of the interconnect harness that may be intermingled with the main harness. Allow the interconnect harness to hang along the left side of the front fender.
16. See Figure 2-138. Capturing all connectors, tightly wrap clean shop towels around the main harness, radio antenna cable, twist grip sensor jumper harness, and handlebar switch harness, and secure with masking tape.
17. See Figure 2-139. Remove four locknuts (9) to release radio bracket and inner fairing from fairing bracket.
18. Lift inner fairing (with attached radio bracket and interconnect harness) from fairing bracket studs and move to bench area.

Disassembly

1. Remove right side instrument nacelle. See 2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS.
2. Remove shop towels and masking tape from around the harness bundle and separate.
3. Pull main harness out through opening on right side of fairing bracket and hang over top of engine guard.
4. **ABS equipped:** Draw front wheel speed sensor connector [167], 2-place Amp (Tyco), out through opening on left side of fairing bracket and disconnect from main harness.
5. Draw main to interconnect harness connector [2] out left side of fairing bracket and hang over top of engine guard.
6. Pull handlebar switch conduit and twist grip sensor jumper harness conduit out through opening at top of fairing bracket.
7. Remove locknuts (3) and bolts (2) to release fairing bracket from steering head.



1. **Fairing bracket**
2. **Bolt (2)**
3. **Locknut (2)**
4. **Studs**
5. **Inner fairing**
6. **Opening**
7. **Slot**
8. **Radio bracket**
9. **Locknut (4)**
10. **Outer fairing hooks**
11. **Trim strip**

Figure 2-139. Inner Fairing Assembly

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

INSTALLATION

Outer Fairing

1. See Figure 2-139. Install fairing bracket and secure with bolts (2) from right side. Install locknuts (3) and tighten to 20-30 ft-lbs (27.1-40.7 Nm).
2. See Figure 2-140. Route handlebar switch harness and twist grip sensor jumper harness through opening at top of fairing bracket.
3. **ABS equipped:** Mate front wheel speed sensor connector [167] to main harness.
4. Route main harness that terminates with interconnect harness [2] and wheel speed sensor [167] connectors through the opening on the left side of fairing bracket.
5. Route main harness that terminates with the radio antenna cable [51], twist grip sensor jumper harness [204], ignition switch [33], and main to interconnect harness connectors, [1] and [15], through the opening on the right side of fairing bracket.
6. See Figure 2-138. Draw wire harnesses out tunnel of fairing bracket and pull as far forward as possible. Tightly wrap clean shop towels around the main harness, radio antenna cable, twist grip sensor jumper harness, and handlebar switch harness, and secure with masking tape.
7. Install right side instrument nacelle. See 2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS.

Inner Fairing

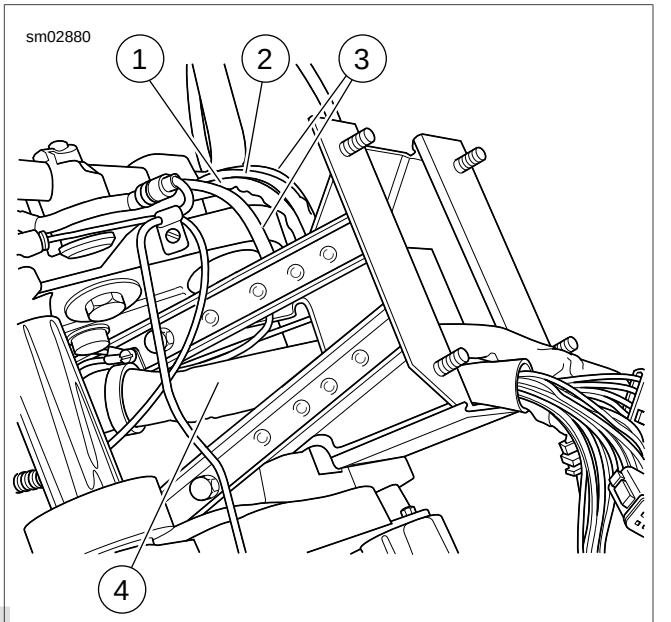
1. Place protective material on top of front fender to protect paint. Rest inner fairing (with attached radio bracket and interconnect harness) on front fender.
2. See Figure 2-139. Place inner fairing over four fairing bracket studs while feeding end of harness bundle through opening (6). Verify that sides of inner fairing are positioned outboard of both fairing supports (on engine guards).
3. Install four locknuts (9). Tighten locknuts to 96-144 **in-lbs** (10.9-16.3 Nm).
4. See Figure 2-138. Draw the harness bundle as far forward as possible, resting the end of the bundle on the front fender.
5. Feed the branch of the interconnect harness terminating in the ambient temperature sensor connector from front of the inner fairing into the tunnel and then out through the opening on the left side of the fairing bracket. Mate the connector to the ambient temperature sensor.
6. Feed the branch of interconnect harness terminating in odometer reset switch and speedometer, tachometer, indicator lights and instrument nacelle switch connectors from the front of the inner fairing through the tunnel of the fairing bracket and then out through opening at top of fairing bracket to instrument nacelle.
7. Connect instrument nacelle switch connector [105A/B] to interconnect harness.

8. Remove shop towels and masking tape from the harness bundle. Separate the harnesses from each other.
9. Feed the branch of main harness terminating in ignition switch connector from the front of the inner fairing through the tunnel of the fairing bracket and then out through opening at top of fairing bracket to instrument nacelle.
10. Mate ignition switch connector [33].
11. Connect interconnect harness ground terminal to the spade contact at the front of the upper fork bracket (left side).
12. See Figure 2-137. Connect handlebar switches to interconnect harness. Proceed as follows:
    a. Left handlebar switch connector (5).
    b. Right handlebar switch connector (4).
13. Connect twist grip sensor jumper harness connector (10) to main harness.
14. Connect radio antenna cable connector (9).
15. Connect main harness to interconnect harness as follows:
    a. Main to interconnect harness connector (1) (black).
    b. Main to interconnect harness connector (2) (gray).
    c. Main to interconnect harness connector (3) (black).
16. Orient connectors. Install two **new** cable straps outboard of radio bracket hooks to secure wire bundles to interconnect harness. Cut any excess cable strap material.

NOTE

To avoid chafing wires of interconnect harness, verify that trim strips are installed inboard of hooks on radio bracket.

17. Install outer fairing. See 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.
18. Install left side of instrument nacelle. See 2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS.
19. Install bezel. See 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS.



1. **Ignition switch**
2. **Twist grip sensor jumper harness**
3. **Left and right handlebar switches**
4. **Main harness**

Figure 2-140. Route Main Harness and Conduit Thru Fairing Bracket

GLOVE BOX DOOR AND HINGE: FRAME MOUNTED FAIRING MODELS 2.42

GLOVE BOX DOOR AND HINGE

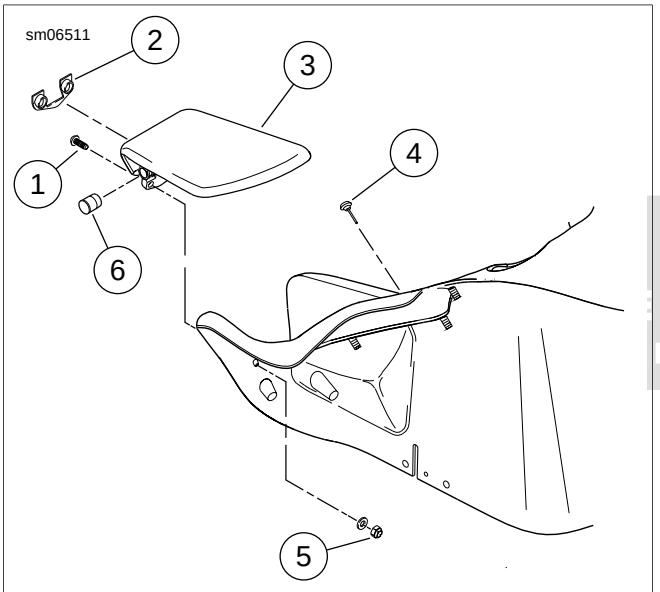
Removal

1. Remove the outer fairing. See 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.
2. See Figure 2-141. Remove screw cover (2).
3. Remove locknuts (5) and washers from screws (1).

NOTE

Hold glove box door closed as hinge screws are completely removed to prevent it from unexpectedly falling.

4. Remove screws (1) and door (3).
5. If hinge replacement is necessary, remove plastic barrels (6) to release hinge from door.



1. **Screw (2)**
2. **Screw cover**
3. **Door**
4. **Bumper (2)**
5. **Locknut (2)**
6. **Barrel (2)**

Figure 2-141. Glove Box Door

Installation

1. Place spring inside hinge inserting spring pin into closest hole. With coil and one spring pin positioned inside hinge, second spring pin is outside.
2. Place hinge into position capturing free end of external spring pin between ribs molded into glove box door.
3. See Figure 2-141. Install plastic barrels (6). Slot in barrel prevents interference with spring pin. Push barrels in until tight.

NOTE

*If removed, install **new** glove box door bumpers (4) in inner fairing and pull anchor through hole.*

4. Place glove box door into position and secure with screws (1), washers and locknuts (5).
5. Snap screw cover (2) into place.
6. Install the outer fairing. See 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.

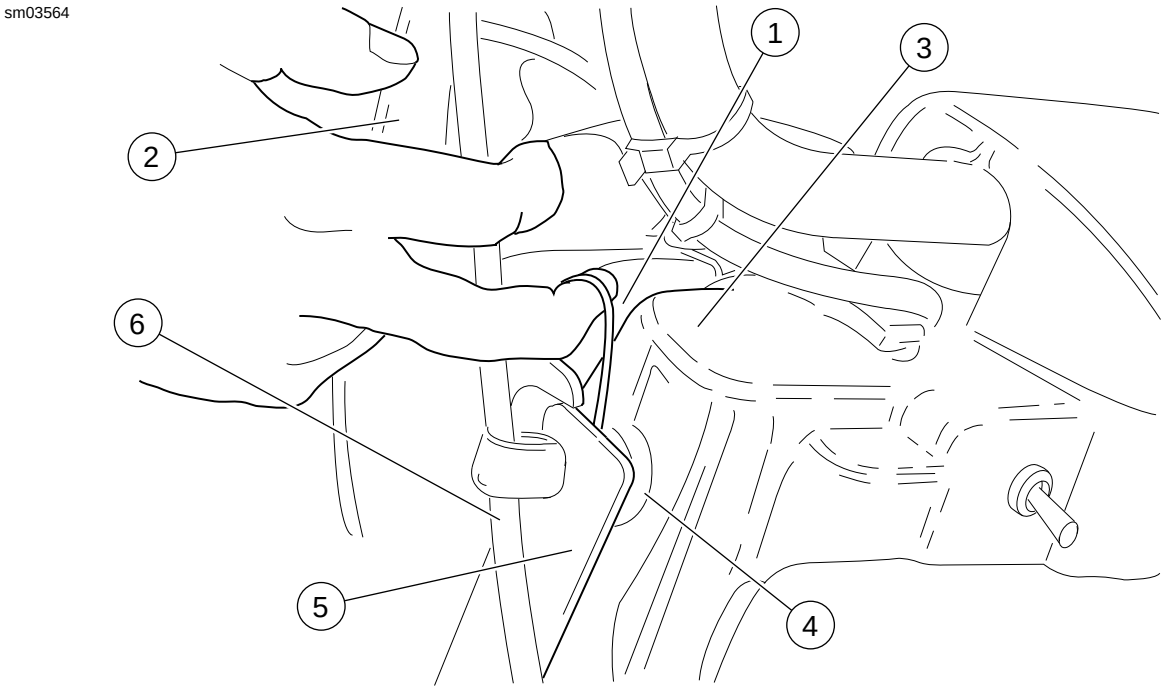
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WINDSHIELD: ROAD KING MODELS 2.43

WINDSHIELD

Removal

1. See Figure 2-142. Raise the wireform latch springs on both sides of the windshield.
2. Gently pull on the top of the windshield until the upper notches on the windshield brackets are free of the upper grommets.
3. Carefully raise the windshield until the lower notches are free of the lower grommets.
4. Remove windshield from motorcycle.



1. **Wireform latch spring**
2. **Windshield**
3. **Headlamp nacelle**
4. **Upper grommet**
5. **Auxiliary lamp bracket**
6. **Clutch cable**

Figure 2-142. Windshield (FLHR/C)

Installation

NOTE

To avoid scratching headlamp nacelle or auxiliary lamp bracket, be sure that all four notches on the windshield brackets are firmly seated on a rubber grommet.

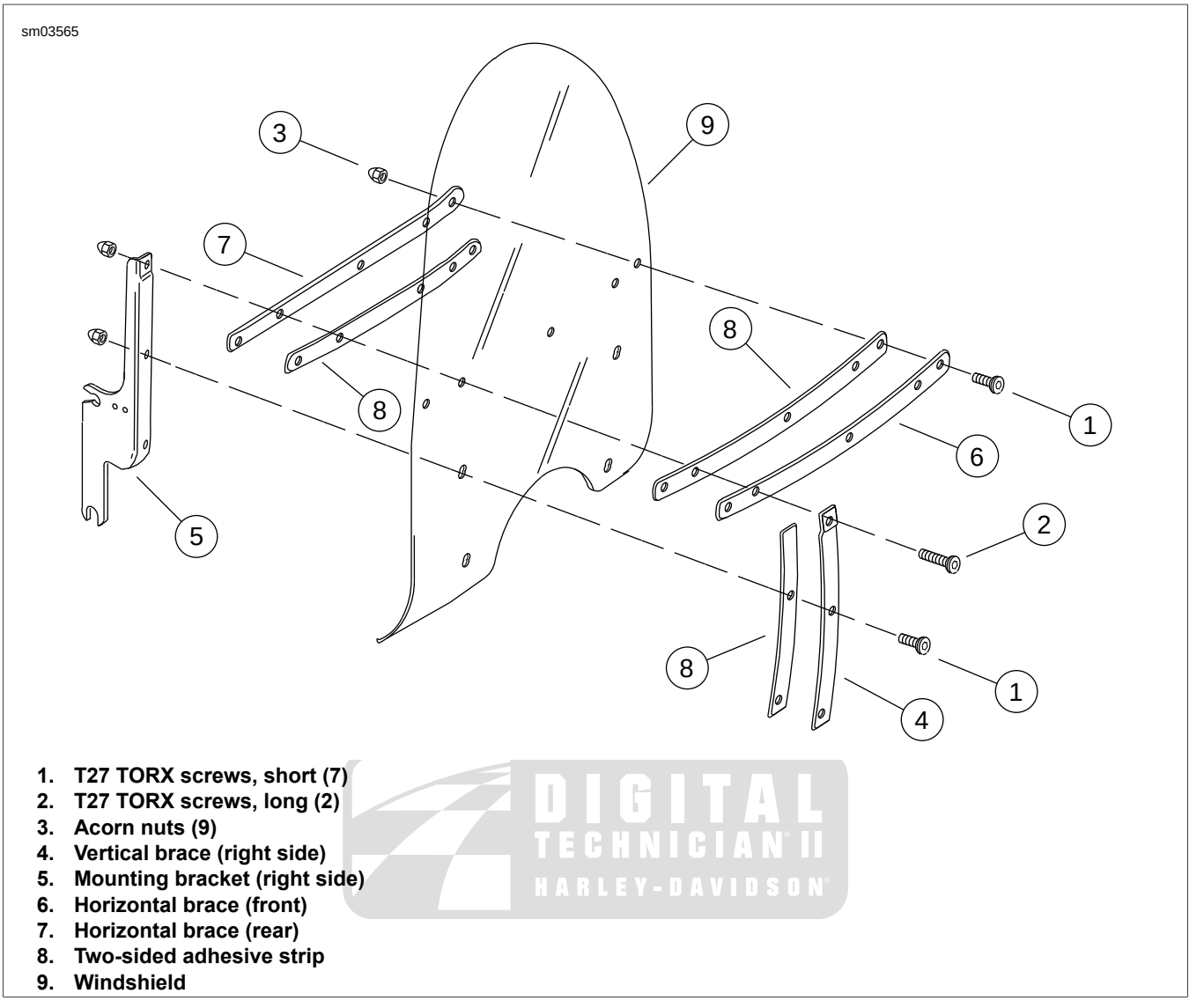
1. Carefully insert the windshield brackets between the headlamp nacelle and the auxiliary lamp bracket. Lower the windshield into position until the lower notches on the windshield brackets are seated on the lower grommets.
2. See Figure 2-142. Gently push the top of the windshield toward the rear until the upper notches fully engage the upper grommets.
3. Push down on the wireform latch springs, so that they overhang the rubber grommets. If some adjustment is necessary, loosen the retaining screws and rotate the latch springs into the proper position.

WINDSHIELD WINDOW

PART NUMBER	TOOL NAME
HD-25070	ROBINAIR HEAT GUN

Removal

1. Remove windshield. See 2.43 WINDSHIELD: ROAD KING MODELS.
2. Place windshield front side up on clean padded surface.
3. See Figure 2-143. Remove acorn nuts and screws from each vertical brace to release mounting bracket.
4. Remove three remaining screws from horizontal brace.



1. **T27 TORX screws, short (7)**
2. **T27 TORX screws, long (2)**
3. **Acorn nuts (9)**
4. **Vertical brace (right side)**
5. **Mounting bracket (right side)**
6. **Horizontal brace (front)**
7. **Horizontal brace (rear)**
8. **Two-sided adhesive strip**
9. **Windshield**

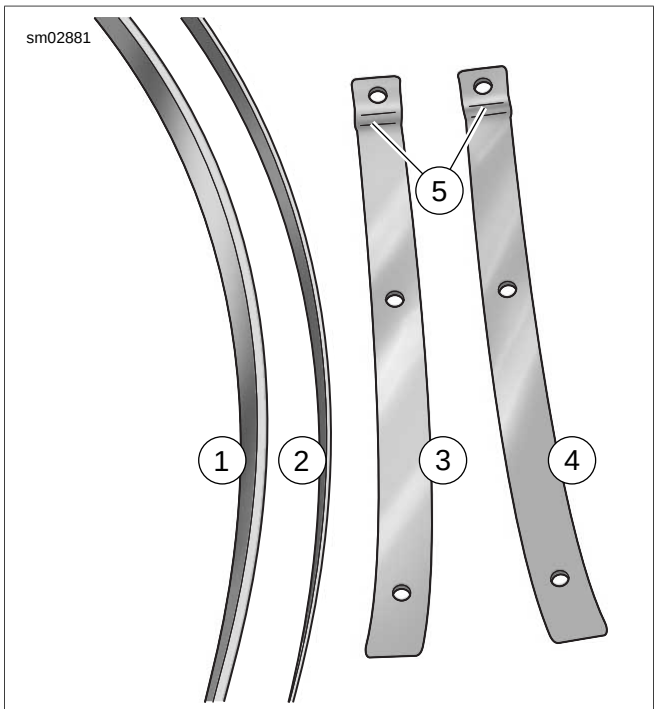
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Figure 2-143. Windshield Assembly

5. Carefully pry braces from windshield. Discard windshield.
6. Remove adhesive strip from braces as follows:
   a. Liberally apply 3M general purpose adhesive remover (Part No. 051135) and allow to soak.
   b. Apply heat with ROBINAIR HEAT GUN (Part No. HD-25070).
   c. Peel adhesive strip from braces.
   d. Remove any remaining adhesive with 3M general Purpose adhesive remover (Part No. 051135).

Installation

1. Remove paper backing from one side of each adhesive strip and apply to windshield side of each brace.
2. Place **new** windshield with front side down on clean padded surface.
3. See Figure 2-144. Remove paper backing from adhesive strip on thicker horizontal brace. Align holes in brace with holes in windshield and press brace into position.
4. Turn windshield over (front side up).
5. Remove paper backing from adhesive strip on thinner horizontal brace. Align holes in brace with holes in windshield Edges of inner and outer braces must be even. Press into position.



1. **Horizontal brace - thick (rear)**
2. **Horizontal brace - thin (front)**
3. **Vertical brace (right side)**
4. **Vertical brace (left side)**
5. **Stepped ends**

Figure 2-144. Windshield Braces

6. Apply one drop of Loctite Medium Strength Threadlocker 243 (blue) to threads of three short screws. Install screws through the middle and outer holes of the horizontal braces. Loosely install acorn nuts on rear side.
7. See Figure 2-144. Remove paper backing from adhesive strip on vertical brace. With the stepped end overlapping the horizontal brace and the end with the slight bend angled outward, align holes in brace with holes in windshield. Press into position.
8. Position mounting bracket on rear side of windshield with the wireform facing inboard.
9. Apply one drop of Loctite Medium Strength Threadlocker 243 (blue) to the threads of two short screws and one long screw. Install the longer screw at the stepped end where the vertical brace overlaps the horizontal brace, and short screws in the remaining holes. Loosely install acorn nuts.
10. Install second vertical brace and mounting bracket in a similar manner.
11. See Figure 2-145. Following the sequence shown, tighten all screws to 20-25 **in-lbs** (2.3-2.8 Nm).
12. Install windshield. See 2.43 WINDSHIELD: ROAD KING MODELS.

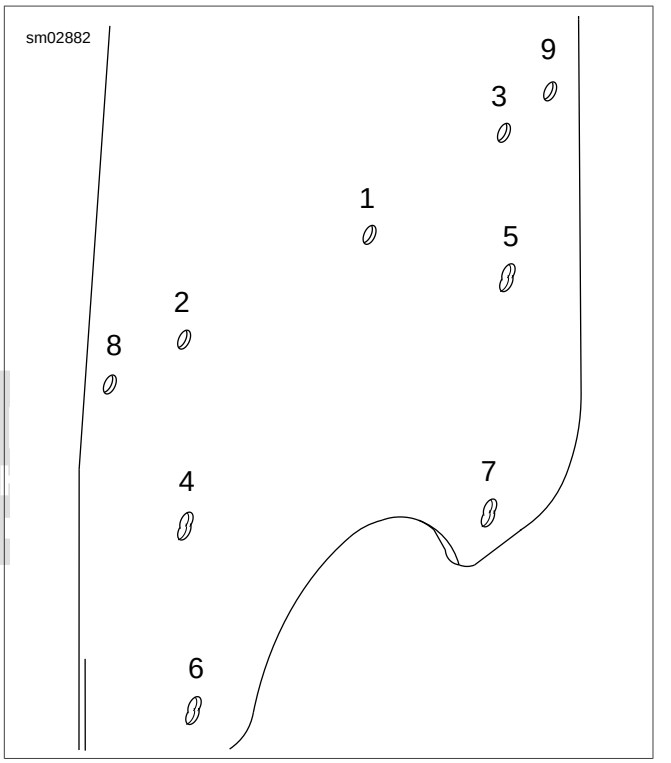
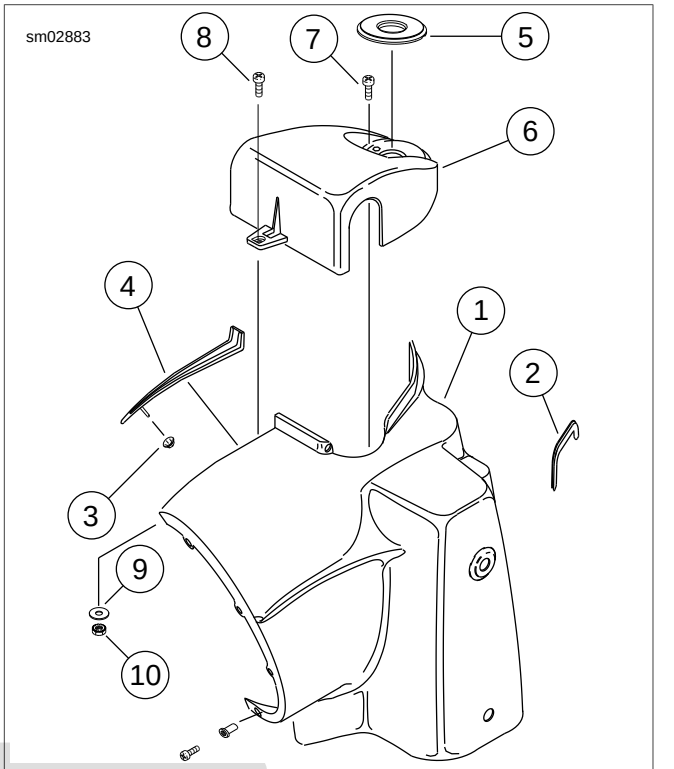


Figure 2-145. Windshield Torque Sequence

HEADLAMP NACELLE: ROAD KING MODELS 2.44

REMOVAL

1. Remove windshield. See 2.43 WINDSHIELD: ROAD KING MODELS.
2. Remove the screw securing the bottom of the headlamp door (chrome ring). Remove the headlamp door.
3. Remove seven screws to free the headlamp housing from the headlamp nacelle.
4. Remove headlamp connector [38] from back of headlamp bulb. Remove the headlamp housing assembly from the motorcycle.
5. See Figure 2-146. Remove flange nut (3) and remove chrome strip (4).
6. Carefully pry off the fork lock plate (5). Remove two screws (7).
7. Loosen screw (8) but do not remove nut (10) and flat washer (9).
8. Remove acorn nuts from the left side and right side fork bracket studs.
9. Cover the front fender to protect the fender paint. Remove the auxiliary lamp bracket from the fork bracket studs and carefully set on front fender.
10. Remove the grommets and clutch cable clamp from the fork bracket studs.
11. See Figure 2-147. Separate the halves of the headlamp nacelle slightly and slide the handlebar clamp shroud forward running the shaft of the screw down the gap.
12. See Figure 2-148. Disconnect the accessory switch connector (1) and auxiliary lamp switch connector (2).
13. Carefully separate the halves of the headlamp nacelle and remove from motorcycle.



1. Headlamp nacelle (left side
2. Trim strip
3. Flange nut
4. Chrome strip
5. Fork lock plate
6. Handlebar clamp shroud
7. Phillips screw (2)
8. Phillips screw
9. Flat washer
10. Keps nut

Figure 2-146. Headlamp Nacelle Assembly

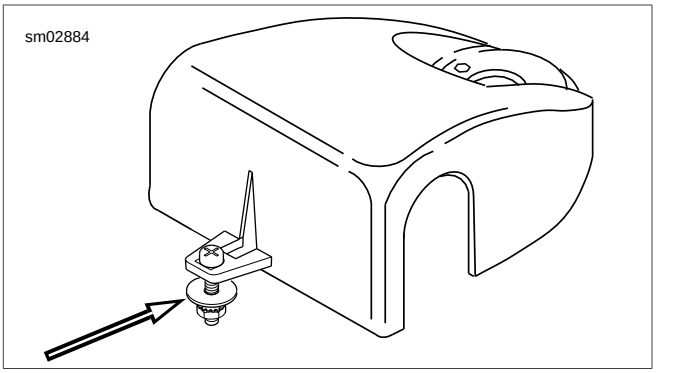


Figure 2-147. Handlebar Clamp Shroud and Screw Assembly

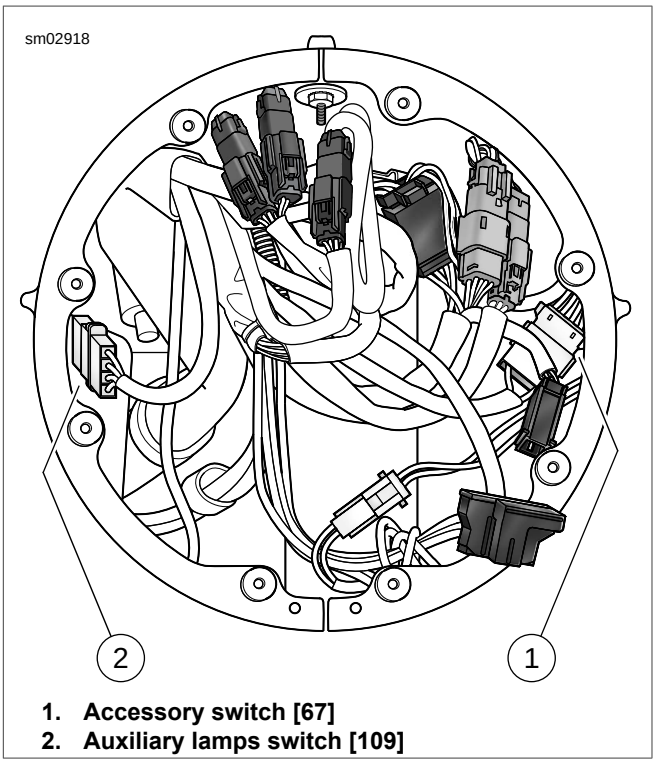
INSTALLATION

1. Fit halves of the headlamp nacelle together engaging the holes in the nacelle with the left side and right side fork bracket studs.
2. See Figure 2-148. Connect accessory switch connector (1) and auxiliary lamp switch connector (2).
3. See Figure 2-147. If disassembled, install screw, flat washer and nut on the handlebar clamp shroud.
4. Part the halves of the headlamp nacelle slightly. Slide the handlebar clamp shroud rearward running the shaft of the screw down the gap. Position the shroud over the flange at the top of the nacelle.
5. Mate the halves of the headlamp nacelle and tighten the screws to 10-20 **in-lbs** (1.1-2.3 Nm).
6. See Figure 2-146. Install screws (7) and tighten to 10-20 **in-lbs** (1.1-2.3 Nm). Install fork lock plate (5).

NOTE

*To avoid possible damage to the brake hose and/or handlebar switch wires, verify that trim strips are installed on inside edges of the headlamp nacelle. Install **new** trim strips if cracked, damaged or missing. Cutting or severe chafing of the brake hose and/or handlebar switch wires could cause loss of function while riding.*

7. Install chrome strip (4) and secure with flange nut (3). Tighten flange nut to 15-20 **in-lbs** (1.7-2.3 Nm).
8. Install the grommets on the left and right side fork bracket studs.
9. Slide the auxiliary lamp bracket onto the fork bracket studs. Verify that the four grommets are in place on the inboard side of the auxiliary lamp brackets.



1. **Accessory switch [67]**
2. **Auxiliary lamps switch [109]**

Figure 2-148. Headlamp Nacelle (FLHRC)

10. Install the acorn nuts on the fork bracket studs and tighten to 72-108 **in-lbs** (8.1-12.2 Nm). Be sure to capture the clutch cable clamp on the upper left stud before installing the acorn nut.
11. Install headlamp connector [38] to back of headlamp bulb.
12. Install headlamp housing and secure with seven screws. Tighten to 9-18 **in-lbs** (1.0-2.0 Nm).
13. Fit the square-shaped portion of the headlamp door spring into the slot at the top of the headlamp housing and then snap the headlamp door (chrome ring) into place. Install screw at the bottom of the headlamp door and tighten to 9-18 **in-lbs** (1.0-2.0 Nm).
14. Install windshield. See 2.43 WINDSHIELD: ROAD KING MODELS.

FRONT FENDER 2.45

REMOVAL

NOTE

Start procedure at step 4 if fender tip lamp is absent.

1. If equipped, disconnect fender tip lamp connector. See 7.15 FENDER TIP LAMPS.
2. Draw connector housing down to fender area.
3. Remove front wheel. See 2.4 FRONT WHEEL.
4. Bend tabs on lockplates away from heads of front fender mount screws. Remove screws and lockplates. Remove fender from motorcycle.

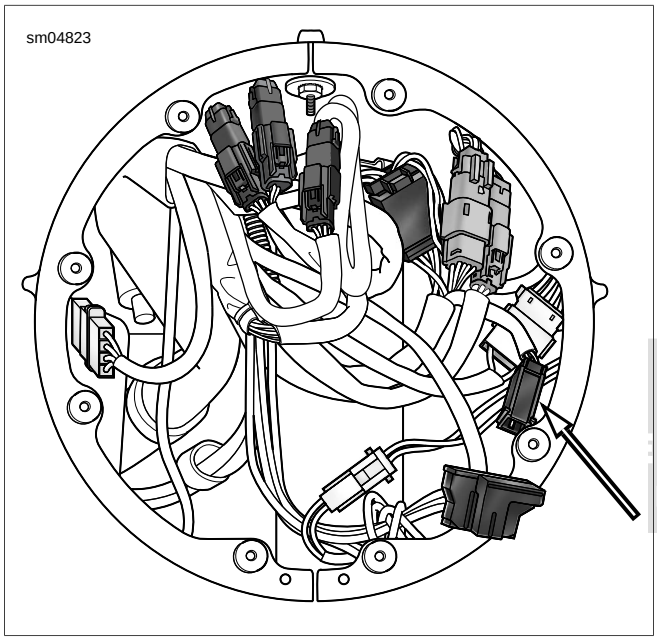


Figure 2-149. Front Fender Tip Lamp Jumper Harness Connector (FLHR/C)

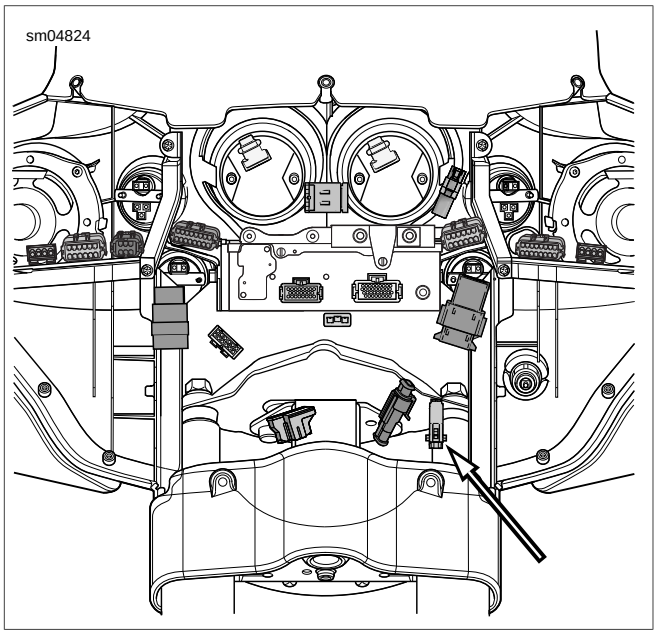


Figure 2-150. Front Fender Tip Lamp Jumper Harness Connector (FLHTC/U)

INSTALLATION

1. Install lockplates on front fender mount screws. Install fender on fork sliders and start screws.
2. Tighten screws to 16-20 ft-lbs (22-27 Nm). Bend tabs on lockplates against flats on screw heads.
3. Install front wheel. See 2.4 FRONT WHEEL.
4. If equipped, connect fender tip lamp connector. See 7.15 FENDER TIP LAMPS.

REAR FENDER 2.46

REMOVAL

1. Remove seat. See 2.25 SEAT.
2. **All except FLHX, FLTRX:** See Figure 2-151. Disconnect rear lighting connector from front of fender. Release connector from fender.
3. **FLHX, FLTRX:** See Figure 2-152. Remove shield and disconnect lights harness from rear fascia lamp. Release lights harness from retainers on left fascia.
4. See Figure 2-153. Remove saddlebag support fastener (4) from each side.
5. Remove fastener (10), seat strap (9) and saddlebag bracket (8) from each side.
6. Remove fastener (11) on each side. Remove frame covers (1).

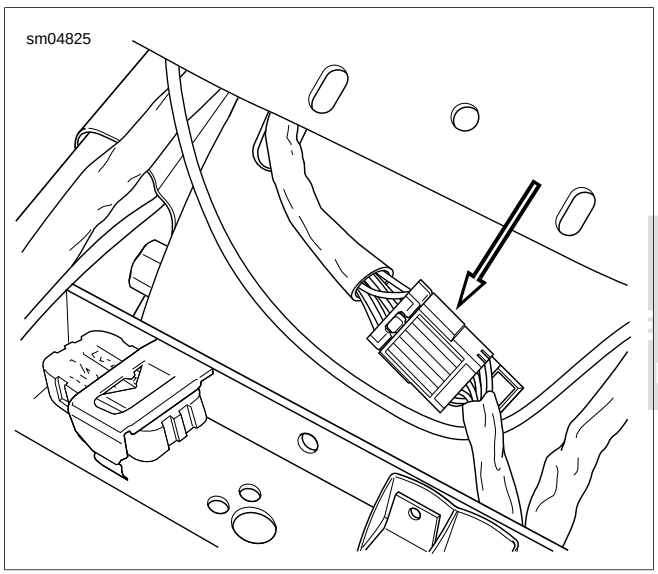


Figure 2-151. Rear Fender Lights Connector (models with under fender wiring)

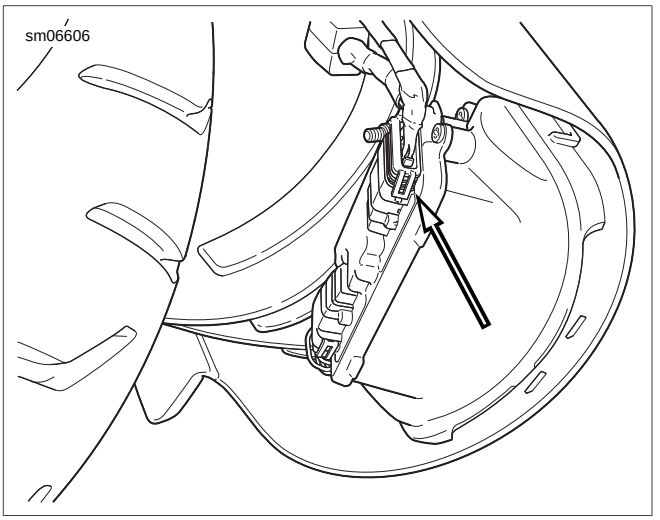
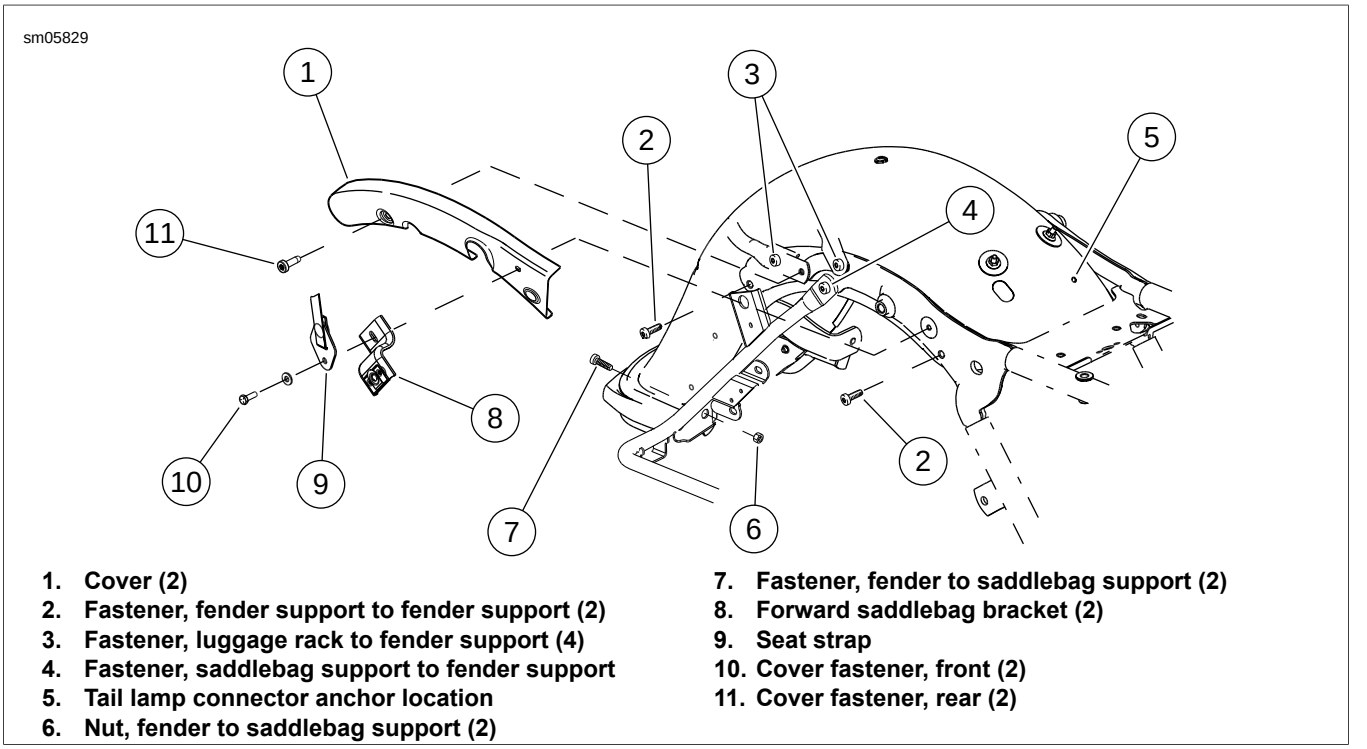


Figure 2-152. Rear Fender Lights Connector (FLHX, FLTRX)

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1. **Cover (2)**
2. **Fastener, fender support to fender support (2)**
3. **Fastener, luggage rack to fender support (4)**
4. **Fastener, saddlebag support to fender support**
5. **Tail lamp connector anchor location**
6. **Nut, fender to saddlebag support (2)**
7. **Fastener, fender to saddlebag support (2)**
8. **Forward saddlebag bracket (2)**
9. **Seat strap**
10. **Cover fastener, front (2)**
11. **Cover fastener, rear (2)**

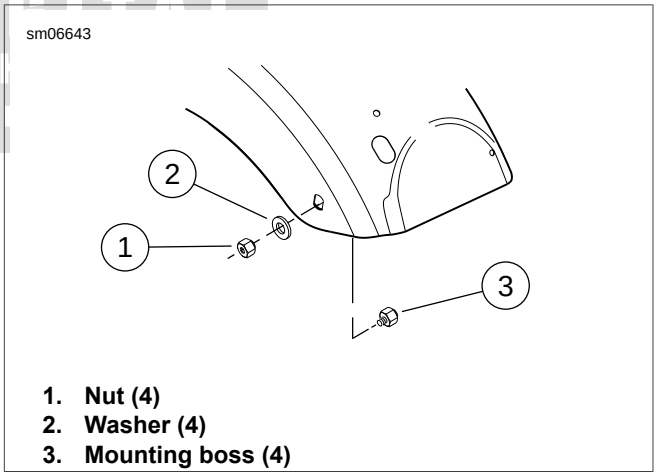
Figure 2-153. Rear Fender

7. See Figure 2-153. Remove fasteners (7) and flange nuts (6) to release fender support bracket from saddlebag support.
8. If equipped with a luggage rack or Tour-Pak, back out screws (3) 2-3 turns.
9. Remove fender mounting screws (2) from both sides. Be aware that rear fender will drop when screws are removed.
10. See Figure 2-155. Carefully roll the fender back and out of the frame.

FENDER REPAIR

Mounting Hardware

1. See Figure 2-154. Remove nut (1), washer (2) and mounting boss (3).
2. Install **new** components as necessary. Tighten nut (1) to 15-20 ft-lbs (20.3-27.1 Nm)



1. **Nut (4)**
2. **Washer (4)**
3. **Mounting boss (4)**

Figure 2-154. Rear Fender Mounting Hardware

Lights and Harnesses

All except FLHX, FLTRX: For service of the tail lights or harness, see 7.14 TAIL LAMP.

FLHX, FLTRX: For service of the rear fascia or fascia lamp see 2.47 REAR FASCIA. For service of the tail lights or harness, see 7.14 TAIL LAMP.

INSTALLATION

1. See Figure 2-155. Carefully roll the fender into position.

NOTE

FLHX, FLTRX: *The rear fender lights harness is routed below the front left fender mounting nut.*

2. See Figure 2-153. Verify the rear fender lights harness is routed below the front left fender mounting nut. Install four fasteners (2) and tighten to 15-20 ft-lbs (20.3-27.1 Nm).
3. Tighten four luggage rack fasteners (3) to 15-20 ft-lbs (20.3-27.1 Nm).

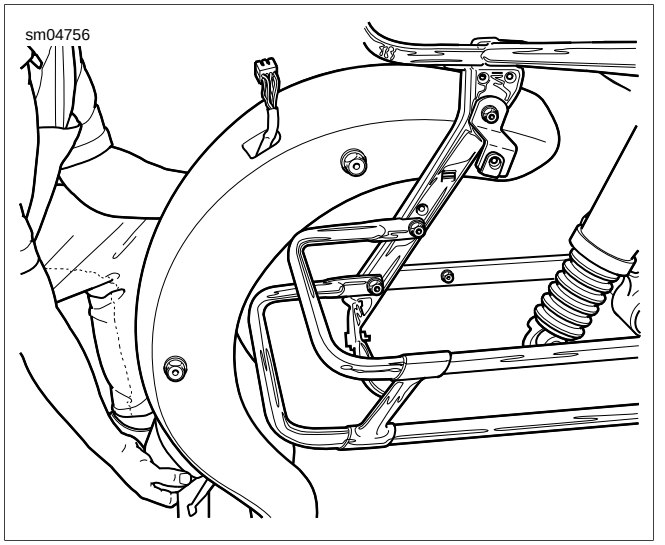


Figure 2-155. Carefully Roll Out Rear Fender

4. See Figure 2-153. Install rear fender support-to-saddlebag support fastener (7) and nut (6). Tighten to 15-20 ft-lbs (20.3-27.1 Nm).
5. Install cover (1) on each side and start fastener (11). Verify all electrical harnesses are above the cover flange and not pinched.
6. Install forward cover fastener (10) along with flat washer, seat strap (9) and saddlebag bracket (8) on each side but do not tighten at this time.
7. Install saddlebag support fastener (4) on each side. The air suspension fitting bracket is also retained by this fastener on the left side. Tighten fasteners (4) to 15-20 ft-lbs (20.3-27.1 Nm).
8. Tighten cover fasteners (11) to 15-20 ft-lbs (20.3-27.1 Nm).
9. **All except FLHX, FLTRX:** See Figure 2-151. Connect rear fender lights connector and secure anchor in rear fender hole.
10. **FLHX, FLTRX:** See Figure 2-152. Connect rear fender lights connector and install shield. Secure harness in retainers on left fascia.
11. Install seat. See 2.25 SEAT.
12. Install saddlebags. The front bracket (8) may need to be rotated to align with attachment stud. Once saddlebags are secured, tighten fasteners (10) to 12-15 ft-lbs (16.3-20.3 Nm).

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REAR FASCIA 2.47

REMOVAL

1. Remove saddlebags.
2. See Figure 2-156. Remove six flange nuts (1).
3. Remove radio antenna mast.
4. Release rear lamps harness from molded clips on left side of fascia.
5. Remove shield (7). Disconnect rear lamps harness and tail lamp jumper from fascia lamp (8).
6. Loosen nut (5).
7. Spread top of fascia (2) to release from top studs and pull downward to release fascia from fender.
8. If necessary, remove fascia lamp.

INSTALLATION

1. If removed, install fascia lamp. Tighten screws to 18-22 **in-lbs** (2.0-2.5 Nm).
2. See Figure 2-156. Insert flange at top of fascia between support (4) and fender. Tighten nut (5) to 45-85 **in-lbs** (5.1-9.6 Nm). Spread top of fascia to engage top studs.
3. Apply a drop of Loctite Medium Strength Threadlocker 243 (blue) to threads of each stud. Install flange nuts (1) and tighten to 30-45 **in-lbs** (3.4-5.1 Nm).
4. Secure rear lamps harness in molded clips of left fascia and connect harness to fascia lamp. Connect tail lamp jumper to fascia lamp. Install shield (7).
5. Install radio antenna mast.
6. Install saddlebags.

STUD PLATE

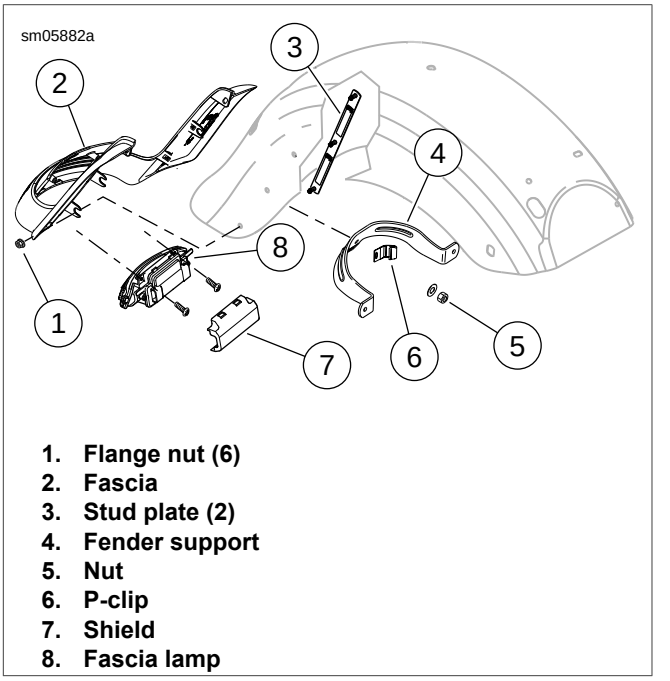
Removal

1. Remove rear wheel as necessary to gain access to fender well. See 2.5 REAR WHEEL.
2. See Figure 2-156. Remove rear fascia (2) See 2.47 REAR FASCIA.
3. Remove screws and nuts securing fender support (4) to saddlebag support on both sides. Remove nut (5), flat washer and P-clamp (6). Remove support.

NOTE

Stud plates installed in production use adhesive strips as an assembly aid. Beginning at the edges, carefully work stud plate free using a small putty knife or gasket scraper.

4. Carefully pry stud plate (3) away from rear fender.



1. **Flange nut (6)**
2. **Fascia**
3. **Stud plate (2)**
4. **Fender support**
5. **Nut**
6. **P-clip**
7. **Shield**
8. **Fascia lamp**

Figure 2-156. Rear Fascia

Installation

1. See Figure 2-156. Install **new** stud plate (3).
2. Install fender support (4). Install P-clamp (6), washer and tighten nut (5) to 45-85 **in-lbs** (5.1-9.6 Nm). Secure fender support to saddlebag support with screws and nuts and tighten to 15-20 ft-lbs (20.3-27.1 Nm).
3. Install rear fascia. See 2.47 REAR FASCIA.
4. If removed, install rear wheel. See 2.5 REAR WHEEL.

REAR FASCIA LAMP

Removal

1. See Figure 2-156. Remove shield (7) and disconnect rear lights harness and tail light jumper harness from fascia lamp.
2. Remove screws securing lamp (8).

Installation

1. Secure lamp (8) with two screws. Tighten screws to 18-22 **in-lbs** (2.0-2.5 Nm).
2. Connect rear lights harness and tail lamp jumper harness to fascia lamp.
3. Install shield (7).

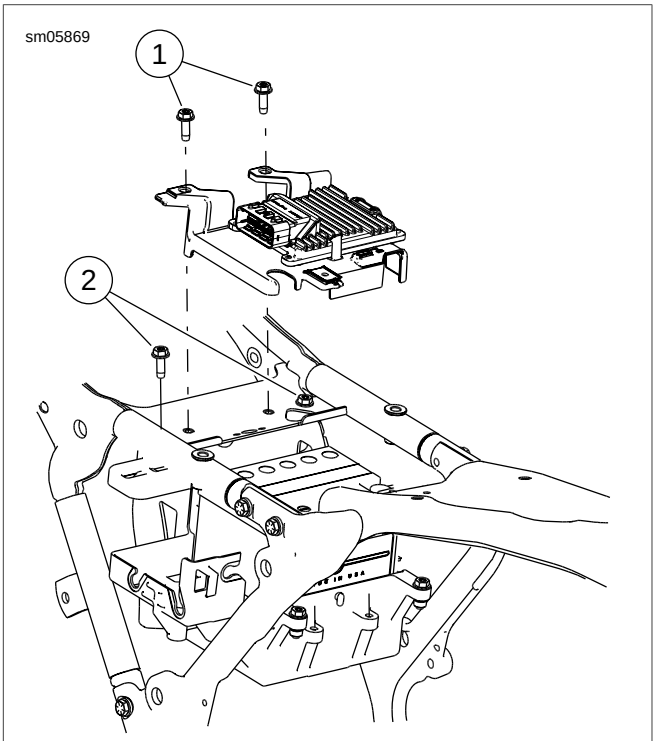
REAR FRAME

Removal

NOTICE

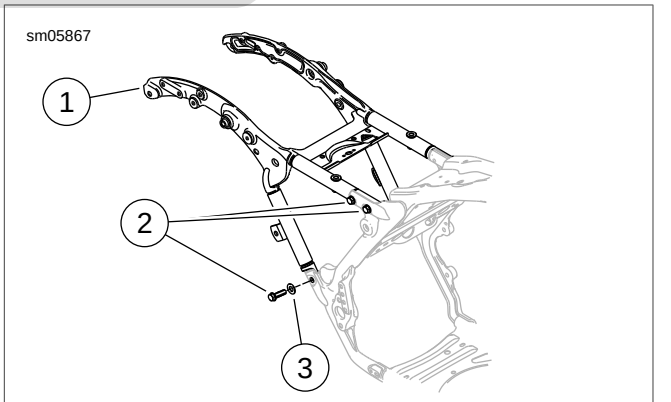
When lifting a motorcycle using a jack, be sure jack contacts both lower frame tubes where down tubes and lower frame tubes converge. Never lift by jacking on cross-members, oil pan or other housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586c)

1. Lift the motorcycle with suitable lifting device.
2. Remove the seat.
3. See Figure 2-157. Remove the top caddy and move caddy aside. See 7.8 ELECTRICAL CADDIES.
4. Remove the battery. See 1.23 BATTERY MAINTENANCE.
5. **FLHTC/U:** Remove the Tour-Pak. See 2.28 TOUR-PAK.
6. Cut cable straps securing harnesses to each side of rear frame and luggage rack and move harnesses aside. Take note of cable strap locations for reassembly.
7. Remove rear fender. See 2.46 REAR FENDER.
8. Remove saddlebag supports. See 2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail.
9. Remove shock absorbers. See 2.20 REAR SHOCK ABSORBERS.
10. Remove luggage rack if equipped. See 2.28 TOUR-PAK, Luggage Rack/Tour-Pak Support.
11. See Figure 2-157. Remove two upper battery tray fasteners (2).
12. Remove fastener that secures left-side electrical caddy to rear frame.
13. See Figure 2-158. Remove six fasteners (2) and washers (3) securing the rear frame (1).
14. Remove rear frame.



1. **Top caddy fasteners**
2. **Rear battery tray fasteners**

Figure 2-157. Upper Caddy Fasteners



1. **Rear frame**
2. **Fasteners (6)**
3. **Hardened washer (6)**

Figure 2-158. Subframe

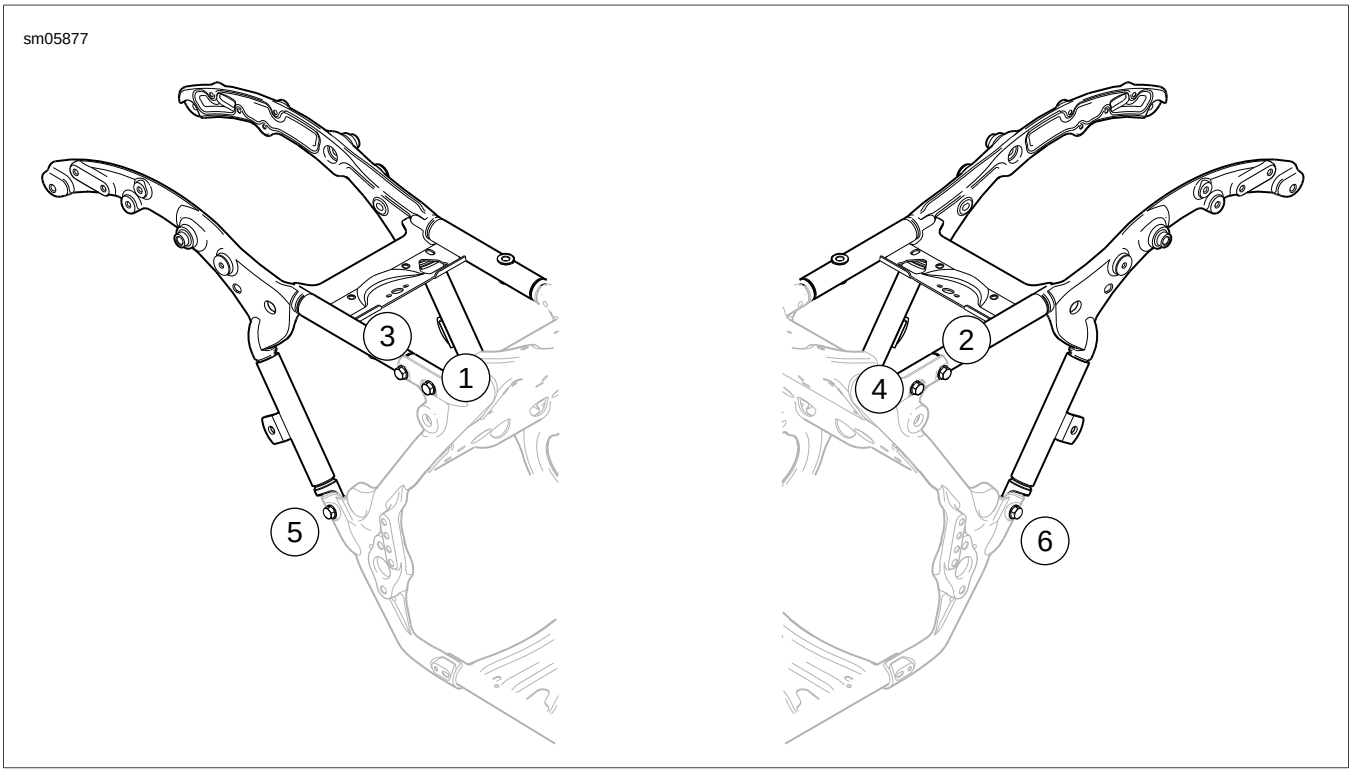


Figure 2-159. Rear Frame Torque Sequence

Installation

1. See Figure 2-158. Fit the rear frame to the main frame and start two lower fasteners (2) with hardened washers (3). Install four remaining upper fasteners and hardened washers.
2. See Figure 2-159. Tighten rear frame fasteners in sequence shown to 40-45 ft-lbs (54.2-61.0 Nm).
3. Secure left-side electrical caddy to rear frame and tighten fastener to 72-96 **in-lbs** (8.1-10.8 Nm).
4. See Figure 2-157. Secure upper battery tray to rear frame. Tighten fasteners (2) to 72-96 **in-lbs** (8.1-10.8 Nm).
5. Install luggage rack if equipped. See 2.28 TOUR-PAK, Luggage Rack/Tour-Pak Support.
6. Install shock absorbers. See 2.20 REAR SHOCK ABSORBERS.
7. Install rear fender. See 2.46 REAR FENDER.
8. Install saddlebag supports. See 2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail.
9. **FLHTC/U, FLHTK, FLTRU:** Install Tour-Pak. See 2.28 TOUR-PAK.
10. Secure harnesses to each side of rear frame and luggage rack with cable straps. Position straps as noted during disassembly.
11. Install saddlebags.
12. Install battery. See 1.23 BATTERY MAINTENANCE.
13. See Figure 2-157. Install top caddy and tighten fasteners (1) to 72-96 **in-lbs** (8.1-10.8 Nm).

⚠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)

14. Install the seat.

Thread Repair

NOTES

- *Never re-tap the threaded holes in the rear frame to repair damaged threads. Always use the following procedure to provide repair.*
- *If more than one threaded hole is damaged on a given side, or if a thread repair has previously been done, the rear frame must be replaced. Never repair more than one hole per side.*

1. Remove the damaged fastener.
2. Drill out damaged threads and install the appropriate size thread repair insert.
3. Install **new** fastener with hardened washer and tighten to the proper torque.

FOOTBOARDS AND FOOTRESTS 2.49

RIDER FOOTBOARDS

Removal

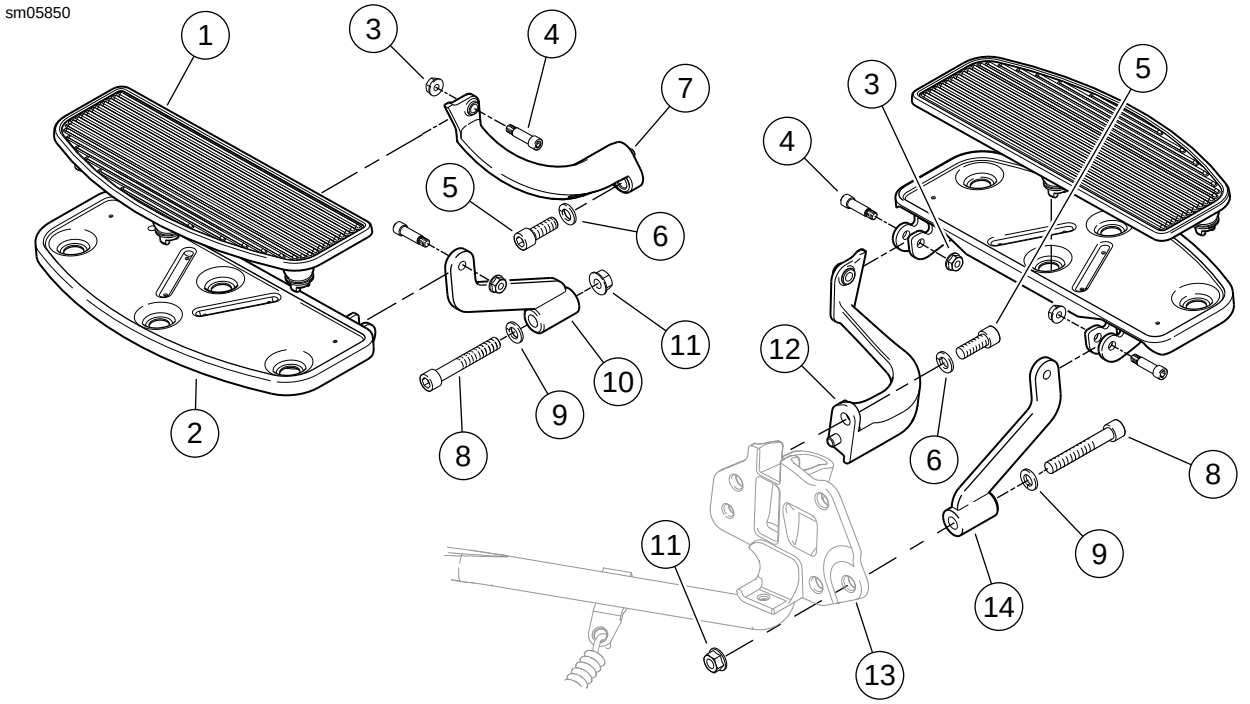
NOTICE

When lifting a motorcycle using a jack, be sure jack contacts both lower frame tubes where down tubes and lower frame tubes converge. Never lift by jacking on cross-members, oil pan or other housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586c)

1. Left side footboard fasteners also secure the jiffy stand bracket. If removing left side footboard, raise motorcycle with a suitable lifting device to remove weight from jiffy stand.
2. See Figure 2-160. Remove screw (5) and lockwasher (6).
3. Remove screw (8), lockwasher (9) and flange nut (11).
4. Remove footboard and bracket assembly from motorcycle.

Installation

1. See Figure 2-160. Install footboard and bracket assembly and secure with screws (5, 8), lockwashers (6, 9), and flange nut (11).
2. Tighten screws to 36-42 ft-lbs (48.8-57.0 Nm).



1. **Rubber pad**
2. **Footboard**
3. **Pivot screw nut (2)**
4. **Pivot screw (2)**
5. **Socket head screw, short**
6. **Lockwasher**
7. **Right rear bracket**
8. **Socket head screw, long**
9. **Lockwasher**
10. **Right forward bracket**
11. **Flange nut**
12. **Left rear bracket**
13. **Jiffy stand bracket**
14. **Left forward bracket**

Figure 2-160. Rider Footboards (Typical) (Quantities shown are for each footboard)

Disassembly

NOTE

If only replacing the rubber pad, refer to step 1 below and then see steps 3-4 under ASSEMBLY.

1. Tilt footboard upward. From bottom of footboard, use a large flat blade screwdriver to push four rubber anchors on pad up through holes in footboard.
2. See Figure 2-160. Remove nuts (3) and pivot screws (4) from underside of footboard.
3. Remove footboard from brackets.

Assembly

1. Place footboard into position between brackets and install pivot screws (4) so that the nuts (3) will be on the inboard side.

NOTE

The bottom of FLHX footboards are stamped L(eft) or R(ight) to verify proper installation.

2. Install nuts (3) onto pivot screws and tighten to 60-80 **in-lbs** (6.8-9.0 Nm).
3. Moisten four rubber anchors on bottom of **new** pad (1) with soapy water.
4. Place pad into position on footboard. From bottom of footboard, use pliers to pull rubber anchors through holes in footboard.

PASSENGER FOOTBOARD

Removal

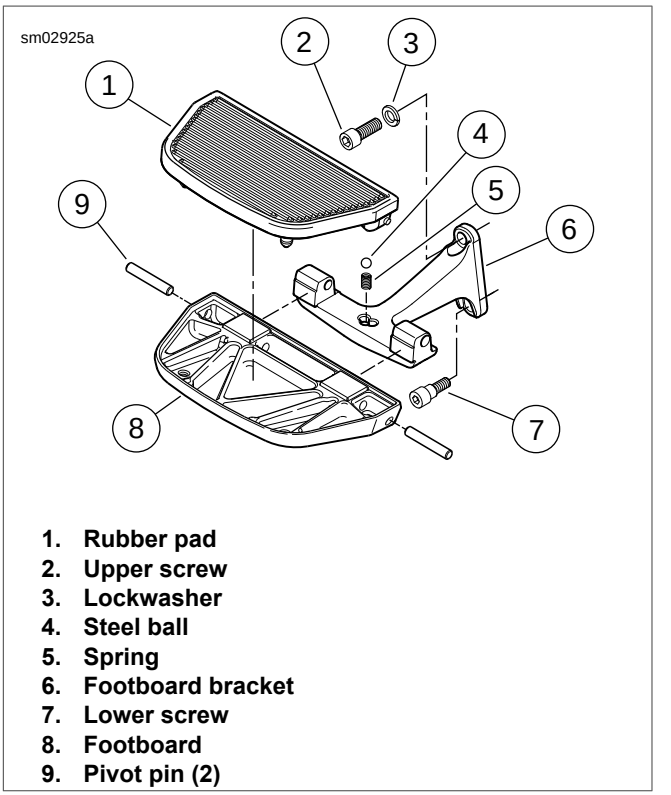
See Figure 2-161. Remove screw (2), lockwasher (3), screw (7) and footboard/bracket assembly from frame.

Disassembly

1. See Figure 2-161. Use a small flat blade screwdriver to push rubber beads on pad bottom through holes in footboard. Remove pad.
2. Using a brass drift and mallet, tap two pivot pins (9) toward center of footboard and remove.
3. Remove footboard from footboard bracket.
4. Remove steel ball (4) and spring (5).

Assembly

1. See Figure 2-161. Place spring (5) and ball (4) into hole in footboard bracket.
2. Place footboard into position on bracket and install pivot pins (9) from the outboard side. Using a brass drift and mallet, tap pins until centered in lugs of bracket.



1. **Rubber pad**
2. **Upper screw**
3. **Lockwasher**
4. **Steel ball**
5. **Spring**
6. **Footboard bracket**
7. **Lower screw**
8. **Footboard**
9. **Pivot pin (2)**

Figure 2-161. Passenger Footboard

3. Moisten rubber beads on pad with soapy water. Use needle nose pliers to pull rubber beads through holes in footboard.
4. Engage nubs on inboard corners of pad with holes in footboard.

Installation

NOTE

Passenger footboards can be installed to one of three positions. To install footboards in a new position, remove plastic plugs from holes in frame.

1. If reusing screws, apply a drop of Loctite Threadlocker 243 (blue) to the threads of each screw.
2. See Figure 2-161. Secure bracket (6) with screw (2), lockwasher (3) and screw (7).
   a. Tighten upper screw (2) to 36-42 ft-lbs (48.8-56.9 Nm).
   b. Tighten lower screw (7) to 48-72 **in lbs** (5.4-8.1 Nm).

PASSENGER FOOTREST: FLHX, FLTRX

Removal

See Figure 2-162. Remove screw (9) and lockwasher (10) to remove footrest bracket from frame.

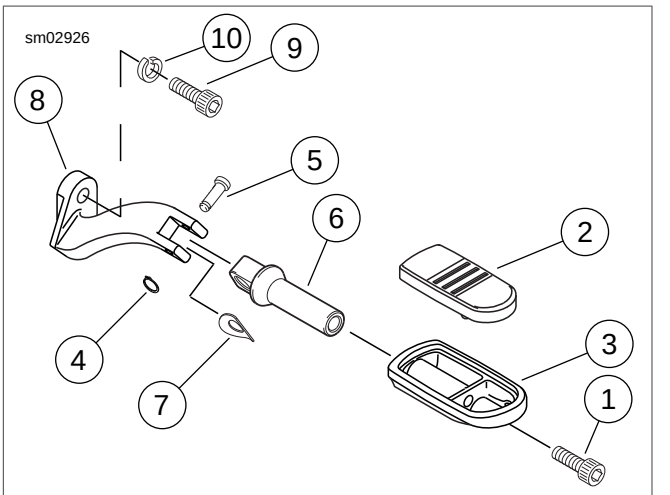
Disassembly

1. See Figure 2-162. Remove screw (1). Remove rubber pad (2) from footrest.
2. Remove footrest (3) from footrest mount.

3. Remove retaining ring (4) and pivot pin (5).
4. Remove footrest mount (6) and wave spring (7).

Assembly

1. See Figure 2-162. Holding wave spring in place with concave side against bracket, install footrest with the rounded side of the pivot end up.
2. Install pivot pin and secure with **new** retaining ring.
3. Install footrest onto footrest mount and install rubber pad into footrest.
4. Apply a drop of Loctite Medium Strength Threadlocker 243 (blue) to threads of screw (1) and install.
5. Rotate footrest so that the rubber pad is topside and tighten screw to 15-20 ft-lbs (20-27 Nm).



1. **Socket screw**
2. **Rubber pad**
3. **Footrest**
4. **Retaining ring**
5. **Pivot pin**
6. **Footrest mount**
7. **Wave spring**
8. **Footrest bracket**
9. **Socket screw**
10. **Lockwasher**

Figure 2-162. Passenger Footrest (FLHX, FLTRX)

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Installation

1. Locate pin on footrest bracket into hole in frame.

NOTE

Passenger footrests can be adjusted to one of three positions. To move footrests to a new position, remove plastic plugs from holes in frame as necessary.

2. See Figure 2-162. Install screw (9) and lockwasher (10). Tighten screw to 36-42 ft-lbs (48.8-56.9 Nm).

JIFFY STAND 2.50

GENERAL

⚠WARNING

The jiffy stand locks when placed in the full forward (down) position with vehicle weight on it. If the jiffy stand is not in the full forward (down) position with vehicle weight on it, the vehicle can fall over which could result in death or serious injury. (00006a)

⚠WARNING

Always park motorcycle on a level, firm surface. An unbalanced motorcycle can fall over, which could result in death or serious injury. (00039a)

LEG REMOVAL

⚠WARNING

Block vehicle under frame such that vehicle will not fall when jiffy stand is removed. Failure to properly block vehicle could result in death or serious injury. (00462b)

NOTICE

When lifting a motorcycle using a jack, be sure jack contacts both lower frame tubes where down tubes and lower frame tubes converge. Never lift by jacking on crossmembers, oil pan or other housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586c)

1. Support the motorcycle with a suitable lifting device so it is upright and level. Jiffy stand should be able to move through its full range of travel without the weight of the motorcycle resting on it.
2. See Figure 2-165. Move jiffy stand to the full forward (down) position. Remove hex bolt (4), lockwasher (3), flat washer (2) and leg stop (5).
3. Swing jiffy stand forward beyond the normal down position and remove end of spring (9) from jiffy stand. Remove leg (8) from bracket. Remove other end of spring from frame weldment.
4. Inspect components for worn or damaged parts. Replace parts as necessary.

LEG INSTALLATION

1. Apply SILVER GRADE ANTI-SEIZE (part number 98960-97) to area of leg that rotates within the bracket.

NOTE

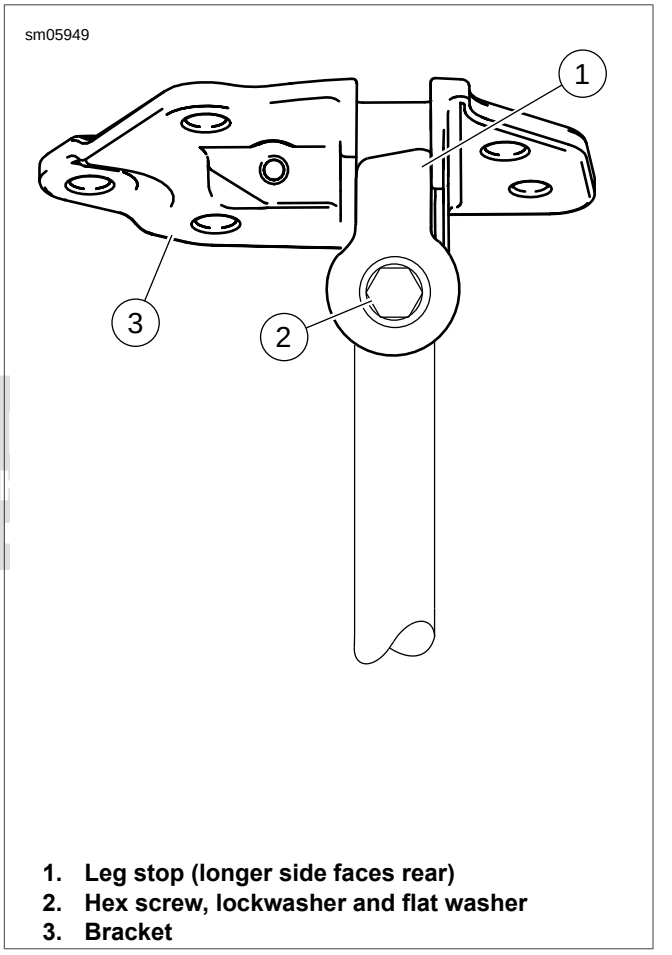
See Figure 2-164. Verify that end of spring enters hole from front of leg weldment. If end of spring enters hole from rear of weldment, spring coil will rub on leg when exercised.

2. Install end of spring into hole in frame weldment. Insert leg up through bracket. Swing jiffy stand forward beyond the normal down position and install other end of spring into hole in leg weldment.

⚠WARNING

If leg stop is incorrectly installed, excessive wear can allow vehicle to fall when rested on jiffy stand, which could result in death or serious injury. (00479b)

3. See Figure 2-163. Holding leg at the normal forward (down) position, install stop (1) over threaded end with the stamped side down. Verify that the longer side of the stop faces the rear of the motorcycle. Install flat washer, lockwasher and hex screw. Tighten hex screw to 15-20 ft-lbs (20.3-27.1 Nm).



1. Leg stop (longer side faces rear)
2. Hex screw, lockwasher and flat washer
3. Bracket

Figure 2-163. Leg Stop Orientation in Full Forward (Down) Position

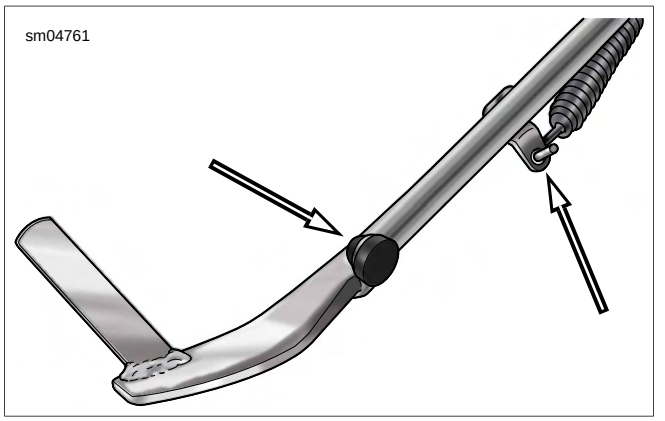


Figure 2-164. Rubber Stop and Spring Orientation

4. Extend and retract jiffy stand several times to verify proper operation. Jiffy stand should swing freely to the fully extended and fully retracted positions.
5. Move jiffy stand to the full forward (down) position and remove lifting device from beneath motorcycle. Rest motorcycle on jiffy stand.

NOTE

See Figure 2-164. Verify that rubber stop is installed in hole of jiffy stand weldment to prevent damage to the painted finish.

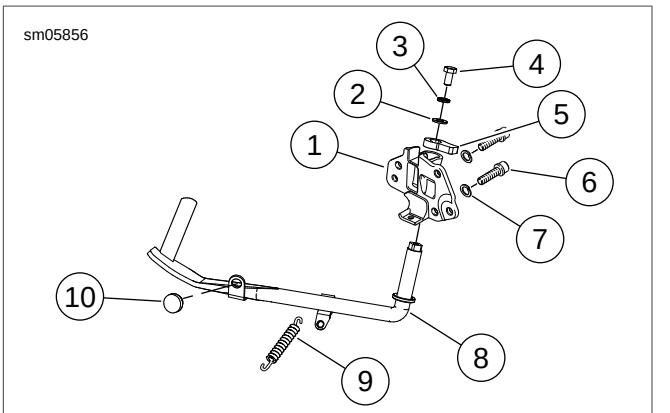
JIFFY STAND BRACKET

Removal

NOTICE

When lifting a motorcycle using a jack, be sure jack contacts both lower frame tubes where down tubes and lower frame tubes converge. Never lift by jacking on cross-members, oil pan or other housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586c)

1. Support motorcycle with suitable lifting device.
2. Remove left rider footboard and support brackets. See 2.49 FOOTBOARDS AND FOOTRESTS.
3. See Figure 2-165. Remove jiffy stand leg (8). See 2.50 JIFFY STAND, Leg Removal.
4. Remove two fasteners (6) and lockwashers (7) to release jiffy stand bracket from frame weldment.



1. **Bracket**
2. **Flat washer**
3. **Lockwasher**
4. **Bolt**
5. **Stop**
6. **Fastener (2)**
7. **Lockwasher (2)**
8. **Leg**
9. **Spring**
10. **Rubber stop**

Figure 2-165. Jiffy Stand Assembly

Installation

1. See Figure 2-165. Install two fasteners (6) and lockwashers (7) to secure front of bracket (1) to frame weldment.
2. Temporarily install footboard rear fastener to align rear of jiffy stand bracket but do not tighten.
3. Tighten front fasteners (6) to 36-42 ft-lbs (48.8-57.0 Nm).
4. Install footrest. See 2.49 FOOTBOARDS AND FOOTRESTS.
5. Install jiffy stand leg. See 2.50 JIFFY STAND, Leg Installation.

JIFFY STAND INTERLOCK SENSOR

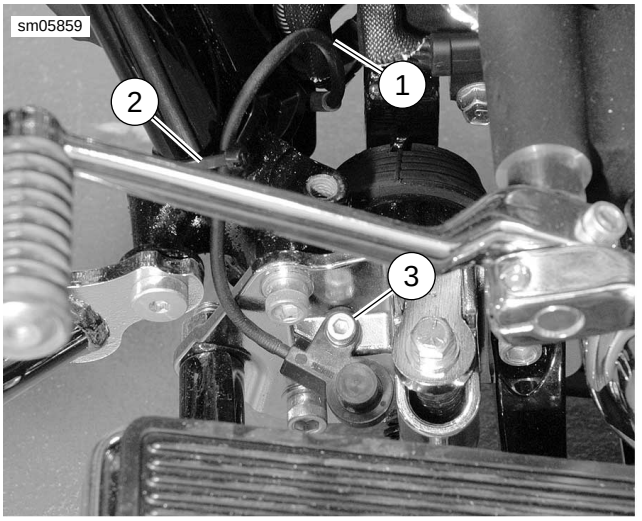
Removal

NOTE

See Figure 2-166. The sensor connector (1) is located below the voltage regulator.

1. Push anchor on sensor connector from hole in front frame cross member. Disconnect connector.
2. See Figure 2-166. Cut cable strap (2) to release cable.
3. Move jiffy stand to full forward (down) position.
4. Remove fastener (3) and pull sensor from jiffy stand bracket.

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1. **Connector location**
2. **Cable strap**
3. **Sensor fastener**

Figure 2-166. Jiffy Stand Interlock Sensor

Installation

1. Move jiffy stand to full forward (down) position.
2. See Figure 2-166. Install sensor into bore of jiffy stand bracket.
3. If reusing fastener (3), apply a small dab of Loctite Medium Strength Threadlocker 243 (blue) to threads before installation. Install fastener and tighten to 96-120 **in-lbs** (10.8-13.6 Nm).
4. Route connector and cable over top of frame weldment, staying rear of front frame down tube, and to area below voltage regulator.
5. Connect jiffy stand interlock sensor connector and push anchor into hole in front frame cross member.
6. Install **new** cable strap (2) to capture cable. Cut any excess cable strap material.

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FRONT ENGINE MOUNT 2.51

REMOVAL

1. Remove right lower fairing, if present. See 2.33 LOWER FAIRING AND ENGINE GUARD.
2. Remove right side rider footboard. See 2.49 FOOTBOARDS AND FOOTRESTS.
3. Place a jack under the oil pan and use a block of wood between the jack and the oil pan to distribute pressure across the length of the casting. Raise the jack until firm contact is made with the bottom of the oil pan.
4. Remove rear brake pedal from master cylinder and engine mount end cap. See 2.14 REAR BRAKE MASTER CYLINDER.
5. Remove rear master cylinder from engine mount end cap.
6. See Figure 2-167. Loosen, but do not remove, front engine mount fasteners (3).
7. Remove engine mounts.
   a. Remove nuts (7), washers (8) and engine mount bracket fasteners (6).
   b. Remove end cap fasteners (1) and end cap (2).
   c. Remove engine mount bracket (5) with attached engine mounts (4).
8. Remove front engine mount fasteners and engine mounts from engine mount bracket.

INSTALLATION

NOTES

- *See Figure 2-167. Tapered end of engine mounts (4) face engine mounting bracket (5).*
- *Notches on engine mounts fit over tabs on engine mount bracket.*

1. Install engine mounts (4) to engine mount bracket (5). Verify the notches and tabs are aligned and install fasteners (3) finger tight.
2. Fit left side engine mount into frame weldment on left side of motorcycle.
3. Install end cap (2) over right engine mount and secure with end cap fasteners (1) finger tight.

NOTE

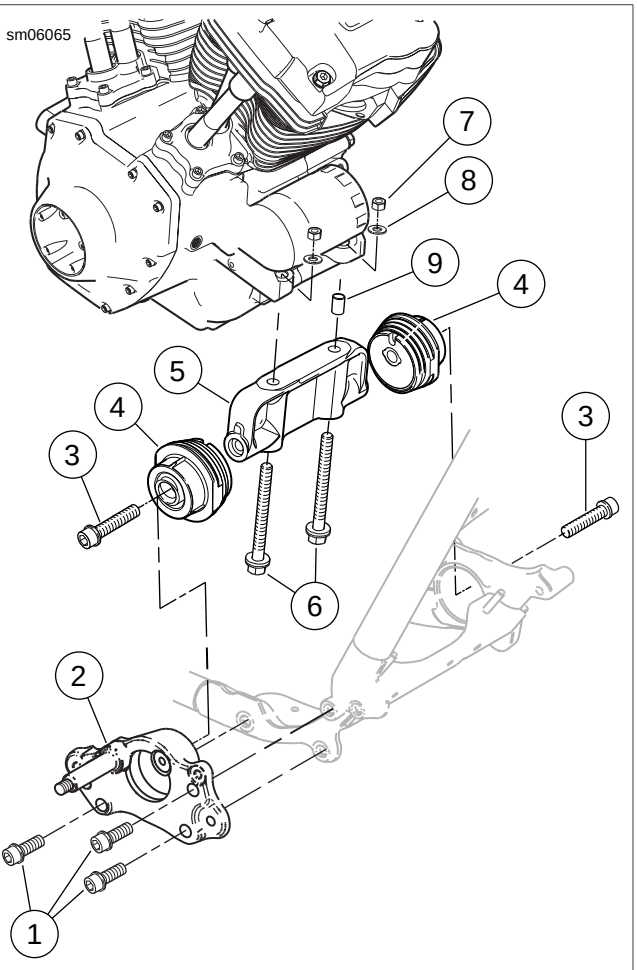
Verify hollow dowels (9)are engaged in the mount bracket (5) when installing fasteners (6).

4. Align engine mount bracket to engine and install fasteners (6).
5. Apply Loctite Medium Strength Threadlocker 243 (blue) to threads of nuts (7). Install washers (8) and nuts.

NOTE

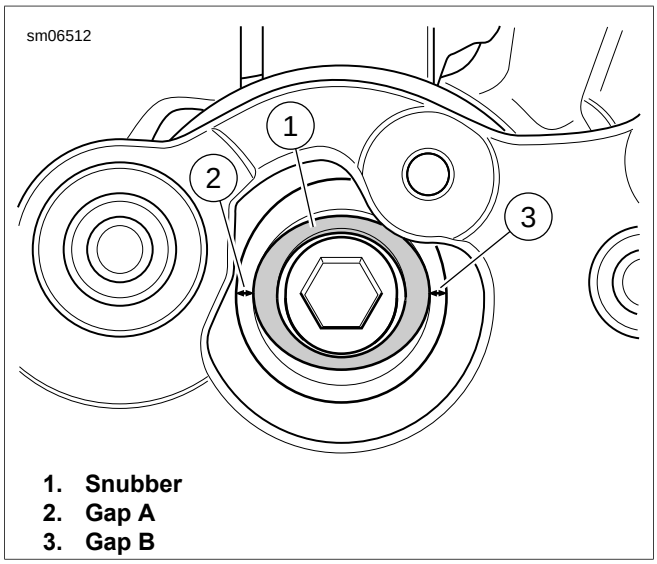
See Figure 2-168. Verify that the snubber (1) on each mount is centered fore and aft with gap A (2) and gap B (3) approximately equal. Vertical centering can not be adjusted.

6. See Figure 2-167. Tighten engine mount bracket fasteners (6) to 36-40 ft-lbs (48.8-54.2 Nm). Verify engine mount snubbers are still centered and correct as necessary.
7. Tighten end cap fasteners (1) to 42-48 ft-lbs (56.9-65.0 Nm).
8. Tighten front engine mount fasteners (3) to 40-50 ft-lbs (54.2-67.8 Nm).
9. Install master cylinder to engine mount end cap. Install rear brake pedal. See 2.14 REAR BRAKE MASTER CYLINDER.
10. Install right side rider footboard. See 2.49 FOOTBOARDS AND FOOTRESTS.



1. **End cap fastener**
2. **End cap**
3. **Front engine mount fastener (2)**
4. **Engine mount**
5. **Engine mount bracket**
6. **Engine mount bracket fasteners**
7. **Nut (2)**
8. **Washer (2)**
9. **Hollow dowel (2)**

Figure 2-167. Front Engine Mount



1. **Snubber**
2. **Gap A**
3. **Gap B**

Figure 2-168. Front Mount Centering

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NOTES

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NOTES

FASTENER TORQUE VALUES 3.1

FASTENER TORQUE VALUES IN THIS CHAPTER

The table below lists torque values for all fasteners presented in this chapter.

FASTENER	TORQUE VALUE		NOTES
Breather assembly screws	120-156 **in-lbs**	13.6-17.6 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Breather and Rocker Cover
Cam chain tensioner fasteners	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Cam cover screws	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Cam support plate screws	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Cam support plate screws	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Crankcase bolt (final torque)	15-19 ft-lbs	20.3-25.8 Nm	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly
Crankcase bolt (initial torque)	120 **in-lbs**	13.6 Nm	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly
Crankcase pipe plugs	120-144 **in-lbs**	13.6-16.3 Nm	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Pipe Plug and Oil Fittings
Crankshaft sprocket bolt, final torque	24 ft-lbs	32.5 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Crossover pipe hanger bracket	84-132 **in-lbs**	9.5-14.9 Nm	3.31 OIL PAN, Installation
Cylinder head bolts, final	15-17 ft-lbs plus 90 degrees	20.3-23.0 Nm plus 90 degrees	3.23 CYLINDER, Inspection/ See procedure to tighten
Cylinder head bolts, final	15-17 ft-lbs plus 90 degrees	20.3-23.0 Nm plus 90 degrees	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/ See procedure to tighten
Cylinder head bolts, initial	120-144 **in-lbs**	13.6-16.2 Nm	3.23 CYLINDER, Inspection
Cylinder head bolts, initial	120-144 **in-lbs**	13.6-16.3 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder Head
Cylinder stud	120-240 **in-lbs**	13.6-27.1 Nm	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Cylinder Studs
Engine oil drain plug	14-21 ft-lbs	19.0-28.5 Nm	3.31 OIL PAN, Installation/Clean plug before installation
Lifter cover screws	90-120 **in-lbs**	10.2-13.6 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Push Rods, Lifters and Covers
Oil cooler adapter inspection cover	90-120 **in-lbs**	10.2-13.6 Nm	3.10 OIL COOLER ADAPTER, Assembly/Apply 1 drop LOCTITE 246 THREADLOCKER MEDIUM STRENGH/HIGH TEMPERATURE to the fasteners
Oil cooler mounting screws	20-22 ft-lbs	27.1-29.8 Nm	3.9 OIL COOLER, Installation
Oil filter adapter	18-22 ft-lbs	24.4-27.3 Nm	3.10 OIL COOLER ADAPTER, Installation
Oil pan fasteners	132-156 **in-lbs**	14.9-17.6 Nm	3.31 OIL PAN, Installation/Torque sequence; Loctite Threadlocker 243 (blue) with used fasteners
Oil pan tapered plug	18-22 ft-lbs	24.4-29.8 Nm	3.31 OIL PAN, Installation/Apply Loctite Pipe Sealant With Teflon 565 (P/N 99818-97)
Oil pump screws, initial torque	40-45 **in-lbs**	4.5-5.1 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation

FASTENER	TORQUE VALUE		NOTES
Piston jet screws	25-35 **in-lbs**	2.8-3.9 Nm	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
Primary cam sprocket flange bolts, final torque	34 ft-lbs	46.1 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Primary cam sprocket flange bolts, initial torque	15 ft-lbs	20.3 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Primary cam sprocket flange bolts, initial torque	15 ft-lbs	20.3 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Right main bearing retaining screws	40-70 **in-lbs**	4.5-7.9 Nm	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
Rocker arm support plate bolts	18-22 ft-lbs	24.4-29.8 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Rocker Arm Support Plate
Rocker cover screws	15-18 ft-lbs	20.3-24.4 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Breather and Rocker Cover
Rocker housing bolts	120-168 **in-lbs**	13.6-19.0 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder Head
Secondary cam chain tensioner fastener	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Camshafts
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	3.8 TROUBLESHOOTING, Compression Test
Top engine stabilizer bracket to cylinder head bolts	30-35 ft-lbs	41-48 Nm	3.15 ASSEMBLING MOTORCYCLE AFTER SERVICE, Procedure
Top engine stabilizer bracket to cylinder head bolts	30-35 ft-lbs	41-48 Nm	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
Top stabilizer link bolt	18-22 ft-lbs	24.4-29.8 Nm	3.15 ASSEMBLING MOTORCYCLE AFTER SERVICE, Procedure
Top stabilizer link bolt	18-22 ft-lbs	24.4-29.8 Nm	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	3.31 OIL PAN, Installation/Clean plug before installation
Transmission mounting bolts, final torque	34-39 ft-lbs	46.1-52.9 Nm	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
Transmission mounting bolts, initial torque	15 ft-lbs	20.3 Nm	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
Voltage regulator locknuts	70-100 **in-lbs**	7.9-11.3 Nm	3.9 OIL COOLER, Installation

SPECIFICATIONS 3.2

SPECIFICATIONS

Table 3-1. Engine: Twin Cam 96™

ITEM	SPECIFICATION	
Number of cylinders	2	
Type	4-cycle, 45 degree V-Type, air cooled	
Compression ratio	9.2:1	
Bore	3.750 in	95.25 mm
Stroke	4.375 in	111.12 mm
Displacement	96.0 in^3	1584 cm^3
Lubrication system	Pressurized, dry sump	

Table 3-2. Engine: Twin Cam 103™

ITEM	SPECIFICATION	
Number of cylinders	2	
Type	4-cycle, 45 degree V-Type, air-cooled	
Compression ratio	9.6:1	
Bore	3.875 in	98.42 mm
Stroke	4.375 in	111.12 mm
Displacement	103.0 in^3	1690 cm^3
Lubrication system	Pressurized, dry sump with oil cooler	

Table 3-3. Oiling System

OIL PUMP	DATA
Type	Twin geroter, dual scavenge, crank mounted and driven, internal oil pump, dry sump
Pressure	30-38 PSI (207-262 kN/m^2) at 2000 RPM and normal operating temperature of 230 °F (110 °C)
Filtration	5 micron media, filtered between pump and engine
Cooling: Twin Cam 103™	Thermostat controlled oil cooler

Table 3-4. Rocker Arms Specifications

ROCKER ARMS	IN.	MM
Shaft fit in bushing (loose)	0.0005-0.0020	0.013-0.051
End clearance	0.003-0.013	0.08-0.33
Bushing fit in rocker arm (tight)	0.002-0.004	0.051-0.102

Table 3-5. Rocker Arm Shaft Specifications

ROCKER ARM SHAFTS	IN.	MM
Shaft fit in rocker arm support plate (loose)	0.0007-0.0022	0.018-0.056

Table 3-6. Hydraulic Lifter Specifications

HYDRAULIC LIFTERS	IN	MM
Fit in crankcase (loose)	0.0009-0.0026	0.002-0.066

Table 3-7. Cylinder Head Specifications

CYLINDER HEAD	IN.	MM
Valve guide in head (tight)	0.0022-0.0033	0.051-0.084
Valve seat in head (tight)	0.003-0.0045	0.076-0.114
Valve stem protrusion (min)	2.022	51.36
Head gasket surface (flatness)	0-0.006	0-0.152

Table 3-8. Valve Specifications

VALVES	IN.	MM
Exhaust: fit in guide	0.001-0.003	0.0254-0.0762
Intake: fit in guide	0.001-0.003	0.0254-0.0762
Seat Width	0.040-0.062	1.02-1.58
Stem protrusion from cylinder head boss	2.012-2.032	51.10-51.61

Table 3-9. Valve Springs Specifications

VALVE SPRINGS	IN.	MM
Closed	135 lbs @ 1.850 in.	61.2 kg @ 47.0 mm
Open	312 lbs @ 1.300 in.	141.5 kg @ 33.0 mm
Free length	2.325 in.	59.1 mm

Table 3-10. Piston: Twin Cam 96™

PISTON		IN.	MM
Fit in cylinder (loose)		0.0014-0.0025	0.036-0.064
Piston pin fit (loose)		0.0002-0.0005	0.005-0.013
Ring end gap	Top compression	0.010-0.020	0.254-0.508
	2nd compression	0.014-0.024	0.356-0.610
	Oil control ring	0.010-0.050	0.254-1.27
Ring side clearance	Top compression	0.0012-0.0037	0.030-0.094
	2nd compression	0.0012-0.0037	0.030-0.094
	Oil control rails	0.0031-0.0091	0.079-0.231

Table 3-11. Piston: Twin Cam 103™

PISTON		IN.	MM
Fit in cylinder (loose)		0.0014-0.0025	0.036-0.064
Piston pin fit (loose)		0.0002-0.0005	0.005-0.013
Ring end gap	Top compression	0.012-0.022	0.305-0.559
	2nd compression	0.015-0.025	0.381-0.635
	Oil control ring	0.010-0.050	0.254-1.270
Ring side clearance	Top compression	0.0012-0.0037	0.030-0.094
	2nd compression	0.0012-0.0037	0.030-0.094
	Oil control rails	0.0031-0.0091	0.079-0.231

Table 3-12. Connecting Rod Specifications

CONNECTING ROD	IN.	MM
Piston pin fit (loose)	0.0007-0.0012	0.018-0.030
Side play between flywheels	0.005-0.015	0.13-0.38
Connecting rod to crankpin (loose)	0.0004-0.0017	0.0102-0.0432

Table 3-13. Flywheel Specifications

FLYWHEELS	IN.	MM
Runout (shaft measured in case)	0.000-0.010	0.0-0.254
Runout (measured in truing stand)	0.000-0.004	0.0-0.102
End play	0.003-0.013	0.076-0.330

Table 3-14. Crankshaft/Sprocket Shaft Bearing Specifications

CRANKSHAFT/SPROCKET SHAFT BEARINGS	IN.	MM
Roller bearing fit (loose)	0.0002-0.0015	0.005-0.038
Bearing fit in crankcase (tight)	0.0038-0.0054	0.097-0.137
Bearing inner race on crankshaft (tight)	0.0004-0.0014	0.010-0.036

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SERVICE WEAR LIMITS 3.3

GENERAL

Wear limits are given here as a guideline for measuring used engine components. Replace components when they exceed values listed here.

Table 3-15. Rocker Arm/Rocker Arm Shaft

ROCKER ARM/ROCKER ARM SHAFT	REPLACE IF WEAR EXCEEDS	
	IN.	MM
Shaft fit in bushing (loose)	0.0035	0.089
End clearance	0.025	0.635
Shaft fit in rocker arm support (loose)	0.0035	0.089

Table 3-16. Hydraulic Lifter

HYDRAULIC LIFTER	REPLACE IF WEAR EXCEEDS	
	IN.	MM
Fit in crankcase	0.003	0.076
Roller fit	0.0015	0.038
Roller end clearance	0.022	0.559

Table 3-17. Cam Support Plate (Twin Cam 96™)

ITEM	REPLACE IF WEAR EXCEEDS	
	IN.	MM
Cam chain tensioner shoe thickness	0.060 min.	1.52 min.
Crankshaft bore maximum ID	0.8545	21.704
Camshaft bore	1.1023	27.998
Flatness	0.010	0.25

Table 3-18. Cam Support Plate (Twin Cam 103™)

ITEM	REPLACE IF WEAR EXCEEDS	
	IN.	MM
Cam chain tensioner shoe thickness	0.060 min.	1.52 min.
Flatness	0.010	0.25
Crankshaft bore clearance	0.0008-0.001	0.0203-0.0254

Table 3-19. Oil Pump

OIL PUMP	REPLACE IF WEAR EXCEEDS	
	IN.	MM
Rotor tip clearance	0.004	0.10
Rotor thickness variation	0.001	0.025
Rotor protrusion (pump assembled)	0.015-0.025	0.38-0.64

Table 3-20. Cylinder Head

CYLINDER HEAD	REPLACE IF	
	IN.	MM
Valve guide press fit in head	Less than 0.002	Less than 0.05
Valve seat press fit in head	Less than 0.002	Less than 0.05
Valve seat width (max)	0.062	1.57
Valve margin (min)	0.031	0.80
Valve stem protrusion (max)	2.069	52.55
Head warpage (max)	0.006	0.15

Table 3-21. Cylinder

CYLINDER	REPLACE IF WEAR EXCEEDS	
	IN.	MM
Taper	0.002	0.051
Out of round	0.002	0.051
Warpage of gasket surfaces: top	0.006	0.152
Warpage of gasket or O-ring surfaces: base	0.004	0.102

Table 3-22. Cylinder Bore (Twin Cam 96™)

CYLINDER BORE	REPLACE IF WEAR EXCEEDS	
	IN.	MM
Standard	3.752	95.301
0.005 in. oversize	3.757	95.428
0.010 in. oversize	3.762	95.555

Table 3-23. Cylinder Bore (Twin Cam 103™)

ITEM	REPLACE IF WEAR EXCEEDS	
	IN.	MM
Standard	3.877	98.48
0.005 in. oversize	3.882	98.60
0.010 in. oversize	3.887	98.73

Table 3-24. Piston

PISTON		REPLACE IF WEAR EXCEEDS	
		IN.	MM
Fit in cylinder (loose)		0.003	0.076
Piston pin fit (loose)		0.0008	0.020
Ring end gap	Top compression	0.030	0.762
	2nd compression	0.034	0.864
	Oil control rails	0.050	1.27
Ring side clearance	Top compression	0.0045	0.114
	2nd compression	0.0045	0.114
	Oil control rails	0.010	0.254

Table 3-25. Connecting Rod (Twin Cam 96™)

CONNECTING ROD	REPLACE IF WEAR EXCEEDS	
	IN.	MM
Piston pin fit (loose)	0.002	0.051
Side play between flywheels	0.020	0.508
Fit on crankpin (loose)	0.002	0.051

Table 3-26. Connecting Rods (Twin Cam 103™)

ITEM	REPLACE IF WEAR EXCEEDS	
	INCHES	MM
Piston pin fit (loose)	0.001	0.025

Table 3-27. Breather Assembly

BREATHER ASSEMBLY	REPLACE IF WEAR EXCEEDS	
	IN.	MM
Breather cover warpage	0.005	0.13
Breather baffle warpage	0.005	0.13

Table 3-28. Valve Stem to Guide (Twin Cam 96™)

VALVE STEM TO GUIDE	REPLACE IF WEAR EXCEEDS	
	IN.	MM
Intake	0.0038	0.0965
Exhaust	0.0038	0.0965

Table 3-29. Valve Stem to Guide Clearance (Twin Cam 103™)

ITEM	REPLACE IF WEAR EXCEEDS	
	INCHES	MM
Intake	0.0035	0.089
Exhaust	0.0040	0.102

Table 3-30. Flywheel

FLYWHEEL	REPLACE IF WEAR EXCEEDS	
	IN.	MM
Runout (shaft measured in case)	0.012	0.305
Runout (measured in truing stand)	0.005	0.127
End play	0.013	0.330

Table 3-31. Crankshaft Roller Bearing (Twin Cam 96™)

CRANKSHAFT ROLLER BEARING	REPLACE IF	
	IN.	MM
Roller bearing fit (loose)	More than 0.0015	More than 0.038
Bearing fit in crankcase (tight)	Less than 0.0038	Less than 0.097
Inner race on crankshaft (tight)	Less than 0.0004	Less than 0.010

Table 3-32. Crankshaft/Sprocket Shaft Bearing (Twin Cam 103™)

ITEM	REPLACE IF WEAR EXCEEDS	
	INCHES	MM
Crankshaft runout	Greater than 0.003	Greater than 0.076
Bearing fit in crankcase (tight)	0.0038-0.0054	0.097-0.137
Bearing inner race on crankshaft (tight)	Less than 0.0001	Less than 0.0254

ENGINE OIL FLOW 3.4

OIL FEED

NOTE

The oiling system is carefully designed for optimum efficiency. All oil holes and passageways are specially sized. Exercise caution to avoid enlarging oil holes during cleaning. Any modification of the oiling system will adversely affect oil pressure or cooling and lubrication efficiency.

Two illustrations accompany this explanation.

- Cam support plate oil flow is shown in Figure 3-1.
- Top end oil flow is shown in Figure 3-2.

Oil flows from the oil pan through an internal passageway at the front of the transmission housing, and enters the lower passageway (A1) cast into the rear right side of the crankcase.

Running through a passageway in the crankcase, oil exits a hole in the crankcase flange (B2) and enters a hole on the inboard side of the cam support plate. Passing through a channel in the cam support plate (A3), the oil enters the feed side of the oil pump. See 3.5 OIL PUMP OPERATION. The feed gerotors of the pump direct the flow up a second channel in the cam support plate (A4).

A drilling in this channel connects to a pressure relief valve mounted in the bypass port of the cam support plate (A5). When the oil pressure exceeds the setting of the relief valve spring 35 psi (241.3 kPa), the orifice opens to bypass excess oil back to the feed side of the pump (A3).

Oil not returned to the feed side exits a hole on the inboard side of the cam support plate and passes through a hole in the crankcase flange (B6). Flowing through a passageway in the crankcase, where a reading is taken by the oil pressure sending unit (B7), the oil exits the lower off-center hole in the oil filter mount (D8).

After circulating through the oil filter, the flow of oil is directed back into the crankcase through the center hole in the oil filter mount (D9). Exiting a passageway in the crankcase through a hole in the crankcase flange (B10), the flow of oil reenters the cam support plate.

Filtered oil is then routed to the top and bottom ends of the engine as described in 3.4 ENGINE OIL FLOW, Top End and 3.4 ENGINE OIL FLOW, Bottom End which follow.

TOP END

Two illustrations accompany this explanation.

- Cam support plate oil flow is shown in Figure 3-1.
- Top end oil flow is shown in Figure 3-2.

Oil passes through a channel in the cam support plate exiting the inboard side through two holes near the top (A11, A12). Entering two holes in the crankcase flange (B13, B14), one leading to the front cylinder and the other to the rear, the oil travels through passageways in the crankcase to the hydraulic lifter bores (D15).

Exiting a hole in each lifter bore (E16), the oil flows around the lifter and enters a hole at the side of the lifter body. As the chamber inside the lifter body is filled, the push rod socket rises to achieve the no-lash fit of the valve train components. The flow of oil then exits a hole centered in the lifter socket and runs up the hollow push rods.

NOTE

Note that there is one additional hole drilled into the inside lifter bores while the oblong hole circulates oil around the lifter body as described, the round hole (E17) feeds oil to the piston jets in the flywheel compartment.

Exiting holes at the top of the hollow push rods, oil enters a hole at the bottom of the intake and exhaust rocker arms. Lubricating the rocker arm bushings, oil flows down the rocker arm shafts and exits a pin hole in the outboard side of each rocker arm housing (F18) where it sprays the valve springs and the top of the valve stem.

Oil runs down to the low side of the rocker housing and enters the exhaust valve spring pocket where a drain hole (G19) leads to a passageway in the cylinder head casting.

Oil exits the bottom of the cylinder head and passes through a dowel pin (H20) on the "down side" of the cylinder flange. The oil runs through a vertical passageway in the cylinder, passes through a second dowel pin on the "down side" of the cylinder deck (I21) and enters the left crankcase half.

Flowing through a horizontal passageway in the left crankcase half (J22), oil runs through a third dowel pin (K23) to the right crankcase half where it travels through another passageway before emptying into the cam compartment (B23, B24).

Oil collecting in the cam compartment is picked up by one of two scavenge lobes on the oil pump (B25).

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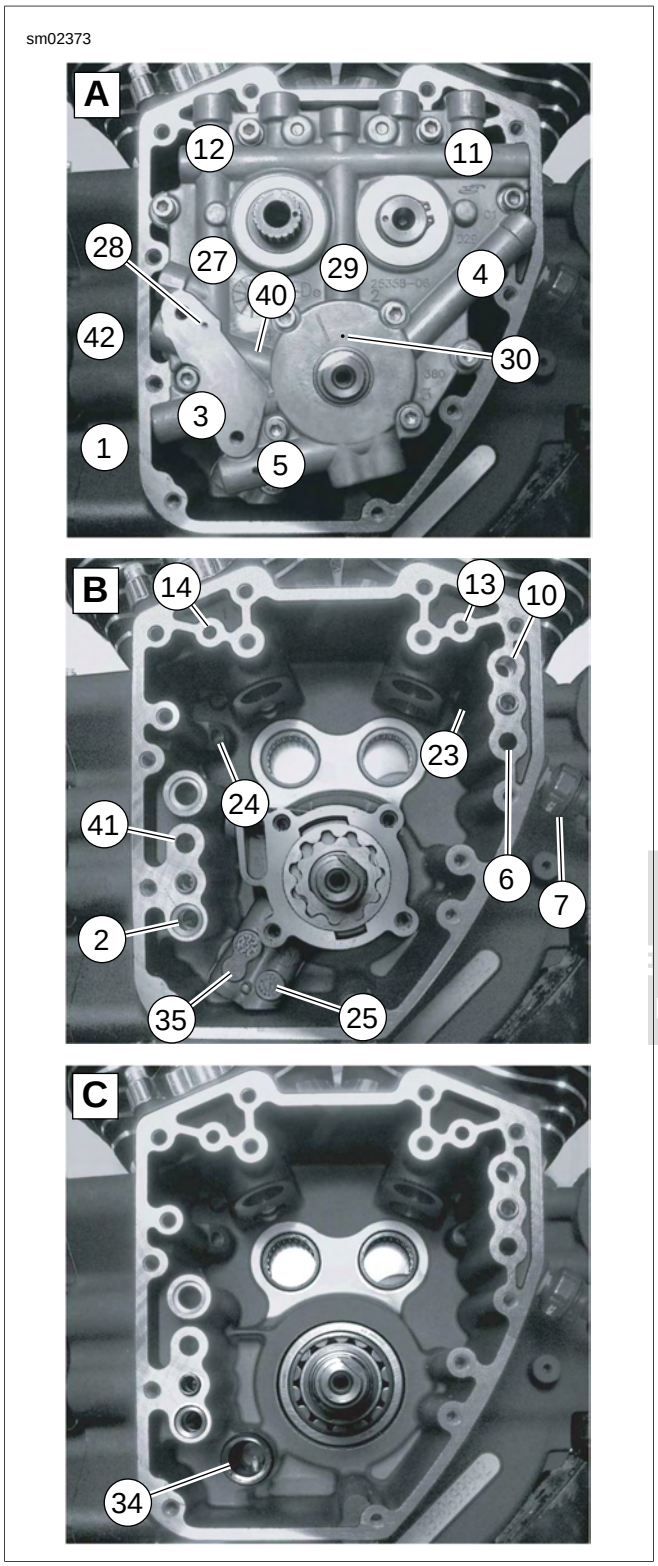


Figure 3-1. Engine Oil Flow - Cam Support Plate/Right Crankcase Half

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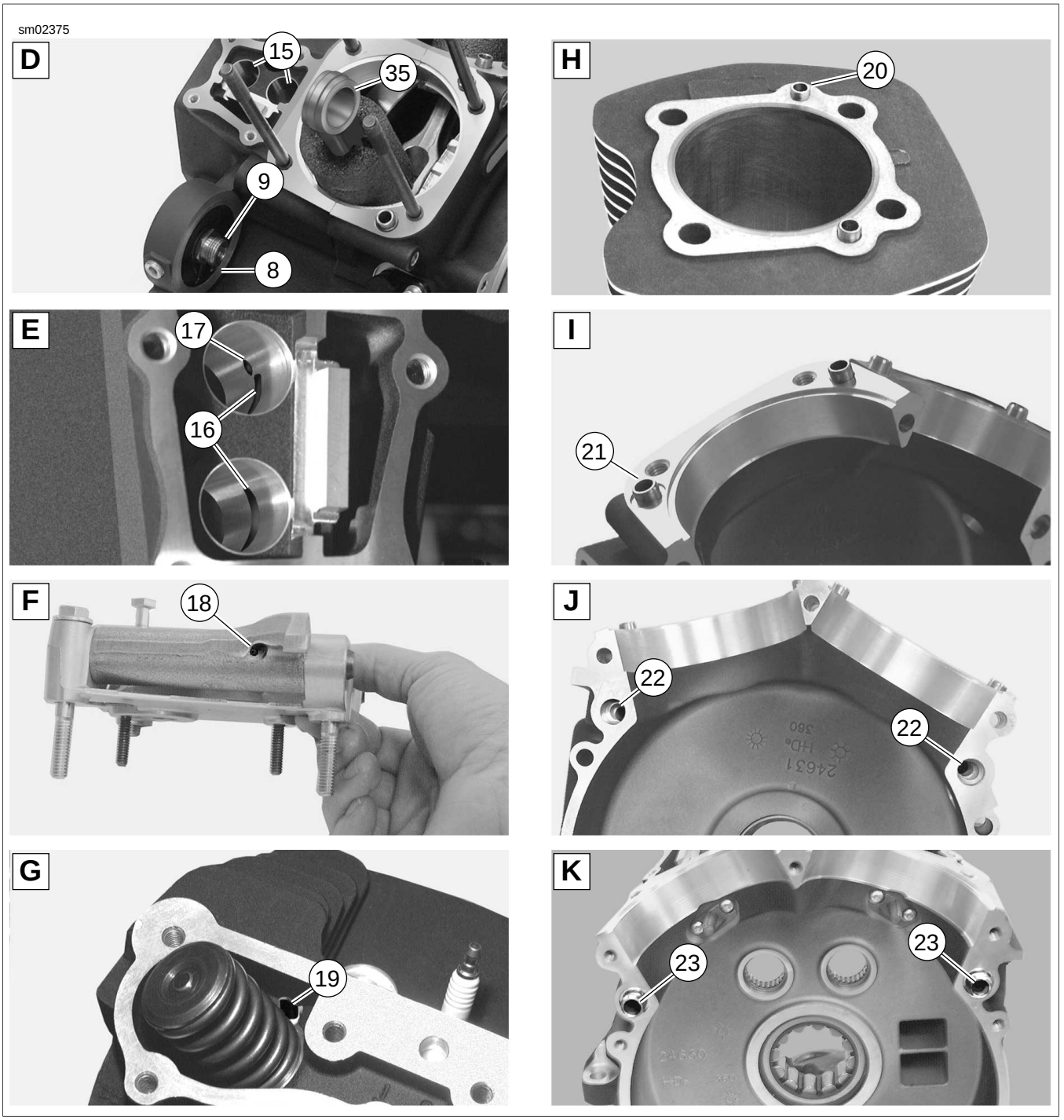


Figure 3-2. Engine Oil Flow - Top End

BOTTOM END

Three illustrations accompany this explanation.

- Cam support plate oil flow is shown in Figure 3-1.
- Top end oil flow is shown in Figure 3-2.
- Bottom end oil flow is shown in Figure 3-3.

Oil traveling through the horizontal passage at the top of the cam support plate (en route to the front and rear cylinders) also passes through a hole at the top of each camshaft bore to lubricate the journals of the plain bearing cams. On the inboard side of the passage leading to the rear cylinder, oil sprays out through a pin hole to lubricate the secondary cam chain.

The flow of oil to the rear cylinder also travels down the vertical passage at the rear of the cam support plate (A27) and exits a hole on the outboard side to supply oil to the primary cam chain tensioner (A28).

The flow of oil in the vertical passage at the center of the cam support plate (A29) passes through a hole on the inboard side

to supply oil to the secondary cam chain tensioner and also sprays out through a pin hole on the outboard side to lubricate the primary cam chain (A30). The flow of oil then passes through a hole in the crankshaft bushing where it enters a drilling in the crankshaft (L31).

Oil runs down the center of the crankshaft and then up across drilling into the right side of the flywheel. The flow exits a drilling in the crank pin bore, enters the crank pin and then sprays out through three holes to lubricate the lower rod bearing set.

The oil splash and mist created by the action of the flywheel lubricates the crankshaft bearing and the camshaft needle bearings in the right crankcase half. This same action serves to lubricate the sprocket shaft bearing in the left crankcase half (M32).

Since the oil mist also lubricates the cylinder walls, three holes on each side of the piston (in the area of the third ring land) evacuate excess oil scraped from the walls on the piston downstroke.

The piston jets (N33), which receive a supply of oil from the intake lifter bores, spray the underside of the piston for cooling of the piston crown and skirt area. A check valve in each jet opens only when the oil pressure reaches 12-15 PSI (82.7-103.4 kPa), at which point the engine is operating above idle speed. At idle speeds (9-12 PSI (62.1-82.7 kPa)), the valve remains closed to prevent over oiling and to provide proper system operating pressure.

Oil spray from each piston jet also enters a hole at the bottom of each pin boss (O34) for lubrication of the piston pin. The spray also allows a portion of the oil to reach the upper rod bushing (D35).

Surplus oil falls back to the bottom of the flywheel compartment where it collects in the sump area (P36). Oil in the sump is drawn to the cam compartment through an internal channel (P37, C34) that connects with the second scavenge lobe of the oil pump (B35).

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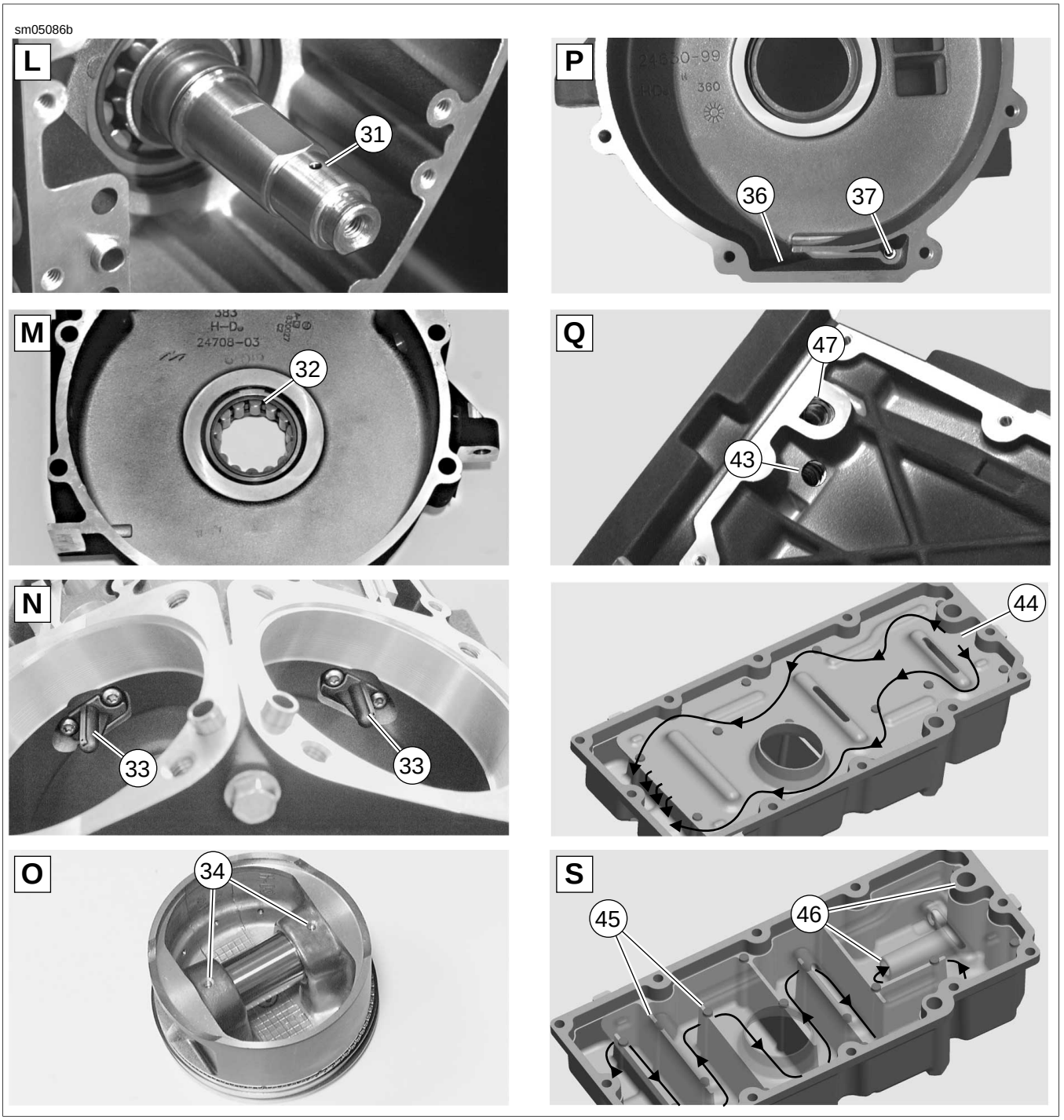


Figure 3-3. Engine Oil Flow - Bottom End

OIL RETURN

Two illustrations accompany this explanation.

- Cam support plate oil flow is shown in Figure 3-1.
- Bottom end oil flow is shown in Figure 3-3.

The "dual kidney" designation given to the oil pump refers to its two scavenging functions, whereby it simultaneously draws oil from both the cam and flywheel compartments.

Oil sucked up by the scavenge lobes passes through the scavenge gerotors of the oil pump and is directed through a return channel in the cam support plate (A40). See 3.5 OIL PUMP OPERATION.

Exiting a hole on the inboard side of the cam support plate, oil enters the upper hole in the crankcase flange (B41).

Oil flows through the upper passageway in the crankcase (A42), enters a passageway at the front of the transmission housing and empties into the oil pan (Q43) onto the front of the baffle plate (R44).

The oil flows to the rear of the oil pan along the top of the baffle plate, then drops from the open end of the baffle plate into the oil pan where it is redirected forward. The baffles (S45) cast into the oil pan slow the circulation of the oil through the pan to enhance cooling.

Oil pickup occurs in the front compartment of the baffle where a passageway in the casting (S46) directs the flow upward. Passing through a second passageway in the transmission housing (Q47), the flow of oil enters the lower passageway in the crankcase (A1) to repeat the circuit.

OIL COOLER OPERATION

NOTE

The following information pertains only to models with Twin Cam 103™ or larger engines equipped with an oil cooler.

The flow of oil to the cooler is controlled by a thermostat in an adapter located between the oil filter and the filter mount.

Under pressure from the crankcase, engine oil flows from the crankcase oil filter mount into a passage in the oil cooler adapter. The thermostat is located between the supply and return ports of the adapter and consists of a temperature sensitive element compressed between a spring and a threaded plug.

When the engine oil temperature is below 200 °F (93 °C), an open thermostat allows the largest percentage of engine oil in the supply port to pass through to the return port and then to the oil filter. A smaller percentage flows through the oil cooler.

When oil temperature exceeds 200 °F (93 °C), the thermostat closes and all the oil flows through the supply hose to the oil cooler.

The oil circulates through the finned tubes of the cooler to dissipate heat and returns to the oil cooler adapter through a return hose.

The oil is then filtered before returning to the crankcase.

NOTE

*Regardless of whether the thermostat is closed or open, oil is **always** pressurized in the oil cooler adapter, the oil cooler supply hose, the oil cooler and the oil return hose.*

At every service interval, the oil cooler fins should be checked for dirt and debris.

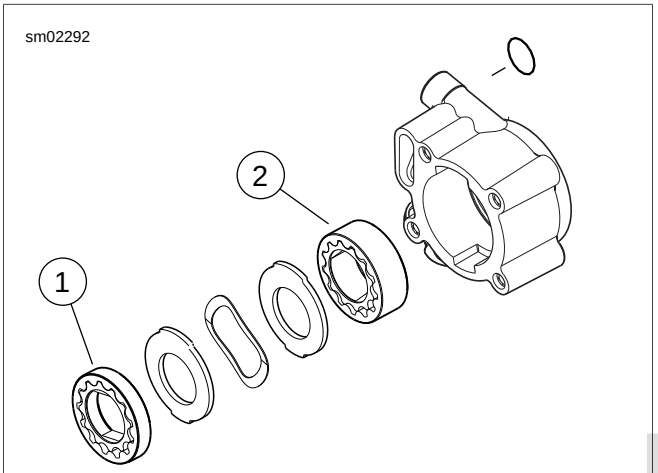
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OIL PUMP OPERATION 3.5

GENERAL

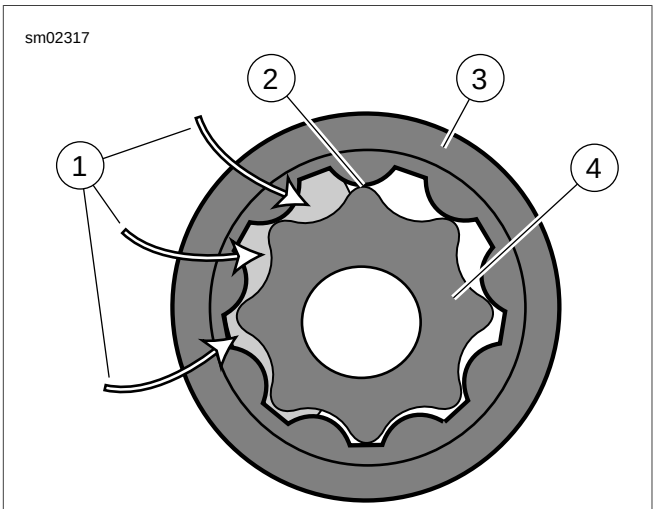
See Figure 3-4. The oil pump consists of a housing containing two gerotor gear sets, one feed and the other scavenge. Driven by the crankshaft, the feed gerotor set distributes oil to the engine, while the scavenge gerotor set draws oil from the cam and flywheel compartments and returns it to the oil pan.

Each gerotor gear set has two parts, an inner and outer gerotor. The inner and outer gerotors have fixed centers that are slightly offset to one another. Also, the inner gerotor has one less tooth.



1. **Feed gerotor**
2. **Scavenge gerotor**

Figure 3-4. Oil Pump Gerotors



1. **Oil in**
2. **Seal**
3. **Outer gerotor**
4. **Inner gerotor**

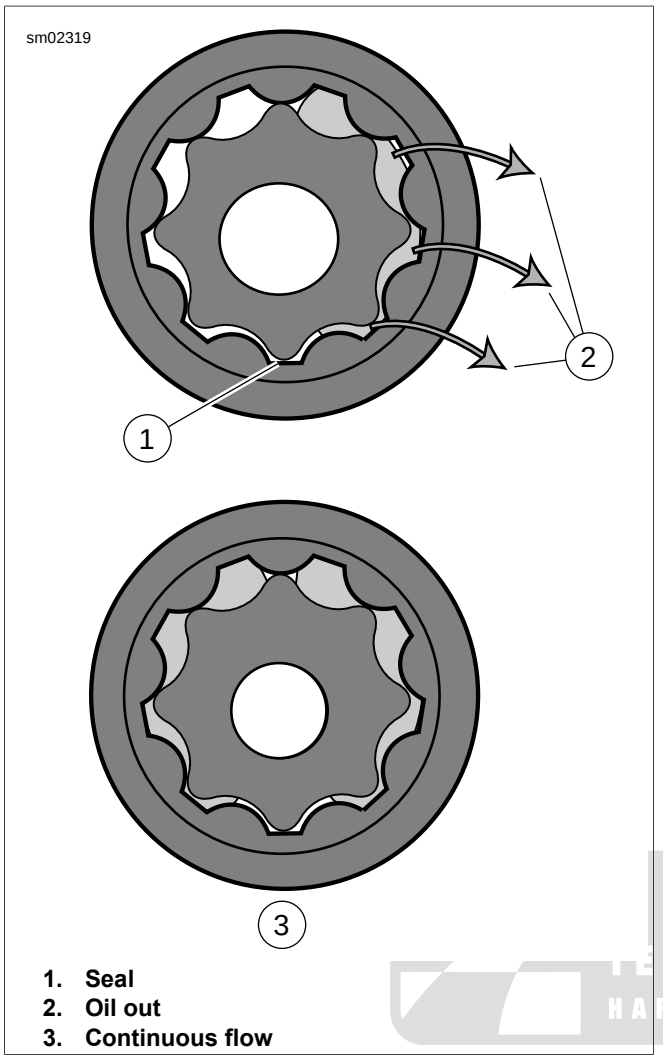
Figure 3-5. Inlet Side Oil Flow

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OPERATION

See Figure 3-5. As the crankshaft rotates, the cavity between the inner and outer gerotors on the inlet side of the pump increases in volume. This creates a vacuum causing oil to be drawn in. The cavity continues to increase until the volume is equivalent to that of the missing tooth on the inner gerotor. Note that the inlet and outlet sides of the pump are sealed by the tips and lobes of the inner and outer gerotors.

See Figure 3-6. Continued rotation moves the pocket of oil to the outlet side of the pump. In this area, the cavity decreases in volume as the gerotor teeth mesh causing the oil to be squeezed out the discharge port. As the cavity on the outlet side is emptied, a second seal formed by the tips and lobes of the inner and outer gerotors prevents oil on the outlet side (high pressure) from being transferred to the inlet side (low pressure). In operation, the gerotors provide a continuous flow of oil.



1. Seal
2. Oil out
3. Continuous flow

Figure 3-6. Outlet Side Oil Flow

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

BREATHER OPERATION 3.6

GENERAL

The crankcase breather system relieves crankcase pressure produced by the downstroke of the pistons and allows crankcase vapors to be directed into the intake air stream to be burned during normal combustion. Through effective recirculation of crankcase vapors, the system serves to eliminate the pollutants normally discharged from the crankcase.

See Figure 3-7. As each piston pushes downward, displaced air in the crankcase is vented through the crankshaft roller bearing into the cam compartment and then up the push rod covers (1) into the rocker housing. The moving air absorbs a small amount if oil vapor as it travels through the engine.

The oil/air vapor rushes under the rocker arm support plate, which is elevated slightly, and passes through an opening at the bottom of the plate to enter the breather baffle compartment (2).

In the baffle compartment, the flow of air passes upward through the oil filter gauze, where the oil is removed from the air. Two pin holes in the rocker arm support plate allow the separated oil to drain back into the crankcase.

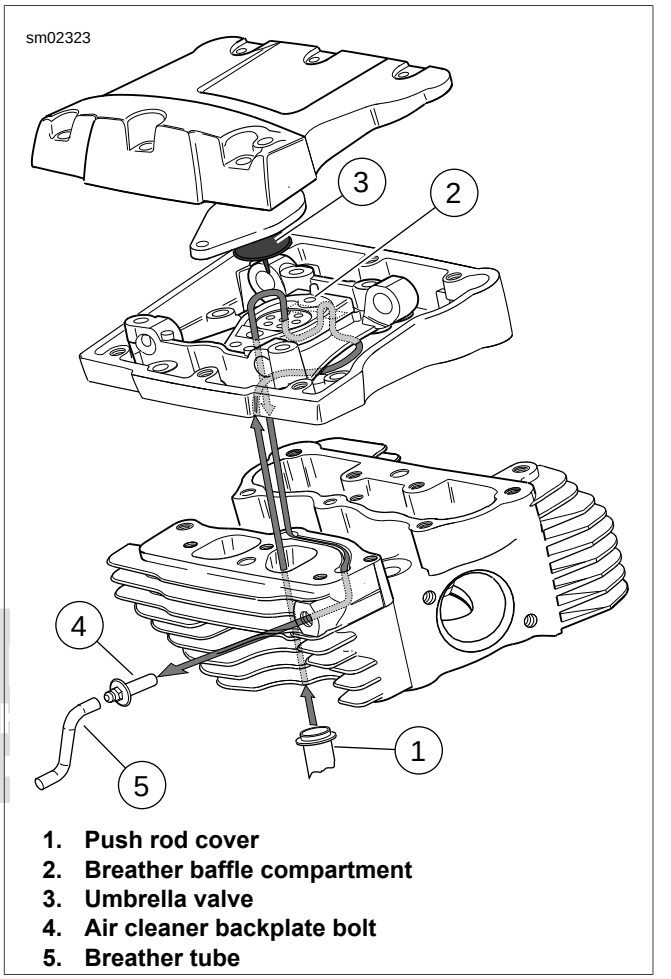
Passing through the oil filter gauze, the vapor passes through the umbrella valve (3) into the breather compartment. The flaps of the umbrella valve only allow air to be vented one way, rising to allow the passage of air, then falling back into place to seal the vent holes as the flow of air stops.

In the breather compartment, the air flows downward through holes aligned in the breather baffle, rocker arm support plate and rocker housing. Exiting the rocker housing, the air enters a passageway cast into the top of the cylinder head. Proper orientation of the rocker housing gasket is critical for effective sealing of this passageway.

Flowing through the cylinder head passageway, the air passes through a drilling in the air cleaner backplate bolt (4) and then through a breather tube (5) into the air filter element where it joins with the intake air stream and is burned during normal combustion.

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.



1. **Push rod cover**
2. **Breather baffle compartment**
3. **Umbrella valve**
4. **Air cleaner backplate bolt**
5. **Breather tube**

Figure 3-7. Breather Air Flow

OIL PRESSURE 3.7

OIL PRESSURE INDICATOR LAMP

See Figure 3-8. The red OIL PRESSURE indicator lamp illuminates to indicate improper circulation of the engine oil. The lamp illuminates when the ignition is first turned on (before the engine is started), but should be extinguished once the engine is running.

NOTICE

If the oil pressure indicator lamp remains lit, always check the oil supply first. If the oil supply is normal and the lamp is still lit, stop the engine at once and do not ride further until the trouble is located and the necessary repairs are made. Failure to do so may result in engine damage. (00157a)

If the indicator lamp is not extinguished, it may be the result of a low oil level or diluted oil supply. In freezing weather, the oil feed and return lines can clog with ice or sludge. A problem in the lamp wiring, faulty oil pressure sending unit, damaged oil pump, plugged oil filter element, incorrect oil viscosity, broken or weak spring in the oil pressure relief valve and/or damaged or incorrectly installed O-rings in the engine may also cause the indicator lamp to remain on.

To troubleshoot the problem, always check the engine oil level first. If the oil level is OK, determine if oil returns to the oil pan. If oil does not return, shut off the engine until the problem is located and corrected.

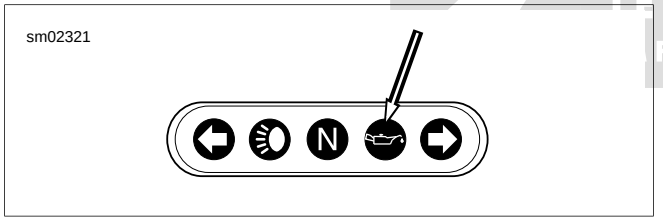


Figure 3-8. Oil Pressure Indicator Lamp

CHECKING OIL PRESSURE

PART NUMBER	TOOL NAME
HD-96921-52D	OIL PRESSURE GAUGE SET

Check operating oil pressure as follows:

1. Verify engine oil is at the proper level. See 1.6 ENGINE OIL AND FILTER.
2. See Figure 3-9. Remove oil pressure switch from crankcase. See 7.25 OIL PRESSURE SWITCH AND SENDER.
3. See Figure 3-10. Install OIL PRESSURE GAUGE SET (Part No. HD-96921-52D).
   a. Install adapter (2) in oil pressure switch mounting hole. Tighten adapter until snug.
   b. Assemble banjo bolt (3), washer (4), oil pressure gauge (1) banjo fitting and second washer onto adapter and tighten until snug.
4. Start engine and allow to reach operating temperature.

NOTE

Engine oil should be at normal operating temperature, 230 °F (110 °C), for an accurate reading.

5. Oil pressure should be within specifications shown in Table 3-33. See 1.6 ENGINE OIL AND FILTER if readings are questionable.
6. Stop engine. Remove oil pressure gauge assembly from oil pressure switch mounting hole in crankcase.
7. Install oil pressure switch. See 7.25 OIL PRESSURE SWITCH AND SENDER.

Table 3-33. Oil Pressure

CHECK	SPECIFICATION *	
	SAE	METRIC
Oil pressure - min. at idle	5 psi	34.5 kPa
Oil pressure - normal at 2000 rpm	30-38 psi	207-262 kPa
Oil pressure - max.	50 psi	345 kPa
* With oil at normal operating temperature of 230 °F (110 °C)		

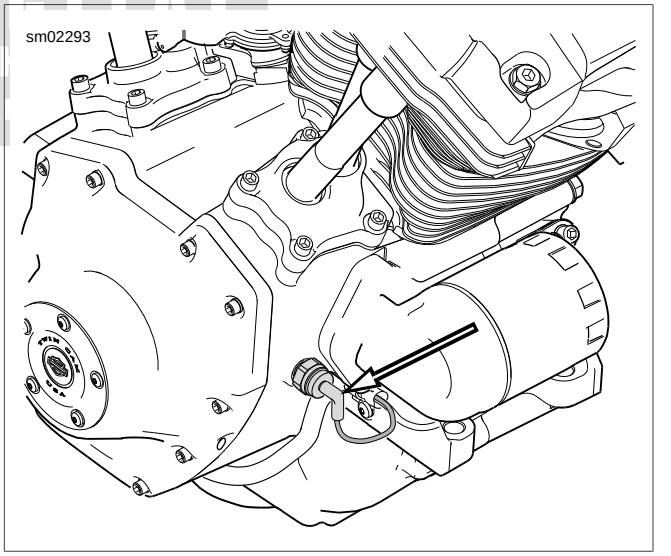
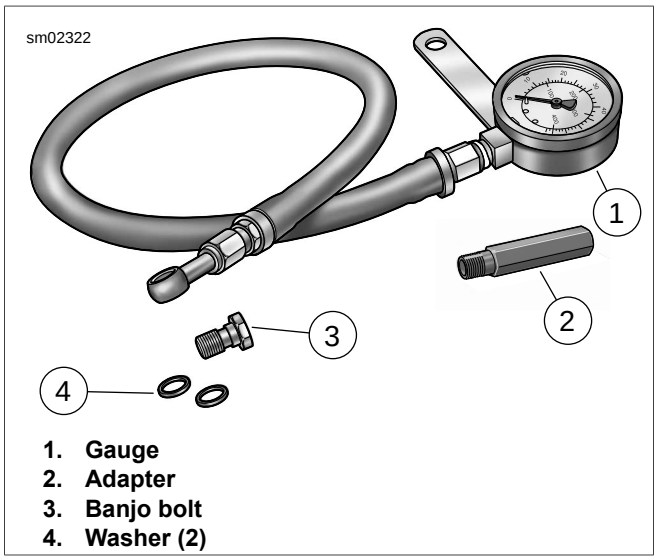


Figure 3-9. Oil Pressure Switch



1. Gauge
2. Adapter
3. Banjo bolt
4. Washer (2)

Figure 3-10. Oil Pressure Gauge Set

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DIAGNOSING VALVE TRAIN NOISE

To diagnose and correct noisy hydraulic lifters and valve train components, use the following procedures:

1. With engine and oil at normal operating temperature, check oil pressure at 2000 RPM. If oil pressure is above 50 PSI (345 kPa) or below 5 PSI (34 kPa), inspect oil pump, crankcase passages, and oil hoses for restrictions or blockage. Repair or replace parts as necessary.
2. If oil is not reaching the hydraulic lifters, remove and inspect. See 3.21 PUSH RODS, LIFTERS AND COVERS, Lifter Inspection. Clean lifter bore of all foreign material. Replace hydraulic lifter if required.
3. Examine push rod, lifter and lifter block for proper fit and any signs of unusual wear. Replace parts as necessary.
4. Visually inspect camshaft lobes for abnormal wear.
5. Check cam chain tensioning shoe for wear.
6. Remove cylinder head and rocker box assemblies. Check rocker arm end play and check for binding. Inspect valve stems for scuffing and check stem to guide clearance. Check valve seats for signs of looseness or shifting.
7. Grind valves and valve seats. See 3.22 CYLINDER HEAD, Valve and Seat Refacing.

COMPRESSION TEST

PART NUMBER	TOOL NAME
HD-33223-1	CYLINDER COMPRESSION GAUGE

A compression test can help determine the source of cylinder leakage. Use CYLINDER COMPRESSION GAUGE (Part No. HD-33223-1) with a screw-in type adapter.

The following procedure covers both 96 cubic inch twin cam engines without automatic compression relief (ACR) and 103 cubic inch twin cam engines which are ACR equipped.

NOTE

All twin cam engines use a 12 mm adapter with the compression gauge.

1. Operate engine to normal operating temperature.
2. Disconnect spark plug wires, clean around plug base and remove plugs.
3. Remove air cleaner. See 4.4 AIR CLEANER ASSEMBLY.
4. **ACR equipped models:** Disconnect TCA connector [211] from the induction module.

NOTE

Never use a metal object to hold the throttle plate open. Damage to the throttle plate or throat of the induction module may result.

5. Insert a 0.75 in. (19 mm) diameter by approximately 12 in. (305 mm) long wooden or nylon dowel to hold the throttle valve open.
6. Connect compression tester to front cylinder per manufacturer's instructions.
7. Make sure transmission is in neutral. Crank engine continuously through 5 to 7 full compression strokes and note gauge readings at the end of the first and last compression strokes. Record test results.
8. **ACR equipped models:** Remove the system relay from fuse block to disable ACR and repeat test. See 7.7 SYSTEM FUSES AND RELAYS.
9. **ACR equipped models:** Install system relay.
10. Repeat tests on rear cylinder.
11. Hold throttle valve open and remove dowel. Connect TCA connector [211] when tests are complete.
12. **ACR equipped models:** Removal of the system relay may set diagnostic trouble codes. Clear codes when test is complete.
13. Assemble and install the air cleaner. See 4.4 AIR CLEANER ASSEMBLY.
14. Refer to Table 3-34. If the final readings are within specifications and do not indicate more than a 10% variance between cylinders, compression is considered normal. If compression does not meet specifications, refer to Table 3-35 for possible causes.
15. If readings do not meet specifications, inject approximately 1/2 oz. (15 ml) engine oil into each cylinder and repeat the compression tests on both cylinders. Readings that are considerably higher during the second test indicate worn piston rings.
16. Install the spark plugs and tighten to 12-18 ft-lbs (16.3-24.4 Nm). Connect spark plug wires.

Table 3-34. Compression Specifications

ACR STATUS	PSI	kPa
Engines without ACR	125 (min.)	862 (min.)
System relay installed	110 (min.)	758 (min.)
System relay removed	175 (min.)	1207 (min.)

Table 3-35. Compression Test Results

DIAGNOSIS	TEST RESULTS
Ring trouble	Compression low on first stroke, tends to build up on the following strokes, but does not reach normal. Improves considerably when oil is added to cylinder.
Valve trouble	Compression low on first stroke, does not build up much on following strokes. Does not improve considerably with the addition of oil. Check for correct push rod length.
Head gasket leak	Same reaction as valve trouble.

CYLINDER LEAKDOWN TEST

PART NUMBER	TOOL NAME
HD-35667-A	CYLINDER LEAKDOWN TESTER

NOTE

On vehicles with automatic compression release (ACR), make sure the ACRs are closed for this test. Either perform the test with the ignition/light switch in the off position or with the system relay removed.

The cylinder leakdown test will pinpoint engine problems including leaking valves, worn, damaged or stuck piston rings and blown head gaskets. The cylinder leakage tester applies compressed air to the cylinder at a controlled pressure and volume and measures the percent of leakage from the cylinder.

Use the CYLINDER LEAKDOWN TESTER (Part No. HD-35667-A) and follow the specific instructions supplied with the tester.

The following are some general instructions that apply to Harley-Davidson V-twin engines:

1. Run engine until it reaches normal operating temperature.
2. Stop engine. Clean dirt from around spark plugs and remove the spark plugs.

NOTE

Never use a metal object to hold the throttle plate open. Damage to the throttle plate or throat of the induction module may result.

3. Remove the air cleaner and set the throttle to the wide open position. On models having electronic throttle control, open the throttle plate by hand and insert a wooden or plastic dowel approximately 0.75 in. (19 mm) diameter by approximately 12 in. (305 mm) long to hold the throttle valve open.
4. The piston in the cylinder being tested must be at top dead center of compression stroke (both valves closed) during the test.
5. To keep the engine from turning over when air pressure is applied to the cylinder, engage transmission in highest gear and lock the rear brake.

NOTE

Before performing the cylinder leakdown test, verify that the tester itself is free from leakage to obtain the most accurate test results. With a soap solution (applied around all tester fittings), connect the cylinder leakdown tester to the compressed air source and look for any bubbles that would indicate leakage from the tester.

6. Following the manufacturer's instructions, perform a cylinder leakage test on the front cylinder. Make a note of the percent of leakage. Leakage greater than 10% indicates internal engine problems.
7. Listen for air leaks at throttle body intake, exhaust pipe, and head gasket. Air escaping through the throttle body indicates a leaking intake valve. Air escaping through the exhaust pipe indicates a leaking exhaust valve.

NOTE

If air is escaping through valves, verify that piston is still at TDC or check for correct push rod length.

8. Repeat procedure on rear cylinder.

NOTE

After installing spark plugs, be sure that throttle plate is in the closed position before starting the engine.

DIAGNOSING SMOKING ENGINE OR HIGH OIL CONSUMPTION

Perform both a compression test and a cylinder leakage test. See 3.8 TROUBLESHOOTING, Compression Test and 3.8 TROUBLESHOOTING, Cylinder Leakdown Test. If further testing is needed, remove suspect head(s) and inspect for the following:

Check Prior To Cylinder Head Removal

1. Oil level overfull.
2. Oil carryover.
3. Breather hose restricted.
4. Restricted oil filter.

Check After Cylinder Head Removal

1. Oil return passages for clogging.
2. Valve guide seals.
3. Valve guide to valve stem clearance.
4. Gasket surface of both head and cylinder.
5. Cylinder head casting's porosity allowing oil to drain into combustion chamber.
6. O-ring damaged or missing from oil pump/crankcase junction.

OIL COOLER 3.9

REMOVAL

PART NUMBER	TOOL NAME
HD-97087-65B	HOSE CLAMP PLIERS

1. Cover the front fender to protect finish.
2. Place a container under the motorcycle to catch excess oil.

NOTE

Dispose of oil in accordance with local regulations.

3. See Figure 3-11. Pull out on the bottom of the oil cooler cover (4) to disengage the lower retaining pins, then pull up and remove cover from oil cooler.
4. Remove screws (1) securing the oil cooler (3) to the frame.
5. Slide clamps (5) down the oil hoses (6, 7) and disconnect hoses from the oil cooler adapter (8).
6. Remove the oil cooler.
7. Inspect oil cooler for dirt, debris and damage.
8. If removing the hoses from the oil cooler, use HOSE CLAMP PLIERS (Part No. HD-97087-65B) to cut clamps (2) on the supply and return hoses.

INSTALLATION

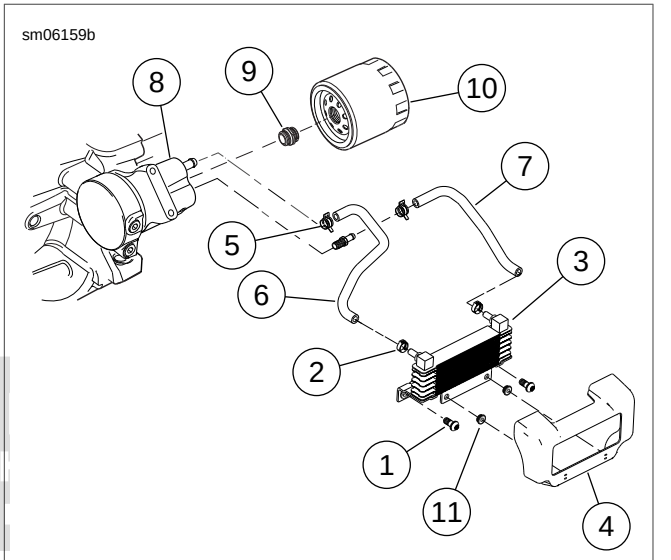
PART NUMBER	TOOL NAME
HD-97087-65B	HOSE CLAMP PLIERS

1. See Figure 3-11. If replacing the hoses, place **new** hose clamps (2) on the oil cooler end of the hoses.
2. Push the supply and return hoses onto the fittings of the oil cooler.
3. Align the hoses as necessary and use HOSE CLAMP PLIERS (Part No. HD-97087-65B) to tighten the hose clamps.
4. Secure cooler to frame and tighten screws (1) to 20-22 ft-lbs (27.1-29.8 Nm).
5. Place clamps (5) on hoses and install the oil hoses into the fittings of the oil cooler adapter. Secure clamps on hoses at oil cooler adapter.
6. Check the condition of grommets (11) and replace as necessary. Install cover (4), upper latches first, then push down and back to engage lower pins into grommets.

NOTE

If upper cover latches refuse to engage properly, the gap between the oil cooler and voltage regulator may be too small. Temporarily loosen the regulator locknuts, install cover, and tighten locknuts to 70-100 ***in-lbs*** *(7.9-11.3 Nm).*

7. Check oil level and add oil as required.
8. After running engine, inspect oil cooler hose fittings for leaks.



1. **Screw (2)**
2. **Clamp (2)**
3. **Oil cooler**
4. **Cover**
5. **Hose clamp (2)**
6. **Return oil hose**
7. **Supply oil hose**
8. **Oil cooler adapter**
9. **Oil filter adapter**
10. **Oil filter**
11. **Grommet (2)**

Figure 3-11. Oil Cooler

OIL COOLER ADAPTER 3.10

REMOVAL

PART NUMBER	TOOL NAME
HD-42311	OIL FILTER WRENCH

NOTE

The following information pertains only to models with Twin Cam 103™ or larger engines equipped with an oil cooler.

1. Place a container under motorcycle to catch excess oil.
2. Bend a cardboard funnel and fit to motorcycle to route fluid away from regulator and oil cooler toward the container.
3. Use OIL FILTER WRENCH (Part No. HD-42311) to remove the oil filter.
4. Remove the clamps from the oil hoses at the adapter.
5. See Figure 3-12. Remove the oil filter adapter (1).
6. Remove the oil cooler adapter (2) with the gasket (3).

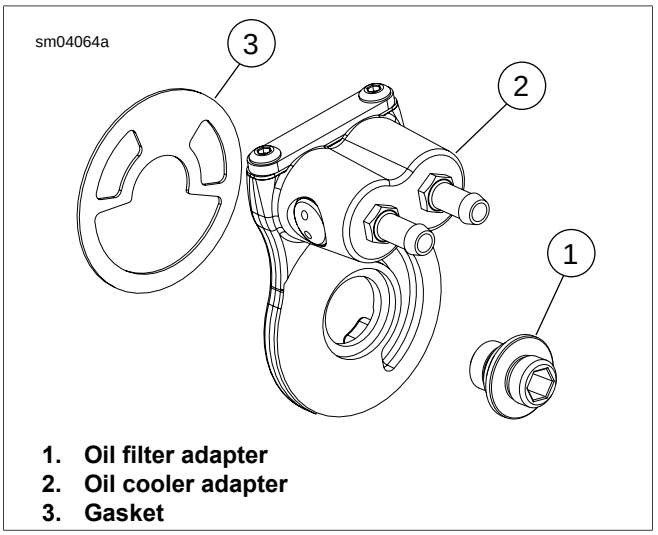
DISASSEMBLY

1. See Figure 3-13. Inspect the crankcase mating surface and, if necessary, remove any old gasket material.
2. Remove the inspection cover (1) and gasket.
3. Remove the two oil cooler line fittings.

NOTE

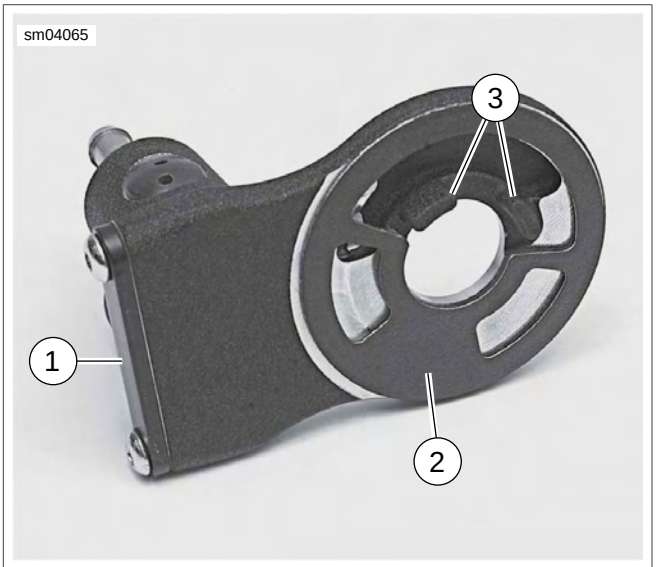
Replace the oil cooler adapter if the thermostat is not functioning.

4. Clean the oil filter mount surface of old filter gasket material.
5. Clean the oil passages in solvent.
6. Inspect the oil passages and the oil cooler mount.



1. **Oil filter adapter**
2. **Oil cooler adapter**
3. **Gasket**

Figure 3-12. Oil Cooler Adapter



1. **Inspection cover**
2. **Gasket**
3. **Positioning bosses**

Figure 3-13. Oil Cooler Adapter

ASSEMBLY

1. Install the inspection passage cover and **new** gasket.
2. Clean all residual oil and threadlocking compound from the threaded holes and screws.
3. Apply one drop LOCTITE 246 THREADLOCKER MEDIUM STRENGTH/HIGH TEMPERATURE to the fasteners and tighten to 90-120 **in-lbs** (10.2-13.6 Nm).
4. See Figure 3-14. Install the supply (1) and return (2) port oil line fittings.
   a. Finger tighten.
   b. From finger tight, turn 2-3 more turns.

INSTALLATION

1. See Figure 3-13. Match the positioning bosses (3) on the oil cooler adapter to the oil filter mount.

NOTE

The oil cooler adapter will only fit in one location.

2. Clean all residual oil and threadlocking compound from the threaded hole in the crankcase and threads of the oil filter adapter.
3. Apply LOCTITE 246 THREADLOCKER MEDIUM STRENGTH/HIGH TEMPERATURE to the threads of the oil filter adapter.

NOTE

Exercise care when starting oil filter adapter to prevent cross-threading.

4. Hold oil cooler adapter in place and install the oil filter adapter with the internal hex facing outward. Tighten to 18-22 ft-lbs (24.4-27.3 Nm).
5. Install the oil hoses and clamps.
6. Install a **new** oil filter.

NOTICE

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)

7. Perform an oil level COLD CHECK.

NOTE

Add only enough oil to bring the level between the two arrows on the dipstick.

NOTICE

Do not operate the engine when the oil level is below the add mark on the dipstick at operating temperature. Engine damage will result. (00187b)

8. Start engine and check for oil leaks.
9. When at operating temperature, perform an oil level HOT CHECK.



1. **Supply port**
2. **Return port**
3. **Oil filter gasket surface**

Figure 3-14. Oil Line Fittings on Adapter

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

HOW TO USE THIS SECTION 3.11

TOP END REPAIR

NOTE

During top end disassembly, the engine may be left in the chassis for service.

If servicing only cylinder head components, pistons, cylinders and/or upper rod bushings, two options are available depending upon engine status.

- 3.12 TOP END SERVICE, Engine in Chassis.
- 3.12 TOP END SERVICE, Engine Removed from Chassis.

BOTTOM END REPAIR

NOTE

Servicing components in the cam compartment requires only partial disassembly. This can be done with the engine left in the chassis.

After disassembling as far as the cylinder heads you may find that bottom end repair is necessary. Bottom end service may require either partial or complete disassembly of the engine.

- To service the cam compartment, see 3.26 CAM COMPARTMENT AND COMPONENTS.
- To service components in the flywheel compartment, the engine must be removed and the crankcase halves split.

  See 3.13 CAM COMPARTMENT SERVICE, Engine Removed From Chassis.

TYPICAL SYMPTOMS

Symptoms indicating a need for engine repair are often misleading, but generally if more than one symptom is present, possible causes can be narrowed down to make at least a partial diagnosis. An above normal consumption of oil, for example, could be caused by several mechanical faults. But when accompanied by a blue-gray smoke from the exhaust, and when low compression is present, it indicates the rings need replacing. Low compression by itself, however, indicates improperly seated valves, not worn rings.

Certain "knocking" noises may be caused by loose bearings, others by piston slap, a condition where piston or cylinder or both out of tolerance, allowing the piston to slap from front to rear of the cylinder as it moves up and down.

Most frequently, valves, rings, pins, bushings, and bearings need attention at about the same time. If the symptoms can be narrowed down through the process of elimination to indicate that any one of the above components is worn, it is best to give attention to all of the cylinder head and cylinder parts.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TOP END SERVICE 3.12

ENGINE IN CHASSIS

Table 3-36. Engine In Chassis

SERVICE PROCEDURE		COMPONENT REPAIR PROCEDURE
Remove parts to gain access to all components above cylinder deck. See 3.14 STRIPPING MOTORCYCLE FOR SERVICE.		
Disassemble top end. See 3.18 TOP END OVERHAUL: DISASSEMBLY.		
	BREATHER ASSEMBLY	Inspect and repair. See 3.19 BREATHER ASSEMBLY*.
	ROCKER ARM SUPPORT	Inspect and repair. See 3.20 ROCKER ARM SUPPORT PLATE*.
	PUSH RODS, LIFTERS AND COVERS	Inspect and repair. See 3.21 PUSH RODS, LIFTERS AND COVERS*.
	CYLINDER HEAD	Inspect and repair. See 3.22 CYLINDER HEAD*.
	CYLINDER	Inspect and repair. See 3.23 CYLINDER*.
	PISTON	Inspect and repair. See 3.24 PISTON*.
Assemble top end. See 3.25 TOP END OVERHAUL: ASSEMBLY.		
Assemble motorcycle. See 3.15 ASSEMBLING MOTORCYCLE AFTER SERVICE.		
Note: * If no other work is to be done, you may advance to 3.25 TOP END OVERHAUL: ASSEMBLY when this step is completed during top end service.		

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

ENGINE REMOVED FROM CHASSIS

Table 3-37. Engine Removed From Chassis

SERVICE PROCEDURE		COMPONENT REPAIR PROCEDURE
Remove engine from motorcycle. See 3.16 REMOVING ENGINE FROM CHASSIS.		
Disassemble top end. See 3.18 TOP END OVERHAUL: DISASSEMBLY.		
	BREATHER ASSEMBLY	Inspect and repair. See 3.19 BREATHER ASSEMBLY*.
	ROCKER ARM SUPPORT	Inspect and repair. See 3.20 ROCKER ARM SUPPORT PLATE*.
	PUSH RODS, LIFTERS AND COVERS	Inspect and repair. See 3.21 PUSH RODS, LIFTERS AND COVERS*.
	CYLINDER HEAD	Inspect and repair. See 3.22 CYLINDER HEAD*.
	CYLINDER	Inspect and repair. See 3.23 CYLINDER*.
	PISTON	Inspect and repair. See 3.24 PISTON.
Assemble top end. See 3.25 TOP END OVERHAUL: ASSEMBLY.		
Install engine in motorcycle. See 3.17 INSTALLING ENGINE IN CHASSIS.		
Note: * If no other work is to be done, you may advance to 3.25 TOP END OVERHAUL: ASSEMBLY when this step is completed during top end service.		

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

CAM COMPARTMENT SERVICE 3.13

ENGINE IN CHASSIS

Table 3-38. Engine In Chassis: Cam Compartment Service

SERVICE PROCEDURE		COMPONENT REPAIR PROCEDURES
Remove parts to gain access to all components above cylinder deck. See 3.14 STRIPPING MOTORCYCLE FOR SERVICE.		
Dissassemble top end. See 3.18 TOP END OVERHAUL: DISASSEMBLY.		
	BREATHER ASSEMBLY.	Inspect and repair. See 3.19 BREATHER ASSEMBLY.
	ROCKER ARM SUPPORT PLATE.	Inspect and repair. See 3.20 ROCKER ARM SUPPORT PLATE.
	PUSH RODS, LIFTERS AND COVERS.	Inspect and repair. See 3.21 PUSH RODS, LIFTERS AND COVERS.
Disassemble bottom end. See 3.26 CAM COMPARTMENT AND COMPONENTS.		
	COVER AND CAM SUPPORT PLATE	Inspect and repair. See 3.26 CAM COMPARTMENT AND COMPONENTS*.
	OIL PUMP	Inspect and repair. See 3.27 OIL PUMP.
Assemble bottom end. See 3.26 CAM COMPARTMENT AND COMPONENTS.		
Assemble motorcycle. See 3.15 ASSEMBLING MOTORCYCLE AFTER SERVICE.		
Note: * If no other work is to be done, you may advance to 3.30 CRANKCASE ASSEMBLY when this step is completed during bottom end service.		

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

ENGINE REMOVED FROM CHASSIS

Table 3-39. Engine Removed: Flywheel Compartment Service or Complete Engine Overhaul

SERVICE PROCEDURE		COMPONENT REPAIR PROCEDURES
Remove engine from motorcycle. See 3.16 REMOVING ENGINE FROM CHASSIS		
Disassemble top end. See 3.18 TOP END OVERHAUL: DISASSEMBLY		
	BREATHER ASSEMBLY	Inspect and repair. See 3.19 BREATHER ASSEMBLY
	ROCKER ARM SUPPORT PLATE	Inspect and repair. See 3.20 ROCKER ARM SUPPORT PLATE
	PUSH RODS, LIFTERS AND COVERS	Inspect and repair. See 3.21 PUSH RODS, LIFTERS AND COVERS
	CYLINDER HEAD	Inspect and repair. See 3.22 CYLINDER HEAD
	CYLINDER	Inspect and repair. See 3.23 CYLINDER
	PISTON	Inspect and repair. See 3.24 PISTON
Disassemble bottom end.		
	COVER AND CAM SUPPORT PLATE	Inspect and repair. See 3.26 CAM COMPARTMENT AND COMPONENTS
	CRANKCASE	Inspect crankcase and repair. See 3.28 CRANKCASE DISASSEMBLY AND REPAIR
		Inspect and repair flywheel/connecting rod assembly. See 3.29 FLYWHEEL AND CONNECTING RODS
Assemble bottom end. See 3.30 CRANKCASE ASSEMBLY and 3.26 CAM COMPARTMENT AND COMPONENTS		
Assemble top end. See 3.25 TOP END OVERHAUL: ASSEMBLY		
Install engine in motorcycle. See 3.17 INSTALLING ENGINE IN CHASSIS.		

DIGITAL TECHNICIAN HARLEY-DAVIDSON

STRIPPING MOTORCYCLE FOR SERVICE 3.14

PROCEDURE

Cam Compartment Service Only

1. Remove exhaust system. See 4.19 EXHAUST SYSTEM.
2. Remove fuel tank. See 4.5 FUEL TANK.
3. Remove air cleaner and backplate. See 4.4 AIR CLEANER ASSEMBLY.
4. Remove spark plug cables. Remove spark plugs. See 1.17 SPARK PLUGS.
5. Remove purge solenoid hose, if equipped, from induction module. See 4.22 EVAPORATIVE EMISSIONS CONTROL SYSTEM.

Top End Service

1. Complete all steps under Cam Compartment Service Only.
2. Remove induction module. See 4.13 INDUCTION MODULE.
3. Gather disconnected branches of main harness and tape to top of wire trough to keep out of the way.
4. Remove two hex head bolts (with flat washers) to release top engine mounting bracket from front cylinder head. Remove hex head bolt to release stabilizer link from frame weldment.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

ASSEMBLING MOTORCYCLE AFTER SERVICE 3.15

PROCEDURE

After Top End Service

1. Start two hex head bolts (with flat washers) to fasten top engine stabilizer bracket to front cylinder head. Tighten bolts to 30-35 ft-lbs (41-48 Nm).

NOTE

Check each end of the stabilizer link for excessive wear prior to installation. The spherical ball end may rotate freely, but should not have any lateral movement. Replace the link if lateral movement exists.

2. Secure stabilizer link to frame weldment. Tighten bolt to 18-22 ft-lbs (24.4-29.8 Nm).
3. Start bolt (with flat washer) to fasten horn bracket to front cylinder head.
4. Remove tape to release disconnected branches of main harness from top of wire trough.
5. Install induction module. See 4.13 INDUCTION MODULE.
6. Continue with steps under After Cam Compartment Service.

After Cam Compartment Service

1. Install purge solenoid hose, if equipped, to induction module. See 4.22 EVAPORATIVE EMISSIONS CONTROL SYSTEM.
2. Install spark plugs and connect spark plug cables.
3. Install backplate and air cleaner. See 4.4 AIR CLEANER ASSEMBLY.
4. Install fuel tank. See 4.5 FUEL TANK.
5. Install exhaust system. See 4.19 EXHAUST SYSTEM.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

REMOVING ENGINE FROM CHASSIS 3.16

PROCEDURE

PART NUMBER	TOOL NAME
HD-42310	BENCH STAND
HD-42310-2	TWIN CAM 88 CRADLE
HD-43646A	ROLLING STAND

1. Remove exhaust system. See 4.19 EXHAUST SYSTEM.
2. Remove fuel tank. See 4.5 FUEL TANK.
3. Remove air cleaner and backplate. See 4.4 AIR CLEANER ASSEMBLY.
4. Remove spark plug cables. Remove spark plugs. See 1.17 SPARK PLUGS.
5. Remove induction module. See 4.13 INDUCTION MODULE.
6. Gather disconnected branches of main harness and tape to top of wire trough.
7. Remove voltage regulator. See 7.3 VOLTAGE REGULATOR.
8. Remove CKP sensor. See 7.20 CRANKSHAFT POSITION SENSOR (CKP).
9. Remove oil filter. See 1.6 ENGINE OIL AND FILTER.
10. Remove oil pressure switch/sender. See 7.25 OIL PRESSURE SWITCH AND SENDER.
11. Coil main harness and allow to hang below lower frame tube at front of motorcycle.
12. Remove primary chaincase. See 5.5 PRIMARY CHAINCASE HOUSING.
13. Remove rotor and stator. See 7.22 ALTERNATOR.
14. Wrap rear master cylinder reservoir with foam padding or bubble pack.
15. Cover lower frame tubes (both left and right side) with foam padding or bubble pack to prevent paint damage to left frame tube, brake line and main harness. A split loom conduit or a half shell of PVC tubing will also produce good results.
16. Cover rocker covers with foam padding or bubble pack.
17. Place a jack under the oil pan and use a block of wood between the jack and oil pan to distribute pressure across the length of the casting. Raise the jack until firm contact is made with the bottom of the oil pan.
18. Remove top engine mounting bracket from front cylinder head. Remove stabilizer link from frame weldment.
19. Remove four bolts (with flat washers) in a crosswise pattern to free transmission from crankcase.
20. Remove front engine mount. See 2.51 FRONT ENGINE MOUNT.
21. Move engine forward far enough to clear two ring dowels at bottom of transmission flange. Raise engine and remove from right side of motorcycle. Exercise caution to avoid contact with rear brake line, rear brake master cylinder reservoir, and main harness.
22. See Figure 3-15. Using the TWIN CAM 88 CRADLE (Part No. HD-42310-2), install engine in BENCH STAND (Part No. HD-42310) or ROLLING STAND (Part No. HD-43646A).
23. Thoroughly wipe all engine oil from pockets in crankcase flange. Remove gasket and two index pins from transmission flange. Discard gasket.
24. Remove and clean the oil pan under any of the following conditions. See 3.31 OIL PAN.
    a. Metal debris is found in the engine or crankcase.
    b. Oil contamination is suspected.
    c. A complete engine overhaul is being performed as a result of a major engine failure.
    d. The engine is being replaced with a **new** one.

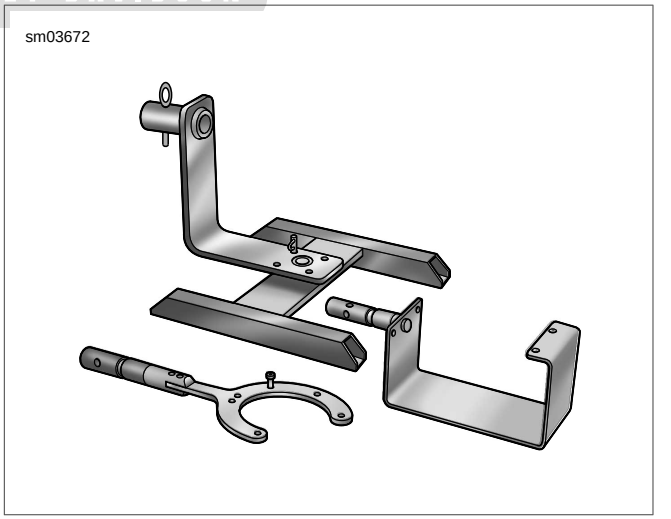


Figure 3-15. Engine/Transmission Bench Stand (HD-42310)

INSTALLING ENGINE IN CHASSIS 3.17

PROCEDURE

PART NUMBER	TOOL NAME
SNAP-ON FC018	OPEN END CROWFOOT

1. Install oil pan, if removed. See 3.31 OIL PAN.
2. Cover rocker covers of front and rear cylinders with foam padding or bubble pack.
3. Cover lower frame tubes (both left and right side) with foam padding or bubble pack to prevent paint damage to left frame tube, brake line and main harness. A split loom conduit or a half shell of PVC tubing will also produce good results.
4. Wrap rear master cylinder reservoir with foam padding or bubble pack.
5. Install engine in chassis from right side of motorcycle setting front of crankcase onto front engine mount crossmember. Engine must be forward far enough to clear two ring dowels in lower flange of transmission. Exercise caution to avoid contact with rear brake master cylinder reservoir, brake line and main harness at top of lower right frame tube.
6. Install **new** gasket and engage two index pins in holes at center of transmission flange. Mate engine to transmission and fully engage two ring dowels at bottom of transmission flange.
7. Install front engine mount assembly. Install but do not fasten crankcase to front engine mount bracket at this time. See 2.51 FRONT ENGINE MOUNT.
8. Secure the engine as follows:
   a. Hand tighten four bolts (with flat washers) to secure transmission to crankcase. Install the shorter 1/2 inch bolts at the top, the longer 9/16 inch bolts at the bottom.
   b. Tighten the four transmission to crankcase bolts to 15 ft-lbs (20.3 Nm) in a crosswise pattern.

   NOTE

   For best results, use OPEN END CROWFOOT (Part No. Snap-On FC018) on upper left and upper right transmission to crankcase bolts.

   c. Repeating the crosswise pattern, final tighten the four transmission to crankcase bolts to 34-39 ft-lbs (46.1-52.9 Nm).
   d. Secure engine to front engine mount. See 2.51 FRONT ENGINE MOUNT.

   NOTE

   Check each end of the stabilizer link for excessive wear prior to installation. The spherical ball end may rotate freely, but should not have any lateral movement. Replace the link if lateral movement exists.

   e. Secure front stabilizer link bracket to front cylinder head. Tighten bolts to 30-35 ft-lbs (41-48 Nm).
   f. Secure stabilizer link to frame weldment. Tighten bolt to 18-22 ft-lbs (24.4-29.8 Nm).
9. Remove jack and wooden block from under oil pan.
10. Install oil filter. See 1.6 ENGINE OIL AND FILTER.
11. Install stator and rotor. See 7.22 ALTERNATOR.
12. Install primary chaincase. See 5.5 PRIMARY CHAINCASE HOUSING.
13. Uncoil main harness conduit and allow to hang below lower frame tube at front of motorcycle.
14. Install oil pressure switch/sender. See 7.25 OIL PRESSURE SWITCH AND SENDER.
15. Install CKP sensor. See 7.20 CRANKSHAFT POSITION SENSOR (CKP).
16. Install voltage regulator. See 7.3 VOLTAGE REGULATOR.
17. Release disconnected branches of main harness from top of wire trough.
18. Install induction module. See 4.13 INDUCTION MODULE.
19. Install purge solenoid hose, if equipped, to induction module. See 4.22 EVAPORATIVE EMISSIONS CONTROL SYSTEM.
20. Install spark plugs. See 1.17 SPARK PLUGS.
21. Install spark plug cables.
22. Install backplate and air cleaner. See 4.4 AIR CLEANER ASSEMBLY.
23. Install fuel tank. See 4.5 FUEL TANK.
24. Install exhaust system. See 4.19 EXHAUST SYSTEM.
25. Verify proper oil level. See 1.6 ENGINE OIL AND FILTER.
    a. If oil pan was drained, add appropriate amount and type of engine oil before checking oil level.
    b. If oil pan was **not** drained, perform **COLD CHECK** and **HOT CHECK** only.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON®

TOP END OVERHAUL: DISASSEMBLY 3.18

GENERAL

It is assumed that each step performed on one cylinder is automatically repeated on the other.

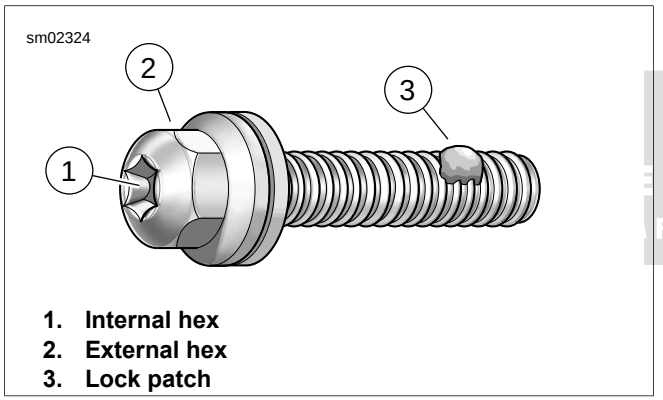
To perform a complete top end overhaul, follow all steps listed in this section including inspection and repair procedures.

ROCKER COVERS

NOTE

Dirt caked on cooling fins and other areas can fall into crankcase bore or stick to subassemblies as parts are removed. Abrasive particles can damage machined surfaces or plug oil passageways. Remove all dirt and particles before disassembly to prevent component damage.

1. Use low pressure spray to thoroughly clean exterior surfaces of engine prior to disassembly.
2. See Figure 3-17. Following the sequence shown, alternately loosen the six rocker cover bolts. Remove the rocker cover bolts and their captive washers.
3. Remove the rocker cover and gasket. Discard gasket.



1. **Internal hex**
2. **External hex**
3. **Lock patch**

Figure 3-16. Rocker Cover Bolt (Rocker Housing Bolt Similar)

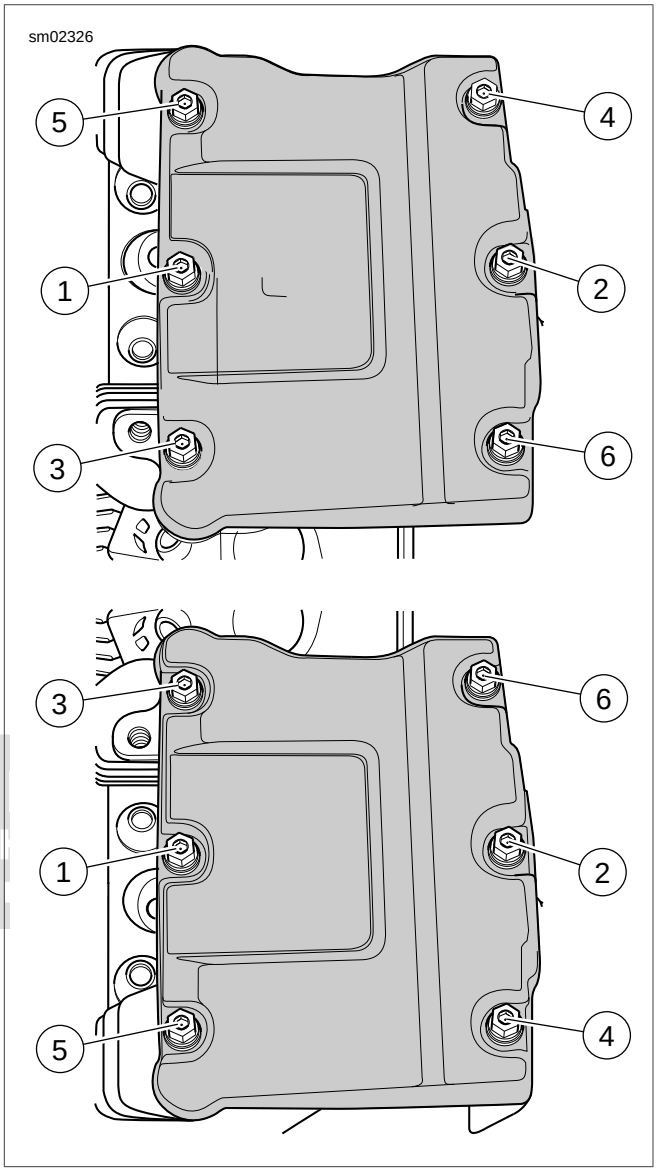
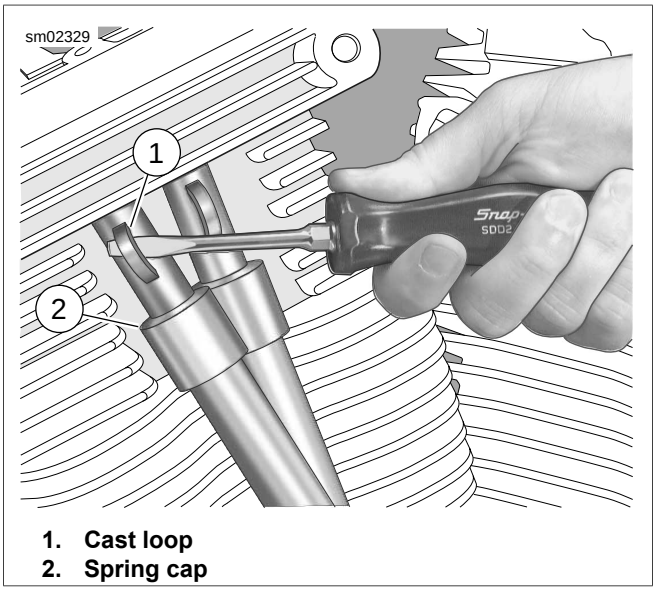


Figure 3-17. Rocker Cover Bolt Removal Sequence

ROCKER ARM SUPPORT PLATE

PART NUMBER	TOOL NAME
HD-48283	CRANKSHAFT ROTATING WRENCH

1. See Figure 3-18. Insert the blade of a small screwdriver into cast loop (1) of spring cap retainer (at top of upper push rod cover). While pushing down on spring cap (2), rotate bottom of screwdriver toward outboard side to remove. Repeat step on second push rod cover.



1. **Cast loop**
2. **Spring cap**

Figure 3-18. Removing Spring Cap Retainer

2. Collapse upper and lower push rod covers.

NOTE

Do not attempt to rotate the crankshaft by removing the cam cover and placing a socket on the crankshaft or primary cam sprocket flange bolt.

3. To remove the rocker arm support plate, both lifters of the cylinder being serviced must be on the base circle (lowest position) of the cam. To find the base circle, it is first necessary to rotate the crankshaft. Based on the level of disassembly required, three methods of engine rotation are presented below.
   a. **With primary cover installed:** Remove spark plugs. With the rear wheel raised, place the transmission in 6th gear and rotate rear wheel backward until the base circle is found.
   b. **With primary cover removed:** Remove spark plugs. Place the transmission in neutral. Fit a socket on the compensating sprocket shaft nut. Rotate nut counterclockwise until the base circle is found.
   c. See Figure 3-19. **With engine mounted in engine stand:** Install CRANKSHAFT ROTATING WRENCH (Part No. HD-48283) on sprocket shaft and rotate counterclockwise until the base circle is found.

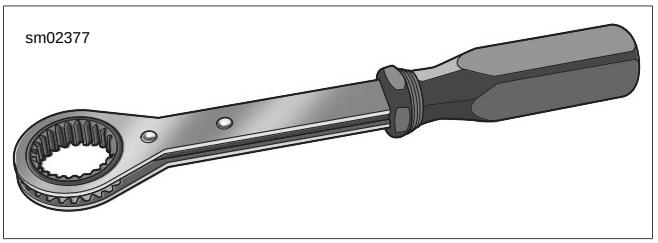


Figure 3-19. Crankshaft Rotating Wrench

4. Using one of the methods prior, rotate engine until piston is at top dead center (TDC) of compression stroke.
   a. To accomplish this, first raise lower push rod cover to access intake lifter (inside hole of lifter cover).
   b. Place index finger on top of the intake lifter. While rotating engine, feel lifter rise (valve open) and fall (valve closed).
   c. Now place finger tightly over spark plug hole and rotate engine again. In the compression stroke, air will be forced out against your finger until the piston reaches the TDC position. Stop engine rotation when the flow of air through the spark plug hole stops.
   d. Direct the beam of a small flashlight into spark plug hole to verify piston is at TDC. Both intake and exhaust valves are now closed and the push rods are in the unloaded (loose) position.
5. See Figure 3-20. Remove two bolts to release breather assembly (arrow) and filter element from the rocker arm support plate. For inspection and repair information, see 3.19 BREATHER ASSEMBLY.
6. Alternately loosen each of the four rocker arm support plate bolts 1/4 turn in the pattern shown the figure. Continue turning the bolts in these increments until loose. Remove the rocker arm support plate bolts with flat washers.
7. Remove the rocker arm support plate assembly from the rocker housing. For inspection and repair information, see 3.20 ROCKER ARM SUPPLY PLATE.

NOTE

Always service each cylinder separately. After the first cylinder is serviced the engine must be rotated to find the base circle on the second cam. Service on the remaining cylinder can then proceed.

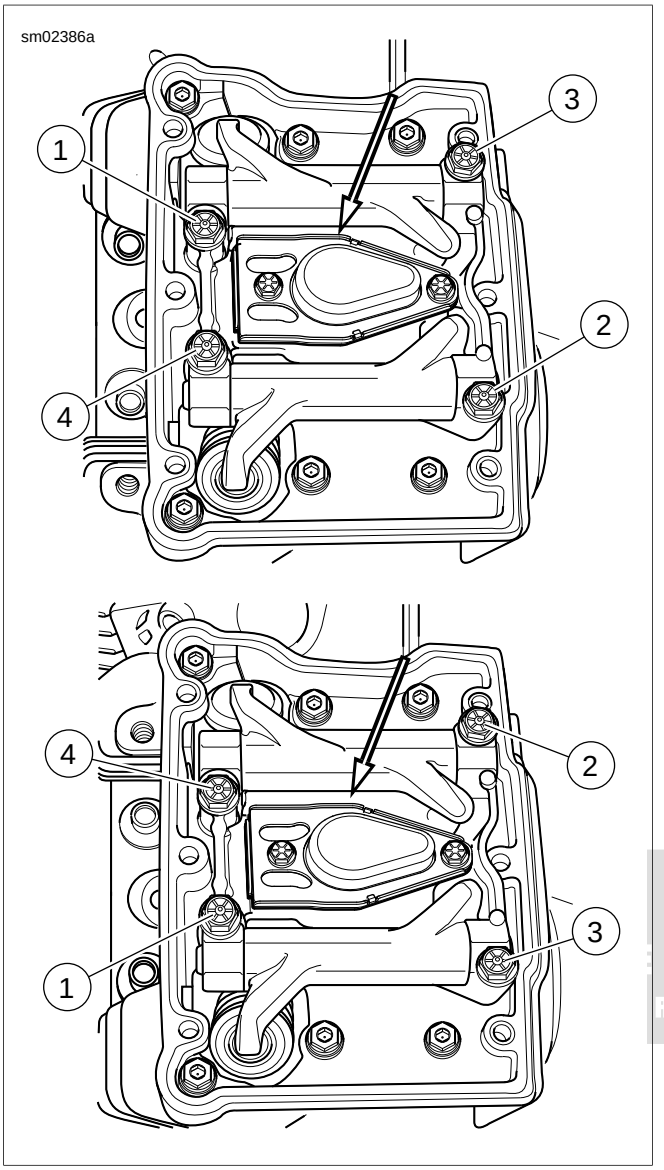
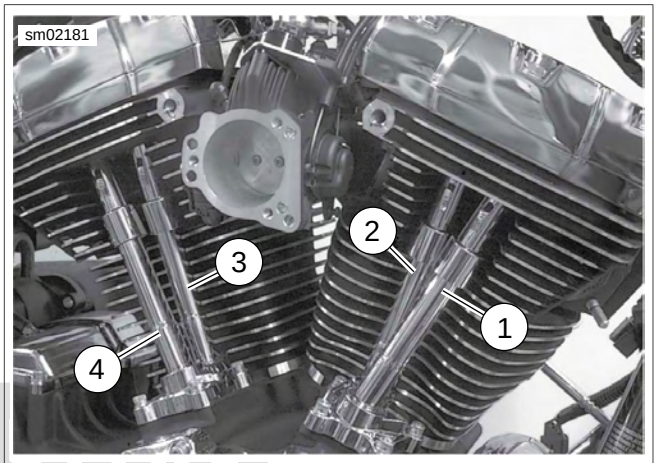


Figure 3-20. Rocker Arm Bolt Sequence (late production shown)

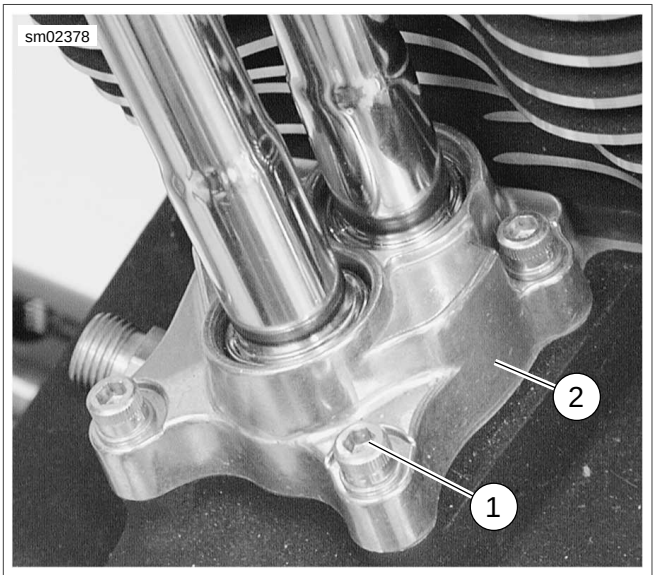
PUSH RODS, LIFTERS AND COVERS

1. See Figure 3-21. Remove the intake and exhaust push rods and push rod covers.
   a. Tag the push rods for location (front/rear cylinder), and orientation (top/bottom) as they are removed. This will simplify installation.
   b. Remove push rod covers from cylinder head and lifter cover bores.
   c. Remove three O-rings from push rod covers and discard. If O-ring is missing from upper push rod cover, be sure to dislodge it from the cylinder head bore.
2. See Figure 3-22. Remove lifter covers.
   a. Using a crosswise pattern, remove four screws with captive washers (1) to release the lifter cover (2).
   b. Remove the lifter cover and gasket. Discard gasket.
3. Remove lifters.
   a. Remove the anti-rotational pin to free the hydraulic lifters.
   b. Tag the lifters for location (front/rear cylinder) and function (intake/exhaust) as they are removed. This will simplify installation.
   c. Place the lifters in clean plastic bags to keep out dust, dirt and debris.
4. See Figure 3-23. Remove and discard O-ring from groove around breather baffle hole in rocker housing.
5. For inspection and repair information, see 3.21 PUSH RODS, LIFTERS AND COVERS.



1. **Front cylinder exhaust push rod**
2. **Front cylinder intake push rod**
3. **Rear cylinder intake push rod**
4. **Rear cylinder exhaust push rod**

Figure 3-21. Push Rod Locations



1. **Screw with captive washer (4)**
2. **Lifter cover**

Figure 3-22. Lifter Cover

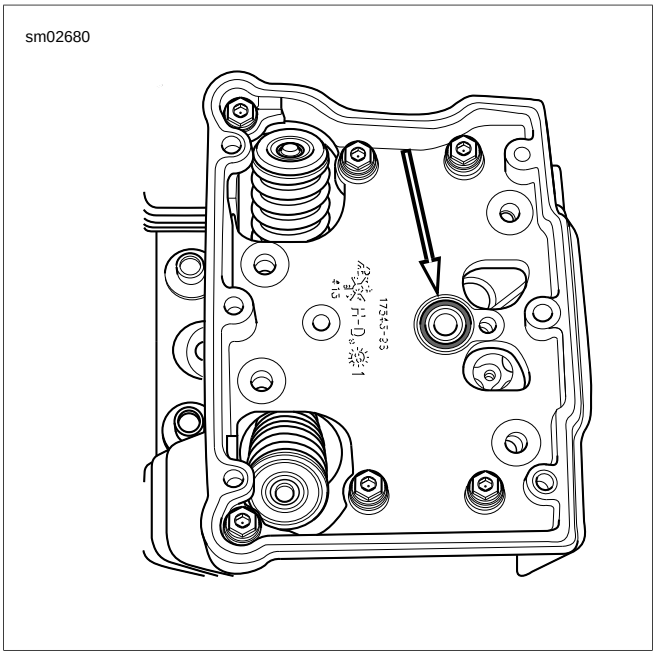


Figure 3-23. Breather Baffle Hole O-Ring

CYLINDER HEAD

PART NUMBER	TOOL NAME
HD-42324-A	CYLINDER TORQUE PLATES

1. See Figure 3-24. Following the sequence shown, alternately loosen the six rocker housing bolts. Remove rocker housing bolts and their captive washers.
2. Remove rocker housing and gasket. Discard gasket.

NOTE

To prevent distortion of the cylinder head, cylinder and cylinder studs, gradually loosen the cylinder head bolts in the specified sequence.

3. See Figure 3-25. Remove cylinder head bolts.
   a. Following the sequence shown, alternately loosen each of the four cylinder head bolts just 1/4 turn.
   b. Continue turning the bolts in these increments until loose.
   c. Remove the cylinder head bolts.
4. Remove cylinder head and head gasket.

NOTE

Save the cylinder head gasket (if salvageable) for use with the CYLINDER TORQUE PLATES (Part No. HD-42324-A) when measuring, boring or honing of the cylinder is required.

5. For inspection and repair information, see 3.22 CYLINDER HEAD.

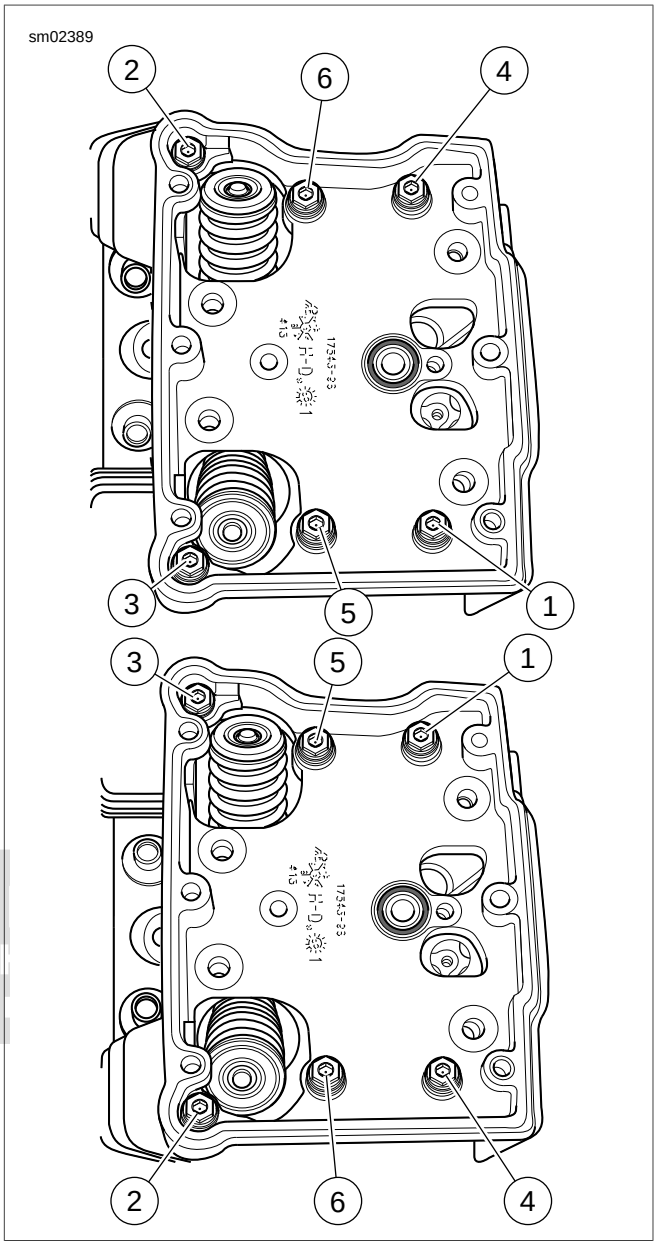


Figure 3-24. Rocker Housing Bolts Removal Sequence

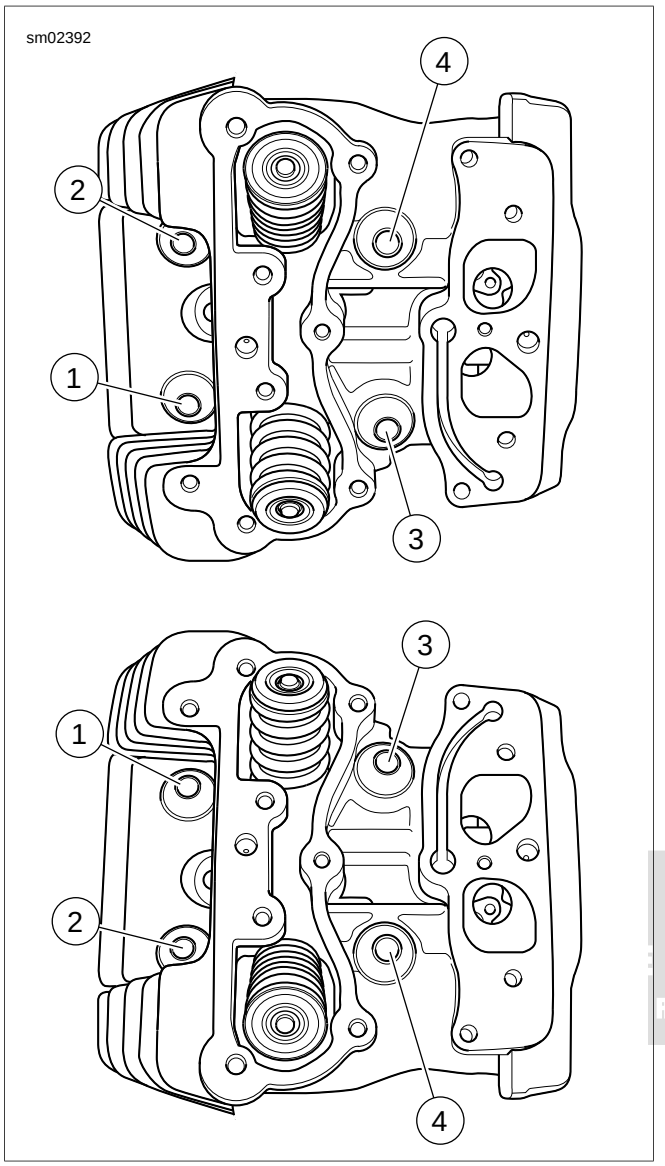


Figure 3-25. 1/4 Turn Head Bolts in Sequence

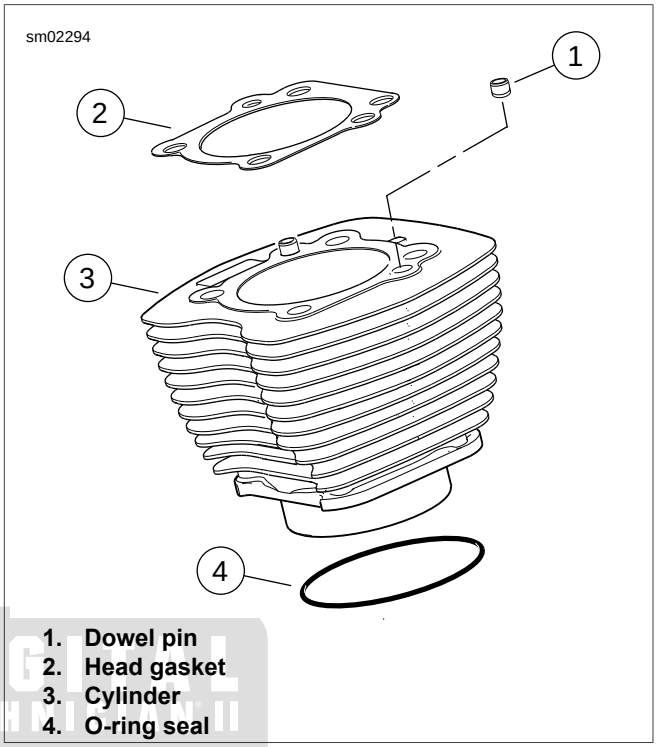
CYLINDER

1. Raise the cylinder just enough to place clean shop towels under the piston. This will prevent any dirt or debris, such as broken ring pieces, from falling into the crankcase bore.

NOTE

Exercise caution to avoid bending the cylinder studs. Even a slight bend or nick can cause a stress riser leading to stud failure.

2. Carefully remove the cylinder. Exercise caution to avoid bending the cylinder studs. As the piston becomes free of the cylinder, hold it upright to prevent it from striking the studs or dragging across the stud thread area.
3. Mark cylinder FRONT or REAR as appropriate.
4. Slide approximately 6.0 in. (152 mm) of plastic tubing, rubber hose or conduit over each cylinder stud. Use material with I.D. of 0.5 in. (12.7 mm) to protect cylinder studs and piston from damage.
5. See Figure 3-26. Remove O-ring seal (4) from the bottom of the cylinder liner. Discard O-ring seal.
6. See Figure 3-27. Remove O-ring from dowel pin (4) on base of cylinder deck. Discard O-ring.
7. For inspection and repair information, see 3.23 CYLINDER.



1. **Dowel pin**
2. **Head gasket**
3. **Cylinder**
4. **O-ring seal**

Figure 3-26. Cylinder Assembly

PISTON

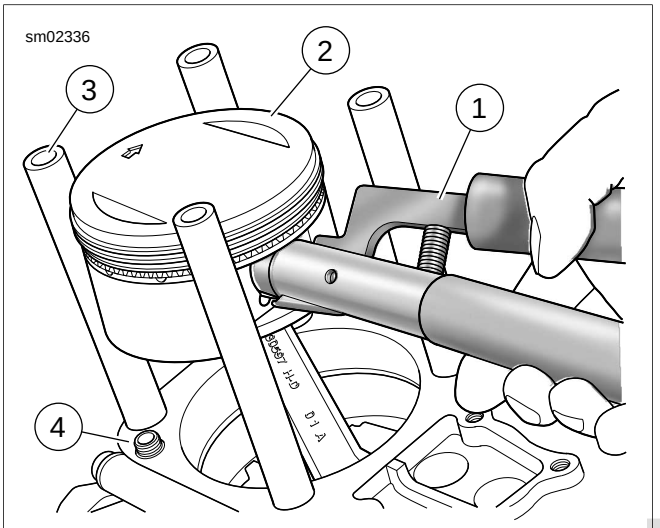
PART NUMBER	TOOL NAME
HD-42317-A	PISTON PIN CIRCLIP REMOVER/INSTALLER
HD-42320-B	PISTON PIN REMOVER

1. Verify that clean shop towels are properly positioned over the crankcase bore to prevent the piston pin circlip from falling into the crankcase.

⚠WARNING

Wear safety glasses or goggles when removing or installing piston pin retaining rings. Piston pin retaining rings are compressed in the ring groove and can fly out when removed from the groove, which could result in serious eye injury. (00293a)

2. See Figure 3-27. Remove the piston pin circlip.
   a. Insert the PISTON PIN CIRCLIP REMOVER/INSTALLER (Part No. HD-42317-A) (1) into the piston pin bore. Position claw on tool in slot of piston (2) (directly under circlip).
   b. Hold a shop towel over the piston pin bore in case a circlip should fly out during removal. Squeeze the handles of the tool together and pull from bore. Remove circlip from claw and discard.



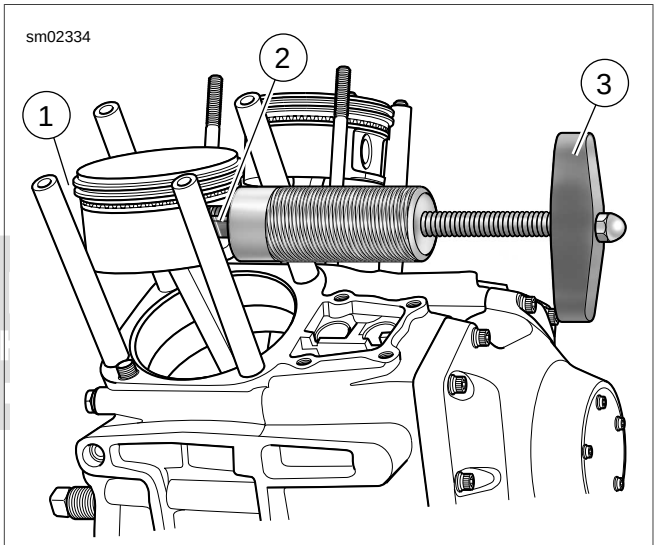
1. **Piston pin circlip remover/installer**
2. **Piston**
3. **Protective material over cylinder studs**
4. **Cylinder deck dowel (O-ring not shown)**

Figure 3-27. Piston Pin Circlip Removal (Part No. HD-42317)

NOTE

It is not necessary to remove both piston pin circlips during piston removal. Leave the second circlip in the pin bore.

3. See Figure 3-28. Remove the piston pin. If piston pin is difficult to remove, use PISTON PIN REMOVER (Part No. HD-42320-B).
   a. Remove acorn nut and spacer from rod end of tool.
   b. Slide rod end through piston pin. Install spacer and acorn nut (1) on end of rod.
   c. Position rubber-coated tips (2) of tool on flat each side of pin bore.
   d. Turn handle (3) in a clockwise direction until piston pin is pulled free of bore.
4. Remove the piston. Be sure to hold the connecting rod shank upright to prevent it from striking the crankcase. Place a 3.0 in. (76.2 mm) long piece of foam-type water pipe insulation around each connecting rod. Use material with an O.D. of 2.25 in. (57.1 mm) and an I.D. of 1.0 in. (25.4 mm) to prevent damage.
5. Turn the piston over. Mark the pin boss with the letters F(ront) or R(ear) to identify location.
6. Service as needed. For inspection and repair information, see 3.24 PISTON.
7. Complete engine work.
   a. If performing a top end overhaul only, see 3.25 TOP END OVERHAUL: ASSEMBLY.
   b. If performing a complete engine overhaul, see 3.26 CAM COMPARTMENT AND COMPONENTS and 3.28 CRANKCASE DISASSEMBLY AND REPAIR.



1. **Spacer and acorn nut**
2. **Rubber coated tip**
3. **Handle**

Figure 3-28. Piston Pin Remover (Part No. HD-42320-B)

BREATHER ASSEMBLY 3.19

DISASSEMBLY

Early Production

1. Remove rocker cover. See 3.18 TOP END OVERHAUL: DISASSEMBLY, Rocker Covers.
2. See Figure 3-29. Remove two fasteners (1) from the breather assembly cover (2) and remove breather assembly from rocker arm support plate (8).
3. Remove the breather cover and cover gasket (3). Discard gasket. Remove breather baffle (5) and breather baffle gasket (7). Discard gasket. Pull filter element (6) from bore on underside of breather baffle. Pull umbrella valve (4) from hole at top of breather baffle. Discard both filter element and umbrella valve.

Late Production

NOTE

See Figure 3-30. Breather baffle assembly is manufactured with gaskets attached and is supplied with the filter element (5) and umbrella valve (3). Any time the breather is disassembled, the baffle assembly must be replaced with a ***new*** *assembly.*

1. Remove rocker cover. See 3.18 TOP END OVERHAUL: DISASSEMBLY, Rocker Covers.
2. Remove two fasteners (1) and remove breather cover (2) from rocker arm support plate (6).
3. Remove breather baffle (4). Discard breather baffle, filter element (5) and umbrella valve (3).

CLEANING AND INSPECTION

⚠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 cover and screws in a non-volatile cleaning solution or solvent. Dry parts with low pressure compressed air.
2. Set a straightedge diagonally across the length of the breather cover intersecting the opposite corners of the gasket surface. Slide a feeler gauge beneath the straightedge to check the breather cover flatness. Repeat the step checking the opposite diagonal. Discard the breather cover if any low spot exceeds 0.005 in. (0.13 mm).
3. **Early Production:** Check the breather baffle gasket surface flatness. Discard the breather baffle if any low spot exceeds 0.005 in. (0.13 mm).

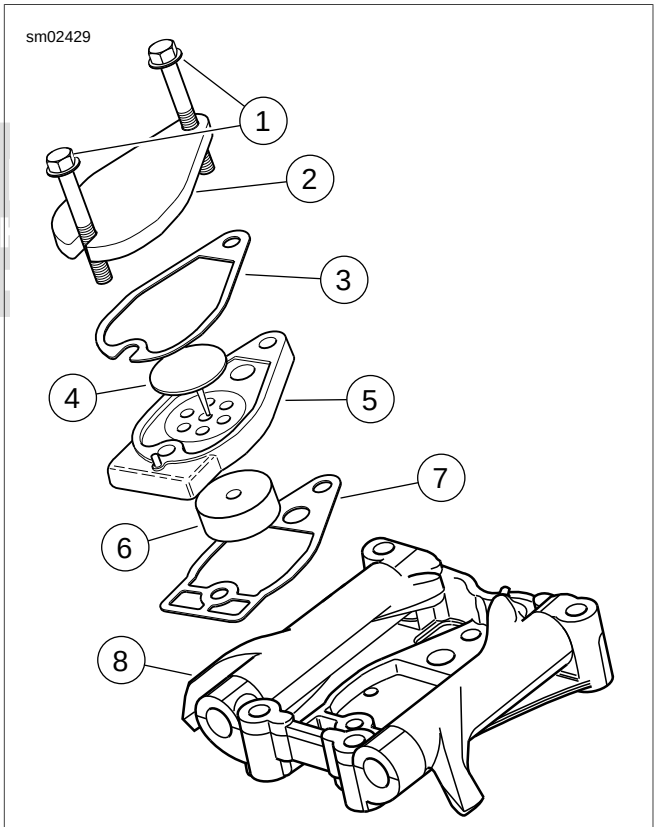
ASSEMBLY

Early Production

1. See Figure 3-29. Insert stem of **new** umbrella valve (4) through center hole at top of breather baffle (5). Carefully pull rubber bead on stem through hole in baffle. Use denatured alcohol or glass cleaner to lubricate stem if necessary. Verify that rubber bead is pulled completely through hole.
2. Press **new** filter element (6) into bore at bottom of baffle. Hole in filter element accommodates umbrella valve stem.
3. Place breather baffle gasket (7) on a clean flat surface. Stack breather baffle (5), cover gasket (3) and breather cover (2) on top of breather baffle gasket. Slide two fasteners (1) through stack-up to keep assembly together until time of installation.
4. Install breather assembly and rocker cover. See 3.25 TOP END OVERHAUL: ASSEMBLY, Breather and Rocker Cover.

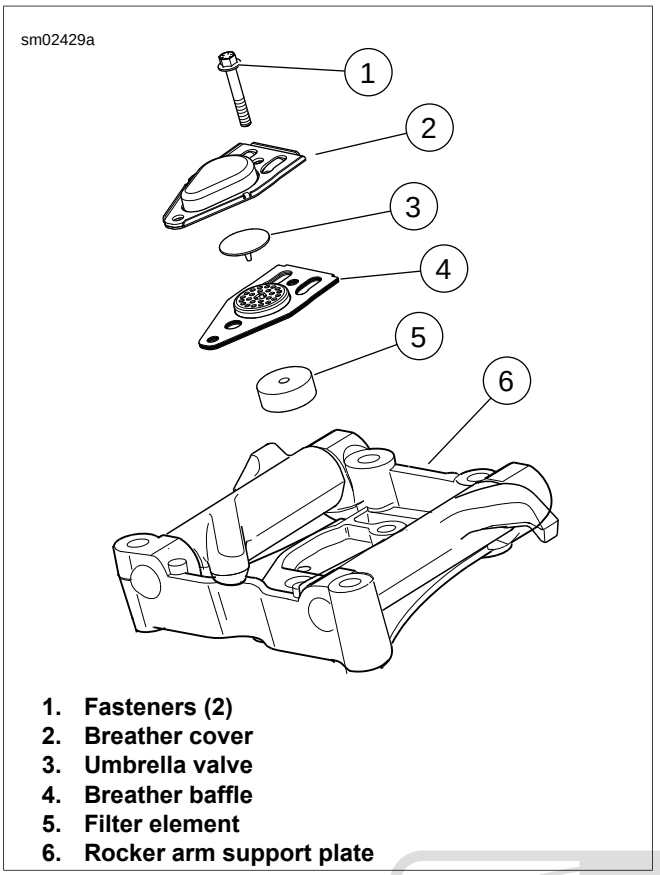
Late Production

See Figure 3-29. Install breather assembly using **new** baffle assembly and rocker cover. See 3.25 TOP END OVERHAUL: ASSEMBLY, Breather and Rocker Cover.



1. **Fasteners (2)**
2. **Breather cover**
3. **Cover gasket**
4. **Umbrella valve**
5. **Breather baffle**
6. **Filter element**
7. **Breather baffle gasket**
8. **Rocker arm support plate**

Figure 3-29. Breather Assembly, Early Production



1. **Fasteners (2)**
2. **Breather cover**
3. **Umbrella valve**
4. **Breather baffle**
5. **Filter element**
6. **Rocker arm support plate**

Figure 3-30. Breather Assembly, Late Production

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

ROCKER ARM SUPPORT PLATE 3.20

DISASSEMBLY

1. See Figure 3-31. Remove four bolts with flat washers (1) from the rocker arm support plate (5). The rocker arm shafts (4) on the push rod side (right) are notched to lock them in position.
2. Using a hammer and brass drift, tap left side of rocker arm shafts (4) so that the notched ends exit the rocker arm support plate (5) first. Mark the shafts so that they are installed in their original locations at time of assembly.
3. Remove the rocker arms from the rocker arm support plate. Mark the rocker arms to indicate location.

CLEANING AND INSPECTION

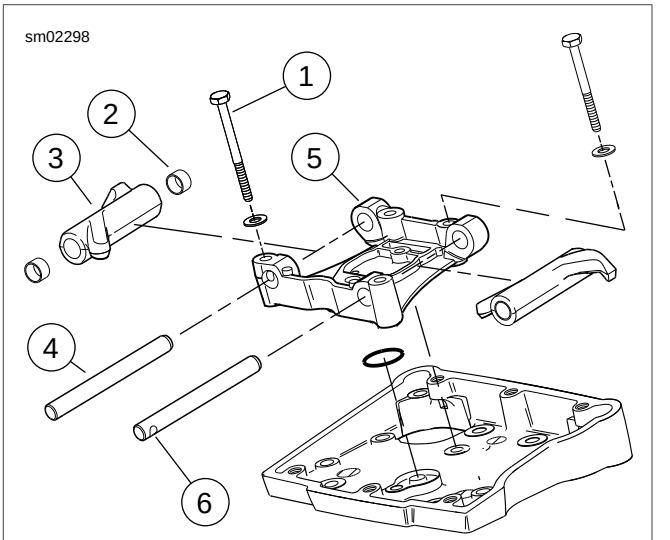
PART NUMBER	TOOL NAME
HD-94804-57	ROCKER ARM BUSHING REAMER

Inspection

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 in a non-volatile cleaning solution or solvent. Blow parts dry with low pressure compressed air.
2. See Figure 3-31. Check rocker arms (3) for uneven wear or pitting where contact is made with the valve stem tips. Check for concave wear where rocker arms contact the push rod ends. Replace rocker arm if excessive wear is found at either location.
3. Verify that oil holes in rocker arms and rocker arm support plate (5) are clean and open.
4. Inspect rocker arm shafts (4) for scratches, burrs, scoring or excessive wear. Replace as necessary.



1. **Bolt with flat washer**
2. **Rocker arm bushings**
3. **Rocker arm**
4. **Rocker arm shaft**
5. **Rocker arm support plate**
6. **Notch**

Figure 3-31. Rocker Arm Assembly

Rocker Shaft Fit

1. See Figure 3-32. Measure the inside diameter of the rocker arm support plate bore.
2. See Figure 3-33. Measure the outside diameter of the rocker arm shaft where it fits in the bore.
3. Repeat the measurement on opposite side of support plate and shaft. Replace shaft or support plate if clearance equals or exceeds 0.0035 in. (0.089 mm).

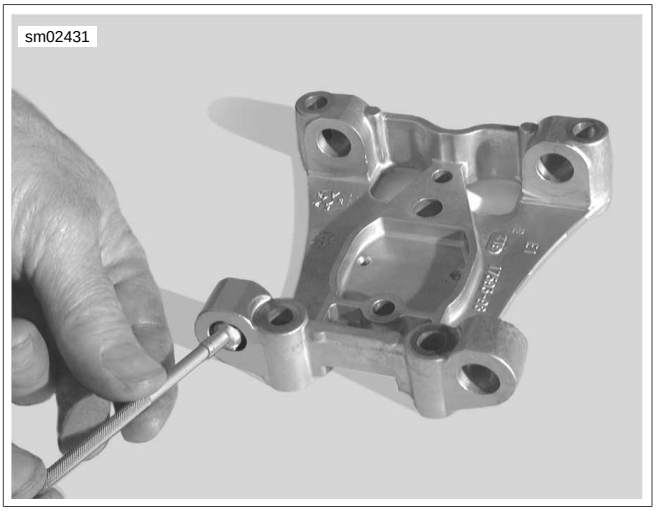


Figure 3-32. Checking Support Plate Bore



Figure 3-33. Checking Shaft to Support Plate Fit



Figure 3-35. Checking Shaft to Bushing Fit

Rocker Arm Shaft to Bushing

1. Check rocker arm shaft to bushing fit.
   a. See Figure 3-34. Measure the inside diameter of the rocker arm bushing.
   b. See Figure 3-35. Measure the outside diameter of the rocker arm shaft where it rides in the bushing.
2. Repeat measurement on opposite side of rocker arm and shaft. Replace shaft or bushings if clearance equals or exceeds service wear limit of 0.0035 in. (0.089 mm).

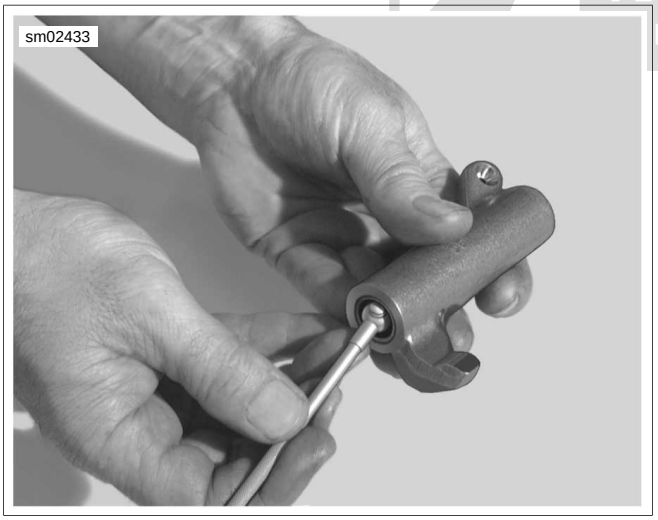


Figure 3-34. Checking Bushings

Replace Rocker Arm Bushings

NOTE

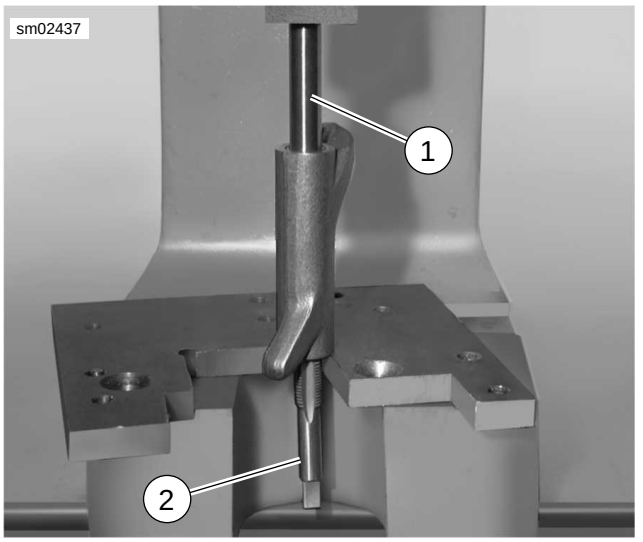
Bushing replacement and reaming must be done one at a time to achieve proper alignment. Follow all steps for one bushing and then repeat for the other bushing.

1. See Figure 3-36. Turn a 9/16"-18 tap (2) into bushing until tight. Place rocker arm under ram of arbor press with tap at bottom. Slide a discarded rocker arm shaft (1) through open end of rocker arm until contact is made with tap. Using shaft as driver (and untapped bushing as pilot), press against shaft until both tap and bushing are free.
2. See Figure 3-37. Using a suitable driver, press **new** bushing into side of rocker arm until flush with casting. Be sure to orient bushing so that split line faces top of rocker arm.

NOTE

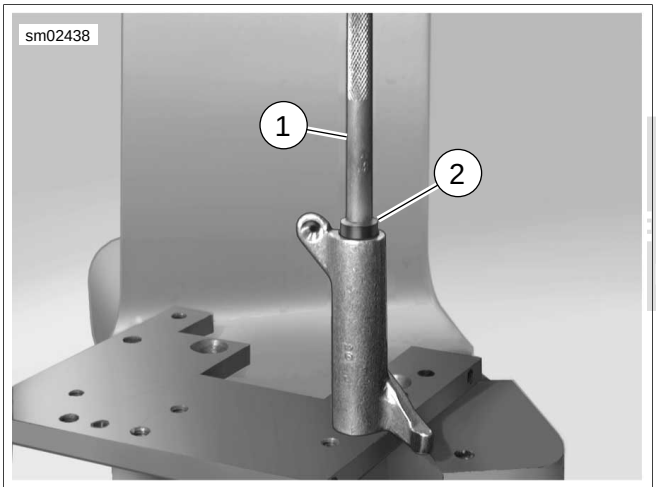
*Never back reamer out of rocker arm or **new** bushing will be damaged.*

3. See Figure 3-38. Lock rocker arm in a vise using brass jaw inserts or shop towels to prevent casting damage. Insert tapered end of ROCKER ARM BUSHING REAMER (Part No. HD-94804-57) into old bushing in rocker arm. Note that old bushing on drive side of reamer as pilot. Rotate reamer until the **new** bushing on the far side is reamed, and then continuing in the same direction, draw drive side of reamer from **new** bushing.
4. Repeat steps to remove, install and ream second bushing.



1. **Discarded shaft used as driver**
2. **Tap**

Figure 3-36. Removing Bushing



1. **Driver**
2. **Bushing**

Figure 3-37. Installing Bushing

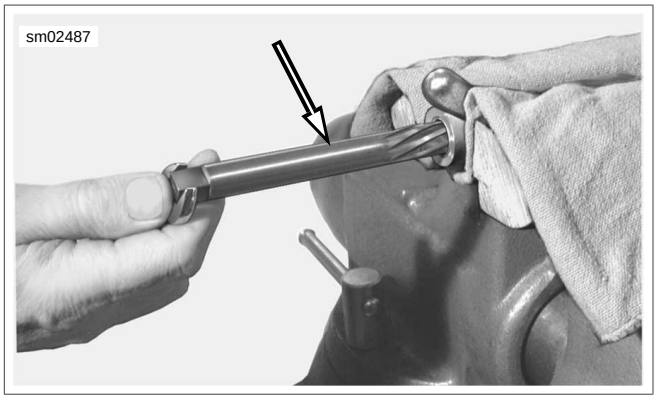


Figure 3-38. Ream Bushing

ASSEMBLY

1. Place the rocker arms into position on the rocker arm support plate.
2. Push the un-notched ends of the rocker arm shafts into the right side of the support plate and then into the rocker arms. As they approach their fully installed positions, rotate the shafts so that the notches are aligned with the bolt holes in the support plate.
3. See Figure 3-39. Check for proper end play.
   a. Insert a feeler gauge between the rocker arm and support plate.
   b. Repeat measurement on other rocker arm.
   c. Replace the rocker arm, rocker arm support plate or both if end play exceeds 0.025 in. (0.635 mm).
4. Install the four bolts with flat washers in the rocker arm support plate. Remember that the two bolts on the push rod side (right) must engage the notches in the rocker arm shafts for proper assembly.



Figure 3-39. Check End Play

PUSH RODS, LIFTERS AND COVERS 3.21

DISASSEMBLY

See Figure 3-40. With the exception of the lifter covers, all parts should have been disassembled and marked during the removal procedure. Disassemble the lifter covers as follows:

1. Separate upper (2) and lower push rod covers (8).
2. Remove O-ring (9) from seat at bottom of lower push rod cover. Discard O-ring.
3. Remove O-ring (1) from seat at top of upper push rod cover. Slide O-ring (7), flat washer (6), spring (5) and spring cap (4) from body of upper push rod cover (2). Discard O-rings.

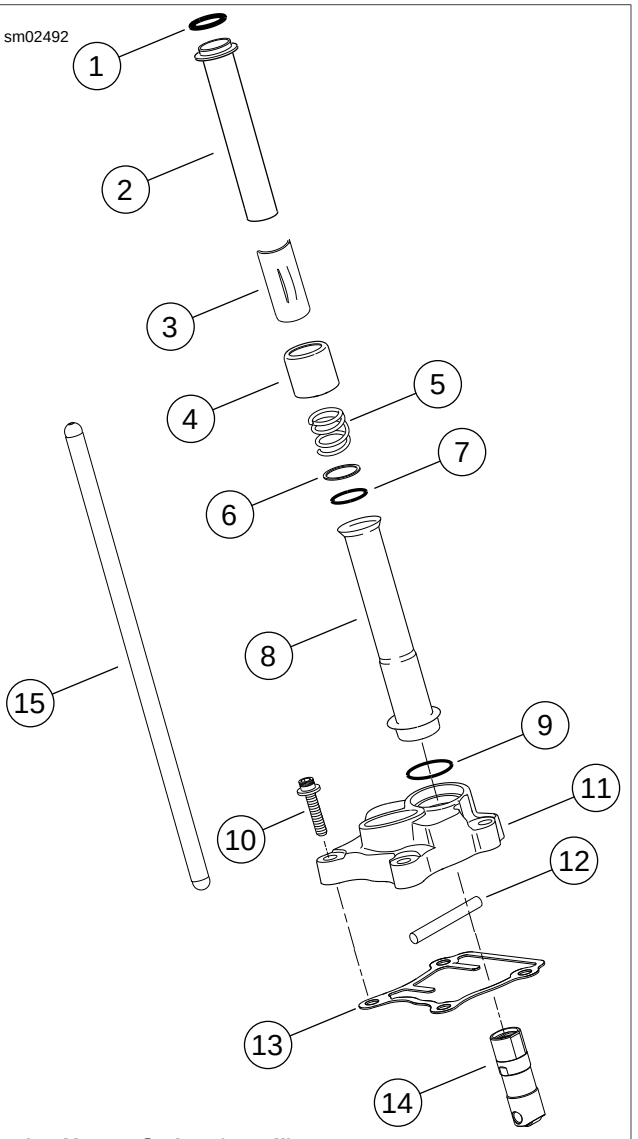
CLEANING AND INSPECTION

1. See Figure 3-40. Scrape old gasket material from the lifter cover (11) flange. Old gasket material left on mating surfaces will cause leaks.
2. With the exception of the hydraulic lifters (14), clean all parts in a non-volatile cleaning solution or solvent. Verify that the O-ring seats and contact surfaces of the push rod covers (2, 8) are completely clean.

⚠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)

3. Blow parts dry with low pressure compressed air. Verify that all oil holes are clean and open.
4. Verify that the hydraulic lifter rollers turn freely and are free of flat spots, scuff marks and pitting. If flat spots exist, examine the cam lobe on which the lifter operates.
5. Inspect the lifter socket for signs of wear. Verify that the plunger of the hydraulic lifter is fully extended up against the C-clip. Use index finger to pump plunger to verify lifter operation.
6. Examine the push rods (15). Replace any push rods that are bent, dented, damaged or discolored. Replace the rod if the ball ends show signs of excessive wear or damage.
7. Cover all parts with a clean plastic sheet to protect them from dust and dirt.



1. **Upper O-ring (small)**
2. **Upper push rod cover**
3. **Spring cap retainer**
4. **Spring cap**
5. **Spring**
6. **Flat washer**
7. **Middle O-ring (intermediate)**
8. **Lower push rod cover**
9. **Lower O-ring (large)**
10. **Lifter cover screw**
11. **Lifter cover**
12. **Anti-rotational pin**
13. **Lifter cover gasket**
14. **Hydraulic lifter**
15. **Push rod**

Figure 3-40. Push Rods, Lifters and Covers

LIFTER INSPECTION

NOTE

Inside and outside micrometers used for measuring lifters and lifter bores must be calibrated to take accurate readings.

1. Inspect lifters for excessive clearance in bores. Accurately measure the lifter outer diameter and record the measurement.
2. Accurately measure lifter bore inner diameter with a snap gauge. Subtract this measurement from the lifter measurement to determine clearance.
   a. Clearance should be within 0.0008-0.0020 in. (0.0203-0.0508 mm).
   b. Install **new** lifters and/or replace crankcases if clearance exceeds SERVICE WEAR LIMIT of 0.0030 in (0.076 mm).
3. Check lifter roller radial play.
   a. Roller radial movement should be within 0.0006-0.0010 in (0.0152-0.0254 mm).
   b. Replace lifters if radial movement exceeds SERVICE WEAR LIMIT of 0.0015 in. (0.0381 mm).
4. Check lifter roller end clearance.
   a. End clearance should be within 0.008-0.022 in. (0.203-0.559 mm).
   b. Replace lifters if end clearance exceeds SERVICE WEAR LIMIT of 0.022 in. (0.559 mm).
5. Soak lifters in clean engine oil. Keep covered until assembly.

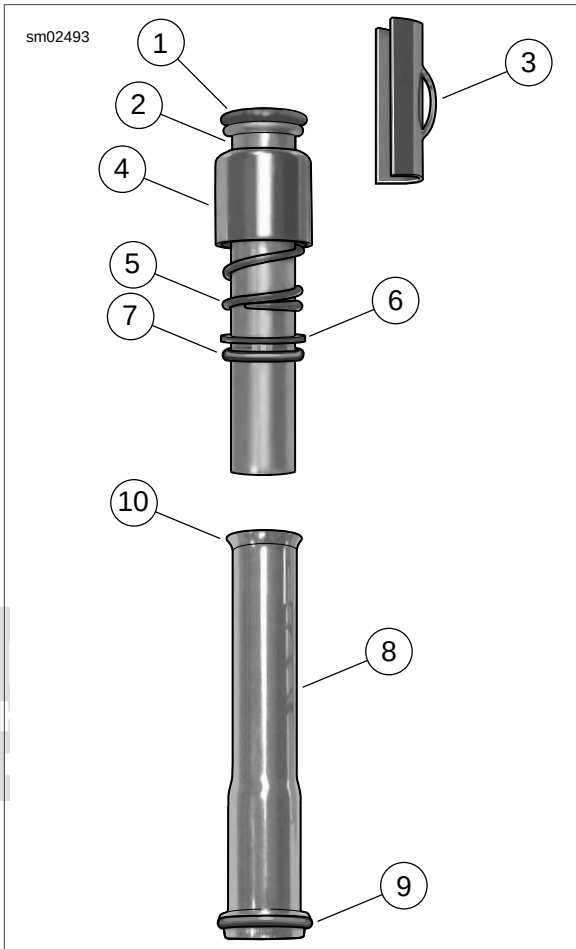
ASSEMBLY

With the exception of the push rod covers, all parts will be assembled during the installation procedure. Assemble the push rod covers as follows:

NOTE

*O-rings that are missing, distorted, pinched or otherwise damaged will result in either oil leakage or low oil pressure. Use of the wrong O-ring will have the same results. Since many O-rings are similar in size and appearance, always use **new** O-rings keeping them packaged until use to avoid confusion.*

1. See Figure 3-41. Obtain three **new** O-rings (1, 7 and 9). Apply a very thin film of clean H-D 20W50 engine oil to O-rings before installation.
2. Install **new** small O-ring (1) on seat at the top of the upper push rod cover (2).
3. Slide the spring cap (4), spring (5), flat washer (6) and **new** intermediate size O-ring (7) onto the body of the upper push rod cover. Move parts up body until spring cap (4) contacts upper O-ring seat.
4. Fit the straight end of the upper push rod cover into the flared end of the lower push rod cover (8).
5. Install **new** large O-ring (9) on seat at bottom of lower push rod cover.



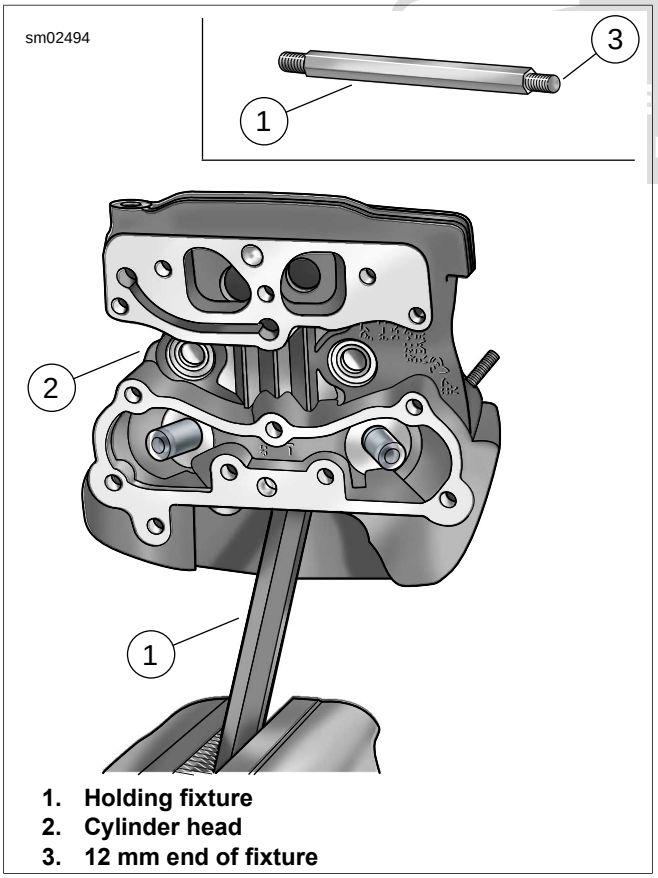
1. **Upper O-ring (small)**
2. **Upper push rod cover**
3. **Spring cap retainer**
4. **Spring cap**
5. **Spring**
6. **Flat washer**
7. **Middle O-ring (intermediate)**
8. **Lower push rod cover**
9. **Lower O-ring (large)**
10. **Flared end of lower push rod cover**

Figure 3-41. Assembled Push Rod Cover

DISASSEMBLY

PART NUMBER	TOOL NAME
HD-34736-B	VALVE SPRING COMPRESSOR
HD-39786	CYLINDER HEAD HOLDING FIXTURE

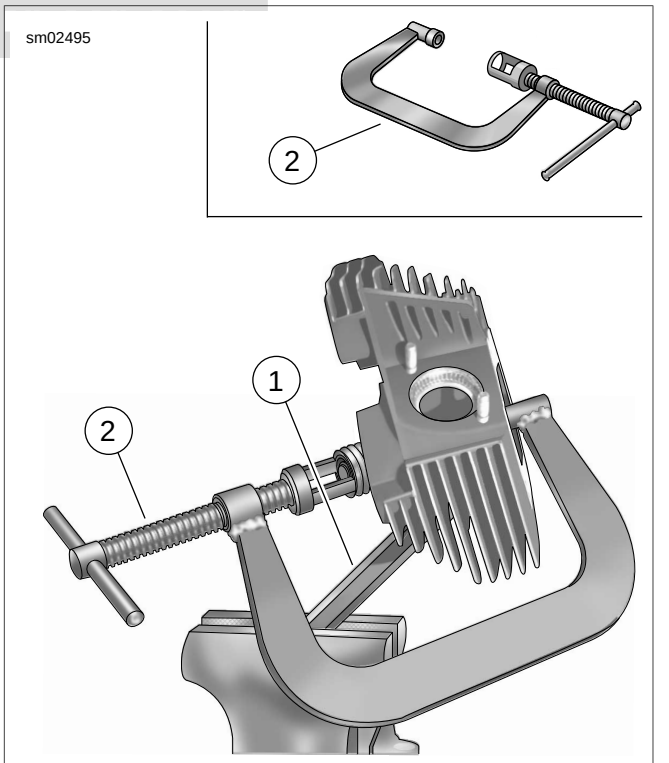
1. Before proceeding with the disassembly procedure, determine if valve reconditioning is necessary.
   a. Raise valve ports of cylinder head to strong light source. If light is visible around edges of seats, the cylinder head and valves require reconditioning.
   b. Fill ports at top of cylinder head with solvent. Wait ten full seconds and and check for leakage into combustion chamber. If solvent leakage into combustion chamber is evident, the cylinder head and valves require reconditioning.
2. See Figure 3-42. Secure cylinder head for service.
   a. Thread 12 mm end of CYLINDER HEAD HOLDING FIXTURE (Part No. HD-39786) (1) into cylinder head (2) spark plug hole.
   b. Clamp tool in vise at a 45 degree angle or one that offers a comfortable working position.



1. Holding fixture
2. Cylinder head
3. 12 mm end of fixture

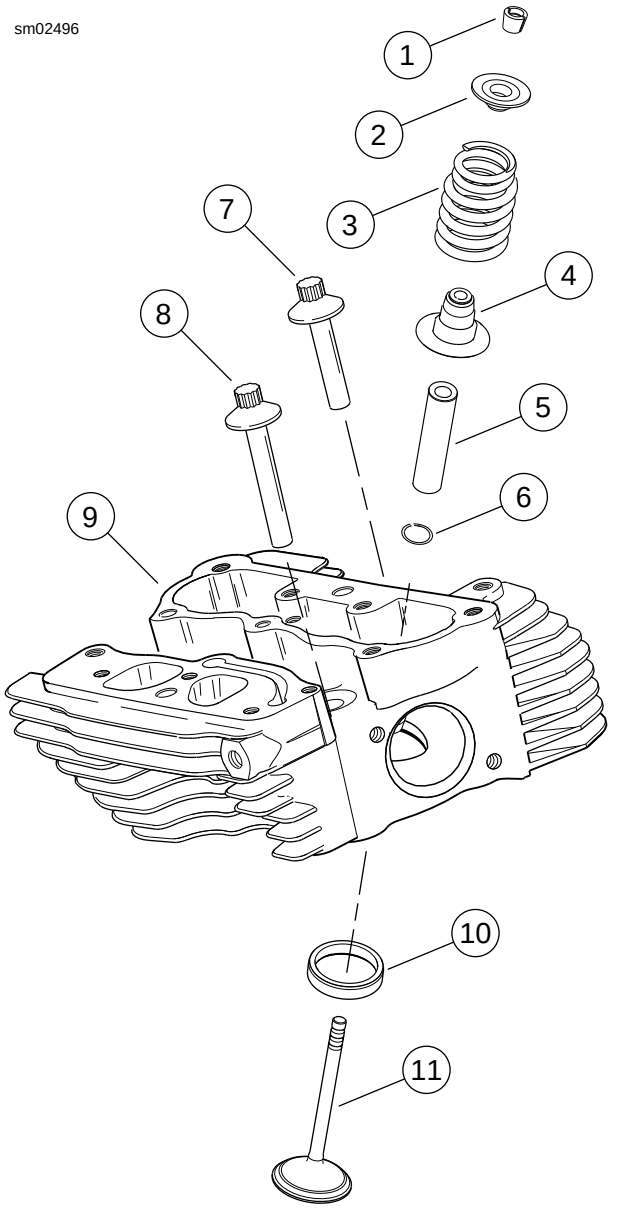
Figure 3-42. Cylinder Head Holding Fixture

3. See Figure 3-43. Release valve spring compression.
   a. Place VALVE SPRING COMPRESSOR (Part No. HD-34736-B) (2) over cylinder head. Center blunt end on the valve head. Seat adapter at end of forcing screw on the valve spring retainer.
   b. Rotate forcing screw to compress valve spring.
   c. See Figure 3-44. If spring retainer (2) is not free of tapered keepers (1), give head of tool a sharp tap with a soft mallet. Using magnetic rod or small screwdriver, remove the keepers (1) from the valve stem (11) groove.
   d. Rotate forcing screw to release the valve spring compression.
4. Remove the spring retainer (2) and valve spring (3).
5. Slide the valve (11) from the valve guide (5).
6. Remove valve seal assembly.
7. Mark the bottom of the valve F(ront) or R(ear) for identification. Also, separate and tag tapered keepers, valve spring and spring retainer so that they are installed on the same valve at time of assembly.
8. Repeat previous steps to remove the other valve components.
9. Release the cylinder head holding fixture from the vise. Remove fixture tool from spark plug hole.



1. Holding fixture
2. Compressor

Figure 3-43. Valve Spring Compressor (Part No. HD-34736-B)



1. **Tapered keepers**
2. **Spring retainer**
3. **Valve spring**
4. **Spring seat/valve stem seal**
5. **Valve guide**
6. **Lock ring**
7. **Cylinder head bolt, short**
8. **Cylinder head bolt, long**
9. **Cylinder head**
10. **Valve seat**
11. **Valve**

Figure 3-44. Cylinder Head Assembly

CLEANING

1. See Figure 3-44. Remove old gasket material from cylinder head (9). Gasket material left on sealing surfaces will cause leaks.

NOTICE

Do not use glass or sand to bead blast surfaces exposed to engine oil. Blasting materials can lodge in pores of the casting. Heat expansion releases this material which can contaminate oil resulting in engine damage. (00534b)

NOTE

Bead blasting materials could also enter threaded holes adversely affecting fastener engagement and torque indication. Cover all threaded holes before bead blasting.

2. Remove all carbon deposits from combustion chamber and machined surfaces of cylinder head. Exercise caution to avoid removing any metal material. For best results, use an air tool with a **worn** wire brush. Scraping may result in scratches or nicks.
3. To soften stubborn deposits, soak the cylinder head in a chemical solution, such as GUNK HYDRO-SEAL or other carbon and gum dissolving agent. Repeat previous step as necessary.
4. Thoroughly clean the cylinder head, spring retainers, tapered keepers, valves and valve springs in a non-volatile cleaning solution or solvent. Follow up with a thorough wash in hot soapy water.

⚠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)

5. Blow parts dry with low pressure compressed air.

INSPECTION

PART NUMBER	TOOL NAME
B-45525	VALVE GUIDE HONE
HD-34751	VALVE GUIDE CLEANING BRUSH
HD-42324-A	CYLINDER TORQUE PLATES
HD-96796-47	VALVE SPRING TESTER

Cylinder Head

1. Check for scratches and nicks on all gasket sealing surfaces.
2. Check for warpage.
   a. With the combustion chamber side facing upward, set a straightedge diagonally across the length of the cylinder head intersecting the upper and lower corners of the gasket surface.
   b. Slide a feeler gauge beneath the straightedge to check the head for warpage.
   c. Checking the opposite diagonal, repeat the procedure to verify that the gasket surface is flat (especially if a head gasket was blown). Discard the head if any low spot is 0.006 in. (0.152 mm) or greater.

NOTE

For best results, use one of the CYLINDER TORQUE PLATES (Part No. HD-42324-A) in lieu of the straightedge. Lay the upper plate (without vise grip) flat on the machined surface of the head. As a preliminary check, see if the plate rocks from side to side. A head on which the plate rocks is immediately suspect. Insert a feeler gauge between the plate and head at various locations to see if warpage exceeds above specification.

3. Verify that oil passageways are open and clean.

Valve Guides

1. Inspect external surfaces, particularly the combustion chamber side, for cracks. Replace the guide if any cracks are found.
2. Prepare valve guides for inspection.
   a. Lightly hone bore using the VALVE GUIDE HONE (Part No. B-45525).
   b. Scrub with the VALVE GUIDE CLEANING BRUSH (Part No. HD-34751) to remove any dust or debris.
   c. Polish the valve stem with fine emery cloth or steel wool to remove carbon buildup.
3. Check valve stem to guide clearance:
   a. Carefully measure the **inside** diameter of the valve guide using an inside ball gauge.
   b. Measure the **outside** diameter of the valve stem with an outside micrometer.
   c. Refer to Table 3-40. If the clearance between stem and guide exceeds the limits shown, the valve stem and/or guide are excessively worn.
   d. Repeat measurements with a **new** valve to determine if the guide must be replaced.

Table 3-40. Valve Stem to Guide Clearance Service Wear Limits

VALVE	IN.	MM
Intake	0.0038	0.0965
Exhaust	0.0038	0.0965

Valves

1. Replace the valve if there is evidence of burning or cracking.
2. Inspect the end of the valve stem for pitting or uneven wear. Replace the valve if either of these conditions are found.
3. Inspect for burrs around the valve stem keeper groove. Remove burrs with a fine tooth file if found.
4. To determine if the valve stem is excessively worn, see valve guide inspection.

Valve Springs

1. Inspect springs for cracked or discolored coils. Replace springs if either of these conditions are found.
2. Set the intake and exhaust valve springs on a level surface and use a straightedge to check for proper squareness and height. Too much height corresponds to a reduction in spring pressure which results in sluggish valve action.
3. Check free length of springs using a dial vernier caliper or load test with the VALVE SPRING TESTER (Part No. HD-96796-47). Replace springs if free length or compression force do not meet specifications. See 3.2 SPECIFICATIONS.

Tapered Keepers

1. Inspect parts for damage or rust pits. Replace as necessary.
2. Inspect inboard side of tapered keepers for excessive wear. Upraised center must be pronounced and fit snugly in valve stem groove. Place keepers into groove and verify that they grip tightly without sliding.

Valve Seats

1. Inspect seats for cracking, chipping or burning. Replace seats if any evidence of these conditions are found.
2. Check seats for recession by measuring valve stem protrusion. See 3.22 CYLINDER HEAD, Valve and Seat Refacing.

VALVE GUIDE REPLACEMENT

PART NUMBER	TOOL NAME
B-45523	VALVE GUIDE REAMER
B-45524-1	VALVE GUIDE DRIVER
B-45524-2A	VALVE GUIDE INSTALLER SLEEVE
B-45525	VALVE GUIDE HONE
HD-34751	VALVE GUIDE CLEANING BRUSH
HD-39782-1	CYLINDER HEAD SUPPORT STAND
HD-39782-3	INTAKE SEAT ADAPTER
HD-39782-4	EXHAUST SEAT ADAPTER
HD-39782-B	CYLINDER HEAD SUPPORT STAND KIT
HD-39786	CYLINDER HEAD HOLDING FIXTURE
HD-39847	REAMER T-HANDLE
HD-39964	REAMER LUBRICANT

Removal

NOTES

- *If valve guide replacement is necessary, always install **new** guide before refacing valve seat.*
- *CYLINDER HEAD SUPPORT STAND KIT (Part No. HD-39782-B) ensures that valve guide and seat are perpendicular. If perpendicularity is not achieved, the cylinder head valve guide bore will be damaged during the press procedure.*

1. See Figure 3-45. Prepare cylinder head for valve guide replacement.
   a. Obtain CYLINDER HEAD SUPPORT STAND KIT (Part No. HD-39782-B).
   b. Insert sleeve of INTAKE SEAT ADAPTER (Part No. HD-39782-3) (3) or EXHAUST SEAT ADAPTER (Part No. HD-39782-4) (4) seat adapter into tube at top CYLINDER HEAD SUPPORT STAND (Part No. HD-39782-1) (2).
   c. Position cylinder head so that valve seat is centered on seat adapter.

NOTE

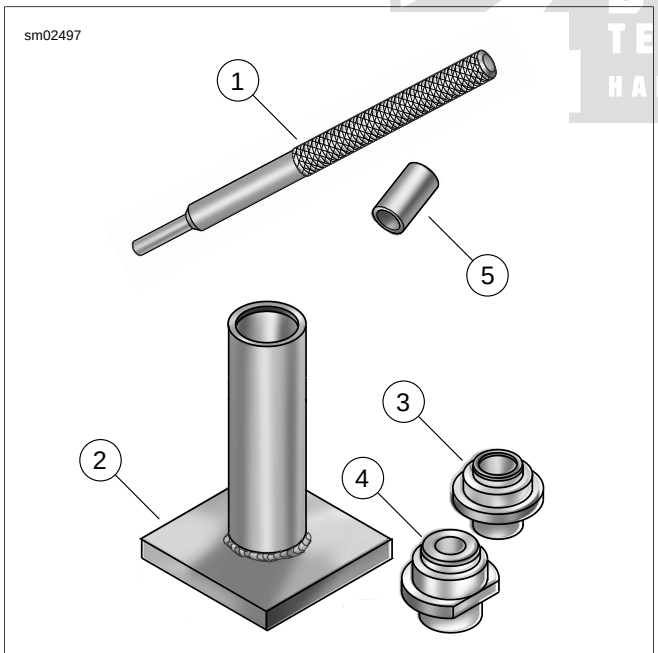
Do not press out the valve guide from the bottom of the cylinder head. Carbon buildup on the combustion chamber side of the guide can deeply gouge the cylinder head bore diminishing the likelihood of achieving the proper interference fit and possibly requiring replacement of the cylinder head casting.

2. Remove and discard lock ring from valve guide groove.

NOTE

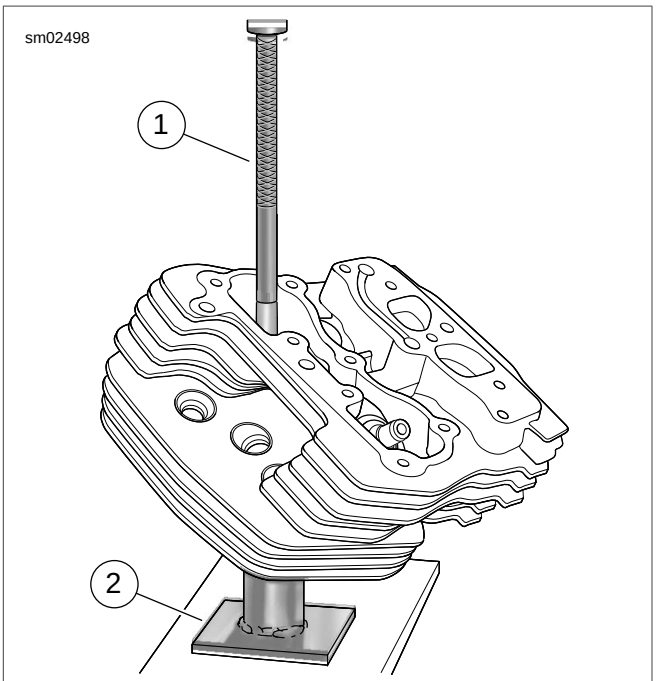
Lock ring is present on OEM intake and exhaust valve guides.

3. At top of the cylinder head, insert VALVE GUIDE DRIVER (Part No. B-45524-1) (1) into valve guide bore until stopped by shoulder.
4. See Figure 3-46. Center valve guide driver under ram of arbor press. Apply pressure until valve guide drops free of cylinder head. Discard valve guide.



1. **Valve guide driver**
2. **Cylinder head support stand**
3. **Intake seat adapter**
4. **Exhaust seat adapter**
5. **Valve guide installer sleeve**

Figure 3-45. Valve Guide Replacement Tools



1. **Valve guide driver**
2. **Cylinder head stand**

Figure 3-46. Remove Valve Guide

Installation

1. Check valve guide to valve bore clearance.
   a. Measure the outside diameter of a **new** standard valve guide.
   b. Measure the cylinder head valve guide bore. The valve guide should be 0.0020-0.0033 in. (0.051-0.084 mm) larger than the bore.
   c. If clearance is not within specification, then select one of the following oversize guides: 0.001 in. (0.025 mm), 0.002 in. (0.05 mm) or 0.003 in. (0.08 mm).

NOTE

Since some material is typically removed when the guide is pressed out, it is normal to go to the next larger size for the proper interference fit.

2. Measure cylinder head bore and outside diameter of selected oversize guide to verify correct interference fit.

NOTE

Support stand ensures that valve guide and seat are perpendicular. If perpendicularity is not achieved, cylinder head valve guide bore will be damaged during the press procedure.

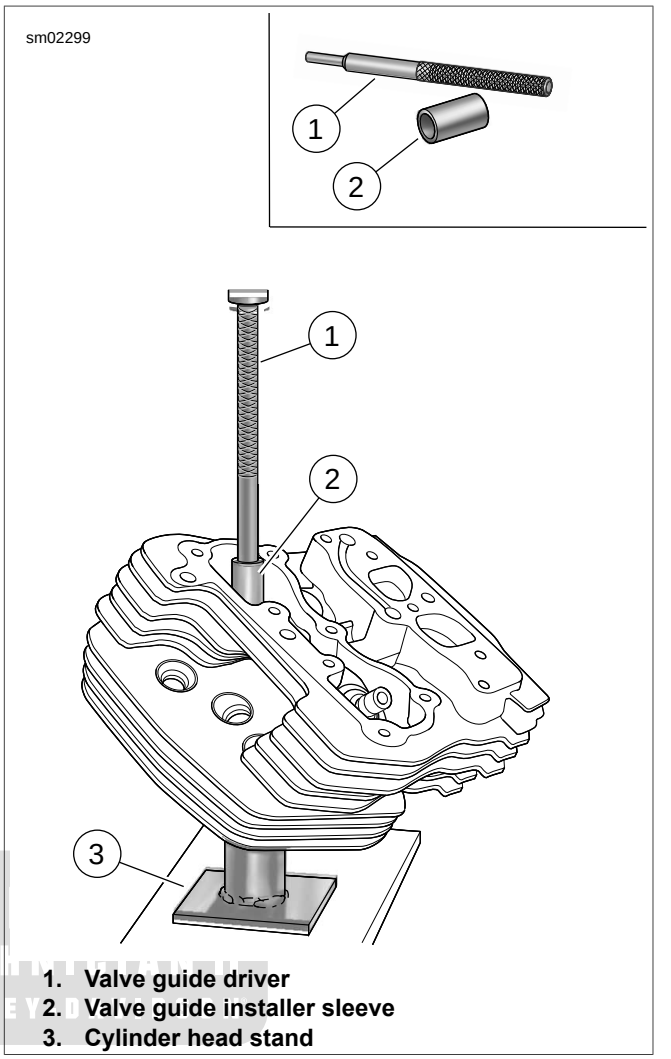
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3. Prepare cylinder head for valve guide replacement.
   a. See Figure 3-45. Insert sleeve of INTAKE SEAT ADAPTER (Part No. HD-39782-3) (3) or EXHAUST SEAT ADAPTER (Part No. HD-39782-4) (4) into tube at top of support stand (2). Position cylinder head so that valve seat is centered on seat adapter.
   b. Apply Vaseline to lightly lubricate external surfaces of valve guide. Spread lubricant so that thin film covers entire surface area.
   c. At top of cylinder head, start valve guide into bore.
   d. See Figure 3-47. Place VALVE GUIDE INSTALLER SLEEVE (Part No. B-45524-2A) (2) over valve guide and then insert tapered end of valve guide driver (1) into sleeve.
   e. Center valve guide driver under ram of arbor press and apply pressure only until valve guide is started in bore and then back off ram slightly to allow guide to center itself.

NOTE

Always back off ram to allow the valve guide to find center. Pressing guide into cylinder head in one stroke can bend driver, break guide, distort cylinder head casting and/or damage cylinder head valve guide bore.

   f. Verify that support stand (3) and driver (1) are square. Center driver under ram and press valve guide further into bore, but then back off ram again to allow valve guide to find center.
   g. Repeat previous step and then apply pressure to driver until installer sleeve contacts machined area of cylinder head.
   h. Install **new** lock ring into valve guide groove. Verify that lock ring is square and fully seated in the groove.



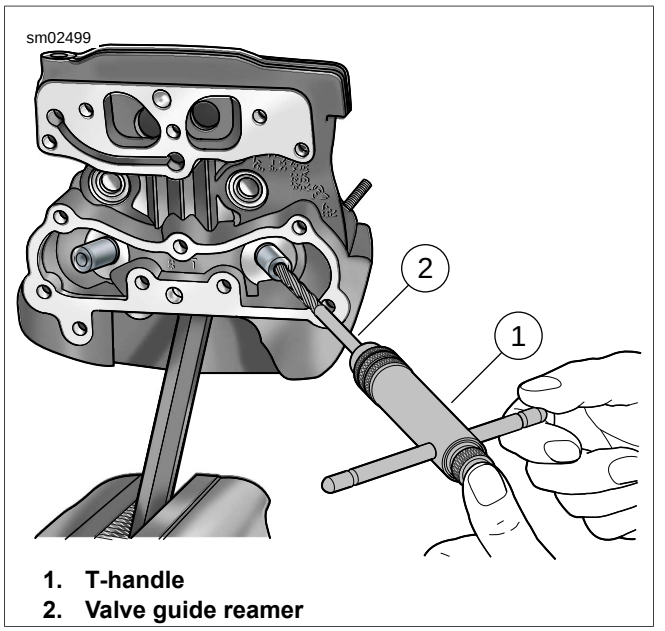
1. Valve guide driver
2. Valve guide installer sleeve
3. Cylinder head stand

Figure 3-47. Install Valve Guide

4. Secure cylinder head for service.
   a. Thread 12 mm end of CYLINDER HEAD HOLDING FIXTURE (Part No. HD-39786) into cylinder head spark plug hole.
   b. Clamp tool in vise at a 45 degree angle or one that offers a comfortable working position.

NOTE

Valve guides must be reamed to within 0.0005-0.0001 in. (0.013-0.0025 mm) of finished size.



1. **T-handle**
2. **Valve guide reamer**

Figure 3-48. Reaming Valve Guide Bore

5. See Figure 3-48. Obtain the VALVE GUIDE REAMER (Part No. B-45523), REAMER T-HANDLE (Part No. HD-39847) and REAMER LUBRICANT (Part No. HD-39964).
   a. Install T-handle (1) on reamer (2).
   b. Apply a liberal amount of reamer lubricant to valve guide bore and bit of reamer. Start bit of reamer into bore at top of cylinder head.
   c. Placing thumb on drive socket of reamer T-handle, apply slight pressure on reamer while rotating in a clockwise direction. Squirt additional lubricant onto reamer and into guide as necessary.

   NOTE

   For best results, do not push on reamer or apply pressure to the reamer handle. While excessive pressure results in a rough cut, bore will be tapered if pressure is not centrally applied.

   d. Continue rotating reamer T-handle until entire bit has passed through valve guide bore and shank of reamer rotates freely.
   e. Remove T-handle from reamer, and carefully pulling on bit, draw shaft of reamer out combustion chamber side of valve guide.

⚠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)

6. Direct compressed air into the valve guide bore to remove any metal shavings or debris.
7. See Figure 3-49. Clean valve guide bore with the VALVE GUIDE CLEANING BRUSH (Part No. HD-34751).
8. See Figure 3-50. Obtain the VALVE GUIDE HONE (Part No. B-45525) and REAMER LUBRICANT (Part No.HD-39964).
   a. Install hone in a high speed electric drill.
   b. Apply reamer lubricant to finishing stones of hone and valve guide bore.
   c. Start finishing stones of hone into bore.
   d. Activating the drill, move the entire length of the finishing stone arrangement forward and backward through the bore for 10 to 12 complete strokes. Work for a crosshatch pattern of approximately 60 degrees.
9. Direct compressed air into the valve guide bore to remove any debris. Clean with the VALVE GUIDE CLEANING BRUSH (Part No. HD-34751).

   NOTE

   Always verify valve stem to valve guide clearance after honing, since a worn reamer may cut the bore undersize.

10. Check valve stem to valve guide clearance.
    a. Measure the inside diameter of the valve guide with an inside ball micrometer.
    b. Measure the outside diameter of the valve stem with an outside micrometer.
    c. Refer to Table 3-41. If the clearance between stem and guide is not within the limits shown, the low end being preferable, then the valve stem may be excessively worn or the valve guide bore undercut.

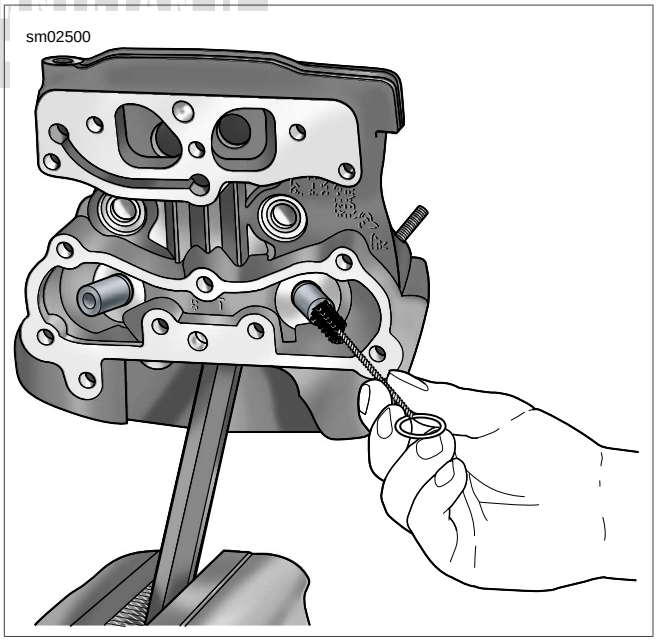


Figure 3-49. Scrubbing Valve Guide Bore

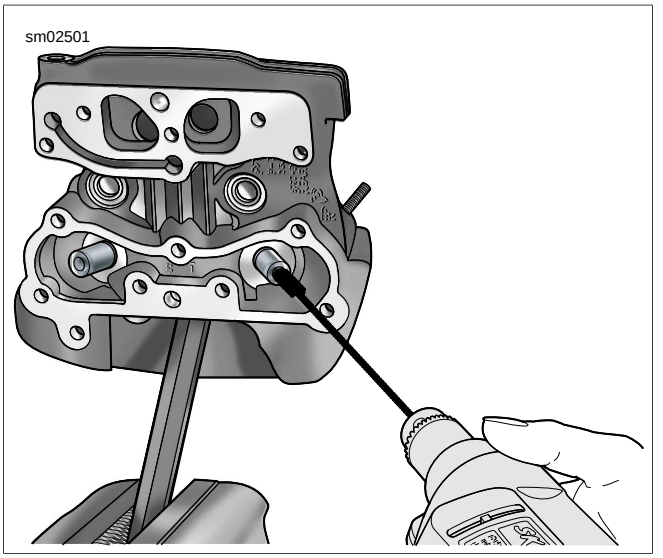


Figure 3-50. Honing Valve Guide Bore

11. Clean cylinder head assembly again.
    a. Using cleaning solvent, thoroughly clean cylinder head and valve guide bore.
    b. Scrub valve guide bore with the VALVE GUIDE CLEANING BRUSH (Part No. HD-34751). For best results, use a thin engine oil and clean valve guide bore with the type of swabs or patches found in gun cleaning kits.
    c. Continue to wipe bore until clean cloth shows no evidence of dirt or debris. Follow up with a thorough wash in hot soapy water.

⚠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)

12. Blow parts dry with low pressure compressed air.

Table 3-41. Valve Stem to Guide Clearance

VALVE	IN.	MM
Intake	0.001-0.003	0.0254-0.0762
Exhaust	0.001-0.003	0.0254-0.0762

VALVE AND SEAT REFACING

PART NUMBER	TOOL NAME
HD-34751	VALVE GUIDE CLEANING BRUSH
HD-35758-C	NEWAY VALVE SEAT CUTTER SET
HD-39786	CYLINDER HEAD HOLDING FIXTURE

NOTES

- *Verify correct valve stem to valve guide clearance before refacing. Refer to Table 3-41. If **new** guides must be installed, complete that task before refacing valve seats.*
- *This procedure is not based on the lapping of valves. The end result is an interference fit between the 45 degree valve face and the valve seat which will be 46 degrees.*

1. Hold the valve firmly against a wire wheel in a bench grinder. Remove all carbon deposits from the valve head, face and stem, but exercise caution to avoid removing any metal. Carbon left on the stem may affect alignment in the valve refacer. Polish the valve stem with steel wool or crocus cloth to remove any marks that might be left by the wire wheel.
2. Install valve (both intake and exhaust) in a valve refacer set to a 45 degree angle. The valve refacer is required equipment, since accuracy in matching the angle of the valve face with the angle of the valve seat is critical.

NOTES

- *Do not remove any more metal than is necessary to clean up and true the valve face. Removing metal reduces the service life of the valve. The amount of grinding needed to retrue the valve is a clear indication of its condition. Discard the valve if it cannot be quickly refaced while maintaining a good margin. See Figure 3-53. Valves that do not clean up quickly are either warped, excessively worn or too deeply pitted to be used.*
- *Obtain a **new** valve if grinding leaves the margin less than 0.0313 in (0.795 mm). A valve in this condition does not seat normally, burns easily and may crack or cause pre-ignition.*

3. Wipe valve seats and valve faces clean. From the bottom of the cylinder head, insert the valve stem into the valve guide. Push on head of valve until it contacts the valve seat.
4. See Figure 3-51. Measure valve stem protrusion. Seat wear causes the valve stem protrusion to change.
    a. Placing finger at bottom of valve to keep valve seated, use a dial vernier caliper to check the distance from the top of the valve stem to the machined area on the cylinder head.
    b. Seat wear and valve refacing causes the valve stem protrusion to change. If protrusion exceeds 2.069 in. (52.553 mm), then replace the valve, valve seat or cylinder head as necessary.

NOTE

Do not shorten the valve by grinding on the end of the stem. Grinding replaces the hardened case with mild steel which results in accelerated wear.

5. Secure cylinder head for servicing.
   a. Thread 12 mm end of CYLINDER HEAD HOLDING FIXTURE (Part No. HD-39786) into cylinder head spark plug hole.
   b. Clamp fixture in vise and further tighten cylinder head onto the fixture to prevent any movement during operation.
   c. Place cylinder head at a 45 degree angle or one that offers a comfortable working position.
6. In order to determine the correct location of the 46 degree valve seat in the head, measure the width of the valve to be used and subtract 0.080 in. (2.032 mm) from that number.
7. Set your dial caliper to the lesser measurement and lock down for quick reference. This is the location of your valve seat.
8. Use a permanent magic marker to highlight the valve seat area that is going to be cut. Be sure to highlight all three angles. Allow marker to dry before proceeding.

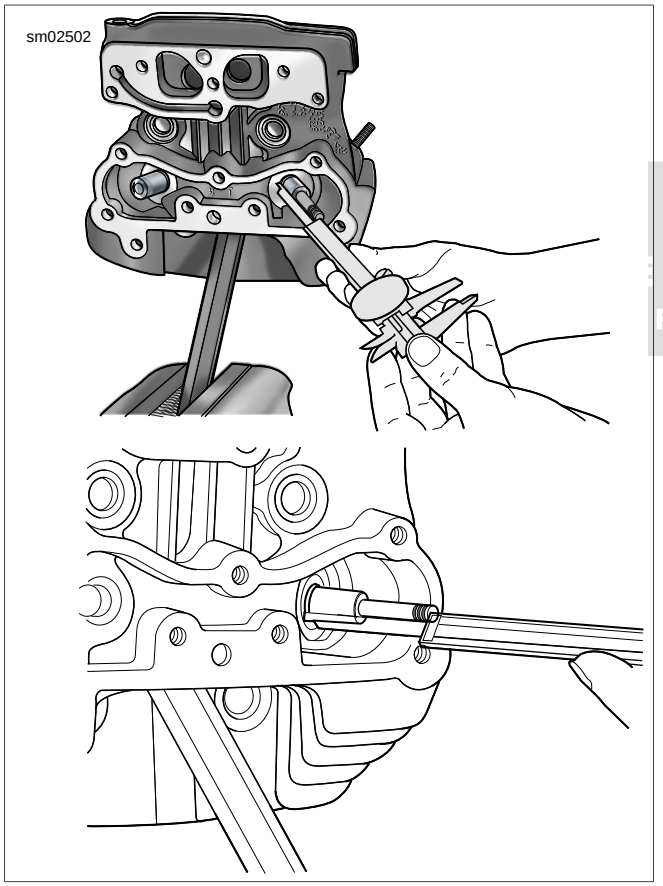


Figure 3-51. Checking Valve Stem Protrusion

NOTES

- *Always verify cutter blades and cutter pilot are clean before beginning the cutting process. The correct cleaning brush is supplied with the Neway tool set.*
- *Always verify the inside of the valve guide is clean by using VALVE GUIDE CLEANING BRUSH (Part No. HD-34751).*

9. See Figure 3-52. Obtain the NEWAY VALVE SEAT CUTTER SET (Part No. HD-35758-C). Choose the cutter pilot that fits properly into the valve guide hole. Securely seat the pilot by pushing down and turning using the installation tool supplied in the tool set.
10. Choose the proper 46 degree cutter (intake or exhaust) and gently slide the cutter onto the pilot. Be careful not to drop the cutter onto the seat.
11. While applying a constant and consistent pressure, remove just enough material to show a complete clean-up on the 46 degree angle. Do not remove any more metal than is necessary to clean up the seat (that is, to provide a uniform finish and remove pitting).

NOTES

- *If the width of the clean-up angle is greater on one side of the seat than the other, the guide may need to be replaced due to improper installation.*
- *After making the 46 degree cut, if you discover a groove cut completely around the seat, this means the blades of the cutter are in alignment and need to be staggered. This is accomplished by loosening all of the blades from the cutter body and moving each blade slightly in its cradle in opposite directions on the cutter. The tool needed to loosen the blades is supplied in the tool set. A permanent magic marker mark every 90 degrees will help in determining where new angles are.*

12. Next, with your dial caliper locked to the predetermined setting, measure the 46 degree cut at the outermost edge at the widest point of the circle to determine what cut needs to be made next.
    a. If the 46 degree cut is too high (towards the combustion chamber), use the 31 degree cutter to lower the valve seat closer to the port.
    b. If the 46 degree cut is too low, use the 60 degree cutter to raise the valve seat or move it away from the port.

NOTES

- *Because you are using the top measurement of the valve seat as a reference point it will usually be necessary to use the 31 degree cutter following the initial 46 degree cut.*
- *Always highlight the valve seat with the permanent magic marker in order to better view the location of the 46 degree valve seat.*

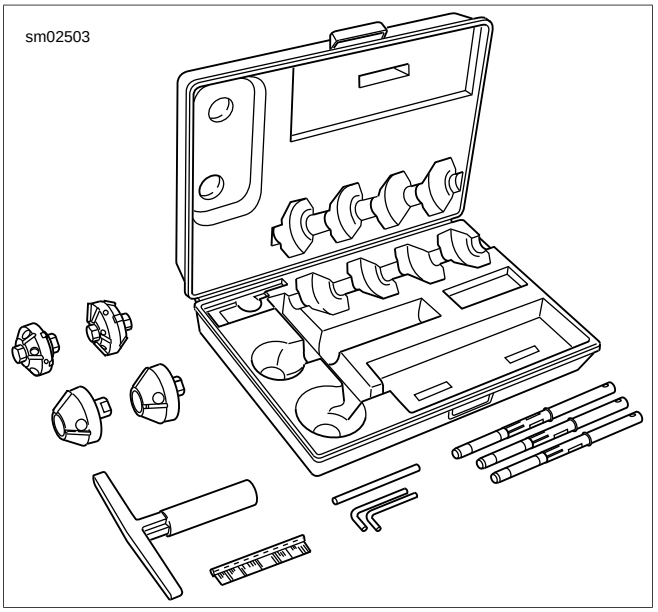
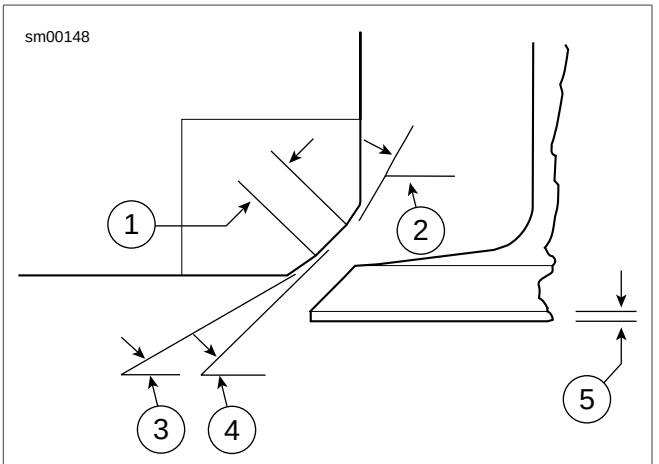


Figure 3-52. Neway Valve Seat Cutter Set



1. **Minimum: 0.040 in. (1.016 mm) / Maximum: 0.062 in. (1.575 mm)**
2. **60 degrees**
3. **31 degrees**
4. **46 degrees**
5. **Margin**

Figure 3-53. Valve and Seat Dimensions

13. If the location of the valve seat is not correct, repeat steps 10 and 11.
14. When you accomplish a complete clean-up of the 46 degree angle and the width is at least 0.062 in. (1.575 mm), proceed to the next step.
15. Select the proper 60 degree cutter and gently slide the cutter down the cutter pilot to the valve seat.
16. Remove just enough material to provide an even valve seat width of 0.040-0.062 in. (1.016-1.575 mm).
17. Remove cutter and cutter pilot.
18. Insert valve to be used in the valve guide and bottom on the valve seat. Positioning the cylinder head port upwards and with slight thumb pressure against the valve, completely fill the port with solvent to verify proper seal between the valve and the valve seat.

NOTE

Hold pressure against the valve for a minimum of 10 seconds. If any leakage occurs, examine the valve and valve seat for irregularities or defects and if necessary repeat the above valve grinding or valve seat cutting process.

19. Repeat the process on any valve seat that needs service.
20. Clean valves, cylinder head and valve seats in solvent. Follow up with a thorough wash in hot soapy water.

⚠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)

21. Blow parts dry with low pressure compressed air.

ASSEMBLY

PART NUMBER	TOOL NAME
HD-34736-B	VALVE SPRING COMPRESSOR
HD-34751	VALVE GUIDE CLEANING BRUSH
HD-39786	CYLINDER HEAD HOLDING FIXTURE

1. Secure cylinder head for service.
   a. Thread 12 mm end of CYLINDER HEAD HOLDING FIXTURE (Part No. HD-39786) into cylinder head spark plug hole.
   b. Clamp tool in vise at a 45 degree angle or one that offers a comfortable working position.

NOTE

At the time of disassembly, all parts should have been marked or tagged so that they are installed on the same valve (and in the same head).

2. Run the VALVE GUIDE CLEANING BRUSH (Part No. HD-34751) through the valve guide bore to verify cleanliness.
3. Apply a liberal amount of Screamin' Eagle Assembly Lube (Part No. 94971-09) to valve stem.
4. From the bottom of the cylinder head, insert the valve stem into the valve guide.
5. To distribute the assembly lube evenly around the valve stem and guide, hand spin the valve as it is installed. Work the valve back and forth in the bore to verify that it slides smoothly and seats properly.
6. Remove the valve and apply a second coat of assembly lube to the valve stem. Install the valve in the valve guide.

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NOTICE

Failure to install plastic capsule can cause the valve stem seal to catch the edge of the valve stem keeper groove. The resulting damage can cause leakage around the valve stem, excessive oil consumption and valve sticking. (00535b)

7. See Figure 3-54. Push on bottom of valve until it contacts the valve seat. Placing finger at bottom of valve to keep valve seated, slide plastic capsule over valve stem tip and keeper groove.
8. Apply a very thin film of Screamin' Eagle Assembly Lube (Part No. 94971-09) to capsule.
9. See Figure 3-55. Obtain **new** valve stem seal.
10. Slide **new** valve stem seal/spring seat over capsule and down valve stem until contact is made with top of valve guide and machined area of cylinder head casting. Remove capsule from valve stem tip.

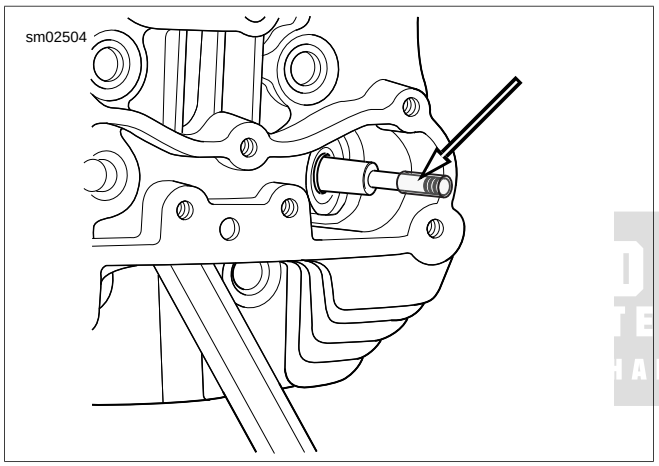


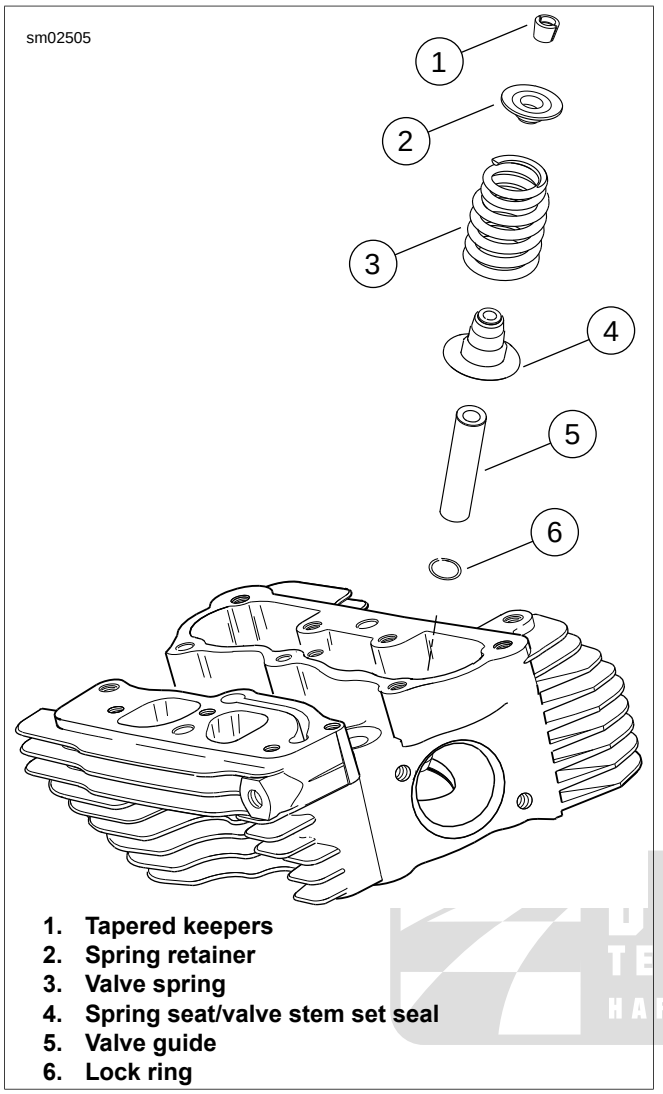
Figure 3-54. Plastic Capsule



Figure 3-55. Valve Stem Seal/Spring Seat Assembly

11. See Figure 3-56. Apply a liberal amount of assembly lube to valve stem tip and keeper groove (1).
12. With the smaller diameter coils topside, install the valve spring (3) over the valve guide (5). Place the spring retainer (2) on top of the valve spring.
13. Obtain the VALVE SPRING COMPRESSOR (Part No. HD-34736-B) and proceed as follows:
    a. Place tool over cylinder head so that the blunt end is centered on the valve head and adapter at end of forcing screw is seated on the valve spring retainer.
    b. Rotate forcing screw to compress valve spring.
    c. With the tapered side down, fit the keepers into the valve stem groove. For best results, apply a dab of grease to the inboard side of the keepers before installation and use a magnetic rod for easy placement.
    d. Arranging tapered keepers so that the gaps are evenly spaced, turn forcing screw to release valve spring compression.
14. Tap the end of the valve stem once or twice with a soft mallet to be sure that tapered keepers are tightly seated in the valve stem groove.
15. Repeat previous steps to install the other valve components.
16. Release the cylinder head holding fixture from the vise. Remove fixture tool from spark plug hole.
17. Cover the cylinder head to protect it from dust and dirt until time of installation.

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1. Tapered keepers
2. Spring retainer
3. Valve spring
4. Spring seat/valve stem set seal
5. Valve guide
6. Lock ring

Figure 3-56. Valve Assembly

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

CYLINDER 3.23

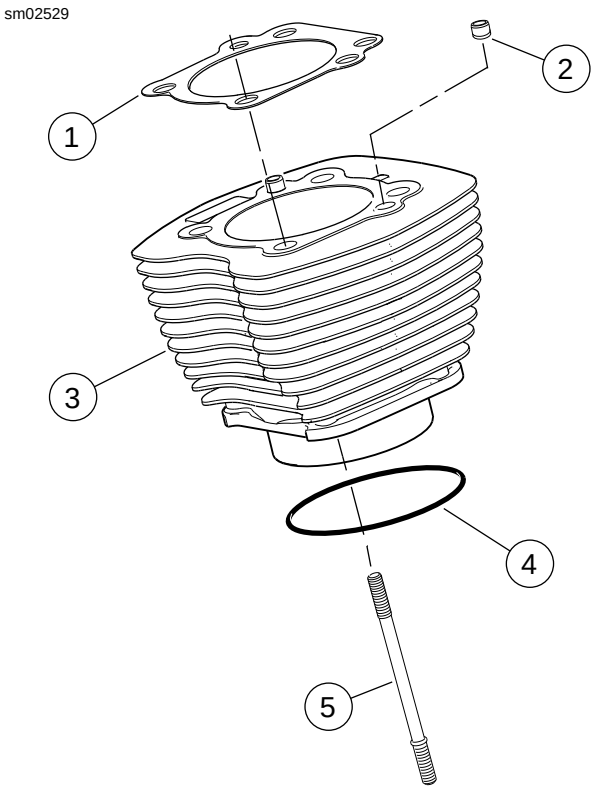
CLEANING

1. See Figure 3-57. Scrape any remaining cylinder head gasket material from the gasket surface at the top of the cylinder (3).

⚠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. Clean cylinder in a non-volatile cleaning solution or solvent. Blow parts dry with low pressure compressed air. Verify that oil passageways are clean and open.
3. Inspect the cylinder bore for obvious defects or damage in the ring travel area. Replace cylinders that are severely scored, scuffed, scratched, burnt or gouged.
4. Use a file to carefully remove any nicks or burrs from the machined surfaces of the cylinder.



1. **Cylinder head gasket**
2. **Dowel pin**
3. **Cylinder**
4. **O-ring seal**
5. **Cylinder stud**

Figure 3-57. Cylinder Assembly

INSPECTION

PART NUMBER	TOOL NAME
HD-33446-B	CYLINDER TORQUE PLATES
TA360	SNAP-ON TORQUE ANGLE GAUGE

1. Using Magnaflux Dye Penetrant, inspect the cylinder for cracks. If no cracks are found, thoroughly wash cylinder to remove traces of dye.
2. See Figure 3-58. Check the machined surfaces for flatness using a feeler gauge and CYLINDER TORQUE PLATES (Part No. HD-33446-B) as follows:
   a. Lay gasket side of the upper torque plate (3) flat against the head gasket surface of the cylinder.
   b. As a preliminary check, see if the plate rocks from side to side. A cylinder on which the plate rocks is immediately suspect.
   c. Insert a feeler gauge between the plate and cylinder at various locations.
   d. The head gasket surface must be flat within 0.006 in. (0.15 mm).
   e. Lay the seal side of the lower torque plate (2) flat against the O-ring seal surface and check flatness using a feeler gauge.
   f. The O-ring seal surface must be flat within 0.004 in. (0.102 mm).
   g. Replace the cylinder (and piston) if either surface is not within specification.

NOTE

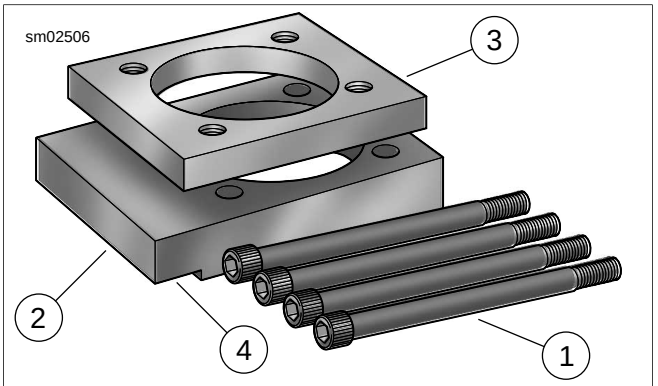
Failure to use cylinder torque plates can produce measurements that vary by as much as 0.001 in. (0.025 mm), possibly resulting in the use of parts that are not suitable for service.

3. Install CYLINDER TORQUE PLATES (Part No. HD-33446-B) as follows:
   a. Remove O-ring seal from cylinder sleeve, if installed.
   b. See Figure 3-59. Clamp the stepped side of the lower plate in a vise with soft jaws.
   c. Lightly oil threads and shoulders of four bolts (1) with clean H-D 20W50 engine oil and slide through holes of lower plate (2).
   d. Slide cylinder onto bolts with the indent in the cooling fins facing upward.
   e. Place a used head gasket on cylinder and install upper plate with blind holes aligned with dowel pins in cylinder. Secure with bolts (1).
   f. See Figure 3-60. Tighten the bolts to 120-144 **in-lbs** (13.6-16.2 Nm) in the sequence shown.
   g. Following the same sequence, tighten each bolt to 15-17 ft-lbs plus 90 degrees (20.3-23.0 Nm plus 90 degrees).

NOTE

For best results use SNAP-ON TORQUE ANGLE GAUGE (Part No. TA360). If the tool is not available, mark a straight line on each bolt head continuing the line onto the lower plate.

h. Turn each bolt an additional 90 degrees in the sequence shown in Figure 3-60.



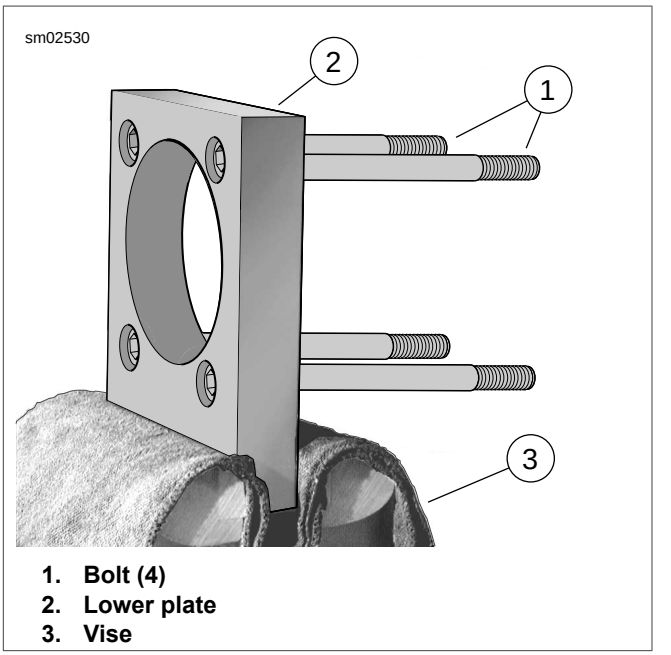
1. **Bolts**
2. **Lower plate**
3. **Upper plate**
4. **Vise grip step**

Figure 3-58. Cylinder Torque Plates

NOTE

Maximum cylinder wear occurs at the top of top ring travel. Minimum wear occurs below ring travel. Failure to measure the cylinder at these points may result in a faulty decision regarding the suitability of the cylinder for continued use.

4. See Figure 3-61. Using an inside micrometer or dial bore gauge, check cylinder bore for out-of round and taper:
   a. At the top of the piston ring travel zone, measure the cylinder diameter at two locations; parallel and perpendicular to the crankshaft. Record the readings.
   b. Repeat the two measurements at the center of the piston ring travel zone and again at the bottom of the bore at a point below the piston ring travel zone.
   c. See 3.3 SERVICE WEAR LIMITS. If the out-of-round or taper measurements are not within specification, the cylinder must be rebored and/or honed to accept the next standard oversize piston. See 3.23 CYLINDER, Boring and Honing Cylinder.
   d. If cylinders are not scuffed or scored and are not worn beyond the service limits, see 3.23 CYLINDER, Deglazing Cylinder.



1. **Bolt (4)**
2. **Lower plate**
3. **Vise**

Figure 3-59. Attaching Cylinder Torque Plates

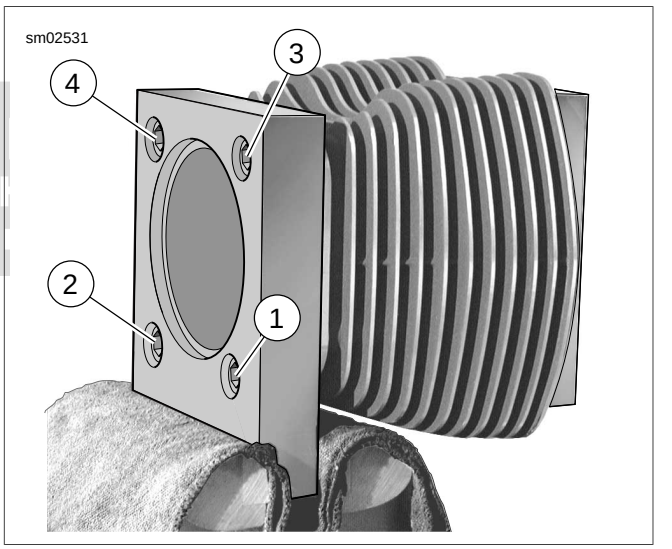


Figure 3-60. Cylinder Torque Plate Bolt Sequence

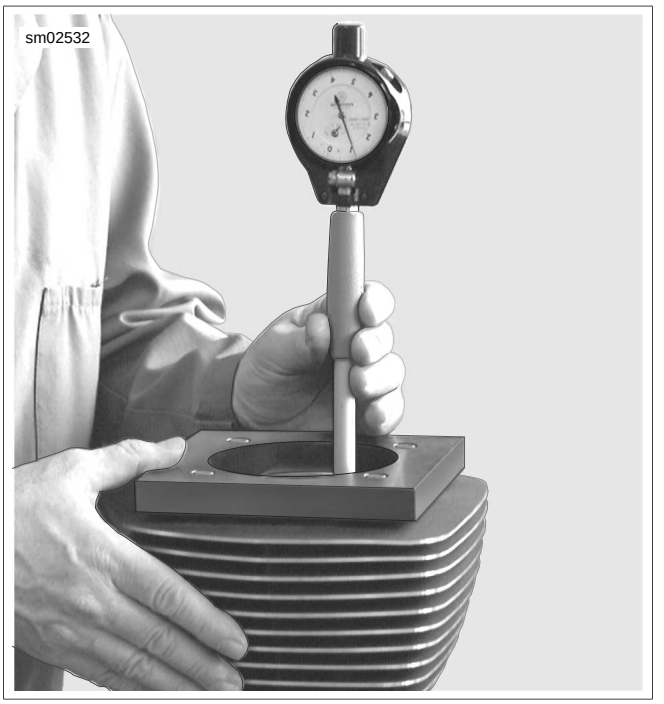


Figure 3-61. Measure for Out-of-Round and Taper

DEGLAZING CYLINDER

NOTE

Deglazing removes wear patterns, minor scuff marks and scratches without enlarging the bore diameter.

1. Lightly swab the cylinder bore with a cloth dipped in clean engine oil.
2. Obtain a 240 grit flexible ball-type deglazing tool with a bristle tip or finishing stone arrangement able to produce a 60 degree cross hatch pattern.
3. Install the deglazing tool in a slow-speed drill. The speed at which the tool rotates determines the speed at which it must be stroked up and down the bore to produce the desired cross hatch pattern.
4. Starting at the bottom of the cylinder, move the deglazing tool up and down the entire length of the cylinder bore for 10 to 12 complete strokes.
5. Stop to examine the cylinder bore and/or take measurements. A precise 60 degree cross hatch pattern in the piston travel area is the most important.

NOTICE

The angular cross hatch pattern ensures an even flow of oil onto the cylinder walls and promotes longer cylinder, piston and ring life. An incorrect cross hatch pattern will result in insufficient oil retention and possible piston seizure and/or high oil consumption. (00536b)

NOTICE

Failure to remove all abrasive particles may result in premature cylinder, piston and ring wear and engine failure. (00537b) .

6. Thoroughly wash the cylinder bore with liquid dishwashing soap and hot water to remove all abrasive particles and residual grit. Continue cleaning until a clean cloth shows no evidence of dirt or debris.
7. Hot rinse the cylinder and dry with moisture free compressed air. Immediately apply a thin film of clean engine oil to a clean white paper towel and thoroughly wipe the inside of the cylinder to prevent the cylinder bore from rusting.

NOTE

After wiping the cylinder with a clean, oiled paper towel, the towel will be dark with contamination. Repeat this process using a new lightly oiled paper towel each time until the towel remains white. The cylinder is now clean.

8. With the cylinder at room temperature, check the piston clearance in the cylinder in which the piston will run. See 3.24 PISTON, Inspection.

BORING AND HONING CYLINDER

1. Bore cylinder with gaskets and torque plates attached. Refer to Table 3-42. Bore the cylinder to 0.003 in. (0.08 mm) under the desired finished size.

NOTICE

An incorrect cross hatch pattern or too fine a hone will result in insufficient oil retention and possible piston seizure and/or high oil consumption. (00538b)

2. Hone the cylinder to its finished size using a 280 grit rigid hone followed by a 240 grit flexible ball hone. Honing must be done with the torque plates attached. All honing must be done from the bottom (crankcase) end of the cylinder. Work for a 60° crosshatch pattern.
3. Stop frequently to examine the cylinder bore and/or take measurements. Remember, a precise 60° crosshatch pattern in the piston travel area is important.

NOTE

Example: A 0.005 in. (0.13 mm) oversize piston for a Twin Cam 96™ will have the proper running clearance with a cylinder bore size of 3.7550-3.7555 in. (95.377-95.390 mm).

NOTICE

Failure to remove all abrasive particles may result in premature cylinder, piston and ring wear and engine failure. (00537b) .

4. Thoroughly wash the cylinder bore with liquid dishwashing soap and warm water to remove all abrasive particles and residual grit. Continue cleaning until a clean cloth shows no evidence of dirt or debris.
5. Hot rinse the cylinder and dry with moisture free compressed air.
6. Immediately apply a thin film of clean engine oil to a clean white paper towel and thoroughly wipe the inside of the cylinder. This prevents the cylinder bore from rusting.

NOTE

After wiping the cylinder with a clean, oiled paper towel, the towel will be dark with contamination. Repeat this process

using a new lightly oiled paper towel each time until the towel remains white. The cylinder is now clean.

7. With the cylinder at room temperature, check the piston clearance in the cylinder in which the piston will run. See 3.24 PISTON, Inspection.

Table 3-42. Oversize Pistons/Cylinder Bores, Twin Cam 96

PISTON			CYLINDER BORE FINISHED SIZE	
SIZE	IN.	MM	IN.	MM
Standard	N/A	N/A	3.7500-3.7505	95.250-95.263
Oversize	0.005	0.13	3.7550-3.7555	95.377-95.390
	0.010	0.25	3.7600-3.7605	95.504-95.517

Table 3-43. Oversize Pistons and Cylinder Bores, Twin Cam 103™

PISTON		CYLINDER BORE FINISHED SIZE	
TYPE	SIZE	MINIMUM	MAXIMUM
Standard	STD	3.8750 in (98.425 mm)	3.8755 in (98.438 mm)
Oversize	0.005 in (0.13 mm)	3.8800 in (98.552 mm)	3.8805 in (98.565 mm)
	0.010 in (0.25 mm)	3.8850 in (98.679 mm)	3.8855 in (98.692 mm)

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

PISTON 3.24

DISASSEMBLY

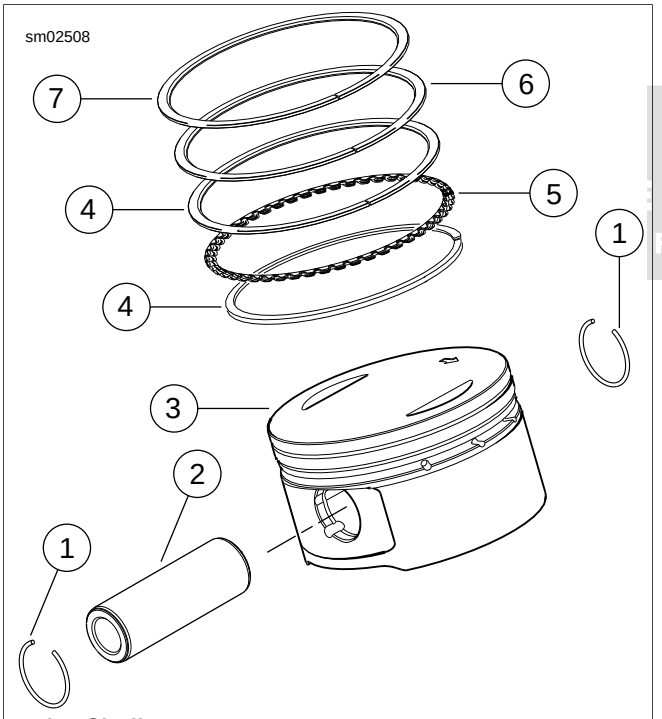
PART NUMBER	TOOL NAME
SNAP-ON PRS8	PISTON RING EXPANDER

Piston Rings

WARNING

Wear safety glasses or goggles when removing or installing compression rings. Compression rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00469c)

1. See Figure 3-62. Carefully remove top (7) and second (6) compression rings using the proper PISTON RING EXPANDER (Part No. Snap-on PRS8).
2. Using your fingers, remove top and bottom oil rails (4) from the third ring groove. Remove the oil rail expansion ring (5).
3. Discard the piston rings.



1. **Circlip**
2. **Piston pin**
3. **Piston**
4. **Oil rail**
5. **Expansion ring**
6. **Second compression ring**
7. **Top compression ring**

Figure 3-62. Piston Assembly

CLEANING

1. Remove all carbon and combustion deposits by soaking the pistons in hot water with dishwashing liquid or a cleaner specifically designed to remove carbon and will not corrode aluminum. Follow the manufacturers instructions when using these cleaners.

NOTE

Do not sand blast or glass bead blast pistons. Bead blasting rounds off ring lands and will result in oil contamination leading to accelerated wear.

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. Thoroughly rinse the pistons. Dry parts with moisture free compressed air.
3. Clean the oil drain holes leading from the oil control ring groove to the underside of the piston crown. Run a small bristle brush through the passageways, but be careful not to damage or enlarge the holes. Do not use a wire brush.
4. Verify that all other oil holes are clean and open.

NOTE

Exercise care to avoid scratching the sides of the piston ring grooves.

5. Thoroughly clean the three piston ring grooves of all carbon deposits. A portion of a compression ring properly ground to a sharp chisel-like edge may be used for this purpose.
6. Using Magnaflux Dye Penetrant, inspect the piston for surface cracks. Pay special attention to the area around the pin bores, ring lands and oil drain holes beneath the piston crown. If no cracks are found, thoroughly wash piston to remove traces of dye.

INSPECTION

1. See Figure 3-63. Check piston pin. Pin must slide without binding.
   a. Lightly oil a good piston pin and insert it into the piston pin bore to feel for the proper interference fit. The pin should slide in and out without binding, but also without pivoting or rocking.
   b. Replace piston and/or pin if clearance exceeds 0.0008 in. (0.02 mm).

NOTE

Pistons with superficial wear marks, minor scratching or mild scoring may continue to be used.

2. Carefully inspect the pistons for damage or excessive wear.
   a. Discard pistons with cracked, worn or bent ring lands.
   b. Check the piston skirt for cracks, gouges, deep scratches or heavy scoring.
   c. Check the piston heads for evidence of burning, etching or melting.
   d. Look for marks or imprints caused by contact with valves.
3. Run your index finger around the edge of the piston crown to feel for dings, nicks or burrs. Lightly file the edge of the crown to remove any defects.

NOTE

Worn ring grooves result in high oil consumption and blow-by of exhaust gases. Blow-by of exhaust gases contaminates the engine oil supply with acids and leaves sludge in the crankcase. It also reduces engine efficiency by weakening the combustion seal necessary for efficient transfer of energy to the piston.

4. See Figure 3-64. Measure piston ring side clearance.
   a. Insert the edge of a **new** ring into the piston ring groove. Insert a feeler gauge between the upper surface of the ring and the ring land.
   b. Since the grooves wear unevenly, repeat this check at several locations around the piston groove circumference.
   c. Discard the piston if the side clearance of either compression ring exceeds 0.0045 in. (0.11 mm).
   d. Discard the piston if the oil control ring side clearance exceeds 0.010 in. (0.25 mm).

NOTES

- *Check the piston clearance in the cylinder in which the piston will run. The torque plates must be installed on the cylinder and it must be deglazed and suitable for continued service.*
- *This inspection is very heat sensitive. Do not check piston running clearance immediately after honing or deglazing cylinder. Even holding the piston in your hand for too long can cause measurements to vary by as much as 0.0002 in. (0.0051 mm). Both piston and cylinder must be at room temperatures before proceeding.*
- *Piston measurement is taken on the bare aluminum to avoid measuring errors. An oval-shaped opening is present on each side of the piston for proper placement of the micrometer. See upper frame of Figure 3-65. The oval openings are too small for a standard flat anvil micrometer which would result in measuring errors. Use a 3-4 inch blade or ball anvil style micrometer, or a 4-5 inch micrometer with spherical ball anvil adapters. See lower frame of Figure 3-65.*

5. See Figure 3-65. Measure running clearance of pistons as follows:
   a. Holding outside micrometer, measure piston skirt diameter across the thrust faces (perpendicular to piston pin bore). Start below the bottom ring land and move micrometer towards bottom of skirt. Micrometer will be loose, then tight, about 0.5 in. (12.7 mm), from bottom and then loose again.
   b. Measure the piston skirt at the tightest spot and then transfer that measurement to dial bore gauge.
   c. Using a grease pencil, mark the top, middle and bottom of the piston ring travel zone in the cylinder bore. Measure at markings in cylinder parallel and perpendicular to crankshaft.
   d. Replace piston and/or cylinder if running clearance exceeds 0.003 in. (0.076 mm).



Figure 3-63. Piston Pin Clearance

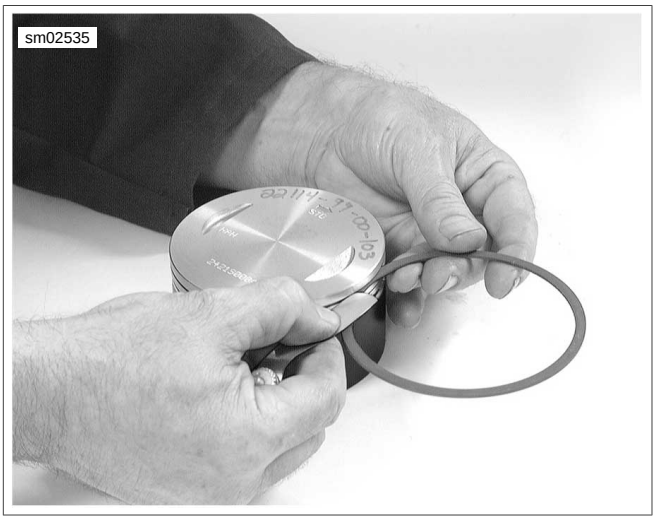
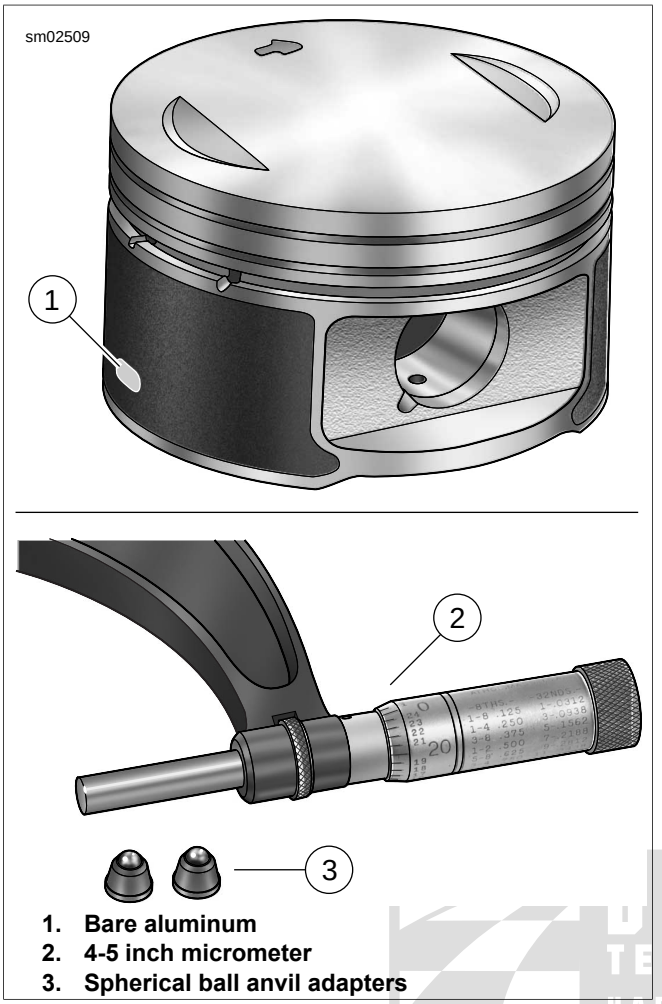


Figure 3-64. Measure Piston Ring Side Clearance



1. **Bare aluminum**
2. **4-5 inch micrometer**
3. **Spherical ball anvil adapters**

Figure 3-65. Measuring Running Clearance of Piston

ASSEMBLY

PART NUMBER	TOOL NAME
SNAP-ON PRS8	PISTON RING EXPANDER

Checking Piston Ring Gap

NOTES

- *Always use **new** piston rings. Piston rings take a definite set and must not be reused if the engine has been operated. Always deglaze (or hone) the cylinder before installing **new** rings. Ring sets are available to fit oversize pistons.*
- *Insufficient ring gap may cause the ends to abut at engine operating temperatures, resulting in ring breakage, cylinder scuffing and/or piston seizure.*
- *Excessive ring gap results in high oil consumption and blow-by of exhaust gases. While blow-by contaminates the oil supply and leaves sludge in the crankcase, it also reduces engine efficiency by weakening the combustion seal necessary for efficient transfer of energy to the piston.*

1. See Figure 3-66. Check ring end gap of each ring before placing on the piston. Insert the **new** ring into the cylinder and square it in the bore using the top of the piston. Measure the ring end gap with a feeler gauge. Refer to Table 3-44.

NOTE

Ring end gap dimensions also apply to oversize rings. Replace ring if end gap exceeds specification. If end gap is under specification, filing is permissible.

⚠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. Use compressed air to remove any dirt or dust that may have settled in the oil drain holes and piston ring grooves.

Table 3-44. Piston Ring End Gap

PISTON		IN.	MM
Twin Cam 96™	Top compression	0.010-0.020	0.254-0.508
	2nd compression	0.014-0.024	0.356-0.610
	Oil control ring	0.010-0.050	0.254-1.27
Twin Cam 103™	Top compression	0.012-0.022	0.305-0.559
	2nd compression	0.015-0.025	0.381-0.635
	Oil control ring	0.010-0.050	0.254-1.270



Figure 3-66. Measuring Ring Gap

Installing Piston Rings

1. See Figure 3-67. Apply clean H-D 20W50 engine oil to three piston ring grooves.
2. Install expansion ring (4) into third ring groove.
3. Spiral bottom oil rail (5) into space below expansion ring (4). Position gap 90 degrees from the gap in the expansion ring.
4. Spiral top oil rail (3) into space above expansion ring (4). Position gap 180 degrees from the gap in the bottom oil rail.

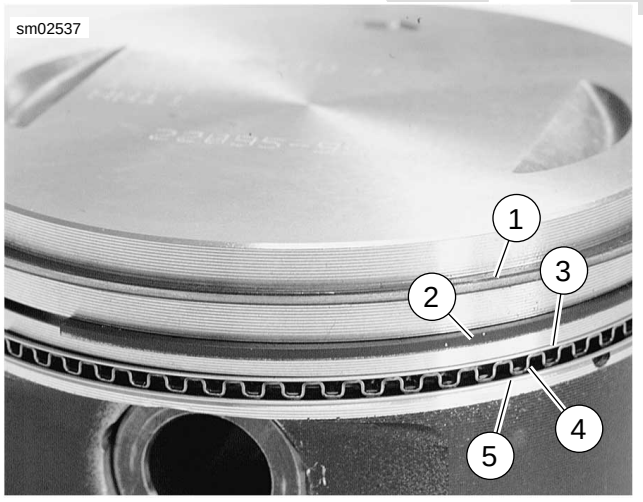
⚠WARNING

Wear safety glasses or goggles when removing or installing compression rings. Compression rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00469c)

NOTES

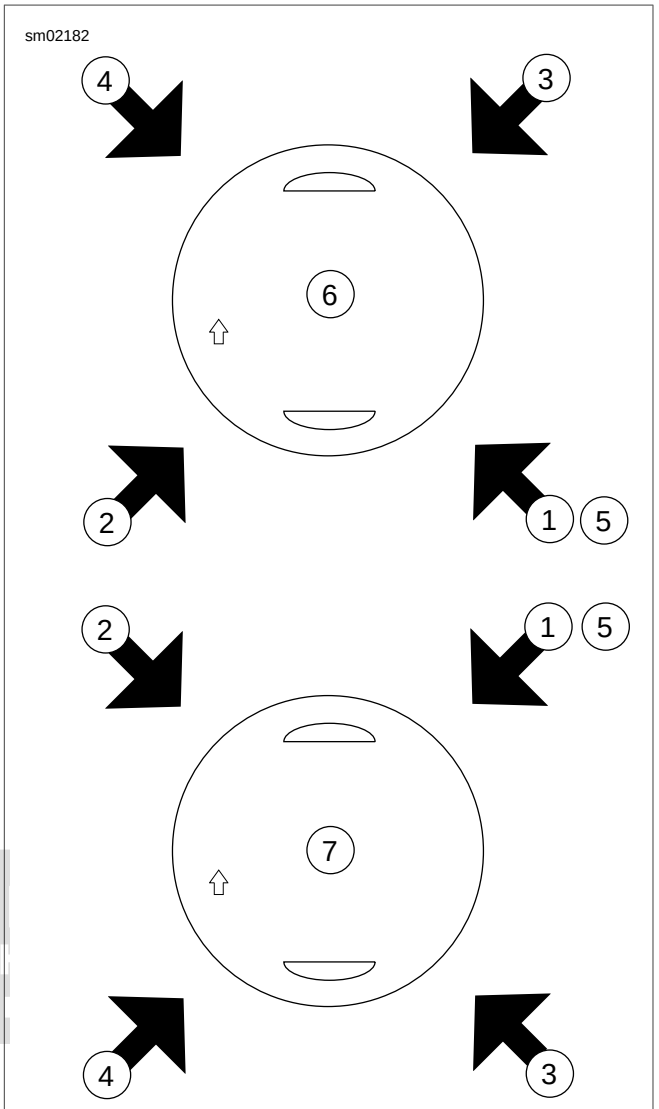
- *Use the proper piston ring spreader to prevent excessive ring twist and expansion. Over expansion may cause the ring to crack opposite the ring gap. Damaged or distorted rings result in blow-by of exhaust gases, increased oil consumption and lower service life on valves and other components.*
- *Installing the second compression ring upside down will cause oil to be scraped up into the combustion chamber resulting in excessive oil consumption and low service life on valves and other components.*

5. Using the proper PISTON RING EXPANDER (Part No. Snap-on PRS8), carefully install the second compression ring. Make sure the dot (punch mark) near the ring gap faces the piston crown. Rotate the ring so the gap is 180 degrees from the gap in the expansion ring.
6. Install the top compression ring. Make sure the dot (punch mark) near the ring gap faces the piston crown. Rotate the ring so the gap is 180 degrees from the gap in the second compression ring.
7. Rotate the three piston rings using the palms of both hands. The rings must rotate freely without sticking.
8. See Figure 3-68. Verify the ring gaps are still properly staggered.



1. **Top compression ring**
2. **Second compression ring**
3. **Top oil rail**
4. **Expansion ring**
5. **Bottom oil rail**

Figure 3-67. Piston Rings



1. **Expander ring**
2. **Bottom oil rail**
3. **Top oil rail**
4. **Second compression ring**
5. **Top compression ring**
6. **Front**
7. **Rear**

Figure 3-68. Piston Ring Gap Alignment

TOP END OVERHAUL: ASSEMBLY 3.25

GENERAL

NOTES

- *It is assumed that each step performed on one cylinder is automatically repeated on the other.*
- *Do not use 2006 and earlier connecting rods with 2007 and later pistons. 2007 and later pistons have a tapered wrist pin boss. The wrist pin portion of the 2007 and later connecting rod is tapered to match the boss on the piston.*

This section provides a sequential process for top end assembly after a complete disassembly. If only a partial disassembly was performed, start where necessary and continue to the end of the section.

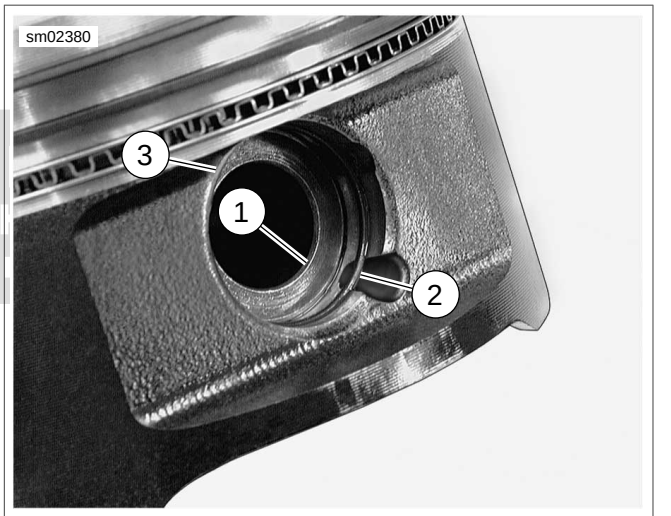
PISTON

PART NUMBER	TOOL NAME
HD-42317-A	PISTON PIN CIRCLIP REMOVER/INSTALLER

1. Slide approximately 6.0 in. (152 mm) of plastic tubing, rubber hose or conduit over each cylinder stud, if removed. Use material with I.D. of 0.5 in. (12.7 mm) to protect cylinder studs and piston from damage.
2. Apply Screamin' Eagle Assembly Lube (Part No. 94971-09) to piston pin, piston bosses and upper connecting rod bore.
3. Remove water pipe insulation from connecting rod shank.
4. See Figure 3-69. Place piston over rod end so that the arrow stamped at the top of the piston points toward the front of the engine.
5. See Figure 3-70. Insert piston pin (1) through pin bore and upper connecting rod bore. Push pin until it contacts circlip installed in opposite pin boss. Verify that end gap (3) for circlip is 180 degrees from opening (2).
6. Place clean shop towels over the cylinder and lifter bores to prevent the piston pin circlip from falling into the crankcase. Verify that the circlip groove is clean and free of dirt and grime.



Figure 3-69. Piston Installation Arrow



1. **Piston pin**
2. **Circlip opening**
3. **End gap location**

Figure 3-70. Preinstalled Circlip

NOTE

Do not reuse piston pin circlips. The circlips could weaken during removal causing them to break or dislodge during engine operation, a condition that will result in engine damage.

7. Install **new** piston pin circlip with the PISTON PIN CIRCLIP REMOVER/INSTALLER (Part No. HD-42317-A).
   a. See Figure 3-71. Slide circlip down nose of tool until it contacts claw. Lightly squeeze handles of tool to capture circlip in claw.
   b. Releasing pressure on handles, rotate circlip so that the end gap is centered at top of tool and then recapture in claw.
   c. Tilt the circlip forward until the end gap contacts nose of tool.
   d. See Figure 3-72. Insert the tool (1) into the piston pin bore until claw is aligned with slot (2) in piston.
   e. Firmly push the tool into the piston pin bore until it bottoms. Release handles and remove tool.
   f. Inspect the circlip to verify that it is fully seated in the groove.

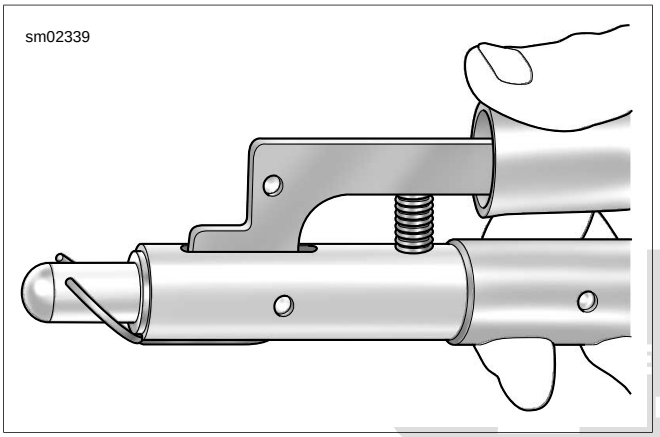
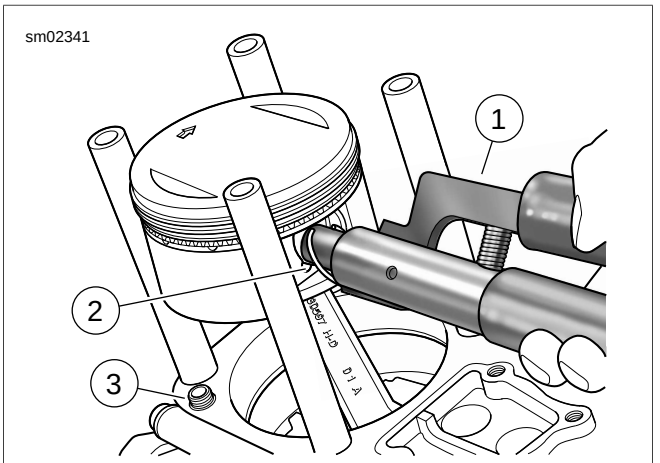


Figure 3-71. Aligning Circlip



1. **Piston pin circlip remover/installer**
2. **Slot**
3. **Cylinder deck dowel (O-ring not shown)**

Figure 3-72. Pin Circlip Remover/Installer (Part No. HD-42317)

CYLINDER

PART NUMBER	TOOL NAME
HD-42322	PISTON SUPPORT PLATE
HD-95952-1	THREADED CYLINDERS
HD-95952-33C	CONNECTING ROD CLAMPING TOOL
HD-96333-51F	PISTON RING COMPRESSOR

NOTE

*O-rings that are missing, distorted, pinched or otherwise damaged will result in either oil leakage or low oil pressure. Use of the wrong O-ring will have the same results. Since many O-rings are similar in size and appearance, always use **new** O-rings, keeping them packaged until use to avoid confusion.*

1. See Figure 3-72. Apply a very thin film of clean H-D 20W50 engine oil to **new** O-rings for both lower cylinder deck dowels. Install and verify that O-ring is properly seated in groove.
2. See Figure 3-73. Apply a very thin film of clean H-D 20W50 engine oil to **new** O-ring seal for the bottom of the cylinder liner. Install **new** O-ring seal.

NOTE

Excessive lubrication of cylinder sleeve O-ring seal will result in oil weepage between cylinder and crankcase as engine is run. This condition may be incorrectly diagnosed as an oil leak.

3. See Figure 3-74. Verify that the piston ring end gaps are staggered. Rotate each ring to position the gap 90 to 180 degrees from the gap in the ring above it. Locate the top piston ring (5) gap towards the intake port.
4. Apply clean H-D 20W50 engine oil to piston, piston rings and cylinder bore.
5. Remove protective covers from cylinder studs. Rotate engine until piston is at top dead center. If necessary, see 3.18 TOP END OVERHAUL: DISASSEMBLY, Rocker Arm Support Plate for three methods of engine rotation.
6. See Figure 3-75. Install the PISTON SUPPORT PLATE (Part No. HD-42322).
   a. Slide both adjustable knobs (2) on support plate (1) down away from forked end. Tighten knobs when contact is made with flats at end of slots.
   b. With the forked end of the tool pointing towards the center of the engine and the adjustable knobs facing downward, capture shank of connecting rod in fork. Lay tool on cylinder deck so that adjustable knobs contact wall of cylinder bore.
   c. Rotate engine until piston skirt is centered and firmly seated on top of support plate.

7. See Figure 3-76. Install cylinder using PISTON RING COMPRESSOR (Part No. HD-96333-51F).
   a. Fit tabs on pliers (1) into slots of ring compressor band (2). The arrow stamped on the band indicates the side that faces up, so disregard the word "bottom". Place band around piston. Press the lever on the right side of the pliers to open the jaws for band expansion.
   b. Orient tool so that the top of the band is positioned between the top compression ring and the piston crown. Tightly squeeze handles of tool to compress piston rings. The ratcheting action of the tool allows release of the handles after the rings are compressed.
   c. With the indent in the cooling fins facing the right side of the engine, gently slide cylinder over the cylinder studs and the piston crown resting it on the top of the ring compressor band.
   d. Place the palms of both hands at the top of the cylinder. Push down on the cylinder with a sharp, quick motion to pass the piston ring area.
   e. Rotate the engine slightly to raise piston off support plate. Remove pliers from band and then remove band from around shank of connecting rod. Remove piston support plate.
8. Remove shop towels from around the crankcase bore exercising caution to keep out any dirt or debris.
9. Carefully set the cylinder over the two dowel pins in the cylinder deck. Push down on the cylinder until it is fully seated in the crankcase bore.

NOTE

See Figure 3-77. To hold the first cylinder in position while installing the second, install THREADED CYLINDERS (Part No. HD-95952-1) from CONNECTING ROD CLAMPING TOOL (Part No. HD-95952-33C) onto cylinder studs with the knurled side down. This will prevent the piston rings from raising the cylinder as the engine is rotated to bring the other piston into position for installation of the second cylinder.

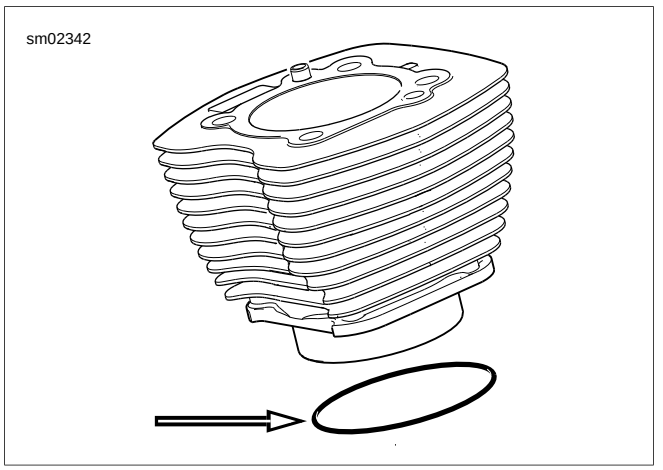
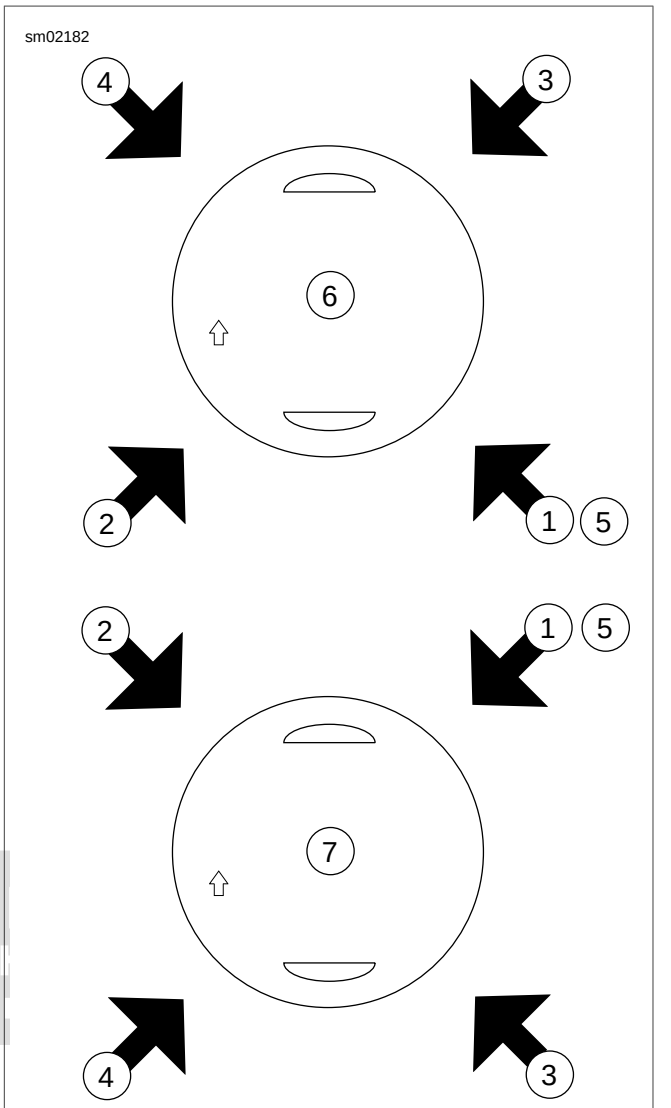
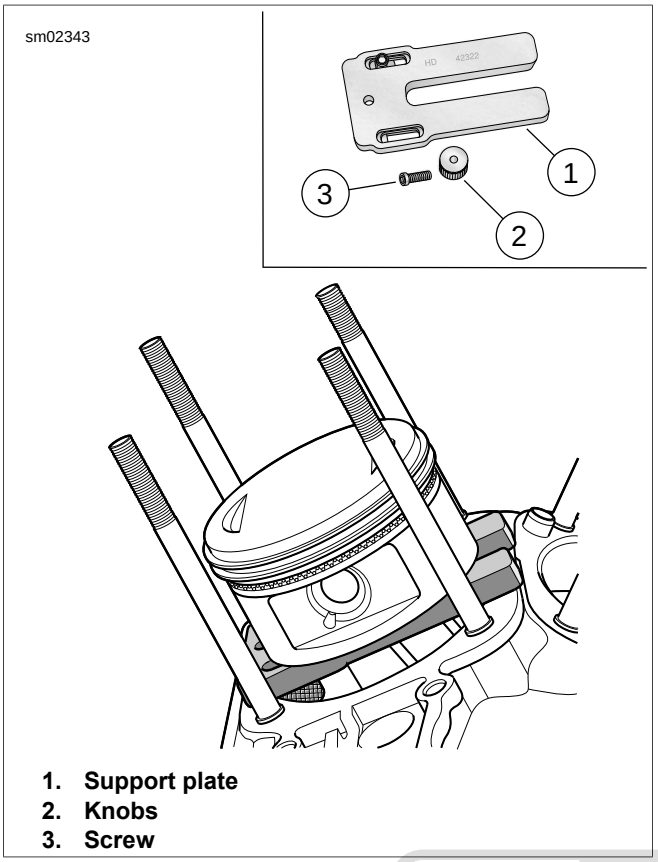


Figure 3-73. O-ring Seal For Cylinder



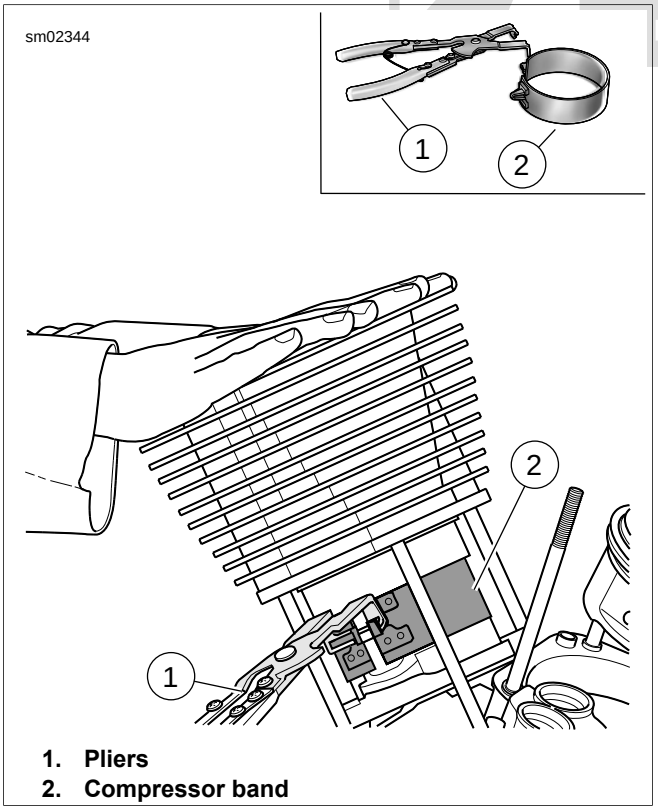
1. **Expander spring**
2. **Bottom oil rail**
3. **Top oil rail**
4. **Second compression ring**
5. **Top compression ring**
6. **Front**
7. **Rear**

Figure 3-74. Piston Ring Alignment



1. **Support plate**
2. **Knobs**
3. **Screw**

Figure 3-75. Piston Support Plate



1. **Pliers**
2. **Compressor band**

Figure 3-76. Piston Ring Compressor

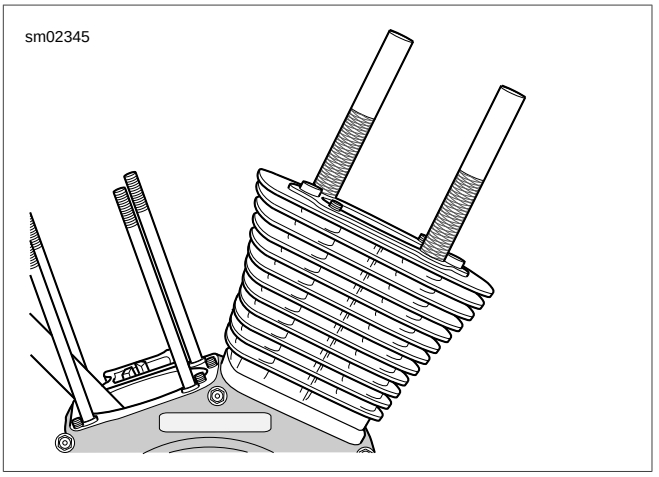


Figure 3-77. Install Threaded Cylinders to Studs

CYLINDER HEAD

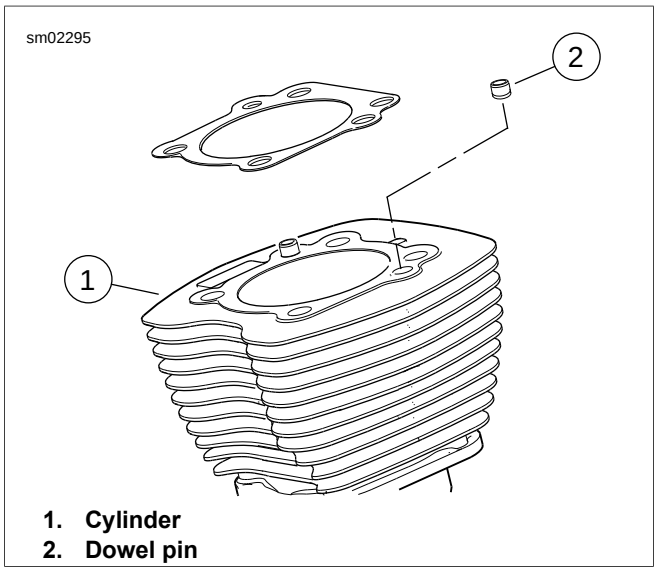
PART NUMBER	TOOL NAME
TA360	SNAP-ON TORQUE ANGLE GAUGE

1. See Figure 3-78. With the part number face up, place the head gasket over the two dowel pins in the upper flange of the cylinder.
2. Note that the word "Front" or "Rear" is cast into the top of the cylinder head to verify proper installation. With the indent in the cooling fins facing the right side of the engine, gently slide cylinder head over the two cylinder flange dowel pins. Lower the cylinder head at an angle that closely approximates the angle of the crankcase to avoid damage to machined surfaces or the dowel pins.

NOTE

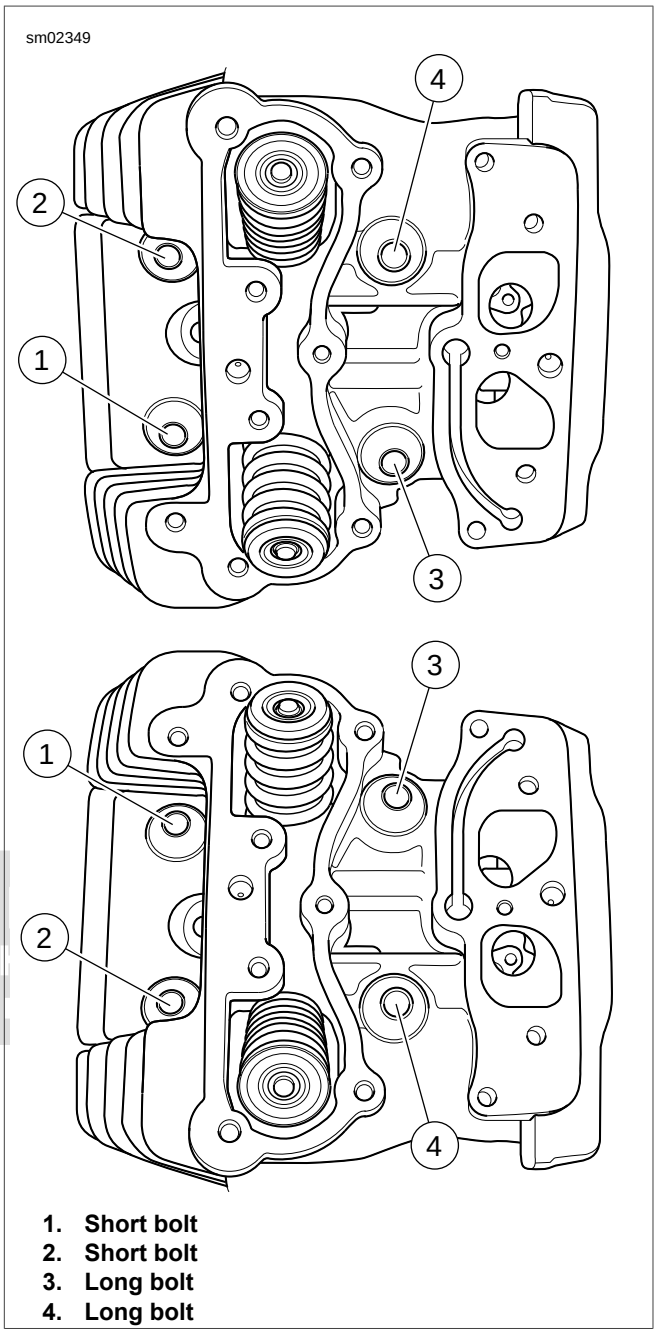
Thoroughly clean and lubricate the threads of the cylinder head bolts before installation. Friction caused by dirt and grime will result in a false torque indication.

3. Lightly coat the threads and bottom face of the cylinder head bolts in clean H-D 20W50 engine oil. Wipe off any excess oil.
4. See Figure 3-79. Loosely install the cylinder head bolts onto the cylinder studs. Place two short bolts on the left side of the engine and two long bolts on the right.



1. Cylinder
2. Dowel pin

Figure 3-78. Cylinder Dowel Pins



1. Short bolt
2. Short bolt
3. Long bolt
4. Long bolt

Figure 3-79. Cylinder Head Bolt Torque Sequence (Top: Front Cylinder Head, Bottom: Rear Cylinder Head)

NOTE

Improperly tightened cylinder head bolts may result in gasket leaks, stud failure and distortion of the cylinder and/or cylinder head.

5. Tighten the four cylinder head bolts.
   a. Following sequence shown, alternately turn each cylinder head bolt until finger tight.
   b. Following the same sequence, tighten the cylinder head bolts to 120-144 **in-lbs** (13.6-16.3 Nm).
   c. Continuing the same sequence, tighten each bolt to 15-17 ft-lbs plus 90 degrees (20.3-23.0 Nm plus 90 degrees).
   d. See Figure 3-80. Using a grease pencil, mark a straight line on the cylinder head bolt continuing the line over onto the cylinder head.
   e. Using the marks as a guide, turn each bolt 1/4 turn or 90 degrees. Be sure to tighten the cylinder head bolts in the sequence shown in Figure 3-79.

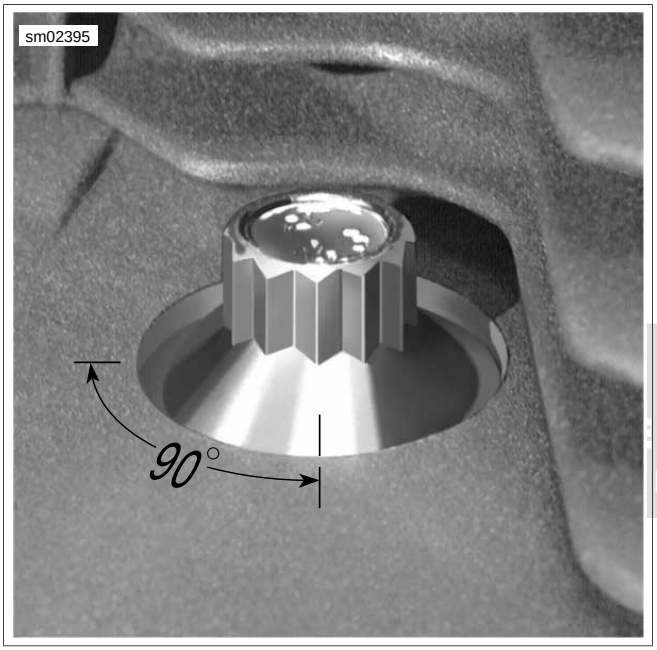


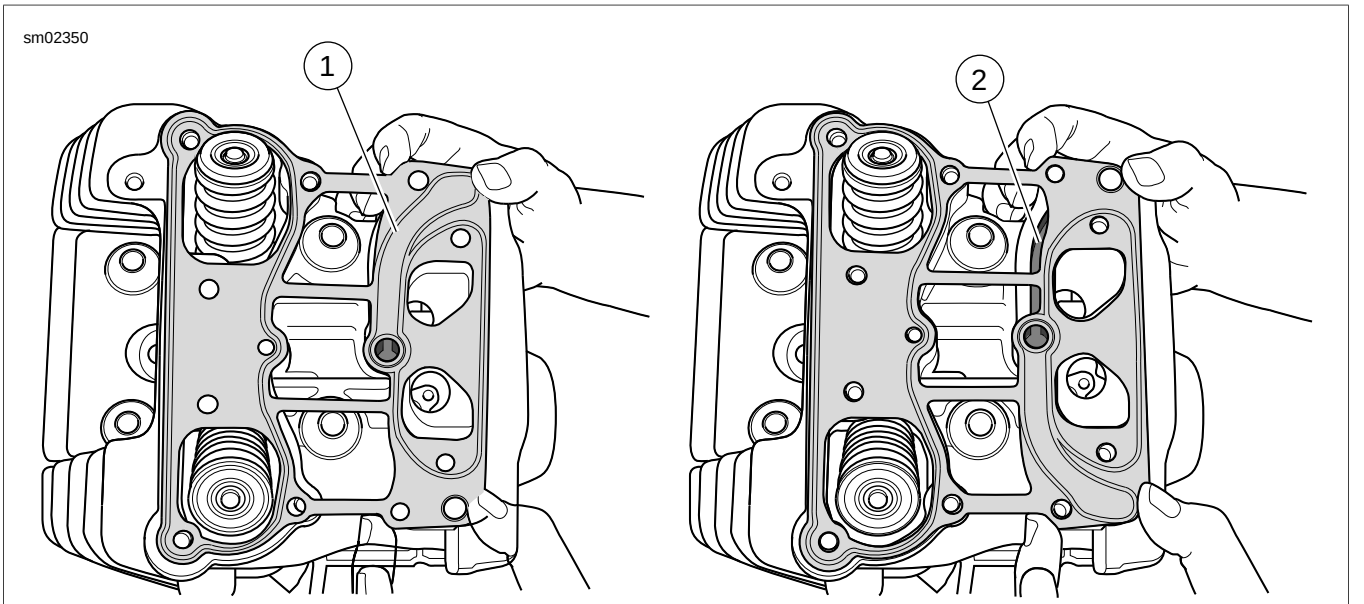
Figure 3-80. Final Tightening for Cylinder Head Bolts

NOTES

- *For best results, use SNAP-ON TORQUE ANGLE GAUGE (Part No. TA360) .*
- *Even though all bolt holes (rocker housing, rocker arm support plate and breather assembly) may appear to be in alignment, the rocker housing gasket may be installed upside down. An upside down gasket will result in an open breather channel causing a major oil leak when the vehicle is started, possibly resulting in engine and/or property damage.*
- *On front cylinder head, install side of gasket marked "front" facing up. On rear cylinder head, install side of gasket marked "rear" facing up.*

6. See Figure 3-81. Install a **new** rocker housing gasket on the cylinder head. Verify that the rocker housing gasket covers the breather channel.

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1. **CORRECT: Breather channel covered**
2. **INCORRECT: Breather channel exposed**

Figure 3-81. Install Rocker Housing Gasket (Rear Cylinder Shown)

7. See Figure 3-83. With the indent (1) facing forward, place the rocker housing into position aligning the holes in the housing with those in the gasket.
8. See Figure 3-82. Apply a small dab of LOCTITE THREADLOCKER 243 (blue) to threads of six rocker housing bolts. Loosely install the rocker housing bolts. Place two long bolts on the left side of the engine and four intermediate bolts in the interior. Alternately tighten the bolts to 120-168 **in-lbs** (13.6-19.0 Nm) in the sequence shown.

NOTES

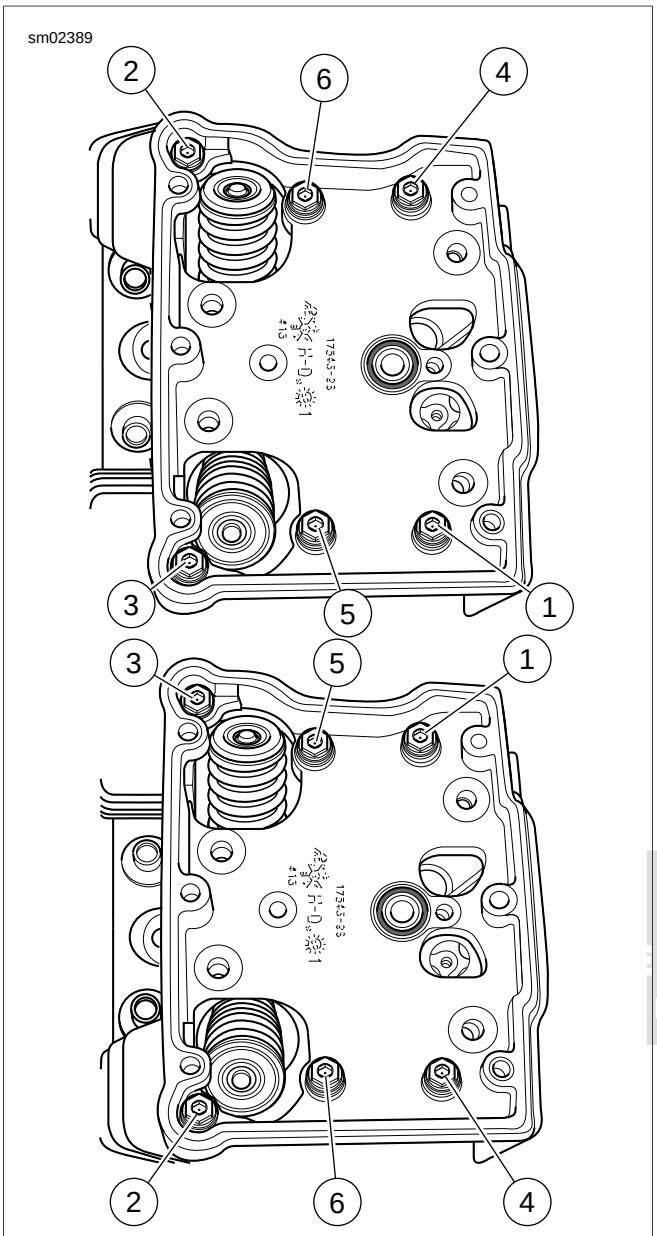
- *If the engine was left in the chassis for service, final tighten the rear left rocker housing bolt (rear cylinder) using a torque wrench with a 1/4 in. drive.*
- *O-rings that are missing, distorted, pinched or otherwise damaged will result in either oil leakage or low oil pressure. Use of the wrong O-ring will have the same results. Since many O-rings are similar in size and appearance, always use **new** O-rings, keeping them packaged until use to avoid confusion.*

9. See Figure 3-83. Apply a very thin film of clean H-D 20W50 engine oil to **new** baffle hole O-ring (2). Install **new** O-ring in groove around breather baffle hole in rocker housing.

NOTE

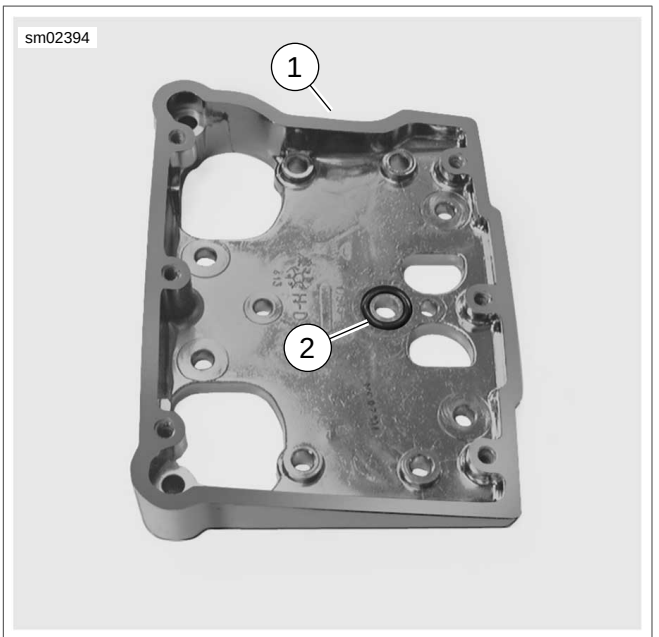
Do not confuse breather baffle hole O-ring (Part No. 11270, large inner diameter) with the top push rod O-ring (Part No. 11293, small inner diameter).

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1. **Short bolt, 1.25 in. (31.8 mm)**
2. **Long bolt, 1.75 in. (44.5 mm)**
3. **Long bolt, 1.75 in. (44.5 mm)**
4. **Short bolt, 1.25 in. (31.8 mm)**
5. **Short bolt, 1.25 in. (31.8 mm)**
6. **Short bolt, 1.25 in. (31.8 mm)**

Figure 3-82. Rocker Housing Torque Sequence and Bolt Size



1. **Indent**
2. **Breather baffle hole O-ring**

Figure 3-83. Rocker Housing Alignment

PUSH RODS, LIFTERS AND COVERS

1. Remove any labels used on the hydraulic lifters. Apply a thin film of Screamin' Eagle Assembly Lube (Part No. 94971-09) to outer surface of each lifter and pour a small amount onto each cam lobe.
2. Install lifters in the crankcase bores with the oil hole on the inboard side and the flats on the lifters facing forward and rearward. To avoid damage, do not drop lifters onto cam lobes.
3. See Figure 3-84. Place the anti-rotational pin (4) on the machined flat between the blocks cast into the crankcase.
4. Install **new** O-rings in the lifter cover bores and the cylinder head push rod cover bores.

NOTE

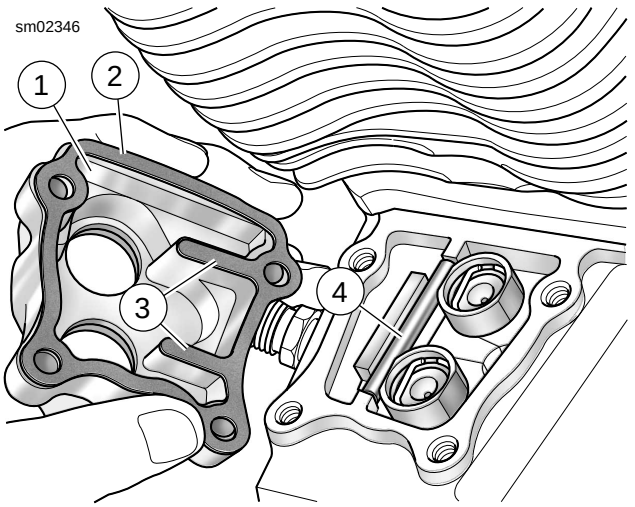
During cover installation, verify that the anti-rotational pin (4) is held in place by the ribs (3) cast into the inboard side of the lifter cover. Movement or loss of the pin can result in lifter rotation causing engine damage.

5. Install the lifter cover (1) and **new** gasket (2). Install four socket head screws. Tighten the lifter cover screws to 90-120 **in-lbs** (10.2-13.6 Nm) in a crosswise pattern.
6. Install push rod covers.
   a. Assemble push rod covers with **new** O-rings.
   b. Hand compress the push rod cover assembly and fit the push rod cover into the lifter cover bore.
   c. Extending the assembly, fit the push rod cover into the cylinder head bore.
   d. Do not install the spring cap retainers at this time.

NOTE

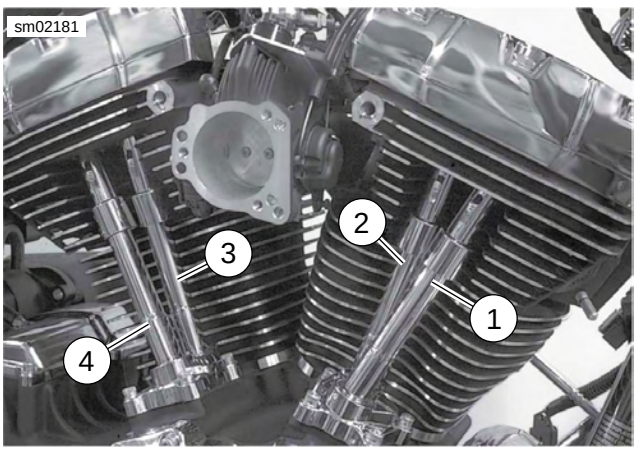
To install spring cap retainers, see 3.25 TOP END OVERHAUL: ASSEMBLY, Rocker Arm Support Plate.

7. Apply a small amount of Screamin' Eagle Assembly Lube (Part No. 94971-09) to the ends of each push rod.
8. See Figure 3-85. Install the push rods. If installing original parts, install them in their original locations and orientation. Be sure to remove any tags that may have been used for identification.



1. **Cover**
2. **Gasket**
3. **Ribs on cover**
4. **Anti-rotational pin**

Figure 3-84. Installing Lifters



1. **Front cylinder exhaust push rod**
2. **Front cylinder intake push rod**
3. **Rear cylinder intake push rod**
4. **Rear cylinder exhaust push rod**

Figure 3-85. Push Rod Locations

ROCKER ARM SUPPORT PLATE

PART NUMBER	TOOL NAME
FRDH161	SNAP-ON "DOG BONE" TORQUE ADAPTER

NOTES

- *Installing the rocker arms and rotating the crankshaft with the valve train loaded can result in bent push rods, damaged bushings or a warped support plate.*
- *Although only the late production breather is shown, installation of the early production parts are identical.*

1. Rotate the crankshaft to position both lifters of the cylinder being serviced on the base circle (or lowest position) of the cam lobe.
2. See Figure 3-86. Place the rocker arm support plate assembly into the rocker housing and loosely install four rocker arm support plate bolts with flat washers.

NOTE

If the engine was left in the chassis for service, final tighten the rocker arm support plate bolt on the rear left side of the rear cylinder using a 3/8 in. drive torque wrench with a 1/2 in. flank drive SNAP-ON "DOG BONE" TORQUE ADAPTER (Part No. FRDH161) or equivalent. Failure to properly use this combination will over-tighten the bolts causing distortion of the rocker housing.

3. Tighten rocker arm support plate bolts.
   a. Following the sequence shown, alternately tighten each of the four rocker arm support plate bolts 1/4 turn at a time until snug.
   b. Following the same sequence, tighten the bolts to 18-22 ft-lbs (24.4-29.8 Nm).
4. Verify that both push rods spin freely.

NOTE

Always service each cylinder separately. After the first cylinder is serviced the crankshaft must be rotated to find the base circle on the second cam.

5. Repeat steps on remaining cylinder.

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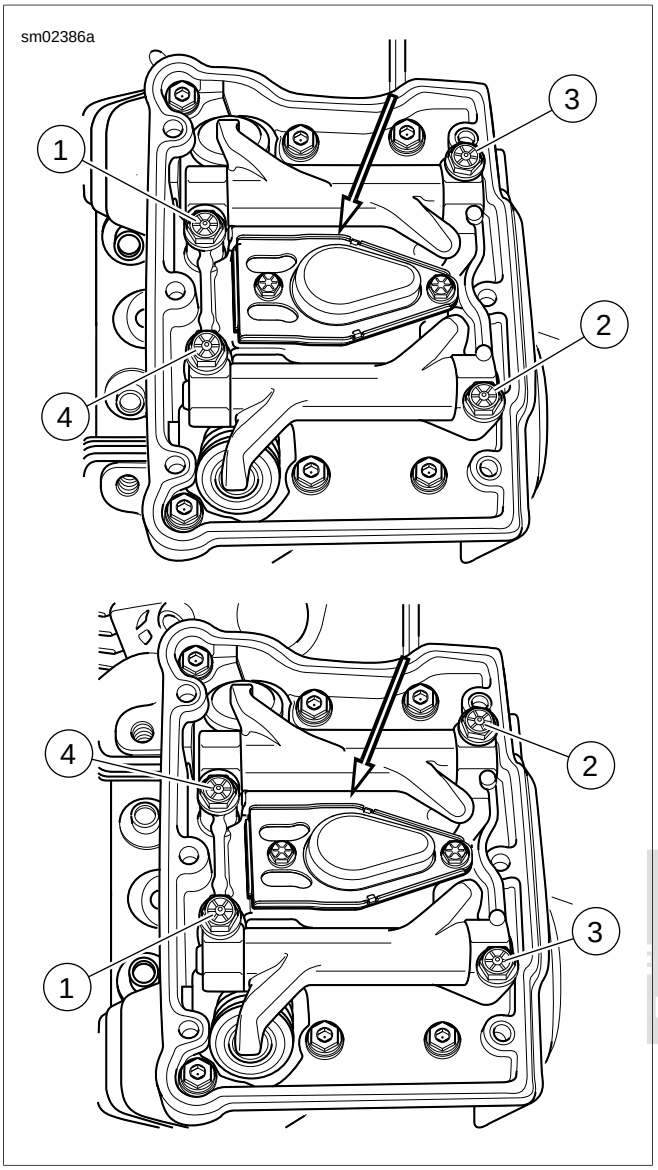


Figure 3-86. Rocker Arm Bolt Sequence (late production shown)

6. Complete installation of the push rod covers.
   a. Verify that the O-ring ends of the upper and lower push rod covers fit snugly into the cylinder head and lifter cover bores.
   b. Insert the upper edge of spring cap retainer into the cylinder head bore leaving the bottom edge free.
   c. Insert blade of small screwdriver between bottom edge of spring cap retainer and top of spring cap.

NOTE

For best results, be sure that screwdriver, spring cap and spring cap retainer are free of grease and oil.

   d. See Figure 3-87. While simultaneously depressing spring cap with tip of screwdriver, use forefinger to slide bottom edge of spring cap retainer down shaft towards tip of screwdriver blade. As spring cap reaches its full length of travel, spring cap retainer should be in approximate position against upper push rod cover.
   e. Verify that spring cap retainer is seated tightly against upper push rod cover.



Figure 3-87. Install Spring Cap Retainers

BREATHER AND ROCKER COVER

PART NUMBER	TOOL NAME
SNAP-ON FRDH141	"DOG BONE" TORQUE ADAPTER

NOTE

For breather assembly service procedures, see 3.19 BREATHER ASSEMBLY.

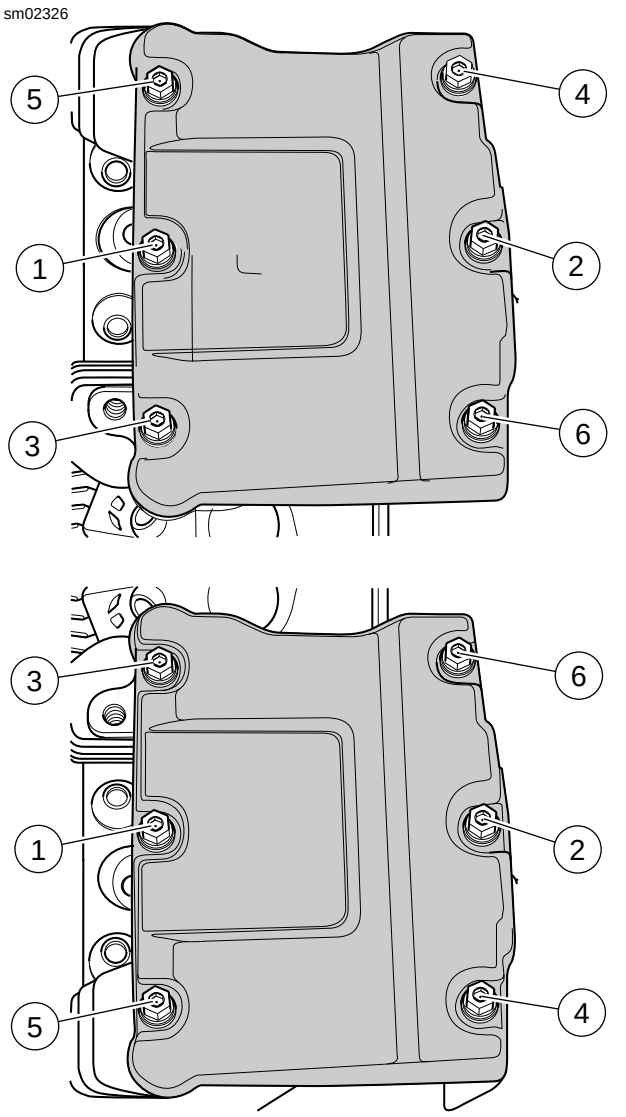
1. To secure breather assembly, tighten two screws to 120-156 **in-lbs** (13.6-17.6 Nm).

NOTE

If the engine was left in the chassis for service, final tighten the three rocker cover bolts on the left side of the rear cylinder using a 3/8 in. drive torque wrench with a 7/16 in. flank drive "DOG BONE" TORQUE ADAPTER (Part No. Snap-on FRDH141). Failure to properly use this combination will over-tighten the bolts causing distortion of the rocker cover.

2. Apply a drop of LOCTITE THREADLOCKER 243 (blue) to threads of rocker cover screws.
3. See Figure 3-88. Install rocker cover and a **new** rocker cover gasket. Tighten screws following the sequence shown to 15-18 ft-lbs (20.3-24.4 Nm).

4. Complete motorcycle assembly.
   a. If engine was left in the chassis for service, see 3.15 ASSEMBLING MOTORCYCLE AFTER SERVICE.
   b. If engine was removed for service, see 3.17 INSTALLING ENGINE IN CHASSIS.



1. **Short bolt, 1.0 in. (25.4 mm)**
2. **Long bolt, 1.75 in. (44.5 mm)**
3. **Short bolt, 1.0 in. (25.4 mm)**
4. **Long bolt, 1.75 in. (44.5 mm)**
5. **Short bolt, 1.0 in. (25.4 mm)**
6. **Long bolt, 1.75 in. (44.5 mm)**

Figure 3-88. Rocker Cover Bolts Torque Sequence

CAM SUPPORT PLATE AND COVER REMOVAL

PART NUMBER	TOOL NAME
93979-10	SCREAMIN' EAGLE MAGNETIC LIFTER HOLDERS
HD-47941	CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL

Prepare Engine

NOTE

The following steps outline removal with the rest of the engine intact. If performing a complete engine overhaul, perform all steps under 3.18 TOP END OVERHAUL: DISASSEMBLY.

1. Remove breather assembly, rocker arm support plate, push rods and push rod covers. Do not remove lifters. See appropriate topics under 3.18 TOP END OVERHAUL: DISASSEMBLY.
2. See Figure 3-90. Support lifters using SCREAMIN' EAGLE MAGNETIC LIFTER HOLDERS (Part No. 93979-10).
3. See Figure 3-89. Remove the socket head screws to release the cam cover. Remove and discard the cam cover gasket.

NOTE

Cam cover screws are 1/4 x 1-1/4 in. while the cam support plate, lifter cover and crankshaft position sensor screws are 1/4 x 1 in. The shorter screws are interchangeable. Use care to keep the two lengths separate to be sure of using the correct length during assembly.

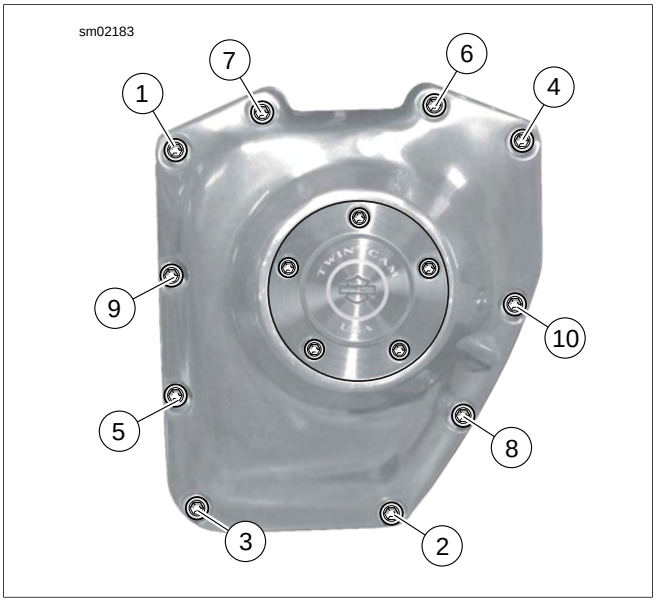


Figure 3-89. Cam Cover Screws

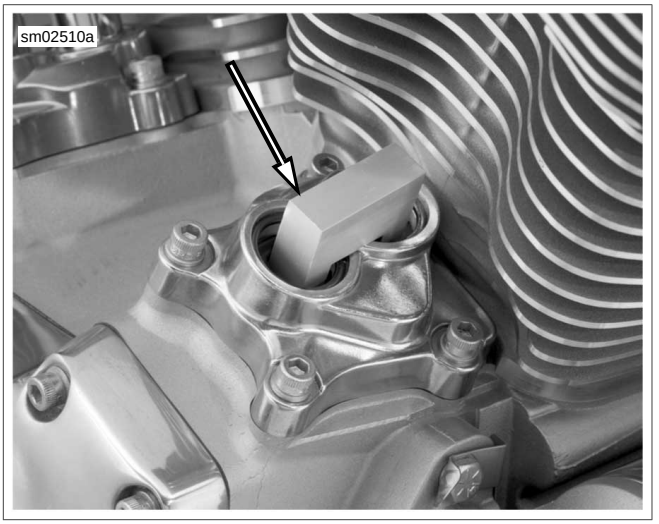


Figure 3-90. Screamin' Eagle Magnetic Lifter Holder

Cam Chain and Sprockets Removal

1. See Figure 3-91. Using a colored marker, mark one of the links (1) of the primary cam chain to identify the visible side. Maintaining the original direction of rotation during assembly may prolong service life.

NOTE

Use a piece of wire in retention hole (6) to keep cam chain tensioner components assembled.

2. Remove primary cam chain tensioner fasteners (4) and primary cam chain tensioner (3).

NOTE

Be sure side of tool labeled "crank side" faces crankshaft sprocket.

3. See Figure 3-92. Install CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL (Part No. HD-47941) between cam sprocket (2) and crank sprocket (5).

⚠WARNING

Be sure to follow manufacturer's instructions when using propane torches. Failure to follow manufacturer's instructions can cause a fire, which could result in death or serious injury. (00465c)

- **Avoid directing heat toward any fuel system component. Extreme heat can cause fuel ignition/explosion resulting in death or serious injury.**
- **Avoid directing heat toward any electrical system component.**

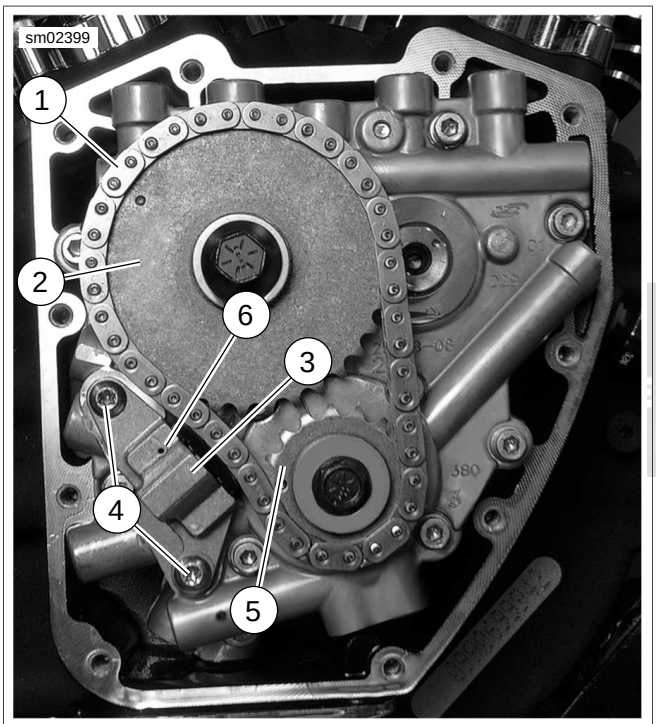
NOTES

- *Only use approved methods for removing rear cam bolt. Other methods of removal, such as the use of a large*

breaker bar, may result in damage to chain drive and other components.

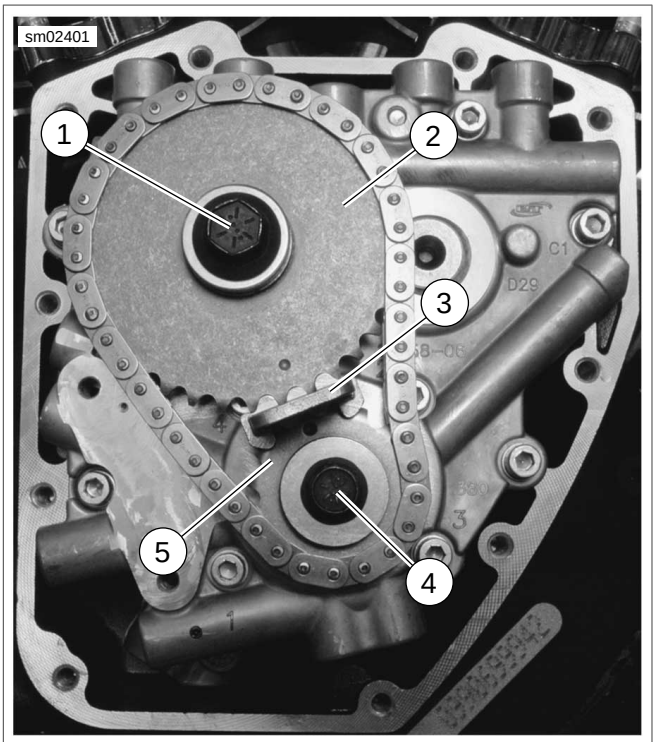
- *If necessary, soften LOCTITE by using heat from a small propane torch. Apply flame evenly around bolt in a circular motion, but do not allow bolt to turn blue.*

4. Remove the rear cam sprocket bolt and flat washer (1) from the rear cam sprocket (2).
5. Remove the crank sprocket bolt and flat washer (4) from the crank sprocket (5).
6. Remove camshaft locking tool.
7. Use a small pry bar between rear cam sprocket and cam support plate to carefully ease off rear cam sprocket until loose on camshaft.
8. Use a small pry bar to ease off crank sprocket. Remove both sprockets and primary cam chain.



1. **Link**
2. **Rear cam sprocket**
3. **Primary cam chain tensioner**
4. **Primary cam chain tensioner fasteners**
5. **Crank sprocket**
6. **Retention hole**

Figure 3-91. Cam Support Plate Assembly



1. **Rear cam sprocket bolt (large) and flat washer**
2. **Rear cam sprocket**
3. **Camshaft locking tool**
4. **Crank sprocket bolt (small) and flat washer**
5. **Crank sprocket**

Figure 3-92. Cam Support Plate Assembly

Cam Support Plate Removal

1. See Figure 3-93. Following the sequence shown, remove four socket head screws.
2. See Figure 3-94. Following the sequence shown, remove six socket head screws to release the cam support plate from the crankcase.
3. See Figure 3-95. Use a small pry bar between the cam support plate and crankcase flange in areas adjacent to the ring dowels (2, 3) to work cam support plate and camshafts from end of crankshaft.

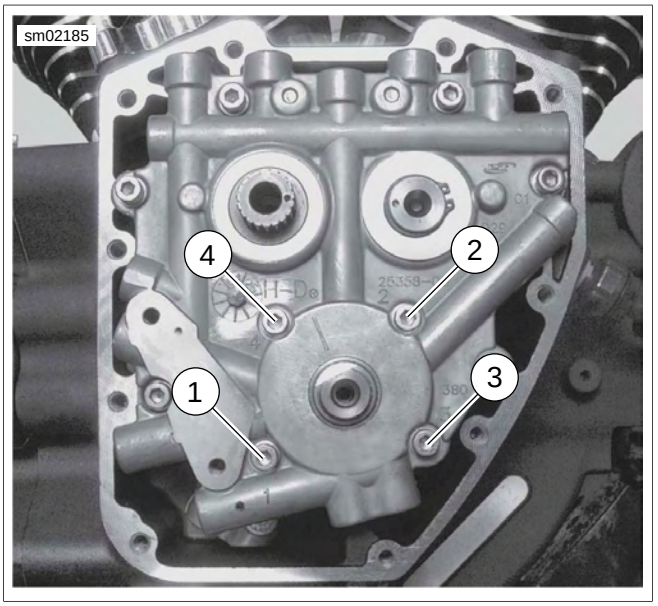


Figure 3-93. Oil Pump Torque Sequence

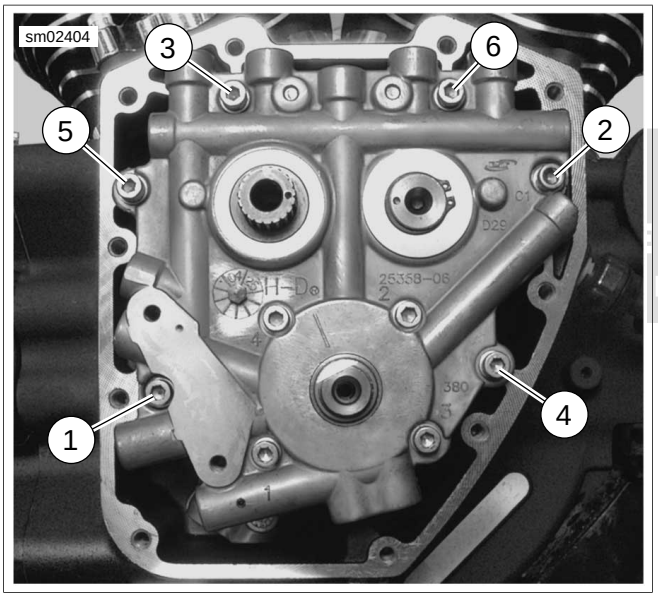
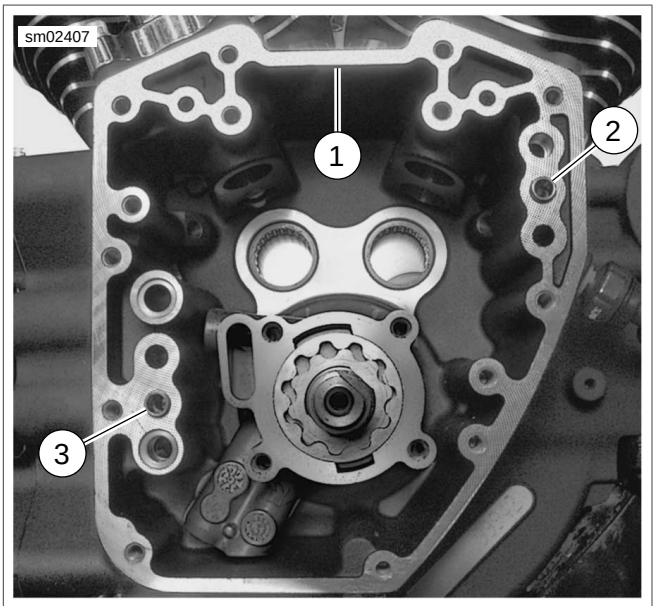


Figure 3-94. Cam Support Plate Torque Sequence



1. **Right crankcase half**
2. **Forward ring dowel**
3. **Rear ring dowel**

Figure 3-95. Ring Dowels

CAM SUPPORT PLATE CLEANING AND INSPECTION

Oil Pressure Valve

Inspect oil pressure valve. See 3.26 CAM COMPARTMENT AND COMPONENTS, Oil Pressure Relief Valve.

Cam Support Plate

1. Measure the diameters of the camshaft bores and crankshaft bore. See 3.3 SERVICE WEAR LIMITS, General.
2. Measure flatness of support plate. See 3.3 SERVICE WEAR LIMITS, General.
3. Inspect gerotor area for excessive wear or deep grooves.
4. Verify that all oil holes are clean and open.

NOTE

Exercise caution to avoid enlarging the oil holes or oil pressure will be adversely affected.

CAMSHAFTS

PART NUMBER	TOOL NAME
HD-47956	CAMSHAFT ASSEMBLY TOOL

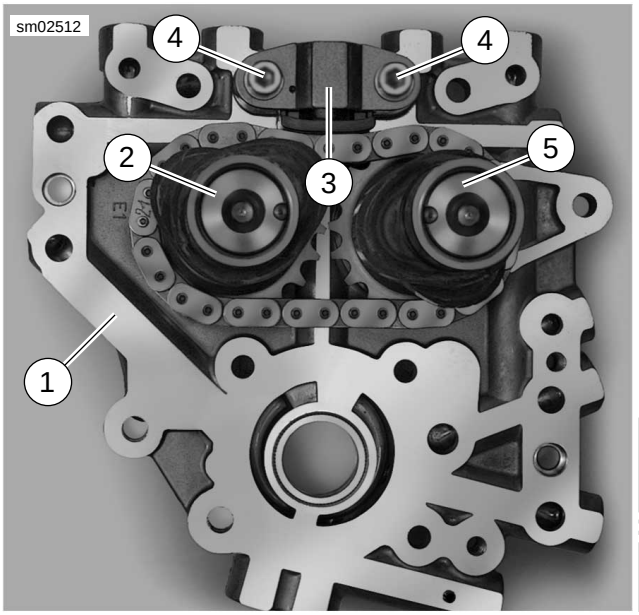
Removal

1. See Figure 3-96. Remove screws (4) and remove secondary cam chain tensioner (3).

⚠WARNING

Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

2. Remove retaining ring securing front camshaft. Discard retaining ring.
3. Remove spacer from front camshaft. Do not mix front and rear camshaft spacers. Front spacer is 0.100 in. (2.54 mm) thick.
4. Using a colored marker, mark one of the links of the secondary cam chain. Maintaining the original direction of rotation during assembly may prolong service life.
5. Slide camshafts and secondary cam chain out of cam support plate.
6. Remove secondary cam chain from cam sprockets.



1. **Cam support plate**
2. **Front cam**
3. **Secondary cam chain tensioner**
4. **Secondary cam chain tensioner fasteners**
5. **Rear cam**

Figure 3-96. Camshafts

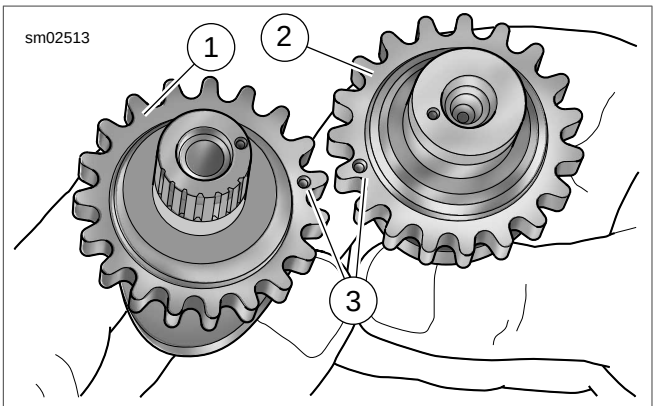
Installation

1. See Figure 3-97. Align timing marks on teeth of secondary cam sprockets.

NOTE

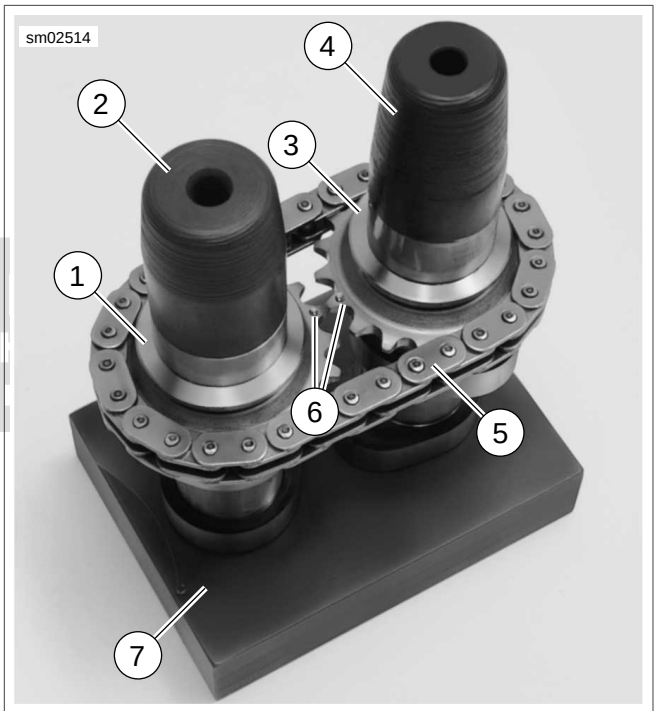
Do not mix camshafts during installation. The rear camshaft, which can be identified by the splined shaft, must go into the hole at the rear of the cam support plate.

2. Place the secondary cam chain around the sprockets of both the front and rear camshafts while keeping the timing marks (3) in alignment. To maintain the original direction of rotation, be sure that the mark placed on the chain link during disassembly is visible during installation.



1. **Rear camshaft**
2. **Front camshaft**
3. **Timing marks**

Figure 3-97. Camshaft Timing Marks



1. **Rear camshaft**
2. **Small guide**
3. **Front camshaft**
4. **Large guide**
5. **Cam chain**
6. **Timing marks**
7. **Assembly tool base**

Figure 3-98. Camshaft Assembly Tool

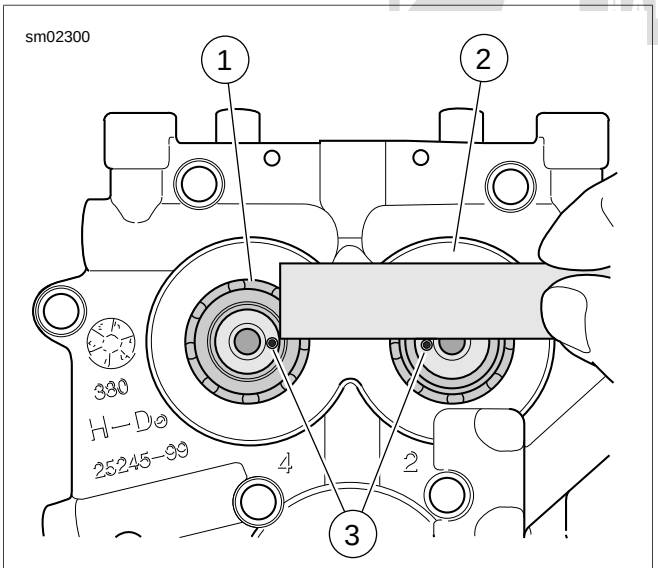
3. See Figure 3-98. Obtain CAMSHAFT ASSEMBLY TOOL (Part No. HD-47956). Place crankcase side of camshaft/cam chain assembly into assembly tool base (7) while maintaining cam timing mark (6) alignment.
4. Place small guide (2) on rear camshaft (1). Place large guide (4) on front camshaft (3).

5. Lubricate support plate camshaft cavities with Screamin' Eagle Assembly Lube (Part No. 94971-09).
6. Install cam support plate over guides.
7. Remove guides and base.
8. See Figure 3-99. Using a straightedge, verify that the timing marks are in alignment. If they are not, then the camshafts must be removed, realigned and reinstalled.
9. Install 0.100 in. (2.54 mm) thick front camshaft spacer over end of front camshaft.

⚠WARNING

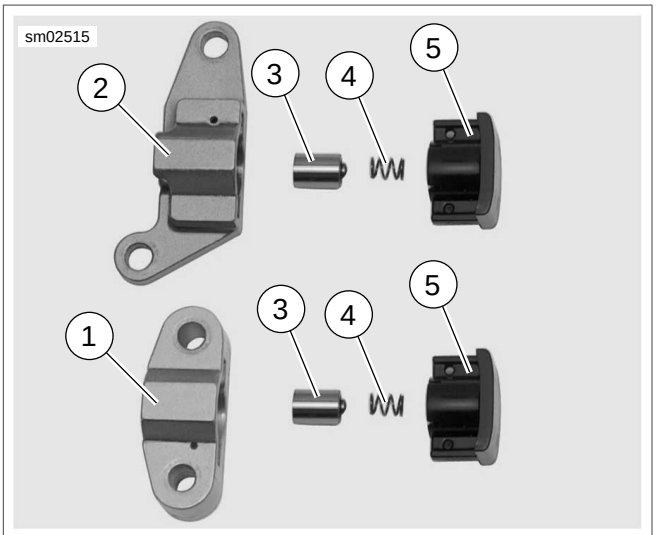
Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

10. With the sharp edge out, install **new** retaining ring in groove at end of front camshaft.
11. Inspect primary and secondary cam chain tensioners.
    a. Inspect tensioners for wear. Replace tensioners if damaged or if chain contact portion of shoe material is less than 0.060 in. (1.52 mm) thick.
    b. See Figure 3-100. Be sure primary and secondary cam chain tensioners are assembled as shown. If assembled incorrectly, tensioners will not function properly.
12. Install secondary cam chain tensioner. Tighten fasteners to 90-120 **in-lbs** (10.2-13.6 Nm).



1. **Rear camshaft**
2. **Front camshaft**
3. **Timing marks**

Figure 3-99. Verify Alignment of Timing Marks



1. **Secondary cam chain tensioner**
2. **Primary cam chain tensioner**
3. **Piston**
4. **Spring**
5. **Shoe**

Figure 3-100. Cam Chain Tensioner Assemblies

OIL PRESSURE RELIEF VALVE

Removal

1. See Figure 3-101. Secure the cam support plate in a vise with soft jaws.
2. With piston in place, insert straight stiff wire into bore until it bottoms in the piston. Mark wire at edge of bore in cam support plate. Remove wire and measure distance from the end to the mark. With piston fully seated in the bore, depth should be approximately 2.25 in. (57.15 mm). If it is less than specified, the piston is not fully seated and a low oil pressure condition will likely be the result.
3. Use a 1/8 in. punch to remove roll pin (1). Discard roll pin.
4. Remove spring (2) and piston (3) from bypass port.

Inspection

NOTE

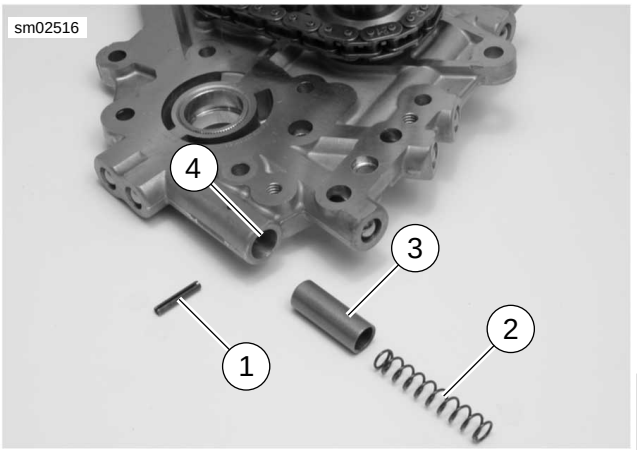
A stretched spring or sticking piston can result in high oil pressure.

1. Inspect spring for stretching, kinks, or distortion.
2. Inspect piston and bore for burrs, scoring or other damage. Look for steel particles or aluminum chips. Replace cam support plate and piston if any of these conditions are found.
3. Measure running clearance of piston in bore. If running clearance exceeds 0.003 in. (0.076 mm), install **new** piston and measure again. Replace cam support plate if running clearance still exceeds specification.

Installation

1. Secure the cam support plate in a vise with soft jaws.

2. See Figure 3-101. Lubricate piston (3) with Screamin' Eagle Assembly Lube (Part No. 94971-09). Slide piston into bypass port of cam support plate with the open side facing outward.
3. Slide spring (2) into bypass port until seated in piston.
4. Start **new** roll pin (1) into hole in cam support plate. Compress spring using the blade of a small screwdriver.
5. Hold spring compressed and tap roll pin into cam support plate until it approaches pin hole on opposite side.
6. Remove screwdriver to release spring. Verify that spring is straight and square in bore.
7. Use a 1/8 in. punch to install roll pin until flush with casting.



1. **Roll pin**
2. **Spring**
3. **Piston**
4. **Bypass port**

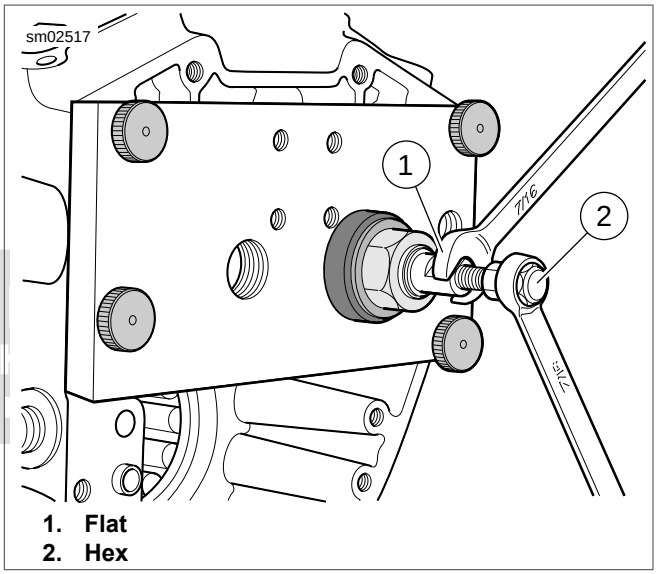
Figure 3-101. Oil Pressure Relief Valve Assembly

CAM NEEDLE BEARINGS

PART NUMBER	TOOL NAME
HD-42325-A	CAMSHAFT NEEDLE BEARING REMOVER/INSTALLER

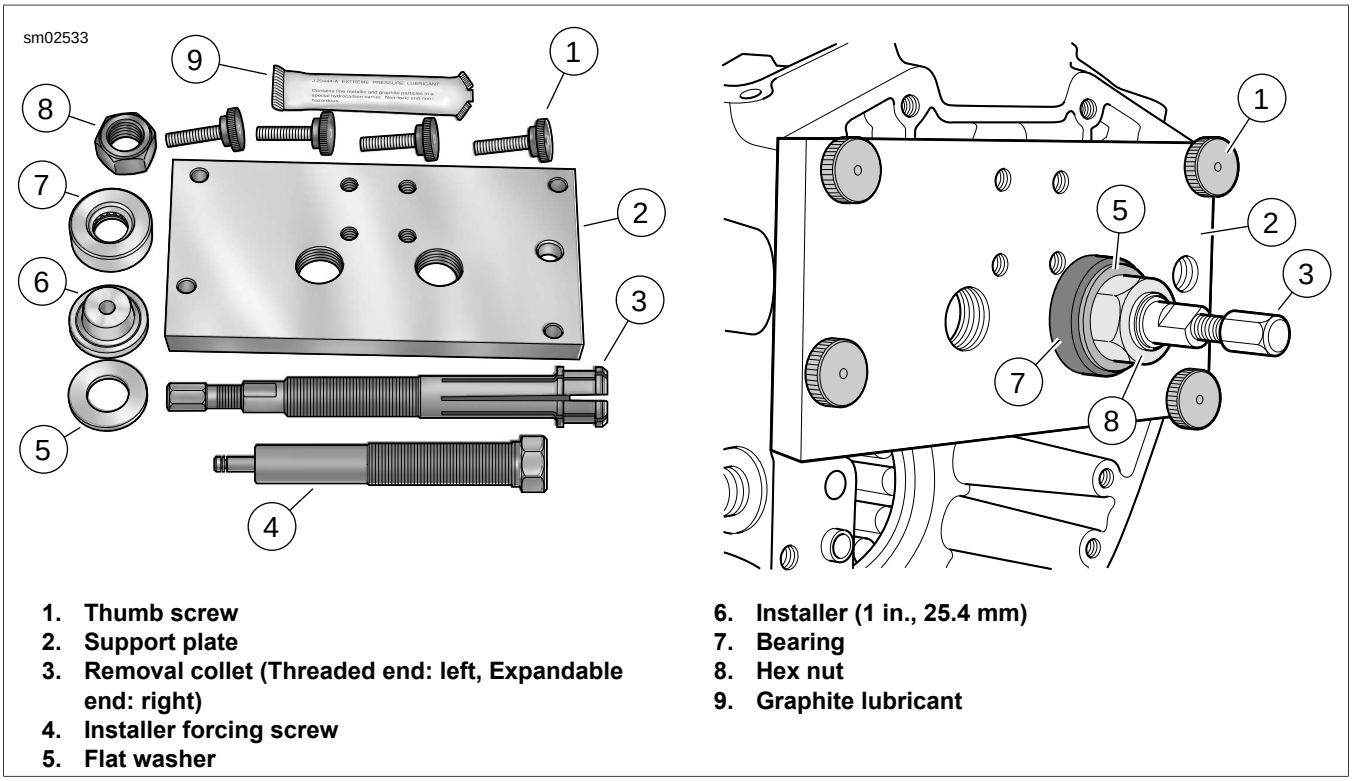
Removal

1. Obtain the CAMSHAFT NEEDLE BEARING REMOVER/INSTALLER (Part No. HD-42325-A).
2. See Figure 3-103. Remove four thumb screws (1) from threaded holes in support plate (2), if installed.
3. Sparingly apply clean engine oil (9) to threads of collet (3) to prolong service life and verify smooth operation.
4. Slide collet through support plate so that threaded end exits stamped side of plate.
5. Aligning two large holes in support plate with needle bearing bores, hang right side of plate on ring dowel in crankcase flange.
6. Install thumb screws to secure support plate to crankcase.
7. Center expandable end of collet in bearing bore and slide bearing (7) and flat washer (5) on threaded end. Start hex nut (8) on threaded end.
8. Push expandable end of collet through bearing bore into flywheel compartment. Feel for inside edge of needle bearing using end of collet and then back off slightly.



1. **Flat**
2. **Hex**

Figure 3-102. Expanding Collet by Turning Hex Clockwise



1. **Thumb screw**
2. **Support plate**
3. **Removal collet (Threaded end: left, Expandable end: right)**
4. **Installer forcing screw**
5. **Flat washer**
6. **Installer (1 in., 25.4 mm)**
7. **Bearing**
8. **Hex nut**
9. **Graphite lubricant**

Figure 3-103. Camshaft Needle Bearing Remover/Installer (Part No. HD-42325-A)

9. Holding collet to prevent lateral movement, finger tighten hex nut until bearing contacts support plate.
10. See Figure 3-107. Hold flat on collet to prevent rotation and expand collet by turning hex at end of shaft clockwise. Expandable end of collet makes contact with needle bearing ID.
11. See Figure 3-102. Turn hex nut clockwise until bearing is free. If necessary, hold flat on collet to prevent rotation.
12. Remove four thumb screws and pull support plate from crankcase.
13. Holding flat on collet, turn hex at end of shaft counterclockwise to close collet. Remove and discard needle bearing.
14. Repeat procedure to remove second needle bearing.

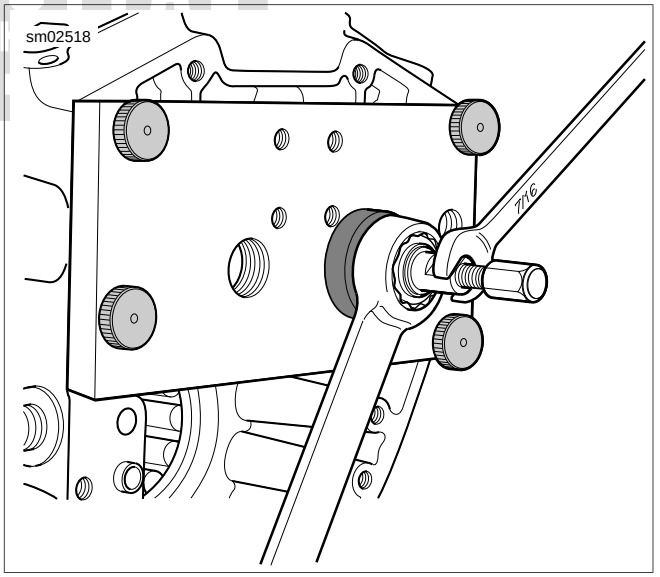


Figure 3-104. Bearing Removal

Installation

1. Obtain the CAMSHAFT NEEDLE BEARING REMOVER/INSTALLER (Part No. HD-42325-A).

NOTE

To avoid engine damage, care must be taken to install needle bearings to the correct depth. The correct depth is achieved only when the edge of the needle bearing is 3.10 in. (78.7 mm) from the cam cover flange.

2. See Figure 3-105. Using a dial caliper, measure thickness of support plate.
3. Determine the required distance from the top of the support plate to the edge of the installed needle bearing by adding support place thickness to 3.10 in. (78.7 mm).

NOTE

For example, if the support plate is 0.50 in. (12.7 mm) thick, then the measurement from the top of the support plate to the edge of the needle bearing should be 3.60 in. (91.4 mm).

4. See Figure 3-103. Sparingly apply clean engine oil to threads of installer forcing screw (4) to prolong service life and verify smooth operation.
5. Thread installer forcing screw into stamped side of support plate (2) until threads begin to emerge from opposite side.
6. Place installer (6) at end of installer forcing screw.
7. Place **new** needle bearing on installer with lettered side facing shoulder of installer.
8. See Figure 3-106. Aligning two large holes in support plate with needle bearing bores, hang right side of plate on ring dowel in crankcase flange.
9. Install thumb screws to secure support plate to crankcase.

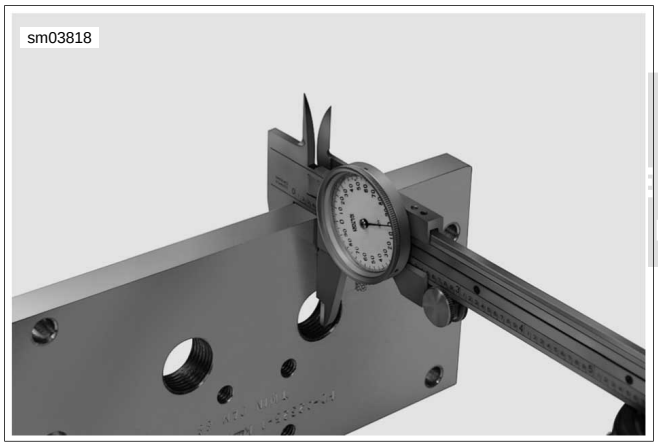


Figure 3-105. Measure Thickness of Support Plate

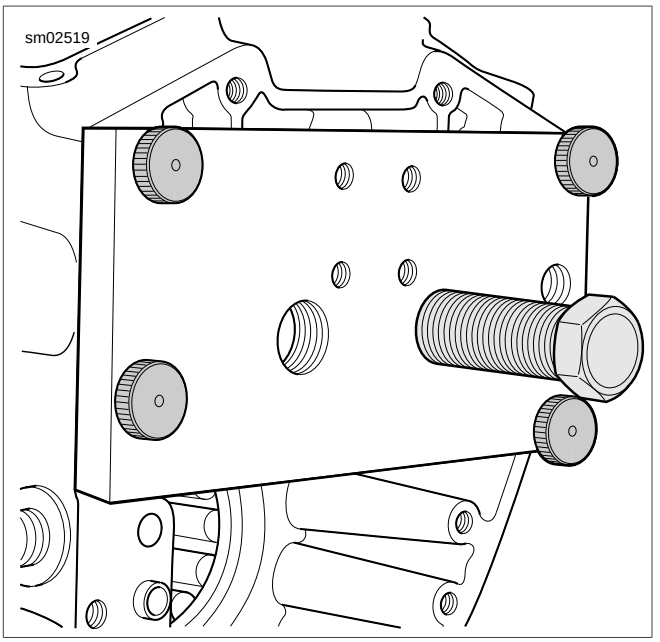


Figure 3-106. Installer Forcing Screw Installation

10. Install first needle bearing as follows:
    a. See Figure 3-107. Turn forcing screw clockwise to press needle bearing into bore.
    b. Back out forcing screw and remove installer. Remove forcing screw from support plate.
    c. See Figure 3-108. Insert dial caliper through forcing screw bore and measure distance from top of support plate to edge of needle bearing.
    d. Repeat steps until bearing is at correct installed depth. Temporarily leave tool in this position.
11. See Figure 3-109. Once the bearing is at correct depth, measure from head (top) of installer forcing screw to support plate. Record this measurement.
12. Remove forcing screw from support plate and install over second needle bearing bore. Place installer at end of forcing screw. Place **new** needle bearing on installer with lettered side facing shoulder of installer.
13. Turn forcing screw until distance from head (top) of forcing screw to support plate equals measurement obtained previously.

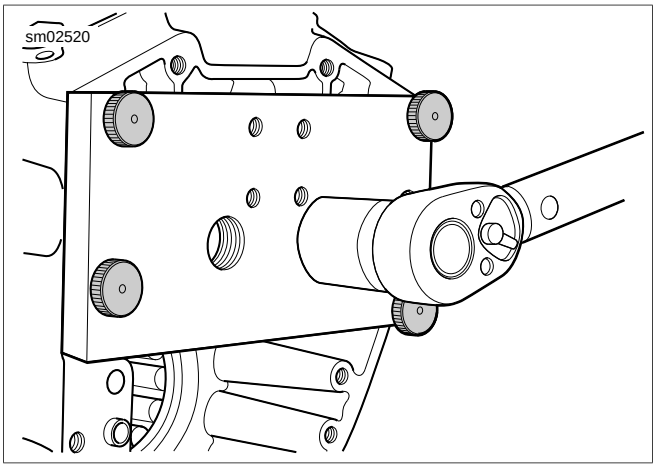


Figure 3-107. Bearing Installation

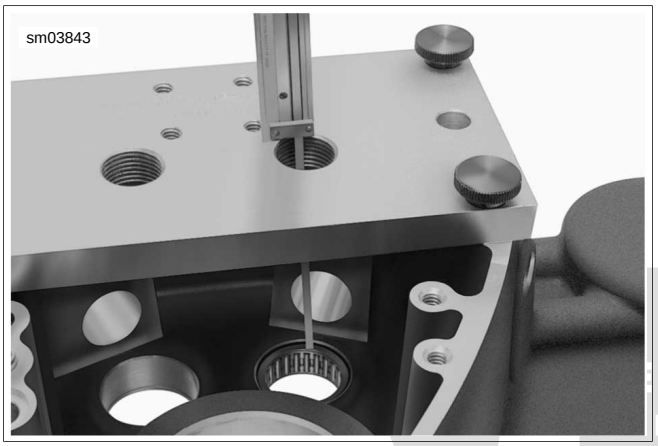


Figure 3-108. Measure from Top of Support Plate to Edge of Needle Bearing

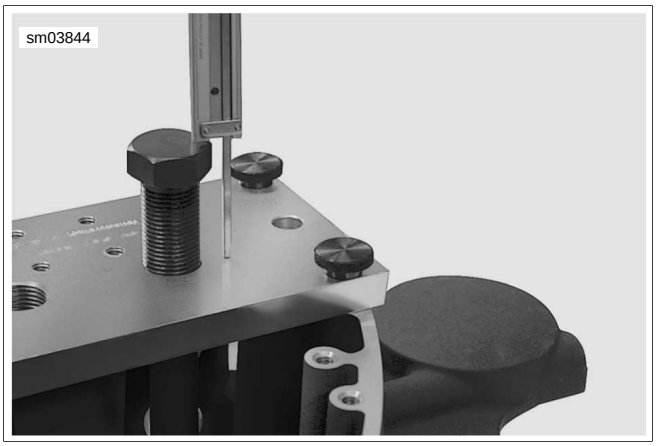


Figure 3-109. Measure from Top of Forcing Screw to Support Plate

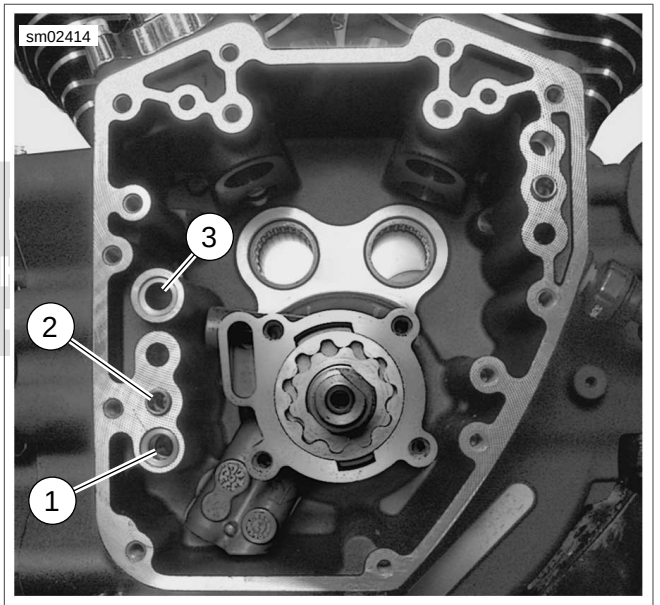
CAM SUPPORT PLATE AND COVER INSTALLATION

PART NUMBER	TOOL NAME
HD-47941	CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL

NOTE

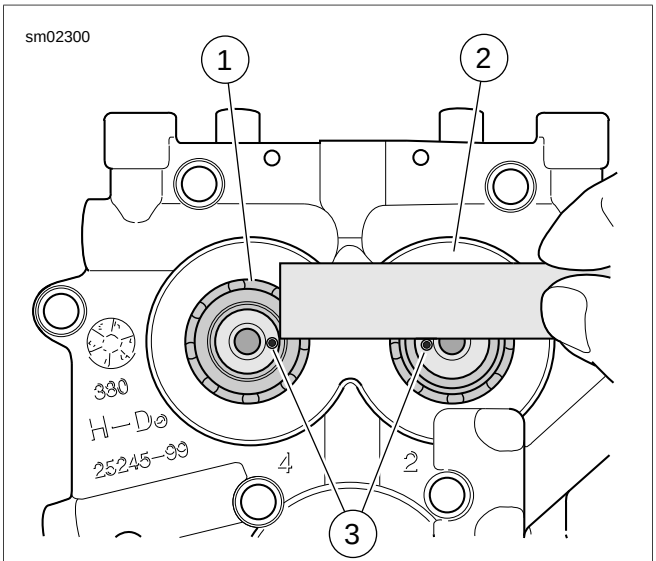
*O-rings that are missing, distorted, pinched or otherwise damaged will result in either oil leakage or low oil pressure. Use of the wrong O-ring will have the same results. Since many O-rings are similar in size and appearance, always use **new** O-rings keeping them packaged until use to avoid confusion.*

1. See Figure 3-110. Apply a very thin film of Screamin' Eagle Assembly Lube (Part No. 94971-09) to **new** O-ring (1) and install in groove around oil feed hole.
2. Lubricate cam needle bearings with Screamin' Eagle Assembly Lube (Part No. 94971-09).
3. See Figure 3-111. Verify that the timing marks on the ends of the front and rear camshafts are in alignment.



1. **Oil feed hole O-ring**
2. **Rear ring dowel**
3. **O-ring on crankcase post**

Figure 3-110. Oil Feed Hole



1. **Rear camshaft**
2. **Front camshaft**
3. **Timing marks**

Figure 3-111. Verify Alignment of Timing Marks

4. Slide cam support plate over crankshaft and onto two ring dowels in crankcase flange. Use a rubber mallet to fully seat cam support plate on ring dowels.

NOTE

Cam cover screws are 1/4 x 1-1/4 in. while the cam support plate, lifter cover and crankshaft position sensor screws are 1/4 x 1 in. The shorter screws are interchangeable. Use care to keep the two lengths separate to be sure of using the correct length during assembly.

5. See Figure 3-112. Install cam support plate screws and tighten to 90-120 **in-lbs** (10.2-13.6 Nm) in the sequence shown.

6. See Figure 3-113. Secure oil pump.
   a. Start four screws to secure oil pump.

   NOTE

   Rotating the crankshaft while tightening screws will allow the oil pump to find its natural center. For methods of crankshaft rotation, see 3.18 TOP END OVERHAUL: DISASSEMBLY, Rocker Arm Support Plate.

   b. While rotating the crankshaft, tighten screws (1 and 2) until snug.

   c. Tighten the screws (3 and 4) until snug.

   NOTE

   Numbers cast adjacent to the bolt holes indicate the oil pump torque sequence.

   d. Tighten all four screws to 40-45 **in-lbs** (4.5-5.1 Nm) in sequence shown.

   e. Final tighten all four screws to 90-120 **in-lbs** (10.2-13.6 Nm) in the sequence shown.

7. With the lettering facing inboard, install rear cam sprocket spacer onto the rear camshaft.

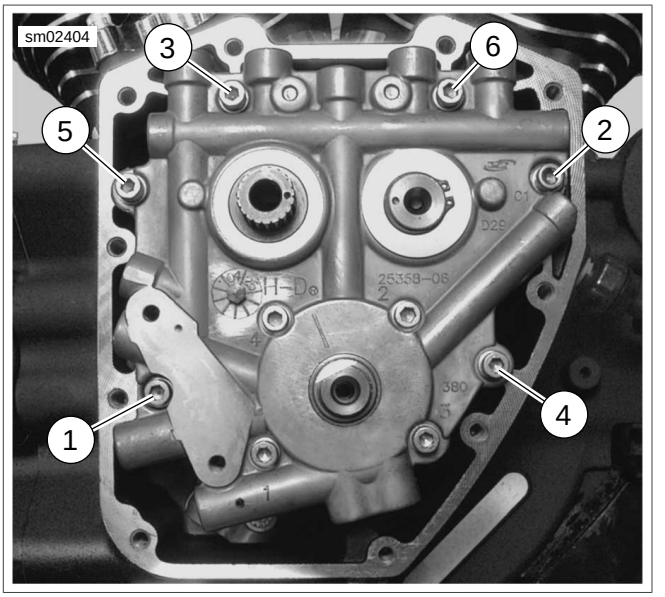


Figure 3-112. Cam Support Plate Torque Sequence

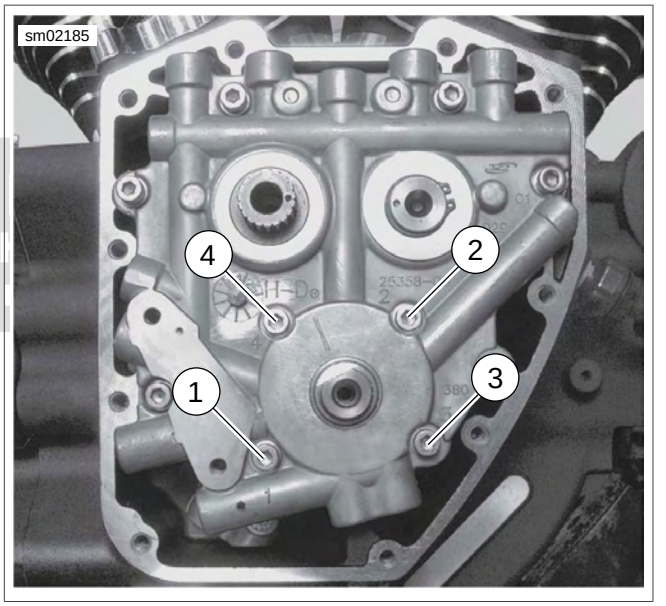


Figure 3-113. Oil Pump Torque Sequence

8. If using the original cam support plate, camshafts, primary cam sprocket, crank sprocket and flywheel assembly,

move to next step. However, if any of these parts have been replaced, then proceed as follows:

a. Install primary cam sprocket without chain using the long flange bolt with thicker flat washer.

b. Install crank sprocket without chain using the short flange bolt and a smaller diameter flat washer from bulk inventory.

c. Position the CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL (Part No. HD-47941) between the crank and primary cam sprockets. Tighten the crank and primary cam sprocket flange bolts to 15 ft-lbs (20.3 Nm). Remove the sprocket locking tool.

d. Rotate engine stand so cam compartment is pointing upward. Push on crankshaft and rear camshaft to eliminate endplay.

e. If engine was not removed from motorcycle, install compensating sprocket assembly to pull the crankshaft to the left side of the engine. Push on crankshaft and rear camshaft to eliminate endplay.

f. See Figure 3-114. Place a straightedge across the sprocket faces. Attempt to insert a 0.010 in. (0.254 mm) feeler gauge between the straightedge and the each sprocket face. If the feeler gauge will not fit at either location, sprocket offset is within specification. Remove both sprockets and discard temporary small washer.

g. If measurement is not within specification, replace the rear cam sprocket spacer using Table 3-45 as a guide.

h. Repeat height inspection with the **new** spacer installed. Remove both sprockets when measurement is within specification and discard temporary small washer.

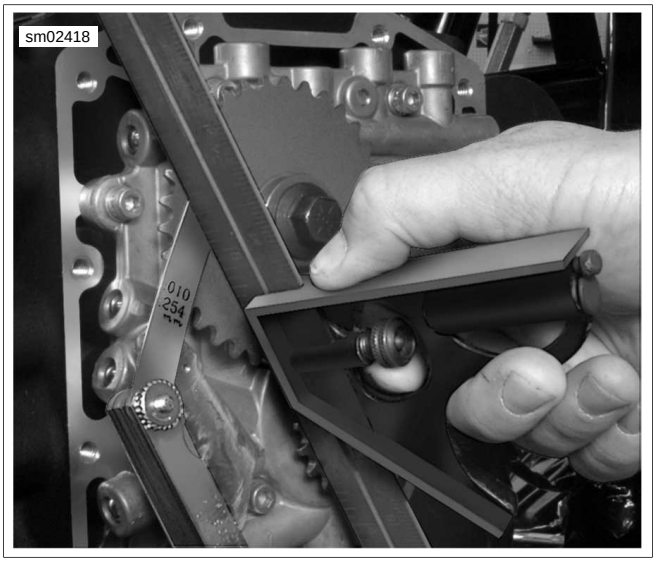


Figure 3-114. Check Alignment of Crank and Rear Cam Sprocket Faces

Table 3-45. Rear Cam Sprocket Spacers

PART NO.	IN.	MM.
25729-06	0.100	2.54
25731-06	0.110	2.79
25734-06	0.120	3.05
25736-06	0.130	3.30
25737-06	0.140	3.56
25738-06	0.150	3.81

9. See Figure 3-115. Apply a light film of Screamin' Eagle Assembly Lube (Part No. 94971-09) to splines on rear cam. Install the primary cam chain and sprocket assembly.
   a. Place both cam sprockets (2, 4) in the primary chain with the timing marks aligned. Verify that the colored mark placed on the chain link (7) is on the same side as the timing marks and is visible during installation.
   b. With the timing marks in alignment, start the rear cam sprocket onto the end of the rear camshaft. Note that the sprocket has an integral key that must be aligned with the keyway in the camshaft.
   c. Maintaining the position of the crank sprocket on the chain, rotate the rear cam sprocket in a clockwise direction until the flat on the crank sprocket is aligned with the flat on the crankshaft. Install the crank sprocket.
10. Rotate the crankshaft clockwise until the timing marks on the sprockets are aligned and also aligned with alignment mark (5) on cam support plate.

NOTES

- *If the timing marks are not in alignment, then the sprockets must be removed and realigned. Misaligned sprockets will make the engine run erratically.*
- *Both crank and rear cam sprocket flange bolts are specially hardened and the flat washers are of a special diameter. Use only genuine Harley-Davidson parts when replacement is necessary. If **new** flange bolts are not available, thoroughly clean both internal and external threads and apply a **small** amount LOCTITE THREADLOCKER 262 (red) before installation. Both sprocket bolts must install freely by hand. The crankshaft and rear cam sprocket flange bolts and flat washers are **not** interchangeable.*

11. Apply a film of oil to bottom of both sprocket bolt heads and washers. Loosely install to secure sprockets.
12. Position the CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL (Part No. HD-47941) between the crank and rear cam sprockets to prevent rotation. The handle

of the tool is stamped "Crank" and "Cam" to verify proper orientation.

a. Tighten both sprocket bolts (1, 3) to 15 ft-lbs (20.3 Nm).

b. Loosen both bolts one revolution (360 degrees).

c. Final tighten the rear cam sprocket bolt (1) to 34 ft-lbs (46.1 Nm).

d. Final tighten the crankshaft sprocket bolt (3) to 24 ft-lbs (32.5 Nm).

e. Remove the sprocket locking tool.

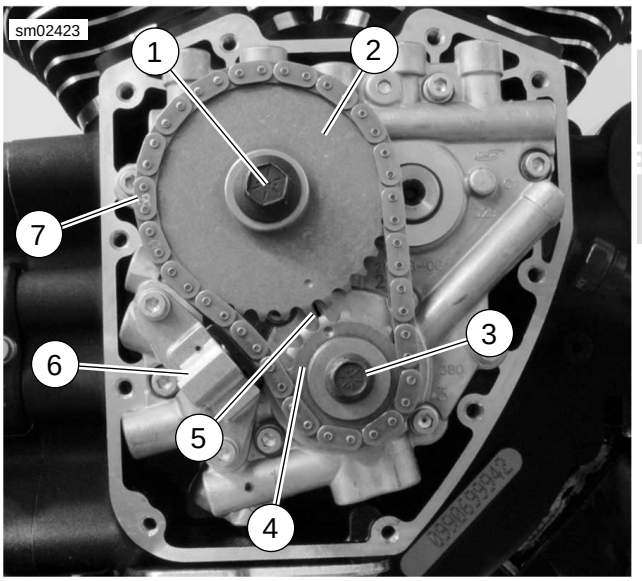
13. Install primary cam chain tensioner. Tighten fasteners to 90-120 **in-lbs** (10.2-13.6 Nm).

14. Apply Screamin' Eagle Assembly Lube (Part No. 94971-09) to both sprockets.

NOTE

Before installing cam cover, verify cleanliness of blind holes in the crankcase flange. Tightening a screw with dirt, water or oil in the hole can cause the casting to crack or break. Damage to the casting requires replacement of the right crankcase half.

15. See Figure 3-116. Install cam cover and **new** cam cover gasket.



1. **Rear cam sprocket bolt (large) and flat washer**
2. **Rear cam sprocket**
3. **Crank sprocket bolt (small) and flat washer**
4. **Crank sprocket**
5. **Alignment mark on support plate**
6. **Primary chain tensioner**
7. **Marked link**

Figure 3-115. Primary Chain and Sprockets

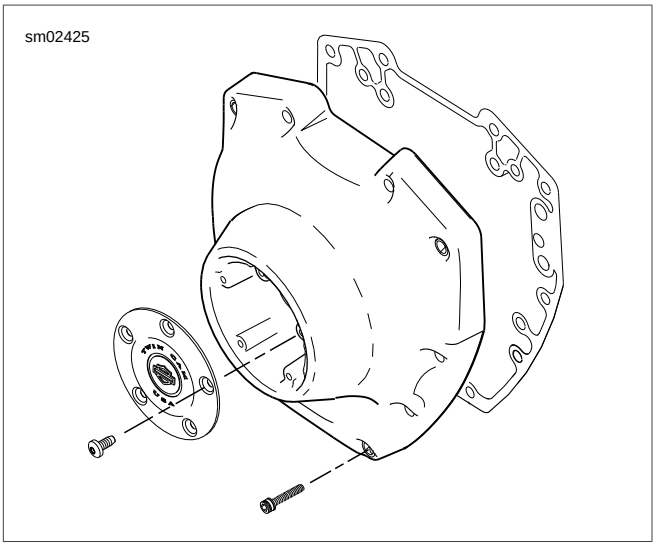


Figure 3-116. Cam Cover Gasket

16. See Figure 3-117. Secure cover with socket head screws. Following the sequence shown, tighten the screws to 90-120 **in-lbs** (10.2-13.6 Nm).

17. Complete motorcycle assembly.

a. If engine was completely overhauled, see 3.25 TOP END OVERHAUL: ASSEMBLY. Perform all steps.

b. If only cam compartment components were serviced, install push rod covers, push rods, rocker arm support plate and breather assembly. See appropriate topics under 3.25 TOP END OVERHAUL: ASSEMBLY.

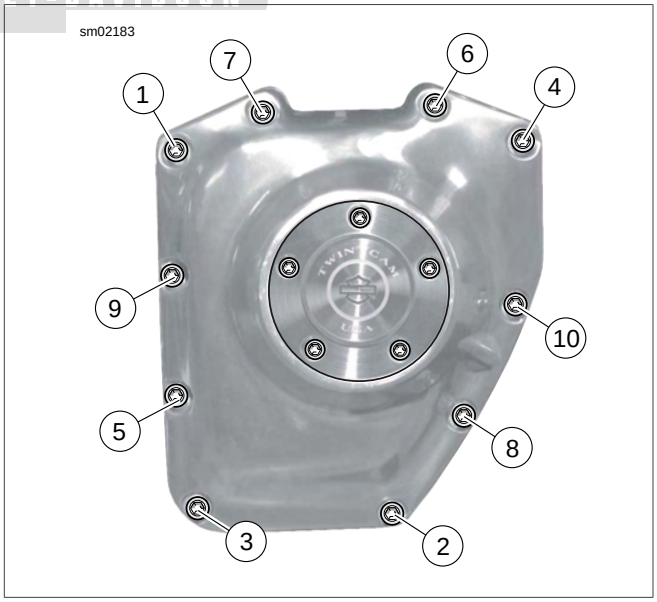
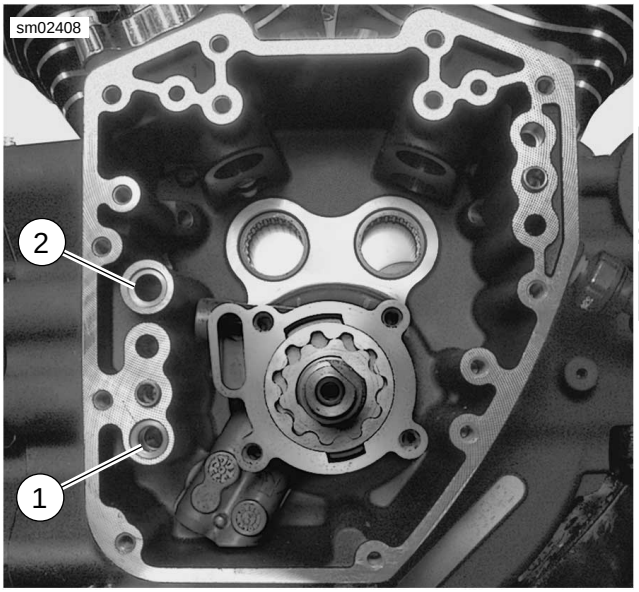


Figure 3-117. Cam Cover Screws

OIL PUMP 3.27

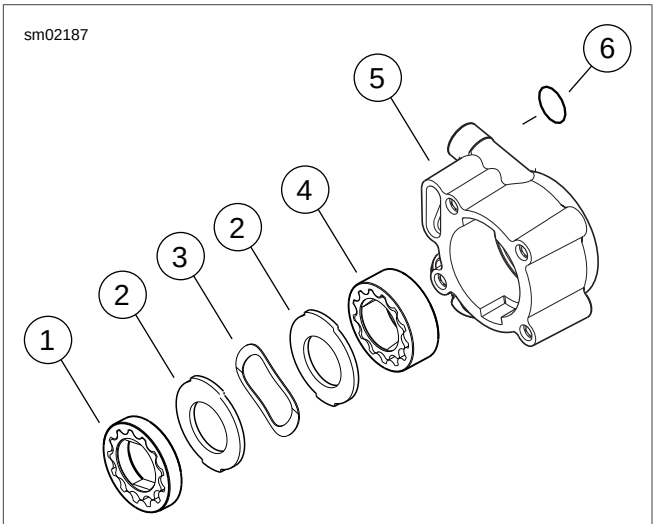
REMOVAL

1. See 3.18 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.
   d. Support hydraulic lifters from dropping into the cam compartment using fabricated tool. See 3.26 CAM COMPARTMENT AND COMPONENTS.
2. Remove cover and cam support plate. See 3.26 CAM COMPARTMENT AND COMPONENTS.
3. Carefully remove oil pump assembly from crankshaft.
4. See Figure 3-118. Remove and discard O-rings (1, 2).
5. See Figure 3-119. Disassemble and inspect oil pump components.



1. Oil feed hole O-ring
2. O-ring on crankcase post

Figure 3-118. Oil Pump O-rings



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 3-119. Assembling Oil Pump

CLEANING AND INSPECTION

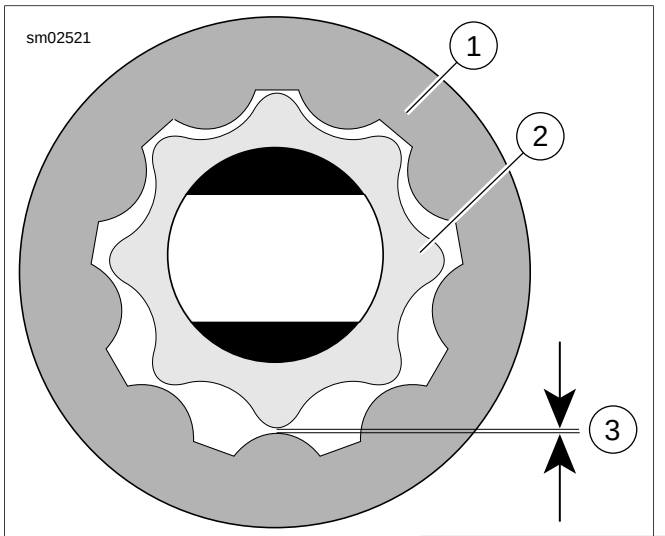
1. Clean all parts in a non-volatile cleaning solution or solvent.

⚠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. Dry parts using low pressure compressed air. Verify that all oil passages are clean and open.
3. Inspect for scoring, gouging or cracking caused by foreign material.
4. Inspect for grooves or scratches on the cam support plate.
5. Check for excessive wear or damage on lobes of outer and inner gerotor gears.
6. See Figure 3-120. 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 and compare thickness of each rotor in both gerotor sets. Replace the gerotor set if the difference exceeds 0.001 in. (0.025 mm).
8. See Figure 3-121. 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**

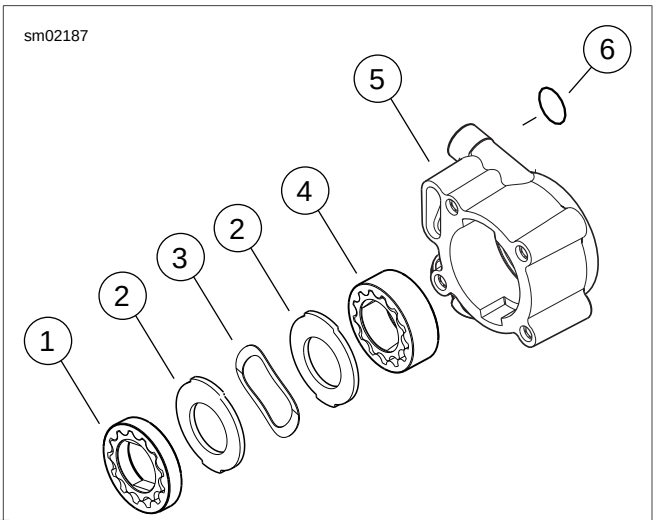
Figure 3-120. Measure Gerotor Sets for Wear

INSTALLATION

NOTES

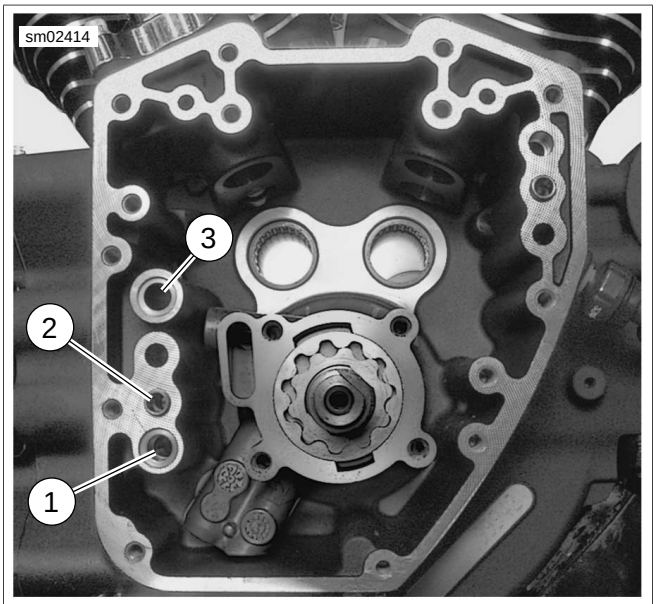
- *O-rings that are missing, distorted, pinched or otherwise damaged will result in either oil leakage or low oil pressure. Use of the wrong O-ring will have the same results. Since many O-rings are similar in size and appearance, always use **new** O-rings keeping them packaged until use to avoid confusion.*
- *Lubricate parts with Screamin' Eagle Assembly Lube (Part No. 94971-09) during assembly.*

1. See Figure 3-121. Apply a very thin film of Screamin' Eagle Assembly Lube (Part No. 94971-09) to **new** scavenge port stub O-ring (6) and install on scavenge port stub of oil pump housing.
2. Slide oil pump housing (5) onto crankshaft while fitting O-ring on scavenge port stub into crankcase bore. Firmly push on scavenge port stub with thumb to be sure that it is snug in bore. Inspect O-ring to verify that it is not pinched or distorted.
3. Assemble the wide gerotor set (4) and install on the crankshaft until it bottoms in the oil pump housing.
4. Install inside separator plate (2) on the crankshaft until it contacts the wide gerotor set (4). Install wave washer (3) and outside separator plate (2).
5. Assemble the narrow gerotor set (1) and install on the crankshaft until it contacts the outside separator plate (2).
6. See Figure 3-122. Apply a very thin film of Screamin' Eagle Assembly Lube (Part No. 94971-09) to **new** O-ring (3) for crankcase post. Install **new** O-ring in groove on crankcase post.
7. Complete engine assembly. See 3.26 CAM COMPARTMENT AND COMPONENTS and 3.25 TOP END OVERHAUL: ASSEMBLY.



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 3-121. Assembling Oil Pump



1. Oil feed hole O-ring
2. Rear ring dowel
3. O-ring on crankcase post

Figure 3-122. Oil Feed Hole

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

CRANKCASE DISASSEMBLY AND REPAIR 3.28

CRANKCASE DISASSEMBLY

1. Remove oil pump from crankshaft.

NOTE

Do NOT rotate left crankcase half in the engine stand so the flywheel sprocket shaft is facing up. The flywheel assembly will fall out of the case.

2. Rotate crankcase in the engine stand so that the cam cover flange is facing straight upward.
3. See Figure 3-123. Remove the nine crankcase bolts in the sequence shown.

NOTE

Never move or lift the crankcase by grasping the cylinder studs. The crankcase is too heavy to be carried in this manner and may be dropped.

4. Separate case halves. Lift right crankcase half off end of crankshaft.
5. See Figure 3-124. Remove two dowel pins in split line face of right case half.
6. Remove flywheel assembly from the crankcase. Inspect crankshaft/flywheel assembly. See 3.29 FLYWHEEL AND CONNECTING RODS.

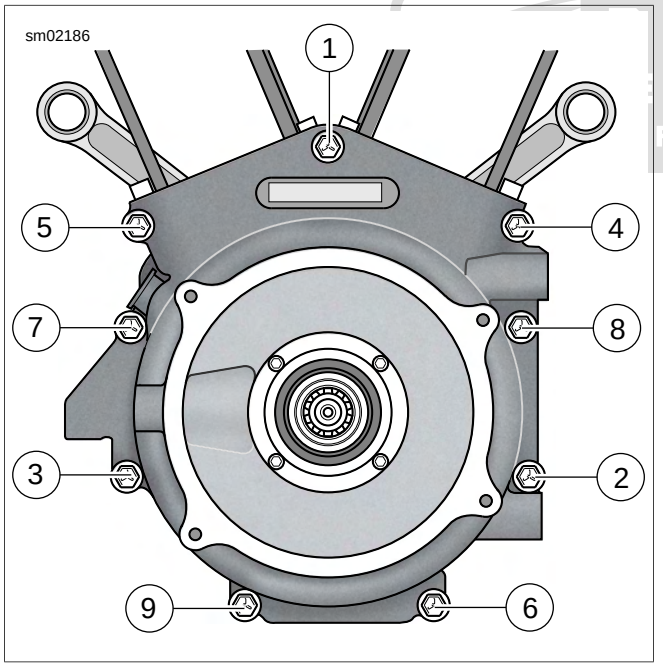


Figure 3-123. Crankcase Bolt Sequence

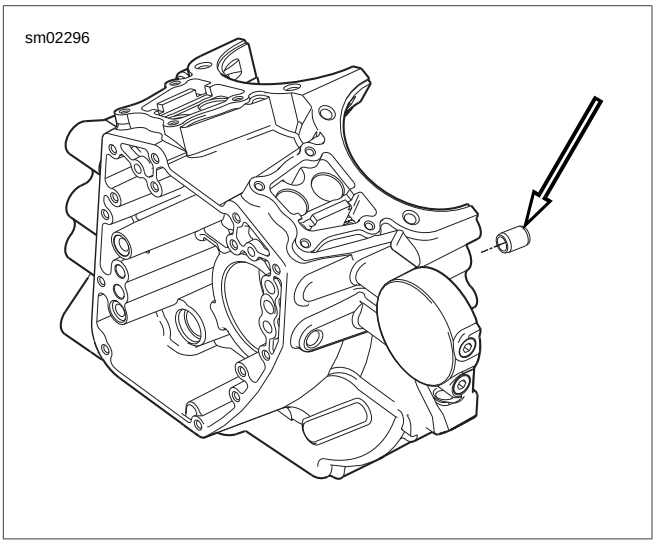


Figure 3-124. Right Crankcase Forward Dowel Pin (Rear Dowel Pin Not Shown)

CLEANING AND INSPECTION

1. Scrape old gasket material from the crankcase flanges. Old gasket material left on mating surfaces will cause leaks.
2. 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)

3. Dry parts with moisture free compressed air..
4. Verify that all oil holes and passageways are clean and open.
5. Check ring dowels for looseness, wear or damage. Replace as necessary.
6. Use a file to carefully remove any nicks or burrs from machined surfaces.
7. Clean out tapped holes and clean up damaged threads.
8. Check the top of the crankcase for flatness with a straightedge and feeler gauge. Replace if warped.
9. Spray all machined surfaces with clean engine oil.
10. Inspect crankshaft/flywheel assembly. See 3.29 FLYWHEEL AND CONNECTING RODS.

RIGHT CRANKCASE HALF

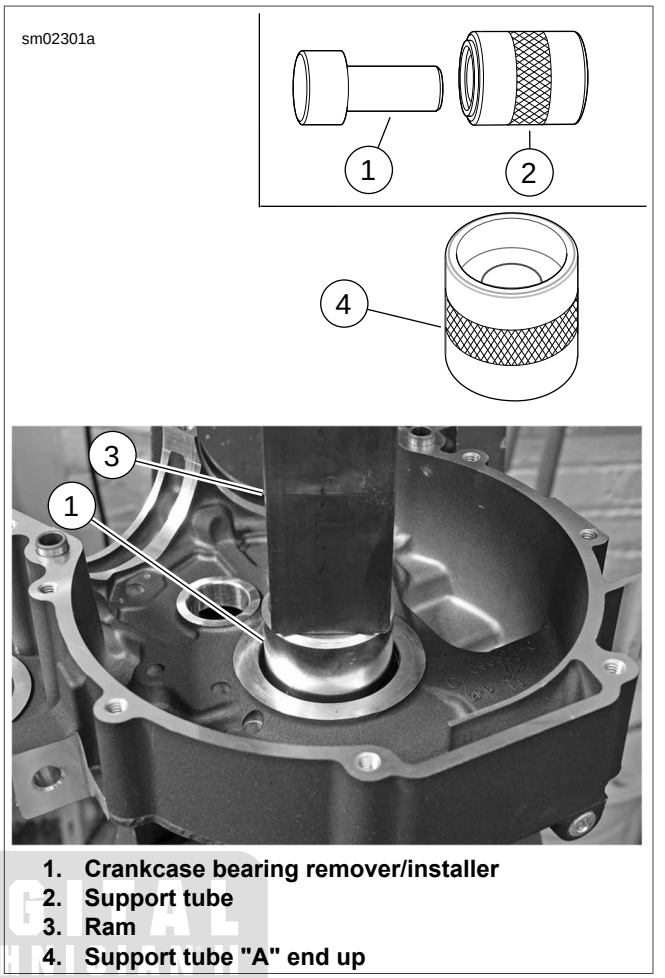
PART NUMBER	TOOL NAME
B-45655	CRANKCASE BEARING REMOVER/INSTALLER
HD-42720-4	CRANKSHAFT BEARING DRIVER SHIM
HD-42720-5	REMOVER/INSTALLER SUPPORT TUBE

Main Bearing Removal

NOTE

Do not move or lift the crankcase by grasping the cylinder studs. The crankcase is too heavy to be carried in this manner and could be dropped.

1. See Figure 3-127. Remove two main bearing retaining screws (5) from the cam compartment side.
2. See Figure 3-125. Obtain CRANKCASE BEARING REMOVER/INSTALLER (Part No. B-45655) and REMOVER/INSTALLER SUPPORT TUBE (Part No. HD-42720-5).
3. Place support tube (4) on hydraulic press table with the "A" end up. Note that the sides of the support tube are stamped to verify proper orientation.
4. With the cam compartment side facing downward, position main bearing bore over support tube.
5. Slide remover/installer (1) through bearing into support tube.
6. Center remover/installer under ram (3) of press. Apply pressure until bearing is free.
7. Remove crankcase, remover/installer and bearing from support tube. Discard bearing.



1. **Crankcase bearing remover/installer**
2. **Support tube**
3. **Ram**
4. **Support tube "A" end up**

Figure 3-125. Right Main Bearing Removal

Main Bearing Installation

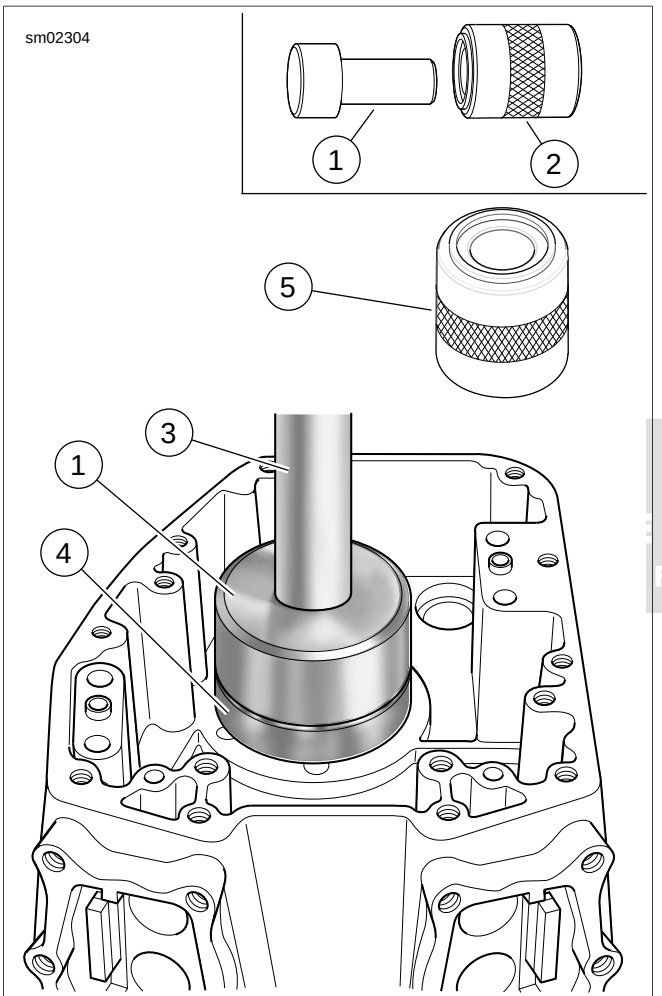
1. See Figure 3-126. Obtain CRANKCASE BEARING REMOVER/INSTALLER (Part No. B-45655), CRANKSHAFT BEARING DRIVER SHIM (Part No. HD-42720-4) and REMOVER/INSTALLER SUPPORT TUBE (Part No. HD-42720-5).
2. Spread a thin film of clean engine oil on O.D. of **new** bearing (4).
3. Place support tube (2) on press table so that the "B" end is up. The ends of the support tube are stamped "A" and "B" to verify proper orientation.
4. Place CRANKSHAFT BEARING DRIVER SHIM (Part No. HD-42720-4) on support tube (2).
5. With the cam compartment side facing upward, position main bearing bore over support tube.
6. Start the **new** bearing in bearing bore with the lettering facing into the cam compartment (up).
7. Slide remover/installer (1) through bearing into support tube.
8. Center remover/installer under ram (3) of press. Apply pressure until resistance is felt and bearing is bottomed on the support tube.

9. Remove remover/installer and crankcase half from support tube.

NOTES

- *Verify that the bearing is flush or slightly below the surface of the crankcase. Never "push" the bearing into position using the retaining screws.*
- *If **new** retaining screws are not available, apply LOCTITE THREADLOCKER 243 (blue) to threads of screws before installation.*

10. See Figure 3-127. Install two **new** main bearing retaining screws (5) from the cam compartment side. Tighten screws to 40-70 **in-lbs** (4.5-7.9 Nm).

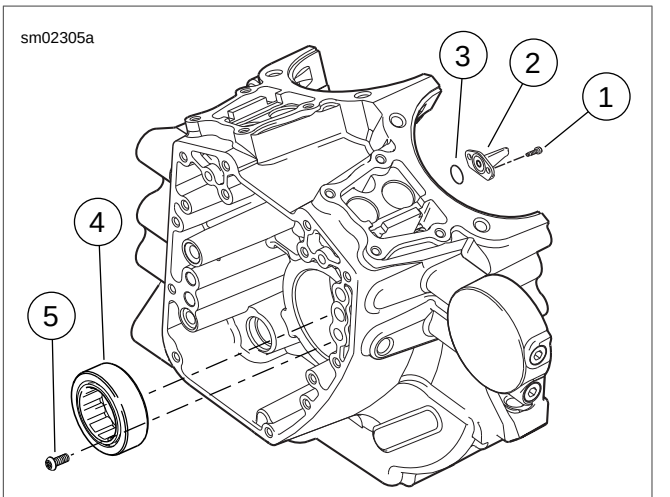


1. **Pilot/driver**
2. **Support tube**
3. **Ram**
4. **Main bearing**
5. **Support tube (2) "B" end up**

Figure 3-126. Right Main Bearing Installation

Piston Jets Removal

1. See Figure 3-127. Remove two screws (1) to free piston jet (2) from crankcase.
2. Remove O-ring (3) from groove in mounting flange of jet. Discard O-ring.



1. **Screw (2 each jet)**
2. **Piston jet (2)**
3. **O-ring (2)**
4. **Main bearing**
5. **Screw (2)**

Figure 3-127. Piston Jets

Piston Jets Installation

NOTES

- *If piston jet is being reused, apply LOCTITE THREADLOCKER 222 (purple) to threads of screws before installation.*
- *O-rings that are missing, distorted, pinched or otherwise damaged will result in either oil leakage or low oil pressure. Use of the wrong O-ring will have the same results. Since many O-rings are similar in size and appearance, always use **new** O-rings keeping them packaged until use to avoid confusion.*

1. See Figure 3-127. Apply a very thin film of clean H-D 20W50 engine oil to **new** O-ring (3) for piston jet. Install **new** O-ring in groove of jet mounting flange.
2. With jet pointed upward, start two screws (1) to secure piston jet (2) to crankcase. Tighten to 25-35 **in-lbs** (2.8-3.9 Nm).

LEFT CRANKCASE HALF

PART NUMBER	TOOL NAME
B-45655	CRANKCASE BEARING REMOVER/INSTALLER
HD-42720-5	CRANKCASE BEARING REMOVER/INSTALLER BASE

Main Bearing Removal

NOTE

Never move or lift the crankcase by grasping the cylinder studs. The crankcase is too heavy to be carried in this manner and could be dropped.

⚠CAUTION

Do not rotate left crankcase half in engine stand such that flywheel sprocket shaft is facing up. The flywheel assembly can fall out, resulting in parts damage or moderate injury. (00552b)

1. While holding flywheel assembly so that it does not fall out of left crankcase half, rotate bottom end assembly in engine stand so assembly is upright and flywheel shafts are horizontal.
2. Carefully slide flywheel assembly out of left crankcase and place it in a clean safe place.
3. Remove thrust washer from outboard side of crankcase half by pulling it past oil seal. Set thrust washer aside for inspection or reuse.
4. Remove oil seal from crankcase bore. Discard oil seal.
5. See Figure 3-128. Using the tip of a flat blade screwdriver, carefully lift the edge of the bearing retaining ring up out of its groove in the crankcase. Slide the screwdriver tip around the edge of the bearing, lifting the retaining ring up and out of the groove. Be careful not to damage the lip of the groove in the crankcase.

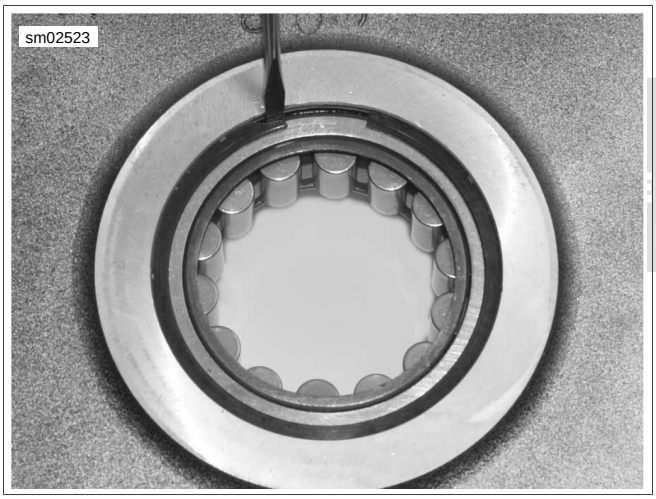
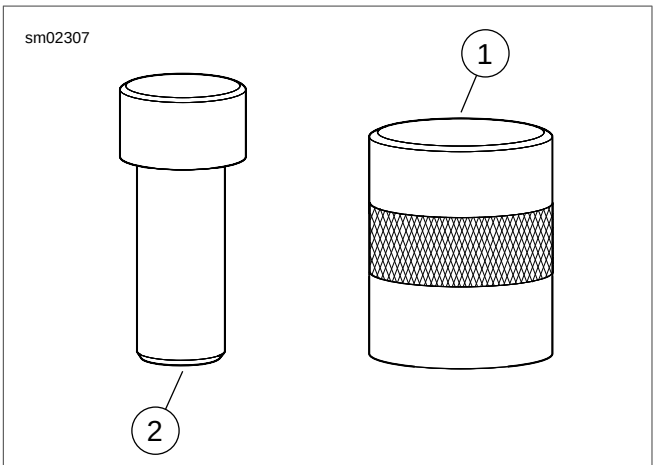
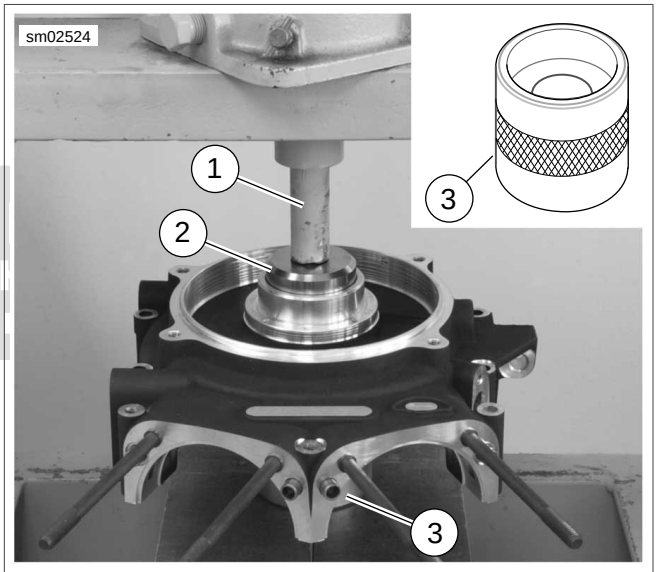


Figure 3-128. Removing Retaining Ring



1. **Support tube**
2. **Pilot/driver**

Figure 3-129. Left Main Bearing Remover and Installer Tools



1. **Ram**
2. **Pilot/driver**
3. **Support tube ("B" end up)**

Figure 3-130. Left Main Bearing Removal

NOTE

See Figure 3-129. If the ram of the press is wider than the head of pilot/driver (2), a suitable press plug will be needed in order to remove the main bearing.

6. Obtain CRANKCASE BEARING REMOVER/INSTALLER (Part No. B-45655) and CRANKCASE BEARING REMOVER/INSTALLER BASE (Part No. HD-42720-5).
7. See Figure 3-130. Place support tube (3) on press table with "A" end up. Note that support tube is stamped "A" and "B" to provide proper orientation.

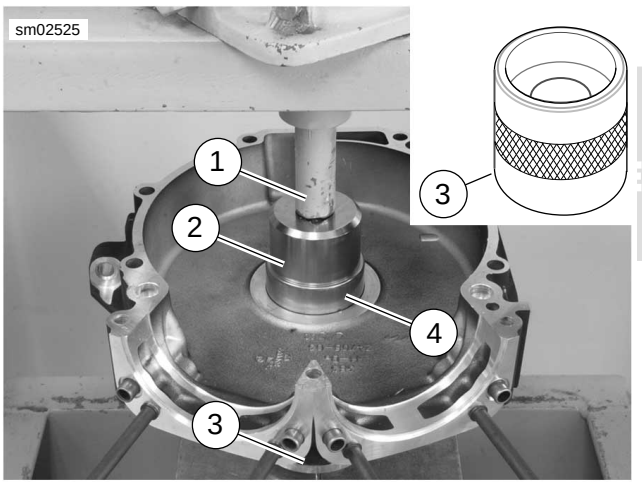
8. With the outboard side of the left crankcase half facing upward, position main bearing bore over support tube.
9. Slide pilot/driver (2) through the main bearing into support tube (3).
10. Center pilot/driver under ram (1) of press. Apply pressure to pilot/driver until bearing is free.
11. Remove crankcase half, pilot/driver and bearing from support tube. Discard bearing.

Main Bearing Installation

NOTES

- *Never move or lift the crankcase by grasping the cylinder studs. The crankcase is too heavy to be carried in this manner and could be dropped.*
- *Always replace sprocket shaft bearing inner race whenever left main bearing is replaced. See 3.28 CRANKCASE DISASSEMBLY AND REPAIR, Sprocket Shaft Bearing Inner Race.*

1. See Figure 3-129. Obtain CRANKCASE BEARING REMOVER/INSTALLER (Part No. B-45655) and CRANKCASE BEARING REMOVER/INSTALLER BASE (Part No. HD-42720-5).



1. **Ram**
2. **Pilot/driver**
3. **Support tube ("A" end up)**
4. **Main bearing**

Figure 3-131. Left Main Bearing Installation

2. See Figure 3-131. Place a thin film of clean engine oil on outer diameter of **new** main bearing (4).
3. Place support tube (3) on hydraulic press table with the "A" end up.
4. With the inboard side of the left crankcase half facing upward, position main bearing bore over support tube.
5. Start **new** main bearing in bearing bore, letter side down.
6. Slide pilot/driver (2) through bearing into support tube.
7. Apply pressure to pilot/driver until bearing is lightly bottomed in main bearing bore.
8. Remove crankcase half and pilot/driver from support tube.
9. Install **new** retaining ring in bearing bore groove, being careful not to damage edges of groove. Make sure retaining ring is fully seated in groove.

NOTE

If retaining ring will not fit into groove, the bearing may not be fully seated in the bore. Examine the bearing and bore. If necessary, remove bearing, clean bore and install bearing. Then install retaining ring.

SPROCKET SHAFT BEARING INNER RACE

PART NUMBER	TOOL NAME
HD-25070	ROBINAIR HEAT GUN
HD-34902-B	MAINSHAFT BEARING INNER RACE PULLER/INSTALLER
HD-44358	FLYWHEEL SUPPORT FIXTURE
HD-95637-46B	WEDGE ATTACHMENT
HD-97225-55C	SPROCKET SHAFT BEARING INSTALLER

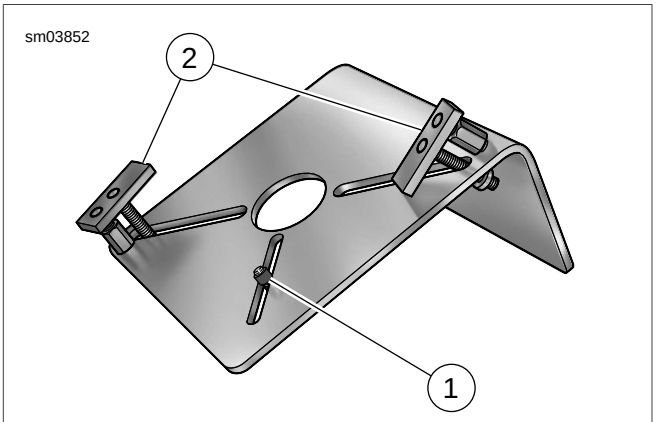
Removal

If reusing flywheel, remove bearing inner race and thrust washer as follows:

1. Obtain FLYWHEEL SUPPORT FIXTURE (Part No. HD-44358). See Figure 3-132. Install brass jaws or shop towels around teeth of vise to prevent damage to tool. Clamp tool in vise with the round hole topside.
2. Insert crankshaft end through hole resting flywheel assembly on fixture. Slide knurled locating pin down slot in tool to engage crank pin hole. Hand tighten locating pin.
3. Slide hold-down clamp down slot to engage inboard side of right flywheel half, and then hand tighten knurled nut at bottom to secure. Repeat step to secure hold-down clamp on opposite side of flywheel.

NOTE

For proper clamping force, hold-down clamp must not be tilted. Rotate hex on outboard stud until clamp is level.



1. **Locating pin**
2. **Hold-down clamp**

Figure 3-132. Flywheel Fixture (Part No. HD-44358)

4. Position WEDGE ATTACHMENT (Part No. HD-95637-46B) on inboard side of thrust washer and turn hex nuts an equal number of turns to draw halves of wedge together.

NOTICE

Install wedge attachment only so far as necessary to ensure positive contact with bearing inner race. Installing tool with more contact than necessary will result in damage to the flywheel (00500b)

5. Obtain two 3/8-16 inch bolts 7-1/2 inches long (with flat washers). Install flat washers on bolts. Obtain bridge and forcing screw from MAINSHAFT BEARING INNER RACE PULLER/INSTALLER (Part No. HD-34902-B). Also obtain a suitable hardened washer to use between the puller screw and the end of the shaft.
6. Slide one bolt into channel on each side of bridge so that flat washer is between bridge and bolt head. Thread bolts into wedge attachment an equal number of turns.
7. Sparingly apply graphite lubricant to threads of forcing screw to prolong service life and verify smooth operation. Start forcing screw into center hole of bridge.

NOTE

Failure to use hardened washer may result in damage to forcing screw and/or sprocket shaft.

8. Place hardened washer against end of sprocket shaft. Thread forcing screw into bridge until the steel ball at the end of the screw makes firm contact with hardened washer.

⚠WARNING

Do not use heating devices with penetrating oil. Penetrating oil is flammable which could result in death or serious injury. (00375a)

9. Using the ROBINAIR HEAT GUN (Part No. HD-25070), uniformly heat the bearing inner race for about 30 seconds using a circular motion.

NOTE

To facilitate removal without heat, apply a light penetrating oil to shaft and leading edge of bearing inner race.

10. Turn forcing screw until thrust washer and bearing inner race move approximately 1/8 in. (3.2 mm).
11. Turn hex nuts an equal number of turns to separate halves of WEDGE ATTACHMENT (Part No. HD-95637-46B).
12. After bottoming thrust washer on shaft, reposition WEDGE ATTACHMENT (Part No. HD-95637-46B) on inboard side of bearing inner race. Turn hex nuts an equal number of turns to draw halves of wedge together.

NOTICE

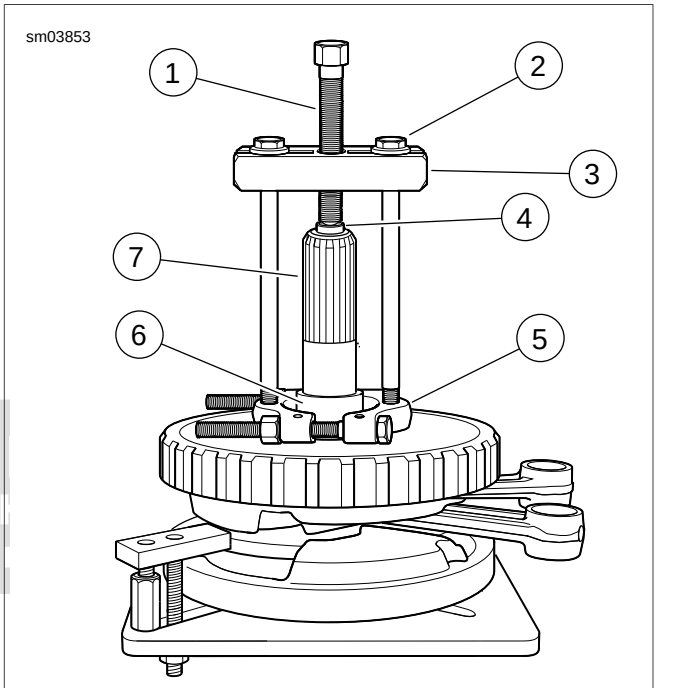
Install wedge attachment only so far as necessary to ensure positive contact with bearing inner race. Installing tool with more contact than necessary will result in damage to the flywheel (00500b)

13. See Figure 3-133. Verify that the tool assembly is square, so that the bearing inner race is not cocked during removal.
14. Using the ROBINAIR HEAT GUN (Part No. HD-25070), uniformly heat the bearing inner race for about 30 seconds using a circular motion.

NOTE

To facilitate removal without heat, apply a light penetrating oil to shaft and leading edge of bearing inner race.

15. Turn forcing screw until bearing inner race is pulled free of sprocket shaft.
16. Remove thrust washer from sprocket shaft.



1. **Forcing screw**
2. **3/8-16 in. bolt with flat washer**
3. **Bridge**
4. **Hardened washer**
5. **Wedge attachment**
6. **Bearing inner race**
7. **Sprocket shaft**

Figure 3-133. Remove Inner Race from Sprocket Shaft

Installation

1. Place **new** thrust washer over sprocket shaft.
2. Place **new** bearing inner race on bench top. Using the ROBINAIR HEAT GUN (Part No. HD-25070), uniformly heat bearing inner race for about 60 seconds using a circular motion.
3. Wearing suitable gloves to protect hands from burns, place heated bearing inner race over sprocket shaft.

⚠WARNING

Do not use heating devices with penetrating oil. Penetrating oil is flammable which could result in death or serious injury. (00375a)

NOTE

To facilitate installation without heat, apply a light penetrating oil to shaft and leading edge of bearing inner race.

4. See Figure 3-134. Obtain the SPROCKET SHAFT BEARING INSTALLER (Part No. HD-97225-55C). Assemble tool as described below.
   a. See Figure 3-135. Thread pilot adapter into sprocket shaft.
   b. Thread pilot shaft onto pilot adapter.
   c. Slide long collar over pilot shaft until it contacts bearing inner race.
   d. Slide short collar over pilot shaft until it contacts long collar.
   e. Slide bearing and large flat washer over pilot shaft.
   f. Sparingly apply graphite lubricant to threads of pilot shaft to prolong service life and verify smooth operation.
   g. See Figure 3-136.Thread handle onto pilot shaft.
5. See Figure 3-137. Rotate handle of tool in a clockwise direction until bearing inner race makes firm contact with thrust washer. Verify that thrust washer cannot be rotated by hand.
6. Remove handle, flat washer, bearing, short collar, long collar, pilot shaft and pilot adapter from sprocket shaft.

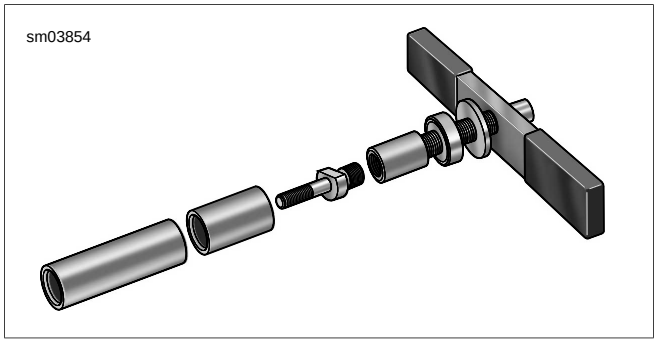


Figure 3-134. Sprocket Shaft Bearing Installer (Part No. HD-97225-55C)

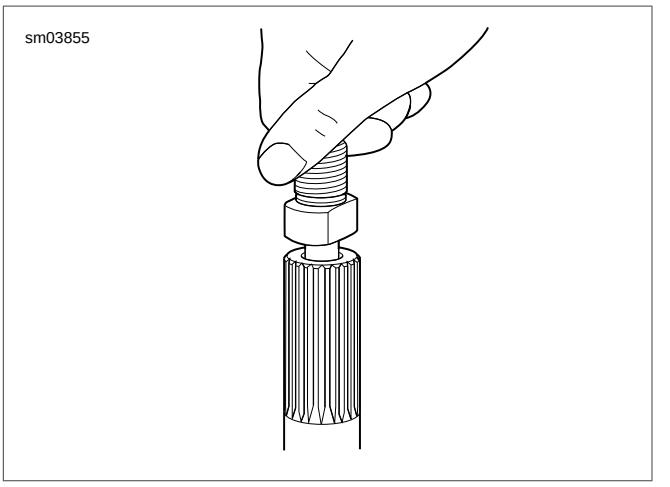
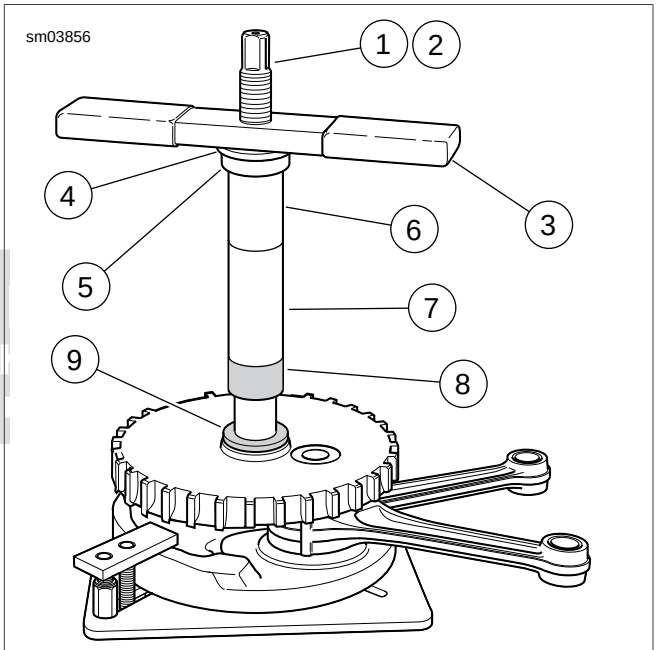


Figure 3-135. Thread Pilot Adapter into Sprocket Shaft



1. **Pilot adapter**
2. **Pilot shaft**
3. **Handle**
4. **Flat washer**
5. **Bearing**
6. **Short collar**
7. **Long collar**
8. **Inner race**
9. **Thrust washer**

Figure 3-136. Press Inner Race onto Sprocket Shaft: Setup

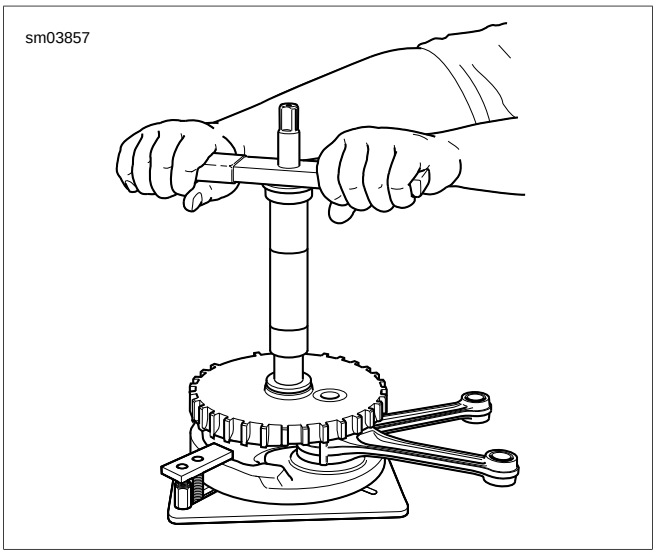


Figure 3-137. Press Inner Race onto Sprocket Shaft: Operation

CYLINDER STUDS

Removal

1. Thread a 3/8"-16 nut onto cylinder stud.
2. Thread a second nut onto stud until it contacts the first.
3. Placing wrench on first nut installed, remove stud.

Installation

1. Place a steel ball inside a head screw. Put the head screw on the end of the cylinder stud without the collar.
2. Start the stud in the cylinder deck with the collar side down. Tighten using air gun until collar reaches crankcase.
3. Hand tighten stud to 120-240 **in-lbs** (13.6-27.1 Nm).

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PIPE PLUG AND OIL FITTINGS

Removal

See Figure 3-138. Turn pipe plug counterclockwise until free.

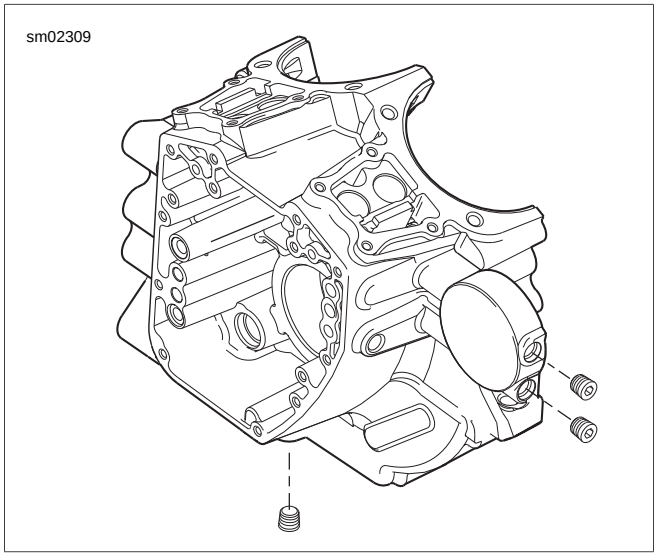


Figure 3-138. Pipe Plug

Installation

1. Apply LOCTITE PIPE SEALANT 565 to threads.
2. Install pipe plug. Tighten pipe plug to 120-144 **in-lbs** (13.6-16.3 Nm).

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INSPECTION

NOTE

Do not attempt to straighten connecting rods. Straightening rods will damage both the upper bushing and lower bearing.

1. Replace the flywheel/connecting rod assembly if any of the following conditions are noted:
   a. Connecting rods are bent or twisted.
   b. Connecting rods do not fall under their own weight or are in a bind.
   c. Sprocket teeth are worn in an irregular pattern or chipped.
   d. The crankshaft (roller) bearing inner races are brinelled, burnt, scored, blued or damaged.
   e. The crankshaft runout exceeds specification.

NOTE

Bluing on connecting rods is part of the hardening process and is considered a normal condition.

2. Check connecting rod bearing clearance. Orient the assembly as shown in Figure 3-139.
   a. Holding the shank of each rod just above the bearing bore, pull up and down on the connecting rods.
   b. Any discernible up and down movement indicates excessive lower bearing clearance. Replace the flywheel/connecting rod assembly.
3. See Figure 3-140. Check connecting rod side play.
   a. Insert a feeler gauge between the thrust washer and the outboard side of the connecting rod.
   b. Replace the assembly if rod side play exceeds 0.020 in. (0.51 mm).
4. Measure crankshaft runout if the crankshaft is suspected of being out-of-true.

NOTE

If the flywheel, connecting rods or right side bearing inner race need to be replaced, then replace the entire flywheel assembly.

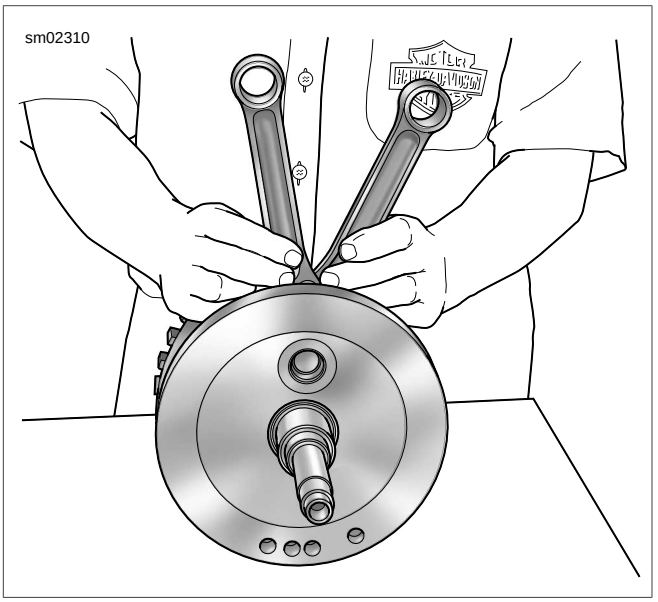


Figure 3-139. Connecting Rod Bearing Clearance

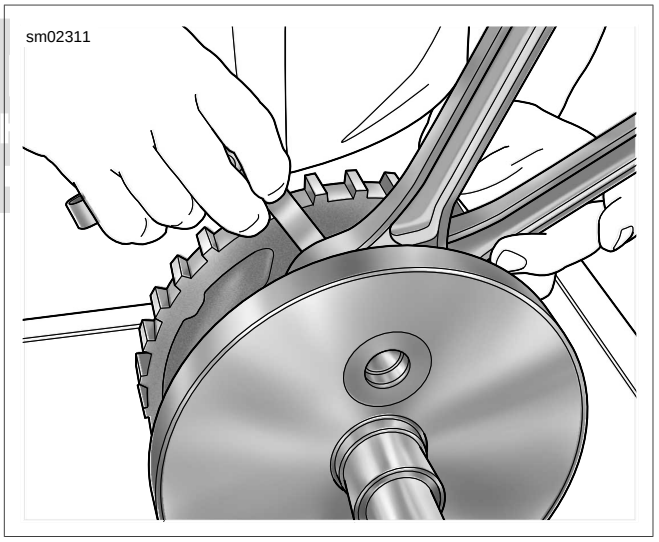


Figure 3-140. Connecting Rod Side Play

MEASURING CRANKSHAFT RUNOUT

Crankshaft Removed

NOTES

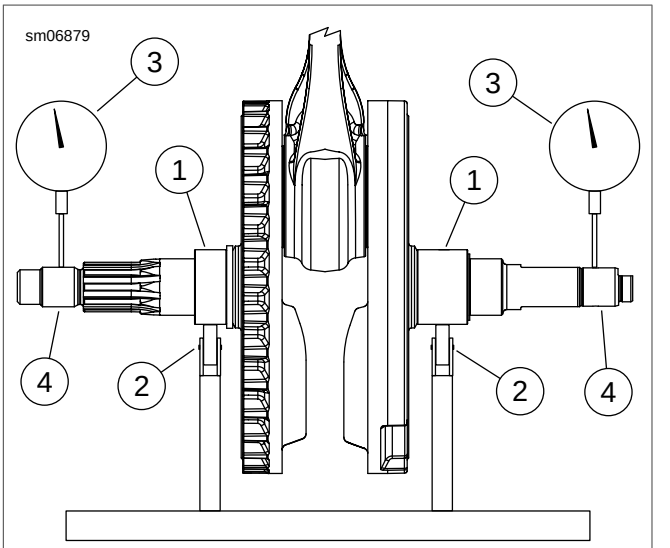
- *The following procedure should be performed if the crankshaft/flywheel assembly is suspected of being out-of-true.*
- *The crankshaft must be supported by the bearing races during inspection. Never use centers as the holes may not be perfectly centered.*

1. See Figure 3-141. Mount crankshaft in truing stand so it is supported on the bearing races (1) by the roller supports (2).
2. Secure a dial indicator mount near each end of the crankshaft.
3. Set up each indicator (3) to measure the machined surfaces (4) near each end.
4. Adjust both indicators to zero.
5. Slowly rotate the crankshaft assembly while observing the total indicator reading.

NOTE

Twin Cam crankshaft/flywheel assemblies are not serviceable and must be replaced if not within specifications.

6. Compare results to Table 3-46. If the total indicator reading exceeds service wear limit, the crankshaft/flywheel assembly must be replaced.



1. **Bearing race**
2. **Roller support**
3. **Dial indicator**
4. **Machined surface**

Figure 3-141. Checking Crankshaft Runout

Table 3-46. Flywheel

FLYWHEEL	REPLACE IF WEAR EXCEEDS	
	IN.	MM
Runout (shaft measured in case)	0.012	0.305
Runout (measured in truing stand)	0.005	0.127
End play	0.013	0.330

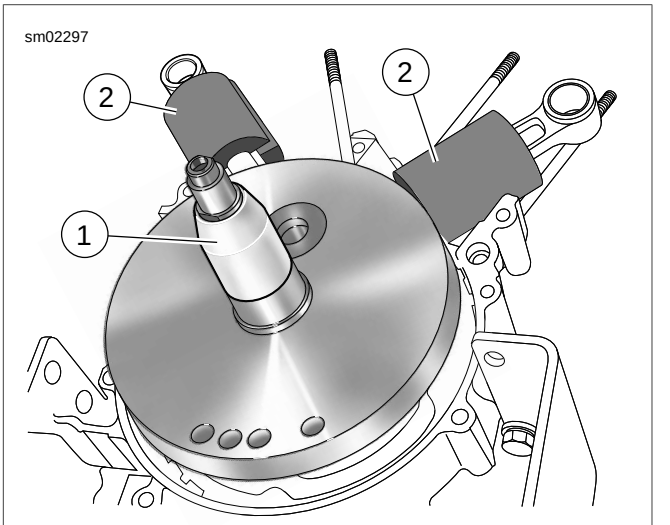
CRANKCASE ASSEMBLY

PART NUMBER	TOOL NAME
99650-02	HIGH-PERFORMANCE SEALANT, GRAY
HD-39361-B	SPROCKET SHAFT OIL SEAL INSTALLER
HD-42326-B	CRANKSHAFT GUIDE
HD-97225-55C	SPROCKET SHAFT BEARING INSTALLER

NOTE

*O-rings that are missing, distorted, pinched or otherwise damaged will result in either oil leakage or low oil pressure. Use of the wrong O-ring will have the same results. Since many O-rings are similar in size and appearance, always use **new** O-rings keeping them packaged until use to avoid confusion.*

1. Secure left crankcase half upright in engine stand.
2. Slide CRANKSHAFT GUIDE (Part No. HD-42326-B) onto flywheel sprocket shaft.
3. Slide flywheel assembly into left crankcase half. Remove crankshaft guide tool.
4. Rotate crankcase assembly so flywheel sprocket shaft is pointing straight up.
5. Verify that both dowel pins are installed in split line face of right case half.
6. Apply a bead of HIGH-PERFORMANCE SEALANT, GRAY (Part No. 99650-02) approximately 0.056 in. (1.42 mm) wide to the split line face and around the two dowel pins of right crankcase half.
7. See Figure 3-142. Place CRANKSHAFT GUIDE (Part No. HD-42326-B) over end of crankshaft until it contacts shoulder on shaft.
8. Mate case halves. Remove crankshaft guide.



1. **Crankshaft guide**
2. **Water pipe insulation**

Figure 3-142. Crankshaft Guide (Part No. HD-42326-A)

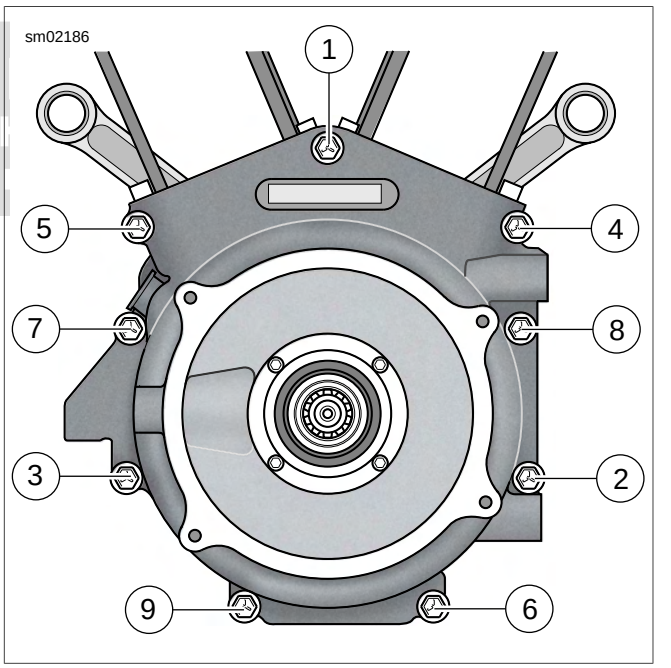


Figure 3-143. Tightening Crankcase Bolts

9. See Figure 3-143. Start the nine crankcase bolts and tighten in the following sequence.
   a. Finger-tighten each crankcase bolt.
   b. Tighten the crankcase bolts to 120 **in-lbs** (13.6 Nm) in the order shown.
   c. Following the same sequence, tighten each bolt to 15-19 ft-lbs (20.3-25.8 Nm).

10. Tip crankcase assembly so that sprocket shaft is pointing straight up.
11. Install thrust washer on sprocket shaft with "THIS SIDE OUT" facing out (and the chamfer inboard). If using original part without markings, orient as required to preserve existing wear pattern.
12. See Figure 3-144. Install **new** oil seal into bearing bore. Obtain pilot adapter, pilot shaft, short collar, bearing, large flat washer and handle from SPROCKET SHAFT BEARING INSTALLER (Part No. HD-97225-55C).
    a. Thread pilot adapter into sprocket shaft.
    b. Thread pilot shaft onto pilot adapter.
    c. Verify that lip garter spring is in place on both sides of oil seal.
    d. Install sprocket shaft spacer in oil seal bore.
    e. With the lettering on the oil seal facing outward, slide sprocket shaft spacer and oil seal over pilot shaft until it contacts bearing bore.
    f. Slide SPROCKET SHAFT OIL SEAL INSTALLER (Part No. HD-39361-B) over pilot shaft until it contacts oil seal.
    g. Slide short collar, bearing, large flat washer, and thread handle onto pilot shaft to complete assembly of tool.

    NOTE

    Sparingly apply graphite lubricant to threads of pilot shaft to prolong service life and verify smooth operation.
13. Rotate handle in a clockwise direction until oil seal installer makes firm contact with crankcase stator mount.
14. Remove tool components from sprocket shaft.
15. Rotate crankcase in engine stand so that cam cover flange is facing upward.
16. Install oil pump and cam support plate. See 3.26 CAM COMPARTMENT AND COMPONENTS.
17. Complete engine assembly.

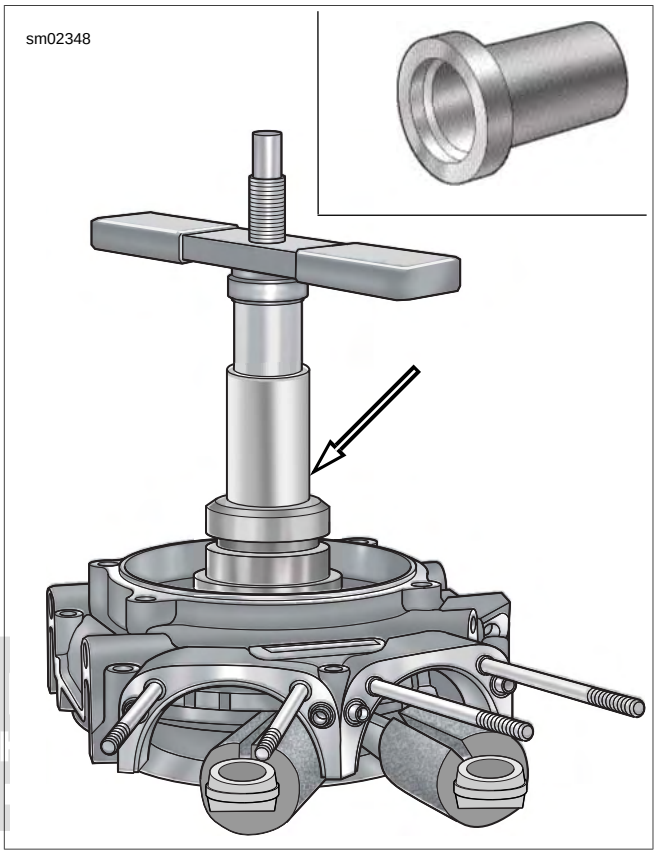


Figure 3-144. Sprocket Shaft Oil Seal Installer

OIL PAN 3.31

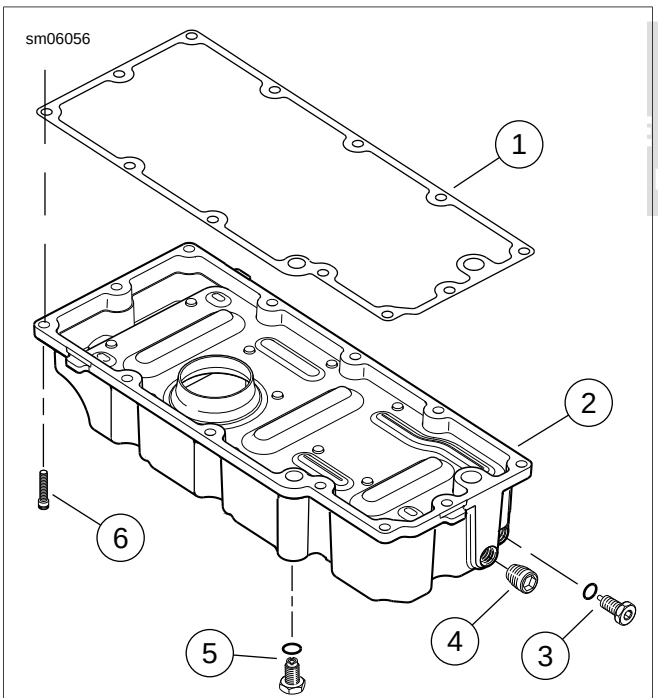
REMOVAL

1. Position motorcycle on a suitable lift.
2. See Figure 3-145. Remove engine oil drain plug (3), fill plug/dipstick and oil filter. Drain oil into suitable container.
3. Remove transmission drain plug (5) and drain transmission fluid into suitable container.
4. Remove rear wheel. See 2.5 REAR WHEEL.
5. Remove left muffler, exhaust crossover pipe and crossover pipe clamp bracket from transmission. See 4.19 EXHAUST SYSTEM.
6. See Figure 3-145. Remove 12 fasteners (6) that secure the oil pan to the transmission.

NOTE

Verify engine oil fill plug/dipstick is removed before attempting to slide the oil pan rearward or damage to the dipstick will result.

7. Slide oil pan (2) rearward to remove. Remove and discard oil pan gasket (1).
8. If necessary, remove tapered plug (4).



1. **Gasket**
2. **Pan/baffle assembly**
3. **Engine oil drain plug and O-ring**
4. **Tapered pipe plug**
5. **Transmission drain plug and O-ring**
6. **Fastener (12)**

Figure 3-145. Oil Pan Assembly

INSTALLATION

1. See Figure 3-145. Clean and examine transmission and oil pan flanges.
2. If removed, install tapered plug (4) using Loctite Pipe Sealant With Teflon 565 (P/N 99818-97). Tighten to 18-22 ft-lbs (24.4-29.8 Nm).
3. Apply a thin coat of HYLOMAR® gasket sealer to oil pan flange.
4. Place **new** gasket (1) on oil pan flange. Allow sealer to dry until tacky.

NOTE

If oil pan fasteners are to be reused, apply 1-2 drops of Loctite Threadlocker 243 (blue). New fasteners have a lock patch applied.

5. Position oil pan with gasket on bottom of transmission and loosely install fasteners (6).
6. Verify the gasket is properly positioned and tighten oil pan fasteners (6) to 132-156 **in-lbs** (14.9-17.6 Nm) following sequence shown in Figure 3-146.
7. Wipe any foreign material from engine and transmission drain plugs. Examine drain plug O-rings for tears or damage. Replace O-rings as required.
8. Install transmission drain plug and O-ring (5). Tighten to 14-21 ft-lbs (19.0-28.5 Nm).
9. Install engine oil drain plug and O-ring (3). Tighten to 14-21 ft-lbs (19.0-28.5 Nm).
10. Install exhaust crossover pipe hanger bracket and tighten fasteners to 84-132 **in-lbs** (9.5-14.9 Nm).
11. Install exhaust crossover pipe and left muffler. See 4.19 EXHAUST SYSTEM.
12. Install rear wheel. See 2.5 REAR WHEEL.
13. Add fluids.
    a. Add transmission fluid and check level. See 1.10 TRANSMISSION LUBRICANT.
    b. Install engine oil filter. Add engine oil and check level. See 1.6 ENGINE OIL AND FILTER.

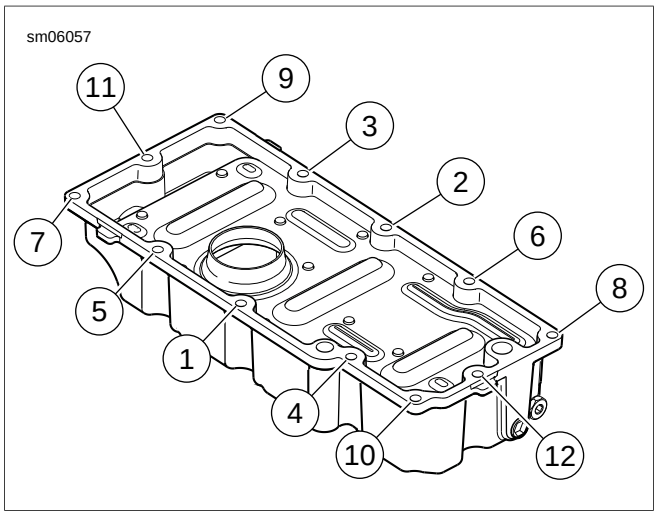


Figure 3-146. Oil Pan Torque Sequence

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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NOTES

FASTENER TORQUE VALUES 4.1

FASTENER TORQUE VALUES IN THIS CHAPTER

The table below lists torque values for all fasteners presented in this chapter.

FASTENER	TORQUE VALUE		NOTES
Breather bolts	22-24 ft-lbs	29.8-32.5 Nm	4.4 AIR CLEANER ASSEMBLY, Installation/metric
Charcoal canister screws	10-15 **in-lbs**	1.1-1.7 Nm	4.22 EVAPORATIVE EMISSIONS CONTROL SYSTEM, Charcoal Canister/metric
Console-to-tank screw	36-60 **in-lbs**	4.1-6.8 Nm	4.5 FUEL TANK, Installation/metric
Console-to-tank screw	36-60 **in-lbs**	4.1-6.8 Nm	4.5 FUEL TANK, Evaporative Emissions Tube: Non-CA Models/metric
Console-to-tank screw	36-60 **in-lbs**	4.1-6.8 Nm	4.6 FUEL TANK TOP PLATE, Installation/metric
Console-to-tank screw	36-60 **in-lbs**	4.1-6.8 Nm	4.22 EVAPORATIVE EMISSIONS CONTROL SYSTEM, Fuel Vapor Vent Tube/metric
Cover bracket screws	40-60 **in-lbs**	4.5-6.8 Nm	4.4 AIR CLEANER ASSEMBLY, Installation/metric
Cover screw	36-60**in-lbs**	4.1-6.8 Nm	4.4 AIR CLEANER ASSEMBLY, Installation/Use Loctite Medium Strength Threadlocker 243 (Blue)
Crossover pipe hanger bracket	84-132 **in-lbs**	9.5-14.9 Nm	4.19 EXHAUST SYSTEM, System Installation
Crossover support clamp-to-transmission bracket fastener	14-18 ft-lbs	19.0-24.4 Nm	4.19 EXHAUST SYSTEM, System Installation
Electrical caddy (left) screws	72-96 **in-lbs**	8.1-10.9 Nm	4.22 EVAPORATIVE EMISSIONS CONTROL SYSTEM, Charcoal Canister/metric
ET sensor	120-180 **in-lbs**	13.6-20.3 Nm	4.12 ENGINE TEMPERATURE SENSOR (ET), Installation
Exhaust crossover pipe clamp	25-30 ft-lbs	33.9-40.7 Nm	4.19 EXHAUST SYSTEM, System Installation/Always use a new clamp
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm	4.19 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm	4.19 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm	4.19 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm	4.19 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, initial	9-18 **in-lbs**	1-2 Nm	4.19 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, initial	9-18 **in-lbs**	1-2 Nm	4.19 EXHAUST SYSTEM, System Installation
Exhaust heat shield worm drive clamp screw	20-40 **in-lbs**	2.3-4.5 Nm	4.19 EXHAUST SYSTEM, System Installation
Exhaust side bracket carriage bolt	20-25 ft-lbs	27.1-33.9 Nm	4.19 EXHAUST SYSTEM, System Installation
Exhaust valve actuator fasteners	32-40 **in-lbs**	3.6-4.5 Nm	4.20 ACTIVE EXHAUST (HDI), Exhaust Valve Actuator
Fuel supply line quick-connect fitting	22-26 ft-lbs	29.8-35.3 Nm	4.5 FUEL TANK, Fuel Supply Check Valve/Tube/metric
Fuel supply tube clamp screw	66-82 **in-lbs**	7.5-9.3 Nm	4.16 FUEL INJECTORS, Installation/metric
Fuel tank front screws	15-20 ft-lbs	20.3-27.1 Nm	4.5 FUEL TANK, Installation
Fuel tank rear bracket screws	15-20 ft-lbs	20.3-27.1 Nm	4.5 FUEL TANK, Installation
Induction module flange adapter screws	96-144 **in-lbs**	10.9-16.3 Nm	4.13 INDUCTION MODULE, Installation/metric
Induction module flange adapter screws	96-144 **in-lbs**	10.9-16.3 Nm	4.13 INDUCTION MODULE, Installation/metric
Muffler clamp	38-43 ft-lbs	51.5-58.3 Nm	4.19 EXHAUST SYSTEM, Mufflers
Oxygen sensor	14 ft-lbs	19 Nm	4.15 OXYGEN SENSORS (O2), Installation/metric

FASTENER	TORQUE VALUE		NOTES
Rear muffler fastener	96-144 **in-lbs**	10.8-16.3 Nm	4.19 EXHAUST SYSTEM, Mufflers
TMAP hex screw	84-108 **in-lbs**	9.5-12.2 Nm	4.14 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE SENSOR (TMAP), Installation/metric
Top caddy hold-down	32-40 **in-lbs**	3.6-4.5 Nm	4.22 EVAPORATIVE EMISSIONS CONTROL SYSTEM, Charcoal Canister

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

SPECIFICATIONS: FUEL SYSTEM 4.2

SPECIFICATIONS

Table 4-1. Fuel Capacity

FUEL TANK CAPACITY	GALLONS	LITERS
Total	6.0	22.7
Reserve (warning light on)	1.0	3.79

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ELECTRONIC FUEL INJECTION (EFI) 4.3

TROUBLESHOOTING

See the electrical diagnostic manual for troubleshooting and diagnostic information.

AIR CLEANER ASSEMBLY 4.4

REMOVAL

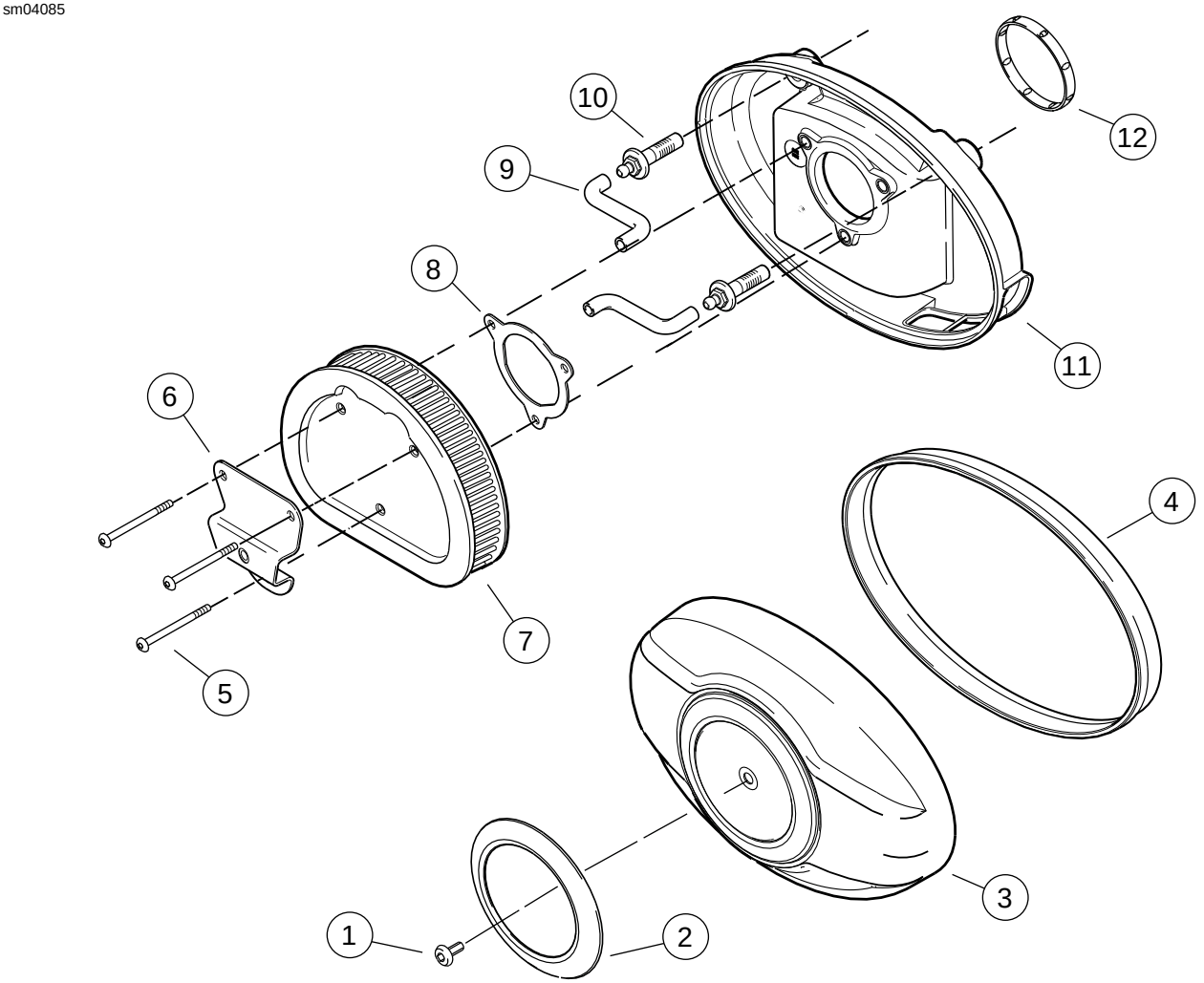
1. See Figure 4-1. Remove cover screw (1) from air cleaner cover (3). Remove air cleaner cover with rubber seal (4).
2. Remove three T27 TORX screws (5) to release cover bracket (6) from filter element (7).
3. Remove filter element pulling two breather tubes (9) from holes on inboard side.
4. Remove gasket (8) from sleeve on inboard side of filter element. Discard gasket.
5. Remove breather tubes from fittings on two cylinder head breather bolts (10).
6. Remove two cylinder head breather bolts from backplate (11).
7. Remove backplate from cylinder heads.
8. Remove seal ring (12) from groove on inboard side of backplate. Discard seal ring.

⚠WARNING

Do not use gasoline or solvents to clean filter element. Flammable cleaning agents can cause an intake system fire, which could result in death or serious injury. (00101a)

9. Inspect filter element. See 1.7 AIR CLEANER AND EXHAUST SYSTEM. Replace the filter element if damaged or if filter media cannot be adequately cleaned.

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1. **Cover screw**
2. **Cover trim**
3. **Air cleaner cover**
4. **Rubber seal**
5. **T27 Torx screw (3)**
6. **Cover bracket**
7. **Filter element**
8. **Gasket**
9. **Breather tube (2)**
10. **Breather bolt (2)**
11. **Backplate**
12. **Seal ring**

Figure 4-1. Air Cleaner Assembly

INSTALLATION

1. See Figure 4-1. With the nubs contacting the ring groove walls, install seal ring (12) on inboard side of backplate (11).
2. Align holes in backplate with those in cylinder heads and install cylinder head breather bolts (10). Alternately tighten bolts to 22-24 ft-lbs (29.8-32.5 Nm).
3. Slide **new** gasket (8) over sleeve on inboard side of filter element.
4. Insert breather tubes about 0.25 in (6.4 mm) into holes on inboard side of filter element (7).
5. 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.

6. Place filter element onto backplate with the flat side down.
7. Align holes in cover bracket (6) with those in filter element and start three T27 TORX screws (5). Alternately tighten screws to 40-60 **in-lbs** (4.5-6.8 Nm).

8. Verify that rubber seal (4) is properly seated around perimeter of air cleaner cover (3).
9. Fit air cleaner cover into backplate. Apply a small dab of LOCTITE MEDIUM STRENGTH THREADLOCKER 243 (BLUE) to threads of cover screw (1). Install screw and tighten to 36-60**in-lbs** (4.1-6.8 Nm).

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FUEL TANK 4.5

REMOVAL

NOTE

The fuel tank can be removed without draining. However, draining is necessary whenever the fuel tank or internal components are serviced.

Purge and Disconnect Fuel Line

⚠WARNING

To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

NOTE

The gasoline in the fuel supply line is under high pressure: 58 psi (400 kPA). To avoid an uncontrolled discharge or spray of gasoline, always purge the line before disconnecting.

1. Remove left side saddlebag. See 2.26 SADDLEBAGS.
2. Remove left side cover.
3. See Figure 4-2. Remove 15 amp fuel pump fuse.
4. Start the engine and allow the motorcycle to run until engine stalls. Operate starter an additional 3 seconds to remove remaining fuel from fuel supply line.
5. Remove main fuse.
6. Install 15 amp fuel pump fuse.
7. See Figure 4-3. Pull up on chrome sleeve of quick-connect fitting and pull down on fuel supply line fitting to disconnect.

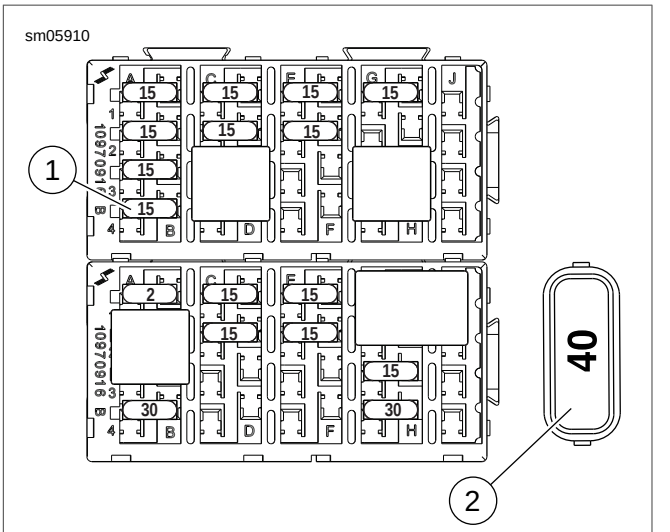
Remove Tank

1. Remove seat. See 2.25 SEAT.
2. Remove console from tank and lay out of the way.
3. Carefully pry fuel vapor vent tube from vapor valve fitting on top plate.
4. Remove fuel level sender/fuel pump connector [141], 4-place Delphi.
5. **Road King models:** Gently pull on convoluted tubing to draw fuel gauge connector out of tunnel at front of fuel tank. Disconnect connector.

⚠WARNING

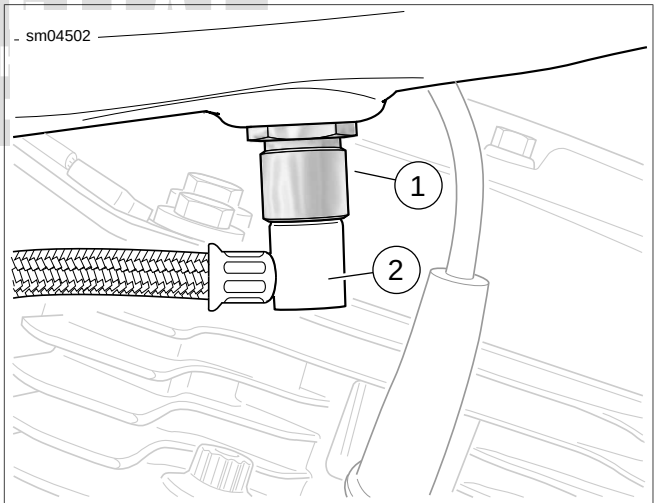
Gasoline can drain from the fuel line when disconnected from fuel tank. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. Wipe up spilled fuel immediately and dispose of rags in a suitable manner. (00260a)

6. Remove rubber caps to reveal two front fuel tank screws. Remove screws.
7. Remove two screws to release rear tank bracket from frame backbone.
8. Remove fuel tank from motorcycle.



1. **Fuel pump fuse**
2. **Main fuse**

Figure 4-2. Fuse Blocks



1. **Quick connect fitting (chrome sleeve)**
2. **Fuel supply line fitting**

Figure 4-3. Fuel Tank (Left Side View)

INSTALLATION

1. Place fuel tank onto frame backbone and start front fuel tank fasteners.
2. Secure rear fuel tank bracket to frame backbone. Tighten screws to 15-20 ft-lbs (20.3-27.1 Nm). Install plastic trim cover over bracket.
3. Tighten front fuel tank screws to 15-20 ft-lbs (20.3-27.1 Nm). Install rubber caps over screws. Note that the left and right caps are not interchangeable.

⚠WARNING

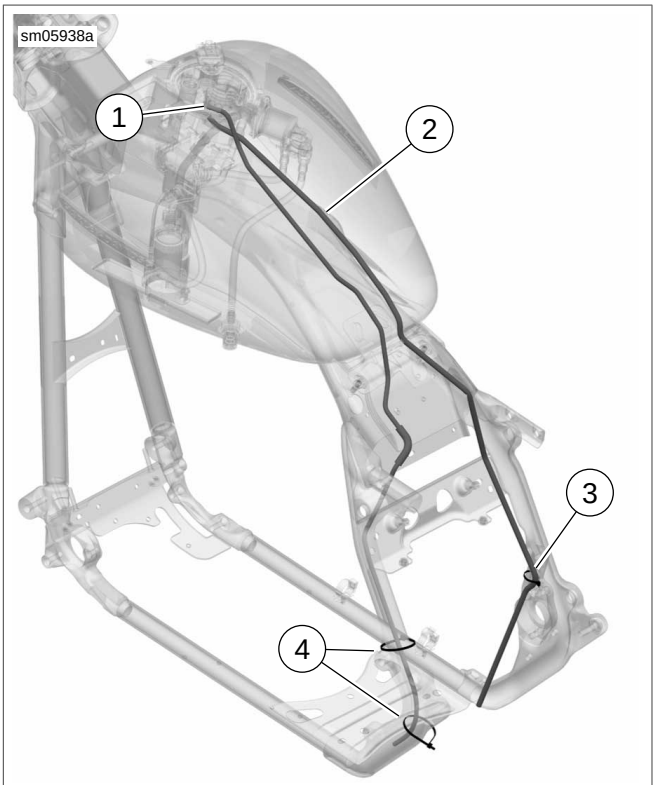
To prevent spray of fuel, be sure quick-connect fittings are properly mated. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00268a)

4. Connect quick-connect fitting to fuel tank. While pushing up on bottom of fitting, pull down on chrome sleeve. Tug on fuel line fitting to verify that it is locked in position.
5. **Road King models:** Mate fuel gauge connector. Feed connector into tunnel at front of fuel tank.
6. See Figure 4-4. Connect fuel vapor vent tube to vapor valve fitting (1) on top plate.
7. If equipped, connect overflow hose (2) to top plate and route along inner downtube as shown. Secure to brake line with cable strap (3). Do not over-tighten cable strap.
8. Install fuel level sender/fuel pump connector [141], 4-place Delphi. For best clearance with cam ring, tilt connector at 35 degree angle before installation.
9. Install console. Tighten fasteners to 36-60 **in-lbs** (4.1-6.8 Nm).
10. Install seat. See 2.25 SEAT.
11. Install main fuse, left side cover and saddlebag.

EVAPORATIVE EMISSIONS TUBE: NON-CA MODELS

Removal

1. Remove seat. See 2.25 SEAT.
2. Remove fuel tank console:
   a. Remove screws to release front and rear of console from fuel tank.
   b. Lay a clean shop towel on forward part of rear fender.
   c. **FLHR/C:** Remove console and lay upside down on shop towel.
   d. **FLHX, FLHTC/U, FLHTK, FLTRX, FLTRU:** Remove filler cap. Remove console and lay upside down on shop towel. Install filler cap.
3. See Figure 4-4. Remove vapor tube from fitting (1) on fuel tank top plate.
4. Remove two cable straps (4) securing tube to rear frame downtube.
5. Remove tube from motorcycle.
6. Inspect for deterioration, chaffing, or other damage. Replace as necessary.



1. **Fuel vapor vent tube fitting**
2. **Overflow hose**
3. **Cable strap**
4. **Cable strap**

Figure 4-4. Non-California Evaporative System

Installation

1. See Figure 4-4. Route tube down along inner side of rear left downtube. Install two cable straps (4) to secure to frame.
2. Route line along center of fuel tank and connect to fitting (1) on fuel tank top plate.
3. Install fuel tank console:
   a. **FLHR/C:** Position console on fuel tank.
   b. **FLHX, FLHTC/U, FLHTK, FLTRX, FLTRU:** Remove filler cap and position console on fuel tank. Install filler cap.
   c. Verify harnesses and vent tube are not pinched.
   d. Install screws to fasten front and rear of console to fuel tank.
   e. Tighten screws to 36-60 **in-lbs** (4.1-6.8 Nm).
4. Install seat. See 2.25 SEAT.

FUEL SUPPLY CHECK VALVE/TUBE

Removal

NOTE

The in-tank check valve is housed in the quick-connect fitting. The check valve prevents the fuel tank from draining when the external supply line is disconnected.

1. Remove top plate. See 4.6 FUEL TANK TOP PLATE.

⚠WARNING

Gasoline can drain from the fuel line when disconnected from fuel tank. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. Wipe up spilled fuel immediately and dispose of rags in a suitable manner. (00260a)

2. Pull up on chrome sleeve and pull down on fuel supply line fitting to disconnect fuel line from tank.
3. See Figure 4-5. Loosen quick-connect fitting.
4. Remove the fitting and fuel supply tube from fuel tank.

Installation

NOTE

Carefully inspect fuel supply tube for cuts, tears, holes or other damage. Replace tube (and quick-connect fitting assembly) if any damage is found.

1. See Figure 4-6. Apply a very light film of clean engine oil to **new** O-ring. Slide O-ring into groove of quick-connect fitting.
2. Feeding fuel supply tube through hole at bottom of fuel tank, hand thread quick-connect fitting into bore.
3. Tighten fitting to 22-26 ft-lbs (29.8-35.3 Nm).

⚠WARNING

To prevent spray of fuel, be sure quick-connect fittings are properly mated. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00268a)

4. Connect quick-connect fitting to fuel tank. While pushing up on bottom of fitting, pull down on chrome sleeve. Tug on fuel line fitting to verify that it is locked in position.
5. Install top plate. See 4.6 FUEL TANK TOP PLATE.

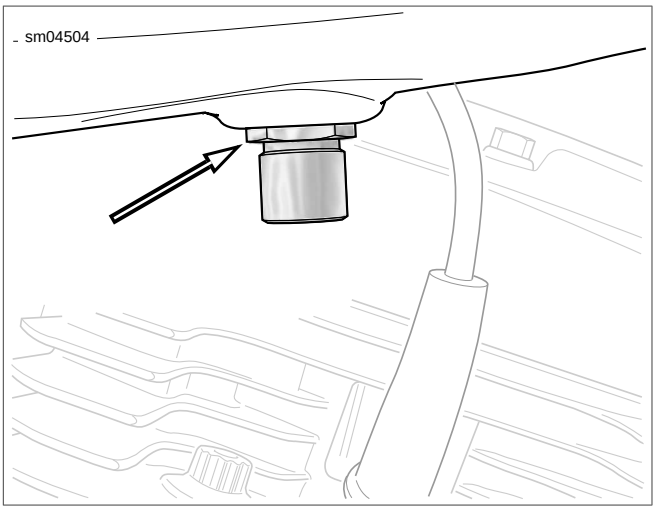
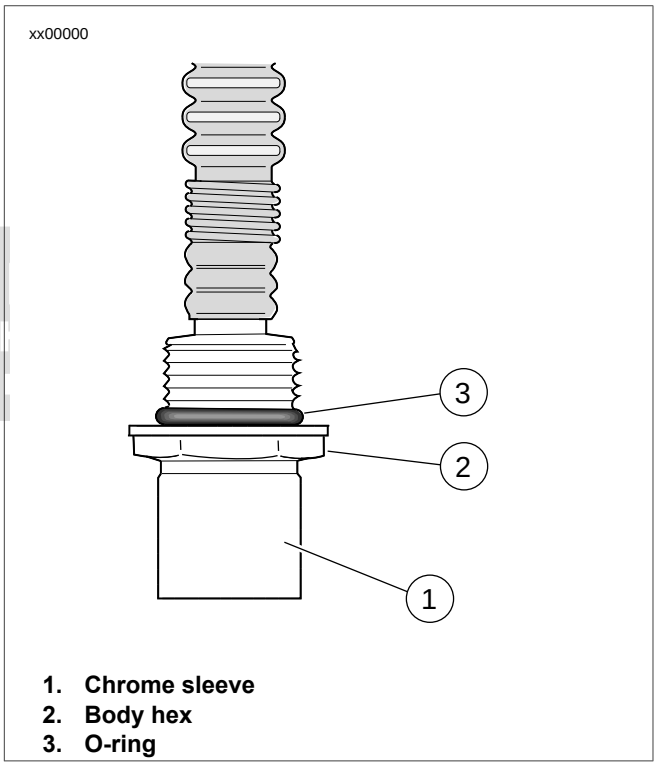


Figure 4-5. Engage Hex on Quick-Connect Fitting



1. **Chrome sleeve**
2. **Body hex**
3. **O-ring**

Figure 4-6. Fuel Supply Check Valve/Tube

FUEL TANK TOP PLATE 4.6

REMOVAL

PART NUMBER	TOOL NAME
HD-48646	CAM RING REMOVER/INSTALLER

NOTE

The gasoline in the fuel supply line is under high pressure (58 psi (400 kPa). To avoid an uncontrolled discharge or spray of gasoline, always purge the line before top plate removal.

1. Relieve pressure from fuel system. See 4.5 FUEL TANK, Removal.
2. Drain fuel from tank. Use a common pump or siphon and an approved gasoline storage container of sufficient capacity.
3. Remove seat. See 2.25 SEAT.
4. Remove console from tank and lay out of the way.
5. See Figure 4-7. Remove cam ring using CAM RING REMOVER/INSTALLER (Part No. HD-48646) and raise top plate.

NOTE

See Figure 4-8. Always hold on to both the Cam Ring Remover/Installer and ratchet to prevent unexpected separation resulting in possible damage to the fuel tank.

6. Remove connector at bottom of top plate. A small screwdriver may help with removal.
7. See Figure 4-9. Disconnect ground wire spade terminal from slot of top plate.
8. See Figure 4-10. Press tabs on fuel line retainers (3) to remove lines from fittings on fuel filter shell.
9. If top plate replacement is necessary, remove fuel filter shell. See 4.7 FUEL FILTER.

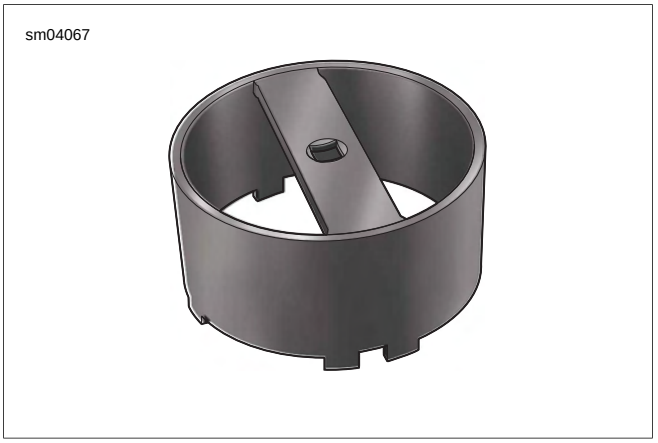


Figure 4-7. Cam Ring Remover/Installer (HD-48646)

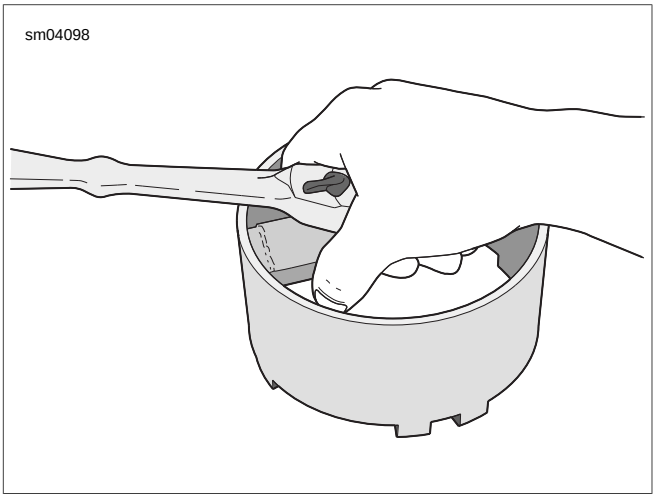
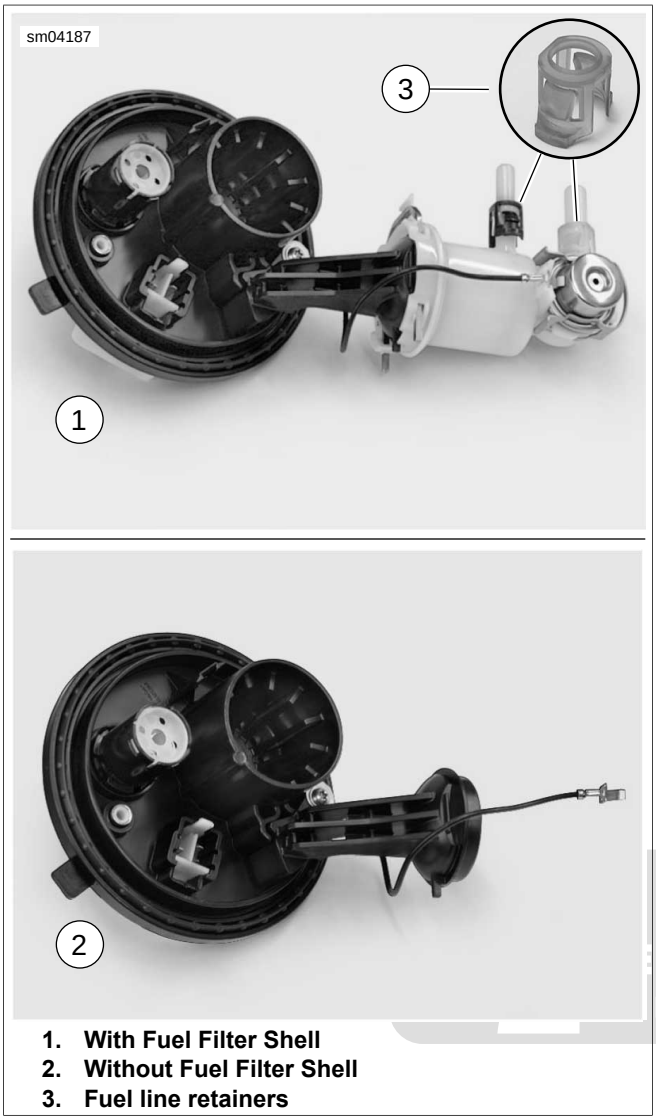


Figure 4-8. Hold Both Tool and Ratchet During Handling



Figure 4-9. Remove Ground Wire Spade Terminal From Top Plate



1. **With Fuel Filter Shell**
2. **Without Fuel Filter Shell**
3. **Fuel line retainers**

Figure 4-10. Top Plate Assembly

INSTALLATION

PART NUMBER	TOOL NAME
HD-48646	CAM RING REMOVER/INSTALLER

1. If installing a **new** top plate, first install fuel filter shell. See 4.7 FUEL FILTER.
2. Inspect seal ring at bottom of top plate for cuts, tears or signs of deterioration. If necessary, install **new** seal ring with the nubs contacting the ring groove walls.
3. See Figure 4-10. Verify retainers (3) are secure on fuel filter fittings, and that they are not damaged. Note that retainers are of different sizes to prevent improper assembly.
4. Aligning latches and push tubes onto fittings of fuel filter shell until an audible click is heard. Pull on tubes to verify they are attached securely.
5. Install connector at bottom of top plate.
6. Route ground wire (from top plate connector) along inboard side of vapor valve and install spade terminal into slot in top plate.
7. Install fuel tank top plate engaging index tab in slot at front of fuel tank collar.
8. See Figure 4-11. Install cam ring over fuel tank top plate with the TOP stamp up.
9. Engage CAM RING REMOVER/INSTALLER (Part No. HD-48646) in top plate. Push down on tool and rotate in a clockwise direction until each of four index tabs begin to engage slots in fuel tank collar.
10. Install ratchet and rotate until cam ring is fully installed.

NOTE

See Figure 4-8. Always hold onto both the Cam Ring Remover/Installer and ratchet during handling or separation of parts may cause one to be dropped, possibly resulting in hard contact with fuel tank.

11. Install console. Tighten fasteners to 36-60 **in-lbs** (4.1-6.8 Nm).
12. Install seat. See 2.25 SEAT.

⚠WARNING

Wipe up spilled fuel and dispose of rags in a suitable manner. An open spark around gasoline could cause a fire or explosion, resulting in death or serious injury. (00518b)

13. Fill fuel tank. Carefully inspect for leaks. Start engine and repeat inspection.

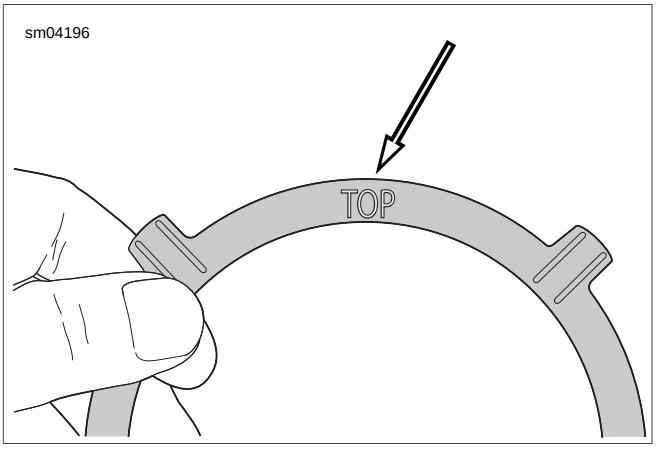


Figure 4-11. Cam Ring Stamp

FUEL FILTER 4.7

REMOVAL

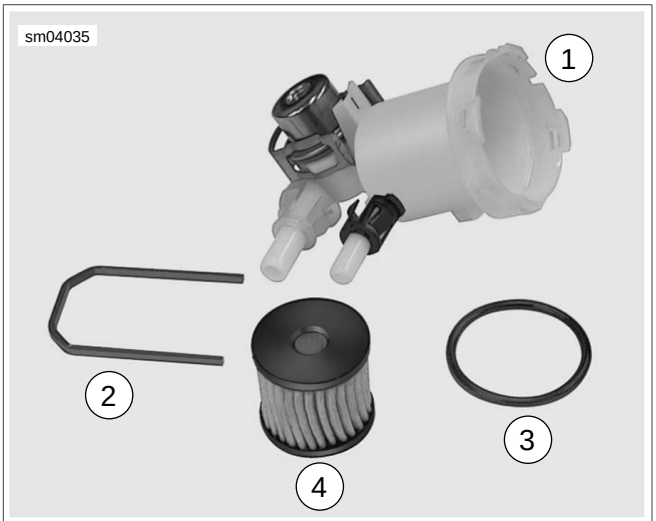
⚠WARNING

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)

1. Remove top plate. See 4.6 FUEL TANK TOP PLATE.
2. Locate ground wire spade terminal in slot of fuel filter shell. Insert tip of small flat blade screwdriver through window to press tang, and then pull terminal from slot. See Figure 4-12.
3. Gently raise locking arm and pull U-clip from holes in fuel filter shell.
4. Remove fuel filter shell from end cap.
5. Remove O-ring and filter from fuel filter shell. See Figure 4-13.



Figure 4-12. Remove Ground Wire Spade Terminal From Fuel Filter Shell



1. **Filter shell**
2. **U-clip**
3. **O-ring**
4. **Filter**

Figure 4-13. Fuel Filter Assembly

INSTALLATION

1. Install **new** filter in fuel filter shell.
2. Seat O-ring on counterbore at top of filter.
3. Install fuel filter shell over end cap, so that slot in fuel filter shell engages index pin on end cap.
4. Holding parts together, slide U-clip through holes on locking arm side of fuel filter shell. Push U-clip until ends exit holes on opposite side. Retract U-clip until contact is made with step in locking arm.
5. Route ground wire (from top plate TORX screw) around index pin side of end cap and install spade terminal into slot in fuel filter shell. Gently tug on wire to verify that terminal is locked.

NOTE

If terminal does not lock, use a thin flat blade, like that on a hobby knife, to bend tang outward slightly away from terminal body.

6. Install top plate. See 4.6 FUEL TANK TOP PLATE.

FUEL PRESSURE REGULATOR 4.8

REMOVAL

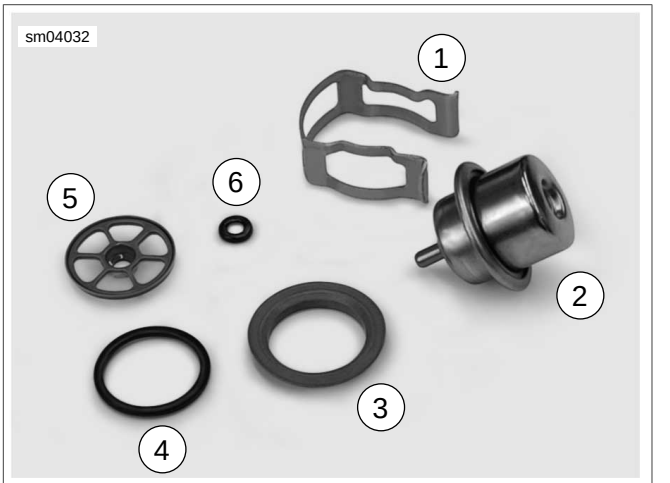
⚠WARNING

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)

1. Remove top plate. See 4.6 FUEL TANK TOP PLATE.
2. See Figure 4-14. Remove ground wire spade terminal from slot of fuel filter shell.
3. Remove spring clip from fuel pressure regulator. For best results, free one side first and then the other.
4. See Figure 4-15. Remove fuel pressure regulator, regulator seat, large O-ring, screen and small O-ring.



Figure 4-14. Remove Ground Wire Spade Terminal From Fuel Filter Shell



1. **Spring clip**
2. **Fuel pressure regulator**
3. **Regulator seat**
4. **Large O-ring**
5. **Screen**
6. **Small O-ring**

Figure 4-15. Fuel Pressure Regulator Assembly

INSTALLATION

1. See Figure 4-15. Insert small O-ring at top of pressure port bore.
2. Install screen at top of pressure regulator bore, so that sleeve on ID faces small O-ring. Install regulator seat to evenly press screen into bore. Remove regulator seat.
3. Install large O-ring at top of screen.
4. Install regulator seat and fuel pressure regulator.
5. Install spring clip, so that indented sides engage top of center rib on fuel pressure regulator, while rounded side engages bottom of tabs on housing.
6. Route ground wire around index pin side of end cap and install spade terminal into slot in fuel filter shell.
7. Install top plate. See 4.6 FUEL TANK TOP PLATE.

FUEL LEVEL SENDER 4.9

REMOVAL

⚠WARNING

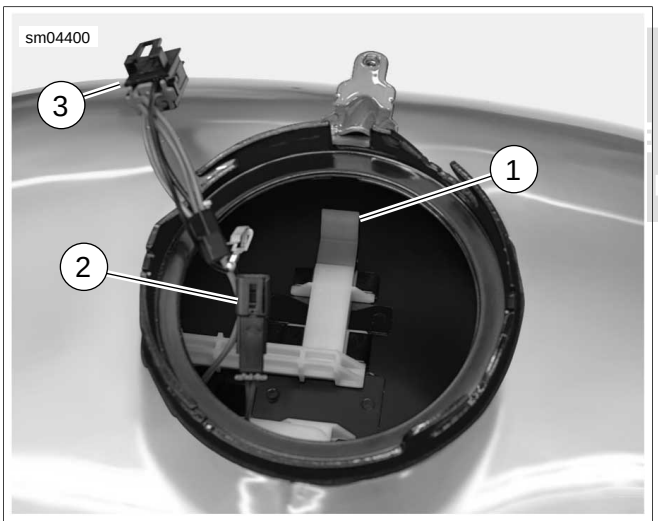
Stop the engine when refueling or servicing the fuel system. Do not smoke or allow open flame or sparks near gasoline. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00002a)

1. Remove top plate. See 4.6 FUEL TANK TOP PLATE.
2. Disconnect 2-place connector to release fuel level sender from wire harness.

NOTE

Looking into fuel tank at bracketry at top of tunnel, note that finger on front bracket points forward, while finger on rear bracket points rearward. See Figure 4-16.

3. Reaching into fuel tank, pull up on front finger and slide fuel level sender bracket rearward until four ears on bracket are free of catches at top of tunnel.
4. Remove fuel level sender from left side of fuel tank. See Figure 4-17.



1. **Fuel level sender bracket (front finger)**
2. **Fuel level sender connector**
3. **Top plate connector**

Figure 4-16. Front Finger (Fuel Level Sender Bracket)

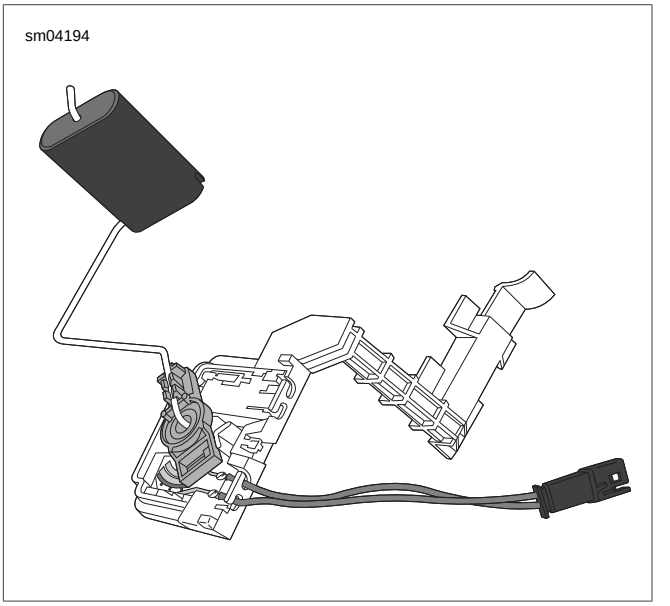


Figure 4-17. Fuel Level Sender

INSTALLATION

1. With the finger on the fuel level sender bracket pointing forward, install fuel level sender into left side of fuel tank.
2. Engage four ears on fuel level sender bracket with front set of catches at top of tunnel. Push fuel level sender bracket forward until ears are fully engaged.
3. Connect 2-place connector to attach fuel level sender to wire harness.
4. Install top plate. See 4.6 FUEL TANK TOP PLATE.

TWIST GRIP SENSOR 4.10

REMOVAL

1. Remove main fuse.

NOTICE

Do not remove or install the master cylinder assembly without first positioning a 5/32-inch (4 mm) thick insert between the brake lever and lever bracket. Removing or installing the master cylinder assembly without the insert in place may result in damage to the rubber boot and plunger on the front stoplight switch. (00324a)

2. Release the right switch housing and front brake control from the handlebar. See 7.40 HANDLEBAR SWITCH ASSEMBLIES.

3. **Models with heated handgrips:** Pry end cap from handgrip and pull connector out through end of handgrip. See 2.23 HANDLEBARS, Heated Handgrips. It is not necessary to disconnect the heated handgrip power or interconnect connectors.

NOTE

To remove the handgrip, a slight tug may be necessary.

4. Remove the handgrip from the end of the handlebar.

5. If present, remove two harness retainers from holes in handlebar.

NOTE

The twist grip sensor jumper harness connector [204] is a 6-place Molex (black).

6. **Road King models:** See Figure 4-18. Remove headlamp and handlebar clamp shroud. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS. Remove twist grip sensor jumper harness connector from T-stud on fork stem nut lock plate and disconnect.

7. **Fork mounted fairing models:** See Figure 4-19. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS. Remove twist grip sensor jumper harness connector from T-stud and disconnect.

8. **Frame mounted fairing models:** See Figure 4-20. Remove outer fairing and instrument bezel. See 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS and 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS. Disconnect twist grip sensor jumper harness connector.

NOTE

The twist grip sensor connector can break if the twist grip sensor is pulled too hard. The connector is not serviceable. Damage requires replacement of the twist grip sensor jumper harness or twist grip sensor assembly.

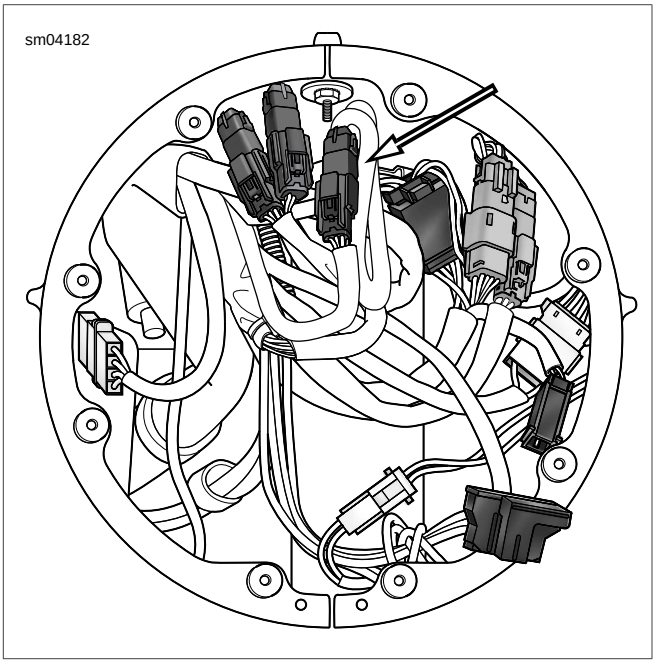


Figure 4-18. Twist Grip Sensor Jumper Harness Connector (Road King models)

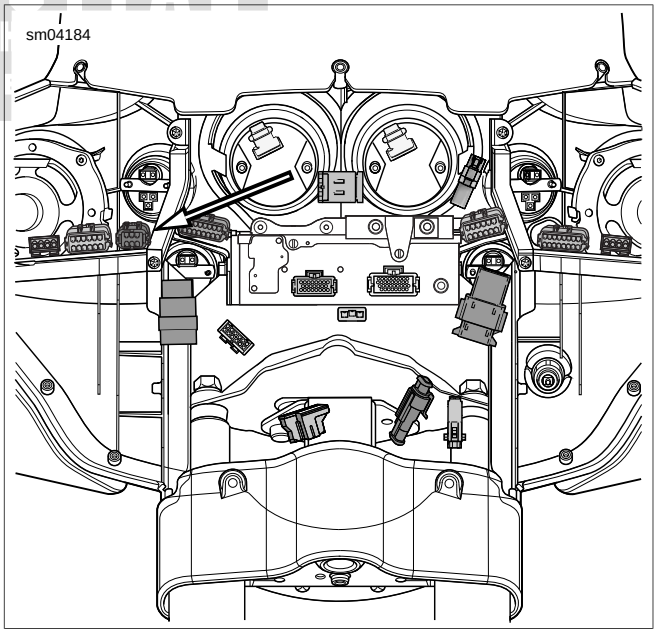


Figure 4-19. Twist Grip Sensor Jumper Harness Connector (fork mounted fairing models)

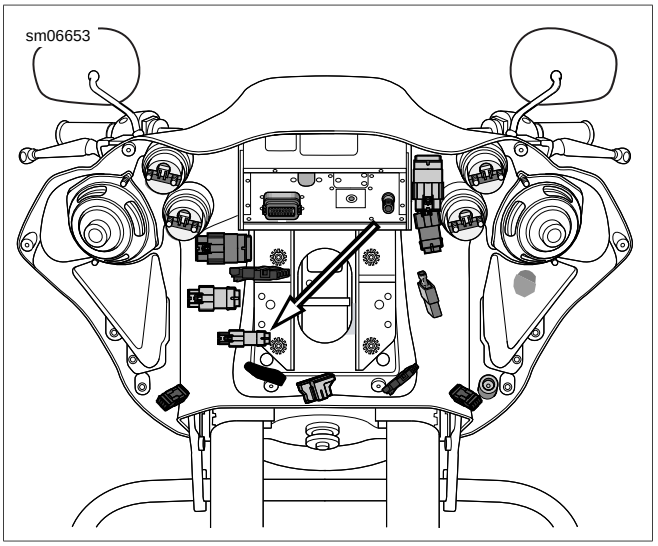


Figure 4-20. Twist Grip Sensor Jumper Harness Connector (frame mounted fairing models)

9. Carefully pull twist grip sensor out of handlebar while feeding jumper harness into center of handlebar. Pull out only as far as necessary to access the connectors.

NOTE

The latch on the pin housing is very fragile. Use extreme care when releasing it. The connector is not serviceable and can only be obtained as part of the twist grip sensor jumper harness.

10. Gently insert a small flat blade screwdriver between pin and socket housings as shown in Figure 4-21 and separate housings. Do not pivot or rotate screwdriver after insertion or damage to pin housing may occur.
11. See Figure 4-22. **Models with heated handgrips:** Separate the interconnect harness connector (2).
12. Remove twist grip sensor.

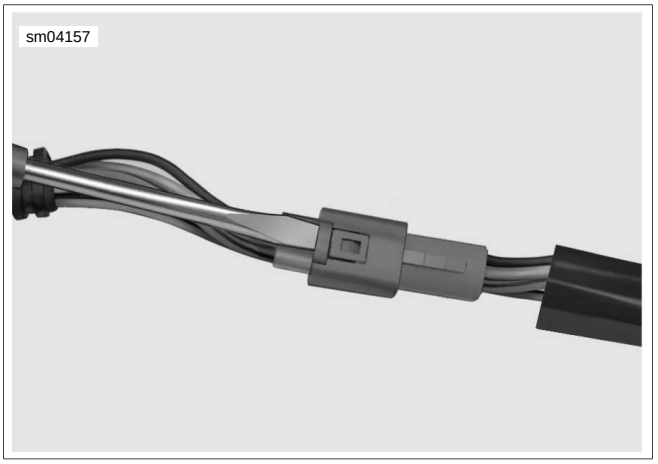
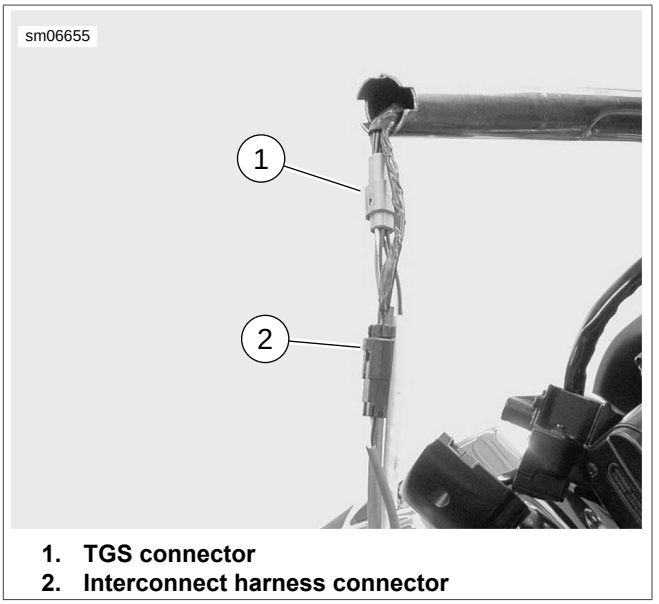


Figure 4-21. Gently Insert Screwdriver to Disconnect Twist Grip Sensor Connector



1. **TGS connector**
2. **Interconnect harness connector**

Figure 4-22. Heated Handgrip Connectors

INSTALLATION

NOTE

The seal cap protects the TGS terminals from dirt and moisture, and also serves as a retention device for installation of the throttle grip.

1. Verify that seal cap is installed at end of twist grip sensor. If seal cap is not present, it may be engaged inside throttle grip.
   a. Check condition of O-ring on seal cap. O-ring is only available as part of the seal cap assembly.
   b. See Figure 4-23. Install seal cap engaging legs in slots at end of twist grip sensor.
2. Connect TGS connector to TGS jumper harness.
3. **Models with heated handgrips:** See Figure 4-22. Connect the interconnect harness connector (2).
4. See Figure 4-24. Gently draw jumper harness into handlebar while guiding TGS into end of handlebar. Align index tabs on twist grip sensor into slots in handlebar. Verify that the TGS is completely engaged into the slots in the handlebar.
5. Position hand grip so any cosmetic features are properly positioned. Install the handgrip and rotate to verify that internal splines are engaged with the twist grip sensor.
6. **Models with heated handgrips:** Install handgrip and connect heated handgrip connector. See 2.23 HANDLEBARS, Heated Handgrips. Install end cap.
7. Install switch housing and brake lever/master cylinder assembly. See 7.40 HANDLEBAR SWITCH ASSEMBLIES.

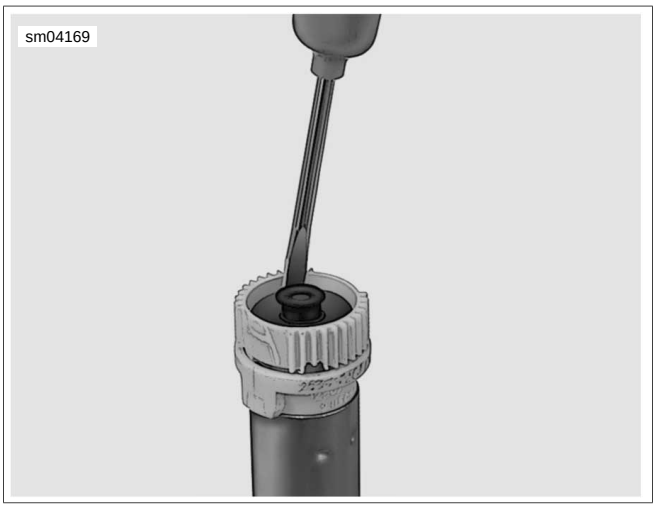


Figure 4-23. Install Seal Cap (models without heated grips)



Figure 4-24. Install Twist Grip Sensor

8. Connect twist grip sensor jumper harness connector and secure on T-stud if equipped.
9. **Road King models:** Install handlebar clamp shroud and headlamp. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.
10. **Fork mounted fairing models:** Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
11. **Frame mounted fairing models:** Install outer fairing and instrument bezel. See 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS and 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS, respectively.
12. If present, install two cable clips on handlebar switch conduit into holes in handlebar.
13. Install main fuse.

NOTE

*Whenever a **new** twist grip sensor (or ECM) is installed, place the engine run/stop switch in the RUN position and turn the ignition/light keyswitch to IGNITION and then back to OFF four times (without starting engine). Allow at least three seconds to elapse between ignition cycles. As the ECM uses the first four ignition cycles to establish the optimum idle speed, there may be initial performance problems if the procedure is not performed.*

TWIST GRIP SENSOR JUMPER HARNESS

Removal

1. Remove twist grip sensor.
2. See Figure 4-25. Securely attach chaser wire to jumper harness.
3. Gently pull jumper harness out through slot at center of handlebar. Remove chaser wire from jumper harness.

Installation

1. Securely attach chaser wire to jumper harness. If equipped, secure heated handgrip connector to harness with electrical tape.
2. Carefully draw connector and jumper harness through handlebar while feeding harness into handlebar.
3. Remove chaser wire from jumper harness.
4. Install twist grip sensor.

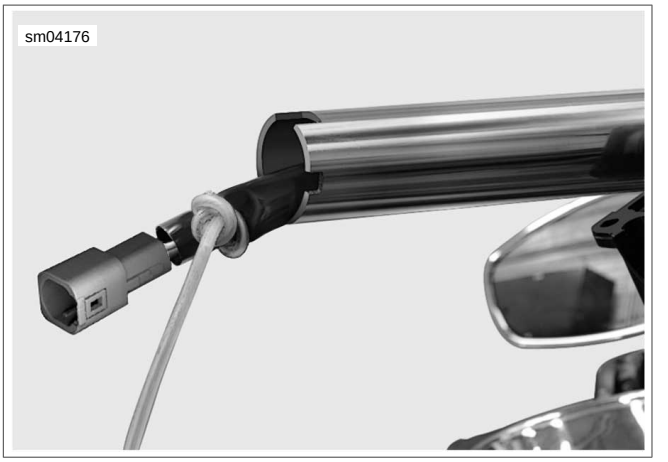


Figure 4-25. Attach Chaser Wire to Twist Grip Sensor Jumper Harness

THROTTLE CONTROL ACTUATOR (TCA) 4.11

GENERAL

NOTE

See Figure 4-26. The TCA is not sold separately. Damage or failure requires complete replacement of the induction module. Also note that tampering or removing TCA cover voids warranty.

Refer to the electrical diagnostic manual for information on the function and testing of the TCA.

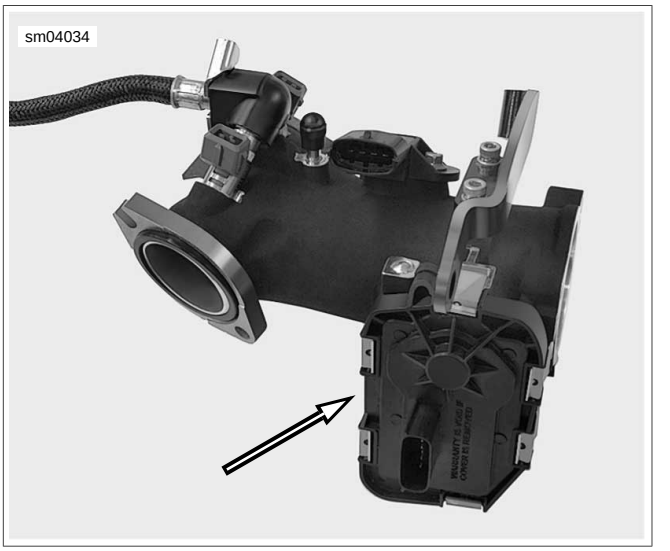


Figure 4-26. TCA

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ENGINE TEMPERATURE SENSOR (ET) 4.12

REMOVAL

1. Remove main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
2. Loosen horn bracket bolt to front cylinder head. Remove horn bracket bolt (with flat washer) from rear cylinder head and swing horn bracket forward.
3. Pull back boot at back of front cylinder and remove ET sensor connector [90].
4. See Figure 4-27. Remove sensor.

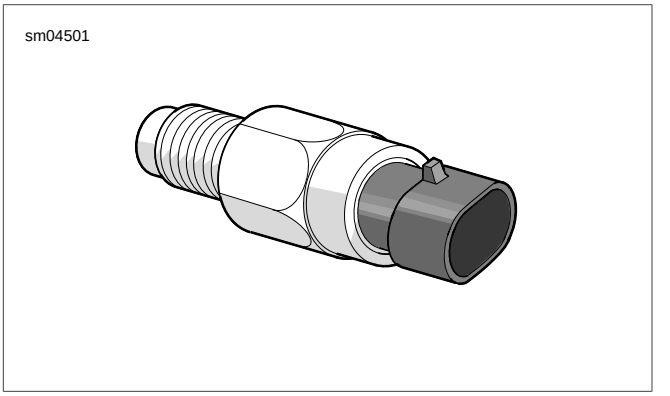


Figure 4-27. ET Sensor

INSTALLATION

1. Hand start **new** ET sensor into bore at back of front cylinder.
2. Tighten to 120-180 **in-lbs** (13.6-20.3 Nm).
3. Install ET sensor connector [90]. Pull boot over connector.
4. Install main fuse. See 7.7 SYSTEM FUSES AND RELAYS.

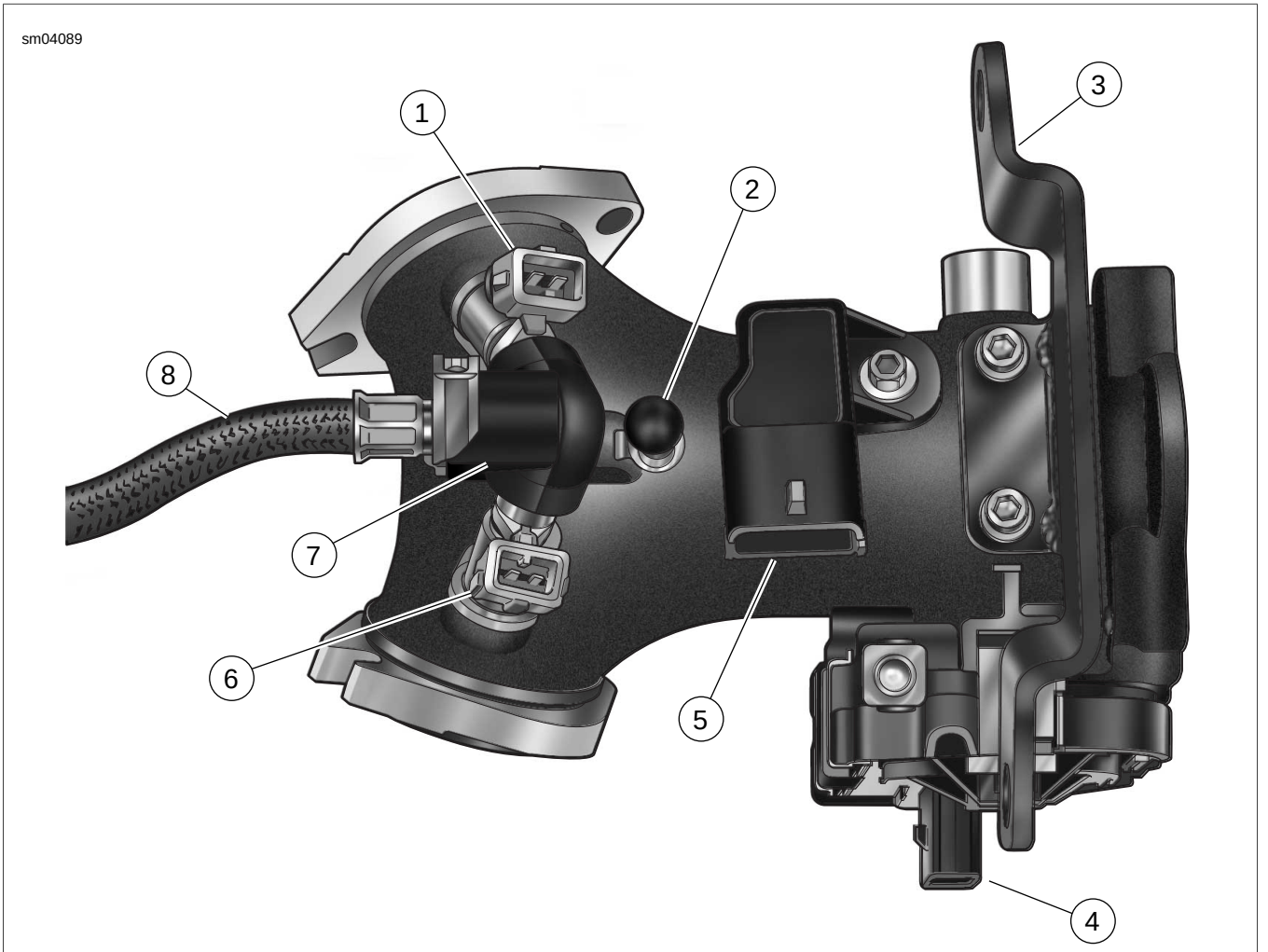
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

INDUCTION MODULE 4.13

REMOVAL

PART NUMBER	TOOL NAME
HD-47250	INTAKE MANIFOLD WRENCH

1. Remove fuel tank. See 4.5 FUEL TANK.
2. Remove air cleaner and backplate. See 4.4 AIR CLEANER ASSEMBLY.
3. See Figure 4-28. If ACR equipped, remove ACR connectors and retainer from mounting bracket (3).
4. Pull purge tube from fitting (2) at top of induction module (California models only).
5. Remove TMAP sensor connector (5).
6. Remove front fuel injector connector (1) and rear fuel injector connector (6).
7. Remove TCA connector (4). Cut anchored cable strap to release connector conduit from front right side of induction module.
8. Remove right side screws from front and rear cylinder head flange adapters. For best results, use the INTAKE MANIFOLD WRENCH (Part No. HD-47250). See Figure 4-29.
9. Loosen left side screws from flange adapters. Slots in flanges make removal of screws unnecessary.
10. Slide induction module out right side of motorcycle.
11. Remove seals from flange adapters. Discard seals. Remove flange adapters from outlet ports of induction module.



1. **Front fuel injector [84]**
2. **Purge tube fitting/cap**
3. **Mounting bracket**
4. **TCA [211]**
5. **TMAP sensor [80]**
6. **Rear fuel injector [85]**
7. **Fuel rail**
8. **Fuel supply tube**

Figure 4-28. Induction Module Assembly

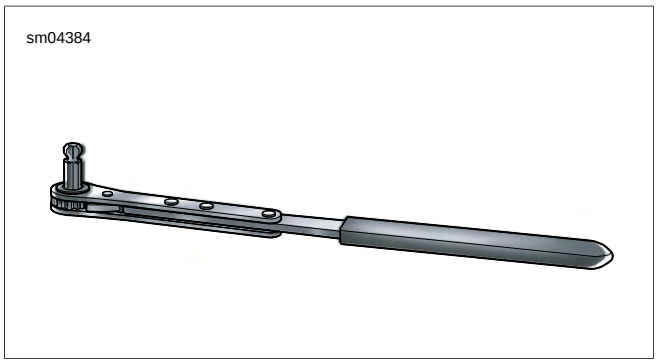


Figure 4-29. Intake Manifold Wrench

INSTALLATION

PART NUMBER	TOOL NAME
HD-47250	INTAKE MANIFOLD WRENCH

1. With the counterbore facing outward, slide flange adapters onto the induction module.
2. Place a **new** seal in each flange adapter with the beveled side against the counterbore.
3. See Figure 4-28. Slide induction into position until slots engage screws on left side.
4. Start right side screws. For best results, use the INTAKE MANIFOLD WRENCH (Part No. HD-47250).
5. Loosely install two breather bolts to temporarily fasten mounting bracket to cylinder heads.
6. Tighten right side flange adapter screws until snug. Tighten left side screws to 96-144 **in-lbs** (10.9-16.3 Nm).
7. Tighten right side screws to 96-144 **in-lbs** (10.9-16.3 Nm).
8. See Figure 4-28. Install rear fuel injector connector (6) and front fuel injector connector (1).
9. Install TMAP sensor connector (5).
10. Route TCA connector and conduit straight down between induction module and front cylinder staying inboard of mounting bracket. Install **new** anchored cable strap in hole at front right side of induction module and loosely capture TCA conduit.
11. Route conduit rearward under induction module and install TCA connector (4). Tighten cable strap and cut any excess cable strap material.
12. Connect purge tube to fitting (2) (California models only). On non-California models, inspect rubber cap for tears, cracks or signs of deterioration. Replace cap if damaged or missing.
13. If equipped with ACR, install ACR connector retainer on mounting bracket (3) and secure connectors to it.
14. Install fuel tank. See 4.5 FUEL TANK.
15. Install backplate and air cleaner. See 4.4 AIR CLEANER ASSEMBLY.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TEMPERATURE MANIFOLD ABSOLUTE PRESSURE SENSOR (TMAP) 4.14

GENERAL

See the electrical diagnostic manual for information on the function and testing of the temperature/manifold absolute pressure (TMAP) sensor.

REMOVAL

1. Remove fuel tank. See 4.5 FUEL TANK.
2. Remove hex screw to release TMAP sensor bracket from induction module. Discard screw.
3. See Figure 4-30. While rotating TMAP sensor slightly, pull straight up to release pressure port from hole in induction module.

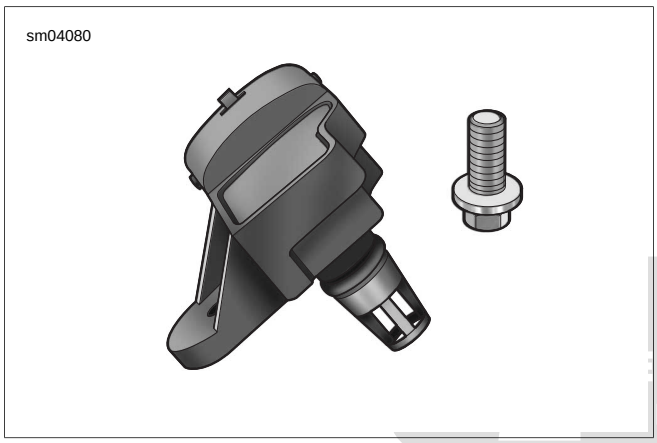


Figure 4-30. TMAP Sensor

INSTALLATION

1. Inspect O-ring on pressure port for cuts, tears or signs of deterioration. Install **new** O-ring if necessary.
2. With the electrical connector facing toward the rear of the induction module, insert pressure port on TMAP sensor into hole in induction module.
3. Align hole in TMAP sensor bracket with threaded hole in induction module.
4. Install **new** hex screw and tighten to 84-108 **in-lbs** (9.5-12.2 Nm).
5. Install fuel tank. See 4.5 FUEL TANK.

IGITAL
CHNICIAN II
RLEY-DAVIDSON

OXYGEN SENSORS (O2) 4.15

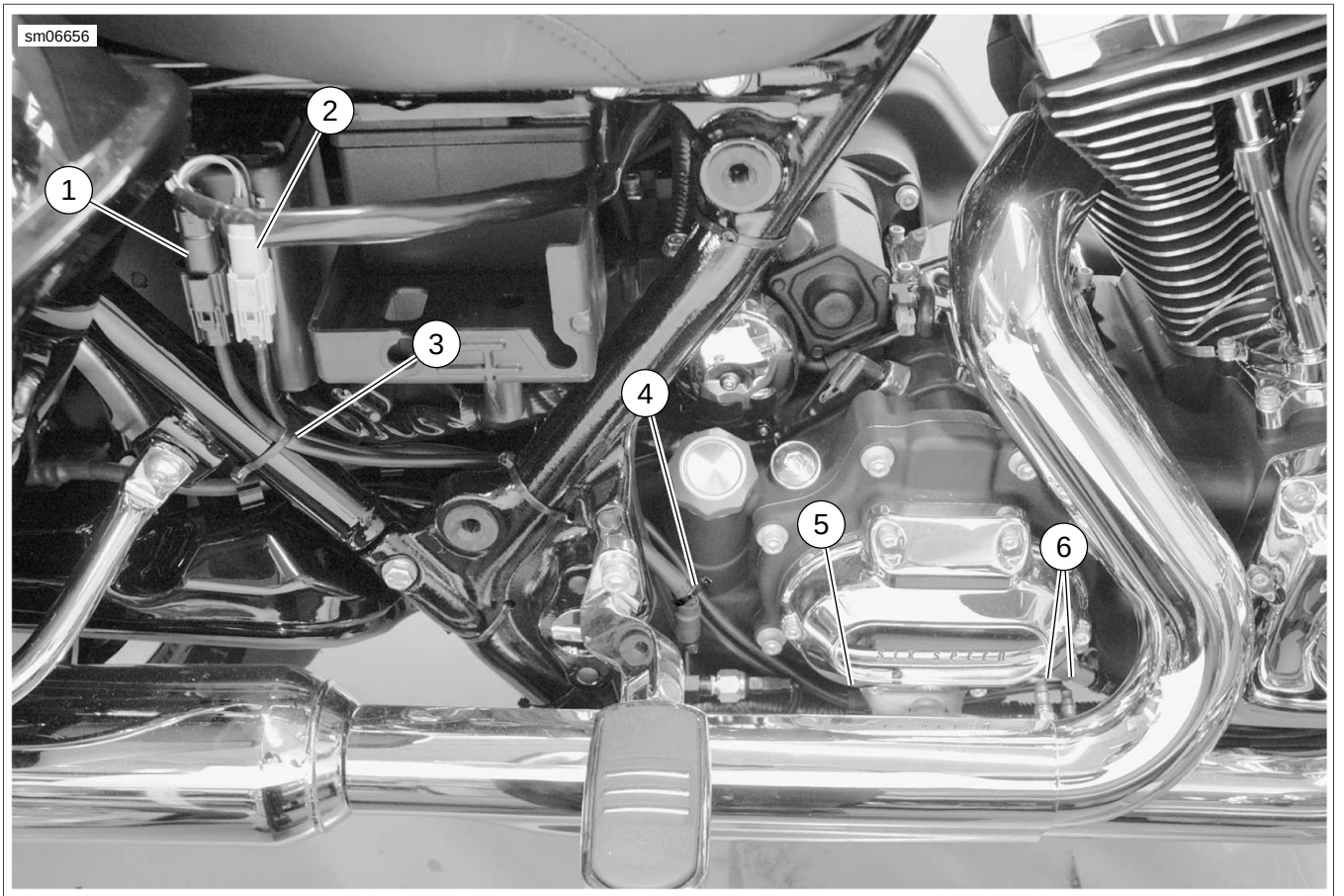
GENERAL

See the electrical diagnostic manual for information on the function and testing of the oxygen sensor (O2).

REMOVAL

PART NUMBER	TOOL NAME
HD-50017	OXYGEN SENSOR WRENCH

1. Remove main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
2. See Figure 4-31. Cut cable straps (3, 4) and disconnect oxygen sensor connector (1 or 2).
3. Release harness from retainer (5).
4. Using OXYGEN SENSOR WRENCH (Part No. HD-50017), remove oxygen sensor (6).



1. **Rear oxygen sensor connector**
2. **Front oxygen sensor connector**
3. **Cable strap to frame**
4. **Cable strap to brake hose**
5. **Cable retainer**
6. **Oxygen sensors**

Figure 4-31. Oxygen Sensors

INSTALLATION

PART NUMBER	TOOL NAME
HD-50017	OXYGEN SENSOR WRENCH

NOTES

- *Do not install sensors that have been dropped or impacted by other components. Damage to the sensing element may have occurred.*
- *Replacement sensors have anti-seize pre-applied to the threads. Apply a thin coat of anti-seize lubricant to the threads of sensors that are to be reused. Never use any other lubricant or sealant.*

1. If reusing oxygen sensor:
   a. Remove used seal and install a **new** one.
   b. Apply a light coating of SILVER GRADE ANTI-SEIZE (Part no. 98960-97) to threads.
2. Using OXYGEN SENSOR WRENCH (Part No. HD-50017), install oxygen sensor and tighten to 14 ft-lbs (19 Nm).
3. See Figure 4-31. Route harness along lower frame and above the rear engine mount. Secure in harness retainer (5).

NOTE

Verify connector halves are clean and free of grease or other contaminants. NEVER apply dielectric grease, cleaning agents, or any other lubricants, sealants or fluids to oxygen sensor connectors. Any such application will result in signal trouble and sensor failure.

4. Connect sensor connector (1 or 2). Secure sensor harnesses with **new** cable straps to rear frame down tube (3) and brake hose (4).
5. Install main fuse. See 7.7 SYSTEM FUSES AND RELAYS.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

FUEL INJECTORS 4.16

GENERAL

⚠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)

See the electrical diagnostic manual for information on the function and testing of the fuel injectors.

REMOVAL

1. Remove induction module. See 4.13 INDUCTION MODULE.
2. Remove T25 TORX screw to release fuel supply tube clamp from fuel rail.
3. See Figure 4-32. Rotate fuel supply tube clamp 90 degrees in a clockwise direction and then remove from groove in fuel supply tube fitting.
4. Pull fuel supply tube from fuel rail bore and remove two O-rings and two sealing washers. Discard O-rings and sealing washers.
5. Pull fuel injectors with attached fuel rail from induction module. To overcome the resistance of the bottom O-ring on both fuel injectors, gently rock assembly back and forth while pulling.
6. Pull fuel injectors from fuel rail. To overcome the resistance of the top O-ring, gently rock each fuel injector while pulling.
7. Remove O-rings from fuel injectors. Discard O-rings.

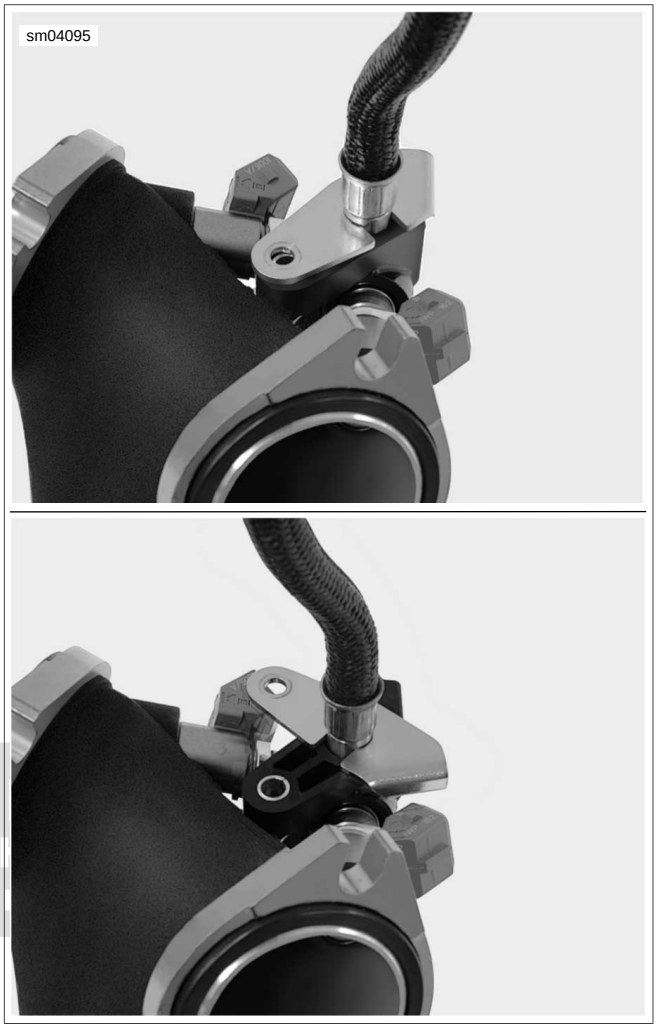


Figure 4-32. Rotate Fuel Supply Tube Clamp

INSTALLATION

1. Apply a very light film of clean engine oil to **new** O-rings. Install O-rings on fuel injectors.
2. Push open end of fuel injectors (opposite cone spray) into fuel rail.
3. Rotate fuel injectors, so that the electrical connectors are on the outboard side. Push cone spray end of fuel injectors into bores of induction module until slot at bottom of fuel rail engages machined tab at top of induction module.
4. Install **new** O-ring and sealing washer in fuel rail bore. Install second O-ring and second sealing washer.
5. Push fuel supply tube into fuel rail bore.
6. Rotate fuel supply tube in a clockwise direction until tapered end of quick connect fitting is pointing upward. Now rotate tube an additional 90°, so that fitting is pointing rearward (toward TCA on induction module).
7. Engage slot on fuel supply tube clamp in groove of fuel supply tube fitting. Rotate fuel supply tube clamp 90° in a

counter-clockwise direction until curled lip on fuel supply tube clamp engages flange on fuel rail.

8. Align thru holes in fuel rail and fuel supply tube clamp with threaded hole in induction module. Install T25 TORX screw and tighten to 66-82 **in-lbs** (7.5-9.3 Nm).
9. Install induction module. 4.13 INDUCTION MODULE.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

FUEL PUMP 4.17

GENERAL

⚠WARNING

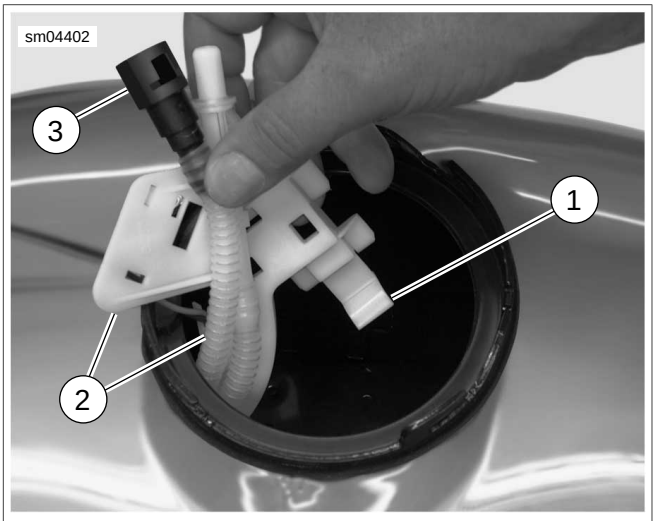
When servicing the fuel system, do not smoke or allow open flame or sparks in the vicinity. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00330a)

Carefully inspect tubes for cuts, tears, holes or other damage. Replace fuel pump if any damage is found. Even a small hole can cause a reduction in fuel pressure.

Refer to the electrical diagnostic manual for information on the function and testing of the fuel pump.

REMOVAL

1. Remove top plate. See 4.6 FUEL TANK TOP PLATE.
2. Remove fuel level sender. See 4.9 FUEL LEVEL SENDER.
3. Pull up on transfer tube bracket to release two tabs at bottom from slots at top of fuel pump bracket.
4. Depress collar on each side of fitting to disconnect transfer tube from transfer tube bracket.
5. See Figure 4-33. Pull up on rear finger and slide fuel pump bracket forward until four ears on bracket are free of catches at top of tunnel.
6. See Figure 4-34. Remove fuel pump from left side of fuel tank. For best results, rotate fuel pump assembly 90 degrees in a clockwise direction until transfer tube connection is pointing rearward, and then pull from fuel tank.
7. If necessary, further disassemble fuel pump assembly as follows:
   a. Reaching into fuel tank, release transfer tube from weld clip on right side of tunnel and remove from fuel tank.
   b. Depress arms on fuel inlet strainer and remove from slots in fuel pump housing.
   c. Inspect the condition of the fuel pump wiring. If the wiring needs to be replaced, see 4.17 FUEL PUMP, Fuel Pump and Fuel Level Sender Wire Harness.



1. **Fuel pump bracket (rear finger)**
2. **Transfer tube/bracket**
3. **Fuel pump to fuel filter fitting**

Figure 4-33. Rear Finger (Fuel Pump Bracket)

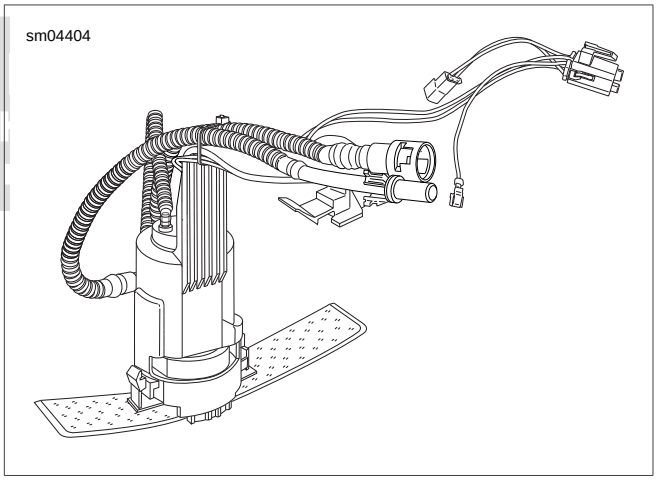


Figure 4-34. Fuel Pump Assembly

INSTALLATION

1. If removed, assemble fuel pump assembly as follows:
   a. Reaching into fuel tank, capture transfer tube in weld clip on right side of tunnel.
   b. Install fuel inlet strainer at bottom of fuel pump engaging arms in slots of fuel pump housing.
2. Install fuel pump into left side of fuel tank. For best results, hold fuel pump assembly, so that transfer tube connection is pointing rearward, and then insert into fuel tank. Now rotate assembly 90 degrees in a counter-clockwise direction.
3. Look into fuel tank to verify that fuel inlet strainer lies flat and that ends are not folded under fuel pump. Also verify

that wire harness is still captured in molded clip at front of fuel pump bracket.

4. With the finger on the fuel pump bracket pointing rearward, engage four ears on bracket with rear set of catches at top of tunnel. Push fuel pump bracket rearward until ears are fully engaged.
5. Install transfer tube onto transfer tube bracket. Fit two tabs at bottom of transfer tube bracket into slots at top of fuel pump bracket. Verify that transfer tube is still captured in weld clip on right side of tunnel and that free end is in contact with bottom of fuel tank.
6. Install fuel level sender. See 4.9 FUEL LEVEL SENDER.
7. Install top plate. See 4.6 FUEL TANK TOP PLATE.

FUEL PUMP AND FUEL LEVEL SENDER WIRE HARNESS

Removal

NOTE

Damaged wiring, terminals and/or connectors requires replacement of the wire harness. Do not replace the special teflon coated wiring with ordinary bulk wire. Ordinary insulation materials may deteriorate when in contact with gasoline.

1. Remove fuel pump. See 4.17 FUEL PUMP.
2. Cut cable strap to release wire harness and both fuel pump and transfer tubes from arm of fuel pump bracket.
3. Release wire harness from molded clip at front of fuel pump bracket.
4. Remove connector at top of fuel pump.

Installation

1. Install connector at top of fuel pump.
2. Route wire harness rearward and then forward under arm of fuel pump bracket. Install **new** cable strap at elbow capturing fuel pump and transfer tubes at top of arm and wire harness at bottom. See Figure 4-35.
3. Route wire harness through molded clip at front of fuel pump bracket. See Figure 4-36.
4. Install fuel pump. See 4.17 FUEL PUMP.

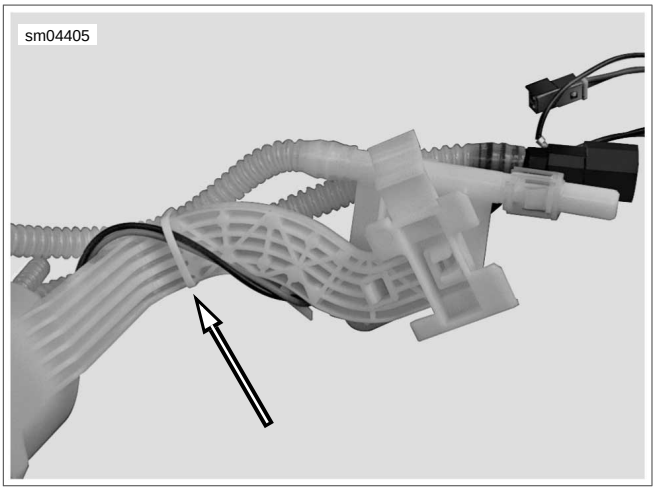


Figure 4-35. Cable Wires in Cable Strap

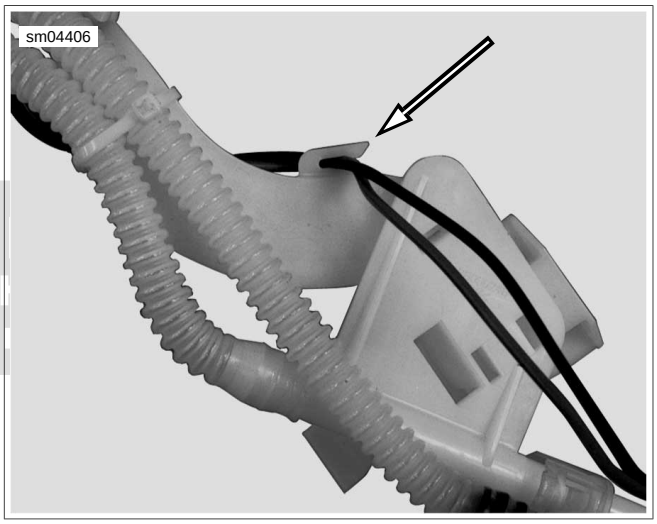


Figure 4-36. Capture Wires in Molded Clip

FUEL PRESSURE TEST 4.18

GENERAL

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

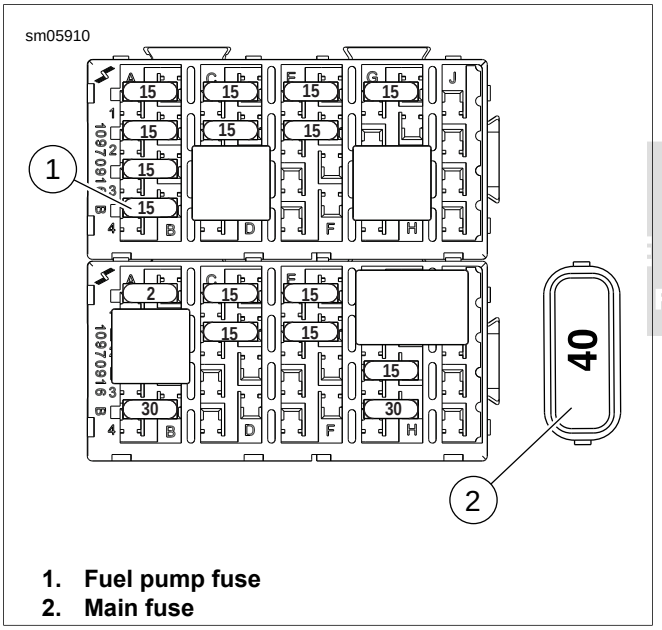
See Figure 4-37. The fuel pump fuse is located in the fuse block under the left side cover. The fuel pump can be turned on with DIGITAL TECHNICIAN II (Part No. HD-48650) or by applying battery voltage to the fuel pump fuse.

Improper fuel system pressure may contribute to one of the following conditions:

- Cranks, but won't run.
- Cuts out (may feel like ignition problem).
- Hesitation, loss of power or poor fuel economy.

NOTE

Refer to the electrical diagnostic manual for further information on the function and testing of the fuel system.



1. **Fuel pump fuse**
2. **Main fuse**

Figure 4-37. Fuse Blocks

TESTING

PART NUMBER	TOOL NAME
HD-41182	FUEL PRESSURE GAUGE
HD-44061	FUEL PRESSURE GAUGE ADAPTER

NOTE

Avoid kinking the fuel supply line when installing/removing the fuel pressure gauge and adapters.

WARNING

To prevent spray of fuel, purge system of high-pressure fuel before supply line is disconnected. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00275a)

1. Purge and disconnect fuel supply line. See 4.5 FUEL TANK, Removal. Leave the fuel pump fuse removed.

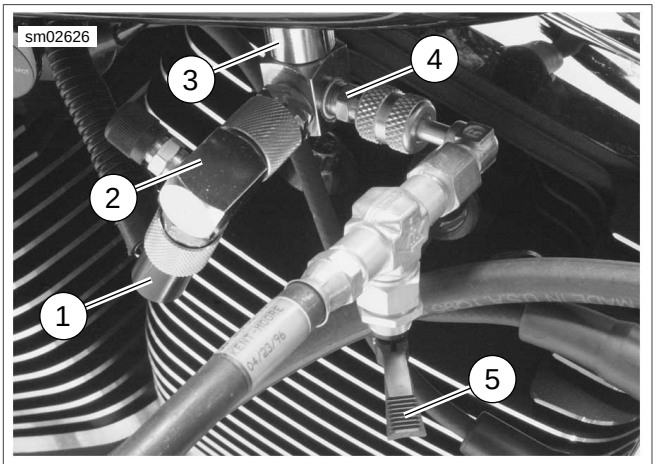
NOTE

Use two fuel pressure gauge adapters to prevent twisting of the fuel supply line. Tug on all connections to verify they are secure.

2. Install fuel pressure gauge adapters as follows:
   a. See Figure 4-38. Connect two FUEL PRESSURE GAUGE ADAPTER (Part No. HD-44061) together.
   b. Connect fuel line to adapter assembly.
   c. Connect adapter assembly to quick-connect fitting on fuel tank.



Figure 4-38. Fuel Pressure Gauge Adapters



1. **Fuel supply line**
2. **Adapter to fuel line**
3. **Adapter to fuel tank**
4. **Pressure adapter Schroeder valve union**
5. **Fuel valve (closed position)**

Figure 4-39. Fuel Line

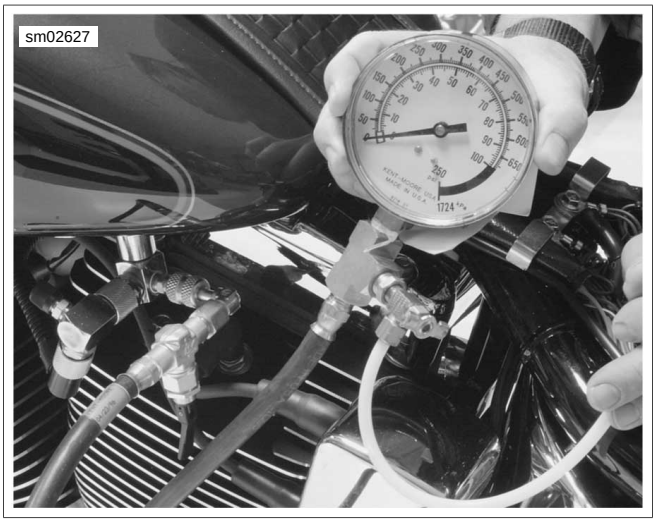


Figure 4-40. Fuel Pressure Gauge Installed (Typical)

⚠WARNING

To prevent spray of fuel, be sure quick-connect fittings are properly mated. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00268a)

3. Verify that the fuel valve and air bleed petcock on the FUEL PRESSURE GAUGE (Part No. HD-41182) are closed.
4. See Figure 4-39. Connect fuel pressure gauge to Schroeder valve closest to the fuel tank.
5. Install fuel pump fuse.
6. Start and idle engine to pressurize the fuel system. Open the fuel valve.
7. Position the clear air bleed tube in a suitable container and purge the gauge and hose of air. Close the petcock.
8. Vary the engine speed and note the reading of the pressure gauge. Fuel pressure should remain steady at 55-62 psi (380-425 kPa).

NOTE

If the fuel pressure is not within specification, see electrical diagnostic manual for further diagnosis.

⚠WARNING

Gasoline can drain from the fuel line and adapter when removed. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. Wipe up spilled fuel immediately and dispose of rags in a suitable manner. (00255a)

9. Turn the engine off. Purge the fuel pressure gauge of gasoline and remove fuel pressure gauge from Schroeder valve. Install protective cap.
10. Remove adaptor fitting assembly from fuel supply line and quick-connect fitting on fuel tank.

⚠WARNING

To prevent spray of fuel, be sure quick-connect fittings are properly mated. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00268a)

11. Connect fuel supply line fitting to fuel tank quick-connect. Tug on fuel supply line fitting to verify that it is secure.

EXHAUST SYSTEM 4.19

MUFFLERS

Removal

1. Remove saddlebags. See 2.26 SADDLEBAGS.
2. See Figure 4-41. Remove two fasteners (2) and lock washers.
3. Loosen clamp (23).
4. Pull and twist muffler to remove.
5. Inspect rubber mount (1) for deterioration or damage. Replace as necessary.

Installation

1. Slide **new** muffler clamp onto muffler. Push muffler squarely onto exhaust pipe.
2. Secure muffler to bracket (3) with fasteners (2) and lock-washers. Tighten fasteners to 96-144 **in-lbs** (10.8-16.3 Nm).
3. Position and tighten clamp (23) to 38-43 ft-lbs (51.5-58.3 Nm).
4. Install saddlebags. See 2.26 SADDLEBAGS.

SYSTEM REMOVAL

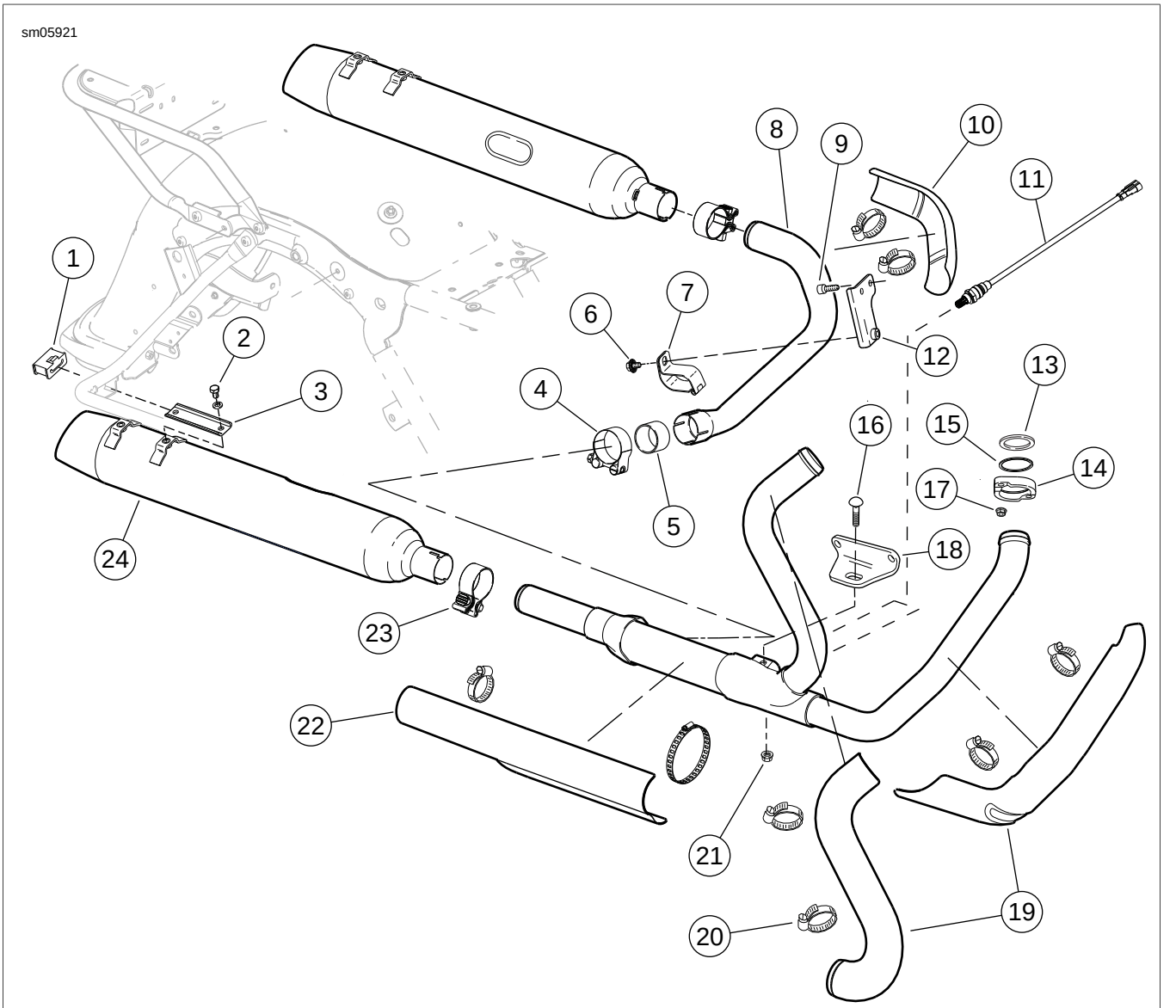
1. Remove saddlebags. See 2.26 SADDLEBAGS.
2. Remove mufflers. See 4.19 EXHAUST SYSTEM, Mufflers.
3. Remove seat. See 2.25 SEAT.
4. Remove right side front footboard and brackets from frame. See 2.49 FOOTBOARDS AND FOOTRESTS, Rider Footboards.
5. On HDI models, disconnect cable to exhaust valve actuator as follows:
   a. Locate active exhaust valve just forward of the right side muffler. Push cam rearward to remove tension from cable, and then release ball end from slot.
   b. Remove cable clip from slotted flange at front of active exhaust valve.
6. Disconnect front and rear O2 sensor connectors.
7. See Figure 4-41. Remove heat shields (10, 19, 22) from pipes.

NOTE

Some models are equipped with only a single muffler on the right side.

8. Loosen clamp (4).
9. Remove fastener (6) and bracket (7).
10. Pull and twist on crossover pipe to remove (8).
11. Remove two flange nuts (17) to release front header pipe from studs of front cylinder head. Slide exhaust flange down header pipe to improve clearance around exhaust port.
12. Remove two flange nuts (17) to release rear header pipe from studs of rear cylinder head.
13. Remove flange nut (21) and carriage bolt (16).
14. Remove exhaust from motorcycle.
15. Remove and discard gaskets (13) from front and rear exhaust ports.
16. Inspect retaining rings (15) and flanges (14). Replace as necessary.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON®



1. **Rubber mount**
2. **Fastener (4)**
3. **Bracket (2)**
4. **Clamp**
5. **Gasket**
6. **Flange bolt**
7. **Exhaust support clamp**
8. **Crossover pipe**
9. **Fastener (2)**
10. **Heat shield, crossover pipe**
11. **O2 Sensor (2)**
12. **Transmission exhaust bracket**
13. **Gasket (2)**
14. **Exhaust flange (2)**
15. **Retaining ring (2)**
16. **Carriage bolt**
17. **Flange nut (4)**
18. **Exhaust bracket**
19. **Heat shields, header pipe, front**
20. **Worm clamps**
21. **Flange locknut**
22. **Heat shield, header pipe, rear**
23. **Muffler clamp**
24. **Muffler**

Figure 4-41. Exhaust System

SYSTEM INSTALLATION

1. See Figure 4-41. If removed, install transmission exhaust bracket (12) and tighten fasteners (9) to 84-132 **in-lbs** (9.5-14.9 Nm).
2. Install **new** gaskets in both the front and rear cylinder head exhaust ports with the tapered side out.
3. Place exhaust header pipe into position on motorcycle and start two exhaust flange nuts to secure front header pipe to studs of front cylinder head.
4. Roll pipe into position at rear cylinder, making sure welded bracket on header pipe is below the side exhaust bracket (18).

5. Start two exhaust flange nuts to secure rear header pipe to studs of rear cylinder head.
6. Secure header pipe to side exhaust bracket (18) with carriage bolt (16) and flange nut (21). Do not tighten at this time.

NOTE

Some models are equipped with only a single muffler on the right side.

7. Slide **new** clamp (4) onto crossover pipe.
8. Install **new** gasket (5). Twist and push crossover pipe (8) onto exhaust header pipe.
9. Install exhaust support clamp (7) and secure with fastener (6). Do not tighten.
10. Install mufflers. See 4.19 EXHAUST SYSTEM, Mufflers.

NOTES

- *Verify that the exhaust components do not contact the motorcycle frame or any mounted components.*
- *Verify that no components are in a bind before and during tightening to reduce the chance of unwanted noise or vibration.*

11. Tighten the exhaust system as follows:
    a. Tighten the bottom nut of the rear cylinder head exhaust flange to 9-18 **in-lbs** (1-2 Nm). Tighten the top nut to 100-120 **in-lbs** (11.3-13.6 Nm). Final tighten the bottom nut to 100-120 **in-lbs** (11.3-13.6 Nm).
    b. Tighten the top nut of the front cylinder head exhaust flange to 9-18 **in-lbs** (1-2 Nm). Tighten the bottom nut to 100-120 **in-lbs** (11.3-13.6 Nm). Final tighten the top nut to 100-120 **in-lbs** (11.3-13.6 Nm).
    c. Tighten flange locknut (21) to 20-25 ft-lbs (27.1-33.9 Nm).
    d. Tighten crossover pipe clamp (4) to 25-30 ft-lbs (33.9-40.7 Nm).
    e. Tighten fastener (6) to 14-18 ft-lbs (19.0-24.4 Nm).

NOTES

- *Verify that the heat shields do not contact the motorcycle frame or any mounted components.*
- *See Figure 4-42. Install crossover pipe heat shield with the longer straight portion toward the muffler.*

12. Install heat shields. Position each worm drive clamp so that screw is on the outboard side in the most accessible position and tighten to 20-40 **in-lbs** (2.3-4.5 Nm).
13. Connect O2 sensor connectors and install **new** cable strap to secure leads to rear frame. Secure in harness retainer on lower frame.
14. On HDI models, connect cable to exhaust valve actuator as follows:
    a. Install cable clip onto slotted flange at front of active exhaust valve.
    b. Push cam rearward and install ball end of cable into slot. Verify that cable is properly seated in channel of active exhaust valve.
15. Install right side front footboard and brackets. See 2.49 FOOTBOARDS AND FOOTRESTS, Rider Footboards.
16. Install seat. See 2.25 SEAT.
17. Install saddlebags. See 2.26 SADDLEBAGS.

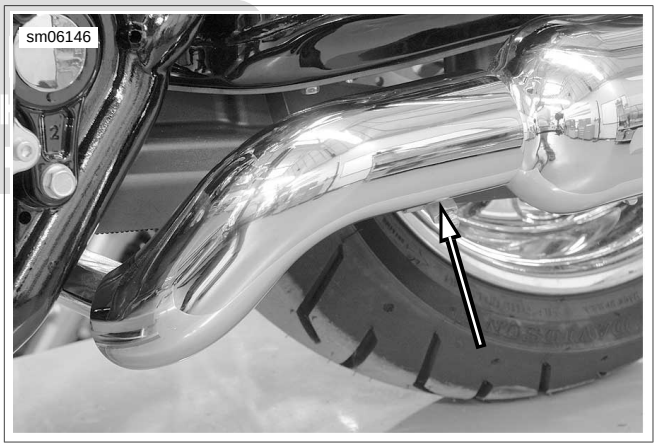


Figure 4-42. Crossover Pipe Heat Shield

ACTIVE EXHAUST (HDI) 4.20

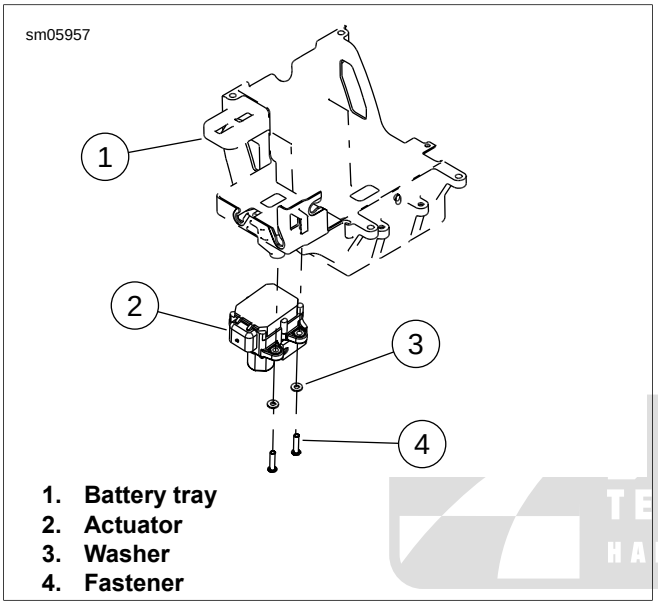
EXHAUST VALVE ACTUATOR

Removal

See Figure 4-43. Remove two fasteners (4) and washers (3) to release active exhaust valve actuator (2) from bottom of battery tray (1).

Installation

Install two fasteners to secure active exhaust valve actuator to bottom of battery tray. Tighten screws to 32-40 **in-lbs** (3.6-4.5 Nm).



1. **Battery tray**
2. **Actuator**
3. **Washer**
4. **Fastener**

Figure 4-43. Active Exhaust Actuator

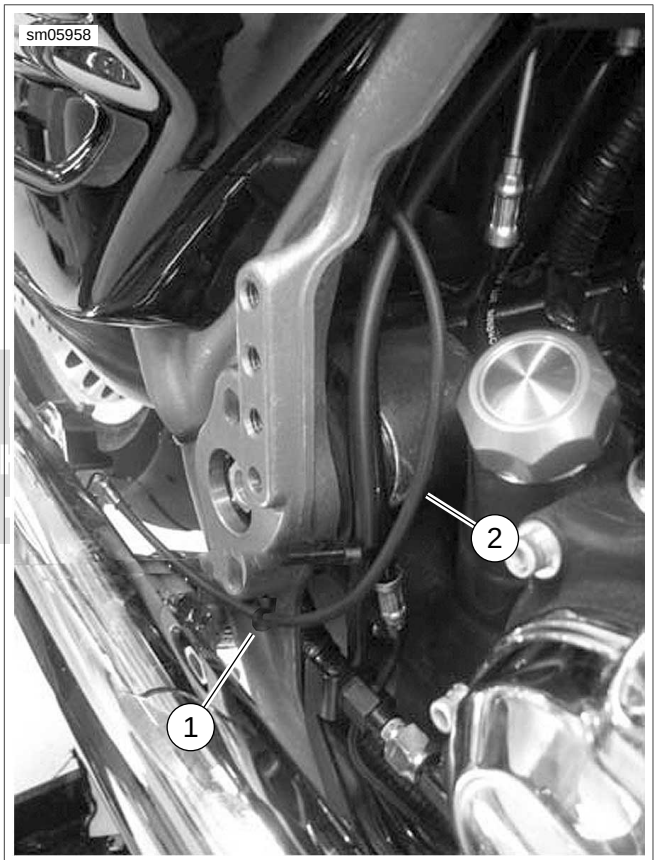
EXHAUST VALVE ACTUATOR CABLE

Removal

1. Remove exhaust valve actuator. See 4.20 ACTIVE EXHAUST (HDI), Exhaust Valve Actuator.
2. Remove cable as follows:
   a. Push on metal sleeve at end of cable housing to release plastic insert from slot in cable guide.
   b. Release cable from groove at center of actuator wheel and gently pull barrel end from hole.
3. See Figure 4-44. Release cable housing (2) from cable clip (1).

Installation

1. Install cable as follows:
   a. Gently push barrel end into hole in actuator wheel until cable engages groove at center.
   b. Push on metal sleeve at end of cable housing to engage plastic insert in slot of cable guide.
2. Install exhaust valve actuator. See 4.20 ACTIVE EXHAUST (HDI), Exhaust Valve Actuator.
3. See Figure 4-44. Secure cable housing (2) with cable clip (1).



1. **Cable clip**
2. **Cable housing**

Figure 4-44. Cable Routing

ACTIVE EXHAUST VALVE

General

The active exhaust valve is not repairable. Replace the rear exhaust header pipe if the valve is damaged or fails. See 4.19 EXHAUST SYSTEM.

INTAKE LEAK TEST 4.21

GENERAL

⚠WARNING

Do not allow open flame or sparks near propane. Propane is extremely flammable, which could cause death or serious injury. (00521b)

⚠WARNING

Read and follow warnings and directions on propane bottle. Failure to follow warnings and directions can result in death or serious injury. (00471b)

NOTES

- *To prevent false readings, keep air cleaner cover installed when performing test.*
- *Do not direct propane into air cleaner; false readings will result.*
- *Be careful when testing vehicle with Screamin' Eagle air cleaner assembly. This type of air cleaner has an open backing plate. Even with air cleaner cover on, directing nozzle too close to backing plate can give false readings.*

LEAK TESTER

PART NUMBER	TOOL NAME
HD-41417	PROPANE ENRICHMENT KIT

Parts List

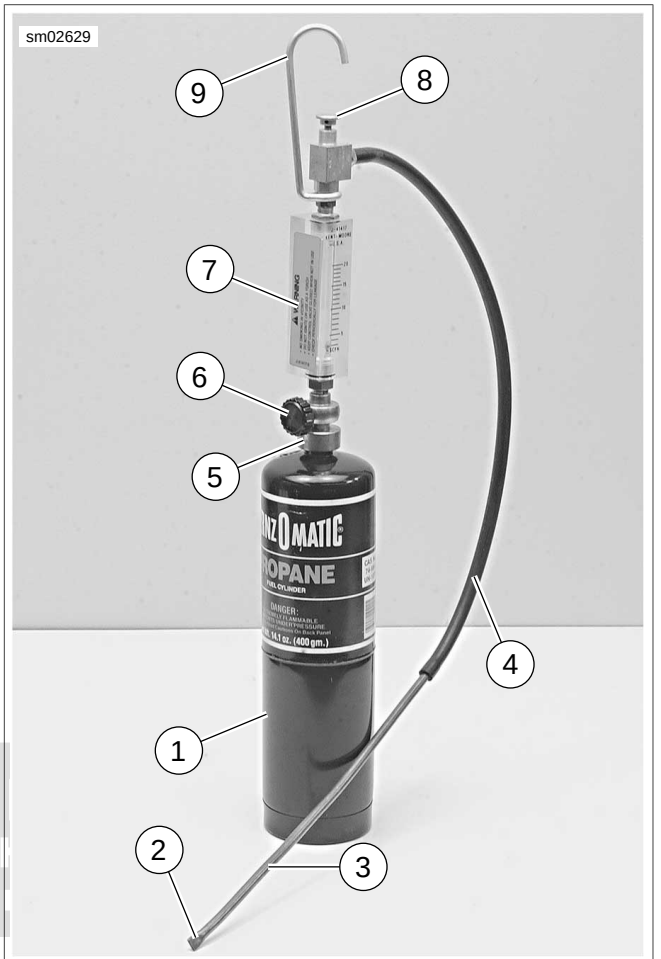
- Standard 14 oz. propane cylinder.
- PROPANE ENRICHMENT KIT (Part No. HD-41417).

Tester Assembly

1. See Figure 4-45. Make sure valve knob (6) is closed (fully clockwise).
2. Screw valve assembly (5) onto propane bottle (1).

Tester Adjustment

1. See Figure 4-45. Press and hold trigger button (8).
2. Slowly open valve knob (6) until pellet in flow gauge (7) rises 5-10 SCFH on gauge.
3. Release trigger button.



1. **Propane bottle**
2. **Nozzle**
3. **Copper tube**
4. **Hose**
5. **Valve assembly**
6. **Valve knob**
7. **Flow gauge**
8. **Trigger button**
9. **Hanger**

Figure 4-45. Leak Tester

PROCEDURE

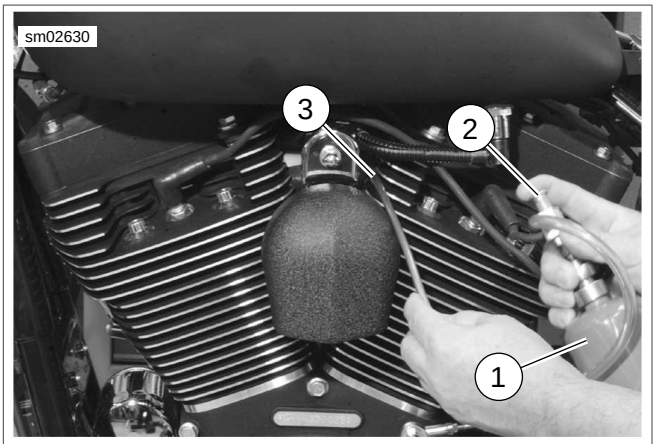
1. Start engine.
2. Warm up engine to operating temperature.

NOTE

Do not direct propane stream toward air cleaner. If propane enters air cleaner, a false reading will be obtained.

3. See Figure 4-46. Aim nozzle (3) toward possible sources of leak such as intake manifold mating surfaces.
4. Press and release trigger button (2) to dispense propane. Tone of engine will change when propane enters source of leak. Repeat as necessary to detect leak.

5. When test is finished, close valve knob (turn knob fully clockwise).



1. **Propane bottle**
2. **Trigger button**
3. **Nozzle**

Figure 4-46. Checking for Leaks

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

EVAPORATIVE EMISSIONS CONTROL SYSTEM 4.22

GENERAL

Motorcycles sold in some markets are equipped with an evaporative (EVAP) emissions control system. See Figure 4-47. The EVAP system functions as follows:

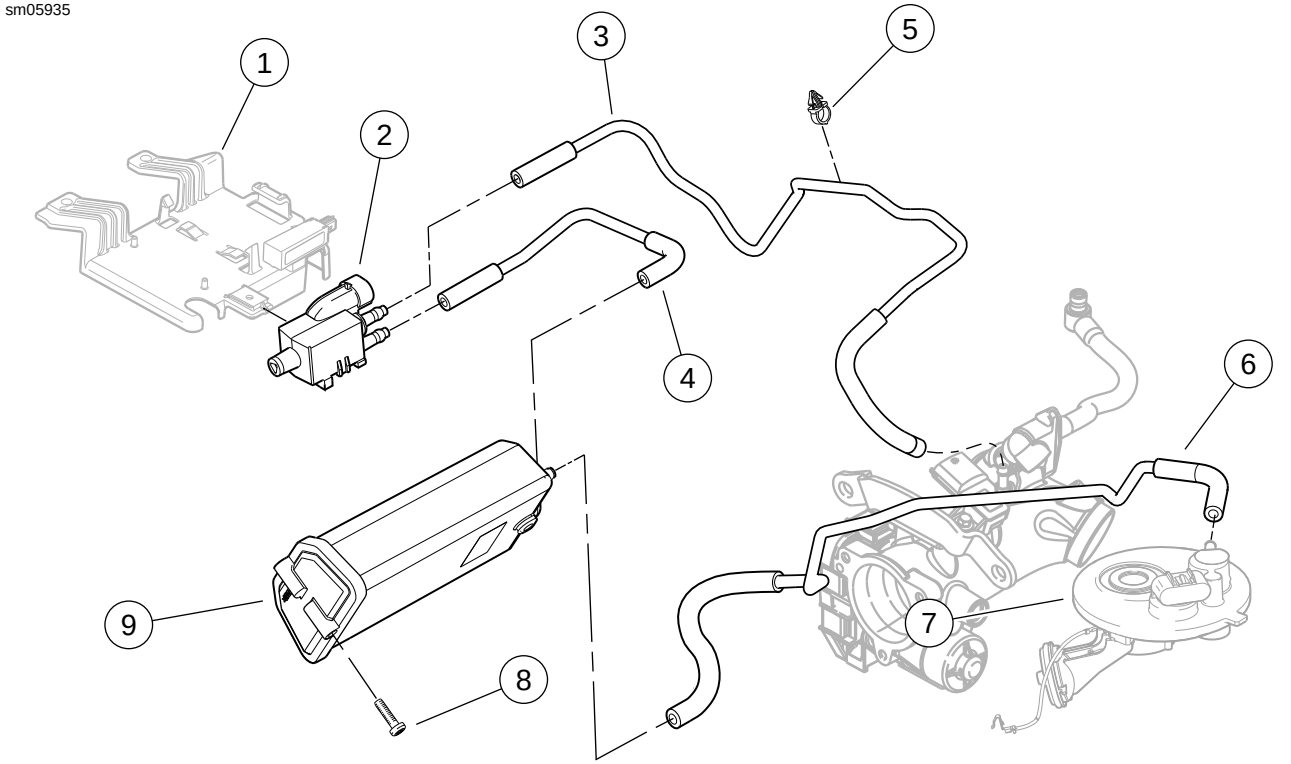
- The fuel vapor vent tube connected to the vapor valve on the fuel tank top plate allows fuel vapors in the fuel tank to be vented to the charcoal canister. If the motorcycle is tipped, the vapor valve also prevents the loss of gasoline through the vent tube.
- Under certain engine conditions, the ECM (working in conjunction with the EFI system relay) opens the purge solenoid. Negative pressure (vacuum) draws the fuel vapors stored in the charcoal canister through the purge tube to the induction module, where they are burned as part of the normal combustion process.

⚠WARNING

Keep evaporative emissions vent lines away from exhaust and engine. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00266a)

NOTE

The EVAP system has been designed to operate with a minimum of maintenance. Check that all tubes are correctly routed and properly connected. Also, verify that the tubes are not pinched or kinked, and that there is no contact with the engine parts.



1. **Top caddy**
2. **Purge solenoid**
3. **Canister-to-induction module tube**
4. **Canister-to solenoid tube**
5. **Cable clip**
6. **Fuel vapor vent tube**
7. **Fuel tank top plate**
8. **Fastener (2)**
9. **Charcoal canister**

Figure 4-47. Evaporative Emissions Control System (EVAP)

VAPOR VALVE

NOTE

See Figure 4-48. The vapor valve is not serviceable. Damage or failure of the vapor valve requires replacement of the fuel tank top plate. See 4.6 FUEL TANK TOP PLATE.

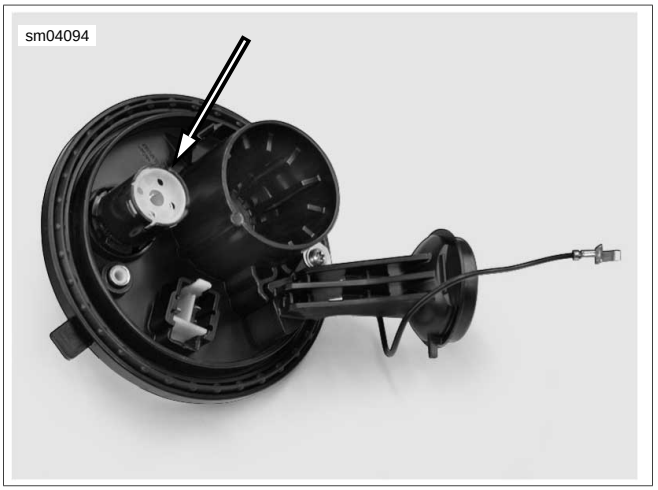


Figure 4-48. Fuel Tank Top Plate With Vapor Valve

FUEL VAPOR VENT TUBE

Removal

1. Remove seat. See 2.25 SEAT.
2. Remove fuel tank console:
   a. Remove screws to release front and rear of console from fuel tank.
   b. Lay a clean shop towel on forward part of rear fender.
   c. **FLHR/C:** Remove console and lay upside down on shop towel.
   d. **FLHX, FLHTC/U, FLHTK, FLTRX, FLTRU:** Remove filler cap. Remove console and lay upside down on shop towel. Install filler cap.
3. See Figure 4-47. Remove fuel vapor vent tube (6) from vapor valve fitting on fuel tank top plate (7).
4. Disconnect vent tube from fitting on canister (9).
5. Remove vapor vent tube from motorcycle.

Installation

1. See Figure 4-47. Connect fuel vapor vent tube (6) onto vapor valve fitting of fuel tank top plate (7).
2. Connect vent tube to fitting on charcoal canister (9) marked "TANK".
3. Install fuel tank console:
   a. **FLHR/C:** Position console on fuel tank.
   b. **FLHX, FLHTC/U, FLHTK, FLTRX, FLTRU:** Remove filler cap and position console on fuel tank. Install filler cap.
   c. Verify harnesses and vent tube are not pinched.
   d. Install screws to fasten front and rear of console to fuel tank.
   e. Tighten screws to 36-60 **in-lbs** (4.1-6.8 Nm).
4. Install seat. See 2.25 SEAT.

CANISTER-TO-SOLENOID TUBE

Removal

1. Remove seat. See 2.25 SEAT.
2. See Figure 4-49. Remove purge tube (2) from fitting of purge solenoid and canister.

Installation

1. Install end of purge tube with curved hose onto lower fitting of canister.
2. Install opposite end onto purge solenoid.
3. Install seat. See 2.25 SEAT.

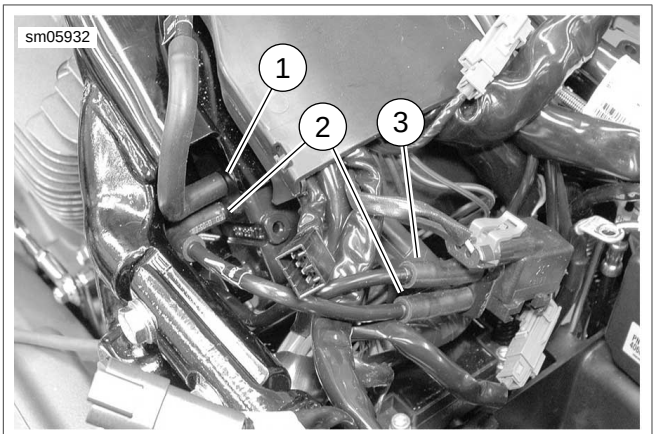
SOLENOID-TO-INDUCTION MODULE TUBE

Removal

1. Remove seat. See 2.25 SEAT.
2. Remove fuel tank. See 4.5 FUEL TANK.
3. See Figure 4-49. Remove purge tube (3) from purge solenoid.
4. Remove cable clip on purge tube from frame backbone.
5. Disconnect tube from fitting on induction module.
6. Remove purge tube from motorcycle.

Installation

1. Route purge tube rearward under frame crossmember and into area near purge solenoid, then along bottom of frame backbone toward induction module. Connect to fitting on induction module.
2. See Figure 4-49. Route purge tube under frame crossmember and install on upper fitting (3) of purge solenoid.
3. Secure purge tube to bottom of frame backbone with **new** retainer.
4. Install fuel tank. See 4.5 FUEL TANK.
5. Install seat. See 2.25 SEAT.



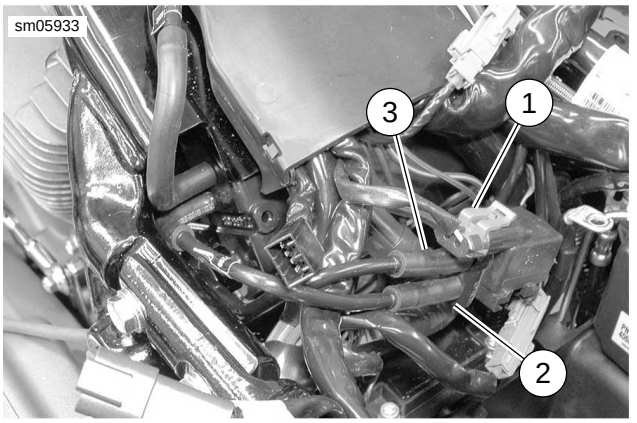
1. **Fuel vapor vent tube**
2. **Canister-to-solenoid purge tube**
3. **Solenoid-to-induction module purge tube**

Figure 4-49. Purge Tube Connections

PURGE SOLENOID

Removal

1. Remove seat. See 2.25 SEAT.
2. Remove top electrical caddy and remove purge solenoid from caddy. Lay caddy aside. See 7.8 ELECTRICAL CADDIES.
3. See Figure 4-50. Remove purge solenoid connector (1).
4. Remove purge tubes (2, 3) from purge solenoid.
5. Remove purge solenoid from motorcycle.



1. **Purge solenoid connector**
2. **Canister-to-solenoid purge tube**
3. **Solenoid-to-induction module purge tube**

Figure 4-50. Purge Solenoid

Installation

1. See Figure 4-50. Install purge tube to induction module (3) onto fitting of purge solenoid closest to the connector cavity.
2. Install purge tube from charcoal canister (2) onto purge solenoid.
3. Install purge solenoid connector (1).
4. Secure solenoid to top caddy and install top caddy. See 7.8 ELECTRICAL CADDIES.
5. Check all routing to be sure that tubes are not pinched or kinked, and that there is no contact with hot exhaust or engine parts.
6. Install seat. See 2.25 SEAT.

CHARCOAL CANISTER

Removal

1. Remove seat. See 2.25 SEAT.
2. Remove saddlebags. See 2.26 SADDLEBAGS.
3. Remove side covers.
4. Remove battery. See 1.23 BATTERY MAINTENANCE.
5. Remove two fasteners to free top caddy hold-down bracket.
6. See Figure 4-51. Remove cable strap (1) securing main harness to frame near left side caddy.
7. Remove screws (2) securing left side caddy to frame.
8. See Figure 4-52. Disconnect fuel vapor vent tube (1) from canister fitting marked "TANK."
9. Disconnect purge tube (2) from canister fitting marked "PURGE."
10. See Figure 4-53. Remove three ground ring terminals from left ground stud (1).
11. Remove two ground ring terminals from right ground stud (2).
12. Remove two screws to release charcoal canister from frame cross member.
13. Work canister down into battery tray, right end first, and remove from motorcycle.

Installation

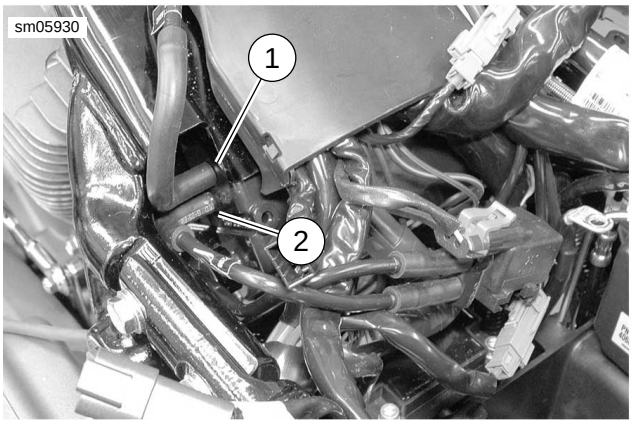
1. Slide the charcoal canister under electrical harnesses, fitting end first, and work into place.
2. Secure canister with two screws and tighten to 10-15 **in-lbs** (1.1-1.7 Nm).
3. See Figure 4-53. Install three ground ring terminals on left-side ground stud (1).
4. Install two ground ring terminals on right-side ground stud (2). Battery chassis ground terminal should be placed on stud first.
5. See Figure 4-52. Connect purge tube (2) (charcoal canister to purge solenoid) to lower canister fitting marked "PURGE."
6. Connect fuel vapor vent tube (1) (vapor valve to charcoal canister) to upper canister fitting marked "TANK."
7. See Figure 4-51. Install left side caddy and tighten two fasteners (2) to 72-96 **in-lbs** (8.1-10.9 Nm).
8. Secure main harness to frame with cable strap (1).



1. **Cable strap**
2. **Fasteners**

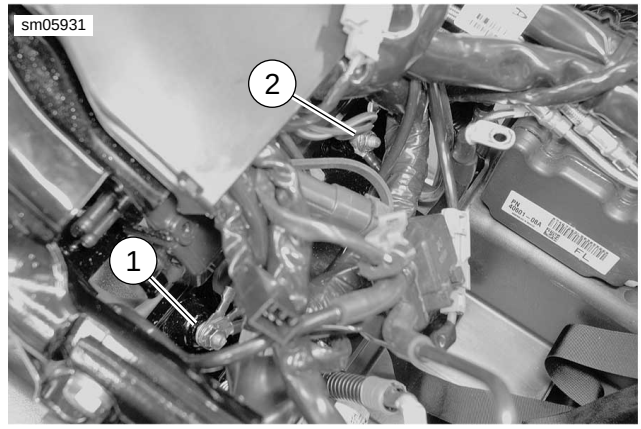
Figure 4-51. Left Electrical Caddy

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1. **Fuel vapor vent tube**
2. **Purge tube**

Figure 4-52. Purge Tube Connections



1. **Left ground stud**
2. **Right ground stud**

Figure 4-53. Chassis Ground Studs

9. Check all routing to be sure that tubes are not pinched or kinked, and that there is no contact with hot exhaust or engine parts.
10. Install top caddy hold-down bracket. Tighten two fasteners to 32-40 **in-lbs** (3.6-4.5 Nm) .
11. Install battery. See 1.23 BATTERY MAINTENANCE.
12. Install side covers.
13. Install saddlebags. See 2.26 SADDLEBAGS.
14. Install seat. See 2.25 SEAT.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

NOTES

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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NOTES

FASTENER TORQUE VALUES 5.1

FASTENER TORQUE VALUES IN THIS CHAPTER

The table below lists torque values for all fasteners presented in this chapter.

FASTENER	TORQUE VALUE		NOTES
Chain tensioner fasteners	15-19 ft-lbs	20.3-25.8 Nm	5.4 DRIVE COMPONENTS, Installation
Clutch diaphragm spring retainer bolts	70-100 **in-lbs**	7.9-11.3 Nm	5.6 CLUTCH, Clutch Pack Only
Clutch hub mainshaft nut	70-80 ft-lbs	94.9-108.5 Nm	5.4 DRIVE COMPONENTS, Installation
Compensating sprocket bolt: Initial torque	100 ft-lbs	135.7 Nm	5.4 DRIVE COMPONENTS, Installation
Compensating sprocket bolt: Initial torque	140 ft-lbs	190.0 Nm	5.4 DRIVE COMPONENTS, Installation
Diaphragm spring retainer bolts	70-100 **in-lbs**	7.9-11.3 Nm	5.6 CLUTCH, Clutch Pack and Bearing
Primary cover fasteners	108-120 **in-lbs**	12.2-13.6 Nm	5.3 PRIMARY CHAINCASE COVER, Installation/See sequence in the procedure
Sealing fasteners	25-27 ft-lbs	33.9-36.6 Nm	5.5 PRIMARY CHAINCASE HOUSING, Installation
Shift lever fasteners	18-22 ft-lbs	24-30 Nm	5.3 PRIMARY CHAINCASE COVER, Installation
Shift lever shaft fastener	90-110 **in-lbs**	10.2-12.4 Nm	5.3 PRIMARY CHAINCASE COVER, Installation
Transmission lockplate screws	90-120 **in-lbs**	10.2-13.6 Nm	5.7 TRANSMISSION SPROCKET, Installation/LOCTITE patch, use 3-5 times
Transmission sprocket nut, final	35 ft-lbs	47.5 Nm	5.7 TRANSMISSION SPROCKET, Installation/Plus an additional 35-45 degrees final torque
Transmission sprocket nut, initial	100 ft-lbs	135.7 Nm	5.7 TRANSMISSION SPROCKET, Installation/Right hand threads, initial torque only, apply several drops of LOCTITE THREADLOCKER 271 (red) to last few threads.
Transmission sprocket nut (maximum)	35 ft-lbs	47.5 Nm	5.7 TRANSMISSION SPROCKET, Installation

SPECIFICATIONS: DRIVE 5.2

SPECIFICATIONS

Table 5-1. Sprocket Teeth

DRIVE	ITEM	NUMBER OF TEETH
Primary	Engine	34
	Clutch	46
Final	Transmission	32
	Rear wheel	68

Table 5-2. Clutch Specifications

CLUTCH	DESCRIPTION
Type	Wet-multiple disc
Clutch lever freeplay (after internal adjustment)	1/16-1/8 in. (1.6-3.2 mm)

Table 5-3. Overall Drive Ratios

GEAR	RATIO
1st Gear	9.593
2nd Gear	6.650
3rd Gear	4.938
4th Gear	4.000
5th Gear	3.407
6th Gear	2.875

NOTE

Overall gear ratios indicate number of engine revolutions required to drive rear wheel one revolution.

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PRIMARY CHAINCASE COVER 5.3

GENERAL

The primary chaincase is a sealed housing containing the primary chain, chain tensioner, clutch, engine compensating sprocket and alternator.

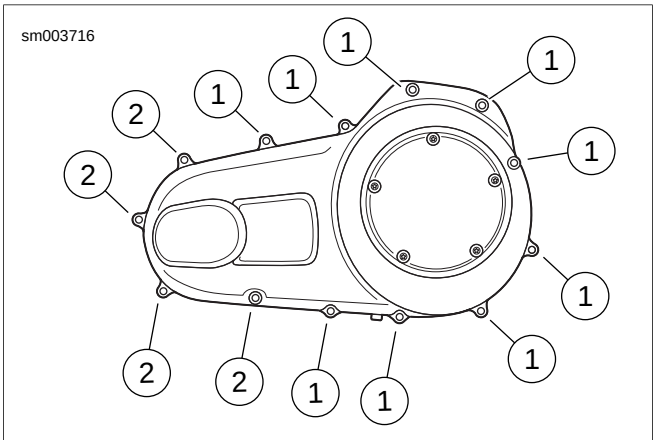
For information on primary chain lubrication, see 1.9 PRIMARY CHAINCASE LUBRICANT.

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. Drain the primary chaincase lubricant. See 1.9 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant.
3. Remove left passenger footboard from rear fork bracket.
4. Remove fastener to release front footboard forward bracket from frame weldment. Remove two fasteners to free jiffy stand and front footboard rear bracket from frame weldment as an assembly.
5. Remove heel and toe shift lever fasteners from shift lever shaft and pull shift levers from shift lever shaft. Remove rubber spacer. An alternate method is to remove socket head fastener to release inner shift arm then pull shift lever shaft and heel toe shift lever assembly from primary chaincase bore.
6. See Figure 5-1. Remove nine short (1) and four long (2) cover fasteners and cover.



1. **Short cover fasteners**
2. **Long cover fasteners**

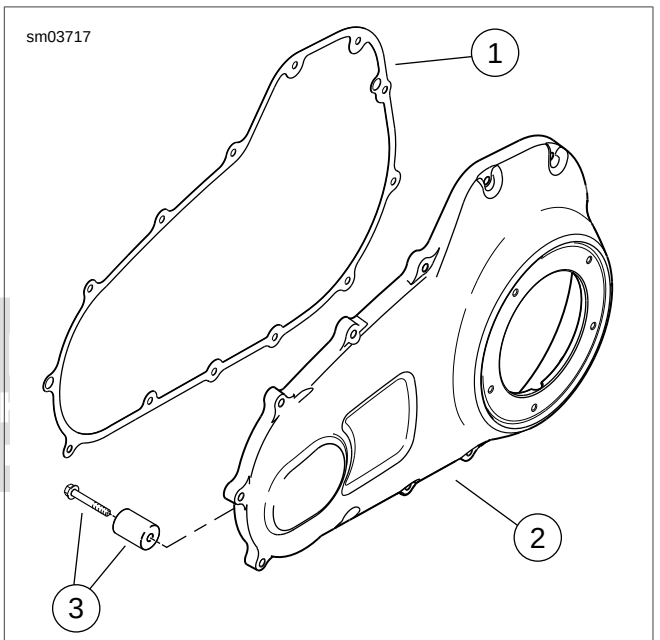
Figure 5-1. Primary Chaincase Cover: Touring Models

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.

1. See Figure 5-2. Install **new** cover gasket (1).
2. See Figure 5-1. Apply a drop of Loctite Threadlocker 243 (blue) (Part no. 99642-97). Install nine short (1) and four long (2) primary cover fasteners in positions shown. Snug fasteners.
3. See Figure 5-3. Tighten primary cover fasteners to 108-120 **in-lbs** (12.2-13.6 Nm) in the sequence shown.



1. **Cover gasket**
2. **Primary chaincase cover**
3. **Mass dampener/screw (Japan only)**

Figure 5-2. Primary Chaincase Cover Gasket

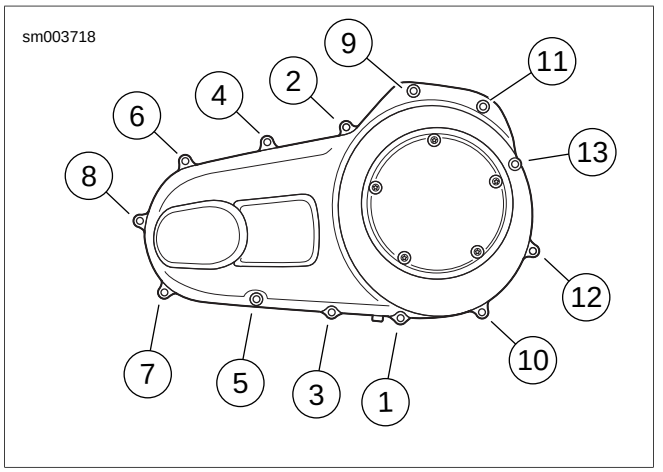


Figure 5-3. Primary Chaincase Cover Torque Sequence: Touring Models

NOTICE

Do not overfill the primary chaincase with lubricant. Overfilling can cause rough clutch engagement, incomplete disengagement, clutch drag and/or difficulty in finding neutral at engine idle. (00199b)

4. Place motorcycle in an upright position and fill primary chaincase. See 1.9 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant.

5. If installing heel-toe shift levers onto shift lever shaft:
   a. Install inboard shift lever (toe) onto splines of shift lever shaft. When properly installed, fastener hole is countersunk at the top.
   b. Install outboard shift lever (heel) onto splines of shift lever shaft. When properly installed, fastener hole is countersunk at the bottom.
   c. Install fasteners to fasten heel-toe shift levers to shift lever shaft. Tighten shift lever fasteners to 18-22 ft-lbs (24-30 Nm).
6. If just installing inner shift arm onto shift lever shaft:
   a. Install rubber spacer onto shift lever shaft. Install shift lever shaft into primary chaincase bore.
   b. Install inner shift arm onto splines of shift lever shaft.
   c. Install fastener to attach inner shift arm to shift lever shaft. Tighten fastener to 90-110 **in-lbs** (10.2-12.4 Nm).
7. Install jiffy stand and rider footboard. See 2.49 FOOTBOARDS AND FOOTRESTS.
8. Install passenger left footboard. See 2.49 FOOTBOARDS AND FOOTRESTS.
9. Connect negative battery cable.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

REMOVAL

PART NUMBER	TOOL NAME
HD-48219	PRIMARY DRIVE LOCKING TOOL

1. Disconnect the battery, negative cable first.
2. Remove primary chaincase cover. See 5.3 PRIMARY CHAINCASE COVER, Removal.
3. See Figure 5-4. Secure chain tensioner with a cable tie as shown. Make sure the tail of the cable tie hangs down past the primary housing when secured. This will serve as a reminder to remove the cable tie before installing the primary cover during assembly.
4. See Figure 5-5. Remove chain tensioner fasteners (2) and remove chain tensioner (1).

NOTE

Marking one of the outboard links of the primary chain to help identify the original direction of rotation during assembly may prolong service life.

5. Use a colored marker to mark one of the links of the primary chain to help identify the original direction of rotation during assembly.

WARNING

Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

6. See Figure 5-6. Loosen locknut (3).
7. Remove retaining ring (1) and release plate (2).

WARNING

Do not apply heat to remove the clutch hub nut. Fuel vapor and possible fuel mixture in crankcase oil is extremely flammable and highly explosive, which could result in death or serious injury. (00440b)

NOTES

- *Use only PRIMARY DRIVE LOCKING TOOL (Part No. HD-48219) to remove and install components. Do not use PRIMARY DRIVE LOCKING TOOL (Part No. HD-41214) to remove or install components. Damage to components can occur if this tool is used.*
- *The mainshaft nut has left-hand threads. Turn clockwise to remove.*

8. See Figure 5-7. Install PRIMARY DRIVE LOCKING TOOL (Part No. HD-48219) (2) between the teeth of the engine and clutch sprockets as shown. Rotate clutch hub mainshaft nut (4) clockwise to remove.
9. See Figure 5-8. Install PRIMARY DRIVE LOCKING TOOL (Part No. HD-48219) (2) between the teeth of the engine and clutch sprockets as shown. Rotate compensating sprocket bolt (1) counterclockwise to remove.
10. See Figure 5-9. Remove bolt (9), sprocket retainer (8) and thrust washer (7).
11. Remove clutch assembly, primary chain and compensating sprocket assembly as a single assembly.

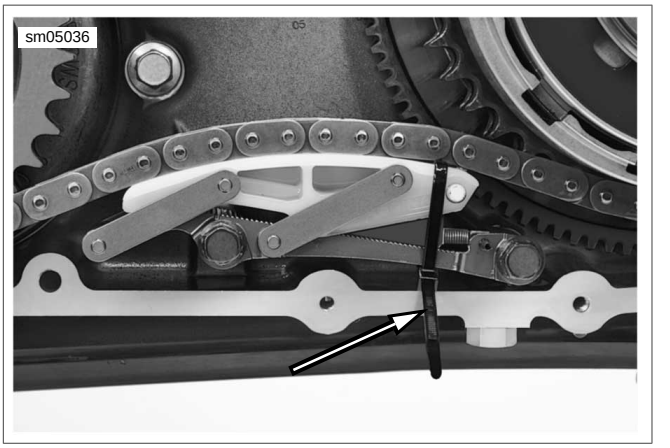
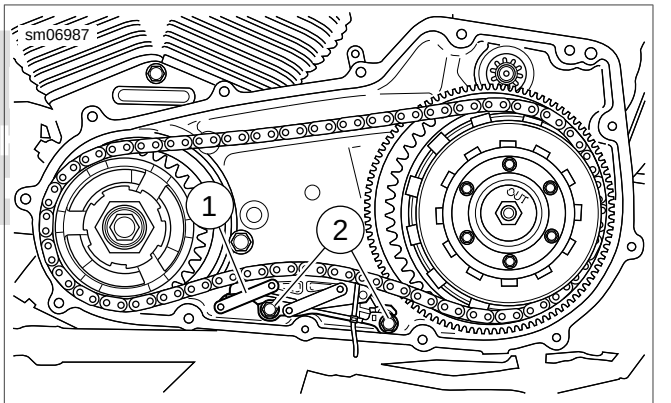
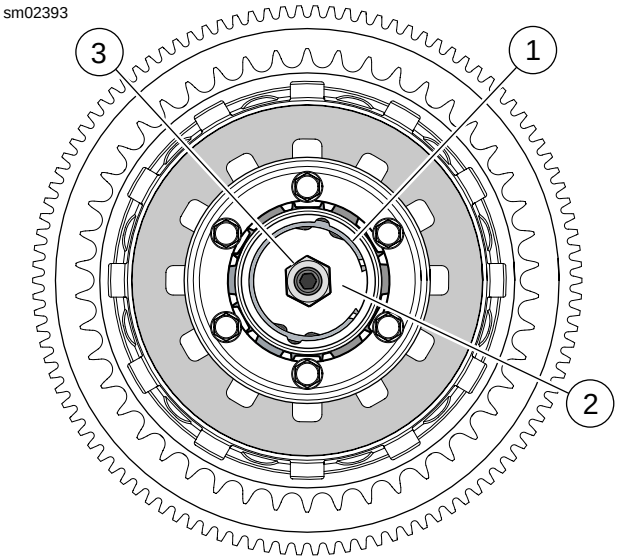


Figure 5-4. Securing Chain Tensioner



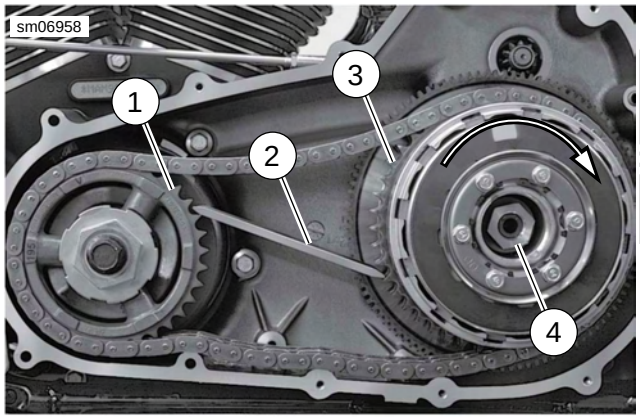
1. **Chain tensioner**
2. **Chain tensioner fasteners**

Figure 5-5. Chain Tensioner



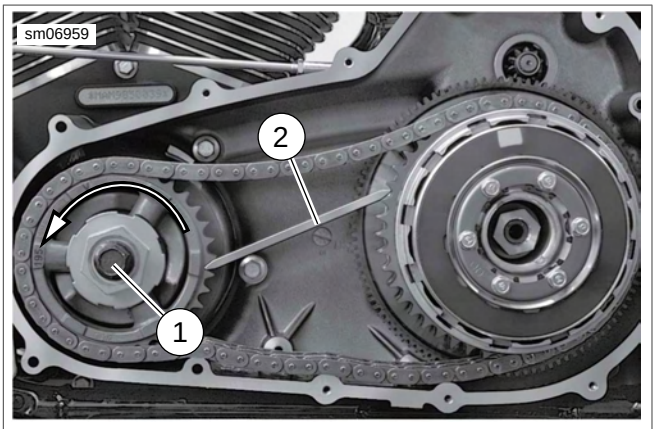
1. Retaining ring
2. Release plate
3. Locknut

Figure 5-6. Clutch



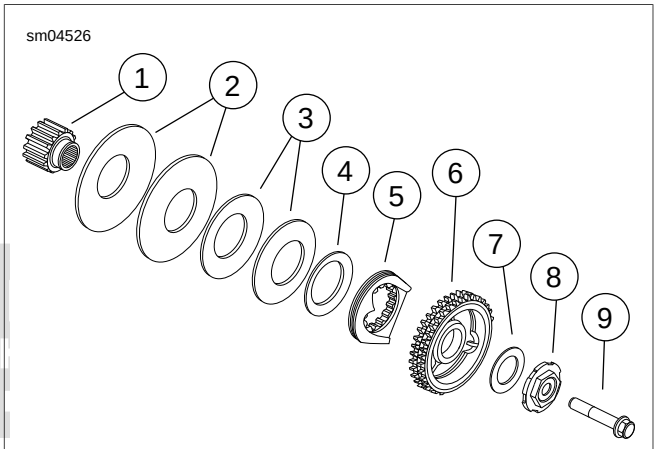
1. Engine sprocket
2. Primary drive locking tool
3. Clutch sprocket
4. Clutch hub nut

Figure 5-7. Removing Clutch Hub Mainshaft Nut



1. Bolt
2. Primary drive locking tool

Figure 5-8. Removing Compensating Sprocket Bolt



1. Shaft extension
2. Large spring washer (2)
3. Medium spring washer (2)
4. Small spring washer
5. Sliding cam
6. Compensating sprocket
7. Thrust washer
8. Sprocket retainer
9. Bolt

Figure 5-9. Compensating Sprocket

INSTALLATION

PART NUMBER	TOOL NAME
HD-48219	PRIMARY DRIVE LOCKING TOOL

1. See Figure 5-9. Install compensating sprocket assembly.
   a. Install shaft extension (1) with bearing journal facing away from vehicle. Apply a thin layer of primary chaincase oil to the splines and bearing journal.
   b. See Figure 5-10. Install large spring washers (1). Outer diameter of spring washers should be contacting each other.
   c. Install medium spring washers (2). Outer diameter of spring washers should be contacting each other.
   d. See Figure 5-9. Install small spring washer (4) so that outer diameter will contact sliding cam (5), once installed.
   e. Install sliding cam with flat face contacting small spring (4). Lubricate sliding cam ramps with primary chaincase oil.
   f. Place drive components [primary chain, compensating sprocket (6) (with text "this side out" facing away from motorcycle), and clutch assembly] into position. The clutch hub and shaft extension are splined, so a slight rotation of the chain drive will aid installation.

NOTE

When installing sprocket retainer (8) make sure that thrust washer (7) does not fall off sprocket retainer or that it does not get pinched between the sprocket retainer and extension shaft. A small amount of white lithium grease will help hold the thrust washer to the sprocket retainer.

   g. Install thrust washer (7) and sprocket retainer (8).

NOTES

- *When installing bolt (9), make sure the spring washers are properly aligned and that spring nearest rotor assembly has not slipped between extension and rotor hub.*
- *Make sure the thrust washer has not slipped between the sprocket and sprocket retainer.*

   h. See Figure 5-11. Install PRIMARY DRIVE LOCKING TOOL (Part No. HD-48219) as shown. Install **new** bolt (1) by hand and snug against sprocket retainer. Tighten compensating sprocket to 100 ft-lbs (135.7 Nm).
   i. Loosen compensating sprocket back one full turn (360 degrees).
   j. Re-tighten compensating sprocket to 140 ft-lbs (190.0 Nm).
   k. Rotate compensating sprocket to make sure there is a light pressure on sprocket from the springs, no clearance should be felt. A slight rotation should be possible by hand with transmission in neutral.

NOTE

Clutch hub mainshaft nut has left handed threads, so turn counterclockwise to install.

   l. Clean and prime threads of nut. Apply two drops of LOCTITE THREADLOCKER 262 (red) to the threads of the clutch hub mainshaft nut. Start nut onto mainshaft and tighten hand tight.

2. See Figure 5-12. Install PRIMARY DRIVE LOCKING TOOL (Part No. HD-48219) as shown. Tighten clutch hub mainshaft nut to 70-80 ft-lbs (94.9-108.5 Nm). Remove primary drive locking tool.
3. See Figure 5-13. Install release plate (5) with locknut (2) and adjuster screw (3) into clutch hub bore. The word "OUT" stamped on the release plate should face outward.

⚠WARNING

Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

4. Inspect retaining ring (4) and replace if necessary. Install retaining ring in clutch hub bore to lock release plate in position. Verify that the retaining ring is completely seated in the groove.
5. Adjust clutch. See 1.11 CLUTCH, Adjustment.

NOTE

Primary chain tensioner is non-repairable. If tensioner is worn or damaged, assembly must be replaced.

6. See Figure 5-14. If primary chain tensioner becomes disassembled, assemble in order shown.
7. See Figure 5-15. Locate end of spring rod (2) on roll pin (3).
8. See Figure 5-16. Slide wedge (2) of primary chain tensioner in direction of arrow until all travel is removed. Hold shoe (1) and wedge (2) together.
9. See Figure 5-17. Insert cable tie (2) as shown to hold wedge in place. Make sure end of cable tie is located below primary chain tensioner to serve as a reminder to remove cable tie before installing primary cover.

NOTE

Primary chain tensioner will not complete chain adjustment until vehicle is ridden. Vehicle must be test ridden after tensioner removal/installation to verify proper adjustment.

10. See Figure 5-18. Install primary chain tensioner (1) and tighten fasteners (2) to 15-19 ft-lbs (20.3-25.8 Nm). Remove cable tie.

NOTE

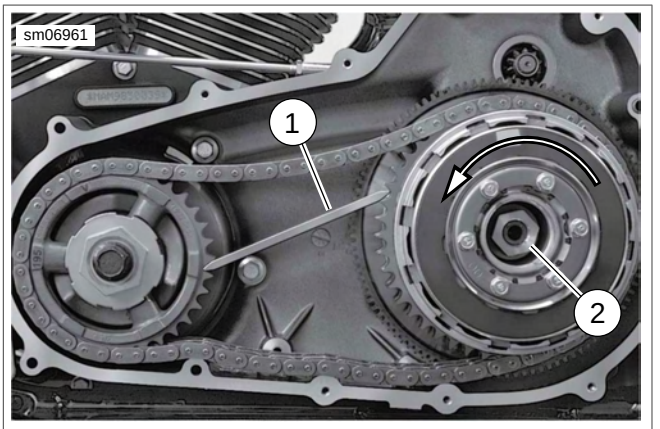
The gasket between the primary chaincase cover and chaincase must be replaced each time the cover is removed to prevent primary chaincase leaks.

11. Install primary chaincase cover and fill with lubricant. See 5.3 PRIMARY CHAINCASE COVER, Installation.



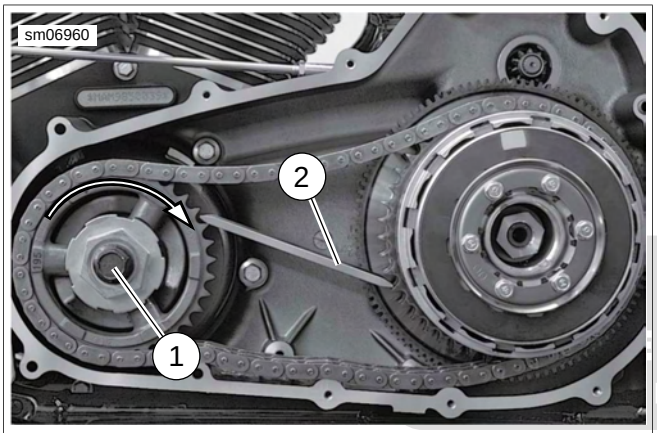
1. Large spring washers
2. Medium spring washers

Figure 5-10. Spring Washer Orientation



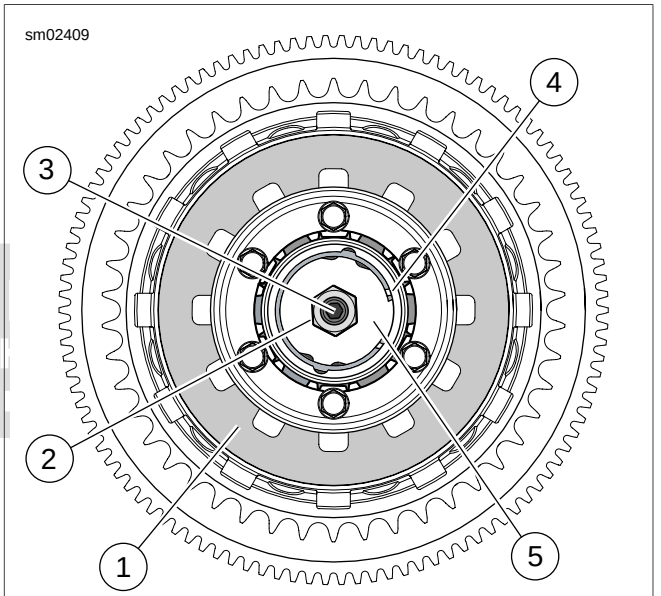
1. Primary drive locking tool
2. Clutch hub nut

Figure 5-12. Installing Clutch Hub Mainshaft Nut



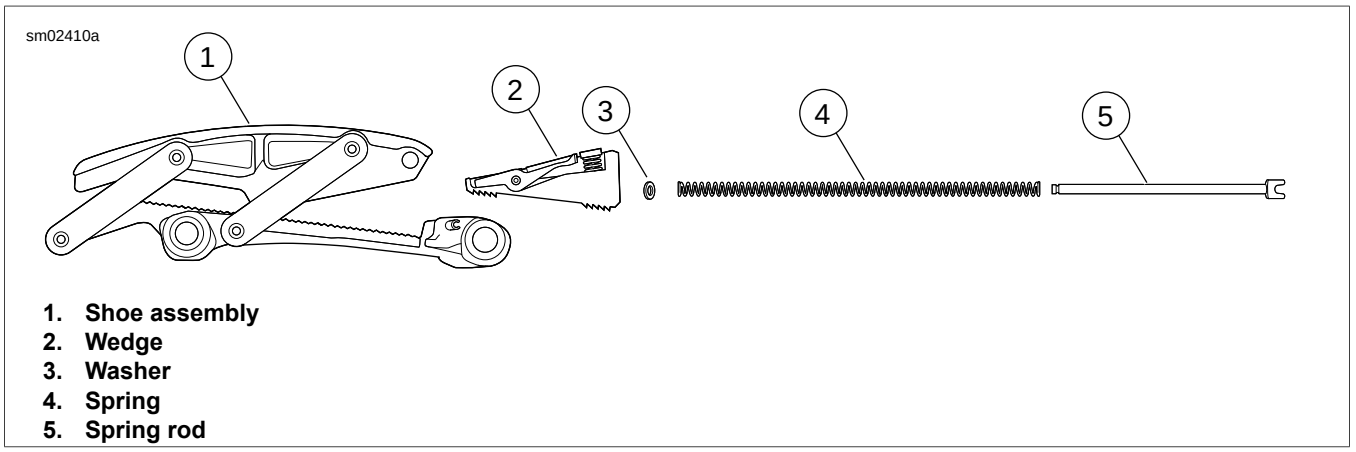
1. Bolt
2. Primary drive locking tool

Figure 5-11. Installing Compensating Sprocket Bolt



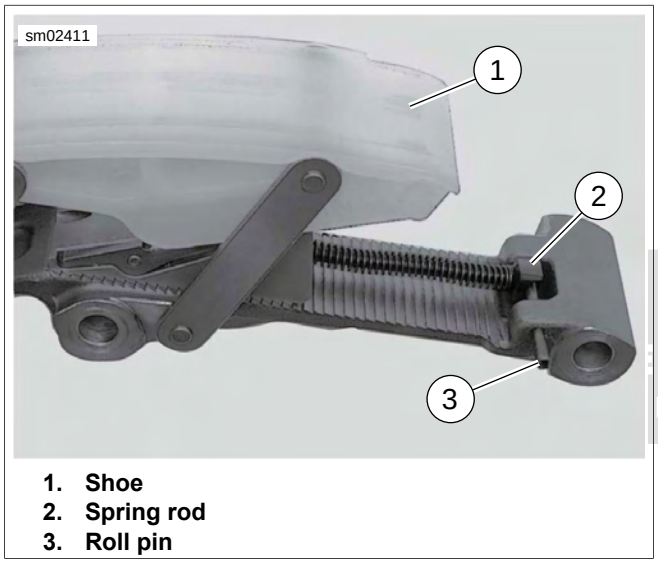
1. Diaphragm spring
2. Locknut
3. Adjuster screw
4. Retaining ring
5. Release plate

Figure 5-13. Clutch



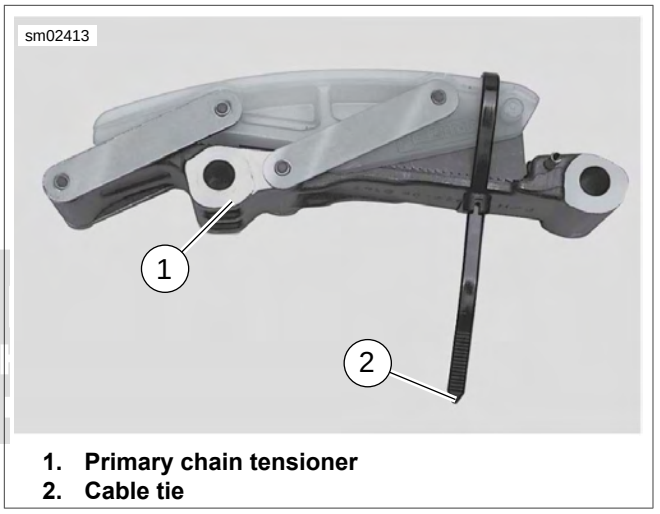
1. Shoe assembly
2. Wedge
3. Washer
4. Spring
5. Spring rod

Figure 5-14. Primary Chain Tensioner Assembly



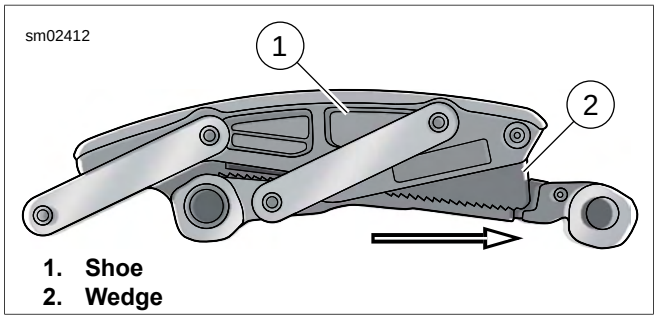
1. Shoe
2. Spring rod
3. Roll pin

Figure 5-15. Spring Rod Location



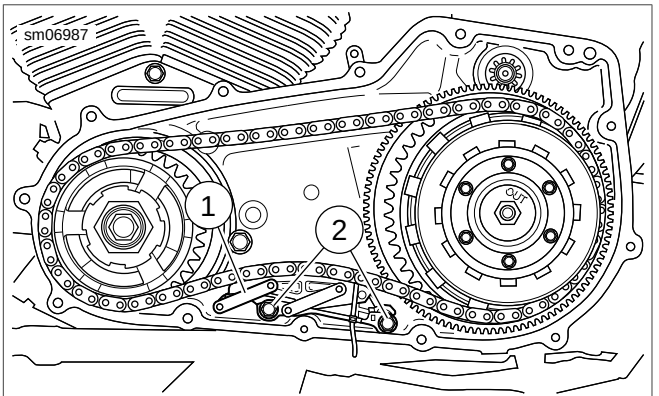
1. Primary chain tensioner
2. Cable tie

Figure 5-17. Securing Primary Chain Tensioner



1. Shoe
2. Wedge

Figure 5-16. Primary Chain Tensioner



1. Chain tensioner
2. Chain tensioner fasteners

Figure 5-18. Chain Tensioner

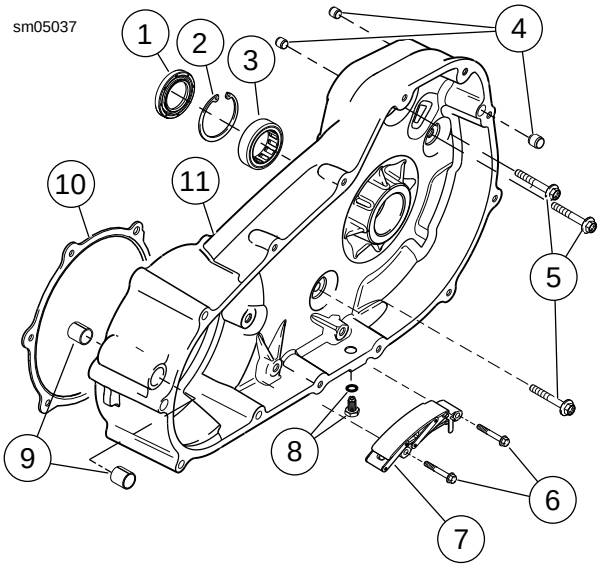
PRIMARY CHAINCASE HOUSING 5.5

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 chaincase cover. See 5.3 PRIMARY CHAINCASE COVER, Removal.
3. Remove starter. See 7.10 STARTER, Removal.
4. Remove primary chain, clutch, and compensating sprocket. See 5.4 DRIVE COMPONENTS, Removal.
5. See Figure 5-19. Remove five sealing fasteners (5) and remove primary chaincase housing (11). Discard the crankcase gasket (10) and sealing fasteners.



1. **Seal**
2. **Lock ring**
3. **Bearing**
4. **Dowel pin**
5. **Sealing fastener (5)**
6. **Chain tensioner fasteners**
7. **Chain tensioner**
8. **Drain plug and O-ring**
9. **Shifter shaft bushings**
10. **Crankcase gasket**
11. **Primary chaincase housing**

Figure 5-19. Primary Chaincase Housing

INSPECTION

1. Inspect primary chaincase for cracks or damaged gasket surface.
2. Check the mainshaft bearing. Replace if bearing does not rotate freely. Replace the lip seal. See 5.5 PRIMARY CHAINCASE HOUSING, Mainshaft Bearing and Lip Seal.
3. Inspect shifter shaft bushings. Replace if worn or damaged. See 5.5 PRIMARY CHAINCASE HOUSING, Shifter Shaft Bushings.

MAINSHAFT BEARING AND LIP SEAL

Removal

⚠WARNING

Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

1. Remove lip seal from bearing bore on transmission side of primary chaincase. Use a seal remover or rolling head pry bar for best results.
2. Remove retaining ring from groove on transmission side of bearing.
3. Support inner primary chaincase on transmission side of bearing.

NOTE

Support inner primary chain case area on transmission side while pressing bearing out of primary chaincase. The force needed to remove bearing may cause damage to primary chain case.

4. Place primary chaincase in arbor press. Press out bearing from clutch side applying pressure to the outer race.

Installation

1. Inspect the bearing bore to verify that it is clean and smooth. Install retaining ring in groove on pulley side of primary chaincase.
2. Place primary chaincase in arbor press with the transmission side up.
3. Support the bearing support area on the clutch side of the primary chaincase.

NOTE

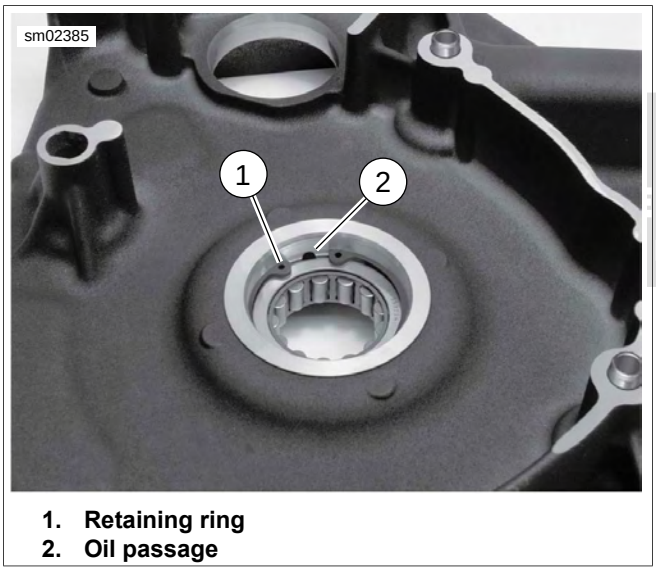
Support the bearing support area on clutch side while pressing bearing into bore. The force needed to press bearing into position may force and unsupported primary chain case to become damaged.

4. Apply a thin film of oil to outer diameter of bearing.
5. Applying pressure to the outer race, press **new** bearing letter side up, into bore until it makes solid contact with the bearing support area.
6. See Figure 5-20. Retaining ring (1) must be oriented as shown to prevent blocking of oil passage (2). Install retaining ring to lock position of bearing in bore. Verify that the ring is fully seated in the groove and is in proper orientation.

NOTES

- *The lip garter spring side of the oil seal is also identified by the words "OIL SIDE".*
- *Install oil seal with a seal driver that will press only against outer rim of oil seal, NOT against the inner area.*
- *The minimum allowable depth of the seal is reached when the outer edge of the seal carrier is flush with the machined surface of the primary housing. The maximum allowable depth of the seal is reached when the seal carrier contacts the mainshaft bearing snap ring.*

7. Install mainshaft oil seal:
   a. Lubricate the O.D. of the **new** seal with Screamin' Eagle Assembly Lube (part No. 94971-09.)
   b. See Figure 5-21. With the lip garter spring side (stamped "oil side") facing toward the bearing, press squarely on the outer edge of oil seal until outer edge of seal is flush with machined surface of inner primary housing.
8. Lubricate the bearing and seal lip with multi-purpose grease or Screamin' Eagle Assembly Lube (part No. 94971-09.)



1. **Retaining ring**
2. **Oil passage**

Figure 5-20. Retaining Ring Orientation

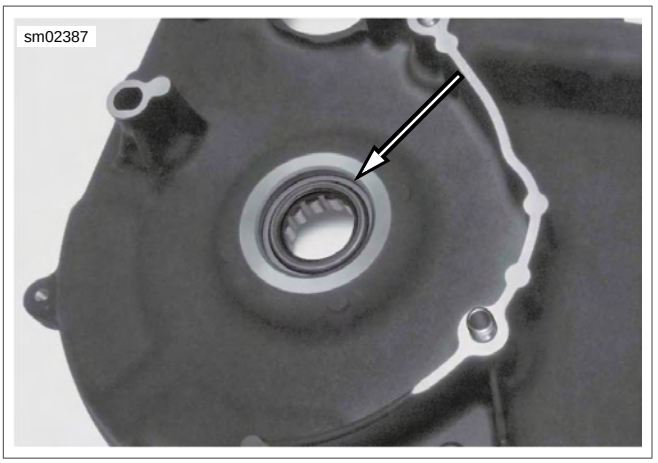


Figure 5-21. Oil Seal

MAINSHAFT BEARING INNER RACE

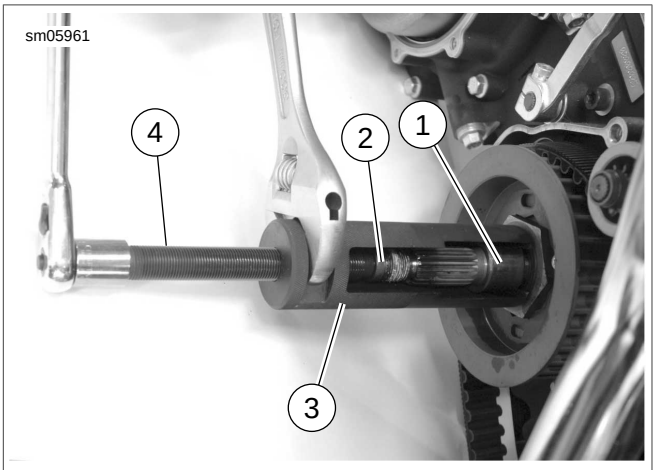
PART NUMBER	TOOL NAME
HD-34902-C	MAINSHAFT BEARING INNER RACE REMOVER/INSTALLER

Removal

NOTE

The bearing inner race must be positioned on the shaft a precise distance to properly align with the bearing outer race in the primary chaincase. To remove and install the bearing inner race, use the combination MAINSHAFT BEARING INNER RACE REMOVER/INSTALLER (Part No. HD-34902-C).

1. See Figure 5-22. Install end cap (2) into end of mainshaft.
2. Position puller (3) around mainshaft, under bearing inner race.
3. Turn forcing screw (4) clockwise while holding puller to remove bearing.



1. **Bearing inner race**
2. **End cap**
3. **Puller**
4. **Forcing screw**

Figure 5-22. Pulling Mainshaft Inner Bearing Race

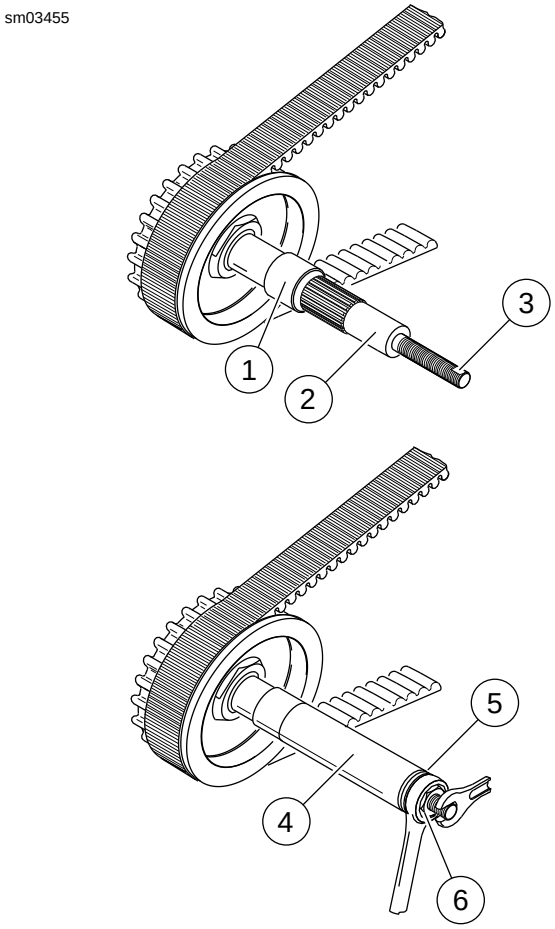
Installation

1. See Figure 5-23. Slide bearing inner race (1) onto mainshaft.

NOTE

Extension shaft has left-hand threads.

2. Thread extension shaft (2) onto end of mainshaft.
3. Position installer sleeve (4) over extension shaft and against bearing inner race. Apply graphite lubricant to threads of extension shaft.
4. Place two washers (5) over threaded portion of extension shaft and install nut.
5. Tighten nut (6) while holding extension shaft stationary with wrench on flats (3) at end of screw threads. Press race onto shaft until edge of race contacts step on shaft.
6. Lubricate race with Screamin' Eagle Assembly Lube (Part No. 94971-09.)

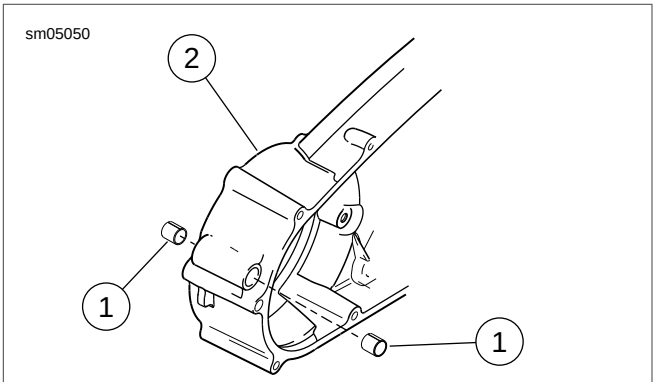


1. **Bearing inner race**
2. **Extension shaft**
3. **Wrench flat**
4. **Installer sleeve**
5. **Washers**
6. **Nut**

Figure 5-23. Installing Bearing Race

SHIFTER SHAFT BUSHINGS

1. See Figure 5-24. Press out old bushings (1) using an arbor press. Inspect the bushing bore to verify that it is clean and smooth.
2. Press **new** bushings into each side of the bore using an arbor press. Installed bushing must be flush to 0.010 in. (0.25 mm) below edge of bore.



1. **Shifter shaft bushing (2)**
2. **Primary chaincase**

Figure 5-24. Shifter Shaft Bushings

INSTALLATION

NOTE

Cover mainshaft clutch hub splines with tape to prevent the splines damaging the inner primary cover oil seal.

1. Verify pivot shaft torque. See 2.21 REAR FORK, Installation.

NOTE

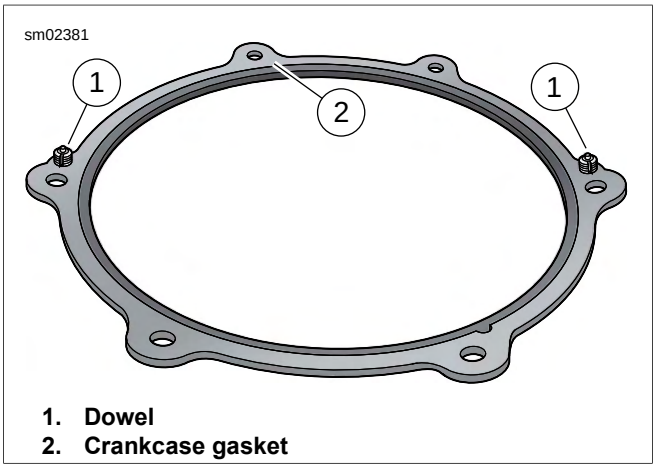
See Figure 5-25. In next step, be sure dowels (1) in crankcase gasket (2) engage holes in crankcase.

2. See Figure 5-26. Place crankcase gasket in place on gasket surface (2). Be sure dowels in gasket engage dowel holes (3).
3. 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.
4. See Figure 5-27. Insert **new** sealing fasteners.
5. See Figure 5-28. Tighten fasteners in sequence shown to 25-27 ft-lbs (33.9-36.6 Nm).
6. Install the primary chain, clutch, and compensating sprocket as an assembly. See 5.4 DRIVE COMPONENTS, Installation.
7. Install chain tensioner assembly.
8. Install starter. See 7.10 STARTER, Installation.

NOTE

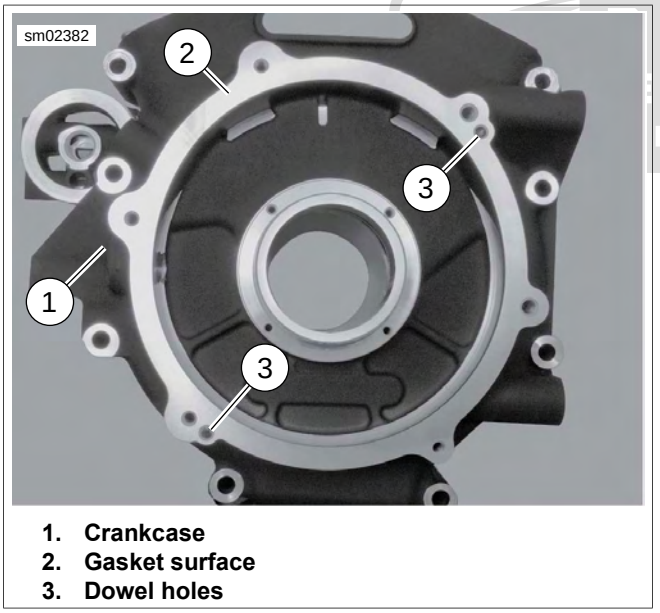
The gasket between the primary chaincase cover and chaincase must be replaced each time the cover is removed. Failure to replace this gasket may cause primary chaincase leaks.

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



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

Figure 5-25. Crankcase Gasket



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

Figure 5-26. Crankcase

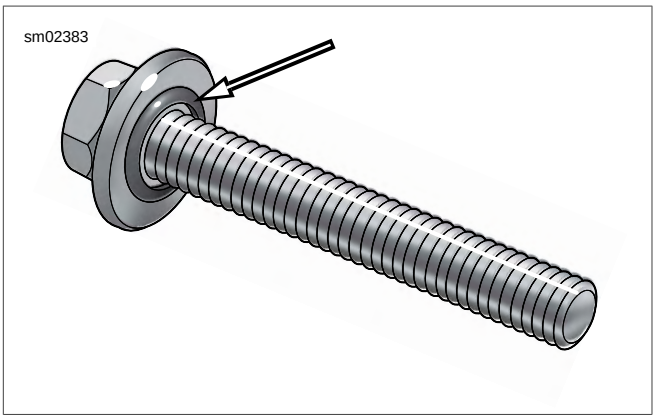


Figure 5-27. Sealing Fastener

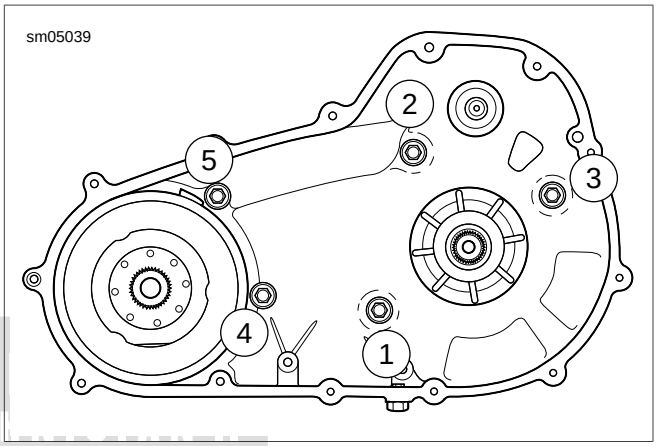


Figure 5-28. Sealing Fastener Torque Sequence

CLUTCH 5.6

REMOVAL AND INSTALLATION

To remove the clutch without disassembly or for installation instructions, see 5.4 DRIVE COMPONENTS, Removal.

CLUTCH PACK ONLY

Partial Disassembly

This procedure can be performed on the motorcycle without removing the clutch shell or hub.

1. Remove primary chaincase cover. See 5.3 PRIMARY CHAINCASE COVER, Removal.
2. See Figure 5-29. Remove six bolts (1) (metric) to release diaphragm spring retainer (2) from clutch hub. Loosen each bolt gradually and in a star sequence around the hub.
3. Remove diaphragm spring retainer, diaphragm spring (3) and pressure plate (4) from clutch hub.
4. Remove friction plates (5, 7), steel plates (6), damper spring (8) and damper spring seat (9) from clutch hub (11).

Cleaning And Inspection

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. Wash all parts in cleaning solvent, except for friction plates and bearing, if removed. Blow parts dry with low pressure compressed air.
2. Check **friction plates** as follows:
   a. Blow off all lubricant from the friction plates. Do not wipe off with a rag.
   b. Measure the thickness of each plate with a dial caliper or micrometer.
   c. If the thickness of any plate is less than 0.143 in. (3.62 mm), discard all friction plates and replace with an entirely **new** set.
   d. Look for worn or damaged fiber surface material (both sides).

NOTE

Replace all nine friction plates with an entirely new set if any individual plate shows evidence of wear or damage. Submerge and soak all friction plates in primary chaincase lubricant for at least five minutes.

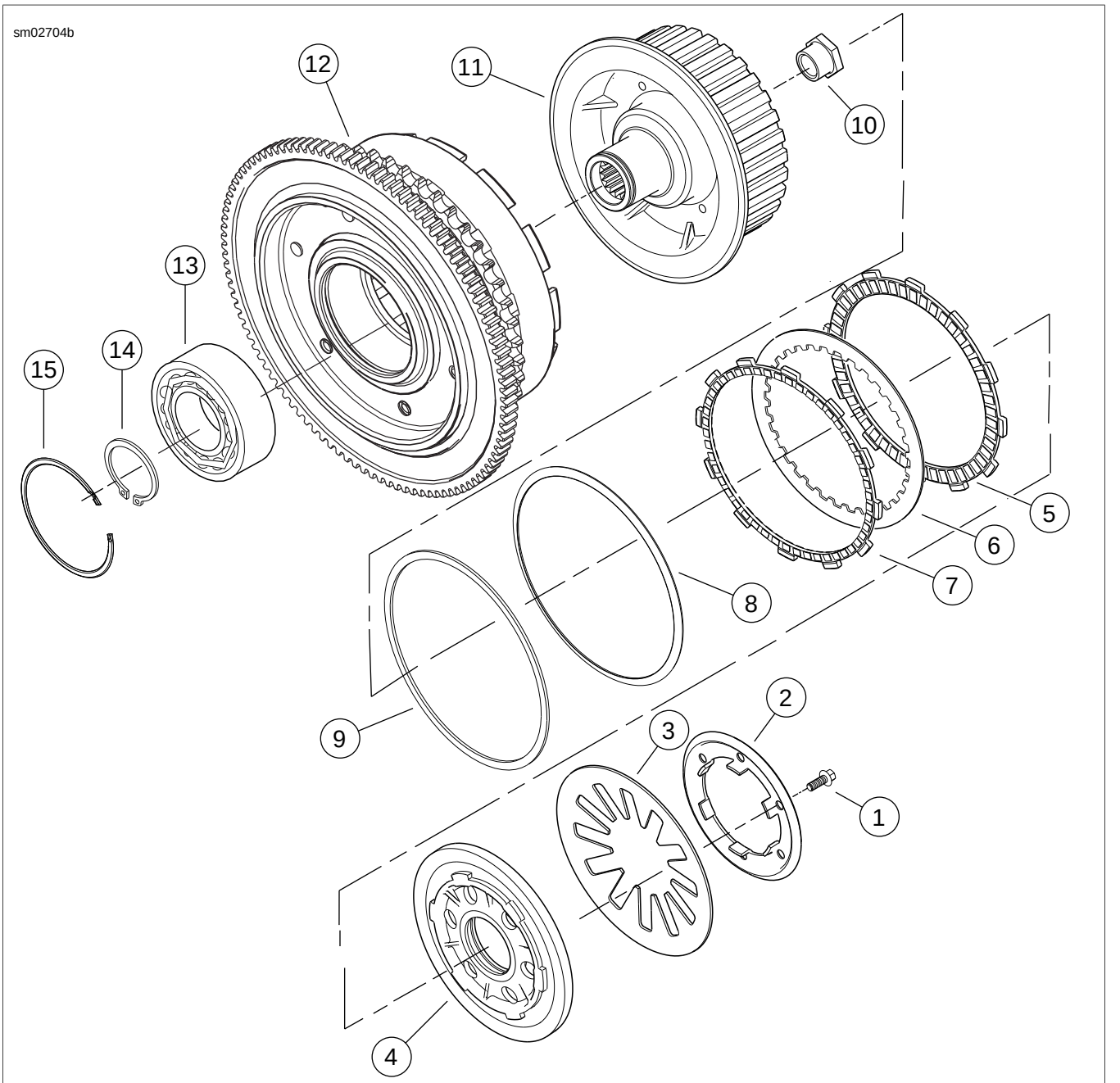
3. Check the **steel plates** as follows:
   a. Discard any plate that is grooved or bluish in color. Blue plates are likely warped or distorted.
   b. Check each plate for distortion. Lay the plate on a precision flat surface. Insert a feeler gauge between the plate and the flat surface in several places. Replace any steel plate that is warped more than 0.006 in. (0.15 mm).
4. Holding the clutch hub, rotate the clutch shell to check bearing for smoothness. Replace the bearing if it runs rough, binds or has any end play.
5. Check the primary chain sprocket and the starter ring gear on the clutch shell. Replace the clutch shell if either sprocket or ring gear are badly worn or damaged.
6. Check the slots that mate with the clutch plates on both the clutch shell and hub. Replace shell or hub if slots are worn or damaged.

NOTE

Springs are identified by a dab of paint on one face. Refer to the parts catalog to verify the correct spring is installed.

7. Check the diaphragm spring and diaphragm spring retainer for cracks or bent tabs. Obtain a **new** diaphragm spring or diaphragm spring retainer if either condition exists.

DIGITAL TECHNICIAN HARLEY-DAVIDSON®



1. **Bolt (6) (metric)**
2. **Diaphragm spring retainer**
3. **Diaphragm spring**
4. **Pressure plate**
5. **Friction plate (9)**
6. **Steel plate (8)**
7. **Narrow friction plate**
8. **Damper spring**
9. **Damper spring seat**
10. **Mainshaft nut (metric)**
11. **Clutch hub**
12. **Clutch shell**
13. **Bearing**
14. **Retaining ring**
15. **Retaining ring**

Figure 5-29. Clutch Shell Assembly

Assembly

NOTE

Submerge and soak all friction plates in primary chaincase lubricant for at least five minutes.

1. See Figure 5-30. Install the narrow friction plate on the clutch hub. Engage tabs on plate with slots in clutch shell.
2. See Figure 5-29. Install damper spring seat (9) on clutch hub (11). It must sit inboard of narrow friction plate (7).

NOTE

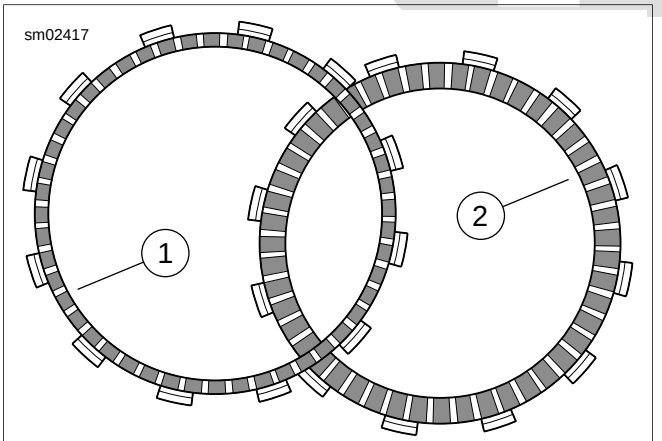
See Figure 5-35. Notice damper spring (4) orientation with respect to damper spring seat (3).

3. See Figure 5-29. Install damper spring (8) on clutch hub with the concave side out (facing away from damper spring seat).
4. Install a steel plate (6) with round edge outward and then a friction plate (5) on the clutch hub. Install seven remaining sets in the same manner, alternating between steel plates and friction plates.
5. Install pressure plate (4) on clutch hub aligning holes in plate with threaded bosses on hub.
6. Seat diaphragm spring (3) in recess of pressure plate with the concave side inward.
7. Align holes in diaphragm spring retainer (2) with threaded bosses on clutch hub. Tabs on spring retainer contact flats on inboard side of bosses.
8. Install six bolts (1) (metric) to secure diaphragm spring retainer to clutch hub. Alternately tighten the bolts to 70-100 **in-lbs** (7.9-11.3 Nm).

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.

9. Install primary chaincase cover and gasket. See 5.3 PRIMARY CHAINCASE COVER, Installation.
10. Fill primary chaincase with lubricant. See 1.9 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant.



1. **Narrow plate**
2. **Regular plate**

Figure 5-30. Friction Plates

CLUTCH PACK AND BEARING

Complete Disassembly

1. Remove the primary chaincase cover. See 5.3 PRIMARY CHAINCASE COVER, Removal.
2. Remove clutch assembly. See 5.4 DRIVE COMPONENTS, Removal.
3. Follow all partial disassembly information under 5.6 CLUTCH, Clutch Pack Only.

NOTE

To avoid possible bearing damage, do not disassemble the clutch shell and hub assembly unless the bearing, hub or shell require replacement. Replace the bearing if disassembled.

⚠WARNING

Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

4. See Figure 5-31. With the transmission side up, remove retaining ring from clutch hub groove.
5. See Figure 5-32. Supporting clutch shell in same orientation, use arbor press and a suitable press plug to press hub from bearing in clutch shell.
6. See Figure 5-33. With the transmission side up, remove retaining ring from groove in clutch shell bore.
7. See Figure 5-34. Turn clutch shell over so that transmission side is down. Using arbor press and a suitable press plug, press on inner race to remove bearing from clutch shell bore.
8. Continue with Cleaning and Inspection found under 5.6 CLUTCH, Clutch Pack Only.

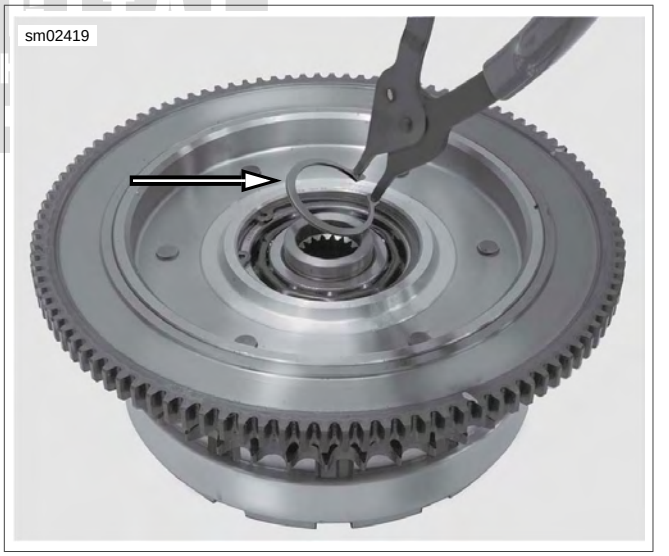


Figure 5-31. Clutch Hub Retaining Ring

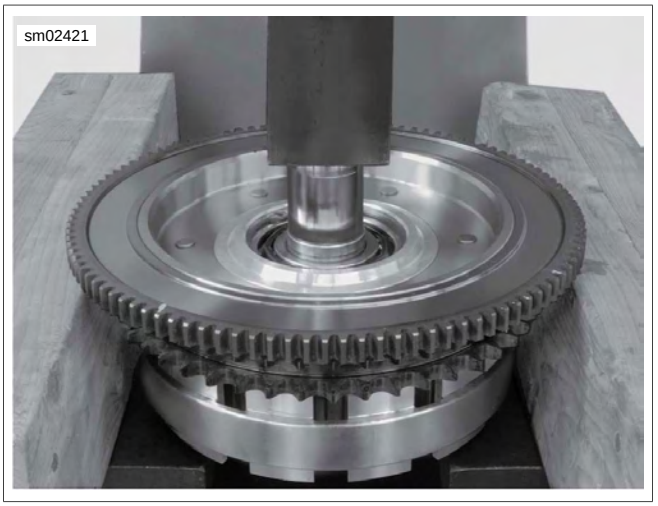


Figure 5-32. Pressing Clutch Hub From Bearing

Assembly

1. Orient clutch shell in arbor press with transmission side up. Be sure to support clutch shell bore on sprocket side to avoid damage to ears on clutch basket. Using a suitable press plug, press against outer race until bearing contacts shoulder in clutch shell bore.

⚠WARNING

Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

2. See Figure 5-33. Install retaining ring in groove of clutch shell bore so that flat side of retaining ring is towards bearing.
3. Turn clutch shell over so sprocket side is up. Center hub in bearing. Be sure that bearing inner race is supported with sleeve on transmission side. Press hub into bearing until hub shoulder contacts bearing inner race.
4. See Figure 5-31. Turn assembly over so that the transmission side is up. Install retaining ring in groove of clutch hub.
5. Place clutch assembly on bench oriented with the transmission side down.
6. Soak all friction and steel plates in primary chaincase lubricant for at least five minutes.
7. See Figure 5-35. Install the narrow friction plate on the clutch hub engaging tabs on plate with slots in clutch shell.
8. Install damper spring seat on clutch hub so that it seats inboard of narrow friction plate.
9. Install damper spring on clutch hub with the concave side up (facing opposite damper spring seat).
10. Install a steel plate and then a friction plate on the clutch hub. Install seven remaining sets in the same manner, alternating between steel plates and frictions plates.
11. Install pressure plate on clutch hub aligning holes in plate with threaded bosses on hub.
12. See Figure 5-36. Seat diaphragm spring (1) in recess of pressure plate with the concave side down.
13. Align holes in diaphragm spring retainer with threaded bosses on clutch hub. Tabs on spring retainer contact flats on inboard side of bosses.
14. Install six bolts (5) (metric) to secure diaphragm spring retainer to clutch hub. Alternately tighten 70-100 **in-lbs** (7.9-11.3 Nm).
15. Install clutch. See 5.4 DRIVE COMPONENTS, 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.

16. Install primary chaincase cover and gasket. See 5.3 PRIMARY CHAINCASE COVER, Installation.
17. Fill primary chaincase with lubricant. See 1.9 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant.



Figure 5-33. Install Clutch Shell Retaining Ring with Flat Side Against Bearing

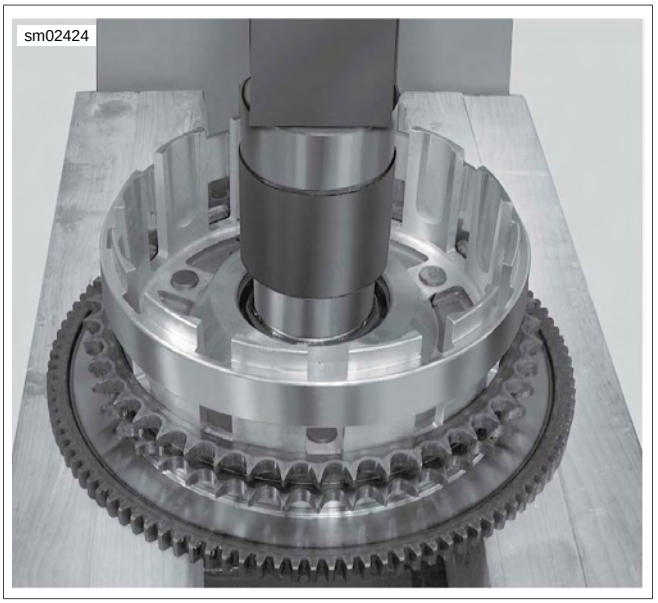
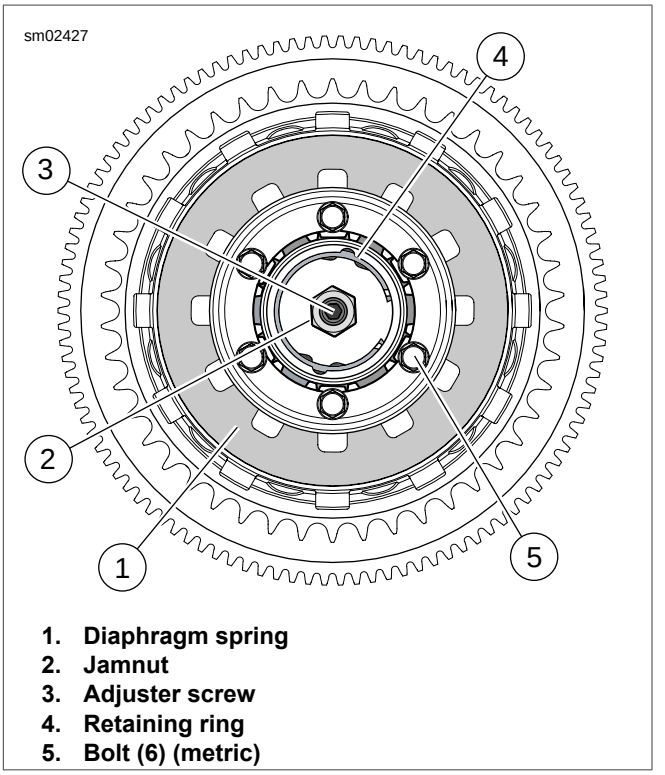
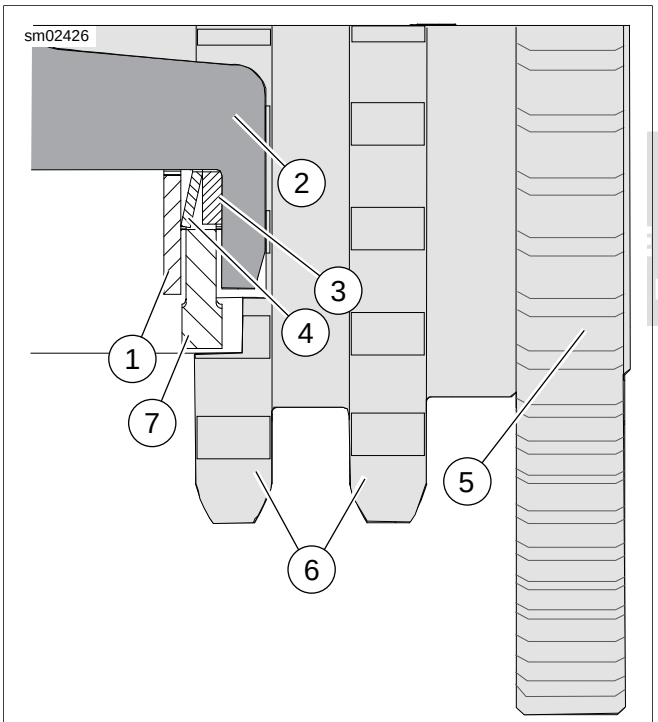


Figure 5-34. Pressing Bearing From Clutch Shell



1. Diaphragm spring
2. Jamnut
3. Adjuster screw
4. Retaining ring
5. Bolt (6) (metric)

Figure 5-36. Assembled Clutch



1. Steel plate
2. Clutch hub
3. Damper spring seat
4. Damper spring
5. Starter ring gear
6. Primary chain sprocket
7. Narrow friction plate

Figure 5-35. Clutch Stackup

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TRANSMISSION SPROCKET 5.7

REMOVAL

PART NUMBER	TOOL NAME
HD-46282A	FINAL DRIVE SPROCKET LOCKING TOOL
HD-47910	MAINSHAFT LOCKNUT WRENCH
HD-94660-2	PILOT

1. Remove primary chaincase. See 5.5 PRIMARY CHAINCASE HOUSING.
2. Loosen drive belt tension. See 1.12 DRIVE BELT AND SPROCKETS.

NOTE

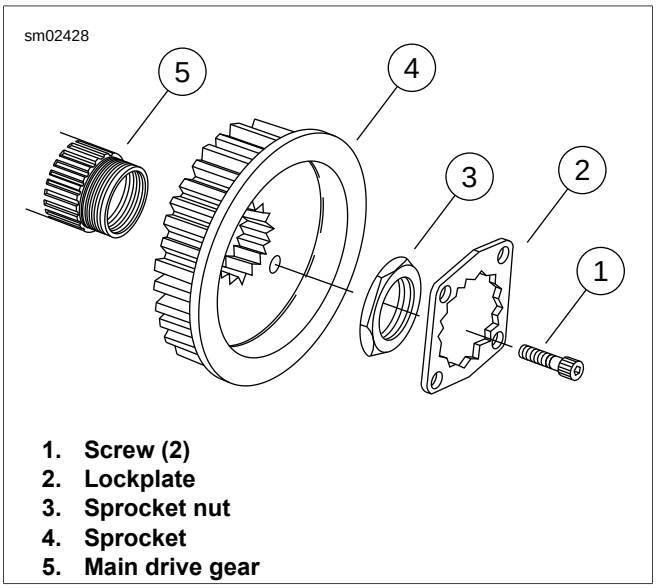
Remove sprocket nut only while transmission is installed in frame. Failure to do so will result in damage to transmission and/or transmission stand.

3. See Figure 5-37. Remove two screws (1) and lockplate (2).
4. See Figure 5-38. Install FINAL DRIVE SPROCKET LOCKING TOOL (Part No. HD-46282A) (2) so that arm of tool rests against bottom of rear fork pivot (1).

NOTE

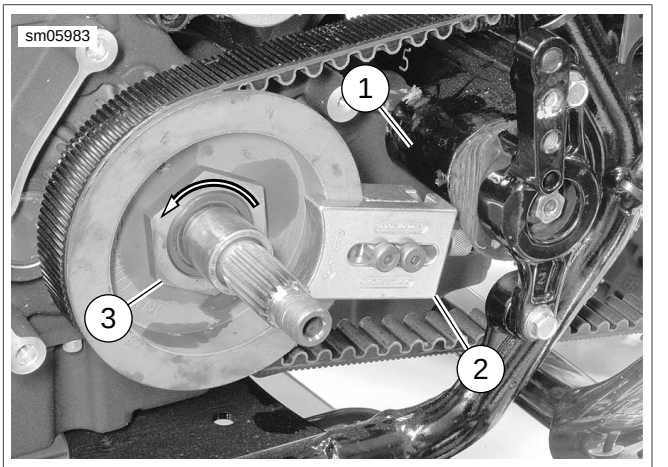
Sprocket nut has a right-hand thread.

5. Install PILOT (Part No. HD-94660-2) on mainshaft.
6. Remove the sprocket nut (3) using MAINSHAFT LOCKNUT WRENCH (Part No. HD-47910) (1).
7. Remove sprocket, allowing belt to slip from sprocket as sprocket is removed.



1. **Screw (2)**
2. **Lockplate**
3. **Sprocket nut**
4. **Sprocket**
5. **Main drive gear**

Figure 5-37. Transmission Sprocket



1. **Rear fork pivot**
2. **Final drive sprocket locking tool**
3. **Sprocket nut**

Figure 5-38. Sprocket Nut Removal

CLEANING AND INSPECTION

1. Using a non-volatile cleaning solvent, clean sprocket of all grease and dirt.
2. Inspect belt and sprocket. See 1.12 DRIVE BELT AND SPROCKETS, Inspection.
3. Inspect both main drive gear and mainshaft seals. Replace if damaged.

INSTALLATION

PART NUMBER	TOOL NAME
HD-46282A	FINAL DRIVE SPROCKET LOCKING TOOL
HD-47910	MAINSHAFT LOCKNUT WRENCH
HD-94660-2	PILOT

NOTE

Install sprocket nut only while transmission is installed in frame. Failure to do so will result in damage to transmission and/or transmission stand.

1. Place transmission sprocket in position. Install the belt on the sprocket as the sprocket is installed.
2. If reusing the sprocket nut, apply Loctite High Strength Threadlocker 271 (red) to the threads of the sprocket nut.

NOTES

- *Exercise caution to avoid getting oil on the threads of the sprocket nut or the integrity of the lock patch may be compromised.*
- *The transmission sprocket nut has **right-hand** threads. Turn the nut **clockwise** to install on the main drive gear.*

3. See Figure 5-37. Carefully spread a small quantity of clean engine oil on the inside face of the sprocket nut (3) and the outside face of the sprocket (4) where the surfaces of

the two parts contact each other. Install the sprocket nut until finger tight.

4. See Figure 5-39. Lock transmission sprocket with the FINAL DRIVE SPROCKET LOCKING TOOL (Part No. HD-46282A) (2). Arm of locking tool must rest against upper portion of rear fork pivot (1).
5. Install PILOT (Part No. HD-94660-2) on mainshaft.
6. Using MAINSHAFT LOCKNUT WRENCH (Part No. HD-47910), tighten sprocket nut to 100 ft-lbs (135.7 Nm) initial torque.
7. See Figure 5-37. Relocate locking tool as when removing sprocket nut.
8. Loosen sprocket nut one full turn.
9. Relocate locking tool as shown in Figure 5-39.
10. Tighten sprocket nut to 35 ft-lbs (47.5 Nm).
11. See Figure 5-40. Scribe lines (3) on the transmission sprocket nut (1). Continue the lines onto the transmission sprocket (2) as shown.
12. Tighten sprocket nut an additional 35-40 degrees.
13. Install lockplate over transmission sprocket nut so that two of lockplate's four drilled holes align with sprocket's two tapped holes. To find the best fit, lockplate can be rotated to a number of positions and can be placed with either side facing sprocket.

NOTE

Maximum allowable tightening of sprocket nut is 45 degrees of clockwise rotation after a torque of 35 ft-lbs (47.5 Nm). Do not loosen sprocket nut to align holes or nut will be under tightened.

14. If holes in lockplate do not align with those in sprocket, continue to tighten sprocket nut (up to the 45 degrees maximum) until sprocket and lockplate holes are in alignment.

NOTES

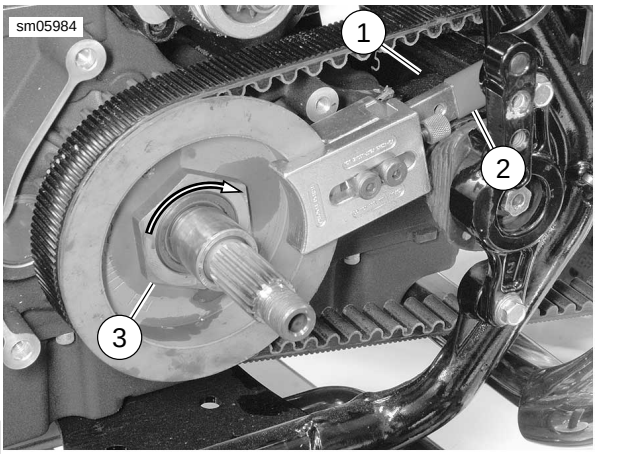
- ***New** screws have LOCTITE patches.*
- *Screws can be re-used up to three times if LOCTITE High Strength Threadlocker 271 (red) is applied before installation.*
- *To be sure of the lockplate's security, BOTH screws must be installed in the lockplate.*

15. See Figure 5-37. Install two screws (1) to secure lockplate (2) to sprocket (4).
16. Tighten screws to 90-120 **in-lbs** (10.2-13.6 Nm).
17. Install primary chain assembly. See 5.4 DRIVE COMPONENTS.

NOTE

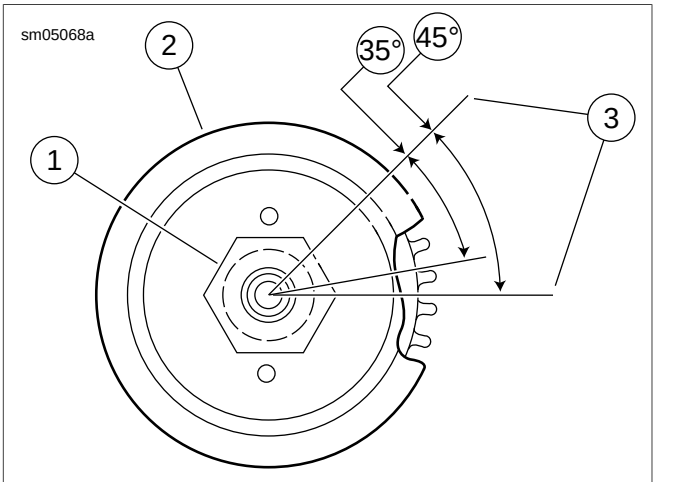
The gasket between the primary chaincase cover and chaincase must be replaced each time the cover is removed. Failure to replace this gasket may cause primary chaincase leaks.

18. Install primary chaincase cover and **new** gasket. See 5.3 PRIMARY CHAINCASE COVER.
19. Fill primary chaincase with lubricant. See 1.9 PRIMARY CHAINCASE LUBRICANT.
20. Verify pivot shaft torque. See 2.21 REAR FORK.
21. Adjust belt tension. See 1.12 DRIVE BELT AND SPROCKETS.



1. **Rear fork pivot**
2. **Final drive sprocket locking tool**
3. **Sprocket nut**

Figure 5-39. Sprocket Nut Installation



1. **Transmission sprocket nut**
2. **Transmission sprocket**
3. **Scribed lines**

Figure 5-40. Transmission Sprocket Nut Final Tightening

DRIVE BELT 5.8

REMOVAL AND ADJUSTMENT

Adjustment

See 1.12 DRIVE BELT AND SPROCKETS, Setting Belt Deflection.

Removal

1. Remove rear wheel and rear fork. See 2.21 REAR FORK.
2. Remove primary chain, clutch, engine compensating sprocket, and chain adjuster as an assembly. See 5.4 DRIVE COMPONENTS.
3. Remove primary chaincase housing. See 5.5 PRIMARY CHAINCASE HOUSING, Removal.
4. Remove belt from transmission sprocket.

INSTALLATION

⚠WARNING

Never bend belt forward into a loop smaller than the drive sprocket diameter. Never bend belt into a reverse loop. Over bending can damage belt resulting in premature failure, which could cause loss of control and death or serious injury. (00339a)

1. Install belt over transmission sprocket.
2. Install the primary chaincase housing. See 5.5 PRIMARY CHAINCASE HOUSING, 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.

3. Install primary chain assembly and primary chaincase cover. Fill primary chaincase with lubricant. See 5.4 DRIVE COMPONENTS.
4. Install rear fork and rear wheel. See 2.21 REAR FORK.
5. Adjust belt tension. See 1.12 DRIVE BELT AND SPROCKETS.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

NOTES

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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DIGITAL TECHNICIAN® II
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NOTES

FASTENER TORQUE VALUES 6.1

FASTENER TORQUE VALUES IN THIS CHAPTER

The table below lists torque values for all fasteners presented in this chapter.

FASTENER	TORQUE VALUE		NOTES
Clutch cable fitting	90-120 **in-lbs**	10.2-13.6 Nm	6.5 CLUTCH RELEASE COVER, Assembly and Installation
Clutch release cover screws	90-120 **in-lbs**	10.2-13.6 Nm	6.5 CLUTCH RELEASE COVER, Assembly and Installation
Mainshaft/countershaft nuts	85-95 ft-lbs	115.3-128.8 Nm	6.6 TRANSMISSION ASSEMBLY, Assembly
Neutral switch	120-180 **in-lbs**	13.6-20.3 Nm	6.8 TRANSMISSION CASE, Installation
Shift drum detent arm fastener	120-150 **in-lbs**	13.6-17.0 Nm	6.6 TRANSMISSION ASSEMBLY, Assembly
Shift drum lock plate fasteners	57-63 **in-lbs**	6.4-7.1 Nm	6.6 TRANSMISSION ASSEMBLY, Assembly
Shifter rod lever screw	18-22 ft-lbs	24.4-29.8 Nm	6.8 TRANSMISSION CASE, Assembly
Shifter rod locknut	80-120 **in-lbs**	9.0-13.6 Nm	6.4 SHIFTER LINKAGE, Shifter Rod
Side door fasteners	13-18 ft-lbs	17.6-24.4 Nm	6.6 TRANSMISSION ASSEMBLY, Installation
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	6.6 TRANSMISSION ASSEMBLY, Installation
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	6.8 TRANSMISSION CASE, Installation
Transmission mounting bolts, final torque	34-39 ft-lbs	46.1-52.9 Nm	6.8 TRANSMISSION CASE, Installation
Transmission mounting bolts, initial torque	15 ft-lbs	20.3 Nm	6.8 TRANSMISSION CASE, Installation
Transmission top cover	90-120 **in-lbs**	10.2-13.6 Nm	6.6 TRANSMISSION ASSEMBLY, Installation
VSS fastener	84-132 **in-lbs**	9.5-14.9 Nm	6.8 TRANSMISSION CASE, Installation

SPECIFICATIONS: TRANSMISSION 6.2

SPECIFICATIONS

Table 6-1. Transmission Specifications

TRANSMISSION	DATA
Type	6-speed forward constant mesh
FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT	Part No. 99851-05 (qt)
SYN3 20W50 Oil	Part No. 99824-03/00QT (qt)
Capacity	32 oz.
	946.4 ml

Table 6-2. Transmission Gear Ratios

GEAR	GEAR RATIO
First (low)	3.34
Second	2.31
Third	1.72
Fourth	1.39
Fifth	1.19
Sixth (high)	1.00

NOTE

Final gear ratios indicate the number of mainshaft revolutions required to drive the output sprocket one revolution.

SERVICE WEAR LIMITS

Table 6-3. Main Drive Gear Specifications

MAIN DRIVE GEAR (6th)	IN.	MM
Bearing fit in transmission case (loose)	0.0003-0.0017	0.0076-0.043
Fit in bearing (press-fit)	0.001-0.003	0.025-0.076
End play	none	none

Table 6-4. Mainshaft Tolerance Specifications

MAINSHAFT TOLERANCE	IN.	MM
Mainshaft runout	0.000-0.003	0.00-0.08
Mainshaft end play	none	none
5th gear end play (axial)	0.002-0.026	0.05-0.66
5th gear clearance (radial)	0.0004-0.0020	0.009-0.052
Main drive gear (6th) fit	0.0009-0.0022	0.023-0.056

Table 6-5. Countershaft Tolerance Specifications

COUNTERSHAFT TOLERANCE	IN.	MM
Countershaft runout	0.000-0.003	0.00-0.08
Countershaft end play	0.001-0.003	0.025-0.08
1st gear end play (axial)	0.001-0.023	0.03-0.58
1st gear clearance (radial)	0.0004-0.0020	0.010-0.052
2nd gear end play (axial)	0.001-0.40	0.03-1.02
2nd gear clearance (radial)	0.0004-0.0020	0.010-0.052
3rd gear end play (axial)	0.001-0.042	0.03-1.07
3rd gear clearance (radial)	0.0004-0.0020	0.010-0.052
4th gear end play (axial)	0.001-0.028	0.03-0.71
4th gear clearance (radial)	0.0004-0.0020	0.010-0.052

Table 6-6. Shifter Dog Clearance Specifications

SHIFTER DOG	IN.	MM
1st	0.013-0.121	0.33-3.07
2nd	0.016-0.138	0.41-3.51
3rd	0.010-0.125	0.25-3.17
4th	0.018-0.129	0.46-3.28
5th	0.007-0.117	0.18-2.97
6th	0.022-0.131	0.56-3.33

Table 6-7. Side Door Bearing Specifications

SIDE DOOR BEARING	IN.	MM
Fit in side door (tight)	0.0001-0.0014	0.0025-0.0356
Fit on countershaft (tight)	-0.0004	-0.010
Fit on countershaft (loose)	+0.0012	+0.030
Fit on mainshaft (tight)	-0.0004	-0.010
Fit on mainshaft (loose)	+0.0012	+0.030

Table 6-8. Shifter Fork Specifications

SHIFTER FORKS	IN.	MM
Shifter fork to cam groove end play	0.004-0.012	0.102-0.305
Shifter fork to dog ring end play	0.004-0.016	0.102-0.4060
First and second gear shift fork pad thickness wear limit	0.258	6.55
Third and fourth gear shift fork pad thickness wear limit	0.198	5.03
Fifth and sixth gear shift fork pad thickness wear limit	0.258	6.55

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TRANSMISSION 6.3

POWER FLOW

See Figure 6-1. The 6-speed transmission consists of two parallel shafts supporting six gears each. The longer, or mainshaft (7), also supports the clutch and serves as the input shaft. The shorter shaft is called the countershaft (8).

Each gear on the mainshaft is in constant mesh with a corresponding gear on the countershaft. Each of these six pairs of gears makes up a different speed in the transmission.

The transmission gears are divided into two types, gears that rotate with the shaft, and freewheeling gears that ride on bearings and spin freely on the shaft. A gear that rotates with the shaft always meshes with a freewheeling gear. Also, three dog rings are able to slide sideways on the shaft. These dog rings are used to change transmission speeds. The dogs, or projections, on the sides of the dog rings, engage dogs on adjacent freewheeling gears, transmitting power through the transmission.

Gear shifting is accomplished by three forks which fit into grooves machined into the dog rings that slide on the guide hubs. The position of the shifter forks is controlled by a drum-shaped shifter cam located in the transmission side door.

Neutral

Power is introduced to the transmission through the clutch. In neutral, with the clutch engaged, the mainshaft 1st, 2nd, 3rd and 4th gears are rotating, but no power is transferred to the countershaft since countershaft 1st, 2nd, 3rd and 4th gears are freewheeling gears.

1st Gear

When the transmission is shifted into first gear, the dog ring between countershaft 1st and 2nd, which rotates with the countershaft, engages countershaft 1st, which has been spinning freely on the countershaft driven by mainshaft 1st.

Now countershaft 1st is no longer freewheeling, but locked to the countershaft causing the countershaft and countershaft 6th to turn. Countershaft 6th transmits the power to the main drive gear and the sprocket as shown (1).

2nd Gear

Second gear is engaged when the dog ring between countershaft 1st and 2nd is shifted out of countershaft 1st and engages countershaft 2nd. This locks countershaft 2nd to the countershaft to complete the power flow as shown (2).

3rd Gear

Two shifter forks are used to make the shift from second to third. One fork moves the dog ring between countershaft 1st and 2nd to its neutral position, while another fork engages the dog ring between countershaft 3rd and 4th with countershaft 3rd. This locks countershaft 3rd to the countershaft to complete the power flow as shown (3).

4th Gear

Fourth gear is engaged when the dog ring between countershaft 3rd and 4th is shifted out of countershaft 3rd and engages countershaft 4th. This locks countershaft 4th to the countershaft to complete the power flow as shown (4).

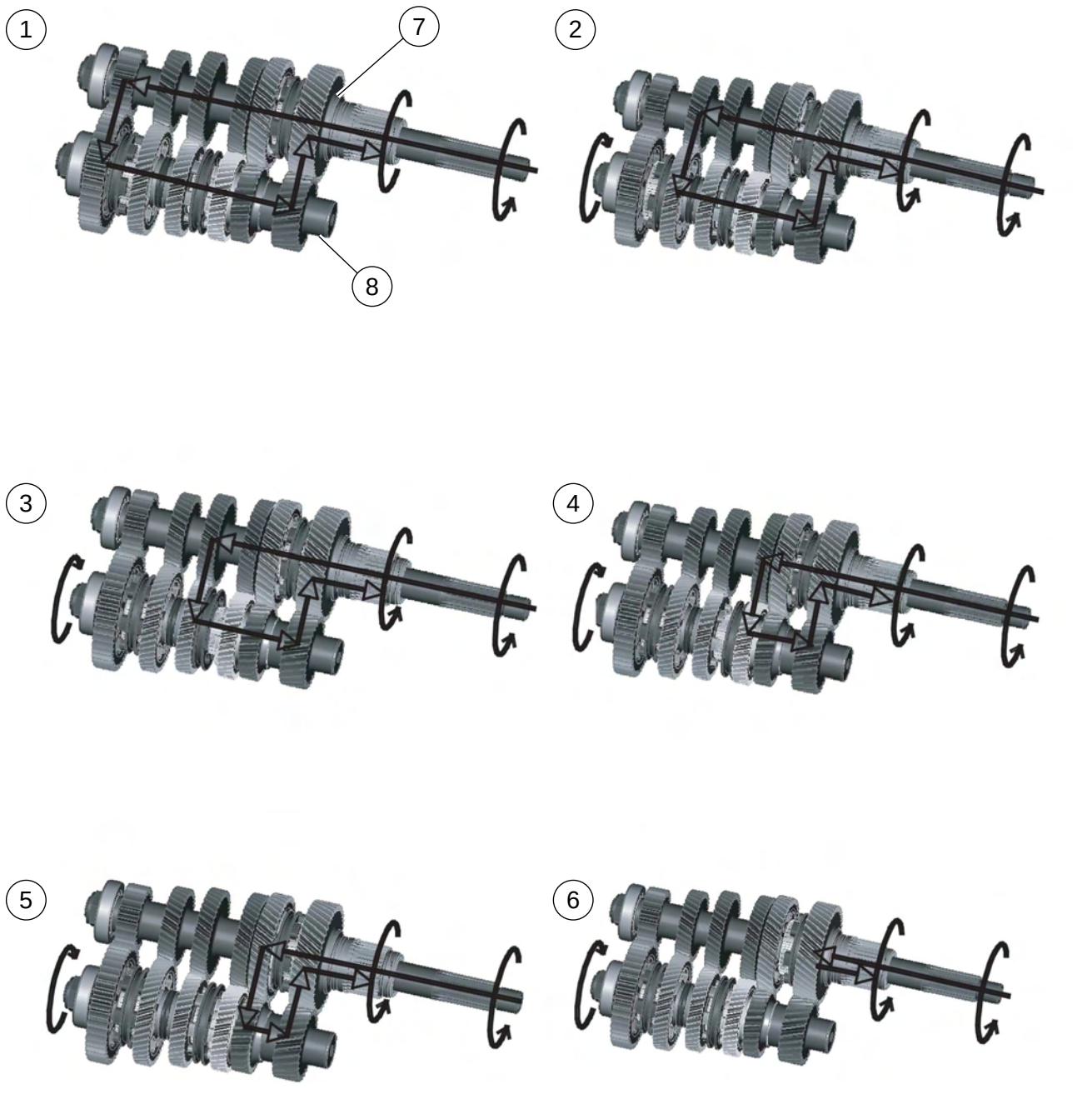
5th Gear

Two shifter forks are used to make the shift from fourth to fifth. One fork moves the dog ring between countershaft 3rd and 4th to its neutral position, while another fork engages the dog ring between mainshaft 5th and 6th with mainshaft 5th. This locks mainshaft 5th to the mainshaft to complete the power flow as shown (5).

6th Gear

The shift from fifth to sixth gear occurs when the dog ring between mainshaft 5th and 6th is shifted out of mainshaft 5th, and is shifted directly into the main drive gear (6th gear). The main drive gear is locked to the mainshaft resulting in a direct one-to-one drive ratio from the clutch to the sprocket as shown (6).

sm00068a



1. First gear
2. Second gear
3. Third gear
4. Fourth gear
5. Fifth gear
6. Sixth gear
7. Mainshaft
8. Countershaft

Figure 6-1. Transmission Power Flow

SHIFTER LINKAGE 6.4

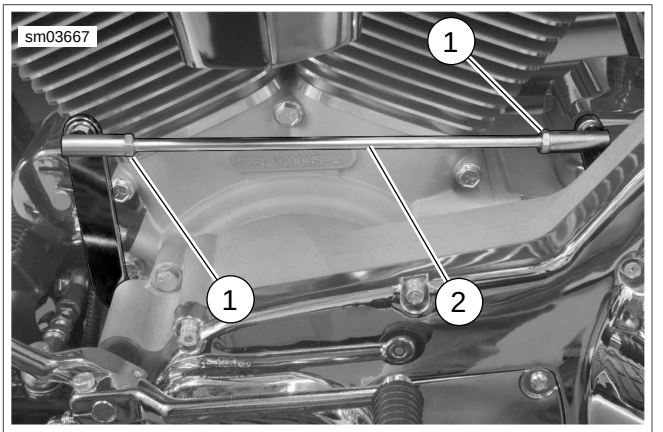
SHIFTER ROD

The shifter rod is set at the factory and should not need adjustment under normal circumstances. However, if full engagement or full lever travel is not achieved, adjust the shifter rod.

NOTE

To ensure proper gear engagement and avoid possible damage to transmission, the shift levers should not contact the footboard when shifting.

1. See Figure 6-2. Remove locknut, lockwasher and flat washer to free front end of shifter rod from inner shift arm.
2. Loosen locknuts (1) and adjust rod (2) as necessary.
3. Install flat washer, lockwasher and locknut to fasten front end of shifter rod to inner shift arm.
4. Tighten locknuts (1) to 80-120 **in-lbs** (9.0-13.6 Nm).



1. Locknut (2)
2. Shifter rod

Figure 6-2. Shifter Rod

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

CLUTCH RELEASE COVER 6.5

REMOVAL AND DISASSEMBLY

1. Remove main fuse.
2. Remove exhaust system if needed. See 4.19 EXHAUST SYSTEM.
3. Drain transmission. See 1.10 TRANSMISSION LUBRICANT, Transmission Lubrication.

NOTE

Actuating the clutch hand lever after removing the six screws will help break the cover free.

4. See Figure 6-3. Remove the six screws that hold the clutch release cover in place. Remove the clutch release cover and discard the gasket.
5. Add freeplay to clutch cable. See 1.11 CLUTCH, Adjustment.

⚠WARNING

Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

6. See Figure 6-4. Remove retaining ring (4). Lift inner ramp (5) and ramp coupling (3) out of clutch release cover. Disconnect clutch cable end (2) from the ramp coupling (3).
7. Remove coupling (3) from inner ramp.
8. See Figure 6-5. Remove balls (4) and outer ramp (2).
9. Unscrew clutch cable fitting from clutch release cover.

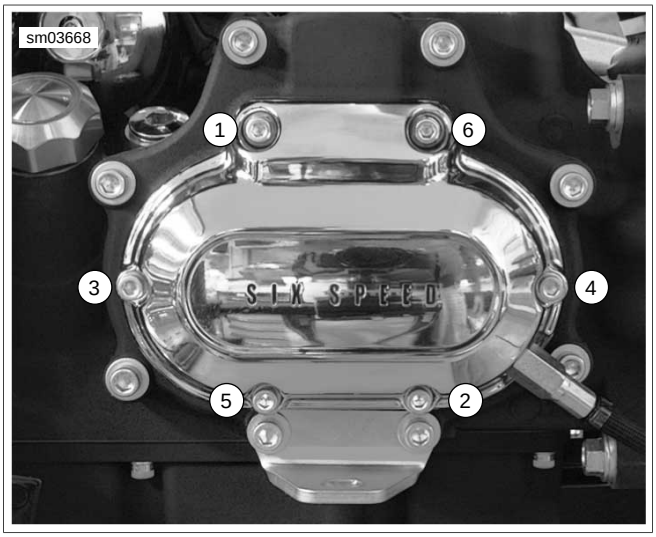
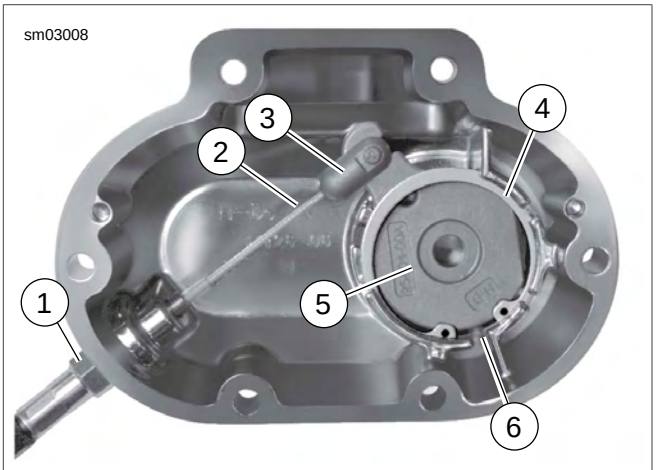


Figure 6-3. Clutch Release Cover Torque Sequence (Short Screws at Locations 1 and 6)



1. **Cable fitting**
2. **Clutch cable end**
3. **Ramp coupling**
4. **Retaining ring**
5. **Inner ramp**
6. **Retaining ring opening**

Figure 6-4. Clutch Cable Connection

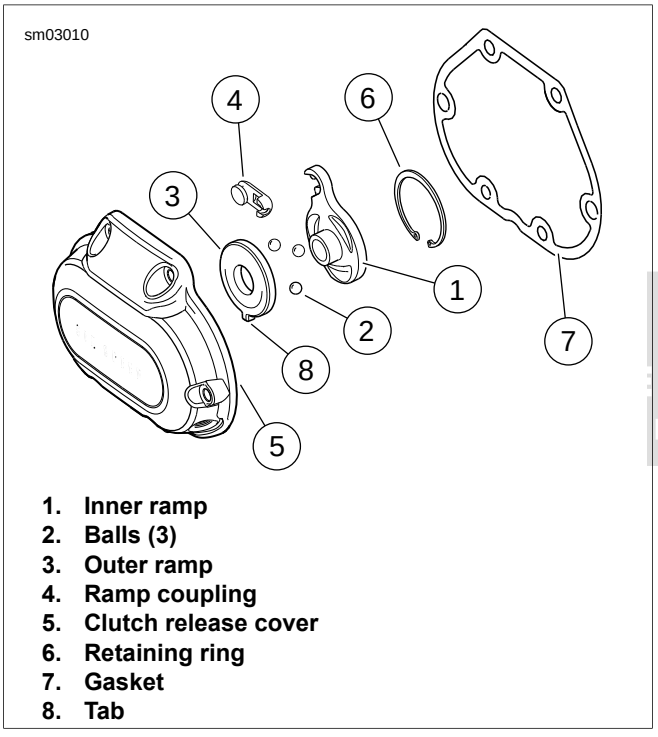


1. **Inner ramp**
2. **Outer ramp**
3. **Outer ramp tab**
4. **Balls (3)**
5. **Ramp coupling**

Figure 6-5. Coupling and Ramp Assembly

CLEANING AND INSPECTION

1. See Figure 6-6. Wash the ball and ramp mechanism components in cleaning solvent.
2. Inspect the three balls (2) and ball socket surfaces on ramps (1, 3) for wear, pitting, surface breakdown and other damage. Replace damaged parts.
3. Check fit of the ramp coupling (4) on inner ramp (1). Replace both parts if there is excessive wear.
4. Inspect the retaining ring (6) for damage or distortion.
5. Check clutch cable end for frayed or worn ends. Replace cable if damaged or worn. Check cable fitting O-ring for cuts, tears or signs of deterioration.
6. Check the bore in the cover (5) where the ramps (1, 3) are retained. There should be no wear that would cause the ramps to cock, causing improper clutch adjustment.



1. **Inner ramp**
2. **Balls (3)**
3. **Outer ramp**
4. **Ramp coupling**
5. **Clutch release cover**
6. **Retaining ring**
7. **Gasket**
8. **Tab**

Figure 6-6. Release Mechanism Assembly

ASSEMBLY AND INSTALLATION

NOTE

Replace cable fitting O-ring if damaged or deformed.

1. See Figure 6-4. Apply a drop of Loctite Threadlocker 243 (blue) to the clutch cable fitting (1) and install into clutch release cover. Do not tighten at this time.
2. See Figure 6-6. Place outer ramp (3) with ball socket side up in clutch release cover. Be sure tab (8) is in clutch release cover slot.
3. Apply a multi-purpose grease to the balls and outer ramp sockets. Place a ball in each of the outer ramp sockets.
4. See Figure 6-4. Connect cable end to ramp coupling (3). Install coupling on inner ramp (5) and place inner ramp and coupling in position in clutch release cover.

⚠WARNING

Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

NOTE

Retaining ring opening (6) must be centered above the break in the ribbing at bottom of the clutch release cover.

5. Install retaining ring (4).
6. Verify that two dowel pins are in place on transmission side door flange. Place a **new** gasket on dowel pins.

NOTE

See Figure 6-3. Clutch release cover screws in positions (1) and (6) are shorter than the others.

7. See Figure 6-3. Install clutch release cover. Tighten screws to 90-120 **in-lbs** (10.2-13.6 Nm) in sequence shown.
8. Tighten clutch cable fitting to 90-120 **in-lbs** (10.2-13.6 Nm).
9. Fill transmission to proper level with fresh transmission fluid. See 1.10 TRANSMISSION LUBRICANT, Transmission Lubrication.
10. Adjust clutch cable. See 1.11 CLUTCH.
11. Install exhaust system if removed. See 4.19 EXHAUST SYSTEM.
12. Install main fuse.

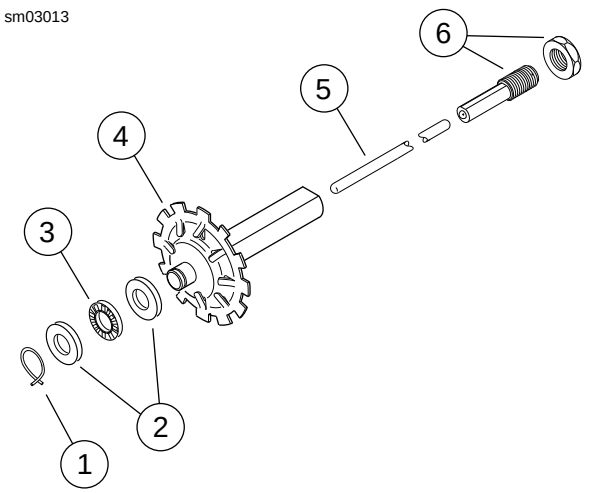
TRANSMISSION ASSEMBLY 6.6

REMOVAL

NOTE

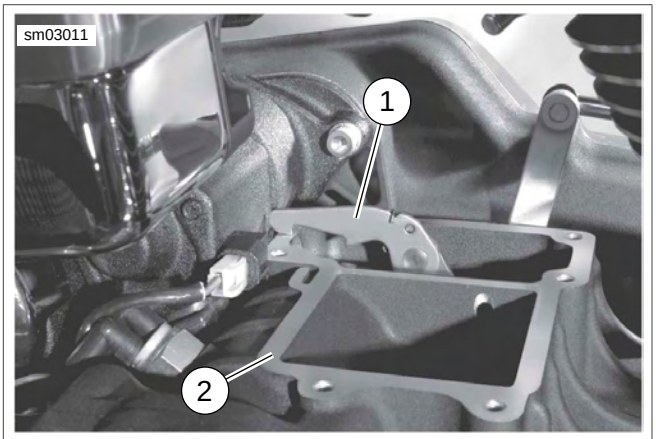
Leave the transmission case in the frame unless the case itself requires replacement. For illustration purposes, some photographs may show the case removed. For information on case removal see 6.8 TRANSMISSION CASE.

1. Remove exhaust system. See 4.19 EXHAUST SYSTEM.
2. Relieve drive belt tension. See 1.12 DRIVE BELT AND SPROCKETS.
3. Remove primary chaincase cover, clutch assembly, primary chain, compensating sprocket assembly and primary chaincase. See 5.5 PRIMARY CHAINCASE HOUSING, Removal.
4. Remove the bearing inner race from the transmission mainshaft. See 5.5 PRIMARY CHAINCASE HOUSING, Mainshaft Bearing Inner Race.
5. Remove the clutch release cover from the transmission side door. See 6.5 CLUTCH RELEASE COVER, Removal and Disassembly.
6. See Figure 6-7. Remove oil slinger assembly from mainshaft. Insert long rod through mainshaft bore and remove push rod.
7. Remove transmission top cover, leaving the cover gasket in place.
8. See Figure 6-8. Rotate the shifter pawl forward enough to raise the free end and place shifter cam pawl on top cover gasket.



1. **Retaining ring**
2. **Thrust washer (2)**
3. **Throw out bearing**
4. **Oil slinger**
5. **Push rod**
6. **Push rod end, left side**

Figure 6-7. Push Rod Assembly



1. **Shifter pawl**
2. **Top cover gasket surface**

Figure 6-8. Set Shifter Pawl on Gasket

NOTES

- *Remove and install sprocket nut only while transmission is in vehicle frame. Trying to remove and install sprocket nut with transmission in transmission stand may cause damage to transmission or stand.*
- *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.*

9. If main drive gear is to be removed, see 6.7 MAIN DRIVE GEAR AND BEARING, Removal.
10. Cover mainshaft clutch hub splines with tape to prevent the splines damaging the main drive gear bearings.
11. See Figure 6-10. Remove the transmission side door mounting hardware. Remove exhaust bracket, if equipped.

NOTE

See Figure 6-9. Never attempt to remove side door by tapping on shafts from opposite side. Tapping them with a hammer 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.

12. Pry the side door loose and remove side door, mainshaft, countershaft and shifter cam from transmission case as an assembly. Discard gasket.

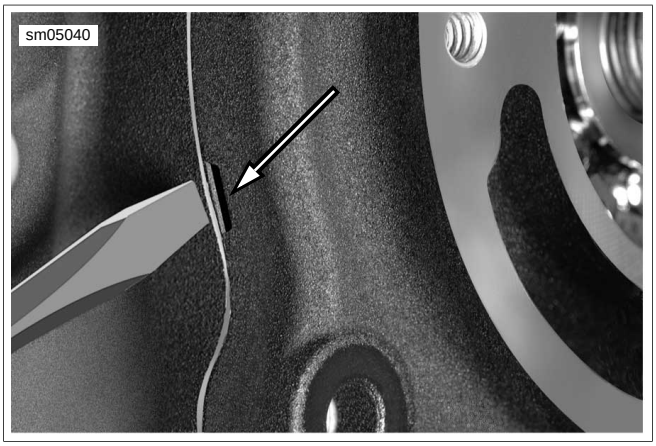
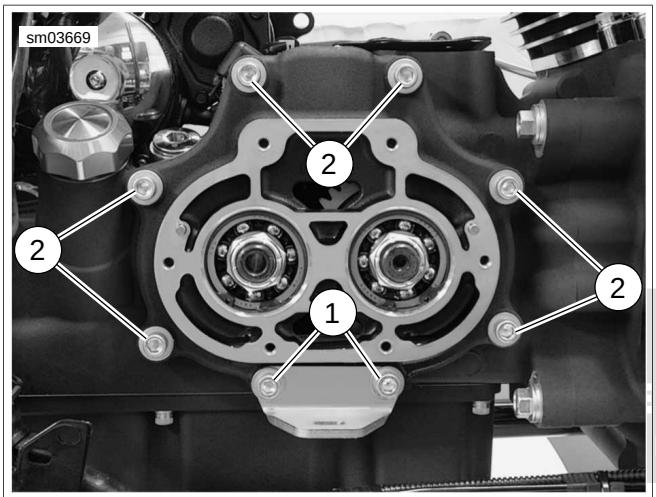


Figure 6-9. Side Door Pry Point



1. **Long screw (2)**
2. **Short screw (6)**

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) or vise grips. 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

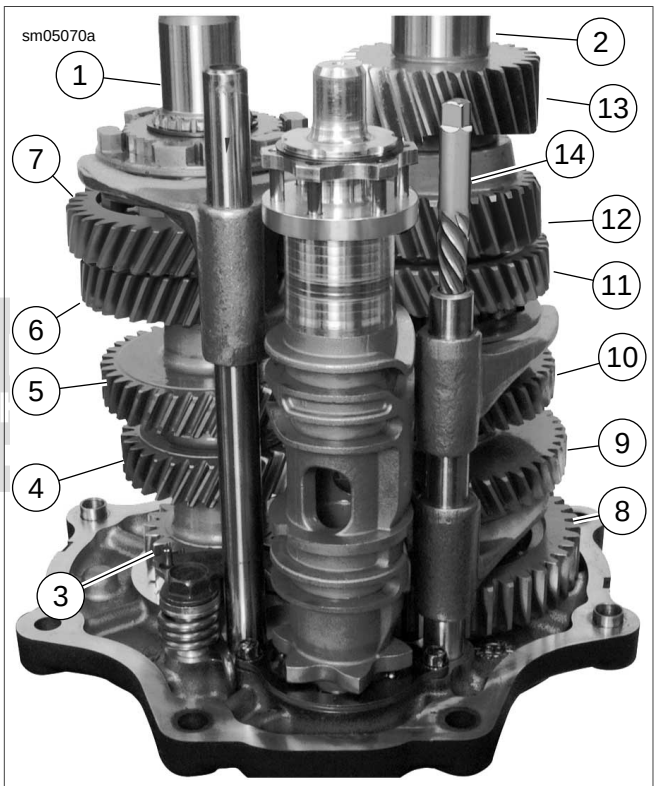
Shifter shafts have a slight interference fit. Shifter shafts can be reused, so avoid damaging end of shaft. Mark shafts so they can be reinstalled in original position during assembly.

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

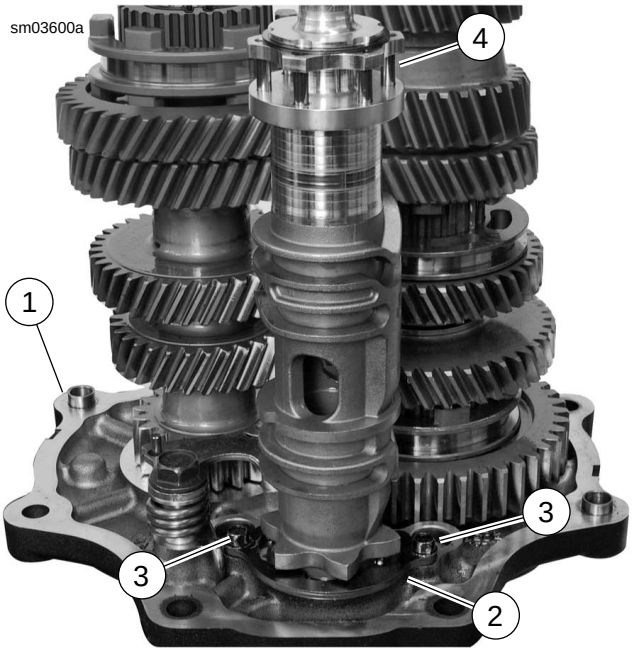
Although many transmission parts can be installed in either direction, make sure used parts are installed in same direction as when removed to prolong usable life.

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.
8. Remove transmission assembly from transmission case.



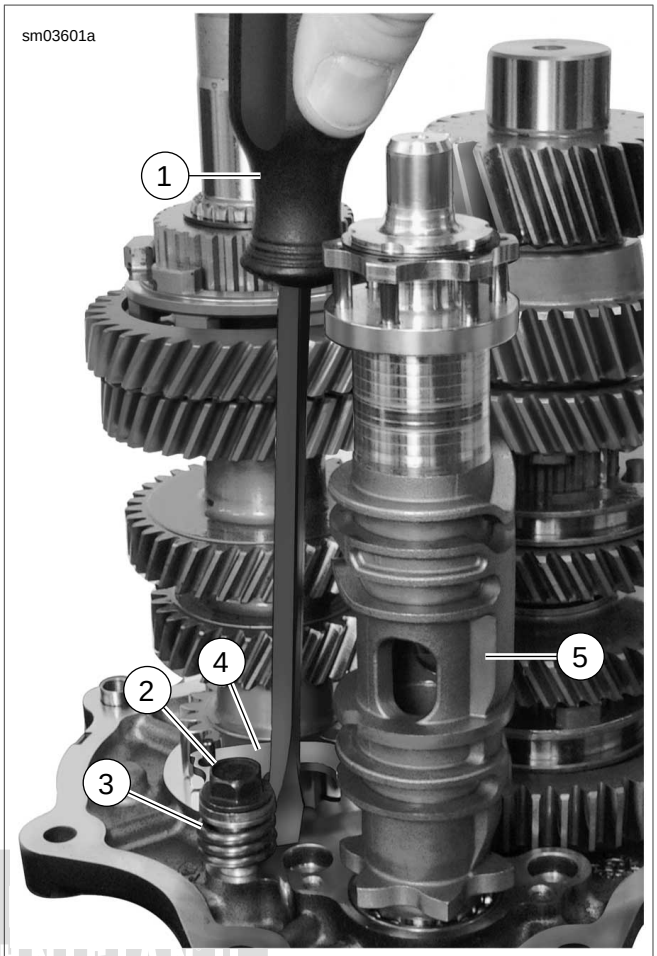
1. **Mainshaft**
2. **Countershaft**
3. **Mainshaft 1st gear**
4. **Mainshaft 2nd gear**
5. **Mainshaft 3rd gear**
6. **Mainshaft 4th gear**
7. **Mainshaft 5th gear**
8. **Countershaft 1st gear**
9. **Countershaft 2nd gear**
10. **Countershaft 3rd gear**
11. **Countershaft 4th gear**
12. **Countershaft 5th gear**
13. **Countershaft 6th gear**
14. **Screw extractor**

Figure 6-11. Gear Set



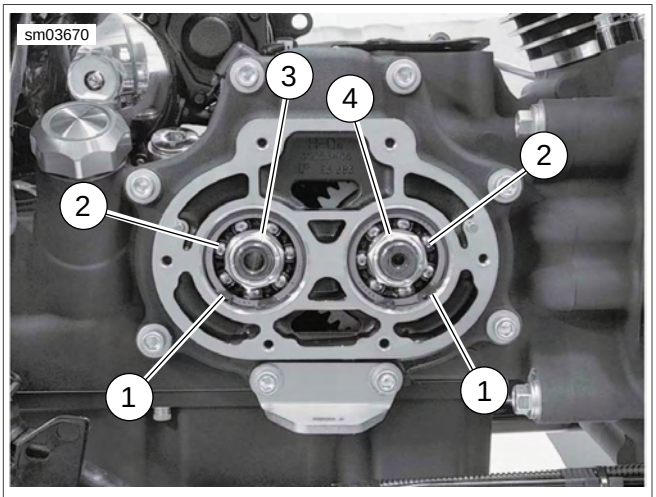
1. Side door
2. Lock plate
3. Lock plate fastener (2)
4. Shift cam

Figure 6-12. Shift Drum



1. Screwdriver
2. Detent fastener
3. Detent spring
4. Detent arm
5. Shift cam

Figure 6-13. Detent Assembly



1. Retaining ring (2)
2. Bearing (2)
3. Mainshaft locknut
4. Countershaft locknut

Figure 6-14. Side Door Locknuts

Mainshaft

WARNING

Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

NOTE

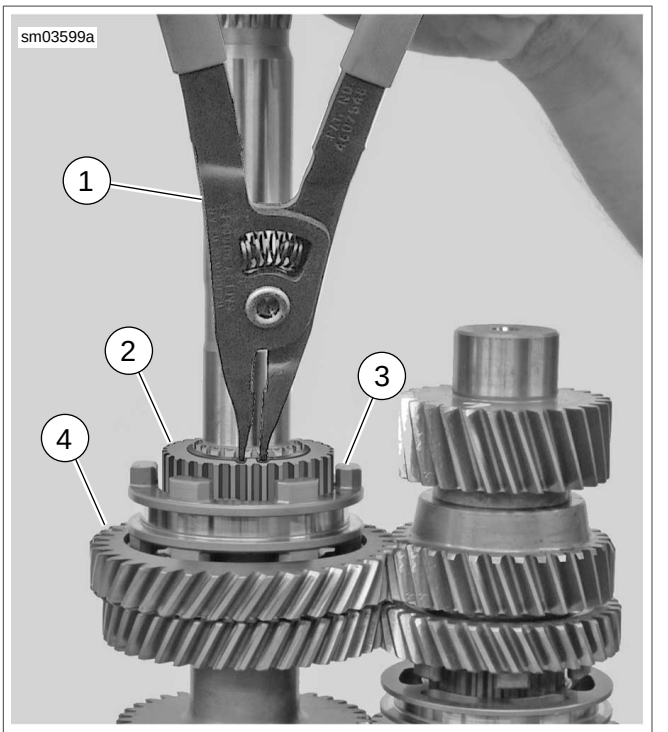
As mainshaft 4th gear, 3rd gear, 2nd gear and 1st gear are an integral part of the shaft, damage to any gear requires mainshaft replacement.

1. See Figure 6-15. Using TRANSMISSION SHAFT RETAINING RING PLIERS (Part No. J-5586A), remove retaining ring. Remove dog ring (3), guiding hub (2), mainshaft 5th gear (4) and bearing.

NOTE

Do not press directly on the end of the mainshaft. Place a spacer such as a washer between the end of the mainshaft and the press ram.

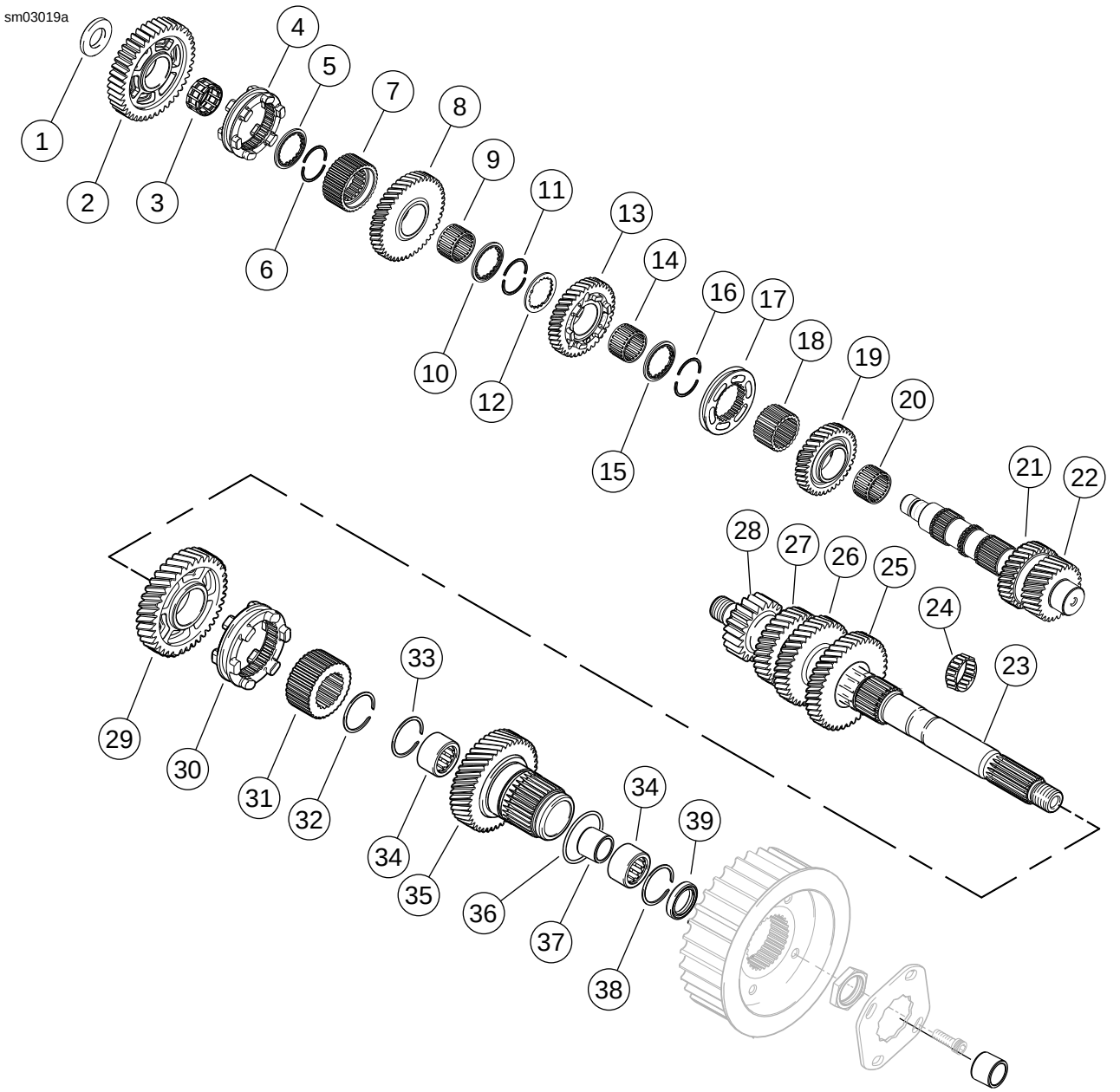
2. Place transmission assembly in arbor press and press mainshaft out of side door bearings.



1. **Retaining ring pliers**
2. **Guiding hub**
3. **Dog ring**
4. **Mainshaft 5th gear**

Figure 6-15. Mainshaft Retaining Ring

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. Spacer
2. Countershaft 1st gear
3. Bearing
4. Dog ring
5. Lock ring
6. Securing segment (2)
7. Guiding hub
8. Countershaft 2nd gear
9. Bearing
10. Lock ring
11. Securing segment (2)
12. Internal spline washer
13. Countershaft 3rd gear
14. Bearing
15. Lock ring
16. Securing segment (2)
17. Dog ring
18. Guiding hub
19. Countershaft 4th gear
20. Bearing
21. Countershaft 5th gear (part of countershaft)
22. Countershaft 6th gear (part of countershaft)
23. Mainshaft
24. Bearing
25. Mainshaft 4th gear
26. Mainshaft 3rd gear
27. Mainshaft 2nd gear
28. Mainshaft 1st gear
29. Mainshaft 5th gear
30. Dog ring
31. Guiding hub
32. Retaining ring
33. Retaining ring
34. Main drive gear bearing (2)
35. Main drive gear
36. O-ring
37. Bearing spacer
38. Retaining ring
39. Oil seal

Figure 6-16. Mainshaft and Countershaft Assembly

Countershaft

NOTES

- *If removing countershaft without removing the mainshaft, hold countershaft 3rd and 4th gear shift dog up while pressing countershaft out of side door bearings.*
- *Do not press directly on the end of the countershaft. Place a spacer such as a washer between the end of the countershaft and the press ram.*

1. Press countershaft out of side door bearings.
2. See Removing Side Door Bearings on the following page for side door bearing replacement.
3. See Figure 6-17. Remove washer (1), countershaft 1st gear (2) and bearing.

NOTE

See Figure 6-18. Note the direction that the 2nd gear locking ring is installed.

4. Remove countershaft 2nd gear lock ring.
5. See Figure 6-19. Remove securing segments (1). Remove dog ring (3), guiding hub (2), countershaft 2nd gear (4) and bearing.



1. Washer
2. Countershaft 1st gear

Figure 6-17. Countershaft 1st Gear

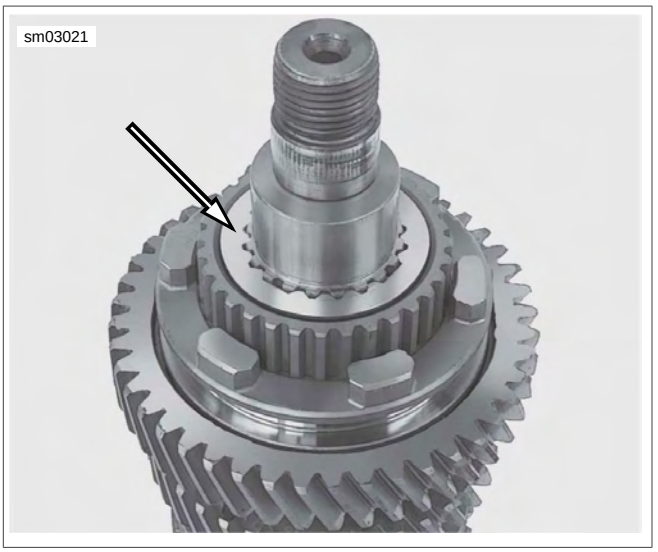
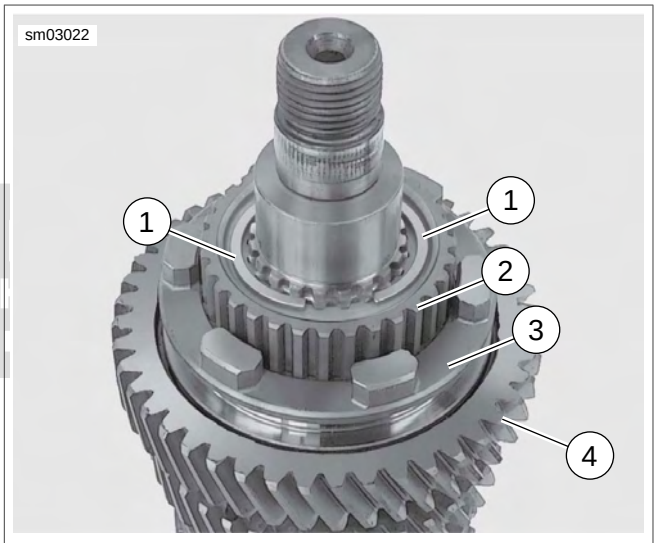


Figure 6-18. Lock Ring



1. Securing segment
2. Guiding hub
3. Dog ring
4. Countershaft 2nd gear

Figure 6-19. Securing Segment

NOTE

See Figure 6-20. Note the direction that the 3rd gear locking ring is installed.

6. Remove countershaft 3rd gear lock ring.
7. See Figure 6-21. Remove securing segments (1), internal spline washer (2), countershaft 3rd gear (3) and bearing.

NOTE

See Figure 6-22. Note the direction that the 4th gear locking ring is installed.

8. Remove 4th gear lock ring (1), securing segments, dog ring (3), guiding hub (2), and countershaft 4th gear (4) and bearing.

NOTE

As countershaft 5th gear and 6th gear are an integral part of the shaft, damage to either gear requires countershaft replacement.

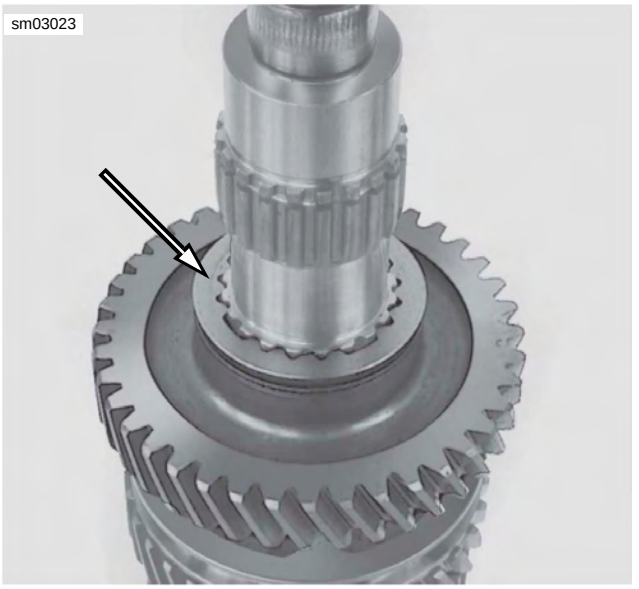
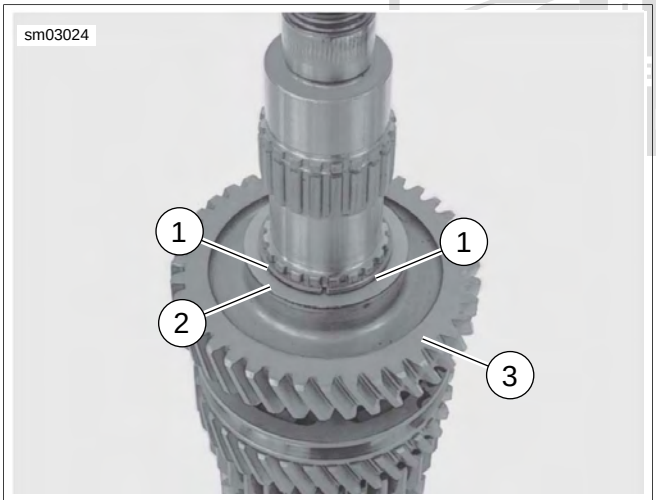
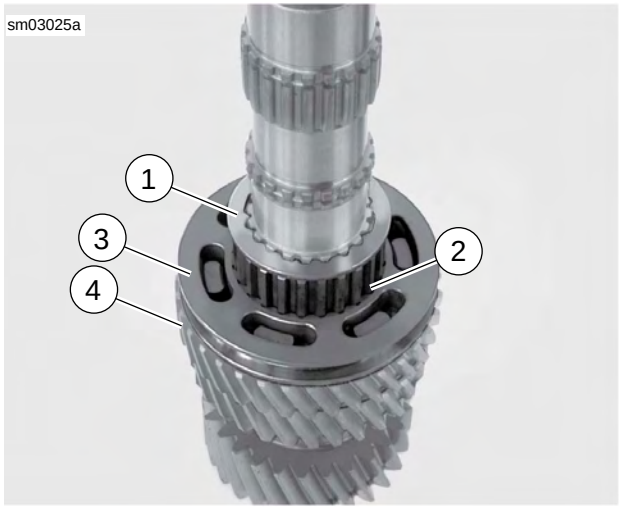


Figure 6-20. Third Gear Lock Ring



1. **Securing segment**
2. **Internal spline washer**
3. **Countershaft 3rd gear**

Figure 6-21. Countershaft Third Gear



1. **4th gear lock ring**
2. **Guiding hub**
3. **Dog ring**
4. **Countershaft 4th gear**

Figure 6-22. Countershaft Assembly

Removing Side Door Bearings

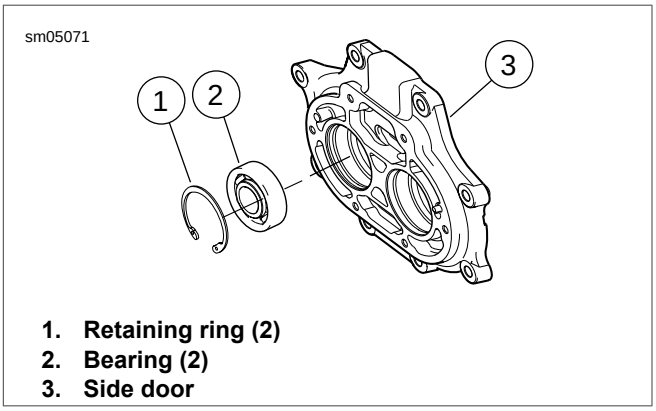
NOTE

Always replace side door bearing if the shaft is pressed out.

⚠WARNING

Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

1. See Figure 6-23. Remove the retaining rings (1).
2. Press the bearings out of the side door.



1. **Retaining ring (2)**
2. **Bearing (2)**
3. **Side door**

Figure 6-23. Side Door Bearings

CLEANING AND INSPECTION

⚠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 solvent. Blow parts dry with low pressure compressed air.
2. Check gear teeth for damage. If gears are pitted, scored, rounded, cracked or chipped, they should be replaced.
3. Inspect the engaging dogs and pockets on the dog rings. Replace the dog rings if dogs and/or pockets are rounded, battered or chipped.
4. Inspect guiding hubs. Replace guiding hubs if splines are rounded, battered or chipped.
5. Inspect shift fork shafts. Replace if bent or damaged.
6. Inspect shift forks for wear or signs of overheating. Replace a shift fork if it is excessively worn or shows signs of overheating.
7. See Figure 6-24. Using a small carpenter's square, verify the shift forks are square. If shift fork does not rest directly on the square, then it is bent and must be replaced.
8. Inspect shift drum and bearing. Replace shift drum assembly if drum or bearing are damaged.
9. Clean shift cam lock plate mounting holes in transmission bearing housing.
10. Inspect side door bearings. Bearings must rotate freely without drag. Replace the bearings if pitted, grooved or if the shafts were removed.

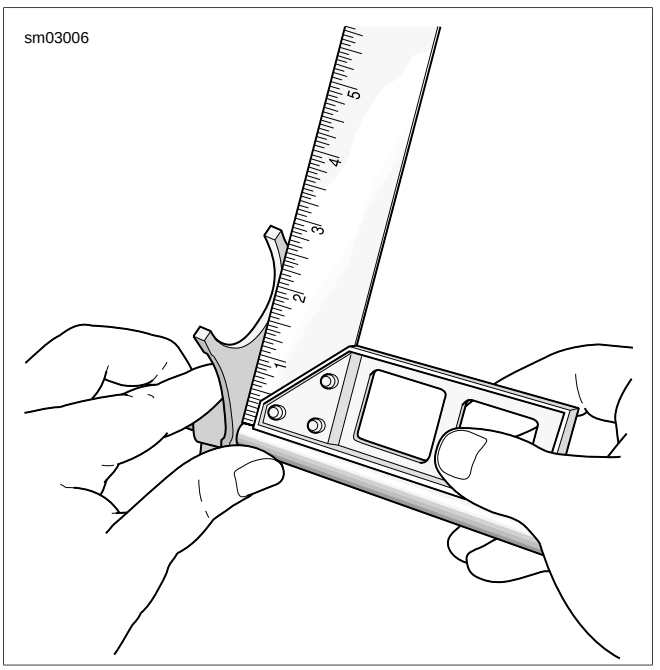


Figure 6-24. Checking Fork

ASSEMBLY

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

Installing Side Door Bearings

NOTES

- *Always replace side door bearing if the shaft was pressed out.*
- *To perform the next step, you must use a plate for support or the bearing door will be damaged.*
- *When pressing **new** bearings into side door, press on the outside diameter of the bearing side with the numbers stamped on it.*

1. Support the door from the opposite side at the bearing bores with a flat plate.
2. Position **new** bearing over bore with number side UP.
3. Using a press, apply pressure to the outer diameter of the bearing until the bearing is seated in the bore.

⚠WARNING

Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

4. See Figure 6-23. Install beveled retaining ring (1) with the flat side next to the bearing.

Countershaft

NOTES

- *Replace retaining ring and all gear roller bearings with **new** parts during assembly. Lubricate needle bearings and races with Screamin' Eagle Assembly Lube (Part No. 94971-090 before installation.*
- *Install securing segments so the side with the rounded edge is facing up and the side with the straight edge is down. Be sure segments fully engage grooves in countershaft.*
- *One side of the 2nd, 3rd, and 4th gear lock rings have a waved, stepped face. The waved, stepped face always faces the securing segments.*

1. See Figure 6-22. Install **new** needle bearing, countershaft 4th gear (4), guiding hub (2), dog ring (3) securing segments and internal splined washer (1) on countershaft.
2. See Figure 6-21. Install **new** needle bearing, countershaft 3rd gear (3), internal spline washer (2) and securing segments (1).
3. See Figure 6-20. Place countershaft 3rd gear lock ring over securing segments.

NOTES

- *In next step, the side of the guiding hub with the deeper counterbore faces countershaft 2nd gear.*
- *Countershaft 2nd gear bearing is wider than other bearings on the countershaft.*

4. See Figure 6-19. Install **new** needle bearing, countershaft 2nd gear (4), guiding hub (2), dog ring (3) and securing segments (1) on countershaft.
5. See Figure 6-18. Place lock ring over securing segments with the stepped face of the lock ring against the securing segments.
6. See Figure 6-17. Install **new** needle bearing, countershaft 1st gear (2) and washer (1).

NOTES

- *If installing countershaft only, hold countershaft 3rd and 4th gear shift dog up while pressing side door bearing on to countershaft.*
- *Failure to press on inner bearing races while pressing bearings on the shafts will damage the bearings.*

7. See Figure 6-25. Place countershaft in an arbor press supporting countershaft 6th gear. Using a suitable socket, press on inner bearing race until side door bearing contacts countershaft 1st gear washer.



Figure 6-25. Installing Countershaft

Mainshaft

NOTES

- *Failure to press on inner bearing race while pressing bearing on the shaft will damage the bearing.*
- *See Figure 6-26. Hold dog ring so that it is engaged with countershaft 3rd gear during the press procedure. If press is performed with dog ring engaged with countershaft 4th gear, contact with mainshaft 4th gear will push shafts out of alignment and result in possible bearing and gear damage.*

1. Place mainshaft in an arbor press, supporting mainshaft 4th gear.
2. Place rear side door bearing over mainshaft. Using a suitable socket, press on inner bearing race until side door bearing contacts mainshaft 1st gear.
3. See Figure 6-15. With side door on end (shafts pointing upward), install **new** bearing and mainshaft 5th gear (4).
4. Be sure guiding hub counterbore is facing mainshaft 5th gear and install guiding hub (2) and dog ring (3).
5. Install **new** retaining ring using TRANSMISSION SHAFT RETAINING RING PLIERS (Part No. J-5586A) (1).

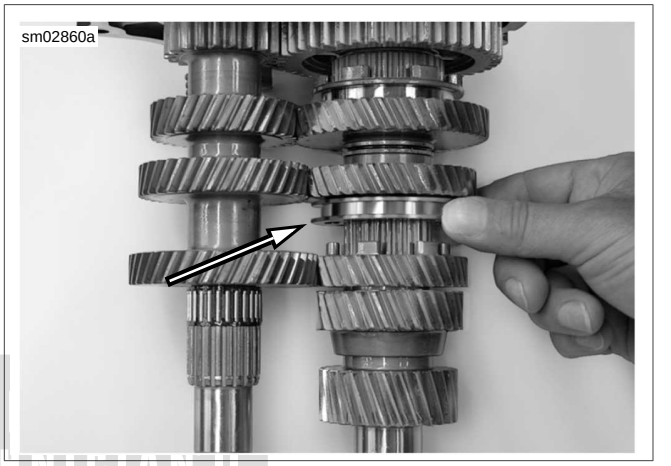


Figure 6-26. Raise and Hold Dog Ring

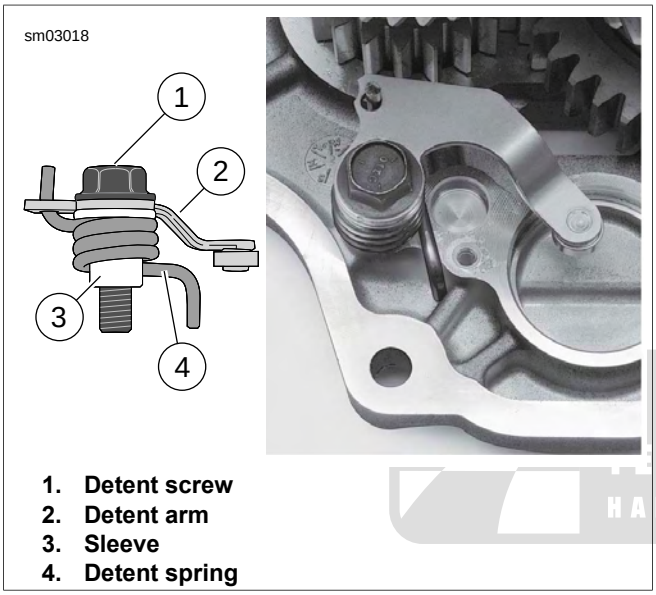
Shifter Cam/Shifter Forks

1. Using dog rings, lock two gears in place. Temporarily place transmission assembly into transmission case.
2. Install **new** nuts on mainshaft and countershaft. Tighten nuts to 85-95 ft-lbs (115.3-128.8 Nm).
3. Remove transmission assembly from case.
4. Place side door on bench with shafts pointing upward.
5. If removed, install detent arm assembly:
   a. See Figure 6-27. Clean detent screw mounting hole in transmission side door.
   b. Assemble **new** detent screw, detent arm, sleeve and detent spring. Mount detent assembly in bearing housing as shown. Make certain to orient spring and detent arm as shown in the figure. Tighten screw to 120-150 **in-lbs** (13.6-17.0 Nm).
6. See Figure 6-28. Using screwdriver (1), pull detent arm back to allow installation of shift cam assembly.
7. Install shift cam assembly (5).
8. See Figure 6-29. Install lock plate (2) and **new** lock plate fasteners (3). Tighten fasteners to 57-63 **in-lbs** (6.4-7.1 Nm).

9. See Figure 6-30. The forks are different from each other and are identified as shown.
10. See Figure 6-31. Insert shifter fork (2) into the slot of the dog ring in between mainshaft 5th and 6th gear. Slide long shift shaft through 5th and 6th gear shifter fork and install shaft in hole in side door.
11. Insert shifter fork (6) into the slot of the dog ring in between countershaft 3rd and 4th gear. Insert shifter fork (9) into the slot of the dog ring in between countershaft 1st and 2nd gear. Slide short shift shaft through countershaft shifter forks and install shaft in hole in side door.

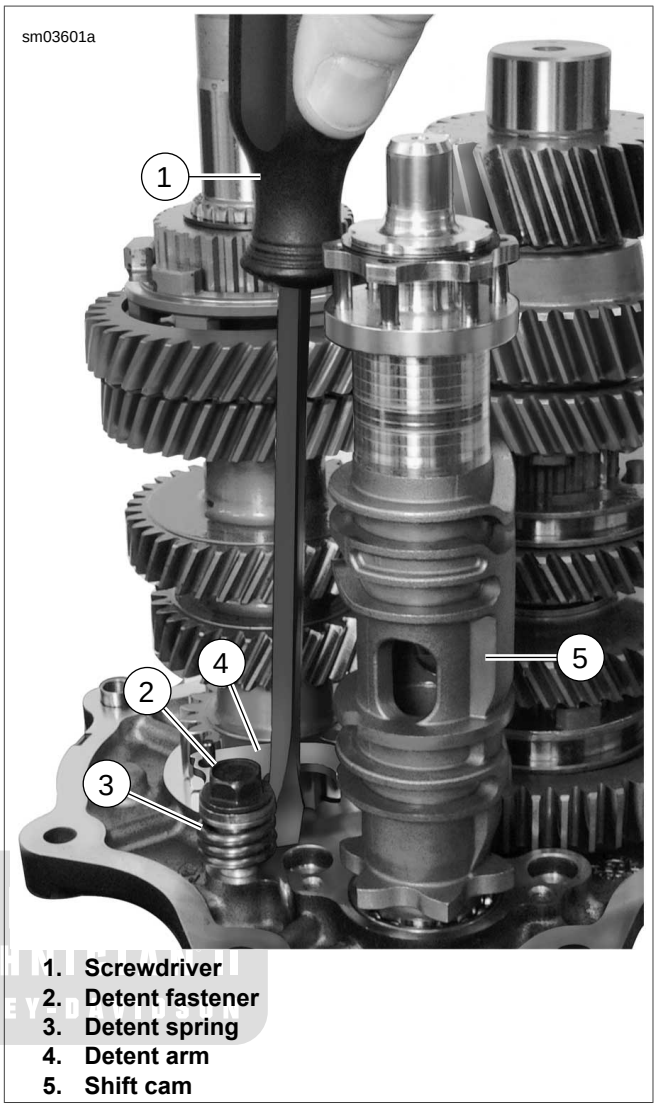
NOTE

If main drive gear was removed, install it now. See 6.7 MAIN DRIVE GEAR AND BEARING.



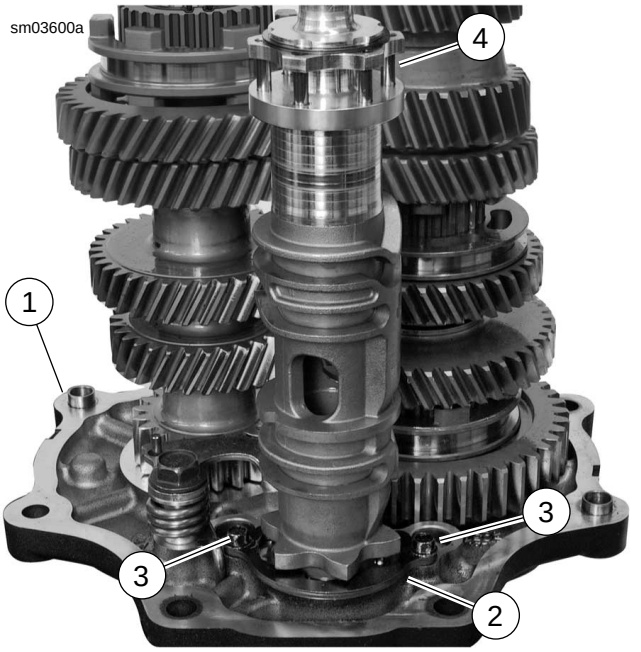
1. **Detent screw**
2. **Detent arm**
3. **Sleeve**
4. **Detent spring**

Figure 6-27. Detent Assembly



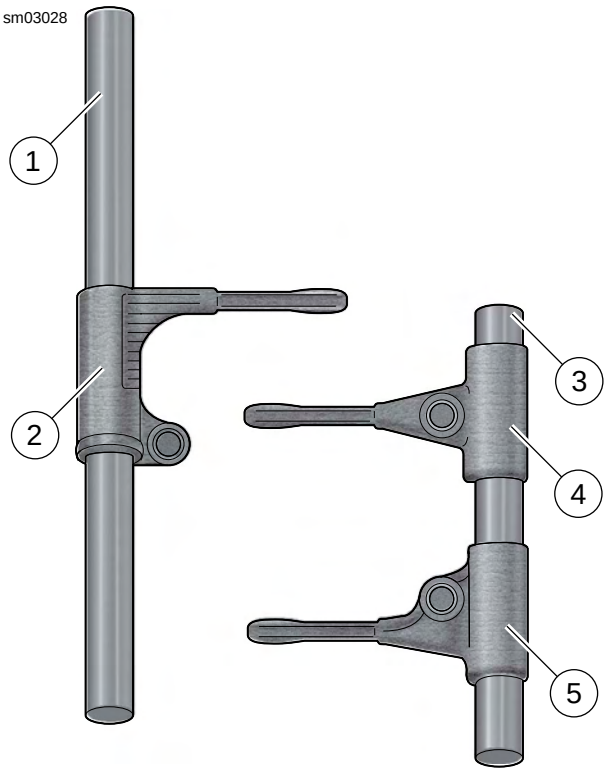
1. **Screwdriver**
2. **Detent fastener**
3. **Detent spring**
4. **Detent arm**
5. **Shift cam**

Figure 6-28. Detent Assembly



1. Side door
2. Lock plate
3. Lock plate fastener (2)
4. Shift cam

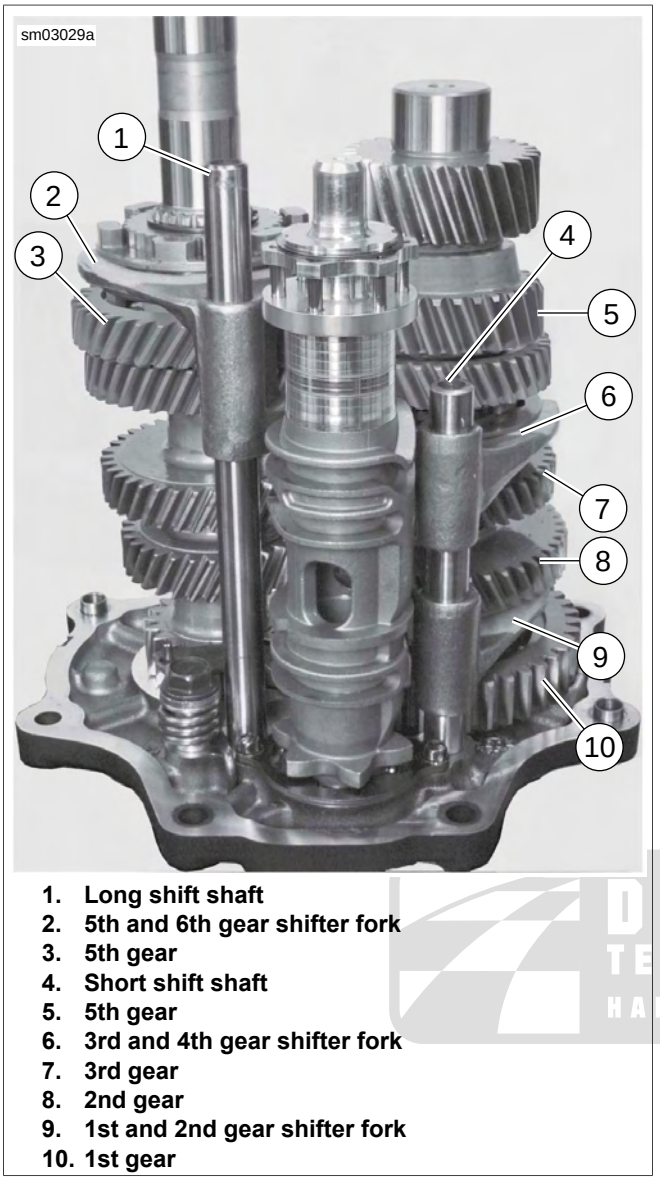
Figure 6-29. Shift Drum



1. Long shift shaft
2. 5th and 6th gear shifter fork
3. Short shift shaft
4. 3rd and 4th gear shifter fork
5. 1st and 2nd gear shifter fork

Figure 6-30. Shifter Forks and Shafts

DIGITECHNICIAN HARLEY-DAVIDSON



1. **Long shift shaft**
2. **5th and 6th gear shifter fork**
3. **5th gear**
4. **Short shift shaft**
5. **5th gear**
6. **3rd and 4th gear shifter fork**
7. **3rd gear**
8. **2nd gear**
9. **1st and 2nd gear shifter fork**
10. **1st gear**

Figure 6-31. Transmission Gears and Shifter Forks

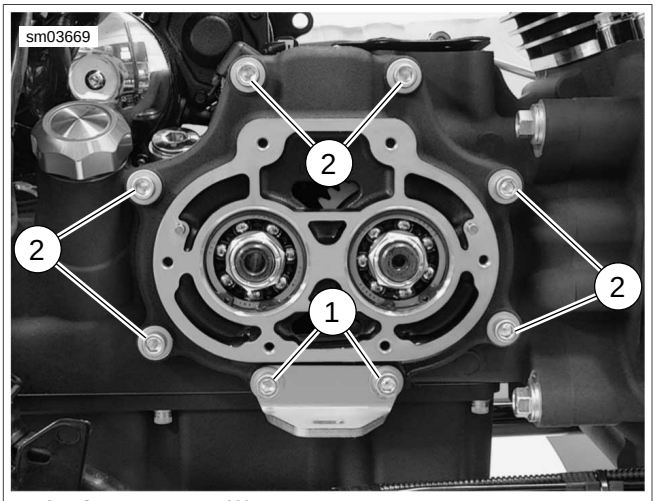
INSTALLATION

1. Cover mainshaft clutch hub splines with tape to prevent the splines damaging the main drive gear oil seal.
2. Verify that two ring dowels are in place on side door flange. Place a **new** gasket on the ring dowels.
3. Apply clean transmission lubricant to the main drive gear bearings.

NOTE

Be sure the transmission filler plug/dipstick is removed before installing transmission assembly. Contact with the filler plug/dipstick will prevent installation of transmission assembly.

4. Install the transmission assembly in the transmission case with a **new** gasket.
5. See Figure 6-32. Install exhaust bracket using long screws (1). Install remaining side door screws (2).
6. See Figure 6-33. Tighten all side door hardware in the sequence shown to 13-18 ft-lbs (17.6-24.4 Nm).



1. **Long screw (2)**
2. **Short screw (6)**

Figure 6-32. Side Door hardware

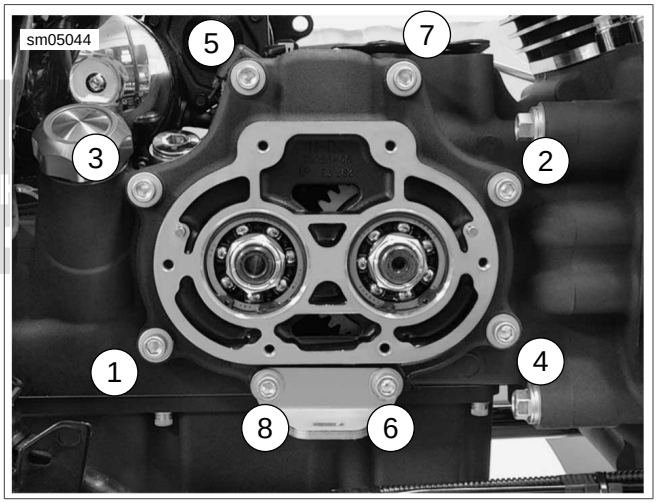
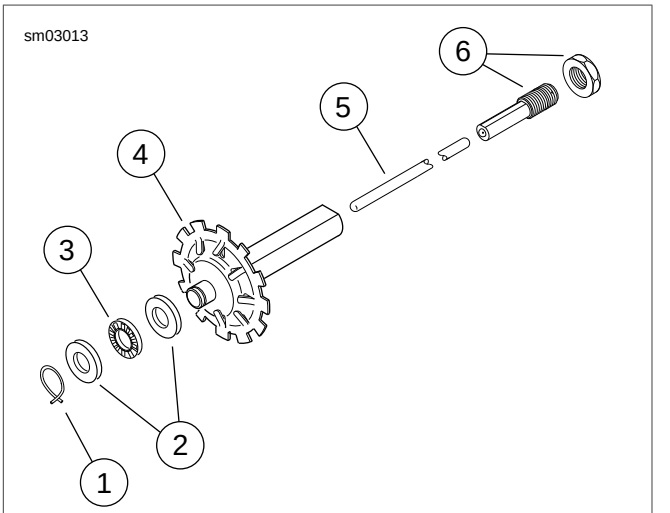


Figure 6-33. Side Door Torque Sequence

7. Install mainshaft bearing inner race. See 5.7 TRANSMISSION SPROCKET.
8. See Figure 6-34. Install push rod assembly (items 2-5) in mainshaft hole. Secure with **new** retaining ring (1) if removed.
9. Install the clutch release cover, using a **new** gasket. See 6.5 CLUTCH RELEASE COVER.
10. Rotate shifter cam pawl forward and lower into place on shift cam. Install **new** transmission top cover gasket. Install transmission top cover. Tighten fasteners to 90-120 **in-lbs** (10.2-13.6 Nm).
11. Install vent hose to top cover fitting, if removed.
12. Install transmission sprocket nut. See 5.7 TRANSMISSION SPROCKET.

13. Install primary chaincase, clutch assembly and primary cover. See 5.3 PRIMARY CHAINCASE COVER, Installation.
14. Replace O-ring on plug. Clean and install transmission drain plug. Tighten to 14-21 ft-lbs (19.0-28.5 Nm).
15. Fill transmission to proper level with fresh transmission fluid. See 1.10 TRANSMISSION LUBRICANT.
16. Adjust drive belt tension. See 1.12 DRIVE BELT AND SPROCKETS.
17. Install exhaust system. See 4.19 EXHAUST SYSTEM.



1. **Retaining ring**
2. **Thrust washer (2)**
3. **Throw out bearing**
4. **Oil slinger**
5. **Push rod**
6. **Push rod end, left side**

Figure 6-34. Push Rod Assembly

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

MAIN DRIVE GEAR AND BEARING 6.7

REMOVAL

PART NUMBER	TOOL NAME
HD-35316-10	PILOT
HD-35316-11	RECEIVER CUP
HD-35316-3A	CROSS PLATE
HD-35316-4A	8 IN. BOLT
HD-35316-5	12 IN. BOLT
HD-35316-7	WASHER
HD-35316-9	BEARING DRIVER
HD-35316-C	MAIN DRIVE GEAR/BEARING REMOVER AND INSTALLER
HD-95637-10	LONG BOLTS
HD-95637-46B	WEDGE ATTACHMENT
RS-25100-200	BEARING

NOTE

Leave the transmission case in the frame unless the case itself must be replaced. For illustration purposes, some photographs may show the case removed.

1. Remove the exhaust system. See 4.19 EXHAUST SYSTEM.
2. Remove the primary chaincase cover, clutch assembly, primary chain, compensating sprocket, and primary chaincase. See 5.5 PRIMARY CHAINCASE HOUSING.
3. Remove the bearing inner race from the transmission mainshaft. See 5.5 PRIMARY CHAINCASE HOUSING, Mainshaft Bearing Inner Race.
4. Remove the transmission side door. See 6.6 TRANSMISSION ASSEMBLY.

NOTICE

Failure to use Main Drive Gear Remover and Installer can cause premature failure of bearing and related parts. (00540b)

NOTE

Main drive gear and bearing can be removed with the transmission case in the frame after removing door assembly. Use MAIN DRIVE GEAR/BEARING REMOVER AND INSTALLER (Part No. HD-35316-C).

5. Remove retaining ring.

NOTES

- *The main drive gear bearing and retaining ring must be replaced if the main drive gear is removed. The bearing will be damaged during the removal procedure.*
- *The CROSS PLATE (Part No. HD-35316-3A) is stamped, "UP 6 SPEED". Mount cross plate with this end pointing up.*

6. See Figure 6-35. Place CROSS PLATE (Part No. HD-35316-3A) (1) on right side of transmission case as shown, and secure with two screws (2). Position cross plate so that large bolt hole in cross plate is lined up with center of main drive gear (4).
7. Apply a light coat of graphite lubricant to the threads of the 12 IN. BOLT (Part No. HD-35316-5) (3) and insert through cross plate and main drive gear.
8. At left side of transmission case, place WASHER (Part No. HD-35316-7), BEARING (Part No. RS-25100-200) (6), flat washer (7) and nut (8) over end of bolt. Tighten nut until main drive gear is free.

NOTES

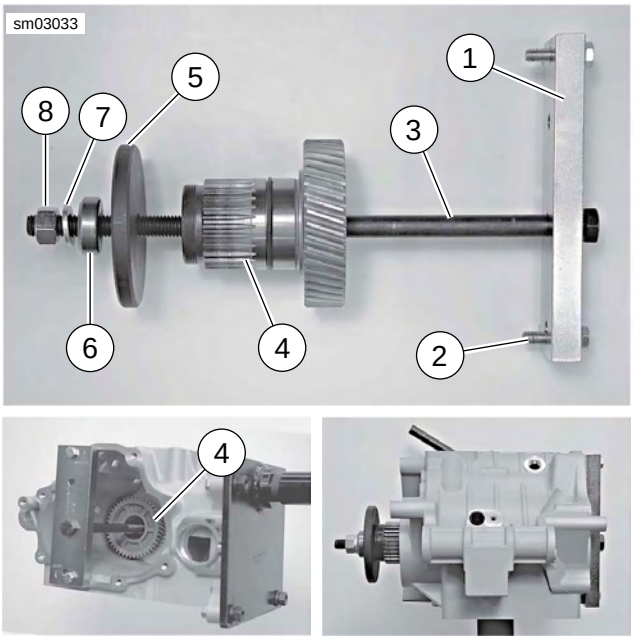
- *When removing the main drive gear, the gear is pressed out against the resistance of the bearing inner race. Without any support at the inner race, the bearing is destroyed. Whenever the main drive gear is removed the main drive gear bearing must also be replaced.*
- *See Figure 6-36. When the main drive gear is removed, a portion of the bearing inner race remains attached to the main drive gear. If the main drive gear is to be re-used, this inner race must be removed first.*

9. Remove tool and remove gear from gearcase.
10. See Figure 6-36. Use WEDGE ATTACHMENT (Part No. HD-95637-46B) and LONG BOLTS (Part No. HD-95637-10) to remove inner race from main drive gear.
11. Remove large main drive gear oil seal.
12. Remove retaining ring from bearing bore.
13. See Figure 6-37. Slide PILOT (Part No. HD-35316-10) (3) over small end of BEARING DRIVER (Part No. HD-35316-9) (2).
14. Apply a light coat of graphite lubricant to the threads of the 8 IN. BOLT (Part No. HD-35316-4A) (1) and insert through bearing driver and pilot.
15. Insert bolt with bearing driver and pilot into right side of transmission case, through main drive gear bearing (4). Make sure bearing driver fits up against main drive gear bearing and pilot is centered in bearing bore.
16. At left side of case, slide RECEIVER CUP (Part No. HD-35316-11) (5) onto bolt and over main drive gear bearing. Install BEARING (Part No. RS-25100-200) (6), flat washer (7) and nut (8) over end of bolt.

NOTE

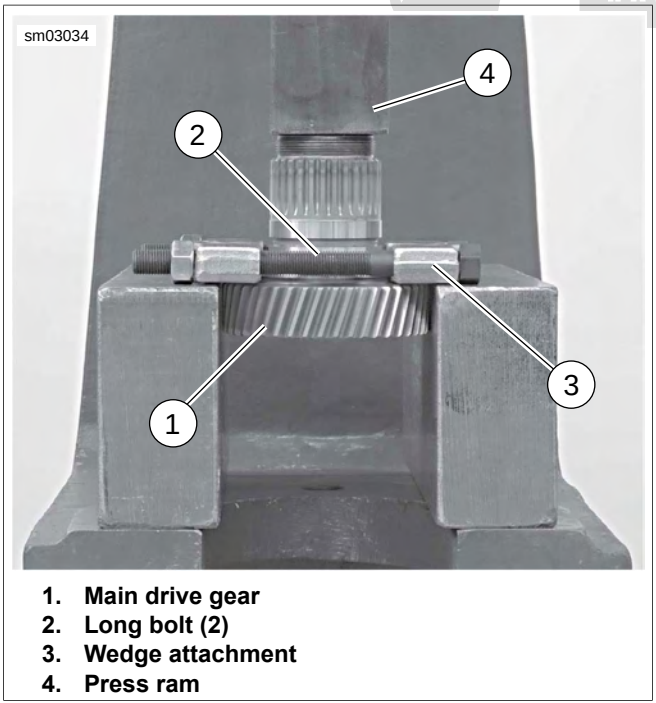
Support bearing remover assembly as you remove bearing in the following step. Entire assembly will fall out of transmission case when bearing comes free.

17. Tighten nut until main drive gear bearing is free.
18. Discard main drive gear bearing.



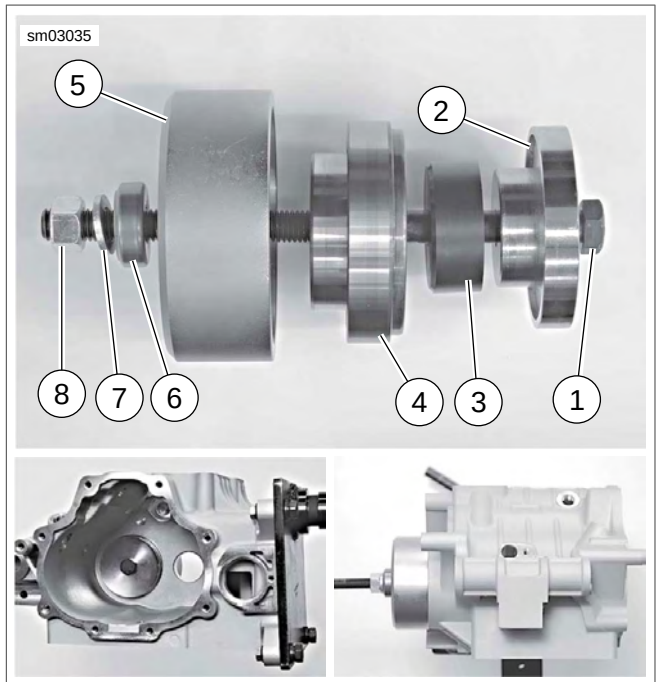
1. Cross plate
2. Screw (2)
3. 12 in. bolt
4. Main drive gear
5. Washer
6. Bearing
7. Flat washer
8. Nut

Figure 6-35. Removing Main Drive Gear



1. Main drive gear
2. Long bolt (2)
3. Wedge attachment
4. Press ram

Figure 6-36. Removing Inner Bearing Race From Main Drive Gear



1. 8 in. Bolt
2. Bearing driver
3. Pilot
4. Main drive gear bearing
5. Receiver cup
6. Bearing
7. Flat washer
8. Nut

Figure 6-37. Removing Main Drive Gear Bearing

CLEANING AND INSPECTION

PART NUMBER	TOOL NAME
HD-47932	MAIN DRIVE GEAR BEARING AND SEAL INSTALLATION TOOL

⚠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 in solvent except the transmission case and needle bearings. Blow dry with compressed air.

NOTE

Never wash the transmission case and needle bearings with solvent unless the needle bearings are to be replaced. Normal cleaning methods will wash dirt or other contaminants into the bearing case (behind the needles) and leads to bearing failure.

2. Inspect the main drive gear for pitting and wear. Replace if necessary.
3. Inspect the needle bearings inside the main drive gear. Replace the needle bearings if the mainshaft race is pitted or grooved.

4. Replace the sprocket if teeth are cracked or worn. See 5.7 TRANSMISSION SPROCKET, Cleaning and Inspection for more information.

5. Inspect the needle bearings on the inside of the main drive gear. If mainshaft race surface appears pitted or grooved, replace these bearings.

NOTE

If the main drive gear needle bearings and/or seal need to be replaced, continue as follows. Otherwise, proceed to 6.8 TRANSMISSION CASE, Assembly.

Needle Bearing Replacement

⚠WARNING

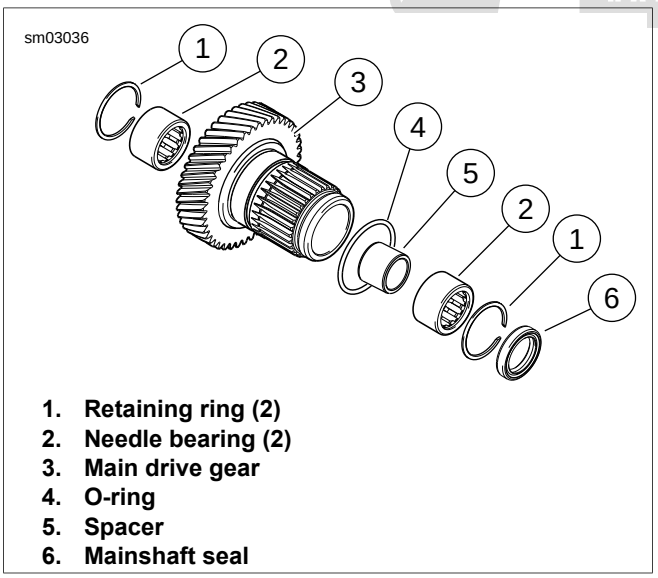
Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

NOTES

- *See Figure 6-39. When replacing needle bearings, discard original retaining rings (1) and install replacement retaining rings (2).*
- *To install the inner main drive gear needle bearings and mainshaft seal, use MAIN DRIVE GEAR BEARING AND SEAL INSTALLATION TOOL (Part No. HD-47932).*

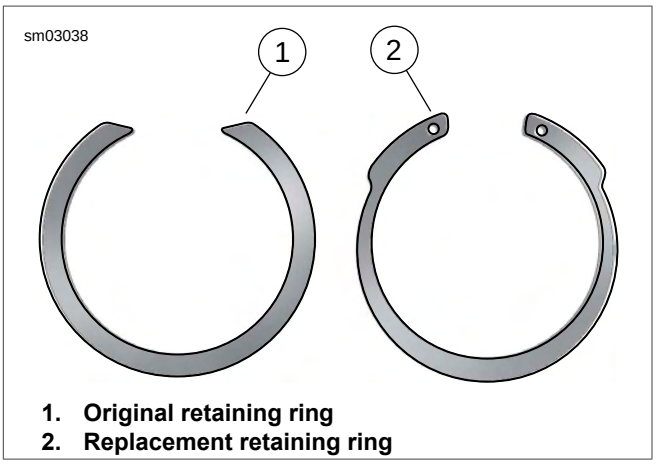
1. See Figure 6-38. Remove mainshaft seal (6). Remove retaining rings (1), needle bearings (2) and spacer (5) from main drive gear (3). Discard retaining rings.

2. Remove and discard O-ring (4).



1. **Retaining ring (2)**
2. **Needle bearing (2)**
3. **Main drive gear**
4. **O-ring**
5. **Spacer**
6. **Mainshaft seal**

Figure 6-38. Main Drive Gear Assembly



1. **Original retaining ring**
2. **Replacement retaining ring**

Figure 6-39. Main Drive Gear Retaining Rings

3. See Figure 6-40. Install clutch side needle bearing using an arbor press and the 0.400 in. step end of tool as shown. Press until tool contacts gear.

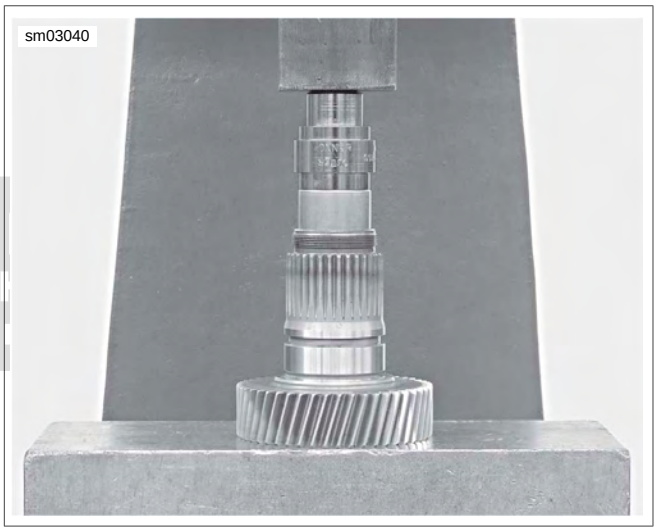


Figure 6-40. Installing Clutch Side Needle Bearing in Main Drive Gear

NOTE

An alternative method is provided which allows the mainshaft seal to be pressed into place after installation of the main drive gear. See 6.7 MAIN DRIVE GEAR AND BEARING, Mainshaft Seal Replacement.

4. See Figure 6-41. Turn over tool and press in mainshaft seal using the 0.090 in. step with garter spring side down.

5. Install spacer.

6. See Figure 6-42. Turn over the main drive gear in the arbor press. With the tool at the 0.188 in. step, press inner bearing until tool contacts gear.

⚠WARNING

Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

7. See Figure 6-38. Install **new** retaining rings (1).
8. Install **new** O-ring (4) into groove in main drive gear.

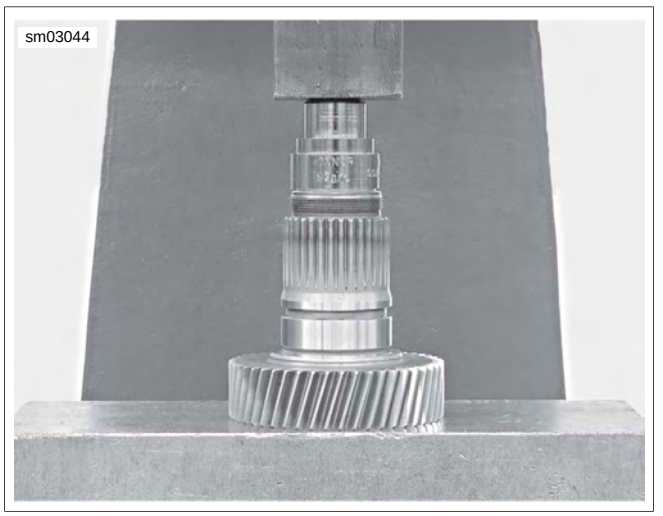


Figure 6-41. Pressing in Seal

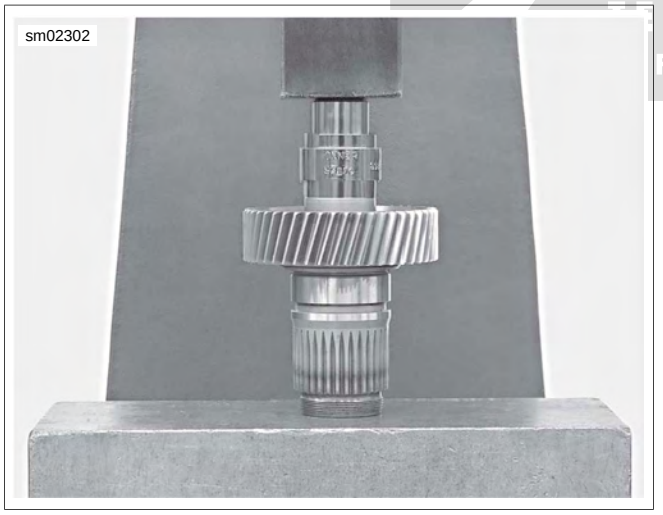
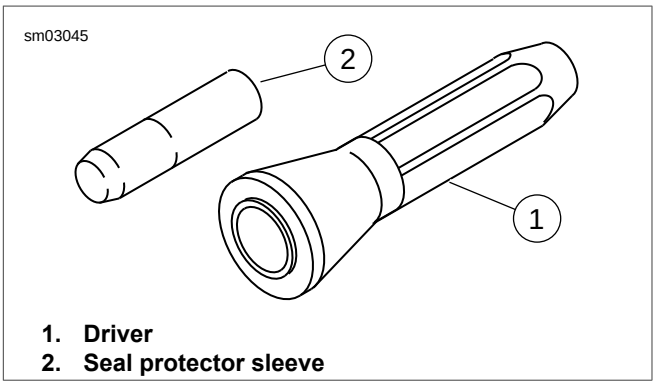


Figure 6-42. Installing Transmission Side Needle Bearing in Main Driver Gear

MAINSHAFT SEAL REPLACEMENT

PART NUMBER	TOOL NAME
HD-47933	MAIN DRIVE GEAR SEAL INSTALLER

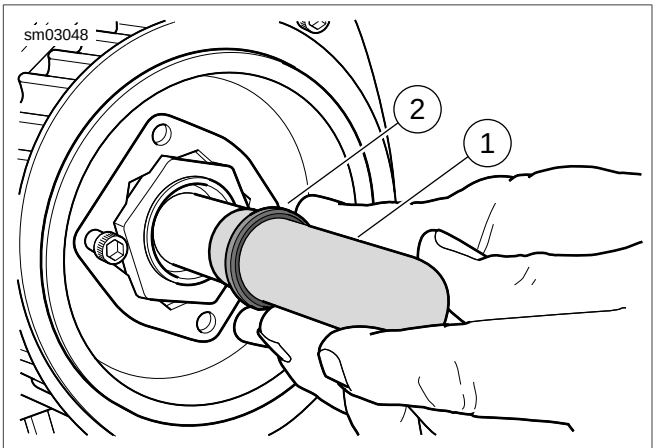
See Figure 6-43. If the mainshaft seal was not installed with the main drive gear needle bearings (or if a faulty seal is discovered with the main drive gear installed in the transmission case), the seal can be installed using the MAIN DRIVE GEAR SEAL INSTALLER (Part No. HD-47933).



1. **Driver**
2. **Seal protector sleeve**

Figure 6-43. Main Drive Gear Seal Installer (Part No. HD-47933)

1. Remove the damaged seal using a seal remover or rolling head pry bar.
2. Inspect bore to be sure it is clean and smooth.
3. See Figure 6-44. Place the seal protector sleeve (1) over the end of the mainshaft. Lightly lubricate the protector sleeve and seal ID with clean transmission oil.
4. Verify that the garter spring is in place on the lip of the **new** oil seal. Apply a light coat of H-D 20W-50 engine oil to the seal lip.
5. Squarely seat the mainshaft seal (2) on the seal protector sleeve with the garter spring facing the bearing.
6. See Figure 6-45. Using MAIN DRIVE GEAR SEAL INSTALLER (Part No. HD-47933), hand press seal onto mainshaft and into end of main drive gear. A rubber mallet may be used to lightly tap driver, if necessary. Seal is properly installed when seal driver contacts end of main drive gear.



1. **Seal protector sleeve**
2. **Seal**

Figure 6-44. Seal Protector Sleeve

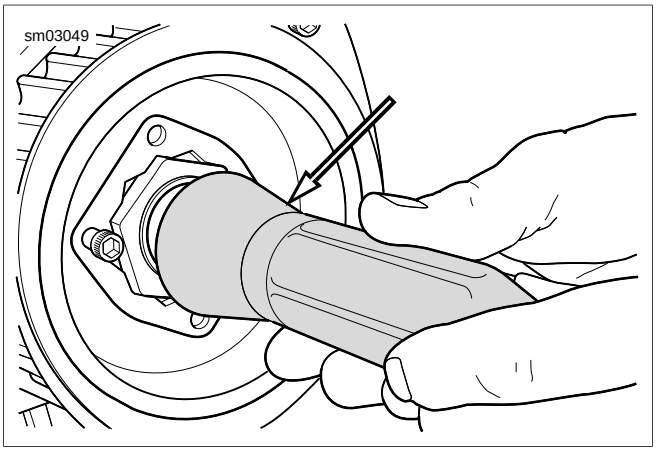


Figure 6-45. Seal Driver

INSTALLATION

PART NUMBER	TOOL NAME
HD-35316-12	INSTALLER CUP
HD-35316-3A	CROSS PLATE
HD-35316-4A	8 IN. BOLT
HD-35316-5	12 IN. BOLT
HD-35316-7	WASHER
HD-35316-8	BEARING DRIVER
HD-47856-1	INSTALLER
HD-47856-2	PILOT
HD-47856-3	ADAPTER
HD-47856-6	NUT
HD-47856-7	CROW'S FOOT WRENCH

NOTICE

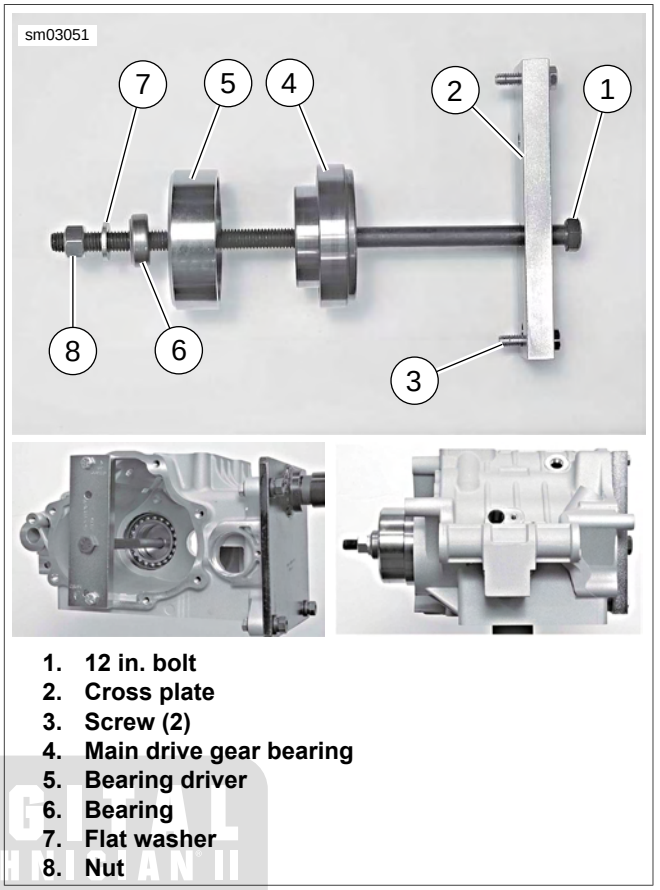
Improper tightening of sprocket nut can cause drive component damage. (00541b)

Installing Main Drive Gear Bearing

NOTE

CROSS PLATE (Part No. HD-35316-3A) will retrofit to earlier transmissions. Note that one end of cross plate is stamped, "UP 6 SPEED". Mount cross plate with this end pointing up for 6 speed transmissions.

1. See Figure 6-46. Place CROSS PLATE (Part No. HD-35316-3A) (2) on right side of transmission case as shown, and secure with two screws (3). Position cross plate so that large bolt hole in cross plate is lined up with center of main drive gear bearing bore in left side of transmission case.
2. Apply a light coat of graphite lubricant to the threads of 12 IN. BOLT (Part No. HD-35316-5) (1) and install through cross plate and main drive gear bearing bore.
3. At left side of case, place main drive gear bearing (4), BEARING DRIVER (Part No. HD-35316-8) (5), BEARING (6), FLAT WASHER (7) and NUT (8) over end of bolt.
4. Tighten nut until main drive gear bearing bottoms against lip cast into transmission case bearing bore.



1. **12 in. bolt**
2. **Cross plate**
3. **Screw (2)**
4. **Main drive gear bearing**
5. **Bearing driver**
6. **Bearing**
7. **Flat washer**
8. **Nut**

Figure 6-46. Installing Main Drive Gear Bearing (Typical)

Installing Main Drive Gear

NOTE

*See Figure 6-47. Make sure **new** O-ring (4) is installed onto main drive gear (3). Lubricate O-ring with clean engine oil before installing drive gear into transmission case.*

1. See Figure 6-47. Apply a light coat of graphite lubricant to the threads of 8 IN. BOLT (Part No. HD-35316-4A) (1) and insert through WASHER (Part No. HD-35316-7) (2) and main drive gear (3). Insert assembly into transmission case, through main drive gear bearing.
2. At outside of case, place INSTALLER CUP (Part No. HD-35316-12) (5), BEARING (6), FLAT WASHER (7) and NUT (8) over end of bolt.
3. Tighten nut until main drive gear contacts main drive gear bearing.

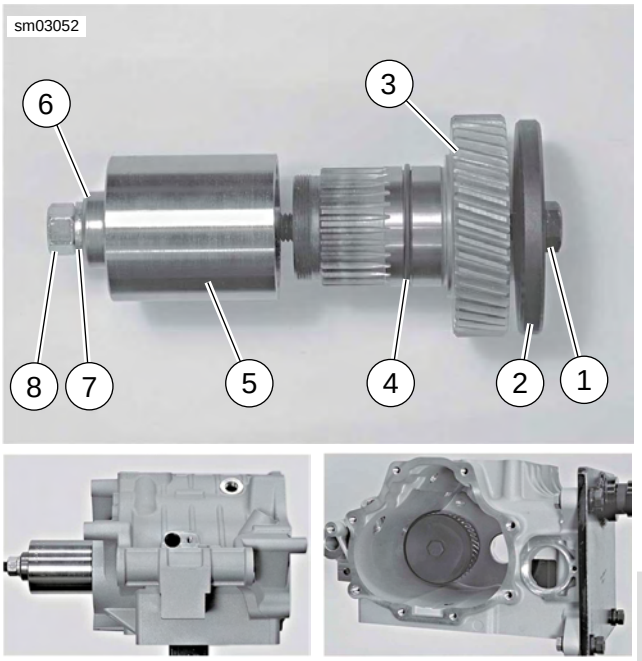
NOTE

See Figure 6-48. In next step, bearing retaining ring must be installed with the flat side facing the bearing and the opening in the ninety degree range shown.

⚠WARNING

Wear safety glasses or goggles when removing or installing retaining rings. Retaining rings can slip from the pliers and could be propelled with enough force to cause serious eye injury. (00312a)

4. See Figure 6-49. Install **new** retaining ring (2).



1. **8 in. bolt**
2. **Washer**
3. **Main drive gear**
4. **O-ring**
5. **Installer cup**
6. **Bearing**
7. **Flat washer**
8. **Nut**

Figure 6-47. Installing Main Drive Gear (Typical)

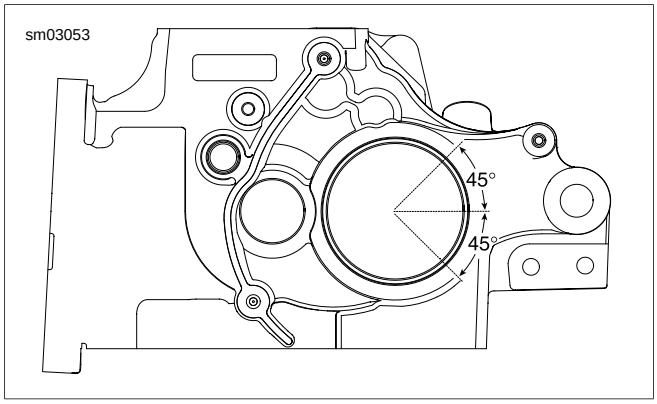


Figure 6-48. Retaining Ring Opening

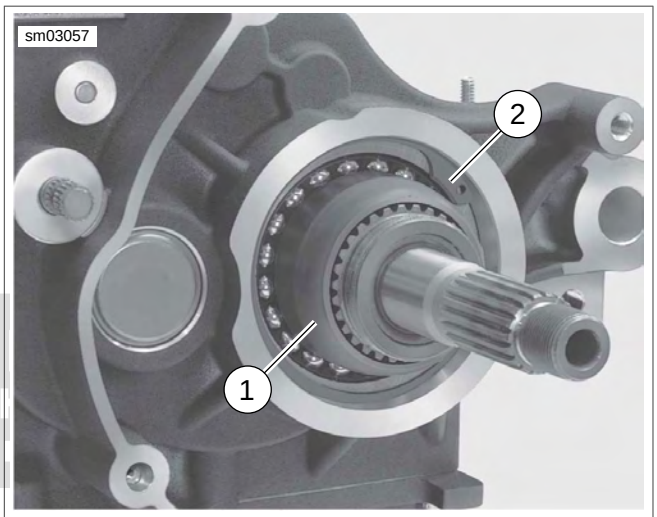
Installing Main Drive Gear Large Seal

1. See Figure 6-49. From outside of crankcase, install PILOT (Part No. HD-47856-2) over end of main drive gear bearing inner race.
2. Coat lips of **new** main drive gear seal with transmission lubricant.
3. See Figure 6-50. Place seal over pilot with garter spring facing bearing, and position seal squarely in end of crankcase bore.

NOTE

ADAPTER (Part No. HD-47856-3) and main drive gear have right-hand threads.

4. See Figure 6-51. Thread ADAPTER (Part No. HD-47856-3) onto end of main drive gear until it contacts main drive gear.



1. **Pilot**
2. **Retaining Ring**

Figure 6-49. Install Pilot

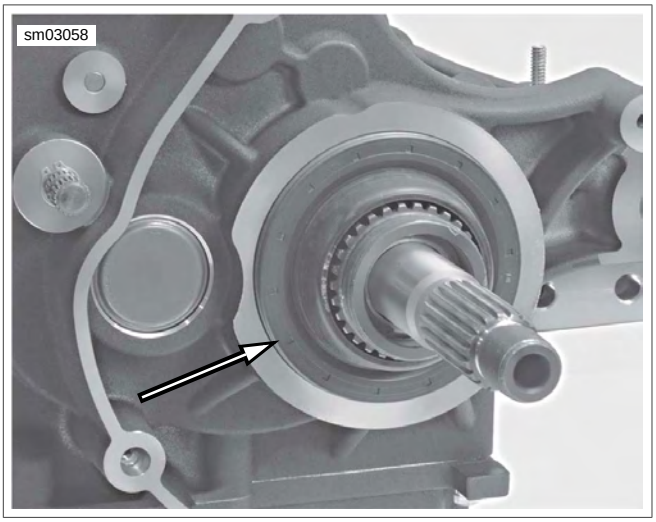


Figure 6-50. Place Main Drive Gear Seal Over Pilot

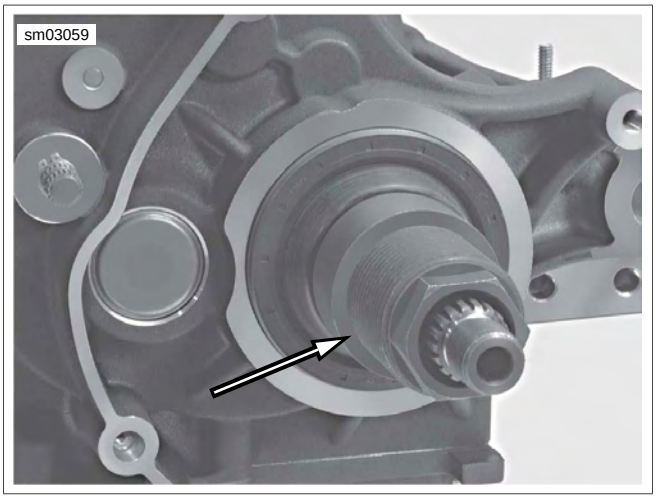


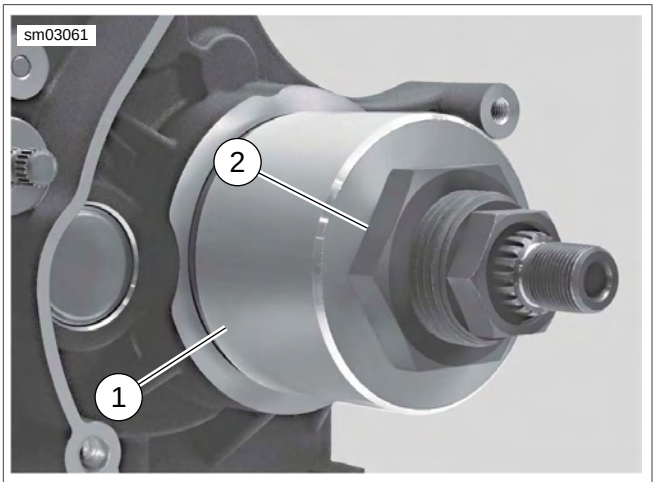
Figure 6-51. Install Adapter

5. See Figure 6-52. Slide INSTALLER (Part No. HD-47856-1) (1) over adapter until cupped end of installer is flat against seal.
6. Thread NUT (Part No. HD-47856-6) (2) onto end of adapter, until it tightens against installer.
7. See Figure 6-53. Place CROW'S FOOT WRENCH (Part No. HD-47856-7) (1) with 1/2 inch drive breaker bar (2) on large nut. Place an adjustable wrench (3) on flats of hex head cast into end of adapter.
8. Holding adjustable wrench, tighten large nut with crow's foot wrench until outer face of seal is flush with outer edge of transmission bore.

NOTE

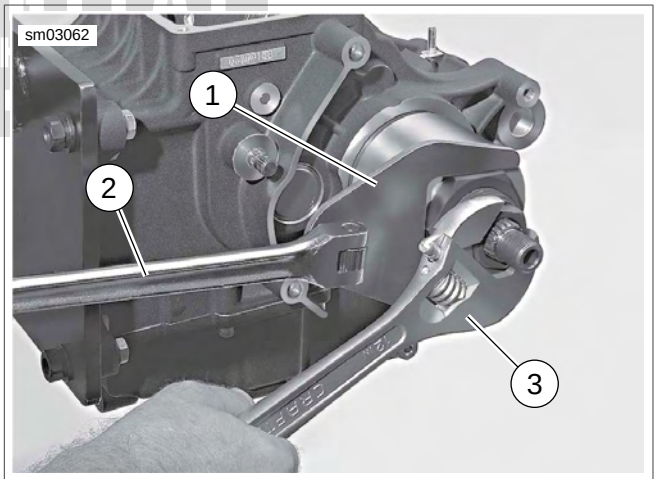
It is acceptable to recess seal as much as 0.030 in. (0.762 mm) below outer edge of bore. Seal depth will be controlled by tool.

9. Remove nut, installer, adapter and pilot.
10. Install side door and transmission components. See 6.6 TRANSMISSION ASSEMBLY, Installation.
11. Install sprocket and drive belt. See 5.7 TRANSMISSION SPROCKET. Do not adjust belt at this time.
12. Install the bearing inner race on the transmission mainshaft. See 6.6 TRANSMISSION ASSEMBLY, Assembly.
13. Install the primary chaincase housing. See 5.5 PRIMARY CHAINCASE HOUSING, Installation.
14. Install the clutch assembly, primary chain, chain tensioner assembly and compensating sprocket components. See 5.4 DRIVE COMPONENTS, Installation.
15. Install the primary chaincase cover. See 5.3 PRIMARY CHAINCASE COVER, Installation.
16. Adjust the drive belt. See 1.12 DRIVE BELT AND SPROCKETS, Setting Belt Deflection.
17. Install exhaust system. See 4.19 EXHAUST SYSTEM, System Installation.



1. **Installer**
2. **Nut**

Figure 6-52. Installer and Nut



1. **Crow's foot wrench**
2. **1/2 inch breaker bar**
3. **Adjustable wrench**

Figure 6-53. Press Seal Into Crankcase

TRANSMISSION CASE 6.8

REMOVAL

⚠WARNING

Disconnect negative (-) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00049a)

1. Disconnect battery, negative (-) cable first.
2. Drain engine oil. See 1.6 ENGINE OIL AND FILTER, Changing Oil and Oil Filter.
3. Drain transmission lubricant. See 1.10 TRANSMISSION LUBRICANT, Transmission Lubrication.
4. Remove starter. See 7.10 STARTER, Removal.
5. Remove transmission assembly. See 6.6 TRANSMISSION ASSEMBLY, Removal.
6. Remove oil pan. See 3.31 OIL PAN.

NOTICE

When lifting a motorcycle using a jack, be sure jack contacts both lower frame tubes where down tubes and lower frame tubes converge. Never lift by jacking on crossmembers, oil pan or other housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586c)

7. Position jack across lower frame to support rear of motorcycle. Slide wooden blocks beneath the crankcase to support the weight of the engine and transmission assembly.
8. Remove rear fork. See 2.21 REAR FORK, Removal.
9. Disconnect vehicle speed sensor (VSS). See 7.23 VEHICLE SPEED SENSOR (VSS), VSS.
10. Disconnect neutral switch. See 7.24 NEUTRAL SWITCH, Removal.
11. Remove fastener from ground post at top of transmission case and remove battery negative ring terminal.
12. Move O2 sensor, starter solenoid, neutral switch and VSS harness out of the way.
13. Mark splines on shift arm and shift shaft to assist in assembly. Remove shift arm from shift shaft.
14. In a crosswise pattern, remove four fasteners that connect transmission to engine.

NOTE

See Figure 6-54. Do not use a hammer to remove transmission. If the transmission sticks or binds on the ring dowels, gently pry away from crankcase using the indent.

15. Move transmission rearward until two ring dowels in lower flange are free of crankcase. Remove transmission case from left side of the motorcycle.

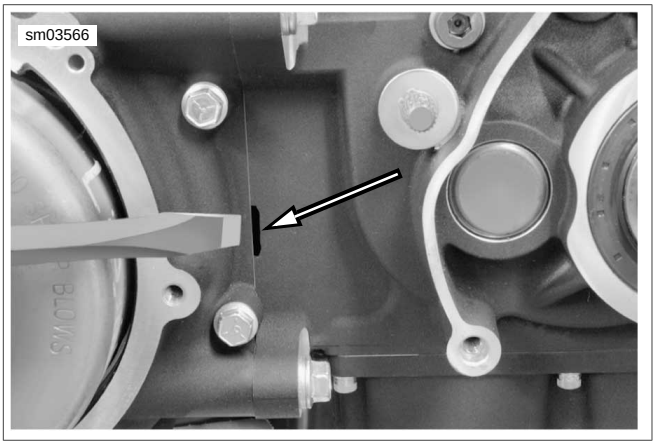


Figure 6-54. Transmission Case Pry Point

INSTALLATION

1. Install **new** ground post at top of transmission case. Tighten ground post until snug.

NOTE

*A **new** transmission case comes with the shifter shaft sleeve and seal, centering screw, countershaft needle bearing and main drive gear bearing and seal installed.*

2. Thoroughly wipe all engine oil from pockets in crankcase flange.
3. Install **new** engine-to-transmission gasket engaging two index pins in holes of transmission flange.
4. Verify that transmission dowels are seated. Place transmission case into position behind crankcase. Mate engine and transmission flanges.
5. Install and tighten fasteners.
   a. Shorter bolts are installed at the top, longer fasteners are installed at the bottom. Using a crosswise pattern, **hand tighten** fasteners.
   b. See Figure 6-55. Tighten bolts in the sequence shown to 15 ft-lbs (20.3 Nm) in the same crosswise pattern.
   c. Final tighten bolts to 34-39 ft-lbs (46.1-52.9 Nm).
6. Install oil pan. See 3.31 OIL PAN.
7. Install rear fork. See 2.21 REAR FORK, Installation.
8. Install shift arm on shift shaft. Align marks made during disassembly.
9. Install transmission and side door assembly. See 6.6 TRANSMISSION ASSEMBLY, Installation.
10. Connect battery ground (-) cable to ground post at top of transmission case. Tighten securely.
11. Adjust drive belt tension. See 1.12 DRIVE BELT AND SPROCKETS.
12. Install primary chaincase. See 5.5 PRIMARY CHAINCASE HOUSING.

13. Install drive components. See 5.4 DRIVE COMPONENTS.

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.

14. Install primary chaincase cover. See 5.3 PRIMARY CHAINCASE COVER.
15. Install neutral switch and tighten to 120-180 **in-lbs** (13.6-20.3 Nm).
16. Install VSS and tighten screw to 84-132 **in-lbs** (9.5-14.9 Nm).
17. Mate VSS, O2 sensors, starter solenoid and neutral switch connectors to main harness.
18. Install starter. See 7.10 STARTER, Installation.
19. Install the exhaust system. See 4.19 EXHAUST SYSTEM.
20. Clean transmission drain plug and install. Tighten to 14-21 ft-lbs (19.0-28.5 Nm). Place motorcycle in an upright position. Fill transmission to proper level with fresh transmission fluid. See 1.10 TRANSMISSION LUBRICANT.

NOTICE

Do not overfill the primary chaincase with lubricant. Overfilling can cause rough clutch engagement, incomplete disengagement, clutch drag and/or difficulty in finding neutral at engine idle. (00199b)

21. Fill primary. See 1.9 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant.
22. Fill engine oil. See 1.6 ENGINE OIL AND FILTER, Changing Oil and Oil Filter.

⚠WARNING

Connect positive (+) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00068a)

23. Connect battery cables.

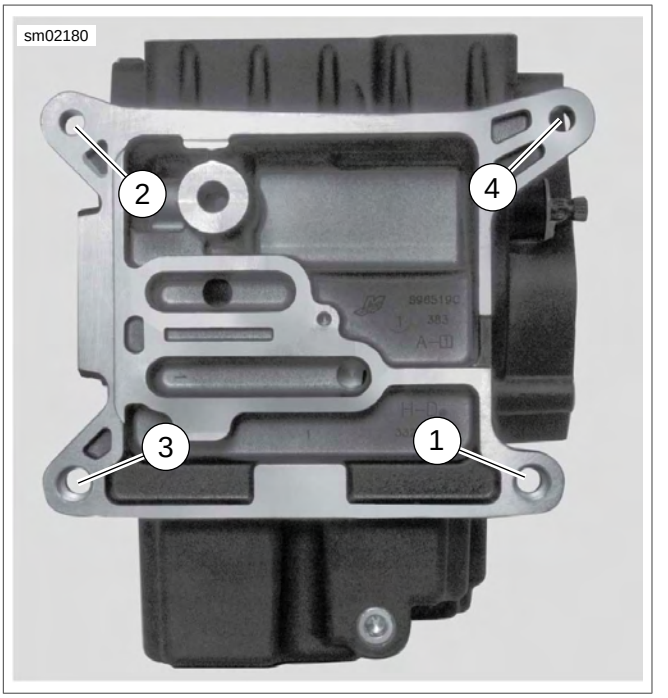


Figure 6-55. Transmission Housing to Crankcase Torque Sequence

DISASSEMBLY

Shifter Arm Assembly

1. See Figure 6-56. After removing door assembly, remove screw (8) and shifter rod lever (9) from the shifter pawl lever assembly (1).
2. Remove retaining ring (7), washer (6) and seal (5). Discard retaining ring and seal. Pull shifter pawl lever assembly out of the transmission case.
3. Inspect sleeve (2) inside transmission case.

CLEANING AND INSPECTION

⚠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)

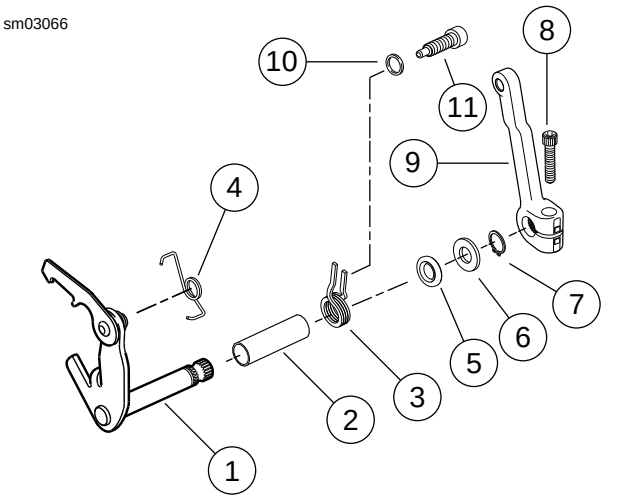
1. Clean all parts in solvent except the case and main drive gear needle bearings. Blow parts dry with low pressure compressed air.

NOTE

Never wash the transmission case and needle bearings with solvent. Normal cleaning methods will wash dirt or other contaminants into the bearing case (behind the needles) leading to bearing failure.

2. See Figure 6-56. Inspect the shifter pawl lever assembly (1) for wear. Replace assembly if pawl ends are damaged. Replace centering spring (3) if elongated.

3. Inspect the shifter spring (4). Replace if the spring fails to hold the pawl on the cam pins.
4. Thoroughly clean the oil pan with solvent.
5. Inspect preformed transmission top cover vent hose for nicks, cuts or general deterioration. Replace as necessary. Use low-pressure compressed air to verify that hose and fitting are unobstructed.



1. **Shifter pawl lever assembly**
2. **Sleeve (inside transmission case)**
3. **Shift lever centering spring**
4. **Shifter shaft lever spring**
5. **Seal**
6. **Washer**
7. **Retaining ring**
8. **Screw**
9. **Shifter rod lever**
10. **Washer**
11. **Screw**

Figure 6-56. Shifter Arm Assembly

ASSEMBLY

Countershaft Needle Bearing Replacement

1. Find a suitable bearing driver 1.25 in. (31.75 mm) in diameter.
2. From the outside of the transmission case place the needle bearing open end first next to the bearing bore. Hold the driver squarely against the closed end of the bearing and tap the bearing into place. The bearing is properly positioned when it is driven inward flush with the outside surface of the case or to a maximum depth of 0.030 in. (0.76 mm).
3. Lubricate the bearing with Screamin' Eagle Assembly Lube (Part No. 94971-09.)

Shifter Pawl Lever Assembly

1. See Figure 6-56. Verify that sleeve (2) is inside transmission case.
2. See Figure 6-57. Slide shifter lever centering spring (3) over shaft of shifter pawl lever assembly (2). Align opening on spring with tab on lever.
3. Place shifter shaft lever spring (4) on shifter pawl lever assembly.

NOTE

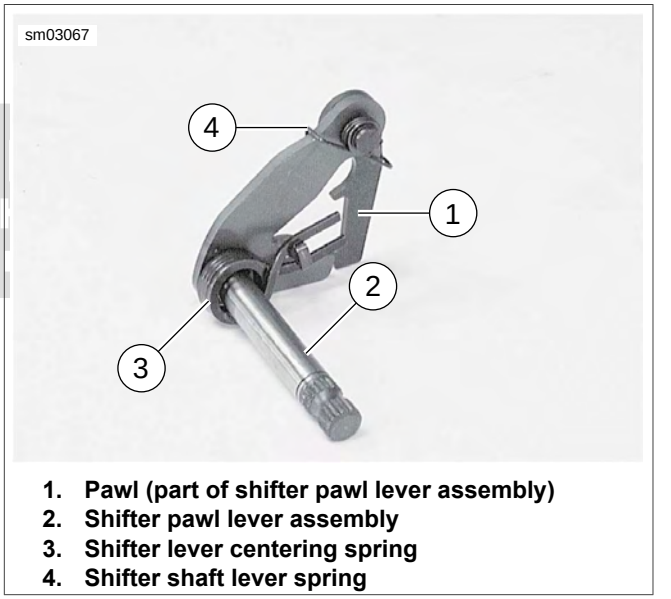
Do not bend shifter shaft lever spring more than necessary for assembly.

4. See Figure 6-58. Insert the assembly into the transmission case.
5. See Figure 6-59. Verify that pin sits inside shifter shaft lever spring.
6. See Figure 6-58. Install a **new** seal. Install washer (1) and a **new** retaining ring (2).

NOTE

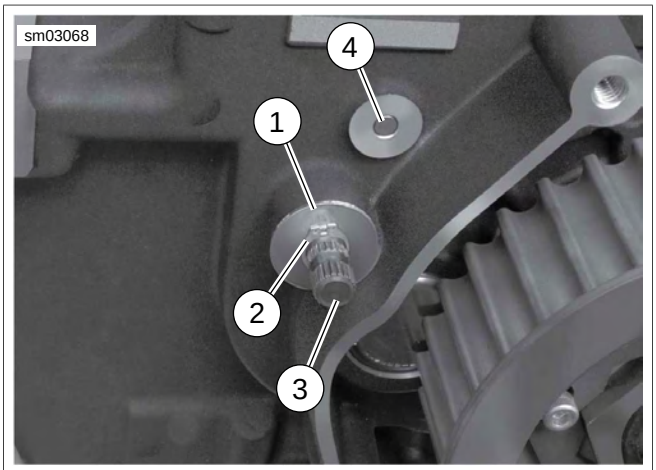
In next step, shifter rod lever must be installed so angle of lever is toward front of vehicle, one spline from vertical.

7. See Figure 6-56. Install shifter rod lever (9) on the shifter pawl lever assembly shaft end using screw (8). Tighten to 18-22 ft-lbs (24.4-29.8 Nm).



1. **Pawl (part of shifter pawl lever assembly)**
2. **Shifter pawl lever assembly**
3. **Shifter lever centering spring**
4. **Shifter shaft lever spring**

Figure 6-57. Shifter Pawl Lever Assembly



1. Washer (with seal behind)
2. Retaining ring
3. Shifter shaft lever
4. Pin

Figure 6-58. Shifter Shaft Lever, Exterior View

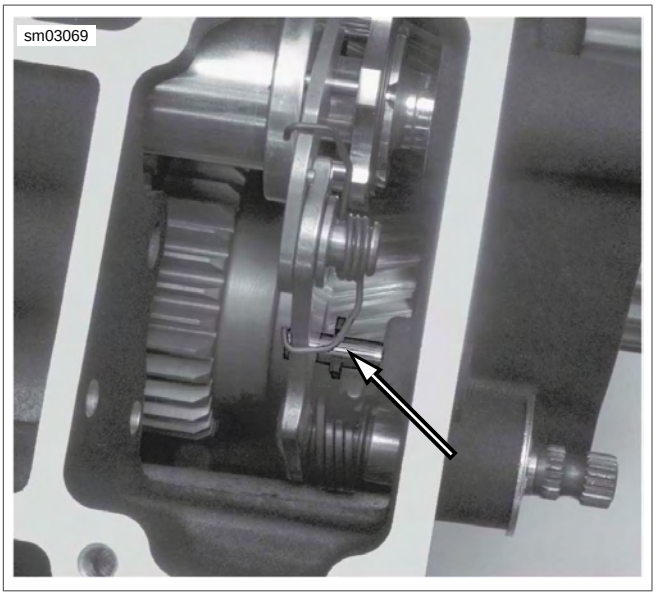


Figure 6-59. Shifter Shaft Lever Spring

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

NOTES

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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NOTES

FASTENER TORQUE VALUES 7.1

FASTENER TORQUE VALUES IN THIS CHAPTER

The table below lists torque values for all fasteners presented in this chapter.

FASTENER	TORQUE VALUE		NOTES
2 inch diameter gauge nuts	10-20 **in-lbs**	1.1-2.3 Nm	7.29 GAUGES AND INSTRUMENTS: FAIRING MODELS, 2 Inch Diameter Gauges: Fuel Level, Ambient Air Temperature, Voltmeter, Oil Pressure
Automatic compression release (ACR)	11-15 ft-lbs	14.9-20.3 Nm	7.21 AUTOMATIC COMPRESSION RELEASE (ACR), Installation/Apply three equally spaced dots of LOCTITE 246 THREADLOCKER MEDIUM STRENGTH/HIGH TEMPERATURE around lower third of threads
Auxiliary lamp bracket to fork bracket screws (FLHTC/U, FLHTK)	15-20 ft-lbs	20-27 Nm	7.13 AUXILIARY LAMPS AND BRACKETS, Auxiliary Lamp Bracket
Auxiliary lamp bracket to fork bracket stud acorn nuts (FLHR/C)	72-108 **in-lbs**	8.1-12.2 Nm	7.13 AUXILIARY LAMPS AND BRACKETS, Auxiliary Lamp Bracket
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm	7.10 STARTER, Installation
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm	7.22 ALTERNATOR, Installation
Battery tray screws	72-96 **in-lbs**	8.1-10.9 Nm	7.8 ELECTRICAL CADDIES, Battery Tray
Brake clamp fasteners	72-108 **in-lbs**	8.1-12.2 Nm	7.40 HANDLEBAR SWITCH ASSEMBLIES, Installation
CB module to radio screw	35-45 **in-lbs**	4.0-5.1 Nm	7.33 ADVANCED AUDIO SYSTEM, Radio
CB module to radio screw	35-45 **in-lbs**	4.0-5.1 Nm	7.33 ADVANCED AUDIO SYSTEM, CB Module
CKP sensor mount screw	90-120 **in-lbs**	10.2-13.6 Nm	7.20 CRANKSHAFT POSITION SENSOR (CKP), Installation
Console-to-tank screw	36-60 **in-lbs**	4.1-6.8 Nm	7.31 GAUGES AND INSTRUMENTS: ROAD KING MODELS, Speedometer
Console-to-tank screw	36-60 **in-lbs**	4.1-6.8 Nm	7.32 INDICATOR LAMPS: ROAD KING MODELS, Indicator Lamps
Fairing cap screws	25-30 **in-lbs**	2.8-3.4 Nm	7.18 FAIRING CAP SWITCHES: FORK MOUNTED FAIRING MODELS, Installation
Fairing speaker lower screw (FLHX, FLHTC/U)	22-28 **in-lbs**	2.5-3.2 Nm	7.33 ADVANCED AUDIO SYSTEM, Front Fairing Speakers
Fairing speaker upper screws (FLHX, FLHTC/U)	35-50 **in-lbs**	4.0-5.7 Nm	7.33 ADVANCED AUDIO SYSTEM, Front Fairing Speakers
Fork lock screws (Road King)	36-60 **in-lbs**	4.1-6.8 Nm	7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK, Road King Models
Front fender tip lamp bracket screws	20-25 **in-lbs**	2.3-2.8 Nm	7.15 FENDER TIP LAMPS, Front Fender Tip Lamp
Front fender tip lamp bracket screws	20-25 **in-lbs**	2.3-2.8 Nm	7.15 FENDER TIP LAMPS, Front Fender Tip Lamp Jumper Harness
Front fender tip lamp trim strip tee bolt nuts	10-15 **in-lbs**	1.1-1.7 Nm	7.15 FENDER TIP LAMPS, Front Fender Tip Lamp Jumper Harness
Front turn signal lamp mounting bracket screws (Bullet Style; fork mounted)	15-20 ft-lbs	20-27 Nm	7.16 TURN SIGNAL LAMPS, Front Turn Signal Lamp
Front turn signal lamp mounting bracket screws (FLHR/C, FLHT/C/U)	30-60 **in-lbs**	4.1-6.8 Nm	7.16 TURN SIGNAL LAMPS, Front Turn Signal Lamp
Front turn signal lamp-to-bracket fastener: Bullet Style; fork mounted	15-20 ft-lbs	20-27 Nm	7.16 TURN SIGNAL LAMPS, Front Turn Signal Lamp

FASTENER	TORQUE VALUE		NOTES
Fuel tank console screws	36-60 **in-lbs**	4.1-6.8 Nm	7.33 ADVANCED AUDIO SYSTEM, Front Headset Receptacle
Ground terminal nut	50-90 **in-lbs**	5.7-10.2 Nm	7.6 IGNITION COIL, Installation
Handlebar clamp to clutch lever bracket screws	72-108 **in-lbs**	8.1-12.2 Nm	7.40 HANDLEBAR SWITCH ASSEMBLIES, Assembly: Left Side Handlebar Switches
Handlebar clamp to clutch lever bracket screws	72-108 **in-lbs**	8.1-12.2 Nm	7.40 HANDLEBAR SWITCH ASSEMBLIES, Installation
Handlebar clamp to master cylinder screws	72-108 **in-lbs**	8.1-12.2 Nm	7.40 HANDLEBAR SWITCH ASSEMBLIES, Assembly: Right Side Handlebar Switches
Handlebar switch housing screws	35-45 **in-lbs**	4.0-5.0 Nm	7.40 HANDLEBAR SWITCH ASSEMBLIES, Assembly: Right Side Handlebar Switches
Handlebar switch housing screws	35-45 **in-lbs**	4.0-5.0 Nm	7.40 HANDLEBAR SWITCH ASSEMBLIES, Assembly: Left Side Handlebar Switches
Handlebar switch housing screws	35-45 **in-lbs**	4.0-5.0 Nm	7.40 HANDLEBAR SWITCH ASSEMBLIES, Installation
Handlebar switch housing screws	35-45 **in-lbs**	4.0-5.0 Nm	7.40 HANDLEBAR SWITCH ASSEMBLIES, Installation
Harness ground stud flange nuts	50-90 **in-lbs**	5.7-10.2 Nm	7.35 MAIN WIRING HARNESS, Installation: All Models (Part 1)/(10 mm)
Harness ground stud flange nuts	50-90 **in-lbs**	5.7-10.2 Nm	7.35 MAIN WIRING HARNESS, Installation: All Models (Part 1)/(10 mm)
Headlamp adjuster mounting screw (dual headlamp models)	35-45 **in-lbs**	4.0-5.1 Nm	7.12 HEADLAMP: ROAD GLIDE, Headlamp Adjuster Assembly
Headlamp door screw	9-18 **in-lbs**	1.0-2.0 Nm	7.11 HEADLAMP: ALL EXCEPT ROAD GLIDE, Headlamp: Single Headlamp Models
Headlamp mounting screw (dual headlamp models)	15-25 **in-lbs**	1.7-2.8 Nm	7.12 HEADLAMP: ROAD GLIDE, Headlamp Adjuster Assembly
Headlamp mounting screw (dual headlamp models)	15-25 **in-lbs**	1.7-2.8 Nm	7.12 HEADLAMP: ROAD GLIDE, Headlamp Bulb Replacement: Dual Headlamp Models
Headlamp retaining screws (Fairing equipped)	22-32 **in-lbs**	2.5-3.6 Nm	7.11 HEADLAMP: ALL EXCEPT ROAD GLIDE, Headlamp: Single Headlamp Models
Headlamp retaining screws (Non-fairing equipped)	9-18 **in-lbs**	1.0-2.0 Nm	7.11 HEADLAMP: ALL EXCEPT ROAD GLIDE, Headlamp: Single Headlamp Models
Horn bracket acorn nut	80-120 **in-lbs**	9.0-13.6 Nm	7.27 HORN, Installation
Horn stud flange nut	80-100 **in-lbs**	9.0-11.3 Nm	7.27 HORN, Installation
Ignition coil screws	32-40 **in-lbs**	3.6-4.5 Nm	7.6 IGNITION COIL, Installation
Ignition switch housing nut	85-115 **in-lbs**	9.6-13.0 Nm	7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK, Fairing Models
Ignition switch housing screws	36-60 **in-lbs**	4.1-6.8 Nm	7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK, Fairing Models
Ignition switch screws (Road King)	20-30 **in-lbs**	2.3-3.4 Nm	7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK, Road King Models
Instrument bezel screws	25-35 **in-lbs**	2.8-4.0 Nm	7.19 INSTRUMENT NACELLE SWITCHES: FRAME MOUNTED FAIRING MODELS, Installation
Instrument console screws	36-60 **in-lbs**	4.1-6.8 Nm	7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK, Road King Models
Instrument nacelle to fork bracket screws	15-20 ft-lbs	20-27 Nm	7.19 INSTRUMENT NACELLE SWITCHES: FRAME MOUNTED FAIRING MODELS, Installation
Instrument nacelle to fork bracket screws	15-20 ft-lbs	20-27 Nm	7.19 INSTRUMENT NACELLE SWITCHES: FRAME MOUNTED FAIRING MODELS, Installation
Left electrical caddy fastener	72-96 **in-lbs**	8.1-10.9 Nm	7.8 ELECTRICAL CADDIES, Left Side Caddy

FASTENER	TORQUE VALUE		NOTES
License plate bracket screws	60-80 **in-lbs**	6.8-9.0 Nm	7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket
License plate bracket screws	60-80 **in-lbs**	6.8-9.0 Nm	7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket
Neutral switch	120-180 **in-lbs**	13.6-20.3 Nm	7.24 NEUTRAL SWITCH, Installation
Oil pressure sender	96-144 **in-lbs**	10.8-16.3 Nm	7.25 OIL PRESSURE SWITCH AND SENDER, Installation
Oil pressure switch	96-144 **in-lbs**	10.8-16.3 Nm	7.25 OIL PRESSURE SWITCH AND SENDER, Installation
Radio (storage box) to support bracket screws	35-45 **in-lbs**	4.0-5.1 Nm	7.33 ADVANCED AUDIO SYSTEM, Radio
Radio support bracket screws	35-45 **in-lbs**	4.0-5.1 Nm	7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK, Fairing Models
Rear fender lights harness stud plate flange nuts	60-96 **in-lbs**	6.8-10.9 Nm	7.14 TAIL LAMP, Rear Fender Lights Harness: all except FLHX, FLTRX
Rear fender tip lamp screws	20-25 **in-lbs**	2.3-2.8 Nm	7.15 FENDER TIP LAMPS, Rear Fender Tip Lamp
Rear stoplight switch	12-15 ft-lbs	16.3-20.3 Nm	7.26 STOPLIGHT SWITCHES, Rear Stoplight Switch/Use Loctite Pipe Sealant with Teflon 565
Rear turn signal lamps bracket screws	84-144 **in-lbs**	9.5-16.3 Nm	7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket/Use LOCTITE High Strength Threadlocker 271 (red)
Rear turn signal lamps bracket screws	84-144 **in-lbs**	9.5-16.3 Nm	7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket/Use LOCTITE High Strength Threadlocker 271 (red)
Rear turn signal lamp-to-rear turn signal lamps bracket screws	30-50 **in-lbs**	3.4-5.6 Nm	7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamp
Solenoid contact post jamnut	65-80 **in-lbs**	7.3-9.0 Nm	7.10 STARTER, Solenoid
Solenoid ring terminal nut	70-90 **in-lbs**	7.9-10.2 Nm	7.10 STARTER, Drive Assembly
Speedometer bracket screws	10-20 **in-lbs**	1.1-2.3 Nm	7.29 GAUGES AND INSTRUMENTS: FAIRING MODELS, Speedometer
Starter end cover screw	90-110 **in-lbs**	10.2-12.4 Nm	7.10 STARTER, Drive Assembly
Starter mounting screw	25-27 ft-lbs	33.9-36.6 Nm	7.10 STARTER, Installation/Apply a drop of Loctite Threadlocker 243 (blue) to the threads.
Starter ring terminal hex nut	70-90 **in-lbs**	7.9-10.2 Nm	7.10 STARTER, Solenoid
Starter terminal post nut	70-90 **in-lbs**	7.9-10.2 Nm	7.10 STARTER, Installation
Starter through bolts	39-65 **in-lbs**	4.4-7.3 Nm	7.10 STARTER, Drive Assembly
Stator mounting screws	55-75 **in-lbs**	6.2-8.5 Nm	7.22 ALTERNATOR, Installation/Always use new screws
Tachometer bracket screws	10-20 **in-lbs**	1.1-2.3 Nm	7.29 GAUGES AND INSTRUMENTS: FAIRING MODELS, Tachometer
Tail lamp circuit board/chrome base screw	40-48 **in-lbs**	4.5-5.4 Nm	7.14 TAIL LAMP, Circuit Board/Chrome Base
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.14 TAIL LAMP, Tail Lamp Bulb Replacement
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.14 TAIL LAMP, Circuit Board/Chrome Base
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.14 TAIL LAMP, Rear Fender Lights Harness: all except FLHX, FLTRX
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.14 TAIL LAMP, Rear Fender Lights Harness: FLHX, FLTRX
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.15 FENDER TIP LAMPS, Rear Fender Tip Lamp
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamp

FASTENER	TORQUE VALUE		NOTES
Top caddy clamp screws	72-96 **in-lbs**	8.1-10.9 Nm	7.8 ELECTRICAL CADDIES, Top Caddy
Turn signal lamp mounting bracket screws	36-60 **in-lbs**	4.1-6.8 Nm	7.13 AUXILIARY LAMPS AND BRACKETS, Auxiliary Lamp Housing
Turn signal lamp to auxiliary lamp stud locknut	15-18 ft-lbs	20.3-24.4 Nm	7.13 AUXILIARY LAMPS AND BRACKETS, Auxiliary Lamp Housing
Voltage regulator locknuts	70-100 **in-lbs**	7.9-11.3 Nm	7.3 VOLTAGE REGULATOR, Installation
VSS fastener	84-132 **in-lbs**	9.5-14.9 Nm	7.23 VEHICLE SPEED SENSOR (VSS), VSS

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

SPECIFICATIONS: ELECTRICAL 7.2

SPECIFICATIONS

Table 7-1. Ignition

IGNITION	DATA
Idle speed	1000 ± 50 RPM
Spark plug size	12 mm
Spark plug gap	0.038-0.043 in.
	0.97-1.09 mm
Spark plug type	Harley-Davidson No. 6R12 (no substitute)
Ignition coil primary resistance	0.5-0.7 ohms
Ignition coil secondary resistance	5500-7500 ohms

Table 7-2. Fuses

FUSE	AMPS
Main fuse	40
Brakes	15
Accessory	15
P&A	15
Radio power/siren	15
ECM power	15
Ignition	15
Engine control: active exhaust (HDI only)	15
Lighting	15
Instruments	15
Headlamp	15
ABS	30
P&A ignition	2
Fuel pump	15
Battery	15
Power outlet (if equipped)	15
Radio memory	15

Table 7-3. Charging System

CHARGING SYSTEM	DATA
Battery	28 amp hour/405 CCA
Alternator AC voltage output	16-23 VAC per 1000 RPM
Alternator stator coil resistance	0.1-0.2 ohms
Regulator voltage output @ 3600 RPM	14.3-14.7 @ 75 °F (24 °C)
Regulator amperes @ 3000 RPM	35-50 amps

Table 7-4. Starter Specifications

STARTER DATA	
Free speed	3000 rpm (min) @ 11.5 V
Free current	90 A (max) @ 11.5 V
Cranking current	200 A (max) @ 68 °F
Stall torque	8.0 ft-lbs (10.8 Nm) @ 2.4 V

Table 7-5. Starter Service Wear Limits

ITEM	in	mm
Brush length (minimum)	0.443	11.0
Commutator runout	0.016	0.41
Commutator diameter (minimum)	1.141	28.98
Commutator mica depth (minimum)	0.008	0.203

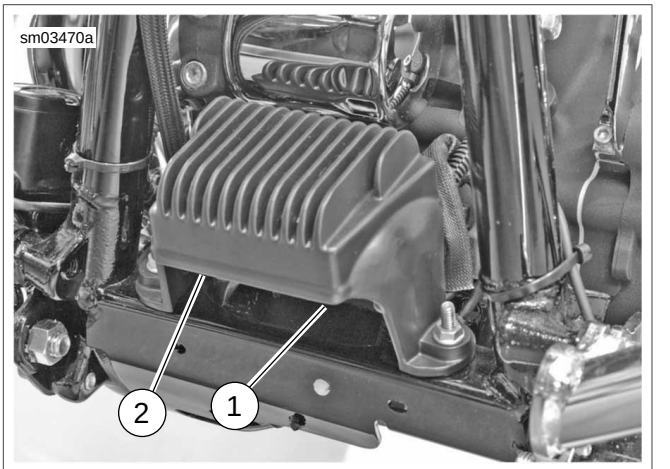
VOLTAGE REGULATOR 7.3

REMOVAL

1. Remove main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
2. Remove locknuts from studs on lower frame crossmember. Lift voltage regulator off studs. Allow voltage regulator to hang upside down at front of lower frame crossmember.
3. See Figure 7-2. Pull away locking latch and remove socket of voltage regulator connector [77] (2).
4. Pull away locking latch and remove socket of stator connector [46] (1).

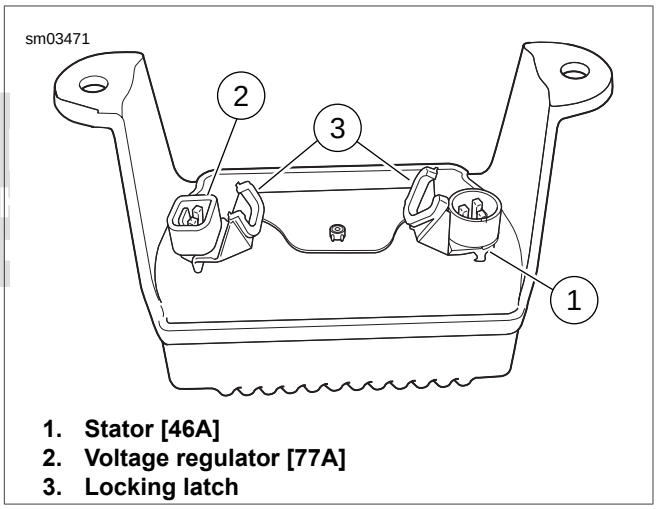
INSTALLATION

1. See Figure 7-2. Install stator connector [46] (1). Secure connector with locking latch (3).
2. Install voltage regulator connector [77] (2). Secure connector with locking latch (3).
3. See Figure 7-1. Install voltage regulator with locknuts on studs and tighten to 70-100 **in-lbs** (7.9-11.3 Nm).
4. Make sure wires are properly secured.
5. Install main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
6. Test charging system.



1. Stator connector [46]
2. Voltage regulator output connector [77]

Figure 7-1. Voltage Regulator (Left Side View)



1. Stator [46A]
2. Voltage regulator [77A]
3. Locking latch

Figure 7-2. Voltage Regulator (Bottom View)

ELECTRONIC CONTROL MODULE (ECM) 7.4

ECM

Removal

1. Remove seat. See 2.25 SEAT.
2. Free ECM from top caddy.
3. Disconnect ECM connector. See A.11 DELPHI GT 280 SEALED 73-TERMINAL ECM CONNECTOR.

NOTE

Internal latches are not fully disengaged until locking bar is in the fully released position. Forcing socket housing with latches partially engaged will result in connector damage.

Installation

1. Connect ECM connector. See A.11 DELPHI GT 280 SEALED 73-TERMINAL ECM CONNECTOR.

NOTE

Pin and socket housings must be fully engaged before locking bar is rotated to the latched position. Forcing locking bar without full engagement will result in connector damage.

2. Secure ECM in top caddy. Verify holes engage two index pins on right side of top caddy.

⚠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)

3. Install seat. See 2.25 SEAT.

NOTE

After installing ECM, the password learn procedure must be performed.

4. Perform password learn procedure. See 7.44 TSM/HFSM: PASSWORD LEARN.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TURN SIGNAL AND SECURITY MODULE (TSM/TSSM/HFSM) 7.5

GENERAL

See Figure 7-3. The Turn Signal Module (TSM) has two major functions:

- Control turn signals.
- Serve as bank angle sensor.

The optional factory-installed security system provides the same functionality as the TSM, but also includes security and immobilization functions.

Two security system modules are available: The Turn Signal Security Module (TSSM) for Japan/Korea markets and the Hands Free Security Module (HFSM) for all other markets.

See the electrical diagnostic manual for complete details of the TSM/TSSM/HFSM features and functions.

NOTE

The TSM/TSSM/HFSM cannot be repaired. Replace the unit if it fails.



Figure 7-3. TSM/TSSM/HFSM (TSM Shown)

REMOVAL

NOTE

If equipped with the optional "Harley-Davidson Smart Security System," verify that the security status lamp in speedometer face is not flashing before proceeding (security system disarmed).

1. With the ignition key ON and the security fob present, remove the main fuse.
2. Remove right saddlebag and side cover.
3. See Figure 7-4. If equipped with ABS, release rear ABS wheel speed sensor connector (1) from battery tray.

NOTE

It is not necessary to disconnect or remove the oxygen sensor connectors (5) from the upper retainer (2).

4. Pull out on bottom of module to release from retainer in battery tray.
5. Remove module from upper retainer (2) and disconnect TSM/HFSM connector (3) and HFSM antenna jumper harness connector (4) if equipped.

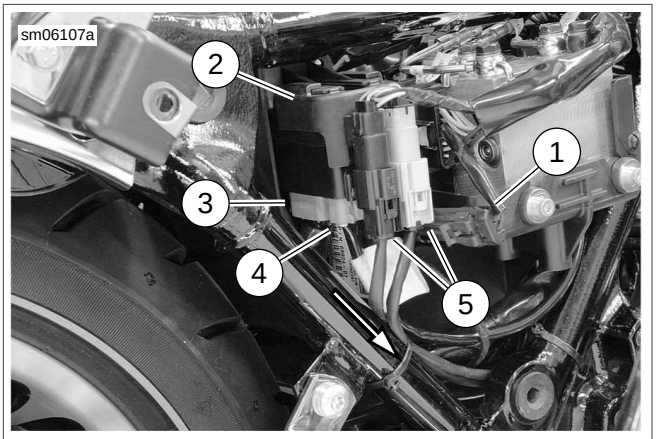
INSTALLATION

1. See Figure 7-4. Connect TSM/HFSM connector (3) and HFSM antenna jumper harness connector (4) if equipped.
2. Place module into upper retainer (2) and push bottom of module until it is secure in the retainer on the battery tray.
3. If equipped, secure rear wheel speed sensor connector (1) to retainer.
4. Install right side cover and saddlebag.
5. After installing ECM, the password learning procedure must be performed. See 7.44 TSM/HFSM: PASSWORD LEARN.

⚠WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

6. Test all turn signal functions. Test all security system functions, if equipped.



1. **Rear wheel speed sensor connector**
2. **Upper retainer**
3. **TSM/HFSM connector**
4. **HFSM antenna jumper harness connector**
5. **Oxygen sensor connectors**

Figure 7-4. TSM/HFSM Module

HFSM ANTENNA

Removal

1. Remove seat.
2. See Figure 7-5. Release HFSM antenna (2) from top caddy.
3. Disconnect HFSM antenna jumper harness.
4. If necessary, remove HFSM antenna jumper harness as follows:
   a. Remove HFSM module and disconnect antenna jumper harness. See 7.5 TURN SIGNAL AND SECURITY MODULE (TSM/TSSM/HFSM), Removal.
   b. Cut cable strap retaining jumper harness and main harness to rear downtube.
   c. Remove jumper harness through right side opening.

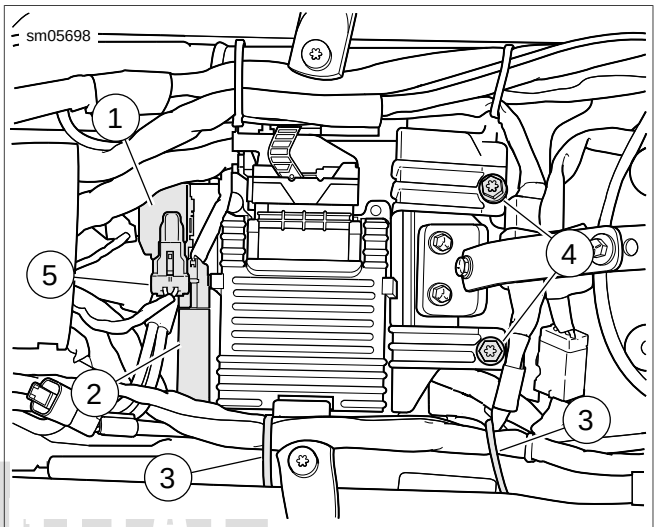
Installation

1. Install HFSM antenna jumper harness as follows:
   a. Feed jumper harness down ahead of battery tray and out through right side opening.
   b. Route jumper harness under ABS mounting area of battery tray to the TSM/HFSM module.
   c. Connect jumper harness connector to HFSM module and install HFSM module. See 7.5 TURN SIGNAL AND SECURITY MODULE (TSM/TSSM/HFSM), Installation.
   d. Secure antenna harness and main harness to down tube using a **new** cable strap.
2. See Figure 7-5. Connect HFSM antenna (2) to jumper harness.
3. Engage groove on HFSM antenna on tongue at front of top caddy.

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)

4. Install seat.
5. Test all security system functions.



1. **Purge solenoid**
2. **HFSM antenna**
3. **Cable ties**
4. **Fastener**
5. **Hold-down (not visible)**

Figure 7-5. Top Caddy

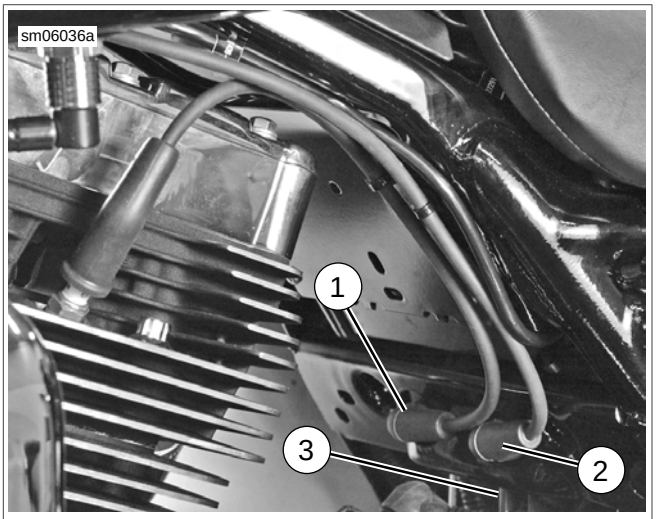
IGNITION COIL 7.6

REMOVAL

1. Remove battery. See 1.23 BATTERY MAINTENANCE.
2. See Figure 7-6. Unplug rear and front spark plug wires (1, 2) from ignition coil.
3. Remove ignition coil connector [83] (3).
4. See Figure 7-7. Remove screws (2) and battery hold-down bracket (3).
5. Loosen ground terminal nut (4). While holding ground terminal wires out of the way, remove ignition coil (1).

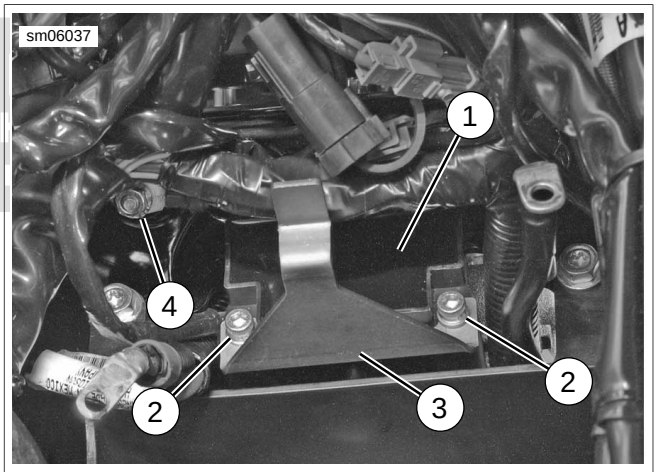
INSTALLATION

1. See Figure 7-7. While holding ground terminal wires out of the way, place ignition coil (1) into position.
2. Install battery hold-down bracket (3) and screws (2). Tighten screws to 32-40 **in-lbs** (3.6-4.5 Nm).
3. Place ground terminal wires in proper position and tighten nut (4) to 50-90 **in-lbs** (5.7-10.2 Nm) .
4. See Figure 7-6. Install ignition coil connector [83] (3).
5. Connect rear (1) and front (2) spark plug wires to ignition coil.
6. Install battery. See 1.23 BATTERY MAINTENANCE.



1. **Rear spark plug wire**
2. **Front spark plug wire**
3. **Ignition coil connector [83]**

Figure 7-6. Spark Plug Wires



1. **Ignition coil**
2. **Screw (2)**
3. **Battery hold-down bracket**
4. **Ground terminal nut**

Figure 7-7. Ignition Coil

SYSTEM FUSES AND RELAYS 7.7

MAIN FUSE

Removal

1. Remove left side saddlebag. See 2.26 SADDLEBAGS.
2. Remove left side cover.
3. See Figure 7-8. Pull main fuse from main fuse holder.

Installation

1. See Figure 7-8. Insert main fuse into main fuse holder.
2. Install left side cover.
3. Install left side saddlebag. See 2.26 SADDLEBAGS.

MAIN FUSE HOLDER

Removal

1. Remove left side saddlebag. See 2.26 SADDLEBAGS.
2. Remove left side cover.
3. Pull main fuse from fuse holder.
4. Remove battery. See 1.23 BATTERY MAINTENANCE.
5. Inboard of left side caddy:
   a. Cut front cable strap to release main harness bundle and main power cable (to main fuse holder). Remove and discard cable strap.
   b. Push up on tongue at bottom of harness cover to release from slot in caddy, and then rotate up and disengage hinges.
   c. Press latches on main fuse holder and pull from hole in caddy.

NOTE

If further disassembly of the left side caddy is necessary, see 7.8 ELECTRICAL CADDIES.

6. Remove socket terminals from main fuse holder. See A.7 DELPHI 800 METRI-PACK SEALED MAIN FUSE HOUSING.

Installation

1. Install socket terminals into main fuse holder. See A.7 DELPHI 800 METRI-PACK SEALED MAIN FUSE HOUSING.
2. Inboard of left side caddy:
   a. Push main fuse holder into hole until it locks in place.
   b. Install **new** cable strap through front slot in caddy capturing main harness bundle and main power cable (to main fuse holder).
   c. Engage hinges and rotate harness cover down over main harness bundle. Push up on tongue at bottom of cover to engage slot in caddy.

NOTE

If further assembly of the left side caddy is necessary, see 7.8 ELECTRICAL CADDIES.

3. Install battery. See 1.23 BATTERY MAINTENANCE.
4. Insert main fuse into main fuse holder.
5. Install left side cover.
6. Install left side saddlebag. See 2.26 SADDLEBAGS.

SYSTEM FUSES AND RELAYS

NOTE

Touring model motorcycles use a common fuse block cover. Actual fuse use may vary based on model and options.

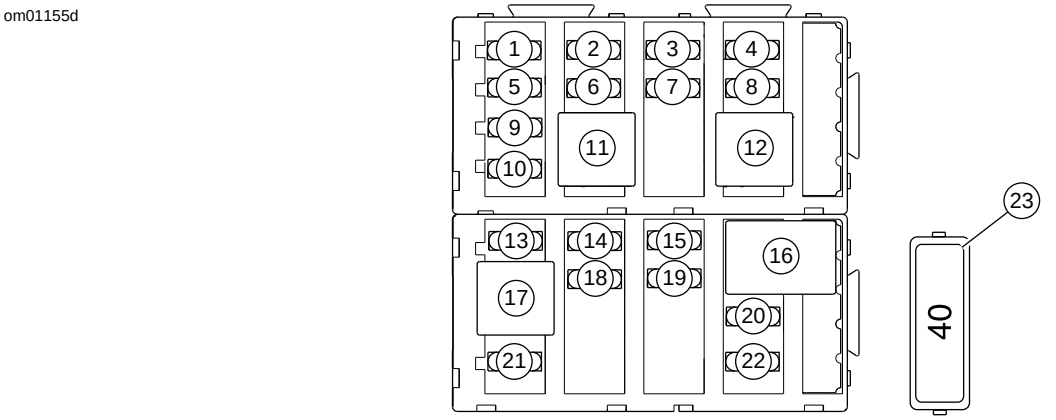
Removal

1. Remove left side saddlebag. See 2.26 SADDLEBAGS.
2. Remove left side cover.
3. Pull main fuse from fuse holder.
4. Push up on tongue at bottom of fuse block cover to release from slot in caddy, and then rotate up and disengage hinge.
5. See Figure 7-8. Remove system fuse/relay from fuse block. Replace fuse if the element is burned. Automotive type ATO fuses are used.

Installation

1. See Figure 7-8. Install system fuse/relay in fuse block.
2. Engage hinge and rotate fuse block cover down over fuse blocks. Push up on tongue at bottom of cover to engage slot in caddy.
3. Insert main fuse into fuse holder.
4. Install left side cover.
5. Install left side saddlebag. See 2.26 SADDLEBAGS.

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1. **Brake (15 A)**
2. **Accessory (15 A)**
3. **P&A (15 A)**
4. **Radio power (15 A)**
5. **Radio memory (15 A)**
6. **Battery (15 A)**
7. **ECM power (15 A)**
8. **Power outlet (15 A) (if equipped)**
9. **Exhaust control (15 A)**
10. **Fuel pump (15 A)**
11. **System relay**
12. **Start relay**
13. **P&A ignition (2 A max)**
14. **Instruments (15 A)**
15. **Ignition (15 A)**
16. **Lighting relay**
17. **Brake relay**
18. **Headlamp (15 A)**
19. **Lights (15 A)**
20. **Spare (15 A)**
21. **ABS (30 A)**
22. **Spare (30 A)**
23. **Main fuse (40 A)**

Figure 7-8. Fuses

FUSE BLOCKS

Removal

1. Remove left side caddy as necessary to release fuse blocks. See 7.8 ELECTRICAL CADDIES.
2. Remove system fuses and relays from fuse blocks.
3. Remove socket terminals from fuse blocks. See A.4 DELPHI 280 METRI-PACK UNSEALED CONNECTORS.

Installation

1. Install socket terminals into fuse blocks. See A.4 DELPHI 280 METRI-PACK UNSEALED CONNECTORS.
2. See Figure 7-8. Install system fuses and relays into fuse blocks.
3. Install fuse blocks into left side caddy. Install left side caddy. See 7.8 ELECTRICAL CADDIES.

ELECTRICAL CADDIES 7.8

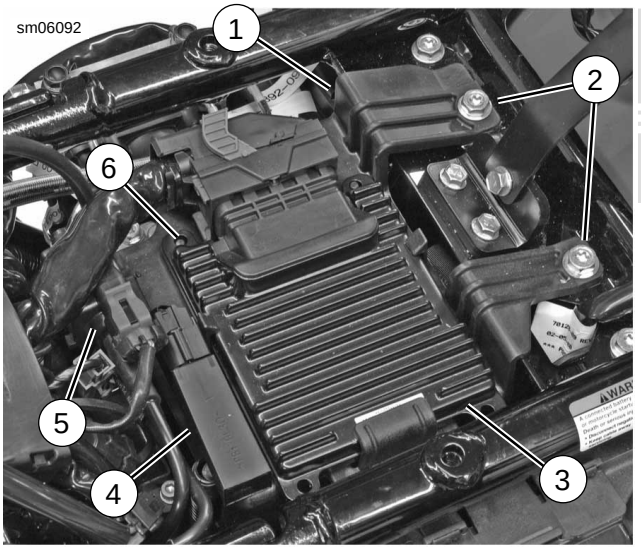
TOP CADDY

Removal

1. Remove seat. See 2.25 SEAT.
2. See Figure 7-9. Remove HFSM antenna (4), if present.
3. Lift up on ECM (3) until free of caddy.
4. Remove screws (2).
5. Lift up on top caddy and slide purge valve solenoid (5) from front caddy, if present. Remove front caddy.

Installation

1. See Figure 7-9. Install purge valve solenoid (5) on front caddy (1) and place caddy into position over battery.
2. Install both screws (2). Tighten screws to 72-96 **in-lbs** (8.1-10.9 Nm).
3. Install ECM (3). Make sure holes in ECM are positioned over alignment pins (6).
4. Install HFSM antenna (4) onto caddy, if present.
5. Install seat. See 2.25 SEAT.



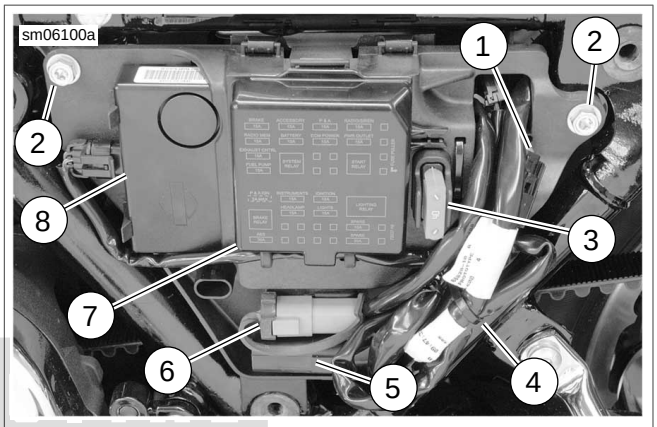
1. **Front caddy**
2. **Screw (2)**
3. **ECM**
4. **HFSM antenna**
5. **Purge valve solenoid**
6. **Alignment pin (2)**

Figure 7-9. Top Caddy

LEFT SIDE CADDY

Removal

1. Remove left side saddlebag. See 2.26 SADDLEBAGS.
2. Remove left side cover.
3. Remove seat. See 2.25 SEAT.
4. See Figure 7-10. Remove main fuse (3).
5. Disconnect rear fender lights harness connector (1) and slide connector body off of mounting tab.
6. Cut cable strap (4) securing excess wire loop for AM/FM antenna, if used.
7. Disconnect siren (8), if installed, and remove from caddy.
8. Remove ABS diode pack (5), if installed, data link connector (6), and fuse block cover (7) from caddy.
9. Remove screws (2).



1. **Rear fender lights harness**
2. **Screw (2)**
3. **Main fuse**
4. **Cable tie**
5. **ABS diode pack**
6. **Data link connector**
7. **Fuse block cover**
8. **Siren (if equipped)**

Figure 7-10. Caddy Components

10. See Figure 7-11. Remove front and rear cable straps (1, 4).
11. Remove harness cover (11).
12. Remove wires from square shaped opening (9).
13. From back side of caddy, squeeze tabs at top and bottom of main fuse holder (15) and pull away from left-side caddy.
14. On back side of caddy, pull tabs holding fuse block (13) to caddy and remove fuse block from back side of caddy.

Installation

1. See Figure 7-11. Insert fuse block (13) from back side of caddy. Make sure tabs on caddy are secured to top and bottom of fuse block.
2. Insert main fuse holder (15) into caddy. Make sure the tabs on the top and bottom of the fuse holder are fastened to the caddy.

3. Route wires for siren, data link connector, ABS diode pack, and excess wire loop for AM/FM antenna, if used, through square shaped opening (9).
4. Install harness cover (11).
5. Secure wires with front and rear cable straps (1, 4).
6. See Figure 7-10. Install screws (2). Tighten to 72-96 **in-lbs** (8.1-10.9 Nm).
7. Install ABS diode pack (5), if ABS installed, data link connector (6), and fuse block cover (7) to caddy.
8. Install siren (8), if used and attach electrical connector to siren.
9. Attach excess wire loop for AM/FM antenna to caddy using a **new** cable tie (4).
10. Connect rear fender lights harness connector (1) and slide connector body onto mounting tab.
11. Install main fuse (3).

⚠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)

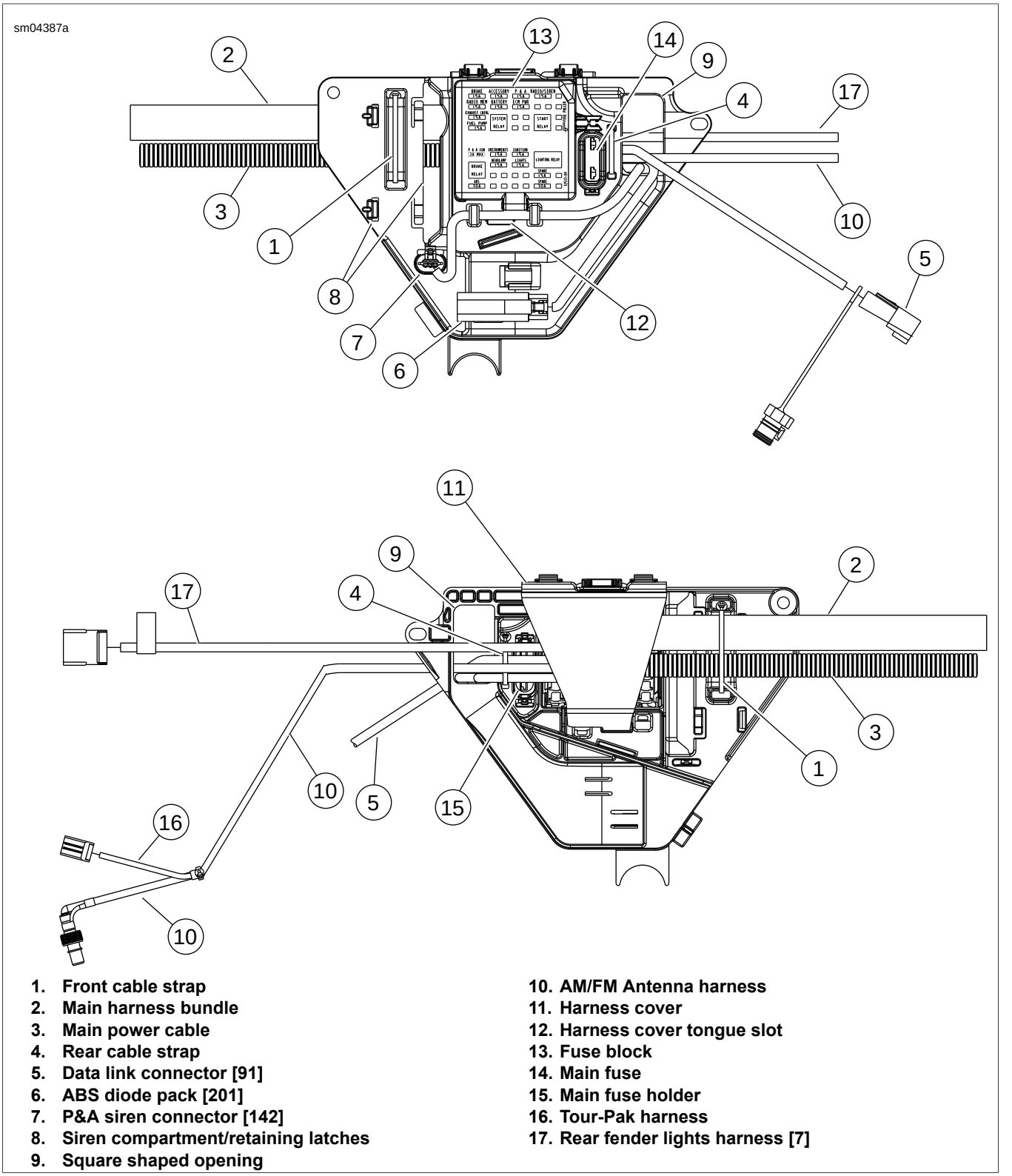
12. Install seat. See 2.25 SEAT.
13. Install left side cover.
14. Install left side saddlebag. See 2.26 SADDLEBAGS.

⚠WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

15. Turn ignition on and test all lights and switches for proper operation.

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1. **Front cable strap**
2. **Main harness bundle**
3. **Main power cable**
4. **Rear cable strap**
5. **Data link connector [91]**
6. **ABS diode pack [201]**
7. **P&A siren connector [142]**
8. **Siren compartment/retaining latches**
9. **Square shaped opening**
10. **AM/FM Antenna harness**
11. **Harness cover**
12. **Harness cover tongue slot**
13. **Fuse block**
14. **Main fuse**
15. **Main fuse holder**
16. **Tour-Pak harness**
17. **Rear fender lights harness [7]**

Figure 7-11. Left Side Caddy (Typical)

BATTERY TRAY

Removal

1. Remove battery. See 1.23 BATTERY MAINTENANCE.
2. Remove rear wheel. See 2.5 REAR WHEEL.
3. Remove left side caddy. See 7.8 ELECTRICAL CADDIES, Left Side Caddy.

4. If Tour-Pak harness is routed through side of battery tray, disconnect Tour-Pak connectors and pull harness away from battery tray.
5. Remove ignition coil. See 7.6 IGNITION COIL.
6. Remove ABS module, if equipped. See C.2 ABS MODULE.
7. Pull TSM/HFSM away from battery tray. See 7.5 TURN SIGNAL AND SECURITY MODULE (TSM/TSSM/HFSM).
8. If active exhaust actuator is not used, disconnect actuator connector from battery tray.
9. Remove four screws securing battery tray to frame.
10. Pull battery tray rearward out through frame.

Installation

1. Install battery tray in from behind frame.
2. Install four screws securing battery tray to frame. Tighten to 72-96 **in-lbs** (8.1-10.9 Nm).
3. If active exhaust actuator is not used, connect actuator connector to battery tray.
4. Install TSM/HFSM onto battery tray. See 7.5 TURN SIGNAL AND SECURITY MODULE (TSM/TSSM/HFSM).
5. Install ABS module, if equipped. See C.2 ABS MODULE.
6. Install ignition coil. See 7.6 IGNITION COIL.
7. If equipped with Tour-Pak, route harness through side of battery tray and connect Tour-Pak connectors. Install cable ties to secure harness.
8. Install left side caddy. See 7.8 ELECTRICAL CADDIES, Left Side Caddy.
9. Install rear wheel. See 2.5 REAR WHEEL.
10. Install battery and top caddy. See 1.23 BATTERY MAINTENANCE.

⚠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)

11. Install seat. 2.25 SEAT.

⚠WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

12. Turn ignition on and test switches and lights for proper operation.

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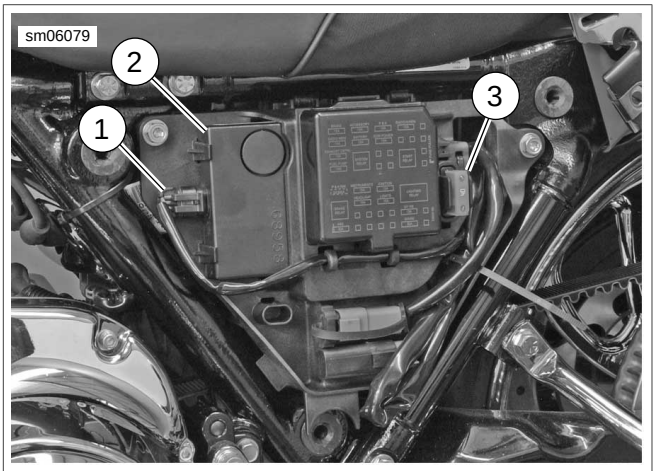
SECURITY SIREN 7.9

REMOVAL

1. Remove left side saddlebag. See 2.26 SADDLEBAGS.
2. Remove left side cover.
3. With security fob present, turn ignition on.
4. See Figure 7-12. Remove main fuse (3).
5. Disconnect security siren connector [142] (1).
6. Remove security siren (2).

INSTALLATION

1. See Figure 7-12. Install security siren (2).
2. Connect security siren connector [142] (1).
3. Install main fuse (3) into holder.
4. Install left side cover.
5. Install left side saddlebag. See 2.26 SADDLEBAGS.



1. Security siren connector [142]
2. Security siren
3. Main fuse

Figure 7-12. Security Siren

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

STARTER 7.10

GENERAL

The starter is made up of a field coil assembly, solenoid assembly and drive assembly. The repair instructions contained in this section are divided into two major service areas for the solenoid assembly and drive assembly.

NOTES

- *For troubleshooting and diagnostic information on the solenoid assembly and drive assembly, see the electrical diagnostic manual for this motorcycle.*
- *Any damaged paint should be touched up after assembly prior to installation using the appropriate touch up paint. Follow the directions provided with the paint. Paint flaking does not require the starter to be replaced.*

REMOVAL

1. Remove seat. See 2.25 SEAT.

⚠WARNING

Disconnect negative (-) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00049a)

2. Remove battery negative (-) cable (black) from battery.

NOTE

The battery positive cable and power wire for the main fuse are crimped together at the starter ring terminal. Both must be replaced as an assembly if either requires replacement. See A.7 DELPHI 800 METRI-PACK SEALED MAIN FUSE HOUSING for removal of power wire from main fuse connector.

3. Remove battery positive and main fuse power cable ring terminal from starter solenoid stud.
4. Remove starter solenoid connector [128] at front of starter.
5. Remove engine oil filler cap/dipstick. Cover fill spout with clean shop cloth to keep out dirt and debris.
6. Remove starter front and rear mounting screws.
7. Remove starter from motorcycle. Exercise caution to avoid losing the ring dowels.

DRIVE ASSEMBLY

Disassembly

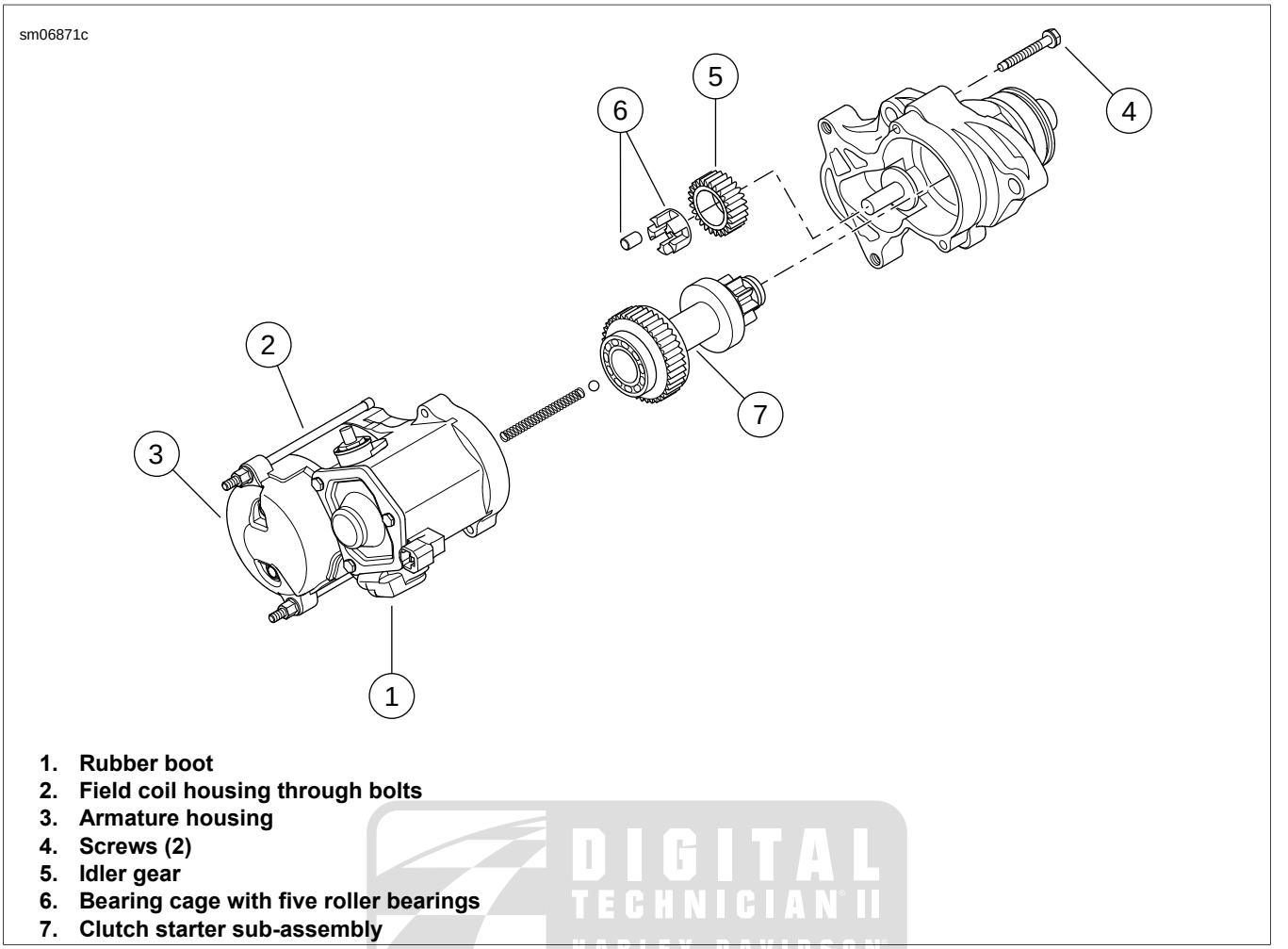
1. Remove screw to release end cover, if equipped.
2. Remove two nuts to release end cover bracket from through bolts, if equipped.
3. See Figure 7-13. Pull up rubber boot (1) and remove hex nut with captive lockwasher to release field wire from terminal post on solenoid housing.
4. Loosen two through bolts (2) to release field coil housing from solenoid housing.
5. Remove armature housing (3) keeping all contents together for reassembly.

NOTE

Do not remove armature and brush plate from housing. Replacement parts for components in the armature housing are not available.

6. Remove two screws to release drive housing from solenoid housing.
7. Use a rubber mallet to separate drive and solenoid housings, if necessary.
8. Remove idler gear (5) from bearing cage in drive housing. Remove bearing cage with five roller bearings (6) from shaft in drive housing.
9. Push on end of drive shaft to remove clutch starter sub assembly (7) from drive housing.
10. Remove solenoid spring and ball from the output shaft of the clutch starter sub assembly.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Rubber boot**
2. **Field coil housing through bolts**
3. **Armature housing**
4. **Screws (2)**
5. **Idler gear**
6. **Bearing cage with five roller bearings**
7. **Clutch starter sub-assembly**

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Figure 7-13. Clutch Starter Sub-Assembly and Housing

Inspection

1. Inspect two O-rings in and on drive housing for cuts, tears or signs of deterioration.
2. See Figure 7-13. Make sure that the idler gear (5) rotates freely without drag or sticking.
3. Inspect idler gear once removed from idler bearings and replace starter motor if the gear is pitted, scored, rounded, cracked, chipped or worn.
4. Inspect roller bearings (6). Bearings must rotate freely without drag or sticking. Replace starter motor if the bearings are pitted or grooved.
5. Inspect the steel ball for wear, pitting, surface breakdown or other damage. Replace if necessary.

NOTE

If the solenoid return spring is not in working condition, the entire starter motor must be replaced.

Assembly

1. See Figure 7-13. Lubricate parts with high temperature grease, such as LUBRIPLATE 110, during assembly and install bearing cage with five roller bearings (6) onto shaft in drive housing. Be sure that all five roller bearings are installed in grooves of bearing cage. Install idler gear (5) over bearing cage.
2. Lubricate bearings with LUBRIPLATE 110 before installation, if necessary, and install **new** clutch starter sub assembly (7) in drive housing seating the larger bearing in the counterbore.
3. Apply a light film of LUBRIPLATE 110 to solenoid plunger shaft. Install return spring on solenoid plunger shaft.

NOTE

Before mating the solenoid and drive housings, apply a thin layer of Harley-Davidson High-Performance Sealant (gray) (Part No. 99650-02) to drive housing to act as a seal between the two housings.

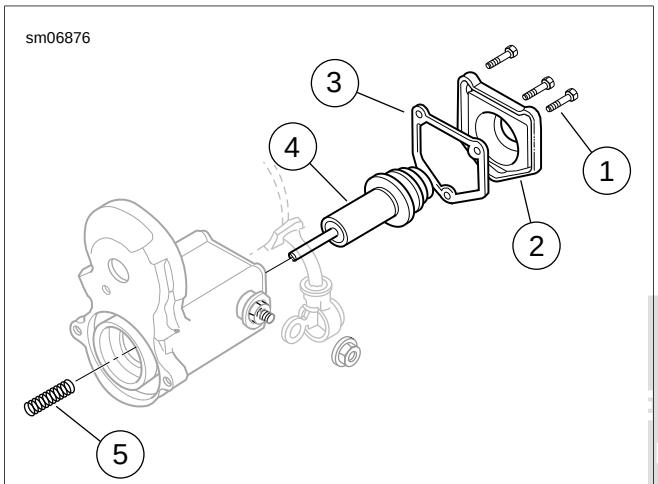
4. Mate the solenoid and drive housings and install two hex screws. Alternately tighten hex screws until snug.
5. Install through bolts to fasten field coil to solenoid housing. Tighten through bolts to 39-65 **in-lbs** (4.4-7.3 Nm).
6. Attach field wire ring terminal to short post on solenoid housing and install hex nut with captive lockwasher. Tighten hex nut to 70-90 **in-lbs** (7.9-10.2 Nm). Cover field wire ring terminal with rubber boot (1).

7. Install end cover bracket, if equipped, onto threaded end of through bolts, if equipped. For proper orientation, the longest end of the bracket (before the bend) must be on the field wire side. Install two nuts and tighten until snug.
8. Install screw to fasten end cover to end cover bracket, if equipped. Tighten screw to 90-110 **in-lbs** (10.2-12.4 Nm).

SOLENOID

Cover and Plunger Removal

1. See Figure 7-14. Remove the cover:
   a. Remove the three fasteners (1).
   b. Remove the cover (2).
   c. Remove the gasket (3).
2. Remove the plunger (4) with the spring (5).

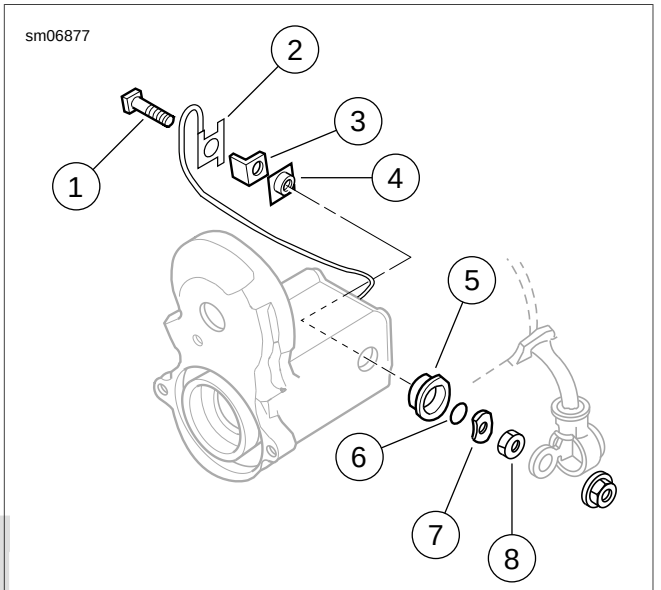


1. **Fasteners**
2. **Cover**
3. **Gasket**
4. **Plunger**
5. **Spring**

Figure 7-14. Soleniod Plunger

Short Post Contact: Starter

1. Disassemble the short post contact:
   a. Remove the starter ring terminal hex nut and the ring terminal from the post.
   b. See Figure 7-15. Remove the jamnut (8), the wave washer (7), the O-ring (6) and the round bushing (5):
   c. Remove the post bolt (1).
   d. Remove the hold-in terminal (2) from the post bolt.
   e. Remove the contact plate (3) and the square bushing.
2. Assemble the short post contact:
   a. Insert the square bushing into the housing.
   b. Install the contact plate with the 90 degree part of the contact plate against the solenoid winding.
   c. Install the post bolt through the hold-in terminal, the contact plate and the square bushing.
   d. Install the round bushing, the O-ring, the wave washer and the jamnut.



1. **Post bolt**
2. **Hold-in terminal**
3. **Contact plate**
4. **Square bushing**
5. **Round bushing**
6. **O-ring**
7. **Wave washer**
8. **Jamnut**

Figure 7-15. Short Post Contact (starter)

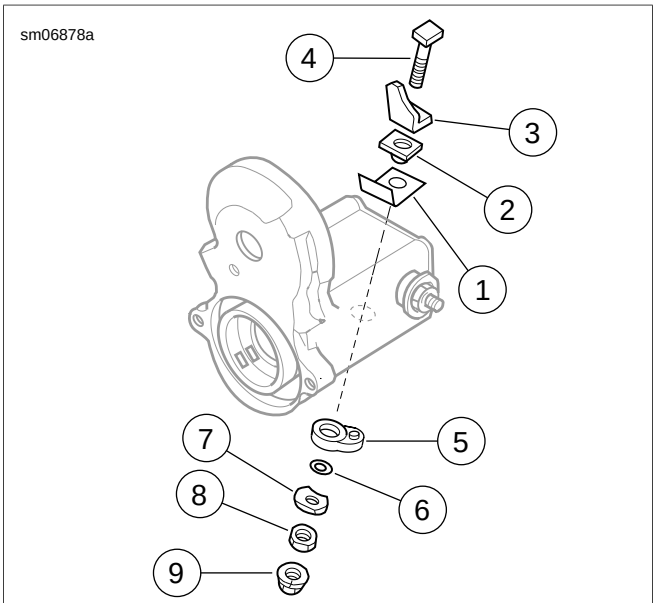
Long Post Contact: Battery Positive

1. See Figure 7-16. Remove the long post contact:
   a. Remove hex nut (9).
   b. Remove the jamnut (8), the wave washer (7) and the O-ring (6) and the round bushing (5).
   c. Remove the post bolt (4), the contact plate (3), the square bushing (2) and the paper insulator (1).
2. Install the long post contact:
   a. Insert the square bushing through the paper insulator into the housing.
   b. Install the contact plate with the foot against the solenoid winding.
   c. Install the post bolt.

NOTE

Check that the index pin on the round bushing fits the blind hole in the housing.

d. Install the round bushing, the O-ring, the wave washer and the jamnut.



1. **Paper insulator**
2. **Square bushing**
3. **Contact plate**
4. **Post bolt**
5. **Round bushing**
6. **O-ring**
7. **Wave washer**
8. **Jamnut**
9. **Hex nut**

Figure 7-16. Long Post Contact (battery)

Plunger and Cover Installation

1. Apply LUBRIPLATE 110 to the plunger shaft and install the spring.
2. Install the plunger and spring in the housing.
3. While compressing the plunger, alternately tighten the contact post jamnuts to 65-80 **in-lbs** (7.3-9.0 Nm).
4. Check that the contact plates are aligned to the solenoid winding.
5. Install the cover:
   a. Install a **new** gasket on the cover.
   b. Install the cover.
   c. Install the fasteners and tighten until snug.
6. Install the starter ring terminal.
7. Install and tighten the hex nut to 70-90 **in-lbs** (7.9-10.2 Nm).

INSTALLATION

1. Verify that two ring dowels are installed in the primary chaincase or starter flange.
2. Lubricate O-ring on starter and bore of primary chaincase with light film of clean primary chaincase lubricant.
3. Apply a drop of Loctite Threadlocker 243 (blue) to the threads of the starter mounting screws.
4. Move starter into its installed position and start both mounting screws.
5. Tighten starter mounting screws to 25-27 ft-lbs (33.9-36.6 Nm).
6. Remove shop cloth over fill spout and install engine oil filler cap/dipstick at top of transmission case.
7. Install battery positive cable on stud of solenoid. Install hex nut and tighten to 70-90 **in-lbs** (7.9-10.2 Nm). Pull down rubber boot over terminal connections.
8. Install starter solenoid connector [128] at front of starter.

NOTICE

Do not over-tighten bolts on battery terminals. Use recommended torque values. Over-tightening battery terminal bolts could result in damage to battery terminals. (00216a)

9. Connect battery negative (-) cable to battery and tighten bolt to 60-70 **in-lbs** (6.8-7.9 Nm).
10. Install seat. See 2.25 SEAT.

HEADLAMP: ALL EXCEPT ROAD GLIDE 7.11

HEADLAMP: SINGLE HEADLAMP MODELS

Removal

1. Remove screw at bottom of headlamp door (chrome ring). Remove headlamp door.
2. See Figure 7-17. Remove screws securing headlamp assembly.
3. Remove headlamp connector from headlamp bulb.

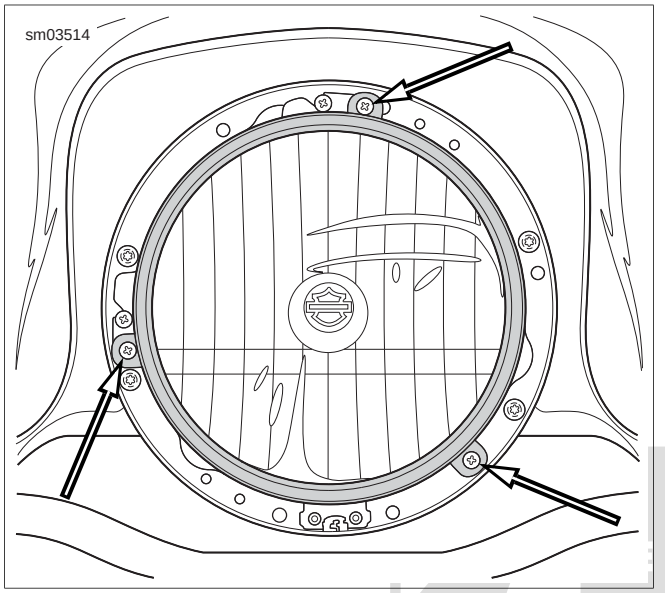


Figure 7-17. Headlamp Retaining Screws (typical)

Bulb Replacement

NOTICE

When replacement is required, use only the specified sealed beam unit or bulb, available from a Harley-Davidson dealer. An improper wattage sealed beam or bulb, can cause charging system problems. (00209a)

NOTE

The headlamp uses a replaceable quartz halogen bulb which is very delicate and must be handled with care.

1. Remove headlamp assembly.
2. Remove rubber boot at back of housing.
3. See Figure 7-18. Release wire retaining clip (1) from retainer (2). Swing wireform out of the way.

NOTE

It may be necessary to loosen retainer screw 1/2-1 turn to release wireform.

WARNING

Handle bulb carefully and wear eye protection. Bulb contains gas under pressure, which, if not handled carefully, could cause serious eye injury. (00062b)

4. Remove and discard bulb.

NOTICE

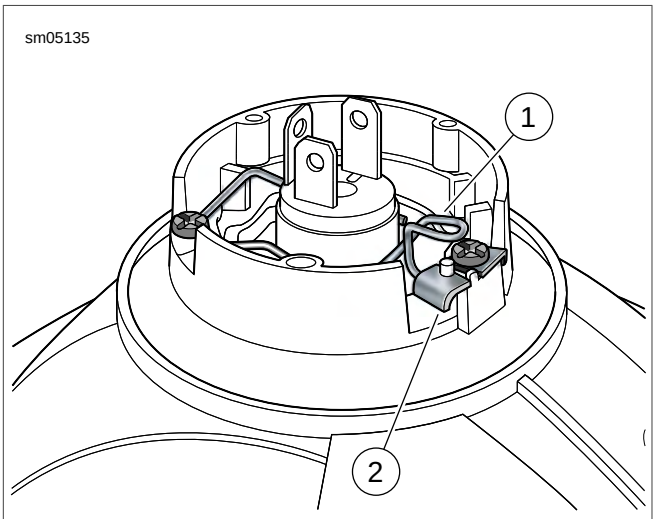
Never touch the quartz bulb. Fingerprints will etch the glass and decrease bulb life. Handle the bulb with paper or a clean, dry cloth. Failure to do so could result in bulb damage. (00210b)

5. Install **new** bulb. Align the tab on the bulb with the notch in the headlamp housing.
6. See Figure 7-18. Rotate wire retaining clip (1) into place and latch under lip of retainer (2).

NOTE

If retainer screw was loosened to release wire retaining clip, hold retainer in place and tighten screw until snug. Verify that reflector cone is still centered under decorative logo. If it is not, loosen retainer screw and repeat step until the proper results are achieved.

7. Install rubber boot at back of housing.
8. **HDI models:** Rotate position lamp bulb retainer 1/4 turn counterclockwise to remove. Replace bulb and install bulb retainer in lamp housing.
9. Install headlamp assembly.



1. **Wire retaining clip**
2. **Retainer**

Figure 7-18. Wire Retaining Clip

Installation

1. Install headlamp connector on headlamp bulb.

2. Install headlamp assembly and tighten screws to:
   a. **Non-fairing equipped:** 9-18 **in-lbs** (1.0-2.0 Nm).
   b. **Fairing equipped:** 22-32 **in-lbs** (2.5-3.6 Nm).
3. Fit the headlamp door spring into slot at top of headlamp housing and secure the headlamp door (chrome ring) with screw. Tighten to 9-18 **in-lbs** (1.0-2.0 Nm).

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HEADLAMP: ROAD GLIDE 7.12

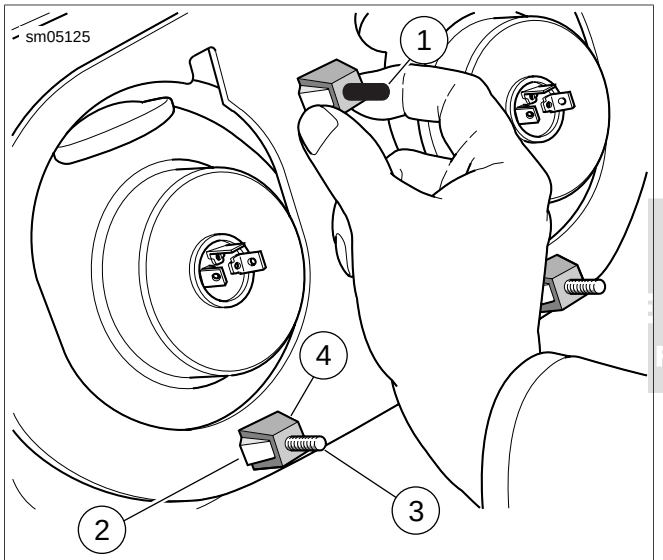
HEADLAMP ADJUSTER ASSEMBLY

Removal

NOTE

Either headlamp assembly can be replaced individually without removing the fairing. See 7.12 HEADLAMP: ROAD GLIDE, Headlamp Bulb Replacement: Dual Headlamp Models.

1. Carefully pry headlamp outer trim from front of motorcycle.
2. Remove four screws securing each headlamp assembly to trim ring.
3. Disconnect headlamp harnesses from bulbs and set headlamp assemblies aside.
4. See Figure 7-19. Reach into fairing and compress tabs (2) on each mounting clip (4) and remove headlamp trim ring assembly.



1. **Protective sleeve**
2. **Tab**
3. **Hex adjuster stud**
4. **Mounting clip**

Figure 7-19. Compress Mounting Clips (shown with fairing removed for clarity of illustration)

Repair

1. Remove screw securing adjuster screw assembly.
2. Remove mounting clip and mount plate from adjuster screw
3. Install mount plate on adjuster screw with arc oriented as shown.
4. Install mounting clip on adjuster screw.
5. Install adjuster assembly on trim ring and tighten screw to 35-45 **in-lbs** (4.0-5.1 Nm).

Installation

NOTES

- *See Figure 7-19. Install protective sleeve on top center stud of headlamp adjuster assembly.*
- *Mounting clips should be inserted with the tabs (2) on the sides, not top and bottom.*

1. Push headlamp trim ring assembly into position until tabs on mounting clips engage outer fairing.
2. Connect and install both headlamp assemblies. Tighten screws to 15-25 **in-lbs** (1.7-2.8 Nm).
3. Install headlamp outer trim.
4. Check headlamp alignment. See 1.21 HEADLAMP ALIGNMENT.

HEADLAMP BULB REPLACEMENT: DUAL HEADLAMP MODELS

Removal

1. Carefully pry headlamp bezel from front of motorcycle.
2. Remove four screws securing headlamp assembly to trim ring/adjuster assembly.
3. Disconnect headlamp harness from bulb and remove headlamp housing assembly.

Bulb Replacement

NOTICE

When replacement is required, use only the specified sealed beam unit or bulb, available from a Harley-Davidson dealer. An improper wattage sealed beam or bulb, can cause charging system problems. (00209a)

NOTE

The headlamp uses a replaceable quartz halogen bulb which is bulb is very delicate and must be handled with care.

1. See Figure 7-20. Remove rubber boot (1).
2. Rotate retainer (2) counter-clockwise and remove.

⚠WARNING

Handle bulb carefully and wear eye protection. Bulb contains gas under pressure, which, if not handled carefully, could cause serious eye injury. (00062b)

3. Remove and discard bulb.

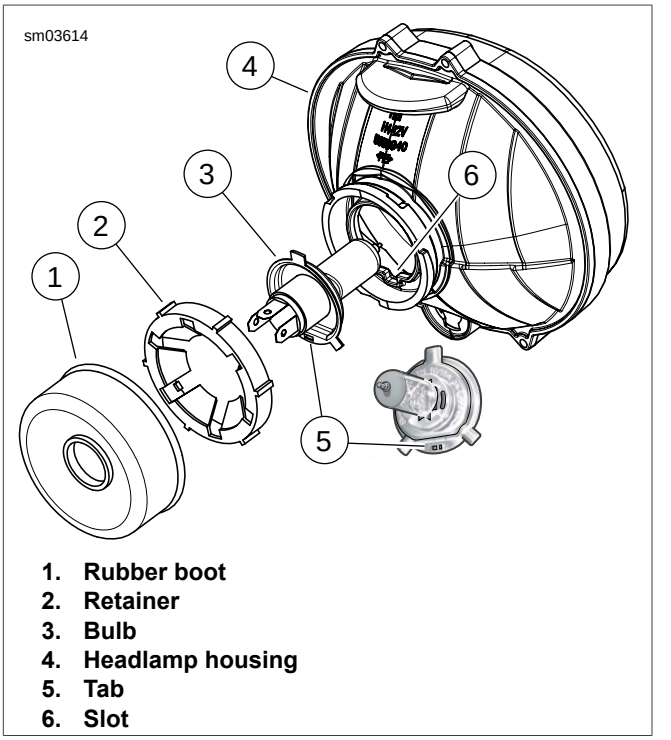
NOTICE

Never touch the quartz bulb. Fingerprints will etch the glass and decrease bulb life. Handle the bulb with paper or a clean, dry cloth. Failure to do so could result in bulb damage. (00210b)

4. See Figure 7-20. Install **new** bulb in headlamp housing. Be sure tab (5) on bulb is aligned with slot (6) in bulb housing.
5. Install retainer (2) and rotate clockwise to secure.
6. Install rubber boot (1) over retainer until flush with base of bulb socket.
7. **HDI models:** Rotate position lamp bulb retainer 1/4 turn counterclockwise to remove. Replace bulb and install bulb retainer in lamp housing.

Installation

1. Install headlamp assembly and tighten screws to 15-25 **in-lbs** (1.7-2.8 Nm).
2. Install headlamp bezel.



1. **Rubber boot**
2. **Retainer**
3. **Bulb**
4. **Headlamp housing**
5. **Tab**
6. **Slot**

Figure 7-20. Headlamp Housing Assembly

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

AUXILIARY LAMPS AND BRACKETS 7.13

AUXILIARY LAMP BULB REPLACEMENT

Removal

1. See Figure 7-21. Loosen screw (3) and pull door (2) from lip of lamp housing.
2. Disconnect auxiliary lamp connector.
3. See Figure 7-22. Remove nesting ring.

⚠WARNING

Handle bulb carefully and wear eye protection. Bulb contains gas under pressure, which, if not handled carefully, could cause serious eye injury. (00062b)

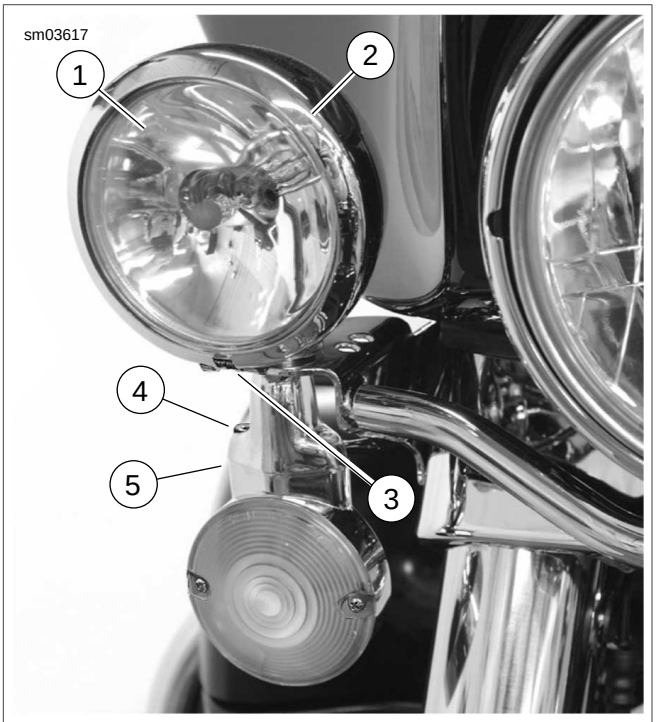
4. Rotate bulb housing 1/4 turn counterclockwise and remove from lens. Discard bulb/housing assembly.

NOTICE

Never touch the quartz bulb. Fingerprints will etch the glass and decrease bulb life. Handle the bulb with paper or a clean, dry cloth. Failure to do so could result in bulb damage. (00210b)

Installation

1. Install **new** bulb/housing assembly and rotate 1/4 turn clockwise.
2. See Figure 7-22. Place nesting ring on back of lens with the concave side up.
3. Secure harness connector to bulb housing.
4. Place nesting ring on lamp housing and rotate until index tab (2) engages slot at bottom of lamp housing.
5. Hold nesting ring in place and rotate lens so that index tabs (1) engage slots in nesting ring.
6. See Figure 7-21. Install lamp door over on lamp housing with screw centered at bottom. Tighten door screw until snug.



1. **Auxiliary lamp**
2. **Door**
3. **Door screw**
4. **Screw (2)**
5. **Mounting bracket**

Figure 7-21. Auxiliary Lamp



1. **Lamp index tab**
2. **Nesting ring index tab**

Figure 7-22. Auxiliary Lamp Assembly

AUXILIARY LAMP HOUSING

PART NUMBER	TOOL NAME
SNAP-ON® FRX181	FLARE NUT SOCKET

Removal

NOTE

See Figure 7-25. If replacing only the lamp housing, begin at step 1. Start at step 2 if replacing the entire lamp assembly.

1. Disassemble auxiliary lamp. See 7.13 AUXILIARY LAMPS AND BRACKETS, Auxiliary Lamp Bulb Replacement.
2. Proceed as follows:
   a. **Road King models:** See Figure 7-23. Remove headlamp assembly. See 7.11 HEADLAMP: ALL EXCEPT ROAD GLIDE. Disconnect auxiliary lamps connector [73], 2-place Multilock.
   b. **Fairing models:** See Figure 7-24. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS. Disconnect the left or right front turn signal/auxiliary lamp connector [31L/R], 4-place Multilock, on T-stud at top of left or right fairing support brace (outboard side).
3. Remove appropriate terminal(s) from socket housing.

Table 7-6. FLHR/C Auxiliary Lamps [73]

LEFT SIDE		RIGHT SIDE	
WIRE COLOR	CHAMBER	WIRE COLOR	CHAMBER
Gray/Black	1	Gray/Black	2

Table 7-7. FLHTC/U, FLHTK Auxiliary Lamps [31L/R]

LEFT SIDE [31L]		RIGHT SIDE [31R]	
WIRE COLOR	CHAMBER	WIRE COLOR	CHAMBER
Gray/Black	4	Gray/Black	4
Note: Terminals 1, 2 and 3 are reserved for the turn signal lamp.			

NOTE

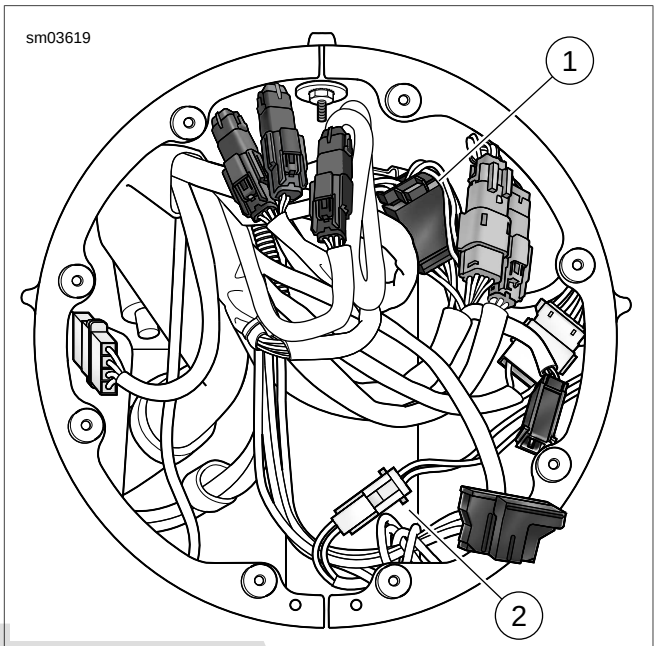
For instructions on removing terminals, see A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

4. See Figure 7-21. Remove two screws to release turn signal lamp from mounting bracket.
5. See Figure 7-26. Obtain length of strong flexible wire for use as mechanics wire. Feed wire through opening in socket terminal and then loop back twisting end until tightly coiled around longer strand.

NOTE

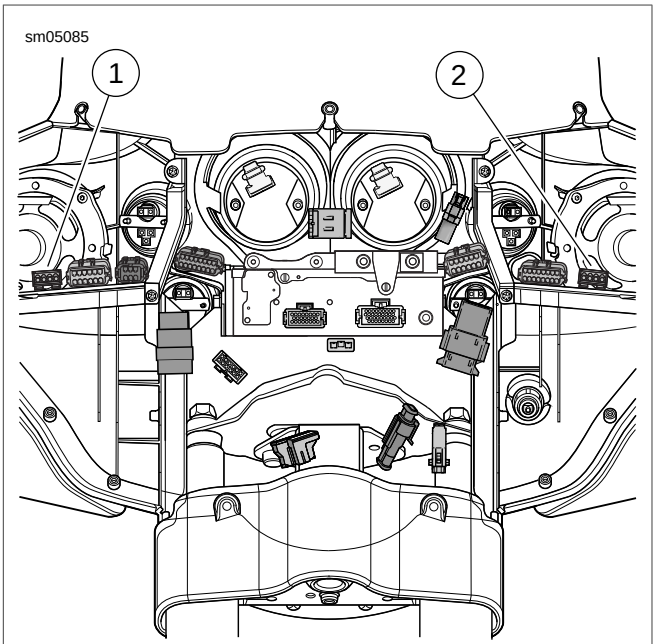
Be sure that mechanics wire is of sufficient strength to pull terminal through conduit without breaking. Wire length must also be long enough so that free end is not lost in conduit when pulled.

6. Carefully pull wire to draw socket terminal through conduit.
7. Unravel mechanics wire to release socket terminal.
8. Insert FLARE NUT SOCKET (Part No. Snap-on® FRX181) at bottom of turn signal mounting bracket and remove locknut from stud. Remove the turn signal mounting bracket and clamp block.
9. Remove auxiliary lamp (with Belleville washer and swivel block) from the auxiliary lamp bracket.



1. **Front turn signal lamps [31]**
2. **Auxiliary lamps [73]**

Figure 7-23. Headlamp Nacelle (Road King)



1. **Right front turn signal/auxiliary lamp [31R]**
2. **Left front turn signal/auxiliary lamp [31L]**

Figure 7-24. Inner Fairing (fork mounted fairing models)

Installation

1. Lay old auxiliary lamp next to **new** auxiliary lamp and cut wire to length.
2. Strip 3/16 in (4.8 mm) of insulation off wire and crimp on **new** socket terminal.

NOTE

For instructions on crimping terminals, see A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

3. If removed, slide swivel block and Belleville washer down wire onto auxiliary lamp stud. Be sure that rounded side of swivel block and concave side of Belleville washer face auxiliary lamp.
4. Feed wire through slot at top of auxiliary lamp bracket and insert threaded stud into forward slot. Slide clamp block (rounded side up), turn signal mounting bracket and locknut up wire onto auxiliary lamp stud at bottom of bracket.
5. Using FLARE NUT SOCKET (Part No. Snap-on® FRX181), tighten locknut to 15-18 ft-lbs (20.3-24.4 Nm).
6. Reattach mechanics wire to socket terminal and carefully pull end of mechanics wire to draw socket terminal back through conduit.
7. Carefully remove mechanics wire to avoid damage to terminal.
8. Install terminal into socket housing. Refer to Table 7-6 or Table 7-7.

NOTE

For instructions on installing terminals, see A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

9. Connect front turn signal/auxiliary lamp connector.
10. Turn Ignition/Light Key Switch to IGNITION and test for proper operation and alignment. Adjust if necessary.
11. See Figure 7-21. Start two screws to secure turn signal lamp to mounting bracket. Verify that conduit fits in slot at back of bracket and is not pinched. Alternately tighten screws to 36-60 **in-lbs** (4.1-6.8 Nm).
12. Proceed as follows:
    a. **Road King models:** Install headlamp assembly. See 7.11 HEADLAMP: ALL EXCEPT ROAD GLIDE.
    b. **Fairing models:** Install connector on T-stud at top of left or right fairing support brace (outboard side). Verify that conduit is routed inboard using relief in upper outboard corner of chrome skirt. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
13. Assemble auxiliary lamp, if necessary. See 7.13 AUXILIARY LAMPS AND BRACKETS, Auxiliary Lamp Bulb Replacement.

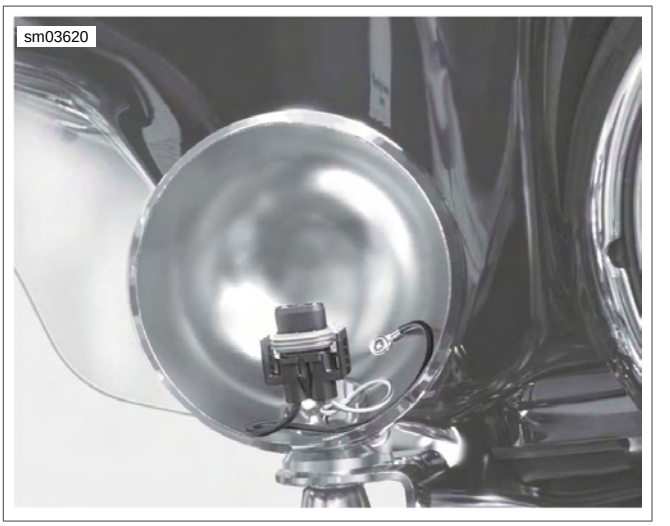


Figure 7-25. Auxiliary Lamp Housing

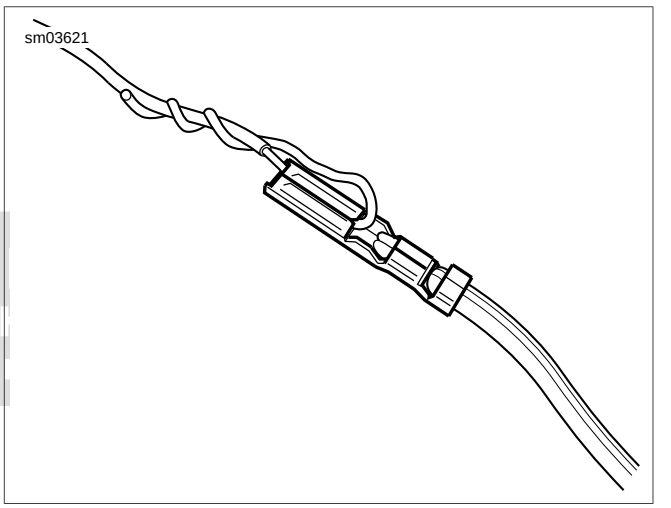


Figure 7-26. Fix Mechanics Wire to Socket Terminal

AUXILIARY LAMP BRACKET

Removal

1. Proceed as follows:
    a. **Road King Models:** See Figure 7-23. Remove headlamp assembly. See 7.11 HEADLAMP: ALL EXCEPT ROAD GLIDE. Disconnect auxiliary lamps connector [73], white 2-place Multilock. Disconnect front turn signal lamps connector [31], 6-place Multilock, anchored in hole of fork stem nut lockplate (left side).
    b. **Fork Mounted Fairing Models:** See Figure 7-24. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS. Disconnect the left and right front turn signal/auxiliary lamp connectors [31L/R], 4-place Multilocks, on T-studs at top of left and right fairing support braces (outboard sides).

2. Proceed as follows:
   a. **Road King Models:** Remove acorn nuts from fork bracket studs.
   b. **Fork Mounted Fairing Models:** Loosen screws in upper and lower fork brackets.
3. Remove auxiliary lamp bracket from motorcycle.

Installation

1. Install auxiliary lamp bracket on motorcycle. Proceed as follows:
   a. **Road King Models:** Slide slots of auxiliary lamp bracket onto upper and lower fork bracket studs. Install acorn nuts on studs. Alternately tighten acorn nuts to 72-108 **in-lbs** (8.1-12.2 Nm) using a crosswise pattern.
   b. **Fork Mounted Fairing Models:** Slide slots of auxiliary lamp bracket onto screws in upper and lower fork brackets. Alternately tighten screws to 15-20 ft-lbs (20-27 Nm) using a crosswise pattern.
2. Proceed as follows:
   a. **Road King Models:** Connect auxiliary lamps connector [73], white 2-place Multilock. Connect front turn signal lamps connector [31], 6-place Multilock. Install anchor on connector into hole of fork stem nut lockplate (left side). Install headlamp assembly. See 7.11 HEADLAMP: ALL EXCEPT ROAD GLIDE.
   b. **Fork Mounted Fairing Models:** Connect the left and right front turn signal/auxiliary lamp connectors [31L/R], 4-place Multilocks. Install connectors on T-studs at top of left and right fairing support braces (outboard sides). Verify that conduit is routed inboard using reliefs in upper outboard corners of chrome skirt. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.

ADJUSTMENT

See 1.21 HEADLAMP ALIGNMENT for alignment procedures.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TAIL LAMP 7.14

TAIL LAMP BULB REPLACEMENT

Removal

1. Remove two screws to release tail lamp assembly from chrome base.
2. See Figure 7-27. Disconnect tail lamp connector (3).
3. Rotate bulb socket (4) 1/4 turn counterclockwise and remove from tail lamp assembly. Pull bulb from socket.

Installation

1. Coat base of **new** bulb with ELECTRICAL CONTACT LUBRICANT (Part No. 99861-02). Install **new** bulb in socket.
2. Insert socket (4) into tail lamp assembly and rotate 1/4 turn clockwise.
3. See Figure 7-27. Connect tail lamp connector (3).
4. Place tail lamp into position against chrome base.

NOTE

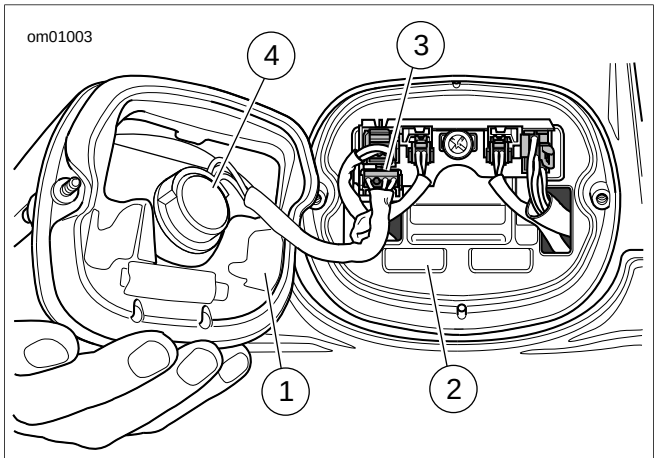
Over tightening screws can crack the lens.

5. Install two screws and tighten to 20-24 **in-lbs** (2.3-2.7 Nm).

⚠WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

6. Test tail lamp operation.



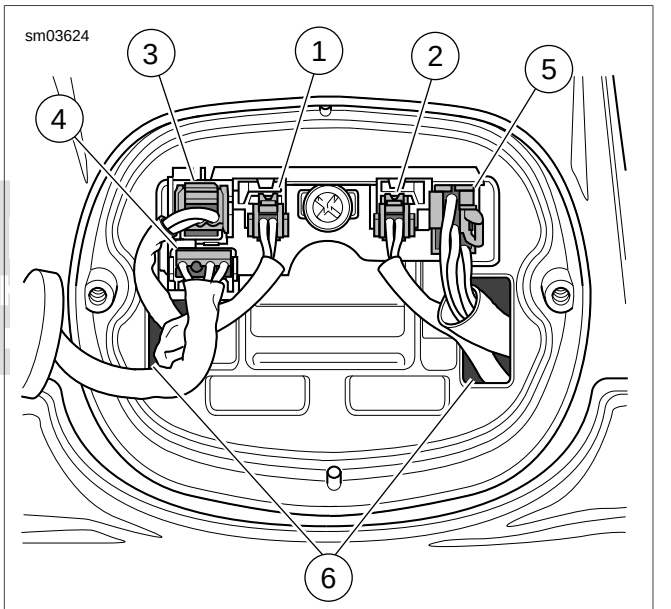
1. **Lens**
2. **Base**
3. **4-pin multilock connector**
4. **Bulb socket**

Figure 7-27. Tail Lamp Assembly

CIRCUIT BOARD/CHROME BASE

Removal

1. Remove two screws to release tail lamp assembly from chrome base.
2. See Figure 7-27. Disconnect tail lamp connector (3).
3. See Figure 7-28 and Figure 7-29. Disconnect remaining connectors. To release socket housings of left and right turn signal lamps, use a pick or small screwdriver to press button.
4. Remove screw at center of chrome base. Push chrome base upward until it is free of fender and pull out of fender hole.
5. See Figure 7-28. Feed connector housings through openings to inboard side of chrome base. For best results, free the smaller socket housings first.



1. **Left turn signal lamp [18]**
2. **Right turn signal lamp [19]**
3. **Rear fender tip lamp [45]**
4. **Tail lamp [93]**
5. **Rear fender lights harness [94]**
6. **Opening**

Figure 7-28. Rear Fender Lights Assembly

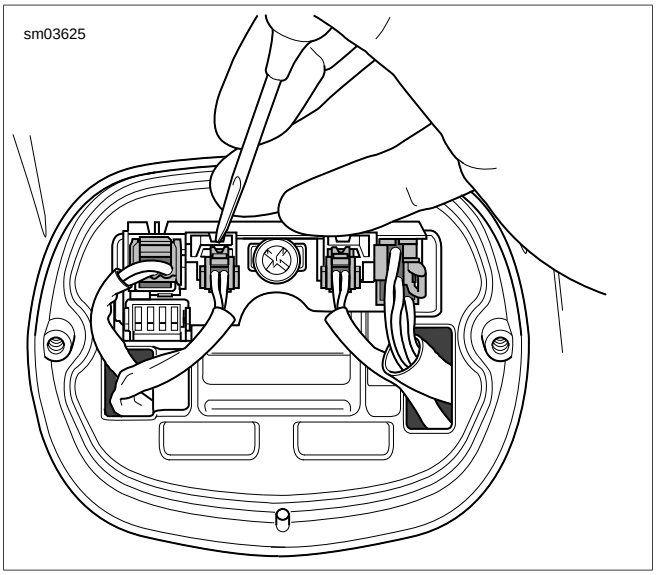


Figure 7-29. Use Pick Tool to Release Left Turn Signal Lamp Socket

6. Remove pin housing/circuit board from chrome base.

Installation

1. See Figure 7-28. Feed connector housings through openings to outboard side of chrome base. For best results, feed the larger socket housings first.
2. Fit bottom of chrome base into fender hole and push down to align center hole with clip nut on fender flange.
3. See Figure 7-30. Place pin housing over circuit board, if removed.
4. Insert index pins at back of pin housing into holes in chrome base.

NOTE

Over tightening screw can crack the chrome base.

5. Install screw (with captive washer) to secure pin housing/circuit board. Tighten screw to 40-48 **in-lbs** (4.5-5.4 Nm).
6. Install connector housings into circuit board.
7. See Figure 7-27. To avoid stressing wires, verify that tail lamp conduit is positioned on the outboard side of the rear fender tip lamp and left turn signal lamp conduit.
8. Place tail lamp into position against chrome base.

NOTE

Over tightening screws can crack the lens.

9. Install two screws and tighten to 20-24 **in-lbs** (2.3-2.7 Nm).

⚠WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

10. Test lamp for proper operation.

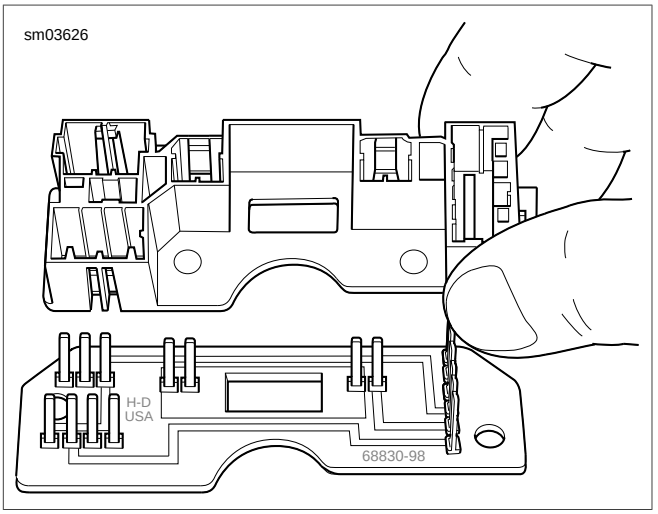


Figure 7-30. Place Pin Housing Over Circuit Board

REAR FENDER LIGHTS HARNESS: ALL EXCEPT FLHX, FLTRX

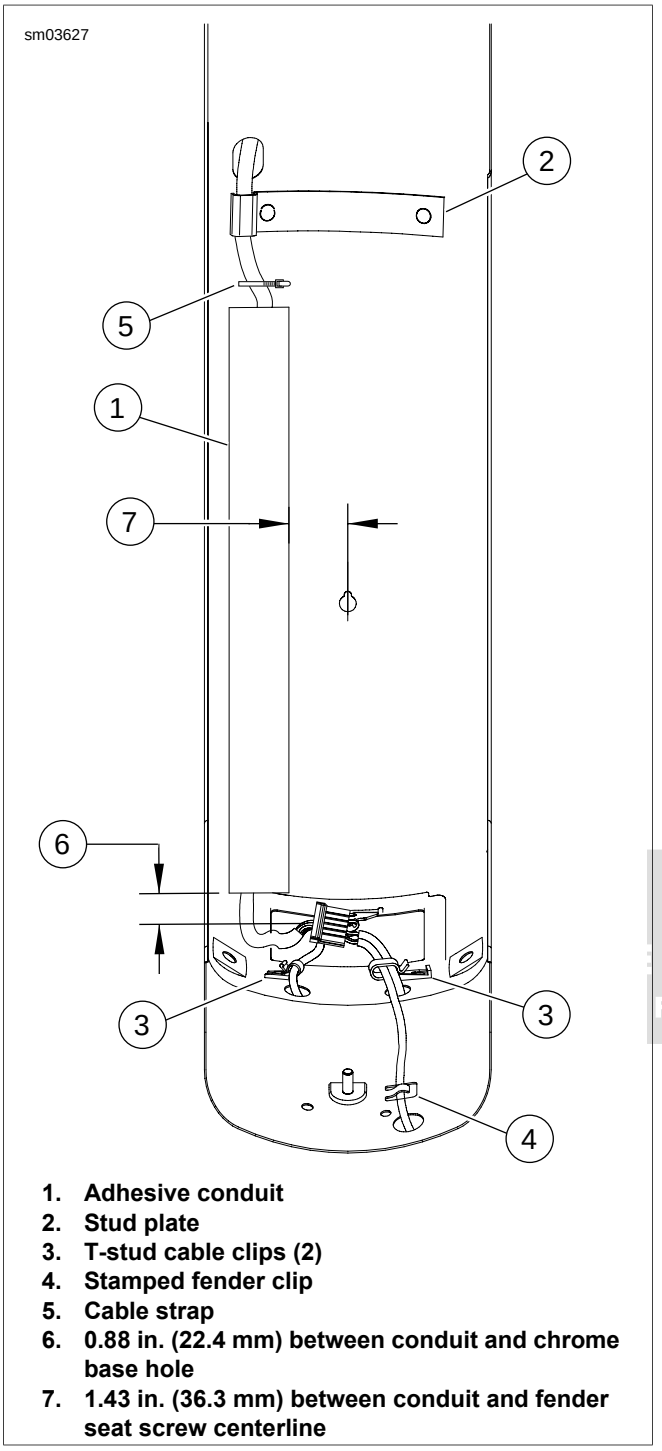
Removal

NOTE

FLHTC models use a jumper harness between the fender harness connector and the main harness connector located in the left electrical caddy, which can be removed and installed independent of the fender harness.

1. Remove rear fender. See 2.46 REAR FENDER.
2. Remove tail lamp assembly from chrome base.
3. See Figure 7-28. Disconnect connector (4) and set tail lamp assembly aside. Disconnect connector (5) and feed through opening to inboard side of fender.
4. See Figure 7-31. Release turn signal lamp wires from cable clips (3). On FLHTC/U, FLHTK models, release wire from stamped fender clip (4).
5. Release harness from channel in stud plate (2). Loosen flange nuts if necessary.
6. Remove adhesive conduit (1) with wire harness from fender well.
7. If replacing only conduit (1):
   a. Carefully cut adhesive conduit and remove wire harness.
   b. Remove rear connector from harness. See B.1 CONNECTORS.

DIGITAL TECHNICIAN HARLEY-DAVIDSON®



1. **Adhesive conduit**
2. **Stud plate**
3. **T-stud cable clips (2)**
4. **Stamped fender clip**
5. **Cable strap**
6. **0.88 in. (22.4 mm) between conduit and chrome base hole**
7. **1.43 in. (36.3 mm) between conduit and fender seat screw centerline**

Figure 7-31. Rear Fender Well

Installation

1. Clean fender as follows:
   a. Thoroughly clean fender well with soap and water. Do not use solvents or harsh chemicals that may damage painted surfaces.
   b. Remove all residual adhesive using 3M General Purpose Adhesive Remover (Part No. 051135).
   c. See Figure 7-31. Using a soapy Scotch Brite® pad, thoroughly clean fender well in area of adhesive conduit.
   d. Rinse with clear water and thoroughly dry with a clean white cloth. Repeat until clean cloth shows no evidence of dirt.
   e. Swab area with isopropyl alcohol and allow to dry.
2. If replacing only the adhesive conduit:
   a. Verify cable strap (3) is installed as shown in Figure 7-32 to prevent rearward movement of the harness.
   b. Draw harness through **new** conduit until progress is halted by installed cable strap (3).
3. Install connector housing on harness. See B.1 CONNECTORS. Refer to Table 7-8 for proper wire location.
4. See Figure 7-31. Remove paper backing and lightly press conduit in location shown in graphic.
5. Use a wallpaper seam roller to press conduit securely in place.
6. Allow the adhesive 72 hours to fully cure. Installation of the fender may proceed, but exercise caution to avoid pulling or repositioning adhesive conduit.
7. Feed forward connector housing of harness through hole in front of fender.
8. Capture harness in channel of stud plate (2). If loosened, tighten flange nuts to 60-96 **in-lbs** (6.8-10.9 Nm).
9. Feed rear harness connectors through openings in fender and capture turn signal lamp wires in cable clips (3). On FLHTC/U, FLHTK models, capture rear fender tip lamp wire in stamped fender clip (4).
10. See Figure 7-28. Mate tail lamp connectors (3, 4) to tail lamp base.
11. Verify that tail lamp harnesses are routed as shown in Figure 7-27.

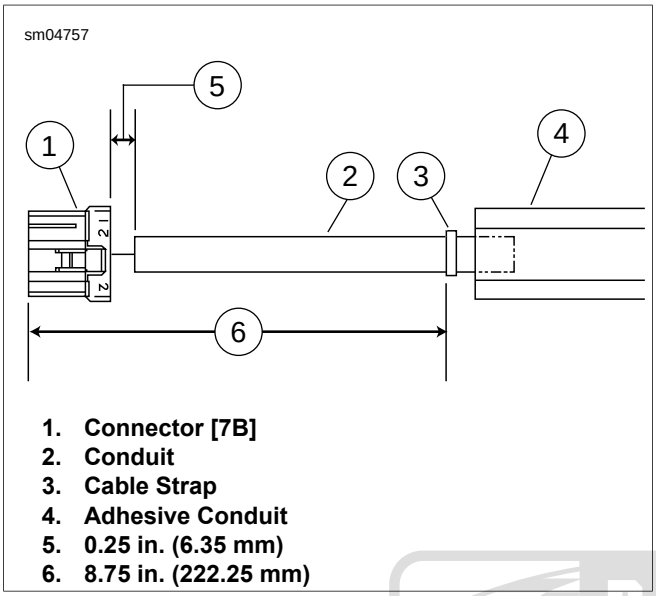
NOTE

Over-tightening screws can crack the lens.

12. Install tail lamp and tighten screws to 20-24 **in-lbs** (2.3-2.7 Nm).
13. Install rear fender. See 2.46 REAR FENDER.

Table 7-8. Rear Fender Lights [94]

WIRE COLOR	CHAMBER NUMBER	WIRE COLOR	CHAMBER NUMBER
Orange/White	1	Red/Yellow	4
Brown	2	Violet	5
Blue	3	Black	6



1. **Connector [7B]**
2. **Conduit**
3. **Cable Strap**
4. **Adhesive Conduit**
5. **0.25 in. (6.35 mm)**
6. **8.75 in. (222.25 mm)**

Figure 7-32. Install Cable Strap on Conduit

REAR FENDER LIGHTS HARNESS: FLHX, FLTRX

Removal

1. Remove left saddlebag and left side cover.
2. See Figure 7-33. Cut cable straps (2, 3).
3. Separate connector (1).
4. See Figure 7-34. Cut cable straps (1).
5. Release harness from molded clips (2) on fascia.
6. Disconnect harness from fender tip lamp.
7. Note harness routing and remove harness.

NOTE

Models intended for sale in Canada incorporate both a turn signal light bar and tail lamp, and include an additional jumper harness.

8. **Canadian Models:** See Figure 7-35.
   a. Remove rear fender. See 2.46 REAR FENDER.
   b. Remove tail lamp lens.
   c. Disconnect jumper harness (2) from the rear fascia lamp and the tail lamp.
   d. Release jumper harness from clamps (1, 3) and remove from fender.

Installation

1. **Canadian Models:** See Figure 7-35.
   a. Route jumper harness (2) from tail lamp to the fascia lamp and connect to each lamp.

   NOTE

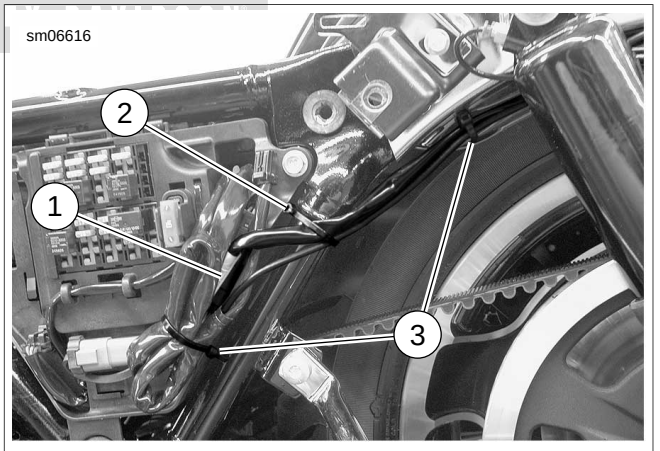
   Over tightening screws can crack the lens.

   b. Install tail lamp lens and tighten screws to 20-24 **in-lbs** (2.3-2.7 Nm).
   c. Secure jumper harness with clamps (1, 3) and install fender. See 2.46 REAR FENDER.
2. See Figure 7-33 and Figure 7-34. Route harness in approximate position, passing behind frame and through opening in left caddy.
3. See Figure 7-34. Pass harness under antenna mount (3) and secure harness in molded clips (2) on inside of fascia. Connect to fender tip lamp. Pull harness up to remove slack near fender tip lamp.

NOTE

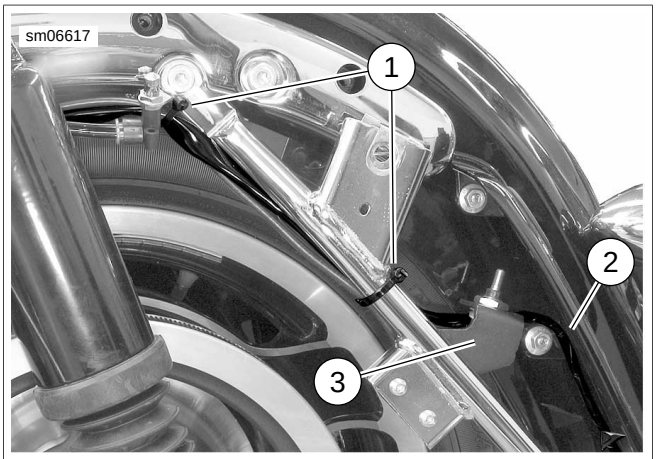
Cable ties may also secure additional harnesses.

4. Secure harness using **new** cable ties (1) around air valve bracket and saddlebag support as shown.
5. See Figure 7-33. Pull slack from harness and secure to caddy with **new** cable strap (2).
6. Mate connector (1) and secure harness with **new** anchored cable straps (3).
7. Install side cover and saddlebag.



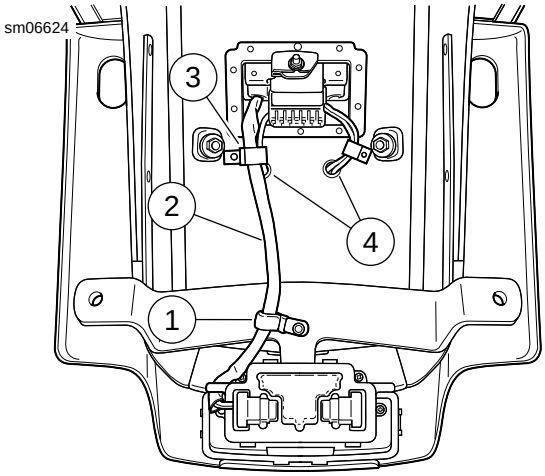
1. **Connector**
2. **Cable strap**
3. **Cable strap, anchored**

Figure 7-33. Rear Fender Lamps Harness, Antenna Cable and Air Tube Routing



1. Cable strap
2. Molded clip (2)
3. Antenna mount

Figure 7-34. Rear Fender Lamps Harness, Antenna Cable and Air Tube Routing



1. P-clamp
2. Jumper harness
3. Clamp, tee-stud
4. Turn signal lamps harnesses

Figure 7-35. Tail Lamp Jumper Harness (models with tail lamp)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

FENDER TIP LAMPS 7.15

FRONT FENDER TIP LAMP

Removal

1. Insert blade of small screwdriver into slot at top of fender tip lamp lens. Rotate end of screwdriver to unsnap lens from lamp bracket.
2. Holding Keps nuts at inboard side of rear fender, remove two screws to release fender tip lamp bracket.
3. See Figure 7-38. Disconnect front fender tip lamp connector [143], 2-place Multilock.

Installation

1. See Figure 7-38. Connect front fender tip lamp connector [143], 2-place Multilock.
2. With wires routed along bottom left side, place fender tip lamp bracket into position aligning holes in bracket with those in fender.
3. Slide screws through bracket and fender holes and install Keps nuts. Holding nuts at inboard side of fender, tighten screws to 20-25 **in-lbs** (2.3-2.8 Nm).

NOTE

Over tightening screws can crack the bracket or result in scratching of the fender paint.

4. Insert tab at bottom of lens into slot of fender tip lamp bracket. Apply thumb pressure at top of lens until it snaps into place.

⚠WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

5. Turn the Ignition/Light Key Switch to IGNITION and test lamp for proper operation.

FRONT FENDER TIP LAMP JUMPER HARNESS

Removal

1. **FLHR:** Remove headlamp assembly. See 7.11 HEADLAMP: ALL EXCEPT ROAD GLIDE. Disconnect the front fender tip lamp jumper harness connector [32], 2-place Multilock. See Figure 7-36.
2. **FLHTC/U, FLHTK:** Reaching in below the fairing cap on the left side of the steering head, disconnect the front fender tip lamp jumper harness connector [32], 2-place Multilock. See Figure 7-37. Remove outer fairing only if necessary. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
3. Draw socket housing down to fender area.
4. Carefully cut cable strap to release front fender tip lamp wires from brake caliper hose.
5. Remove terminals from socket housing.

NOTE

For instructions on removing terminals, see A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

6. Place the motorcycle on a suitable lifting device with the front wheel raised off the ground.

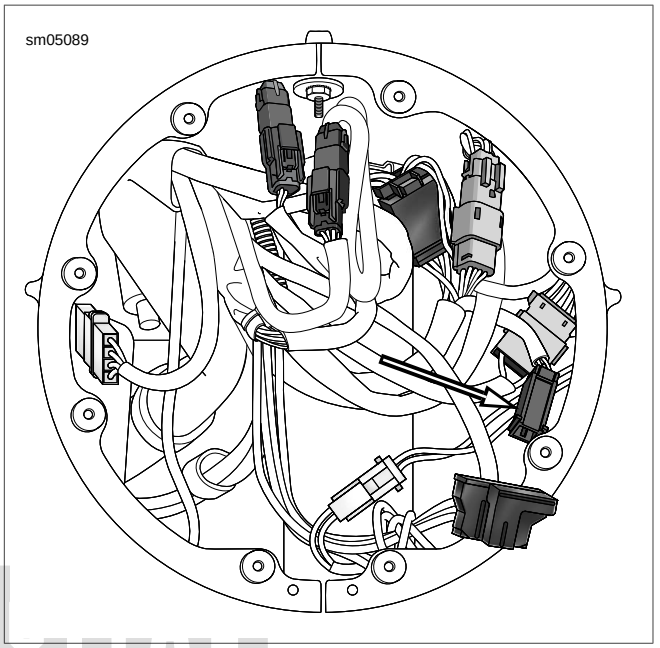


Figure 7-36. Front Fender Tip Lamp Jumper Harness Connector (Road King)

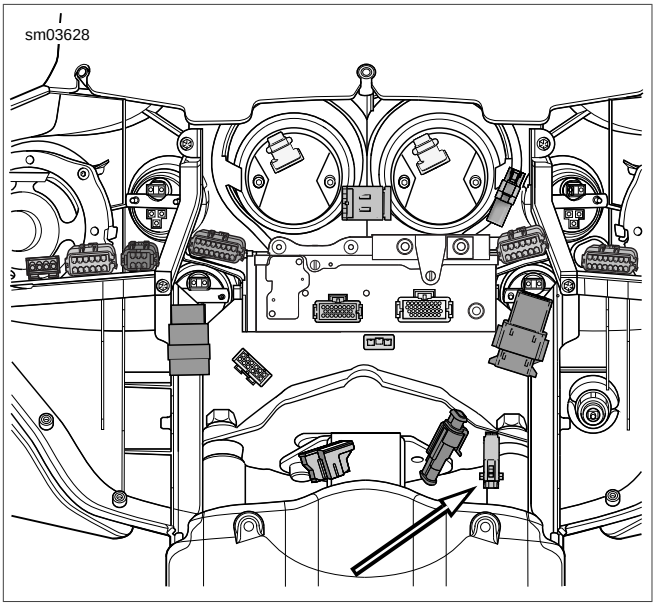
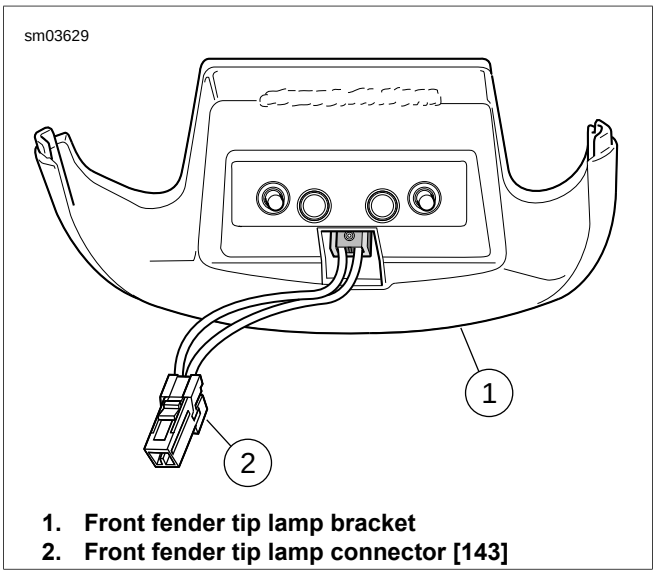


Figure 7-37. Front Fender Tip Lamp Jumper Harness Connector (models with fork mounted fairing)

7. Remove front wheel. See 2.4 FRONT WHEEL.

8. From inboard side of front fender, remove two nuts to release trim strip from left side of fender. See Figure 7-39.
9. Pull wires and socket terminals through grommet to inboard side of fender. See Figure 7-40. Reaching under left side of fender, draw wires forward out from beneath fender bracket.
10. Feed wires through oblong hole to outboard side of fender.



1. **Front fender tip lamp bracket**
2. **Front fender tip lamp connector [143]**

Figure 7-38. Front Fender Tip Lamp Assembly

11. Insert blade of small screwdriver into slot at top of fender tip lamp lens. Rotate end of screwdriver to unsnap lens from lamp bracket.
12. Holding Keps nuts at inboard side of front fender, remove two screws to release fender tip lamp bracket.
13. Disconnect front fender tip lamp connector [143], 2-place Multilock, to release fender tip lamp assembly from jumper harness. See Figure 7-38.

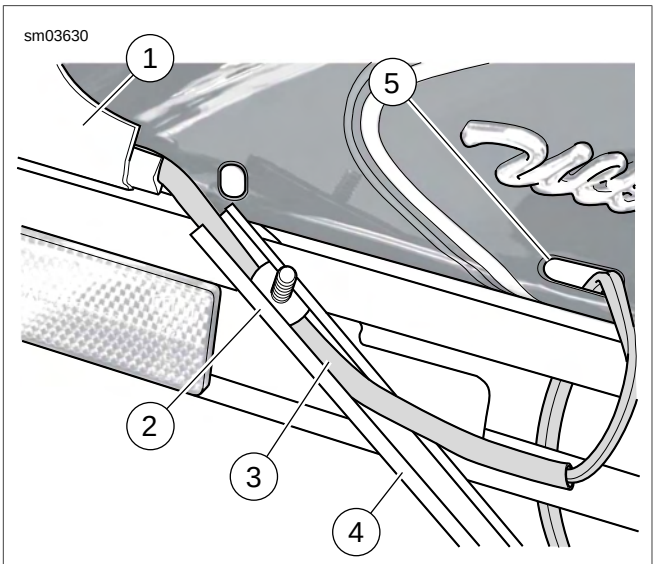
Installation

1. Connect front fender tip lamp connector [143], 2-place Multilock, to attach fender tip lamp assembly to jumper harness. See Figure 7-38.
2. Pull jumper harness conduit as close to fender tip lamp connector [143] as possible, for the conduit is not easily routed beneath the fender bracket.
3. With conduit routed along bottom left side, place fender tip lamp bracket into position aligning holes in bracket with those in fender.
4. Slide screws through bracket and fender holes and install Keps nuts. Holding nuts at inboard side of fender, tighten screws to 20-25 **in-lbs** (2.3-2.8 Nm).

NOTE

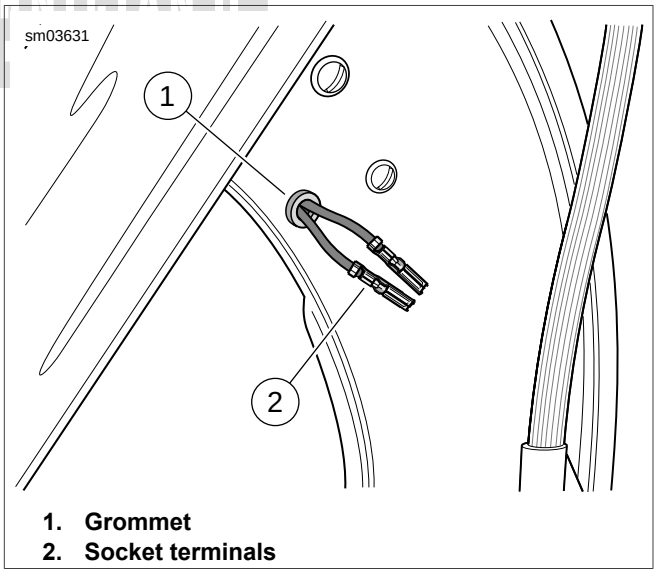
Over tightening screws can crack the bracket or result in scratching of the fender paint.

5. Insert tab at bottom of lens into slot of fender tip lamp bracket. Apply thumb pressure at top of lens until it snaps into place.
6. Route wire conduit inside trim strip and slide front tee bolt over conduit. See Figure 7-39. Verify that second tee bolt is in position at rear of trim strip.



1. **Fender tip lamp bracket**
2. **Tee bolt**
3. **Wire conduit**
4. **Trim strip**
5. **Oblong hole**

Figure 7-39. Install Conduit in Trim Strip



1. **Grommet**
2. **Socket terminals**

Figure 7-40. Pull Fender Tip Lamp Wires and Terminals Through Fender Grommet

7. Feed socket terminals and wires through oblong hole to inboard side of fender.

NOTE

Use the rearmost oblong hole as the front may be used for installation of certain P&A accessories.

8. While removing slack from wires on outboard side of fender, align tee bolts with fender holes. With trim strip

positioned against left side of fender, reach under fender and install nuts on tee bolts. Alternately tighten nuts to 10-15 **in-lbs** (1.1-1.7 Nm).

9. Reaching under left side of fender, route wires of the jumper harness rearward between tee bolt nut and fender bracket and then beneath fender bracket to grommet. See Figure 7-41.
10. Feed socket terminals and wires through grommet to outboard side of fender. See Figure 7-40.

NOTE

If any portion of the jumper harness is above the height of the fender bracket, contact with the tire can cause chafing or other damage. Damage to the wiring can lead to loss of lighting.

11. Remove slack from wires on inboard side of fender. Verify that no portion of the jumper harness is above the height of the fender bracket.
12. Install terminals into socket housing.

NOTE

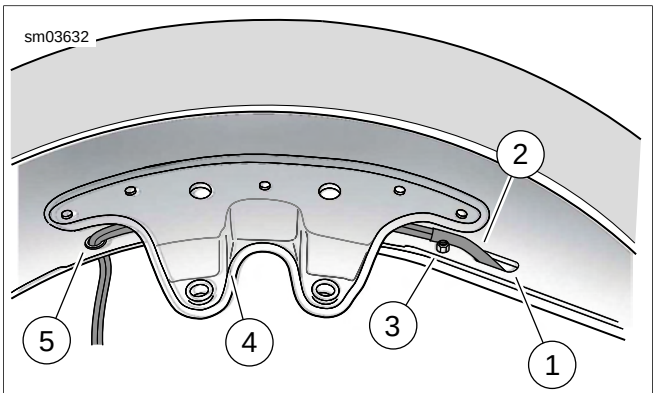
For instructions on installing terminals, see A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

13. Route socket housing upward behind chrome skirt (FLHTC/U, FLHTK) or through bottom of headlamp nacelle (FLHR) to area beneath upper fork bracket. Connect front fender tip lamp jumper harness connector [32].

NOTE

To connect jumper harness connector with the outer fairing installed (FLHTC/U, FLHTK models), reach in below the fairing cap on the left side of the steering head.

14. Install front wheel. See 2.4 FRONT WHEEL.
15. Install **new** cable strap to secure front fender tip lamp wires to brake caliper hose. See Figure 7-42.
16. **FLHR:** Install headlamp assembly. See 7.11 HEADLAMP: ALL EXCEPT ROAD GLIDE.
17. **FLHTC/U, FLHTK:** Install outer fairing, if removed. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.



1. **Oblong hole**
2. **Jumper harness**
3. **T-bolt nut**
4. **Fender bracket**
5. **Grommet**

Figure 7-41. Left Side Front Fender Well

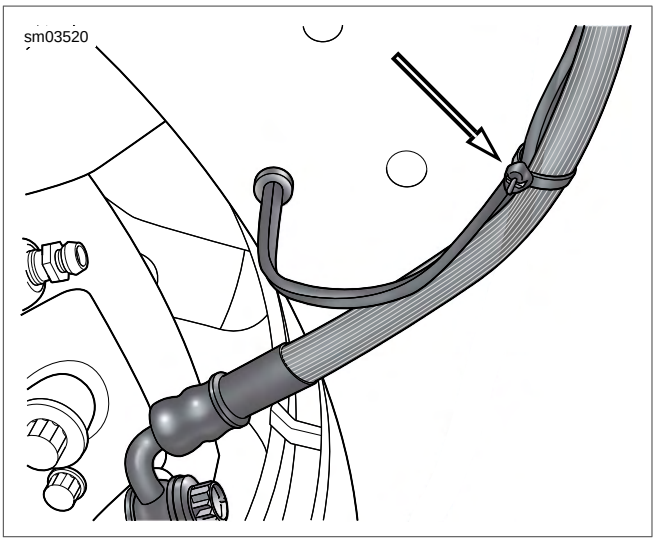


Figure 7-42. Capture Brake Hose and Front Fender Tip Lamp Wires

⚠WARNING

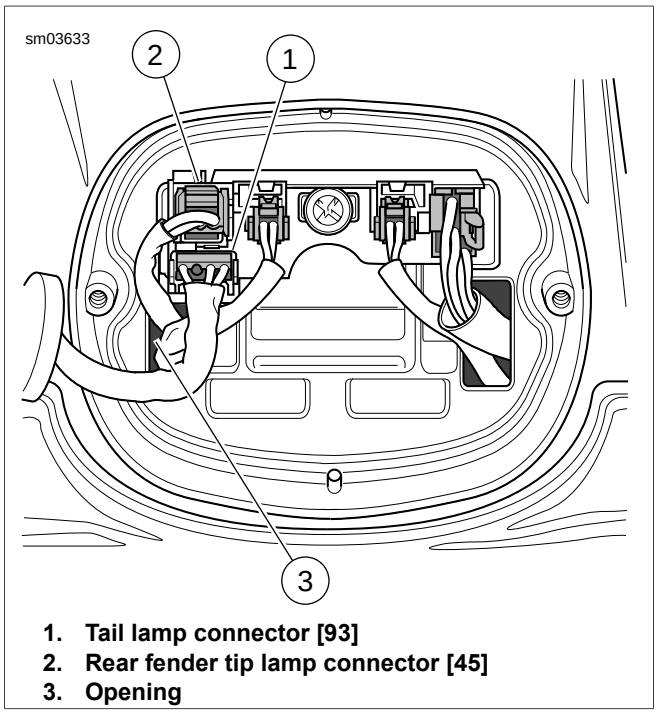
Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

18. Turn Ignition/Light Key Switch to IGNITION and test lamp for proper operation.

REAR FENDER TIP LAMP

Removal

1. Remove screws to release tail lamp assembly from chrome base.
2. See Figure 7-43. Disconnect tail lamp connector [93] (1). Set tail lamp assembly aside.
3. Disconnect rear fender tip lamp connector [45] (2).
4. Feed harness through opening (3) in chrome base to inboard side of rear fender.
5. Remove harness from both clips on inner side of fender.
6. See Figure 7-44. Remove two screws (2) from inboard side of fender to release fender tip lamp.
7. Remove fender tip lamp from rear fender.



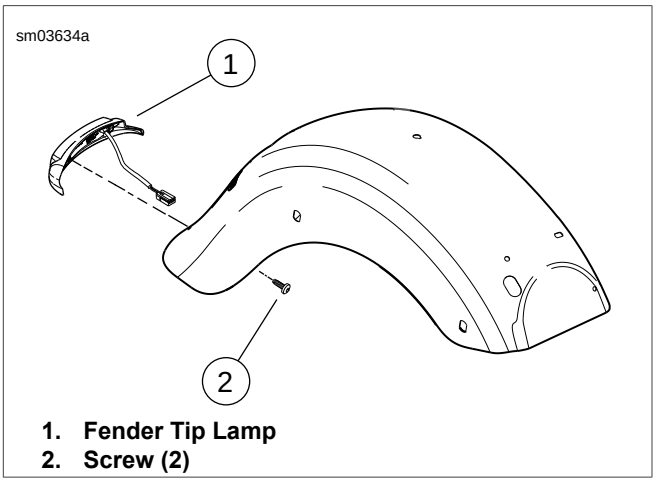
1. **Tail lamp connector [93]**
2. **Rear fender tip lamp connector [45]**
3. **Opening**

Figure 7-43. Depress Button to Release Socket from Pin Housing

4. See Figure 7-43. Attach tail lamp connector [93] (1) to base.
5. Install tail lamp with two screws and tighten to 20-24 **in-lbs** (2.3-2.7 Nm).

NOTE

Over tightening screws can crack the lens or result in scratching of the fender paint.



1. **Fender Tip Lamp**
2. **Screw (2)**

Figure 7-44. Rear Fender Tip Lamp

Installation

1. See Figure 7-43. Route rear fender tip lamp harness through hole at bottom of fender and back through opening (3) in tail lamp base. Attach rear fender tip lamp connector [45] (2).
2. Install rear fender tip lamp harness into both clips on inner side of fender.
3. See Figure 7-44. Place fender tip lamp into position and secure with two screws (2). Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).

⚠WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

6. Turn the Ignition/Light Key Switch to IGNITION and test lamp for proper operation.

TURN SIGNAL LAMPS 7.16

TURN SIGNAL BULB REPLACEMENT: BULLET STYLE

1. See Figure 7-45. Insert a coin or the blade of a small screwdriver into the notch at the bottom of the lens cap. Carefully twist until the lens cap pops out of the lamp housing.
2. Push bulb in and rotate counterclockwise. Pull bulb from socket.
3. Inspect condition of electrical contacts in socket. If necessary, clean with a small wire brush and electrical contact cleaner.
4. Coat base of **new** bulb with ELECTRICAL CONTACT LUBRICANT (Part No. 99861-02).
5. Align pins on bulb with pin guides in bulb socket. Push **new** bulb in and turn clockwise to lock in place.
6. Snap lens cap back into the lamp holder. Rotate lens to position notch at bottom of lamp.

⚠WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

7. Turn ignition on and test for proper operation.

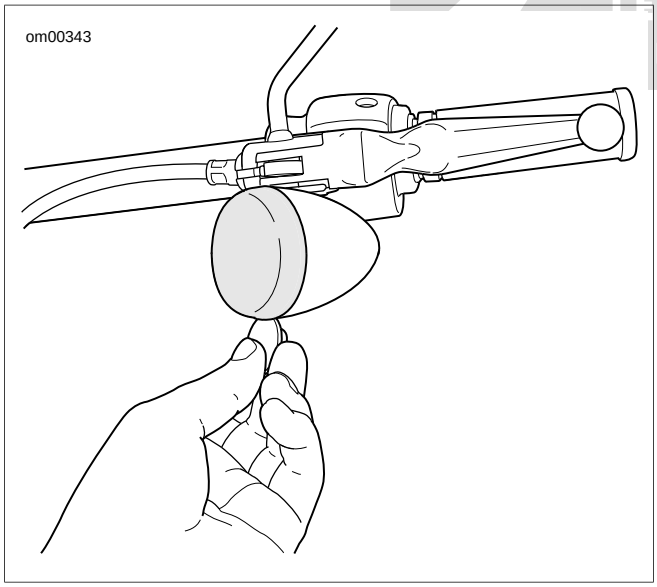


Figure 7-45. Lens Cap Notch

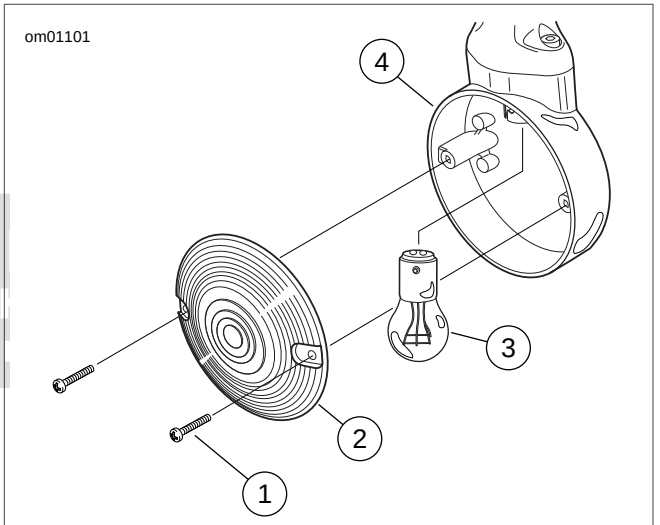
TURN SIGNAL BULB REPLACEMENT: FLAT LENS STYLE

1. See Figure 7-46. Remove two screws to release lens from lamp housing.
2. Push bulb in and rotate counterclockwise to remove bulb from socket.
3. Inspect condition of electrical contacts in socket. If necessary, clean with a small wire brush and electrical contact cleaner.
4. Liberally apply ELECTRICAL CONTACT LUBRICANT (Part No. 99861-02) to contacts in socket and at bottom of **new** bulb.
5. Orient index pins on **new** bulb with pin guides inside bulb socket. Push bulb in and turn clockwise to lock in place.
6. Seat lens in lamp and install two screws.

⚠WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

7. Test turn signal operation.



1. **Screws (2)**
2. **Lens**
3. **Bulb**
4. **Lamp housing**

Figure 7-46. Turn Signal Lamp Assembly: Flat Lens Style

FRONT TURN SIGNAL LAMP

Removal: Flat Lens Style

1. **Road King models:** See Figure 7-47. Remove headlamp assembly. See 7.11 HEADLAMP: ALL EXCEPT ROAD GLIDE. Disconnect front turn signal lamps connector.
2. **Fork mounted fairing models:** See Figure 7-48. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS. Disconnect the left or right front turn signal/auxiliary lamp connector.
3. Remove terminal(s) from connector housing. Refer to Table 7-9 or Table 7-10. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

Table 7-9. Front Turn Signal Lamps [31] (Road King)

LEFT SIDE		RIGHT SIDE	
WIRE COLOR	CHAMBER	WIRE COLOR	CHAMBER
Blue (DOM)	4	Black	1
Violet	5	Brown	2
Black	6	Blue (DOM)	3

Table 7-10. Front Turn Signal Lamps [31L/R] (fork mounted fairing models)

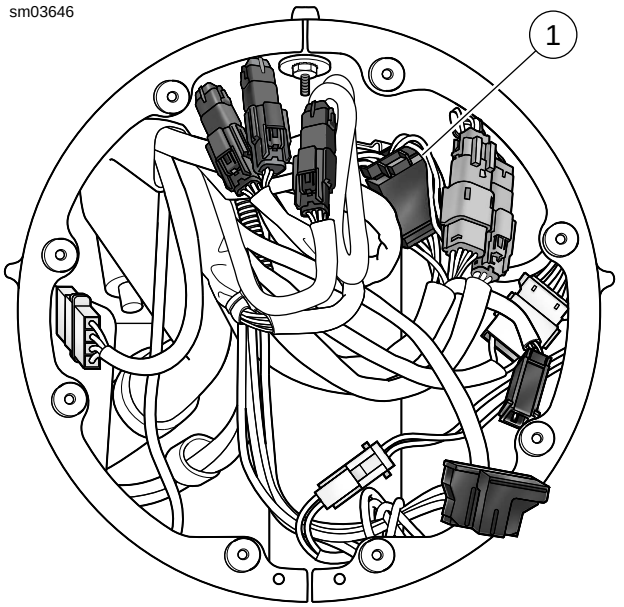
LEFT SIDE [31L]		RIGHT SIDE [31R]	
WIRE COLOR	CHAMBER	WIRE COLOR	CHAMBER
Blue	1	Blue	1
Violet	2	Brown	2
Black	3	Black	3
Note: Terminal 4 is reserved for the auxiliary lamp.			

4. See Figure 7-46. Remove two screws to release turn signal lamp from mounting bracket.

NOTE

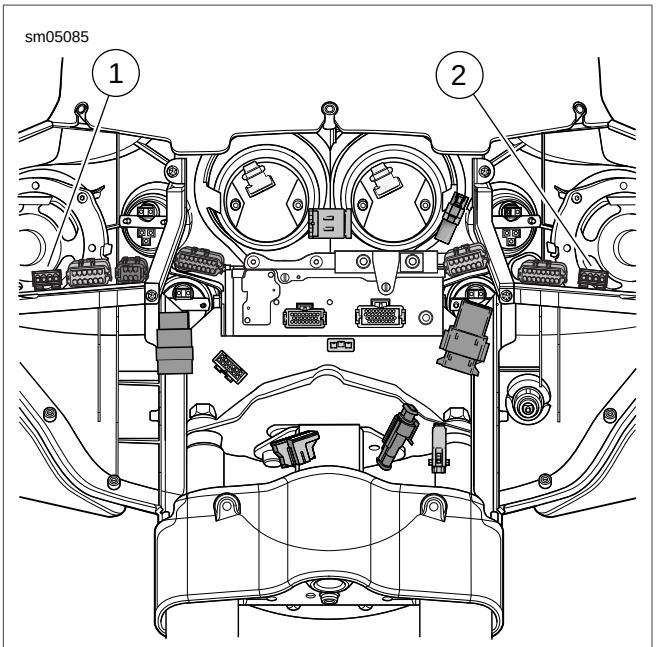
Be sure that chaser wire is of sufficient strength to pull terminals through conduit without breaking. Wire lengths must also be long enough so that free ends are not lost in conduit when pulled.

5. See Figure 7-49. Obtain three equal lengths of strong flexible wire for use as chaser wires. Securely attach a chaser wire to terminal of each wire.



1. **Front turn signal lamps [31]**

Figure 7-47. Headlamp Nacelle (Road King models)



1. **Right front turn signal/auxiliary lamp [31R]**
2. **Left front turn signal/auxiliary lamp [31L]**

Figure 7-48. Inner Fairing (fork mounted fairing models)

6. Carefully pull wires to draw terminals through both sections of conduit. For best results, pull one wire at a time.
7. Remove chaser wire from terminals.

Installation: Flat Lens Style

1. Lay old turn signal lamp next to **new** turn signal lamp and cut wires to length.
2. Strip 3/16 in. (4.8 mm) of insulation off wires and crimp on **new** terminals. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
3. Secure chaser wires to terminals. Carefully draw terminals back through conduit.
4. Remove chaser wires.
5. Install terminals into connector housing. Refer to Table 7-9 or Table 7-10. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
6. See Figure 7-46. Start two screws to secure turn signal lamp to mounting bracket. Verify that conduit fits in slot at back of bracket and is not pinched. Tighten screws to 30-60 **in-lbs** (4.1-6.8 Nm).
7. Connect front turn signal/auxiliary lamp connector.
8. **Road King models:** See Figure 7-47. Secure anchor to fork stem nut lockplate. Install headlamp assembly. See 7.11 HEADLAMP: ALL EXCEPT ROAD GLIDE.
9. **Fork mounted fairing models:** See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS. Secure connector on T-stud at top of fairing support brace. Verify that conduit is routed inboard using relief in upper outboard corner of chrome skirt. Install outer fairing.

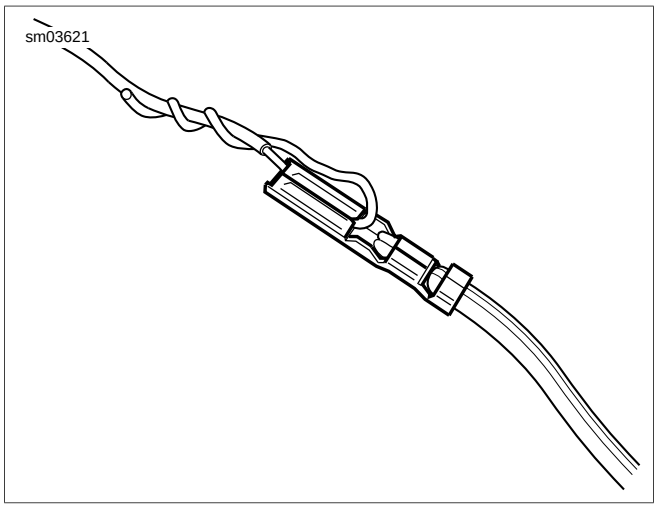


Figure 7-49. Fix Mechanics Wire to Socket Terminal

⚠WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

10. Test lamp operation.

Removal: Bullet Style, Fork Mounted

1. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
2. See Figure 7-48. Disconnect the turn signal lamp connector [31L/R], 4-place Multilock.
3. See Figure 7-50. Remove two screws to release turn signal lamp mounting bracket from upper and lower fork brackets.
4. To remove reflector/isolator assembly, proceed as follows:
   a. Remove terminals from connector housing. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
   b. Pull mounting bracket from conduit.
   c. Remove lens and bulb.
   d. See Figure 7-52. Insert a right angle pick or a 7/64 in. hex key through hole (4) and pull reflector from lamp.
   e. Remove isolator (3) from lamp if still installed.

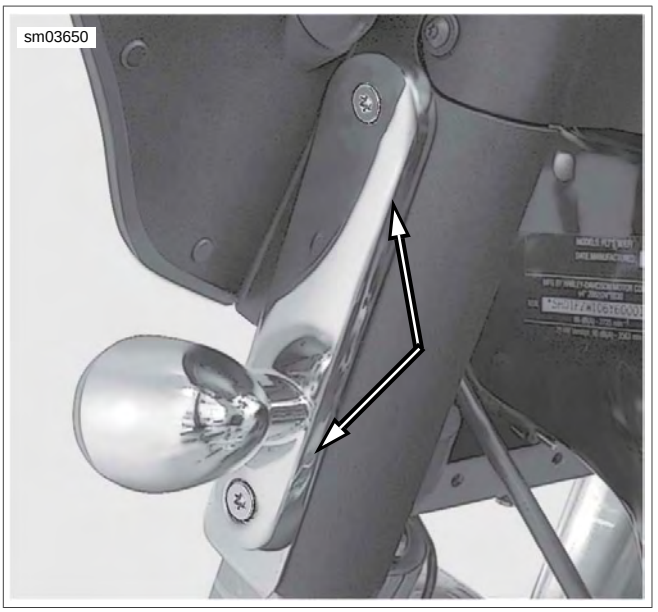


Figure 7-50. Front Turn Signal Lamp (FLHX)

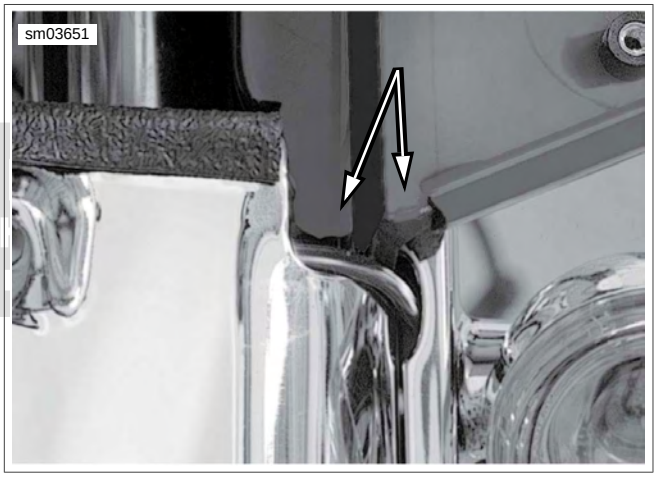
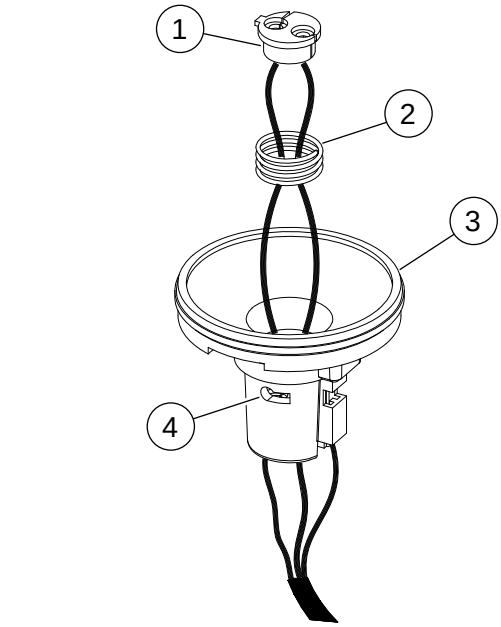


Figure 7-51. Route Conduit Through Mounting Bracket and Chrome Skirt Reliefs (FLHX)



1. **Lamp terminal base**
2. **Spring**
3. **Isolator**
4. **Hole**

Figure 7-52. Reflector/Isolator Assembly

Installation: Bullet Style, Fork Mounted

1. To install reflector/isolator assembly, proceed as follows:
   a. Seat reflector assembly in rubber isolator, aligning tab on reflector with slot in isolator.
   b. Feed wires through lens opening and out through unthreaded hole.
   c. Aligning tab on reflector with slot inside lamp, use thumbs of both hands and apply even pressure around outer edge of reflector assembly until fully seated.
   d. Liberally apply dielectric grease to contacts in socket and at bottom of bulb. Install bulb and lens with slot at bottom of lamp.
   e. Feed wires through hole in mounting bracket.
   f. Install lamp on mounting bracket and tighten screw to 15-20 ft-lbs (20-27 Nm).
   g. Install terminals into connector housing as shown in Table 7-11. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

Table 7-11. Turn Signal Lamp Connector (Bullet Style)

LEFT SIDE [31L]		RIGHT SIDE [31R]	
WIRE COLOR	CHAMBER	WIRE COLOR	CHAMBER
Blue	1	Blue	1
Violet	2	Brown	2
Black	3	Black	3
Empty	4	Empty	4

2. Start two screws to fasten turn signal lamp mounting bracket to upper and lower fork brackets.
3. See Figure 7-51. Verify that conduit is routed as shown and tighten screws to 15-20 ft-lbs (20-27 Nm).
4. See Figure 7-48. Connect front turn signal lamp connector and secure to fairing support brace.
5. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.

WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

6. Test lamp operation.

Removal: Bullet Style, Fairing Mounted

1. Remove outer fairing and front turn signal lamp. See 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.
2. To remove reflector/isolator assembly, proceed as follows:
   a. Remove terminals from connector housing. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
   b. Pull lamp from mounting bracket.
   c. Remove lens and bulb.
   d. See Figure 7-52. Insert a right angle pick or a 7/64 in. hex key through hole (4) and pull reflector from lamp.
   e. Remove isolator (3) from lamp if still installed.

Installation: Bullet Style, Fairing Mounted

1. Assemble front turn signal lamp as follows:
   a. Seat reflector assembly in rubber isolator, aligning tab on reflector with slot in isolator.
   b. Feed wires through lens opening and out through unthreaded hole.
   c. Aligning tab on reflector with slot inside lamp, use thumbs of both hands and apply even pressure around outer edge of reflector assembly until fully seated.
   d. Liberally apply dielectric grease to contacts in socket and at bottom of bulb. Install bulb and lens with slot at bottom of lamp.
   e. Install lamp onto mounting bracket.
   f. Install terminals into connector housing as shown in Table 7-11. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
2. Install outer fairing and front turn signal lamps. See 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.

WARNING

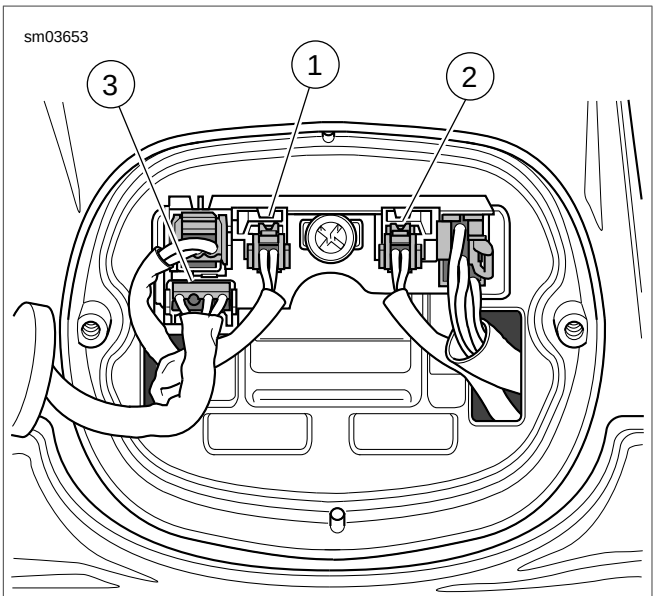
Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

3. Test lamp operation.

REAR TURN SIGNAL LAMP

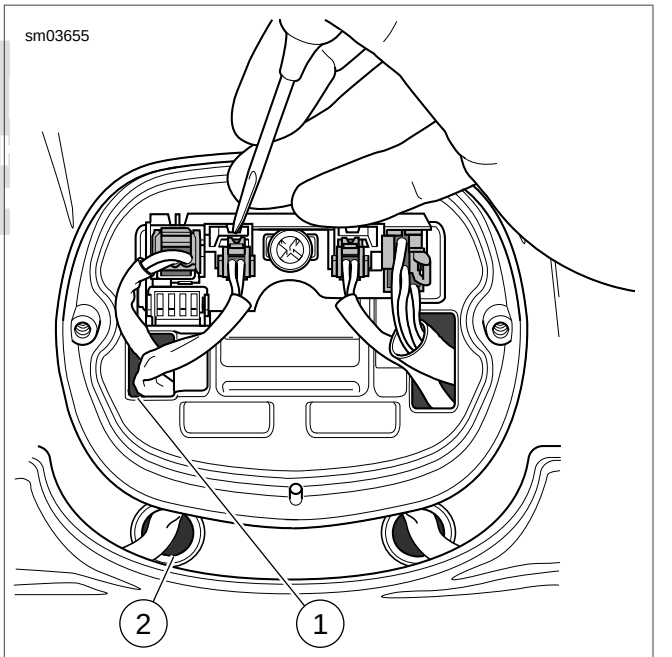
Removal: FLHR/C, FLHTC/U, FLHTK

1. Remove saddlebag as necessary. See 2.26 SADDLEBAGS.
2. Remove two screws to release tail lamp assembly from chrome base.



1. **Left turn signal lamp [18]**
2. **Right turn signal lamp [19]**
3. **Tail lamp [93]**

Figure 7-53. Release Tail Lamp Connector



1. **Opening**
2. **Fender hole**

Figure 7-54. Release Turn Signal Lamp Connector

3. See Figure 7-53. Disconnect tail lamp connector [93] (3), (4-place Multilock). Set tail lamp assembly aside.
4. See Figure 7-54. Disconnect turn signal lamp assembly, (2-place Multilock). For best results, use a pick or small screwdriver to press release button.
5. Feed connector housing through opening (1) in chrome base to inboard side of rear fender.

6. Release harness from cable clip inside fender.
7. Draw harness and connector housing out through fender hole (2).
8. Draw connector housing through channel on inboard side of rear turn signal lamp bracket, so that length of conduit hangs below turn signal lamp.
9. Inserting a long shank ball end socket (Snap-On FABL5) through channel in bracket, remove two screws to release turn signal lamp assembly.
10. Remove terminals from connector housing. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

Installation: FLHR/C, FLHTC/U, FLHTK

1. Place **new** turn signal lamp assembly next to discarded unit and cut wires to proper length.
2. Crimp **new** terminals onto turn signal lamp wires. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
3. Install terminals into connector housing. Refer to Table 7-12. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

Table 7-12. Rear Turn Signal Lamps Connector (models with tail lamp)

WIRE COLOR	CAVITY NUMBER
Violet	1
Black	2

4. Install turn signal lamp assembly and tighten screws to 30-50 **in-lbs** (3.4-5.6 Nm).
5. See Figure 7-54. Route connector housing through channel in bracket, then feed through fender hole (2).
6. Capture harness in cable clip under fender.
7. Feed connector housing through opening (1) in chrome base.
8. See Figure 7-53. Connect turn signal harness connector (1 or 2) to pin housing/circuit board.
9. Connect 4-place Multilock tail lamp connector (3). Verify that tail lamp conduit is positioned outboard of the rear fender tip lamp and left turn signal lamp harnesses.

NOTE

Over tightening screws can crack the lens.

10. Install tail lamp and tighten screws to 20-24 **in-lbs** (2.3-2.7 Nm).

⚠WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

11. Test lamp for proper operation.
12. Install saddlebag.

Removal: FLHX, FLTRX, FLTRU

NOTES

- *This procedure covers replacement of the rear turn signal lamp reflector/ isolator assembly only.*
- *LED-type lamps can not be replaced individually. The entire bracket must be replaced as an assembly. See 7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket.*

1. **Models with tail lamp:**
   a. Remove chrome base and circuit board assembly. See 7.14 TAIL LAMP.
   b. Remove terminals from turn signal lamp connector housing. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
   c. Release harness from cable clip inside fender.
   d. Draw harness and terminals through hole to outboard side of fender. Proceed with reflector/isolator removal.
2. **Models without tail lamp:**
   a. Remove turn signal lamps bracket. See 7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket.
   b. Remove grommet from harness.
   c. Remove license plate bracket.
   d. Remove screws securing license plate lamp.
   e. Remove terminals from connector housing. See A.9 DELPHI MICRO 64 SEALED CONNECTORS.
   f. Pull wires through main conduit. Proceed with reflector/isolator removal.
3. Reflector/isolator removal:
   a. Remove lens and bulb.
   b. Push grommet into lamp housing. Lightly lubricate grommet with glass cleaner, if necessary.
   c. See Figure 7-55. Insert a right angle pick or a 7/64 in. hex key through hole (4) and pull reflector from lamp.
   d. Remove rubber isolator (3) from lamp if still installed.

Installation: FLHX, FLTRX, FLTRU

1. Place **new** reflector/isolator assembly next to discarded unit and cut wires to proper length.

2. Install reflector/isolator assembly:
   a. Seat reflector assembly in rubber isolator, aligning tab on reflector with slot in isolator.
   b. Feed wires through lens opening and out through hole in lamp housing.
   c. Install grommet in lamp housing. Lightly lubricate grommet with glass cleaner, if necessary.
   d. Aligning tab on reflector with slot inside lamp, use thumbs of both hands and apply even pressure around outer edge of reflector assembly until fully seated.
   e. Liberally apply dielectric grease to contacts in socket and at bottom of bulb. Install bulb and lens with slot at bottom of lamp.
3. **Models with tail lamp:**
   a. Install **new** terminals onto wires. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
   b. Feed terminals through hole to inboard side of fender.
   c. Install terminals into connector housing. Refer to Table 7-12. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
   d. Capture harness in cable clip inside fender.
   e. Install chrome base and circuit board assembly. See 7.14 TAIL LAMP.
4. **Models without tail lamp:**
   a. Feed wires through main conduit. Install **new** terminals and install in connector housing. Refer to Table 7-13 or Table 7-14. See A.9 DELPHI MICRO 64 SEALED CONNECTORS.
   b. Route both turn signal lamp harnesses under license plate lamp area and install license plate lamp and license plate bracket. See 7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket.
   c. Install turn signal lamps bracket. See 7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket.

⚠WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

5. Test lamp operation.

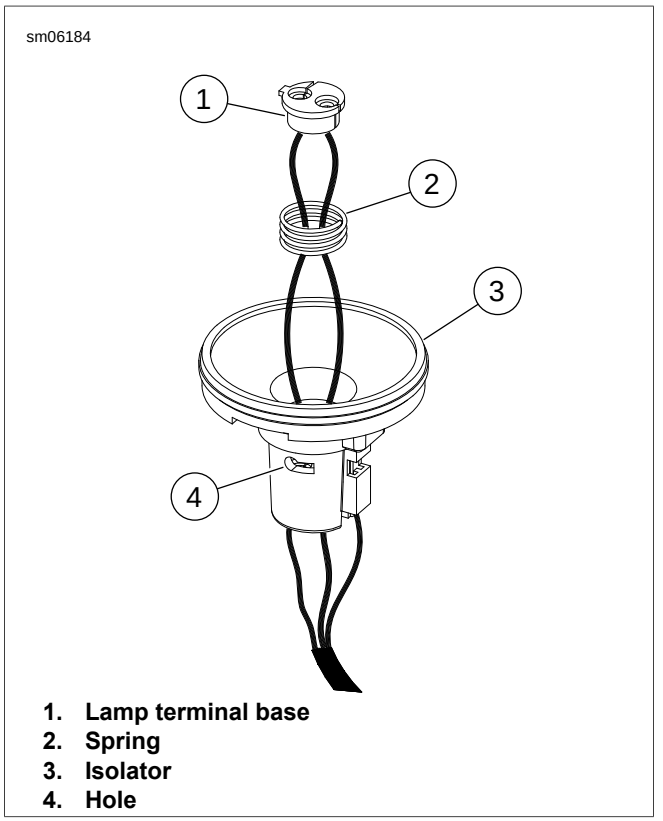
Table 7-13. Rear Turn Signal Lamps Connector (Incandesent) (models without tail lamp)

WIRE COLOR	CAVITY NUMBER	FUNCTION
Violet/Brown	1	Right turn
Violet	2	Left turn
Plug	3	-
Plug	4	-
Black	5	Left ground
Black	6	Right ground
Black	7	License plate lamp
Blue	8	Left tail
Blue	9	Right tail
Plug	10	-
Black	11	License plate lamp ground
Plug	12	-

Table 7-14. Rear Turn Signal Lamps Connector (LED) (models without tail lamp)

WIRE COLOR	CAVITY NUMBER	FUNCTION
Green/stripe	1	Right turn
White/stripe	2	Right tail
Red/stripe	3	Right stop
Yellow/stripe	4	Right ground
Black	5	License plate lamp ground
Plug	6	-
Green	7	Left turn
White	8	Left tail
Red	9	Left stop
Black	10	License plate lamp
Yellow	11	Left ground
Plug	12	-

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Lamp terminal base**
2. **Spring**
3. **Isolator**
4. **Hole**

Figure 7-55. Reflector/Isolator Assembly

REAR TURN SIGNAL LAMPS BRACKET

Removal: FLHR/C, FLHTC/U, FLHTK

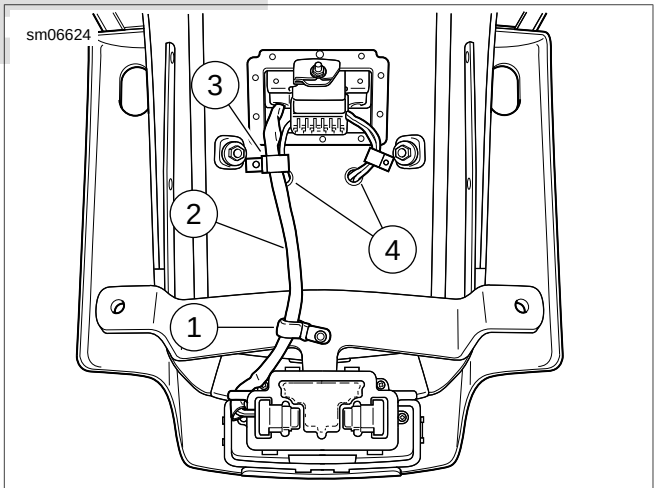
1. Remove chrome base and circuit board assembly. See 7.14 TAIL LAMP.
2. Remove rear turn signal lamps from bracket. See 7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamp in this section.
3. If equipped with license plate lamp on turn signal bracket, remove terminals from license plate lamp connector. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
4. Remove two screws to free rear turn signal lamps bracket from rear fender.
5. If equipped with license plate lamp on turn signal bracket, remove license plate bracket and lamp.

Installation: FLHR/C, FLHTC/U, FLHTK

1. If equipped with license plate lamp on turn signal bracket, install license plate lamp and bracket. Tighten license plate bracket screws to 60-80 **in-lbs** (6.8-9.0 Nm).
2. Apply one drop of Loctite High Strength Threadlocker 271 (red) to screws.
3. Install rear turn signal lamps bracket and tighten screws to 84-144 **in-lbs** (9.5-16.3 Nm).
4. If equipped with license plate lamp on turn signal bracket, route wires through hole in fender and install terminals into license plate lamp connector. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR. Also refer to Table 7-15.
5. Install rear turn signal lamps in bracket. See 7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamp in this section.
6. Install chrome base and circuit board assembly. See 7.14 TAIL LAMP.

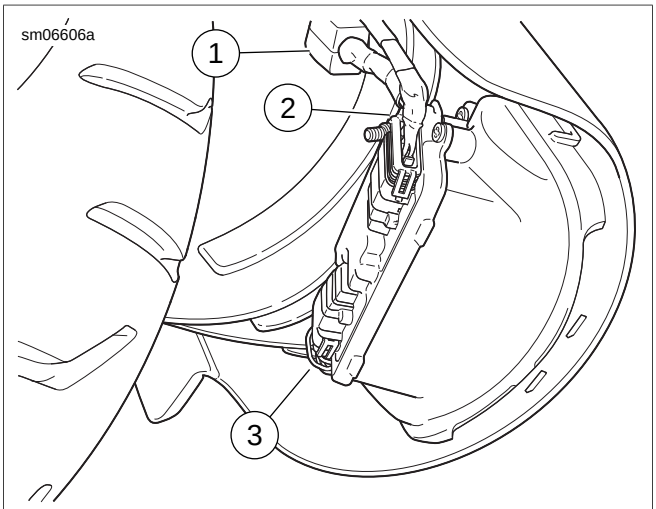
Removal: FLHX, FLTRX, FLTRU

1. **Models with tail lamp:**
   a. Remove circuit board and chrome base. See 7.14 TAIL LAMP.
   b. See Figure 7-56. Release turn signal lamp harnesses (4) from cable clips.
   c. Remove terminals from license plate lamp connector. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.
2. **Models without tail lamp:**
   a. See Figure 7-57. Disconnect turn signal connector (3) from rear fascia lamp.
   b. Release harness from J-clamp (2) located above fascia lamp.
   c. Push grommet (1) rearward out of hole in fender.
3. Remove two screws to release rear turn signal lamps bracket. Remove bracket and harnesses
4. Remove screws to release license plate bracket and lamp from turn signal bracket.



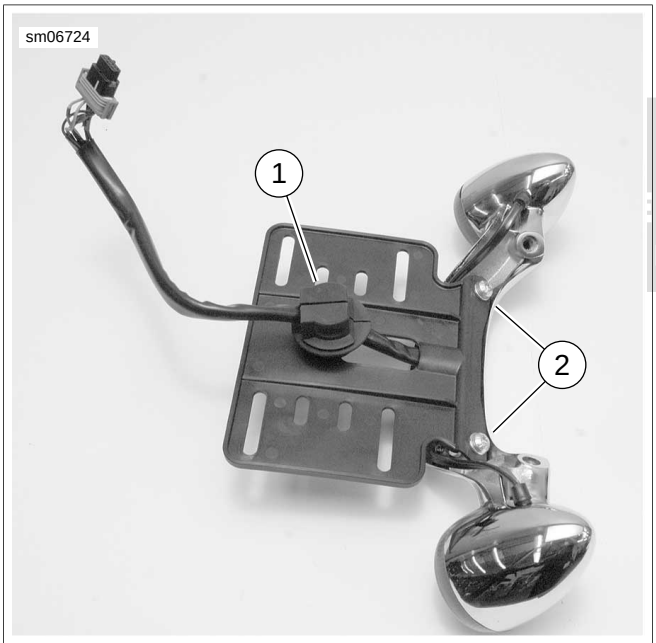
1. **P-clamp**
2. **Jumper harness**
3. **Clamp, tee-stud**
4. **Turn signal lamps harnesses**

Figure 7-56. Tail Lamp Jumper Harness (models with tail lamp)



1. **Grommet**
2. **J-clamp**
3. **Connector**

Figure 7-57. Rear Turn Signal Lights Connector (models without tail lamp)



1. **Grommet**
2. **License plate bracket screws**

Figure 7-58. Rear Turn Signal Lamps and Harness (models without tail lamp)

Installation: FLHX, FLTRX, FLTRU

1. Install license plate lamp and bracket onto turn signal bracket. Tighten screws to 60-80 **in-lbs** (6.8-9.0 Nm).
2. **Models with tail lamp:** Feed socket housings of left and right rear turn signal lamps and license plate wire terminals through respective holes to inboard side of fender.
3. **Models without tail lamp:**
   a. See Figure 7-58. Install grommet (1) and orient as shown.
   b. Route harness through hole in fender and seat grommet in hole.
4. Apply one drop of Loctite High Strength Threadlocker 271 (red) to screws.
5. Install rear turn signal lamps bracket and tighten screws to 84-144 **in-lbs** (9.5-16.3 Nm).
6. **Models with tail lamp:**
   a. Install terminals into license plate lamp connector. See A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR. Also refer to Table 7-15.
   b. Install chrome base and circuit board assembly. See 7.14 TAIL LAMP.
7. **Models without tail lamp:**
   a. See Figure 7-57. Install connector (3).
   b. Secure harness in J-clamp (2) and under tab on end of fascia lamp.

Table 7-15. License Plate Lamp Connector [45]

WIRE COLOR	CHAMBER NUMBER
Black	1
Not Used	2
Black	3

IGNITION/LIGHT KEY SWITCH AND FORK LOCK 7.17

FAIRING MODELS

PART NUMBER	TOOL NAME
HD-45961	IGNITION SWITCH CONNECTOR REMOVER
HD-45962	IGNITION SWITCH ALIGNMENT TOOL

Removal

1. Remove main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
2. Remove the ignition switch knob:
   a. Insert the ignition switch key and turn to the UNLOCK position. Leave the key installed.
   b. See Figure 7-59. Turn the front forks to the left fork stop and rotate the knob to FORK LOCK.
   c. Press and hold the release button at bottom (left side) of the knob, and turn key 60 degrees counterclockwise.
3. Lift and remove knob. Be aware that spring will drop out of bore at underside of knob when removed.

NOTE

See Figure 7-61. After removal of the knob, the IGNITION SWITCH ALIGNMENT TOOL (Part No. HD-45962) may be used to move the switch to other positions as required. Insert tool until bottom of handle contacts top of threaded post, and then rotate handle to the selected position.

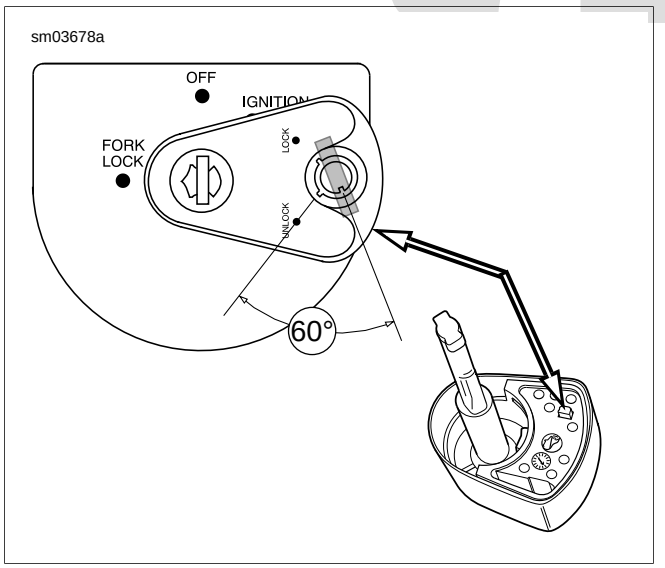


Figure 7-59. Ignition Switch Knob Release Button (Top and Bottom Views)

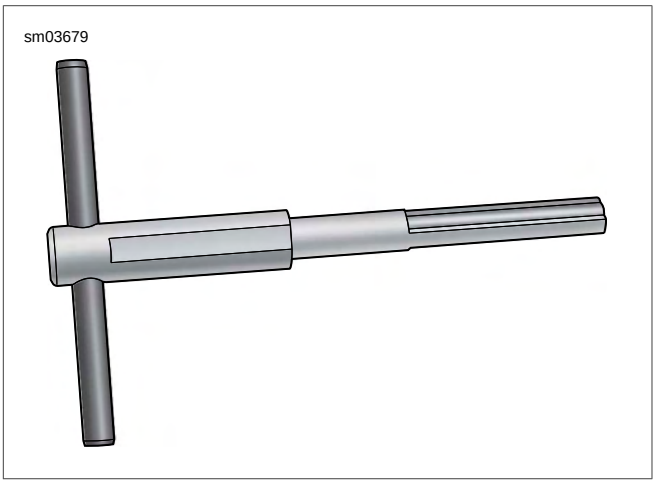


Figure 7-60. Ignition Switch Alignment Tool

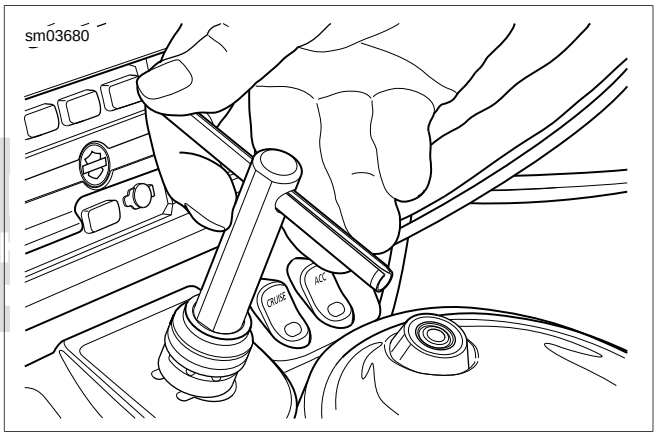


Figure 7-61. Bottom Alignment Tool in Threaded Post and Rotate to Desired Position

4. Turn the front forks to the right fork stop and remove nut from threaded post of ignition switch housing using a 7/8 inch open end wrench.
5. Remove collar and spacer from threaded post.
6. Remove the switch position plate by pulling tabs from slots in fairing cap or instrument nacelle (depending on model).

7. **Fork mounted fairing models:**
   a. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
   b. Using a long shank ball end socket (Snap-on® FABL6E), remove four socket head screws to release radio or storage box from left and right radio support brackets. Use oblong holes in fairing brackets to access screws. Lift radio slightly.
   c. Cut anchored cable strap to release main harness conduit from bottom right corner of radio.
   d. Remove fairing cap. See 2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS.
8. **Frame mounted fairing models:** Remove instrument nacelle. See 2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS.
9. Disconnect ignition switch connector [33] as follows:
   a. See Figure 7-62. Obtain the IGNITION SWITCH CONNECTOR REMOVER (Part No. HD-45961).
   b. Gently insert end of Figure 7-62 into slot in ignition switch housing until it stops.
   c. See Figure 7-63. Pull the main harness and tool at the same time to release connector from ignition switch.

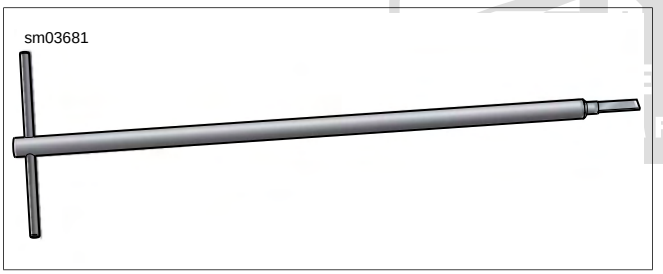


Figure 7-62. Ignition Switch Connector Remover

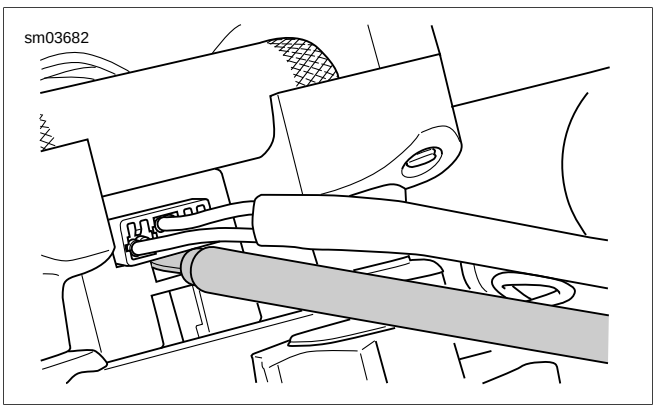
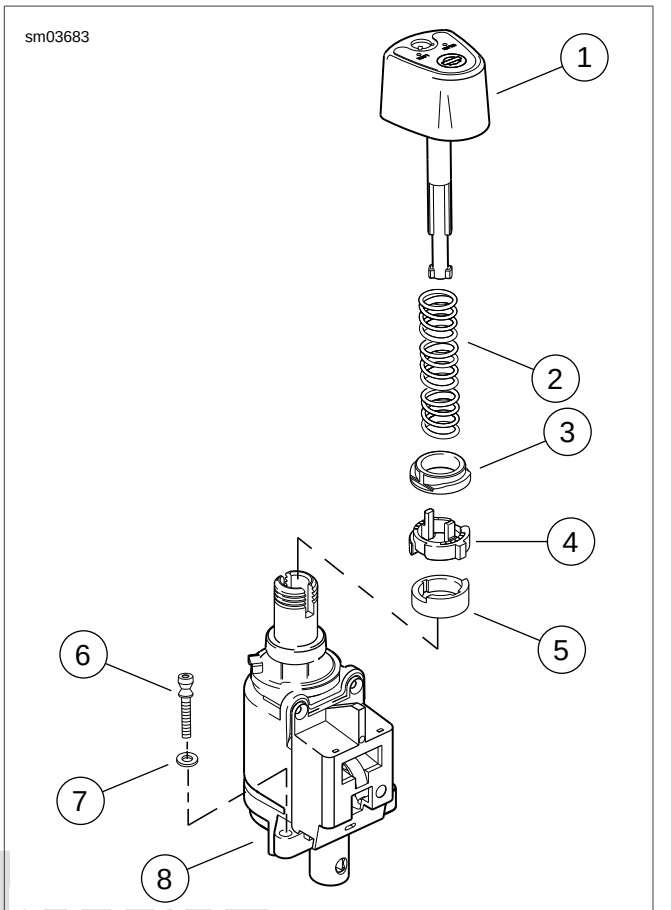


Figure 7-63. Pull Main Harness Conduit and Tool to Release Socket Housing



1. **Knob**
2. **Spring**
3. **Nut**
4. **Collar**
5. **Spacer**
6. **Break-away screw (international only)**
7. **Flat washer**
8. **Switch housing**

Figure 7-64. Ignition Switch Assembly (International)

10. **Domestic:** Remove two screws (with flat washers) at base of ignition switch housing.

⚠CAUTION

Always wear proper eye protection when drilling or grinding. Flying debris could cause serious eye injury. (00402e)

11. **International models:** Remove two break-away screws (with flat washers) as follows.
    a. Use a center punch to make a pilot hole at the top of each break-away screw.
    b. Install a 1/8 inch left handed bit in drill and set the drill to REVERSE. Positioning the bit in the pilot hole, spin out the break-away screws.

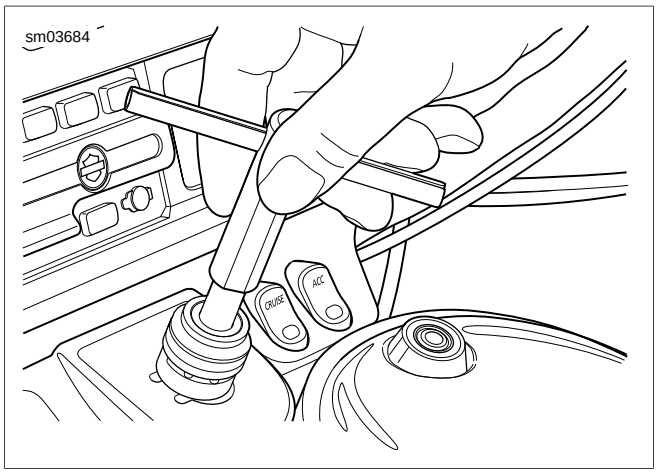


Figure 7-65. Rotate Alignment Tool Without Bottoming

NOTE

If the above method fails, use a 3/16 inch bit with long shank to carefully drill off heads of break-away screws. Use pliers to remove the shafts from the upper fork bracket.

12. See Figure 7-64. Remove ignition switch housing from bore of upper fork bracket.

Installation

1. Slide base of ignition switch housing into bore of upper fork bracket.
2. **Domestic models:** Install two screws (with flat washers) at base of ignition switch housing and tighten to 36-60 **in-lbs** (4.1-6.8 Nm).
3. **International:** Install two **new** break-away screws (with flat washers) as follows.
   a. Verify that the threads in the upper fork bracket are clean and in good condition. Dirty and/or damaged threads may cause the heads of the break-away screws to snap off before the switch housing is properly tightened.

   NOTE

   Exercise care to avoid losing heads of break-away screws in motorcycle. Vibration may cause captured heads to scratch finished surfaces, chafe wires or cause other damage.

   b. Install screws and tighten until heads snap off.
4. Install handlebars. See 2.23 HANDLEBARS, Installation.
5. Install ignition switch connector to ignition switch housing.
6. Install anchor of **new** cable strap in hole at bottom right side of radio and capture main harness.
7. **Fork mounted fairing models:**
   a. Install fairing cap. See 2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS.
   b. Install four socket head screws to fasten radio or storage box to left and right radio support brackets. Tighten screws to 35-45 **in-lbs** (4.0-5.1 Nm).
   c. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
8. **Frame mounted fairing models:** Install instrument nacelle. See 2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS.
9. Install switch position plate. Plate snaps in place when properly installed. Exercise care to avoid breaking tabs. Replace plate if tabs are damaged.
10. See Figure 7-64. Install spacer (5) and orient so the widest side is forward and the inside tabs fit in slots of switch post.
11. Slide collar (4) over threaded post and orient collar so the outside tab is forward and the inside tabs fit in slots of post.
12. Install nut (3). Turn the front forks to the right fork stop, and using a 7/8 inch Open End Crow Foot, tighten nut to 85-115 **in-lbs** (9.6-13.0 Nm).
13. Install spring into bore at underside of knob.
14. Install ignition switch knob:
   a. See Figure 7-59. Verify that button at bottom of knob is pressed and key is turned 60 degrees counterclockwise of the UNLOCK position.
   b. With the knob pointing toward the FORK LOCK position, insert shaft into threaded post.
   c. Hold the knob down and the turn key clockwise to the UNLOCK position. An audible "click" should be heard when knob and switch are properly engaged.
   d. Release the knob and rotate through all four switch positions to verify proper operation. If the knob does not install properly, proceed to next step.
15. Knob was removed in the ACCESS position or switch may have been moved out of the FORK LOCK position. Proceed as follows:
   a. See Figure 7-61. Insert alignment tool until bottom of handle contacts top of threaded post, and holding front forks at the left fork stop, rotate handle of tool counterclockwise until fork locks.
   b. Remove tool and repeat previous step.
   c. If knob does not install properly, proceed to next step.
16. Detent and switch position lugs are misaligned. This can occur when the alignment tool (or ignition switch knob) is

rotated before it is properly bottomed in the ignition switch housing. Proceed as follows:

a. Insert shaft into threaded post and gently rotate knob until it drops into the partially installed position. Take note whether it is pointing toward the rear, or to ACCESS, IGNITION or OFF.

b. See Figure 7-65. Remove knob and insert alignment tool so that the bottom of the handle is approximately 0.500-0.0750 in. (12.7-19.1 mm) from the top of the threaded post, and then hold.

c. Rotate alignment tool counterclockwise the number of positions needed to get to FORK LOCK. Repeat installation step.

17. Install main fuse. See 7.7 SYSTEM FUSES AND RELAYS.

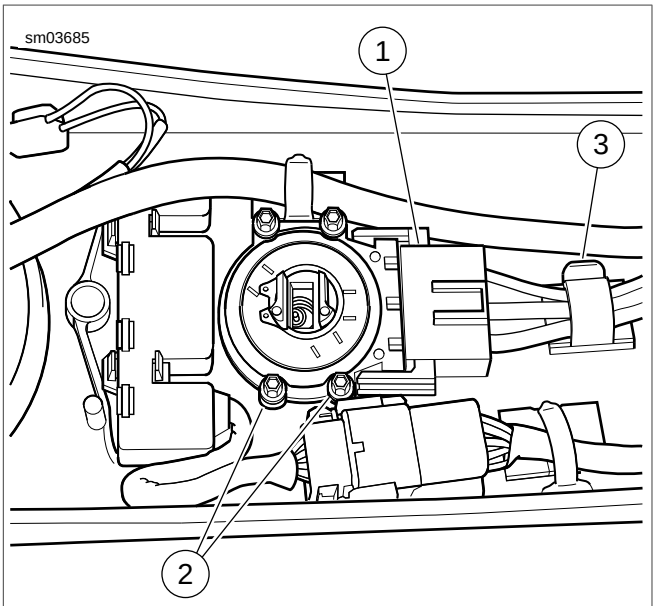
ROAD KING MODELS

Ignition/Light Key Switch: Removal

1. Remove main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
2. Remove seat. See 2.25 SEAT.
3. Remove console from fuel tank. Lay a clean shop towel on forward part of rear fender and lay console on shop towel.
4. See Figure 7-66. Disconnect ignition switch connector [33]. Release ignition switch conduit from plastic clip, if necessary.
5. Remove four screws to release ignition switch from console.

Ignition/Light Key Switch: Installation

1. See Figure 7-66. Install ignition switch and tighten to 20-30 **in-lbs** (2.3-3.4 Nm) in a crosswise pattern.
2. Connect ignition connector [33]. Capture ignition switch conduit in plastic clip, if removed.
3. Exercising caution to avoid pinching wire harness and vent tube, install console on fuel tank. Tighten screws to 36-60 **in-lbs** (4.1-6.8 Nm).



1. **Ignition switch connector [33]**
2. **Screw (4)**
3. **Plastic clip**

Figure 7-66. Instrument Console (Road King)

4. Install seat. See 2.25 SEAT.
5. Install main fuse. See 7.7 SYSTEM FUSES AND RELAYS.

Fork Lock: Removal

1. Remove handlebar clamp shroud. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.
2. Start acorn nuts on both the left and right side fork bracket studs to keep halves of headlamp nacelle on motorcycle.
3. See Figure 7-67. Remove two screws (with flat washers) and pull fork lock assembly from upper fork bracket bore.

NOTE

On HDI models, use a center punch to make a pilot hole at the top of each break-away screw. Install a 1/8 inch left handed bit in drill and set the drill to reverse. Positioning the bit in the pilot hole, spin out the break-away screws.

Fork Lock: Installation

1. See Figure 7-67. Install **new** fork lock assembly into bore of upper fork bracket.
2. Install two screws (with flat washers) and tighten to 36-60 **in-lbs** (4.1-6.8 Nm).

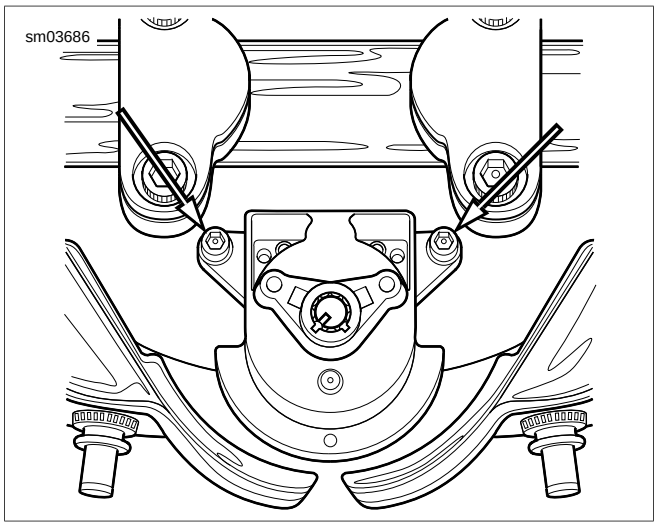


Figure 7-67. Fork Lock (Road King)

NOTE

*On HDI models, install **new** break-away screws and tighten until heads snap off. Verify that threads in upper fork bracket are clean and in good condition or heads may break off before fork lock assembly is properly tightened. Avoid losing heads of screws in motorcycle as vibration may cause captured heads to scratch finished surfaces, chafe wires or cause other damage.*

3. Install handlebar clamp shroud. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

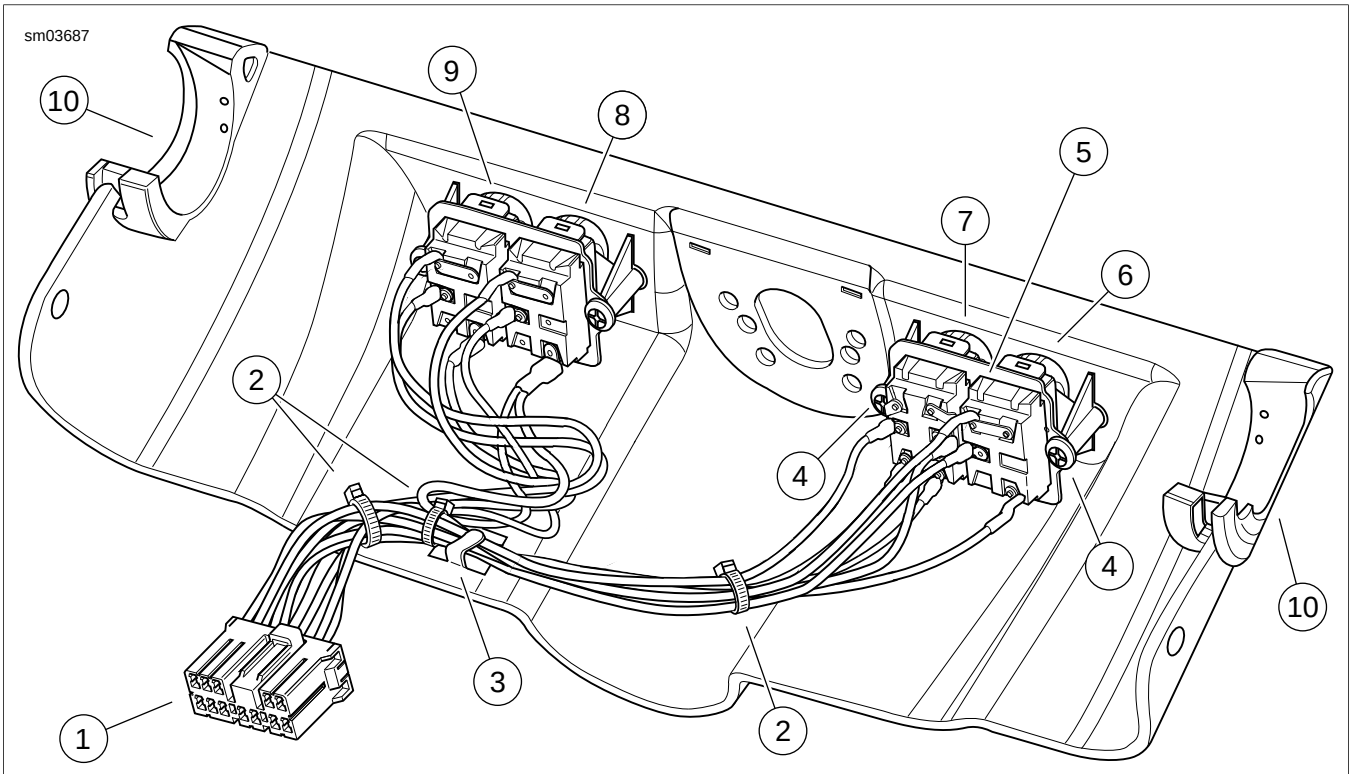
FAIRING CAP SWITCHES: FORK MOUNTED FAIRING MODELS 7.18

REMOVAL

1. Partially disassemble ignition switch: remove ignition switch knob, spring, nut, collar, spacer and switch position plate. See 7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK.
2. Remove two screws (with flat washers) to release fairing cap from left and right sides of inner fairing.
3. With the front forks turned to the left fork stop, reach behind right side of fairing cap and disconnect the fairing cap switch connector [105], 12-place Multilock.
4. See Figure 7-68. Remove fairing cap from motorcycle.
5. Bend back the flexible clamp to release switch wires from the inboard side of the fairing cap. Carefully cut cable straps to free wires from bundles.
6. Remove two screws to release switch bracket from fairing cap.
7. Gently pry two latches on bracket outward to release tabs on switch. Remove switch from bracket. See Figure 7-69.
8. If replacing Cruise or Speaker Switch, cut Black/Green wire lead halfway between Cruise and Speaker Switch terminals.
9. Follow the wires of the faulty switch to the socket housing, or see Figure 7-70 and refer to Table 7-16 for the applicable chamber numbers. For wire location purposes, numbers are stamped into the secondary locks of both the pin and socket housings.
10. Remove the appropriate terminals from the socket housing.

NOTE

For instructions on properly removing wire terminals, see A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.



1. **Fairing cap switch connector [105]**
2. **Cable strap**
3. **Flexible clamp**
4. **Switch bracket screws**
5. **Switch bracket**
6. **Auxiliary lamp switch**
7. **Speaker switch**
8. **Cruise switch**
9. **Accessory switch**
10. **Grommet**

Figure 7-68. Fairing Cap (Inboard Side) (typical)

INSTALLATION

1. Feeding wires through bracket, place **new** switch into position. Engage tabs on switch in slots of latches and then gently bend tabs upward to lock position of switch in bracket.
2. Install terminals into socket housing.

NOTE

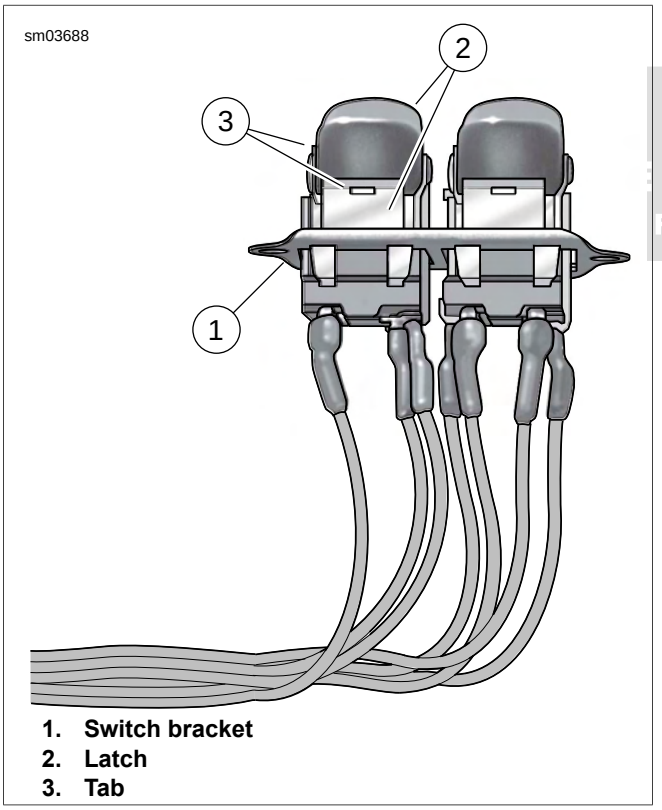
For instructions on properly installing wire terminals, see A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

3. If Cruise or Speaker Switch was replaced, butt splice Black/Green wire lead between Cruise and Speaker Switch terminals.

NOTE

For detailed butt splicing information, see A.20 SEALED SPLICE CONNECTORS.

4. Install two screws to secure switch bracket to fairing cap.
5. Install **new** cable straps to capture wire bundles and then secure switch wires to the fairing cap using the flexible clamp. Route the wires as shown in Figure 7-68.
6. Verify that the rubber grommets are installed on each side of the fairing cap. Barbs on cap fit into holes in grommets.



1. **Switch bracket**
2. **Latch**
3. **Tab**

Figure 7-69. Bend Latches Outward to Release Tabs

Table 7-16. Fairing Cap Switches [105]

SWITCH	WIRE COLOR	CHAMBER NUMBER
Accessory	Orange/Red	1
	Orange	2
	Black	3
Cruise Ultra Only	Orange/Violet	4
	Red/Green	5
	Black/Green (Double Lugged)	12 To Speaker Switch
Auxiliary Lamp	Yellow	6
	Gray/Black	7
	Black	8
Speaker Ultra Only	Orange/Blue	9
	Violet/Orange	10
	Brown/Orange	11
	Black/Green	To Cruise Switch

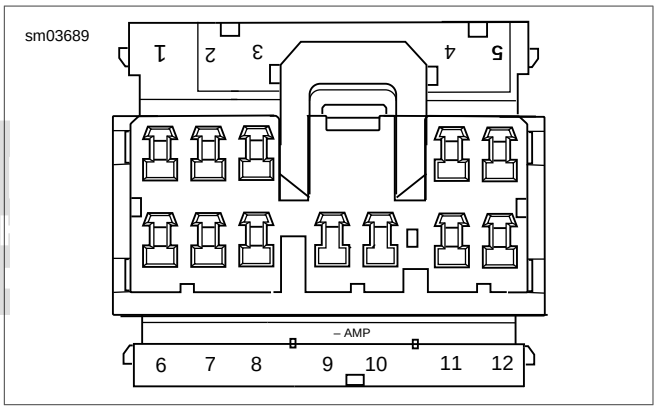


Figure 7-70. Socket Housing (Secondary Locks Open)

7. Connect the fairing cap switch connector [105], 12-place Multilock, on the right side of fairing cap.
8. With the front forks turned to the left fork stop, install fairing cap over ignition switch housing. Verify that grommets in fairing cap fully capture handlebar, handlebar switch conduit, and brake line from front master cylinder reservoir (right side).
9. Start two screws (with flat washers) to fasten fairing cap to left and right sides of inner fairing. Alternately tighten screws to 25-30 **in-lbs** (2.8-3.4 Nm).
10. Assemble ignition switch: install switch position plate, spacer, collar, nut, spring and knob. See 7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK.

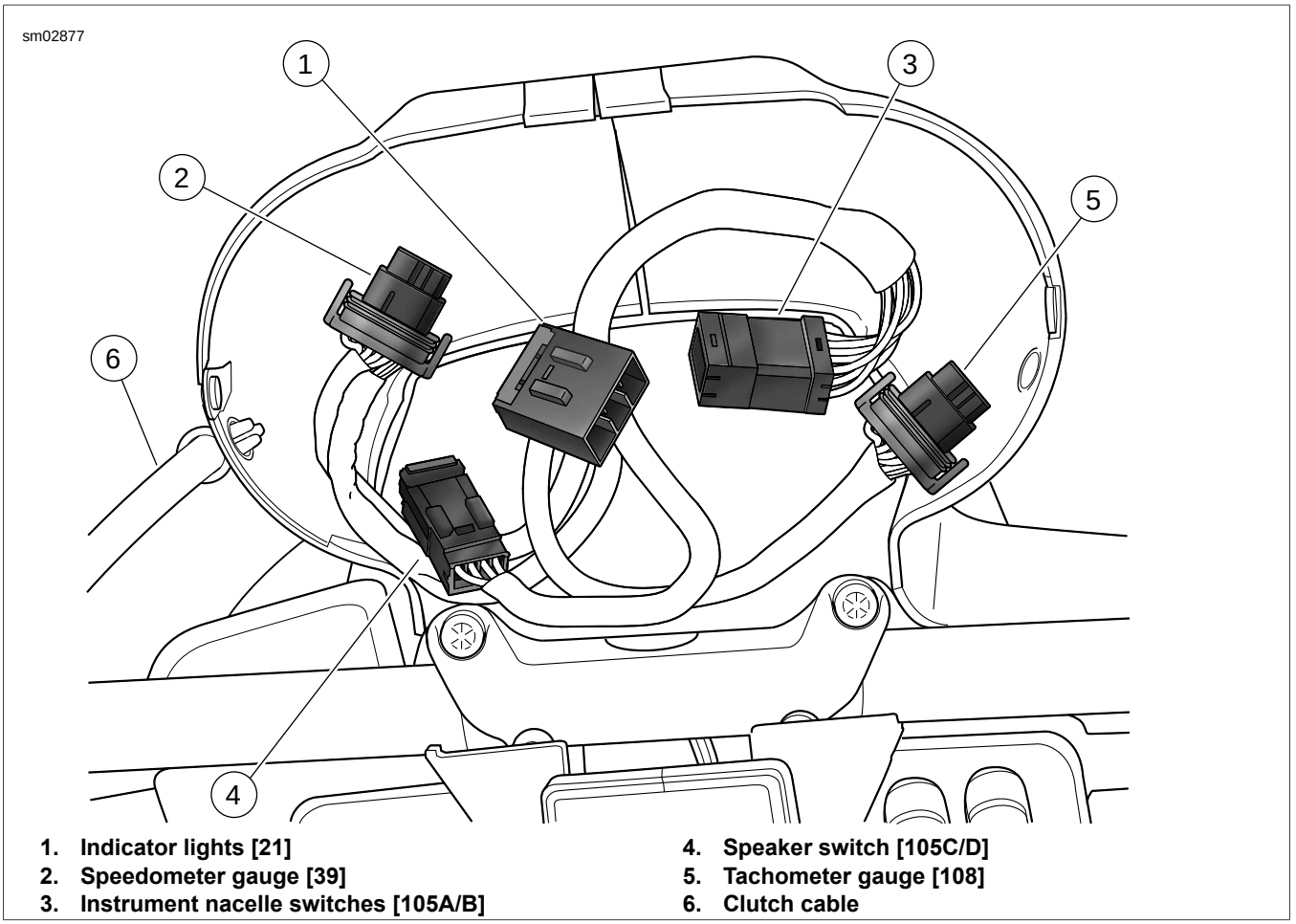
INSTRUMENT NACELLE SWITCHES: FRAME MOUNTED FAIRING MODELS 7.19

REMOVAL

1. Partially disassemble ignition switch: remove ignition switch knob, spring, nut, collar, spacer and switch position plate. See 7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK.
2. Remove screw on each side of bezel.
3. Use thumbs to push tab at rear of bezel from slot in front of ignition switch. Gently raise free side of bezel until tabs at front of instrument nacelle become disengaged from slot at front of bezel (concealed behind decorative adhesive strip).
4. See Figure 7-71. Raising bezel slightly, disconnect instruments and indicator lights from interconnect harness as follows:
   a. Speedometer connector [39], 12-place Packard.
   b. Tachometer connector [108], 12-place Packard.
   c. Indicator lights connector [21], 10-place Multilock.
5. Remove bezel from motorcycle.
6. Follow instructions based on location of defective switch.

Left Side Switch

1. See Figure 7-71. Disconnect speaker switch connector [105], 4-place Multilock.
2. Pull clutch cable clip from hole on left side of instrument nacelle.
3. Remove two screws (with flat washers) to release left side of instrument nacelle from upper and lower fork brackets.
4. See Figure 7-71. Unthread rubber boot from odometer reset switch, and while carefully removing left side instrument nacelle from motorcycle, pull odometer reset switch from hole. Move left side of nacelle to bench area leaving right side on motorcycle.
5. Gently bend back molded retainer to release switch bracket assembly from instrument nacelle.
6. See Figure 7-72. Carefully pry two latches on bracket outward to release tabs on switch. Remove switch from bracket.



1. **Indicator lights [21]**
2. **Speedometer gauge [39]**
3. **Instrument nacelle switches [105A/B]**
4. **Speaker switch [105C/D]**
5. **Tachometer gauge [108]**
6. **Clutch cable**

Figure 7-71. Frame Mounted Fairing Models: Instrument Nacelle (Bezel Removed)

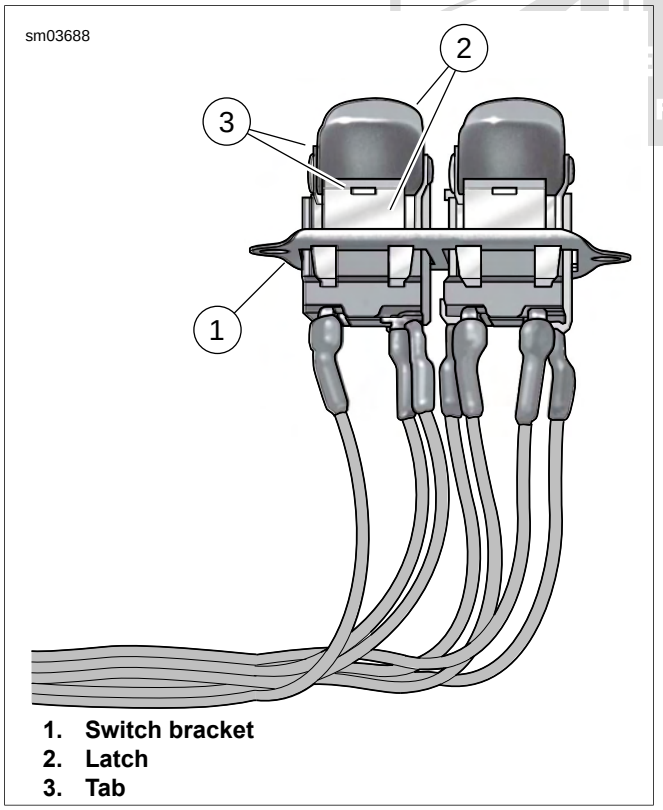
Right Side Switches

1. See Figure 7-71. Disconnect speaker switch connector [105], 4-place Multilock.
2. Disconnect instrument nacelle switch connector [105], 12-place Multilock.
3. Remove two screws (with flat washers) to release right side of instrument nacelle from upper and lower fork brackets. Move right side of nacelle to bench area leaving left side on motorcycle.
4. Gently bend back molded retainer to release switch bracket assembly from instrument nacelle.
5. See Figure 7-72. Carefully pry two latches on bracket outward to release tabs on switch. Remove switch from bracket.
6. See Figure 7-73. Remove the appropriate terminals from the socket and/or pin housings. Follow the wires of the faulty switch or reference Table 7-17 for the applicable chamber numbers. For wire location purposes, numbers are stamped into the secondary locks.

NOTE

For instructions on properly removing wire terminals, see A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

7. Carefully pull wires to draw terminals through conduit to backside of switch. For best results, pull one wire at a time.



1. **Switch bracket**
2. **Latch**
3. **Tab**

Figure 7-72. Bend Latches Outward to Release Tabs

Table 7-17. Right Side Instrument Nacelle Switches

SWITCH	WIRE COLOR	CHAMBER NUMBER	
		12-PLACE SOCKET	4-PLACE PIN
Accessory	Orange/Red	1	
	Orange	2	
	Black	3	
Cruise	Orange/Violet	4	
	Red/Green	5	
	Black/Green (Double Lugged)	12	4

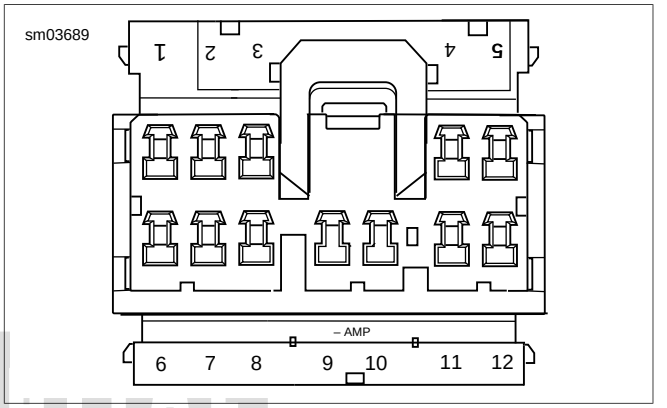


Figure 7-73. Socket Housing (Secondary Locks Open)

INSTALLATION

Left Side Switch

1. Place **new** switch into position in bracket. Engaging tabs on switch in slots of latches, gently bend tabs upward to lock position of switch in bracket.
2. Snap switch bracket into molded retainer in instrument nacelle.
3. See Figure 7-74. While carefully placing left side of instrument nacelle on motorcycle, slide odometer reset switch through hole and install rubber boot.
4. See Figure 7-71. Connect speaker switch connector [105], 4-place Multilock.
5. Install two screws (with flat washers) to fasten left side instrument nacelle to upper and lower fork brackets. Alternately tighten screws to 15-20 ft-lbs (20-27 Nm).
6. Capture clutch cable in cable clip. Insert cable clip into hole in left side of instrument nacelle.

Right Side Switches

1. See Figure 7-72. Place **new** switch into position in bracket. Engaging tabs on switch in slots of latches, gently bend tabs upward to lock position of switch in bracket.



1. **Left side nacelle**
2. **Clutch cable clip hole**
3. **Speaker switch connector [105D]**
4. **Right side nacelle**
5. **Speaker switch connector [105C]**
6. **Instrument nacelle switch connector [105B]**

Figure 7-74. Instrument Nacelle Halves

2. Push terminals through two lengths of conduit to wire end of socket or pin housing. For best results, push one wire through conduit at a time.
3. See Figure 7-73 and refer to Table 7-17. Install terminals into socket or pin housing.

NOTE

For instructions on properly installing wire terminals, see A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

4. Snap switch bracket into molded retainer in instrument nacelle.
5. See Figure 7-74. Install right side of instrument nacelle on motorcycle.
6. See Figure 7-71. Connect speaker switch connector [105], 4-place Multilock.
7. Connect instrument nacelle switch connector [105], 12-place Multilock.
8. Install two screws (with flat washers) to fasten right side instrument nacelle to upper and lower fork brackets. Alternately tighten screws to 15-20 ft-lbs (20-27 Nm).

9. Looking into instrument nacelle, connect instruments and indicator lights to interconnect harness as follows:
   a. Speedometer connector [39], 12-place Packard.
   b. Tachometer connector [108], 12-place Packard.
   c. Indicator lights connector [21], 10-place Multilock.
10. Verify that left and right sides of instrument nacelle are properly mated. Pins on left side of nacelle must fully engage holes on right.
11. Insert tab at rear of bezel into slot of instrument nacelle (just in front of ignition switch). Holding left and right sides of nacelle together, place bezel over instrument nacelle flange. When properly mated, tabs at front of instrument nacelle engage lip in slot at front of bezel (behind decorative adhesive strip).

NOTE

*If tabs do not properly engage slot at front of bezel, then a loose fit will result. Remove decorative adhesive strip by gently prying up outer edges, and using a flat bladed screwdriver, carefully raise tabs so that they engage lip in slot. If damaged, install **new** decorative adhesive strip.*

12. Install screw on each side of bezel. Alternately tighten screws to 25-35 **in-lbs** (2.8-4.0 Nm).
13. Assemble ignition switch. See 7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

CRANKSHAFT POSITION SENSOR (CKP) 7.20

GENERAL

The crank position sensor is a variable reluctance (VR) sensor that generates an AC signal by sensing the passing of the 30 teeth machined in the left side flywheel. Two consecutive teeth are missing in the flywheel to establish a reference point. The crank position sensor sends a signal to the electronic control module which is used to reference engine position (TDC) and engine speed.

NOTE

CKP sensor connector is not serviceable. If connector or sensor fails, the entire assembly must be replaced.

REMOVAL

1. Remove main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
2. Locate CKP sensor connector [79], 2-place Deutsch, fixed to front caddy at bottom of lower frame crossmember.
3. Push connector toward right side of motorcycle to disengage small end of slot on attachment clip from T-stud on front caddy. Lift connector off T-stud.
4. Press button on socket terminal side and pull apart pin and socket halves.
5. See Figure 7-75 and Figure 7-76. Remove screw to free CKP sensor mount from front left side of crankcase. Pull sensor from bore.

INSTALLATION

1. Install **new** O-ring on sensor body if missing, distorted, pinched or otherwise damaged. Apply a thin film of clean H-D 20W50 engine oil to O-ring before installation.
2. See Figure 7-75. Push sensor into bore aligning hole in sensor mount with hole in spot face. Install screw and tighten to 90-120 **in-lbs** (10.2-13.6 Nm).
3. Route connector and convoluted tubing downward at rear of front engine stabilizer link to front caddy at bottom of lower frame crossmember.
4. Mate pin and socket halves of CKP sensor connector [79].

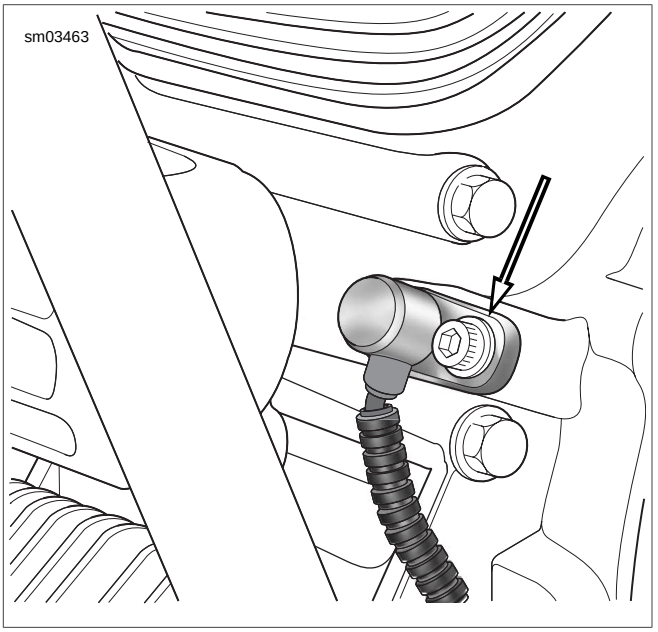


Figure 7-75. Remove CKP Sensor Mount Screw

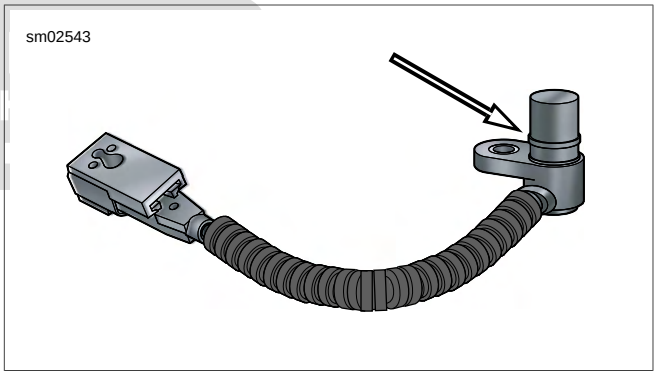


Figure 7-76. CKP Sensor O-Ring

5. Place large end of slot on attachment clip over T-stud on front caddy. Push connector toward left side of motorcycle to engage small end of slot.
6. Install main fuse. See 7.7 SYSTEM FUSES AND RELAYS.

AUTOMATIC COMPRESSION RELEASE (ACR) 7.21

GENERAL

NOTE

ACR is used only on 103 cu. in. and larger engines.

See Figure 7-77. The Automatic Compression Release (ACR) is opened and closed by the ECM to assist starting.

See Figure 7-78. When open, compressed gases are released through the exhaust port.

REMOVAL

PART NUMBER	TOOL NAME
HD-48498-A	ACR SOLENOID SOCKET

1. Remove the rocker cover and the rocker box. See 3.12 TOP END SERVICE.
2. Separate the ACR rear [203R] or front [203F] connector from the main wiring harness and remove connectors from retainer clip.
3. See Figure 7-82. Use ACR SOLENOID SOCKET (Part No. HD-48498-A) to remove the ACR from the cylinder head.

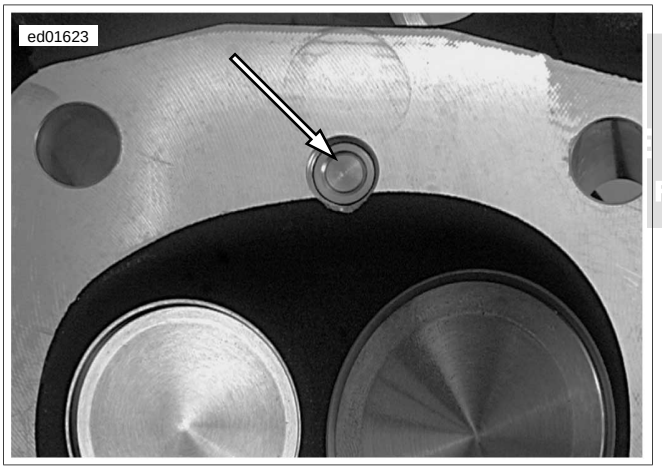


Figure 7-77. ACR Valve in Combustion Chamber

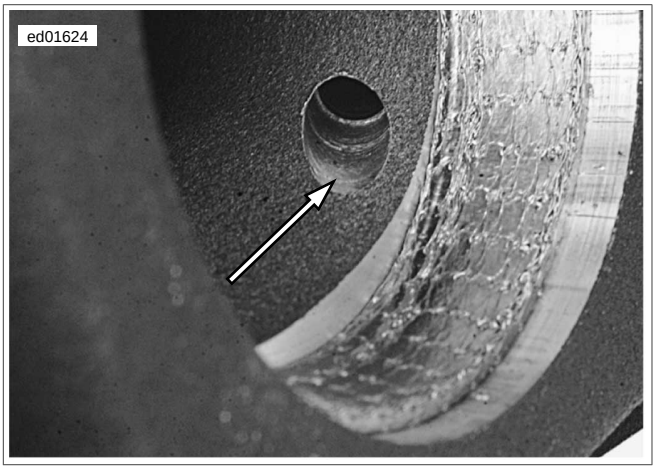


Figure 7-78. ACR Exhaust Port Release

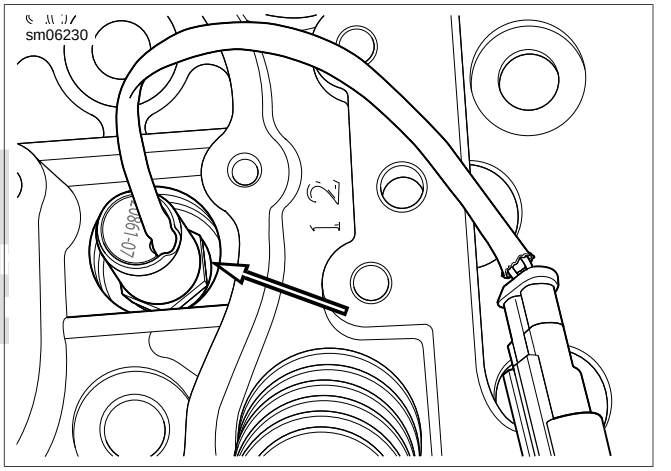


Figure 7-79. ACR in Head

INSTALLATION

PART NUMBER	TOOL NAME
HD-48498-A	ACR SOLENOID SOCKET

1. Verify that the copper seal washer is in place on the ACR.
2. See Figure 7-80. Identify a location around the threads of the ACR approximately 1/3 of the way up from the end.
3. See Figure 7-81. Apply three equally spaced dots of LOCTITE 246 THREADLOCKER MEDIUM STRENGTH/HIGH TEMPERATURE (blue) on threads.
4. To prevent cross threading, install and finger tighten.
5. See Figure 7-82. Using ACR SOLENOID SOCKET (Part No. HD-48498-A), tighten to 11-15 ft-lbs (14.9-20.3 Nm).
6. Route the wire harness between the cylinder V.
7. Install rocker box and rocker cover. See 3.12 TOP END SERVICE.

8. Mate the ACR connectors [203R] and [203F] to the main wiring harness. Secure connectors to retaining clip.

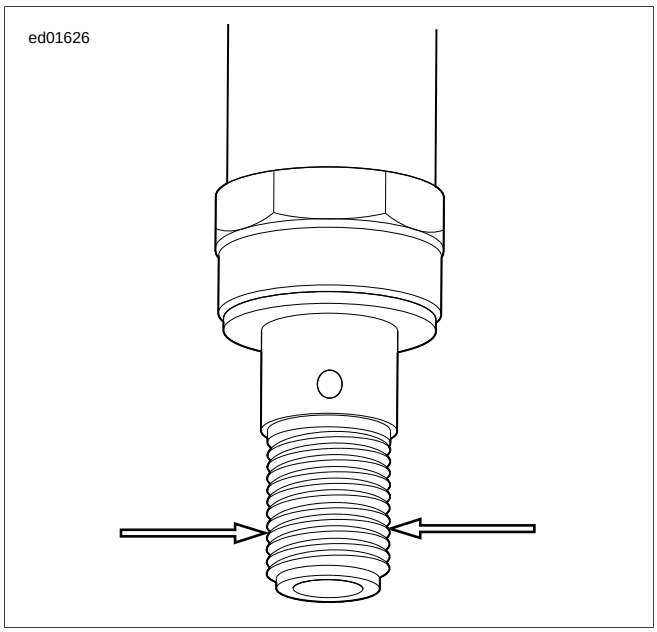


Figure 7-80. Bottom Third

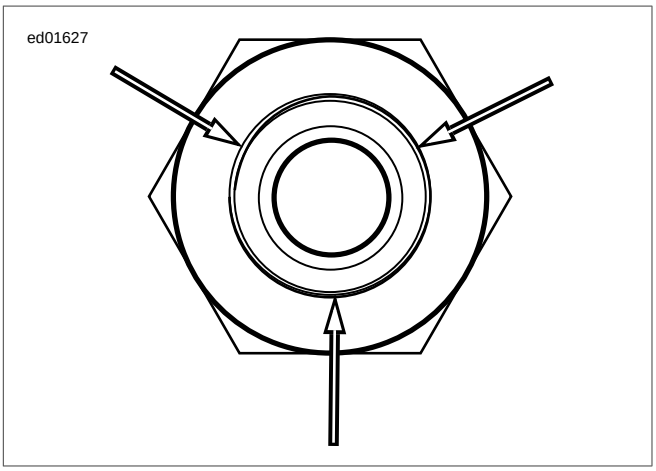


Figure 7-81. Three Dots of Loctite 246 Medium Strength/High Temperature

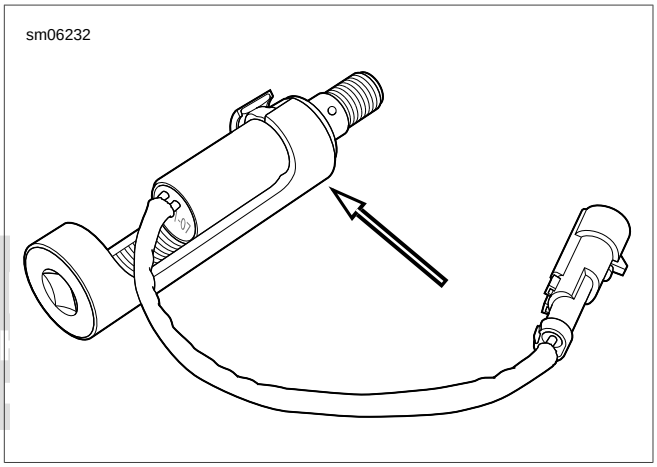


Figure 7-82. ACR Solenoid Socket and ACR

ALTERNATOR 7.22

REMOVAL

1. Remove seat. See 2.25 SEAT.

⚠WARNING

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

2. Remove battery negative (-) cable (black) from battery.
3. Remove the primary chaincase. See 5.5 PRIMARY CHAINCASE HOUSING.

⚠CAUTION

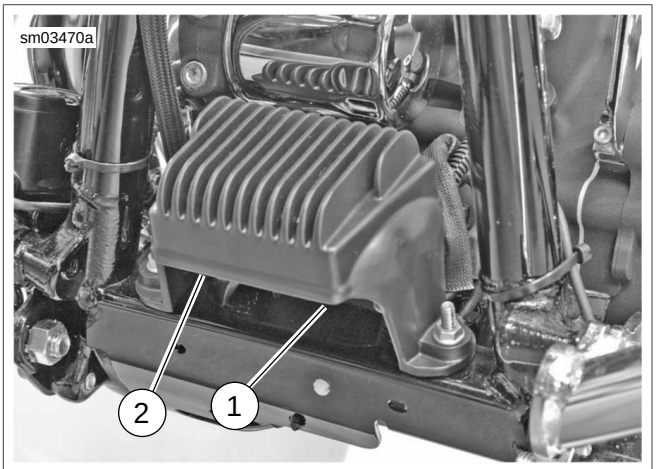
The high-output rotor contains powerful magnets. Exercise caution to prevent possible hand injury during removal and installation. (00558b)

4. Using allen wrenches or similar tools through holes in rotor, pull rotor from the engine compensating sprocket shaft.
5. See Figure 7-83. Release locking latch and remove connector (1) from regulator.
6. Cut anchored cable strap securing stator wiring to frame.
7. Remove four screws to free stator from crankcase. Discard screws.

NOTES

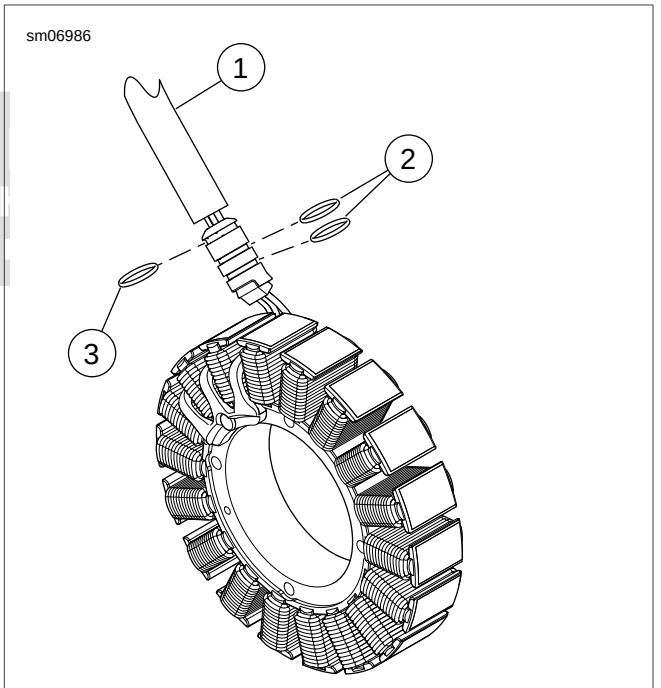
- *Note positions of grommet O-rings before removal.*
- *Do not damage O-ring grooves when removing O-rings.*

8. See Figure 7-84. Remove and discard retention O-ring (3) from stator grommet. Squirt isopropyl alcohol or glass cleaner into opening.
9. While pushing on the grommet from outside of crankcase, draw grommet through the bore by pulling on inside of grommet with needle nose pliers. Do not pull on the wires unless the stator is to be replaced. Exercise caution to avoid damaging grommet if stator is to be reused.
10. Draw conduit and connector through crankcase bore as stator is removed.
11. Remove and discard sealing O-rings (2).



1. Stator connector [46]
2. Voltage regulator output connector [77]

Figure 7-83. Voltage Regulator (Left Side View)



1. To voltage regulator
2. Sealing O-rings
3. Retention O-ring

Figure 7-84. Stator Grommet

CLEANING AND INSPECTION

1. Remove all foreign particles from rotor magnets. Clean rotor by wiping thoroughly with a clean cloth.
2. Replace rotor if magnets are cracked or loose, stator bolts have loosened and contacted rotor, or there is evidence of spline damage on the rotor center mounting bolt hole.

3. Clean stator, stator leads and grommet thoroughly with a clean cloth. Examine stator leads for cracked or damaged insulation.
4. Replace stator if there are any signs of contact with rotor, insulation is damaged or cracked, or stator fails any stator electrical tests. See the electrical diagnostic manual.

NOTE

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

INSTALLATION

1. See Figure 7-84. Install **new** sealing O-rings (2) on grommet.
2. Feed connector and conduit through hole in crankcase from inside crankcase.
3. Thoroughly lubricate O-rings with isopropyl alcohol or glass cleaner. O-rings must be clean and free of dirt and oily residue.
4. Carefully grasp cable stop behind grommet with a needle nose pliers. Push grommet into crankcase bore while carefully pulling on outside cable. Push grommet until it is seated in crankcase.
5. Install retaining O-ring (3) on grommet.
6. Push grommet into crankcase bore. Installation is complete when retaining O-ring bottoms on casting.

NOTE

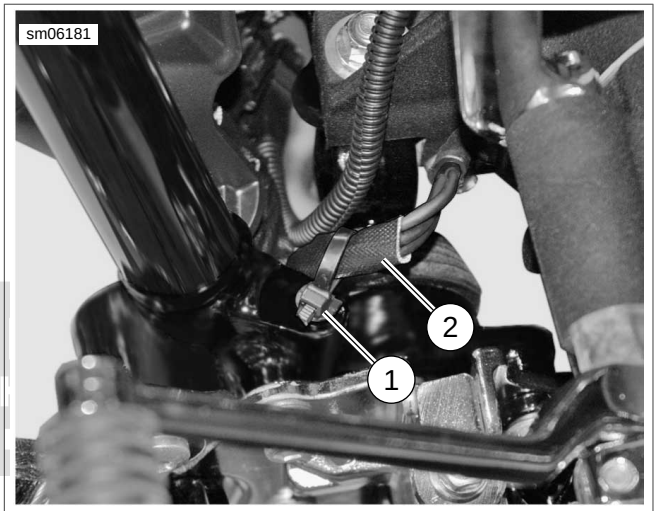
Do not reuse stator mounting screws. The threads of the screws contain a locking compound in pellet form. When the screw is started, the pellet breaks, releasing the compound.

7. Secure stator to crankcase using four **new** screws. Tighten screws to 55-75 **in-lbs** (6.2-8.5 Nm).
8. See Figure 7-85. Install **new** anchored cable strap (1) on stator wiring (2) and push anchor into hole in frame.
9. Install connector to voltage regulator and engage locking latch.

⚠CAUTION

The high-output rotor contains powerful magnets. Exercise caution to prevent possible hand injury during removal and installation. (00558b)

10. Using allen wrenches or similar tools through holes in rotor, ease rotor onto the engine compensating sprocket shaft.
11. Install the primary chaincase. See 5.5 PRIMARY CHAINCASE HOUSING.
12. Connect battery negative cable (black) to battery negative (-) terminal. Tighten bolt to 60-70 **in-lbs** (6.8-7.9 Nm).
13. Install seat. See 2.25 SEAT.



1. Anchored cable strap
2. Stator wiring

Figure 7-85. Stator Wiring

VEHICLE SPEED SENSOR (VSS) 7.23

VSS

Removal

1. Remove starter. See 7.10 STARTER.
2. See Figure 7-86. Disconnect VSS connector [65], 3-place Delphi.
3. Remove screw and pull sensor from transmission case.

Installation

1. Inspect VSS O-ring for cuts, tears or general deterioration. Replace as necessary.
2. Insert sensor into transmission case. Install screw and tighten to 84-132 **in-lbs** (9.5-14.9 Nm).
3. Connect VSS connector [65], 3-place Delphi.
4. Install starter. See 7.10 STARTER.



Figure 7-86. VSS Location

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

NEUTRAL SWITCH 7.24

REMOVAL

1. Verify that transmission is in NEUTRAL.
2. See Figure 7-87. Remove two elbow connectors from neutral switch posts.
3. Remove neutral switch from transmission case.

INSTALLATION

1. See Figure 7-88. Inspect O-ring for cuts, tears or general deterioration. Replace as necessary. Lightly lubricate **new** O-ring with clean transmission oil before installation.
2. Verify that transmission is in NEUTRAL.
3. Install neutral switch in transmission case and tighten to 120-180 **in-lbs** (13.6-20.3 Nm).

NOTE

The neutral switch is not polarity sensitive. Install the elbow connectors on either post.

4. Install two elbow connectors onto neutral switch posts.
5. Test neutral switch for proper operation as follows:
   a. Verify that transmission is in NEUTRAL.
   b. Turn Ignition/Light Key Switch to IGNITION.
   c. Verify that neutral indicator light illuminates.

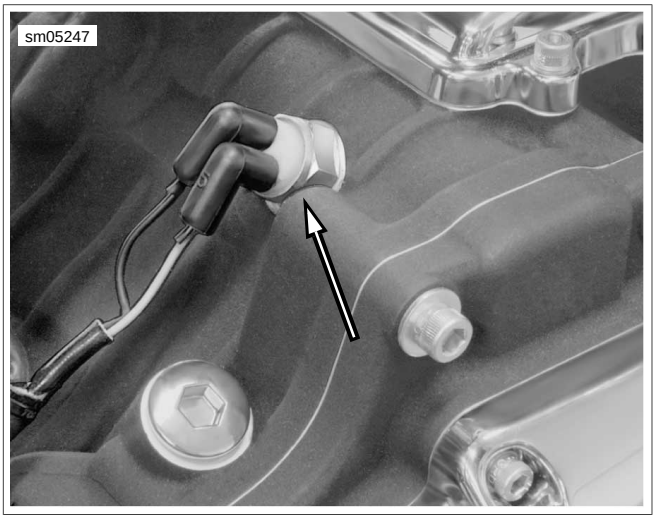


Figure 7-87. Neutral Switch

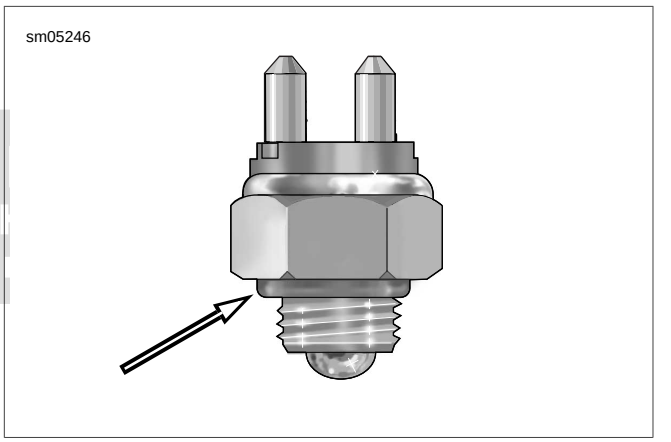


Figure 7-88. Neutral Switch O-Ring

OIL PRESSURE SWITCH AND SENDER 7.25

REMOVAL

1. **FLHR/C:** See Figure 7-89. Remove elbow connector (1) from post terminal of oil pressure switch (2).
2. **FLHX, FLHTC/U, FLHTK, FLTRX, FLTRU:** Remove 4-place Delphi connector (3) from oil pressure sender (4).
3. Remove switch or sender from crankcase.

INSTALLATION

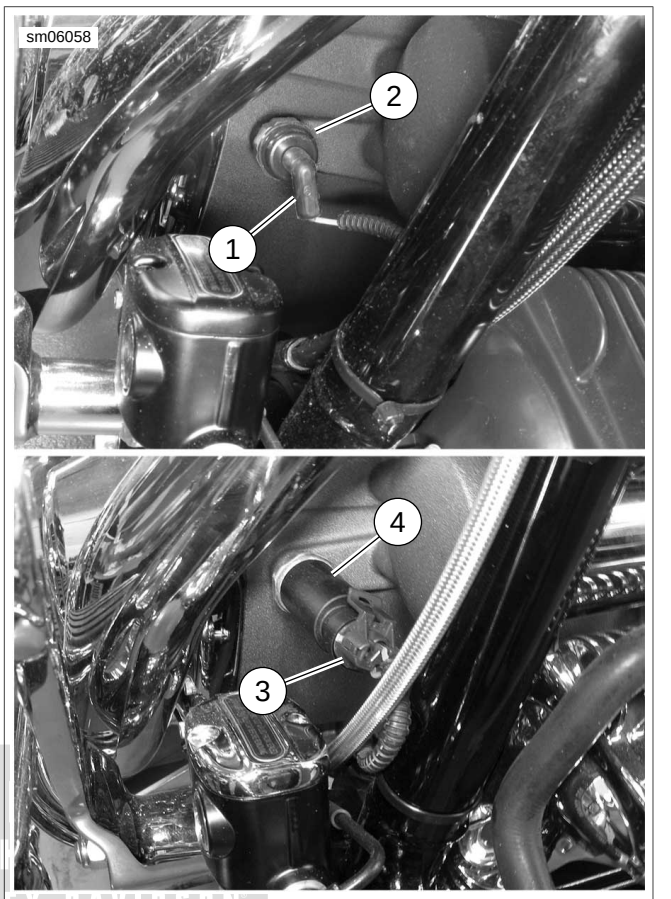
NOTE

If reusing oil pressure switch/sender, apply Loctite Pipe Sealant with Teflon 565 to threads.

1. See Figure 7-89. Start oil pressure switch or sender into crankcase bore.
2. **FLHR/C:**
   a. Tighten oil pressure switch to 96-144 **in-lbs** (10.8-16.3 Nm).
   b. Install elbow connector (1) onto post terminal.
3. **FLHX, FLHTC/U, FLHTK, FLTRU, FLTRX:**
   a. Tighten oil pressure sender to 96-144 **in-lbs** (10.8-16.3 Nm).
   b. Install 4-place Delphi connector (3).

   NOTE

   Be sure harness is routed outside frame rail as shown.
4. Test oil pressure switch/sender for proper operation and check for leaks.



1. **Elbow connector**
2. **Oil pressure switch**
3. **Delphi connector**
4. **Oil pressure sender**

Figure 7-89. Oil Pressure Switch/Sender

STOPLIGHT SWITCHES 7.26

FRONT STOPLIGHT SWITCH

Removal/Installation

See 7.40 HANDLEBAR SWITCH ASSEMBLIES.

REAR STOPLIGHT SWITCH

Removal

NOTICE

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)

NOTE

Immediately wipe up any brake fluid spillage with a clean, dry, soft cloth. Follow up by thoroughly wiping affected area with a clean, damp, soft cloth (small spills) or washing with a large quantity of soapy water (large spills).

1. See Figure 7-90. Remove wire connectors (1).

NOTE

Wrap rear brake line with piece of shop towel to absorb any loss of brake fluid.

2. Hold brake line fitting (3) and remove rear stoplight switch (2).

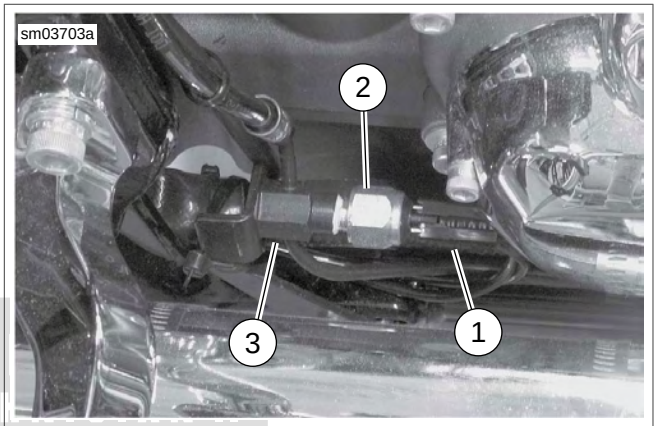
Installation

1. Apply Loctite Pipe Sealant with Teflon 565 to threads of rear stoplight switch.
2. See Figure 7-90. Install rear stoplight switch (2) into rear brake line fitting (3).
3. Hold brake line fitting and tighten rear stoplight switch to 12-15 ft-lbs (16.3-20.3 Nm).
4. Fill and bleed rear brake system. See 2.16 BLEEDING BRAKES.

⚠WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

5. Verify proper operation of tail lamp/rear brake light.



1. **Wire connectors**
2. **Stoplight switch**
3. **Brake line fitting**

Figure 7-90. Rear Stoplight Switch

HORN 7.27

INSPECTION

If the horn fails to sound or does not sound satisfactorily, check for loose, frayed or damaged wires leading to horn terminal, discharged battery or corroded ground.

The horn is permanently sealed and non-repairable. Only the mounting hardware is replaceable.

NOTE

No tonal adjustments may be made to this horn.

REMOVAL

1. Remove acorn nut and flat washer to free horn assembly from rubber mount stud.
2. Remove elbow terminals from spade contacts and release main harness conduit from J-clamp.
3. Remove flange nut (10mm) from circular recess at back of horn bracket. Remove horn from chrome horn cover.

INSTALLATION

1. Fit horn into chrome cover so that stud at back slides through hole in horn bracket. Apply two drops of Loctite Low Strength Threadlocker 222 (purple) to threads of horn stud.

NOTE

Overtightening the flange nut can cause permanent horn damage resulting in reduced volume and tone quality.

2. Install flange nut (10mm) on horn stud and tighten to 80-100 **in-lbs** (9.0-11.3 Nm).
3. Install elbow terminals onto spade contacts.

NOTE

The horn is not polarity sensitive. Elbow terminals may be attached to either spade contact.

4. Capture main harness conduit in J-clamp and install horn bracket onto rubber mount stud. Install flat washer and acorn nut. Tighten acorn nut to 80-120 **in-lbs** (9.0-13.6 Nm).

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

CIGARETTE LIGHTER: FAIRING MODELS 7.28

TROUBLESHOOTING

NOTE

The lighter socket is not intended to be used as a power port for electrical devices. Damage to the lighter socket may occur.

1. Ignition/light key switch must be ON or in ACCESSORY position for lighter operation.
2. If lighter does not work, substitute a known good lighter element.
3. If lighter is still inoperative, check for 12 vdc at center socket contact and ground at outer shell contact.
4. Refer to applicable wiring diagram in B.2 WIRING DIAGRAMS if 12 vdc or ground are not present. Use voltage checks to isolate problem.

REMOVAL

1. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS or 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.
2. Disconnect socket terminals from spade contacts on cigarette lighter.
3. Remove lighter from socket. Holding socket, unscrew outer shell. Remove socket and outer shell from inner fairing.

INSTALLATION

1. Slide socket of cigarette lighter through bore in fairing. Thread outer shell onto socket until tight. Install cigarette lighter in socket.
2. Connect orange wire terminal to center socket spade contact, the black wire terminal to outer shell contact.
3. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS or 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

GAUGES AND INSTRUMENTS: FAIRING MODELS 7.29

2 INCH DIAMETER GAUGES: FUEL LEVEL, AMBIENT AIR TEMPERATURE, VOLTMETER, OIL PRESSURE

Removal

1. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS or 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.
2. Pull 2-place and 3-place socket housings to release interconnect harness from lamp and gauge, respectively.

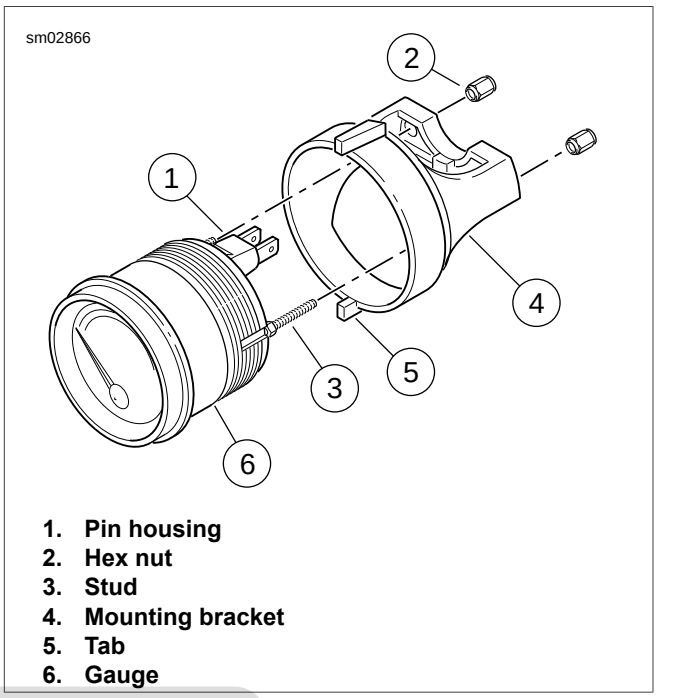
NOTE

*See Figure 7-91. To replace lamp, pull pin housing from gauge and then pull lamp from slot of pin housing. Install **new** lamp in slot and insert pin housing back into gauge.*

3. Remove hex nuts from studs. Remove mounting bracket.
4. Remove gauge from inner fairing.

Installation

1. Install gauge in inner fairing.
2. See Figure 7-91. Slide mounting bracket over studs. Verify that tabs on top and bottom of bracket engage slots in inner fairing.
3. Loosely install hex nuts on studs. Verify that gauge is properly aligned and then tighten nuts to 10-20 **in-lbs** (1.1-2.3 Nm).
4. Install 3-place and 2-place socket housings to connect interconnect harness to gauge and lamp, respectively.
5. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS or 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.



1. **Pin housing**
2. **Hex nut**
3. **Stud**
4. **Mounting bracket**
5. **Tab**
6. **Gauge**

Figure 7-91. 2 Inch Diameter Gauges

TACHOMETER

Removal

1. Proceed as follows:
   a. **Fork mounted fairing models:** Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
   b. **Frame mounted fairing models:** Remove bezel. See 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS.
2. Remove tachometer connector [108].
3. Remove two screws to free tachometer bracket from back of tachometer gauge.
4. Push tachometer gauge toward rear of motorcycle to remove.

Installation

1. Insert tachometer gauge into inner fairing or bezel bore (depending on model).
2. Align holes in tachometer bracket with those at back of tachometer gauge and start two screws.
3. Rotate tachometer gauge until tabs at top and bottom of bracket engage slots in inner fairing or bezel.
4. Verify that gauge is properly aligned and tighten two screws to 10-20 **in-lbs** (1.1-2.3 Nm).
5. Install tachometer connector [108].

6. Proceed as follows:
   a. **Fork mounted fairing models:** Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
   b. **Frame mounted fairing models:** Install bezel. See 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS.

SPEEDOMETER

Removal

1. Proceed as follows:
   a. **Fork mounted fairing models:** Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
   b. **Frame mounted fairing models:** Remove bezel. See 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS.
2. Remove speedometer connector [39].
3. Remove two screws to free speedometer bracket from back of speedometer gauge. On fork mounted fairing models, leave anchor on interconnect harness installed in lower ear of speedometer bracket, if present.
4. Push speedometer gauge toward rear of motorcycle to remove.

Installation

1. Insert speedometer gauge into opening.
2. Align holes in speedometer bracket with those at back of speedometer gauge and start two screws.

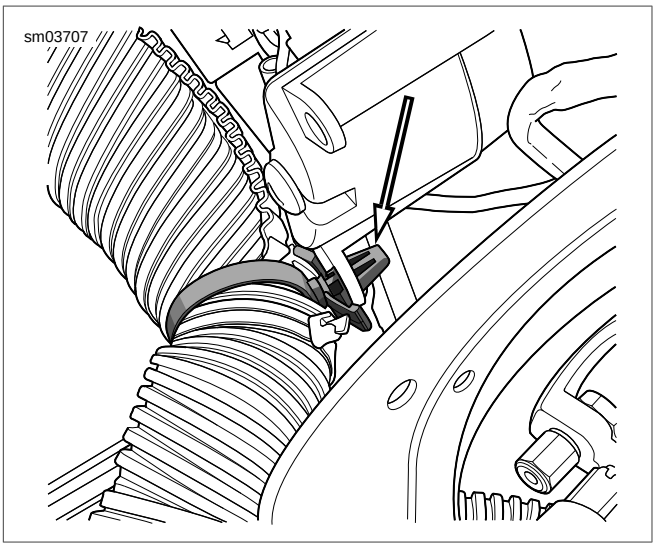


Figure 7-92. Anchor Interconnect Harness in Ear of Speedometer Bracket

3. Rotate speedometer gauge until tabs at top and bottom of bracket engage slots in inner fairing or bezel (depending on model).
4. Verify that gauge is properly aligned and tighten two screws to 10-20 **in-lbs** (1.1-2.3 Nm).
5. Install speedometer connector [39].
6. Proceed as follows:
   a. **Fork mounted fairing models:** Verify that anchor on interconnect harness is installed in lower ear of speedometer bracket. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
   b. **Frame mounted fairing models:** Install bezel. See 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS.

DIGITAL TECHNICIAN HARLEY-DAVIDSON

INDICATOR LAMPS: FAIRING MODELS 7.30

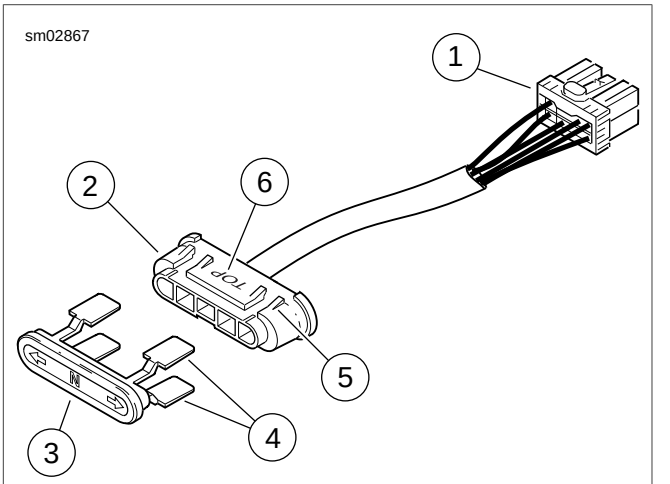
INDICATOR LAMPS

Removal

NOTE

All models are equipped with Light Emitting Diodes (LEDs) in lieu of indicator lamps. The indicator lamp assembly is not serviceable. If one LED is bad, the indicator lamp assembly must be replaced.

1. Proceed as follows:
   a. **Fork mounted fairing models:** Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
   b. **Frame mounted fairing models:** Remove bezel. See 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS.
2. Disconnect indicator lamp connector [21].
3. On fork mounted fairing models, remove tachometer gauge to access indicator lamp assembly. See 7.29 GAUGES AND INSTRUMENTS: FAIRING MODELS.
4. See Figure 7-93. Release each paddle on lens from pair of index tabs on indicator lamp assembly. Remove lens if damaged.



1. **Indicator lamp connector [21]**
2. **Indicator lamp assembly**
3. **Lens**
4. **Paddles**
5. **Index tabs**
6. **Orientation stamp**

Figure 7-93. Indicator Lamp Assembly

Installation

1. Place lens in inner opening, if removed. Note position of oil icon on frame mounted fairing models to be sure that lens is right side up. On fork mounted fairing models, slot at bottom of lens engages index tab in inner fairing to prevent improper orientation.
2. With the word "TOP" facing upward, engage each paddle on lens with pair of index tabs on indicator lamp assembly.
3. Connect indicator lamp connector [21].
4. On fork mounted fairing models, install tachometer gauge. See 7.29 GAUGES AND INSTRUMENTS: FAIRING MODELS.
5. Proceed as follows:
   a. **Fork mounted fairing models:** Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
   b. **Frame mounted fairing models:** Install bezel. See 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS.

DIGITAL TECHNICIAN HARLEY-DAVIDSON

GAUGES AND INSTRUMENTS: ROAD KING MODELS 7.31

FUEL GAUGE

Removal

1. Remove main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
2. Draw fuel gauge connector [117], 4-place Multilock, out of tunnel on left side of fuel tank and disconnect.

NOTE

For instructions to remove wire terminals see A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

3. Remove terminals from connector housing.
4. Remove convoluted tubing from wires.
5. Remove the gauge from the top left side of the fuel tank. Do not twist during removal. Pull upward just far enough to free the gauge from the fuel tank.
6. Remove fuel gauge from motorcycle while feeding wires and pin terminals up through tube.
7. If reusing gauge, inspect rubber seal for tears, cuts or general deterioration. Replace seal if necessary. Install **new** seal so that flat side contacts edge of gauge.

Installation

1. Place **new** fuel gauge assembly next to discarded unit and cut wires to proper length.

NOTE

For instructions on crimping wire terminals, see A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

2. Crimp **new** pin terminals onto fuel gauge wires.
3. Feed wires down into tube while lowering cap into position. When pin terminals exit hole at bottom of fuel tank, gently pull wires while installing the fuel gauge on the fuel tank. Do not twist the gauge during installation. Hold the gauge firmly and press downward until it snaps in place.
4. Install convoluted tubing on wires.

NOTE

For instructions on properly installing wire terminals, see A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR.

5. See Figure 7-94. Install terminals into connector housing.
6. Route pin housing and convoluted tubing forward and then inboard between front of crossover hose fitting and bottom of fuel tank. Connect fuel gauge connector and feed into tunnel of fuel tank.
7. Install main fuse. See 7.7 SYSTEM FUSES AND RELAYS.

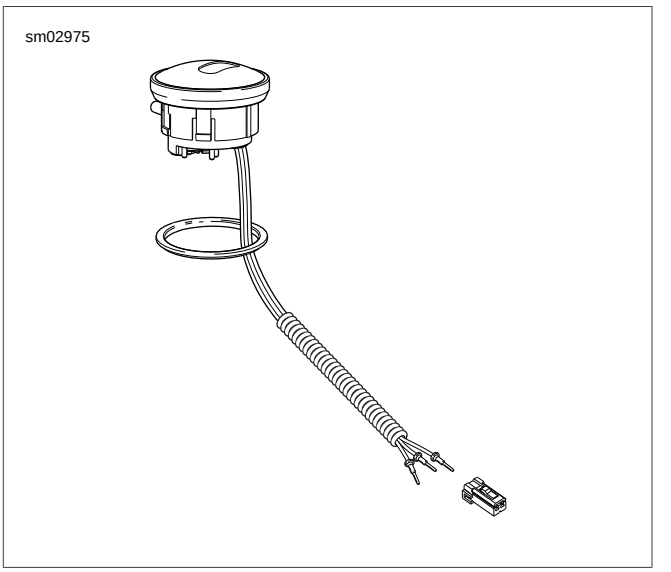


Figure 7-94. Fuel Gauge (FLHR/C)

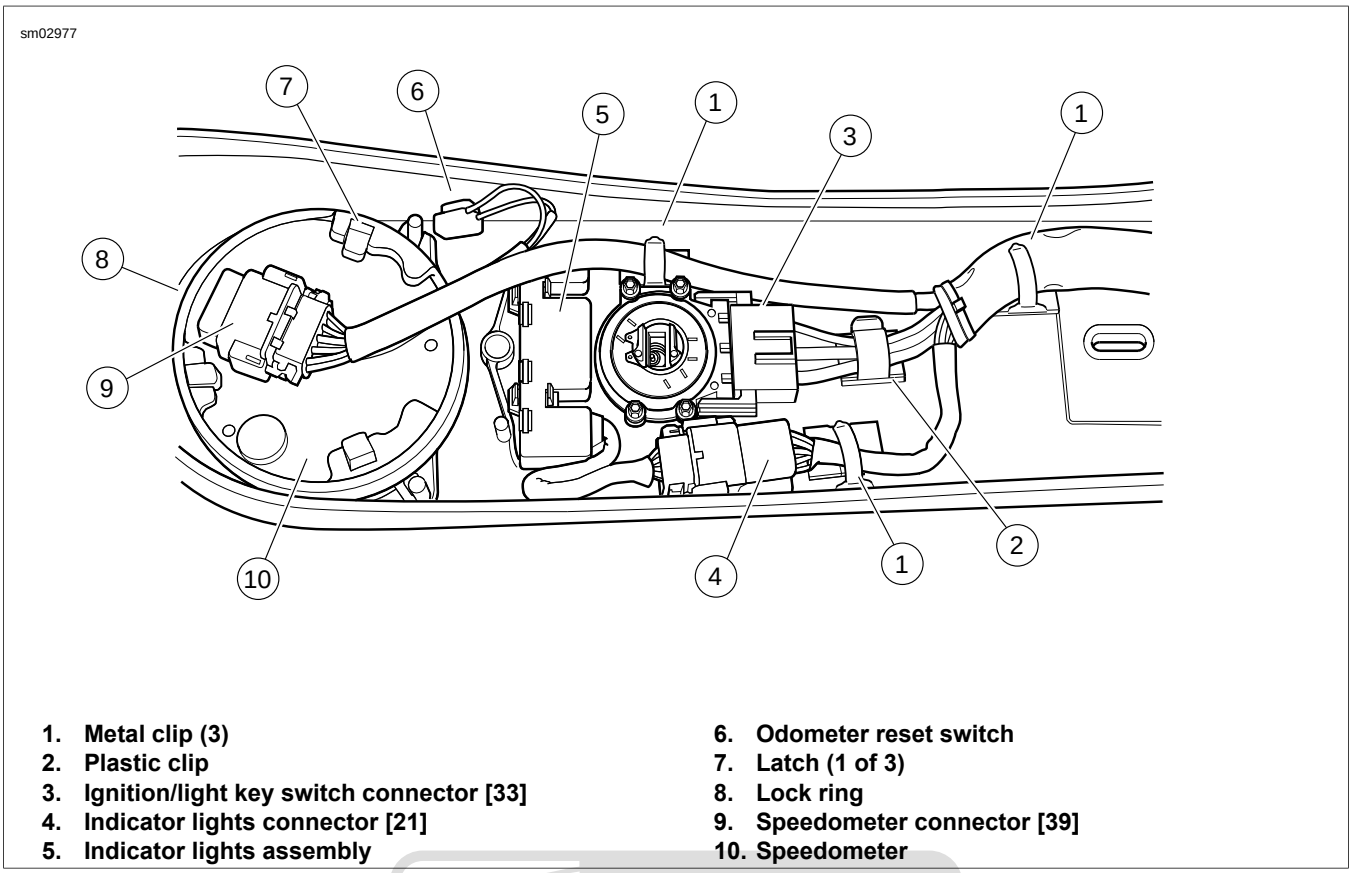
Table 7-18. FLHR/C Fuel Gauge [17]

WIRE COLOR	CHAMBER NUMBER
Orange	1
Yellow/White	2
-	3
Black	4

SPEEDOMETER

Removal

1. Remove main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
2. Remove seat. See 2.25 SEAT.
3. Remove fasteners to release console from fuel tank.
4. Lay a clean shop towel on forward part of rear fender and lay console upside down on shop towel.
5. See Figure 7-95. Remove speedometer connector (9). If necessary, bend back flexible metal clips (1) to free connector conduit.
6. Gently pry three latches (7) upward to release lock ring (8) from back of speedometer.
7. Remove speedometer from top side of console.
8. Remove rubber gasket from speedometer bore.



1. **Metal clip (3)**
2. **Plastic clip**
3. **Ignition/light key switch connector [33]**
4. **Indicator lights connector [21]**
5. **Indicator lights assembly**
6. **Odometer reset switch**
7. **Latch (1 of 3)**
8. **Lock ring**
9. **Speedometer connector [39]**
10. **Speedometer**

Figure 7-95. Instrument Console Assembly (FLHR/C)

Installation

1. Lubricate groove in rubber gasket with isopropyl alcohol or glass cleaner. Place the gasket into position around the console speedometer bore.
2. Install speedometer into rubber gasket. Lubricate gasket with isopropyl alcohol or glass cleaner, if necessary. The speedometer should fit snugly against the gasket without movement.
3. See Figure 7-95. Place lock ring over back of speedometer aligning two slots with console bosses. Press latches (7) down until they lock into position.
4. Connect speedometer connector (9).
5. If released, bend flexible metal clips (1) to capture connector conduit.
6. Exercising caution to avoid pinching wire harness and vent tube, position console on fuel tank.
7. Install front and rear fasteners to secure console to fuel tank.
8. Tighten fasteners to 36-60 **in-lbs** (4.1-6.8 Nm).
9. Install seat. See 2.25 SEAT.
10. Install main fuse. See 7.7 SYSTEM FUSES AND RELAYS.

INDICATOR LAMPS: ROAD KING MODELS 7.32

INDICATOR LAMPS

Removal

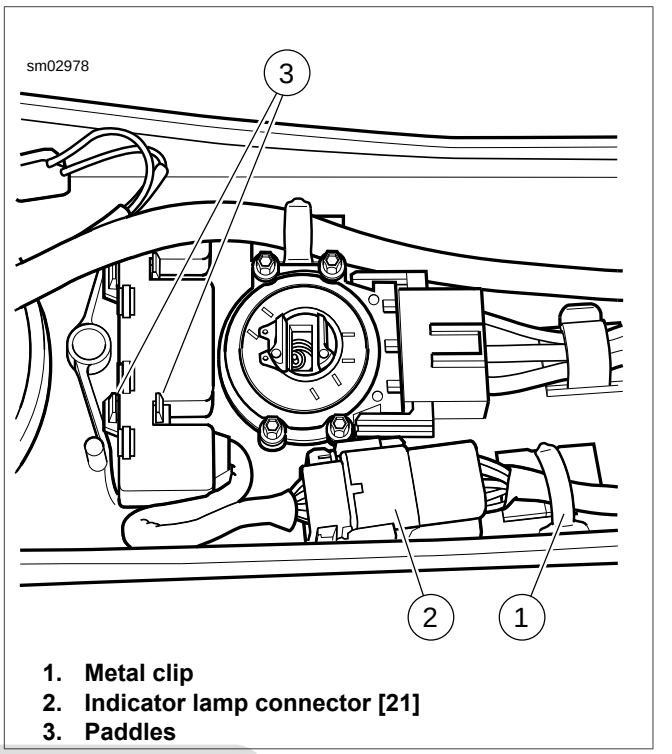
NOTE

All models are equipped with Light Emitting Diodes (LEDs) in lieu of indicator lamps. The indicator lamp assembly is not serviceable. If one LED is bad, the indicator lamp assembly must be replaced.

1. Remove main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
2. Remove seat. See 2.25 SEAT.
3. Remove fasteners to release console from fuel tank.
4. Lay a clean shop towel on forward part of rear fender and lay console upside down on shop towel.
5. See Figure 7-96. Disconnect indicator lamp connector (2). If necessary, bend flexible metal clip (1) to free connector conduit.
6. Remove indicator lamp assembly from console as follows:
   a. Insert the blade of a large screwdriver under rear corner of indicator lamp assembly.
   b. Squeeze front and rear paddles (3) on same side of assembly while rotating screwdriver.
   c. When one side of assembly becomes free, repeat procedure on opposite side to release unit from console.

Installation

1. Install indicator lamp assembly into console as follows:
   a. Place assembly into position in console engaging four paddles in slots of indicator lamp assembly.
   b. While pushing down on assembly, push up on lens on outboard side of console until assembly fits snugly.



1. **Metal clip**
2. **Indicator lamp connector [21]**
3. **Paddles**

Figure 7-96. Release Paddles to Free Indicator Lamp Assembly (FLHR/C)

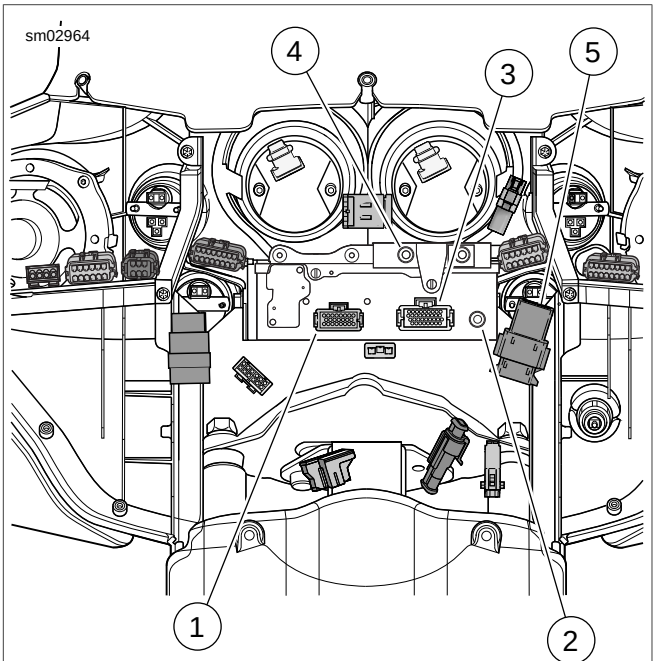
2. Connect indicator lamp connector. If released, bend flexible metal clip to capture connector conduit.
3. Exercising caution to avoid pinching wire harness and vent tube, position console on fuel tank.
4. Install front and rear fasteners to secure console to fuel tank.
5. Tighten fasteners to 36-60 **in-lbs** (4.1-6.8 Nm).
6. Install seat. See 2.25 SEAT.
7. Install main fuel. See 7.7 SYSTEM FUSES AND RELAYS.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

RADIO

Removal

1. Remove main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
2. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS or 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.
3. **Non-Ultra Models:**
   a. See Figure 7-97. Disconnect radio connector (1).
   b. Disconnect radio antenna cable connector (2).
4. **Ultra Models:**
   a. See Figure 7-97. Disconnect radio connector (1).
   b. Disconnect radio antenna cable connector (2).
   c. Disconnect radio connector (3).
   d. Disconnect CB antenna cable connector (4).
   e. Disconnect CB module connector (5).
   f. Remove screw to release flange of CB module from radio. Remove CB module.
5. See Figure 7-98. Remove four screws to release radio from radio support brackets.
6. Pull radio forward to remove from opening in inner fairing.



1. **Radio [27]**
2. **Radio antenna cable [51]**
3. **Radio [28]**
4. **CB antenna cable [50]**
5. **CB module [184]**

Figure 7-97. Radio/CB Connections

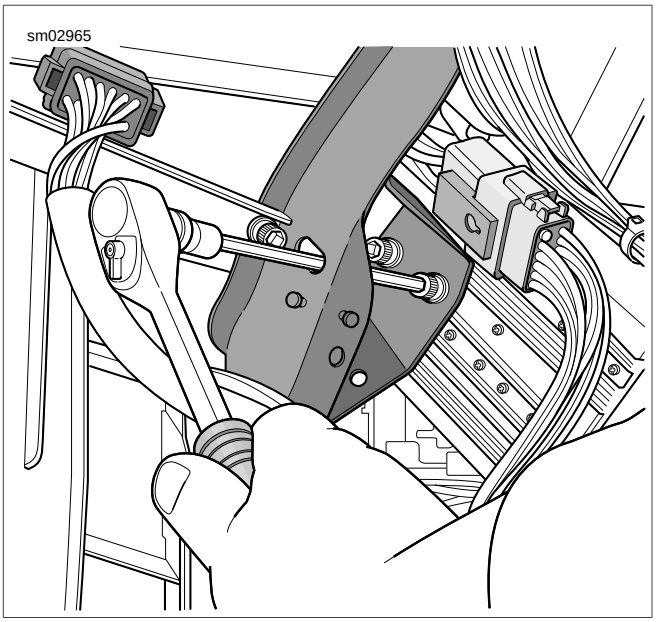


Figure 7-98. Release Radio from Fairing Brackets

Installation

1. Position radio between radio support brackets and push into opening in inner fairing.

2. Starting at the rear, install four screws and tighten to 35-45 **in-lbs** (4.0-5.1 Nm).
3. **Non-Ultra Models:**
   a. See Figure 7-97. Connect radio connector (1).
   b. Connect radio antenna cable connector (2).
4. **Ultra Models:**
   a. See Figure 7-97. Fit CB module into rubber grommets at top left side of radio.
   b. Fasten flange of CB module to radio and tighten screw to 35-45 **in-lbs** (4.0-5.1 Nm).
   c. Connect radio connector (3).
   d. Connect CB antenna cable connector (4).
   e. Connect CB module connector (5).
   f. Connect radio connector (1).
   g. Connect radio antenna cable connector (2).
5. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS or 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.
6. Install main fuse. See 7.7 SYSTEM FUSES AND RELAYS.

FRONT FAIRING SPEAKERS

Removal

1. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS or 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.
2. Carefully pull socket terminals from speaker spade contacts.
3. Remove three screws to release speaker adapter assembly from inner fairing.
4. Carefully pull speaker from adapter.

Installation

1. With the speaker spade contacts at the top of the adapter, the top being the side with the widest edge, snap speaker into adapter using finger pressure.
2. If speaker grille is loose, apply 3M-847 adhesive (Part No. 99618-60) to outer edge of adapter ring. Install grille on adhesive.
3. With the widest edge of adapter at the top, align holes in speaker adapter assembly with those in inner fairing.
4. Start two long screws to secure top of speaker adapter assembly to inner fairing. Capturing fairing support brace, install short screw in lower outboard hole (positioning flat washer between adapter and support brace). The screw hole on the lower inboard side is not used.
5. Tighten lower speaker screw to 22-28 **in-lbs** (2.5-3.2 Nm). Tighten two upper speaker screws to 35-50 **in-lbs** (4.0-5.7 Nm).
6. Install socket terminals onto speaker spade contacts. Different size spade contacts prevent improper assembly.
7. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS or 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.

FRONT HEADSET RECEPTACLE

NOTE

The following instructions may also be used for replacement of the fuel tank console on which the front headset receptacle is mounted.

Removal

1. Remove seat. See 2.25 SEAT.
2. Remove left side saddlebag. See 2.26 SADDLEBAGS.
3. Remove left side cover.
4. Carefully cut two cable straps securing headset receptacle conduit and audio harness to inboard side of left upper frame tube (front and rear of saddlebag rail).
5. Release console connector [53], 12-place Deutsch, from attachment clip anchored in hole of frame crossmember (at rear of battery). Disconnect pin and socket halves.
6. Remove socket screw to release front of console from fuel tank weldment.
7. Remove hex screw to release rear console bracket from clip nut on rear fuel tank bracket.
8. Lay a clean shop towel on forward part of rear fender.
9. Press button to open fuel door on console. Remove filler cap. Remove console bending back flexible metal clips as necessary to release wire harness and front headset receptacle conduit.
10. Lay console upside down on shop towel. Install filler cap.
11. See Figure 7-99. Raise headset receptacle cap. Place pin punch in either notch of lock ring and rotate in a counterclockwise direction until loose.
12. Remove lock ring and cap from headset receptacle.
13. Remove headset receptacle from console.

Installation

1. Insert threaded end of headset receptacle through hole in console.
2. Slide receptacle cap over threaded end of headset receptacle.
3. Open cap, and with the notches on the outboard side, thread lock ring onto headset receptacle.
4. See Figure 7-99. Place pin punch in either notch of lock ring and rotate in a clockwise direction until tight.
5. Remove filler cap, if installed. Position console on fuel tank bending flexible metal clips as necessary to capture wire harness and front headset receptacle conduit. Install filler cap.

6. Start socket screw to fasten front of console to fuel tank weldment.
7. Start hex screw to fasten rear console bracket to clip nut on rear fuel tank bracket.
8. Alternately tighten socket/hex screws to 36-60 **in-lbs** (4.1-6.8 Nm).
9. Connect console connector [53], 12-place Deutsch. Install connector onto attachment clip anchored in hole of frame crossmember (at rear of battery).
10. Install two **new** cable straps to secure headset receptacle conduit and audio harness to inboard side of left upper frame tube (front and rear of saddlebag rail).
11. Install left side cover.
12. Install left side saddlebag. See 2.26 SADDLEBAGS.
13. Install seat. See 2.25 SEAT.
14. Test operation of headset receptacle.

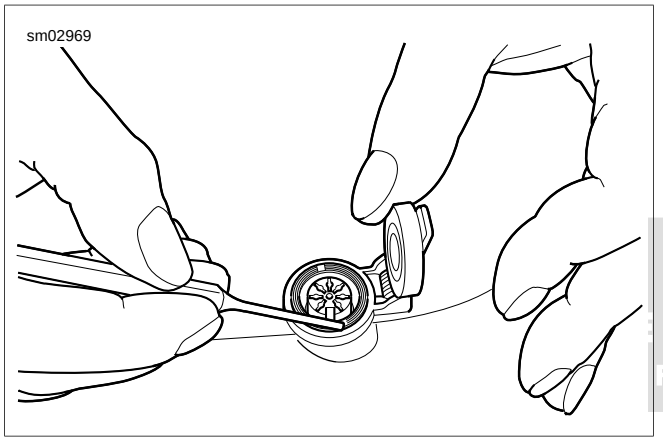


Figure 7-99. Remove Lock Ring from Receptacle

REAR HEADSET RECEPTACLE

Replace audio harness. See 7.38 REAR AUDIO HARNESS: ULTRA MODELS.

REAR PASSENGER SWITCHES

Removal

NOTE

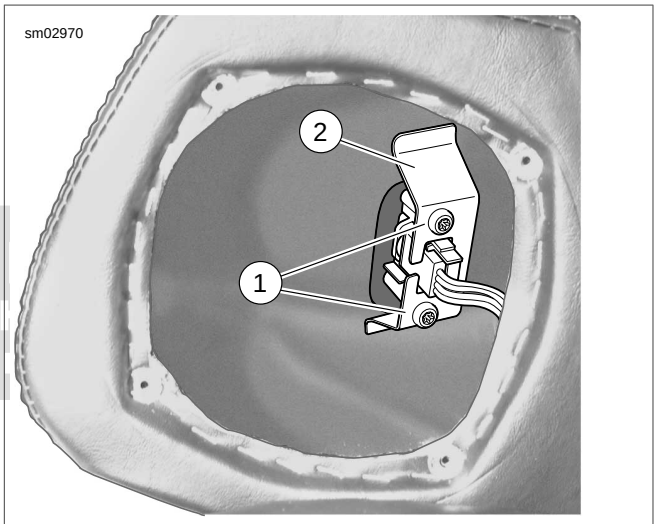
Right and left side replacement passenger switch assemblies are interchangeable.

1. Remove main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
2. Open Tour-Pak.
3. Remove four screws and pull speaker grille from speaker box.
4. Remove speaker from speaker box and carefully pull socket terminals from speaker spade contacts.
5. Remove trim ring and gently pull on wire harness to draw rear speaker/passenger controls connector, 6-place Deutsch, out of speaker box.
6. Disconnect pin and socket halves of connector.
7. Draw socket housing back into speaker box and pull out through speaker hole.
8. See Figure 7-100. Remove two screws to release switch bracket from inside of speaker box. Remove bracket using slot to free switch wires.
9. Pull switch housing assembly, wire harness, speaker terminals and socket housing from speaker box using switch housing hole on outboard side.
10. Carefully pull keycap from switch shaft. Remove switch from switch housing.
11. Remove terminals 1 through 4 from socket housing.

NOTE

For instructions on properly removing wire terminals, see A.12 DEUTSCH DT SEALED CONNECTORS.

12. Pulling one wire at a time, draw four switch wires from conduit.



1. **T25 TORX screw (2)**
2. **Switch bracket**

Figure 7-100. Remove Passenger Switch Assembly

Installation

1. Inserting one wire at a time, push four switch wires through conduit.
2. Install terminals into socket housing. Refer to Table 7-19.

Table 7-19. Rear Passenger Switches [41/42]

WIRE COLOR	CHAMBER NUMBER
Pink/White	1
Gray/White	2
Violet/Black	3
*Orange/Black	4
* Mates to O/BK on [41A], BN/W on [42A].	

NOTE

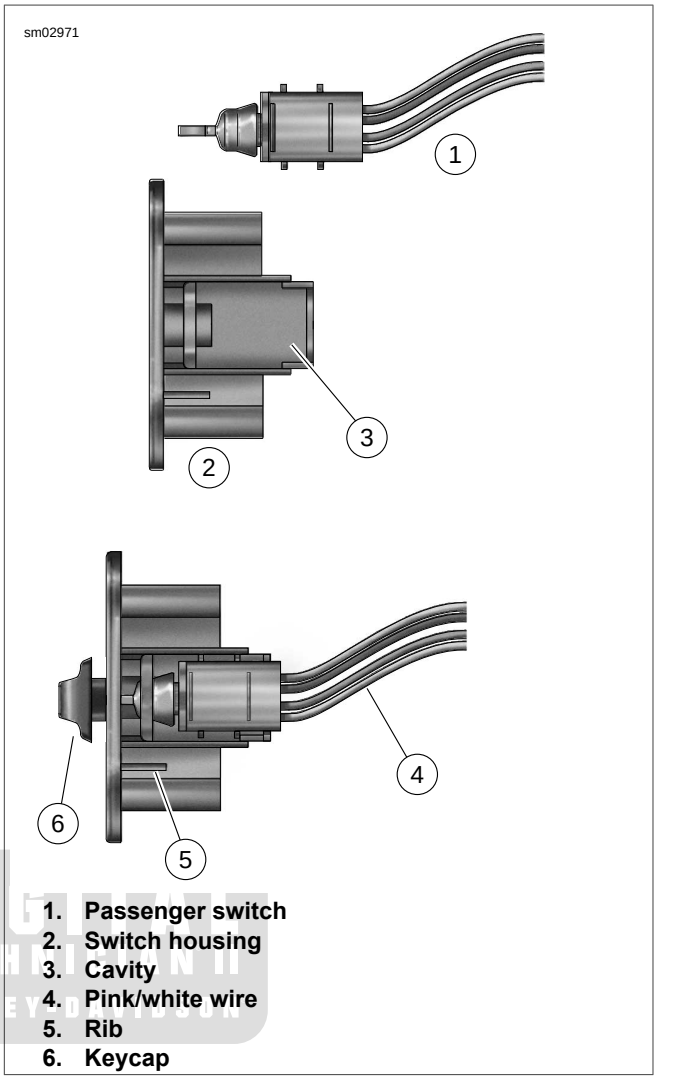
For instructions on properly installing wire terminals, see A.12 DEUTSCH DT SEALED CONNECTORS.

3. See Figure 7-101. With the Pink/White wire at the bottom, place switch in cavity of switch housing. Bottom of assembly is determined by location of rib on switch housing.
4. Note lettering for proper orientation and gently push keycap onto switch shaft. When orienting keycap, remember that bottom of assembly is determined by location of switch housing rib.
5. Feed socket housing, speaker terminals and wire harness through switch housing hole on outboard side of speaker box until switch housing backplate contacts speaker box. Pull wire harness out through speaker hole.

NOTE

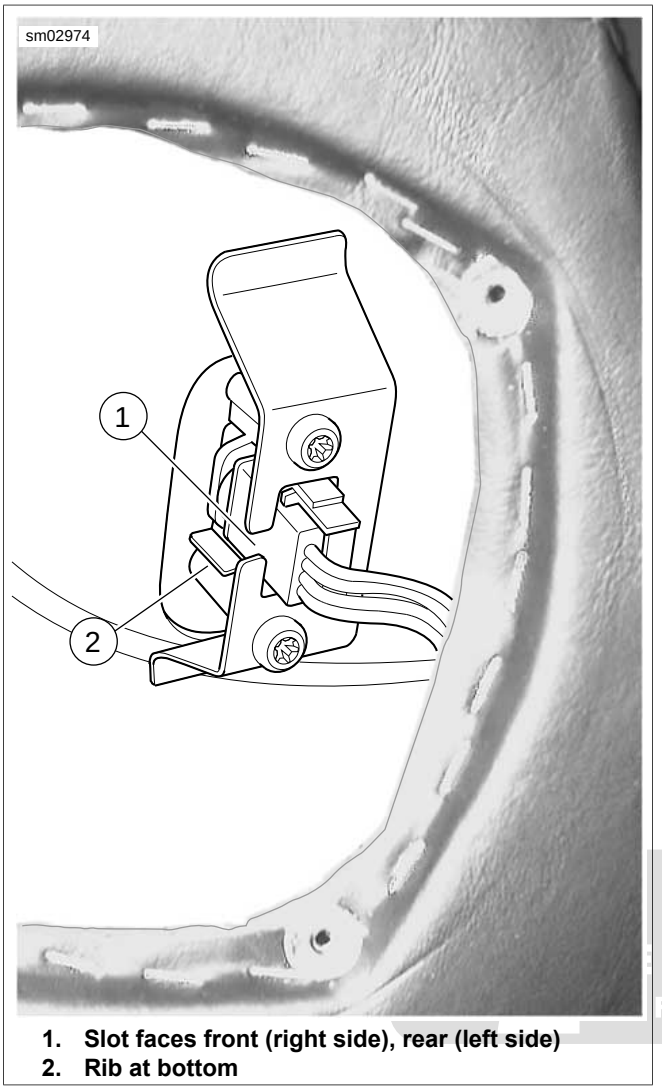
See Figure 7-102. To align bracket and switch housing holes, slot in bracket must face toward the front on right side switch assembly and toward the rear on left side switch assembly. Switch also must be square in cavity of switch housing or bracket will not fit.

6. Reaching into speaker box, align holes in bracket with holes in switch housing. Install two screws.
7. Feed socket housing through speaker hole into speaker box and pull out through harness hole on inboard side.
8. Mate pin and socket halves of connector. Feed connector back up into speaker box pressing trim ring into hole.
9. Install socket terminals onto speaker spade contacts. Different size spade contacts prevent improper assembly.
10. Align holes in speaker grille with those in speaker and slide four screws through grille and speaker holes.
11. With spade contacts at bottom rear corner, position speaker/grille assembly against speaker box. Start screws into speaker box and alternately tighten in a crosswise pattern.
12. Close Tour-Pak.
13. Install main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
14. Test switch for proper operation.



1. **Passenger switch**
2. **Switch housing**
3. **Cavity**
4. **Pink/white wire**
5. **Rib**
6. **Keycap**

Figure 7-101. Install Switch in Housing



1. **Slot faces front (right side), rear (left side)**
2. **Rib at bottom**

Figure 7-102. Install Passenger Switch Assembly

REAR SPEAKERS

Removal

1. Remove main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
2. Open Tour-Pak.
3. Remove four screws from speaker grille. Remove speaker grille from speaker box.
4. Remove speaker from speaker box. Carefully pull two socket terminals from speaker spade contacts.

Installation

1. Install two socket terminals onto speaker spade contacts. Different size spade contacts prevent improper assembly.
2. With spade contacts at bottom, install speaker in speaker box.
3. Align holes in speaker with those in speaker box. Align holes in grille with those in speaker.
4. Install four screws and alternately tighten in a crosswise pattern.
5. Close Tour-Pak.
6. Install main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
7. Test speaker for proper operation.

CB MODULE

Removal

1. Remove main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
2. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
3. See Figure 7-97. Disconnect the following:
   a. CB antenna cable connector [50].
   b. CB module connector [184], 12-place Deutsch (black).
4. Remove screw to release flange of CB module from radio. Remove CB module.

Installation

1. Fit metal cones on CB module into rubber grommets at top of radio. Use the position above radio connector [28], 35-place Amp, as the other location has been reserved for certain P&A accessories.
2. Install screw to fasten flange of CB module to radio. Tighten screw to 35-45 **in-lbs** (4.0-5.1 Nm).
3. See Figure 7-97. Connect the following:
   a. CB antenna cable connector [50].
   b. CB module connector [184], 12-place Deutsch (black).
4. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
5. Install main fuse. See 7.7 SYSTEM FUSES AND RELAYS.

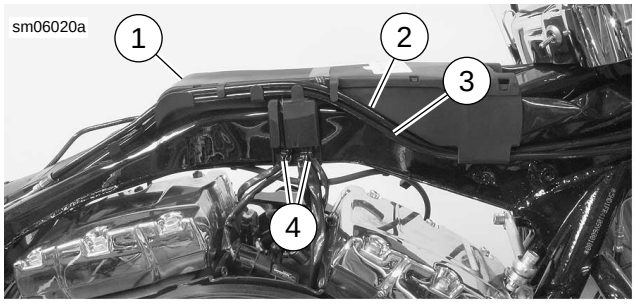
WIRE TROUGH 7.34

REMOVAL

1. Remove main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
2. Remove fuel tank. See 4.5 FUEL TANK.
3. Remove T-MAP sensor connector [80].
4. Remove front [84] and rear [85] fuel injector connectors.
5. Remove TCA connector [211]. Cut anchored cable strap to release connector conduit from front side of induction module.
6. **Models with 103 engine:** Disconnect ACR connectors and release connector housings from induction module support.
7. Disconnect elbow terminals from spade contacts on horn and release harness conduit from J-clamp.
8. Pull back boot and disconnect ET sensor connector [90].
9. Draw connectors removed in previous steps to right side of motorcycle.
10. See Figure 7-103. On ABS equipped motorcycles, release brake lines (2, 3) from wire trough.
11. Cut two cable straps (4) to release breakout harnesses from right side of wire trough.
12. Release catches on cover and remove cover (1).
13. See Figure 7-104. Using a paint pen, draw a line on each wire bundle on both sides of each cable strap.

NOTE

Note that there are a total of ten cable straps. Eight cable straps fix the position of the harness(es) inside the wire trough, while two more fix the position of the breakouts on the right side.

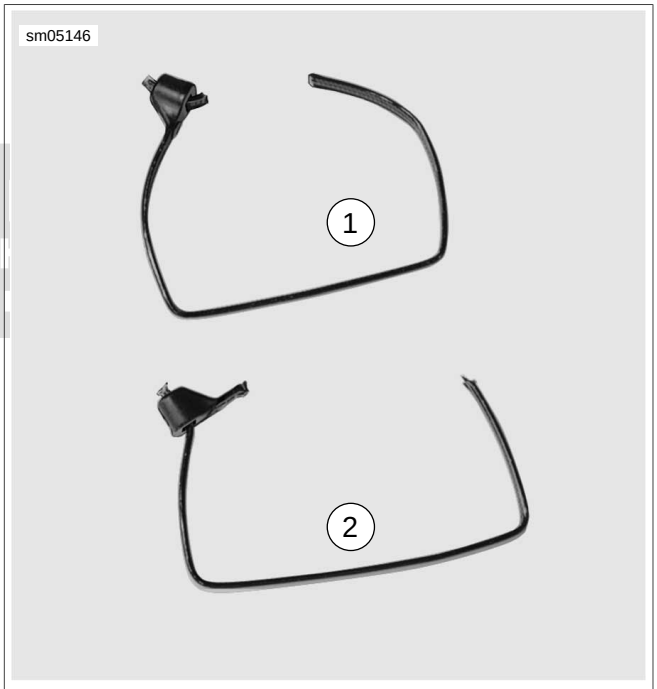


1. **Wire trough cover**
2. **Front master cylinder-to-ABS module line**
3. **ABS module-to-front caliper line**
4. **Breakout harness cable straps**

Figure 7-103. Wire Trough and Brake Lines



Figure 7-104. Mark Location of Cable Straps



1. **Reusable (tail removed)**
2. **Not reusable (eyelet removed)**

Figure 7-105. Cut Cable Straps

NOTE

See Figure 7-105. When removing cable ties, cut off the tail of the cable strap and not the eyelet. The cable strap can then be reused to gather wires when removing harness from wire trough.

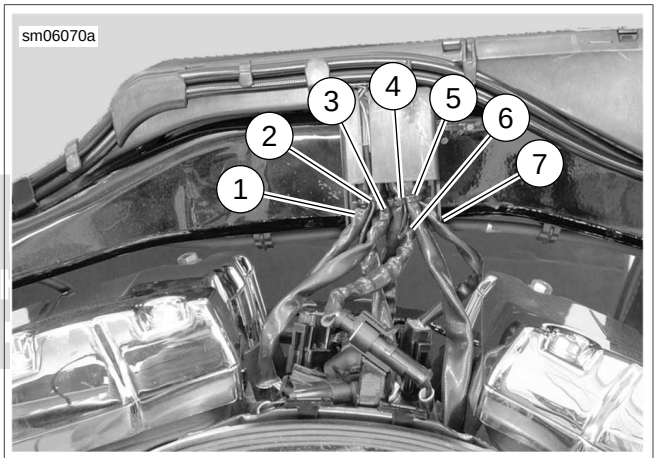
14. Cutting as close to the eyelet as possible, cut eight cable straps inside the wire trough. Remove each cable strap from slots in wire trough and remove the tail remnant from the eyelet. Install the cable strap back on the harness near

the painted lines to gather the bunch of wires. Be sure to capture each wire of the harness.

15. Pull breakout harnesses out through slot in breakout compartment. If ABS equipped, move harnesses outboard of brake lines.
16. **FLHR/C, FLHTK:** Remove fuel gauge harness from slot in front of wire trough.
17. Pry anchor pins at rear of wire trough from holes in frame backbone.
18. Raise wire harnesses and remove wire trough from right side of motorcycle.

INSTALLATION

1. Thread eight **new** cable straps through slots inside wire trough.
2. Raise wire harnesses and slide wire trough into position on frame backbone from right side of motorcycle.
3. **FLHR/C, FLHTK:** Route the fuel gauge harness through slot in front-left of wire trough.
4. See Figure 7-106. Install rear fuel injector, rear ACR (if equipped) and T-MAP sensor breakout harnesses in the rear of the breakout compartment and install a **new** cable tie but do not tighten cable tie.
5. Install front fuel injector, horn/ET sensor, front ACR (if equipped) and TCA breakout harnesses in the front of the breakout compartment and install a **new** cable tie but do not tighten cable tie.
6. Pull breakout harnesses inboard of brake lines on ABS equipped vehicles.
7. Adjust harness wires inside wire trough, so they are positioned within the eight cable straps. Engage each cable strap but do not tighten.
8. Remove the cable straps used to gather the wire bunches.
9. Route main harness and audio harness (if equipped) through front-left channel of wire trough.
10. Route main harness through front-right channel of wire trough.
11. Push anchor pins at rear of wire trough into holes in frame backbone.
12. Make final adjustments to harnesses so that the painted lines are aligned with the cable straps. Tighten cable straps and cut excess cable strap material.
13. Pull on each harness exiting the breakout compartment until painted lines are aligned with cable straps. Tighten cable straps and cut excess cable strap material.
14. Secure cover to wire trough starting at the rear and working forward. Verify that all latches are fully engaged.
15. **ABS equipped motorcycles:** Secure brake line as shown in Figure 7-103.
16. Install T-MAP sensor connector, rear fuel injector connector, front fuel injector connector, ET sensor connector, and elbow terminals onto horn spade contacts. Capture horn harness conduit in J-clamp.
17. Install TCA connector. Install **new** anchored cable strap in hole at front right side of induction module and secure harness. Cut excess cable strap material.
18. **Models with 103 engine:** Connect ACR connectors and secure to induction module support.
19. Install fuel tank. See 4.5 FUEL TANK.
20. Install main fuse. See 7.7 SYSTEM FUSES AND RELAYS.



1. **Rear fuel injector**
2. **Rear ACR (if equipped)**
3. **T-MAP sensor**
4. **Horn/ET sensor**
5. **Front ACR (if equipped)**
6. **TCA**
7. **Front fuel injector**

Figure 7-106. Breakout Harnesses

MAIN WIRING HARNESS 7.35

REMOVAL: ALL MODELS (PART 1)

1. Remove fuel tank. See 4.5 FUEL TANK.
2. Remove battery. See 1.23 BATTERY MAINTENANCE.
3. Remove saddlebags. See 2.26 SADDLEBAGS.
4. Remove left and right side covers.

NOTE

Depending upon model, continue procedure at 7.35 MAIN WIRING HARNESS, Removal: Road King Models (Part 2), 7.35 MAIN WIRING HARNESS, Removal: Fork Mounted Fairing Models (Part 2) or 7.35 MAIN WIRING HARNESS, Removal: Frame Mounted Fairing Models (Part 2).

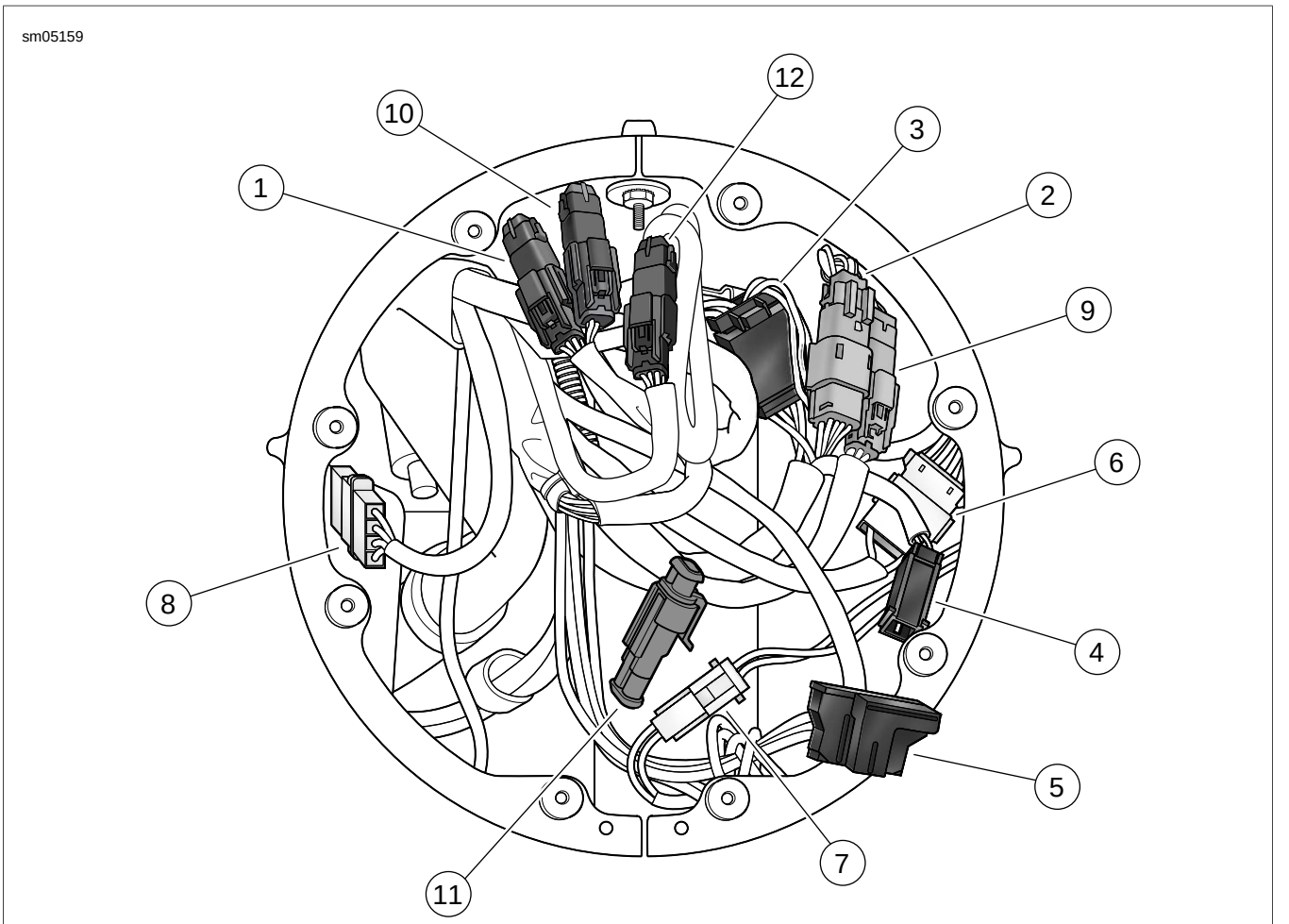
REMOVAL: ROAD KING MODELS (PART 2)

1. Remove headlamp assembly. See 7.11 HEADLAMP: ALL EXCEPT ROAD GLIDE.
2. See Figure 7-107. Reaching inside headlamp nacelle, disconnect connectors and remove from their retaining devices, if present:
   a. Auxiliary lamps [73], 2-place Multilock (white).
   b. Auxiliary lamps switch [109], 4-place Amp.
   c. Right handlebar switches [22], 6-place Molex (black).
   d. Cruise set/resume switch [159], 3-place Molex (black); used on FLHRC only.
   e. Twist grip sensor jumper harness [204], 6-place Molex (black).
3. Remove rivet and P-clamp to release main harness conduit from right side of steering head.
4. Carefully pull main harness rearward under right side of headlamp nacelle allowing conduit and connectors to hang over top of engine guard.
5. Reaching inside headlamp nacelle, disconnect connectors and remove from their retaining devices, if present:
   a. Front fender tip lamp jumper harness [32], 2-place Multilock (black); used on FLHR only.
   b. Accessory switch [67], 4-place Amp.
   c. Front turn signal lamps [31], 6-place Multilock.
   d. Left handlebar switches [24], 8-place Molex (gray).
   e. Cruise on/off switch [158], 3-place Molex (gray); used on FLHRC only.
   f. Front wheel speed sensor [167], 2-place Amp (Tyco); used on ABS equipped motorcycles only.
6. Remove rivet and P-clamp to release main harness conduit from left side of steering head.
7. Carefully pull main harness rearward under left side of headlamp nacelle allowing conduit and connectors to hang over top of engine guard.

NOTE

Continue procedure at 7.35 MAIN WIRING HARNESS, Removal: All Models (Part 3).

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1. **Right handlebar switches [22]**
2. **Left handlebar switches [24]**
3. **Front turn signals [31]**
4. **Front fender tip lamp [32], FLHR only**
5. **Headlamp [38]**
6. **Accessory switch [67]**
7. **Auxiliary lamps [73]**
8. **Auxiliary lamps switch [109]**
9. **Cruise on/off switch [158], FLHRC only**
10. **Cruise set/resume switch [159], FLHRC only**
11. **Front wheel speed sensor [167], ABS equipped**
12. **TGS jumper harness [204]**

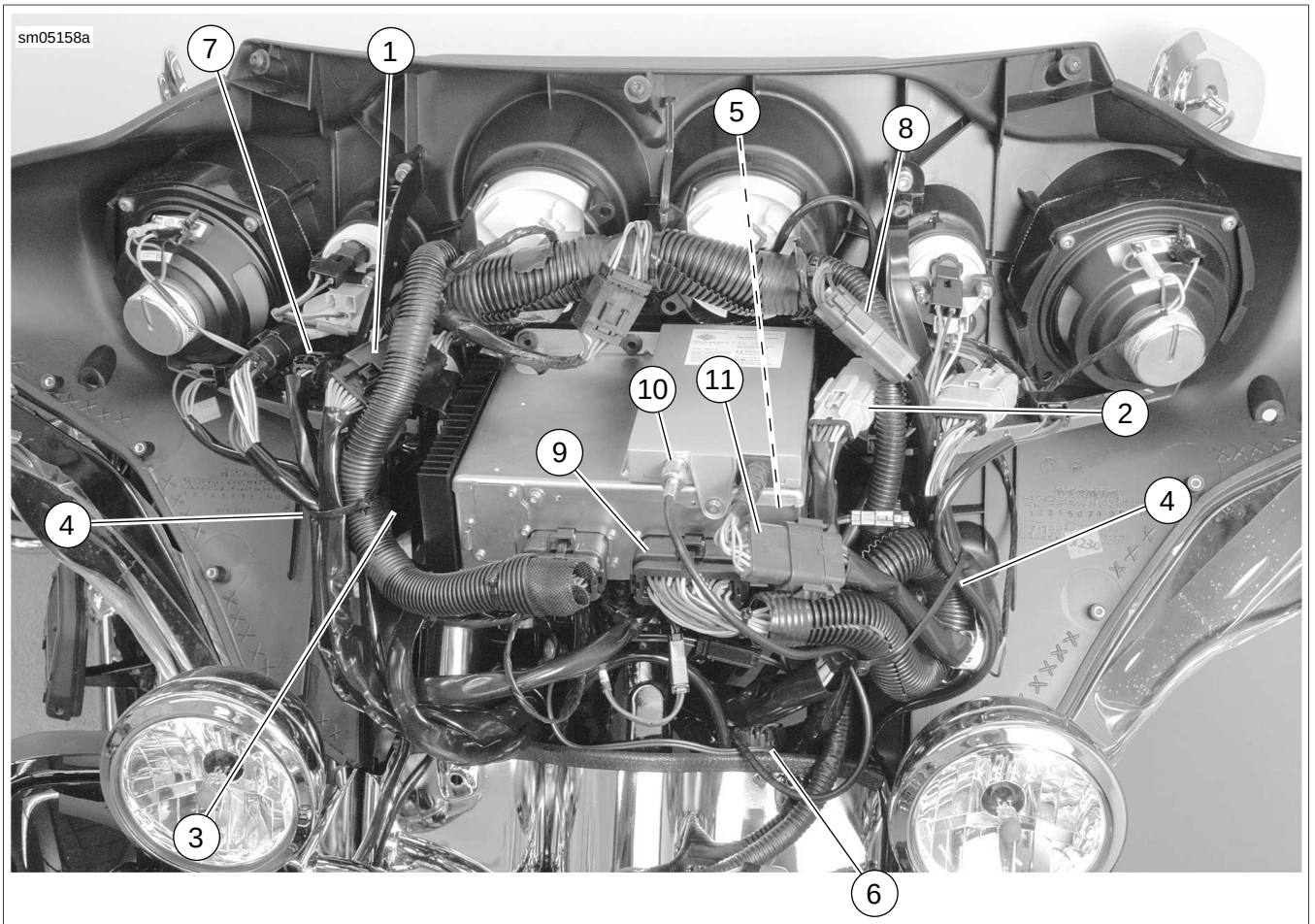
Figure 7-107. Headlamp Nacelle- Main Harness Connectors (Road King models)

REMOVAL: FORK MOUNTED FAIRING MODELS (PART 2)

1. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
2. See Figure 7-108. Cut cable straps (4).
3. Disconnect connectors and remove from their retaining devices, if present:
   a. Twist grip sensor jumper harness (7).
   b. Main to interconnect harness (1).
   c. Main to interconnect harness (3).
   d. Radio antenna cable connector (5).
   e. Main to interconnect harness (2).
   f. Front wheel speed sensor (6) if equipped.
4. Disconnect ignition switch connector. See 7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK.
5. Remove P-clamps securing main harnesses to steering head.
6. Carefully pull main harnesses rearward fairing cap and allow to hang over top of engine guard.
7. Disconnect rear audio harness connectors (8-11) if equipped.

NOTE

Continue procedure at 7.35 MAIN WIRING HARNESS, Removal: All Models (Part 3).



1. **Main to interconnect harness [1]**
2. **Main to interconnect harness [2]**
3. **Main to interconnect harness [15]**
4. **Cable straps**
5. **Radio antenna cable [51] (not visible)**
6. **Front wheel speed sensor [167]**
7. **TGS jumper harness [204]**
8. **Audio to interconnect harness [6]**
9. **Radio [28]**
10. **CB antenna cable [50]**
11. **CB module [184]**

Figure 7-108. Main Harness Fairing Connectors (fork mounted fairing models, typical)

REMOVAL: FRAME MOUNTED FAIRING MODELS (PART 2)

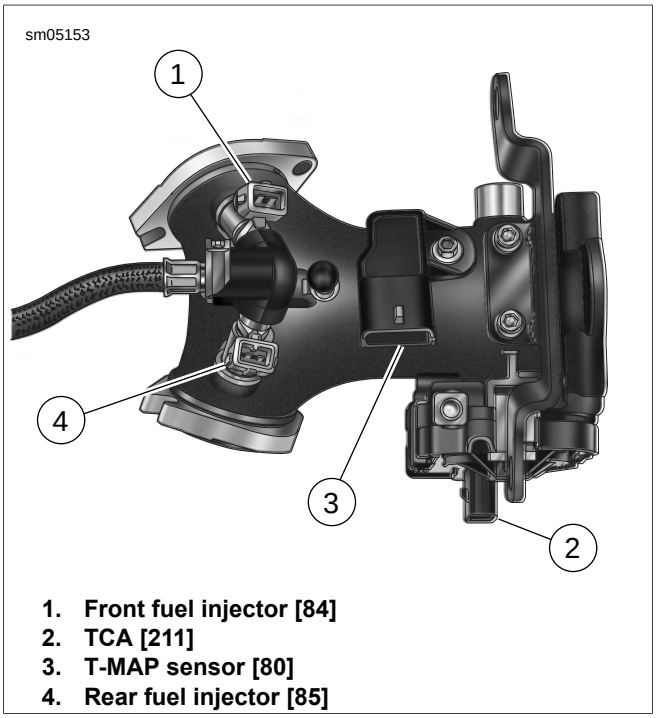
Remove inner fairing. See 2.41 INNER FAIRING: FRAME MOUNTED FAIRING MODELS.

NOTE

Continue procedure at 7.35 MAIN WIRING HARNESS, Removal: All Models (Part 3).

REMOVAL: ALL MODELS (PART 3)

1. Remove air cleaner and backplate. See 4.4 AIR CLEANER ASSEMBLY.
2. Disconnect ACR connectors (if equipped).
3. See Figure 7-109. Remove connectors from induction module:
   a. Remove T-MAP sensor connector (3).
   b. Remove fuel injector connectors (1, 4).
   c. Remove TCA connector (2). Cut anchored cable strap securing harness to front right side of induction module.



1. **Front fuel injector [84]**
2. **TCA [211]**
3. **T-MAP sensor [80]**
4. **Rear fuel injector [85]**

Figure 7-109. Induction Module Assembly (Top View)

4. Remove terminals from horn spade terminals and release conduit from J-clamp.
5. Remove ET sensor connector [90].
6. Draw conduit and connectors to right side of motorcycle.
7. **ABS equipped motorcycles:** release brake lines from clips in wire trough.
8. Cut cable straps securing harnesses to both upper frame rails.
9. Remove purge solenoid connector [95], if equipped.
10. Disconnect ECM connector [78]
11. Remove ignition coil connector [83].

NOTE

Take note of harness ground ring terminal orientation when removing.

12. Remove main harness ground ring terminals from left and right frame ground studs located ahead of battery tray.
13. Pry anchor pins at rear of wire trough from holes in frame backbone.
14. Disconnect siren, if equipped, and remove siren from left side caddy.
15. Remove left side electrical caddy from battery tray. See 7.8 ELECTRICAL CADDIES.
16. **FLHR/C Only:**
    a. Pull anchor on ignition switch jumper harness connector [222], 4-place Packard, from hole in left caddy. Disconnect connector.
    b. Disconnect instrument console connector [20], 16-place Molex, inboard of left upper frame tube. Remove instrument console from motorcycle.
17. **FLHX, FLTRX:**
    a. Cut cable straps to release radio antenna cable from left fender mount and saddlebag mounting bracket.
    b. Disconnect radio antenna cable connector from antenna.
    c. Draw radio antenna cable forward and out through opening at rear of left side caddy.
18. **Models with Tour-Pak:**
    a. Remove rubber mat or map pocket and molded liner from Tour-Pak.
    b. Disconnect radio antenna cable connector. Release cable from two adhesive clips at bottom of Tour-Pak.
    c. Disconnect Tour-Pak lights connector [12] and power outlet connector [258] as equipped.
    d. Disconnect rear audio harness if equipped. See 7.38 REAR AUDIO HARNESS: ULTRA MODELS.
    e. Pull Tour-Pak harness and radio antenna cable out of Tour-Pak.
    f. Cut cable strap to release harnesses from luggage rack rail. Draw Tour-Pak and audio harnesses out through opening at rear of left side caddy.
19. Disconnect oxygen sensor connectors and remove from anchors. Remove and disconnect TSM/HFSM module.
20. **ABS Equipped Only:**
    a. Disconnect ABS module connector [166].
    b. Disconnect rear wheel speed sensor connector [168].
    c. Feed conduit and connectors into battery tray.
21. Remove main power cable ring terminal from starter solenoid post. Draw cable out through opening at rear of left side caddy.
22. Remove starter and disconnect VSS connector. See 7.23 VEHICLE SPEED SENSOR (VSS).
23. Remove connectors from neutral switch.
24. Pull VSS, neutral switch, and starter solenoid connectors through opening at front of battery tray and out through opening at rear of left side caddy.
25. Disconnect voltage regulator. See 7.3 VOLTAGE REGULATOR.
26. Remove CKP sensor connector from front caddy and disconnect. See 7.20 CRANKSHAFT POSITION SENSOR (CKP).
27. Disconnect jiffy stand interlock sensor connector [133].

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28. Disconnect oil pressure switch/sender at front right side of crankcase.
29. Free main harness conduit clamp from front engine mounting bracket.
30. Free main harness from two conduit clips anchored to lower-right frame tube.
31. Disconnect rear brake light switch.
32. Cut cable straps to release main harness from middle frame downtube, near rear mount bracket and brake light switch bracket
33. Remove connector [179] from active exhaust valve actuator or from mock pin housing on right side of battery tray, as equipped.
34. Pull rear brake light switch, oil pressure, CKP sensor, jiffy stand interlock sensor, voltage regulator, ABS (if equipped) and oxygen sensor harness and connectors up through opening at front of battery tray.
35. While pulling left side caddy away from motorcycle, feed wire trough out through opening between frame downtubes.

INSTALLATION: ALL MODELS (PART 1)

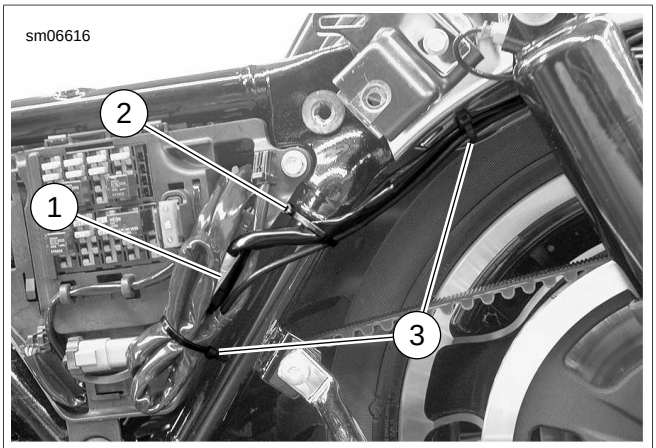
1. Feed front end of wire trough in through opening between left frame downtubes, and then pull up and out through opening at top of battery tray. Lay wire trough on top of frame backbone.
2. Push anchor pins at rear of wire trough into holes in frame backbone.
3. Route branch terminating in the active exhaust valve actuator, rear brake light switch, oil pressure switch/sender, CKP sensor, jiffy stand interlock sensor, voltage regulator, TSM/HFSM and O2 sensor connectors to front of motorcycle following inboard side of lower frame tube.
4. Feed branch terminating in the VSS, neutral switch, rear O2 sensor and starter solenoid connectors through opening at rear of left side caddy, and down through opening at front of battery tray to top of transmission.
5. Locate branch terminating in oxygen sensor, TSM/HFSM, ABS module (if equipped) and rear wheel speed sensor connectors. Feed harness rearward.
6. Feed branch terminating in the Tour-Pak lights and radio antenna cable connectors through opening at rear of left side caddy and up through opening between frame crossmember and front of rear fender. Lay harness along left side of rear fender.
7. **Models with Tour-Pak:**
   a. Route rear audio harness and CB antenna cable up through opening at top of battery tray and lay along right side of rear fender.
   b. Route branch terminating in the rear headset receptacle and rear speaker/passenger controls connector up through opening at top of battery tray and lay along left side of rear fender.
8. Feed main power cable ring terminal, B+, accessory, rear fender lights, purge solenoid and ignition coil connectors inboard and install left side electrical caddy. See 7.8 ELECTRICAL CADDIES.
9. Route main power cable ring terminal down to top of transmission.
10. Tuck B+ and accessory connectors and conduit into corner at front of battery tray. Route rear fender lights connector under frame crossmember at rear of battery tray and secure to top of fender.
11. Connect VSS connector and neutral switch.
12. Install starter. See 7.10 STARTER.
13. Install purge solenoid connector [95] if equipped.
14. Install ignition coil connector [83].
15. Connect rear brake light switch. Install **new** cable straps to secure rear brake light switch wires to harness.

NOTE

Replace conduit clips if damaged, deteriorated or missing. With the slotted side up, push hole in conduit clip over T-stud to install.

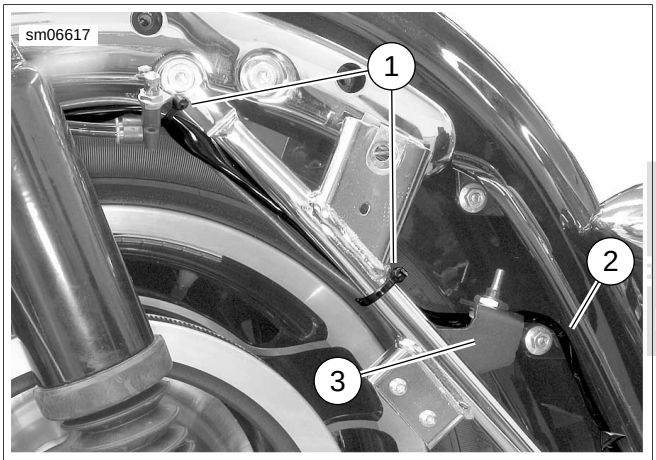
16. Route main harness conduit inboard of front engine mounting bracket. See Figure 7-112 for harness retention points. Secure main harness to mid and lower frame using **new** cable ties.
17. Connect and install voltage regulator. See 7.3 VOLTAGE REGULATOR.
18. Connect CKP sensor connector [79]. Push anchor on connector into hole in front caddy.
19. Connect jiffy stand interlock sensor connector [133] and secure to T-stud on front caddy.
20. Install oil pressure switch/sender connector.
21. Install connector [179] to the active exhaust valve actuator or to mock pin housing on right side of battery tray, as equipped.
22. **ABS Equipped Only:** Connect ABS module connector [166] and rear wheel speed sensor connector [168]. Secure rear wheel speed sensor connector to hole in right side caddy.
23. Connect and install TSM/HFSM.
24. See Figure 7-112. Connect oxygen sensor front (grey) and rear (black) connectors. Secure connectors to TSM/HFSM bracket. Secure wires to rear conduit clip (3).
25. **FLHX, FLTRX:**
   a. See Figure 7-110 and Figure 7-111. Route radio antenna cable rearward following inboard side of upper frame tube, under crossmember and along fender support following rear fender lights harness.
   b. Install **new** cable straps to secure rear fascia lamp wires, air tubes and radio antenna cable to rear fender support and saddlebag mounting bracket.
   c. Connect antenna cable connector [29].

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1. **Connector**
2. **Cable strap**
3. **Cable strap, anchored**

Figure 7-110. Rear Fender Lamps Harness, Antenna Cable and Air Tube Routing



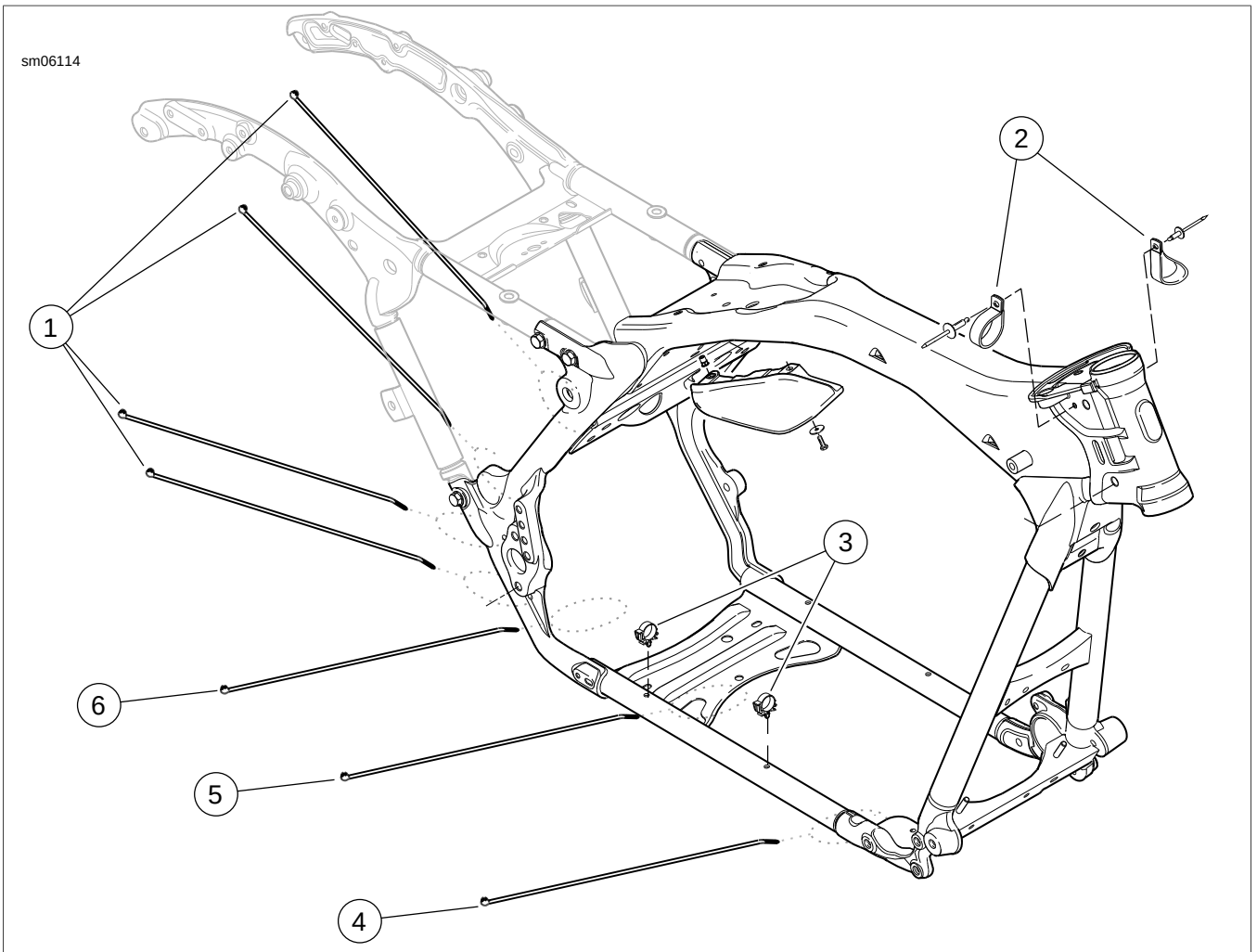
1. **Cable strap**
2. **Molded clip (2)**
3. **Antenna mount**

Figure 7-111. Rear Fender Lamps Harness, Antenna Cable and Air Tube Routing

26. **Models with Tour-Pak:**
    a. Route Tour-Pak lights harness and radio antenna cable into left side of Tour-Pak and install grommet with the larger OD facing inside.
    b. Connect Tour-Pak lights connector, power outlet connector (if equipped), and radio antenna cable connector. Capture antenna cable in two adhesive clips at bottom of Tour-Pak.
    c. Connect audio harness and CB antenna cable if equipped. See 7.38 REAR AUDIO HARNESS: ULTRA MODELS.
    d. Secure harnesses and antenna cables to luggage rack rail and rear frame using **new** cable straps.
    e. Install rubber mat or molded liner and map pocket as equipped.
27. **Models with under-fender harness routing:** Route rear fender lights connector [7] up between frame crossmember and rear fender. Connect and attach to anchor on rear fender.
28. **FLHR/C Only:**
    a. Lay a clean shop towel on forward part of rear fender. Lay console upside down on shop towel.
    b. Connect instrument console connector [20].
    c. Connect ignition switch jumper harness connector [222]. Secure connector in hole in left side of battery tray.
29. Connect ECM connector [78].
30. Install two main harness ground ring terminals onto left frame ground stud and tighten nut to 50-90 **in-lbs** (5.7-10.2 Nm).
31. Route chassis ground cable forward along left side of wire trough and install ring terminal on right frame ground stud. Install flange nut and tighten to 50-90 **in-lbs** (5.7-10.2 Nm).
32. See Figure 7-109. Install connectors to induction module as follows:
    a. Install T-MAP sensor connector (3).
    b. Install TCA connector (2). Install **new** anchored cable strap in hole at front right side of induction module.
    c. Install fuel injector connectors (1, 4).
33. Connect ACR conectors if equipped.
34. Install backplate and air cleaner. See 4.4 AIR CLEANER ASSEMBLY.
35. Install ET sensor connector [90] at back of front cylinder. Pull boot over sensor.
36. Connect horn spade terminals and capture conduit in J-clamp.
37. On ABS equipped motorcycles, secure brake lines into clips in wire trough.

NOTE

Depending upon model, continue procedure at 7.35 MAIN WIRING HARNESS, Installation: Road King Models (Part 2), 7.35 MAIN WIRING HARNESS, Installation: Fork Mounted Fairing Models (Part 2) or 7.35 MAIN WIRING HARNESS, Installation: Frame Mounted Fairing Models (Part 2).



1. **Secures harness to frame**
2. **P-clamps**
3. **Conduit clips - secure harness and brake line**
4. **Secures harness only to frame**
5. **Secures harness to brake line**
6. **Secures harness to brake light switch bracket**

Figure 7-112. Cable Strap Locations

INSTALLATION: ROAD KING MODELS (PART 2)

1. Route front right section of main harness forward along right side of steering head and into headlamp nacelle.
2. See Figure 7-107. Connect connectors and install onto their retaining devices, if present:
   a. Auxiliary lamps (7).
   b. Auxiliary lamps switch (8).
   c. Right handlebar switches (1).
   d. Cruise set/resume switch (10) (FLHRC only).
   e. Twist grip sensor jumper harness (12).
3. Route front left section of main harness forward along left side of steering head and into headlamp nacelle.
4. Connect connectors and install onto their retaining devices, if present:
   a. Front fender tip lamp jumper harness (4) (FLHR only).
   b. Accessory switch (6).
   c. Front turn signal lamps (3).
   d. Left handlebar switches (2).
   e. Cruise on/off switch (9) (FLHRC only).
   f. Front wheel speed sensor (11) if equipped with ABS.
5. See Figure 7-112. Secure harnesses in P-clamps (2) and install new rivet.
6. Install headlamp assembly. See 7.11 HEADLAMP: ALL EXCEPT ROAD GLIDE.

NOTE

Continue procedure at 7.35 MAIN WIRING HARNESS, Installation: All Models (Part 3).

INSTALLATION: FORK MOUNTED FAIRING MODELS (PART 2)

1. Route main harness and rear audio harness (if equipped) forward along each side of steering head and to front of inner fairing.
2. Connect ignition switch connector [33]. See 7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK.
3. See Figure 7-108. Connect connectors on right side and install onto their retaining devices, if present:
   a. Twist grip sensor jumper harness (7).
   b. Main to interconnect harness (1).
   c. Main to interconnect harness (3).
4. Using oval shaped hole in right fairing bracket, install **new** cable strap (4).
5. Connect connectors on left side and install onto their retaining devices, if present:
   a. Main to interconnect harness (2).
   b. Front wheel speed sensor (6) (ABS equipped motorcycles only).
   c. Radio antenna cable connector (5).
6. Using round hole inf left fairing bracket, install **new** cable strap (4).
7. Connect rear audio harness (8) if equipped.
8. See Figure 7-112. Secure harnesses in P-clamps (2) and install new rivets.
9. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.

NOTE

Continue procedure at 7.35 MAIN WIRING HARNESS, Installation: All Models (Part 3).

INSTALLATION: FRAME MOUNTED FAIRING MODELS (PART 2)

1. Install inner fairing. See 2.41 INNER FAIRING: FRAME MOUNTED FAIRING MODELS.

NOTE

Continue procedure at 7.35 MAIN WIRING HARNESS, Installation: All Models (Part 3).

INSTALLATION: ALL MODELS (PART 3)

1. Install side covers.
2. Install saddlebags. See 2.26 SADDLEBAGS.
3. Install fuel tank. See 4.5 FUEL TANK.
4. Install battery. See 1.23 BATTERY MAINTENANCE.

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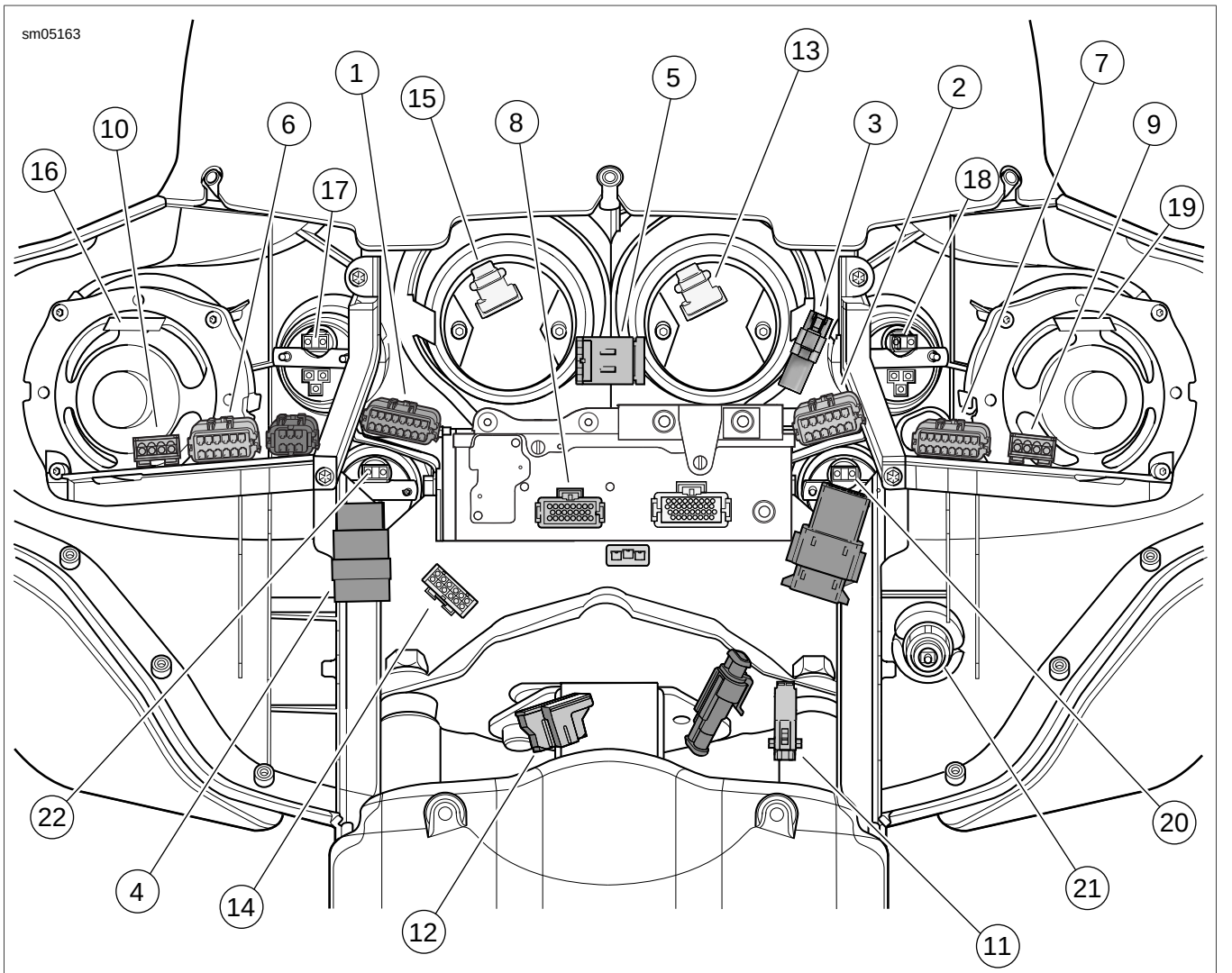
INTERCONNECT HARNESS 7.36

FORK MOUNTED FAIRING MODELS

Removal

1. Remove main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
2. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
3. Release anchor securing interconnect harness to speedometer bracket.
4. See Figure 7-115. Cut cable straps (1, 2) to release harnesses from left and right fairing brackets.
5. See Figure 7-114. Remove anchor securing headlamp harness to left fairing bracket.
6. See Figure 7-113. Disconnect connectors and remove from retaining devices, if present.
   a. Left front turn signal/auxiliary lamp (9).
   b. Left handlebar switches (7).
   c. Main to interconnect harness (2).
   d. Audio to interconnect harness (3).
   e. Indicator lights (5).
   f. Speedometer (13). Remove rubber boot from odometer reset switch and pull switch from hole in inner fairing.
   g. Tachometer (15).
   h. Main to interconnect harness (1).
   i. Right handlebar switches (6).
   j. Right front turn signal/auxiliary lamp (10).
   k. Main to interconnect harness (4).
   l. Fairing cap switches (14).
   m. Radio (8).
   n. Front fender tip lamp jumper harness (11) if equipped.
   o. Ambient temperature sensor [107], if equipped; 3-place Multilock (black); anchored on left side of steering head.
   p. Heated handgrip power connector (if equipped). See 2.23 HANDLEBARS, Heated Handgrips.
   q. Cigarette lighter (21).
   r. Left front speaker (19).
   s. Fuel gauge and lamp (18).
   t. Air temperature gauge and lamp (20), if equipped.
   u. Right front speaker (16).
   v. Voltmeter gauge and lamp (17).
   w. Oil pressure gauge and lamp (22), if equipped.
   x. Remove harness ground socket terminal from spade contact at top of upper fork bracket (left side).
7. Remove interconnect harness from motorcycle.

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1. **Main to interconnect harness [1]**
2. **Main to interconnect harness [2]**
3. **Audio to interconnect harness [6]**
4. **Main to interconnect harness [15]**
5. **Indicator lights [21]**
6. **Right handlebar switches [22]**
7. **Left handlebar switches [24]**
8. **Radio [27]**
9. **Left front turn signal/auxiliary lamp [31L]**
10. **Right front turn signal/auxiliary lamp [31R]**
11. **Front fender tip lamp [32]**
12. **Headlamp [38]**
13. **Speedometer gauge [39]**
14. **Fairing cap switches [105]**
15. **Tachometer gauge [108]**
16. **Right speaker [34]**
17. **Voltmeter [110]**
18. **Fuel gauge [117]**
19. **Left speaker [35]**
20. **Air temperature gauge [115]**
21. **Cigarette lighter [132]**
22. **Oil pressure gauge [113]**

Figure 7-113. Interconnect Harness Connectors

Installation

1. Center interconnect harness on top of radio (or storage box) with headlamp harness on left side of motorcycle and harness with fairing cap switch connector [105] on the right.
2. Route left side speaker, fuel gauge, air temperature gauge (if equipped), cigarette lighter, left front turn signal/auxiliary lamp, and left handlebar switch connectors behind left fairing bracket to area of left support brace.
3. Route right side speaker, voltmeter gauge, oil pressure gauge (if equipped), right front turn signal/auxiliary lamp, and right handlebar switch connectors behind right fairing bracket to area of right support brace.
4. Secure interconnect harness to speedometer bracket.

5. See Figure 7-113. Install connectors:
   a. Air temperature gauge (20) and lamp, if equipped.
   b. Fuel gauge (18) and lamp.
   c. Left front speaker (19).
   d. Cigarette lighter (21). Connect orange/white to the center contact and black to the shell contact.
   e. Harness ground socket terminal onto spade contact at top of upper fork bracket (left side).
   f. Oil pressure gauge (22) and lamp, if equipped.
   g. Voltmeter gauge (17) and lamp.
   h. Right front speaker (16).
   i. Left front turn signal/auxiliary lamp (9).
   j. Left handlebar switches (7).
   k. Main to interconnect harness (2).
   l. Audio to interconnect harness (3), if equipped.
   m. Indicator lights (5).
   n. Speedometer (13). Install odometer reset switch in inner fairing.
   o. Tachometer (15).
   p. Main to interconnect harness (1).
   q. Right handlebar switches (6).
   r. Right front turn signal/auxiliary lamp (10).
   s. Main to interconnect harness (4).
   t. Fairing cap switches (14).
   u. Radio (8).
   v. Front fender tip lamp jumper harness (11), if equipped.
   w. Ambient temperature sensor [107], if present; 3-place Multilock (black); anchored on left side of steering head.
   x. Heated handgrip power connector (if equipped). See 2.23 HANDLEBARS, Heated Handgrips.
6. See Figure 7-114. Secure convoluted tubing of headlamp harness into hole at front of left fairing bracket.
7. See Figure 7-115. Capture left side interconnect, headlamp, audio, heated handgrips (if equipped) and left handlebar switch harnesses to left fairing bracket with a **new** cable strap (2).
8. Capture radio harness, two main to interconnect harnesses and right handlebar switch harness to right fairing bracket with a **new** cable strap (1).
9. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
10. Install main fuse. See 7.7 SYSTEM FUSES AND RELAYS.

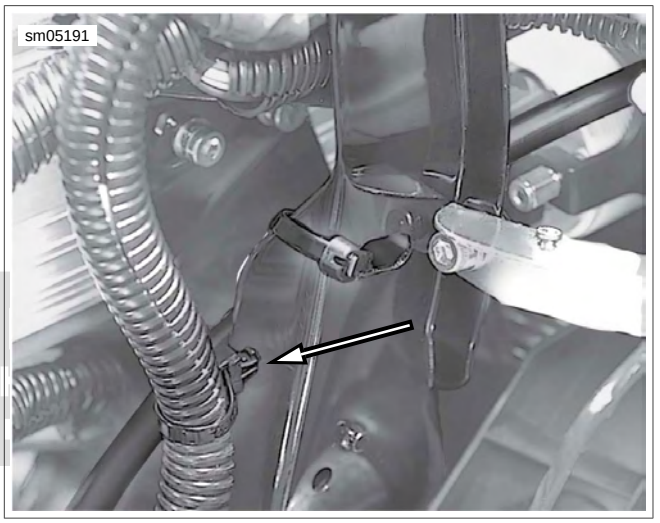


Figure 7-114. Anchor Convoluted Tubing of Headlamp Connector to Fairing Bracket (Left Side)



1. **Right cable strap**
2. **Left cable strap**

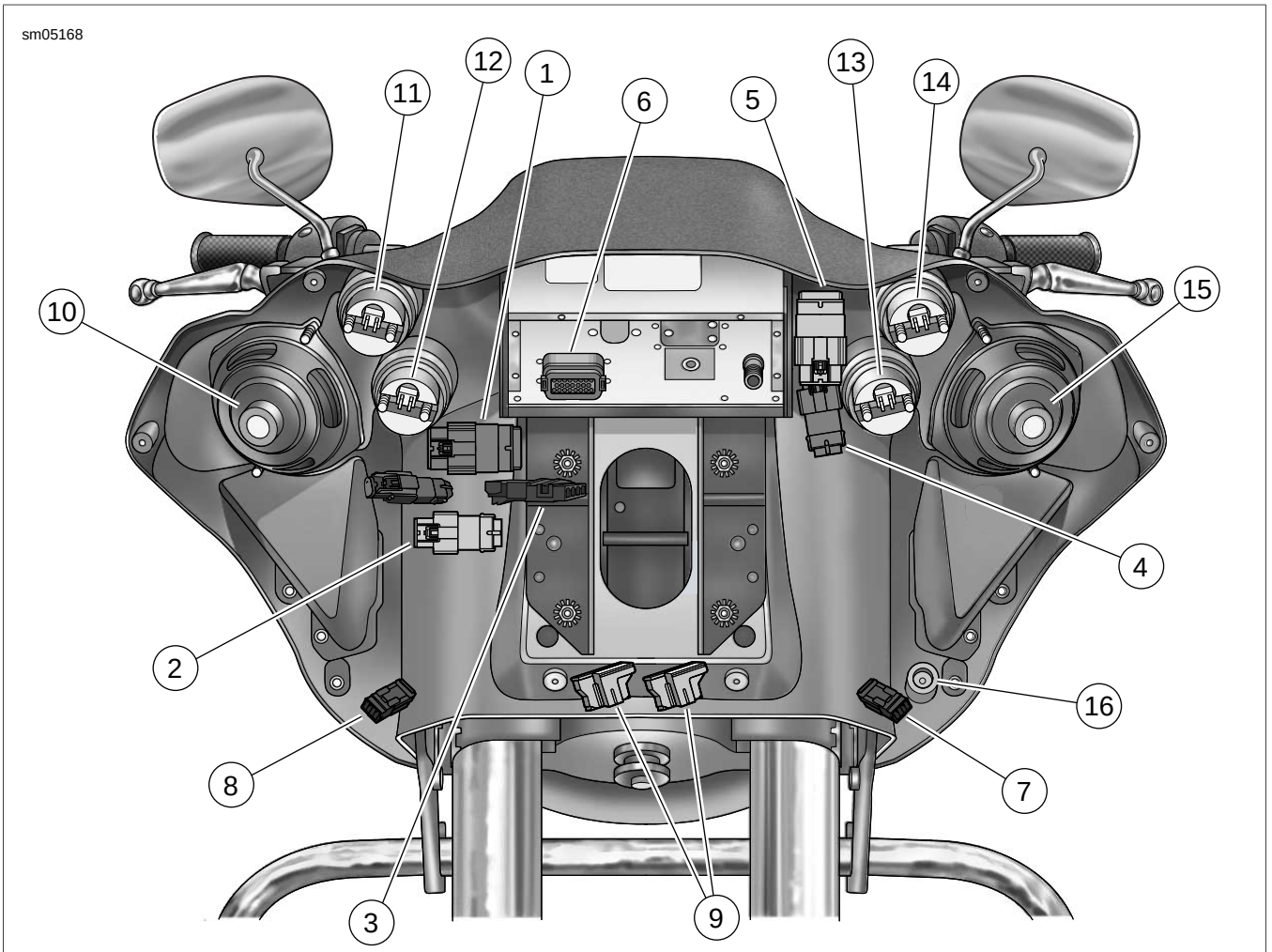
Figure 7-115. Secure Harnesses

FRAME MOUNTED FAIRING MODELS

Removal

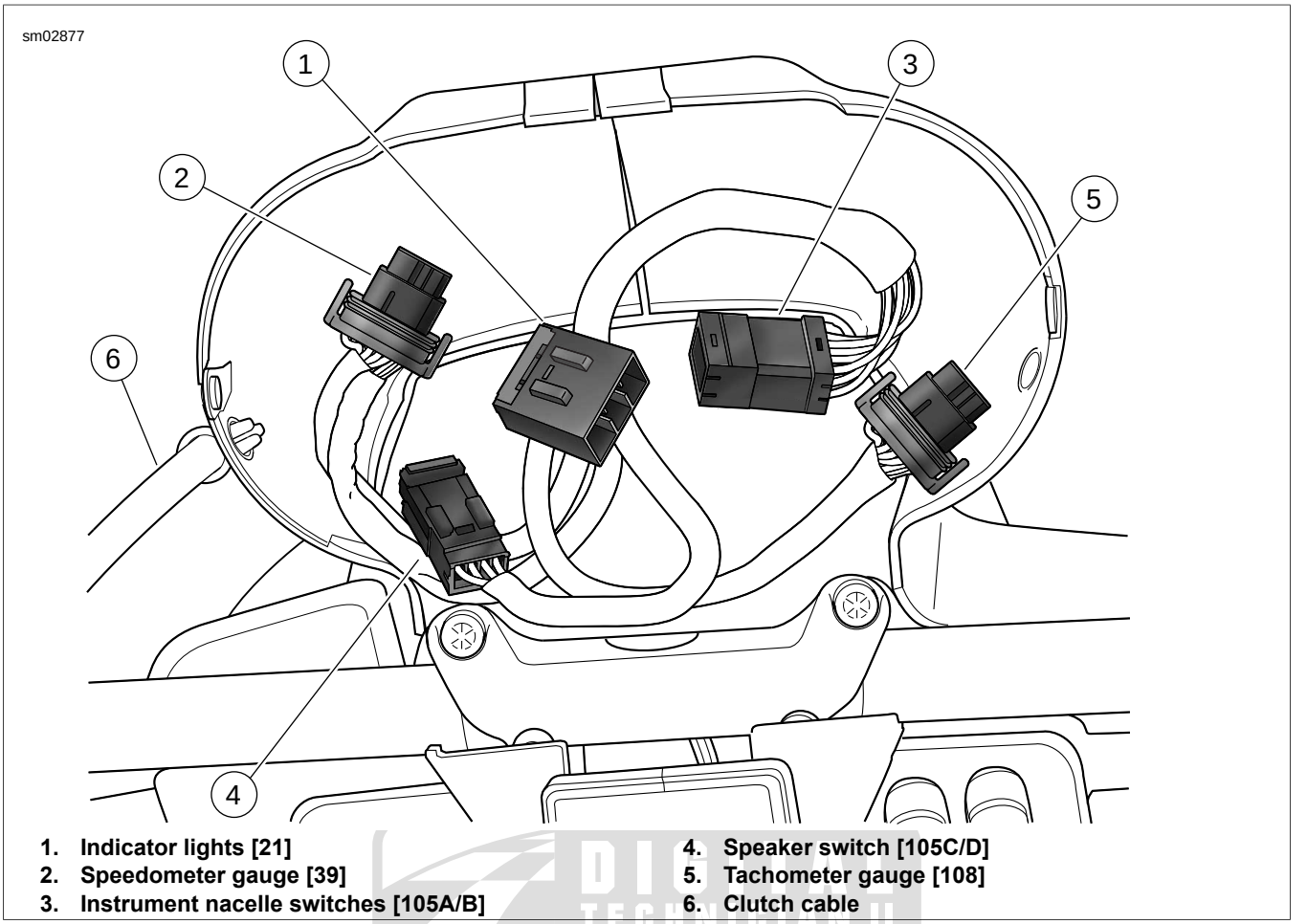
1. Remove main fuse. See 7.7 SYSTEM FUSES AND RELAYS.
2. Remove outer fairing. See 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.
3. Cut two cable straps to free wire bundles and conduit from convoluted tubing of interconnect harness.
4. See Figure 7-116. Disconnect connectors and remove from their retaining devices, if present:
   a. Main to interconnect harness (1).
   b. Main to interconnect harness (2).
   c. Main to interconnect harness (3).
   d. Left handlebar switches (5).
   e. Right handlebar switches (4).
   f. Radio (6).
5. Disconnect ambient temperature sensor connector [107], 3-place Multilock, from sensor anchored to left side of steering head.
6. Proceed as follows:
   a. See Figure 7-117. Remove left side of instrument nacelle. See 2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS.
   b. Disconnect Instrument nacelle switch connector [105] (3).
   c. Remove harness ground socket terminal from spade contact fastened to top of upper fork bracket (left side).
7. Draw branches of interconnect harness to front of inner fairing.
8. See Figure 7-116. Remove remaining connectors:
   a. Cigarette lighter (16).
   b. Left speaker (15).
   c. Fuel gauge (14) and lamp.
   d. Air temperature gauge (13) and lamp.
   e. Right speaker (10).
   f. Voltmeter gauge (11) and lamp.
   g. Oil pressure gauge (12) and lamp.
   h. Front turn signal lamp connectors (7, 8).

9. Remove interconnect harness from motorcycle. Remove radio antenna cable connector from radio if necessary.



1. **Main to interconnect harness [1]**
2. **Main to interconnect harness [2]**
3. **Main to interconnect harness [15]**
4. **Right handlebar switches [22]**
5. **Left handlebar switches [24]**
6. **Radio [27]**
7. **Left turn signal [31L]**
8. **Right turn signal [31R]**
9. **Headlamp [38]**
10. **Right speaker [35]**
11. **Voltmeter [111]**
12. **Oil pressure gauge [113]**
13. **Air temperature [114]**
14. **Fuel gauge [116]**
15. **Left speaker [35]**
16. **Cigarette lighter [132]**

Figure 7-116. Frame Mounted Fairing Models: Interconnect Harness Connectors



1. **Indicator lights [21]**
2. **Speedometer gauge [39]**
3. **Instrument nacelle switches [105A/B]**
4. **Speaker switch [105C/D]**
5. **Tachometer gauge [108]**
6. **Clutch cable**

Figure 7-117. Frame Mounted Fairing Models: Instrument Nacelle (Bezel Removed)

Installation

NOTE

To avoid chafing wires of interconnect harness, verify that trim strips are installed on hooks of radio bracket.

1. Center interconnect harness above and inboard of hooks on radio bracket end terminating in terminals of cigarette lighter on the left side of motorcycle. Install radio antenna cable connector if removed.
2. See Figure 7-116. Install connectors:
   a. Cigarette lighter (16) with the orange/white wire terminal to the center contact and black wire terminal to the shell contact.
   b. Left speaker (15).
   c. Fuel gauge (14) and lamp.
   d. Air temperature gauge (13) and lamp.
   e. Right speaker(10).
   f. Voltmeter gauge (11) and lamp.
   g. Oil pressure gauge (12) and lamp.
3. Route branch of interconnect harness terminating in speedometer, tachometer, etc. through tunnel of fairing bracket and into instrument nacelle.
4. Proceed as follows:
   a. Install harness ground terminal onto spade contact at top of upper fork bracket (left side).
   b. See Figure 7-117. Connect Instrument nacelle switch connector (3).
   c. Install left side of instrument nacelle. See 2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS.
5. See Figure 7-116. Connect connectors and install onto their retaining devices, if present:
   a. Main to interconnect harness (1).
   b. Main to interconnect harness (2).
   c. Main to interconnect harness (3).
   d. Left handlebar switches (5).
   e. Right handlebar switches (4).
   f. Radio (6).
   g. Connect front turn signal lamp connectors (7, 8).

6. Orient connectors as shown in Figure 7-116.
7. See Figure 7-118. Install two **new** cable straps outboard of radio bracket hooks to secure wire bundles to interconnect harness.
8. Install outer fairing. See 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.
9. Install main fuse. See 7.7 SYSTEM FUSES AND RELAYS.

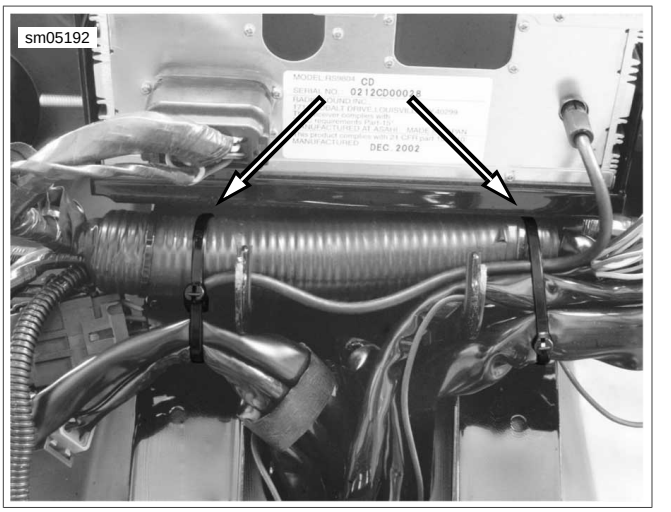


Figure 7-118. Frame Mounted Fairing Models: Cable Strap Convoluted Tubing and Conduit

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

RADIO ANTENNA CABLE 7.37

MODELS EQUIPPED WITH TOUR-PAK

Removal

1. Remove fuel tank and seat. See 4.5 FUEL TANK.
2. Remove left side saddlebag. See 2.26 SADDLEBAGS.
3. Remove left side cover.
4. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
5. See Figure 7-119. Remove radio antenna cable connector. Cut cable where it exits main harness conduit.
6. Remove rivet and P-clamp to release main harness from left side of steering head.
7. Starting at front of wire trough, remove cover.
8. Cut two cable straps securing main harness conduit to left upper frame tube. Cut cable strap securing main harness conduit to luggage rack rail.
9. Open Tour-Pak and remove rubber mat or map pocket and molded liner as equipped.
10. See Figure 7-120. Disconnect radio antenna cable connector from antenna base. Release cable from two adhesive clips (2) at bottom of Tour-Pak.
11. Disconnect Tour-Pak lights connector (3) and power outlet connector (if equipped).
12. Pull grommet (4) into Tour-Pak and remove from harness.
13. See Figure 7-121. Pull Tour-Pak lights and radio antenna cable connectors out through hole at front of Tour-Pak.
14. Carefully cut radio antenna cable where it exits main harness conduit.

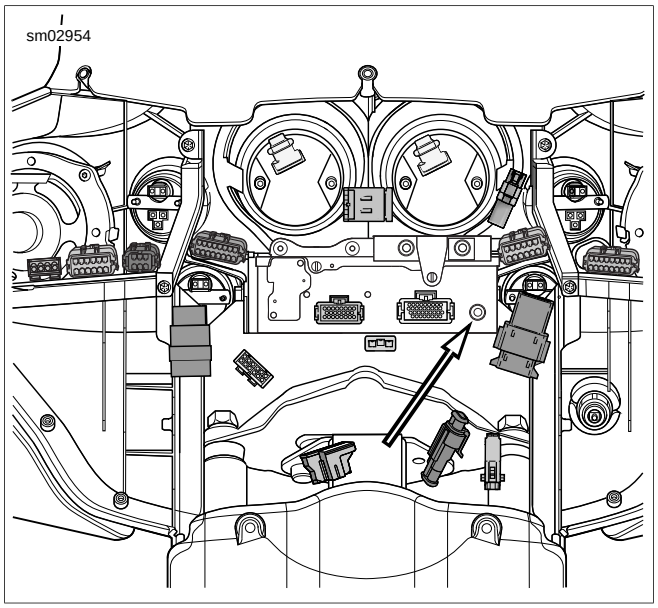
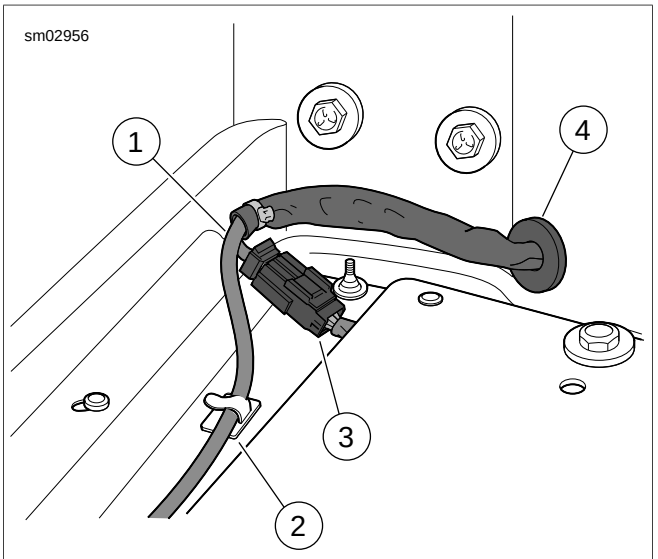


Figure 7-119. Radio Antenna Cable Connector

Installation

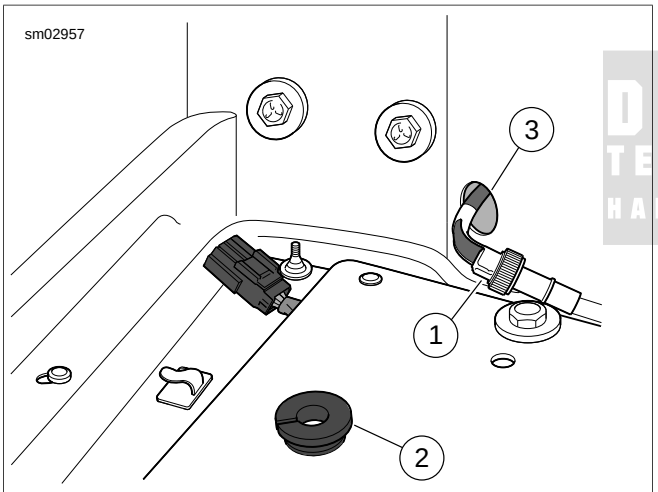
1. See Figure 7-119. Connect **new** radio antenna cable connector to radio.
2. Route free end of radio antenna cable rearward along left side of steering head, rearward through left side of wire trough, then along inboard side of left upper frame tube. Continue rearward following luggage rack rail to front of Tour-Pak.
3. Capture radio antenna cable and main harness conduit in P-clamp. Secure P-clamp to steering head with rivet.
4. Loosely install two **new** cable straps to secure radio antenna cable, main harness and rear audio harness (if equipped) to left upper frame tube and one to luggage rack rail.
5. Feed Tour-Pak lights and radio antenna cable connectors through hole at front of Tour-Pak. Install grommet with the larger OD inside.
6. See Figure 7-120. Connect Tour-Pak lights connector (3) and power outlet connector if equipped.
7. Connect radio antenna cable connector to antenna base. Capture cable in two adhesive clips (2) at bottom of Tour-Pak.
8. Tighten three cable straps securing radio antenna cable and main harness to left upper frame tube and luggage rack rail. Cut excess cable strap material.
9. Install rubber mat or molded liner and map pocket in Tour-Pak.
10. Install cover over wire trough. Verify that all latches are fully engaged.
11. Install fuel tank and seat. See 4.5 FUEL TANK.
12. Install left side cover.
13. Install left side saddlebag. See 2.26 SADDLEBAGS.
14. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Radio antenna cable**
2. **Adhesive clip**
3. **Tour-pak lights connector [12]**
4. **Grommet**

Figure 7-120. Disconnect Tour-Pak Lights Connector



1. **Radio antenna cable connector [29]**
2. **Grommet**
3. **Tour-pak hole**

Figure 7-121. Feed Main Harness Through Tour-Pak Hole

MODELS WITHOUT TOUR-PAK

Removal

1. Remove seat and fuel tank. See 4.5 FUEL TANK.
2. Remove left side saddlebag. See 2.26 SADDLEBAGS.
3. Remove left side cover.
4. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS or 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.
5. See Figure 7-122. Remove radio antenna cable connector. Cut antenna cable where it exits main harness conduit.
6. Remove rivet and P-clamp to release main harness conduit from left side of steering head.
7. Starting at front of wire trough, remove cover.
8. See Figure 7-123. Cut cable straps to release radio antenna cable from fender support (1), air valve mounting bracket (2) and saddlebag support (3).
9. Disconnect radio antenna cable connector from antenna.
10. Cut radio antenna cable where it exits main harness conduit.

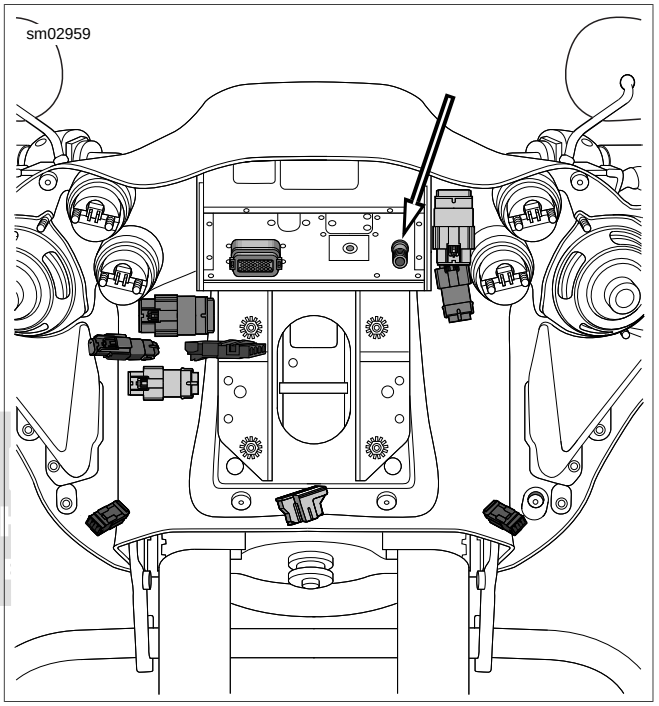
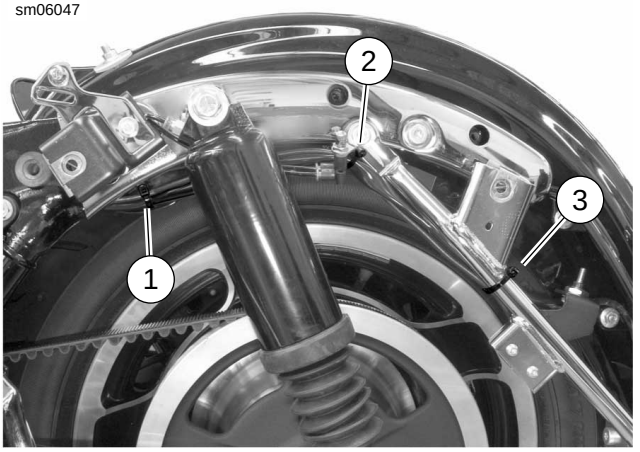


Figure 7-122. Radio Antenna Cable Connector

Installation

1. See Figure 7-122. Connect radio antenna cable connector.
2. Proceed as follows:
   a. **FLHX:** Route free end of radio antenna cable rearward along left side of steering head.
   b. **FLTRX:** Route free end of radio antenna cable into tunnel of fairing bracket pulling it out through opening on left side of bracket and then continuing rearward along steering head.
3. Capture radio antenna cable and main harness in P-clamp and secure to steering head with rivet.
4. Route radio antenna cable rearward through left side of wire trough, then along inboard side of left upper frame tube to area of antenna.
5. See Figure 7-123. Loosely install **new** cable straps to secure radio antenna cable and rear fender lights harness to fender support (1), air fitting bracket (2) and saddlebag support (3).

6. Connect radio antenna cable to bottom of antenna.
7. Tighten cable straps securing radio antenna cable and cut excess cable strap material.
8. Install cover over wire trough. Verify that all latches are fully engaged.
9. Install fuel tank and seat. See 4.5 FUEL TANK.
10. Install left side cover.
11. Install left side saddlebag. See 2.26 SADDLEBAGS.
12. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS or 2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS.



1. **Fender support (tree mount)**
2. **Air valve bracket**
3. **Saddlebag support**

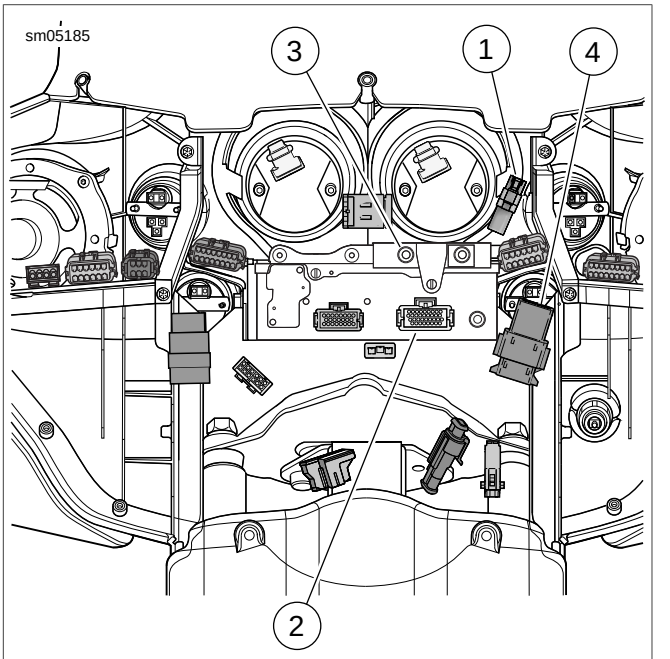
Figure 7-123. Radio Antenna Cable Routing

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

REAR AUDIO HARNESS: ULTRA MODELS 7.38

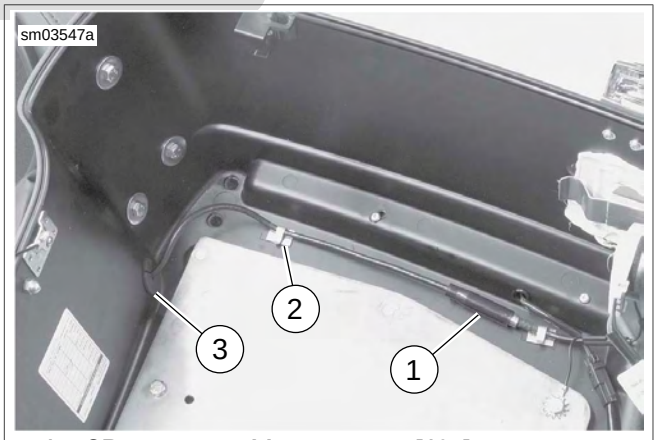
REMOVAL

1. Remove fuel tank. See 4.5 FUEL TANK.
2. Remove saddlebags. See 2.26 SADDLEBAGS.
3. Remove both side cover.
4. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
5. See Figure 7-124. Disconnect the following connectors:
   a. CB antenna cable (3).
   b. Audio to interconnect harness (1).
   c. Radio (2).
   d. CB module (4).
6. Remove rivet and P-clamp securing audio and main harness to left side of steering head.
7. Pull audio harness rearward and out of fairing cap.
8. Remove map pocket and molded liner from Tour-Pak.
9. See Figure 7-125. Disconnect CB antenna cable connector (1). Release cable from adhesive clip (2).
10. Pull grommet (3) into Tour-Pak and remove from CB antenna cable. Pull CB antenna cable out through hole.
11. Draw rear speaker/passenger controls connector out of right side speaker box and disconnect. Repeat with left speaker harness.
12. Cut cable straps securing audio harnesses and CB antenna cable to luggage rack rails.
13. Release rear headset receptacle from bracket at bottom of left side speaker box and disengage spring.
14. Release console connector [53], 12-place Deutsch, from attachment clip anchored in hole of frame weldment at rear of battery tray. Disconnect connector.
15. Cut four cable straps securing audio harness to left and right upper frame tubes.
16. Remove cover from wire trough.
17. Using a paint pen, draw a line on the audio harness conduit where it enters and exits the wire trough.
18. Draw a line on both sides of each cable strap that captures the audio harness. Carry the line over onto the main harness where possible.
19. Cut and remove cables straps to free audio harness.
20. Remove audio harness from motorcycle.



1. **Audio to interconnect harness [6]**
2. **Radio [28]**
3. **CB antenna cable [50]**
4. **CB module [184]**

Figure 7-124. Audio Harness Connectors



1. **CB antenna cable connector [104]**
2. **Adhesive clip**
3. **Grommet**

Figure 7-125. CB Antenna Cable Connector [104]

INSTALLATION

1. Lay **new** and used audio harnesses side by side. Transfer painted lines onto **new** harness.
2. Install **new** cable straps through slots of wire trough where removed.

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NOTE

If additional clearance is needed for installation of the cable straps, pry up rear of wire trough to release anchor pins from holes in frame backbone. Install wire trough after placement of cable straps.

3. Adjust main harness as necessary, so that the painted lines are aligned with the cable straps installed in the wire trough.
4. Place audio harness on top of main harness aligning the entrance and exit lines with the wire trough. Verify that branch containing rear headset receptacle exits left side of wire trough and branch containing CB antenna cable connector exits right side.
5. Engage end of each cable strap into eyelet, but do not tighten.
6. Route front section of audio harness along left side of steering head and up toward radio.
7. Install connectors in radio and CB module.
8. Secure audio and main harness to left side of steering head using P-clamp and **new** rivet.
9. Route right harness branch along inboard side of right upper frame tube and up the luggage rack rail to speaker. Route CB antenna cable through hole in Tour-Pak.
10. Loosely install **new** cable straps to secure audio harness to right upper frame tube and luggage rack rail.
11. Install grommet in Tour-Pak with the larger OD facing inside.
12. Connect CB antenna cable connector and capture cable in adhesive clip at bottom of Tour-Pak.
13. Connect right speaker/passenger controls connector. Feed connector into speaker box pressing trim ring into hole.
14. Tighten cable straps securing right-side harness to frame and luggage rack. Remove excess strap material.
15. Connect console connector [53], 12-place Deutsch. Install connector onto attachment clip anchored in hole of frame weldment at rear of battery tray.
16. Route left harness branch along inboard side of left upper frame tube, up luggage rack rail to speaker.
17. Connect left speaker/passenger controls connector. Feed connector into speaker box pressing trim ring into hole.
18. Connect spring loop of rear headset receptacle onto tab on right side of license plate bracket. Capture headset receptacle in bracket.
19. Loosely install **new** cable straps to secure audio harness to left upper frame tube and luggage rack rail.
20. Install molded liner and map pocket in Tour-Pak.
21. Make final adjustments to harness, so that painted lines are aligned with cable straps. Tighten all cable straps and cut excess strap material.
22. Install cover on wire trough. Verify that all latches are fully engaged.
23. Install fuel tank. See 4.5 FUEL TANK.
24. Install side covers and saddlebags, right side first. See 2.26 SADDLEBAGS.
25. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.

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CB ANTENNA CABLE: ULTRA MODELS 7.39

REMOVAL

1. Remove fuel tank. See 4.5 FUEL TANK.
2. Remove right side saddlebag. See 2.26 SADDLEBAGS.
3. Remove right side cover.
4. Remove outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.
5. See Figure 7-126. Disconnect CB antenna cable connector from CB module. Carefully cut cable where it exits audio harness conduit.
6. Remove cover from wire trough.
7. Carefully cut two cable straps securing audio harness to right upper frame tube and one securing audio harness to luggage rack rail.
8. Remove map pocket and molded liner from Tour-Pak.
9. See Figure 7-127. Disconnect CB antenna cable connector (1). Release cable from front adhesive clip (2).
10. Pull grommet (3) into Tour-Pak and remove from CB antenna cable. Pull CB antenna cable out through hole at front of Tour-Pak.
11. Cut CB antenna cable where it exits audio harness conduit.

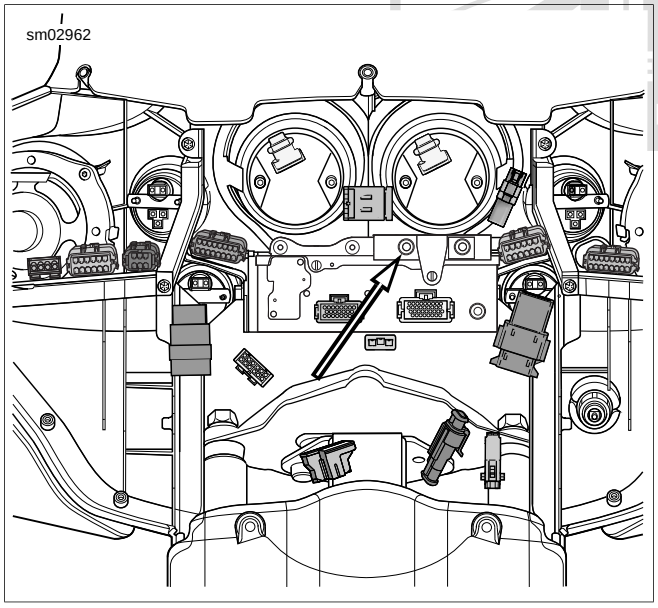
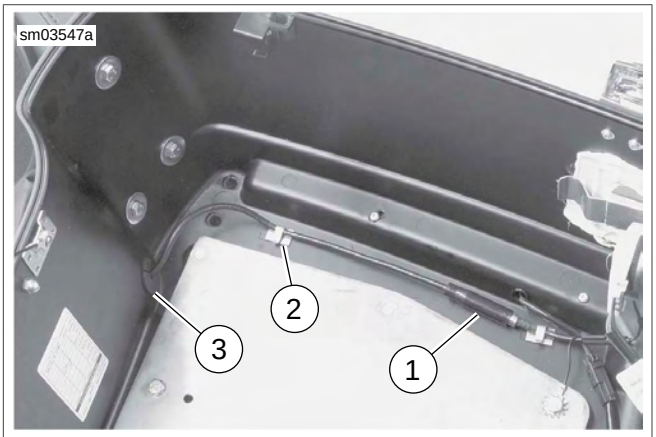


Figure 7-126. CB Antenna Cable Connector [50]



1. **CB antenna cable connector [104]**
2. **Adhesive clip**
3. **Grommet**

Figure 7-127. CB Antenna Cable Connector [104]

INSTALLATION

1. Connect CB antenna cable connector to CB module.
2. Route free end of CB antenna cable rearward along left side of steering head and through wire trough. Exit wire trough at rear right side and route cable along inboard side of right upper frame tube, following luggage rack rail and into front of Tour-Pak.
3. Remove rivet and P-clamp to release audio and main harness conduit from left side of steering head. Capture CB antenna cable in P-clamp and install.
4. Loosely install two **new** cable straps to secure CB antenna cable and audio harness to right upper frame tube.
5. See Figure 7-128. Loosely install **new** cable strap to secure CB antenna cable and audio harness conduit to luggage rack rail. Loosely install **new** cable strap to secure CB antenna cable to speaker/passenger controls conduit.
6. Install grommet in Tour-Pak with the larger OD facing inside.
7. Connect CB antenna cable connector. Capture cable in front adhesive clip at bottom of Tour-Pak.
8. Tighten all cable straps securing CB antenna cable. Remove excess cable strap material.
9. Install molded liner and map pocket in Tour-Pak.
10. Install cover on wire trough. Verify that all latches are fully engaged.
11. Install fuel tank. See 4.5 FUEL TANK.
12. Install right side cover.
13. Install right side saddlebag. See 2.26 SADDLEBAGS.
14. Install outer fairing. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS.

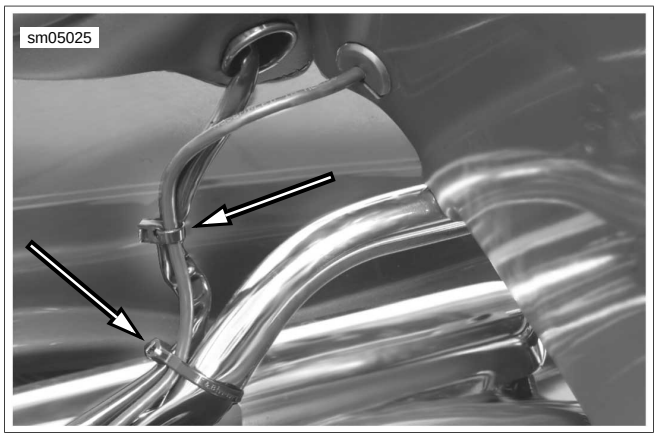


Figure 7-128. Capture Audio Harness and CB Antenna Cable

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

HANDLEBAR SWITCH ASSEMBLIES 7.40

REMOVAL

NOTES

- *While there are four different switch configurations for Touring models (Road King, Road King Classic, Classic and Ultra), the removal procedures are the same. To simplify these instructions, only the Road King switch configuration is represented in the photographs and illustrations which follow.*
- *Replacement switches come with adequate wire to replace the switch and run the new wire to the appropriate connector. You may choose to replace the complete switch and wire and terminate it at the appropriate connector or use the splicing procedure explained in this section*

Right Handlebar Controls

NOTICE

Do not remove or install the master cylinder assembly without first positioning a 5/32-inch (4 mm) thick insert between the brake lever and lever bracket. Removing or installing the master cylinder assembly without the insert in place may result in damage to the rubber boot and plunger on the front stoplight switch. (00324a)

NOTE

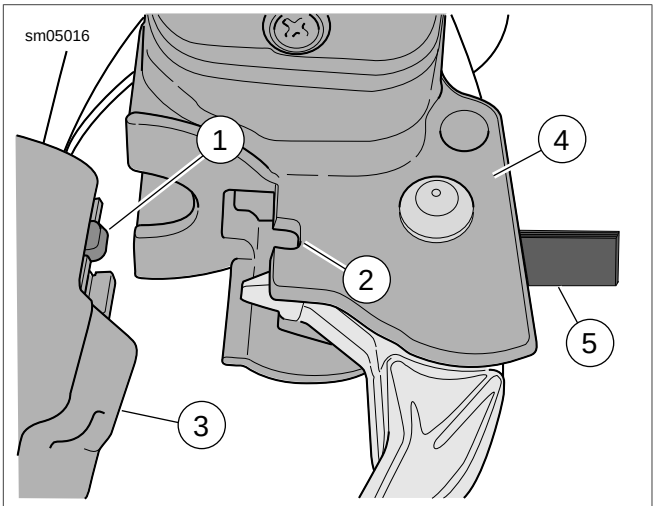
Use the eyelet of a cable strap if the cardboard insert is not available.

1. See Figure 7-129. Place cardboard insert between brake lever and lever bracket.
2. Remove two screws (with flat washers) securing handlebar clamp to master cylinder housing. Remove brake lever/master cylinder assembly and clamp from handlebar.
3. Remove upper and lower switch housing screws.
4. Remove friction shoe from end of tension adjuster screw (non cruise equipped models only).

NOTE

The friction shoe is a loose fit and may fall out or become dislodged if lower switch housing is turned upside down or shaken.

5. Cut two cable straps to release wire harness conduit from handlebar, if present.



1. **Tab**
2. **Groove**
3. **Switch housing assembly**
4. **Brake lever bracket**
5. **Cardboard insert**

Figure 7-129. Remove Master Cylinder/Brake Lever Assembly

Left Handlebar Controls

1. Remove two screws (with flat washers) securing handlebar clamp to clutch lever bracket. Remove clutch hand lever assembly and clamp from handlebar.
2. Remove upper and lower switch housing screws.
3. Cut two cable straps to release wire harness conduit from handlebar, if present.
4. Remove hand grip from handlebar, if damaged. See 2.23 HANDLEBARS, Left Handgrip.

DISASSEMBLY

Right Side Handlebar Switches

NOTICE

Do not remove or install the master cylinder assembly without first positioning a 5/32-inch (4 mm) thick insert between the brake lever and lever bracket. Removing or installing the master cylinder assembly without the insert in place may result in damage to the rubber boot and plunger on the front stoplight switch. (00324a)

NOTE

Use the eyelet of a cable strap if the cardboard insert is not available.

1. Place cardboard insert between brake lever and lever bracket.
2. Remove upper and lower switch housing screws.

3. If replacing lower housing switches, proceed to next step. If replacing upper housing switches, proceed to 7.40 HANDLEBAR SWITCH ASSEMBLIES, Specific Repair Procedures: Upper Switch Housings.
4. Loosen upper screw securing handlebar clamp to master cylinder housing. Remove lower clamp screw (with flat washer).
5. Remove friction shoe from end of tension adjuster screw (non cruise equipped models only).

NOTE

The friction shoe is a loose fit and may fall out or become dislodged if lower switch housing is turned upside down or shaken.

Left Side Handlebar Switches

1. Remove upper and lower switch housing screws.
2. If replacing lower housing switches, proceed to next step. If replacing upper housing switches, proceed to 7.40 HANDLEBAR SWITCH ASSEMBLIES, Specific Repair Procedures: Upper Switch Housings.
3. Loosen upper screw securing handlebar clamp to clutch lever bracket. Remove lower clamp screw (with flat washer).

SPECIFIC REPAIR PROCEDURES: UPPER SWITCH HOUSINGS

NOTES

- *Regardless of model or option, all motorcycles use the same upper switch housings.*
- *Replace Engine Stop and Engine Start Switches as a single assembly even if only one switch is determined to be faulty.*

Right Side Handlebar (All Models)

1. See Figure 7-130. From inside switch housing, remove screw to release bracket. Remove bracket and switch assembly from housing.
2. Move cable conduit from beneath wing of bracket. Cut wires 0.25 in. (6.4 mm) from old switches. Discard old switch and bracket assembly.
3. Slide conduit forward over severed ends of switch wires and cut off 0.5 in. (12.7 mm) of conduit material. Push conduit back to access switch wires.
4. Separate **new** Engine Stop Switch and Start Switch wires into two bundles.

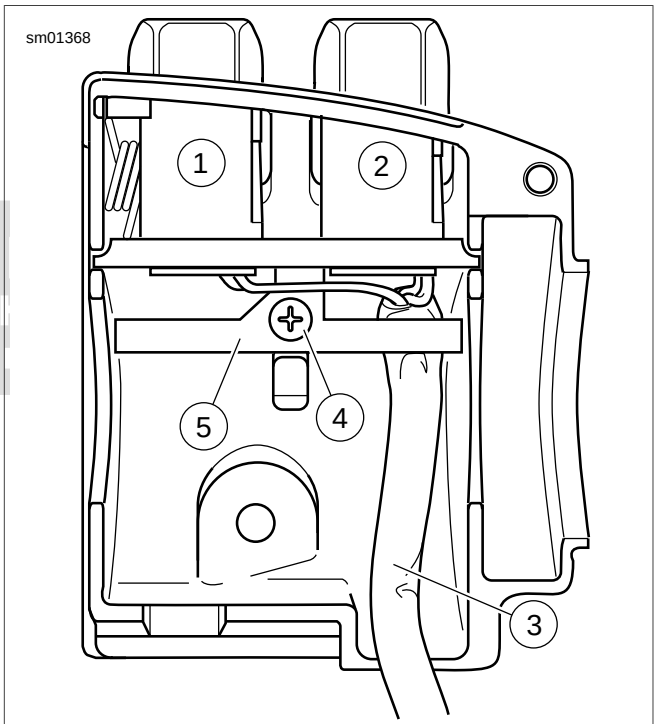
NOTE

Replacement Stop Switch and Start Switch wires are cut to length, 2.5 in. (63.5 mm) and 2.0 in. (50.8 mm), respectively, and partially stripped.

5. Splice wires together. See 7.40 HANDLEBAR SWITCH ASSEMBLIES, General Repair Procedures.
6. Loop switch wires so that spliced lengths are positioned as shown in Figure 7-131. Route wires downstream of splices beneath wing on Engine Stop Switch side of bracket as shown in Figure 7-130.
7. Install **new** 7.0 in. (178 mm) cable strap beneath wing on Engine Start Switch side of bracket and capture wire splices.
8. Place switch assembly into upper housing aligning hole in bracket with threaded hole in boss. Be sure that bracket is fully seated. The step at edge of boss captures bottom edge of bracket, while tabs on each side of bracket fit in slots cast into housing.
9. See Figure 7-130. Install screw to secure bracket inside housing. Verify that wing on Engine Stop Switch side of bracket captures edge of conduit.
10. Securely tighten cable strap to draw splices to bracket. Remove any excess cable strap material.
11. Complete assembly. See 7.40 HANDLEBAR SWITCH ASSEMBLIES, Assembly: Right Side Handlebar Switches.

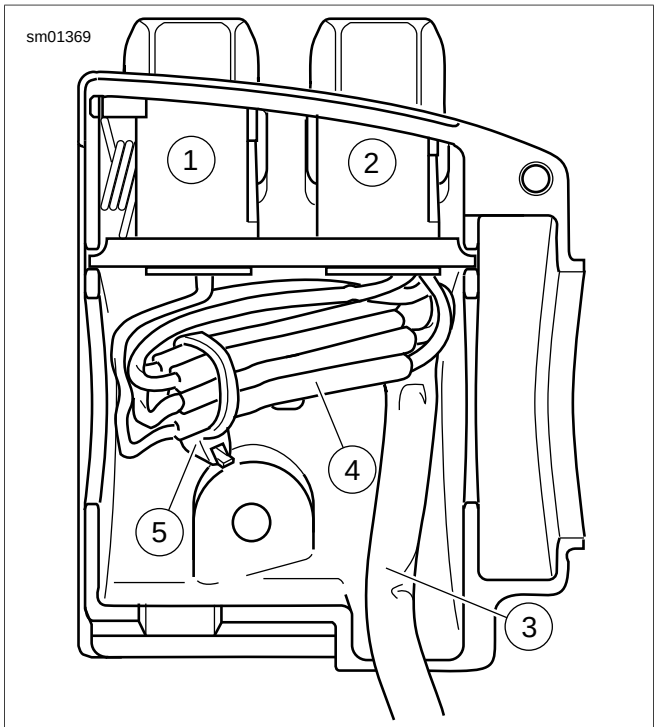
NOTE

Replace Horn and High/Low Beam Switches as a single assembly even if only one switch is determined to be faulty.



1. **Start switch**
2. **Stop switch**
3. **Conduit**
4. **Screw with lock washer**
5. **Bracket**

Figure 7-130. Upper Right Handlebar Switch Housing (Without Splices)



1. **Start switch**
2. **Stop switch**
3. **Conduit**
4. **Splices**
5. **Cable strap**

Figure 7-131. Upper Right Handlebar Switch Housing (With Splices)

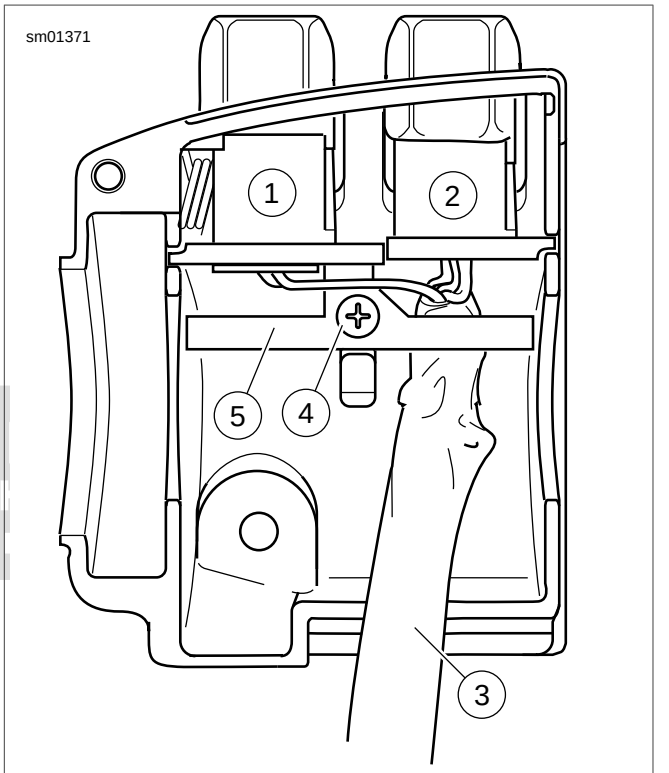
Left Side Handlebar (All Models)

1. See Figure 7-132. From inside switch housing, remove screw to release bracket. Remove bracket and switch assembly from housing.
2. Move cable conduit from beneath wing of bracket. Cut wires 0.25 in. (6.4 mm) from old switches. Discard old switch and bracket assembly.
3. Slide conduit forward over severed ends of switch wires and cut off 0.5 in. (12.7 mm) of conduit material. Push conduit back to access switch wires.
4. Separate **new** Horn and High/Low Beam Switch wires into two bundles.

NOTE

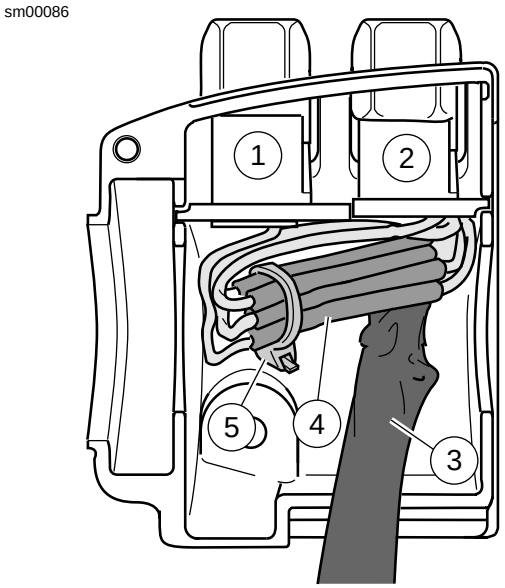
Replacement High/Low Beam Switch and Horn Switch wires are cut to length, 2.5 in. (63.5 mm) and 2.0 in. (50.8 mm), respectively, and partially stripped.

5. Splice wires together. See 7.40 HANDLEBAR SWITCH ASSEMBLIES, General Repair Procedures.
6. Loop switch wires so that spliced lengths are positioned as shown in Figure 7-133. Route wires downstream of splices beneath wing on High/Low Beam Switch side of bracket as shown in Figure 7-132.
7. Install **new** 7.0 in. (178 mm) cable strap beneath wing on Horn Switch side of bracket and capture wire splices.
8. Place switch assembly into upper housing aligning hole in bracket with threaded hole in boss. Be sure that bracket is fully seated. The step at edge of boss captures bottom edge of bracket, while tabs on each side of bracket fit in slots cast into housing.
9. See Figure 7-132. Install screw to secure bracket inside housing. Verify that wing on High/Low Beam Switch side of bracket captures edge of conduit.
10. See Figure 7-133. Securely tighten cable strap to draw splices to bracket. Remove any excess cable strap material.
11. Complete assembly. See 7.40 HANDLEBAR SWITCH ASSEMBLIES, Assembly: Right Side Handlebar Switches.



1. **Horn switch**
2. **High/low beam switch**
3. **Conduit**
4. **Screw with lock washer**
5. **Bracket**

Figure 7-132. Upper Left Handlebar Switch Housing (Without Splices)



1. **Horn switch**
2. **High/low beam switch**
3. **Conduit**
4. **Splices**
5. **Cable strap**

Figure 7-133. Upper Left Handlebar Switch Housing (With Splices)

SPECIFIC REPAIR PROCEDURES: RIGHT SIDE LOWER SWITCH HOUSINGS

Preliminary Instructions

1. From inside switch housing, carefully cut cable strap to free conduit from turn signal switch bracket, if present.
2. Remove screw to release turn signal switch bracket. Remove bracket and switch assembly from housing.

NOTE

On Classic and Ultra models, pull conduit back to introduce some slack in wires or the tight fit of the bundle will prevent removal of turn signal switch bracket.

Turn-Right Signal Switch (All Models)

1. Cut wires 1.5 in. (38.1 mm) from old switch. Discard old switch assembly.

NOTE

Replacement Turn-Right Signal Switch wires are cut to length, 1.5 in. (38.1 mm), and partially stripped.

2. Complete assembly. See 7.40 HANDLEBAR SWITCH ASSEMBLIES, General Repair Procedures.

Front Stoplight Switch (All Models)

1. Carefully remove wedge between switch and switch housing, if present. To remove switch from housing, press plunger and slowly rotate switch upward while rocking slightly.
2. Cut wires 1.0 in. (25.4 mm) from old switch. Discard old switch.

NOTE

Replacement stoplight switch wires are cut to length, 2.5 in. (63.5 mm), and partially stripped.

3. Complete assembly. See 7.40 HANDLEBAR SWITCH ASSEMBLIES, General Repair Procedures.
4. Carefully press plunger against inside wall of switch housing. With thumb over plunger bore, move switch into installed position in switch housing cavity. When plunger is positioned against thumb, slowly rotate switch downward while rocking slightly. Release plunger only after switch is properly positioned in cavity.
5. Verify that plunger is square in bore and that boot is not compressed, collapsed or torn. If necessary, gently work plunger in and out until boot is fully extended.
6. See Figure 7-134. Push down on switch, so that it bottoms against housing and wires run in groove at base of cavity. With concave side facing outward, insert wedge between switch and outboard side of switch housing.
7. Push wedge down until it also bottoms against housing. Verify that plunger is still square in bore and then place a drop of RTV Silicone Sealant on upper corner of wedge.

Mode Select Switch (Classic and Ultra Models)

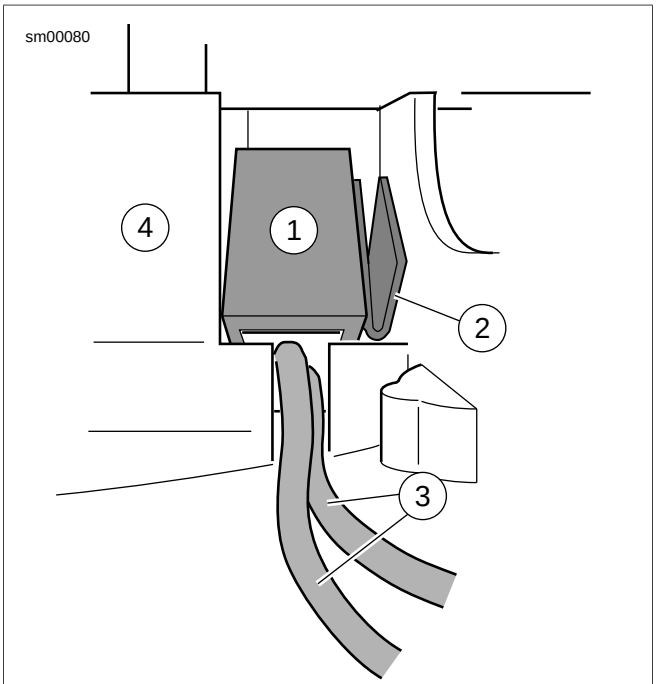
1. Pull keycap from switch shaft.
2. See Figure 7-135. Remove two lower bracket screws. Pull bracket and switch from switch housing.
3. Cut wires 1.25 in. (31.8 mm) from old switch. Discard switch assembly.

NOTE

Replacement Mode Select Switch wires are cut to length, 2.25 in. (57.2 mm), and partially stripped.

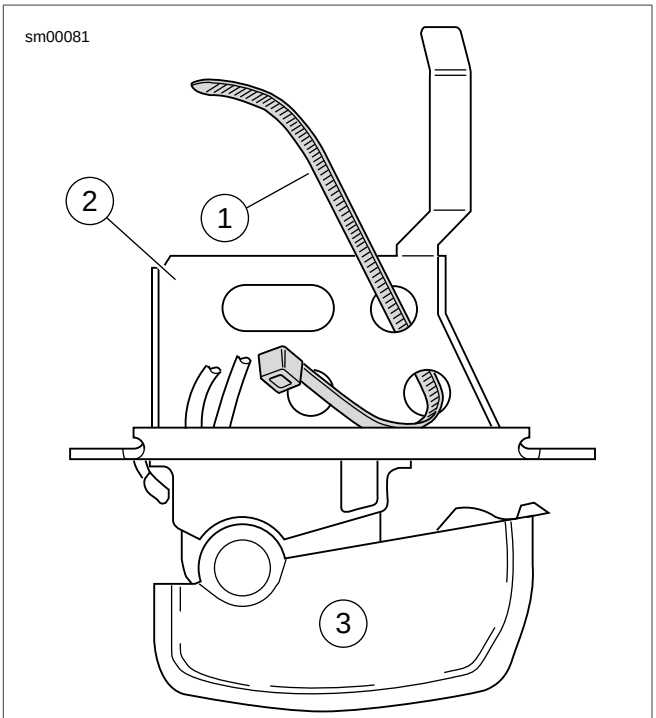
4. Complete assembly. See 7.40 HANDLEBAR SWITCH ASSEMBLIES, General Repair Procedures.
5. Fit **new** switch into cavity, so that it sits on edge in a vertical position (gray/white wire topside). Properly installed, switch is captured by blocks cast into lower housing. Verify that switch shaft is aligned for proper keycap operation.
6. Place lower bracket into housing (with weld nut side down), but keep splices above bracket. Verify that slots in upper step of bracket engage two tabs on switch body.
7. Install shorter screw to secure front side of lower bracket to threaded boss. Install longer rear screw. To engage threaded hole in casting, use thru hole in lower step of bracket on Classic models, thru hole in upper step on Ultra.
8. Install keycap on switch shaft.

DIGITAL TECHNICIAN HARLEY-DAVIDSON®



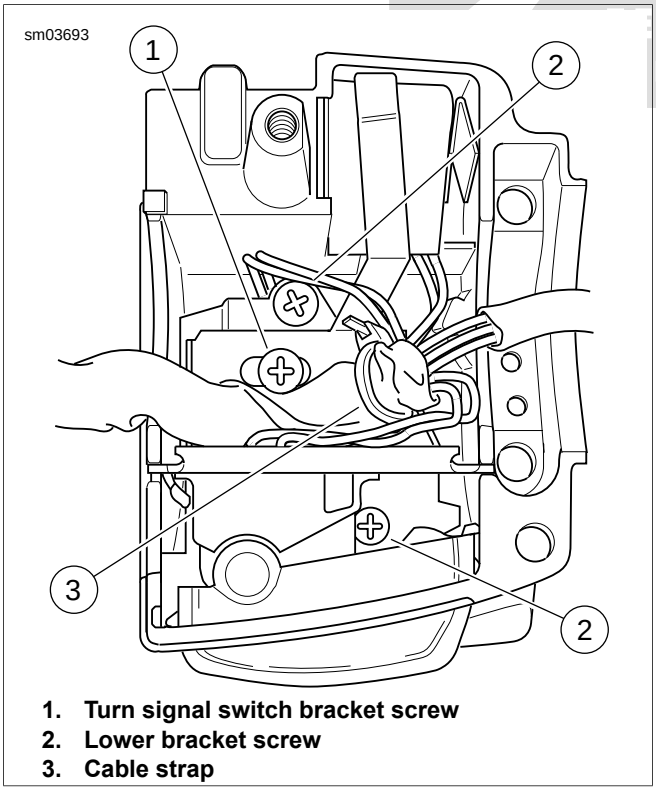
1. **Stoplight switch**
2. **Wedge**
3. **Switch wires**
4. **Lower switch housing**

Figure 7-134. Install Stoplight Switch



1. **Cable strap**
2. **Bracket**
3. **Right turn signal switch**

Figure 7-136. Insert Cable Strap in Switch Bracket



1. **Turn signal switch bracket screw**
2. **Lower bracket screw**
3. **Cable strap**

Figure 7-135. Lower Right Handlebar Switch Housing (Without Splices) - Classic/Ultra Models

Cruise Set/Resume Switch (Road King Classic and Ultra Models)

1. Pull keycap from switch shaft.
2. Remove two lower bracket screws. Pull bracket and switch from switch housing.
3. Cut wires 1.5 in. (38.1 mm) from old switch. Discard switch assembly.

NOTE

Replacement Cruise Set/Resume Switch wires are cut to length, 2.0 in. (50.8 mm), and partially stripped.

4. Complete assembly. See 7.40 HANDLEBAR SWITCH ASSEMBLIES, General Repair Procedures.
5. Fit **new** switch into cavity, so that it sits in a horizontal position (blue/black wire towards master cylinder). Properly installed, switch is captured by blocks cast into lower housing.
6. Keeping splices above bracket, install lower bracket (weld nut side down), so that lower step is positioned over switch. Slots in upper step engage two tabs on plastic insert (Road King Classic) or on body of Mode Select Switch (Ultra models).

NOTE

The Mode Select Switch is vertically oriented with the gray/white wire topside.

7. Install shorter screw to secure front side of lower bracket to threaded boss. Install longer rear screw. Use thru hole

in upper step of bracket to engage threaded hole in casting.

8. Note lettering for proper orientation and gently push keycap onto switch shaft.

Final Instructions

1. See Figure 7-136. Insert tapered end of **new** 7.0 in. (178 mm) cable strap into round hole in turn signal switch bracket and then feed back through using adjacent hole. Reserve oblong hole for bracket screw.

NOTE

Be sure that all splices are positioned above the turn signal switch bracket.

2. Place turn signal switch assembly into housing aligning oblong hole in bracket with lower bracket weld nut (threaded boss on Road King Standard models). Be sure that bracket is fully seated. Tabs on each side of bracket are captured in slots cast into switch housing.

3. Start screw to secure bracket inside housing.

NOTICE

If routed incorrectly, wires can be pinched by casting or handlebar resulting in switch failure. (00542b)

4. Loop switch wires, so that spliced lengths are positioned as shown in Figure 7-137 or Figure 7-138.

5. Capturing conduit about 0.25 in. (6.4 mm) from end, securely tighten cable strap to draw conduit to bracket. Remove any excess cable strap material.

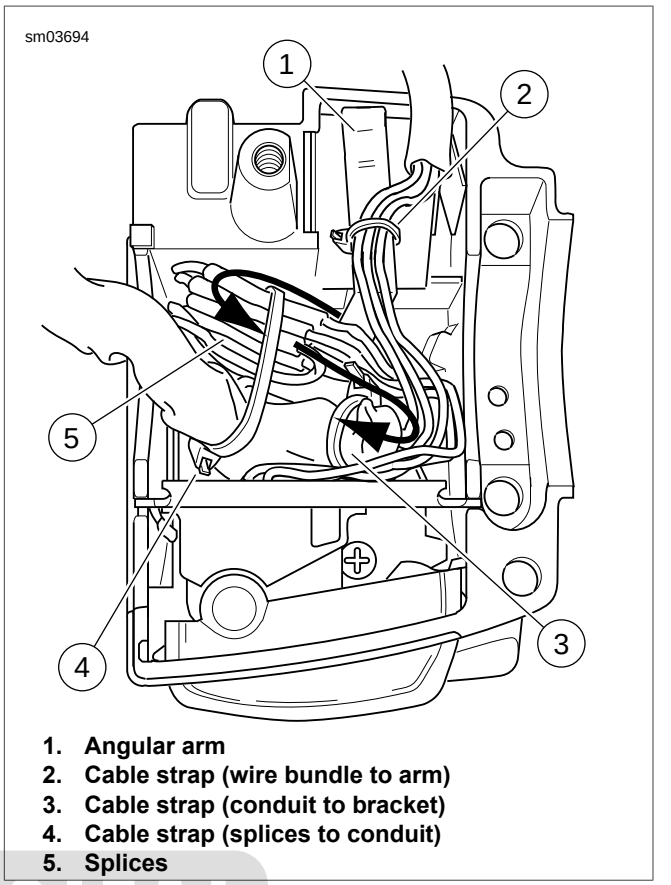
6. Install second 7.0 in. (178 mm) cable strap capturing conduit and wire splices. Securely tighten cable strap to draw splices to conduit. Remove any excess cable strap material.

7. Tighten screw to secure bracket inside housing.

8. Route wire bundle to upper switch housing by gently pressing conduit into channel next to angular arm of bracket. Secure bundle to arm using third cable strap.

   Cut any excess cable strap material. If necessary, bend angular arm of bracket downward to firmly secure Front Stoplight Switch in installed position.

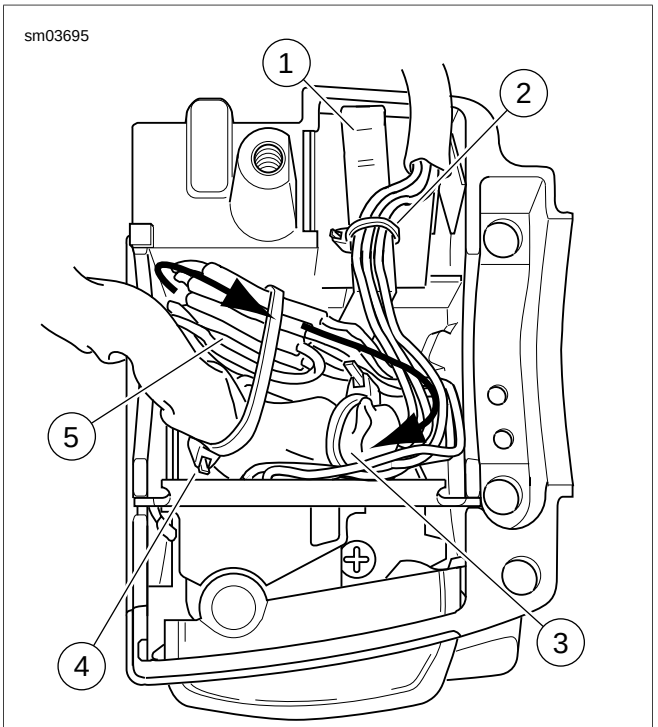
9. Complete assembly. See 7.40 HANDLEBAR SWITCH ASSEMBLIES, General Repair Procedures.



1. **Angular arm**
2. **Cable strap (wire bundle to arm)**
3. **Cable strap (conduit to bracket)**
4. **Cable strap (splices to conduit)**
5. **Splices**

Figure 7-137. Mode Select Handlebar Switch Housing (Lower Right) - Classic/Ultra Models

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Angular arm**
2. **Cable strap (wire bundle to arm)**
3. **Cable strap (conduit to bracket)**
4. **Cable strap (splices to conduit)**
5. **Splices**

Figure 7-138. Cruise Control Handlebar Switch Housing (Lower Right) - Classic/Ultra Models

SPECIFIC REPAIR PROCEDURES: LEFT SIDE LOWER SWITCH HOUSINGS

Preliminary Instructions

1. From inside switch housing, carefully cut cable strap to free conduit from turn signal switch bracket, if present.
2. Remove screw to release turn signal switch bracket. Remove bracket and switch assembly from housing.

NOTE

On Classic and Ultra models, pull conduit back to introduce some slack in wires or the tight fit of the bundle will prevent removal of the switch bracket.

Turn-Left Signal Switch (All Models)

1. Cut wires 1.5 in. (38.1 mm) from old switch. Discard old switch assembly.

NOTE

Replacement Turn-Left Signal Switch wires are cut to length, 1.5 in. (38.1 mm), and partially stripped.

2. Complete assembly. See 7.40 HANDLEBAR SWITCH ASSEMBLIES, General Repair Procedures.

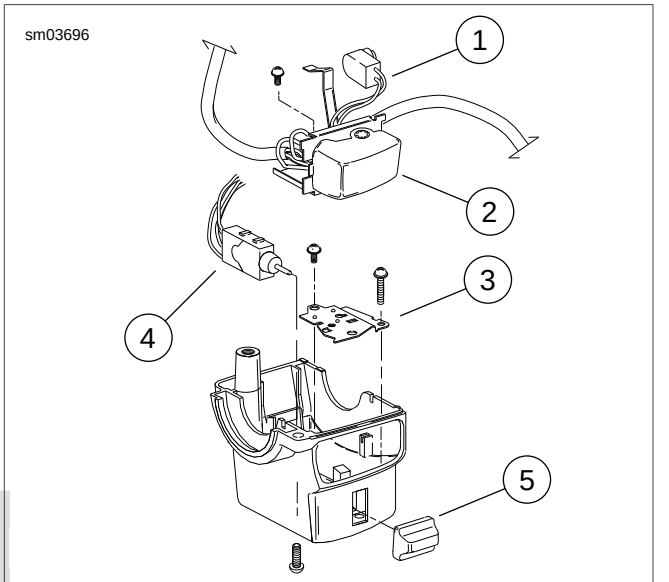
Clutch Interlock Switch

1. Cut wires 0.25 in. (6.4 mm) from old switch. Discard switch assembly.

NOTE

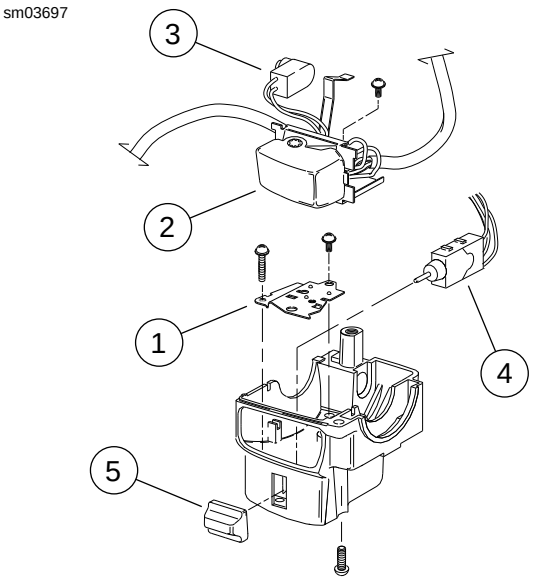
Replacement Clutch Interlock Switch wires are cut to length and partially stripped. Looking at backside, left side switch wire is 2.25 in. (57.2 mm) long, right side is 2.75 in. (70 mm) long.

2. Complete assembly. See 7.40 HANDLEBAR SWITCH ASSEMBLIES, General Repair Procedures.
3. Seat switch in cavity. Verify that plunger is square in bore and that boot is not compressed, collapsed or torn. Push down on switch, so that it bottoms against housing and wires run in groove at base of cavity.



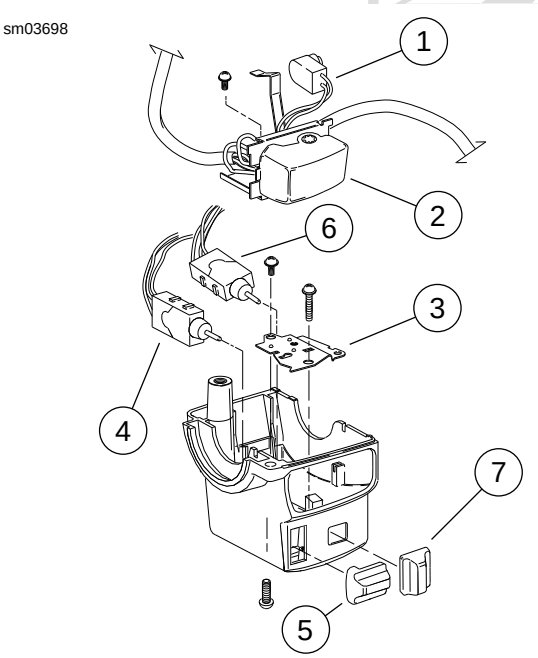
1. **Clutch interlock switch**
2. **Left turn signal switch and bracket**
3. **Lower bracket**
4. **Audio control switch**
5. **Audio switch keycap**

Figure 7-139. Lower Left Handlebar Switch Assembly (Classic)



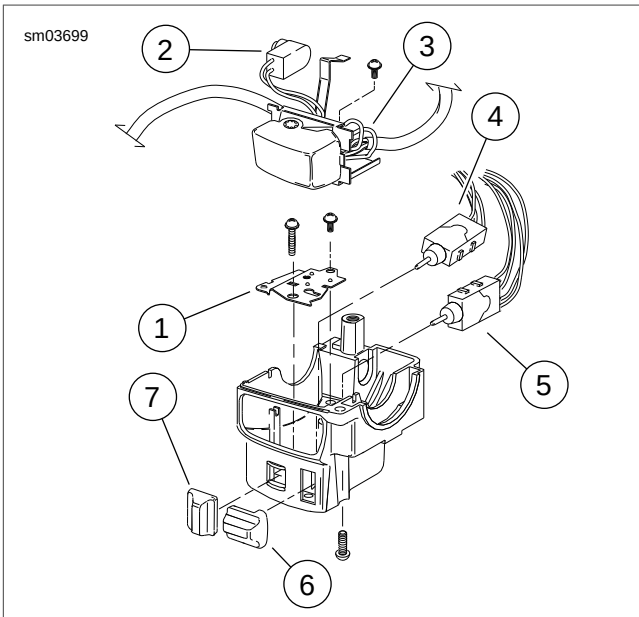
1. Lower bracket
2. Right turn signal switch and bracket
3. Stoplight switch
4. Mode select switch
5. Mode select keycap

Figure 7-140. Lower Right Handlebar Switch Assembly (Classic)



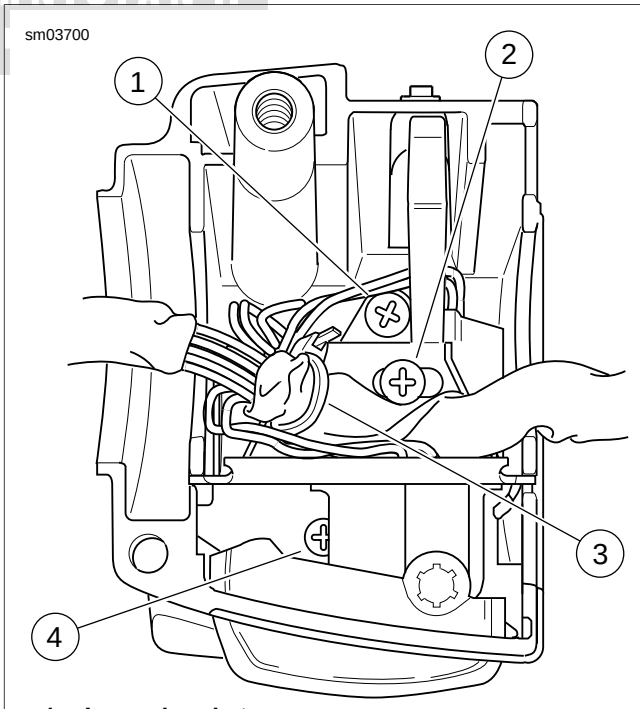
1. Clutch interlock switch
2. Left turn signal switch and bracket
3. Lower bracket
4. Audio control switch
5. Audio switch keycap
6. PTT switch
7. PTT switch keycap

Figure 7-141. Lower Left Handlebar Switch Assembly (Ultra)



1. Lower bracket
2. Stoplight switch
3. Right turn signal switch and bracket
4. Cruise control switch
5. Mode select switch
6. Mode select keycap
7. Cruise switch keycap

Figure 7-142. Lower Right Handlebar Switch Assembly (Ultra)



1. Lower bracket screw
2. Turn signal switch bracket screw
3. Cable strap
4. Lower bracket screw

Figure 7-143. Lower Left Handlebar Switch Housing (Without Splices) - Classic/Ultra Models

Audio Control Switch (Classic and Ultra Models)

1. Pull keycap from switch shaft.
2. See Figure 7-143. Remove two lower bracket screws. Pull bracket and switch from switch housing.
3. Cut wires 1.25 in. (31.8 mm) from old switch. Discard switch assembly.

NOTE

Replacement Audio Control Switch wires are cut to length, 2.25 in. (57.2 mm), and partially stripped.

4. Complete assembly. See 7.40 HANDLEBAR SWITCH ASSEMBLIES, General Repair Procedures.
5. Fit **new** switch into cavity, so that it sits on edge in a vertical position (gray/green wire topside). Properly installed, switch is captured by blocks cast into lower housing. Verify that switch shaft is aligned for proper keycap operation.
6. Place lower bracket into housing (with weld nut side down), but keep splices above bracket. Verify that slots in upper step of bracket engage two tabs on switch body.
7. Install shorter screw to secure front side of lower bracket to threaded boss. Install longer rear screw. To engage threaded hole in casting, use thru hole in lower step of bracket on Classic models, thru hole in upper step on Ultra.
8. Note lettering for proper orientation and gently push keycap onto switch shaft.

CB Push-To-Transmit Switch (Ultra Models)

1. Pull keycap from switch shaft.
2. See Figure 7-143. Remove two lower bracket screws. Pull bracket and switch from switch housing.
3. Cut wires 1.5 in. (38.1 mm) from old switch. Discard switch assembly.

NOTE

Replacement Push-to-Transmit Switch wires are cut to length, 2.0 in. (50.8 mm), and partially stripped.

4. Complete assembly. See 7.40 HANDLEBAR SWITCH ASSEMBLIES, General Repair Procedures.
5. Fit **new** switch into cavity, so that it sits in a horizontal position (brown/black wire towards clutch lever bracket). Properly installed, switch is captured by blocks cast into lower housing.
6. Keeping splices above bracket, install lower bracket (weld nut side down), so that lower step is positioned over Push-to-Transmit Switch (horizontally oriented). Slots in upper step engage two tabs on body of Audio Control Switch (vertically oriented with gray wire topside).
7. Install shorter screw to secure front side of lower bracket to threaded boss. Install longer rear screw. To engage threaded hole in casting, use thru hole in upper step of bracket.
8. Note lettering for proper orientation and gently push keycap onto switch shaft.

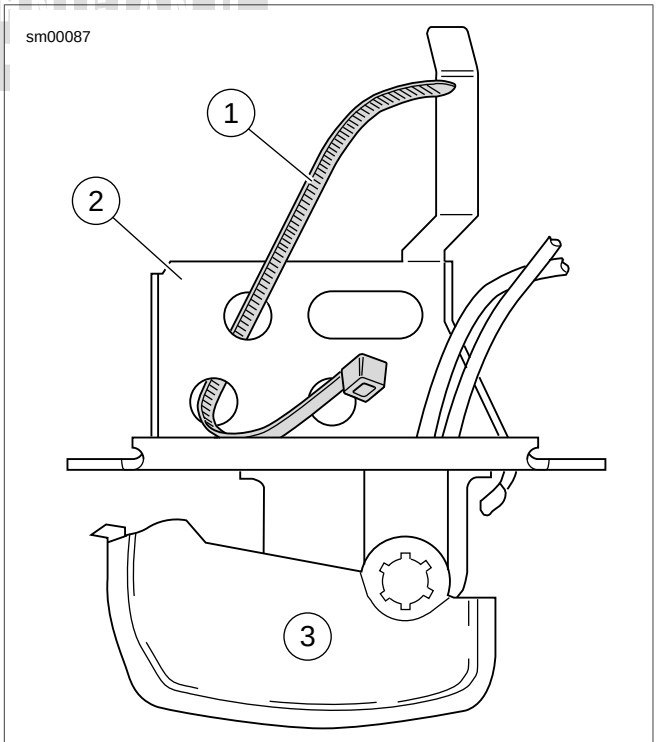
Cruise On/Off Switch (Road King Classic Models)

1. Pull keycap from switch shaft.
2. Remove two lower bracket screws. Pull bracket and switch from switch housing.
3. Cut wires 1.5 in. (38.1 mm) from old switch. Discard switch assembly.

NOTE

Cut replacement Cruise On/Off Switch wires to 2.0 in. (50.8 mm) and strip 0.5 in. (12.7 mm) of insulation.

4. Complete assembly. See 7.40 HANDLEBAR SWITCH ASSEMBLIES, General Repair Procedures.
5. Fit **new** switch into cavity, so that it sits in a horizontal position (orange/white wire towards clutch lever bracket). Properly installed, switch is captured by blocks cast into lower housing.
6. Keeping splices above bracket, install lower bracket (weld nut side down), so that lower step is positioned over switch. Slots in upper step engage two tabs on plastic insert.
7. Install shorter screw to secure front side of lower bracket to threaded boss. Install longer rear screw. Use thru hole in upper step of bracket to engage threaded hole in casting.
8. Note lettering for proper orientation and gently push keycap onto switch shaft.



1. **Cable strap**
2. **Bracket**
3. **Left turn signal switch**

Figure 7-144. Insert Cable Strap in Switch Bracket

Final Instructions

1. See Figure 7-144. Insert tapered end of **new** cable strap into round hole in turn signal switch bracket and then feed back through using adjacent hole. Reserve oblong hole for bracket screw.

NOTE

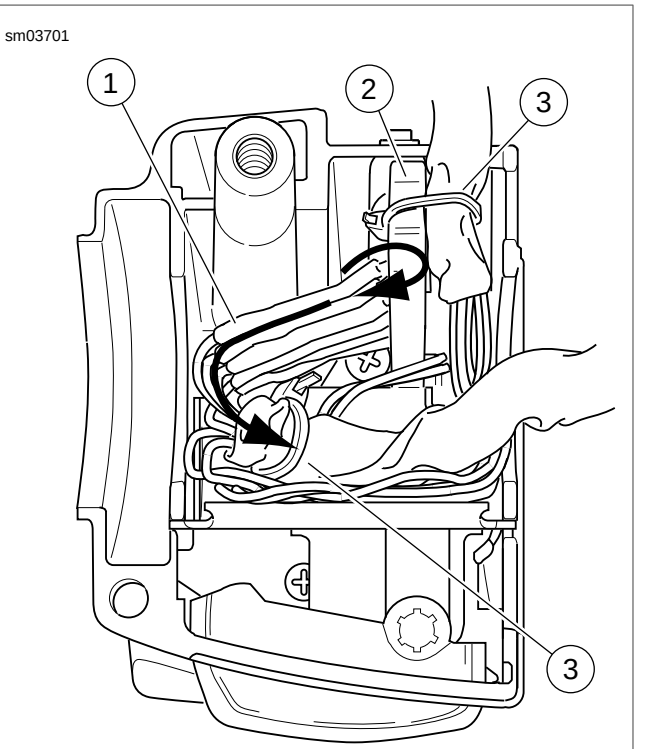
Be sure that all splices are positioned above the turn signal switch bracket.

2. Place turn signal switch assembly into housing aligning oblong hole in bracket with lower bracket weld nut (threaded boss on Road King Standard models). Be sure that bracket is fully seated. Tabs on each side of bracket are captured in slots cast into switch housing.
3. Start screw to secure bracket inside housing.

NOTICE

If routed incorrectly, wires can be pinched by casting or handlebar resulting in switch failure. (00542b)

4. Loop switch wires, so that spliced lengths are positioned as shown in Figure 7-145.
5. Capturing conduit about 0.25 in. (6.4 mm) from end, securely tighten cable strap to draw conduit to bracket. Remove any excess cable strap material.
6. Tighten screw to secure bracket inside housing.
7. See Figure 7-145. Route wire bundle to upper switch housing below and then forward of the main wire harness positioning conduit in channel next to angular arm of bracket. Secure bundle to arm using **new** cable strap. Cut any excess cable strap material.
8. Complete assembly. See 7.40 HANDLEBAR SWITCH ASSEMBLIES, Assembly: Left Side Handlebar Switches.



1. **Splices**
2. **Angular arm**
3. **Cable strap**

Figure 7-145. Lower Left Handlebar Switch Housing (With Splices) - Classic/Ultra Models

GENERAL REPAIR PROCEDURES

1. To better access wires and avoid damaging conduit with radiant heating device, push conduit back and secure with extra 7.0 in. (178 mm) cable strap in kit.
2. Strip 0.5 in. (12.7 mm) of insulation off switch wires. Twist stripped ends of switch wires until all strands are tightly coiled.
3. Cut dual wall heat-shrink tubing supplied in kit into 1.0 in. (25.4 mm) segments. Slide tubing over each wire of **new** switch assembly.

NOTE

If absent from kit, obtain heat shrink tubing (Part No. 72266-94) and two 7.0 in. (178 mm) cable straps (Part No. 10181).

4. See Figure 7-146. Matching wire colors, mate old and **new** switch wires and splice as follows:
   a. Hold the wires so that the stripped ends cross (1). Note that the wire on the left is on top and two-thirds of its stripped length lies beyond the point where they intersect. Looking at the other wire, only 1/3 of its stripped length lies beyond the intersection point.
   b. Holding the wires together at their juncture, start the splice by tightly twisting the top one-third length of the right hand wire over the left (2).
   c. Tightly coil the remaining two-thirds of the left hand wire around the right (3).
   d. Solder the spliced connections.

NOTE

For best results, do one wire at a time.

5. Center the heat-shrink tubing over the soldered splices.

⚠WARNING

Be sure to follow manufacturer's instructions when using the UltraTorch UT-100 or any other radiant heating device. Failure to follow manufacturer's instructions can cause a fire, which could result in death or serious injury. (00335a)

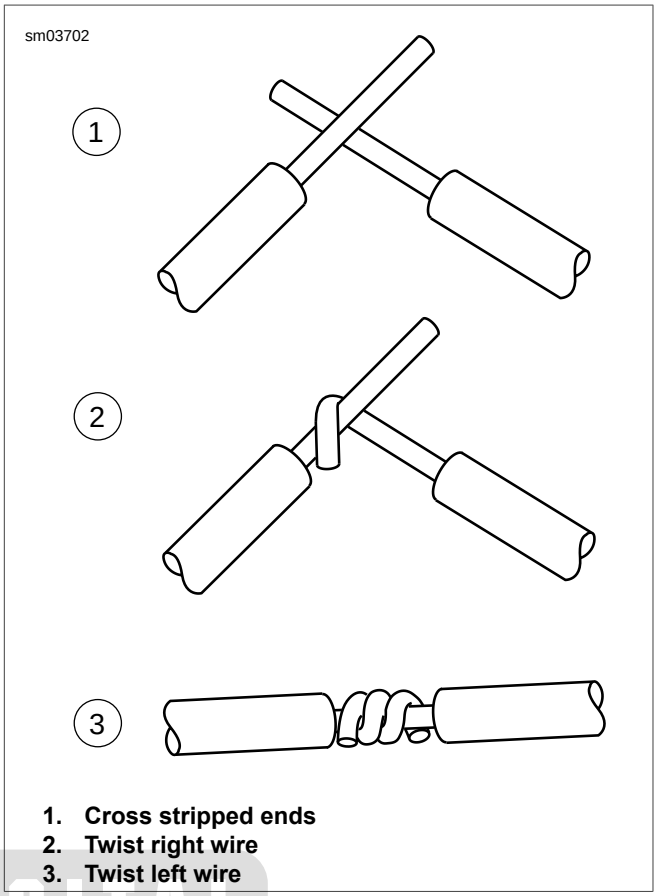
- **Avoid directing heat toward any fuel system component. Extreme heat can cause fuel ignition/explosion resulting in death or serious injury.**
- **Avoid directing heat toward any electrical system component other than the connectors on which heat shrink work is being performed.**
- **Always keep hands away from tool tip area and heat shrink attachment.**

6. See Figure 7-147. Using the UltraTorch UT-100, Robinair Heat Gun with heatshrink attachment or other suitable radiant heating device, uniformly heat the heat-shrink tubing to insulate and seal the soldered connections. Apply heat just until the meltable sealant exudes out both ends of the tubing and it assumes a smooth cylindrical appearance.

NOTE

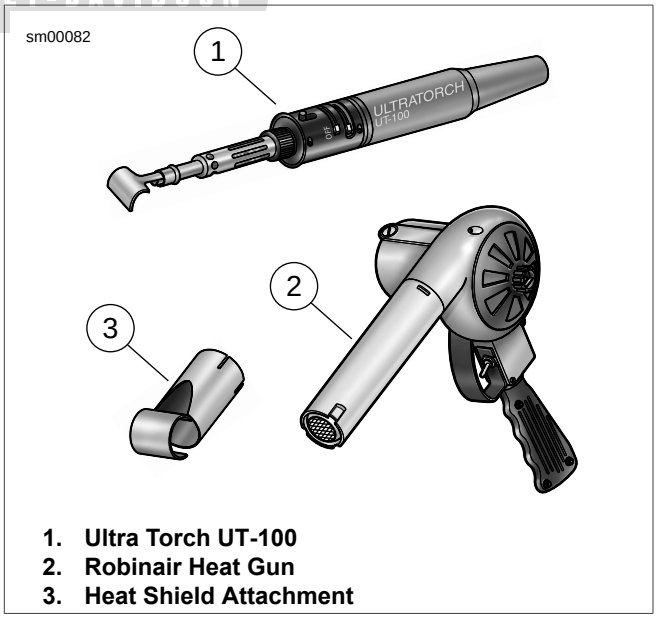
Electrically connected solder outside the tubing may cause a short to ground resulting in switch failure.

7. Inspect the melted sealant for solder beads. Excess solder or heat may force some solder out with the melted sealant. Use a small needle nose pliers to remove any solder found. Briefly heat the connection to reseal the tubing if solder beads were removed. Use less solder or reduce heating time or intensity when doing subsequent splices.
8. Cut cable strap compressing conduit and move to its original position.



1. **Cross stripped ends**
2. **Twist right wire**
3. **Twist left wire**

Figure 7-146. Splice Switch Wires



1. **Ultra Torch UT-100**
2. **Robinair Heat Gun**
3. **Heat Shield Attachment**

Figure 7-147. Radiant Heating Devices

ASSEMBLY: RIGHT SIDE HANDLEBAR SWITCHES

1. If replacing lower housing switches, proceed to next step. If replacing upper housing switches, proceed to step 8.

2. With concave side facing upward, install friction shoe so that pin hole is over point of adjuster screw (non cruise equipped models only).

NOTE

The friction shoe is a loose fit and may fall out or become dislodged if lower switch housing is turned upside down or shaken.

3. Position lower switch housing beneath throttle grip.
4. Position upper switch housing over handlebar and lower switch housing. Verify that wire harness conduit runs in depression at bottom of handlebar.
5. Start upper and lower switch housing screws, but do not tighten.
6. Position brake lever/master cylinder assembly inboard of switch housing assembly engaging tab on lower switch housing in groove at top of brake lever bracket.
7. Align holes in handlebar clamp with those in master cylinder housing and start lower screw (with flat washer). Position for rider comfort. Beginning with top screw, tighten screws to 72-108 **in-lbs** (8.1-12.2 Nm).
8. Tighten lower and upper switch housing screws to 35-45 **in-lbs** (4.0-5.0 Nm).

NOTE

Always tighten lower switch housing screw first, so that any gap between upper and lower housings is at front of switch assembly.

9. Remove cardboard insert between brake lever and lever bracket.

WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

10. Test switches for proper operation.

ASSEMBLY: LEFT SIDE HANDLEBAR SWITCHES

1. If replacing lower housing switches, proceed to next step. If replacing upper housing switches, proceed to step 6.
2. Install upper and lower switch housings on handlebar. Be sure that ribs on outboard side of switch housings fit in grooves molded into grip. Verify that wire harness conduit runs in depression at bottom of handlebar.
3. Start upper and lower switch housing screws, but do not tighten.
4. Position clutch hand lever assembly inboard of switch housing assembly engaging tab on lower switch housing in groove at bottom of clutch lever bracket.
5. Align holes in handlebar clamp with those in clutch lever bracket and start lower screw (with flat washer). Position for rider comfort. Beginning with top screw, tighten screws to 72-108 **in-lbs** (8.1-12.2 Nm).
6. Tighten lower and upper switch housing screws to 35-45 **in-lbs** (4.0-5.0 Nm).

NOTE

Always tighten lower switch housing screw first, so that any gap between upper and lower housings is at front of switch assembly.

WARNING

Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

7. Test switches for proper operation.

INSTALLATION

NOTE

While there are four different switch configurations for Touring models (Road King, Road King Classic, Classic and Ultra), the installation procedures are the same. To simplify these instructions, only the Road King switch configuration is represented in the photographs and illustrations which follow.

Right Handlebar Controls

1. Verify that TGS is installed and fully engaged in the slots in handlebar. Position handgrip such that any cosmetic features are properly positioned. Install handgrip on handlebar and fully engage on TGS splines until it bottoms. Connect heated handgrip connector if equipped. See 2.23 HANDLEBARS, Heated Handgrips.
2. With concave side facing upward, install friction shoe so that pin hole is over point of adjuster screw (non cruise equipped models only).

NOTE

The friction shoe is a loose fit and may fall out or become dislodged if lower switch housing is turned upside down or shaken.

3. Position lower switch housing beneath the throttle grip.
4. Position upper switch housing over handlebar and lower switch housing.
5. Verify that wire harness conduit runs in the depression at bottom of handlebar. Be sure that upper switch housing harness will not be pinched under handlebar when switch housing screws are tightened.
6. Start upper and lower switch housing screws. Turn screws until snug, but do not tighten.
7. See Figure 7-148. Position brake lever/master cylinder assembly inboard of switch housing assembly engaging tab on lower switch housing in groove at top of brake lever bracket.
8. Align holes in handlebar clamp with those in master cylinder housing and start two screws (with flat washers). Position for rider comfort.
9. Verify handgrip is fully seated on TGS but not binding.

NOTE

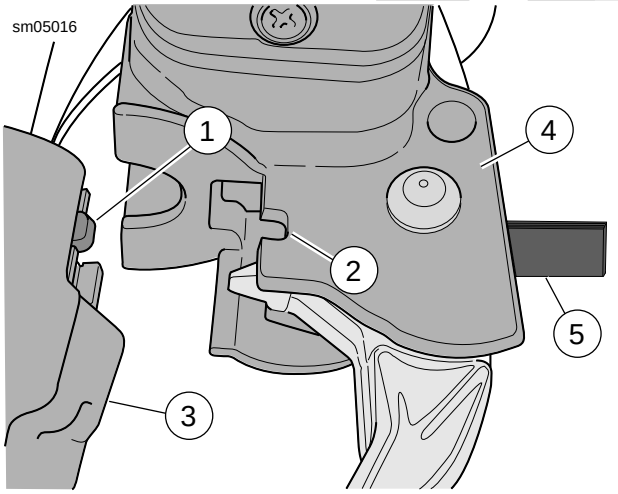
Always tighten lower switch housing screw first, so that any gap between upper and lower housings is at front of switch.

10. Tighten switch housing.
    a. Push handgrip inboard compressing spring action of TGS.
    b. Hold switch housing outboard against grip.
    c. While holding switch housing in place, release handgrip and tighten switch housing screws to 35-45 **in-lbs** (4.0-5.0 Nm).
    d. Release handgrip and verify free rotation and slight inboard-outboard free play.
11. Verify master cylinder to switch housing orientation and brake light switch engagement. Begin with top screw, tighten brake clamp screws to 72-108 **in-lbs** (8.1-12.2 Nm). Again verify throttle grip function and slight end play.
12. Remove cardboard insert between brake lever and lever bracket.
13. Secure wire harness conduit to handlebar using two **new** cable straps. Position first cable strap approximately 4.0-5.0 in. (102-127 mm) from handlebar clamp. Cut any excess cable strap material.

⚠WARNING

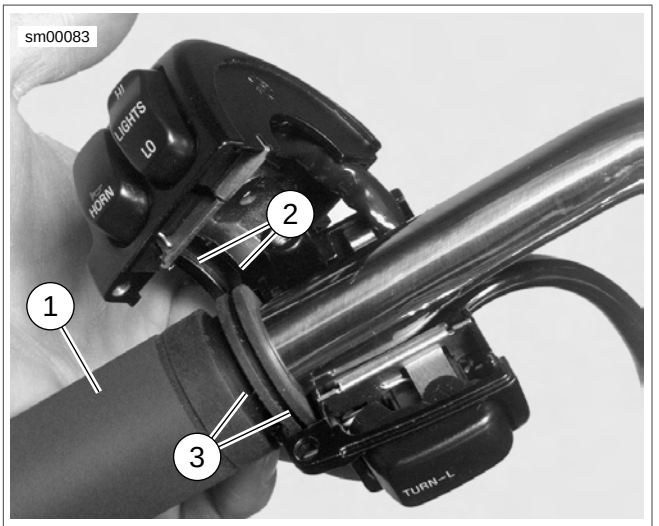
Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

14. Test switches for proper operation.



1. **Tab**
2. **Groove**
3. **Switch housing assembly**
4. **Brake lever bracket**
5. **Cardboard insert**

Figure 7-148. Remove Master Cylinder/Brake Lever Assembly



1. **Grip sleeve**
2. **Ribs**
3. **Grooves**

Figure 7-149. Install Left Handlebar Switch Housings

Left Handlebar Controls

1. Install **new** hand grip, if removed. See 2.23 HANDLEBARS, Left Handgrip.
2. See Figure 7-149. Install upper and lower switch housings on handlebar. Be sure that ribs on outboard side of switch housings fit in grooves molded into grip.
3. Verify that wire harness conduit runs in groove at bottom of handlebar. Be sure that upper switch housing harness will not be pinched under handlebar when switch housing screws are tightened.
4. Start upper and lower switch housing screws, but do not tighten.
5. See Figure 7-150. Position clutch hand lever assembly inboard of switch housing assembly engaging tab on lower switch housing in groove at bottom of clutch lever bracket.
6. Align holes in handlebar clamp with those in clutch lever bracket and start two screws (with flat washers). Position for rider comfort. Beginning with top screw, tighten screws to 72-108 **in-lbs** (8.1-12.2 Nm).
7. Tighten lower and upper switch housing screws to 35-45 **in-lbs** (4.0-5.0 Nm).

NOTE

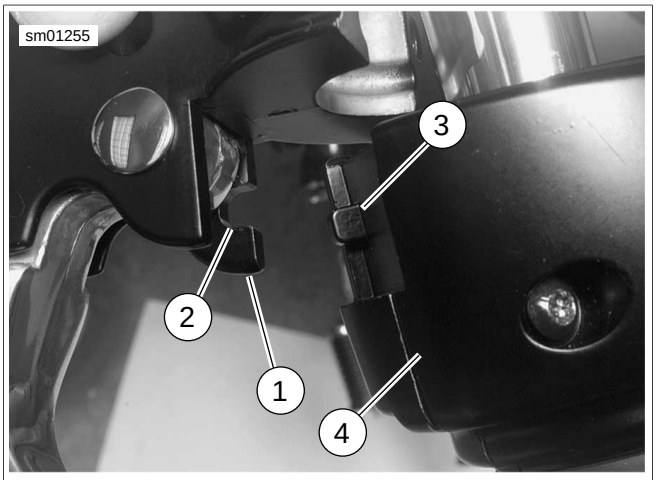
Always tighten lower switch housing screw first, so that any gap between upper and lower housings is at front of switch.

8. Secure wire harness conduit to handlebar using two **new** cable straps. Position first cable strap approximately 4.0-5.0 in. (102-127 mm) from handlebar clamp. Cut any excess cable strap material.

⚠WARNING

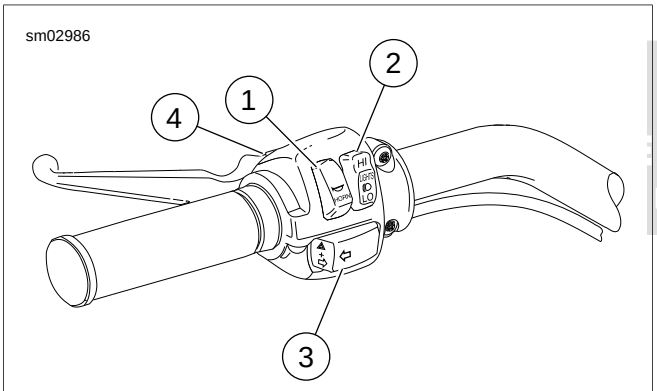
Be sure that all lights and switches operate properly before operating motorcycle. Low visibility of rider can result in death or serious injury. (00316a)

9. Test switches for proper operation.



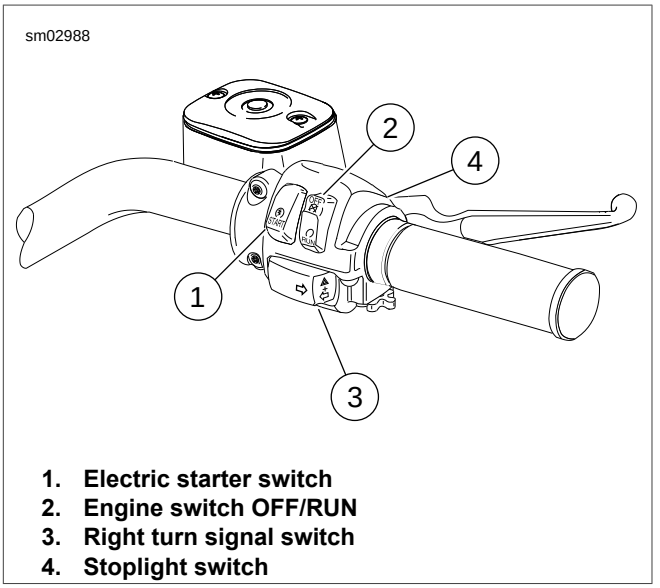
1. Clutch lever bracket
2. Groove
3. Tab
4. Switch housing assembly

Figure 7-150. Fit Clutch Lever Bracket to Left Handlebar Switch Housing



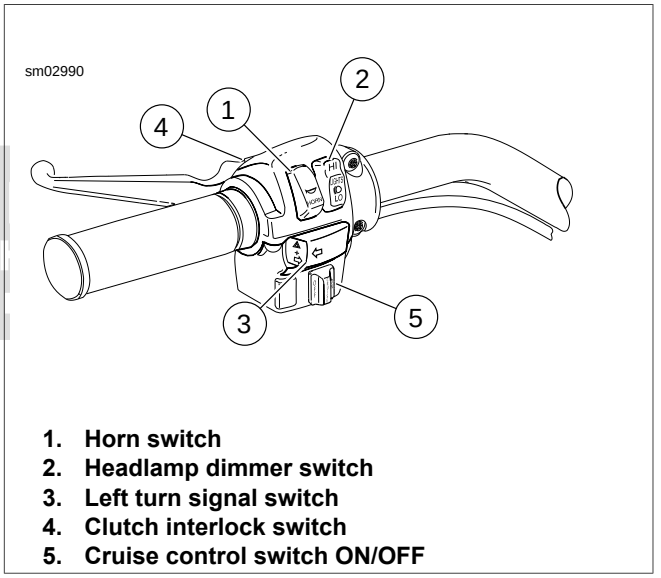
1. Horn switch
2. Headlamp dimmer switch HI/LO
3. Left turn signal switch
4. Clutch interlock switch

Figure 7-151. Road King Left Handlebar Controls



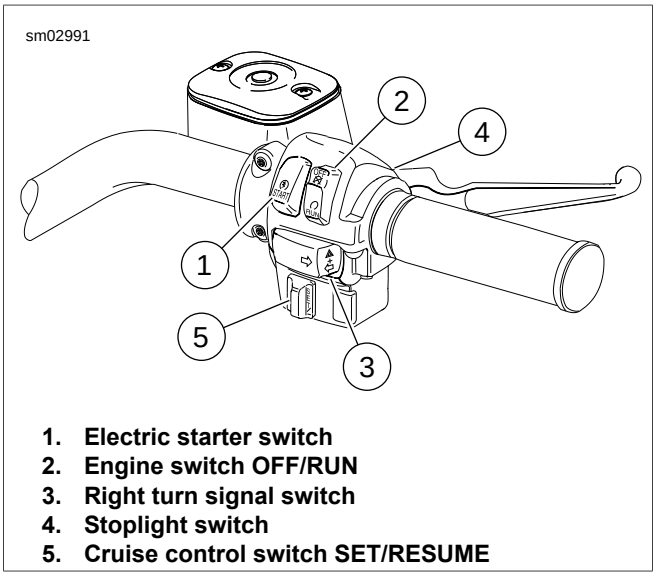
1. Electric starter switch
2. Engine switch OFF/RUN
3. Right turn signal switch
4. Stoplight switch

Figure 7-152. Road King Right Handlebar Controls



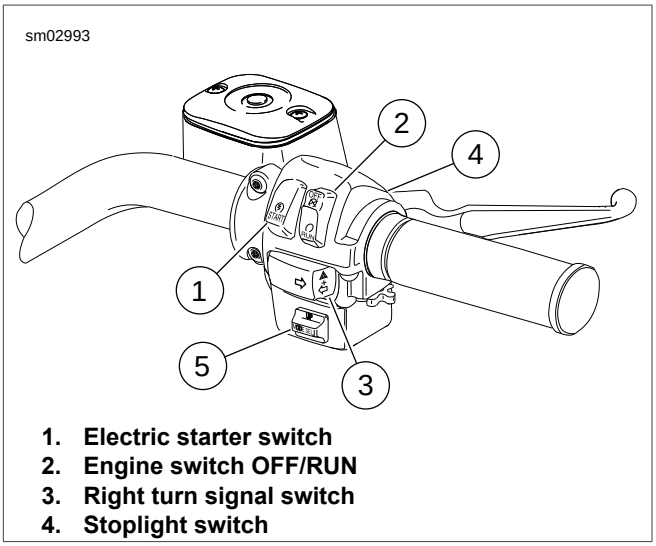
1. Horn switch
2. Headlamp dimmer switch
3. Left turn signal switch
4. Clutch interlock switch
5. Cruise control switch ON/OFF

Figure 7-153. Road King Classic Left Handlebar Controls



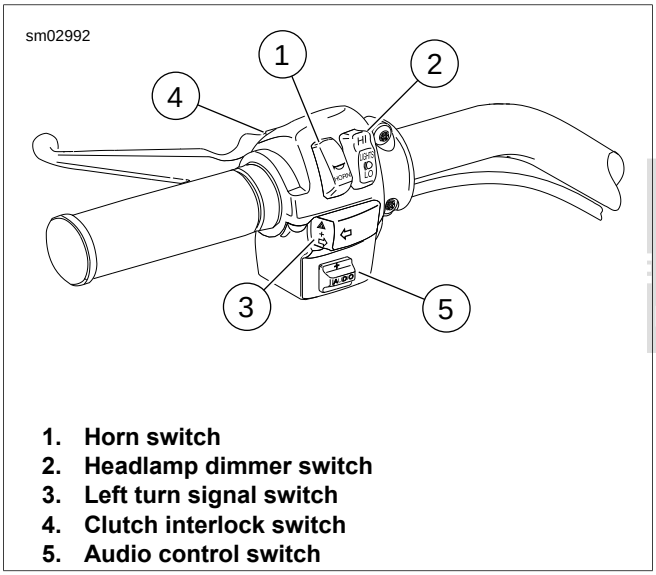
1. Electric starter switch
2. Engine switch OFF/RUN
3. Right turn signal switch
4. Stoplight switch
5. Cruise control switch SET/RESUME

Figure 7-154. Road King Classic Right Handlebar Controls



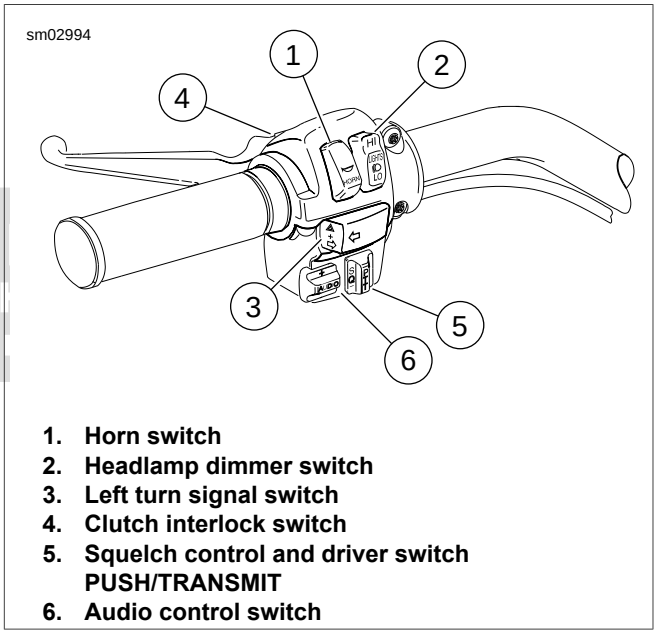
1. Electric starter switch
2. Engine switch OFF/RUN
3. Right turn signal switch
4. Stoplight switch

Figure 7-156. Classic Right Handlebar Controls



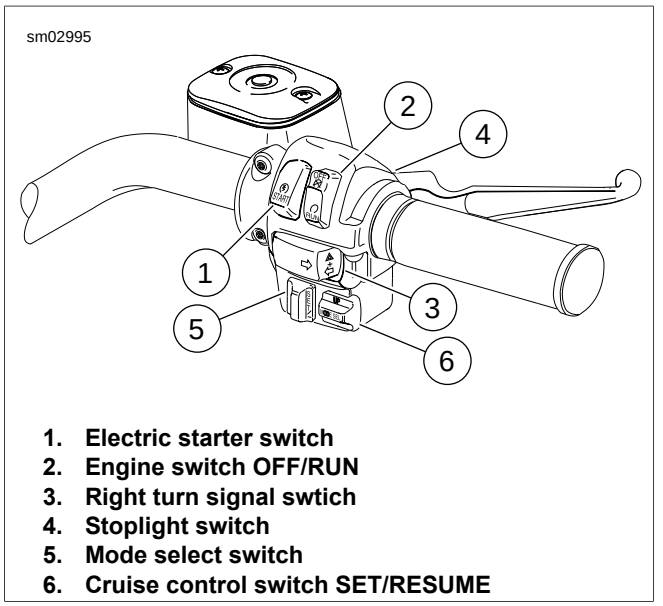
1. Horn switch
2. Headlamp dimmer switch
3. Left turn signal switch
4. Clutch interlock switch
5. Audio control switch

Figure 7-155. Classic Left Handlebar Controls



1. Horn switch
2. Headlamp dimmer switch
3. Left turn signal switch
4. Clutch interlock switch
5. Squelch control and driver switch PUSH/TRANSMIT
6. Audio control switch

Figure 7-157. Ultra Left Handlebar Controls



1. **Electric starter switch**
2. **Engine switch OFF/RUN**
3. **Right turn signal swtich**
4. **Stoplight switch**
5. **Mode select switch**
6. **Cruise control switch SET/RESUME**

Figure 7-158. Ultra Right Handlebar Controls

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TSSM/HFSM MAINTENANCE 7.41

GENERAL

The TSSM and HFSM use batteries in the fob and siren. These are the only parts requiring periodic maintenance.

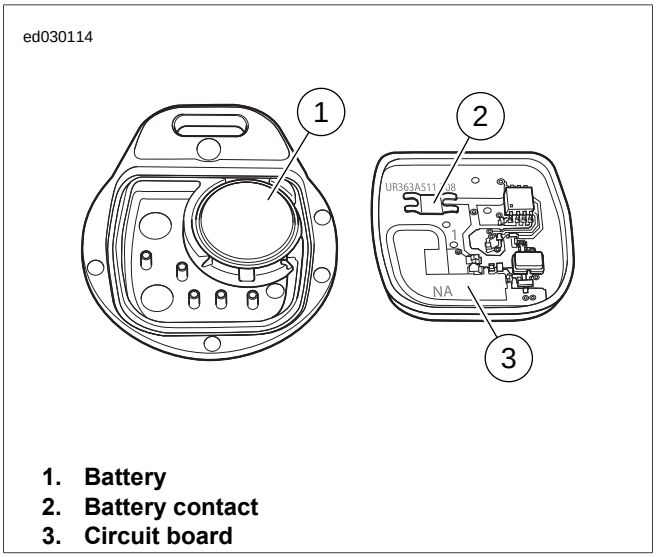
FOB BATTERY

Battery Replacement Schedule

Replace the fob battery every year.

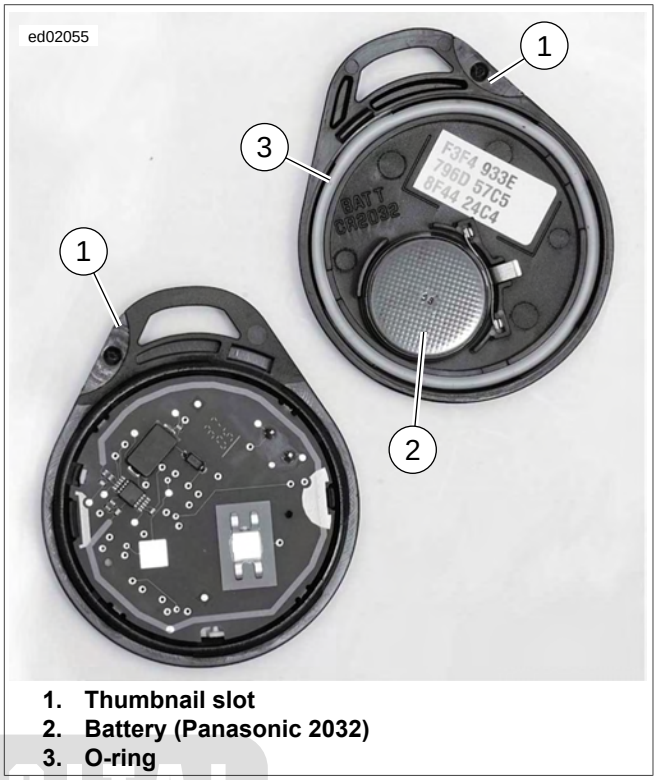
Battery Replacement

1. Open the fob case.
   a. **TSSM:** See Figure 7-159. Place a thin blade between the two halves of the case.
   b. **HFSM:** See Figure 7-160. Place a thin blade in the thumbnail slot (1) between the two halves of the case.
   c. Slowly twist the blade.
2. Replace the battery.
   a. Remove the original battery.
   b. Install a **new** battery with the positive (+) side down. Use a Panasonic® 2032 or equivalent.
3. Close the case.
   a. **TSSM:** See Figure 7-159. Align case and circuit board (3) as shown.
   b. **HFSM:** See Figure 7-160. With O-ring (3) in place, align case halves.
   c. Snap case halves together.
4. **TSSM:** While standing next to the motorcycle, press and hold the fob button for 10-15 seconds until the security system responds with two turn signal flashes/siren chirps.



1. **Battery**
2. **Battery contact**
3. **Circuit board**

Figure 7-159. Open Fob: TSSM



1. **Thumbnail slot**
2. **Battery (Panasonic 2032)**
3. **O-ring**

Figure 7-160. Open Fob: HFSM

SMART SIREN (IF INSTALLED)

Battery Replacement Schedule

The siren's internal 9V battery is rechargeable and does not need to be replaced on a regular basis. Battery life under normal conditions is approximately three to six years.

NOTE

The internal siren battery may not charge if the motorcycle's battery is less than 12.5V.

Battery Replacement

1. Disarm system and remove siren.
2. See Figure 7-161. With a small screwdriver or pick, push the catches (1) in through the two slots (2) in the end of the siren to release the battery cover (3).

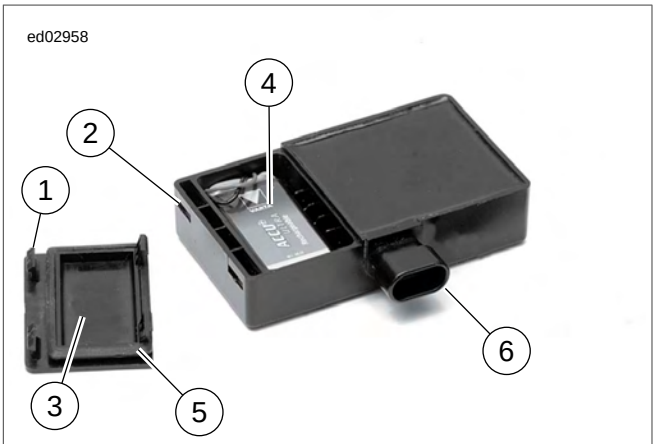
NOTES

- *For protection against corrosion, battery terminals and battery clip are covered with a special grease. Do not wipe away this substance. Apply all available existing grease to terminals on **new** battery.*
- *Only a 9V nickel metal hydride battery should be used in the siren.*

3. Replace battery (4) by removing old battery from polarized battery clip.
4. Recharge and install or install a **new** 9V nickel metal hydride battery.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

5. Install battery cover (3).
   a. Carefully replace the rubber seal (5) on the cover.
   b. Align battery cover with case placing round corners on cover away from connector [142A] (6).
   c. Snap cover into place.
6. Install siren and check operation. If siren is working properly, it responds with two chirps after receiving the arm command.



1. **Catch (2)**
2. **Slot (2)**
3. **Cover**
4. **9 Volt battery**
5. **Rubber seal**
6. **Connector [142A]**

Figure 7-161. Battery Compartment

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

PERSONAL IDENTIFICATION NUMBER (PIN) 7.42

GENERAL

The PIN consists of five digits. Each digit can be any number from 1 through 9. There can be no zeros (0) in the PIN. Use the PIN to disarm the security system in case the fob becomes unavailable.

INITIAL PIN ENTRY

To enter a PIN on a motorcycle with no PIN previously installed during HFSM actuation, refer to Table 7-20.

Table 7-20. Entering an Initial PIN: HFSM, TSSM

STEP	ACTION	CONFIRMATION
1	Select a five-digit (1 through 9) initial PIN and record in the Owner's Manual and on the wallet card.	
2	With an assigned fob present, set engine stop switch to **OFF.**	
3	Cycle ignition switch **IGNITION**-OFF-**IGNITION**-OFF-**IGNITION.**	
4	Press **left** turn signal button twice.	Turn signals flash three times.
5	Press **right** turn signal button once.	Five dashes appear in the odometer window. The first dash flashes.
6	Enter first digit (a) of initial PIN by pressing **left** turn signal button until desired digit is displayed in odometer.	
7	Press **right** turn signal button once.	The digit (a) replaces the dash in the odometer. The second dash flashes.
8	Enter second digit (b) of initial PIN by pressing **left** turn signal button until desired digit is displayed in odometer.	
9	Press **right** turn signal button once.	The digit (b) replaces the dash in the odometer. The third dash flashes.
10	Enter third digit (c) of initial PIN by pressing **left** turn signal button until desired digit is displayed in odometer.	
11	Press **right** turn signal button once.	The digit (c) replaces the dash in the odometer. The fourth dash flashes.
12	Enter fourth digit (d) of initial PIN by pressing **left** turn signal button until desired digit is displayed in odometer.	
13	Press **right** turn signal button once.	The digit (d) replaces the dash in the odometer. The fifth dash flashes.
14	Enter fifth digit (e) of initial PIN by pressing **left** turn signal button until desired digit is displayed in odometer.	
15	Press **right** turn signal button once.	The digit (e) replaces the dash in the odometer. The first digit flashes.
16	Turn the ignition switch to **OFF.**	

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

CHANGING THE PIN

To change a PIN, refer to Table 7-21. The rider can change the PIN at any time.

Modifying an Existing Pin

If a PIN was previously entered, the odometer will display the equivalent digit. Each additional press of the left turn switch will increment the digit.

Examples:

- To advance from 5 to 6, press and release the left turn switch 1 time.
- To advance from 8 to 2, press and release the left turn switch 3 times (9-1-2).

Table 7-21. Changing the PIN: HFSM

STEP	ACTION	CONFIRMATION	NOTES
1	Select a five-digit (1 through 9) PIN and record in the Owner's Manual and on the wallet card.		
2	With fobs present, cycle ignition switch IGNITION-OFF-IGNITION-OFF-IGNITION.		
3	Press **left** turn signal button twice.	Turn signals flash 3 times.	
4	Press **right** turn signal button once.	Current PIN will appear in odometer. The first digit will flash.	
5	Enter first digit (a) of new PIN by pressing **left** turn signal button until desired digit is displayed in odometer.		
6	Press **right** turn signal button once.	The new digit replaces the current in the odometer. The second digit flashes.	
7	Enter second digit (b) of new PIN by pressing **left** turn signal button until desired digit is displayed in odometer.		
8	Press **right** turn signal button once.	The new digit replaces the current in the odometer. The third digit flashes.	
9	Enter third digit (c) of new PIN by pressing **left** turn signal button until desired digit is displayed in odometer.		
10	Press **right** turn signal button once.	The new digit replaces the dash in the odometer. The fourth digit flashes.	
11	Enter fourth digit (d) of new PIN by pressing **left** turn signal button until desired digit is displayed in odometer.		
12	Press **right** turn signal button once.	The new digit replaces the current in the odometer. The fifth digit flashes.	
13	Enter fifth digit (e) of new PIN by pressing **left** turn signal button until desired digit is displayed in odometer.		
14	Press **right** turn signal button once.	The new digit replaces the current in the odometer. The first digit flashes.	
15	Turn the ignition switch to **OFF.**		Turning ignition switch to OFF stores PIN.

DIGITAL TECHNICIAN II

H-DSSS ACTUATION 7.43

GENERAL

Setting up a vehicle TSM/HFSM depends on whether the vehicle has a TSM or the optional HFSM security system installed.

SIDECAR CONFIGURATION

⚠WARNING

Only Touring Harley-Davidson Motorcycles are suitable for sidecar use. Consult a Harley-Davidson dealer. Use of motorcycles other than Touring models with sidecars could result in death or serious injury. (00040a)

All motorcycles ship with the H-DSSS set for use **without** a sidecar installed. If a motorcycle is equipped with a TSM, no further actuation is required.

ACTUATION

Actuation consists of assigning two fobs to the system, and entering an initial PIN. The PIN can be changed by the rider at any time.

1. Configure HFSM motorcycles by assigning **both** fobs to the vehicle.
2. Configure HFSM motorcycles by entering a PIN picked by the owner. The personal code allows the owner to operate the system if the fob is lost or inoperable. Record the PIN in the Owner's Manual and instruct the customer to carry a copy (use the wallet card found in the Owner's Manual). See 7.42 PERSONAL IDENTIFICATION NUMBER (PIN).

Once the system has been activated, it will always "arm" within 5 seconds of turning the ignition switch to **OFF** and no motorcycle motion.

FOB ASSIGNMENT

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Use DIGITAL TECHNICIAN II (Part No. HD-48650) to assign both fobs to the H-DSSS. Follow the menu prompts in the DIGITAL TECHNICIAN II (Part No. HD-48650) display and scan the fob serial number with the bar code reader, or key-in the number from the keyboard. See a Harley-Davidson dealer.

NOTE

Each fob has a unique serial number. The label should be removed from the fob and attached to a blank NOTES page in the Owner's Manual for reference.

POWER DISRUPTION AND CONFIGURING

Removing battery voltage from the TSM/HFSM module can happen because of any of the following:

- Battery disconnect
- Power drain
- Battery fuse removal
- Connecting a breakout box to the TSM/HFSM connector

After battery voltage has been removed from terminal 1 of the TSM/HFSM, the module will not enter the PIN entry mode on the first attempt. Initialize the PIN entry configuration sequence twice before entering the PIN:

1. Set engine OFF/RUN switch to **OFF**.
2. Cycle the ignition switch: **IGNITION-OFF-IGNITION-OFF-IGNITION**.
3. Press the left turn signal switch **twice**.
4. Repeat steps listed above.
5. Continue with the PIN entry sequence.

TSM/HFSM: PASSWORD LEARN 7.44

GENERAL

If the ECM or TSM/HFSM is faulty, replace the unit. See 7.4 ELECTRONIC CONTROL MODULE (ECM) or 7.5 TURN SIGNAL AND SECURITY MODULE (TSM/TSSM/HFSM). Then, to determine if password learn is necessary, refer to Table 7-22.

Table 7-22. Password Learn

DEVICE REPLACED	IS PASSWORD LEARN NECESSARY?
ECM	Yes
TSM	No *
TSM/HFSM	Yes
* If a TSM has been replaced by a HFSM, or a HFSM has been replaced by a TSM, password learn is necessary.	

PASSWORD LEARN

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

To perform the password learn procedure, refer to Table 7-23. When finished, continue with all instructions under 7.43 H-DSSS ACTUATION.

TSM/HFSM: Always perform all appropriate instructions under 7.43 H-DSSS ACTUATION after TSM/HFSM replacement or removal.

TSM/TSSM (Japan/Korea markets): Always perform all appropriate instructions under VEHICLE DELIVERY in the electrical diagnostic manual after TSM/TSSM replacement or removal.

NOTES

- ***HFSM:*** *Fob assignment must be performed at an authorized Harley-Davidson dealer using DIGITAL TECHNICIAN II (Part No. HD-48650).*
- ***TSSM:*** *Do not forget to enter a Personal Identification Number (PIN) for TSSM vehicles. If a code is not assigned and the key fob is lost or damaged while the vehicle is armed, the TSSM must be replaced.*

Table 7-23. Setting TSM/TSSM/HFSM and ECM Password

NO.	ACTION	CONFIRMATION	NOTES
	Ignition must be turned off for at least 15 seconds.	With Ignition Switch turned off, Check Engine lamp and Security lamp will be off.	
1	Install **new** TSM/TSSM/HFSM or ECM.		
2	Set Engine Stop Switch to **RUN.**		
3	Turn Ignition Switch **ON.**	Verify Check Engine lamp and Security lamp illuminate and then turn off.	TSM/HFSM enables start relay.
4	Attempt normal start one time.	Engine starts and stalls. Check Engine lamp illuminates and stays on.	Password has not been learned. ECM sets DTC P1009.
5	Wait ten seconds. Security lamp will illuminate and stay on.	Security lamp illuminates.	ECM enters Password Learning mode for ten minutes. Do not cycle Ignition Switch or interrupt vehicle power or Password Learn will be unsuccessful.
6	Wait until Security lamp turns off.		This takes ten minutes.
7	Quickly (within two seconds) turn Ignition Switch OFF-**ON.**		ECM must not be allowed to shutdown.
8	Wait until Security lamp turns off.		This takes ten minutes.
9	Quickly (within two seconds) turn Ignition Switch OFF-**ON.**		ECM must not be allowed to shutdown.
10	Wait until Security lamp turns off.		This takes ten minutes.
11	Quickly (within two seconds) turn Ignition Switch OFF-**ON.**		ECM must not be allowed to shutdown.

Table 7-23. Setting TSM/TSSM/HFSM and ECM Password

NO.	ACTION	CONFIRMATION	NOTES
12	Turn Ignition Switch **OFF**. Wait 15 seconds before turning Ignition Switch on. Turn Ignition Switch **ON** and start engine to confirm successful Password Learn procedure. Clear DTCs.		
13	**TSM/HFSM:** Perform all steps under 7.43 H-DSSS ACTUATION. **TSM/TSSM (Japan/Korea markets):** Perform all steps under VEHICLE DELIVERY in electrical diagnostic manual.		

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DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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NOTES

AUTOFUSE UNSEALED ELECTRICAL CONNECTORS A.1

AUTOFUSE UNSEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
GA500A	SNAP-ON TERMINAL PICK

General

Autofuse Unsealed connector terminals are found in ignition switches and some fuse blocks.

Disassembly

1. Obtain SNAP-ON TERMINAL PICK (Part No. GA500A).
2. See Figure A-1 or Figure A-2. Insert smallest pair of pins into chamber on mating end of socket housing to press tangs on each side of terminal simultaneously.
3. Gently pull on wire to remove terminal from wire end of socket housing.
4. If necessary, crimp **new** terminals on wires.

Assembly

1. Using a thin flat blade, like that on a hobby knife, carefully bend tang on each side of terminal outward away from terminal body.
2. With the open side of the terminal facing rib on wire end of socket housing, insert terminal into chamber until it locks in place.

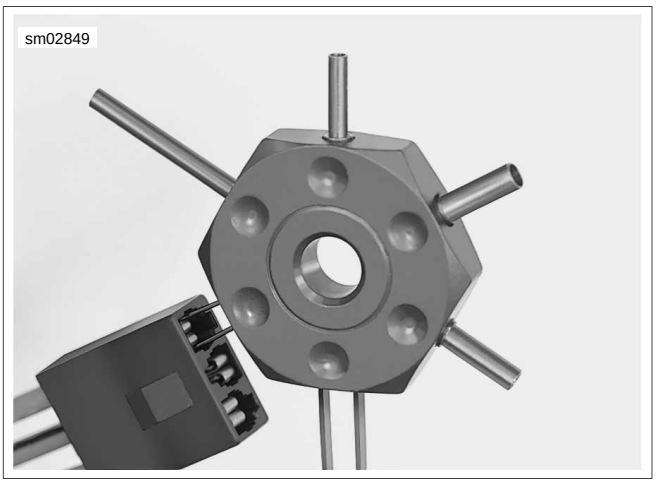


Figure A-1. Removing Autofuse Unsealed Terminal from Ignition Switch

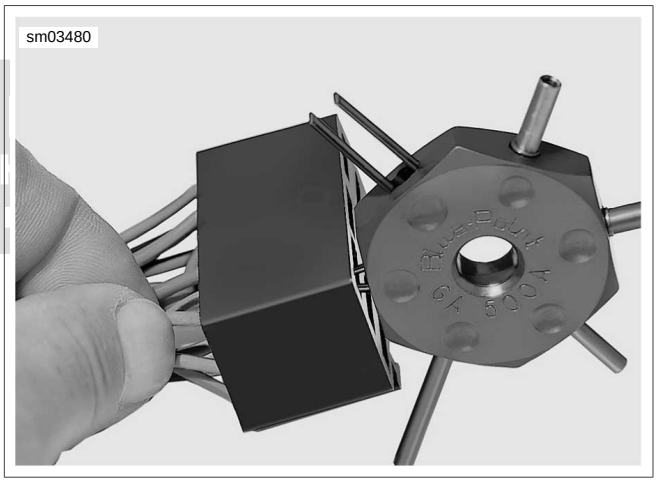


Figure A-2. Removing Autofuse Unsealed Terminal from Fuse Block

DELPHI 100W MICRO-PACK SEALED CONNECTOR A.2

DELPHI 100W MICRO-PACK SEALED CONNECTOR REPAIR

General

A Delphi 100W Micro-Pack Sealed connector connects the electronic control module (ECM) to the main harness.

NOTE

For vehicles with 73-pin connectors, see A.9 DELPHI MICRO 64 SEALED CONNECTORS and A.8 DELPHI METRI-PACK TERMINAL REPAIR.

Separating Socket Housing From ECM

See Figure A-3. While pressing the connector into the ECM, press the thumb lever (1) against the connector until the latch (2) pops out of the catch (3) on the ECM.

Mating Socket Housing To ECM

Push the connector into the ECM until the latch is captured by the catch on the ECM.

Removing Socket Terminal

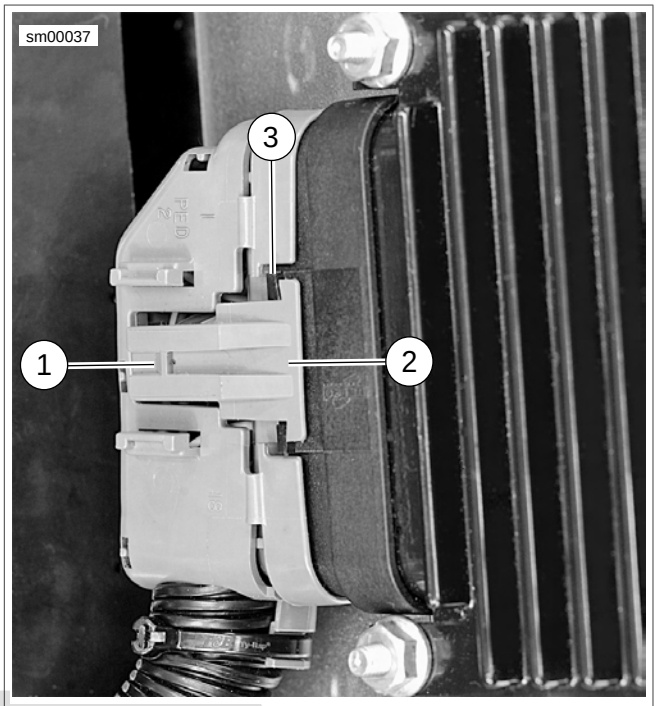
1. See Figure A-4. Gently press latch (1) on each side of the clear plastic secondary lock (2) and remove. For best results, release one side at a time.
2. Carefully cut cable strap (3) to free strain relief collar (4) from conduit (5).
3. See Figure A-5. Using a thin blade, gently pry at seam at back of socket housing to release three plastic pins (1) from slots in housing. Separate and spread halves of socket housing.
4. Push on wire lead to free terminal from chamber.

Installing Socket Terminal

1. From inside socket housing, gently pull on wire to draw terminal into chamber.
2. Exercising caution to avoid pinching wires, press halves of socket housing together until three plastic pins fully engage slots in housing.
3. Install **new** cable strap in groove of strain relief collar capturing cable conduit.
4. With the two ribs on the secondary lock on the same side as the external latch, install over terminals until latches lock in place.

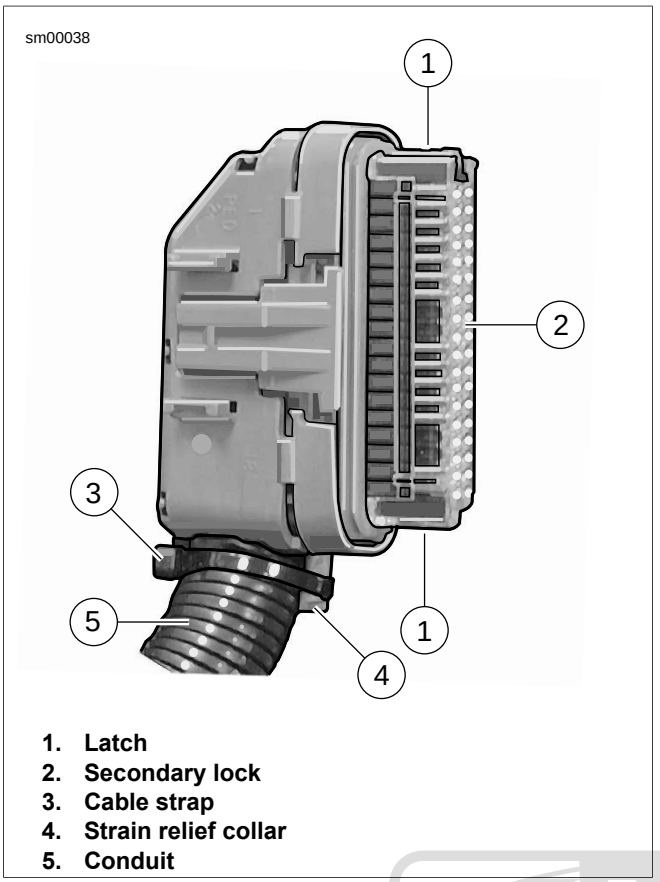
Crimping Terminals

If necessary, crimp **new** terminals on wire leads. See A.8 DELPHI METRI-PACK TERMINAL REPAIR.



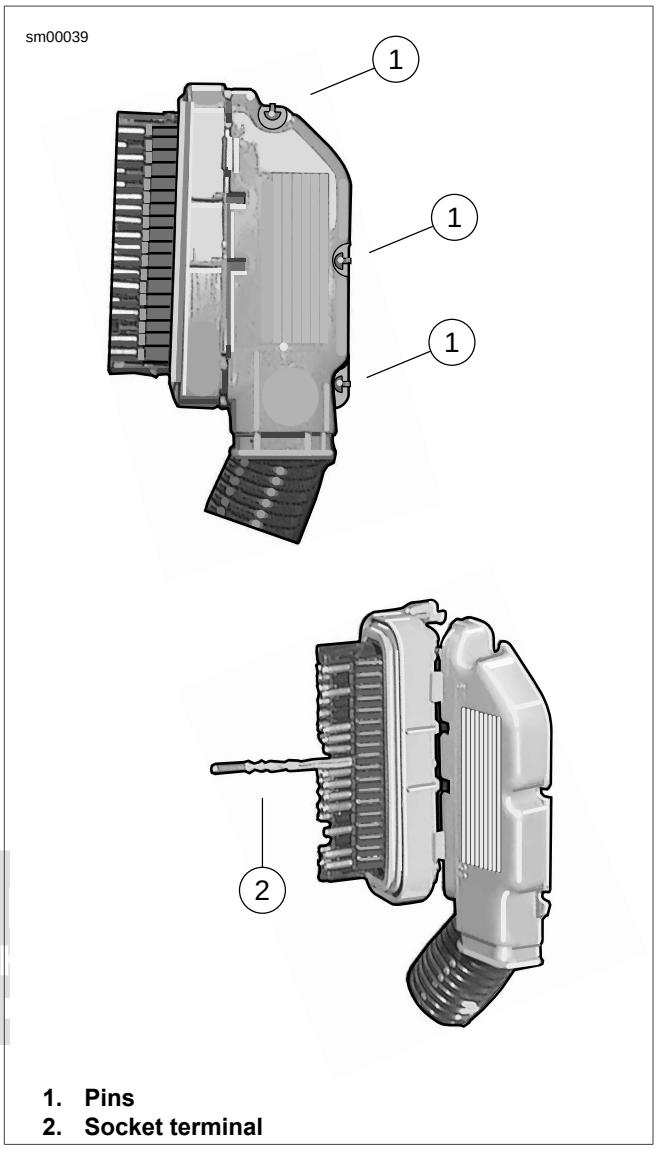
1. **Thumb lever**
2. **Latch**
3. **Catch (ECM)**

Figure A-3. Delphi 100W Micro-Pack Sealed Connector to ECM (typical)



1. Latch
2. Secondary lock
3. Cable strap
4. Strain relief collar
5. Conduit

Figure A-4. Delphi 100W Micro-Pack Sealed Connector



1. Pins
2. Socket terminal

Figure A-5. Delpi 100W Micro-Pack Sealed Connector: Separate Halves of Socket Housing

DELPHI 150 METRI-PACK SEALED CONNECTORS A.3

DELPHI 150 METRI-PACK SEALED CONNECTOR REPAIR

General

Delphi 150 Metri-Pack Sealed connectors are embossed with the initials (P.E.D.).

There are two types of connectors in this series:

- Pull-to-Seat
- Push-to-Seat

Separating Pin and Socket Housings

Bend back the external latch slightly and separate the pin and socket halves of the connector.

Mating Pin and Socket Housings

Align the wire colors and push the pin and socket halves of the connector together.

Removing Socket Terminal

1. See Figure A-6 for pull-to-seat connector or Figure A-7 for push to seat connector. Remove wire lock (1) from wire end of socket housing on push-to-seat type connectors.

NOTE

For best results, free one side of wire lock first and then release the other side.

2. Find the locking tang in the mating end of the connector.

NOTE

The tangs are always positioned in the middle of the chamber and are on the same side as the external latch.

3. Gently insert a safety pin into the chamber about 1/8 in. (3.2 mm).
   a. **For pull-to-seat:** Stay between the terminal and the chamber wall and pivot the end of the pin toward the terminal body.
   b. **For push-to-seat:** There is a small opening for the pin.
4. When a click is heard, remove the pin and repeat the procedure.

NOTE

The click is the sound of the tang returning to the locked position as it slips from the point of the pin.

5. Pick at the tang until the clicking stops and the pin seems to slide in deeper than it had previously. This is an indication that the tang has been depressed.

NOTE

On those terminals that have been extracted on multiple occasions, the click may not be heard, but pivot the pin as if the click was heard at least 3 times.

6. Remove the pin.
   a. **For pull-to-seat:** Push on the lead to extract the terminal from the mating end of the connector.
   b. **For push-to-seat:** Pull on the lead to draw the terminal out the wire end.

Inserting Socket Terminal

NOTE

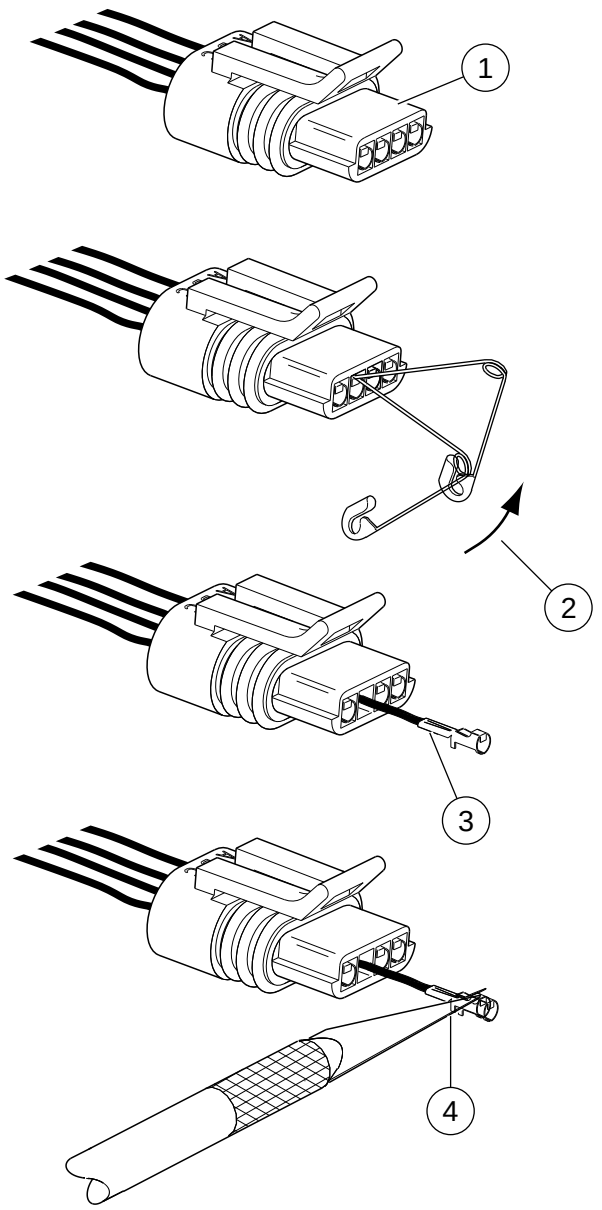
For wire location purposes, alpha characters are stamped into the socket housings.

1. See Figure A-6 for pull-to-seat connector or Figure A-7 for push to seat connector. Using a thin flat blade, like that on a hobby knife, carefully bend the tang outward away from the terminal body.
2. Gently pull or push on the lead to install the terminal back into the chamber. A click is heard when the terminal is properly seated.
3. Gently pull or push on the lead to verify that the terminal is locked in place.

   For push-to-seat: See Figure A-7. Seat wires in separate channels of wire lock and then push channels **inside** chambers at wire end of socket housing. Fully installed, slot on each side of wire lock engages ear on socket housing.

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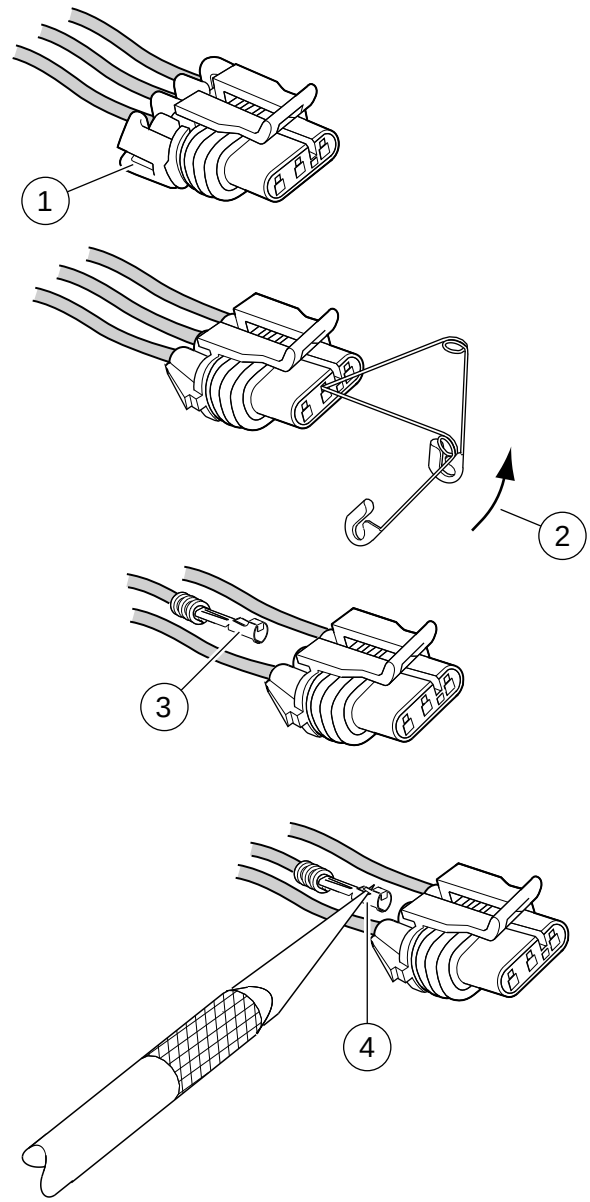
sm00027



1. Locate tang in chamber
2. Pivot pin to depress tang
3. Push to remove
4. Raise tang to install

Figure A-6. Delphi 150 Metri-Pack Sealed Connector: Pull-to-Seat

sm00028



1. Remove wire lock
2. Pivot pin to depress tang
3. Pull to remove
4. Raise tang to install

Figure A-7. Delphi 150 Metri-Pack Sealed Connector: Push-to-Seat

DELPHI 280 METRI-PACK UNSEALED CONNECTORS A.4

FUSE BLOCK REPAIR

Removing Socket Terminals

1. See Figure A-8. To remove secondary locks, insert end of small flat blade screwdriver (1) under lip of locking wedge (2) and gently pry up secondary lock.

NOTE

For best results, start with locking wedge on outboard side of secondary lock.

2. Looking into chamber at top of fuse block, note the tang next to each socket terminal.
3. Using a thin flat blade, like that on a hobby knife, gently push tang away from terminal, and then tug on wire to back terminal out.

Installing Socket Terminals

1. Match the wire lead color to the fuse block terminal cavity.

NOTES

- *Refer to the main harness wiring diagram for wire lead color codes.*
- *See Figure A-9. The main fuse block terminal cavity is identified as alpha (1) and numeric (2) coordinates. Refer to the main harness wiring diagram for fuse block terminal cavity coordinates.*

2. With the open side of the socket terminal facing the tang, push lead into chamber at the wire end of the fuse block. A click is heard when the terminal is properly engaged.
3. Gently tug on the wire to verify that the terminal is locked in place and will not back out of the chamber.
4. Install the secondary locks. With the locking wedges positioned above the tangs in each chamber, slide flat side of secondary lock into slot (between rows), and push down until it bottoms.

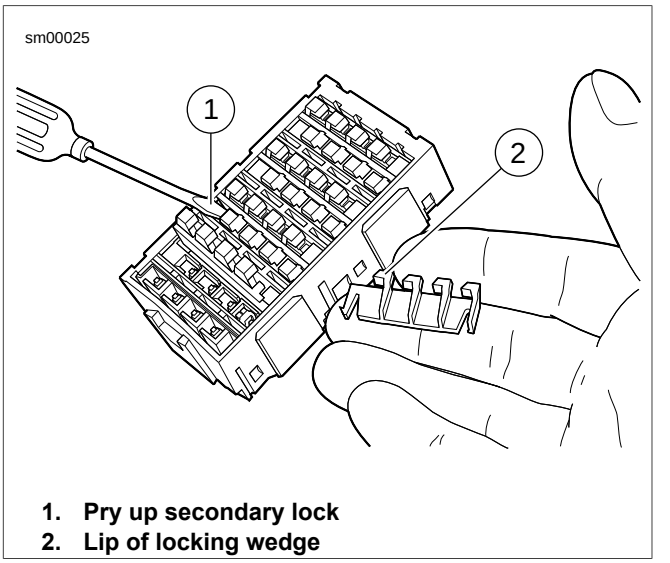
Crimping Terminals

Terminals are crimped twice; once over the wire core and a second time over the insulation/seal.

A correctly crimped terminal may require different crimping dies found on separate crimpers.

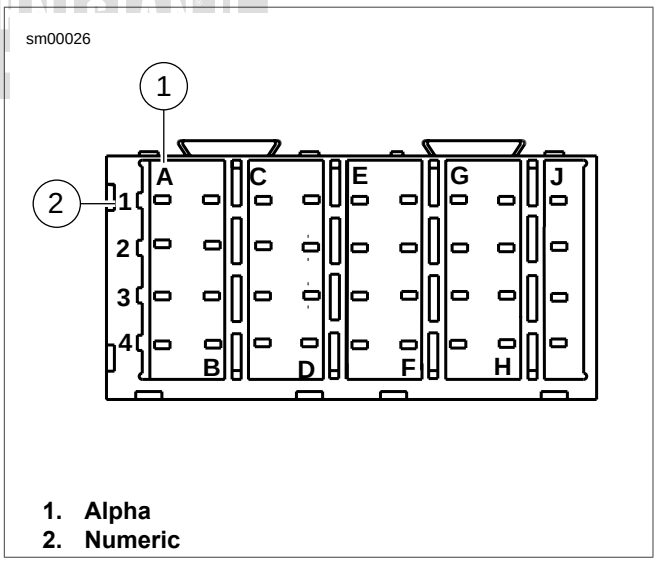
NOTE

The wiring diagram indicates when one socket terminal is be crimped to two wire leads.



1. **Pry up secondary lock**
2. **Lip of locking wedge**

Figure A-8. Fuse Block: Remove Secondary Locks



1. **Alpha**
2. **Numeric**

Figure A-9. Fuse Block: Coordinates (typical)

DELPHI 480 METRI-PACK UNSEALED CONNECTORS A.5

DELPHI 480 METRI-PACK UNSEALED CONNECTOR REPAIR

General

A 480 Metri-Pack connector is frequently used for the B+ (battery voltage) connector to power P&A accessories.

See Figure A-10. An AFL housing (5) is used on many ignition/light switches. The secondary lock (4) must be opened before removing the terminal from the housing.

Separating Pin and Socket Housings

NOTE

Cut any cable strap anchoring the wire conduits of the pin (accessory connector housing) and the socket (B+) housing.

See Figure A-10. Using small flat blade screwdriver, press button (1) on pin housing (red wire) side of the connector and pull apart the pin and socket housings.

Mating Pin and Socket Housings

Orient the latch on the socket housing to the button catch on the pin housing and press the housings together.

Removing Socket Terminals

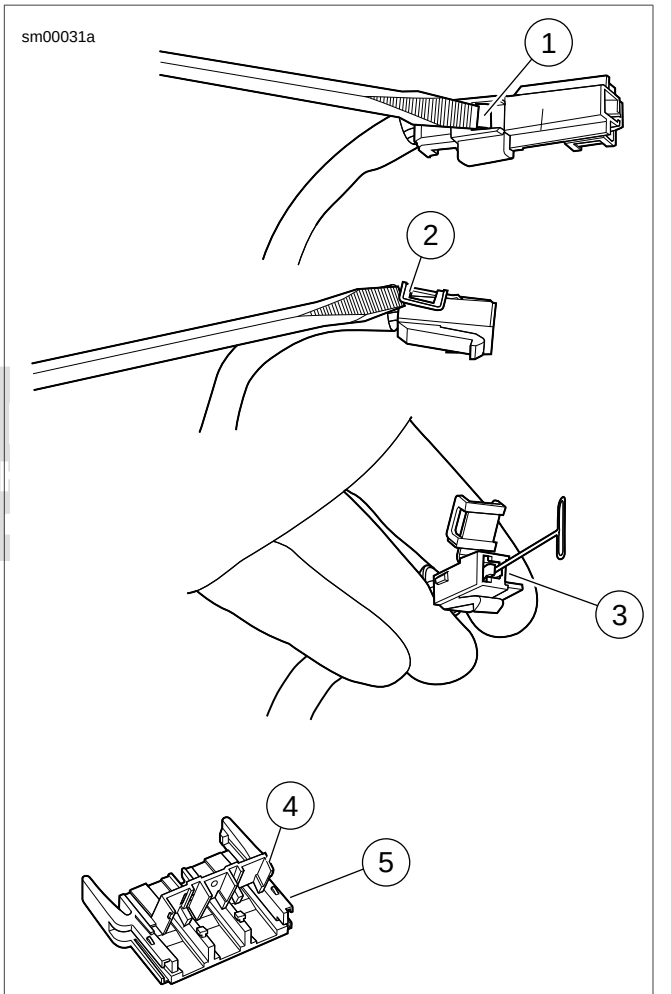
1. See Figure A-10. Bend back the latch (2) slightly and free one side of secondary lock, then repeat to release the opposite side. Rotate the secondary lock outward on hinge to access terminal in chamber of connector housing.
2. On the mating end of the connector, note the tang in the square shaped opening centered next to the terminal. Gently insert the point of a stick pin or large safety pin into the opening (3) between the tang and the chamber wall until it stops.
3. Pivot the end of the pin toward the terminal body to press the tang.
4. Remove the pin and then pull terminal out of the wire end of connector housing.
5. If necessary, crimp **new** terminals on wires. See A.8 DELPHI METRI-PACK TERMINAL REPAIR.

Installing Socket Terminals

1. Carefully bend the tang outward away from the terminal body.
2. With the tang on the same side as the square shaped opening in the mating end of the connector housing, feed terminal into wire end of connector housing until it "clicks" in place.
3. Verify that terminal will not back out of the chamber. A slight tug on the cable will confirm that it is locked.
4. Rotate the hinged secondary lock inward until latches fully engage tabs on both sides of connector housing.

NOTE

*If removed, install **new** anchored cable strap in O.E. location. Tighten cable strap to capture conduit of both accessory connector and B+ connector approximately 1.0 in. (25.4 mm) from housings.*



1. **Button on pin housing**
2. **Secondary lock latch**
3. **Opening between tang and chamber wall**
4. **Secondary Lock (shown open)**
5. **AFL housing**

Figure A-10. Delphi 480 Metri-Pack Unsealed Connector: Remove Socket Terminal

DELPHI 630 METRI-PACK UNSEALED CONNECTORS A.6

DELPHI 630 METRI-PACK UNSEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
SNAP-ON TT600-3	SNAP-ON PICK

Separating Pin and Socket Housings

NOTE

If necessary, remove connector from barbed anchor or other retaining device.

Bend back the external latch slightly and separate pin and socket halves of the connector.

Mating Pin and Socket Housings

Orient the latch to the catch and push the pin and socket halves of the connector together until the latch "clicks".

NOTE

If removed, install connector on barbed anchor or other OE retaining device.

Removing Socket Terminal

1. Bend back the latch slightly and free one side of the secondary lock. Repeat the step to unlatch the other side.
2. Rotate the secondary lock outward on hinge to view the terminals in the chambers of the connector housing. The locking tang is on the side opposite the crimp tails and engages a rib in the chamber wall to lock the terminal in place.
3. Moving to the mating end of the connector, take note of the small opening on the chamber wall side of each terminal.
4. Insert SNAP-ON PICK (Part No. SNAP-ON TT600-3) into opening until it stops. Pivot the end of the pick toward the terminal to press the locking tang.
5. Remove the pick and gently tug on the wire to pull the terminal from the wire end of the connector. Repeat steps if the terminal is still locked in place.
6. If necessary, crimp **new** terminals on wires. Refer to A.8 DELPHI METRI-PACK TERMINAL REPAIR.

Installing Socket Terminal

NOTE

Refer to the wiring diagrams to match wire lead colors to alpha characters molded into the secondary locks of each connector housing.

1. Using a thin flat blade, like that of a hobby knife, carefully bend the tang outward away from the terminal body.
2. With the tang facing the chamber wall, push the lead into the chamber at the wire end of the connector. A click is heard when the terminal is properly seated.
3. Gently tug on the wire end to verify that the terminal is locked in place and will not back out of the chamber.
4. Rotate the hinged secondary lock inward until tabs fully engage latches on both sides of connector.

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DELPHI 800 METRI-PACK SEALED MAIN FUSE HOUSING A.7

DELPHI 800 METRI-PACK SEALED MAIN FUSE HOUSING REPAIR

Removing Socket Terminals

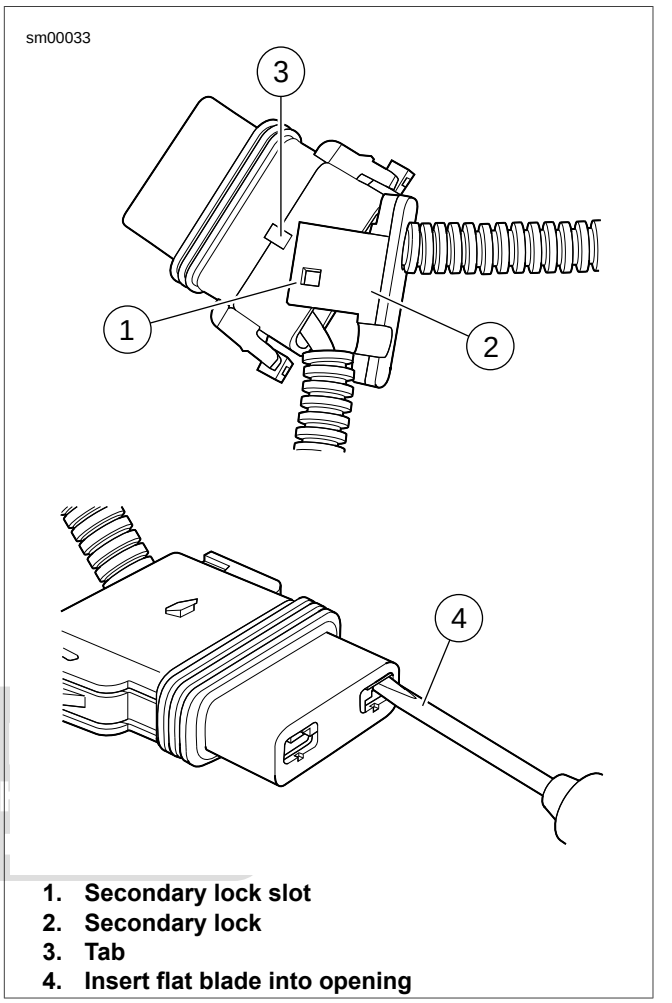
1. Disconnect battery.
2. See Figure A-11. Disengage slots (1) on secondary lock (2) from tabs (3) and remove secondary lock.
3. Insert flat blade of pick or small screwdriver into opening (4) until it stops.
4. Tug on cable to pull socket from connector housing. Pivot the pick toward the terminal body to release the latch if necessary.
5. Repeat to remove remaining socket terminal.

NOTE

The battery positive cable and power wire for the main fuse are crimped together at the starter ring terminal. Both must be replaced as an assembly if either requires replacement.

Installing Socket Terminals

1. See Figure A-12. Carefully bend tang outward away from the terminal body.
2. Properly orient terminal to the cavity in the housing and push terminal into connector housing until it clicks in place. Verify that socket will not back out of chamber.
3. Push rubber seal into connector housing.
4. Repeat to install remaining socket terminal.
5. Install secondary lock onto connector housing. be sure slots engage tabs on sides of connector housing.
6. Connect battery cables.



1. **Secondary lock slot**
2. **Secondary lock**
3. **Tab**
4. **Insert flat blade into opening**

Figure A-11. Delphi 800 Metri-Pack Sealed Main Fuse Housing: Remove Socket Terminals

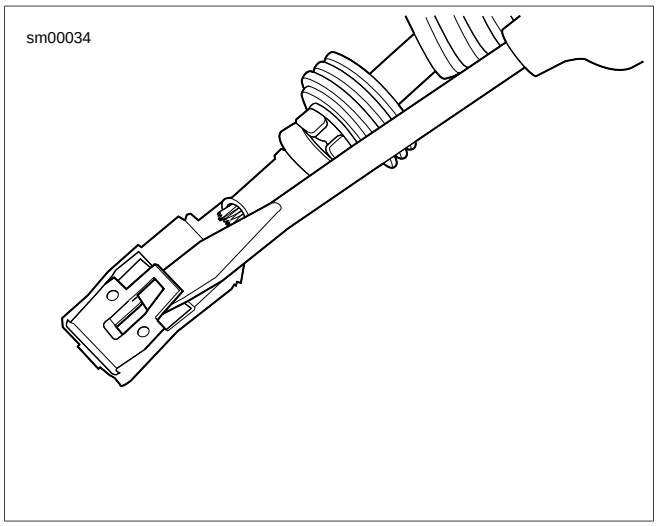


Figure A-12. Delphi 800 Metri-Pack Sealed Main Fuse Housing: Bend Tang

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DELPHI METRI-PACK TERMINAL REPAIR A.8

METRI-PACK TERMINAL CRIMPS

PART NUMBER	TOOL NAME
HD-38125-6	PACKARD TERMINAL CRIMP TOOL
HD-38125-7	PACKARD TERMINAL CRIMPER
HD-38125-8	PACKARD CRIMPING TOOL

Matching Terminal To Crimper

Metri-Pack connectors embossed with the initials P.E.D. require Packard crimp tools to crimp terminals to wire leads.

Terminals are crimped twice to a wire lead, once over the wire core and a second time over the insulation/seal.

See Figure A-13. A completed crimp may require two different crimping dies found on PACKARD TERMINAL CRIMP TOOL (Part No. HD-38125-6) and/or PACKARD TERMINAL CRIMPER (Part No. HD-38125-7). The terminal (pin or socket) and the wire lead gauge will determine the core crimp die and the insulator/seal die.

NOTE

The PACKARD CRIMPING TOOL (Part No. HD-38125-8) will also crimp sealed splice connectors in wire gauge sizes 18-20, 14-16 and 10-12.

Preparing Wire Lead

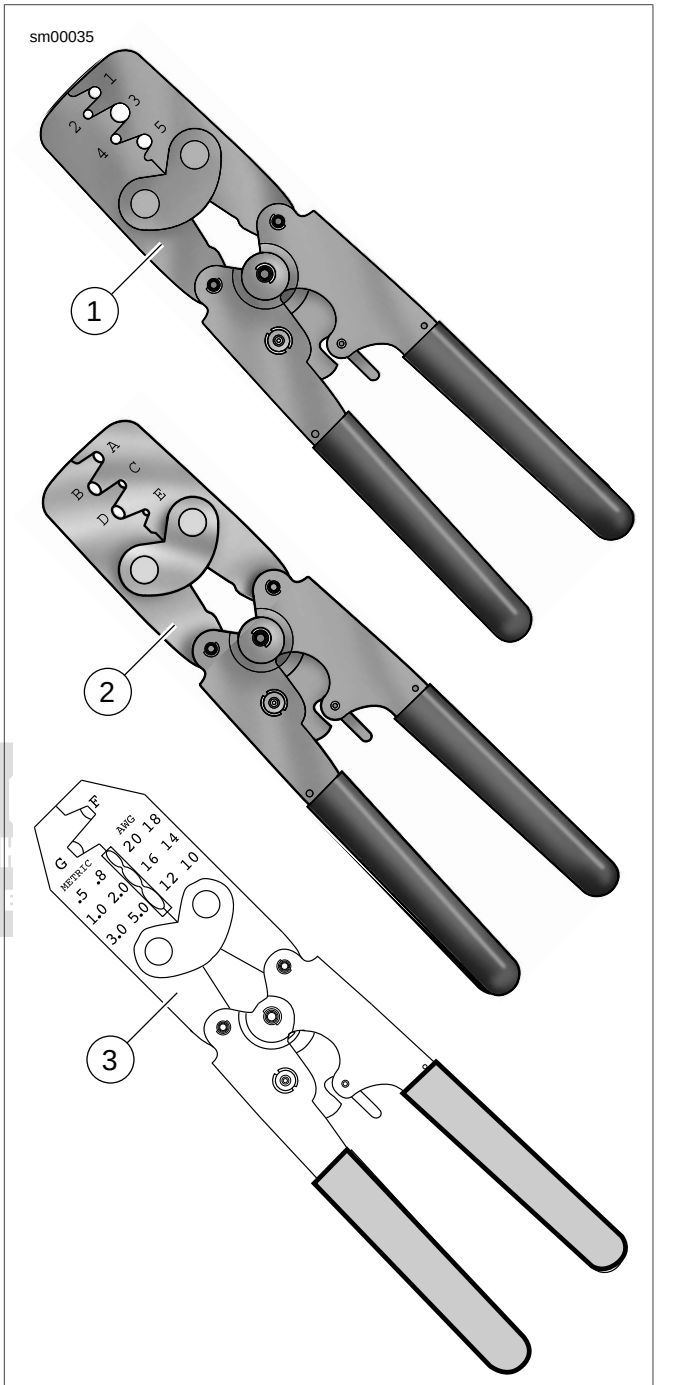
Use a wire striper to strip off the insulation and expose 5/32 in. (4.0 mm) of wire core.

Crimping Wire Core

NOTE

*Metri-Pack terminal crimps require two steps. Always perform **Crimping Wire Core** before **Crimping Insulation/Seal**.*

1. Squeeze and release handles until ratchet automatically opens.
2. Identify the corresponding sized nest for the core crimp.
3. Position the core crimp in the die. Be Sure the core crimp tails are facing the forming jaws.
4. Gently squeeze the handles until crimpers just secure the core crimp tails.
5. Insert stripped wire between crimp tails. Verify that wire is positioned so that short pair of crimp tails squeeze core wire strands, while long pair is positioned over the insulation or seal material.
6. Squeeze handles tightly closed. Release grip and the tool will automatically open.



1. **HD-38125-6 sealed terminals**
2. **HD-38125-7 non-sealed terminals**
3. **HD-38125-8 non-sealed terminals**

Figure A-13. Metri-Pack Terminal Crimp Tools

Crimping Insulation/Seal

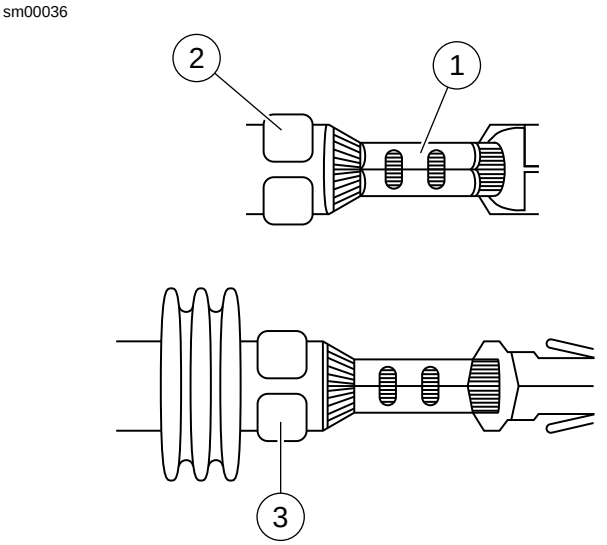
NOTE

*Always perform **Crimping Wire Core** before **Crimping Insulation/Seal**.*

1. See Figure A-14. Identify the correct die for the insulation/seal crimp (2).
2. Position the insulation/seal crimp in the nest. Be sure the insulation/seal crimp tails are facing the forming jaws.
3. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimp is complete.

Inspecting Crimps

1. See Figure A-14. Inspect the wire core crimp (1). The tails should be folded in on the wire core without any distortion or excess wire strands.
2. Inspect the insulation (2) or seal (3) crimp. The tails of the terminal should be wrapped around the insulation without distortion.



1. **Wire core crimp**
2. **Insulation crimp**
3. **Seal crimp**

Figure A-14. Metri-Pack Connector: Inspect Core and Insulation/Seal Crimps

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DELPHI MICRO 64 SEALED CONNECTORS A.9

DELPHI MICRO 64 SEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-45928	TERMINAL REMOVER
HD-45929	TERMINAL CRIMPER

General

Delphi Micro 64 Sealed connectors are frequently found on speedometers, tachometers and the ECM of Touring Models.

Separating Pin and Socket Housings

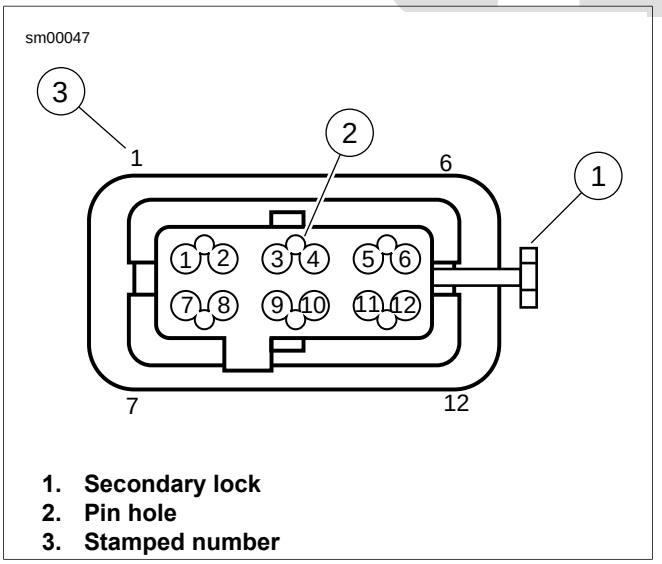
Bend back the external latches slightly and separate the pin and socket housings.

Mating Pin and Socket Housings

Orient the wire lead colors and push the pin and socket housings of the connector together until the latches click.

Removing Terminal

1. See Figure A-15. Locate the head of the secondary lock (1) on one side of the connector housing.
2. Insert the blade of a small screwdriver between the center ear of the lock and the connector housing and gently pry out lock. When partially removed, pull lock from connector housing.
3. Locate pin hole (2) between terminals on mating end of connector.



1. **Secondary lock**
2. **Pin hole**
3. **Stamped number**

Figure A-15. Delphi Micro-64 Sealed Connector: Housing

4. See Figure A-16. Obtain the TERMINAL REMOVER (Part No. HD-45928).
5. See Figure A-17. Push the adjacent terminals all the way into the connector housing and then insert tool into hole until it bottoms.
6. Leaving the tool installed, gently tug on wires to pull either one or both terminals from wire end of connector. Remove tool.

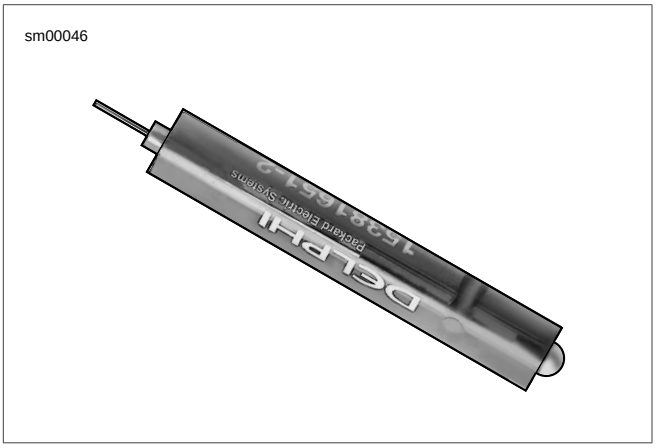


Figure A-16. Terminal Remover (HD-45928)

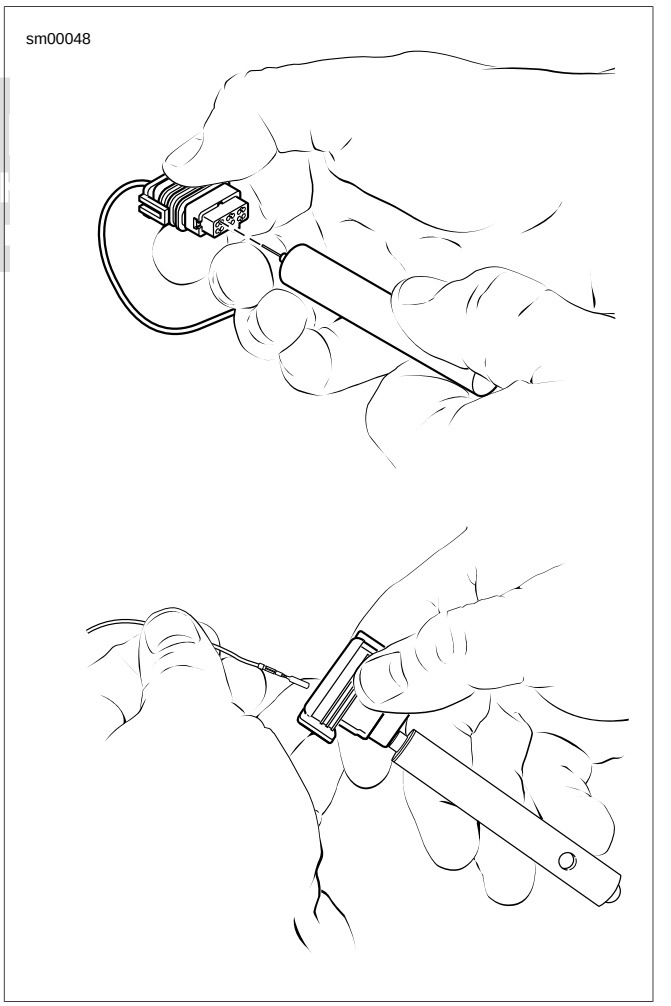


Figure A-17. Delphi Micro-64 Sealed Connector: Insert Tool and Remove Terminal

Installing Terminal

1. Insert terminal into its respective numbered chamber on wire end of connector. No special orientation of the terminal is necessary.

NOTE

See Figure A-15. For wire location purposes, the corners of the socket housing are stamped (3) with the numbers 1, 6, 7 and 12, representing terminals 1-6 on one side, and 7-12 on the other.

2. Bottom the terminal in the chamber and then gently tug on the wire to verify that it is locked in place.

NOTE

Once the terminal is removed it may not lock in place when first installed. Until the lock engages, move the terminal back and forth slightly while wiggling the lead.

3. Since the terminal remover tool releases two terminals simultaneously, repeat step 2 on the adjacent terminal even if it was not pulled from the connector housing.

4. With the center ear on the head of the secondary lockpin facing the mating end of the connector, push secondary lock in until head is flush with the connector housing.

Preparing Wire Leads for Crimping

Strip lead removing 1/8 in. (3.0 mm) of insulation.

Crimping Terminals

1. Inspect **new** socket terminal for bent or deformed contact and crimp tails. Replace as necessary.

2. See Figure A-19. Squeeze the handles of the TERMINAL CRIMPER (Part No. HD-45929) to cycle the tool to the fully open position (1).

3. Raise locking bar and barrel holder by pushing up on bottom tab with index finger (2).

4. With the crimp tails facing upward, insert terminal through locking bar into front hole in barrel holder (20-22 gauge wire) (3).

5. Release locking bar to lock position of contact. When correctly positioned, the locking bar fits snugly in the space at the front of the core crimp tails and the closed side of the terminal rests on the outer nest of the crimp tool.

6. Insert wires between crimp tails until ends make contact with locking bar. Verify that wire is positioned so that wide pair of crimp tails squeeze bare wire strands, while the narrow pair folds over the insulation material.

7. Squeeze handle of crimp tool until tightly closed (4). Tool automatically opens when the crimping sequence is complete.

8. Raise locking bar and barrel holder to remove contact.

Inspecting Crimps

Inspect the quality of the core and insulation crimps. Distortion should be minimal.

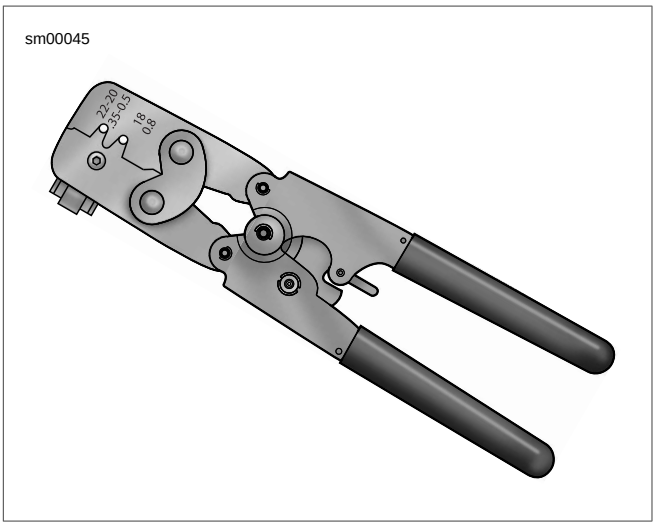
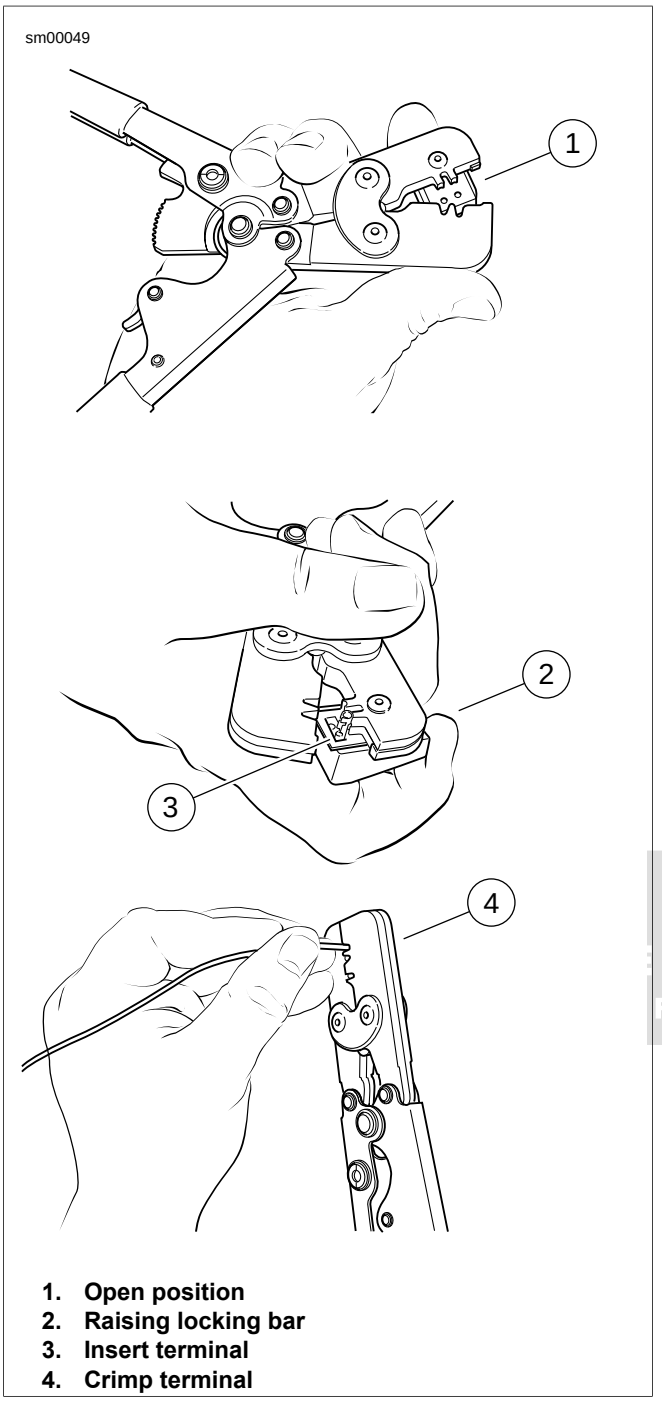


Figure A-18. Terminal Crimper (HD-45929)

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1. **Open position**
2. **Raising locking bar**
3. **Insert terminal**
4. **Crimp terminal**

Figure A-19. Delphi Micro-64 Sealed Connector: Terminal in Crimper

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DELPHI GT 150 SEALED CONNECTORS A.10

DELPHI GT 150 SEALED CONNECTOR REPAIR

General

Delphi connectors are embossed with the brand name, Delphi, on the housing latch or terminal block.

Separating Pin and Socket Housings

See Figure A-20. Bend back the external latch(es) slightly and separate pin and socket halves of connector.

Mating Pin and Socket Housings

Push pin and socket halves of connector together until external latch(es) engage.

Removing Socket Terminals

NOTE

Although the parts of the different Delphi connectors vary in appearance, the instructions which follow will work for all.

1. See Figure A-21. If present, free one side of wire lock (1) from ear on wire end of socket housing, then release the other side. Release wires from channels in wire lock and remove from socket housing.
2. Use a fingernail to pry colored terminal lock (2) loose and then remove from mating end of socket housing.
3. Using a thin flat blade, like the unsharpened edge of a hobby knife, gently pry tang (3) outward away from terminal, and then tug on wire to back terminal out wire end of chamber. Do not pull on wire until tang is released or terminal will be difficult to remove.

Installing Socket Terminals

NOTE

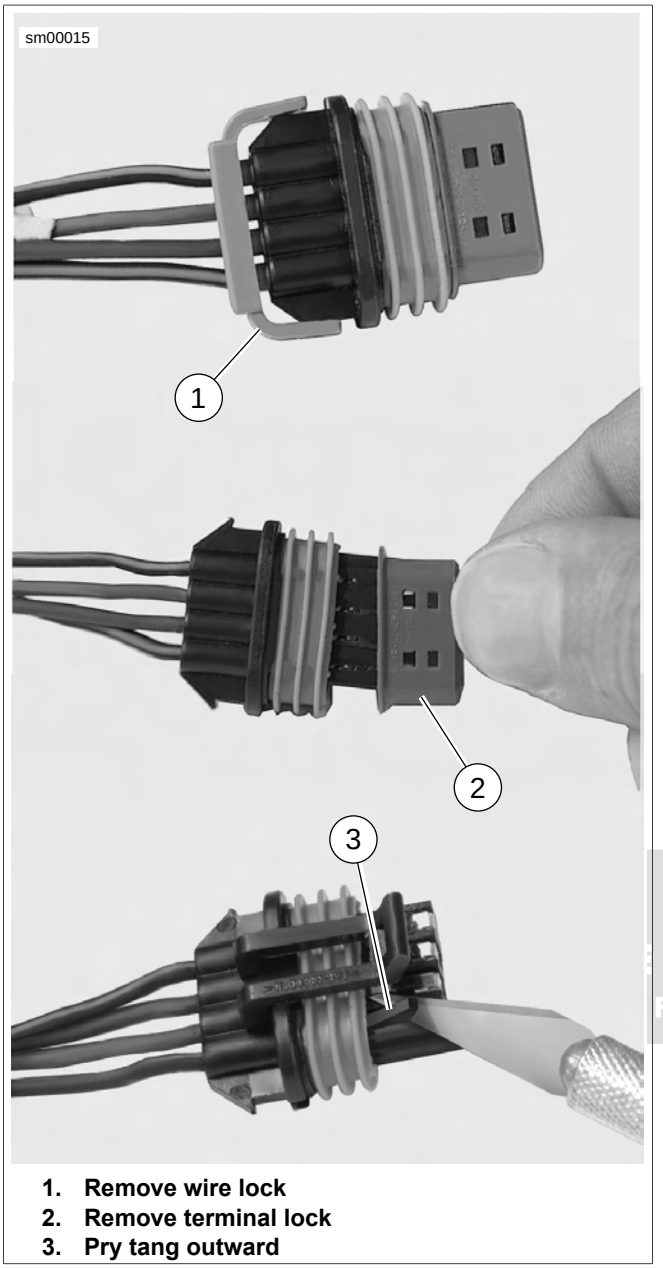
For wire location purposes, alpha or numeric characters are stamped into the wire end of each socket housing.

1. Gently push tang on socket housing inward toward chamber. With the open side of the terminal facing the tang, push terminal into chamber at wire end of socket housing.
2. Gently tug on wire to verify that terminal is locked and will not back out of chamber. If necessary, use fingernail to push tang into engagement with terminal.
3. Install colored terminal lock onto mating end of socket housing.
4. If present, seat wires in separate channels of wire lock and then push channels **inside** chambers at wire end of socket housing. Fully installed, slot on each side of wire lock engages ear on socket housing.



Figure A-20. Delphi GT 150 Sealed Connector: Socket Housing Latch

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1. **Remove wire lock**
2. **Remove terminal lock**
3. **Pry tang outward**

Figure A-21. Delphi GT 150 Sealed Connector: Removing Socket Terminals

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DELPHI GT 280 SEALED 73-TERMINAL ECM CONNECTOR A.11

DELPHI GT 280 SEALED 73-TERMINAL ECM CONNECTOR

NOTE

Do not operate latch lever when connector is not mated to ECU. Damage will occur.

Separating Socket Housing From ECM

NOTE

Although this procedure shows the ECM removed, the ECM connector can be removed and installed with the ECM removed or in place.

See Figure A-22. Remove strap. While pressing latch (1), rotate lock lever to the released position (2).

Mating Socket Housing To ECM

Push the connector into the ECM and rotate lock lever to the locked position.

Socket Terminal

1. Cut cable strap to release harness from strain relief collar of connector housing.
2. See Figure A-23. Release latches (4) that retain cover (3) to housing (2) and remove cover.
3. Follow instructions in A.9 DELPHI MICRO 64 SEALED CONNECTORS to remove and service the Micro-64 terminals.
4. Install connector housing cover. Verify all wires are within the confines of the cover and that the cover latches are engaged.
5. Install **new** cable strap cable to the strain relief of the connector.

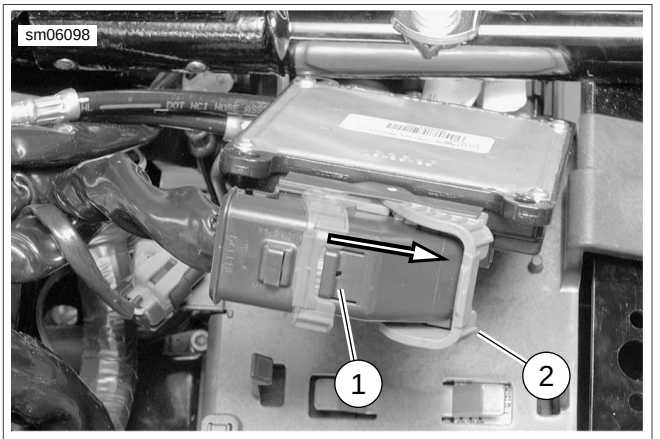
ECM Ground Terminal

1. See Figure A-23. Remove secondary lock (1).
2. See Figure A-24. Using a thin blade screwdriver, gently pry ground terminal retainer from connector housing.
3. See Figure A-25. Using a thin blade screwdriver, release latch and pull ground wire, wire seal and terminal from cover side of housing.
4. Follow instructions in A.8 DELPHI METRI-PACK TERMINAL REPAIR to replace the terminal or wire seal.
5. Push the terminal into place from the cover side of the connector housing until the latch engages. Pull on wire to verify terminal is secure.

NOTE

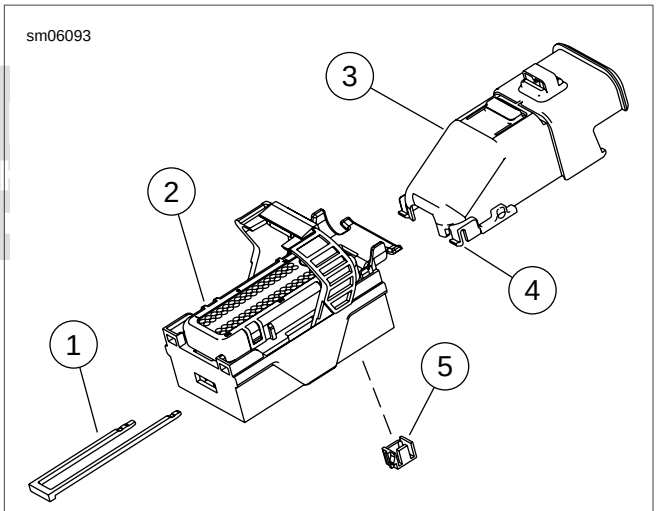
Secondary lock has one short leg and one long leg. Be sure to install correctly as shown in Figure A-23.

6. See Figure A-23. Install ground secondary lock (5) and install secondary lock (1) as shown.



1. **Latch**
2. **Lock lever released**

Figure A-22. Unlatch ECM Connector



1. **Secondary lock**
2. **Terminal housing**
3. **Cover**
4. **Cover latch**
5. **Ground secondary lock**

Figure A-23. Delphi 73-Terminal ECM Connector

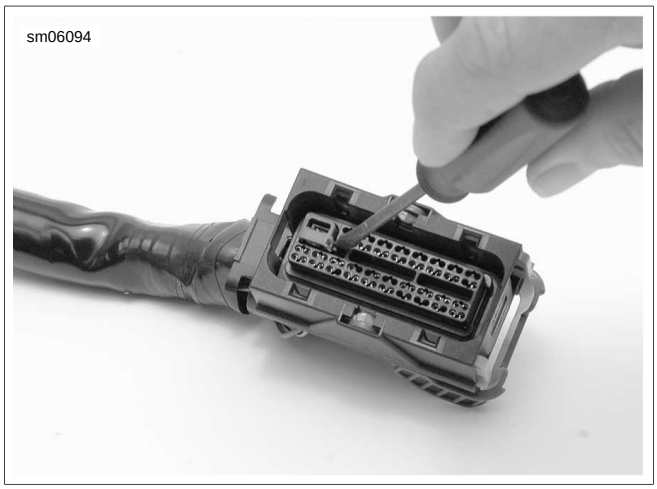


Figure A-24. Remove Ground Secondary Lock

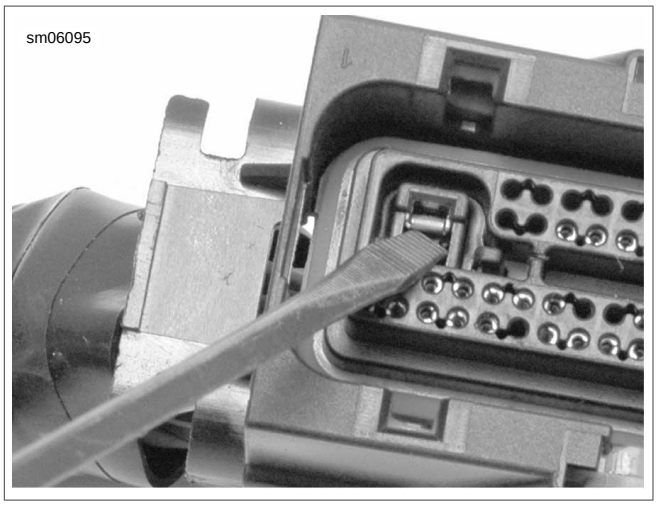


Figure A-25. Remove ECM Ground Terminal

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DEUTSCH DT SEALED CONNECTORS A.12

DEUTSCH DT SEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-41475	DEUTSCH TERMINAL REPAIR KIT
HD-41475-100	FLAT BLADE L-HOOK

General

Deutsch DT Sealed connectors are colored coded for location purposes. Those connectors associated with **left** side accessories, such as the front and rear **left** turn signals, are **gray**. All other connectors, including those associated with right side accessories, are **black**.

NOTE

A DEUTSCH TERMINAL REPAIR KIT (Part No. HD-41475) contains a selection of wire seals, internal seals, seal plugs, secondary locking wedges, attachment clips and socket/pin terminals. Also included is a compartmented storage box, carrying case and a FLAT BLADE L-HOOK (Part No. HD-41475-100) is used for the removal of all types of locking wedges.

Separating Pin and Socket Housings

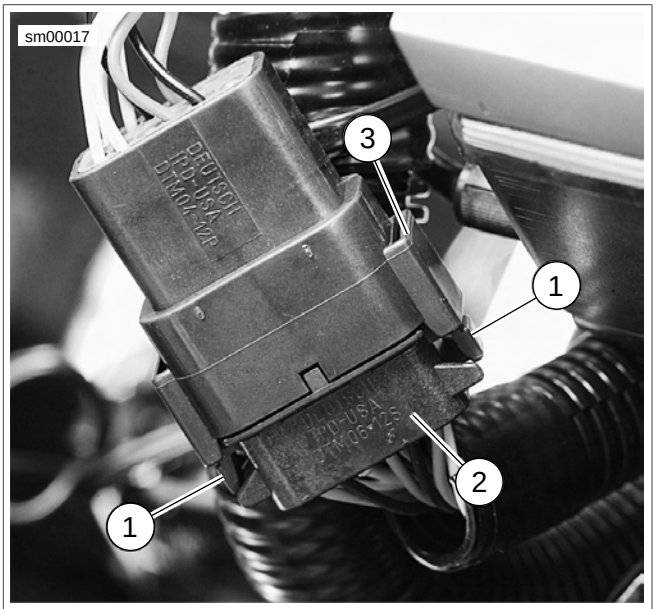
See Figure A-26. To separate the connector halves, Press the external latch(es) (1) on the socket housing (2) while rocking the pin (3) and socket housings.

NOTES

- *Generally, the socket housing is found on the accessory side, while the pin housing is plumbed to the wiring harness.*
- *Two-, three-, four- and six-place Deutsch connectors have one latch on the connector.*
- *Eight- and twelve-place connectors have a latch on each side. Simultaneously press both latches to separate the connector.*

Mating Pin and Socket Housings

1. Align the connectors to match the wire lead colors.
   a. **For One External Latch:** Two-, three-, four- and six-place Deutsch connectors have one external latch on the socket half of the connector. To fit the halves of the connector together, the latch on the socket side must be aligned with the latch cover on the pin side.
   b. **For Two External Latches:** (8-place and 12-place) Align the tabs on the socket housing with the grooves on the pin housing.
2. Insert socket housing into pin housing until it snaps or clicks into place.
   For Two External Latches: (8-place and 12-place) If latches do not click (latch), press on one side of the connector until that latch engages, then press on the opposite side to engage the other latch.
3. If necessary, fit the attachment clip to the pin housing.
4. Place large end of slot on attachment clip over T-stud on frame. Push assembly forward to engage small end of slot.



1. **External latch**
2. **Socket housing**
3. **Pin housing**

Figure A-26. Deutsch DT Sealted Connector

Removing Socket Terminals

1. See Figure A-27. Insert a small screwdriver between the socket housing and locking wedge in-line with the groove (in-line with the pin holes if the groove is absent). Turn the screwdriver 90 degrees to pop the wedge up and remove the secondary locking wedge.
2. See Figure A-30. Use a pick or small screwdriver to Press terminal latches inside socket housing and back out sockets through holes in rear wire seal.

NOTE

*If wire leads require **new** terminals, see the instructions for crimping terminals.*

Installing Socket Terminals

1. Match wire lead color to connector cavity.
2. See Figure A-29. Fit rear wire seal (1) into back of socket housing (2), if removed.
3. Grasp wire lead (3) approximately 1.0 in. (25.4 mm) behind the socket terminal. Gently push socket through hole in wire seal into its chambers until it "clicks" in place.
4. A tug on the wire will confirm that it is properly locked in place.

NOTE

Seal plugs (6) are installed through the wire seals of unused chambers. If removed, seal plugs must be replaced to seal the connector.

5. Install internal seal (4) on lip of socket housing, if removed.
6. Insert tapered end of secondary locking wedge (5) into socket housing and press down until it snaps in place. The wedge fits into the center groove within the socket housing and holds the terminal latches tightly closed.

NOTES

- *See Figure A-28. While rectangular wedges do not require a special orientation, the conical secondary locking wedge of the 3-place connector must be installed with the arrow (1) pointing toward the external latch.*
- *If the secondary locking wedge does not slide into the installed position easily, verify that all terminals are fully installed in the socket housing. The lock indicates when terminals are not properly installed by not entering its fully installed position.*

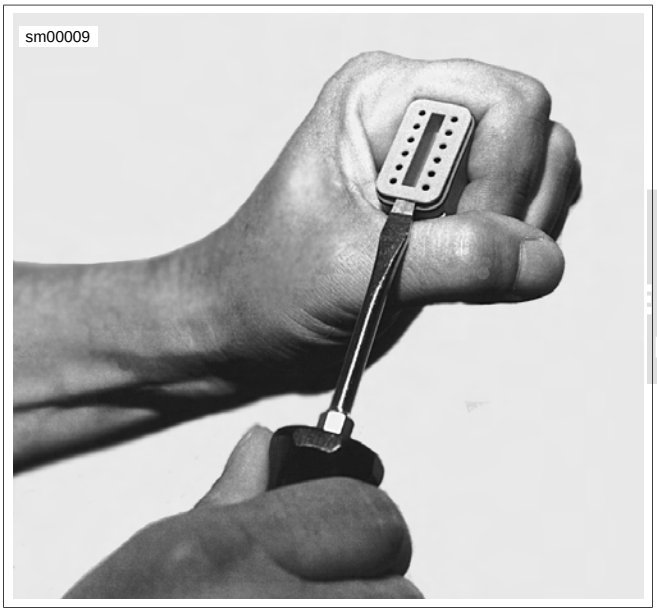
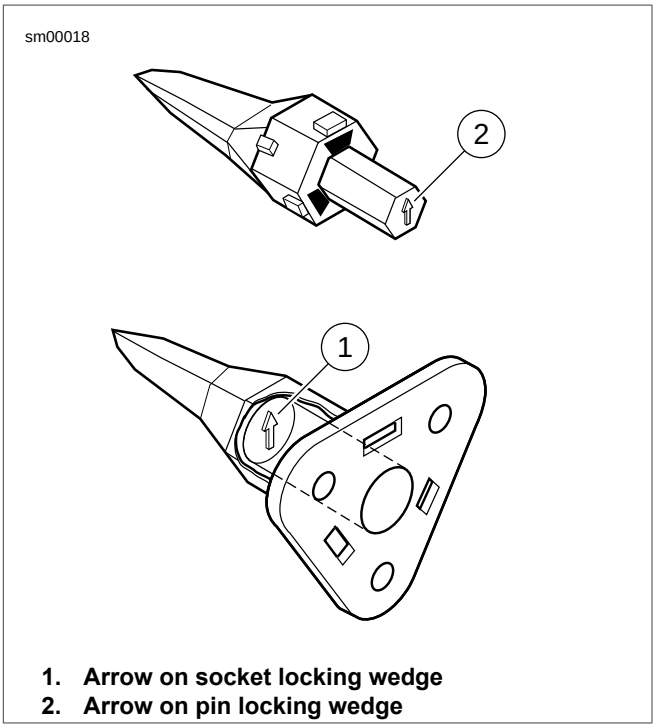


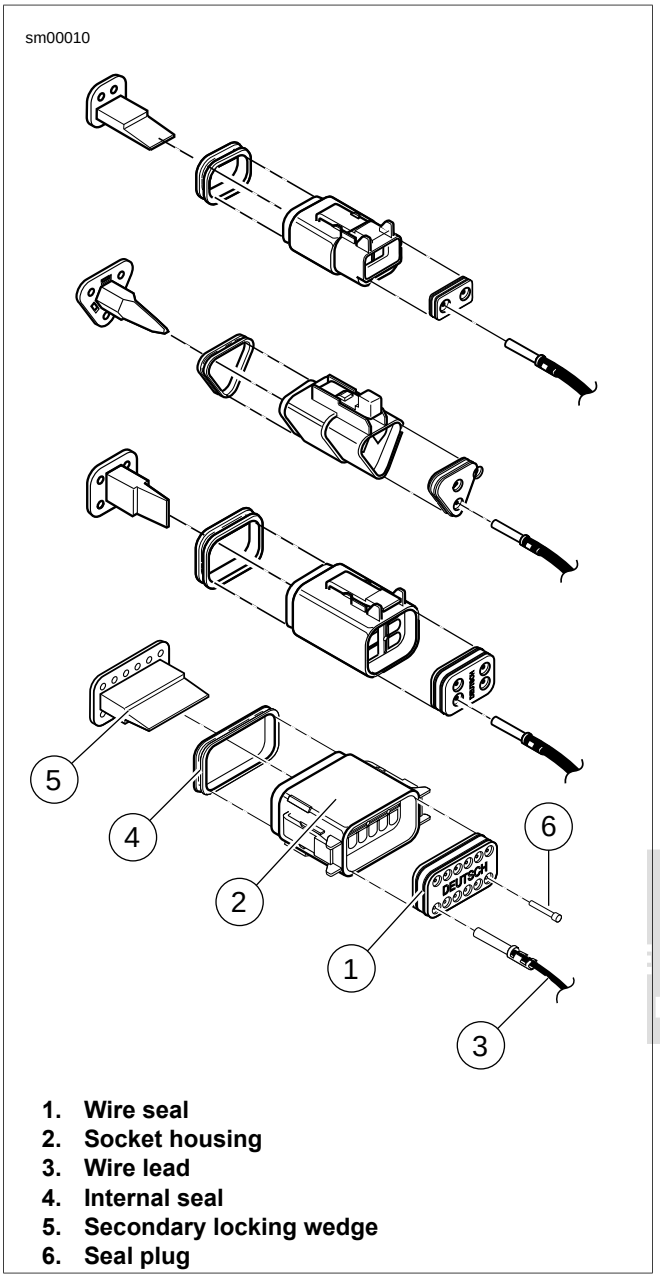
Figure A-27. Deutsch DT Sealed Connector: Remove Secondary Locking Wedge



1. **Arrow on socket locking wedge**
2. **Arrow on pin locking wedge**

Figure A-28. Deutsch DT Sealed Connector: 3-Place Locking Wedges

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1. **Wire seal**
2. **Socket housing**
3. **Wire lead**
4. **Internal seal**
5. **Secondary locking wedge**
6. **Seal plug**

Figure A-29. Deutsch DT Sealed Connector: 2, 3, 4 and 12-Place Socket Housings

Removing Pin Terminals

1. Use the hooked end of a stiff piece of mechanics wire, a needle nose pliers or the FLAT BLADE L-HOOK (Part No. HD-41475-100) to remove the secondary locking wedge.
2. Gently Press terminal latches inside pin housing and back out pins through holes in wire seal.

NOTES

- *If wire leads require **new** terminals, see the instructions for crimping terminals.*
- *If it should become necessary to replace a pin or socket housing, note that the 8-place and 12-place gray and black connectors are not interchangeable. Since location of the alignment tabs differ between the black and gray connectors, plugs or receptacles must be replaced by those of the same color.*
- *When replacing both socket and pin housings, then the black may be substituted for the gray. The socket and pin housings of all other connectors are interchangeable, that is, the black may be mated with the gray, since the alignment tabs are absent and the orientation of the external latch is the same.*

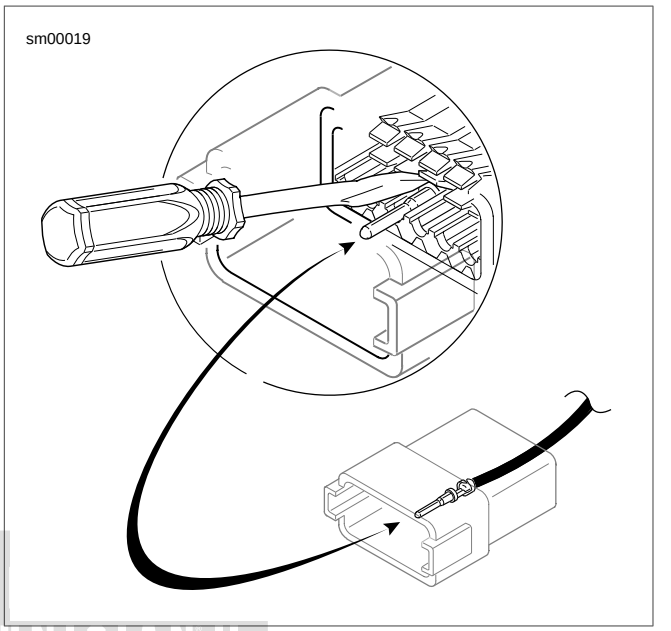


Figure A-30. Deutsch DT Sealed Connector: Depress Terminal Latch and Back Out Pin

Installing Pin Terminals

1. See Figure A-31. Fit wire seal (1) into back of pin housing (2).
2. Grasp wire lead approximately 1.0 in. (25.4 mm) behind the pin terminal (3). Gently push pin through holes in wire seal into its respective numbered chamber until it "clicks" in place.

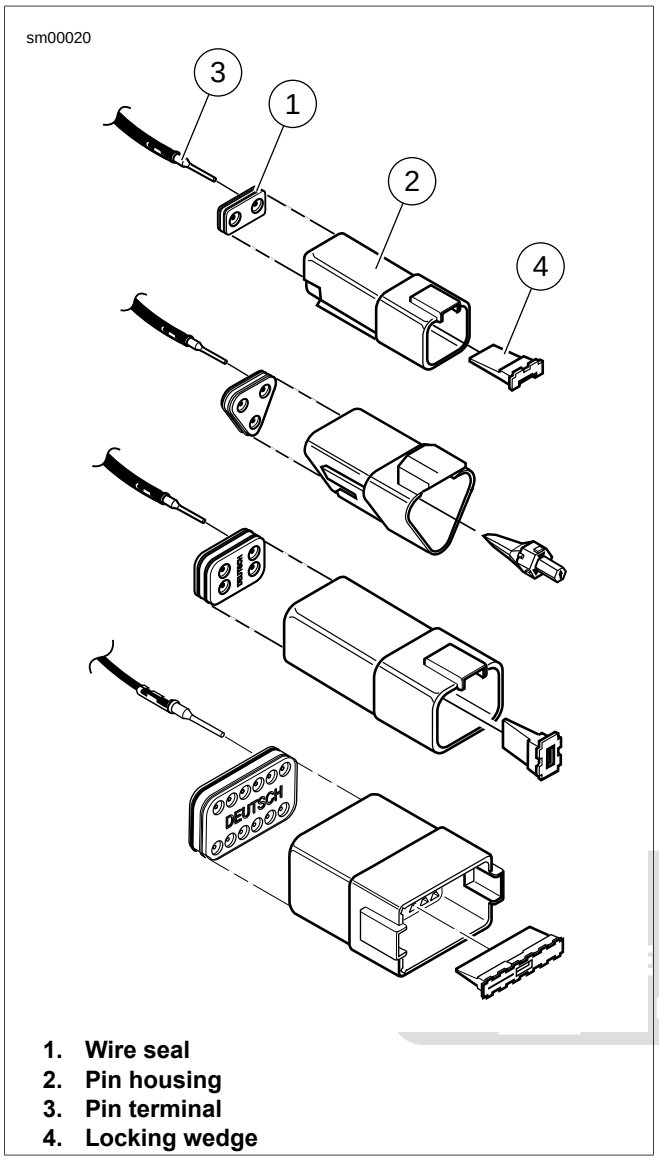
NOTE

A tug on the wire lead will confirm that a pin is locked in place.

3. Insert tapered end of secondary locking wedge (4) into pin housing and press down until it snaps in place.

NOTES

- *The wedge fits in the center groove of the pin housing and holds the terminal latches tightly closed.*
- *See Figure A-28. While rectangular wedges do not require a special orientation, the conical secondary locking wedge of the 3-place connector must be installed with the arrow (2) pointing toward the external latch.*
- *If the secondary locking wedge does not slide into the installed position easily, verify that all terminals are fully installed in the pin housing. The lock indicates when terminals are not properly installed by not entering its fully installed position.*



1. **Wire seal**
2. **Pin housing**
3. **Pin terminal**
4. **Locking wedge**

Figure A-31. Deutsch DT Sealed Connector: 2, 3, 4 and 12-Place Pin Housings

Crimping Terminals

Identify which of the types of Deutsch terminals are used with the connector and follow the corresponding crimping instructions. Refer to Table A-1.

Table A-1. Deutsch Connector: Terminal Crimping Instructions

TYPE	CRIMPING INSTRUCTIONS
DT Sealed (with crimp tails)	A.13 DEUTSCH DT SEALED TERMINAL REPAIR
DTM Mini Sealed Terminal (solid barrel)	A.15 DEUTSCH DTM SEALED SOLID BARREL MINI TERMINAL REPAIR
DTM Mini Sealed Terminal (with crimp tails)	A.14 DEUTSCH DTM SEALED MINI TERMINAL REPAIR

DEUTSCH DT SEALED TERMINAL REPAIR A.13

DEUTSCH DT SEALED TERMINAL CRIMPS

PART NUMBER	TOOL NAME
HD-39965-A	DEUTSCH TERMINAL CRIMP TOOL

Preparing Wire Leads for Crimping

1. Use a shop gauge to determine gauge of wire lead.
2. Strip lead removing 5/32 in. (4.0 mm) of insulation.

Crimping Terminal to Lead

1. See Figure A-32. Squeeze the handles of the DEUTSCH TERMINAL CRIMP TOOL (Part No. HD-39965-A) to open the jaws. Push the locking bar (1) up.
2. Insert (2) terminal (socket/pin) through hole of the locking bar, so that the rounded side of the contact barrel rests in the nest (concave split level area) with the crimp tails facing upward. To match the wire gauge to the crimp tool die, refer to Table A-2.
3. Release locking bar to lock terminal in die.

NOTE

If the crimp tails are slightly out of vertical alignment, the crimp tool automatically rotates the terminal so that the tails face straight upward. When positioned, the locking bar fits snugly in the space between the contact band and the core crimp tails.

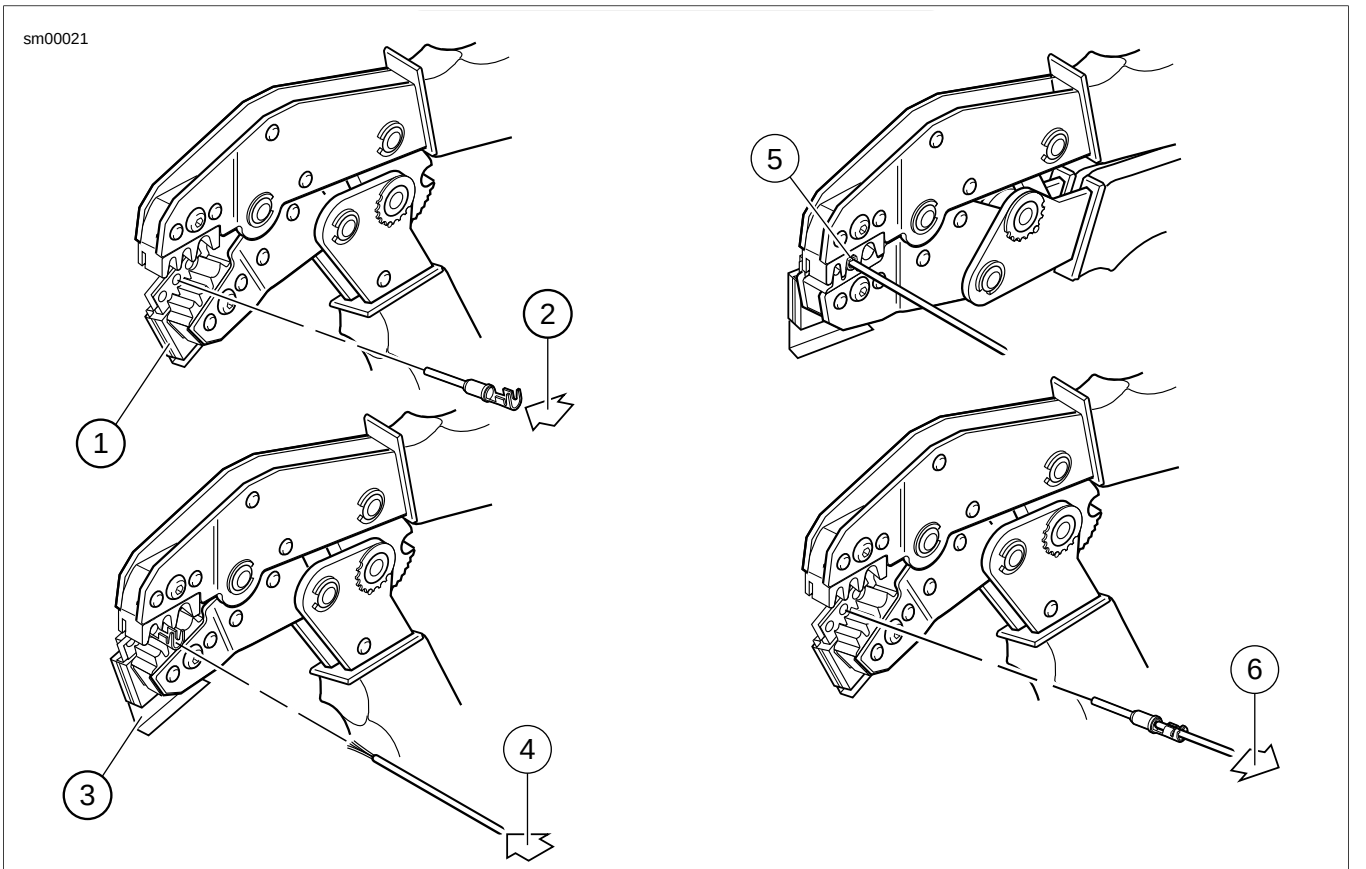
4. Insert stripped wire core between crimp tails until ends make contact with locking bar. Verify that wire is positioned so that short pair of crimp tails squeeze bare wire strands, while long pair folds over the insulation.
5. Squeeze handle of crimp tool until tightly closed. Tool automatically opens after the terminal is crimped.
6. Raise locking bar up and remove wire lead and terminal.

Inspecting Crimps

Inspect the wire core and insulation crimps. Distortion should be minimal.

Table A-2. Deutsch DT Sealed Terminal Crimp: Wire Gauge To Die

WIRE GAUGE (AWG)	CRIMP TOOL DIE
20	Front
16-18	Middle



1. **Open jaws and raise locking bar**
2. **Insert terminal in locking bar**
3. **Release locking bar to lock terminal in die**
4. **Insert stripped lead**
5. **Squeeze crimper**
6. **Raise locking bar and remove terminal**

Figure A-32. Crimping a Deutsch DT Sealed Terminal

DEUTSCH DTM SEALED MINI TERMINAL REPAIR A.14

DEUTSCH DTM SEALED MINI TERMINAL CRIMPS

PART NUMBER	TOOL NAME
HD-38125-7	PACKARD TERMINAL CRIMPER

Preparing Wire Leads for Crimping

Strip wire lead removing 5/32 in. (4.0 mm) of insulation.

Crimping a Mini Terminal to Wire Lead

1. See Figure A-33. Compress the handles of PACKARD TERMINAL CRIMPER (Part No. HD-38125-7) until the ratchet (2) automatically opens.

NOTE

Always perform core crimp before insulation crimp.

2. Position the core crimp on die E (1) of the crimper. Be sure the core crimp tails are facing the forming jaws.
3. Gently apply pressure to handles of tool until crimpers just secure the core crimp tails.
4. Insert stripped wire core stands between crimp tails. Position wire so that short pair of crimp tails squeeze bare wire strands, while long pair squeeze over the insulation.
5. Squeeze handle of crimper until tightly closed. Tool automatically opens when the crimping sequence is complete.

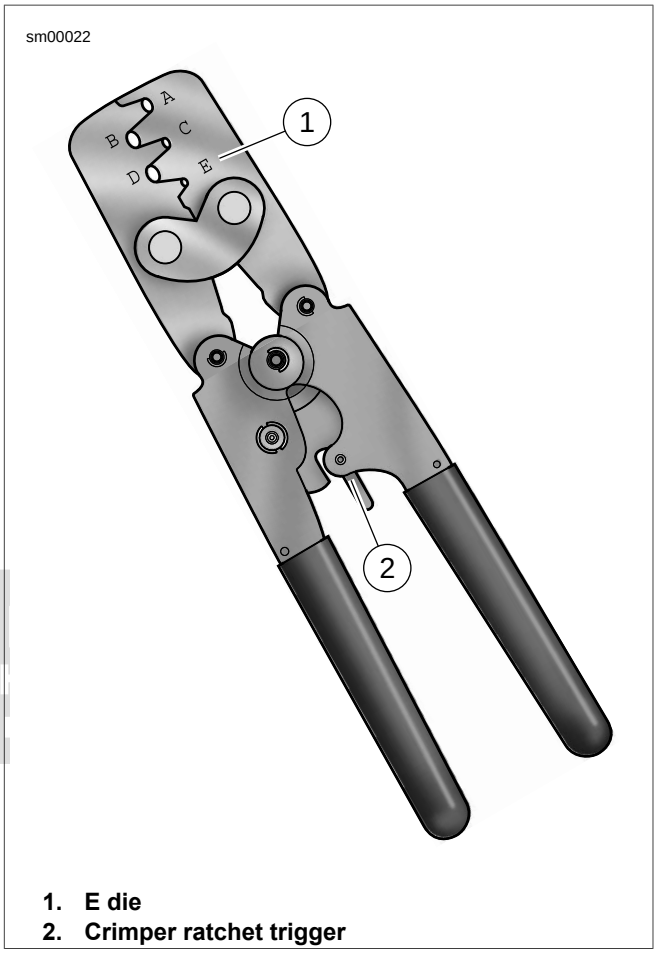
NOTE

If the crimper does not open, it can be opened by squeezing the ratchet trigger (2).

6. Position the insulation crimp on nest C of the crimper. Be sure the insulation crimp tails are facing the forming jaws.
7. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimping sequence is complete.

Inspecting Crimps

Inspect the core and insulation crimps. Distortion should be minimal.



1. **E die**
2. **Crimper ratchet trigger**

Figure A-33. Packard Terminal Crimper (HD-38125-7)

DEUTSCH DTM SEALED SOLID BARREL MINI TERMINAL REPAIR A.15

DEUTSCH DTM SEALED SOLID BARREL TERMINAL CRIMPS

PART NUMBER	TOOL NAME
HD-42879	ELECTRICAL CRIMPER TOOL

Preparing Wire Leads For Crimping

For size 20, 16 and 12 contacts, wire ranges 26-12 AWG.

Strip wire lead removing 1/4 in. (6.4 mm) of insulation.

Adjusting Crimper Tool

1. See Figure A-34. Squeeze the ELECTRICAL CRIMPER TOOL (Part No. HD-42879) handles to cycle the crimp tool to open.
2. Remove locking pin (1) from selector knob (2).
3. Raise selector knob and rotate until selected wire size stamped on wheel is aligned with "SEL. NO." arrow (3).
4. Loosen knurled locknut (4) and turn adjusting screw (5) clockwise (in) until it stops.

Crimping a Barrel Contact To Wire Lead

1. See Figure A-35. Turn tool over and drop contact barrel (1) into indentor cover (2) hole with the wire end out.
2. Turn adjusting screw counterclockwise (out) until contact is flush with bottom of depression in indentor cover. Tighten knurled locknut.
3. Slowly squeeze handles of crimp tool until contact is centered between the four indentor points (3).
4. Insert bare wire core strands of stripped wire lead (4) into contact barrel. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimping sequence is complete.
5. Remove wire lead with crimped contact from indentor.

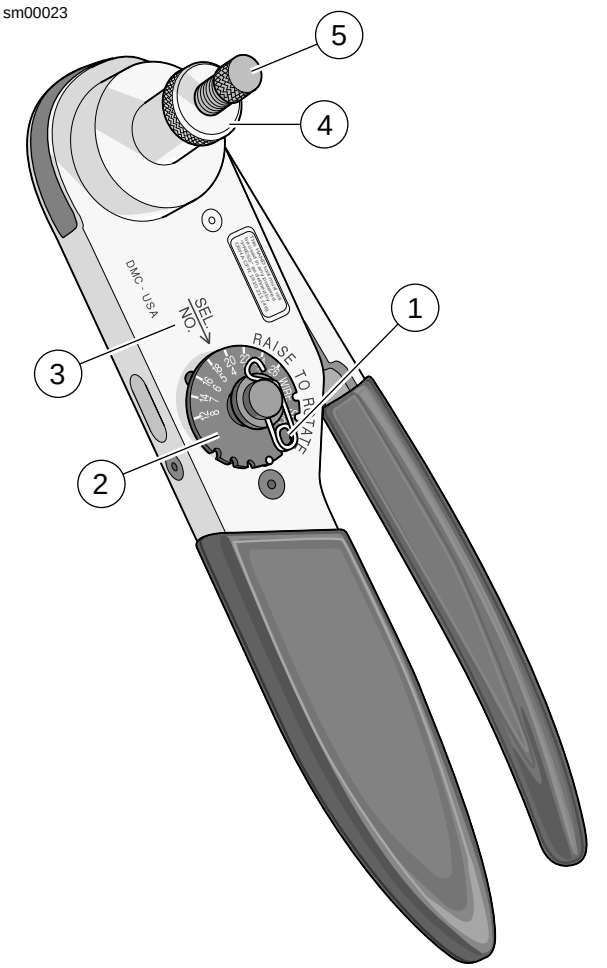
NOTE

Tool must be readjusted when changing contact size/type.

6. Install pin to lock selector knob.

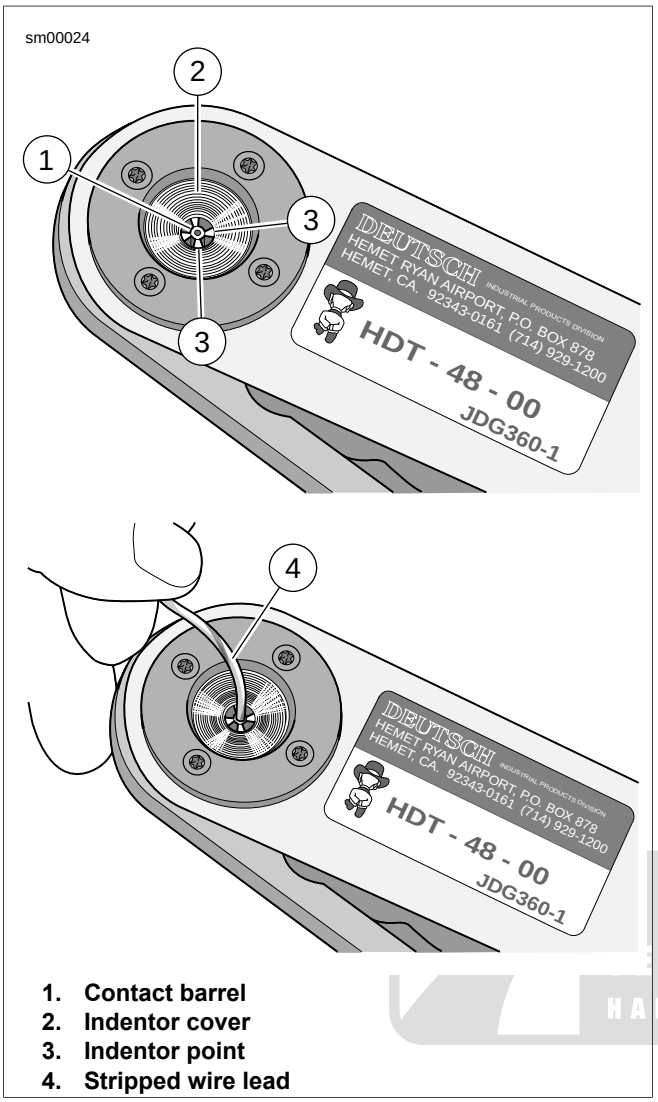
Inspecting Crimps

Inspect the crimp. All core wire strands are to be crimped in the barrel.



1. **Locking pin**
2. **Selector knob**
3. **SEL. NO. arrow**
4. **Knurled locknut**
5. **Adjusting screw**

Figure A-34. Electrical Crimper Tool (HD-42879)



1. **Contact barrel**
2. **Indentor cover**
3. **Indentor point**
4. **Stripped wire lead**

Figure A-35. Deutsch Solid Barrel

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

JAE MX19 SEALED CONNECTORS A.16

JAE MX19 SEALED CONNECTORS

PART NUMBER	TOOL NAME
B-50085	TERMINAL EXTRACTOR

Connector Housings

Separate Housings: See Figure A-36. Press the two release buttons on each side of the housing to separate the connector.

Connect Housings: Align and press the housings together until the locking tabs click.

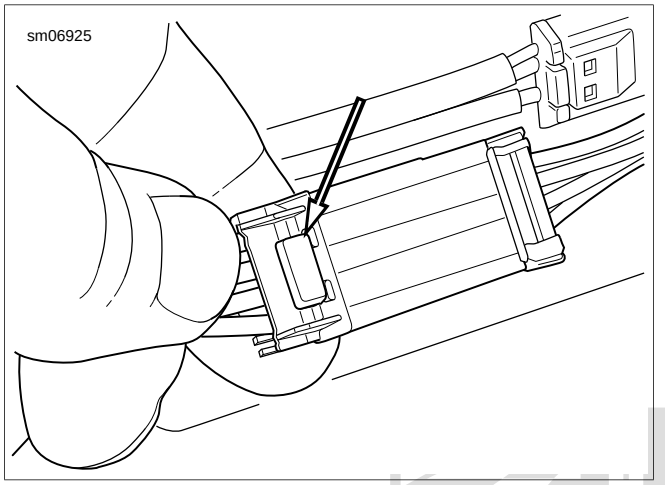


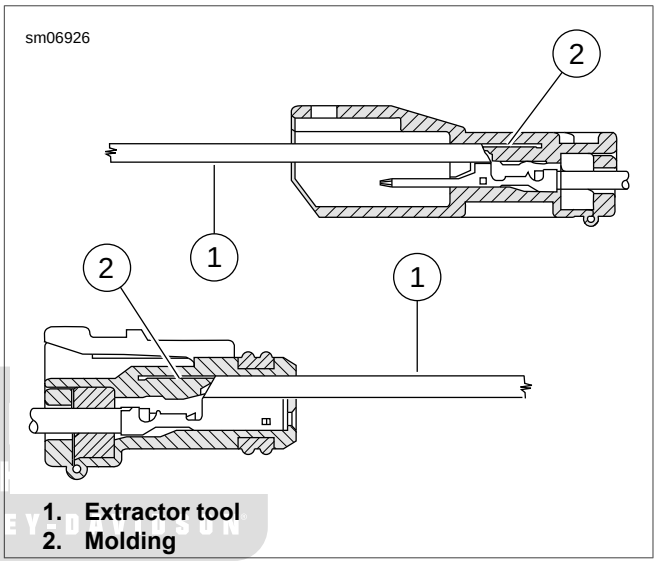
Figure A-36. Release Buttons: JAE MX19 Sealed Connector

Removing Terminals

1. Modify a TERMINAL EXTRACTOR (Part No. B-50085) by filing the front edge to 45 degrees.
2. See Figure A-37. Insert the extractor (1) into the opening above the terminal and press the plastic molding (2) up and out of the way.
3. Pull the wire lead and terminal out of the back of the housing.

Installing Terminals

1. Inspect the plastic molding and replace the connector housing if necessary.
2. Orient the terminal to the housing and push terminal into the housing until it snaps into place.



1. Extractor tool
2. Molding

Figure A-37. JAE MX19 Terminal Removal

MOLEX CMC SEALED CONNECTORS

Separating the Connector

Release: See Figure A-38. Press the catch and rotate the lever arm down.

Connect: Press on the front guard to release the latch and rotate the lever arm up until the catch clicks in place.

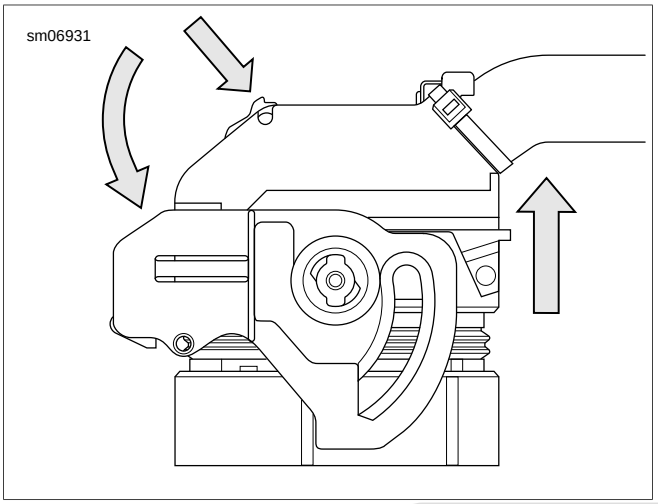
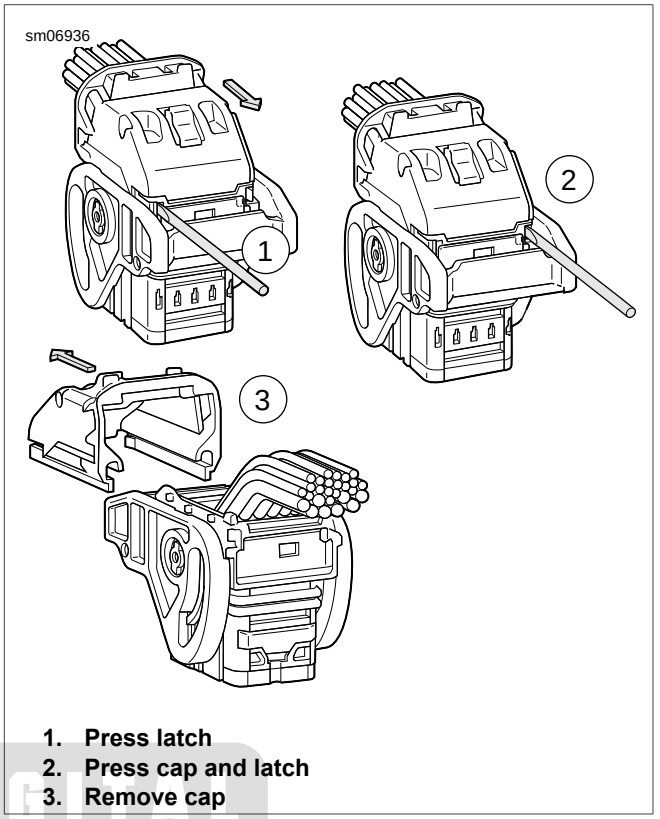


Figure A-38. Release



1. **Press latch**
2. **Press cap and latch**
3. **Remove cap**

Figure A-39. Remove the Wire Lead Cap

Removing Terminals

1. With the lever arm open, cut the cable strap around the wire bundle.
2. See Figure A-39. Open a wire cap latch with a small screwdriver (1).
3. Maintain pressure on the cap and open the opposite latch with the screw driver (2).
4. Slide the cap off (3).
5. See Figure A-40. Use the screwdriver to open the secondary lock. Pull the locking bar all the way out.
6. See Figure A-41. Locate the wire lead cavity by the alpha-numeric coordinates.
7. See Figure A-42. Insert the pins of the CMC extractor tool (1) into the access slots (2) of the terminal cavity and retract the lead and terminal.

Installing Terminals

1. Orient the terminal to the housing cavity and snap the terminal in place.
2. Slide the cap over the lead bundle and snap the cap in place.
3. Install a cable strap through the guide and around the lead bundle.

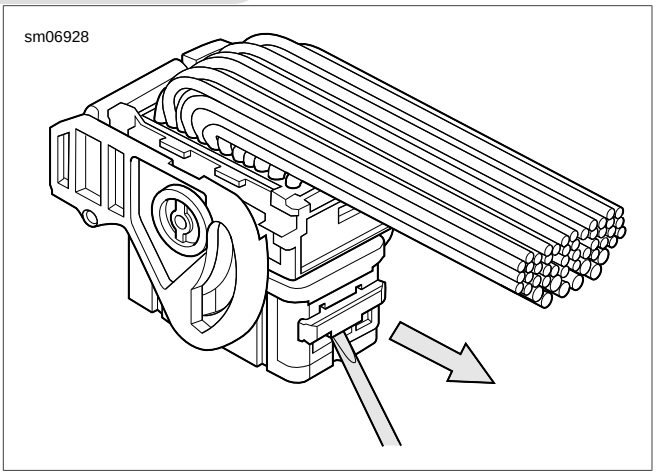
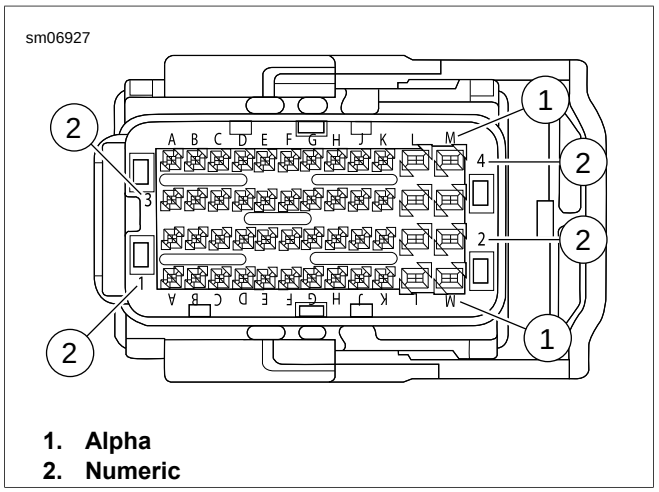
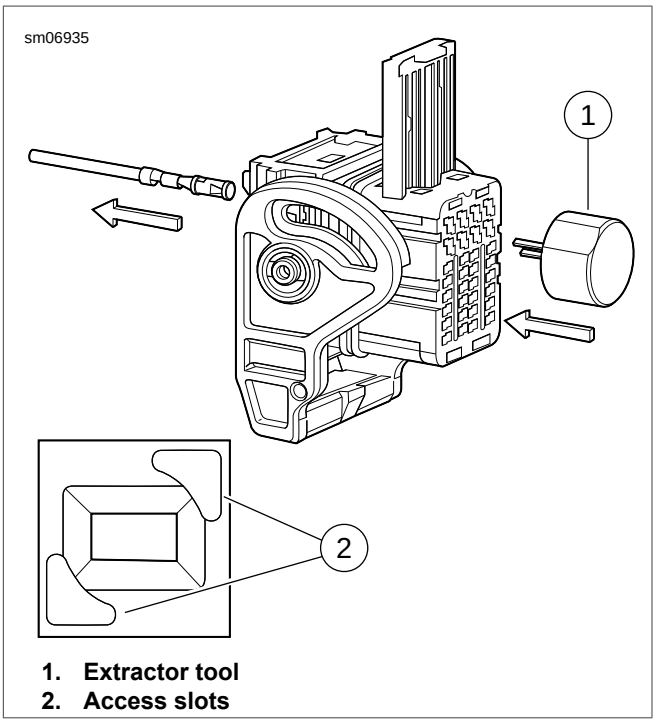


Figure A-40. Molex CMC Sealed Connector Secondary Lock



1. Alpha
2. Numeric

Figure A-41. Alpha - Numeric Coordinates



1. Extractor tool
2. Access slots

Figure A-42. Terminal Removal

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

MOLEX MX 150 SEALED CONNECTORS A.18

MOLEX MX 150 SEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-48114	TERMINAL REMOVER

Separating Pin and Socket Housings

See Figure A-43. Press the latch while pulling the pin and socket housings apart.

Mating Pin and Socket Housings

1. Orient the latch on the pin housing to the latch pocket on the socket housing so the rails on the outside of the pin housings lines up with the tunnels on the socket housing.
2. Press the housings together until the latch clicks.

Removing Terminals

1. Pull the secondary lock up, approximately 3/16 in. (4.8 mm), until it stops.
   a. **Socket Housing:** See Figure A-44. Use a small screwdriver in the pry slot. The slot next to the external latch provides a pivot point.
   b. **Pin Housing:** See Figure A-45. Use needle nose pliers to engage the D-holes in the center of the secondary lock.

NOTE

Do not remove the secondary lock from the connector housing.

2. See Figure A-46. Insert TERMINAL REMOVER (Part No. HD-48114) into the pin hole next to the terminal until the tool bottoms.
   a. **Socket Housing:** The pin holes are inside the terminal openings.
   b. **Pin Housing:** The pin holes are outside the pins.
3. Pressing the terminal remover to the bottom of the pin hole, gently pull on the wire to remove wire terminal from its cavity.

Installing Terminals

1. See Figure A-47. From the wiring diagram, match the wire color to its numbered terminal cavity.

NOTE

Cavity numbers (1) are stamped on the housing at the ends of the cavity rows. The cavity number can be determined by counting the cavities up or down along the row from each stamped number.

2. Orient the terminal so that the tang (2) opposite the open crimp engages the slot (3) in the cavity.
3. Push the terminal into the cavity.
4. Gently tug on wire to verify that the terminal is captured by the secondary lock.
5. With all terminals installed, push the secondary lock into the socket housing to lock the wire terminals into the housing.

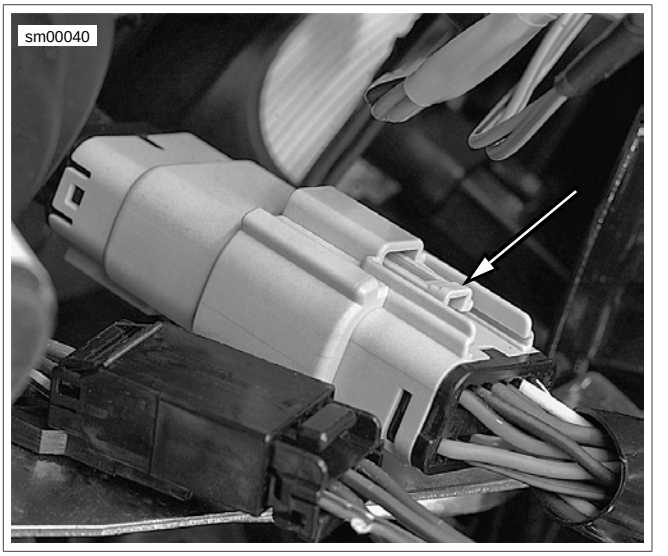


Figure A-43. Molex MX 150 Sealed Connector: Latch

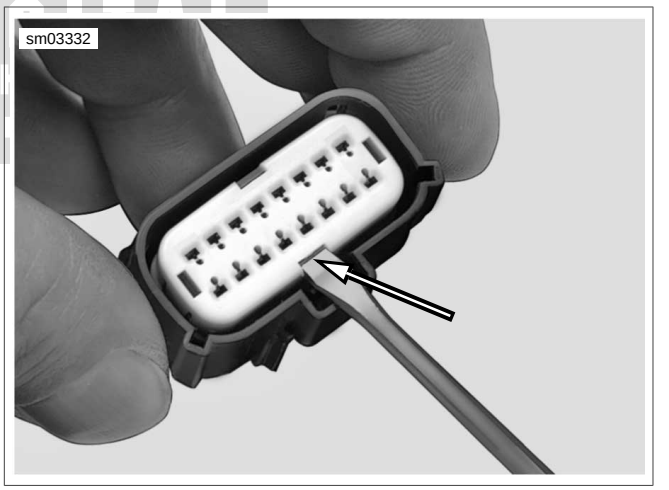


Figure A-44. Secondary Lock Pry Slot (Socket Housing)

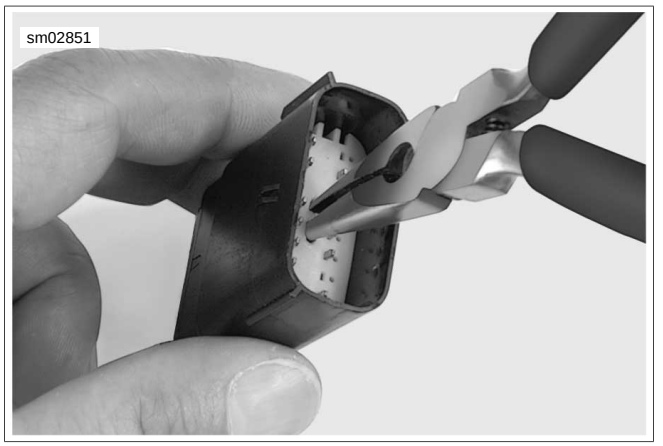
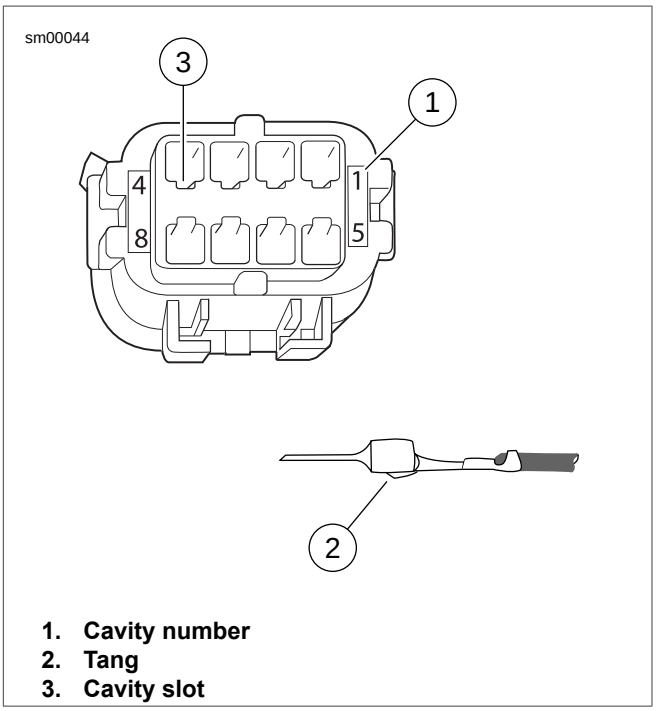


Figure A-45. Pull Up Secondary Lock (Pin Housing)



Figure A-46. Molex MX 150 Sealed Connector: Terminal Remover (HD-48114)



1. **Cavity number**
2. **Tang**
3. **Cavity slot**

Figure A-47. Molex MX 150 Sealed Connector: Pin Cavities and Wire Terminal

CRIMP TERMINAL TO LEAD

PART NUMBER	TOOL NAME
HD-48119	TERMINAL CRIMPER

Prepare Lead

1. Cut the damaged terminal close to the back of the terminal to leave as much wire length as possible.
2. Strip approximately 3/16 in. (4.70-5.60 mm) of insulation from the end of the wire lead.

NOTE

The strip length is the same for both pin and socket terminals and for wire gauges from 22 to 14.

Prepare Tool

1. Identify the punch/die in the jaws of the TERMINAL CRIMPER (Part No. HD-48119) for the wire gauge. Refer to Table A-3.
2. Squeeze and release the handles to open the tool.

NOTE

The crimp tool automatically opens when the handles are released.

3. See Figure A-48. Hold fully open tool at approximately 45 degrees.

NOTE

Do NOT tighten the locknut holding the locator bars. The bars must float to accommodate the different terminal gauges.

Table A-3. Crimp Tool Wire Gauge Punch/Die

AWG (WIRE GAUGE)	PUNCH/DIE
22	Left
18-20	Middle
14-16*	Right
* Crimp 16 AWG **pin** terminals in the 18-20 middle die.	

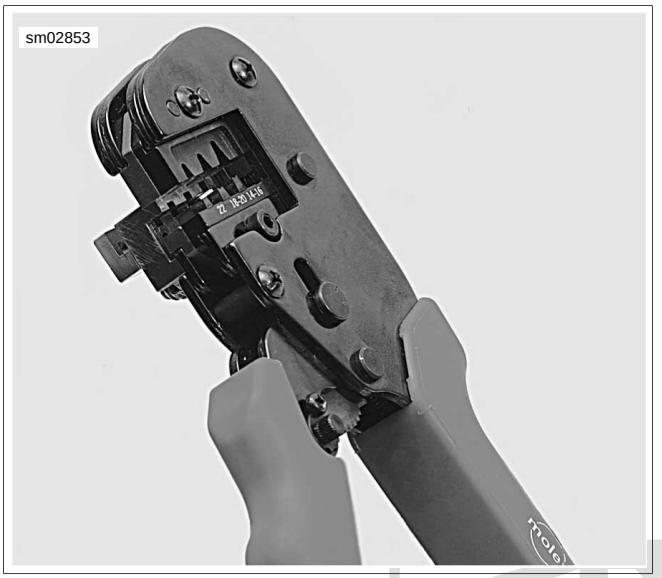
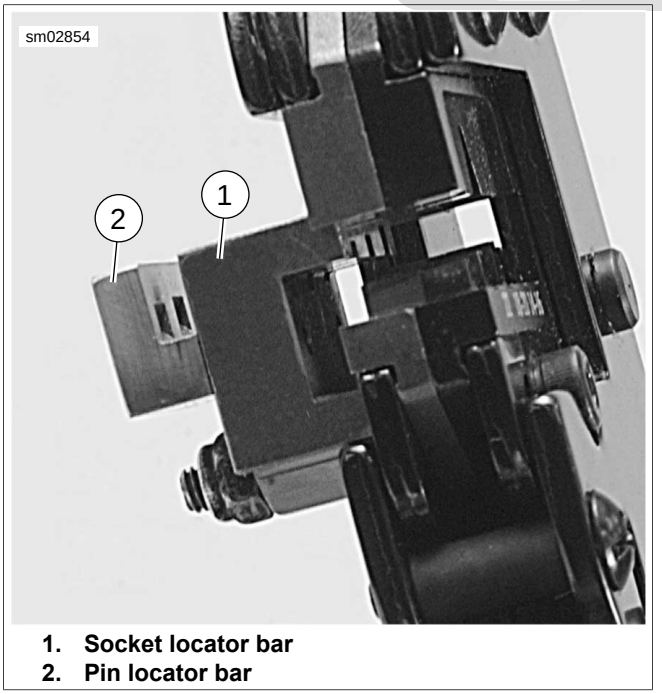


Figure A-48. Open Terminal Crimper (HD-48119) at 45 Degrees



1. **Socket locator bar**
2. **Pin locator bar**

Figure A-49. Terminal Locator Bars

Position Terminal in the Punch/Die

1. See Figure A-50. With the crimp tails up, place the terminal through the punch/die into the square opening in the socket locator bar.
   a. **Socket Terminal:** See Figure A-49. A socket terminal stops against the back face of the socket locator bar (1).
   b. **Pin Terminal:** See Figure A-51. The tip of a pin terminal passes through the socket locator bar and stops in the notch in the face of the pin locator bar.
2. See Figure A-52. Ratchet the handles together until the crimp tails are held in vertical alignment between the punch and the die.

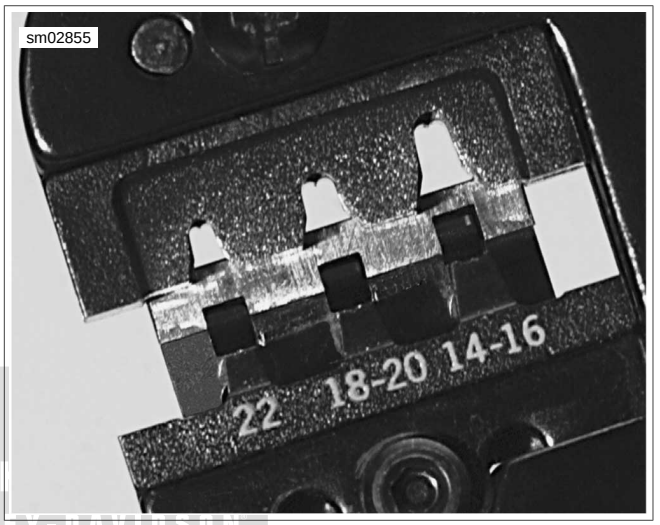


Figure A-50. Square Openings in Socket Locator Bar

Insert Stripped Lead

See Figure A-53. Insert the stripped end (wire core) between the crimp tails at an up angle until the wire core touches the face of the socket locator bar above the square opening.

NOTES

- *The insulation must extend through the insulation crimp tails.*
- *Insert the wire with little or no pressure. Pressing on the lead will bend the wire core.*

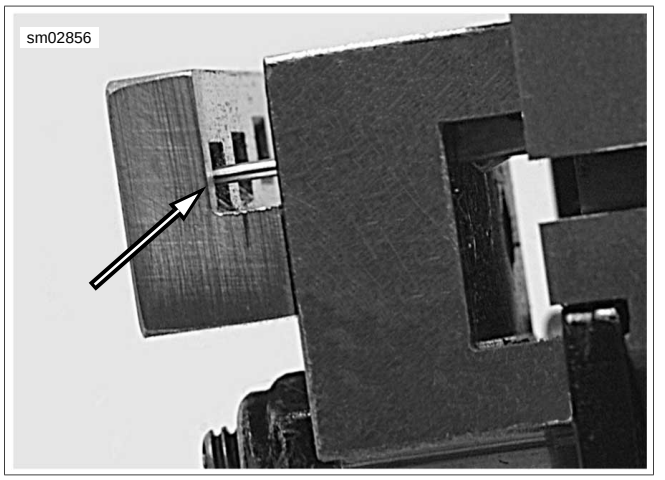


Figure A-51. Pin Terminal against Pin Locator Bar

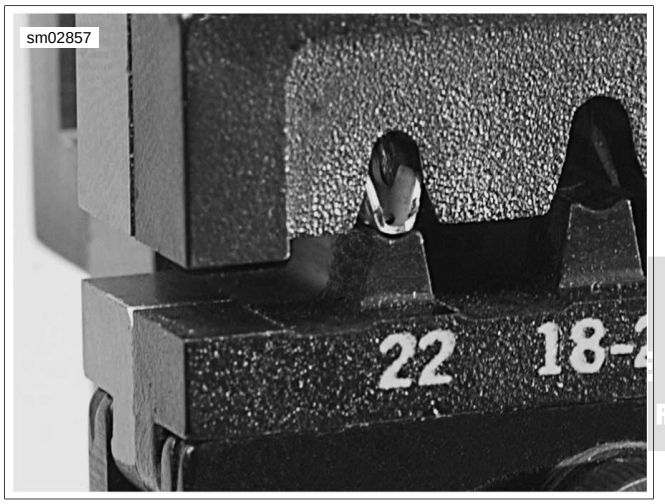


Figure A-52. Crimp Tails in Vertical Alignment between Punch and Die

Crimp Terminal to Lead

1. Holding the wire lead in position touching the locator face at an angle, quickly and smoothly squeeze the crimp tool closed.
2. Final squeeze the handles to open the tool and release the terminal.

NOTE

*A stuck or jammed tool can be opened by pressing the ratchet release lever found between the handles. Do **not** force the handles open or closed.*

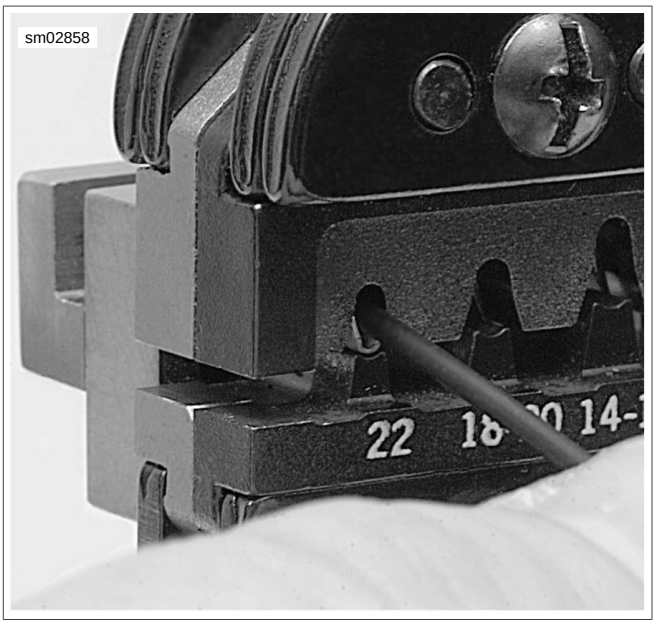
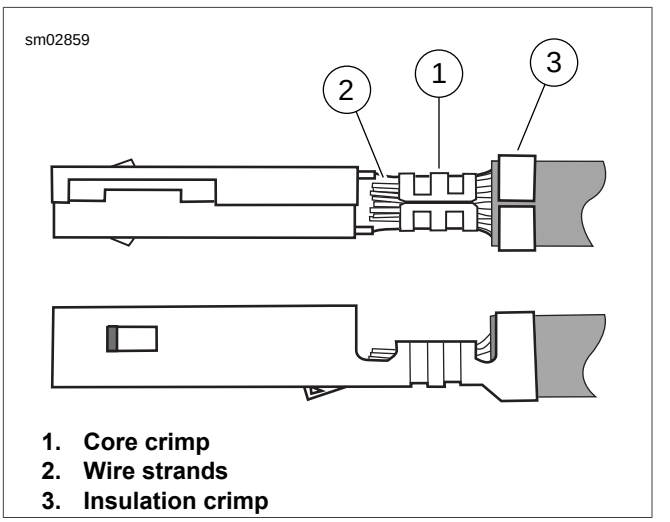


Figure A-53. Stripped Lead at Up Angle

Inspect Crimp

1. **Inspect Crimp:** Inspect the core and insulation crimp.
   a. See Figure A-54. The core tails should be creased into the wire strands at the core crimp (1).
   b. Strands (2) of wire should be visible beyond the core crimp but not forward into the terminal shell.
   c. The insulation tails should be folded into the insulation (3) without piercing or cutting the insulation.
   d. Distortion should be minimal.
2. **Test Crimp:** Hold the terminal and pull the lead.



1. **Core crimp**
2. **Wire strands**
3. **Insulation crimp**

Figure A-54. Terminal Crimp

TYCO 070 MULTILOCK UNSEALED CONNECTOR A.19

TYCO 070 MULTILOCK UNSEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-41609	AMP MULTI-LOCK CRIMPER
SNAP-ON TT600-3	SNAP-ON PICK

General

Tyco 070 Multilock Unsealed connectors are found between wire harnesses and component wiring and may be either floating or anchored to the frame with attachment clips.

See Figure A-55. Attachment clips (1) on the pin housings are fitted to T-studs on the motorcycle frame. The T-studs identify OE connector locations. To maintain serviceability, always return connectors to OE locations after service.

Obtain the necessary tools to repair the connector and terminals.

NOTE

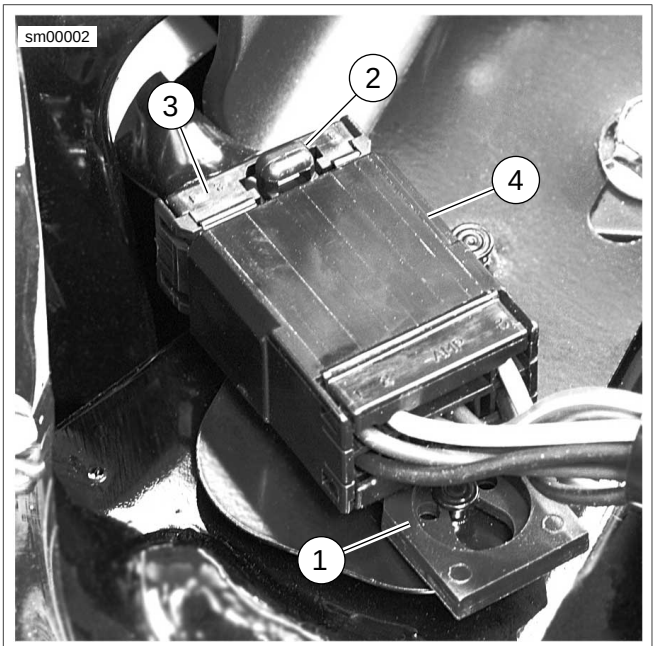
For terminal crimping use the AMP MULTI-LOCK CRIMPER (Part No. HD-41609).

Separating Pin and Socket Housings

1. If necessary, slide connector attachment clip T-stud to the large end of the opening.
2. See Figure A-55. Press the release button (2) on the socket terminal side of the connector and pull the socket housing (3) out of the pin housing (4).

Mating Pin and Socket Housings

1. Hold the housings to match wire color to wire color.
2. Insert the socket housing into the pin housing until it snaps in place.
3. If OE location is a T-stud, fit large opening end of attachment clip over T-stud and slide connector to engage T-stud to small end of opening.



1. **Attachment clip**
2. **Release button**
3. **Socket housing**
4. **Pin housing**

Figure A-55. Tyco 070 Multilock Unsealed Connector

Removing Terminals from Housing

1. See Figure A-56. Bend back the latch (1) to free one end of secondary lock (2) then repeat on the opposite end. Hinge the secondary lock outward.
2. Look in the terminal side of the connector (opposite the secondary lock) and note the cavity next to each terminal.
3. Insert a pick or pin into the terminal cavity until it stops.

NOTE

If socket/pin terminal tool is not available, a push pin/safety pin or a SNAP-ON PICK (Part No. SNAP-ON TT600-3) may be used.

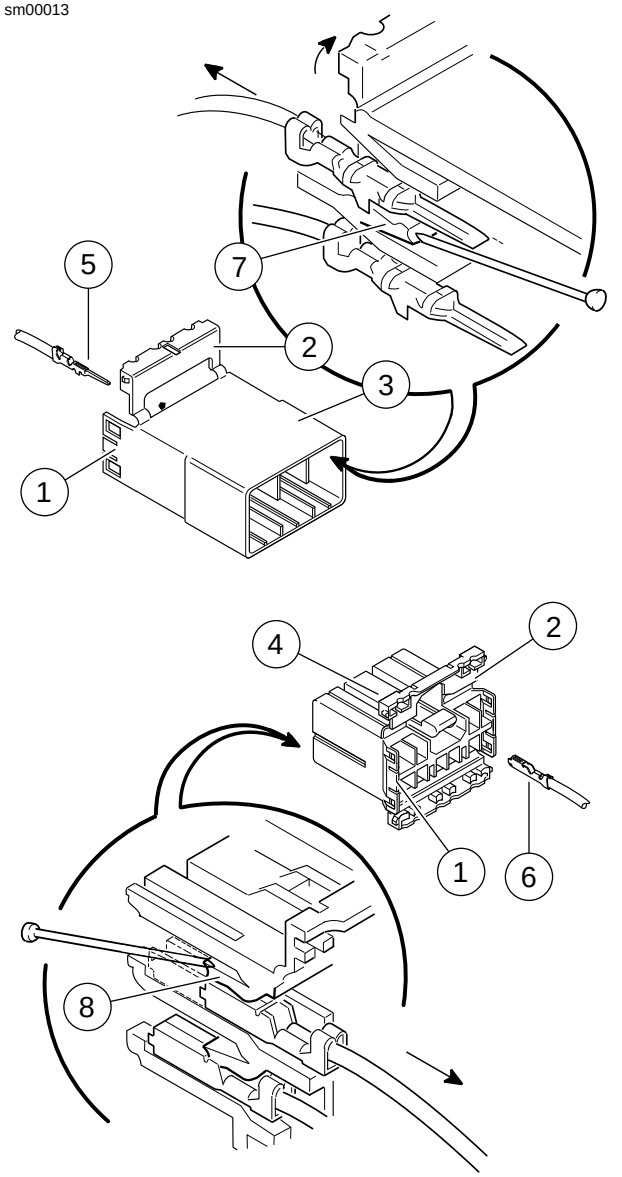
4. Press the tang in the housing to release the terminal.
   a. **Socket:** Lift the socket tang (8) up.
   b. **Pin:** Press the pin tang (7) down.

NOTE

A "click" is heard if the tang is released.

5. Gently tug on wire to pull wire and terminal from cavity.

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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-56. Tyco 070 Multilock Unsealed Connector: Socket and Pin Housings

Inserting Terminals into Housing

NOTE

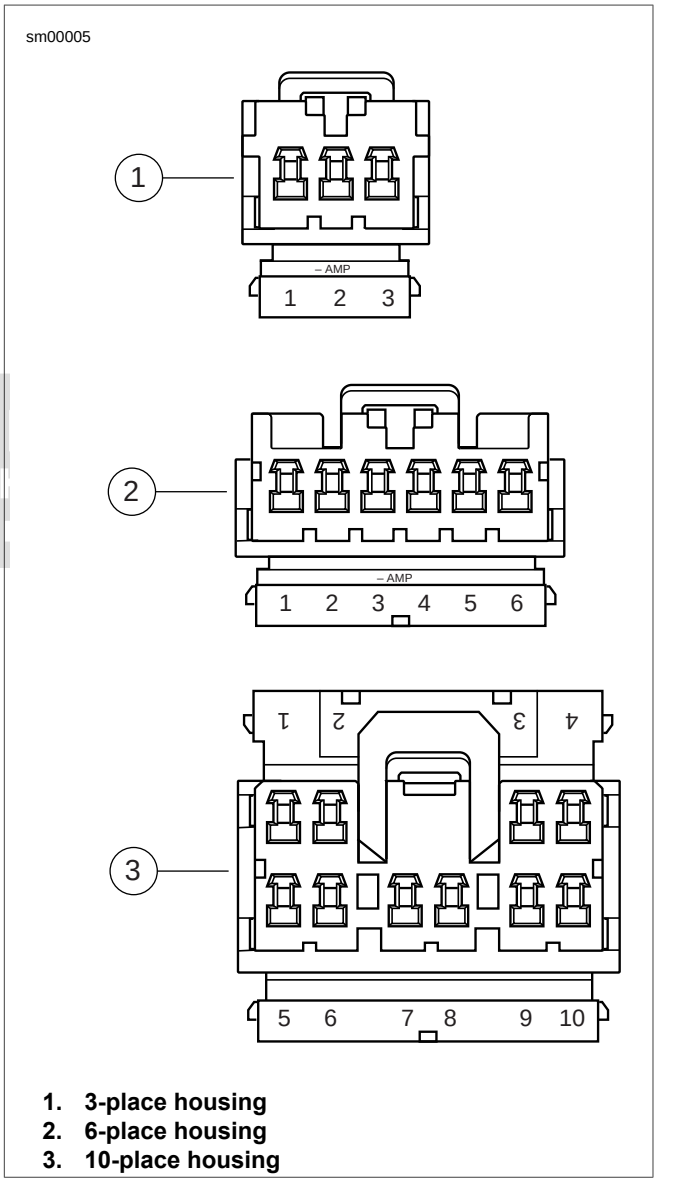
See Figure A-57. Cavity numbers are stamped into the secondary locks of both the socket and pin housings. Match the wire color to the cavity number found on the wiring diagram.

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-57. Tyco 070 Multilock Unsealed Connector: Cavity Numbers on Secondary Locks (socket housings shown)

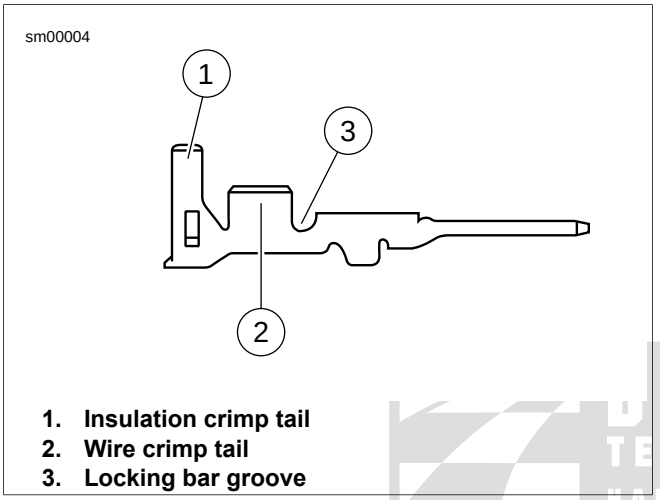
Preparing Wire Leads for Crimping

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

2. See Figure A-58 and Figure A-59. Select the pin/socket terminals from the parts catalog and identify the insulation crimp tails (1) and the wire crimp tails (2) and the groove for the crimp tool locking bar (3).
3. Identify the wire lead gauge and the corresponding crimper tool and nesting die. Refer to Table A-4.

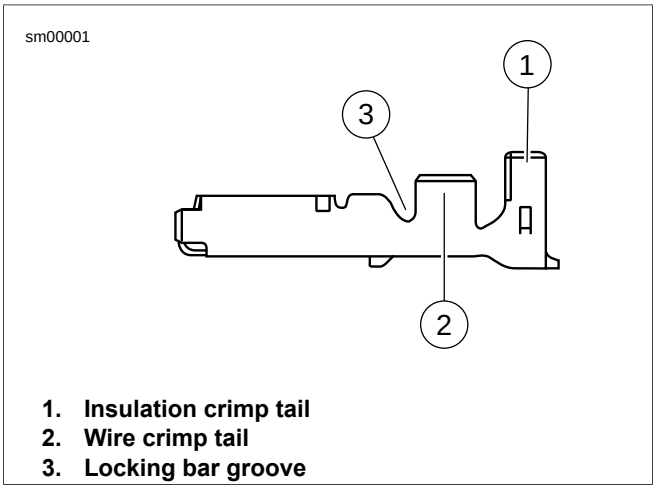
Table A-4. AMP Multilock Connector: Crimp Tool Wire Gauge/Nest

WIRE GAUGE	NEST
20	Front
16	Middle
18	Rear



1. **Insulation crimp tail**
2. **Wire crimp tail**
3. **Locking bar groove**

Figure A-58. Tyco 070 Multilock Unsealed Connector: Pin Terminal



1. **Insulation crimp tail**
2. **Wire crimp tail**
3. **Locking bar groove**

Figure A-59. Tyco 070 Multilock Unsealed Connector: Socket Terminal

Crimping Terminals to Leads

NOTE

Crimping with the AMP Multi-lock Crimper is a one step operation. One squeeze crimps both the wire core and the insulation tails.

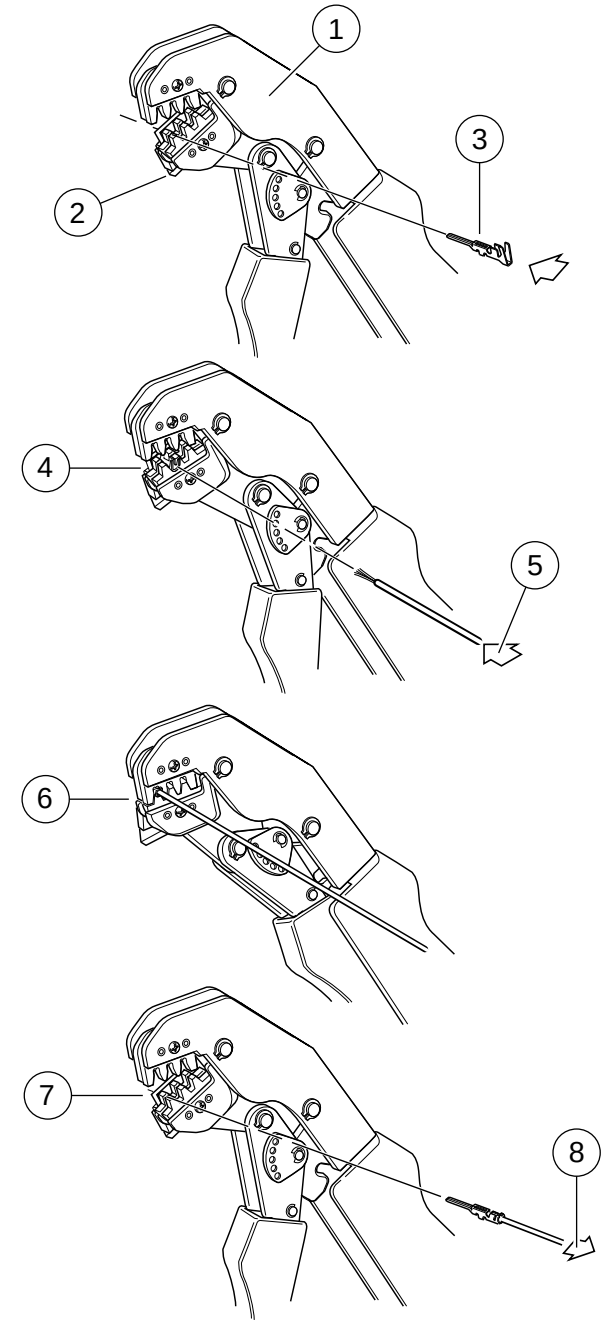
1. See Figure A-60. Squeeze the handles to cycle the AMP MULTI-LOCK CRIMPER (Part No. HD-41609) to the fully open position (1).
2. Raise locking bar by pushing up on bottom flange (2).

NOTE

See Figure A-58 and Figure A-59. Hold the terminal with the insulation crimp tail (1) facing up. The tool will hold the terminal by the locking bar groove (3) and crimp the wire crimp tail (2) around the bare wire of the stripped lead and the insulation crimp tail around the insulation.

3. See Figure A-60. With the insulation crimp tail facing upward, insert terminal (pin or socket) (3) through the locking bar, so that the closed side of the terminal rests on the nest of the crimp tool.
4. Release locking bar to lock position of contact (4). When correctly positioned, the locking bar fits snugly in the space at the front of the core crimp tails.
5. Insert stripped end of lead (5) until ends make contact with locking bar.
6. Verify that wire is positioned so that wire crimp tails squeeze bare wire strands, while insulation crimp tails fold over the wire lead insulation.
7. Squeeze handle of crimp tool until tightly closed. Tool automatically opens when the crimping sequence is complete.
8. Raise up locking bar (7) and remove crimped terminal.

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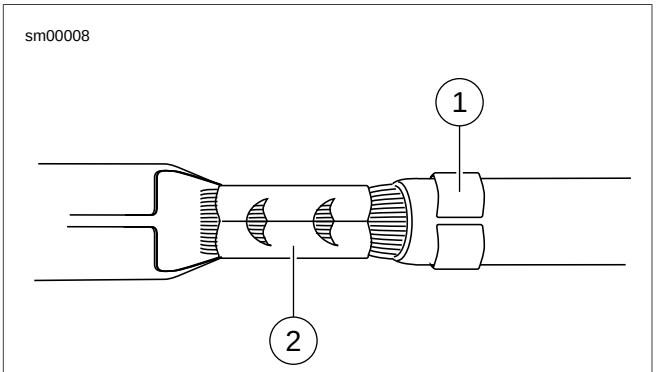


1. Open position
2. Locking bar flange
3. Insert contact
4. Release locking bar
5. Insert lead
6. Squeeze
7. Raise locking bar
8. Remove crimped terminal

Figure A-60. Tyco 070 Multilock Unsealed Connector: Terminal Crimping Procedure

Inspecting Crimped Terminals

See Figure A-61. Inspect the wire core crimp (2) and insulation crimp (1). Distortion should be minimal.



1. Insulation crimp
2. Wire core crimp

Figure A-61. Tydo 070 Multilock Unsealed Connector: Terminal Crimp

IGITAL
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SEALED SPLICE CONNECTORS A.20

SEALED SPLICE CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-25070	HEAT GUN
HD-38125-8	PACKARD CRIMPING TOOL
HD-39969	ULTRA TORCH
HD-41183	HEAT SHIELD ATTACHMENT

General

Splice connectors and several OE ring terminal connectors use heat shrink covering to seal the connection.

Preparing Wire Leads

NOTE

If adjacent wires are to be spliced, stagger the splices so that the sealed splice connectors will not touch each other but are located at different positions along the length of the wires.

1. Using a shop gauge, identify the gauge of the wire.
2. Match the wire gauge to a sealed splice connector by color and part number. Refer to Table A-5.
3. Using a wire stripper, cut and strip a length of insulation off the wire ends. Refer to Table A-5 for the strip length.

Table A-5. Sealed Splice Connectors

WIRE GAUGE	COLOR	PART NO.	STRIP LENGTH
18-20 (0.5-0.8 mm)	Red	70585-93	3/8 in. (9.5 mm)
14-16 (1.0-2.0 mm)	Blue	70586-93	3/8 in. (9.5 mm)
10-12 (3.0-5.0 mm)	Yellow	70587-93	3/8 in. (9.5 mm)

NOTE

If any copper wire strands are cut off of the wire core, trim the end and strip the wire again in a larger gauge stripper.

Splicing Wire Leads

NOTE

See Figure A-63. The connector is crimped twice - one side and then the other.

1. See Figure A-62. Open the PACKARD CRIMPING TOOL (Part No. HD-38125-8) ratchet by squeezing the handles closed.
2. Match the connector color to the wire gauge crimp die in the jaws and insert one end of the sealed connector.
3. Gently squeeze the handles until the connector is held in the jaws.
4. See Figure A-63. Feed the stripped end of a wire into the connector until the wire stops inside the metal insert (1).
5. Squeeze the handles tightly closed to crimp the lead in the insert (2). The tool automatically opens when the crimping is complete.
6. Slide the connector to the other half of the metal insert. Insert the stripped wire lead (1) until it stops, and crimp the lead in the insert (2).

⚠WARNING

Be sure to follow manufacturer's instructions when using the UltraTorch UT-100 or any other radiant heating device. Failure to follow manufacturer's instructions can cause a fire, which could result in death or serious injury. (00335a)

- Avoid directing heat toward any fuel system component. Extreme heat can cause fuel ignition/explosion resulting in death or serious injury.
- Avoid directing heat toward any electrical system component other than the connectors on which heat shrink work is being performed.
- Always keep hands away from tool tip area and heat shrink attachment.

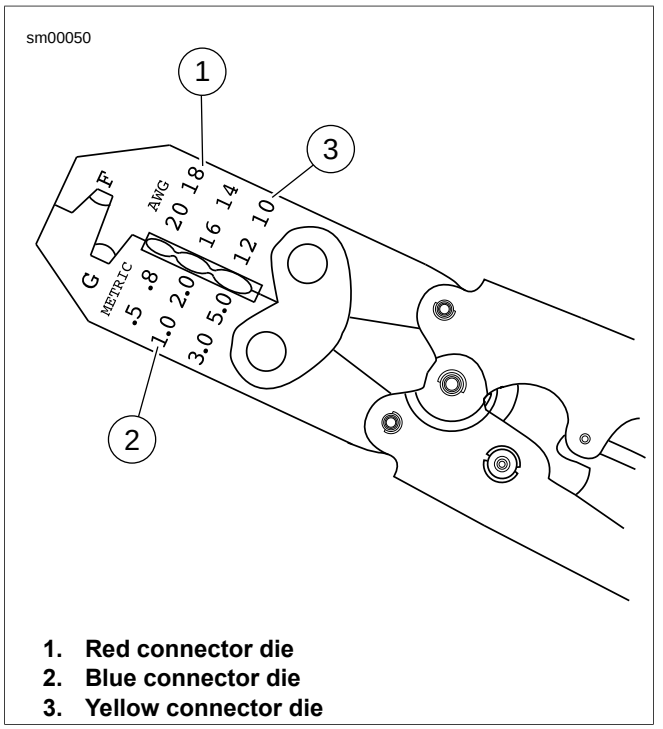
7. Use an ULTRA TORCH (Part No. HD-39969), or a HEAT GUN (Part No. HD-25070) with a HEAT SHIELD ATTACHMENT (Part No. HD-41183), to heat the connector from the center of the crimp (3) out to each end.

NOTE

It is acceptable for the splice to rest against the heat shrink tool attachment.

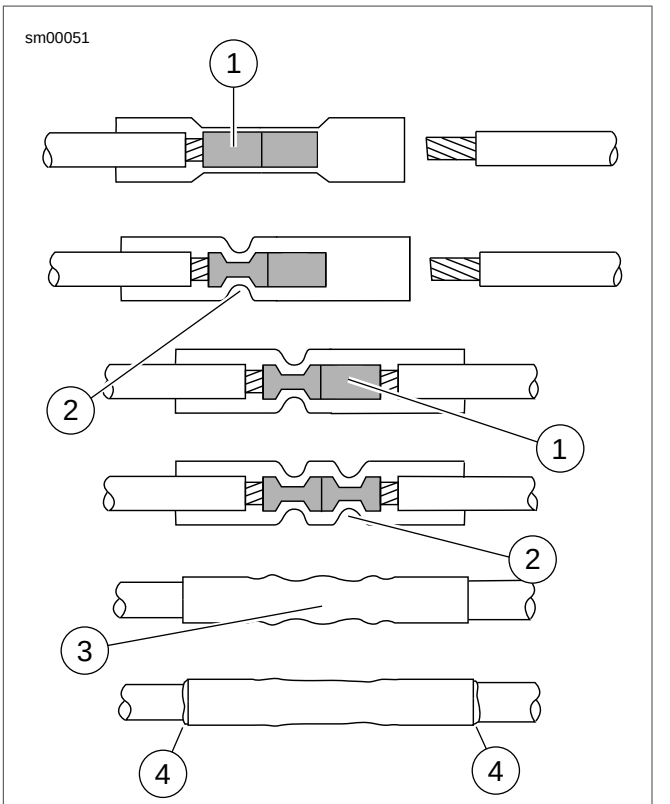
Inspecting Seals

See Figure A-63. Allow the splice to cool and inspect the seal. The insulation should appear smooth and cylindrical. Melted sealant will have extruded out the ends (4) of the insulation.



1. Red connector die
2. Blue connector die
3. Yellow connector die

Figure A-62. Packard Crimping Tool (HD-38125-8)



1. Wire lead in metal insert
2. Crimp metal insert
3. Center of crimp
4. Melted sealant

Figure A-63. Sealed Splice Connector

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DIGITAL TECHNICIAN® II
HARLEY-DAVIDSON®

NOTES

CONNECTORS B.1

CONNECTOR LOCATIONS

Function/Location

On the motorcycle, a connector can be identified by its function and location. Refer to Table B-1.

Place and Color

The place (number of wire cavities of a connector housing) and color of the connector can also aid identification.

Connector Number

On wiring diagrams and in service/repair instructions, connectors are identified by a number in brackets.

Repair Instructions

The repair instructions in this service manual are by connector type. Refer to Table B-1.

Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[1]	Main to interconnect harness	16-place Molex MX 150 Sealed (BK)	Gray	Inner fairing - right radio support bracket (FLH models) Inner fairing - right side below radio (FLT models)
[2]	Main to interconnect harness	12-place MX 150 Sealed (GY)	Gray	Inner fairing - left radio support bracket
[4]	P&A Accessory	4-place Deutsch DT Sealed (BK)	Black	Under seat
[5]	Main fuse	2-place Delphi 800 Metripack Sealed (BK)	Red	Under left side cover
[6]	Audio to interconnect harness	6-place Deutsch DT Sealed (BK)	Black	Inner fairing - left side of radio (FLH models) Inner fairing - right fairing support brace (FLT models)
[7]	Rear fender lights harness	8-place Tyco 070 Multilock Unsealed (BK)	Gray	Top of rear fender (under seat)
[12]	Tour-Pak lights (rear facia lamp on FLHX)	3-place Tyco 070 Multilock Unsealed (BK)	Gray	Inside Tour-Pak (inboard of upper frame tube on FLHX)
[13]	Fuel tank harness	4-place Tyco 070 Multilock Unsealed (BK)	Gray	Behind fuel tank (under seat)
[15]	Main to interconnect harness	4-place Delphi 630 Sealed (BK)	Gray	Inner fairing - right fairing bracket (FLH models) Inner fairing - below radio (right side FLT models)
[18]	Right rear turn signal	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly
[19]	Left rear turn signal	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly
[20]	Console harness	16-place Molex MX 150 Sealed (BK)	Gray	Under seat
[21]	Indicator lamps	10-place Tyco 070 Multilock Unsealed (BK) (All except FLHR/C) 8-place Deutsch DTM Sealed (BK) (FLHR/C)	Gray Black	Inner fairing - above radio (All except FLHR/C) Under console (FLHR/C)
[22]	Interconnect to right handlebar switches	12-place Molex MX 150 Sealed (BK) (All except FLHR/C) 6-place Molex MX 150 Sealed (BK) (FLHR/C)	Gray	Inner fairing - right fairing support bracket (All except FLHR/C) Inside headlamp nacelle - fork stem nut lock plate (right side) (FLHR/C)

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Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[24]	Interconnect to left handlebar switches	16-place Molex MX 150 Sealed (GY) (All except FLHR/C) 8-place Molex MX 150 Sealed (GY) (FLHR/C)	Gray	Inner fairing - left fairing support brace (All except FLHR/C) Inside headlamp nacelle - fork stem nut (left side) (FLHR/C)
[27]	Radio	23-place Tyco Superseal Sealed (BK)	Breakout Box	Inner fairing - back of radio (right side)
[28]	Radio	35-place Tyco Superseal Sealed (BK)	Breakout Box	Inner fairing - back of radio (left side)
[29]	HDI position lamp	Flag terminals	Gray	Back of headlamp
[30]	TSM/TSSM/HFSM	12-place Deutsch DT Sealed (GY)	Breakout Box	Under right side cover
[31]	Front turn signals	6-place Tyco 070 Multilock Unsealed (BK)	Gray	Inside headlamp nacelle - fork stem nut lock plate (left side) (FLHR/C)
[31L]	Left front turn signal/auxiliary lamp	4-place Tyco 070 Multilock Unsealed (BK)	Gray	Inner fairing - left fairing support brace (outboard side) (FLH models) Inner fairing - left (outboard side) (FLT models)
[31R]	Right front turn signal/auxiliary lamp	4-place Tyco 070 Multilock Unsealed (BK)	Gray	Inner fairing - right fairing support brace (outboard side) (FLH models) Inner fairing - right (outboard side) (FLT models)
[32]	Front fender tip lamp jumper harness (DOM)	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Inner fairing - below upper for bracket (left side) (All except FLHR/C) Inside headlamp nacelle (FLHR/C)
[33]	Ignition Switch	3-place AutoFuse Unsealed (FLHR/C) Faston 250 Spade terminals (FLHX, FLHTK, FLHTC/U, FLTRX/U) (BK)	Red	Bottom of ignition switch (All except FLHR/C) Under console (FLHR/C)
[34]	Right front speaker	Tyco Insulated Spade terminals (BK)	Gray	Inner fairing (back of speaker)
[35]	Left front speaker	Tyco Insulated Spade terminals (BK)	Gray	Inner fairing (back of speaker)
[38]	Headlamp	Tyco Unsealed Spade (BK)	Gray	Inner fairing (back of headlamp) (All except FLHR/C) Inside headlamp nacelle (FLHR/C)
[39]	Speedometer	12-place Delphi Micro 64 Sealed (GY)	Breakout Box	Inner fairing (back of speedometer) (FLHTC/U, FLHTK, FLHX) Instrument nacelle (back of speedometer) (FLT models) Back of speedometer (back of console) (FLHR/C)
[41]	Rear right speaker/passenger controls	6-place Molex MX 150 Sealed (BK)	Black	Inside rear right speaker box
[42]	Rear left speaker/passenger controls	6-place Molex MX 150 Sealed (BK)	Black	Inside rear left speaker box
[45]	Rear fender tip lamp (DOM)	3-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly
[47]	Stator	3-place Dekko (BK)	Green	Bottom of voltage regulator (left side)
[50]	CB antenna cable			Inner fairing - back of CB module
[51]	Radio antenna cable			Inner fairing - back of radio (left side)

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Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[52]	Radio antenna cable to mast			Inside of Tour-Pak
[53]	Console pod	12-place Deutsch DTM Sealed (BK)	Black	Rear of battery box (under seat)
[64]	Fuse block/relays	Delphi PED 280 Unsealed	Gray	Under left side cover
[65]	VSS	3-place Delphi GT 150 Sealed (BK)	Gray	Top of transmission case (under starter)
[67]	Accessory switch	4-place Tyco Mate-N-lok Unsealed (BK)	Gray	Inside headlamp nacelle (FLHR/C)
[73]	Auxiliary lamps	2-place Tyco 070 Multilock Unsealed (W)	Gray	Inside headlamp nacelle (FLHR/C)
[76]	Passenger headset	7-place DIN (BK)		Below rear left speaker box
[77]	Voltage regulator	2-place Dekko (BK)	Green	Bottom of voltage regulator (right side)
[78]	ECM	73-place Delphi Micro 64 Sealed (BK)	Breakout Box	Under seat
[79]	CKP sensor	2-place Deutsch DTM Sealed (BK)	Brown	Rear of lower front frame cross-member
[80]	TMAP sensor	4-place Bosch Compact 1.1M Sealed (BK)	Gray	Top of induction module
[83]	Ignition coil	4-place Delphi GT 150 Sealed (BK)	Gray	Bottom front of battery tray
[84]	Front fuel injector	2-place Molex BPT Sealed (BK)	Purple	Below fuel tank (left side)
[85]	Rear fuel injector	2-place Molex BPT Sealed (BK)	Purple	Below fuel tank (left side)
[90]	ET sensor	2-place Delphi GT 150 Sealed (BK)	Gray	Back of front cylinder (left side)
[91]	DLC	4-place Deutsch DT Sealed (GY)	Black	Under left side cover
[93]	Tail lamp	4-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly
[94]	Rear fender lights harness in circuit board	6-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly
[95]	Purge solenoid	2-place Delphi 150 Metripack Sealed (BK)	Purple	Under seat
[105]	Fairing cap switches	12-place Tyco 070 Multilock Unsealed (BK)	Gray	Inner fairing - above upper fork bracket (right side)
[105A, 105B]	Interconnect to nacelle switch harness	12-place Tyco 070 Multilock Unsealed (BK)	Gray	Inside instrument nacelle (under bezel) (FLT models)
[105C, 105D]	Nacelle switch harness to speaker switch	4-place Tyco 070 Multilock Unsealed (BK)	Gray	Inside instrument nacelle (under bezel) (FLT models)
[107]	Ambient Air Temperature (AAT) sensor	3-place Tyco 070 Multilock Unsealed (BK)	Gray	Steering head, left side (FLHTC/U, FLHTK) Inside instrument nacelle (under bezel) (FLT models)
[108]	Tachometer	12-place Delphi Micro 64 Sealed (GY)	Breakout Box Red	Inner fairing (back of tachometer) (FLH models) Instrument nacelle (back of tachometer) (FLT models)
[109]	Auxiliary lamps switch	4-place Tyco Mate-N-Lok Unsealed (BK)	Gray	Inside headlamp nacelle (FLHR/C)

Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[110]	Voltmeter lamp	2-way Tyco Positive Lock Spade Unsealed (BK)	Red	Inner fairing (back of voltmeter)
[111]	Voltmeter	3-way Faston 250 Spade Unsealed (BK)	Red	Inner fairing (back of voltmeter)
[112]	Oil pressure gauge lamp	2-way Tyco Positive Lock Spade Unsealed (BK)	Red	Inner fairing (back of oil pressure gauge)
[113]	Oil pressure gauge	3-way Faston 250 Spade Unsealed (BK)	Red	Inner fairing (back of oil pressure gauge)
[114]	Air temperature gauge lamp	2-way Tyco Positive Lock Spade Unsealed (BK)	Red	Inner fairing (back of air temperature gauge)
[115]	Air temperature gauge	3-way Faston 250 Spade Unsealed (BK)	Red	Inner fairing (back of air temperature gauge)
[116]	Fuel gauge lamp	2-way Tyco Positive Lock Spade Unsealed (BK)	Red	Inner fairing (back of fuel gauge)
[117]	Fuel gauge	3-way Faston 250 Spade Unsealed (BK)	Red	Inner fairing (back of fuel gauge) (All except FLHR/C) Bottom fuel tank left side (FLHR/C)
[120]	Oil pressure switch	Push On Right Angle Molded terminal (BK)	Black	Front right crankcase (FLHR/C)
[121]	Rear stop lamp switch	Tyco Insulated Spade terminals (BK)	Red	Mid-chassis, lower right side between frame and exhaust pipe)
[122]	Horn	Flag terminals (BK)	Red	Between cylinders (left side)
[128]	Starter solenoid	Delphi 56 Spade terminal (W)	Red	Top of starter
[131]	Neutral switch	Push On Right Angle Molded terminals (BK)		Top of transmission (right side)
[132]	Cigar lighter	Tyco Insulated Spade terminals	Red	Inner fairing
[133]	Jiffy stand sensor (if equipped)	3-place Molex MX 150 Sealed (BK)		Rear of lower front frame cross-member.
			Gray	HDI: Rear of lower front frame crossmember.
[134]	Sidecar BAS	3-place Delphi GT 150 Sealed	Gray	Under seat
[137]	HO2 sensor rear exhaust header	4-place Molex MX 150 Sealed (BK)	Gray	Under right side cover
[138]	HO2 sensor front exhaust header	4-place Molex MX 150 Sealed (GY)	Gray	Under right side cover
[139]	Oil pressure sender	4-place Delphi 150 Metripack Sealed (BK)	Gray	Front right crankcase (FLHX, FLHTK, FLHTC/U, FLTR/U/X)
[141]	Fuel pump and fuel level sender	4-place Delphi GT 280 Sealed (BK)	Gray	Under console on top of fuel tank canopy
[142]	Security siren (optional)	3-place Delphi GT 150 Sealed (BK)	Gray	Under left side cover
[143]	Front fender tip lamp (if equipped)	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Under front fender tip lamp bracket
[149]	Audio amplifier	24-place Tyco Ampseal Sealed (BK)		Under Tour-Pak
[158]	Left handlebar switches (cruise control)	3-place Molex MX 150 Sealed (BK)	Gray	Inside headlamp nacelle (FLHR/C)
[159]	Right handlebar switches (cruise control)	3-place Molex MX 150 Sealed (GY)	Gray	Inside headlamp nacelle (FLHR/C)

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Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[160]	B+	1-place Delphi 480 Metripack Unsealed (GY)	Red	Under seat
[166]	ABS module	20-place Molex MX 150 Sealed (BK)	Breakout Box	Under right side cover
[167]	Front WSS	2-place Delphi 150 Metripack Sealed (BK)	Gray	Inner fairing - below upper fork bracket (left side) (All except FLHR/C) Inside headlamp nacelle (FLHR/C)
[168]	Rear WSS	2-place Delphi 150 Metripack Sealed (BK)	Gray	Under right side cover
[179]	Active exhaust actuator (if equipped)	5-place Tyco Superseal 1.5 Sealed (BK)	Gray	HDI: Under right side cover
[184]	CB module	12-place Deutsch (BK)	Black	Inner fairing - left side of radio (FLHTC/U, FLHTK, FLHX)
[185]	XM module, antenna	12-place Deutsch DTM Sealed (BK)	Black	Inner fairing - back of radio
[187]	Hands-free module	8-place Deutsch DTM Sealed (BK)	Black	Inner fairing
[189]	Heated handgrip to main harness	3-place Tyco 040 Unsealed		Inside outer fairing, left side (FLHTK)
[201]	ABS diode	4-place Deutsch DT Sealed (BK)	Black	Under left side cover (below fuse box)
[203F]	ACR (front)	2-place Tyco Superseal 1.5 Sealed		Bracket attached to the throttle body
[203R]	ACR (rear)	2-place Tyco Superseal 1.5 Sealed		Bracket attached to the throttle body
[204]	TGS harness	6-place Molex MX 150 Sealed (BK)	Gray	Inner fairing - right fairing support bracket (FLHT/C/K, FLHX) Inner fairing - right side below radio (FLT models) Inside headlamp nacelle - fork stem nut lock plate (FLHR/C)
[206]	Heated handgrip interconnect	2-place Tyco 040 Unsealed		Inside outer fairing, right side (FLHTK)
[208]	HFSM antenna jumper harness	4-place Deutsch DT Sealed (GY)	Black	Under right side cover
[209]	HFSM antenna	2-place Molex MX 64 Unsealed (BK)	Gray	Under seat
[211]	TCA	6-place Molex MX 150 Sealed (BK)	Gray	Right side of engine (induction module)
[222]	Console ignition switch interconnect	4-place Delphi 630 Sealed (BK)	Gray	Under seat (FLHR/C)
[224]	TGS	7-place Tyco Mini Multilock (BK)		Handlebar throttle (inside right side handlebar)
[226]	Rear lighting jumper harness	12-place Delphi Micro 64 Sealed (GY)	Breakout Box	Rear fender tip fascia module (FLHX, FLTRX)
[237]	Right heated grip	2-place Tyco 040 Unsealed		Inside handlebars, right side
[257]	Rear lighting jumper harness	6-place Molex MX 150 Sealed (BK)	Gray	Under left side cover

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Table B-1. Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[258]	Power outlet	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Inside Tour-Pak (FLHTK)
[262]	Rear lighting jumper harness	12-place Delphi Micro 64 Sealed (GY)	Breakout Box	Rear fender tip fascia module (FLHX, FLTRX)
[GND1] [GND1A] [GND2]	Harness grounds	Ring terminals		Under seat

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

WIRING DIAGRAMS B.2

WIRING DIAGRAM INFORMATION

Wire Color Codes

Wire traces on wiring diagrams are labeled with alpha codes. Refer to Table B-2.

For Solid Color Wires: See Figure B-1. The alpha code identifies wire color.

For Striped Wires: The code is written with a slash (/) between the solid color code and the stripe code. For example, a trace labeled GN/Y is a green wire with a yellow stripe.

Wiring Diagram Symbols

See Figure B-1. On wiring diagrams and in service/repair instructions, connectors are identified by a number in brackets [ ]. The letter inside the brackets identifies whether the housing is a socket or pin housing.

A=Pin: The letter A and the pin symbol after a connector number identifies the pin side of the terminal connectors.

B=Socket: The letter B and the socket symbol after a connector number identifies the socket side of the terminal connectors. Other symbols found on the wiring diagrams include the following:

Diode: The diode allows current flow in one direction only in a circuit.

Wire break: The wire breaks are used to show option variances or page breaks.

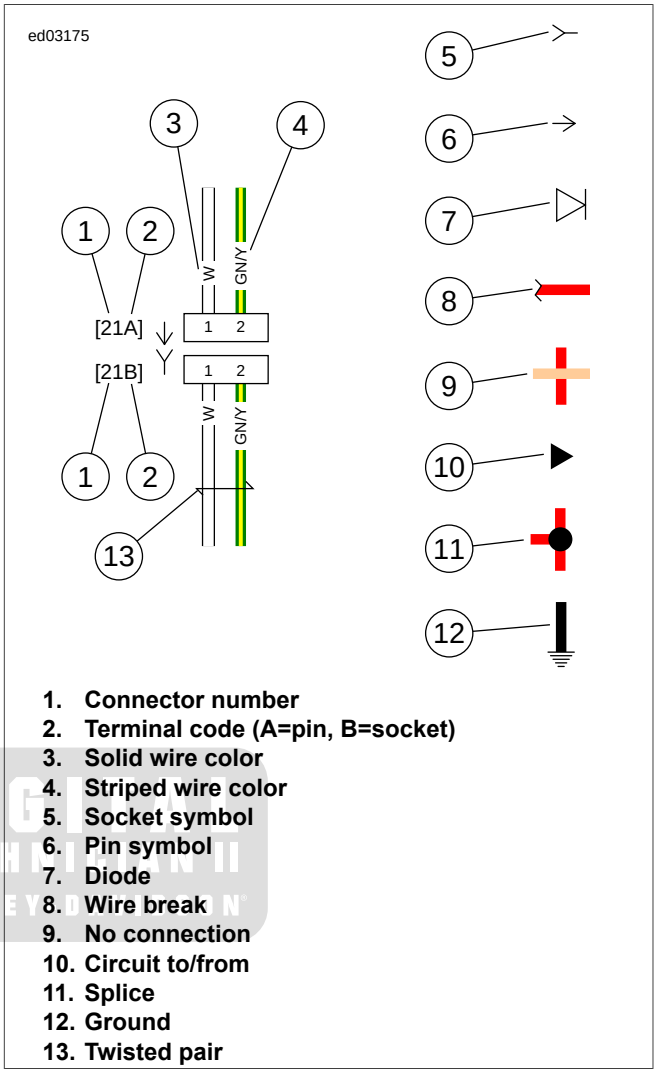
No Connection: Two wires crossing over each other in a wiring diagram that are shown with no splice indicating they are not connected together.

Circuit to/from: This symbol is used to identify there is a more complete circuit diagram on another page. The symbol is also identifying the direction of current flow.

Splice: Splices are where two or more wires are connected together along a wiring diagram. The location of the splice indicated in the wiring diagram is not the true location of the splice in the actual harness but to identify that the wires are spliced to that circuit.

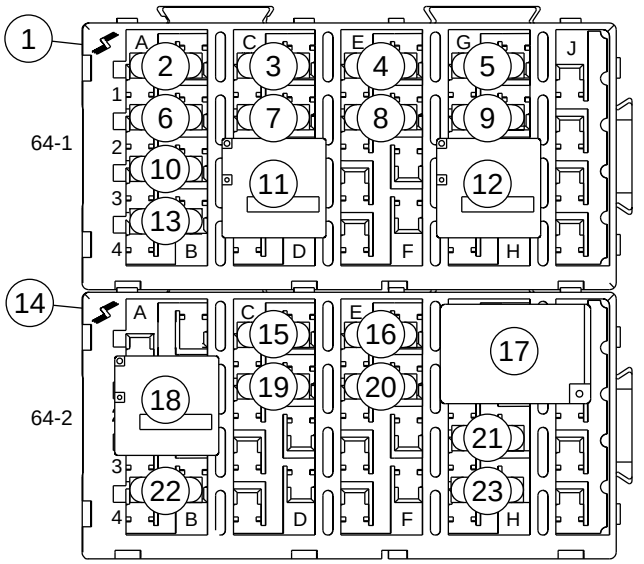
Ground: Grounds can be classified as either clean or dirty grounds. Clean grounds are identified by a (BK/GN) wire and are normally used for sensors or modules. These grounds usually do not have electric motors, coils or anything that may cause electrical interference on the ground circuit. The dirty grounds are identified by a (BK) wire and are used for components that are not as sensitive to electrical interference.

Twisted pair: This symbol indicates the two wires are twisted together in the harness. This minimizes the circuit's electromagnetic interference from external sources. If repairs are necessary to these wires they should remain as twisted wires.



1. **Connector number**
2. **Terminal code (A=pin, B=socket)**
3. **Solid wire color**
4. **Striped wire color**
5. **Socket symbol**
6. **Pin symbol**
7. **Diode**
8. **Wire break**
9. **No connection**
10. **Circuit to/from**
11. **Splice**
12. **Ground**
13. **Twisted pair**

Figure B-1. Connector/Wiring Diagram Symbols



1. **Fuse block [64-1]**
2. **Brake**
3. **Accessory**
4. **P&A**
5. **Radio power/siren**
6. **Radio memory**
7. **Battery**
8. **ECM power**
9. **Pwr outlet**
10. **Exhaust CNTRL**
11. **System relay**
12. **Start relay**
13. **Fuel pump**
14. **Fuse block [64-2]**
15. **Instruments**
16. **Ignition**
17. **Lighting relay**
18. **Brake relay**
19. **Headlamp**
20. **Lights**
21. **Spare**
22. **ABS**
23. **Spare**

Figure B-2. Fuse Block and Socket Terminals

Table B-2. Wire Color Codes

ALPHA CODE	WIRE COLOR
BE	Blue
BK	Black
BN	Brown
GN	Green
GY	Grey
LGN	Light Green
O	Orange
PK	Pink
R	Red
TN	Tan
V	Violet
W	White
Y	Yellow

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

2011 TOURING WIRING DIAGRAMS

Wiring Diagram List

DIAGRAM	LOCATION
Battery Power: FLHR/C	Figure B-3
Battery Power: Except FLHR/C	Figure B-4
Ignition Power: FLHR/C	Figure B-5
Ignition Power: Except FLHR/C	Figure B-6
Accessory Power: FLHR/C	Figure B-7
Accessory Power: Except FLHR/C	Figure B-8
Sensor Grounds	Figure B-9
Right GND2: FLHR/C	Figure B-10
Right GND2: Except FLHR/C	Figure B-11
Left GND1: FLHR/C	Figure B-12
Left GND1: 2011 Touring (Except FLHR/C)	Figure B-13
MAIN HARNESS (1 OF 5): 2011 Touring (Except FLHR/C) without ABS	Figure B-14
MAIN HARNESS (2 OF 5): 2011 Touring (Except FLHR/C) with ABS	Figure B-15
MAIN HARNESS (3 OF 5): 2011 Touring (FLHR/C) without ABS	Figure B-16
MAIN HARNESS (4 OF 5): 2011 Touring (FLHR/C) with ABS	Figure B-17
MAIN HARNESS (5 OF 5): 2011 Touring	Figure B-18
Fairing Harness: 2011 Touring	Figure B-19
Indicators, Fairing Switches, Handlebar Switches: 2011 Touring	Figure B-20
Starting Circuit: 2011 Touring	Figure B-21
Rear Lighting, Charging System: 2011 Touring	Figure B-22
Front Lighting, Console Harness, ABS: 2011 Touring	Figure B-23
Security Circuit: 2011 Touring	Figure B-24
Security Circuit: 2011 Touring With Anti-Theft Tracking Module	Figure B-25
Ultra Radio RF Interconnect Circuit: 2011 Touring	Figure B-26
Classic Radio Circuit: 2011 Touring	Figure B-27
Ultra Radio Circuit: 2011 Touring	Figure B-28
2-Place Intercom and Headset Audio: 2011 Touring	Figure B-29
CAN and Module Audio Inputs to Ultra Radio: 2011 Touring	Figure B-30

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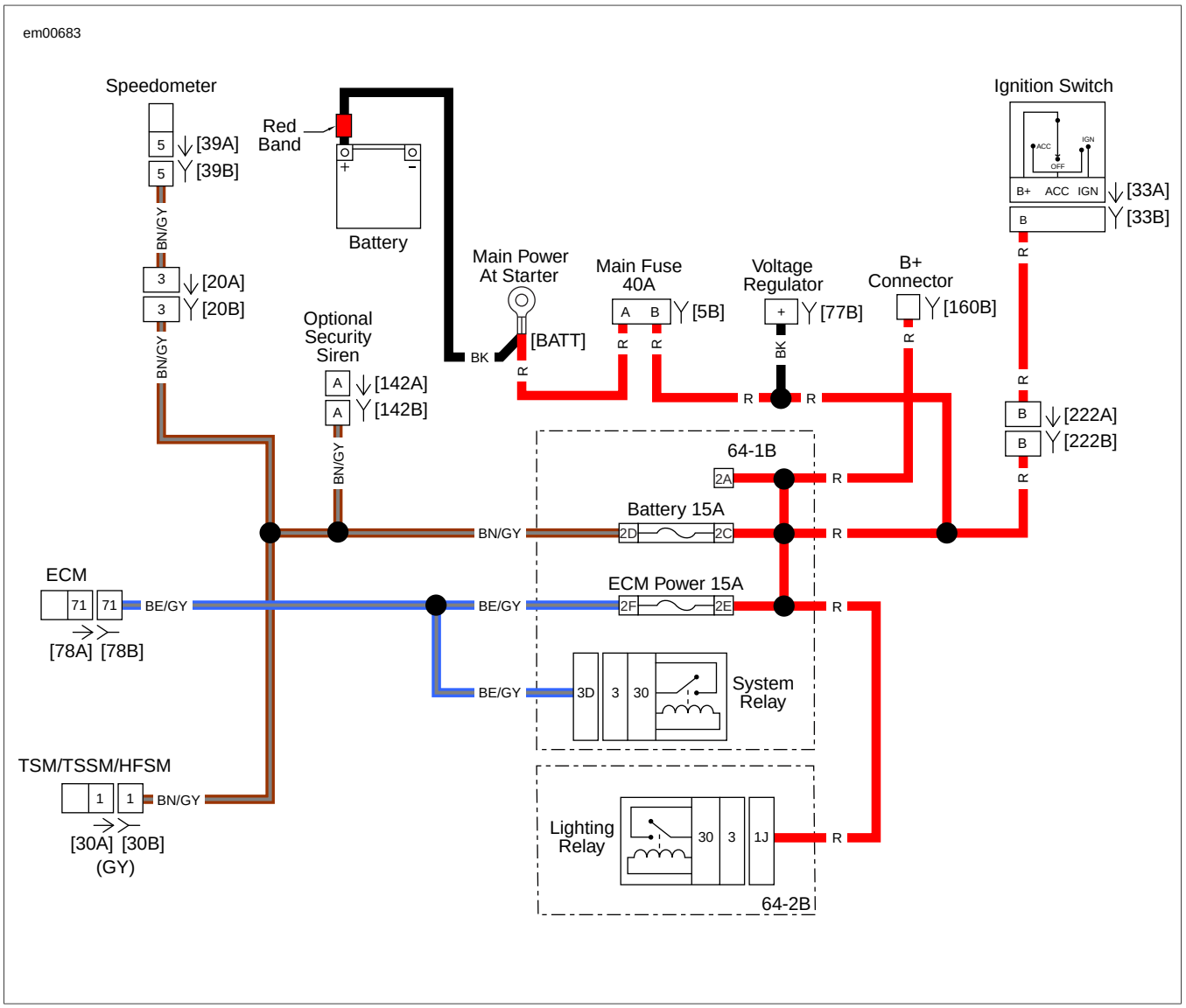


Figure B-3. Battery Power: FLHR/C

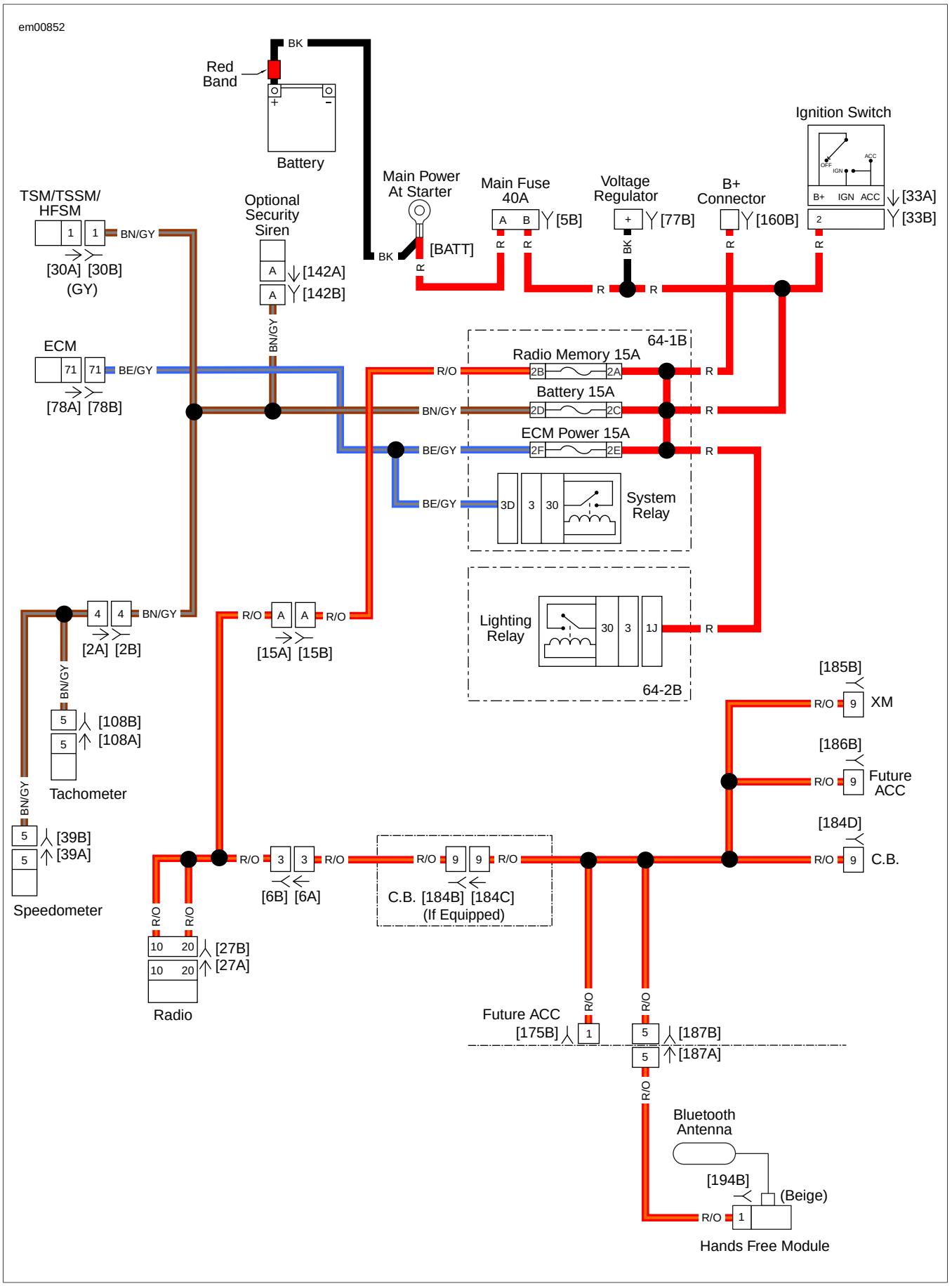


Figure B-4. Battery Power: Except FLHR/C

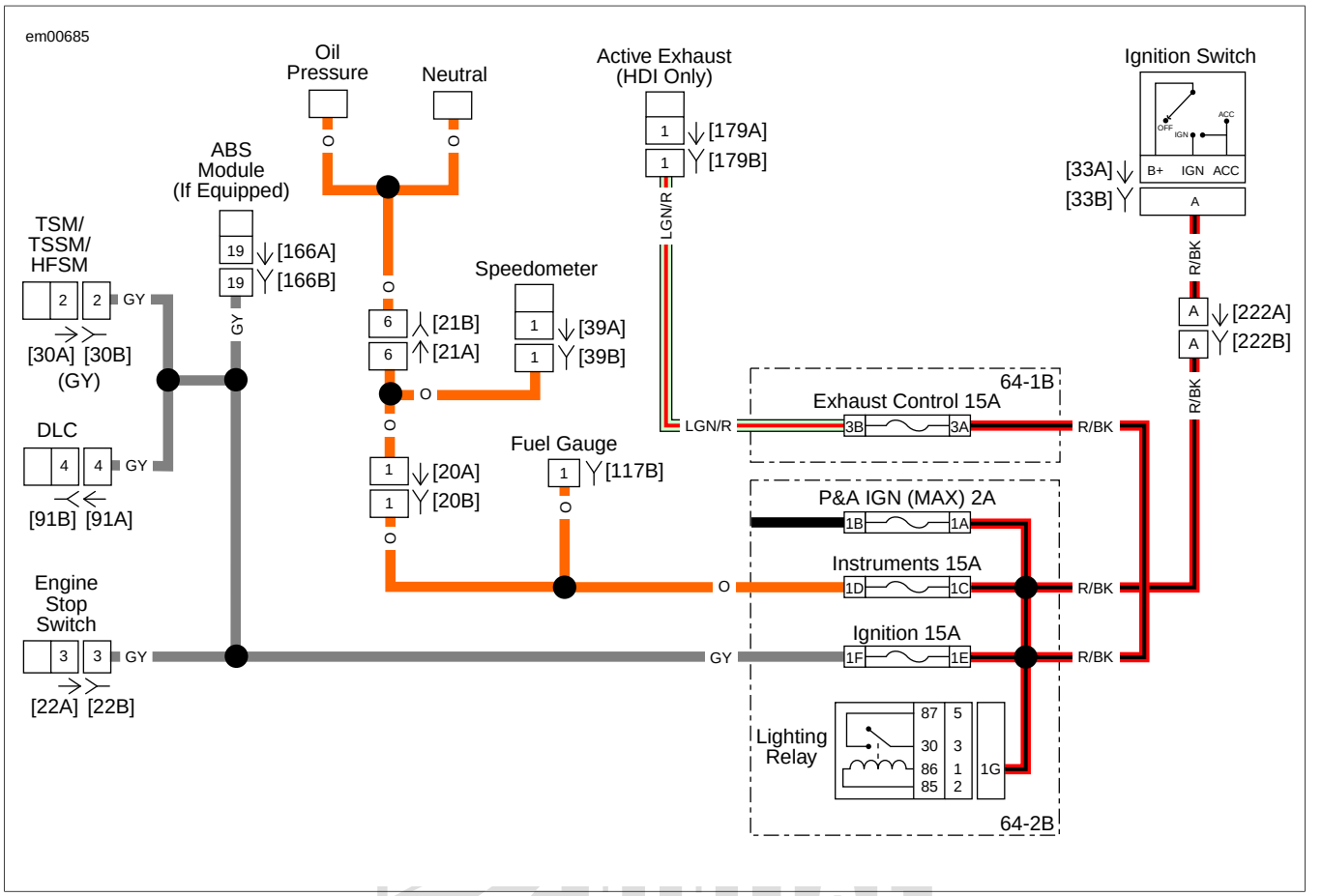


Figure B-5. Ignition Power: FLHR/C

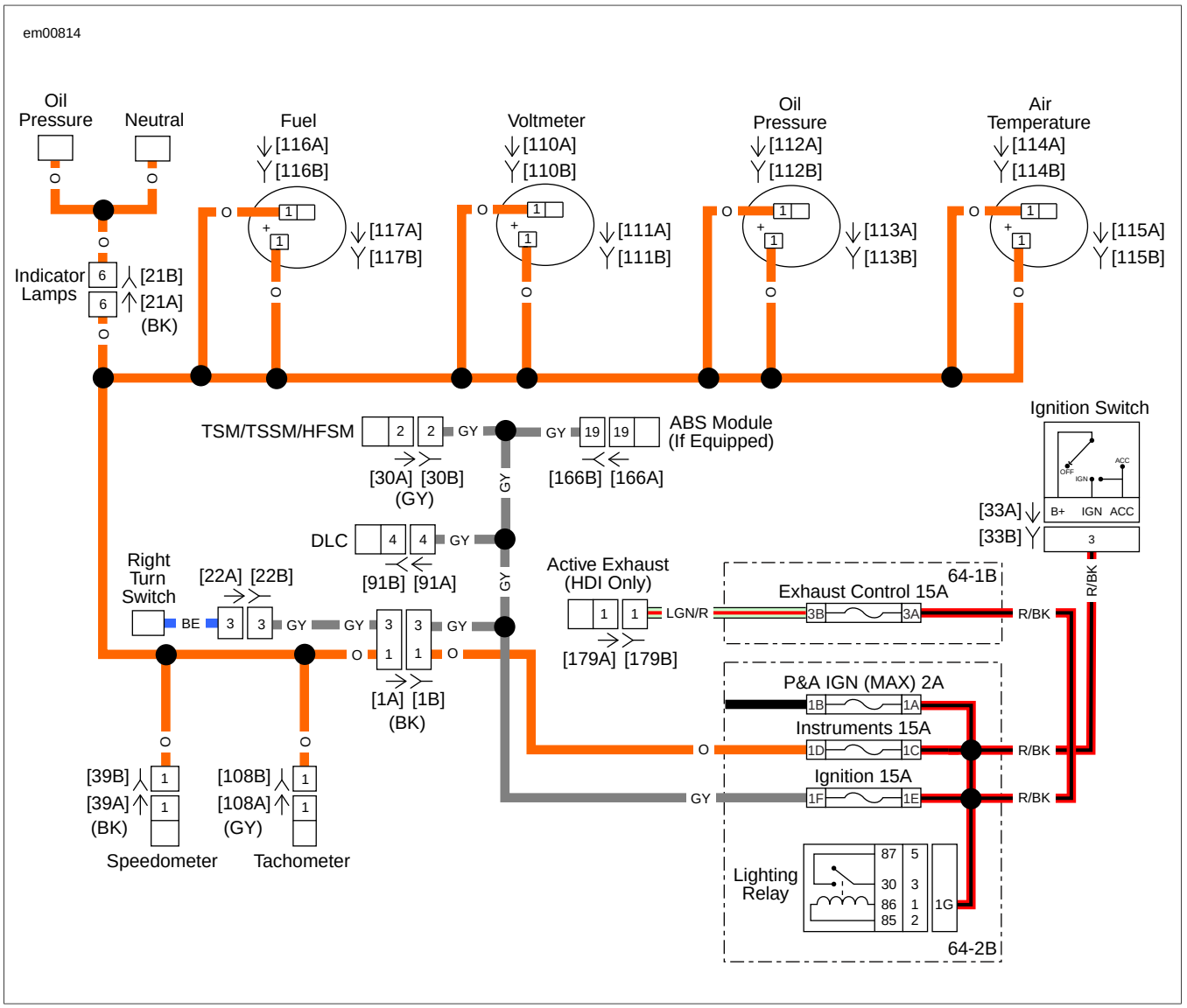


Figure B-6. Ignition Power: Except FLHR/C

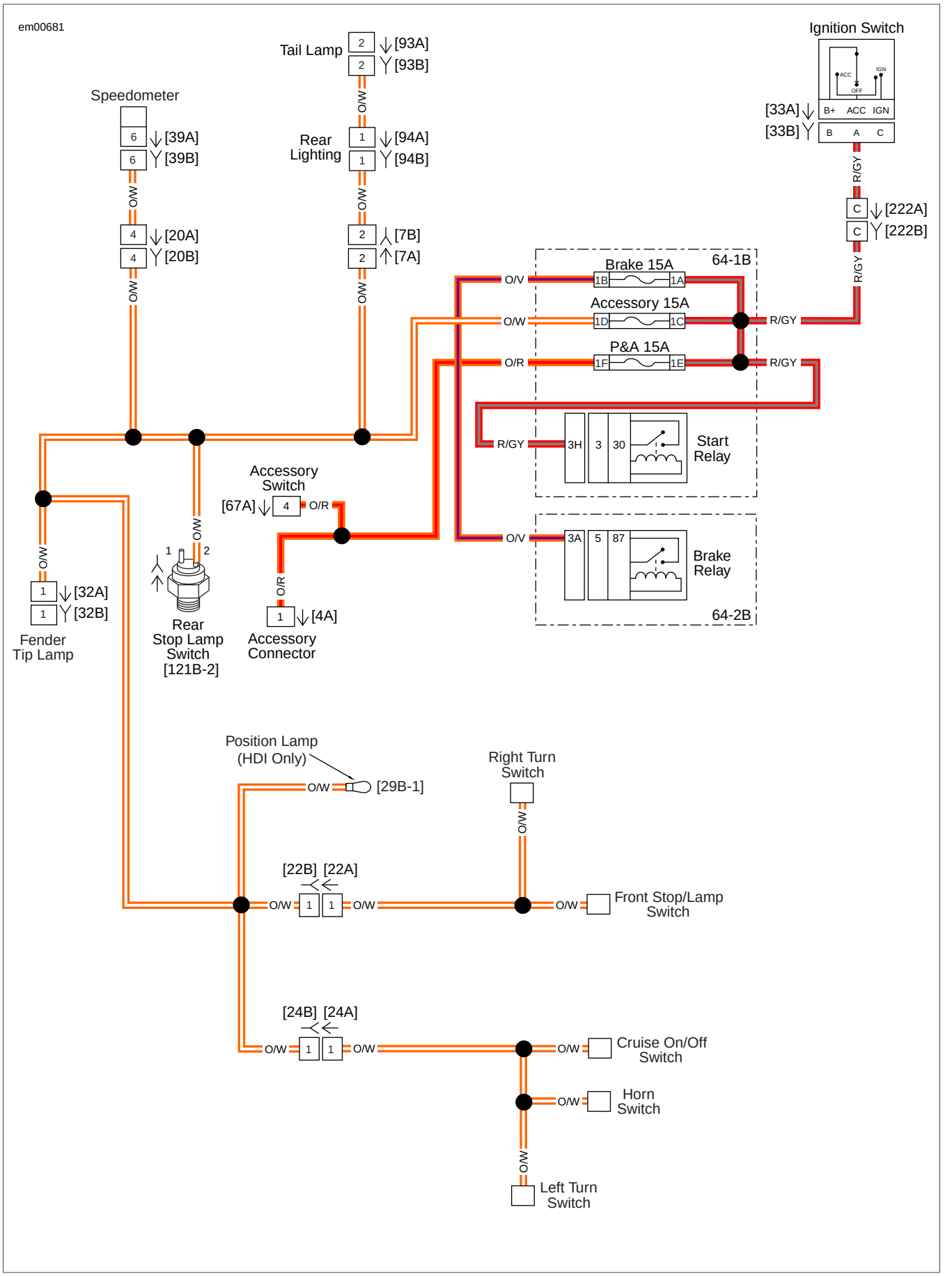


Figure B-7. Accessory Power: FLHR/C

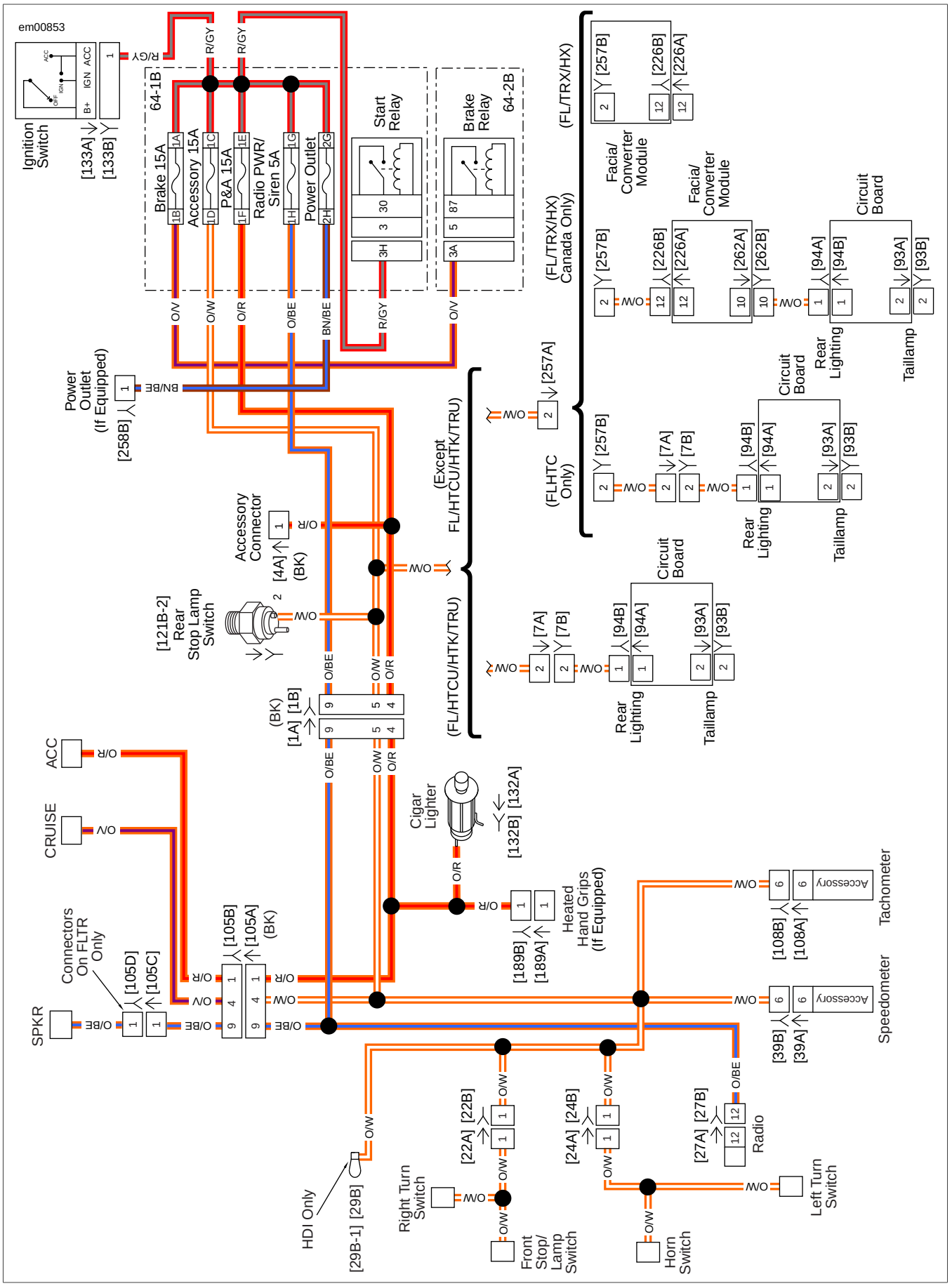


Figure B-8. Accessory Power: Except FLHR/C

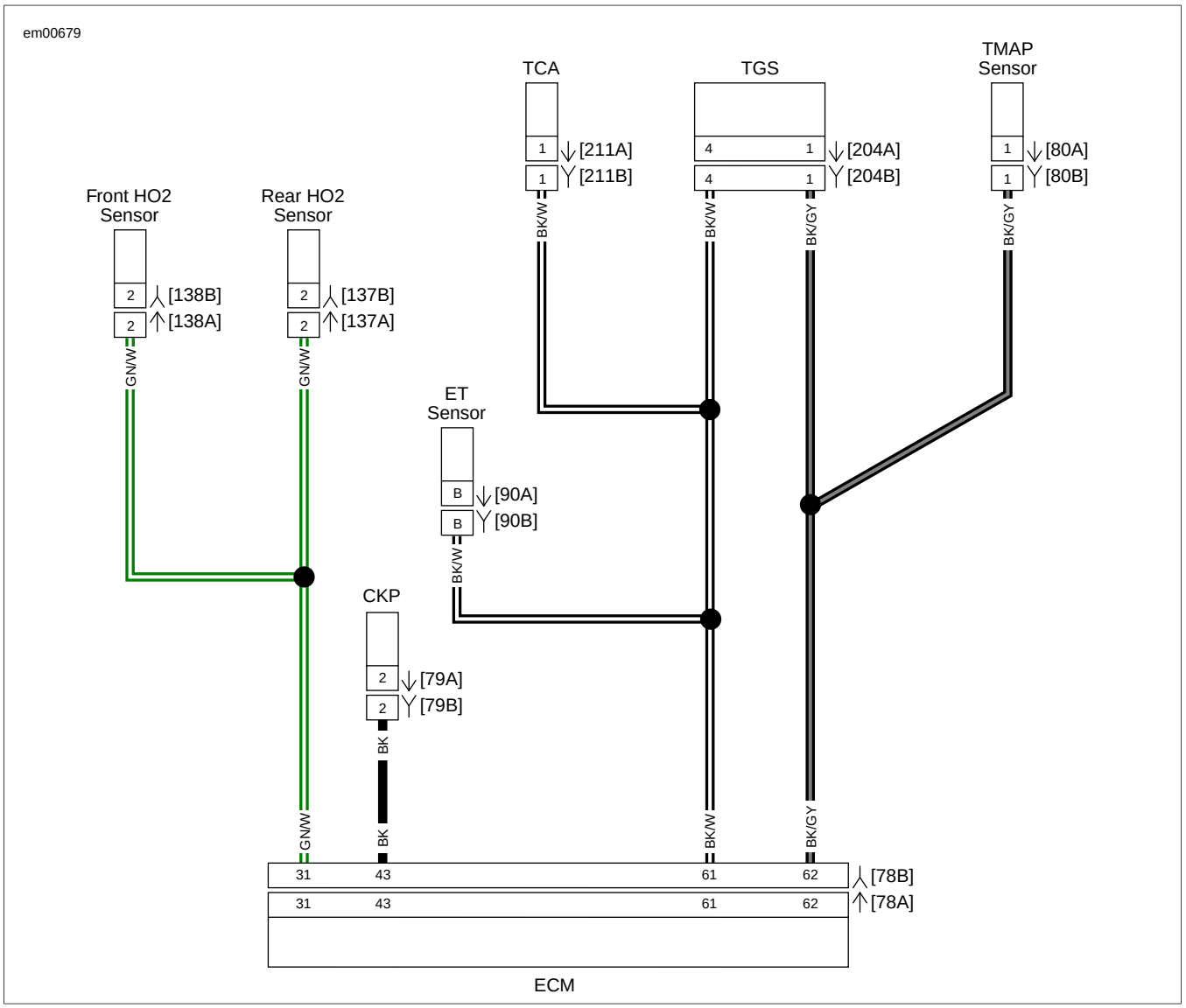


Figure B-9. Sensor Grounds

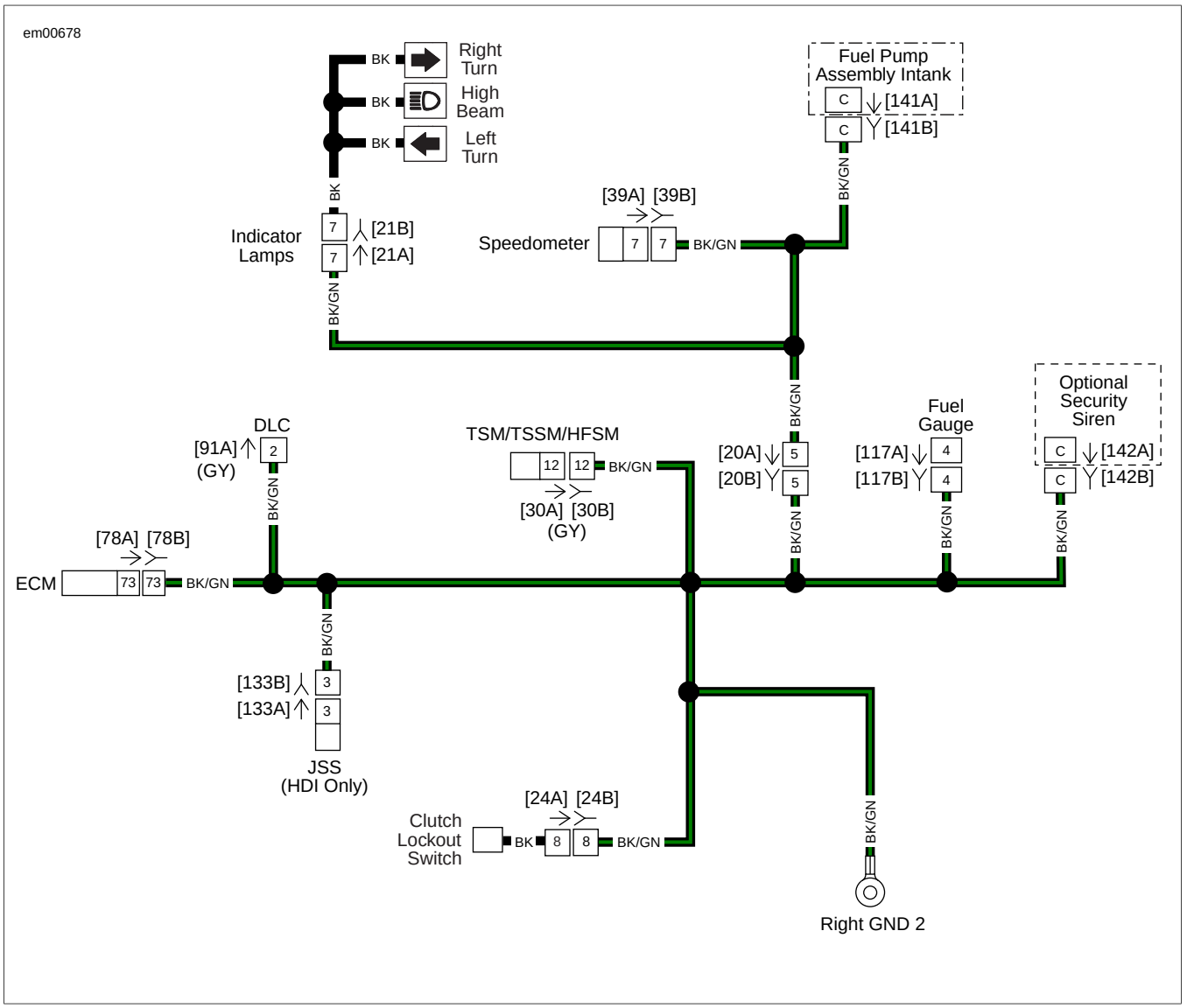


Figure B-10. Right GND2: FLHR/C

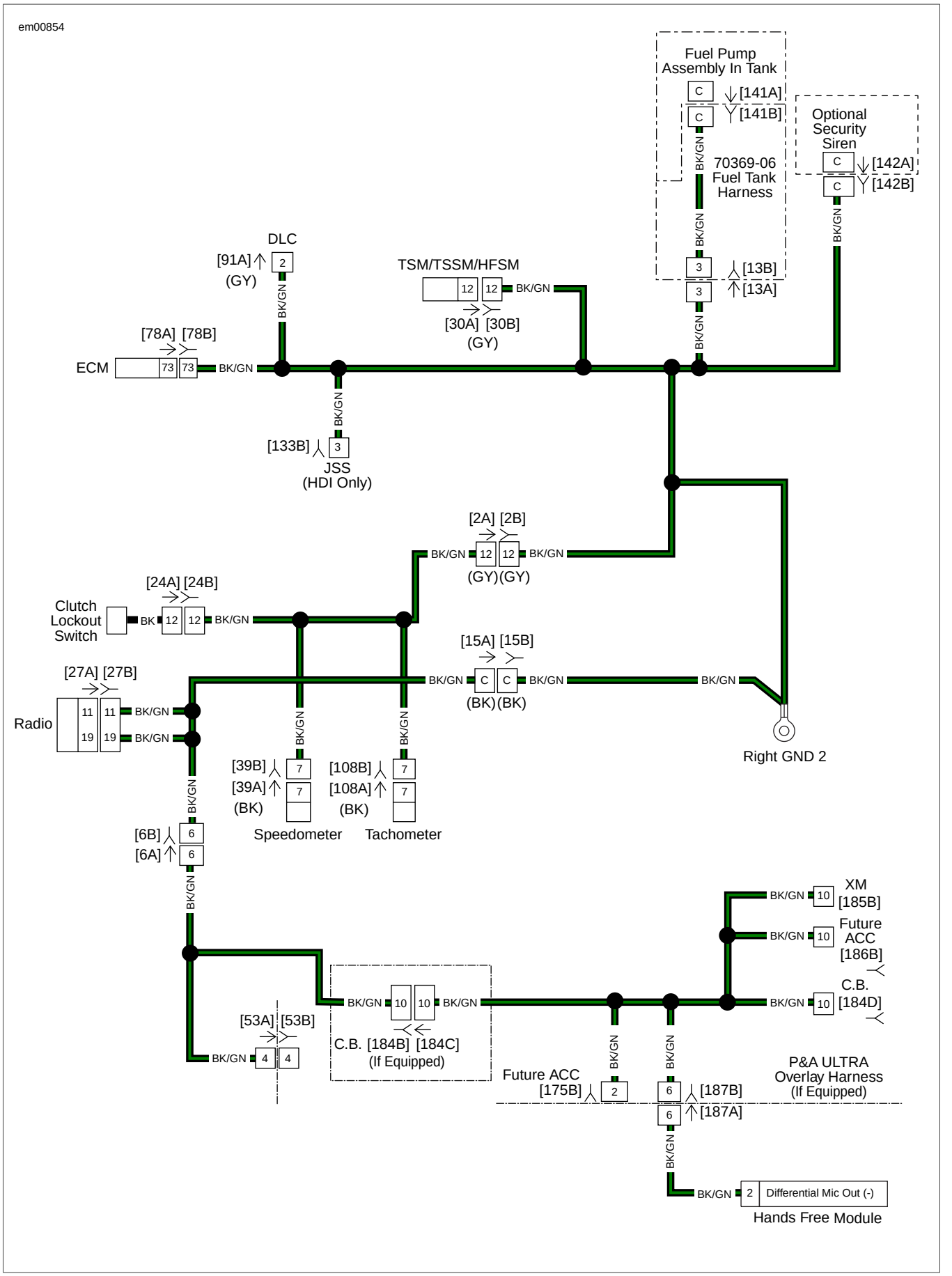


Figure B-11. Right GND2: Except FLHR/C

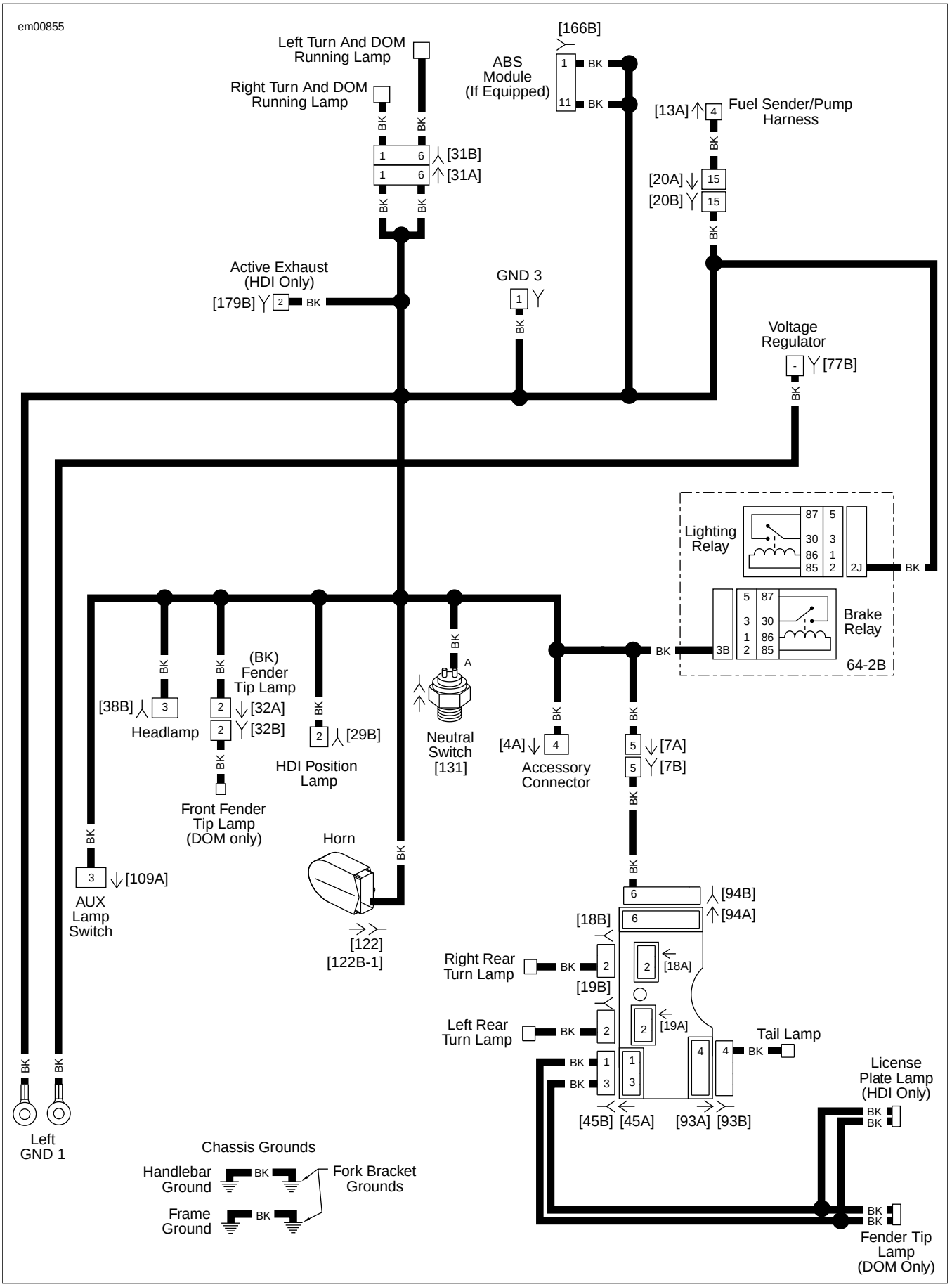


Figure B-12. Left GND1: FLHR/C

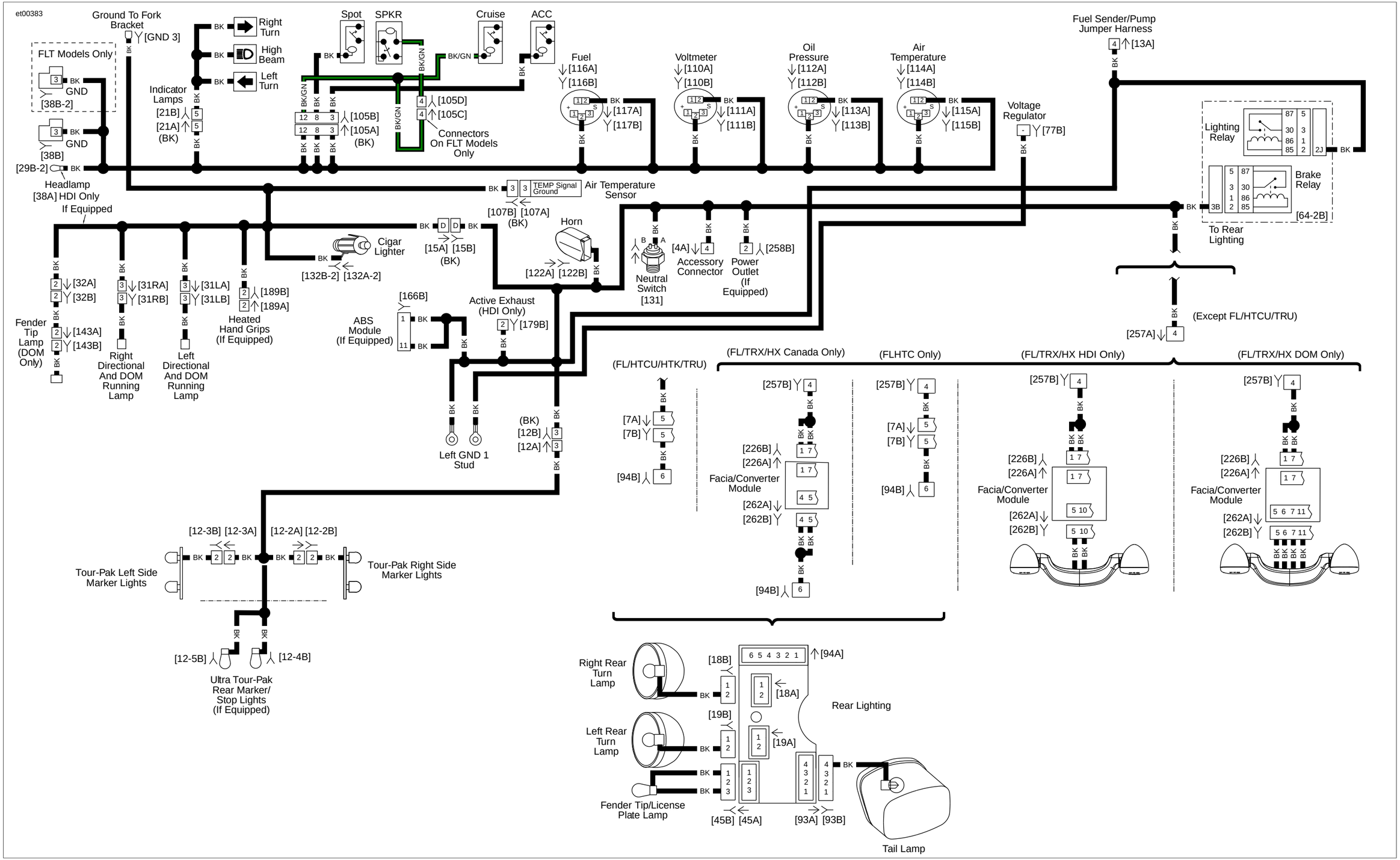


Figure B-13. Left GND1: 2011 Touring (Except FLHR/C)

Figure B-13.
Left GND1: 2011 Touring (Except FLHR/C)

Figure B-13.
Left GND1: 2011 Touring (Except FLHR/C)

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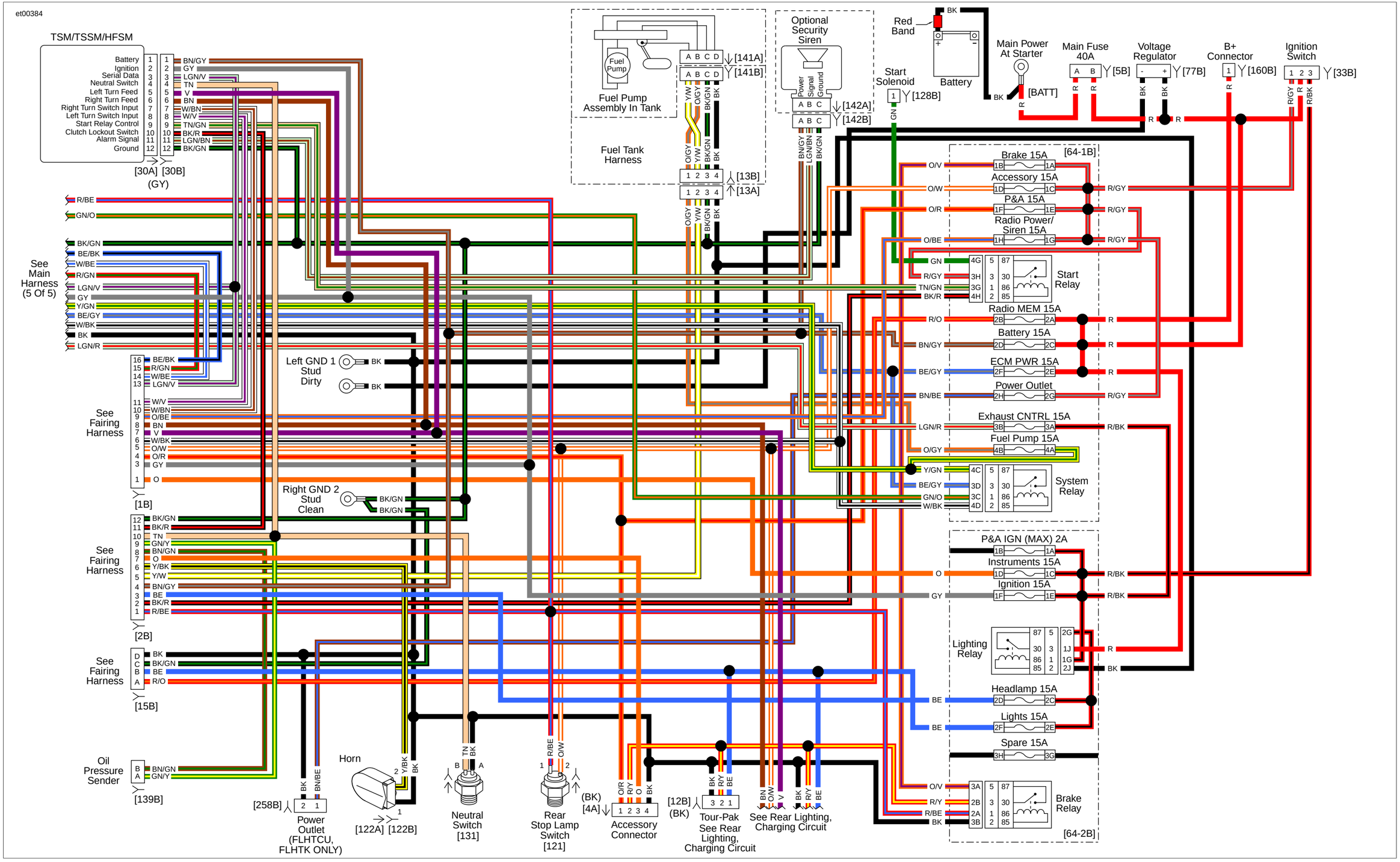


Figure B-14. MAIN HARNESS (1 OF 5): 2011 Touring (Except FLHR/C) without ABS

Figure B-14.
MAIN HARNESS (1 OF 5): 2011 Touring (Except FLHR/C) without ABS

Figure B-14.
MAIN HARNESS (1 OF 5): 2011 Touring (Except FLHR/C) without ABS

et00385

TSM/TSSM/HFSM

Battery 1 — BN/GY
Ignition 2 — GY
Serial Data 3 — LGN/V
Neutral Switch 4 — TN
Left Turn Feed 5 — V
Right Turn Feed 6 — BN
Right Turn Switch Input 7 — W/BN
Left Turn Switch Input 8 — W/V
Start Relay Control 9 — TN/GN
Clutch Lockout Switch 10 — BK/R
Alarm Signal 11 — LGN/BN
Ground 12 — BK/GN

[30A] [30B] (GY)

See Front Lighting, Console Harness, ABS

BK R/BN PK/BN R/V LGN/V GY R/BE

Fuel Pump Assembly In Tank
Fuel Pump
A B C D [141A]
A B C D [141B]

Fuel Tank Harness
Y/W O/GY BK/GN BK
O/GY Y/W BK/GN BK
1 2 3 4 [13B]
1 2 3 4 [13A]
O/GY Y/W BK/GN BK

Optional Security Siren
Power
Signal
Ground
A B C [142A]
A B C [142B]
BN/GY LGN/BN BK/GN

Start Solenoid
1 [128B]
GN

Red Band
BK
Battery
BK

Main Power At Starter
R
[BATT]

Main Fuse 40A
A B [5B]
R R

Voltage Regulator
- + [77B]
BK BK
R

B+ Connector
1 [160B]
R

Ignition Switch
1 2 3 [33B]
R/GY R R/BK

See Main Harness (5 Of 5)
R/BE
GN/O
BK/GN
BE/BK
W/BE
R/GN
LGN/V
GY
Y/GN
BE/GY
W/BK
BK
LGN/R

See Fairing Harness
16 BE/BK
15 R/GN
14 W/BE
13 LGN/V
11 W/V
10 W/BN
9 O/BE
8 BN
7 V
6 W/BK
5 O/W
4 O/R
3 GY
1 O
[1B]

Left GND 1 Stud Dirty
BK
BK

Right GND 2 Stud Clean
BK/GN
BK/GN

See Fairing Harness
12 BK/GN
11 BK/R
10 TN
9 GN/Y
8 BN/GN
7 O
6 Y/BK
5 Y/W
4 BN/GY
3 BE
2 BK/R
1 R/BN
[2B]

See Fairing Harness
D BK
C BK/GN
B BE
A R/O
[15B]

Oil Pressure Sender
B BN/GN
A GN/Y
[139B]

[258B] BK BN/BE
2 1
Power Outlet (FLHTCU, FLHTK ONLY)

Horn
2 Y/BK BK
1
[122]

B TN BK A
Neutral Switch [131]

1 PK/BN O/W 2
Rear Stop Lamp Switch [121]

(BK) [4A] O/R R/Y O BK
1 2 3 4
Accessory Connector

[12B] BK R/Y BE
3 2 1
Tour-Pak See Rear Lighting, Charging Circuit

BN O/W V BK R/Y BE
See Rear Lighting, Charging Circuit

Brake 15A [64-1B]
1B 1A
O/V
Accessory 15A
1D 1C R/GY
O/W
P&A 15A
1F 1E R/GY
O/R
Radio Power/ Siren 5A
1H 1G R/GY
O/BE

GN
R/GY
TN/GN
BK/R
4G 5 87
3H 3 30
3G 1 86
4H 2 85
Start Relay

Radio MEM 15A
2B 2A R
R/O
Battery 15A
2D 2C R
BN/GY
ECM PWR 15A
2F 2E R
BE/GY
Power Outlet
2H 2C R/GY
BN/BE
Exhaust CNTRL 15A
3B 3A R/BK
LGN/R
Fuel Pump 15A
4B 4A
O/GY

Y/GN
BE/GY
GN/O
W/BK
4C 5 87
3D 3 30
3C 1 86
4D 2 85
System Relay

P&A IGN (MAX) 2A
1B 1A
Instruments 15A
1D 1C R/BK
O
Ignition 15A
1F 1E R/BK
GY

Lighting Relay
87 5 2G
30 3 1J
86 1 1G
85 2 2J
R
BK

Headlamp 15A
2D 2C
BE
Lights 15A
2F 2E
BE
Spare 15A
3H 3G BK
ABS 30A
4B 4A R
R/V

O/V
R/Y
R/BE
3A 5 87
2B 3 30
2A 1 86
3B 2 85
Brake Relay

Spare 30A
BK
4H 4G
[64-2B]

Figure B-15. MAIN HARNESS (2 OF 5): 2011 Touring (Except FLHR/C) with ABS

Figure B-15.
MAIN HARNESS (2 OF 5): 2011 Touring (Except FLHR/C) with ABS

Figure B-15.
MAIN HARNESS (2 OF 5): 2011 Touring (Except FLHR/C) with ABS

et00386

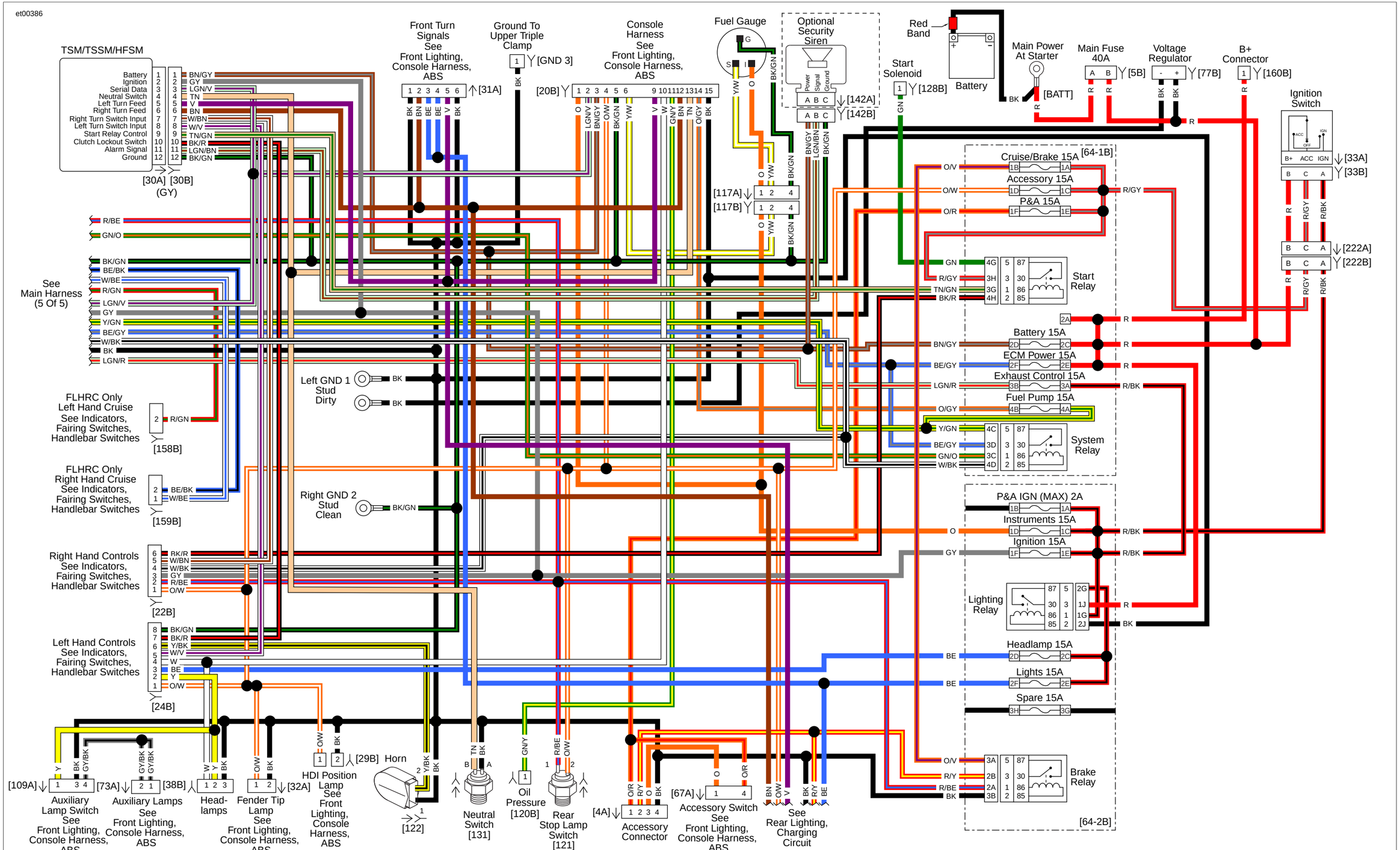


Figure B-16. MAIN HARNESS (3 OF 5): 2011 Touring (FLHR/C) without ABS

Figure B-16.
MAIN HARNESS (3 OF 5): 2011 Touring (FLHR/C) without ABS

Figure B-16.
MAIN HARNESS (3 OF 5): 2011 Touring (FLHR/C) without ABS

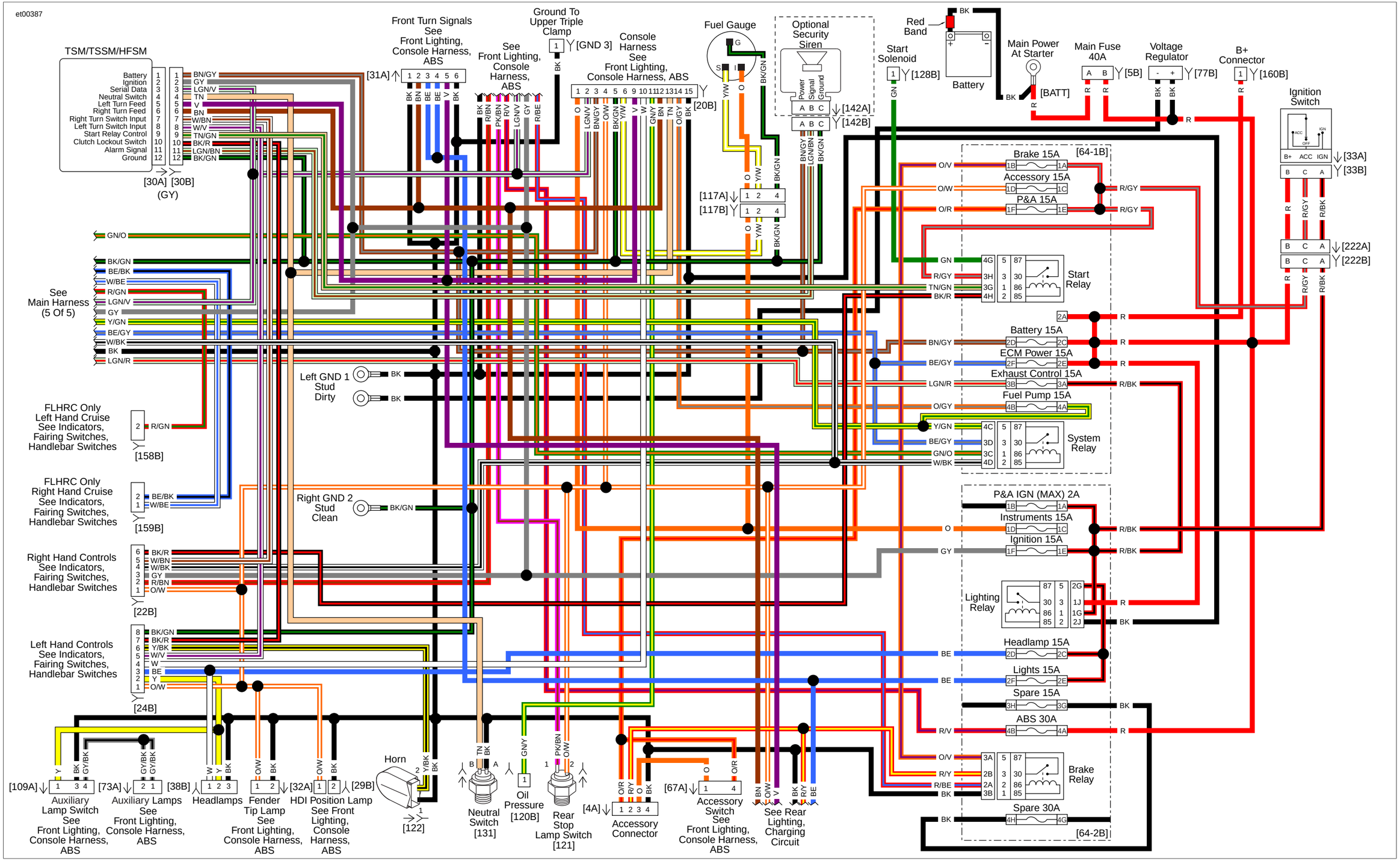


Figure B-17. MAIN HARNESS (4 OF 5): 2011 Touring (FLHR/C) with ABS

Figure B-17.
MAIN HARNESS (4 OF 5): 2011 Touring (FLHR/C) with ABS

Figure B-17.
MAIN HARNESS (4 OF 5): 2011 Touring (FLHR/C) with ABS

et00388

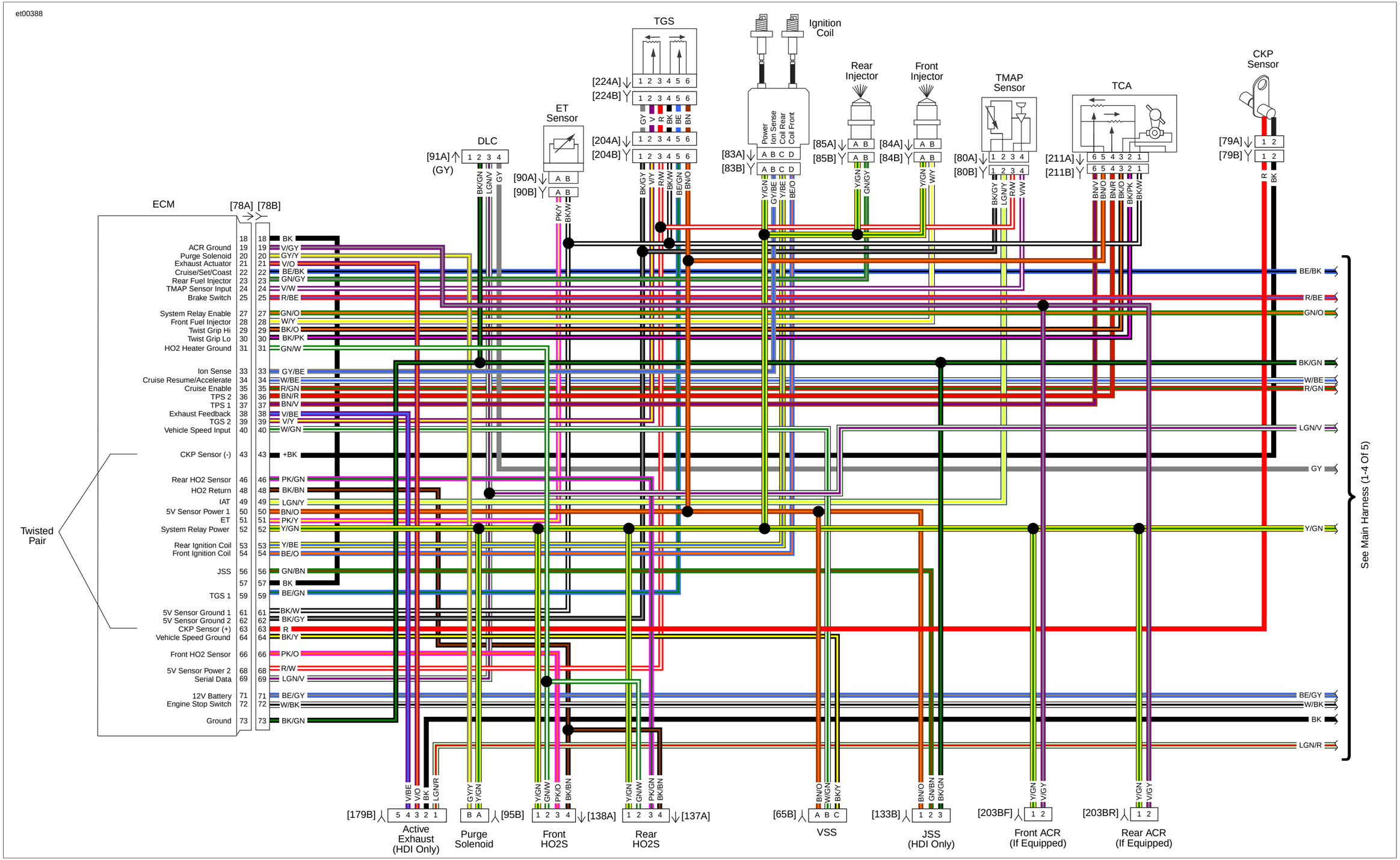


Figure B-18. MAIN HARNESS (5 OF 5): 2011 Touring

Figure B-18.
MAIN HARNESS (5 OF 5): 2011 Touring

Figure B-18.
MAIN HARNESS (5 OF 5): 2011 Touring

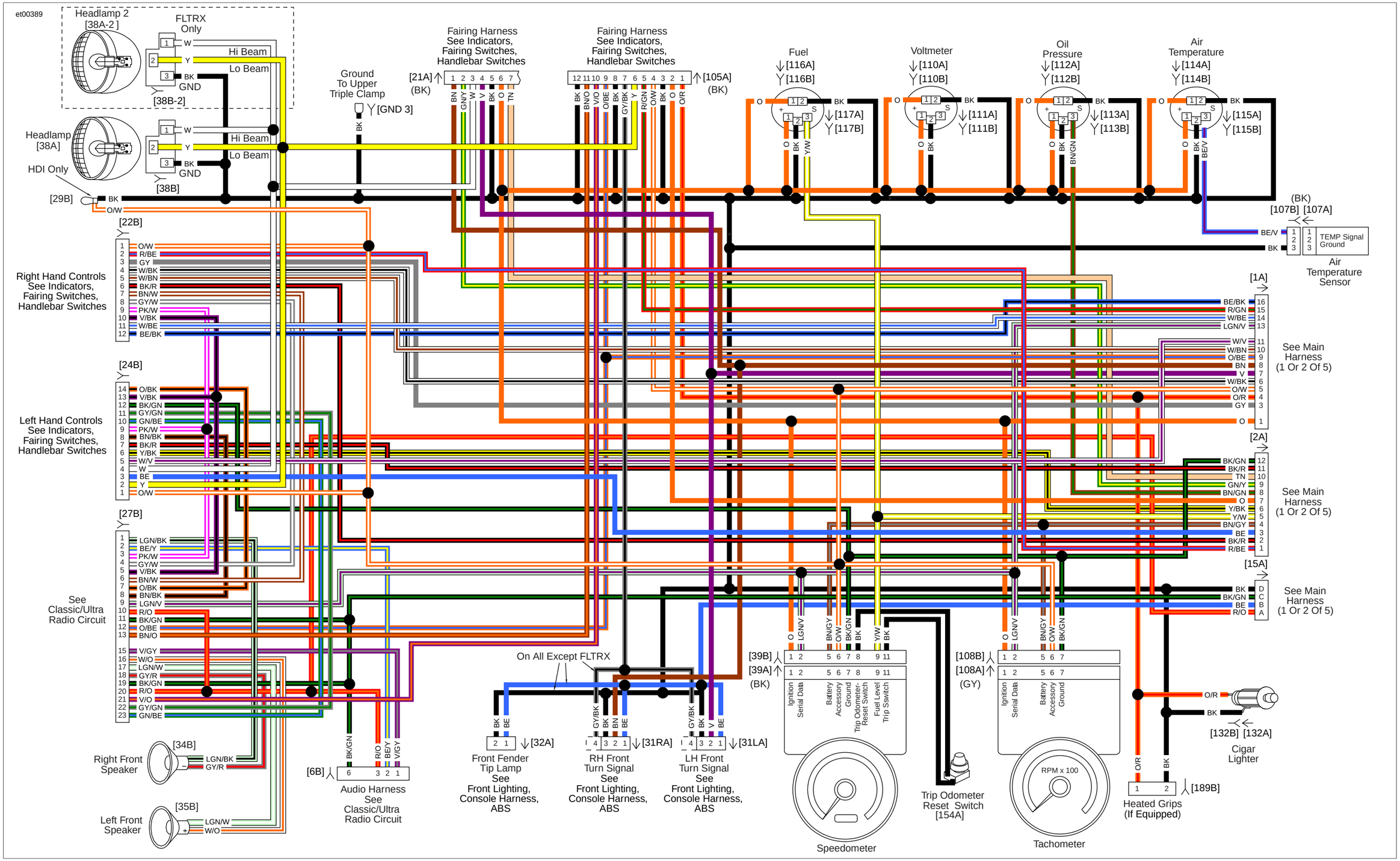
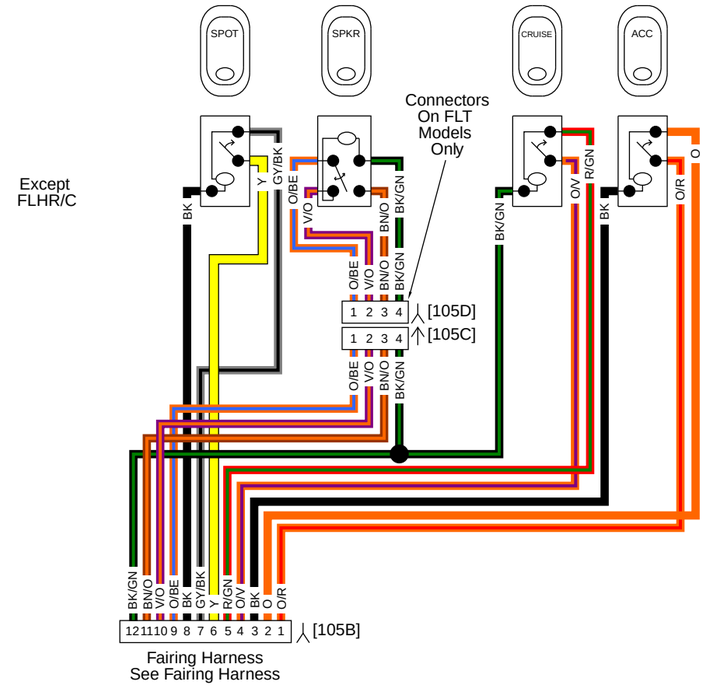


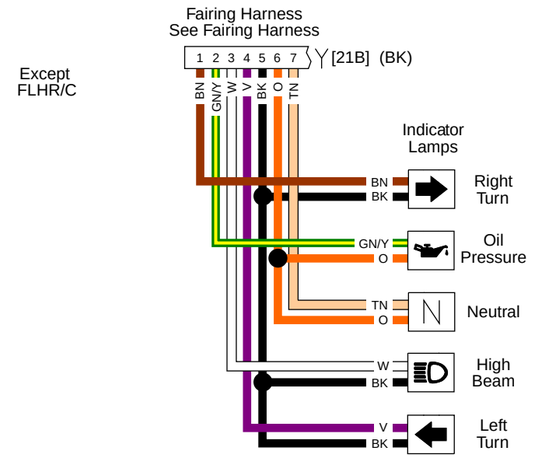
Figure B-19. Fairing Harness: 2011 Touring

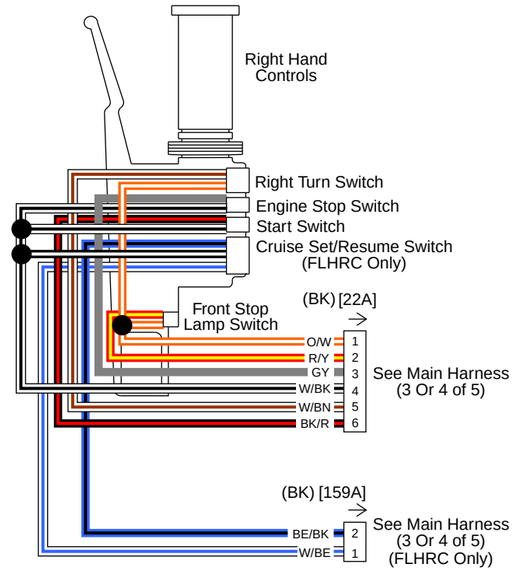
Figure B-19.
Fairing Harness: 2011 Touring

Figure B-19.
Fairing Harness: 2011 Touring

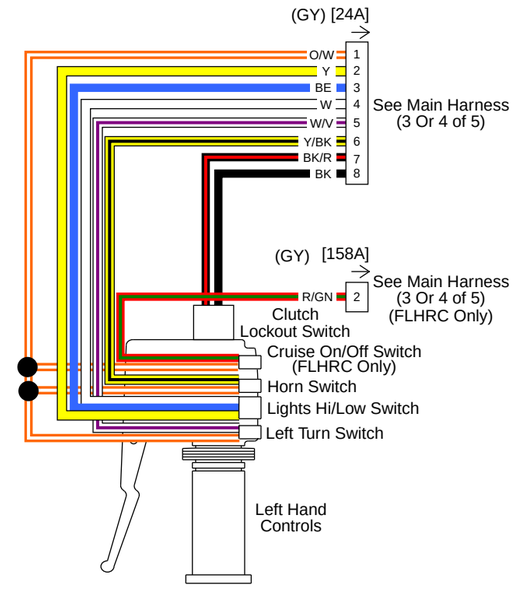
et00390







FLHR/C



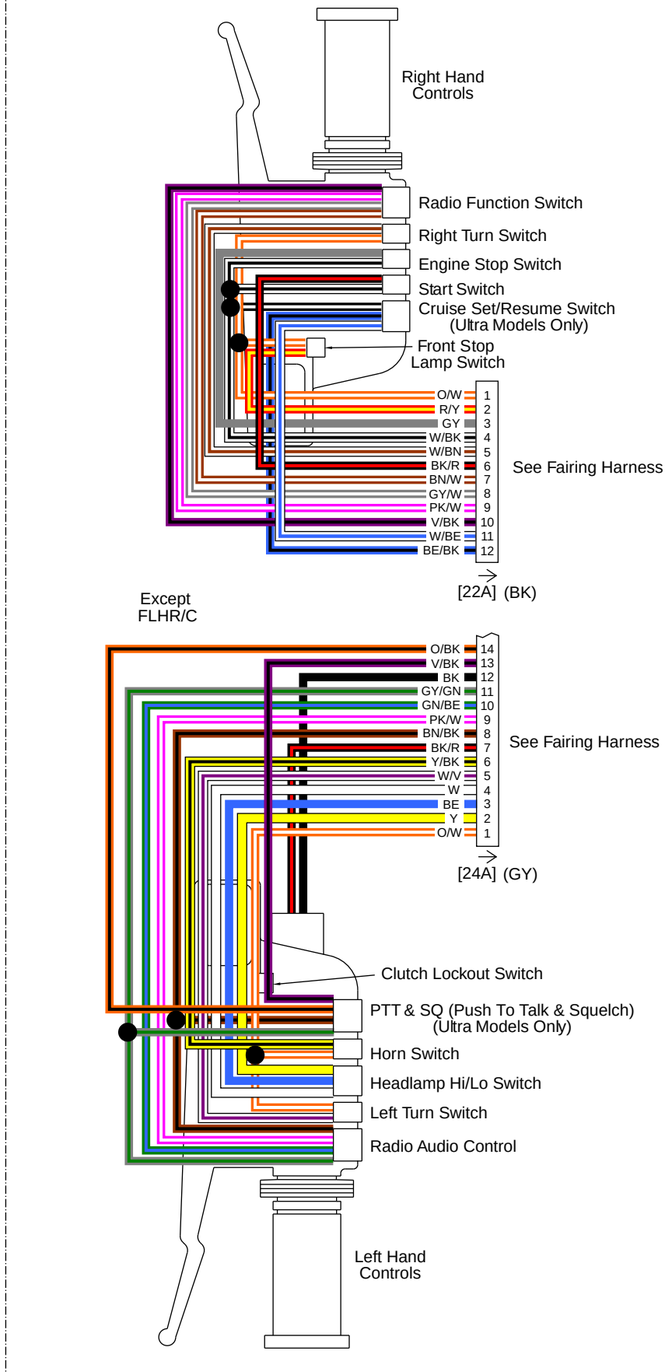


Figure B-20. Indicators, Fairing Switches, Handlebar Switches: 2011 Touring

Figure B-20.
Indicators, Fairing Switches, Handlebar Switches: 2011
Touring

Figure B-20.
Indicators, Fairing Switches, Handlebar Switches: 2011
Touring

et00391

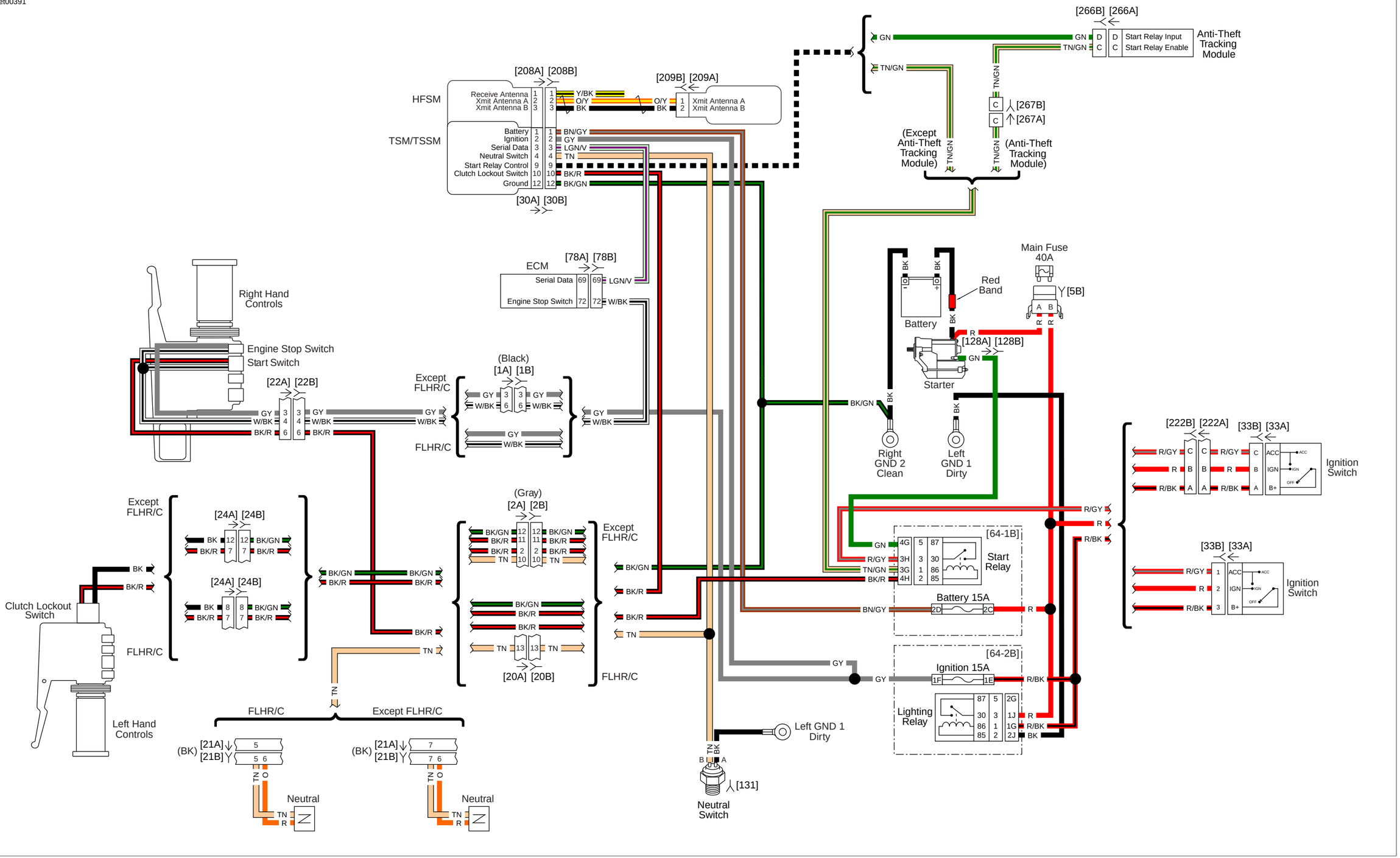


Figure B-21. Starting Circuit: 2011 Touring

Figure B-21.
Starting Circuit: 2011 Touring

Figure B-21.
Starting Circuit: 2011 Touring

et00392

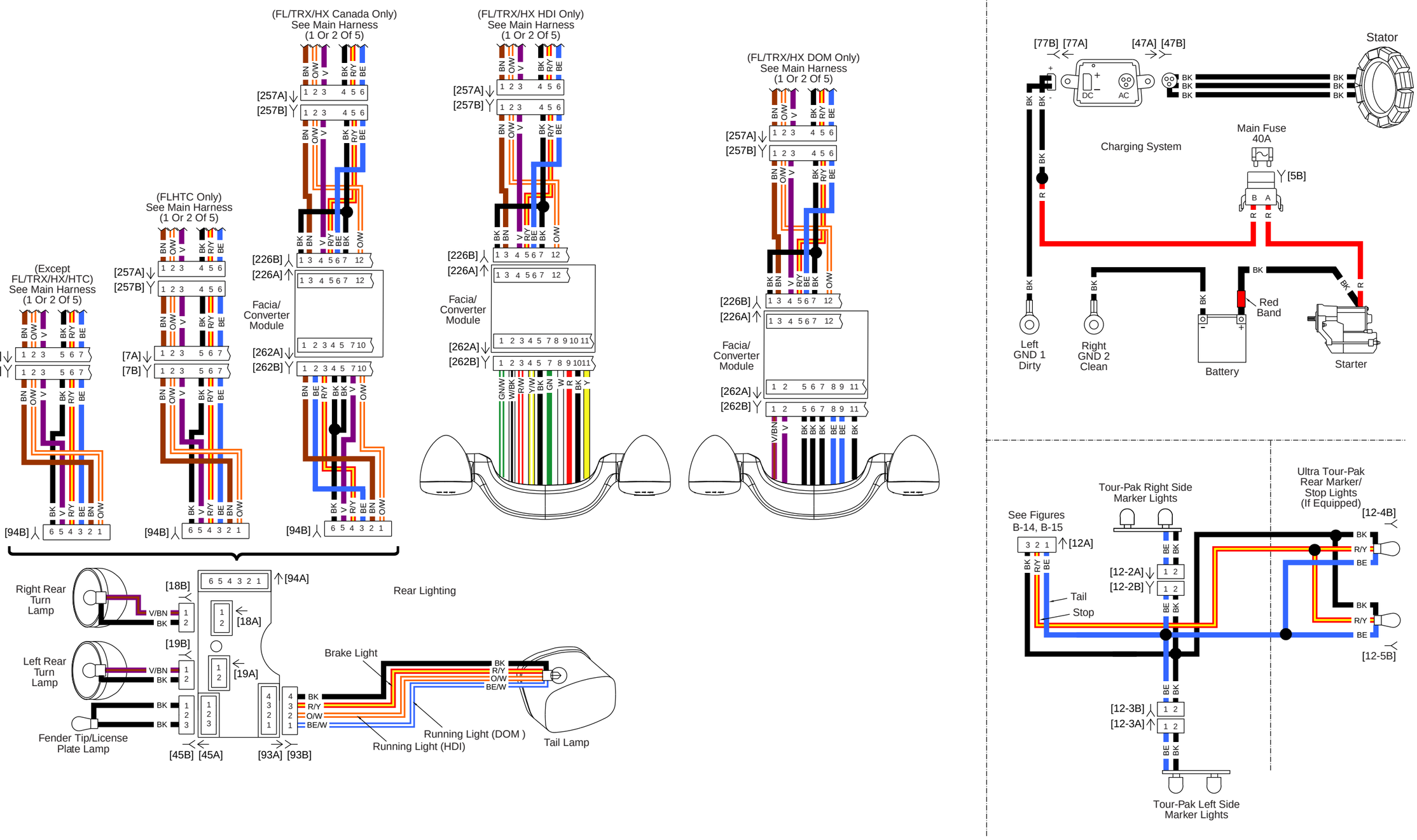
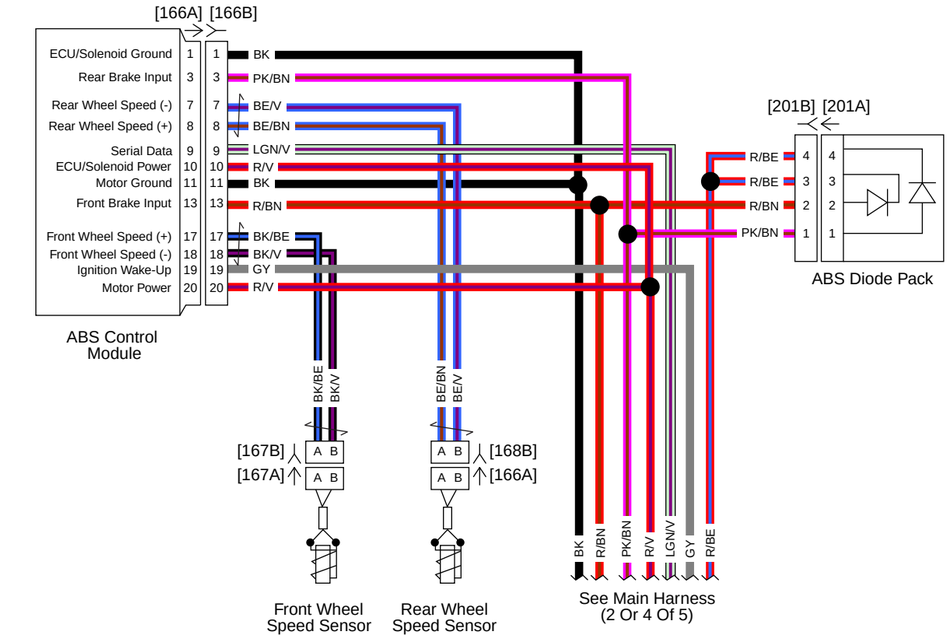


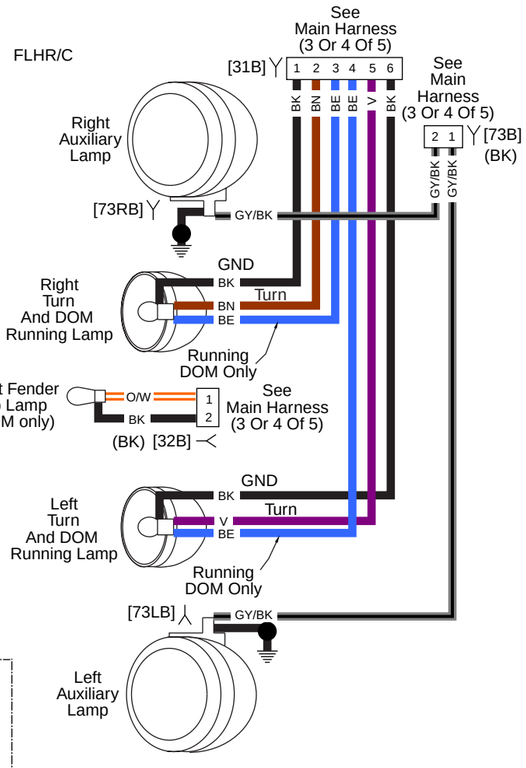
Figure B-22. Rear Lighting, Charging System: 2011 Touring

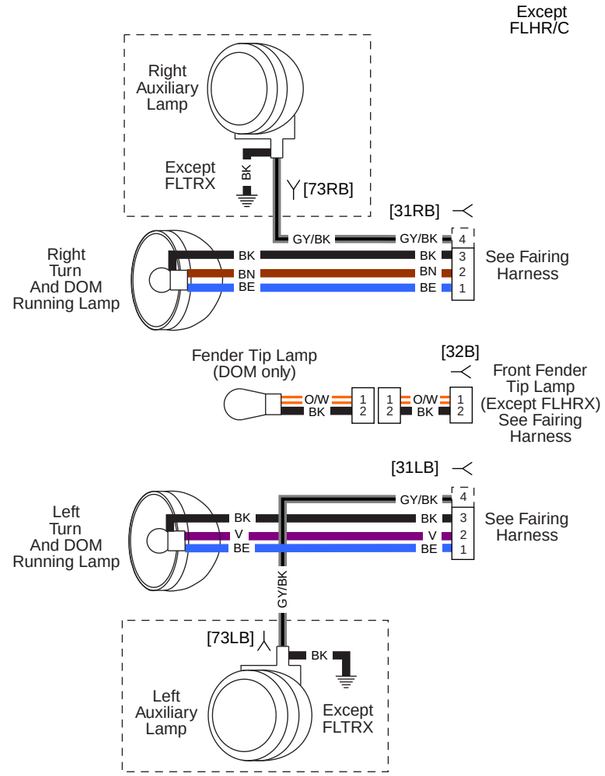
Figure B-22.
Rear Lighting, Charging System: 2011 Touring

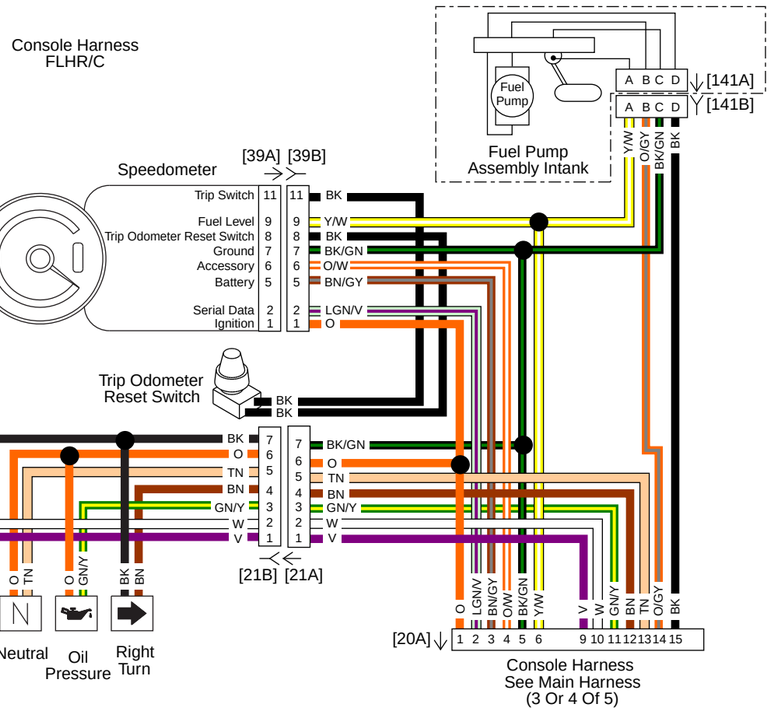
Figure B-22.
Rear Lighting, Charging System: 2011 Touring

et00393









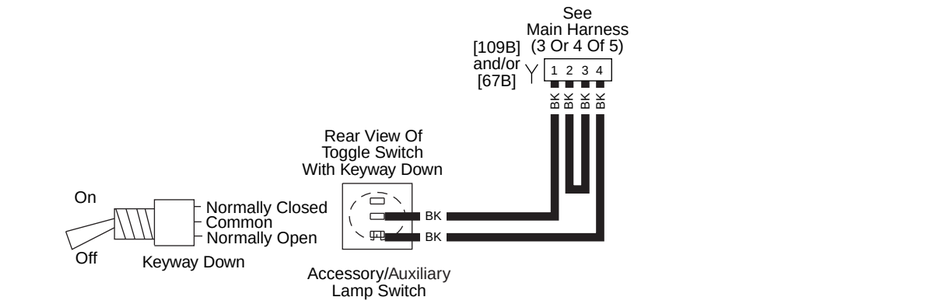


Figure B-23. Front Lighting, Console Harness, ABS: 2011 Touring

Figure B-23.
Front Lighting, Console Harness, ABS: 2011 Touring

Figure B-23.
Front Lighting, Console Harness, ABS: 2011 Touring

et00402

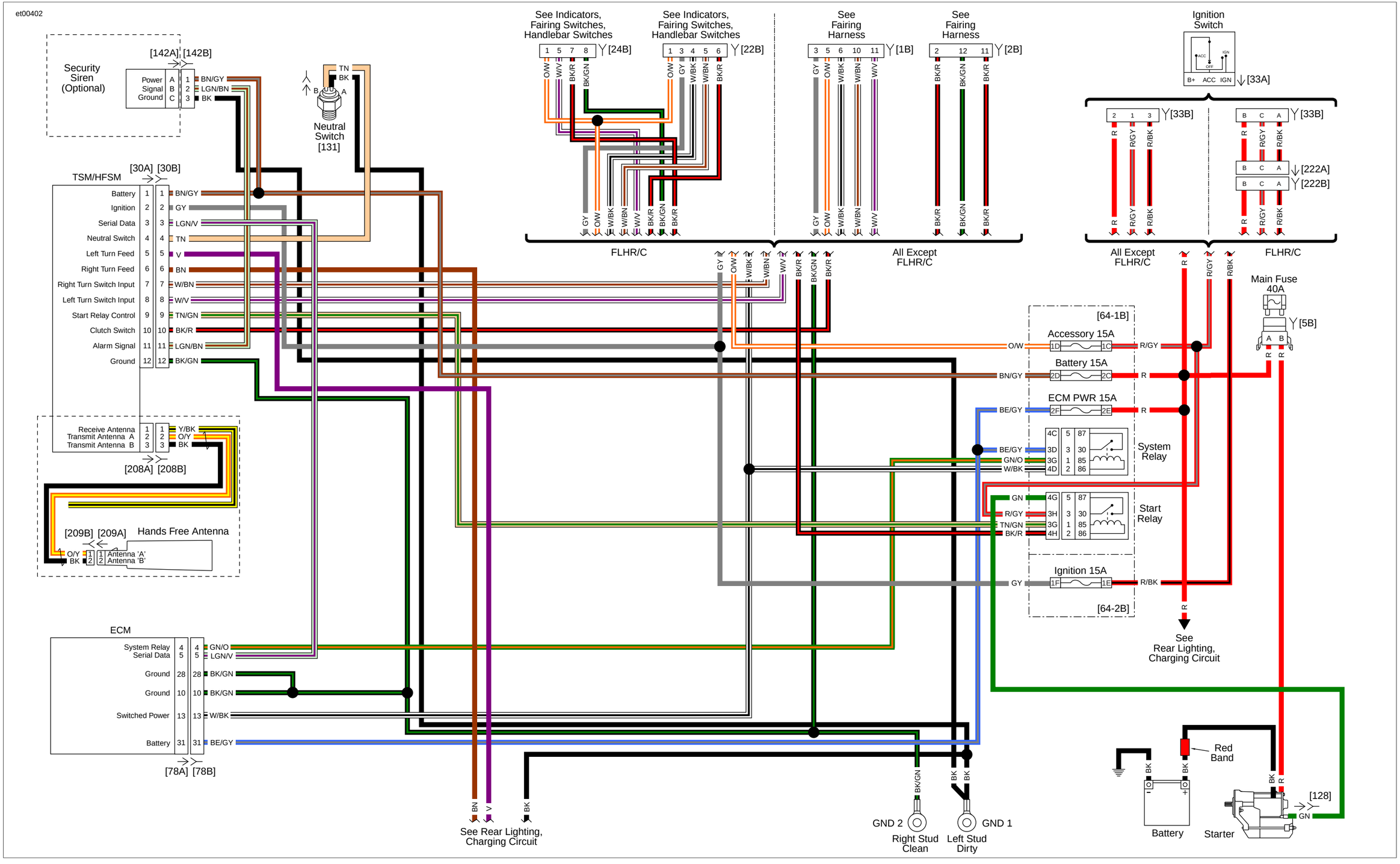


Figure B-24. Security Circuit: 2011 Touring

Figure B-24.
Security Circuit: 2011 Touring

Figure B-24.
Security Circuit: 2011 Touring

et00403

Anti-Theft Tracking Module

[142A] [142B]

Power
Signal
Ground

Right
Left
Start Enable
Start Input

[266A] [266B]

[267A] [267B]

Neutral Switch [131]

TSM/HFSM

[30A] [30B]

Battery
Ignition
Serial Data
Neutral Switch
Left Turn Feed
Right Turn Feed
Right Turn Switch Input
Left Turn Switch Input
Start Relay Control
Clutch Switch
Alarm Signal
Ground

BN/GY
GY
LGN/V
TN
V
BN
W/BN
W/V
GN
BK/R
LGN/BN
BK/GN

Receive Antenna
Transmit Antenna A
Transmit Antenna B

Y/BK
O/Y
BK

[208A] [208B]

[209B] [209A]

Hands Free Antenna

Antenna 'A'
Antenna 'B'

ECM

System Relay
Serial Data
Ground
Ground
Switched Power
Battery

GN/O
LGN/V
BK/GN
BK/GN
W/BK
BE/GY

[78A] [78B]

See Rear Lighting, Charging Circuit

See Indicators, Fairing Switches, Handlebar Switches

[24B]

See Indicators, Fairing Switches, Handlebar Switches

[22B]

See Fairing Harness

[1B]

See Fairing Harness

[2B]

FLHR/C

All Except FLHR/C

Ignition Switch

B+ ACC IGN

[33A]

[33B]

[222A]

[222B]

All Except FLHR/C

FLHR/C

Main Fuse 40A

[5B]

[64-1B]

Accessory 15A

Battery 15A

ECM PWR 15A

Ignition 15A

[64-2B]

System Relay

Start Relay

See Rear Lighting, Charging Circuit

GND 2
Right Stud Clean

GND 1
Left Stud Dirty

Red Band

Battery

Starter

[128]

Figure B-25. Security Circuit: 2011 Touring With Anti-Theft Tracking Module

Figure B-25.
Security Circuit: 2011 Touring With Anti-Theft Tracking Module

Figure B-25.
Security Circuit: 2011 Touring With Anti-Theft Tracking Module

et00281

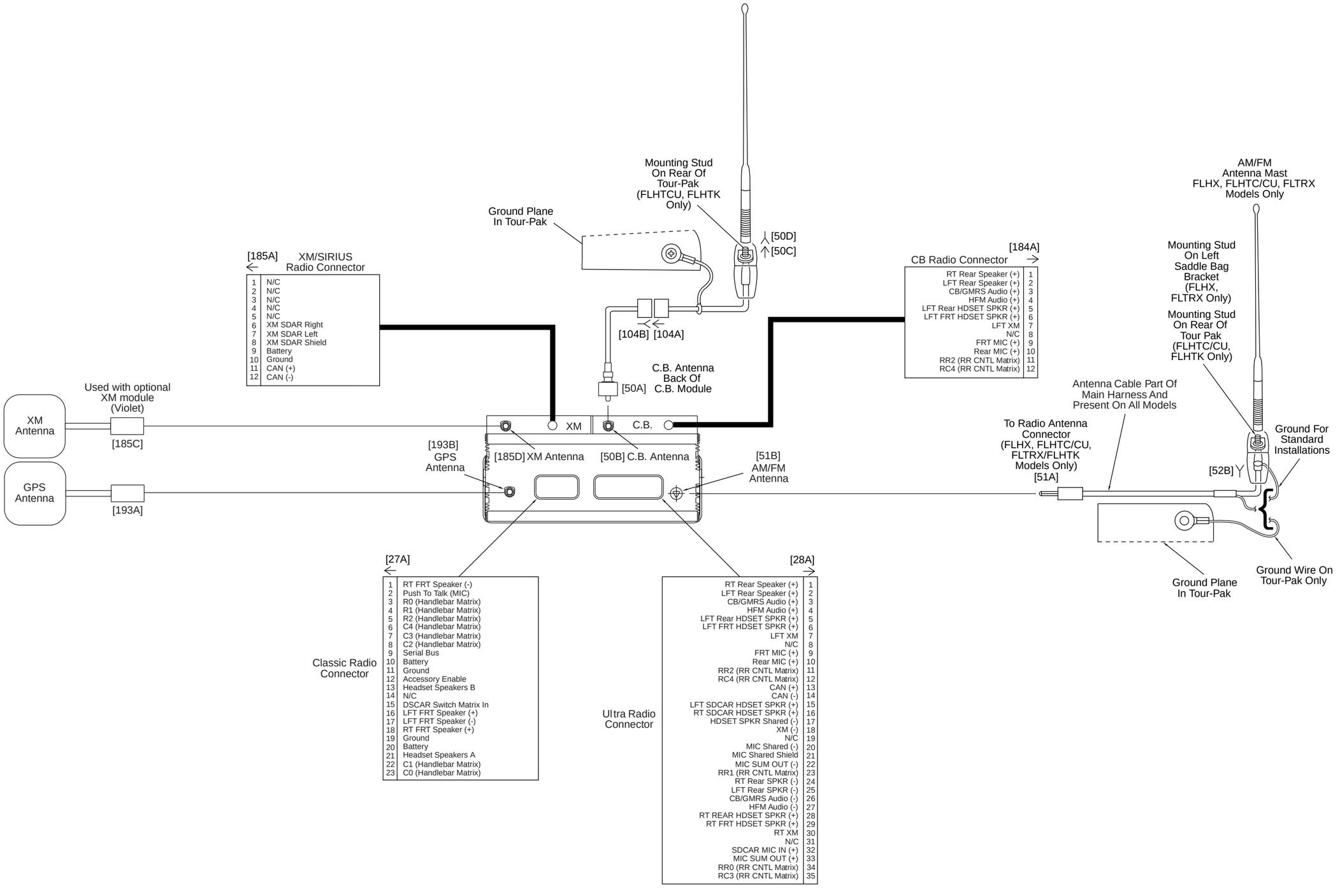


Figure B-26. Ultra Radio RF Interconnect Circuit: 2011 Touring

Figure B-26.
Ultra Radio RF Interconnect Circuit: 2011 Touring

Figure B-26.
Ultra Radio RF Interconnect Circuit: 2011 Touring

et00394

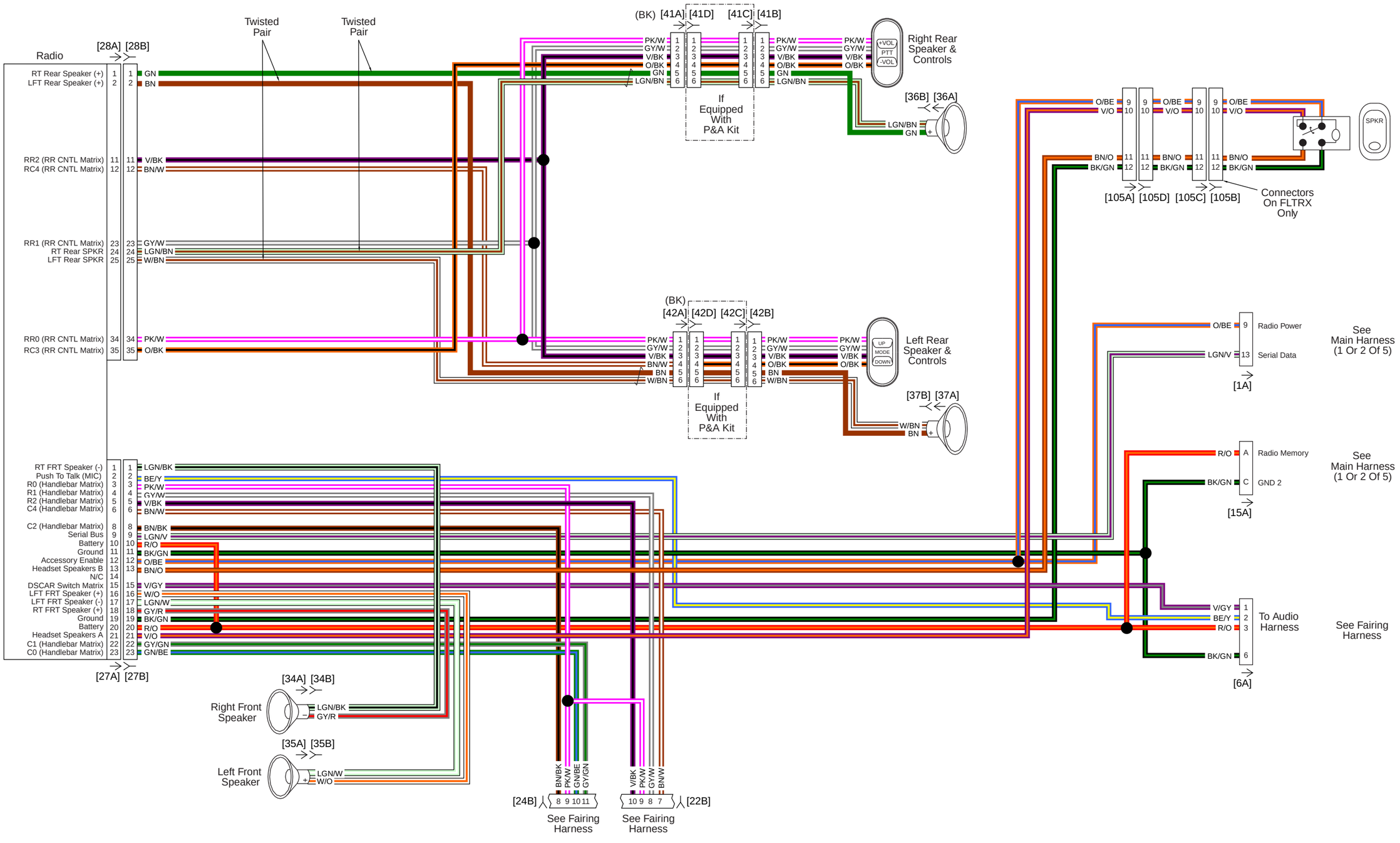


Figure B-27. Classic Radio Circuit: 2011 Touring

Figure B-27.
Classic Radio Circuit: 2011 Touring

Figure B-27.
Classic Radio Circuit: 2011 Touring

et00410

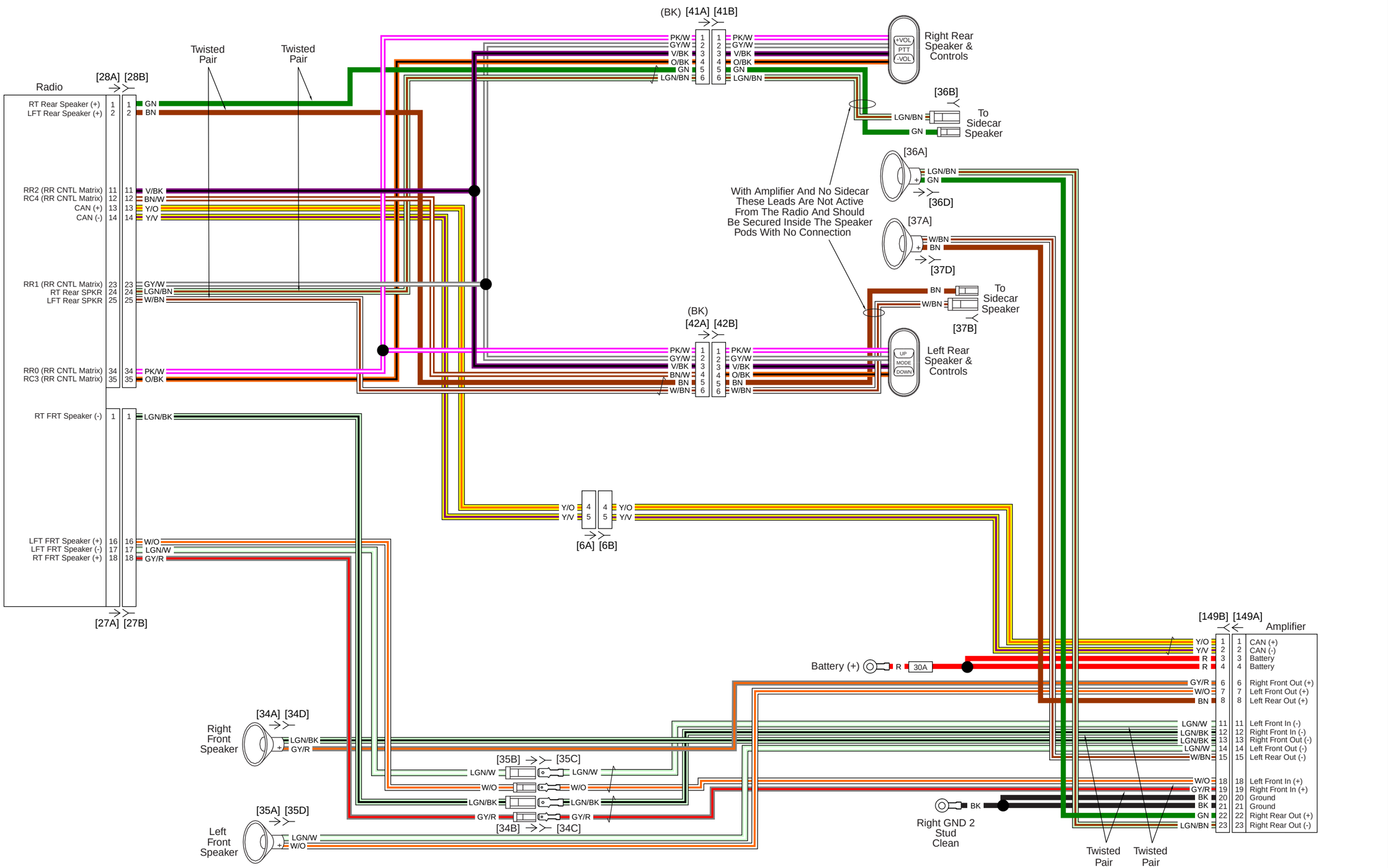


Figure B-28. Ultra Radio Circuit: 2011 Touring

Figure B-28.
Ultra Radio Circuit: 2011 Touring

Figure B-28.
Ultra Radio Circuit: 2011 Touring

et00411

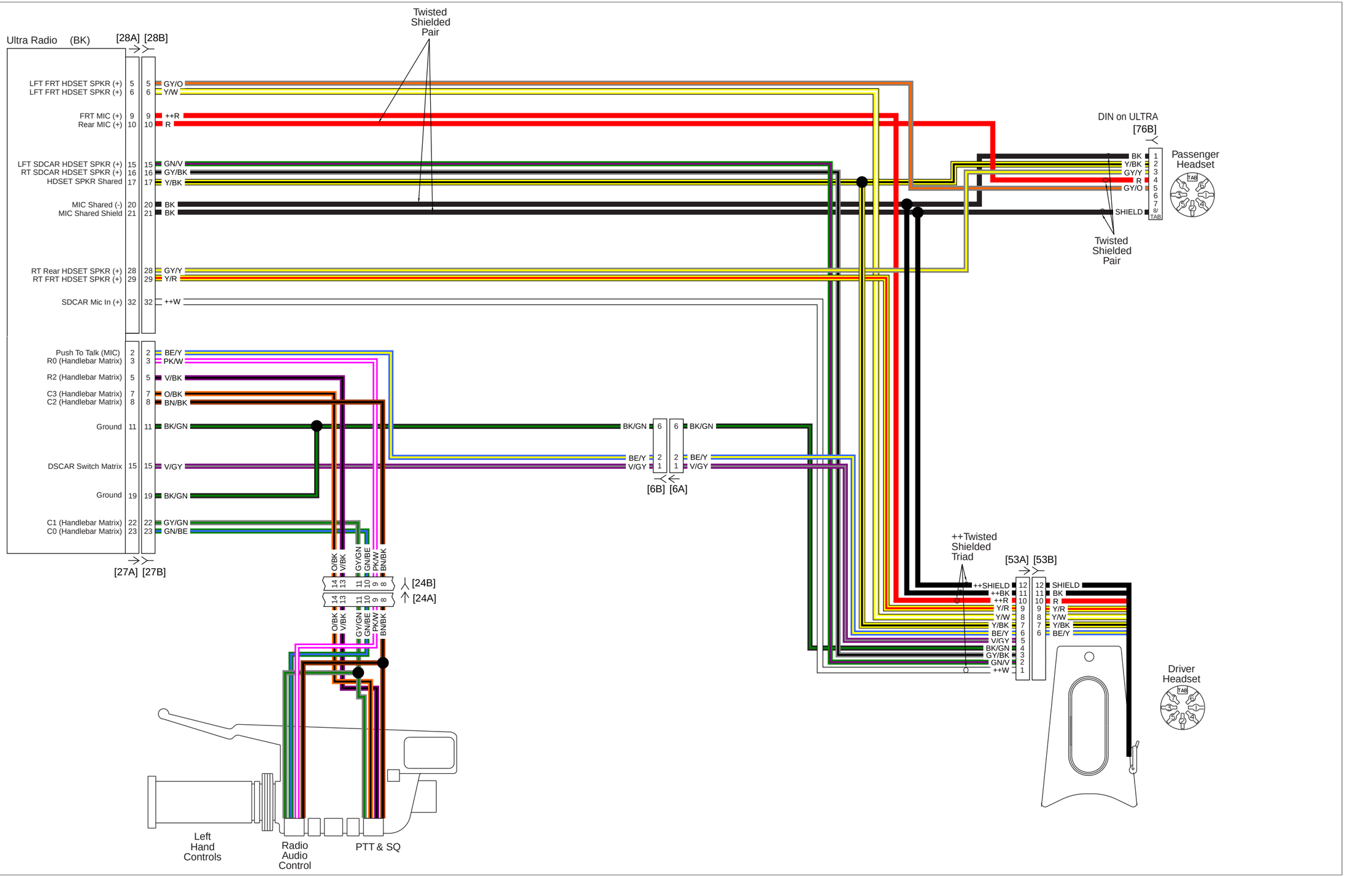


Figure B-29. 2-Place Intercom and Headset Audio: 2011 Touring

Figure B-29.
2-Place Intercom and Headset Audio: 2011 Touring

Figure B-29.
2-Place Intercom and Headset Audio: 2011 Touring

et00412

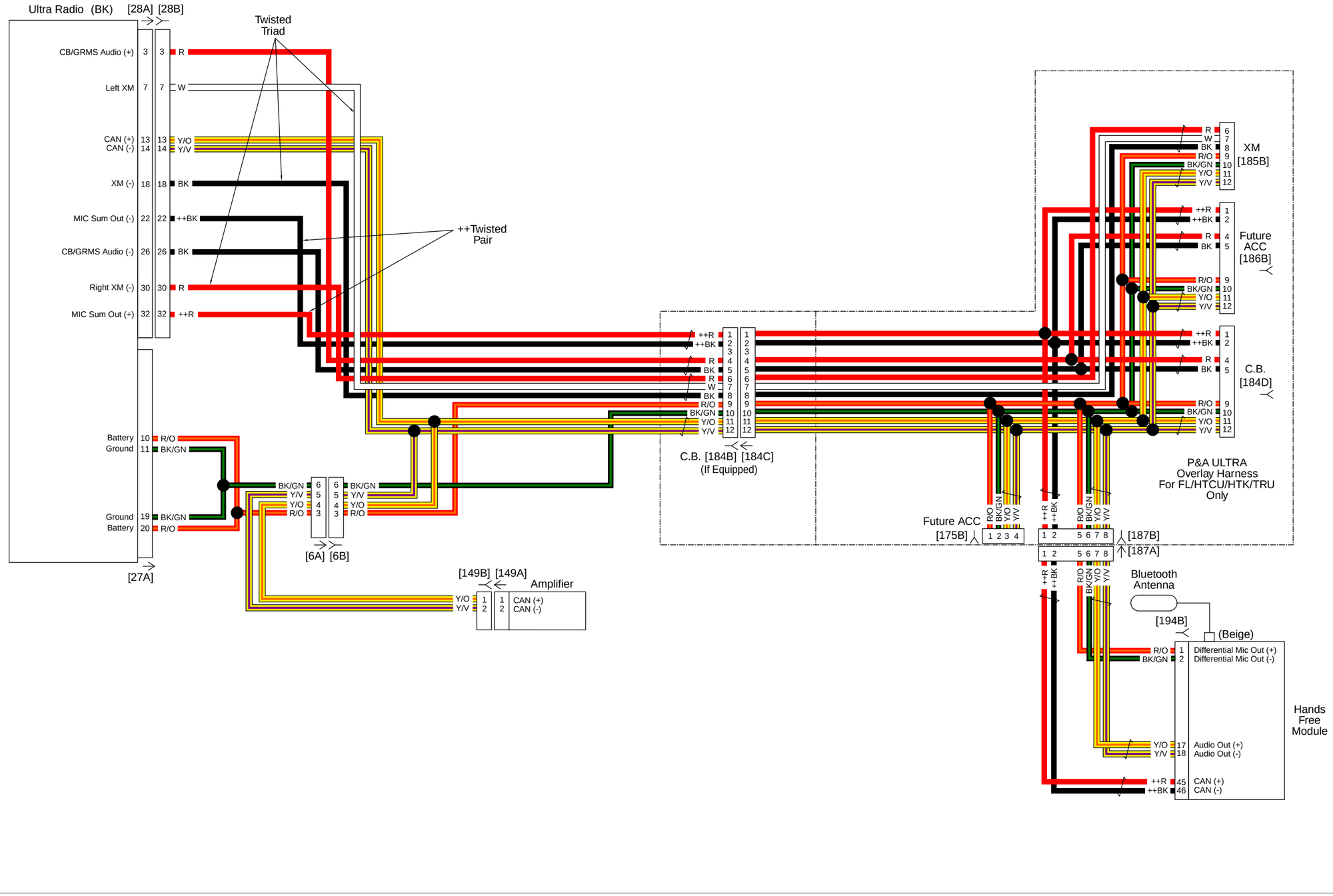


Figure B-30. CAN and Module Audio Inputs to Ultra Radio: 2011 Touring

Figure B-30.
CAN and Module Audio Inputs to Ultra Radio: 2011 Touring

Figure B-30.
CAN and Module Audio Inputs to Ultra Radio: 2011 Touring

TABLE OF CONTENTS

SUBJECT	PAGE NO.
C.1 FASTENER TORQUE VALUES	C-1
C.2 ABS MODULE	C-2
C.3 WHEEL SPEED SENSORS	C-5
C.4 ABS BRAKE LINES	C-7

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

NOTES

FASTENER TORQUE VALUES C.1

FASTENER TORQUE VALUES IN THIS CHAPTER

The table below lists torque values for all fasteners presented in this chapter.

FASTENER	TORQUE VALUE		NOTES
ABS ECU-to-HCU fastener	35-45 **in-lbs**	4.0-5.1 Nm	C.2 ABS MODULE, Hydraulic Control Unit (HCU)
ABS ECU-to-HCU fastener	35-45 **in-lbs**	4.0-5.1 Nm	C.2 ABS MODULE, Electronic Control Unit (ECU)
ABS module fastener	39-60 **in-lbs**	4.4-6.8 Nm	C.2 ABS MODULE, Hydraulic Control Unit (HCU)
Banjo bleeder bolt to front calipers	17-19 ft-lbs	23.1-25.8 Nm	C.4 ABS BRAKE LINES, ABS Module to Front Brake Calipers
Banjo bolt to ABS module	12.5-14.5 ft-lbs	16.9-19.7 Nm	C.2 ABS MODULE, Hydraulic Control Unit (HCU)
Banjo bolt to ABS module	12.5-14.5 ft-lbs	16.9-19.7 Nm	C.4 ABS BRAKE LINES, Front Master Cylinder to ABS Module
Banjo bolt to ABS module	12.5-14.5 ft-lbs	16.9-19.7 Nm	C.4 ABS BRAKE LINES, ABS Module to Front Brake Calipers
Banjo bolt to ABS module	12.5-14.5 ft-lbs	16.9-19.7 Nm	C.4 ABS BRAKE LINES, Rear Master Cylinder to ABS Module
Banjo bolt to ABS module	12.5-14.5 ft-lbs	16.9-19.7 Nm	C.4 ABS BRAKE LINES, ABS Module to Rear Brake Caliper
Banjo bolt to front master cylinder	12.5-14.5 ft-lbs	16.9-19.7 Nm	C.4 ABS BRAKE LINES, Front Master Cylinder to ABS Module
Banjo bolt to rear caliper	17-19 ft-lbs	23.1-25.8 Nm	C.4 ABS BRAKE LINES, ABS Module to Rear Brake Caliper
Banjo bolt to rear master cylinder	12.5-14.5 ft-lbs	17.0-19.7 Nm	C.4 ABS BRAKE LINES, Rear Master Cylinder to ABS Module
Brake light switch bracket fastener	80-100 **in-lbs**	9.0-11.3 Nm	C.4 ABS BRAKE LINES, Rear Master Cylinder to ABS Module
Brake line bracket flange screw	20-30 **in-lbs**	2.3-3.4 Nm	C.4 ABS BRAKE LINES, Front Master Cylinder to ABS Module
Brake line bracket flange screw	20-30 **in-lbs**	2.3-3.4 Nm	C.4 ABS BRAKE LINES, ABS Module to Front Brake Calipers
Brake pedal shaft locknut	15-20 ft-lbs	20-27 Nm	C.4 ABS BRAKE LINES, Rear Master Cylinder to ABS Module
Front brake caliper mounting screws	28-38 ft-lbs	37.9-51.5 Nm	C.3 WHEEL SPEED SENSORS, Front Wheel Speed Sensor
Front brake line-to-lower fork bracket fastener	120-180 **in-lbs**	13.6-20.3 Nm	C.4 ABS BRAKE LINES, ABS Module to Front Brake Calipers
Rear brake light switch	12-15 ft-lbs	16.3-20.3 Nm	C.4 ABS BRAKE LINES, Rear Master Cylinder to ABS Module/Use Loctite Pipe Sealant with Teflon 565
Rear master cylinder-to-frame screws	126-150 **in-lbs**	14.2-17.0 Nm	C.4 ABS BRAKE LINES, Rear Master Cylinder to ABS Module

ABS MODULE C.2

HYDRAULIC CONTROL UNIT (HCU)

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER

NOTE

The ABS module consists of the hydraulic control unit (HCU) and the electronic control unit (ECU), each of which can be serviced separately. Follow the procedure below to replace the HCU or the entire ABS module assembly.

Removal

1. Remove right side saddlebag. See 2.26 SADDLEBAGS.
2. Remove right side cover.
3. Remove battery. See 1.23 BATTERY MAINTENANCE.

NOTE

For best results, use the BASIC VACUUM BRAKE BLEEDER (Part No. Snap-On BB200A) or equivalent tool to drain the brake systems.

4. Drain brake systems.
5. Disconnect ABS module electrical connector.

NOTE

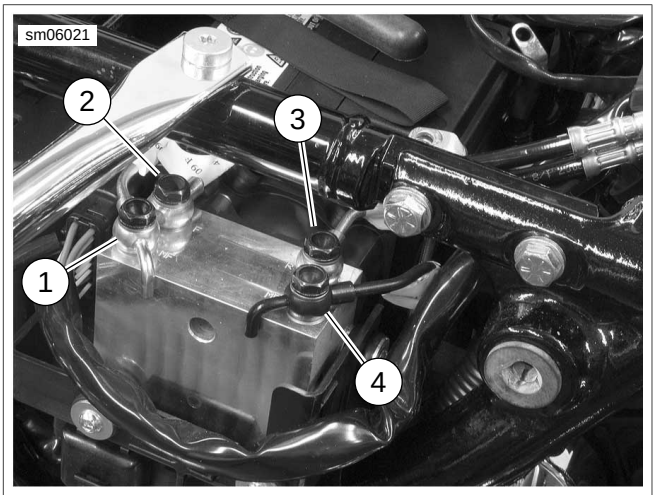
Wrap banjo fittings with pieces of shop towel to absorb leakage of residual brake fluid.

6. See Figure C-1. Remove four banjo bolts to release brake lines from ABS module. Discard sealing washers.

NOTICE

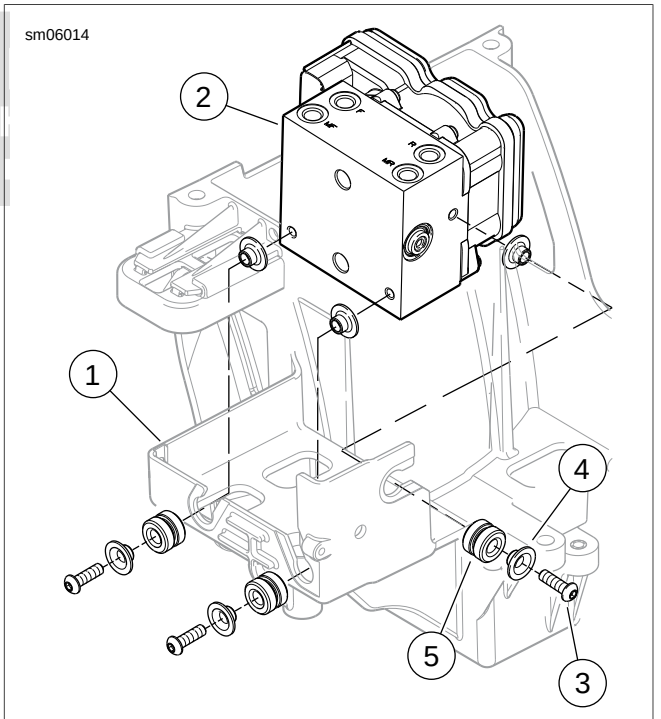
This device is sensitive to electrostatic discharge (ESD). Care must be taken to prevent exposure to ESD while handling the electronic control unit (ECU) alone or when mated to the hydraulic control unit (HCU). Always touch the motorcycle frame or a grounded surface before handling. (00588b)

7. See Figure C-2. Remove three fasteners (3) to release ABS module (2) from battery tray (1).
8. Remove ABS module from motorcycle.
9. Inspect three rubber mounts (5) for damage or deterioration. If replacement is necessary, proceed as follows:
   a. Remove bushing (4) from each side of rubber mount. Remove rubber mount from battery tray.
   b. Install **new** rubber mount. Install bushing in each side of rubber mount.
10. See Figure C-3. Remove four fasteners (4) to separate the HCU from the ECU.



1. **Front master cylinder-to-ABS module line**
2. **ABS module-to-front caliper line**
3. **ABS module-to-rear caliper line**
4. **Rear master cylinder-to-ABS module line**

Figure C-1. ABS Module Connections



1. **Battery tray**
2. **ABS module**
3. **Fastener (3)**
4. **Bushing (6)**
5. **Rubber mount (3)**

Figure C-2. ABS Module

Installation

NOTICE

This device is sensitive to electrostatic discharge (ESD). Care must be taken to prevent exposure to ESD while handling the electronic control unit (ECU) alone or when mated to the hydraulic control unit (HCU). Always touch the motorcycle frame or a grounded surface before handling. (00588b)

1. See Figure C-3. Install gasket (2) to ECU (3).
2. Secure ECU to HCU using four fasteners (4). Tighten fasteners to 35-45 **in-lbs** (4.0-5.1 Nm).
3. See Figure C-2. Position ABS module (2) on battery tray (1).
4. Install three fasteners (3) and tighten to 39-60 **in-lbs** (4.4-6.8 Nm).
5. See Figure C-1. Install banjo fittings to their respective ports on the ABS module using **new** sealing washers. Be sure to route banjo fitting of brake line for front brake calipers beneath brake line from front master cylinder.
6. Tighten banjo bolts to 12.5-14.5 ft-lbs (16.9-19.7 Nm).
7. Connect ABS module electrical connector.
8. Install battery. See 2.26 SADDLEBAGS.
9. If a **new** ABS module assembly or ABS module ECU were installed, program the ECU using DIGITAL TECHNICIAN II (Part No. HD-48650).

⚠WARNING

Any time the ABS module, either master cylinder, or any line between a master cylinder and the ABS module is disconnected or replaced, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to do so could result in air in the hydraulic brake system, reducing brake efficiency, which could result in death or serious injury. (00585b)

10. Fill and bleed brake systems. See 2.16 BLEEDING BRAKES.

NOTE

For best results, use the BASIC VACUUM BRAKE BLEEDER (Part No. Snap-On BB200A) or equivalent tool.

11. To confirm that the brake systems are properly connected and air is completely purged, install master cylinder reservoir covers, connect motorcycle to DIGITAL TECHNICIAN II (Part No. HD-48650) and perform "ABS Service" procedure.
12. Install right side cover.
13. Install right side saddlebag. See 1.23 BATTERY MAINTENANCE.

⚠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)

14. Operate motorcycle at low speeds and verify braking systems operate properly.

ELECTRONIC CONTROL UNIT (ECU)

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Removal

1. Remove battery. See 2.26 SADDLEBAGS.

NOTE

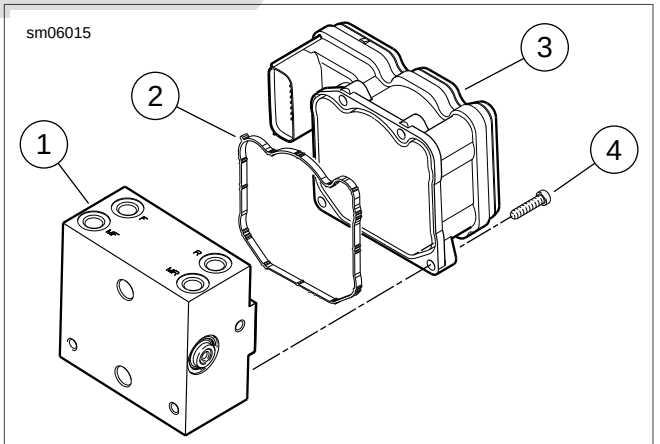
It is not necessary to remove the ABS module assembly to replace the ABS ECU.

2. Disconnect ABS module electrical connector.

NOTICE

This device is sensitive to electrostatic discharge (ESD). Care must be taken to prevent exposure to ESD while handling the electronic control unit (ECU) alone or when mated to the hydraulic control unit (HCU). Always touch the motorcycle frame or a grounded surface before handling. (00588b)

3. See Figure C-3. Remove four fasteners (4) and separate ECU (3) from HCU (1).



1. **Hydraulic control unit (HCU)**
2. **Gasket**
3. **Electrical control unit (ECU)**
4. **Fastener (4)**

Figure C-3. ABS Module Components

Installation

NOTICE

This device is sensitive to electrostatic discharge (ESD). Care must be taken to prevent exposure to ESD while handling the electronic control unit (ECU) alone or when mated to the hydraulic control unit (HCU). Always touch the motorcycle frame or a grounded surface before handling. (00588b)

1. See Figure C-3. Install gasket (2) to ECU (3).
2. Secure ECU to HCU using four fasteners (4). Tighten fasteners to 35-45 **in-lbs** (4.0-5.1 Nm).
3. Install battery. See 1.23 BATTERY MAINTENANCE.
4. If a **new** ABS module ECU was installed, program the ECU using DIGITAL TECHNICIAN II (Part No. HD-48650).

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

WHEEL SPEED SENSORS C.3

FRONT WHEEL SPEED SENSOR

Removal

1. **Road King and Fork mounted fairing models:** Turn front wheel to right fork stop. Reach under headlamp nacelle or fairing cap (as equipped) on left side of steering head and disconnect front wheel speed sensor connector. Draw connector down through opening.
2. **Frame mounted fairing models:** Turn front wheel to right fork stop. Gently pull cable to draw front wheel speed sensor connector out left side of fairing bracket. Disconnect connector.
3. Cut cable straps to release front wheel speed sensor cable from brake hose.
4. See Figure C-4. Release front wheel speed sensor cable from clip as follows:
   a. Push on lip (1) at rear of clip to disengage from bracket. Rotate tab (2) (stamped ABS) rearward until clip is perpendicular to bracket and remove cable.

   NOTE

   If clip is not installed as described below, tab can slip out of slot in bracket. If this occurs, remove caliper mounting screws to release bracket from fork slider and then install tab in slot. Install bracket and tighten screws to 28-38 ft-lbs (37.9-51.5 Nm).

   b. Rotate tab (2) forward until clip is aligned with bracket and apply pressure to tab until lip (1) engages.
5. Retract axle until front wheel speed sensor is free. See 2.4 FRONT WHEEL.

NOTE

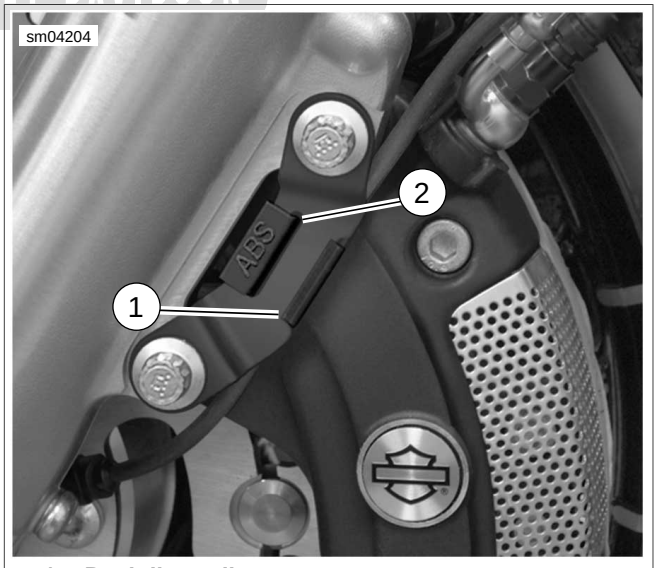
The wheel speed sensor works in conjunction with the ABS encoder bearing installed in the wheel hub. If necessary, see 2.10 SEALED WHEEL BEARINGS for removal and installation instructions.

Installation

NOTES

- *Always keep the wheel speed sensor away from magnetic fields (such as magnetic parts trays, magnetic base dial indicators, alternator rotors, etc.) or damage will occur. Never pull wheel speed sensor cable taut or use to retain wheel, axle or other components.*
- *Install wheel speed sensor with index pin on the out-board side or sensor will be damaged during installation.*

1. Push axle through **new** front wheel speed sensor and left fork slider.
2. Secure front wheel. See 2.4 FRONT WHEEL. Be sure to rotate front wheel speed sensor until index pin makes contact with shoulder on fork slider as shown in Figure C-5.
3. Route wheel speed sensor cable up to lower fork bracket following brake hose.
4. **Road King and Fork mounted fairing models:** Turn front wheel to right fork stop. Feed connector up through opening in front of lower fork bracket and connect to socket housing.
5. **Frame mounted fairing models:** Turn front wheel to right fork stop. Connect front wheel speed sensor connector and feed connector under main harness conduit into left side of fairing bracket.
6. Secure the sensor cable and fender tip lamp wires using three **new** cable straps as follows:
   a. On the brake hose lower crimp capturing front wheel speed sensor cable and brake hose.
   b. Approximately midway between the upper and lower brake hose crimps capturing front wheel speed sensor cable, brake hose and front fender tip lamp wires, if equipped.
   c. Approximately 2.5 in. (63.5 mm) below the brake hose upper crimp capturing front wheel speed sensor cable, brake hose and front fender tip lamp wires, if equipped.
7. See Figure C-4. Install front wheel speed sensor cable in clip as follows:
   a. Push on lip (1) at rear of clip to disengage from bracket. Rotate tab (2) (stamped ABS) rearward until clip (1) is perpendicular to bracket and install cable.
   b. Rotate tab (2) forward and apply pressure until lip (1) engages. Gently tug on cable to verify that clip is properly installed.



1. Push lip to disengage
2. Push tab to engage

Figure C-4. Front Wheel Speed Sensor Cable Clip

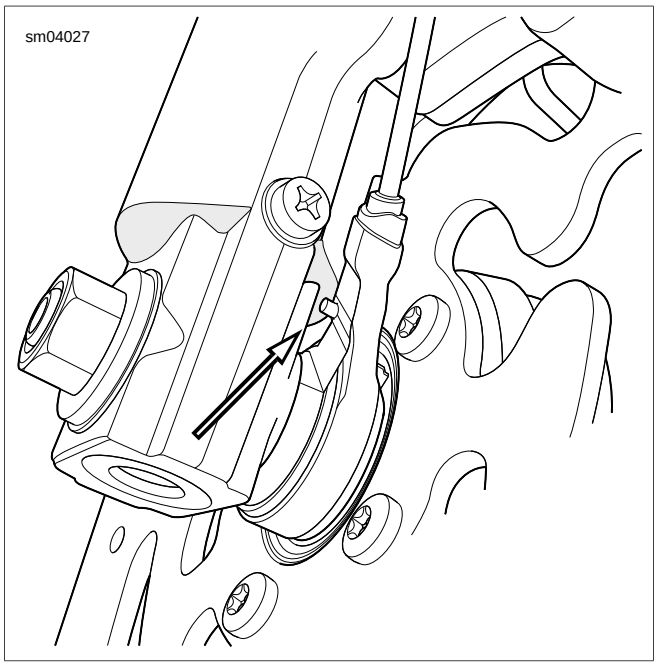


Figure C-5. Front Wheel Speed Sensor Index Pin

REAR WHEEL SPEED SENSOR

Removal

1. Remove right saddlebag. See 2.26 SADDLEBAGS.
2. Remove right side cover.
3. Release rear wheel speed sensor connector from anchor on right side battery tray. Disconnect connector.
4. Rear wheel speed sensor cable and rear brake hose are secured to the rear fork with two cable retainers. The sensor cable is additionally secured to the brake hose with a conduit clip. Free rear wheel speed sensor cable from all three.
5. Retract axle until rear wheel speed sensor is free. See 2.5 REAR WHEEL.

NOTE

The wheel speed sensor works in conjunction with the ABS encoder bearing installed in the wheel hub. If necessary, see 2.10 SEALED WHEEL BEARINGS for removal and installation instructions.

Installation

NOTES

- *Always keep the wheel speed sensor away from magnetic fields (such as magnetic parts trays, magnetic base dial indicators, alternator rotors, etc.) or damage will occur. Never pull wheel speed sensor cable taut or use to retain wheel, axle or other components.*
- *Install wheel speed sensor with index pin on the out-board side or sensor will be damaged during installation.*

1. See Figure C-6. Hold **new** rear wheel speed sensor in place with index pin outboard toward rear fork, and push axle through sensor, caliper bracket and right side of rear fork.
2. Secure rear wheel. See 2.5 REAR WHEEL. Rotate rear wheel speed sensor until index pin makes contact with caliper bracket at point shown in Figure C-6.
3. Route rear wheel speed sensor cable forward along top of rear fork.
4. Capture rear wheel speed sensor cable and brake hose in rear cable clips on top of rear fork. Secure cable to brake hose with conduit clip placed 1.25 in. (31.8 mm) ahead of the rear brake hose crimp.
5. Route cable to outboard right side of battery caddy. Connect pin and socket housings and secure to anchor.
6. Install right side cover.
7. Install right saddlebag. See 2.26 SADDLEBAGS.

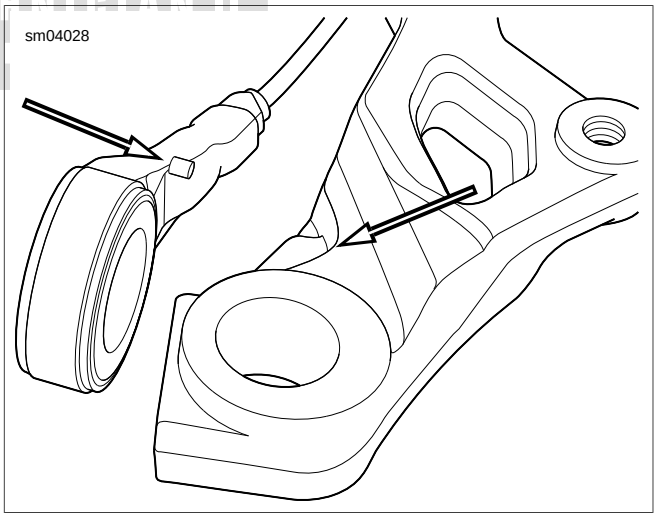


Figure C-6. Rear Wheel Speed Sensor Index Pin

ABS BRAKE LINES C.4

FRONT MASTER CYLINDER TO ABS MODULE

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

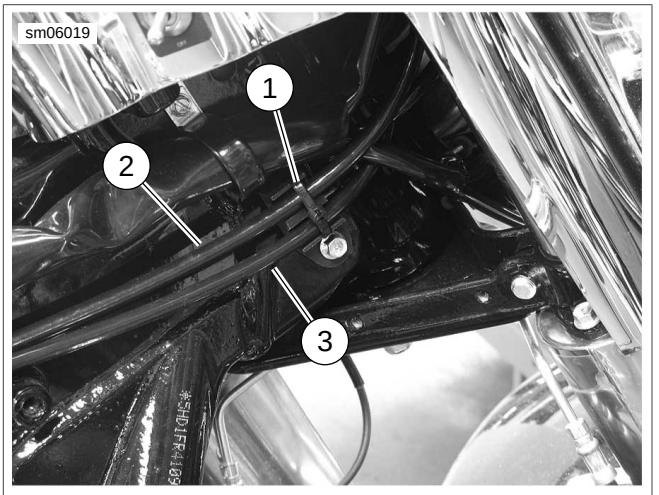
Removal

1. Remove right side saddlebag. See 2.26 SADDLEBAGS.
2. Remove right side cover.
3. Remove fuel tank. See 4.5 FUEL TANK.
4. Remove top caddy. See 7.8 ELECTRICAL CADDIES.
5. **Road King models:** Remove right side headlamp nacelle. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.
6. **Fork mounted fairing models:** Remove outer fairing and fairing cap. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS and 2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS, respectively.
7. **Frame mounted fairing models:** Remove bezel. See 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS.
8. Cut cable strap to release brake line from right handlebar riser or right handlebar.
9. See Figure C-7. Cut cable strap (1) to release brake lines (2, 3) from brake line bracket at right side of steering head.
10. See Figure C-8. Release brake lines (2, 3) from wire trough (1).

NOTE

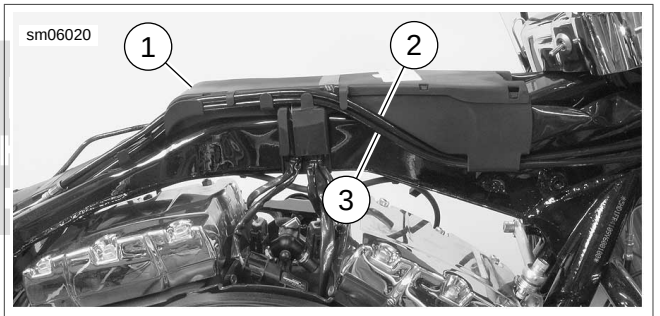
Wrap banjo fittings with pieces of shop towel to absorb any loss of brake fluid.

11. See Figure C-9. Remove banjo bolt to release brake line (1) from MF port of ABS module. Discard sealing washers.
12. Remove cover from master cylinder reservoir.
13. Remove banjo bolt to release brake line from master cylinder reservoir. Hold suitable container under banjo bolt bore to allow reservoir to drain. Discard sealing washers.
14. Remove brake line from motorcycle.



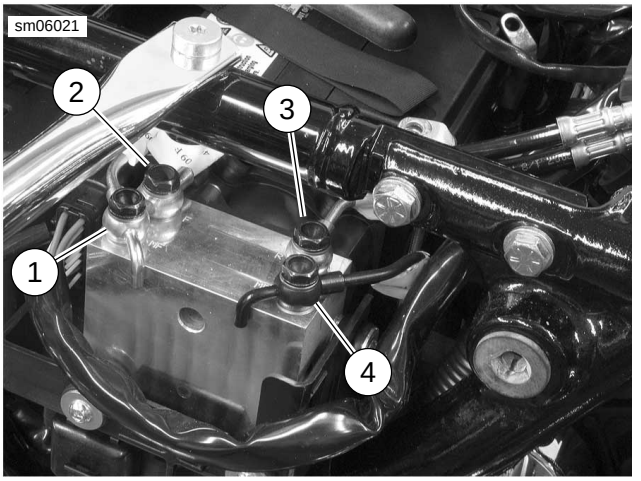
1. **Cable strap**
2. **Front master cylinder-to-ABS module line**
3. **ABS module-to-front caliper line**

Figure C-7. Brake Line Bracket



1. **Wire trough**
2. **Front master cylinder-to-ABS module line**
3. **ABS module-to-front caliper line**

Figure C-8. Brake Line Routing



1. **Front master cylinder-to-ABS module line**
2. **ABS module-to-front caliper line**
3. **ABS module-to-rear caliper line**
4. **Rear master cylinder-to-ABS module line**

Figure C-9. ABS Module Connections

Installation

1. Position brake line along right side of wire trough with rear banjo fitting adjacent to ABS module.
2. Feed front section of brake line forward along right side of steering head, past upper fork bracket, and to master cylinder.
3. Start banjo bolt with **new** sealing washers to secure brake line to master cylinder.
4. Start banjo bolt with **new** sealing washers to secure brake line to MF port of ABS module.
5. Secure brake line as follows:
   a. **Road King and Frame mounted fairing models:** Loosely install **new** cable strap to secure handlebar switch harness and brake hose to right handlebar riser.
   b. **Fork mounted fairing models:** Install **new** cable strap 2.5 in. (63.5 mm) rear of fairing cap opening to secure handlebar switch harness and brake line to right handlebar.
6. See Figure C-7. Be sure lines are routed as shown and secure with **new** cable strap (1) to brake line bracket at right side of steering head.

NOTE

*If installing **new** brake line bracket, tighten flange screw to 20-30 **in-lbs** (2.3-3.4 Nm).*

7. See Figure C-8. Secure brake lines to wire trough.
8. Tighten master cylinder banjo bolt to 12.5-14.5 ft-lbs (16.9-19.7 Nm).
9. Tighten ABS module banjo bolt to 12.5-14.5 ft-lbs (16.9-19.7 Nm).

⚠WARNING

Any time the ABS module, either master cylinder, or any line between a master cylinder and the ABS module is disconnected or replaced, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to do so could result in air in the hydraulic brake system, reducing brake efficiency, which could result in death or serious injury. (00585b)

10. Fill and bleed brake system. See 2.16 BLEEDING BRAKES.
11. To confirm that brake system is properly connected and that all air is purged, connect motorcycle to DIGITAL TECHNICIAN II (Part No. HD-48650) and perform "ABS Service" procedure.
12. **Road King models:** Install right side headlamp nacelle. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.
13. **Fork mounted fairing models:** Install outer fairing and fairing cap. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS and 2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS, respectively.
14. **Frame mounted fairing models:** Install bezel. See 2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS.
15. Install top caddy. See 7.8 ELECTRICAL CADDIES.
16. Install fuel tank. See 4.5 FUEL TANK.
17. Install right side cover.
18. Install right saddlebag. See 2.26 SADDLEBAGS.

ABS MODULE TO FRONT BRAKE CALIPERS

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Removal

1. Remove right side saddlebag. See 2.26 SADDLEBAGS.
2. Remove right side cover.
3. Remove fuel tank. See 4.5 FUEL TANK.
4. Remove top caddy. See 7.8 ELECTRICAL CADDIES.
5. **Road King models:** Remove left side headlamp nacelle. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.
6. **Fork mounted fairing models:**
   a. Remove outer fairing and fairing cap. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS and 2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS, respectively.
   b. Remove front turn signal lamps or auxiliary lamps as equipped. See 7.16 TURN SIGNAL LAMPS or 7.13 AUXILIARY LAMPS AND BRACKETS.
   c. Remove chrome skirt.

7. **Frame mounted fairing models:** No disassembly required.
8. Cut three cable straps to release front wheel speed sensor cable and front fender tip lamp wires (if equipped) from left caliper brake hose.
9. Cut cable strap to release brake line from right handlebar riser or right handlebar.
10. See Figure C-7. Cut cable strap (1) to release brake lines (2, 3) from brake line bracket at right side of steering head.
11. Remove fastener securing front brake lines to the lower fork bracket.

NOTE

Wrap banjo fittings with pieces of shop towel to absorb any loss of brake fluid.

12. See Figure C-9. Remove banjo bolt to release brake line (2) from F port of ABS module. Discard sealing washers.
13. Remove banjo bleeder bolts to release brake lines to calipers. Discard sealing washers.
14. Pull brake line forward to remove from motorcycle.

Installation

1. Feed brake line rearward below lower fork bracket and along right side of steering head and wire trough.
2. Secure caliper brake lines to lower fork bracket. Verify that brake lines are equal distance from the left and right fork sliders and that the crimp joints can not touch the fender. Tighten fastener to 120-180 **in-lbs** (13.6-20.3 Nm).
3. Start banjo bleeder bolts with **new** sealing washers to secure brake lines to calipers.
4. See Figure C-9. Route banjo fitting (2) under brake line (1) and start banjo bolt with **new** sealing washers to secure brake line to F port of ABS module.
5. Secure brake line as follows:
   a. **Road King and Frame mounted fairing models:** Loosely install **new** cable strap to secure handlebar switch harness and brake hose to right handlebar riser.
   b. **Fork mounted fairing models:** Install **new** cable strap 2.5 in. (63.5 mm) rear of fairing cap opening to secure handlebar switch harness and brake line to right handlebar.
6. See Figure C-7. Route lines as shown and secure with **new** cable strap (1) to brake line bracket at right side of steering head.

NOTE

*If installing **new** brake line bracket, tighten flange screw to 20-30 **in-lbs** (2.3-3.4 Nm).*

7. See Figure C-8. Secure brake lines to wire trough.
8. Tighten caliper banjo bleeder bolts to 17-19 ft-lbs (23.1-25.8 Nm).
9. Tighten ABS module banjo bolt to 12.5-14.5 ft-lbs (16.9-19.7 Nm).
10. Secure the sensor cable and fender tip lamp wires using three **new** cable straps as follows:
    a. On the brake hose lower crimp capturing front wheel speed sensor cable and brake hose.
    b. Approximately midway between the upper and lower brake hose crimps capturing front wheel speed sensor cable, brake hose and front fender tip lamp wires, if equipped.
    c. Approximately 2.5 in. (63.5 mm) below the brake hose upper crimp capturing front wheel speed sensor cable, brake hose and front fender tip lamp wires, if equipped.
11. Fill and bleed brake system. See 2.16 BLEEDING BRAKES.
12. To confirm that brake system is properly connected and that all air is purged, connect motorcycle to DIGITAL TECHNICIAN II (Part No. HD-48650) and perform "ABS Service" procedure.
13. **Road King models:** Install left side headlamp nacelle. See 2.44 HEADLAMP NACELLE: ROAD KING MODELS.
14. **Fork mounted fairing models:**
    a. Install chrome skirt. Do not capture brake line between chrome skirt and front of steering head, as it may become pinched or kinked when handlebar is turned. Route brake line above chrome skirt as shown in Figure C-10.
    b. Install front turn signal lamps or auxiliary lamps as equipped. See 7.16 TURN SIGNAL LAMPS or 7.13 AUXILIARY LAMPS AND BRACKETS.
    c. Install outer fairing and fairing cap. See 2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS and 2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS, respectively.
15. Install top caddy. See 7.8 ELECTRICAL CADDIES.
16. Install fuel tank. See 4.5 FUEL TANK.
17. Install right side cover.
18. Install right side saddlebag. See 2.26 SADDLEBAGS.



Figure C-10. Route Brake Line to Front Calipers Above Chrome Skirt

REAR MASTER CYLINDER TO ABS MODULE

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Removal

1. Remove right side saddlebag. See 2.26 SADDLEBAGS.
2. Remove right side cover.
3. Remove right side rider footboard. See 2.49 FOOTBOARDS AND FOOTRESTS.
4. See Figure C-12. Free brake line from electrical harness conduit clips (6).
5. Remove terminals from rear brake light switch (4).
6. Remove fastener (5) securing brake light switch bracket to frame.
7. Remove cable strap near middle frame downtube.

NOTE

Wrap banjo fittings with pieces of shop towel to absorb any loss of brake fluid.

8. See Figure C-11. Remove banjo bolt (4) to release brake line from MR port of ABS module. Discard sealing washers.
9. See Figure C-12. Remove socket terminals from rear brake light switch (4). Cut cable strap to free rear brake light switch wires from lower frame tube, if necessary.
10. Remove fastener (5).
11. Stand motorcycle upright so rear master cylinder reservoir is level.

NOTE

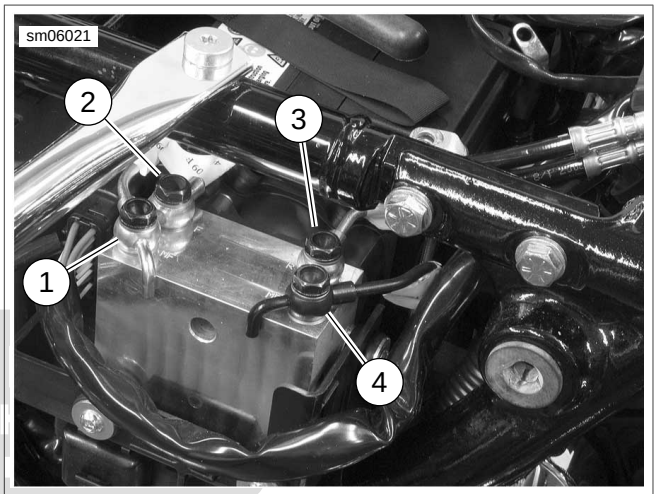
To prevent dirt and other contaminants from entering the master cylinder reservoir, thoroughly clean the cover before removal.

12. Remove cover from master cylinder reservoir.

NOTE

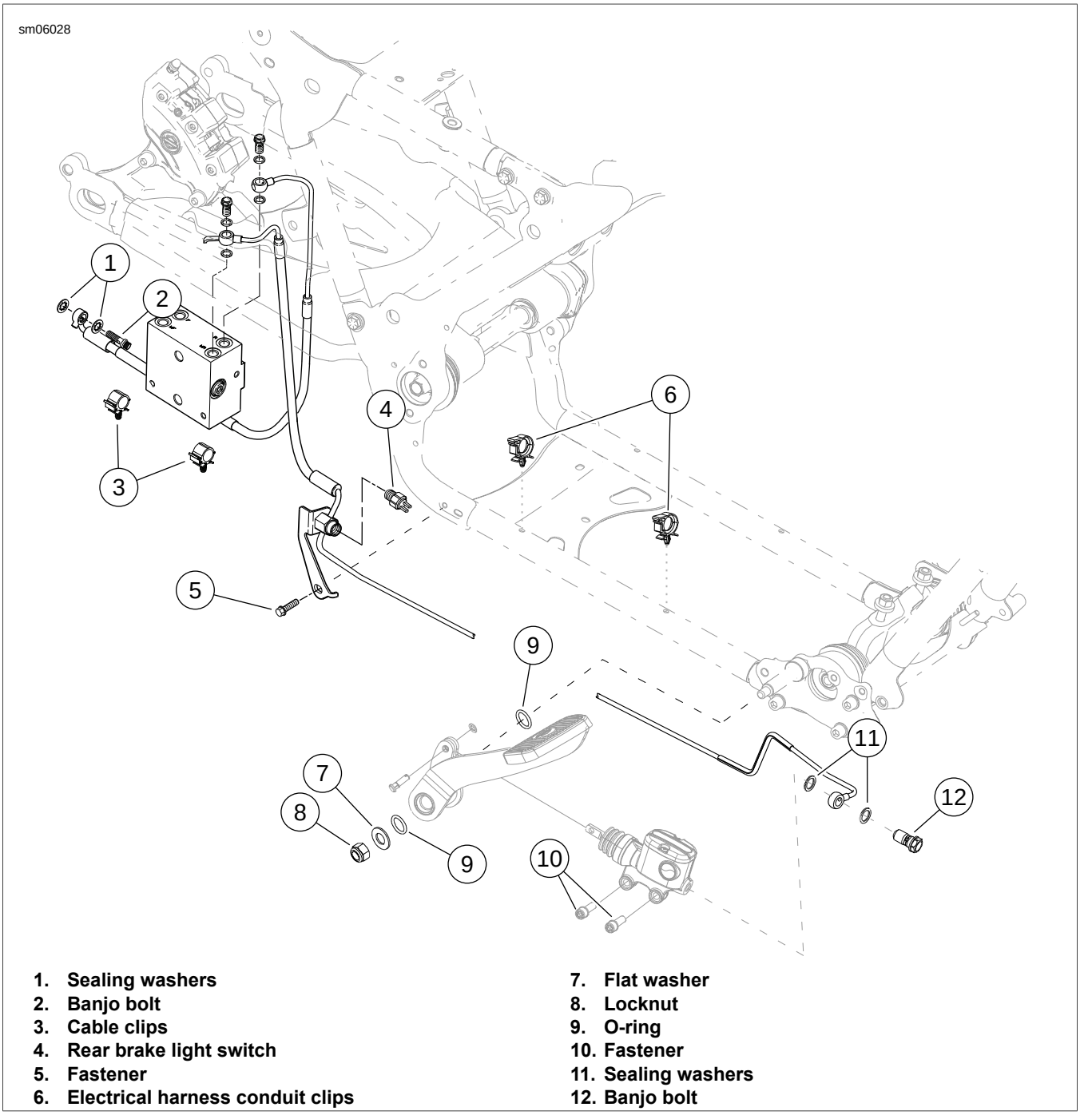
Wrap banjo fittings with pieces of shop towel to absorb any loss of brake fluid.

13. Remove banjo bolt (12) from master cylinder reservoir. Hold suitable container under banjo bolt bore to allow reservoir to drain. Discard sealing washers (11).
14. Using a clean shop cloth, wipe out any remaining fluid in the master cylinder reservoir.
15. Remove screws (10) securing master cylinder to frame.
16. Remove locknut (8) with flat washer (7) and pull brake pedal/master cylinder assembly from pedal shaft. Remove and discard O-rings (9).
17. Remove brake line from motorcycle.



1. **Front master cylinder-to-ABS module line**
2. **ABS module-to-front caliper line**
3. **ABS module-to-rear caliper line**
4. **Rear master cylinder-to-ABS module line**

Figure C-11. ABS Module Connections



1. **Sealing washers**
2. **Banjo bolt**
3. **Cable clips**
4. **Rear brake light switch**
5. **Fastener**
6. **Electrical harness conduit clips**
7. **Flat washer**
8. **Locknut**
9. **O-ring**
10. **Fastener**
11. **Sealing washers**
12. **Banjo bolt**

Figure C-12. Rear ABS Brake Line Assembly

Installation

1. Place rear brake line into approximate position along top of lower right frame tube. From area of brake lamp switch, feed brake line hose upward, inboard of downtube and toward ABS module.
2. See Figure C-11. Start banjo bolt with **new** sealing washers to secure brake line (4) to MR port of ABS module.

NOTE

*If installing **new** rear brake light switch, apply Loctite Pipe Sealant with Teflon 565 to threads and start switch into rear brake line. Using flats on switch, tighten to 12-15 ft-lbs (16.3-20.3 Nm).*

3. See Figure C-12. Align locating tab on brake light switch bracket with slot in frame. Install fastener (5) and tighten to 80-100 **in-lbs** (9.0-11.3 Nm).
4. Connect terminals onto rear brake light switch (4). If removed, install **new** cable strap to secure rear brake light switch wires.

5. Capture rear brake line to electrical harness conduit clips (6).
6. Apply a light coat of Wheel Bearing Grease (Part No. 99855-89) to the brake pedal shaft and bore. Install **new** O-rings (9) on each side of bore.
7. Install brake pedal/master cylinder assembly on the pedal shaft. Install flat washer (7) and **new** locknut (8) on pedal shaft.
8. Fasten master cylinder to frame. Tighten screws (10) to 126-150 **in-lbs** (14.2-17.0 Nm).
9. Tighten brake pedal shaft locknut (8) to 15-20 ft-lbs (20-27 Nm).
10. Secure brake line to master cylinder reservoir using **new** sealing washers. Tighten banjo bolt (12) to 12.5-14.5 ft-lbs (17.0-19.7 Nm).
11. Tighten banjo bolt to ABS module to 12.5-14.5 ft-lbs (16.9-19.7 Nm).

⚠WARNING

Any time the ABS module, either master cylinder, or any line between a master cylinder and the ABS module is disconnected or replaced, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to do so could result in air in the hydraulic brake system, reducing brake efficiency, which could result in death or serious injury. (00585b)

12. Fill and bleed brake system. See 2.16 BLEEDING BRAKES.
13. To confirm that brake system is properly connected and all air is purged, install master cylinder reservoir cover, connect motorcycle to DIGITAL TECHNICIAN II (Part No. HD-48650) and perform "ABS Service" procedure in the "Toolbox" menu.
14. Install right side rider footboard. See 2.49 FOOTBOARDS AND FOOTRESTS.
15. Install right side cover.
16. Install right side saddlebag. See 2.26 SADDLEBAGS.

ABS MODULE TO REAR BRAKE CALIPER

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

Removal

1. Remove right side saddlebag. See 2.26 SADDLEBAGS.
2. Remove right side cover.
3. See Figure C-12. Free rear brake line hose from cable clips (3) on rear fork.
4. Remove conduit clip securing rear wheel speed sensor cable to brake hose.

NOTE

Wrap banjo fittings with pieces of shop towel to absorb any loss of brake fluid.

5. See Figure C-11. Remove banjo bolt to release brake line (3) from R port of ABS module. Discard sealing washers.
6. See Figure C-12. Remove banjo bolt (2) from rear brake caliper. Discard sealing washers (1).
7. Remove brake line from channel on front of battery tray.
8. Remove brake line from motorcycle.

Installation

1. Place rear brake line into approximate position along top of rear fork and up toward ABS module. Secure brake line into channel on front of battery tray.
2. See Figure C-12. Capture rear brake line hose in two cable clips (3) on rear fork.
3. See Figure C-11. Install banjo bolt (3) with **new** sealing washers and tighten to 12.5-14.5 ft-lbs (16.9-19.7 Nm).
4. See Figure C-12. Install banjo bolt (2) with **new** sealing washers and tighten to 17-19 ft-lbs (23.1-25.8 Nm).
5. Install **new** conduit clip 1.25 in. (31.8 mm) in front of the rear brake hose crimp capturing rear wheel speed sensor cable to brake hose.
6. Fill and bleed brake system. See 2.16 BLEEDING BRAKES.
7. To confirm that brake system is properly connected and all air is purged, connect motorcycle to DIGITAL TECHNICIAN II (Part No. HD-48650) and perform "ABS Service" procedure.
8. Install right side cover.
9. Install right side saddlebag. See 2.26 SADDLEBAGS.

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METRIC CONVERSION D.1

CONVERSION TABLE

Table D-1. Metric Conversions

MILLIMETERS to INCHES (MM x 0.03937 = IN)								INCHES to MILLIMETERS (IN x 25.40 = MM)							
mm	in	mm	in	mm	in	mm	in	in	mm	in	mm	in	mm	in	mm
.1	.0039	25	.9842	58	2.283	91	3.582	.001	.025	.6	15.240	1-15/16	49.21	3-5/16	84.14
.2	.0078	26	1.024	59	2.323	92	3.622	.002	.051	5/8	15.875	2	50.80	3-3/8	85.72
.3	.0118	27	1.063	60	2.362	93	3.661	.003	.076	11/16	17.462	2-1/16	52.39	3.4	86.36
.4	.0157	28	1.102	61	2.401	94	3.701	.004	.102	.7	17.780	2.1	53.34	3-7/16	87.31
.5	.0197	29	1.142	62	2.441	95	3.740	.005	.127	3/4	19.050	2-1/8	53.97	3-1/2	88.90
.6	.0236	30	1.181	63	2.480	96	3.779	.006	.152	.8	20.320	2-3/16	55.56	3-9/16	90.49
.7	.0275	31	1.220	64	2.519	97	3.819	.007	.178	13/16	20.638	2.2	55.88	3.6	91.44
.8	.0315	32	1.260	65	2.559	98	3.858	.008	.203	7/8	22.225	2-1/4	57.15	3-5/8	92.07
.9	.0354	33	1.299	66	2.598	99	3.897	.009	.229	.9	22.860	2.3	58.42	3-11/16	93.66
1	.0394	34	1.338	67	2.638	100	3.937	.010	.254	15/16	23.812	2-5/16	58.74	3.7	93.98
2	.0787	35	1.378	68	2.677	101	3.976	1/64	.397	1	25.40	2-3/8	60.32	3-3/4	95.25
3	.1181	36	1.417	69	2.716	102	4.016	.020	.508	1-1/16	26.99	2.4	60.96	3.8	96.52
4	.1575	37	1.456	70	2.756	103	4.055	.030	.762	1.1	27.94	2-7/16	61.91	3-13/16	96.84
5	.1968	38	1.496	71	2.795	104	4.094	1/32	.794	1-1/8	28.57	2-1/2	63.50	3-7/8	98.42
6	.2362	39	1.535	72	2.834	105	4.134	.040	1.016	1-3/16	30.16	2-9/16	65.09	3.9	99.06
7	.2756	40	1.575	73	2.874	106	4.173	.050	1.270	1.2	30.48	2.6	66.04	3-15/16	100.01
8	.3149	41	1.614	74	2.913	107	4.212	.060	1.524	1-1/4	31.75	2-5/8	66.67	4	101.6
9	.3543	42	1.653	75	2.953	108	4.252	1/16	1.588	1.3	33.02	2-11/16	68.26	4-1/16	102.19
10	.3937	43	1.693	76	2.992	109	4.291	.070	1.778	1-5/16	33.34	2.7	68.58	4.1	104.14
11	.4331	44	1.732	77	3.031	110	4.331	.080	2.032	1-3/8	34.92	2-3/4	69.85	4-1/8	104.77
12	.4724	45	1.772	78	3.071	111	4.370	.090	2.286	1.4	35.56	2.8	71.12	4-3/16	106.36
13	.5118	46	1.811	79	3.110	112	4.409	.1	2.540	1-7/16	36.51	2-13/16	71.44	4.2	106.68
14	.5512	47	1.850	80	3.149	113	4.449	1/8	3.175	1-1/2	38.10	2-7/8	73.02	4-1/4	107.95
15	.5905	48	1.890	81	3.189	114	4.488	3/16	4.762	1-9/16	39.69	2.9	73.66	4.3	109.22
16	.6299	49	1.929	82	3.228	115	4.527	.2	5.080	1.6	40.64	2-15/16	74.61	4-5/16	109.54
17	.6693	50	1.968	83	3.268	116	4.567	1/4	6.350	1-5/8	41.27	3	76.20	4-3/8	111.12
18	.7086	51	2.008	84	3.307	117	4.606	.3	7.620	1-11/16	42.86	3-1/16	77.79	4.4	111.76
19	.7480	52	2.047	85	3.346	118	4.645	5/16	7.938	1.7	43.18	3.1	78.74	4-7/16	112.71
20	.7874	53	2.086	86	3.386	119	4.685	3/8	9.525	1-3/4	44.45	3-1/8	79.37	4-1/2	114.30
21	.8268	54	2.126	87	3.425	120	4.724	.4	10.160	1.8	45.72	3-3/16	80.96	4-9/16	115.89
22	.8661	55	2.165	88	3.464	121	4.764	7/16	11.112	1-13/16	46.04	3.2	81.28	4.6	116.84
23	.9055	56	2.205	89	3.504	122	4.803	1/2	12.700	1-7/8	47.62	3-1/4	82.55	4-5/8	117.47
24	.9449	57	2.244	90	3.543	123	4.842	9/16	14.288	1.9	48.26	3.3	83.82	4-11/16	119.06

FLUID CONVERSIONS D.2

UNITED STATES SYSTEM

Unless otherwise specified, all fluid volume measurements in this service manual are expressed in United States (U.S.) units-of-measure. See below:

- 1 pint (U.S.) = 16 fluid ounces (U.S.)
- 1 quart (U.S.) = 2 pints (U.S.) = 32 fl. oz. (U.S.)
- 1 gallon (U.S.) = 4 quarts (U.S.) = 128 fl. oz. (U.S.)

METRIC SYSTEM

Fluid volume measurements in this service manual include the metric system equivalents. In the metric system, 1 liter (L) = 1,000 milliliters (mL). Should you need to convert between U.S. units-of-measure and metric units-of-measure, refer to the following:

- fluid ounces (U.S.) x 29.574 = milliliters
- pints (U.S.) x 0.473 = liters
- quarts (U.S.) x 0.946 = liters
- gallons (U.S.) x 3.785 = liters
- milliliters x 0.0338 = fluid ounces (U.S.)
- liters x 2.114 = pints (U.S.)
- liters x 1.057 = quarts (U.S.)
- liters x 0.264 = gallons (U.S.)

BRITISH IMPERIAL SYSTEM

Fluid volume measurements in this service manual do not include the British Imperial (Imp.) system equivalents. The following conversions exist in the British Imperial system:

- 1 pint (Imp.) = 20 fluid ounces (Imp.)
- 1 quart (Imp.) = 2 pints (Imp.)
- 1 gallon (Imp.) = 4 quarts (Imp.)

Although the same unit-of-measure terminology as the U.S. system is used in the British Imperial (Imp.) system, the actual volume of each British Imperial unit-of-measure differs from its U.S. counterpart. The U.S. fluid ounce is larger than the British Imperial fluid ounce. However, the U.S. pint, quart, and gallon are smaller than the British Imperial pint, quart, and gallon, respectively. Should you need to convert between U.S. units and British Imperial units, refer to the following:

- fluid ounces (U.S.) x 1.042 = fluid ounces (Imp.)
- pints (U.S.) x 0.833 = pints (Imp.)
- quarts (U.S.) x 0.833 = quarts (Imp.)
- gallons (U.S.) x 0.833 = gallons (Imp.)
- fluid ounces (Imp.) x 0.960 = fluid ounces (U.S.)
- pints (Imp.) x 1.201 = pints (U.S.)
- quarts (Imp.) x 1.201 = quarts (U.S.)
- gallons (Imp.) x 1.201 = gallons (U.S.)

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TORQUE CONVERSIONS D.3

UNITED STATES SYSTEM

The U.S. units of torque, foot pounds and inch pounds, are used in this service manual. To convert units, use the following equations:

- foot pounds (ft-lbs) X 12.00000 = inch pounds (**in-lbs**).
- inch pounds (**in-lbs**) X 0.08333 = foot pounds (ft-lbs).

METRIC SYSTEM

All metric torque specifications are written in Newton-meters (Nm). To convert metric to United States units and United States to metric, use the following equations:

- Newton meters (Nm) X 0.737563 = foot pounds (ft-lbs).
- Newton meters (Nm) X 8.85085 = inch pounds (**in-lbs).**
- foot pounds (ft-lbs) X 1.35582 = Newton meters (Nm).
- inch pounds (**in-lbs**) X 0.112985 = Newton meters (Nm).

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GLOSSARY E.1

ACRONYMS AND ABBREVIATIONS

Table E-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
A	Amperes
ABS	Anti-lock braking system
Ah	Ampere-hour
AC	Alternating current
ACC	Accessory position on ignition switch
ACR	Automatic compression release
AIS	Active Intake Solenoid
AGM	Absorbed glass mat (battery)
AWG	American wire gauge
B+	Battery voltage
bar	Bar
BAS	Bank angle sensor
BTDC	Before top dead center
°C	Celsius (Centigrade)
CA	California
CAL	Calibration
CAN	Controller area network
cc	Cubic centimeters
cm	Centimeters
cm^3	Cubic centimeters
CCA	Cold cranking amps
CKP	Crankshaft position
cm	Centimeter
CCW	Counterclockwise
CW	Clockwise
DC	Direct current
DLC	Data link connector
DOM	Domestic
DTC	Diagnostic trouble code
DOT	Department of Transportation
DVOM	Digital volt ohm meter
ECM	Electronic control module
ECT	Engine coolant temperature
ECU	Electronic Control Unit
EEPROM	Electrically erasable programmable read only memory
EFI	Electronic fuel injection
ET	Engine temperature
EVAP	Evaporative emissions control system
°F	Fahrenheit
FPS	Fuel pressure sensor

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Table E-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
ft	Foot
ft-lbs	Foot pounds
fl oz	Fluid ounce
g	Gram
gal	Gallon
GAWR	Gross axle weight rating
GPS	Global positioning system
GND	Ground (electrical)
GVWR	Gross vehicle weight rating
HCU	Hydraulic control unit
HDI	Harley-Davidson International
H-DSSS	Harley-Davidson smart security system
HFSM	Hands-free security module
Hg	Mercury
H02S	Heated oxygen sensor
hp	Horsepower
hr	Hour
IAC	Idle air control
IAT	Intake air temperature
IC	Instrument cluster
ID	Inside diameter
IGN	Ignition light/key switch position
in	Inch
in^3	Cubic inch
INJ PW	Injector pulse width
in-lbs	Inch pounds
JSS	Jiffy stand sensor
kg	Kilogram
km	Kilometer
kPa	Kilopascal
km/h	Kilometers per hour
kW	Kilowatt
L	Liter
lb	Pounds
LCD	Liquid crystal display
LED	Light emitting diode
mA	Milliampere
MAP	Manifold absolute pressure
max	Maximum
mi	Mile
min	Minimum
mL	Milliliter
mm	Millimeter

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Table E-1. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
mph	Miles per hour
ms	millisecond
Nm	Newton-meter
NiMH	Nickel metal hydride
N/A	Not applicable
O2	Oxygen
OD	Outside diameter
OEM	Original equipment manufacturer
oz	Ounce
P&A	Parts and Accessories
Part No.	Part number
PIN	Personal identification number
psi	Pounds per square inch
PWM signal	Pulse width modulated signal
qt	Quart
RCM	Reverse control module
RES	Reserve mark on fuel supply valve
rpm	Revolutions per minute
s	seconds
SCFH	Cubic feet per hour at standard conditions
TCA	Throttle control actuator
TDC	Top dead center
TGS	Twist grip sensor
TMAP	Intake air temperature/manifold absolute pressure
TPS	Throttle position sensor
TSM	Turn signal module
TSSM	Turn signal/security module
V	Volt
VAC	Volts of alternating current
VDC	Volts of direct current
VIN	Vehicle identification number
VSS	Vehicle speed sensor
W	Watt
WSS	Wheel speed sensor

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
93979-10	SCREAMIN' EAGLE MAGNETIC LIFTER HOLDERS	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Removal
94681-80	SPOKE NIPPLE WRENCH	2.9 CHECKING AND TRUING WHEELS, Truing Laced Wheels
98716-87A	STORAGE COVER	1.25 STORAGE, Placing in Storage
99650-02	HIGH-PERFORMANCE SEALANT, GRAY	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly
99863-01A	GLOBAL BATTERY CHARGER	1.23 BATTERY MAINTENANCE, Storage
B-45523	VALVE GUIDE REAMER	3.22 CYLINDER HEAD, Valve Guide Replacement
B-45524-1	VALVE GUIDE DRIVER	3.22 CYLINDER HEAD, Valve Guide Replacement
B-45524-2A	VALVE GUIDE INSTALLER SLEEVE	3.22 CYLINDER HEAD, Valve Guide Replacement
B-45525	VALVE GUIDE HONE	3.22 CYLINDER HEAD, Inspection
B-45525	VALVE GUIDE HONE	3.22 CYLINDER HEAD, Valve Guide Replacement
B-45655	CRANKCASE BEARING REMOVER/INSTALLER	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
B-45655	CRANKCASE BEARING REMOVER/INSTALLER	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
B-45655	CRANKCASE BEARING REMOVER/INSTALLER	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Left Crankcase Half
B-45655	CRANKCASE BEARING REMOVER/INSTALLER	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Left Crankcase Half
B-50085	TERMINAL EXTRACTOR	A.16 JAE MX19 SEALED CONNECTORS, JAE MX19 Sealed Connectors
FRDH161	SNAP-ON "DOG BONE" TORQUE ADAPTER	3.25 TOP END OVERHAUL: ASSEMBLY, Rocker Arm Support Plate
GA500A	SNAP-ON TERMINAL PICK	A.1 AUTOFUSE UNSEALED ELECTRICAL CONNECTORS, Autofuse Unsealed Connector Repair
HD-25070	ROBINAIR HEAT GUN	2.43 WINDSHIELD: ROAD KING MODELS, Windshield Window
HD-25070	ROBINAIR HEAT GUN	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Sprocket Shaft Bearing Inner Race
HD-25070	ROBINAIR HEAT GUN	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Sprocket Shaft Bearing Inner Race
HD-25070	HEAT GUN	A.20 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-33223-1	CYLINDER COMPRESSION GAUGE	3.8 TROUBLESHOOTING, Compression Test
HD-33416	UNIVERSAL DRIVER	2.18 STEERING HEAD BEARINGS, Removal
HD-33446-B	CYLINDER TORQUE PLATES	3.23 CYLINDER, Inspection
HD-34633	AIR SUSPENSION PUMP AND GAUGE	2.20 REAR SHOCK ABSORBERS, Removal
HD-34633A	AIR SUSPENSION PUMP AND GAUGE	1.19 SUSPENSION ADJUSTMENTS, General
HD-34633A	AIR SUSPENSION PUMP AND GAUGE	2.19 REAR AIR SUSPENSION, Check for Air Leaks
HD-34634	FORK OIL SEAL INSTALLER	2.17 FRONT FORK, Assembly
HD-34736-B	VALVE SPRING COMPRESSOR	3.22 CYLINDER HEAD, Disassembly
HD-34736-B	VALVE SPRING COMPRESSOR	3.22 CYLINDER HEAD, Assembly
HD-34751	VALVE GUIDE CLEANING BRUSH	3.22 CYLINDER HEAD, Inspection
HD-34751	VALVE GUIDE CLEANING BRUSH	3.22 CYLINDER HEAD, Valve Guide Replacement
HD-34751	VALVE GUIDE CLEANING BRUSH	3.22 CYLINDER HEAD, Valve Guide Replacement
HD-34751	VALVE GUIDE CLEANING BRUSH	3.22 CYLINDER HEAD, Valve and Seat Refacing
HD-34751	VALVE GUIDE CLEANING BRUSH	3.22 CYLINDER HEAD, Assembly

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-34902-B	MAINSHAFT BEARING INNER RACE PULLER/INSTALLER	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Sprocket Shaft Bearing Inner Race
HD-34902-C	MAINSHAFT BEARING INNER RACE REMOVER/INSTALLER	5.5 PRIMARY CHAINCASE HOUSING, Mainshaft Bearing Inner Race
HD-35316-10	PILOT	6.7 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-11	RECEIVER CUP	6.7 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-12	INSTALLER CUP	6.7 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-3A	CROSS PLATE	6.7 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-3A	CROSS PLATE	6.7 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-4A	8 IN. BOLT	6.7 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-4A	8 IN. BOLT	6.7 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-5	12 IN. BOLT	6.7 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-5	12 IN. BOLT	6.7 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-7	WASHER	6.7 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-7	WASHER	6.7 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-8	BEARING DRIVER	6.7 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-9	BEARING DRIVER	6.7 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-C	MAIN DRIVE GEAR/BEARING REMOVER AND INSTALLER	6.7 MAIN DRIVE GEAR AND BEARING, Removal
HD-35381A	BELT TENSION GAUGE	1.12 DRIVE BELT AND SPROCKETS, Checking Drive Belt Deflection
HD-35381A	BELT TENSION GAUGE	1.12 DRIVE BELT AND SPROCKETS, Setting Belt Deflection
HD-35381A	BELT TENSION GAUGE	2.5 REAR WHEEL, Installation
HD-35667-A	CYLINDER LEAKDOWN TESTER	3.8 TROUBLESHOOTING, Cylinder Leakdown Test
HD-35758-C	NEWAY VALVE SEAT CUTTER SET	3.22 CYLINDER HEAD, Valve and Seat Refacing
HD-38125-6	PACKARD TERMINAL CRIMP TOOL	A.8 DELPHI METRI-PACK TERMINAL REPAIR, Metri-Pack Terminal Crimps
HD-38125-7	PACKARD TERMINAL CRIMPER	A.8 DELPHI METRI-PACK TERMINAL REPAIR, Metri-Pack Terminal Crimps
HD-38125-7	PACKARD TERMINAL CRIMPER	A.14 DEUTSCH DTM SEALED MINI TERMINAL REPAIR, Deutsch DTM Sealed Mini Terminal Crimps
HD-38125-8	PACKARD CRIMPING TOOL	A.8 DELPHI METRI-PACK TERMINAL REPAIR, Metri-Pack Terminal Crimps
HD-38125-8	PACKARD CRIMPING TOOL	A.20 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-39301A	STEERING HEAD BEARING CUP REMOVER	2.18 STEERING HEAD BEARINGS, Removal
HD-39302	STEERING HEAD BEARING CUP INSTALLER	2.18 STEERING HEAD BEARINGS, Installation
HD-39361-B	SPROCKET SHAFT OIL SEAL INSTALLER	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly
HD-39782-1	CYLINDER HEAD SUPPORT STAND	3.22 CYLINDER HEAD, Valve Guide Replacement
HD-39782-3	INTAKE SEAT ADAPTER	3.22 CYLINDER HEAD, Valve Guide Replacement
HD-39782-4	EXHAUST SEAT ADAPTER	3.22 CYLINDER HEAD, Valve Guide Replacement
HD-39782-B	CYLINDER HEAD SUPPORT STAND KIT	3.22 CYLINDER HEAD, Valve Guide Replacement

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Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-39786	CYLINDER HEAD HOLDING FIXTURE	3.22 CYLINDER HEAD, Disassembly
HD-39786	CYLINDER HEAD HOLDING FIXTURE	3.22 CYLINDER HEAD, Valve Guide Replacement
HD-39786	CYLINDER HEAD HOLDING FIXTURE	3.22 CYLINDER HEAD, Valve and Seat Refacing
HD-39786	CYLINDER HEAD HOLDING FIXTURE	3.22 CYLINDER HEAD, Assembly
HD-39787A	RIVET TOOL	2.29 TOUR-PAK SERVICE, Hinges
HD-39847	REAMER T-HANDLE	3.22 CYLINDER HEAD, Valve Guide Replacement
HD-39964	REAMER LUBRICANT	3.22 CYLINDER HEAD, Valve Guide Replacement
HD-39965-A	DEUTSCH TERMINAL CRIMP TOOL	A.13 DEUTSCH DT SEALED TERMINAL REPAIR, Deutsch DT Sealed Terminal Crimps
HD-39969	ULTRA TORCH	A.20 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-41177	FORK HOLDING TOOL	2.17 FRONT FORK, Changing Fork Oil
HD-41177	FORK HOLDING TOOL	2.17 FRONT FORK, Assembly
HD-41182	FUEL PRESSURE GAUGE	4.18 FUEL PRESSURE TEST, Testing
HD-41183	HEAT SHIELD ATTACHMENT	A.20 SEALED SPLICE CONNECTORS, Sealed Splice Connector Repair
HD-41417	PROPANE ENRICHMENT KIT	4.21 INTAKE LEAK TEST, Leak Tester
HD-41475	DEUTSCH TERMINAL REPAIR KIT	A.12 DEUTSCH DT SEALED CONNECTORS, Deutsch DT Sealed Connector Repair
HD-41475-100	FLAT BLADE L-HOOK	A.12 DEUTSCH DT SEALED CONNECTORS, Deutsch DT Sealed Connector Repair
HD-41609	AMP MULTI-LOCK CRIMPER	A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR, Tyco 070 Multilock Unsealed Connector Repair
HD-41609	AMP MULTI-LOCK CRIMPER	A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR, Tyco 070 Multilock Unsealed Connector Repair
HD-42310	BENCH STAND	3.16 REMOVING ENGINE FROM CHASSIS, Procedure
HD-42310-2	TWIN CAM 88 CRADLE	3.16 REMOVING ENGINE FROM CHASSIS, Procedure
HD-42311	OIL FILTER WRENCH	1.6 ENGINE OIL AND FILTER, Changing Oil and Oil Filter
HD-42311	OIL FILTER WRENCH	3.10 OIL COOLER ADAPTER, Removal
HD-42317-A	PISTON PIN CIRCLIP REMOVER/INSTALLER	3.18 TOP END OVERHAUL: DISASSEMBLY, Piston
HD-42317-A	PISTON PIN CIRCLIP REMOVER/INSTALLER	3.25 TOP END OVERHAUL: ASSEMBLY, Piston
HD-42320-B	PISTON PIN REMOVER	3.18 TOP END OVERHAUL: DISASSEMBLY, Piston
HD-42322	PISTON SUPPORT PLATE	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder
HD-42324-A	CYLINDER TORQUE PLATES	3.18 TOP END OVERHAUL: DISASSEMBLY, Cylinder Head
HD-42324-A	CYLINDER TORQUE PLATES	3.22 CYLINDER HEAD, Inspection
HD-42325-A	CAMSHAFT NEEDLE BEARING REMOVER/INSTALLER	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Needle Bearings
HD-42326-B	CRANKSHAFT GUIDE	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly
HD-42326-B	CRANKSHAFT GUIDE	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly
HD-42720-4	CRANKSHAFT BEARING DRIVER SHIM	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half

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PART NUMBER	TOOL NAME	NOTES
HD-42720-4	CRANKSHAFT BEARING DRIVER SHIM	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
HD-42720-5	REMOVER/INSTALLER SUPPORT TUBE	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
HD-42720-5	REMOVER/INSTALLER SUPPORT TUBE	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
HD-42720-5	CRANKCASE BEARING REMOVER/INSTALLER BASE	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Left Crankcase Half
HD-42720-5	CRANKCASE BEARING REMOVER/INSTALLER BASE	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Left Crankcase Half
HD-42879	ELECTRICAL CRIMPER TOOL	A.15 DEUTSCH DTM SEALED SOLID BARREL MINI TERMINAL REPAIR, Deutsch DTM Sealed Solid Barrel Terminal Crimps
HD-43646A	ROLLING STAND	3.16 REMOVING ENGINE FROM CHASSIS, Procedure
HD-44060C	WHEEL BEARING REMOVER/INSTALLER	2.10 SEALED WHEEL BEARINGS, Removal
HD-44061	FUEL PRESSURE GAUGE ADAPTER	4.18 FUEL PRESSURE TEST, Testing
HD-44067A	OIL FILTER WRENCH	1.6 ENGINE OIL AND FILTER, Changing Oil and Oil Filter
HD-44358	FLYWHEEL SUPPORT FIXTURE	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Sprocket Shaft Bearing Inner Race
HD-45327	REAR FORK BEARING INSTALLER	2.21 REAR FORK, Disassembly and Assembly
HD-45928	TERMINAL REMOVER	A.9 DELPHI MICRO 64 SEALED CONNECTORS, Delphi Micro 64 Sealed Connector Repair
HD-45929	TERMINAL CRIMPER	A.9 DELPHI MICRO 64 SEALED CONNECTORS, Delphi Micro 64 Sealed Connector Repair
HD-45961	IGNITION SWITCH CONNECTOR REMOVER	2.41 INNER FAIRING: FRAME MOUNTED FAIRING MODELS, Removal
HD-45961	IGNITION SWITCH CONNECTOR REMOVER	7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK, Fairing Models
HD-45962	IGNITION SWITCH ALIGNMENT TOOL	7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK, Fairing Models
HD-46282A	FINAL DRIVE SPROCKET LOCKING TOOL	5.7 TRANSMISSION SPROCKET, Removal
HD-46282A	FINAL DRIVE SPROCKET LOCKING TOOL	5.7 TRANSMISSION SPROCKET, Installation
HD-47250	INTAKE MANIFOLD WRENCH	4.13 INDUCTION MODULE, Removal
HD-47856-1	INSTALLER	6.7 MAIN DRIVE GEAR AND BEARING, Installation
HD-47856-2	PILOT	6.7 MAIN DRIVE GEAR AND BEARING, Installation
HD-47856-3	ADAPTER	6.7 MAIN DRIVE GEAR AND BEARING, Installation
HD-47856-6	NUT	6.7 MAIN DRIVE GEAR AND BEARING, Installation
HD-47856-7	CROW'S FOOT WRENCH	6.7 MAIN DRIVE GEAR AND BEARING, Installation
HD-47910	MAINSHAFT LOCKNUT WRENCH	5.7 TRANSMISSION SPROCKET, Removal
HD-47910	MAINSHAFT LOCKNUT WRENCH	5.7 TRANSMISSION SPROCKET, Installation
HD-47925	AXLE NUT TORQUE ADAPTER	1.12 DRIVE BELT AND SPROCKETS, Setting Belt Deflection
HD-47925	AXLE NUT TORQUE ADAPTER	1.12 DRIVE BELT AND SPROCKETS, Setting Belt Deflection
HD-47925	AXLE NUT TORQUE ADAPTER	2.5 REAR WHEEL, Removal

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-47932	MAIN DRIVE GEAR BEARING AND SEAL INSTALLATION TOOL	6.7 MAIN DRIVE GEAR AND BEARING, Cleaning and Inspection
HD-47933	MAIN DRIVE GEAR SEAL INSTALLER	6.7 MAIN DRIVE GEAR AND BEARING, Mainshaft Seal Replacement
HD-47941	CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Removal
HD-47941	CRANKSHAFT/CAMSHAFT SPROCKET LOCKING TOOL	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
HD-47956	CAMSHAFT ASSEMBLY TOOL	3.26 CAM COMPARTMENT AND COMPONENTS, Camshafts
HD-48114	TERMINAL REMOVER	A.18 MOLEX MX 150 SEALED CONNECTORS, Molex MX 150 Sealed Connector Repair
HD-48119	TERMINAL CRIMPER	A.18 MOLEX MX 150 SEALED CONNECTORS, Crimp Terminal to Lead
HD-48219	PRIMARY DRIVE LOCKING TOOL	5.4 DRIVE COMPONENTS, Removal
HD-48283	CRANKSHAFT ROTATING WRENCH	3.18 TOP END OVERHAUL: DISASSEMBLY, Rocker Arm Support Plate
HD-48498-A	ACR SOLENOID SOCKET	7.21 AUTOMATIC COMPRESSION RELEASE (ACR), Removal
HD-48646	CAM RING REMOVER/INSTALLER	4.6 FUEL TANK TOP PLATE, Removal
HD-48650	DIGITAL TECHNICIAN II	2.16 BLEEDING BRAKES, Procedure
HD-48650	DIGITAL TECHNICIAN II	4.18 FUEL PRESSURE TEST, General
HD-48650	DIGITAL TECHNICIAN II	7.43 H-DSSS ACTUATION, Fob Assignment
HD-48650	DIGITAL TECHNICIAN II	C.2 ABS MODULE, Hydraulic Control Unit (HCU)
HD-48650	DIGITAL TECHNICIAN II	C.2 ABS MODULE, Hydraulic Control Unit (HCU)
HD-48921	REAR WHEEL COMPENSATOR SPROCKET BEARING REMOVER/INSTALLER	2.6 REAR WHEEL COMPENSATOR, Sprocket Bearing Replacement
HD-48985	SPOKE TORQUE WRENCH	1.8 TIRES AND WHEELS, Wheel Spokes
HD-48985	SPOKE TORQUE WRENCH	2.9 CHECKING AND TRUING WHEELS, Truing Laced Wheels
HD-50017	OXYGEN SENSOR WRENCH	4.15 OXYGEN SENSORS (O2), Removal
HD-59000B	FORK OIL LEVEL GAUGE	2.17 FRONT FORK, Changing Fork Oil
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 CHECKING AND TRUING WHEELS, Laced Wheel Rim Offset
HD-94804-57	ROCKER ARM BUSHING REAMER	3.20 ROCKER ARM SUPPORT PLATE, Cleaning and Inspection
HD-95637-10	LONG BOLTS	6.7 MAIN DRIVE GEAR AND BEARING, Removal
HD-95637-46B	WEDGE ATTACHMENT	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Sprocket Shaft Bearing Inner Race
HD-95637-46B	WEDGE ATTACHMENT	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Sprocket Shaft Bearing Inner Race
HD-95637-46B	WEDGE ATTACHMENT	6.7 MAIN DRIVE GEAR AND BEARING, Removal

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-95952-1	THREADED CYLINDERS	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder
HD-95952-33C	CONNECTING ROD CLAMPING TOOL	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder
HD-96333-51F	PISTON RING COMPRESSOR	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder
HD-96796-47	VALVE SPRING TESTER	3.22 CYLINDER HEAD, Inspection
HD-96921-52D	OIL PRESSURE GAUGE SET	3.7 OIL PRESSURE, Checking Oil Pressure
HD-97087-65B	HOSE CLAMP PLIERS	3.9 OIL COOLER, Removal
HD-97225-55C	SPROCKET SHAFT BEARING INSTALLER	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Sprocket Shaft Bearing Inner Race
HD-97225-55C	SPROCKET SHAFT BEARING INSTALLER	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly
HD-99500-80	WHEEL TRUING AND BALANCING STAND	2.9 CHECKING AND TRUING WHEELS, Checking Wheel Runout
HD-99500-80	WHEEL TRUING STAND	2.9 CHECKING AND TRUING WHEELS, Truing Laced Wheels
HD-99500-80	WHEEL TRUING STAND	2.9 CHECKING AND TRUING WHEELS, Truing Laced Wheels
HD-99500-80	WHEEL TRUING STAND	2.11 TIRES, Wheel Balancing
J-5586A	TRANSMISSION SHAFT RETAINING RING PLIERS	6.6 TRANSMISSION ASSEMBLY, Disassembly
RS-25100-200	BEARING	6.7 MAIN DRIVE GEAR AND BEARING, Removal
RS-25100-200	BEARING	6.7 MAIN DRIVE GEAR AND BEARING, Removal
SNAP-ON® FRX181	FLARE NUT SOCKET	1.21 HEADLAMP ALIGNMENT, Auxiliary Lamp Alignment
SNAP-ON® FRX181	FLARE NUT SOCKET	7.13 AUXILIARY LAMPS AND BRACKETS, Auxiliary Lamp Housing
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER	2.16 BLEEDING BRAKES, Procedure
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER	C.2 ABS MODULE, Hydraulic Control Unit (HCU)
SNAP-ON BB200A	BASIC VACUUM BRAKE BLEEDER	C.2 ABS MODULE, Hydraulic Control Unit (HCU)
SNAP-ON FC018	OPEN END CROWFOOT	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
SNAP-ON FRDH141	"DOG BONE" TORQUE ADAPTER	3.25 TOP END OVERHAUL: ASSEMBLY, Breather and Rocker Cover
SNAP-ON PRS8	PISTON RING EXPANDER	3.24 PISTON, Disassembly
SNAP-ON TT600-3	SNAP-ON PICK	A.6 DELPHI 630 METRI-PACK UNSEALED CONNECTORS, Delphi 630 Metri-Pack Unsealed Connector Repair
SNAP-ON TT600-3	SNAP-ON PICK	A.19 TYCO 070 MULTILOCK UNSEALED CONNECTOR, Tyco 070 Multilock Unsealed Connector Repair
TA360	SNAP-ON TORQUE ANGLE GAUGE	3.23 CYLINDER, Inspection
TA360	SNAP-ON TORQUE ANGLE GAUGE	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder Head

DIGITAL TECHNICIAN HARLEY-DAVIDSON®

FASTENER	TORQUE VALUE		NOTES
2 inch diameter gauge nuts	10-20 **in-lbs**	1.1-2.3 Nm	2.36 INNER FAIRING: FORK MOUNTED FAIRING MODELS, Installation
2 inch diameter gauge nuts	10-20 **in-lbs**	1.1-2.3 Nm	7.29 GAUGES AND INSTRUMENTS: FAIRING MODELS, 2 Inch Diameter Gauges: Fuel Level, Ambient Air Temperature, Voltmeter, Oil Pressure
ABS ECU-to-HCU fastener	35-45 **in-lbs**	4.0-5.1 Nm	C.2 ABS MODULE, Hydraulic Control Unit (HCU)
ABS ECU-to-HCU fastener	35-45 **in-lbs**	4.0-5.1 Nm	C.2 ABS MODULE, Electronic Control Unit (ECU)
ABS module fastener	39-60 **in-lbs**	4.4-6.8 Nm	C.2 ABS MODULE, Hydraulic Control Unit (HCU)
Air cleaner cover bracket screws	108-132 **in-lbs**	12.2-14.9 Nm	1.5 MAINTENANCE SCHEDULE, General
Air cleaner cover bracket screws	108-132 **in-lbs**	12.2-14.9 Nm	1.7 AIR CLEANER AND EXHAUST SYSTEM, Installation
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	1.5 MAINTENANCE SCHEDULE, General
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	1.7 AIR CLEANER AND EXHAUST SYSTEM, Installation/Use Loctite Medium Strength Threadlocker 243 (Blue)
Air deflector bolts	25-35 **in-lbs**	2.8-4.0 Nm	2.37 AIR DEFLECTORS, Mid-Frame Air Deflectors
Air deflector screws	25-30 **in-lbs**	2.8-3.4 Nm	2.37 AIR DEFLECTORS, Air Deflectors
Air valve mount hex nut	40-50 **in-lbs**	4.5-5.6 Nm	2.19 REAR AIR SUSPENSION, Check for Air Leaks
Automatic compression release (ACR)	11-15 ft-lbs	14.9-20.3 Nm	7.21 AUTOMATIC COMPRESSION RELEASE (ACR), Installation/Apply three equally spaced dots of LOCTITE 246 THREADLOCKER MEDIUM STRENGTH/HIGH TEMPERATURE around lower third of threads
Auxiliary lamp bracket to fork bracket screws (FLHT/C/U)	15-20 ft-lbs	20-27 Nm	2.36 INNER FAIRING: FORK MOUNTED FAIRING MODELS, Installation
Auxiliary lamp bracket to fork bracket screws (FLHTC/U, FLHTK)	15-20 ft-lbs	20-27 Nm	7.13 AUXILIARY LAMPS AND BRACKETS, Auxiliary Lamp Bracket
Auxiliary lamp bracket to fork bracket stud acorn nuts (FLHR/C)	72-108 **in-lbs**	8.1-12.2 Nm	7.13 AUXILIARY LAMPS AND BRACKETS, Auxiliary Lamp Bracket
Auxiliary lamp flange nut	15-18 ft-lbs	20.3-24.4 Nm	1.21 HEADLAMP ALIGNMENT, Auxiliary Lamp Alignment
Banjo bleeder bolt to front caliper	17-19 ft-lbs	23.1-25.8 Nm	2.12 FRONT BRAKE MASTER CYLINDER, Front Brake Line: Non-ABS Equipped
Banjo bleeder bolt to front caliper	17-19 ft-lbs	23.1-25.8 Nm	2.13 FRONT BRAKE CALIPER, Installation
Banjo bleeder bolt to front calipers	17-19 ft-lbs	23.1-25.8 Nm	C.4 ABS BRAKE LINES, ABS Module to Front Brake Calipers
Banjo bolt to ABS module	12.5-14.5 ft-lbs	16.9-19.7 Nm	C.2 ABS MODULE, Hydraulic Control Unit (HCU)
Banjo bolt to ABS module	12.5-14.5 ft-lbs	16.9-19.7 Nm	C.4 ABS BRAKE LINES, Front Master Cylinder to ABS Module
Banjo bolt to ABS module	12.5-14.5 ft-lbs	16.9-19.7 Nm	C.4 ABS BRAKE LINES, ABS Module to Front Brake Calipers
Banjo bolt to ABS module	12.5-14.5 ft-lbs	16.9-19.7 Nm	C.4 ABS BRAKE LINES, Rear Master Cylinder to ABS Module
Banjo bolt to ABS module	12.5-14.5 ft-lbs	16.9-19.7 Nm	C.4 ABS BRAKE LINES, ABS Module to Rear Brake Caliper
Banjo bolt to front master cylinder	12.5-14.5 ft-lbs	16.9-19.7 Nm	2.12 FRONT BRAKE MASTER CYLINDER, Assembly and Installation
Banjo bolt to front master cylinder	12.5-14.5 ft-lbs	16.9-19.7 Nm	2.12 FRONT BRAKE MASTER CYLINDER, Front Brake Line: Non-ABS Equipped
Banjo bolt to front master cylinder	12.5-14.5 ft-lbs	16.9-19.7 Nm	C.4 ABS BRAKE LINES, Front Master Cylinder to ABS Module

FASTENER	TORQUE VALUE		NOTES
Banjo bolt to rear caliper	17-19 ft-lbs	23.1-25.8 Nm	2.14 REAR BRAKE MASTER CYLINDER, Rear Brake Line: Non-ABS Equipped
Banjo bolt to rear caliper	17-19 ft-lbs	23.1-25.8 Nm	2.15 REAR BRAKE CALIPER, Installation
Banjo bolt to rear caliper	17-19 ft-lbs	23.1-25.8 Nm	C.4 ABS BRAKE LINES, ABS Module to Rear Brake Caliper
Banjo bolt to rear master cylinder	12.5-14.5 ft-lbs	16.9-19.7 Nm	2.14 REAR BRAKE MASTER CYL-INDER, Assembly and Installation
Banjo bolt to rear master cylinder	12.5-14.5 ft-lbs	16.9-19.7 Nm	2.14 REAR BRAKE MASTER CYLINDER, Rear Brake Line: Non-ABS Equipped
Banjo bolt to rear master cylinder	12.5-14.5 ft-lbs	17.0-19.7 Nm	C.4 ABS BRAKE LINES, Rear Master Cylinder to ABS Module
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm	1.5 MAINTENANCE SCHEDULE, General
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm	1.23 BATTERY MAINTENANCE, Battery
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm	1.23 BATTERY MAINTENANCE, Battery
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm	7.10 STARTER, Installation
Battery terminal bolt	60-70 **in-lbs**	6.8-7.9 Nm	7.22 ALTERNATOR, Installation
Battery tray screws	72-96 **in-lbs**	8.1-10.8 Nm	2.48 REAR FRAME, Rear Frame
Battery tray screws	72-96 **in-lbs**	8.1-10.9 Nm	7.8 ELECTRICAL CADDIES, Battery Tray
Brake caliper (front) mounting screws	28-38 ft-lbs	37.9-51.5 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement/metric
Brake caliper (front) mounting screws	28-38 ft-lbs	37.9-51.5 Nm	2.13 FRONT BRAKE CALIPER, Installation/metric
Brake caliper (rear) mounting screws	43-48 ft-lbs	58.3-65.1 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement/metric
Brake caliper (rear) mounting screws	43-48 ft-lbs	58.3-65.1 Nm	2.5 REAR WHEEL, Installation/metric
Brake caliper (rear) mounting screws	43-48 ft-lbs	58.3-65.1 Nm	2.15 REAR BRAKE CALIPER, Installation/metric
Brake caliper bleeder valve	80-100 **in-lbs**	9.0-11.3 Nm	2.16 BLEEDING BRAKES, Procedure
Brake caliper pad pin	75-102 **in-lbs**	8.5.-11.5 Nm	1.5 MAINTENANCE SCHEDULE, General
Brake caliper pad pin	75-102 **in-lbs**	8.5-11.5 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement/Always use new pin
Brake caliper pad pin	75-102 **in-lbs**	8.5-11.5 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement/Always use new pin
Brake clamp fasteners	72-108 **in-lbs**	8.1-12.2 Nm	7.40 HANDLEBAR SWITCH ASSEMBLIES, Install-ation
Brake disc (front) screws	16-24 ft-lbs	21.7-32.5 Nm	2.4 FRONT WHEEL, Installation/Always use new screws
Brake disc (rear) screws	30-45 ft-lbs	41-61 Nm	2.5 REAR WHEEL, Installation/Always use new screws
Brake light switch bracket fastener	80-100 **in-lbs**	9.0-11.3 Nm	2.14 REAR BRAKE MASTER CYLINDER, Rear Brake Line: Non-ABS Equipped
Brake light switch bracket fastener	80-100 **in-lbs**	9.0-11.3 Nm	C.4 ABS BRAKE LINES, Rear Master Cylinder to ABS Module
Brake line bracket flange screw	20-30 **in-lbs**	2.3-3.4 Nm	C.4 ABS BRAKE LINES, Front Master Cylinder to ABS Module
Brake line bracket flange screw	20-30 **in-lbs**	2.3-3.4 Nm	C.4 ABS BRAKE LINES, ABS Module to Front Brake Calipers
Brake line bracket-to-lower fork bracket screw	120-180 **in-lbs**	13.6-20.3 Nm	2.12 FRONT BRAKE MASTER CYLINDER, Front Brake Line: Non-ABS Equipped

FASTENER	TORQUE VALUE		NOTES
Brake line bracket-to-lower fork bracket screw	120-180 **in-lbs**	13.6-20.3 Nm	2.18 STEERING HEAD BEARINGS, Installation
Brake pedal shaft locknut	15-20 ft-lbs	20.3-27.1 Nm	2.14 REAR BRAKE MASTER CYLINDER, Assembly and Installation
Brake pedal shaft locknut	15-20 ft-lbs	20.3-27.1 Nm	2.14 REAR BRAKE MASTER CYLINDER, Rear Brake Line: Non-ABS Equipped
Brake pedal shaft locknut	15-20 ft-lbs	20-27 Nm	C.4 ABS BRAKE LINES, Rear Master Cylinder to ABS Module
Breather assembly screws	120-156 **in-lbs**	13.6-17.6 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Breather and Rocker Cover
Breather bolts	22-24 ft-lbs	29.8-32.5 Nm	4.4 AIR CLEANER ASSEMBLY, Installation/metric
Cam chain tensioner fasteners	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Cam cover screws	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Cam support plate screws	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Cam support plate screws	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
CB module to radio screw	35-45 **in-lbs**	4.0-5.1 Nm	7.33 ADVANCED AUDIO SYSTEM, Radio
CB module to radio screw	35-45 **in-lbs**	4.0-5.1 Nm	7.33 ADVANCED AUDIO SYSTEM, CB Module
Chain tensioner fasteners	15-19 ft-lbs	20.3-25.8 Nm	5.4 DRIVE COMPONENTS, Installation
Charcoal canister screws	10-15 **in-lbs**	1.1-1.7 Nm	4.22 EVAPORATIVE EMISSIONS CONTROL SYSTEM, Charcoal Canister/metric
CKP sensor mount screw	90-120 **in-lbs**	10.2-13.6 Nm	7.20 CRANKSHAFT POSITION SENSOR (CKP), Installation
Clutch adjuster screw jam nut	72-120 **in-lbs**	8.1-13.6 Nm	1.5 MAINTENANCE SCHEDULE, General
Clutch adjuster screw jam nut	72-120 **in-lbs**	8.1-13.6 Nm	1.11 CLUTCH, Adjustment
Clutch cable adjustment jam nut	120 **in-lbs**	13.6 Nm	1.11 CLUTCH, Adjustment
Clutch cable fitting	90-120 **in-lbs**	10.2-13.6 Nm	6.5 CLUTCH RELEASE COVER, Assembly and Installation
Clutch diaphragm spring retainer bolts	70-100 **in-lbs**	7.9-11.3 Nm	5.6 CLUTCH, Clutch Pack Only
Clutch hub mainshaft nut	70-80 ft-lbs	94.9-108.5 Nm	5.4 DRIVE COMPONENTS, Installation
Clutch inspection cover screw	84-108 **in-lbs**	9.5-12.2 Nm	1.9 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant
Clutch inspection cover screws	84-108 **in-lbs**	9.5-12.2 Nm	1.5 MAINTENANCE SCHEDULE, General
Clutch inspection cover screws	84-108 **in-lbs**	9.5-12.2 Nm	1.11 CLUTCH, Adjustment
Clutch release cover screws	90-120 **in-lbs**	10.2-13.6 Nm	6.5 CLUTCH RELEASE COVER, Assembly and Installation
Compensating sprocket bolt: Initial torque	100 ft-lbs	135.7 Nm	5.4 DRIVE COMPONENTS, Installation
Compensating sprocket bolt: Initial torque	140 ft-lbs	190.0 Nm	5.4 DRIVE COMPONENTS, Installation
Console-to-tank screw	36-60 **in-lbs**	4.1-6.8 Nm	4.5 FUEL TANK, Installation/metric
Console-to-tank screw	36-60 **in-lbs**	4.1-6.8 Nm	4.5 FUEL TANK, Evaporative Emissions Tube: Non-CA Models/metric
Console-to-tank screw	36-60 **in-lbs**	4.1-6.8 Nm	4.6 FUEL TANK TOP PLATE, Installation/metric

FASTENER	TORQUE VALUE		NOTES
Console-to-tank screw	36-60 **in-lbs**	4.1-6.8 Nm	4.22 EVAPORATIVE EMISSIONS CONTROL SYSTEM, Fuel Vapor Vent Tube/metric
Console-to-tank screw	36-60 **in-lbs**	4.1-6.8 Nm	7.31 GAUGES AND INSTRUMENTS: ROAD KING MODELS, Speedometer
Console-to-tank screw	36-60 **in-lbs**	4.1-6.8 Nm	7.32 INDICATOR LAMPS: ROAD KING MODELS, Indicator Lamps
Cover bracket screws	40-60 **in-lbs**	4.5-6.8 Nm	4.4 AIR CLEANER ASSEMBLY, Installation/metric
Cover screw	36-60**in-lbs**	4.1-6.8 Nm	4.4 AIR CLEANER ASSEMBLY, Installation/Use Loctite Medium Strength Threadlocker 243 (Blue)
Crankcase bolt (final torque)	15-19 ft-lbs	20.3-25.8 Nm	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly
Crankcase bolt (initial torque)	120 **in-lbs**	13.6 Nm	3.30 CRANKCASE ASSEMBLY, Crankcase Assembly
Crankcase pipe plugs	120-144 **in-lbs**	13.6-16.3 Nm	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Pipe Plug and Oil Fittings
Crankshaft sprocket bolt, final torque	24 ft-lbs	32.5 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Crossover pipe hanger bracket	84-132 **in-lbs**	9.5-14.9 Nm	3.31 OIL PAN, Installation
Crossover pipe hanger bracket	84-132 **in-lbs**	9.5-14.9 Nm	4.19 EXHAUST SYSTEM, System Installation
Crossover support clamp-to-transmission bracket fastener	14-18 ft-lbs	19.0-24.4 Nm	4.19 EXHAUST SYSTEM, System Installation
Cylinder head bolts, final	15-17 ft-lbs plus 90 degrees	20.3-23.0 Nm plus 90 degrees	3.23 CYLINDER, Inspection/ See procedure to tighten
Cylinder head bolts, final	15-17 ft-lbs plus 90 degrees	20.3-23.0 Nm plus 90 degrees	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/ See procedure to tighten
Cylinder head bolts, initial	120-144 **in-lbs**	13.6-16.2 Nm	3.23 CYLINDER, Inspection
Cylinder head bolts, initial	120-144 **in-lbs**	13.6-16.3 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder Head
Cylinder stud	120-240 **in-lbs**	13.6-27.1 Nm	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Cylinder Studs
Diaphragm spring retainer bolts	70-100 **in-lbs**	7.9-11.3 Nm	5.6 CLUTCH, Clutch Pack and Bearing
Electrical caddy (left) screws	72-96 **in-lbs**	8.1-10.9 Nm	4.22 EVAPORATIVE EMISSIONS CONTROL SYSTEM, Charcoal Canister/metric
Engine guard screws	15-20 ft-lbs	20.3-27.1 Nm	2.33 LOWER FAIRING AND ENGINE GUARD, Engine Guard
Engine mount bracket fasteners	36-40 ft-lbs	48.8-54.2 Nm	2.51 FRONT ENGINE MOUNT, Installation
Engine mount end cap fasteners	42-48 ft-lbs	56.9-65.0 Nm	2.51 FRONT ENGINE MOUNT, Installation
Engine oil drain plug	14-21 ft-lbs	19.0-28.5 Nm	1.5 MAINTENANCE SCHEDULE, General
Engine oil drain plug	14-21 ft-lb	19.0-28.5 Nm	1.6 ENGINE OIL AND FILTER, Changing Oil and Oil Filter
Engine oil drain plug	14-21 ft-lbs	19.0-28.5 Nm	3.31 OIL PAN, Installation/Clean plug before installation
Engine to front engine mounting bracket	36-40 ft-lbs	49-54 Nm	1.24 ENGINE MOUNTS, Inspection
ET sensor	120-180 **in-lbs**	13.6-20.3 Nm	4.12 ENGINE TEMPERATURE SENSOR (ET), Installation
Exhaust crossover pipe clamp	25-30 ft-lbs	33.9-40.7 Nm	4.19 EXHAUST SYSTEM, System Installation/Always use a new clamp

FASTENER	TORQUE VALUE		NOTES
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm	4.19 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm	4.19 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm	4.19 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, final	100-120 **in-lbs**	11.3-13.6 Nm	4.19 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, initial	9-18 **in-lbs**	1-2 Nm	4.19 EXHAUST SYSTEM, System Installation
Exhaust flange adapter nuts, initial	9-18 **in-lbs**	1-2 Nm	4.19 EXHAUST SYSTEM, System Installation
Exhaust heat shield worm drive clamp screw	20-40 **in-lbs**	2.3-4.5 Nm	4.19 EXHAUST SYSTEM, System Installation
Exhaust side bracket carriage bolt	20-25 ft-lbs	27.1-33.9 Nm	4.19 EXHAUST SYSTEM, System Installation
Exhaust valve actuator fasteners	32-40 **in-lbs**	3.6-4.5 Nm	4.20 ACTIVE EXHAUST (HDI), Exhaust Valve Actuator
Fairing bracket-to-steering head locknuts (frame mounted fairing)	20-30 ft-lbs	27.1-40.7 Nm	2.41 INNER FAIRING: FRAME MOUNTED FAIRING MODELS, Installation
Fairing cap screws	25-30 **in-lbs**	2.8-3.4 Nm	2.35 FAIRING CAP: FORK MOUNTED FAIRING MODELS, Fairing Cap
Fairing cap screws	25-30 **in-lbs**	2.8-3.4 Nm	7.18 FAIRING CAP SWITCHES: FORK MOUNTED FAIRING MODELS, Installation
Fairing speaker lower screw (FLHX, FLHTC/U)	22-28 **in-lbs**	2.5-3.2 Nm	2.36 INNER FAIRING: FORK MOUNTED FAIRING MODELS, Installation
Fairing speaker lower screw (FLHX, FLHTC/U)	22-28 **in-lbs**	2.5-3.2 Nm	7.33 ADVANCED AUDIO SYSTEM, Front Fairing Speakers
Fairing speaker upper screws (FLHX, FLHTC/U)	35-50 **in-lbs**	4.0-5.7 Nm	2.36 INNER FAIRING: FORK MOUNTED FAIRING MODELS, Installation
Fairing speaker upper screws (FLHX, FLHTC/U)	35-50 **in-lbs**	4.0-5.7 Nm	7.33 ADVANCED AUDIO SYSTEM, Front Fairing Speakers
Fork bracket pinch bolt	53-57 ft-lbs	71.9-77.3 Nm	1.20 STEERING HEAD BEARINGS, Adjustment
Fork bracket pinch bolt	53-57 ft-lbs	71.9-77.3 Nm	2.17 FRONT FORK, Installation
Fork cap bolt	60-70 ft-lbs	81.4-94.9 Nm	2.17 FRONT FORK, Installation
Fork damper tube screw (metric)	132-216 **in-lbs**	14.9-24.4 Nm	2.17 FRONT FORK, Assembly
Fork lock screws (Road King)	36-60 **in-lbs**	4.1-6.8 Nm	7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK, Road King Models
Fork oil drain plug	72-96 **in-lbs**	8-11 Nm	2.17 FRONT FORK, Changing Fork Oil
Fork stem nut	70-80 ft-lbs	94.9-108.4 Nm	1.20 STEERING HEAD BEARINGS, Adjustment
Fork stem nut	70-80 ft-lbs	94.9-108.4 Nm	1.20 STEERING HEAD BEARINGS, Adjustment
Fork tube plug	60-70 ft-lbs	81.4-94.9 Nm	2.17 FRONT FORK, Changing Fork Oil
Frame cover fastener, rear	15-20 ft lbs	20.3-27.1 Nm	2.28 TOUR-PAK, Luggage Rack/Tour-Pak Support
Frame cover fastener, rear	15-20 ft-lbs	20.3-27.1 Nm	2.46 REAR FENDER, Installation
Front axle holder nuts	132-180 **in-lbs**	14.9-20.3 Nm	2.4 FRONT WHEEL, Installation/metric
Front axle nut	60-65 ft-lbs	81.4-88.1 Nm	2.4 FRONT WHEEL, Installation/metric
Front brake caliper mounting screws	28-38 ft-lbs	37.9-51.5 Nm	C.3 WHEEL SPEED SENSORS, Front Wheel Speed Sensor
Front brake line-to-lower fork bracket fastener	120-180 **in-lbs**	13.6-20.3 Nm	C.4 ABS BRAKE LINES, ABS Module to Front Brake Calipers
Front engine mount end cap fastener	42-48 ft-lbs	56.9-65.0 Nm	1.24 ENGINE MOUNTS, Inspection
Front engine mount fasteners	40-50 ft-lbs	54.2-67.8 Nm	2.51 FRONT ENGINE MOUNT, Installation

FASTENER	TORQUE VALUE		NOTES
Front fender mount screws	16-20 ft-lbs	22-27 Nm	2.45 FRONT FENDER, Installation
Front fender tip lamp bracket screws	20-25 **in-lbs**	2.3-2.8 Nm	7.15 FENDER TIP LAMPS, Front Fender Tip Lamp
Front fender tip lamp bracket screws	20-25 **in-lbs**	2.3-2.8 Nm	7.15 FENDER TIP LAMPS, Front Fender Tip Lamp Jumper Harness
Front fender tip lamp trim strip tee bolt nuts	10-15 **in-lbs**	1.1-1.7 Nm	7.15 FENDER TIP LAMPS, Front Fender Tip Lamp Jumper Harness
Front master cylinder reservoir cover screws	10-12 **in-lbs**	1.1-1.4 Nm	1.5 MAINTENANCE SCHEDULE, General
Front master cylinder reservoir cover screws	10-12 **in-lbs**	1.1-1.4 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement
Front master cylinder reservoir cover screws	10-12 **in-lbs**	1.1-1.4 Nm	2.16 BLEEDING BRAKES, Procedure
Front turn signal lamp acorn nuts, frame mounted fairing	60-84 **in-lbs**	6.8-9.5 Nm	2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS, Outer Fairing
Front turn signal lamp mounting bracket screws (Bullet Style; fork mounted)	15-20 ft-lbs	20-27 Nm	7.16 TURN SIGNAL LAMPS, Front Turn Signal Lamp
Front turn signal lamp mounting bracket screws (FLHR/C, FLHT/C/U)	30-60 **in-lbs**	4.1-6.8 Nm	7.16 TURN SIGNAL LAMPS, Front Turn Signal Lamp
Front turn signal lamp-to-bracket fastener: Bullet Style; fork mounted	15-20 ft-lbs	20-27 Nm	7.16 TURN SIGNAL LAMPS, Front Turn Signal Lamp
Fuel supply line quick-connect fitting	22-26 ft-lbs	29.8-35.3 Nm	4.5 FUEL TANK, Fuel Supply Check Valve/Tube/metric
Fuel supply tube clamp screw	66-82 **in-lbs**	7.5-9.3 Nm	4.16 FUEL INJECTORS, Installation/metric
Fuel tank console screws	36-60 **in-lbs**	4.1-6.8 Nm	7.33 ADVANCED AUDIO SYSTEM, Front Headset Receptacle
Fuel tank front screws	15-20 ft-lbs	20.3-27.1 Nm	4.5 FUEL TANK, Installation
Fuel tank rear bracket screws	15-20 ft-lbs	20.3-27.1 Nm	4.5 FUEL TANK, Installation
Ground terminal nut	50-90 **in-lbs**	5.7-10.2 Nm	7.6 IGNITION COIL, Installation
Guard to frame screws	32-36 ft-lbs	43.4-48.8 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Handlebar clamp to clutch lever bracket screws	72-108 **in-lbs**	8.1-12.0 Nm	2.22 CLUTCH CABLE, Installation
Handlebar clamp to clutch lever bracket screws	72-108 **in-lbs**	8.1-12.0 Nm	2.23 HANDLEBARS, Adjustment
Handlebar clamp to clutch lever bracket screws	72-108 **in-lbs**	8.1-12.2 Nm	7.40 HANDLEBAR SWITCH ASSEMBLIES, Assembly: Left Side Handlebar Switches
Handlebar clamp to clutch lever bracket screws	72-108 **in-lbs**	8.1-12.2 Nm	7.40 HANDLEBAR SWITCH ASSEMBLIES, Installation
Handlebar clamp to master cylinder screws	72-108 **in-lbs**	8.1-12.2 Nm	2.12 FRONT BRAKE MASTER CYLINDER, Assembly and Installation
Handlebar clamp to master cylinder screws	72-108 **in-lbs**	8.1-12.2 Nm	7.40 HANDLEBAR SWITCH ASSEMBLIES, Assembly: Right Side Handlebar Switches
Handlebar lower clamp bolts (risers)	30-40 ft-lbs	40.7-54.2 Nm	2.23 HANDLEBARS, Rubber Mounts
Handlebar switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	1.5 MAINTENANCE SCHEDULE, General
Handlebar switch housing screws	35-45 **in-lbs**	4.0-5.0 Nm	7.40 HANDLEBAR SWITCH ASSEMBLIES, Assembly: Right Side Handlebar Switches
Handlebar switch housing screws	35-45 **in-lbs**	4.0-5.0 Nm	7.40 HANDLEBAR SWITCH ASSEMBLIES, Assembly: Left Side Handlebar Switches

FASTENER	TORQUE VALUE		NOTES
Handlebar switch housing screws	35-45 **in-lbs**	4.0-5.0 Nm	7.40 HANDLEBAR SWITCH ASSEMBLIES, Installation
Handlebar switch housing screws	35-45 **in-lbs**	4.0-5.0 Nm	7.40 HANDLEBAR SWITCH ASSEMBLIES, Installation
Handlebar upper clamp screws	16-20 ft-lbs	21.7-27.1 Nm	2.23 HANDLEBARS, Adjustment
Handlebar upper clamp screws	16-20 ft-lbs	21.7-27.1 Nm	2.23 HANDLEBARS, Installation
Handlebar upper clamp screws	16-20 ft-lbs	21.7-27.1 Nm	2.23 HANDLEBARS, Installation
Harness ground stud flange nuts	50-90 **in-lbs**	5.7-10.2 Nm	7.35 MAIN WIRING HARNESS, Installation: All Models (Part 1)/(10 mm)
Harness ground stud flange nuts	50-90 **in-lbs**	5.7-10.2 Nm	7.35 MAIN WIRING HARNESS, Installation: All Models (Part 1)/(10 mm)
Headlamp adjuster mounting screw (dual headlamp models)	35-45 **in-lbs**	4.0-5.1 Nm	7.12 HEADLAMP: ROAD GLIDE, Headlamp Adjuster Assembly
Headlamp door screw	9-18 **in-lbs**	1.0-2.0 Nm	7.11 HEADLAMP: ALL EXCEPT ROAD GLIDE, Headlamp: Single Headlamp Models
Headlamp housing screws	9-18 **in-lbs**	1.0-2.0 Nm	2.44 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp housing screws	9-18 **in-lbs**	1.0-2.0 Nm	2.44 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp mounting screw (dual headlamp models)	15-25 **in-lbs**	1.7-2.8 Nm	7.12 HEADLAMP: ROAD GLIDE, Headlamp Adjuster Assembly
Headlamp mounting screw (dual headlamp models)	15-25 **in-lbs**	1.7-2.8 Nm	7.12 HEADLAMP: ROAD GLIDE, Headlamp Bulb Replacement: Dual Headlamp Models
Headlamp nacelle handlebar chrome strip flange nut	15-20 **in-lbs**	1.7-2.3 Nm	2.44 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp nacelle handlebar clamp shroud screws	10-20 **in-lbs**	1.1-2.3 Nm	2.44 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp nacelle handlebar clamp shroud screws	10-20 **in-lbs**	1.1-2.3 Nm	2.44 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp nacelle to fork bracket stud acorn nuts	72-108 **in-lbs**	8.1-12.2 Nm	2.44 HEADLAMP NACELLE: ROAD KING MODELS, Installation
Headlamp retaining screws (Fairing equipped)	22-32 **in-lbs**	2.5-3.6 Nm	7.11 HEADLAMP: ALL EXCEPT ROAD GLIDE, Headlamp: Single Headlamp Models
Headlamp retaining screws (Non-fairing equipped)	9-18 **in-lbs**	1.0-2.0 Nm	7.11 HEADLAMP: ALL EXCEPT ROAD GLIDE, Headlamp: Single Headlamp Models
Horn bracket acorn nut	80-120 **in-lbs**	9.0-13.6 Nm	7.27 HORN, Installation
Horn stud flange nut	80-100 **in-lbs**	9.0-11.3 Nm	7.27 HORN, Installation
Ignition coil screws	32-40 **in-lbs**	3.6-4.5 Nm	7.6 IGNITION COIL, Installation
Ignition switch housing nut	85-115 **in-lbs**	9.6-13.0 Nm	7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK, Fairing Models
Ignition switch housing screws	36-60 **in-lbs**	4.1-6.8 Nm	7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK, Fairing Models
Ignition switch screws (Road King)	20-30 **in-lbs**	2.3-3.4 Nm	7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK, Road King Models
Induction module flange adapter screws	96-144 **in-lbs**	10.9-16.3 Nm	4.13 INDUCTION MODULE, Installation/metric
Induction module flange adapter screws	96-144 **in-lbs**	10.9-16.3 Nm	4.13 INDUCTION MODULE, Installation/metric
Instrument bezel screws	25-35 **in-lbs**	2.8-4.0 Nm	7.19 INSTRUMENT NACELLE SWITCHES: FRAME MOUNTED FAIRING MODELS, Installation

FASTENER	TORQUE VALUE		NOTES
Instrument bezel screws (frame mounted fairing models)	25-35 **in-lbs**	2.8-4.0 Nm	2.39 INSTRUMENT BEZEL: FRAME MOUNTED FAIRING MODELS, Bezel
Instrument console screws	36-60 **in-lbs**	4.1-6.8 Nm	7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK, Road King Models
Instrument nacelle to fork bracket screws	15-20 ft-lbs	20-27 Nm	7.19 INSTRUMENT NACELLE SWITCHES: FRAME MOUNTED FAIRING MODELS, Installation
Instrument nacelle to fork bracket screws	15-20 ft-lbs	20-27 Nm	7.19 INSTRUMENT NACELLE SWITCHES: FRAME MOUNTED FAIRING MODELS, Installation
Instrument nacelle to fork bracket screws (frame mounted fairing models)	15-20 ft-lbs	20.3-27.1 Nm	2.40 INSTRUMENT NACELLE: FRAME MOUNTED FAIRING MODELS, Instrument Nacelle
Jiffy stand bracket fasteners	36-42 ft-lbs	48.8-57.0 Nm	2.50 JIFFY STAND, Jiffy Stand Bracket
Jiffy stand interlock sensor fastener	96-120 **in-lbs**	10.8-13.6 Nm	2.50 JIFFY STAND, Jiffy Stand Interlock Sensor/Use Loctite Medium Strength Threadlocker 243 (blue) if reusing screw
Jiffy stand leg stop hex screw	15-20 ft-lbs	20.3-27.1 Nm	2.50 JIFFY STAND, Leg Installation
Left electrical caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm	2.48 REAR FRAME, Rear Frame
Left electrical caddy fastener	72-96 **in-lbs**	8.1-10.9 Nm	7.8 ELECTRICAL CADDIES, Left Side Caddy
License plate bracket screws	60-80 **in-lbs**	6.8-9.0 Nm	7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket
License plate bracket screws	60-80 **in-lbs**	6.8-9.0 Nm	7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket
Lifter cover screws	90-120 **in-lbs**	10.2-13.6 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Push Rods, Lifters and Covers
Lower fairing clip stud flange nuts	35-40 **in-lbs**	4.0-4.5 Nm	2.33 LOWER FAIRING AND ENGINE GUARD, Lower Fairing
Lower fairing glove box tray screws	20-25 **in-lbs**	2.3-2.8 Nm	2.33 LOWER FAIRING AND ENGINE GUARD, Lower Fairing
Lower fairing glove box tray screws	20-25 **in-lbs**	2.3-2.8 Nm	2.33 LOWER FAIRING AND ENGINE GUARD, Lower Fairing
Lower fairing to engine guard clamp screws	90-100 **in-lbs**	10.2-11.3 Nm	2.33 LOWER FAIRING AND ENGINE GUARD, Lower Fairing
Luggage rack screws	15-20 ft lbs	20.3-27.1 Nm	2.28 TOUR-PAK, Luggage Rack/Tour-Pak Support
Luggage rack screws	15-20 ft-lbs	20.3-27.1 Nm	2.46 REAR FENDER, Installation
Mainshaft/countershaft nuts	85-95 ft-lbs	115.3-128.8 Nm	6.6 TRANSMISSION ASSEMBLY, Assembly
Mirror flange nut (FLHX)	30-40 **in-lbs**	3.4-4.5 Nm	2.24 MIRRORS, FLHX/metric
Mirror stem acorn nut	60-96 **in-lbs**	6.8-10.8 Nm	2.24 MIRRORS, All Models Except FLHX/metric
Muffler clamp	38-43 ft-lbs	51.5-58.3 Nm	4.19 EXHAUST SYSTEM, Mufflers
Neutral switch	120-180 **in-lbs**	13.6-20.3 Nm	6.8 TRANSMISSION CASE, Installation
Neutral switch	120-180 **in-lbs**	13.6-20.3 Nm	7.24 NEUTRAL SWITCH, Installation
Oil cooler adapter inspection cover	90-120 **in-lbs**	10.2-13.6 Nm	3.10 OIL COOLER ADAPTER, Assembly/Apply 1 drop LOCTITE 246 THREADLOCKER MEDIUM STRENGH/HIGH TEMPERATURE to the fasteners
Oil cooler mounting screws	20-22 ft-lbs	27.1-29.8 Nm	3.9 OIL COOLER, Installation
Oil filter adapter	18-22 ft-lbs	24.4-27.3 Nm	3.10 OIL COOLER ADAPTER, Installation
Oil pan fasteners	132-156 **in-lbs**	14.9-17.6 Nm	3.31 OIL PAN, Installation/Torque sequence; Loctite Threadlocker 243 (blue) with used fasteners

FASTENER	TORQUE VALUE		NOTES
Oil pan tapered plug	18-22 ft-lbs	24.4-29.8 Nm	3.31 OIL PAN, Installation/Apply Loctite Pipe Sealant With Teflon 565 (P/N 99818-97)
Oil pressure sender	96-144 **in-lbs**	10.8-16.3 Nm	7.25 OIL PRESSURE SWITCH AND SENDER, Installation
Oil pressure switch	96-144 **in-lbs**	10.8-16.3 Nm	7.25 OIL PRESSURE SWITCH AND SENDER, Installation
Oil pump screws, initial torque	40-45 **in-lbs**	4.5-5.1 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Outer fairing long screws, frame mounted fairing	10-15 **in-lbs**	1.1-1.7 Nm	2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS, Outer Fairing
Outer fairing screws (fork mounted fairing)	20-30 **in-lbs**	2.3-3.4 Nm	2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS, Outer Fairing and Windshield
Outer fairing short screws, frame mounted fairing	6-12 **in-lbs**	0.7-1.4 Nm	2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS, Outer Fairing
Oxygen sensor	14 ft-lbs	19 Nm	4.15 OXYGEN SENSORS (O2), Installation/metric
Passenger footboard/footrest fastener	36-42 ft-lbs	48.8-56.9 Nm	2.49 FOOTBOARDS AND FOOTRESTS, Passenger Footrest: FLHX, FLTRX
Passenger footboard/footrest lower fastener	48-72 **in lbs**	5.4-8.1 Nm	2.49 FOOTBOARDS AND FOOTRESTS, Passenger Footboard
Passenger footboard/footrest upper fastener	36-42 ft-lbs	48.8-56.9 Nm	2.49 FOOTBOARDS AND FOOTRESTS, Passenger Footboard
Passenger footrest pad screw (FLHX, FLTRX)	15-20 ft-lbs	20-27 Nm	2.49 FOOTBOARDS AND FOOTRESTS, Passenger Footrest: FLHX, FLTRX/Use Loctite Medium Strength Threadlocker 243 (blue)
Piston jet screws	25-35 **in-lbs**	2.8-3.9 Nm	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
Primary cam sprocket flange bolts, final torque	34 ft-lbs	46.1 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Primary cam sprocket flange bolts, initial torque	15 ft-lbs	20.3 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Primary cam sprocket flange bolts, initial torque	15 ft-lbs	20.3 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Cam Support Plate and Cover Installation
Primary chaincase drain plug	14-21 ft-lbs	19.0-28.5 Nm	1.5 MAINTENANCE SCHEDULE, General
Primary chaincase drain plug	14-21 ft-lbs	19.0-28.5 Nm	1.9 PRIMARY CHAINCASE LUBRICANT, Changing Primary Chaincase Lubricant
Primary cover fasteners	108-120 **in-lbs**	12.2-13.6 Nm	5.3 PRIMARY CHAINCASE COVER, Installation/See sequence in the procedure
Radio (storage box) to support bracket screws	35-45 **in-lbs**	4.0-5.1 Nm	7.33 ADVANCED AUDIO SYSTEM, Radio
Radio bracket-to-fairing bracket locknuts (frame mounted fairing)	96-144 **in-lbs**	10.9-16.3 Nm	2.41 INNER FAIRING: FRAME MOUNTED FAIRING MODELS, Installation
Radio support bracket screws	35-45 **in-lbs**	4.0-5.1 Nm	7.17 IGNITION/LIGHT KEY SWITCH AND FORK LOCK, Fairing Models
Rail clamp screws	30-50 **in-lbs**	3.4-5.6 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Rear axle cone nut (final)	95-105 ft-lbs	128.8-142.4 Nm	1.12 DRIVE BELT AND SPROCKETS, Setting Belt Deflection
Rear axle cone nut (preliminary)	15-20 ft-lbs	20-27 Nm	2.5 REAR WHEEL, Installation/metric

FASTENER	TORQUE VALUE		NOTES
Rear axle cone nut (preliminary)	15-20 ft-lbs	20-27 Nm	1.12 DRIVE BELT AND SPROCKETS, Setting Belt Deflection/For belt adjustment only
Rear brake light switch	12-15 ft-lbs	16.3-20.3 Nm	2.14 REAR BRAKE MASTER CYLINDER, Rear Brake Line: Non-ABS Equipped/Use Loctite Pipe Sealant with Teflon 565
Rear brake light switch	12-15 ft-lbs	16.3-20.3 Nm	C.4 ABS BRAKE LINES, Rear Master Cylinder to ABS Module/Use Loctite Pipe Sealant with Teflon 565
Rear fascia flange nuts	30-45 **in-lbs**	3.4-5.1 Nm	2.47 REAR FASCIA, Installation
Rear fascia lamp screws	18-22 **in-lbs**	2.0-2.5 Nm	2.47 REAR FASCIA, Installation
Rear fascia lamp screws	18-22 **in-lbs**	2.0-2.5 Nm	2.47 REAR FASCIA, Rear Fascia Lamp
Rear fender lights harness stud plate flange nuts	60-96 **in-lbs**	6.8-10.9 Nm	7.14 TAIL LAMP, Rear Fender Lights Harness: all except FLHX, FLTRX
Rear fender mounting boss	15-20 ft-lbs	20.3-27.1 Nm	2.46 REAR FENDER, Fender Repair
Rear fender mounting screws	15-20 ft-lbs	20.3-27.1 Nm	2.46 REAR FENDER, Installation
Rear fender support-to-fender nut	45-85 **in-lbs**	5.1-9.6 Nm	2.47 REAR FASCIA, Installation
Rear fender support-to-fender nut	45-85 **in-lbs**	5.1-9.6 Nm	2.47 REAR FASCIA, Stud Plate
Rear fender support -to-saddlebag support fastener	15-20 ft-lbs	20.3-27.1 Nm	2.46 REAR FENDER, Installation
Rear fender support-to-saddlebag support fastener	15-20 ft-lbs	20.3-27.1 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Rear fender support-to-saddlebag support fastener	15-20 ft-lbs	20.3-27.1 Nm	2.47 REAR FASCIA, Stud Plate
Rear fender tip lamp screws	20-25 **in-lbs**	2.3-2.8 Nm	7.15 FENDER TIP LAMPS, Rear Fender Tip Lamp
Rear fork bracket screws	55-65 ft-lbs	74.6-88.1 Nm	2.21 REAR FORK, Installation/Apply two drops of Loctite Medium Strength Threadlocker 243 (blue) to threads
Rear fork pivot shaft fasteners	55-65 ft-lbs	74.6-88.2 Nm	2.21 REAR FORK, Installation/Apply two drops of Loctite Medium Strength Threadlocker 243 (blue) to threads
Rear frame-to-main frame fastener	40-50 ft-lbs	54.2-67.8 Nm	1.24 ENGINE MOUNTS, Inspection
Rear frame-to-main frame fastener	40-45 ft-lbs	54.2-61.0 Nm	2.48 REAR FRAME, Rear Frame
Rear master cylinder reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	1.5 MAINTENANCE SCHEDULE, General
Rear master cylinder reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement
Rear master cylinder reservoir cover screws	12-15 **in-lbs**	1.4-1.7 Nm	2.16 BLEEDING BRAKES, Procedure
Rear master cylinder-to-frame screws	126-150 **in-lbs**	14.2-17.0 Nm	2.14 REAR BRAKE MASTER CYLINDER, Assembly and Installation
Rear master cylinder-to-frame screws	126-150 **in-lbs**	14.2-17.0 Nm	2.14 REAR BRAKE MASTER CYLINDER, Rear Brake Line: Non-ABS Equipped
Rear master cylinder-to-frame screws	126-150 **in-lbs**	14.2-17.0 Nm	C.4 ABS BRAKE LINES, Rear Master Cylinder to ABS Module
Rear muffler fastener	96-144 **in-lbs**	10.9-16.3 Nm	1.12 DRIVE BELT AND SPROCKETS, Setting Belt Deflection
Rear muffler fastener	96-144 **in-lbs**	10.8-16.3 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail

FASTENER	TORQUE VALUE		NOTES
Rear muffler fastener	96-144 **in-lbs**	10.8-16.3 Nm	4.19 EXHAUST SYSTEM, Mufflers
Rear stoplight switch	12-15 ft-lbs	16.3-20.3 Nm	7.26 STOPLIGHT SWITCHES, Rear Stoplight Switch/Use Loctite Pipe Sealant with Teflon 565
Rear turn signal lamps bracket screws	84-144 **in-lbs**	9.5-16.3 Nm	7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket/Use LOCTITE High Strength Threadlocker 271 (red)
Rear turn signal lamps bracket screws	84-144 **in-lbs**	9.5-16.3 Nm	7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamps Bracket/Use LOCTITE High Strength Threadlocker 271 (red)
Rear turn signal lamp-to-rear turn signal lamps bracket screws	30-50 **in-lbs**	3.4-5.6 Nm	7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamp
Rider footboard bracket screws	36-42 ft-lbs	48.8-57.0 Nm	2.49 FOOTBOARDS AND FOOTRESTS, Rider Footboards
Rider footboard pivot bolt nut	60-80 **in-lbs**	6.8-9.0 Nm	2.49 FOOTBOARDS AND FOOTRESTS, Rider Footboards
Right main bearing retaining screws	40-70 **in-lbs**	4.5-7.9 Nm	3.28 CRANKCASE DISASSEMBLY AND REPAIR, Right Crankcase Half
Rocker arm support plate bolts	18-22 ft-lbs	24.4-29.8 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Rocker Arm Support Plate
Rocker cover screws	15-18 ft-lbs	20.3-24.4 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Breather and Rocker Cover
Rocker housing bolts	120-168 **in-lbs**	13.6-19.0 Nm	3.25 TOP END OVERHAUL: ASSEMBLY, Cylinder Head
Saddlebag latch/check strap screws	20-25 **in-lbs**	2.3-2.8 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Hardware
Saddlebag latch/check strap screws	20-25 **in-lbs**	2.3-2.8 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Hardware
Saddlebag lid check strap screws	18-20 **in-lbs**	2.0-2.3 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Hardware
Saddlebag mounting bracket screw	60-96 **in-lbs**	6.8-10.8 Nm	2.25 SEAT, Seat: Road King Models
Saddlebag mounting bracket screw	12-15 ft-lbs	16.3-20.3 Nm	2.26 SADDLEBAGS, Installation
Saddlebag mounting bracket screw	12-15 ft-lbs	16.3-20.3 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Saddlebag mounting bracket screw	12-15 ft lbs	16.3-20.3 Nm	2.28 TOUR-PAK, Luggage Rack/Tour-Pak Support
Saddlebag mounting bracket screw	12-15 ft-lbs	16.3-20.3 Nm	2.46 REAR FENDER, Installation
Saddlebag side guard to front guard screw	72-120 **in-lbs**	8.1-13.6 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Saddlebag support rail to front guard screw	70-100 **in-lbs**	7.9-11.3 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Saddlebag support to fender support fastener	15-20 ft-lbs	20.3-27.1 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Saddlebag support to fender support fastener	15-20 ft-lbs	20.3-27.1 Nm	2.46 REAR FENDER, Installation
Sealing fasteners	25-27 ft-lbs	33.9-36.6 Nm	5.5 PRIMARY CHAINCASE HOUSING, Installation
Seat bumper fastener	80-120 **in-lbs**	9.0-13.6 Nm	2.25 SEAT, Seat Bumper
Seat mounting screw	48-72 **in-lbs**	5.4-8.1 Nm	2.25 SEAT, Seat: Models without Tour-Pak
Seat mounting screw	48-72 **in-lbs**	5.4-8.1 Nm	2.25 SEAT, Seat: Models with Tour-Pak
Seat mounting screw	48-72 **in-lbs**	5.4-8.1 Nm	2.25 SEAT, Seat: Road King Models
Seat strap screw	48-72 **in-lbs**	5.4-8.1 Nm	2.25 SEAT, Seat: Models without Tour-Pak
Seat strap screw	48-72 **in-lbs**	5.4-8.1 Nm	2.25 SEAT, Seat: Models with Tour-Pak

FASTENER	TORQUE VALUE		NOTES
Secondary cam chain tensioner fastener	90-120 **in-lbs**	10.2-13.6 Nm	3.26 CAM COMPARTMENT AND COMPONENTS, Camshafts
Shift drum detent arm fastener	120-150 **in-lbs**	13.6-17.0 Nm	6.6 TRANSMISSION ASSEMBLY, Assembly
Shift drum lock plate fasteners	57-63 **in-lbs**	6.4-7.1 Nm	6.6 TRANSMISSION ASSEMBLY, Assembly
Shifter rod lever screw	18-22 ft-lbs	24.4-29.8 Nm	6.8 TRANSMISSION CASE, Assembly
Shifter rod locknut	80-120 **in-lbs**	9.0-13.6 Nm	6.4 SHIFTER LINKAGE, Shifter Rod
Shift lever fasteners	18-22 ft-lbs	24-30 Nm	5.3 PRIMARY CHAINCASE COVER, Installation
Shift lever shaft fastener	90-110 **in-lbs**	10.2-12.4 Nm	5.3 PRIMARY CHAINCASE COVER, Installation
Shock absorber compression fitting	12-17 ft-lbs	16.3-23.0 Nm	2.19 REAR AIR SUSPENSION, Check for Air Leaks
Shock absorber compression fitting	12-17 ft-lbs	16.3-23.0 Nm	2.20 REAR SHOCK ABSORBERS, Disassembly and Assembly
Shock lower mounting bolt	35-40 ft-lbs	47.5-54.2 Nm	2.20 REAR SHOCK ABSORBERS, Installation/Use LOCTITE MEDIUM STRENGTH THREADLOCKER 243 (blue)
Shock lower mounting bolt	35-40 ft-lbs	47.5-54.2 Nm	2.21 REAR FORK, Installation/Apply two or three drops of Loctite Medium Strength Threadlocker 243 (blue) to threads
Shock upper mounting bolt	35-40 ft-lbs	47.5-54.2 Nm	2.20 REAR SHOCK ABSORBERS, Installation/Use LOCTITE MEDIUM STRENGTH THREADLOCKER 243 (blue)
Side door fasteners	13-18 ft-lbs	17.6-24.4 Nm	6.6 TRANSMISSION ASSEMBLY, Installation
Side rail to saddlebag support screws	15-20 ft-lbs	20.3-27.1 Nm	2.27 SADDLEBAG SERVICE, Saddlebag Guard/Support Rail
Solenoid contact post jamnut	65-80 **in-lbs**	7.3-9.0 Nm	7.10 STARTER, Solenoid
Solenoid ring terminal nut	70-90 **in-lbs**	7.9-10.2 Nm	7.10 STARTER, Drive Assembly
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	1.5 MAINTENANCE SCHEDULE, General
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	1.17 SPARK PLUGS, Inspection
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	3.8 TROUBLESHOOTING, Compression Test
Speaker box fasteners	25-35 **in-lbs**	2.8-4.0 Nm	2.32 TOUR-PAK SPEAKER BOX, Speaker Box
Speaker box mounting screws	25-35 **in-lbs**	2.8-4.0 Nm	2.28 TOUR-PAK, Removal/Installation
Speedometer/tachometer bracket screws	10-20 **in-lbs**	1.1-2.3 Nm	2.36 INNER FAIRING: FORK MOUNTED FAIRING MODELS, Installation
Speedometer bracket screws	10-20 **in-lbs**	1.1-2.3 Nm	7.29 GAUGES AND INSTRUMENTS: FAIRING MODELS, Speedometer
Spoke nipple	55 **in-lbs**	6.2 Nm	1.5 MAINTENANCE SCHEDULE, General
Spoke nipple	55 **in-lbs**	6.2 Nm	1.8 TIRES AND WHEELS, Wheel Spokes
Spoke nipple	55 **in-lbs**	6.2 Nm	2.9 CHECKING AND TRUING WHEELS, Truing Laced Wheels
Starter end cover screw	90-110 **in-lbs**	10.2-12.4 Nm	7.10 STARTER, Drive Assembly
Starter mounting screw	25-27 ft-lbs	33.9-36.6 Nm	7.10 STARTER, Installation/Apply a drop of Loctite Threadlocker 243 (blue) to the threads.
Starter ring terminal hex nut	70-90 **in-lbs**	7.9-10.2 Nm	7.10 STARTER, Solenoid
Starter terminal post nut	70-90 **in-lbs**	7.9-10.2 Nm	7.10 STARTER, Installation
Starter through bolts	39-65 **in-lbs**	4.4-7.3 Nm	7.10 STARTER, Drive Assembly

FASTENER	TORQUE VALUE		NOTES
Stator mounting screws	55-75 **in-lbs**	6.2-8.5 Nm	7.22 ALTERNATOR, Installation/Always use new screws
Tachometer bracket screws	10-20 **in-lbs**	1.1-2.3 Nm	7.29 GAUGES AND INSTRUMENTS: FAIRING MODELS, Tachometer
Tail lamp circuit board/chrome base screw	40-48 **in-lbs**	4.5-5.4 Nm	7.14 TAIL LAMP, Circuit Board/Chrome Base
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.14 TAIL LAMP, Tail Lamp Bulb Replacement
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.14 TAIL LAMP, Circuit Board/Chrome Base
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.14 TAIL LAMP, Rear Fender Lights Harness: all except FLHX, FLTRX
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.14 TAIL LAMP, Rear Fender Lights Harness: FLHX, FLTRX
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.15 FENDER TIP LAMPS, Rear Fender Tip Lamp
Tail lamp screws	20-24 **in-lbs**	2.3-2.7 Nm	7.16 TURN SIGNAL LAMPS, Rear Turn Signal Lamp
TMAP hex screw	84-108 **in-lbs**	9.5-12.2 Nm	4.14 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE SENSOR (TMAP), Installation/metric
Top caddy clamp screws	72-96 **in-lbs**	8.1-10.9 Nm	7.8 ELECTRICAL CADDIES, Top Caddy
Top caddy hold-down	32-40 **in-lbs**	3.6-4.5 Nm	4.22 EVAPORATIVE EMISSIONS CONTROL SYSTEM, Charcoal Canister
Top caddy mounting screw	72-96 **in-lbs**	8.1-10.9 Nm	1.5 MAINTENANCE SCHEDULE, General
Top caddy mounting screw	72-96 **in-lbs**	8.1-10.9 Nm	1.23 BATTERY MAINTENANCE, Battery
Top caddy mounting screw	72-96 **in-lbs**	8.1-10.8 Nm	2.48 REAR FRAME, Rear Frame
Top engine stabilizer bracket to cylinder head bolts	30-35 ft-lbs	41-48 Nm	3.15 ASSEMBLING MOTORCYCLE AFTER SERVICE, Procedure
Top engine stabilizer bracket to cylinder head bolts	30-35 ft-lbs	41-48 Nm	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
Top stabilizer link bolt	18-22 ft-lbs	24.4-29.9 Nm	1.24 ENGINE MOUNTS, Inspection
Top stabilizer link bolt	18-22 ft-lbs	24.4-29.9 Nm	1.24 ENGINE MOUNTS, Inspection
Top stabilizer link bolt	18-22 ft-lbs	24.4-29.8 Nm	3.15 ASSEMBLING MOTORCYCLE AFTER SERVICE, Procedure
Top stabilizer link bolt	18-22 ft-lbs	24.4-29.8 Nm	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
Tour-Pak latch screw	20-25 **in-lbs**	2.3-2.8 Nm	2.29 TOUR-PAK SERVICE, Latches/Lockset Catch/Use Loctite Medium Strength Threadlocker 243 (blue)
Tour-Pak lockset hex nut	25-35 **in-lbs**	2.8-4.0 Nm	2.29 TOUR-PAK SERVICE, Lockset
Tour-Pak lockset jam nut	30-45 **in-lbs**	3.4-5.1 Nm	2.29 TOUR-PAK SERVICE, Lockset
Tour-Pak luggage rack fastener	60-84 **in-lbs**	6.8-9.5 Nm	2.29 TOUR-PAK SERVICE, Luggage Rack
Tour-Pak metal plate flange nuts	65-70 **in-lbs**	7.3-7.9 Nm	2.30 TOUR-PAK LIGHTS, Tour-Pak Lights Harness
Tour-Pak mounting bolts	96-120 **in-lbs**	10.8-13.6 Nm	2.30 TOUR-PAK LIGHTS, Tour-Pak Lights Harness
Tour-Pak mounting screws	96-120 **in-lbs**	10.8-13.6 Nm	2.28 TOUR-PAK, Removal/Installation
Tour-Pak mounting screws	96-120 **in-lbs**	10.8-13.6 Nm	2.28 TOUR-PAK, Adjustment
Tour-Pak passenger backrest flange nuts	40-60 **in-lbs**	4.5-6.8 Nm	2.29 TOUR-PAK SERVICE, Tether Brackets
Tour-Pak passenger backrest flange nuts	40-60 **in-lbs**	4.5-6.8 Nm	2.31 TOUR-PAK BACKREST, Passenger Backrest

FASTENER	TORQUE VALUE		NOTES
Tour-Pak passenger backrest flap screws	21-24 **in-lbs**	2.4-2.7 Nm	2.31 TOUR-PAK BACKREST, Passenger Backrest Flap
Tour-Pak side marker lights screws	20-25 **in-lbs**	2.3-2.8 Nm	2.30 TOUR-PAK LIGHTS, Side Marker Lights (if equipped)
Tour-Pak tether screw	20-25 **in-lbs**	2.3-2.8 Nm	2.29 TOUR-PAK SERVICE, Hinges/Use Loctite High Strength Threadlocker 262 (red)
Tour-Pak tether screw	20-25 **in-lbs**	2.3-2.8 Nm	2.29 TOUR-PAK SERVICE, Tether/Use Loctite High Strength Threadlocker 262 (red)
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	1.5 MAINTENANCE SCHEDULE, General
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	1.10 TRANSMISSION LUBRICANT, Transmission Lubrication
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	2.22 CLUTCH CABLE, Installation
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	3.31 OIL PAN, Installation/Clean plug before installation
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	6.6 TRANSMISSION ASSEMBLY, Installation
Transmission drain plug	14-21 ft-lbs	19.0-28.5 Nm	6.8 TRANSMISSION CASE, Installation
Transmission filler/check plug	25-75 **in-lbs**	2.8-8.5 Nm	1.5 MAINTENANCE SCHEDULE, General
Transmission filler/check plug	25-75 **in-lbs**	2.8-8.5 Nm	1.10 TRANSMISSION LUBRICANT, Transmission Lubrication
Transmission filler/check plug	25-75 **in-lbs**	2.8-8.5 Nm	1.10 TRANSMISSION LUBRICANT, Transmission Lubrication
Transmission lockplate screws	90-120 **in-lbs**	10.2-13.6 Nm	5.7 TRANSMISSION SPROCKET, Installation/LOCTITE patch, use 3-5 times
Transmission mounting bolts, final torque	34-39 ft-lbs	46.1-52.9 Nm	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
Transmission mounting bolts, final torque	34-39 ft-lbs	46.1-52.9 Nm	6.8 TRANSMISSION CASE, Installation
Transmission mounting bolts, initial torque	15 ft-lbs	20.3 Nm	3.17 INSTALLING ENGINE IN CHASSIS, Procedure
Transmission mounting bolts, initial torque	15 ft-lbs	20.3 Nm	6.8 TRANSMISSION CASE, Installation
Transmission sprocket nut, final	35 ft-lbs	47.5 Nm	5.7 TRANSMISSION SPROCKET, Installation/Plus an additional 35-45 degrees final torque
Transmission sprocket nut, initial	100 ft-lbs	135.7 Nm	5.7 TRANSMISSION SPROCKET, Installation/Right hand threads, initial torque only, apply several drops of LOCTITE THREADLOCKER 271 (red) to last few threads.
Transmission sprocket nut (maximum)	35 ft-lbs	47.5 Nm	5.7 TRANSMISSION SPROCKET, Installation
Transmission top cover	90-120 **in-lbs**	10.2-13.6 Nm	6.6 TRANSMISSION ASSEMBLY, Installation
Turn signal lamp mounting bracket screws	36-60 **in-lbs**	4.1-6.8 Nm	7.13 AUXILIARY LAMPS AND BRACKETS, Auxiliary Lamp Housing
Turn signal lamp to auxiliary lamp stud locknut	15-18 ft-lbs	20.3-24.4 Nm	7.13 AUXILIARY LAMPS AND BRACKETS, Auxiliary Lamp Housing
Turn signal lamp to mounting bracket screws	36-60 **in-lbs**	4.1-6.8 Nm	1.21 HEADLAMP ALIGNMENT, Auxiliary Lamp Alignment
Valve stem nut	12-15 **in-lbs**	1.4-1.7 Nm	2.11 TIRES, Installation
Voltage regulator locknuts	70-100 **in-lbs**	7.9-11.3 Nm	3.9 OIL COOLER, Installation
Voltage regulator locknuts	70-100 **in-lbs**	7.9-11.3 Nm	7.3 VOLTAGE REGULATOR, Installation

FASTENER	TORQUE VALUE		NOTES
VSS fastener	84-132 **in-lbs**	9.5-14.9 Nm	6.8 TRANSMISSION CASE, Installation
VSS fastener	84-132 **in-lbs**	9.5-14.9 Nm	7.23 VEHICLE SPEED SENSOR (VSS), VSS
Windshield screws (fork mounted fairing)	25-30 **in-lbs**	2.8-3.4 Nm	2.34 UPPER FAIRING AND WINDSHIELD: FORK MOUNTED FAIRING MODELS, Outer Fairing and Windshield
Windshield wellnut screws (frame mounted fairing)	6-13 **in-lbs**	0.7-1.5 Nm	2.38 UPPER FAIRING AND WINDSHIELD: FRAME MOUNTED FAIRING MODELS, Windshield
Windshield window screws (Road King Models)	20-25 **in-lbs**	2.3-2.8 Nm	2.43 WINDSHIELD: ROAD KING MODELS, Windshield Window

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

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