2015 Harley-Davidson Sportster Models Service Manual

99484-15

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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

2015 Harley-Davidson Sportster Models Service Manual

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2015 Harley-Davidson Sportster Models Service Manual (99484-15)

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

⚠WARNING

The rider's safety depends upon proper motorcycle service and maintenance. If a procedure in this manual is not within your capabilities or you do not have the correct tools, have a Harley-Davidson dealer perform the procedure. Improper service or maintenance could result in death or serious injury. (00627b)

This service manual has been prepared with the following purposes in mind:

- To acquaint the user with the construction of the Harley-Davidson product and assist in the performance of basic maintenance and repair.
- To introduce the professional Harley-Davidson technician to 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 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/Transmission
6	Electrical
A	Appendix A Connector Repair
B	Appendix B Wiring
C	Appendix C Compensating Sprocket
D	Appendix D Reference

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 D.4 GLOSSARY for a list of acronyms, abbreviations and definitions.

PREPARATION FOR SERVICE

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

⚠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. Start each job with a clean work area. This will allow the repair to proceed as smoothly as possible. It will also reduce the incidence of misplaced tools and parts.

Clean a motorcycle that is excessively dirty before work starts. Cleaning will occasionally uncover sources of trouble. Gather any tools, instruments and any parts needed for the job before work begins. Interrupting a job to locate tools or parts is a distraction and causes needless delay.

NOTES

- *To avoid unnecessary disassembly, carefully read all related service information before repair work begins.*
- *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), first disarm the system. Keep the fob close to the vehicle or use DIGITAL TECHNICIAN II (Part No. HD-48650) to disable the system. Activate 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. It is recommended that you take special notice of these items.

Proper service and repair are 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.

Special Tools

All tools mentioned in this manual with a part number beginning with "HD", "J" or "B" must be ordered through your local Harley-Davidson dealer. Special tools may only be purchased, serviced or warrantied through a Harley-Davidson dealer.

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, 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 screw	36-60 **in-lbs**	4.1-6.8 Nm	1.7 AIR CLEANER AND EXHAUST SYSTEM, Air Cleaner
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm	1.7 AIR CLEANER AND EXHAUST SYSTEM, Air Cleaner
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	1.12 DRIVE BELT AND SPROCKETS, Adjustment
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	1.21 WHEEL ALIGNMENT, Wheel Alignment
Battery strap fastener	72-96 **in-lbs**	8.1-10.8 Nm	1.20 BATTERY MAINTENANCE, Installation and Connection
Battery terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	1.20 BATTERY MAINTENANCE, Installation and Connection
Battery terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	1.20 BATTERY MAINTENANCE, Installation and Connection
Brake caliper, front, mounting bolt	28-38 ft-lbs	38.0-51.5 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Front
Brake caliper, rear, mounting bolt	28-38 ft-lbs	38.0-51.5 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Rear
Brake caliper pad pin	131-173 **in-lbs**	14.8-19.5 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Front
Brake caliper pad pin	131-173 **in-lbs**	14.8-19.5 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Rear
Brake hose clamp to rear fork screw	30-40 **in-lbs**	3.4-4.5 Nm	1.12 DRIVE BELT AND SPROCKETS, Adjustment
Brake line, front, manifold bolt	36-48 **in-lbs**	4.1-5.4 Nm	1.18 STEERING HEAD BEARINGS, Fall-Away
Brake line P-clamp, rear, screw	30-40 **in-lbs**	3.4-4.5 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Rear
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Front
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	1.15 BRAKES, Fluid Level
Brake master cylinder, rear, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Rear
Clutch cable adjuster jamnut	120 **in-lbs**	13.6 Nm	1.11 CLUTCH, Adjustment
Clutch inspection cover screws	90-120 **in-lbs**	10.3-13.6 Nm	1.10 TRANSMISSION LUBRICANT, Transmission Lubrication
Clutch inspection cover screws	90-120 **in-lbs**	10.3-13.6 Nm	1.10 TRANSMISSION LUBRICANT, Transmission Lubrication
Clutch inspection cover screws	90-120 **in-lbs**	10.2-13.6 Nm	1.11 CLUTCH, Adjustment
Fork bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	1.18 STEERING HEAD BEARINGS, Fall-Away
Fork stem pinch bolt	30-35 ft-lbs	40.7-47.5 Nm	1.18 STEERING HEAD BEARINGS, Fall-Away
Headlamp clamp nut: XL 883L/N/R, XL 1200T	120-240 **in-lbs**	13.6-27.1 Nm	1.23 HEADLAMP ALIGNMENT, Headlamp Adjustment
Headlamp horizontal adjustment: XL 1200C/CP/CA/CB/V/X	30-35 ft-lbs	40.7-47.5 Nm	1.23 HEADLAMP ALIGNMENT, Headlamp Adjustment

FASTENER	TORQUE VALUE		NOTES
Headlamp vertical adjustment: XL 1200C/CP/CA/CB/V/X	30-35 ft-lbs	40.7-47.5 Nm	1.23 HEADLAMP ALIGNMENT, Headlamp Adjustment
Oil drain hose worm clamp	6-10 **in-lbs**	0.7-1.1 Nm	1.6 ENGINE OIL AND FILTER, Changing Oil and Filter
Primary chain adjuster locknut	20-25 ft-lbs	27.1-33.9 Nm	1.9 PRIMARY CHAIN, Free Play Adjustment
Primary chaincase drain plug	14-30 ft-lbs	19.0-40.7 Nm	1.10 TRANSMISSION LUBRICANT, Transmission Lubrication/Apply LOCTITE 565 THREAD SEALANT
Primary chain inspection cover	90-120 **in-lbs**	10.2-13.6 Nm	1.9 PRIMARY CHAIN, Free Play Adjustment
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	1.17 SPARK PLUGS, Installation
Spoke nipple	55 **in-lbs**	6.2 Nm	1.8 TIRES AND WHEELS, Wheel Spokes
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	1.13 THROTTLE CONTROL, Cable Inspection and Lubrication

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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)

Perform necessary set-up tasks before customer delivery. See 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 headbolts or engine damage may result.*
- *During the initial break-in period, use only GENUINE HARLEY-DAVIDSON H-D 360 MOTORCYCLE OIL 20W50. Failure to use the recommended oil will result in improper break-in of the engine cylinders and piston rings.*

Inspect motorcycle on a regular basis for additional maintenance needs. Routinely check components between regular maintenance intervals. Always inspect motorcycle after periods of storage before riding.

Check:

1. Tires for correct pressure, excessive wear or any signs of tire damage.
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.
5. Check brake pads and discs for wear.
6. Cables for fraying, crimping and free operation.
7. Engine oil and transmission fluid levels.
8. Headlamp, auxiliary/fog lamp, tail lamp, stop lamp, horn and turn signal operation.

DISPOSAL AND RECYCLING

Help protect our environment! Many communities maintain facilities for recycling used fluids, plastics and metals. Dispose of or recycle used oil, lubricants, fuel, coolant, brake fluid and batteries in accordance with local regulations. Many Harley-Davidson parts and accessories are made of plastics and metals which can also be recycled.

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 parts catalog.

Safety

Safety is always the most important consideration when performing any job.

- Always have a complete understanding of the task.
- 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. If a hoist and adjustable lifting beam or sling are needed to remove some parts, verify that:

- The lengths of multiple chains or cables from the hoist to the part are equal and parallel.
- Slings, chains and cables are positioned directly over the center of the part.
- No obstructions will interfere with the lifting operation.
- Parts are not left suspended.

⚠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. Verify that no 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

Always clean around lines or covers before they are removed. Plug, tape or cap holes and openings to keep out dirt, dust and debris. Clean and inspect all parts as they are removed. Verify all holes and passages are clean and open. After cleaning, cover all parts with clean lint-free cloth, paper or other material. Verify the part is clean when installed.

Thoroughly clean all parts to be reused before assembly. Clean parts promote better component operation and longer life.

Seals, filters and covers used in this vehicle keep out extraneous dirt and dust. Keep these items in good condition to guarantee satisfactory operation.

When instructed to clean fastener threads or threaded holes, always:

- 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.
- Clear all threaded holes with low pressure compressed air.

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. Make all necessary adjustments. Inspect your work when finished to verify 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

Check torque using a torque wrench set to the minimum specification for that fastener. If the fastener does not rotate, the 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 material from the threaded hole. Replace the fastener with a **new** one or clean the original fastener threads and apply the appropriate threadlocking product. 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 from normal wear are usually trapped in the oil filter or by the magnetic drain plug. Magnetized parts in the engine can retain these fragments, potentially causing accelerated engine wear and damage.

Never place parts from inside the vehicle's powertrain on a magnetic parts tray.

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 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, thoroughly clean all fasteners and threaded holes. Always use the recommended threadlocking agent for the specific procedure.

Wiring, Hoses and Lines

Replace 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

Always use the proper tools and fixtures when servicing 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, always verify that the chamfered side of the bearing 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.

Only remove bearings if necessary. Removal usually damages bearings requiring replacement with **new** parts.

Bushings

Do not remove a bushing unless damaged, excessively worn or loose in its bore. Press out bushings requiring replacement.

When pressing or driving bushings, always 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.

Verify that all oil holes are properly aligned during installation.

Gaskets

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

Do not remove seals unless necessary. Only remove seals 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

Always discard O-rings after removal. Many O-rings are similar in size and appearance. Always use **new** O-rings keeping them packaged until use to avoid confusion. To prevent leaks, lubricate the O-rings before installation with 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. Verify that 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

⚠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)

Always install **new** genuine Harley-Davidson parts and accessories. This will provide best service life and maintain compliance with noise and emissions regulations.

Installing non-Harley-Davidson, off-road or competition parts can void warranty or result in an unsafe vehicle.

CLEANING

Protecting Rubber Parts

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.

Never use cleaners containing chlorine or ammonia on plastic parts. Chlorine will cause parts to become distorted and brittle resulting in cracks. Ammonia will cause cloudiness and brittleness in windshields and non-painted parts to form a white haze.

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 damaged 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 of a screwdriver 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. Always push tool cabinets 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/METHYL TERTIARY BUTYL ETHER (MTBE) blends are a mixture of gasoline and as much as 15 percent MTBE. Gasoline/MTBE blends use in your motorcycle is approved.
- ETHANOL fuel is a mixture of ethanol (grain alcohol) and unleaded gasoline and can have an impact on fuel mileage. Fuels with an ethanol content of up to 10 percent may be used in your motorcycle without affecting vehicle performance. U.S. EPA regulations currently indicate that fuels with 15 percent ethanol (E15) are restricted from use in motorcycles at the time of this publication. Some motorcycles are calibrated to operate with higher ethanol concentrations to meet the fuel standards in certain countries.
- REFORMULATED OR OXYGENATED GASOLINES (RFG) describes gasoline blends that are specifically designed to burn cleaner than other types of gasoline. This results in fewer tailpipe emissions. They are also formulated to evaporate less when filling the tank. Reformulated gasolines use additives to oxygenate the gas. Your motorcycle will run normally using this type of fuel. Harley-Davidson recommends using it whenever possible as an aid to cleaner air in our environment.
- Do not use racing fuel or fuel containing methanol. Use of these fuels will damage the fuel system.
- Using fuel additives other than those approved for use by Harley-Davidson may damage the engine, fuel system and other components.

Some gasoline blends might adversely affect starting, driveability or fuel efficiency. 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 engine oil is 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. (00357d)

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

This motorcycle was originally equipped with GENUINE HARLEY-DAVIDSON H-D 360 MOTORCYCLE OIL 20W50. H-D 360 is the preferred oil under normal operating conditions. If operation under extreme cold or heat are expected, refer to Table 1-2 for alternative choices.

If necessary and H-D 360 is not available, add oil certified for diesel engines. Acceptable designations include: CH-4, CI-4 and CJ-4. The preferred viscosities, 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.

Table 1-2. Recommended Engine Oils

TYPE	VISCOSITY	RATING	LOWEST AMBIENT TEMPERATURE	COLD-WEATHER STARTS BELOW 50 °F (10 °C)
Screamin' Eagle SYN 3 Full Synthetic Motorcycle Lubricant	SAE 20W50	HD 360	Above 30 °F (-1 °C)	Excellent
Genuine Harley-Davidson H-D 360 Motorcycle Oil	SAE 20W50	HD 360	Above 40 °F (4 °C)	Good
Genuine Harley-Davidson H-D 360 Motorcycle Oil	SAE 50	HD 360	Above 60 °F (16 °C)	Poor
Genuine Harley-Davidson H-D 360 Motorcycle Oil	SAE 60	HD 360	Above 80 °F (27 °C)	Poor
Genuine Harley-Davidson H-D 360 Motorcycle Oil	SAE 10W40	HD 360	Below 40 °F (4 °C)	Excellent

WINTER LUBRICATION

Change engine oil often in colder climates. If motorcycle is frequently used for trips less than 15 mi (24 km), in ambient temperatures below 60 °F (16 °C), reduce oil change intervals to 1500 mi (2400 km).

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 water vapor condenses to liquid form on the cool metal surfaces inside the engine. In freezing weather this water will become slush or ice. Over time, accumulated slush or ice may block the oil lines and cause engine damage.

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

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

BULB REQUIREMENTS 1.4

BULB CHART

Table 1-3. Bulb Chart

LAMP	DESCRIPTION (ALL LAMPS 12 V)	BULBS REQUIRED	CURRENT DRAW (AMPERAGE)	HARLEY-DAVIDSON PART NUMBER
Headlamp	High beam/low beam	1	5.0/4.58	68329-03
	Position lamp international	1	0.32	53436-97
Indicator lamp module	All models	-	-	LED assembly
License plate lamp	XL 883N, XL 1200X/V (DOM)	-	-	LED assembly
	XL 883N, XL 1200X/V (HDI)	2	0.35	52441-95
Tail and stop lamp	Tail and stop lamp XL 1200C/CP/CA/CB	-	-	LED assembly
	Tail and stop lamp (all other models)	1	2.10/0.59	68167-04
Turn signal lamp	Front/running	2	2.25/0.59	68168-89A
	Front international	2	1.75	68163-84
	Rear (DOM XL 883N, XL 1200X/V)*	2	2.25	68168-89A
	Rear (CAN XL 883N, XL 1200X)	-	2.25	68572-64B
	Rear (HDI XL 883N/R, XL 1200X/V)	2	-	LED assembly
	Rear (all other models)	2	1.75	68163-84
* Functions as turn signal, tail and stop lamps.				

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

MAINTENANCE SCHEDULE 1.5

GENERAL

At each regular service interval, perform the required maintenance. Refer to Table 1-4.

Use the quick reference maintenance chart for torque values, lubricants or cross references to maintenance procedures. Refer to Table 1-5.

Use the lubricants, greases and sealants table to identify maintenance supplies. Refer to Table 1-6.

Table 1-4. Regular Service Intervals: 2015 Sportster 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
Electrical equipment and switches	Check operation	X	X	X	X	X	X	X	X	X	X	X	
Front tire	Check pressure, inspect tread	X	X	X	X	X	X	X	X	X	X	X	1
Front wheel spokes (if equipped)	Check torque	X	X			X			X			X	2, 3, 4
Front brake fluid	Inspect sight glass	X	X	X	X	X	X	X	X	X	X	X	5
Reservoir cover screw: front brake	Check torque	X		X		X		X		X		X	1, 2, 6
Steering head bearings	Adjust	X		X		X		X		X		X	2
	Lubricate							X					2, 7
Throttle controls	Check, adjust and lubricate	X	X	X	X	X	X	X	X	X	X	X	2
Hand controls: upper and lower switch housing screws	Check torque	X		X		X		X		X		X	1, 2, 6
Air cleaner	Inspect, service as required		X	X	X	X	X	X	X	X	X	X	4
Engine oil and filter	Replace	X	X	X	X	X	X	X	X	X	X	X	1, 4
Primary chain	Check adjustment	X	X	X	X	X	X	X	X	X	X	X	
Transmission lubricant	Replace	X		X		X		X		X		X	4
Oil lines and brake system	Inspect for leaks, contact or abrasion	X	X	X	X	X	X	X	X	X	X	X	1, 2
Fuel lines and fittings	Inspect for leaks, contact or abrasion	X	X	X	X	X	X	X	X	X	X	X	1, 2
Stabilizer link: engine bracket mounting screws, upper front	Check torque	X		X		X		X		X		X	1, 2, 6
Isolator mounting bolt and nut, front	Check torque	X		X		X		X		X		X	1, 2, 8
Rear brake fluid	Inspect sight glass	X	X	X	X	X	X	X	X	X	X	X	5
Reservoir cover screw: rear brake	Check torque	X		X		X		X		X		X	1, 2, 6
Brake pads and discs	Inspect for wear	X	X	X	X	X	X	X	X	X	X	X	
Front axle nut	Check torque	X		X		X		X		X		X	1, 2, 6
Brakes: banjo bolt	Check torque	X		X		X		X		X		X	1, 2, 6
Jiffy stand	Inspect and lubricate	X	X	X	X	X	X	X	X	X	X	X	2, 4
Clutch	Check adjustment	X	X	X	X	X	X	X	X	X	X	X	2, 4
Brake and clutch controls	Check, adjust and lubricate	X	X	X	X	X	X	X	X	X	X	X	
Rear wheel spokes (if equipped)	Check torque	X	X			X			X			X	2, 3, 4
Rear tire	Check pressure, inspect tread	X	X	X	X	X	X	X	X	X	X	X	1

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Table 1-4. Regular Service Intervals: 2015 Sportster 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
Drive belt and sprockets	Inspect, adjust belt	X	X	X	X	X	X	X	X	X	X	X	2
Rear axle nut	Check torque	X		X		X		X		X		X	1, 2, 6
Exhaust system	Inspect for leaks, cracks and loose or missing fasteners or exhaust shields	X	X	X	X	X	X	X	X	X	X	X	1, 4
Battery		Check battery, terminal torque and clean connections annually.											1
Spark plugs		Replace every two years or every 30,000 mi (48,000 km), whichever comes first.											
Front fork	Rebuild												2, 9
Fuel filter element		Replace every 100,000 mi (160,000 km).											2
Road test	Verify component and system functions	X	X	X	X	X	X	X	X	X	X	X	

NOTES:

1. Perform annually or at specified intervals, whichever comes first.
2. Should be performed by an authorized Harley-Davidson dealer, unless you have the proper tools, service data and are mechanically qualified.
3. Perform spoke tension check at 1000 mi (1600 km), 5000 mi (8000 km), 20,000 mi (32,000 km) services and every 15,000 mi (24,000 km) interval thereafter. Not all vehicles have spoked wheels. Consult appropriate topic in service manual.
4. Perform maintenance more frequently in severe riding conditions (such as extreme temperatures, dusty environments, mountainous or rough roads, long storage conditions, short runs, heavy stop/go traffic or poor fuel quality).
5. Change DOT 4 brake fluid and flush system every two years.
6. 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. No further attention is necessary. If fastener moves, tighten to specification.
7. Disassemble, lubricate and inspect every 30,000 mi (48,000 km).
8. 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. No further attention is necessary. If the fastener moves, 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). Install fastener. Tighten to specification.
9. Disassemble, inspect, rebuild forks and replace fork oil every 50,000 mi (80,000 km).

DIGITAL TECHNICIAN II

Table 1-5. Quick Reference Maintenance and Torque Chart

ITEM SERVICED	SPECIFICATION	DATA
Air cleaner	See 1.7 AIR CLEANER AND EXHAUST SYSTEM.	
	Air filter screw torque	40-60 **in-lbs** (4.5-6.8 Nm)
	Air cleaner cover screw torque	36-60 **in-lbs** (4.1-6.8 Nm)
Axles	Front nut torque	60-65 ft-lbs (81-88 Nm)
	Rear nut torque	95-105 ft-lbs (129-142 Nm)
Battery	Lubricant	ELECTRICAL CONTACT LUBRICANT
	Terminal screw torque	60-70 **in-lbs** (6.8-7.9 Nm)
Brakes	Brake fluid type	DOT 4 BRAKE FLUID
	Brake fluid level	Above low level mark
	Brake line banjo bolt torque	14-18 ft-lbs (19.0-24.4 Nm)
	Reservoir cover screw torque	9-17 **in-lbs** (1.0-2.0 Nm)
	Handlebar control lever clamp screw torque	108-132 **in-lbs** (12.2-14.9 Nm)
	Rear master cylinder reservoir mounting screw torque	18-22 ft-lbs (23.1-29.9 Nm)
	Minimum brake pad thickness	0.04 in (1.02 mm)
	Minimum brake disc thickness	See stamp on side of disc.
Clutch adjustment	Free play at adjuster screw	1/4 turn
	Free play at hand lever	1/16-1/8 in (1.6-3.2 mm)
	Handlebar control lever clamp screw torque	108-132 **in-lbs** (12.2-14.9 Nm)
	Clutch inspection cover screw torque	90-120 **in-lbs** (10.3-13.6 Nm)

Table 1-5. Quick Reference Maintenance and Torque Chart

ITEM SERVICED	SPECIFICATION	DATA
Clutch and throttle cables	Lubricant	HARLEY LUBE
	Handlebar control lever clamp screw torque	108-132 **in-lbs** (12.2-14.9 Nm)
	Switch housing screw torque	35-45 **in-lbs** (4.0-5.1 Nm)
Drive belt	Apply upward measurement force at midpoint of bottom belt strand.	10 lb (4.5 kg)
	Belt deflection with motorcycle on jiffy stand, belt and sprockets at ambient temperature (cold engine), without rider or luggage	XL 883R: 9/16-5/8 in (14.3-15.9 mm)
		Other XL models 1/4-5/16 in (6.35-7.94 mm)
Engine idle speed	Idle speed	950-1050 rpm
Engine mounts/isolators and stabilizers	See 2.22 FRONT ENGINE MOUNT/ISOLATOR, 2.23 REAR ENGINE MOUNT/ISOLATOR, and 2.21 STABILIZER LINKS.	
	Stabilizer link, upper front, engine bracket mounting screw torque	55-65 ft-lbs (74.2-88.2 Nm)
	Engine mount, front, bolt torque	95-105 ft-lbs (128.9-142.3 Nm)
Engine oil and filter	Oil capacity	2.8 qt (2.65 L)
	Filter	Hand tighten 1/2-3/4 turn after gasket contact.
Front fork oil	Type	TYPE "E" HYDRAULIC FORK OIL
	Amount	See 2.16 FRONT FORK, Assembly.
Fuel filter	Fuel pump module mounting screw torque	40-45 **in-lbs** (4.5-5.1 Nm)
Primary chain tension	Deflection with hot engine	1/4-3/8 in (6.3-9.5 mm)
	Deflection with cold engine	3/8-1/2 in (9.5-12.7 mm)
	Chain tensioner nut torque	20-25 ft-lbs (27.1-33.9 Nm)
	Primary chain inspection cover screw torque	90-120 **in-lbs** (10.2-13.6 Nm)
Primary chain/transmission lubricant	Lubricant capacity	32 oz (946 mL)
	Primary chaincase drain plug torque	14-30 ft-lbs (19.0-40.7 Nm)
	Lubricant	FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT
Spark plugs	Type	6R12
	Gap	0.038-0.043 in (0.96-1.09 mm)
	Torque	12-18 ft-lbs (16.3-24.4 Nm)
Steering head bearings	Lubricant	SPECIAL PURPOSE GREASE
Tires	Pressure: XL 883L, XL 1200T	Front: 36 psi (248 kPa) Rear: 42 psi (290 kPa)
	Pressure: XL883N/R, XL1200V models)	Front: 30 psi (207 kPa) Rear: 40 psi (276 kPa)
	Pressure: XL 1200X/C/CP/CA/CB	Front: 36 psi (248 kPa) Rear: 40 psi (275 kPa)
	Wear	If 1/32 in (0.8 mm) or less of tread pattern remains, replace tire.
Wheel spokes	Spoke nipple torque	55 **in-lbs** (6.2 Nm)

Table 1-6. Lubricants, Greases, Sealants

ITEM	PART NUMBER	PACKAGE
3M 847 Adhesive	021200-19718 *	5 oz tube
3M General Purpose Adhesive Remover		15 oz aerosol

Table 1-6. Lubricants, Greases, Sealants

ITEM	PART NUMBER	PACKAGE
Anti-Seize Lubricant	98960-97	1 oz squeeze tube
CCI #20 Brake Grease	42830-05	squeeze packet (included in master cylinder rebuild kit)
DOT 4 Brake Fluid	99953-99A	12 oz bottle
Dow Corning Moly 44 Grease	94674-99	2 cc packet
Electrical Contact Lubricant	11300004	1 oz squeeze tube
Formula+ Transmission and Primary Chaincase Lubricant	99851-05	1 qt bottle
G40M Brake Grease	42820-04	squeeze packet
Genuine Harley-Davidson Extended Life Antifreeze and Coolant	99822-02	1 gal container
Genuine Harley-Davidson H-D 360 20W50 Motorcycle Oil	99816-2050/00QT	1 qt bottle
Harley-Davidson Adhesive (Griplock)	99839-95	10 g tube
Harley-Davidson High Performance Sealant - Gray	99650-02	1.9 oz squeeze tube
Harley-Davidson Leather Dressing	98261-91V	6 oz can
Harley-Davidson Seal Grease	11300005	1 oz tube
Harley Lube	94968-09	1/4 oz needle dispenser
Hylomar Gasket and Thread Sealant	99653-85	3.5 oz tube
Loctite 222 Low Strength Threadlocker and Sealant (purple)	99811-97	6 mL tube
Loctite 243 Medium Strength Threadlocker and Sealant (blue)	99642-97	6 mL tube
	11100005	50 mL bottle
Loctite 246 Medium Strength/High Temperature Threadlocker (blue)		
Loctite 262 High Strength Threadlocker and Sealant (red)	94759-99	6 mL tube
Loctite 271 High Strength Threadlocker and Sealant (red)		6 mL tube
	11100006	50 mL bottle
Loctite 411 Prism Instant Adhesive		
Loctite 420 Super Bonder Adhesive		
Loctite 565 Thread Sealant	99818-97	6 mL tube
Loctite 770 Prism Primer		
Loctite 7649 Cleaner/Primer	98968-99	1.75 oz bottle
RTV Silicone Sealer	99650-02	1.9 oz tube
Screamin' Eagle Assembly Lube	11300002	4 oz bottle
Screamin' Eagle SYN3 Full Synthetic Motorcycle Lubricant 20W50	99824-03/00QT	1 qt bottle
Special Purpose Grease	99857-97A	14 oz cartridge
Type "E" Hydraulic Fork Oil	62600026	16 oz bottle
Wheel Bearing Grease	99855-89	1 lb can
	99856-92	14 oz cartridge
* Not a Harley-Davidson part number		

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

ENGINE OIL AND FILTER 1.6

CHECKING AND ADDING OIL

Removing and Replacing Oil Filler Cap

1. Park the motorcycle on level ground.
2. See Figure 1-1. Remove the filler cap from the oil tank.
   a. Press straight down on the filler cap and release. The cap will pop up.
   b. Pull up on the filler cap while turning counterclockwise one-quarter turn as if removing the filler cap.
3. Wipe the dipstick clean.

NOTE

See Figure 1-2. Align tabs on oil tank filler neck to slots (1, 2) on dipstick.

4. Install the dipstick into the tank.
   a. Turn the filler cap clockwise one-quarter turn as if screwing the filler cap into tank. When the filler cap stops turning, it is seated.
   b. Press down on the filler cap until it snaps in place, flush with the top of the oil tank cover.

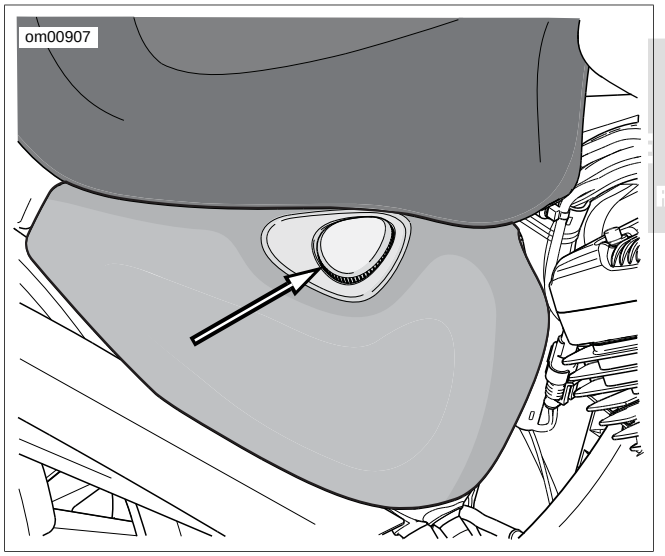
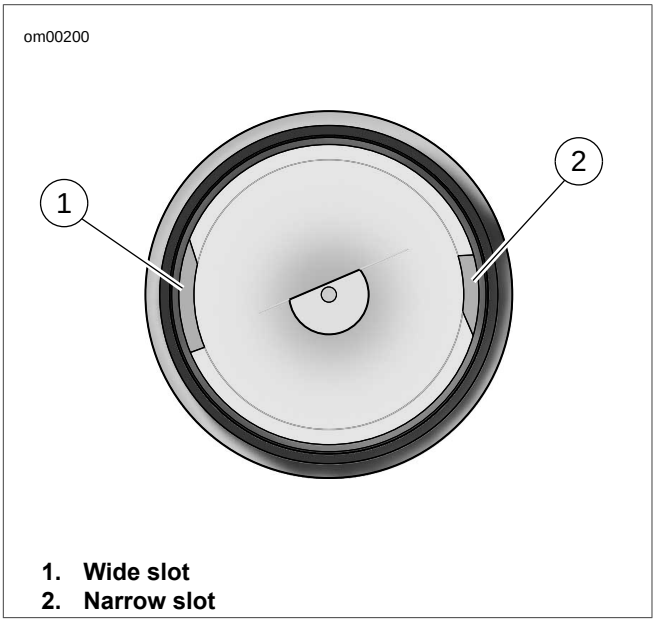


Figure 1-1. Filler Cap Location



1. **Wide slot**
2. **Narrow slot**

Figure 1-2. Filler Cap Slots

Oil Level Cold Check

NOTES

- *Check engine oil level at each complete fuel refill.*
- *An accurate engine oil check can only be made with the engine at operating temperature (Hot Check).*

1. Park the motorcycle on level ground.
2. Remove the filler cap and wipe the dipstick clean. Install the oil filler cap in tank.
3. Remove oil filler cap again and visually check for oil in the tank.
4. If oil is not visible in the tank, install the filler cap.

NOTE

If the oil pressure lamp stays lit after starting engine, immediately shut the engine off.

5. Start and idle the engine for 30 seconds. Stop the engine.
6. Remove oil filler cap and visually check for oil in the tank.

NOTICE

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

NOTE

Use only recommended oil. Recommended viscosity depends upon ambient temperature. Refer to Table 1-2.

7. If there is no oil visible in the tank, add oil until it is present on the bottom of the dipstick.

8. When oil is present on the bottom of the dipstick, perform a hot check.

Oil Level Hot Check

1. Run the engine until the engine oil is at operating temperature.
2. Idle the motorcycle on the jiffy stand for one to two minutes. Turn the engine off.
3. Park the motorcycle on level ground.
4. Remove the filler cap. Wipe the dipstick clean and install the filler cap in the tank.

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)

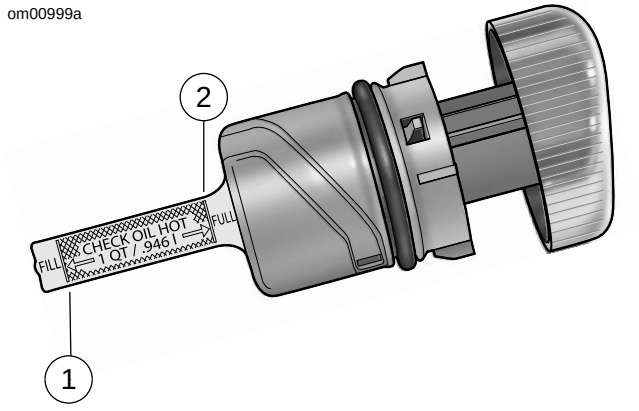
NOTICE

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

NOTES

- *Use only recommended oil. Recommended viscosity depends upon ambient temperature. Refer to Table 1-2.*
- *Do not overfill the oil tank. The oil tank has a built-in pressure relief valve. If the oil tank is overfilled, excessive pressure is created in the oil tank. The pressure relief valve will open to relieve the pressure and prevent damage to the oil tank. Excessive oil due to overfilling will also be forced out the pressure relief valve when it opens.*

5. See Figure 1-3. Remove the filler cap and check the hot oil level on the dipstick.
   a. **Below the lower mark:** Add only enough oil until the level reads between the upper and lower marks.
   b. **Between the upper and lower marks:** It is safe to operate the motorcycle.
   c. **Above the upper mark:** Drain the oil until the level reads between the upper and lower marks.
6. Install the filler cap.
7. If oil was added, remove the filler cap and verify the engine oil level in the oil tank. Do not fill oil tank to a level above upper mark on the dipstick. Install the filler cap.



1. **Lower mark (FILL)**
2. **Upper mark (FULL)**

Figure 1-3. Dipstick

CHANGING OIL AND FILTER

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

FASTENER	TORQUE VALUE	
Oil drain hose worm clamp	6-10 **in-lbs**	0.7-1.1 Nm

Draining Oil Tank

⚠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

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

Completely drain oil tank of used oil at scheduled service intervals. Refill with fresh oil. Refer to Table 1-4.

NOTES

- *Change oil at specified intervals in normal service at warm or moderate temperatures.*
- *Change engine oil at shorter intervals in cold weather or in severe operating conditions. See 1.3 FUEL AND OIL, Winter Lubrication.*
- *Change engine oil at shorter intervals if ridden extremely hard, used in competition or driven on dusty roads.*
- *Always change oil filter when changing engine oil.*

1. Run motorcycle until engine is at normal operating temperature.

NOTE

To drain oil faster, remove the dipstick.

2. Remove dipstick from oil tank.

NOTE

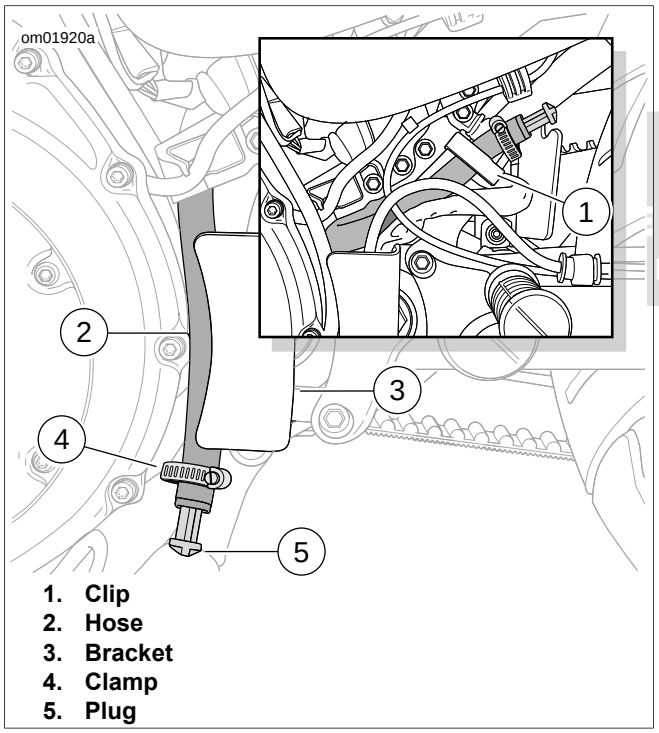
The drain pan must hold approximately 3.0 qt (2.8 L).

3. Place a drain pan directly under the drain hose.
4. See Figure 1-4. Pull drain hose clip (1) from frame tube.
5. Direct hose (2) in front of the brake line bracket (3) into drain pan.
6. Loosen worm drive clamp (4). Pull drain plug (5) from end of drain hose.

NOTE

Completely drain engine oil from oil tank.

7. Allow oil to drain.
8. Install drain plug into end of drain hose.
9. Tighten worm drive clamp to 6-10 **in-lbs** (0.7-1.1 Nm).
10. Route drain hose alongside frame tube.
11. Clip hose to frame.



1. **Clip**
2. **Hose**
3. **Bracket**
4. **Clamp**
5. **Plug**

Figure 1-4. Drain Hose to Drain Pan

Removing Oil Filter

1. Place a drain pan under the oil filter.

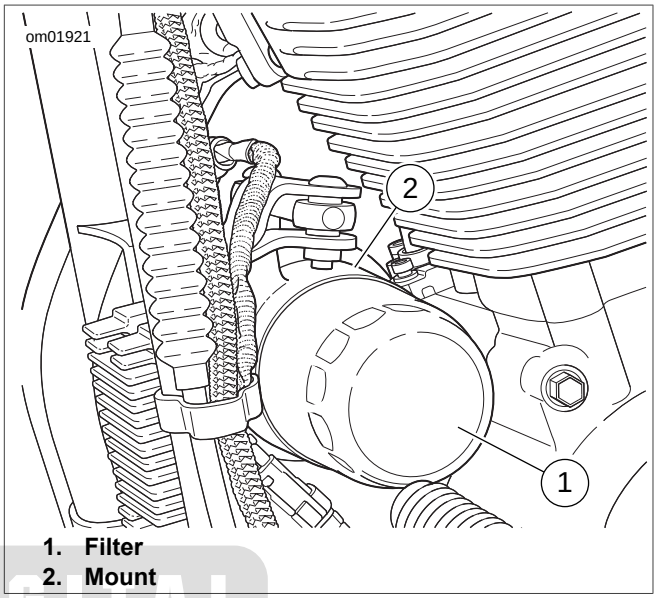
NOTICE

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

NOTE

See Figure 1-5. Turn oil filter (1) counterclockwise to remove from mount (2).

2. Remove oil filter using HARLEY-DAVIDSON OIL FILTER WRENCH (Part No. HD-42311) or HARLEY-DAVIDSON OIL FILTER WRENCH (Part No. HD-44067-A).
3. Drain engine oil. Discard oil filter.
4. Clean any oil spills off crankcase and frame.



1. **Filter**
2. **Mount**

Figure 1-5. Oil Filter

Installing Oil Filter

NOTE

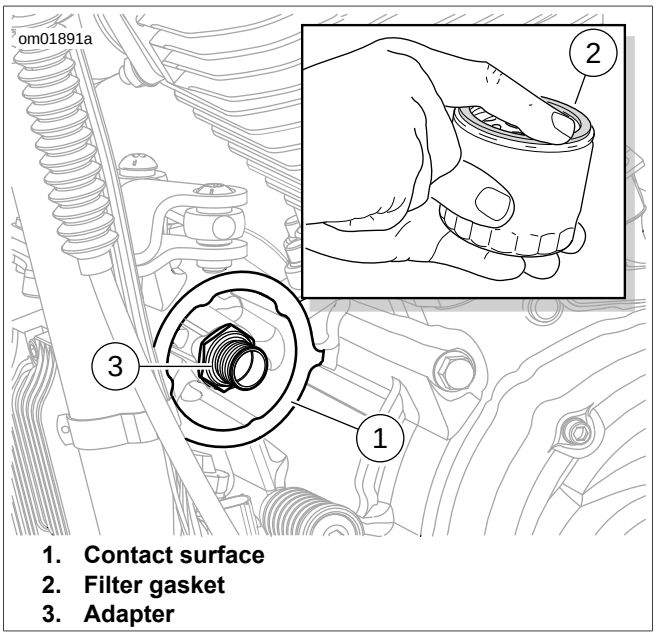
To build oil pressure on engine startup, partially fill oil filter.

1. Pour about 4 fl oz (120 mL) of fresh, clean engine oil into **new** oil filter.
2. Allow time for oil to soak into filter element.
3. See Figure 1-6. Wipe filter gasket contact surface (1) of oil filter mount with a clean cloth. Surface must be smooth and free of debris or old gasket material.
4. Apply a thin film of oil to contact surface of the oil filter mount and filter gasket (2) of **new** oil filter.

NOTE

*Do not use oil filter wrench to install **new** oil filter.*

5. Install **new** oil filter.
   a. Screw filter onto adapter (3) until gasket contacts the gasket contact surface.
   b. Hand tighten an extra 1/2-3/4 turn to secure the oil filter.



1. **Contact surface**
2. **Filter gasket**
3. **Adapter**

Figure 1-6. Installing Oil Filter

Refilling Oil Tank

NOTICE

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

NOTES

- *Do not overfill the oil tank. Excess oil creates excessive pressure. To prevent damage, a pressure relief valve opens to release the excess oil.*
- *Use the proper grade of oil for the lowest temperature expected before the next oil change. Refer to Table 1-2.*

1. Pour 2.0 qt (1.9 L) of oil into engine oil tank.
2. Install dipstick in oil tank. Seat cap.
3. See Figure 1-7. Verify oil pressure.
   a. Start engine.
   b. Verify that the oil pressure indicator turns off at 1000 rpm or above.
   c. Turn off engine.
4. Perform engine oil level hot check.
5. Start engine and carefully check for oil leaks around drain plug and oil filter.

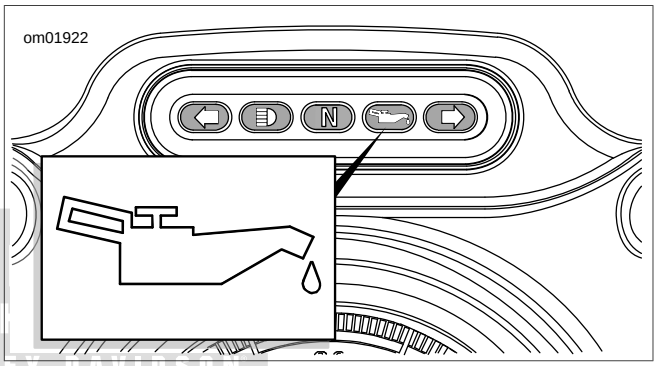


Figure 1-7. Oil Pressure Indicator

AIR CLEANER AND EXHAUST SYSTEM 1.7

AIR CLEANER

FASTENER	TORQUE VALUE	
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm

Removal

1. See Figure 1-8. Remove the fasteners (8) and any trim insert (7) from the air cleaner cover (6).
2. Remove air cleaner cover. Remove cover seal (5) from the cover.
3. Remove three fasteners (4). Remove the filter element (3) and the gasket (2) from the backplate. Discard the gasket.
4. Inspect the O-rings (1). Replace as necessary.
5. Inspect the cover seal. Replace as necessary.
6. Clean the air cleaner backplate.
7. Clean the inside of air cleaner cover.

NOTICE

Install air filter before running engine. Failure to do so can draw debris into the engine and could result in engine damage. (00207a)

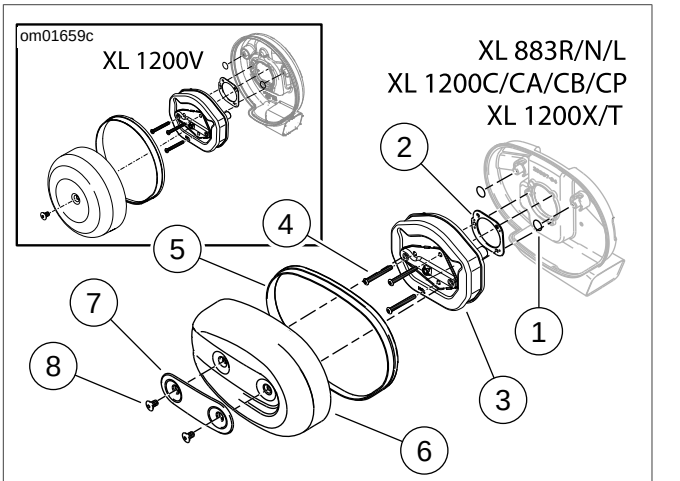
Installation

1. See Figure 1-8. Apply a thin coat of engine oil or light grease to the O-rings (1).
2. Position a **new** gasket (2) on the air cleaner. Line up the gasket holes with the backplate holes.

NOTE

Install the air filter with THIS SIDE OUT on top.

3. Apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to each of three air filter fasteners (4). Install the air filter (3) onto the backplate. Tighten to 40-60 **in-lbs** (4.5-6.8 Nm).
4. Fit cover seal (5) onto cover (6). Verify alignment around cover edge.
5. Install air cleaner cover onto backplate. Do not pinch or distort seal.
6. Install trim insert (7) (if necessary) and cover with fasteners (8). Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).



1. **O-ring (2)**
2. **Gasket**
3. **Filter element**
4. **Element screw (3)**
5. **Seal**
6. **Cover**
7. **Trim**
8. **Cover screw (2)**

Figure 1-8. Air Cleaner

CLEANING FILTER ELEMENT

⚠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)

NOTE

Do not tap the filter on a hard surface.

1. Wash the filter in warm soapy water.
2. To remove soot, soak the filter in warm soapy water for 30 minutes.

NOTE

The filter is clean if light is visible through filter.

3. Hold the filter up to light.

⚠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)

4. Dry the filter with low-pressure compressed air from the inside.

EXHAUST SYSTEM LEAK CHECK

Check exhaust system for leaks at every scheduled service interval.

1. Check entire exhaust system for loose or missing fasteners and fractured pipe clamps or brackets. Check exhaust system for obvious signs of leakage such as carbon tracks at pipe joints.
2. Check for loose or fractured exhaust shields. Replace or repair 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.

Exhaust System Leakage

If an exhaust system leak is evident at a muffler or header pipe connection, disassemble and clean all mating surfaces. See 4.16 EXHAUST SYSTEM.

- Replace any damaged components and assemble.
- If leak continues, disassemble and apply Permatex Ultra Copper or LOCTITE 5920 FLANGE SEALANT. If neither are available, use an equivalent oxygen sensor/catalyst-safe alternative.
- Assemble components. Wipe off any excess sealant.
- Follow sealant product instructions. Allow adequate curing time before operating vehicle.

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

TIRES AND WHEELS 1.8

AIR PRESSURE

⚠WARNING

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

Always maintain proper tire pressure as specified in Table 1-7. Do not load tires beyond GAWR specified in Table 2-4. Underinflated, over-inflated or overloaded tires can fail.

Check tire pressure when the tires are cold. Refer to Table 1-7.

NOTE

Harley-Davidson does not perform any testing with only nitrogen in tires. Harley-Davidson neither recommends nor discourages the use of pure nitrogen to inflate tires.

Table 1-7. Tire Pressure (cold): 2015 Sportster Models

MODEL	WHEEL	psi	kPa
XL 883L	Front	36	248
	Rear	42	290
XL 883N	Front	30	207
	Rear	40	276
XL 883R	Front	30	207
	Rear	40	276
XL 1200C	Front	36	248
	Rear	40	276
XL 1200CP	Front	36	248
	Rear	40	276
XL 1200CA	Front	36	248
	Rear	40	276
XL 1200CB	Front	36	248
	Rear	40	276
XL 1200T	Front	36	248
	Rear	42	290
XL 1200V	Front	30	207
	Rear	40	276
XL 1200X	Front	36	248
	Rear	40	276

TIRE REPLACEMENT

Tread Wear

⚠WARNING

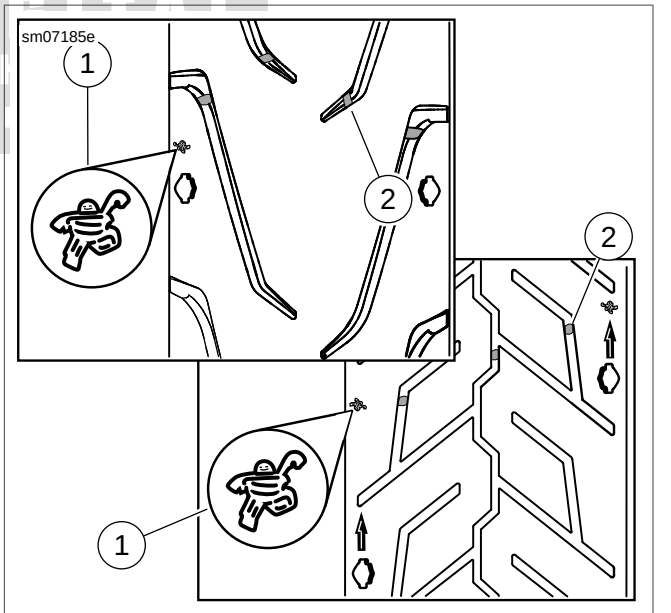
Replace tire immediately with a Harley-Davidson specified tire when wear bars become visible or only 1/32 in (0.8 mm) tread depth remains. Riding with a worn tire could result in death or serious injury. (00090c)

Harley-Davidson tires are equipped with wear bars that run horizontally across the tread. When a tire is worn to the point that the wear bars are visible, or 1/32 in (0.8 mm) tread depth remains, the tire can:

- Be more easily damaged leading to tire failure.
- Provide reduced traction.
- Adversely affect stability and handling.

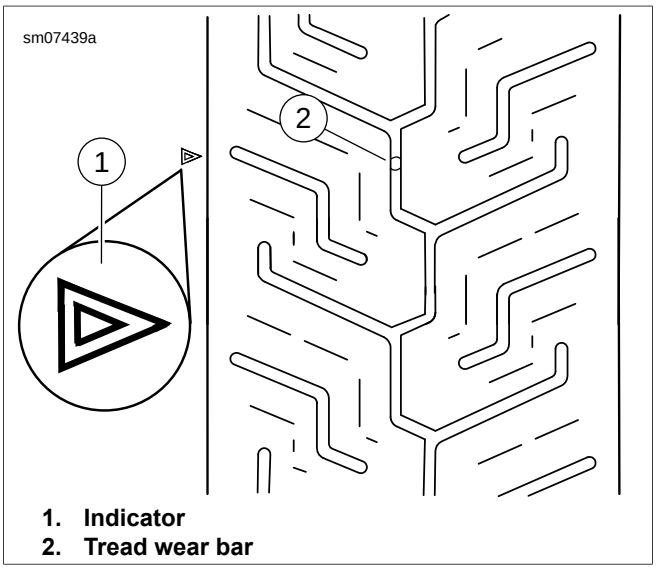
Replace the tires with **new** tires before the tread wear bars appear:

- See Figure 1-9 or Figure 1-10. Indicators (1) on the tire sidewalls point to tread wear bars (2) in the tread.
- Tread wear bars appear in the tread pattern when 1/32 in (0.8 mm) or less of tread remains.



1. **Indicator**
2. **Tread wear bar**

Figure 1-9. Tread Pattern: Michelin Tires



1. **Indicator**
2. **Tread wear bar**

Figure 1-10. Tread Pattern: Dunlop Tires

Tire Damage

Replace tires with **new** tires when:

- Tire cords or fabric are visible through cracked sidewalls, snags or deep cuts.
- A bump, bulge or split is found anywhere on the tire.
- A puncture, cut or other damage cannot be repaired.

SPECIFIED TIRES

WARNING

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

WARNING

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

- Store **new** tires on a horizontal tire rack. Do not stack tires in a vertical stack.
- Mount only Harley-Davidson specified tires. Refer to Table 1-8.

Table 1-8. Specified Tires: 2015 Sportster Models

MODEL	WHEEL	SPECIFIED TIRE
XL 883L	F	Michelin Scorcher "11F" 120/70ZR18
	R	Michelin Scorcher "11" 150/60ZR17
XL 883N/R	F	Michelin Scorcher "31" 100/90B19
	R	Michelin Scorcher "31" 150/80B16
XL 1200C/X XL 1200CP XL 1200CA XL 1200CB	F	Michelin Scorcher "31" 130/90B16
	R	Michelin Scorcher "31" 150/80B16
XL 1200T	F	Michelin Scorcher "11T" 120/70ZR18
	R	Michelin Scorcher "11T" 150/70ZR17
XL 1200V	F	Dunlop D402F MH90 21 M/C 54H WW
	R	Dunlop D401 150/80B16 M/C 71H WWW

WHEEL BEARINGS

NOTE

Replace bearings in sets only. See 2.5 WHEELS, Sealed Wheel Bearings.

1. Replace when bearings exceed end play service wear limit of 0.002 in (0.051 mm).
2. Inspect any time the wheels are removed.
   a. Inspect the play of the wheel bearings by finger while they are in the wheel.
   b. Rotate the inner bearing race. Listen for abnormal noise.
   c. Verify smooth bearing rotation.
3. Check wheel bearings and axle spacers for wear and corrosion. Excessive play or roughness indicates worn bearings.

WHEEL SPOKES

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

FASTENER	TORQUE VALUE	
Spoke nipple	55 **in-lbs**	6.2 Nm

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 rim seal, resulting in rapid tire deflation, which could cause death or serious injury. (00611b)

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, mounting brackets, components or housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586d)

Identify Wheel Spoke Groups

NOTE

Spokes are grouped in sets of four.

1. Raise wheel with a suitable lifting device.
2. See Figure 1-11. 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 way.

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 spoke torque wrench to loosen spokes. Use SPOKE NIPPLE WRENCH (Part No. HD-94681-80) to loosen spokes.*

1. See Figure 1-11. Starting with the first group of spokes, loosen spoke (1) 1/4 turn using SPOKE NIPPLE WRENCH (Part No. HD-94681-80).
2. Using SPOKE TORQUE WRENCH (Part No. HD-48985) tighten spoke (1) to the value listed in Table 1-9.
   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 than 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 than 1/4 turn past alignment mark.
7. True the wheel. See 2.7 CHECKING AND TRUING WHEELS.

Table 1-9. Spoke Nipple Torque Specification

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

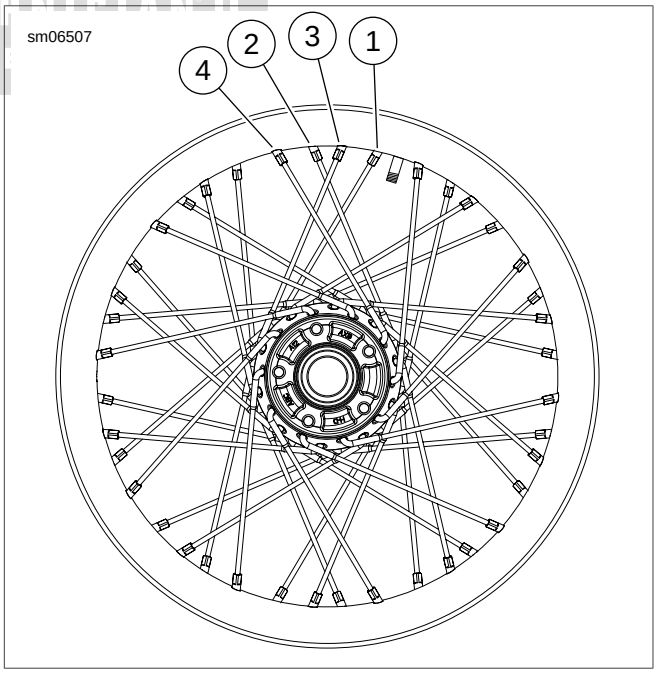


Figure 1-11. Tightening Laced Wheels (typical)

PRIMARY CHAIN 1.9

FREE PLAY ADJUSTMENT

FASTENER	TORQUE VALUE	
Primary chain adjuster locknut	20-25 ft-lbs	27.1-33.9 Nm
Primary chain inspection cover	90-120 **in-lbs**	10.2-13.6 Nm

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. See Figure 1-12. Remove the primary chain inspection cover (1).

NOTE

Rotate the engine to measure free play at several chain positions.

3. See Figure 1-13. Through the inspection opening, measure chain free play at the tightest position.

NOTICE

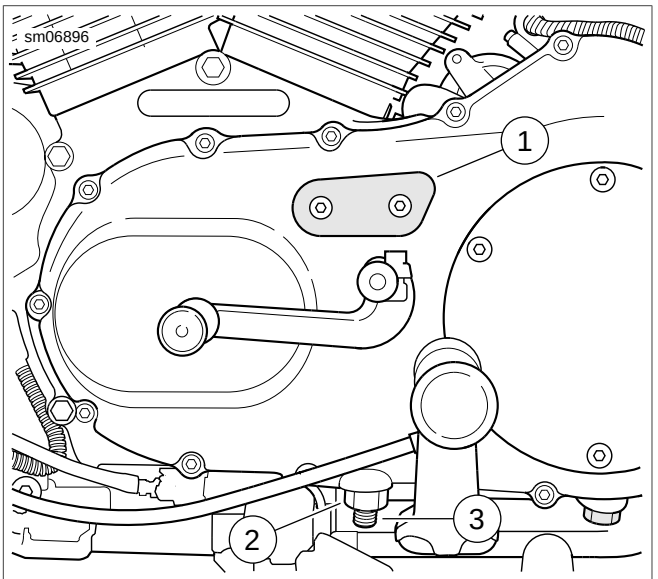
Do not adjust the primary chain tighter than specified. Running chain too tight will result in excessive wear. (00202a)

NOTE

***Factory setting:** Initial cold engine free play is 1/4-3/8 in (6.35-9.53 mm). With the engine cold, measure free play on a primary chain that has never been adjusted:*

- *Less than 1/4 in (6.35 mm): Adjust to specification.*
- *Between 1/4 in (6.35 mm) and 3/8 in (9.53 mm): Do NOT adjust.*

4. If the measurement is not in specification, adjust the primary chain. Refer to Table 1-10.
   a. See Figure 1-12. Loosen the locknut (2).
   b. With a hex key, turn the adjuster screw (3) clockwise to reduce free play or counterclockwise to increase free play.
   c. When free play is within specification, hold the adjuster screw with a hex key. Tighten the locknut to 20-25 ft-lbs (27.1-33.9 Nm).
5. If the primary chain cannot be adjusted to specification, replace the chain. See 5.4 PRIMARY DRIVE AND CLUTCH.
6. Install a **new** gasket and the primary chain inspection cover. Tighten to 90-120 **in-lbs** (10.2-13.6 Nm).
7. Install main fuse.



1. **Inspection cover**
2. **Locknut**
3. **Adjuster screw**

Figure 1-12. Primary Chain Inspection Cover and Adjuster

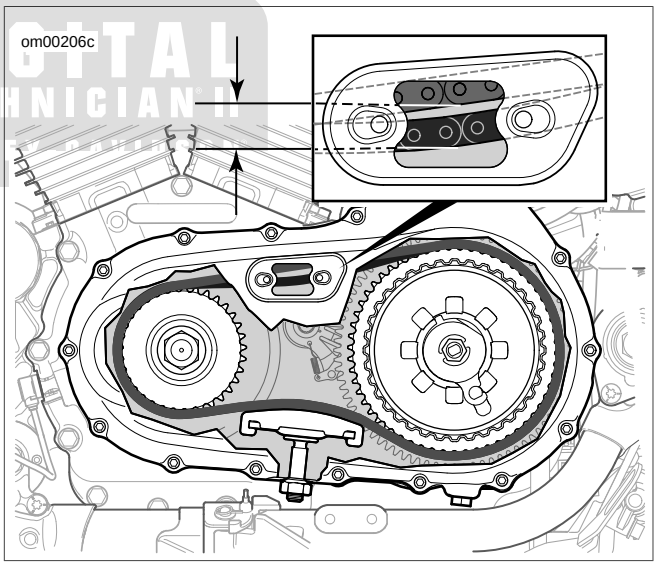


Figure 1-13. Primary Chain Free Play

Table 1-10. Primary Chain Free Play Specifications

ENGINE	in	mm
Cold	3/8-1/2	9.5-12.7
Hot	1/4-3/8	6.3-9.5

TRANSMISSION LUBRICANT 1.10

TRANSMISSION LUBRICATION

FASTENER	TORQUE VALUE	
Clutch inspection cover screws	90-120 **in-lbs**	10.3-13.6 Nm
Primary chaincase drain plug	14-30 ft-lbs	19.0-40.7 Nm
Clutch inspection cover screws	90-120 **in-lbs**	10.3-13.6 Nm

Check Lubricant Level

1. Run motorcycle until engine is at normal operating temperature.
2. Turn off ignition switch and STOP/RUN switch.

NOTE

Stand motorcycle upright to equalize lubricant level in the transmission and clutch compartments.

3. Stand motorcycle upright (not leaning on jiffy stand) on a level surface.

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

4. **Mid-mount controls:** Remove left side rider footrest and mounting bracket assembly. See 2.39 RIDER FOOT CONTROLS: MID-MOUNT.
5. See Figure 1-14. Remove screws with washers. Remove clutch inspection cover (1).
6. See Figure 1-15. Verify that lubricant level is even with bottom of clutch diaphragm spring (1).

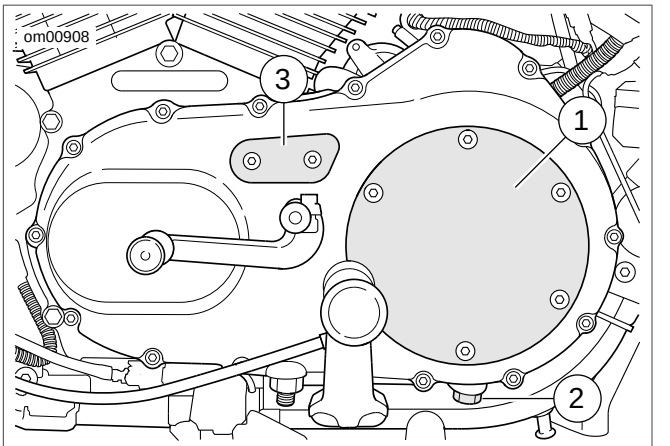
NOTICE

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

NOTICE

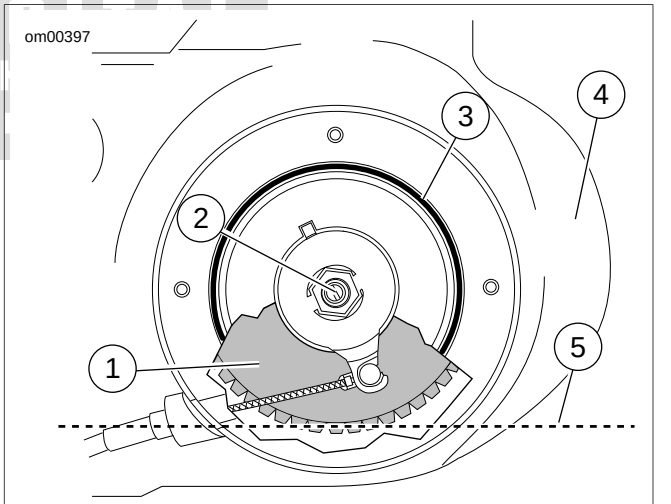
Do not overfill the primary chaincase with lubricant. Overfilling can cause rough clutch engagement, incomplete disengagement, clutch drag and/or difficulty in finding neutral at engine idle. (00199b)

7. If the level is low, add FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT through clutch inspection cover opening. Verify that lubricant level is even with bottom of clutch diaphragm spring.
8. Install the clutch inspection cover:
   a. Install **new** quad ring. Verify that the quad ring is fully seated in groove of primary cover.
   b. See Figure 1-16. Install cover and tighten screws in sequence to 90-120 **in-lbs** (10.3-13.6 Nm).
9. **Mid-mount controls:** Install left side rider footrest and mounting bracket assembly. See 2.39 RIDER FOOT CONTROLS: MID-MOUNT.
10. Run engine. Check for leaks.



1. **Clutch inspection cover**
2. **Drain plug**
3. **Primary chain inspection cover**

Figure 1-14. Primary Cover



1. **Clutch diaphragm spring**
2. **Clutch adjusting screw**
3. **Quad ring**
4. **Primary cover**
5. **Chaincase lubricant level**

Figure 1-15. Chaincase Lubricant Level

Change Lubricant

⚠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. Run motorcycle until engine is at normal operating temperature.
2. Park motorcycle on jiffy stand. The chaincase lubricant can drain out of transmission.

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

3. Turn off ignition switch and STOP/RUN switch.
4. See Figure 1-14. Position a suitable container under transmission drain plug (2).
5. Remove drain plug. Drain lubricant.
6. Position the motorcycle straight up and level to allow extra fluid to drain from clutch compartment.

NOTICE

Do not over-tighten filler or drain plug. Doing so could result in a lubricant leak. (00200b)

7. Clean magnetic drain plug. Replace drain plug O-ring if damaged.
8. Apply LOCTITE 565 THREAD SEALANT. Install drain plug. Tighten to 14-30 ft-lbs (19.0-40.7 Nm).
9. Remove the clutch inspection cover.
10. See Figure 1-15. Add 1.00 qt (0.95 L) of FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT through clutch inspection cover opening. Verify that level is even with bottom of clutch diaphragm spring (1).
11. Install the clutch inspection cover:
    a. Install **new** quad ring. Verify that the quad ring is fully seated in groove of the primary cover.
    b. See Figure 1-16. Install cover and tighten screws in sequence to 90-120 **in-lbs** (10.3-13.6 Nm).
12. Run engine. Check for lubricant leaks.

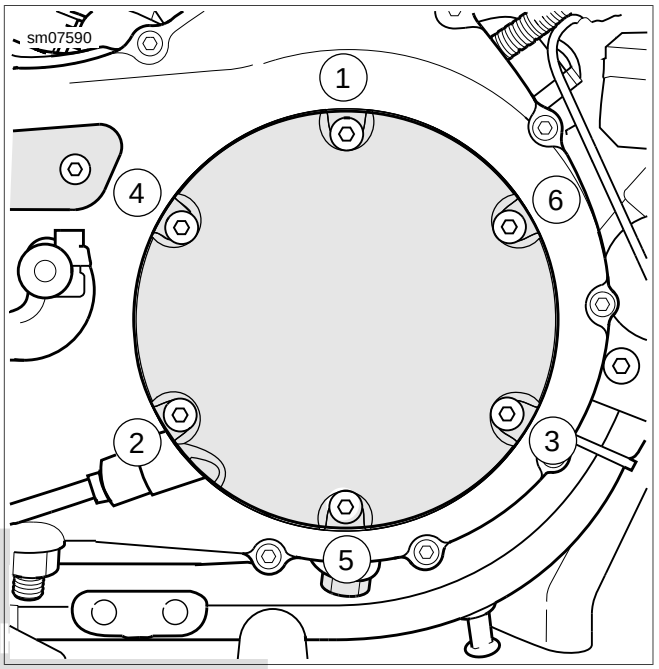


Figure 1-16. Clutch Inspection Cover Torque Sequence

CLUTCH 1.11

ADJUSTMENT

FASTENER	TORQUE VALUE	
Clutch inspection cover screws	90-120 **in-lbs**	10.2-13.6 Nm
Clutch cable adjuster jamnut	120 **in-lbs**	13.6 Nm

Release the Clutch Cable Tension

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. See Figure 1-17. Remove cable adjuster from the frame retaining clips.
3. See Figure 1-18. Pull the boot (1) away from the cable adjuster (2).
4. Loosen the jamnut (3).
5. Turn the adjuster to loosen the clutch cable at the hand lever.

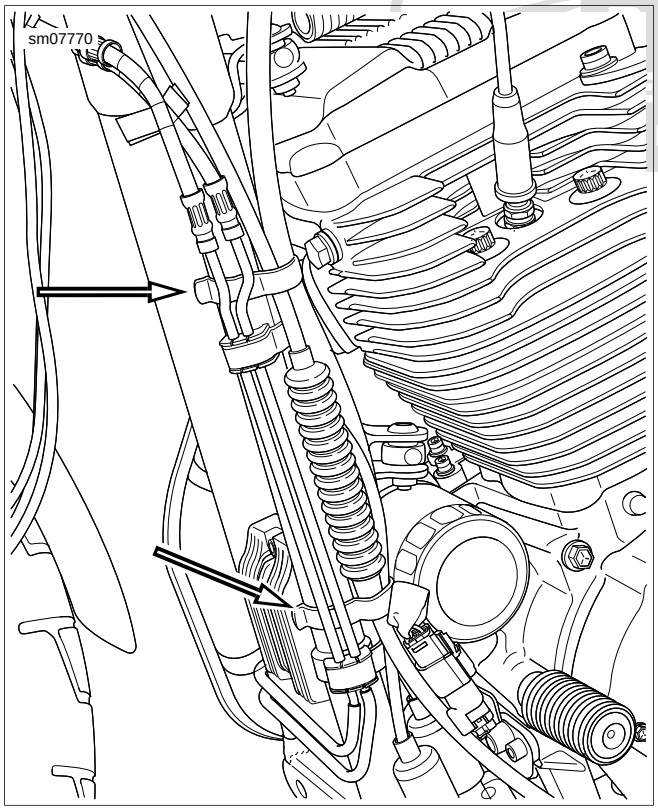
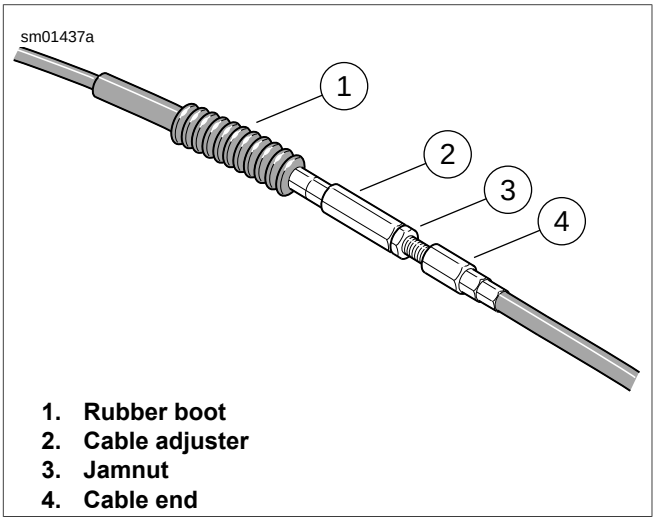


Figure 1-17. Frame Retaining Clips

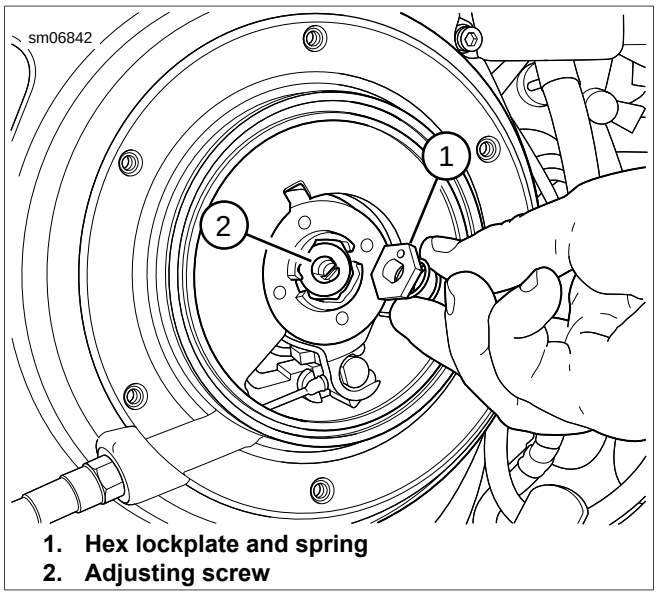


1. **Rubber boot**
2. **Cable adjuster**
3. **Jamnut**
4. **Cable end**

Figure 1-18. Clutch Cable Adjuster

Clutch Adjustment

1. **Mid-mount controls:** Remove the clutch side rider footrest and mounting bracket assembly to access the clutch inspection cover. See 2.39 RIDER FOOT CONTROLS: MID-MOUNT.
2. Remove the clutch inspection cover. Discard the quad ring.
3. See Figure 1-19. Remove the hex lockplate with the spring (1) from the clutch adjusting screw (2).
4. Turn the adjusting screw counterclockwise until resistance is felt. Turn the adjusting screw clockwise 1/4 turn.
5. Install the hex lockplate with the spring. Turn the adjusting screw clockwise to fit the lockplate onto the flats of the adjusting screw.
6. Install the clutch inspection cover.
   a. Install a **new** quad ring in the primary cover.
   b. Install the inspection cover.
   c. Install the screws and tighten in a crosswise pattern to 90-120 **in-lbs** (10.2-13.6 Nm).
7. **Mid-mount controls:** Install the footrest and mounting bracket. See 2.39 RIDER FOOT CONTROLS: MID-MOUNT.

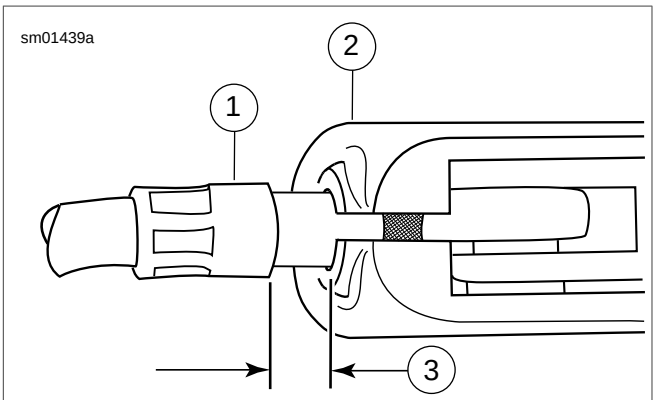


1. **Hex lockplate and spring**
2. **Adjusting screw**

Figure 1-19. Clutch Adjustment Screw

Lever Free Play

1. Turn the adjuster away from the jamnut until there is no slack in the cable at the clutch lever.
2. See Figure 1-20. Pull the clutch cable ferrule (1) away from the clutch lever bracket (2) and measure the free play (3).
3. Adjust to specification. Refer to Table 1-11.
4. Tighten the jamnut to 120 **in-lbs** (13.6 Nm).
5. Pull the rubber boot over the cable adjuster.
6. Secure the cable in the cable retainers.
7. Install main fuse.



1. **Clutch cable ferrule**
2. **Clutch lever bracket**
3. **Free play**

Figure 1-20. Clutch Free Play Adjustment

Table 1-11. Clutch Lever Free Play Specifications

FREE PLAY	in	mm
Measurement	1/16-1/8	1.6-3.2

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DRIVE BELT AND SPROCKETS 1.12

GENERAL

⚠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)

In the case of stone damage to belt, inspect the sprockets for damage and replace as required. If replacing belt, always replace both transmission and rear sprockets.

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.

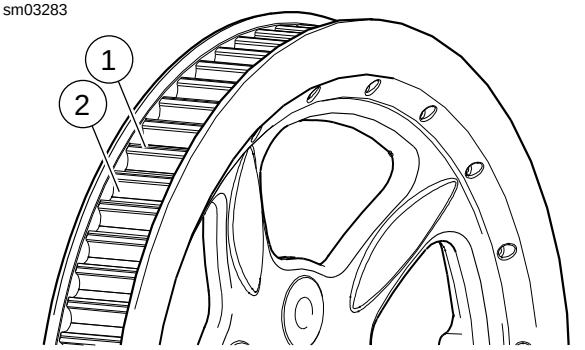
INSPECTION

Sprockets

NOTE

Chrome chips or large rear sprocket gouges leave a pattern on belt face.

1. See Figure 1-21. Inspect each tooth (1) of rear sprocket for:
   a. Tooth damage.
   b. Large chrome chips with sharp edges.
   c. Gouges caused by hard objects.
   d. Excessive loss of chrome plating.
2. To check if chrome is worn, drag with medium pressure a scribe across bottom of a groove (2).
   a. If scribe slides across groove without digging in or leaving a visible mark, chrome is still good.
   b. If scribe or knife points digs in and leaves a visible mark, it is cutting bare aluminum. A knife point does not penetrates chrome.
3. Replace rear sprocket if major tooth damage or loss of chrome exists.



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

Figure 1-21. Rear Sprocket

Drive Belt

NOTE

Belt teeth are coated with polyethylene lubricant. Coating will wear off over time. Worn coating is not an indicator of belt wear.

See Figure 1-22. Inspect drive belt for:

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

NOTE

Condition 1 may develop into 2 or 3 over time. Condition 1 is not grounds for replacing belt. Watch condition 1 closely before condition 2 develops which requires belt replacement.

Table 1-12. Drive Belt Wear Analysis

NO.*	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.
* See Figure 1-22.		

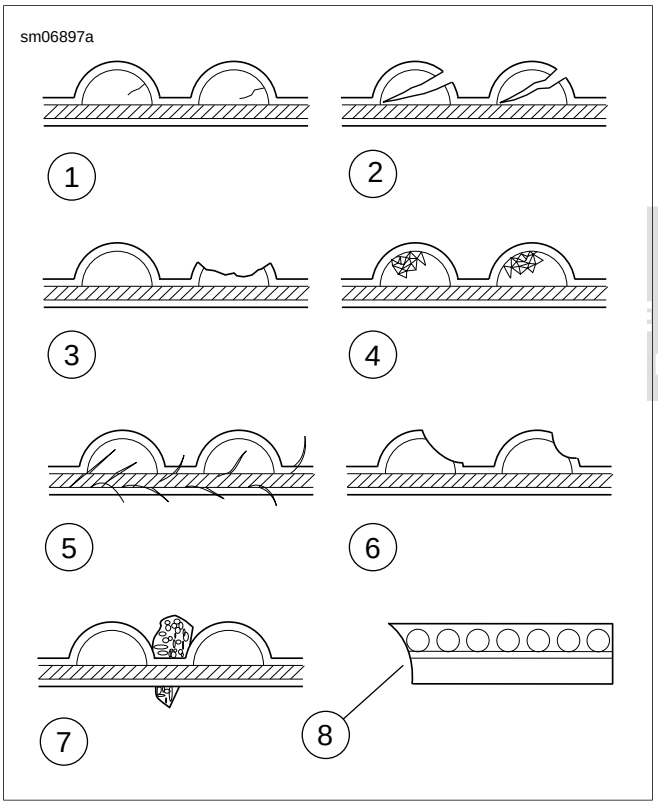


Figure 1-22. Drive Belt Wear Patterns

CHECKING DRIVE BELT DEFLECTION

PART NUMBER	TOOL NAME
HD-35381-A	BELT TENSION GAUGE

NOTE

Always use BELT TENSION GAUGE (Part No. HD-35381-A) to measure belt deflection. Failure to use tension gauge may cause under-tensioned belts. Loose belts can fail due to "ratcheting" (jumping a tooth) which causes tensile cord crimping and breakage.

Check deflection:

- As part of pre-ride inspection.
- At every scheduled service interval.
- With transmission in neutral.
- With motorcycle at ambient temperature.
- With motorcycle upright or on jiffy stand with rear wheel on the ground.
- With the vehicle unladen: no rider, no luggage and saddlebags (if equipped) empty.

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Disarm security system. Remove main fuse. See 6.3 FUSES, Replacement.
2. See Figure 1-23. Obtain H-D BELT TENSION GAUGE (Part No. HD-35381-A).

NOTE

Gauge is available from an authorized Harley-Davidson dealer.

3. To use the belt tension gauge:
   a. Slide O-ring (4) to 0 lb (0 kg) mark (3).
   b. **Models equipped with belt deflection window:** Fit belt cradle (2) against bottom of drive belt in line with belt deflection window.
   c. **All other models:** Fit belt cradle (2) against bottom of drive belt half-way between drive pulleys.
   d. Press upward on knob (6) until O-ring slides down to 10 lb (4.5 kg) mark (5) and hold steady.

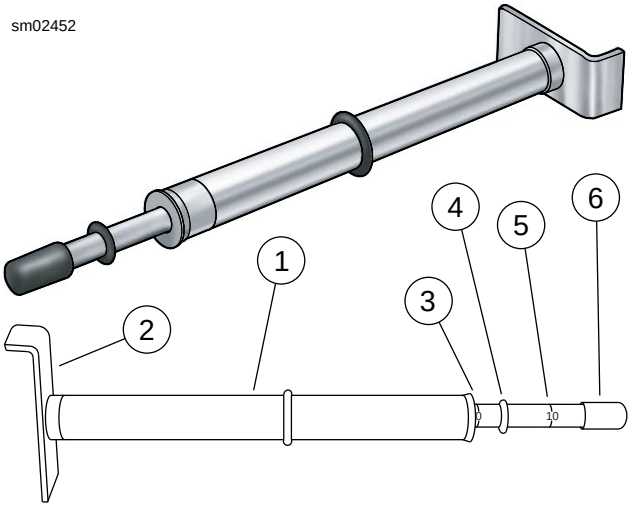
NOTE

Measure belt deflection with motorcycle unladen and upright or on jiffy stand with rear wheel on the ground.

4. Measure belt deflection:
   a. **Models equipped with belt deflection window:** See Figure 1-24. Measure belt deflection as viewed through belt deflection viewing window while holding gauge steady. Each deflection graduation is approximately 1/16 in (1.59 mm).
   b. **All other models:** See Figure 1-25. Measure belt deflection (4) while holding gauge steady.
5. Compare with specifications listed in Table 1-13. Adjust as necessary.
6. Install main fuse.

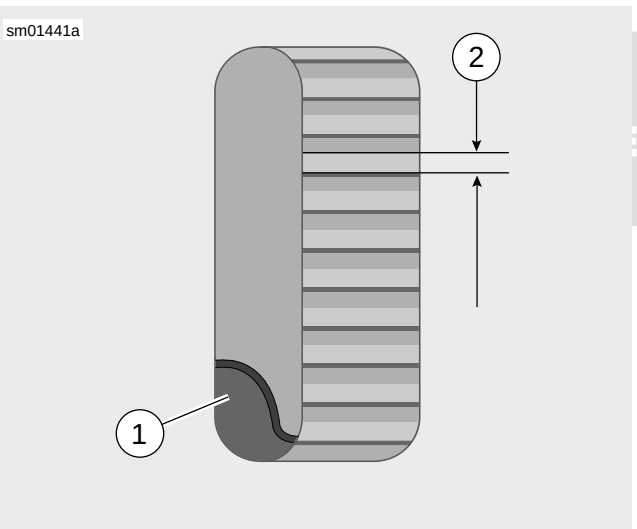
Table 1-13. Belt Deflection Specifications*

MODELS	in	mm
XL 883R	9/16-5/8	14.3-15.9
Other XL models	1/4-5/16	6.4-7.9
* Deflection measured at 10 lb (4.5 kg) tension.		



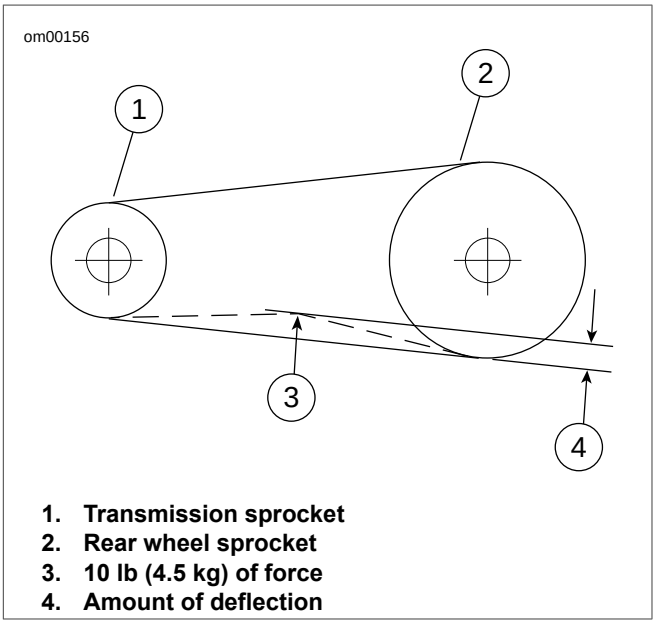
1. **Belt tension gauge**
2. **Belt cradle**
3. **0 lb (0 kg) mark**
4. **O-ring**
5. **10 lb (4.5 kg) mark**
6. **Knob**

Figure 1-23. Belt Tension Gauge



1. **Drive belt**
2. **Deflection graduation**

Figure 1-24. Belt Deflection Window



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

Figure 1-25. Checking Belt Deflection

ADJUSTMENT

FASTENER	TORQUE VALUE	
Axle, rear, nut	95-105 ft-lbs	129-142 Nm
Brake hose clamp to rear fork screw	30-40 **in-lbs**	3.4-4.5 Nm

NOTE

Rear brake line is clamped tightly to rear fork to avoid chafing of brake line in clamp. A small amount of slack must be maintained in rear brake line between clamp and rear caliper.

1. See Figure 1-26. Remove screw (1) from clamp (2) on rear brake line (3).
2. See Figure 1-27. Remove and discard E-clip (1) and loosen rear axle nut (4).

NOTE

Turn both adjuster nuts same number of turns in order to maintain approximate alignment of rear wheel.

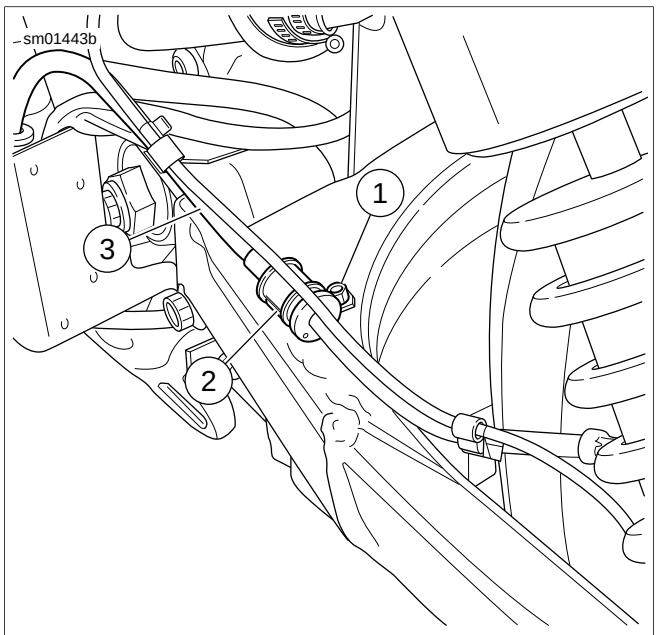
3. Turn axle adjuster nuts (2) clockwise to decrease belt deflection (increase tension), or counterclockwise to increase belt deflection (decrease tension).
4. Check rear wheel alignment. See 1.21 WHEEL ALIGNMENT, Wheel Alignment.

⚠WARNING

Do not exceed specified torque when tightening axle nut. Exceeding torque can cause wheel bearings to seize during vehicle operation, which could result in death or serious injury. (00408e)

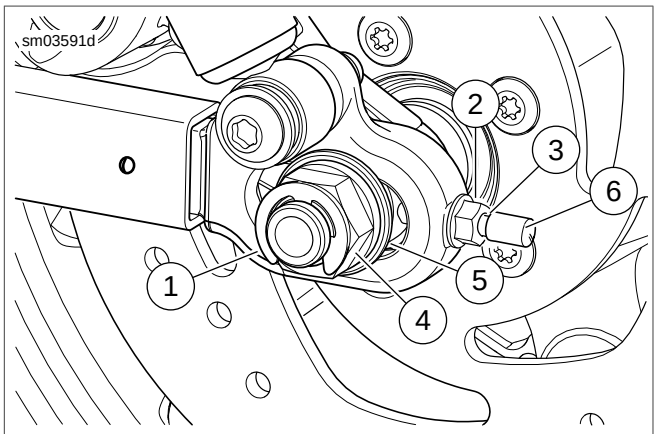
5. Tighten axle nut (4) to 95-105 ft-lbs (129-142 Nm). Install **new** E-clip (1).

6. See Figure 1-26. Reposition clamp (2) on rear brake line (3). Secure clamp to rear fork with screw (1). Tighten to 30-40 **in-lbs** (3.4-4.5 Nm).



1. **Screw**
2. **Clamp**
3. **Rear brake line**

Figure 1-26. Rear Brake Line



1. **E-clip**
2. **Axle adjuster nut (2)**
3. **Axle adjuster (2)**
4. **Axle nut**
5. **Washer**
6. **Protective cap (2)**

Figure 1-27. Drive Belt Adjustment

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

THROTTLE CONTROL 1.13

CABLE INSPECTION AND LUBRICATION

FASTENER	TORQUE VALUE	
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm

1. Release throttle cable tension. See 1.13 THROTTLE CONTROL, Cable Adjustment.
2. See Figure 1-28. Remove screws (1) to separate upper switch housing from the lower housing.
3. Unhook ferrules and cables from throttle grip. Remove throttle sleeve.
4. Inspect each cable. Replace cable assembly if cable is frayed or kinked.
5. Inspect cable outer sheath from throttle grip to induction module. Replace as necessary.
6. Apply a light coating of graphite to handlebar and inside surface of housings. Replace throttle grip.
7. Pour two drops of HARLEY LUBE into cable housings.
8. Install switch housing. Tighten to 35-45 **in-lbs** (4.0-5.1 Nm).
9. Adjust throttle cables.

CABLE ADJUSTMENT

Operation

WARNING

Before starting engine, be sure throttle control will snap back to idle position when released. A throttle control that prevents engine from automatically returning to idle can lead to loss of control, which could result in death or serious injury. (00390a)

WARNING

Do not tighten throttle friction adjustment screw to the point where the engine will not return to idle automatically. Over-tightening can lead to loss of vehicle control, which could result in death or serious injury. (00031b)

1. Back off friction screw.
2. Roll on and release throttle grip. If throttle does not return to closed (idle), inspect and adjust throttle cables.
3. With engine idling, turn handlebar stop to stop. If engine speed changes, adjust throttle cables.

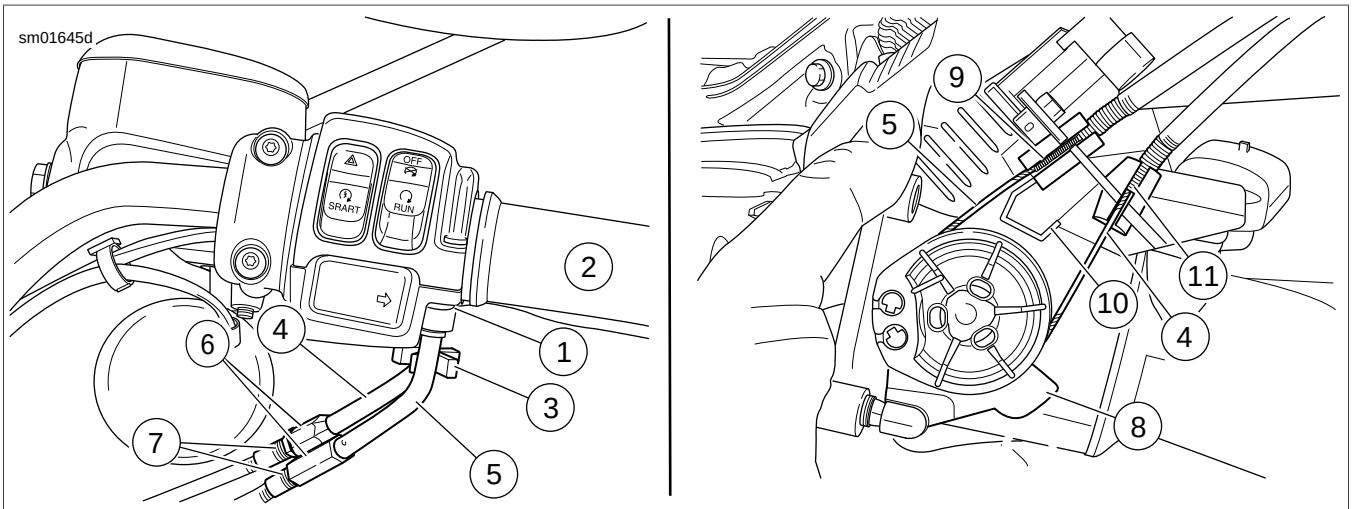
Adjustment

1. See Figure 1-28. Loosen throttle friction screw (3).
2. Slide rubber boot off control cable adjusters (6).
3. Loosen jamnuts (7).
4. Turn cable adjusters to shorten cable housings to minimum length.
5. Point front wheel straight ahead. With engine OFF, roll throttle grip (2) fully open. Hold in position.
6. Gently turn adjuster (6) on throttle control cable (4) counterclockwise until throttle cam (8) touches throttle cam stop (10). Release throttle grip. Tighten jamnut on throttle cable adjuster.
7. Turn handlebar full right lock. Turn adjuster (6) on idle control cable (5) to lengthen sleeve until end of cable housing touches spring (9) within cable guide (11).

NOTE

The throttle control must operate freely when front wheel is turned to right and left fork stops.

8. Check adjustment. Twist and release throttle grip two or three times. If throttle does not return to idle, turn idle adjuster to shorten sleeve until correct. Tighten jamnuts.
9. Slide rubber boots over cable adjusters.



1. Screw (2)
2. Throttle grip
3. Friction screw
4. Throttle (pull open) cable
5. Idle (pull close) cable
6. Cable adjuster (2)
7. Jamnut (2)
8. Throttle cam
9. Spring
10. Throttle cam stop
11. Cable guide

Figure 1-28. Throttle Cable Adjustment

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

CABLE AND CHASSIS LUBRICATION 1.14

GENERAL

Inspect and lubricate the following items according to 1.5 MAINTENANCE SCHEDULE.

- Front brake hand lever
- Clutch hand lever
- Throttle control cables
- Throttle control grip sleeve
- Clutch cable
- Steering head bearings
- Jiffy stand

If service is on muddy or dusty roads, clean and lubricate at shorter intervals.

CABLES AND HAND LEVERS

For throttle cables, see 2.24 THROTTLE CABLES.

Use HARLEY® LUBE for clutch lever and cable.

Use G40M BRAKE GREASE on front brake lever pin pivot hole and on the end of piston that contacts brake lever.

JIFFY STAND

Clean and lubricate the jiffy stand. For more information, see 2.37 JIFFY STAND.

STEERING HEAD BEARINGS

Lubricate the steering head bearings with SPECIAL PURPOSE GREASE. See 1.18 STEERING HEAD BEARINGS.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

GENERAL

The front and rear brakes are fully hydraulic disc brake systems that require little maintenance.

⚠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

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)

⚠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)

NOTES

- *If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.*
- *Cover handlebar switches with a shop towel before adding brake fluid to front master cylinder reservoir. Spilling brake fluid on handlebar switches can render them inoperative.*

BRAKE LINES INSPECTION

Inspect brake lines for leaks, contact or abrasion. Refer to Table 1-14.

Table 1-14. Brake Line Inspection

LINE TYPE	INSPECTION	REMEDY
Steel lines	No marks	OK/Monitor
	Slight mark in paint or plating*	
	Copper colored-paint/plating worn off*	
	Silver colored base material-no noticeable feel of wear*	
	Silver colored base material-noticeable feel of wear*	Replace
	Brake fluid leak or other damage	
Flexible lines	No marks	OK/Monitor
	Slight dent in protective cover or flattening of ribs*	
	Worn through protective cover or to bottom of ribs	Replace
	Brake fluid leak or other damage	
Protective cover (steel, rubber, plastic or braided)	No marks	OK/Monitor
	Slight dent in covering*	
	Slight dent or flattening of plastic covering*	
	Worn or cut-through covering-exposed brake line material	Replace
	Brake fluid leak or other damage	
* If there is line contact, reposition the line. If base material is visible, prevent corrosion with touch-up paint.		

FLUID LEVEL

FASTENER	TORQUE VALUE	
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm

NOTES

- *Fluid should never need to be added or removed from the system during normal wear. Reservoir volume is adequate to provide fluid to the wear limits of the pads and discs.*
- *Fluid level in reservoir will decrease with brake wear. If level is below the full level, suspect worn brake pads and rotors or leakage.*

1. **Front brake:** Check fluid level.
   a. Set motorcycle upright/turn handlebar to level reservoir.
   b. See Figure 1-29. Check low-level mark on reservoir sight glass.
2. **Rear brake:** Check fluid level.
   a. Set motorcycle upright.
   b. See Figure 1-30. Check low-level mark on reservoir sight glass.
3. If fluid is low:
   a. Check brake pad installation or for wear beyond specification. Replace or repair as necessary. See 1.16 BRAKE PADS AND DISCS.
   b. Check brake components for leaks. Repair as necessary.
4. If fluid is still low, add DOT 4 BRAKE FLUID as necessary.
   a. Clean cover.
   b. Remove cover screws and cover.
   c. Remove diaphragm plate and diaphragm.
   d. Add DOT 4 BRAKE FLUID to full level ridge around top of reservoir.
   e. Install diaphragm, plate and cover.
   f. Tighten to 9-17 **in-lbs** (1.0-2.0 Nm).
5. Test front brake lever and rear brake pedal for firm feel. Bleed brakes as necessary. See 2.14 BLEEDING BRAKES.

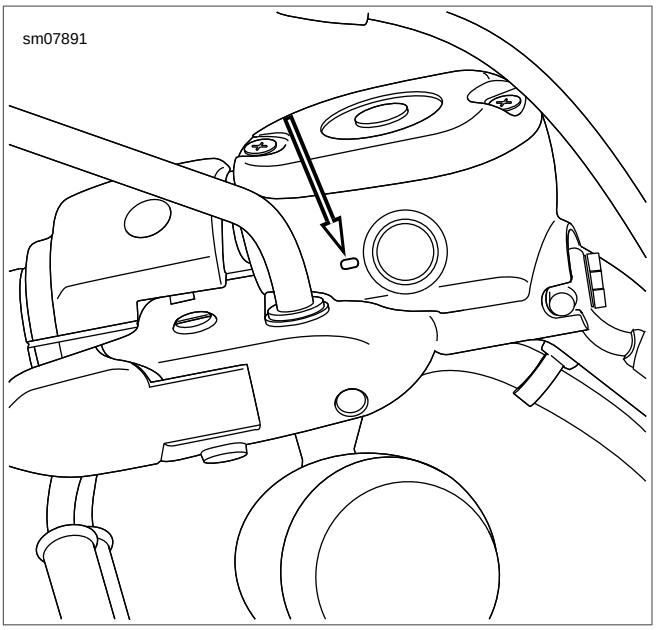


Figure 1-29. Reservoir Low Level Mark

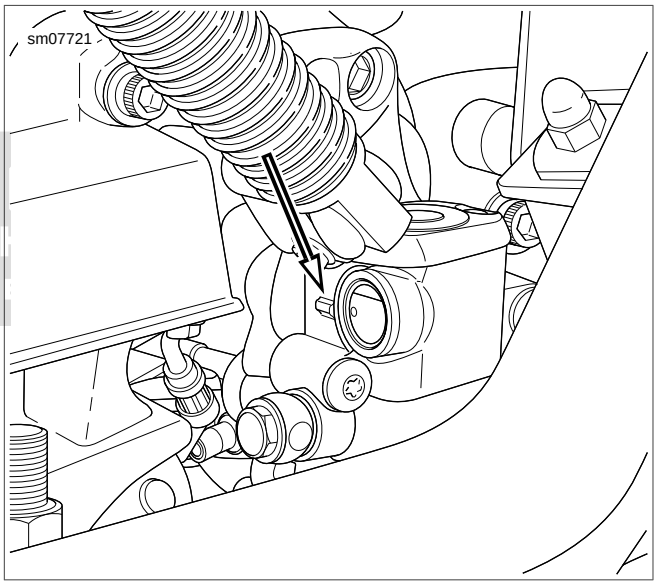


Figure 1-30. Reservoir Low Level Mark

TROUBLESHOOTING

Use the following troubleshooting guide to help in determining probable causes of poor brake operation. Refer to Table 1-15.

Table 1-15. Troubleshooting Brakes

CONDITION	CHECK FOR	REMEDY
Low reservoir fluid level	Leaks in brake system	Repair as necessary. Bleed brake system.
	Worn pads and discs	Replace pads and discs.
Excessive lever or pedal travel or spongy feel	Air in system	Bleed brake system.
	Low reservoir fluid level	Repair leaks as necessary. Bleed brake system.
		Replace pads and discs.
Chattering sound when brake is applied	Worn brake pads	Replace brake pads.
	Loose mounting bolts	Tighten bolts.
	Warped brake disc	Replace brake disc.
Ineffective brake lever or pedal - travels to limit	Low fluid level	Repair leaks as necessary. Bleed brake system.
		Replace pads and discs.
	Piston cup not functioning	Rebuild master cylinder.
Ineffective brake lever or pedal - travel normal	Distorted or glazed brake disc	Replace brake disc.
	Distorted, glazed or contaminated brake pads	Replace brake pads.
Brake pads drag on disc - does not retract.	Cup in master cylinder blocking relief port	Inspect master cylinder.
	Master cylinder overfilled	Correct fluid level.

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

BRAKE PADS AND DISCS 1.16

INSPECTION

Brake Pads

⚠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)

⚠CAUTION

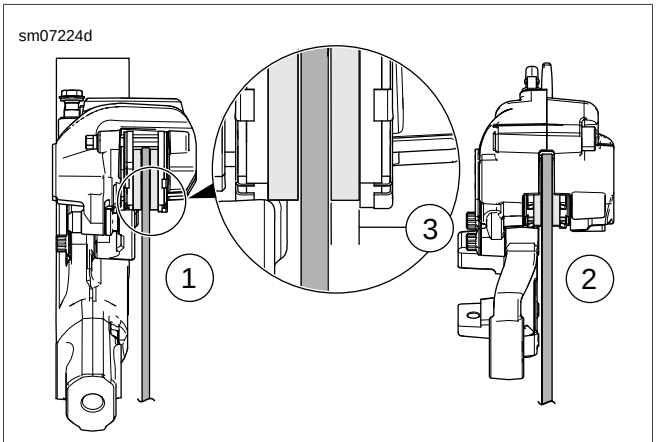
Direct contact of D.O.T. 4 brake fluid with eyes can cause irritation. Avoid eye contact. In case of eye contact flush with large amounts of water and get medical attention. Swallowing large amounts of D.O.T. 4 brake fluid can cause digestive discomfort. If swallowed, obtain medical attention. Use in 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)

See Figure 1-31. Replace brake pads if pads on either front or rear are worn to 0.04 in (1.02 mm) or less above backplate. Always replace both pads as a set. See 1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Front or 1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Rear.

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



1. **Front, from below**
2. **Rear, from above**
3. **Pad thickness**

Figure 1-31. XL Brake Pad Thickness

Brake Disc Thickness, Lateral Runout and Warpage

Minimum acceptable thickness is stamped on side of disc. Replace disc if warped, badly scored or worn beyond service limit.

Maximum brake disc lateral runout and warpage is 0.008 in (0.2 mm) when measured near outside diameter.

- To replace front brake discs, see 2.5 WHEELS, Front Wheel.
- To replace rear brake disc, see 2.5 WHEELS, Rear Wheel.

BRAKE PAD REPLACEMENT: FRONT

FASTENER	TORQUE VALUE	
Brake caliper, front, mounting bolt	28-38 ft-lbs	38.0-51.5 Nm
Brake caliper pad pin	131-173 **in-lbs**	14.8-19.5 Nm
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm

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)

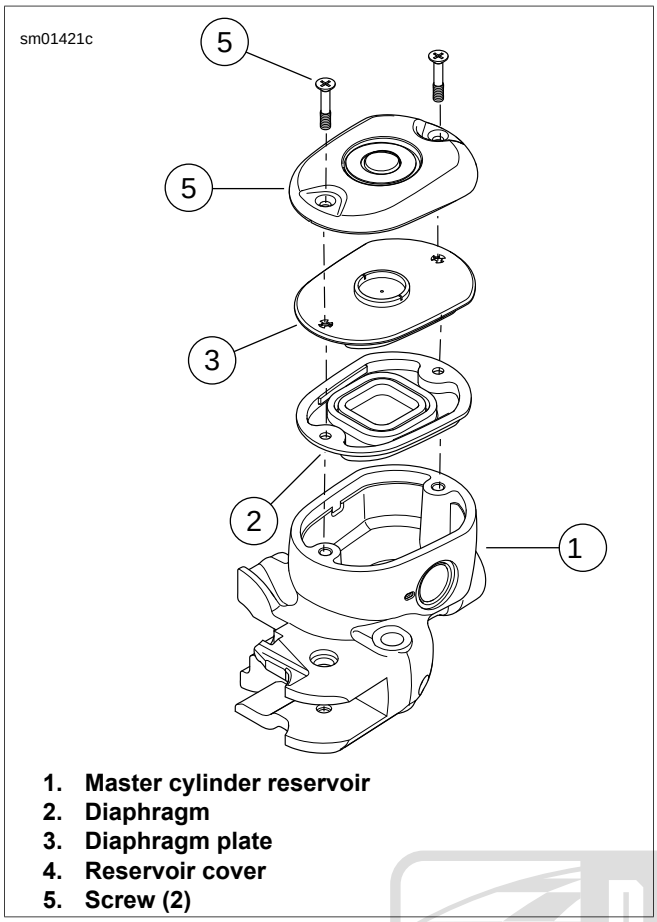
NOTES

- *If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.*
- *Cover handlebar switches with a shop towel before adding brake fluid to reservoir.*

1. Position motorcycle to level front master cylinder reservoir.
2. Wrap a shop towel around master cylinder reservoir to contain any brake fluid spills.
3. See Figure 1-32. Remove screws (5), reservoir cover (4), diaphragm plate (3) and diaphragm (2) from master cylinder reservoir.

NOTE

As pistons are pressed into their bores, fluid level can rise above max fill level. Remove fluid as necessary.



1. **Master cylinder reservoir**
2. **Diaphragm**
3. **Diaphragm plate**
4. **Reservoir cover**
5. **Screw (2)**

Figure 1-32. Front Brake Master Cylinder Cover

4. Remove caliper bracket and caliper.
   a. Loosen, but do not remove, brake pad pin.
   b. Remove caliper bracket mounting bolts.
   c. **ABS models:** Remove WSS wire lead clips from the brake line.
   d. Remove caliper bracket and caliper.
5. Remove old pads.
   a. Support caliper assembly.
   b. To press the pistons back into their bores, press pads apart.
   c. Pull pad pin part way until wheel side pad is free.
   d. Continue to pull out pad pin until piston side pad is free.
   e. Remove pads.
6. Inspect pad pin for grooving and wear.
   a. Measure pad pin diameter in an unworn area
   b. Measure pad pin diameter in an area of grooving or wear.
   c. If wear exceeds 0.011 in (0.28 mm), replace pin.

Installation

NOTE

*See Figure 1-33. Verify that pad spring is installed before installing **new** pads.*

1. Install piston side brake pad.
   a. Slide pad mounting tab to rear.
   b. Press pad against pistons.
   c. See Figure 1-34. Align pad spring feet against pad spring.
2. Install wheel side brake pad.
   a. Fit mounting tab under retaining clip.
   b. Press pad against mounting bracket.
3. Install pad pin.
   a. Press piston side pad down.
   b. Start pad pin.
   c. Press wheel side pad against pad spring.
   d. Complete pad pin installation.

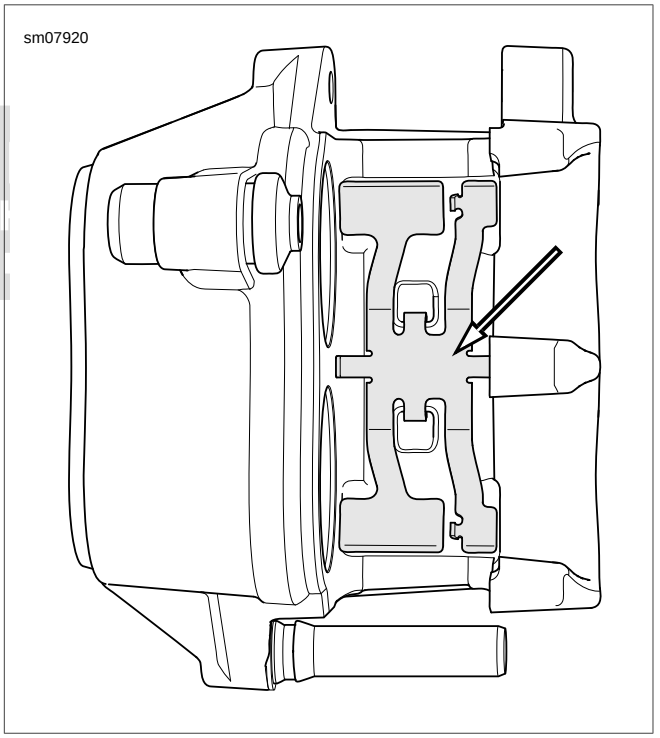


Figure 1-33. Caliper Pad Spring

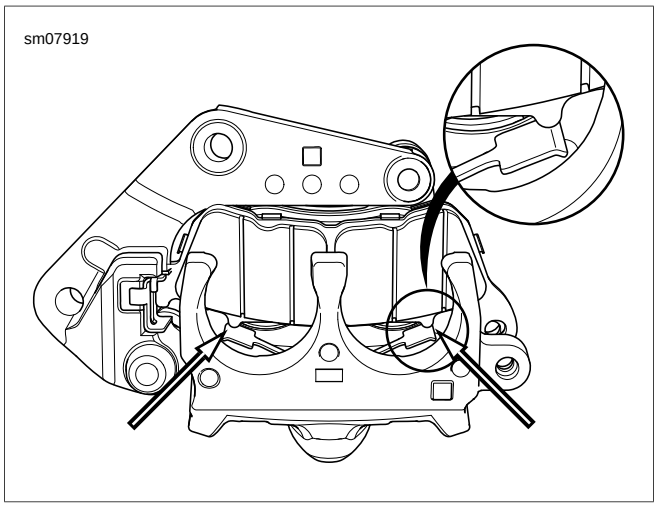


Figure 1-34. Pad Spring Feet

4. Install caliper and bracket.
   a. **ABS models:** Fit WSS wire lead bracket, clip and wire lead to caliper mounting boss.
   b. Install mounting bolts.
   c. Tighten to 28-38 ft-lbs (38.0-51.5 Nm).
   d. Tighten pad pin to 131-173 **in-lbs** (14.8-19.5 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)

5. Squeeze brake lever to push pistons against outside brake pad.

⚠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

If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.

6. Check fluid level in brake reservoir. Add enough DOT 4 BRAKE FLUID to reservoir to bring fluid level to max fill level.
7. Install diaphragm and plate. Install reservoir cover with screws. Tighten screws to 9-17 **in-lbs** (1.0-2.0 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)

NOTE

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

8. Test brakes.
   a. Turn ignition on. Check operation of rear lamps.
   b. Test ride motorcycle. Repeat the bleeding procedure if brakes feel spongy. See 2.14 BLEEDING BRAKES.

BRAKE PAD REPLACEMENT: REAR

FASTENER	TORQUE VALUE	
Brake caliper, rear, mounting bolt	28-38 ft-lbs	38.0-51.5 Nm
Brake caliper pad pin	131-173 **in-lbs**	14.8-19.5 Nm
Brake line P-clamp, rear, screw	30-40 **in-lbs**	3.4-4.5 Nm
Brake master cylinder, rear, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm

Removal

NOTES

- *If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.*
- *As piston is pushed back into caliper, fluid level can rise higher than max fill level. If necessary, remove fluid.*

1. **XL 1200T:** Prepare motorcycle:
   a. Raise the motorcycle.
   b. Remove LH saddlebag. See 2.29 SADDLEBAGS: XL 1200T.
   c. Remove LH lower shock bolt. Rotate shock away from caliper. See 2.20 SHOCK ABSORBERS.
2. **All other models:** Position motorcycle to level master cylinder reservoir.
3. Place container under reservoir to catch fluid overflow
4. Remove reservoir cover.
5. Remove caliper.
   a. Remove brake line P-clamp from rear fork.
   b. Loosen, but do not remove, pad pin.
   c. Remove caliper mounting bolts.
   d. Remove caliper from bracket.

ULTRA TECHNICIAN II HARLEY-DAVIDSON

6. Remove old pads.
   a. Support caliper.
   b. To press pistons into their bores, press pads apart.
   c. Pull pad pin part way until wheel side pad is free.
   d. Pull pin until outside pad is free.
   e. Remove pads and pad spring.
7. Inspect pin for grooving and wear.
   a. Measure pin diameter in an unworn area.
   b. Measure pin in area of any grooving or wear.
   c. If wear exceeds 0.011 in (0.28 mm), replace pin.

Installation

NOTE

*Verify that pad spring is installed before installing **new** pads.*

1. See Figure 1-35. Install **new** pads.
   a. Hold pad spring (1).
   b. Hold brake pads (2) in position.
   c. Press pad pin (3) through outside caliper, outside pad and spring.
   d. While compressing pads and spring, press pad pin over center of pad spring through wheel side pad.
   e. While pressing down on spring center, align pin with wheel side caliper.
   f. Partially thread in pad pin.
2. Install caliper.
   a. Fit caliper over brake disc.
   b. Install mounting bolts. Tighten to 28-38 ft-lbs (38.0-51.5 Nm).
   c. Tighten pad pin to 131-173 **in-lbs** (14.8-19.5 Nm).
   d. Install brake line P-clamp. Tighten to 30-40 **in-lbs** (3.4-4.5 Nm).
3. Check fluid level in brake reservoir. Level must be between low-level mark and max fill level.
4. Install master cylinder reservoir cover and screws. Tighten to 9-17 **in-lbs** (1.0-2.0 Nm).
5. **XL 1200T:** Return to service.
   a. Install shock absorber. See 2.20 SHOCK ABSORBERS.
   b. Install saddlebag. See 2.29 SADDLEBAGS: XL 1200T.
   c. Lower the motorcycle.

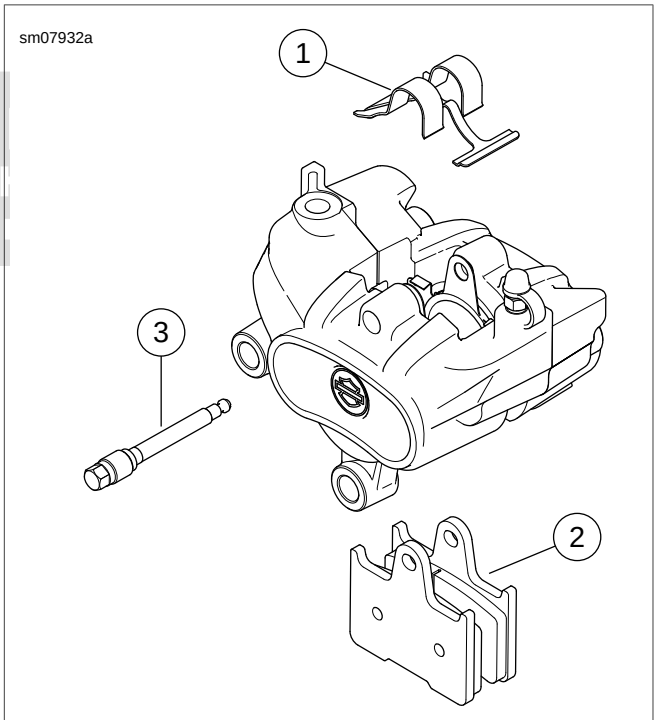
WARNING

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)

NOTE

*Avoid making hard stops for first 100 mi (160 km) to allow **new** pads to become conditioned to brake discs.*

6. Test brakes.
   a. Turn ignition switch ON. Check operation of rear lamps.
   b. Test ride motorcycle at low speed. Bleed the brake fluid if brakes feel spongy. See 2.14 BLEEDING BRAKES.



1. **Pad spring**
2. **Pads**
3. **Pad pin**

Figure 1-35. Rear Brake Pads

SPARK PLUGS 1.17

REMOVAL

⚠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 before servicing.

1. Disconnect spark plug cables.
2. Remove spark plugs.

INSPECTION

NOTE

Discard plugs with eroded electrodes, heavy deposits or a cracked insulator.

See Figure 1-36. Compare plug deposits to Table 1-16.

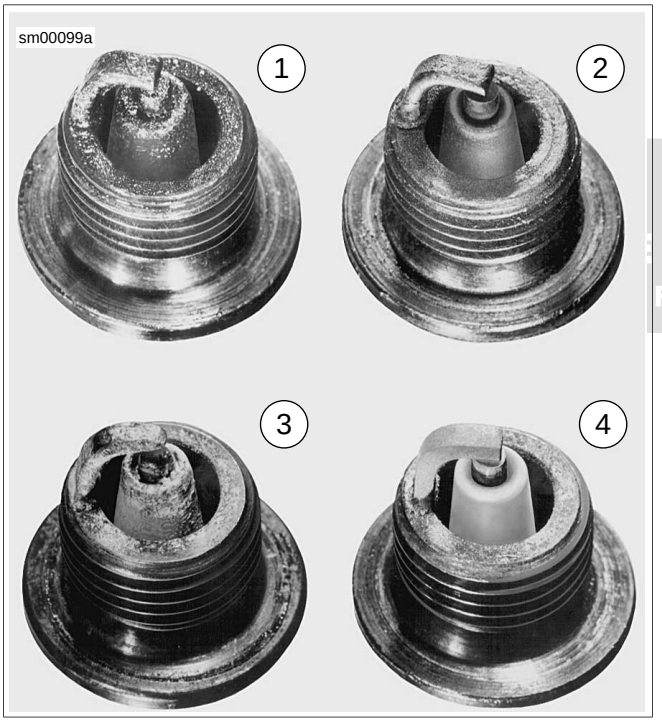


Figure 1-36. Spark Plug Deposits

Table 1-16. Spark Plug Deposit Analysis

PLUG	DEPOSITS	POSSIBLE CAUSE
1	Wet, black and shiny	Worn pistons Worn piston rings Worn valves Worn valve guides Worn valve seals Weak battery Faulty ignition system
2	Dry, fluffy or sooty and black	Air-fuel mixture too rich
3	Light brown and glassy* May be accompanied by cracks in the insulator or by electrode erosion.	Air-fuel mixture too lean Hot running engine Valves not seating Improper ignition timing
4	White, gray or tan and powdery	Balanced combustion Clean off deposits at regular intervals.
* The glassy deposit on a spark plug may cause high-speed misfiring.		

CLEANING

⚠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)

If the plugs require cleaning between tune-ups:

1. Clean electrodes and insulator with electrical contact cleaner. Dry plug with compressed air.
2. Use a thin file to flatten electrodes.

NOTE

Electrodes with sharp edges require 25-40 percent less voltage than ones with rounded edges.

3. Check condition of threads in cylinder head. Use a penetrating oil and clean out with a thread chaser. Verify that plug threads are clean.
4. If necessary, replace with **new** spark plugs.

INSTALLATION

FASTENER	TORQUE VALUE	
Spark plug	12-18 ft-lbs	16.3-24.4 Nm

1. Verify proper gap before installing **new** or cleaned spark plugs.
   a. Select a wire-type feeler gauge within specification. Refer to Table 1-17.

NOTE

If there is a slight drag on the gauge, the spark plug gap is within specification.

b. Pass the wire gauge between the center and the outer electrodes.

c. If necessary use the proper tool to bend the outer electrode to bring the gap to within specification.

2. Apply ANTI-SEIZE LUBRICANT to the spark plug threads. Tighten to 12-18 ft-lbs (16.3-24.4 Nm).

3. See Figure 1-37. Connect spark plug cables. Verify that the cables are connected to coil, spark plugs and anchor clips or harness caddies.

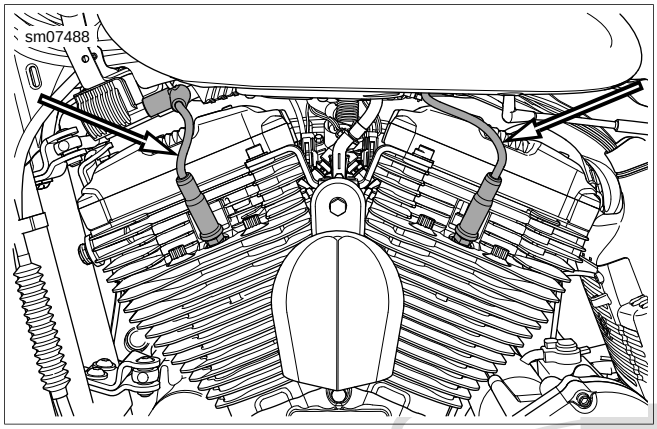


Figure 1-37. Spark Plug Cable Routing: All Models

Table 1-17. Spark Plug Gap

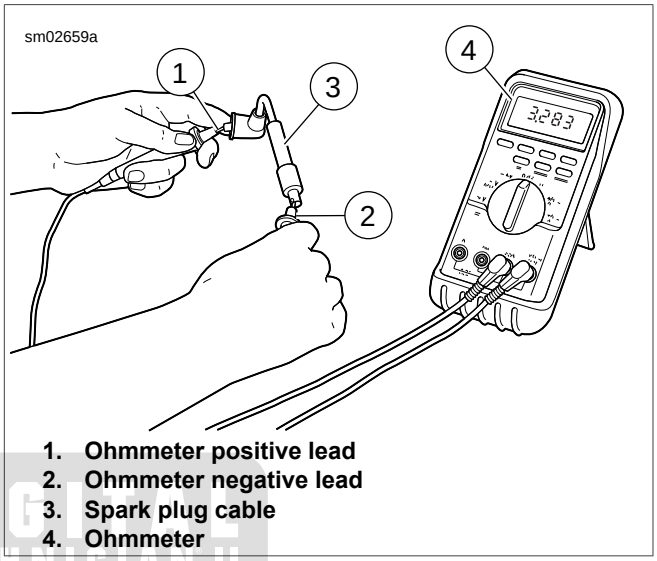
MODEL	TYPE	in	mm
XL	6R12	0.038-0.043	0.97-1.09

SPARK PLUG CABLE INSPECTION

1. Inspect spark plug cables. Replace if necessary.
   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 1-38. Check spark plug cable resistance with an ohmmeter. Replace cables not meeting resistance specifications. Refer to Table 1-18.

Table 1-18. Spark Plug Cable Resistance

CABLE	RESISTANCE (OHMS)
Front	1,750-4,836
Rear	4,843-15,420



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

Figure 1-38. Testing Resistance

STEERING HEAD BEARINGS 1.18

FALL-AWAY

FASTENER	TORQUE VALUE	
Fork stem pinch bolt	30-35 ft-lbs	40.7-47.5 Nm
Fork bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm
Brake line, front, manifold bolt	36-48 **in-lbs**	4.1-5.4 Nm

Measurement

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, mounting brackets, components or housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586d)

1. Lift motorcycle until both tires are off the ground. Verify that the lower frame rails front to back and left to right are level.
2. **XL 1200T:** Remove windshield.
3. **All models:** Remove any accessory that interferes with front fork swing.
4. Disconnect the clutch cable.
5. **XL 1200T:** Remove the throttle cable retainer clip.
6. **ABS models:** Remove:
   a. Fastener securing the brake line manifold to the lower fork bracket.
   b. Upper clamp securing brake lines to the left frame tube.
7. Cover the front fender tip with a strip of masking tape.
8. Install a pointer mounted to a floor stand. With the front wheel pointed straight ahead, position the pointer at the center of the fender.
9. Tap the fender on one side until the front fork begins to pivot (fall-away) without being tapped. Mark that point. Repeat in the opposite direction.
10. Measure the distance between the two fall-away marks.
11. If fall-away is not within specification, adjust the fall-away. Refer to Table 1-19.

Table 1-19. Fall-Away Specifications

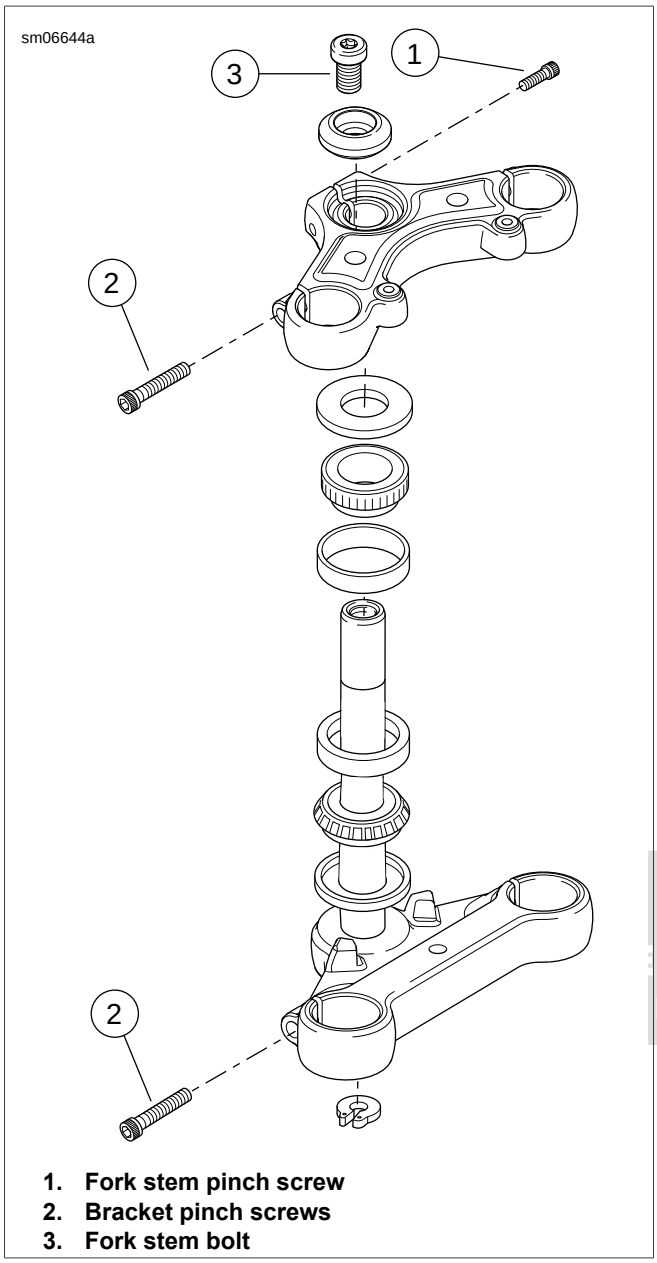
MODEL	MINIMUM		MAXIMUM	
	in	mm	in	mm
XL models	1.0	25	2.0	50

Adjustment

1. See Figure 1-39. Loosen the two lower bracket pinch screws (2) and the fork stem pinch screw (1).
2. Adjust fall-away:
   a. If fall-away is more than the maximum, loosen the fork stem bolt (3).
   b. If fall-away is less than the minimum, tighten the fork stem bolt.
3. Tighten the fork stem pinch screw to 30-35 ft-lbs (40.7-47.5 Nm) and tighten the lower bracket pinch screw to 30-35 ft-lbs (40.7-47.5 Nm).
4. Verify fall-away.
5. If removed, attach brake line manifold to lower fork bracket. Tighten to 36-48 **in-lbs** (4.1-5.4 Nm).
6. Install clamp securing brake lines to left frame tube.
7. **ABS models:** Install:
   a. Fastener securing the brake line manifold to the lower fork bracket.
   b. Upper clamp securing brake lines to the left frame tube.
8. Install the clutch cable. Adjust clutch cable free play.
9. **XL 1200T:** Install:
   a. The throttle cable retainer clip.
   b. Windshield.
10. **All models:** Install any accessories.

LUBRICATION

See Figure 1-39. Disassemble the steering head assembly and lubricate the tapered roller bearings with SPECIAL PURPOSE GREASE. See 2.17 FORK STEM AND BRACKET ASSEMBLY.



1. **Fork stem pinch screw**
2. **Bracket pinch screws**
3. **Fork stem bolt**

Figure 1-39. Steering Head Assembly (typical)

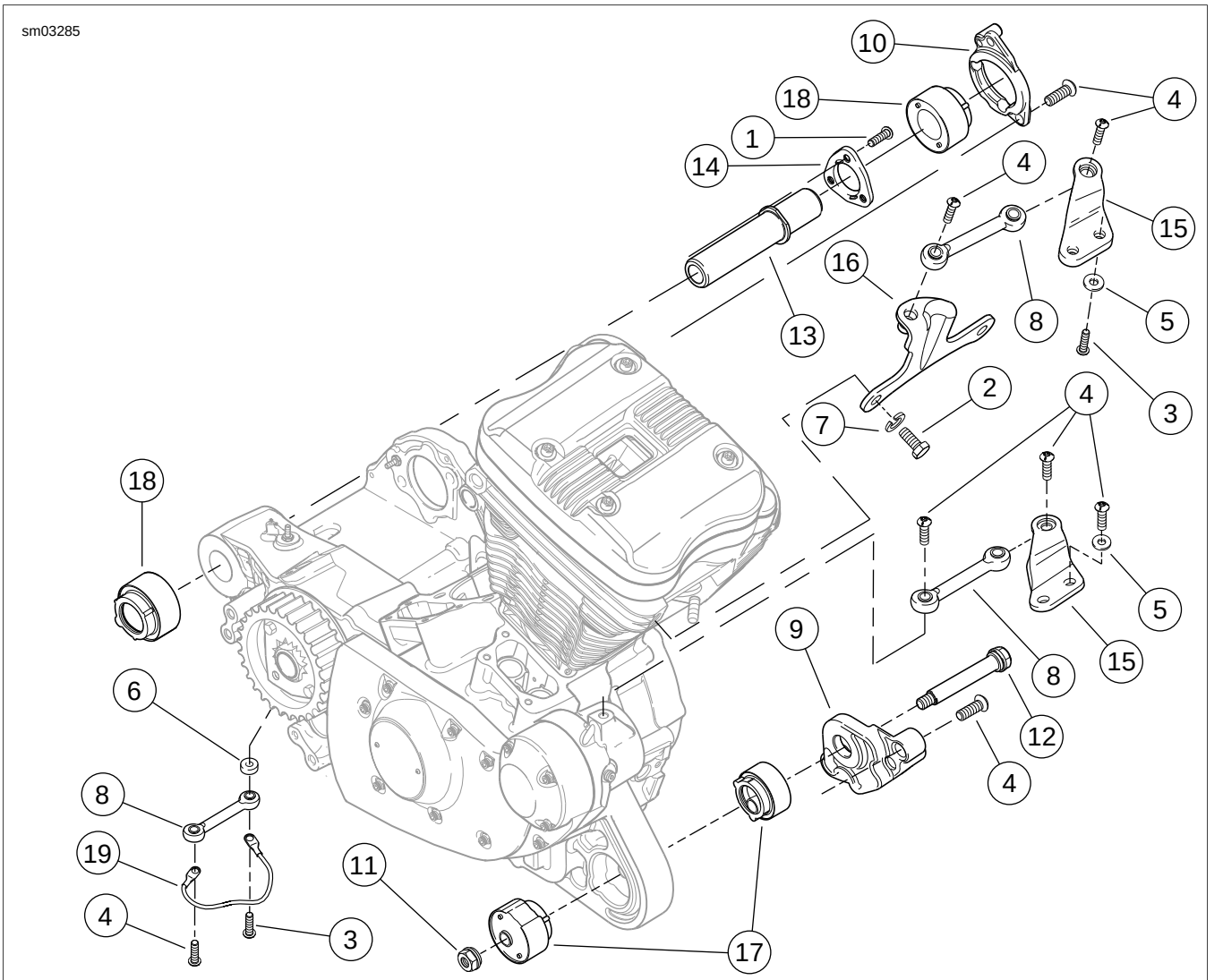
IGITAL
CHNICIAN II
RLEY-DAVIDSON

ENGINE MOUNTS AND STABILIZER LINKS 1.19

INSPECTION

Check engine mounts and stabilizer links as follows:

1. See Figure 1-40. Check for cracks or tears in engine mount isolator rubber (17, 18).
2. Check for lateral movement at each end of the three stabilizer links (8). Any lateral movement indicates the need to replace the stabilizer link. Rotational movement does not indicate excess wear.
3. Check that all engine mount bolts and stabilizer link screws are tight. See 2.21 STABILIZER LINKS, 2.22 FRONT ENGINE MOUNT/ISOLATOR, or 2.23 REAR ENGINE MOUNT/ISOLATOR for torque specifications.
4. Check that the mounts are supporting the weight of the motor.



1. Screw (3)
2. Screw (2)
3. Screw (3)
4. Screw (11)
5. Washer (4)
6. Spacer
7. Lockwasher (2)
8. Stabilizer link (3)
9. Front isolator mount
10. Rear isolator mount
11. Nut
12. Bolt
13. Rear fork pivot shaft
14. Rear pivot lockplate
15. Stabilizer link bracket (2)
16. Engine bracket
17. Front mount isolator (2)
18. Rear mount isolator (2)
19. Grounding strap

Figure 1-40. Engine Mounting Assemblies: All Models

BATTERY MAINTENANCE 1.20

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)

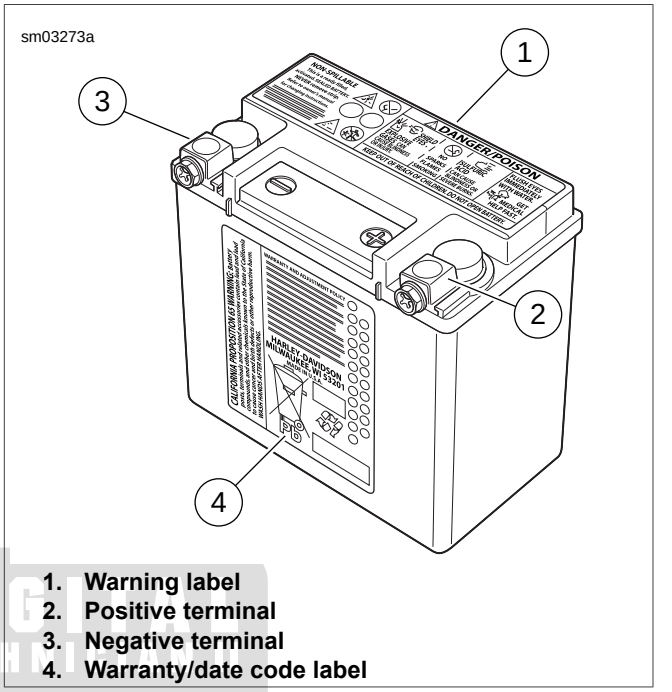
NOTICE

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)

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



1. Warning label
2. Positive terminal
3. Negative terminal
4. Warranty/date code label

Figure 1-41. Battery

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 1-42. Battery Warning Label

Table 1-20. 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.

DISCONNECTION AND REMOVAL

⚠WARNING

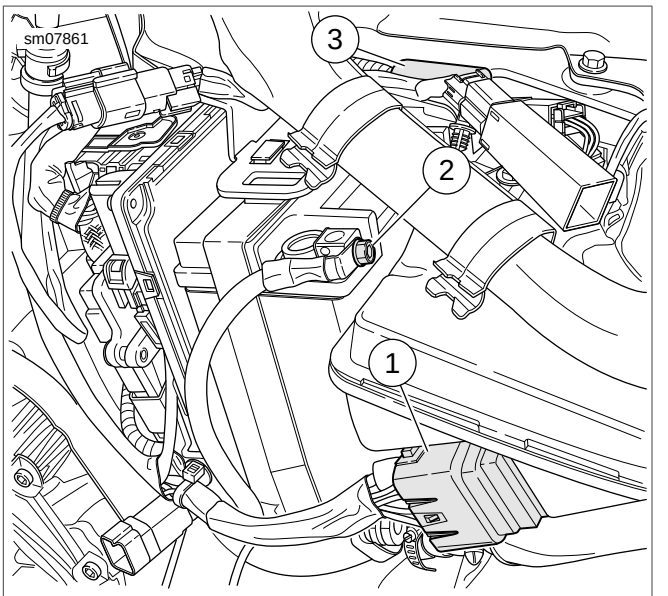
Disconnect negative (-) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00049a)

1. Remove seat.
2. Remove left side cover.

NOTE

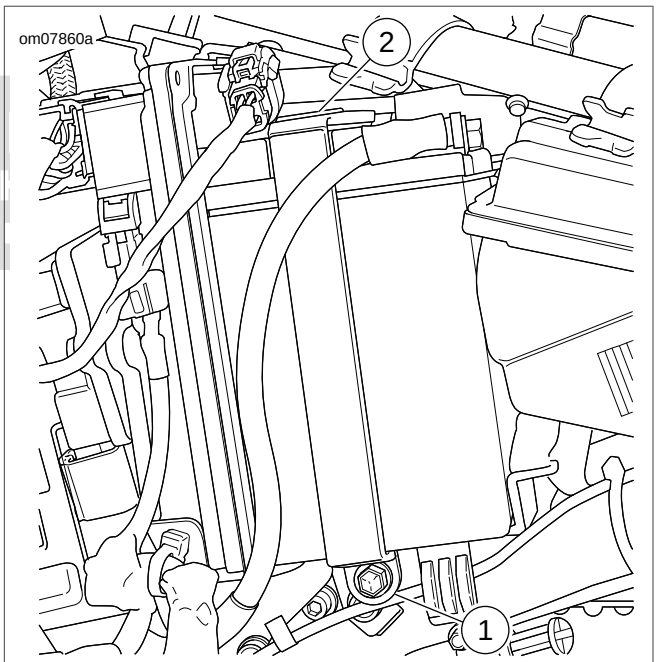
Keyless models with sirens: *Verify that fob is present. Switch OFF/RUN switch to RUN before removing main fuse or disconnecting battery.*

3. See Figure 1-43. Pull the fuse block (1) aside.
4. Remove main fuse.
5. Disconnect the negative battery cable at the battery terminal (2).
6. Lift protective rubber boot covering battery positive terminal (3). Disconnect the positive battery cable.
7. See Figure 1-44. Remove battery strap fastener (1).
8. Unhook battery strap from battery tray mount (2) on top of battery.
9. Remove battery from battery tray.



1. **Fuse block**
2. **Negative terminal**
3. **Positive terminal boot**

Figure 1-43. Battery Compartment



1. **Fastener**
2. **Mount**

Figure 1-44. Battery Strap

CLEANING AND INSPECTION

NOTE

Battery top must be clean and dry. Dirt and electrolyte on top of the battery causes battery to self-discharge.

1. Clean battery top with a solution of baking soda (sodium bicarbonate) and water (5 teaspoons baking soda per quart or liter of water).

2. When the solution stops bubbling, rinse off the battery with clean water.
3. Clean cable connectors and battery terminals using a wire brush or sandpaper. Remove any oxidation.
4. Inspect the battery screws, and cables for breakage, loose connections and corrosion.
5. Check the battery terminals for melting or damage caused by over-tightening.
6. Inspect the battery for discoloration, raised top or a warped or distorted case. This might indicate that the battery has been frozen, overheated or overcharged.
7. Inspect the battery case for cracks or leaks.

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)

The voltmeter test provides a general indicator of battery condition. Check the voltage of the battery to verify that it is fully charged.

1. If the open circuit (disconnected) voltage reading is below 12.6 V:
   a. Charge the battery.
   b. Check the voltage after the battery has set for at least one hour.
2. If the voltage reading is 12.7 V or above:
   a. Perform a battery diagnostic test. See the electrical diagnostic manual for the load test procedure.
   b. Refer to Table 1-21.

Table 1-21. 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

An automatic, constant monitoring battery charger/tender with a charging rate of 5 amps maximum at no more than 14.6 volts is recommended. The use of constant current chargers (including trickle chargers) to charge sealed AGM batteries is not recommended.

Any overcharge will cause dry-out and premature battery failure. Always review charger instructions before charging a battery. 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. Black negative lead to the negative terminal. If the battery is still in the vehicle, connect the negative lead to the chassis ground. Verify that the ignition and all electrical accessories are turned off.
- Verify that charger leads to 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:

- 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. Check charge state with voltmeter test. If battery voltage is less than 12.7 volts, see the next step.

⚠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)

NOTES

- *Most constant monitoring battery chargers are completely automatic. They can be left connected to both AC power and to the battery that is being charged. When leaving this type of charger connected for extended periods of time, periodically check the battery to see if it is unusually warm. This is an indication that the battery may have a weak cell or internal short. Read the manufacturer's instructions for the charger.*
- *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 5 amps maximum at no more than 14.6 volts.*

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.

⚠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. Disconnect the black battery charger lead from the negative terminal of the battery.
5. Disconnect the red battery charger lead from the positive terminal of the battery.
6. Mark the charging date on the battery.
7. Perform a battery diagnostic 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.

INSTALLATION AND CONNECTION

FASTENER	TORQUE VALUE	
Battery strap fastener	72-96 **in-lbs**	8.1-10.8 Nm
Battery terminal screw	60-70 **in-lbs**	6.8-7.9 Nm
Battery terminal screw	60-70 **in-lbs**	6.8-7.9 Nm

NOTICE

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

1. Apply a light coat of petroleum jelly or corrosion retardant to negative and positive terminals.
2. Slide battery into tray.
3. Hook top of battery strap to battery tray mount on top of battery. Install strap fastener. Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).

⚠WARNING

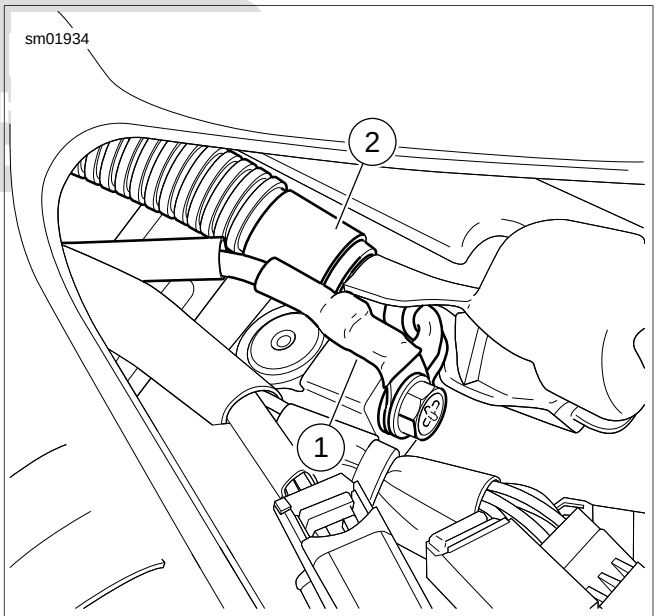
Connect positive (+) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00068a)

4. See Figure 1-45. Install positive terminal screw through main fuse cable (1) then main positive battery cable (2). Tighten to 60-70 **in-lbs** (6.8-7.9 Nm).
5. Cover terminal with rubber boot.

NOTE

See Figure 1-46. Route negative battery cable behind fuse block wire harness.

6. Install screw through negative battery cable and into negative battery terminal. Tighten to 60-70 **in-lbs** (6.8-7.9 Nm).
7. Install main fuse.
8. Mount fuse block to oil tank.
9. Install left side cover.
10. Install seat.



1. **Main fuse**
2. **Positive cable**

Figure 1-45. Positive Terminal

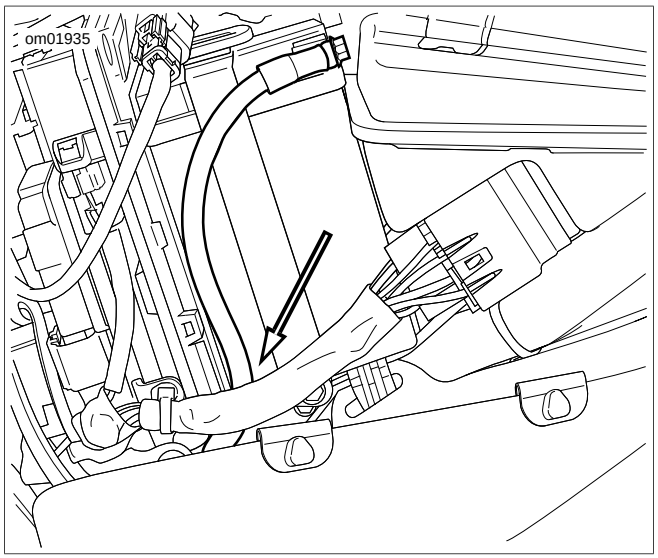


Figure 1-46. Negative Battery Cable under Fuse Block Wire Harness

STORAGE

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 stored with the security system armed, connect an automatic, constant monitoring battery charger/tender to maintain battery charge. Refer to the Harley-Davidson Parts and Accessories catalog.

If the motorcycle is stored with the battery installed, without a Harley-Davidson constant monitoring battery charger/tender, and with the security system **not** armed, remove main fuse.

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

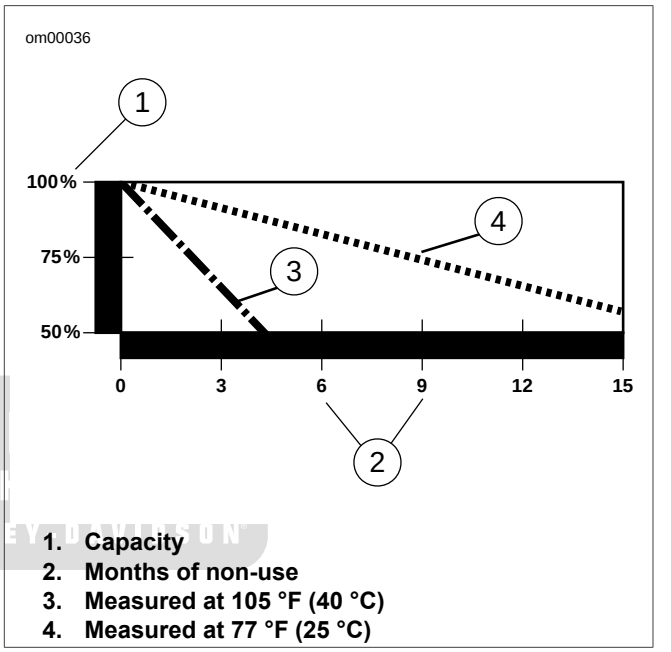
See Figure 1-47. A battery that is removed from the vehicle is affected by self-discharge. A battery that is stored in the vehicle is affected by self-discharge and, more significantly, by parasitic loads. A parasitic load is caused by things like diode leakage or maintaining computer memory with the 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 every two weeks if stored in the vehicle. Charge the battery once per month if stored out of the vehicle.

NOTE

Use a Harley-Davidson constant monitoring battery charger/tender to maintain battery charge for extended periods of time without risk of overcharging or boiling.



1. **Capacity**
2. **Months of non-use**
3. **Measured at 105 °F (40 °C)**
4. **Measured at 77 °F (25 °C)**

Figure 1-47. Effective Rate of Temperature on Battery Self-discharging Rate

WHEEL ALIGNMENT 1.21

WHEEL ALIGNMENT

PART NUMBER	TOOL NAME
HD-48856-A	AXLE ALIGNMENT PLUGS

FASTENER	TORQUE VALUE	
Axle, rear, nut	95-105 ft-lbs	129-142 Nm

Checking Wheel Alignment

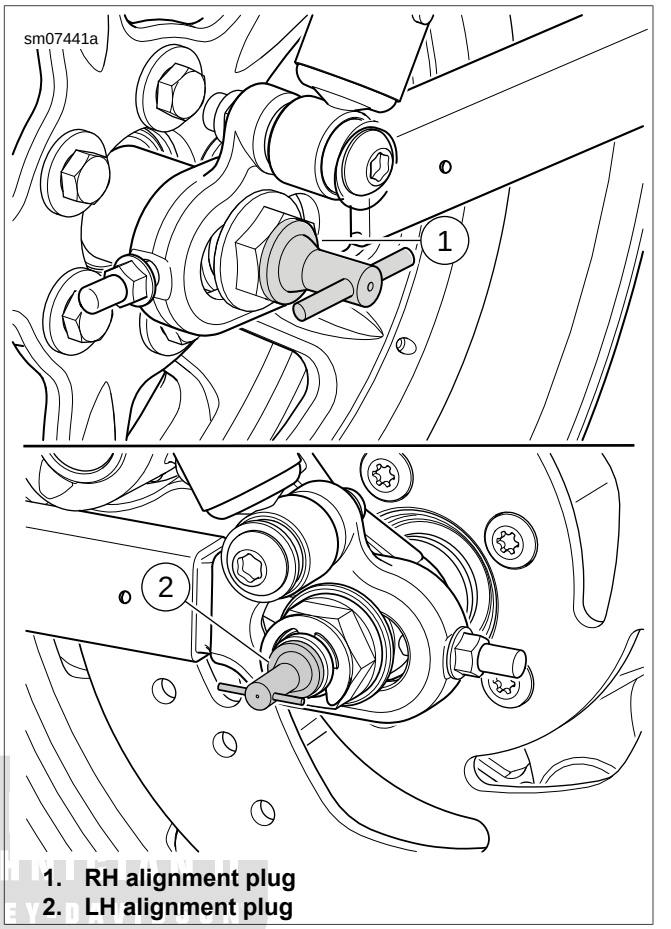
⚠ WARNING

Check vehicle alignment according to following procedures. Incorrect alignment can adversely affect stability and handling, which could result in death or serious injury. (00287a)

NOTE

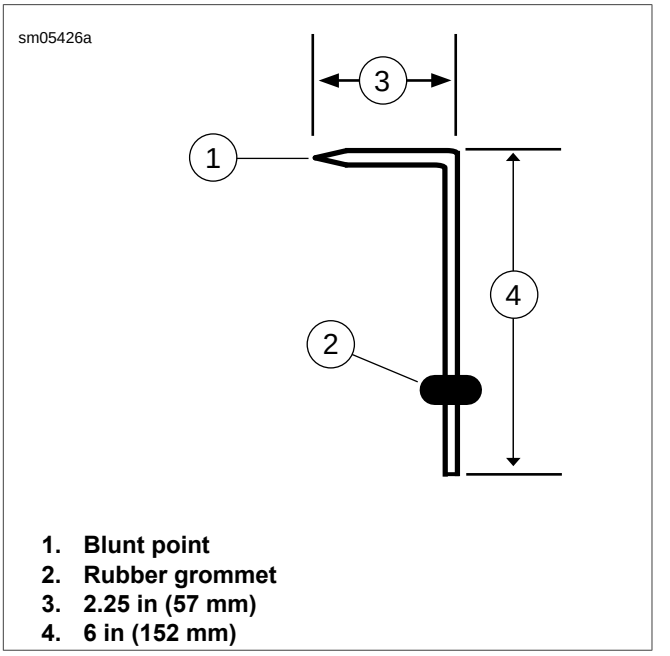
Some models require muffler removal.

1. See Figure 1-48. Insert alignment plugs (1, 2) from AXLE ALIGNMENT PLUGS (Part No. HD-48856-A) into right and left ends of rear axle. Turn handle until plug is firmly held in axle.
2. See Figure 1-49. Fabricate an alignment tool using a piece of 1/8 in (3.175 mm) diameter aluminum welding rod 6 in (153 mm) long:
   a. Grind one end down to a blunt point (1).
   b. Bend rod at a 90 degree angle, 2.25 in (57 mm) (3) from blunt point.
   c. Place a snug-fitting rubber grommet (2) on rod to act as a slide measurement indicator.
3. Gauge distance between rear fork pivot bolt and rear axle alignment plug center:
   a. See Figure 1-50. Insert tool point (1) in alignment dimple (4).
   b. Slide rubber grommet (2) along tool shaft until it aligns with hole in center of alignment plug (3).
   c. Without moving grommet, position alignment tool on left side of rear fork.
4. Verify measurements match on both sides of axle. Adjust if necessary.



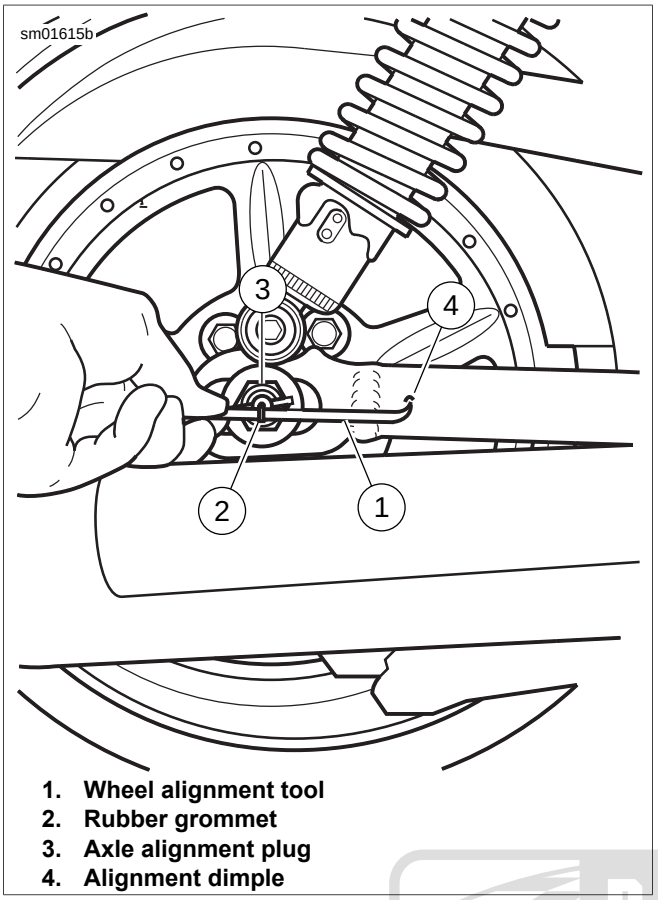
1. RH alignment plug
2. LH alignment plug

Figure 1-48. Axle Alignment Plugs



1. Blunt point
2. Rubber grommet
3. 2.25 in (57 mm)
4. 6 in (152 mm)

Figure 1-49. Wheel Alignment Tool



1. **Wheel alignment tool**
2. **Rubber grommet**
3. **Axle alignment plug**
4. **Alignment dimple**

Figure 1-50. Checking Wheel Alignment

Adjusting Wheel Alignment

1. Remove and discard E-clip.
2. Loosen rear axle nut.
3. On side with longer alignment dimple to axle center distance, turn nut on axle adjuster counterclockwise to shorten distance. Adjust axle until left and right side alignment measurements are equal.

NOTES

- *Keep axle adjuster mechanisms firmly seated (under tension) on each side of rear fork during wheel alignment. Do so by applying moderate upward force on lower span of drive belt. This force tensions drive belt, which holds rear axle forward against both adjuster mechanisms.*
- *Do not tighten rear axle nut or install **new** E-clip until after checking drive belt tension.*

4. Adjust drive belt deflection. See 1.12 DRIVE BELT AND SPROCKETS, Checking Drive Belt Deflection.

⚠WARNING

Do not exceed specified torque when tightening axle nut. Exceeding torque can cause wheel bearings to seize during vehicle operation, which could result in death or serious injury. (00408e)

NOTE

If rear axle has been moved, verify slack in rear brake line between clamp and rear caliper. If necessary, reposition brake line. See 1.12 DRIVE BELT AND SPROCKETS, Checking Drive Belt Deflection.

5. Tighten axle nut to 95-105 ft-lbs (129-142 Nm).
6. Install **new** E-clip.
7. Install muffler if removed.

DIGITAL TECHNICIAN HARLEY-DAVIDSON

SUSPENSION ADJUSTMENTS 1.22

SHOCK ABSORBER PRELOAD: ALL EXCEPT XL 1200T

PART NUMBER	TOOL NAME
94448-82B	SHOCK ADJUSTMENT SPANNER

⚠WARNING

Adjust both shock absorbers equally. Improper adjustment can adversely affect stability and handling, which could result in death or serious injury. (00036b)

NOTICE

Do not turn the shock absorber adjustment collar clockwise beyond adjustment setting 5. Doing so may result in equipment damage. (00166b)

NOTES

- ***Five-position shocks:*** *See Figure 1-51. Do not turn the preload cam past position five (5) to position one (1) or from position one (1) to position five (5).*
- ***Three-position shocks:*** *Do not turn the preload cam past position three to position one or from position one to position three.*

Using SHOCK ADJUSTMENT SPANNER (Part No. 94448-82B), turn the adjustment cam to specification.

- **Five-position shocks:** Refer to Table 1-22.
- **Three-position shocks:** Refer to Table 1-23.

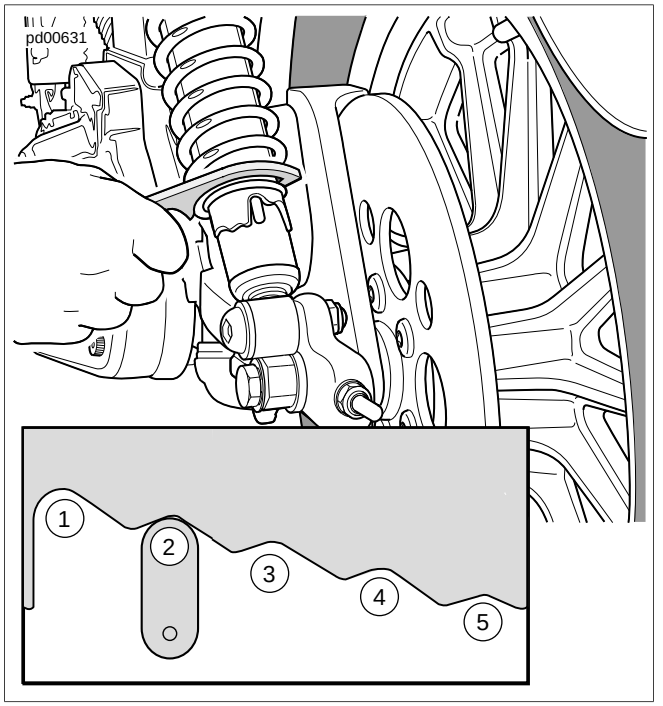


Figure 1-51. Shock Absorber Preload Adjustment

Table 1-22. Recommended Shock Preload: Five-Position

LOAD*	POSITION
Less than 165 lb (75.0 kg)	1
165-195 lb (75.0-89.0 kg)	2
195-225 lb (89.0-102.0 kg)	3
225-255 lb (102.0-116.0 kg)	4
255 lb (116.0 kg) to maximum added weight allowed.**	5
* Add the weight of the rider, passenger, riding gear, accessories and cargo. ** Refer to Table 1-24.	

Table 1-23. Recommended Shock Preload: Three-Position

LOAD*	POSITION
Less than 165 lb (75.0 kg)	1
165-225 lb (75.0-102.0 kg)	2
225 lb (102.0 kg) to maximum added weight allowed.**	3
* Add the weight of the rider, passenger, riding gear, accessories and cargo. **Refer to Table 1-24.	

Table 1-24. Maximum Added Weight Allowed: All except XL 1200T

MODEL	SPECIFICATIONS	
	lb	kg
XL 883L	438	199
XL 883N	438	199
XL 883R	416	189
XL 1200C/CP	416	189
XL 1200CA	416	189
XL 1200CB	416	189
XL 1200X	438	199
XL 1200V	438	199

SHOCK PRELOAD: XL 1200T

⚠WARNING

Adjust rear shock before riding. Distractions can lead to loss of control, resulting in death or serious injury. (00638b)

⚠WARNING

Do not adjust suspension while riding. Adjustment knob is located near spinning rear tire/wheel, which could be inadvertently contacted, resulting in serious injury. (00639b)

1. See Figure 1-52. Locate the preload adjustment knob behind the left saddlebag.
2. Rotate the preload adjustment knob counterclockwise until it stops. The LOW position is the minimum preload.

NOTE

Two clicks of the knob are a turn.

3. See Figure 1-53. Rotate the knob clockwise the recommended number of turns for the weight of the rider and the combined weight of a passenger and cargo.

NOTE

***Example:** For a rider weighing 160 lb (73 kg) riding with a passenger weighing 125 lb (56.7 kg) and 10 lb (4.5 kg) of cargo in the saddlebags, the recommended preload setting is 16 turns (32 clicks) from the LOW position.*

WARNING

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

NOTE

Maximum additional weight allowed cannot exceed specifications. Refer to Table 1-25.

Table 1-25. Load Capacities: XL 1200T

ITEM	SPECIFICATIONS	
	lb	kg
Maximum added weight allowed	403	182
GVWR	1002	454
GAWR: Front	340	154
GAWR: Rear	663	301

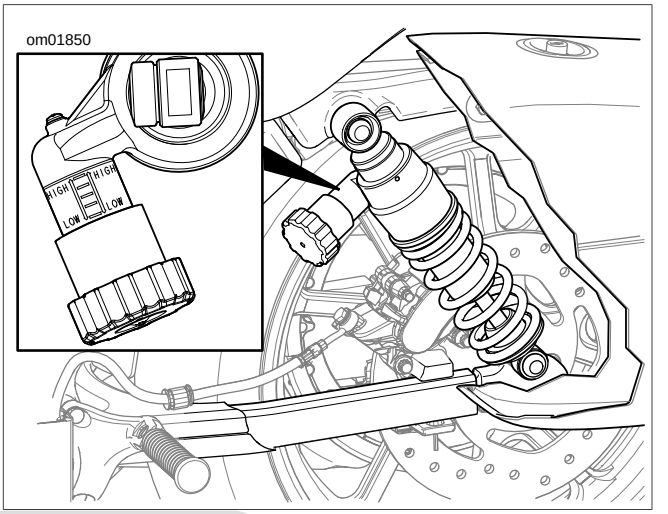


Figure 1-52. Preload Adjustment Knob: XL 1200T

om01857

RIDER WEIGHT lb	RIDER WEIGHT kg	COMBINED WEIGHT OF PASSENGER AND CARGO lb	COMBINED WEIGHT OF PASSENGER AND CARGO kg
		0.0	0.0
		7.5	3.4
		15	6.8
		22.5	10.2
		30	13.6
		37.5	17
		45	20.4
		52.5	23.8
		60	27.2
		67.5	30.6
		75	34
		82.5	37.4
		90	40.8
		97.5	44.2
		105	47.6
		112.5	51
		120	54.4
		127.5	57.8
		135	61.2
		142.5	64.6
		150	68
		157.5	71.4
		165	74.8
		172.5	78.2
		180	81.6
		187.5	85
		195	88.4
100	45	0 0 0 0 0 0 0 0 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	
110	50	0 0 0 0 0 0 0 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	
120	54	0 0 0 0 0 0 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	
130	59	0 0 0 0 0 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	
140	64	0 0 0 0 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	
150	68	0 0 0 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	
160	73	0 0 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	
170	77	0 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	
180	82	0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	
190	86	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	
200	91	2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	
210	95	3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	
220	100	4 5 6 7 8 9 10 11 12 13 14 15 16 17 18	
230	104	5 6 7 8 9 10 11 12 13 14 15 16 17 18	

Turn Preload Knob to “HIGH”

Figure 1-53. Recommended Turns: XL 1200T Shock Preload Knob (two clicks equal one turn)

HEADLAMP ALIGNMENT 1.23

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

Adjust the headlamps of motorcycles with multiple beam headlamps to converge into one pattern.

1. Check the tire pressure.
2. Fill fuel tank or add an equal amount of ballast.
3. Adjust the rear shocks for the rider and intended load.

NOTE

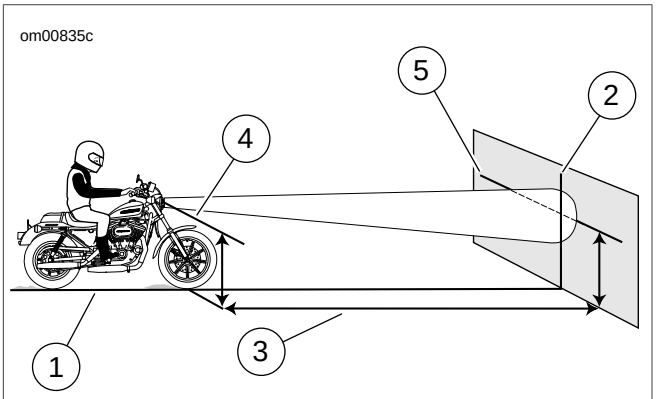
Choose a wall in minimum light.

4. See Figure 1-54. Park the motorcycle in a line (1) perpendicular to the wall.
5. Position motorcycle so that front axle is 25 ft (7.6 m) from wall.
6. Draw a vertical line (2) on the wall.
7. With the motorcycle loaded, point the front wheel straight forward at wall. Measure the distance (4) from the floor to the center of the high beam bulb.
8. Draw a horizontal line (5) through the vertical line on the wall. Place line 2.1 in (53.3 mm) lower than the measured bulb centerline.

NOTE

See Figure 1-54. The headlamp is aligned when the light beam hot spot is located over the intersection of the lines.

9. With the high beam activated, verify headlamp alignment. Adjust as necessary.



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

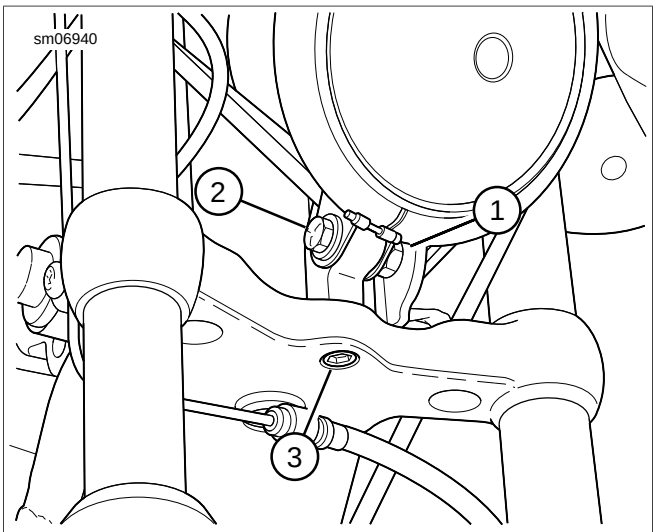
Figure 1-54. Headlamp Alignment: Sportster Models

HEADLAMP ADJUSTMENT

FASTENER	TORQUE VALUE	
Headlamp horizontal adjustment: XL 1200C/CP/CA/CB/V/X	30-35 ft-lbs	40.7-47.5 Nm
Headlamp vertical adjustment: XL 1200C/CP/CA/CB/V/X	30-35 ft-lbs	40.7-47.5 Nm
Headlamp clamp nut: XL 883L/N/R, XL 1200T	120-240 **in-lbs**	13.6-27.1 Nm

Adjustment: XL 1200C/CP/CA/CB/V/X

1. Set horizontal adjustment:
   a. See Figure 1-55. Loosen horizontal adjustment screw (3).
   b. Turn headlamp right or left as necessary to direct light beam straight ahead.
   c. Tighten horizontal adjustment screw to 30-35 ft-lbs (40.7-47.5 Nm).
2. Set vertical adjustment:
   a. Loosen locknut (1) for vertical adjustment bolt.
   b. Tilt headlamp up or down to aim it at horizontal line on wall.
   c. Tighten headlamp locknut to 30-35 ft-lbs (40.7-47.5 Nm).

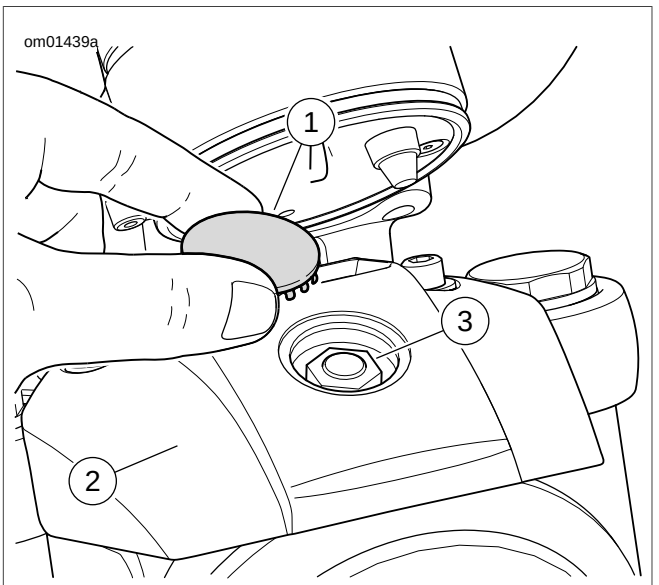


1. **Locknut**
2. **Vertical adjustment bolt**
3. **Horizontal adjustment screw**

Figure 1-55. Headlamp Adjustment: XL 1200C/CP/CA/CB/V/X

Adjustment: XL 883L/N/R, XL 1200T

1. See Figure 1-56. Remove snap plug (1) on top of headlamp bracket (2).
2. Loosen headlamp clamp nut (3).
3. Tilt headlamp up or down to aim it at horizontal line. At same time, turn it right or left to aim beam straight ahead.
4. Tighten headlamp clamp nut to 120-240 **in-lbs** (13.6-27.1 Nm) after lamp is properly positioned.
5. Install snap plug in headlamp bracket.



1. **Snap plug**
2. **Headlamp bracket**
3. **Clamp nut**

Figure 1-56. Headlamp Adjustment: XL 883R/L/N, XL 1200T

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STORAGE 1.24

PLACING IN STORAGE

⚠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)

1. Change the engine oil. See 1.6 ENGINE OIL AND FILTER, Changing Oil and Filter.
2. Check the transmission lubricant level. See 1.10 TRANSMISSION LUBRICANT, Transmission Lubrication.

⚠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)

3. Fill fuel tank. Add fuel stabilizer following manufacturer's instructions.
4. Remove the spark plugs, inject a few squirts of engine oil into each cylinder and crank the engine 5-6 revolutions. Replace the spark plugs.
5. Inspect drive belt deflection. See 1.21 WHEEL ALIGNMENT.
6. Inspect drive belt and sprockets. See 1.12 DRIVE BELT AND SPROCKETS.
7. Inspect air cleaner filter. See 1.7 AIR CLEANER AND EXHAUST SYSTEM, Air Cleaner.
8. Lubricate controls. See 1.14 CABLE AND CHASSIS LUBRICATION.
9. Inspect operation of all electrical equipment and switches.
10. 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.

⚠WARNING

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

11. 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)

12. Remove battery from vehicle. Charge 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 1.20 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)

13. If the motorcycle is to be covered, use a material that will breathe, such as a Harley-Davidson storage cover 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 battery. If main fuse was removed, plug it in.
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.

TROUBLESHOOTING 1.25

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)

Use the symptoms listed for general troubleshooting. More than one condition may be present at a time. Check all possible items to keep motorcycle in good operating condition.

NOTE

See the electrical diagnostic manual for additional information.

ENGINE

Starter Motor Does Not Operate or Does Not Turn Engine Over

1. Engine run switch in OFF position.
2. Ignition switch not in IGNITION 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. Bank angle sensor (BAS) tripped and ignition switch not cycled OFF then back to IGNITION position.
7. Security system activated.
8. Motorcycle in gear and clutch not pulled in.
9. Main fuse not in place.
10. Jiffy stand down and transmission in gear (HDI models).

Engine Turns Over But Does Not Start

1. Fuel tank empty.
2. Fuel filter clogged.
3. Plugged fuel injectors.
4. Discharged battery, loose or damaged battery terminal connections.
5. Fouled spark plugs.
6. Spark plug cables in bad condition and shorting, cable connections loose or cables connected to incorrect cylinders.
7. Ignition timing incorrect due to faulty coil, ECM or sensors (TMAP, CKP).
8. BAS tripped and ignition/light key switch not cycled OFF then back to IGNITION.
9. Damaged wire or loose wire connection at ignition coil, battery or ECM connector.
10. Sticking or damaged valve(s) or wrong length pushrod(s).
11. Engine lubricant too heavy (winter operation).

NOTE

For cold weather starts, always disengage clutch.

Starts Hard

1. Spark plugs in bad condition, have improper gap or are partially fouled.
2. Spark plug cables in bad condition.
3. Battery nearly discharged.
4. Damaged wire or loose wire connection at battery terminal, ignition coil or ECM connector.
5. Ignition not functioning properly (possible sensor failure).
6. Faulty ignition coil.
7. Fuel tank filler cap vent plugged or fuel line closed off restricting fuel flow.
8. Water or dirt in fuel system.
9. Intake air leak.
10. Partially plugged fuel injectors.
11. Valves sticking.
12. Engine lubricant too heavy (winter operation).

NOTE

For cold weather starts, always disengage clutch.

Starts But Runs Irregularly or Misses

1. Spark plugs in bad condition or partially fouled.
2. Spark plug cables in bad condition and shorting or leaking.
3. Spark plug gap too close or too wide.
4. Faulty ignition coil, ECM, or sensor (TMAP, CKP, ET or HO2S).
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. Partially plugged fuel injectors.
12. Damaged intake or exhaust valve(s).
13. Weak or damaged valve springs.
14. Incorrect valve timing.

Spark Plug Fouls Repeatedly

1. Incorrect spark plug.
2. Piston rings badly worn or damaged.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

3. Fuel mixture too rich.
4. Valve guides or seals badly worn or damaged.

Pre-Ignition or Detonation (Knocks or Pings)

1. Excessive carbon deposit on piston head or in combustion chamber.
2. Incorrect heat range spark plug.
3. Faulty spark plug(s).
4. Ignition timing advanced. ECM or sensors (CKP, ET or TMAP) defective.
5. Fuel octane rating too low.
6. Intake manifold vacuum leak.

Check Engine Light Illuminates During Operation

Fault detected. See the electrical diagnostic manual for this motorcycle.

Overheating

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

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 pushrod(s).
4. Incorrect pushrod length.
5. Cam(s), cam gear(s), or cam bushing(s) worn.
6. Rocker arm binding on shaft.
7. Valve sticking in guide.

Excessive Vibration

1. Stabilizer links worn or loose, or stabilizer link brackets loose or damaged.
2. Isolators worn or isolator bolts loose or damaged.
3. Isolator mounting brackets (left side of vehicle) loose or damaged.
4. Rubber mounts loose or worn.
5. Rear fork pivot shaft fasteners loose.
6. Front engine mounting bolts loose.
7. Exhaust system binding or hitting frame.
8. Engine/transmission and rear wheel not aligned properly.
9. Damaged frame.
10. Ignition timing advanced due to faulty sensor inputs (CKP, TMAP)/poorly tuned engine.
11. Primary chain badly worn or links tight as a result of insufficient lubrication or misalignment.
12. Wheels not aligned, rims bent, or tires worn or damaged.
13. Internal engine problem.

LUBRICATION SYSTEM

PART NUMBER	TOOL NAME
HD-35457	BLACK LIGHT LEAK DETECTOR

Oil Does Not Return To Oil Tank

1. Oil tank empty.
2. Oil pump gerotors damaged. The oil pump is not functioning.
3. Restricted oil hoses or fittings.
4. Restricted oil filter.

Engine Uses Too Much Oil Or Smokes Excessively

1. Piston rings badly worn or damaged.
2. Valve guide(s) or seal(s) worn or damaged.
3. Restricted oil filter.
4. Oil tank overfilled.
5. Restricted oil return hose to tank.
6. Restricted breather operation.
7. Plugged crankcase scavenge port.
8. Oil diluted with gasoline.

Engine Leaks Oil From Cases, Pushrods, Hoses, Etc.

1. Loose parts.
2. Imperfect seal at gaskets, pushrod cover, washers, etc.

NOTE

To aid locating leaks, use BLACK LIGHT LEAK DETECTOR (Part No. HD-35457).

3. Restricted oil return hose to tank.
4. Restricted breather passage(s) to air cleaner.
5. Restricted oil filter.
6. Oil tank overfilled.
7. Porosity.

Low Oil Pressure

1. Oil tank underfilled.
2. Faulty low oil pressure switch.
3. Worn oil pump gerotor(s).
4. Worn pinion shaft drive gear.

5. Restricted feed hose from oil tank.
6. Restricted high-pressure feed hose to oil filter housing.
7. Oil diluted with gasoline.
8. Oil bypass plunger stuck open.

High Oil Pressure

1. Oil tank overfilled.
2. Restricted oil tank return hose.
3. Oil bypass plunger stuck closed.

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. Clutch dragging slightly.
2. Transmission lubricant level too high.
3. Transmission lubricant too heavy (winter operation).
4. Shifter return spring (inside primary chaincase) bent or broken.
5. Bent shifter rod.
6. Shifter forks sprung or damaged.
7. Corners worn off gear dogs and shifter dog rings.

Jumps Out Of Gear

1. Shifter engaging parts (inside transmission) badly worn and rounded.
2. Shifter forks bent.
3. Shifter drum damaged/worn.
4. Damaged gears.

Clutch Slips

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

Clutch Drags Or Does Not Release

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

Clutch Chatters

Friction plates or steel plates worn, warped or dragging.

HANDLING

1. Tires improperly inflated. Do not overinflate.
2. Loose wheel axle nuts. Tighten to torque specification.
3. Improper vehicle alignment: rear wheel out of alignment with frame and front wheel.
4. Rims and tires out-of-true sideways.
5. Rims and tires out-of-round or eccentric with hub.
6. Loose spokes (models with laced wheels).
7. Irregular or peaked front tire tread wear.
8. Damaged tires or improper front-rear tire combination.
9. Tire and wheel unbalanced.
10. Steering head bearings improperly adjusted or pitted or worn bearings and races.
11. Shock absorbers damaged/worn - not functioning normally.
12. Heavy front end loading. Non-standard equipment on the front end (such as heavy radio receivers, extra lighting equipment, or luggage) tends to cause unstable handling.
13. Engine mounts/stabilizer links loose, worn or damaged.
14. Rear fork pivot assembly: improperly tightened or assembled, or loose, pitted or damaged pivot bearings.
15. Incorrect, non-specified tire(s) mounted on front or rear wheel.

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.

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7. Brake drags - insufficient brake pedal or hand lever free play, 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
Axle, front, nut	60-65 ft-lbs	81-88 Nm	2.5 WHEELS, General
Axle, front, nut	60-65 ft-lbs	81-88 Nm	2.5 WHEELS, Front Wheel
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	2.5 WHEELS, General
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	2.5 WHEELS, Rear Wheel
Belt guard screw	120-180 **in-lbs**	13.6-20.4 Nm	2.18 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard
Brake caliper, front, mounting bolt	28-38 ft-lbs	38.0-51.6 Nm	2.9 FRONT BRAKE CALIPERS, Installation
Brake caliper bleeder screw	35-61 **in-lbs**	3.9-6.9 Nm	2.9 FRONT BRAKE CALIPERS, Assembly
Brake caliper bleeder screw	35-61 **in-lbs**	3.9-6.9 Nm	2.11 REAR BRAKE CALIPER, Assembly
Brake caliper bleeder screw	35-61 **in-lbs**	3.9-6.9 Nm	2.12 BRAKE LINES, Front Brake Line (Non-ABS)
Brake caliper bleeder screw	35-61 **in-lbs**	3.9-6.9 Nm	2.12 BRAKE LINES, Rear Brake Line (Non-ABS)
Brake caliper bleeder valve	35-61 **in-lbs**	3.9-6.9 Nm	2.14 BLEEDING BRAKES, Procedure
Brake disc, front, screw	16-24 ft-lbs	21.7-32.6 Nm	2.5 WHEELS, Front Wheel/Cast front wheel
Brake disc, front, screw	16-24 ft-lbs	21.7-32.6 Nm	2.5 WHEELS, Front Wheel
Brake disc, front, screw	16-24 ft-lbs	21.7-32.6 Nm	2.5 WHEELS, Front Wheel/Laced front wheel
Brake disc, rear, screw	30-45 ft-lbs	40.7-61.1 Nm	2.5 WHEELS, Rear Wheel
Brake lever pivot pin	5-13 **in-lbs**	0.5-1.5 Nm	2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR, Brake Lever
Brake lever pivot pin nut	44-61 **in-lbs**	4.9-6.9 Nm	2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR, Brake Lever
Brake line, front, manifold bolt	36-48 **in-lbs**	4.1-5.4 Nm	2.12 BRAKE LINES, Front Master Cylinder to Manifold to Caliper (ABS)
Brake line, front, manifold bolt	36-48 **in-lbs**	4.1-5.4 Nm	2.12 BRAKE LINES, Front Manifold to EHCU (ABS)
Brake line, rear, bracket fasteners	120-180 **in-lbs**	13.6-20.3 Nm	2.19 REAR FORK, Installation
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR, Installation
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.9 FRONT BRAKE CALIPERS, Installation
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR, Installation
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.11 REAR BRAKE CALIPER, Installation
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Front Brake Line (Non-ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Front Brake Line (Non-ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Rear Brake Line (Non-ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Rear Brake Line (Non-ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Front Master Cylinder to Manifold to Caliper (ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Front Master Cylinder to Manifold to Caliper (ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Front Manifold to EHCU (ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Rear Master Cylinder to EHCU (ABS)

FASTENER	TORQUE VALUE		NOTES
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Rear Master Cylinder to EHCU (ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Rear EHCU to Caliper (ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Rear EHCU to Caliper (ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Installation
Brake line bracket clamp fastener	20-30 **in-lbs**	2.3-3.4 Nm	2.12 BRAKE LINES, Front Manifold to EHCU (ABS)
Brake line bracket fasteners	120-180 **in-lbs**	13.6-20.3 Nm	2.41 PASSENGER FOOTRESTS, Left
Brake line clamp screw, fork bracket	45-65 **in-lbs**	5.1-7.4 Nm	2.12 BRAKE LINES, Front Brake Line (Non-ABS)
Brake line clamp screw, fork bracket	45-65 **in-lbs**	5.1-7.4 Nm	2.12 BRAKE LINES, Front Master Cylinder to Manifold to Caliper (ABS)
Brake line clamp screw, steering stem	120-168 **in-lbs**	13.6-19.0 Nm	2.12 BRAKE LINES, Front Brake Line (Non-ABS)
Brake line P-clamp, rear, screw	30-40 **in-lbs**	3.4-4.5 Nm	2.12 BRAKE LINES, Rear Brake Line (Non-ABS)
Brake line P-clamp, rear, screw	30-40 **in-lbs**	3.4-4.5 Nm	2.12 BRAKE LINES, Rear EHCU to Caliper (ABS)
Brake line P-clamp, rear, screw	30-40 **in-lbs**	3.4-4.5 Nm	2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Installation
Brake line tube nuts	128-173 **in-lbs**	14.5-19.5 Nm	2.12 BRAKE LINES, Front Master Cylinder to Manifold to Caliper (ABS)
Brake line tube nuts	128-173 **in-lbs**	14.5-19.5 Nm	2.12 BRAKE LINES, Front Manifold to EHCU (ABS)
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR, Reservoir Cover
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	2.14 BLEEDING BRAKES, Procedure
Brake master cylinder, rear, mounting bracket screw	45-50 ft-lbs	61-68 Nm	2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR, Master Cylinder Mounting Bracket
Brake master cylinder, rear, mounting screw	18-22 ft-lbs	24.4-29.9 Nm	2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR, Installation
Brake master cylinder, rear, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR, Cover
Brake master cylinder, rear, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	2.14 BLEEDING BRAKES, Procedure
Brake master cylinder/reservoir, rear, pushrod collar	130-173 **in-lbs**	14.7-19.6 Nm	2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR, Master Cylinder Rebuild Kit
Brake master cylinder clamp, front, screw	108-132 **in-lbs**	12.2-14.9 Nm	2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR, Installation
Brake pad pin	131-173 **in-lbs**	14.8-19.5 Nm	2.9 FRONT BRAKE CALIPERS, Assembly
Brake pad pin	131-173 **in-lbs**	14.8-19.5 Nm	2.11 REAR BRAKE CALIPER, Assembly
Brake pedal clevis screw	13-17 ft-lbs	17.6-23.0 Nm	2.39 RIDER FOOT CONTROLS: MID-MOUNT, Right Footrest and Rear Brake Pedal Assembly
Brake pedal clevis screw	13-17 ft-lbs	17.6-23.0 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal Assembly
Brake rod ball stud	120-180 **in-lbs**	13.6-20.4 Nm	2.39 RIDER FOOT CONTROLS: MID-MOUNT, Right Footrest and Rear Brake Pedal Assembly
Brake rod ball stud	120-180 **in-lbs**	13.6-20.4 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal Assembly
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm	2.24 THROTTLE CABLES, Installation
Caliper to mounting bracket, rear	28-38 ft-lbs	38.0-51.5 Nm	2.11 REAR BRAKE CALIPER, Installation

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FASTENER	TORQUE VALUE		NOTES
Clutch cable fitting	36-108 **in-lbs**	4.1-12.2 Nm	2.25 CLUTCH CONTROL, Assembly and Installation
Clutch cable wireform screw	9-11 **in-lbs**	1.1-1.2 Nm	2.17 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Clutch inspection cover screws	90-120 **in-lbs**	10.2-13.6 Nm	2.25 CLUTCH CONTROL, Assembly and Installation
Clutch lever anti-rattle spring screw	8-13 **in-lbs**	0.9-1.5 Nm	2.25 CLUTCH CONTROL, Assembly and Installation
Debris deflector screw	36-60 **in-lbs**	4.1-6.8 Nm	2.18 BELT GUARD AND DEBRIS DEFLECTOR, Debris Deflector
EHCU mounting bracket fasteners	15-18 ft-lbs	20.3-24.4 Nm	2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Installation
EHCU to mounting bracket fastener	50-70 **in-lbs**	5.8-7.8 Nm	2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Installation
Engine mount, front, bolt	95-105 ft-lbs	129-142 Nm	2.22 FRONT ENGINE MOUNT/ISOLATOR, Installation
Exhaust pipe clamp bracket screw	30-33 ft-lbs	40.7-44.7 Nm	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
Fender, rear, mounting fastener: XL 1200C/CP/CA/CB	120-168 **in-lbs**	13.6-19.0 Nm	2.31 REAR FENDER: XL 1200C/CP/CA/CB, Replacement
Fender, rear, mounting fastener: XL 883N, XL 1200X/V	120-168 **in-lbs**	13.6-19.0 Nm	2.33 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V, Assembly and Installation
Fender, rear, mounting fastener: XL 883R/L, CAN XL 883N, XL 1200VX	120-168 **in-lbs**	13.6-19.0 Nm	2.30 REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X, Installation
Fender, rear, saddlebag support bolts: XL 1200T	24-27 ft-lbs	32.6-36.6 Nm	2.32 REAR FENDER: XL 1200T, Installation/Same fastener as the saddlebag support bolt.
Fender brace, rear, screw	20-25 **in-lbs**	2.3-2.8 Nm	2.33 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V, Assembly and Installation
Fender to fork brace, front: XL 1200X	30-42 **in-lbs**	3.4-4.7 Nm	2.27 FRONT FENDER, All Models/Tighten in cross pattern.
Fender to forks, front: XL except XL 1200X	96-156 **in-lbs**	10.9-17.6 Nm	2.27 FRONT FENDER, All Models
Footrest support bracket	45-50 ft-lbs	61-68 Nm	2.19 REAR FORK, Installation
Footrest support bracket	45-50 ft-lbs	61-68 Nm	2.25 CLUTCH CONTROL, Assembly and Installation
Footrest support bracket	45-50 ft-lbs	61-68 Nm	2.39 RIDER FOOT CONTROLS: MID-MOUNT, Right Footrest and Rear Brake Pedal Assembly
Footrest support bracket	45-50 ft-lbs	61-68 Nm	2.39 RIDER FOOT CONTROLS: MID-MOUNT, Left Footrest and Shift Lever Assembly
Footrest support bracket	45-50 ft-lbs	61-68 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal Assembly
Footrest support bracket	45-50 ft-lbs	61-68 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Left Footrest and Shift Lever Assembly
Footrest wear peg	72-108 **in-lbs**	8.1- 12.2 Nm	2.39 RIDER FOOT CONTROLS: MID-MOUNT, Right Footrest and Rear Brake Pedal Assembly
Footrest wear peg	72-108 **in-lbs**	8.1- 12.2 Nm	2.39 RIDER FOOT CONTROLS: MID-MOUNT, Left Footrest and Shift Lever Assembly
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal Assembly

FASTENER	TORQUE VALUE		NOTES
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Left Footrest and Shift Lever Assembly
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	2.16 FRONT FORK, Installation
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	2.16 FRONT FORK, Installation
Fork, front, chrome cover	120-192 **in-lbs**	13.5-21.6 Nm	2.17 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Fork, front, pinch bolt	21-27 ft-lbs	28.5-36.6 Nm	2.5 WHEELS, Front Wheel
Fork, front, stem bolt, final torque	72-96 **in-lbs**	8.1-10.9 Nm	2.17 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Fork, front, stem bolt, first torque	23-27 ft-lbs	31.2-36.6 Nm	2.17 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Fork, rear, pivot bolt nut	120-130 ft-lbs	162.7-176.3 Nm	2.19 REAR FORK, Installation
Fork, rear, pivot bolt nut	120-130 ft-lbs	162.7-176.3 Nm	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
Fork brace to forks: XL 1200X	18-22 ft-lbs	24.4-29.8 Nm	2.27 FRONT FENDER, All Models
Fork slider tube cap	22-58 ft-lbs	29.9-78.7 Nm	2.16 FRONT FORK, Installation
Fork slider tube fastener	132-216 **in-lbs**	14.9-24.4 Nm	2.16 FRONT FORK, Assembly
Fork stem pinch bolt	30-35 ft-lbs	40.7-47.5 Nm	2.17 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Fork stem pinch bolt	30-35 ft-lbs	40.7-47.5 Nm	2.17 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Gear shift lever pinch screw	16-20 ft-lbs	21.7-27.1 Nm	2.39 RIDER FOOT CONTROLS: MID-MOUNT, Left Footrest and Shift Lever Assembly
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.26 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.26 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.26 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.26 HANDLEBAR, Installation
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm	2.25 CLUTCH CONTROL, Assembly and Installation
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm	2.26 HANDLEBAR, Installation
Handlebar riser bolt, lower	30-40 ft-lbs	40.7-54.3 Nm	2.26 HANDLEBAR, Installation
Handlebar riser bolt, lower	30-40 ft-lbs	40.7-54.3 Nm	2.26 HANDLEBAR, Installation
Handlebar riser cover screw	8-12 **in-lbs**	0.9-1.4 Nm	2.26 HANDLEBAR, Installation
Hub plate mounting screw	16-24 ft-lbs	21.7-32.6 Nm	2.5 WHEELS, Front Wheel/XL 883N
Isolator, front, mounting bracket screw	25-35 ft-lbs	33.9-47.5 Nm	2.22 FRONT ENGINE MOUNT/ISOLATOR, Installation
Isolator, front, mounting bracket screw	25-35 ft-lbs	33.9-47.5 Nm	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
License plate, front, fastener: XL 1200X/C (India)	10-15 **in-lbs**	1.1-1.7 Nm	2.28 FRONT LICENSE PLATE: INDIA MODELS, Front License Plate (India)
License plate, front, fastener: XL 883L/N/R (India)	10-15 **in-lbs**	1.1-1.7 Nm	2.28 FRONT LICENSE PLATE: INDIA MODELS, Front License Plate (India)
License plate clamp nut: XL 1200C/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm	2.31 REAR FENDER: XL 1200C/CP/CA/CB, License Plate Bracket: XL 1200C/CP/CA/CB
License plate clamp nut: XL 1200T	20-25 **in-lbs**	2.3-2.8 Nm	2.32 REAR FENDER: XL 1200T, License Plate Bracket: XL 1200T
License plate clamp nut: XL 883R/L, CAN XL 883N, XL 1200V/X	20-25 **in-lbs**	2.3-2.8 Nm	2.30 REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X, License Plate Bracket: XL 883R/L, CAN XL 883N, XL 1200V/X

FASTENER	TORQUE VALUE		NOTES
License plate screw: XL 883L/R (India)	10-15 **in-lbs**	1.1-1.7 Nm	2.36 REAR LICENSE PLATE: INDIA MODELS, Rear License Plate (India)
License plate screw: XL 883N, XL 1200X (India)	10-15 **in-lbs**	1.1-1.7 Nm	2.36 REAR LICENSE PLATE: INDIA MODELS, Rear License Plate (India)
License plate support bracket screws: XL 1200C/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm	2.31 REAR FENDER: XL 1200C/CP/CA/CB, License Plate Bracket: XL 1200C/CP/CA/CB
License plate support bracket screws: XL 883R/L, CAN XL 883N, XL 1200V/X	20-25 **in-lbs**	2.3-2.8 Nm	2.30 REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X, License Plate Bracket: XL 883R/L, CAN XL 883N, XL 1200V/X
Mirror stem locknut	96-144 **in-lbs**	10.9-16.3 Nm	2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR, Installation
Mirror stem locknut	96-144 **in-lbs**	10.9-16.3 Nm	2.25 CLUTCH CONTROL, Assembly and Installation
Passenger footrest support bracket, left-front, fastener: XL 883R, XL 1200C saree guard	16-20 ft-lbs	21.7-27.1 Nm	2.35 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C (India)
Passenger footrest support bracket fastener	45-50 ft-lbs	61-68 Nm	2.41 PASSENGER FOOTRESTS, Left
Passenger footrest support bracket fastener	45-50 ft-lbs	61-68 Nm	2.41 PASSENGER FOOTRESTS, Right
Preload knob screw: XL 1200T	25-43 **in-lbs**	2.8-4.8 Nm	2.20 SHOCK ABSORBERS, Preload Shock Repair: XL 1200T
Saddlebag locknut: XL 1200T	24-27 ft-lbs	32.6-36.6 Nm	2.29 SADDLEBAGS: XL 1200T, Installation
Seat mounting screw	20-40 **in-lbs**	2.3-4.5 Nm	2.38 SEAT, Installation
Seat post bolt	120-168 **in-lbs**	13.6-19.0 Nm	2.30 REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X, Installation
Seat post bolt	120-168 **in-lbs**	13.6-19.0 Nm	2.31 REAR FENDER: XL 1200C/CP/CA/CB, Replacement
Seat post bolt	120-168 **in-lbs**	13.6-19.0 Nm	2.32 REAR FENDER: XL 1200T, Installation
Seat post bolt	120-168 **in-lbs**	13.6-19.0 Nm	2.33 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V, Assembly and Installation
Shifter peg screw	96-144 **in-lbs**	10.9-16.3 Nm	2.39 RIDER FOOT CONTROLS: MID-MOUNT, Left Footrest and Shift Lever Assembly
Shifter peg screw	96-144 **in-lbs**	10.9-16.3 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Left Footrest and Shift Lever Assembly
Shifter rod to shift lever screw	120-180 **in-lbs**	13.6-20.4 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Left Footrest and Shift Lever Assembly
Shifter rod to shift lever screw	120-180 **in-lbs**	13.6-20.4 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Left Footrest and Shift Lever Assembly
Shift lever pinch screw	16-20 ft-lbs	21.7-27.1 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Left Footrest and Shift Lever Assembly
Shift pedal clevis screw	13-17 ft-lbs	17.6-23.0 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Left Footrest and Shift Lever Assembly
Shift rod jamnuts	84-132 **in-lbs**	9.5-14.9 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Adjusting Shift Pedal
Shift rod screw	120-180 **in-lbs**	13.6-20.4 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Adjusting Shift Pedal
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.5 WHEELS, Rear Wheel
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.18 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard

FASTENER	TORQUE VALUE		NOTES
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.20 SHOCK ABSORBERS, Installation/Apply 2-3 drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads.
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.20 SHOCK ABSORBERS, Installation
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.35 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C (India)/Saree Guards: Apply 2-3 drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads.
Single disc cast front wheel hub plate screw	16-24 ft-lbs	21.7-32.6 Nm	2.5 WHEELS, Sealed Wheel Bearings
Spoke nipple	55 **in-lbs**	6.2 Nm	2.7 CHECKING AND TRUING WHEELS, Truing Laced Wheels
Sprocket cover, forward and lower screw	80-120 **in-lbs**	9.0-13.6 Nm	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
Sprocket mounting screw, final torque	80 ft-lbs	108.0 Nm	2.5 WHEELS, Rear Wheel
Sprocket mounting screw, first torque	60 ft-lbs	81.3 Nm	2.5 WHEELS, Rear Wheel
Stabilizer link, lower front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link, lower front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.21 STABILIZER LINKS, Lower Front Stabilizer Link
Stabilizer link, upper front, engine bracket mounting screw	55-65 ft-lbs	74.6-88.2 Nm	2.21 STABILIZER LINKS, Upper Front Stabilizer Link
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.22 FRONT ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.21 STABILIZER LINKS, Upper Front Stabilizer Link
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.21 STABILIZER LINKS, Upper Front Stabilizer Link
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.21 STABILIZER LINKS, Lower Front Stabilizer Link
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.21 STABILIZER LINKS, Lower Front Stabilizer Link
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.21 STABILIZER LINKS, Rear Stabilizer Link
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.22 FRONT ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.22 FRONT ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
Stop lamp switch, rear	12-15 **in-lbs**	1.4-1.6 Nm	2.12 BRAKE LINES, Rear Master Cylinder to EHCU (ABS)
Strut cover fastener, front: XL 883R, XL 1200C (India)	120-168 **in-lbs**	13.6-19.0 Nm	2.35 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C (India)
Strut cover fastener, rear: XL 883R, XL 1200C (India)	120-168 **in-lbs**	13.6-19.0 Nm	2.35 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C (India)
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	2.24 THROTTLE CABLES, Installation

FASTENER	TORQUE VALUE		NOTES
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	2.25 CLUTCH CONTROL, Assembly and Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	2.26 HANDLEBAR, Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	2.26 HANDLEBAR, Installation
Turn signal, front, set screw	96-120 **in-lbs**	10.9-13.6 Nm	2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR, Installation
Turn signal, front, set screw	96-120 **in-lbs**	10.9-13.6 Nm	2.25 CLUTCH CONTROL, Assembly and Installation
Turn signal stalk locknut: XL 1200C/CP/CA/CB	120-168 **in-lbs**	13.6-19.0 Nm	2.31 REAR FENDER: XL 1200C/CP/CA/CB, Replacement
Turn signal stalk locknut: XL 883N, XL 1200X/V	120-168 **in-lbs**	13.6-19.0 Nm	2.33 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V, Assembly and Installation
Turn signal stalk locknut: XL 883R, XL 1200C (India)	96-156 **in-lbs**	10.9-17.6 Nm	2.35 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C (India)
Turn signal stalk locknut: XL 883R/L, CAN XL 883N, XL 1200V/X	120-168 **in-lbs**	13.6-19.0 Nm	2.30 REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X, Installation
Valve stem, tubeless type, nut	12-15 **in-lbs**	1.4-1.7 Nm	2.4 TIRES, Installation
Valve stem, tube type, nut	3-7 **in-lbs**	0.3-0.8 Nm	2.4 TIRES, Installation
Windshield assembly screws: XL 1200T	23-27 **in-lbs**	2.6-3.1 Nm	2.34 WINDSHIELD: XL 1200T, Window
Windshield clamp shoulder bolt: XL 1200T	48-72 **in-lbs**	5.4-8.1 Nm	2.34 WINDSHIELD: XL 1200T, Windshield: XL 1200T
Windshield clamp shoulder bolt: XL 1200T	48-72 **in-lbs**	5.4-8.1 Nm	2.34 WINDSHIELD: XL 1200T, Mounting Clamps

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

SPECIFICATIONS 2.2

TABLES

Chassis

Table 2-1. Dimensions: XL 883 Models

ITEM	XL 883R		XL 883L		XL 883N	
	in	mm	in	mm	in	mm
Length	88.4	2245	87.2	2215	88.8	2255
Overall width	36.6	930	33.3	845	33.7	855
Overall height	45.3	1150	43.9	1115	44.1	1120
Wheel base	59.8	1520	59.1	1500	59.5	1510
Road clearance	5.9	150	3.9	100	4.7	120
Seat height*	29.1	740	25.5	648	25.7	653
*With 180 lb (81.7 kg) rider on seat.						

Table 2-2. Dimensions: XL 1200 Models

ITEM	XL 1200C/CP*		XL 1200CA		XL 1200CB		XL 1200T		XL 1200X		XL 1200V	
	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm
Length	87.6	2225	87.6	2225	87.6	2225	87.6	2225	88.8	2255	89.6	2275
Overall width	33.1	840	32.3	820	37.0	940	33.7	856	32.3	820	36.2	920
Overall height	44.9	1140	42.7	1085	48.2	1225	51.9	1319	41.9	1065	47.6	1210
Wheel base	59.8	1520	59.8	1520	59.8	1520	59.1	1500	59.8	1520	60.0	1525
Road clearance	4.3	110	4.3	110	4.3	110	4.2	106	3.9	100	4.7	120
Seat height**	26.6	675	26.6	675	26.6	675	26.1	664	26.6	675	26.0	660
* Dimensions may vary for factory customized vehicles. ** With 180 lb (81.7 kg) rider on seat.												

⚠WARNING

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

- GVWR is sum of weight of motorcycle, accessories and maximum weight of rider, passenger and cargo that can be safely carried.
- GAWR is maximum amount of weight that can be safely carried on each axle.
- The GVWR and GAWR are shown on information plate, on frame down tube.

NOTES

- *The maximum additional weight allowed on motorcycle equals Gross Vehicle Weight Rating (GVWR) minus running weight. For example, a motorcycle with GVWR of 1200 lbs (544 kg) having a running weight of 800 lbs (363 kg), would allow a maximum of an additional 400 lbs (181 kg) combined weight of rider, passenger, riding gear, cargo and installed accessories.*
- *For important information regarding tire data and tire inflation, see 1.8 TIRES AND WHEELS.*

Table 2-3. Weights: XL 883 Models

ITEM	XL 883L		XL 883R		XL 883N	
	lb	kg	lb	kg	lb	kg
Running weight*	562	255	584	265	562	255
Maximum added weight allowed**	438	199	416	189	438	199
GVWR	1000	454	1000	454	1000	454
GAWR front	339	154	335	152	335	152
GAWR rear	661	300	665	302	665	302

* The total weight of the motorcycle as delivered with all oil/fluids and approximately 90% of fuel.
** The total weight of accessories, cargo, riding gear, passenger and rider must not exceed this weight.

Table 2-4. Weights: XL 1200 Models

ITEM	XL 1200C/CP*		XL 1200CA		XL 1200CB		XL 1200T		XL 1200X		XL 1200V	
	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg	lb	kg
Running weight**	584	265	584	265	584	265	599	272	562	255	562	255
Maximum added weight allowed***	416	189	416	189	416	189	403	182	438	199	438	199
GVWR	1000	454	1000	454	1000	454	1002	454	1000	454	1000	454
GAWR, front	335	152	335	152	335	152	340	154	335	152	335	152
GAWR, rear	665	302	665	302	665	302	663	301	665	302	665	302

* Weights may vary for factory customized vehicles.
** Total weight as delivered with all oil/fluids and approximately 90% of fuel.
*** The total weight of accessories, cargo, riding gear, passenger and rider must not exceed this weight.

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Table 2-5. Capacities: XL 883 Models

ITEM	XL 883R		XL 883L		XL 883N	
	U.S.	METRIC	U.S.	METRIC	U.S.	METRIC
Fuel tank (total)	3.3 gal	12.5 L	4.5 gal	17.0 L	3.3 gal	12.5 L
Oil tank with filter	2.8 qt	2.6 L	2.8 qt	2.6 L	2.8 qt	2.6 L
Transmission (approximate)	1.0 qt	0.95 L	1.0 qt	0.95 L	1.0 qt	0.95 L
Low fuel warning light	0.8 gal	3.0 L	1.0 gal	3.8 L	0.8 gal	3.0 L

Table 2-6. Capacities: XL 1200 Models

ITEM	XL 1200C/CP/CA/CB		XL 1200T		XL 1200X/V	
	U.S.	METRIC	U.S.	METRIC	U.S.	METRIC
Fuel tank (total)	4.5 gal	17.0 L	4.5 gal	17.0 L	2.1 gal	7.9 L
Oil tank with filter	2.8 qt	2.6 L	2.8 qt	2.6 L	2.8 qt	2.6 L
Transmission (approximate)	1.0 qt	0.95 L	1.0 qt	0.95 L	1.0 qt	0.95 L
Low fuel warning light	1.0 gal	3.8 L	1.0 gal	3.8 L	0.65 gal	2.5 L

Table 2-7. Brake Disc Specifications

SPECIFICATION	FRONT		REAR	
	in	mm	in	mm
Diameter	11.811	300	10.236	260
Min thickness	0.177	4.5	0.256	6.5
Max runout	0.008	0.20	0.008	0.20

Wheels and Tires

WARNING

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

Table 2-8. Tubeless Cast Wheels: Tire Fitment

MODEL	WHEEL SIZE AND POSITION	RIM SIZE AND CONTOUR	SPECIFIED TIRE	
			TYPE	SIZE
XL 883L	18 in - front	T18 x 3.5 MT	Michelin Scorcher "11F"	120/70ZR18
	17 in - rear	T17 x 4.5 MT	Michelin Scorcher "11"	150/60ZR17
XL 883N/R	19 in - front	T19 x 2.15 MT	Michelin Scorcher "31"	100/90B19
	16 in - rear	T16 x 3.00 D	Michelin Scorcher "31"	150/80B16
XL 1200C	16 in - front	T16 x 3.00 MT	Michelin Scorcher "31"	130/90-16
	16 in - rear	T16 x 3.00 MT	Michelin Scorcher "31"	150/80B16
XL 1200CP/CA	16 in - front	T16 x 3.00 MT	Michelin Scorcher "31"	130/90B16
	16 in - rear	T16 x 3.00 MT	Michelin Scorcher "31"	150/80B16
XL 1200T	18 in - front	T18 x 3.5 MT	Michelin Scorcher "11T"	120/70ZR18
	17 in - rear	T17 x 4.5 MT	Michelin Scorcher "11T"	150/70ZR17

Table 2-9. Tube Type Steel Laced Wheels: Tire Fitment

MODEL	WHEEL	RIM SIZE AND CONTOUR	TUBE SIZE	SPECIFIED TIRE	
				TYPE	SIZE
XL 1200X	16 in - front	T16 x 3.00 D	MT90-16	Michelin Scorcher "31"	130/90B16
	16 in - rear	T16 x 3.00 D	MT90-16	Michelin Scorcher "31"	150/80B16
XL 1200V	21 in - front	T21 x 2.15 TLA	MH90-21	Dunlop D402F	MH90 21 M/C 54H WW
	16 in - rear	T16 x 3.00 D	MT/MU90-16	Dunlop D401	150/80/B16 16 M/C 71H WWW
XL 1200C	16 in - front	T16 x 3.00 D	MT90-16	Michelin Scorcher "31"	130/90-16
	16 in - rear	T16 x 3.00 D	MT90-16	Michelin Scorcher "31"	150/80B16
XL 1200CP/CB	16 in - front	T16 x 3.00 D	MT90-16	Michelin Scorcher "31"	130/90B16
	16 in - rear	T16 x 3.00 D	MT90-16	Michelin Scorcher "31"	150/80B16

VEHICLE IDENTIFICATION NUMBER (VIN) 2.3

VEHICLE IDENTIFICATION NUMBER (VIN)

General

See Figure 2-2. A unique 17-digit serial or Vehicle Identification Number (VIN) is assigned to each motorcycle. Refer to Table 2-10.

Location

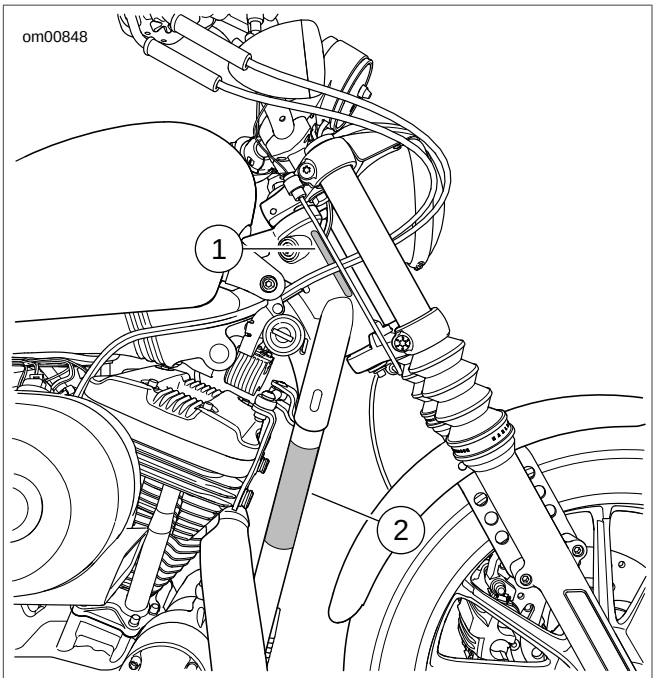
See Figure 2-1. The full 17-digit VIN is stamped on the right side of the frame near the steering head. In some destinations, a printed VIN label is also attached on the front downtube.

Abbreviated VIN

An abbreviated VIN showing the vehicle model, engine type, model year, and sequential number is stamped on the left side of the crankcase between the engine cylinders.

NOTE

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



1. **Stamped VIN**
2. **VIN label**

Figure 2-1. VIN Locations

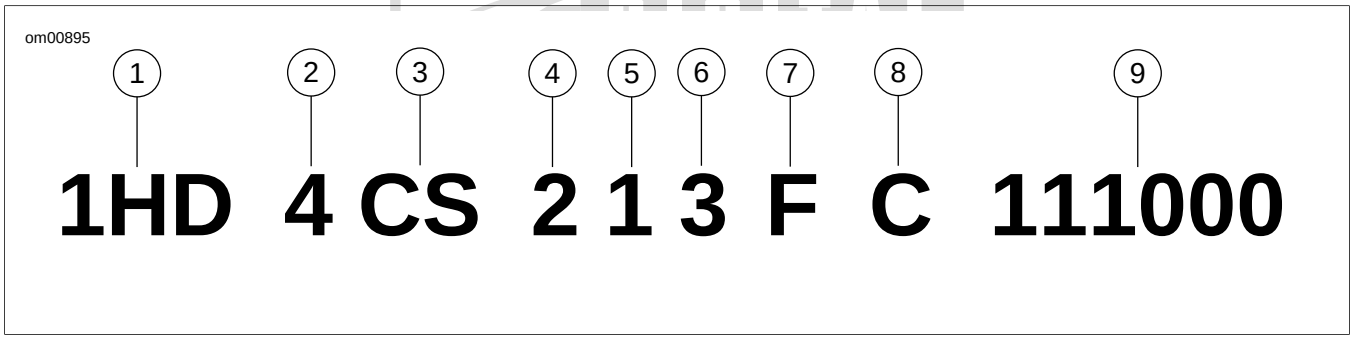


Figure 2-2. Typical Harley-Davidson VIN: 2015 Sportster Models

Table 2-10. Harley-Davidson VIN Breakdown: 2015 Sportster Models

POSITION	DESCRIPTION	POSSIBLE VALUES
1	World manufacturer identifier	1HD=Originally manufactured in the United States 5HD=Originally manufactured in the United States for sale outside of the United States 932=Originally manufactured in Brazil MEG=Originally manufactured in India
2	Motorcycle type	1=Heavyweight motorcycle (901 cm^3 or larger) 4=Middleweight motorcycle (351 cm^3 to 900 cm^3)
3	Model	See VIN model table
4	Engine type	2=Evolution® 883 cm^3 air-cooled, fuel-injected 3=Evolution® 1202 cm^3 air-cooled, fuel-injected

Table 2-10. Harley-Davidson VIN Breakdown: 2015 Sportster Models

POSITION	DESCRIPTION	POSSIBLE VALUES	
5	Configuration/calibration, introduction	**Normal Introduction** 1=Domestic (DOM) 3=California (CAL) A=Canada (CAN) C=HDI E=Japan (JPN) G=Australia (AUS) J=Brazil (BRZ) L=Asia Pacific (APC) N=India (IND)	**Mid-year or Special Introduction** 2, 4=Domestic (DOM) 5, 6=California (CAL) B=Canada (CAN) D=HDI F=Japan (JPN) H=Australia (AUS) K=Brazil (BRZ) M=Asia Pacific (APC) P=India (IND)
6	VIN check digit	Can be 0-9 or X	
7	Model year	F=2015	
8	Assembly plant	C=Kansas City, MO U.S.A. D=H-D Brazil-Manaus, Brazil (CKD) N=Haryana India (Bawal District Rewari)	
9	Sequential number	Varies	

Table 2-11. VIN Model Codes: 2015 Sportster Models

CODE	MODEL	CODE	MODEL
CR	XL 883L SuperLow®	LF	XL 1200V Seventy-Two®
CS	XL 883R 883 Roadster	LH	XL 1200CP 1200 Custom (factory custom)
CT	XL 1200C 1200 Custom	LJ	XL 1200CA 1200 Custom Limited A
LC	XL 1200X Forty-Eight®	LK	XL 1200CB 1200 Custom Limited B
LE	XL 883N Iron 883™	LL	XL 1200T SuperLow® 1200T

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TIRES 2.4

REMOVAL

NOTE

Take care when replacing tire to prevent cosmetic damage to wheel. Painted surfaces are easily damaged.

1. Remove wheel. See 2.5 WHEELS, Front Wheel or 2.5 WHEELS, Rear Wheel.
2. Deflate tire.

NOTE

***Tube type wheels:** Do not completely remove tire from rim to replace tube. Removing one side allows access to tube and tire inspection.*

3. Loosen both tire beads from rim flange. Use a bead breaker machine if available.
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 tire. See 2.7 CHECKING AND TRUING WHEELS.
4. Inspect the tire for wear and damage.
5. Inspect tread depth. Replace worn tires.

⚠WARNING

Replace punctured or damaged tires. In some cases, small punctures in the tread area may be repaired from within the removed 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 lead to tire failure and result in death or serious injury. (00015b)

6. Repair tread on tubeless tires if puncture is 1/4 in (6.4 mm) or smaller. Make repairs from inside the tire.
7. Always combine a patch and plug when repairing damaged tires.

INSTALLATION

FASTENER	TORQUE VALUE	
Valve stem, tube type, nut	3-7 **in-lbs**	0.3-0.8 Nm
Valve stem, tubeless type, nut	12-15 **in-lbs**	1.4-1.7 Nm

Mounting

⚠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

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

Mount tires with arrows molded into the tire sidewall with the arrow pointing in the direction of forward rotation.

If a tire has a colored balance dot on the sidewall, locate the balance dot next to the valve stem.

For tire pressures, see 1.8 TIRES AND WHEELS, Air Pressure.

Tube Type Tires

⚠WARNING

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

NOTES

- *Replace the tube whenever the tire is replaced.*
- *Only patch inner tubes as an emergency measure. Replace a patched tube as soon as possible.*
- *For correct tire and tube types, see 1.8 TIRES AND WHEELS, Specified Tires.*

1. See Figure 2-3. On laced wheels, install a rim strip into the rim well.
   a. Verify that the spokes do not protrude through the nipples.
   b. Align the valve stem hole in rim strip with valve stem hole in rim.
2. Install tube and tire.
3. Install valve stem nut. Tighten to 3-7 **in-lbs** (0.3-0.8 Nm).

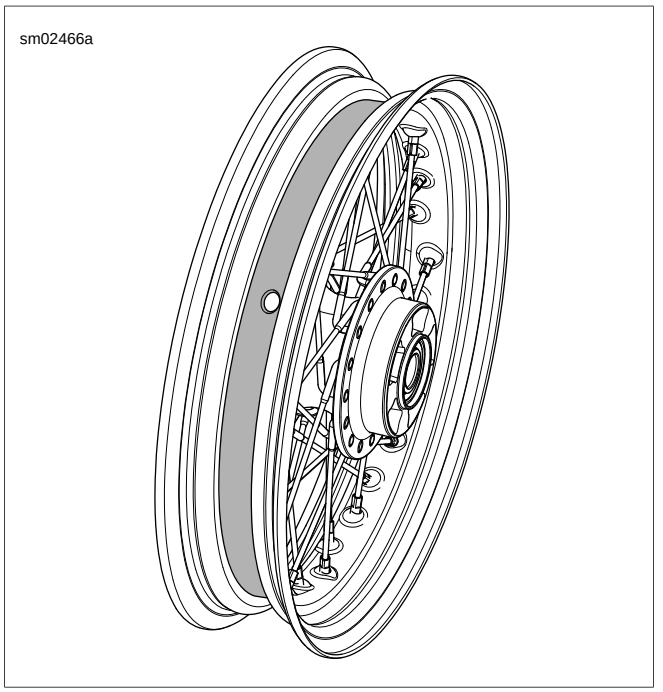


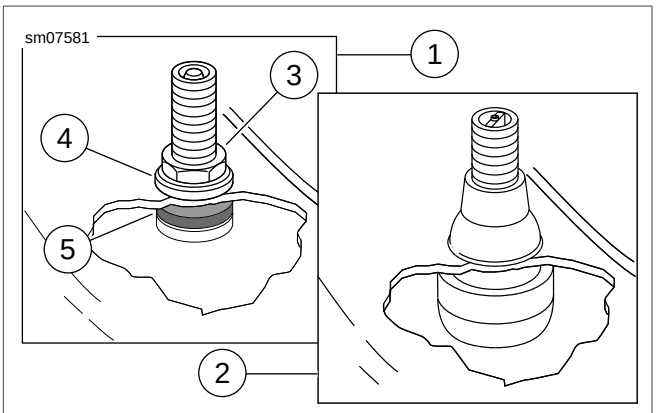
Figure 2-3. Installed Rim Strip

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 2-4. Replace damaged or leaking valve stems.
2. **XL 883N/R cast wheels:**
   a. Install rubber grommet (5) on valve stem (1).
   b. Insert valve stem into rim hole.
   c. Install metal washer (4).
   d. Install nut (3). Tighten to 12-15 **in-lbs** (1.4-1.7 Nm).
3. **XL 883L, XL 1200C/CP/CA, XL 1200T cast wheels:** Press the snap-in valve stem (2) into the rim hole.
4. Install tire.



1. **Bolt-on valve stem**
2. **Snap-in valve stem**
3. **Nut**
4. **Metal washer**
5. **Rubber grommet**

Figure 2-4. Tubeless Tire Valve Stems

CHECKING TIRE RUNOUT

Lateral Runout

1. Check tire pressure.
2. See Figure 2-5. 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 2.7 CHECKING AND TRUING WHEELS.
   a. If rim lateral runout is within specification, the tire is at fault and must be replaced.
   b. If rim lateral runout is not within specification, correct by adjusting selected spokes on laced wheels or replace cast wheels. See 2.7 CHECKING AND TRUING WHEELS.
4. Install the tire. Check tire lateral runout of replacement tire.

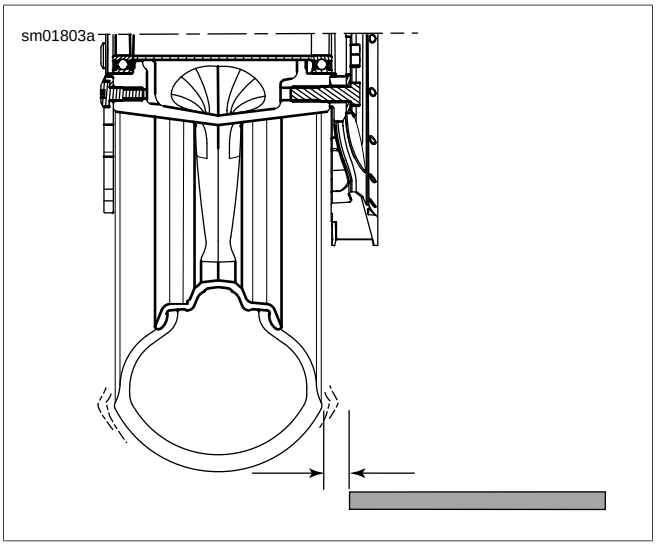


Figure 2-5. Tire Lateral Runout

Radial Runout

1. Check tire pressure.
2. See Figure 2-6. 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 2.7 CHECKING AND TRUING WHEELS.
   a. If rim radial runout is within specification, the tire is at fault and must be replaced.
   b. If rim radial runout is not within specification, correct by adjusting selected spokes on laced wheels or replace cast wheels. See 2.7 CHECKING AND TRUING WHEELS.
4. Install the tire. Check tire radial runout of replacement tire.

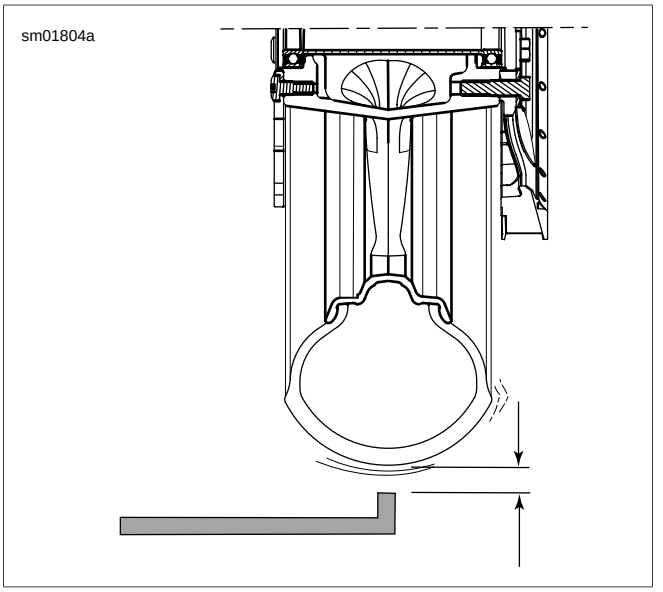


Figure 2-6. Tire Radial Runout

WHEEL BALANCING

Static vs Dynamic

Wheel balancing is recommended to improve handling. Balancing wheels reduces vibration especially at high speeds.

Static balancing produces satisfactory results for normal highway speeds. Dynamic balancing can produce better results for deceleration.

Weights

The maximum weight permissible to balance a wheel 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, rotate the tire 180 degrees on the rim and again balance the assembly. Balance wheels to within 0.5 oz (14 g).

All wheel weights currently supplied by Harley-Davidson are made from zinc which is lighter than lead. The weight of each zinc segment is 0.18 oz (5 g) as compared to 0.25 oz (7 g) for lead. Weights are stamped for easy identification.

NOTES

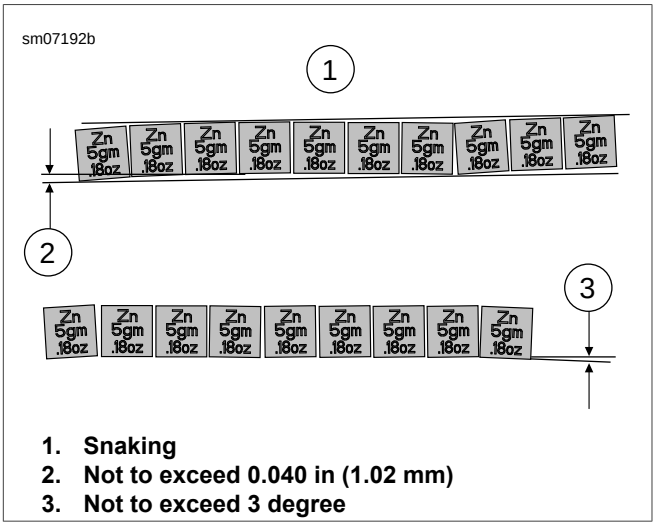
- *If adding more than 1.5 oz (43 g) of weight at one location, divide the amount to apply half to each side of rim.*
- *On cast wheels without a flat area near the bead, place the weights crosswise through the opening.*

1. See Figure 2-8. Place weights on a smooth surface of the wheel rim such that centrifugal force keeps them in place. Make sure that the area of application is clean, dry and free of oil and grease.

NOTE

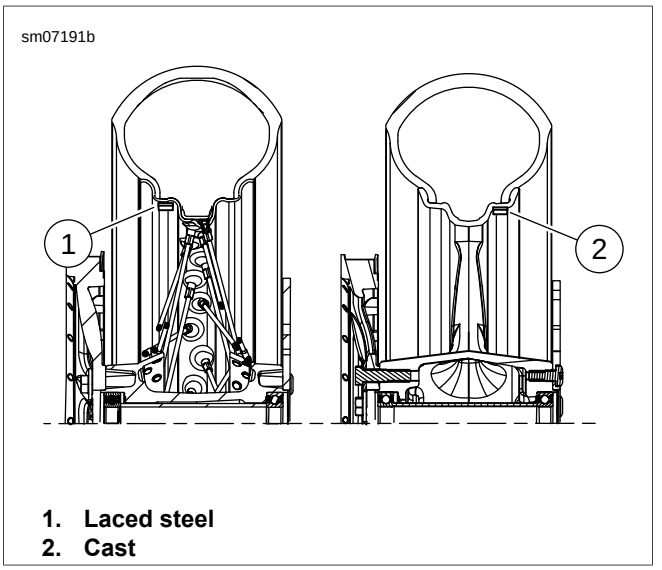
See Figure 2-7. When installing wheel weights, consider cosmetics. Keep snaking (1) within 0.040 in (1.02 mm) (2) of straight. Also keep the angle alignment of individual segments (3) within three degrees.

2. Remove paper backing from the weight. Press firmly in place and hold for ten seconds.



1. **Snaking**
2. **Not to exceed 0.040 in (1.02 mm)**
3. **Not to exceed 3 degree**

Figure 2-7. Weight Segment Alignment



1. **Laced steel**
2. **Cast**

Figure 2-8. Wheel Weight Placement

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WHEELS 2.5

GENERAL

FASTENER	TORQUE VALUE	
Axle, front, nut	60-65 ft-lbs	81-88 Nm
Axle, rear, nut	95-105 ft-lbs	129-142 Nm

Good handling and maximum tire mileage are directly related to the care of wheels and tires. Regularly inspect wheels and tires for damage and wear. If handling problems occur, see 1.25 TROUBLESHOOTING or refer to Table 2-12 for a list of probable causes.

Keep tires inflated to the recommended air pressure. Always balance the wheel after replacing a tube or tire.

Table 2-12. Wheel Service Chart

CHECK FOR	REMEDY
Loose axle nuts.	Tighten front axle nut to 60-65 ft-lbs (81-88 Nm).
	Tighten rear axle nut to 95-105 ft-lbs (129-142 Nm).
Excessive side-play or radial (up-and-down) play in wheel hubs.	Replace wheel hub bearings. See 2.5 WHEELS, Sealed Wheel Bearings.
Loose spokes.	Tighten or replace spokes. See 2.6 WHEEL LACING and 2.7 CHECKING AND TRUING WHEELS.
Alignment of rear wheel in frame or with front wheel.	Check rear wheel alignment as described in this section or repair rear fork as described in 2.19 REAR FORK.
Rims and tires lateral runout more than 1/32 in (0.76 mm).	True wheels, replace rims or replace spokes. See 2.6 WHEEL LACING and 2.7 CHECKING AND TRUING WHEELS.
Rims and tires radial runout more than 1/32 in (0.76 mm).	
Irregular or peaked front tire wear.	Replace as described in 2.5 WHEELS and 2.4 TIRES.
Correct tire inflation.	Inflate tires to correct pressure. See 1.8 TIRES AND WHEELS.
Correct tire and wheel balance.	Static balance can be satisfactory if dynamic balancing facilities are not available. However, dynamic balancing is recommended.
Steering head bearings.	Replace pitted or worn bearings. Check steering head bearing fall-away. See 2.17 FORK STEM AND BRACKET ASSEMBLY.
Damper tubes.	Check for leaks. See 2.16 FRONT FORK.
Shock absorbers.	Check damping action and mounting stud bushings. See 2.20 SHOCK ABSORBERS.
Rear fork bearings.	Check for looseness. See 2.19 REAR FORK.

WHEEL BEARING END PLAY

1. Raise the wheel off the ground.

NOTE

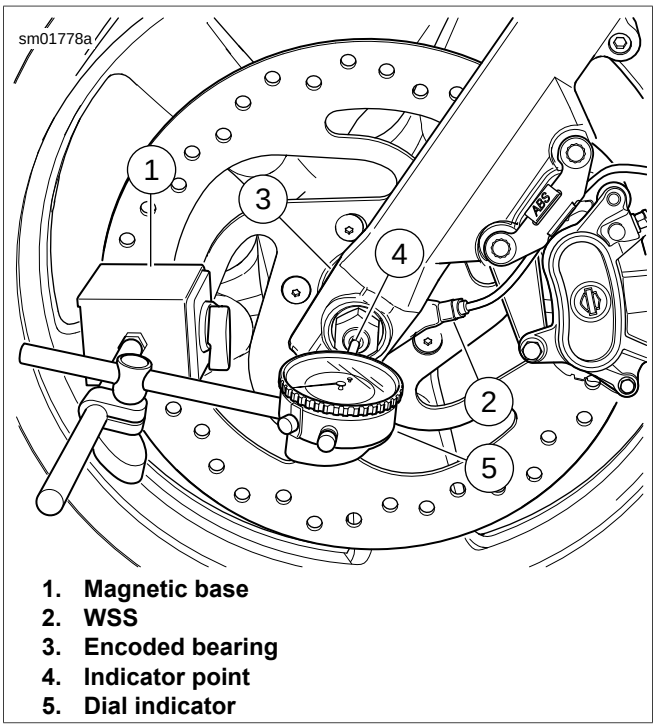
ABS models: *See Figure 2-9. Mount magnetic base (1) far from WSS (2) and ABS encoded bearing (3).*

2. Mount a magnetic base dial indicator on the brake disc.
3. Set the indicator contact point (4) on the end of the axle.

NOTE

When checking end play, pull or push on the wheel not the brake disc. Pulling or pushing brake disc can distort disc causing a false end play reading.

4. Move the wheel all the way back. Hold the wheel in position. Zero the dial indicator (5).
5. Move the wheel all the way forward. Note the reading of the dial indicator. Verify the reading.
6. If end play exceeds specifications, replace both wheel bearings. Refer to Table 2-13.



1. **Magnetic base**
2. **WSS**
3. **Encoded bearing**
4. **Indicator point**
5. **Dial indicator**

Figure 2-9. Measuring Wheel Bearing End Play

Table 2-13. Wheel Bearing End Play

DIRECTION	in	mm
Lateral	0.002	0.05

FRONT WHEEL

FASTENER	TORQUE VALUE	
Hub plate mounting screw	16-24 ft-lbs	21.7-32.6 Nm
Brake disc, front, screw	16-24 ft-lbs	21.7-32.6 Nm
Brake disc, front, screw	16-24 ft-lbs	21.7-32.6 Nm
Brake disc, front, screw	16-24 ft-lbs	21.7-32.6 Nm
Axle, front, nut	60-65 ft-lbs	81-88 Nm
Fork, front, pinch bolt	21-27 ft-lbs	28.5-36.6 Nm

Removal

1. Raise front end.

NOTES

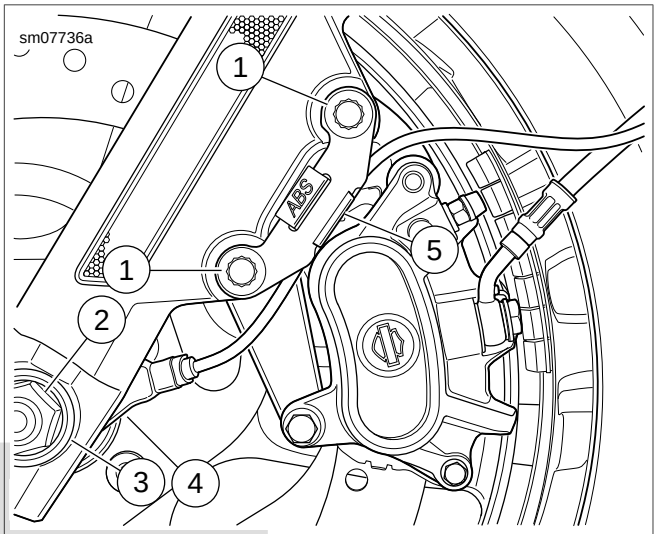
- *Do not operate brakes with caliper removed or caliper pistons can be forced out. Seating piston requires caliper disassembly.*
- ***Dual disc model:** Remove both brake calipers.*

2. See Figure 2-10. Remove brake caliper mounting screws (1). Slide caliper off brake disc. Support caliper out of way.
3. **XL 1200X/C/CP/CA/CB:** Remove front fender. See 2.27 FRONT FENDER.
4. Remove axle nut (2) and flat washer (3) from axle on left side.
5. See Figure 2-11. On right side, loosen nut (4) on pinch screw (1).

NOTES

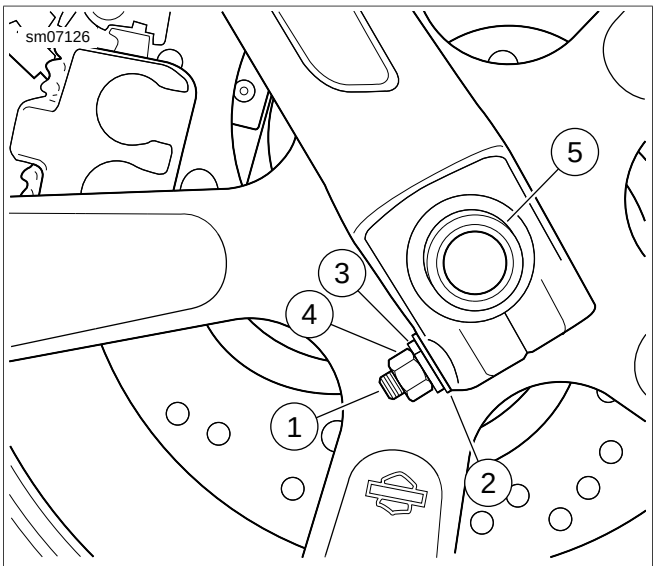
- ***ABS models:** Do not pull wheel speed sensor cable taut or use to retain wheel, axle or other components.*
- ***ABS models:** Keep wheel speed sensor and ABS encoder bearing away from magnetic fields. Items such as magnetic parts trays, magnetic base dial indicators, alternator rotors can damage sensors.*

6. Pull axle out of hub while supporting wheel.
7. Remove spacer and front wheel assembly.



1. **Mounting screw (2)**
2. **Axle nut**
3. **Flat washer**
4. **WSS**
5. **ABS wire lead clip**

Figure 2-10. Left Side Front Wheel Mounting



1. **Pinch screw**
2. **Washer**
3. **Lockwasher**
4. **Nut**
5. **Axle**

Figure 2-11. Right Side Front Wheel Mounting

Disassembly: Cast Front Wheel

1. If necessary, remove tire. See 2.4 TIRES.
2. Remove five screws and left side brake disc.
3. If necessary, remove five screws and right side brake disc (dual front disc models) or, if equipped, hub plate (single front disc models).
4. If necessary, remove roller bearings and hub spacer. See 2.5 WHEELS, Sealed Wheel Bearings.

Assembly: Cast Single Disc

WARNING

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

1. See Figure 2-12. Install hub spacer (7) and **new** wheel bearings (6). See 2.5 WHEELS, Sealed Wheel Bearings.
2. **XL 883N:** Install hub plate (8) on right side of wheel. Secure with **new** screws and tighten in an alternating pattern to 16-24 ft-lbs (21.7-32.6 Nm).

NOTE

See Figure 2-13. Orient brake discs with the word LEFT (1) facing out. Verify that bulb shaped end (2) of slots points opposite direction of rotation (3).

3. Install brake disc. Secure with **new** screws and tighten in an alternating pattern to 16-24 ft-lbs (21.7-32.6 Nm).

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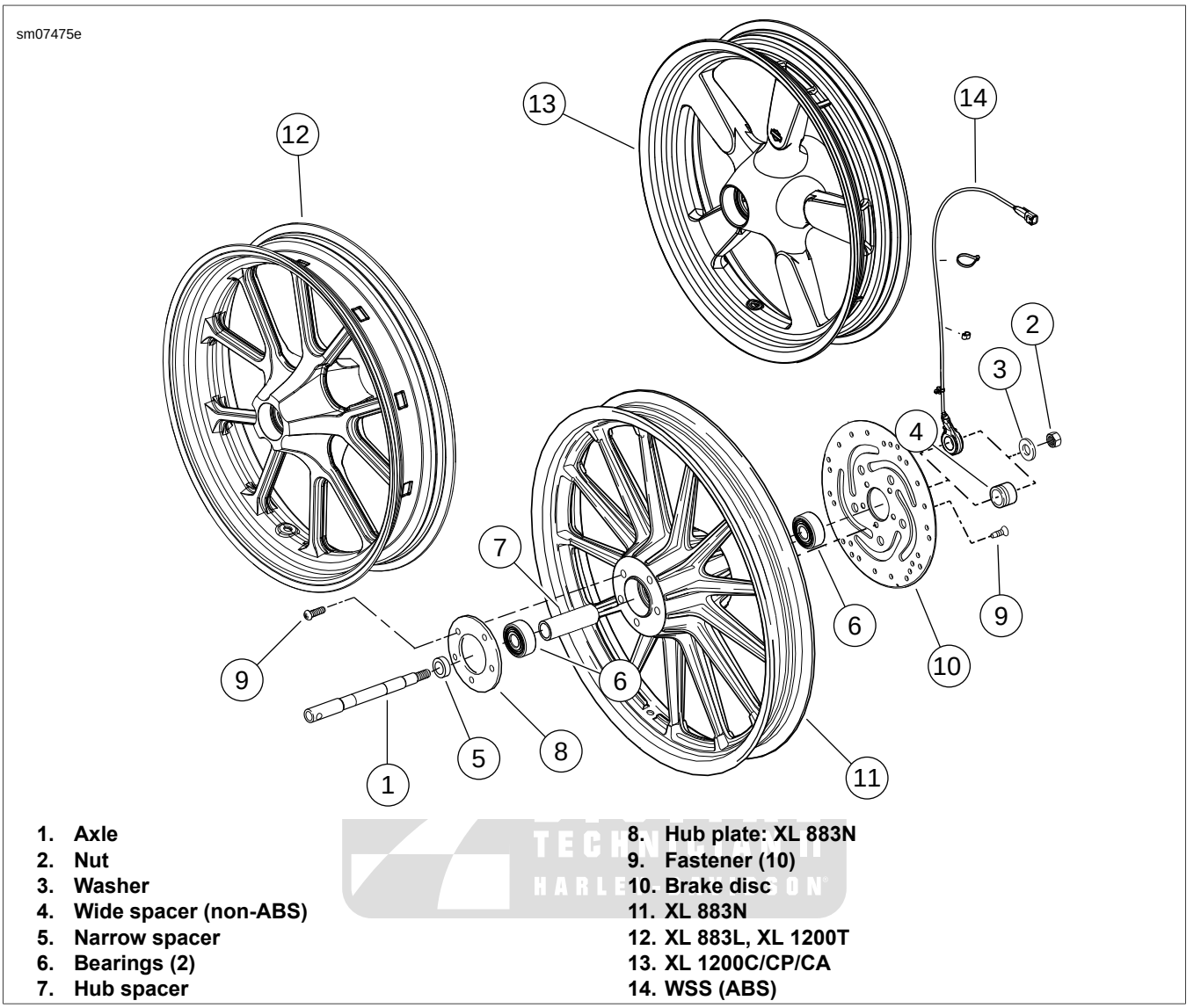
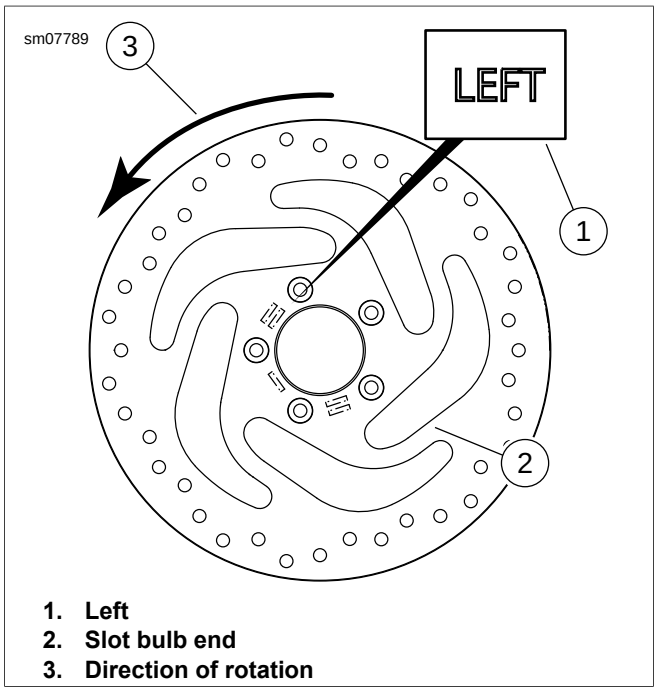


1. Axle
2. Nut
3. Washer
4. Wide spacer (non-ABS)
5. Narrow spacer
6. Bearings (2)
7. Hub spacer
8. Hub plate: XL 883N
9. Fastener (10)
10. Brake disc
11. XL 883N
12. XL 883L, XL 1200T
13. XL 1200C/CP/CA
14. WSS (ABS)

Figure 2-12. Single Disc Wheels



1. **Left**
2. **Slot bulb end**
3. **Direction of rotation**

Figure 2-13. Single Disc Orientation

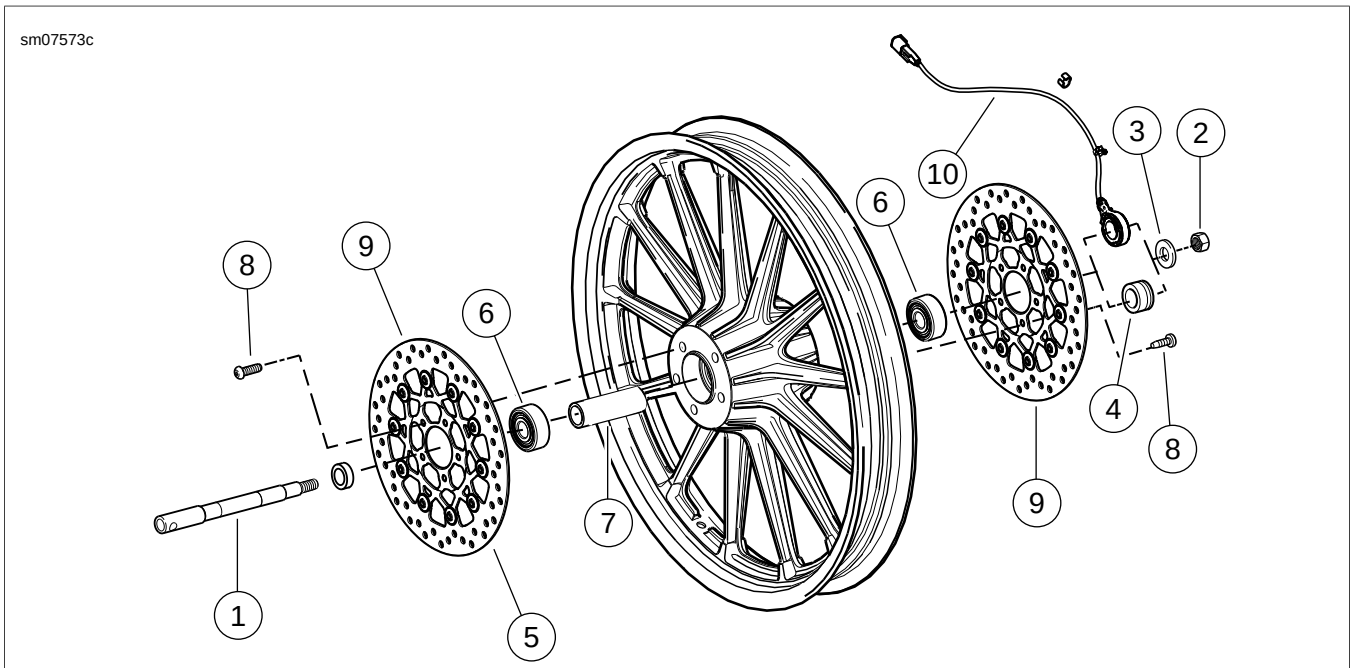
Assembly: Cast Dual Disc (XL 883R)

1. See Figure 2-14. Install hub spacer (7) and **new** wheel bearings (6). See 2.5 WHEELS, Sealed Wheel Bearings.
2. Hold brake discs together with inboard sides facing each other. Minimum thickness, alignment and part number stampings are on outboard side of brake disc.

NOTE

Marks align with spoke when marks are opposite valve stem.

3. See Figure 2-15. Rotate brake disc to alignment disc marks with center of spoke.
4. Install brake discs onto hub.
5. Secure brake disc onto hub with **new** screws. Tighten in an alternating pattern to 16-24 ft-lbs (21.7-32.6 Nm).
6. Verify that wheel is true. See 2.7 CHECKING AND TRUING WHEELS, Cast Wheel Runout.



1. **Axle**
2. **Nut**
3. **Washer**
4. **Wide spacer (non-ABS)**
5. **Narrow spacer**
6. **Bearing (2)**
7. **Hub spacer**
8. **Fastener (10)**
9. **Brake disc (2)**
10. **WSS (ABS)**

Figure 2-14. Dual Disc Wheel: XL 883R

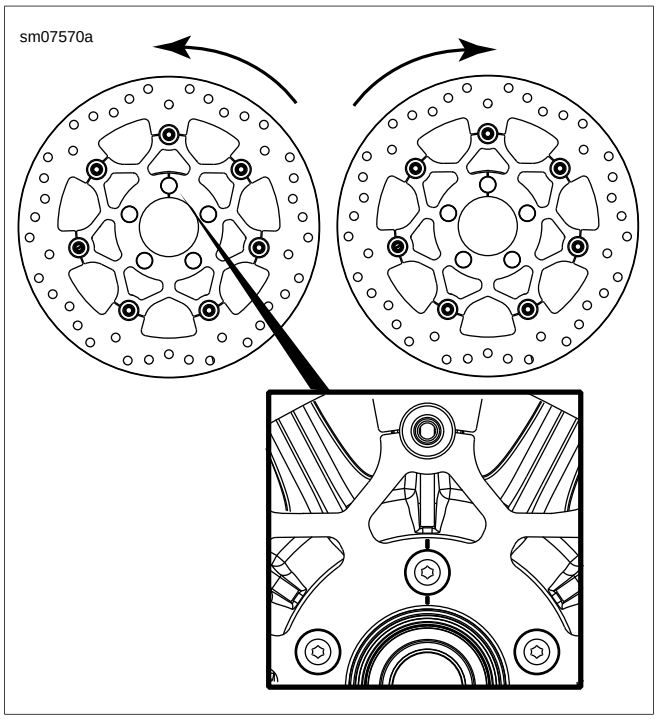


Figure 2-15. Dual Disc Alignment Marks: XL 883R

Disassembly: Laced Front Wheel

1. See Figure 2-16. If necessary, remove five screws (1) and brake disc (9). Discard screws.
2. If necessary, remove wheel bearings (4) and hub spacer (6). See 2.5 WHEELS, Sealed Wheel Bearings.

NOTE

*To replace rim, tape spokes together to hold position on hub. Remove spokes from rim. Install taped hub/spoke assembly to **new** rim and tighten spokes. Then remove tape and true wheels. See 2.6 WHEEL LACING and 2.7 CHECKING AND TRUING WHEELS.*

3. To disassemble wheel, loosen spoke nipples and spokes and slide each spoke out of hub.

Assembly: Laced Front Wheel

1. See Figure 2-16. Install hub spacer (6) and **new** wheel bearings (4) if removed. See 2.5 WHEELS, Sealed Wheel Bearings.
2. If hub and rim were disassembled, reassemble and true wheel. See 2.6 WHEEL LACING and 2.7 CHECKING AND TRUING WHEELS.

⚠WARNING

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

3. Install brake disc (9). Secure with **new** screws (1). Tighten in an alternating pattern to 16-24 ft-lbs (21.7-32.6 Nm).
4. Verify that wheel is true.

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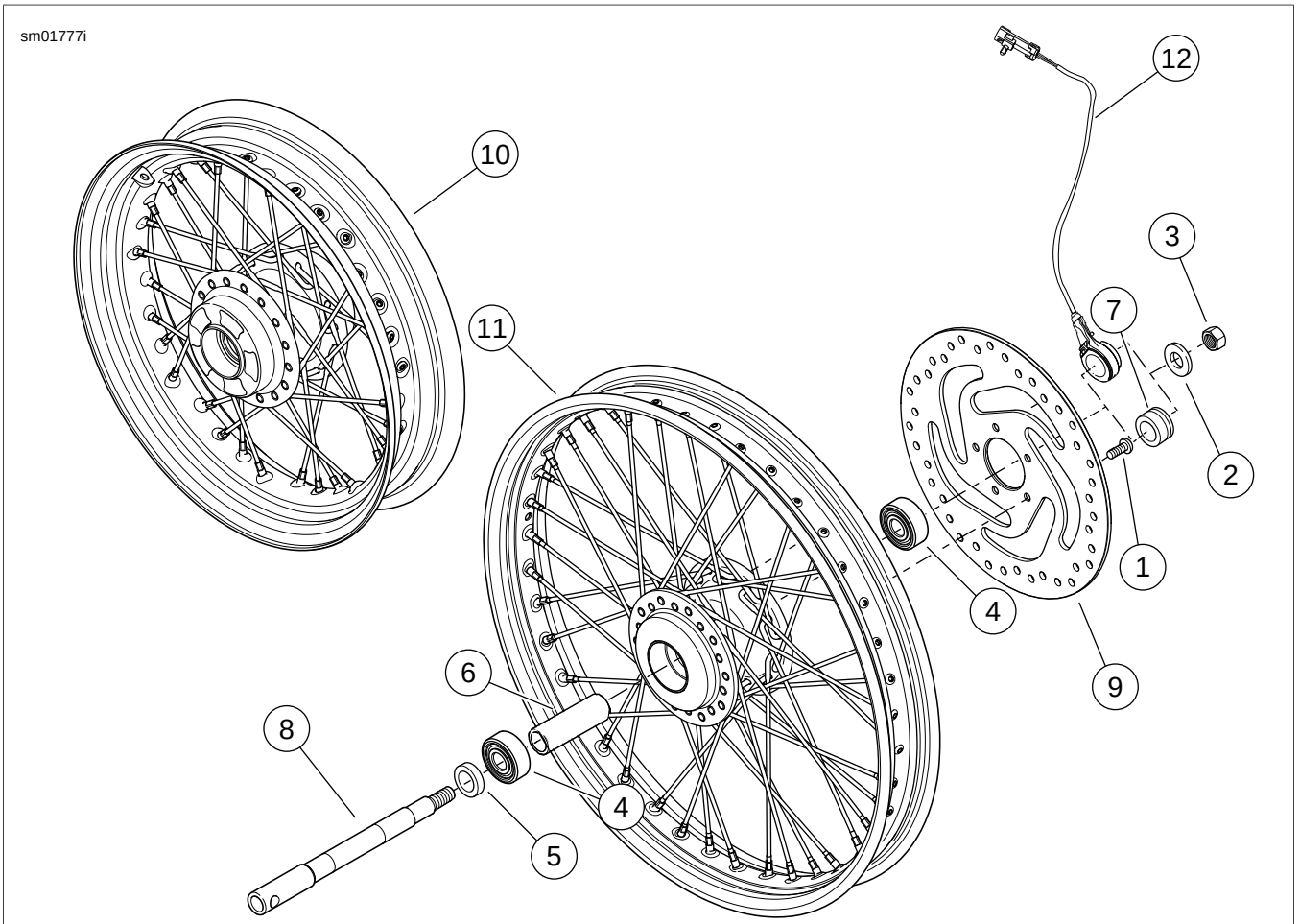


1. **Screw (5)**
2. **Washer**
3. **Nut**
4. **Roller bearing (2)**
5. **Bearing spacer, narrow**
6. **Hub spacer**
7. **Bearing spacer, wide (non-ABS)**
8. **Front axle**
9. **Brake disc**
10. **Wheel: 16 in XL 1200X/CP/CB certain markets**
11. **Wheel: 21 in XL 1200V**
12. **WSS (ABS)**

Figure 2-16. Laced Front Wheel

Installation

1. Apply a light coat of ANTI-SEIZE LUBRICANT to axle, bearing bores and hub spacer bore.
2. Position wheel between forks. Verify that bearing spacers, on right and left side of wheel bearings, and the WSS (ABS models) are in position.
3. With pinch bolt loose, insert threaded end of axle through right side fork. Push axle through fork and wheel hub until it begins to emerge from left side of hub.
4. Push axle through left fork, until axle shoulder contacts external bearing spacer on right fork side.

NOTE

ABS models: *Rotate front WSS counterclockwise until index pin contacts shoulder on left fork slider.*

5. Install flat washer and axle nut over threaded end of axle. Insert screwdriver or steel rod through hole in axle on right side of vehicle. While holding axle stationary, tighten axle nut to 60-65 ft-lbs (81-88 Nm).
6. Tighten pinch bolt to 21-27 ft-lbs (28.5-36.6 Nm).
7. **XL 1200X/C/CP/CA/CB:** Install front fender. See 2.27 FRONT FENDER.

NOTE

ABS models: *Install WSS cable bracket when installing brake caliper. Secure WSS cable to clip bracket with cable clip.*

8. Install brake calipers. See 2.9 FRONT BRAKE CALIPERS.

⚠WARNING

Check wheel bearing end play after tightening axle nut to specified torque. Excessive end play can adversely affect stability and handling and can cause loss of control, which could result in death or serious injury. (00285b)

⚠WARNING

Whenever a wheel is installed and before moving the motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00284a)

NOTE

***ABS models:** Make sure that WSS cable is secured with three retainer clips and cable strap.*

9. Pump brakes to move out pistons until brake pads contact rotor. Verify piston location against pad.

REAR WHEEL

FASTENER	TORQUE VALUE	
Brake disc, rear, screw	30-45 ft-lbs	40.7-61.1 Nm
Sprocket mounting screw, first torque	60 ft-lbs	81.3 Nm
Sprocket mounting screw, final torque	80 ft-lbs	108.0 Nm
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm
Axle, rear, nut	95-105 ft-lbs	129-142 Nm

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, mounting brackets, components or housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586d)

Removal

1. Raise the motorcycle.
2. Remove rear muffler. See 4.16 EXHAUST SYSTEM.
3. Remove right lower shock absorber nut. To avoid damage to sprocket when rear wheel is removed, pull screw out slightly.
4. See Figure 2-17. Remove E-clip (2), axle nut (1) and washer (3).
5. Loosen adjuster screws several turns to relieve belt tension.
6. Gently tap end of axle (4) with a soft hammer to loosen. Pull axle free of rear fork assembly.
7. Slide wheel forward and slip belt off sprocket.

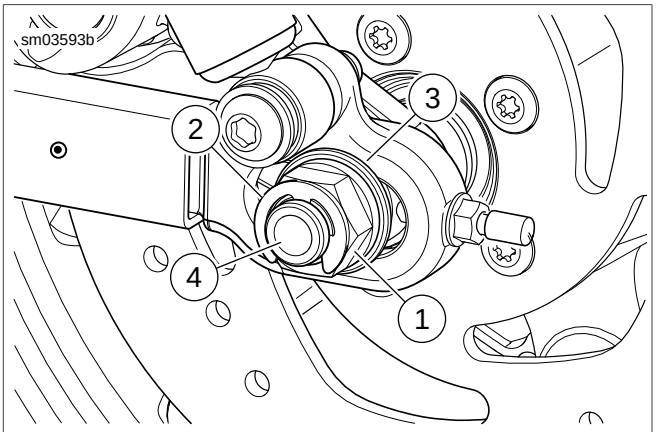
NOTES

- *Do not disassemble rear brake caliper in order to remove rear wheel.*
- ***ABS models:** Do not pull wheel speed sensor cable taut or use to retain wheel, axle or other components.*
- ***ABS models:** Keep wheel speed sensor and ABS encoder bearing away from magnetic fields. Items such as magnetic parts trays, magnetic base dial indicators, alternator rotors can damage sensors.*

8. Remove spacers and roll rear wheel assembly back out of fork.
9. Remove rear wheel assembly.

NOTE

Do not operate rear brake pedal with rear wheel removed or caliper piston is forced out of piston bore. Seating piston requires disassembly of caliper.



1. **Axle nut**
2. **E-clip**
3. **Washer**
4. **Rear axle**

Figure 2-17. Rear Wheel Mounting

Disassembly

NOTES

- *Sportster models sold in certain markets have rear wheel compensating sprockets. See C.2 COMPENSATING SPROCKET.*
- *Mark parts to indicate location. Do not mix parts upon assembly.*

1. If necessary, remove tire. See 2.4 TIRES.
2. See Figure 2-18 or Figure 2-19. If necessary, remove screws to detach rear brake disc from left side of wheel.
3. If necessary, remove screws and washers to detach rear sprocket from right side of wheel.
4. If necessary, remove wheel bearings and hub spacer. See 2.5 WHEELS, Sealed Wheel Bearings.

NOTE

***Laced wheel:** When replacing rim, tape spokes together to hold position on hub. Remove spokes from rim. See 2.6 WHEEL LACING.*

5. **Laced wheel:** To disassemble wheel, loosen spoke nipples and spokes and slide each spoke out of hub.

Cleaning and Inspection

1. Inspect parts for wear or damage.

⚠WARNING

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

2. Inspect brake pads and disc. See 1.16 BRAKE PADS AND DISCS.
3. Inspect drive belt and sprocket. See 1.12 DRIVE BELT AND SPROCKETS.

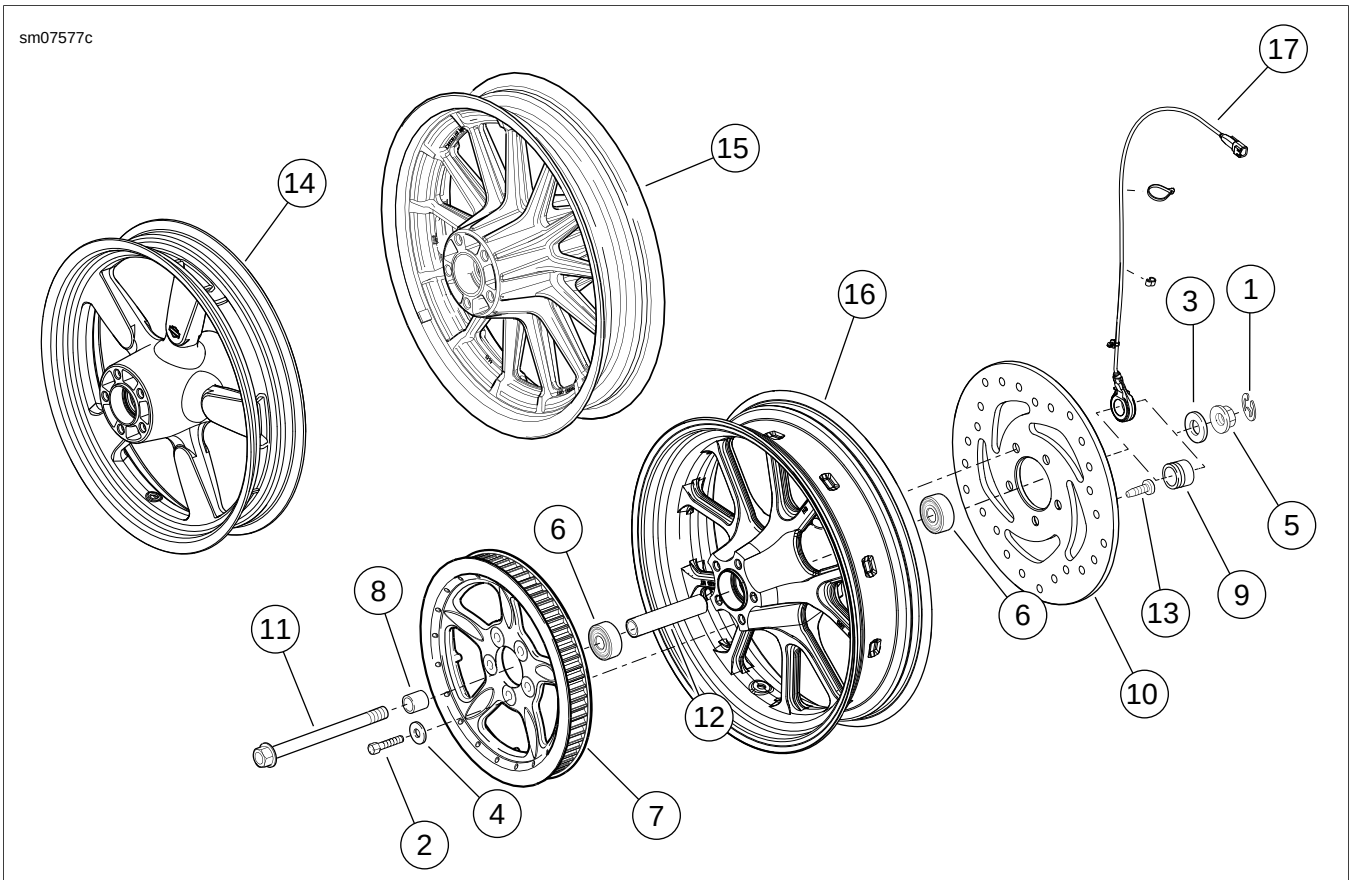
Assembly

1. **Laced wheel:** If wheel was disassembled, reassemble hub, rim, spokes and nipples, and tighten spokes. See 2.6 WHEEL LACING.
2. Install hub spacer and **new** wheel bearings, if removed. See 2.5 WHEELS, Sealed Wheel Bearings.
   a. **Cast or disc wheel:** See Figure 2-18.
   b. **Laced wheel:** See Figure 2-19.
3. If brake disc was removed, install brake disc on valve stem side of wheel. Secure with **new** screws. Tighten to 30-45 ft-lbs (40.7-61.1 Nm).

NOTE

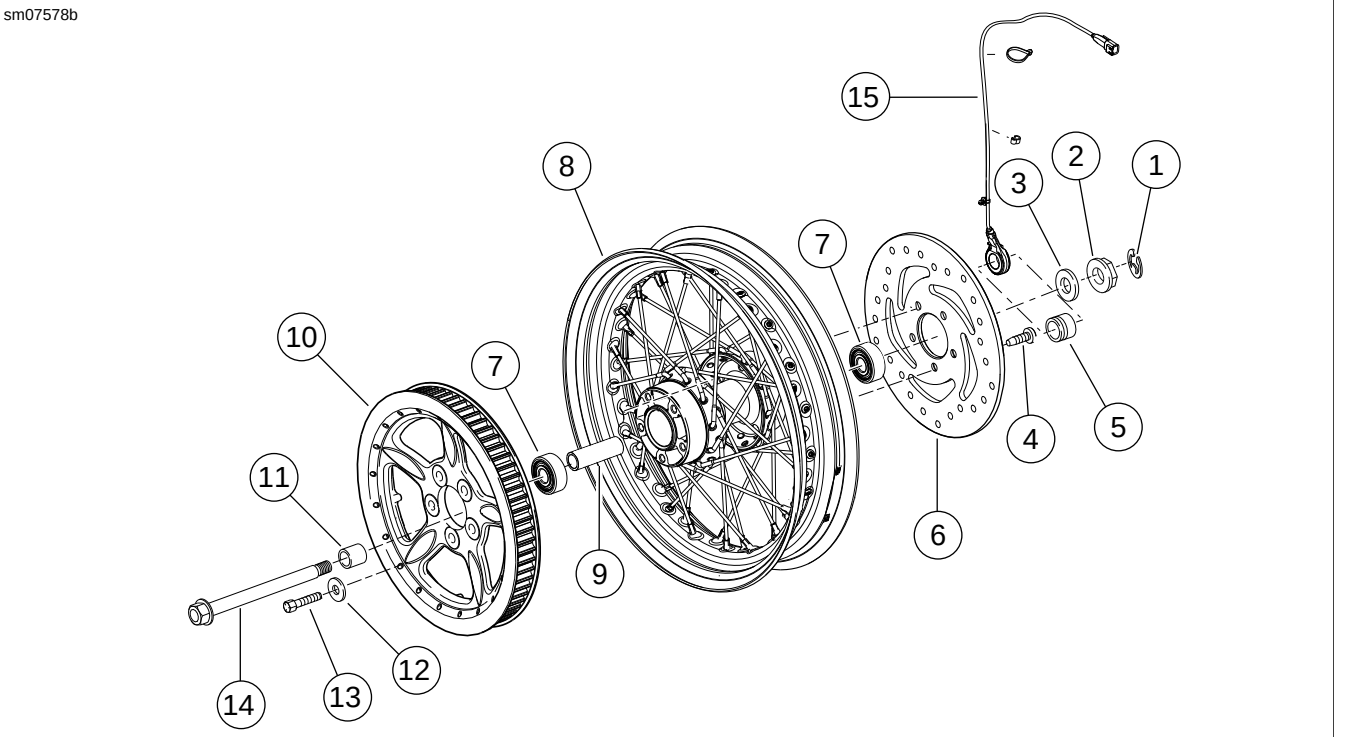
Sportster models sold in certain markets have rear wheel compensating sprockets. See C.2 COMPENSATING SPROCKET.

4. If rear sprocket was removed, install sprocket on side of wheel opposite valve stem.
   a. Secure with **new** screws and washers. Tighten to 60 ft-lbs (81.3 Nm).
   b. Loosen each screw 180 degrees. Tighten to 80 ft-lbs (108.0 Nm).
5. Verify that wheel assembly is true. See 2.7 CHECKING AND TRUING WHEELS.
6. Install tire. See 2.4 TIRES.



1. **E-clip**
2. **Screw (5)**
3. **Washer**
4. **Washer (5)**
5. **Axle nut**
6. **Roller bearing (2)**
7. **Sprocket**
8. **Spacer, wide**
9. **Spacer, narrow (non-ABS)**
10. **Brake disc**
11. **Axle**
12. **Hub spacer**
13. **Screw (5)**
14. **Wheel: 16 in XL 1200C/CP/CA (certain markets)**
15. **Wheel: 16 in XL 883N/R**
16. **Wheel: 17 in XL 883L, XL 1200T**
17. **WSS (ABS)**

Figure 2-18. Cast Rear Wheel



1. **E-clip**
2. **Axle nut**
3. **Washer**
4. **Fastener (5)**
5. **Spacer, narrow (non-ABS)**
6. **Brake disc**
7. **Roller bearing (2)**
8. **Wheel: 16 in XL 1200X/V/CP/CB and XL 1200C/CA certain markets**
9. **Hub spacer**
10. **Sprocket**
11. **Spacer, wide**
12. **Washer (5)**
13. **Fastener (5)**
14. **Axle**
15. **WSS (ABS)**

Figure 2-19. Laced Rear Wheel

Installation

1. See Figure 2-18 or Figure 2-19. Apply a light coat of ANTI-SEIZE LUBRICANT to axle, bearing bores and hub spacer bore.
2. Place wheel centrally in rear fork assembly. Engage brake disc in caliper.
3. Slide wheel forward. Pull drive belt over sprockets.
4. Position sprocket side spacer between wheel and rear fork.
5. Insert axle through right side of rear fork and axle adjuster, sprocket side spacer, wheel assembly, disc side spacer, rear caliper bracket, WSS and left side of rear fork and axle adjuster.
6. Install washer and axle nut on left end of axle. Leave fasteners loose.
7. Slide right lower shock absorber screw back in place. Install nut. Tighten to 45-50 ft-lbs (61-68 Nm).

NOTE

If rear brake caliper was disassembled or removed, see 2.11 REAR BRAKE CALIPER.

8. Adjust drive belt deflection. See 1.21 WHEEL ALIGNMENT.

NOTE

***ABS models:** Rotate WSS counterclockwise until index pin contacts caliper bracket.*

9. Tighten axle nut to 95-105 ft-lbs (129-142 Nm). Install E-clip.

⚠WARNING

Check wheel bearing end play after tightening axle nut to specified torque. Excessive end play can adversely affect stability and handling and can cause loss of control, which could result in death or serious injury. (00285b)

NOTE

***ABS models:** Secure WSS wire harness to rear brake line with clips.*

10. Check wheel bearing end play. See 2.5 WHEELS, Wheel Bearing End Play.
11. Install rear muffler. See 4.16 EXHAUST SYSTEM.

⚠WARNING

Whenever a wheel is installed and before moving the motorcycle, pump brakes to build brake system pressure. Insufficient pressure can adversely affect brake performance, which could result in death or serious injury. (00284a)

12. Pump brake pedal to move out piston until it contacts outside brake pad. Verify piston location against pad.

SEALED WHEEL BEARINGS

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

FASTENER	TORQUE VALUE	
Single disc cast front wheel hub plate screw	16-24 ft-lbs	21.7-32.6 Nm

Inspection

1. Rotate the inner bearing race and check for abnormal noise. Bearing must rotate smoothly.
2. Check wheel bearings and axle spacers for wear and corrosion. Excessive play or roughness indicates worn bearings. Replace bearings in sets only.

Removal

1. Remove wheel. See 2.5 WHEELS.
2. Remove hub plate from wheel on side opposite front brake disc. Discard fasteners.

NOTE

See Figure 2-20. Some wheel hubs do not provide adequate support for the puller bridge. Place a used brake disc over the hub to support the puller bridge.

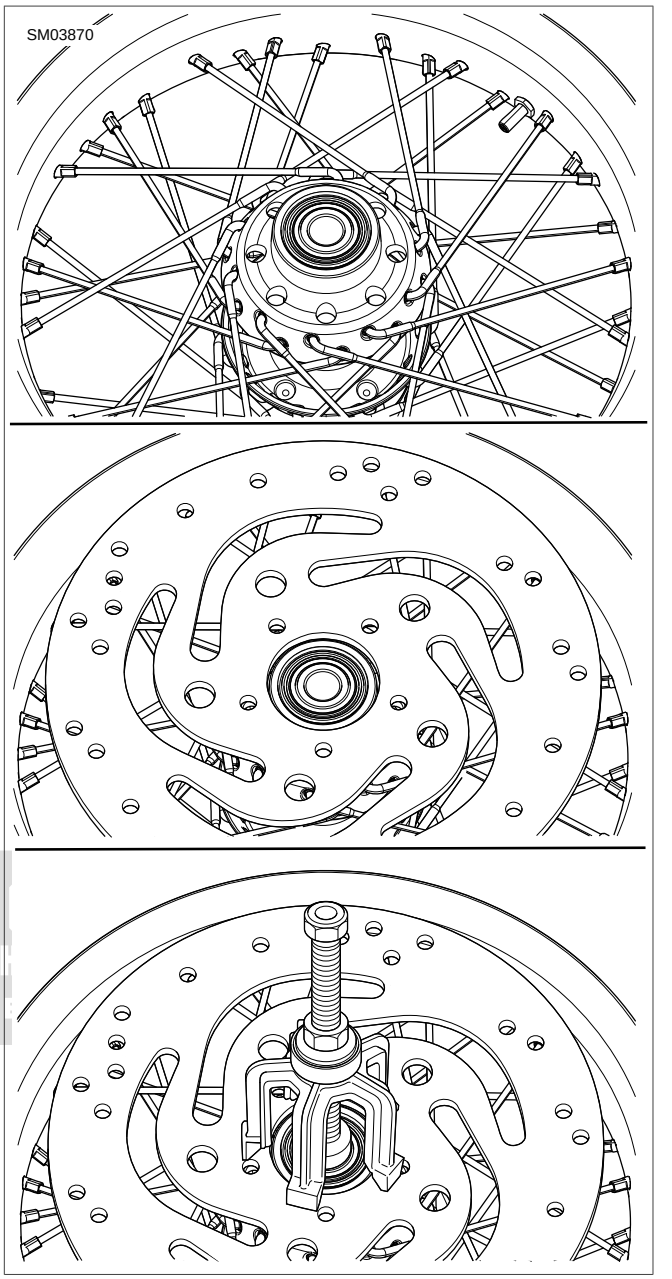
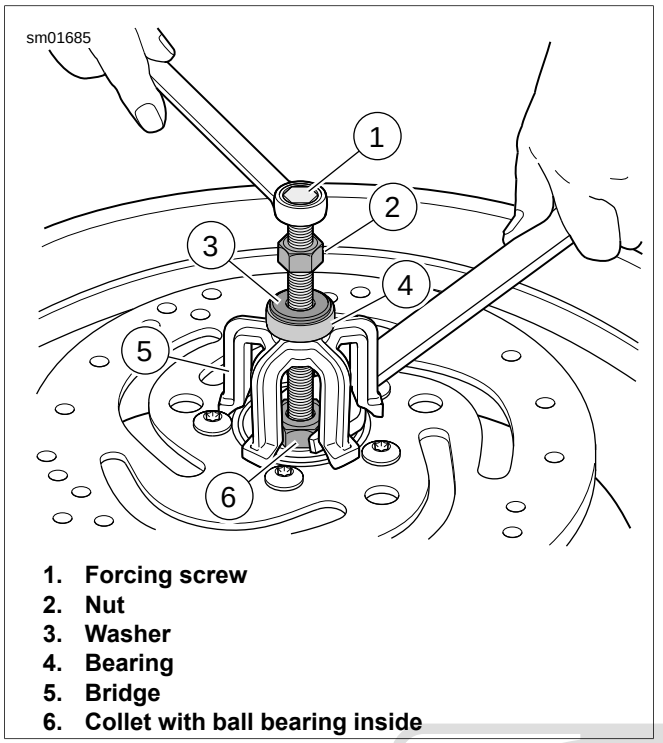


Figure 2-20. Brake Disk as Puller Aid

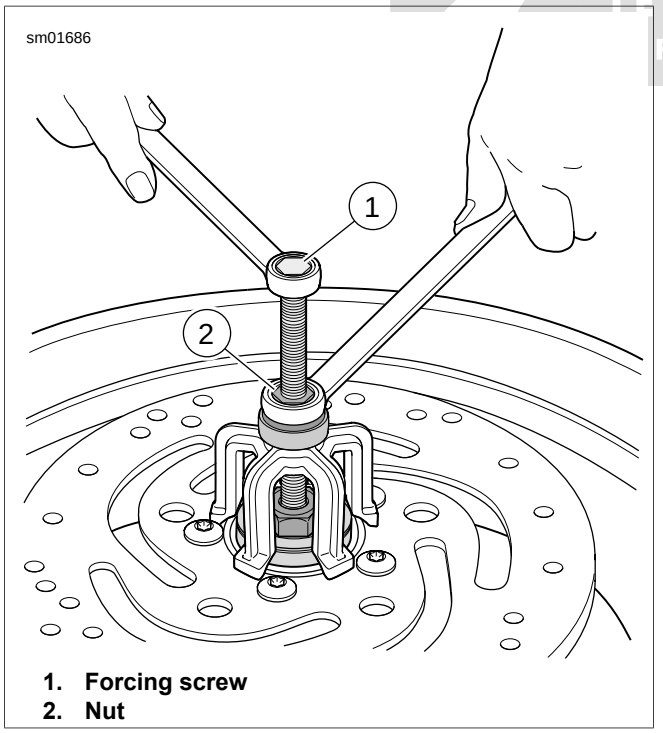
3. See Figure 2-21. Obtain WHEEL BEARING INSTALLER/REMOVER (Part No. HD-44060-C) and assemble.
   a. Sparingly apply graphite lubricant forcing screw (1) for prolonged service life and smooth operation.
   b. Install nut (2), washer (3) and bearing (4) on screw. Insert assembly through hole in bridge (5).
   c. Drop ball bearing inside collet (6). Fasten collet and ball bearing to forcing screw.
4. Hold end of forcing screw and turn collet to expand edges of collet.
5. See Figure 2-22. When expanded collet has gripped bearing edges, hold end of forcing screw (1) and turn the nut (2) to remove bearing from wheel.

6. Remove spacer from inside wheel hub.
7. Repeat procedure for opposite side bearing. Discard both bearings upon removal.



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

Figure 2-21. Wheel Bearing Removal Tool



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

Figure 2-22. Removing Bearing

Installation

NOTES

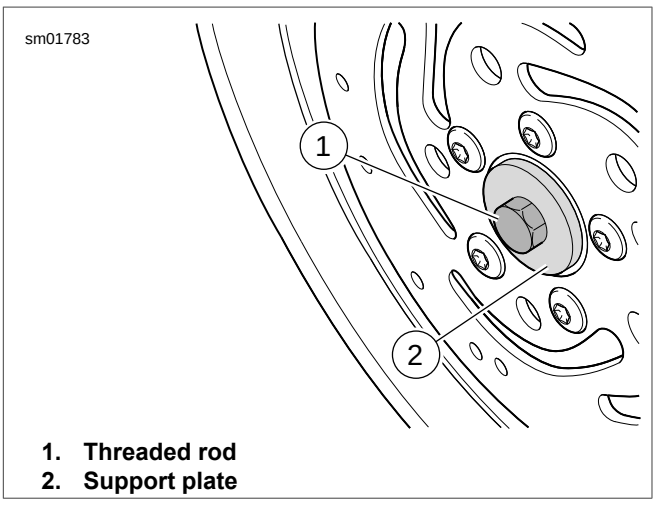
- *When installing wheel bearings, use WHEEL BEARING INSTALLER/REMOVER (Part No. HD-44060-C).*
- ***ABS models:** The encoder bearing (tan in color) is installed on the primary (left) brake disc side. One or two grooves in the disc mounting surface identify the primary (left) side.*
- ***ABS models:** The standard bearing (black) is installed on the side opposite the primary (left) side.*
- ***Single disc models:** Install bearing on primary (left) brake disc side first.*
- ***Dual disc models:** Install bearing on the primary (left) side first.*

1. Obtain WHEEL BEARING INSTALLER/REMOVER (Part No. HD-44060-C) and assemble.
   a. Lightly apply graphite lubricant to threaded rod.
   b. See Figure 2-23. Place threaded rod (1) through support plate (2). Insert assembly through wheel.
   c. See Figure 2-24. Place **new** bearing on rod (1) with lettered side facing out.
   d. Assemble installer (5), bearing (4), washer (3) and nut (2) over rod.

NOTE

Bearing is seated when nut can no longer be turned.

2. Holding hex end of threaded rod, turn nut to install wheel bearing. Remove tool.
3. Install spacer inside wheel hub.
4. Reverse tool to install opposite side wheel bearing.
5. Install hub plate opposite brake disc with **new** screws. Tighten to 16-24 ft-lbs (21.7-32.6 Nm).



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

Figure 2-23. Assembling Installation Tool

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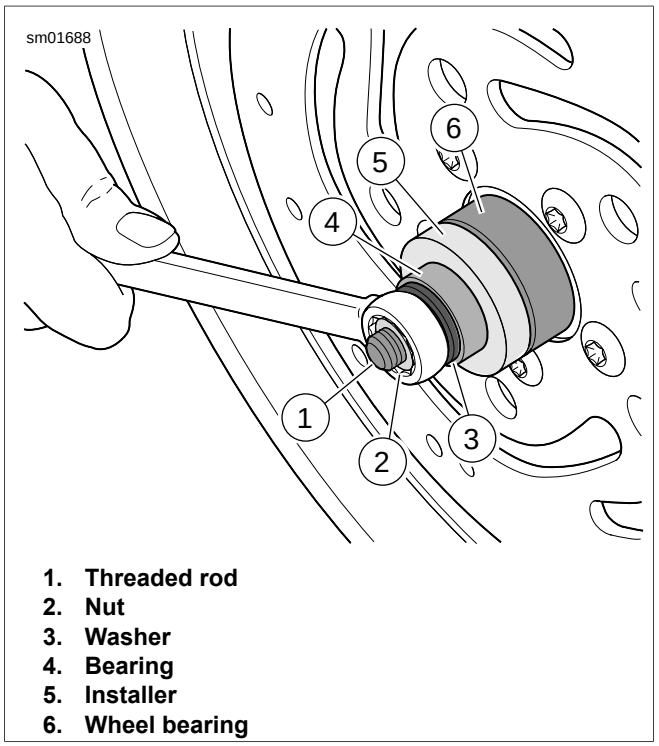


1. **Threaded rod**
2. **Nut**
3. **Washer**
4. **Bearing**
5. **Installer**
6. **Wheel bearing**

Figure 2-24. Installing Bearing

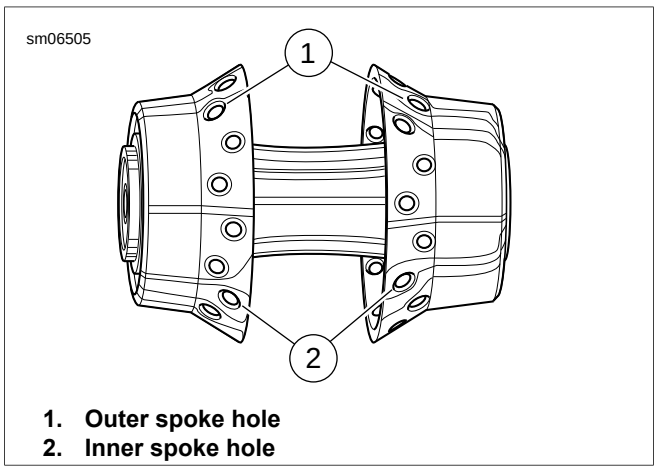
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

WHEEL LACING 2.6

WHEEL LACING: ANGLE FLANGE HUB

NOTES

- *See Figure 2-25. The following procedure is valid for wheels that use an angle flange hub regardless of rim style or diameter.*
- *The primary brake side of the hub has one or two grooves cut into the disc mounting surface.*



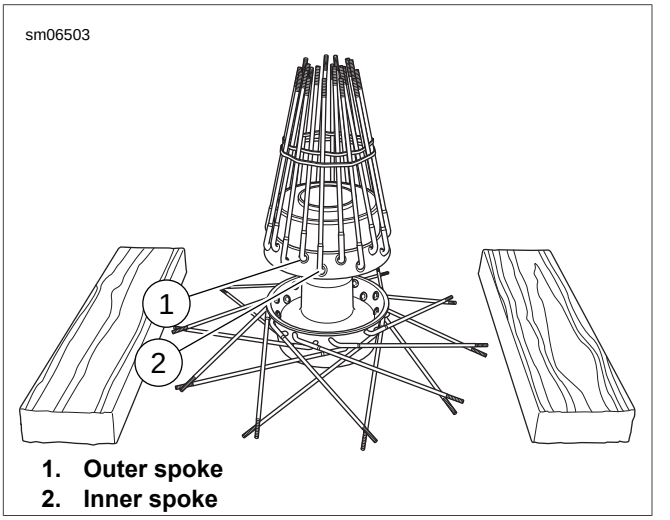
1. **Outer spoke hole**
2. **Inner spoke hole**

Figure 2-25. Angle Flange Hub

1. Place hub on workbench:
   a. **Front:** primary brake side up.
   b. **Rear:** brake side down.
2. Install all spokes in the lower flange.
3. See Figure 2-26. Flip hub over. Gather all outer spokes and hold upright with a rubber band. Repeat with the inner spokes using a second rubber band.
4. Install spokes in remaining flange.
5. Rotate the lower flange spokes as far as they will go:
   a. Outer spokes clockwise.
   b. Inner spokes counterclockwise.
6. 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. If 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 2-26. Spokes Gathered

7. Install lower flange outer spokes and loosely install spoke nipples:
   a. **Rim with side valve hole:** See Figure 2-27. Start at the valve stem hole (1).
   b. **Rim with center valve hole:** See Figure 2-28. Start at the first hole counterclockwise (1) from valve stem hole.
8. Install remaining outer spokes in every 4th hole.
9. 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.
10. Carefully release upper flange inner spokes and fan out around rim, rotating them clockwise.
11. Starting at the first hole counterclockwise (3) from first spoke installed, install inner spoke. Install all remaining inner spokes in every 4th hole.
12. Carefully release upper flange outer spokes and fan out around rim, rotating them counterclockwise.
13. Install outer spokes in remaining holes (4).
14. Verify spoke heads are seated. See 2.7 CHECKING AND TRUING WHEELS.
   a. Evenly hand-tighten spoke nipples until snug.
   b. Only tighten until slack is removed.
   c. Proper torque will be applied when the wheel is trued.
   d. Adjust offset and true the wheel.

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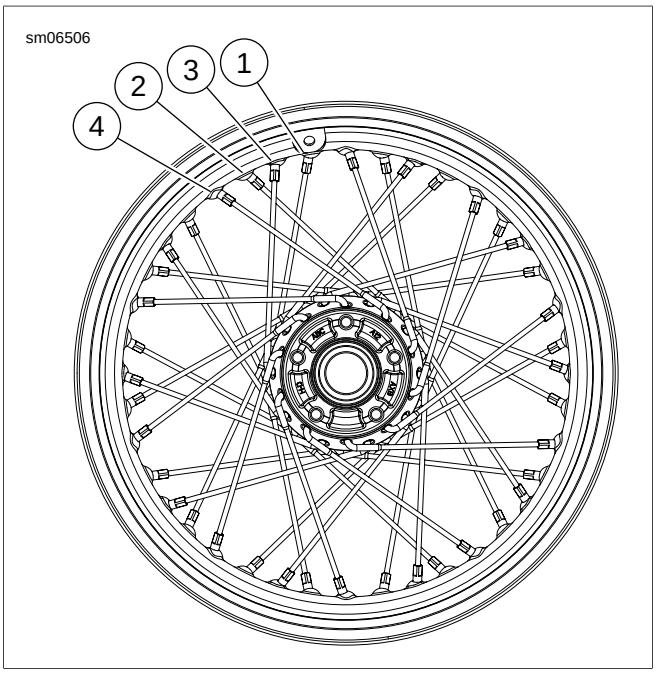


Figure 2-27. Side Valve Rim

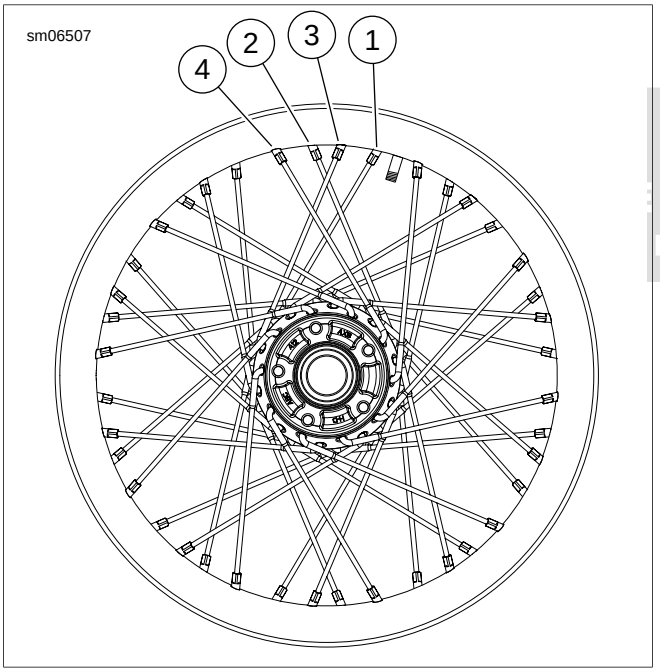


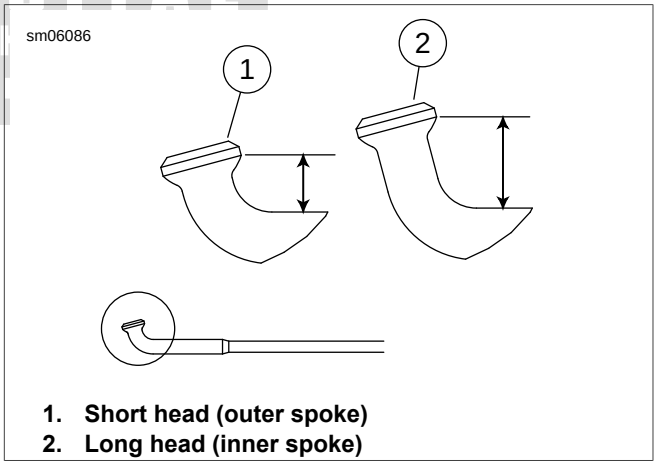
Figure 2-28. Center Valve Rim

WHEEL LACING: STRAIGHT FLANGE HUB, SINGLE HOLE CIRCLE

NOTES

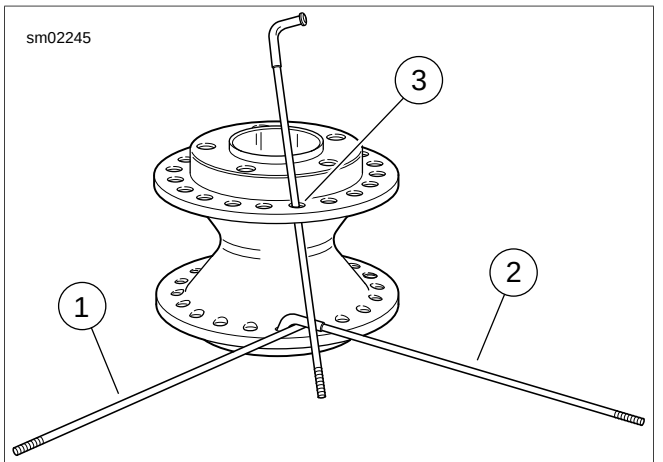
- *See Figure 2-30. The following procedure is valid for laced wheels that use a straight flange, single spoke hole circle hub regardless of rim style or diameter.*
- *The primary brake side of the hub has one or two grooves cut into the disc mounting surface.*

1. See Figure 2-29. Divide spokes into inner and outer groups.
   a. Inner spokes (2) have long heads.
   b. Outer spokes (1) have short heads.
2. Lubricate all spoke threads and nipple shoulders with tire mounting lubricant.
3. Place hub on bench with the primary brake disc side up.
4. Fit the first two spokes.
   a. See Figure 2-30. Insert one outer spoke (1) (short head) into any bottom flange hole and swing it clockwise.
   b. Insert an inner spoke (2) (long head) in the next hole counterclockwise from the outer spoke.
   c. Swing the inner spoke counterclockwise over the outer spoke.
5. Find the hole (3) in the upper flange directly above the first two spokes. Insert a long head inner spoke.
6. Insert all remaining spokes in the upper flange, alternating the inner and outer spokes.
7. Flip the hub (primary brake side down). Install remaining spokes alternating inner and outer spokes.
8. See Figure 2-31. Group all spokes on the upper flange into two bundles of equal numbers. Secure each group with throttle grips.



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

Figure 2-29. Spoke Heads



1. **Outer spoke (short head)**
2. **Inner spoke (long head)**
3. **Hole directly above two spokes**

Figure 2-30. Lacing Single Row Wheel Hub

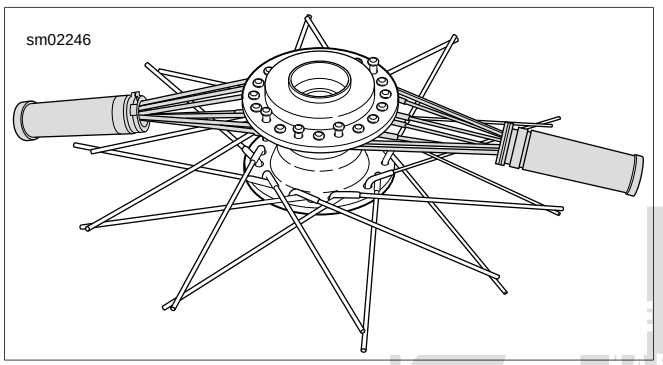


Figure 2-31. Bundling Top Spokes

NOTE

Outer spokes must not cross an outer spoke. Inner spokes must not cross an inner spoke.

9. Angle all lower flange spokes as far as they will go without overlapping a LIKE spoke:
   a. Outer spokes (short head) clockwise.
   b. Inner spokes (long head) counterclockwise.
10. Support the rim on wooden blocks approximately 0.75 in (19 mm) thick.
11. Place the hub and spoke assembly into the rim and centered in the rim.

NOTE

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

12. See Figure 2-32. Beginning with the 2nd hole counterclockwise (1) from valve stem hole, install lower flange outer spokes (short head) in every 4th hole. Loosely install spoke nipples.

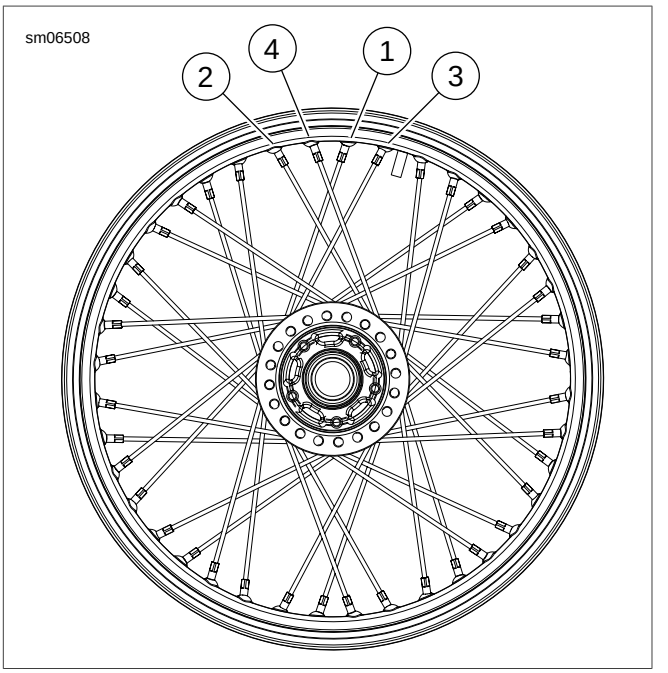


Figure 2-32. 40 Spoke Single Row Straight Flange Hub

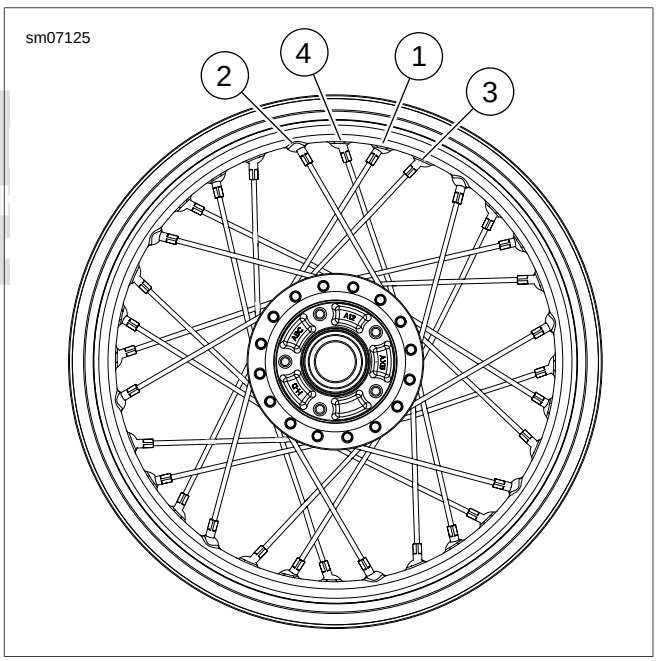


Figure 2-33. 32-Spoke Single Row Straight Flange Hub

13. Beginning with 4th hole counterclockwise (2) from valve stem hole, install lower flange inner spokes (long head) in every 4th hole. Loosely install spoke nipples. Each inner spoke will cross four outer spokes.
14. See Figure 2-34. Carefully release each top bundle and fan the spokes around the rim edge.

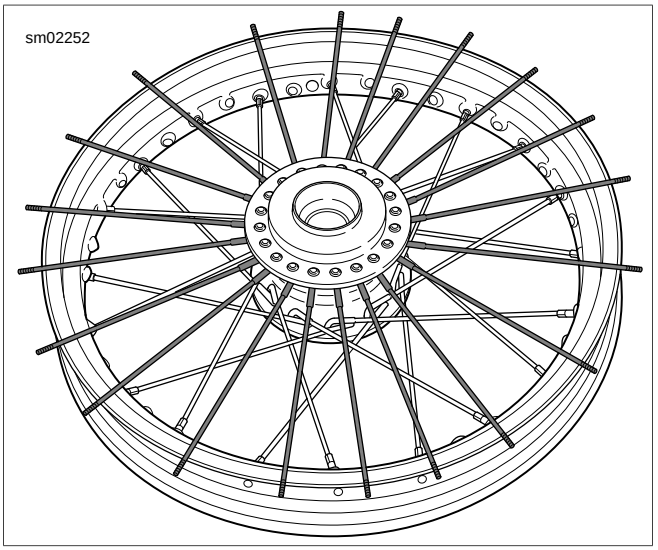


Figure 2-34. Fanning Top Flange Spokes

15. Rotate all the upper flange inner spokes (long head) clockwise, one at a time, leaving the outer spokes (short head) resting on the rim.

NOTE

Be sure outer spokes do not fall under the inner spoke and become trapped.

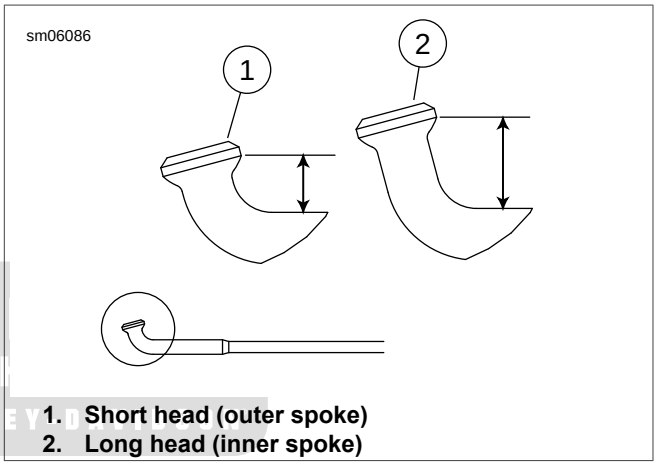
16. See Figure 2-32. Beginning with the first hole counterclockwise (3) from valve stem hole, install upper flange inner spokes (long head) in every 4th hole.
17. Rotate outer spokes (short head) counterclockwise and install in the remaining holes (4) in the rim.
18. Verify spoke heads are seated. Evenly hand-tighten spoke nipples until snug. Only tighten until slack is removed.
19. Adjust rim offset and true the wheel. Tighten the nipples to specification. See 2.7 CHECKING AND TRUING WHEELS.

WHEEL LACING: STRAIGHT FLANGE HUB, DUAL HOLE CIRCLE

NOTES

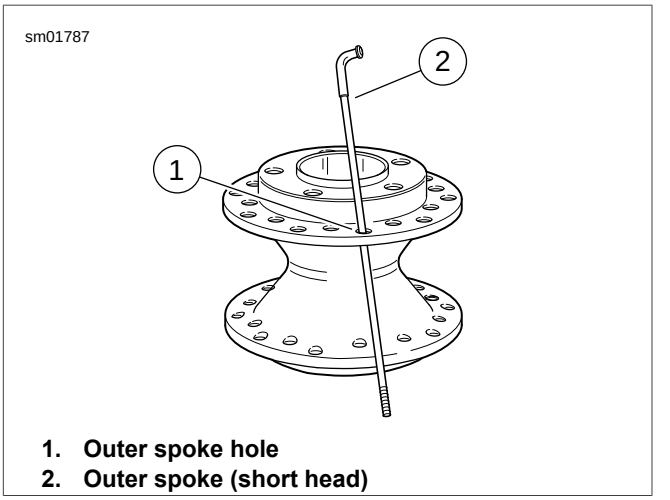
- *See Figure 2-36. This procedure is valid for 40-spoke wheels that use a straight flange, dual spoke hole circle hub regardless of rim style or diameter.*
- *The primary brake side of the hub has one or two grooves cut into the disc mounting surface.*

1. See Figure 2-35. Divide spokes into inner and outer groups.
   a. Inner spokes (2) have long heads.
   b. Outer spokes (1) have short heads.
2. Lubricate all spoke threads and nipple shoulders with tire mounting lubricant.
3. Place hub on bench with the primary brake disc side up.
4. Install first two spokes:
   a. See Figure 2-36. Insert one outer spoke (short head) into any upper flange outer hole. Swing it counterclockwise.
   b. Insert an inner spoke (long head) in the next hole counterclockwise from the outer spoke.
   c. Swing the inner spoke clockwise under the outer spoke.
5. Insert all remaining spokes in the upper flange, alternating the inner and outer spokes.
6. Flip the wheel hub (primary brake side down) and install remaining spokes in the same manner, again alternating inner and outer spokes.
7. See Figure 2-37. Group all spokes on the upper flange into two bundles of ten. Secure each group with throttle grips.



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

Figure 2-35. Spoke Heads



1. Outer spoke hole
2. Outer spoke (short head)

Figure 2-36. Lacing Dual Row Wheel Hub

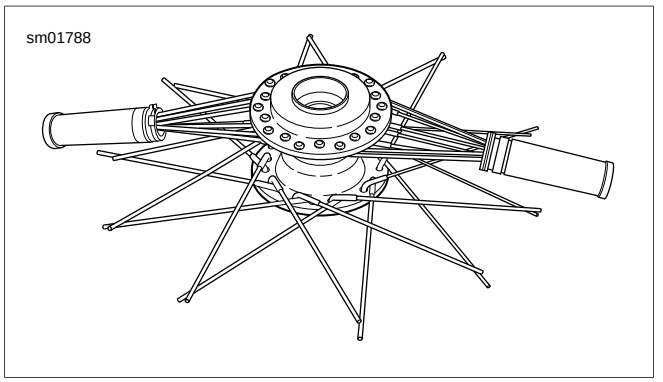


Figure 2-37. Bundling Top Spokes

8. Angle all lower flange spokes as far as they will go without overlapping a LIKE spoke (inner must not cross inner; outer must not cross outer):
   a. Outer spokes (short head) clockwise.
   b. Inner spokes (long head) counterclockwise. All inner spokes lay over outer spokes.
9. Support the rim on wooden blocks approximately 0.75 in (19 mm) thick.
10. Place the hub and spoke assembly into the rim and centered in the rim.

NOTE

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

11. See Figure 2-38. Beginning with the 1st hole counterclockwise (1) from valve stem hole, install lower flange outer spokes (short head) in every 4th hole. Loosely install spoke nipples.

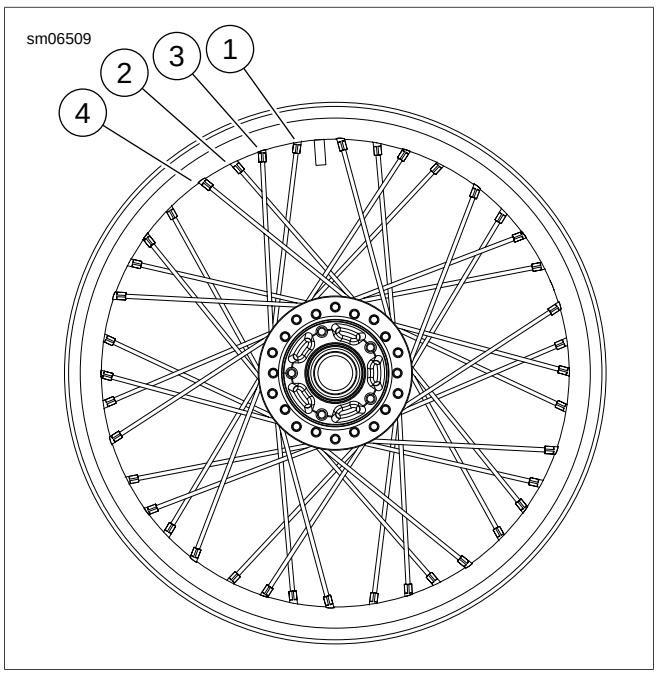


Figure 2-38. Flat Flange Hub, Dual Row

12. Beginning with 3rd hole counterclockwise (2) from valve stem hole, install lower flange inner spokes (long head) in every 4th hole. Loosely install spoke nipples. Each inner spoke will cross four outer spokes.
13. See Figure 2-39. Carefully release each top bundle and fan the spokes around the rim edge.

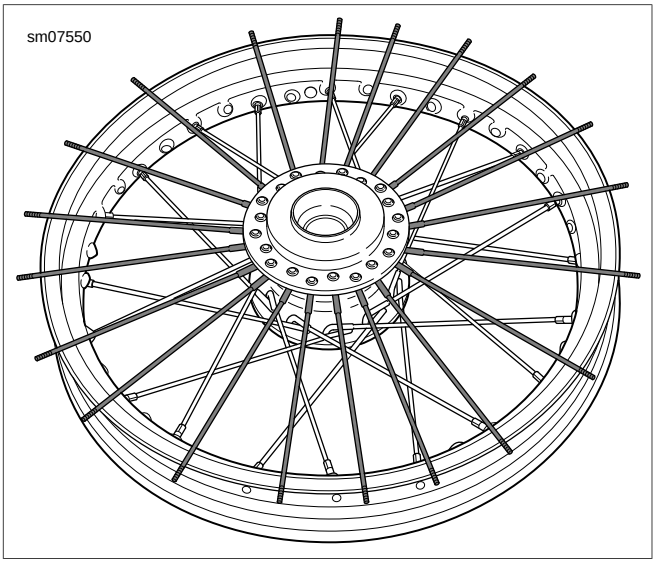


Figure 2-39. Fanning Top Flange Spokes

14. Rotate all the upper flange inner spokes (long head) clockwise, one at a time, leaving the outer spokes (short head) resting on the rim.

NOTE

Be sure outer spokes do not fall under the inner spoke and become trapped.

15. See Figure 2-38. Beginning with the 2nd hole counterclockwise (3) from valve stem hole, install upper flange inner spokes (long head) in every 4th hole.
16. Rotate outer spokes (short head) counterclockwise. Install in the remaining holes (4) in the rim.
17. Verify spoke heads are seated. See 2.7 CHECKING AND TRUING WHEELS.
   a. Evenly hand-tighten spoke nipples until snug.
   b. Only tighten until slack is removed.
   c. Proper torque will be applied when the wheel is trued.
   d. Adjust offset and true the wheel.

CHECKING AND TRUING WHEELS 2.7

CAST WHEEL RUNOUT

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

Wheel Stand

1. Check the wheel bearings before measuring runout. See 2.5 WHEELS, Sealed Wheel Bearings.
2. Install the truing arbor in the wheel hub. Mount the wheel in a WHEEL TRUING AND BALANCING STAND (Part No. HD-99500-80).
3. Tighten the arbor nuts so that the hub will turn on its bearings.
4. Mount a gauge rod or a dial indicator to the base of the truing stand.

Lateral Runout

1. See Figure 2-40. Point the gauge rod or indicator at the rim bead flange.
2. Rotate the wheel and measure the lateral distance at several locations around the rim. Replace the wheel if lateral runout exceeds specification. Refer to Table 2-14.

Radial Runout

1. See Figure 2-41. Point the gauge rod or indicator at the rim tire bead safety hump.
2. Rotate the wheel and measure radial distance at several locations. Replace the wheel if radial runout exceeds specification. Refer to Table 2-14.

Table 2-14. Wheel Rim Runout

RUNOUT	in	mm
Lateral	0.030	0.76
Radial	0.030	0.76

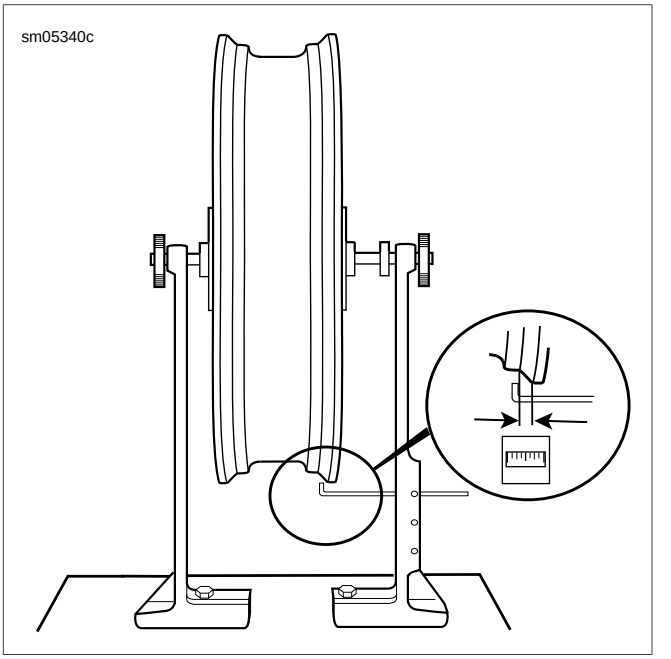


Figure 2-40. Lateral Runout

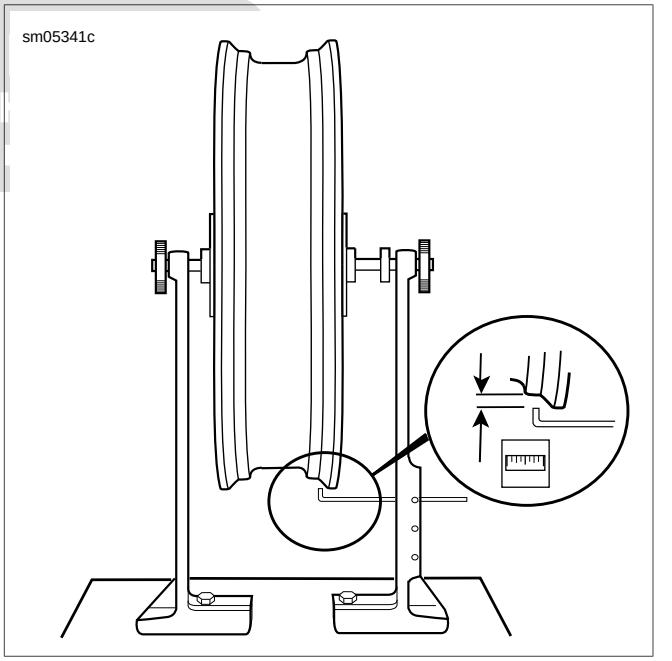


Figure 2-41. Radial Runout

LACED WHEEL RIM OFFSET

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

1. See Figure 2-42. 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.

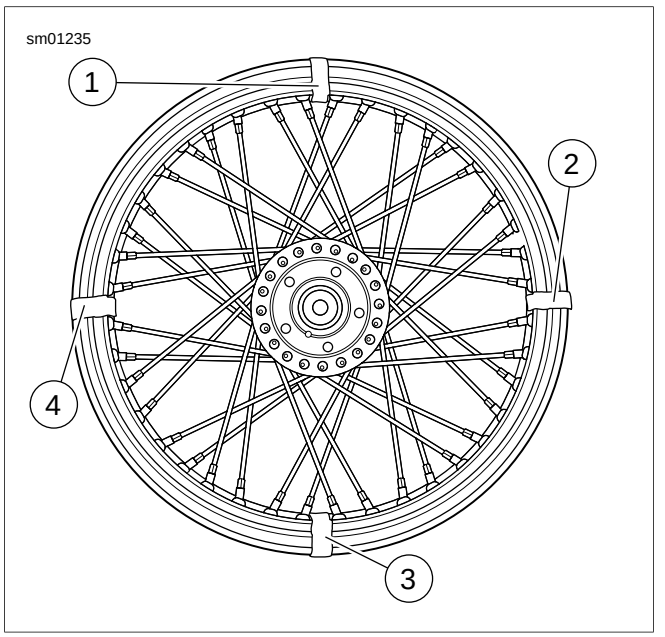


Figure 2-42. Marking Spoke Groups

2. See Figure 2-43. 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 has 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 2-44. Measure the distance from the straightedge to the location shown, based on rim design, to determine distance A. Refer to Table 2-15.

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 NIPPLE WRENCH (Part No. HD-94681-80). For example: if the **right** side is **less** than specification, **loosen** the two spokes on the hub **right** side. Then **tighten** the two spokes attached to the hub **left** side. Turn all four spokes an equal number of turns until offset is to specification.
6. Repeat the previous step for all groups on the wheel. Verify the offset.
7. True the wheel. See 2.7 CHECKING AND TRUING WHEELS, Truing Laced Wheels.

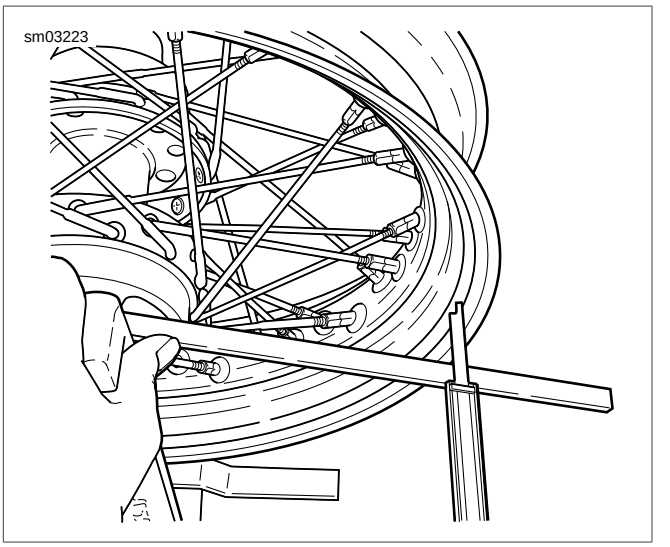
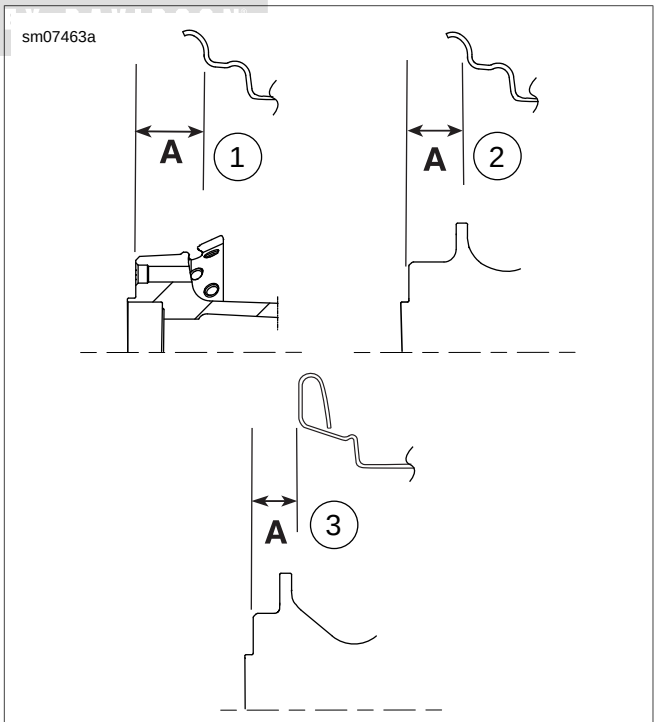


Figure 2-43. Checking Wheel Hub Offset Dimension (typical)

Table 2-15. Laced Wheel Hub Offset Dimensions

RIM			DIMENSION A	
TYPE	NO.*	SIZE	in	mm
Rear	1	16	1.472-1.492	37.39-37.90
Front	2	16	1.139-1.163	28.94-29.55
	3	21	0.837-0.857	18.14-18.90

* See Figure 2-44.



1. **16 in rim, rear**
2. **16 in rim, front**
3. **21 in rim, front**

Figure 2-44. Laced Wheel Hub Offset Dimensions

TRUING LACED WHEELS

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

FASTENER	TORQUE VALUE	
Spoke nipple	55 **in-lbs**	6.2 Nm

NOTES

- *Dial indicators are more accurate than gauge rods.*
- *Perform radial truing before lateral truing.*

Radial Runout

1. See Figure 2-45. With the wheel mounted in WHEEL TRUING AND BALANCING STAND (Part No. HD-99500-80), adjust the truing stand gauge (3) near to the 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.

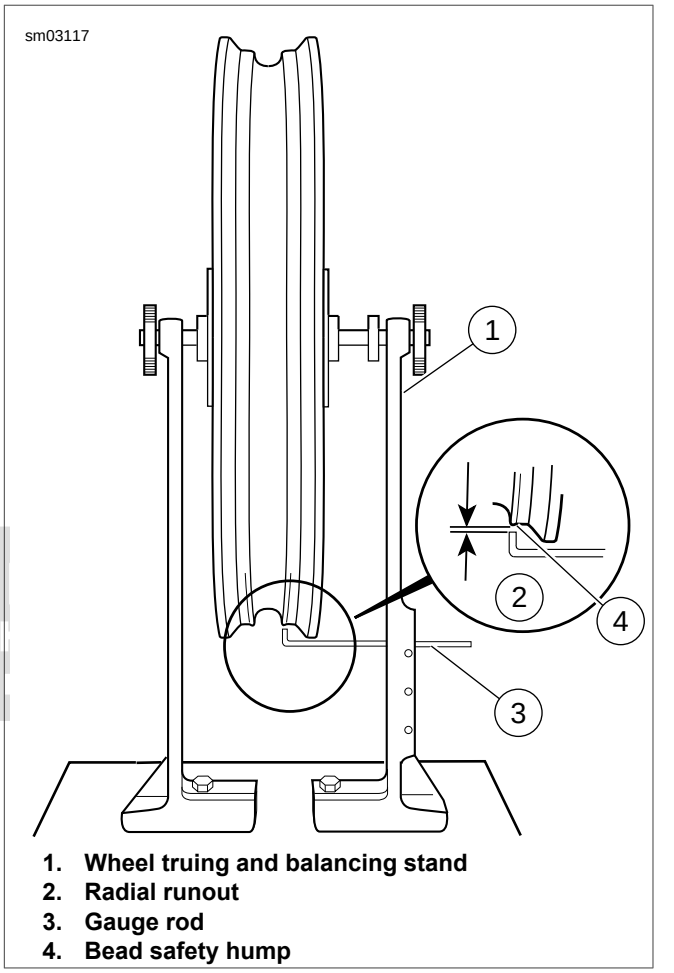
NOTES

- *Always loosen the appropriate spokes, using SPOKE NIPPLE WRENCH (Part No. HD-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 2-16.
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 2-45. Checking Radial Runout

Table 2-16. Spoke Nipple Torque Specification

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

Lateral Runout

NOTE

Dial indicators are more accurate than gauge rods.

1. See Figure 2-46. With the wheel mounted in WHEEL TRUING AND BALANCING 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.

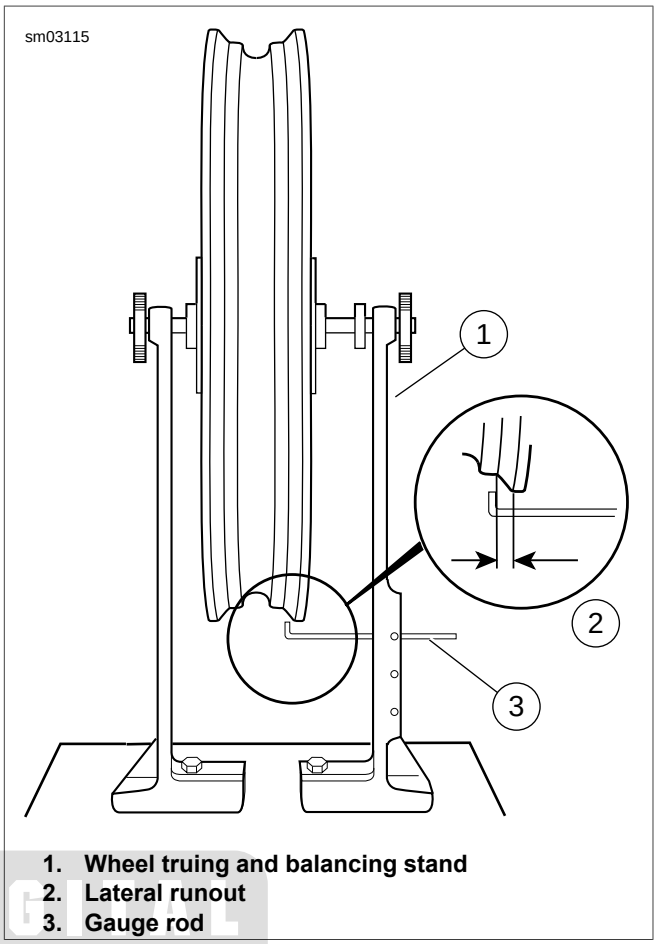
NOTES

- *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 that all spoke nipples are tightened to the specification. Refer to Table 2-16.
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 or rim seal when tire is mounted.

NOTE

After installation, verify the wheel is approximately centered between the fork fender bosses.



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

Figure 2-46. Checking Lateral Runout

DIGITAL TECHNICIAN HARLEY-DAVIDSON®

FRONT BRAKE MASTER CYLINDER/RESERVOIR 2.8

INSPECTION

1. Check fluid level in brake reservoir. If it is low, check for worn pads/disc(s) or leaks in brake system. See 1.16 BRAKE PADS AND DISCS, Inspection.
2. Check brake pads and discs for excessive wear or damage. Replace or repair as necessary.
   a. **Brake pads:** See 1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Front.
   b. **Brake discs:** See 2.5 WHEELS, Front Wheel.
3. Check for leaks in brake lines, banjo fittings, front caliper pistons or bleeder screw. Repair as necessary.
   a. **Brake line:** See 2.12 BRAKE LINES.
   b. **Brake caliper:** See 2.9 FRONT BRAKE CALIPERS.
4. Repeat the bleeding procedure if brakes feel spongy. See 2.14 BLEEDING BRAKES.
5. If brake still does not operate properly, the master cylinder is defective. Replace or repair as necessary.

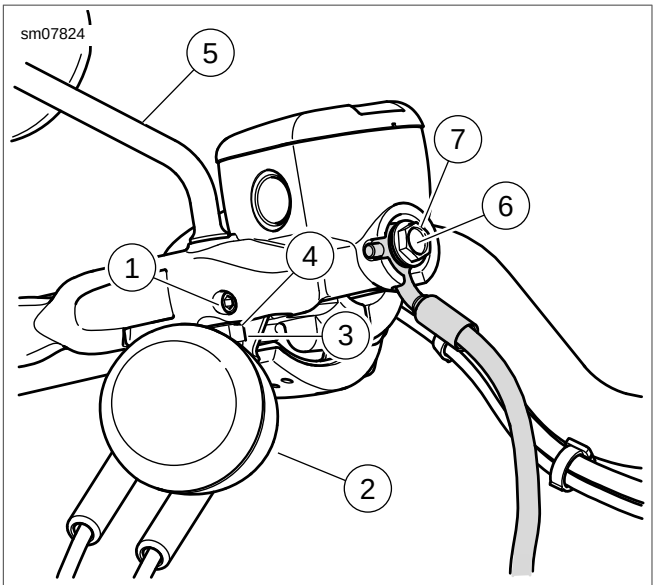
REMOVAL

1. **All models except XL 1200T/X:** See Figure 2-47. Remove turn signal.
   a. Loosen turn signal clamp screw (1).
   b. Remove and support turn signal (2) and wire harness.
2. Remove locknut (3), washer (4) and mirror (5).

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)

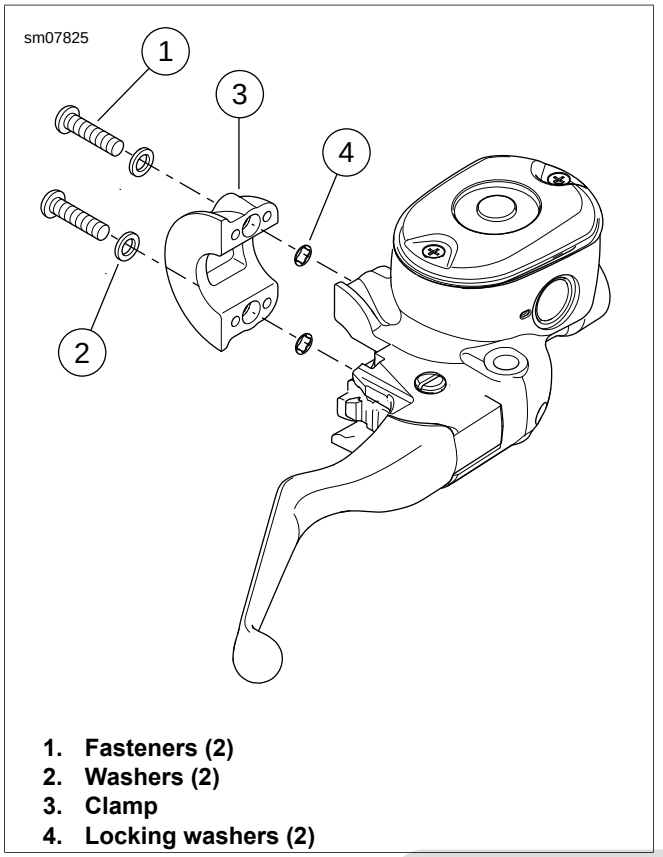
3. Drain brake fluid.
   a. Remove bleeder cap from caliper bleeder screw.
   b. Install a length of 5/16 in (7.9 mm) ID clear plastic tubing over bleeder screw. Place free end in a suitable container.
   c. Open bleeder screw one-half turn.
   d. Remove reservoir cover.
   e. Pump brake hand lever several times to drain brake fluid.
   f. Close bleeder screw.
4. Remove banjo bolt (6) and two sealing washers (7). Discard sealing washers.
5. See Figure 2-48. Remove the screws (1), washers (2) securing the handlebar clamp (3) to the master cylinder housing.
6. Capture the locking washers (4).



1. **Turn signal clamp screw**
2. **Turn signal**
3. **Locknut**
4. **Washer**
5. **Mirror**
6. **Banjo bolt**
7. **Sealing washer (2)**

Figure 2-47. Front Brake Master Cylinder

DIGITAL TECHNICIAN HARLEY-DAVIDSON®



1. **Fasteners (2)**
2. **Washers (2)**
3. **Clamp**
4. **Locking washers (2)**

Figure 2-48. Master Cylinder Handlebar Clamp

BRAKE LEVER

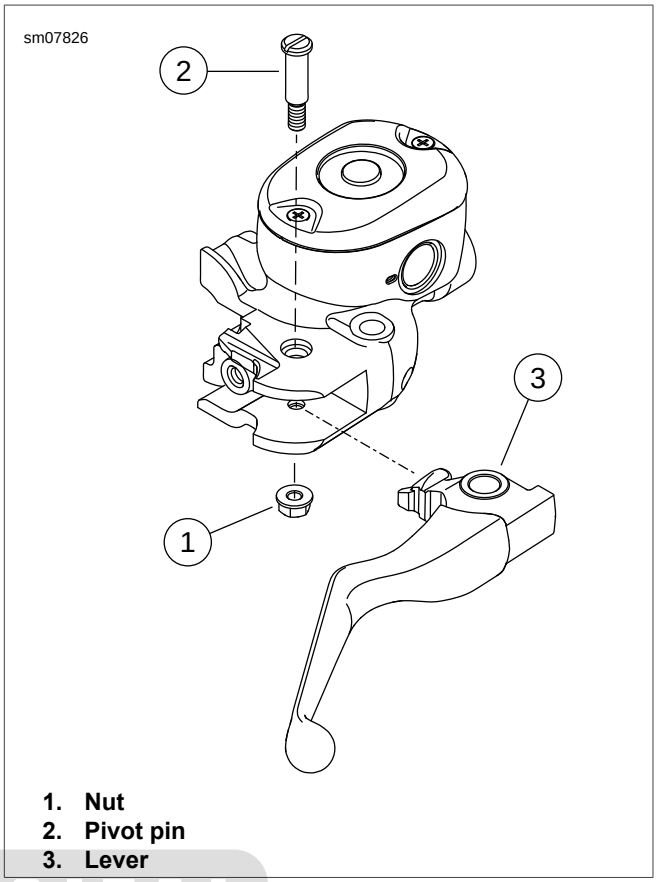
FASTENER	TORQUE VALUE	
Brake lever pivot pin	5-13 **in-lbs**	0.5-1.5 Nm
Brake lever pivot pin nut	44-61 **in-lbs**	4.9-6.9 Nm

Removal

1. See Figure 2-49. Remove the nut (1) and pivot pin (2).
2. Remove the brake lever (3).

Installation

1. See Figure 2-49. Lubrication the brake lever pivot pin hole and bushing with G40 BRAKE GREASE.
2. Install the brake lever (3).
3. Install the pivot pin (2). Tighten to 5-13 **in-lbs** (0.5-1.5 Nm).
4. Install the nut (1). Tighten to 44-61 **in-lbs** (4.9-6.9 Nm).



1. **Nut**
2. **Pivot pin**
3. **Lever**

Figure 2-49. Front Brake Lever

RESERVOIR COVER

FASTENER	TORQUE VALUE	
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm

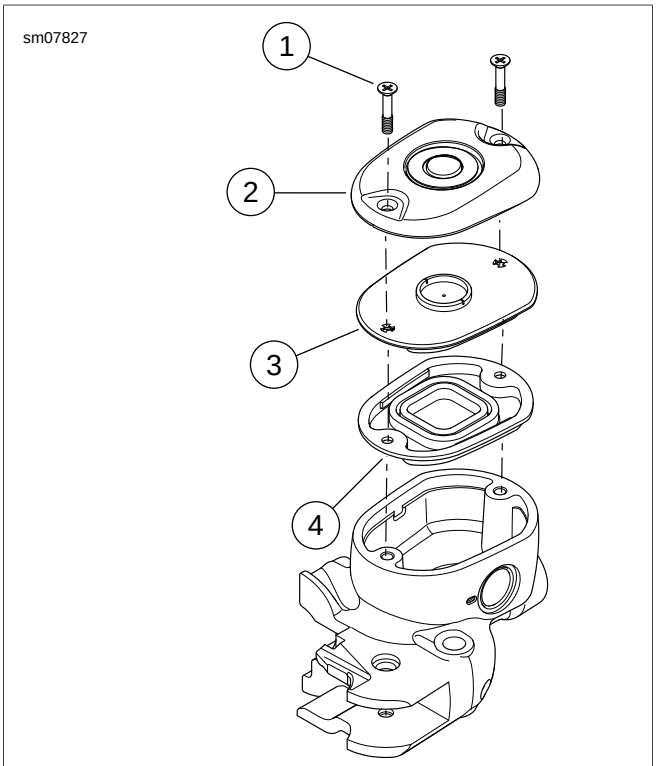
Removal

1. To prevent dirt entering reservoir, clean cover.
2. See Figure 2-50. Remove screws (1) and cover (2).
3. Remove diaphragm plate (3) and diaphragm (4).

Installation

1. Install diaphragm and diaphragm plate.
2. Install cover.
3. Install two cover screws. Tighten to 9-17 **in-lbs** (1.0-2.0 Nm).

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Screw (2)**
2. **Cover**
3. **Diaphragm plate**
4. **Diaphragm**

Figure 2-50. Front Brake Master Cylinder/Reservoir Cover

MASTER CYLINDER

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)

NOTE

To prevent damage, install soft jaw covers on vise.

1. See Figure 2-51. Clamp master cylinder in a vise by mirror mounting boss. Point banjo fitting hole straight down.
2. Remove dust boot. Discard.
3. See Figure 2-52. Press down on end of piston. Remove and discard retaining ring.
4. Remove and discard boot, piston assembly and spring.

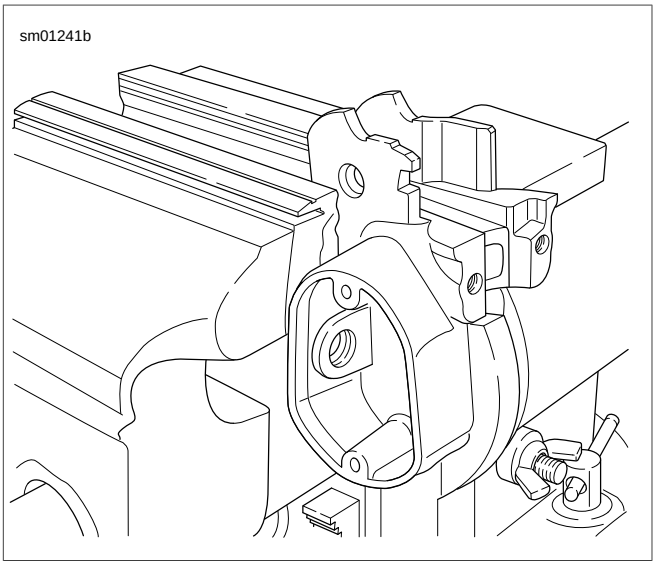


Figure 2-51. Clamping Front Master Cylinder

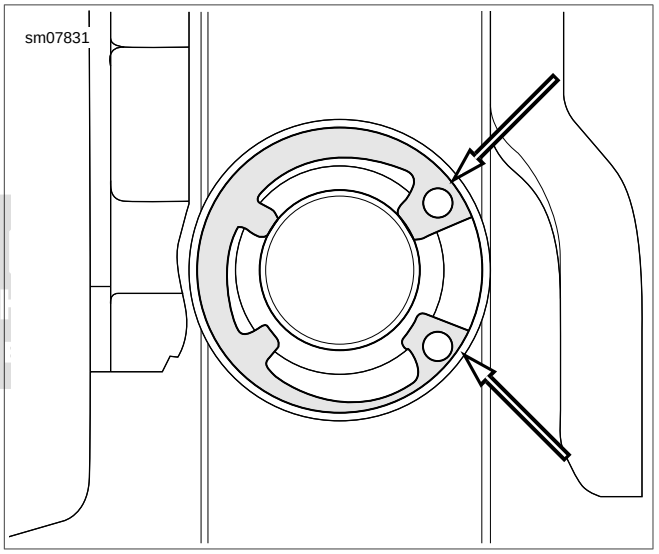


Figure 2-52. Piston Retaining Ring

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)

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)

NOTES

- *Do not use a wire or similar tool to clean drilled passages in bottom of reservoir.*
- *Do not contaminate with mineral oil or other solvents.*

1. Clean master cylinder/reservoir.
   a. Clean components with denatured alcohol.
   b. Blow out drilled passages and piston bore with low pressure compressed air from a clean air supply.
   c. Wipe parts dry with a clean, lint-free cloth.
2. Inspect parts. Replace or repair as necessary.
   a. Inspect piston bore for scoring, pitting or corrosion.
   b. Inspect outlet port that mates with banjo fitting. This surface is a critical sealing surface.
   c. Inspect diaphragm for damage.

Installation

NOTES

- *There are three master cylinder bore sizes: 12.7 mm, 14 mm and 15.87 mm. Install master cylinder with **new** parts from the correct service repair kit.*
- *Use only CCI #20 BRAKE GREASE to lubricate master cylinder bores, pistons, primary cups and secondary cups.*
- *Use only G40M BRAKE GREASE on end of piston that contacts brake lever.*
- *To prevent damage, install soft jaw covers on vise.*

1. See Figure 2-51. Clamp master cylinder in a vise with banjo fitting hole pointing straight down.

NOTE

If necessary, assemble secondary cup to piston. The wide end of secondary cup faces master cylinder.

2. See Figure 2-53. Coat piston bore of master cylinder housing, piston assembly (3, 5) and primary cup (4) with CCI #20 BRAKE GREASE.
3. Slide large end of spring (6) into master cylinder bore. Seat spring against counter-bore at bottom of cylinder.
4. **ABS single disc/all dual disc:** Install piston.
   a. Slide primary cup over spring.
   b. Slide piston assembly into cylinder.
5. **Non-ABS single disc:** Slide piston assembly (5) into cylinder.

⚠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

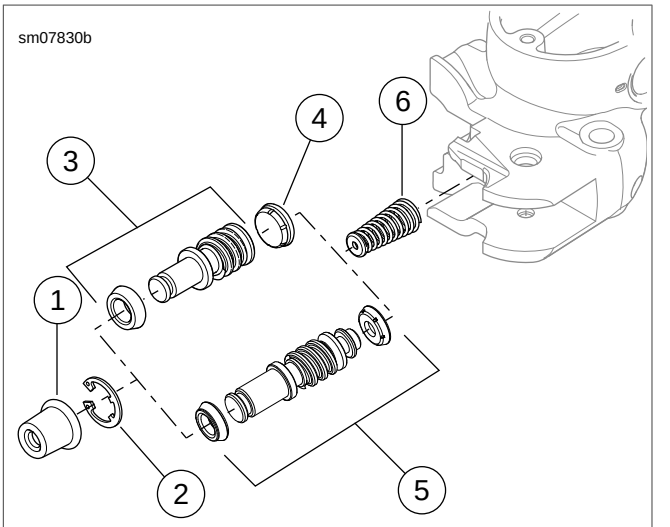
Use correct retaining ring pliers and correct tips. Verify that tips are not excessively worn or damaged.

6. Press down on piston. Install retaining ring (2). Verify that retaining ring is seated in groove.

NOTE

Large lip fits inside cylinder. Work small lip of boot into groove in piston.

7. Install dust boot (1).
8. Apply approximately 0.1 g G40M BRAKE GREASE to end of piston.



1. **Dust boot**
2. **Retaining ring**
3. **Piston: ABS single disc/all dual disc**
4. **Primary cup**
5. **Piston: non-ABS single disc**
6. **Spring**

Figure 2-53. Master Cylinder Rebuild Kits

INSTALLATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
Brake master cylinder clamp, front, screw	108-132 **in-lbs**	12.2-14.9 Nm
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm
Mirror stem locknut	96-144 **in-lbs**	10.9-16.3 Nm
Turn signal, front, set screw	96-120 **in-lbs**	10.9-13.6 Nm

1. Install brake lever.
2. Position brake lever/master cylinder assembly inboard of switch housing assembly.
3. See Figure 2-54. Engage tab of stop lamp switch (1) on lower switch housing in slot (2) at top of brake lever bracket.
4. Align holes in handlebar clamp with master cylinder housing. Start two screws with washers.

5. Beginning with top screw, tighten both screws to 108-132 **in-lbs** (12.2-14.9 Nm).

NOTICE

Avoid leakage. Be sure gaskets, banjo bolt(s), brake line and master cylinder bore are clean and undamaged before assembly. (00322a)

6. See Figure 2-55. Install brake line banjo fitting.
   a. Support a **new** sealing washer on each side of brake line banjo fitting.
   b. Insert banjo bolt through sealing washers and fitting.
   c. Thread bolt into master cylinder housing.
   d. Tighten to 14-18 ft-lbs (19.0-24.4 Nm).

⚠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)

NOTES

- *If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.*
- *Cover handlebar switches with a shop towel before adding brake fluid. Spilling brake fluid on handlebar switches can render them inoperative.*
- *Do not use sight glass (2) to determine maximum fluid level. Add DOT 4 BRAKE FLUID to level even with ridge inside reservoir, about 1/4 in (6.35 mm) below top edge.*
- *Fill master cylinder with DOT 4 BRAKE FLUID from a sealed container.*
- *Do not overfill reservoir.*

7. Fill and bleed brakes. See 2.14 BLEEDING BRAKES.

⚠WARNING

When any hydraulic brake component, line or connection is loosened or replaced on an ABS motorcycle, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to properly bleed the brake system could adversely affect braking, which could result in death or serious injury. (00585c)

8. **ABS models:** Use DIGITAL TECHNICIAN II (Part No. HD-48650) to verify that system is bled. Perform "ABS Service" procedure in "Tool Box" menu.

NOTE

***XL 1200X:** Install mirrors below handlebar controls.*

9. See Figure 2-56. Install mirror.
   a. Install locknut and washer.
   b. Adjust mirrors as necessary.
   c. Lay a protective cover over fuel tank.
   d. **XL 1200X:** Slowly turn handlebar lock-to-lock. Verify that mirror does not strike fuel tank.
   e. Tighten locknut to 96-144 **in-lbs** (10.9-16.3 Nm).

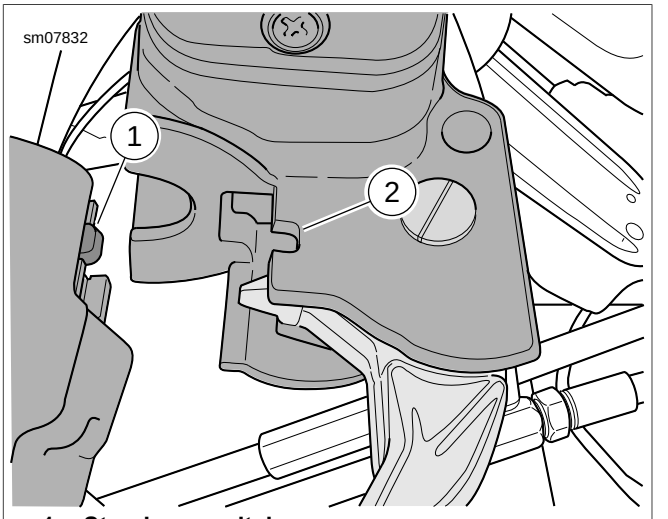
10. **All Models except XL 1200T/X:** See Figure 2-57. Install turn signal.
    a. Insert turn signal (2).
    b. Start set screw (1) to capture turn signal.
    c. Face lens forward.
    d. Lay a protective cover over fuel tank.
    e. Slowly turn handlebar lock-to-lock. Verify that turn signal does not strike fuel tank.
    f. Tighten set screw to 96-120 **in-lbs** (10.9-13.6 Nm).

11. Check operation of rear lamps.

⚠WARNING

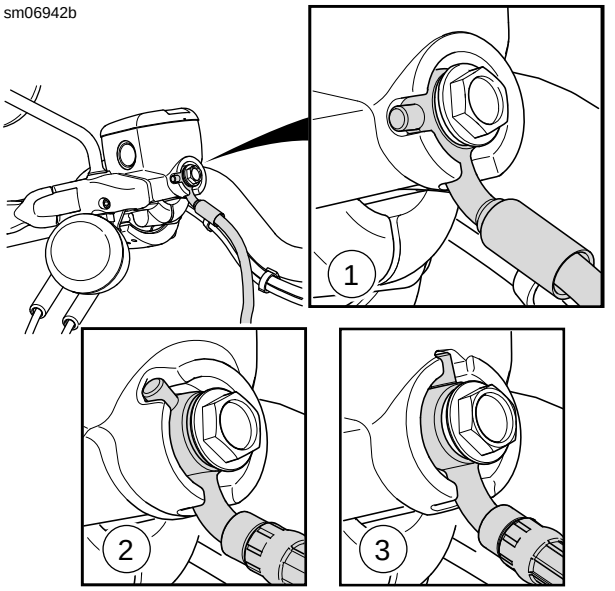
After repairing the brake system, test brakes at low speed. If brakes are not operating properly, testing at high speeds can cause loss of control, which could result in death or serious injury. (00289a)

12. Test brakes.



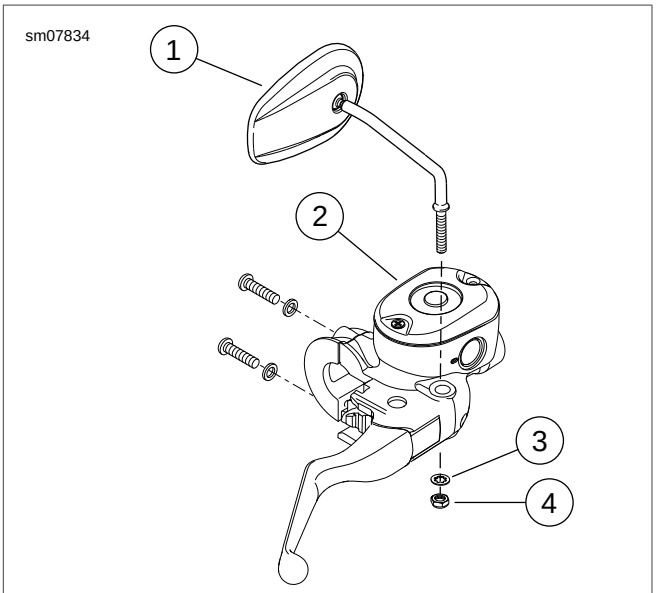
1. **Stop lamp switch**
2. **Bracket slot**

Figure 2-54. Brake Lever Bracket to Switch Housings



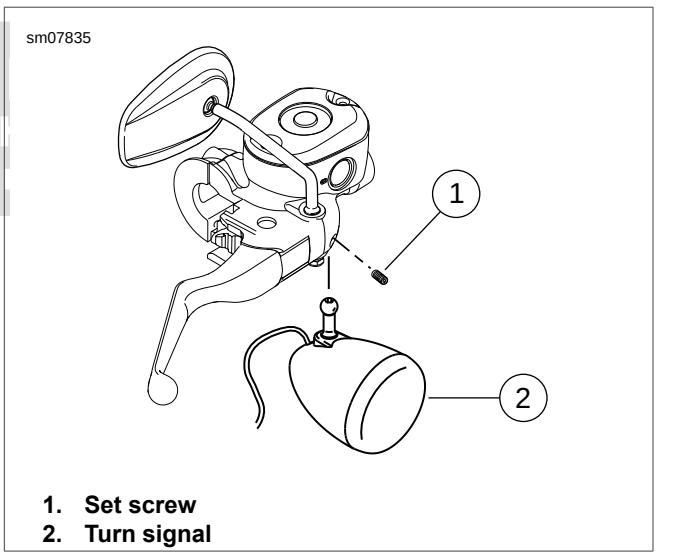
1. ABS single disc
2. Non-ABS single disc
3. ABS and non-ABS dual disc

Figure 2-55. Banjo Fitting Pegs



1. Mirror
2. Master cylinder/reservoir
3. Lockwasher
4. Locknut

Figure 2-56. Mirror



1. Set screw
2. Turn signal

Figure 2-57. Turn Signal: XL Models except XL 1200T/X

FRONT BRAKE CALIPERS 2.9

REMOVAL

⚠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)

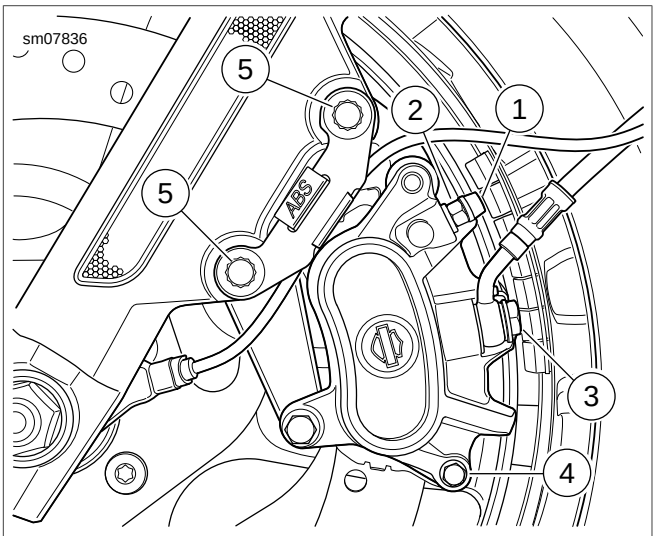
NOTICE

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)

NOTES

- *To replace brake pads, do not remove front brake calipers from caliper mounting brackets. See 1.16 BRAKE PADS AND DISCS.*
- *Carefully remove brake line components to prevent damage to banjo bolt seating surfaces.*
- *If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.*

1. Drain brake fluid.
   a. See Figure 2-58. Remove bleeder screw cap (1) from bleeder screw (2).
   b. Install end of a length of 5/16 in (7.9 mm) ID clear plastic tubing over bleeder screw. Place free end in a suitable container.
   c. Open bleeder screw one-half turn.
   d. Pump brake hand lever repeatedly to drain brake fluid.
   e. Close bleeder screw.
2. Remove banjo bolt (3) and sealing washers to detach front brake line from caliper. Discard sealing washers.
3. Loosen, but do not remove, brake pad pin (4).
4. Remove both mounting bolts (5).
5. To disengage from brake disc, pull caliper and mounting bracket rearward.



1. **Cap**
2. **Bleeder screw**
3. **Banjo bolt**
4. **Pad pin**
5. **Mounting bolt (2)**

Figure 2-58. Front Brake Caliper

DISASSEMBLY

1. See Figure 2-59. Remove brake pad pin (11) and brake pads (13, 14, 15).
2. Slide brake caliper off mounting bracket (2).
3. Remove pad spring (12). Do not remove bleeder screw (10).
4. Install a discarded brake pad with friction material against back of the caliper and backplate facing pistons.
5. To hold brake pad in place, loosely install pad pin.

⚠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)

⚠CAUTION

When removing piston with compressed air, piston can develop considerable force and fly out of caliper bore. Keep hands away from piston to avoid possible injury. (00530b)

NOTE

Do not damage banjo bolt sealing surface or threads. Use an air nozzle with a rubber tip.

6. Apply low pressure compressed air through banjo bolt hole to force pistons (7) from bores.
7. Remove pad pin and brake pad.

NOTE

If necessary, gently wiggle pistons.

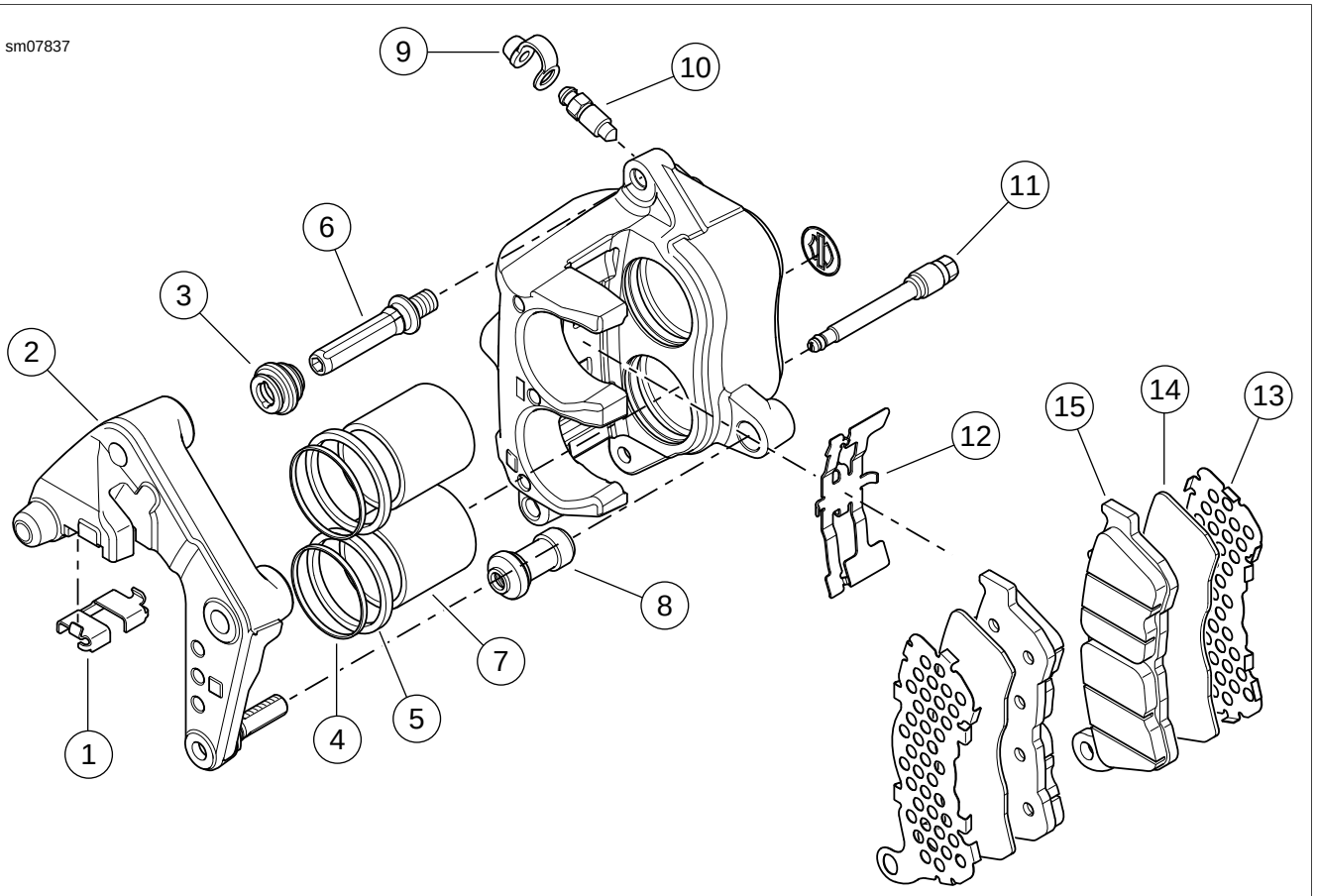
8. Remove pistons by hand.

NOTE

Damaged piston bores leak. Do not use metal objects to remove or install objects from piston bores. Use only a wooden toothpick to prevent damage to pistons, seals and bores.

9. Use a wooden toothpick to remove dust seal (5) and piston seal (6). Discard seals.

10. If necessary, remove bleeder screw.



1. **Retainer clip**
2. **Bracket**
3. **Pin boot**
4. **Piston seal (2)**
5. **Dust seal (2)**
6. **Bolt pin**
7. **Piston (2)**
8. **Bushing boot**
9. **Bleeder screw cap**
10. **Bleeder screw**
11. **Pad pin**
12. **Pad spring**
13. **Pad retainer(2)**
14. **Insulator (2)**
15. **Brake pad (2)**

Figure 2-59. Front Brake Caliper

CLEANING AND INSPECTION

1. Inspect brake pads and brake disc(s). See 1.16 BRAKE PADS AND DISCS, Inspection.
   a. If necessary, replace brake pads. See 1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Front.
   b. If necessary, replace brake disc. See 2.5 WHEELS, Front Wheel.
2. Wipe old lubrication from inside of caliper pin boot and caliper bushing boot with a soft, clean cloth.
3. Clean all other rubber parts with DOT 4 BRAKE FLUID.

⚠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)

4. Clean all metal parts with denatured alcohol.
5. Wipe parts dry with a clean, lint-free cloth.

⚠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)

NOTE

Do not use a wire or similar instrument to clean drilled passages.

6. Blow out drilled passages and piston bore with low pressure compressed air from a clean air supply.
7. Inspect all components. Replace as necessary.
   a. Check pistons for pitting, scratching or corrosion on outside surfaces.

   NOTE

   Do not hone bores.

   b. Inspect caliper piston bores. If bores show pitting or corrosion, replace caliper.
   c. Inspect caliper bolt pin. If damaged or worn, replace entire brake caliper assembly.
   d. Inspect caliper bushing boot and caliper pin boot. Replace as necessary.
   e. Replace all seals after disassembly.
8. Measure pad pin wear.
   a. Measure pad pin diameter (A) across an unworn section.
   b. Measure pad pin diameter (B) across visible grooves or wear.
   c. Subtract B from A. If wear is out of specification, replace pad pin. Refer to Table 2-17.

Table 2-17. Pad Pin Wear: Specifications

PAD PIN	in	mm
Wear (max)	0.011	0.28

ASSEMBLY

FASTENER	TORQUE VALUE	
Brake caliper bleeder screw	35-61 **in-lbs**	3.9-6.9 Nm
Brake pad pin	131-173 **in-lbs**	14.8-19.5 Nm

Pistons

NOTE

Use ONLY KS62F assembly grease for lubrication.

1. Lubricate following parts with a light coat of KS62F silicone grease from service parts kit. All other surfaces must be dry.
   a. Nose radius of pistons.
   b. All surfaces of piston seals and dust seals.

NOTE

Damaged piston bores leak. Do not use metal objects to remove or install objects from piston bores. Use only a wooden toothpick to prevent damage to pistons, seals and bores.

2. Install a **new** piston seal and a **new** dust seal into each piston bore.
3. By hand, carefully insert pistons, nose radius first, into caliper bores. If resistance is felt, remove pistons. Check if seals are fully seated in grooves.
4. If removed, install bleeder screw. Tighten bleeder screw to 35-61 **in-lbs** (3.9-6.9 Nm).
5. See Figure 2-60. Install pad spring in channel. Press firmly into place.

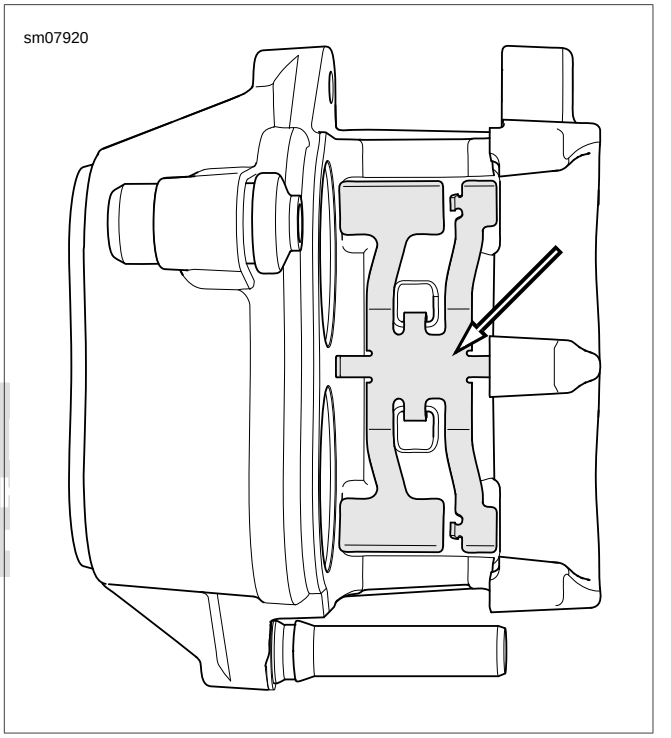
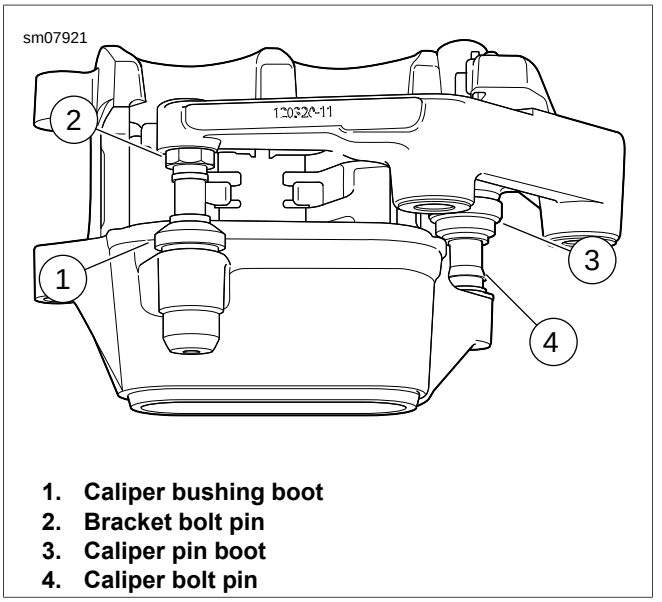


Figure 2-60. Caliper Pad Spring

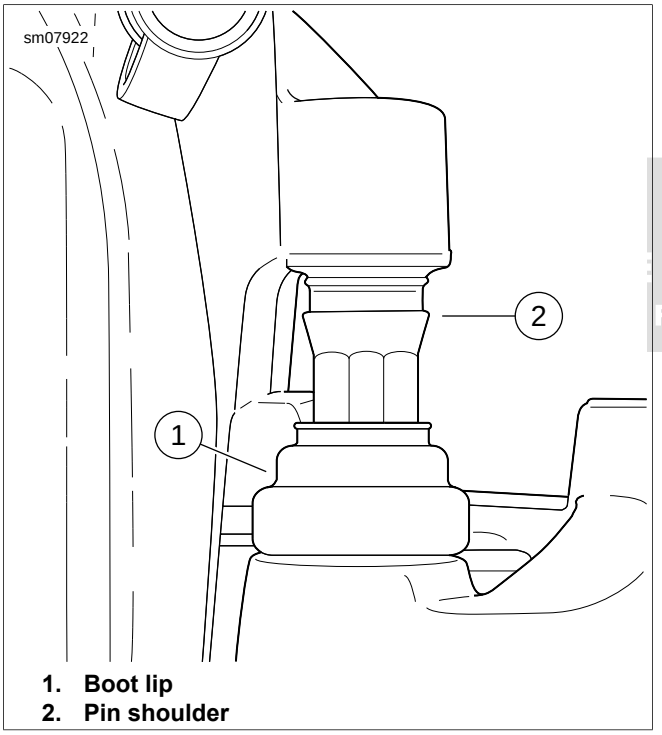
Brake Caliper to Mounting Bracket

1. See Figure 2-59. Verify that the retainer clip (1) is snapped onto mounting bracket (2).
2. Apply approximately 0.4 g of G40M BRAKE GREASE inside caliper bushing boot (8) and caliper pin boot (3).
3. See Figure 2-61. Apply G40M BRAKE GREASE inside boot lip to prevent sticking between boots and bolt pins.
4. Assemble brake caliper and mounting bracket, carefully sliding bolt pins into boots.
5. See Figure 2-62. Slide brake caliper all way onto mounting bracket until boot lips (1) fit over tapered shoulders (2) of bolt pins.



1. **Caliper bushing boot**
2. **Bracket bolt pin**
3. **Caliper pin boot**
4. **Caliper bolt pin**

Figure 2-61. Caliper Pins and Boots



1. **Boot lip**
2. **Pin shoulder**

Figure 2-62. Pins Shoulder and Boot Lips

Brake Pads

1. Install piston side brake pad.
   a. Slide pad mounting tab to rear.
   b. Press pad against pistons.
   c. See Figure 2-63. Align pad spring feet against pad spring.
   d. Press down to allow pad pin to pass though pad pin hole.
2. Install opposite brake pad.
   a. Fit mounting tab under retainer clip.
   b. Press pad against mounting bracket.
   c. Press against pad spring to align with pad pin.
   d. Install pad pin.
3. Tighten pad pin to 131-173 **in-lbs** (14.8-19.5 Nm).

NOTES

If pad pin does not fit, check following:

- *The pads must be a set. Do not use two identical pads.*
- *Pad spring must be correctly oriented.*
- *Pad mounting tabs must be fully seated in mounting bracket slot.*
- *Before pad pin is installed, pads must be pushed tight up against pad spring.*

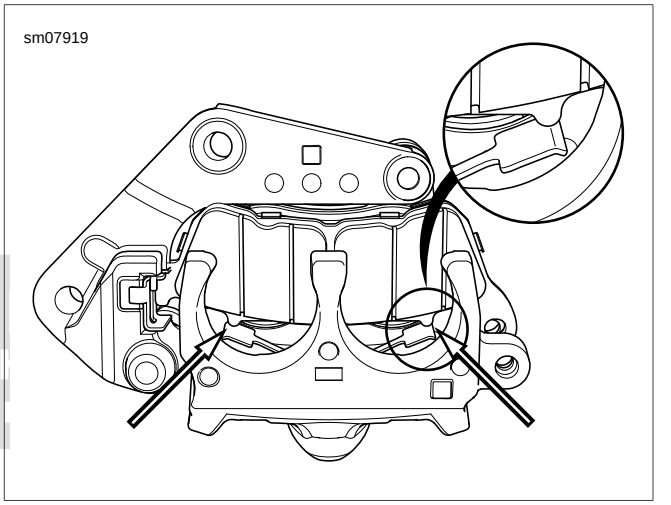


Figure 2-63. Pad Spring Feet

INSTALLATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
Brake caliper, front, mounting bolt	28-38 ft-lbs	38.0-51.6 Nm
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm

⚠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

If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.

1. See Figure 2-64. Place brake caliper (1) and mounting bracket (2) over brake disc with bleeder screw (3) facing upwards.

NOTE

***ABS models:** Position WSS wire clip bracket over mounting holes.*

2. Install mounting bolts (4) into mounting holes on fork leg. Tighten to 28-38 ft-lbs (38.0-51.6 Nm).

NOTICE

Avoid leakage. Be sure gaskets, banjo bolt(s), brake line and caliper bore are clean and undamaged before assembly. (00321a)

3. Install brake line banjo fitting (5).
   a. Support a **new** sealing washer on each side of brake line banjo fitting.
   b. Insert banjo bolt through sealing washers and fitting.
   c. Thread banjo bolt into master cylinder housing.
   d. Rotate banjo fitting clockwise until it contacts positive stop.
   e. Tighten to 14-18 ft-lbs (19.0-24.4 Nm).

NOTES

- *Do not use sight glass to determine maximum fluid level. Only read fluid level in sight glass as an indicator that fluid level is low.*
- *Cover handlebar switches with a shop towel before adding brake fluid to reservoir. Spilling brake fluid on handlebar switches can render them inoperative.*
- *Use only DOT 4 BRAKE FLUID from a sealed container.*
- *Do not overfill reservoir.*
- *Do not reuse old brake fluid.*

4. Check operation of rear lamps.
5. Bleed brake system. See 2.14 BLEEDING BRAKES.
6. Fill brake fluid reservoir with DOT 4 BRAKE FLUID to full level ridge around the top of the reservoir.

⚠WARNING

When any hydraulic brake component, line or connection is loosened or replaced on an ABS motorcycle, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to properly bleed the brake system could adversely affect braking, which could result in death or serious injury. (00585c)

7. **ABS models:** Use DIGITAL TECHNICIAN II (Part No. HD-48650) to verify operation of brakes. Perform "ABS Service" procedure in "Tool Box" menu.

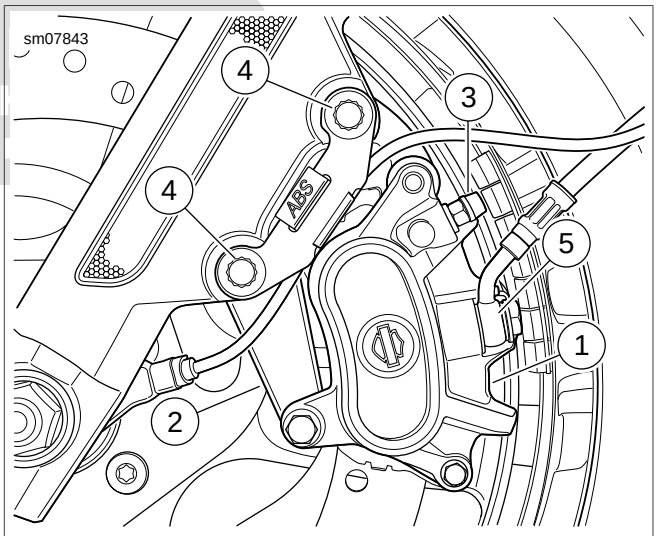
⚠WARNING

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)

NOTE

*Avoid making hard stops for first 100 mi (160 km). Allow **new** pads to become conditioned to brake discs.*

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



1. **Brake caliper**
2. **Mounting bracket**
3. **Bleeder screw**
4. **Mounting bolt (2) (12 pt/10 mm)**
5. **Banjo fitting**

Figure 2-64. Front Caliper Assembly

REAR BRAKE MASTER CYLINDER/RESERVOIR 2.10

INSPECTION

1. If the fluid level in brake reservoir is low, check for worn pads/disc(s) or leaks in brake system.
2. Check rear brake pads and disc for excessive wear or damage. See 1.16 BRAKE PADS AND DISCS, Inspection.
   a. **Brake pads:** See 1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Rear.
   b. **Brake discs:** See 2.5 WHEELS, Rear Wheel.
3. Check for leaks in brake lines, around banjo fittings or brake caliper pistons or bleeder screw. Repair as necessary.
   a. **Non-ABS brake line:** See 2.12 BRAKE LINES, Rear Brake Line (Non-ABS).
   b. **ABS brake line:** See 2.12 BRAKE LINES, Rear Master Cylinder to EHCU (ABS) and 2.12 BRAKE LINES, Rear EHCU to Caliper (ABS).
   c. **Brake caliper:** See 2.11 REAR BRAKE CALIPER.
4. Check mechanical brake linkage from brake pedal to master cylinder for damage. Replace or repair as necessary.
   a. **Mid-mount controls:** See 2.39 RIDER FOOT CONTROLS: MID-MOUNT.
   b. **Forward controls:** See 2.40 RIDER FOOT CONTROLS: FORWARD.
5. Repeat the bleeding procedure if brakes feel spongy. See 2.14 BLEEDING BRAKES.
6. If brake still does not operate properly, brake master cylinder is defective. Replace or repair as necessary.

REMOVAL

⚠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

If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush the affected area with plenty of clear water.

1. Drain brake fluid.
   a. Remove cap from caliper bleeder screw.
   b. Install a length of 5/16 in (7.9 mm) ID clear plastic tubing over bleeder screw. Place free end in a suitable container.
   c. Open bleeder screw 1/2 turn.
   d. Pump the brake pedal several times to drain brake fluid.
   e. Close bleeder screw.
2. Remove exhaust system. See 4.16 EXHAUST SYSTEM.
3. Remove the rider control assembly. See 2.39 RIDER FOOT CONTROLS: MID-MOUNT, Right Footrest and Rear Brake Pedal Assembly or 2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal 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)

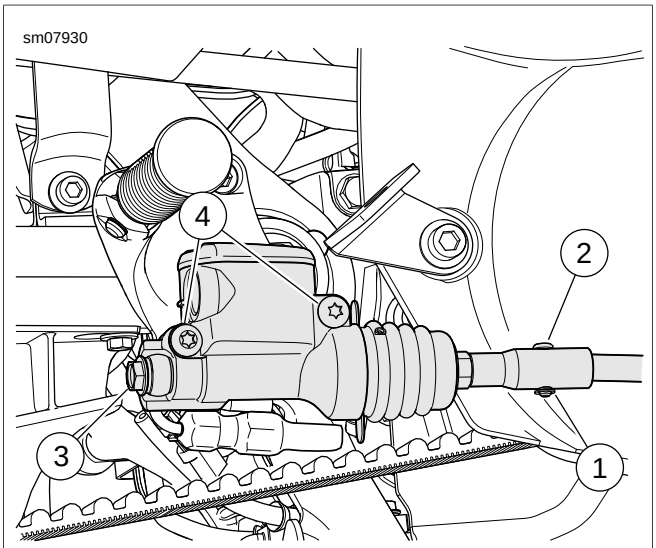
4. See Figure 2-65. Remove retaining ring (1) and brake rod pin (2).
5. Remove banjo bolt (3) and sealing washers. Discard sealing washers.

NOTE

Models without passenger footrests have a master cylinder mounting bracket in place of a footrest mounting bracket.

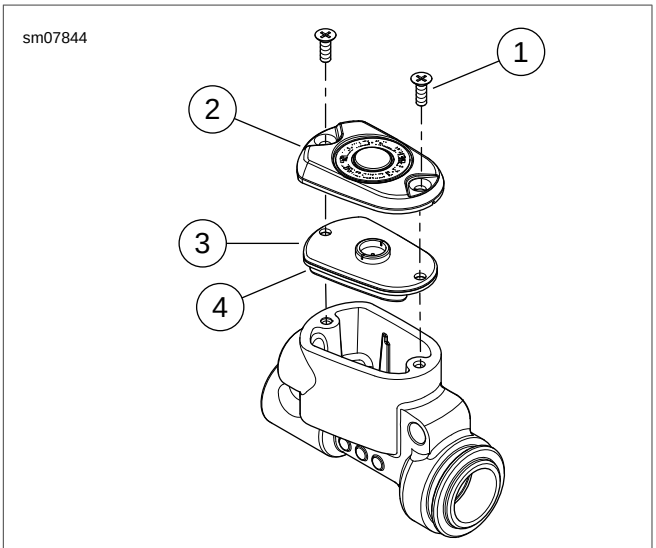
6. Remove two screws (4) and two washers securing master cylinder to passenger footrest mounting bracket.

DIGITAL TECHNICIAN HARLEY-DAVIDSON



1. **Retaining ring**
2. **Pin**
3. **Banjo bolt and sealing washers**
4. **Screws and washers**

Figure 2-65. Rear Master Cylinder/Reservoir



1. **Srews (2)**
2. **Cover**
3. **Diaphragm plate**
4. **Gasket**

Figure 2-66. Cover

COVER

FASTENER	TORQUE VALUE	
Brake master cylinder, rear, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm

Removal

1. See Figure 2-66. Clean cover.
2. Remove cover screws (1).
3. Remove cover (2), diaphragm plate (3) and gasket (4).

Installation

1. Install gasket.
2. Install diaphragm plate.
3. Install cover.
4. Install cover screws. Tighten to 9-17 **in-lbs** (1.0-2.0 Nm).

MASTER CYLINDER REBUILD KIT

FASTENER	TORQUE VALUE	
Brake master cylinder/reservoir, rear, pushrod collar	130-173 **in-lbs**	14.7-19.6 Nm

Disassembly

NOTES

- *Do not disassemble rear master cylinder unless necessary.*
- *Install a **new** rebuild kit when unit is reassembled.*

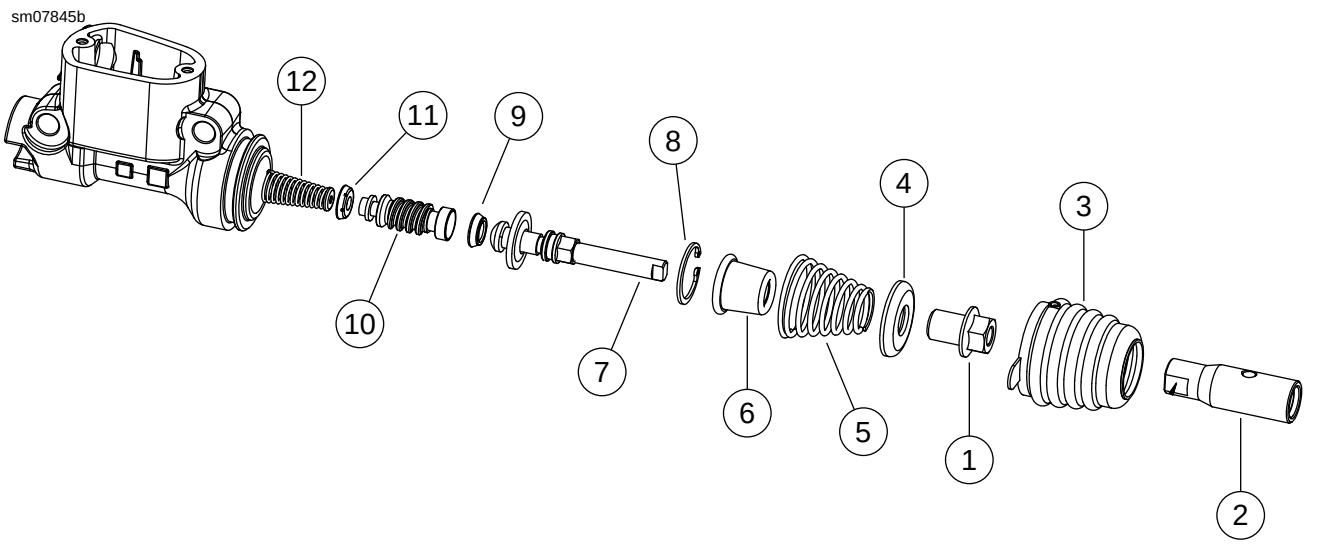
1. See Figure 2-67. Hold hex nut (1). Remove pushrod collar (2).
2. Remove hex nut.
3. Remove spring retainer (4), external boot (3), pushrod (7) and return spring (5).

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. Remove retaining ring (8).
5. Remove pushrod, piston (10) with secondary (9) and primary cup (11) and spring (12).

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Hex nut**
2. **Pushrod collar**
3. **Return spring boot**
4. **Spring retainer**
5. **Return spring**
6. **Boot**
7. **Pushrod assembly**
8. **Retaining ring**
9. **Secondary cup**
10. **Piston**
11. **Primary cup**
12. **Spring**

Figure 2-67. Master Cylinder

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)

NOTE

Do not use wire or similar tool to clean drilled passages.

1. Blow out drilled passages and piston bore in master cylinder body with low pressure compressed air from a clean air supply.
2. Inspect parts for wear or damage.
   a. Inspect piston bore for damage. Replace or repair as necessary.
   b. Inspect outlet port critical sealing surface that mates with brake line banjo fitting. Replace or repair as necessary.
3. Verify that vent holes in master cylinder air separator are open and free of dirt or debris.

Assembly

NOTE

*When assembling rear brake master cylinder, always use **new** parts from the service parts kit. See parts catalog.*

1. Lubricate cylinder bore, piston and cups with CCI #20 BRAKE GREASE.
2. If necessary, install cups on piston.
3. Install spring. Seat spring against counter bore at bottom of cylinder.
4. Install piston assembly.
5. Apply approximately 0.1 g of G40M BRAKE GREASE to ball end of pushrod. Insert ball end of pushrod into cupped end of piston.
6. Temporarily thread hex nut onto pushrod several turns to protect pushrod threads.
7. Compress piston with pushrod.

⚠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

Use correct retaining ring pliers and correct tips. Verify that tips are not excessively worn or damaged.

8. Install retaining ring. Verify that retaining ring is completely seated in groove.
9. Remove hex nut from pushrod.
10. Apply approximately 0.1 g of G40M BRAKE GREASE around groove in wide washer foot of pushrod.
11. Carefully slide boot over pushrod and into end of master cylinder bore. Press lip of inner boot down around groove in boot collar nut.
12. Fit boot into grooves inside master cylinder bore.
13. Install external return spring.
14. Install retainer and hex nut.
15. See Figure 2-68. Tighten hex nut to 1.92 in (48.8 mm) from face of master cylinder to end of hex nut.
16. Install pushrod collar.
    a. Thread collar onto pushrod until it contacts hex nut.
    b. Hold hex nut. Tighten collar to 130-173 **in-lbs** (14.7-19.6 Nm).
17. Install external boot.
    a. Fit lip of external boot to master cylinder groove.
    b. Position tabs at 3 o'clock and 9 o'clock position when master cylinder body is held upright.

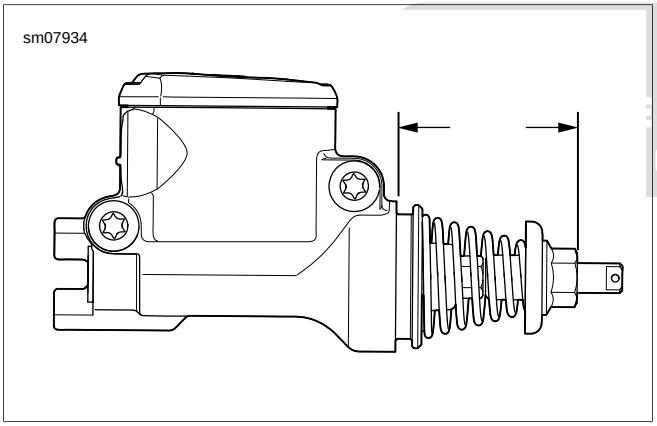


Figure 2-68. 1.92 in (48.8 mm)

MASTER CYLINDER MOUNTING BRACKET

FASTENER	TORQUE VALUE	
Brake master cylinder, rear, mounting bracket screw	45-50 ft-lbs	61-68 Nm

NOTE

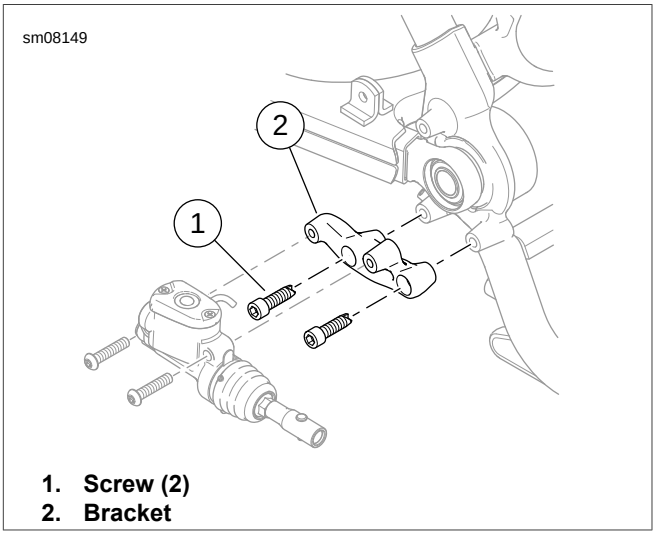
If the model does not include passenger footrests, the master cylinder mounts to a separate bracket.

Removal

1. Remove the master cylinder.
2. Remove the two screws (1) and the bracket (2).

Installation

1. See Figure 2-69. Install the bracket.
2. Install the two screws. Tighten to 45-50 ft-lbs (61-68 Nm).
3. Install the master cylinder.



1. **Screw (2)**
2. **Bracket**

Figure 2-69. Master Cylinder Mounting Bracket

INSTALLATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
Brake master cylinder, rear, mounting screw	18-22 ft-lbs	24.4-29.9 Nm
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm

⚠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 2-70. Install rear master cylinder/reservoir and screws (1) on mounting bracket (3) or passenger footrest bracket (2).
2. Tighten to 18-22 ft-lbs (24.4-29.9 Nm).

NOTE

When tightening banjo bolt into master cylinder, rotate banjo fitting clockwise until it contacts positive stop.

3. Install brake line banjo fitting.
    a. Support a **new** sealing washer on each side of hydraulic brake line banjo fitting.
    b. Insert banjo bolt through washers and fitting.
    c. Thread bolt into master cylinder housing.
    d. Tighten to 14-18 ft-lbs (19.0-24.4 Nm).

⚠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)

4. Install brake control rod.
5. Insert rod pin. Secure with retaining ring.
6. Install rider footrest assembly. See 2.39 RIDER FOOT CONTROLS: MID-MOUNT, Right Footrest and Rear Brake Pedal Assembly or 2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal Assembly.
7. Install exhaust system. See 4.16 EXHAUST SYSTEM.
8. Stand motorcycle upright (not leaning on jiffy stand) on a level surface.

NOTES

- *If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.*
- *Rear brake master cylinder reservoir must be level to fill. Check fluid level.*
- *Use only DOT 4 BRAKE FLUID from a sealed container.*
- *Do not overfill reservoir.*
- *Do not reuse old brake fluid.*

9. Remove reservoir cap.
10. Fill reservoir with DOT 4 BRAKE FLUID until fluid level reaches max fill level.
11. Bleed brake system. See 2.14 BLEEDING BRAKES.

⚠WARNING

When any hydraulic brake component, line or connection is loosened or replaced on an ABS motorcycle, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to properly bleed the brake system could adversely affect braking, which could result in death or serious injury. (00585c)

12. **ABS models:** Use DIGITAL TECHNICIAN II (Part No. HD-48650) to verify that system is bled. Perform "ABS Service" procedure in "Tool Box" menu.

⚠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)

13. Test stop lamp.

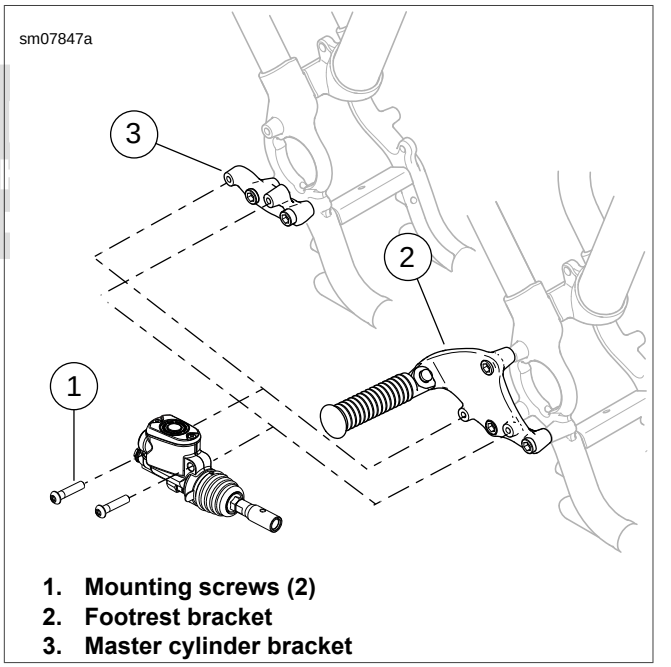
⚠WARNING

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)

⚠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. Test ride motorcycle at low speed.



1. **Mounting screws (2)**
2. **Footrest bracket**
3. **Master cylinder bracket**

Figure 2-70. Master Cylinder/Reservoir Mounting

REAR BRAKE CALIPER 2.11

REMOVAL

⚠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)

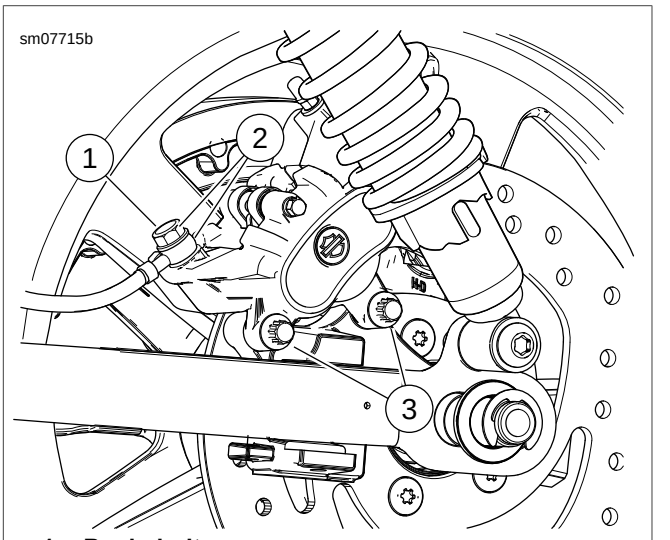
NOTICE

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)

NOTES

- *Damaged banjo bolt surfaces will leak. Do not damage banjo fitting seating surfaces.*
- *If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.*
- *Do not reuse brake fluid.*

1. Stand motorcycle upright (not leaning on jiffy stand) on a level surface.
2. **XL 1200T:** Raise the rear end of the motorcycle.
   a. Remove LH saddlebag. See 2.29 SADDLEBAGS: XL 1200T.
   b. Remove the LH lower shock bolt. Rotate shock away from the caliper. See 2.20 SHOCK ABSORBERS.
3. Place suitable container under rear caliper brake line banjo fitting to catch brake fluid.
4. See Figure 2-71. Remove banjo bolt (1) and sealing washers (2). Discard sealing washers.
5. Remove brake caliper mounting bolts (3) and caliper.



1. **Banjo bolt**
2. **Sealing washers (2)**
3. **Mounting bolts (2)**

Figure 2-71. Rear Brake Caliper

DISASSEMBLY

1. See Figure 2-72. Remove pad pin (1).
2. Remove pad spring (2).
3. Remove brake pads (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)

⚠CAUTION

When removing piston with compressed air, piston can develop considerable force and fly out of caliper bore. Keep hands away from piston to avoid possible injury. (00530b)

NOTE

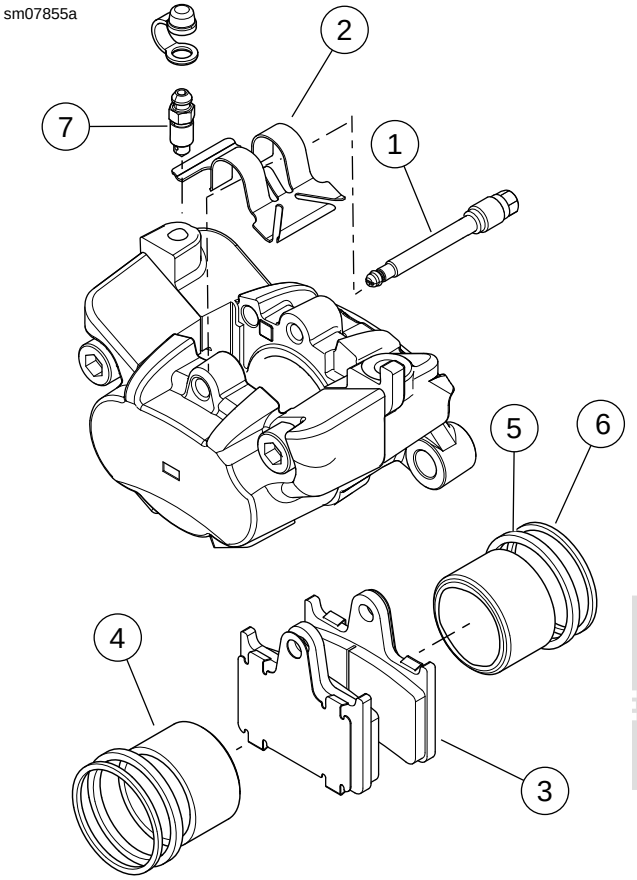
Do not damage banjo bolt sealing surface or threads of banjo bolt hole. Use an air nozzle with a rubber tip.

4. Remove brake pad from caliper.
5. Remove and discard pistons.
   a. Install a discarded brake pad.
   b. Apply low pressure compressed air to banjo bolt hole to force a piston (4) partially out of caliper bore.
   c. Remove discarded pad and piston.
   d. Repeat for opposite piston.

NOTE

Do not use metal objects to remove or install seals in piston bore.

6. Using a wooden toothpick remove dust seals (5) and piston seals (6) from caliper bores. Discard seals.
7. If necessary, remove bleeder screw (7).



1. **Pad pin**
2. **Pad spring**
3. **Brake shoes**
4. **Piston (2)**
5. **Dust seal (2)**
6. **Piston seal (2)**
7. **Bleeder screw**

Figure 2-72. Rear Brake Caliper

CLEANING AND INSPECTION

1. Inspect brake pads and brake disc. See 1.16 BRAKE PADS AND DISCS, Inspection.
   a. If necessary, replace brake pads. See 1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Rear.
   b. If necessary, replace brake disc. See 2.5 WHEELS, Rear Wheel.

⚠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)

2. Clean caliper halves with denatured alcohol.
3. Wipe parts dry with a clean, lint-free cloth.

⚠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)

NOTE

Do not use a wire or similar instrument to clean drilled passages.

4. Blow out drilled passages and piston bore with low pressure compressed air from a clean air supply.

NOTE

Do not hone bores.

5. Inspect caliper piston bores. If bores show pitting or corrosion, replace caliper.
6. Measure pad pin wear.
   a. Measure pad pin diameter (A) across an unworn section.
   b. Measure pad pin diameter (B) across visible grooves or wear.
   c. Subtract B from A. If wear is out of specification, replace pad pin. Refer to Table 2-18.

Table 2-18. Pad Pin Wear: Specifications

PAD PIN	in	mm
Wear (max)	0.011	0.28

ASSEMBLY

FASTENER	TORQUE VALUE	
Brake caliper bleeder screw	35-61 **in-lbs**	3.9-6.9 Nm
Brake pad pin	131-173 **in-lbs**	14.8-19.5 Nm

1. Lubricate following with a light coat of KS62F ASSEMBLY GREASE from service parts kit. All other surfaces must be dry.
   a. Piston seal
   b. Dust seal

NOTE

Do not use metal tools to install seals in piston bore. To prevent damage, only use a wooden toothpick.

2. Install **new** piston seals into groove in piston bores.
3. Install **new** dust seals into groove in piston bores.

NOTE

If piston meets resistance, check if seals are seated in grooves.

4. Carefully insert **new** piston into caliper bore. Repeat for opposite piston.
5. If removed, install bleeder screw and cap. Tighten to 35-61 **in-lbs** (3.9-6.9 Nm).
6. Install brake pads.
   a. See Figure 2-73. Install and hold pad spring.
   b. Install a **new** set of pads. Hold pads in position.
   c. Press pad pin through outside caliper, outside pad and spring.
   d. While compressing pads and spring, press pad pin over center of pad spring through wheel side pad.
   e. While pressing down on spring center, align pin with wheel side caliper.
   f. Thread in pad pin. Tighten to 131-173 **in-lbs** (14.8-19.5 Nm).

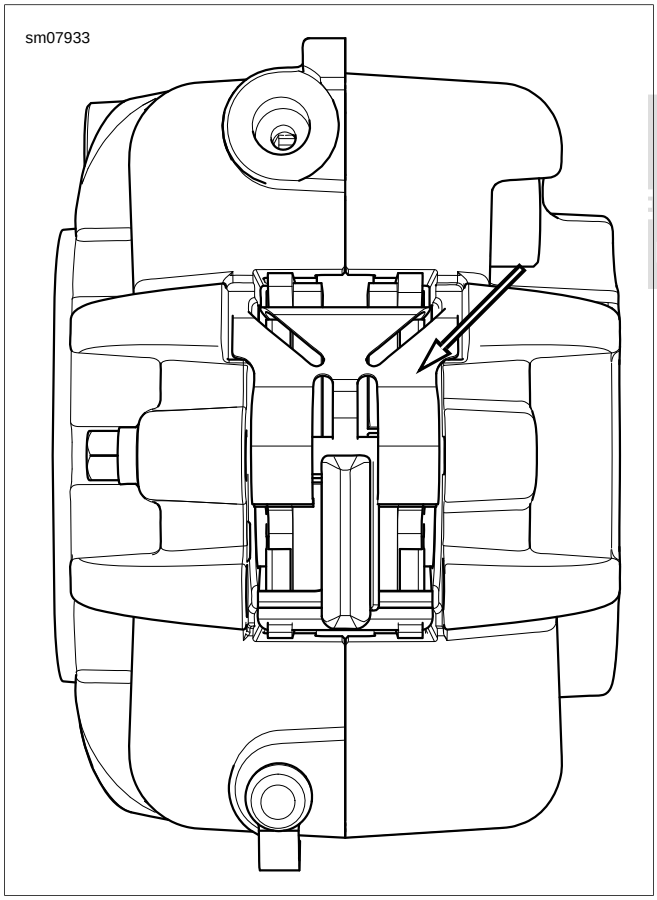


Figure 2-73. Rear Caliper Pad Spring

INSTALLATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
Caliper to mounting bracket, rear	28-38 ft-lbs	38.0-51.5 Nm
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm

1. See Figure 2-74. Install rear caliper over brake disc onto mounting bracket.
2. Install mounting bolts (3). Tighten to 28-38 ft-lbs (38.0-51.5 Nm).

NOTE

Rotate banjo fitting clockwise until it contacts positive stop on caliper housing.

3. Insert banjo bolt (1) through **new** sealing washers (2) and fitting.
4. Install banjo bolt into caliper housing. Tighten to 14-18 ft-lbs (19.0-24.4 Nm).
5. **XL 1200T:** Return to service.
   a. Install the shock absorber. See 2.20 SHOCK ABSORBERS.
   b. Install the saddlebag. See 2.29 SADDLEBAGS: XL 1200T.
   c. Lower the motorcycle.

⚠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)

⚠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)

6. Bleed brake system. See 2.14 BLEEDING BRAKES.

⚠WARNING

When any hydraulic brake component, line or connection is loosened or replaced on an ABS motorcycle, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to properly bleed the brake system could adversely affect braking, which could result in death or serious injury. (00585c)

7. **ABS models:** Use DIGITAL TECHNICIAN II (Part No. HD-48650) to verify that system is bled.

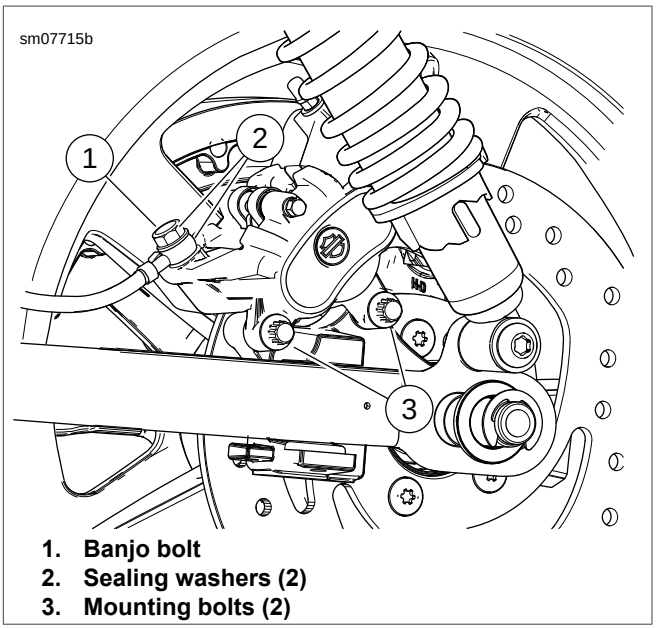
⚠WARNING

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)

NOTE

*To condition **new** pads to brake discs, avoid making hard stops for first 100 mi (160 km).*

8. Test brakes.
   a. Check operation of rear lamps.
   b. Test ride motorcycle at low speed. Repeat the bleeding procedure if brakes feel spongy. See 2.14 BLEEDING BRAKES.



1. **Banjo bolt**
2. **Sealing washers (2)**
3. **Mounting bolts (2)**

Figure 2-74. Rear Brake Caliper

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

BRAKE LINES 2.12

FRONT BRAKE LINE (NON-ABS)

FASTENER	TORQUE VALUE	
Brake caliper bleeder screw	35-61 **in-lbs**	3.9-6.9 Nm
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm
Brake line clamp screw, fork bracket	45-65 **in-lbs**	5.1-7.4 Nm
Brake line clamp screw, steering stem	120-168 **in-lbs**	13.6-19.0 Nm
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm

Removal

⚠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)

1. Drain brake fluid.
   a. Remove cap from bleeder screw.
   b. Install end of a length of 5/16 in (7.9 mm) ID clear plastic tubing over bleeder screw. Place free end in a suitable container.
   c. Open bleeder screw one-half turn.
   d. Pump brake hand lever repeatedly to drain brake fluid.
   e. Close bleeder screw. Tighten to 35-61 **in-lbs** (3.9-6.9 Nm).
2. Remove brake line clamp screw from fork bracket.
3. Remove brake line clamp at steering stem under lower fork bracket.
   a. **Single disc models:** Remove screw with captive washer and clamp.
   b. **Dual disc model:** Remove screw with captive washer and clamp to remove brake line manifold.

NOTE

Carefully remove brake line components to prevent damage to banjo bolt sealing surfaces.

4. Remove banjo bolt and sealing washers from master cylinder. Discard sealing washers.
5. Remove banjo bolt and sealing washers from front brake calipers. Discard sealing washers.
6. Inspect brake line. Replace or repair as necessary.

Installation

1. Route brake line. See 2.12 BRAKE LINES, Front Brake Line Routing (Non-ABS).

NOTE

See Figure 2-75. Banjo fittings are pegged to fit matching size master cylinder.

2. See Figure 2-76 or Figure 2-77. Loosely install master cylinder banjo bolt (1) and fitting with **new** sealing washers (2).
3. Loosely install upper clamp (3) with screw (4).
4. Loosely install lower clamp:
   a. **Single disc models:** To lower fork bracket stem with screw.
   b. **Dual disc model:** See Figure 2-77. Install screw through brake line manifold into steering head stem.
5. Loosely install banjo bolt and banjo fitting with **new** sealing washers to brake calipers.
6. Tighten fasteners to specification:
   a. Master cylinder banjo bolt to 14-18 ft-lbs (19.0-24.4 Nm).
   b. Fork bracket clamp screw to 45-65 **in-lbs** (5.1-7.4 Nm).
   c. Steering stem clamp screw to 120-168 **in-lbs** (13.6-19.0 Nm).
   d. Brake caliper banjo bolt to 14-18 ft-lbs (19.0-24.4 Nm).
7. Fill and bleed brakes with **new** DOT 4 BRAKE FLUID. See 2.14 BLEEDING BRAKES, Procedure.

⚠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)

8. Test ride motorcycle.

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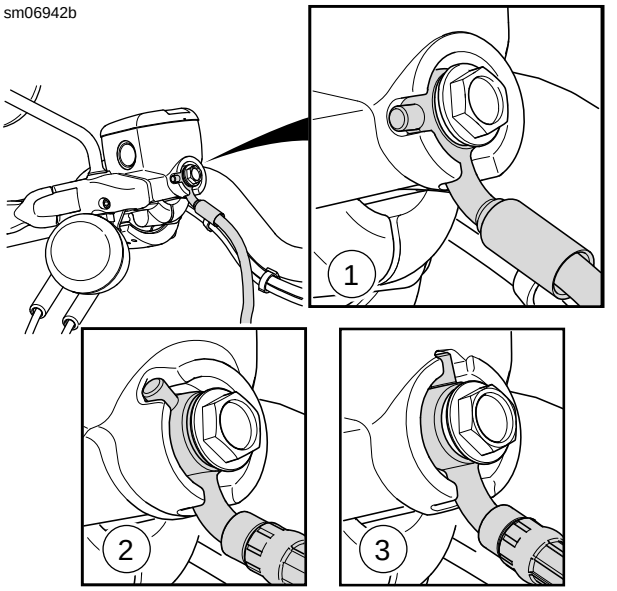
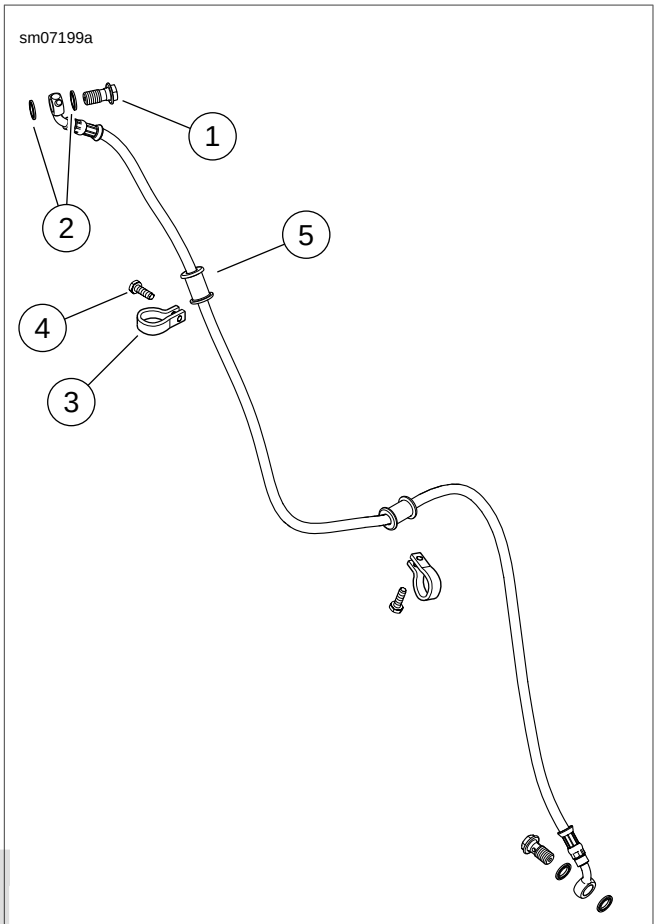


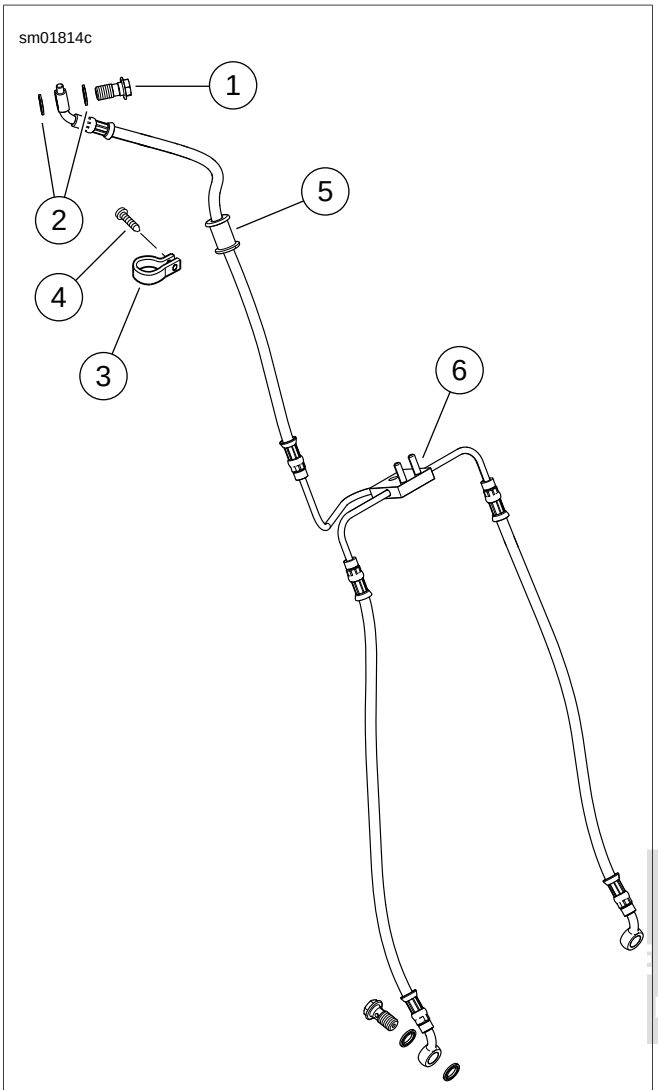
1. **ABS single disc**
2. **Non-ABS single disc**
3. **ABS and non-ABS dual disc**

Figure 2-75. Banjo Fitting Pegs



1. **Banjo bolt (2)**
2. **Sealing washer (4)**
3. **P-clamp (2)**
4. **Screw (2)**
5. **Grommet (2)**

Figure 2-76. Brake Lines: Non-ABS Single Disc Models



1. **Banjo bolt (3)**
2. **Sealing washer (6)**
3. **Screw**
4. **Clamp**
5. **Grommet**
6. **Manifold**

Figure 2-77. Non-ABS Brake Line: Dual Disc Model

FRONT BRAKE LINE ROUTING (NON-ABS)

⚠WARNING

Do not bend metal brake line. Bending brake line could cause metal fatigue and brake failure, which could result in death or serious injury. (00543b)

XL 883R

1. See Figure 2-78. Fit the clamp to upper grommet.
2. Route brake line behind handlebar and fork brackets.
3. Loosely install fastener through manifold.
4. Separate two brake lines.
5. Route each line down to its caliper.

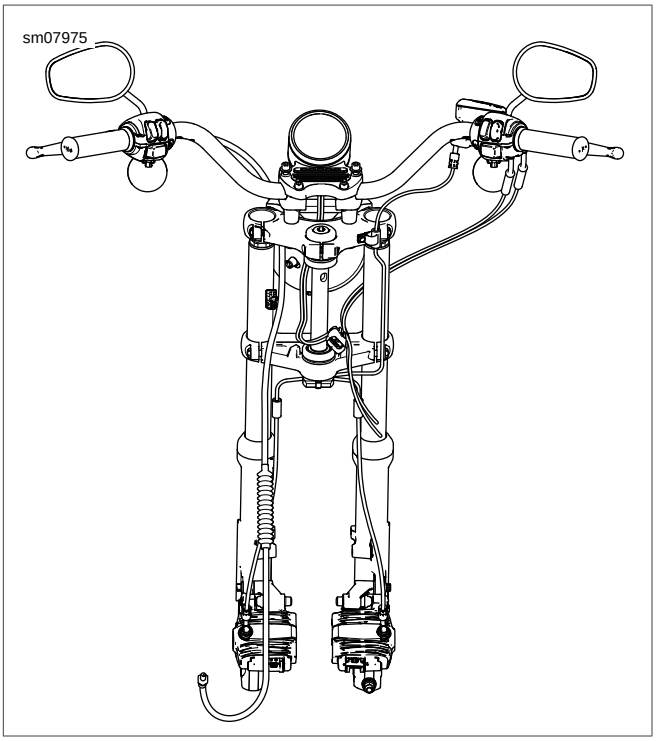
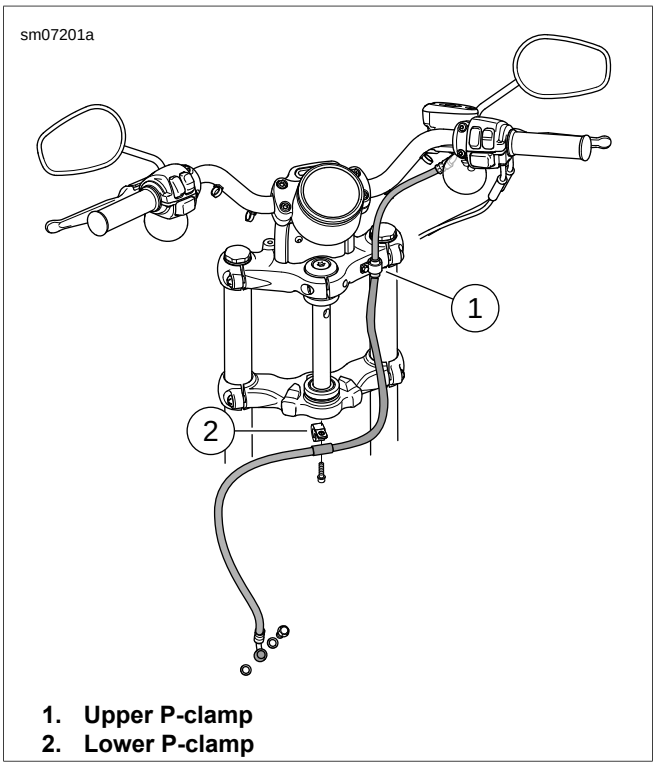


Figure 2-78. Brake Line Routing: XL 883R

XL 883L/N, XL 1200C/CP w/Pull Back, XL 1200T, XL 1200X

1. See Figure 2-79. Fit upper and lower clamps to grommets.
2. Route brake line downward in front of handlebar and inward behind the fork brackets.
3. Route brake line downward and across to left side under front fork lower bracket to brake caliper.

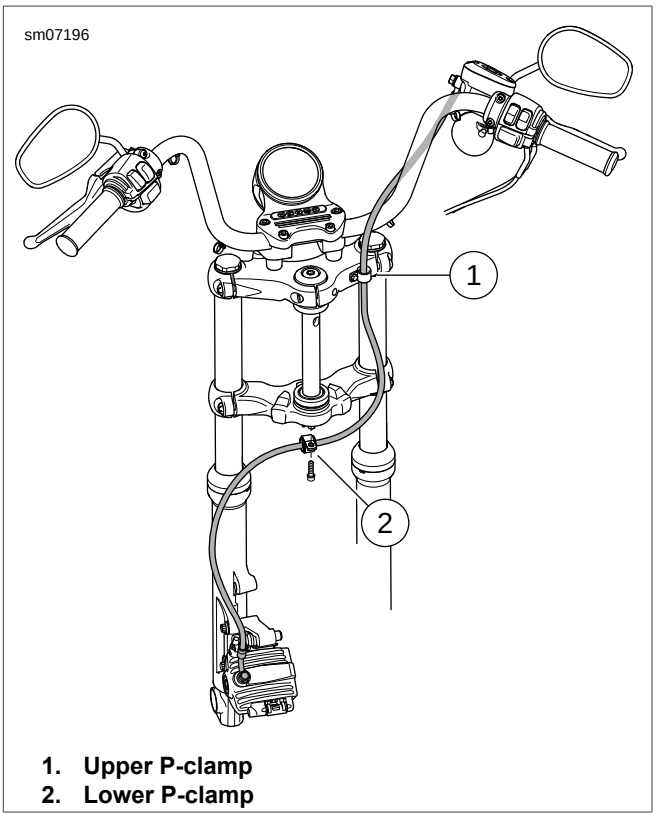


1. **Upper P-clamp**
2. **Lower P-clamp**

Figure 2-79. Brake Line Routing: XL 883L/N, XL 1200C/CP w/Pull Back, XL 1200T, XL 1200X

XL 1200V/CP/CB w/Mini-Ape

1. Fit upper and lower clamps to brake line grommets.
2. See Figure 2-80. Match the straight banjo bolt fitting to master cylinder.
3. Route brake line over top of mini-ape and behind fork brackets.
4. Cross brake line under lower fork bracket and down fork leg to the brake caliper.



1. **Upper P-clamp**
2. **Lower P-clamp**

Figure 2-80. Brake Line Routing: XL 1200V/CP/CB w/Mini-Ape

XL 1200CP/CA with Drag Bar

1. See Figure 2-81. Fit upper and lower clamps to brake line grommets.
2. Match banjo bolt fitting to master cylinder.
3. Route brake line behind fork brackets.
4. Cross brake line under lower fork bracket and down fork leg to the brake caliper.

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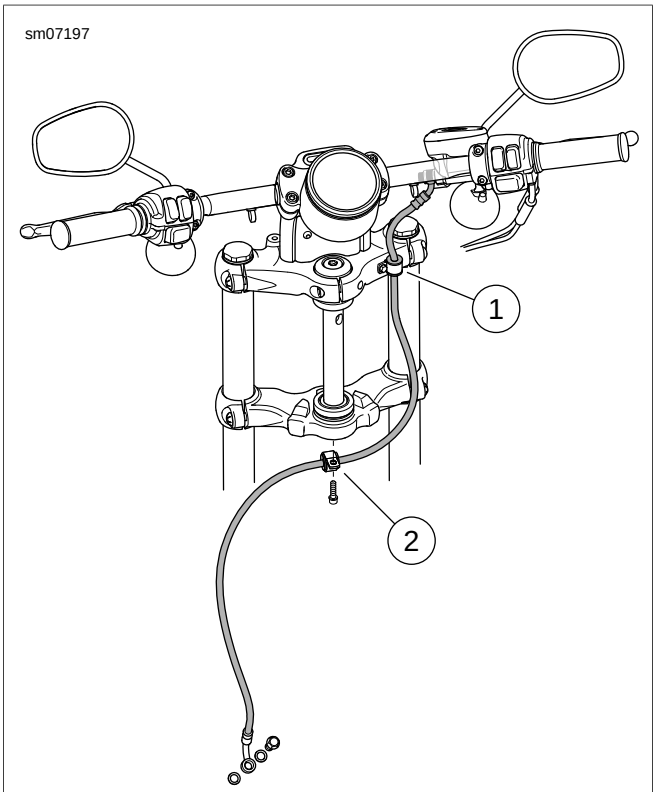


1. **Upper P-clamp**
2. **Lower P-clamp**

Figure 2-81. Brake Line Routing: XL 1200CP/CA w/Drag Bar

REAR BRAKE LINE (NON-ABS)

FASTENER	TORQUE VALUE	
Brake caliper bleeder screw	35-61 **in-lbs**	3.9-6.9 Nm
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm
Brake line P-clamp, rear, screw	30-40 **in-lbs**	3.4-4.5 Nm
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm

⚠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

If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.

Removal

1. Drain rear brake fluid:
   a. Remove bleeder screw cap from bleeder screw on rear brake caliper.
   b. Install end of a length of 5/16 in (7.9 mm) ID clear plastic tubing over caliper bleeder screw. Place the free end in a suitable container.
   c. Open bleeder screw 1/2 turn.
   d. Pump brake pedal to drain brake fluid.
   e. Close bleeder screw. Tighten to 35-61 **in-lbs** (3.9-6.9 Nm).
2. Remove belt guard. See 2.18 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard.
3. Separate stop lamp switch connector [121] housings.
4. Remove banjo bolt and sealing washers. Discard washers.

NOTE

If necessary, replace extrusion plug and J-clamp.

5. See Figure 2-82. Remove brake line from J-clamp.
6. See Figure 2-83. Open plastic clamps in brake line bracket.
7. Remove screw to detach P-clamp from rear fork.
8. Remove banjo bolt and sealing washers from caliper. Discard washers.
9. If necessary, replace stop lamp switch. See 6.22 REAR STOP LAMP SWITCH.

Installation

1. Loosely route brake line from master cylinder to rear caliper.
   a. See Figure 2-82. Install banjo bolt and **new** sealing washers to master cylinder.
   b. Install brake line in J-clamp on frame crossmember.
   c. See Figure 2-83. Route brake line through plastic clamps in brake line bracket.
   d. Install P-clamp around brake line to rear fork.
   e. Install banjo bolt and **new** sealing washers to caliper.

NOTES

- *Adjust brake hose length between rear caliper and clamp so there is no extra length.*
- *Do not twist or stretch brake hose.*
- *Rotate banjo fitting clockwise until it contacts positive stop.*

2. Tighten fasteners:
   a. Master cylinder banjo bolt to 14-18 ft-lbs (19.0-24.4 Nm).
   b. P-clamp screw to 30-40 **in-lbs** (3.4-4.5 Nm).
   c. Caliper banjo bolt to 14-18 ft-lbs (19.0-24.4 Nm).

3. Connect stop lamp connector [121] housings.
4. Install belt guard. See 2.18 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard.

⚠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)

5. Bleed brake system. See 2.14 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)

6. Check operation of rear lamps.
7. Test ride motorcycle. Repeat the bleeding procedure if brakes feel spongy.

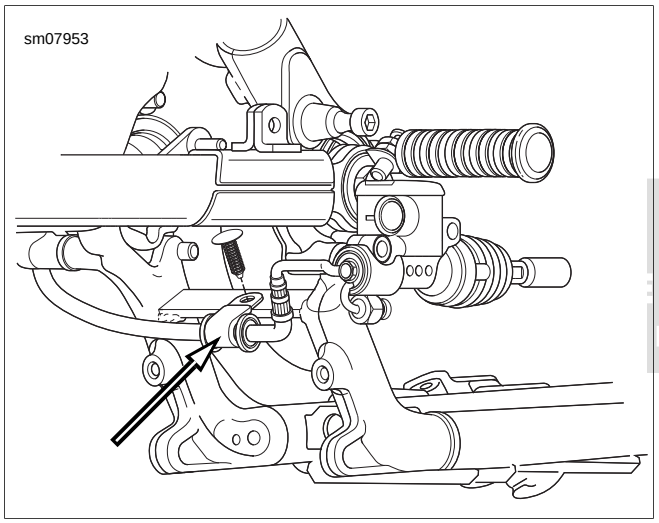


Figure 2-82. Rear Brake Line J-clamp

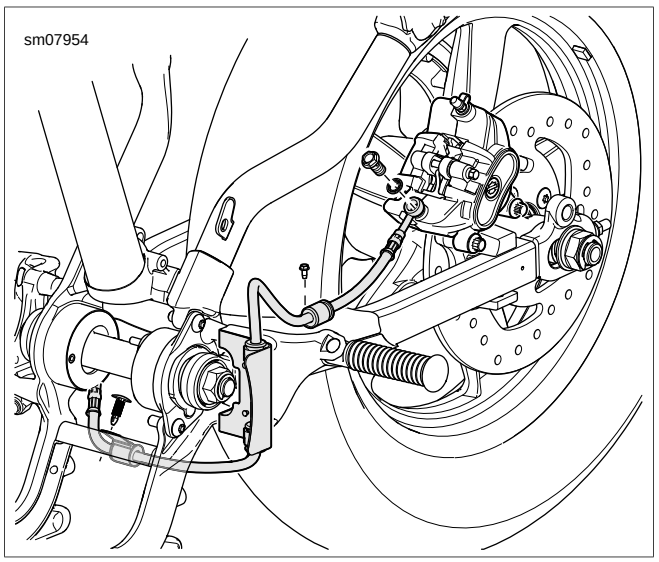


Figure 2-83. Rear Brake Line to Caliper

FRONT MASTER CYLINDER TO MANIFOLD TO CALIPER (ABS)

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm
Brake line clamp screw, fork bracket	45-65 **in-lbs**	5.1-7.4 Nm
Brake line, front, manifold bolt	36-48 **in-lbs**	4.1-5.4 Nm
Brake line tube nuts	128-173 **in-lbs**	14.5-19.5 Nm
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm

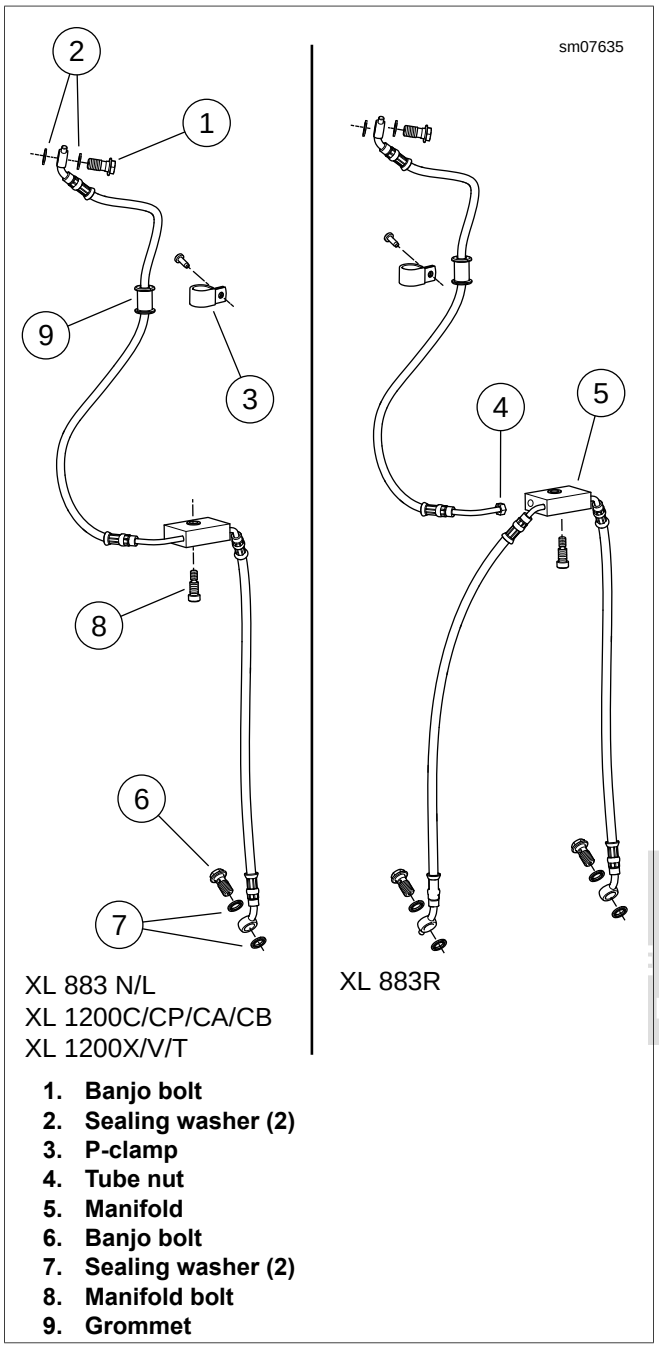
Removal

1. Cover front fender and surface finishes.
2. Drain brake fluid. See 2.14 BLEEDING BRAKES.
3. See Figure 2-84. Remove master cylinder banjo bolt (1) and sealing washers (2). Discard sealing washers.
4. Remove P-clamp (3) from upper fork bracket.
5. Remove both manifold to EHCU brake line tube nuts from the rear of the manifold.
6. Remove clips to WSS wire harness.

NOTE

***Dual disc model:** Remove caliper banjo bolts at both calipers.*

7. Remove caliper banjo bolt (6) and sealing washers (7). Discard sealing washers.
8. Remove manifold bolt (8).
9. **Dual disc model:** Remove upper brake line tube nut (4) from manifold (5).



1. **Banjo bolt**
2. **Sealing washer (2)**
3. **P-clamp**
4. **Tube nut**
5. **Manifold**
6. **Banjo bolt**
7. **Sealing washer (2)**
8. **Manifold bolt**
9. **Grommet**

Figure 2-84. Brake Line Master Cylinder to Manifold to Caliper

Installation

1. **Dual disc model:** Finger-tighten tube nut from upper brake line to manifold.
2. See Figure 2-85. Route brake line behind fork bracket.
3. Install banjo bolt with **new** sealing washers. Tighten to 14-18 ft-lbs (19.0-24.4 Nm).
4. Install P-clamp to fork bracket. Tighten to 45-65 **in-lbs** (5.1-7.4 Nm).
5. Loosely install both manifold to EHCU brake line tube nuts to the rear of the manifold.
6. Install manifold bolt. Tighten to 36-48 **in-lbs** (4.1-5.4 Nm).
7. Tighten tube nuts to 128-173 **in-lbs** (14.5-19.5 Nm).
8. Route brake line to caliper.

NOTE

Dual disc model: *Install banjo bolts to both calipers.*

9. Install banjo bolt with **new** sealing washers. Rotate fitting against caliper. Tighten to 14-18 ft-lbs (19.0-24.4 Nm).
10. Install clips on brake line and WSS wire lead at wire lead flags.

⚠WARNING

When any hydraulic brake component, line or connection is loosened or replaced on an ABS motorcycle, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to properly bleed the brake system could adversely affect braking, which could result in death or serious injury. (00585c)

NOTE

Dual calipers: *Bleed both calipers.*

11. Fill and bleed brakes. See 2.14 BLEEDING BRAKES.
12. Use DIGITAL TECHNICIAN II (Part No. HD-48650) to verify that system is bled.

⚠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 brakes.
    a. Apply brakes to check proper lamp operation.
    b. Test ride motorcycle.

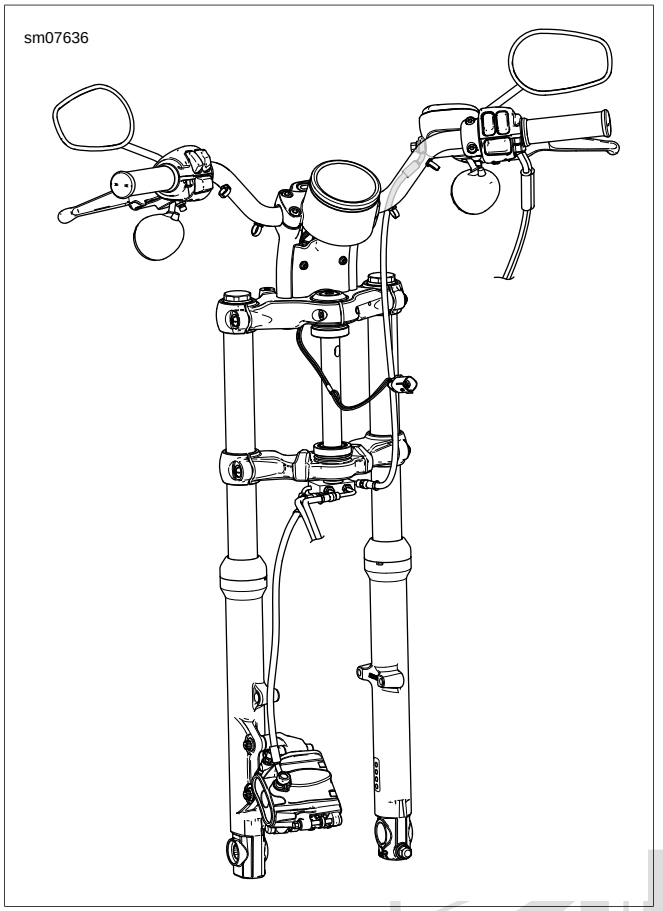


Figure 2-85. Front Brake Line (ABS) Routing

FRONT MANIFOLD TO EHCU (ABS)

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
Brake line, front, manifold bolt	36-48 **in-lbs**	4.1-5.4 Nm
Brake line tube nuts	128-173 **in-lbs**	14.5-19.5 Nm
Brake line bracket clamp fastener	20-30 **in-lbs**	2.3-3.4 Nm
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm

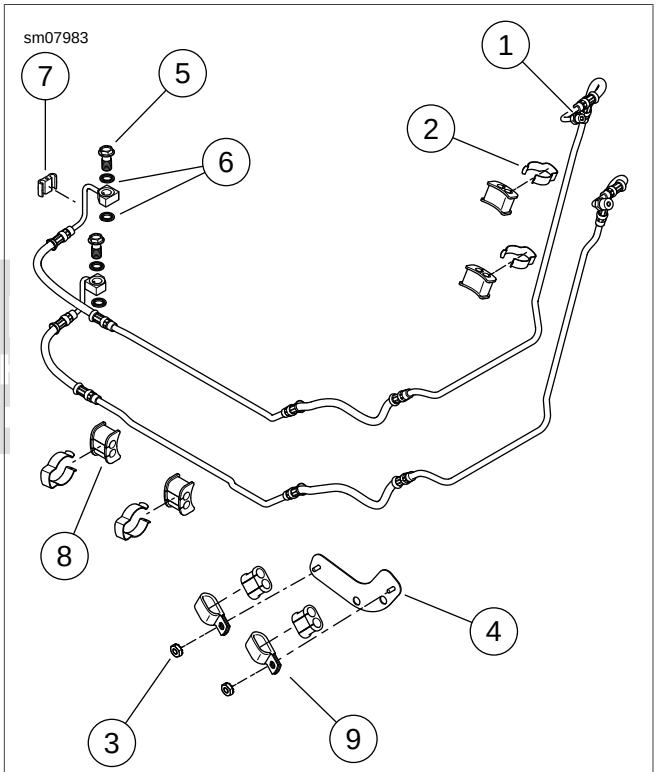
Removal

1. Remove side cover.
2. Remove main fuse.
3. Drain brake fluid. See 2.14 BLEEDING BRAKES.
4. **Forward controls:** Remove rider right side control assembly. See 2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal Assembly.
5. Remove brake rod C-clip and pin. Pull rod out of master cylinder.
6. See Figure 2-86. Remove tube nuts (1) from manifold.
7. Remove frame clips (2) on downtube.
8. Remove clamp (9) fasteners (3) at bracket (4).
9. Remove frame clips along right lower frame tube.
10. **EVAP models:** Remove canister and bracket. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL.
11. Remove EHCU. See 2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Removal.
12. Remove front brake line banjo bolts (5) and sealing washers (6) on EHCU ports. Discard sealing washers.
13. Remove rear clip (7).

NOTE

*The lines are glued to grommets (8) at factory. Leave grommets attached unless replacing a single line. Install **new** grommets if both lines are replaced.*

14. As necessary, separate brake lines from grommets.



1. **Tube nuts (2)**
2. **Frame clips (4)**
3. **Clamp fasteners (2)**
4. **Bracket**
5. **Banjo bolt (2)**
6. **Sealing washers (4)**
7. **Clip**
8. **Grommets (6)**
9. **Clamps (2)**

Figure 2-86. Manifold to EHCU Brake Lines

Installation

1. Loosely install line clamps over brake lines and to bracket (4).

NOTE

All banjo eyelets must fit anti-rotation features.

2. Loosely install banjo fittings with **new** sealing washers and bolts to EHCU ports.
3. Install the clip (7) over brake lines.
4. See Figure 2-87. Route brake lines around rear of frame and along the lower right frame toward the front.
5. Route the brake lines across both downtubes and up the left frame tube to the manifold.
6. Install two frame clamps around line grommets on lower right frame tube.
7. Install two frame clamps around line grommets on left front downtube.

NOTE

Level each metal brake line to other at manifold.

8. Loosely install lines to manifold.
   a. Remove manifold fastener.
   b. Loosely install tube nuts on manifold.
   c. Loosely install manifold fastener.
9. Install brake rod into pushrod collar. Install C-clip and pin.
10. **Forward controls:** Install rider right side footrest assembly. See 2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal Assembly.
11. Tighten fasteners:
    a. Manifold fastener to 36-48 **in-lbs** (4.1-5.4 Nm).
    b. Tube nuts to 128-173 **in-lbs** (14.5-19.5 Nm).
    c. Brake line clamp fasteners to 20-30 **in-lbs** (2.3-3.4 Nm).
    d. Banjo bolts to 14-18 ft-lbs (19.0-24.4 Nm).
12. Install EHCU bracket. See 2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Installation.
13. **EVAP models:** Install EVAP bracket and canister. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL.

⚠WARNING

When any hydraulic brake component, line or connection is loosened or replaced on an ABS motorcycle, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to properly bleed the brake system could adversely affect braking, which could result in death or serious injury. (00585c)

NOTE

***Dual calipers:** Bleed both calipers.*

14. Fill and bleed brake fluid. See 2.14 BLEEDING BRAKES.
15. Use DIGITAL TECHNICIAN II (Part No. HD-48650) to verify that system is bled.
16. Install main fuse.
17. Install side cover.

⚠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)

18. Test brakes.
    a. Turn ignition on. Apply brakes to check proper lamp operation.
    b. Test ride motorcycle.

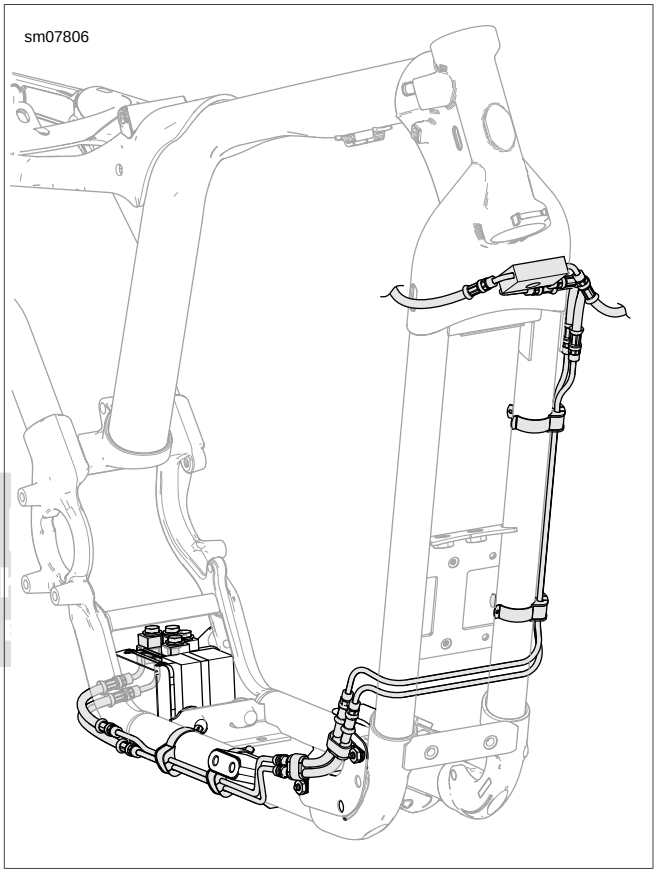


Figure 2-87. Manifold to EHCU Front Brake Line Routing

REAR MASTER CYLINDER TO EHCU (ABS)

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
Stop lamp switch, rear	12-15 **in-lbs**	1.4-1.6 Nm
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm

Removal

1. Remove side cover.
2. Remove main fuse.

3. Remove belt guard. See 2.18 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard.
4. Drain brake system. See 2.14 BLEEDING BRAKES, Procedure.
5. **EVAP models:** Remove EVAP canister and bracket. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL.
6. Separate rear stop lamp switch connectors [121-1] [121-2].
7. Remove EHCU. See 2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Removal.
8. Remove banjo bolt from master cylinder. Discard sealing washers.
9. See Figure 2-88. Remove the EHCU MC2 banjo bolt. Discard sealing washers.

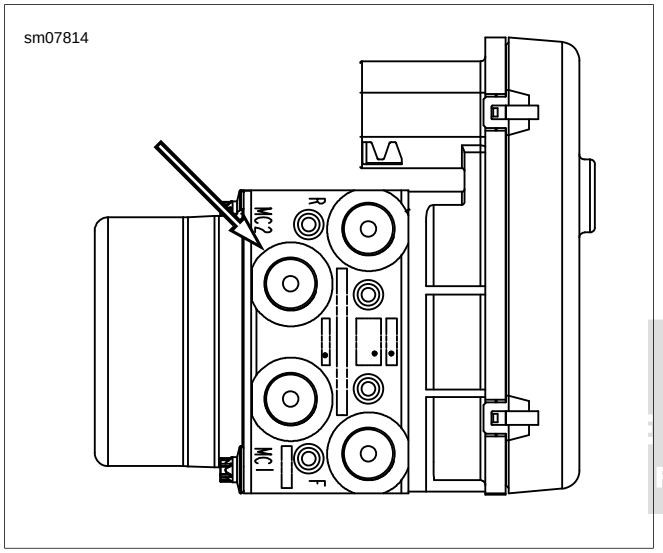


Figure 2-88. EHCU Rear Master Cylinder MC2

NOTE

If necessary, remove stop lamp switch.

Installation

1. If removed, install stop lamp switch. Tighten to 12-15 **in-lbs** (1.4-1.6 Nm).
2. Route brake line from master cylinder to EHCU.

NOTE

All banjo eyelets must fit anti-rotation features.

3. See Figure 2-89. Loosely install banjo bolts with **new** sealing washers to:
   a. Rear master cylinder
   b. EHCU MC2 port
4. Tighten banjo bolts:
   a. Rear master cylinder 14-18 ft-lbs (19.0-24.4 Nm)
   b. EHCU port MC2 14-18 ft-lbs (19.0-24.4 Nm)
5. Install EHCU and bracket. See 2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Installation.
6. Install belt guard. See 2.18 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard.

⚠WARNING

When any hydraulic brake component, line or connection is loosened or replaced on an ABS motorcycle, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to properly bleed the brake system could adversely affect braking, which could result in death or serious injury. (00585c)

7. Bleed brake system. See 2.14 BLEEDING BRAKES, Procedure.
8. Use DIGITAL TECHNICIAN II (Part No. HD-48650) to verify that system is bled.

⚠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)

9. Test brakes.
   a. Turn ignition switch ON. Check operation of rear lamps.
   b. Test ride motorcycle.

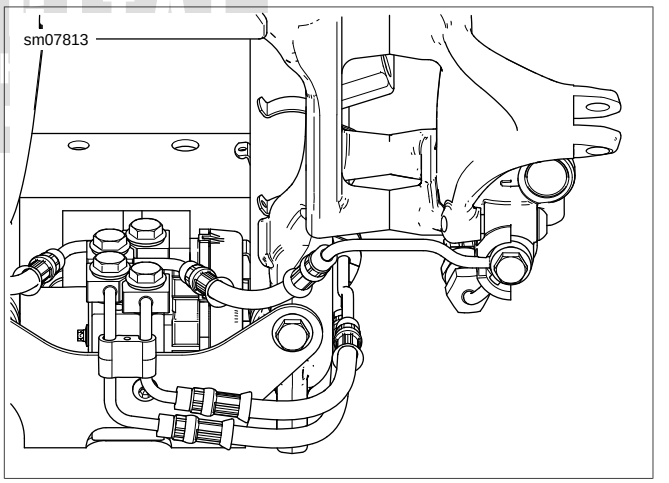


Figure 2-89. Master Cylinder to EHCU Brake Line Routing

REAR EHCU TO CALIPER (ABS)

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm
Brake line P-clamp, rear, screw	30-40 **in-lbs**	3.4-4.5 Nm
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm

Removal

1. Remove side cover.
2. Remove main fuse.
3. Drain brake system. See 2.14 BLEEDING BRAKES, Procedure.
4. Remove EVAP canister and bracket. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL.
5. Lower EHCU. See 2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Removal.
6. Remove rear caliper banjo bolt. Discard sealing washers.
7. Remove P-clamp fastener on rear fork.
8. Remove WSS line clips from brake line bracket.
9. Open plastic clamps in brake line bracket.
10. Remove EHCU banjo bolt from R port. Discard sealing washers.

Installation

1. See Figure 2-90. Route brake line from EHCU to caliper.

NOTE

All banjo eyelets must fit anti-rotation features.

2. Install EHCU banjo bolt with **new** sealing washers. Tighten to 14-18 ft-lbs (19.0-24.4 Nm).
3. Route brake line through plastic clamps in brake line bracket. Close clamps.
4. Install rear fork P-clamp. Tighten to 30-40 **in-lbs** (3.4-4.5 Nm).
5. Install rear brake caliper banjo bolt. Tighten to 14-18 ft-lbs (19.0-24.4 Nm).
6. Install clips over WSS wire lead and rear brake line.
7. Install bracket and EHCU. See 2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Installation.
8. Install EVAP canister and bracket. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL.

WARNING

When any hydraulic brake component, line or connection is loosened or replaced on an ABS motorcycle, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to properly bleed the brake system could adversely affect braking, which could result in death or serious injury. (00585c)

9. Fill and bleed brake fluid. See 2.14 BLEEDING BRAKES, Procedure.
10. Use DIGITAL TECHNICIAN II (Part No. HD-48650) to verify that system is bled.
11. Install main fuse.
12. Install side cover.

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 brakes.
    a. Turn ignition on. Check operation of rear lamps.
    b. Test ride motorcycle.

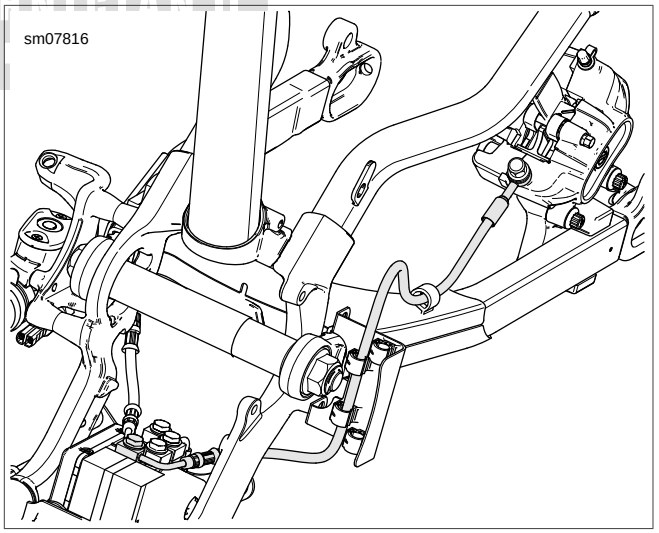


Figure 2-90. EHCU to Caliper Rear Brake Line Routing

ELECTRO HYDRAULIC CONTROL UNIT (EHCU) 2.13

REMOVAL

PART NUMBER	TOOL NAME
BB200A	SNAP-ON BASIC VACUUM BRAKE BLEEDER

⚠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)

1. Remove left side cover.
2. Remove main fuse.

NOTES

- *For best results, use a SNAP-ON BASIC VACUUM BRAKE BLEEDER (Part No. BB200A) to drain brakes.*
- *Dispose of used brake fluid in accordance with local regulations.*

3. Drain both front and rear brakes.
   a. Remove bleeder screw caps.
   b. Install a length of 5/16 in (7.9 mm) ID plastic tubing over bleeder screws. Place free in catch container.
   c. Open bleeder screw 1/2 turn.
   d. Pump brake several times to drain brake fluid.
   e. Close bleeder screw.
4. See Figure 2-91. Remove frame clamps (1).
5. Remove P-clamp on rear brake line to rear fork.
6. Open plastic clamps in brake line bracket. Pull brake line away from bracket

NOTE

***EVAP models:** The two fasteners securing EVAP bracket also secure ABS module bracket.*

7. **EVAP models:** Remove EVAP cannister. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL.
8. Remove two fasteners (2) to EHCU bracket.

NOTE

Do not bend the metal brake lines when lowering or removing the EHCU.

9. Lower EHCU to access connector and banjo bolts.
10. Disconnect EHCU connector [166] (3).

NOTE

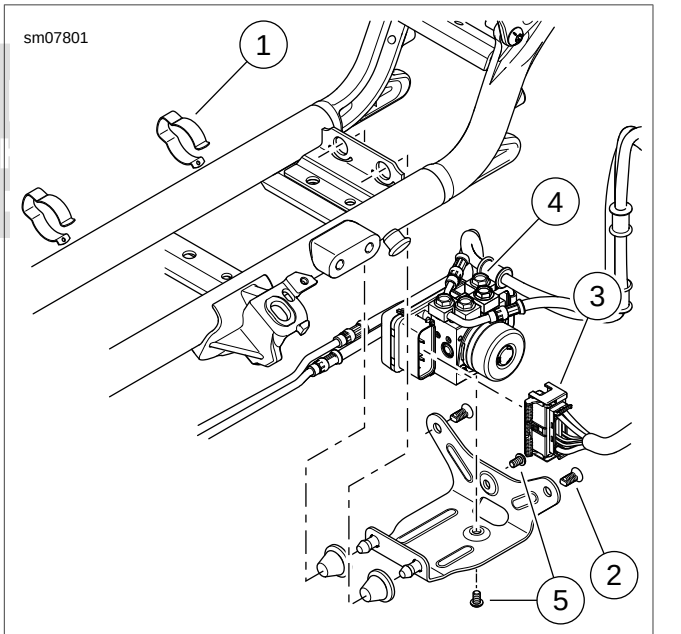
Wrap banjo fittings with a lint-free cloth to absorb brake fluid.

11. Remove four brake line banjo bolts (4). Discard sealing washers.

NOTICE

This device is sensitive to electrostatic discharge (ESD). To prevent damage to the device, always touch the motorcycle frame or a grounded surface before handling. (00588c)

12. Remove fasteners (5) securing EHCU to bracket.



1. **Frame clamps (2)**
2. **Bracket to frame fasteners (2)**
3. **Connector [166]**
4. **Banjo bolts (4)**
5. **EHCU fastener (2)**

Figure 2-91. EHCU and Bracket

INSTALLATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
EHCU to mounting bracket fastener	50-70 **in-lbs**	5.8-7.8 Nm
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm
EHCU mounting bracket fasteners	15-18 ft-lbs	20.3-24.4 Nm
Brake line P-clamp, rear, screw	30-40 **in-lbs**	3.4-4.5 Nm

1. Inspect rubber frame grommets. Replace or repair as necessary.
2. Attach EHCU to mounting bracket.
   a. Start both EHCU fasteners to capture EHCU against both sides of bracket.
   b. Tighten to 50-70 **in-lbs** (5.8-7.8 Nm).

NOTE
EHCU marks identify brake line connections.

3. See Figure 2-92. Install brake line banjo fittings.
   a. Loosely install banjo fittings to EHCU with **new** sealing washers.
   b. See Figure 2-93. Install clip over MC2 and MC1 brake lines.
   c. Tighten banjo bolts to 14-18 ft-lbs (19.0-24.4 Nm).
4. Connect EHCU connector [166].
5. Mount EHCU bracket to frame.
   a. **EVAP models:** Install EVAP cannister bracket. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL.
   b. Loosely install fasteners.
   c. Tighten to 15-18 ft-lbs (20.3-24.4 Nm).
6. Install brake line through plastic clamps in brake line bracket.
7. Install rear brake line P-clamp. Tighten to 30-40 **in-lbs** (3.4-4.5 Nm).
8. Install frame clamps over brake line grommets.
9. For a **new** unit, calibrate EHCU with DIGITAL TECHNICIAN II (Part No. HD-48650).

⚠WARNING

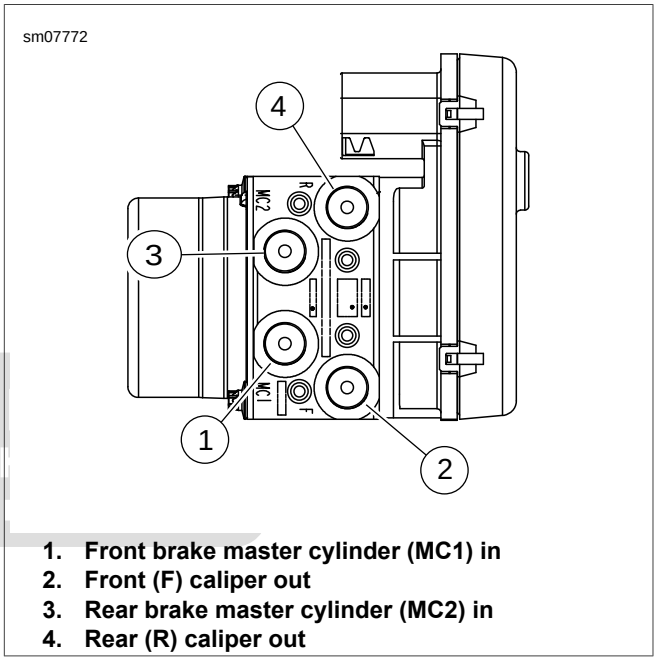
When any hydraulic brake component, line or connection is loosened or replaced on an ABS motorcycle, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to properly bleed the brake system could adversely affect braking, which could result in death or serious injury. (00585c)

10. Bleed brake system. See 2.14 BLEEDING BRAKES.
11. Use DIGITAL TECHNICIAN II (Part No. HD-48650) to verify that system is bled.

⚠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)

12. Test brakes.
    a. Verify stop lamp.
    b. Test ride. Test for soft or spongy brakes. Bleed brakes as necessary.



1. **Front brake master cylinder (MC1) in**
2. **Front (F) caliper out**
3. **Rear brake master cylinder (MC2) in**
4. **Rear (R) caliper out**

Figure 2-92. Brake Fluid Line Connections

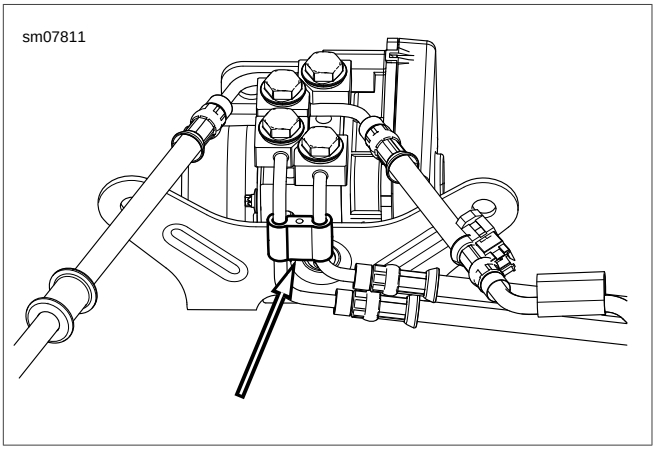


Figure 2-93. Brake Line Clip

BLEEDING BRAKES 2.14

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)

If DOT 4 brake fluid contacts painted surfaces, IMMEDIATELY flush area with clear water.

⚠WARNING

When any hydraulic brake component, line or connection is loosened or replaced on an ABS motorcycle, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to properly bleed the brake system could adversely affect braking, which could result in death or serious injury. (00585c)

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)

Verify front brake hand lever and rear brake foot pedal have a firm feel when applied. Bleed system as necessary.

PROCEDURE

PART NUMBER	TOOL NAME
BB200A	SNAP-ON BASIC VACUUM BRAKE BLEEDER

FASTENER	TORQUE VALUE	
Brake caliper bleeder valve	35-61 **in-lbs**	3.9-6.9 Nm
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm
Brake master cylinder, rear, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm

NOTE

If the brake system was drained, use the SNAP-ON BASIC VACUUM BRAKE BLEEDER (Part No. BB200A). Refer to the instructions provided with the tool. If a vacuum brake bleeder is not available, use the following procedure.

1. Remove bleeder screw cap. Install end of clear plastic tubing over bleeder screw and place free end in a clean container.
2. Position vehicle or handlebar so master cylinder reservoir is level.

NOTE

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

3. Remove cover from master cylinder reservoir.

⚠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)

NOTE

Pay careful attention to the fluid level in the master cylinder reservoir. Add fluid before it empties to avoid drawing air into the brake lines.

4. Refer to Table 2-19. Add brake fluid as necessary. Verify proper operation of the master cylinder relief port by actuating the brake pedal or lever. A slight spurt of fluid breaks the fluid surface in the reservoir if internal components are working properly.
5. Operate the brake lever or pedal to build hydraulic pressure.
6. While holding pressure with the brake lever or pedal:
   a. Open bleeder screw about three-quarter turn.
   b. Close bleeder screw as soon as the lever or pedal has moved full range of travel.
   c. 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.

8. Tighten bleeder screw to specification. Install bleeder screw cap.

NOTE

Bleed both calipers.

9. Fill reservoir to specified level.

NOTE

Check master cylinder cover gasket bellows. Verify that the master cylinder cover gasket bellows is not extended or brake fluid is ejected from the reservoir.

10. Refer to Table 2-20. Verify that gasket and sealing surfaces are free of debris. Install master cylinder reservoir cover.
    a. **Front master cylinder reservoir:** Orient the cover with the vent holes facing the rear. Install cover screws. Tighten to specification.
    b. **Rear master cylinder reservoir:** Install cover screws. Tighten to specification.
11. Check operation of rear lamps.

⚠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)

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

Table 2-19. Fluid Level

ITEM	SPECIFICATION
Front reservoir	Boss or ridge
Rear reservoir	Ledge or range window

Table 2-20. Torque Specifications

COMPONENT	TORQUE
Bleeder	35-61 **in-lbs** (3.9-6.9 Nm)
Front cover	9-17 **in-lbs** (1.0-2.0 Nm)
Rear cover	9-17 **in-lbs** (1.0-2.0 Nm)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

LEFT SIDE COVER 2.15

OPENING/CLOSING

Open

1. Cover passenger footpeg and rear brake fluid line.
2. Grasp top corners of side cover.

NOTES

- *Disengage rear clip first.*
- *See Figure 2-94. Cover hangs from hook (3) on battery tray.*

3. Gently pull cover with barrel clips (1) away from plastic socket clips (2) on frame.

NOTICE

Leaning or placing tools on side cover could cause damage to cover and/or mounting tab on battery tray. (00523b)

4. Rest cover on passenger footpeg.

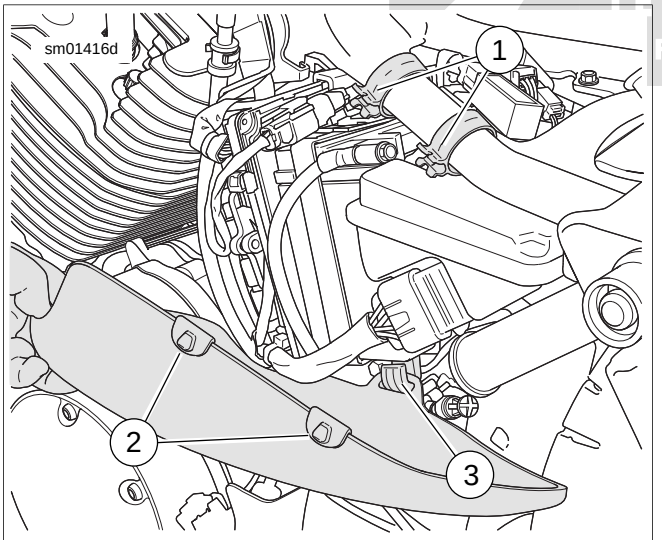
Close

1. Raise the cover.

NOTE

Align the front clip first.

2. Align the barrel clips with the socket clips.
3. Press the top of cover to snap the clips in place.



1. **Barrel clip (2)**
2. **Socket clip (2)**
3. **Mounting hook**

Figure 2-94. Left Side Cover

REPLACEMENT

Remove

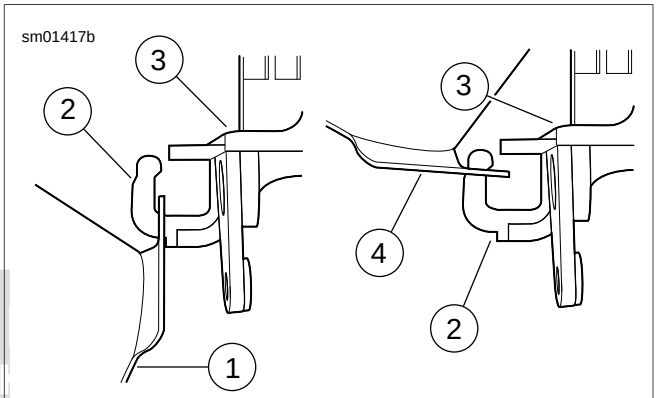
1. Lift side cover up.
2. Tilt cover to the rear.
3. See Figure 2-95. With a back and forth rocking motion, pull up and out to disengage cover (1) from mounting hook (2) on battery tray (3).

Barrel Clip

See Figure 2-96. Install barrel clip (1) with fastener (2). Hand tighten.

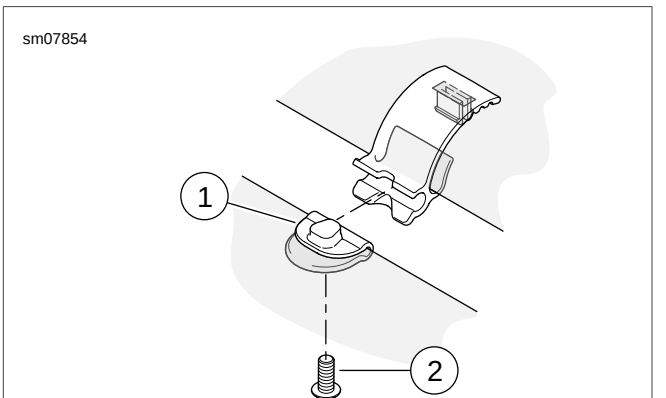
Install

1. Position cover over battery tray. Align slot in cover to mounting hook.
2. Install cover over mounting hook.
3. Close the cover.



1. **Side cover (open)**
2. **Mounting hook**
3. **Battery tray**
4. **Side cover (closed)**

Figure 2-95. Bottom Mount



1. **Barrel Clip**
2. **Fastener**

Figure 2-96. Barrel Clip

FRONT FORK 2.16

FORK OIL LEAK CHECK

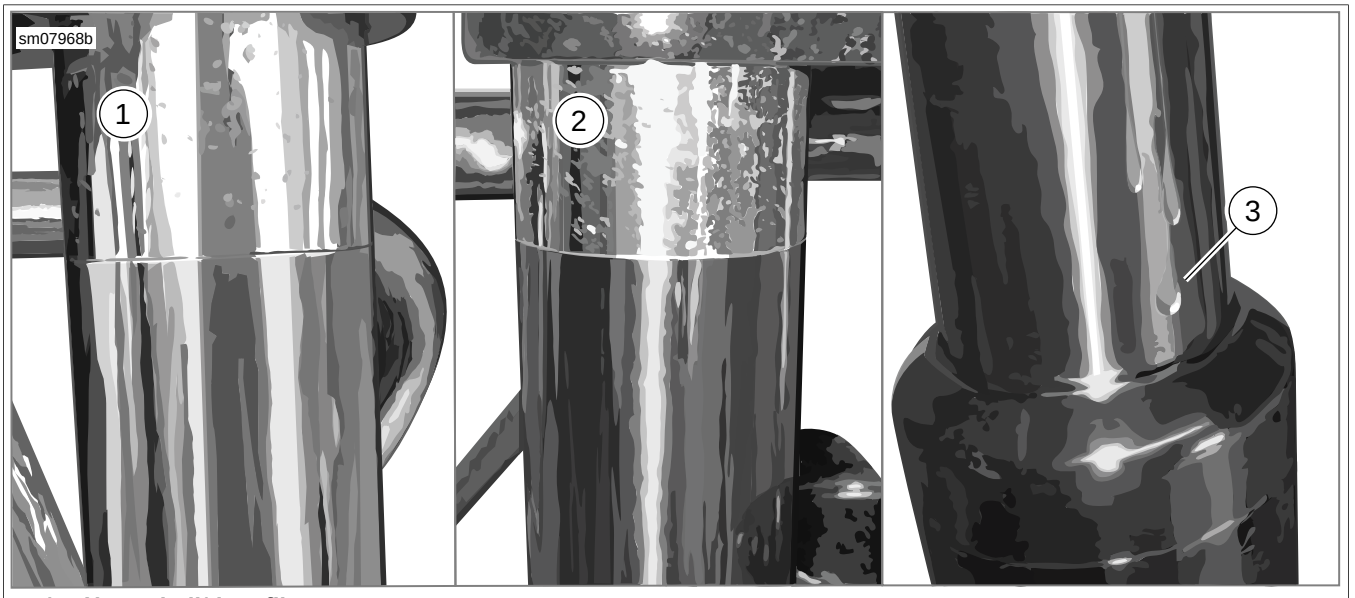
Fork Oil Seals

The fork oil seal allows a fine film of oil to lubricate the fork sliding surface.

- The oil film is more visible after continuous high-speed compression and rebound movement.
- Due to greater lubrication needs, larger forks have a greater amount of oil film than smaller forks.

Oil Leak Check

1. Observe oil-ring.
2. Wipe fork clean.
3. Ride motorcycle over bumpy road or complete six braking events.
4. See Figure 2-97. Check fork slider tube for oil.
   a. If a normal oil/dust film (1, 2) is present, there is no leak.
   b. If an oil run or drip (3) is present, perform procedure two or three more times to confirm oil leak.

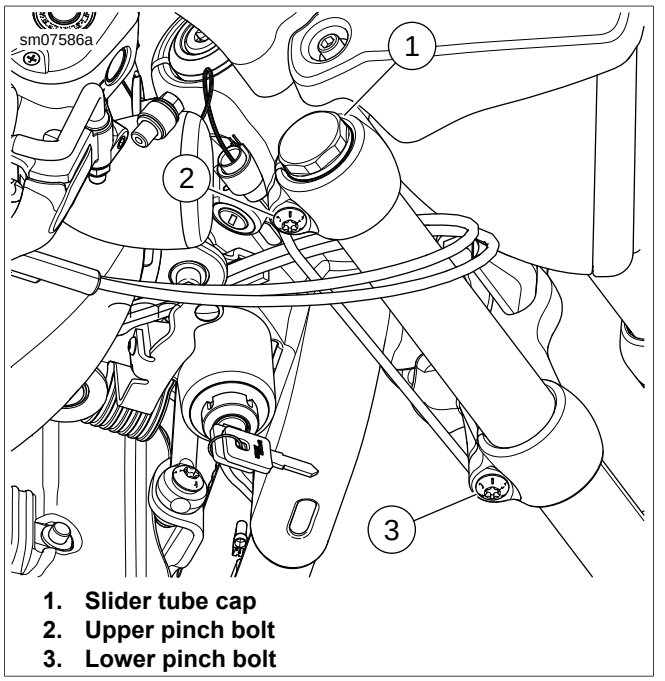


1. **Normal oil/dust film**
2. **Normal oil/dust film**
3. **Drip**

Figure 2-97. Front Forks

REMOVAL

1. Remove front brake caliper. See 2.9 FRONT BRAKE CALIPERS.
2. Remove front wheel assembly. See 2.5 WHEELS.
3. Remove front fender mounting screws and locknuts. Remove fender. See 2.27 FRONT FENDER.
4. **XL 1200T:** Remove windshield.
5. **XL 1200T:** Remove throttle cable clip.
6. See Figure 2-98. Loosen the upper pinch bolts (2).
7. Loosen, but do not remove, slider tube caps (1).
8. Loosen lower pinch bolts (3). Remove fork assemblies from fork brackets.



1. **Slider tube cap**
2. **Upper pinch bolt**
3. **Lower pinch bolt**

Figure 2-98. Fork Tube Bracket

DISASSEMBLY

Drain Fork Oil

1. See Figure 2-99. Remove tube cap (7) from slider tube (9). Remove O-ring (6) from tube cap.
2. Place a pan under fork.
3. Turn fork upside over pan. Pump slider to drain fork oil.

Fork Disassembly

1. See Figure 2-99. Remove spring (5) from slider tube.
2. **All except XL 883L and XL 1200X:** Remove spring collar (19) and spring washer (20) from slider tube.
3. **All except XL 883N:** Remove cover (11).

NOTE

See Figure 2-104. The XL 883N has fork gaiters (2) instead of metal covers. The lower lip (3) of the gaiter fits into groove at upper end of slider (1). The upper end of gaiter fits tightly around slider tube, just below lower bracket (4).

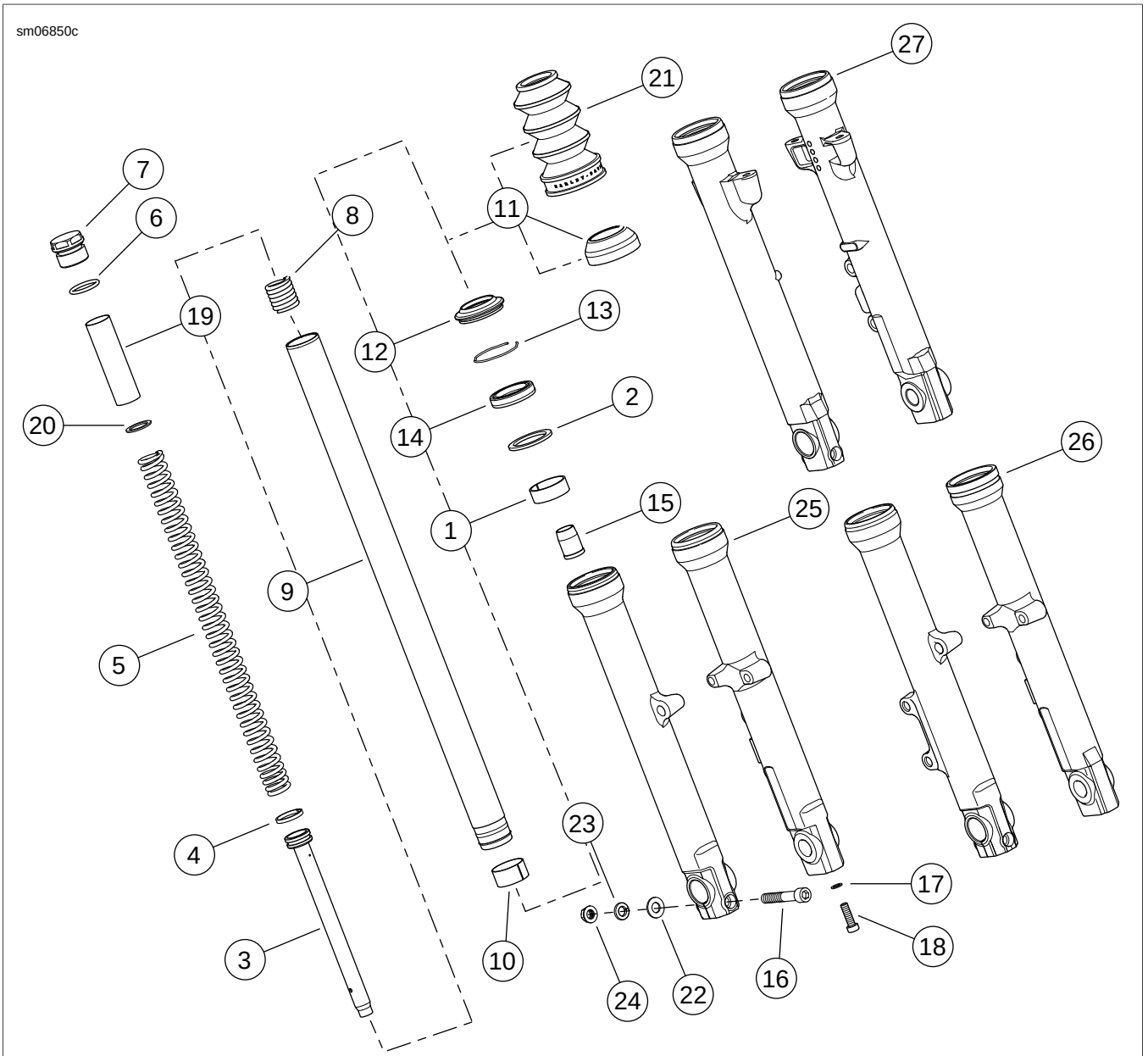
4. **XL 883N:** See Figure 2-104. Peel back lower lip (3) of fork gaiter (2) from slider groove and slide fork gaiter up and off end of slider tube.
5. See Figure 2-99. Remove dust seal (12). Compress internal circle clip (13). Remove clip from groove in top of slider bore.
6. Remove screw (18) and washer (17) from bottom of slider.

NOTE

Since there is little resistance to damper tube (3) rotation within slider tube (9) when removing screw (18), use an air impact wrench for best results.

7. Withdraw slider tube (9) from slider until lower bushing (10) on slider tube contacts upper bushing (1) in slider.
8. Tap out oil seal (14), spacer (2) and upper bushing with lower bushing on slider.
9. Remove sleeve (15). Sleeve is within slider or on bottom end of damper tube (3).
10. Insert a small diameter rod through opening in bottom of slider tube to remove damper tube assembly.
11. Remove rebound spring (8) from damper tube.
12. Remove damper tube ring (4) from damper tube.
13. Remove lower bushing from damper tube only if replacement is necessary.

DIGITAL TECHNICIAN HARLEY-DAVIDSON



1. Upper bushing
2. Spacer
3. Damper tube
4. Damper tube ring
5. Spring
6. O-ring
7. Tube cap
8. Rebound spring
9. Slider tube
10. Lower bushing
11. Cover (all except XL 883N)
12. Dust seal
13. Internal circle clip
14. Oil seal
15. Sleeve
16. Pinch bolt
17. Washer
18. Screw
19. Spring collar (all except XL 883L, XL 1200X)
20. Spring washer (all except XL 883L and XL 1200X)
21. Fork gaiter (XL 883N)
22. Washer
23. Lockwasher
24. Nut
25. Sliders (RH and LH XL 883L/N and 1200C/CP/CA/CB/T/V)
26. Sliders (RH and LH XL 883R)
27. Sliders (RH and LH XL 1200X)

Figure 2-99. Front Slider Tube/Slider Assembly

CLEANING AND INSPECTION

1. Clean all parts.
2. Inspect parts for wear or damage. Replace any parts that are damaged.
3. Replace retaining clip if bent or distorted.

4. Inspect OD of slider bushing and ID of fork tube bushing:
   a. If coating is worn through (metallic substrate showing), replace bushing.
   b. Inspect for distortion.
   c. If deep scratches or scoring are found, replace bushing. Also inspect mating components for similar wear. Repair or replace as necessary.
5. Check fork tube and slider for scoring, scratches and abnormal wear.
6. Inspect fork tube for nicks from stones and road debris, especially in area where seal contacts it. Replace if necessary.
7. See Figure 2-100. Check runout with a dial indicator.
   a. Set fork tube on V-blocks.
   b. Replace fork if runout exceeds 0.008 in (0.2 mm).

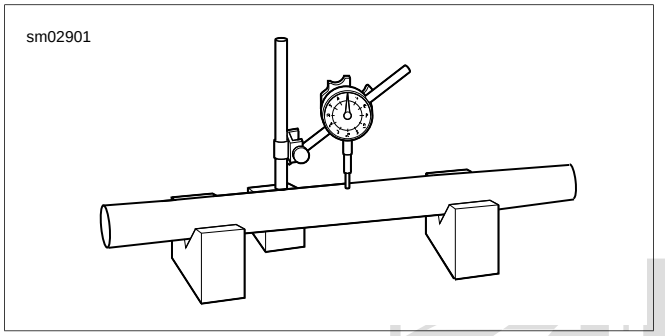


Figure 2-100. Measure Fork Tube Runout

ASSEMBLY

PART NUMBER	TOOL NAME
HD-36583	FORK SEAL AND BUSHING INSTALLATION TOOL

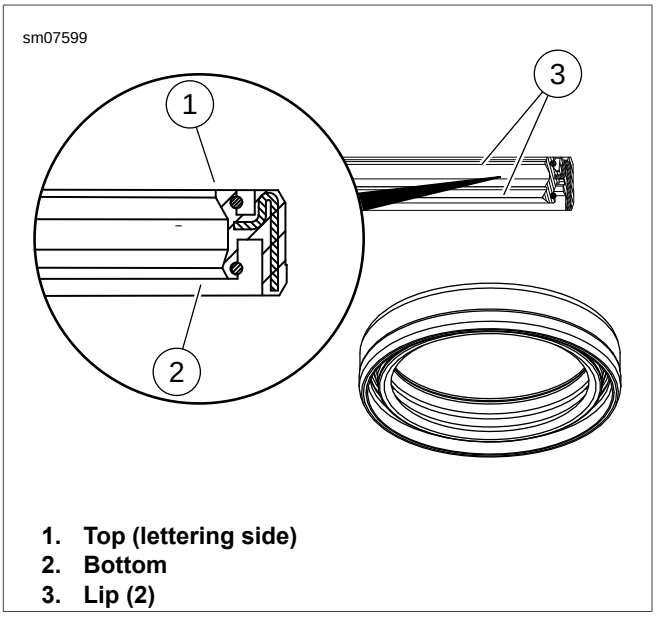
FASTENER	TORQUE VALUE	
Fork slider tube fastener	132-216 **in-lbs**	14.9-24.4 Nm

1. See Figure 2-99. If lower bushing (10) was removed, install **new** lower bushing in groove of slider tube (9). Expand bushing only enough to fit over tube.
2. Install damper tube rings (4) into grooves of damper tube (3).
3. Place rebound spring (8) over damper tube (3). Insert damper tube into slider tube.
4. Insert spring into slider tube with tapered end down.
5. Push damper tube through opening at bottom of slider tube using spring. Place sleeve (15) over end of damper tube.
6. **All except XL 883L and XL 1200X:** Install spring washer (20) and spring collar (19) into slider tube.
7. Install slider tube assembly:
   a. Install slider tube assembly into slider.
   b. Install screw (18) with washer (17) at bottom of slider.
   c. Move slider tube through its full range of travel within slider several times to verify proper component alignment.
   d. Apply a downward force on spring. Tighten screw to 132-216 **in-lbs** (14.9-24.4 Nm).

NOTES

- *See Figure 2-101. Coat lips (3) and inner diameter of oil seal with HARLEY-DAVIDSON SEAL GREASE.*
- *Apply HARLEY-DAVIDSON SEAL GREASE to mating surfaces of dust cover and oil seal.*

8. See Figure 2-99. Place upper bushing (1), spacer (2) (concave side down) and oil seal (14) (lettering side up) over slider tube. Place FORK SEAL AND BUSHING INSTALLATION TOOL (Part No. HD-36583) over slider tube. Install bushing, spacer and seal into slider bore by tapping components downward with installation tool.
9. Install internal circle clip (13) into groove in top of slider bore.
10. Install dust seal (12) at top of slider.
11. **All except XL 883N:** Install cover (11).
12. **XL 883N:** See Figure 2-104. Slide a fork gaiter (2) down each slider tube. Peel back lower lip (3) and slip over end of fork slider (1). Fit lower lip down over groove in upper end of fork slider. Slide upper end of fork gaiter down as far as possible.
13. Fill fork tube with fork oil. See 2.16 FRONT FORK, Fill with Fork Oil.



1. **Top (lettering side)**
2. **Bottom**
3. **Lip (2)**

Figure 2-101. Fork Seal

FILL WITH FORK OIL

PART NUMBER	TOOL NAME
HD-59000-B	OIL LEVEL GAUGE

NOTE

Remove the spring, spring washer and spring collar before adding oil.

1. Position fork tube assembly upright. Compress assembly fully.
2. Pour approximately 14 fl oz (414 mL) of TYPE "E" HYDRAULIC FORK OIL into fork.
3. Pump slider tube 8-10 times to expel air and compress assembly fully.
4. See Figure 2-102. Use OIL LEVEL GAUGE (Part No. HD-59000-B) to set fork oil level.
   a. Adjust length of draw off tube to specification (1). Refer to Table 2-21.
   b. Lock tube (2) to collar (3) with thumb lock (4).
   c. Fit collar to fork tube.
   d. Draw off excess oil.
5. Install spring and other components.

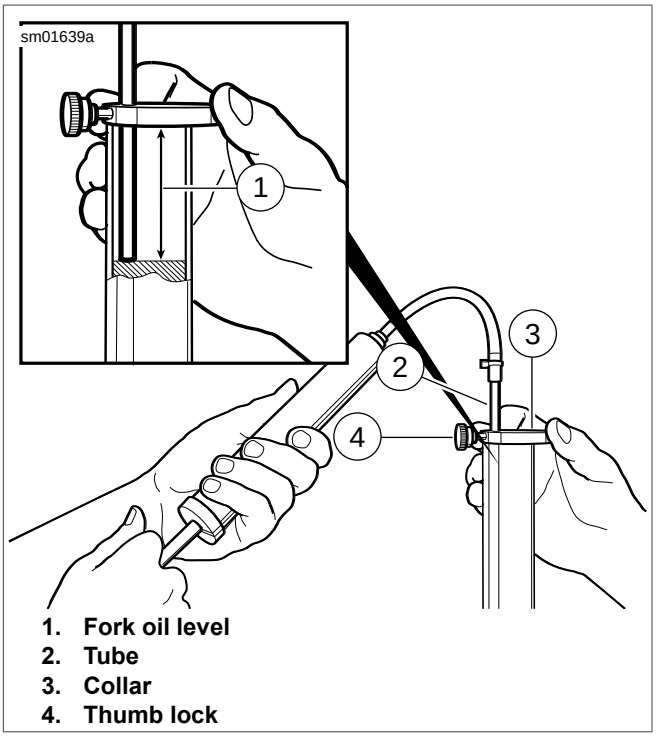
NOTE

Apply HARLEY-DAVIDSON SEAL GREASE to O-ring.

6. Install slider tube cap with O-ring. Screw tube cap all the way into slider tube. Finger-tighten only.

Table 2-21. Fork Oil Level Specifications

MODEL	in	mm
XL 883N	4.72	120
XL 883L	4.80	122
XL 883R	4.92	125
XL 1200C/CA/CB/CP	4.72	120
XL 1200T	4.49	114
XL 1200V	4.92	125
XL 1200X	6.34	161



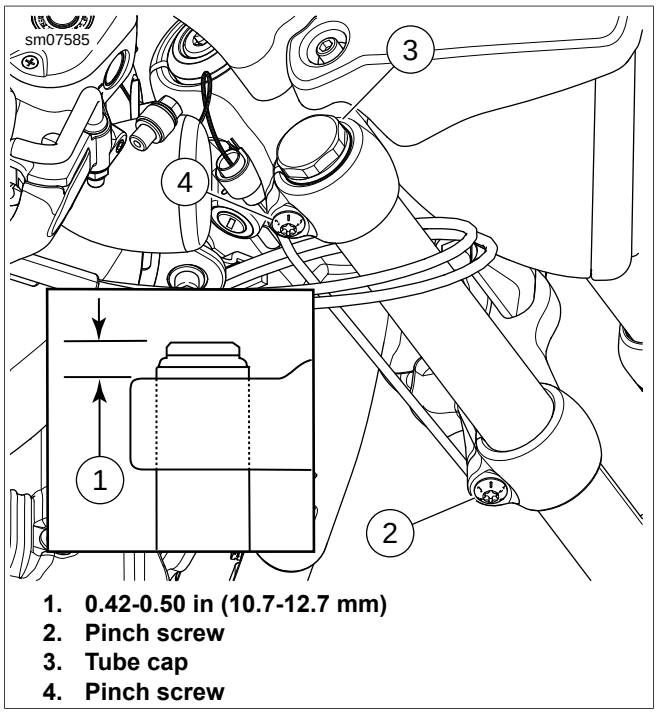
1. **Fork oil level**
2. **Tube**
3. **Collar**
4. **Thumb lock**

Figure 2-102. Oil Level Gauge

INSTALLATION

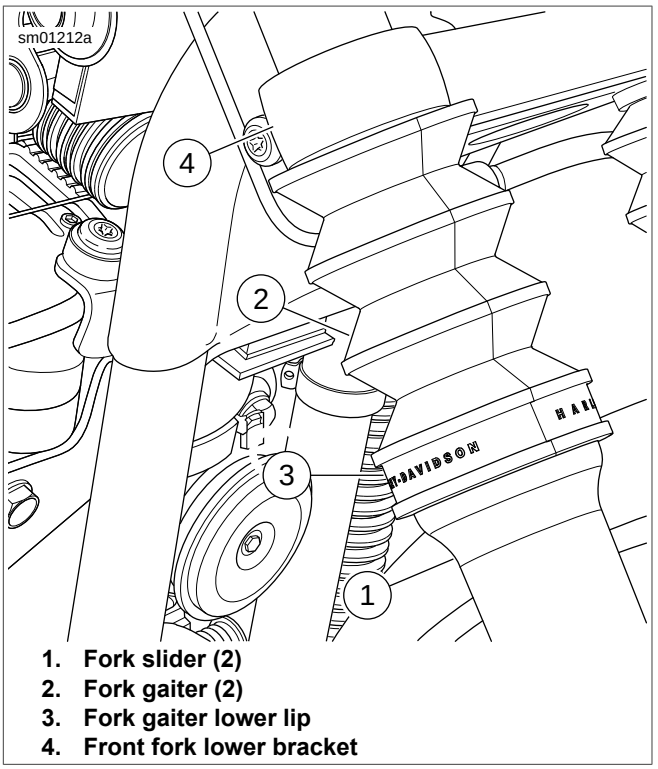
FASTENER	TORQUE VALUE	
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm
Fork slider tube cap	22-58 ft-lbs	29.9-78.7 Nm
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm

1. See Figure 2-103. Insert each fork assembly through front fork lower and upper brackets. Position slider tubes to extend fork tube caps 0.42-0.50 in (10.7-12.7 mm) (1) above top surface of front fork upper bracket.
2. Tighten front fork lower bracket pinch screws (2) to 30-35 ft-lbs (40.7-47.5 Nm).
3. Now tighten slider tube caps (3) to 22-58 ft-lbs (29.9-78.7 Nm).
4. Tighten front fork upper bracket pinch screws (4) to 30-35 ft-lbs (40.7-47.5 Nm).
5. **XL 883N:** See Figure 2-104. Slide upper end of each fork gaiter (2) up until it contacts underside of front fork lower bracket (4).
6. **XL 1200T:** Install throttle cable clip.
7. **XL 1200T:** Install windshield.
8. Install front fender. See 2.27 FRONT FENDER.
9. Install front wheel and caliper. See 2.5 WHEELS.



1. 0.42-0.50 in (10.7-12.7 mm)
2. Pinch screw
3. Tube cap
4. Pinch screw

Figure 2-103. Tube Cap Extension



1. Fork slider (2)
2. Fork gaiter (2)
3. Fork gaiter lower lip
4. Front fork lower bracket

Figure 2-104. Fork Gaiter: XL 883N

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

FORK STEM AND BRACKET ASSEMBLY 2.17

REMOVAL AND DISASSEMBLY

1. Cover the fuel tank.
2. Remove the fork tube assemblies. See 2.16 FRONT FORK.
3. **XL 1200V:** See Figure 2-105. Remove the two fasteners and the chrome cover.
4. See Figure 2-106. Loosen fork stem pinch screw (7). Remove fork stem bolt (9) and washer (8).

NOTE

Exercise caution to avoid damaging control cables, wiring harnesses, clutch cable or brake lines.

5. Remove P-clamps securing brake lines to fork brackets. See 2.12 BRAKE LINES.
6. Lift handlebar assembly from steering head with fork upper bracket (6) attached. Carefully position assembly out of the way.

NOTE

Only disconnect handlebar connections if removing as an assembly.

7. Remove upper seal (5) and upper bearing cone (3). Slide fork stem and lower bracket (1) from frame.
8. **XL 1200T:** Remove the clutch cable wireform from the lower bracket.

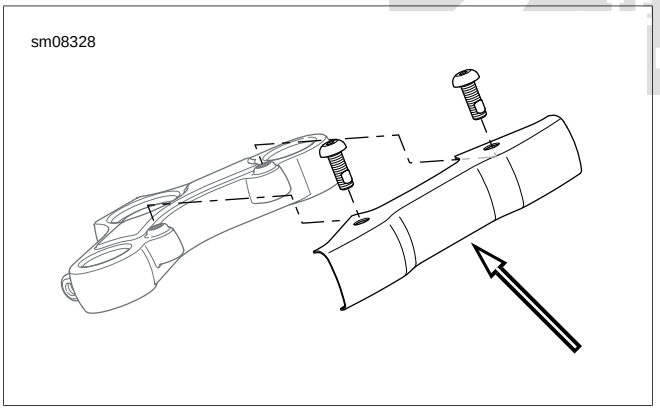
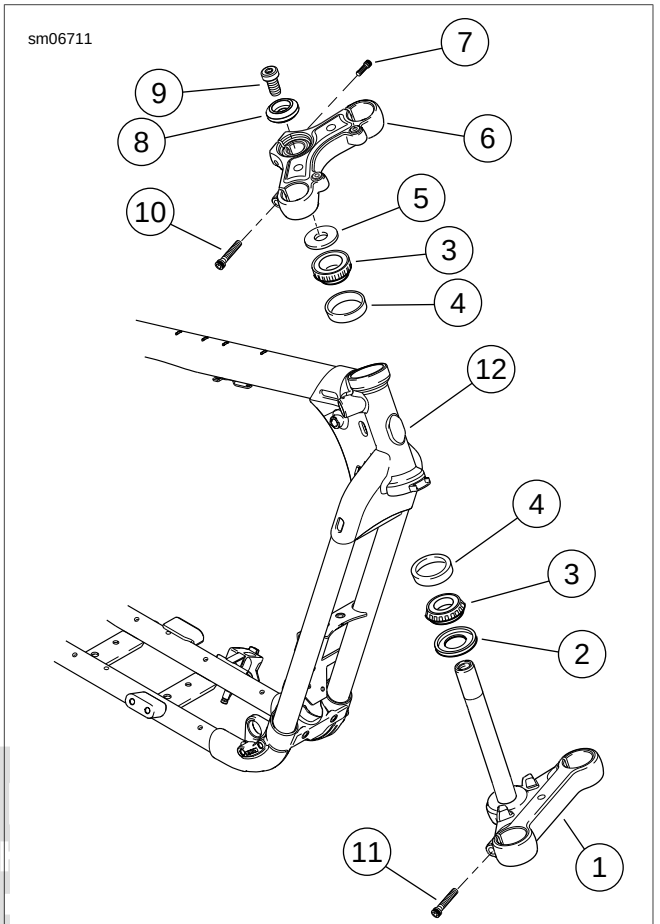


Figure 2-105. Chrome Bracket Cover: XL 1200V



1. **Fork stem and lower bracket**
2. **Seal, lower**
3. **Bearing cone (2)**
4. **Bearing cup (2)**
5. **Seal, upper**
6. **Fork upper bracket**
7. **Fork stem pinch screw**
8. **Washer**
9. **Fork stem bolt**
10. **Pinch screw, upper (2)**
11. **Pinch screw, lower (2)**
12. **Steering head (part of frame)**

Figure 2-106. Fork Stem and Bracket Assembly: Typical

CLEANING, INSPECTION AND REPAIR

PART NUMBER	TOOL NAME
HD-33416	UNIVERSAL DRIVER HANDLE
HD-39301-A	STEERING HEAD BEARING RACE REMOVAL TOOL

1. See Figure 2-106. Clean the seals (2, 5), bearing cones (3), fork stem and lower bracket (1) and steering head (12) with solvent.
2. Inspect fork stem and lower bracket (1). Replace as necessary.

NOTE

Replace bearings and bearing cups as a set.

3. Inspect bearings. Replace as necessary.
   a. Pitting
   b. Wear
   c. Scoring
4. Turn the bearings in the races to check for roughness. Replace as necessary.

NOTICE

Replace both bearing assemblies even if one assembly appears to be good. Mismatched bearings can lead to excessive wear and premature replacement. (00532c)

NOTE

The lower bearing cone is a slip-fit on the fork stem. If necessary, gently pry bearing cone off fork stem with a pair of flat blade screwdrivers.

5. Replace bearings and bearing cups:
   a. Slide lower bearing cone up and off fork stem.
   b. Remove lower seal (2).
   c. Drive bearing cups from steering head using STEERING HEAD BEARING RACE REMOVAL TOOL (Part No. HD-39301-A) and UNIVERSAL DRIVER HANDLE (Part No. HD-33416). **Discard bearing cups.**

ASSEMBLY AND INSTALLATION

PART NUMBER	TOOL NAME
HD-39302	STEERING HEAD BEARING RACE INSTALLATION TOOL

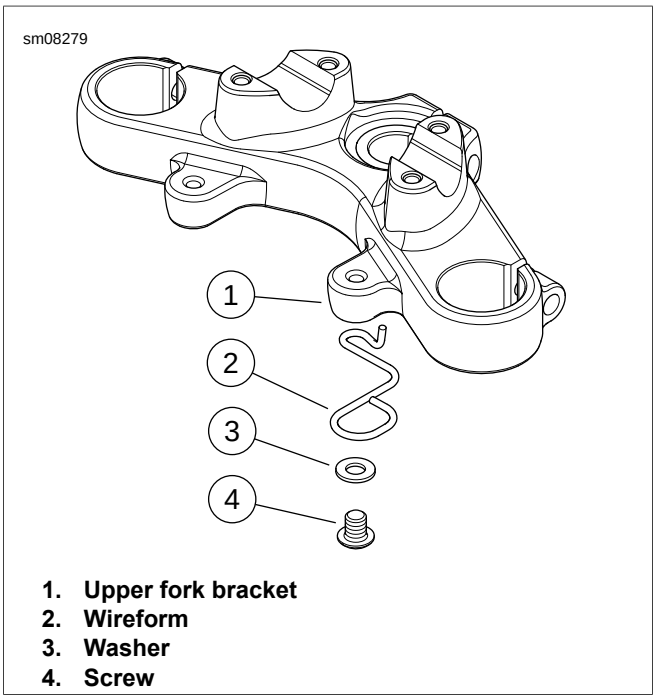
FASTENER	TORQUE VALUE	
Fork, front, stem bolt, first torque	23-27 ft-lbs	31.2-36.6 Nm
Fork, front, stem bolt, final torque	72-96 **in-lbs**	8.1-10.9 Nm
Fork stem pinch bolt	30-35 ft-lbs	40.7-47.5 Nm
Fork stem pinch bolt	30-35 ft-lbs	40.7-47.5 Nm
Fork, front, chrome cover	120-192 **in-lbs**	13.5-21.6 Nm
Clutch cable wireform screw	9-11 **in-lbs**	1.1-1.2 Nm

1. See Figure 2-107. If bearing cups (4) were removed, obtain **new** bearings and bearing cups. Install **new** bearing cups into frame steering head using STEERING HEAD BEARING RACE INSTALLATION TOOL (Part No. HD-39302).

⚠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)

2. Liberally coat the bearing cones (3) with SPECIAL PURPOSE GREASE. Work the grease thoroughly into the bearing rollers.
3. Place lower bearing seal (2) over fork stem. Install lower bearing cone (3) onto fork stem and bracket (1).
4. Insert fork stem and bracket (1) through the steering head. Install bearing cone (3) and seal (5) onto the stem.
5. Install the upper bracket (6) including the handlebar assembly and loosely install fork stem bolt (9) with washer (8).
6. Install fork slider and tube assemblies. See 2.16 FRONT FORK. Leave both lower fork bracket pinch screws (11) loose.
7. Install P-clamps securing brake lines to fork brackets. See 2.12 BRAKE LINES.
8. Tighten fork stem bolt (9) to 23-27 ft-lbs (31.2-36.6 Nm). Loosen fork stem bolt. Tighten to 72-96 **in-lbs** (8.1-10.9 Nm).
9. Tighten lower fork bracket pinch bolt to 30-35 ft-lbs (40.7-47.5 Nm).
10. Tighten fork stem pinch screw (7) to 30-35 ft-lbs (40.7-47.5 Nm).
11. **XL 1200V:** Install the chrome upper bracket cover and screws. Tighten to 120-192 **in-lbs** (13.5-21.6 Nm).
12. **XL 1200T:** See Figure 2-107. Install the clutch cable wireform (2), washer (3) and fastener (4) to the upper fork bracket (1). Tighten to 9-11 **in-lbs** (1.1-1.2 Nm).
13. Check steering head bearing fall-away. See 1.18 STEERING HEAD BEARINGS, Fall-Away.



1. **Upper fork bracket**
2. **Wireform**
3. **Washer**
4. **Screw**

Figure 2-107. Clutch Cable Wireform: XL 1200T

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

BELT GUARD AND DEBRIS DEFLECTOR 2.18

BELT GUARD

FASTENER	TORQUE VALUE	
Belt guard screw	120-180 **in-lbs**	13.6-20.4 Nm
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm

Removal

1. See Figure 2-108. Remove right side lower shock absorber mount locknut (1).
2. Pull shock absorber mounting bolt (2) out slightly until it clears mounting hole in belt guard (4).
3. Remove screw (5), washer (6) and nut (7) securing front of belt guard to rear fork.

Installation

1. See Figure 2-108. Slide belt guard (4) into place. Tab on front of belt guard mounts outboard of mounting bracket on rear fork.
2. Secure front of belt guard to rear fork with screw (5), washer (6) and nut (7). Tighten to 120-180 **in-lbs** (13.6-20.4 Nm).
3. Push lower shock absorber bolt (2) through belt guard mounting hole. Thread locknut (1) on screw. Tighten to 45-50 ft-lbs (61-68 Nm).

DEBRIS DEFLECTOR

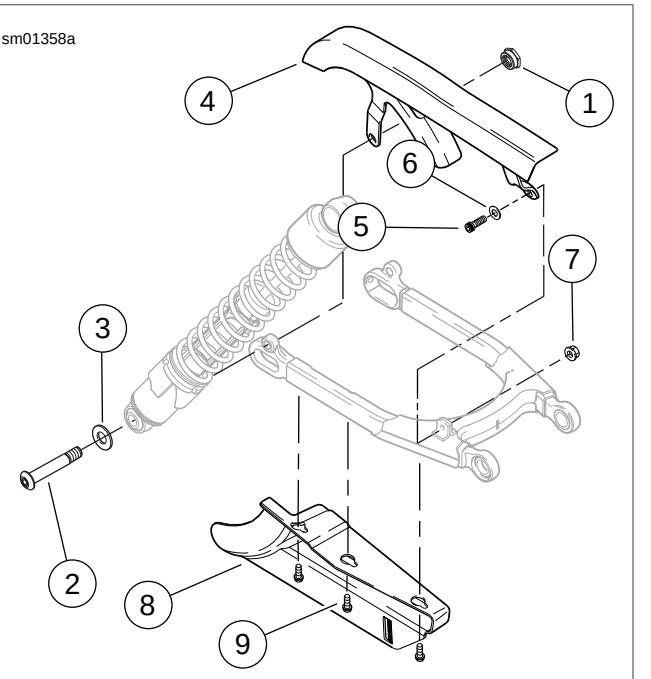
FASTENER	TORQUE VALUE	
Debris deflector screw	36-60 **in-lbs**	4.1-6.8 Nm

Removal

1. See Figure 2-108. Loosen, but do not remove, three screws and captive washers (9) securing debris deflector (8) to underside of rear fork.
2. Slide debris deflector forward until keyway slots in deflector clear screw heads.

Installation

1. See Figure 2-108. Position debris deflector (8) in place on underside of rear fork.
2. Fit large end of keyway slots in deflector over screw heads and captive washers (9). Slide deflector rearward to lock screws in slots.
3. Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).



1. **Locknut**
2. **Mounting bolt**
3. **Washer**
4. **Belt guard**
5. **Screw**
6. **Washer**
7. **Nut**
8. **Debris deflector**
9. **Screw with captive washer (3)**

Figure 2-108. Belt Guard/Debris Deflector

REAR FORK 2.19

REMOVAL

NOTICE

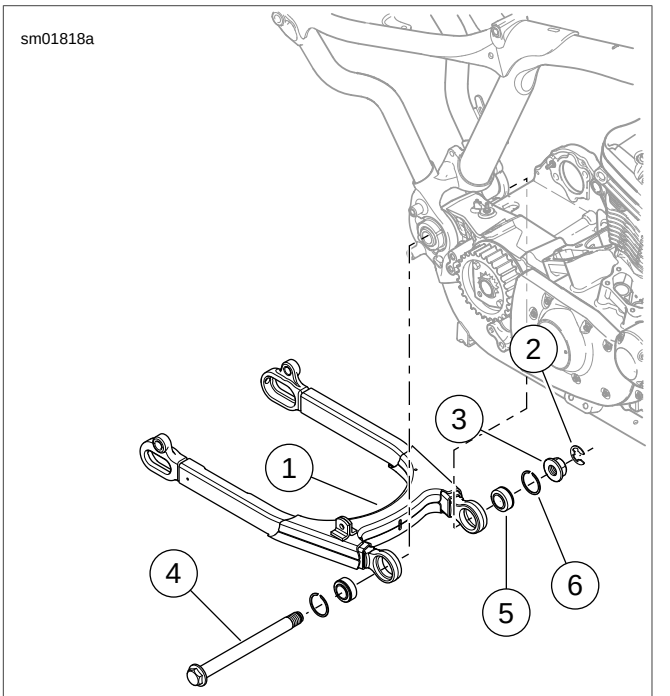
When lifting a motorcycle using a jack, be sure jack contacts both lower frame tubes where down tubes and lower frame tubes converge. Never lift by jacking on cross-members, oil pan, mounting brackets, components or housings. Failure to comply can cause serious damage resulting in the need to perform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

1. Raise the motorcycle.
2. Remove exhaust system. See 4.16 EXHAUST SYSTEM.
3. Remove rear wheel. See 2.5 WHEELS, Rear Wheel.
4. Remove the rider footrest bracket.
   a. Remove the brake pushrod E-clip and pin.
   b. Remove the rider support bracket fasteners.

NOTE

The rear brake components can be removed without draining the brake fluid. Support the components to prevent strain on the brake lines.

5. Remove rear brake master cylinder reservoir. See 2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR.
6. Remove screw securing brake line clamp to rear fork. See 2.11 REAR BRAKE CALIPER.
7. Remove rear brake caliper from rear fork mounting bracket.
8. Remove the caliper mounting bracket.
9. Remove left passenger footrest support bracket. See 2.41 PASSENGER FOOTRESTS, Left.
10. Support the brake line harness bracket.
11. Remove both shock absorber screws, washers and nuts from rear fork. See 2.20 SHOCK ABSORBERS.
12. Remove belt guard and debris deflector. See 2.18 BELT GUARD AND DEBRIS DEFLECTOR.
13. See Figure 2-109. Remove rear fork.
    a. Support rear fork (1).
    b. Remove the retaining clip (2).
    c. Remove the flange nut (3).
    d. Pull the pivot bolt from the rear fork and the pivot sleeve.



1. **Rear fork**
2. **Retaining clip**
3. **Flange nut**
4. **Pivot bolt**
5. **Bearing (2)**
6. **Retaining ring (2)**

Figure 2-109. Rear Fork Assembly

INSTALLATION

FASTENER	TORQUE VALUE	
Fork, rear, pivot bolt nut	120-130 ft-lbs	162.7-176.3 Nm
Brake line, rear, bracket fasteners	120-180 **in-lbs**	13.6-20.3 Nm
Footrest support bracket	45-50 ft-lbs	61-68 Nm

1. Install rear fork.
   a. Slide pivot bolt through fork and pivot sleeve.
   b. Install flange nut.
   c. Tighten to 120-130 ft-lbs (162.7-176.3 Nm).
   d. Install retaining ring.
2. Install belt guard and debris deflector. See 2.18 BELT GUARD AND DEBRIS DEFLECTOR.
3. Install caliper mounting bracket.
4. Install both shock absorber screws, washers and nuts. See 2.20 SHOCK ABSORBERS.
5. Capture brake line harness bracket in left passenger footrest.

6. **Passenger footrest models:** Install left passenger footrest. See 2.41 PASSENGER FOOTRESTS, Left.
7. **Non-passenger footrest models:** Install brake line harness bracket and fasteners. Tighten to 120-180 **in-lbs** (13.6-20.3 Nm).
8. Install rear brake master cylinder/reservoir. See 2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR.
9. Install right rider footrest bracket.
   a. Install brake rod into master cylinder/reservoir pushrod.
   b. Install pushrod pin. Secure with E-clip.
   c. Mount support bracket with two fasteners. Tighten to 45-50 ft-lbs (61-68 Nm).
10. Install rear brake caliper.
11. Install rear brake hose clamp.
12. Install rear wheel. See 2.5 WHEELS.
13. Adjust drive belt deflection.
14. Install exhaust system. See 4.16 EXHAUST SYSTEM.

PIVOT BEARINGS

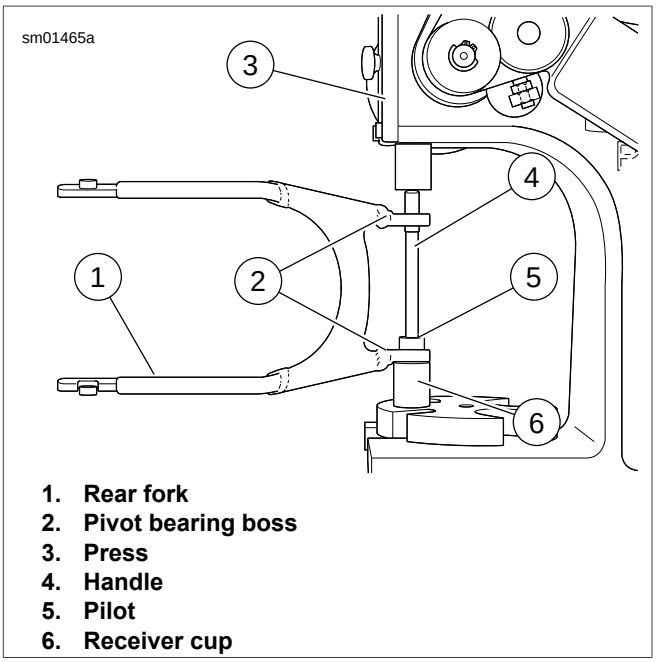
PART NUMBER	TOOL NAME
HD-46281	BEARING REMOVER/INSTALLER TOOL

Removal

NOTE

Remove pivot bearings only if replacement is required.

1. See Figure 2-110. With recessed end of cup facing up, place receiver cup from BEARING REMOVER/INSTALLER TOOL (Part No. HD-46281) on press bed.
2. Place rear fork pivot bearing boss (2) over cup.
3. Slide pilot (5) through bearing and into receiver cup.
4. Insert handle (4) through other rear fork pivot bearing boss and bearing, down into pilot.
5. Engage press ram on end of handle.
6. Press bearing out.



1. **Rear fork**
2. **Pivot bearing boss**
3. **Press**
4. **Handle**
5. **Pilot**
6. **Receiver cup**

Figure 2-110. Removing Rear Fork Pivot Bearings

Cleaning and Inspection

1. Clean all components in solvent.

WARNING

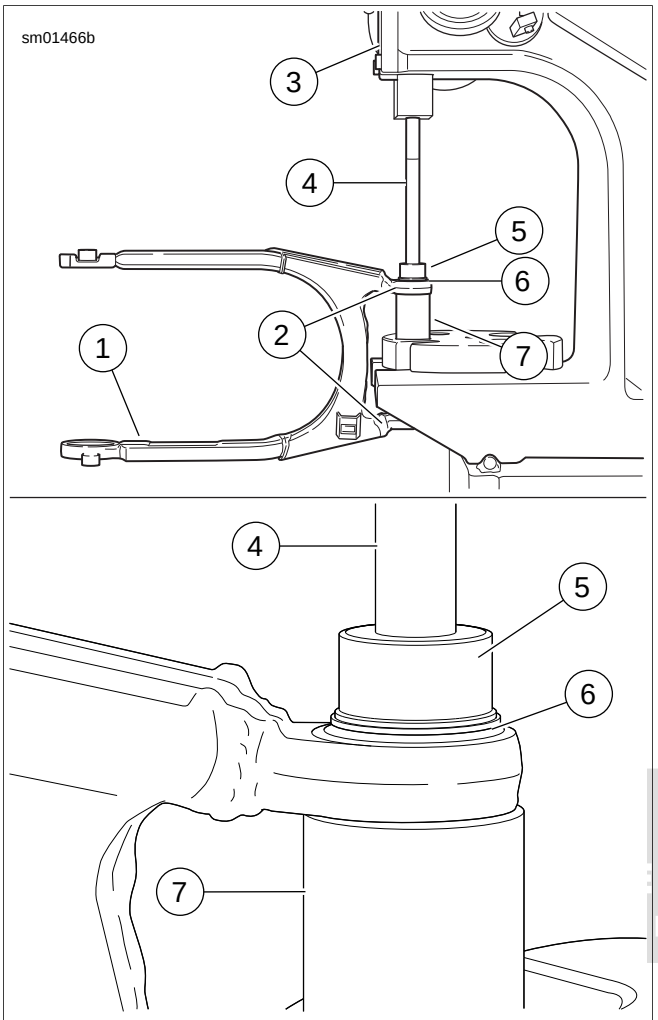
Compressed air can pierce the skin and flying debris from compressed air could cause serious eye injury. Wear safety glasses when working with compressed air. Never use your hand to check for air leaks or to determine air flow rates. (00061a)

2. Dry parts with low-pressure, compressed air.
3. Carefully inspect bearings for wear and/or corrosion. Replace or repair as necessary.
4. Verify that the bearing retaining rings are not bent or damaged. Replace or repair as necessary.
5. Check that rear fork is not bent, twisted or cracked. Replace or repair as necessary.

Installation

1. Assemble the bearings and retaining rings.
2. See Figure 2-111. With recessed end of cup facing up, place receiver cup (7) from BEARING REMOVER/INSTALLER TOOL (Part No. HD-46281) on press bed.
3. Place rear fork pivot bearing boss (2) over cup.
4. Place **new** pivot bearing (6) over pivot bearing boss, with retaining ring side of bearing up.
5. Slide pilot (5) through **new** pivot bearing, through pivot bearing boss, and into receiver cup.
6. Insert handle (4) down into pilot.
7. Engage press ram on end of handle.

8. Press bearing down until retaining ring bottoms out in rear fork pivot bearing boss.



1. **Rear fork**
2. **Pivot bearing boss**
3. **Press**
4. **Handle**
5. **Pilot**
6. **Bearing**
7. **Receiver cup**

Figure 2-111. Installing Rear Fork Pivot Bearings

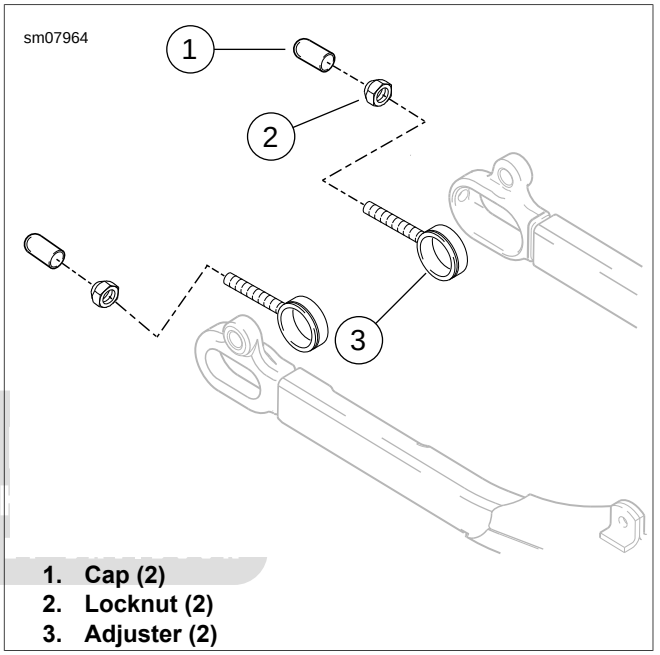
AXLE ADJUSTERS

Removal

1. Remove rear wheel. See 2.5 WHEELS, Rear Wheel.
2. Remove caliper bracket.
3. See Figure 2-112. Remove caps (1), locknuts (2) and adjusters (3).

Installation

1. Install axle adjusters, locknuts and caps.
2. Install caliper bracket.
3. Install rear wheel. See 2.5 WHEELS, Rear Wheel.



1. **Cap (2)**
2. **Locknut (2)**
3. **Adjuster (2)**

Figure 2-112. Axle Adjusters

SHOCK ABSORBERS 2.20

REMOVAL

NOTES

- *If a lift is not available, service one shock absorber at a time.*
- ***Models with saree guard:*** *Remove saree guard. See 2.35 SAREE GUARD: INDIA MODELS.*

1. **XL 1200T:** Remove the saddlebags. See 2.29 SADDLEBAGS: XL 1200T.
2. Note preload setting.
3. See Figure 2-114. Remove mounting screw (1), washer (2) and locknut (3) from bottom end of shock absorber.
4. Remove mounting screw (5) and washer (6) from top end of shock absorber.
5. Remove stud cover (7).
6. Remove shock absorber.

CLEANING AND INSPECTION

NOTE

Replace shock absorbers as set if either unit is damaged.

1. Clean all parts.
2. Inspect parts for wear or damage.
3. Check rubber bushings for wear, cracking and stiffness.
4. Examine shock absorber for signs of leakage.

PRELOAD SHOCK REPAIR: XL 1200T

FASTENER	TORQUE VALUE	
Preload knob screw: XL 1200T	25-43 **in-lbs**	2.8-4.8 Nm

NOTES

- *Except the adjustment knob, screw, washer, detent ball and spring, the rear shock absorbers contain no serviceable parts.*
- *Do not remove the knob quickly. The detent spring and ball are located under the collar of the knob.*

1. Remove the preload shock. See 2.20 SHOCK ABSORBERS, Removal.
2. Lay shock absorber on workbench with adjustment knob facing up.
3. Wrap the knob and adjuster housing with a shop towel to prevent loss of spring and ball.
4. See Figure 2-113. Remove the screw and flat washer securing the knob. Carefully remove the knob.
5. If necessary, remove detent ball and spring.
6. If removed, install detent ball and spring.
   a. Place spring in bore.
   b. Press ball onto end of spring.
7. Install knob on adjuster housing.
8. Install screw and flat washer. Tighten to 25-43 **in-lbs** (2.8-4.8 Nm).
9. Rotate knob. Listen for clicks to verify operation.

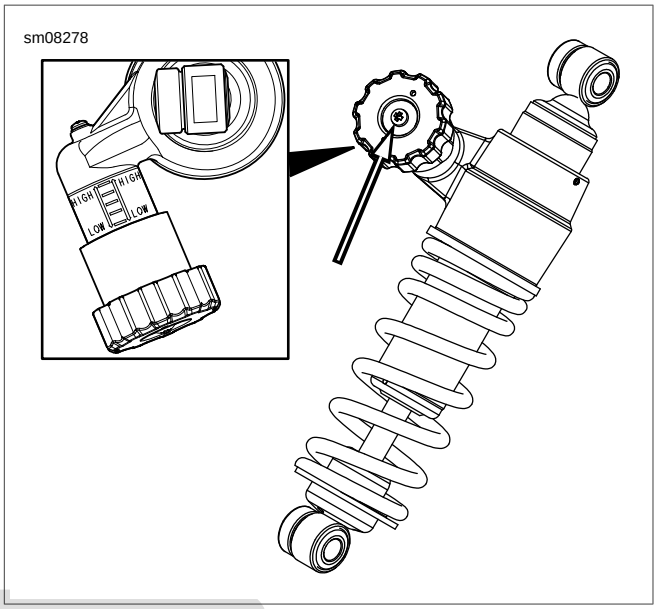


Figure 2-113. Preload Adjustment Knob Retaining Screw

INSTALLATION

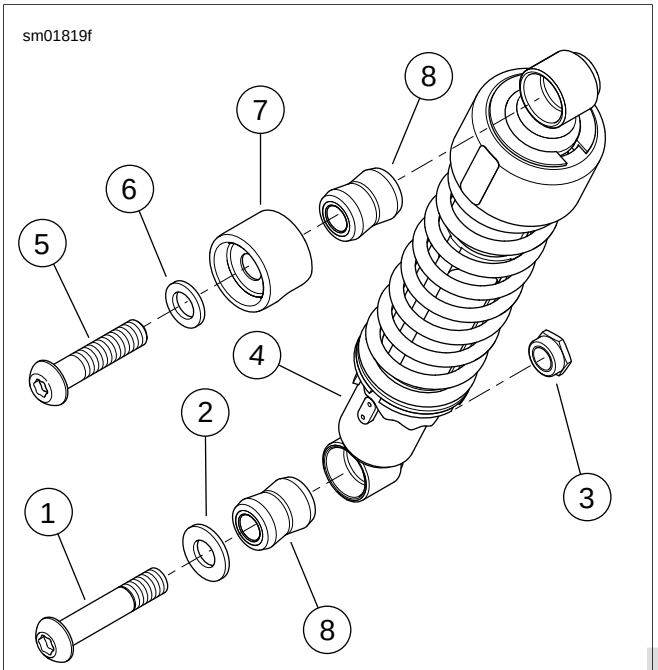
FASTENER	TORQUE VALUE	
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm

NOTE

XL 1200T: *See Figure 2-115. Do not install shocks upside down. Install shock with the preload adjustment knob on left side. Install right side shock with spring collar at the top.*

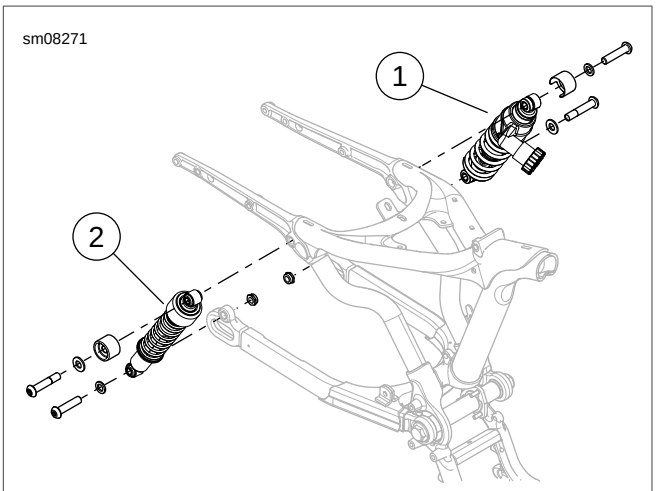
1. See Figure 2-114. Assemble mounting bolt (5), washer (6) and stud cover (7).
2. Install shock absorber mounting stack through shock absorber (4).
3. Position bottom end of shock absorber against outboard side of rear fork mount. Insert lower mounting bolt (1) and washer (2) through damper bushing (8) and rear fork mount.
4. Install locknut (3).
5. Remove upper mounting bolt. Apply 2-3 drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads.
6. Install upper mounting bolt into frame boss. Tighten to 45-50 ft-lbs (61-68 Nm).
7. Tighten locknut to 45-50 ft-lbs (61-68 Nm).

8. **XL 1200T:** Install saddlebags. See 2.29 SADDLEBAGS: XL 1200T.
9. **India models:** If removed, install saree guards. See 2.35 SAREE GUARD: INDIA MODELS.
10. Adjust shock absorber preload to original settings.



1. **Mounting fastener (2)**
2. **Washer (2)**
3. **Locknut (2)**
4. **Shock absorber with preload cam**
5. **Mounting fastener (2)**
6. **Washer (2)**
7. **Stud cover (2)**
8. **Damper bushing (4)**

Figure 2-114. Rear Shocks: All except XL 1200T



1. **Left hand preload shock**
2. **Right hand shock**

Figure 2-115. Rear Shocks: XL 1200T

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

STABILIZER LINKS 2.21

GENERAL

The stabilizer link system allows the engine to move on its rubber engine mounts while maintaining engine-to-frame alignment. The stabilizer links provide a fixed alignment, and no adjustment is necessary or possible.

The spherical ball end of the stabilizer may rotate loosely, but should not have lateral movement. Replace the link if lateral movement exists.

UPPER FRONT STABILIZER LINK

FASTENER	TORQUE VALUE	
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm
Stabilizer link, upper front, engine bracket mounting screw	55-65 ft-lbs	74.6-88.2 Nm
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm

Removal

NOTE

See Figure 2-116. Models with a side-mounted horn do not include a horn bracket (9).

1. Remove screws (5), washers (8), horn bracket (9) and upper frame bracket (3) from frame.
2. Remove screws (6), lockwashers (7) and engine bracket (1) from front cylinder head.

Disassembly

1. See Figure 2-116. Remove screw (4) from engine bracket (1) and stabilizer link (2).
2. Remove screw (4) from upper frame bracket (3) and stabilizer link (2).

Assembly

1. See Figure 2-116. Install screw (4) through stabilizer link (2) to engine bracket (1).
2. Install screw (4) through stabilizer link to upper frame bracket (3).
3. Tighten stabilizer link screws to 25-35 ft-lbs (33.9-47.5 Nm).

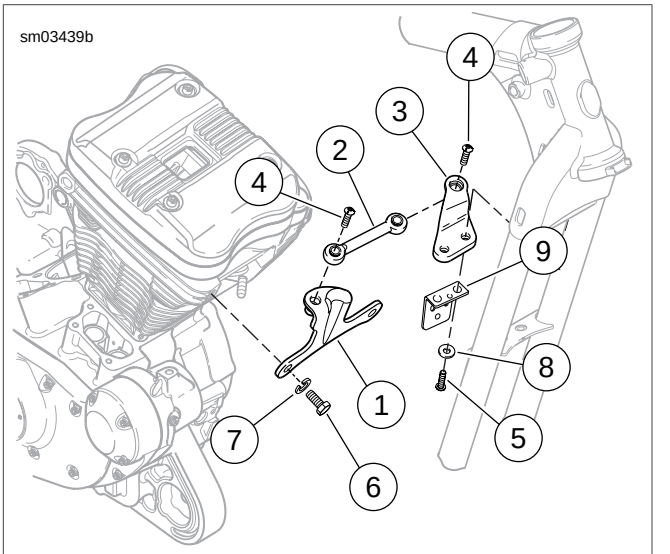
Installation

1. See Figure 2-116. Install screws (6), lockwashers (7) and engine bracket (1) to front cylinder head. Tighten to 55-65 ft-lbs (74.6-88.2 Nm).

NOTE

Models with a side-mounted horn do not include a horn bracket (9).

2. Install upper frame bracket (3), horn bracket (9), screws (5) and washers (8). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).



1. **Engine bracket**
2. **Upper stabilizer link**
3. **Upper frame bracket**
4. **Screw**
5. **Screw (2)**
6. **Screw (2)**
7. **Lockwasher (2)**
8. **Washer (2)**
9. **Horn bracket (front mount models)**

Figure 2-116. Upper Front Stabilizer Link Assembly

LOWER FRONT STABILIZER LINK

FASTENER	TORQUE VALUE	
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm
Stabilizer link, lower front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm

Removal

1. Position motorcycle upright.
2. See Figure 2-117. Remove screw (3) securing stabilizer link (1) to engine case.
3. Remove screws (4), washers (5) and lower frame bracket (2) from frame.

Disassembly

1. See Figure 2-117. Remove screw (3) from lower frame bracket (2).
2. Remove stabilizer link (1) from lower frame bracket.

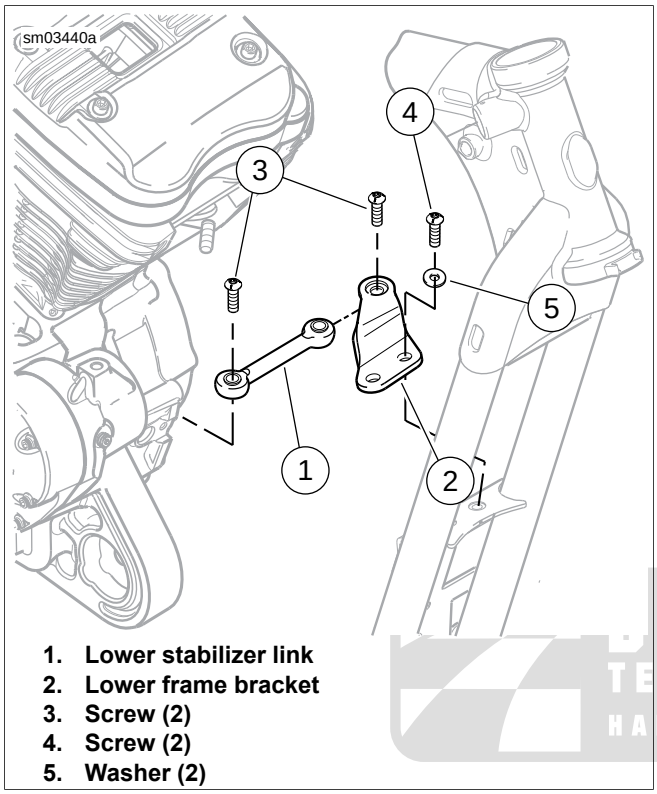
Assembly

1. See Figure 2-117. Install stabilizer link (1) into lower frame bracket (2).
2. Install screw (3) through stabilizer link (1) to lower frame bracket (2)

3. Tighten stabilizer link screw to 25-35 ft-lbs (33.9-47.5 Nm).

Installation

1. See Figure 2-117. Install screws (4), washers (5) and lower frame bracket (2) to frame. Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
2. Install stabilizer link to engine case (1). Secure with screw (3). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).



1. **Lower stabilizer link**
2. **Lower frame bracket**
3. **Screw (2)**
4. **Screw (2)**
5. **Washer (2)**

Figure 2-117. Lower Front Stabilizer Link Assembly

REAR STABILIZER LINK

FASTENER	TORQUE VALUE	
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm

Removal

1. **EVAP models:** Remove EVAP canister and mounting bracket. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL, Charcoal Canister.
2. See Figure 2-118. Remove short screw (3), long screw (4), ground strap (2), stabilizer link (1) and spacer (5).

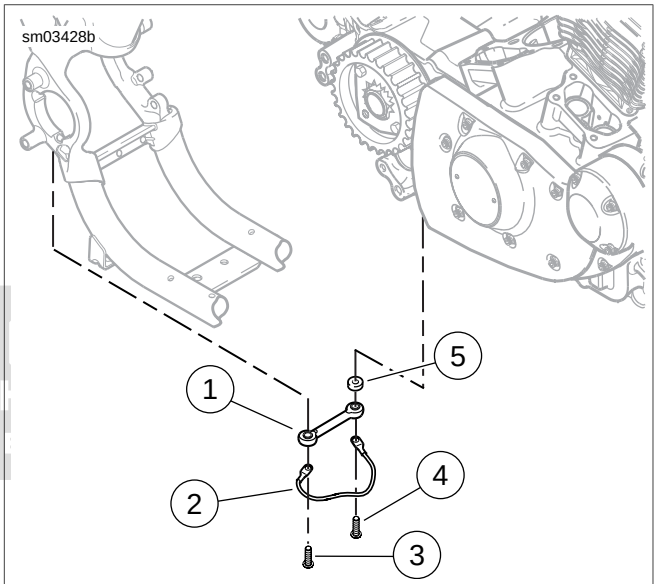
Installation

1. See Figure 2-118. Install short screw (3) through ground strap (2) and stabilizer link (1). Install screw into frame on right side of motorcycle. Leave fasteners loose.
2. Install long screw (4) through ground strap, stabilizer link and spacer (5) into engine case.

NOTE

Orient ground strap so it does not come into contact with EVAP canister mounting hardware.

3. Tighten both screws to 25-35 ft-lbs (33.9-47.5 Nm).
4. **EVAP models:** Install EVAP canister and mounting bracket. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL, Charcoal Canister.



1. **Stabilizer link**
2. **Grounding strap**
3. **Screw**
4. **Screw**
5. **Spacer**

Figure 2-118. Rear Stabilizer Link Assembly

FRONT ENGINE MOUNT/ISOLATOR 2.22

REMOVAL

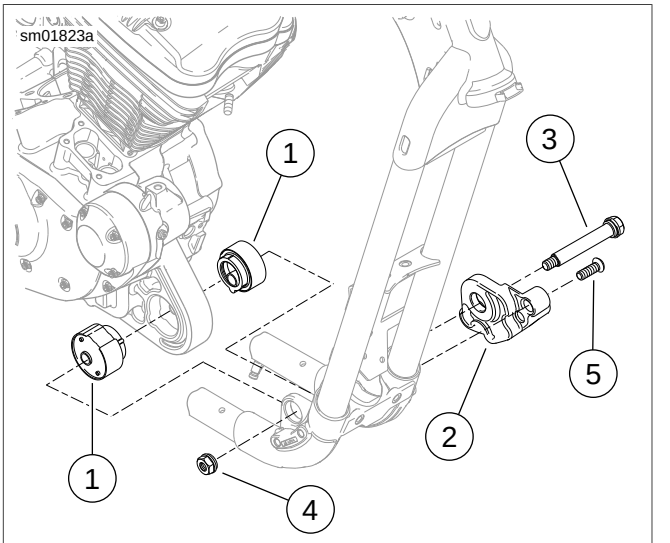
PART NUMBER	TOOL NAME
HD-45968	FAT JACK

1. Raise the motorcycle.
2. Remove exhaust system. See 4.16 EXHAUST SYSTEM.
3. Loose rear axle and drive belt. See 5.5 DRIVE BELT.
4. **Forward mount controls:** Remove both forward control assemblies. See 2.40 RIDER FOOT CONTROLS: FORWARD.
5. Support front of engine with FAT JACK (Part No. HD-45968) and suitable blocks.
6. See Figure 2-116. Remove screw (4) securing upper front stabilizer link (2) to stabilizer link bracket (3).
7. See Figure 2-117. Remove screw (3) securing lower front stabilizer link (1) to stabilizer link bracket (2).
8. See Figure 2-118. Remove screw (4) from left end of rear stabilizer link (1) and ground strap (2). Remove spacer (5).

NOTE

See Figure 2-119. Jack engine up or down to remove bolt (3).

9. Remove nut (4) and bolt (3) from front engine mount/isolator assembly.
10. Remove screws (5) from front isolator mount (2) on left side of motorcycle. Remove isolator mount and left front isolator (1).
11. Without damaging wire harness caddy, raise front of engine.
12. Without damaging frame downtube, carefully pry front end of engine to left approximately 1.0 in (25.4 mm).
13. Remove right front isolator (1) from crankcase.



1. **Isolator**
2. **Front isolator mount**
3. **Bolt**
4. **Nut**
5. **Screw (2)**

Figure 2-119. Front Engine Mount/Isolator

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

INSTALLATION

PART NUMBER	TOOL NAME
HD-45968	FAT JACK

FASTENER	TORQUE VALUE	
Isolator, front, mounting bracket screw	25-35 ft-lbs	33.9-47.5 Nm
Engine mount, front, bolt	95-105 ft-lbs	129-142 Nm
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm

1. See Figure 2-119. Install both front isolators (1) in engine mounting boss on front of crankcase. Each isolator has a half-moon tab and fits into engine mounting boss in only one way. Push engine to right until right isolator contacts frame boss.
2. Install front isolator mount (2) over left front isolator.
3. Install screws (5) through front isolator mount and thread into frame. Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
4. Insert bolt (3) through front isolator/engine mount assembly from left side. Thread nut (4) onto bolt. Tighten to 95-105 ft-lbs (129-142 Nm).
5. See Figure 2-117. Attach lower front stabilizer link (1) to bracket (2) with screw (3). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
6. See Figure 2-116. Attach upper front stabilizer link (2) to bracket (3) with screw (4). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
7. See Figure 2-118. Install screw (4) through free end of ground strap (2), rear stabilizer link (1), spacer (5), and into engine crankcase. Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
8. Remove FAT JACK (Part No. HD-45968) and blocks from under engine.
9. **Forward mount controls:** Install both forward control assemblies. See 2.40 RIDER FOOT CONTROLS: FORWARD.
10. Install exhaust system. See 4.16 EXHAUST SYSTEM.
11. Adjust drive belt. See 1.12 DRIVE BELT AND SPROCKETS.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

REAR ENGINE MOUNT/ISOLATOR 2.23

REMOVAL

PART NUMBER	TOOL NAME
HD-45967	SHOP DOLLY
HD-45968	FAT JACK

1. Remove exhaust system. See 4.16 EXHAUST SYSTEM.

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, mounting brackets, components or housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586d)

NOTE

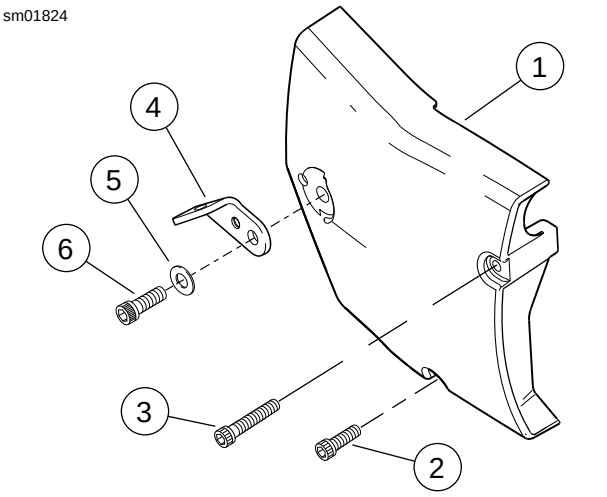
Position vehicle on SHOP DOLLY. Use FAT JACK (with aid of suitable blocks) to support engine.

2. With a FAT JACK (Part No. HD-45968), support motorcycle on SHOP DOLLY (Part No. HD-45967).
3. Remove sprocket cover.
   a. See Figure 2-120. Remove screw (6), washer (5) and exhaust pipe clamp bracket (4).
   b. Remove two screws (2, 3).
   c. Remove sprocket cover (1).
4. Remove rear drive belt. See 5.5 DRIVE BELT.
5. **Passenger footrests:** Remove left passenger footrest assembly. See 2.41 PASSENGER FOOTRESTS.
6. Unbolt rear brake master cylinder remote reservoir. Do not disconnect hose from reservoir. Secure reservoir to vehicle in an upright position, out of way. See 2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR.
7. Support rear fork.
8. See Figure 2-121. Remove retaining ring (9), nut (8) and rear fork pivot bolt (1).
9. Pull rear fork back far enough to clear rear engine mounts and isolators.
10. **EVAP models:** Remove EVAP canister and mounting bracket. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL, Charcoal Canister.
11. See Figure 2-118. Remove screws (3, 4) securing rear stabilizer link (1). Remove stabilizer link, ground strap (2), and spacer (5).
12. See Figure 2-116. Remove screw (4) securing upper front stabilizer link (2) to stabilizer link bracket (3).
13. See Figure 2-117. Remove screw (3) securing lower front stabilizer link (1) to stabilizer link bracket (2).
14. Support rear of engine.
15. See Figure 2-121. Remove two screws (7) securing rear isolator mount (2) to left side of frame. Remove isolator mount and left isolator (3).
16. Remove three screws (6) securing rear pivot lockplate (5) to rear of engine case. Remove lockplate and rear fork pivot shaft (4).

NOTE

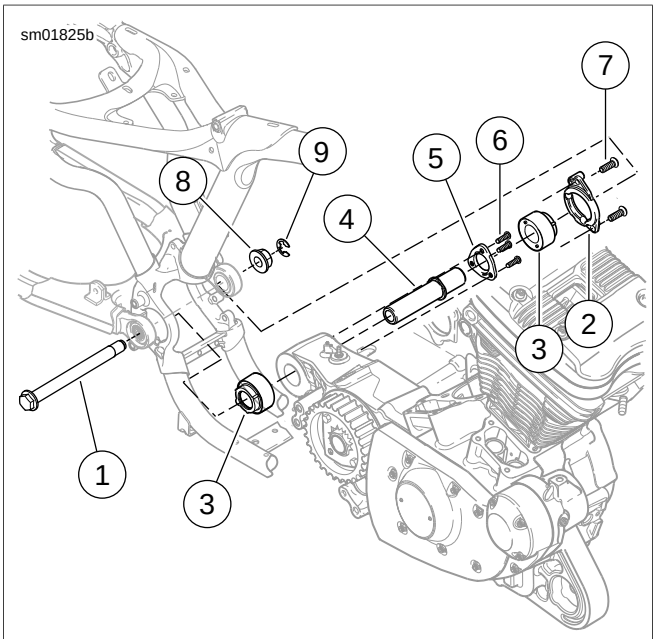
Move engine up or down slightly to remove pivot shaft.

17. Carefully pry rear end of engine to left approximately 1.0 in (25.4 mm). Remove right rear isolator (3) from frame.



1. **Sprocket cover**
2. **Screw**
3. **Screw**
4. **Exhaust pipe clamp bracket**
5. **Washer**
6. **Screw**

Figure 2-120. Sprocket Cover



1. **Pivot bolt**
2. **Rear isolator mount**
3. **Isolator (2)**
4. **Rear fork pivot shaft**
5. **Rear pivot lockplate**
6. **Screw (3)**
7. **Screw (2)**
8. **Nut**
9. **Retaining ring**

Figure 2-121. Rear Engine Mount/Isolator

INSTALLATION

PART NUMBER	TOOL NAME
HD-45968	FAT JACK

FASTENER	TORQUE VALUE	
Sprocket cover, forward and lower screw	80-120 **in-lbs**	9.0-13.6 Nm
Isolator, front, mounting bracket screw	25-35 ft-lbs	33.9-47.5 Nm
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm
Stabilizer link, lower front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm
Fork, rear, pivot bolt nut	120-130 ft-lbs	162.7-176.3 Nm
Exhaust pipe clamp bracket screw	30-33 ft-lbs	40.7-44.7 Nm
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm

1. See Figure 2-121. Install **new** right rear isolator (3) into frame, lining up tabs on isolator with slots in frame. Slide rear end of engine to right until engine mounting boss on rear of crankcase contacts right isolator.
2. Slide rear fork pivot shaft (4) through engine mounting boss.

NOTE

Move engine slightly in one direction or another to align pivot shaft with isolator.

3. Install rear pivot lockplate (5) over pivot shaft with ridges on lockplate engaging flats on pivot shaft flange. Secure to crankcase with three screws (6). Tighten to 80-120 **in-lbs** (9.0-13.6 Nm).
4. Install **new** left rear isolator (3) on rear fork pivot shaft.
5. Place rear isolator mount (2) over left rear isolator, lining up tabs on isolator with slots in isolator mount. Install screws (7). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
6. Remove FAT JACK (Part No. HD-45968) and blocks.
7. See Figure 2-116. Attach upper front stabilizer link (2) to bracket (3) with screw (4). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
8. See Figure 2-117. Attach lower front stabilizer link (1) to bracket (2) with screw (3). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
9. See Figure 2-118. Install ground strap (2) and rear stabilizer link (1) to right side frame using short screw (3). Install free end of ground strap, stabilizer link and spacer (5) into engine case using long screw (4). Tighten screws to 25-35 ft-lbs (33.9-47.5 Nm).
10. **EVAP models:** Install EVAP canister and mounting bracket. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL, Charcoal Canister.
11. See Figure 2-121. Install rear fork pivot bolt (1).
    a. Slide rear fork forward into position.
    b. Install pivot bolt.
    c. Install pivot bolt nut (8).
    d. Tighten to 120-130 ft-lbs (162.7-176.3 Nm).
    e. Install retaining ring (9).
12. Lower rear fork.
13. Install rear brake master cylinder remote reservoir. See 2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR.
14. **Passenger footrests:** Install left passenger footrest assembly. See 2.41 PASSENGER FOOTRESTS.
15. Install rear drive belt. See 5.5 DRIVE BELT.
16. Install sprocket cover.
    a. See Figure 2-120. Install sprocket cover (1). Secure with two screws (2, 3). Long screw goes in top hole, short screw in bottom hole. Leave fasteners loose.
    b. Install exhaust pipe clamp bracket (4), washer (5) and screw (6). Tighten to 30-33 ft-lbs (40.7-44.7 Nm). Now tighten screws (2, 3) to 80-120 **in-lbs** (9.0-13.6 Nm).
17. Install exhaust system. See 4.16 EXHAUST SYSTEM.

THROTTLE CABLES 2.24

REMOVAL

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 4.4 FUEL TANK.

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. Remove seat.
4. **XL 1200T:** See Figure 2-122. Remove clip from around throttle cables and fork slider tube.
5. Remove fuel tank. See 4.4 FUEL TANK, Removing Fuel Tank.
6. See Figure 2-123. Remove left hand wire harness caddy fastener.
7. See Figure 2-124. Cut cable straps (1, 2) securing throttle cables to right hand wire harness caddy.
8. Disengage ignition coil bracket (3) from frame. Remove throttle cables.
9. Shorten cable housings:
   a. See Figure 2-125. Slide rubber boots off cable adjusters.
   b. Loosen jamnuts (1) on each adjuster (2).
   c. Turn adjusters to shorten cable housings.
10. Remove upper and lower switch housing screws. Remove upper housing.
11. See Figure 2-126. Unhook ferrules and cables from throttle control grip.
12. Remove friction spring.
13. Remove the retaining rings from throttle and idle cable housing inserts.

NOTE

Place a drop of light oil on retaining rings.

14. With a rocking motion, pull crimped inserts and cables from lower housing.
15. Remove air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY, All Models.
16. See Figure 2-127. Disconnect cables from throttle cam:
    a. Remove throttle cable from guide and cam.
    b. Remove idle cable and spring from guide and cam.

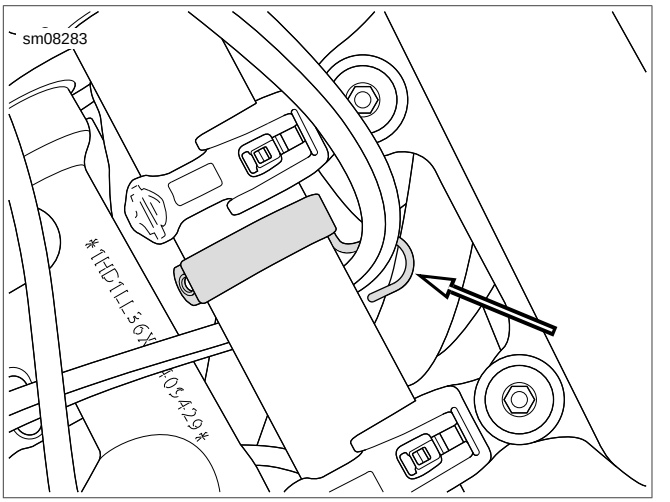


Figure 2-122. Throttle Cable Clip: XL 1200T

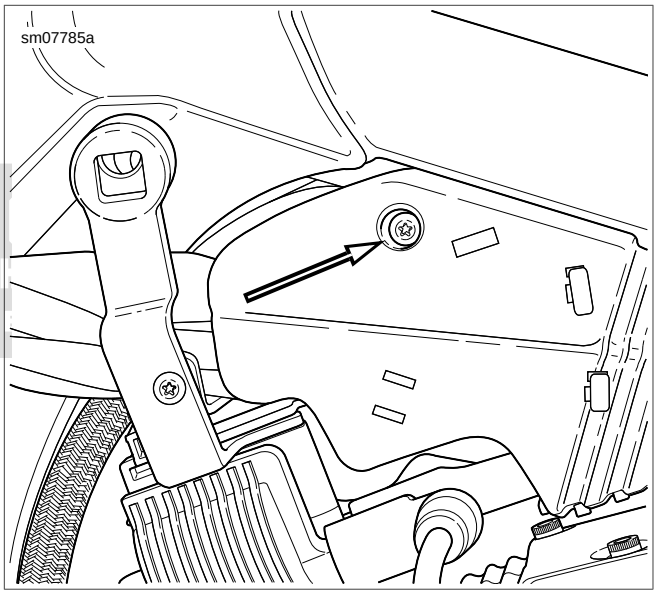
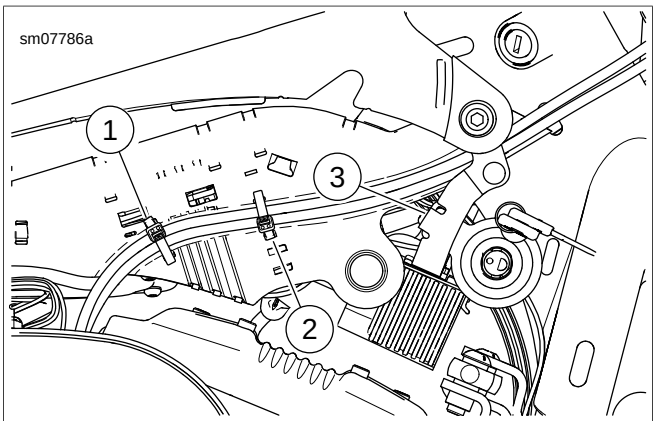
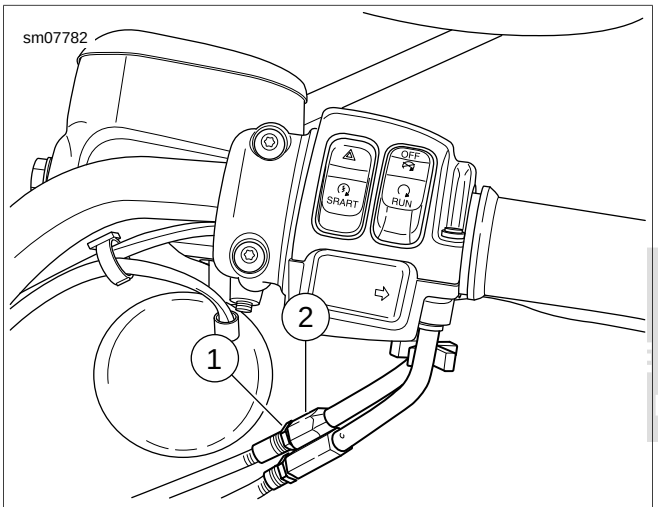


Figure 2-123. Caddy Fastener



1. Cable strap
2. Cable strap
3. Coil bracket

Figure 2-124. Cable Straps around Throttle Cables



1. Jamnut (2)
2. Adjuster (2)

Figure 2-125. Throttle Cable Adjusters

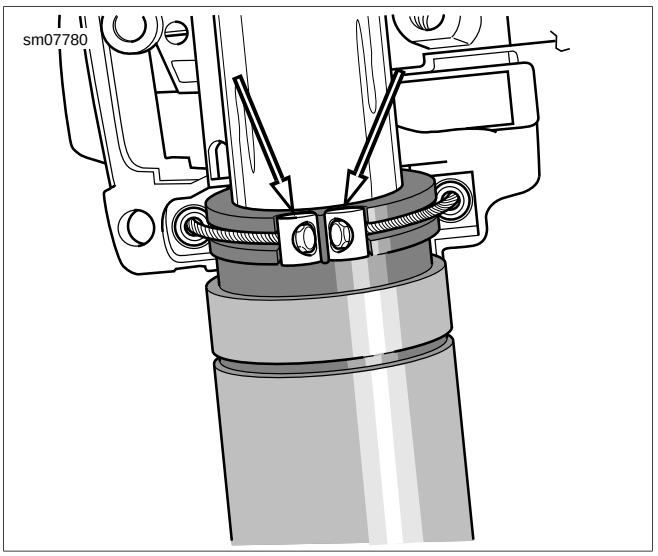


Figure 2-126. Throttle Cable Ferrules

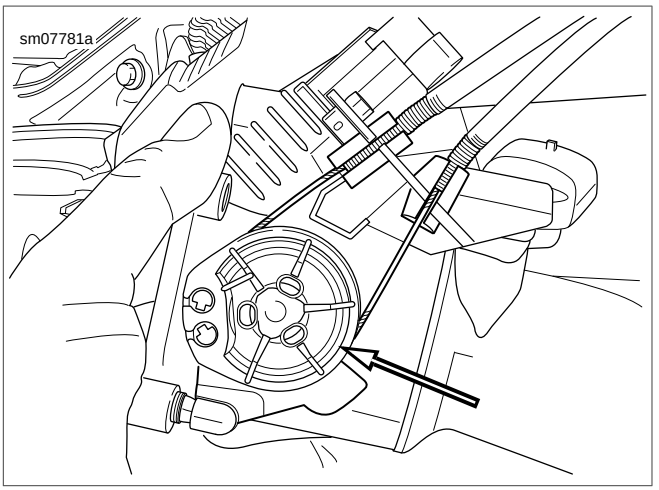


Figure 2-127. Induction Module Throttle Cam

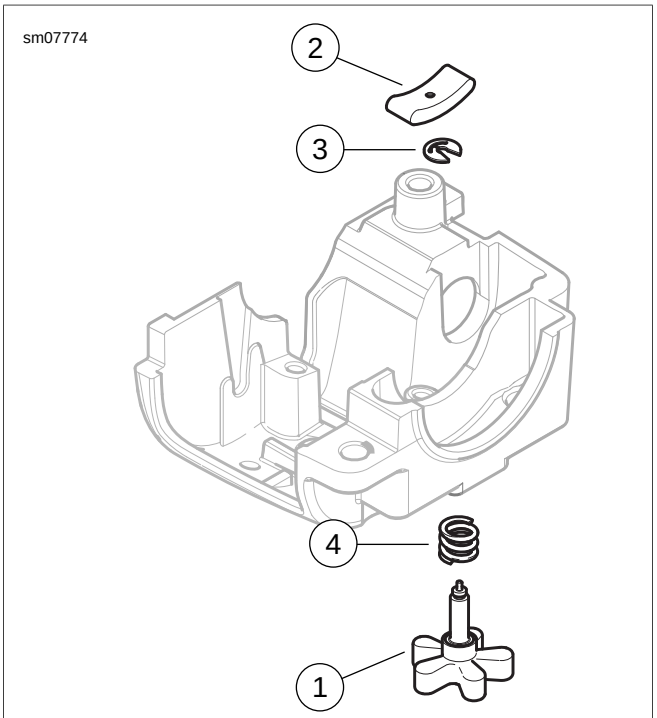
THROTTLE ADJUSTING SCREW

Removal

1. See Figure 2-128. Thread throttle adjusting screw (1) all way out.
2. Remove friction shoe (2) from switch housing.
3. Remove retaining ring (4) from screw. Remove spring (3).

Installation

1. Thread adjusting screw and spring into switch housing.
2. Snap retaining ring into place.
3. Coat bottom of friction shoe with SPECIAL PURPOSE GREASE.
4. Thread adjusting screw into friction shoe.



1. **Adjusting screw**
2. **Friction shoe**
3. **Spring**
4. **Retaining ring**

Figure 2-128. Throttle Adjusting Screw

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)

- Clean all parts in a non-flammable cleaning solvent.
- Blow dry with low pressure compressed air.
- Replace cables if necessary.

INSTALLATION

FASTENER	TORQUE VALUE	
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm

1. Lightly coat graphite to handlebar and inside surfaces of switch housings.

NOTES

- *Always replace retaining rings if damaged or distorted.*
- *Place a drop of light oil on retaining rings of crimped inserts.*

2. See Figure 2-129. Attach cables to lower housing with retaining rings.
   a. Gold throttle insert, 5/16 in (7.9 mm) DIA, in rear hole.
   b. Silver idle insert, 1/4 in (6.3 mm) DIA, in front hole.
3. See Figure 2-130. Connect cables:
   a. Ferrule grip notches at top, slide throttle control grip (1) over end of right side handlebar until it bottoms against closed end. Pull grip back about 1/8 in (3.2 mm) to prevent binding.
   b. Install friction shoe (2) in lower housing.
   c. Engage housing (3) into throttle control grip.
   d. Fit ferrules (4) over cable ball ends (5).
   e. Seat ferrules in opposite grip notches.
4. Install upper switch housing (6) over handlebar and lower housing:
   a. Install upper (7) and lower housing screws (8).
   b. Tighten to 35-45 **in-lbs** (4.0-5.1 Nm).
5. Route the cables:
   a. Point cables forward from throttle control grip and front fork upper bracket.
   b. Turn downward between right slider tube and headlamp.
   c. **XL 1200T:** Install clip around throttle cables and slider tube.
   d. Route rearward along right side of frame steering head and frame backbone.
   e. Turn over ignition switch housing.
   f. Pass between coil bracket and frame.
   g. Route downward to induction module.
6. Install cables into throttle cam:
   a. Install idle control cable housing into inboard (idle) cable guide and cam grip notch.
   b. Install throttle control cable housing and spring into outboard (throttle) cable guide and cam grip notch.
7. Secure throttle cables into right side wire harness caddy:
   a. Secure instrument connector [20] with forward cable strap.
   b. Secure wiring harnesses inside caddy with rear cable strap.

⚠WARNING

Be sure that steering is smooth and free without interference. Interference with steering could result in loss of vehicle control and death or serious injury. (00371a)

NOTE

Do not pinch cables between frame and/or forks.

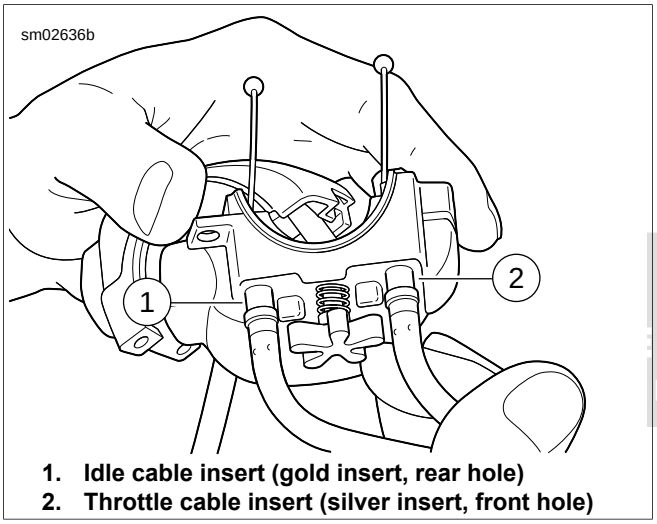
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

8. Secure left side harness caddy to right side wire harness caddy with screw. Tighten to 15-25 **in-lbs** (1.7-2.8 Nm).
9. Turn handlebar lock-to-lock. Verify cables do not pull tight.
10. Adjust control cables. See 1.13 THROTTLE CONTROL, Cable Adjustment.
11. Install air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY.
12. Install fuel tank. See 4.4 FUEL TANK, Installing Fuel Tank.

⚠WARNING

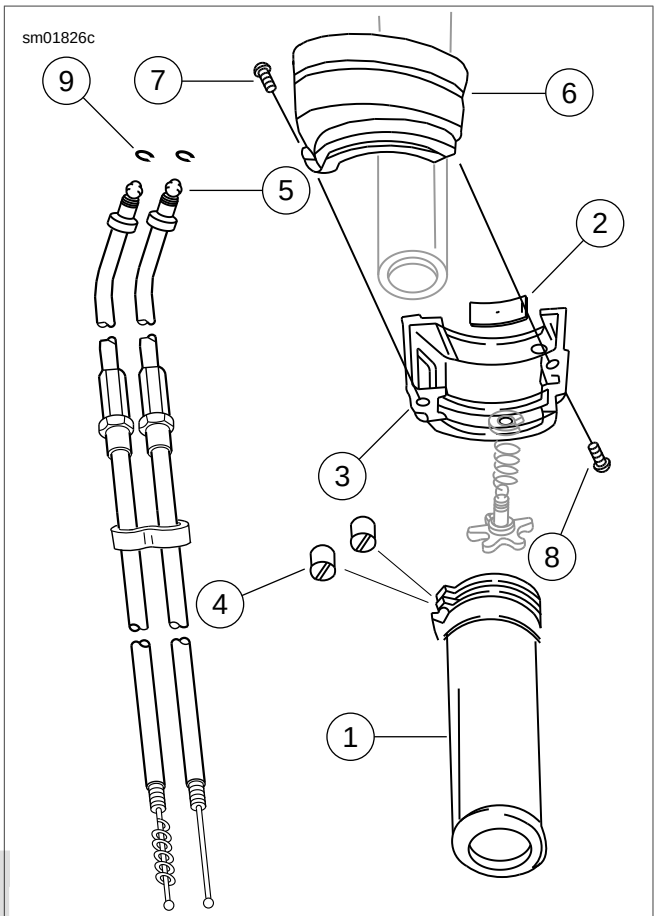
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

13. Install seat.
14. Install main fuse.



1. **Idle cable insert (gold insert, rear hole)**
2. **Throttle cable insert (silver insert, front hole)**

Figure 2-129. Throttle Cable Inserts



1. **Throttle control grip**
2. **Friction shoe**
3. **Lower switch housing**
4. **Ferrule (2)**
5. **Cable ball end**
6. **Upper switch housing**
7. **Upper housing screw**
8. **Lower housing screw**
9. **Retaining ring (2)**

Figure 2-130. Throttle Control

CLUTCH CONTROL 2.25

REMOVAL AND DISASSEMBLY

Clutch Cable: Lower

⚠WARNING

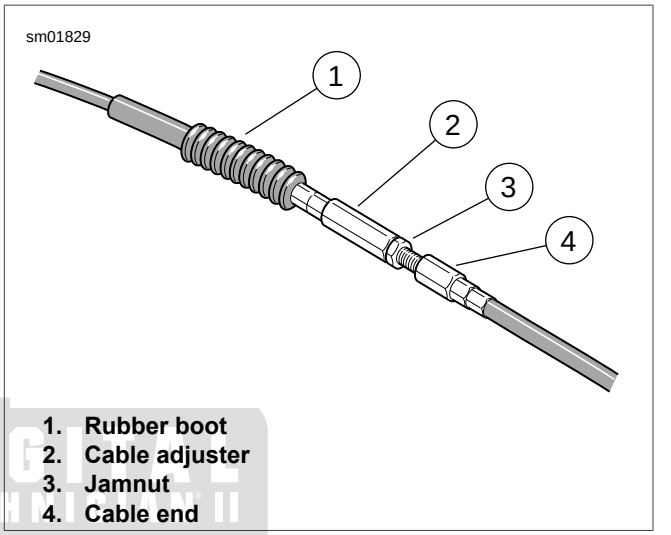
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. **Mid-mount controls:** Remove left side rider footrest and mounting bracket assembly. See 2.39 RIDER FOOT CONTROLS: MID-MOUNT.
3. Remove clips securing clutch cable to frame downtube.
4. See Figure 2-131. Slide rubber boot (1) on clutch cable adjuster (2) upward. Loosen jamnut (3) from adjuster.
5. Turn adjuster to shorten cable housing until there is a large amount of free play at clutch hand lever. See 1.11 CLUTCH.

NOTE

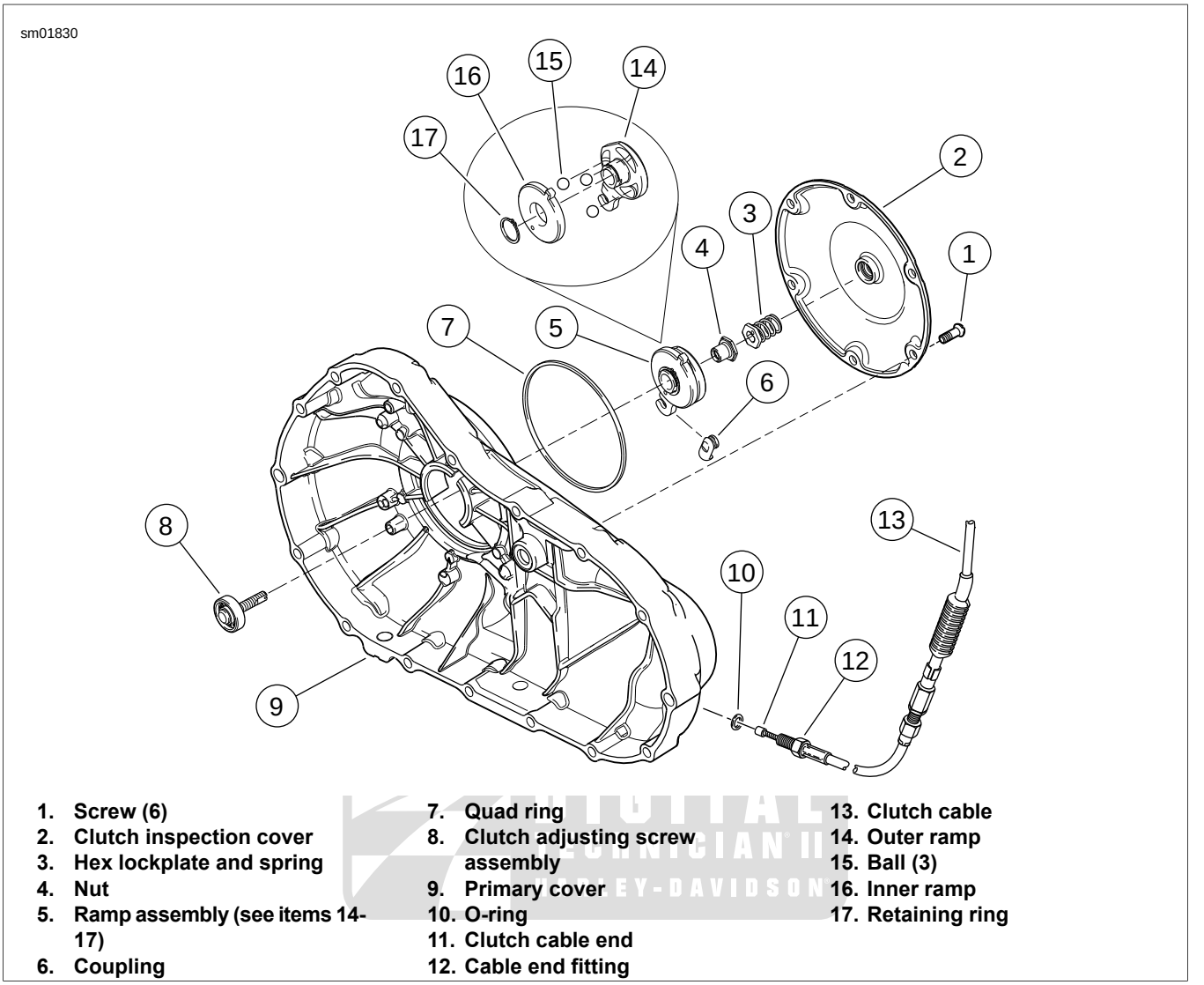
See Figure 2-132. Exercise caution to avoid damaging or dislodging quad ring (7) from groove in primary cover (9)

6. Remove screws (1) and clutch inspection cover (2)..
7. Slide hex lockplate with attached spring (3) from flats of adjusting screw assembly (8).
8. Turn adjusting screw assembly clockwise to release ramp assembly (5) and coupling (6). Remove nut (4) from end of adjusting screw.
9. Remove hook of ramp from cable coupling. Remove clutch cable end (11) from slot in coupling. Remove coupling and ramp assembly.
10. Remove cable end fitting (12) and clutch cable (13) lower section from primary cover. Remove O-ring (10) from cable end fitting. Discard O-ring.
11. Clean parts in a non-volatile cleaning solution.



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

Figure 2-131. Clutch Cable Adjuster Mechanism



1. **Screw (6)**
2. **Clutch inspection cover**
3. **Hex lockplate and spring**
4. **Nut**
5. **Ramp assembly (see items 14-17)**
6. **Coupling**
7. **Quad ring**
8. **Clutch adjusting screw assembly**
9. **Primary cover**
10. **O-ring**
11. **Clutch cable end**
12. **Cable end fitting**
13. **Clutch cable**
14. **Outer ramp**
15. **Ball (3)**
16. **Inner ramp**
17. **Retaining ring**

Figure 2-132. Clutch Release Mechanism

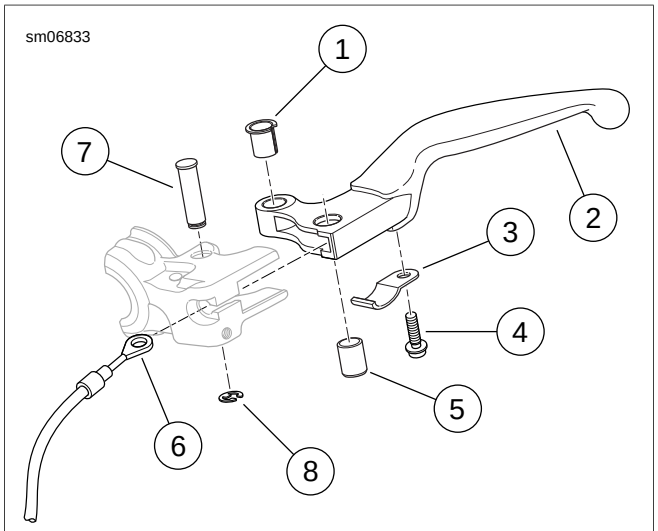
Clutch Lever and Cable: Upper

1. See Figure 2-133. Remove retaining ring (8) and pivot pin (7). Discard retaining ring.
2. Remove clutch lever (2) from clutch lever bracket.
3. Remove clutch cable pin (5). Disconnect clutch cable (6) upper section from lever.

NOTE

Remove bushing from top of lever.

4. Remove bushing (1) from clutch lever.
5. Remove screw (4) and anti-rattle spring (3).



1. **Bushing**
2. **Lever**
3. **Anti-rattle spring**
4. **Screw**
5. **Clutch cable pin**
6. **Clutch cable**
7. **Pivot pin**
8. **Retaining ring**

Figure 2-133. Clutch Lever and Cable

Clutch Hand Control

NOTE

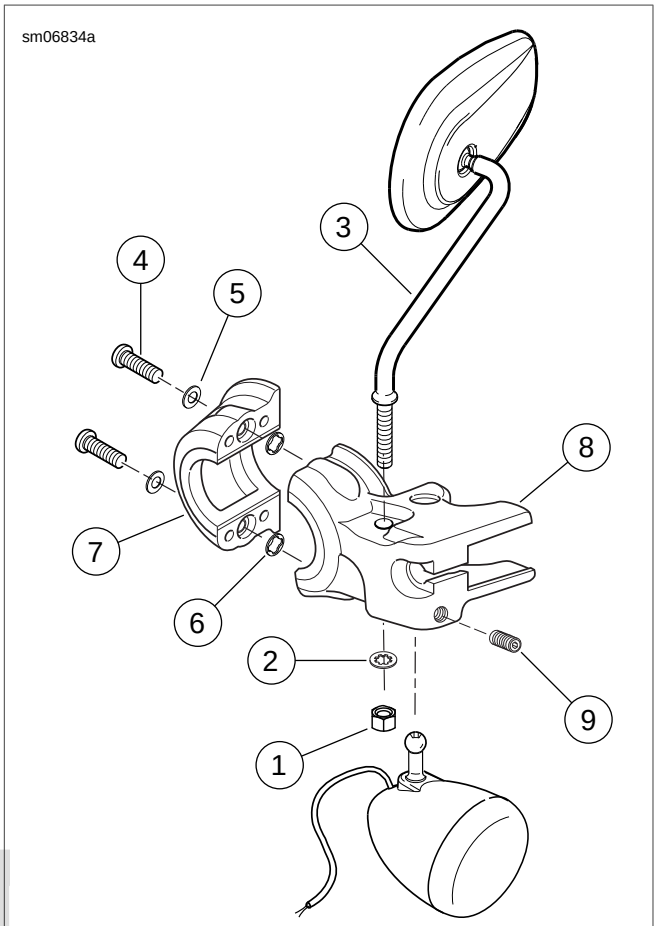
XL 1200T/X: *Leave turn signals and brackets installed.*

1. **All models except XL 1200T/X:** See Figure 2-134. Loosen set screw (9). Remove turn signal assembly from clutch lever bracket. See 6.20 FRONT TURN SIGNALS, Wire Harness.
2. Remove locknut (1), lockwasher (2) and mirror (3).

NOTE

Loosen two screws of left handlebar switch housing to remove clutch control clamp and clutch lever bracket.

3. See Figure 2-134. Loosen two fasteners (4) and washers (5) with nylon retainers (6) to remove clutch control clamp (7).
4. Remove clutch lever bracket (8).



1. **Locknut**
2. **Washer**
3. **Mirror**
4. **Fastener**
5. **Washer**
6. **Nylon retainer**
7. **Clamp**
8. **Bracket**
9. **Set screw**

Figure 2-134. Clutch Hand Control Clamp and Bracket (typical)

ASSEMBLY AND INSTALLATION

FASTENER	TORQUE VALUE	
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm
Mirror stem locknut	96-144 **in-lbs**	10.9-16.3 Nm
Turn signal, front, set screw	96-120 **in-lbs**	10.9-13.6 Nm
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm
Clutch lever anti-rattle spring screw	8-13 **in-lbs**	0.9-1.5 Nm
Clutch cable fitting	36-108 **in-lbs**	4.1-12.2 Nm
Clutch inspection cover screws	90-120 **in-lbs**	10.2-13.6 Nm
Footrest support bracket	45-50 ft-lbs	61-68 Nm

Clutch Hand Control

1. See Figure 2-135. Position clutch control clamp (7) and clutch lever bracket (8) onto left handlebar. Hold clamp and bracket assembly firmly against left handlebar switch housing.
2. Secure components to left handlebar using two screws (4) and washers (5) and retainers (6). Starting with top screw, tighten to 108-132 **in-lbs** (12.2-14.9 Nm).

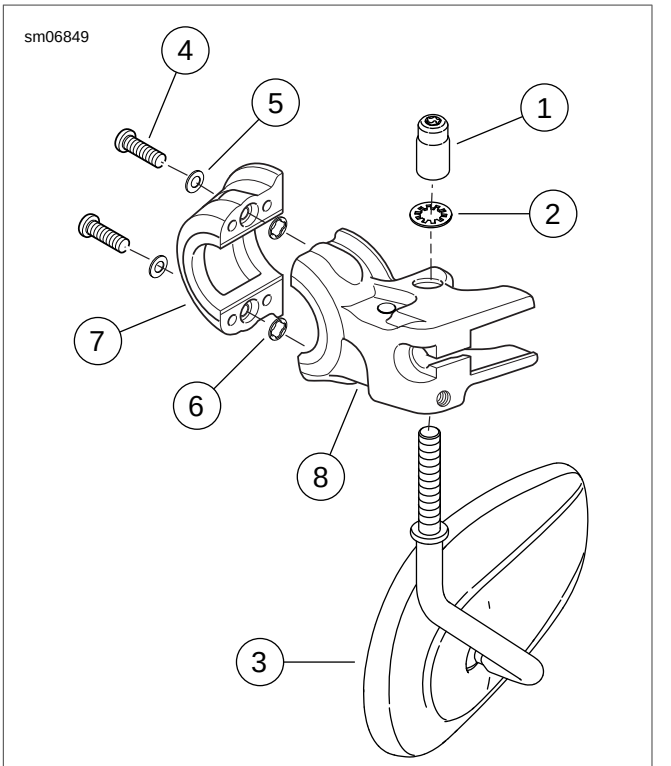
NOTES

- *Adjust mirrors so you can see a small portion of your shoulders in each mirror.*
- *Do not allow mirrors to strike fuel tank on lock-to-lock handlebar turns.*

3. Install mirror with locknut and lockwasher. Tighten to 96-144 **in-lbs** (10.9-16.3 Nm).
4. **All Models except XL 1200X and XL 1200T:** Install turn signal.
   a. Secure with set screw. See 6.20 FRONT TURN SIGNALS, Wire Harness.
   b. Position so turn signal lens faces directly forward. Verify there is no contact or binding.
   c. Tighten to 96-120 **in-lbs** (10.9-13.6 Nm).

NOTE

*If two screws of left handlebar switch housing were loosened during clutch hand control removal, tighten to 35-45 **in-lbs** (4.0-5.1 Nm).*



1. **Locknut**
2. **Lockwasher**
3. **Mirror**
4. **Fastener**
5. **Washer**
6. **Nylon retainer**
7. **Clamp**
8. **Bracket**

Figure 2-135. Clutch Hand Control Bracket: XL 1200X

Clutch Lever and Clutch Cable: Upper

1. Install anti-rattle spring and screw onto clutch lever. Tighten to 8-13 **in-lbs** (0.9-1.5 Nm).

NOTE

Bushing has a collar on one end. Install bushing from top of lever.

2. Install bushing in clutch lever.
3. Connect end of clutch cable upper section to clutch lever using clutch cable pin.
4. Install lever.
   a. Position lever within clutch lever bracket.
   b. Install pivot pin.
   c. Secure with **new** retaining ring.

Clutch Cable: Lower

1. See Figure 2-137. Route clutch cable (3):
   a. Forward from clutch lever (1).
   b. **XL 1200T:** Through clutch cable clip on lower fork bracket.
   c. Downward to left front fork slider tube. Refer to Table 2-22.
   d. Through two clips (6) on left front frame downtube.
   e. Rearward to primary cover (4).

NOTE

Check that cable is not pinched between lower steering head bracket and frame and left and right fork stops.

2. **Non-ABS Models:** See Figure 2-136. Rotate the clutch cable clip back and up as far as it goes.

Table 2-22. Clutch Cable Lower Routing Around Left Fork Slider

MODEL	ROUTE	NOTES
XL 883L	Outboard	-
XL 883N	Outboard	-
XL 883R	Outboard	-
XL 1200C XL 1200CP/CA/CB	Inboard	Through the clutch cable guide
XL 1200T	Inboard	Through the clutch cable guide
XL 1200X	Inboard	-
XL 1200V	Inboard	-

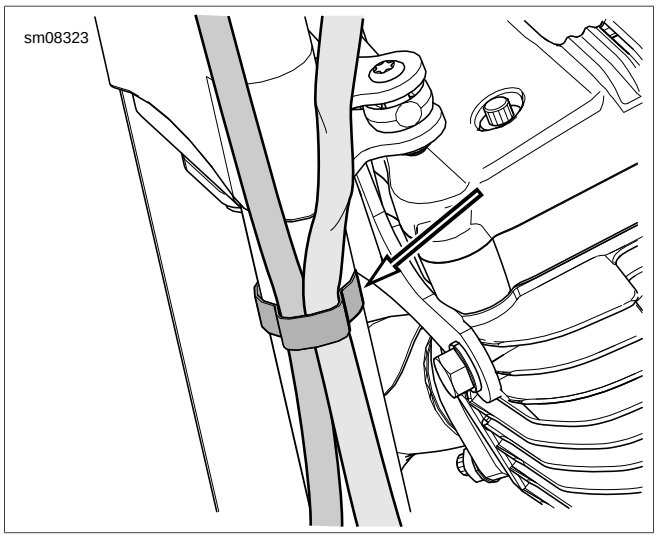


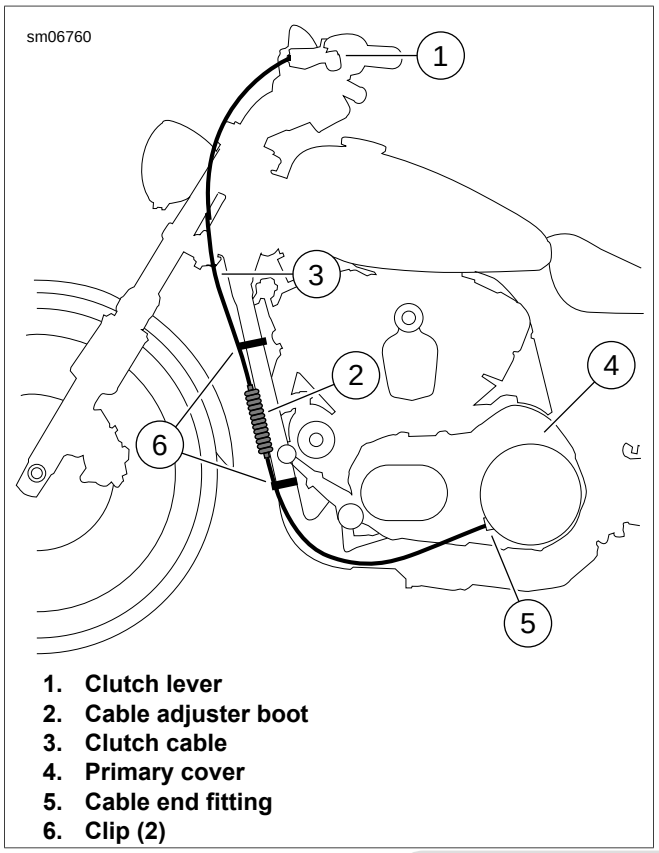
Figure 2-136. Non-ABS Clutch Cable Clip Orientation

3. See Figure 2-132. Install **new** O-ring (10) over cable end fitting (12) of clutch cable (13) lower section.
4. Screw fitting into primary cover (9). Tighten to 36-108 **in-lbs** (4.1-12.2 Nm).
5. Install coupling (6):
   a. Install coupling (6) over cable end (11) with rounded side inboard and ramp connector button outboard.
   b. With retaining ring side of ramp assembly (5) facing inward, place hook of ramp around coupling button.
   c. Rotate assembly counterclockwise until tang on inner ramp (16) fits in slot of primary cover.
6. Thread nut (4) on adjusting screw assembly (8) until slot of screw is accessible with a screwdriver. Fit nut hex into recess of outer ramp (14).
7. Turn adjusting screw counterclockwise until resistance is felt. Back off adjusting screw 1/4 turn.

NOTE

Slightly turn adjusting screw clockwise to slide lockplate onto flats within recess of outer ramp.

8. Install hex lockplate and spring (3) onto flats of adjusting screw assembly (8).
9. Install clutch inspection cover (2).
   a. Verify that quad ring (7) is fully seated in groove of primary cover (9).
   b. Secure cover with screws (1).
   c. In a crosswise pattern, tighten to 90-120 **in-lbs** (10.2-13.6 Nm).
10. **Mid-mount controls:** Install left side rider footrest and mounting bracket assembly. Tighten to 45-50 ft-lbs (61-68 Nm). See 2.39 RIDER FOOT CONTROLS: MID-MOUNT.
11. Install main fuse.



1. Clutch lever
2. Cable adjuster boot
3. Clutch cable
4. Primary cover
5. Cable end fitting
6. Clip (2)

Figure 2-137. Clutch Cable

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

HANDLEBAR 2.26

REMOVAL

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

All Models

1. Remove main fuse.
2. Remove two screws securing clutch control assembly to left side of handlebar. See 2.25 CLUTCH CONTROL.
3. Remove two screws securing left handlebar switch assembly to handlebar. See 6.34 LEFT HANDLEBAR CONTROL MODULE. Let wires carefully support switch assembly.
4. Remove left handlebar grip. See 2.26 HANDLEBAR, Left Hand Grip.
5. Remove front brake master cylinder assembly from right handlebar. See 2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR.

XL 1200C

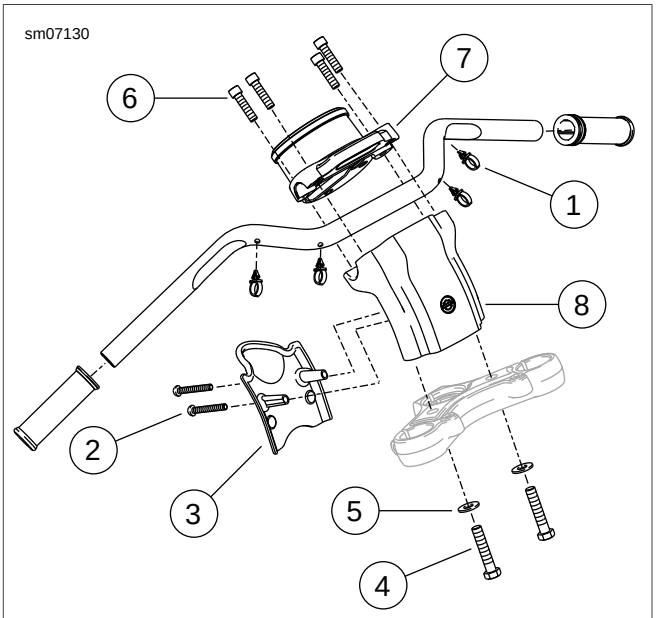
1. See Figure 2-138. Remove four wiring harness retainers (1). Discard retainers.
2. Loosen, but do not remove, two control housings screws.
3. Remove screws (2) and riser cover (3).
4. Remove screws (6) and upper handlebar clamp/speedometer housing (7). Detach handlebar from riser.
5. Slide right-hand control and throttle assembly off detached handlebar.
6. If removing riser (8), remove bolts (4), washers (5) and riser from upper fork bracket.

XL 1200CP/CA/CB

Pull back: See Figure 2-138. See **Removal, XL 1200C**.

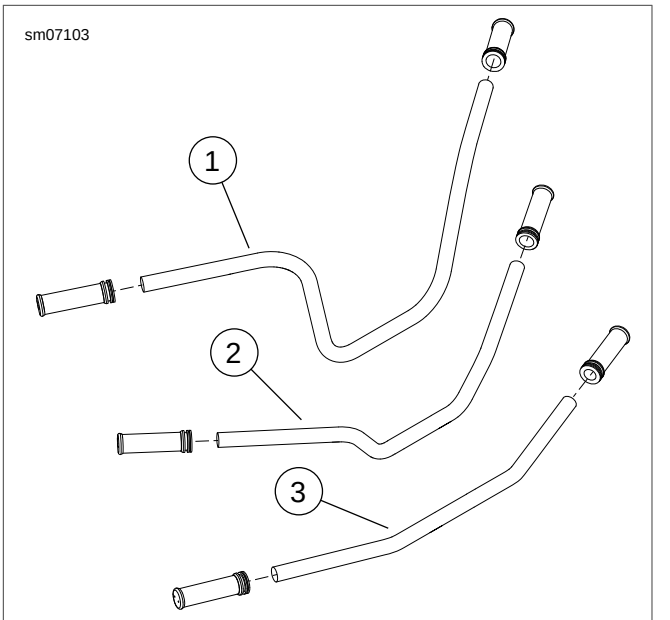
Drag bar: See Figure 2-139. See **Removal, XL 1200C**.

Mini-ape: See Figure 2-139. See **Removal, All XL Models except XL 1200C**.



1. **Wire harness retainer (4)**
2. **Screw (2)**
3. **Riser cover**
4. **Bolt (2)**
5. **Washer (2)**
6. **Screw (4)**
7. **Upper handlebar clamp/speedometer housing**
8. **Handlebar riser**

Figure 2-138. Handlebar: XL 1200C/CP Pull Back

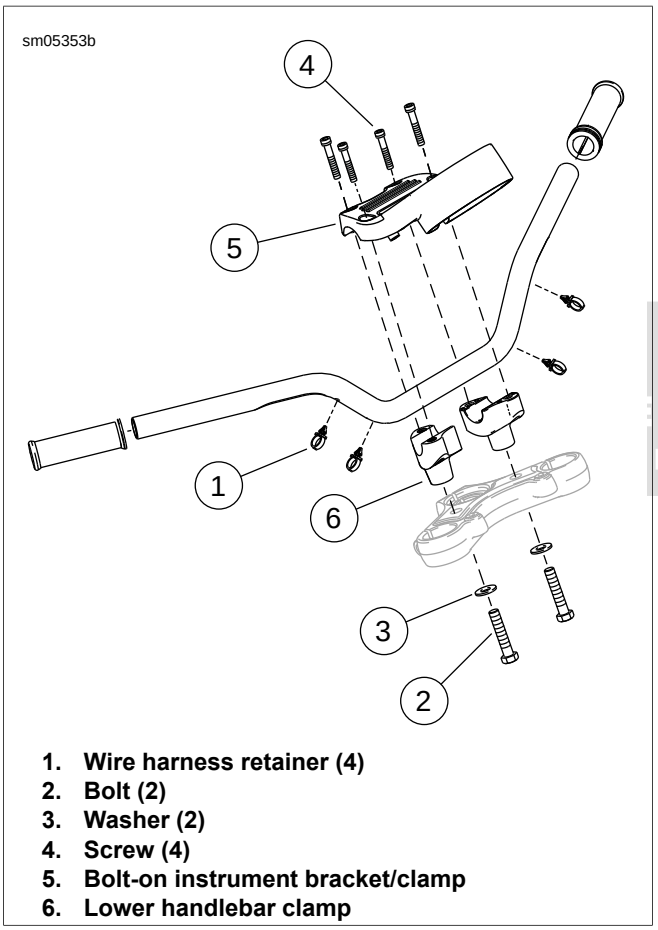


1. **Mini-ape: XL 1200CP/CB**
2. **Pull back: XL 1200CP**
3. **Drag: XL 1200CP/CA**

Figure 2-139. Handlebars: XL 1200CP/CA/CB

All XL Models except XL 1200C

1. See Figure 2-140. Remove four wiring harness retainers (1). Do not cut into wiring harnesses. Discard retainers.
2. Loosen two control housing screws. Do not remove.
3. If removing lower handlebar clamps, loosen, but do not remove, two bolts (2) securing lower handlebar clamps (6) to upper fork bracket.
4. Remove screws (4) and instrument bracket (5).
5. Detach handlebar from lower handlebar clamps.
6. Slide right-hand control housing and throttle assembly off detached handlebar.
7. If removing lower handlebar clamps, remove bolts, washers (3) and lower handlebar clamps from upper fork bracket.



1. **Wire harness retainer (4)**
2. **Bolt (2)**
3. **Washer (2)**
4. **Screw (4)**
5. **Bolt-on instrument bracket/clamp**
6. **Lower handlebar clamp**

Figure 2-140. Handlebar: All Models except XL 1200C/CP

INSTALLATION

FASTENER	TORQUE VALUE	
Handlebar riser bolt, lower	30-40 ft-lbs	40.7-54.3 Nm
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm
Handlebar riser cover screw	8-12 **in-lbs**	0.9-1.4 Nm
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm
Handlebar riser bolt, lower	30-40 ft-lbs	40.7-54.3 Nm
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm

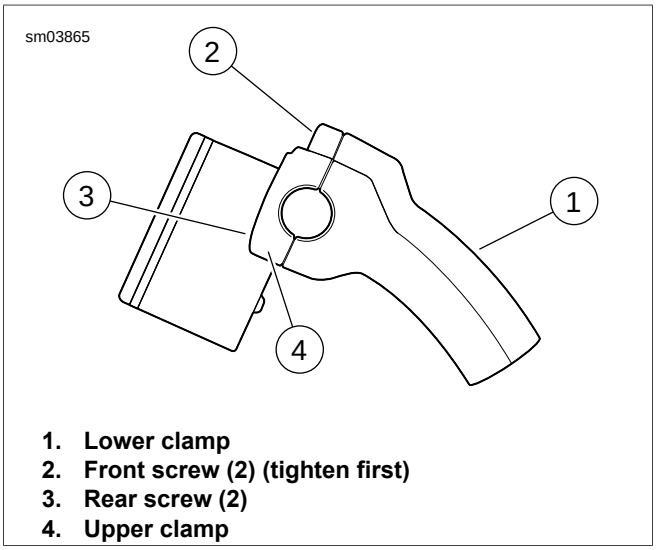
XL 1200C/CP with One-Piece Riser

1. If riser was removed, secure riser to upper fork bracket with bolts and washers. Route handlebar wiring inside riser. Tighten to 30-40 ft-lbs (40.7-54.3 Nm).
2. Side right side handlebar control housing and throttle assembly onto the right end of handlebar.
3. See Figure 2-141. Install handlebar.
   a. Position handlebar on lower handlebar camp.
   b. Adjust handlebar to desired position.
   c. Place upper handlebar clamp/speedometer housing in position and thread screws in place.
   d. Tighten front screws first to 12-18 ft-lbs (16.3-24.4 Nm).
   e. Tighten rear screws to 12-18 ft-lbs (16.3-24.4 Nm).

NOTES

- *Route handlebar wiring harnesses.*
- *Do not pinch wiring harnesses.*

4. Install riser cover and screws. Tighten to 8-12 **in-lbs** (0.9-1.4 Nm).



1. **Lower clamp**
2. **Front screw (2) (tighten first)**
3. **Rear screw (2)**
4. **Upper clamp**

Figure 2-141. Handlebar Riser: XL 1200C

XL 1200CP

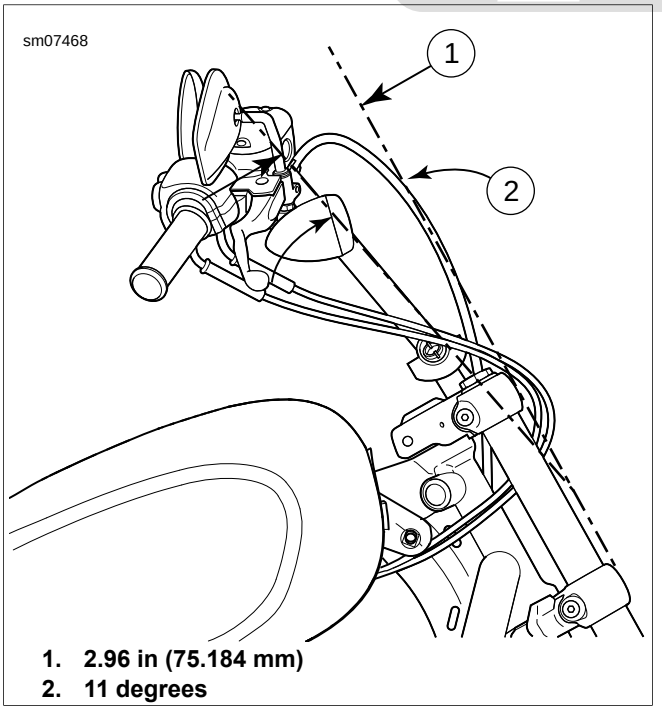
Pull back: See Figure 2-139. See **Installation, XL 1200C**.

Drag bar: See Figure 2-140. See **Installation, XL 1200C**.

Mini-ape: See Figure 2-140. See **Installation, All Models except XL 1200C**.

NOTE

See Figure 2-142. Rotate mini-ape handlebar 11 degrees (2) rearward of fork angle. Measure from a straight edge placed on fork bracket 2.96 in (75 mm) to end of straight (1) (beginning of last bend). This position places the hand grips 15 in (381 mm) above the seat.



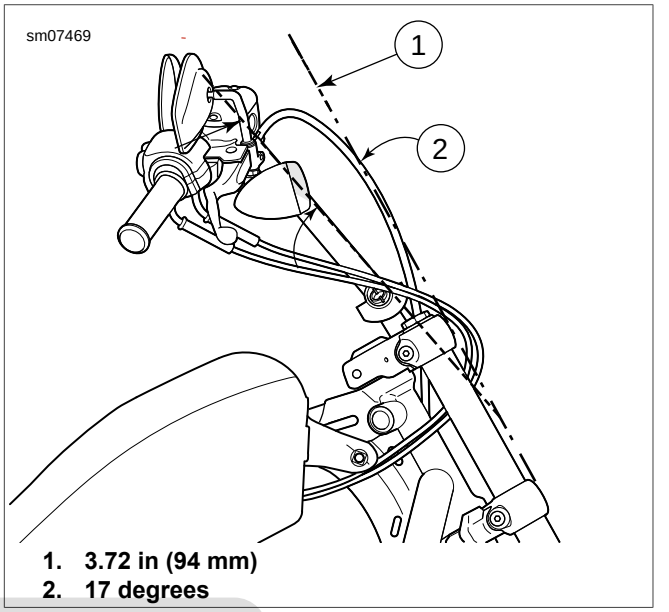
1. **2.96 in (75.184 mm)**
2. **11 degrees**

Figure 2-142. XL 1200CP/CB Mini-Ape Handlebar Angle

XL 1200V

NOTE

See Figure 2-143. Rotate mini-ape handlebar 17 degrees (2) rearward of fork angle. Measure from a straight edge placed on fork bracket 3.72 in (94 mm) to end of straight (1) (beginning of last bend). This angle positions center of hand grips 15 in (381 mm) above the seat.



1. **3.72 in (94 mm)**
2. **17 degrees**

Figure 2-143. XL 1200V Handlebar Angle Domestic, California and Canada Markets Only

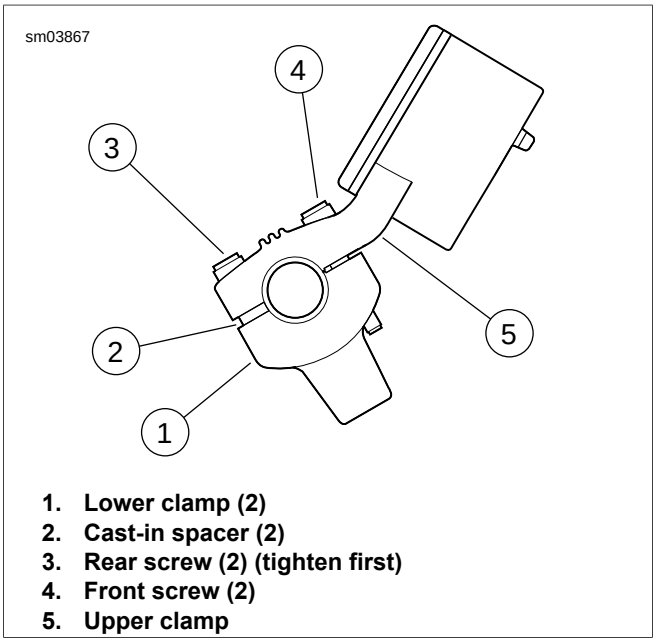
All XL Models except XL 1200C

1. If lower handlebar clamps were removed, secure clamps to upper fork bracket with bolts and washers. Finger tighten bolts. Route wiring harnesses between lower handlebar clamps.
2. Slide right side handlebar control housing and throttle assembly onto right end of handlebar. Position handlebar on lower handlebar clamps.
3. Place upper handlebar clamp/instrument bracket in position. Install four screws.
4. Adjust handlebar to desired position.

NOTE

***XL 1200X:** Tighten front clamp screws first. Then tighten rear clamp screws.*

5. Tighten clamp screws:
   a. Rear clamp screws, first, to 12-18 ft-lbs (16.3-24.4 Nm).
   b. Front clamp screws, second, to 12-18 ft-lbs (16.3-24.4 Nm).
6. Tighten lower handlebar riser bolts to 30-40 ft-lbs (40.7-54.3 Nm).



1. **Lower clamp (2)**
2. **Cast-in spacer (2)**
3. **Rear screw (2) (tighten first)**
4. **Front screw (2)**
5. **Upper clamp**

Figure 2-144. Handlebar Riser: XL Models except XL 1200C

All Models

1. Install front brake master cylinder assembly. See 2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR.
2. Install a **new** left side grip. See 2.26 HANDLEBAR, Left Hand Grip.
3. Position left side control and loosely install hand control clamp screws. See 6.34 LEFT HANDLEBAR CONTROL MODULE.
4. Attach clutch control assembly to left side of handlebar.
5. Tighten:
   a. Clutch lever handlebar clamp screw to 108-132 **in-lbs** (12.2-14.9 Nm). See 2.25 CLUTCH CONTROL.
   b. Left side control clamp screws to 35-45 **in-lbs** (4.0-5.1 Nm).
   c. Right side control clamp screws to 35-45 **in-lbs** (4.0-5.1 Nm).
6. Install four **new** wiring harness retainers around handlebar wiring harnesses. Push retainers into holes in handlebar.
7. Install 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)

8. Verify following:
   a. Clutch cable adjustment/operation.
   b. Throttle cable operation.
   c. All electrical switch functions.
   d. Brake operation and stop lamp function.

LEFT HAND GRIP

Removal

Slice hand grip open with a sharp knife. Peel hand grip open to remove.

Installation

1. Rough left grip end of handlebar with emery cloth.
2. Clean grip end with acetone.
3. Apply LOCTITE 770 PRISM PRIMER to inside of a **new** hand grip. Remove any excess primer with a clean cloth. Wait two minutes for the primer to set.
4. Apply LOCTITE 411 PRISM INSTANT ADHESIVE to inside of **new** hand grip.

NOTE

LOCTITE 411 PRISM INSTANT ADHESIVE sets in four minutes and cures in 24 hours.

5. Install **new** hand grip with a twisting motion.

FRONT FENDER 2.27

ALL MODELS

FASTENER	TORQUE VALUE	
Fender to forks, front: XL except XL 1200X	96-156 **in-lbs**	10.9-17.6 Nm
Fender to fork brace, front: XL 1200X	30-42 **in-lbs**	3.4-4.7 Nm
Fork brace to forks: XL 1200X	18-22 ft-lbs	24.4-29.8 Nm

See Figure 2-145. Tighten in a crosswise pattern to specification. Refer to Table 2-23.

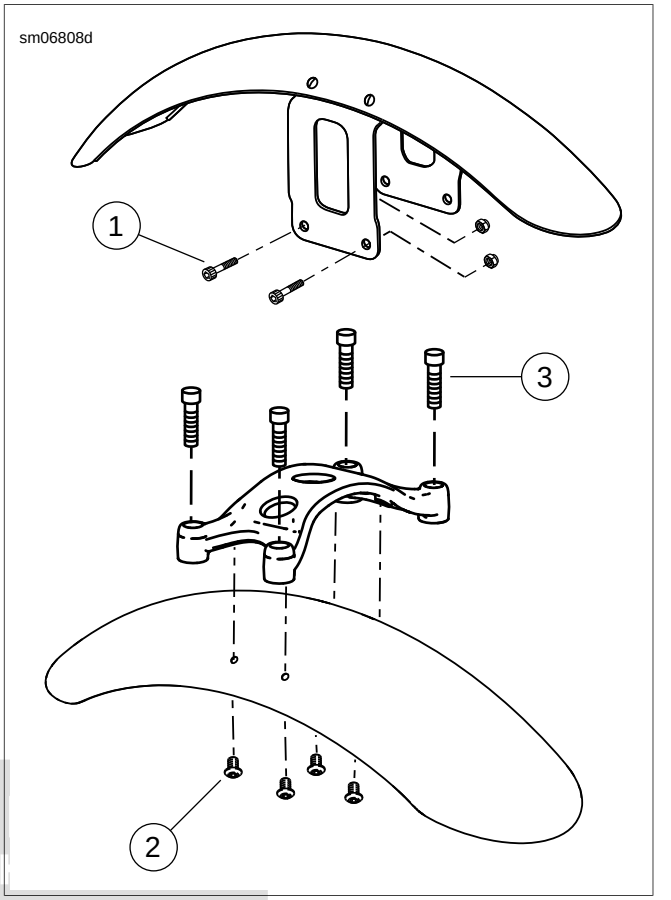


Figure 2-145. Front Fenders

Table 2-23. Front Fender Fastener Torque Values

MODEL	CALLOUT	FASTENER	TORQUE
XL models (except XL 1200X)	1	Fender to forks, front: XL except XL 1200X (fasteners with locknuts)	96-156 **in-lbs** (10.9-17.6 Nm)
XL 1200X	2	Fender to fork brace, front: XL 1200X (tighten in cross pattern)	30-42 **in-lbs** (3.4-4.7 Nm)
	3	Fork brace to forks, front: XL 1200X	18-22 ft-lbs (24.4-29.8 Nm)

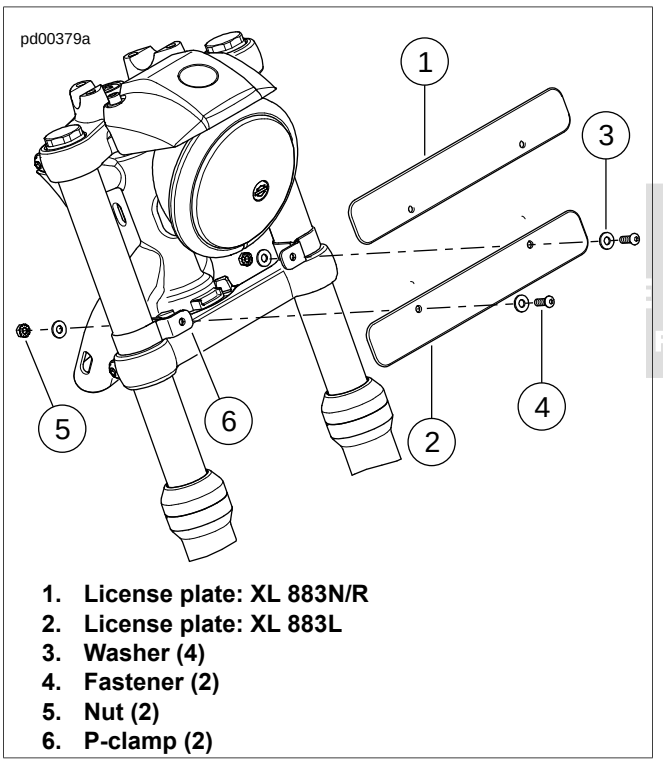
FRONT LICENSE PLATE: INDIA MODELS 2.28

FRONT LICENSE PLATE (INDIA)

FASTENER	TORQUE VALUE	
License plate, front, fastener: XL 883L/N/R (India)	10-15 **in-lbs**	1.1-1.7 Nm
License plate, front, fastener: XL 1200X/C (India)	10-15 **in-lbs**	1.1-1.7 Nm

XL 883L/N/R

1. See Figure 2-146. Install P-clamps (6) on fork tubes.
2. Install license plate to P-clamps. Install fasteners (4), washers (3) and nuts (5).
   a. **XL 883N/R** (1)
   b. **XL 883L** (2)
3. Tighten to 10-15 **in-lbs** (1.1-1.7 Nm).

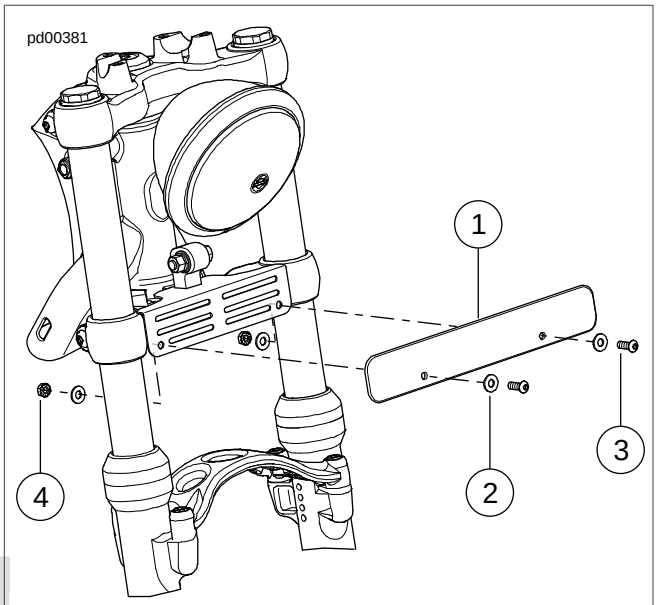


1. **License plate: XL 883N/R**
2. **License plate: XL 883L**
3. **Washer (4)**
4. **Fastener (2)**
5. **Nut (2)**
6. **P-clamp (2)**

Figure 2-146. License Plate Mount: XL 883L/N/R (India)

XL 1200X/C

1. See Figure 2-147. Install license plate (1) to license plate bracket and secure with fasteners (3), washers (2) and nuts (4).
2. Tighten to 10-15 **in-lbs** (1.1-1.7 Nm).



1. **License plate**
2. **Washer (4)**
3. **Fastener (2)**
4. **Nut (2)**

Figure 2-147. License Plate Mount: XL 1200X/C (India)

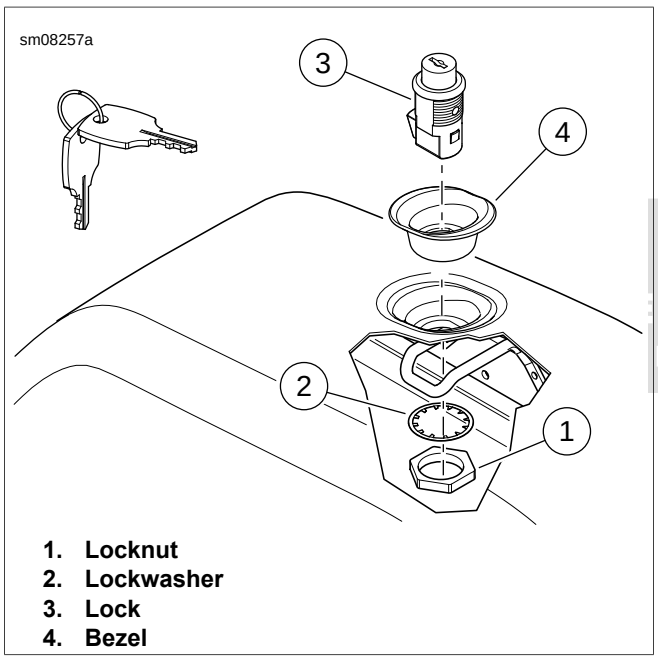
SADDLEBAGS: XL 1200T 2.29

REMOVAL

1. See Figure 2-149. Open saddlebag.
2. Remove saddlebag locknuts (1).
3. Remove saddlebags.

LOCKSET

1. Open saddlebag.
2. See Figure 2-148. Remove locknut (1).
3. Remove lockwasher (2) and lock (3).
4. Replace bezel (4) if necessary.
5. Install lock.
6. Install lockwasher and locknut.
7. Firmly tighten locknut.



1. **Locknut**
2. **Lockwasher**
3. **Lock**
4. **Bezel**

Figure 2-148. Lockset

REFLECTORS AND MEDALLIONS

Reflectors

1. See Figure 2-149. Clean the reflector mount (2) with soap and water. Allow the mount to dry.
2. Secure the reflector mount with two push nuts (3) inside saddlebag.
3. Remove adhesive backing from reflector. Install on mount.

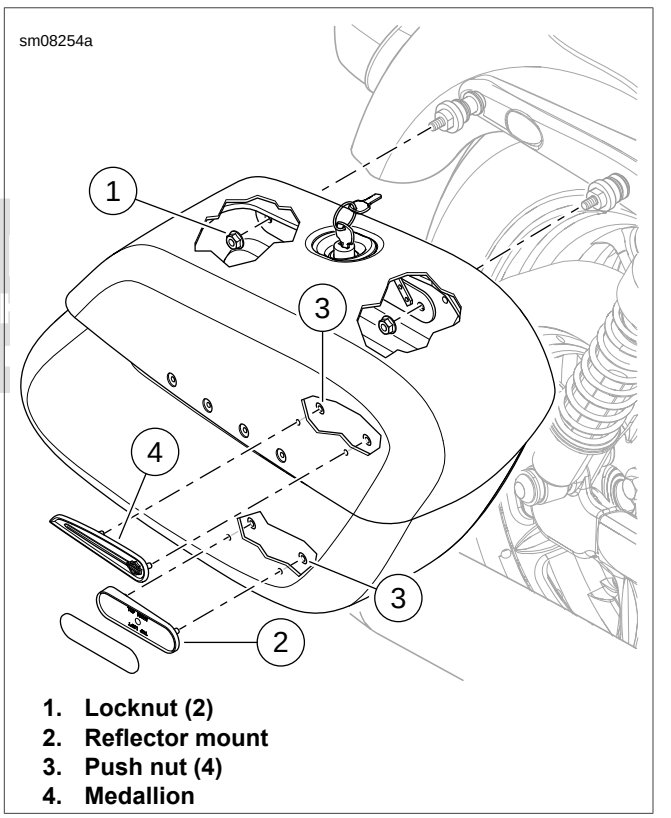
Medallions

Secure the medallions (4) to the saddlebag with two push nuts (3) inside saddlebag.

INSTALLATION

FASTENER	TORQUE VALUE	
Saddlebag locknut: XL 1200T	24-27 ft-lbs	32.6-36.6 Nm

1. See Figure 2-149. Fit the saddlebags to the mounting screws.
2. Install the saddlebag locknuts (1). Tighten to 24-27 ft-lbs (32.6-36.6 Nm).



1. **Locknut (2)**
2. **Reflector mount**
3. **Push nut (4)**
4. **Medallion**

Figure 2-149. Saddlebag

REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X 2.30

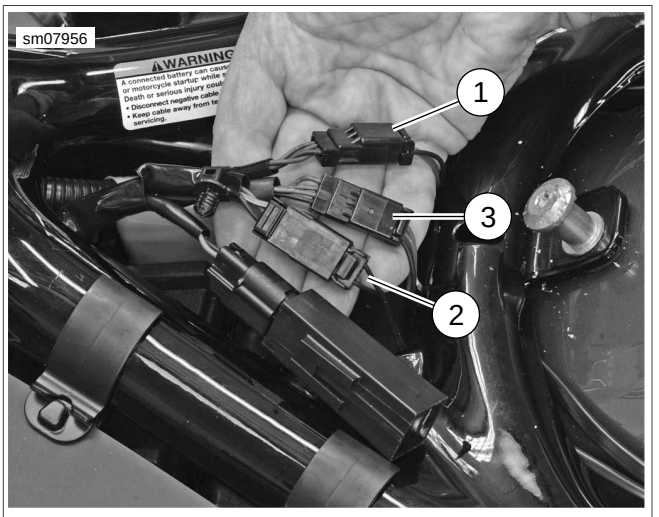
REMOVAL

1. Remove seat.

⚠WARNING

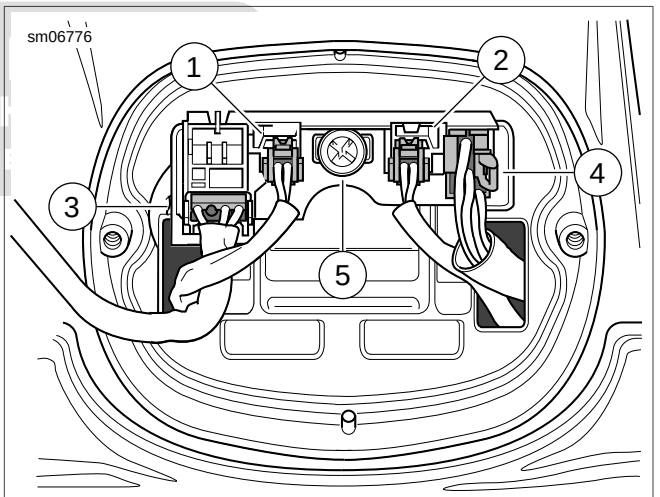
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. See Figure 2-150. Disconnect rear lighting connectors.
   a. Right turn signal [18] (3)
   b. Tail lamp [40] (2)
   c. Left turn signal [19] (1)
4. Access fender hardware.
   a. Remove lower shock bolts.
   b. Raise motorcycle to lower rear wheel.
5. Remove tail lamp assembly.
   a. Remove tail lamp lens and bulb. See 6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L, XL 1200T.
   b. See Figure 2-151. Unplug left [19] (1) and right [18] (2) turn signal connectors from rear lighting circuit board.
   c. Pull turn signal wiring harnesses through holes in tail lamp base and rear fender.
   d. Disengage turn signal wiring harnesses from wire retention brackets.
6. See Figure 2-152. Remove rear turn signal stalk locknuts (1) from inside rear fender on both sides.
   a. See Figure 2-153. Support fender. Remove front strut cover fastener (4), washer (3) and locknut (1), and rear strut cover fastener (2), washer (3) and clip nut (5). Repeat on opposite side.
   b. Remove rear fender strut covers and attached turn signal assemblies.
   c. Remove bolt (11), seat post (7) and washer (8) to detach top of fender from frame cross member tab.
   d. Carefully remove rear fender and attached license plate bracket, tail lamp base and wire harness.



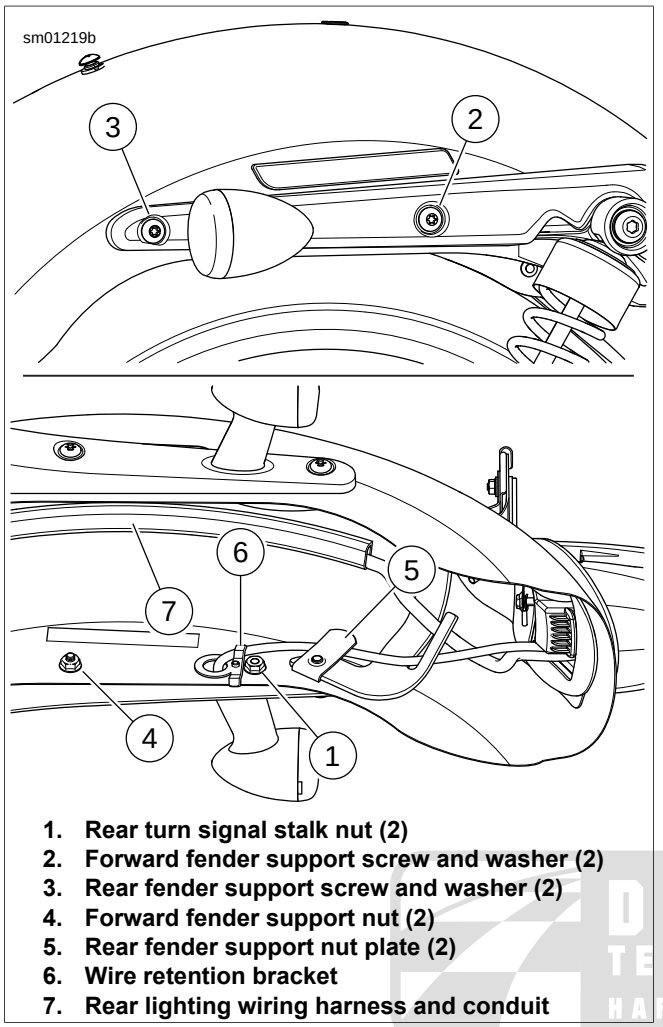
1. **Left turn signal [19]**
2. **Tail lamp [40]**
3. **Right turn signal [18]**

Figure 2-150. Rear Lighting Connectors



1. **Left turn signal connector [19]**
2. **Right turn signal connector [18]**
3. **Rear lighting power connector [94]**
4. **Tail lamp connector [93]**
5. **Screw and washer**

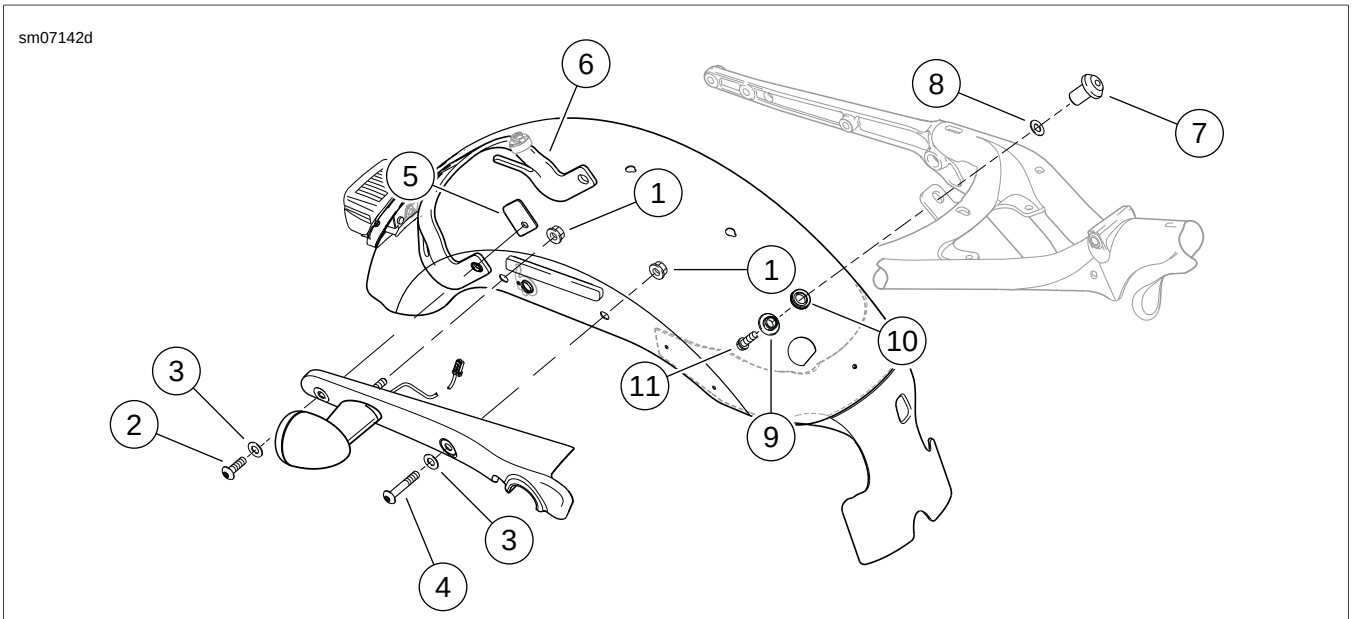
Figure 2-151. Tail Lamp Housing



1. **Rear turn signal stalk nut (2)**
2. **Forward fender support screw and washer (2)**
3. **Rear fender support screw and washer (2)**
4. **Forward fender support nut (2)**
5. **Rear fender support nut plate (2)**
6. **Wire retention bracket**
7. **Rear lighting wiring harness and conduit**

Figure 2-152. Rear Fender, Strut Cover and Turn Signal Lamp Assembly

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Locknut**
2. **Rear strut cover fastener**
3. **Washer**
4. **Front strut cover fastener**
5. **Clip nut**
6. **Inner fender brace**
7. **Seat post**
8. **Washer**
9. **Tee spacer**
10. **Grommet**
11. **Bolt**

Figure 2-153. Rear Fender Assembly: XL 883R/L, CAN XL 883N, XL 1200V/X

INSTALLATION

FASTENER	TORQUE VALUE	
Seat post bolt	120-168 **in-lbs**	13.6-19.0 Nm
Turn signal stalk locknut: XL 883R/L, CAN XL 883N, XL 1200V/X	120-168 **in-lbs**	13.6-19.0 Nm
Fender, rear, mounting fastener: XL 883R/L, CAN XL 883N, XL 1200VX	120-168 **in-lbs**	13.6-19.0 Nm

1. Carefully install rear fender onto motorcycle.
2. See Figure 2-153. Temporarily install screws to hold fender in place.
3. Route rear lighting connectors between frame cross member and top of oil tank.
   a. Right turn signal [18]
   b. Tail lamp [40]
   c. Left turn signal [19]
4. Connect housings.
5. Secure front of fender with bolt (11), washer (8) and seat post (7). Finger-tighten.
6. Remove fasteners (4, 2). Install fender strut cover with attached turn signal assembly to fender strut.
7. Push turn signal wiring harness through openings in strut and fender.
8. Install locknut (1) onto turn signal stalk from inside fender. Finger-tighten.
9. Secure fender to strut with fasteners (4), washer (3) and locknut (1) in forward mounting hole.
10. Install fastener (2), washer (3) and clip nut (5) in aft mounting hole. Finger-tighten.
11. In sequence, tighten all fender mounting hardware:
    a. Bolt and seat post to 120-168 **in-lbs** (13.6-19.0 Nm).
    b. Turn signal stalk locknuts to 120-168 **in-lbs** (13.6-19.0 Nm).
    c. Fender mounting fasteners to 120-168 **in-lbs** (13.6-19.0 Nm).
12. Install tail lamp assembly.
    a. Route turn signal wiring harnesses through wire retention brackets.
    b. Pull turn signal wiring harnesses through holes in rear fender and tail lamp base.
    c. See Figure 2-150. Connect tail lamp connector [94] (3) and left [19] (1) and right [18] (2) turn signal connectors.
    d. Install tail lamp lens and bulb. See 6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L, XL 1200T.
13. Install main fuse.

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 seat.

WARNING

Be sure headlamp, tail and stop lamp and turn signals are operating properly before riding. Poor visibility of rider to other motorists can result in death or serious injury. (00478b)

15. Check operation of all lamps.

FENDER PREPARATION

Tail Lamp Assembly

XL 883R/L: Replace tail lamp. See 6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L, XL 1200T.

Seat Nut

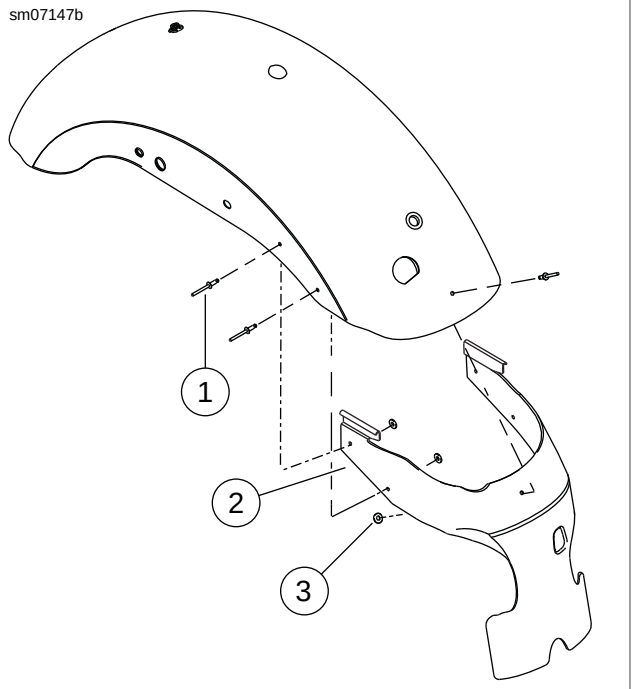
Replace C-clip and seat nut with a **new** seat nut kit.

Fender Extension

1. See Figure 2-154. Drill out rivets (1) securing rear fender extension (2) to fender with a 1/4 drill bit.
2. Rivet fender extension to fender backed by a washer (3).

Wire Harness and Conduit

If necessary, replace the wire harness. See 6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Rear Lighting Harness.



1. **Rivet**
2. **Extension**
3. **Washer**

Figure 2-154. Fender Extension

LICENSE PLATE BRACKET: XL 883R/L, CAN XL 883N, XL 1200V/X

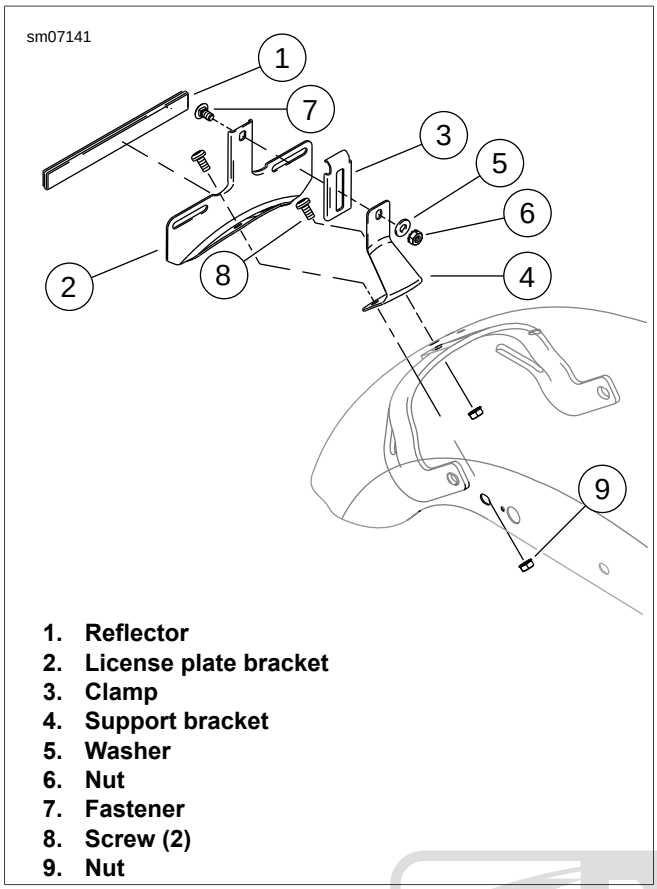
FASTENER	TORQUE VALUE	
License plate support bracket screws: XL 883R/L, CAN XL 883N, XL 1200V/X	20-25 **in-lbs**	2.3-2.8 Nm
License plate clamp nut: XL 883R/L, CAN XL 883N, XL 1200V/X	20-25 **in-lbs**	2.3-2.8 Nm

Removal

1. Loosen the Keps nut. Remove license plate.
2. Remove nut, washer and bolt to remove clamp and the bracket.
3. Remove screws to remove support bracket from fender.

Installation

1. See Figure 2-155. Mount support bracket (4) on fender with screws (8).
2. Fit fender brace to middle screw.
3. Secure with nuts (9). Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
4. Assemble license plate bracket (2) and clamp (3) to support bracket with bolt (7), washer (5) and nut (6).
5. Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).



1. Reflector
2. License plate bracket
3. Clamp
4. Support bracket
5. Washer
6. Nut
7. Fastener
8. Screw (2)
9. Nut

Figure 2-155. License Plate Bracket: XL 883R/L, CAN XL 883N, XL 1200V/X

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

REAR FENDER: XL 1200C/CP/CA/CB 2.31

REPLACEMENT

FASTENER	TORQUE VALUE	
Seat post bolt	120-168 **in-lbs**	13.6-19.0 Nm
Turn signal stalk locknut: XL 1200C/CP/CA/CB	120-168 **in-lbs**	13.6-19.0 Nm
Fender, rear, mounting fastener: XL 1200C/CP/CA/CB	120-168 **in-lbs**	13.6-19.0 Nm

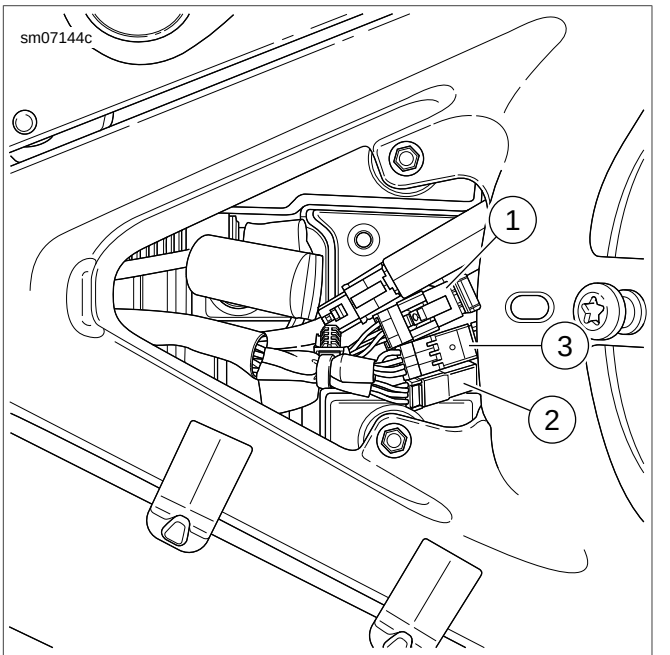
Removal

1. Remove seat.

⚠WARNING

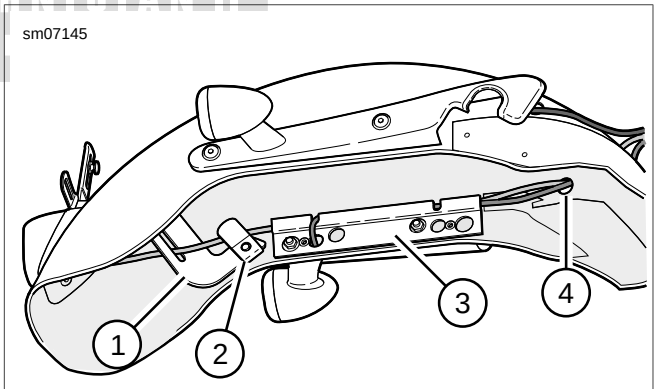
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. See Figure 2-156. Disconnect the right [18] (1) and left [19] (3) turn signal connectors and tail lamp connector [40] (2).
4. Remove lower shock bolts and lower rear wheel to access fender hardware.
5. See Figure 2-157. Route turn signal wire harness through openings (4) in fender and from retention bracket (3).
6. See Figure 2-158. Remove rear turn signal stalk nuts (1) from inside rear fender on both sides.
7. Support fender. Remove front (4) and rear (2) fender fasteners, washers (3) strut covers and attached turn signal assemblies from rear fender struts.
8. Remove bolt (11), seat post (7) and flat washer (8) to detach top of rear fender from frame cross member tab.
9. Carefully remove rear fender.



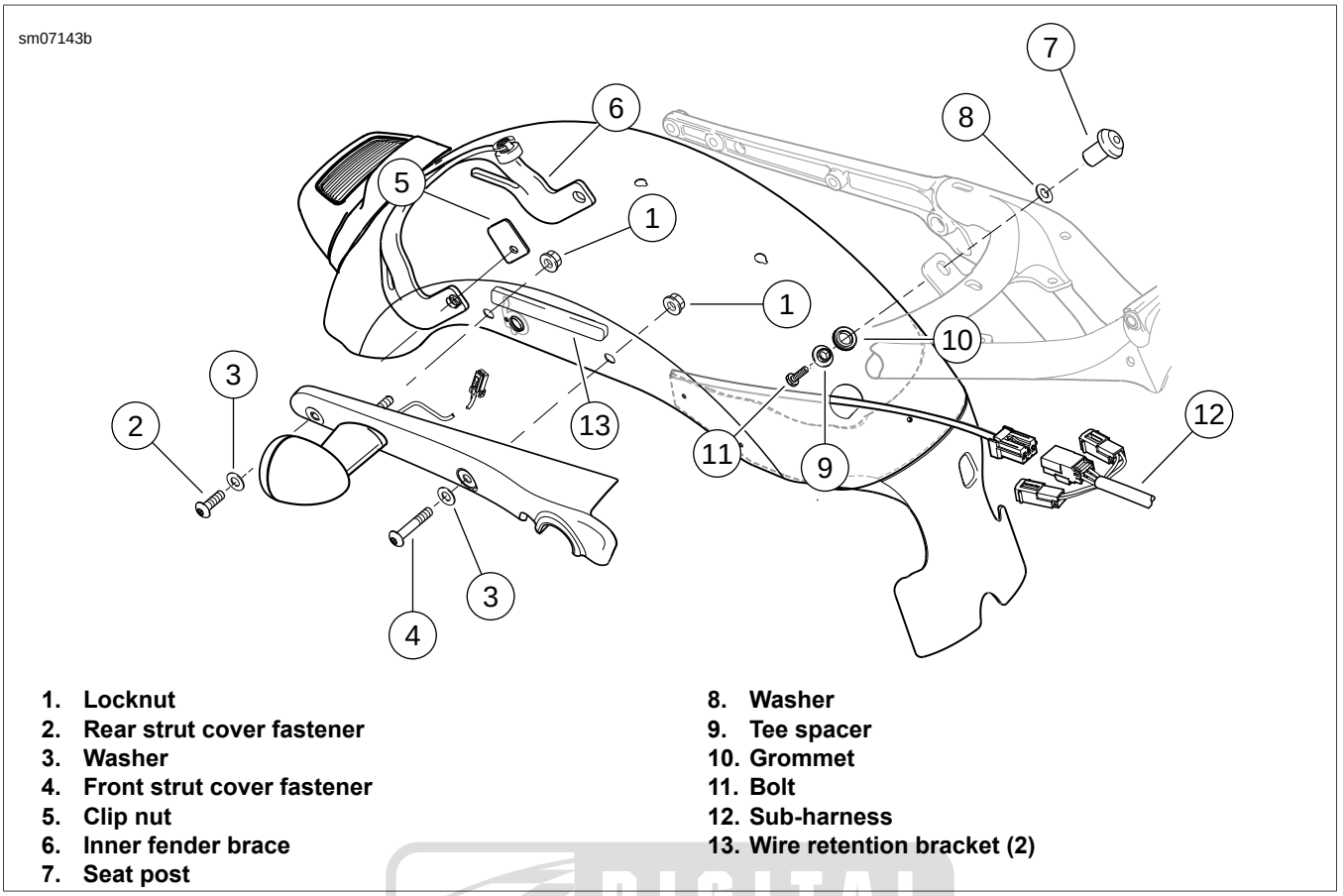
1. **Right turn [18]**
2. **Stop/tail lamp [40]**
3. **Left turn [19]**

Figure 2-156. Rear Lighting Connectors: XL 1200C/CP/CA/CB



1. **Fender brace**
2. **Retention clip**
3. **Retention bracket**
4. **Fender opening**

Figure 2-157. Inner Rear Fender: XL 1200C/CP



1. **Locknut**
2. **Rear strut cover fastener**
3. **Washer**
4. **Front strut cover fastener**
5. **Clip nut**
6. **Inner fender brace**
7. **Seat post**
8. **Washer**
9. **Tee spacer**
10. **Grommet**
11. **Bolt**
12. **Sub-harness**
13. **Wire retention bracket (2)**

Figure 2-158. Rear Fender Assembly: XL 1200C/CP

Installation

1. Install rear fender onto motorcycle. Align holes in fender with holes in struts. Temporarily install screws to hold fender in place.
2. Route tail lamp harness connector between frame cross member and top of oil tank.
3. See Figure 2-158. Secure front of fender with bolt (11), washer (8) and seat post (7). Finger-tighten.
4. **Security system:** Make sure that antenna harness is not pinched between fender and frame crossmember.
5. Remove fasteners from right side of fender. Install fender strut cover with attached turn signal assembly to fender strut with locknut (1).
6. Secure fender to strut with fasteners (4), washer (3) and locknut (1) in forward mounting hole.
7. Install fastener (2), washer (3) and clip nut (5) in aft mounting hole. Finger-tighten.
8. Push turn signal wiring harness through openings in strut and fender.
9. Install nut onto turn signal stalk from inside fender. Finger-tighten.
10. Now tighten all fender mounting hardware in following sequence:
    a. Tighten bolt (11) and seat post (7) to 120-168 **in-lbs** (13.6-19.0 Nm).
    b. Tighten turn signal stalk nuts (1) to 120-168 **in-lbs** (13.6-19.0 Nm).
    c. Tighten fasteners (2, 4) to 120-168 **in-lbs** (13.6-19.0 Nm).
11. Install lower shock bolts and lower rear wheel.
12. Connect right [18] and left [19] turn signal connectors and tail lamp connector [40].
13. Install main fuse.

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 seat.

WARNING

Be sure headlamp, tail and stop lamp and turn signals are operating properly before riding. Poor visibility of rider to other motorists can result in death or serious injury. (00478b)

15. Check operation of all lamps.

FENDER PREPARATION

Tail Lamp Assembly

XL 1200C/CP/CA/CB: Replace LED tail lamp assembly. See 6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, LED Tail Lamp: XL 1200C/CP/CA/CB.

Seat Nut

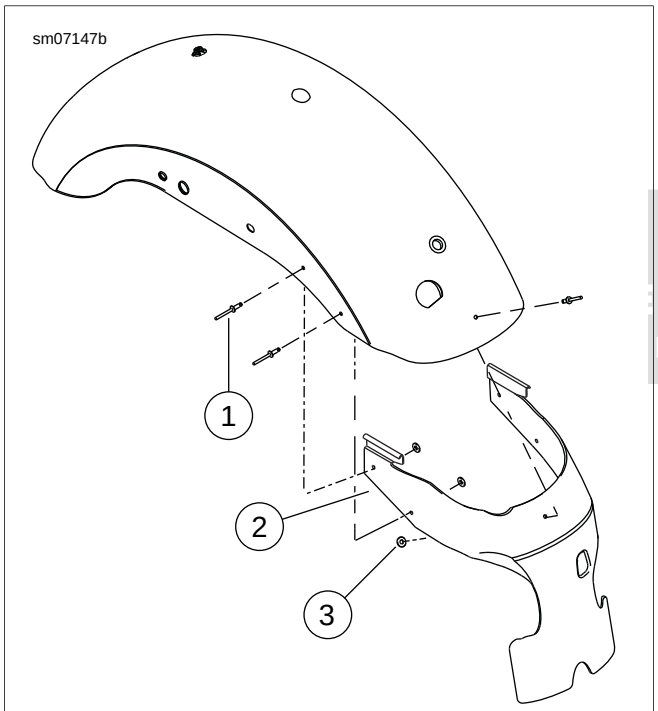
Replace C-clip and seat nut with a **new** seat nut kit

Fender Extension

1. See Figure 2-159. Drill out rivets (1) securing rear fender extension (2) to fender with a 1/4 drill bit.
2. Rivet fender extension to fender backed by a washer (3).

Wire Harness

If necessary, replace the wire harness. See 6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Rear Lighting Harness.



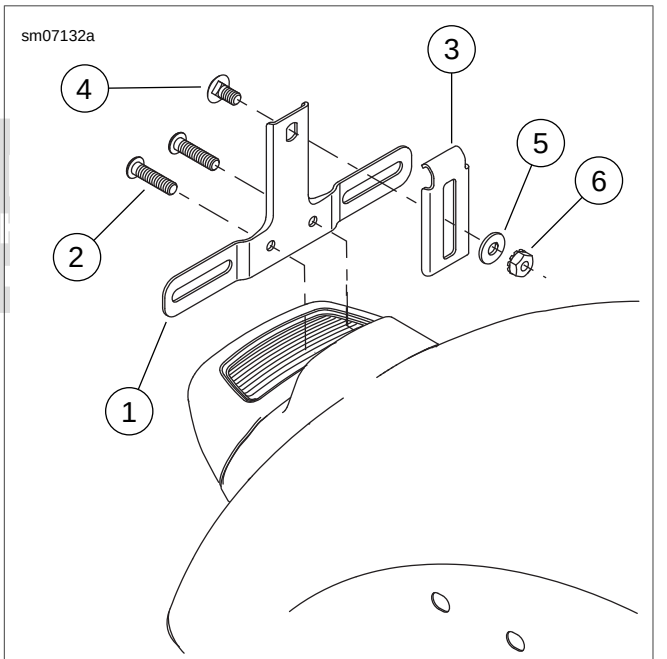
1. **Rivet**
2. **Extension**
3. **Washer**

Figure 2-159. Fender Extension

LICENSE PLATE BRACKET: XL 1200C/CP/CA/CB

FASTENER	TORQUE VALUE	
License plate support bracket screws: XL 1200C/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm
License plate clamp nut: XL 1200C/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm

1. See Figure 2-160. Disassemble clamp (3), bolt (4), washer (5) and nut (6).
2. Remove two screws (2) from tail lamp base to remove license plate bracket (1).
3. Install license plate bracket, bolt, washer and nut. Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
4. Install tail lamp. See 6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, LED Tail Lamp: XL 1200C/CP/CA/CB.
5. Assemble clamp with bolt, washer and nut.
6. Install license plate. Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).



1. **License plate bracket**
2. **Screws (2)**
3. **Clamp**
4. **Bolt**
5. **Washer**
6. **Keps nut**

Figure 2-160. License Plate Bracket: XL 1200C/CP/CA/CB

REAR FENDER: XL 1200T 2.32

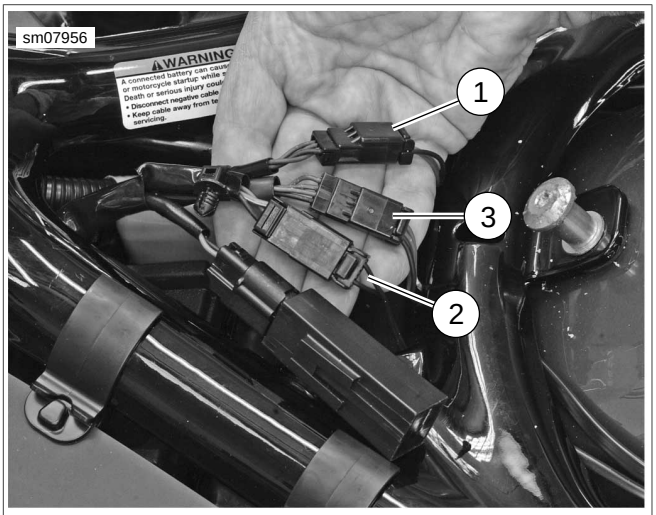
REMOVAL

1. Remove seat.

⚠WARNING

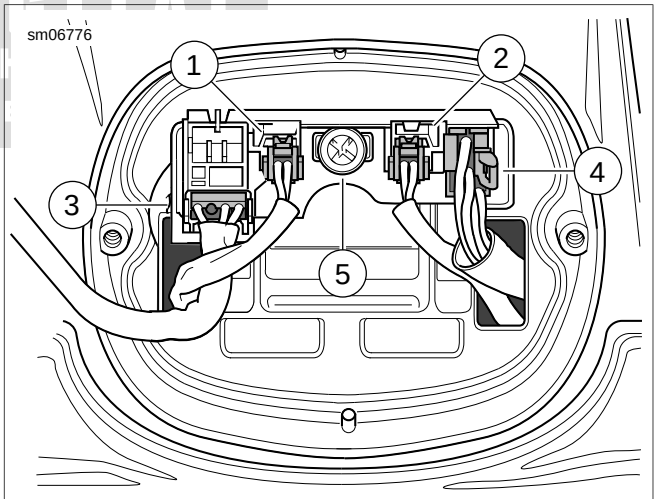
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. Remove saddlebags. See 2.29 SADDLEBAGS: XL 1200T.
4. See Figure 2-161. Disconnect rear lighting connectors.
   a. Right turn signal [18] (3)
   b. Tail lamp [40] (2)
   c. Left turn signal [19] (1)
5. Access fender hardware.
   a. Remove lower shock bolts.
   b. Raise motorcycle to lower rear wheel and access saddlebag support mounting screws.
6. Remove tail lamp lens.
   a. Remove tail lamp lens and bulb. See 6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L, XL 1200T.
   b. See Figure 2-162. Unplug left [19] (1) and right [18] (2) turn signal connectors from rear lighting circuit board.
   c. Pull turn signal wiring harnesses through holes in tail lamp base.
7. Remove rear turn signal directional bar. See 6.21 REAR TURN SIGNALS, XL 1200T.
8. See Figure 2-163. Remove fender:
   a. Support the fender.
   b. Loosen but do not remove bolt, seat post and washer.
   c. Remove the saddlebag support screws, strut covers and saddlebag supports.
   d. Remove the fender mounting bolts and saddlebag supports.
   e. Carefully remove rear fender and attached tail lamp base and wire harness.
9. If necessary, replace the rear lighting wire harness. See 6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Rear Lighting Harness.



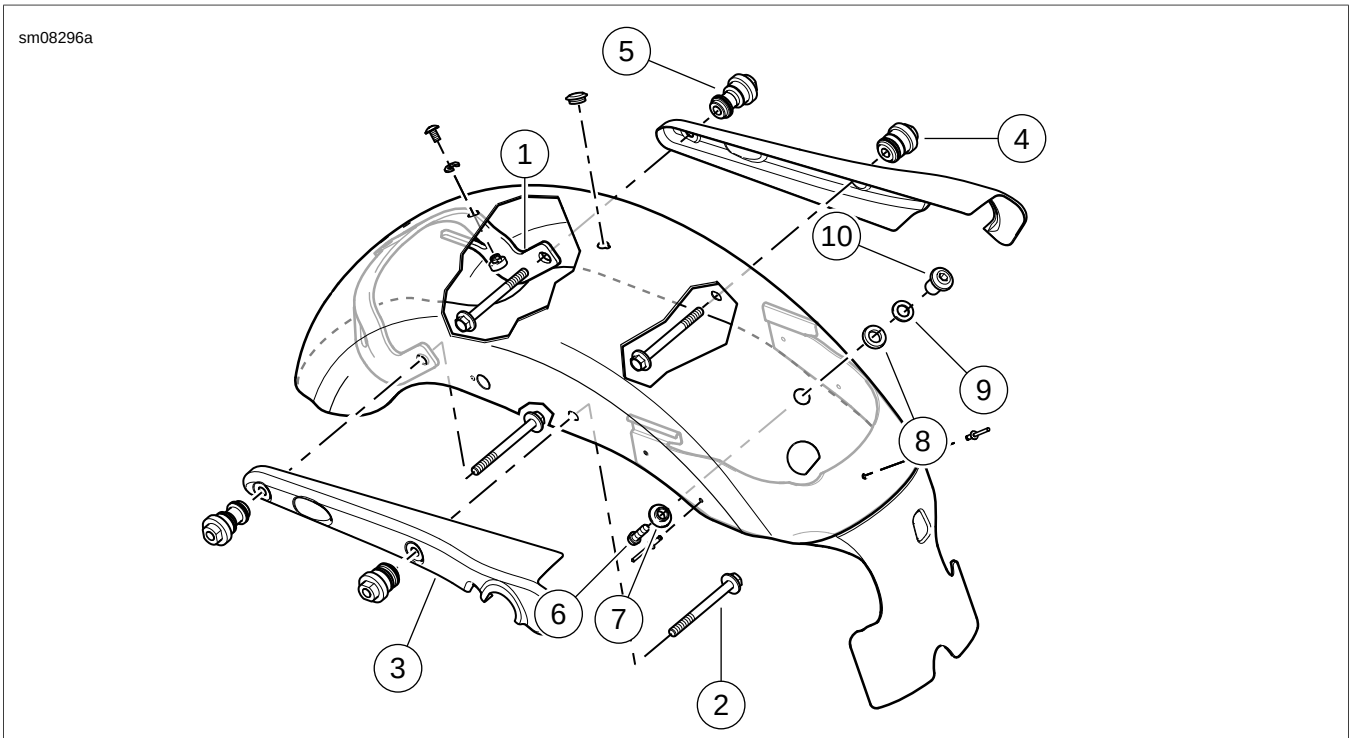
1. **Left turn signal [19]**
2. **Tail lamp [40]**
3. **Right turn signal [18]**

Figure 2-161. Rear Lighting Connectors



1. **Left turn signal connector [19]**
2. **Right turn signal connector [18]**
3. **Rear lighting power connector [94]**
4. **Tail lamp connector [93]**
5. **Screw and washer**

Figure 2-162. Tail Lamp Housing



1. **Fender brace**
2. **Saddlebag support bolts (4)**
3. **Strut cover (2)**
4. **Front short saddble bag support (2)**
5. **Rear long saddlebag support (2)**
6. **Bolt**
7. **Spacer**
8. **Grommet**
9. **Washer**
10. **Seat post**

Figure 2-163. Rear Fender Assembly: XL 1200T

INSTALLATION

FASTENER	TORQUE VALUE	
Fender, rear, saddlebag support bolts: XL 1200T	24-27 ft-lbs	32.6-36.6 Nm
Seat post bolt	120-168 **in-lbs**	13.6-19.0 Nm

1. See Figure 2-163. Install fender:
   a. Align holes in fender and fender brace (1) with holes in struts. Support fender.
   b. Install saddlebag support bolts (2) through fender brace, fender and fender struts.
   c. Install strut covers (3).
   d. Install the short saddlebag supports (4) on the front support bolts.
   e. Install the long saddlebag supports (5) on the rear support bolts.
   f. Install bolt (6), spacer (7), grommet (8), washer (9) and seat post (10) through fender and frame cross member tab.
2. Tighten:
   a. Saddlebag support bolts to 24-27 ft-lbs (32.6-36.6 Nm)
   b. Seat post to 120-168 **in-lbs** (13.6-19.0 Nm)
3. Install the turn signal directional bar/license plate bracket assembly. See 6.21 REAR TURN SIGNALS, XL 1200T.
4. Install tail lamp lens and bulb.
   a. Pull turn signal wiring harnesses through holes in rear fender and tail lamp base.
   b. See Figure 2-162. Connect tail lamp connector [94] (3) and left [19] (1) and right [18] (2) turn signal connectors.
   c. Install tail lamp lens and bulb. Remove tail lamp lens and bulb. See 6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L, XL 1200T.
5. Install saddlebags. See 2.29 SADDLEBAGS: XL 1200T.
6. Install main fuse.

⚠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)

7. Install seat.

⚠WARNING

Be sure headlamp, tail and stop lamp and turn signals are operating properly before riding. Poor visibility of rider to other motorists can result in death or serious injury. (00478b)

8. Check operation of all lamps.

FENDER PREPARATION

Tail Lamp Assembly

Replace tail lamp. See 6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L, XL 1200T.

Seat Nut

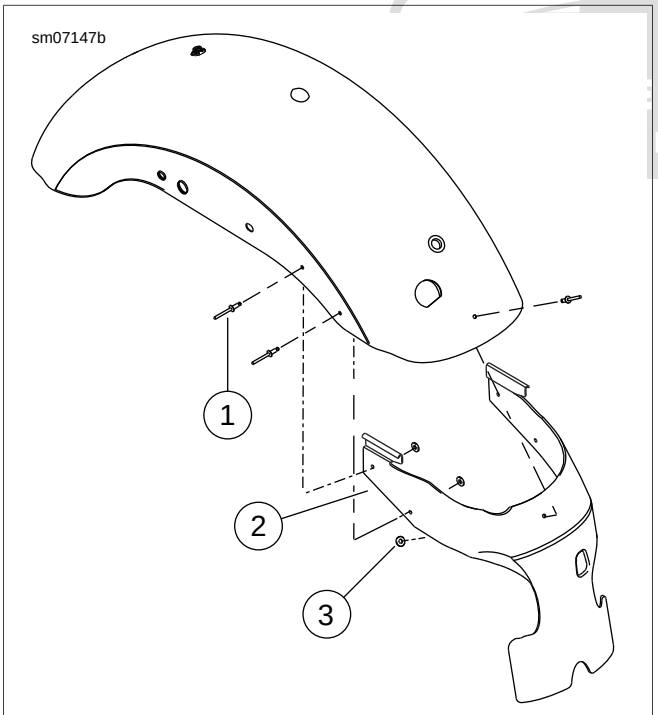
Replace C-clip and seat nut with a **new** seat nut kit.

Fender Extension

1. See Figure 2-164. Drill out rivets (1) securing rear fender extension (2) to fender with a 1/4 drill bit.
2. Rivet fender extension to fender backed by a washer (3).

Wire Harness

If necessary, replace wire harness. See 6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Rear Lighting Harness.



1. **Rivet**
2. **Extension**
3. **Washer**

Figure 2-164. Fender Extension

LICENSE PLATE BRACKET: XL 1200T

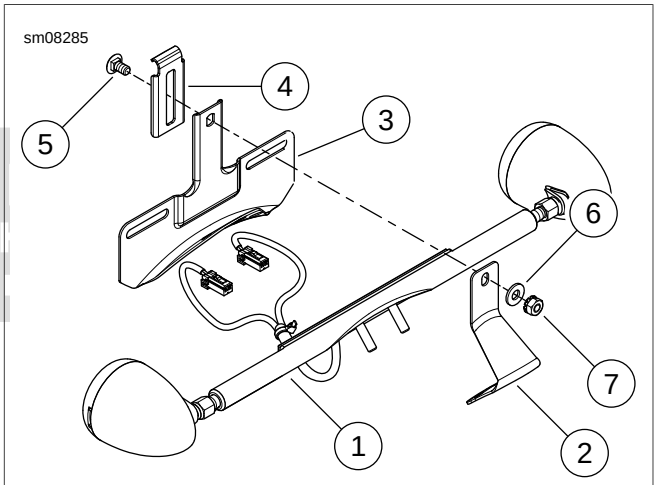
FASTENER	TORQUE VALUE	
License plate clamp nut: XL 1200T	20-25 **in-lbs**	2.3-2.8 Nm

Removal

1. Remove the rear turn signal assembly. See 6.21 REAR TURN SIGNALS, XL 1200T.
2. Remove the license plate clamp nut and clamp.

Installation

1. See Figure 2-165. Assemble the turn signal assembly (1), support bracket (2), license plate bracket (3) with the license plate clamp (4).
2. Install the clamp bolt (5), washer (6) and nut (7). Hand tighten.
3. Install the rear turn signal assembly. See 6.21 REAR TURN SIGNALS, XL 1200T.
4. Install license plate. Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).



1. **Turn signal assembly**
2. **Support bracket**
3. **License plate bracket**
4. **Clamp**
5. **Bolt**
6. **Washer**
7. **Nut**

Figure 2-165. License Plate Bracket: XL 1200T

REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V 2.33

GENERAL

XL 883N and XL 1200X/V models have a side-mount license plate bracket. This bracket includes a license plate lamp.

NOTES

- *This feature may not be available in all markets.*
- *On XL 883N and XL 1200V/X models sold in certain markets, a license plate lamp is center mounted in license plate bracket.*

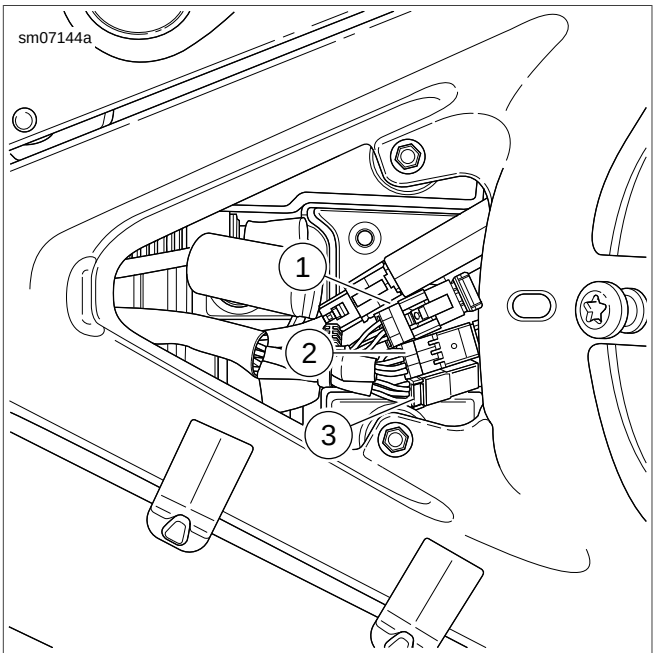
Certain models and markets do not have a rear fender-mounted tail lamp and stop lamp. LED assemblies in rear turn signal housings serve as stop lamp, tail lamp and turn signals.

REMOVAL AND DISASSEMBLY

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

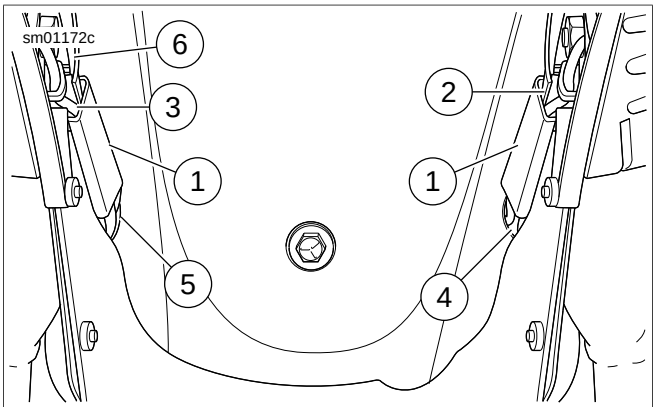
1. Remove seat.
2. Remove main fuse.
3. Raise motorcycle to remove pressure on shock bolts.
4. Remove lower shock bolts. See 2.20 SHOCK ABSORBERS, Removal.
5. Raise motorcycle to gain clearance between rear wheel and fender.
6. See Figure 2-166. Separate lighting connector housings.
   a. Right turn signal connector (1) [18]
   b. License plate lamp connector (2) [40]
   c. Left turn signal connector (3) [19]



1. **Right turn signal [18]**
2. **License plate lamp harness [40]**
3. **Left turn signal [19]**

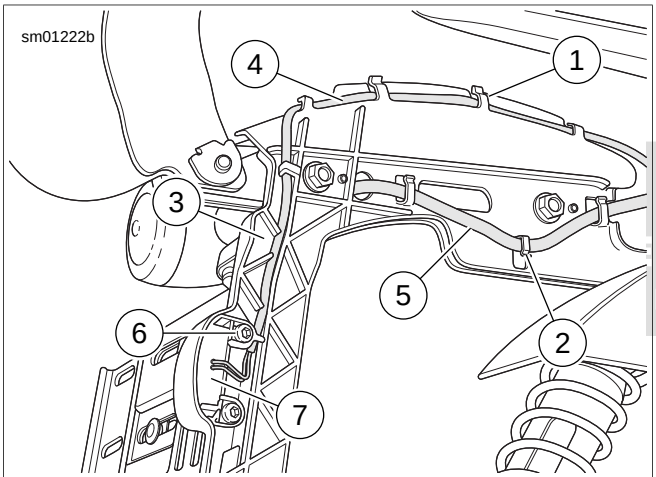
Figure 2-166. Rear Lighting Harness Connectors: XL 883N, XL 1200X/V

7. See Figure 2-167. Carefully pull both rear lighting harnesses (2, 3) and license plate lamp harness (6) through feed-through holes (4, 5) in rear fender.
8. Remove both rear lighting harnesses and license plate lamp harness from fender harness clips (1).
9. See Figure 2-168. Remove left rear lighting harness (5) from harness clips (2) on lower side of bracket on left side of fender. Repeat steps for the opposite side.
10. See Figure 2-169. Remove rear turn signal stalk nuts (6) from inside rear fender on both sides.
11. Remove forward fender support screw with washer (2) and nut (4) and aft fender support screw with washer (3) and nut plate (5). Repeat steps for the opposite side.
12. Remove screw with washer (9) and rear fender brace (7).
13. **HDI models:** Remove license plate lamp module harness from upper harness clips on bracket inside fender (left side). Separate license plate bracket from rear fender brace.
14. Remove rear fender strut covers (1) and attached turn signal assemblies from rear fender struts. Carefully pull turn signal wiring harnesses through holes in rear fender and strut.



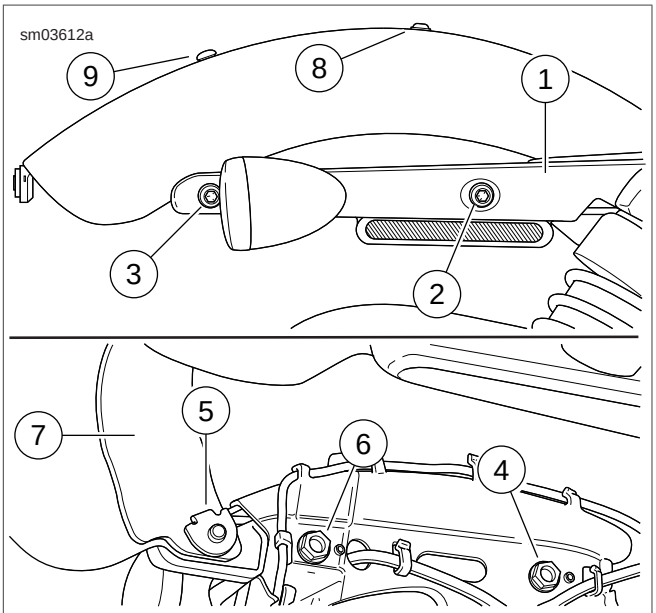
1. **Bracket (2)**
2. **Right turn signal wire harness**
3. **Left turn signal wire harness**
4. **Right feed-through hole**
5. **Left feed-through hole**
6. **License plate lamp harness**

Figure 2-167. Wire Harness Routing and Harness Brackets: XL 883N, XL 1200X/V



1. **Upper license plate bracket harness clip (5)**
2. **Lower license plate bracket harness clip (3)**
3. **Harness channel**
4. **License plate lamp harness**
5. **Left rear lighting harness**
6. **Screw (2)**
7. **License plate lamp module**

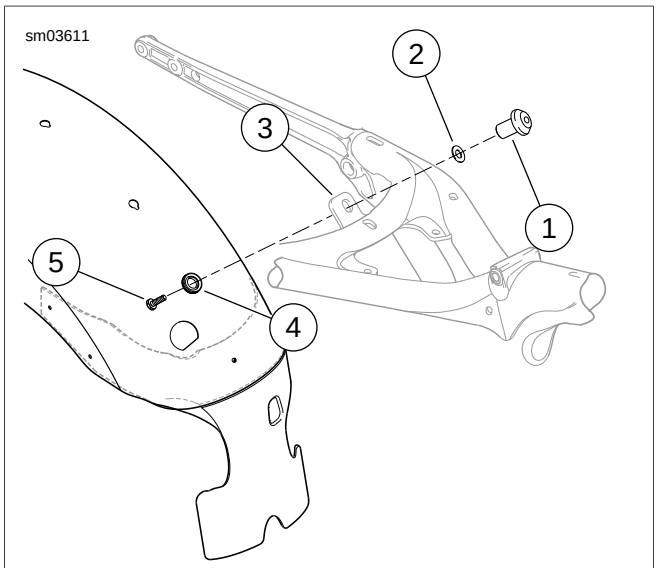
Figure 2-168. Removing/Installing License Plate Lamp Module (U.S.)



1. **Rear fender strut cover**
2. **Forward fender support screw with washer (2)**
3. **Aft fender support screw with washer (2)**
4. **Forward fender support nut (2)**
5. **Aft fender support nut plate (2)**
6. **Rear turn signal stalk nut (2)**
7. **Rear fender brace**
8. **Fender seat nut kit (2)**
9. **Screw with washer**

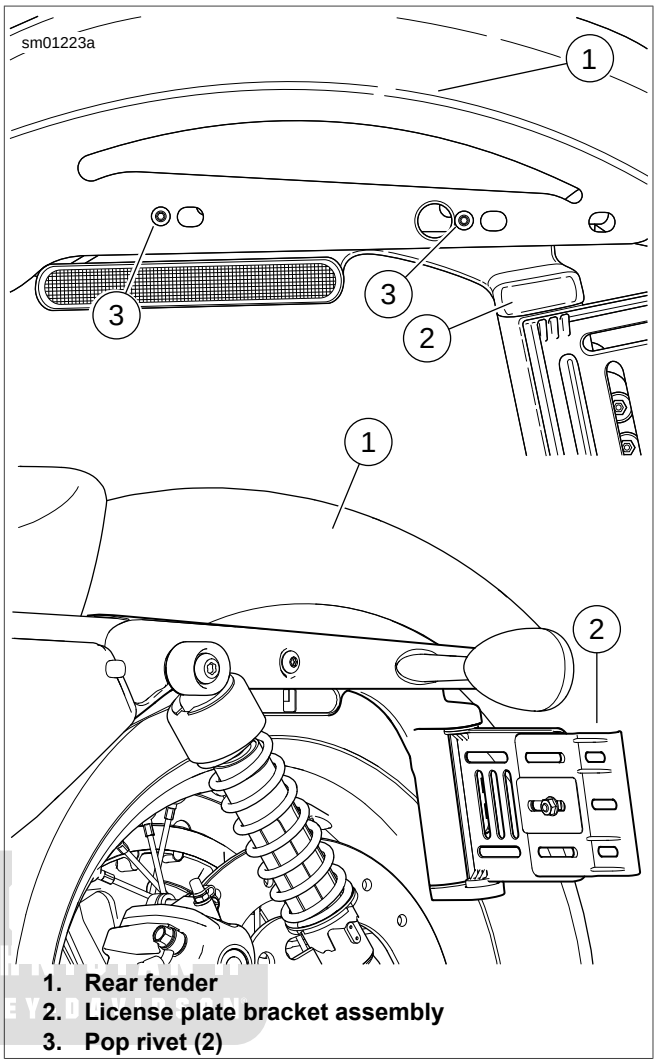
Figure 2-169. Rear Fender, Strut Cover and Turn Signal Lamp Assembly (DOM)

15. Place a clean shop towel between each fender strut and fender to protect paint.
16. Have an assistant hold rear fender in place. See Figure 2-170. Remove seat post (1), washer (2) and screw (5). Remove rear fender. Do not damage paint. Lay rear fender on a soft, clean surface.
17. **US models:** Remove convertible side mount license plate bracket from rear fender.
    a. See Figure 2-168. Remove license plate lamp module harness from upper harness clips (1) and harness channel (3) in license plate bracket. Remove two screws (6) and license plate lamp module (7).
    b. See Figure 2-171. Carefully drill out two pop rivets (3) securing license plate bracket assembly (2) to left side of fender.
18. See Figure 2-169. If replacing rear fender:
    a. Remove fender seat nut kit (8).
    b. Carefully drill out pop rivets securing rear fender extension to old fender with a 1/4 drill bit.
    c. Set nut kit and fender extension aside.



1. **Seat post**
2. **Washer**
3. **Fender mounting tab**
4. **Grommet**
5. **Screw**

Figure 2-170. Seat Post/Rear Fender Mount Hardware



1. **Rear fender**
2. **License plate bracket assembly**
3. **Pop rivet (2)**

Figure 2-171. Removing/Installing License Plate Bracket Assembly (US)

ASSEMBLY AND INSTALLATION

FASTENER	TORQUE VALUE	
Seat post bolt	120-168 **in-lbs**	13.6-19.0 Nm
Turn signal stalk locknut: XL 883N, XL 1200X/V	120-168 **in-lbs**	13.6-19.0 Nm
Fender brace, rear, screw	20-25 **in-lbs**	2.3-2.8 Nm
Fender, rear, mounting fastener: XL 883N, XL 1200X/V	120-168 **in-lbs**	13.6-19.0 Nm

1. See Figure 2-169. Prepare the fender:
   a. Install fender seat nut kit (8).
   b. Rivet rear fender extension to fender.

2. **US models:** Install convertible side mount license plate bracket on fender.
   a. See Figure 2-171. Position license plate bracket assembly (2) against inside of rear fender (1). Line up holes in bracket with holes in fender. Secure bracket to fender with two **new** pop rivets (3).
   b. See Figure 2-168. Install license plate lamp module (7) on to license plate bracket. Secure with two screws (6). Feed license plate lamp harness (4) up through harness channel (3). Insert harness into upper license plate bracket harness clips (1).
3. Place clean shop towels over fender struts. With aid of an assistant, carefully install rear fender onto vehicle.
4. See Figure 2-170. With assistant holding rear fender in place, install screw (5) through fender and frame tab. Install washer (2) on screw. Thread seat post (1) onto screw. Finger-tighten seat post.
5. Remove shop towels from fender struts.
6. See Figure 2-169. Install fender strut covers (1) and attached turn signal lamp assemblies. Carefully feed each turn signal harness through appropriate hole in fender strut and fender as you install each strut cover.
7. Thread nut (6) onto each rear turn signal stalk finger-tight. Install two forward fender support screws and washers (2). Thread nut (4) onto each screw finger-tight.
8. **HDI models:** Hook tab of license plate bracket into slot in rear fender brace.
9. Place rear fender brace (7) in position under fender and secure with screw and washer (9) finger-tight. Install two aft fender support screws with washers (3).
   a. **HDI models:** Thread each mounting screw through rear fender brace, into threaded inserts in license plate bracket. Install finger-tight. Make sure threaded inserts in license plate bracket fit into holes in rear fender brace.
   b. **US models:** See Figure 2-172. Install nut plate (2) on each mounting screw (5) finger-tight.

NOTE

US models: *see Figure 2-172. Make sure that tab (3) on each nut plate (2) fits into slot (4) in fender brace (1).*

10. Tighten all fender mounting hardware in the following order:
    a. See Figure 2-170. Tighten screw (5) and seat post (1) to 120-168 **in-lbs** (13.6-19.0 Nm).
    b. See Figure 2-169. Tighten left and right turn signal stalk nuts (6) to 120-168 **in-lbs** (13.6-19.0 Nm).
    c. Tighten rear fender brace screw (9) to 20-25 **in-lbs** (2.3-2.8 Nm).
    d. Tighten forward and aft fender support screws (2, 3) on both sides of fender to 120-168 **in-lbs** (13.6-19.0 Nm).
11. See Figure 2-167. Install left rear lighting harness (3) and license plate lamp harness (6) into fender harness clip (1) on left side of fender. Install right rear lighting harness (2) into fender harness clip on right side of fender.
12. Carefully feed both rear lighting harnesses and license plate lamp harness through feed-through holes (4, 5) in rear fender.
13. Plug in license plate lamp connector [40].
14. Plug in left rear lighting harness connector [18].
15. Plug in right rear lighting harness connector [19].

⚠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)

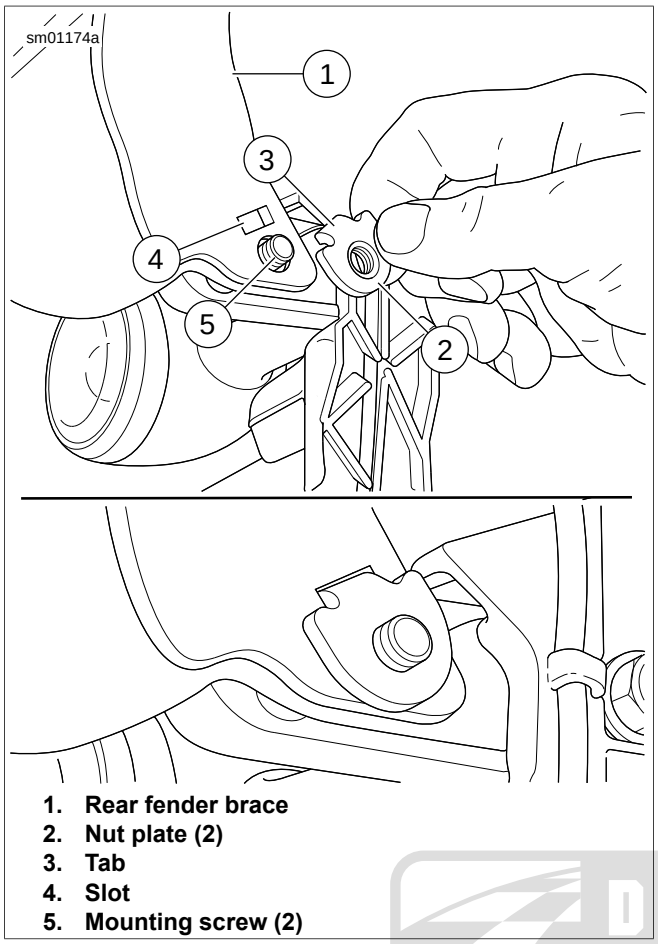
16. Install seat.
17. Lower the motorcycle. Install lower shock bolts. See 2.20 SHOCK ABSORBERS, Installation.
18. Install main fuse.

⚠WARNING

Be sure headlamp, tail and stop lamp and turn signals are operating properly before riding. Poor visibility of rider to other motorists can result in death or serious injury. (00478b)

19. Check operation of all lamps.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. Rear fender brace
2. Nut plate (2)
3. Tab
4. Slot
5. Mounting screw (2)

Figure 2-172. Rear Fender Nut Plate: XL 883N, XL 1200X/V

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

WINDSHIELD: XL 1200T 2.34

WINDSHIELD: XL 1200T

FASTENER	TORQUE VALUE	
Windshield clamp shoulder bolt: XL 1200T	48-72 **in-lbs**	5.4-8.1 Nm

Removal

1. See Figure 2-173. While supporting the windshield, open the clamp levers.

NOTE

Do not scratch headlamp housing, front fender or fuel tank.

2. Lift the windshield forward off the front forks.

Installation

WARNING

Be sure that steering is smooth and free without interference. Interference with steering could result in loss of vehicle control and death or serious injury. (00371a)

WARNING

Pinched throttle cables can restrict throttle response, which could result in loss of control and death or serious injury. (00423b)

1. Verify that rubber gaskets are in place in the clamp saddles.
2. To check operation, cycle the clamps open and close.

NOTE

Do not scratch headlamp housing, front fender or fuel tank.

3. Straddle the front fender. Hold the windshield with both hands. Fit the clamps to the fork slider tubes between the upper and lower fork brackets.

NOTE

*If necessary, tighten clamp shoulder bolts to 48-72 **in-lbs** (5.4-8.1 Nm).*

4. Lock the clamps with the levers.
5. Check that clutch and throttle cables do not contact windshield. Check throttle and clutch operation.

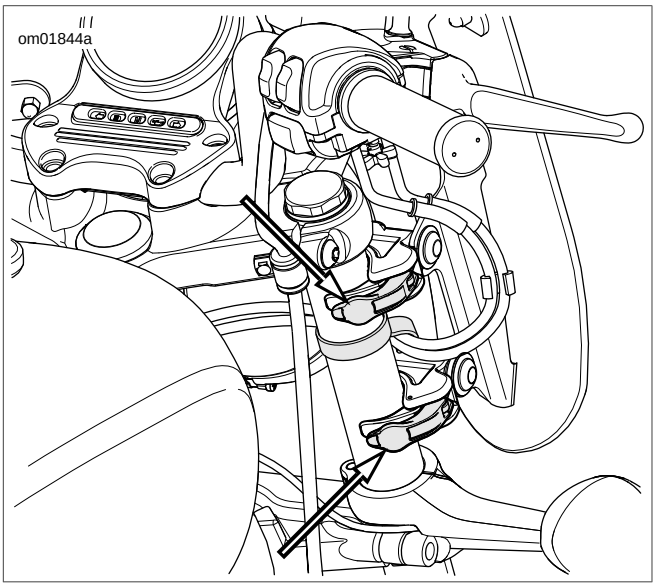


Figure 2-173. Windshield Clamp Levers

CLEANING

NOTICE

Polycarbonate windscreens/windshields require proper attention and care to maintain. Failure to maintain polycarbonate properly can result in damage to the windscreen/windshield. (00483d)

NOTICE

Use only Harley-Davidson recommended products on Harley-Davidson windshields. Do not use harsh chemicals or rain sheeting products, which can cause windshield surface damage, such as dulling or hazing. (00231c)

NOTES

- *Powdered, abrasive or alkaline cleansers can damage the windshield.*
- *Ammonia-based window cleaners cause permanent yellow effects to windshields.*
- *Clean the motorcycle when it is cool and parked in the shade to minimize swirl marks. Faint swirl marks are normal. Swirl marks are more visible on tinted windshields.*

Windshields can be washed with SUNWASH BIKE SOAP or QUICK WASH when washing the entire motorcycle.

1. Use WINDSHIELD CLEANER - INDIVIDUAL WIPES to detail the windshield.
2. Wipe dry with a clean DISPOSABLE DETAILING SOFT CLOTH.

WINDOW

PART NUMBER	TOOL NAME
HD-25070	HEAT GUN

FASTENER	TORQUE VALUE	
Windshield assembly screws: XL 1200T	23-27 **in-lbs**	2.6-3.1 Nm

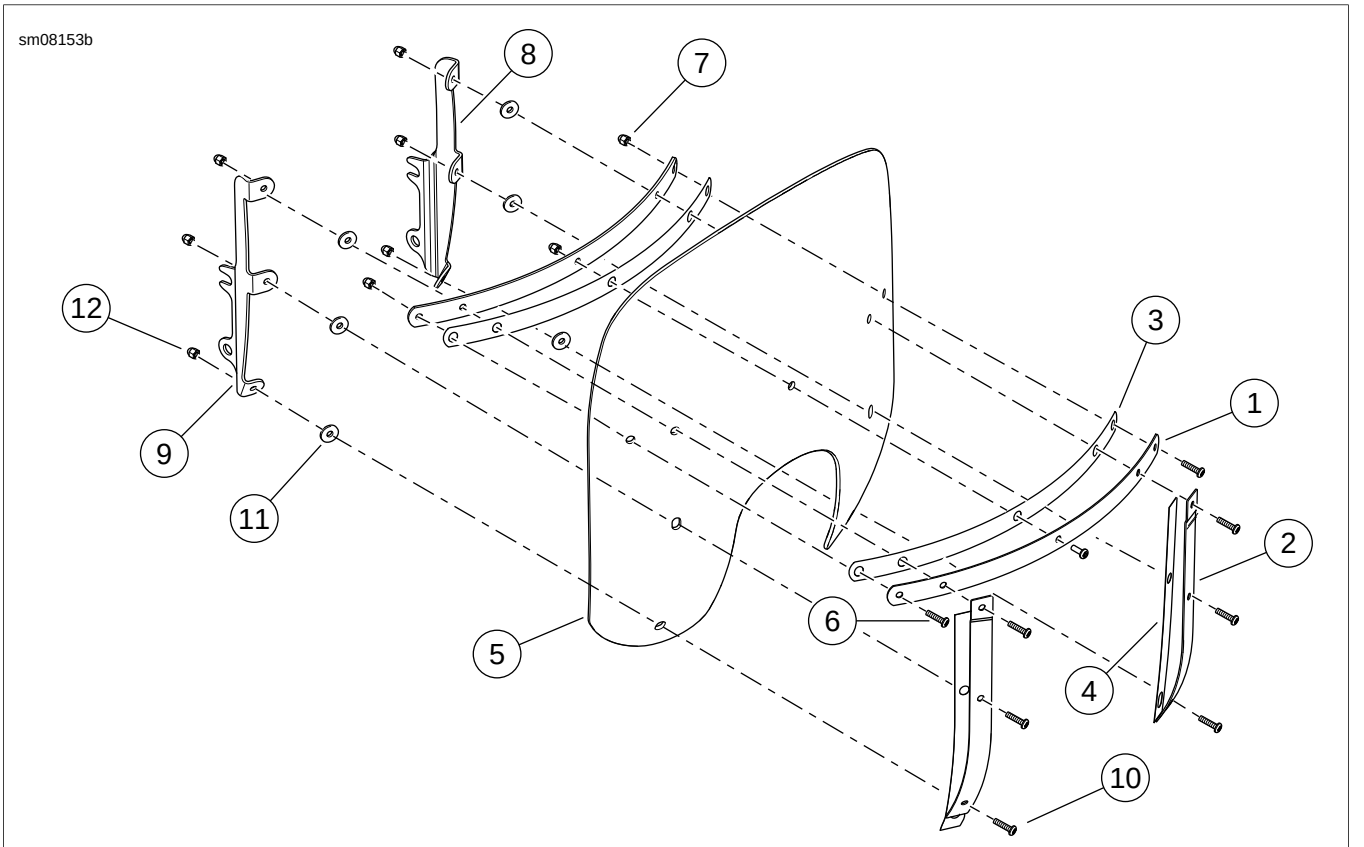
Disassembly

1. Remove mounting clamps. See 2.34 WINDSHIELD: XL 1200T, Mounting Clamps.
2. See Figure 2-174. Remove the acorn nuts, washers and screws to remove the left and right mounting brackets.
3. Remove the acorn nuts, washers and screws from the horizontal braces.
4. Carefully pry braces from windshield. Discard windshield.

⚠WARNING

Be sure to follow manufacturer's instructions when using the Robinair Heat Gun or any other radiant heating device. Failure to follow manufacturer's instructions can cause a fire, which could result in death or serious injury. (00379a)

5. Remove cushioned adhesive tape from braces:
   a. Liberally apply 3M GENERAL PURPOSE ADHESIVE REMOVER. Allow to soak.
   b. Apply heat with HEAT GUN (Part No. HD-25070).
   c. Peel cushioned adhesive tape from braces.
   d. Remove remaining adhesive with 3M GENERAL PURPOSE ADHESIVE REMOVER.



1. **Horizontal brace (2)**
2. **Vertical brace (2)**
3. **Horizontal cushioned adhesive tape (2)**
4. **Vertical cushioned adhesive tape (2)**
5. **Windshield**
6. **Screw (2)**
7. **Acorn nut (2)**
8. **Left bracket**
9. **Right bracket**
10. **Screw (6)**
11. **Washer (6)**
12. **Acorn nut (6)**

Figure 2-174. Windshield

Assembly

1. See Figure 2-174. Prepare the horizontal (1) and vertical braces:
   a. Match cushioned adhesive tape (3, 4) to windshield braces.
   b. Remove paper backing from one side of cushioned adhesive tape.
   c. Align the holes in the **new** tape with the holes in the braces.
   d. Apply to the windshield side of each brace.
2. Place **new** windshield (5) front side down on clean padded surface.

NOTE

The thicker horizontal brace mounts to the inner (rear) surface of the windshield.

3. Install the inner horizontal brace.
   a. Remove paper backing from cushioned adhesive tape on thicker horizontal brace.
   b. Align holes in brace with holes in windshield.
   c. Press brace into position.
4. Turn windshield front side up.
5. Install the outer horizontal brace:
   a. Remove paper backing from cushioned adhesive tape.
   b. Align holes in brace with holes in windshield.
   c. Match the edges of the inner and out braces.
   d. Press into position.
   e. Install **new** screws (6) and acorn nuts (7) in two outer horizontal holes and the center horizontal hole.
6. Install vertical braces:
   a. Remove paper backing from cushioned adhesive tape.
   b. Position the stepped end overlapping the horizontal brace and the end with the slight bend angled outward.
   c. Align the holes in the brace with the holes in the windshield.
   d. Press into position.
7. Install the left (8) and right (9) mounting brackets to the windshield with **new** screws (10), washers (11) and acorn nuts (12).
8. See Figure 2-175. In sequence, tighten to 23-27 **in-lbs** (2.6-3.1 Nm).
9. Install the mounting clamps. See 2.34 WINDSHIELD: XL 1200T, Mounting Clamps.

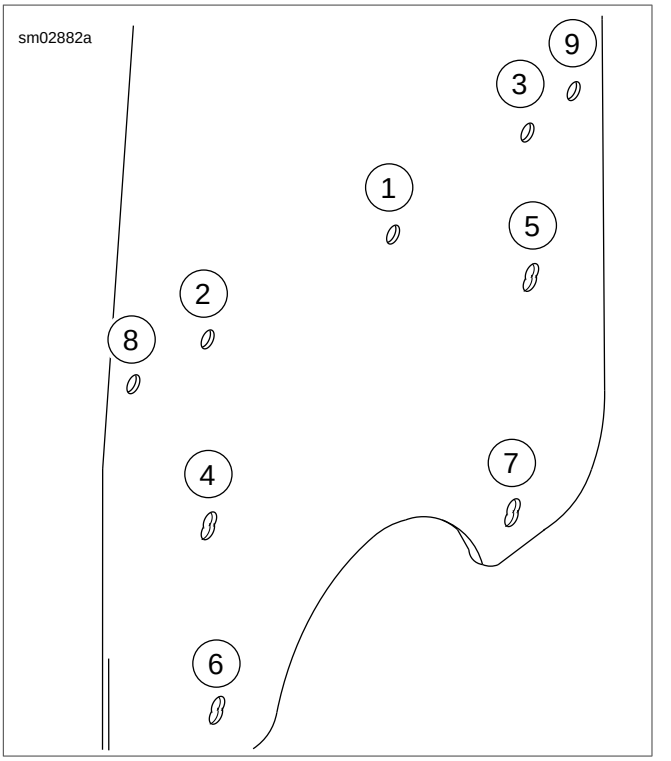


Figure 2-175. Windshield Torque Sequence

MOUNTING CLAMPS

FASTENER	TORQUE VALUE	
Windshield clamp shoulder bolt: XL 1200T	48-72 **in-lbs**	5.4-8.1 Nm

Removal

See Figure 2-176. Remove the shoulder bolts (1), the Belleville washers (4), windshield, spacers (3) and clamps.

Installation

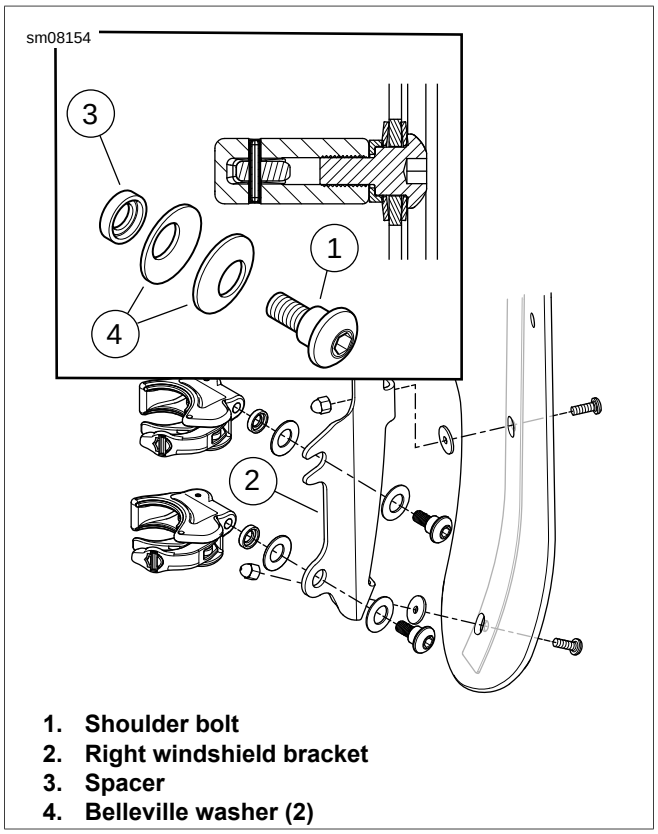
WARNING

The cupped side of the Belleville (cone) washers must face each other and sandwich the windshield mount brackets at each mount point. Failure to orient washers correctly can reduce windshield's ability to break away in a collision, which could result in death or serious injury. (00422b)

NOTE

Face the cupped sides of the Belleville washers towards each other with the windshield bracket between.

1. See Figure 2-176. Install shoulder bolt (1) through a Belleville washer (4), windshield bracket (2), Belleville washer, spacer (3) and into the clamp.
2. Finger-tighten shoulder bolt to hold clamp to bracket during installation.
3. Install windshield.
4. Verify that each shoulder bolt is seated in the windshield bracket. Tighten to 48-72 **in-lbs** (5.4-8.1 Nm).



1. **Shoulder bolt**
2. **Right windshield bracket**
3. **Spacer**
4. **Belleville washer (2)**

Figure 2-176. Windshield Mounting Clamp

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

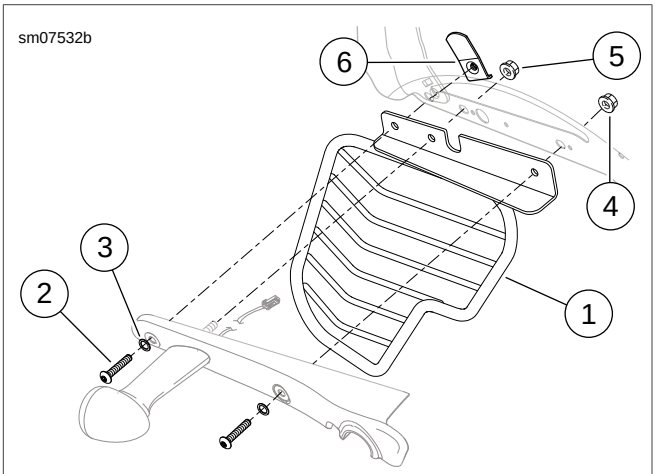
SAREE GUARD: INDIA MODELS 2.35

SAREE GUARD: XL 883R, XL 1200C (INDIA)

FASTENER	TORQUE VALUE	
Strut cover fastener, front: XL 883R, XL 1200C (India)	120-168 **in-lbs**	13.6-19.0 Nm
Turn signal stalk locknut: XL 883R, XL 1200C (India)	96-156 **in-lbs**	10.9-17.6 Nm
Strut cover fastener, rear: XL 883R, XL 1200C (India)	120-168 **in-lbs**	13.6-19.0 Nm
Passenger footrest support bracket, left-front, fastener: XL 883R, XL 1200C saree guard	16-20 ft-lbs	21.7-27.1 Nm
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm

Right and Left-Rear

1. Remove rear strut cover. See 2.30 REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X, Removal.
2. See Figure 2-177. Remove saree guard (1).
3. Install saree guard.
   a. Fit saree guard to fender strut.
   b. Thread turn signal connector and wire harness through notch in saree guard and hole in fender.
   c. Install strut cover.
   d. Verify installation of rear fastener clip nut (6).
   e. Install front and rear strut cover fasteners (2) and washers (3).
   f. Install front fastener locknut (4) and turn signal stalk locknut (5).
4. Tighten fasteners:
   a. Front strut cover fastener to 120-168 **in-lbs** (13.6-19.0 Nm).
   b. Turn signal stalk locknut to 96-156 **in-lbs** (10.9-17.6 Nm).
   c. Rear strut cover fastener to 120-168 **in-lbs** (13.6-19.0 Nm).
5. Complete strut cover installation. See 2.30 REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X, Removal.



1. **Right saree guard**
2. **Strut cover fastener (2)**
3. **Washer (2)**
4. **Strut cover fastener locknut (2)**
5. **Turn signal stalk locknut (2)**
6. **Clip nut (2)**

Figure 2-177. Right and Left-Rear Saree Guard

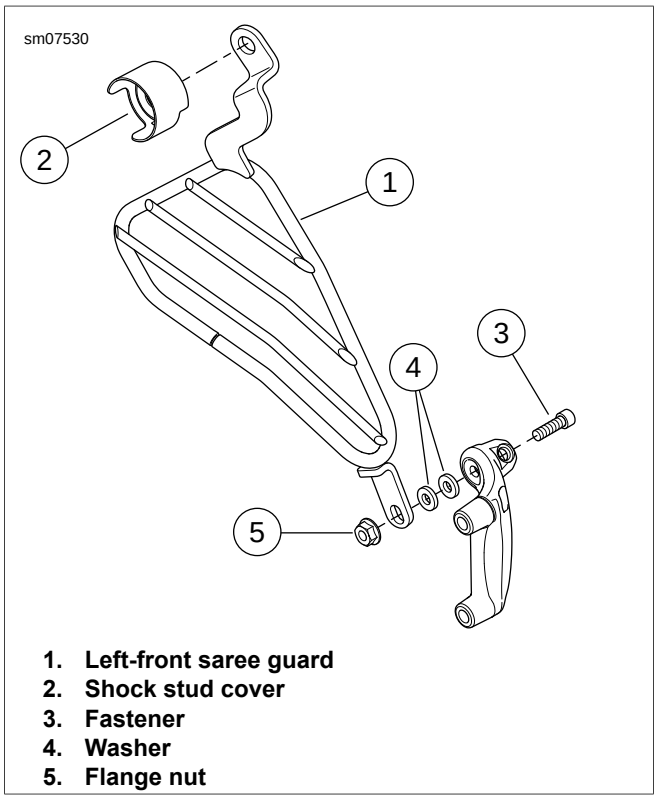
Left-Front

1. Remove left passenger footrest. See 2.41 PASSENGER FOOTRESTS, Left.
2. Remove left upper rear shock absorber fastener and washer. See 2.20 SHOCK ABSORBERS, Removal.
3. See Figure 2-178. Remove saree guard (1).
   a. Remove stud cover (2).
   b. Remove screw (3), two washers (4) and flange nut (5).

NOTE

Apply 2-3 drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to shock absorber fastener.

4. Install saree guard.
   a. Fit saree guard to footrest bracket and shock mount.
   b. Install screw, washers and flange nut.
   c. Install shock stud cover.
   d. Install shock absorber fastener and washer.
5. Tighten passenger footrest support bracket fastener to 16-20 ft-lbs (21.7-27.1 Nm).
6. Tighten shock absorber mounting bolt to 45-50 ft-lbs (61-68 Nm).
7. Install passenger footrest. See 2.41 PASSENGER FOOTRESTS, Left.



1. **Left-front saree guard**
2. **Shock stud cover**
3. **Fastener**
4. **Washer**
5. **Flange nut**

Figure 2-178. Left-Front Saree Guard

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

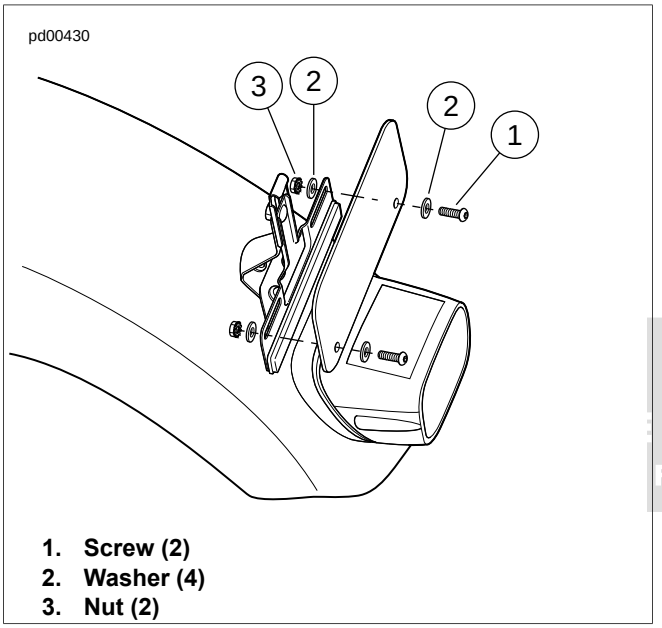
REAR LICENSE PLATE: INDIA MODELS 2.36

REAR LICENSE PLATE (INDIA)

FASTENER	TORQUE VALUE	
License plate screw: XL 883L/R (India)	10-15 **in-lbs**	1.1-1.7 Nm
License plate screw: XL 883N, XL 1200X (India)	10-15 **in-lbs**	1.1-1.7 Nm

XL 883L/R, XL 1200C

1. See Figure 2-179. Assemble screws (1), washers (2), license plate and nuts (3) to the license plate bracket.
2. Tighten to 10-15 **in-lbs** (1.1-1.7 Nm).

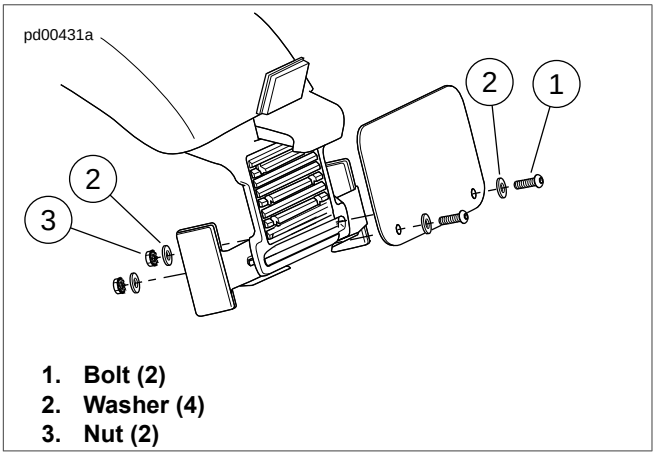


1. **Screw (2)**
2. **Washer (4)**
3. **Nut (2)**

Figure 2-179. License Plate Bracket: XL 883L/R (India)

XL 883N, XL 1200X

1. See Figure 2-180. Assemble screws (1), washers (2), license plate and nuts (3) to the license plate bracket.
2. Tighten to 10-15 **in-lbs** (1.1-1.7 Nm).



1. **Bolt (2)**
2. **Washer (4)**
3. **Nut (2)**

Figure 2-180. License Plate Bracket: XL 883N (India) (shown)

IGITAL
CHNICIAN II
RLEY-DAVIDSON

JIFFY STAND 2.37

REMOVAL

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)

1. Position motorcycle upright on a suitable lift.

NOTE

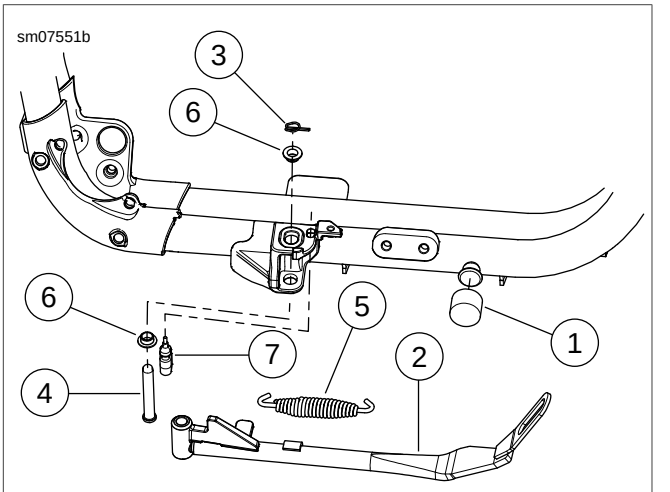
Remove stop to release spring tension.

2. See Figure 2-181. Remove stop (1).
3. Retract leg (2).
4. Remove pretzel clip (3). Discard pretzel clip.

WARNING

Wear safety glasses or goggles when removing or installing spring. Spring tension can cause spring, attached components and/or hand tools to fly out which could result in death or serious injury. (00477c)

5. Hold leg in retracted position. Withdraw clevis pin (4) until it disengages from upper pivot hole of yoke.
6. Use pliers to detach spring (5) from the frame mounted anchor pin. Unhook end of spring from leg.
7. Remove clevis pin from lower pivot hole of yoke.
8. Remove upper and lower bushings (6).
9. Remove bumper (7) if required.
10. Remove JSS if equipped. See 6.30 JIFFY STAND SENSOR (JSS): INTERNATIONAL MODELS.

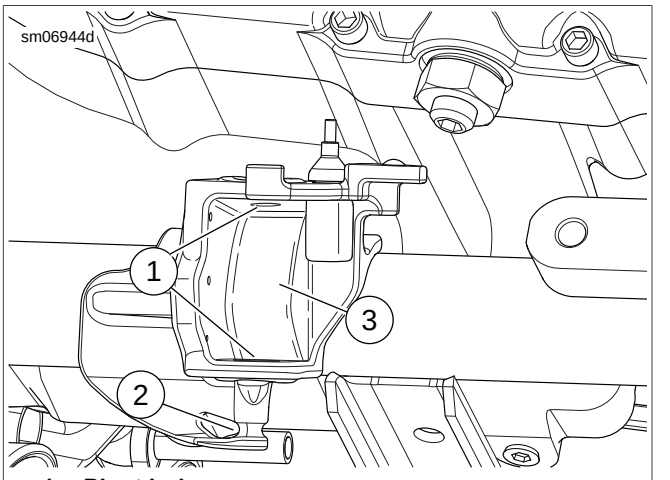


1. **Stop**
2. **Leg**
3. **Pretzel clip**
4. **Clevis pin**
5. **Spring**
6. **Bushing (2)**
7. **Bumper**

Figure 2-181. Jiffy Stand

CLEANING AND LUBRICATION

1. Clean the jiffy stand components, the frame-mounted yoke and the anchor pin.
2. See Figure 2-182. Apply ANTI-SEIZE LUBRICANT to the leg pivot holes in the yoke (1), the groove of the anchor pin (2) and the OD of the clevis pin.
3. Coat the ramp (3) of the yoke with ANTI-SEIZE LUBRICANT.



1. **Pivot holes**
2. **Anchor pin groove**
3. **Ramp**

Figure 2-182. Lubrication Points

INSTALLATION

⚠WARNING

Wear safety glasses or goggles when removing or installing spring. Spring tension can cause spring, attached components and/or hand tools to fly out which could result in death or serious injury. (00477c)

1. If required, install the JSS. See 6.30 JIFFY STAND SENSOR (JSS): INTERNATIONAL MODELS.
2. Press in a **new** rubber bumper.

NOTE

Face open ends of spring hooks toward centerline of vehicle.

3. See Figure 2-183. Install spring.
   a. Hook spring into spring mounting hole (2) on leg.
   b. Hook spring over frame mounted anchor pin (1).
4. Install bushing onto clevis pin with shoulder of bushing facing head of clevis pin.
5. Hold leg in its retracted position. Insert clevis pin halfway up through yoke and pivot hole of leg.

NOTE

Make certain that shank of lower bushing fits inside lower pivot hole in yoke.

6. Push clevis pin through slotted upper hole in yoke.
7. Install upper bushing with shoulder facing up against upper surface of yoke.
8. Insert **new** pretzel clip through hole in end of clevis pin.

NOTE

See Figure 2-184. Snap the loop of the pretzel clip over the end of the clevis pin.

9. Press the stop onto the motorcycle frame.

NOTE

When retracted, the leg should be seated against the stop.

10. Extend and retract jiffy stand leg several times to check operation.

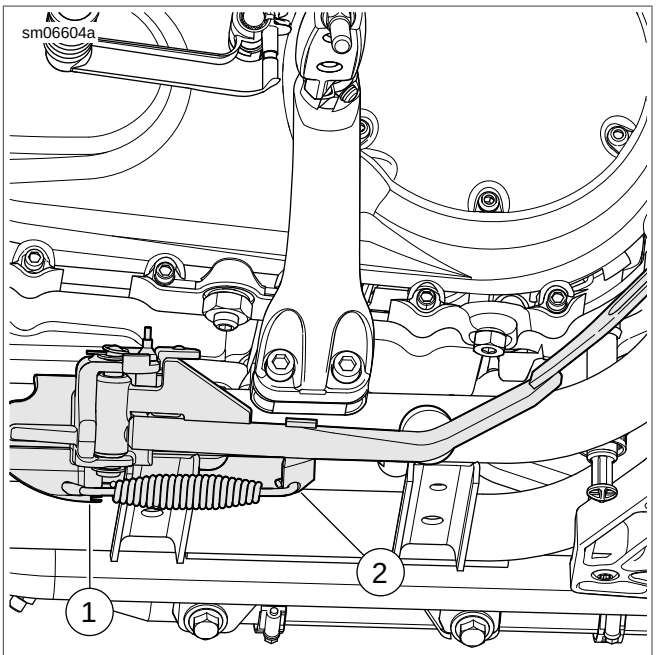
⚠WARNING

Always park motorcycle on a level, firm surface. An unbalanced motorcycle can fall over, which could result in death or serious injury. (00039a)

⚠WARNING

Be sure jiffy stand is fully retracted before riding. If jiffy stand is not fully retracted, it can contact the road surface causing a loss of vehicle control, which could result in death or serious injury. (00007a)

11. Rest motorcycle on jiffy stand.



1. **Anchor pin**
2. **Leg spring mounting hole**

Figure 2-183. Jiffy Stand (typical)

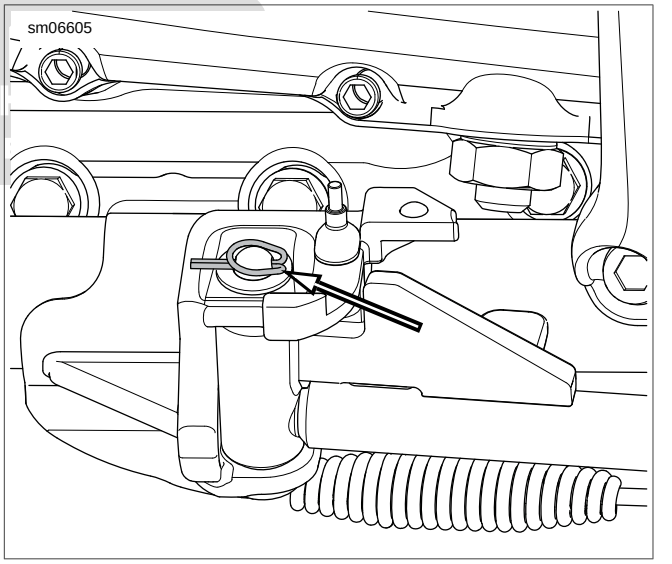


Figure 2-184. Pretzel Clip

SEAT 2.38

REMOVAL

1. Remove screw to detach seat from rear fender.
2. Slide seat forward.
3. See Figure 2-185. Lift slightly to detach keyhole bracket from seat post.
4. See Figure 2-186 or Figure 2-187. Slide seat rearward to detach seat tongue (1) from rear fuel tank bracket.
5. Verify that tongue and mounting bracket (3) are tightly secured to the seat bottom.

NOTE

The passenger strap is not sold separately. Replace entire seat if the strap is damaged.

6. **Two-up seat:** Inspect passenger strap for damage or excessive wear.

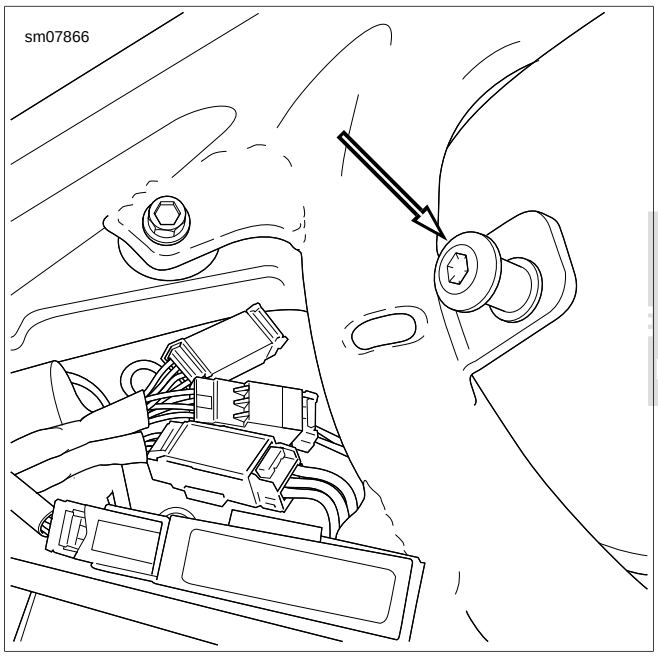
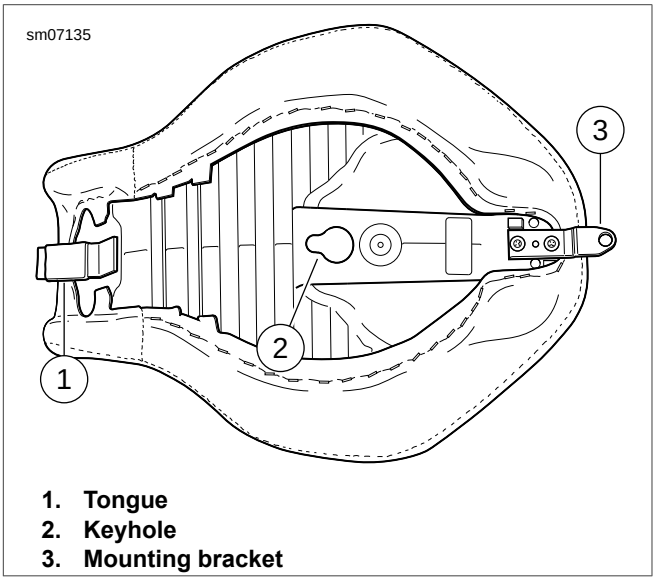
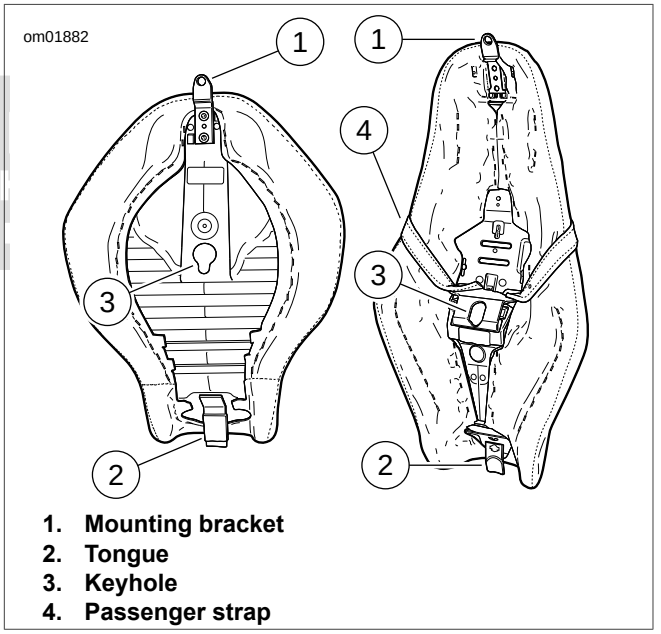


Figure 2-185. Seat Post



1. **Tongue**
2. **Keyhole**
3. **Mounting bracket**

Figure 2-186. Seat: Solo



1. **Mounting bracket**
2. **Tongue**
3. **Keyhole**
4. **Passenger strap**

Figure 2-187. Solo and Two-Up Seats

INSTALLATION

FASTENER	TORQUE VALUE	
Seat mounting screw	20-40 **in-lbs**	2.3-4.5 Nm

1. Position seat on frame with mounting bracket at rear.
2. Slide seat forward until the tongue fits snugly under rear fuel tank bracket.
3. Push seat forward to engage keyhole onto seat post. Pull seat back slightly.

NOTE

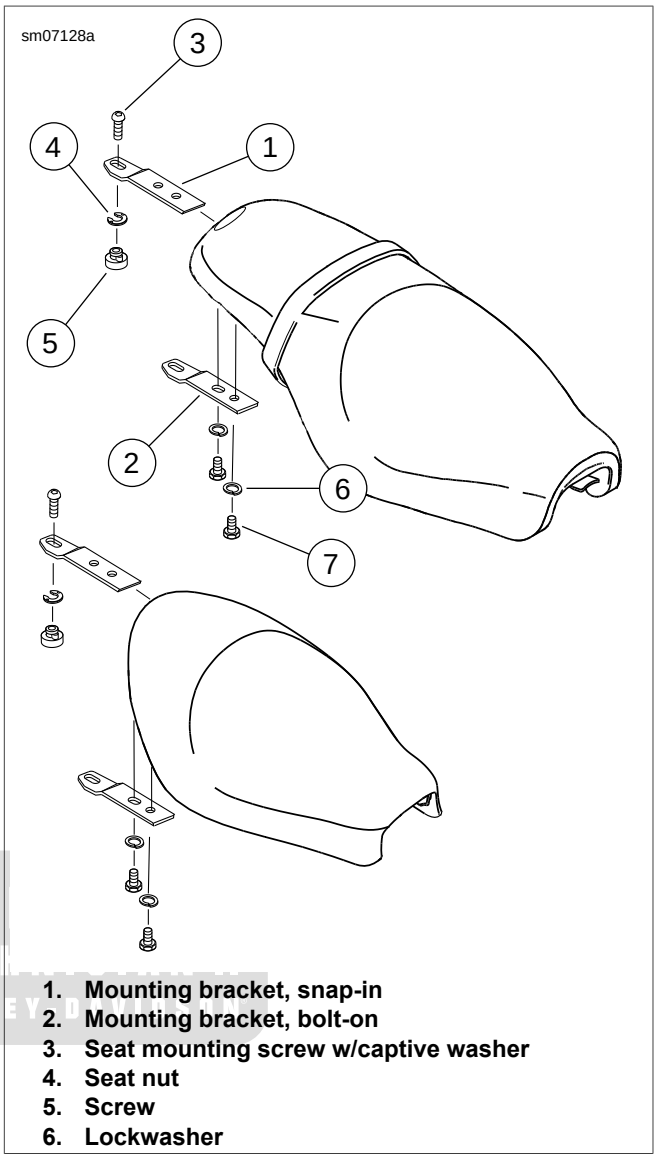
Solo seat bracket uses forward hole in rear fender. Two-up seat bracket uses rearward hole.

4. See Figure 2-188. Install seat mounting screw with captive washer to fasten seat mounting bracket to top of rear fender.
5. Pull up on seat to verify that it is locked in place.
6. Tighten seat mounting screw to 20-40 **in-lbs** (2.3-4.5 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)

7. Pull up on seat again to verify that it is secured at all three points.



1. **Mounting bracket, snap-in**
2. **Mounting bracket, bolt-on**
3. **Seat mounting screw w/captive washer**
4. **Seat nut**
5. **Screw**
6. **Lockwasher**

Figure 2-188. Seat Assembly

RIDER FOOT CONTROLS: MID-MOUNT 2.39

RIGHT FOOTREST AND REAR BRAKE PEDAL ASSEMBLY

FASTENER	TORQUE VALUE	
Footrest support bracket	45-50 ft-lbs	61-68 Nm
Brake pedal clevis screw	13-17 ft-lbs	17.6-23.0 Nm
Footrest wear peg	72-108 **in-lbs**	8.1- 12.2 Nm
Brake rod ball stud	120-180 **in-lbs**	13.6-20.4 Nm

Removal

1. Remove mufflers. See 4.16 EXHAUST SYSTEM.
2. See Figure 2-189. Remove brake rod (7).
   a. Remove retaining ring (1) and clevis pin (2) from master cylinder pushrod collar.
   b. Remove brake rod (7) from brake pedal (8).
3. Remove footrest.
   a. Remove retaining ring (3), clevis pin (4). Discard retaining ring.
   b. Remove retaining ring (9), screw (10) and clevis (11). Discard retaining ring.
   c. Remove footrest (5) and spring washer (6).
4. Remove two fasteners (12) and right rider footrest/brake pedal support bracket (13) from frame.

Installation

1. Mount support bracket with two fasteners. Tighten to 45-50 ft-lbs (61-68 Nm).
2. Install brake pedal.
   a. Slide brake pedal onto clevis.
   b. Fit clevis to support bracket.
   c. Line up hole in clevis with hole in support bracket. Secure with screw.
   d. Tighten to 13-17 ft-lbs (17.6-23.0 Nm).
   e. Install retaining ring.

NOTE

Position spring washer inside clevis with square edge toward the inside.

3. Install footrest.
   a. Install footrest and spring washer on clevis.
   b. Align holes.
   c. Push clevis pin from top down through hole in clevis.
   d. Install retaining ring.
4. If removed, install wear peg. Tighten to 72-108 **in-lbs** (8.1-12.2 Nm).
5. Install brake rod.
   a. Insert brake rod into master cylinder collar. Secure with clevis and retaining ring.
   b. Apply two drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the ball stud.
   c. Thread ball stud into brake pedal. Tighten to 120-180 **in-lbs** (13.6-20.4 Nm).
6. Install mufflers. See 4.16 EXHAUST SYSTEM.

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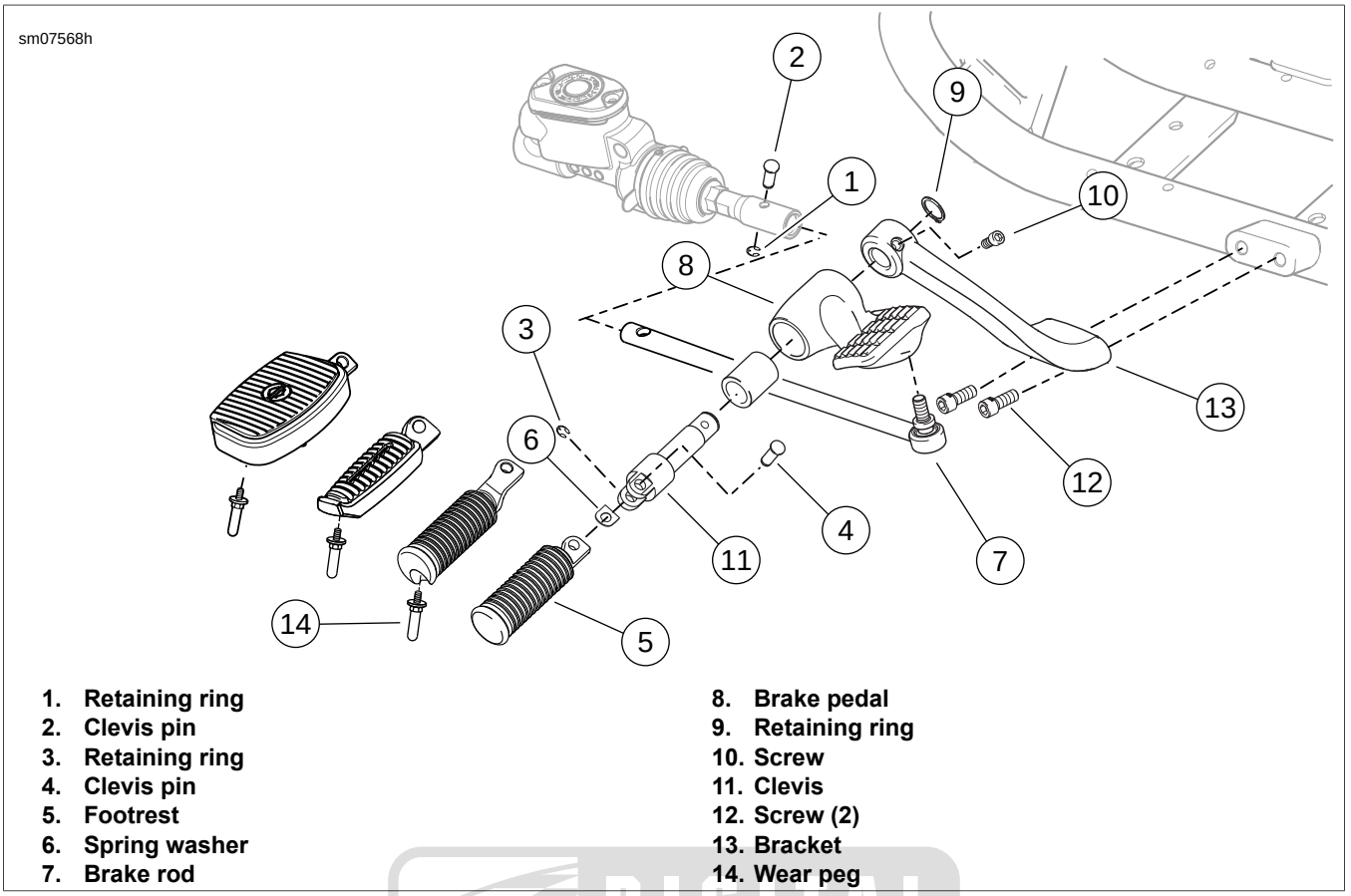


1. **Retaining ring**
2. **Clevis pin**
3. **Retaining ring**
4. **Clevis pin**
5. **Footrest**
6. **Spring washer**
7. **Brake rod**
8. **Brake pedal**
9. **Retaining ring**
10. **Screw**
11. **Clevis**
12. **Screw (2)**
13. **Bracket**
14. **Wear peg**

Figure 2-189. Brake Side Mid-Mount Controls

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

LEFT FOOTREST AND SHIFT LEVER ASSEMBLY

FASTENER	TORQUE VALUE	
Gear shift lever pinch screw	16-20 ft-lbs	21.7-27.1 Nm
Shifter peg screw	96-144 **in-lbs**	10.9-16.3 Nm
Footrest support bracket	45-50 ft-lbs	61-68 Nm
Footrest wear peg	72-108 **in-lbs**	8.1- 12.2 Nm

Removal

1. See Figure 2-190. Remove retaining ring (1), clevis pin (2), footrest (3) and spring washer (4). Discard retaining ring.
2. Remove two screws (5) and left rider footrest support bracket (6) from frame.
3. Remove screw (7) and shifter peg (8).
4. Remove pinch screw (9) and washer (10). Remove shift lever (12) and rubber washer (11).

Installation

1. Install rubber washer and shift lever on transmission shift lever shaft. Secure with washer and pinch screw. Tighten to 16-20 ft-lbs (21.7-27.1 Nm).

NOTE

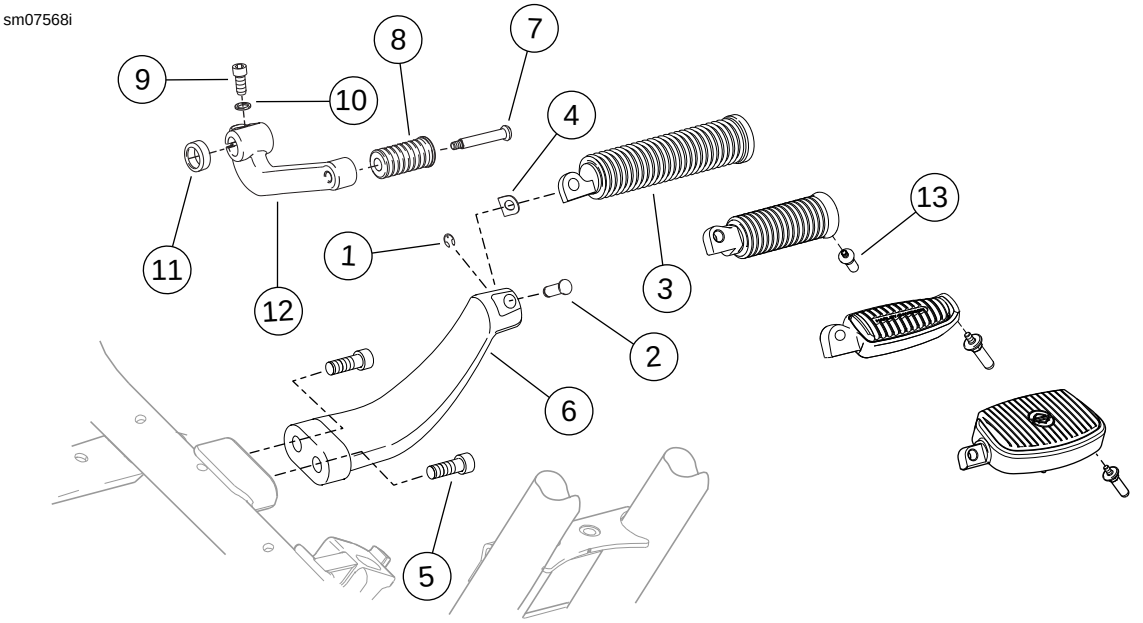
*A **new** shifter peg screw comes with a lock patch.*

2. Install shifter peg.
   a. Clean screw threads of shifter peg screw. Apply one or two drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue).
   b. Install shifter peg and screw.
   c. Tighten to 96-144 **in-lbs** (10.9-16.3 Nm).
3. Attach rider footrest support bracket to frame with two screws. Tighten to 45-50 ft-lbs (61-68 Nm).

NOTE

Position spring washer inside support bracket mounting boss with square edge toward inside.

4. Install footrest.
   a. Install footrest with spring washer on footrest support bracket.
   b. Align holes.
   c. Push clevis pin from top down through hole in support bracket.
   d. Install **new** retaining ring.
5. If removed, install wear peg. Tighten to 72-108 **in-lbs** (8.1-12.2 Nm).



1. Retaining ring
2. Clevis pin
3. Footrest
4. Spring washer
5. Fastener
6. Support bracket
7. Screw
8. Shifter peg
9. Pinch screw
10. Washer
11. Rubber washer
12. Shift lever
13. Wear peg

Figure 2-190. Left Footrest and Shift Lever

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

FOOTBOARD INSERTS: XL 1200T

Removal

1. Apply liquid dishwashing soap to the rubber beads protruding through the bottom of the footboards.
2. Pull the rubber inserts up and off the footboards.

Installation

1. See Figure 2-191. Apply liquid dish soap to the rubber beads on a **new** insert.
2. Match the rubber beads to the holes in the footboard. Press the insert onto the footboard.
3. Pull each rubber bead with pliers until the thick collar is through the footboard hole.
4. Cut of the pull end of each rubber bead.

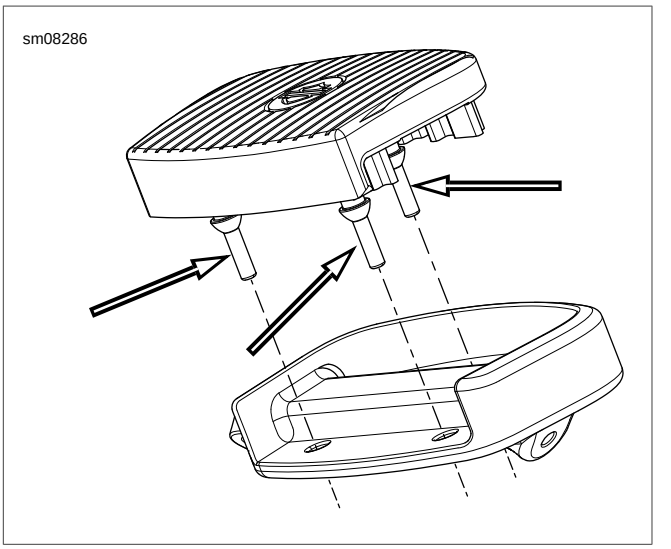


Figure 2-191. Footboard Insert Rubber Beads

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

RIDER FOOT CONTROLS: FORWARD 2.40

RIGHT FOOTREST AND REAR BRAKE PEDAL ASSEMBLY

FASTENER	TORQUE VALUE	
Footrest support bracket	45-50 ft-lbs	61-68 Nm
Brake pedal clevis screw	13-17 ft-lbs	17.6-23.0 Nm
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm
Brake rod ball stud	120-180 **in-lbs**	13.6-20.4 Nm

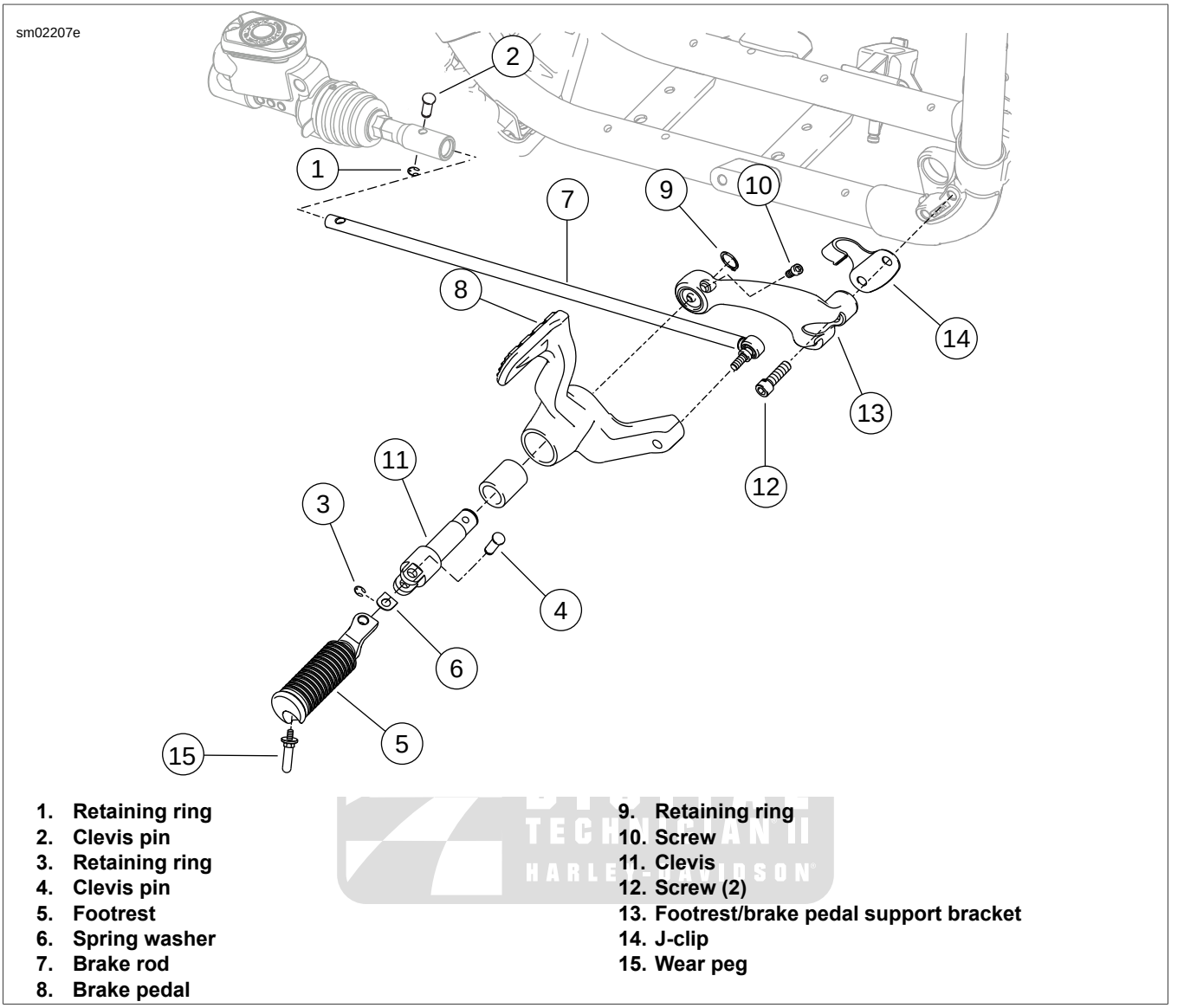
Removal

1. See Figure 2-192. Remove brake rod (7).
   a. Remove retaining ring (1) and clevis pin (2) from master cylinder collar.
   b. Remove brake rod ball stud from brake pedal (8).
2. Remove footrest.
   a. Remove retaining ring (3) and clevis pin (4).
   b. Remove footrest (5) and spring washer (6). Discard retaining ring.
3. Remove brake pedal.
   a. Remove retaining ring (9). Discard retaining ring.
   b. Remove screw (10) and clevis (11).
   c. Slide brake pedal off clevis.
4. Remove footrest/brake pedal support bracket.
   a. **Non-ABS models:** Remove two screws (12), footrest/brake pedal support bracket (13) and J-clip (14).
   b. **ABS models:** Remove two screws (12), footrest/brake pedal support bracket (13) and ABS brake line bracket.

Installation

1. See Figure 2-192. Install footrest/brake pedal support bracket.
   a. **Non-ABS models:** Position J-clip against frame.
   b. **ABS models:** Position ABS brake line bracket against frame
   c. Mount footrest/brake pedal support bracket and J-clip/ABS brake line bracket to frame with screws.
   d. Tighten to 45-50 ft-lbs (61-68 Nm).
2. Install brake pedal.
   a. Slide brake pedal onto clevis.
   b. Mount clevis on footrest/brake pedal support bracket.
   c. Align hole in clevis with hole in support bracket. Secure with screw (10).
   d. Tighten to 13-17 ft-lbs (17.6-23.0 Nm).
   e. Install **new** retaining ring on end of clevis.
3. Install footrest.
   a. Install footrest and spring washer on clevis.
   b. Align holes.
   c. Push clevis pin from top down through hole in clevis.
   d. Install **new** retaining ring.
4. If removed, install wear peg. Tighten to 72-108 **in-lbs** (8.1-12.2 Nm).
5. Install brake rod.
   a. Insert brake rod into master cylinder collar. Secure with clevis and retaining ring.
   b. Apply two drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to ball stud.
   c. Thread ball stud into brake pedal. Tighten to 120-180 **in-lbs** (13.6-20.4 Nm).

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. Retaining ring
2. Clevis pin
3. Retaining ring
4. Clevis pin
5. Footrest
6. Spring washer
7. Brake rod
8. Brake pedal
9. Retaining ring
10. Screw
11. Clevis
12. Screw (2)
13. Footrest/brake pedal support bracket
14. J-clip
15. Wear peg

Figure 2-192. Brake Side Forward Controls

LEFT FOOTREST AND SHIFT LEVER ASSEMBLY

FASTENER	TORQUE VALUE	
Shift lever pinch screw	16-20 ft-lbs	21.7-27.1 Nm
Footrest support bracket	45-50 ft-lbs	61-68 Nm
Shift pedal clevis screw	13-17 ft-lbs	17.6-23.0 Nm
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm
Shifter rod to shift lever screw	120-180 **in-lbs**	13.6-20.4 Nm
Shifter rod to shift lever screw	120-180 **in-lbs**	13.6-20.4 Nm
Shifter peg screw	96-144 **in-lbs**	10.9-16.3 Nm

Removal

1. See Figure 2-193. Remove retaining ring (1), clevis pin (2), footrest (3) and spring washer (4). Discard retaining ring.
2. Remove screw (5) and shifter peg (6).
3. Remove shifter rod screws (7) and shifter rod (8) from shifter lever assembly (9) and shift lever (10).
4. Remove retaining ring (11), screw (12) and clevis (13). Slide shifter lever assembly off clevis. Discard retaining ring.
5. Remove two screws (14), footrest/shifter lever support bracket (15) and J-clip (16) from frame.
6. Remove pinch screw (17), washer (18), shift lever (10) and rubber washer (19) from transmission shift shaft.

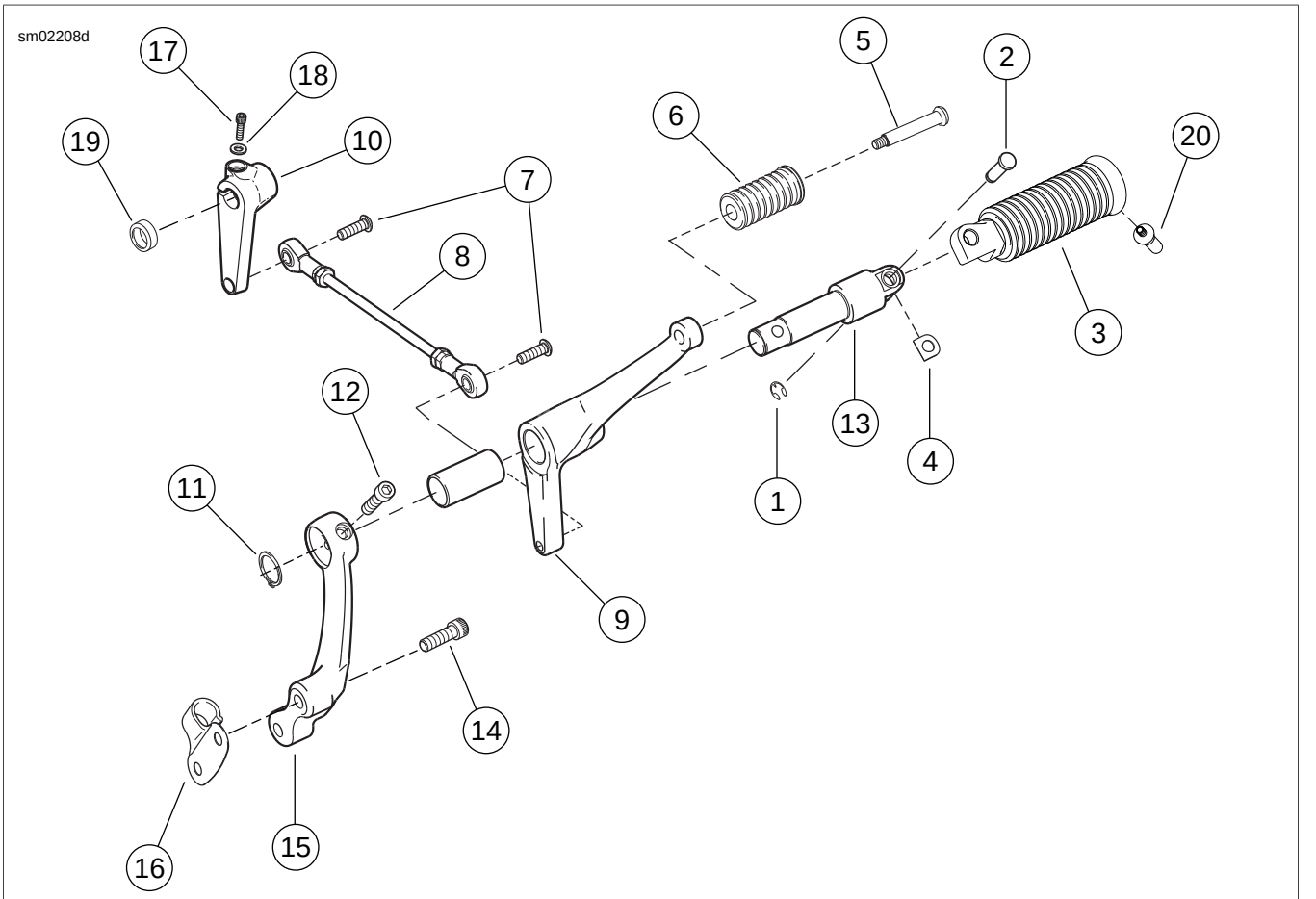
Installation

1. See Figure 2-193. Install rubber washer (19) and shift lever (10) onto transmission shifter shaft, with shift lever arm pointing straight down. Secure with pinch screw (17) and washer (18). Tighten pinch screw to 16-20 ft-lbs (21.7-27.1 Nm).
2. Mount J-clip (16) and footrest/shift lever support bracket (15) to frame with two screws (14). Tighten to 45-50 ft-lbs (61-68 Nm).
3. Install shift lever clevis:
   a. Slide shifter lever assembly (9) onto clevis (13).
   b. Mount clevis on footrest/shifter lever support bracket.
   c. Line up hole in clevis with hole in support bracket.
   d. Secure with screw (12). Tighten to 13-17 ft-lbs (17.6-23.0 Nm).
   e. Install retaining ring (11) on end of clevis.
4. Mount footrest (3) on clevis with spring washer (4):
   a. Position spring washer inside clevis with square edge toward inside.
   b. Align holes.
   c. Push clevis pin (2) from top down through hole in clevis.
   d. Secure with **new** retaining ring (1).
5. If removed, install wear peg. Tighten to 72-108 **in-lbs** (8.1-12.2 Nm).
6. Thread screw (7) in one end of shifter rod (8) into shift lever (10). Tighten to 120-180 **in-lbs** (13.6-20.4 Nm).
7. Thread screw (7) in other end of shifter rod into shift lever assembly (9). Tighten to 120-180 **in-lbs** (13.6-20.4 Nm).

NOTE
*A **new** shifter peg screw has lock patch.*

8. If reusing shifter peg screw, clean screw threads. Apply one or two drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads.
9. Install shifter peg (6). Secure with screw (5). Tighten to 96-144 **in-lbs** (10.9-16.3 Nm).

BIGTWIN TECHNICS HARLEY-DAVIDSON®



1. **Retaining ring**
2. **Clevis pin**
3. **Footrest**
4. **Spring washer**
5. **Screw**
6. **Shifter peg**
7. **Screw (2)**
8. **Shifter rod assembly**
9. **Shifter lever assembly**
10. **Shift lever**
11. **Retaining ring**
12. **Screw**
13. **Clevis**
14. **Screw (2)**
15. **Footrest/shifter lever support bracket**
16. **J-clip**
17. **Pinch screw**
18. **Washer**
19. **Rubber washer**
20. **Wear peg**

Figure 2-193. Shifter Side Forward Controls

ADJUSTING SHIFT PEDAL

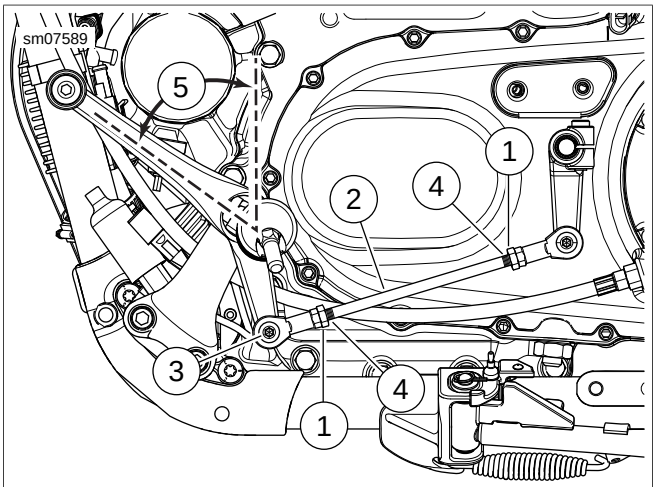
FASTENER	TORQUE VALUE	
Shift rod screw	120-180 **in-lbs**	13.6-20.4 Nm
Shift rod jamnuts	84-132 **in-lbs**	9.5-14.9 Nm

1. See Figure 2-194. Loosen locknuts (1) on shift rod (2).
2. Remove ball joint screw (3).

NOTE

Adjust for an equal number of threads (4) visible on both ends of shift rod.

3. Turn ball joint or shift rod to adjust rod length.
4. Temporarily attach ball joint to shift lever.
5. Measure shift lever angle (5). Remove and adjust as necessary until angle is 45 degrees.
6. Tighten to 120-180 **in-lbs** (13.6-20.4 Nm).
7. Hold shifter rod. Tighten locknuts to 84-132 **in-lbs** (9.5-14.9 Nm).



1. **Locknut**
2. **Shift rod**
3. **Ball joint screw**
4. **Threads**
5. **45 degrees**

Figure 2-194. Shifter Linkage: Models with Forward Controls

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

PASSENGER FOOTRESTS 2.41

LEFT

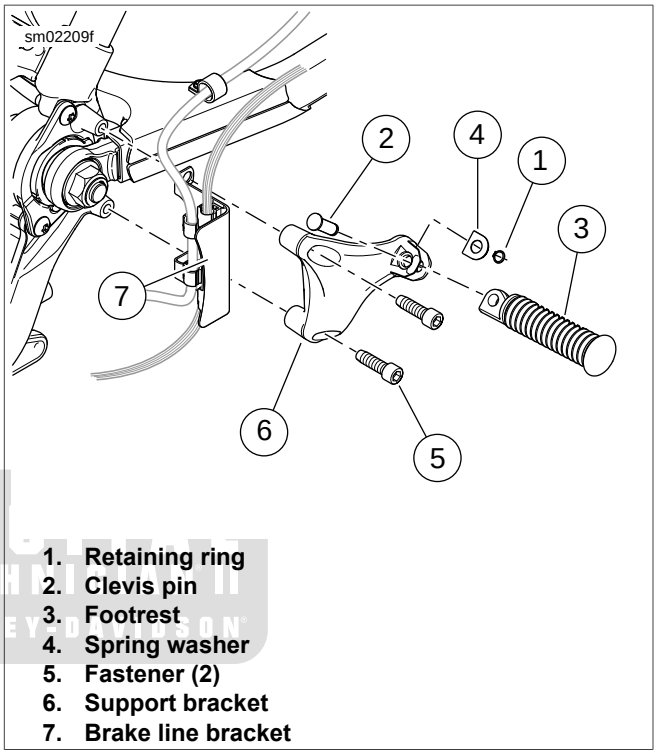
FASTENER	TORQUE VALUE	
Passenger footrest support bracket fastener	45-50 ft-lbs	61-68 Nm
Brake line bracket fasteners	120-180 **in-lbs**	13.6-20.3 Nm

Removal

1. See Figure 2-195. Remove retaining ring (1), clevis pin (2), footrest (3) and spring washer (4). Discard retaining ring.
2. **Passenger footrest models:** Remove fasteners (5) and footrest support bracket (6).
3. **Non-passenger models:** Remove two fasteners (5).
4. Support the brake line bracket (7).

Installation

1. **Passenger footrest models:** Install the footrest support bracket.
   a. Capture the brake line bracket in the support bracket fasteners.
   b. Install support bracket. Tighten to 45-50 ft-lbs (61-68 Nm).
2. **Non-passenger models:** Install brake line bracket with two fasteners. Tighten to 120-180 **in-lbs** (13.6-20.3 Nm).
3. Install footrest.
   a. Position spring washer inside bracket mounting boss with the square edge toward the inside.
   b. Align holes.
   c. Push clevis down through footrest and support bracket.
   d. Secure with **new** retaining ring.



1. Retaining ring
2. Clevis pin
3. Footrest
4. Spring washer
5. Fastener (2)
6. Support bracket
7. Brake line bracket

Figure 2-195. Left Passenger Footrest

RIGHT

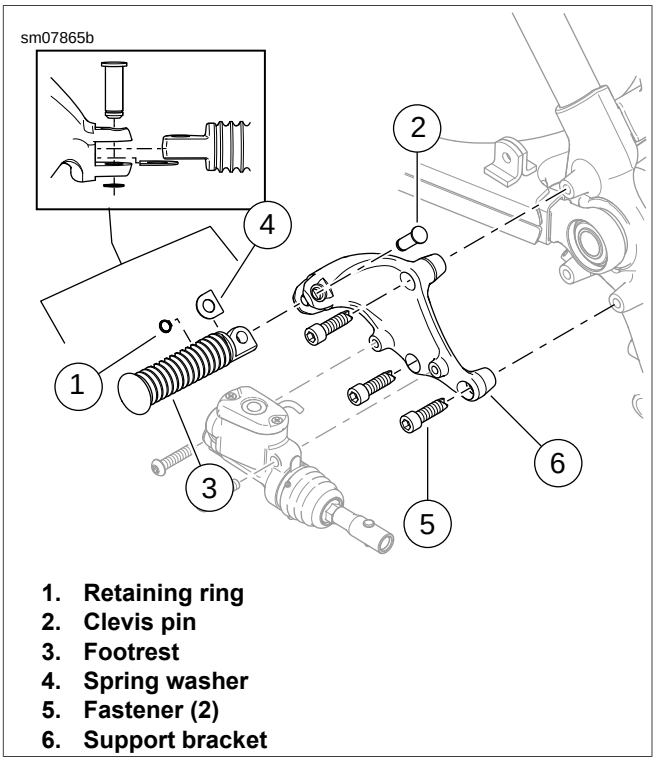
FASTENER	TORQUE VALUE	
Passenger footrest support bracket fastener	45-50 ft-lbs	61-68 Nm

Removal

1. Remove exhaust system. See 4.16 EXHAUST SYSTEM.
2. Remove master cylinder reservoir. See 2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR, Removal.
3. See Figure 2-196. Remove retaining ring (1), clevis pin (2), footrest (3) and spring washer (4). Discard retaining ring.
4. Remove two fasteners (5) and footrest support bracket (6).

Installation

1. Install support bracket with fasteners. Tighten to 45-50 ft-lbs (61-68 Nm).
2. Install footrest.
   a. Position spring washer inside bracket mounting boss with square edge toward inside.
   b. Align holes.
   c. Push clevis pin down through footrest and support bracket.
   d. Secure with **new** retaining ring.
3. Install master cylinder reservoir. See 2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR, Installation.



1. **Retaining ring**
2. **Clevis pin**
3. **Footrest**
4. **Spring washer**
5. **Fastener (2)**
6. **Support bracket**

Figure 2-196. Right Passenger Footrest

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

FORK LOCK 2.42

REMOVAL

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 4.4 FUEL TANK.

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. Remove fuel tank. See 4.4 FUEL TANK.
4. Turn front forks full left lock.

NOTE

Carefully orient drill bit to center of lock pin.

5. See Figure 2-197. Using a 5/64 drill bit, carefully drill a hole in center of lock pin.
6. See Figure 2-198. Remove lock pin.
   a. Insert a screw extractor into drilled hole.
   b. Hold body of screw extractor with a pliers or tap handle.
   c. With a small hammer, gently "tap" on pliers or tap handle.
7. Remove lock assembly.

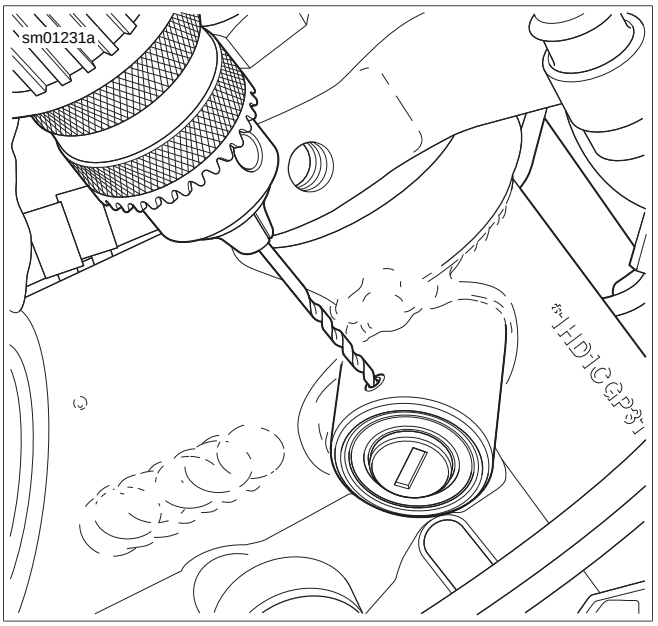


Figure 2-197. Drilling Lock Pin

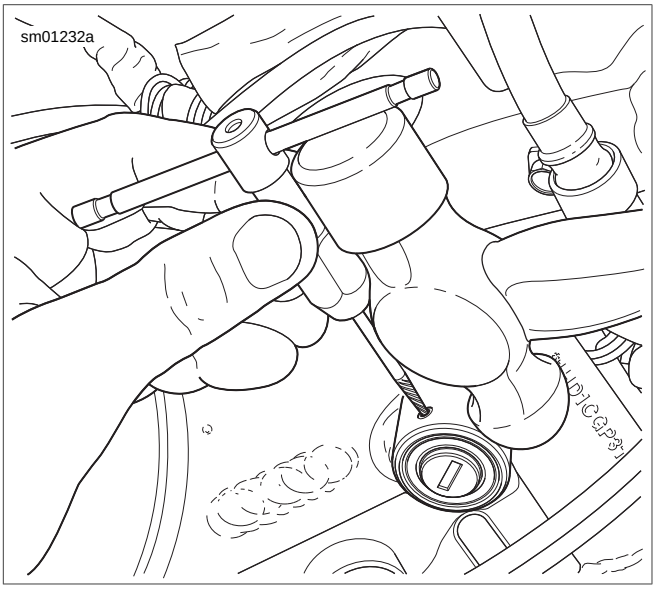


Figure 2-198. Removing Lock Pin

INSTALLATION

1. Insert **new** lock assembly in frame lock housing.
2. Align lock pin hole in **new** lock assembly with hole in frame lock housing.
3. Drive **new** lock pin in position (flush with frame lock housing).
4. Install fuel tank. See 4.4 FUEL TANK.
5. Verify proper operation of fork lock.
   a. Turn front forks fully to left.
   b. Insert key into fork lock. Turn key 90 degrees clockwise.
   c. Verify that front forks are locked and cannot be turned.
   d. Turn key 90 degrees counterclockwise. Remove from fork lock.
   e. Verify that front forks are now free to turn right and left.
6. Install main fuse.

DIGITAL TECHNICIAN HARLEY-DAVIDSON

MEDALLIONS, BADGES AND TANK EMBLEMS 2.43

REMOVAL

1. Mark location of emblem with masking tape.

NOTE

Wear protective gloves.

2. Saw behind emblem with mono-filament fishing line or waxed dental floss to remove emblem.
3. Use 3M GENERAL PURPOSE ADHESIVE REMOVER to remove remaining foam backing tape and adhesive from mounting surface.

NOTE

For maximum bond, surface must be clean and dry.

4. Clean with a mixture of 50 percent isopropyl alcohol and 50 percent distilled water.

NOTE

Apply medallion within minutes of cleaning.

5. Allow to dry completely.

INSTALLATION

NOTES

- *Apply in ambient temperatures between 70-100 °F (21-38 °C).*
- *Do not remove protective film from adhesive until ready to apply.*
- *Do not bend emblem to fit contour of mounting surface.*

1. Test fit medallion in intended location.
   a. Check medallion against curve of mounting surface.
   b. Match left and right sides of fuel tank.

NOTES

- *Protect adhesive from grease, oil, dust, dirt and finger prints.*
- *Once applied, do not shift medallion.*
- *The adhesive bonds in 72 hours at room temperature.*

2. Remove protective film from back of medallion.
3. Apply even pressure across entire surface with palms and fingers of both hands. Hold in place for 15 seconds.
4. Wait 20 minutes before touching medallion.
5. Wait 24 hours before washing.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

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
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure
Brake line fastener	120-180 **in-lbs**	13.6-20.3 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure
Breather screw	35-55 **in-lbs**	4.0-6.2 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Crankcase fastener	15-19 ft-lbs	20.3-25.8 Nm	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
Cylinder screws, 1st torque	96-120 **in-lbs**	11-14 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/See procedure
Cylinder screws, 1st torque	96-120 **in-lbs**	11-14 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/See procedure
Cylinder screws, final torque	13-15 ft-lbs	18-20 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/Plus 90 degrees. See procedure
Cylinder screws, final torque	13-15 ft-lbs	18-20 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/Plus 90 degrees. See procedure
Cylinder stud	120-240 **in-lbs**	13.6-27.1 Nm	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
Engine mount, front, bolt	95-105 ft-lbs	129-142 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure
Exhaust pipe clamp bracket screw	30-33 ft-lbs	40.7-44.7 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure
Fuel tank fasteners	15-20 ft-lbs	20.3-27.1 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair
Gearcase cover fasteners	120-140 **in-lbs**	13.6-15.8 Nm	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover
Isolator mount, front, screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure
Isolator mount, rear, screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure
Oil filter adapter	18-22 ft-lbs	24.4-29.8 Nm	3.21 OIL FILTER MOUNT, Assembly
Oil pump cover screws	70-80 **in-lbs**	7.9-9.0 Nm	3.19 OIL PUMP, Assembly
Oil pump feed fitting	100-120 **in-lbs**	11.3-13.6 Nm	3.19 OIL PUMP, Installation
Oil pump high-pressure feed hose fitting nut	85-105 **in-lbs**	9.6-11.8 Nm	3.19 OIL PUMP, Installation
Oil pump high-pressure feed hose to crankcase fitting	60-90 **in-lbs**	6.8-10.2 Nm	3.19 OIL PUMP, Installation
Oil pump to crankcase screw	125-150 **in-lbs**	14.1-16.9 Nm	3.19 OIL PUMP, Installation
Oil tank bracket fastener	72-96 **in-lbs**	8.1-10.8 Nm	3.22 OIL TANK, Oil Tank Bracket
Oil tank mounting screws	72-96 **in-lbs**	8.1-10.8 Nm	3.22 OIL TANK, Installation
Pinion shaft locking nut	19-21 ft-lbs	26-29 Nm	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover/ plus 15-19 degrees of rotation

FASTENER	TORQUE VALUE		NOTES
Piston oil jet screw	25-35 **in-lbs**	2.8-3.9 Nm	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
Rocker cover, inner, large bolt	18-22 ft-lbs	24.4-29.8 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Rocker cover, inner, screw	135-155 **in-lbs**	15.3-17.5 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Rocker cover, inner, small bolt	135-155 **in-lbs**	15.3-17.5 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Rocker cover, outer, screw	120-168 **in-lbs**	13.6-19.0 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure
Stabilizer link, lower front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair
Tappet cover, anti-rotation mounting screw	90-120 **in-lbs**	10.2-13.6 Nm	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Tappets
Tappet cover fastener	90-120 **in-lbs**	10.2-13.6 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Tappet Covers, Pushrod Covers and Pushrods
Wire harness ground wire	55-75 **in-lbs**	6.2-8.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

SPECIFICATIONS 3.2

SPECIFICATIONS: SPORTSTER MODELS

Table 3-1. Engine

ITEM	XL 883 MODELS		XL 1200 MODELS	
Number of cylinders	2			
Type	4-cycle, 45 degree, V-twin, air cooled			
Compression ratio	8.9:1		10:1	
Bore	3.000 in	76.20 mm	3.500 in	88.90 mm
Stroke	3.812 in	96.82 mm	3.812 in	96.82 mm
Displacement	53.9 in^3	883 cm^3	73.3 in^3	1202 cm^3

Table 3-2. Cylinder Heads: All Models

ITEM	NEW COMPONENTS		SERVICE WEAR LIMITS	
	in	mm	in	mm
Valve guide in head (tight)	0.0033-0.0020	0.084-0.051	-	-
Valve seat in head	0.0035-0.0010	0.089-0.025	-	-
Head gasket surface (flatness)	0.006	0.152	Replace if more than 0.006	Replace if more than 0.152

DIGITAL

Table 3-3. Rocker Arms and Shafts: All Models

ITEM	NEW COMPONENTS		SERVICE WEAR LIMITS	
	in	mm	in	mm
Shaft in bushing (loose)	0.0005-0.0020	0.013-0.051	0.0035	0.0889
End clearance	0.003-0.013	0.08-0.33	0.025	0.635
Bushing fit in rocker arm	0.004-0.002	0.10-0.05	-	-
Shaft fit in rocker cover	0.0007-0.0022	0.018-0.056	0.0035	0.0889

Table 3-4. Valves-883 cc/1200 cc

ITEM	NEW COMPONENTS		SERVICE WEAR LIMITS	
	in	mm	in	mm
Fit in guide (intake/exhaust)	0.001-0.003	0.0254-0.0762	0.0038	0.0965
Seat width	0.040-0.062	1.02-1.57	0.090	2.286
Stem protrusion from cylinder valve pocket	2.028-2.064	51.511-52.426	2.082	52.883

Table 3-5. Valve Springs (Intake/Exhaust): All Models

ITEM	NEW COMPONENTS		SERVICE WEAR LIMITS	
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	2.325 in (min)	59.1 mm (min)

Table 3-6. Tappets: All Models

ITEM	NEW COMPONENTS		SERVICE WEAR LIMITS	
	in	mm	in	mm
Fit in guide	0.0008-0.0023	0.020-0.058	0.003	0.0762
Roller fit	0.0006-0.0013	0.015-0.033	-	-
Roller end clearance	0.008-0.022	0.203-0.559	0.026	0.660

Table 3-7. Cylinder Bore: XL 883 Models

BORE DIAMETER	NEW COMPONENTS		SERVICE WEAR LIMITS	
	in	mm	in	mm
Standard +/-0.0002 in (0.0051 mm)	3.0005	76.213	3.0035	76.289
0.005 in OS +/-0.0002 in (0.0051 mm)	3.0048	76.323	3.0078	76.389
0.010 in OS +/-0.0002 in (0.0051 mm)	3.0098	76.449	3.0128	76.525
Taper	-	-	0.002	0.0508
Out of round	-	-	0.003	0.0762
Top gasket surface warpage	-	-	0.006	0.152
Base gasket surface warpage	-	-	0.008	0.203

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Table 3-8. Cylinder Bore: XL 1200 Models

BORE DIAMETER	NEW COMPONENTS		SERVICE WEAR LIMITS	
	in	mm	in	mm
Standard +/-0.0002 in (0.0051 mm)	3.4978	88.844	3.5008	88.920
0.005 in OS +/-0.0002 in (0.0051 mm)	3.502	88.95	3.505	89.027
0.010 in OS +/-0.0002 in (0.0051 mm)	3.507	89.08	3.510	89.154
Taper	-	-	0.002	0.0508
Out of round	-	-	0.003	0.0762
Top gasket surface warpage	-	-	0.006	0.152
Base gasket surface warpage	-	-	0.008	0.203

Table 3-9. Pistons: XL 883 Models

ITEM	NEW COMPONENTS		SERVICE WEAR LIMITS	
	in	mm	in	mm
Compression ring gap (top and 2nd)	0.010-0.023	0.25-0.58	0.032	0.813
Oil control ring rail gap	0.010-0.053	0.25-1.35	0.065	1.651

Table 3-9. Pistons: XL 883 Models

ITEM	NEW COMPONENTS		SERVICE WEAR LIMITS	
	in	mm	in	mm
Top compression ring side clearance	0.0020-0.0045	0.051-0.114	0.0065	0.165
2nd compression ring side clearance	0.0020-0.0045	0.051-0.114	0.0065	0.165
Oil control ring side clearance	0.0014-0.0074	0.036-0.188	0.0094	0.239
Piston pin fit (loose, room temperature)	0.00005-0.00045	0.0013-0.0114	-	-
Piston fit in cylinder (loose, room temperature)	0.0015-0.0026	0.038-0.066	0.0030	0.076

Table 3-10. Pistons: All 1200 Models

ITEM	NEW COMPONENTS		SERVICE WEAR LIMITS	
	in	mm	in	mm
Compression ring gap (top and 2nd)	0.007-0.020	0.18-0.51	0.032	0.813
Oil control ring rail gap	0.009-0.052	0.23-1.32	0.065	1.651
Top compression ring side clearance	0.0020-0.0045	0.051-0.114	0.0065	0.165
2nd compression ring side clearance	0.0016-0.0041	0.041-0.104	0.0065	0.165
Oil control ring side clearance	0.0016-0.0076	0.041-0.193	0.0094	0.239
Piston pin fit (loose at room temperature)	0.00005-0.00045	0.0013-0.0114	-	-
Piston fit in cylinder (loose at room temperature)	0.0015-0.0026	0.038-0.066	0.0030	0.076

Table 3-11. Connecting Rods: All Models

ITEM	NEW COMPONENTS		SERVICE WEAR LIMITS	
	in	mm	in	mm
Piston pin fit (loose)	0.00125-0.00175	0.0318-0.0445	0.00200	0.0508
Side play between flywheels	0.005-0.025	0.013-0.64	0.030	0.762
Fit on crankpin	0.0004-0.0017	0.010-0.043	0.0027	0.0686

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Table 3-12. Flywheels: All Models

ITEM	NEW COMPONENTS		SERVICE WEAR LIMITS	
	in	mm	in	mm
Runout (flywheels at rim)	0.000-0.010	0.00-0.254	0.010	0.254
Runout (shaft at flywheel end)	0.000-0.002	0.00-0.0508	0.002	0.0508
End play	0.003-0.013	0.076-0.330	0.013	0.330

Table 3-13. Pinion Shaft Bearing: All Models

ITEM	NEW COMPONENTS		SERVICE WEAR LIMITS	
	in	mm	in	mm
Pinion shaft journal diameter	1.2500-1.2496	31.750-31.740	1.2494	31.735
Outer race diameter in right crankcase	1.5646-1.5652	39.741-39.756	1.5656	39.776
Bearing running clearance	0.00012-0.00088	0.0030-0.0224	-	-
Fit in cover bushing (loose)	0.0023-0.0043	0.058-0.109	0.0050	0.127

Table 3-14. Gearcase: All Models

ITEM	NEW COMPONENTS		SERVICE WEAR LIMIT	
	in	mm	in	mm
Cam gear shaft in bushing (loose)	0.0007-0.0022	0.018-0.056	0.003	0.0762
Cam gear shaft endplay (except rear intake)	0.005-0.024	0.13-0.61	0.025	0.635
Rear intake cam gear shaft end play	0.006-0.024	0.15-0.61	0.040	1.016

Table 3-15. Sprocket Shaft Bearing: All Models

ITEM	SPECIFICATION (INTERFERENCE FIT)	
	in	mm
Outer race fit in crankcase (tight)	0.006	0.152
Inner race fit on shaft (tight)	0.006	0.152

Table 3-16. Oil Pressure: At Operating Temperature

rpm	XL MODELS*	
	psi	kPa
1000	7-12	43.3-82.7
2500	10-17	68.9-117
* Pressure reading taken at oil pressure switch fitting.		

Table 3-17. Electrical

COMPONENT	SPECIFICATION	
Ignition timing	Not adjustable	
Battery	12 V, 225 CCA, 12 Ah, sealed and maintenance free	
Charging system	Single-phase, 30 A system (357 W @ 13.5 V, 2000 rpm, 405 W max power @ 13.5 V)	
Spark plug type	6R12	
Spark plug size	12 mm	
Spark plug gap	0.038-0.043 in	0.97-1.09 mm
Spark plug torque	12-18 ft-lbs	16.3-24.4 Nm

Table 3-18. Oil Pump

ITEM	NEW COMPONENTS		SERVICE WEAR LIMITS	
	in	mm	in	mm
Feed/scavenger inner/outer gerotor clearance	0.003	0.08	0.004	0.102
Shaft to pump clearance	0.0025	0.064	-	-

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OIL PRESSURE 3.3

OPERATION

All Models

When an engine is cold, the engine oil is more viscous (thicker). During start-up, oil pressure will be higher than normal and oil circulation will be somewhat restricted. As the engine warms to normal operating temperature, the engine oil warms up and becomes less viscous. The oil pressure decreases.

- Increased engine speed results in higher oil pressure. The faster the oil pump rotors spin, the greater the volume of circulated oil.
- Decreased engine speed lowers the volume of oil pumped and the measured oil pressure.

NOTE

The oil pump is non regulatory and delivers its entire volume of oil under pressure to the oil filter mount.

Oil Pressure Indicator Lamp

See Figure 3-1. The oil pressure indicator lamp turns on to indicate improper circulation of the engine oil.

Refer to Table 3-19. The oil pressure indicator lamp turns on when:

- Ignition switch is turned on prior to starting engine.
- Oil is not circulating through the running engine.
- Oil pressure is abnormally low on the running engine.
- Engine is idling far below 1000 rpm.

The oil pressure indicator lamp turns off when oil is circulating with adequate pressure through the engine running at 1000 rpm or greater.

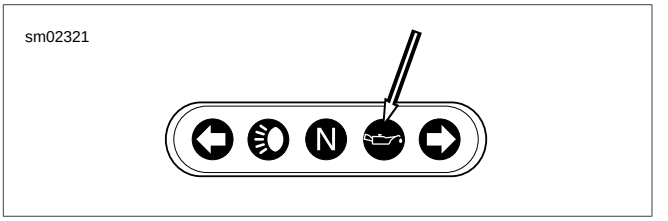

Figure 3-1. Oil Pressure Indicator Lamp

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)

NOTE

Residual oil pressure in the filter housing will sometimes prevent the lamp from turning on. This may occur when cycling the ignition key to on after stopping the engine.

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Table 3-19. Oil Pressure Indicator Lamp Troubleshooting

OIL PRESSURE INDICATOR LAMP	PROBABLE CAUSES
Stays on at speeds above idle.	Empty oil tank.
	Clogged feed line (ice and sludge, freezing temperatures).
	Air-bound oil line.
	Grounded oil pressure switch wire.
	Malfunctioning oil pressure switch.
	Diluted oil.
	Malfunctioning check valve. See 3.21 OIL FILTER MOUNT.
	Malfunctioning or improperly installed pressure relief valve.
Flickers at idle.	Incorrect idle speed. Malfunctioning or improperly installed check valve. See 3.21 OIL FILTER MOUNT.
	Malfunctioning or improperly installed pressure relief valve.
Does not glow when ignition is turned on (before operating engine).	Malfunctioning signal switch.
	Malfunction in wiring.
	Burned-out signal bulb.
	Dead battery.
	See NOTE before this table.

CHECKING OIL PRESSURE

PART NUMBER	TOOL NAME
HD-41675	OIL PRESSURE SENDING UNIT WRENCH
HD-96921-52D	OIL PRESSURE TEST GAUGE KIT
HD-96925-58	OIL PRESSURE GAUGE ADAPTER

Preparation

1. Check engine oil. See 1.6 ENGINE OIL AND FILTER.
2. Slide a catch pan under the motorcycle.
3. Obtain OIL PRESSURE TEST GAUGE KIT (Part No. HD-96921-52D).

Connecting Gauge

1. See Figure 3-2. Detach wiring from oil pressure indicator lamp switch (2).
2. Using OIL PRESSURE SENDING UNIT WRENCH (Part No. HD-41675), remove oil pressure switch.
3. See Figure 3-3. Install OIL PRESSURE GAUGE ADAPTER (Part No. HD-96925-58) (2) in oil pressure indicator lamp switch mounting hole. Tighten adapter snugly. DO NOT OVER-TIGHTEN.

Testing Pressure

1. See Figure 3-4. Assemble banjo bolt (2), washer (3), OIL PRESSURE GAUGE banjo fitting (1) and second washer onto adapter and tighten snugly.

NOTE

For an accurate reading, test when engine oil is at normal operating temperature: 230 °F (110 °C).

2. Temporarily secure oil pressure gauge and hose to motorcycle frame with cable straps. Verify gauge and hose assembly do not interfere with normal operation.
3. Ride motorcycle until engine reaches normal operating temperature.
4. Check and record the pressure readings at normal idle (approximately 1000 rpm) and again at 2500 rpm. Refer to Table 3-16.

Removing Gauge

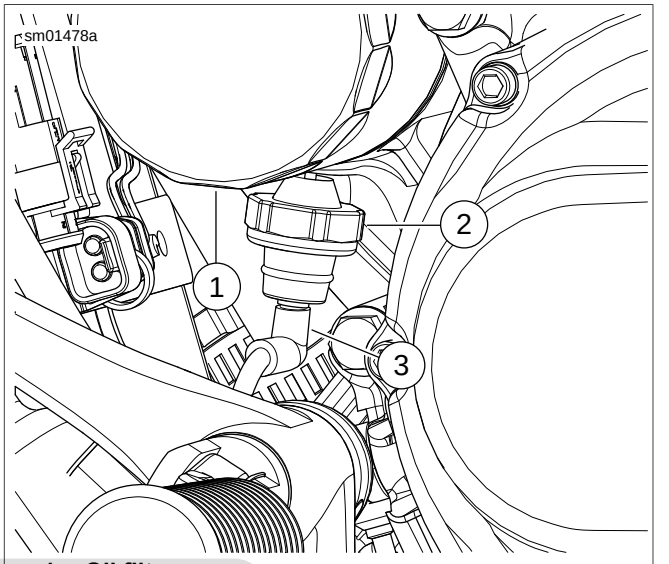
1. Stop engine.
2. Remove OIL PRESSURE GAUGE assembly from oil pressure indicator lamp switch mounting hole in crankcase. Cut cable straps securing gauge and hose. Remove banjo bolt, gauge assembly, washers and adapter.
3. See Figure 3-2. Coat threads of oil pressure switch (2) with LOCTITE 565 THREAD SEALANT.
4. Replace the oil pressure switch. Using OIL PRESSURE SENDING UNIT WRENCH, tighten switch snugly. DO NOT OVER-TIGHTEN.
5. Plug in connector [120] (3) by pushing elbow connector straight up onto stud on oil pressure switch.

Finalize Test

NOTE

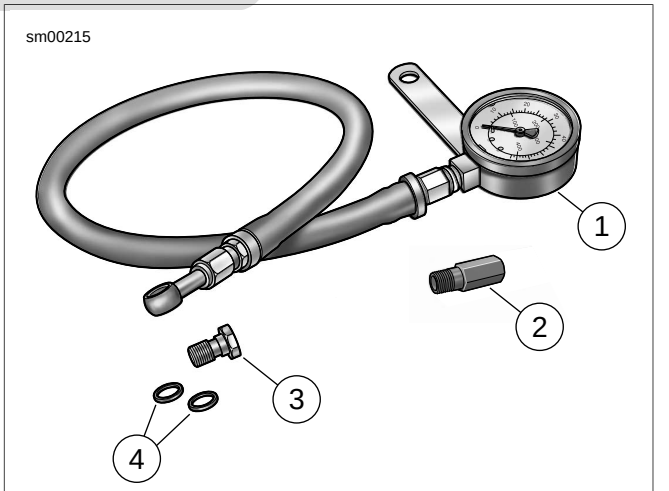
If an appreciable amount of oil leaked out when oil pressure switch was removed, replace with fresh oil.

1. Check engine oil level. See 1.6 ENGINE OIL AND FILTER.
2. Start engine. Test oil pressure switch for proper operation. Check for oil leaks.



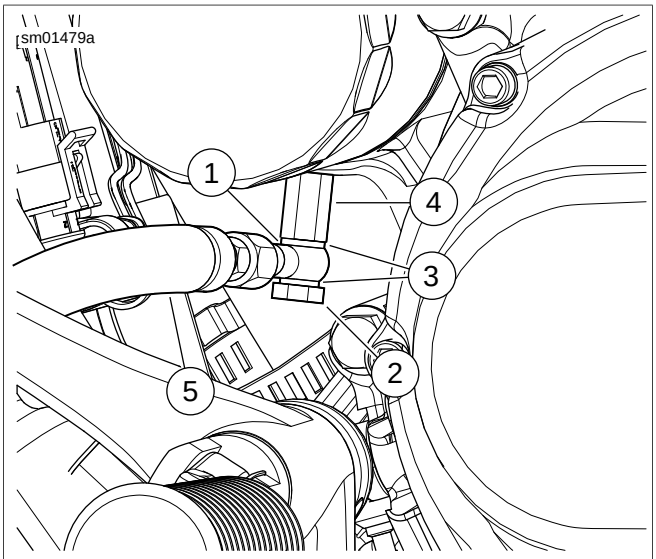
1. **Oil filter**
2. **Indicator switch**
3. **Switch connector [120]**

Figure 3-2. Oil Pressure Indicator Switch



1. **Gauge**
2. **Adapter, pressure switch hole**
3. **Banjo bolt**
4. **Washers (2)**

Figure 3-3. Oil Pressure Test Gauge Set



1. Oil pressure gauge banjo fitting
2. Banjo bolt
3. Washer (2)
4. Adapter
5. Oil pressure gauge hose

Figure 3-4. Oil Pressure Test Connections

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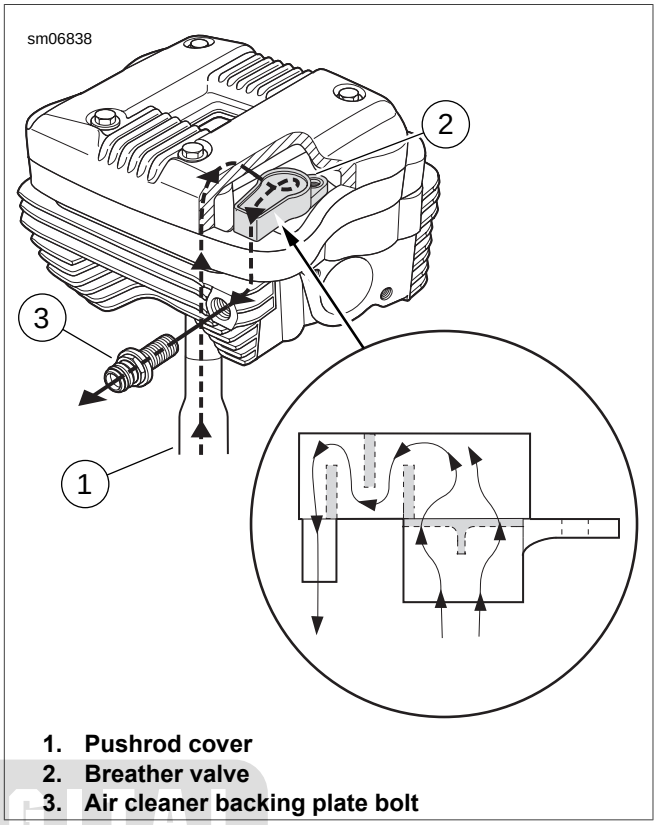
CRANKCASE BREATHING SYSTEM 3.4

OPERATION

See Figure 3-5. On the piston downstroke, a mixture of crankcase air and oil mist is vented up the pushrod covers (1) through a breather valve (2) in each inner rocker box section.

The oil mist separates from the crankcase air, collects and passes through a small drain hole adjacent to the exhaust valve in the head where it eventually returns to the crankcase.

The crankcase air is routed through a passage in each cylinder head. The crankcase air then travels through each air cleaner backing plate mounting bolt (3) into the filtered side of the air cleaner.



1. **Pushrod cover**
2. **Breather valve**
3. **Air cleaner backing plate bolt**

Figure 3-5. Crankcase Breathing System

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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. Repair or replace parts as necessary.
2. If oil is not reaching the hydraulic lifters, remove and inspect. Clean lifter bore of all foreign material. Replace parts as necessary. See 3.20 BOTTOM END OVERHAUL: ASSEMBLY, Tappets.
3. Examine pushrod, lifter and lifter bore for proper fit and any signs of unusual wear. Replace parts as necessary.
4. Visually inspect camshaft lobes for abnormal wear.
5. Remove camshafts and pinion gear, clean and inspect for wear and fit. Replace parts as necessary.
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. Face valves and valve seats.

COMPRESSION TEST

PART NUMBER	TOOL NAME
HD-33223-1	CYLINDER COMPRESSION GAUGE

Combustion chamber leakage may cause performance issues. A compression test can help determine the source of cylinder leakage.

Test engine at normal operating temperature.

1. Disconnect spark plug wires.
2. Clean around spark plug base. Remove spark plugs.
3. Connect CYLINDER COMPRESSION GAUGE (Part No. HD-33223-1) to front cylinder.
4. Make sure transmission is in neutral. With throttle plate in wide open position, crank engine continuously through 5-7 full compression strokes.
5. Note gauge readings at the end of the first and last compression strokes. Record test results.
6. Connect the gauge to the rear cylinder and repeat test.
   a. Compression is normal if final readings are within specification and do not indicate more than a 10 psi (0.689 bar) variance between cylinders. Refer to Table 3-20.
   b. Compression is below specification if the readings are 100 psi (6.89 bar) for 883 cc engines or 150 psi (10.3 bar) for 1200 cc engines. Refer to Table 3-21.
7. Inject approximately 1/2 oz (15 mL) SAE 30 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.

NOTE

Verify throttle plate is in the closed position after testing.

Table 3-20. Normal Compression Ranges

ENGINE	COMPRESSION	
	psi	bar
XL 883	165-180	11.4-12.4
XL 1200	200-225	13.8-15.5

Table 3-21. Compression Test Results

TEST RESULTS	CAUSE
Compression low on first stroke, builds up on the following strokes, but does not reach normal. Improves when oil is added to cylinder.	Ring trouble
Compression low on first stroke, does not build up on following strokes. Does not improve with the addition of oil.	Valve trouble
	Head gasket leak
	Incorrect pushrod length

CYLINDER LEAKAGE TEST

PART NUMBER	TOOL NAME
HD-35667-A	CYLINDER LEAKDOWN TESTER

The cylinder leakage test pinpoints engine problems including leaking valves, worn, damaged or stuck piston rings and blown head gaskets.

Use CYLINDER LEAKDOWN TESTER (Part No. HD-35667-A). Follow the specific instructions supplied with the tester.

1. Run engine until it reaches normal operating temperature.
2. Clean around spark plug base. Remove spark plugs.
3. Remove the air cleaner and set the throttle in the wide open position.
4. Rotate the piston to TDC of the compression stroke (both valves closed).
5. To keep the crankshaft from turning when air pressure is applied to the cylinder, engage transmission in fifth gear and lock the rear brake.

NOTE

Before performing the cylinder leakage test, verify that the tester itself is free from leakage. Apply a soap solution around the tester fittings. Connect the cylinder leakdown tester to the compressed air source. Look for any bubbles that would indicate leakage from the tester.

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6. Following the manufacturer's instructions, perform a cylinder leakage test. Make a note of the percent of leakage. Leakage greater than 12 percent indicates internal engine problems.
7. Listen for air leaks at induction module intake, exhaust pipe and head gasket.
   a. Air escaping through the induction module indicates a leaking intake valve.
   b. Air escaping through the exhaust pipe indicates a leaking exhaust valve.

NOTES

- *If air is escaping through valves, check pushrod length.*
- *Complete the cylinder leakage test(s). Install the spark plugs. Verify that the throttle plate is in the closed position before starting the engine.*

DIAGNOSING SMOKING ENGINE OR HIGH OIL CONSUMPTION

Before removing the cylinder heads, check for compression and cylinder leakage. See 3.5 TROUBLESHOOTING, Compression Test or 3.5 TROUBLESHOOTING, Cylinder Leakage Test.

Check Prior to Cylinder Head Removal

1. Oil tank overfilled.
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.

ADJUSTMENT AND TESTING

General

Often only cylinder head and cylinder repair is needed (valves, rings, piston, etc.). Service these components with the engine in the frame. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Stripping Motorcycle for Top End Repair.

After disassembling the top end only, it may be found that crankcase repair is necessary. Crankcase repair requires removal of engine crankcase from chassis. See 3.10 REMOVING ENGINE FROM CHASSIS.

NOTE

Do not lay engine on primary side. Laying engine on primary side will damage the clutch cable end fitting. If fitting is damaged, replace the clutch cable.

Symptoms indicating a need for engine repair are often misleading. If more than one symptom is present, possible causes can be narrowed down to make a partial diagnosis. An above-normal consumption of oil, for example, could be caused by several mechanical faults. However, when accompanied by blue-gray exhaust smoke and low engine compression, it indicates worn piston rings. Low compression by itself however, may indicate leaking valves, in addition to worn piston rings. See 1.25 TROUBLESHOOTING.

Piston slap is a condition where piston and/or cylinder are worn out-of-round and are loose fitting, allowing the piston to slap from front to rear of the cylinder as it moves up and down.

Frequently, valves, rings, pins, bushings and bearings need attention at the same time. If any one of the above components is worn, inspect all of these components. Repair or replace as necessary.

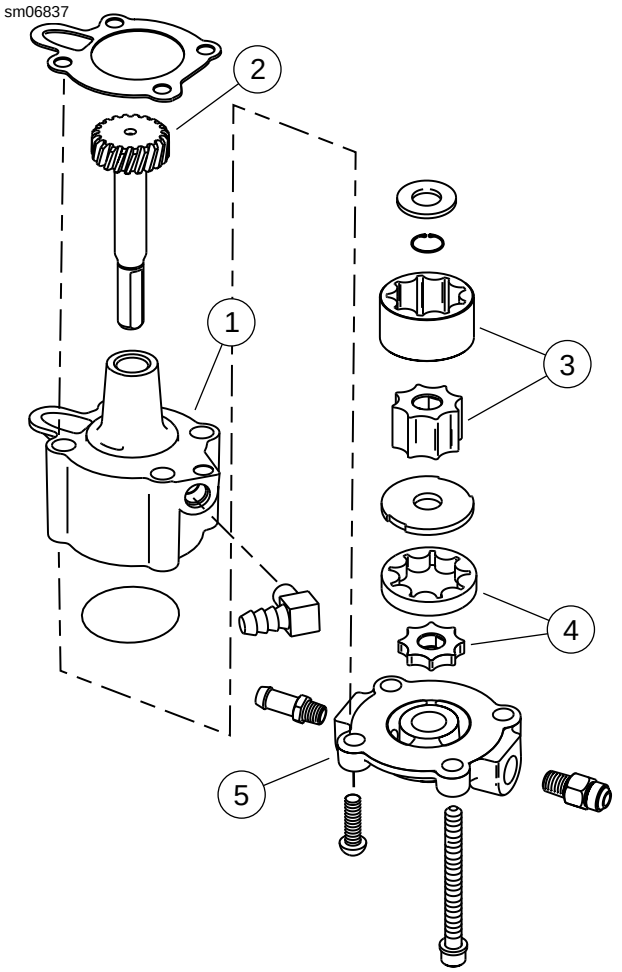
ENGINE LUBRICATION SYSTEM 3.6

OIL PUMP OPERATION

The oil pump consists of two gerotor gear sets housed in one pump body. One is feed and the other scavenge (return). Each gerotor gear set has an inner and an outer gerotor. The inner gerotor has one less lobe than the outer gerotor. Both gerotors have fixed centers which are offset to each other. The inlet and outlet sides of the pump are sealed by the tips and lobes of the gerotor set. This prevents oil on the outlet side (high pressure) from being transferred to the inlet side.

The feed pump distributes oil to the engine and has fewer lobes than the scavenge pump, allowing for greater pressure development. The scavenge pump returns oil to the tank and has more lobes than the feed pump allowing for greater oil flow.

See Figure 3-6. Both rotor sets (3, 4) are driven off a common shaft (2) that is coupled by gears to the crankshaft.

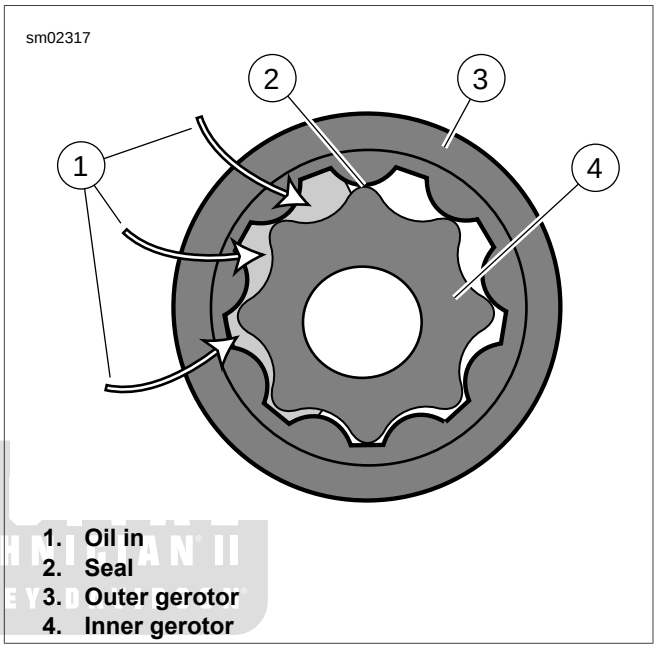


1. **Body**
2. **Gear shaft**
3. **Scavenge rotor set**
4. **Feed rotor set**
5. **Cover**

Figure 3-6. Oil Pump

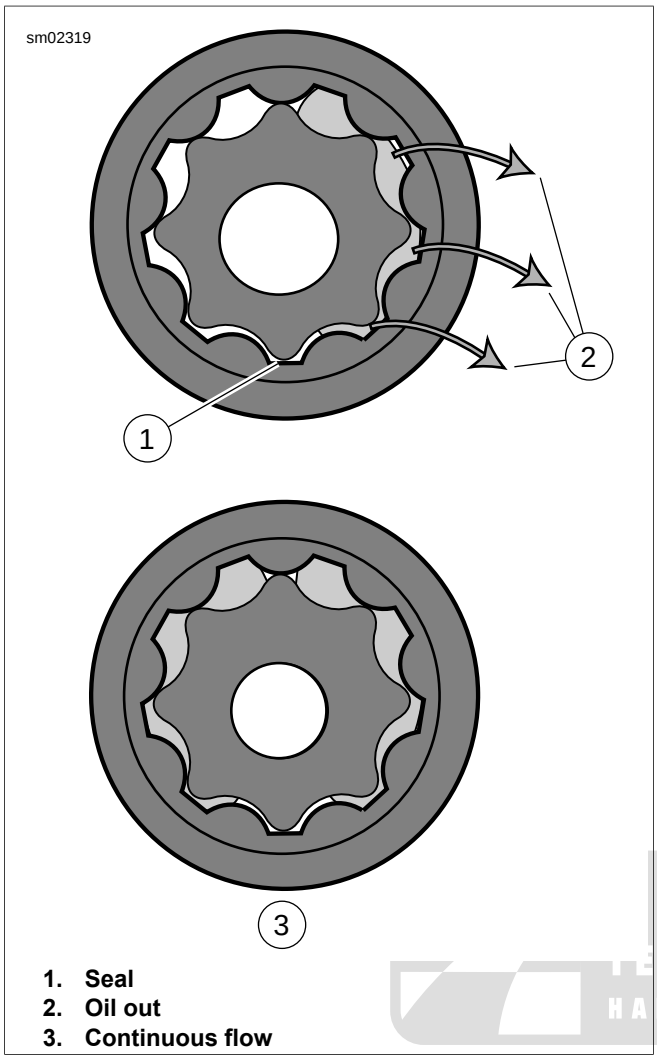
See Figure 3-7. As the crankshaft rotates, the cavity volume increases between the gerotors on the inlet side of the pump. This creates a vacuum causing oil to be drawn in. The volume continues to increase until it is equivalent to that of the missing lobe on the inner gerotor.

See Figure 3-8. Continuous rotation moves the pocket of oil to the outlet side of the pump. As the oil moves to the outlet side of the pump, the cavity decreases in volume. This forces pressurized oil out the discharge port. In operation, the gerotors provide a continuous flow of oil.



1. **Oil in**
2. **Seal**
3. **Outer gerotor**
4. **Inner gerotor**

Figure 3-7. Inlet Side Oil Flow



1. Seal
2. Oil out
3. Continuous flow

Figure 3-8. Outlet Side Oil Flow

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OIL FLOW

NOTE

See Figure 3-8. The paragraph numbers correspond with the callouts.

1. Oil is gravity-fed from the oil tank to the gerotor-style oil pump through a **feed hose.** Oil enters the **feed section** and fills a cavity located under the feed pump. See 3.19 OIL PUMP.
2. The feed pump transfers oil from the inlet cavity through the **feed hose** to the oil filter mount.
3. Oil flows through the **filter mount cavity** to the oil filter.
4. Oil enters the peripheral cavity of the **oil filter,** passes through the filtering medium into the central cavity of the oil filter, and flows into the filter adapter (fitting which connects filter to filter mount).
5. Adequate oil pressure in the filter mount cavity activates the **oil pressure indicator lamp switch** and shuts off the oil pressure indicator lamp.
6. Oil flowing from the filter adapter opens the **check ball.** The check ball opens at 10-13 psi (69-90 kPa) oil pressure.
7. With the check ball open, oil flows into the **crankcase feed galley.**
8. Oil flows through the feed galley in the crankcase to the tappet blocks and hydraulic lifters. **Cross-drilled passages** intersect the main feed galley and carry oil to each hydraulic lifter. From this cavity, oil is also fed to the piston jets.
9. Oil also enters an **intersecting passage** in the gearcase cover. Oil flow is then routed to the crankshaft area.
10. Oil enters a hole in the end of the **pinion gear shaft** and travels to the right flywheel where it is routed through the flywheel to the **crank pin.** Oil is forced through the crank pin to lubricate the rod bearing assembly.
11. Oil flows up passages in the **pushrods** to the rocker arm shafts and bushings.
12. The valve stems are lubricated by oil supplied through drilled oil holes in the **rocker arms**.
13. Collected in the cylinder heads, oil flows down the **pushrod covers** and into the **tappet blocks**. From the tappet block drain holes, oil flows into the gearcase. After lubricating the gearcase, the oil flows to the return side of the oil pump.
14. Feed oil to the rocker area is returned to the gearcase through a **passage** in the head, cylinder and crankcase.
15. Oil collected in the **sump** is splash-fed to the pistons, cylinder walls and flywheel components.
16. Oil in the sump returns to the scavenge pump through an internal **passage** located in the rear of the sump housing. The downward stroke of the pistons and the scavenge pump feed oil to the oil pump.
17. Return oil fills a **cavity** above the pumps return gears. The return gears pump oil back to the oil tank.
18. A small amount of oil flows from the feed galley in the right crankcase through a **restricted orifice.** The orifice sprays the oil onto the rear intake cam gear in the gearcase. Oil is transferred to the teeth of all the cam gears through the gear meshing action.

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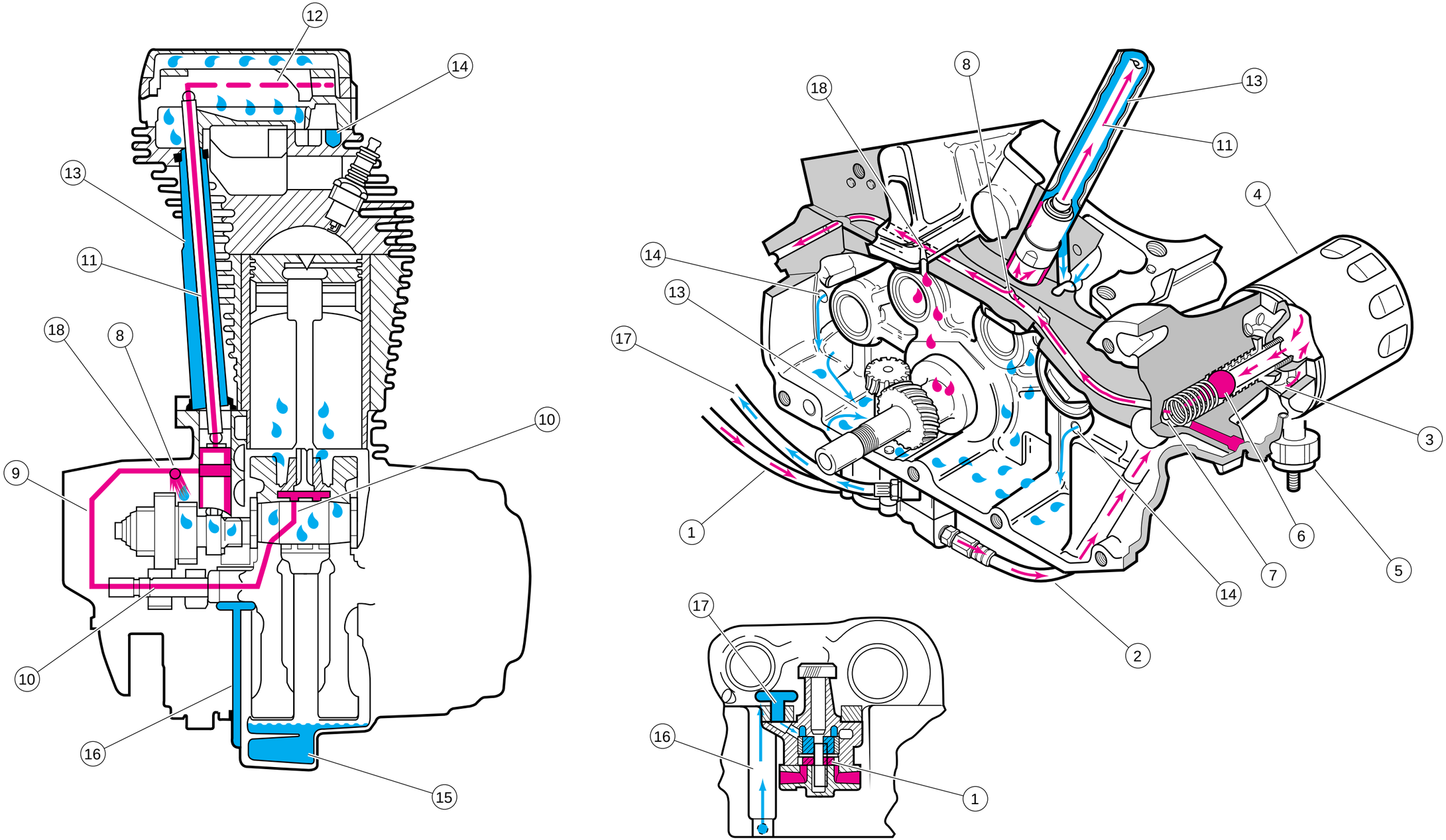

Figure 3-9. Lubrication Diagram (Red=Feed Oil, Blue=Return Oil)

Figure 3-9.
Lubrication Diagram (Red=Feed Oil, Blue=Return Oil)

Figure 3-9.
Lubrication Diagram (Red=Feed Oil, Blue=Return Oil)

HOW TO USE THIS SECTION 3.7

TYPICAL SYMPTOMS

Always use all available symptoms to begin a diagnosis. Symptoms indicating a need for engine repair are often misleading. If more than one symptom is present, possible causes can be narrowed down to make a partial diagnosis. An above normal consumption of oil, for example, could be caused by several mechanical faults. However, when accompanied by blue-gray exhaust smoke and low engine compression, it indicates worn piston rings. Low compression by itself however, may indicate leaking valves, in addition to worn piston rings. See 1.25 TROUBLESHOOTING.

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.

Frequently, valves, rings, pins, bushings and bearings need attention at the same time. If any one of the above components is worn, inspect all of these components. Repair or replace as necessary.

TOP END REPAIR

NOTE

During top end disassembly, the engine can be left in the chassis for service.

Two options are available depending upon engine status.

- 3.8 TOP END SERVICE, Engine in Chassis.
- 3.8 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.

- The cam compartment can be serviced with the engine in the chassis. See 3.9 BOTTOM END SERVICE, Engine in Chassis.
- To service components in the flywheel compartment, the engine must be removed and the crankcase halves split. See 3.9 BOTTOM END SERVICE, Engine Removed From Chassis.

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TOP END SERVICE 3.8

ENGINE IN CHASSIS

Table 3-22. Engine in Chassis

SERVICE PROCEDURE	COMPONENT REPAIR PROCEDURES
Remove parts necessary to gain access to all components above cylinder deck. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Stripping Motorcycle for Top End Repair.	
Continue with 3.12 TOP END OVERHAUL: DISASSEMBLY. Remove/repair sub-assembly components only if necessary.	
Remove rocker arm outer covers. Remove crankcase breathers. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads.	*Inspect and repair as necessary. See 3.4 CRANKCASE BREATHING SYSTEM, Operation.
Remove cylinder heads. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads.	*Inspect and repair as necessary. See 3.13 CYLINDER HEAD.
Remove pushrods, pushrod covers and tappet covers. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads. Remove tappets. See 3.16 BOTTOM END OVERHAUL: DISASSEMBLY, Tappets.	*Inspect and repair as necessary. See 3.20 BOTTOM END OVERHAUL: ASSEMBLY, Tappets.
Remove cylinders and pistons. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder and Piston.	*Inspect and repair as necessary. See 3.14 CYLINDER AND PISTON. Inspect upper connecting rod and repair as necessary. See 3.14 CYLINDER AND PISTON, Connecting Rod Bushings.
Complete all appropriate steps under 3.15 TOP END OVERHAUL: ASSEMBLY.	
Complete motorcycle assembly. See 3.15 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair.	
* When this step is completed during top end service, advance to 3.15 TOP END OVERHAUL: ASSEMBLY if no other work is to be done.	

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ENGINE REMOVED FROM CHASSIS

Table 3-23. Engine Removed from Chassis

SERVICE PROCEDURE	COMPONENT REPAIR PROCEDURES
Remove engine from chassis. See 3.10 REMOVING ENGINE FROM CHASSIS.	
Start 3.12 TOP END OVERHAUL: DISASSEMBLY. Remove and repair subassembly components as necessary.	
Remove rocker arm outer covers. Remove crankcase breathers. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads.	*Inspect and repair as necessary. See 3.4 CRANKCASE BREATHING SYSTEM, Operation.
Remove cylinder heads. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads.	*Inspect and repair as necessary. See 3.13 CYLINDER HEAD.
Remove pushrods, pushrod covers and tappet covers. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads. Remove tappets. See 3.16 BOTTOM END OVERHAUL: DISASSEMBLY, Tappets.	*Inspect and repair as necessary. See 3.20 BOTTOM END OVERHAUL: ASSEMBLY, Tappets.
Remove cylinders and pistons. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder and Piston.	*Inspect and repair as necessary. See 3.14 CYLINDER AND PISTON. Inspect upper connecting rod and repair as necessary. See 3.14 CYLINDER AND PISTON, Connecting Rod Bushings.
Complete all appropriate steps under 3.15 TOP END OVERHAUL: ASSEMBLY.	
Install engine in motorcycle. Complete all appropriate steps under 3.11 INSTALLING ENGINE IN CHASSIS.	
Complete motorcycle assembly. See 3.15 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair.	
* When this step is completed during top end service, advance to 3.15 TOP END OVERHAUL: ASSEMBLY if no other work is to be done.	

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

BOTTOM END SERVICE 3.9

ENGINE IN CHASSIS

Table 3-24. Engine in Chassis: Cam Compartment Service

SERVICE PROCEDURE	COMPONENT REPAIR PROCEDURES
Remove parts necessary to gain access to all components above cylinder deck. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Stripping Motorcycle for Top End Repair.	
Continue with 3.12 TOP END OVERHAUL: DISASSEMBLY. Remove/repair sub-assembly components only if necessary.	
Remove rocker arm outer covers. Remove crankcase breathers. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads.	Inspect and repair as necessary. See 3.4 CRANKCASE BREATHING SYSTEM, Operation.
Remove pushrods, pushrod covers and tappet covers. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads. Remove tappets. See 3.16 BOTTOM END OVERHAUL: DISASSEMBLY, Tappets.	Inspect and repair as necessary. See 3.20 BOTTOM END OVERHAUL: ASSEMBLY, Tappets.
Continue with 3.16 BOTTOM END OVERHAUL: DISASSEMBLY.	
Remove gear case cover and cam gears. See 3.16 BOTTOM END OVERHAUL: DISASSEMBLY, Gearcase Cover and Cam Gears.	*Inspect and repair as necessary. See 3.16 BOTTOM END OVERHAUL: DISASSEMBLY, Gearcase Cover and Cam Gears.
Remove oil pump components. See 3.19 OIL PUMP.	Inspect and repair as necessary. See 3.19 OIL PUMP.
Complete all appropriate steps under 3.20 BOTTOM END OVERHAUL: ASSEMBLY.	
Complete motorcycle assembly. See 3.15 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair.	
* When this step is completed during bottom end service, advance to 3.20 BOTTOM END OVERHAUL: ASSEMBLY if no other work is to be done.	

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ENGINE REMOVED FROM CHASSIS

Table 3-25. Engine Removed from Chassis: Flywheel Compartment Service or Complete Engine Overhaul

SERVICE PROCEDURE	COMPONENT REPAIR PROCEDURES
Remove engine from chassis. See 3.10 REMOVING ENGINE FROM CHASSIS.	
Start 3.12 TOP END OVERHAUL: DISASSEMBLY. Remove and repair subassembly components as necessary.	
Remove rocker arm outer covers. Remove crankcase breathers. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads.	Inspect and repair as necessary. See 3.4 CRANKCASE BREATHING SYSTEM, Operation.
Remove cylinder heads. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads.	Inspect and repair as necessary. See 3.13 CYLINDER HEAD.
Remove pushrods and pushrod covers. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads. Remove tappet covers and tappets. See 3.20 BOTTOM END OVERHAUL: ASSEMBLY, Tappets.	Inspect and repair as necessary. See 3.15 TOP END OVERHAUL: ASSEMBLY, Tappet Covers, Pushrod Covers and Pushrods.
Remove cylinders and pistons. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder and Piston.	Inspect and repair as necessary. See 3.14 CYLINDER AND PISTON. Inspect upper connecting rod and repair as necessary. See 3.14 CYLINDER AND PISTON, Connecting Rod Bushings.
Continue with 3.16 BOTTOM END OVERHAUL: DISASSEMBLY. Remove and repair subassembly components as necessary.	
Remove gearcase cover and cam gears. See 3.16 BOTTOM END OVERHAUL: DISASSEMBLY, Gearcase Cover and Cam Gears.	Inspect and repair as necessary. See 3.16 BOTTOM END OVERHAUL: DISASSEMBLY, Gearcase Cover and Cam Gears.
Remove oil pump. See 3.19 OIL PUMP or 3.19 OIL PUMP.	Inspect and repair as necessary. See 3.19 OIL PUMP.
Complete all appropriate steps under 3.16 BOTTOM END OVERHAUL: DISASSEMBLY, Crankcase to split crankcases and remove flywheel assembly, piston jets, etc.	Inspect and repair as necessary. See 3.18 CRANKCASE. Inspect and repair transmission assembly as necessary. See 5.8 TRANSMISSION REMOVAL AND DISASSEMBLY, 5.9 TRANSMISSION ASSEMBLY, 5.13 TRANSMISSION INSTALLATION and related subjects.
Complete all appropriate steps under 3.20 BOTTOM END OVERHAUL: ASSEMBLY.	
Complete all appropriate steps under 3.15 TOP END OVERHAUL: ASSEMBLY.	
Install engine in motorcycle. Complete all appropriate steps under 3.11 INSTALLING ENGINE IN CHASSIS.	
Complete motorcycle assembly. See 3.15 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair.	

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REMOVING ENGINE FROM CHASSIS 3.10

PROCEDURE

PART NUMBER	TOOL NAME
HD-45968	FAT JACK
HD-46284	ENGINE HOOK

1. Raise the motorcycle.
   a. Secure front wheel.
   b. Use FAT JACK (Part No. HD-45968) under frame to support rear of motorcycle.

⚠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)

2. Purge and disconnect fuel supply line. See 4.4 FUEL TANK.
3. Remove seat.
4. Remove left side cover. See 2.15 LEFT SIDE COVER.

⚠WARNING

Prevent accidental vehicle start-up, which could cause death or serious injury. First disconnect negative (-) battery cable at engine and then positive (+) cable from battery. (00280b)

5. Disconnect battery. See 1.20 BATTERY MAINTENANCE.
6. Drain transmission. See 1.10 TRANSMISSION LUBRICANT.
7. Drain engine oil. See 1.6 ENGINE OIL AND FILTER. Do not install drain plug back in end of drain hose now.
8. Remove exhaust system. See 4.16 EXHAUST SYSTEM.
9. Remove right front footrest assembly and rear brake linkage.
   a. **Mid-mount controls:** See 2.39 RIDER FOOT CONTROLS: MID-MOUNT.
   b. **Forward controls:** See 2.40 RIDER FOOT CONTROLS: FORWARD.
10. Remove sprocket cover. See 5.14 TRANSMISSION SPROCKET.
11. Remove exhaust mounting bracket. See 4.16 EXHAUST SYSTEM, Mounting Bracket.
12. Loosen rear axle nut and move rear axle all the way forward. Tighten axle nut enough to hold the axle and wheel in position in the rear fork. Remove drive belt from transmission sprocket. See 5.5 DRIVE BELT.
13. Disconnect oil tank feed, vent and return hoses from oil tank. See 3.22 OIL TANK.
14. Remove fuel tank. See 4.4 FUEL TANK.
15. Remove air cleaner assembly.
   a. See 4.3 AIR CLEANER ASSEMBLY, All Models.
   b. **EVAP models:** Remove EVAP purge hose from induction module. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL.
16. Remove the horn.
   a. **Front mount:** See 6.32 HORN, Front Mount: XL 883L/N/R, XL 1200X.
   b. **Side mount:** Disconnect horn wiring and remove center engine mount bracket and horn. See 6.32 HORN, Side Mount: XL 1200C/CP/CA/CB, XL 1200T/V.
17. Unplug the following connectors from the induction module:
   a. Fuel injector connectors [84], [85].
   b. TMAP sensor [80].
   c. IAC [87].
   d. TPS [88].
18. Remove push-in fastener securing induction module wire harness to wire caddy.
19. Disconnect throttle and idle cables from induction module. See 2.24 THROTTLE CABLES, Removal.

NOTE

Record cable strap positions. Remove cable straps from stator harness.

20. Unplug the following electrical connectors from the engine:
    a. Main wire harness ground wire at powertrain ground stud on crankcase.
    b. Spark plug wires.
    c. Oil pressure switch [120]. See 6.31 OIL PRESSURE SWITCH.
    d. CKP sensor [79]. See 6.23 CRANK POSITION SENSOR (CKP).
    e. Sidestand switch connector on frame.
    f. Alternator AC connector [46] and DC connector [47]. Remove three cable straps securing stator harness and neutral lead to frame. See Figure 3-13. See 6.24 VOLTAGE REGULATOR.
    g. Neutral indicator switch connector [136]. Remove barbed cable strap. See 6.28 NEUTRAL INDICATOR SWITCH.
    h. VSS [65]. See 6.26 VEHICLE SPEED SENSOR (VSS).
    i. Starter relay wire at starter motor. See 6.12 STARTER.
    j. ET sensor [90]. Cut the barbed cable strap securing sensor harness to oil tank mounting bracket. Remove cable strap. See 4.6 ENGINE TEMPERATURE (ET) SENSOR.
21. Remove battery positive cable from starter and battery negative cable from ground. See 6.10 BATTERY CABLES.
22. Disconnect clutch cable. Remove from clutch lever on left handlebar. Remove cable clips securing clutch cable to frame left front downtube. See 2.25 CLUTCH CONTROL.
23. Remove push-in fasteners securing right wire harness caddy to coil bracket. Discard push-in fasteners. Remove screw securing ignition switch to coil bracket, if equipped. Unplug spark plug wires from coil. Unplug ignition coil harness connector [83] from coil. Remove coil and bracket from frame. See 6.15 IGNITION COIL.
24. Remove screw securing left wire harness caddy to right wire harness caddy. Separate caddies. See 6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Removal.
25. Unplug the following harness connectors located in the wire harness caddies:
    a. Instruments connector [20].
    b. Headlamp connector [38].
    c. Right side control connectors [22-1, 22-2].
    d. Left side control connector [24].
    e. Front turn signal connector [31].
    f. Front wheel speed sensor [167], if equipped.
26. Remove wire harness caddy latch clip from frame backbone.
27. Slide left wire harness caddy between frame and engine, toward right side of vehicle. Move wire harness caddies and wiring harnesses out of the way.
28. **EVAP models:** Remove EVAP canister and EVAP canister clip, leaving hoses connected. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL.
29. **ABS models:** Remove EHCU assembly from frame and unplug connector. Pull EHCU harness out from between engine and frame to prevent damage during engine removal. See 2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Removal.
30. Remove stabilizers. See 2.21 STABILIZER LINKS.
    a. Remove rear stabilizer link assembly.
    b. Remove upper front stabilizer link assembly.
    c. Remove lower front stabilizer link assembly.
31. Remove rider left footrest and mounting bracket assembly and shift lever.
    a. **Mid-mount controls:** See 2.39 RIDER FOOT CONTROLS: MID-MOUNT.
    b. **Models with forward controls:** See 2.40 RIDER FOOT CONTROLS: FORWARD.

NOTE

Keep master cylinder upright. If the reservoir is inverted, bleed the rear brake.

32. **Models with passenger footrests:**
    a. Remove left passenger footrest. See 2.41 PASSENGER FOOTRESTS.
    b. Remove bolts securing rear master cylinder. See 2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR.
    c. Remove passenger footrest mounting bracket assembly. See 2.41 PASSENGER FOOTRESTS.
33. **Models without passenger footrests:**
    a. Remove brake line bracket (left side). See 2.12 BRAKE LINES.
    b. Remove bolts securing rear master cylinder. See 2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR.
    c. Remove two bolts and master cylinder mounting bracket.
34. **Mid-mount controls:**
    a. **Non-ABS models:** See Figure 3-10. Remove fasteners (13) and J-clip (14) from each side of frame.
    b. **ABS models:** Remove fasteners (13) and J-clip (14) from left side of frame. Remove fasteners (13) securing ABS brake line bracket (17) to right side of frame.
35. Loosen, but do not remove, two front isolator mounting bracket screws (11) on left side of engine.
36. Loosen, but do not remove, two rear isolator mounting bracket screws (3) on left side of engine.

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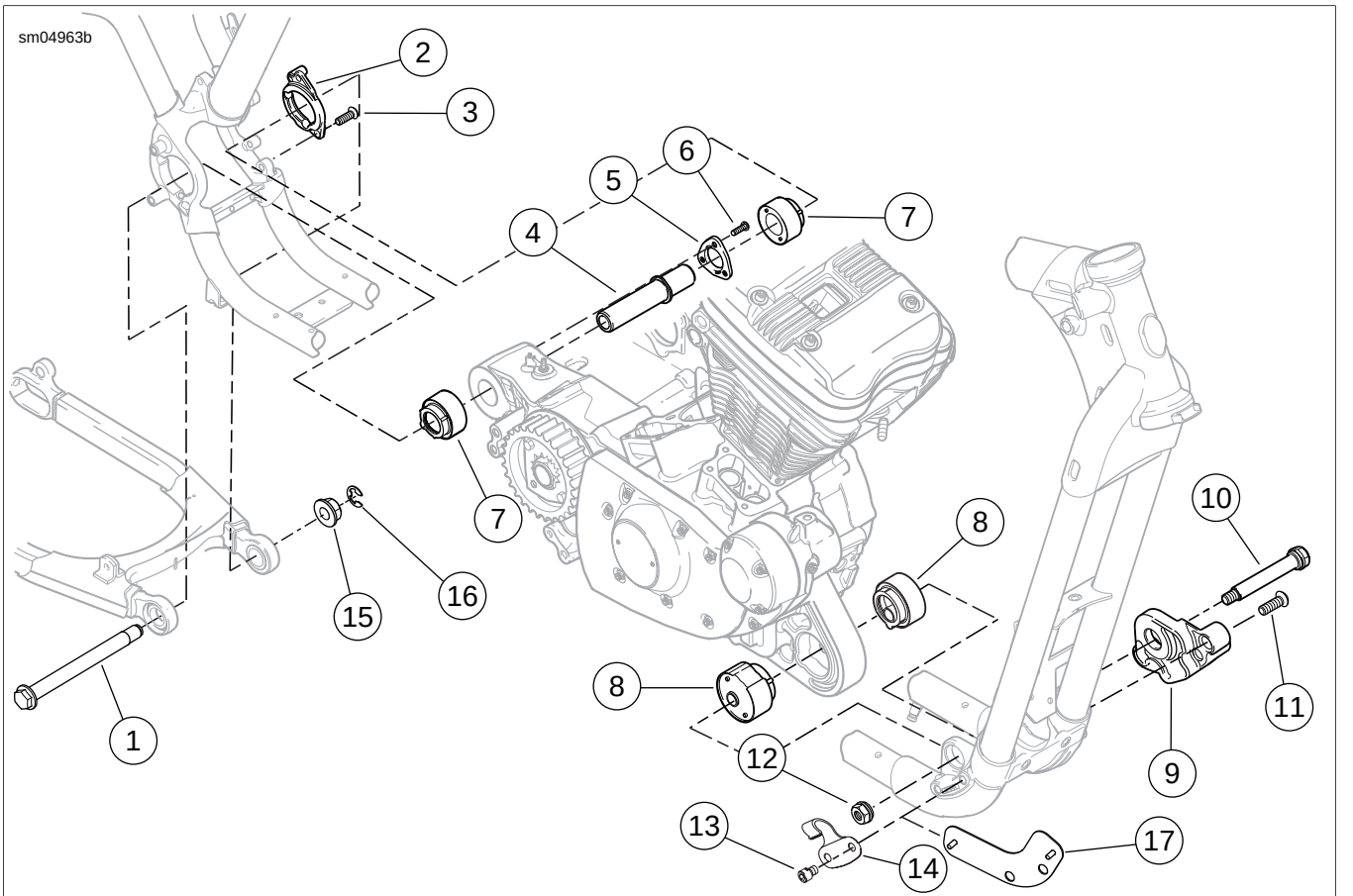
37. Attach ENGINE HOOK (Part No. HD-46284) and engine hoist. Carefully raise engine enough to relieve pressure from mounting bolts.
38. Remove front engine mount bolt (10) and nut (12).
39. Remove two screws (11) and front isolator mount (9).
40. Remove retaining ring (16), nut (15) and rear fork pivot bolt (1). Pull rear fork back until fork pivot bosses clear the frame. See 2.19 REAR FORK.
41. Remove two screws (3) and rear isolator mounting bracket (2) from frame.
42. Remove left side isolators from mounts.
43. Lift engine as necessary and swing assembly out from chassis toward the left side. Swing rear of engine out first. Then remove engine from chassis.



1. **Bolt (2)**
2. **Rear isolator mount**
3. **Screw (2)**
4. **Rear fork pivot shaft**
5. **Rear pivot lockplate**
6. **Screw (3)**
7. **Rear isolator (2)**
8. **Front isolator (2)**
9. **Front isolator mount**
10. **Front mount bolt**
11. **Screw (2)**
12. **Nut**
13. **Screw (4)**
14. **J-clip (2)**
15. **Nut**
16. **Retaining ring**
17. **Brake line bracket (ABS only)**

Figure 3-10. Engine Mount/Isolator Components (typical)

INSTALLING ENGINE IN CHASSIS 3.11

PROCEDURE

PART NUMBER	TOOL NAME
HD-46284	ENGINE HOOK

FASTENER	TORQUE VALUE	
Isolator mount, front, screw	25-35 ft-lbs	33.9-47.5 Nm
Isolator mount, rear, screw	25-35 ft-lbs	33.9-47.5 Nm
Engine mount, front, bolt	95-105 ft-lbs	129-142 Nm
Brake line fastener	120-180 **in-lbs**	13.6-20.3 Nm
Wire harness ground wire	55-75 **in-lbs**	6.2-8.5 Nm
Exhaust pipe clamp bracket screw	30-33 ft-lbs	40.7-44.7 Nm
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm
Axle, rear, nut	95-105 ft-lbs	129-142 Nm

1. See Figure 3-10. Make sure pivot shaft (4) and rear pivot lockplate (5) are mounted on engine mounting boss at rear of engine. Position right rear isolator (7) on pivot shaft on rear of engine. Do not Install left rear isolator now.
2. Position right front isolator (8) on front of engine. Do not Install left front isolator now.
3. Attach ENGINE HOOK (Part No. HD-46284) and engine hoist to engine.

NOTE

Make sure rear isolator locator tabs line up with slots in frame.

4. Lift engine and swing assembly into chassis from left side. Swing front of engine in first.
5. Install left rear isolator (7) over pivot shaft (4). Install rear isolator mount (2) over left rear isolator and attach to frame with two screws (3). Leave fasteners loose.
6. Raise or lower engine until right front isolator lines up with mounting hole in frame.
7. Install left front isolator (8) and front isolator mount (9) to left side of frame with two screws (11). Leave fasteners loose.
8. Insert front engine mount bolt (10) from left side, through isolators and crankcase boss. Place nut (12) on bolt but do not tighten now.
9. Tighten two screws (11) securing front isolator mount (9) to 25-35 ft-lbs (33.9-47.5 Nm).
10. Tighten two screws (3) securing rear isolator mount (2) to 25-35 ft-lbs (33.9-47.5 Nm).
11. Install rear fork. See 2.19 REAR FORK.
12. Tighten front engine mount bolt (10) and nut (12) to 95-105 ft-lbs (129-142 Nm).
13. Remove ENGINE HOOK (Part No. HD-46284).

NOTE

Check each end of the stabilizer links for excessive wear before installation. The spherical ball end may rotate loosely, but should not have any lateral movement. Replace the link if lateral movement exists.

14. Install stabilizers. See 2.21 STABILIZER LINKS.
    a. Install lower front stabilizer link assembly.
    b. Install upper front stabilizer link assembly.
    c. Install rear stabilizer link assembly.
15. **Models with passenger footrests:** Install passenger footrests and brake line bracket. See 2.41 PASSENGER FOOTRESTS.
16. **Models without passenger footrests:**
    a. Install rear brake master cylinder bracket. See 2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR.
    b. Install brake line bracket. Tighten fasteners to 120-180 **in-lbs** (13.6-20.3 Nm).
17. Place belt into position over sprockets.
18. Install rear master cylinder to bracket. See 2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR.
19. Install shift lever and rider left footrest and mounting bracket assembly:
    a. **Mid-mount controls:** See 2.39 RIDER FOOT CONTROLS: MID-MOUNT.
    b. **Forward controls:** See 2.40 RIDER FOOT CONTROLS: FORWARD.
20. **ABS models:** Install EHCU bracket. See 2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Installation.

NOTE

Verify that the EVAP canister mounting hardware does not contact the rear stabilizer ground strap.

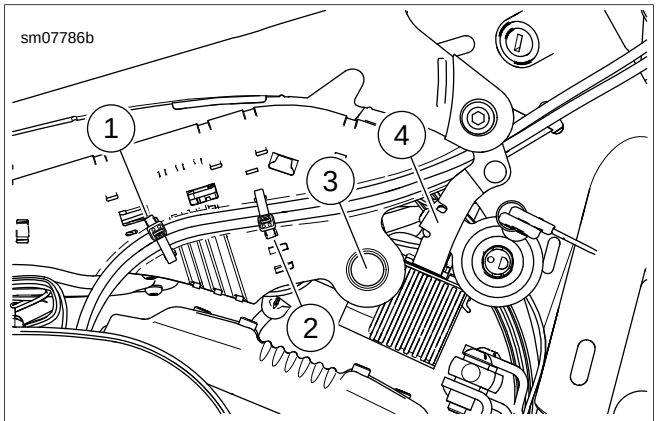
21. **EVAP models:** Install EVAP mounting bracket, canister and hoses. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL.

NOTE

Route rear spark plug wire through wire harness caddy.

22. Position left and right wire harness caddies on either side of frame backbone. Plug in the following connectors, located in the caddies:
    a. Instruments connector [20].
    b. Headlamp connector [38].
    c. Right hand control connectors [22-1, 22-2].
    d. Left hand control connector [24].
    e. Front turn signal connector [31].
    f. Front wheel speed sensor [167] (if equipped).

23. See Figure 3-11. Position the wiring harnesses, the right wire harness caddy and the throttle cables between the coil bracket uprights. Install **new** cable straps (1, 2).
24. Mount caddies together. Verify tabs on caddies engage each other and frame backbone bracket. Secure with screw. See 6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES.
25. Position ignition coil and bracket on frame behind steering head.



1. **Cable strap**
2. **Cable strap**
3. **Push-in fastener**
4. **Coil bracket**

Figure 3-11. Ignition Coil

26. Install ignition coil. Plug ignition coil harness connector into coil. See 6.15 IGNITION COIL. Secure right wire harness caddy to coil bracket with **new** push-in fasteners.
27. Plug spark plug cables into coil. Connect spark plug wires to spark plugs.
28. Connect clutch cable to clutch lever on handlebar. Adjust clutch. See 2.25 CLUTCH CONTROL.
29. Plug the following electrical connectors into the engine:
    a. Engine Temperature (ET) sensor connector. See 4.6 ENGINE TEMPERATURE (ET) SENSOR.
    b. Vehicle Speed Sensor (VSS) connector [65]. See 6.26 VEHICLE SPEED SENSOR (VSS).

NOTE

Route starter relay wire behind VSS wiring to avoid contact with belt.

    c. Starter relay wire at starter motor. See 6.12 STARTER.
    d. Install battery positive cable to starter post and battery negative cable to crankcase stud. See 6.10 BATTERY CABLES.
    e. Install main harness ground cable to powertrain ground stud on crankcase. Tighten fastener to 55-75 **in-lbs** (6.2-8.5 Nm).
    f. Neutral indicator switch connector [136]. See 6.28 NEUTRAL INDICATOR SWITCH.
    g. Alternator AC connector [46] and DC connector [47]. See 6.24 VOLTAGE REGULATOR.
    h. Crank position (CKP) sensor connector [79]. See 6.23 CRANK POSITION SENSOR (CKP).
    i. Jiffy Stand Sensor (JSS) connector. Install into J-clip. On models not equipped with JSS, connector from harness is installed with a plug.
    j. Oil pressure switch connector [120]. See 6.31 OIL PRESSURE SWITCH.
    k. See Figure 3-13. Install lower right frame tube cable straps.
30. Install throttle and idle cables to induction module. See 2.24 THROTTLE CABLES, Installation.
31. Connect the following connectors to the induction module. See 4.7 INDUCTION MODULE.
    a. Throttle position sensor (TPS) connector [88].
    b. Idle Air Control (IAC) connector [87].
    c. Temperature Manifold Absolute Pressure (TMAP) sensor connector [80].
    d. Fuel injector connectors [84], [85].
32. Install horn. See 6.32 HORN.
33. Install air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY, All Models.
    a. **EVAP models:** Install EVAP purge hose on induction module. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL.
    b. See Figure 3-12. Install **new** barbed cable strap on EVAP purge hose. Push barbed end of strap into wire harness caddy.

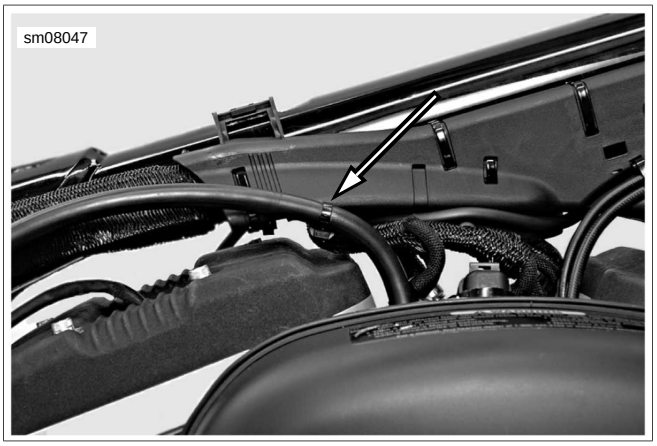


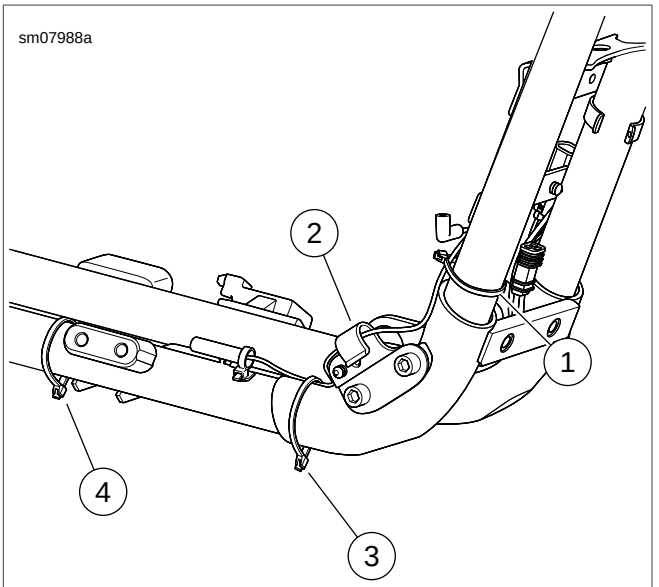
Figure 3-12. EVAP Purge Hose Barbed Cable Strap

34. Using **new** hose clamps, install oil tank feed, vent and return hoses onto oil tank. Install drain plug in the end of the drain hose. Secure with worm drive clamp. Tighten securely. Install drain hose to frame with clip. See 3.22 OIL TANK.
35. Install exhaust pipe bracket to crankcase. See 4.16 EXHAUST SYSTEM, Exhaust Pipe Bracket.
36. Install sprocket cover. See 5.14 TRANSMISSION SPROCKET.
37. Install exhaust pipe clamp bracket, washer and screw to sprocket cover. Tighten to 30-33 ft-lbs (40.7-44.7 Nm). Now tighten other two sprocket cover screws to 80-120 **in-lbs** (9.0-13.6 Nm).
38. Install right front footrest assembly and rear brake linkage.
    a. **Mid-mount controls:** See 2.39 RIDER FOOT CONTROLS: MID-MOUNT.
    b. **Forward controls:** See 2.40 RIDER FOOT CONTROLS: FORWARD.
39. Install exhaust system. See 4.16 EXHAUST SYSTEM.

NOTE

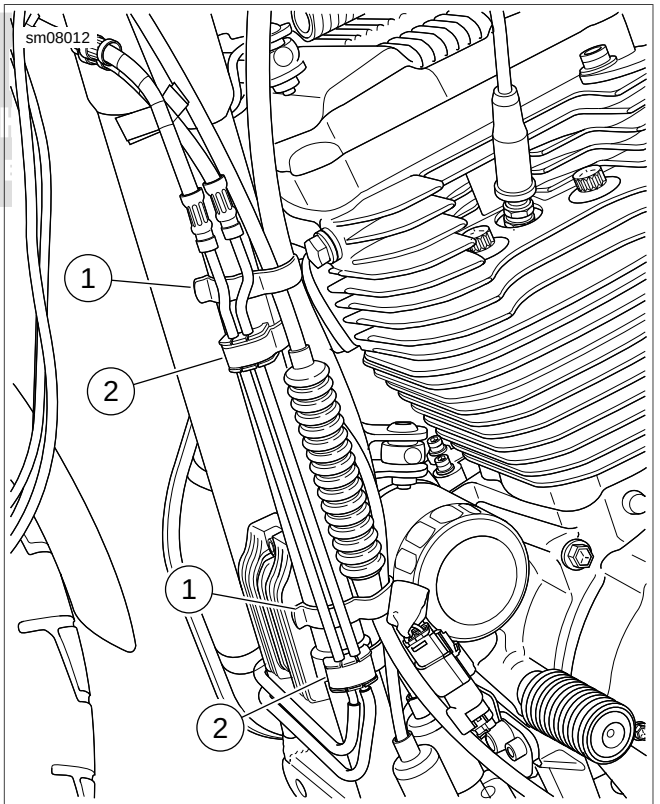
HO2S is installed in lower clip only.

40. See Figure 3-14. Attach clutch cable (along with wiring harness and front HO2S harness) to frame front left downtube with cable clips.



1. **Neutral switch and stator leads**
2. **Non-ABS J-clip**
3. **Neutral switch and stator leads**
4. **Neutral switch and stator leads**

Figure 3-13. Lower Right Frame Tube Cable Straps



1. **Clutch cable clip**
2. **ABS line clip**

Figure 3-14. Frame Retaining Clips

41. Adjust belt tension and rear wheel alignment. Tighten rear axle nut to 95-105 ft-lbs (129-142 Nm). Install **new** E-clip. See 1.21 WHEEL ALIGNMENT.

⚠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)

42. Install fuel tank See 4.4 FUEL TANK.
43. Add engine oil. See 1.6 ENGINE OIL AND FILTER, Changing Oil and Filter.
44. Fill primary chaincase/transmission with FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT. See 1.10 TRANSMISSION LUBRICANT.

⚠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)

45. Connect battery. See 1.20 BATTERY MAINTENANCE.
46. Install left side cover. See 2.15 LEFT SIDE COVER.

⚠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)

47. Install seat.
48. Perform engine oil level hot check. See 1.6 ENGINE OIL AND FILTER, Checking and Adding Oil.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TOP END OVERHAUL: DISASSEMBLY 3.12

GENERAL

This section describes disassembling the top end of the engine, from the cylinder deck up. To perform a complete top end overhaul, follow all steps listed in this section.

Then follow all steps listed in the following sections, including inspection and repair procedures: See 3.13 CYLINDER HEAD and 3.14 CYLINDER AND PISTON.

NOTE

Clean engine before disassembly. Abrasive particles can damage machined surfaces or plug oil passageways. Remove all dirt and particles before disassembly to prevent component damage.

STRIPPING MOTORCYCLE FOR TOP END REPAIR

⚠WARNING

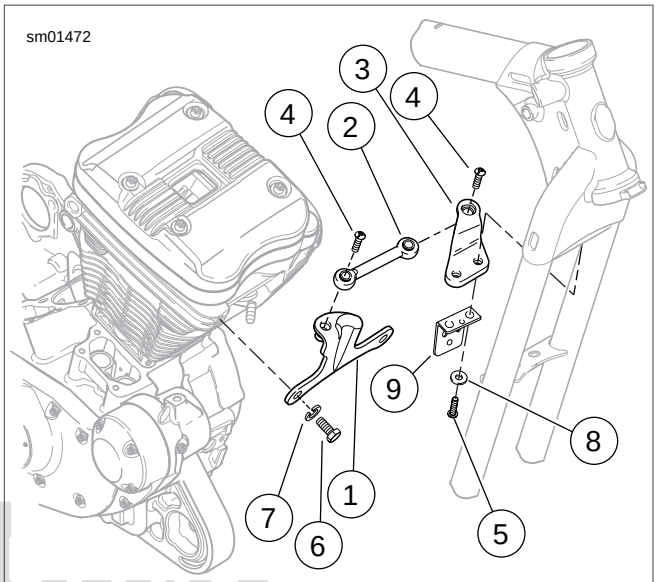
When servicing the fuel system, do not smoke or allow open flame or sparks in the vicinity. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00330a)

1. Purge the fuel supply hose of high pressure gasoline. Disconnect fuel supply hose from fuel pump module. See 4.4 FUEL TANK.
2. Remove seat.

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

3. Remove main fuse.
4. Remove exhaust pipes and mufflers. See 4.16 EXHAUST SYSTEM.
5. Disconnect spark plug cables from spark plugs.
6. Drain and remove fuel tank. See 4.4 FUEL TANK.
7. Remove horn.
   a. **Front mount:** See 6.32 HORN, Front Mount: XL 883L/N/R, XL 1200X.
   b. **Side mount:** See 6.32 HORN, Side Mount: XL 1200C/CP/CA/CB, XL 1200T/V.
8. Remove air cleaner assembly:
   a. Remove cover, air filter and air cleaner backing plate. See 4.3 AIR CLEANER ASSEMBLY, All Models.
   b. **CA models:** Remove EVAP purge hose from induction module. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL.
9. Remove induction module. See 4.7 INDUCTION MODULE.
10. Secure induction module assembly and throttle cables out of the way.
11. See Figure 3-15. Remove upper front stabilizer link and frame bracket:
    a. Remove screw (4) securing stabilizer link (2) to engine bracket (1).
    b. Remove screws (5) and washers (8). Remove horn bracket (9) (models with front mounted horn) and frame bracket (3) with stabilizer link.



1. **Engine bracket**
2. **Upper stabilizer link**
3. **Upper frame bracket**
4. **Screw**
5. **Screw (2)**
6. **Screw (2)**
7. **Lockwasher (2)**
8. **Washer (2)**
9. **Horn bracket**

Figure 3-15. Upper Front Stabilizer Link Assembly

CYLINDER HEADS

Disassembling Rocker Covers

NOTICE

Prevent engine damage. Washers and fasteners used in the engine are hardened parts. Do not use unhardened parts. (00544b)

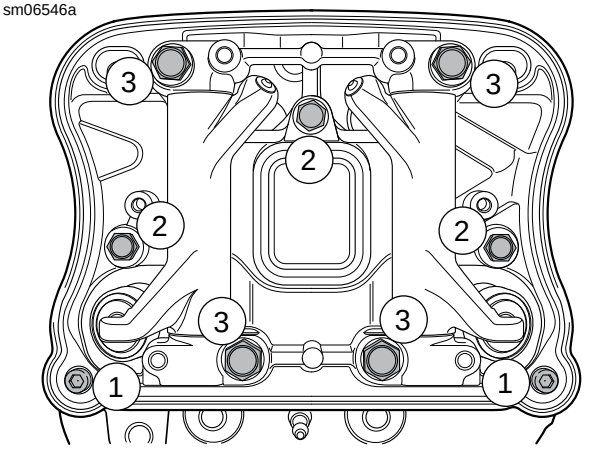
1. Remove spark plugs.
2. See Figure 3-18. Remove four screws and captive washers (1) and sealing washers (2). Discard sealing washers.
3. Remove outer rocker cover (3).
4. Remove and discard gaskets (4, 5).
5. Rotate crankshaft until both valves are closed on head being removed.

6. See Figure 3-16. Remove hardware securing inner rocker cover to cylinder head in the following order.
   a. Remove screws and washers (1).
   b. Remove bolts and washers (2).
   c. Loosen rocker arm bolts (3) in 1/4-1/2 turn increments using a cross pattern. This relieves valve spring pressure evenly on inner rocker cover.
7. See Figure 3-18. Remove inner rocker cover (8). Remove and discard gasket (16).
8. Remove screw (6), breather assembly (7) and breather seal (17). Discard seal.

NOTE

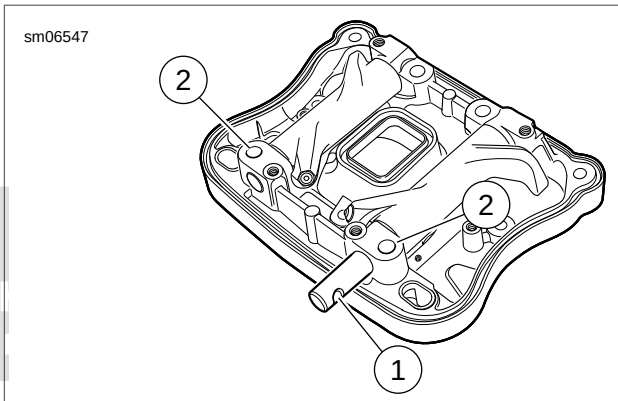
Mark rocker arm shafts for reassembly in their original positions. Install valve train components in their original positions or increased engine wear may result.

9. See Figure 3-17. Remove rocker arm shafts by tapping them out using a hammer and a soft metal punch.
10. See Figure 3-18. Remove rocker arms (11, 12). Mark the rocker arms for reassembly in their original locations.



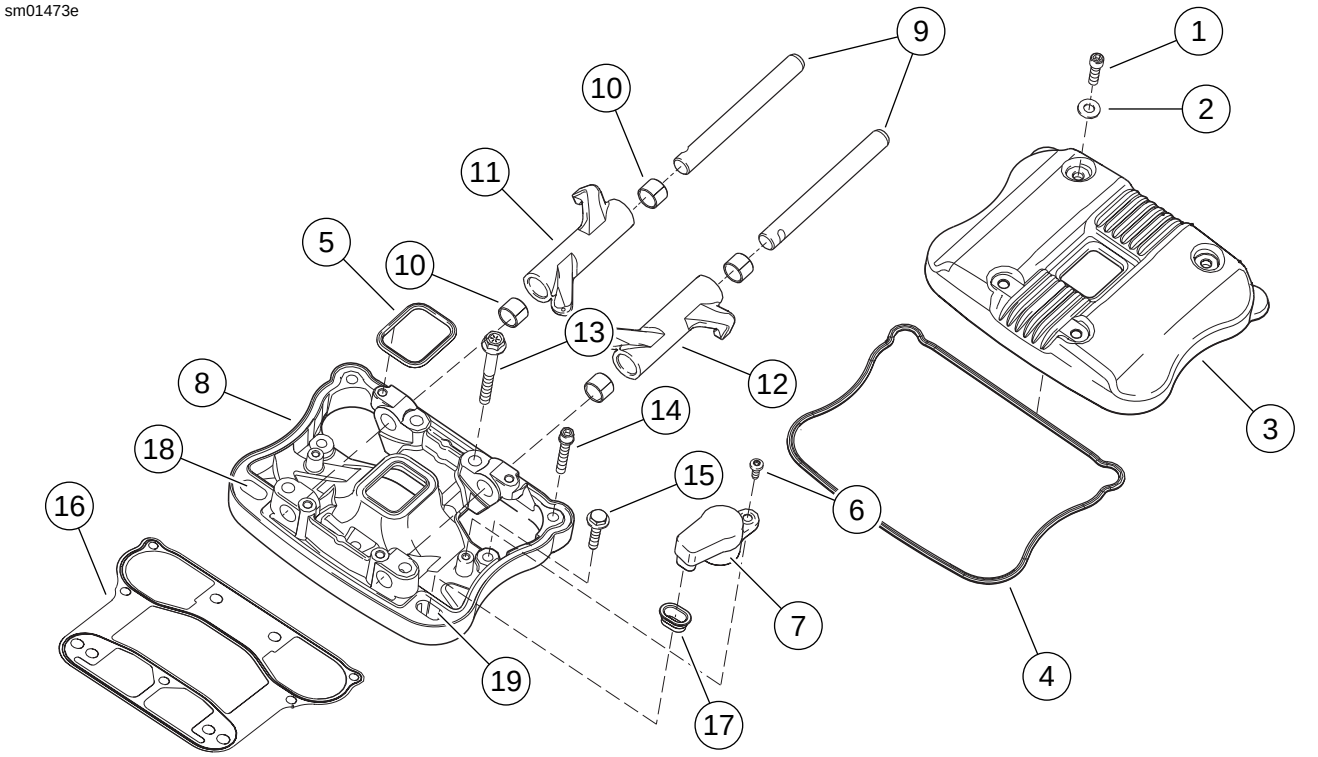
1. **Screws and washers (2)**
2. **Bolts and washers (3)**
3. **Rocker arm bolts (4)**

Figure 3-16. Inner Rocker Cover Fasteners



1. **Retaining notch**
2. **Position of rocker arm retaining bolts**

Figure 3-17. Removing Rocker Arm Shafts (typical)



1. **Screw w/captive washer (4)**
2. **Sealing washer (4)**
3. **Outer rocker cover**
4. **Gasket**
5. **Gasket**
6. **Screw**
7. **Breather assembly**
8. **Inner rocker cover**
9. **Rocker arm shaft (2)**
10. **Rocker arm bushing (4)**
11. **Rocker arm**
12. **Rocker arm**
13. **Bolt (4)**
14. **Screw (2)**
15. **Bolt (3)**
16. **Gasket**
17. **Breather seal**
18. **Breather location: Front Cylinder**
19. **Breather location: Rear Cylinder**

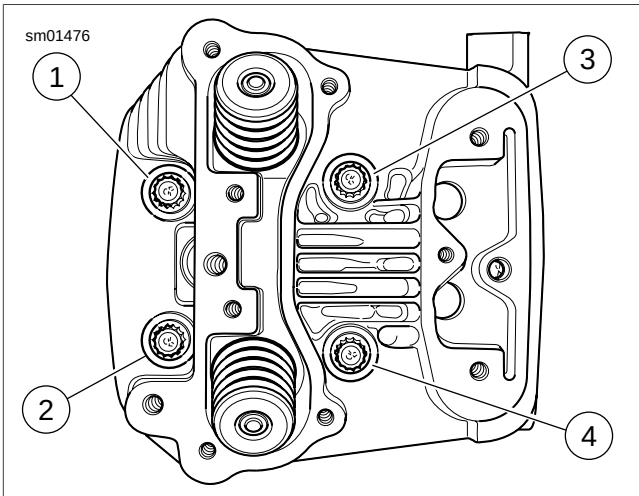
Figure 3-18. Rocker Cover Assembly

Removing Cylinder Head

NOTE

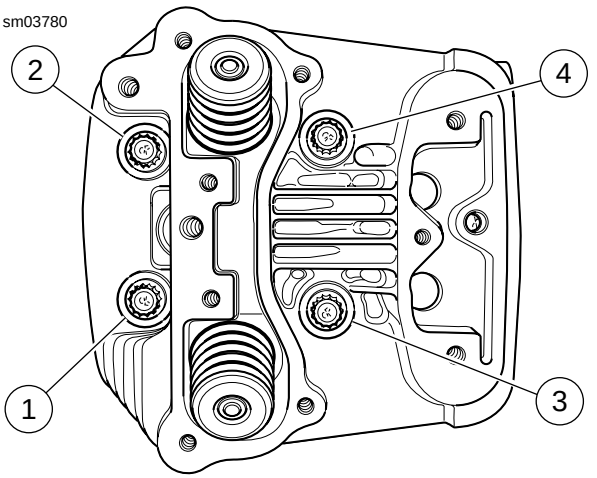
See Figure 3-19 or Figure 3-20. Follow sequence of incremental removal as described below to prevent component damage.

1. See Figure 3-19 and Figure 3-20. Loosen each screw 1/8-turn following the sequence shown.
2. Continue loosening in 1/8-turn increments until screws are loose. Remove head screws.
3. Remove cylinder head and head gasket. Discard head gasket.



1. **Short**
2. **Short**
3. **Long**
4. **Long**

Figure 3-19. Front Cylinder Screw Torque Sequence

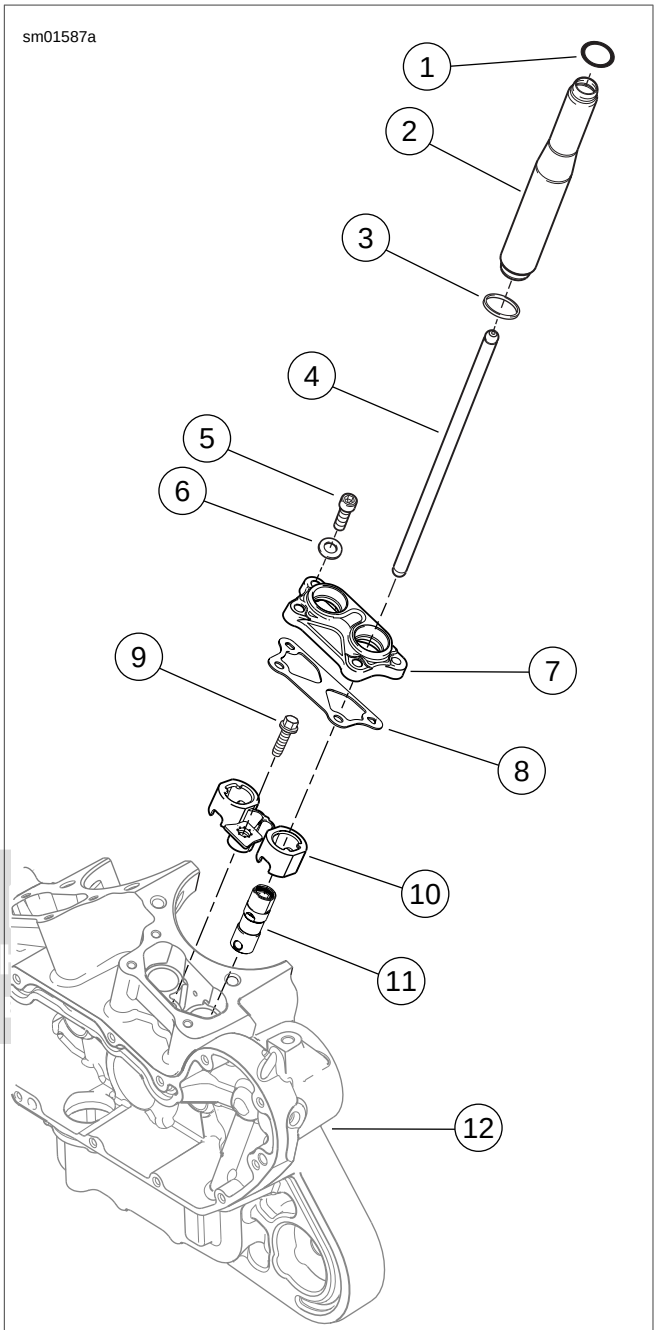


1. **Short**
2. **Short**
3. **Long**
4. **Long**

Figure 3-20. Rear Cylinder Screw Torque Sequence

Disassembling Pushrods and Covers

1. See Figure 3-21. Remove pushrod covers (2), O-rings (1, 3) and pushrods (4). Discard O-rings.
2. Mark the location and orientation (top and bottom) of each pushrod.
3. Remove socket screws (5) and washers (6).
4. Remove tappet cover (7) and gasket (8). Discard gasket.



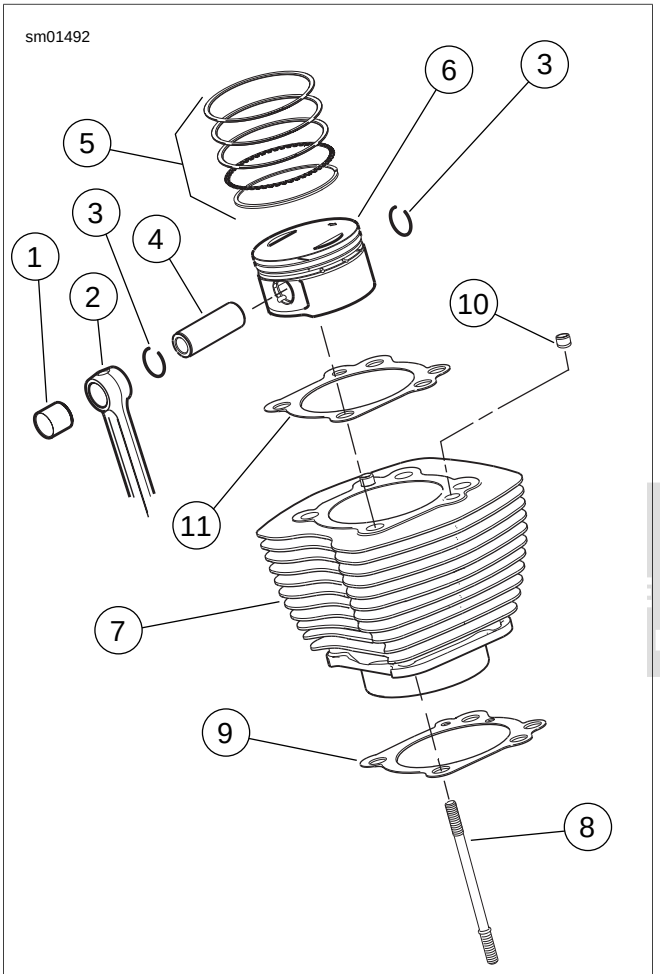
1. **O-ring (4)**
2. **Pushrod cover (4)**
3. **O-ring (4)**
4. **Pushrod (4)**
5. **Screw (8)**
6. **Washer (8)**
7. **Tappet cover (2)**
8. **Gasket (2)**
9. **Screw (2)**
10. **Anti-rotation device (2)**
11. **Tappet (4)**
12. **Right crankcase**

Figure 3-21. Middle Valve Train Components

CYLINDER AND PISTON

PART NUMBER	TOOL NAME
HD-34623-C	PISTON PIN LOCK RING REMOVER/INSTALLER
HD-42320-A	PISTON PIN REMOVER
HD-42322	PISTON SUPPORT PLATE

1. See Figure 3-22. Rotate crankshaft until piston (6) of cylinder being removed is at bottom of its stroke.



1. **Piston pin bushing**
2. **Connecting rod**
3. **Lock ring (2)**
4. **Piston pin**
5. **Piston ring set**
6. **Piston**
7. **Cylinder**
8. **Cylinder stud (4)**
9. **Cylinder base gasket**
10. **Dowel (2)**
11. **Head gasket**

Figure 3-22. Cylinder and Piston

2. Carefully raise cylinder just enough to permit placing clean towel under piston to prevent any foreign matter from falling into crankcase.

NOTES

- *If cylinder does not come loose, tap lightly with rawhide or plastic hammer perpendicular to cylinder fins. Never try to pry cylinder up.*
- *To avoid damage to piston assembly and/or cylinder studs, do not allow piston to fall against studs.*

3. Carefully lift cylinder over piston and cylinder studs (8). Do not allow piston to fall against cylinder studs.

4. Discard cylinder base gasket (9).

NOTE

With cylinder removed, be careful not to bend the cylinder studs. The slightest bend could cause a stress riser and could lead to stud failure.

5. Install a 6.0 in (150 mm) length of 1/2 in (12.7 mm) ID plastic or rubber hose over each cylinder stud. This will protect the studs and the pistons.

⚠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)

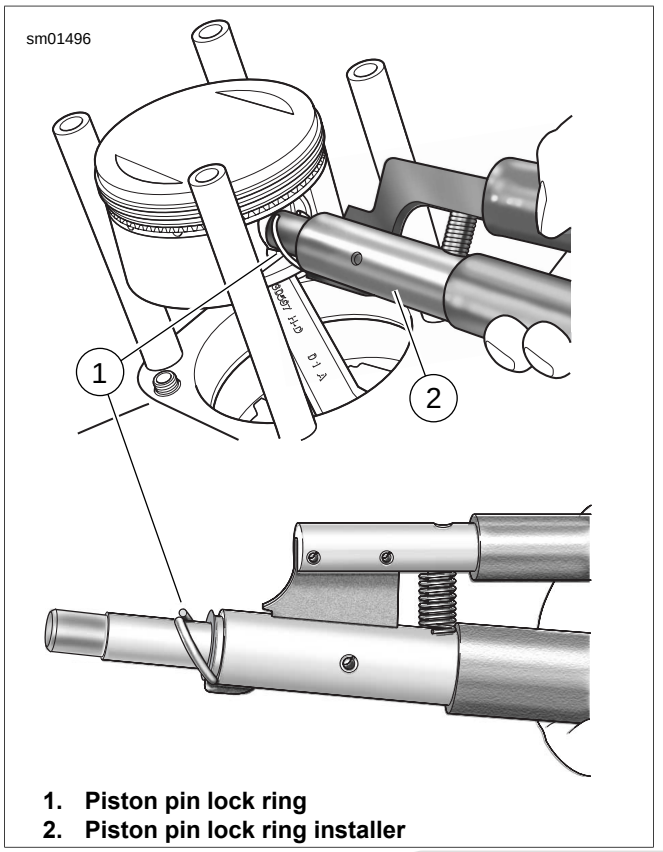
NOTICE

Handle piston with extreme care. The alloy used in these pistons is very hard. Any scratches, gouges or other marks in the pistons could score the cylinder during engine operation and cause engine damage. (00546b)

NOTES

- *It is not necessary to remove both piston pin lock rings during piston removal. Leave second lock ring in piston pin bore.*
- *Do not reuse piston pin lock rings. Removal may weaken lock rings and they may break or dislodge if reused, resulting in engine damage.*

6. See Figure 3-23. Remove piston pin lock ring as follows:
   a. Insert PISTON PIN LOCK RING REMOVER/INSTALLER (Part No. HD-34623-C) into piston pin bore until claw on tool is positioned in slot of piston (directly under lock ring).
   b. Squeeze handles of tool together and pull from bore. Hold a shop towel over bore during removal in the event that the lock ring should fly out. Remove lock ring from claw and discard.



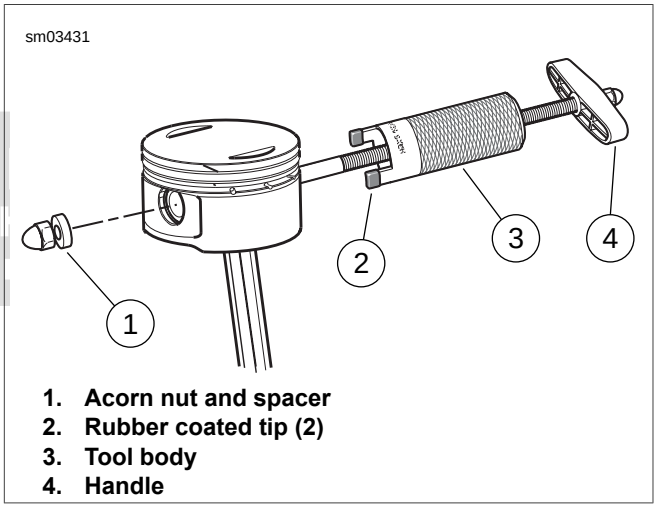
1. **Piston pin lock ring**
2. **Piston pin lock ring installer**

Figure 3-23. Removing Piston Pin Lock Ring

NOTE

To avoid damage to piston or cylinder base studs, use PISTON SUPPORT PLATE (Part No. HD-42322) to secure piston in place while removing piston pin.

7. Remove piston pin. Since pin is a loose fit in piston, pin should easily slide out. If pin is difficult to remove, use PISTON PIN REMOVER (Part No. HD-42320-A), as follows:
   a. See Figure 3-24. Remove acorn nut and spacer (1) from rod end of tool.
   b. Slide rod end through piston pin. Install spacer and acorn nut on end of rod.
   c. Position rubber coated tips (2) of tool on flat on each side of piston pin bore.
   d. Hold tool body (3) and turn handle (4) clockwise until piston pin is pulled free of bore.
8. Remove piston from connecting rod. Be sure to hold connecting rod shank upright to prevent it from striking crankcase.
9. Place a 3.0 in (76.2 mm) length of 1.0 in (25.4 mm) ID foam-type water pipe insulation around each connecting rod to prevent damage.
10. Mark each pin boss with either an "F" or an "R" to indicate front or rear cylinder, respectively.
11. Spread piston rings outward until they clear grooves in piston and lift off.



1. **Acorn nut and spacer**
2. **Rubber coated tip (2)**
3. **Tool body**
4. **Handle**

Figure 3-24. Removing Piston Pin with HD-42320-A Piston Pin Remover

CYLINDER HEAD 3.13

DISASSEMBLY

PART NUMBER	TOOL NAME
HD-34736-B	VALVE SPRING COMPRESSOR

1. See Figure 3-25. Clamp VALVE SPRING COMPRESSOR (Part No. HD-34736-B) in vise. Compress valve spring.
2. See Figure 3-26. Remove valve collar retainers (7), upper valve spring collar (6) and valve spring (5). Mark valve collar retainers for reassembly in original positions.
3. Use a fine tooth file to remove any burrs on the valve stem at the retainer groove. Mark valve to match with cylinder head.
4. Remove valve (1), valve seal and lower valve spring collar (4) by hand. No special tools are required to remove valve seal and lower valve spring collar assembly.

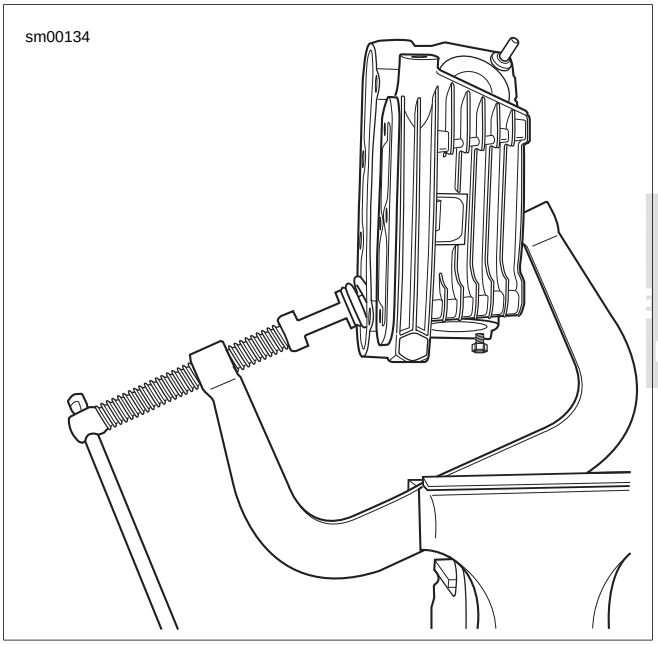
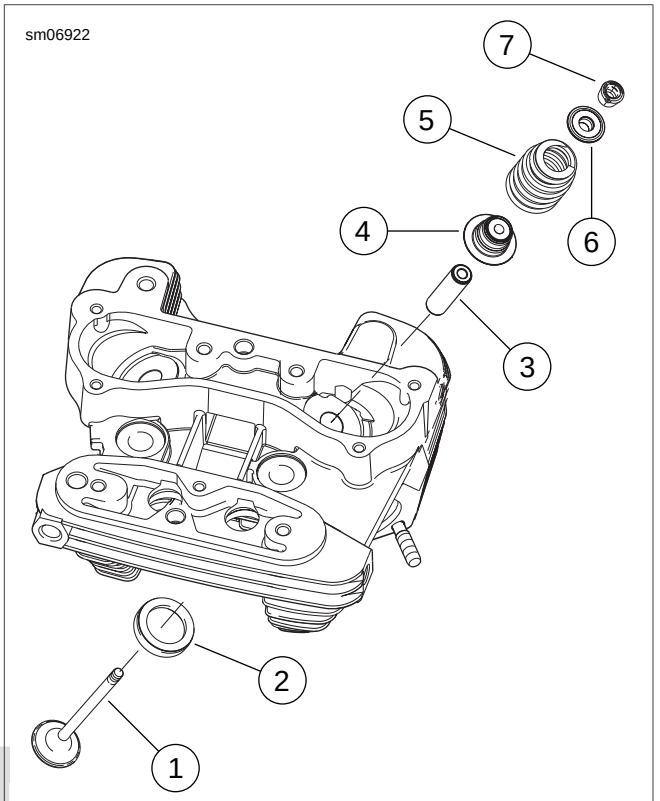


Figure 3-25. Valve Spring Compressor



1. **Valve**
2. **Valve seat**
3. **Valve guide**
4. **Valve seal and lower spring collar**
5. **Spring**
6. **Upper valve spring collar**
7. **Collar retainer**

Figure 3-26. Cylinder Head

CLEANING AND INSPECTION

PART NUMBER	TOOL NAME
B-45525	VALVE GUIDE HONE
HD-34751	VALVE GUIDE CLEANING BRUSH
HD-96796-47	VALVE SPRING TESTER

Cylinder Heads

⚠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. Bead blast or scrape carbon from head and valve ports. Be careful to avoid scratching or nicking cylinder head-to-cylinder joint faces. Blow off loosened carbon or dirt with compressed air.

2. Soak cylinder head in an aluminum-compatible cleaner/solvent to loosen carbon deposits.
3. Wash all parts in non-flammable solvent, followed by a thorough washing with 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)

4. Blow out oil passages in head. Be sure they are free of sludge and carbon particles.
5. Remove loosened carbon from valve head and valve stem using a wire wheel. Never use a file or other hardened tool which could scratch or nick valve.
6. Polish valve stem with very fine emery cloth or steel wool.
7. See Figure 3-27. Check head gasket surface on head for flatness. Machine or replace any head which exceeds SERVICE WEAR LIMIT of 0.006 in (0.152 mm).

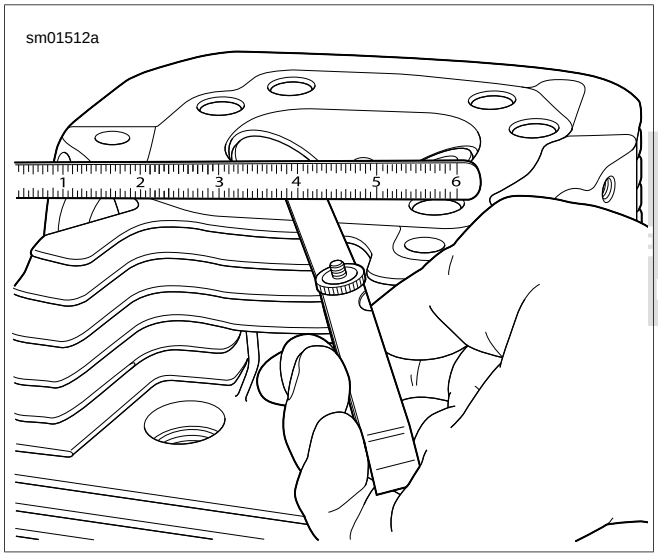


Figure 3-27. Gasket Surface: Flat Within 0.006 in (0.152 mm)

Rocker Arm Assemblies

1. Check each rocker arm at pad end and pushrod end for uneven wear or pitting. Replace rocker arm if either condition exists.

NOTE

Most of the wear in rocker arm shafts and bores results from the up and down movement of the pushrods and valves. Therefore, the following measurements should be taken top-to-bottom on rocker arm shafts and bores.

2. See Figure 3-28. Measure and record rocker arm shaft diameter at the positions where rocker arm bushings ride and where shaft fits in inner rocker cover.

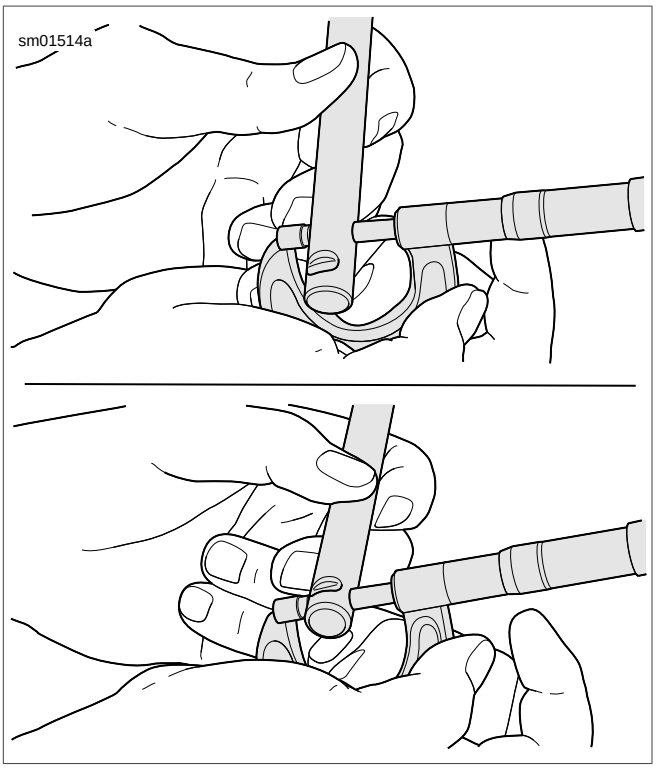


Figure 3-28. Measuring Rocker Arm Shaft Diameter at Bushing Position (top) and Cover Position (bottom)

3. Measure and record rocker arm shaft bore diameters.
   a. See Figure 3-29. Measure rocker arm shaft bore in inner rocker cover.
   b. See Figure 3-30. Measure rocker arm bushing inner diameter.
4. Check clearances and measurements obtained in step 3 against specifications in 3.2 SPECIFICATIONS. Repair or replace parts exceeding Service Wear Limits. If rocker arm bushings require replacement, see 3.13 CYLINDER HEAD, Replacing Rocker Arm Bushings.
5. See Figure 3-31. Assemble rocker arms and rocker arm shafts into inner rocker cover.
6. Check end play of rocker arm with feeler gauge. Replace rocker arm or inner rocker cover or both if end play exceeds 0.025 in (0.635 mm).

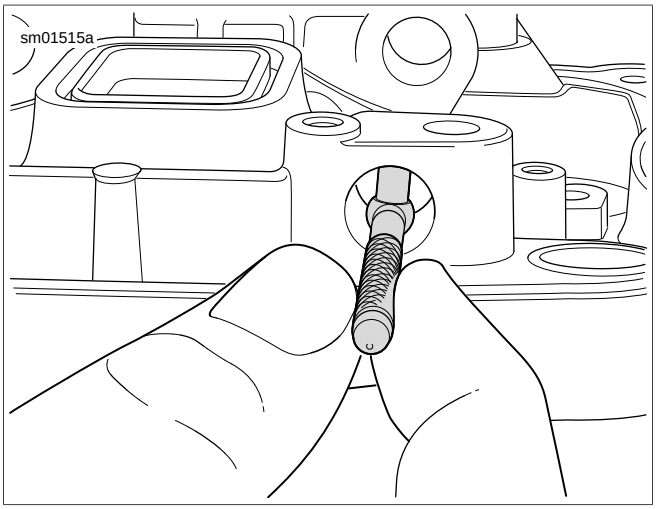


Figure 3-29. Measuring Rocker Arm Shaft Bore Diameter in Inner Rocker Cover

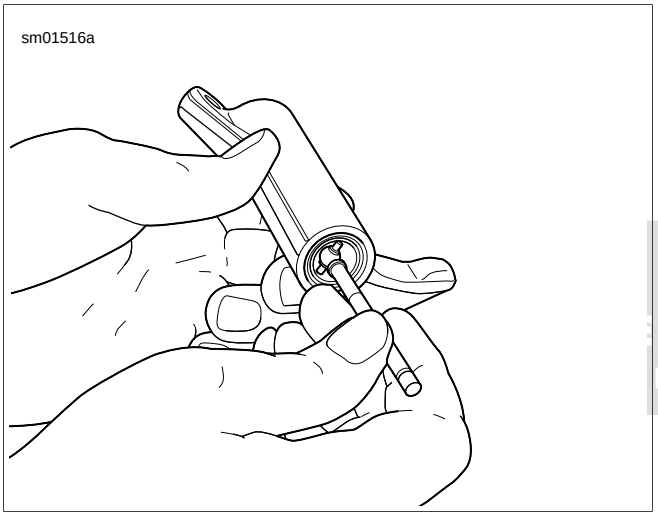
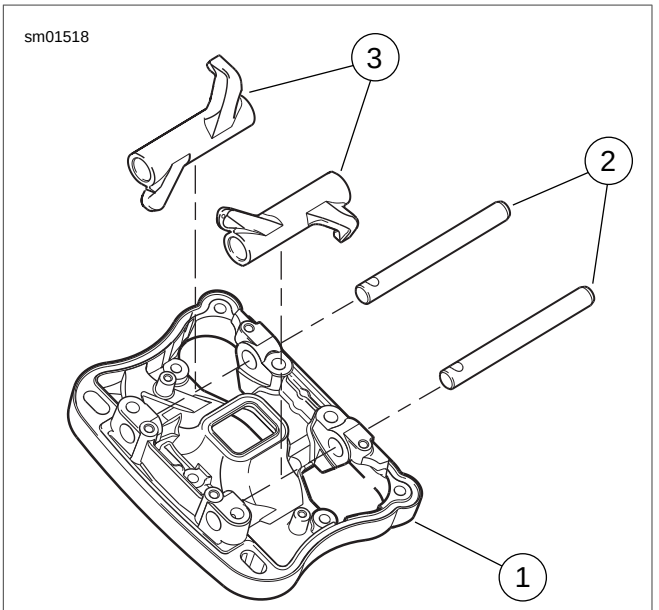


Figure 3-30. Measuring Rocker Arm Bushing Inner Diameter



1. **Inner rocker cover**
2. **Rocker arm shaft (2)**
3. **Rocker arm (2)**

Figure 3-31. Assembling Inner Rocker Cover (typical)

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 necessary.
3. Inspect for burrs around the valve stem retainer groove. Remove burrs with a fine tooth file if found.
4. Inspect valves. Replace as necessary.
   a. Verify a seating surface width of 0.040-0.062 in (1.02-1.57 mm).
   b. Check for pit marks and burn spots.
   c. Verify color of carbon on exhaust valves as black or dark brown.
   d. Check for white or light buff carbon indicating excessive heat and burning.

Valve Seats

NOTE

Valve seats are subject to wear, pitting, and burning. Resurface valve seats after finishing valves.

1. Inspect valve seats for cracking, chipping or burning. Replace valve seats if necessary.

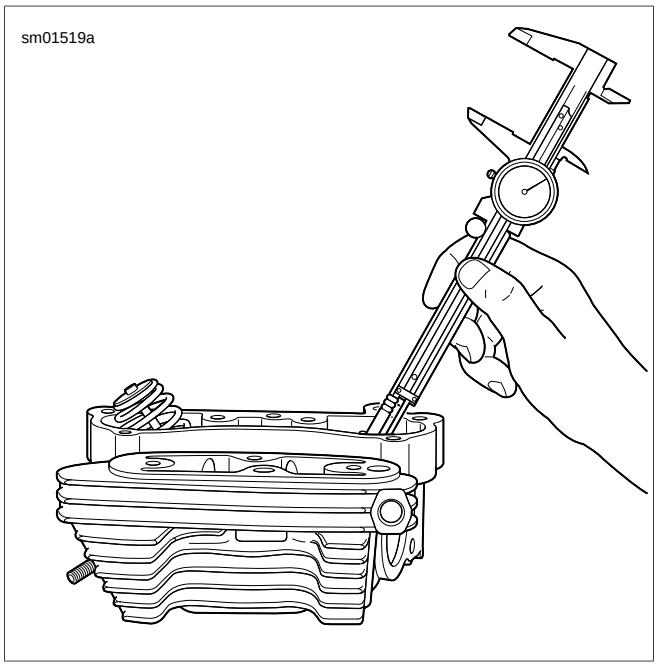


Figure 3-32. Measuring Valve Stem Protrusion

2. See Figure 3-32. Check valve seats for recession by measuring valve stem protrusion.
   a. Wipe valve seats and valve faces clean. Insert valve into valve guide.
   b. Measure valve stem protrusion from end of valve stem to machined surface of head upon which the lower valve collar sits, as shown. If valve stem protrudes more than 2.082 in (52.883 mm), replace valve seat or cylinder head.

NOTE

If the valve seat is loose or is not fully seated in the head, seat movement will prevent the proper transfer of heat from the valve. The valve seat surface must be flush with (or below) the head surface. See 3.2 SPECIFICATIONS for valve seat-to-cylinder head fit.

Valve Guides

1. Clean valve guides by lightly honing with VALVE GUIDE HONE (Part No. B-45525).
2. Scrub valve guides with VALVE GUIDE CLEANING BRUSH (Part No. HD-34751) and hot soapy water.
3. Measure valve stem outer diameter and valve guide inner diameter. Replace if the guides do not match specifications. See 3.2 SPECIFICATIONS.

Valve Springs

1. Inspect valve springs for damaged or discolored coils.
2. See Figure 3-33. Measure free length of each spring. Refer to Table 3-26.
3. Test compression force of spring using VALVE SPRING TESTER (Part No. HD-96796-47). Refer to Table 3-26.
4. Replace as necessary.

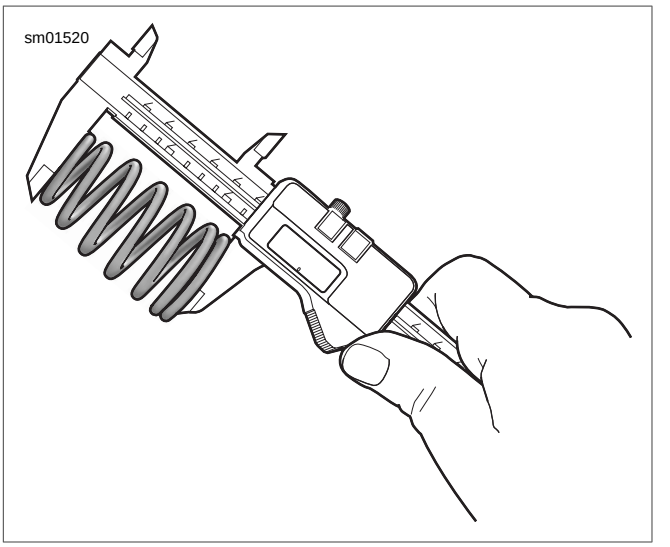


Figure 3-33. Checking Spring Free Length

Table 3-26. Valve Spring Specifications

SPRING	U.S.	METRIC
Length (min)	2.325 in	59.1 mm
Compression (min)	297 lb @ 1.300 in	1321 N @ 33.02 mm
Compression (max)	327 lb @ 1.300 in	1455 N @ 33.02 mm

Spark Plug Threads

Inspect spark plug threads for damage. If threads in cylinder head are damaged, a special plug type insert can be installed using a 12 mm spark plug repair kit.

Pushrods

Examine pushrods, particularly the ball ends. Replace any rods that are bent, worn, discolored or damaged.

REPLACING ROCKER ARM BUSHINGS

PART NUMBER	TOOL NAME
HD-94804-57	ROCKER ARM BUSHING REAMER

1. See Figure 3-34. To replace worn bushings, press or drive them from the rocker arm. If bushing is difficult to remove, turn a 9/16-18 tap into bushing. From opposite side of rocker arm, press out bushing and tap using a discarded rocker arm shaft.
2. Press replacement bushing into rocker arm, flush with rocker arm end, and split portion of bushing towards top of rocker arm.
3. Using remaining old bushing as a pilot, line ream **new** bushing with ROCKER ARM BUSHING REAMER (Part No. HD-94804-57).
4. Repeat for other end of rocker arm.

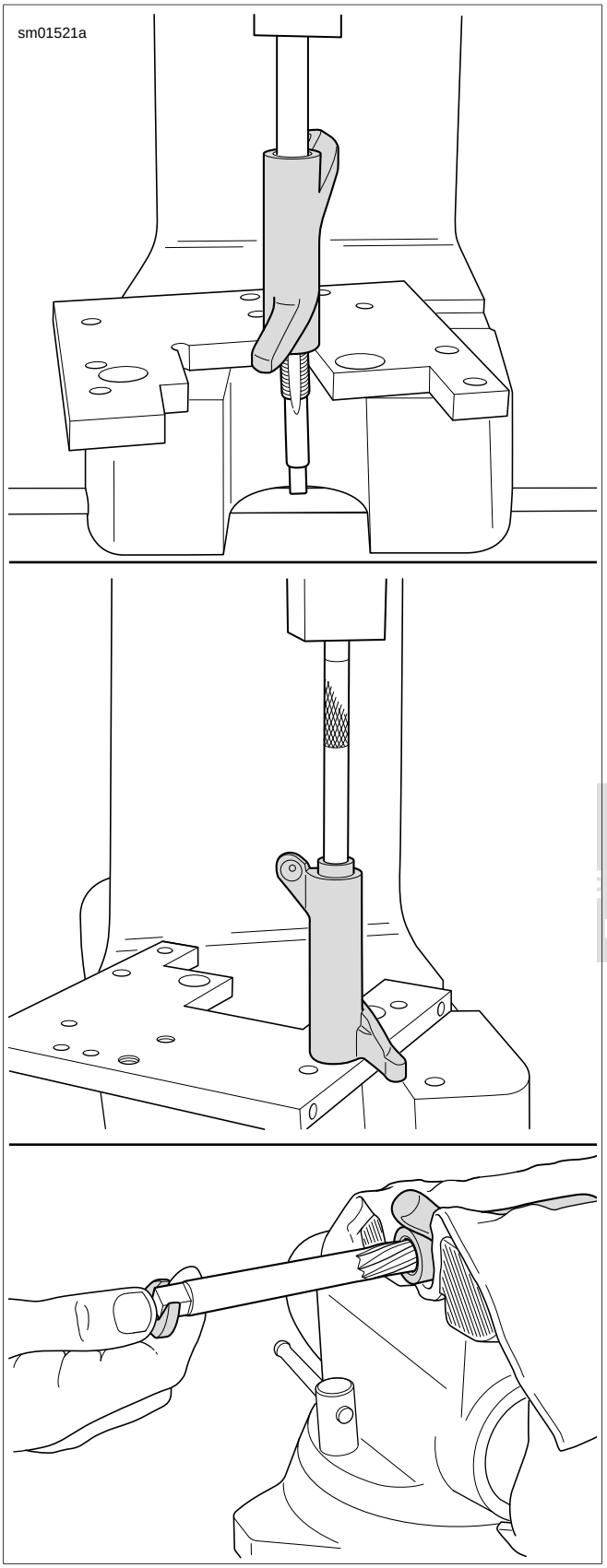


Figure 3-34. Replacing Rocker Arm Bushings

REPLACING VALVE GUIDES

PART NUMBER	TOOL NAME
B-45523	VALVE GUIDE REAMER
B-45524	VALVE GUIDE REMOVER/INSTALLER
B-45525	VALVE GUIDE HONE
HD-34751	VALVE GUIDE CLEANING BRUSH
HD-39782-A	CYLINDER HEAD SUPPORT STAND
HD-39786	CYLINDER HEAD HOLDING FIXTURE
HD-39847	REAMER T-HANDLE
HD-39964	REAMER LUBRICANT

Replace valve guides before grinding valve seats. The valve stem bore in valve guide determines valve seat grinding location. If valve stems and/or valve guides are worn beyond service wear limits, install **new** parts. Refer to Table 3-27.

Removal

NOTE

Always use cylinder head support stand. Misalignment during valve guide replacement can damage cylinder head valve guide bore.

1. See Figure 3-35. Prepare cylinder head for valve guide replacement.
   a. Insert sleeve of intake (4 or 6) or exhaust (5 or 7) seat adapter into tube at top of CYLINDER HEAD SUPPORT STAND (Part No. HD-39782-A) (3).
   b. Center valve seat on seat adapter.

NOTE

Do not press out the valve guide from the bottom of the cylinder head. Excessive carbon buildup prevents a proper interference fit for valve guides.

2. See Figure 3-36. At top of the cylinder head, insert VALVE GUIDE REMOVER/INSTALLER (Part No. B-45524) (1) into valve guide bore until tool shoulder contacts end of valve guide.

NOTE

See Figure 3-35. Installer sleeve (2) is not used for valve guide removal.

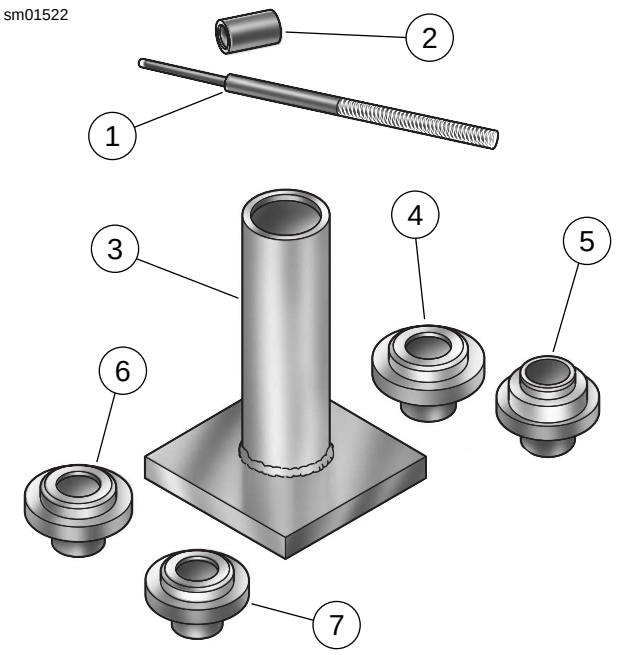
3. Center VALVE GUIDE REMOVER/INSTALLER under press ram (3). Apply pressure until valve guide drops free of cylinder head. Discard valve guide.

Table 3-27. Valve Stem Clearance/Service Wear Limits

VALVE	CLEARANCE		SERVICE WEAR LIMIT	
	in	mm	in	mm
Intake	0.001-0.003	0.0254-0.0762	0.0035	0.0965
Exhaust	0.001-0.003	0.0254-0.0762	0.0035	0.0965

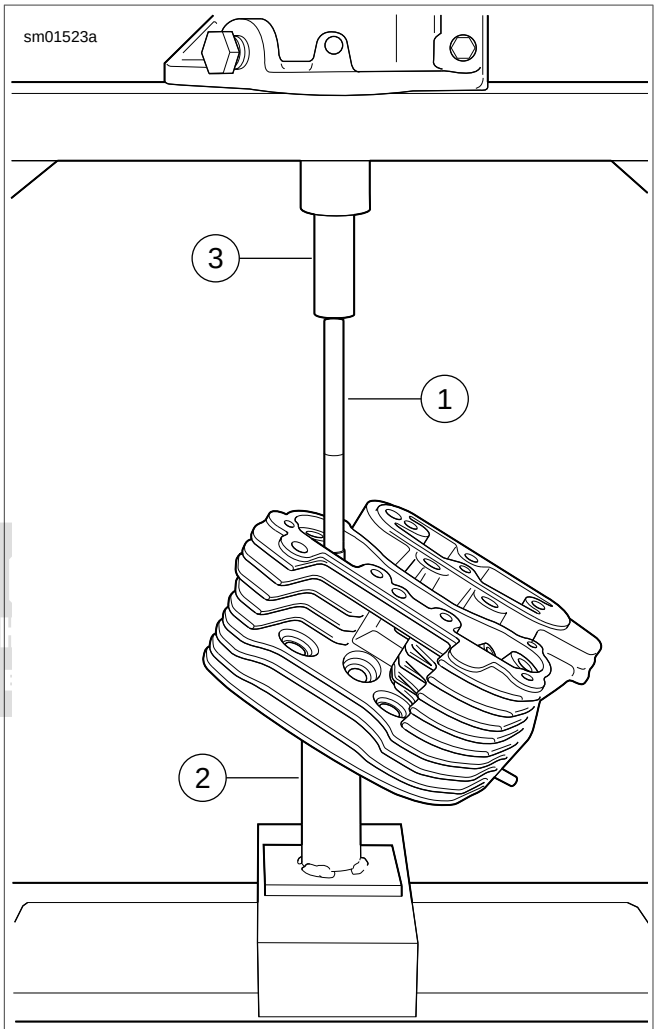
Table 3-28. Valve Guide Remover/Installer Components

PART NO	ITEM
B-45524	Valve guide remover/installer with installer sleeve
HD-39782-A	Cylinder head support stand
HD-39782-2	Intake seat adapter, 883
HD-39782-3	Exhaust seat adapter, 883
HD-39782-6	Intake seat adapter, 1200
HD-39782-7	Exhaust seat adapter, 1200



1. **Valve guide remover/installer**
2. **Installer sleeve**
3. **Cylinder head support stand**
4. **Intake seat adapter, 883**
5. **Exhaust seat adapter, 883**
6. **Intake seat adapter, 1200**
7. **Exhaust seat adapter, 1200**

Figure 3-35. Valve Guide Replacement Tools



1. **Valve guide remover/installer**
2. **Cylinder head support stand**
3. **Ram**

Figure 3-36. Removing Shoulderless Valve Guide

Installation

1. Check valve guide to valve guide bore clearance.
   a. Measure outer diameter of a **new** standard valve guide.
   b. Measure the cylinder head valve guide bore. The valve guide diameter should be 0.0020-0.0033 in (0.0508-0.0838 mm) larger than cylinder head valve guide bore.
   c. If interference fit is within specification, use a replacement valve guide. If interference fit is not within specification, replace the cylinder head.
2. Measure cylinder head bore and outside diameter of replacement valve guide to verify correct interference fit.

NOTE

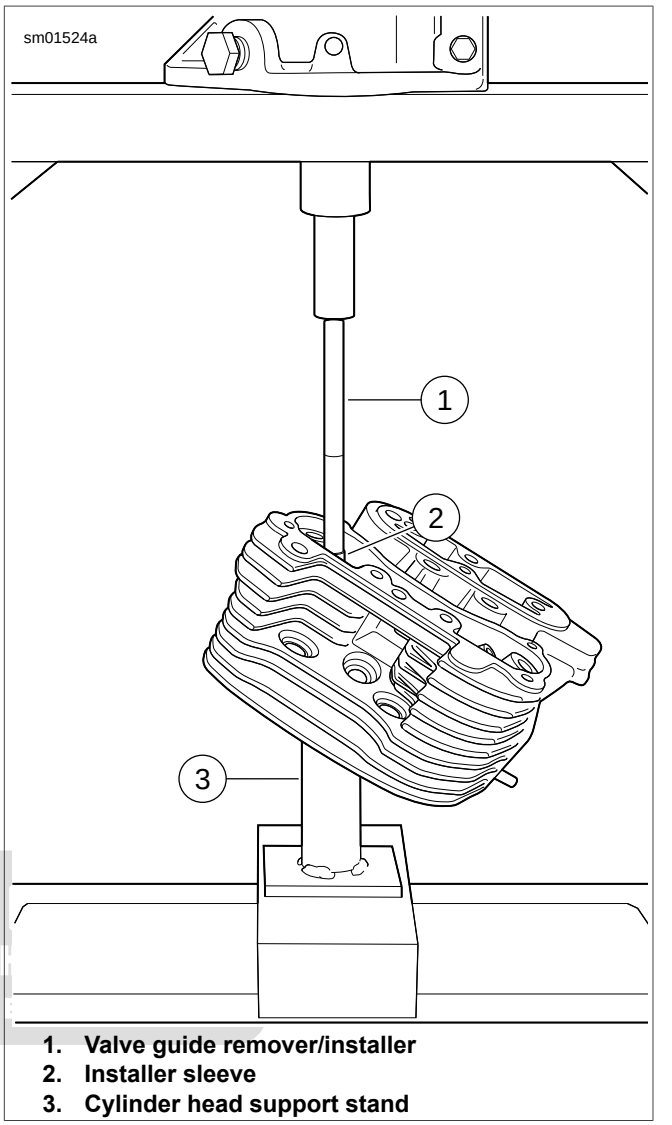
Always use cylinder head support stand. Misalignment during valve guide replacement can damage cylinder head valve guide bore.

3. Prepare cylinder head for valve guide replacement.
   a. See Figure 3-35. Insert sleeve of intake (4 or 6) or exhaust (5 or 7) seat adapter into tube at top of cylinder head support stand (3). Position cylinder head so that valve seat is centered on seat adapter.
   b. Apply petroleum jelly to lightly lubricate external surfaces of valve guide. Spread lubricant so that thin film covers entire surface area.
   c. Start valve guide into bore at top of cylinder head.
   d. Place installer sleeve (2) over valve guide. Insert VALVE GUIDE REMOVER/INSTALLER (1) into installer sleeve.
   e. See Figure 3-37. Center VALVE GUIDE REMOVER/INSTALLER (1) under press ram. Apply pressure until valve guide is started in bore. Back off ram slightly to allow valve guide to center itself.

NOTE

Always back off ram to allow the valve guide to find center. Pressing valve guide into cylinder head in one stroke can damage remover/installer, valve guide and/or cylinder head.

   f. Verify that cylinder head support stand (3) and VALVE GUIDE REMOVER/INSTALLER are square. Center VALVE GUIDE REMOVER/INSTALLER under ram and press valve guide further into bore, then back off ram again to allow valve guide to find center.
   g. Repeat previous step and then apply pressure to VALVE GUIDE REMOVER/INSTALLER until installer sleeve (2) contacts machined area of cylinder head surrounding valve guide.



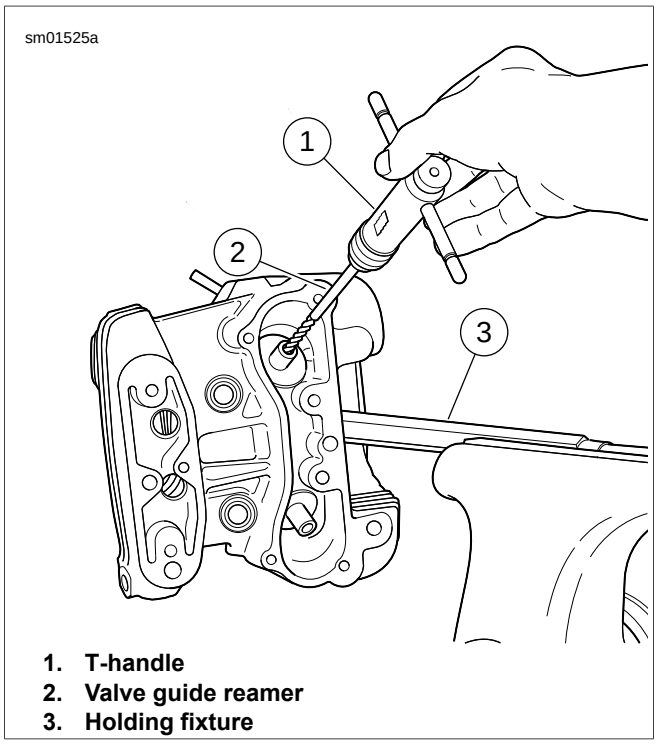
1. **Valve guide remover/installer**
2. **Installer sleeve**
3. **Cylinder head support stand**

Figure 3-37. Installing Shoulderless Valve Guide

4. Secure cylinder head for service.
   a. See Figure 3-38. Thread 12 mm end of CYLINDER HEAD HOLDING FIXTURE (Part No. HD-39786) (3) 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**
3. **Holding fixture**

Figure 3-38. Reaming Valve Guide Bore

NOTES

- *Avoid damage to valve guide bore. Never back reamer out of valve guide.*
- *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.*

5. Obtain the VALVE GUIDE REAMER (Part No. B-45523) (2) and REAMER T-HANDLE (Part No. HD-39847) (1).
   a. Install T-handle on reamer.
   b. Start bit of reamer into bore at top of cylinder head.
   c. Placing thumb on drive socket of REAMER T-HANDLE, apply slight pressure rotating clockwise.
   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. Carefully pulling on bit, draw reamer shaft 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)

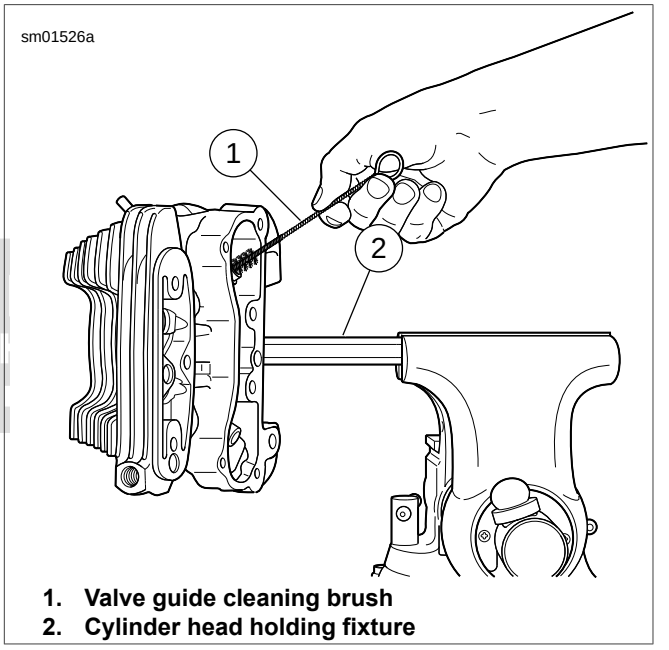
NOTE

Abrasive particles can damage machined surfaces and plug oil passageways possibly resulting in engine failure.

6. Direct low pressure compressed air into the valve guide bore to remove any metal shavings or debris.
7. See Figure 3-39. Clean valve guide bore with VALVE GUIDE CLEANING BRUSH (Part No. HD-34751) (1).
8. See Figure 3-40. Obtain 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. Complete 10 to 12 strokes using entire length of finishing stone arrangement and drill. Work for a crosshatch pattern of approximately 60 degrees.

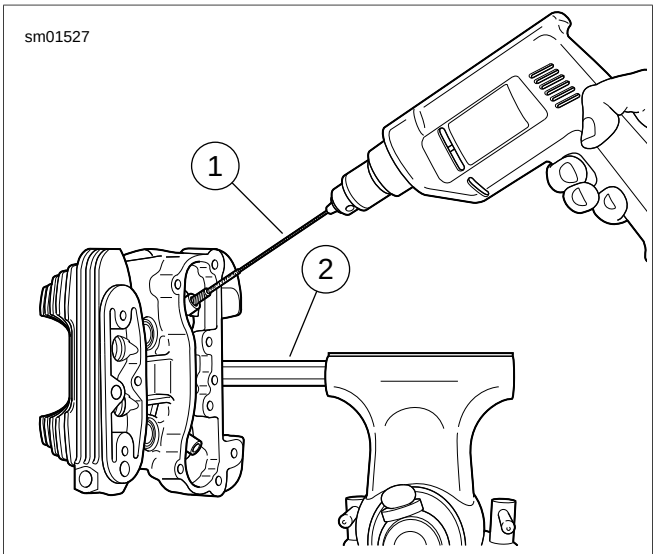
NOTE

The hone is not intended for the removal of material.



1. **Valve guide cleaning brush**
2. **Cylinder head holding fixture**

Figure 3-39. Scrubbing Valve Guide Bore



1. **Valve guide hone**
2. **Cylinder head holding fixture**

Figure 3-40. Honing Valve Guide Bore

⚠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)

NOTE

Abrasive particles can damage machined surfaces and plug oil passageways possibly resulting in engine failure.

9. Direct low pressure compressed air into the valve guide bore to remove any debris.
10. See Figure 3-39. Clean bore with the VALVE GUIDE CLEANING BRUSH (1).

NOTE

Always verify valve stem to valve guide clearance after honing, since a worn reamer may cut the bore undersize.

11. 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. If valve stem to valve guide clearance is not within specification, the valve stem may be excessively worn or the valve guide bore undercut. Refer to Table 3-27.
12. 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. 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)

13. Dry parts with low-pressure, compressed air.

REFACING VALVE SEATS

PART NUMBER	TOOL NAME
B-35758-52A	CUTTER PILOT
HD-34751	VALVE GUIDE CLEANING BRUSH
HD-35758-C	NEWAY VALVE SEAT CUTTER SET
HD-39786	CYLINDER HEAD HOLDING FIXTURE

NOTES

- *Check that valve stem to valve guide clearance is correct before refacing. Refer to Table 3-27. If **new** valve guides must be installed, see 3.13 CYLINDER HEAD, Replacing Valve Guides and 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 46 degree valve seat.*
- *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.*

1. 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. 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.
2. To determine the correct location of the 46 degree valve seat in the head, measure the width of the valve. Subtract 0.080 in (2.032 mm) from that number.
3. Set your dial caliper to the lesser measurement. Lock the caliper for reference. This is the location of your valve seat.

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4. Use a permanent magic marker to highlight the valve seat area to be cut. Highlight all three angles. Allow marker to dry.

NOTES

- *Clean the cutter blades and cutter pilot. The correct cleaning brush is supplied with the Neway tool set.*
- *Clean the inside of the valve guide with the VALVE GUIDE BRUSH.*

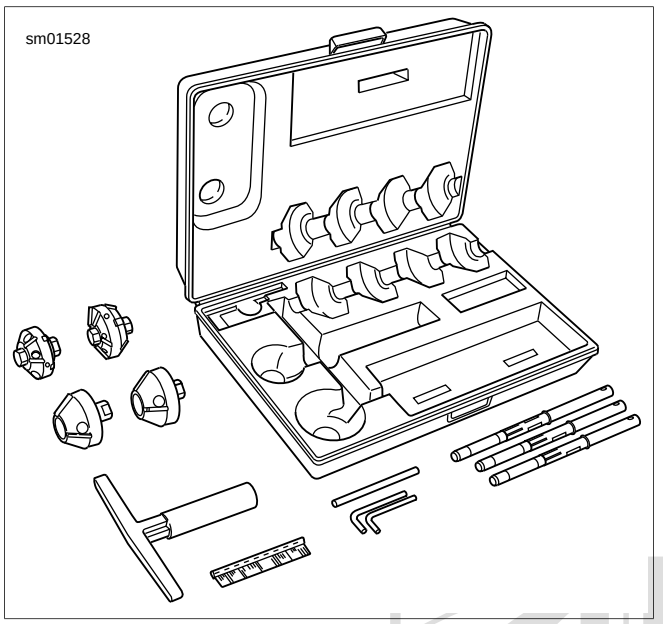


Figure 3-41. Neway Valve Seat Cutter Set (Part No. HD-35758-C)

5. See Figure 3-41. Obtain the NEWAY VALVE SEAT CUTTER SET (Part No. HD-35758-C). Select the correct CUTTER PILOT (Part No. B-35758-52A). Securely seat the pilot by pushing down and turning using the installation tool supplied in the tool set.
6. Choose the proper 46 degree cutter (intake or exhaust) and gently slide the cutter onto the pilot. Do not drop the cutter onto the valve seat.

NOTE

Do not remove any more metal than is necessary.

7. Apply constant pressure. Cut the seat to a uniform finish and to remove pitting.

NOTES

- *If the width of the clean-up angle is greater on one side of the valve seat than the other, replace the valve guide.*
- *After making the 46 degree cut, a groove cut completely around the valve seat indicates worn cutter blades. This condition can be corrected by staggering the blades. Loosen all blades. Move each blade slightly 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 degree will help in determining where new angles are.*

8. Lock a dial caliper to the predetermined setting. Measure the 46 degree cut at the outermost edge at the widest point of the circle to determine the next cut.
   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 verify the location of the 46 degree valve seat.*

9. If the location of the valve seat is not correct, repeat previous two steps.
10. 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.
11. Select the proper 60 degree cutter and gently slide the cutter down the cutter pilot to the valve seat.
12. Remove just enough material to provide an even valve seat width of 0.040-0.062 in (1.016-1.575 mm).
13. Remove cutter and cutter pilot.
14. Repeat the process on any valve seat that needs service.
15. Insert valve in the valve guide and bottom on the valve seat. Position the cylinder head port upwards with slight thumb pressure against the valve. Fill the port with solvent to seal the valve to the seat.

NOTE

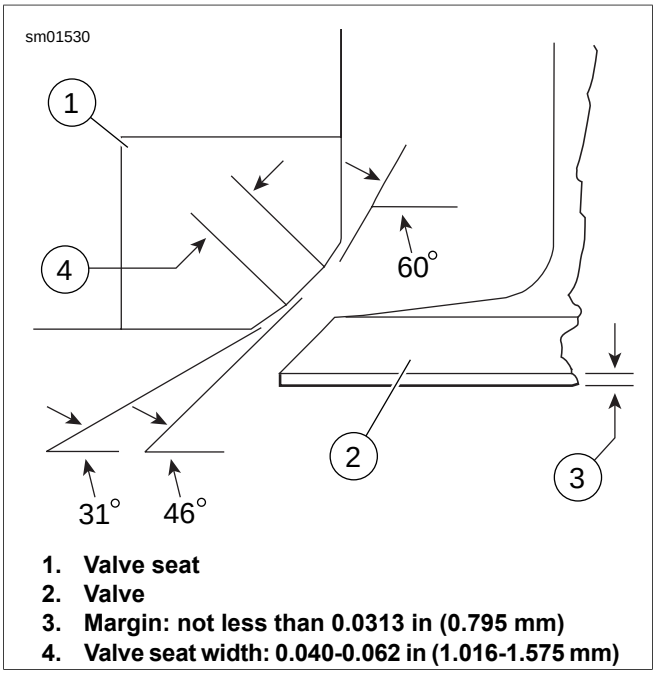
Hold pressure against the valve for a minimum of 10 seconds. If any leakage occurs, examine the valve seat for irregularities or defects and if necessary repeat the above cutting process.

16. Clean valves, cylinder head and valve seats in solvent. Follow up with a thorough wash in hot soapy water.
17. Scrub valve guide bores with VALVE GUIDE CLEANING BRUSH (Part No. HD-34751) and 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)

18. Blow parts dry with low pressure compressed air.



1. **Valve seat**
2. **Valve**
3. **Margin: not less than 0.0313 in (0.795 mm)**
4. **Valve seat width: 0.040-0.062 in (1.016-1.575 mm)**

Figure 3-42. Intake and Exhaust Valve and Seat Dimensions

Replacing Valve Seats

Replacing a valve seat is a complex operation requiring special equipment. If the valve seat is loose or not fully seated, transfer of heat from the valve will be impaired. The valve seat surface must be flush with or below the head surface. See 3.2 SPECIFICATIONS.

ASSEMBLY

PART NUMBER	TOOL NAME
HD-34736-B	VALVE SPRING COMPRESSOR

1. Apply a liberal amount of SCREAMIN' EAGLE ASSEMBLY LUBE to the valve stem.
2. See Figure 3-47. Insert valve (1) into valve guide (3) and bottom valve on valve seat (2).
3. See Figure 3-43. Place a protective sleeve over the valve stem keeper groove. Coat the protective sleeve with SCREAMIN' EAGLE ASSEMBLY LUBE.

NOTES

- *Always use a protective sleeve on the valve stem keeper groove when installing valve stem seal. Installation without the protective sleeve will damage the seal. This will cause leaking around the valve stem, excessive oil consumption and valve sticking.*
- *See Figure 3-44. The valve seal is incorporated into the lower valve collar and is installed by hand. NO SPECIAL TOOLS ARE REQUIRED.*
- *The valve seal is completely installed when the lower valve collar contacts the machined surface of the head.*

4. See Figure 3-45. Place a **new** seal and lower valve collar assembly over valve stem and onto valve guide.

NOTES

- *Do not remove valve after seal is installed. Otherwise, sharp edges on keeper groove will damage seal.*
- *A single valve spring is used for each valve.*

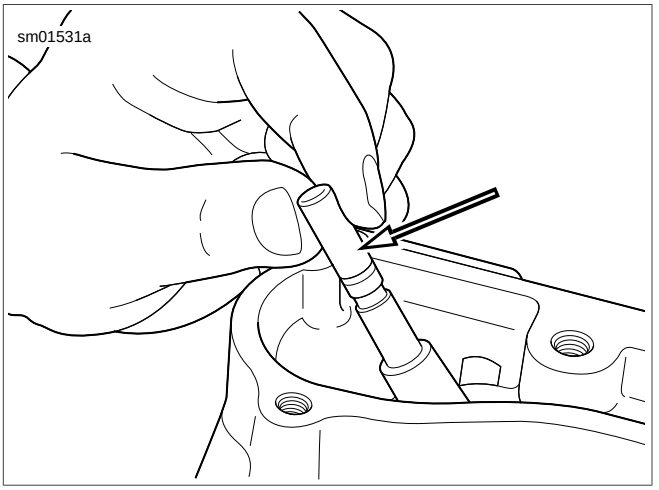


Figure 3-43. Valve Guide Seal Protector Sleeve

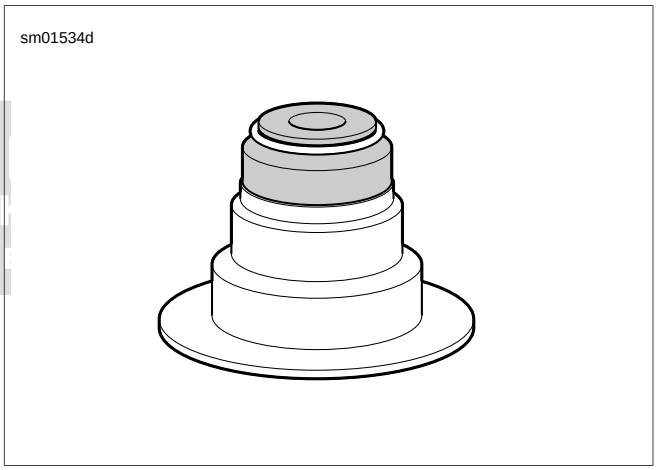


Figure 3-44. Valve Seal and Lower Valve Collar Assembly (seal and lower collar replaced as assembly only)

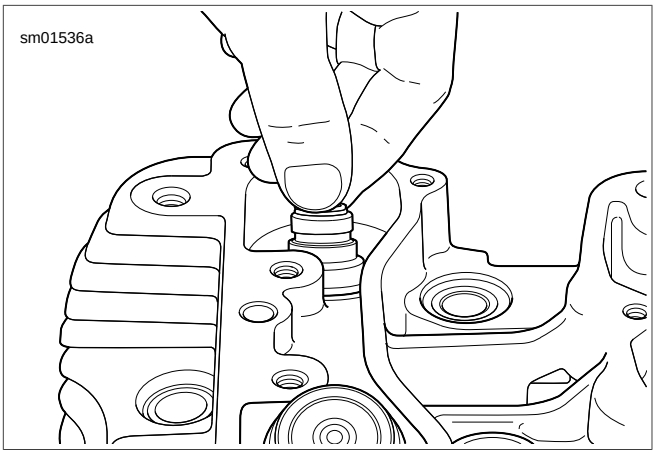


Figure 3-45. Valve Seal and Lower Valve Collar Assembly Installation

5. See Figure 3-47. Install valve spring (5) and upper collar (6).
6. See Figure 3-46. Compress valve spring with VALVE SPRING COMPRESSOR (Part No. HD-34736-B).
7. See Figure 3-47. Insert valve collar retainers (7) into upper collar, making sure they engage groove in valve stem. The retainer gaps should be equal.
8. Release and remove VALVE SPRING COMPRESSOR.
9. Repeat previous steps for remaining valve(s).

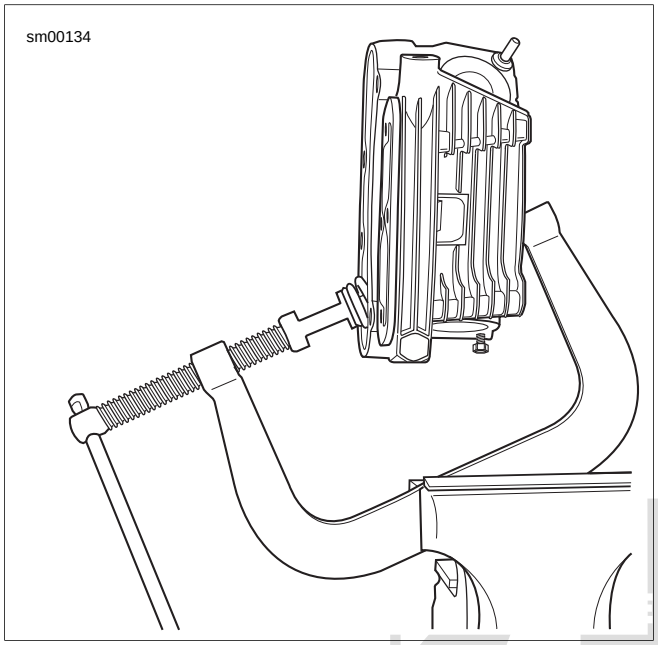
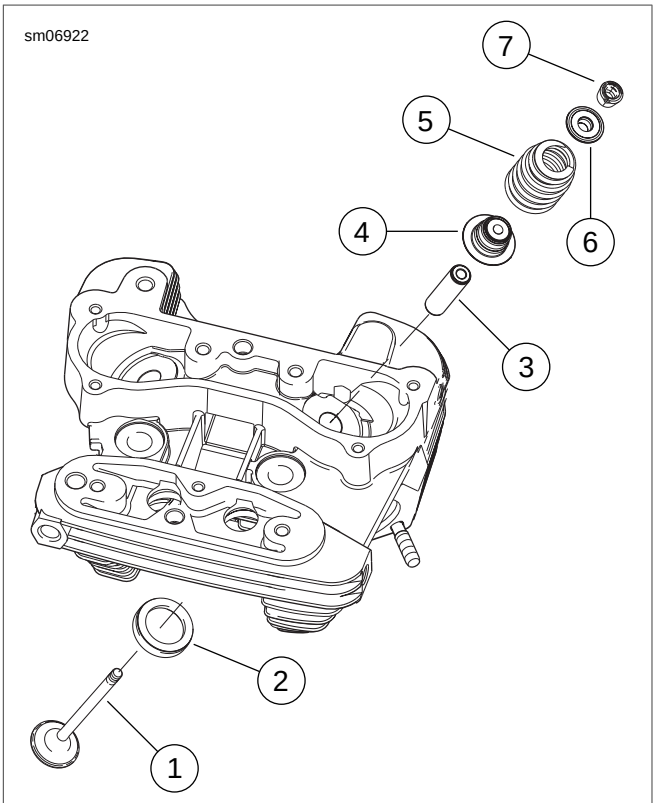


Figure 3-46. Valve Spring Compressor



1. **Valve**
2. **Valve seat**
3. **Valve guide**
4. **Valve seal and lower spring collar**
5. **Spring**
6. **Upper valve spring collar**
7. **Collar retainer**

Figure 3-47. Cylinder Head

CYLINDER AND PISTON 3.14

CLEANING, INSPECTION AND REPAIR

PART NUMBER	TOOL NAME
HD-33446-86	TORQUE PLATE BOLTS
HD-33446-B	CYLINDER TORQUE PLATES

1. Soak cylinder and piston in an aluminum-compatible cleaner/solvent until deposits are soft. Clean with a brush. Blow off loosened carbon and dirt particles. Wash in 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. Clean oil passage in cylinder with low pressure compressed air.
3. Clean piston ring grooves with a piece of compression ring ground to a chisel shape.
4. Inspect piston pin to see that it is not pitted or scored.
5. Check piston pin bushing to see that it is not loose in connecting rod, grooved, pitted or scored.
   a. A piston pin properly fitted to upper connecting rod bushing has a 0.00125-0.00175 in (0.0317-0.0444 mm) clearance in bushing.
   b. If piston pin-to-bushing clearance exceeds 0.002 in (0.0508 mm), replace worn parts. See 3.14 CYLINDER AND PISTON, Connecting Rod Bushings.
6. Clean piston pin lock ring grooves.
7. Inspect piston and cylinder for cracks, burnt spots, grooves and gouges.

NOTE

Check connecting rod for up and down play in lower bearings. When up and down play is detected, replace flywheel and connecting rod assembly.

Checking Gasket Surface

NOTE

Replace the cylinder and piston if either cylinder gasket surface does not meet specification.

1. See Figure 3-48. Check that cylinder top (head) gasket surface is flat within 0.006 in (0.15 mm).
   a. Lay a straight edge across the surface.
   b. Insert a feeler gauge between the straightedge and the gasket surface.
2. Check that the cylinder base gasket surface is flat within 0.008 in (0.20 mm).
   a. Lay a straightedge across the surface.
   b. Insert a feeler gauge between the straightedge and the gasket surface.

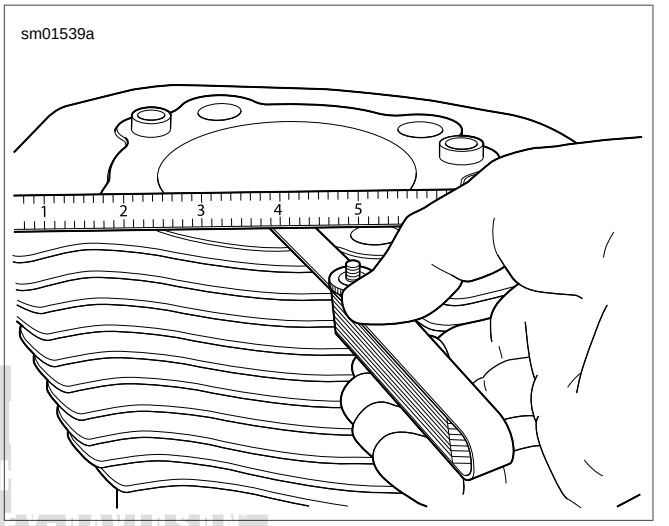


Figure 3-48. Checking Gasket Surfaces

Measuring Cylinder Bore

1. See Figure 3-49. Remove any burrs from the cylinder gasket surfaces.
2. Install a head and base gasket and CYLINDER TORQUE PLATES (Part No. HD-33446-B) and TORQUE PLATE BOLTS (Part No. HD-33446-86). Tighten in the cylinder head torque sequence. See 3.15 TOP END OVERHAUL: ASSEMBLY, Cylinder Head.

NOTE

Torque plates simulate operating conditions. Without torque plates, measurements vary as much as 0.001 in (0.025 mm).

3. Take cylinder bore measurement in ring path, starting about 1/2 in (13 mm) from top of cylinder, measuring from front to rear, and then side to side. Record readings.
4. Measure at top, center and bottom of the ring path. Record readings. Determine if the cylinder is out-of-round, tapered or bulged. Refer to Table 3-29.

Table 3-29. Cylinder Bore Service Wear Limits

BORE SIZE	XL 883		XL 1200	
	in	mm	in	mm
Standard bore	3.0035	76.289	3.5008	88.920
0.005 in (0.13 mm) Oversize	3.0078	76.398	3.5050	89.027
0.010 in (0.25 mm) OS bore	3.0128	76.525	3.5100	89.154

NOTE

If piston clearance exceeds service limit, cylinders should be bored and honed to next standard oversize. Fit the cylinder with the oversized piston and rings. Do not fit piston tighter than 0.0007 in (0.018 mm). See 3.2 SPECIFICATIONS.

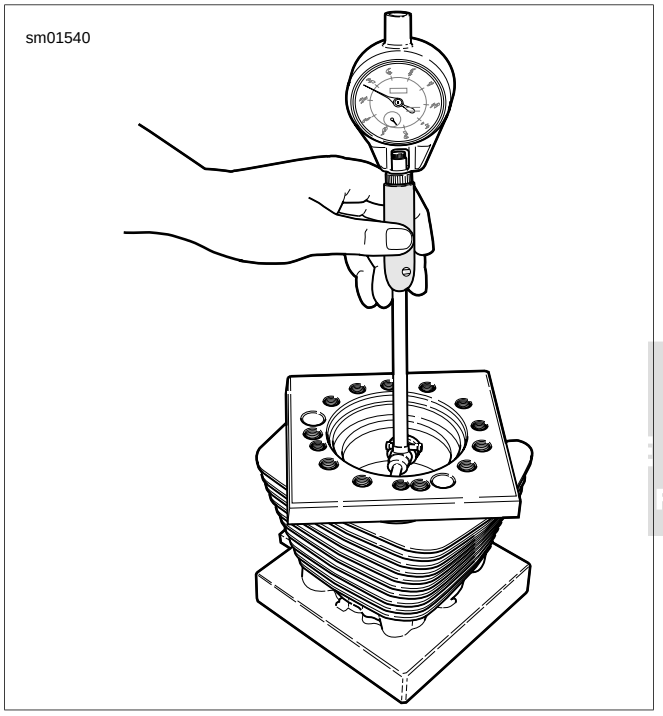


Figure 3-49. Measuring Cylinder Bore

Measuring Piston to Cylinder Fit

NOTES

- *This measurement is heat sensitive. Both piston and cylinder must be at room temperature. Holding the piston in your hand for too long can cause measurements to vary by as much as 0.002 in (0.051 mm).*
- *See Figure 3-50. The measurement is taken on bare aluminum to avoid measuring errors. An oval-shaped opening in the coating is present on each side of the piston for placement of the micrometer.*
- *See Figure 3-51. The oval openings are too small for a standard flat anvil micrometer. Use a 3-4 inch blade or ball anvil style micrometer, or a 4-5 inch micrometer with spherical ball anvil adapters.*

1. Measure the piston skirt at the oval openings. Transfer that measurement to a dial bore gauge.

NOTE

Install the torque plates on the cylinder.

2. Mark the top, middle and bottom of the piston ring travel zone with a marker. Measure at markings in cylinder parallel and perpendicular to crankshaft.
3. Replace piston and/or cylinder if running clearance exceeds 0.003 in (0.076 mm).

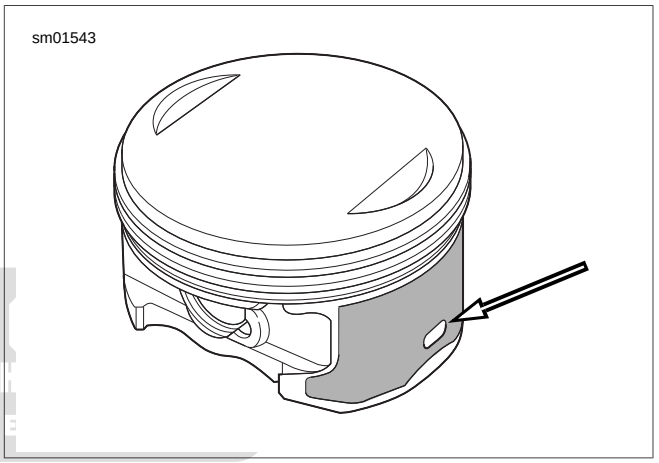
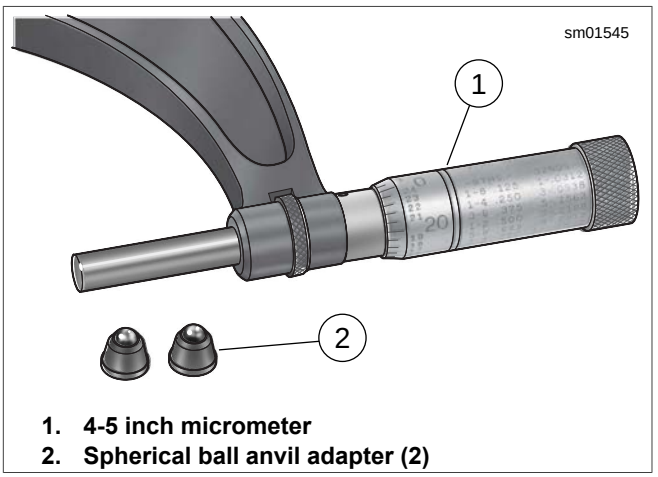


Figure 3-50. Measurement Area



1. **4-5 inch micrometer**
2. **Spherical ball anvil adapter (2)**

Figure 3-51. Micrometer with Anvil Adapters

Boring and Honing Cylinder

1. The cylinder must be bored with gaskets and torque plates attached. Bore the cylinder to 0.003 in (0.08 mm) under the desired finished size.

NOTE

With the torque plates installed, hone the cylinder from the crankcase end of the cylinder.

2. Use a 280 grit rigid hone followed by a 240 grit flexible ball hone to hone the cylinder. Work for a 60 degree crosshatch pattern.

Final cylinder bore sizes are measured after honing. Refer to Table 3-30.

NOTICE

Failure to remove all abrasive particles may result in premature cylinder, piston and ring wear and engine failure. (00537c)

NOTES

- *When cylinder requires boring over 0.010 in (0.25 mm), replace the cylinder.*
- *Replace the cylinder if it is scuffed or grooved.*
- *Use the original piston if cylinder bore was not changed, Replace the rings. Hone the cylinder walls with a No. 240 grit flexible ball hone.*

3. 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 remaining dirt or debris.

⚠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)

4. Hot rinse the cylinder. Dry with moisture free low pressure compressed air.
5. Immediately apply a thin film of clean engine oil to a clean white paper towel and thoroughly wipe the inside of the cylinder.

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.*

6. With the cylinder at room temperature, check the piston clearance in the cylinder in which the piston will run.

Table 3-30. Cylinder Final Bore Sizes

BORE SIZE	XL 883		XL 1200	
	in	mm	in	mm
Standard bore*	3.0005	76.213	3.4978	88.844
0.005 in (0.13 mm) OS bore	3.0048	76.323	3.502	88.95
0.010 in (0.25 mm) OS bore	3.0098	76.449	3.507	89.08
*All bore sizes + 0.0002 in (0.00508 mm)				

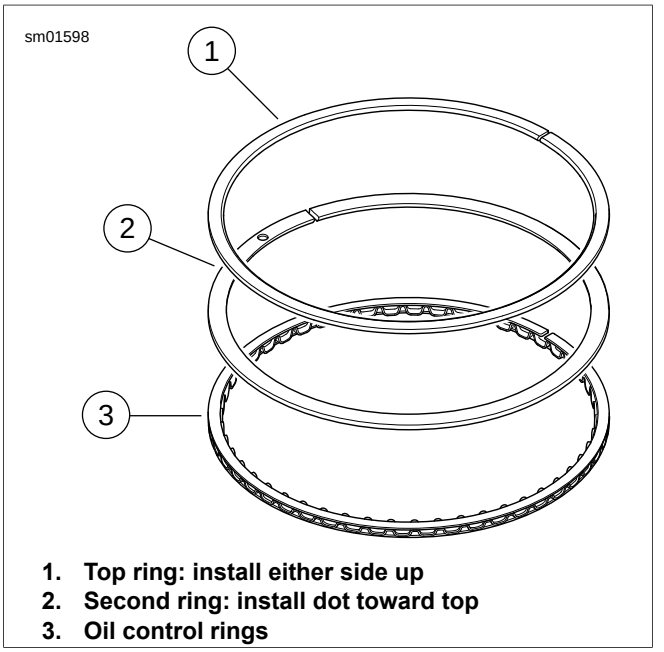
Fitting Piston Rings

See Figure 3-52. Piston rings are of two types: compression and oil control. The two compression rings are positioned in the two upper piston ring grooves. The dot on the second compression ring must face upward. Ring sets are available to fit standard and oversize pistons.

1. See Figure 3-53. Place piston in cylinder about 1/2 in (13 mm) from top. Set ring to be checked inside cylinder, squarely against piston. Remove piston and check ring end gap with thickness gauge. See 3.2 SPECIFICATIONS.

NOTES

- *Always deglaze or hone the cylinder before installing **new** rings.*
- *Always use **new** piston rings. Piston rings take a set and must not be reused.*
- *Replace a ring if the end gap exceeds specification. See 3.2 SPECIFICATIONS.*
- *If end gap is under specification, file the ring gap. Insufficient ring gap can cause ring breakage, cylinder scuffing or piston seizure.*
- *Ring end gap specifications are applicable to rings for oversized pistons.*



1. **Top ring: install either side up**
2. **Second ring: install dot toward top**
3. **Oil control rings**

Figure 3-52. Piston Rings

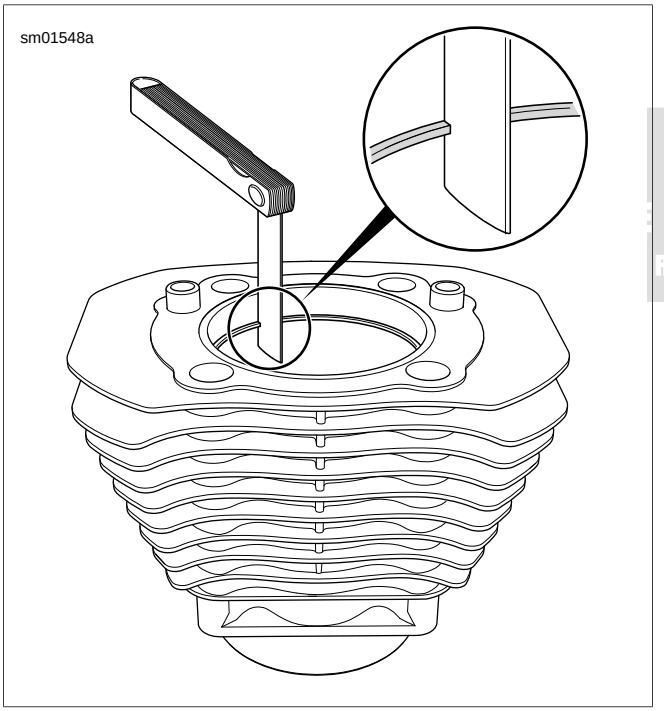


Figure 3-53. Measuring Ring End Gap

⚠WARNING

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

2. Blow debris from piston oil drain holes and ring grooves with low pressure compressed air. Apply clean engine oil to piston ring grooves.

3. See Figure 3-54. Install oil control ring expander spring. Make sure ends of spring point upward. Spiral bottom oil control ring into space in ring groove below expander spring. Position oil control ring gap 90 degrees from gap in expander spring. Spiral top oil control ring into space in ring groove above expander spring. Position oil control ring gap 180 degrees from gap in bottom oil control ring.

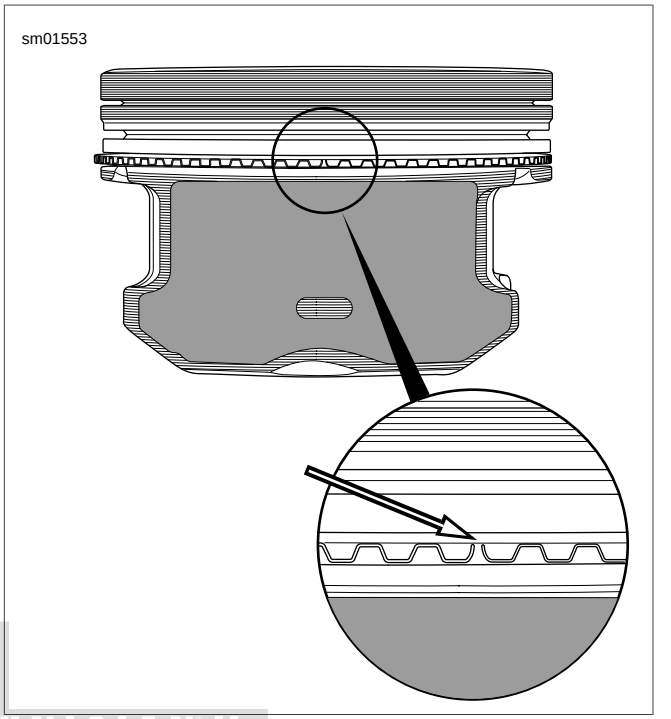


Figure 3-54. Installing Oil Control Ring Expander Spring (typical)

4. See Figure 3-55. Use a piston ring expander tool to slip compression rings over piston into their respective grooves. Install second compression ring first, then top compression ring. Be extremely careful not to over expand or twist rings, or damage piston surface when installing rings.

NOTE

Install second compression ring with dot towards top of piston.

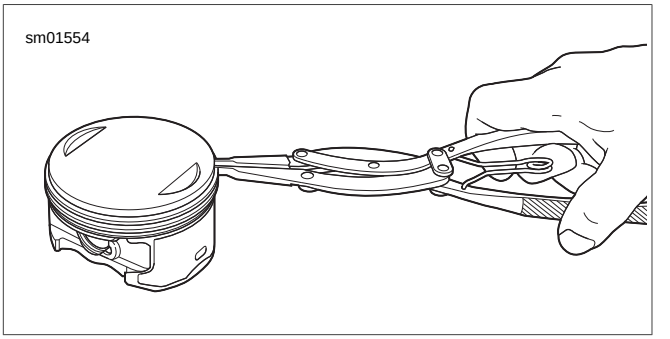


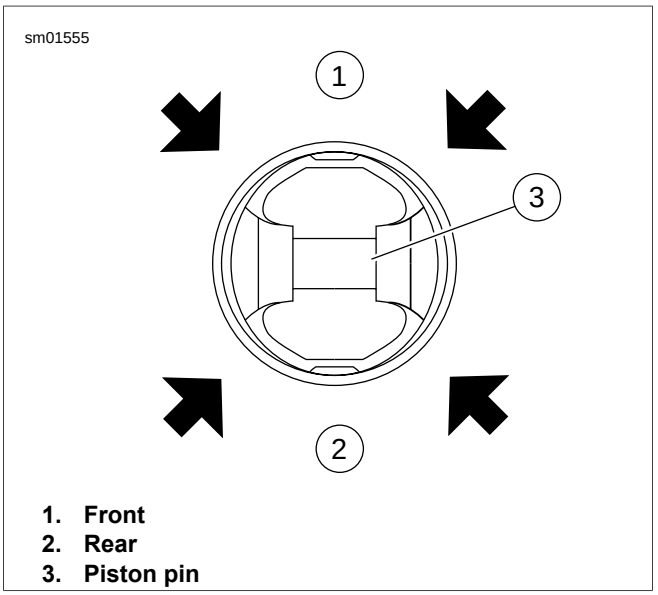
Figure 3-55. Installing Piston Rings

5. See Figure 3-56. Position rings so end gaps of adjacent rings are a minimum of 90 degrees apart. Ring gaps are not to be within 10 degrees of the thrust face centerline.

6. See Figure 3-57. Check for proper side clearance with thickness gauge, as shown. See 3.2 SPECIFICATIONS.

NOTE

If the ring grooves are clean and the side play is still not correct, replace the rings, the piston or both.



1. **Front**
2. **Rear**
3. **Piston pin**

Figure 3-56. Position Ring End Gaps at Arrows

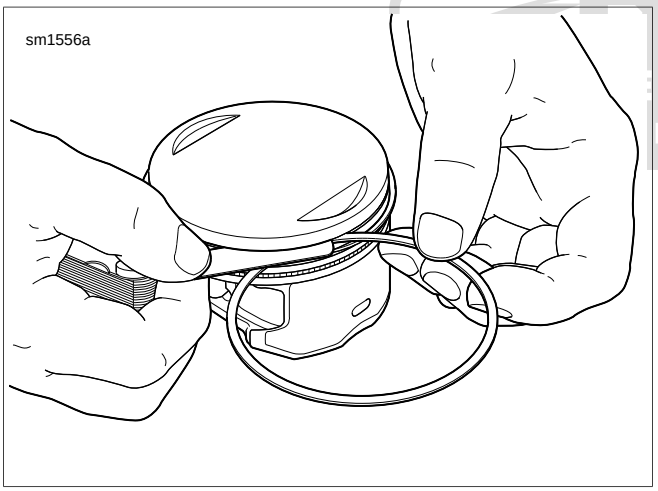


Figure 3-57. Measuring Ring Clearance in Groove

CONNECTING ROD BUSHINGS

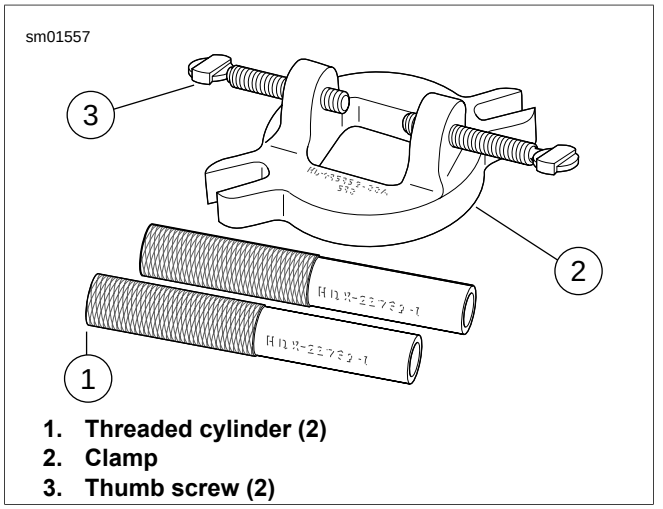
PART NUMBER	TOOL NAME
HD-35102	WRIST PIN BUSHING HONE
HD-39964	REAMER LUBRICANT
HD-94800-26A	CONNECTING ROD BUSHING REAMER
HD-95952-33C	CONNECTING ROD CLAMPING TOOL
HD-95970-32D	CONNECTING ROD BUSHING REMOVER/INSTALLER

Removing Upper Connecting Rod Bushings

NOTES

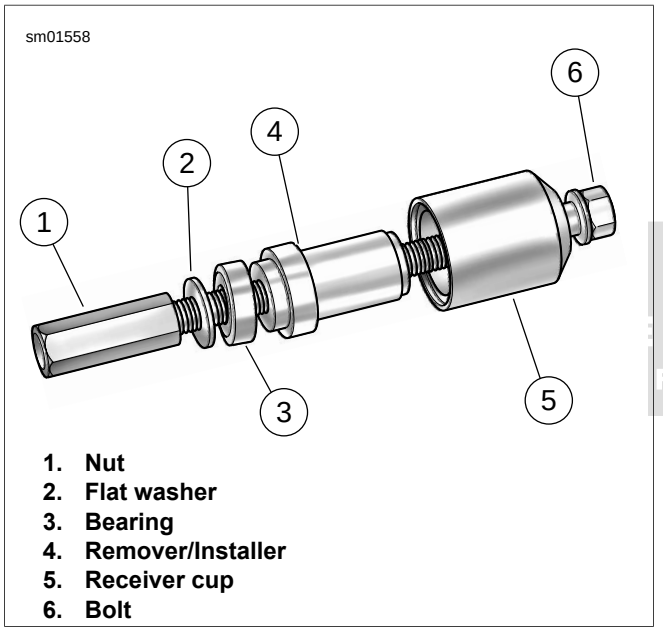
- *Replace the upper connecting rod bushing if the piston pin to rod bushing clearance exceeds 0.002 in (0.051 mm).*
- *Place clean shop towels in and around the crankcase bore. This prevents chips and shavings from falling into the crankcase.*
- *If CONNECTING ROD CLAMPING TOOL (Part No. HD-95952-33C) holes are too small, enlarge the holes in the tool.*

1. See Figure 3-58. Obtain the CONNECTING ROD CLAMPING TOOL and install as follows:
   a. Slide clamp (2) over connecting rod so that slots engage cylinder head studs. Exercise caution to avoid scratching or bending studs.
   b. With the knurled side up, screw threaded cylinders (1) onto studs to secure position of clamp.
   c. Alternately turn each clamp thumbscrew (3) a few turns to gradually fix position of connecting rod. Turning only one thumbscrew will move rod off-center, while tightening second thumbscrew can cause rod to flex or bend.
2. Install rubber hoses over remaining two cylinder studs.
3. See Figure 3-59. Obtain the CONNECTING ROD BUSHING REMOVER/INSTALLER (Part No. HD-95970-32D).
   a. Sparingly apply graphite lubricant to threads of bolt (6) to prolong service life and provide smooth operation.
   b. Slide receiver cup (5) onto bolt with the closed side facing bolt head.
   c. Insert bolt through upper connecting rod bushing.



1. **Threaded cylinder (2)**
2. **Clamp**
3. **Thumb screw (2)**

Figure 3-58. Connecting Rod Clamping Tool (Part No. HD-95952-33C)



1. **Nut**
2. **Flat washer**
3. **Bearing**
4. **Remover/Installer**
5. **Receiver cup**
6. **Bolt**

Figure 3-59. Connecting Rod Bushing Remover/Installer (Part No. HD-95970-32D)

4. Remove bushing as follows:
   a. See Figure 3-60. Slide remover side of remover/installer onto bolt. The driver is stamped to verify proper orientation.
   b. See Figure 3-59. Slide bearing (3) and flat washer (2) onto bolt (6) until they contact remover/installer (4).
   c. Thread nut (1) onto bolt until assembly is snug.
   d. Using two box end wrenches, tighten nut on bolt until bushing is free.
   e. Remove nut from bolt. Remove flat washer, bearing and remover/installer. Remove bolt from bushing bore.
   f. Remove bushing from receiver cup and discard.

NOTE

Leave CONNECTING ROD CLAMPING TOOL installed during bushing installation procedure which follows.

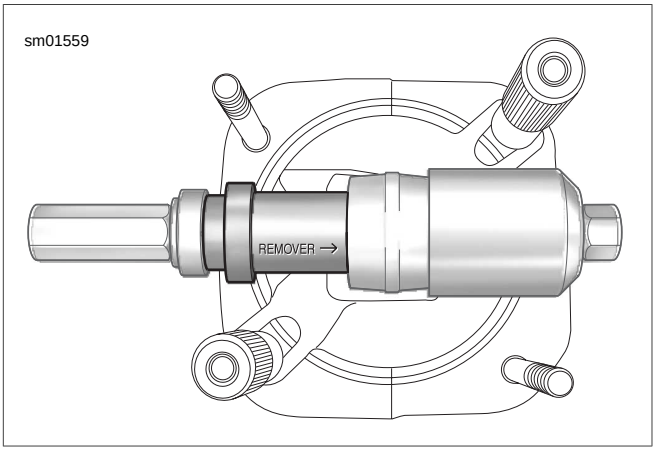


Figure 3-60. Remover Stackup. Use Remover Side Of Remover/Installer

Installing Upper Connecting Rod Bushings

1. See Figure 3-59. Obtain the CONNECTING ROD BUSHING REMOVER/INSTALLER (Part No. HD-95970-32D).
   a. Sparingly apply graphite lubricant to threads of bolt (6) to prolong service life and provide smooth operation.
   b. Slide receiver cup (5) onto bolt with the closed side facing bolt head.
   c. Insert bolt through upper connecting rod bushing bore.
   d. See Figure 3-61. Slide **new** bushing onto bolt. Start bushing into bore. Be sure that bushing is square in bore and not cocked.
   e. Slide installer side of remover/installer onto bolt until shoulder contacts bushing. The remover/installer is stamped to verify proper orientation.
   f. Slide bearing and flat washer onto bolt until they contact remover/installer.
   g. Thread nut onto bolt until assembly is snug.
   h. See Figure 3-62. Using two box end wrenches, tighten nut on bolt until collar on remover/installer bottoms against connecting rod.
2. Remove nut from bolt and remove flat washer, bearing and remover/installer. Remove bolt from bushing bore. Do not scratch or gouge bushing.

NOTE

Leave CONNECTING ROD CLAMPING TOOL installed during bushing reaming procedure which follows.

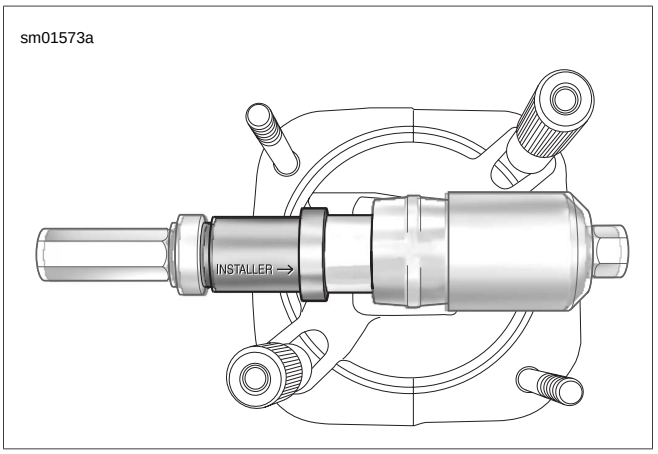
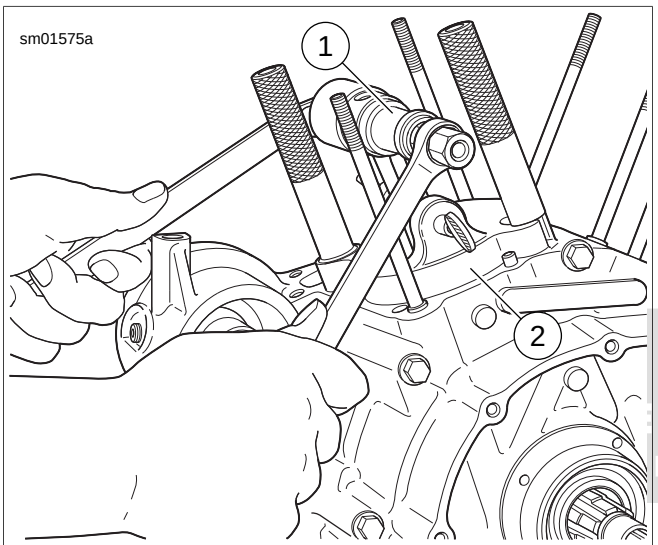


Figure 3-61. Installer Stackup



1. **Piston bushing tool**
2. **Rod clamping fixture**

Figure 3-62. Installing New Piston Pin Bushing

Reaming Upper Connecting Rod Bushings

NOTE

Sizing bushing with less than 0.00125 in (0.0317 mm) clearance can result in a bushing loosening and/or seized pin in rod.

1. Clean up and size bushing to 0.0010-0.0005 in (0.025-0.013 mm) undersize using the CONNECTING ROD BUSHING REAMER (Part No. HD-94800-26A).
   a. Carefully insert bit of reamer into upper connecting rod bushing. Do not apply lubricant to reamer or bushing. Ream the bushing dry or cut will not be accurate.
   b. Install a 11/16 12-pt socket and T-handle on reamer lug.
   c. Placing thumb on drive socket, apply slight pressure on reamer while rotating handle/drive socket clockwise.

   NOTE

   For best results, do not push on reamer or apply pressure to the reamer handle. While excessive pressure results in a rough cut, bushing bore will be tapered if pressure is not centrally applied.

   d. Continue rotating handle/drive socket until entire bit has passed through bushing and shank of reamer rotates freely in the bore.

NOTE

Never back reamer out of connecting rod or bushing will be damaged.

2. Remove T-handle and socket, and carefully pulling on bit, draw shaft of reamer out of connecting rod bushing.

NOTE

Abrasive particles can damage machined surfaces and plug oil passageways possibly resulting in engine failure.

3. Using contact cleaner or cleaning solvent, thoroughly wipe upper connecting rod and bushing of any metal shavings or debris.

NOTE

Leave CONNECTING ROD CLAMPING TOOL installed during bushing honing procedure which follows.

Honing Upper Connecting Rod Bushings

1. Obtain the WRIST PIN BUSHING HONE (Part No. HD-35102) and REAMER LUBRICANT (Part No. HD-39964) to hone bushing to final size. Use a liberal amount of honing oil to prevent damage to hone or bushing. Use care to prevent foreign material from falling into the crankcase.
   a. Install hone in a high speed electric drill.
   b. Apply reamer lubricant to finishing stones of hone and inside of upper connecting rod bushing.
   c. Start finishing stones of hone into bushing.
   d. Complete 10 to 12 complete strokes using entire length of finishing stone arrangement and drill. Work for a crosshatch pattern of approximately 60 degrees.

   NOTE

   Abrasive particles can damage machined surfaces and plug oil passageways possibly resulting in engine failure.

2. Using contact cleaner or cleaning solvent, thoroughly wipe upper connecting rod and bushing of any metal shavings or debris. Continue wiping until a clean cloth shows no evidence of dirt or debris.
3. Lightly oil a good piston pin and insert it into the upper connecting rod bushing bore to feel for the proper interference fit. The pin should slide in and out of the bushing without binding, but also without pivoting or rocking.
4. Remove the connecting rod clamping tool.
5. Remove shop towels exercising caution that shavings, chips and other debris do not fall into crankcase.

Repair

If connecting rod is bent, do not attempt to straighten. Replace flywheel and connecting rod assembly. Straightening connecting rods by bending will damage the bearing on the crank pin and the piston pin bushing.

TOP END OVERHAUL: ASSEMBLY 3.15

GENERAL

This section describes assembling the top end of the engine, from the cylinder deck up. If the engine crankcase has been disassembled for repair, it must be assembled before assembling the top end of the engine. See 3.20 BOTTOM END OVERHAUL: ASSEMBLY.

PISTON AND CYLINDER

PART NUMBER	TOOL NAME
HD-34623-C	PISTON PIN LOCK RING REMOVER/INSTALLER
HD-42322	PISTON SUPPORT PLATE
HD-96333-51E	PISTON RING COMPRESSOR

1. Slide approximately 6.0 in (152 mm) of plastic tubing, rubber hose or conduit over each cylinder stud to protect cylinder studs and piston from damage.

NOTE

See Figure 3-63. Install pistons with the arrow on the top and the side of the piston point toward the front.

2. Install piston assembly over connecting rod.
3. Install piston pin.

NOTE

You may wish to place clean shop towels over cylinder and lifter bores prior to the next step, to prevent the piston pin lock ring from falling into the crankcase.

4. See Figure 3-64. Install **new** piston pin lock rings with the PISTON PIN LOCK RING REMOVER/INSTALLER (Part No. HD-34623-C). Make sure the ring groove is clean and that the ring is fully seated in the groove with the gap away from the slot at the bottom.

NOTES

- *Always use **new** lock ring.*
- *Clean lock ring groove and seat lock ring firmly in groove.*
- *If the lock ring does not seat firmly in groove, discard the lock ring.*
- *Do not install a used lock ring or a **new** one that has been installed and removed. A loosely installed ring will come out of the piston groove and damage cylinder and piston beyond repair.*

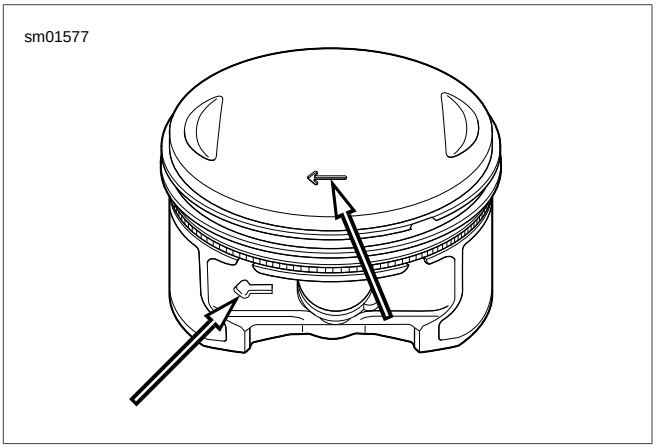


Figure 3-63. Directional Arrows

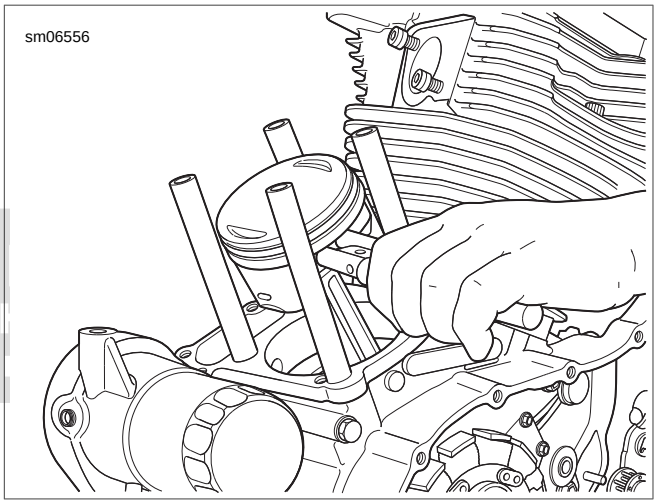
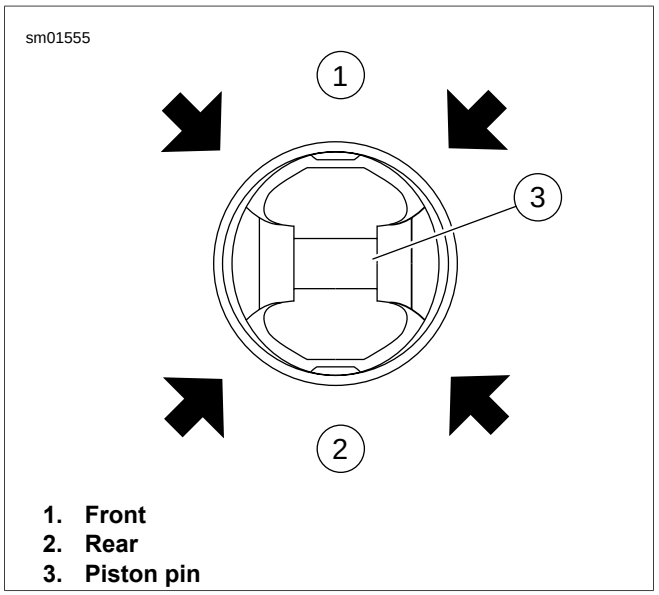


Figure 3-64. Installing Piston Lock Rings

5. See Figure 3-65. Make sure the piston ring end gaps are properly positioned as shown.
6. Lubricate cylinder wall, piston, pin and rod bushing with engine oil.
7. Remove cylinder stud sleeves. Install a **new** cylinder base gasket. Make sure the piston does not bump the studs or crankcase.



1. **Front**
2. **Rear**
3. **Piston pin**

Figure 3-65. Position Ring End Gaps at Arrows

8. See Figure 3-66. Install PISTON SUPPORT PLATE (Part No. HD-42322) as shown. Rotate crankshaft to rest piston on support plate.
9. See Figure 3-67. Compress the piston rings using PISTON RING COMPRESSOR (Part No. HD-96333-51E).
10. Gently slide cylinder over cylinder base studs and piston crown, resting it on the top of the ring compressor band as shown.
11. Push the cylinder down with a firm, quick motion until the bottom of the cylinder bore slides below the piston ring area.
12. Remove the piston ring compressor and piston support plate, and push the cylinder all the way down onto the crankcase cylinder deck.
13. Repeat for other piston and cylinder.

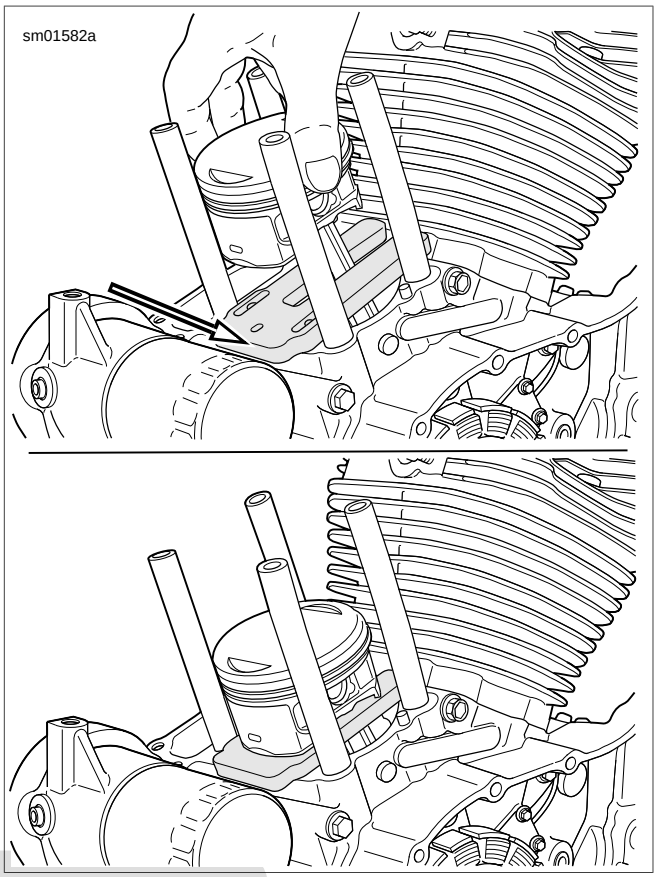


Figure 3-66. Piston Support Plate

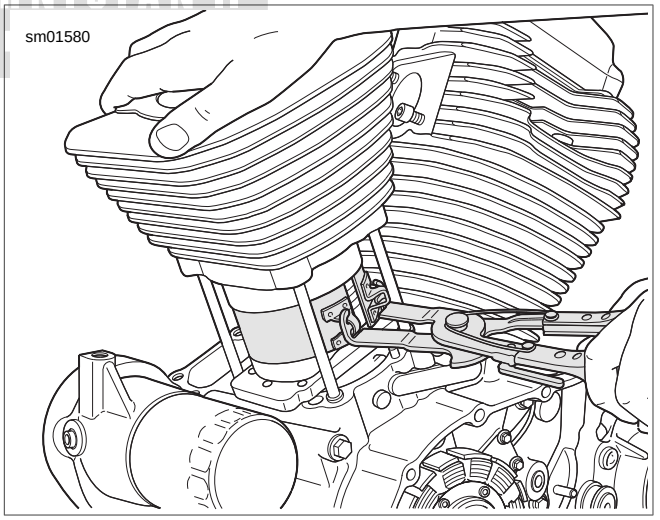


Figure 3-67. Installing Cylinder Over Piston

TAPPET COVERS, PUSHROD COVERS AND PUSHRODS

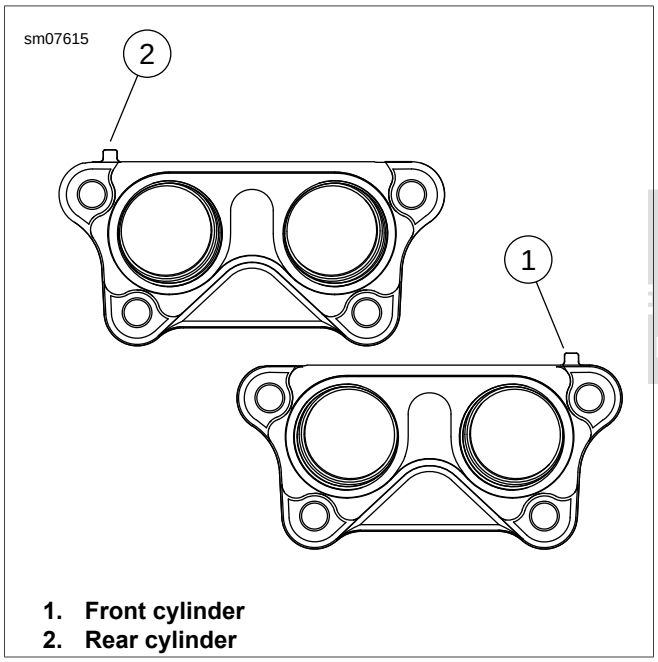
FASTENER	TORQUE VALUE	
Tappet cover fastener	90-120 **in-lbs**	10.2-13.6 Nm

1. See Figure 3-69. If anti-rotation devices (10) and tappets (11) have been removed, install the tappets. See 3.20 BOTTOM END OVERHAUL: ASSEMBLY, Tappets.

2. See Figure 3-68. Orient tabs of the front (1) and rear (2) tappet covers to the front and rear cylinders.
3. See Figure 3-69. Install tappet covers (7) and **new** gaskets (8). Secure with screws (5) and washers (6). Tighten to 90-120 **in-lbs** (10.2-13.6 Nm).
4. Install **new** O-rings (3) in recesses in tappet covers. Press pushrod covers (2) into O-rings.
5. Identify pushrod location by its color and length. Refer to Table 3-31.
6. Slide intake and exhaust pushrods (4) down inside pushrod covers until they rest on seat at top of tappet (11).

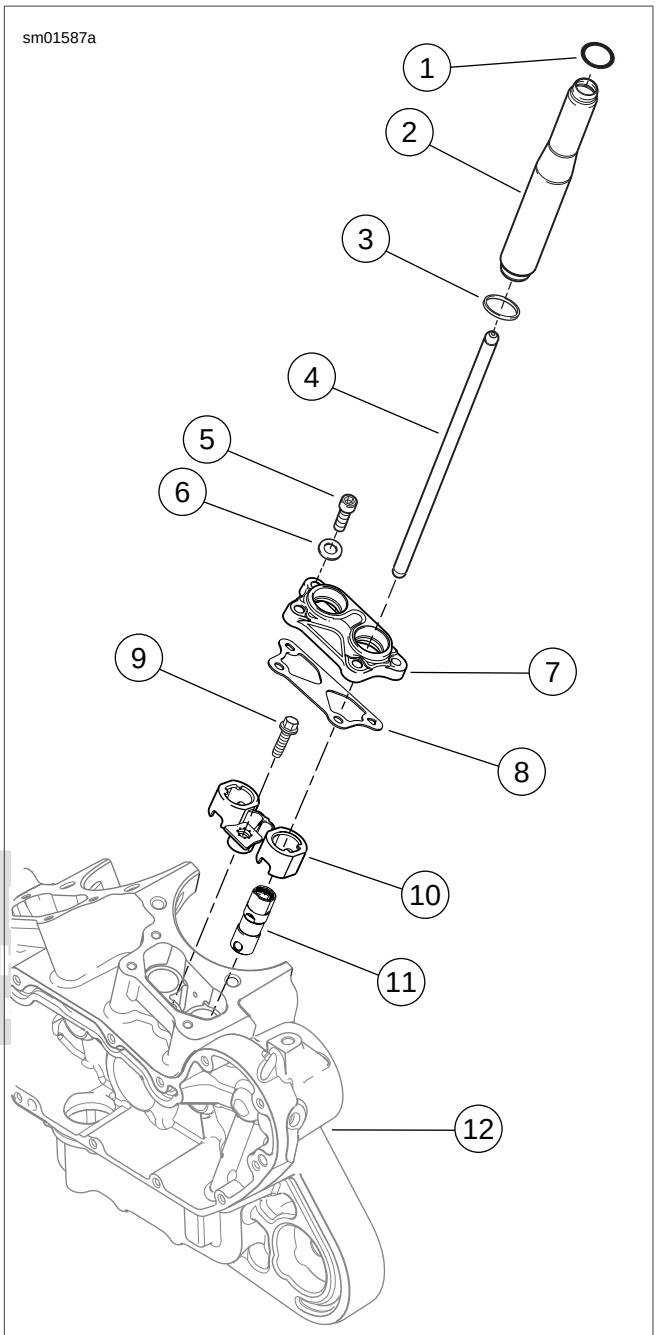
Table 3-31. Pushrod Specifications

POSITION	COLOR BAND	LENGTH	
		in	cm
Intake	Orange	10.746	27.295
Exhaust	Purple	10.800	27.432



1. **Front cylinder**
2. **Rear cylinder**

Figure 3-68. Tappet Cover Orientation



1. **O-ring (4)**
2. **Pushrod cover (4)**
3. **O-ring (4)**
4. **Pushrod (4)**
5. **Screw (8)**
6. **Washer (8)**
7. **Tappet cover (2)**
8. **Gasket (2)**
9. **Screw (2)**
10. **Anti-rotation device (2)**
11. **Tappet (4)**
12. **Right crankcase**

Figure 3-69. Middle Valve Train Components

CYLINDER HEAD

FASTENER	TORQUE VALUE	
Cylinder screws, 1st torque	96-120 **in-lbs**	11-14 Nm
Cylinder screws, final torque	13-15 ft-lbs	18-20 Nm
Cylinder screws, 1st torque	96-120 **in-lbs**	11-14 Nm
Cylinder screws, final torque	13-15 ft-lbs	18-20 Nm

NOTES

- *Install the pushrod covers and lower cover retainers before installing cylinder heads. See 3.15 TOP END OVERHAUL: ASSEMBLY, Tappet Covers, Pushrod Covers and Push-rods.*
- *Thoroughly clean and lubricate threads of cylinder head screws before installation. Friction caused by dirt and grime will result in a false torque indication.*

1. Coat mating surfaces of cylinder base studs and screws with parts cleaning solution.
2. Scrape old oil and any carbon deposits from threads by using a back-and-forth motion, threading each head screw onto its mating cylinder stud.
3. Remove screws from studs. Wipe or blow dry thread surfaces.
4. Thoroughly clean and dry gasket surfaces of cylinder and cylinder head.
5. See Figure 3-70. Install a **new** head gasket to cylinder.
6. Carefully lower cylinder head over studs and position on dowels. Use great care so as not to disturb head gasket.

NOTE

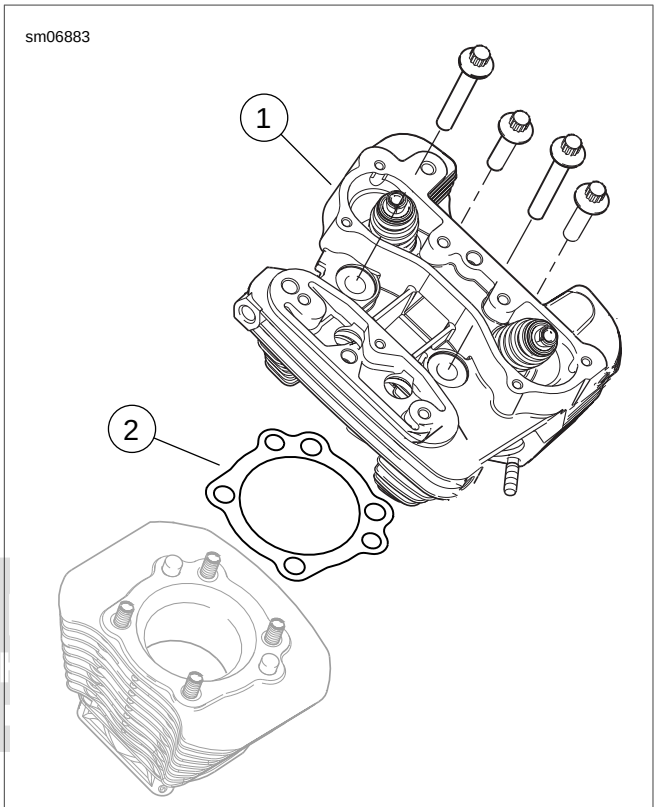
Only oil film must remain on the cylinder head screw surfaces. Too much oil will pool in the head screw sleeve preventing full thread engagement.

7. Lightly coat threads, underside of flange and bottom face of cylinder screws in clean Harley-Davidson 20W50 engine oil. Wipe off excess oil.
8. Start cylinder screws onto cylinder studs, two short screws on left side of engine, two long screws on right. Tighten all screws only finger-tight at this time.

NOTE

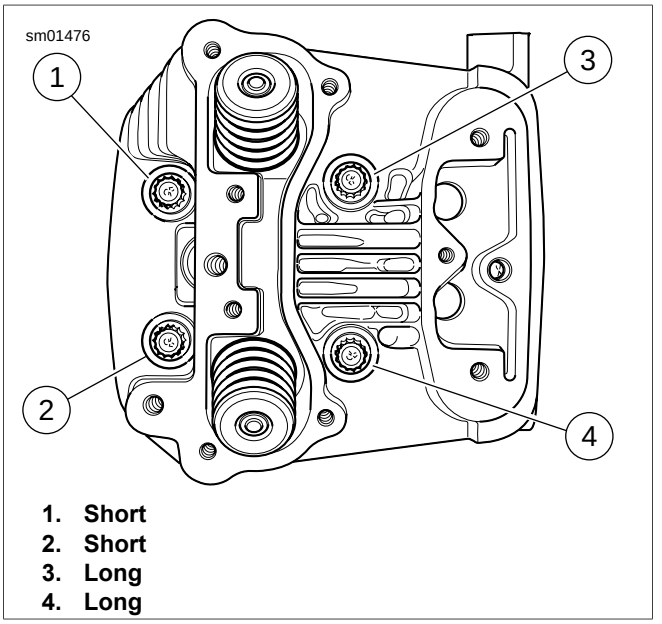
The procedure for tightening the head screws is critical to proper distribution of pressure over gasket area. It prevents gasket leaks, stud failure and head and cylinder distortion.

9. See Figure 3-71 and Figure 3-72. In sequence, tighten screws in the following steps:
   a. Tighten each screw to 96-120 **in-lbs** (11-14 Nm).
   b. Tighten each screw to 13-15 ft-lbs (18-20 Nm).
   c. **Loosen all screws.**
10. After screws are loosened from initial torque, tighten screws in three stages. Tighten in sequence:
    a. Tighten each screw to 96-120 **in-lbs** (11-14 Nm).
    b. Tighten each screw to 13-15 ft-lbs (18-20 Nm).
    c. See Figure 3-73. Mark cylinder head and screw shoulder with a line (1).
    d. Tighten each screw an additional 85-95 degrees (2).



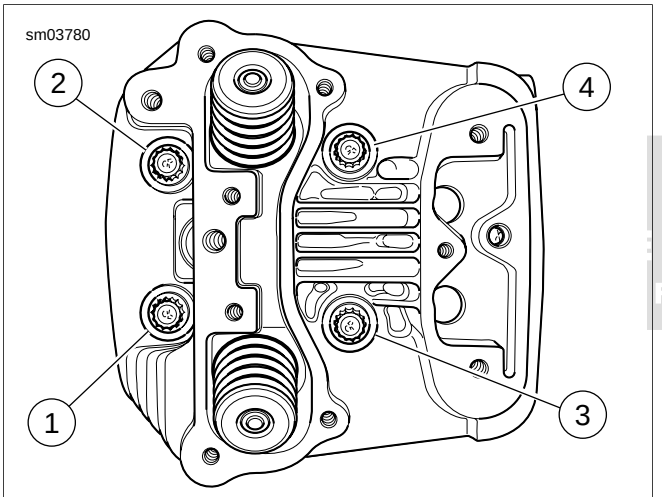
1. Cylinder head
2. Gasket

Figure 3-70. Cylinder Head Installation



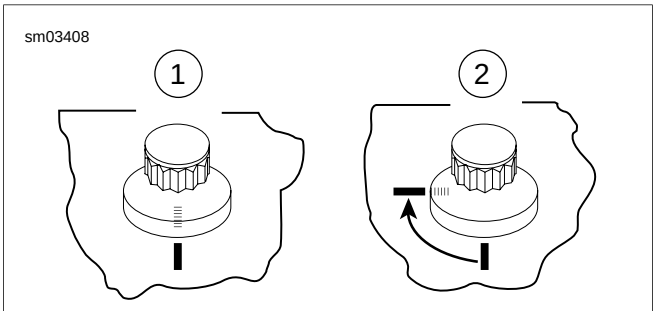
1. **Short**
2. **Short**
3. **Long**
4. **Long**

Figure 3-71. Front Cylinder Screw Torque Sequence



1. **Short**
2. **Short**
3. **Long**
4. **Long**

Figure 3-72. Rear Cylinder Screw Torque Sequence



1. **Mark**
2. **85-95 degrees**

Figure 3-73. Tighten Screws

ROCKER COVERS

FASTENER	TORQUE VALUE	
Rocker cover, inner, large bolt	18-22 ft-lbs	24.4-29.8 Nm
Rocker cover, inner, small bolt	135-155 **in-lbs**	15.3-17.5 Nm
Rocker cover, inner, screw	135-155 **in-lbs**	15.3-17.5 Nm
Breather screw	35-55 **in-lbs**	4.0-6.2 Nm
Rocker cover, outer, screw	120-168 **in-lbs**	13.6-19.0 Nm

Inner Cover

1. Rotate crankshaft to position the lifters on the base circle of the cams.
2. See Figure 3-76. Install **new** gasket (1) with FRONT HEAD facing up on the front head and REAR HEAD facing up on the rear head.
3. Install the inner rocker cover assembly (2) (with rocker arms and shafts). Fit the ends of the pushrods in the rocker arm sockets.

NOTE

To avoid damage to pushrods or rocker arms, do not rotate crankshaft until both pushrods can be turned with fingers.

4. Install all fasteners (3, 5, 4) finger-tight one turn at a time.
5. See Figure 3-74. Tighten the fasteners in sequence:
   a. Tighten the four large bolts (1, 2, 3, 4). Re-tighten the first fastener (5) to 18-22 ft-lbs (24.4-29.8 Nm).
   b. Tighten the three small bolts (6, 7, 8) to 135-155 **in-lbs** (15.3-17.5 Nm).
   c. Tighten the two small bolts (9, 10) to 135-155 **in-lbs** (15.3-17.5 Nm).

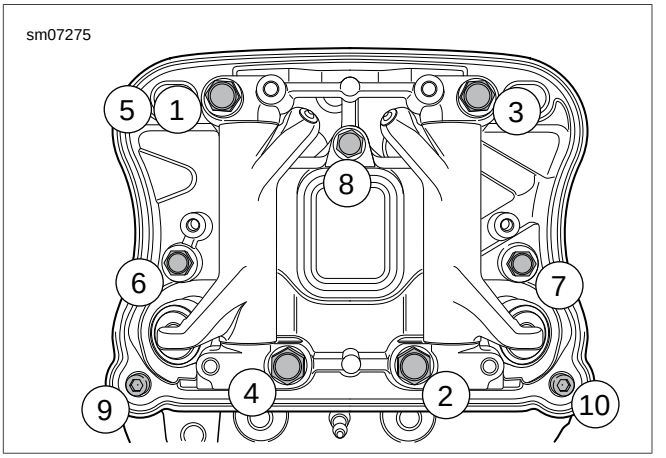


Figure 3-74. Inner Rocker Cover Torque Sequence

Breather

1. Identify breather location for front and rear cylinders.
2. See Figure 3-76. Install breather (7) with **new** breather seal (6).

3. Install screw (8). Tighten to 35-55 **in-lbs** (4.0-6.2 Nm).

Outer Cover

1. See Figure 3-76. Install **new** gaskets (9, 10) on the inner rocker cover.
2. Install outer rocker cover (11) on inner rocker cover. Install fasteners (13) with captive washers and **new** sealing washers (12).
3. See Figure 3-75. Tighten fasteners (1, 2, 3, 4) in sequence and then re-tighten the first fastener (1) to 120-168 **in-lbs** (13.6-19.0 Nm).

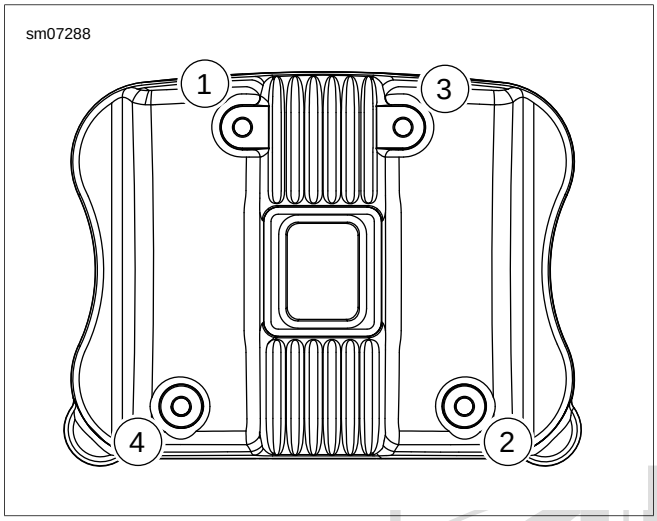
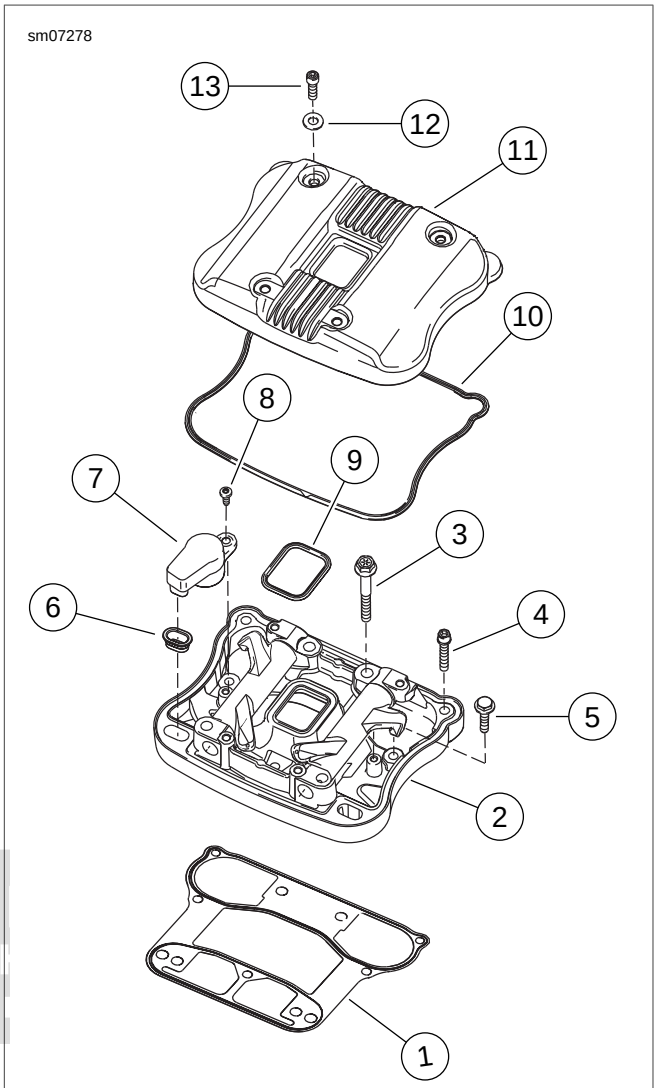


Figure 3-75. Outer Cover Torque Sequence



1. **Gasket**
2. **Inner rocker cover**
3. **Large bolts (4)**
4. **Small bolts (3)**
5. **Screws (2)**
6. **Breather seal**
7. **Breather**
8. **Screw**
9. **Gasket**
10. **Cover gasket**
11. **Outer rocker cover**
12. **Sealing washer (4)**
13. **Fastener (4)**

Figure 3-76. Rocker Cover

ASSEMBLING MOTORCYCLE AFTER TOP END REPAIR

FASTENER	TORQUE VALUE	
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm
Stabilizer link, lower front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm
Fuel tank fasteners	15-20 ft-lbs	20.3-27.1 Nm

1. See Figure 3-77. Install upper front stabilizer link and frame bracket:
   a. Install upper frame bracket (3) with upper stabilizer link (2), horn bracket (9) (models with front mounted horn), screws (5) and washers (8). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
   b. Install screw (4) securing stabilizer link to engine bracket (1). Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
2. Install induction module. See 4.7 INDUCTION MODULE.
3. Install induction module connectors:
   a. TPS [88].
   b. IAC [87].
   c. TMAP sensor [80].
   d. Fuel injector connectors [84], [85].
4. Install air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY, All Models.
5. **EVAP models:** Install EVAP purge hose on induction module. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL.
6. Install horn.
   a. **Front mount:** See 6.32 HORN, Front Mount: XL 883L/N/R, XL 1200X.
   b. **Side mount:** See 6.32 HORN, Side Mount: XL 1200C/CP/CA/CB, XL 1200T/V.

⚠WARNING

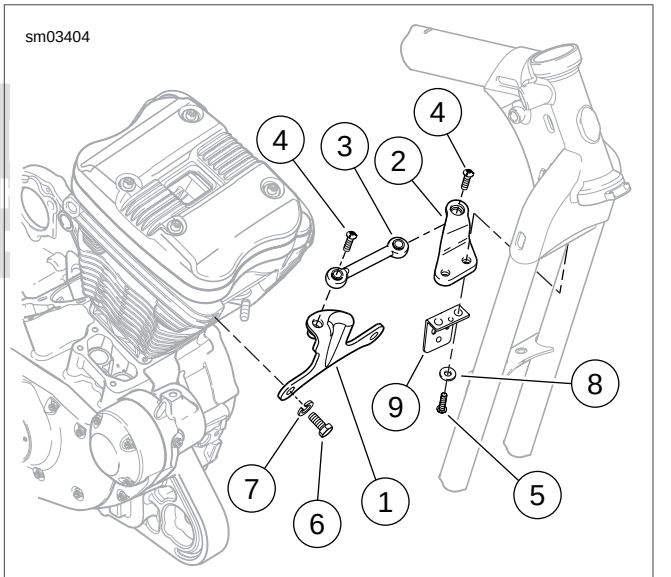
When servicing the fuel system, do not smoke or allow open flame or sparks in the vicinity. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00330a)

7. Install fuel tank.
   a. Install front and rear screws, washers and locknuts. Tighten to 15-20 ft-lbs (20.3-27.1 Nm).
   b. Install fastener protective caps.
   c. Attach quick-connect fitting on fuel line to fuel tank fitting.
   d. Gently tug on quick-connect fitting to verify that it is securely locked in place. See 4.4 FUEL TANK.
8. Install exhaust pipes and mufflers. Plug in rear HO2S connector [137] and front HO2S connector [138]. See 4.16 EXHAUST SYSTEM.
9. Connect spark plug cables to spark plugs.
10. Install main fuse.

⚠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.



1. **Engine bracket**
2. **Upper stabilizer link**
3. **Upper frame bracket**
4. **Screw**
5. **Screw (2)**
6. **Screw (2)**
7. **Lockwasher (2)**
8. **Washer (2)**
9. **Horn bracket (models with front mounted horn)**

Figure 3-77. Upper Front Stabilizer Link Assembly

BOTTOM END OVERHAUL: DISASSEMBLY 3.16

GENERAL

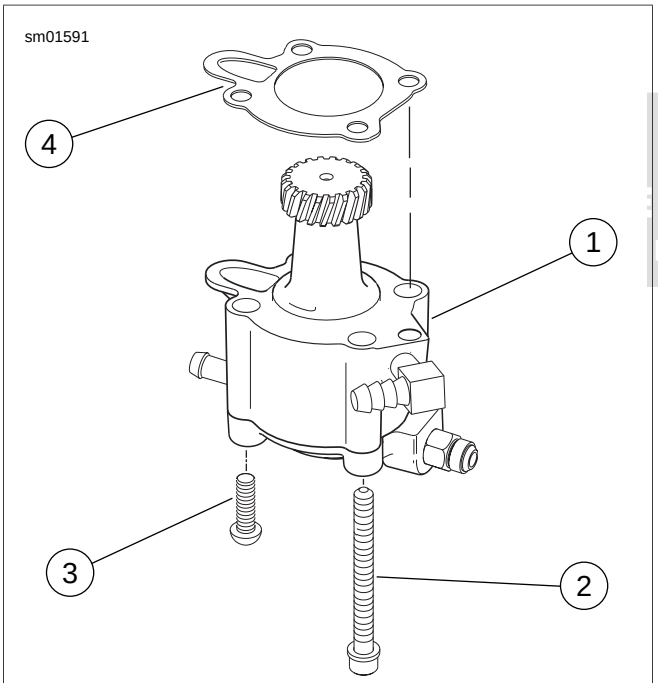
This section describes disassembling the bottom end of the engine. If engine overhaul requires disassembly of crankcases, remove engine from vehicle. See 3.10 REMOVING ENGINE FROM CHASSIS.

Then disassemble top end of engine. See 3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder Heads and 3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder and Piston.

Thoroughly clean area around gearcase cover and tappets. Blow loose dirt from crankcase with low pressure compressed air.

OIL PUMP

1. Remove oil pump feed and return hoses. Mark hoses for later installation. Discard hose clamps.
2. See Figure 3-78. Carefully remove two screws (2) that secure pump to crankcase. Pump will drop with screws removed. Discard mounting gasket.
3. If oil pump requires repair, see 3.19 OIL PUMP.

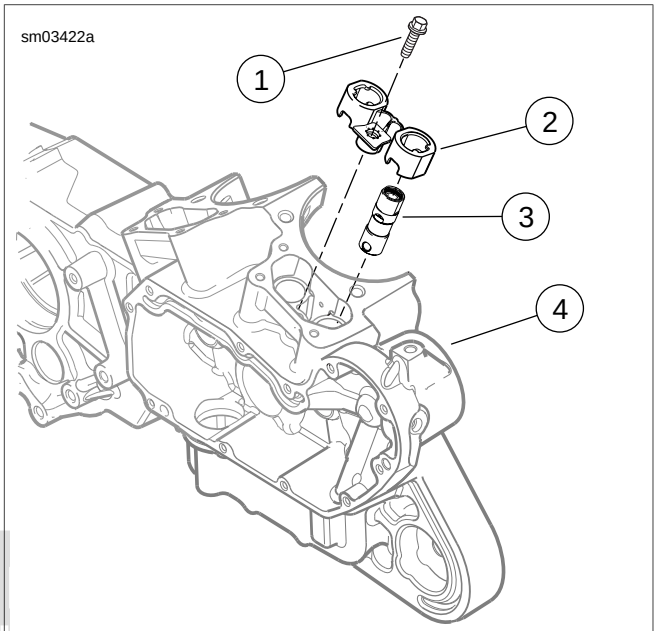


1. **Oil pump**
2. **Screw and washer (2)**
3. **Screw, Torx (2)**
4. **Gasket**

Figure 3-78. Oil Pump

TAPPETS

1. See Figure 3-79. Remove screw (1).
2. Remove anti-rotation device (2). Mark anti-rotation device for location (front/rear cylinder) as it is removed.
3. Remove tappet (3). Mark tappet for location (front/rear cylinder) and function (intake/exhaust) as it is removed. This will simplify installation.
4. Repeat previous steps for other cylinder.
5. Place tappets in clean plastic bags to keep out dust, dirt and debris.



1. **Screw (2)**
2. **Anti-rotation device (2)**
3. **Tappet (4)**
4. **Right crankcase**

Figure 3-79. Tappet Components

CAM GEAR END PLAY

NOTE

Gauge cam gear end play with the tappets removed.

1. Rotate the crankshaft until the lobe of the cam gear is pointing toward the tappet guide bore.
2. With a flat blade screwdriver, gently pry the cam gear toward the gearcase cover.
3. Gauge the gap between the case bushing and the cam gear shaft thrust face.
4. Compare the gauge size to the cam gear end play specifications. Refer to Table 3-14.

GEARCASE COVER AND CAM GEARS

1. Remove any parts that interfere with gearcase disassembly.
2. Remove inner rocker cover to remove valve spring pressure from the camshafts. See 3.20 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover.

3. Measure cam gear end play and record measurements. See 3.16 BOTTOM END OVERHAUL: DISASSEMBLY, Cam Gear End Play.

4. Place a pan under gearcase to collect oil.

NOTE

Never pry cover off. Tap lightly with a rawhide hammer.

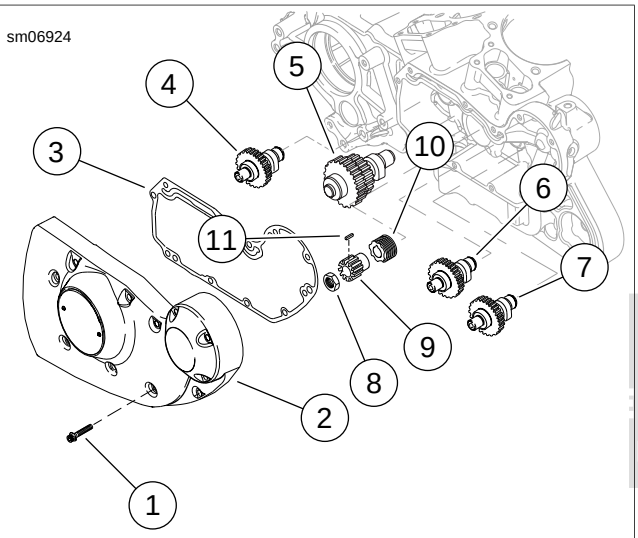
5. See Figure 3-80. Remove cover screws (1) and cover (2). Discard gasket (3).

6. Remove cam gears (4, 5, 6 and 7). Mark each component for installation.

NOTE

Nut is secured by LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) on the nut threads.

7. Remove nut (8). Slide pinion gear (9) and oil pump drive gear (10) off pinion shaft.



1. **Fastener**
2. **Cover**
3. **Gasket**
4. **Rear exhaust cam**
5. **Rear intake cam**
6. **Front intake cam**
7. **Front exhaust cam**
8. **Nut**
9. **Pinion gear**
10. **Oil pump drive gear**
11. **Shaft key**

Figure 3-80. Gearcase Cover and Cam Gears

CRANKCASE

Split Crankcase

1. Remove clutch and primary drive components. See 5.4 PRIMARY DRIVE AND CLUTCH.

2. Remove starter. See 6.12 STARTER.

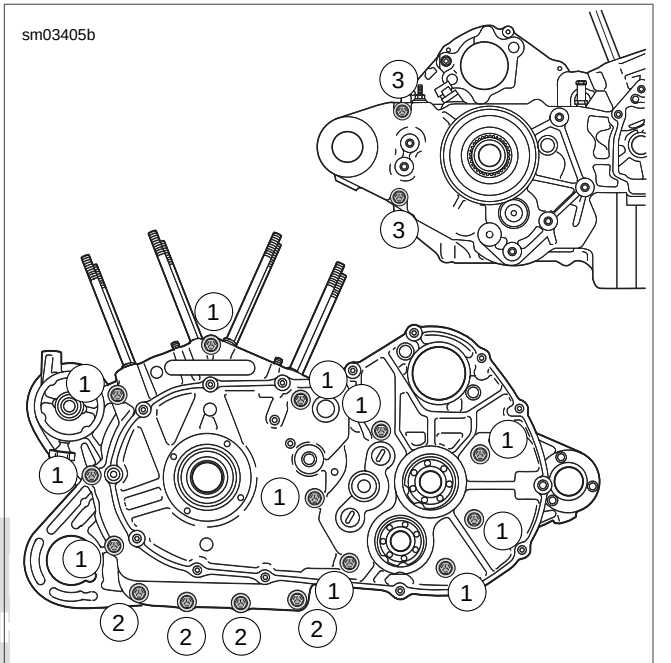
3. Mount crankcase assembly in engine stand. Position crankcase tilted at a 45 degree angle, right side down.

⚠CAUTION

Do not rotate crankcase half in engine stand when flywheel is installed. The flywheel assembly can fall out, resulting in parts damage or moderate injury. (00552c)

4. Remove 11 long fasteners (1, 2) and four short fasteners (3) from left side of crankcase assembly.

5. Remove two fasteners (4) from right side of crankcase assembly.



1. **Long fastener: left side**
2. **Short fastener: left side**
3. **Long fastener: right side**

Figure 3-81. Crankcase Fasteners

6. See Figure 3-82. Tap crankcase gently with rawhide mallet to loosen and separate the halves. Remove left crankcase assembly with transmission.

NOTE

Flywheel assembly slides off left main bearing by hand. No tools are required for this operation.

7. See Figure 3-83. Remove the flywheel assembly from right crankcase.

8. Remove transmission assembly from left crankcase. See 5.8 TRANSMISSION REMOVAL AND DISASSEMBLY.

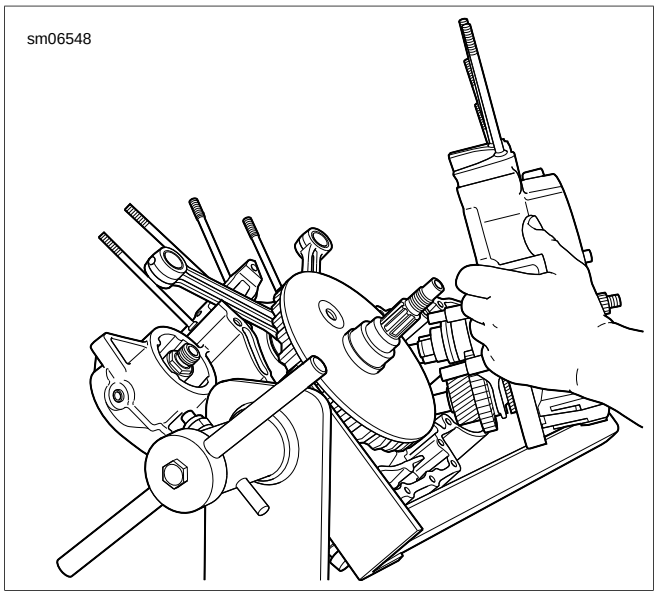


Figure 3-82. Separating Crankcase Halves

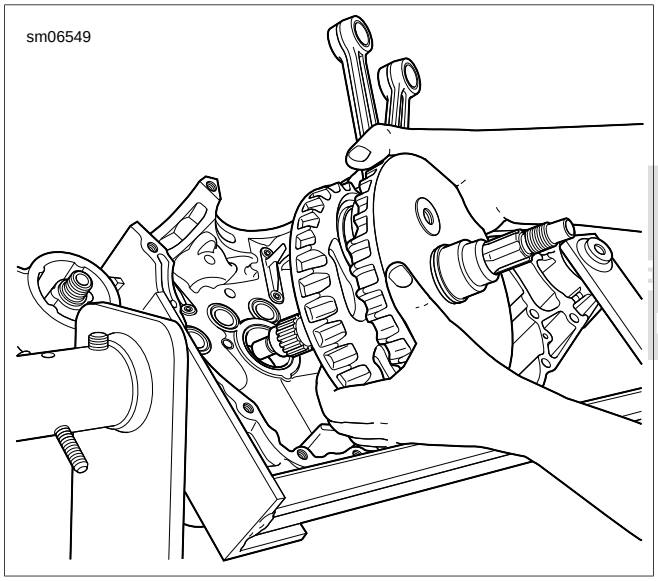
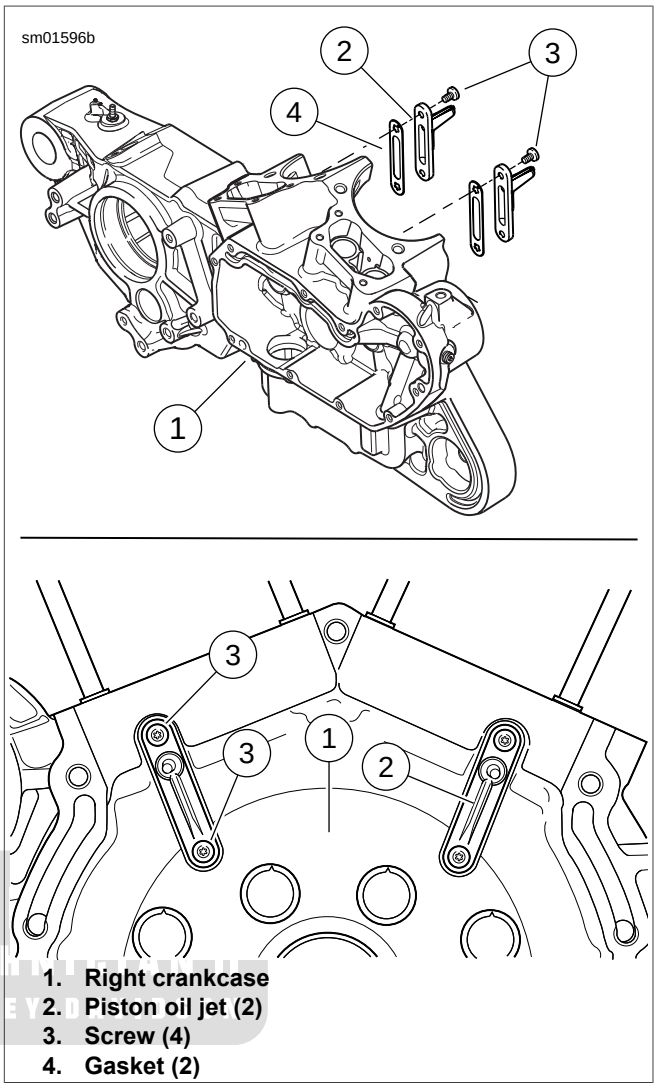


Figure 3-83. Removing Flywheels from Right Crankcase

Piston Oil Jets

1. See Figure 3-84. Remove screws (3) from each piston oil jet assembly (2) to free piston oil jets from right crankcase (1).
2. Remove piston oil jets and gaskets (4) from right crankcase. Discard gaskets.



1. **Right crankcase**
2. **Piston oil jet (2)**
3. **Screw (4)**
4. **Gasket (2)**

Figure 3-84. Piston Oil Jet Assemblies

Removing Cylinder Base Studs

If cylinder base studs require replacement, proceed.

1. Install a 3/8-16 nut onto cylinder base stud.
2. Install a second nut onto stud until it contacts the first nut.
3. Tighten nuts against each other.
4. Placing wrench on first (lower) nut installed, remove stud from cylinder deck.
5. Remove nuts from cylinder base stud.

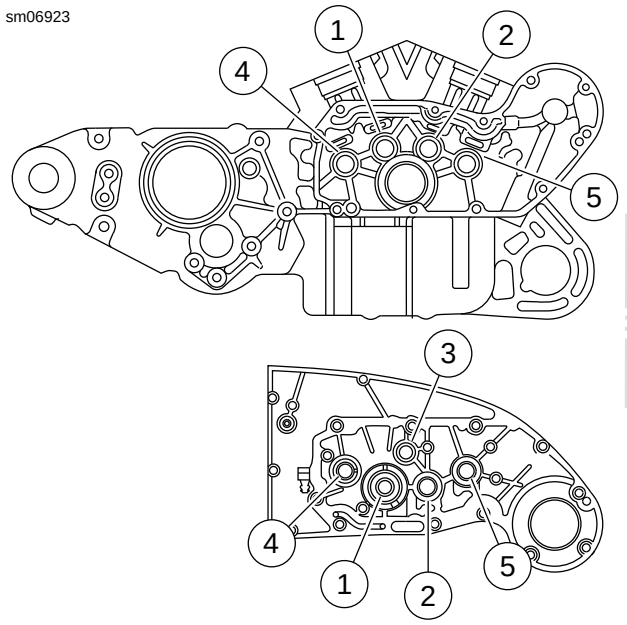
BUSHING INSPECTION AND REMOVAL

PART NUMBER	TOOL NAME
HD-95760-69A	BUSHING AND BEARING PULLER

NOTE

The camshaft and pinion gear shafts are supported by bushings in both the cover and the crankcase.

1. See Figure 3-85. Measure each bushing and its corresponding cam gear shaft or pinion gear shaft. Replace bushings that exceed service wear limits. Refer to Table 3-32.
2. See Figure 3-86. Use BUSHING AND BEARING PULLER (Part No. HD-95760-69A) to remove bushings from gearcase cover and crankcase.



1. **Rear intake**
2. **Front intake**
3. **Pinion**
4. **Rear exhaust**
5. **Front exhaust**

Figure 3-85. Cam and Pinion Bushings

Table 3-32. Cam and Pinion Shaft Specifications

SHAFT	CORRECT CLEARANCE		SERVICE WEAR LIMIT	
	in	mm	in	mm
Cam	0.0007-0.0022	0.018-0.056	0.003	0.08
Pinion	0.0023-0.0043	0.058-0.109	0.005	0.13

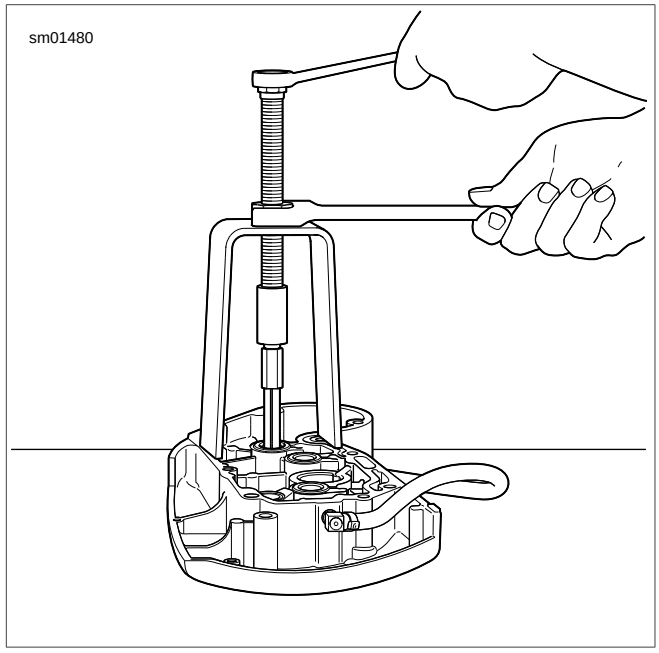


Figure 3-86. Removing Cam Bushing from Gearcase Cover

BUSHING INSTALLATION

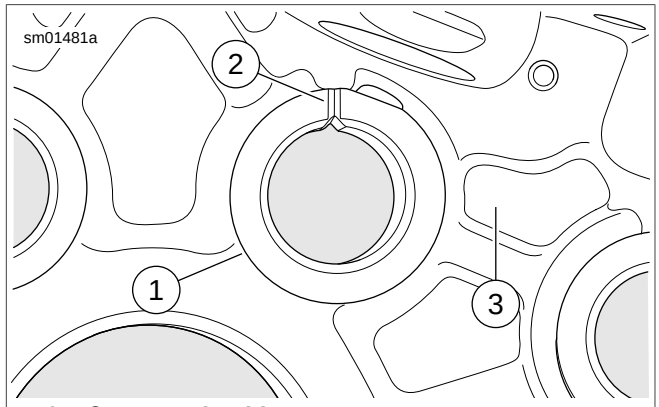
NOTE

Installing and reaming crankcase and gearcase cover bushings can alter the center distances between mating gears. Incorrect spacing can damage gears and increase gear noise.

Cam Gear Bushings in Right Crankcase

See Figure 3-87. Position cam gear bushings in crankcase with oiling slot at exact top of bore (12 o'clock position).

1. Press each bushing in crankcase bore until bushing shoulder contacts crankcase boss.
2. Ream the **new** bushing to size after installation. See 3.17 GEARCASE, Bushing Reaming.



1. **Cam gear bushing**
2. **Slot at top**
3. **Right crankcase**

Figure 3-87. Cam Gear Bushing Installed in Crankcase

Cam Gear Bushings (Except Rear Intake Bushing) in Gearcase Cover

1. Press each bushing in its gearcase cover bore until the bushing shoulder contacts cover boss. These bushings require no specific orientation.
2. Line-ream the **new** bushing to correct size after installation. See 3.17 GEARCASE, Bushing Reaming.

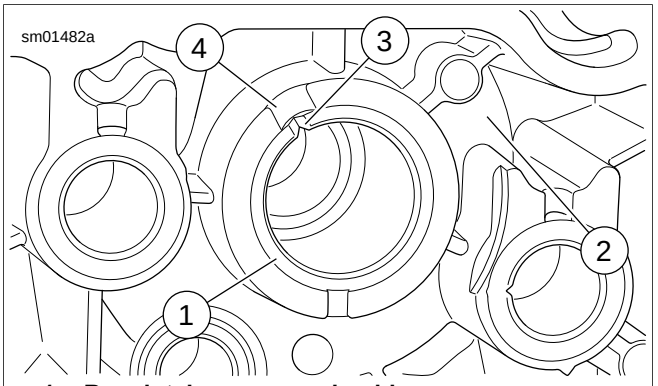
Rear Intake Cam Gear Bushing in Gearcase Cover

Press the rear intake cam gear bushing into its gearcase cover bore with an arbor press. The bushing must be oriented in a specific position of rotation within the cover bore.

1. See Figure 3-88. Position bushing (1) over bore of gearcase cover (2) with chamfered edge downward and slot upward. Align slot in bushing with slot in gearcase cover boss. Press bushing into cover bore until bushing is flush with cover boss.
2. Line-ream the **new** bushing to correct size after installation. See 3.17 GEARCASE, Bushing Reaming.

Pinion Shaft Bushing in Gearcase Cover

1. Using an arbor press, install pinion shaft bushing in gearcase cover flush with cover boss. This bushing requires no specific orientation.
2. See Figure 3-89. The replacement bushing must be secured from rotation by installation of a dowel pin. Drill a No. 31 hole, 0.281 in (7.14 mm) deep, at top side of boss (side toward top of gearcase cover). Center drill bit so hole is drilled half in bushing and half in cover.
3. Drive a **new** dowel pin no more than 0.020 in (0.51 mm) below the bushing face. Carefully peen edges of hole to lock the pin in place.
4. Line-ream the **new** bushing to correct size after installation. See 3.17 GEARCASE, Bushing Reaming.



1. **Rear intake cam gear bushing**
2. **Gearcase cover**
3. **Cam bushing slot**
4. **Gearcase cover slot**

Figure 3-88. Rear Intake Cam Gear Bushing Installed in Gearcase Cover

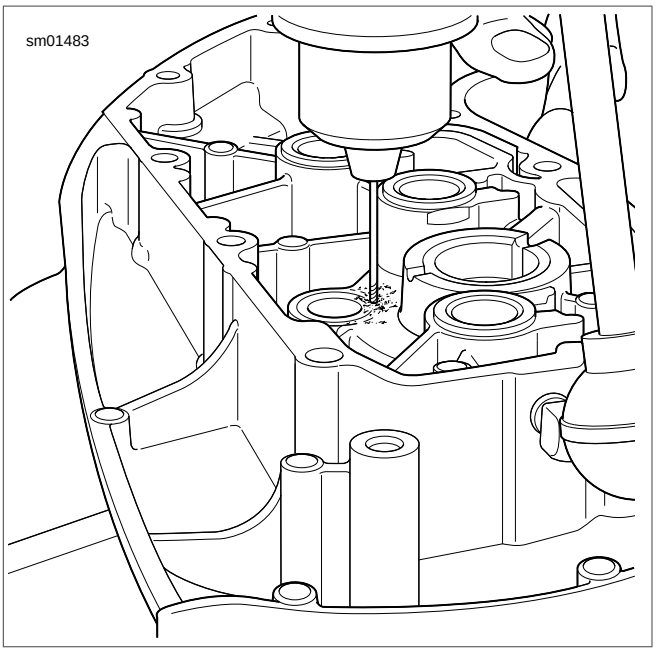


Figure 3-89. Drilling Pinion Bushing Dowel Pin Hole in Gearcase Cover

BUSHING REAMING

PART NUMBER	TOOL NAME
HD-38871	CRANKSHAFT BUSHING PLATE PILOT
HD-94803-67	REAR INTAKE CAM GEAR BUSHING REAMER
HD-94812-1	REAMER
HD-94812-87	PILOT

NOTES

- *Installing and reaming crankcase and gearcase cover bushings can alter the center distances between mating gears. Incorrect spacing can damage gears and increase gear noise.*
- *Bushings in right crankcase serve as pilots for reaming gearcase cover bushings and must, therefore, be reamed to size first.*
- *After reaming any bushing, check shaft fit in the bushing. It may be necessary to make a second pass with reamer to attain proper fit.*

Cam Gear Bushings in Right Crankcase

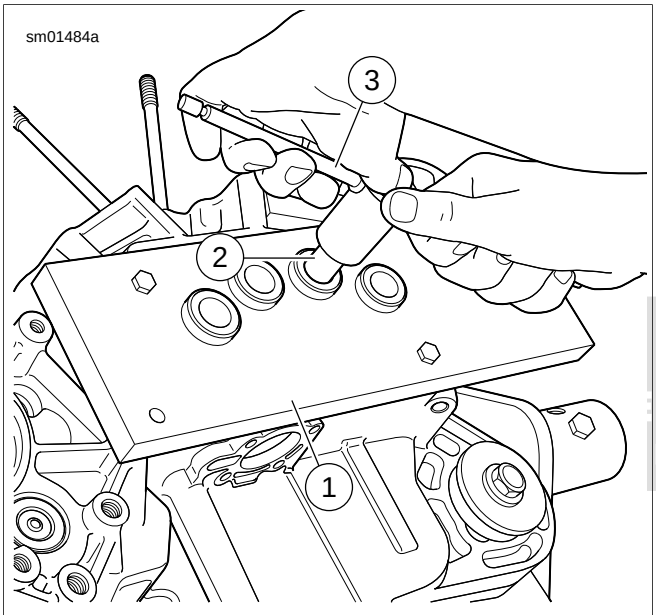
1. Separate two halves of crankcase, unless already done. Place right crankcase on flat surface with gearcase side up.
2. See Figure 3-90. Position CRANKSHAFT BUSHING PLATE PILOT (Part No. HD-38871) onto gearcase side of crankcase. The upper right and lower left indexing holes in pilot must be placed over dowels in crankcase.
3. Insert two bolts (supplied with pilot) through two remaining holes in pilot, and into threaded holes of crankcase. Tighten bolts securely.

4. Insert a standard 11/16 reamer through pilot hole and into bushing while turning reamer clockwise. Continue turning reamer clockwise through bushing until smooth shank of reamer passes through hole in pilot.
5. Detach reamer from handle. Pull reamer out opposite side of crankcase.

⚠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. Thoroughly clean right crankcase, removing all metal chips/shavings. Blow out all bushing bores and oil passages using low pressure compressed air.



1. **Camshaft bushing reamer pilot (Part No. HD-38871)**
2. **Standard 11/16 reamer**
3. **Reamer handle**

Figure 3-90. Reaming Cam Gear Bushing in Right Crankcase

Cam Gear Bushings (Except Rear Intake Bushing) in Gearcase Cover

NOTE

Line-ream newly installed cam gear bushings to establish correct clearance and to produce perfect alignment. Use the right crankcase as a pilot for the reamer. If crankcase halves are not separated, use a spare right crankcase to perform the following line-reaming procedures.

1. Bushings to be reamed must be installed in gearcase cover as described in 3.17 GEARCASE, Bushing Installation. Attach gearcase cover to right crankcase, which has been disassembled from left crankcase, securing with at leaset three mounting screws.
2. Insert a standard 11/16 reamer through the previously reamed cam gear bushing in right crankcase in line with one of the bushings to be reamed in gearcase cover.
3. Turn reamer clockwise through bushing in cover until reamer bottoms. Then give reamer one complete clockwise turn to size the bushing. Continue turning reamer clockwise while extracting reamer from bushing.
4. Repeat two previous steps for remaining two cam gear bushings (except rear intake bushing) in gearcase cover, if required.
5. Separate gearcase cover from right crankcase. Inspect bushings for proper cam gear shaft fit. Repeat line reaming operation if necessary.

⚠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. Thoroughly clean gearcase cover, removing all metal chips/shavings. Blow out all bushing bores and oil passages using low pressure compressed air.

Rear Intake Cam Gear Bushing in Gearcase Cover

NOTE

Line-ream newly installed cam gear bushings to establish correct clearance and to produce perfect alignment. Use the right crankcase as a pilot for the reamer. If crankcase halves are not separated, use a spare right crankcase to perform the following line reaming procedures.

1. Install rear intake cam gear bushing in gearcase cover. See 3.17 GEARCASE, Bushing Installation.
2. Identify the previously reamed rear intake cam gear bushing in right crankcase, which has been disassembled from left crankcase. Insert the shank end of REAR INTAKE CAM GEAR BUSHING REAMER (Part No. HD-94803-67) through gearcase side of this bushing.
3. With reamer inserted into bushing in right crankcase, attach gearcase cover to right crankcase, securing with at least three mounting screws.
4. Turn reamer clockwise through bushing in gearcase cover until reamer bottoms. Then give reamer one complete clockwise turn to size the bushing. Continue turning reamer clockwise while extracting reamer from bushing.
5. Separate gearcase cover from right crankcase. Inspect bushing for proper cam gear shaft fit. Repeat line reaming operation if necessary.

⚠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. Thoroughly clean gearcase cover, removing all metal chips/shavings. Blow out all bushing bores and oil passages using low pressure compressed air.

Pinion Shaft Bushing in Gearcase Cover

NOTE

*Ream a **new** pinion shaft bushing in the gearcase cover with the right crankcase and the PILOT (Part No. HD-94812-87) as pilots for the reamer. If the crankcase halves are not separated, use a spare right crankcase to line ream the bushing.*

1. Install pinion shaft bushing in gearcase cover. See 3.17 GEARCASE, Bushing Installation.
2. Attach gearcase cover to right crankcase with a minimum of three mounting screws.
3. See Figure 3-91. Install a PILOT (Part No. HD-94812-87) into right crankcase roller race. Insert REAMER (Part No. HD-94812-1) through the pilot.
4. Turn reamer clockwise through bushing in gearcase cover until reamer bottoms. Then give reamer one complete clockwise turn to size the bushing. Continue turning reamer clockwise while extracting reamer from bushing.
5. Separate gearcase cover from right crankcase. Inspect bushing for proper pinion shaft fit. Repeat line reaming operation if necessary.

⚠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. Remove pilot from right crankcase roller race. Thoroughly clean gearcase cover, removing all metal chips/shavings. Blow out all bushing bores and oil passages using low pressure compressed air.

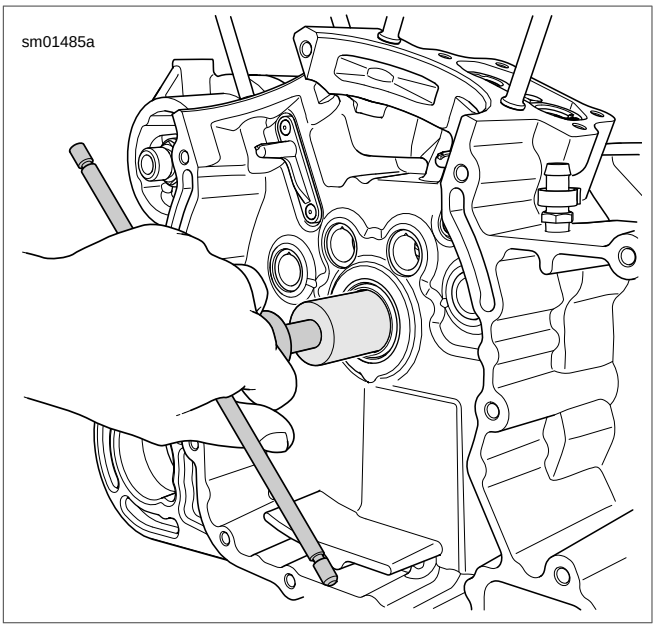


Figure 3-91. Line Reaming Pinion Shaft Bushing

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

CRANKCASE 3.18

GENERAL

When replacing the connecting rod and flywheel assembly, the pinion shaft bearing, or the sprocket shaft bearing, inspect and make repairs to the cylinder heads, the cylinders, the gear case and the transmission. Perform a complete engine overhaul.

NOTE

When engine is removed from chassis, do not lay engine on primary side. Laying engine on primary side will damage the clutch cable end fitting. If fitting is damaged, clutch cable must be replaced.

DISASSEMBLY

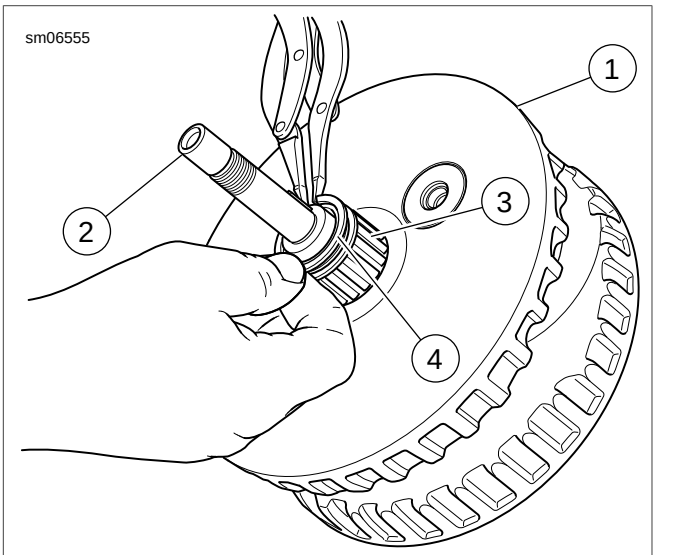
PART NUMBER	TOOL NAME
B-45655	CRANKCASE BEARING REMOVER/INSTALLER
CJ 114	SNAP-ON BODY DENT PULLER
HD-42720-2	CRANKCASE BEARING REMOVER/INSTALLER BASE
HD-46663	CRANKCASE BEARING REMOVER ADAPTER
J-5586-A	TRANSMISSION SHAFT RETAINING RING PLIERS

1. Disassemble crankcase. See 3.16 BOTTOM END OVERHAUL: DISASSEMBLY, Crankcase.

NOTE

Remove either the pinion shaft bearing or the left main bearing with this procedure.

2. See Figure 3-92. The pinion shaft bearing assembly (3) remains on pinion shaft (2) when flywheel assembly (1) is removed from right crankcase. Using TRANSMISSION SHAFT RETAINING RING PLIERS (Part No. J-5586-A), remove retaining ring (4) and slip bearing off pinion shaft.



1. **Flywheel assembly**
2. **Pinion shaft**
3. **Pinion shaft bearing assembly**
4. **Retaining ring**

Figure 3-92. Removing Pinion Shaft Bearing Retaining Ring

NOTE

The sprocket shaft inner race is not replaceable. Replace crankshaft if race is worn or damaged.

3. See Figure 3-93. Remove outer left main bearing retaining ring.

4. Remove left main oil seal from left crankcase with SNAP-ON BODY DENT PULLER (Part No. CJ 114).

5. Remove thrust washer next to left main bearing.

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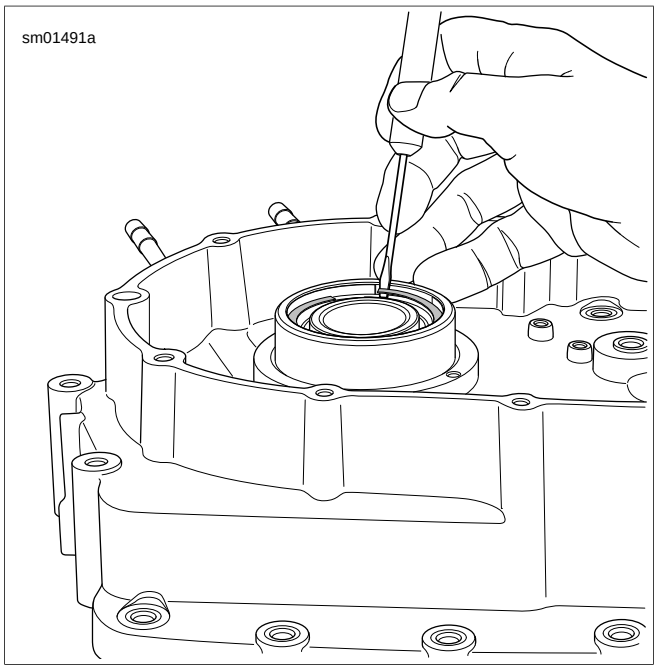


Figure 3-93. Removing Left Main Oil Seal Retaining Ring

6. See Figure 3-94. Remove left main bearing retaining ring from the inside of the left crankcase.

NOTE

Press the left main bearing from the outside of the left crankcase toward the inside. A shoulder in the left crankcase prevents the bearing from being pressed towards the outside.

7. See Figure 3-95. Assemble the CRANKCASE BEARING REMOVER/INSTALLER (Part No. B-45655) with a CRANKCASE BEARING REMOVER/INSTALLER BASE (Part No. HD-42720-2) and a CRANKCASE BEARING REMOVER ADAPTER (Part No. HD-46663). Press left main bearing out of the left crankcase.
   a. Place support tube (1) on press bed with recessed cup end facing up.
   b. With the outboard side of the left crankcase (2) facing upward, position crankshaft bearing bore (3) over support tube.
   c. Place adapter (4) over left main bearing. Insert pilot/driver (5) through adapter, through left main bearing and into support tube.
   d. Carefully apply pressure with press ram (6) until left main bearing drops free.

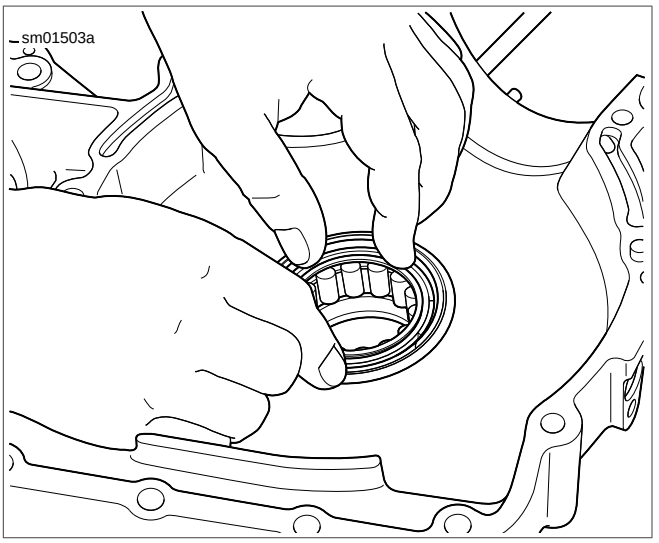
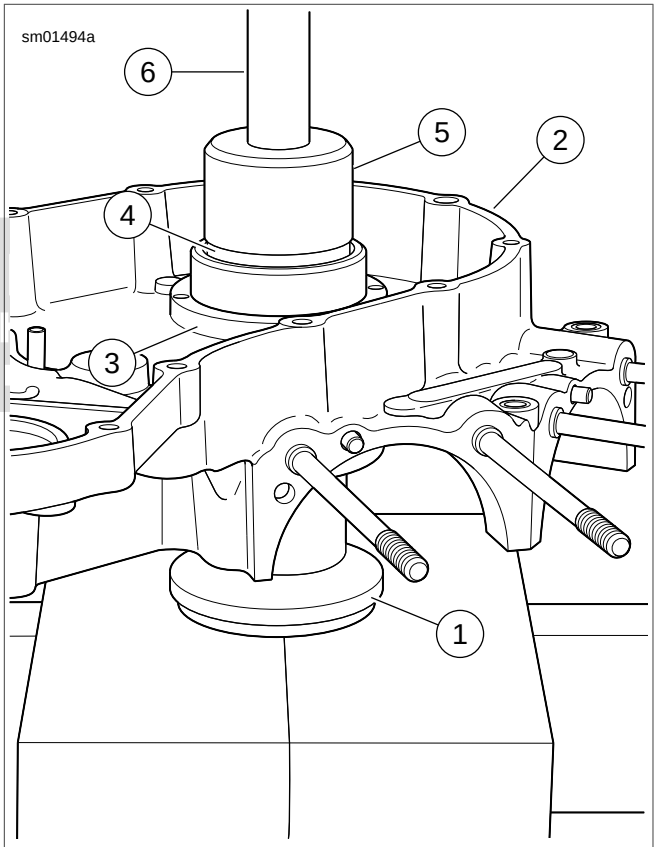


Figure 3-94. Removing Left Main Bearing Retaining Ring



1. **Support tube**
2. **Left crankcase**
3. **Crankshaft bearing bore**
4. **Adapter**
5. **Pilot/driver**
6. **Press ram**

Figure 3-95. Removing Left Main Bearing from Crankcase

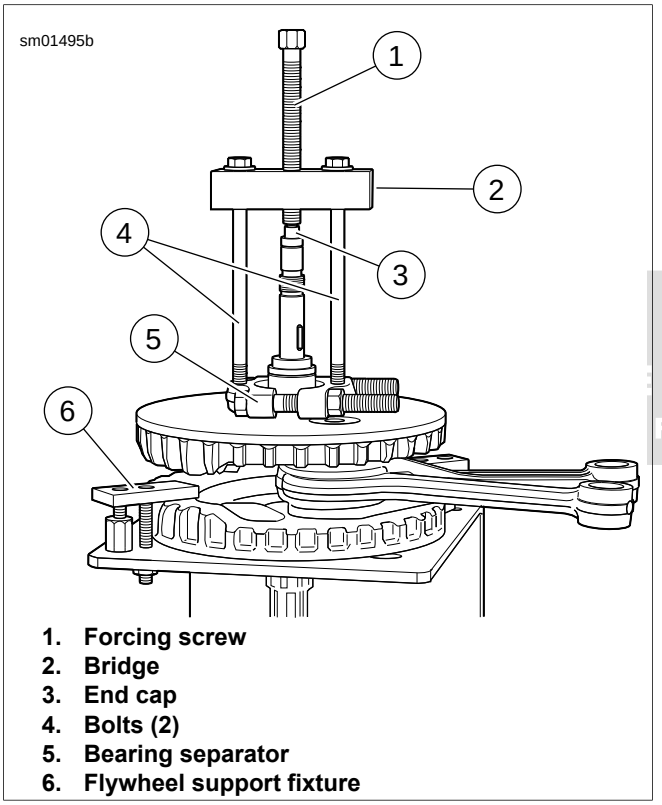
FITTING PINION BEARINGS

PART NUMBER	TOOL NAME
CJ950	SNAP-ON BEARING SEPARATOR
HD-34902-7	END CAP
J-21686-12	FORCING SCREW
J-7830-5	BRIDGE

Outer and Inner Races

The outer race is a pressed-in bushing in the right crankcase. The inner race is pressed on the pinion shaft.

See Figure 3-96. To remove pinion shaft inner race, use SNAP-ON BEARING SEPARATOR (Part No. CJ950), three items from END CAP (Part No. HD-34902-7), BRIDGE (Part No. J-7830-5) and FORCING SCREW (Part No. J-21686-12), and two bolts. Apply heat to race to aid removal.



1. **Forcing screw**
2. **Bridge**
3. **End cap**
4. **Bolts (2)**
5. **Bearing separator**
6. **Flywheel support fixture**

Figure 3-96. Pulling Pinion Shaft Inner Bearing

Pinion bearing selection is based on the largest measured outside diameter (OD) of the inner race and the smallest measured inside diameter (ID) of the outer race (crankcase bushing).

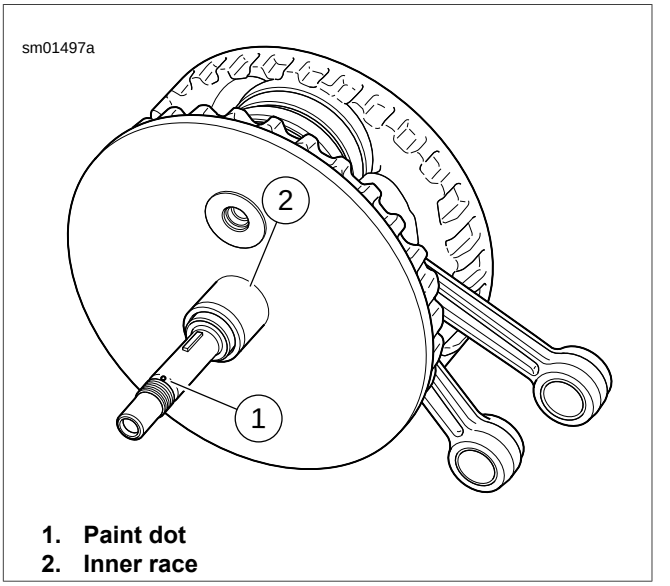
A running clearance of 0.0002-0.0008 in (0.005-0.020 mm) is established during crankcase set or flywheel assembly replacement and engine rebuild.

See Figure 3-97. Installed inner races are identified at the factory as shown.

See Figure 3-99. Outer races are identified at the factory as shown.

NOTE

The different sizes of crankcase sets and flywheel assemblies do not have separate part numbers. Replacement crankcase sets can have a class 1, 2 or 3 pinion outer race. Replacement flywheel assemblies can have either a class A or B inner race.



1. **Paint dot**
2. **Inner race**

Figure 3-97. Factory Inner Race Sizes

Table 3-33. Inner Race Specifications

RACE OD		CLASS	IDENTIFICATION*
in	mm		
1.2498-1.2500	31.745-31.750	A	White
1.2496-1.2498	31.740-31.745	B	Green
* Paint dot on end of spline.			

Bearing Selection

See Figure 3-98. Pinion bearing roller OD cannot be measured to required accuracy with a micrometer. Select bearings using the identification information given for inner and outer races and bearings. Refer to Table 3-36.

NOTE

If either inner or outer race show wear, measure both races to confirm correct bearing fit of 0.0002-0.0008 in (0.005-0.020 mm). The service wear limit of the outer race ID is 1.5656 in (39.776 mm).

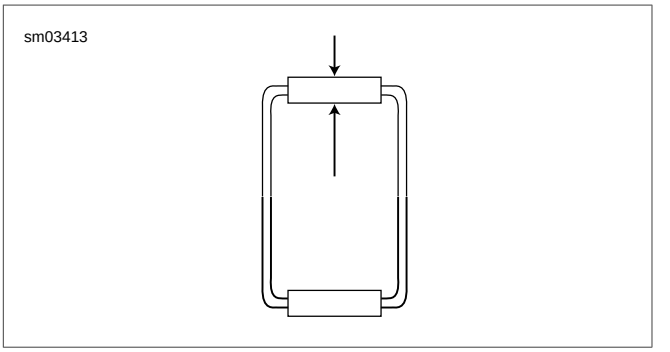


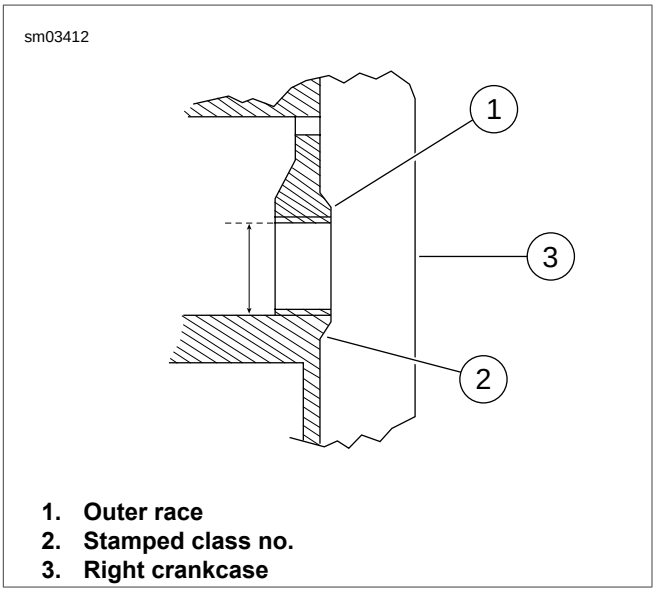
Figure 3-98. Bearing Roller OD (A)

Table 3-34. Roller Specifications

ROLLER OD (A)	IDENTIFICATION (PACKAGE COLOR)
Largest	Red
	Blue
	White (gray)
Smallest	Green

Table 3-35. Outer Race Specifications

RACE ID		CLASS NO.	STAMPED IDENTIFICATION*
in	mm		
1.5646-1.5648	39.741-39-746	1	1
1.5648-1.5650	39.746-39.751	2	2
1.5650-1.5652	39.751-39.756	3	3
* Stamped number inside crankcase near race.			



1. **Outer race**
2. **Stamped class no.**
3. **Right crankcase**

Figure 3-99. Factory Outer Race Sizes

Table 3-36. Pinion Shaft Bearing Selection

FACTORY STAMPED NUMBER	OUTER RACE ID		BEARING SIZE AS IDENTIFIED BY COLOR CODING		
	in	mm			
	1.5654-1.5656	39.761-39.766			Red
	1.5652-1.5654	39.756-39.761		Red	Blue
3	1.5650-1.5652	39.751-39.756	**Red**	**Blue**	White-gray
2	1.5648-1.5650	39.746-39.751	**Blue**	**White-gray**	Green
1	1.5646-1.5648	39.741-39.746	**White-gray**	**Green**	
Inner Race OD (in)			**1.2496-1.2498**	**1.2498-1.2500**	1.2500-1.2502
Inner Race OD (mm)			31.740-31.745	31.745-31.750	31.750-31.755
Factory Color Code			**Green**	**White**	

NOTE

Removal and installation of the inner and outer bearing races require the use of shop-made tools. See Figure 3-101, Figure 3-102, and Figure 3-103.

1. Measure ID of outer race at four places with a dial bore gauge. Take measurement on ID where bearing rollers ride. Record the four measurements.

Table 3-37. Used Pinion Bearing Outer Race Specifications

ITEM	in	mm
Largest ID allowed	1.5656	39.776
Roundness of ID (within)	0.0002	0.005
Taper (within)	0.0002	0.005

2. If the largest measurement is larger than 1.5656 in (39.776 mm) or the required lapping to remove wear marks would enlarge bore beyond 1.5656 in (39.776 mm), continue at Step 8. Refer to Table 3-37.
3. If the largest measurement is 1.5656 in (39.776 mm) or less, cover the cam bearings with masking tape to prevent debris from entering bearings. Assemble crankcase halves.

NOTE

The next step requires lapping the outer race. To keep sprocket shaft and pinion shaft bearings aligned, support the lap by an adaptor or pilot in the left crankcase.

4. Lap the outer race. The race must be lapped until all wear marks are removed. See 3.18 CRANKCASE, Lapping Pinion Bearing Outer Race.
5. After lapping race, again measure ID of race at four places and record the measurements.
6. Check measurements against the specifications listed in Table 3-37.
7. If lapping increased bore ID to larger than 1.5656 in (39.776 mm), go to next step. If roundness or taper do not meet specifications, continue lapping until specifications are met. If all specifications are met, continue at Step 10 to remove and size inner race.

NOTE

Always use the smallest outer race ID measurement and the largest OD inner race measurement when selecting bearings.

8. Press the outer race from the right crankcase. Press **new** outer race into crankcase flush with inside edge of cast-in insert.
9. The **new** outer race must be lapped slightly to true and align with left case bearing to specifications. Refer to Table 3-38. See 3.18 CRANKCASE, Lapping Pinion Bearing Outer Race.

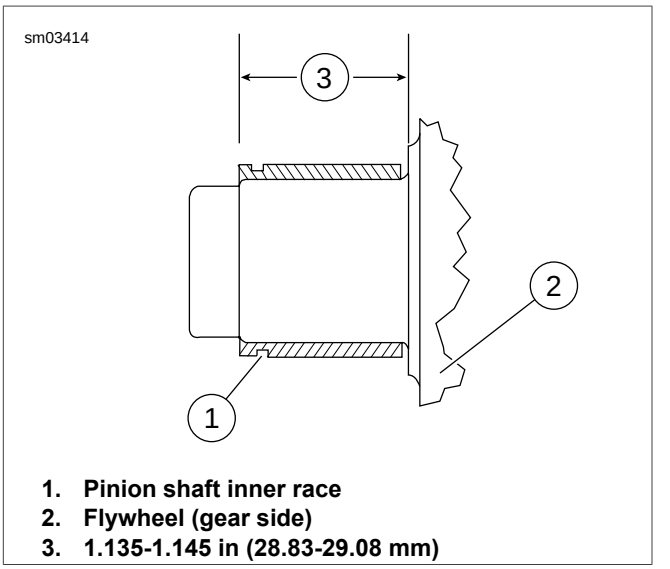
Table 3-38. New Pinion Bearing Outer Race Fit and Finish

ITEM	SPECIFICATION	
	in	mm
ID	1.5646-1.5652	39.741-39.756
Roundness within:	0.0002	0.005
Taper within:	0.0002	0.005
Surface finish	16 RMS	

10. See Figure 3-96. Pull inner race from pinion shaft using SNAP-ON BEARING SEPARATOR (Part No. CJ950), three items from END CAP (Part No. HD-34902-7), BRIDGE (Part No. J-7830-5) and FORCING SCREW (Part No. J-21686-12), and two bolts. Apply heat to race to aid removal.
11. See Figure 3-100. Press **new** inner race on pinion shaft using shop-made tool. When the tool bottoms against the flywheel, the correct inner race location is automatically established. The **new** inner race must be machined to dimension based on the finished lapped ID of the outer race. Refer to Table 3-36.

Table 3-39. Inner Race Fit and Finish

ITEM	SPECIFICATION	
	in	mm
Roundness within:	0.0002	0.005
Taper within:	0.0002	0.005
Surface finish	16 RMS	



1. **Pinion shaft inner race**
2. **Flywheel (gear side)**
3. **1.135-1.145 in (28.83-29.08 mm)**

Figure 3-100. Inner Race Location

Inner Bearing Finish Example

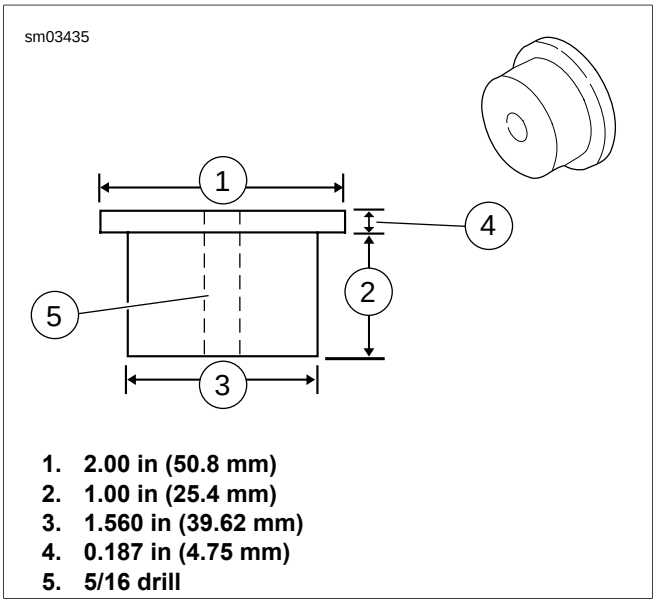
The following example illustrates how to determine the required inner race OD:

1. If smallest measured ID of outer race is 1.5651 in (39.754 mm), an inner race OD range of 1.2496-1.2504 in (31.740-31.760 mm) is required. Refer to Table 3-36.

NOTE

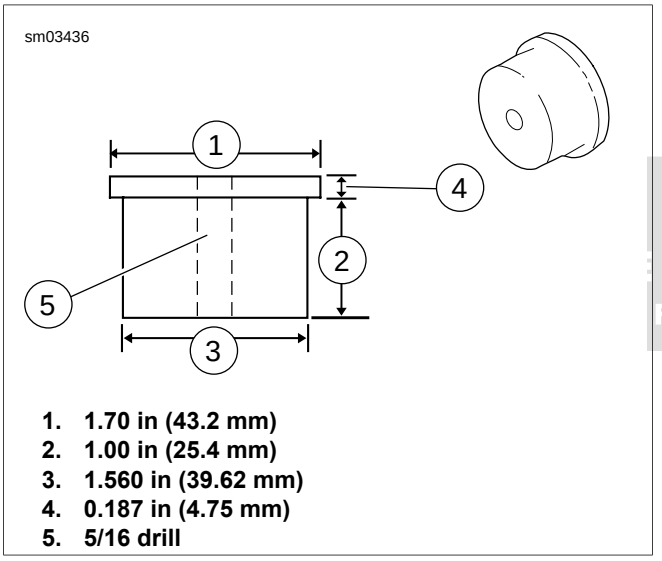
Have machinist precision grind outer race to center or middle of required OD range. This will prevent grinding outer race undersize and gives a more easily achieved tolerance range.

2. Precision grind inner race OD to the middle of the desired range. Refer to Table 3-36.
3. Measure OD at four places. Verify that OD is to specification. Refer to Table 3-39.
4. For example purposes:
   a. The largest measured OD of inner race after grinding is 1.2499 in (31.747 mm) OD.
   b. With a 1.5651 in (39.754 mm) ID outer race and a 1.2499 in (31.747 mm) OD inner race, a blue bearing is required. Refer to Table 3-36.



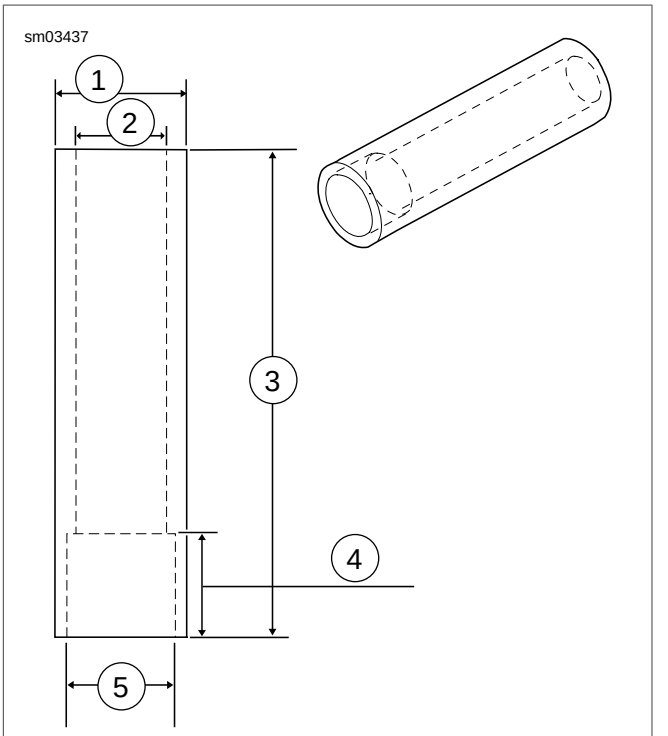
1. 2.00 in (50.8 mm)
2. 1.00 in (25.4 mm)
3. 1.560 in (39.62 mm)
4. 0.187 in (4.75 mm)
5. 5/16 drill

Figure 3-101. Pinion Shaft Outer Race Installation Tool



1. 1.70 in (43.2 mm)
2. 1.00 in (25.4 mm)
3. 1.560 in (39.62 mm)
4. 0.187 in (4.75 mm)
5. 5/16 drill

Figure 3-102. Pinion Shaft Outer Race Removal Tool



1. 1.50 in (38.1 mm)
2. 1.00 in (25.4 mm)
3. 5.50 in (139.7 mm)
4. 1.135-1.145 in (28.83-29.08 mm)
5. 1.262-1.272 in (32.05-32.31 mm)

Figure 3-103. Pinion Shaft Inner Race Installation Tool

LAPPING PINION BEARING OUTER RACE

PART NUMBER	TOOL NAME
HD-46287	LAPPING TOOL ADAPTER
HD-96710-40C	CRANKCASE MAIN BEARING LAPPING TOOL
HD-96712-87A	CRANKCASE MAIN BEARING LAP

1. See Figure 3-104. Obtain CRANKCASE MAIN BEARING LAPPING TOOL (Part No. HD-96710-40C). Assemble CRANKCASE MAIN BEARING LAP (Part No. HD-96712-87A) to lapping handle.

NOTE

Left main roller bearing must be installed in left crankcase to use LAPPING TOOL ADAPTER (Part No. HD-46287). See 3.20 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase.

2. Assemble LAPPING TOOL ADAPTER (Part No. HD-46287) to left main bearing.
3. Secure right and left crankcase halves with three crankcase stud bolts (top center and bottom left and right).
4. Insert lap shaft with arbor assembled through pinion bearing bushing and into lapping tool adapter.

NOTE

Do not adjust arbor snug in bushing or bushing will bell. Belling is a condition where hole is larger at ends than it is in the center.

5. Tighten arbor expansion collars using a length of 0.156 in (3.96 mm) rod as spanner until arbor begins to drag.

NOTE

Do not apply a heavy coat.

6. Withdraw arbor far enough to coat lightly with 220 grit lapping compound. Reposition lap in bushing.

7. Turn handle at moderate hand speed. To avoid grooving and tapering, work lap back and forth in bushing as it is revolved.

NOTE

Lapping is completed when entire bushing surface has a dull, satin finish rather than a glossy, smooth appearance.

8. At frequent intervals, remove lap from crankcase, wash and inspect bushing.

⚠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)

9. When finished, flush off lap tool using cleaning solvent and dry using compressed air. Apply fresh, light coat of fine lapping compound.

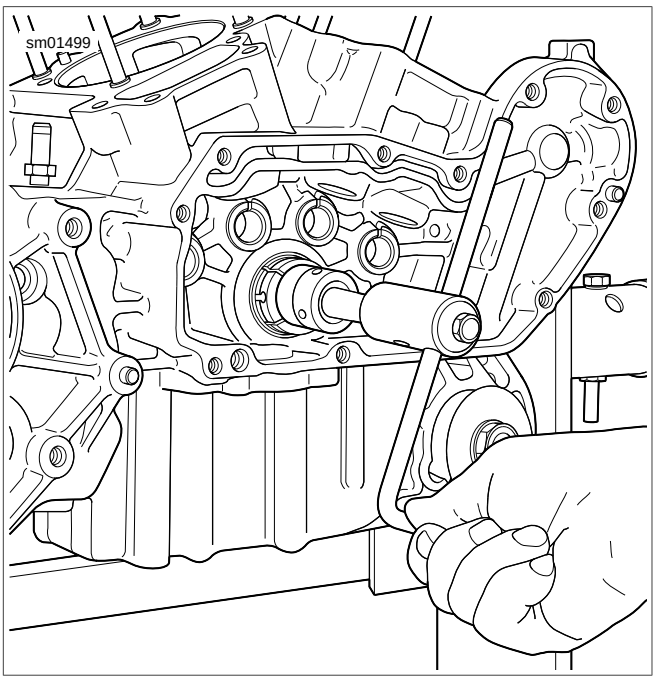


Figure 3-104. Lapping Pinion Bearing Outer Race

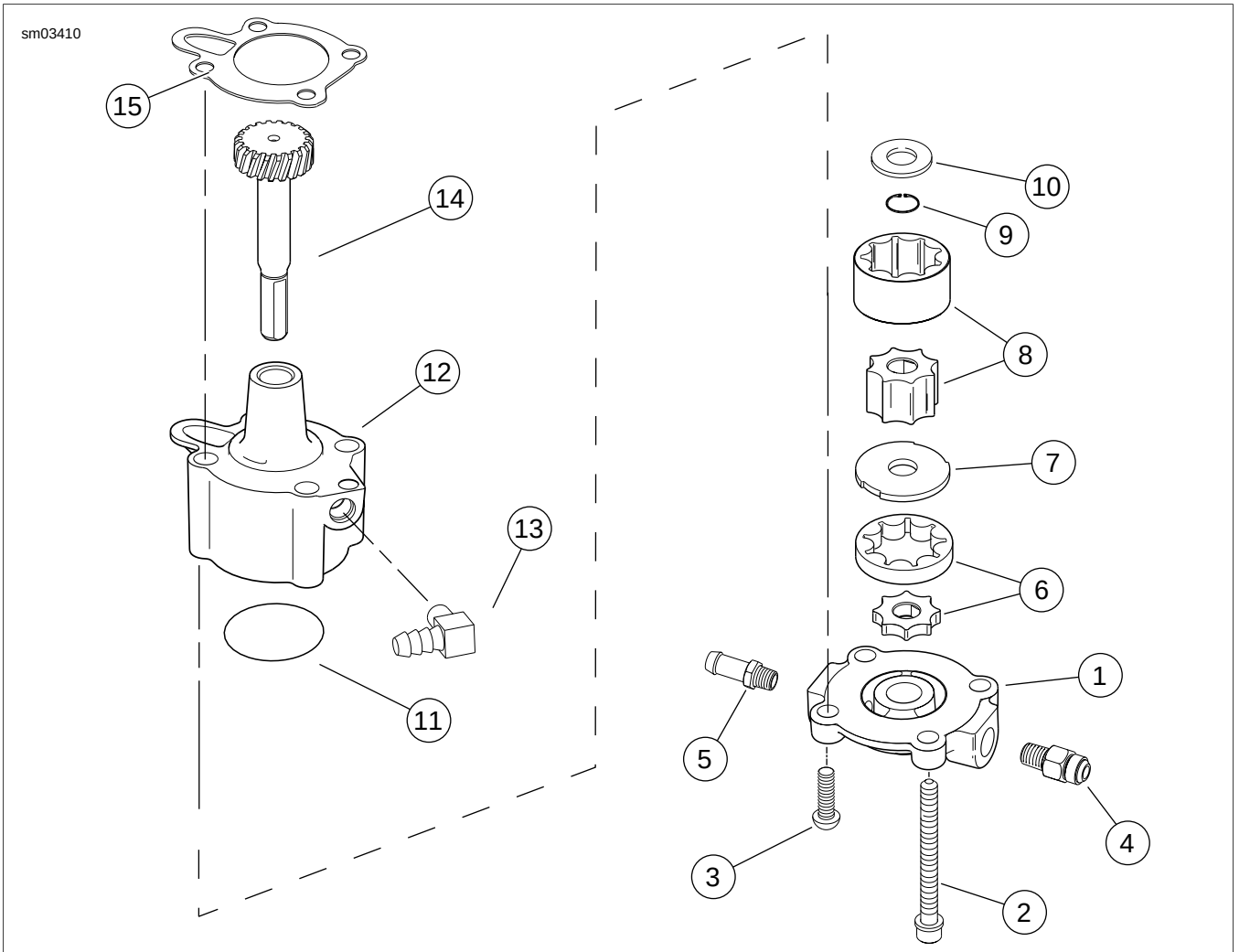
DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

OIL PUMP 3.19

GENERAL

The oil pump seldom needs servicing. Check for all possible malfunctions related to oil pressure before disassembling oil pump. See 3.6 ENGINE LUBRICATION SYSTEM, 3.22 OIL TANK and 6.31 OIL PRESSURE SWITCH.

1. Make sure that all oil line connections are tight and lines are not pinched or damaged.
2. Check level and condition of oil in tank. Diluted oil impacts pressure readings. In freezing weather, proper circulation of oil can be affected if the oil feed line becomes clogged with ice or sludge.
3. If oil pressure indicator fails to go out with engine running, check for a grounded oil pressure switch wire [120] or faulty switch.



1. **Oil pump cover**
2. **Screw with washer (2)**
3. **Torx screw (2)**
4. **Connector**
5. **Hose fitting**
6. **Feed gerotor set**
7. **Gerotor separator plate**
8. **Scavenge gerotor set**
9. **Retaining ring**
10. **Thrust washer**
11. **O-ring**
12. **Oil pump body**
13. **Elbow fitting**
14. **Gear shaft**
15. **Gasket**

Figure 3-105. Oil Pump

REMOVAL

NOTE

The oil pump can be removed with engine in frame and without removing gearcase cover.

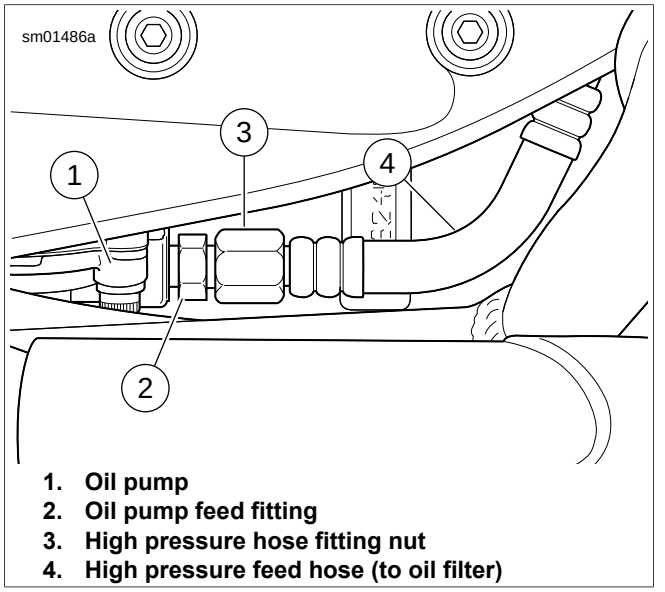
1. Drain oil from oil tank.

NOTE

See Figure 3-106. Do not remove oil pump feed fitting (2) from the pump (1). Hold oil pump feed fitting and loosen large high-

pressure hose fitting nut (3). Then remove high-pressure hose (4) from oil pump feed fitting.

2. See Figure 3-106. Remove high-pressure feed hose (4) from oil pump (1).



1. **Oil pump**
2. **Oil pump feed fitting**
3. **High pressure hose fitting nut**
4. **High pressure feed hose (to oil filter)**

Figure 3-106. Oil Pump Feed Hose

NOTE

See Figure 3-105. The oil pump is designed to be removed as a complete assembly by removing the two long screws (2) at opposite corners of the pump. The other two screws (3) hold the pump together so that it may be removed and installed as a unit.

3. See Figure 3-105. Carefully remove two screws (2) that secure oil pump to crankcase. Pump drops with screws removed. Discard mounting gasket (15).
4. Disconnect and mark the two remaining oil hoses from the pump.

DISASSEMBLY

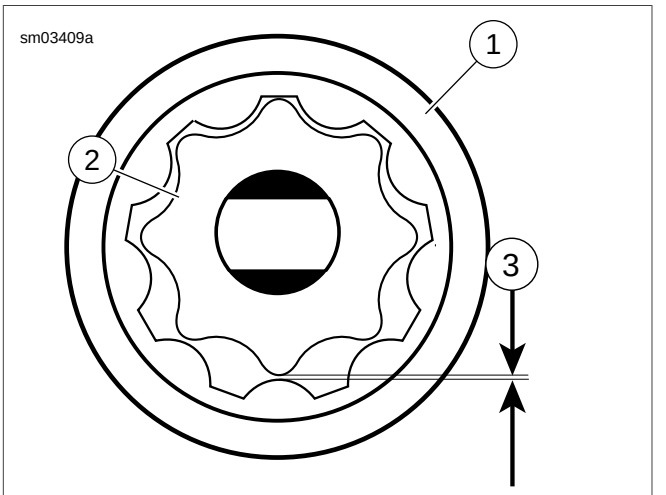
1. See Figure 3-105. Remove screws (3). Lift cover (1) off body (12). Remove and discard O-ring (11).
2. Slide both pieces of feed gerotor set (6), separator plate (7) and both pieces of scavenge gerotor set (8) off gear shaft (14).
3. Remove and discard retaining ring (9). Remove thrust washer (10) and gear shaft.

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 cleaning solvent.
2. Blow out holes and oil passages with compressed air.
3. See Figure 3-107. Inspect both gerotor sets for wear.
   a. Mesh pieces of each set together as shown.
   b. Gauge clearance.
   c. If clearance exceeds 0.004 in (0.102 mm), replace gerotors.
   d. Measure thickness of feed gerotors with a micrometer. Replace gerotors as a set if they are not the same thickness.



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

Figure 3-107. Gerotor Wear Limit

ASSEMBLY

FASTENER	TORQUE VALUE	
Oil pump cover screws	70-80 **in-lbs**	7.9-9.0 Nm

NOTE

Liberally coat all moving parts with clean engine oil to lubricate at start-up.

1. See Figure 3-105. Install gear shaft (14) through oil pump body (12). Position thrust washer (10) over end of shaft. Install **new** retaining ring (9) into groove in shaft.
2. Insert inner gerotor of the scavenge gerotor set (8) over gear shaft.
3. Place outer gerotor over inner to complete scavenge set.
4. Position separator plate (7) into case and line up slots on perimeter with tabs inside oil pump body.
5. Place feed gerotor set (6) over gear shaft.
6. Install a **new** O-ring (11) into groove in oil pump cover (1). Place cover onto pump body. Install cover screws (3). Tighten to 70-80 **in-lbs** (7.9-9.0 Nm).

INSTALLATION

FASTENER	TORQUE VALUE	
Oil pump to crankcase screw	125-150 **in-lbs**	14.1-16.9 Nm
Oil pump feed fitting	100-120 **in-lbs**	11.3-13.6 Nm
Oil pump high-pressure feed hose to crankcase fitting	60-90 **in-lbs**	6.8-10.2 Nm
Oil pump high-pressure feed hose fitting nut	85-105 **in-lbs**	9.6-11.8 Nm

1. See Figure 3-105. Place **new** mounting gasket (15) in position.
2. Secure pump to crankcase with screws (2). Tighten to 125-150 **in-lbs** (14.1-16.9 Nm).

NOTE

*Use **new** hose clamps to secure oil tank feed hose and vent hose to oil pump fittings. If fittings were removed, use TEFLON PIPE SEALANT or HYLOMAR on fitting threads.*

3. Install hoses on oil pump. Attach oil tank feed hose to hose fitting (5) with **new** clamp. Attach oil tank vent hose to elbow fitting (13) with **new** clamp.
4. See Figure 3-106. If oil pump feed fitting (2) was removed for any reason, install fitting in oil pump (1) cover. Tighten to 100-120 **in-lbs** (11.3-13.6 Nm).
5. If high-pressure feed hose (4), was removed completely, install end opposite high-pressure fitting nut (3) in crankcase. Tighten to 60-90 **in-lbs** (6.8-10.2 Nm).
6. Install high-pressure feed hose fitting nut (3) onto feed fitting on front of oil pump. Hold oil pump feed fitting with a wrench and tighten high-pressure hose fitting nut to 85-105 **in-lbs** (9.6-11.8 Nm).
7. Add engine oil. See 1.6 ENGINE OIL AND FILTER.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

BOTTOM END OVERHAUL: ASSEMBLY 3.20

CRANKCASE

PART NUMBER	TOOL NAME
B-45520	GEAR DETENT ASSEMBLY AID
B-45655	CRANKCASE BEARING REMOVER/INSTALLER
B-45676-A	SPROCKET SHAFT SEAL/SPACER INSTALLER
HD-42326-B	CRANKSHAFT GUIDE TOOL
HD-42579-A	SPROCKET SHAFT BEARING/SEAL INSTALLATION TOOL
HD-42720-2	CRANKCASE BEARING REMOVER/INSTALLER BASE
J-5586-A	TRANSMISSION SHAFT RETAINING RING PLIERS

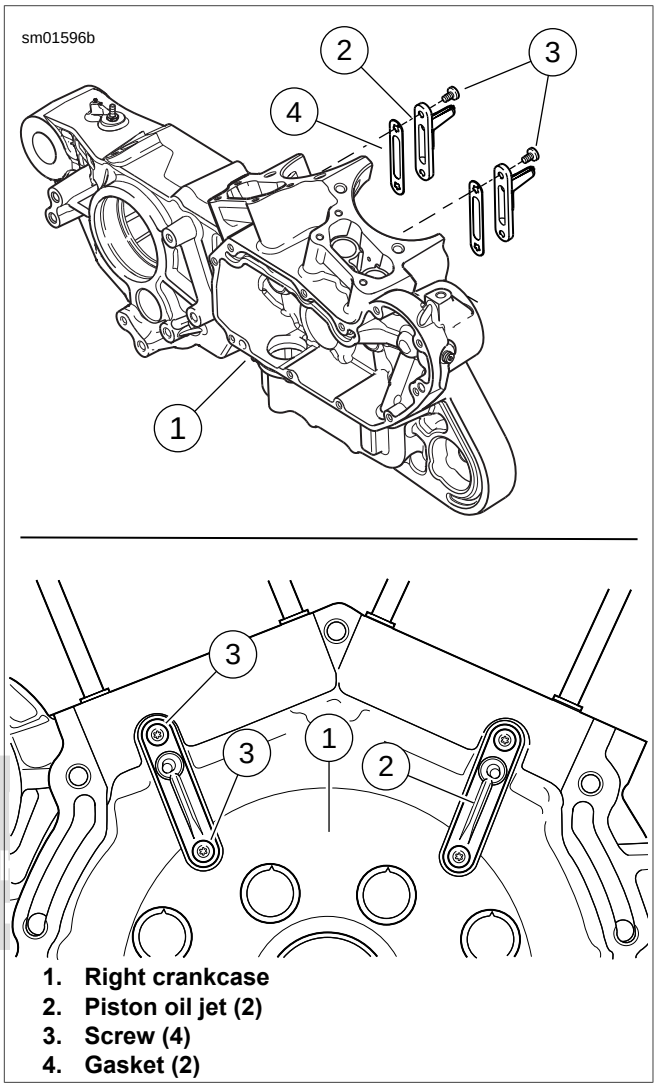
FASTENER	TORQUE VALUE	
Piston oil jet screw	25-35 **in-lbs**	2.8-3.9 Nm
Crankcase fastener	15-19 ft-lbs	20.3-25.8 Nm
Cylinder stud	120-240 **in-lbs**	13.6-27.1 Nm

Installing Piston Oil Jets

NOTES

- *Damaged gaskets cause oil leakage and/or low oil pressure.*
- *See Figure 3-108. Gasket (4) is part of piston oil jet (2) assembly. It is not sold separately.*

1. See Figure 3-108. With oil jet pointed upward, install **new** piston oil jet assemblies (2) with gaskets (4) in right crankcase.
2. Apply LOCTITE 222 LOW STRENGTH THREADLOCKER AND SEALANT (purple) to screws (3).
3. Install screws to secure piston oil jet assembly to crankcase. Tighten to 25-35 **in-lbs** (2.8-3.9 Nm).

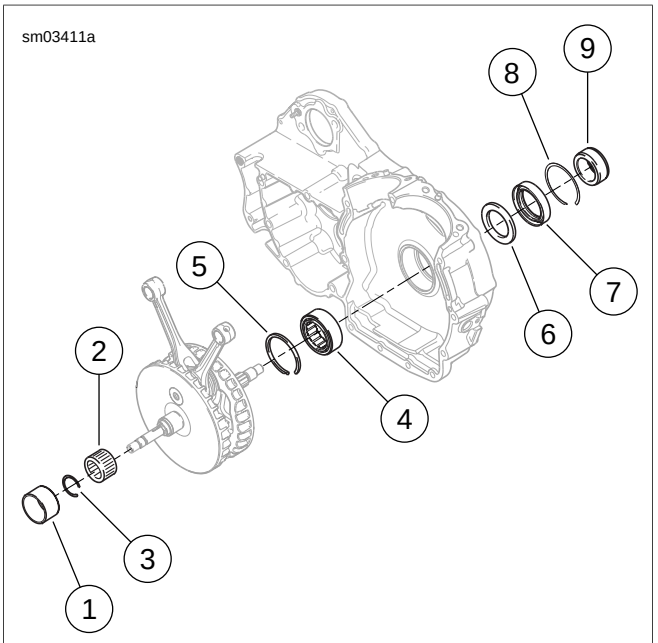


1. **Right crankcase**
2. **Piston oil jet (2)**
3. **Screw (4)**
4. **Gasket (2)**

Figure 3-108. Piston Oil Jet Assemblies

Installing Pinion Shaft Bearings

1. See Figure 3-109. Lubricate pinion shaft and pinion shaft bearing (2) with SCREAMIN' EAGLE ASSEMBLY LUBE.
2. Slip bearing on pinion shaft.
3. See Figure 3-110. Using TRANSMISSION SHAFT RETAINING RING PLIERS (Part No. J-5586-A), install **new** retaining ring in groove of pinion shaft bearing inner race. Make sure that retaining ring is fully seated in groove.



1. **Outer bearing race**
2. **Pinion shaft bearing**
3. **Retaining ring**
4. **Left main bearing**
5. **Retaining ring**
6. **Thrust washer**
7. **Left main oil seal**
8. **Retaining ring**
9. **Sprocket shaft spacer**

Figure 3-109. Pinion Shaft and Left Main Bearings

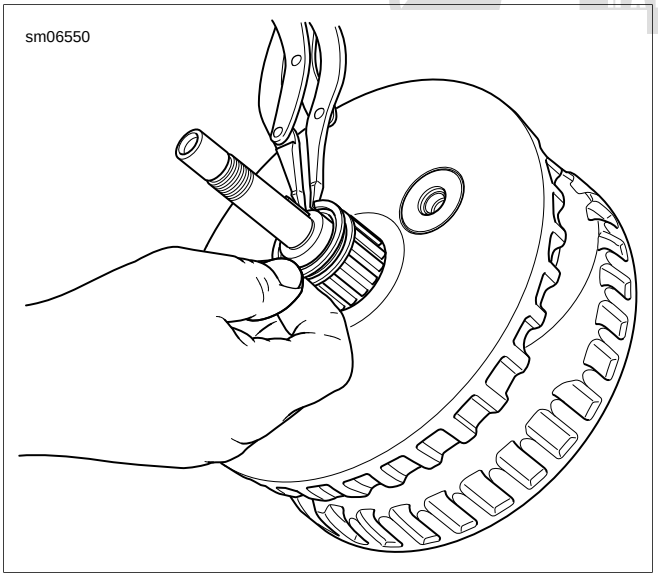


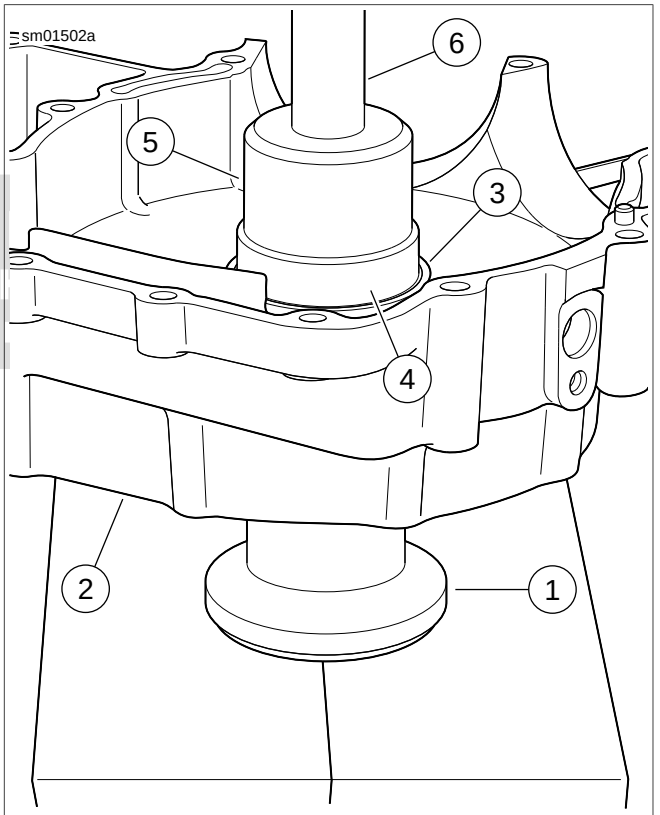
Figure 3-110. Installing Pinion Shaft Bearing and Retaining Ring

Installing Left Main Bearing

NOTE

When installing the left main bearing, press the bearing from the inside of the left crankcase toward the outside. A shoulder is incorporated into the left crankcase. The bearing can be installed in one direction only.

1. See Figure 3-111. Using CRANKCASE BEARING REMOVER/INSTALLER (Part No. B-45655) and CRANKCASE BEARING REMOVER/INSTALLER BASE (Part No. HD-42720-2), press left main bearing into the left crankcase.
   a. Place support tube (1) on press bed with recessed cup end facing up.
   b. With the inboard side of the left crankcase (2) facing upward, position crankshaft bearing bore (3) over support tube.
   c. Place left main bearing (4) over bearing bore. Insert pilot/driver (5) through left main bearing, through crankshaft bearing bore and into support tube.
   d. Apply pressure with press ram (6) until left main bearing bottoms out in bearing bore.
2. See Figure 3-112. Install **new** retaining ring from the inside of the left crankcase.



1. **Support tube (HD-42720-2)**
2. **Left crankcase**
3. **Crankshaft bearing bore**
4. **Left main bearing**
5. **Pilot/driver (B-45655)**
6. **Press ram**

Figure 3-111. Installing Left Main Bearing in Crankcase

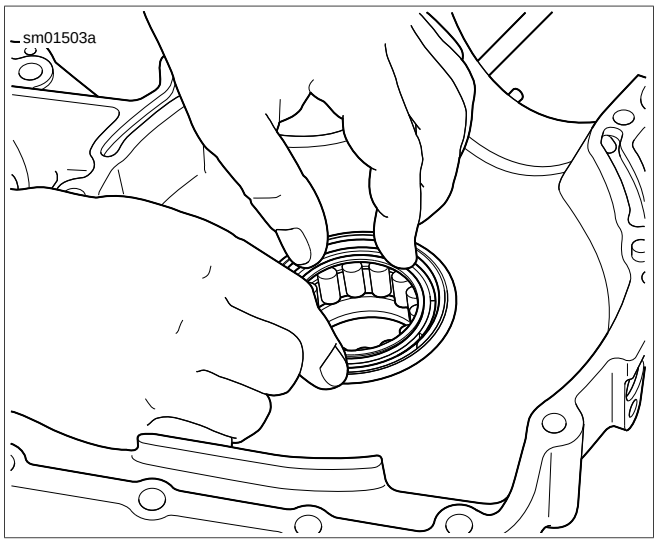


Figure 3-112. Installing Left Main Bearing Retaining Ring

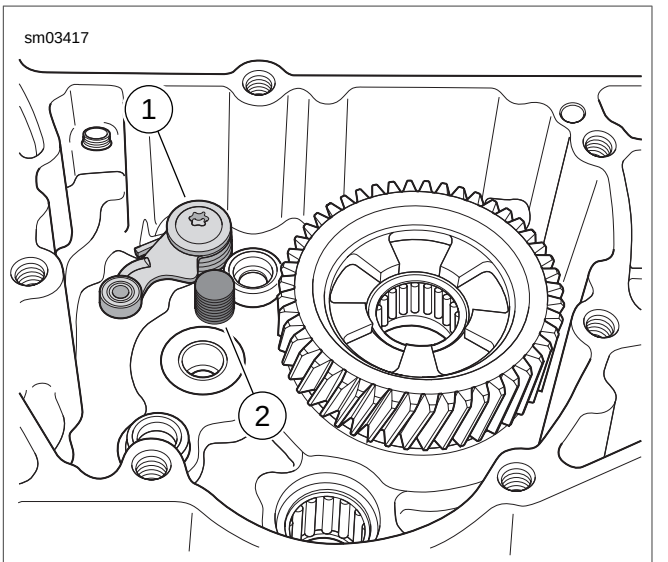
Assembling Crankcase Halves

1. Install transmission assembly in left crankcase. See 5.13 TRANSMISSION INSTALLATION.

NOTE

See Figure 3-113. The gear detent assembly aid is used to move the gear detent lever clear of the shifter drum for assembly.

2. Retract detent assembly in right case half. Install GEAR DETENT ASSEMBLY AID (Part No. B-45520) until it bottoms in right case half.
3. Shift transmission to first gear.
4. Lubricate left main bearing with SCREAMIN' EAGLE ASSEMBLY LUBE.
5. Assemble crankcase halves together.
   a. See Figure 3-114. Install flywheel assembly in right crankcase. Slide pinion shaft through outer race in right crankcase.
   b. Slide CRANKSHAFT GUIDE TOOL (Part No. HD-42326-B) onto flywheel sprocket shaft.
   c. Apply a thin coat of HARLEY-DAVIDSON HIGH-PERFORMANCE SEALANT - GRAY to crankcase joint faces.
   d. See Figure 3-115. Carefully fit crankcases together.
   e. Apply a drop of LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) to last few threads of each crankcase fastener (13 long and four short).
   f. See Figure 3-116. Install four short fasteners in right case bottom locations (1, 2, 3, 4).
   g. Install 11 long fasteners in left case locations (5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15).
   h. Install 2 long fasteners in right case locations (16, 17).
   i. See Figure 3-116. Tighten fasteners to 15-19 ft-lbs (20.3-25.8 Nm) in sequence shown.
6. Remove transmission gear detent assembly aid.



1. **Detent assembly**
2. **Detent assembly aid**

Figure 3-113. Using Gear Detent Assembly Aid (Part No. B-45520)

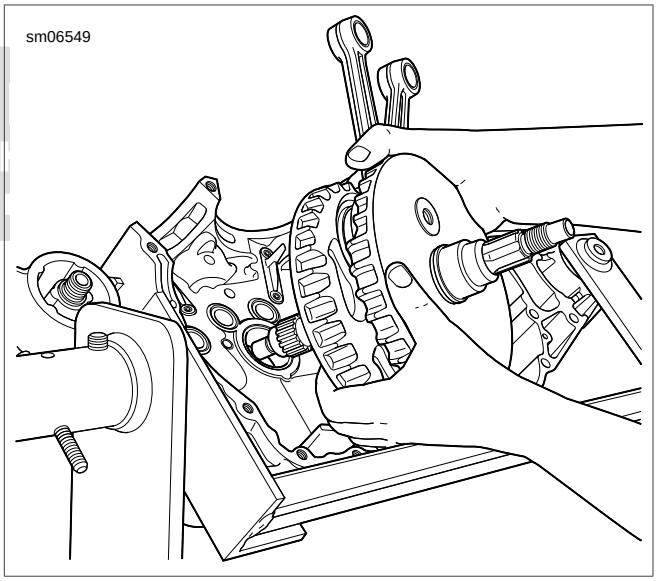


Figure 3-114. Installing Flywheels in Right Crankcase

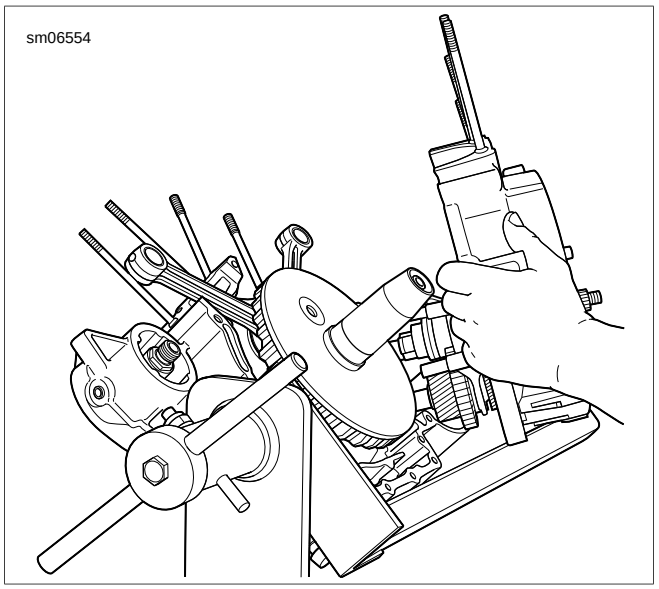


Figure 3-115. Assembling Crankcases with Crankshaft Guide Tool (Part No. HD-42326-B)

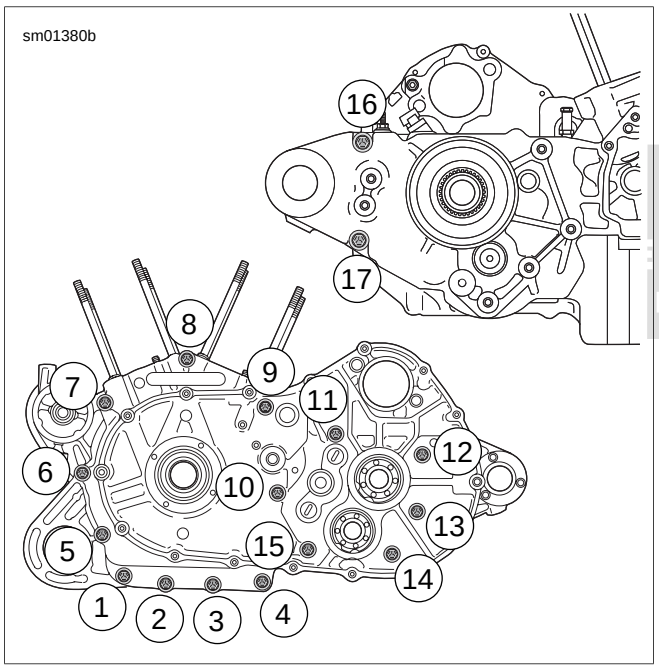


Figure 3-116. Crankcase Fastener Torque Sequence

7. See Figure 3-117 and Figure 3-118. Install spacer in ID of **new** seal. With the open (lipped) side of seal facing outward, center seal/spacer assembly over bearing bore.

NOTE

If the spacer is removed after installation, repeat the seal procedure.

8. See Figure 3-119. Install bearing seal and spacer.
   a. Center seal/spacer driver (2) over seal, so that the sleeve (smaller O.D.) seats between seal wall and garter spring.
   b. Assemble SPROCKET SHAFT BEARING/SEAL INSTALLATION TOOL (Part No. HD-42579-A) (1) and SPROCKET SHAFT SEAL/SPACER INSTALLER (Part No. B-45676-A) onto sprocket shaft.
   c. Rotate handle clockwise until the spacer contacts the bearing. Remove tool from sprocket shaft.
9. Install retaining ring into groove in sprocket shaft bearing bore.

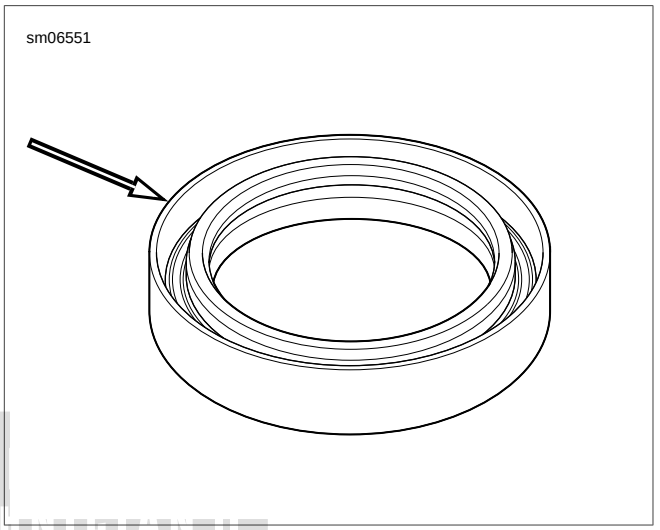


Figure 3-117. Open Side of Seal Faces Out

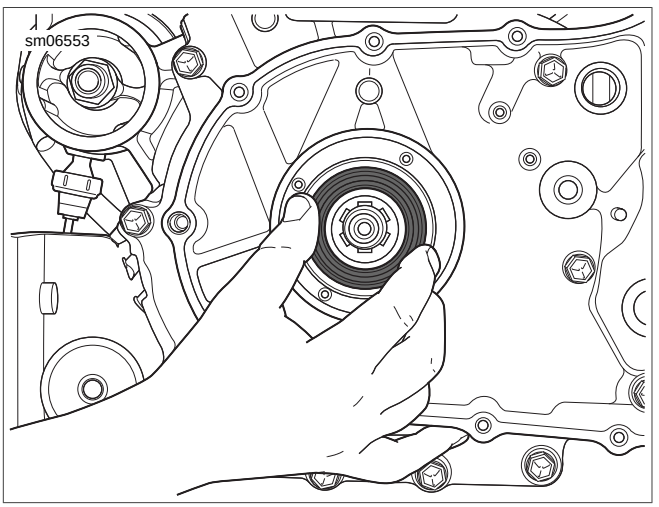
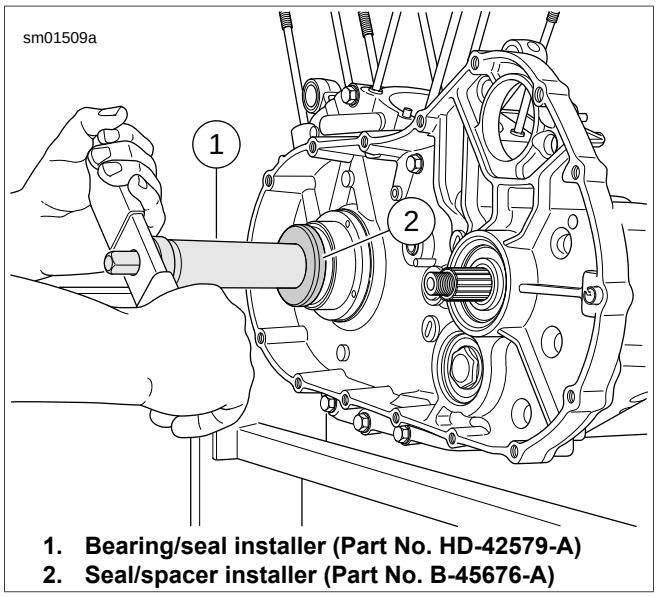


Figure 3-118. Install Spacer and Seal



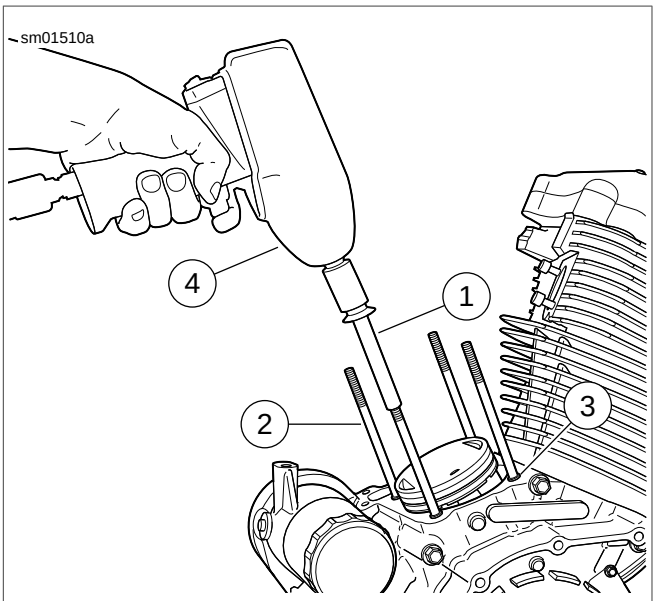
1. **Bearing/seal installer (Part No. HD-42579-A)**
2. **Seal/spacer installer (Part No. B-45676-A)**

Figure 3-119. Install Bearing Seal/Spacer

Installing Cylinder Base Studs

See Figure 3-120. If cylinder studs were removed:

1. Pack clean towels into crankcase opening.
2. Place a steel ball into a head screw (1).
3. The cylinder studs (2) have a shoulder (3) at the lower end. Place the end of the studs without the shoulder into the head screw.
4. Install the studs in the crankcase with the shoulder end down. Use an air gun (4) to drive the stud until the shoulder reaches the crankcase.
5. Remove air gun. Use a torque wrench to tighten studs to 120-240 **in-lbs** (13.6-27.1 Nm).



1. **Head screw with ball inside**
2. **Cylinder stud**
3. **Shoulder on cylinder stud**
4. **Air gun**

Figure 3-120. Cylinder Studs

CAM AND PINION GEAR IDENTIFICATION

NOTE

Prior to changing any cam gears, check gear shaft fit within corresponding bushings. Worn bushings can cause excessive backlash.

See Figure 3-121. Cam lobes are stamped with a number (1, 2, 3, or 4) followed by a letter. The number identifies the cam location/function. The letter identifies the cam lobe profile. Refer to Table 3-40.

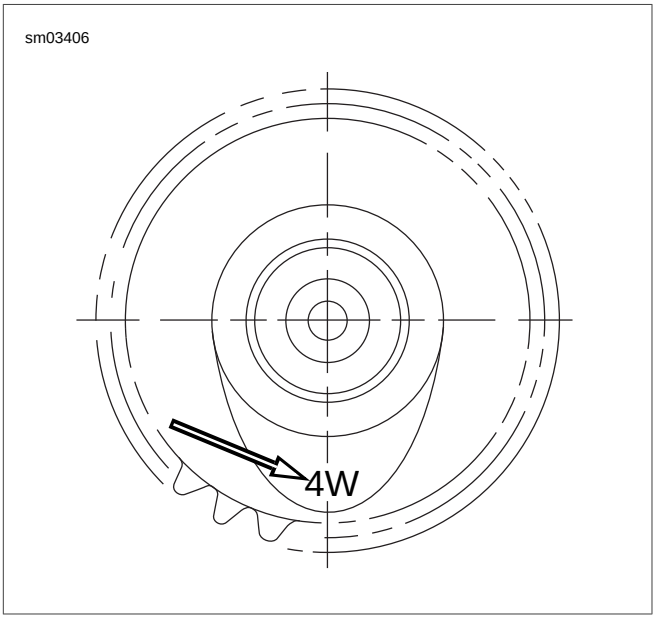


Figure 3-121. Cam Identification (typical)

Table 3-40. Cam Identification

CAM	LOCATION
Rear exhaust	1W
Rear intake	2W
Front intake	3W
Front exhaust	4W

CAM GEARS AND GEARCASE COVER

PART NUMBER	TOOL NAME
HD-43984	CRANKSHAFT LOCKING TOOL

FASTENER	TORQUE VALUE	
Pinion shaft locking nut	19-21 ft-lbs	26-29 Nm
Gearcase cover fasteners	120-140 **in-lbs**	13.6-15.8 Nm

1. See Figure 3-122. Make sure shaft key (11) is installed on flywheel pinion shaft. Install oil pump drive gear (10) and pinion gear (9) on pinion shaft.

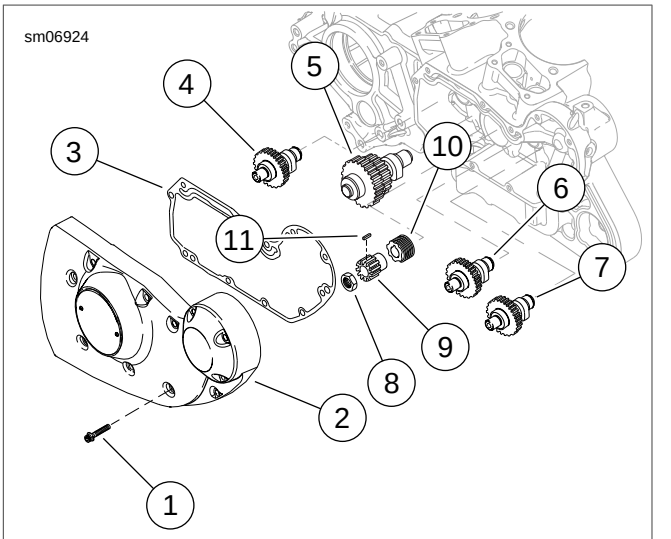
NOTE

See Figure 3-123. Timing mark on pinion gear tooth is aligned with keyway in ID of pinion gear. The timing mark will allow you to easily position pinion gear over shaft key and against oil pump drive gear on pinion shaft.

2. See Figure 3-122. Clean threads on pinion shaft and nut (8). Apply several drops of LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red).

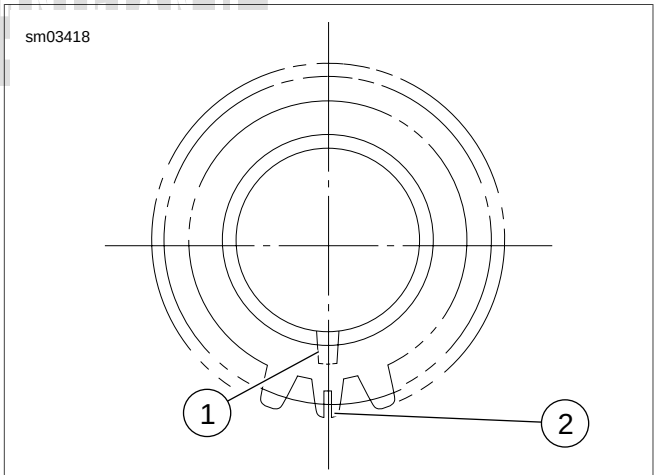
NOTE

When using CRANKSHAFT LOCKING TOOL, do NOT use impact wrench to drive nut onto pinion shaft.



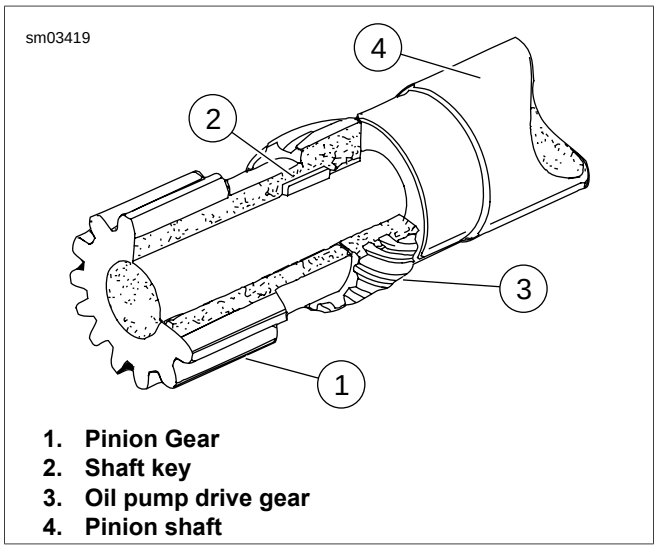
1. **Fastener**
2. **Cover**
3. **Gasket**
4. **Rear exhaust cam**
5. **Rear intake cam**
6. **Front intake cam**
7. **Front exhaust cam**
8. **Nut**
9. **Pinion gear**
10. **Oil pump drive gear**
11. **Shaft key**

Figure 3-122. Gearcase Cover and Cam Gears



1. **Keyway**
2. **Timing mark at centerline of keyway**

Figure 3-123. Pinion Gear Timing Mark and Keyway



1. **Pinion Gear**
2. **Shaft key**
3. **Oil pump drive gear**
4. **Pinion shaft**

Figure 3-124. Oil Pump Drive Gear and Pinion Gear Installed on Pinion Shaft

3. See Figure 3-125. Install pinion shaft nut.
   a. Install CRANKSHAFT LOCKING TOOL (Part No. HD-43984) over pinion shaft.
   b. Install nut on pinion shaft.
   c. Tighten to 19-21 ft-lbs (26-29 Nm).
   d. Tighten another 15-19 degrees of rotation.
   e. Remove CRANKSHAFT LOCKING TOOL (Part No. HD-43984).

NOTE

See Figure 3-126. Install rear exhaust and front intake cam gears before rear intake cam gear. This sequence prevents an alignment problem with the pinion gear.

4. Lubricate all cams and all cam bushings in right crankcase with SCREAMIN' EAGLE ASSEMBLY LUBE.
5. See Figure 3-126. Rotate crankshaft until timing mark on pinion gear points exactly at centerline of rear intake cam bushing.

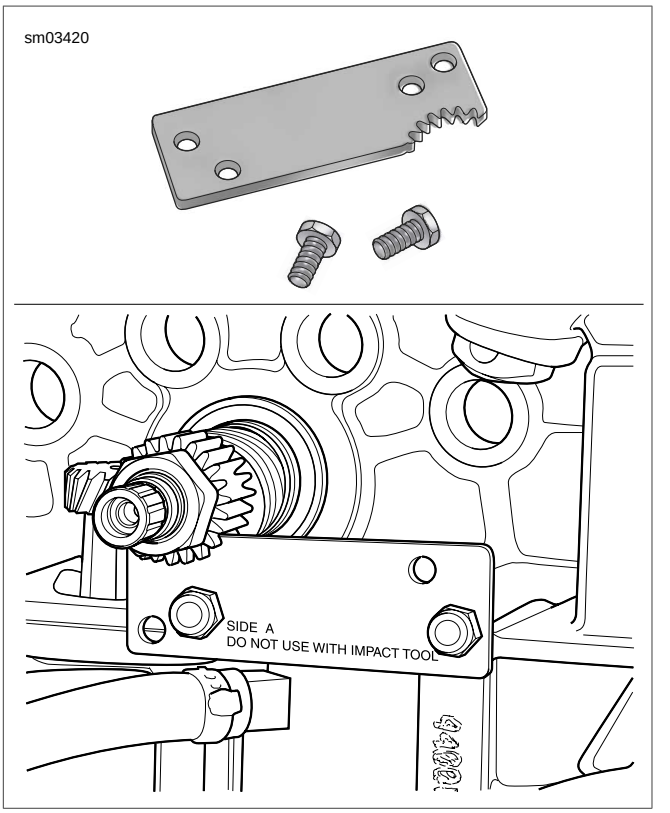


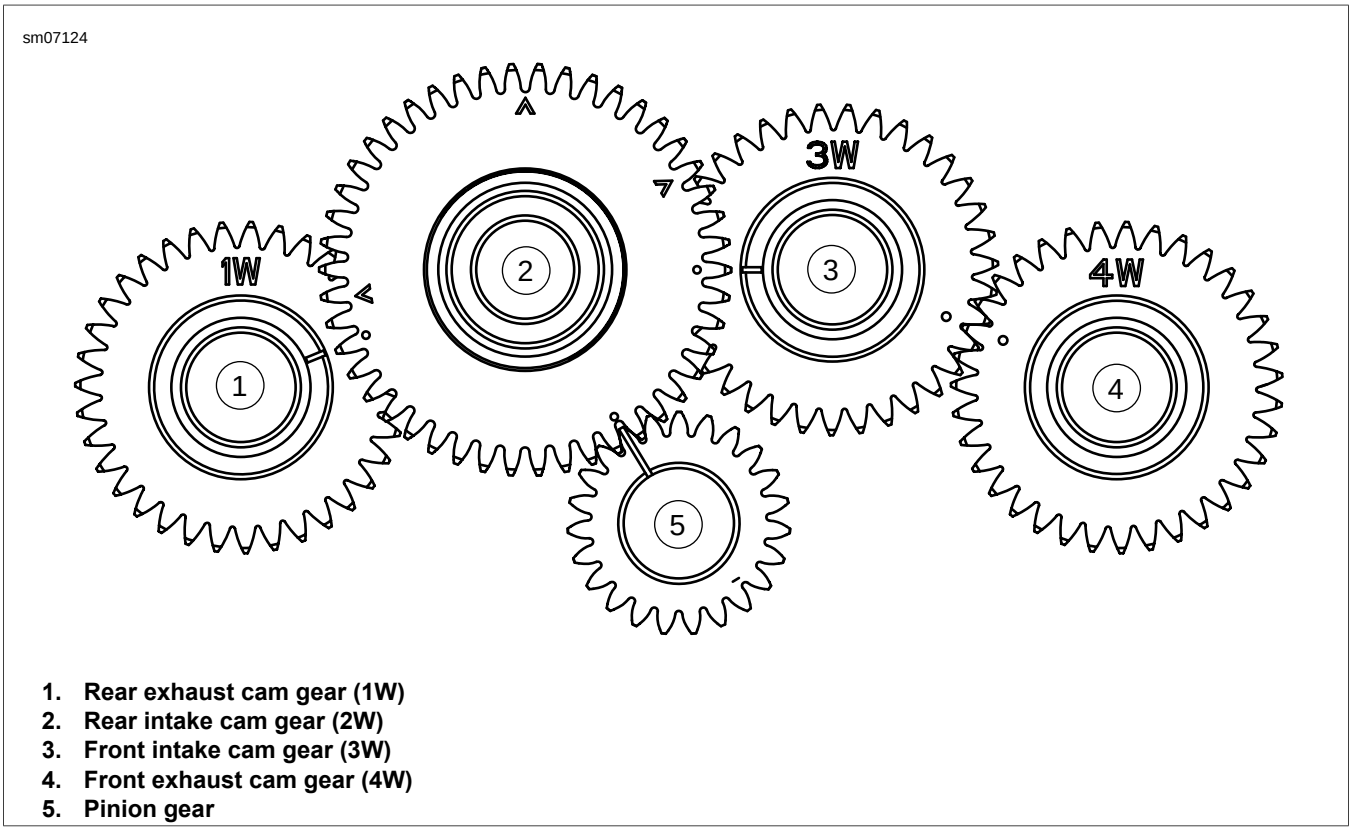
Figure 3-125. Crankshaft Locking Tool (Part No. HD-43984)

6. See Figure 3-122. Install rear exhaust cam (4). Rotate cam until timing mark (a slot) points exactly at centerline of rear intake cam bushing.
7. Install front intake cam (6). Rotate cam until slotted timing mark points exactly at centerline of rear intake cam bushing.

NOTE

See Figure 3-126. "V" marks on rear intake cam are not used for timing of Sportster model engines.

8. See Figure 3-122. Install rear intake cam (5). Rotate the cam to align the three timing marks (dots) with timing marks on the pinion gear, rear exhaust cam and front intake cam.
9. Install front exhaust cam (7). Rotate the cam to line up the timing mark with the timing mark of the front intake cam.
10. See Figure 3-126. Verify timing marks. If necessary, remove a cam, rotate it slightly and install. If timing marks are off even one tooth, engine cannot run correctly.
11. See Figure 3-122. Install a **new** dry gasket (3) on gearcase cover (2).



1. **Rear exhaust cam gear (1W)**
2. **Rear intake cam gear (2W)**
3. **Front intake cam gear (3W)**
4. **Front exhaust cam gear (4W)**
5. **Pinion gear**

Figure 3-126. Cam, Pinion Gear and Timing Mark Indexing (cam #2 "V" marks are not used for timing)

12. Lubricate all cam bushings in gearcase cover with SCREAMIN' EAGLE ASSEMBLY LUBE.
13. See Figure 3-127. Install gearcase cover. Tighten in sequence to 120-140 **in-lbs** (13.6-15.8 Nm).
14. Measure cam gear end play. See 3.16 BOTTOM END OVERHAUL: DISASSEMBLY, Cam Gear End Play.

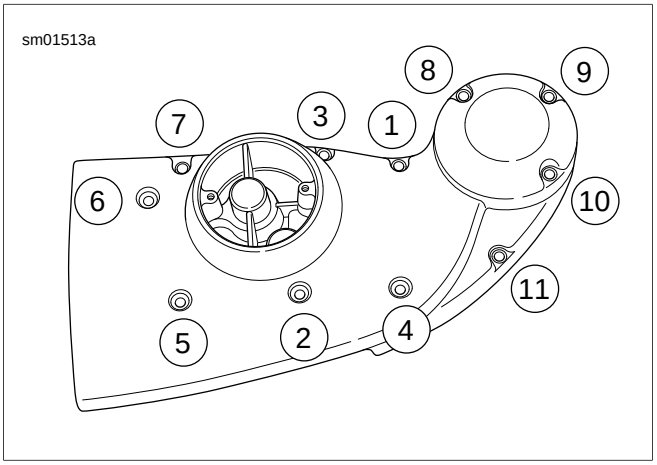


Figure 3-127. Gearcase Cover Mounting Screw Torque Sequence

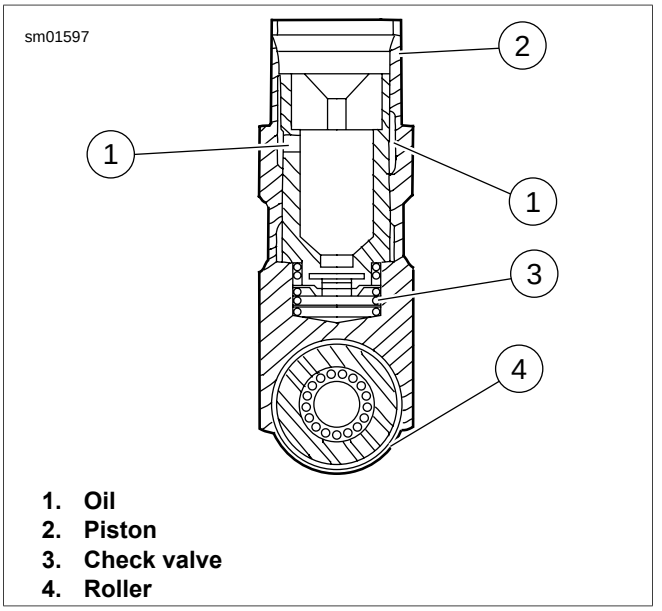
TAPPETS

FASTENER	TORQUE VALUE	
Tappet cover, anti-rotation mounting screw	90-120 **in-lbs**	10.2-13.6 Nm

General

See Figure 3-128. The tappet and roller (4), under compression force from valve spring, follow the surface of the revolving cam. The up-and-down motion is transmitted to the valve by the pushrod and rocker arm. The tappet contains a piston (2) and cylinder. The check valve (3) allows the unit to fill with engine oil (1) reducing clearance in the valve train. The unit automatically compensates for heat expansion to maintain minimal clearances between the cam and the pushrod.

It is normal for tappets to click when engine is started after standing for some time. Tappets have a definite leakdown rate which permits the oil in the tappets to escape. This allows units to compensate for various expansion conditions of parts and still maintain minimal clearances. Tappets are functioning properly if they become quiet after a few minutes of engine operation.



1. **Oil**
2. **Piston**
3. **Check valve**
4. **Roller**

Figure 3-128. Tappet Assembly

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, except roller/tappet assembly, in solvent. Blow dry with compressed air.
2. Measure valve tappet OD and crankcase bore ID to calculate clearance. If guide clearance exceeds specification, replace the tappets and/or crankcases. Refer to Table 3-41.
3. Measure tappet roller free play. Recommended service practice is tappet replacement.
4. Measure tappet roller end clearance.
5. Soak tappets in clean engine oil and kept covered until assembly.
6. Apply SCREAMIN' EAGLE ASSEMBLY LUBE to rollers and OD of tappet before installation.

Table 3-41. Valve Tappet Specifications

ITEM	SERVICE WEAR LIMIT	
	in	mm
Tappet clearance in guide	0.0030	0.076
Tappet roller free play (clearance on pin)	0.0015	0.038
Tappet roller end clearance	0.026	0.660

Installation

1. See Figure 3-129. Rotate engine so that both tappets (3) from the cylinder being serviced will be installed on the base circle (lowest position) of the cam.
2. Apply a liberal amount of engine oil to tappet assembly (especially roller needles) for smooth initial operation.

NOTE

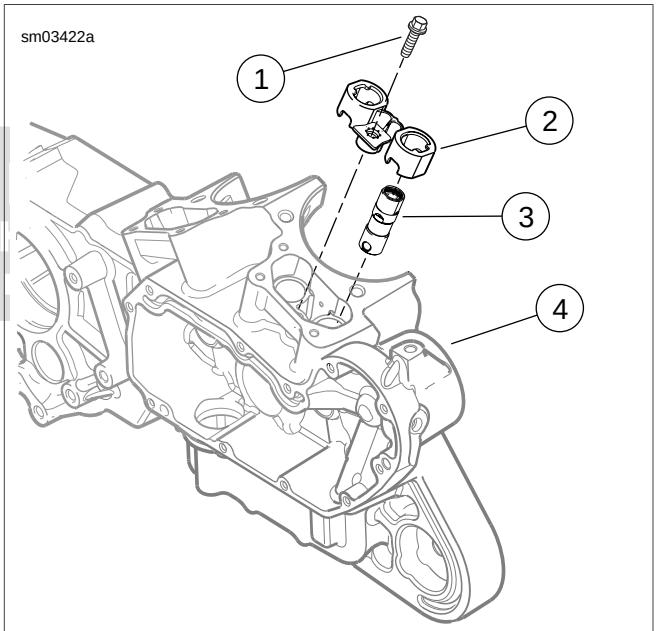
Face the flats of the tappets front and rear when installed in the engine and with the oil feed hole toward the gear cover.

3. Insert the intake and exhaust tappets into the anti-rotation blocks (2).
4. Install anti-rotation blocks with tappets into bore in right crankcase (4). Secure with screw (1). Tighten to 90-120 **in-lbs** (10.2-13.6 Nm).

NOTE

The front tappet cover has a tab on the front or right side. The rear tappet cover has a tab on the rear or left side.

5. Install the tappet covers, pushrod covers, and pushrods. See 3.15 TOP END OVERHAUL: ASSEMBLY, Tappet Covers, Pushrod Covers and Pushrods.



1. **Screw (2)**
2. **Anti-rotation device (2)**
3. **Tappet (4)**
4. **Right crankcase**

Figure 3-129. Tappet Components

OIL FILTER MOUNT 3.21

GENERAL

Oil is pressure-fed from the oil pump to the oil filter mount via a hose connection. Oil travels through the filter mount into the filter via outer filter holes.

Adequate oil pressure activates the oil pressure indicator lamp switch in the filter mount, which turns off the oil pressure indicator lamp.

The check ball in the filter adapter opens at 10-13 psi (68.9-89.6 kPa) oil pressure.

Filtered oil leaves the filter, flowing past the check ball.

DISASSEMBLY

1. Remove oil filter. See 1.6 ENGINE OIL AND FILTER.
2. See Figure 3-130. Remove oil filter adapter (1) from oil filter mount (2).
3. Remove check ball (3) and spring (4).

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)

Thoroughly clean all parts in cleaning solvent. Blow out holes and passages using compressed air.

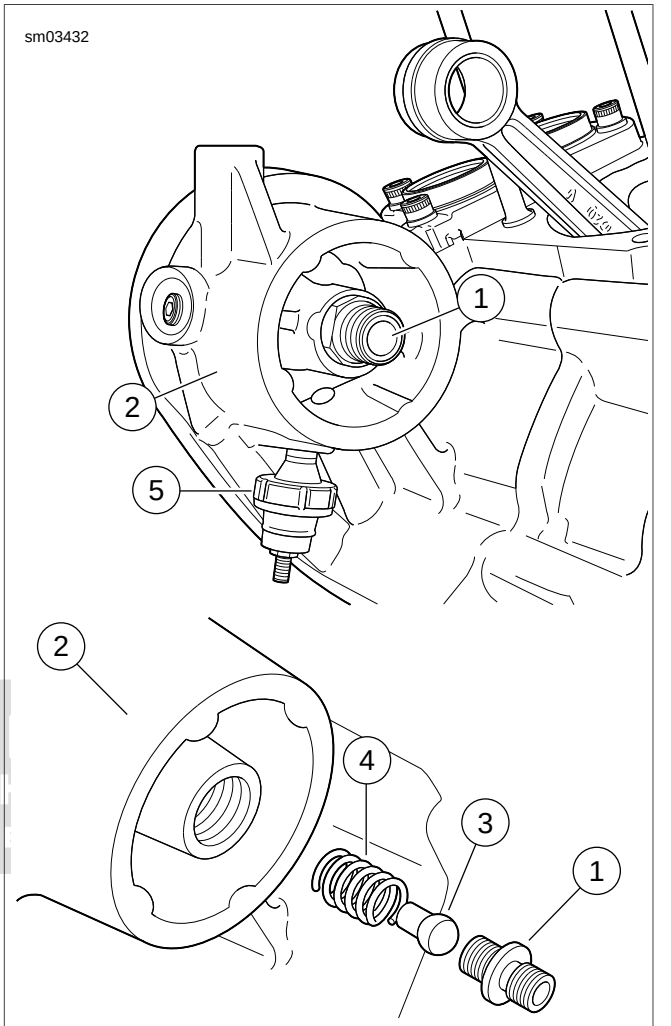
ASSEMBLY

FASTENER	TORQUE VALUE	
Oil filter adapter	18-22 ft-lbs	24.4-29.8 Nm

NOTE

Use TEFLON PIPE SEALANT or HYLOMAR GASKET AND THREAD SEALANT on all fittings installed to oil filter mount.

1. See Figure 3-130. Place spring (4) and check ball (3) into threaded hole at center of mount (2). Push oil filter adapter against ball to compress spring.
2. Install threaded end with LOCTITE 242 MEDIUM STRENGTH THREADLOCKER into threaded hole. Tighten to 18-22 ft-lbs (24.4-29.8 Nm).
3. Install **new** oil filter and add engine oil. See 1.6 ENGINE OIL AND FILTER, Changing Oil and Filter.



1. **Oil filter adapter**
2. **Oil filter mount (part of right crankcase housing)**
3. **Check ball**
4. **Spring**
5. **Oil pressure indicator lamp switch**

Figure 3-130. Oil Filter Mount, Typical (XL model shown)

OIL TANK 3.22

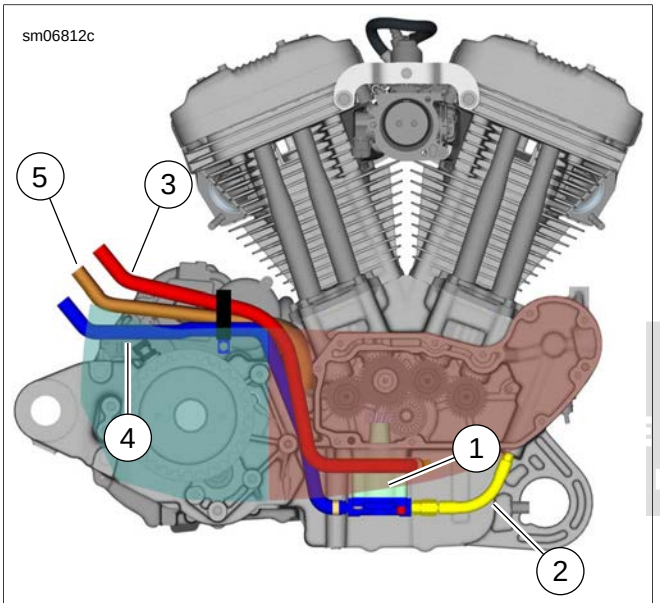
PRESSURE RELIEF VALVE

See Figure 3-133. The oil tank has a pressure relief valve (7) in top of tank. If vent line is pinched, restricted or if tank is overfilled, excessive pressure is created. The valve opens if pressure in tank exceeds 10 psi (68.9 kPa).

OIL LINE ROUTING

See Figure 3-131. An oil line (4) routes oil at front lower right corner of oil tank to a fitting on oil pump (1).

From feed section of oil pump, another feed line (2) directs flow up to the oil filter mount. Eventually, oil drains to sump where it collects in scavenge section of oil pump. The return line (3) routes oil back to tank where cycle is repeated.



1. **Oil pump**
2. **Oil feed line**
3. **Return oil line**
4. **Feed oil line**
5. **Vent line**

Figure 3-131. Engine Hose Routing

CRIMP CLAMPS

PART NUMBER	TOOL NAME
HD-41137	HOSE CLAMP PLIERS

Removal

NOTE

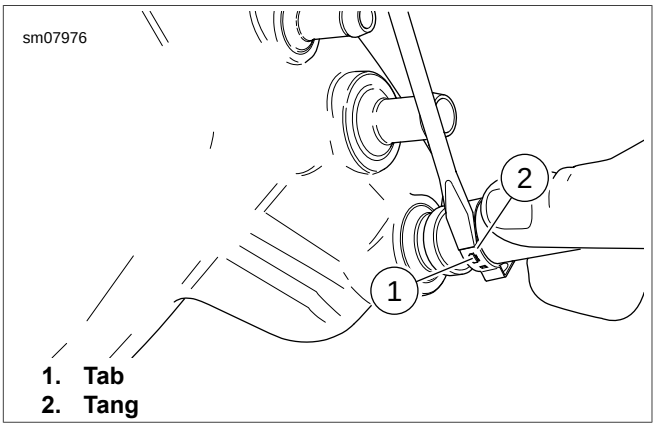
Pry overlap to release crimp clamps. If clamps must be cut, use a sharp high-quality wire cutter. To prevent breaking plastic fittings, do not twist clamp while cutting.

1. See Figure 3-132. Push the tip of a small screwdriver under end of tang (2).

NOTE

Plastic fittings are fragile. Use care when prying to free clamp.

2. Pry until tang is free of tab (1).
3. Remove clamp.



1. **Tab**
2. **Tang**

Figure 3-132. Removing Crimp Clamp

Installation

1. Install **new** clamp.
2. Tighten clamp using HOSE CLAMP PLIERS (Part No. HD-41137).

REMOVAL

1. Remove seat.
2. Remove left side covers.
3. Remove main fuse.
4. Drain engine oil. See 1.6 ENGINE OIL AND FILTER, Changing Oil and Filter.
5. Remove battery. See 1.20 BATTERY MAINTENANCE, Disconnection and Removal.
6. Remove battery tray. See 6.11 BATTERY TRAY, Removal.
7. Remove right side cover.
8. Remove drive belt guard. See 2.18 BELT GUARD AND DEBRIS DEFLECTOR.

NOTE

For ease of assembly, mark oil tank lines: drain, feed, vent and return.

9. See Figure 3-133. Remove clamps and oil lines:
   a. Oil drain (3)
   b. Feed (4)
   c. Vent (5)
   d. Return (6)

NOTE

Remove oil tank from right side.

10. Remove oil tank fasteners (1).

INSTALLATION

FASTENER	TORQUE VALUE	
Oil tank mounting screws	72-96 **in-lbs**	8.1-10.8 Nm

1. Slide oil tank into position from right side.
2. See Figure 3-133. Loosely install oil tank mounting screws (1).
3. Install oil lines with **new** clamps:
   a. Oil drain line (3)
   b. Feed line (4)
   c. Vent line (5)
   d. Return line (6)
4. Crimp oil line clamps.
5. Tighten oil tank mounting screws to 72-96 **in-lbs** (8.1-10.8 Nm).
6. Install belt guard. See 2.18 BELT GUARD AND DEBRIS DEFLECTOR.
7. Install right side cover.
8. Install battery tray. See 6.11 BATTERY TRAY, Installation.

⚠WARNING

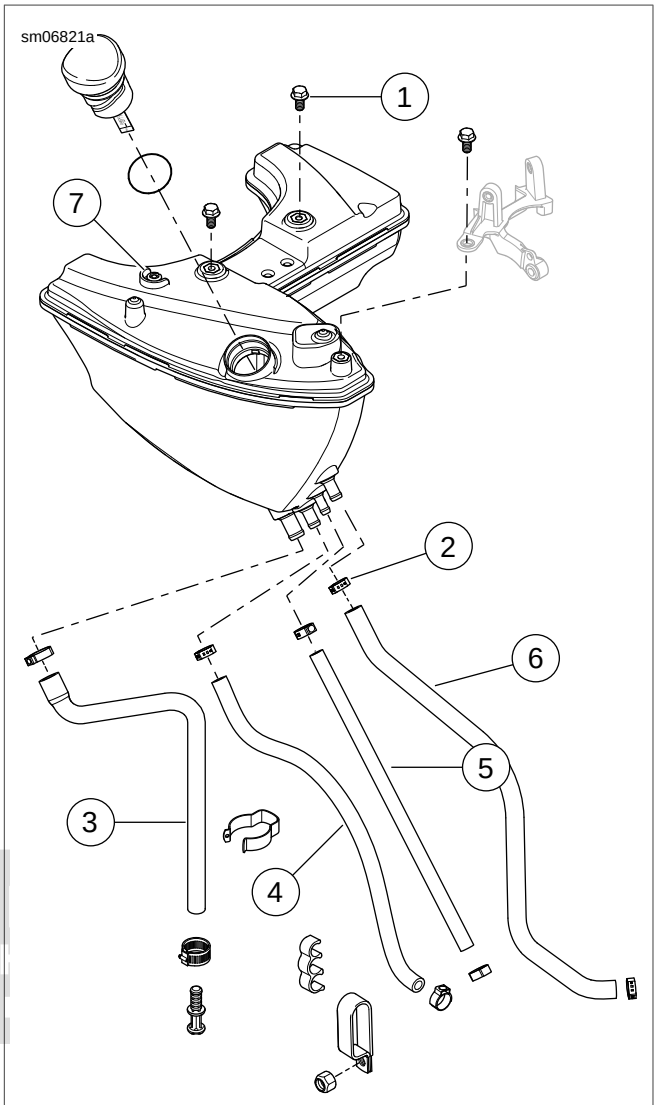
Connect positive (+) battery cable first. If positive (+) cable should contact ground with negative (-) cable connected, the resulting sparks can cause a battery explosion, which could result in death or serious injury. (00068a)

9. Install main fuse.
10. Install left side cover.

⚠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.
12. Add engine oil. See 1.6 ENGINE OIL AND FILTER, Checking and Adding Oil.



1. **Oil tank mounting screw**
2. **Clamp (6)**
3. **Oil drain line**
4. **Oil feed line**
5. **Oil vent line**
6. **Oil return line**
7. **Relief valve**

Figure 3-133. Engine Oil Tank

OIL TANK BRACKET

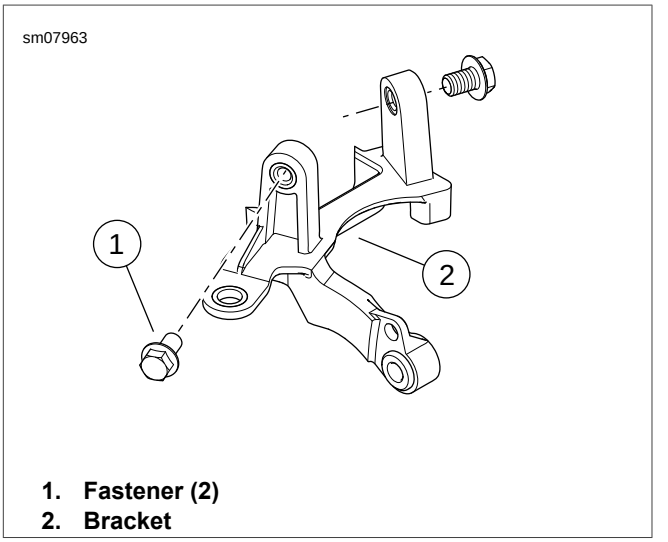
FASTENER	TORQUE VALUE	
Oil tank bracket fastener	72-96 **in-lbs**	8.1-10.8 Nm

Removal

1. Remove oil tank.
2. See Figure 3-134. Remove bracket fasteners (1).
3. Remove bracket (2).

Installation

1. Fit bracket to frame.
2. Install fasteners. Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).
3. Install oil tank.



1. **Fastener (2)**
2. **Bracket**

Figure 3-134. Oil Tank Bracket

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
Air cleaner breather screw	84-120 **in-lbs**	9.5-13.6 Nm	4.3 AIR CLEANER ASSEMBLY, All Models
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	4.3 AIR CLEANER ASSEMBLY, All Models
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm	4.3 AIR CLEANER ASSEMBLY, All Models
Electrical caddy fasteners	50-60 **in-lbs**	5.6-6.8 Nm	4.4 FUEL TANK, Installing Fuel Tank
Electrical caddy fasteners	50-60 **in-lbs**	5.6-6.8 Nm	4.12 FUEL PUMP, Installation
ET sensor	120-168 **in-lbs**	13.6-19.0 Nm	4.6 ENGINE TEMPERATURE (ET) SENSOR, Installation
EVAP canister mounting bracket screw	15-18 ft-lbs	20.3-24.4 Nm	4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL, Charcoal Canister
Exhaust mounting bracket fastener	30-33 ft-lbs	40.7-44.7 Nm	4.16 EXHAUST SYSTEM, Mounting Bracket
Exhaust pipe bracket acorn nut	20-30 ft-lbs	27.1-40.7 Nm	4.16 EXHAUST SYSTEM, Exhaust Pipes
Exhaust pipe clamp bracket fastener	30-33 ft-lbs	40.7-44.7 Nm	4.16 EXHAUST SYSTEM, Exhaust Pipe Bracket
Exhaust pipe flange nut	96-120 **in-lbs**	10.8-13.6 Nm	4.16 EXHAUST SYSTEM, Exhaust Pipes
Exhaust shield worm drive clamps	20-40 **in-lbs**	2.3-4.5 Nm	4.16 EXHAUST SYSTEM, Exhaust Shields
Exhaust shield worm drive clamps	20-40 **in-lbs**	2.3-4.5 Nm	4.16 EXHAUST SYSTEM, Muffler Shields
Fuel hose retaining bracket screw	60 **in-lbs**	6.8 Nm	4.11 FUEL INJECTORS, Installation
Fuel pump bracket mounting screw	19-36 **in-lbs**	2.1-4.1 Nm	4.12 FUEL PUMP, Assembly
Fuel pump module mounting screw	40-45 **in-lbs**	4.5-5.1 Nm	4.12 FUEL PUMP, Installation
Fuel pump module mounting screw	40-45 **in-lbs**	4.5-5.1 Nm	4.13 FUEL FILTER ELEMENT, Installation
Fuel tank fasteners	15-20 ft-lbs	20.3-27.1 Nm	4.4 FUEL TANK, Installing Fuel Tank
Fuel tank fasteners	15-20 ft-lbs	20.3-27.1 Nm	4.7 INDUCTION MODULE, Installation
Fuel tank fasteners	15-20 ft-lbs	20.3-27.1 Nm	4.11 FUEL INJECTORS, Installation
HO2S	12.2-14.2 ft-lbs	16.5-19.3 Nm	4.10 HEATED OXYGEN SENSOR (HO2S), Installation
IAC mounting screw	60 **in-lbs**	6.8 Nm	4.7 INDUCTION MODULE, Assembly
IAC mounting screw	60 **in-lbs**	6.8 Nm	4.8 IDLE AIR CONTROL (IAC), Installation
Induction module cable bracket screw	60 **in-lbs**	6.8 Nm	4.7 INDUCTION MODULE, Assembly
Induction module mounting bracket screw	90-120 **in-lbs**	10.2-13.6 Nm	4.7 INDUCTION MODULE, Installation
Induction module screw	35 **in-lbs**	4.0 Nm	4.7 INDUCTION MODULE, Assembly
Induction module screw	35 **in-lbs**	4.0 Nm	4.9 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR, Installation
Intake manifold mounting screw	96-120 **in-lbs**	10.9-13.6 Nm	4.7 INDUCTION MODULE, Installation
Muffler clamp	38-43 ft-lbs	51.5-58.3 Nm	4.16 EXHAUST SYSTEM, Mufflers
Muffler mounting bracket fastener	17-20 ft-lbs	23.0-27.1 Nm	4.16 EXHAUST SYSTEM, Mufflers
Muffler to bracket screw	17-20 ft-lbs	23.0-27.1 Nm	4.16 EXHAUST SYSTEM, Mufflers
Sprocket cover screws	80-120 **in-lbs**	9.0-13.6 Nm	4.16 EXHAUST SYSTEM, Mounting Bracket
TPS screw	35 **in-lbs**	4.0 Nm	4.5 THROTTLE POSITION SENSOR (TPS), Installation

SPECIFICATIONS: FUEL SYSTEM 4.2

SPECIFICATIONS

Table 4-1. Capacities: XL 883 Models

ITEM	XL 883R		XL 883L		XL 883N	
	U.S.	METRIC	U.S.	METRIC	U.S.	METRIC
Fuel tank (total)	3.3 gal	12.5 L	4.5 gal	17.0 L	3.3 gal	12.5 L
Oil tank with filter	2.8 qt	2.6 L	2.8 qt	2.6 L	2.8 qt	2.6 L
Transmission (approximate)	1.0 qt	0.95 L	1.0 qt	0.95 L	1.0 qt	0.95 L
Low fuel warning light	0.8 gal	3.0 L	1.0 gal	3.8 L	0.8 gal	3.0 L

Table 4-2. Capacities: XL 1200 Models

ITEM	XL 1200C/CP/CA/CB		XL 1200T		XL 1200X/V	
	U.S.	METRIC	U.S.	METRIC	U.S.	METRIC
Fuel tank (total)	4.5 gal	17.0 L	4.5 gal	17.0 L	2.1 gal	7.9 L
Oil tank with filter	2.8 qt	2.6 L	2.8 qt	2.6 L	2.8 qt	2.6 L
Transmission (approximate)	1.0 qt	0.95 L	1.0 qt	0.95 L	1.0 qt	0.95 L
Low fuel warning light	1.0 gal	3.8 L	1.0 gal	3.8 L	0.65 gal	2.5 L

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

AIR CLEANER ASSEMBLY 4.3

ALL MODELS

FASTENER	TORQUE VALUE	
Air cleaner breather screw	84-120 **in-lbs**	9.5-13.6 Nm
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm

Removal

1. See Figure 4-1. Remove screws (1) from air cleaner cover (3).
2. **All except XL 1200V:** Remove trim insert (2).
3. Remove air cleaner cover from air cleaner backplate (10).
4. Remove air cleaner seal (4) from air cleaner cover.
5. Remove three screws (5). Remove air filter element (6) and gasket (7). Discard gasket.
6. Remove O-rings (8) from breather screws (9). Discard O-rings.
7. Remove two breather screws (9) from air cleaner backplate.
8. Remove air cleaner backplate (10) and gasket (11). Discard gasket.

Installation

NOTICE

Install air filter before running engine. Failure to do so can draw debris into the engine and could result in engine damage. (00207a)

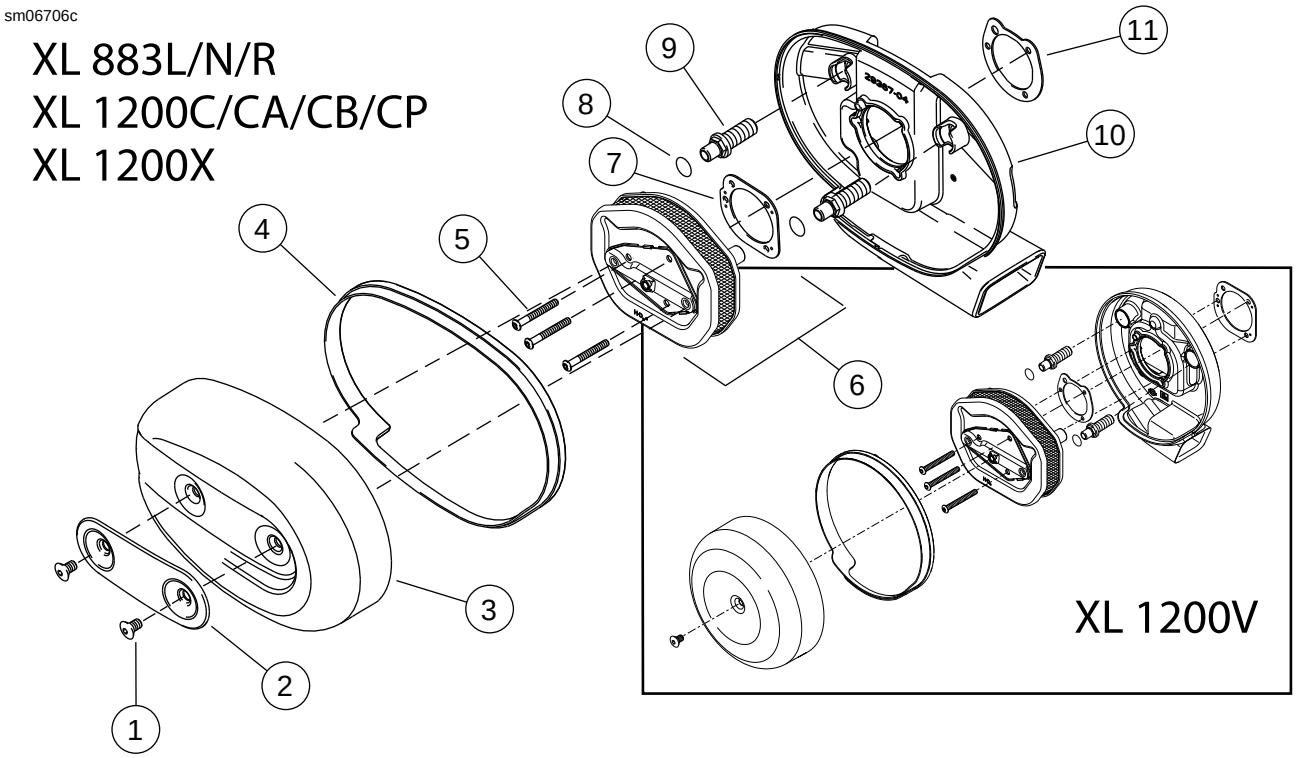
1. See Figure 4-1. Position **new** gasket (11) and air cleaner backplate (10) at induction module air inlet.
2. Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to existing screws or use **new** breather screws (9). Install air cleaner backplate to engine heads. Tighten to 84-120 **in-lbs** (9.5-13.6 Nm).
3. Apply a thin coat of engine oil to O-rings (8). Install O-rings to breather tubes.
4. Position **new** gasket (7) on air cleaner backplate. Align gasket holes with backplate holes.
5. Install air filter element (6) onto backplate. Secure with three **new** screws (5) or apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to existing screws. Tighten to 40-60 **in-lbs** (4.5-6.8 Nm).
6. Install air cleaner seal (4) on air cleaner cover (3). Fit air cleaner seal around entire edge of cover.
7. Install air cleaner cover onto backplate. Do not pinch or distort seal.

NOTE

All except XL 1200V: *Install trim insert with cover screws.*

8. Install air cleaner cover with screw (1). Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. Screw (2)
2. Trim insert
3. Cover
4. Seal
5. Screw (3)
6. Filter element (includes item 7)
7. Filter element gasket
8. O-ring (2)
9. Breather screw (2)
10. Backplate
11. Gasket

Figure 4-1. Air Cleaner Assembly

FUEL TANK 4.4

PURGING AND DISCONNECTING FUEL SUPPLY LINE

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)

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 fuel supply line:
   a. Remove the electrical caddy cover.
   b. See Figure 4-2. Separate fuel pump connector [141] housings.
   c. Start engine.
   d. Operate starter an additional 3 seconds after engine stalls to remove remaining fuel from fuel supply line.

NOTE

Immediately clean up any fuel spills.

2. See Figure 4-3. Disconnect fuel hose (3) from fuel pump (4):
   a. Push up and hold quick-connect release sleeve (1).
   b. Pull down on fuel supply line fitting (2).

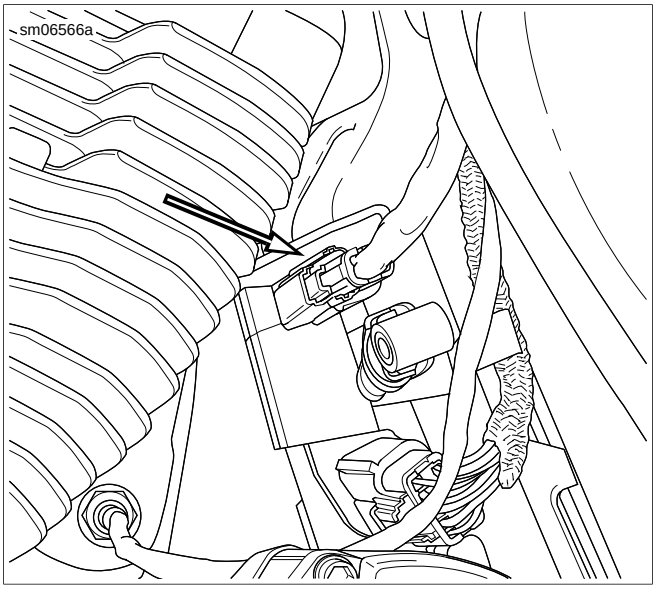
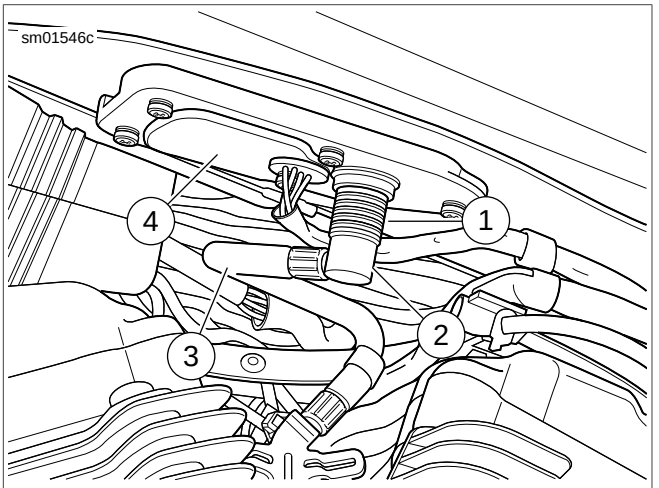


Figure 4-2. Fuel Pump Connector [141]



1. **Release sleeve (quick-connect fitting)**
2. **Fuel supply line fitting**
3. **Fuel supply line**
4. **Fuel pump module**

Figure 4-3. Fuel Tank Quick-Connect Fitting

REMOVING FUEL TANK

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. Remove seat.

NOTES

- *If fuel tank is removed to access other components, do not drain fuel from tank.*
- *Drain fuel if tank is disassembled.*
- *Drain fuel into an approved container.*
- *Immediately wipe up any spilled fuel.*

3. Drain fuel tank:
   a. Obtain a transfer pump with a long, flexible nozzle.
   b. Position vehicle upright.
   c. Remove fuel tank filler cap.

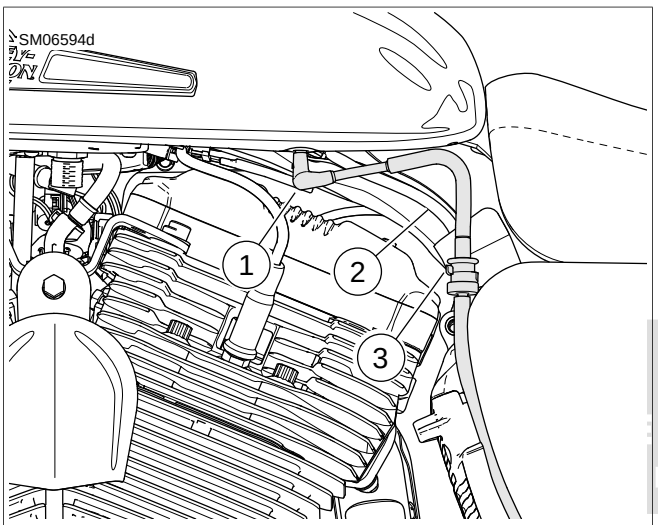
NOTE

Aim nozzle toward right side of fuel tank to avoid contacting and damaging fuel pump assembly.

   d. Insert fuel transfer pump nozzle into fuel tank filler spout.
   e. Direct pumped fuel into an approved container.
   f. Pump fuel until fuel tank is empty.

4. See Figure 4-4. Remove vent line (1) from fuel tank vent nipple.

5. Remove electrical caddy cover.
6. Unplug fuel pump connector [141].
7. Remove protective caps, locknuts, screws and washers from front and rear of fuel tank.
8. Protect top fork clamp and paint with a clean, soft cloth over front of fuel tank.
9. Lift rear of fuel tank.
10. Remove fuel pump harness from trough on electrical caddy.
11. Remove fuel pump harness from caddy clip around frame backbone.
12. Lift fuel tank off motorcycle.
13. Remove fuel pump assembly. See 4.12 FUEL PUMP.



1. **Vent line**
2. **Fuel pump wiring harness**
3. **Cable clip**

Figure 4-4. Fuel Tank Vent Line

CLEANING AND INSPECTION

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)

1. Clean inside of fuel tank:
   a. Flush with a commercial cleaning solvent or a soap and water solution.
   b. Shake fuel tank to agitate cleaning agent
   c. Thoroughly flush fuel tank after cleaning.
   d. Allow to dry completely.
2. Carefully inspect fuel line and vent line for damage, cuts, cracks, holes, wear or general deterioration. Replace or repair as necessary.
3. Inspect the fuel tank for leaks or other damage. Replace as necessary.

INSTALLING FUEL TANK

FASTENER	TORQUE VALUE	
Fuel tank fasteners	15-20 ft-lbs	20.3-27.1 Nm
Electrical caddy fasteners	50-60 **in-lbs**	5.6-6.8 Nm

NOTE

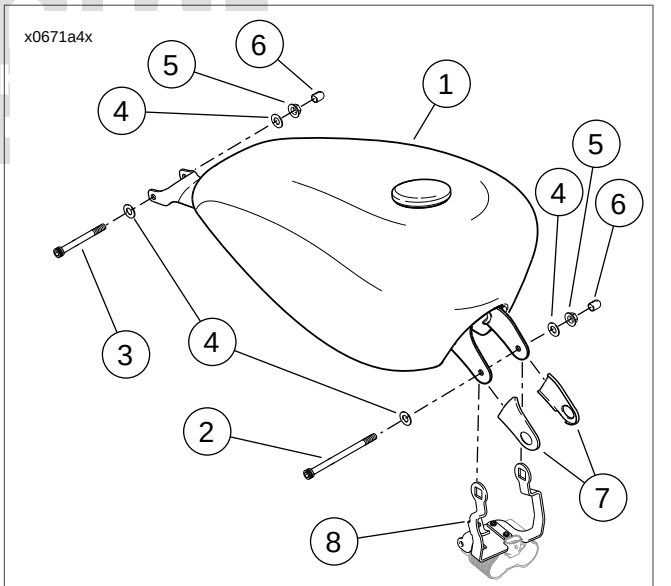
Verify that wiring harnesses are not pinched between fuel tank and frame during tank installation.

1. Install fuel pump into fuel tank using **new** gasket. See 4.12 FUEL PUMP.

NOTE

See Figure 4-5. Verify that front fuel tank brackets are located outboard of ignition coil bracket (8).

2. Position fuel tank on motorcycle.
3. Install front fastener.
   a. Place washer (4) on long screw (2).
   b. From right to left, push screw through front fuel tank bracket, ignition coil bracket and frame.
   c. Place second washer over screw.
   d. Hand-start locknut (5).



1. **Fuel tank (typical)**
2. **Screw (long)**
3. **Screw (short)**
4. **Washer (4)**
5. **Locknut (2)**
6. **Protective cap (2)**
7. **Cosmetic cover (2)**
8. **Ignition coil bracket**

Figure 4-5. Fuel Tank Mounting (typical)

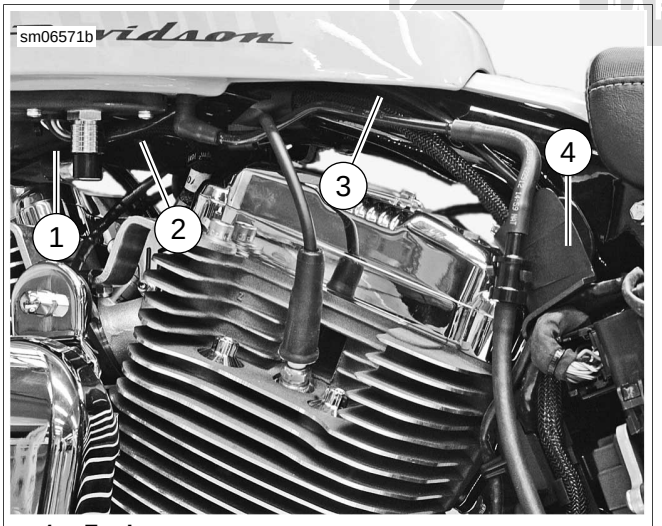
4. Place a clean, soft cloth over front of fuel tank to keep tank from contacting top fork clamp and damaging paint.

5. Lift rear of fuel tank.
6. See Figure 4-6. Route fuel pump wire harness.
   a. Route harness through retainer on caddy latch clip.
   b. Route harness behind vent line (3).
   c. Route harness down through electrical caddy through (4).
   d. Route harness to front of electrical caddy.

NOTE

Do not pinch harness between fuel tank and frame backbone tube.

7. Install fuel tank.
   a. Lower rear of fuel tank into position.
   b. See Figure 4-5. Place washer (4) on short screw (3).
   c. From right to left, push screw through rear fuel tank bracket and frame.
   d. Place second washer over screw
   e. Hand-start locknut (5).
   f. Tighten both front and rear fuel tank mounting fasteners to 15-20 ft-lbs (20.3-27.1 Nm).
   g. Install protective caps (6) on screw ends.
8. See Figure 4-4. Install vent line onto fuel tank vent nipple.
9. Connect fuel pump connector [141] housings.
10. Install electrical caddy cover. Tighten to 50-60 **in-lbs** (5.6-6.8 Nm).



1. **Fuel pump**
2. **Wire harness**
3. **Vent line**
4. **Electrical caddy trough**

Figure 4-6. Fuel Pump Wire Harness Routing

CONNECTING FUEL HOSE AND FILLING 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)

1. See Figure 4-3. Connect fuel hose.
   a. Push up on release sleeve (1).
   b. Push fuel supply line fitting (2) into fuel pump module fuel pump quick-connect fitting.
   c. To lock quick-connect fitting, pull down on release sleeve.
   d. Tug on fuel hose fitting to make sure that it is securely locked in place.
2. See Figure 4-4. Install vent hose onto vent nipple on fuel tank.

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)

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)

3. Fill fuel tank. Carefully inspect for leaks around fuel pump module.
4. Install main fuse.
5. Turn ignition on to verify that fuel pump is activated.
6. Carefully inspect for leaks at quick-connect 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)

7. Install seat.

VAPOR VALVE

General

The fuel tank is vented through a standpipe (vent tube) within the fuel tank. The vent hose allows hydrocarbon vapors (pressure) to escape when motorcycle is upright. The vent hose connects to the vapor valve. The valve prevents fuel tank from draining during a tip over.

Non-EVAP models: The lower vent hose is vented to the atmosphere.

EVAP models: The lower vent hose is routed to a charcoal EVAP canister. See 4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL.

Removal

1. See Figure 4-7. Pull the rubber elbow hose (1) from the tank vent tube.
2. Carefully remove the vapor valve (4) from the caddy clip (6).
3. Pull the exhaust hose (5) out from between the frame tubes.

Installation

⚠WARNING

Excessive pressure can build in the fuel tank if vapor valve is not mounted vertically with long fitting to top. Leaks due to excessive pressure can cause a fire or explosion, which could result in death or serious injury. (00265a)

NOTE

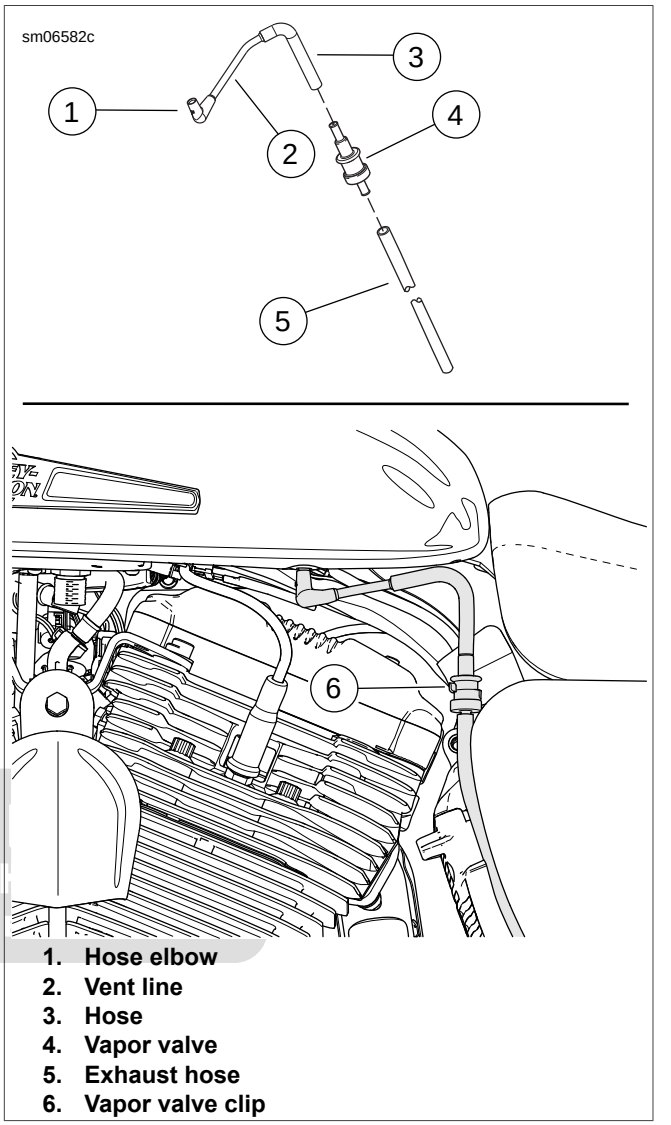
Mount vapor valve upright with longer end at top.

1. See Figure 4-7. Assemble vent hose elbow (1), line (2), vapor valve (4), hose (3) and exhaust hose (5).
2. Press elbow over fitting on bottom of fuel tank.

NOTE

To avoid breaking caddy clip (6), do NOT force valve into clip.

3. Snap valve into clip on ECM caddy.
4. Route vent hose alongside electrical caddy and between frame tubes.



1. **Hose elbow**
2. **Vent line**
3. **Hose**
4. **Vapor valve**
5. **Exhaust hose**
6. **Vapor valve clip**

Figure 4-7. Vent Hose and Vapor Valve

THROTTLE POSITION SENSOR (TPS) 4.5

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 Figure 4-8. The TPS is on the side of the induction module. The TPS monitors the physical position of the throttle shaft. See the electrical diagnostic manual for troubleshooting.

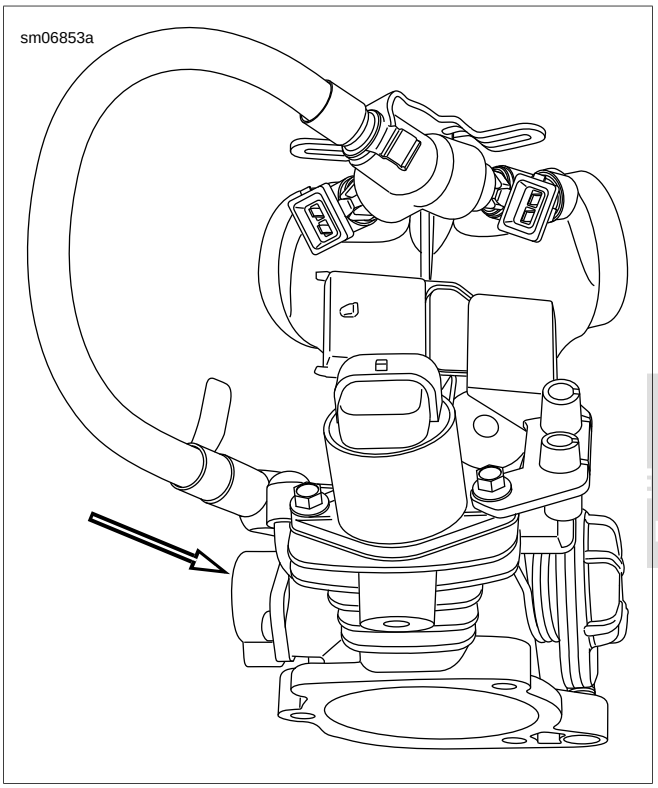


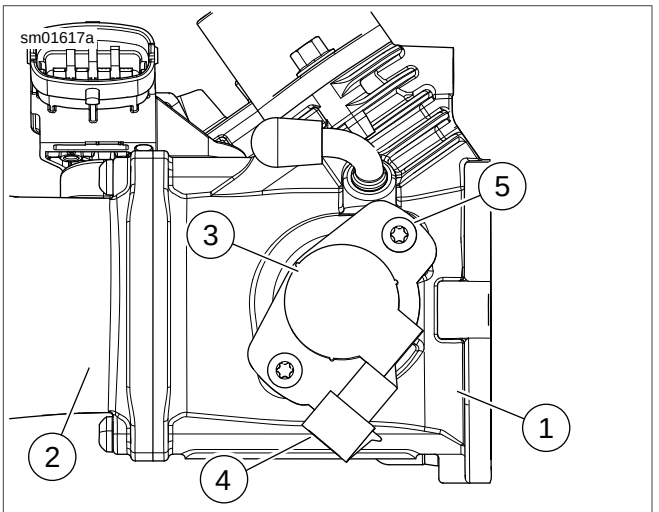
Figure 4-8. TPS Location

REMOVAL

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. Remove air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY.
3. See Figure 4-9. Unplug TPS harness connector [88B] from connector socket [88A] (4).
4. Cover both connectors with tape.
5. Remove two screws (5). Detach TPS (3) from induction module (1).



1. **Induction module**
2. **Intake manifold**
3. **TPS**
4. **TPS connector socket [88A]**
5. **Screw (2)**

Figure 4-9. Throttle Position Sensor (TPS) Removal

INSTALLATION

FASTENER	TORQUE VALUE	
TPS screw	35 **in-lbs**	4.0 Nm

NOTES

- *Close throttle to install TPS.*
- *See Figure 4-9. Note orientation of TPS (3) relative to induction module (1) body. The connector socket (4) is at approximately 7 o'clock position, facing toward intake manifold (2).*

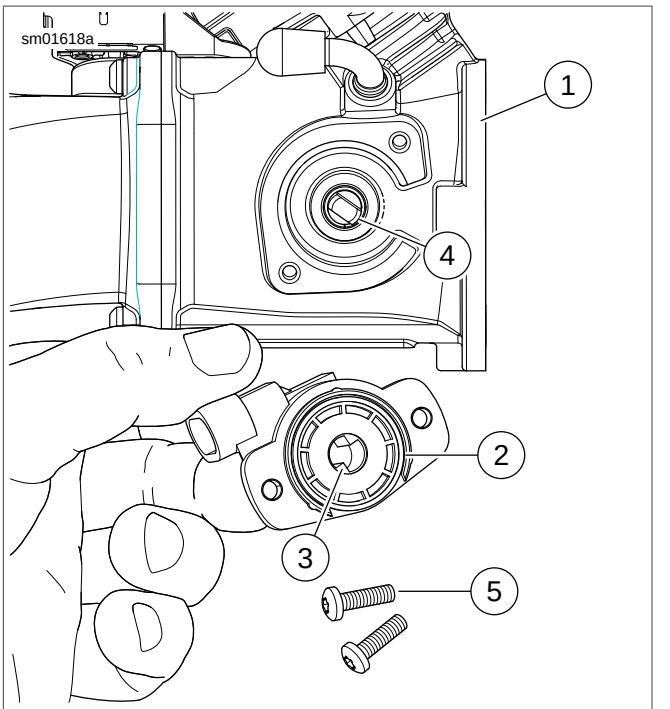
1. See Figure 4-10. Fit pocket (3) of TPS (2) over throttle shaft (4). Orient TPS correctly and line up mounting holes in sensor with holes in body of induction module (1).

NOTE

Mount TPS body flush against mounting boss on induction module.

2. Install two screws (5) to fasten sensor to induction module. Tighten to 35 **in-lbs** (4.0 Nm).
3. Open and close throttle plates to check operation. Verify that mechanism operates without binding or sticking.
4. Connect TPS harness socket connector [88B] to sensor pin connector [88A].
5. Install air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY.
6. Install main fuse.
7. Start motorcycle.
8. Adjust throttle cables.

9. Check for leaks at quick-connect fitting and at induction module.



1. **Induction module**
2. **TPS**
3. **Pocket**
4. **Throttle shaft**
5. **Screw (2)**

Figure 4-10. TPS Installation

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

ENGINE TEMPERATURE (ET) SENSOR 4.6

GENERAL

See Figure 4-11. The ET sensor is located in the top of the rear cylinder head. See the electrical diagnostic manual for troubleshooting.

Figure 4-11. ET Sensor Location

REMOVAL

PART NUMBER	TOOL NAME
HD-48116-A	TEMPERATURE SENSOR SOCKET

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)

WARNING

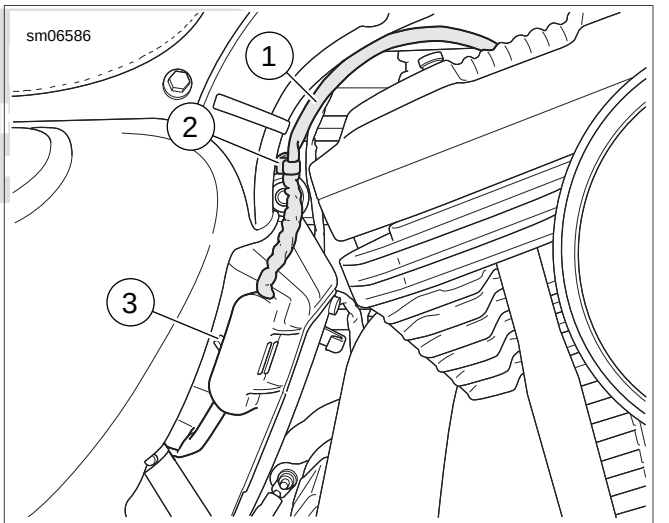
Gasoline can drain from quick-connect fitting when removing fuel line. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. Wipe up spilled fuel immediately and dispose of rags in a suitable manner. (00267a)

1. Purge and disconnect fuel supply line. See 4.4 FUEL TANK.

WARNING

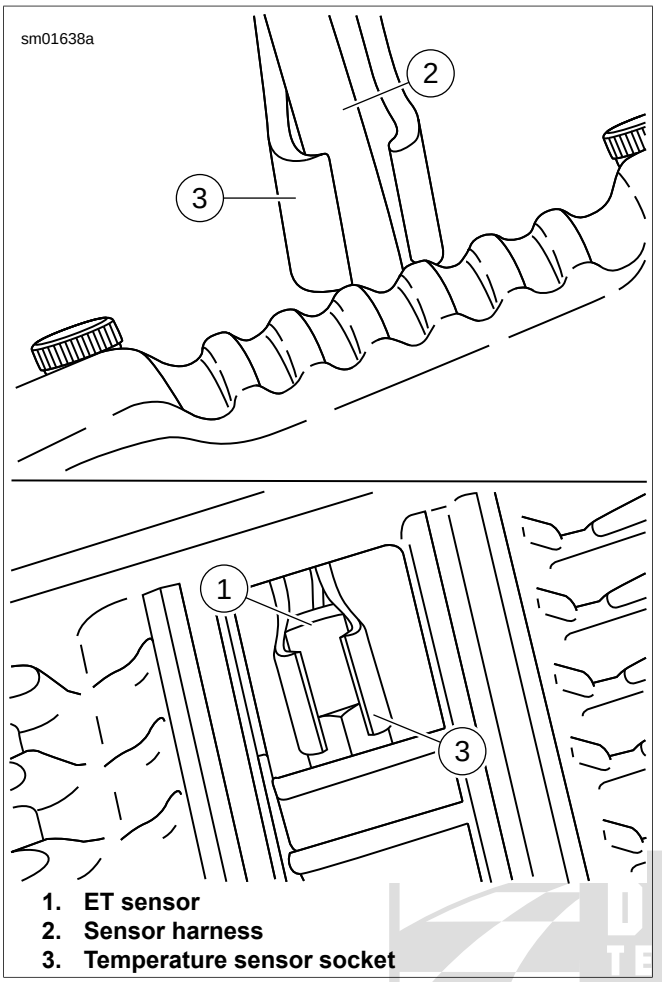
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. Remove fuel tank. See 4.4 FUEL TANK.
4. See Figure 4-12. Disconnect the ET sensor connector [90] (3) on right side of ECM caddy.
5. Cut barbed cable strap (2) to free sensor harness from the oil tank mounting bracket.
6. Remove ET sensor:
   a. Attach a universal joint, a 6 in extension and a ratchet to the TEMPERATURE SENSOR SOCKET (Part No. HD-48116-A).
   b. See Figure 4-13. Fit ET sensor harness (2) into slot in temperature sensor socket (3).
   c. Slide socket down harness, through square hole in center of rear rocker cover assembly and fit onto ET sensor (1).
   d. See Figure 4-14. Once you have installed the temperature sensor socket (1) onto the sensor (4), secure the sensor harness to the socket extension (3) with tape (6) to allow removal of the sensor.
   e. Remove ET sensor from rear cylinder head.



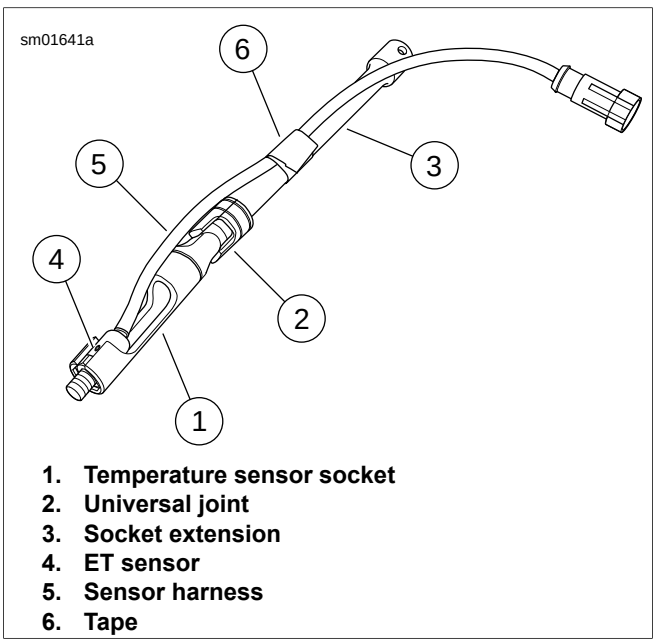
1. **Harness loop**
2. **Barbed cable strap**
3. **ET sensor connector [90]**

Figure 4-12. ET Sensor Harness



1. **ET sensor**
2. **Sensor harness**
3. **Temperature sensor socket**

Figure 4-13. Installing ET Sensor Socket



1. **Temperature sensor socket**
2. **Universal joint**
3. **Socket extension**
4. **ET sensor**
5. **Sensor harness**
6. **Tape**

Figure 4-14. Tape ET Sensor Harness to Extension

INSTALLATION

FASTENER	TORQUE VALUE	
ET sensor	120-168 **in-lbs**	13.6-19.0 Nm

1. See Figure 4-14. Fit ET sensor (4) into temperature sensor socket (1).

NOTE

The sensor harness MUST turn with socket and extension. Otherwise, the harness can be damaged when sensor is installed.

2. Holding ET sensor in place in socket, wrap a piece of tape (6) around sensor harness (5) and socket extension (3).
3. Slide assembly down into top of rear head. Carefully thread sensor into head. Do not cross-thread. Tighten to 120-168 **in-lbs** (13.6-19.0 Nm).

NOTE

Make sure that there is a loop in sensor harness when securing harness. If harness is pulled tight or contacts rear rocker cover, it could be damaged during vehicle operation.

4. See Figure 4-12. Use a **new** barbed cable strap (2) to secure sensor harness to oil tank bracket. Position cable strap so harness forms a loop (1) between sensor and cable strap.
5. Connect sensor connector [90] (3). Secure to ECM caddy.
6. Install fuel tank and connect fuel supply line. See 4.4 FUEL TANK.
7. Install main fuse.

⚠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)

8. Install seat.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

INDUCTION MODULE 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)

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)

WARNING

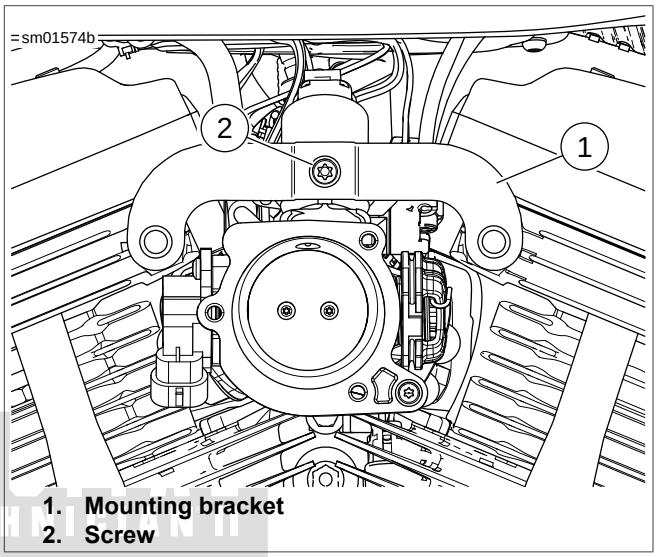
Gasoline can drain from quick-connect fitting when removing fuel line. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. Wipe up spilled fuel immediately and dispose of rags in a suitable manner. (00267a)

1. Purge and disconnect fuel supply line. See 4.4 FUEL TANK.

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

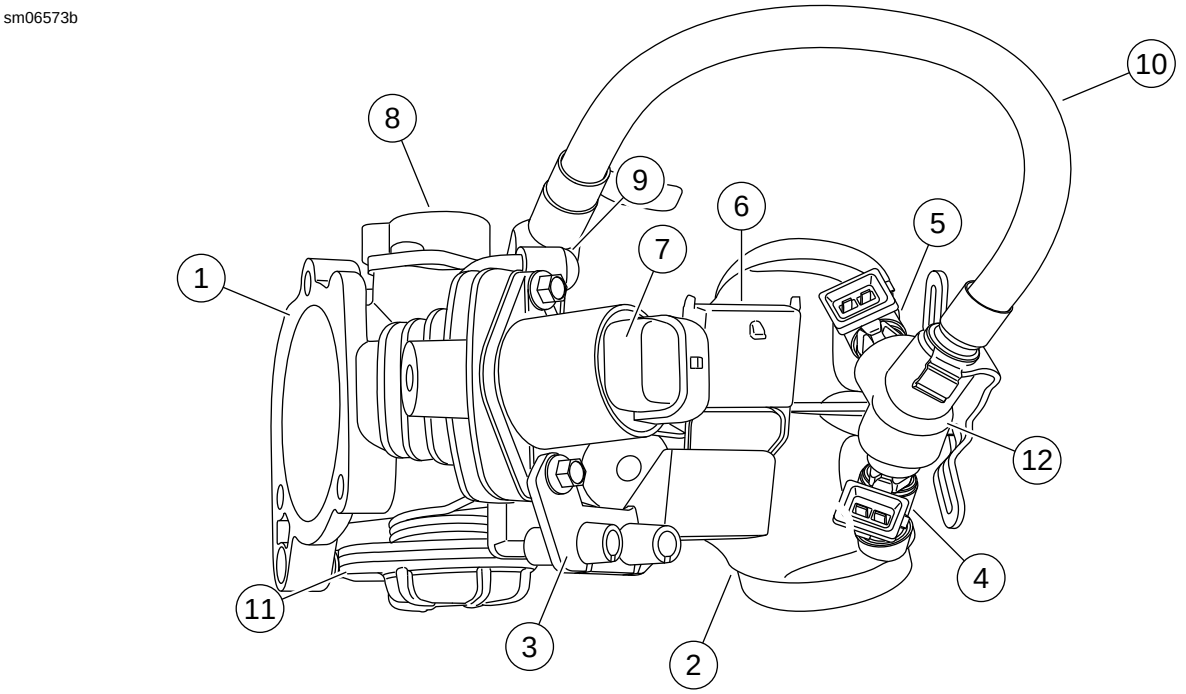
2. Remove main fuse.
3. Remove air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY.
4. Remove seat.
5. Lift rear of fuel tank up to access induction module.
   a. Loosen (but do not remove) front fuel tank mounting screw.
   b. Remove rear fuel tank mounting screw, washers and nut.
   c. Carefully pivot rear of fuel tank upward and prop in position.
6. See Figure 4-15. Remove screw (2) and mounting bracket (1).



1. **Mounting bracket**
2. **Screw**

Figure 4-15. Induction Module Mounting Bracket

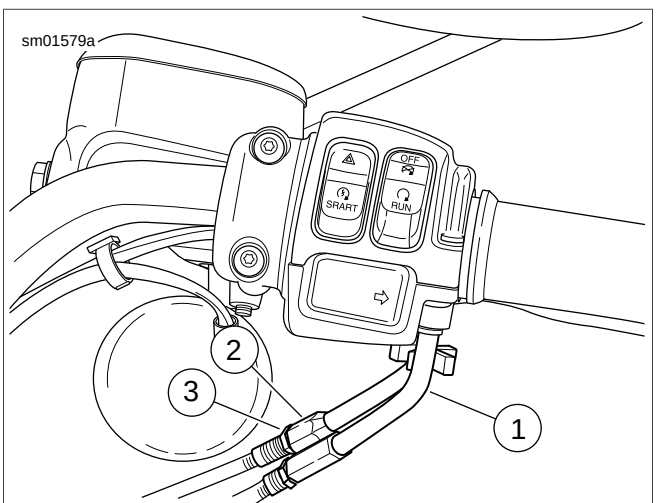
7. See Figure 4-16. Unplug the following connectors:
   a. Front fuel injector (4) connector [84],
   b. Rear fuel injector (5) connector [85],
   c. TMAP sensor (6) connector [80],
   d. IAC (7) connector [87],
   e. TPS (8) connector [88].
8. **EVAP models:** Remove purge hose from fitting (9) on induction module (1).



1. **Induction module**
2. **Intake manifold**
3. **Throttle cable bracket**
4. **Front fuel injector [84A]**
5. **Rear fuel injector [85A]**
6. **TMAP sensor [80A]**
7. **IAC [87A]**
8. **TPS [88A]**
9. **Purge hose fitting (EVAP controlled models)**
10. **Fuel supply line**
11. **Throttle wheel**
12. **Fuel rail**

Figure 4-16. Induction Module Assembly

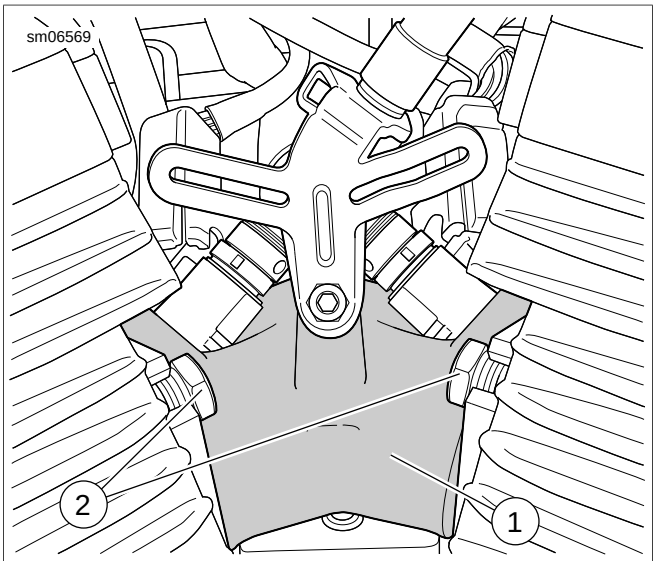
9. See Figure 4-17. Slide rubber boot off idle control cable assembly (1).
10. Loosen jamnut (3).
11. Loosen cable adjuster as far as possible to provide maximum slack in idle cable.



1. **Idle control (pull close) cable assembly**
2. **Cable adjuster**
3. **Jamnut**

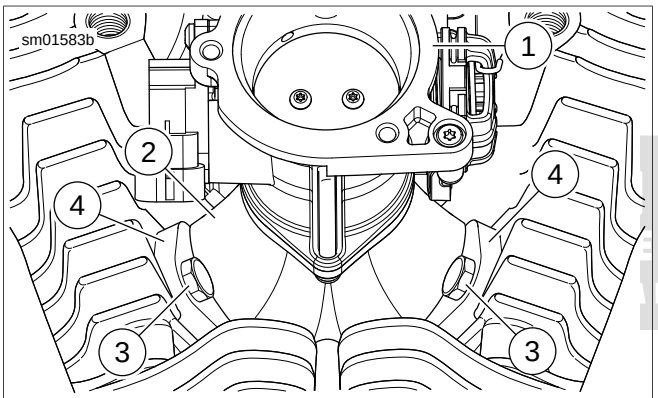
Figure 4-17. Idle Control Cable Adjustment

12. See Figure 4-18. Loosen but do not remove screws (2) securing intake manifold to heads on left side.
13. See Figure 4-19. Remove screws (3) securing intake manifold to heads on right side of vehicle.
14. Pull mounting flanges (4) away from heads as much as possible and pull induction module and intake manifold assembly toward the right side, away from motorcycle.



1. **Intake manifold**
2. **Screw (2)**

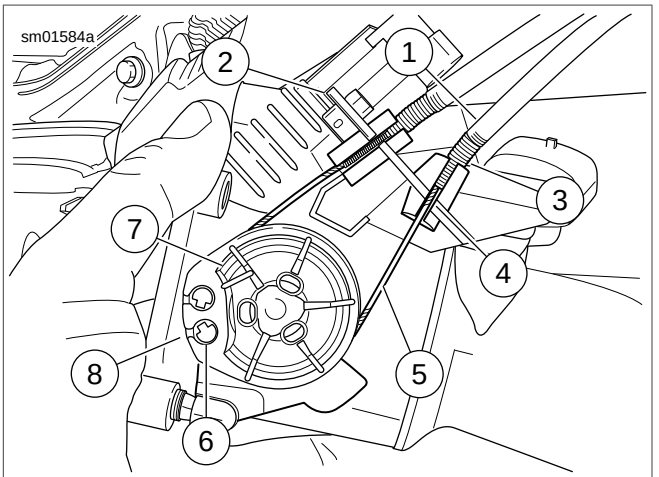
Figure 4-18. Intake Manifold Mounting Screws: Left Side



1. **Induction module**
2. **Intake manifold**
3. **Screw (2)**
4. **Mounting flange (2)**

Figure 4-19. Intake Manifold Mounting Screws: Right Side

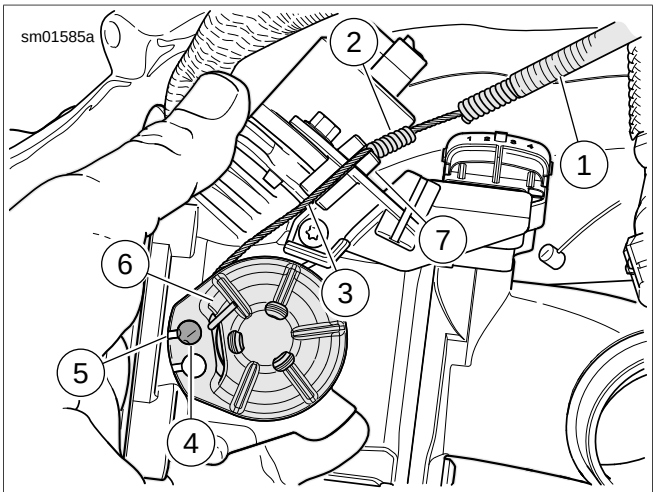
15. See Figure 4-20. Remove throttle cable (5) from throttle wheel (7)
    a. Lift throttle cable housing (1) up out of cable guide (3) in throttle/idle cable bracket (2).
    b. Slide throttle cable (5) out through slot (4) in cable guide.
    c. Unwind throttle cable from groove in throttle wheel (7).
    d. Slide cable out through slot (8). Remove throttle cable barrel (6) from throttle wheel.



1. **Throttle cable housing**
2. **Throttle/idle cable bracket**
3. **Cable guide**
4. **Slot**
5. **Throttle cable**
6. **Cable barrel**
7. **Throttle wheel**
8. **Slot**

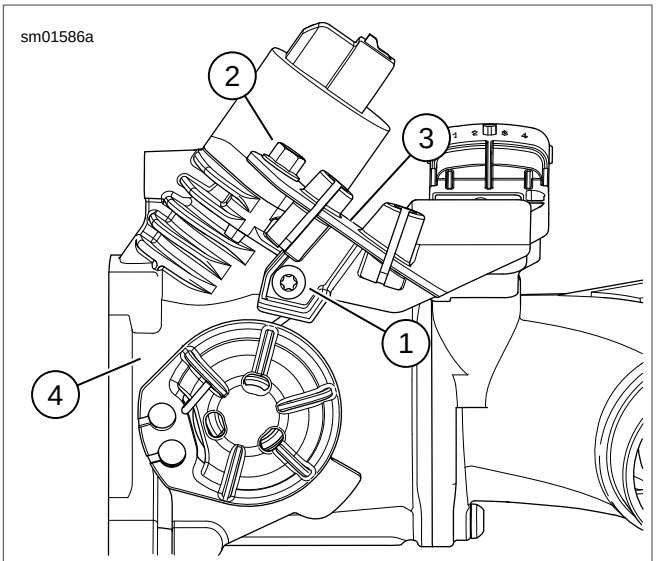
Figure 4-20. Removing/Installing Throttle Cable

16. See Figure 4-21. Remove idle cable (3) from throttle wheel (6):
    a. Lift idle cable housing (1) and spring (2) up out of cable guide (7) in throttle/idle cable bracket.
    b. Slide idle cable (3) out through slot in cable guide.
    c. Unwind idle cable from groove in throttle wheel (6).
    d. Slide cable out through slot (5). Remove idle cable barrel (4) from throttle wheel.
17. Remove induction module and intake manifold from vehicle.



1. **Idle cable housing**
2. **Spring**
3. **Idle cable**
4. **Cable barrel**
5. **Slot**
6. **Throttle wheel**
7. **Cable guide**

Figure 4-21. Removing/Installing Idle Cable



1. **Screw**
2. **Screw**
3. **Cable bracket**
4. **Induction module**

Figure 4-22. Removing/Installing Cable Bracket

DISASSEMBLY

PART NUMBER	TOOL NAME
HD-25070	HEAT GUN

⚠WARNING

Gasoline can drain from the fuel line when disconnected from induction module. 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. (00269a)

1. Remove fuel supply line, fuel rail and fuel injectors. See 4.11 FUEL INJECTORS.

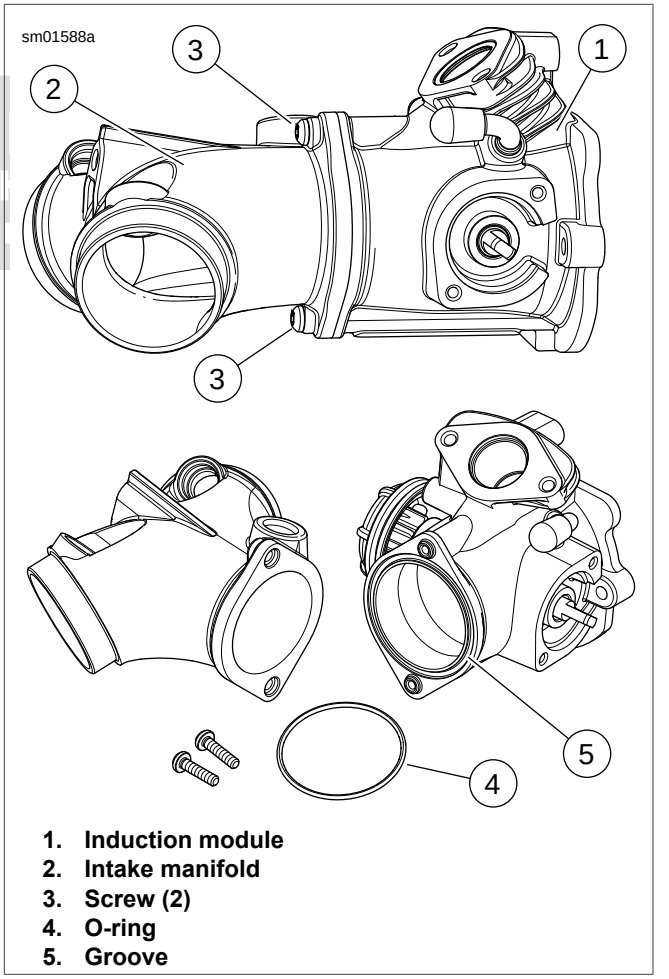
NOTE

Heat mounting screws to soften the thread sealant with HEAT GUN (Part No. HD-25070). Do not use an open flame.

2. See Figure 4-22. Remove screws (1, 2) and cable bracket (3) from induction module (4).
3. Remove the following assemblies:
   a. TPS. See 4.5 THROTTLE POSITION SENSOR (TPS).
   b. TMAP sensor. See 4.9 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR.
   c. IAC. See 4.8 IDLE AIR CONTROL (IAC).
4. See Figure 4-23. Remove two screws (3) to separate induction module (1) from intake manifold (2). Discard O-ring (4).

NOTE

At this level of disassembly, induction module contains no more serviceable parts. Replace module if defective.



1. **Induction module**
2. **Intake manifold**
3. **Screw (2)**
4. **O-ring**
5. **Groove**

Figure 4-23. Induction Module Assembly

ASSEMBLY

FASTENER	TORQUE VALUE	
Induction module screw	35 **in-lbs**	4.0 Nm
IAC mounting screw	60 **in-lbs**	6.8 Nm
Induction module cable bracket screw	60 **in-lbs**	6.8 Nm

1. See Figure 4-23. Place **new** O-ring (4) into groove (5) in induction module (1) mating surface.
2. Align induction module to intake manifold (2). Secure with two screws (3). Tighten screws to 35 **in-lbs** (4.0 Nm).
3. Install the following assemblies:
   a. TPS. See 4.5 THROTTLE POSITION SENSOR (TPS).
   b. TMAP sensor. See 4.9 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR.
   c. IAC. See 4.8 IDLE AIR CONTROL (IAC).

NOTE

Do not install IAC mounting screw on throttle wheel side of induction module until cable bracket is installed. Install other IAC mounting screw but do not tighten.

4. See Figure 4-22. Install cable bracket (3) onto induction module (4):
   a. Use **new** screws (1, 2) or apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to existing screws.
   b. Install both screws finger-tight.
   c. Tighten both IAC mounting screws to 60 **in-lbs** (6.8 Nm). Tighten side screw (1) to 60 **in-lbs** (6.8 Nm).
5. Install fuel injectors, fuel rail and fuel supply line. See 4.11 FUEL INJECTORS.

INSTALLATION

FASTENER	TORQUE VALUE	
Induction module mounting bracket screw	90-120 **in-lbs**	10.2-13.6 Nm
Intake manifold mounting screw	96-120 **in-lbs**	10.9-13.6 Nm
Fuel tank fasteners	15-20 ft-lbs	20.3-27.1 Nm

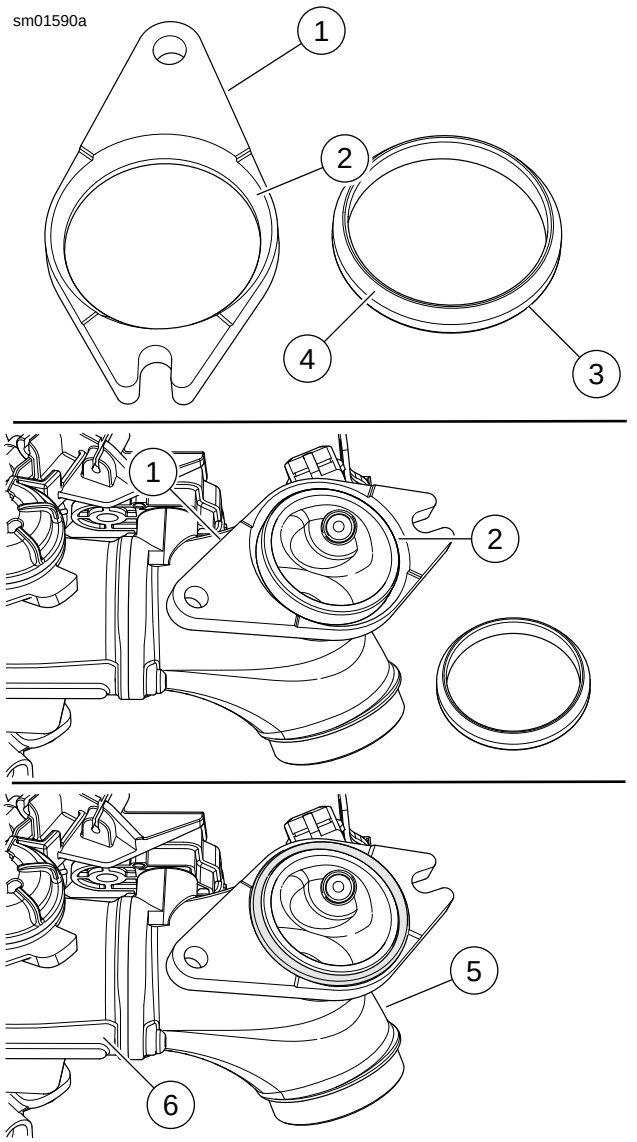
1. See Figure 4-18. Make sure two mounting screws (2) are screwed into heads two or three turns.
2. See Figure 4-24. Install mounting flanges (1) on intake manifold (5) with counterbore (2) facing away from manifold and open slotted ends of flanges facing away from induction module (6).
3. Place a **new** seal (3) into each mounting flange with the beveled edge (4) facing the mounting flange counterbore.

NOTE

When induction module is positioned on manifold mounting screws, verify that the flanges are correctly installed on the manifold. Verify that the rubber seals are in place.

4. Place induction module assembly in position between engine heads. Slide open slotted ends of mounting flanges under heads of two mounting screws on left side of engine.
5. See Figure 4-19. Holding induction module/intake manifold assembly in place, install two mounting screws (3) into remaining mounting flange holes. Tighten all four screws finger-tight.
6. See Figure 4-15. Install mounting bracket (1) and screw (2). Tighten screw finger-tight.
7. Temporarily install two breather screws through mounting bracket. Screw breather screws finger-tight into cylinder heads to line up the induction module.
8. Tighten mounting bracket screws to 90-120 **in-lbs** (10.2-13.6 Nm).
9. Tighten all four intake manifold mounting screws to 96-120 **in-lbs** (10.9-13.6 Nm).
10. See Figure 4-21. Install idle cable barrel (4) into throttle wheel (6). Slide idle cable (3) through slot (5) and wind around groove in throttle wheel.
11. Pull cable through slot in cable guide (7). Slide spring (2) and end of idle cable housing (1) down into cable guide.
12. See Figure 4-20. Install throttle cable barrel (6) into throttle wheel (7). Slide throttle cable through slot (8) and wind around groove in throttle wheel.
13. Pull cable through slot (4) in cable guide (3). Slide end of throttle cable housing (1) down into cable guide.
14. Adjust throttle cables. See 1.13 THROTTLE CONTROL.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Mounting flange (2)**
2. **Counterbore**
3. **Seal (2)**
4. **Beveled edge**
5. **Intake manifold**
6. **Induction module**

Figure 4-24. Installing Mounting Flange and Seal

15. **EVAP controlled models:** See Figure 4-25. Install purge hose onto fitting (2) on induction module (1).
16. See Figure 4-26. Plug in the following connectors:
    a. Front fuel injector (1) connector [84],
    b. Rear fuel injector (2) connector [85],
    c. TMAP sensor (3) connector [80],
    d. IAC (4) connector [87],
    e. TPS (5) connector [88].
17. Remove prop from under rear of fuel tank. Lower rear of fuel tank into position. Install fastener, washer and nut in fuel tank rear mounting holes. Tighten to 15-20 ft-lbs (20.3-27.1 Nm). Install protective caps on screw ends. See 4.4 FUEL TANK.
18. Install air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY.

⚠WARNING

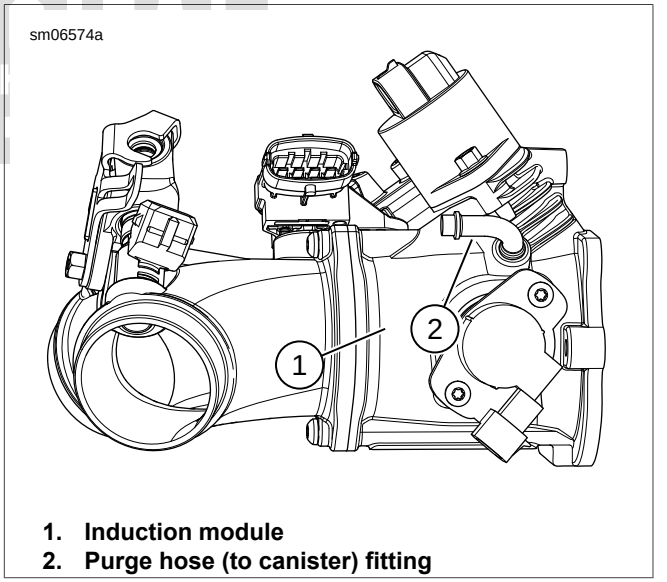
To prevent spray of fuel, be sure quick-connect fittings are properly mated. Gasoline is extremely flammable and highly explosive, which could result in death or serious injury. (00268a)

19. Connect fuel supply line to fuel pump module. Fill fuel tank. Carefully check for leaks around fuel pump module. See 4.4 FUEL TANK.
20. Install main fuse.
21. Close left side cover.
22. Turn ignition switch to ON and OFF to reset IAC to park position.

⚠WARNING

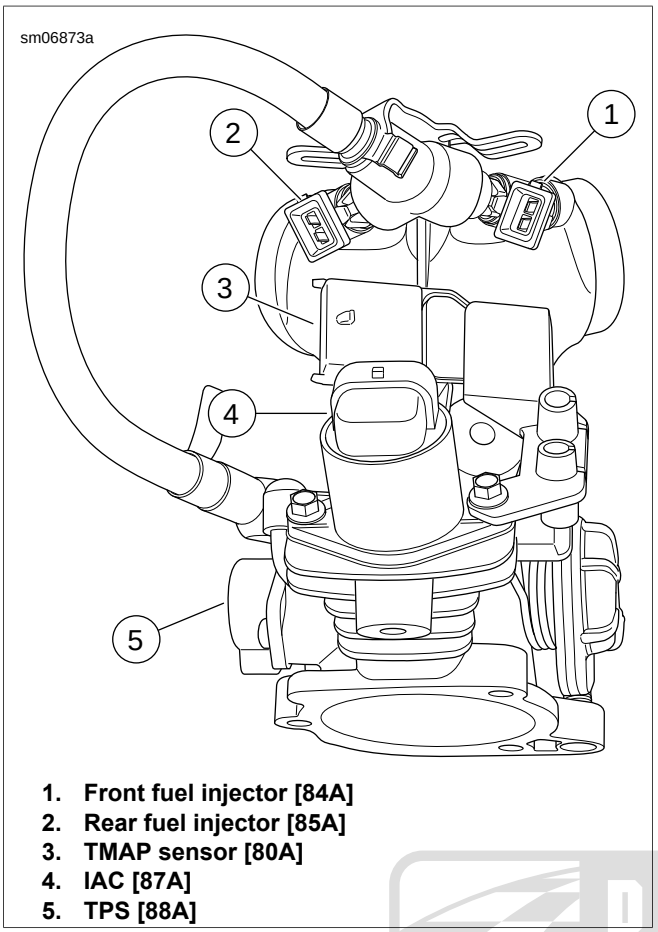
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

23. Install seat.



1. **Induction module**
2. **Purge hose (to canister) fitting**

Figure 4-25. Purge Hose Fitting: CA Models



1. **Front fuel injector [84A]**
2. **Rear fuel injector [85A]**
3. **TMAP sensor [80A]**
4. **IAC [87A]**
5. **TPS [88A]**

Figure 4-26. Induction Module Electrical Connectors

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

IDLE AIR CONTROL (IAC) 4.8

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 Figure 4-27. The ECM uses the IAC to control engine idle speed. See the electrical diagnostic manual for troubleshooting.

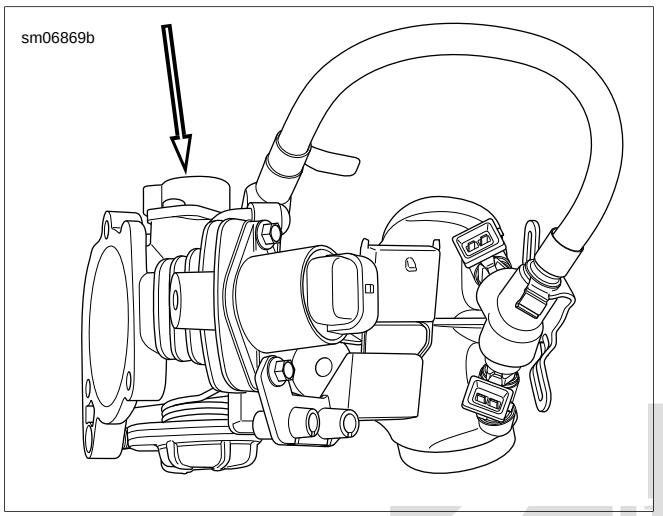


Figure 4-27. IAC

REMOVAL

PART NUMBER	TOOL NAME
HD-25070	HEAT GUN

⚠WARNING

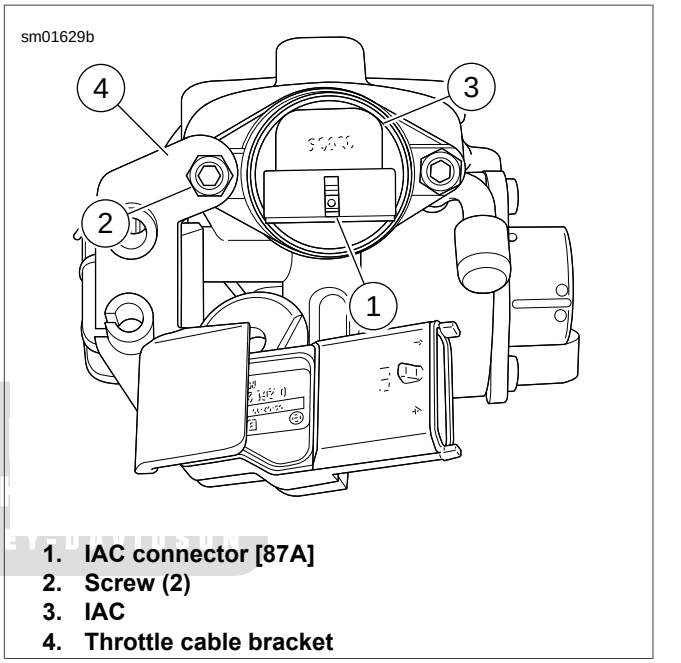
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. Remove air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY.
3. See Figure 4-28. Unplug harness connector [87B] from IAC connector [87A] (1).

NOTE

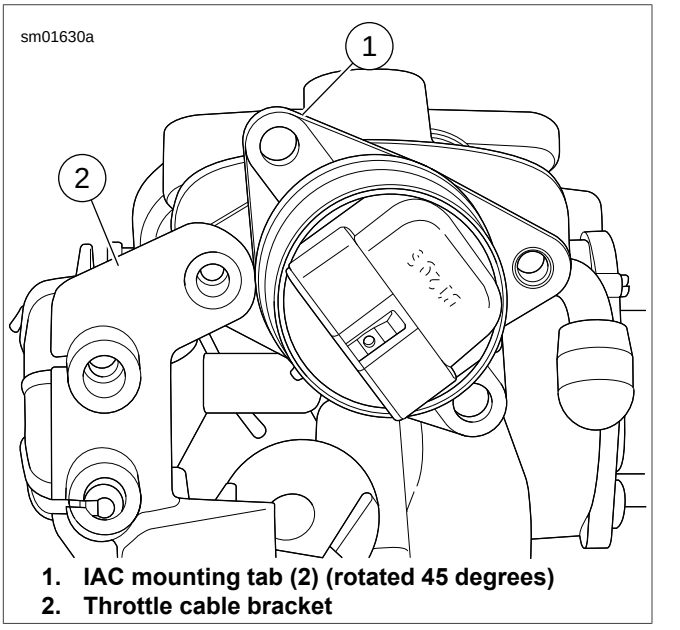
Use HEAT GUN (Part No. HD-25070) to heat screws (2) to soften the thread sealant and avoid breakage during removal. Do not use an open flame.

4. Using a six-point socket (not a Torx wrench), remove two screws (2) in the following order:
   a. Heat fastener nearest to throttle bracket for two minutes using HEAT GUN (Part No. HD-25070). Remove screw.
   b. Heat remaining screw for one minute. Remove screw.
5. See Figure 4-29. Grasp IAC. Rotate clockwise until IAC mounting tab (1) clears throttle cable bracket (2).
6. With a gentle twisting motion, pull IAC straight out of induction module body.



1. **IAC connector [87A]**
2. **Screw (2)**
3. **IAC**
4. **Throttle cable bracket**

Figure 4-28. IAC Removal



1. **IAC mounting tab (2) (rotated 45 degrees)**
2. **Throttle cable bracket**

Figure 4-29. IAC Rotation

INSTALLATION

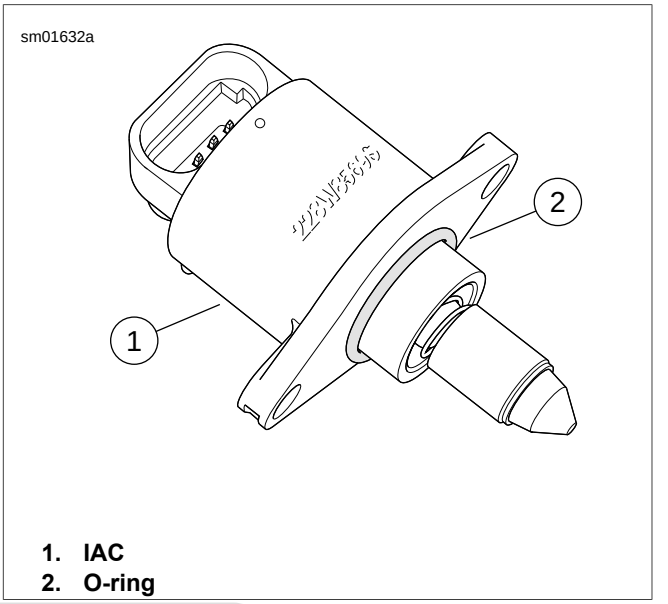
FASTENER	TORQUE VALUE	
IAC mounting screw	60 **in-lbs**	6.8 Nm

1. See Figure 4-30. If reusing IAC (1), inspect O-ring (2) for damage. Replace or repair as necessary.

⚠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 all locking agent from the threads of the attachment screws and holes. Blow debris from screw holes using low-pressure compressed air.
3. Apply a thin coat of **clean** engine oil to O-ring.
4. See Figure 4-29. Rotate IAC approximately 45 degrees clockwise so IAC mounting tab clears throttle cable bracket (2) when IAC is installed.
5. With a gentle twisting motion, insert IAC into induction module.
6. Rotate IAC to face harness connector to intake manifold and position mounting tab underneath tab on throttle cable bracket.
7. Install IAC.
   a. See Figure 4-28. Apply a drop of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to the threads of each screw.
   b. Install screws (2).
   c. Use a six-point socket (not a Torx wrench). Tighten to 60 **in-lbs** (6.8 Nm).
8. Plug harness connector [87B] into IAC connector [87A] (1).
9. Install air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY.
10. Install main fuse.
11. Close left side cover.



1. **IAC**
2. **O-ring**

Figure 4-30. IAC and O-ring

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR 4.9

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 Figure 4-31. The temperature manifold absolute pressure (TMAP) sensor performs the dual functions of monitoring air temperature and air pressure in the intake manifold. See the electrical diagnostic manual for troubleshooting.

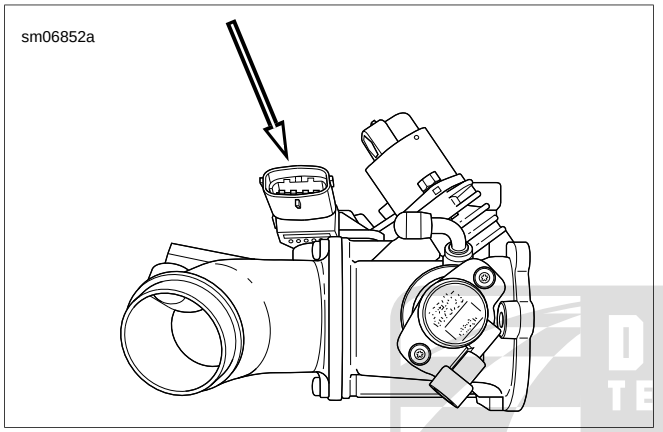


Figure 4-31. TMAP Location

REMOVAL

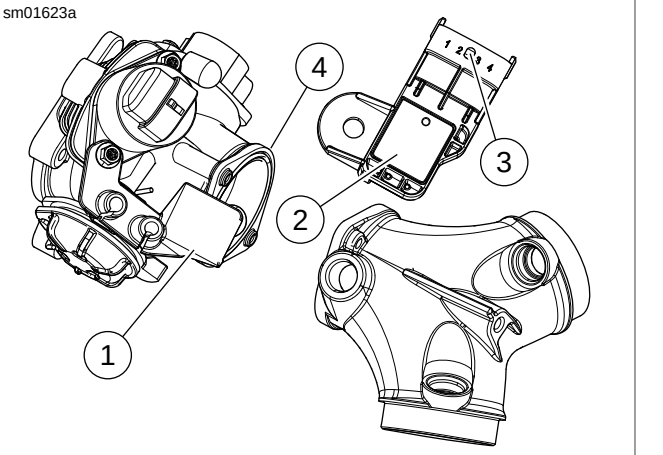
⚠WARNING

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)

⚠WARNING

Gasoline can drain from quick-connect fitting when removing fuel line. 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. (00267a)

1. Remove main fuse.
2. Remove air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY.
3. **XL 1200C/CP/CA/CB, XL 1200V:** Remove side-mounted horn. See 6.32 HORN, Side Mount: XL 1200C/CP/CA/CB, XL 1200T/V.
4. Remove fuel rail and fuel injectors to access two screws that secure induction module to intake manifold. See 4.11 FUEL INJECTORS.
5. Remove screws. Separate induction module from intake manifold. See 4.7 INDUCTION MODULE.
6. See Figure 4-32. Pull induction module away from intake manifold far enough to allow the TMAP sensor retaining bracket (1) to clear the TMAP sensor body (2).
7. Unplug harness connector [80B] from TMAP connector [80A] (3).
8. Grasp TMAP sensor. With a gentle twisting motion, pull sensor straight up out of intake manifold body.



1. **TMAP sensor retaining bracket**
2. **TMAP sensor**
3. **Sensor connector [80A]**
4. **O-ring**

Figure 4-32. TMAP Sensor Removal/Installation

INSTALLATION

FASTENER	TORQUE VALUE	
Induction module screw	35 **in-lbs**	4.0 Nm

1. See Figure 4-33. If reusing TMAP sensor (1), inspect O-ring (2) in groove of sensor for damage. Replace or repair as necessary.
2. Apply a thin coat of **clean** engine oil to TMAP sensor O-ring.
3. See Figure 4-32. With a gentle twisting motion, insert sensor (2) into intake manifold with connector [80A] (3) facing rear cylinder head.
4. Plug harness connector [80B] into TMAP sensor.
5. Inspect O-ring (4) between induction module and intake manifold for damage. Install **new** O-ring if necessary. Make sure that O-ring is fully seated in its grove in induction module body.
6. Mate induction module to intake manifold. Secure with two screws. Tighten to 35 **in-lbs** (4.0 Nm).

7. Install fuel injectors and fuel rail. See 4.11 FUEL INJECTORS.
8. **XL 1200C/CP/CA/CB, XL 1200V:** Install the side-mounted horn. See 6.32 HORN, Side Mount: XL 1200C/CP/CA/CB, XL 1200T/V.
9. Install air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY.

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)

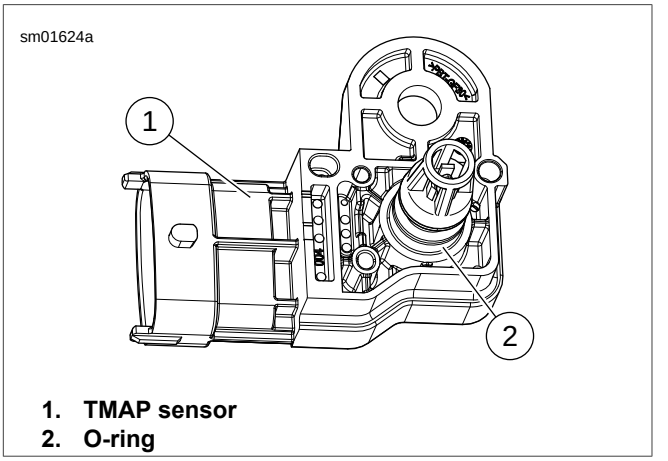
WARNING

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)

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)

10. Connect fuel hose to fuel pump module.
11. Fill fuel tank. Carefully check for leaks around fuel pump module. See 4.4 FUEL TANK, Connecting Fuel Hose and Filling Fuel Tank.
12. Install main fuse.
13. Close left side cover.



1. **TMAP sensor**
2. **O-ring**

Figure 4-33. TMAP Sensor

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

HEATED OXYGEN SENSOR (HO2S) 4.10

REMOVAL

PART NUMBER	TOOL NAME
HD-50017	OXYGEN SENSOR SOCKET

NOTE

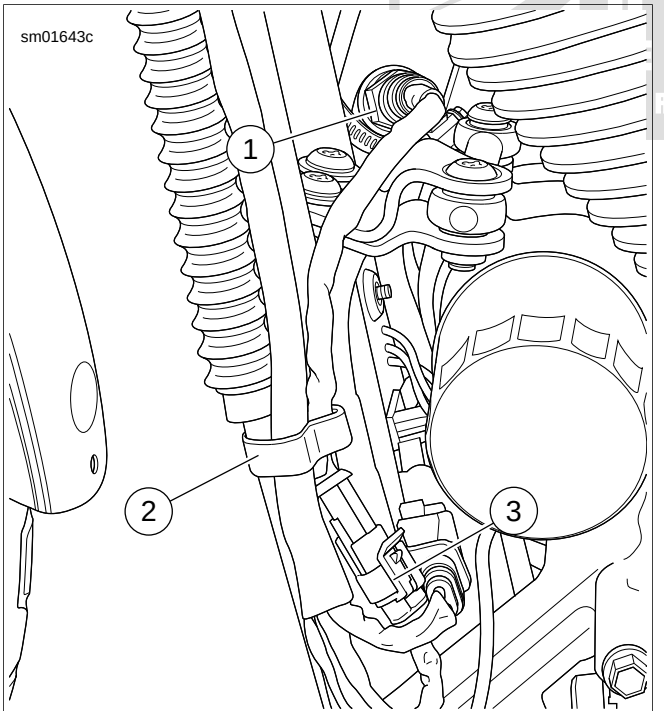
For HO2S troubleshooting, see the electrical diagnostic manual.

1. See Figure 4-34. Disconnect the front HO2S.
   a. Separate the front HO2S connector [138] (1) housings
   b. Remove the frame clip (2).
2. See Figure 4-35. Disconnect the rear HO2S (1).
   a. Open the left side cover.
   b. Separate the rear HO2S connector [137] housings (3).
   c. Remove the wire harness from the caddy cover clip.

NOTES

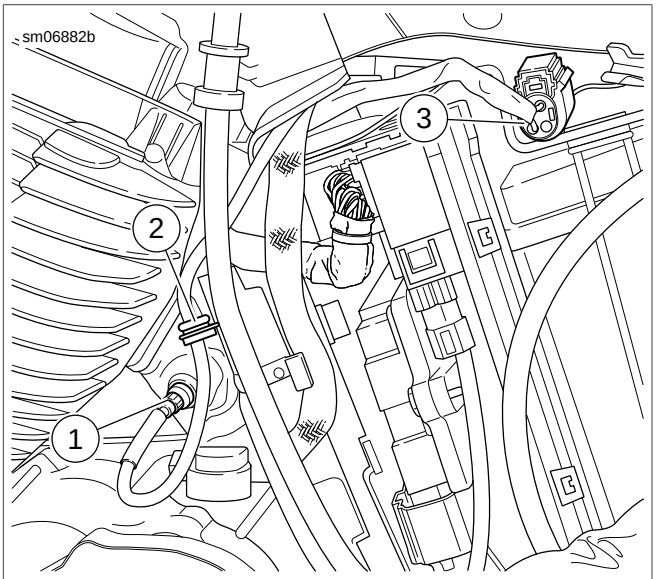
- *Mark each HO2S FRONT or REAR.*
- *Do not damage the HO2S wire harness.*

3. Remove the front and rear HO2S with the OXYGEN SENSOR SOCKET (Part No. HD-50017).



1. Front HO2S
2. Frame clip
3. HO2S connector [138]

Figure 4-34. Front HO2S and Connector



1. HO2S
2. Cover clip
3. HO2S connector

Figure 4-35. Rear HO2S and Connector [137]

INSTALLATION

PART NUMBER	TOOL NAME
HD-50017	OXYGEN SENSOR SOCKET

FASTENER	TORQUE VALUE	
HO2S	12.2-14.2 ft-lbs	16.5-19.3 Nm

NOTES

- *Do not drop or strike HO2Ss. Do not install dropped HO2Ss.*
- ***New** HO2S threads are coated with ANTI-SEIZE LUBRICANT.*
- *If a HO2S is being reused, apply a thin coat of ANTI-SEIZE LUBRICANT to the threads. Install **new** seal rings.*
- *Do not use any other compound on threads.*

1. Install the front and rear HO2S with the OXYGEN SENSOR SOCKET (Part No. HD-50017).
2. Tighten to 12.2-14.2 ft-lbs (16.5-19.3 Nm).

NOTE

Clean any dielectric grease off the connector housings.

3. Connect the front HO2S.
   a. Route the wire harness.
   b. Connect the pin and socket connector [138] housings.
   c. Install the frame clip over the sensor harness, clutch cable and wiring harness.

NOTE

Route rear HO2S harness toward left side in a loop away from the exhaust system. Avoid contact with exhaust port or exhaust pipe.

4. Connect the rear HO2S.
   a. Route the rear HO2S wire harness over the caddy and under the EVAP hose.
   b. Fit the wire harness to the hook on the caddy cover.
   c. Connect the pin and socket connector [137] housings.

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

FUEL INJECTORS 4.11

REMOVAL

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)

WARNING

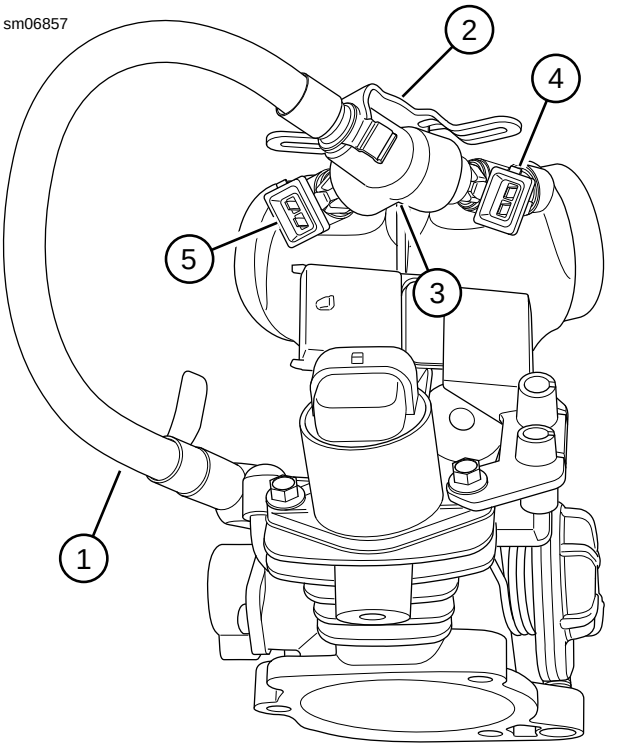
Do not use solvents or other products that contain chlorine on plastic fuel system components. Chlorine can degrade plastic fuel system components, which can cause a loss of fuel system pressure or engine stalling and could result in death or serious injury. (000621b)

1. Purge and disconnect fuel supply line. See 4.4 FUEL TANK.

WARNING

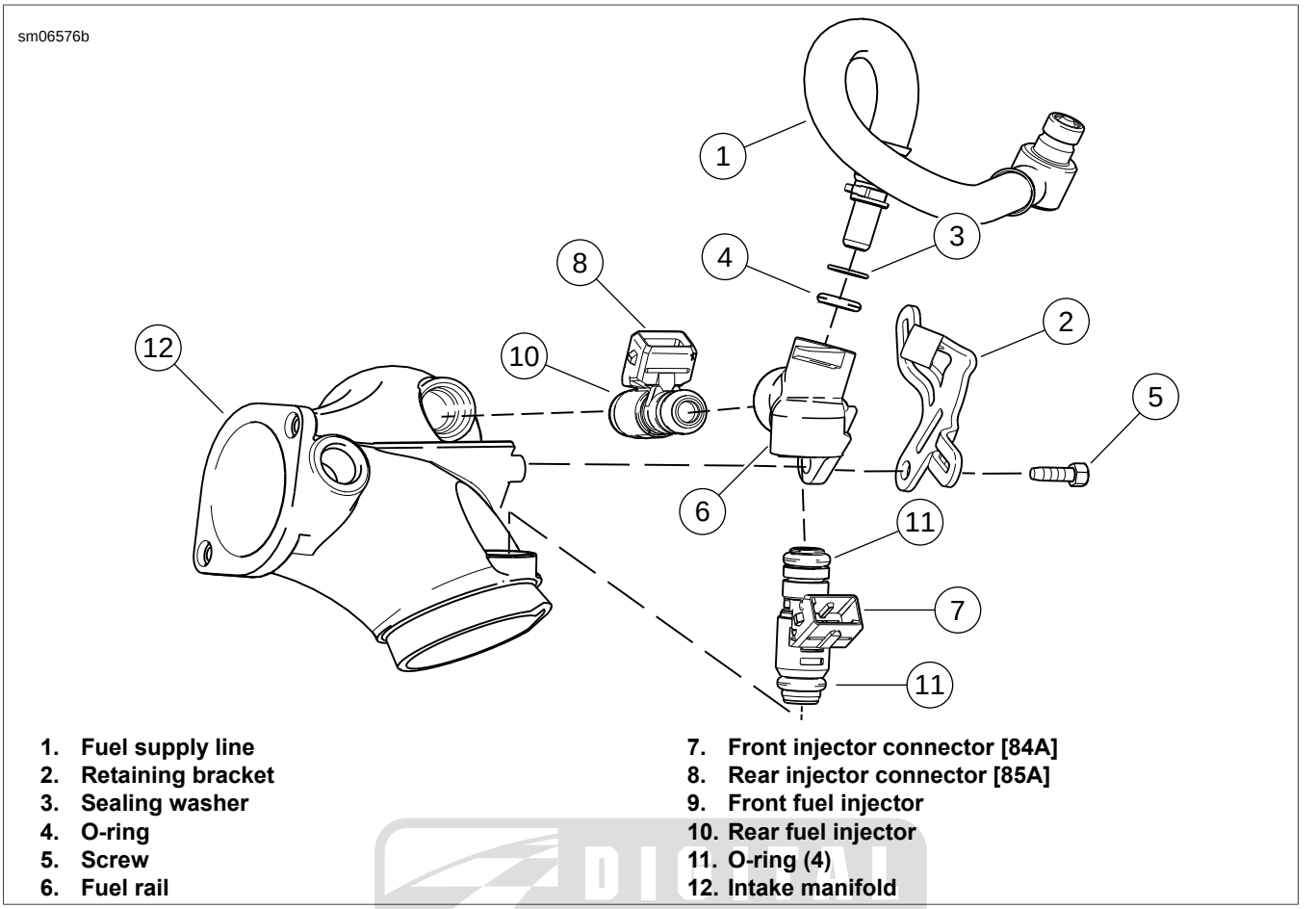
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. **XL models with 4.5 gal (17.0 L) fuel tank**: Raise fuel tank to access fuel injectors and fuel rail.
   a. Remove seat.
   b. Loosen (but do not remove) front fuel tank mounting screw. Remove rear fuel tank mounting screw, washers and nut. See 4.4 FUEL TANK.
   c. Place a clean shop cloth between front of fuel tank and front fork upper bracket to protect fuel tank finish. Carefully pivot rear of fuel tank upward and prop in position with a block of soft wood or other suitable device.
4. See Figure 4-37. Unplug engine sub-harness connectors from fuel injector connectors [84A], [85A] (7, 8).
5. Remove screw (5) and retaining bracket (2).
6. If replacing either fuel supply line (1) or fuel rail (6), remove the fuel supply line:
   a. Hold fuel rail in place.
   b. With a twisting motion, pull fuel supply line straight up out of fuel rail.
7. Hold fuel injectors (9, 10) in place by pressing down on harness connectors (7, 8). Pull off fuel rail injectors with a rocking motion.
8. With a gentle twisting motion, pull fuel injectors out of intake manifold.
9. Remove and discard O-rings (11).



1. **Fuel supply line**
2. **Retaining bracket**
3. **Fuel rail**
4. **Front fuel injector and connector**
5. **Rear fuel injector and connector**

Figure 4-36. Fuel Injector Assembly Location



1. **Fuel supply line**
2. **Retaining bracket**
3. **Sealing washer**
4. **O-ring**
5. **Screw**
6. **Fuel rail**
7. **Front injector connector [84A]**
8. **Rear injector connector [85A]**
9. **Front fuel injector**
10. **Rear fuel injector**
11. **O-ring (4)**
12. **Intake manifold**

Figure 4-37. Fuel Injector Assembly

INSTALLATION

FASTENER	TORQUE VALUE	
Fuel hose retaining bracket screw	60 **in-lbs**	6.8 Nm
Fuel tank fasteners	15-20 ft-lbs	20.3-27.1 Nm

1. See Figure 4-37. Apply a thin coat of clean engine oil to **new** fuel injector O-rings (11). Install O-rings onto fuel injectors (9, 10).
2. With harness connectors (7, 8) facing up, push fuel injectors into intake manifold.
3. See Figure 4-36. Rotate fuel injectors to position harness connectors as shown.
4. Gently press fuel rail onto free end of fuel injectors. Press fuel rail down until hole in fuel rail molded-in bracket lines up with mounting hole in intake manifold (12).
5. If fuel supply line and fuel rail were separated in disassembly procedure, reassemble:
   a. See Figure 4-37. Inspect sealing washer (3) and O-ring (4) for damage. If either require replacement, install a **new** fuel line kit.
   b. Lightly coat O-ring with clean engine oil. Push fuel supply line into fuel rail bore until collar on hose is flush with top of fuel rail.
6. See Figure 4-37. Install retaining bracket (2) and fastener (5):
   a. See Figure 4-38. Orient fuel supply line with locating flange (2) positioned as shown.
   b. Install retaining bracket (3). Fit U-shaped opening in bracket around fuel supply line and locating flange.
   c. See Figure 4-37. Secure retaining bracket (2) with screw (5). Tighten to 60 **in-lbs** (6.8 Nm).

NOTE

See Figure 4-36. The fuel injector harness leads are mounted between bracket and induction module.

7. Connect engine sub-harness connectors to fuel injectors.

WARNING

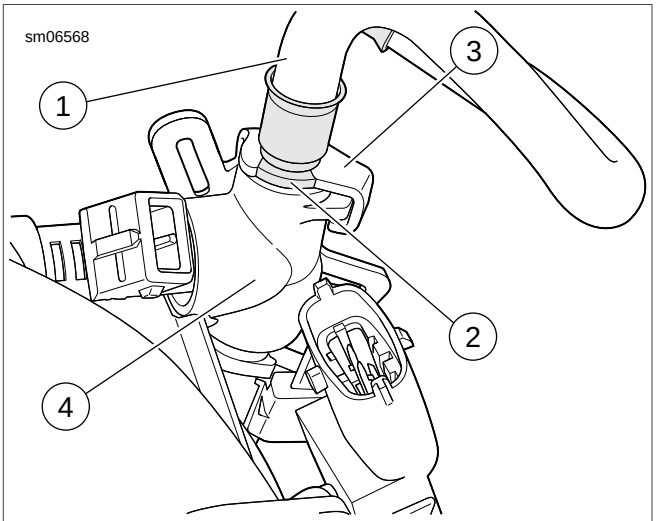
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

8. **Models with 4.5 gal (17.0 L) Fuel Tank:** If fuel tank was raised up to gain access to the fuel injectors, install fuel tank and seat:
   a. Remove prop from under rear of fuel tank.
   b. Lower rear of fuel tank into position.
   c. Install fastener, washer and nut in fuel tank rear mounting holes.
   d. Tighten front and rear fasteners to 15-20 ft-lbs (20.3-27.1 Nm).
   e. Install protective caps on screw ends. See 4.4 FUEL TANK.

⚠ 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)

9. Install seat.
10. Connect fuel hose to fuel pump module.
11. Fill fuel tank.
12. Check for leaks around fuel pump module. See 4.4 FUEL TANK.
13. Install main fuse.
14. Close left side cover.



1. **Fuel supply line**
2. **Locating flange**
3. **Retaining bracket**
4. **Fuel rail**

Figure 4-38. Mounting Fuel Hose and Fuel Rail

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

FUEL PUMP 4.12

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)

WARNING

Do not replace the special Teflon coated fuel pump wiring with ordinary bulk wire. Ordinary insulation materials can deteriorate when put in contact with gasoline and cause an explosion, which could result in death or serious injury. (00566b)

WARNING

Do not use solvents or other products that contain chlorine on plastic fuel system components. Chlorine can degrade plastic fuel system components, which can cause a loss of fuel system pressure or engine stalling and could result in death or serious injury. (000621b)

Carefully inspect fuel line for cuts, tears, holes or other damage. Replace line if any damage is found. Even a small hole can cause a reduction in fuel pressure.

REMOVAL

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 4.4 FUEL TANK.

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. Drain fuel from fuel tank. Remove fuel tank. See 4.4 FUEL TANK.
4. Lay fuel tank upside-down on a soft cloth.
5. See Figure 4-40. Remove screws (3).
6. See Figure 4-41. Carefully lift fuel pump module out of fuel tank. Tilt module when it is almost free of fuel tank.
7. Remove and discard cover plate seal.

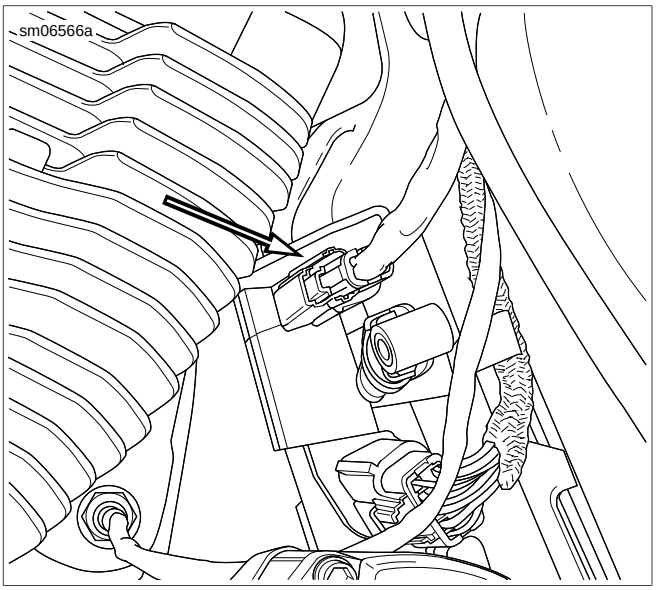
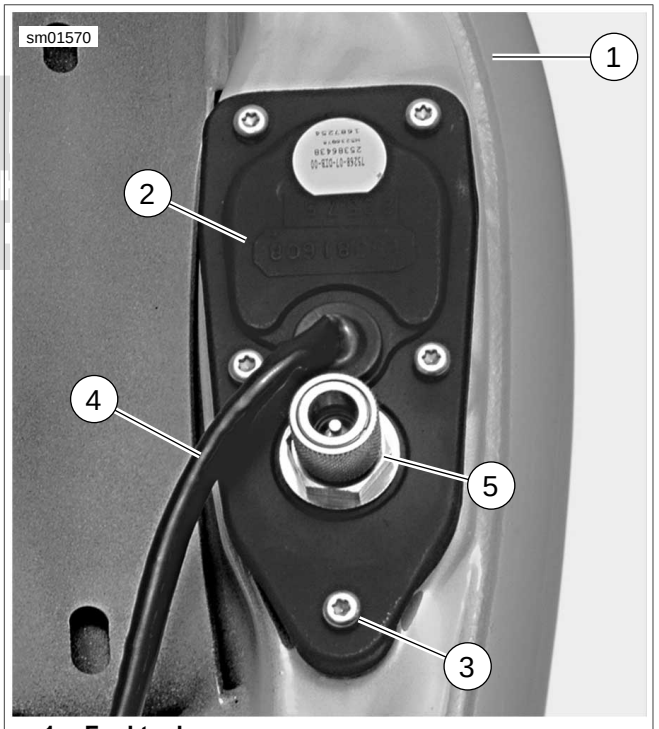


Figure 4-39. Fuel Pump Connector [141]



1. **Fuel tank**
2. **Fuel pump module**
3. **Screw (5)**
4. **Fuel pump harness**
5. **Quick-connect fitting**

Figure 4-40. Fuel Pump Module

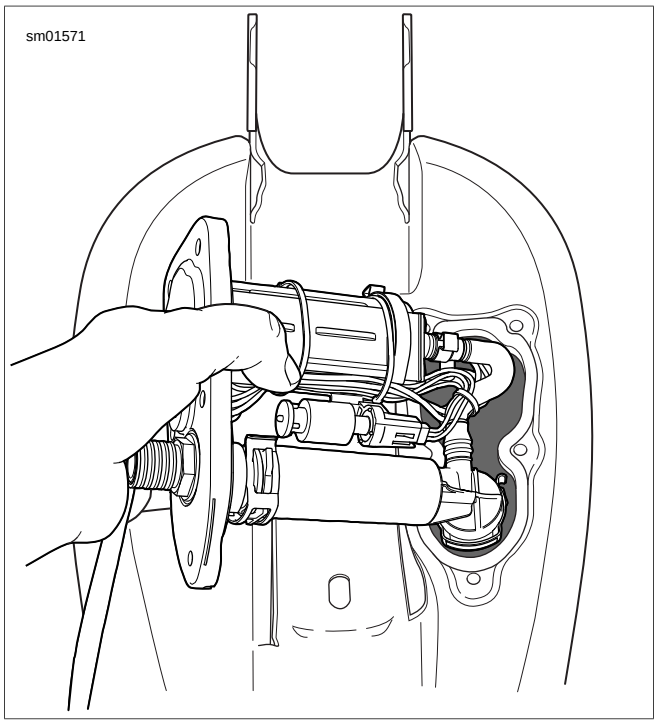


Figure 4-41. Removing/Installing Fuel Pump Module: All Models

DISASSEMBLY

The disassembly procedure consists of following groups:

- Pressure regulator and filter housing.
- Fuel pump assembly and pump bracket.
- Low fuel level sensor assembly.
- Fuel pump.

NOTE

See Figure 4-42. Note positions of wiring harness cable straps (1) and pump assembly clamp (2).

Pressure Regulator and Filter Housing

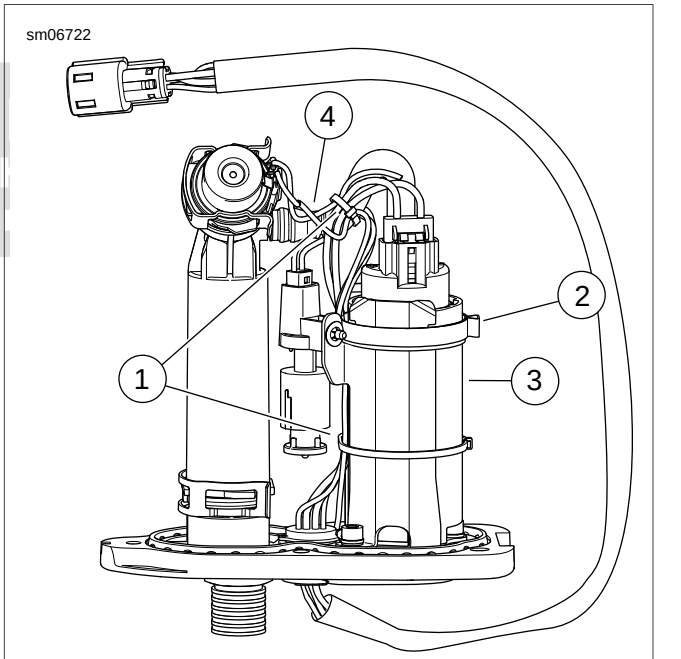
1. See Figure 4-42. Remove cable strap (1) securing wiring harness to the filter housing hose (4).
2. See Figure 4-43. Remove ground clip (12) from top of filter housing (23).
3. Remove and discard clamp (1). Remove filter housing hose (11) from top of fuel pump (2).
4. Remove retaining clip (24) from top of filter housing. Remove pressure regulator (22).
5. Remove second retaining clip (24) from bottom of filter housing. Remove filter housing. Remove fuel filter element (25) from housing.
6. Remove O-ring (26) from filter housing mount (19).

Fuel Pump Assembly and Pump Bracket

1. See Figure 4-42. Record location of any cable straps securing wiring harness to fuel pump bracket (3). Remove cable straps.
2. See Figure 4-43. Unplug fuel pump harness connector [86] (13).
3. Unplug low fuel level sensor connector from fuel pump/sender harness (14).
4. Remove and discard clamp (1). Remove filter housing hose (11) from top of fuel pump (2).
5. Remove and discard pump assembly clamp (7). Remove pump assembly with pump insulator (3) from pump bracket (5).
6. Remove push nut (16) and low fuel level sensor assembly (17) from pump bracket.
7. Remove screws and lockwashers (6). Remove pump bracket from cover plate (9).

Low Fuel Level Sensor Assembly

1. See Figure 4-42. Record location of cable strap (1) securing low fuel level sensor connector to filter housing hose (4). Remove cable strap.
2. See Figure 4-43. Unplug fuel pump/sender harness connector (15) from the low fuel level sensor (17).
3. Remove push nut (16) and low fuel level sensor assembly (17) from pump bracket (5).



1. **Cable strap (3)**
2. **Pump assembly clamp**
3. **Pump bracket**
4. **Filter housing hose**

Figure 4-42. Fuel Pump Cable Straps and Pump Clamp

ASSEMBLY

FASTENER	TORQUE VALUE	
Fuel pump bracket mounting screw	19-36 **in-lbs**	2.1-4.1 Nm

The assembly procedure consists of the following groups:

- Low fuel level sensor assembly.
- Fuel pump assembly and pump bracket.
- Pressure regulator and filter housing.

Low Fuel Level Sensor Assembly

NOTE

The low fuel lamp turns off when there is sufficient fuel in tank, the ignition switch has been cycled and motorcycle is moving.

1. See Figure 4-43. Install low fuel level sensor assembly (17) onto pump bracket (5). Secure with push nut (16).
2. Plug fuel pump/sender harness connector (15) into low fuel level sensor (17).
3. See Figure 4-42. Secure low fuel level sensor connector and fuel pump/sender harness to filter housing hose (4) with cable strap (1).

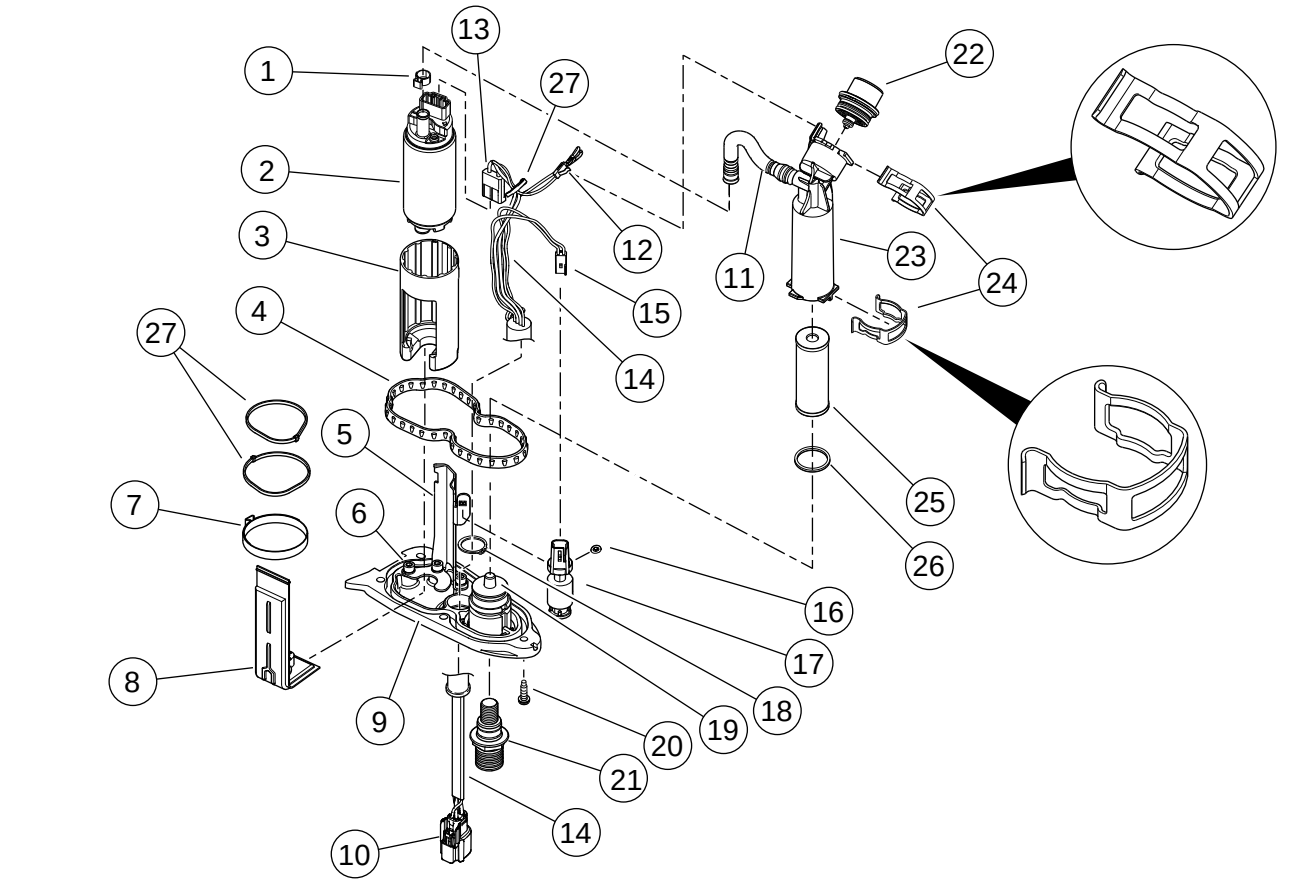
Fuel Pump Assembly and Pump Bracket

1. See Figure 4-43. Install pump bracket (5) onto cover plate (9). Secure with three screws w/lockwashers (6). Tighten to 19-36 **in-lbs** (2.1-4.1 Nm).
2. Install low fuel level sensor assembly (17) onto pump bracket. Secure with push nut (16).
3. Install fuel pump assembly (2) and pump insulator (3) onto pump bracket.
4. Secure with pump assembly clamp (7).
5. Install filter housing hose (11) on top of fuel pump. Secure with clamp (1).
6. Plug in fuel pump harness connector [86] (13).
7. See Figure 4-42. Secure fuel pump/sender harness to fuel pump bracket (3) with **new** cable straps (1).

Pressure Regulator and Filter Housing

1. See Figure 4-43. Install **new** O-ring onto filter housing mount (19).
2. Install fuel filter element (25) into filter housing (23). Install filter housing onto filter housing mount.
3. Orient filter and secure fuel filter element with retaining clip (24) at bottom of housing.
4. Install pressure regulator (22) on top of filter housing.
5. Orient and secure pressure regulator with second retaining clip (24) as shown.
6. Install filter housing hose (11) on top of fuel pump (2). Secure with **new** clamp (1).
7. Install ground clip (12) on top of filter housing.
8. See Figure 4-42. Secure fuel pump/sender harness to filter housing hose (4) with **new** cable strap (1).

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Clamp**
2. **Fuel pump**
3. **Pump insulator**
4. **Cover plate seal**
5. **Pump bracket**
6. **Screw w/lockwasher (3)**
7. **Pump assembly clamp**
8. **Inlet sock**
9. **Cover plate**
10. **Fuel pump/sender harness connector [141]**
11. **Filter housing hose**
12. **Ground clip**
13. **Fuel pump harness connector [86]**
14. **Fuel pump/sender harness**
15. **Low fuel level sensor connector**
16. **Push nut**
17. **Low fuel level sensor**
18. **Retaining ring**
19. **Filter housing mount**
20. **Screw (5)**
21. **Fuel outlet quick-connect fitting**
22. **Pressure regulator**
23. **Filter housing**
24. **Retaining clip (2)**
25. **Fuel filter element**
26. **O-ring**
27. **Cable strap**

Figure 4-43. Fuel Pump and Sender Assembly

INSTALLATION

FASTENER	TORQUE VALUE	
Fuel pump module mounting screw	40-45 **in-lbs**	4.5-5.1 Nm
Electrical caddy fasteners	50-60 **in-lbs**	5.6-6.8 Nm

1. See Figure 4-43. Install **new** cover plate seal (4) into groove in cover plate (9).
2. See Figure 4-41. Carefully install fuel pump module into fuel tank.
   a. Tilt module.
   b. Lower it into fuel tank.
   c. Straighten module to complete installation.
3. See Figure 4-44. Install screws. Tighten to 40-45 **in-lbs** (4.5-5.1 Nm) in sequence.

4. Install fuel tank. See 4.4 FUEL TANK.
   a. Verify that fuel pump harness fits in wire harness caddy latch clip with loop in harness between latch clip and fuel pump module.
   b. Plug in fuel pump harness connector [141].
   c. Install electrical caddy cover. Tighten to 50-60 **in-lbs** (5.6-6.8 Nm).
   d. Connect vent hose to fuel tank vent nipple.
5. Connect fuel hose to fuel tank. Fill fuel tank. Check for leaks around fuel pump module. See 4.4 FUEL TANK.
6. Install main fuse.
7. Close left side cover.
8. Check for leaks:
   a. Turn ignition on.
   b. Verify that fuel pump is activated.
   c. Check for leaks at quick-connect.
   d. Turn ignition off.

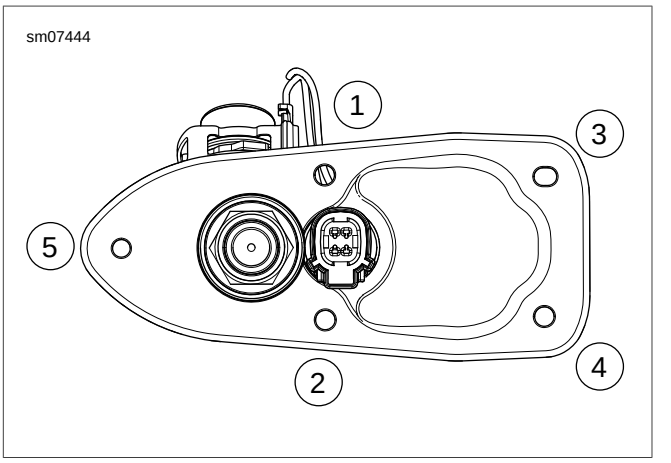


Figure 4-44. Fuel Pump Module Torque Sequence

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

FUEL FILTER ELEMENT 4.13

GENERAL

⚠WARNING

Do not use solvents or other products that contain chlorine on plastic fuel system components. Chlorine can degrade plastic fuel system components, which can cause a loss of fuel system pressure or engine stalling and could result in death or serious injury. (000621b)

The fuel filter element is located in the fuel pump assembly inside the fuel tank.

Check fuel system hose and fittings for leaks.

REMOVAL

⚠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 4.4 FUEL TANK.
2. Remove seat.

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

3. Remove main fuse.
4. Drain and remove fuel tank. See 4.4 FUEL TANK.
5. Remove fuel pump assembly from fuel tank. See 4.12 FUEL PUMP.
6. See Figure 4-45. Remove and discard cover plate seal (6).
7. Remove retaining clip (4).
8. Lift filter housing (5) off fuel pump assembly (1).
9. Remove and discard filter element (3) and O-ring (2).

INSTALLATION

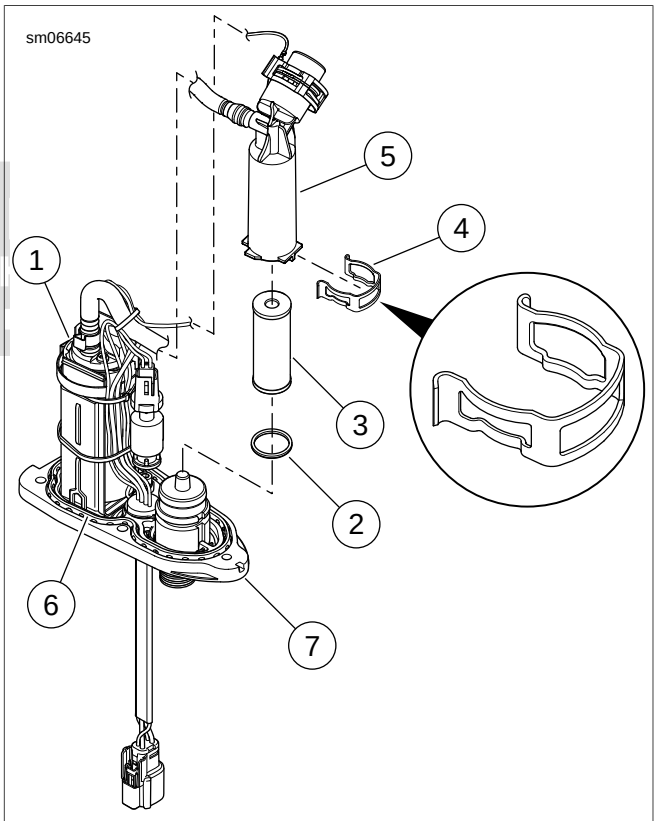
FASTENER	TORQUE VALUE	
Fuel pump module mounting screw	40-45 **in-lbs**	4.5-5.1 Nm

1. See Figure 4-45. Install a **new** O-ring (2).
2. Install **new** filter element (3) into filter housing (5).
3. Install filter housing onto base of fuel pump assembly (1). Secure with retaining clip (4), making sure that clip is oriented right side up, exactly as shown in the figure.
4. Install **new** cover plate seal (6) into groove in cover plate (7).
5. Install fuel pump assembly into fuel tank. Tighten mounting screws in a crosswise pattern to 40-45 **in-lbs** (4.5-5.1 Nm). See 4.12 FUEL PUMP.
6. Install fuel tank and reconnect fuel hose. See 4.4 FUEL TANK. Fill fuel tank. Check for leaks.
7. Install main fuse.

⚠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)

8. Install seat.
9. Turn ignition switch ON. Verify fuel pump operation.



1. **Fuel pump assembly**
2. **O-ring**
3. **Fuel filter element**
4. **Retaining clip**
5. **Filter housing**
6. **Cover plate seal**
7. **Cover plate**

Figure 4-45. Replacing Fuel Filter Element

FUEL PRESSURE TEST 4.14

GENERAL

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

⚠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)

The fuel pump delivers fuel to the fuel hose, a cavity in the induction module that supplies the fuel injectors, and to the pressure regulator. Excess fuel pressure is bypassed to the fuel tank through the pressure regulator.

The fuel pump can be turned on with DIGITAL TECHNICIAN II (Part No. HD-48650).

Improper fuel system pressure may contribute to one of the following conditions:

- Cranks, but does not run.
- Cuts out (may feel like ignition problem).
- Hesitation, loss of power or poor fuel economy.

TESTING

PART NUMBER	TOOL NAME
HD-41142	FUEL PRESSURE GAUGE
HD-44061	FUEL PRESSURE GAUGE ADAPTER

Connect Fuel Pressure Gauge

1. See 4.4 FUEL TANK. Purge fuel supply line and disconnect fuel supply line from fuel pump module.
2. Connect fuel pump connector [141].

NOTE

Do not kink fuel hose when installing or removing fuel pressure gauge and adapter.

3. See Figure 4-46. Attach FUEL PRESSURE GAUGE ADAPTER (Part No. HD-44061):
   a. See Figure 4-47. Pull up on sleeve of fuel tank quick-connect fitting (2) and insert neck of fuel pressure gauge adapter (3) into quick-connect fitting.
   b. Push up on bottom of adapter. Pull down on sleeve until it clicks. Tug on adapter to verify that it is locked in place.
   c. In same manner, connect fuel supply line fitting (1) to quick-connect fitting (4) on adapter.

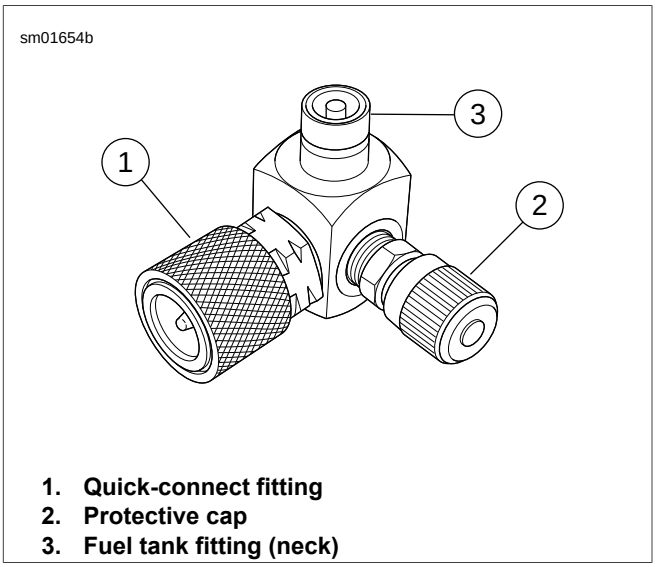
⚠WARNING

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. Verify that fuel valve (6) and air bleed petcock on fuel pressure gauge are closed.
5. See Figure 4-48. Remove protective cap from free end of fuel pressure gauge adapter.
6. Connect FUEL PRESSURE GAUGE (Part No. HD-41142) to Schroeder valve.

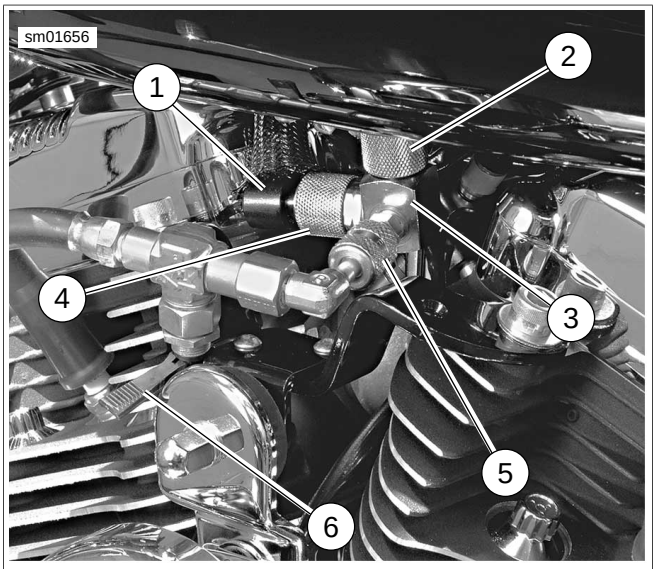
Perform Test

1. Start and idle engine to pressurize fuel system. Open fuel valve to allow flow of fuel down hose of pressure gauge.
2. Purge air from gauge and hose:
   a. Position clear air bleed tube in a suitable container.
   b. Open and close air-bleed petcock to purge gauge and hose of air.
   c. Repeat this step several times until only solid fuel (without bubbles) flows from air bleed tube.
   d. Close petcock.
3. Open and close throttle to change engine speed. Note reading of the pressure gauge.
4. Turn engine OFF and service as necessary. Refer to Table 4-3.



1. Quick-connect fitting
2. Protective cap
3. Fuel tank fitting (neck)

Figure 4-46. Fuel Pressure Gauge Adapter (Part No. HD-44061)



1. **Fuel supply hose fitting**
2. **Fuel tank quick-connect fitting**
3. **Fuel pressure gauge adapter**
4. **Adapter quick-connect fitting**
5. **Pressure adapter/Schroeder valve fitting**
6. **Fuel valve (closed position)**

Figure 4-47. Assembling Adapter, Gauge and Fuel Supply Hose to Fuel Tank: All Models

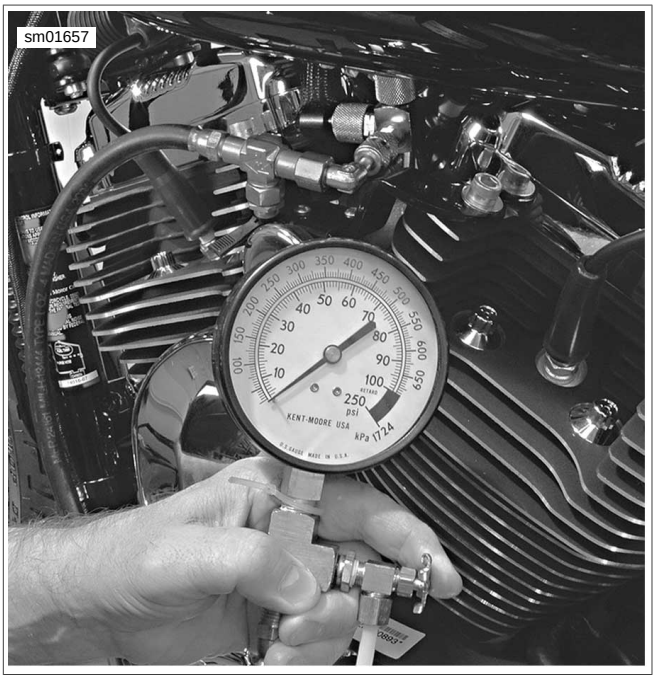


Figure 4-48. Fuel Pressure Gauge Installed: All Models

Table 4-3. Fuel Pressure Test

RESULTS	CAUSE	SOLUTION
Less than: 55 psi (380 kPa)	Restricted fuel filter	Replace.
	Restricted pump inlet screen	Clean.
	Restricted fuel line or hose to gauge	Clear.
	Faulty fuel pump	Replace.
	Restricted check valve fitting	Clear.
	Leak inside tank (hose or coupling)	Replace or repair as necessary.
	Faulty pressure regulator	Replace.
Steady at: 55-62 psi (380-425 kPa)	Correct operating fuel pressure	
More than: 62 psi (425 kPa)	Check valve fitting and fuel tank	Replace or repair as necessary.
	Fuel pressure regulator	Replace.

Return to Service

1. Position air bleed tube in a suitable container. Open air-bleed petcock to relieve fuel system pressure and purge pressure gauge of gasoline.

⚠WARNING

Gasoline can drain from the adapter when gauge is 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. (00254a)

2. Remove fuel pressure gauge from adapter. Install protective cap over Schroeder valve.

⚠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)

3. Remove adapter:
   a. Pull up on knurled sleeve of fuel pressure gauge adapter quick-connect fitting.
   b. Remove fuel supply line from adapter.
   c. Release adapter from 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)

4. Install fuel hose:
   a. Push up on release sleeve of fuel pump quick-connect fitting.
   b. Push fuel hose fitting into quick-connect fitting.
   c. Pull down on release sleeve to lock.
   d. Tug on fuel hose fitting to verify that it is locked.

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

INTAKE LEAK TEST 4.15

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. It will cause false readings.*
- *Be careful when testing vehicle with Screamin' Eagle air cleaner assembly. This type of air cleaner has an open backplate. Even with air cleaner cover on, directing nozzle too close to backplate can give false readings.*

LEAK TESTER

PART NUMBER	TOOL NAME
HD-41417	PROPANE ENRICHMENT KIT

Parts List

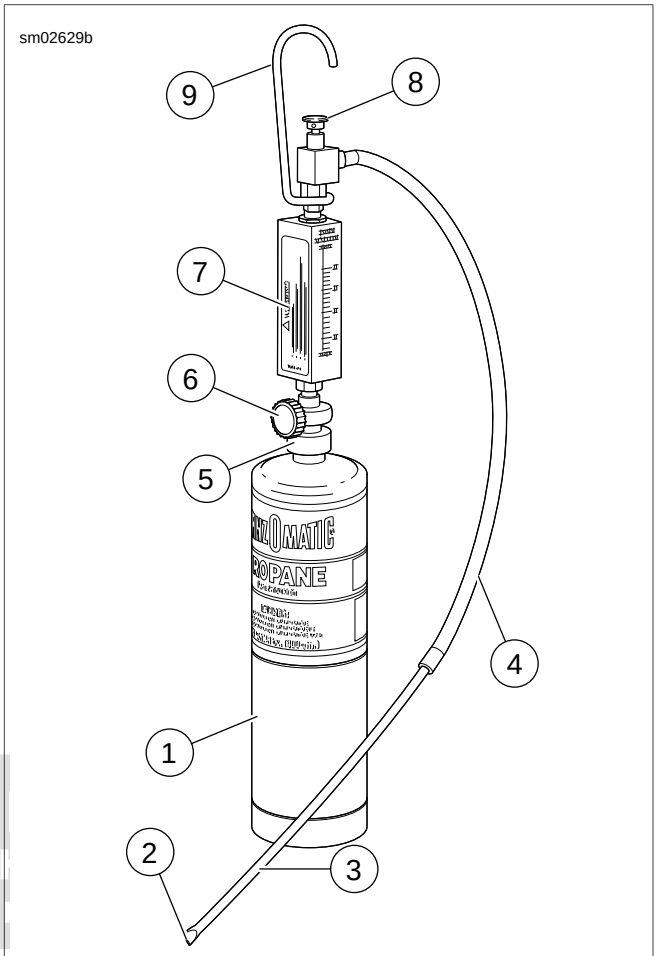
- Standard 14 oz propane cylinder.
- PROPANE ENRICHMENT KIT (Part No. HD-41417).

Tester Assembly

1. See Figure 4-49. Make sure valve knob (6) is closed (fully clockwise).
2. Install valve assembly (5) onto propane bottle (1).

Tester Adjustment

1. See Figure 4-49. 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 4-49. Leak Tester

PROCEDURE

1. Run motorcycle until engine is at normal operating temperature.

NOTE

Do not direct propane stream toward air cleaner. Propane in the air cleaner creates false indicators.

2. See Figure 4-50. Aim nozzle (3) toward possible sources of leak such as intake manifold mating surfaces.
3. Press and release trigger button (2) to dispense propane. The tone of the engine changes when propane enters source of leak. Repeat as necessary to detect leak.
4. When test is finished, close valve knob (turn knob fully clockwise).

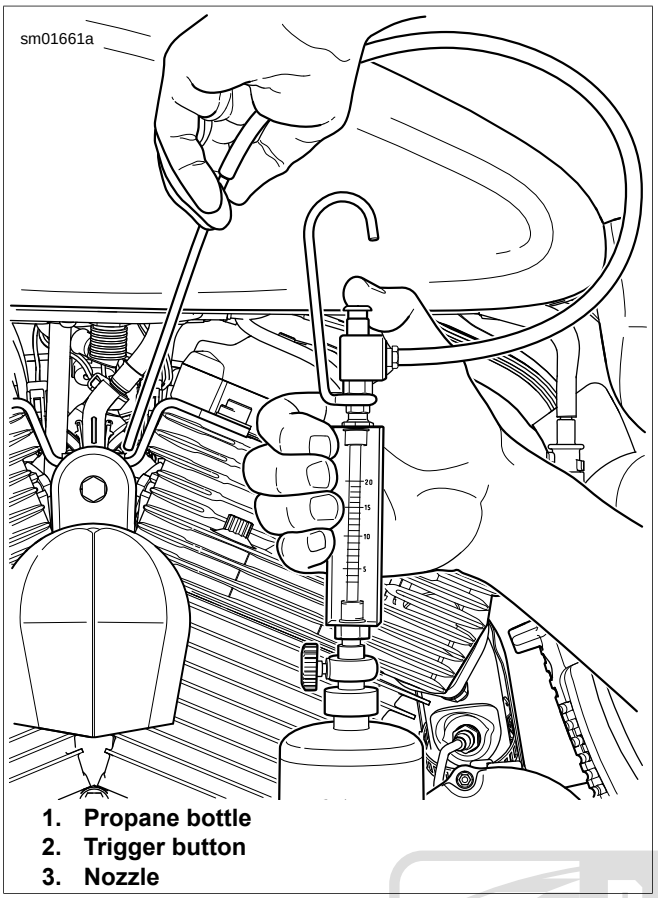


Figure 4-50. Checking for Leaks: All Models

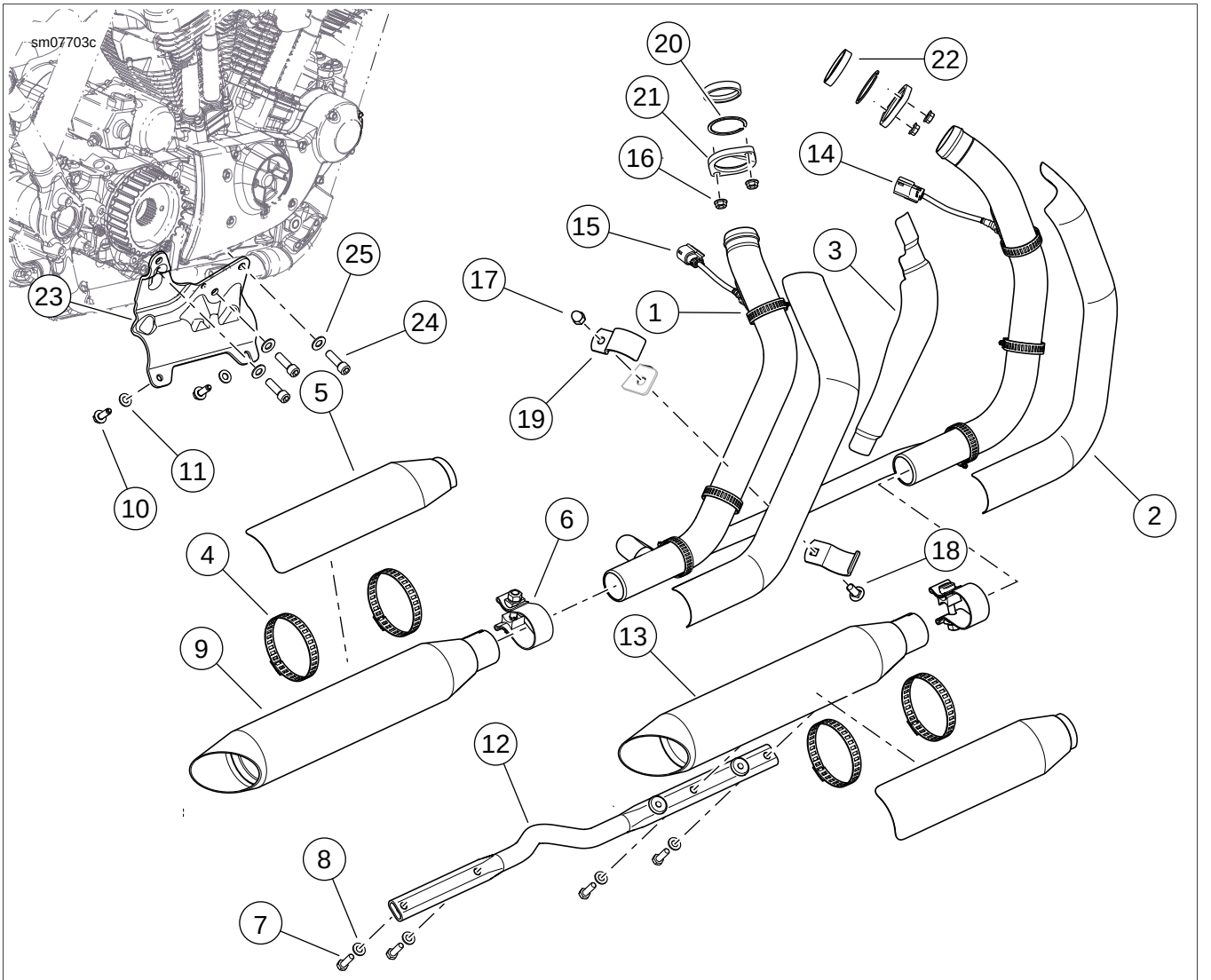
DIGITAL TECHNICIAN II HARLEY-DAVIDSON

EXHAUST SYSTEM 4.16

UNIT REMOVAL

Remove exhaust system in two steps.

1. Remove mufflers. See 4.16 EXHAUST SYSTEM, Mufflers.
2. Remove exhaust pipes. See 4.16 EXHAUST SYSTEM, Exhaust Pipes.



1. Worm drive clamp (6)
2. Exhaust shield (2)
3. Upper rear shield: Mid-mount controls
4. Worm drive clamp (4)
5. Muffler shield (2)
6. Muffler clamps (2)
7. Screws (4)
8. Washers (4)
9. Rear muffler
10. Fasteners (2)
11. Washers (2)
12. Muffler mounting bracket
13. Front muffler
14. Front HO2S connector [138]
15. Rear HO2S connector [137]
16. Nuts (4)
17. Acorn nut
18. Fastener
19. Clamps (2)
20. Retaining ring (2)
21. Exhaust flange(2)
22. Gasket (2)
23. Exhaust mounting bracket
24. Fasteners (3)
25. Washers (3)

Figure 4-51. Exhaust System

EXHAUST SHIELDS

FASTENER	TORQUE VALUE	
Exhaust shield worm drive clamps	20-40 **in-lbs**	2.3-4.5 Nm

Removal

1. See Figure 4-51. Open worm drive clamps (1).
2. Remove exhaust shields (2) and clamps.
3. **Mid-mount controls:** Remove the upper rear shield (3).

Installation

1. Install worm drive clamps with exhaust shields.
2. Orient clamp screws for access.
3. Tighten to 20-40 **in-lbs** (2.3-4.5 Nm).

MUFFLER SHIELDS

FASTENER	TORQUE VALUE	
Exhaust shield worm drive clamps	20-40 **in-lbs**	2.3-4.5 Nm

Removal

1. See Figure 4-51. Open worm drive clamps (4).
2. Remove muffler shields (5) and clamps.

Installation

1. Install worm drive clamps and muffler shields.

NOTE

See Figure 4-52. Install the front muffler shield rear clamp screw as shown. If installed below the muffler, clamp screw can contact ground at maximum lean angle.

2. Orient remaining clamp screws for access and clearance.
3. Tighten to 20-40 **in-lbs** (2.3-4.5 Nm).

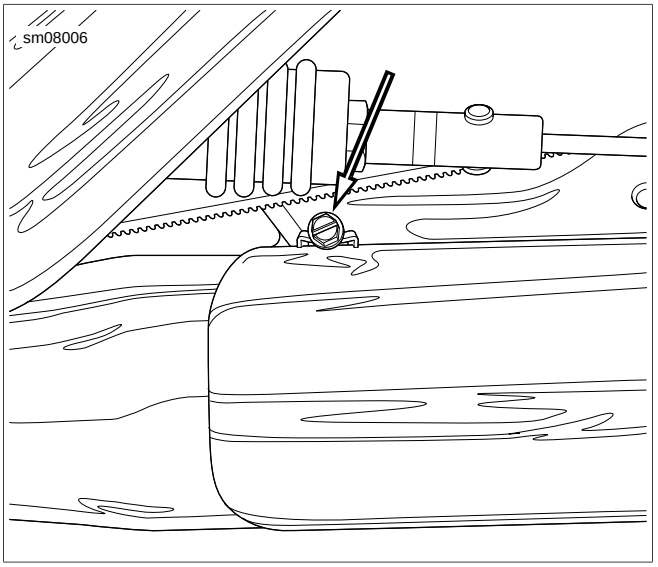


Figure 4-52. Muffler Shield Clamp Screw Orientation

MUFFLERS

FASTENER	TORQUE VALUE	
Muffler mounting bracket fastener	17-20 ft-lbs	23.0-27.1 Nm
Muffler to bracket screw	17-20 ft-lbs	23.0-27.1 Nm
Muffler clamp	38-43 ft-lbs	51.5-58.3 Nm

Removal

1. Remove exhaust shields.
2. Remove muffler shields.
3. See Figure 4-51. Loosen muffler clamps (6).
4. Remove rear muffler screws (7) and washers (8). Remove rear muffler (9).
5. Remove fasteners (10) and washers (11) securing muffler mounting bracket to exhaust mounting bracket.
6. Remove front muffler (13) and mounting bracket (12).
7. Remove front muffler screws and washers.
8. Remove and discard muffler clamps.

Installation

1. Install front muffler on muffler mounting bracket. Finger tighten fasteners.
2. Install **new** muffler clamps over end of mufflers.
3. See Figure 4-53. Thread front mounting bracket fastener 1/2 way into bracket.

NOTE

Rotate front muffler and mounting bracket to clear exhaust bracket.

4. Slide muffler onto exhaust pipe.
5. Rotate muffler and mounting bracket to slide front fastener into exhaust bracket slot.
6. Install rear washer and fastener.
7. Install rear muffler to mounting bracket.

NOTES

- *Orient front muffler clamp down and out.*
- *Orient up rear muffler clamp.*

8. Install washers and bracket fasteners. Finger tighten.
9. Tighten fasteners in sequence:
   a. Muffler mounting bracket to exhaust mounting bracket 17-20 ft-lbs (23.0-27.1 Nm).
   b. Muffler to bracket screw 17-20 ft-lbs (23.0-27.1 Nm).
   c. Muffler clamps 38-43 ft-lbs (51.5-58.3 Nm).
10. Install exhaust shields.
11. Install muffler shields.

DIGITAL TECHNICIAN HARLEY-DAVIDSON

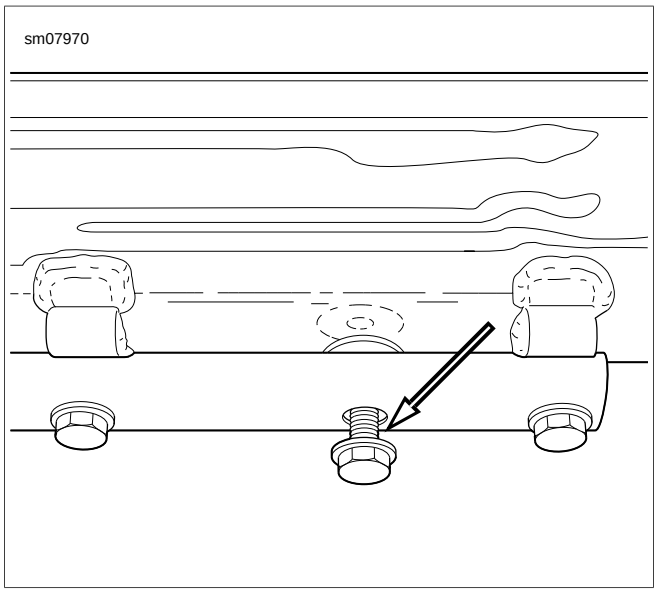


Figure 4-53. Bolt 1/2 Way Installed

EXHAUST PIPES

PART NUMBER	TOOL NAME
PFSX916	SNAP-ON SWIVEL BALL SOCKET EXTENSION

FASTENER	TORQUE VALUE	
Exhaust pipe flange nut	96-120 **in-lbs**	10.8-13.6 Nm
Exhaust pipe bracket acorn nut	20-30 ft-lbs	27.1-40.7 Nm

Removal

1. Remove mufflers. See 4.16 EXHAUST SYSTEM, Mufflers.
2. See Figure 4-51. Separate front HO2S connector [138] (14).
3. Separate rear HO2S connector [137] (15).
4. Remove nuts (16) from front and rear cylinder head studs.

NOTE

Support exhaust pipes.

5. Remove acorn nut (17), fastener (18) and clamps (19) from sprocket cover exhaust pipe bracket.
6. Remove exhaust pipes.
7. Remove retaining ring (20), exhaust flange (21) and gasket (22) as necessary.

Installation

NOTE

Orient flange counterbore to exhaust port.

1. Fit exhaust flange over end of each exhaust pipe.
2. Install **new** retaining ring.
3. Fit exhaust pipe flanges to cylinder head mounting studs.
4. Install flange nuts finger-tight.
5. Install and finger tighten the clamps (19), fastener (18) and acorn nut (17).

NOTE

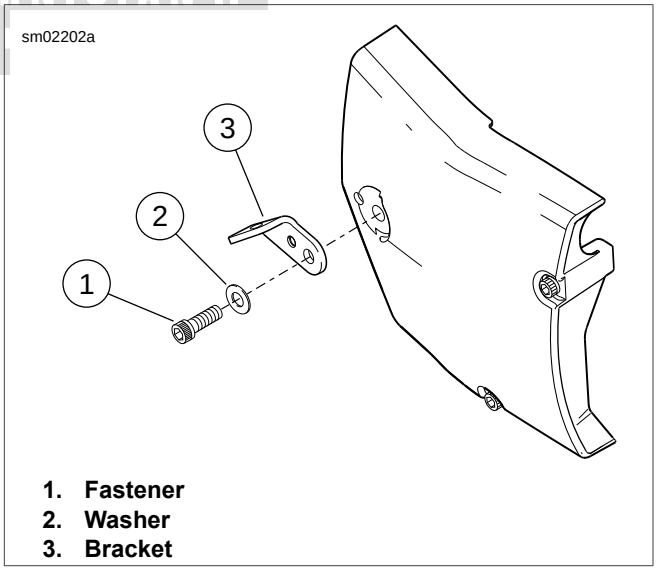
Use SNAP-ON SWIVEL BALL SOCKET EXTENSION (Part No. PFSX916) to reach exhaust pipe flange nuts.

6. Tighten:
   a. Exhaust pipe flange nuts to 96-120 **in-lbs** (10.8-13.6 Nm).
   b. Sprocket cover bracket acorn nut to 20-30 ft-lbs (27.1-40.7 Nm).
7. Connect HO2S [138] connector housings.
8. Connect HO2S [137] connector housings.
9. Install mufflers.
10. Install exhaust shields.
11. Install muffler shields.

EXHAUST PIPE BRACKET

FASTENER	TORQUE VALUE	
Exhaust pipe clamp bracket fastener	30-33 ft-lbs	40.7-44.7 Nm

1. See Figure 4-54. Remove fastener (1), washer (2) and exhaust pipe bracket (3) as necessary.
2. Install bracket, washer and fastener.
3. Tighten to 30-33 ft-lbs (40.7-44.7 Nm).



1. **Fastener**
2. **Washer**
3. **Bracket**

Figure 4-54. Exhaust Pipe Bracket

MOUNTING BRACKET

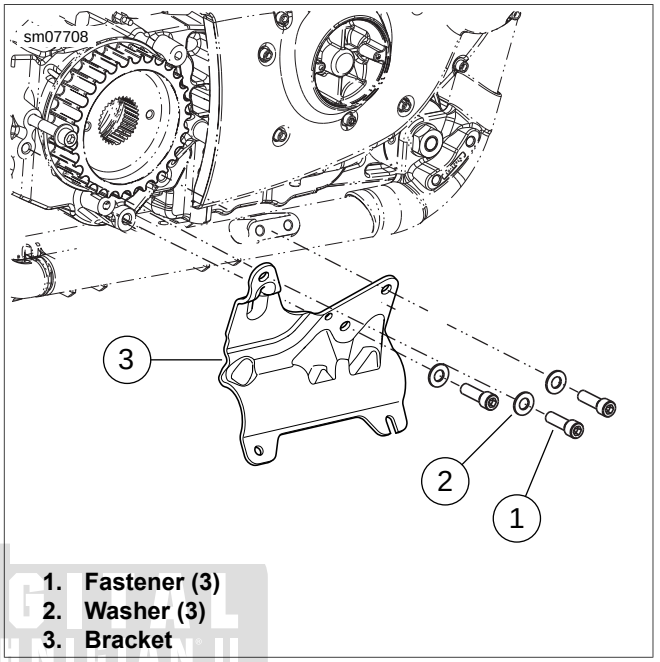
FASTENER	TORQUE VALUE	
Exhaust mounting bracket fastener	30-33 ft-lbs	40.7-44.7 Nm
Sprocket cover screws	80-120 **in-lbs**	9.0-13.6 Nm

Removal

1. Remove exhaust system.
2. Remove rider foot controls as an assembly.
   a. **Mid-mount controls:** See 2.39 RIDER FOOT CONTROLS: MID-MOUNT, Right Footrest and Rear Brake Pedal Assembly.
   b. **Forward controls:** See 2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal Assembly.
3. Remove C-clip and pin from brake rod at master cylinder.
4. Remove sprocket cover.
5. See Figure 4-55. Remove fasteners (1), washers (2) and mounting bracket (3).

Installation

1. Install mounting bracket with washers and fasteners.
2. Tighten to 30-33 ft-lbs (40.7-44.7 Nm).
3. Install sprocket cover and fasteners. Tighten to 80-120 **in-lbs** (9.0-13.6 Nm).
4. Install brake rod with C-clip and pin at master cylinder.
5. Install rider foot controls as an assembly.
   a. **Mid-mount controls:** See 2.39 RIDER FOOT CONTROLS: MID-MOUNT, Right Footrest and Rear Brake Pedal Assembly.
   b. **Forward controls:** See 2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal Assembly.
6. Install exhaust system.



1. **Fastener (3)**
2. **Washer (3)**
3. **Bracket**

Figure 4-55. Exhaust Mounting Bracket

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EVAPORATIVE (EVAP) EMISSIONS CONTROL 4.17

GENERAL

See Figure 4-56. Motorcycles sold in some markets have an evaporative (EVAP) emissions control system.

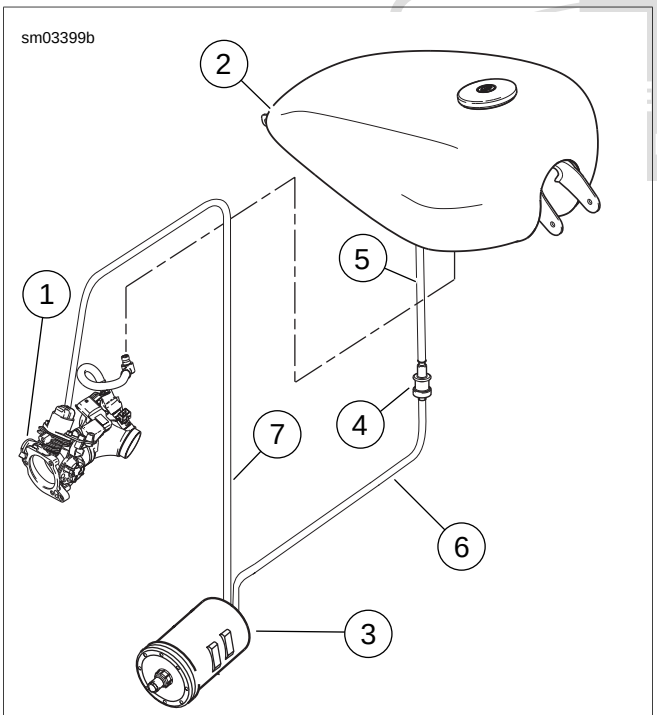
- **Vent:** Hydrocarbon vapors in fuel tank (2) are vented through a vapor valve (4). The vapors are stored in the charcoal canister (3). When tipped, the valve closes. Gasoline cannot leak into charcoal canister from the vent hoses (5, 6).
- **Purge:** When engine is running, intake vacuum draws hydrocarbon vapors from charcoal canister through the purge hose (7). The vapors enter intake where engine combustion burns the vapors.

⚠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

Check all connections and routings. Make sure that the hoses are not pinched, kinked, cracked or torn. Improper connections can leak charcoal from canister.



1. **Induction module**
2. **Fuel tank**
3. **Charcoal canister**
4. **Vapor valve**
5. **Fuel tank-to-vapor valve hose**
6. **Vapor valve-to-canister vent hose**
7. **Canister-to-induction module purge hose**

Figure 4-56. Evaporative (EVAP) Emissions Control

CHARCOAL CANISTER

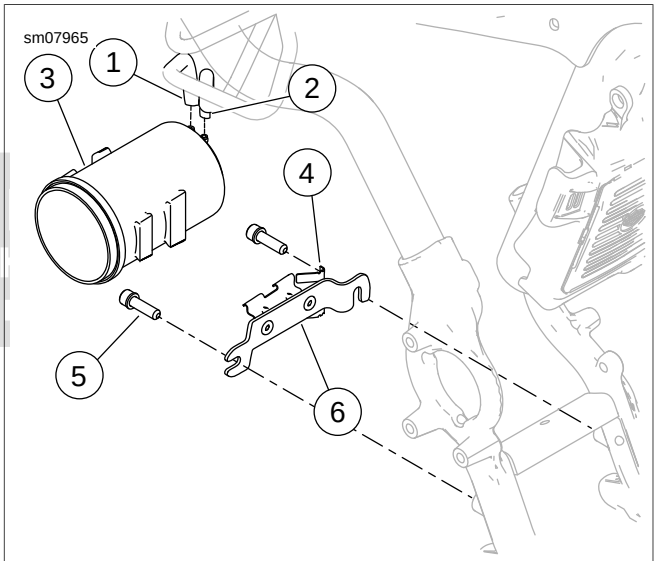
FASTENER	TORQUE VALUE	
EVAP canister mounting bracket screw	15-18 ft-lbs	20.3-24.4 Nm

Removal

NOTE

See Figure 4-57. Mark purge hose (1) as CARB. Mark vent hose (2) as TANK.

1. Mark hoses connected to charcoal canister (3).
2. Disconnect hoses from canister.
3. Press locking tabs (4) at left end of canister clip. Slide canister towards left side to disengage from canister clip.
4. Remove two screws (5) to detach canister mounting bracket (6).



1. **Purge hose**
2. **Vent hose**
3. **Charcoal canister**
4. **Locking tab**
5. **Screw (2)**
6. **Mounting bracket**

Figure 4-57. Canister Mounting

Installation

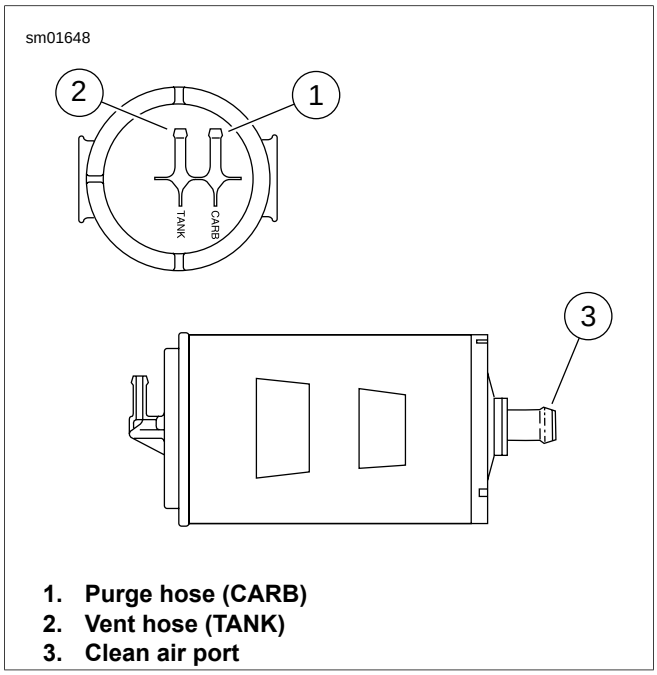
1. Install mounting bracket with screws. Tighten to 15-18 ft-lbs (20.3-24.4 Nm).

NOTE

Bend locking tabs outward somewhat if canister is not held securely.

2. Press canister against tabs. Slide charcoal canister into clip until tabs lock canister in place.

3. See Figure 4-58. Connect hoses.
   a. Connect purge hose to CARB.
   b. Connect vent hose to TANK.



1. **Purge hose (CARB)**
2. **Vent hose (TANK)**
3. **Clean air port**

Figure 4-58. Canister Connections

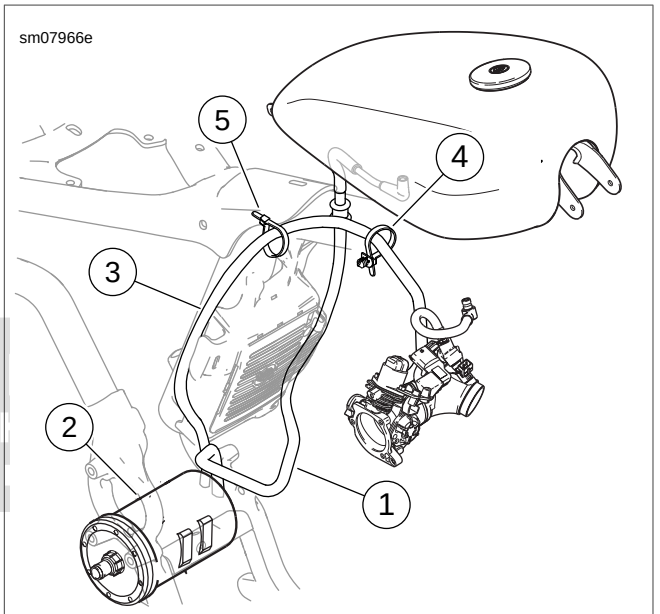
HOSE ROUTING

Vent Hose

1. Install vapor valve. See 4.4 FUEL TANK, Vapor Valve.
2. See Figure 4-59. Route vapor valve to canister (TANK) hose (1):
   a. Fit hose to vapor valve.
   b. Route hose behind electrical caddy cover.
   c. Route hose behind primary case and through frame down tubes to canister.
   d. Connect hose to canister (2) fitting marked TANK.

Purge Hose

1. To access induction module, remove air cleaner and backplate assembly. See 4.3 AIR CLEANER ASSEMBLY.
2. See Figure 4-59. Route induction module-to-canister purge hose (CARB) (3):
   a. Connect purge hose to induction module.
   b. Route hose along backbone electrical caddy.
   c. Snap the plug-in cable strap (4) to the electrical caddy.
   d. Route hose behind the harness guide.
   e. Install the cable strap (5) securing the purge hose to the wire harness.
   f. Route hose between frame down tubes.
   g. Connect purge hose to upper canister fitting marked CARB.
3. Install air cleaner assembly. See 4.3 AIR CLEANER ASSEMBLY.



1. **Vent hose-to-canister (TANK)**
2. **Canister**
3. **Purge hose-from-canister (CARB)**
4. **Plug-in cable strap**
5. **Cable strap**

Figure 4-59. EVAP Hose Routing

NOTES

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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
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	5.5 DRIVE BELT, Drive Belt
Clutch cable fitting	36-108 **in-lbs**	4.1-12.2 Nm	5.3 PRIMARY COVER, Installation
Clutch inspection cover screws	90-120 **in-lbs**	10.3-13.6 Nm	5.3 PRIMARY COVER, Installation
Countershaft retaining screw	33-37 ft-lbs	44.8-50.2 Nm	5.13 TRANSMISSION INSTALLATION, Shifter Shaft Installation
Crankcase fastener	15-19 ft-lbs	20.3-25.8 Nm	5.13 TRANSMISSION INSTALLATION, Assembling Crankcases
Engine sprocket nut	240-260 ft-lbs	326-353 Nm	5.4 PRIMARY DRIVE AND CLUTCH, Installation
Exhaust pipe clamp bracket screw	30-33 ft-lbs	40.7-44.7 Nm	5.5 DRIVE BELT, Drive Belt
Exhaust pipe clamp bracket screw	30-33 ft-lbs	40.7-44.8 Nm	5.14 TRANSMISSION SPROCKET, Installation
Gear detent assembly screw	90-110 **in-lbs**	10.2-12.4 Nm	5.13 TRANSMISSION INSTALLATION, Installation
Gear shift lever pinch screw	16-20 ft-lbs	21.7-27.1 Nm	5.3 PRIMARY COVER, Installation
Muffler mounting bracket screw	30-33 ft-lbs	40.7-44.7 Nm	5.14 TRANSMISSION SPROCKET, Installation
Neutral indicator switch	120-180 **in-lbs**	13.6-20.3 Nm	5.13 TRANSMISSION INSTALLATION, Assembling Crankcases
Oil drain hose worm clamp	6-10 **in-lb**	0.7-1.1 Nm	5.3 PRIMARY COVER, Installation
Primary chain adjuster locknut	20-25 ft-lbs	27.1-33.9 Nm	5.3 PRIMARY COVER, Installation
Primary chaincase drain plug	14-30 ft-lbs	19.0-40.7 Nm	5.3 PRIMARY COVER, Installation
Primary chain cover screws	120-140 **in-lbs**	13.6-15.8 Nm	5.3 PRIMARY COVER, Installation
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	5.5 DRIVE BELT, Drive Belt
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	5.14 TRANSMISSION SPROCKET, Installation
Transmission mainshaft nut	50-60 ft-lbs	67.8-81.3 Nm	5.4 PRIMARY DRIVE AND CLUTCH, Installation
Transmission sprocket lockplate screw	90-120 **in-lbs**	10.3-13.6 Nm	5.14 TRANSMISSION SPROCKET, Installation
Transmission sprocket nut	50 ft-lbs	67.8 Nm	5.14 TRANSMISSION SPROCKET, Installation/Initial torque plus 30-40 degrees.

SPECIFICATIONS: DRIVE 5.2

SPORTSTER SPECIFICATIONS

Table 5-1. Sprocket Teeth

DRIVE	ITEM	NUMBER OF TEETH			
		XL 883 MODELS		XL 1200 MODELS	
		U.S.	WORLD	U.S.	WORLD
Primary	Engine	34	34	38	38
	Clutch	57	57	57	57
Final	Transmission	29	29	29	30
	Rear wheel	68	68	68	68

Table 5-2. Overall Drive Ratios

GEAR	XL 883 MODELS	XL 1200 MODELS	
	ALL	U.S.	WORLD
First	10.407	9.315	9.004
Second	7.436	6.653	6.432
Third	5.530	4.948	4.783
Fourth	4.583	4.102	3.965
Fifth	3.931	3.517	3.400

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NOTE

Service wear limits are given as a guideline for measuring components that are not new. For measurement specifications not given under SERVICE WEAR LIMITS, see NEW COMPONENTS.

Table 5-3. Clutch Pack Plate Specifications

ITEM	NEW COMPONENTS		SERVICE WEAR LIMIT	
	in	mm	in	mm
CLUTCH PLATE THICKNESS				
Friction plate (fiber)	0.8661 ± 0.0031	2.2000 ± 0.0800	0.0795	2.0200
Steel plate	0.0629	1.6000	N/A	N/A
MAXIMUM ALLOWABLE WARPAGE				
Friction plate (fiber)	N/A	N/A	0.0059	0.1500
Steel plate	N/A	N/A	0.0059	0.1500

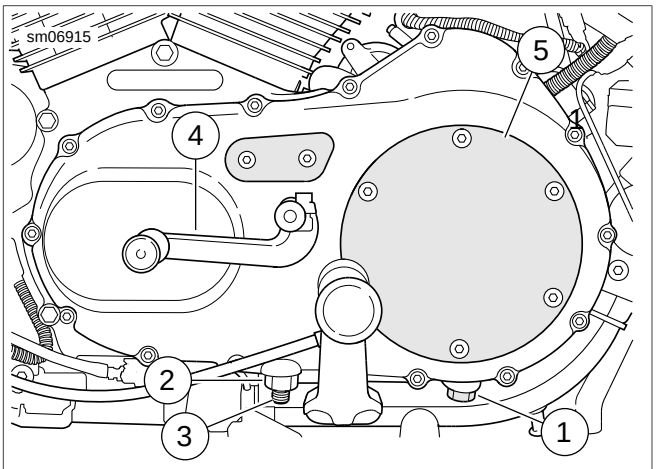
PRIMARY COVER 5.3

REMOVAL

WARNING

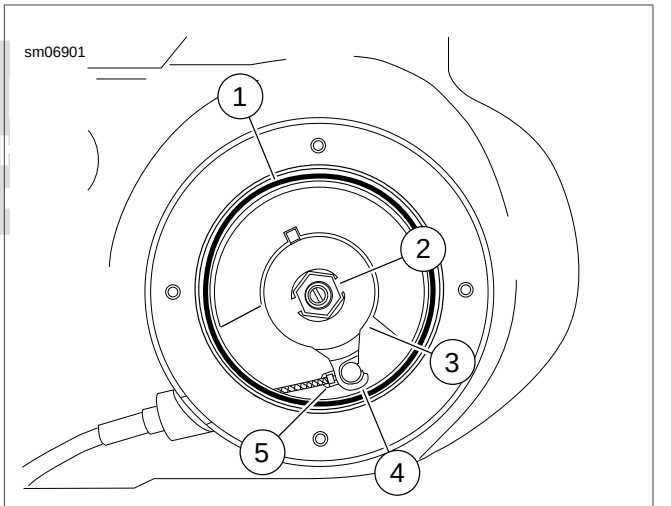
To prevent accidental vehicle start-up, which could cause death or serious injury, disconnect battery cables (negative (-) cable first) before proceeding. (00307a)

1. Disconnect battery cables. See 1.20 BATTERY MAINTENANCE, Disconnection and Removal.
2. Remove left side rider footrest and mounting bracket assembly.
   a. **Mid-mount controls:** See 2.39 RIDER FOOT CONTROLS: MID-MOUNT.
   b. **Forward controls:** See 2.40 RIDER FOOT CONTROLS: FORWARD.
3. See Figure 5-1. Place a drain pan under motorcycle. Remove drain plug (1) and drain lubricant from primary drive housing.
4. Loosen locknut (2). Turn chain adjuster screw (3) counterclockwise to relax primary chain tension.
5. Remove gear shift lever (4) and rubber washer from transmission shifter shaft.
6. Loosen clutch cable tension at clutch cable adjuster.
7. Remove clutch inspection cover (5).
8. See Figure 5-2. Remove quad ring (1) from groove in primary cover. Discard quad ring.
9. Remove hex lockplate (2) and attached spring from flats of adjusting screw.
10. Turn adjusting screw clockwise to release ramp assembly (3) and coupling mechanism. As adjusting screw is turned, ramp assembly moves forward. Remove nut from end of adjusting screw.
11. Remove hook (4) of ramp (3) from cable coupling (5). Remove clutch cable end from slot in coupling. Remove coupling and ramp assembly.
12. See Figure 5-4. Turn cable end fitting counterclockwise to remove clutch cable lower section from primary cover. Remove and discard O-ring from cable end fitting.
13. Remove screws and captive washers to remove cover. Discard gasket.
14. See Figure 5-5. Remove and discard shifter shaft oil seal.



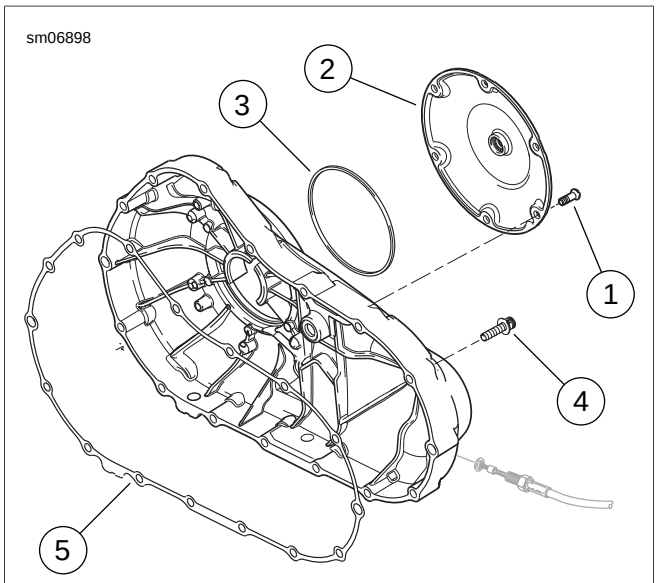
1. **Primary drain plug**
2. **Locknut**
3. **Adjuster screw**
4. **Shift lever**
5. **Clutch inspection cover**

Figure 5-1. Primary Cover (mid-mount controls)



1. **Quad ring**
2. **Hex lockplate**
3. **Ramp assembly**
4. **Hook**
5. **Cable coupling**

Figure 5-2. Clutch Release Ramp



1. **Screw**
2. **Inspection Cover**
3. **Quad ring**
4. **Screw**
5. **Gasket**

Figure 5-3. Primary Cover

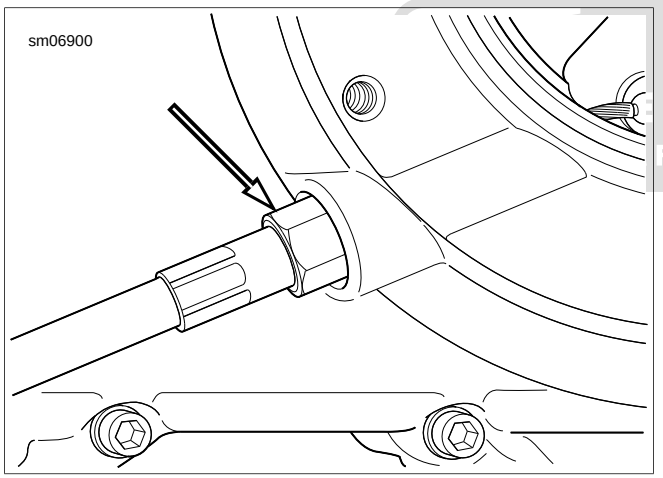


Figure 5-4. Clutch Cable Fitting

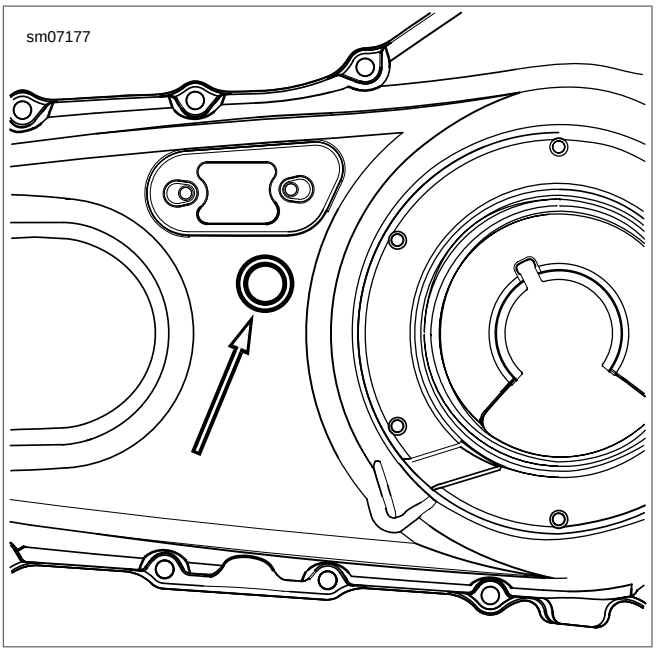
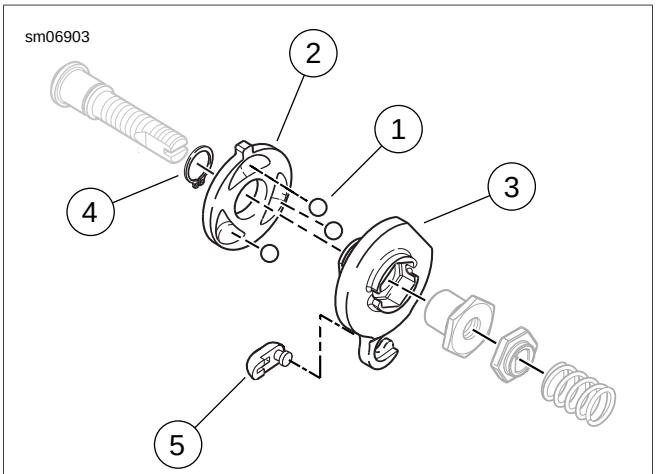


Figure 5-5. Shifter Shaft Oil Seal

CLUTCH RELEASE RAMP

1. Clean all parts with denatured alcohol. Wipe parts dry with a clean, lint-free cloth.
2. See Figure 5-6. Inspect three balls (1) and ball socket surfaces of inner (2) and outer (3) ramp. Replace or repair as necessary.
3. Check hub fit of inner and outer ramps. Replace ramps if excessively worn.
4. Assemble inner and outer ramps.
   a. Apply a light coat of multi-purpose grease to balls and ramps.
   b. Insert balls in sockets of outer ramp.
   c. Install inner ramp on hub of outer ramp with tang on inner ramp 180 degrees from hook of outer ramp.
   d. Install **new** retaining ring (4) in groove of outer ramp hub.
5. Install clutch release ramp.
   a. Fit adapter (5) over clutch cable end with rounded side inboard, the ramp connector button outboard.
   b. With retaining ring side of ramp assembly facing inward, place hook of ramp around coupling button.
   c. Rotate assembly counterclockwise until tang on inner ramp fits in slot of primary cover.



1. **Ball**
2. **Inner ramp**
3. **Outer ramp**
4. **Retaining ring**
5. **Adapter**

Figure 5-6. Clutch Release Ramp

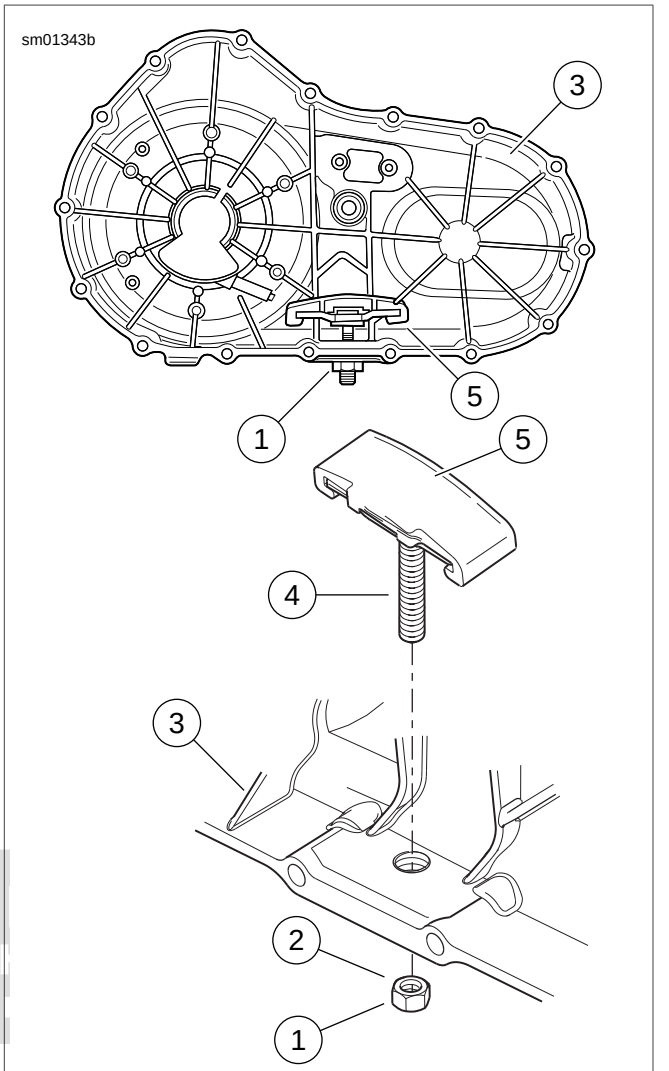
PRIMARY CHAIN ADJUSTER

1. See Figure 5-7. Remove locknut (1) from adjuster screw (4). Turn adjuster screw out of threaded boss in primary cover (3).
2. Inspect adjuster shoe (5). Replace or repair as necessary.
3. Position adjuster inside primary cover (3) with closed side of shoe against cover. Thread adjuster screw (4) all the way into threaded boss at bottom of cover.

NOTE

Hold adjuster screw in place with a hex key while threading locknut on.

4. Thread locknut (1) onto adjuster screw with nylon sealing surface (2) toward cover.



1. **Locknut**
2. **Nylon sealing surface**
3. **Primary cover**
4. **Adjuster screw**
5. **Shoe**

Figure 5-7. Primary Chain Adjuster Assembly

INSTALLATION

FASTENER	TORQUE VALUE	
Primary chain cover screws	120-140 **in-lbs**	13.6-15.8 Nm
Primary chaincase drain plug	14-30 ft-lbs	19.0-40.7 Nm
Clutch cable fitting	36-108 **in-lbs**	4.1-12.2 Nm
Oil drain hose worm clamp	6-10 **in-lb**	0.7-1.1 Nm
Clutch inspection cover screws	90-120 **in-lbs**	10.3-13.6 Nm
Primary chain adjuster locknut	20-25 ft-lbs	27.1-33.9 Nm
Gear shift lever pinch screw	16-20 ft-lbs	21.7-27.1 Nm

1. Install a **new** shifter shaft oil seal.
2. Install a **new** gasket on primary cover.

3. Apply 2-3 drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to primary cover screws.
4. See Figure 5-8. Install primary cover and gasket using 16 screws with captive washers. Tighten to 120-140 **in-lbs** (13.6-15.8 Nm) in sequence.
5. Install drain plug:
   a. Clean magnetic drain plug.
   b. Inspect O-ring and replace if necessary.
   c. Apply LOCTITE 565 PIPE SEALANT WITH TEFLON to drain plug.
   d. Install plug. Tighten to 14-30 ft-lbs (19.0-40.7 Nm).
6. Install **new** O-ring over cable end fitting of clutch cable lower section. Turn fitting clockwise to install into primary cover. Tighten fitting to 36-108 **in-lbs** (4.1-12.2 Nm).
7. Fit coupling over cable end with rounded side of coupling inboard and ramp connector button outboard. With retaining ring side of ramp assembly facing inward, place hook of ramp around coupling button. Rotate assembly counterclockwise until tang on inner ramp fits in slot of primary cover.
8. Thread nut on adjusting screw assembly until slot of screw is accessible with a screwdriver. Fit nut hex into recess of outer ramp and turn adjusting screw counterclockwise until resistance is felt. Back off adjusting screw 1/4 turn.
9. Slide lockplate and spring onto flats of adjusting screw. If necessary, turn adjusting screw clockwise slightly until lockplate slides onto flats. Fit the lockplate within recess of outer ramp.
10. Install oil drain clamp. Tighten to 6-10 **in-lb** (0.7-1.1 Nm).
11. Fill transmission to specification.
12. Install **new** quad ring. Verify that quad ring is fully seated in groove.
13. Install screws to secure clutch inspection cover to primary cover. Tighten in a crosswise pattern to 90-120 **in-lbs** (10.3-13.6 Nm).
14. Adjust clutch and clutch lever free play. See 1.11 CLUTCH.
15. Install left side rider footrest and mounting bracket assembly.
   a. **Mid-mount controls:** See 2.39 RIDER FOOT CONTROLS: MID-MOUNT.
   b. **Forward controls:** See 2.40 RIDER FOOT CONTROLS: FORWARD.
16. Adjust primary chain free play. When tension is set, tighten locknut to 20-25 ft-lbs (27.1-33.9 Nm). See 1.9 PRIMARY CHAIN.
17. Install rubber washer and gear shift lever on shifter shaft. Secure with pinch screw and washer. Tighten to 16-20 ft-lbs (21.7-27.1 Nm).

⚠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)

18. Install battery cables.

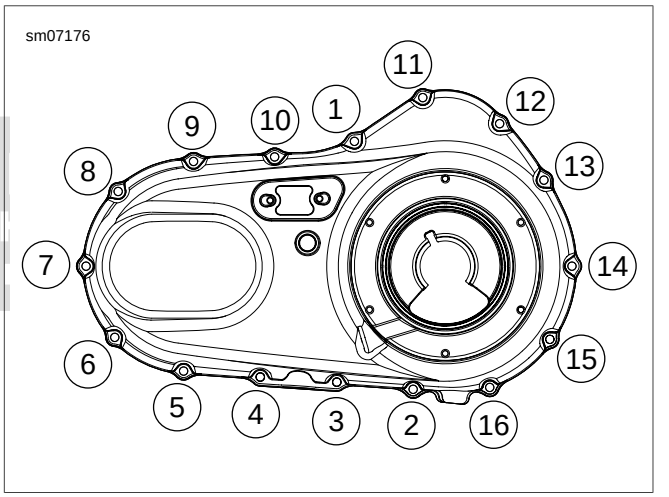


Figure 5-8. Outer Primary Cover Torque Sequence

PRIMARY DRIVE AND CLUTCH 5.4

TROUBLESHOOTING

Refer to Table 5-4.

Table 5-4. Clutch Troubleshooting

SYMPTOM	CHECK ORDER	CAUSE	REMEDY
Clutch slips	1	Incorrect clutch release adjustment	Check and adjust clutch release mechanism.
	2	Worn clutch plates	Check service wear limits. Replace plates.
Clutch drags	1	Incorrect clutch release adjustment	Check and adjust clutch release mechanism.
	2	Worn clutch release ramps or balls	Replace release ramps and/or balls.
	3	Warped clutch steel plates	Replace clutch steel plates.
	4	Worn or damaged clutch gear splines	Replace clutch gear or hub as required.
	5	Overfilled primary	Drain lubricant to correct level.

REMOVAL

PART NUMBER	TOOL NAME
HD-38362	SPORTSTER 5-SPEED SPROCKET LOCKING LINK
HD-46283	PRIMARY DRIVE LOCKING TOOL

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, disconnect battery cables (negative (-) cable first) before proceeding. (00307a)

NOTE

See Figure 5-10. If replacement of clutch pack (28) is only service work required, perform REMOVAL steps 1 and 2 only. Do not remove clutch assembly, primary chain and engine sprocket as an assembly. Proceed to DISASSEMBLY.

1. Disconnect negative battery cable and positive battery cables from battery. See 1.20 BATTERY MAINTENANCE, Disconnection and Removal.
2. Remove primary cover. Discard primary cover gasket. See 5.3 PRIMARY COVER.

NOTE

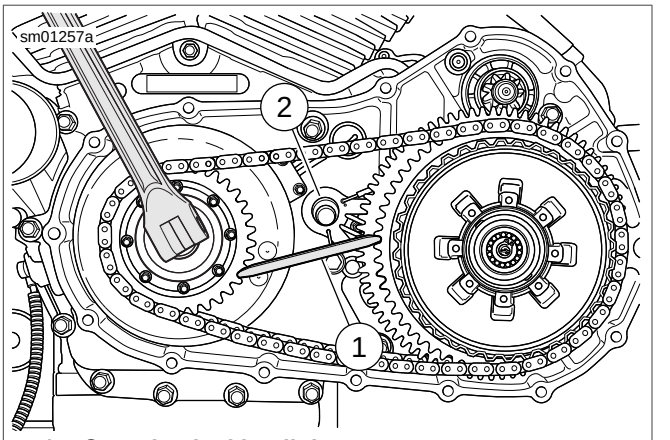
See Figure 5-9. Do not position sprocket locking link too close to shifter shaft (2). If sprocket locking link contacts shifter shaft sprocket, locking link can damage shifter shaft and/or engine crankcase.

3. Install a locking link:
   a. **XL 883 models:** Use SPORTSTER 5-SPEED SPROCKET LOCKING LINK (Part No. HD-38362).
   b. **XL 1200 models:** Use PRIMARY DRIVE LOCKING TOOL (Part No. HD-46283).
4. Remove engine sprocket nut. Do not remove engine sprocket.
5. See Figure 5-10. Remove large retaining ring (16). Remove adjusting screw assembly (12, 13, 14 and 15) from pressure plate (11).

NOTE

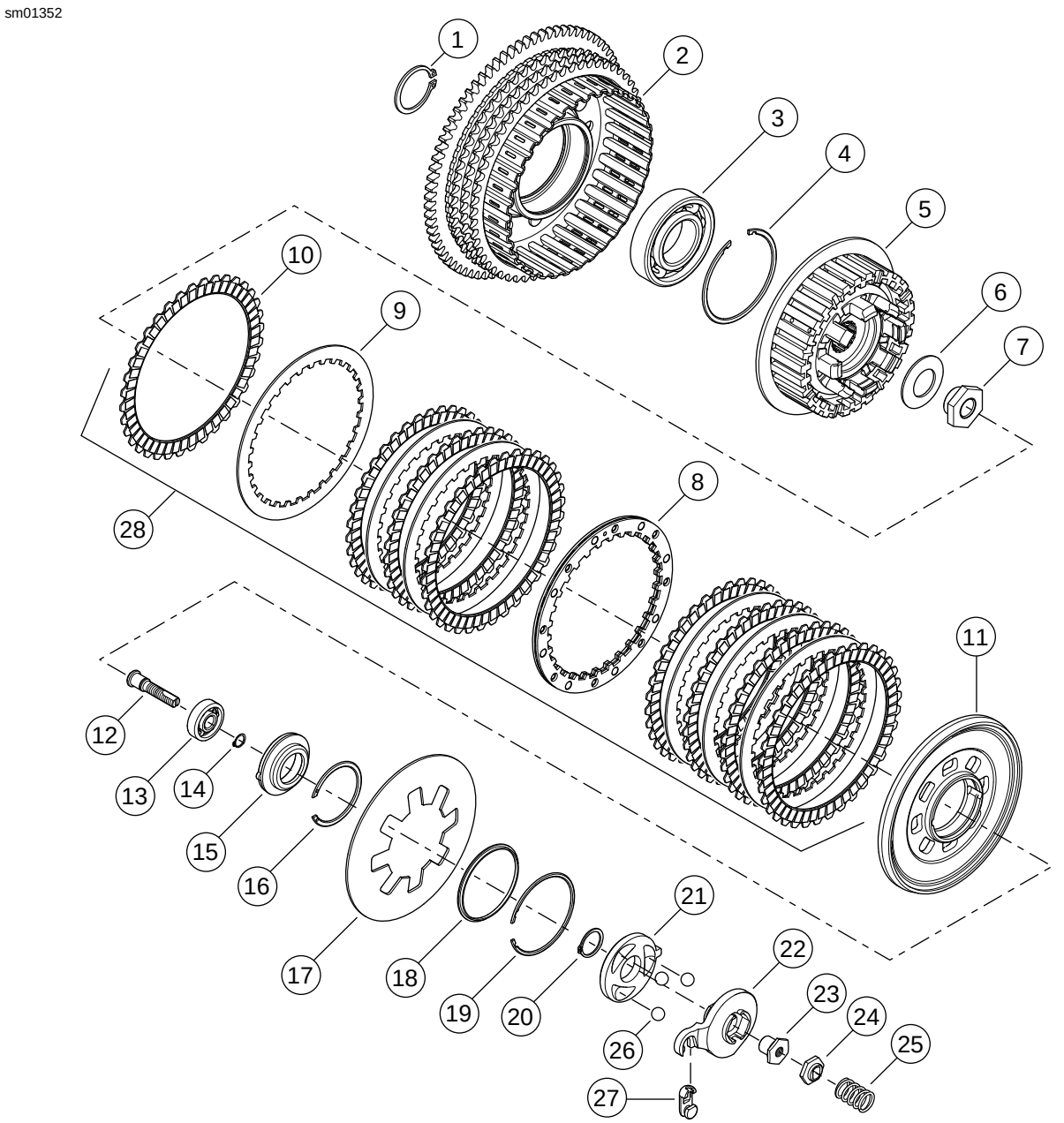
Turn left hand thread mainshaft nut (7) clockwise to remove.

6. Remove mainshaft nut (7) and spring washer (6).
7. Remove clutch assembly, primary chain and engine sprocket as an assembly from vehicle.
8. Inspect primary chain. Replace or repair as necessary.
9. Inspect stator and rotor. Replace or repair as necessary. See 6.25 ALTERNATOR.



1. **Sprocket locking link**
2. **Shifter shaft**

Figure 5-9. Using Sprocket Locking Link (Part No. HD-46283 or HD-38362) to Loosen Engine Sprocket Nut



1. Retaining ring
2. Clutch shell and sprocket
3. Ball bearing
4. Retaining ring
5. Clutch hub
6. Spring washer
7. Mainshaft nut
8. Spring plate
9. Steel plate (6)
10. Friction plate, fiber (8)
11. Pressure plate
12. Adjusting screw
13. Bearing
14. Retaining ring
15. Release plate
16. Retaining ring
17. Diaphragm spring
18. Spring seat
19. Retaining ring
20. Retaining ring
21. Inner ramp
22. Outer ramp
23. Nut
24. Locking plate
25. Clutch adjustment spring
26. Ball (3)
27. Clutch cable coupling
28. Clutch pack (consists of items 8, 9, 10)

Figure 5-10. Clutch Assembly

DISASSEMBLY

PART NUMBER	TOOL NAME
HD-38515-91	CLUTCH SPRING FORCING SCREW
HD-38515-A	SPRING COMPRESSING TOOL

NOTES

- *See Figure 5-10. If replacement of clutch pack (28) is the only service work required, perform DISASSEMBLY Steps 2-5 and 7 only, and then proceed to the NOTE under INSPECTION AND REPAIR.*
- ***Observe all WARNING and CAUTION statements which apply to the steps specified.***

1. See Figure 5-10. With clutch assembly removed from primary chaincase, install the adjusting screw assembly (12, 13, 14 and 15) into the pressure plate (11):
   a. Match the two tabs on release plate (15) to the notches in the pressure plate.
   b. Install the retaining ring (16).

WARNING

Disassemble clutch using a spring compressing tool. The diaphragm spring is compressed and, if removed without proper tools can fly out, which could result in death or serious injury. (00292a)

2. See Figure 5-11. Compress clutch diagram spring.
   a. Thread the CLUTCH SPRING FORCING SCREW (Part No. HD-38515-91) onto the clutch adjusting screw.
   b. Place the bridge of the SPRING COMPRESSING TOOL (Part No. HD-38515-A) against diaphragm spring.
   c. Thread the tool handle onto end of forcing screw.

NOTE

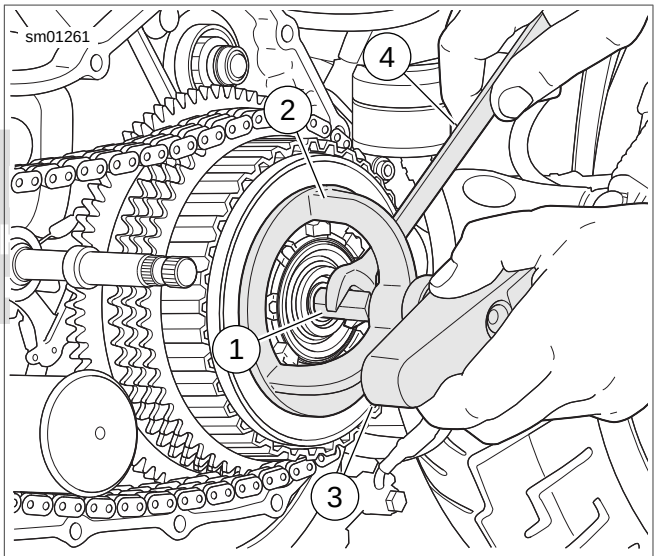
See Figure 5-10. Turn compressing tool handle only enough to remove retaining ring (19) and spring seat (18). Excessive compression of diaphragm spring could damage clutch pressure plate.

3. See Figure 5-10. With a wrench on the clutch spring forcing screw flats to prevent the forcing screw from turning, turn handle clockwise until tool relieves pressure on retaining ring (19) and spring seat (18).
4. Remove and discard retaining ring. Remove spring seat from the groove in clutch hub (5) prongs. Remove the assembly of diaphragm spring (17), pressure plate (11), adjusting screw components (12, 13, 14 and 15) and compressing tool.
5. Turn the compressing tool handle counterclockwise until the clutch spring forcing screw disconnects from the clutch adjusting screw. Remove spring seat and diaphragm spring from pressure plate assembly.
6. Remove retaining ring (16) and adjusting screw assembly from pressure plate. If necessary, disassemble adjusting screw assembly by removing retaining ring (14), and then separating the remaining adjusting screw components (12, 13, and 15).
7. Remove the clutch pack (28) from the clutch hub. The clutch pack consists of one spring plate (8), six steel plates (9), and eight friction (fiber) plates (10).

NOTE

See Figure 5-10. Bearing (3) will be damaged by disassembly of clutch hub (5) and shell (2). Always replace bearing (3) if hub and shell are disassembled. If the assembly is pressed apart, the bearing must be replaced.

8. If necessary, disassemble clutch shell and clutch hub as follows:
   a. Remove retaining ring (1) from inboard end of clutch hub (5).
   b. Using an arbor press, separate clutch hub from assembly of clutch shell (2), bearing (3), and retaining ring (4).
   c. Remove retaining ring (4) from groove in clutch shell.
   d. Press on the inboard side of bearing (3) outer race to remove bearing from clutch shell.



1. **Forcing screw**
2. **Bridge, spring compressing tool**
3. **Handle**
4. **Open-end wrench**

Figure 5-11. Compressing Clutch Diaphragm Spring

INSPECTION AND REPAIR

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)

NOTE

See Figure 5-10. If replacement of clutch pack (28) is only service required, perform all INSPECTION AND REPAIR steps. Proceed to NOTES under ASSEMBLY.

1. See Figure 5-10. Wash all parts, except friction plates (10), spring plate (8) and bearings (3 and 13), in a non-volatile cleaning solution or solvent. Dry parts with low-pressure, compressed air.
2. Examine clutch components:
   a. Inspect all clutch plates for wear and discoloration.
   b. Inspect all friction plates (10) and the spring plate (8) for worn lining surfaces or checked or chipped linings.
   c. Inspect each steel plate (9) for grooves.
   d. Place each steel plate on a flat surface. Using a feeler gauge, check for flatness in several places. If any one of plates are damaged, or warped more than 0.006 in (0.15 mm), replace entire clutch pack.
   e. Wipe lubricant from seven wide friction plates.
   f. See Figure 5-12. Measure thickness of each friction plate. If any one of plates is less than 0.0795 in (2.02 mm), replace entire clutch pack.
   g. See Figure 5-10. Inspect clutch shell ball bearing (3) for smoothness by rotating clutch shell while holding clutch hub. Replace a bearing that is rough or binds.
   h. See Figure 5-13. Check primary chain sprocket (3) and starter ring gear (4) on the clutch shell (1). If either sprocket or ring gear is badly worn or damaged, replace clutch shell.
   i. Check slots (5, 6) that mate with clutch plates on both clutch shell and clutch hub (2). If slots are worn or damaged, replace shell and/or hub.
   j. See Figure 5-10. Check diaphragm spring (17) for cracks or bent tabs. Install a **new** spring if either condition exists.

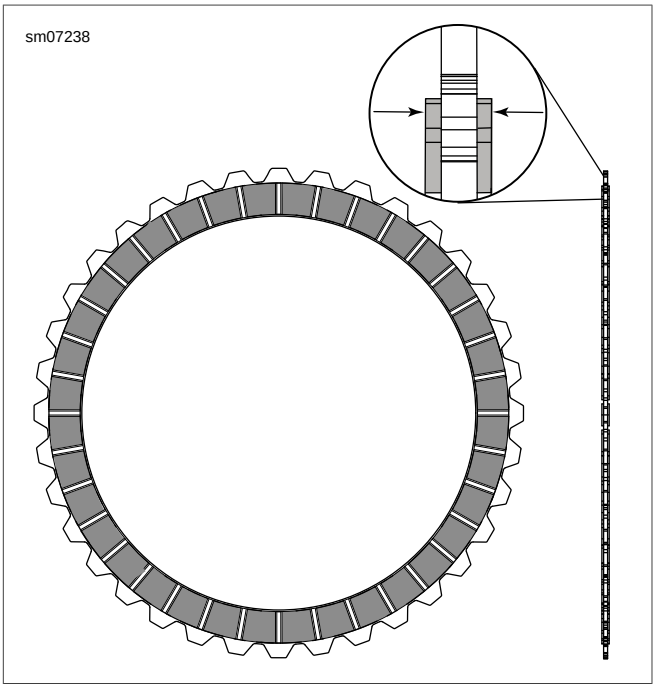
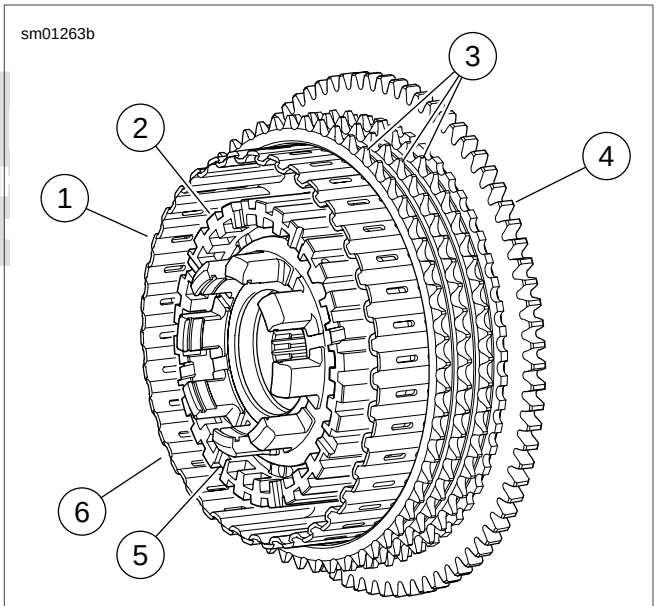


Figure 5-12. Friction Plate Thickness



1. **Clutch shell**
2. **Clutch hub**
3. **Primary chain sprocket**
4. **Starter ring gear**
5. **Clutch hub slots**
6. **Clutch shell slots**

Figure 5-13. Checking Clutch Hub and Clutch Shell

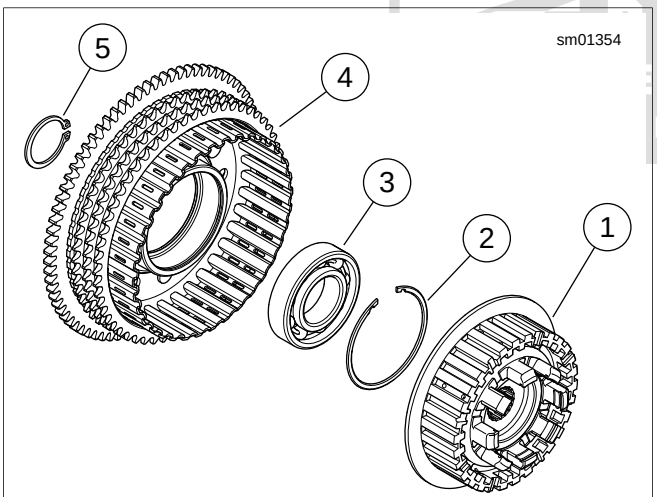
ASSEMBLY

PART NUMBER	TOOL NAME
HD-38515-91	CLUTCH SPRING FORCING SCREW
HD-38515-A	SPRING COMPRESSING TOOL

NOTES

- *See Figure 5-10. If replacement of clutch pack (28) is the only service work required, perform all ASSEMBLY Steps except 2, 5 and 6. Then proceed to the NOTE under INSTALLATION.*
- *Replace the clutch pack, steel plates, friction plates and spring plate, as a set.*

1. Submerge and soak all friction and steel plates in GENUINE HARLEY-DAVIDSON FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT for at least five minutes.
2. See Figure 5-14. Assemble the clutch hub (1) and clutch shell (4):
   a. Press a **new** ball bearing (3) into clutch shell.
   b. Secure the bearing with a **new** retaining ring (2).
   c. Press inboard end of clutch hub into clutch shell bearing.
   d. Secure with a **new** retaining ring (5) on end of hub.



1. **Clutch hub**
2. **Retaining ring**
3. **Ball bearing**
4. **Clutch shell**
5. **Retaining ring**

Figure 5-14. Clutch Hub and Shell Assembly

NOTE

See Figure 5-10. The clutch pack (28) consists of one spring plate (8), six steel plates (9) and eight friction (fiber) plates (10).

3. Install clutch pack into clutch shell in order:
   F - St - F - St - F - St - F - Sp - F - St - F - St - F - St - F
   (**F** = Friction plate, **St** = Steel plate, **Sp** = Spring plate)
4. Place pressure plate (11) and adjusting screw onto clutch pack (28).
5. Assemble bearing (13) and adjusting screw (12) in release plate (15). Secure with **new** retaining ring (14).
6. Align the two tabs on perimeter of release plate (15) with the corresponding recesses in pressure plate. Install adjusting screw assembly (12, 13, 14, 15) into pressure plate (11). Secure adjusting screw assembly with **new** retaining ring (16).
7. Install diaphragm spring (17) with its concave side facing inboard (toward pressure plate), onto pressure plate assembly. Align square openings of pressure plate and diaphragm spring (17).
8. Position spring seat (18) with its flat, larger outer diameter side facing inboard (toward diaphragm spring).
9. Install a **new** retaining ring (19) onto convex (outboard) side of diaphragm spring.
10. Thread the CLUTCH SPRING FORCING SCREW (Part No. HD-38515-91) onto the clutch adjusting screw. Place the bridge of the SPRING COMPRESSING TOOL (Part No. HD-38515-A) against diaphragm spring. Thread the tool handle onto end of forcing screw. Do not tighten compressing tool against diaphragm spring at this time.
11. See Figure 5-11. Place an open-end wrench (4) on the clutch spring forcing screw (1) flats to prevent the forcing screw from turning.

NOTE

Turn compressing tool handle only enough to install spring seat and retaining ring. Excessive compression of diaphragm spring could damage clutch pressure plate.

12. See Figure 5-10. Turn compressing tool handle clockwise to compress diaphragm spring (17). Compresses just enough to install spring seat (18) and retaining ring (19) into the groove in clutch hub (5) prongs.
13. Verify retaining ring is positioned against flange face (outboard side) of spring seat and fully seated in groove of clutch hub. Carefully loosen and remove compressing tool.

NOTE

As the compressing tool is removed, the diaphragm spring will move outward. This movement will force the spring seat up into the inside of the retaining ring. The spring seat provides an operating surface for the diaphragm spring. Additionally, it prevents the retaining ring from coming out during operation.

INSTALLATION

PART NUMBER	TOOL NAME
HD-38362	SPORTSTER 5-SPEED SPROCKET LOCKING LINK
HD-46283	PRIMARY DRIVE LOCKING TOOL

FASTENER	TORQUE VALUE	
Engine sprocket nut	240-260 ft-lbs	326-353 Nm
Transmission mainshaft nut	50-60 ft-lbs	67.8-81.3 Nm

NOTE

See Figure 5-10. If replacement of clutch pack (28) is the only service work required, perform INSTALLATION last step only.

1. See Figure 5-10. Remove retaining ring (16). Remove adjusting screw assembly (12, 13, 14, 15) from pressure plate (11). This step allows installation of the transmission mainshaft nut and washer.
2. Clean the oil off the threads of the engine sprocket shaft, the engine sprocket nut, the transmission mainshaft and the mainshaft nut.
3. Install the engine sprocket, primary chain and clutch assembly as a unit.

NOTE

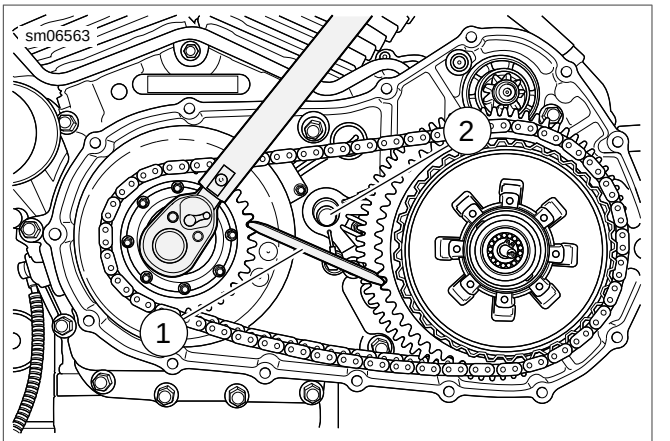
See Figure 5-15. Do not position the sprocket locking link too close to the shifter shaft (2). If the sprocket locking link contacts the shifter shaft while tightening the engine sprocket nut, the shifter shaft and/or the engine crankcase can be damaged.

4. See Figure 5-15. Install the sprocket locking link.
   a. **XL 883 models:** Use the SPORTSTER 5-SPEED SPROCKET LOCKING LINK (Part No. HD-38362).
   b. **XL 1200 models:** Use the PRIMARY DRIVE LOCKING TOOL (Part No. HD-46283).
5. Apply two or three drops of LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) onto threads of engine sprocket shaft.
6. Install engine sprocket nut. Tighten to 240-260 ft-lbs (326-353 Nm).

NOTE

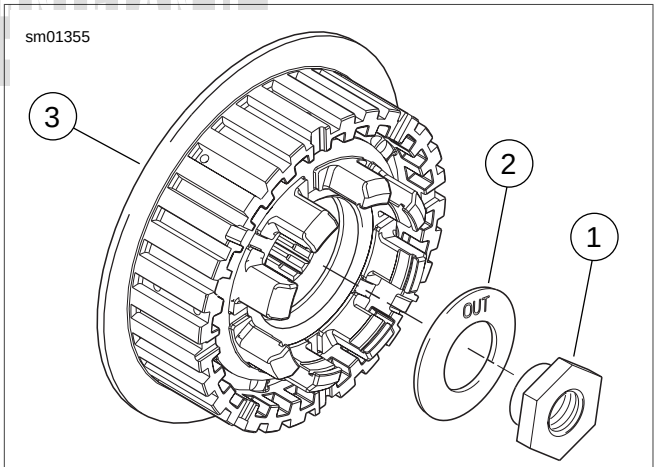
See Figure 5-16. Spring washer (2) must be installed with the word "out" facing the transmission mainshaft nut (1). Incorrect assembly can result in clutch and/or transmission failure.

7. See Figure 5-16. Apply two or three drops of LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) onto threads of transmission mainshaft. Install spring washer (2) and mainshaft nut (1) (left-hand threads) on transmission mainshaft. Tighten nut to 50-60 ft-lbs (67.8-81.3 Nm).
8. Remove the sprocket locking link.
9. See Figure 5-17. Install adjusting screw assembly (1) in pressure plate, noting that two tabs on perimeter of release plate must be inserted into corresponding recesses in pressure plate. Secure assembly with a **new** retaining ring (2).
10. Install primary cover using **new** gasket. See 5.3 PRIMARY COVER.
11. Adjust primary chain and clutch. See 1.9 PRIMARY CHAIN and 1.11 CLUTCH.
12. Fill transmission with GENUINE HARLEY-DAVIDSON FORMULA+ TRANSMISSION AND PRIMARY CHAINCASE LUBRICANT. See 1.10 TRANSMISSION LUBRICANT.
13. Connect battery and close left side cover. See 1.20 BATTERY MAINTENANCE.



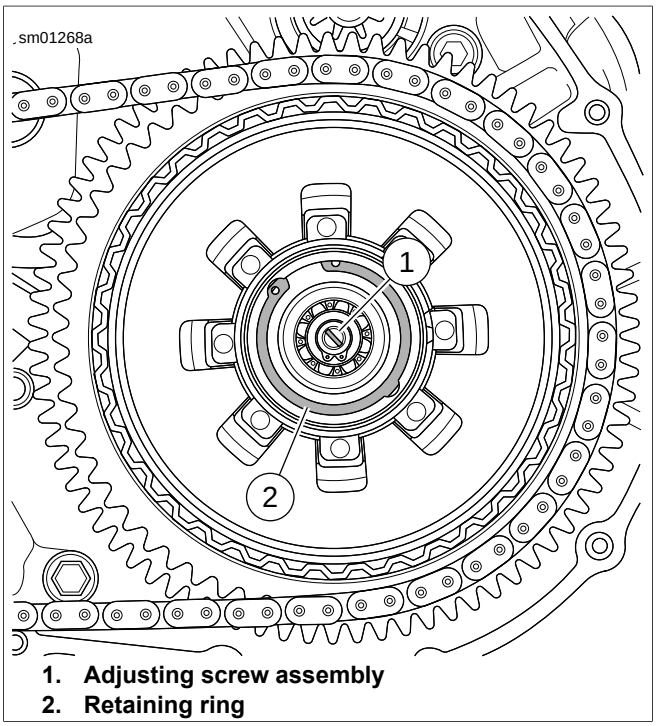
1. **Sprocket locking link**
2. **Shifter shaft**

Figure 5-15. Tighten Engine Sprocket Fastener (typical)



1. **Mainshaft nut**
2. **Spring washer**
3. **Clutch hub**

Figure 5-16. Mainshaft Nut and Washer



1. Adjusting screw assembly
2. Retaining ring

Figure 5-17. Clutch Adjusting Screw Assembly and Retaining Ring

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DRIVE BELT 5.5

DRIVE BELT HANDLING

See Figure 5-18.

- Do not exceed 5 in (127 mm) forward bend (1).
- Do not exceed 10 in (254 mm) reverse bend (2).
- Do not twist (3).
- Do not crimp, pinch or kink (4).
- Do not pry (5).

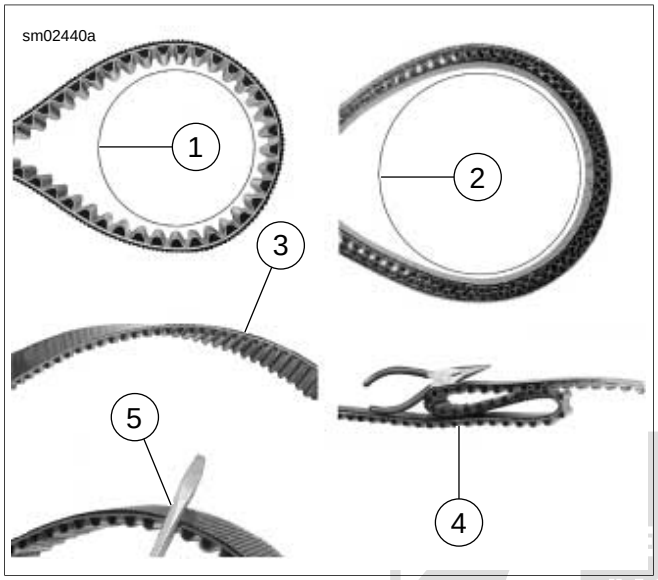


Figure 5-18. Drive Belt Handling

DRIVE BELT

FASTENER	TORQUE VALUE	
Exhaust pipe clamp bracket screw	30-33 ft-lbs	40.7-44.7 Nm
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm
Axle, rear, nut	95-105 ft-lbs	129-142 Nm

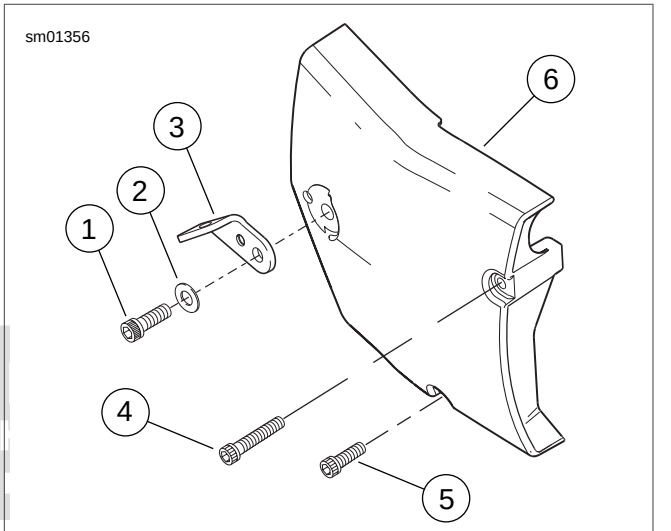
Removal

1. Remove exhaust system. See 4.16 EXHAUST SYSTEM.
2. **Mid-mount controls:** Remove right side rider footrest/brake pedal and mounting bracket assembly. See 2.39 RIDER FOOT CONTROLS: MID-MOUNT.
3. See Figure 5-19. Remove screw (1), washer (2) and exhaust pipe clamp bracket (3).
4. Remove screws (4, 5) and cover (6).
5. See Figure 5-20. Remove E-clip (1). Discard E-clip.
6. Loosen rear axle nut (4).
7. Turn axle adjuster nut (2) on each side of rear fork an equal number of turns counterclockwise to decrease belt tension.
8. Remove right lower shock absorber screw, washer and locknut. See 2.20 SHOCK ABSORBERS, Removal.
9. Remove belt guard and debris deflector. See 2.18 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard.

⚠WARNING

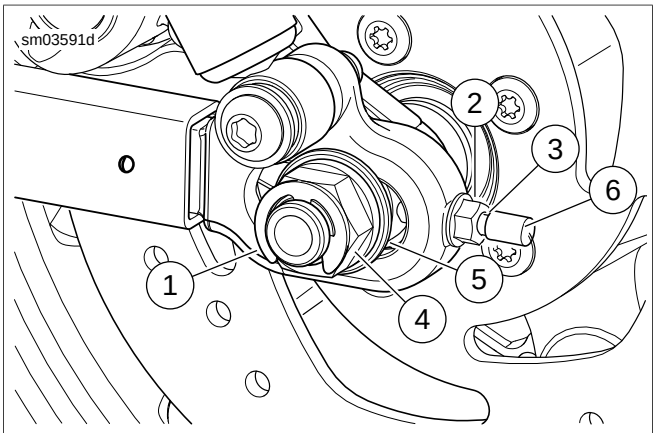
Never bend belt forward into a loop smaller than the drive sprocket diameter. Never bend belt into a reverse loop. Over bending can damage belt resulting in premature failure, which could cause loss of control and death or serious injury. (00339a)

10. Remove belt.



1. **Screw**
2. **Washer**
3. **Exhaust pipe clamp bracket**
4. **Screw**
5. **Screw**
6. **Sprocket cover**

Figure 5-19. Sprocket Cover



1. **E-clip**
2. **Axle adjuster nut (2)**
3. **Axle adjuster (2)**
4. **Axle nut**
5. **Washer**
6. **Protective cap (2)**

Figure 5-20. Drive Belt Adjustment

Installation

1. Install belt onto sprockets.
2. Install front of belt guard. See 2.18 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard.
3. Install debris deflector. See 2.18 BELT GUARD AND DEBRIS DEFLECTOR, Debris Deflector.
4. Install right lower shock absorber bolt, washer and locknut. See 2.20 SHOCK ABSORBERS, Installation.

NOTE

See Figure 5-19. Short screw (5) goes in bottom hole. Long screw (4) goes in top hole. Do not tighten screws.

5. Install sprocket cover (6). Secure with two screws.
6. Install exhaust pipe clamp bracket (3), washer (2) and screw (1).
7. Tighten:
   a. Exhaust pipe clamp bracket fastener 30-33 ft-lbs (40.7-44.7 Nm)
   b. Sprocket cover fasteners 80-120 **in-lbs** (9.0-13.6 Nm)
8. **Mid-mount controls:** Install right side rider footrest/brake pedal and mounting bracket assembly. See 2.39 RIDER FOOT CONTROLS: MID-MOUNT.
9. Install exhaust system. See 4.16 EXHAUST SYSTEM.
10. Adjust drive belt deflection. See 1.12 DRIVE BELT AND SPROCKETS, Checking Drive Belt Deflection.
11. Check wheel alignment. See 1.21 WHEEL ALIGNMENT, Wheel Alignment.
12. See Figure 5-20. Tighten rear axle nut (4) to 95-105 ft-lbs (129-142 Nm).
13. Install **new** E-clip (1).

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TRANSMISSION POWER FLOW 5.6

GENERAL

See Figure 5-21. The transmission is a five-speed constant-mesh type housed in an extension of the crankcase. The transmission permits the rider to vary the ratio of engine speed-to-rear driving wheel speed in order to meet the varying conditions of operation.

The transmission is foot-operated by the gear shifter lever, which transmits the force through a gear shifter shaft. The shifter shaft actuates a pawl and a shifter fork drum. The shifter fork drum moves shifter forks. The shifter forks slide a series of shifter dogs into and out of mesh with the other gears.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

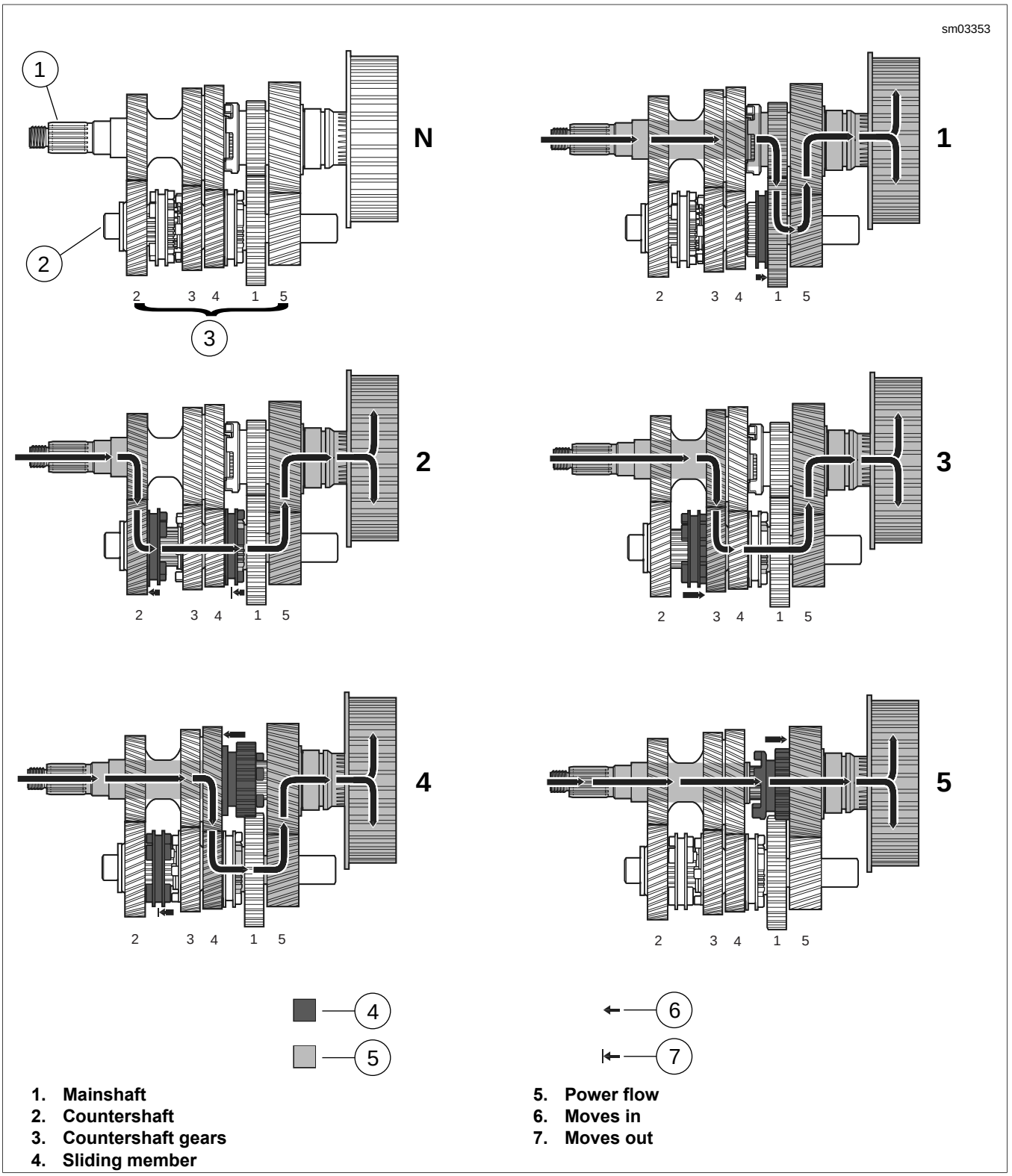


Figure 5-21. Transmission Power Flow

CASE DISASSEMBLY FOR TRANSMISSION REMOVAL 5.7

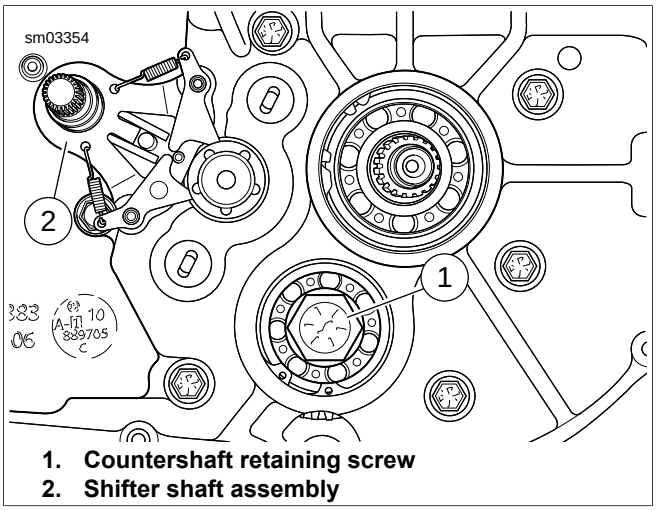
GENERAL

The rear compartment of the left and right crankcase halves form the transmission case. Servicing of transmission components requires removing the engine and disassembling (splitting) the crankcase.

ENGINE REMOVAL AND DISASSEMBLY

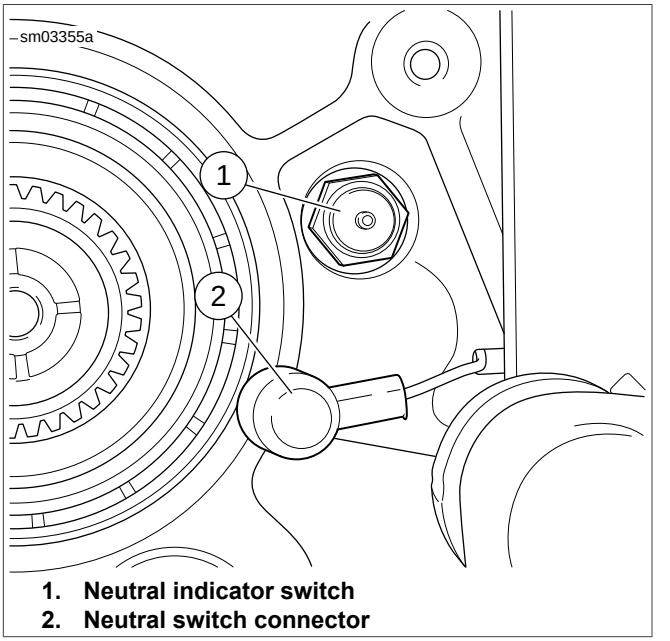
PART NUMBER	TOOL NAME
HD-42310-45	ENGINE SUPPORT CRADLE

1. Remove engine from chassis. See 3.10 REMOVING ENGINE FROM CHASSIS.
2. Support engine using ENGINE SUPPORT CRADLE (Part No. HD-42310-45).
3. Disassemble top end. See 3.12 TOP END OVERHAUL: DISASSEMBLY.
4. Remove primary cover, clutch assembly, primary chain and engine sprocket. See 5.4 PRIMARY DRIVE AND CLUTCH.
5. Disassemble gearcase. See 3.16 BOTTOM END OVERHAUL: DISASSEMBLY.
6. Remove transmission sprocket.
7. See Figure 5-22. Shift transmission into first gear. Remove countershaft retaining screw (1).
8. Shift transmission to NEUTRAL. See Figure 5-23. Unplug neutral switch connector [131] (2) by pulling connector straight off neutral switch (1). Remove neutral switch and flat washer.
9. See Figure 5-24. Verify that shifter drum detent is visible in neutral switch hole indicating that transmission is in neutral.



1. **Countershaft retaining screw**
2. **Shifter shaft assembly**

Figure 5-22. Countershaft Retaining Screw



1. **Neutral indicator switch**
2. **Neutral switch connector**

Figure 5-23. Neutral Switch and Connector

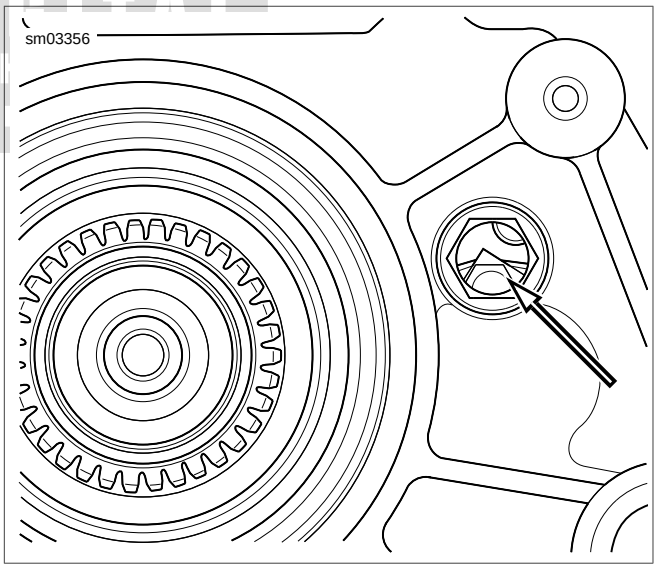
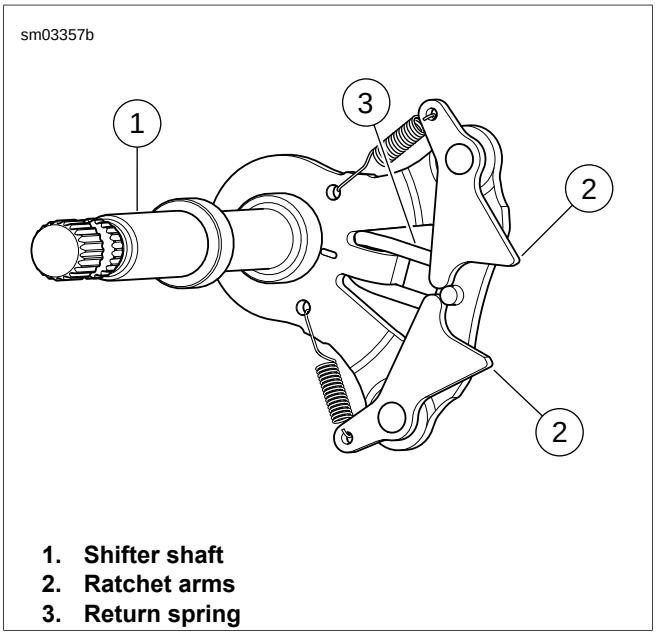


Figure 5-24. Shifter Drum Neutral Detent

10. See Figure 5-25 and Figure 5-26. Compress ratchet arms in order to clear shifter drum. Remove shifter shaft assembly from left crankcase half.
11. Remove starter. See 6.12 STARTER.
12. See Figure 5-27. With transmission still in neutral, scribe a line on end of shifter drum at 12 o'clock position for later reference.



1. **Shifter shaft**
2. **Ratchet arms**
3. **Return spring**

Figure 5-25. Shifter Shaft Assembly

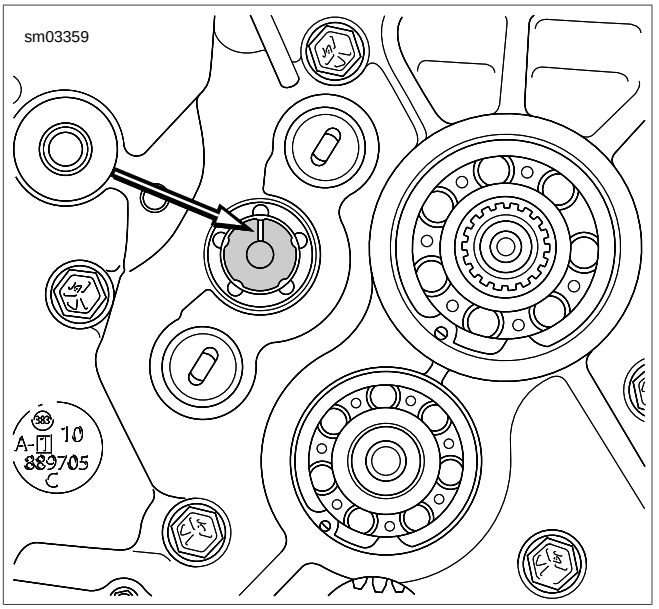


Figure 5-27. Scribed Line on Shifter Drum at 12 o'clock

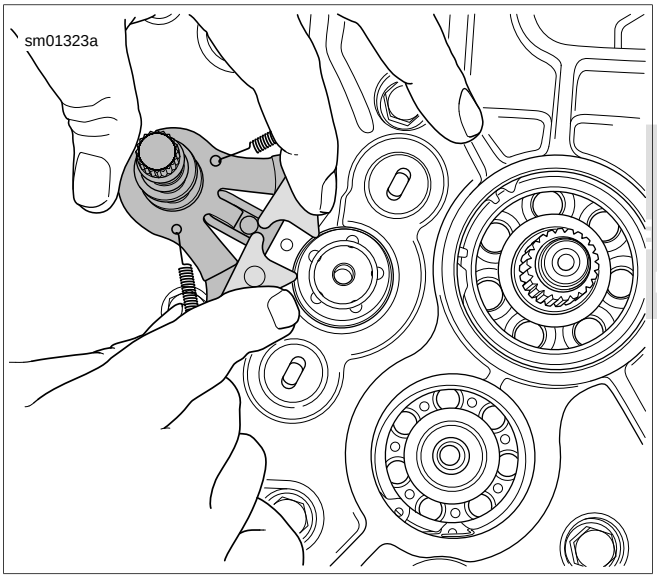
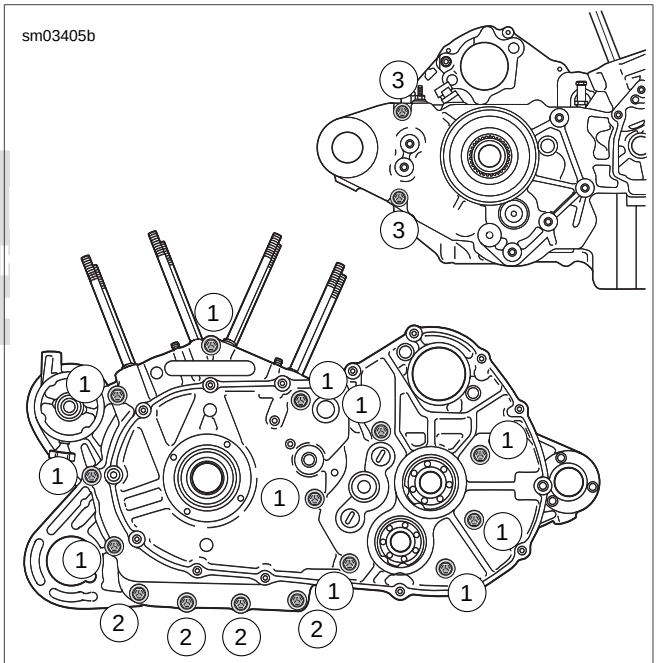


Figure 5-26. Removing Shifter Shaft Assembly



1. **Long fastener: left side**
2. **Short fastener: left side**
3. **Long fastener: right side**

Figure 5-28. Crankcase Fasteners

NOTES

- *Crankcase assembly has 17 fasteners: 15 inserted from left side and two inserted from right side. Verify that all fasteners have been removed before attempting to separate crankcase halves.*
- *Angle crankcase assembly in engine stand to prevent components falling when crankcase halves are separated.*

13. See Figure 5-28. Remove crankcase fasteners (1, 2) (11 long and four short) from left side of crankcase assembly.

Remove fasteners (3) from right side of crankcase assembly.

14. Tap crankcase gently with rawhide mallet to loosen and separate halves. See Figure 5-29. Remove left crankcase assembly with transmission.

NOTE

Flywheel assembly slides off left main bearing by hand. No tools are required for this operation.

15. See Figure 5-30. Remove flywheel assembly from right crankcase half.
16. See Figure 5-31. Remove screw (1), gear detent assembly (2) and detent spring (3) from inside transmission cavity of right crankcase.

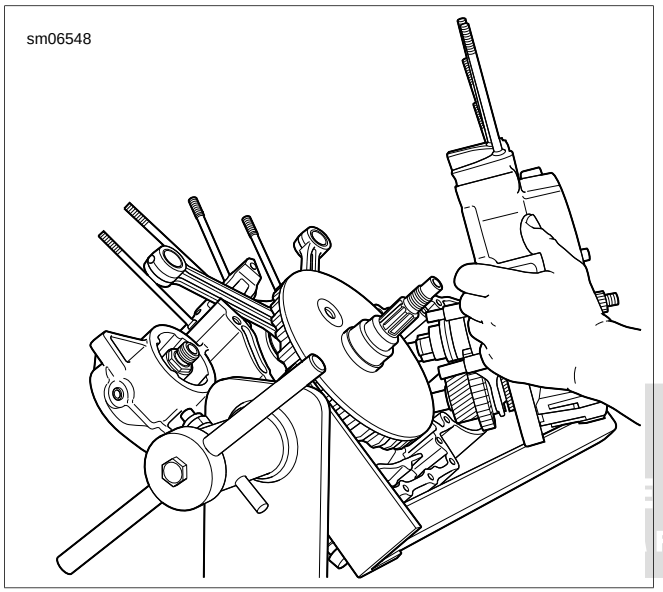


Figure 5-29. Separating Crankcase Halves

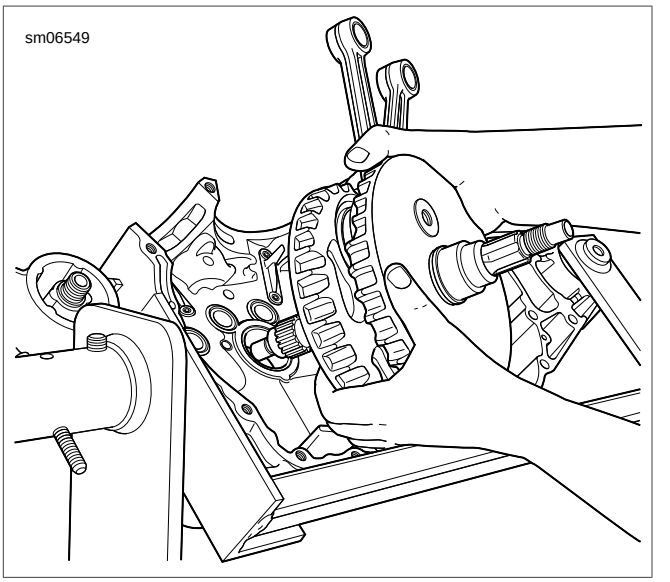
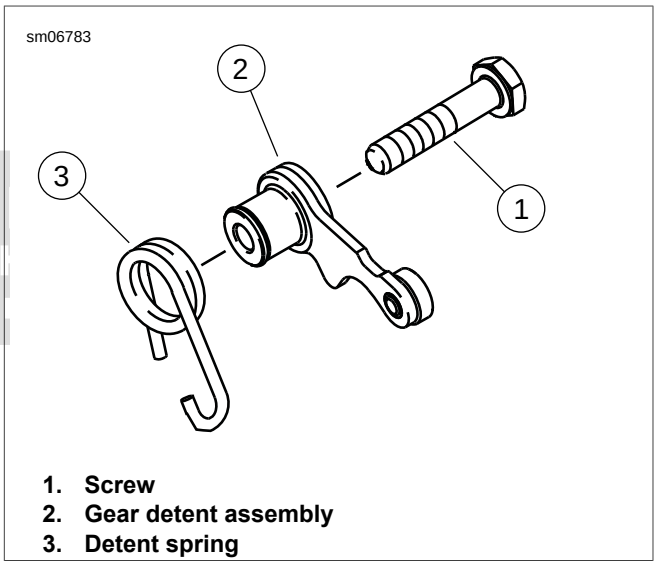


Figure 5-30. Removing Flywheel Assembly From Right Crankcase Half



1. **Screw**
2. **Gear detent assembly**
3. **Detent spring**

Figure 5-31. Gear Detent Assembly

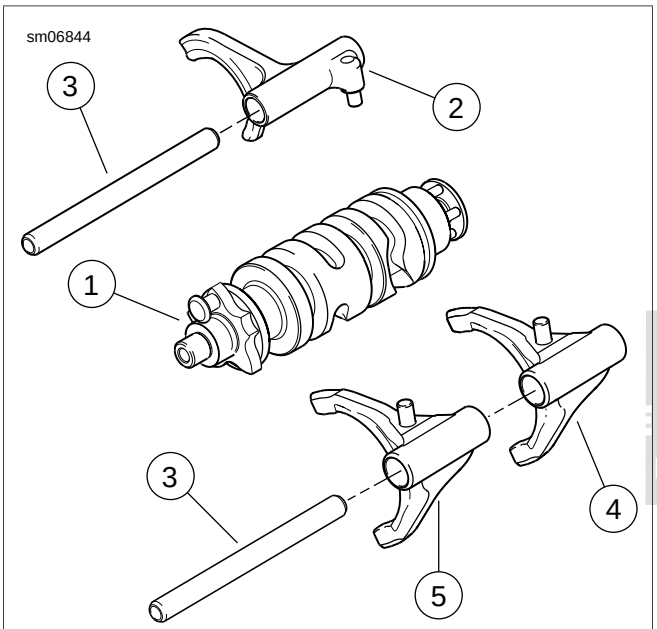
TRANSMISSION REMOVAL AND DISASSEMBLY 5.8

TRANSMISSION REMOVAL FROM LEFT CRANKCASE

PART NUMBER	TOOL NAME
B-43895-1	REMOVER
B-43985	TRANSMISSION REMOVAL AND INSTALLATION TOOL

NOTE

See Figure 5-32. Shifter design allows for one common part number for both countershaft shifter forks (4, 5). As the transmission runs, each shifter fork develops a certain wear pattern with its mating parts. Install shifter forks in original locations.



1. **Shifter drum**
2. **Mainshaft shifter fork (4th/5th)**
3. **Shifter fork shaft**
4. **Countershaft shifter fork (1st)**
5. **Countershaft shifter fork (2nd/3rd)**

Figure 5-32. Shifter Forks, Drum and Shafts

1. See Figure 5-33. Remove shifter fork shafts by inserting a small flat punch in the slots and tapping on the end of each shaft until it falls free.

NOTE

Carefully tap on alternate sides of the shaft using the provided slots.

2. See Figure 5-34. Remove shifter drum (1) and shifter forks (2). Mark each shifter fork as it is removed, so it can be reinstalled in the same location.

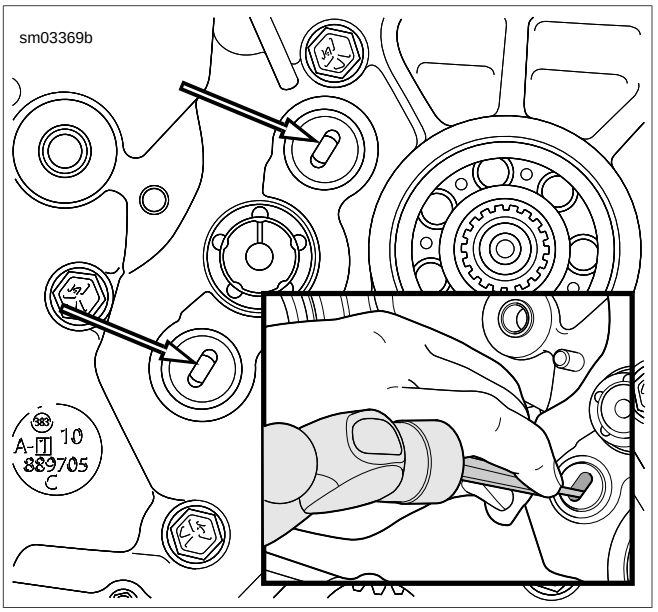
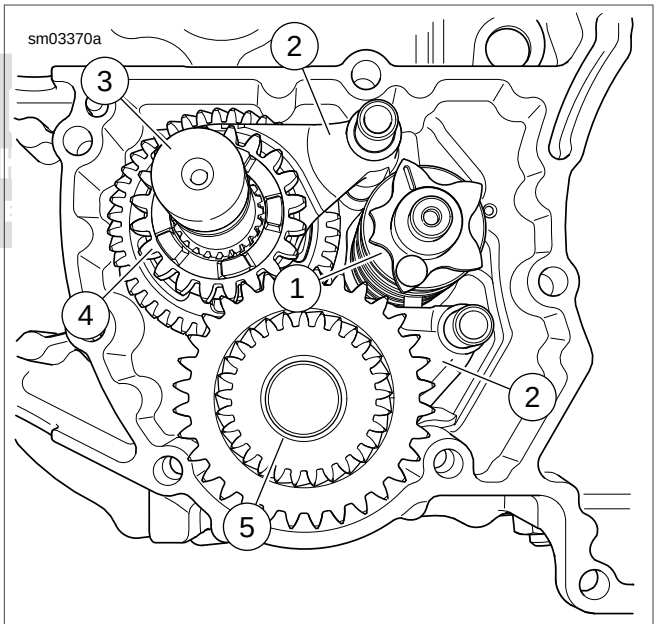
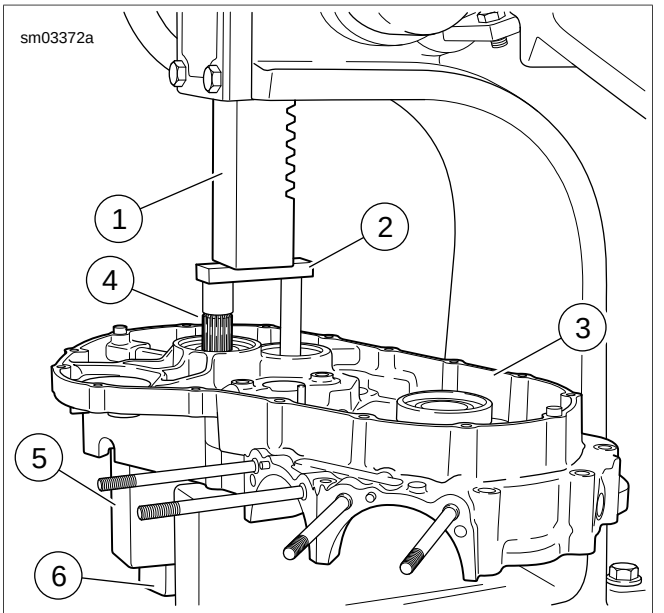


Figure 5-33. Slots For Removing Shifter Fork Shafts



1. **Shifter drum**
2. **Shifter fork (3)**
3. **Mainshaft**
4. **Mainshaft 2nd gear**
5. **Countershaft**

Figure 5-34. Transmission Assembly



1. **Press ram**
2. **Transmission remover**
3. **Crankcase**
4. **Transmission assembly (countershaft visible)**
5. **Parallel support (2)**
6. **Press bed**

Figure 5-35. Pressing Transmission From Left Crankcase

⚠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

Use the TRANSMISSION REMOVAL AND INSTALLATION TOOL (Part No. B-43985) to remove the transmission.

3. See Figure 5-35. Remove left crankcase half (3) and transmission assembly (4) from engine stand.
   a. Place crankcase half and transmission assembly (4) on arbor press (1) and support transmission assembly on parallel supports (5).
   b. Press transmission assembly using REMOVER (Part No. B-43895-1) (2) to remove transmission from crankcase half.
   c. Remove crankcase from press.

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 cleaning solvent. Blow dry with compressed air.
2. Check gear teeth for damage. Replace parts if necessary.
3. Inspect the engaging dogs on the gears. Replace parts if necessary.

MAINSHAFT DISASSEMBLY

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

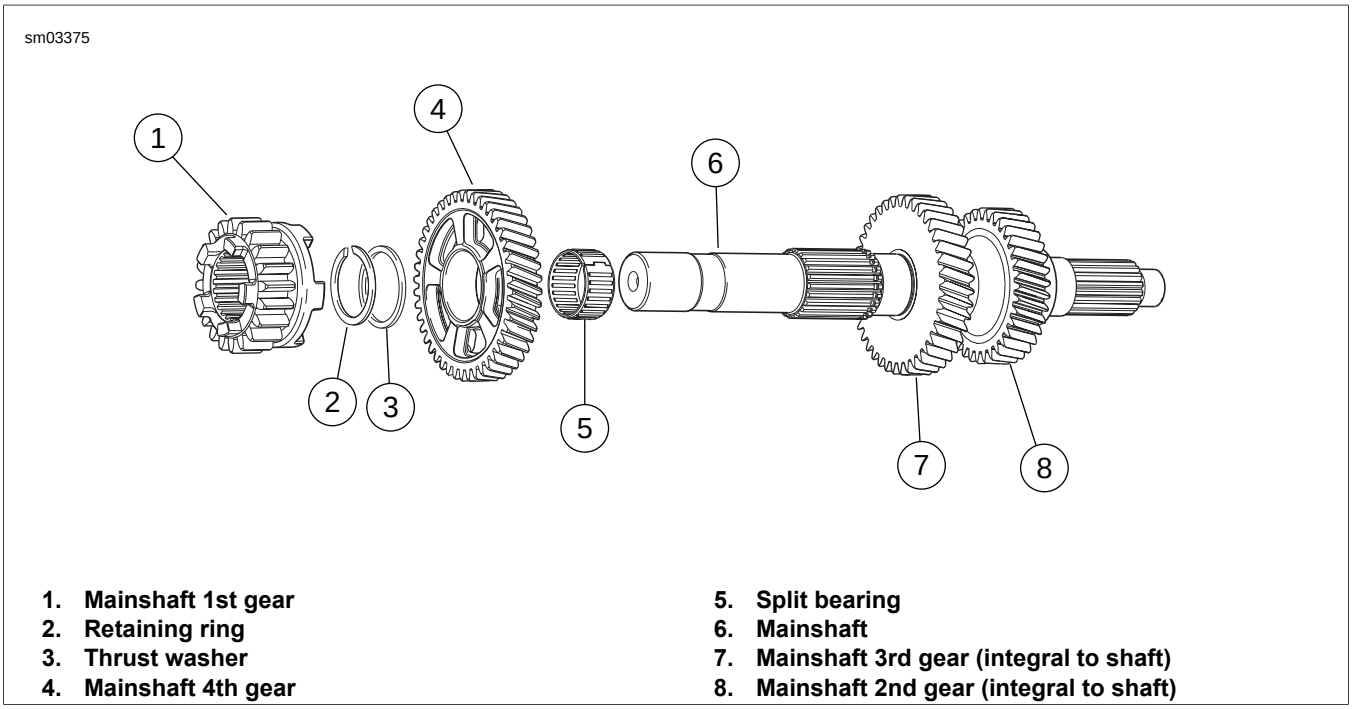
⚠WARNING

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

- *Transmission operation creates a specific wear pattern on the parts. Mark parts for installation in their original location and orientation.*
- *Mainshaft 2nd and 3rd gears are integral to the shaft.*
- *Mainshaft first gear is directional. Mark gear when removed for correct installation.*
- *Press transmission assembly out of left crankcase half to service mainshaft and countershaft.*
- *All thrust washers are one common part number. This transmission requires no shimming.*
- *Use correct retaining ring pliers and correct tips. Verify that tips are not excessively worn or damaged.*

1. See Figure 5-36. Remove first gear (1).
2. Use TRANSMISSION SHAFT RETAINING RING PLIERS (Part No. J-5586-A) to expand retaining ring. Remove retaining ring (2). Discard retaining ring.
3. Slide thrust washer (3) off end of mainshaft.
4. Remove fourth gear (4) and split bearing (5). Discard bearing.



1. **Mainshaft 1st gear**
2. **Retaining ring**
3. **Thrust washer**
4. **Mainshaft 4th gear**
5. **Split bearing**
6. **Mainshaft**
7. **Mainshaft 3rd gear (integral to shaft)**
8. **Mainshaft 2nd gear (integral to shaft)**

Figure 5-36. Transmission Mainshaft Assembly Once Removed from Left Crankcase/Disassembly

COUNTERSHAFT DISASSEMBLY

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

⚠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

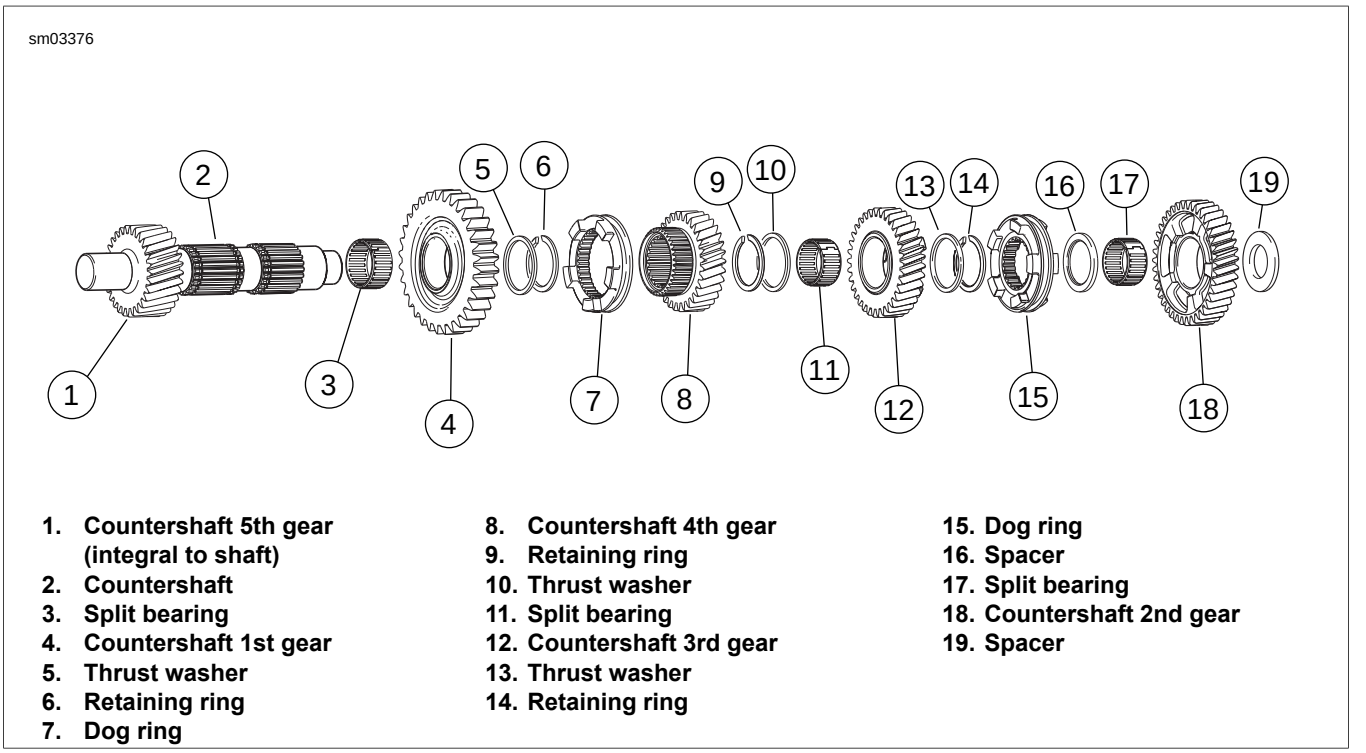
- *Transmission operation creates a specific wear pattern on the parts. Mark parts for installation in their original location and orientation.*
- *Countershaft fifth gear is integral to the shaft.*
- *Once the transmission assembly has been pressed out of the left crankcase half, the mainshaft and countershaft assemblies are serviced separately.*
- *All thrust washers are one common part number. This transmission requires no shimming.*
- *Use correct retaining ring pliers and correct tips. Verify that tips are not excessively worn or damaged.*

1. See Figure 5-37. Remove spacer (19) and second gear (18) from the end of the countershaft (2). Remove and discard split bearing (17).
2. Remove spacer (16).

NOTE

When removing the dog ring (15), it is important to mark the direction of the ring on the shaft as parts establish wear patterns.

3. Remove dog ring (15).
4. Using RETAINING RING PLIERS (Part No. J-5586-A), expand and remove retaining ring (14). Discard retaining ring.
5. Remove thrust washer (13), third gear (12), and split bearing (11). Discard bearing.
6. Remove thrust washer (10).
7. Expand, remove and discard retaining ring (9).
8. Remove fourth gear (8) and dog ring (7).
9. Expand, remove and discard retaining ring (6).
10. Remove thrust washer (5), first gear (4) and split bearing (3). Discard bearing.



1. Countershaft 5th gear (integral to shaft)
2. Countershaft
3. Split bearing
4. Countershaft 1st gear
5. Thrust washer
6. Retaining ring
7. Dog ring
8. Countershaft 4th gear
9. Retaining ring
10. Thrust washer
11. Split bearing
12. Countershaft 3rd gear
13. Thrust washer
14. Retaining ring
15. Dog ring
16. Spacer
17. Split bearing
18. Countershaft 2nd gear
19. Spacer

Figure 5-37. Transmission Countershaft Assembly Once Removed from Left Crankcase/Disassembly

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

MAINSHAFT ASSEMBLY

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

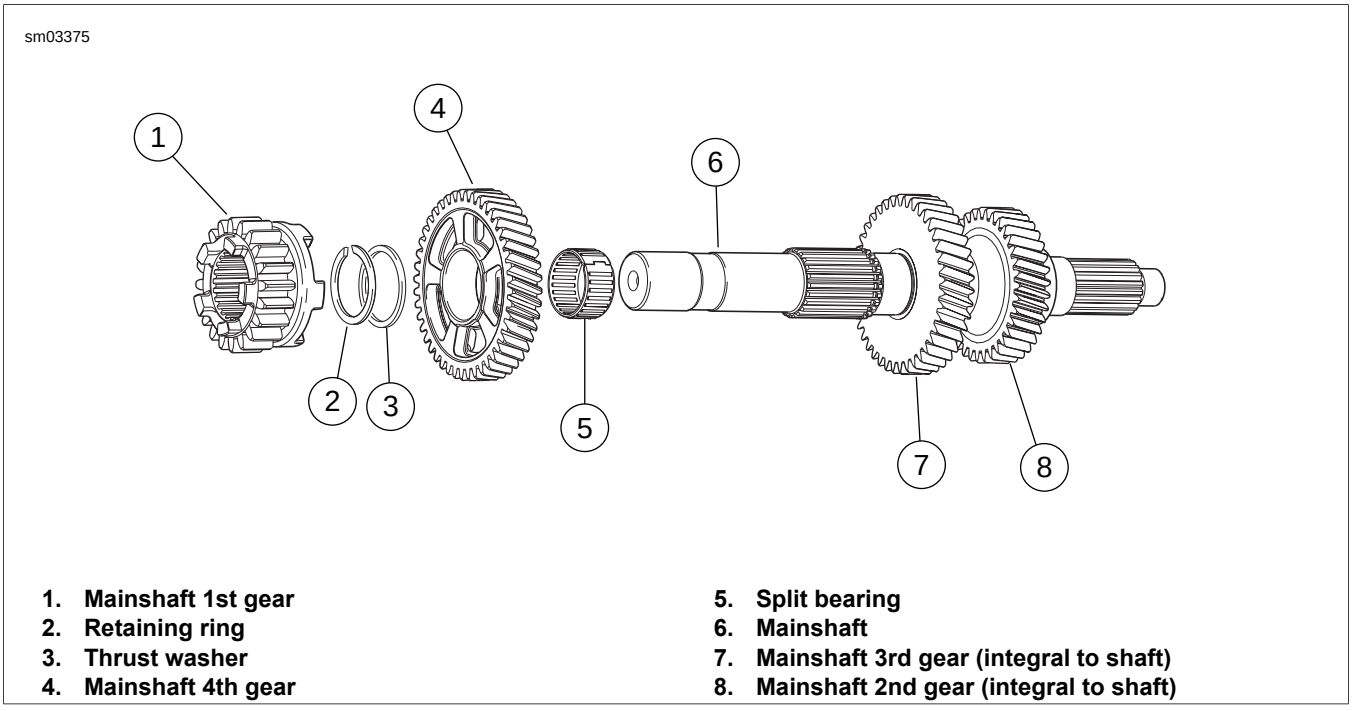
⚠WARNING

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

- *Always install parts in their original locations and orientations.*
- *Use correct retaining ring pliers and correct tips. Verify that tips are not excessively worn or damaged.*
- *Lubricate spit bearings and internal bores of gears with SCREAMIN' EAGLE ASSEMBLY LUBE before assembly.*

1. See Figure 5-38. Install **new** split bearing (5) in fourth gear position on mainshaft.
2. Install fourth gear (4) and thrust washer (3).
3. Using RETAINING RING PLIERS (Part No. J-5586-A), expand and install **new** retaining ring (2).
4. Install first gear (1).



1. **Mainshaft 1st gear**
2. **Retaining ring**
3. **Thrust washer**
4. **Mainshaft 4th gear**
5. **Split bearing**
6. **Mainshaft**
7. **Mainshaft 3rd gear (integral to shaft)**
8. **Mainshaft 2nd gear (integral to shaft)**

Figure 5-38. Transmission Mainshaft Assembly Once Removed from Left Crankcase/Disassembly

COUNTERSHAFT ASSEMBLY

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

⚠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

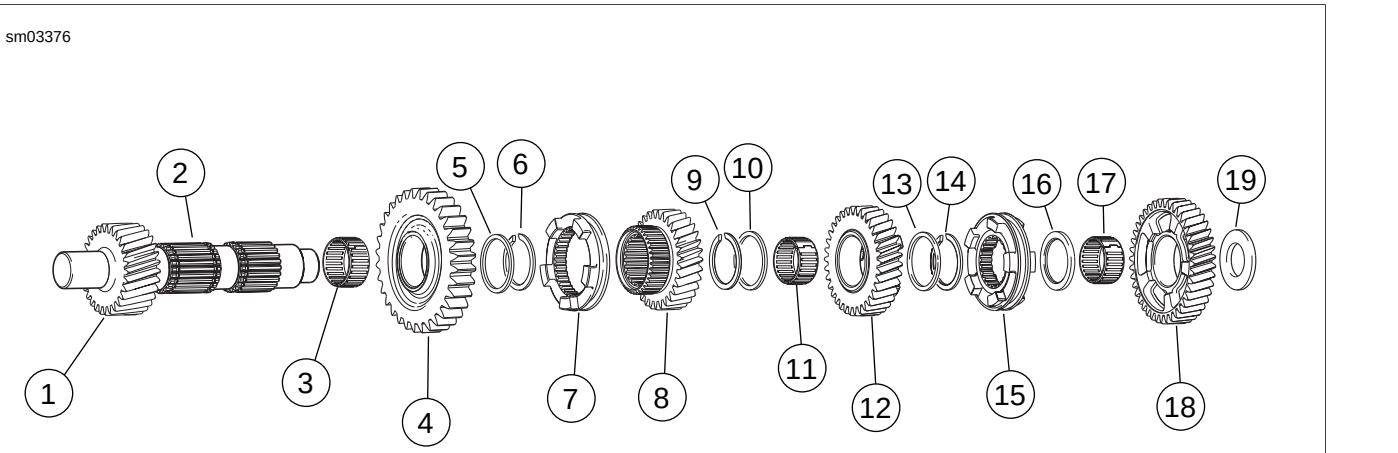
- *Always install parts in their original locations and orientations.*
- *Use correct retaining ring pliers and correct tips. Verify that tips are not excessively worn or damaged.*
- *Lubricate spit bearings and internal bores of gears with SCREAMIN' EAGLE ASSEMBLY LUBE before assembly.*

1. See Figure 5-39. Install **new** split bearing (3) in first gear position on mainshaft.
2. Install first gear (4) and thrust washer (5).
3. Using RETAINING RING PLIERS (Part No. J-5586-A), expand and install **new** retaining ring (6).

4. Install dog ring (7) onto fourth gear (8). Now install dog ring and gear assembly onto countershaft.
5. Expand and install **new** retaining ring (9).
6. Install thrust washer (10).
7. Install **new** split bearing (11) in third gear position on mainshaft.
8. Install third gear (12) and thrust washer (13).
9. Expand and install **new** retaining ring (14).
10. Install dog ring (15). Make sure to install with dog ring facing same direction as when it was removed.
11. Install spacer (16).
12. Install **new** split bearing (17) in second gear position on shaft.
13. Install second gear (18) and spacer (19).

NOTE

At this point both mainshaft and countershaft sub-assemblies can be pressed into the left crankcase half.



1. **Countershaft 5th gear (integral to shaft)**
2. **Countershaft**
3. **Split bearing**
4. **Countershaft 1st gear**
5. **Thrust washer**
6. **Retaining ring**
7. **Dog ring**
8. **Countershaft 4th gear**
9. **Retaining ring**
10. **Thrust washer**
11. **Split bearing**
12. **Countershaft 3rd gear**
13. **Thrust washer**
14. **Retaining ring**
15. **Dog ring**
16. **Spacer**
17. **Split bearing**
18. **Countershaft 2nd gear**
19. **Spacer**

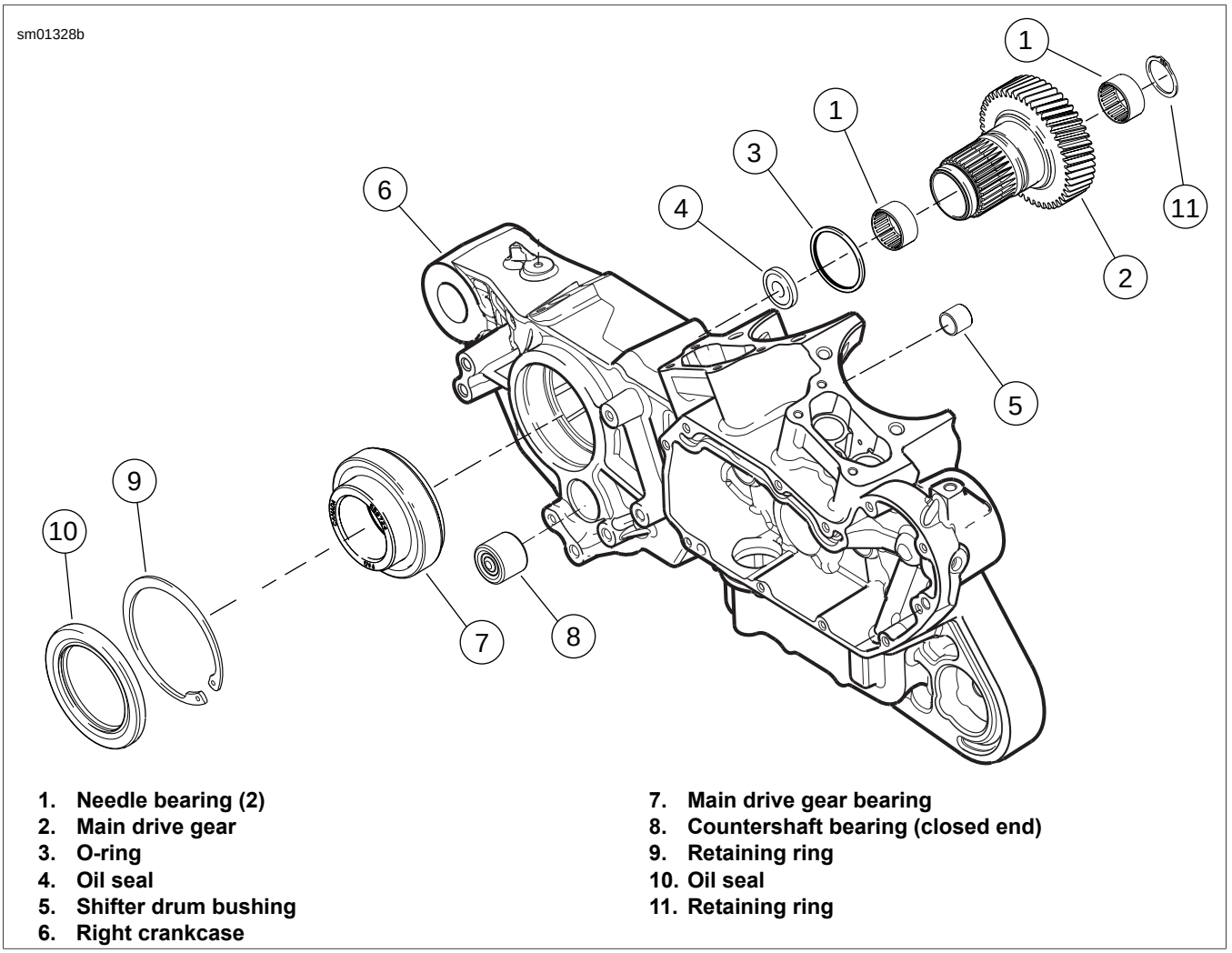
Figure 5-39. Transmission Countershaft Assembly Once Removed from Left Crankcase/Disassembly

MAIN DRIVE GEAR AND BEARING 5.10

GENERAL

NOTE

See Figure 5-40. Main drive gear (2) removal requires replacement of main drive gear bearing (7). Gear removal procedure destroys inner race.



1. Needle bearing (2)
2. Main drive gear
3. O-ring
4. Oil seal
5. Shifter drum bushing
6. Right crankcase
7. Main drive gear bearing
8. Countershaft bearing (closed end)
9. Retaining ring
10. Oil seal
11. Retaining ring

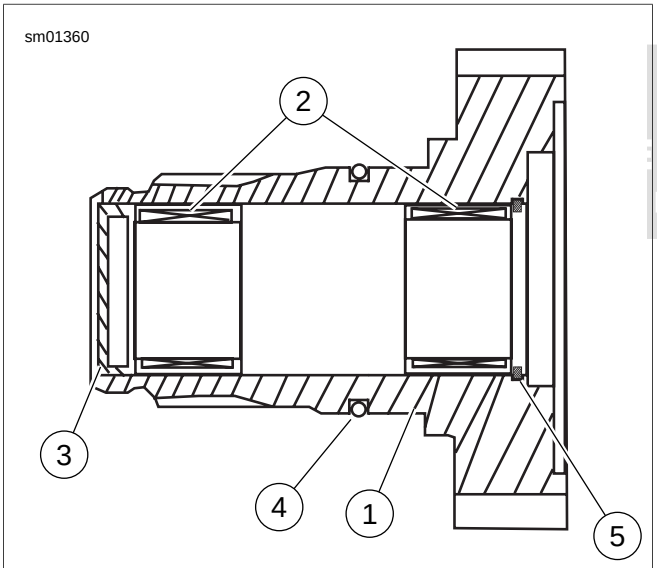
Figure 5-40. Main Drive Gear and Bearing Assembly

REMOVAL

PART NUMBER	TOOL NAME
B-45847	CROSS PLATE
HD-35316-11	RECEIVER CUP
HD-35316-4A	8 INCH BOLT
HD-35316-7	WASHER
HD-35316-9	BEARING DRIVER
HD-35316-D	MAIN DRIVE GEAR REMOVER AND INSTALLER SET

Main Drive Gear

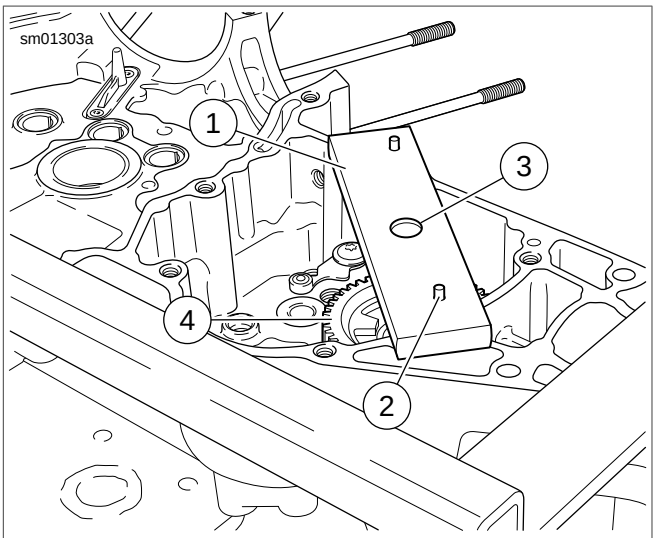
1. Split crankcases. See 5.7 CASE DISASSEMBLY FOR TRANSMISSION REMOVAL.
2. See Figure 5-41. From inside right crankcase, tap out seal (3) at end of main drive gear (1). Discard seal.
3. Obtain MAIN DRIVE GEAR REMOVER AND INSTALLER SET (Part No. HD-35316-D). See Figure 5-42. Position CROSS PLATE (Part No. B-45847) (1) on right crankcase as shown. Position so roll pins (2) fit into crankcase mating screw holes and center bolt hole (3) over main drive gear (4).



1. **Main drive gear**
2. **Needle bearing (2)**
3. **Seal**
4. **O-ring**
5. **Retaining ring**

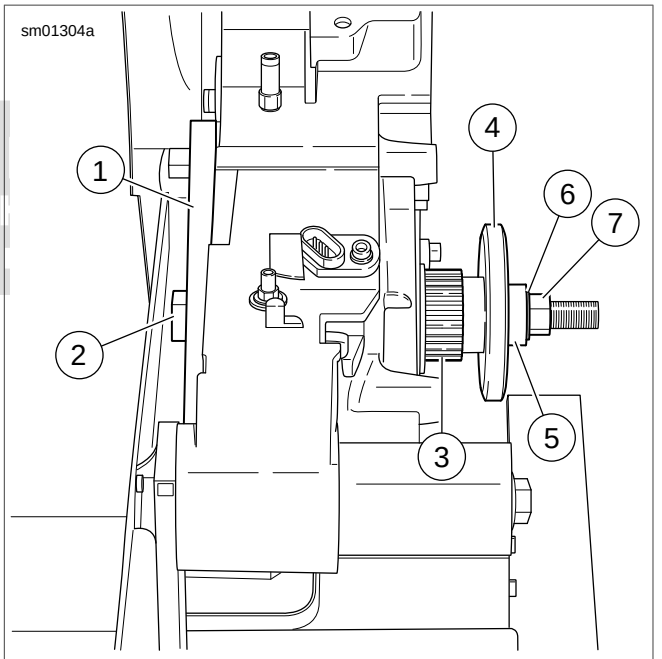
Figure 5-41. Main Drive Gear Assembly (typical)

4. See Figure 5-43. Insert 8 INCH BOLT (Part No. HD-35316-4A) (2) through cross plate (1) and main drive gear (3).
5. At outside of case, place WASHER (Part No. HD-35316-7) (4), BEARING (5), FLAT WASHER (6) and NUT (7) over end of bolt. Tighten nut until main drive gear is free.



1. **Cross plate**
2. **Roll pin (2)**
3. **Bolt hole**
4. **Main drive gear**

Figure 5-42. Positioning Cross Plate



1. **Cross plate**
2. **8 in bolt**
3. **Main drive gear**
4. **Washer**
5. **Bearing**
6. **Washer**
7. **Nut**

Figure 5-43. Removing Main Drive Gear

Main Drive Gear Ball Bearing

⚠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

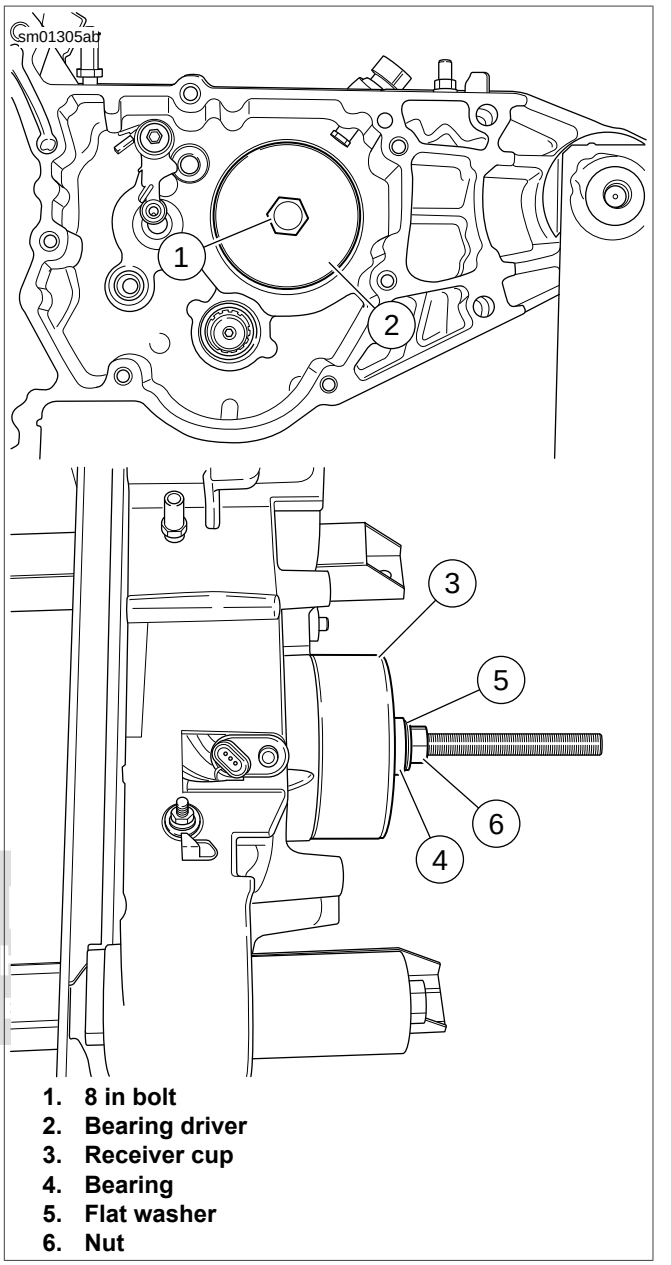
Use correct retaining ring pliers and correct tips. Verify that tips are not excessively worn or damaged.

1. See Figure 5-40. Remove and discard oil seal (10). Remove and discard main drive gear bearing retaining ring (9).
2. See Figure 5-44. From inside crankcase, position BEARING DRIVER (Part No. HD-35316-9) (2) over main drive gear bearing.
3. Insert 8 INCH BOLT (Part No. HD-35316-4A) (1) through bearing driver and bearing.
4. At outside of case, slide RECEIVER CUP (Part No. HD-35316-11) (3) onto bolt and over bearing. Install bearing (4), flat washer (5) and nut (6) over end of bolt.

NOTE

Support bearing remover assembly.

5. Tighten nut until main drive gear ball bearing is free.
6. Discard main drive gear ball bearing.



1. **8 in bolt**
2. **Bearing driver**
3. **Receiver cup**
4. **Bearing**
5. **Flat washer**
6. **Nut**

Figure 5-44. Removing Main Drive Gear Bearing

DISASSEMBLY

PART NUMBER	TOOL NAME
HD-95637-46B	BEARING RACE PULLER

1. See Figure 5-40. Remove retaining ring (11) from inboard end of main drive gear (2). Discard retaining ring.
2. See Figure 5-41. Drive out needle bearings (2) from inside bore of main drive gear (1). Discard needle bearings. Do not reuse bearings after removal from drive gear bore.
3. Remove and discard O-ring (4).

NOTE

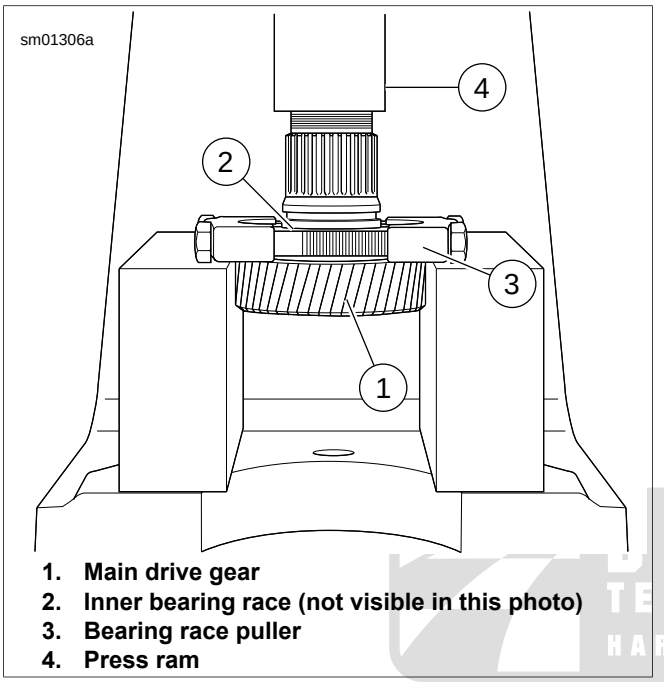
When the main drive gear is removed, a portion of the bearing inner race remains attached to the main drive gear. Remove this inner race before installing main drive gear.

4. See Figure 5-45. Attach BEARING RACE PULLER (Part No. HD-95637-46B) (3) to inner race (2) on main drive gear (1).
5. Place main drive gear with bearing race puller assembly onto press bed as shown in the photo.

NOTE

Provide a soft surface to catch the main drive gear when it falls free in the next step.

6. Press main drive gear out of inner bearing race. Discard inner bearing race.



1. **Main drive gear**
2. **Inner bearing race (not visible in this photo)**
3. **Bearing race puller**
4. **Press ram**

Figure 5-45. Removing Inner Bearing Race from Main Drive Gear

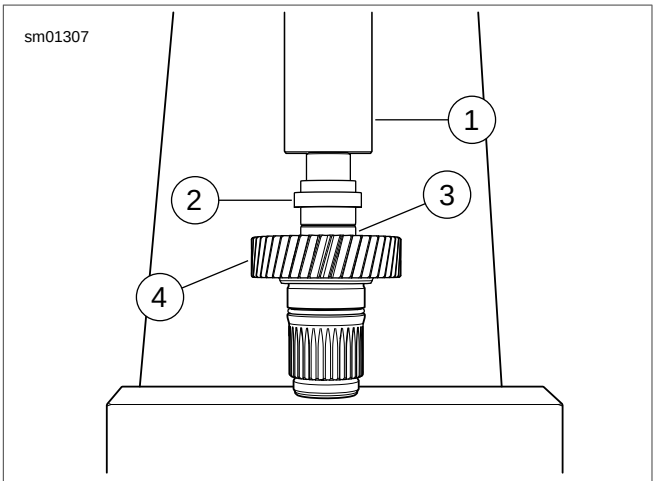
ASSEMBLY

PART NUMBER	TOOL NAME
HD-47855	INNER/OUTER MAIN DRIVE GEAR NEEDLE BEARING INSTALLATION TOOL: XL MODELS

NOTE

When the installation tool bottoms on the gear, the installed bearing depth is correct.

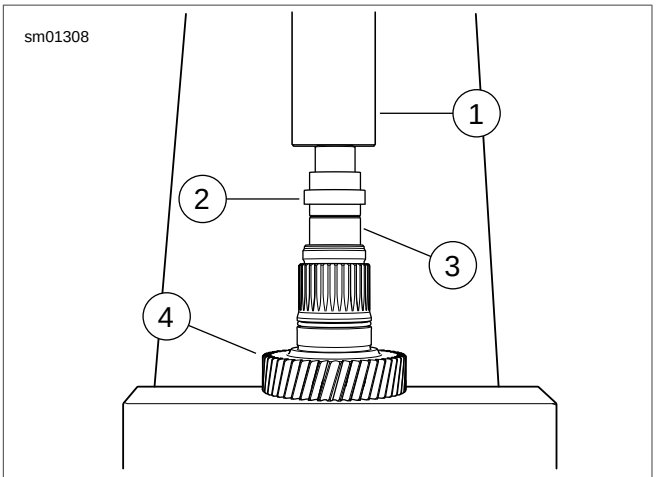
1. See Figure 5-46. Place main drive gear (4) on press bed with gear end facing up.
2. Place needle bearing (3) squarely into end of drive gear with lettered side of bearing facing up. Always press on lettered side of bearing to install. Insert the INNER/OUTER MAIN DRIVE GEAR NEEDLE BEARING INSTALLATION TOOL: XL MODELS (Part No. HD-47855) (2) with end stamped "INNER" facing needle bearing.
3. Press in the inner bearing until the installation tool bottoms on the main drive gear.



1. **Press ram**
2. **Needle bearing installation tool**
3. **Needle bearing**
4. **Main drive gear**

Figure 5-46. Pressing Inner Needle Bearing Assembly into Main Drive Gear

4. See Figure 5-47. Place main drive gear (4) on press bed with gear end facing down.
5. Place needle bearing (3) squarely into end of drive gear with lettered side of bearing facing up. Always press on lettered side of bearing to install. Insert installation tool (2) with end stamped "OUTER" facing needle bearing.
6. Press in the outer needle bearing until the installation tool bottoms on the main drive gear.
7. See Figure 5-40. Install **new** retaining ring (11) in inboard end of main drive gear (2).



1. **Press ram**
2. **Needle bearing installation tool**
3. **Needle bearing**
4. **Main drive gear**

Figure 5-47. Pressing Outer Needle Bearing Assembly into Main Drive Gear

INSTALLATION

PART NUMBER	TOOL NAME
B-45847	CROSS PLATE
HD-35316-12	INSTALLER CUP
HD-35316-4A	8 INCH BOLT
HD-35316-7	WASHER
HD-35316-8	BEARING DRIVER
HD-35316-C	MAIN DRIVE GEAR REMOVER AND INSTALLER SET
HD-47856	MAIN DRIVE GEAR SEAL INSTALLER KIT
HD-47856-1	INSTALLER
HD-47856-2	PILOT
HD-47856-4	ADAPTER
HD-47856-5	LARGE NUT

Main Drive Gear Bearing

1. See Figure 5-48. Place CROSS PLATE (Part No. B-45847) (1) on right crankcase as shown. Position cross plate so that roll pins (2) fit into crankcase mating screw holes and bolt hole (3) in cross plate is centered over crankcase bearing bore (4).
2. See Figure 5-49. Insert 8 INCH BOLT (Part No. HD-35316-4A) (2) through cross plate (1) and main drive gear bearing bore.
3. Place main drive gear bearing (3), BEARING DRIVER (Part No. HD-35316-8) (4), BEARING (5), FLAT WASHER (6) and NUT (7) over end of bolt.

NOTE

Do not continue to tighten nut after bearing bottoms against lip in crankcase bearing bore. Tightening nut too much can break lip in bearing bore casting.

4. Tighten nut until main drive gear bearing bottoms against lip cast into crankcase bearing bore.
5. Remove main drive gear bearing installer tool.

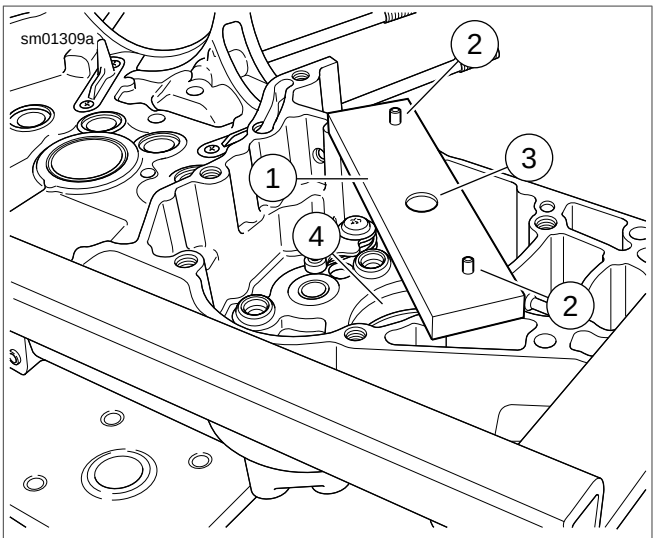
⚠WARNING

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

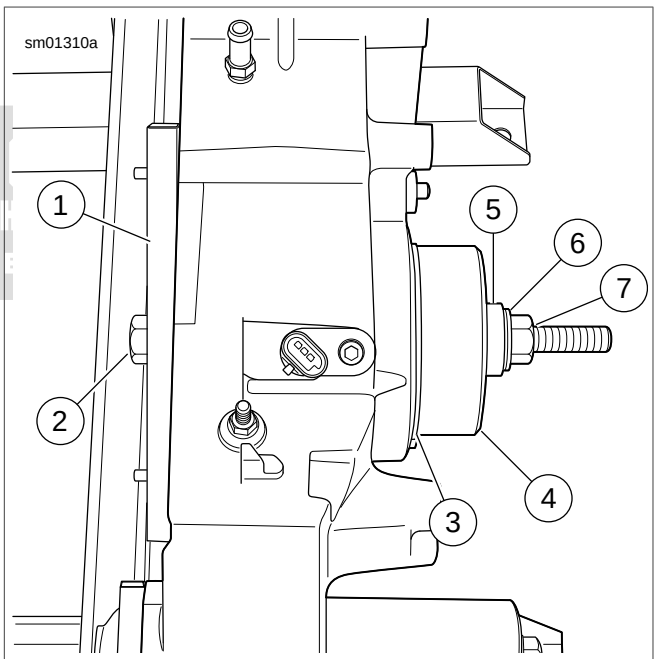
Use correct retaining ring pliers and correct tips. Verify that tips are not excessively worn or damaged.

6. See Figure 5-51. At outside of case install **new** beveled retaining ring (9) in groove inside bearing bore with beveled side facing outside of case.
7. Lubricate main drive gear bearing with SCREAMIN' EAGLE ASSEMBLY LUBE.



1. **Cross plate**
2. **Roll pin (2)**
3. **Bolt hole**
4. **Crankcase bearing bore**

Figure 5-48. Positioning Cross Plate



1. **Cross plate**
2. **8 inch bolt**
3. **Main drive gear bearing**
4. **Bearing driver**
5. **Bearing**
6. **Flat washer**
7. **Nut**

Figure 5-49. Installing Main Drive Gear Bearing

Main Drive Gear

1. See Figure 5-50. Lubricate both main drive gear needle bearing assemblies with SPECIAL PURPOSE GREASE.

2. See Figure 5-51. Install **new** O-ring (3) into groove in main drive gear (2). Lubricate O-ring with SCREAMIN' EAGLE ASSEMBLY LUBE.

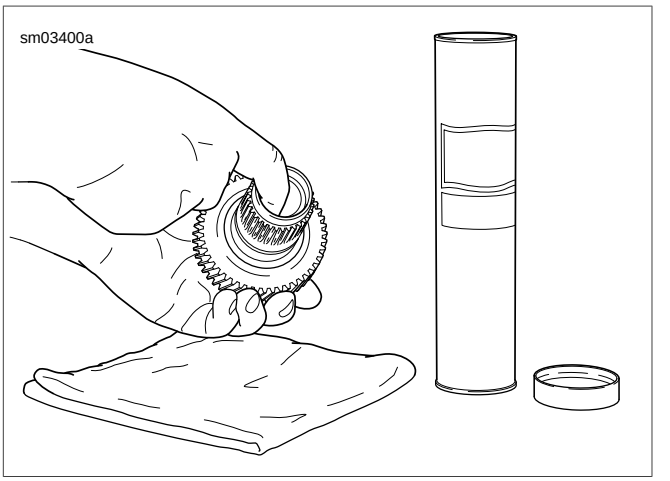
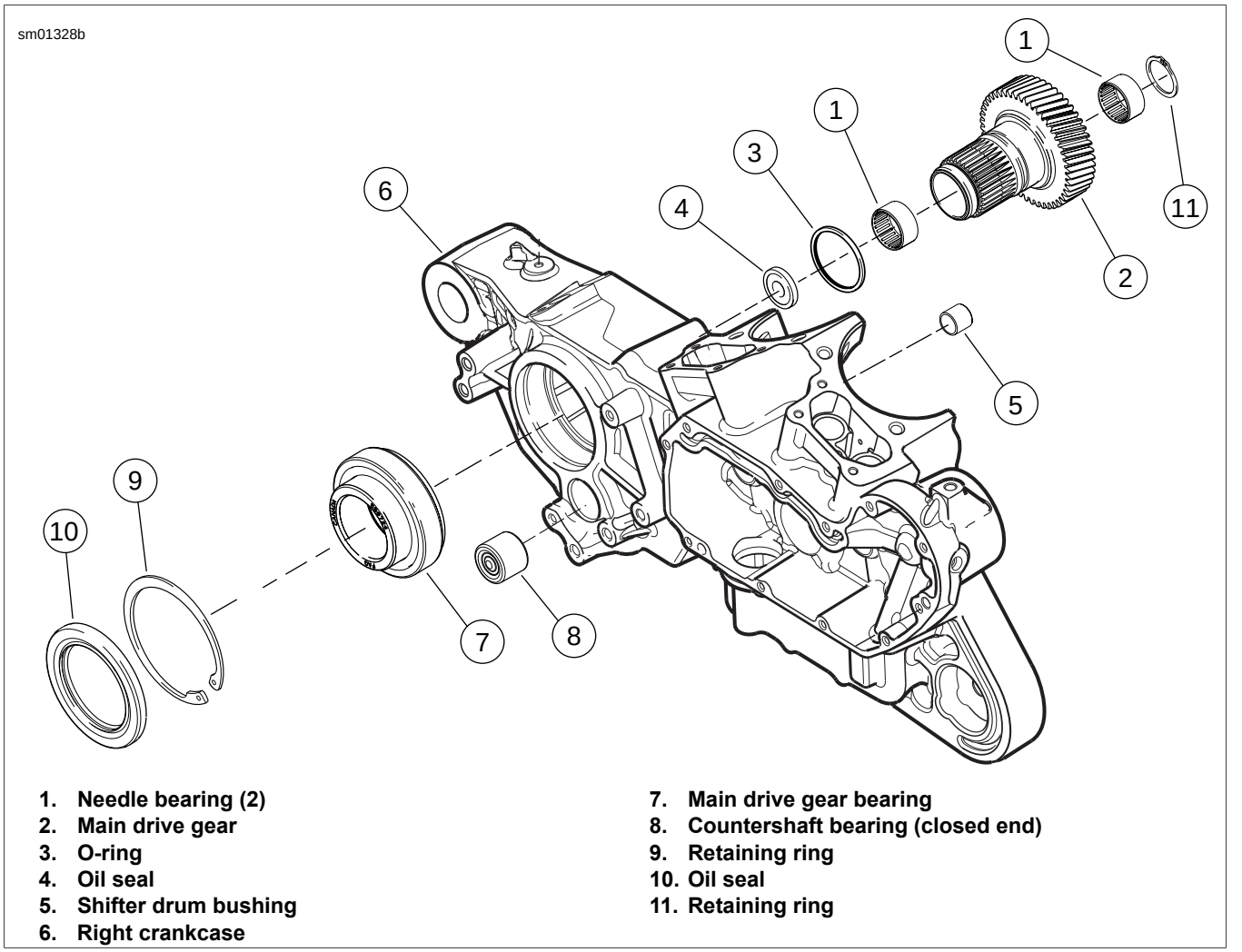


Figure 5-50. Lubricating Main Drive Gear Needle Bearing

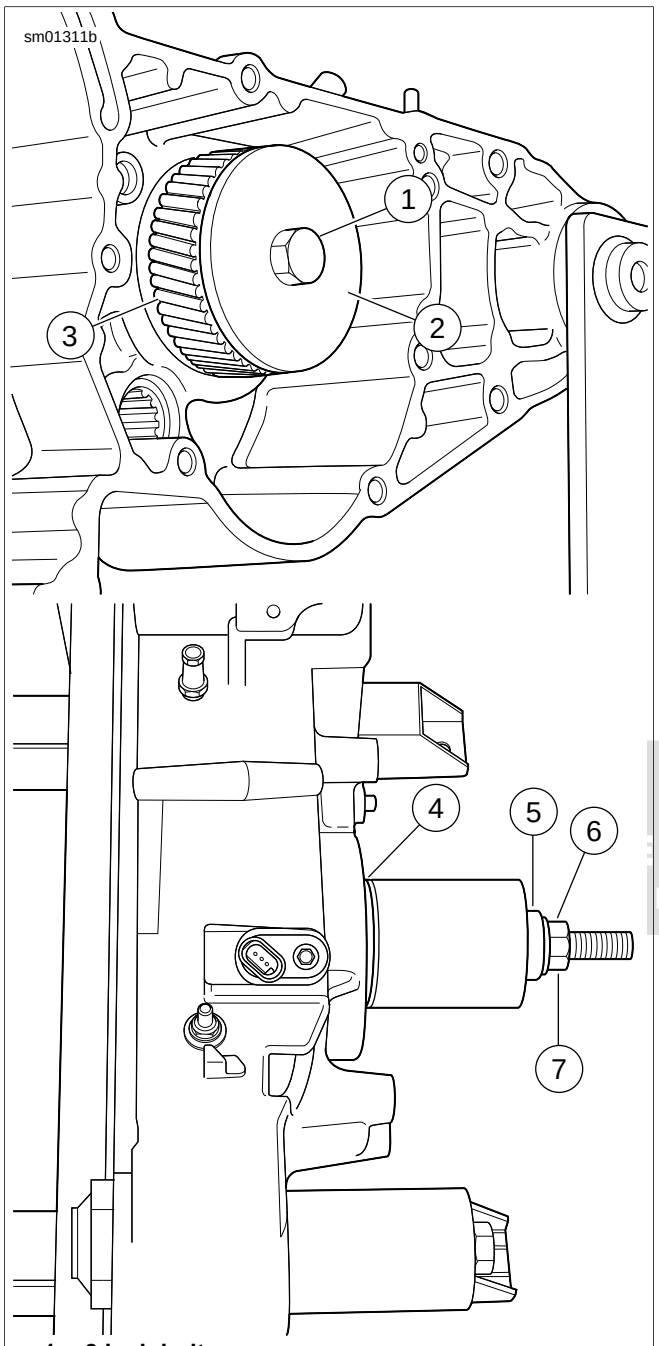


1. **Needle bearing (2)**
2. **Main drive gear**
3. **O-ring**
4. **Oil seal**
5. **Shifter drum bushing**
6. **Right crankcase**
7. **Main drive gear bearing**
8. **Countershaft bearing (closed end)**
9. **Retaining ring**
10. **Oil seal**
11. **Retaining ring**

Figure 5-51. Main Drive Gear and Bearing Assembly

3. See Figure 5-52. Insert 8 INCH BOLT (Part No. HD-35316-4A) (1) through WASHER (Part No. HD-35316-7) (2) and main drive gear (3). From inside of case insert bolt with washer and main drive gear through inner race of main drive gear bearing.
4. At outside of case, place INSTALLER CUP (Part No. HD-35316-12) (4), BEARING (5), FLAT WASHER (6) and NUT (7) over end of bolt. Tighten nut until main drive gear bottoms against main drive gear bearing.
5. Remove MAIN DRIVE GEAR REMOVER AND INSTALLER SET (Part No. HD-35316-C) set.

6. See Figure 5-51. Tap in **new** oil seal (4) at threaded end of main drive gear to a depth of 0.060-0.030 in (1.524-0.762 mm).



1. **8 inch bolt**
2. **Washer**
3. **Main drive gear**
4. **Installer cup**
5. **Bearing**
6. **Flat washer**
7. **Nut**

Figure 5-52. Installing Main Drive Gear (typical)

Main Drive Gear Seal

1. Obtain MAIN DRIVE GEAR SEAL INSTALLER KIT (Part No. HD-47856).
2. See Figure 5-53. From outside of crankcase, install PILOT (Part No. HD-47856-2) over end of main drive gear bearing inner race.
3. Coat lips of **new** main drive gear seal with SCREAMIN' EAGLE ASSEMBLY LUBE.
4. See Figure 5-54. Place seal over pilot and position seal squarely in end of crankcase bore.

NOTE

ADAPTER (Part No. HD-47856-4) and main drive gear have left-hand threads.

5. See Figure 5-55. Thread ADAPTER (Part No. HD-47856-4) onto end of main drive gear several turns. Do NOT tighten on drive gear. Doing so could make it difficult to remove adapter after seal has been installed.

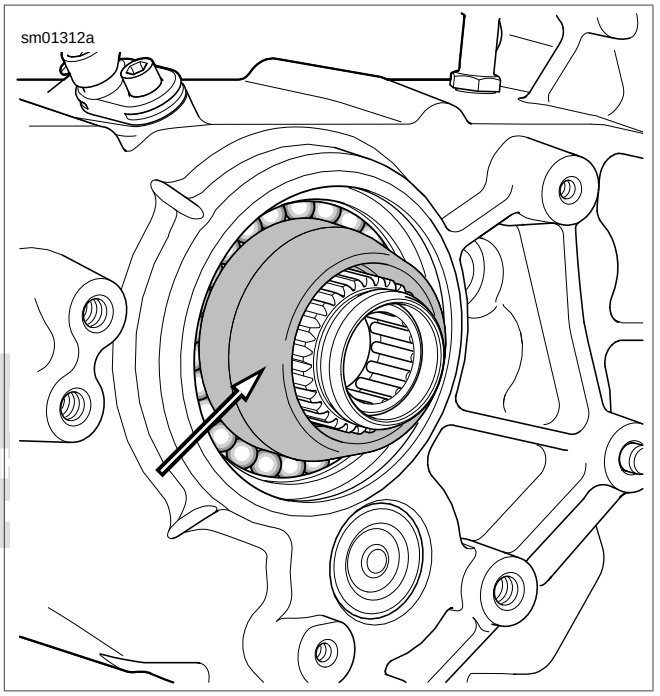


Figure 5-53. Install Pilot

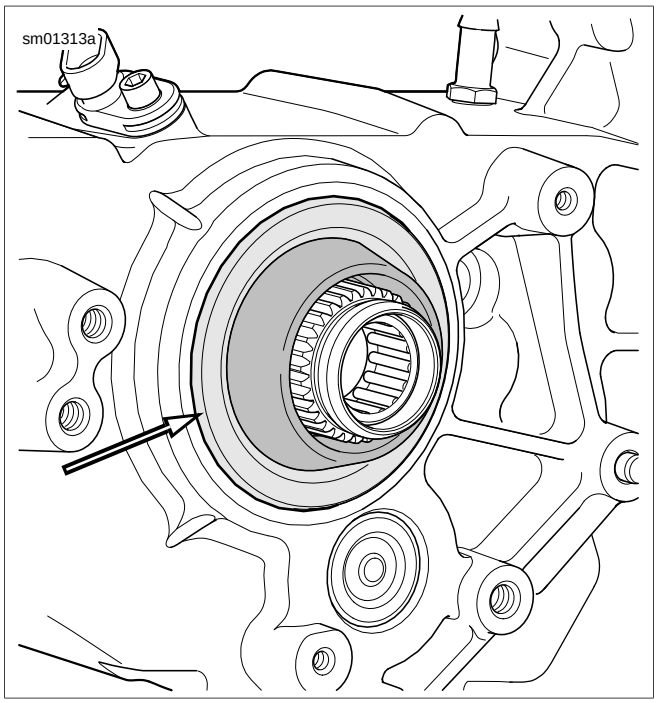


Figure 5-54. Install Main Drive Gear Seal

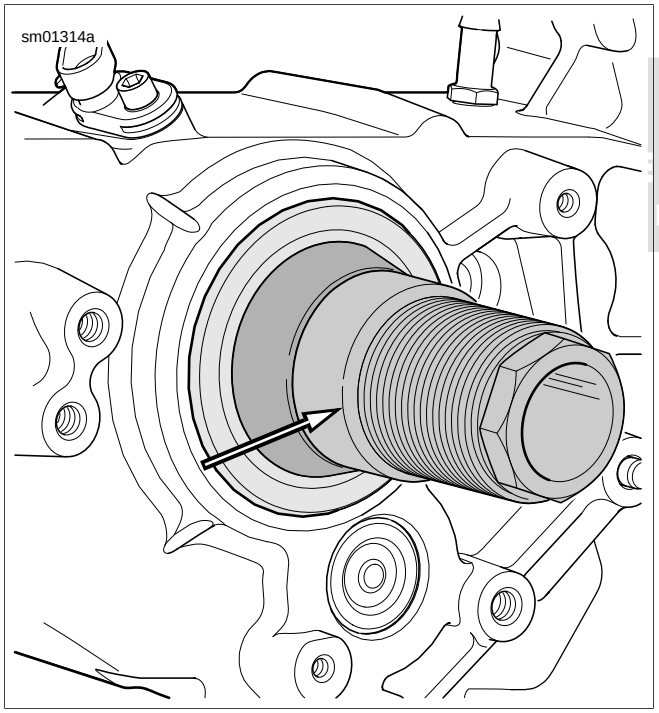


Figure 5-55. Install Adapter

6. See Figure 5-56. Slide INSTALLER (Part No. HD-47856-1) over adapter until cupped end of installer is flat against seal.
7. See Figure 5-57. Thread LARGE NUT (Part No. HD-47856-5) onto end of adapter, until it tightens against installer.
8. See Figure 5-58. Place crow's foot wrench (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.
9. Holding adjustable wrench, tighten large nut with crow's foot wrench until outer face of seal is flush with outer edge of crankcase bore.

NOTE

It is acceptable to recess seal to about 0.030 in (0.762 mm) below outer edge of bore. Seal will be controlled by tool.

10. Remove nut, installer, adapter and pilot.

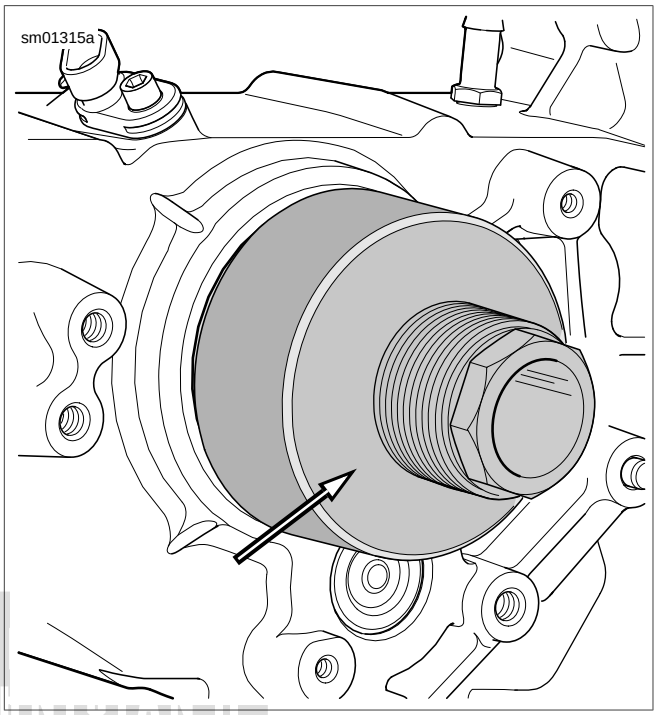


Figure 5-56. Place Installer over Adapter

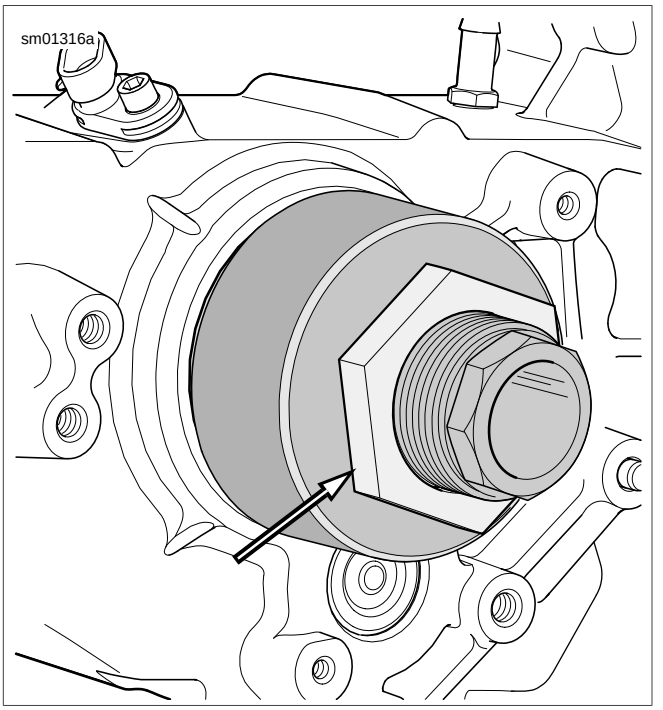
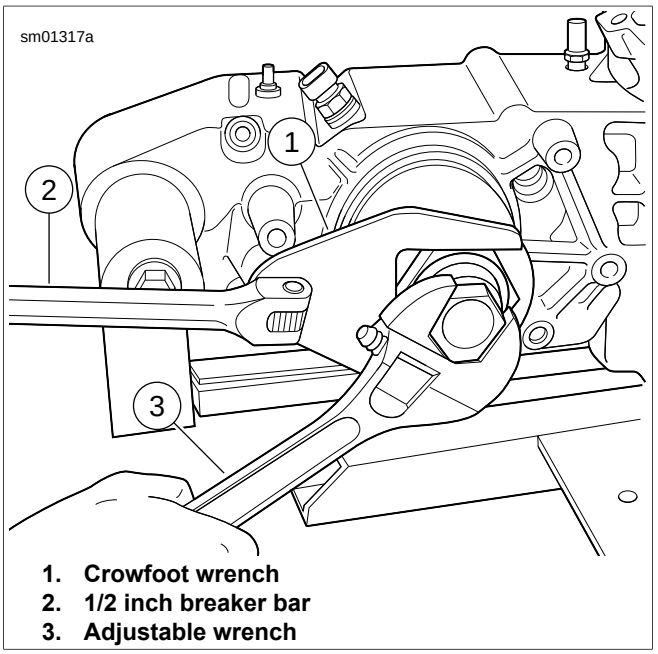


Figure 5-57. Install Nut)



1. Crowfoot wrench
2. 1/2 inch breaker bar
3. Adjustable wrench

Figure 5-58. Press Seal Into Crankcase

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TRANSMISSION RIGHT CASE BEARINGS 5.11

REMOVAL

PART NUMBER	TOOL NAME
HD-95760-69A	BUSHING AND BEARING PULLER
HD-95765-69A	1/2 INCH COLLET

Split crankcases. See 5.7 CASE DISASSEMBLY FOR TRANSMISSION REMOVAL.

Countershaft Needle Bearing

See Figure 5-59. From inside transmission case use a bearing driver to remove countershaft bearing (1) from crankcase bore.

Shifter Drum Bushing

1. See Figure 5-59. The shifter drum bushing (2) is a press fit in the right crankcase half. Inspect the bushing against the corresponding end of the shifter drum for proper fit and wear.
2. If bushing is to be replaced, use BUSHING AND BEARING PULLER (Part No. HD-95760-69A) with 1/2 INCH COLLET (Part No. HD-95765-69A) to remove bushing from crankcase bore.

INSTALLATION

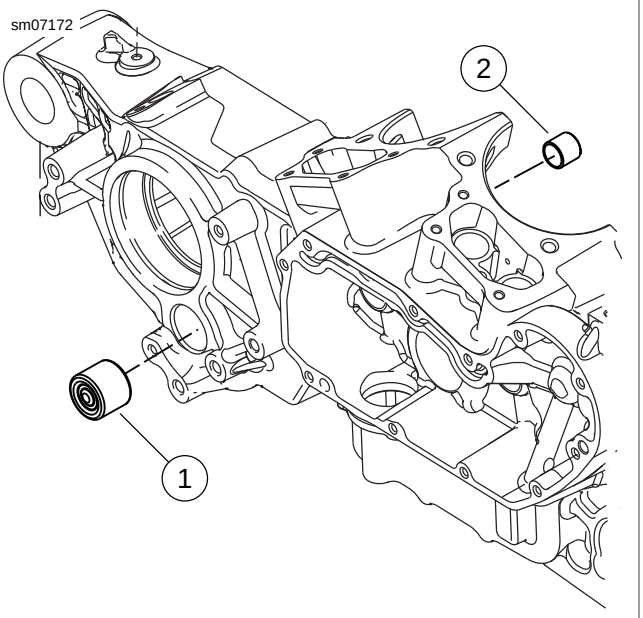
PART NUMBER	TOOL NAME
A157-8	SNAP-ON 1/2 IN ADAPTER
A-157C	SNAP-ON BUSHING DRIVER SET

Countershaft Needle Bearing

1. Find a 1-1/4 in bearing driver.
2. See Figure 5-59. Position the open end of the countershaft bearing (1) toward the bore in the outside of the case.
3. Square the driver against the closed end of the bearing.
4. Drive the bearing flush or no more than 0.030 in (0.762 mm) below the outside surface.
5. Lubricate with SCREAMIN' EAGLE ASSEMBLY LUBE.

Shifter Drum Bushing

1. See Figure 5-59. Using SNAP-ON BUSHING DRIVER SET (Part No. A-157C) and the SNAP-ON 1/2 IN ADAPTER (Part No. A157-8), install a **new** shifter drum bushing (2).
2. Lubricate with SCREAMIN' EAGLE ASSEMBLY LUBE.



1. **Countershaft needle bearing**
2. **Shifter drum bushing**

Figure 5-59. Transmission Right Case Bearings

TRANSMISSION LEFT CASE BEARINGS 5.12

REMOVAL

PART NUMBER	TOOL NAME
PR-36	SNAP-ON SNAP RING PLIERS

Mainshaft and Countershaft Bearings

1. Split crankcases. See 5.7 CASE DISASSEMBLY FOR TRANSMISSION REMOVAL.
2. Disassemble transmission. See 5.8 TRANSMISSION REMOVAL AND DISASSEMBLY.
3. Inspect the mainshaft and countershaft ball bearings for damage.
4. See Figure 5-61. If bearing replacement is required, remove retaining rings (1, 2) using SNAP-ON SNAP RING PLIERS (Part No. PR-36).
5. Press out bearings (3, 4) from the inside of the crankcase.

Shifter Drum Bushing

1. Inspect the shifter drum bushing for damage.
2. If bushing requires replacement, press bushing out of crankcase from primary side toward inside of case.

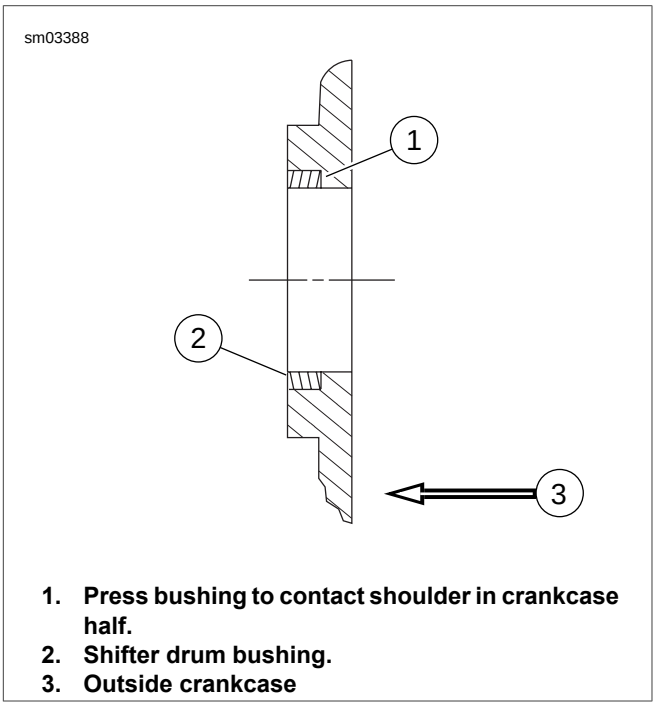
INSTALLATION

Mainshaft and Countershaft Bearings

1. Place crankcase on press with inside surface of crankcase downward.
2. Lay bearing squarely over bore with printed side of bearing upward.
3. Place a driver (slightly smaller than outside diameter of bearing) against outer race.
4. Press bearing into bore until bearing bottoms against shoulder.
5. Install **new** retaining ring with beveled side facing away from bearing.

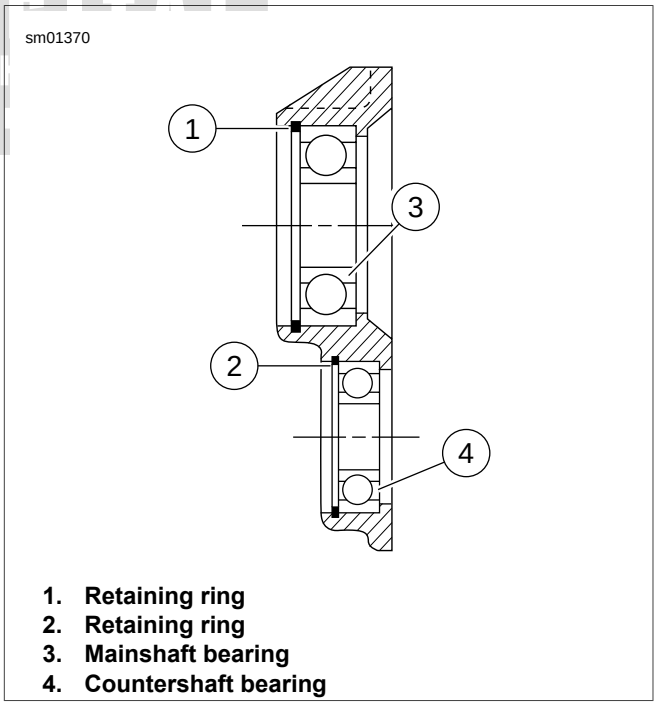
Shift Drum Bushing

1. Place crankcase on press with outside surface of crankcase downward.
2. See Figure 5-60. Lay bushing squarely over bore. Using a pressing tool larger than OD of bushing, press bushing into bore until tool contacts crankcase.



1. **Press bushing to contact shoulder in crankcase half.**
2. **Shifter drum bushing.**
3. **Outside crankcase**

Figure 5-60. Shifter Drum Bushing Assembly



1. **Retaining ring**
2. **Retaining ring**
3. **Mainshaft bearing**
4. **Countershaft bearing**

Figure 5-61. Ball Bearing Assembly

TRANSMISSION INSTALLATION 5.13

GENERAL

Before reinstalling transmission and reassembling crankcase halves, perform any necessary engine overhaul procedures. See 3.9 BOTTOM END SERVICE and 3.8 TOP END SERVICE.

INSTALLATION

PART NUMBER	TOOL NAME
B-43985	TRANSMISSION REMOVAL AND INSTALLATION TOOL
B-43985-3	INSTALLER
B-43985-4	GUIDE
HD-46285-2	CASE HOLDING FIXTURE

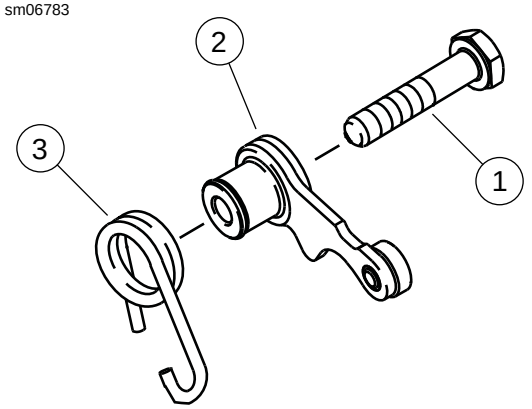
FASTENER	TORQUE VALUE	
Gear detent assembly screw	90-110 **in-lbs**	10.2-12.4 Nm

1. See Figure 5-62. Assemble detent spring (3) onto gear detent assembly (2).
2. Install detent assembly with spring into place in transmission cavity of right crankcase.
3. Secure with screw (1). Tighten to 90-110 **in-lbs** (10.2-12.4 Nm).

NOTE

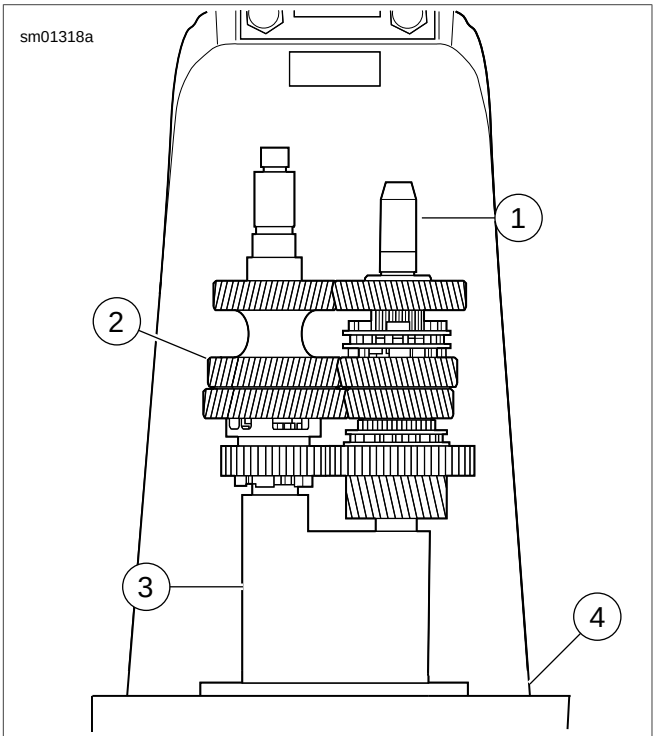
Use the TRANSMISSION REMOVAL AND INSTALLATION TOOL (Part No. B-43985) to install the countershaft.

4. See Figure 5-63. Place transmission assembly (2) onto CASE HOLDING FIXTURE (Part No. HD-46285-2) (3) on press bed. Use support block(s) (4) if necessary.
5. Screw the GUIDE (Part No. B-43985-4) (1) into end of countershaft.



1. **Screw**
2. **Gear detent assembly**
3. **Detent spring**

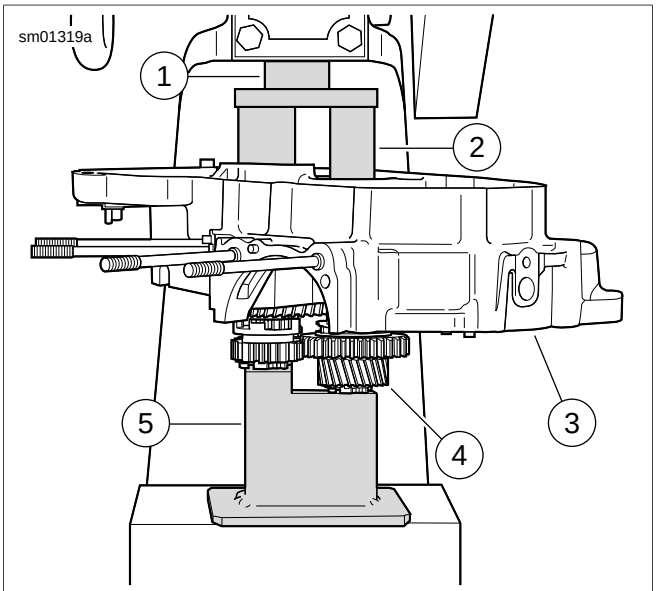
Figure 5-62. Gear Detent Assembly



1. **Countershaft guide**
2. **Transmission**
3. **Transmission fixture**
4. **Support block(s)**

Figure 5-63. Transmission on Fixture

6. See Figure 5-64. Install left crankcase (3) over transmission assembly (4).
7. Place the INSTALLER (Part No. B-43985-3) (2) over mainshaft and countershaft bearings in crankcase.
8. Position crankcase and transmission assemblies on press with installer under press ram (1).



1. **Press ram**
2. **Installer**
3. **Crankcase**
4. **Transmission**
5. **Transmission fixture**

Figure 5-64. Pressing Transmission into Left Crankcase

NOTE

Verify that the crankcase does not tilt when pressed onto transmission assembly. Place press ram on the installer closer to mainshaft to keep the crankcase level.

9. Press crankcase onto transmission assembly until shafts bottom out on bearings.
10. Remove left crankcase with transmission assembly from press.

NOTE

When removing assembly from fixture, prevent 1st gear from falling off shaft. Gear can be damaged if it strikes a hard surface.

SHIFTER FORKS AND DRUM ASSEMBLY

NOTES

- *See Figure 5-65. Each shifter fork develops a wear pattern with its mating parts. Install each shifter fork in its original location.*
- *Lubricate the shaft bore in each shifter fork with SCREAMIN' EAGLE ASSEMBLY LUBE before assembly.*

1. Place 2nd/3rd gear shifter fork onto dog ring between countershaft 2nd and 3rd gears.
2. Install shifter drum into left case half with scribed line at 12 o'clock. This will place shifter drum in neutral position.

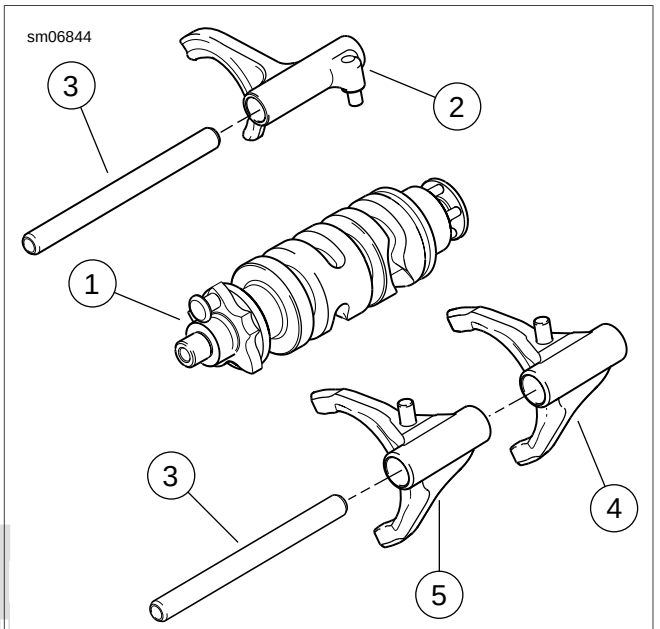
NOTE

See Figure 5-66. Install shifter fork shafts in the left case half by lightly tapping on the end of the shaft with a brass or hard plastic hammer until shaft is seated in bore.

3. Place 1st gear shifter fork onto dog ring between countershaft 1st and 4th gear gears. Install shifter fork shaft through two installed shifter forks and into left crankcase half.
4. Install 4th/5th gear shifter fork onto sliding gear with dogs located on mainshaft. Install remaining shifter fork shaft through last installed shifter fork and into left crankcase half.

NOTE

Seat shifter fork shafts in left crankcase half bore using light taps with a brass hammer.



1. **Shifter drum**
2. **Mainshaft shifter fork (4th/5th)**
3. **Shifter fork shaft**
4. **Countershaft shifter fork (1st)**
5. **Countershaft shifter fork (2nd/3rd)**

Figure 5-65. Shifter Forks, Drum and Shafts

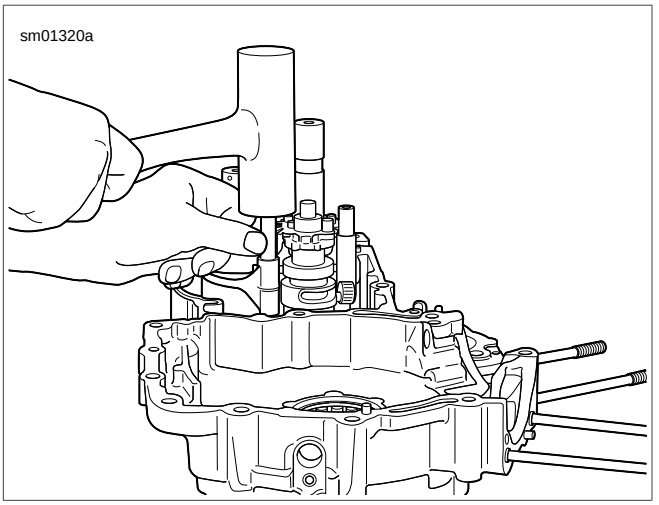


Figure 5-66. Installing Shifter Fork Shafts

ASSEMBLING CRANKCASES

PART NUMBER	TOOL NAME
B-45520	GEAR DETENT ASSEMBLY AID
HD-42326-A	CRANKSHAFT GUIDE TOOL

FASTENER	TORQUE VALUE	
Crankcase fastener	15-19 ft-lbs	20.3-25.8 Nm
Neutral indicator switch	120-180 **in-lbs**	13.6-20.3 Nm

1. See Figure 5-67. Retract detent assembly in right case half and thread GEAR DETENT ASSEMBLY AID (Part No. B-45520) into neutral switch hole until it has bottomed in right case half.
2. See Figure 5-68. Install flywheel assembly into right crankcase half.

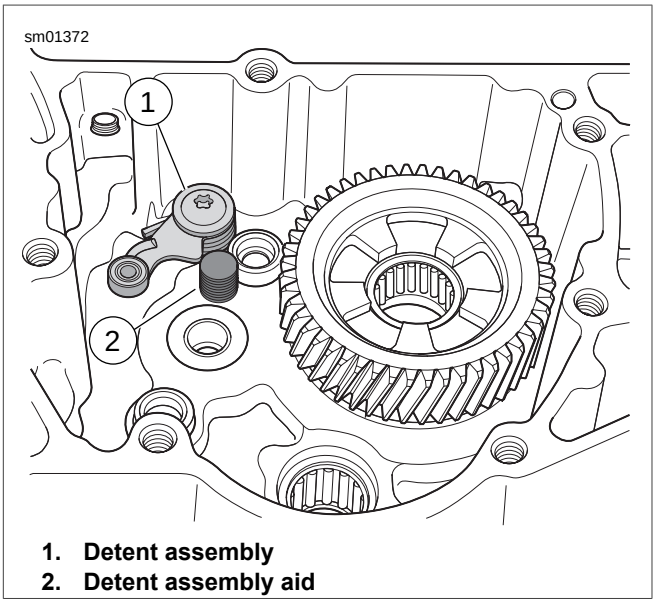
⚠CAUTION

Do not rotate crankcase half in engine stand when flywheel is installed. The flywheel assembly can fall out, resulting in parts damage or moderate injury. (00552c)

NOTE

Always place transmission in first gear when assembling crankcases. Other gear selections could cause damage.

3. Place transmission in first gear.
4. See Figure 5-69. Assemble crankcase halves together.
   a. Slide CRANKSHAFT GUIDE TOOL (Part No. HD-42326-A) onto flywheel sprocket shaft.
   b. Apply a thin coat of HARLEY-DAVIDSON GRAY HIGH-PERFORMANCE SEALANT - GRAY to crankcase joint faces.
   c. Lubricate main drive gear inner bearings with SCREAMIN' EAGLE ASSEMBLY LUBE.
   d. Carefully fit crankcases together.
   e. Apply several drops of LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) to last few threads of crankcase fasteners.
   f. Install 11 long and four short from the left side and two long from the right side.
   g. See Figure 5-70. In sequence, tighten to 15-19 ft-lbs (20.3-25.8 Nm).
5. Remove GEAR DETENT ASSEMBLY AID. Install neutral indicator switch and flat washer. Tighten to 120-180 **in-lbs** (13.6-20.3 Nm).



1. **Detent assembly**
2. **Detent assembly aid**

Figure 5-67. Using Gear Detent Assembly Aid (Part No. B-45520)

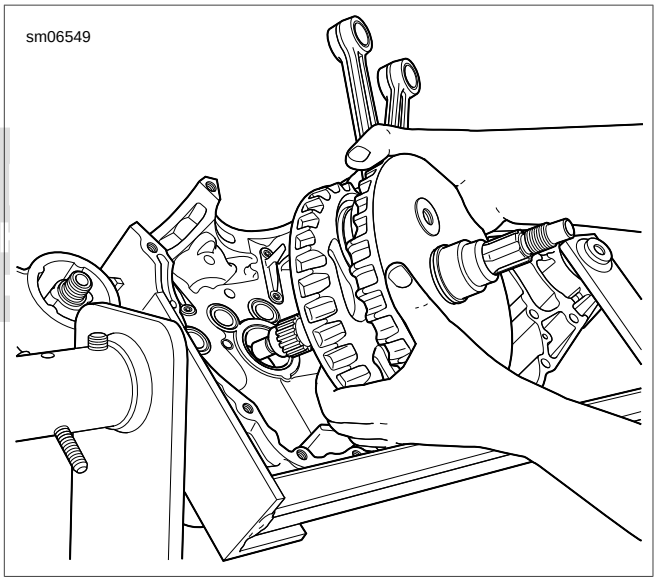


Figure 5-68. Installing Flywheel Assembly In Right Crankcase

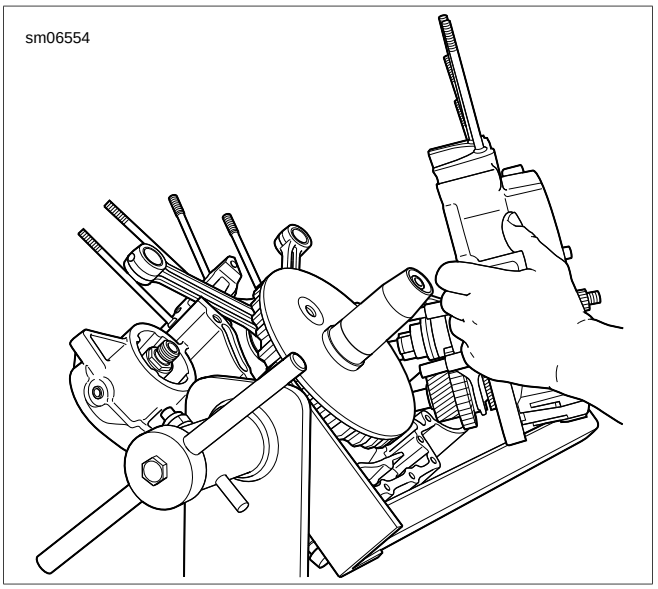


Figure 5-69. Assembling Crankcases With Crankshaft Guide Tool (Part No. HD-42326-A)

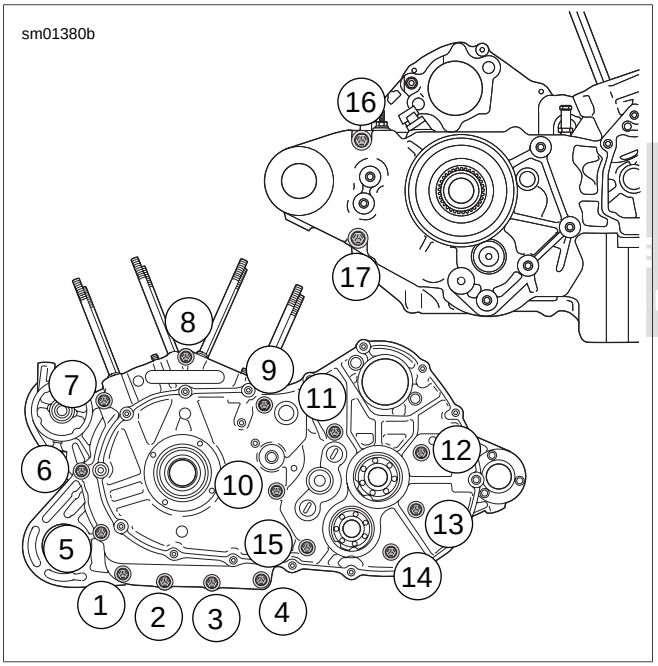


Figure 5-70. Crankcase Fastener Torque Sequence

SHIFTER SHAFT INSTALLATION

FASTENER	TORQUE VALUE	
Countershaft retaining screw	33-37 ft-lbs	44.8-50.2 Nm

1. See Figure 5-71. Correctly install shifter return spring onto the reverse side of the shifter shaft assembly before placing shaft in left crankcase half.

NOTE

See Figure 5-73. Verify shifter shaft return spring assembly and installation. Incorrect spring installation could cause problems with shifting.

2. See Figure 5-73. Press the ratchet arms and insert shaft assembly into the bushing in the left case half and release. Ratchet arms should now be inside the end plate of the shifter drum contacting the shifter drum pins.
3. See Figure 5-74. Apply several drops of LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) to last few threads of countershaft retaining screw. Thread screw into end of shaft.
4. Place transmission in gear. Tighten screw to 33-37 ft-lbs (44.8-50.2 Nm).
5. Install transmission sprocket. See 5.14 TRANSMISSION SPROCKET.
6. Continue assembling engine. See 3.20 BOTTOM END OVERHAUL: ASSEMBLY and 3.15 TOP END OVERHAUL: ASSEMBLY.
7. Install primary chain and engine sprocket, clutch assembly, and primary cover. See 5.4 PRIMARY DRIVE AND CLUTCH.
8. Install engine in chassis. See 3.11 INSTALLING ENGINE IN CHASSIS.

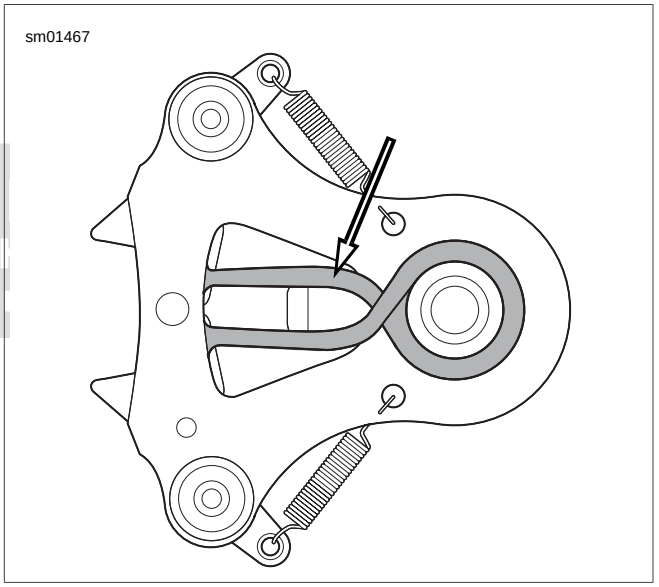


Figure 5-71. Correctly Installed Shifter Shaft Return Spring

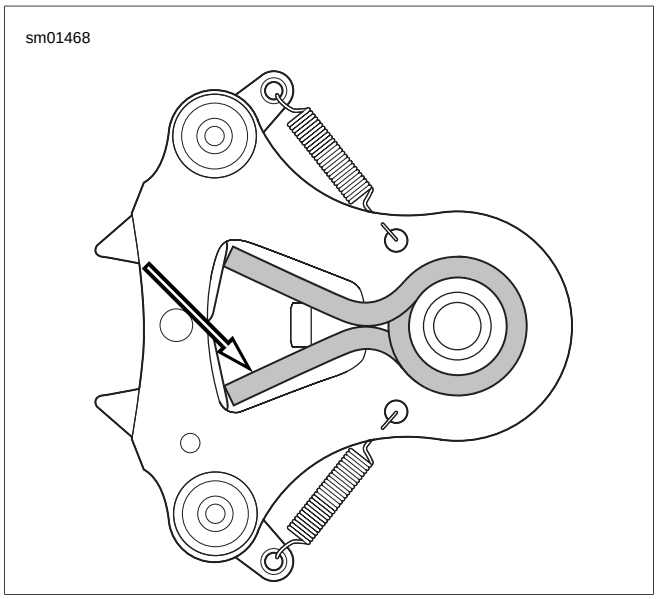


Figure 5-72. Incorrectly Installed Shifter Shaft Return Spring

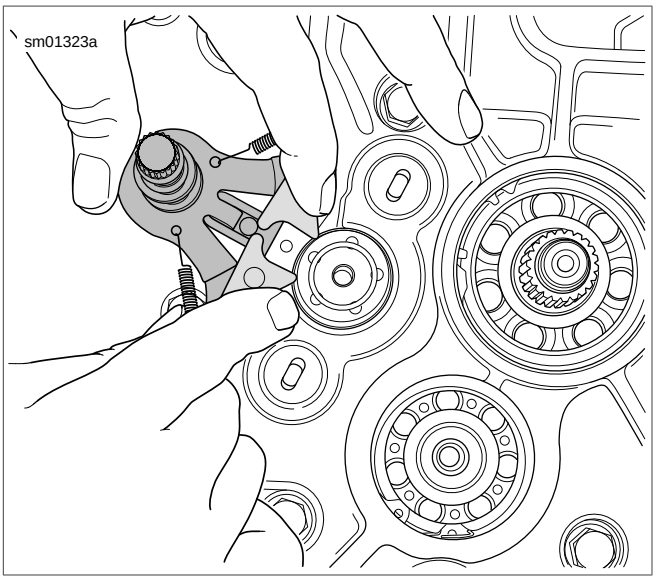


Figure 5-73. Installing Shifter Shaft Assembly

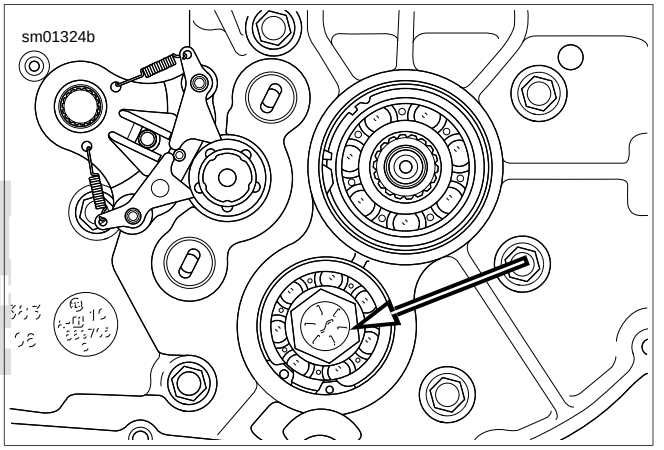


Figure 5-74. Countershaft Retaining Screw

TRANSMISSION SPROCKET 5.14

REMOVAL

PART NUMBER	TOOL NAME
HD-46282-1A	REACTION ADAPTER
HD-46282-A	FINAL DRIVE SPROCKET LOCKING TOOL
HD-46288	MAINSHAFT LOCKNUT WRENCH

WARNING

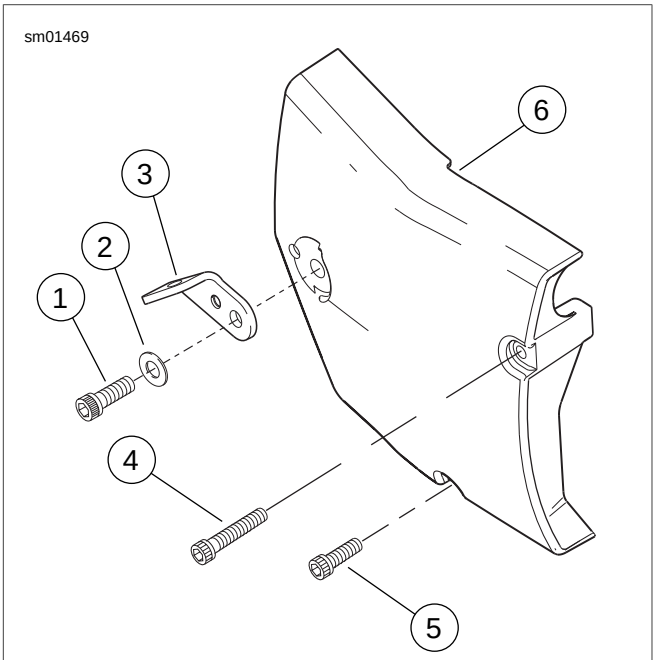
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. Shift transmission to neutral.
3. Remove exhaust system. See 4.16 EXHAUST SYSTEM.
4. Remove retaining ring and clevis pin from master cylinder pushrod collar.
5. Remove right footrest and rear brake pedal assembly. See 2.39 RIDER FOOT CONTROLS: MID-MOUNT, Right Footrest and Rear Brake Pedal Assembly or 2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal Assembly.
6. See Figure 5-75. Remove screw (1), washer (2) and exhaust pipe clamp bracket (3).
7. Remove two screws (4, 5). Remove sprocket cover (6).
8. Remove rear drive belt from transmission sprocket. See 5.5 DRIVE BELT.
9. See Figure 5-76. Remove screw and washer from exhaust mounting bracket.
10. Remove two screws (5) and sprocket lockplate (4).

NOTE

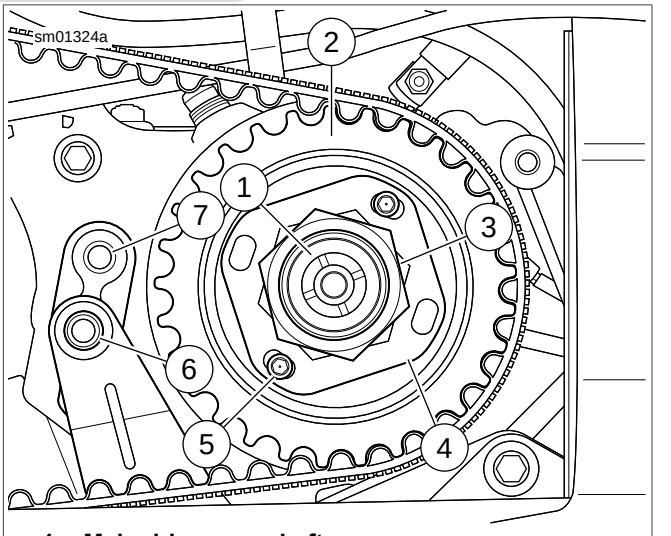
Install REACTION ADAPTER (Part No. HD-46282-1A) through exhaust mounting bracket into threaded boss in crankcase.

11. See Figure 5-77. Install FINAL DRIVE SPROCKET LOCKING TOOL (Part No. HD-46282-A) (2). Place handle of tool underneath reaction adapter.
12. Use a breaker bar (4) with MAINSHAFT LOCKNUT WRENCH (Part No. HD-46288) (3). Turn nut **clockwise** to remove.



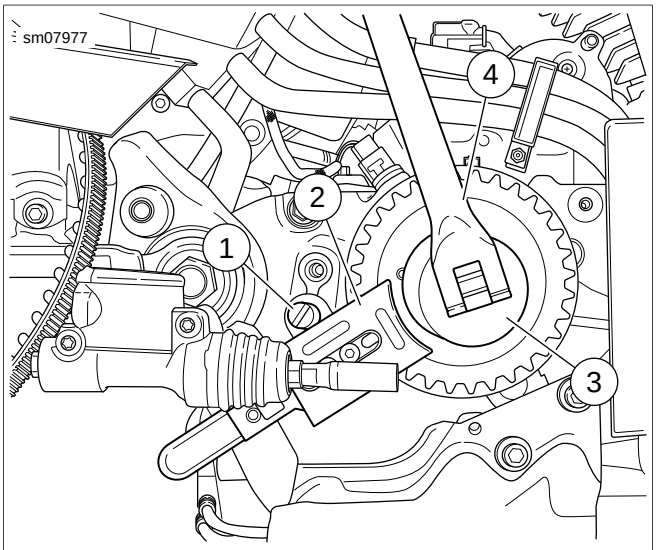
1. **Screw**
2. **Washer**
3. **Exhaust pipe clamp bracket**
4. **Screw**
5. **Screw**
6. **Sprocket cover**

Figure 5-75. Sprocket Cover



1. **Main drive gear shaft**
2. **Transmission sprocket**
3. **Transmission sprocket nut**
4. **Lockplate**
5. **Screw (2)**
6. **Reaction adapter: removal**
7. **Reaction adapter: installation**

Figure 5-76. Transmission Sprocket Assembly



1. **Holding tool reaction adapter (HD-46282-1A)**
2. **Sprocket holding tool (HD-46282-A)**
3. **Mainshaft locknut wrench (HD-46288)**
4. **Breaker bar**

Figure 5-77. Removing Transmission Locknut

INSTALLATION

PART NUMBER	TOOL NAME
HD-46282-1A	REACTION ADAPTER
HD-46282-A	FINAL DRIVE SPROCKET LOCKING TOOL
HD-46288	MAINSHAFT LOCKNUT WRENCH

FASTENER	TORQUE VALUE	
Transmission sprocket nut	50 ft-lbs	67.8 Nm
Transmission sprocket lockplate screw	90-120 **in-lbs**	10.3-13.6 Nm
Muffler mounting bracket screw	30-33 ft-lbs	40.7-44.7 Nm
Exhaust pipe clamp bracket screw	30-33 ft-lbs	40.7-44.8 Nm
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm

1. See Figure 5-76. Install transmission sprocket (2) onto main drive gear shaft (1).

NOTE

Screw REACTION ADAPTER (Part No. HD-46282-1A) into threaded hole in crankcase (7).

2. Shift transmission to neutral.
3. Apply threadlocker and assembly lube.
   a. Apply LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) to the **LH threads** of transmission sprocket nut (3).
   b. Apply a thin film of SCREAMIN' EAGLE ASSEMBLY LUBE to back face of the sprocket nut.

NOTE

*Turn left hand thread sprocket nut **counterclockwise** to install.*

4. See Figure 5-78. Install sprocket nut.
   a. Install FINAL DRIVE SPROCKET LOCKING TOOL (Part No. HD-46282-A) (2). Place handle of tool on top of reaction adapter.
   b. Use a torque wrench (4) with MAINSHAFT LOCKNUT WRENCH (Part No. HD-46288) (3).
5. See Figure 5-79. Tighten transmission sprocket nut to specification.
   a. Tighten to 50 ft-lbs (67.8 Nm) initial torque.
   b. Scribe a line on transmission sprocket nut and continue line on transmission sprocket as shown.
   c. Tighten transmission sprocket nut 30-40 degrees more.

NOTE

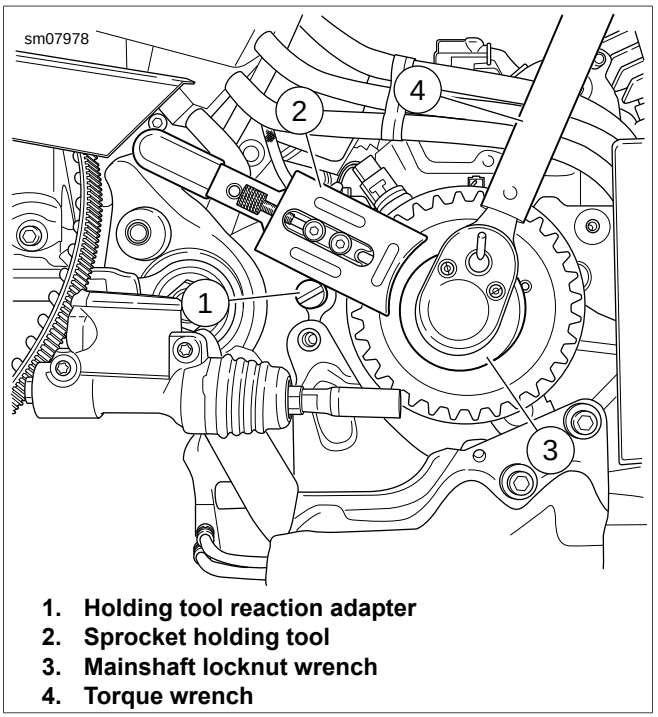
The lockplate can be turned to either side to align screw holes. If screw holes cannot be properly aligned, tighten nut slightly until holes align. Do not exceed 45 degrees. Never LOOSEN nut to align screw holes.

6. See Figure 5-76. Install lockplate.
   a. Install lockplate (4) over nut (3). Align two diagonally opposed holes with two tapped holes of sprocket (2).

NOTE

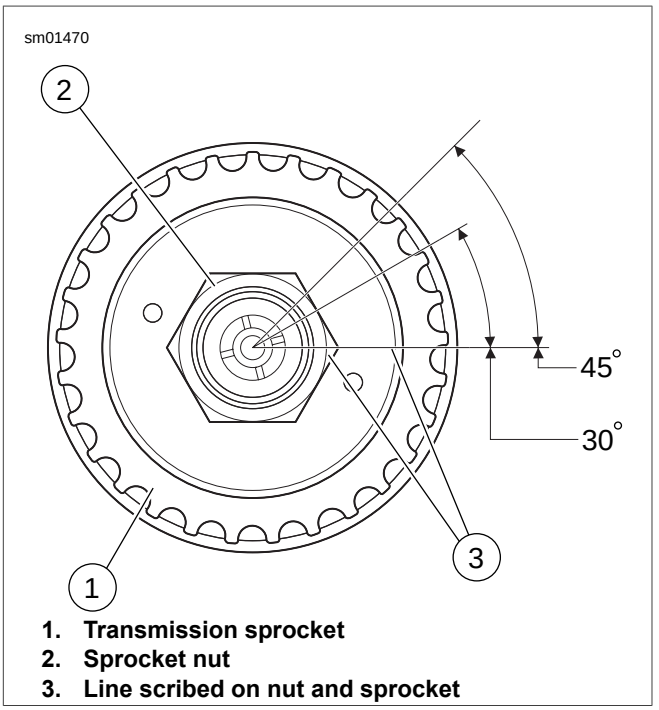
Always install both screws to secure lockplate.

   b. Install screws (5) through two holes in lockplate into two tapped holes in sprocket. Tighten to 90-120 **in-lbs** (10.3-13.6 Nm).
7. Remove REACTION ADAPTER (Part No. HD-46282-1A).
8. See Figure 5-76. Install screw and washer to secure exhaust mounting bracket to engine crankcase. Tighten to 30-33 ft-lbs (40.7-44.7 Nm).
9. Install rear drive belt onto transmission sprocket. See 5.5 DRIVE BELT.
10. Adjust drive belt deflection. See 1.12 DRIVE BELT AND SPROCKETS.
11. See Figure 5-75. Install sprocket cover (6). Thread long screw (4) in top hole and short screw (5) in bottom hole, finger-tight.
12. Install exhaust pipe clamp bracket (3), washer (2) and screw (1). Tighten to 30-33 ft-lbs (40.7-44.8 Nm). Now tighten screws (2, 3) to 80-120 **in-lbs** (9.0-13.6 Nm).
13. Install clevis pin and retaining ring through brake pushrod into master cylinder pushrod collar.
14. Install right footrest and rear brake pedal assembly. See 2.39 RIDER FOOT CONTROLS: MID-MOUNT, Right Footrest and Rear Brake Pedal Assembly or 2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal Assembly.
15. Install exhaust system. See 4.16 EXHAUST SYSTEM.
16. Install main fuse.



1. Holding tool reaction adapter
2. Sprocket holding tool
3. Mainshaft locknut wrench
4. Torque wrench

Figure 5-78. Installing Transmission Sprocket



1. Transmission sprocket
2. Sprocket nut
3. Line scribed on nut and sprocket

Figure 5-79. Transmission Sprocket Nut Final Tightening Procedure

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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
Alternator rotor to sprocket screw	120-140 **in-lbs**	13.6-15.8 Nm	6.25 ALTERNATOR, Assembly and Installation
Alternator stator mounting screw	30-40 **in-lbs**	3.4-4.5 Nm	6.25 ALTERNATOR, Assembly and Installation
Battery negative cable to crankcase stud	55-75 **in-lbs**	6.2-8.5 Nm	6.10 BATTERY CABLES, Negative Battery Cable
Battery strap fastener	72-96 **in-lbs**	8.1-10.8 Nm	6.10 BATTERY CABLES, Positive Battery Cable
Battery terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	6.10 BATTERY CABLES, Negative Battery Cable
Battery terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	6.10 BATTERY CABLES, Positive Battery Cable
Battery terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	6.10 BATTERY CABLES, Positive Battery Cable
Battery tray fastener	96-156 **in-lbs**	10.8-17.6 Nm	6.11 BATTERY TRAY, Installation
Battery tray fastener	96-156 **in-lbs**	10.8-17.6 Nm	6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Installation
Brake caliper bleeder screw	35-61 **in-lbs**	3.9-6.9 Nm	6.22 REAR STOP LAMP SWITCH, Removal
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm	6.17 INDICATOR LAMP MODULE, Assembly
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm	6.27 WHEEL SPEED SENSOR (WSS), Front WSS
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm	6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Backbone Electrical Caddies
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm	6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Installation
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm	6.33 RIGHT HANDLEBAR CONTROL MODULE, Installation
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm	6.34 LEFT HANDLEBAR CONTROL MODULE, Installation
CKP screw	90-120 **in-lbs**	10.3-13.6 Nm	6.23 CRANK POSITION SENSOR (CKP), Installation
Clutch cable guide: XL 1200C/CP/CA/CB	45-65 **in-lbs**	5.0-7.3 Nm	6.16 HEADLAMP, Headlamp Mounts
Coil mounting bracket screw	35-45 **in-lbs**	4.0-5.1 Nm	6.15 IGNITION COIL, Installation
Coil mounting screw	24-72 **in-lbs**	2.7-8.1 Nm	6.15 IGNITION COIL, Installation
ECM caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm	6.11 BATTERY TRAY, Installation
ECM fastener	19-24 **in-lbs**	2.1-2.7 Nm	6.5 ELECTRONIC CONTROL MODULE (ECM), Installation
Electrical caddy cover	50-60 **in-lbs**	5.6-6.8 Nm	6.10 BATTERY CABLES, Positive Battery Cable
Electrical caddy cover	50-60 **in-lbs**	5.6-6.8 Nm	6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Installation
Electrical caddy fastener	50-60 **in-lbs**	5.6-6.8 Nm	6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Installation
Fender, rear, mounting fastener	120-168 **in-lbs**	13.6-19.0 Nm	6.21 REAR TURN SIGNALS, XL 883L/R
Fender, rear, mounting fastener	120-168 **in-lbs**	13.6-19.0 Nm	6.21 REAR TURN SIGNALS, XL 883N and XL 1200X/V
Fender, rear, mounting fastener	120-168 **in-lbs**	13.6-19.0 Nm	6.21 REAR TURN SIGNALS, XL 1200C/CP/CA/CB
Fender brace, rear, screw: XL 883N, XL 1200X/V	20-25 **in-lbs**	2.3-2.8 Nm	6.19 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: HDI
Fender support, rear, screw: XL 883N, XL 1200X/V	132-216 **in-lbs**	14.9-24.4 Nm	6.19 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: HDI

FASTENER	TORQUE VALUE		NOTES
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	6.20 FRONT TURN SIGNALS, XL 1200X
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	6.17 INDICATOR LAMP MODULE, Replacement: XL 883R/L/N, XL 1200CP/CB with Mini-Ape Handlebar, XL 1200T/X/V/XL883N - Tighten rear first, front second.
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	6.17 INDICATOR LAMP MODULE, Replacement: XL 883R/L/N, XL 1200CP/CB with Mini-Ape Handlebar, XL 1200T/X/V/Tighten rear first, front second: XL883N.
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm	6.33 RIGHT HANDLEBAR CONTROL MODULE, Installation
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm	6.34 LEFT HANDLEBAR CONTROL MODULE, Installation
Handlebar riser clamp screw: XL 1200C/CP/CA except with mini-ape handlebar	12-18 ft-lbs	16.3 -24.4 Nm	6.17 INDICATOR LAMP MODULE, Replacement: XL 1200C/CP/CA except with Mini-Ape Handlebar/XL1200C
Handlebar riser clamp screw: XL 1200C/CP/CA except with mini-ape handlebar	12-18 ft-lbs	16.3 -24.4 Nm	6.17 INDICATOR LAMP MODULE, Replacement: XL 1200C/CP/CA except with Mini-Ape Handlebar/XL1200C
Handlebar riser cover screw: XL 1200C/CP/CA except with mini-ape handlebar	8-12 **in-lbs**	0.9-1.4 Nm	6.17 INDICATOR LAMP MODULE, Replacement: XL 1200C/CP/CA except with Mini-Ape Handlebar/XL1200C
Headlamp assembly: XL 1200V/C/CP/CA/CB	30-35 ft-lbs	41-47 Nm	6.16 HEADLAMP, Headlamp Mounts
Headlamp assembly: XL 1200X	30-35 ft-lbs	41-47 Nm	6.16 HEADLAMP, Headlamp Mounts
Headlamp clamp nut: XL 883L/N/R, XL 1200T	120-240 **in-lbs**	13.6-27.1 Nm	6.16 HEADLAMP, Headlamp Mounts
Headlamp mount: XL 1200V/C/CP/CA/CB	30-35 ft-lbs	41-47 Nm	6.16 HEADLAMP, Headlamp Mounts
Headlamp mount: XL 1200X	30-35 ft-lbs	41-47 Nm	6.16 HEADLAMP, Headlamp Mounts
Headlamp upper bracket fasteners: XL 883L/R/N, XL 1200T	120-192 **in-lbs**	14-22 Nm	6.16 HEADLAMP, Headlamp Mounts
Headlamp visor: XL 1200C/CP/CA/CB	120-192 **in-lbs**	14-22 Nm	6.16 HEADLAMP, Headlamp Mounts
Horn acorn nut: XL 1200C/CP/CA/CB XL 1200T/V	60-180 **in-lbs**	6.8-20.4 Nm	6.32 HORN, Side Mount: XL 1200C/CP/CA/CB, XL 1200T/V
Horn bracket rubber stud: XL 1200C/CP/CA/CB XL 1200T/V	96-192 **in-lbs**	10.8-21.7 Nm	6.32 HORN, Side Mount: XL 1200C/CP/CA/CB, XL 1200T/V
Horn bracket to center engine mount bracket: XL 1200C/CP/CA/CB XL 1200T/V	35-45 **in-lbs**	4.0-5.1 Nm	6.32 HORN, Side Mount: XL 1200C/CP/CA/CB, XL 1200T/V
Horn fastener: XL 883L/N/R, XL 1200X	36-48 **in-lbs**	4.1-5.4 Nm	6.32 HORN, Front Mount: XL 883L/N/R, XL 1200X
Horn flange nut: XL 1200C/CP/CA/CB XL 1200T/V	80-100 **in-lbs**	9.0-11.3 Nm	6.32 HORN, Side Mount: XL 1200C/CP/CA/CB, XL 1200T/V
Ignition switch face nut	72-96 **in-lbs**	8.1-10.8 Nm	6.13 IGNITION SWITCH, Installation
Ignition switch mounting screw	35-45 **in-lbs**	4.0-5.1 Nm	6.13 IGNITION SWITCH, Installation
J-clip fastener	45-50 ft-lbs	61.0-67.8 Nm	6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, J-Clips: Mid-Mount Models
JSS screw	96-120 **in-lbs**	10.9-13.6 Nm	6.30 JIFFY STAND SENSOR (JSS): INTERNATIONAL MODELS, Installation
License plate clamp nut	20-25 **in-lbs**	2.3-2.8 Nm	6.21 REAR TURN SIGNALS, XL 1200T
License plate lamp housing screw: XL 883N	14-16 **in-lbs**	1.6-1.8 Nm	6.19 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: HDI

FASTENER	TORQUE VALUE		NOTES
License plate reflector bracket Keps nut: XL 883N, XL 1200X/V (HDI)	10-15 **in-lbs**	1.1-1.7 Nm	6.19 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Reflector Brackets: XL 883N, XL 1200X/V (HDI)
Main harness ground wire	55-75 **in-lbs**	6.2-8.5 Nm	6.10 BATTERY CABLES, Positive Battery Cable
Main harness ground wire	55-75 **in-lbs**	6.2-8.5 Nm	6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Installation
Neutral indicator switch	120-180 **in-lbs**	13.6-20.3 Nm	6.28 NEUTRAL INDICATOR SWITCH, Replacement
Oil pressure switch	60-90 **in-lbs**	6.8-10.2 Nm	6.31 OIL PRESSURE SWITCH, Installation
Oil tank mounting screws	72-96 **in-lbs**	8.1-10.8 Nm	6.10 BATTERY CABLES, Positive Battery Cable
Oil tank mounting screws	72-96 **in-lbs**	8.1-10.8 Nm	6.10 BATTERY CABLES, Positive Battery Cable
Oil tank mounting screws	72-96 **in-lbs**	8.1-10.8 Nm	6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Installation
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	6.19 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: DOM Only
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	6.19 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: HDI
Solenoid contact post jamnut	65-80 **in-lbs**	7.3-9.0 Nm	6.12 STARTER, Solenoid
Speedometer screws	12-17 **in-lbs**	1.4-1.9 Nm	6.4 SPEEDOMETER, Installation
Speedometer screws	12-17 **in-lbs**	1.4-1.9 Nm	6.4 SPEEDOMETER, Installation
Speedometer screws	12-17 **in-lbs**	1.4-1.9 Nm	6.4 SPEEDOMETER, Installation
Stabilizer link, upper front, frame bracket mounting screw: XL 883L/N/R, XL 1200X	25-35 ft-lbs	33.9-47.5 Nm	6.32 HORN, Front Mount: XL 883L/N/R, XL 1200X
Starter motor oil line clamp fastener	16-21 **in-lbs**	1.8-2.4 Nm	6.12 STARTER, Installation
Starter mounting bolt	13-20 ft-lbs	17.6-27.1 Nm	6.12 STARTER, Installation
Starter positive ring terminal	60-80 **in-lbs**	6.8-9.0 Nm	6.12 STARTER, Installation
Starter ring terminal hex nut	60-80 **in-lbs**	6.8-9.0 Nm	6.10 BATTERY CABLES, Positive Battery Cable
Starter ring terminal hex nut	60-80 **in-lbs**	6.8-9.0 Nm	6.12 STARTER, Solenoid
Stator harness retainer screw	56 **in-lbs**	6.3 Nm	6.25 ALTERNATOR, Assembly and Installation/Screw must be flush with plate. Do not exceed torque specification.
Stop lamp switch, rear	12-15 **in-lbs**	1.4-1.6 Nm	6.22 REAR STOP LAMP SWITCH, Installation
Support bracket to horn cover: XL 1200C/CP/CA/CB, XL 1200T/V	36-60 **in-lbs**	4.1-6.8 Nm	6.32 HORN, Side Mount: XL 1200C/CP/CA/CB, XL 1200T/V
Switch assembly retainer screws	8-10 **in-lbs**	0.9-1.1 Nm	6.33 RIGHT HANDLEBAR CONTROL MODULE, Installation
Switch assembly retainer screws	8-10 **in-lbs**	0.9-1.1 Nm	6.34 LEFT HANDLEBAR CONTROL MODULE, Clutch Switch Replacement
Switch assembly retainer screws	8-10 **in-lbs**	0.9-1.1 Nm	6.34 LEFT HANDLEBAR CONTROL MODULE, Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	6.33 RIGHT HANDLEBAR CONTROL MODULE, Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	6.34 LEFT HANDLEBAR CONTROL MODULE, Installation
Tail lamp base mounting screw: XL 883R/L, XL 1200T	45-48 **in-lbs**	5.1-5.4 Nm	6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L, XL 1200T
Tail lamp LED base fasteners: XL 1200C/CP/CA/CB	40-50 **in-lbs**	4.5-5.6 Nm	6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, LED Tail Lamp: XL 1200C/CP/CA/CB

FASTENER	TORQUE VALUE		NOTES
Tail lamp LED screws: XL 1200C/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm	6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, LED Tail Lamp: XL 1200C/CP/CA/CB
Tail lamp lens screw: XL 883R/L, XL 1200T	20-24 **in-lbs**	2.3-2.7 Nm	6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Bulb Replacement: XL 883R/L, XL 1200T
Tail lamp lens screw: XL 883R/L, XL 1200T	20-24 **in-lbs**	2.3-2.7 Nm	6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L, XL 1200T
Tail lamp lens screw: XL 883R/L, XL 1200T	20-24 **in-lbs**	2.3-2.7 Nm	6.21 REAR TURN SIGNALS, XL 1200T
Turn signal, front, ball head studs: all except XL 1200X, XL 1200T	96-144 **in-lbs**	10.8-16.3 Nm	6.20 FRONT TURN SIGNALS, All Except XL 1200X, XL 1200T
Turn signal, front, ball stud set screw: all except XL 1200X, XL 1200T	96-120 **in-lbs**	10.8-13.6 Nm	6.20 FRONT TURN SIGNALS, All Except XL 1200X, XL 1200T
Turn signal/license bracket, rear, nut: XL 1200T	20-25 **in-lbs**	2.3-2.8 Nm	6.21 REAR TURN SIGNALS, XL 1200T
Turn signal bracket pinch screw: XL 1200T	36-54 **in-lbs**	4.1-6.1 Nm	6.20 FRONT TURN SIGNALS, XL 1200T
Turn signal housing, front, nut: XL 1200T	12-16 ft-lbs	16.3-21.7 Nm	6.20 FRONT TURN SIGNALS, XL 1200T
Turn signal housing, rear, locking nut: XL 1200T	64-75 **in-lbs**	7.2-8.4 Nm	6.21 REAR TURN SIGNALS, XL 1200T
Turn signal housing to mount, rear, fastener	96-156 **in-lbs**	10.9-17.6 Nm	6.21 REAR TURN SIGNALS, XL 883L/R
Turn signal housing to mount, rear, fastener	96-156 **in-lbs**	10.9-17.6 Nm	6.21 REAR TURN SIGNALS, XL 883N and XL 1200X/V
Turn signal housing to mount, rear, fastener	96-156 **in-lbs**	10.9-17.6 Nm	6.21 REAR TURN SIGNALS, XL 1200C/CP/CA/CB
Turn signal mount, front, nut: XL 1200X	12-16 ft-lbs	16.3-21.7 Nm	6.20 FRONT TURN SIGNALS, XL 1200X
Turn signal stalk locknut	120-168 **in-lbs**	13.6-19.0 Nm	6.21 REAR TURN SIGNALS, XL 883L/R
Turn signal stalk locknut	120-168 **in-lbs**	13.6-19.0 Nm	6.21 REAR TURN SIGNALS, XL 883N and XL 1200X/V
Turn signal stalk locknut	120-168 **in-lbs**	13.6-19.0 Nm	6.21 REAR TURN SIGNALS, XL 1200C/CP/CA/CB
Voltage regulator mounting screw	30-60 **in-lbs**	3.4-6.8 Nm	6.24 VOLTAGE REGULATOR, Installation
VSS screw	90-120 **in-lbs**	10.2-13.6 Nm	6.26 VEHICLE SPEED SENSOR (VSS), Installation

SPECIFICATIONS: ELECTRICAL 6.2

SPECIFICATIONS

Table 6-1. Electrical

COMPONENT	SPECIFICATION	
Ignition timing	Not adjustable	
Battery	12 V, 225 CCA, 12 Ah, sealed and maintenance free	
Charging system	Single-phase, 30 A system (357 W @ 13.5 V, 2000 rpm, 405 W max power @ 13.5 V)	
Spark plug type	6R12	
Spark plug size	12 mm	
Spark plug gap	0.038-0.043 in	0.97-1.09 mm
Spark plug torque	12-18 ft-lbs	16.3-24.4 Nm

Table 6-2. Ignition Coil Resistance

RESISTANCE	PRIMARY	SECONDARY
All Models	0.3-0.7 Ohm	1500-2400 Ohm

Table 6-3. Alternator

ITEM	SPECIFICATION
AC voltage output	20-28 VAC per 1000 engine rpm
Stator coil resistance	0.1-0.3 Ohm

Table 6-4. Voltage Regulator

ITEM	SPECIFICATION
Voltage output @ 75 °F (23.9 °C)	14.3-14.7 VDC
Current @ 3600 rpm	32 A

Table 6-5. Fuses

ITEM	AMP RATING
Main fuse	40
Battery	10
P&A	15

Table 6-6. 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 (20 °C)
Stall torque	8.0 ft-lbs (10.8 Nm) @ 2.4 V

Table 6-7. 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

FUSES 6.3

REPLACEMENT

Removal

1. See Figure 6-1. Open left side cover.
2. Pull fuse block.
3. See Figure 6-2. Lift side latches to remove the cap.

NOTE

Models with sirens: *With fob present, turn OFF/RUN to RUN (keyless) or turn ignition switch to ON.*

4. See Figure 6-3. Remove the suspect fuse:
   a. Main fuse (1)
   b. P&A (2)
   c. Battery (3)
5. Inspect fuse. Discard damaged fuse.

Installation

1. Turn OFF/RUN to OFF (keyless) or turn ignition switch to OFF.
2. Install **new** fuse as necessary.
3. Install cap.
4. Install fuse block.
5. Close side cover.

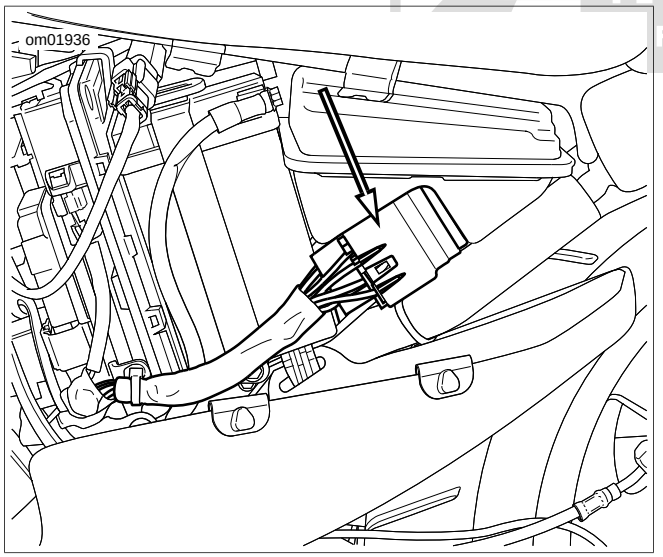


Figure 6-1. Fuse Block

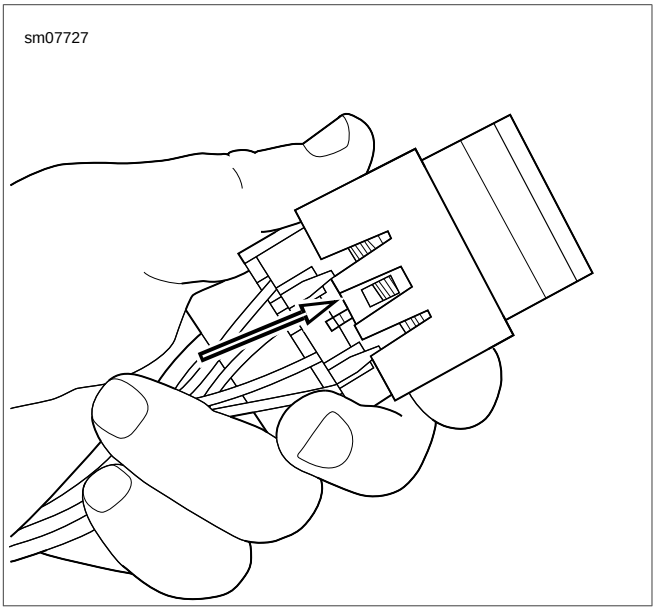


Figure 6-2. Cap Side Latch

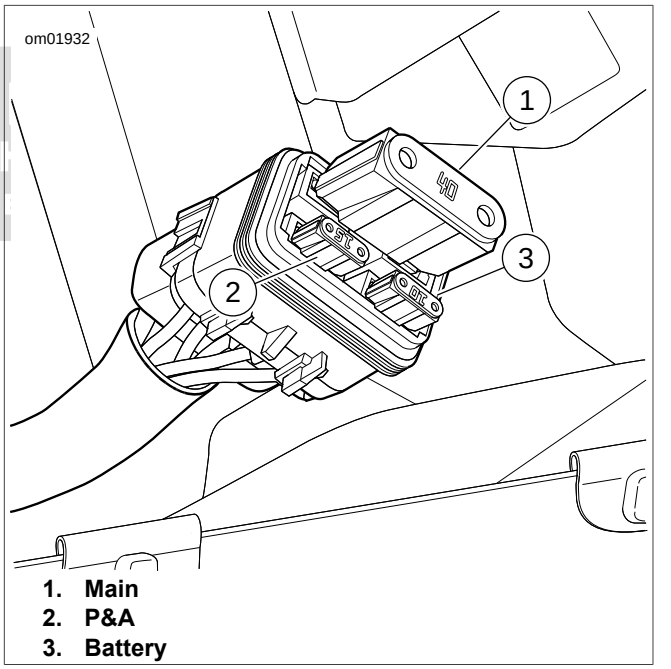


Figure 6-3. Fuses

SPEEDOMETER 6.4

REMOVAL

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

NOTE

The speedometer has backlight LEDs. Replace the entire assembly if an LED fails.

XL 883L/N/R, XL 1200CP/CB with Mini-Ape Handlebar, XL 1200T, XL 1200V

1. See Figure 6-4. Remove screws (6) from backplate (5).
2. Separate speedometer connector [39] (7).
3. Push speedometer (1), front (2) and back (4) gaskets out of instrument housing (3).
4. Inspect gaskets, speedometer connector [39] and wiring. Repair or replace as required.

XL 1200X

1. See Figure 6-5. Remove screws (5) from backplate (4).
2. Separate speedometer connector [39] (6).
3. Push speedometer (1) and gasket (2) out of handlebar/instrument clamp (3).
4. Inspect gaskets, speedometer connector [39] and wiring. Repair or replace as required.

XL 1200C/CA, XL 1200CP without Mini-Ape Handlebar

1. See Figure 6-6. Remove screws (4) from handlebar/instrument clamp (3).
2. Push speedometer (1) and gasket (2) out of handlebar/instrument clamp (3).
3. Separate speedometer connector [39] (8).
4. Inspect gaskets, speedometer connector [39] and wiring. Repair or replace as required.

INSTALLATION

FASTENER	TORQUE VALUE	
Speedometer screws	12-17 **in-lbs**	1.4-1.9 Nm
Speedometer screws	12-17 **in-lbs**	1.4-1.9 Nm
Speedometer screws	12-17 **in-lbs**	1.4-1.9 Nm

XL 883L/N/R, XL 1200CP/CB w/Mini-Ape Handlebar, XL 1200T, XL 1200V

NOTE

Lubricate parts with glass cleaner or isopropyl alcohol.

1. See Figure 6-4. Install front gasket (2) on speedometer.
2. Thread speedometer harness and connector [39] (7) through instrument housing/clamp (3).
3. Plug speedometer connector [39] into back of speedometer.

NOTE

Match speedometer locator features with tabs in housing/clamp.

4. Press speedometer into instrument housing/clamp.

NOTE

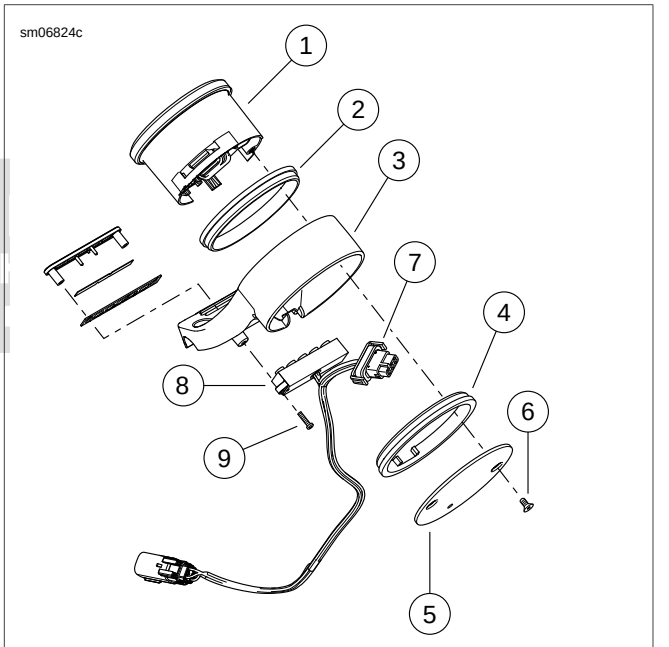
Match gasket tabs with tabs in housing/clamp.

5. Install back gasket (4).

NOTE

Position vent hole at bottom.

6. Fit backplate (5).
7. Install screws (6). Tighten to 12-17 **in-lbs** (1.4-1.9 Nm).
8. Install main fuse.



1. **Speedometer**
2. **Front gasket**
3. **Instrument housing/bracket**
4. **Back gasket**
5. **Backplate**
6. **Screws (2)**
7. **Speedometer connector [39]**
8. **Indicator lamp module**
9. **Fastener (2)**

Figure 6-4. Speedometer: XL 883L/N/R, XL 1200CP/CB Mini-Ape Handlebar, XL 1200T, XL 1200V

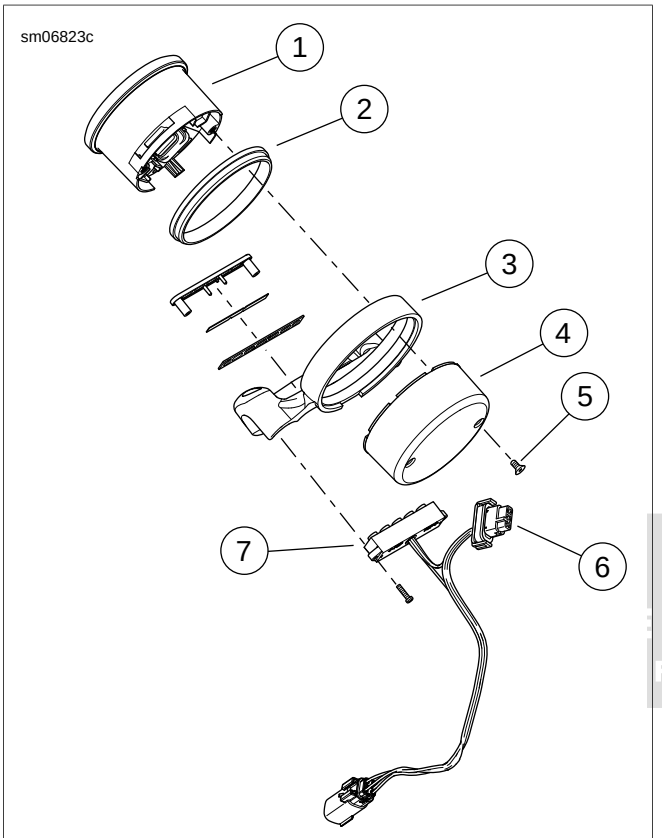
XL 1200X

1. See Figure 6-5. Install gasket (2) on speedometer (1).
2. Thread speedometer harness and connector [39B] (6) through housing/clamp (3).

NOTE

Lubricate parts with glass cleaner or isopropyl alcohol.

3. Plug speedometer connector [39] into back of speedometer.
4. Press speedometer into instrument housing/clamp.
5. Align the backplate (4) slot over harness.
6. Install screws (5). Tighten to 12-17 **in-lbs** (1.4-1.9 Nm).
7. Install main fuse.



1. **Speedometer**
2. **Gasket**
3. **Instrument housing/clamp**
4. **Backplate**
5. **Screw (2)**
6. **Speedometer connector [39B]**
7. **Indicator lamp module**

Figure 6-5. Speedometer: XL 1200X

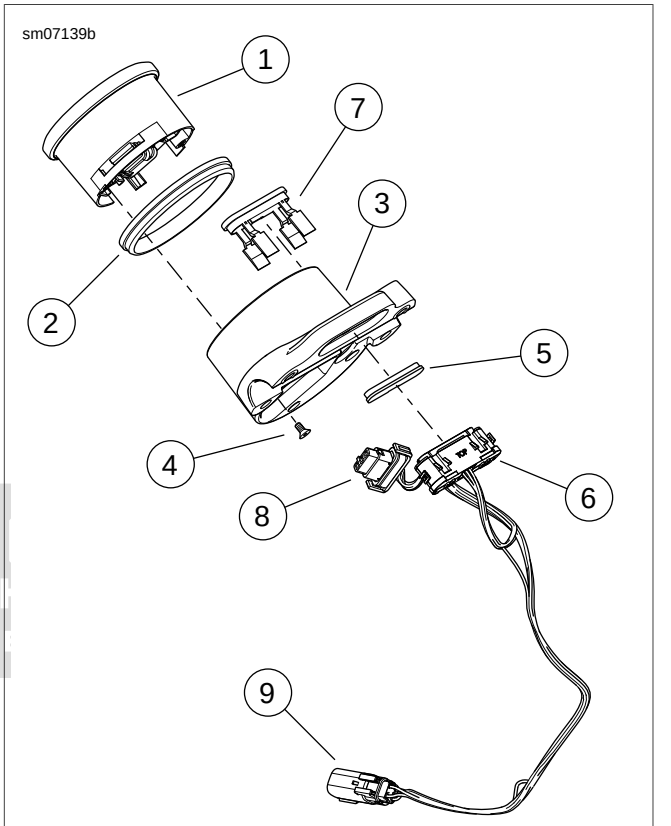
XL 1200C/CA, XL 1200CP without Mini-Ape Handlebar

1. See Figure 6-6. Install gasket (2) on speedometer (1).
2. Thread speedometer harness and connector [39B] (8) through housing/clamp (3).

NOTE

Lubricate parts with glass cleaner or isopropyl alcohol.

3. Plug speedometer connector [39] into back of speedometer.
4. Press speedometer into instrument housing/clamp.
5. Install screws (4). Tighten to 12-17 **in-lbs** (1.4-1.9 Nm).
6. Install main fuse.



1. **Speedometer**
2. **Gasket**
3. **Handlebar/instrument clamp**
4. **Screw (2)**
5. **Indicator lamp lens**
6. **Indicator lamp module**
7. **Indicator lamp bezel**
8. **Speedometer connector [39B]**
9. **Instrument connector [20A]**

Figure 6-6. Speedometer: XL 1200C/CP/CA

ELECTRONIC CONTROL MODULE (ECM) 6.5

REMOVAL

NOTES

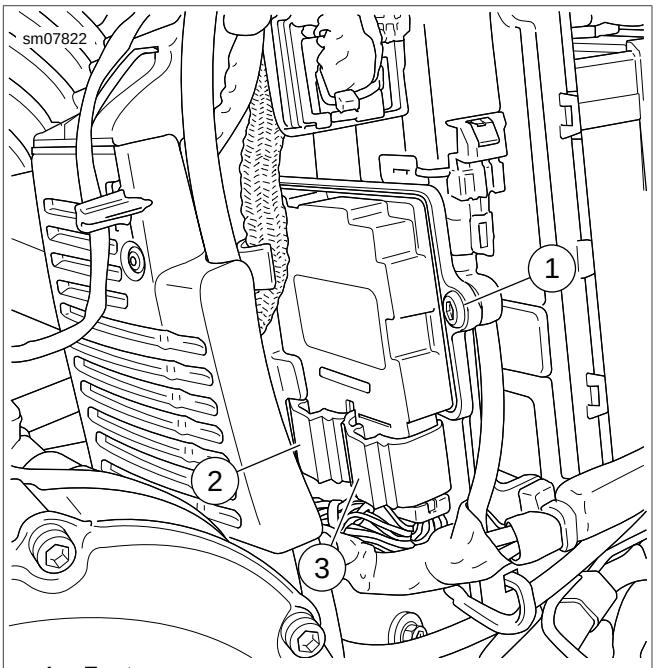
- *For diagnostic information see the electrical diagnostic manual.*
- *This part is not serviceable. Replace assembly upon failure.*

1. **Models with alarms:** Disable alarm system.
2. Remove left side cover.

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

3. Remove main fuse.
4. See Figure 6-7. Remove ECM fastener (1).
5. Remove ECM.
6. Remove connector [78B-1] housing (2).
7. Remove connector [78B-2] housing (3).



1. **Fastener**
2. **Connector [78B-1]**
3. **Connector [78B-2]**

Figure 6-7. Electronic Control Module (ECM)

INSTALLATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
ECM fastener	19-24 **in-lbs**	2.1-2.7 Nm

1. Connect ECM wiring harness connector [78B-1] to ECM.
2. Connect ECM wiring harness connector [78B-2] to ECM.
3. Install ECM to caddy fastener. Tighten to 19-24 **in-lbs** (2.1-2.7 Nm).
4. Install main fuse.
5. Install side cover.
6. Calibrate with DIGITAL TECHNICIAN II (Part No. HD-48650).

BODY CONTROL MODULE (BCM) 6.6

REMOVAL

NOTES

- *For diagnostic information see the electrical diagnostic manual.*
- *This part is not serviceable. Replace assembly upon failure.*

1. Remove side cover.

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. See Figure 6-8. Press release to disconnect battery power connector [259B].
4. Slide BCM out of electrical caddy.
5. See Figure 6-9. Press the central release on BCM connector [242B]. Rotate locking bar. Remove the housing.

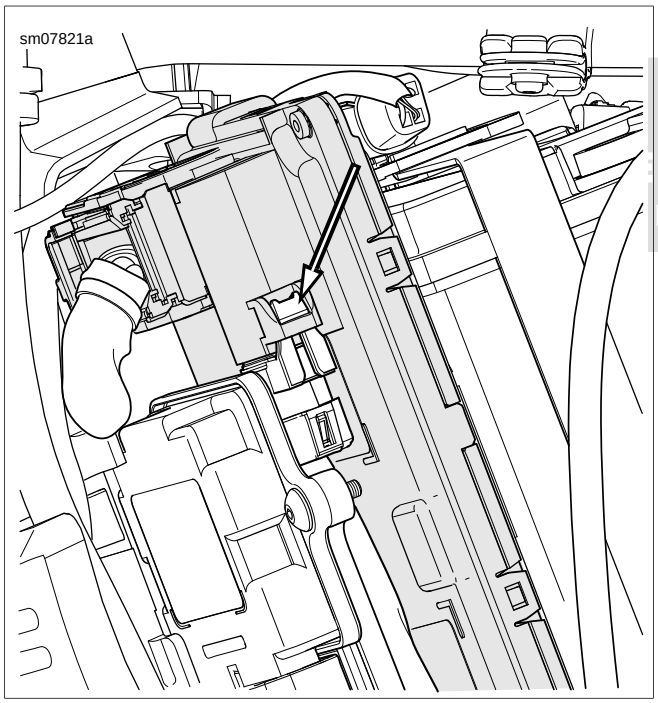


Figure 6-8. Battery Power Connector [259] Release

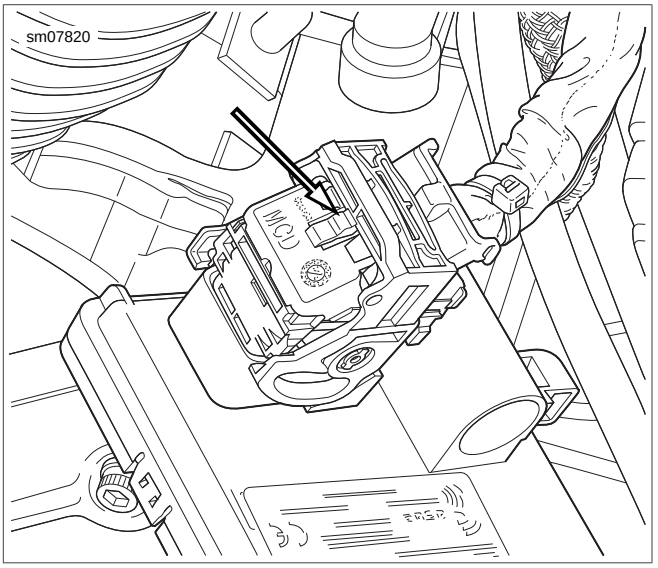


Figure 6-9. BCM Connector [242] Release

INSTALLATION

PART NUMBER	TOOL NAME
HD-48650	DIGITAL TECHNICIAN II

NOTES

- *Replacement BCMs are configured for keyless ignition.*
- *If ignition is cycled ON when BCM is not secured in electrical caddy, the lights cycle on for 2 seconds and word "tip" displays in the odometer.*
- ***Keyed ignition:** If RUN/STOP switch is in RUN position when BCM is replaced, BCM enables all ignition functions. However, ignition switch does not function. To restore functionality, turn ignition and RUN/STOP switches OFF then turn ignition ON.*

1. Verify that ignition and/or OFF/RUN switch are off.
2. Connect BCM connector [242B] connector housing.
3. Slide BCM part way into caddy slot.
4. Connect battery power connector [259B].

NOTE

See Figure 6-10. Route the BCM harness under connector [242B].

5. Install BCM in caddy slot.
6. Install main fuse.
7. **Keyed ignition:** Turn ignition switch to ON to configure BCM.
8. **Keyless ignition:** Turn RUN/STOP switch to RUN.

⚠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. Configure BCM and password learn with DIGITAL TECHNICIAN II (Part No. HD-48650).
10. Install side cover.

⚠WARNING

Be sure headlamp, tail and stop lamp and turn signals are operating properly before riding. Poor visibility of rider to other motorists can result in death or serious injury. (00478b)

11. Test all switches and lights for proper operation.

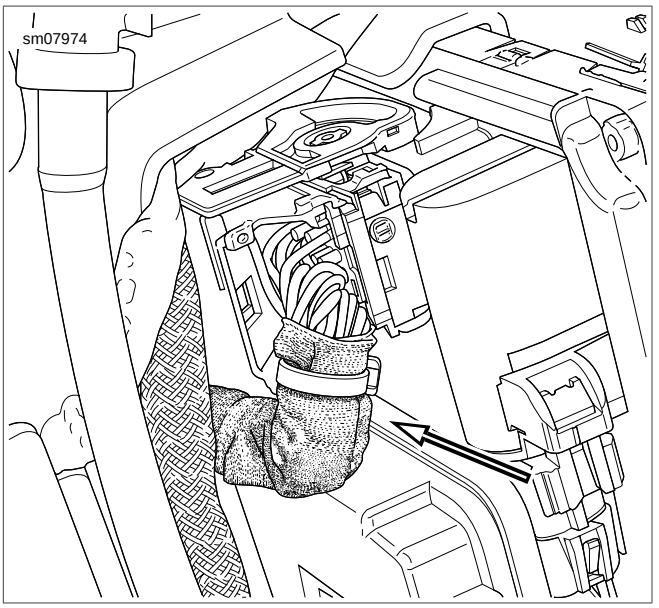


Figure 6-10. BCM Harness Bundle

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

ACTUATION

Activation consists of assigning two fobs to the system and entering an initial PIN. The PIN can be changed by the owner. See 6.8 PERSONAL IDENTIFICATION NUMBER (PIN), Changing The PIN.

1. Configure vehicles by assigning both fobs to the vehicle.
2. Configure vehicles by entering a PIN picked by the owner. The personal PIN allows the owner to operate the system if the fob is lost or inoperable. Record the PIN in the owner's manual. Instruct the customer to carry a copy (use the wallet card found in the owner's manual). See 6.8 PERSONAL IDENTIFICATION NUMBER (PIN).

Once the system has been activated, it "arms" within 5 seconds of switching the OFF/RUN switch to OFF and no motorcycle motion.

ANTENNA

See Figure 6-11. The antenna module connects directly to the antenna connector [209].

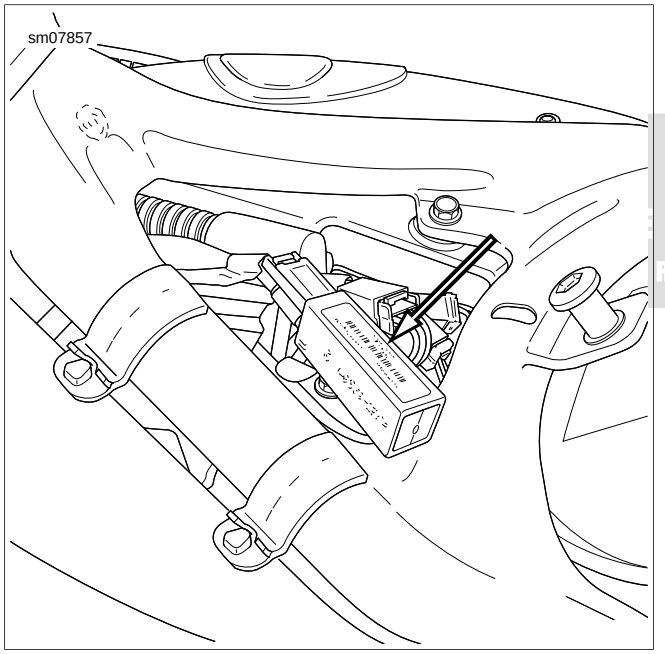


Figure 6-11. Security Antenna

FOB BATTERY

Battery Replacement Schedule

Replace the fob battery every year.

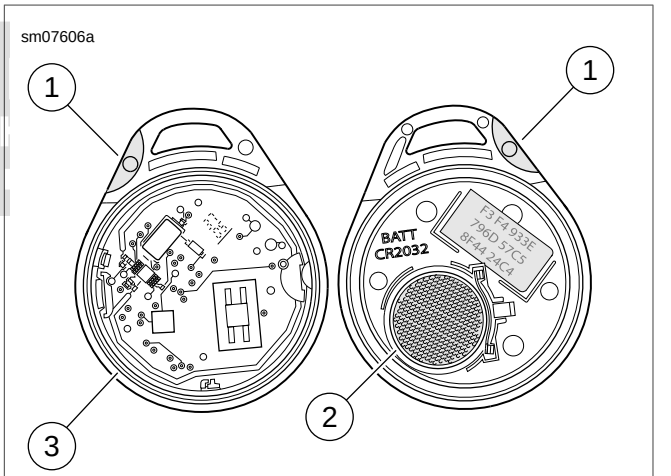
Battery Replacement

1. Open the fob case.
   a. See Figure 6-12. Place a thin blade in the thumbnail slot (1) between the two halves of the case.
   b. Slowly twist the blade.

NOTE

Use a CR2032 or equivalent battery.

2. Replace the battery.
   a. Remove the original battery.
   b. Install a **new** battery with the positive side down.
3. Close the case.
   a. See Figure 6-12. With O-ring (3) in place, align case halves.
   b. Snap case halves together.



1. **Thumbnail slot**
2. **Battery (CR2032)**
3. **O-ring**

Figure 6-12. Open Fob

PERSONAL IDENTIFICATION NUMBER (PIN) 6.8

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.

CHANGING THE PIN

The rider can change the PIN at any time. Refer to Table 6-8.

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 6-8. Changing the PIN

STEP	ACTION	WAIT FOR CONFIRMATION	NOTES
1	Select a 5-digit (1 thru 9) PIN.		
2	With an assigned fob present, turn the OFF/RUN switch to **RUN**.		
3	Cycle the OFF/RUN switch twice: **OFF - RUN - OFF - RUN**.		
4	Press **left** turn signal switch **2 times**.	ENTER PIN will scroll through the odometer window.	
5	Press **right** turn signal switch **1 time** and release.	Turn signals will flash 3 times. Current PIN will appear in odometer. The first digit will be flashing.	
6	Enter first digit of new PIN by pressing and releasing the **left** turn signal switch until the selected digit appears.		
7	Press **right** turn signal switch **1 time** and release.	The new digit will replace the current in odometer window.	
8	Enter second digit of selected PIN by pressing and releasing the **left** turn signal switch until the selected digit is present.		
9	Press **right** turn signal switch **1 time** and release.	The new digit will replace the current in odometer window.	
10	Enter third digit of the selected PIN by pressing and releasing the **left** turn signal switch until the selected digit is present.		
11	Press **right** turn switch **1 time** and release.	The new digit will replace the current in odometer window.	
12	Enter fourth digit of new PIN by pressing and releasing the **left** turn signal switch until the selected digit is present.		
13	Press **right** turn switch **1 time** and release.	The new digit will replace the current in odometer window.	
14	Enter fifth digit of the new PIN by pressing and releasing the **left** turn signal switch until the selected digit is present.		
15	Press **right** turn switch **1 time** and release.	The new digit will replace the current in odometer window.	

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Table 6-8. Changing the PIN

STEP	ACTION	WAIT FOR CONFIRMATION	NOTES
16	Push the OFF/RUN switch to the **OFF** position.		Pushing the OFF/RUN switch to **OFF** stores the new PIN in the module.
17	Record on the wallet card from the owner's manual.		

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

SMART SIREN 6.9

REPLACEMENT

Removal

1. Disarm security system.
2. Remove rear fender.
   a. **XL 883R/L, CAN XL 883N and XL 1200V/X:** See 2.30 REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X.
   b. **XL 1200C/CP/CA/CB:** See 2.31 REAR FENDER: XL 1200C/CP/CA/CB.
   c. **XL 1200T:** See 2.32 REAR FENDER: XL 1200T.
   d. **XL 883N, XL 1200X/V:** See 2.33 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V.
3. See Figure 6-13. Disconnect connector [142B] from siren.

NOTE

BRZ models: *BRZ models include a security tracking antenna.*

4. **BRZ models:** Disconnect connector [266B] from siren.
5. Remove siren.

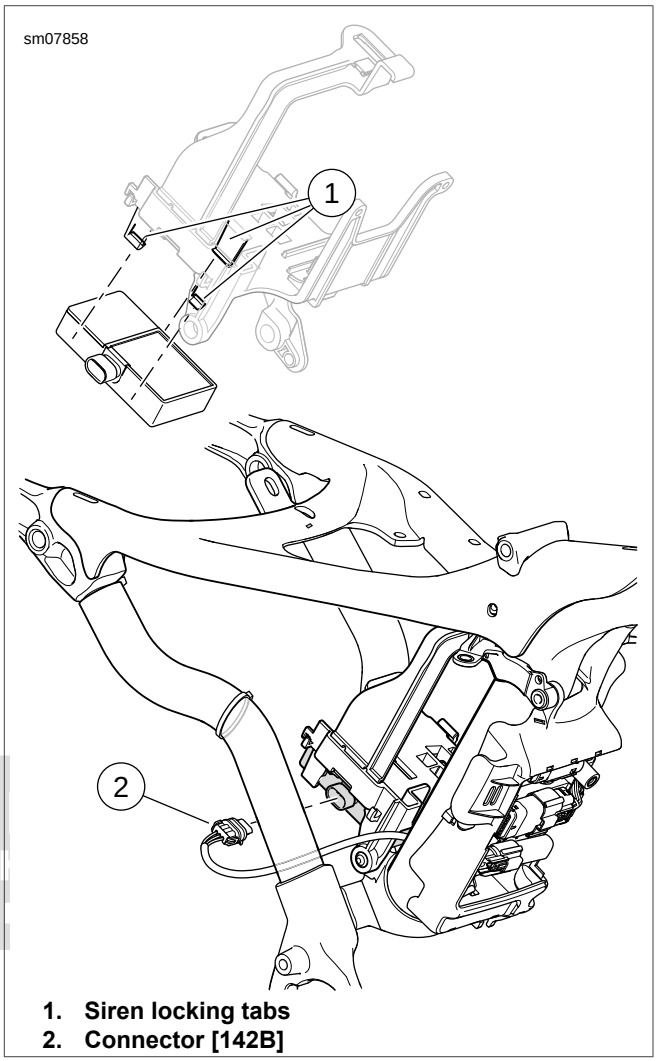
Installation

1. See Figure 6-13. Slide siren into battery tray with sounder disc facing down. Make sure tabs (1) lock siren in place.
2. Connect connector [142B] (2) to siren.
3. **BRZ models:** Mate antenna connector [266B] to siren.
4. Install rear fender.
   a. **XL 883R/L, CAN XL 883N and XL 1200V/X:** See 2.30 REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X.
   b. **XL 1200C/CP/CA/CB:** See 2.31 REAR FENDER: XL 1200C/CP/CA/CB.
   c. **XL 1200T:** See 2.32 REAR FENDER: XL 1200T.
   d. **XL 883N, XL 1200X/V:** See 2.33 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V.

NOTE

Two chirps after an arming command indicate a working siren.

5. Verify siren operation.



1. Siren locking tabs
2. Connector [142B]

Figure 6-13. Smart Siren

BATTERY

Replacement Schedule

NOTES

- *The 9 V battery is rechargeable. Battery life is approximately three to six years.*
- *If the motorcycle battery is less than 12.5 V, the internal siren battery cannot charge.*

Replacement

1. Disarm security system.
2. Remove siren. See 6.9 SMART SIREN, Replacement.
3. See Figure 6-14. To release the battery cover (3), push the catches (1) in through the two slots (2) in the end of the siren with a small pick.

NOTES

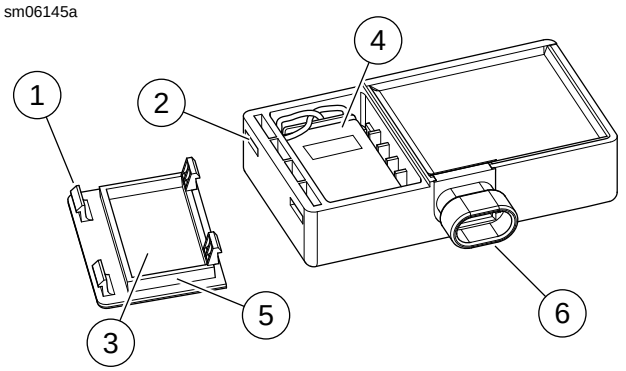
- *Do not wipe away the existing grease. Reapply the grease to terminals on **new** battery.*
- *Only install a 9 V nickel metal hydride battery.*

4. Remove battery (4) from polarized battery clip.
5. Recharge and/or install a **new** battery.
6. Install battery cover (3).
   a. 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.
7. Install siren. See 6.9 SMART SIREN, Replacement.

NOTE

Two chirps after an arming command indicate a working siren.

8. Verify operation.



1. **Catch**
2. **Slot**
3. **Cover**
4. **9 Volt battery**
5. **Rubber seal**
6. **Connector [142A]**

Figure 6-14. Siren Battery Compartment

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

BATTERY CABLES 6.10

NEGATIVE BATTERY CABLE

FASTENER	TORQUE VALUE	
Battery negative cable to crankcase stud	55-75 **in-lbs**	6.2-8.5 Nm
Battery terminal screw	60-70 **in-lbs**	6.8-7.9 Nm

Removal

1. Remove left side cover.
2. Remove main fuse.
3. Remove negative cable from battery. See 1.20 BATTERY MAINTENANCE, Disconnection and Removal.
4. See Figure 6-15. Remove nut and ring terminal from negative battery ground stud.

NOTE

Note routing of negative battery cable across crankcase and under battery tray.

5. Pull cable from notch in bottom of battery tray.
6. Pull negative battery cable from under battery tray.

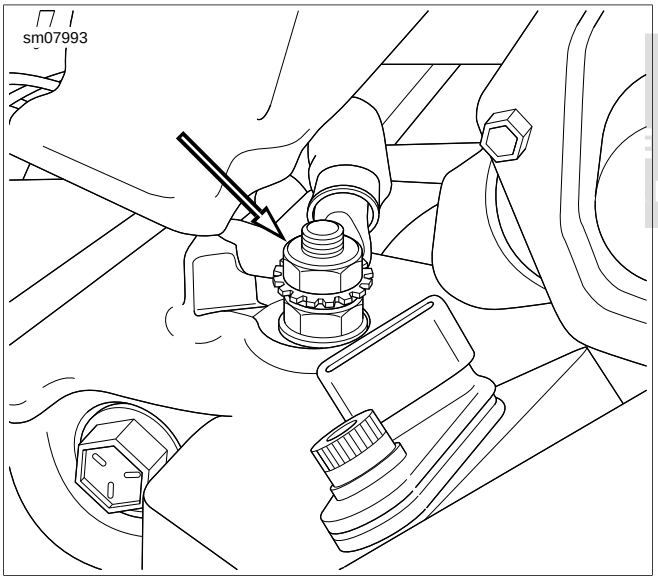


Figure 6-15. Negative Battery Cable Ring Terminal and Ground Stud

Installation

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)

1. Route negative battery cable under battery tray, positive battery cable and main wire harness ground to crankcase ground stud.
2. Install negative battery cable ring terminal and nut. Using a swivel socket, tighten to 55-75 **in-lbs** (6.2-8.5 Nm).
3. Fit negative cable to hook in bottom of battery tray.

NOTE

Apply a light coat of petroleum jelly or corrosion retardant material to battery terminals.

4. Install negative battery cable and terminal screw. Tighten to 60-70 **in-lbs** (6.8-7.9 Nm).
5. Install main fuse.
6. Install left side cover.

POSITIVE BATTERY CABLE

FASTENER	TORQUE VALUE	
Starter ring terminal hex nut	60-80 **in-lbs**	6.8-9.0 Nm
Oil tank mounting screws	72-96 **in-lbs**	8.1-10.8 Nm
Oil tank mounting screws	72-96 **in-lbs**	8.1-10.8 Nm
Main harness ground wire	55-75 **in-lbs**	6.2-8.5 Nm
Battery strap fastener	72-96 **in-lbs**	8.1-10.8 Nm
Battery terminal screw	60-70 **in-lbs**	6.8-7.9 Nm
Battery terminal screw	60-70 **in-lbs**	6.8-7.9 Nm
Electrical caddy cover	50-60 **in-lbs**	5.6-6.8 Nm

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. Remove seat.
2. Remove side covers.
3. Remove ECM caddy cover.
4. Remove battery. See 1.20 BATTERY MAINTENANCE, Disconnection and Removal.
5. Remove ECM. See 6.5 ELECTRONIC CONTROL MODULE (ECM).
6. Remove BCM. See 6.6 BODY CONTROL MODULE (BCM).
7. Remove battery tray. See 6.11 BATTERY TRAY.
8. Remove oil tank fasteners.
9. Remove fastener securing electrical caddy to oil tank bracket.
10. Remove main wire harness ground from crankcase.
11. Pull back rubber cap, remove nut with captive lockwasher and positive battery cable from starter post.
12. Remove boot from battery end of cable.

13. See Figure 6-16. Remove cable strap securing positive battery cable to main wire harness.
14. Pull battery cable up and out.

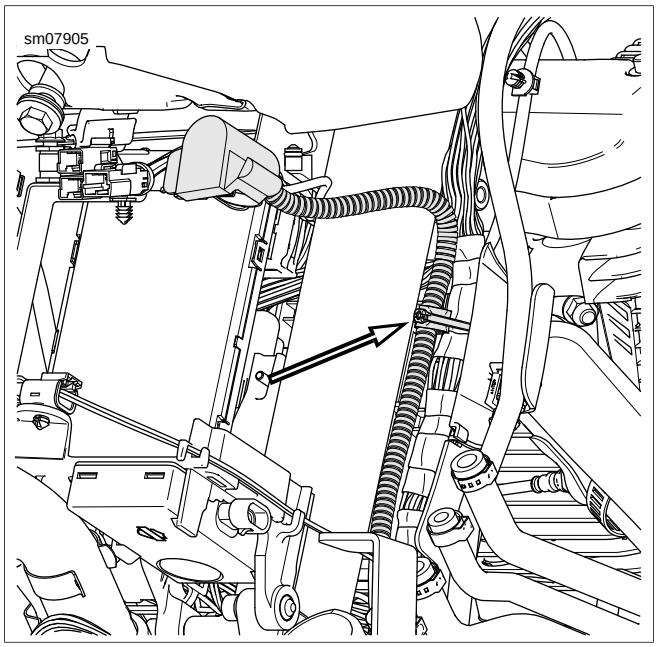


Figure 6-16. Cable Strap around Positive Battery Cable and Wire Harness

Installation

NOTICE

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

1. Wrap **new** cable strap around main wire harness.
2. Fit cable ring terminal over starter post. Loop battery cable to left and back under ECM electrical caddy.
3. Secure positive battery cable to starter post.
   a. Install nut.
   b. Tighten to 60-80 **in-lbs** (6.8-9.0 Nm).
   c. Fit rubber boot over starter post
4. Route positive cable up right side of frame.

NOTE

Position positive battery cable to locate the cable strap on the yellow tape area.

5. Cable strap positive battery cable to main wire harness.
6. Install oil tank mounting screws. Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).
7. Install battery tray. See 6.11 BATTERY TRAY.
8. Install fastener securing electrical caddy to oil tank bracket. Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).
9. Install wire harness ground wire to crankcase. Tighten to 55-75 **in-lbs** (6.2-8.5 Nm).
10. Install ECM. See 6.5 ELECTRONIC CONTROL MODULE (ECM).
11. Install BCM. See 6.6 BODY CONTROL MODULE (BCM).
12. Install boot on positive battery cable.
13. Slide battery in battery tray. See 1.20 BATTERY MAINTENANCE, Installation and Connection.
14. Hook top of battery strap to battery tray mount. Install strap fastener. Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).

NOTE

Apply a light coat of petroleum jelly or corrosion retardant material to battery terminals.

15. Install fuse cable and positive battery cable.
    a. Thread fastener through main fuse cable.
    b. Thread fastener through positive battery cable.
    c. Thread fastener into positive battery terminal.
    d. Tighten to 60-70 **in-lbs** (6.8-7.9 Nm).
    e. Place protective rubber boot over terminal.
16. Install negative battery cable. Tighten to 60-70 **in-lbs** (6.8-7.9 Nm).
17. Install ECM electrical caddy cover. Tighten to 50-60 **in-lbs** (5.6-6.8 Nm).
18. Install side covers.

⚠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)

19. Install seat.

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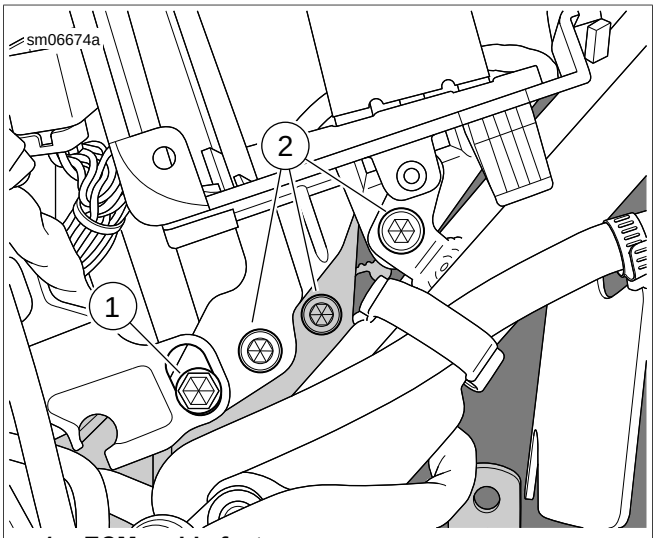
BATTERY TRAY 6.11

REMOVAL

⚠WARNING

Prevent accidental vehicle start-up, which could cause death or serious injury. First disconnect negative (-) battery cable at engine and then positive (+) cable from battery. (00280b)

1. Remove seat.
2. Remove left side cover.
3. Remove main fuse.
4. Remove battery. See 1.20 BATTERY MAINTENANCE, Disconnection and Removal.
5. Remove ECM. See 6.5 ELECTRONIC CONTROL MODULE (ECM), Removal.
6. Remove BCM. See 6.6 BODY CONTROL MODULE (BCM), Removal.
7. Remove cable strap securing fuse block wire harness to battery tray.
8. Remove connectors from battery tray:
   a. Rear HO2S connector [137]
   b. Rear WSS [65]
   c. Data link [91]
9. Remove negative battery cable from tray bottom.
10. See Figure 6-17. Remove ECM caddy fastener (1), battery tray fasteners (2) and battery tray.
11. Unhook WSS wire lead from battery tray clips.



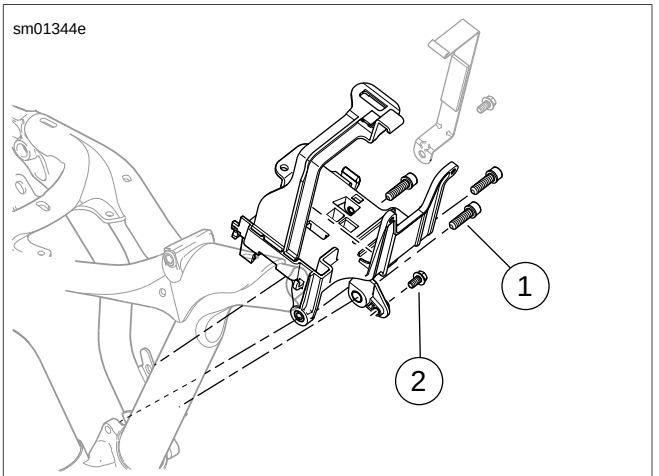
1. **ECM caddy fastener**
2. **Battery tray fasteners (3)**

Figure 6-17. Battery Tray Fasteners

INSTALLATION

FASTENER	TORQUE VALUE	
Battery tray fastener	96-156 **in-lbs**	10.8-17.6 Nm
ECM caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm

1. Set the battery tray in place.
2. Route the WSS [137] through the clips on the back side of the tray. Install the cable strap.
3. See Figure 6-18. Install the battery tray fasteners (1). Tighten to 96-156 **in-lbs** (10.8-17.6 Nm).
4. Install the fastener (2) securing the tray to the ECM caddy. Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).
5. Fit the negative battery cable to the bottom of the tray.
6. Install connectors on the tray:
   a. Data link [91]
   b. WSS [65]
   c. HO2S [137
7. Clip the fuse block wire harness extension into the tray.
8. Install the ECM. See 6.5 ELECTRONIC CONTROL MODULE (ECM), Installation.
9. Install the BCM. See 6.6 BODY CONTROL MODULE (BCM), Installation.
10. Install battery. See 1.20 BATTERY MAINTENANCE, Installation and Connection.
11. Install main fuse.
12. Install left side cover.
13. Install seat.



1. **Battery tray fastener (3)**
2. **ECM caddy fastener**

Figure 6-18. Battery Tray

STARTER 6.12

REMOVAL

⚠WARNING

Prevent accidental vehicle start-up, which could cause death or serious injury. First disconnect negative (-) battery cable at engine and then positive (+) cable from battery. (00280b)

1. Disconnect battery. See 1.20 BATTERY MAINTENANCE.
2. Drain transmission. Remove primary cover. See 5.3 PRIMARY COVER.
3. Remove exhaust system. See 4.16 EXHAUST SYSTEM.
4. Remove starter solenoid connector [128].
5. Remove positive battery lead and solenoid wire from starter.
6. Remove fastener securing oil line retaining clamp to starter.

NOTE

Use a ball hex driver to remove the starter mounting bolts.

7. See Figure 6-19. Remove two starter mounting bolts and washers.
8. Remove starter and gasket from right side of motorcycle.

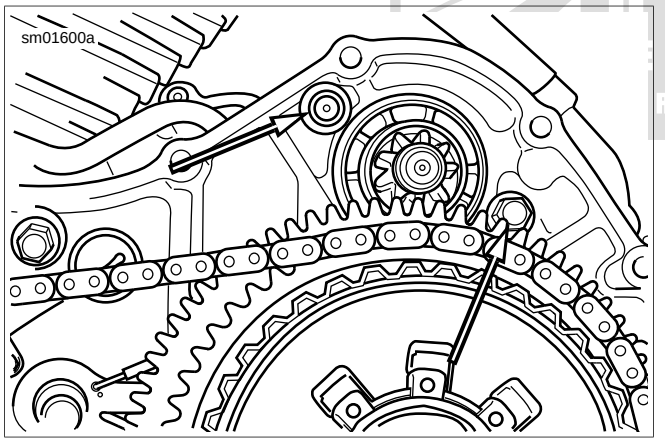


Figure 6-19. Starter Mounting Bolts

TOUCH-UP PAINT

Touch-up damaged paint before installation. Follow directions provided with paint. Paint flaking does not require starter replacement.

INSTALLATION

FASTENER	TORQUE VALUE	
Starter mounting bolt	13-20 ft-lbs	17.6-27.1 Nm
Starter motor oil line clamp fastener	16-21 **in-lbs**	1.8-2.4 Nm
Starter positive ring terminal	60-80 **in-lbs**	6.8-9.0 Nm

1. See Figure 6-19. Install starter and starter gasket from right side of motorcycle.
2. Install two starter mounting bolts and washers. Tighten to 13-20 ft-lbs (17.6-27.1 Nm).
3. Install oil line clamp to starter motor. Tighten to 16-21 **in-lbs** (1.8-2.4 Nm).
4. Connect starter solenoid connector [128].
5. Install positive battery cable and solenoid wire to solenoid stud. Tighten to 60-80 **in-lbs** (6.8-9.0 Nm). Place rubber boot securely over terminal.
6. Install primary cover. See 5.3 PRIMARY COVER.
7. Fill primary chaincase. See 1.10 TRANSMISSION LUBRICANT.
8. Install exhaust system. See 4.16 EXHAUST SYSTEM.

⚠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)

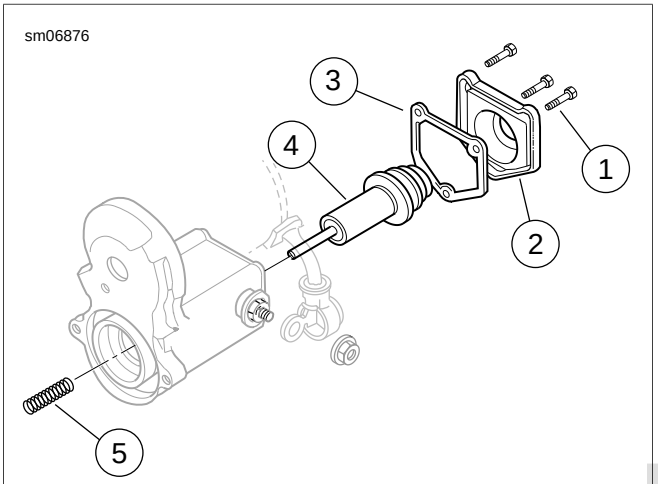
9. Connect battery. See 1.20 BATTERY MAINTENANCE.

SOLENOID

FASTENER	TORQUE VALUE	
Solenoid contact post jamnut	65-80 **in-lbs**	7.3-9.0 Nm
Starter ring terminal hex nut	60-80 **in-lbs**	6.8-9.0 Nm

Cover and Plunger Removal

1. See Figure 6-20. Remove fasteners (1), cover (2) and gasket (3).
2. Remove the plunger (4) with spring (5).

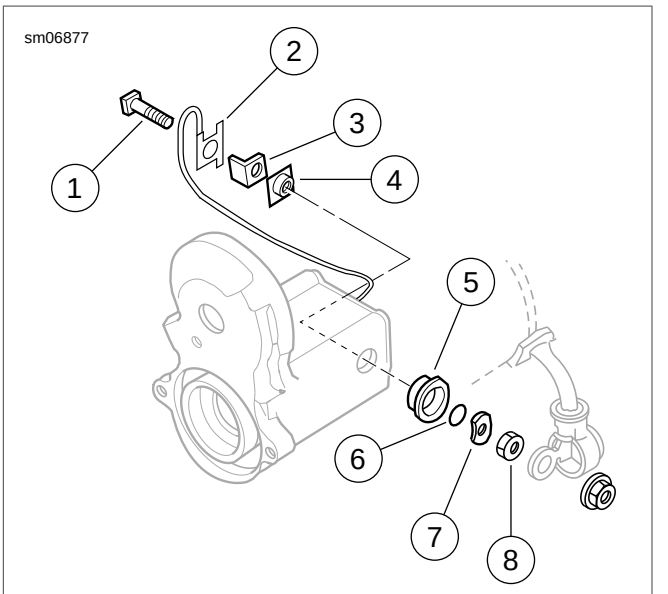


1. **Fasteners**
2. **Cover**
3. **Gasket**
4. **Plunger**
5. **Spring**

Figure 6-20. Solenoid Plunger

Short Post Contact: Starter

1. Disassemble the short post contact:
   a. Remove the hex nut and the ring terminal from the post.
   b. See Figure 6-21. Remove jamnut (8), wave washer (7), O-ring (6) and 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 (4).
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, O-ring, wave washer and 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 6-21. Short Post Contact (starter)

Long Post Contact: Battery Positive

1. See Figure 6-22. Remove the long post contact:
   a. Remove hex nut (9).
   b. Remove jamnut (8), wave washer (7), O-ring (6) and the round bushing (5).
   c. Remove post bolt (4), contact plate (3), square bushing (2) and 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, O-ring, wave washer and jamnut.

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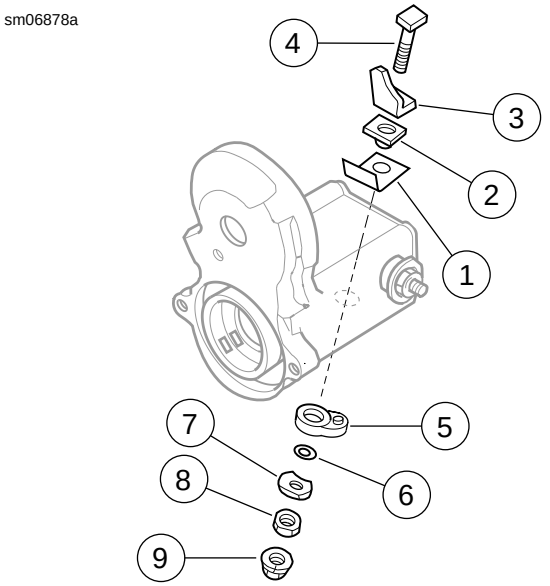


1. **Paper insulator**
2. **Square bushing**
3. **Contact plate**
4. **Post bolt**
5. **Round bushing**
6. **O-ring**
7. **Wave washer**
8. **Jamnut**
9. **Hex nut**

Figure 6-22. Long Post Contact (battery)

Plunger and Cover Installation

1. Apply LUBRIPLATE 110 to the plunger shaft. 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 until snug.
6. Install the starter positive ring terminal.
7. Install the hex nut. Tighten to 60-80 **in-lbs** (6.8-9.0 Nm).

CLUTCH SHAFT ASSEMBLY

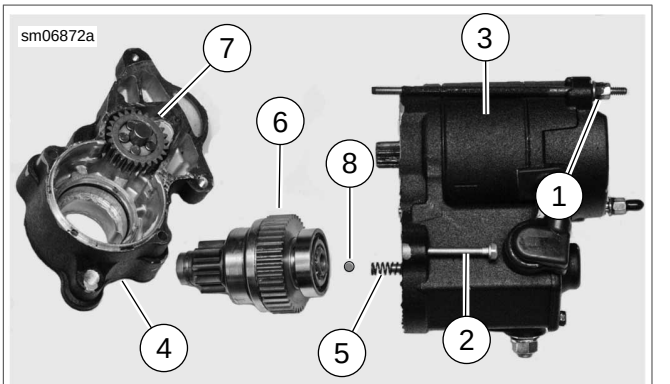
Removal

1. See Figure 6-23. Loosen the two long starter support bolts (1).
2. Remove the two fasteners (2) and separate the clutch assembly housing (4) from the starter/solenoid housing (3).
3. Save the spring (5) from the solenoid plunger shaft.

NOTE

Remove the old assembly lube to release the steel ball (8).

4. Remove and save the steel ball from the bearing end of the clutch shaft assembly (6) bore.
5. Tap on the end of the shaft to remove the clutch shaft assembly from the housing.
6. Remove the idler gear (7) from the bearing cage.
7. Remove bearing cage and the five steel cylinders.



1. **Starter support bolts**
2. **Fasteners**
3. **Starter/solenoid housing**
4. **Clutch assembly housing**
5. **Spring**
6. **Clutch shaft assembly**
7. **Idler gear**
8. **Steel ball**

Figure 6-23. Starter Drive Housing and Clutch Shaft

Inspection

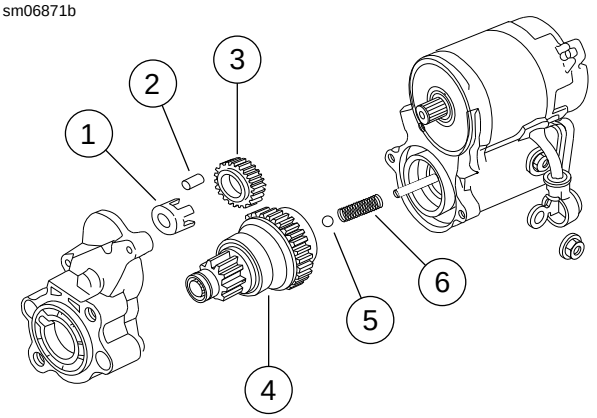
1. Inspect the O-rings in the clutch assembly housing bore.
2. Inspect the spring for kinks or elongation.
3. Inspect the steel ball.
4. Inspect the idler gear and the cage.
5. Inspect the clutch shaft assembly pinion gear for missing or damaged teeth.
6. Check that the roller bearings and the clutch gear on the clutch shaft rotate freely.

Installation

1. Lubricate components with LUBRIPLATE 110.
2. See Figure 6-24. Install the bearing cage (1) with the five steel cylinders (2).
3. Install the idler gear (3) over the bearing cage.
4. Match the gear teeth to the idler gear and install the clutch assembly (4) in the housing. Seat the bearing in the counterbore.
5. Install the steel ball (5) in the bore of the shaft.
6. Apply a light film of LUBRIPLATE 110 to solenoid plunger shaft. Install return spring (6) on solenoid plunger shaft.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

7. Apply a thin layer of HARLEY-DAVIDSON HIGH PERFORMANCE SEALANT - GRAY to the face of the clutch assembly housing.
8. Fit the clutch assembly housing to the starter/solenoid housing to the clutch assembly housing.
9. Install the fasteners and alternately tighten until snug.



1. **Bearing cage**
2. **Steel cylinders**
3. **Idler gear**
4. **Clutch shaft assembly**
5. **Steel ball**
6. **Spring**

Figure 6-24. Starter Clutch Assembly

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

IGNITION SWITCH 6.13

REMOVAL

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

This procedure is for models without keyless ignition.

1. Purge and disconnect fuel supply line. See 4.4 FUEL TANK.

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. Remove seat.
4. Remove fuel tank. See 4.4 FUEL TANK.
5. See Figure 6-25. Remove ignition switch face nut (5).
6. Remove mounting screw (6). Remove switch cover (3).
7. Separate connector (1) from switch.
8. Remove switch.

INSTALLATION

FASTENER	TORQUE VALUE	
Ignition switch mounting screw	35-45 **in-lbs**	4.0-5.1 Nm
Ignition switch face nut	72-96 **in-lbs**	8.1-10.8 Nm

1. See Figure 6-25. Mate connector (1) to switch.
2. Insert ignition switch into the switch cover (3) with the word TOP stamped on the switch body facing upward. Loosely install face nut (5).
3. Install mounting screw (6). Tighten to 35-45 **in-lbs** (4.0-5.1 Nm).
4. Tighten face nut (5) to secure switch (2) within cover (3). Tighten to 72-96 **in-lbs** (8.1-10.8 Nm).
5. Install fuel tank. See 4.4 FUEL TANK.

WARNING

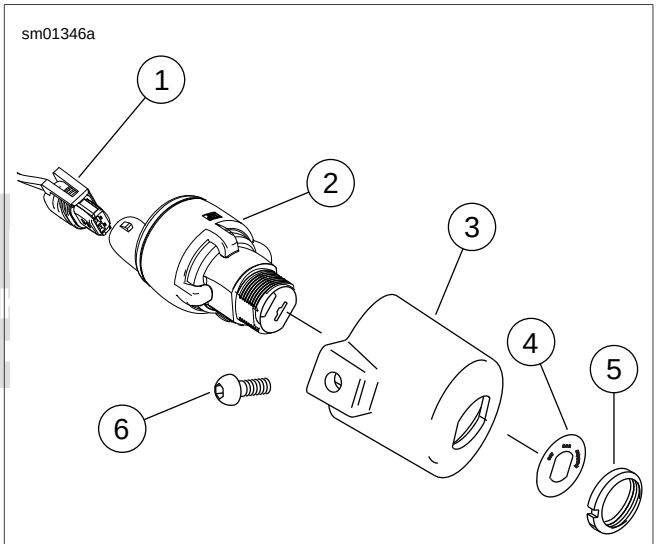
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

6. Install seat.
7. Install 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)

8. Test all switches and lights for proper operation.



1. **Connector**
2. **Ignition switch**
3. **Switch cover**
4. **Decal**
5. **Face nut**
6. **Mounting screw**

Figure 6-25. Ignition Switch

SPARK PLUG CABLES 6.14

GENERAL

Resistor-type high-tension spark plug cables have a carbon-impregnated fabric core (instead of solid wire) for radio noise suppression and improved reliability of electronic components. Use the exact replacement cable for best results.

REMOVAL

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 4.4 FUEL TANK.

WARNING

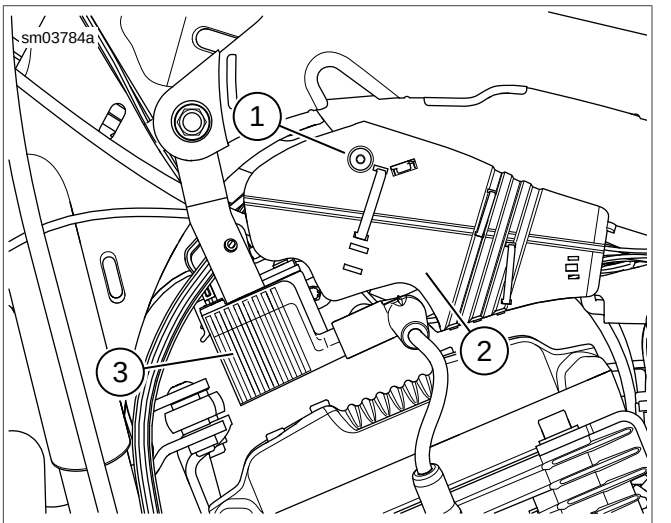
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. Remove seat.
4. Remove fuel tank. See 4.4 FUEL TANK.
5. See Figure 6-26. Remove screw (1) securing left wire harness caddy (2) to right wire harness caddy.
6. Carefully disengage left wire harness caddy. Pull caddy away from frame backbone.

NOTE

Always grasp rubber boot as close as possible to the spark plug terminal when removing spark plug cables. Do not pull on the cable portion itself. Pulling on the cable damages the carbon core.

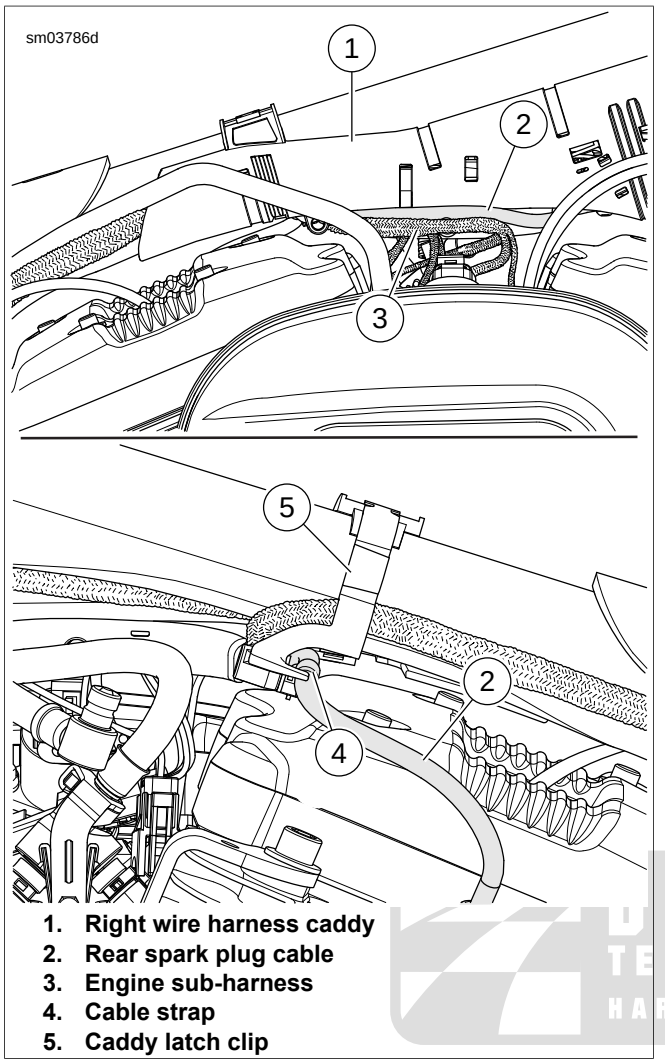
7. Pull front spark plug boot and cable from left side ignition coil tower.
8. Pull rear spark plug boot and cable from right side ignition coil tower.
9. Unplug spark plug boot and cable assemblies from front and rear spark plugs.
10. Disengage rear spark plug cable from notch in right wire harness caddy. Remove the cable.
11. See Figure 6-27. Remove rear spark plug cable (2) from curved trough on wire harness caddy (1).
    a. Cut cable strap (4).
    b. Feed spark plug cable out from between frame and engine. Remove the cable.
    c. Remove cable strap from mounting boss on caddy latch clip (5).



1. **Screw**
2. **Left wire harness caddy**
3. **Ignition coil**

Figure 6-26. Ignition Coil and Left Wire Harness Caddy

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Right wire harness caddy**
2. **Rear spark plug cable**
3. **Engine sub-harness**
4. **Cable strap**
5. **Caddy latch clip**

Figure 6-27. Rear Spark Plug Cable Routing

INSTALLATION

1. Plug rear spark plug cable boot into right side ignition coil tower.
2. Route cable between wire harness caddies, and down through notch in right caddy, toward right side of engine.
3. See Figure 6-27. Route rear spark plug cable (2):
   a. In trough in right wire harness caddy (1).
   b. Over top of engine sub-harness (3).
   c. Back toward left side of engine.
4. See Figure 6-28. Install **new** barbed cable strap (3) on spark plug cable (1), 7.0-7.25 in (178-184 mm) from tip of cable boot (2).
   a. Orient cable strap to position spark plug cable above mounting boss on caddy latch clip.
   b. Press cable strap barbed prong firmly into hole in caddy latch clip mounting boss.
5. Plug rear spark plug cable and boot onto rear spark plug until it clicks. Plug the other end of cable into the right side ignition coil tower.
6. Plug front spark plug cable and boot into left side ignition coil tower. Plug other end of cable onto front spark plug until it clicks.

NOTE

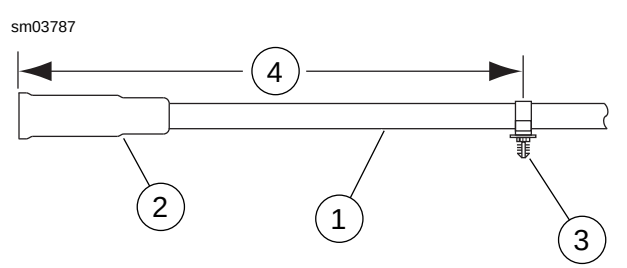
Make sure that rear spark plug cable is routed properly. The cable cannot chafe against frame, fuel tank or rear cylinder head.

7. See Figure 6-26. Mate left wire harness caddy (2) to right wire harness caddy. Secure with screw (1) and tighten. See 6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES.
8. Install fuel tank. See 4.4 FUEL TANK.

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)

9. Install seat.
10. Install main fuse.
11. Start engine to verify ignition.



1. **Rear spark plug cable**
2. **Spark plug boot (spark plug end)**
3. **Barbed cable strap**
4. **7.0-7.25 in (178-184 mm)**

Figure 6-28. Rear Spark Plug Cable and Cable Strap

IGNITION COIL 6.15

GENERAL

The ignition coil is attached to a mounting bracket secured by the front fuel tank mounting bolt. The unit is divided into separate front and rear coils that fire the spark plugs one cylinder at a time.

The ignition coil is mounted on the left half of a two-piece bracket assembly. The right half of the bracket assembly secures the ignition switch and right wire harness caddy to the vehicle. The two bracket halves are secured together with a screw.

NOTE

This part cannot be repaired. Replace upon failure.

See the electrical diagnostic manual for troubleshooting.

REMOVAL

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 4.4 FUEL TANK.

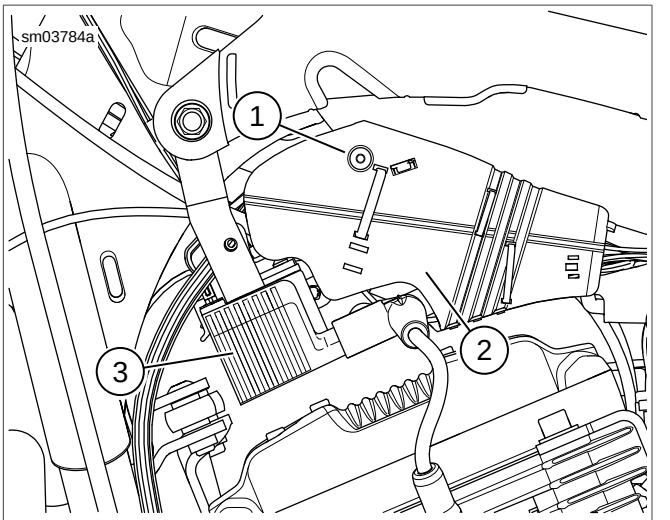
WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. Remove seat.
4. Remove fuel tank. See 4.4 FUEL TANK.
5. See Figure 6-29. Remove screw (1) securing left wire harness caddy (2) to right wire harness caddy. Carefully disengage left wire harness caddy. Pull caddy away from frame backbone.

NOTE

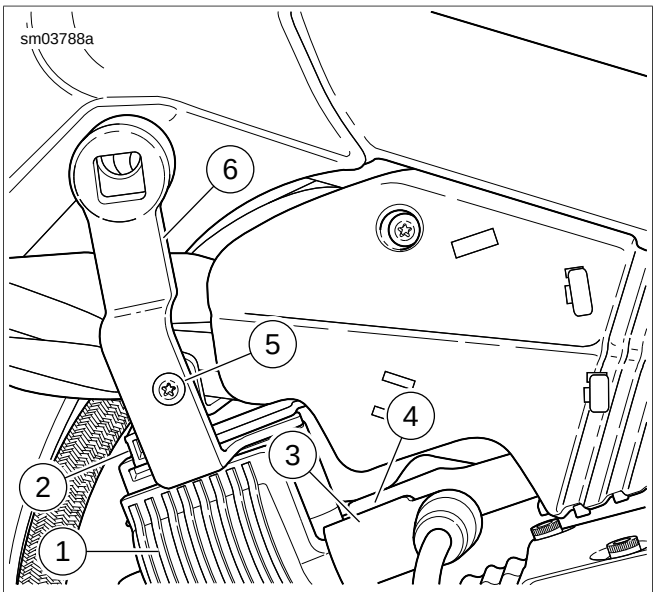
Always grasp rubber boot as close as possible to spark plug terminal when removing spark plug cables. Do not pull on cable portion itself. Pulling on cable damages carbon core.



1. **Screw**
2. **Left wire harness caddy**
3. **Ignition coil**

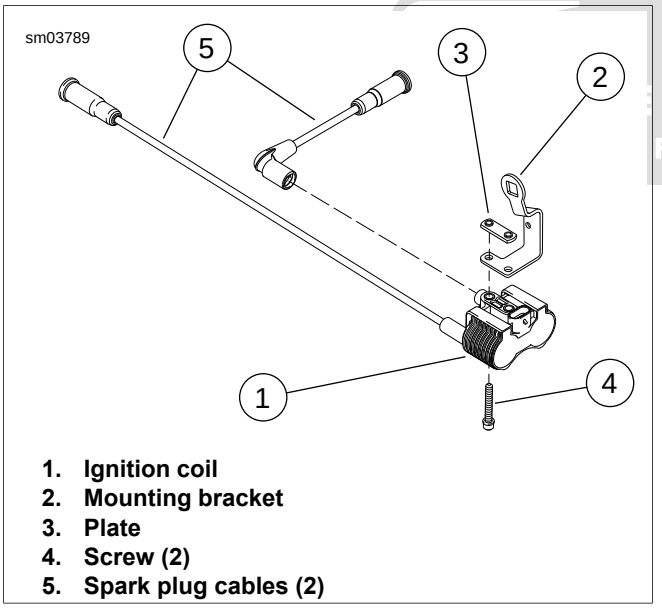
Figure 6-29. Ignition Coil and Left Wire Harness Caddy

6. See Figure 6-30. Unplug coil harness connector [83B] (2) from ignition coil (1).
7. **Keyed ignition:** Unplug ignition switch connector [83B].
8. Pull front spark plug boot and cable (3) from left ignition coil tower.
9. Pull rear spark plug boot and cable (4) from right ignition coil tower.
10. Remove screw (5) securing coil bracket (6). Remove coil and bracket from vehicle.
11. See Figure 6-31. Remove screws (4) to separate ignition coil (1) from mounting bracket (2) and plate (3).



1. **Ignition coil**
2. **Coil harness connector [83B]**
3. **Front spark plug boot and cable**
4. **Rear spark plug boot and cable**
5. **Screw**
6. **Mounting bracket**

Figure 6-30. Ignition Coil Mounting and Connections



1. **Ignition coil**
2. **Mounting bracket**
3. **Plate**
4. **Screw (2)**
5. **Spark plug cables (2)**

Figure 6-31. Ignition Coil Mounting: XL Models Only

INSTALLATION

FASTENER	TORQUE VALUE	
Coil mounting screw	24-72 **in-lbs**	2.7-8.1 Nm
Coil mounting bracket screw	35-45 **in-lbs**	4.0-5.1 Nm

1. See Figure 6-31. Position **new** ignition coil (1) on underside of mounting bracket (2).
2. Fasten coil to mounting bracket with two screws (4) and nut plate (3). Tighten to 24-72 **in-lbs** (2.7-8.1 Nm).
3. See Figure 6-30. Install coil:
   a. Slide coil (1) with mounting bracket (6) into position.
   b. Make sure all wiring harnesses from front or motorcycle are positioned between coil bracket upright and vehicle frame.
   c. Secure bracket with screw (5). Tighten to 35-45 **in-lbs** (4.0-5.1 Nm).
   d. Connect ignition coil [33B].
4. **Keyed ignition:** Connect ignition switch [83B].
5. Plug spark plug cables into ignition coil towers.
   a. Front spark plug cable (3) to left side of coil
   b. Rear spark plug cable (4) to right side of coil
6. See Figure 6-29. Mate left wire harness caddy (2) to right wire harness caddy. Secure with screw (1) and tighten.
7. Install fuel tank. See 4.4 FUEL TANK.

⚠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)

8. Install seat.
9. Install main fuse.

HEADLAMP 6.16

BULB REPLACEMENT

Hi/Lo Beam

NOTE

Replace the bulb with the specified H4 halogen bulb.

1. Remove the trim ring.
   a. **XL 883L/N/R, XL 1200T/X:** See Figure 6-32. Remove the screw (1), nut (2) and the trim ring (3).
   b. **XL 1200V/C/CP/CA/CB:** See Figure 6-33. Remove the screw (1) and the trim ring.
2. Hold the lens and compress the release tabs of the bulb connector (11) to disconnect from spade terminals.
3. Pull the rubber boot (9) from back of the lens.
4. Compress the ends of the retaining clip (8) to release from the retaining tabs and pivot retaining clip back.
5. Remove and replace the bulb (7).

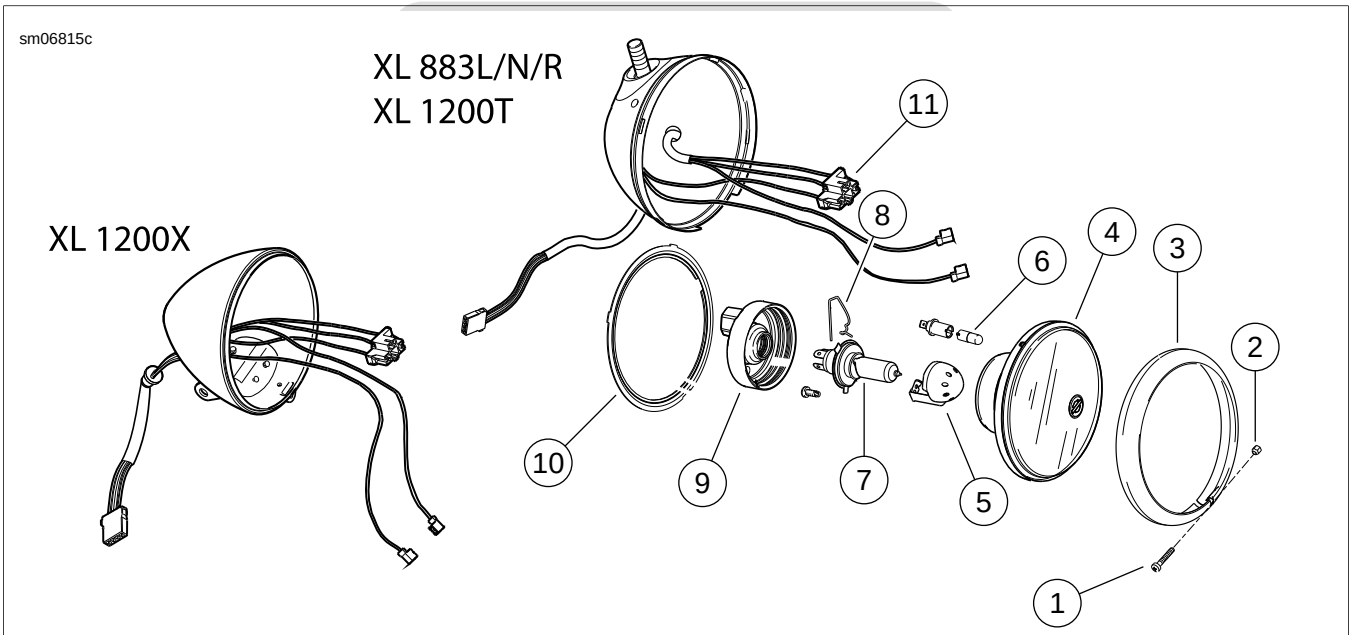
NOTE

The tab opposite bulb center spade connector fits top notch in the reflector which points to top of lens.

6. Pivot the retaining clip over the bulb. Press the ends into the retaining tabs.
7. Install the rubber boot with the word TOP over the top notch. Press the center ring down flush with base of the bulb.
8. Connect the bulb connector to the bulb.
9. Install the lens.
   a. **XL 883L/N/R, XL 1200T/X:** Fit the adapter ring and the lens to the headlamp shell.
   b. **XL 1200V/C/CP/CA/CB:** With the finger gasket in place, fit the adapter ring and the lens to the headlamp shell.
10. Install the trim ring, screw and nut as necessary.

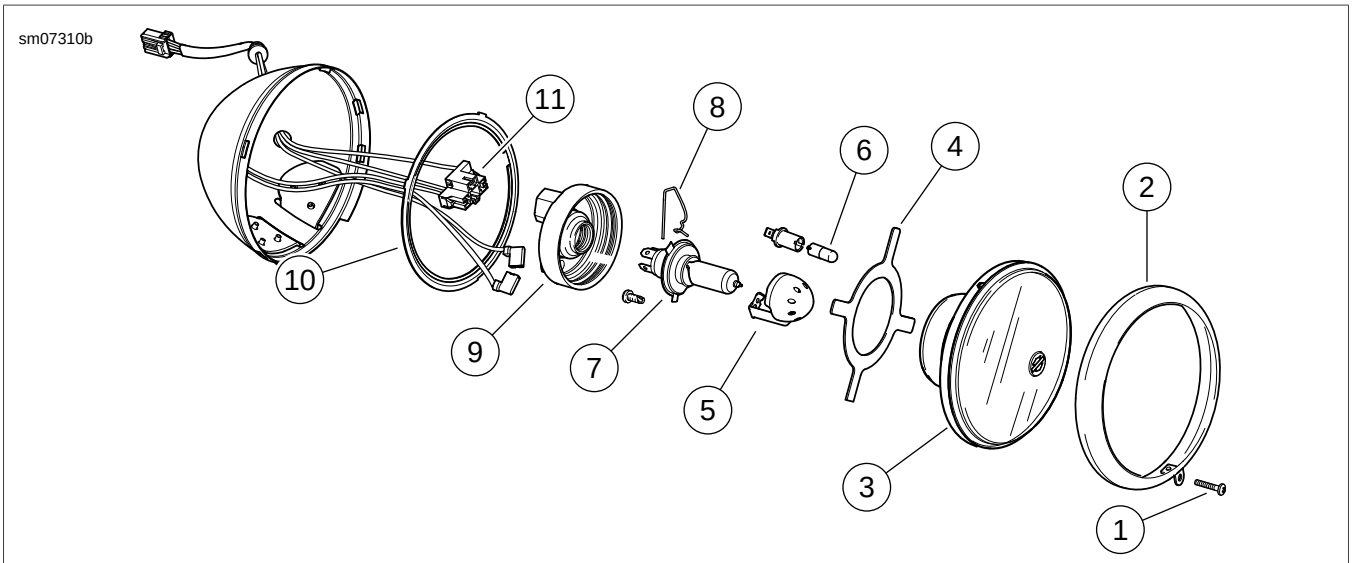
Position Lamp: HDI

1. Disconnect the spade connectors from the position lamp bulb holder.
2. Pull the bulb holder from the lens.
3. Push and rotate **new** bulb clockwise into socket.
4. Replace the bulb holder and connect the connectors.



1. **Screw**
2. **Nut**
3. **Trim ring**
4. **Lens**
5. **Bulb shield**
6. **Position lamp (HDI)**
7. **Bulb**
8. **Retaining clip**
9. **Rubber boot**
10. **Adapter ring**
11. **Connector**

Figure 6-32. Headlamp Assembly: XL 883L/N/R, XL 1200T/X



1. **Screw**
2. **Trim ring**
3. **Lens**
4. **Finger gasket**
5. **Bulb shield**
6. **Position lamp (HDI)**
7. **Bulb**
8. **Wire clip**
9. **Rubber boot**
10. **Adapter ring**
11. **Connector**

Figure 6-33. Headlamp Assembly: XL 1200V/C/CP/CA/CB

HEADLAMP MOUNTS

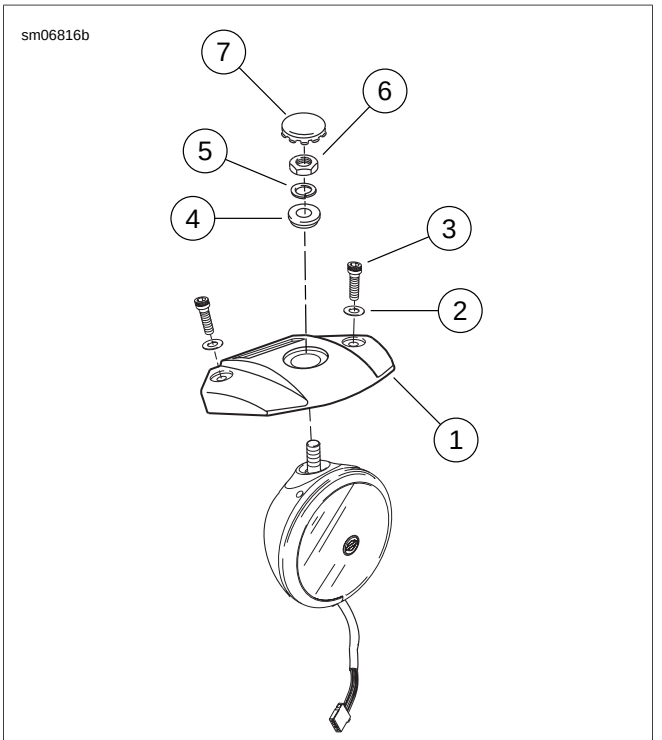
FASTENER	TORQUE VALUE	
Headlamp upper bracket fasteners: XL 883L/R/N, XL 1200T	120-192 **in-lbs**	14-22 Nm
Headlamp clamp nut: XL 883L/N/R, XL 1200T	120-240 **in-lbs**	13.6-27.1 Nm
Headlamp mount: XL 1200X	30-35 ft-lbs	41-47 Nm
Headlamp assembly: XL 1200X	30-35 ft-lbs	41-47 Nm
Headlamp mount: XL 1200V/C/CP/CA/CB	30-35 ft-lbs	41-47 Nm
Headlamp assembly: XL 1200V/C/CP/CA/CB	30-35 ft-lbs	41-47 Nm
Clutch cable guide: XL 1200C/CP/CA/CB	45-65 **in-lbs**	5.0-7.3 Nm
Headlamp visor: XL 1200C/CP/CA/CB	120-192 **in-lbs**	14-22 Nm

Mount: XL 883L/N/R, XL 1200T

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. See Figure 6-34. Mount upper bracket (1) to upper fork clamp with a washer (2) and fastener (3). Tighten to 120-192 **in-lbs** (14-22 Nm).
3. Install headlamp assembly with a washer (4), lockwasher (5) and nut (6) and hand tighten.
4. Install main fuse.
5. Align headlamp. See 1.23 HEADLAMP ALIGNMENT.
6. Final tighten to 120-240 **in-lbs** (13.6-27.1 Nm).
7. Install plug (7).

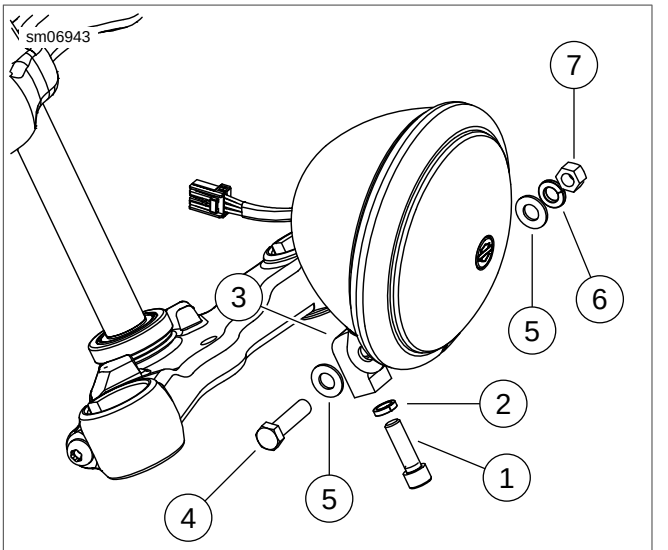


1. **Upper bracket**
2. **Washer (2)**
3. **Fastener (2)**
4. **Washer**
5. **Lockwasher**
6. **Nut**
7. **Plug**

Figure 6-34. Headlamp Mount: XL 883L/N/R, XL 1200T

Mount: XL 1200X

1. Remove main fuse.
2. See Figure 6-35. Install fastener (1), washer (2) and mounting post (3). Tighten to 30-35 ft-lbs (41-47 Nm).
3. Install headlamp, fastener (4) and washer (5). Secure with washer, lockwasher (6) and nut (7). Hand tighten.
4. Install main fuse.
5. Align headlamp. See 1.23 HEADLAMP ALIGNMENT.
6. Tighten headlamp assembly to 30-35 ft-lbs (41-47 Nm).



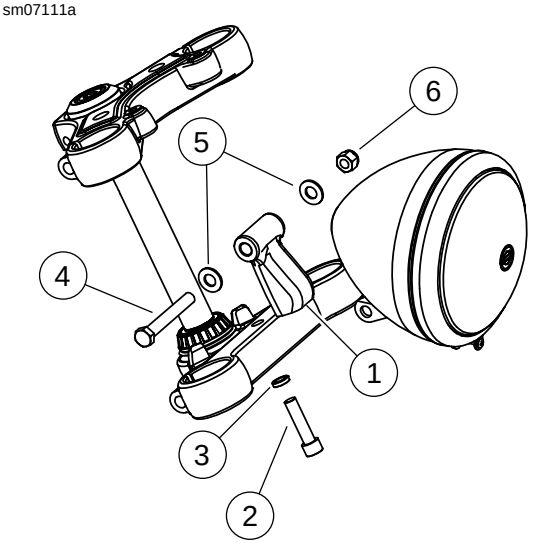
1. **Fastener**
2. **Washer**
3. **Mounting post**
4. **Mount fastener**
5. **Washer (2)**
6. **Lockwasher**
7. **Nut**

Figure 6-35. Headlamp Assembly Mount: XL 1200X

Mount: XL 1200V/C/CP/CA/CB

1. See Figure 6-36. Remove main fuse.
2. Install fastener (2), washer (3) and mounting post (1). Tighten to 30-35 ft-lbs (41-47 Nm).
3. Assemble washer stack (5) and fastener (4). Install headlamp assembly. Hand tighten.
4. Install main fuse.
5. Align headlamp. See 1.23 HEADLAMP ALIGNMENT.
6. Tighten headlamp locknut (6) to 30-35 ft-lbs (41-47 Nm).

DIGITAL TECHNICIAN HARLEY-DAVIDSON

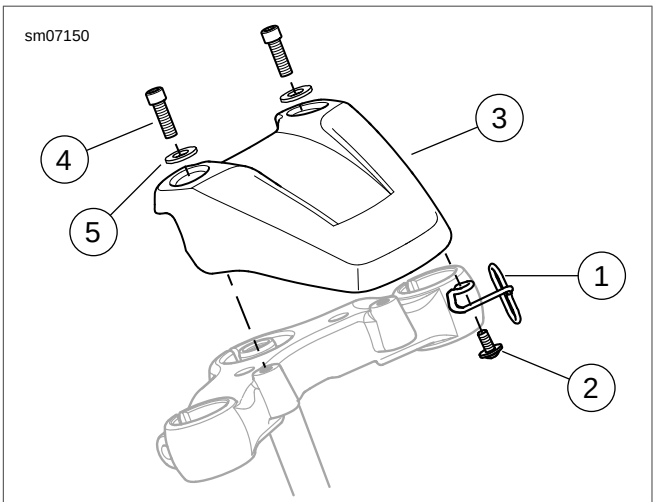


1. **Mounting post**
2. **Fastener**
3. **Washer**
4. **Fastener**
5. **Washer**
6. **Locknut**

Figure 6-36. Headlamp Mount: XL 1200V/C/CP/CA/CB

Visor: XL 1200C/CP/CA/CB

1. See Figure 6-37. Install clutch cable guide (1) and fastener (2). Tighten to 45-65 **in-lbs** (5.0-7.3 Nm).
2. Install headlamp visor (3), fasteners (4) and washers (5). Tighten to 120-192 **in-lbs** (14-22 Nm).



1. **Clutch cable guide**
2. **Fastener**
3. **Visor**
4. **Fastener**
5. **Washer**

Figure 6-37. Headlamp Visor: XL 1200C/CP/CA/CB

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

INDICATOR LAMP MODULE 6.17

PRELIMINARY DISASSEMBLY

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. Position vehicle upright.
2. Purge and disconnect fuel supply line. See 4.4 FUEL TANK.
3. Disconnect fuel supply line from fuel pump module.

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

4. Remove main fuse.
5. Remove seat.
6. Remove fuel tank. See 4.4 FUEL TANK.
7. Separate instrument connector [20].
   a. Remove screw securing left wire harness caddy to right wire harness caddy.
   b. See Figure 6-38. Locate instruments connector [20] on right wire harness caddy.
   c. Separate connector [20] housings.
8. Record cable strap locations before removal.
9. Remove cable straps.

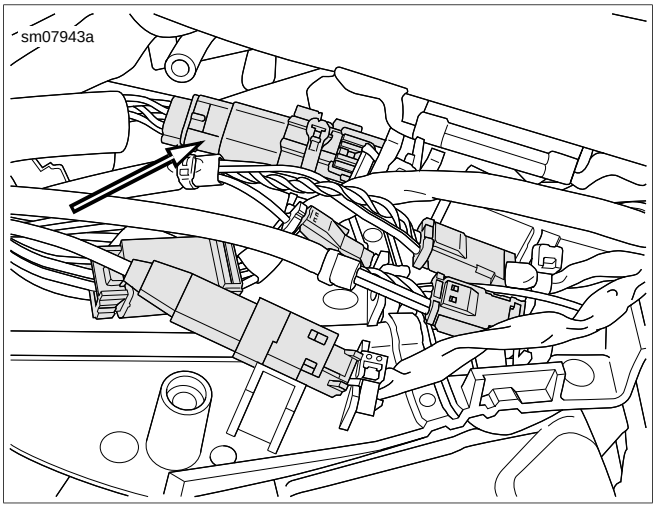


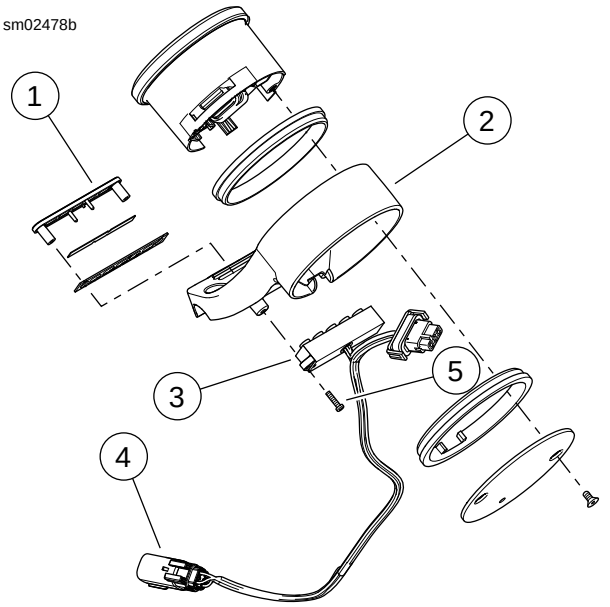
Figure 6-38. Instrument Connector [20]

REPLACEMENT: XL 883R/L/N, XL 1200CP/CB WITH MINI-APE HANDLEBAR, XL 1200T/X/V

FASTENER	TORQUE VALUE	
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm

1. Cover headlamp bracket with a protective cloth.
2. See Figure 6-39. Holding speedometer housing/handlebar clamp (2), remove four screws securing housing/clamp assembly to handlebar risers.
3. Remove two screws (5) to separate indicator lamp module (3) from speedometer housing/handlebar clamp and indicator lamp bezel.
4. Remove speedometer. See 6.4 SPEEDOMETER, Removal.
5. Remove instrument harness.
6. Place **new** instrument harness in position.
7. Install speedometer. See 6.4 SPEEDOMETER, Installation.
8. See Figure 6-39. Assemble indicator lamp bezel (1) and indicator lamp module (3) onto speedometer housing/handlebar clamp (2). Secure with two screws (5).
9. Install housing/clamp assembly onto handlebar risers. Secure with screws:
10. Tighten:
    a. Rear screws first, to 12-18 ft-lbs (16.3-24.4 Nm).
    b. Front screws to 12-18 ft-lbs (16.3-24.4 Nm).

DIGITAL TECHNICIAN HARLEY-DAVIDSON



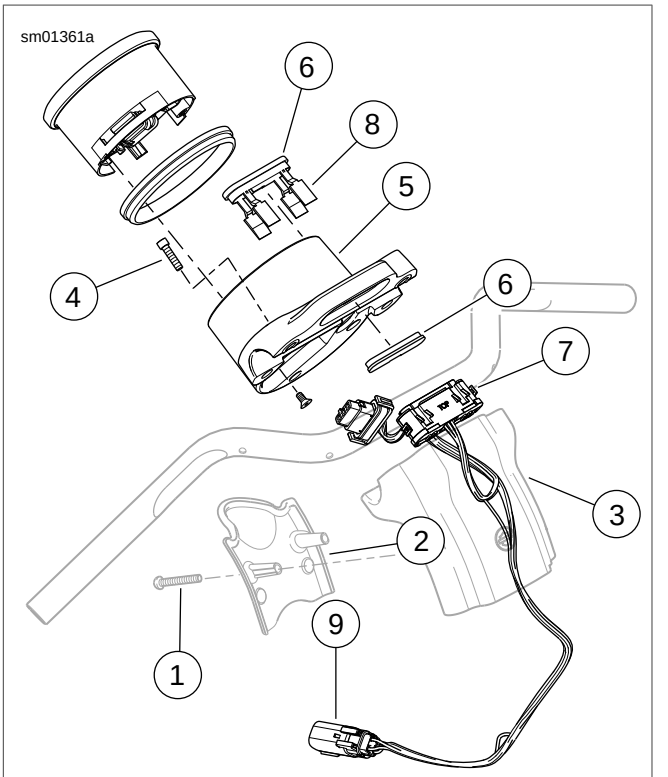
1. **Indicator lamp bezel**
2. **Speedometer housing/handlebar clamp**
3. **Indicator lamp module**
4. **Instrument harness connector [20A]**
5. **Screw (2)**

Figure 6-39. Indicator Lamps: XL 883R/L/N, XL 1200CP/CB w/Mini-ape Handlebar, XL 1200T/X/V

REPLACEMENT: XL 1200C/CP/CA EXCEPT WITH MINI-APE HANDLEBAR

FASTENER	TORQUE VALUE	
Handlebar riser clamp screw: XL 1200C/CP/CA except with mini-ape handlebar	12-18 ft-lbs	16.3 -24.4 Nm
Handlebar riser clamp screw: XL 1200C/CP/CA except with mini-ape handlebar	12-18 ft-lbs	16.3 -24.4 Nm
Handlebar riser cover screw: XL 1200C/CP/CA except with mini-ape handlebar	8-12 **in-lbs**	0.9-1.4 Nm

1. See Figure 6-40. Remove two screws (1) and riser cover (2) from behind handlebar riser (3).
2. Remove four screws (4) securing speedometer housing/handlebar clamp (5) to handlebar riser.
3. Carefully bend back four latches (8) on indicator lamp bezel (6). Remove indicator lamp module (7).
4. Remove speedometer. See 6.4 SPEEDOMETER, Removal.



1. **Screw (2)**
2. **Riser cover**
3. **Handlebar riser**
4. **Screw (4)**
5. **Speedometer housing/handlebar clamp**
6. **Indicator lamp bezel with lens**
7. **Indicator lamp module**
8. **Latch (4)**
9. **Instrument harness connector [20A]**

Figure 6-40. Indicator Lamps: XL 1200C/CP/CA Except w/Mini-Ape Handlebar

5. Carefully pull harness with connector [39B] and trip odometer reset button from back of speedometer housing/handlebar clamp.
6. Pull instrument harness with connector [20A] up through upper fork bracket. Remove harness.
7. Position **new** instrument harness.
8. Carefully feed connector [20A] end down through upper fork bracket and along left side of frame steering head.

NOTES

- *Verify that speedometer harness is positioned underneath handlebar.*
- *Verify that indicator lamp module harness is over the top of handlebar.*

9. Carefully feed end of harness with connector [39B] through back of speedometer housing/handlebar clamp.
10. Install speedometer. See 6.4 SPEEDOMETER, Installation.
11. See Figure 6-40. Install indicator lamp module (7) into back of speedometer housing/handlebar clamp (5). Secure with four latches (8) on indicator lamp bezel (6).

12. Install speedometer housing/handlebar clamp onto handlebar riser (3). Secure with four screws (4).
13. Adjust handlebar to desired position.
14. Tighten:
    a. Front screws first, to 12-18 ft-lbs (16.3 -24.4 Nm).
    b. Rear screws to 12-18 ft-lbs (16.3 -24.4 Nm).
15. Install riser cover (2) behind handlebar riser. Secure with two screws (1). Verify that handlebar control harnesses are not pinched between handlebar riser and riser cover. Tighten to 8-12 **in-lbs** (0.9-1.4 Nm).

ASSEMBLY

FASTENER	TORQUE VALUE	
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm

1. See 6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES.
    a. Feed instrument harness between coil bracket uprights, back to right wire harness caddy.
    b. Plug instrument harness pin connector [20A] into socket connector [20B] in right wire harness caddy.
    c. Mate right and left wire harness caddies.
    d. Install screw. Tighten to 15-25 **in-lbs** (1.7-2.8 Nm).
2. Secure instrument harness with cable straps.
3. Install fuel tank. See 4.4 FUEL TANK.
4. Install main fuse.

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 seat.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V 6.18

BULB REPLACEMENT: XL 883R/L, XL 1200T

FASTENER	TORQUE VALUE	
Tail lamp lens screw: XL 883R/L, XL 1200T	20-24 **in-lbs**	2.3-2.7 Nm

NOTES

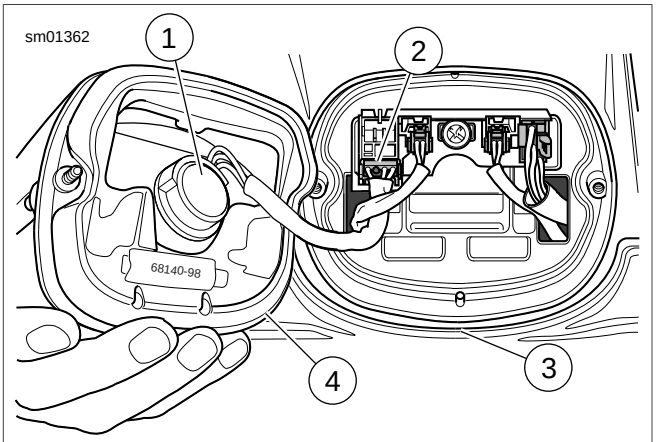
- ***XL 883N/XL 1200X/V:*** *The stop lamps are dual filament bulbs in the turn signal housings with red lenses. Replace turn signal bulbs.*
- ***XL 883N/XL 1200X/V:*** *Certain markets require XL 883R/L tail lamp.*

1. Turn ignition off.
2. See Figure 6-41. Remove two screws and lens (4) from base (3).
3. Press locking tab. Remove 4-pin multilock connector from circuit board.
4. Turn socket assembly (1) one-quarter turn counterclockwise to release assembly from lens. Remove (pull) assembly from lens. Remove bulb.
5. Coat base of **new** bulb with ELECTRICAL CONTACT LUBRICANT. Install **new** bulb.
6. Install socket assembly into lens. Push and rotate assembly clockwise into lens.
7. Connect 4-pin multilock connector to circuit board.
8. Install lens to base with two screws. 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)

9. Check operation of all lamps.



1. **Bulb/socket assembly**
2. **4-pin multilock connector**
3. **Base**
4. **Lens**

Figure 6-41. Tail Lamp

BASE REPLACEMENT: XL 883R/L, XL 1200T

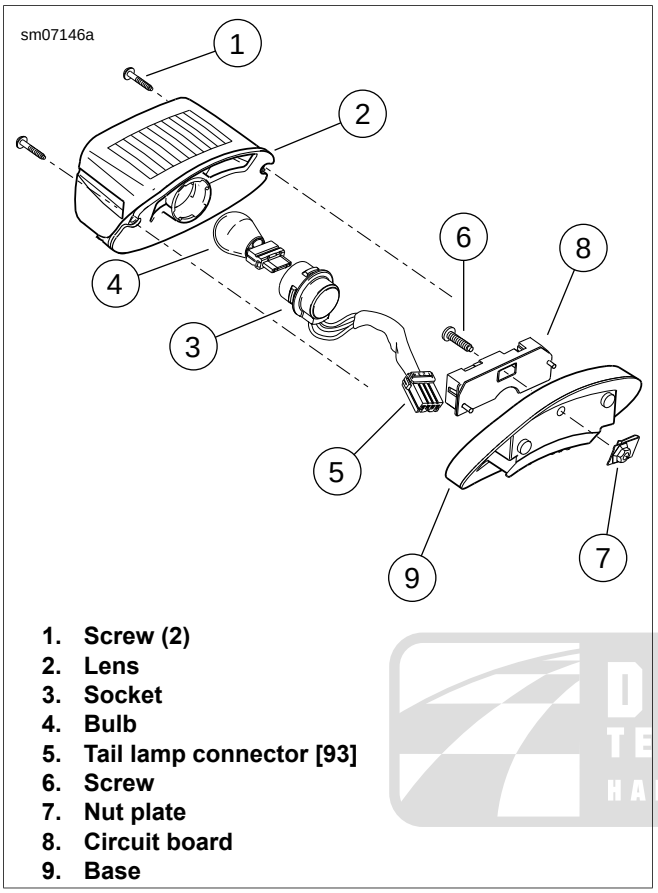
FASTENER	TORQUE VALUE	
Tail lamp base mounting screw: XL 883R/L, XL 1200T	45-48 **in-lbs**	5.1-5.4 Nm
Tail lamp lens screw: XL 883R/L, XL 1200T	20-24 **in-lbs**	2.3-2.7 Nm

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. See Figure 6-42. Remove screws (1) and lens (2) from base (9).
3. See Figure 6-43. Press locking tab. Remove 4-pin multilock connector [93] (1) from circuit board.
4. Press locking tabs. Remove right [18] (3) and left [19] (2) two 2-pin turn signal connectors and 6-pin connector [94] (4) from circuit board.
5. See Figure 6-42. Remove base:
   a. Remove screw (6) from nut plate (7).
   b. Remove circuit board (8) from base (9).
   c. Remove base from rear fender.

6. Install base:
   a. Install base on rear fender.
   b. Support nut plate behind fender.
   c. Install screw, pin housing and circuit board to base. Tighten to 45-48 **in-lbs** (5.1-5.4 Nm).



1. **Screw (2)**
2. **Lens**
3. **Socket**
4. **Bulb**
5. **Tail lamp connector [93]**
6. **Screw**
7. **Nut plate**
8. **Circuit board**
9. **Base**

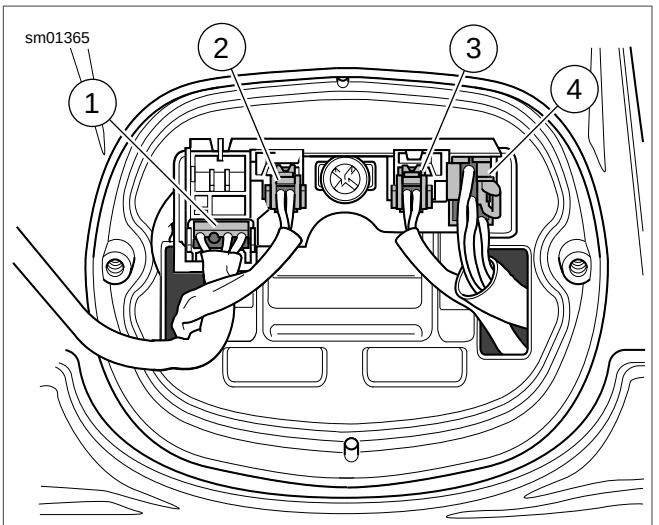
Figure 6-42. Tail Lamp Assembly: XL 883R/L, XL 1200T

7. Install connectors to circuit board.
8. Install lens to base with screws. Tighten to 20-24 **in-lbs** (2.3-2.7 Nm).
9. Install main fuse.

⚠WARNING

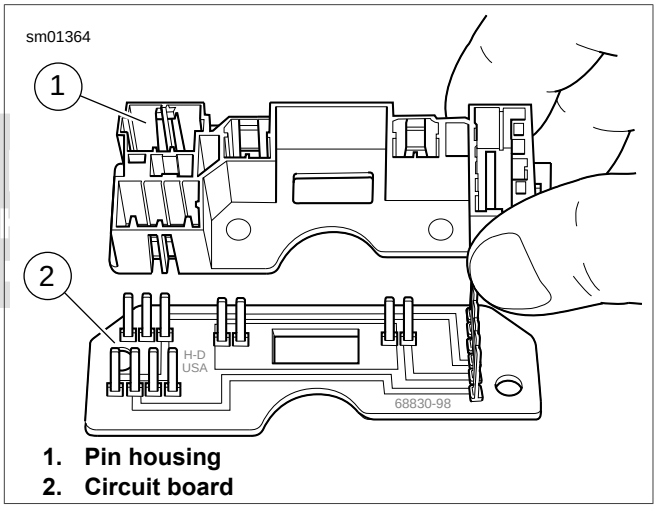
Be sure headlamp, tail and stop lamp and turn signals are operating properly before riding. Poor visibility of rider to other motorists can result in death or serious injury. (00478b)

10. Check operation of all lamps.



1. **Tail lamp [93]**
2. **Left turn signal [19]**
3. **Right turn signal [18]**
4. **Power in [94]**

Figure 6-43. Tail Lamp Base Connectors



1. **Pin housing**
2. **Circuit board**

Figure 6-44. Pin Housing and Circuit Board

REAR LIGHTING HARNESS

PART NUMBER	TOOL NAME
HD-25070	HEAT GUN

Removal

1. Remove turn signals and directional bar. See 2.32 REAR FENDER: XL 1200T, Removal.
2. Remove tail lamp connector [94] from tail lamp base.
3. Remove rear fender.
   a. **XL 883R/L:** See 2.30 REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X.
   b. **XL 1200C/CP/CA/CB:** See 2.31 REAR FENDER: XL 1200C/CP/CA/CB.
   c. **XL 1200T:** See 2.32 REAR FENDER: XL 1200T.

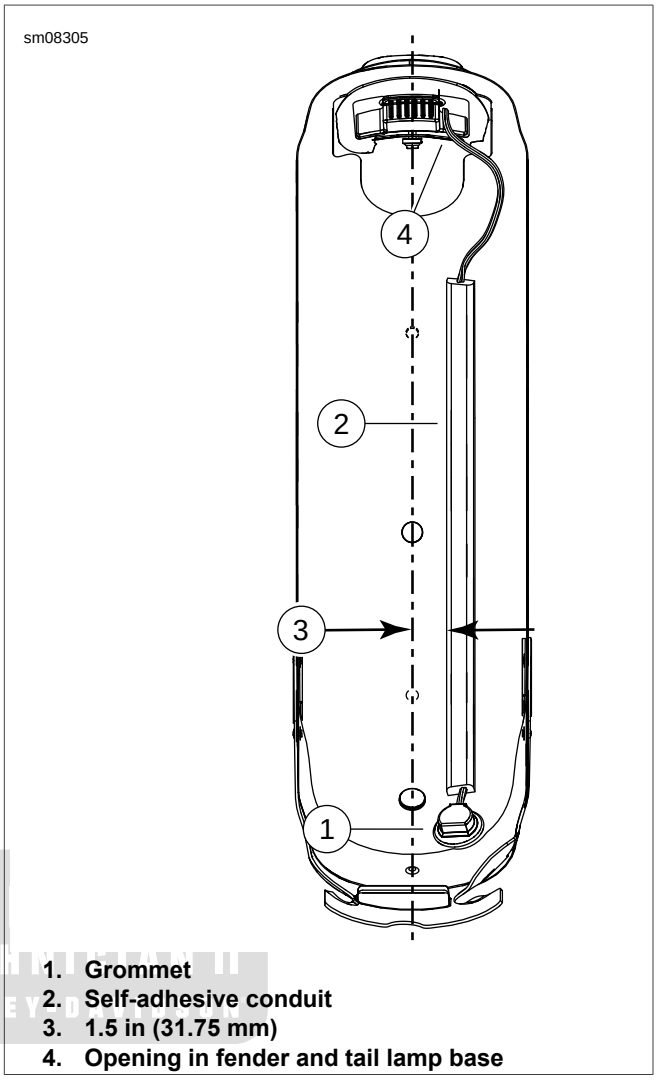
⚠WARNING

Be sure to follow manufacturer's instructions when using the Robinair Heat Gun or any other radiant heating device. Failure to follow manufacturer's instructions can cause a fire, which could result in death or serious injury. (00379a)

4. Remove adhesive tape backed wire harness from fender:
   a. Liberally apply 3M GENERAL PURPOSE ADHESIVE REMOVER. Allow to soak.
   b. Apply heat with HEAT GUN (Part No. HD-25070).
   c. Peel cushioned adhesive tape from fender.
   d. Remove remaining adhesive with 3M GENERAL PURPOSE ADHESIVE REMOVER.
5. Push the grommet from the top side through the D hole in the fender.
6. Feed connectors [18], [19] and [40] through the fender.
7. Pull the connector [94] through the tail lamp base and fender opening.

Installation

1. From the underside, feed connectors [18], [19] and [40] through D hole in fender.
2. See Figure 6-45. Push the grommet (1) to wire plug-in D hole.
3. Install the self-adhesive wire harness conduit (2):
   a. Align the self-adhesive wire harness conduit 1.25 in (31.75 mm) (4) from the center line of the fender.
   b. Remove paper backing from adhesive tape.
   c. Press firmly into position.
4. Fit connector housing [94] through fender and tail lamp base (3) opening.
5. Install the tail lamp base connector [94].
6. Install rear fender.
   a. **XL 883R/L:** See 2.30 REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X.
   b. **XL 1200C/CP/CA/CB:** See 2.31 REAR FENDER: XL 1200C/CP/CA/CB.
   c. **XL 1200T:** See 2.32 REAR FENDER: XL 1200T.



1. **Grommet**
2. **Self-adhesive conduit**
3. **1.5 in (31.75 mm)**
4. **Opening in fender and tail lamp base**

Figure 6-45. Rear Lightning Harness Routing

LED TAIL LAMP: XL 1200C/CP/CA/CB

FASTENER	TORQUE VALUE	
Tail lamp LED screws: XL 1200C/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm
Tail lamp LED base fasteners: XL 1200C/CP/CA/CB	40-50 **in-lbs**	4.5-5.6 Nm

Removal

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. Remove seat.
3. See Figure 6-46. Separate tail lamp sub-harness connector [40] housings.
4. Remove lower rear shock bolts and raise motorcycle to access tail lamp. See 2.20 SHOCK ABSORBERS.

5. See Figure 6-47. Remove the fasteners (3). Remove wire harness from inner fender rail.
6. Separate tail lamp base (2) from rubber gasket (5).
7. Remove two screws (4) to remove LED (1) from tail lamp base.

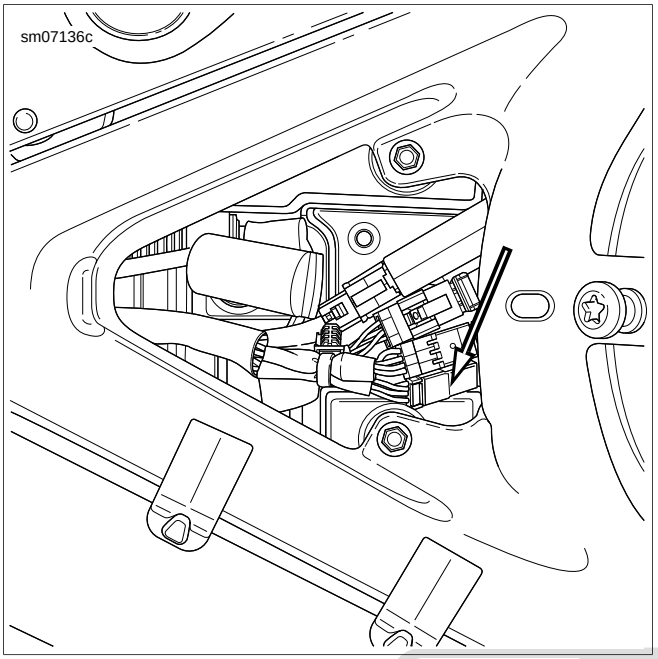


Figure 6-46. Tail Lamp Sub-Harness Connector [40]

Installation

1. Route LED wire harness through tail lamp base and rubber gasket.
2. Fasten LED to tail lamp base with screws. Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
3. Loosely install rubber gasket and tail lamp to fender and thread wire harness back through inner rail.
4. Tighten fasteners to 40-50 **in-lbs** (4.5-5.6 Nm).
5. Lower rear wheel. Install shock bolts. See 2.20 SHOCK ABSORBERS.
6. Connect sub-harness connector [7] housings.
7. Install main fuse.

⚠WARNING

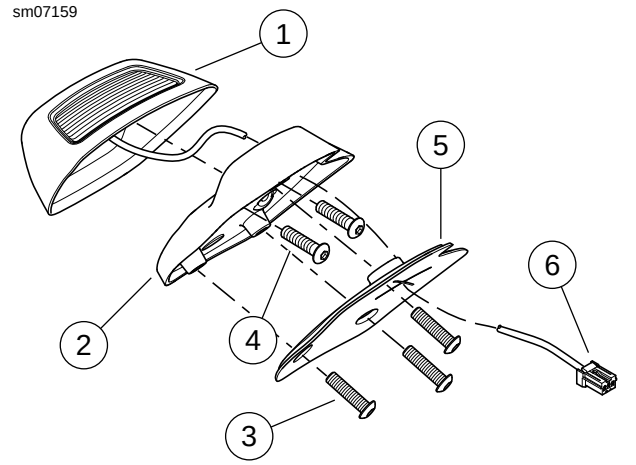
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

8. Install 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)

9. Check operation of all lamps.



1. **LED tail lamp**
2. **Base**
3. **Fasteners**
4. **Screws**
5. **Gasket**
6. **Subharness connector [40]**

Figure 6-47. LED Tail Lamp: XL 1200C/CP/CA/CB

LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V 6.19

GENERAL

The XL 883N and XL 1200X/V models use a convertible side-mount license plate in some markets. This assembly requires a separate license plate lamp module.

NOTES

- *This part cannot be repaired. Replace upon failure.*
- *This feature may not be available in all markets.*

REMOVAL: DOM ONLY

PART NUMBER	TOOL NAME
HD-45968	FAT JACK

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.

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, mounting brackets, components or housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586d)

2. Raise the motorcycle. Use a FAT JACK (Part No. HD-45968) to raise rear wheel to permit the removal of the lower shock absorber mounting screws.
3. Remove lower shock absorber mounting screw and nut on each side. See 2.20 SHOCK ABSORBERS.
4. Continue to raise motorcycle enough to access wiring on underside of rear fender.
5. Remove seat.
6. See Figure 6-48. Unplug license plate lamp connector [40].
7. See Figure 6-49. Carefully pull license plate lamp harness (6) through feed-through hole (5) on left side of fender.
8. Remove license plate lamp harness from fender harness clip (1) on left side of fender.
9. See Figure 6-50. Remove license plate lamp harness (3) from upper license plate bracket harness clips (1) and harness channel (2).
10. Remove screws (4) and license plate lamp module (5) from license plate bracket.

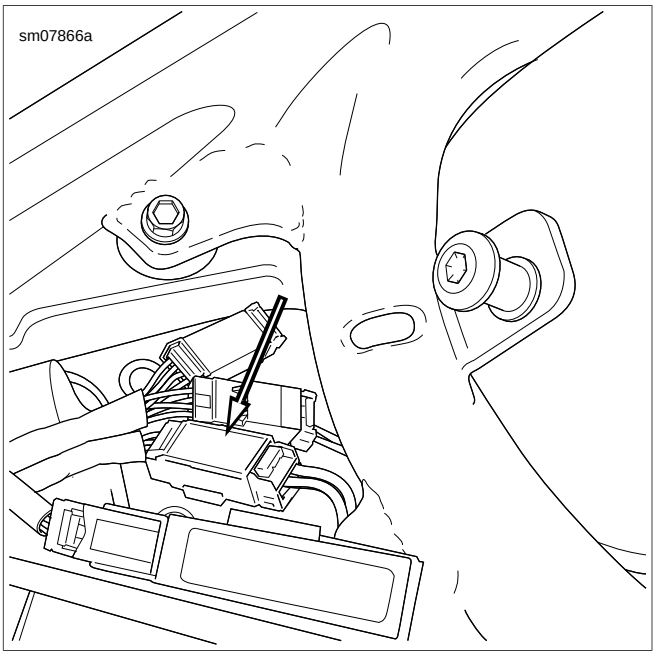
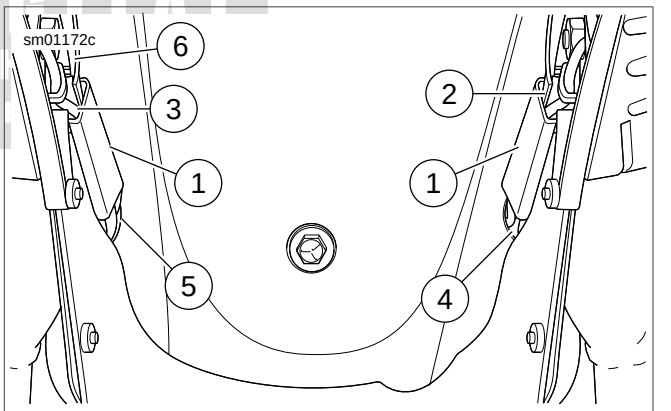
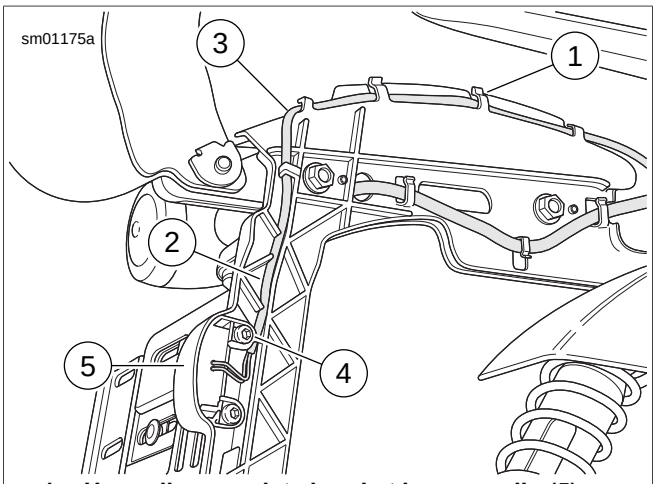


Figure 6-48. License Plate Lamp Connector [40]



1. **Bracket (2)**
2. **Right turn signal wire harness**
3. **Left turn signal wire harness**
4. **Right feed-through hole**
5. **Left feed-through hole**
6. **License plate lamp harness**

Figure 6-49. Wire Harness Routing and Harness Brackets: XL 883N, XL 1200X/V



1. **Upper license plate bracket harness clip (5)**
2. **Harness channel**
3. **License plate lamp harness**
4. **Screw (2)**
5. **License plate lamp module**

Figure 6-50. Removing/Installing License Plate Lamp Module: XL 883N, XL 1200X/V

INSTALLATION: DOM ONLY

FASTENER	TORQUE VALUE	
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm

1. See Figure 6-50. Install **new** license plate lamp module (5) into convertible side mount license plate bracket. Secure with two screws (4).
2. Feed license plate lamp harness (3) up through harness channel (2). Insert harness into upper license plate bracket harness clips (1).
3. See Figure 6-49. Insert license plate lamp harness (6) into fender harness clip (1) on left side of fender.
4. Feed harness through feed-through hole (5) on left side of rear fender.
5. Connect license plate lamp connector [40] housings.

⚠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)

6. Install seat.
7. Install lower shock absorber screw and nut on each side. Tighten to 45-50 ft-lbs (61-68 Nm). See 2.20 SHOCK ABSORBERS.
8. Install main fuse.
9. Lower the motorcycle.

⚠WARNING

Be sure headlamp, tail and stop lamp and turn signals are operating properly before riding. Poor visibility of rider to other motorists can result in death or serious injury. (00478b)

10. Check operation of all lamps.

REMOVAL: ALL EXCEPT DOM

PART NUMBER	TOOL NAME
HD-45968	FAT JACK

See Figure 6-51. The XL 883N and XL 1200X/V models built for international markets have a center-mounted license plate holder and lamp assembly.

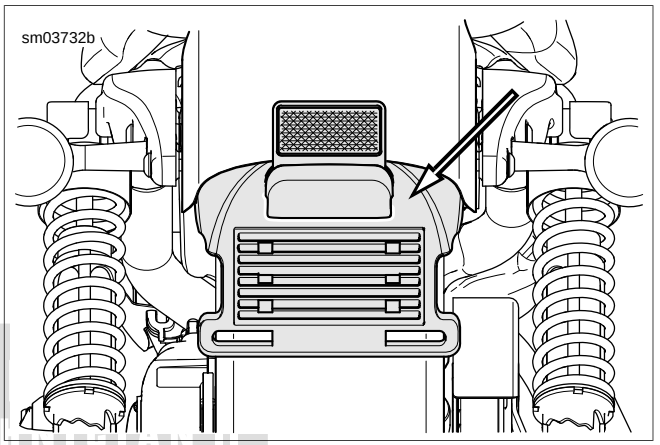


Figure 6-51. License Plate Holder and Lamp Assembly: XL 883N, XL 1200X/V (HDI)

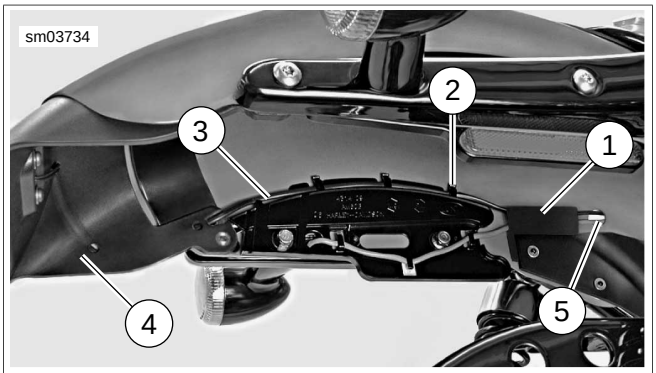
1. Remove main fuse.
2. Remove seat.

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, mounting brackets, components or housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586d)

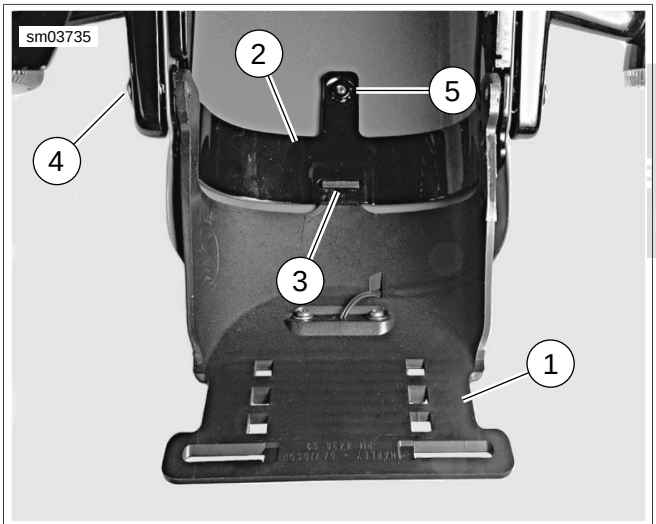
3. Use a FAT JACK (Part No. HD-45968) underneath frame to raise rear wheel to remove the lower shock absorber mounting screws.
4. Remove lower shock absorber mounting screw and nut on each side of vehicle. See 2.20 SHOCK ABSORBERS.
5. Continue to raise vehicle enough to access wiring on underside of rear fender.
6. Separate the license plate lamp harness connector [40] housings.
7. See Figure 6-52. Remove license plate lamp harness (3) from harness bracket (1) and harness clips (2). Route harness and connector in through hole in rear fender.

8. See Figure 6-53. Remove fender support screws with washers (4). Remove screw with washer (5) securing rear fender to fender brace (2). Remove fender brace and license plate holder assembly (1).



1. **Harness bracket**
2. **Harness clip (3)**
3. **License plate lamp harness**
4. **License plate holder**
5. **Feed hole**

Figure 6-52. License Plate Holder and Lamp Harness Mounting: XL 883N, XL 1200X/V (HDI)

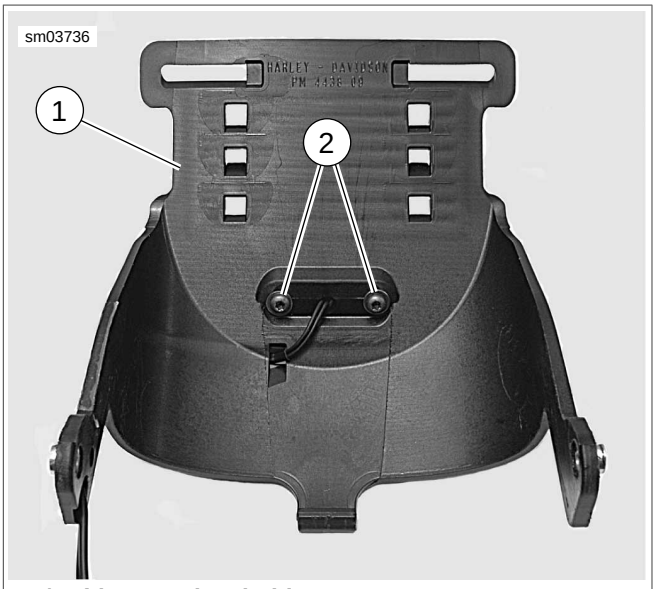


1. **License plate holder**
2. **Rear fender brace**
3. **Tab**
4. **Fender support screw with washer (2)**
5. **Screw with washer**

Figure 6-53. License Plate Holder: XL 883N, XL 1200X/V (HDI)

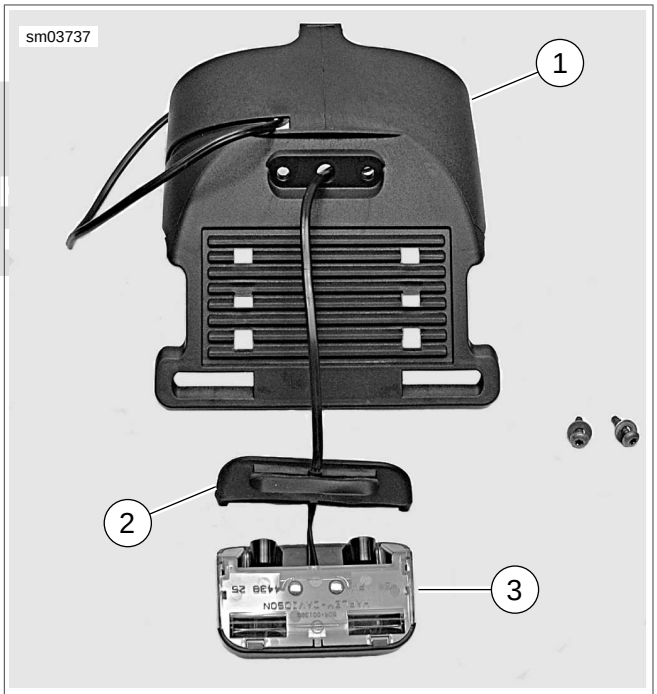
9. See Figure 6-54. Remove screws with washers (2) securing license plate lamp housing to license plate holder (1).

10. See Figure 6-55. Separate lamp housing (3) and gasket (2) from license plate holder (1).



1. **License plate holder**
2. **Screw and washer (2)**

Figure 6-54. License Plate Holder and Lamp Mounting Screws: XL 883N, XL 1200X/V (HDI)

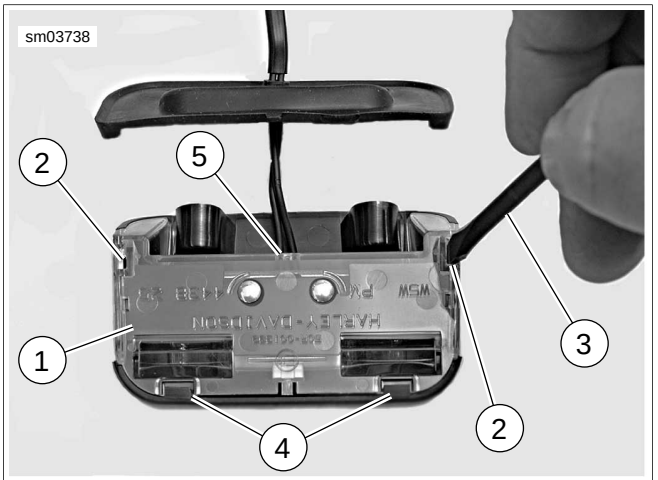


1. **License plate holder**
2. **Gasket**
3. **Lamp housing**

Figure 6-55. Lamp Housing Separated from License Plate Holder: XL 883N, XL 1200X/V (HDI)

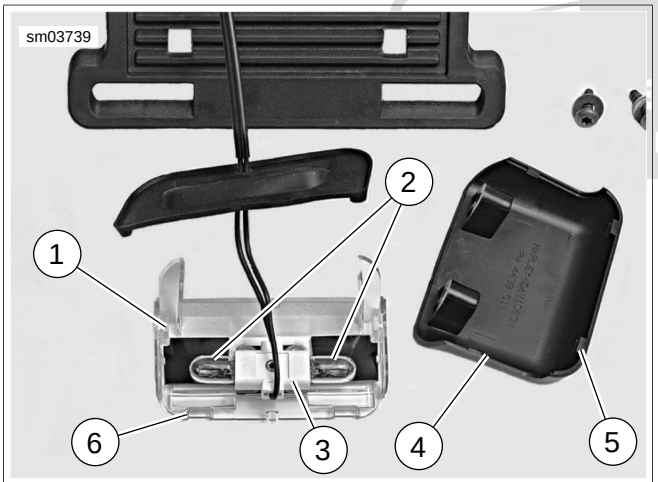
11. See Figure 6-56. Insert the tip of a small flat bladed screwdriver (3) into each slot (2) in lamp housing. Gently tilt screwdriver handle outward (away from lamp housing) enough to disengage housing from cover. Separate housing from cover. Slide housing away from tabs (4) in cover.

12. See Figure 6-57. If replacing a light bulb (2), gently pull bulb straight out of socket assembly (3). Push **new** light bulb into socket.



1. **Lamp housing**
2. **Slot (2)**
3. **Screwdriver**
4. **Tab (2)**
5. **Feed slots for harness wires**

Figure 6-56. Removing License Plate Lamp Housing Cover: XL 883N, XL 1200X/V (HDI)



1. **Lamp housing**
2. **Light bulb (2)**
3. **Socket assembly**
4. **Housing cover**
5. **Tab (2)**
6. **Slot (2)**

Figure 6-57. Replacing License Plate Light Bulbs: XL 883N, XL 1200X/V (HDI)

INSTALLATION: HDI

FASTENER	TORQUE VALUE	
License plate lamp housing screw: XL 883N	14-16 **in-lbs**	1.6-1.8 Nm
Fender support, rear, screw: XL 883N, XL 1200X/V	132-216 **in-lbs**	14.9-24.4 Nm
Fender brace, rear, screw: XL 883N, XL 1200X/V	20-25 **in-lbs**	2.3-2.8 Nm
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm

1. Carefully fit housing cover onto lamp housing, sliding tabs on cover into slots in housing. Make sure harness wires fit into slots in housing.
2. Gently snap cover onto housing Do not pinch wires.
3. Fit gasket onto lamp housing.
4. Install lamp housing onto license plate holder with lamp housing cover facing upward.
5. Secure lamp housing with two screws. Tighten to 14-16 **in-lbs** (1.6-1.8 Nm).
6. Fit tab on license plate holder into slot in rear fender brace. Install assembly onto vehicle. Install screw with washer through fender and into fender brace. Tighten finger-tight.
7. Install two screws with washers through fender struts, fender, fender brace and into threaded inserts in license plate holder.
8. See Figure 6-58. Make sure license plate holder threaded inserts (3) fit into holes (4) in fender brace (2).
9. Tighten fasteners:
   a. Fender support screw to 132-216 **in-lbs** (14.9-24.4 Nm)
   b. Fender brace rear screw to 20-25 **in-lbs** (2.3-2.8 Nm)
10. Install license plate lamp harness into three clips in fender bracket. Feed harness and connector through feedthrough hole in fender. Press harness into harness bracket.
11. Connect license plate lamp harness connector [40B] housings.
12. Install lower shock absorber screw and nut on each side of vehicle. Tighten to 45-50 ft-lbs (61-68 Nm). See 2.20 SHOCK ABSORBERS.

⚠WARNING

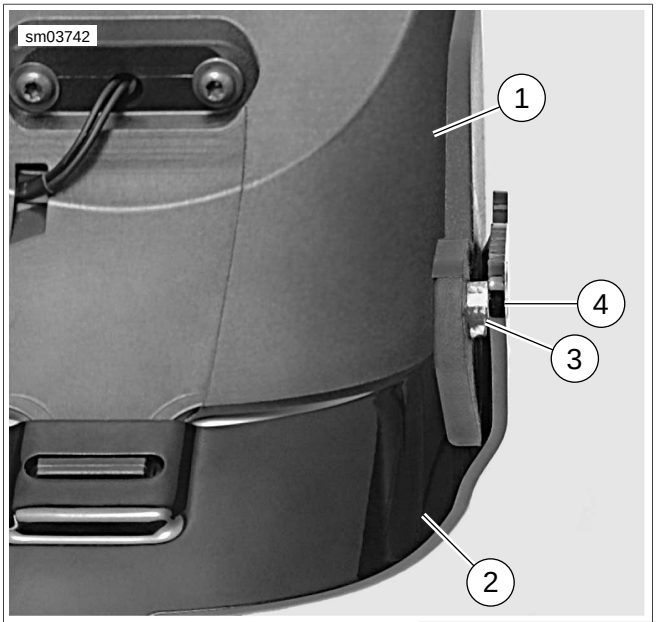
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

13. Install seat.
14. Install 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)

15. Check operation of all lamps.



1. **License plate holder**
2. **Rear fender brace**
3. **Threaded insert**
4. **Hole**

Figure 6-58. License Plate Holder and Rear Fender Brace: XL 883N, XL 1200X/V (HDI)

REFLECTOR BRACKETS: XL 883N, XL 1200X/V (HDI)

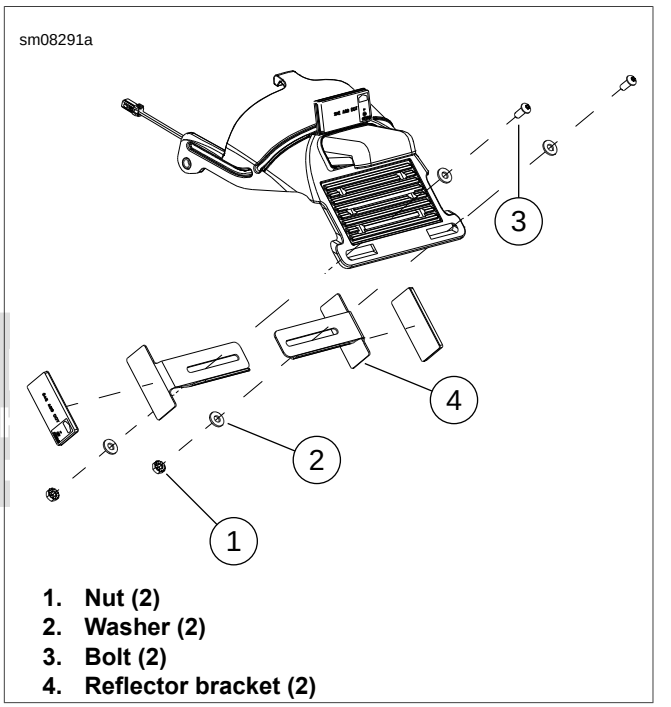
FASTENER	TORQUE VALUE	
License plate reflector bracket Keps nut: XL 883N, XL 1200X/V (HDI)	10-15 **in-lbs**	1.1-1.7 Nm

Removal

See Figure 6-59. Remove the nuts (1), washers (2) and bolts (3). Remove the side reflector brackets (4).

Installation

See Figure 6-59. Assemble the side reflector brackets (4) to the license plate assembly with the bolts (3), washers (2) and nuts (1). Tighten to 10-15 **in-lbs** (1.1-1.7 Nm).



1. **Nut (2)**
2. **Washer (2)**
3. **Bolt (2)**
4. **Reflector bracket (2)**

Figure 6-59. License Plate and Reflector Brackets

FRONT TURN SIGNALS 6.20

BULB REPLACEMENT

1. Insert coin in notch. Carefully twist coin until lens cap pops out of turn signal housing.
2. Replace bulb.
   a. Push bulb and turn counterclockwise.
   b. While pushing bulb in, rotate counterclockwise to remove.
   c. Coat base of **new** bulb with ELECTRICAL CONTACT LUBRICANT.
   d. Push and rotate **new** bulb clockwise into socket.
3. Snap lens cap back into housing.

WIRE HARNESS

Removal

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 4.4 FUEL TANK.

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

2. Remove main fuse.
3. Remove fuel tank. See 4.4 FUEL TANK.
4. Separate left and right wire harness caddies. See 6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES.
5. See Figure 6-60. Locate turn signal connector [31] mounted on right wire harness caddy. Press latch. Separate connector halves.
6. Remove corresponding socket terminals from connector [31B].
7. Remove turn signals.
   a. **All except 1200X/1200T:** See 6.20 FRONT TURN SIGNALS, All Except XL 1200X, XL 1200T.
   b. **XL 1200X:** See 6.20 FRONT TURN SIGNALS, XL 1200X.
   c. **XL 1200T:** See 6.20 FRONT TURN SIGNALS, XL 1200T.
8. Pull wire conduit through coil bracket and cable strapped bundled wire harness.

Installation

1. Lay old turn signal housing and wires next to **new**. Cut **new** wires to length.
2. Trim sheath back approximately 2.5 in (63.5 mm). Crimp **new** socket terminals onto wires.
3. Route wire conduit through fork clamp, handlebar clips (all except XL 1200X), coil bracket, bundled and cable strapped wire harness into electrical caddy.
4. Install turn signals.
   a. **All except 1200X/1200T:** See 6.20 FRONT TURN SIGNALS, All Except XL 1200X, XL 1200T.
   b. **XL 1200X:** See 6.20 FRONT TURN SIGNALS, XL 1200X.
   c. **XL 1200T:** See 6.20 FRONT TURN SIGNALS, XL 1200T.
5. Crimp socket terminals trimmed wire leads.
6. Match wire lead colors. Install socket terminals into connector [31B] housing.
7. Connect housings.
8. Install left and right wire harness shields. See 6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES.
9. Install fuel tank. See 4.4 FUEL TANK.
10. Install 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)

11. Check operation of all lamps.

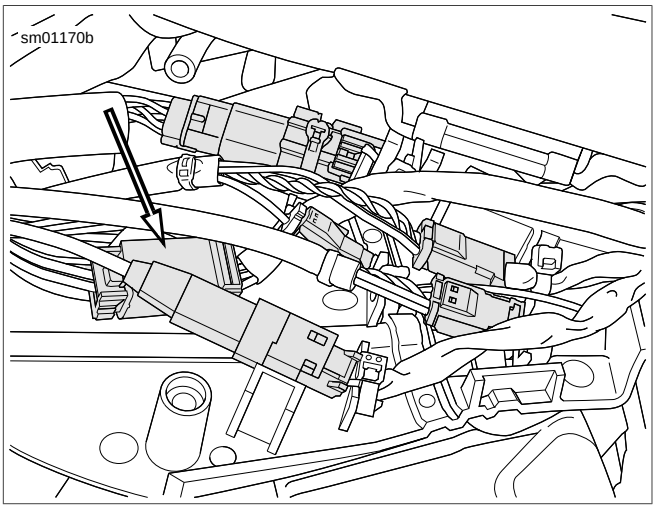


Figure 6-60. Turn Signal Connector [31]

ALL EXCEPT XL 1200X, XL 1200T

FASTENER	TORQUE VALUE	
Turn signal, front, ball head studs: all except XL 1200X, XL 1200T	96-144 **in-lbs**	10.8-16.3 Nm
Turn signal, front, ball stud set screw: all except XL 1200X, XL 1200T	96-120 **in-lbs**	10.8-13.6 Nm

Removal

1. Remove wire harness. See 6.20 FRONT TURN SIGNALS, Wire Harness.
2. See Figure 6-61. Loosen set screw to remove turn signal assembly.

Installation

1. See Figure 6-62. Inspect ball head stud. Replace or repair as necessary.
2. If replaced, tighten **new** ball head studs to 96-144 **in-lbs** (10.8-16.3 Nm).
3. Fit ball head stud to lever bracket. Secure with set screw.
4. Adjust turn signal so lens is aimed directly forward. Tighten set screw to 96-120 **in-lbs** (10.8-13.6 Nm).
5. Check for clearance.
   a. Lay protective cover over fuel tank.
   b. Slowly turn handlebar to full left lock and full right lock.
   c. If either turn signal contacts fuel tank, loosen set screw. Reposition turn signal outward away from fuel tank. Make sure that lens is aimed forward.
   d. Tighten set screw to specification.
6. Install wire harness. See 6.20 FRONT TURN SIGNALS, Wire Harness.

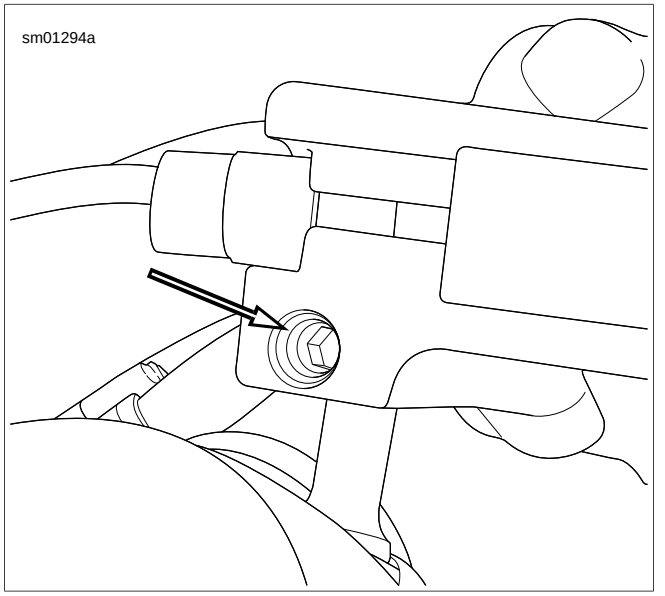
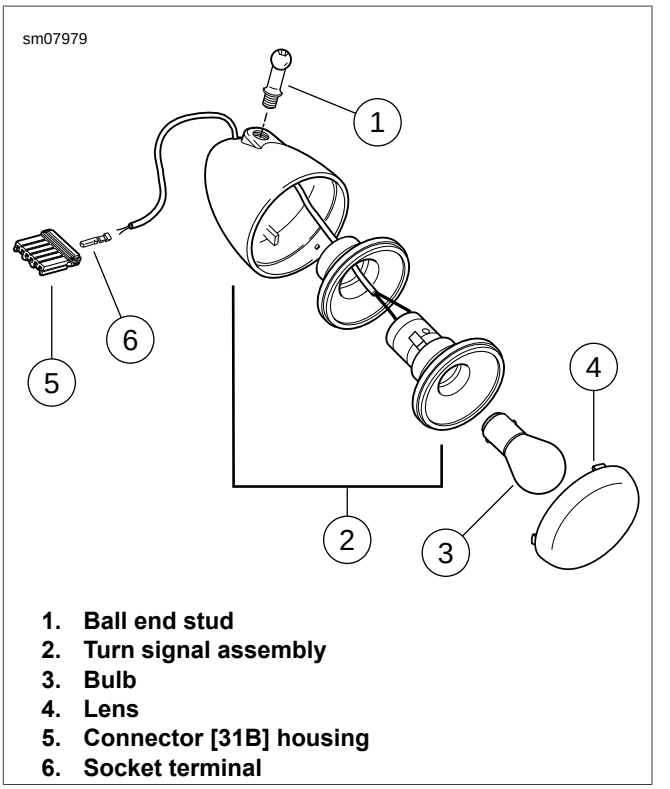


Figure 6-61. Ball Stud Set Screw



1. **Ball end stud**
2. **Turn signal assembly**
3. **Bulb**
4. **Lens**
5. **Connector [31B] housing**
6. **Socket terminal**

Figure 6-62. Turn Signals: All Except XL 1200X

XL 1200X

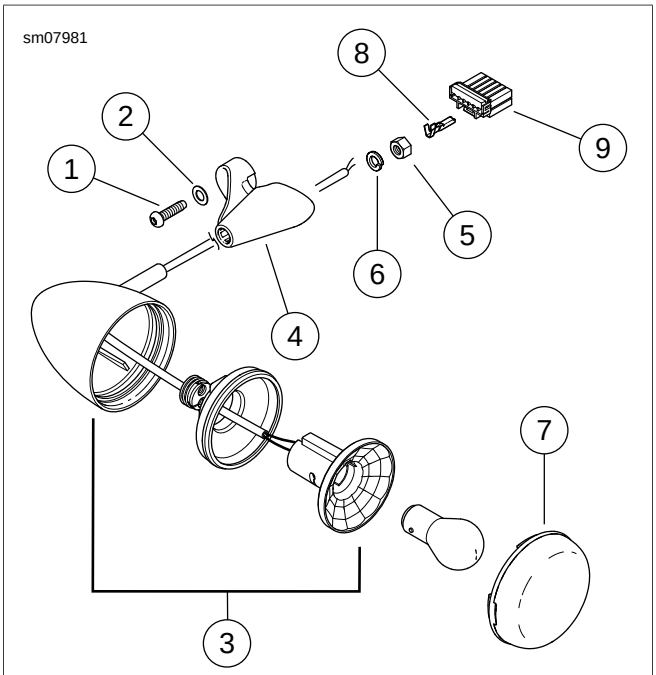
FASTENER	TORQUE VALUE	
Turn signal mount, front, nut: XL 1200X	12-16 ft-lbs	16.3-21.7 Nm
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm

Removal

1. Remove wire harness. See 6.20 FRONT TURN SIGNALS, Wire Harness.
2. See Figure 6-63. Remove fork bracket pinch fastener (1) and washer (2).
3. Remove turn signal assembly (3) and mount (4).
4. Remove nut (5) and lockwasher (6).
5. Pull turn signal and wire harness through mount.

Installation

1. Push wire harness through mount.
2. Install turn signal assembly to mount with lockwasher and nut. Tighten to 12-16 ft-lbs (16.3-21.7 Nm).
3. Install mount to fork bracket with fastener and washer. Tighten to 30-35 ft-lbs (40.7-47.5 Nm).
4. Install wire harness. See 6.20 FRONT TURN SIGNALS, Wire Harness.



1. **Fastener (fork bracket pinch screw)**
2. **Washer**
3. **Turn signal assembly**
4. **Mount**
5. **Nut**
6. **Lockwasher**
7. **Lens**
8. **Socket terminal**
9. **Connector [31B] housing**

Figure 6-63. Turn Signals: XL 1200X

XL 1200T

PART NUMBER	TOOL NAME
FRX 181	SNAP-ON FLARE NUT SOCKET

FASTENER	TORQUE VALUE	
Turn signal housing, front, nut: XL 1200T	12-16 ft-lbs	16.3-21.7 Nm
Turn signal bracket pinch screw: XL 1200T	36-54 **in-lbs**	4.1-6.1 Nm

Removal

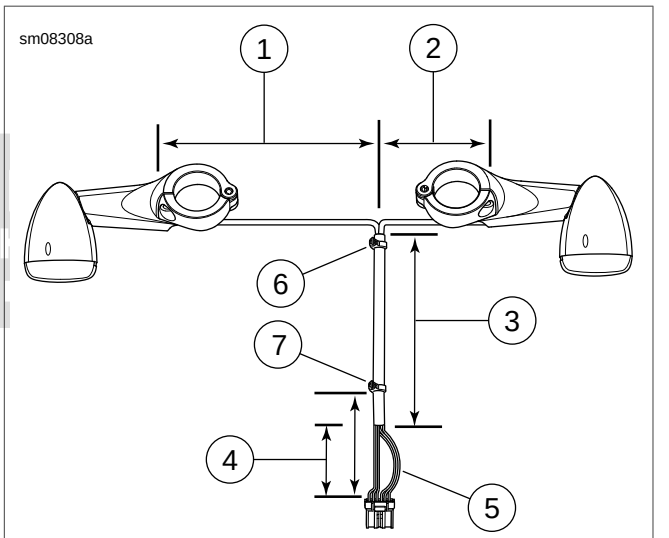
1. Remove connector housing [31] from turn signal wire harness. See 6.20 FRONT TURN SIGNALS, Wire Harness.
2. See Figure 6-66. Remove turn signal bracket pinch screws.
3. Remove turn signal assembly and bracket.

Disassembly

1. Remove cable strap.
2. Remove nut and lockwasher with SNAP-ON FLARE NUT SOCKET (Part No. FRX 181).
3. Remove the turn signal housing.
4. Pull turn signal wire leads through bracket and conduit.

Assembly

1. Lay old turn signal housing and wires next to the **new**. Cut the **new** wires to length.
2. Push turn signal housing wire leads through mount.
3. Install turn signal assembly to bracket with lockwasher and nut. Tighten to 12-16 ft-lbs (16.3-21.7 Nm).
4. See Figure 6-64. Install conduit over each set of turn signal wire leads.
5. Slide the vinyl tubing over the paired conduits.
6. Space the housing leads to specification.
7. Verify the loop from the left turn signal wires.
8. Verify the wire length leads and rubber tubing installation.
9. Install cable strap 3/8 in (9.5 mm) from upper end of vinyl tubing.
10. Crimp the terminals on the wire leads.
11. Install the terminals in the connector housing [31].



1. **8.75 in (222 mm)**
2. **6.0 in (152 mm)**
3. **5.75 in (146 mm)**
4. **2.5 in (64 mm)**
5. **Left turn signal wire loop**
6. **Cable strap 0.375 in (10 mm) from tubing end**
7. **Cable strap (3.0 in (76.2 mm) from connector (HDI only)**

Figure 6-64. Front Turn Signal Wire Harness: XL 1200T

Installation

1. Route wire harness along left side.
2. See Figure 6-66. Fit left and right turn signals to front fork tubes. Close clamps.
3. See Figure 6-65. Match pin on bracket to slot in fork clamp.
4. See Figure 6-66. Secure bracket to fork tube with fastener. Tighten to 36-54 **in-lbs** (4.1-6.1 Nm).

5. Install connector housing and wire harness. See 6.20 FRONT TURN SIGNALS, Wire Harness.

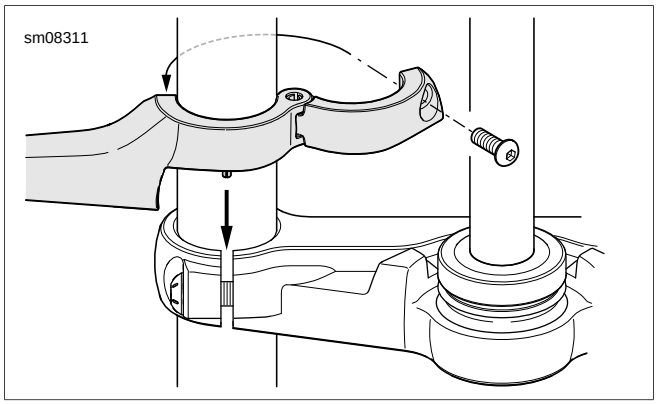
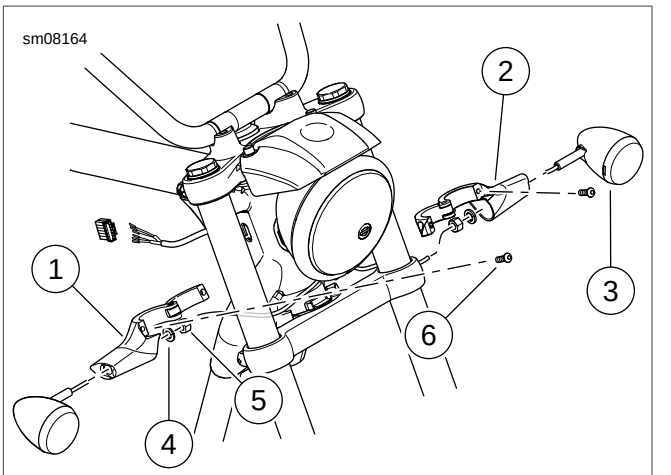


Figure 6-65. Match Pin to Slot in Fork Bracket



1. **Right turn signal bracket**
2. **Left turn signal bracket**
3. **Turn signal housing (2)**
4. **Lockwasher (2)**
5. **Nut (2)**
6. **Pinch screw (2)**

Figure 6-66. Turn Signal Installation: XL 1200T

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

REAR TURN SIGNALS 6.21

GENERAL

Bulb Replacement

See 6.20 FRONT TURN SIGNALS, Bulb Replacement.

Tail and Stop Lamps

XL 883N, XL 1200X/V: The rear turn signals are the tail and stop lamps. This feature may not be available in all markets.

NOTE

XL 883N and XL 1200X/V models in certain markets have LED rear turn signal/stop lamp/tail lamp assemblies. The LED assemblies are sealed units and cannot be disassembled. Replace the entire rear turn signal housing assembly.

XL 883L/R

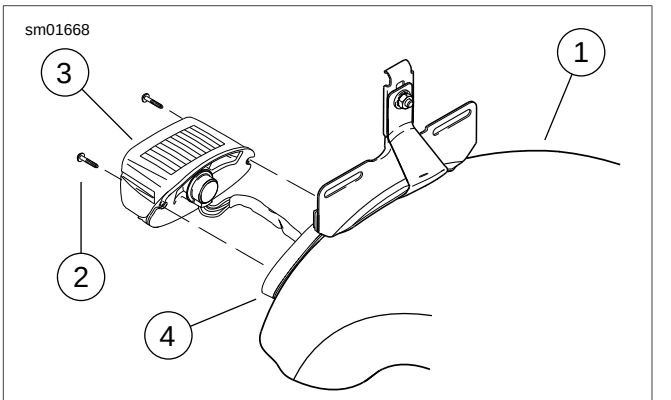
FASTENER	TORQUE VALUE	
Turn signal housing to mount, rear, fastener	96-156 **in-lbs**	10.9-17.6 Nm
Turn signal stalk locknut	120-168 **in-lbs**	13.6-19.0 Nm
Fender, rear, mounting fastener	120-168 **in-lbs**	13.6-19.0 Nm

Removal

WARNING

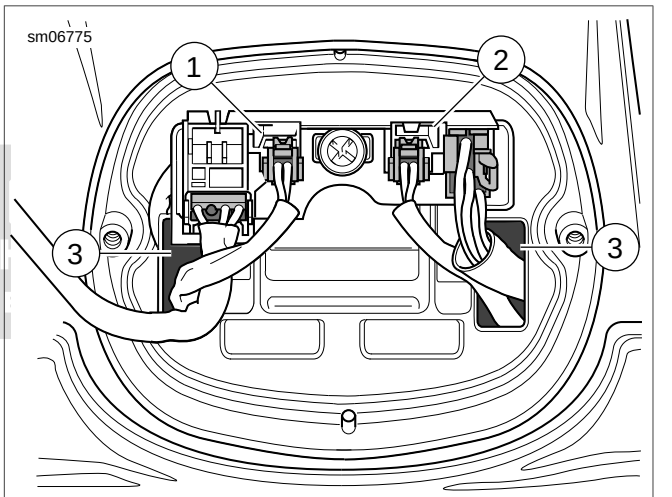
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. Remove seat.
3. See Figure 6-67. Remove screws (2) and tail lamp lens (3) from tail lamp base (4).
4. See Figure 6-68. Remove left and right turn signal connectors (1, 2). Pull turn signal wiring harnesses through harness access holes (3) in tail lamp base.
5. Remove lower shock absorber mounting screws and nuts. See 2.20 SHOCK ABSORBERS.
6. See Figure 6-69. Disengage turn signal wiring harnesses from wire retention brackets (1).
7. See Figure 6-70. Remove screws (3, 4), washers (5), nuts (7) and nut plate (8).
8. Remove rear fender strut covers (1) and attached turn signal assemblies (2) from rear fender struts. Carefully slide wiring through holes.
9. Remove socket terminals from left and right turn signal connectors [18B], [19B].
10. Unscrew and remove turn signal stalk (6) and fender strut cover (1) from each turn signal assembly (2).



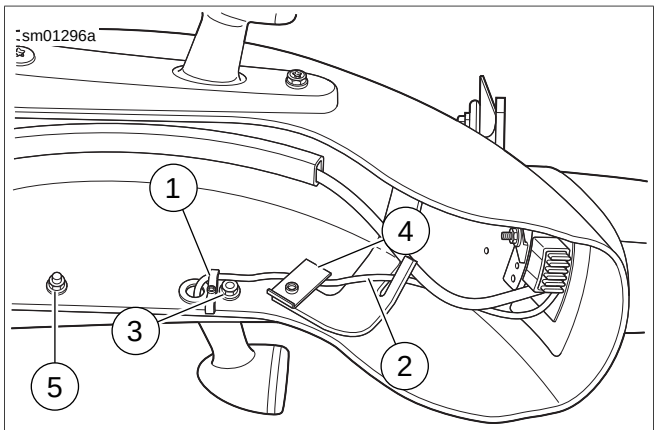
1. **Rear fender**
2. **Screw (2)**
3. **Tail lamp lens**
4. **Tail lamp base**

Figure 6-67. Tail Lamp Lens: XL 883L/R



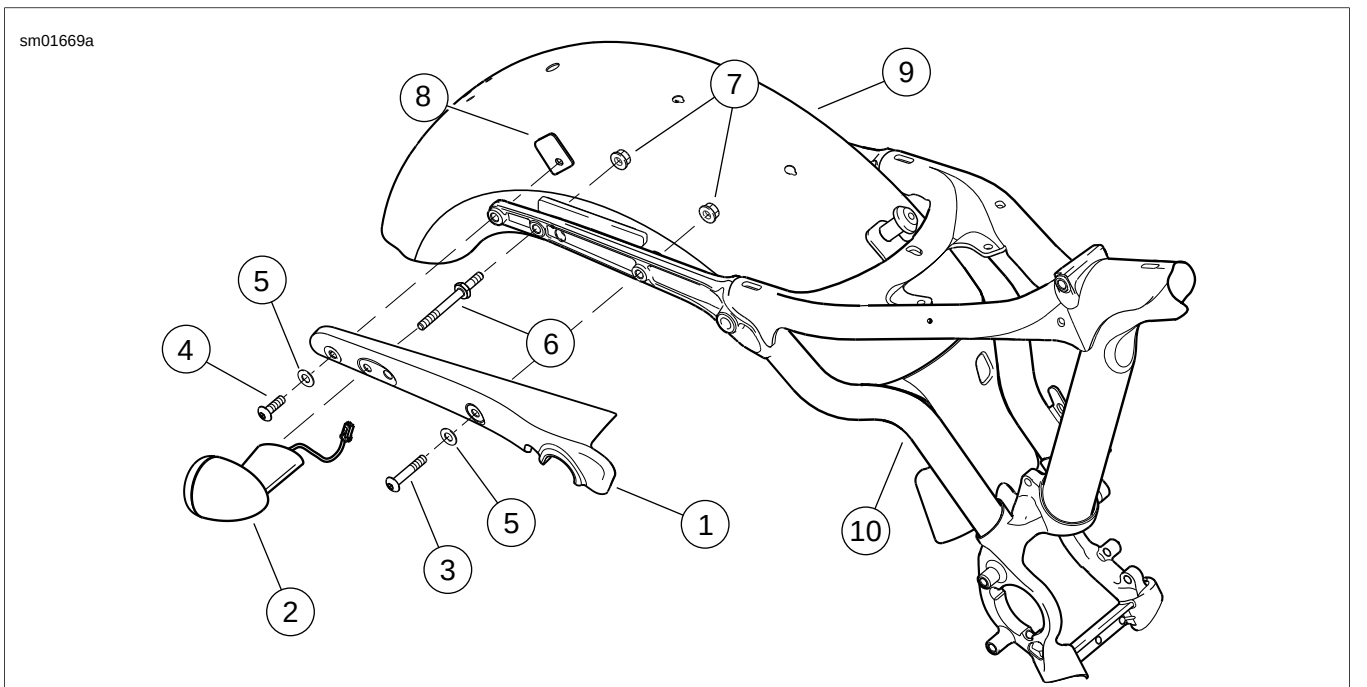
1. **Left turn signal connector [19]**
2. **Right turn signal connector [18]**
3. **Wiring harness access hole (2)**

Figure 6-68. Turn Signal Connectors: XL 883L/R



1. **Wire retention bracket (2)**
2. **Turn signal wiring harness (2)**
3. **Rear turn signal stalk nut (2)**
4. **Nut plate (2)**
5. **Nut (2)**

Figure 6-69. Turn Signal Wire Routing: XL 883L/R



1. **Rear fender strut cover (2)**
2. **Rear turn signal assembly (2)**
3. **Screw (2)**
4. **Screw (2)**
5. **Washer (4)**
6. **Turn signal stalk (2)**
7. **Locknut (4)**
8. **Nut plate (2)**
9. **Rear fender**
10. **Frame**

Figure 6-70. Rear Fender Mounting Components (typical)

Installation

1. Lay old turn signal housing and wires next to **new** and cut **new** wires to length. Trim sheath back approximately 2.5 in (63.5 mm).
2. Crimp **new** terminals onto wires.
3. See Figure 6-71. Install each turn signal housing (3) and mount (4) to rear fender strut cover with turn signal stalk (5). Tighten to 96-156 **in-lbs** (10.9-17.6 Nm).
4. Press wiring harness terminal sockets into left and right connector housings [19B], [18B].
5. Install rear fender strut covers over fender struts. Push turn signal wiring harness through the hole in the strut and fender.
6. Thread nut onto turn signal stalk from inside fender. Finger tighten.

7. Secure fender to each fender strut with screw, washer and nut in forward mounting hole. Install screw, washer and nut plate in aft mounting hole. Finger tighten.
8. Tighten fasteners:
   a. Tighten turn signal stalk nuts to 120-168 **in-lbs** (13.6-19.0 Nm).
   b. Tighten strut cover screws to 120-168 **in-lbs** (13.6-19.0 Nm).
9. Engage turn signal wiring harness in wire retention bracket on each side of rear fender.
10. Push left and right turn signal wiring harnesses through corresponding harness access holes in tail lamp base.
11. Attach left [18] and right [19] turn signal connectors.
12. Attach tail lamp lens to tail lamp base.
13. Install lower shock absorber mounting screws and nuts. See 2.20 SHOCK ABSORBERS.
14. Install main fuse.

WARNING

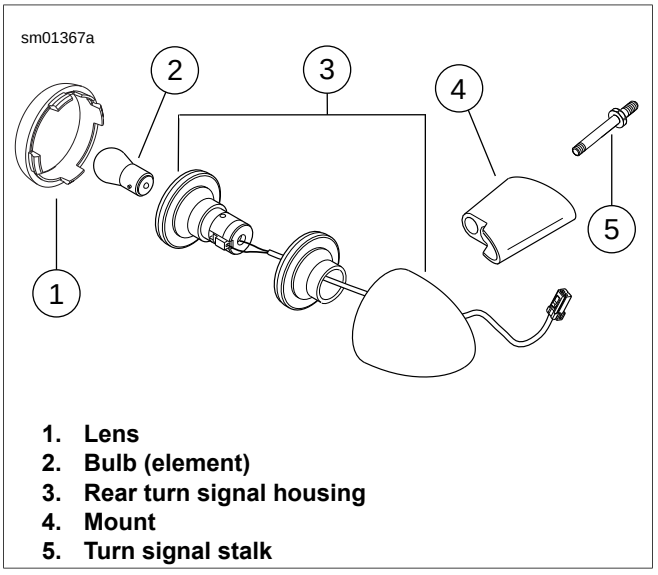
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

15. Install seat.

WARNING

Be sure headlamp, tail and stop lamp and turn signals are operating properly before riding. Poor visibility of rider to other motorists can result in death or serious injury. (00478b)

16. Check operation of all lamps.



1. **Lens**
2. **Bulb (element)**
3. **Rear turn signal housing**
4. **Mount**
5. **Turn signal stalk**

Figure 6-71. Rear Turn Signal Components: XL 883L/R

XL 1200T

FASTENER	TORQUE VALUE	
Turn signal/license bracket, rear, nut: XL 1200T	20-25 **in-lbs**	2.3-2.8 Nm
Tail lamp lens screw: XL 883R/L, XL 1200T	20-24 **in-lbs**	2.3-2.7 Nm
Turn signal housing, rear, locking nut: XL 1200T	64-75 **in-lbs**	7.2-8.4 Nm
License plate clamp nut	20-25 **in-lbs**	2.3-2.8 Nm

Removal

1. Remove main fuse.
2. Remove the saddlebags. See 2.29 SADDLEBAGS: XL 1200T.
3. Access fender hardware.
   a. Raise motorcycle to lower rear wheel.
   b. Remove lower shock bolts. See 2.20 SHOCK ABSORBERS.
4. Remove two screws and the tail lamp lens from the tail lamp base.
5. Remove the turn signal connectors [18], [19].
6. If necessary, loosen the clamp nut to remove license plate.
7. Remove the three Keps nuts under the fender.
8. Remove the turn signal bar/license plate bracket assembly. Pull the wire harness and connectors through the fender opening.

Disassembly

1. Remove the nut and carriage bolt to separate the license plate clamp from the turn signal bar.
2. Remove the terminals from the connector housings.
3. Cut off cable strap around vinyl tubing.
4. Cut off the terminals.
5. Loosen the locking nut.
6. Turn off the turn signal housing, the lockwasher and the locking nut as necessary.
7. Pull the wires through the conduit, the license plate bracket and the directional bar.

Assembly

NOTE

*Lay old turn signal housing and wire leads next to the **new**. Cut the **new** wire leads to length.*

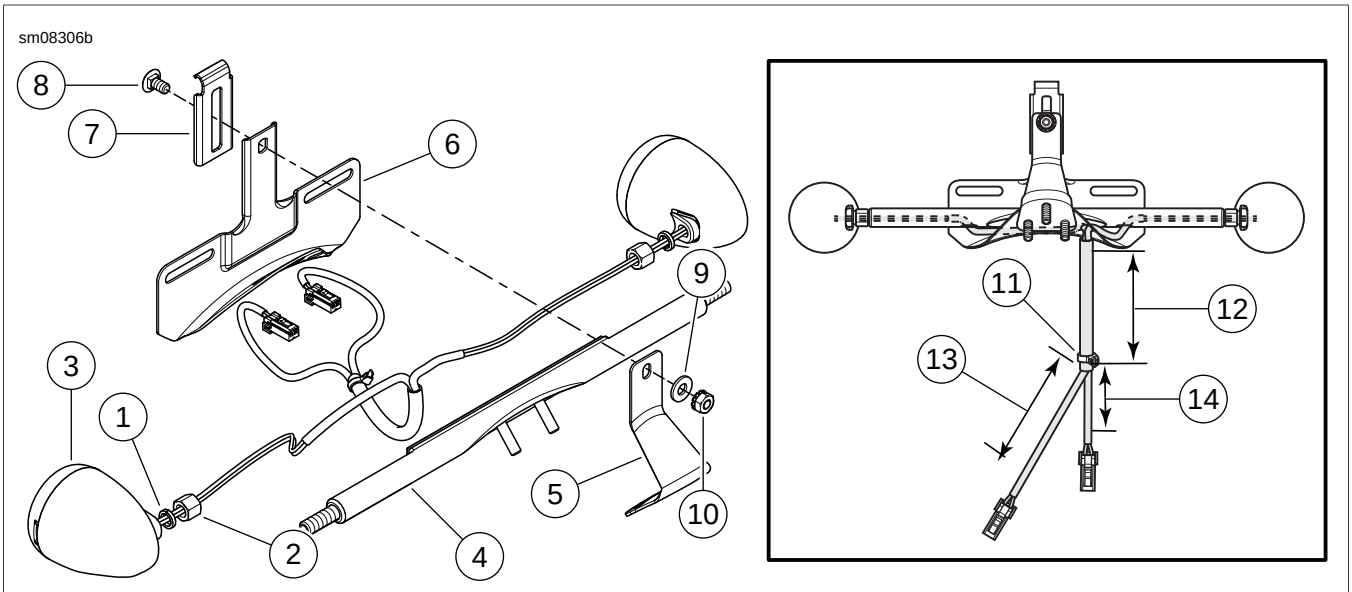
1. See Figure 6-72. Install locking nut (2) and lockwasher (1) on the directional bar (4).
2. Route the wire leads from the turn signal housing (3) through the directional bar.
3. Apply LOCTITE 248T THREADLOCKER (blue) to the internal threads of the turn signal housing.

4. Route the turn signal housing onto the directional bar. Hand tighten.
5. Install conduit over two leads from turn signal housing.
6. Push the conduit a minimum 1/2 in (12.7 mm) into the directional bar.
7. Route the right wire lead conduit along the bottom of the license plate bracket (6).
8. Route the right and left wire leads route through right side hole in license plate bracket.
9. Install turn signal bar to clamp (7), license plate bracket (6) and support (5) with carriage bolt (8). Install washer (9) and nut (10). Hand tighten nut.
10. Route each set of leads through the vinyl tubing. Push the tubing up to the bracket.
11. Secure the vinyl tubing 1/4 in (6.4 mm) from the end with a **new** cable strap (11).

NOTES

- *The vinyl tubing extends 3.88 in (98.6 mm) from bracket.*
- *The right turn signal leads extend 5 in (127 mm) (13) from the vinyl tubing.*
- *The left turn signal leads extend 3 in (76.2 mm) (14) from the vinyl tubing.*

12. Compare the lengths of the left and right turn signal leads. Adjust as necessary.
13. Install **new** terminals.
14. Install the terminals in the connector housings.



1. **Washer (2)**
2. **Locking nut (2)**
3. **Turn signal housing (2)**
4. **Directional bar**
5. **Support**
6. **License plate bracket**
7. **Clamp**
8. **Carriage bolt**
9. **Washer**
10. **Nut**
11. **Cable strap**
12. **3.88 in (98.6)**
13. **5.00 in (127 mm)**
14. **3.00 in (76.2 mm)**

Figure 6-72. Turn Signal and Directional Bar Assembly

Installation

1. Route the connectors through the fender opening.

NOTE

Level the directional signal bar.

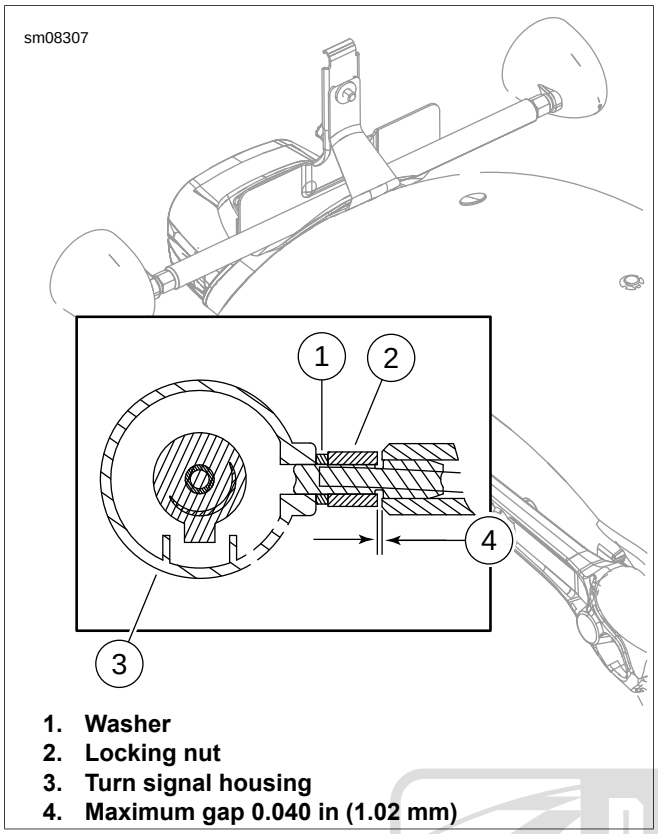
2. Install the bolt and turn signal/license plate bracket with three Keps nuts. Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).
3. Route the turn signal leads through the openings in the tail lamp baseplate.
4. Install the connectors [18] and [19] into the tail lamp baseplate.
5. Install two screws and tail lamp lens. Tighten to 20-24 **in-lbs** (2.3-2.7 Nm).

NOTE

See Figure 6-73. After tightening, the gap between the bar and the locking nut must not exceed 0.040 in (1.02 mm).

6. Aim the turn signal housings to the rear. Tighten the locking nuts. Tighten to 64-75 **in-lbs** (7.2-8.4 Nm).
7. Install shocks:
   a. Lower motorcycle to align shock with rear fork.
   b. Install lower shock bolts. See 2.20 SHOCK ABSORBERS.
8. Install saddlebags. See 2.29 SADDLEBAGS: XL 1200T.
9. Install main fuse.

10. If necessary, install license plate. Tighten to 20-25 **in-lbs** (2.3-2.8 Nm).



1. **Washer**
2. **Locking nut**
3. **Turn signal housing**
4. **Maximum gap 0.040 in (1.02 mm)**

Figure 6-73. Locking Nut Clearance

XL 883N AND XL 1200X/V

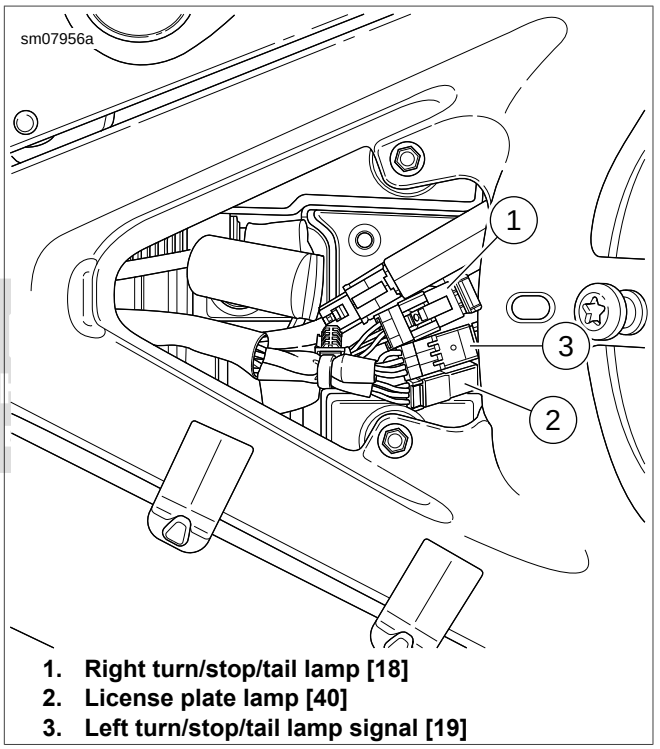
FASTENER	TORQUE VALUE	
Turn signal housing to mount, rear, fastener	96-156 **in-lbs**	10.9-17.6 Nm
Turn signal stalk locknut	120-168 **in-lbs**	13.6-19.0 Nm
Fender, rear, mounting fastener	120-168 **in-lbs**	13.6-19.0 Nm

Removal

WARNING

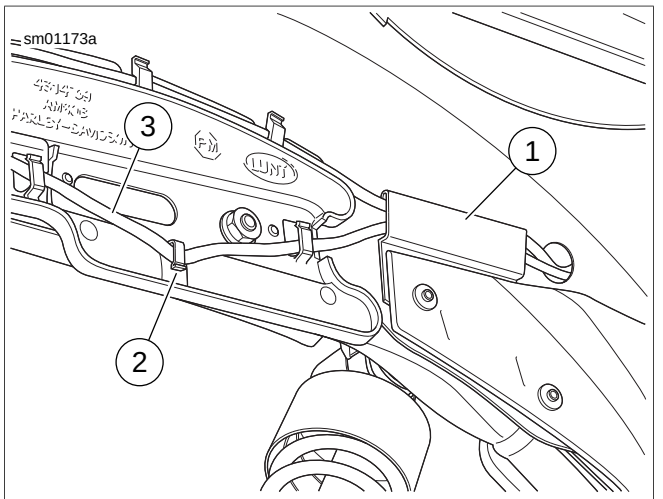
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. Remove seat.
3. Raise the rear end of the motorcycle.
4. Remove lower shock absorber mounting screws and nuts. See 2.20 SHOCK ABSORBERS.
5. Raise motorcycle to access underside of rear fender.
6. See Figure 6-74. Separate turn/stop/tail lamp harness connectors [18], [19] (3, 1).
7. See Figure 6-75. Remove left rear lighting harness (3) from right and left harness bracket (1).
8. Remove lighting harness from RH and LH lower bracket harness clips (2).
9. See Figure 6-76. Pull both rear lighting harnesses (2, 3) through feed-through holes (4, 5) in rear fender.
10. See Figure 6-77. Remove screws (3, 4), washers (5), nuts (7) and nut plate (8). Remove rear fender strut covers (1) and attached turn signal assemblies (2) from rear fender struts. Carefully feed turn signal harnesses through holes in fender and fender struts.
11. Remove socket terminals from left and right turn signal connectors [18B], [19B].
12. Remove turn signal stalk (6) (1) and fender strut cover from each turn signal assembly (2). Separate mount from turn signal housing.



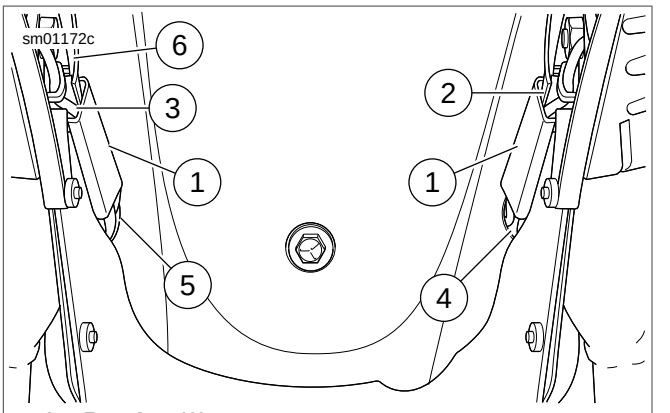
1. **Right turn/stop/tail lamp [18]**
2. **License plate lamp [40]**
3. **Left turn/stop/tail lamp signal [19]**

Figure 6-74. Rear Lighting Harness Connectors: XL 883N, XL 1200X/V



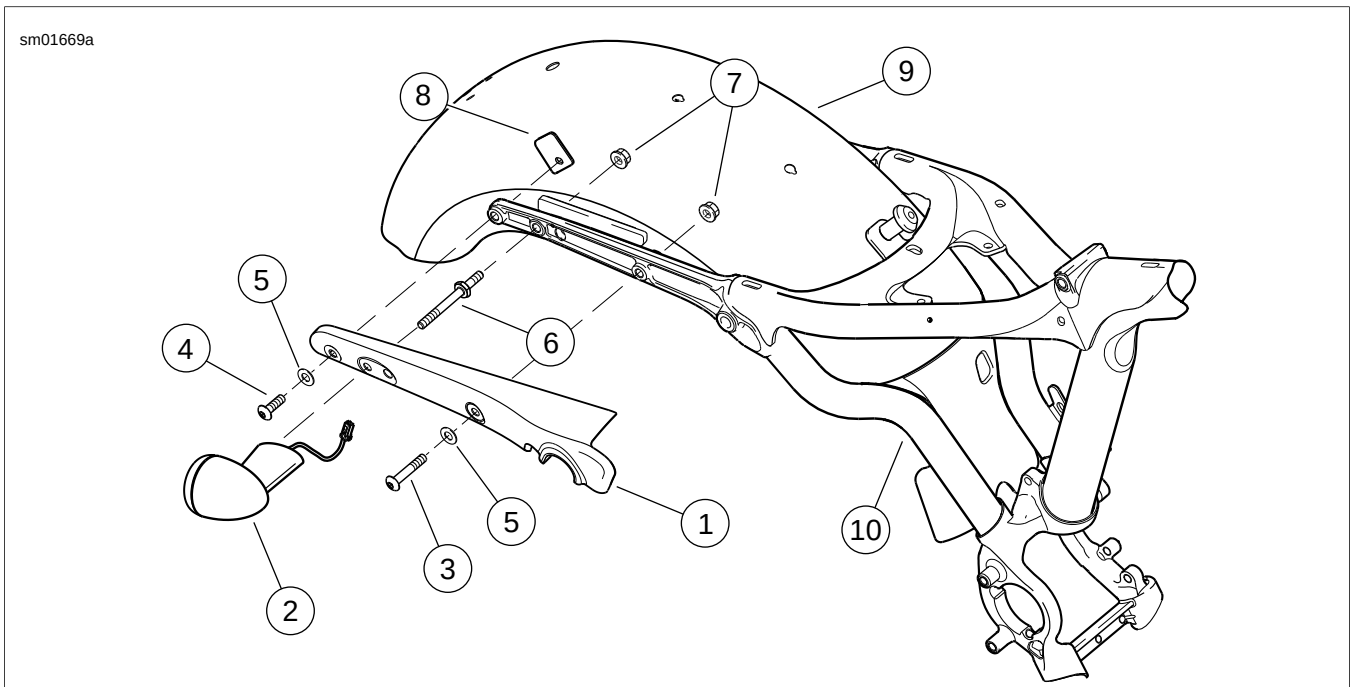
1. Harness bracket
2. Lower bracket harness clip (3)
3. Left rear lighting harness

Figure 6-75. Rear Lighting Harness Removal/Installation: XL 883N, XL 1200X/V



1. Bracket (2)
2. Right turn signal wire harness
3. Left turn signal wire harness
4. Right feed-through hole
5. Left feed-through hole
6. License plate lamp harness

Figure 6-76. Wire Harness Routing and Harness Brackets: XL 883N, XL 1200X/V



1. Rear fender strut cover (2)
2. Rear turn signal assembly (2)
3. Screw (2)
4. Screw (2)
5. Washer (4)
6. Turn signal stalk (2)
7. Locknut (4)
8. Nut plate (2)
9. Rear fender
10. Frame

Figure 6-77. Rear Fender Mounting Components (typical)

Installation

1. Lay old turn signal housing and wires next to **new**. Cut **new** wires to length. Trim sheath back approximately 2.5 in (63.5 mm).
2. Crimp **new** terminals onto wires.
3. See Figure 6-78. Install each turn signal housing (3) and mount (4) to rear fender strut cover with turn signal stalk. Tighten to 96-156 **in-lbs** (10.9-17.6 Nm).
4. Insert wiring harness terminal sockets into left and right connector housings [19B], [18B].
5. Install rear fender strut covers over fender struts. Push turn signal wiring harness through hole in strut and fender.

6. Finger tighten nut onto turn signal stalk from inside fender.
7. Secure fender to each fender strut with screw, washer and nut in forward mounting hole. Install screw, washer and nut plate in aft mounting hole. Finger tighten.

NOTE

See Figure 6-79. Make sure tab (3) on nut plate (2) fits into slot (4) in fender brace (1) when securing nut plate with rear fender mounting fastener (5).

8. Tighten fasteners in following sequence:
   a. Tighten turn signal stalk nuts to 120-168 **in-lbs** (13.6-19.0 Nm).
   b. Tighten strut cover screws to 120-168 **in-lbs** (13.6-19.0 Nm).
9. Install lower shock absorber mounting screws and nuts. See 2.20 SHOCK ABSORBERS.
10. Connect left turn/stop/tail lamp [19] and right turn/stop/tail lamp [18] connector housings.
11. Install main fuse.

WARNING

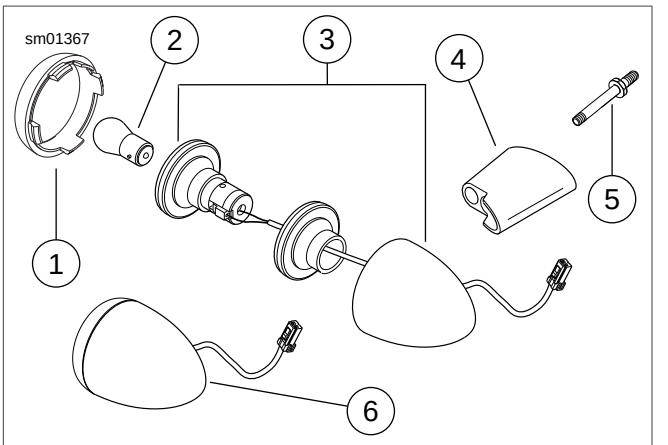
After installing seat, pull upward on seat to be sure it is locked in position. While riding, a loose seat can shift causing loss of control, which could result in death or serious injury. (00070b)

12. Install seat.

WARNING

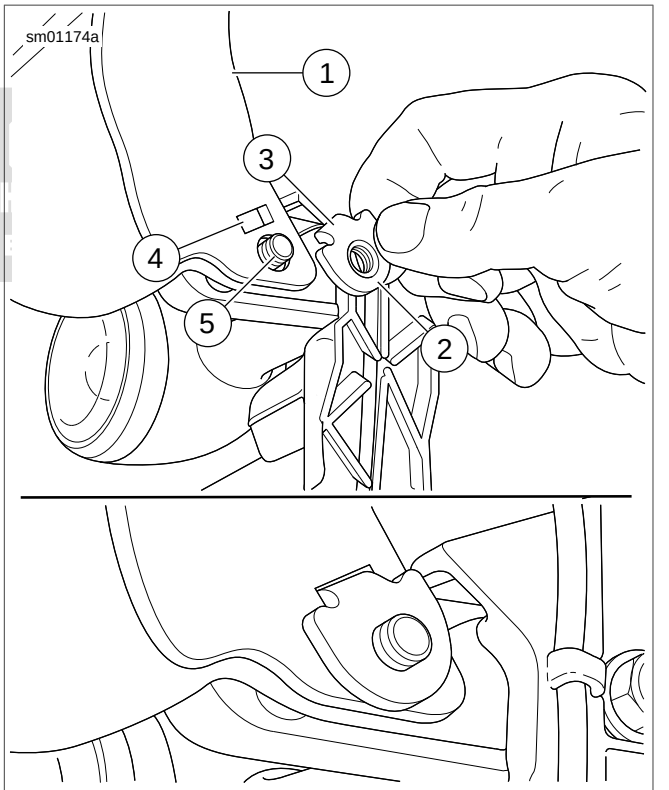
Be sure headlamp, tail and stop lamp and turn signals are operating properly before riding. Poor visibility of rider to other motorists can result in death or serious injury. (00478b)

13. Check operation of all lamps.



1. **Lens**
2. **Bulb (element)**
3. **Rear turn signal housing**
4. **Mount**
5. **Turn signal stalk**
6. **Rear turn signal housing (sealed unit: XL 883N, XL 1200X, XL 1200V)**

Figure 6-78. Rear Turn Signal Components



1. **Rear fender brace**
2. **Nut plate (2)**
3. **Tab**
4. **Slot**
5. **Mounting screw (2)**

Figure 6-79. Rear Fender Nut Plate: XL 883N, XL 1200X/V

XL 1200C/CP/CA/CB

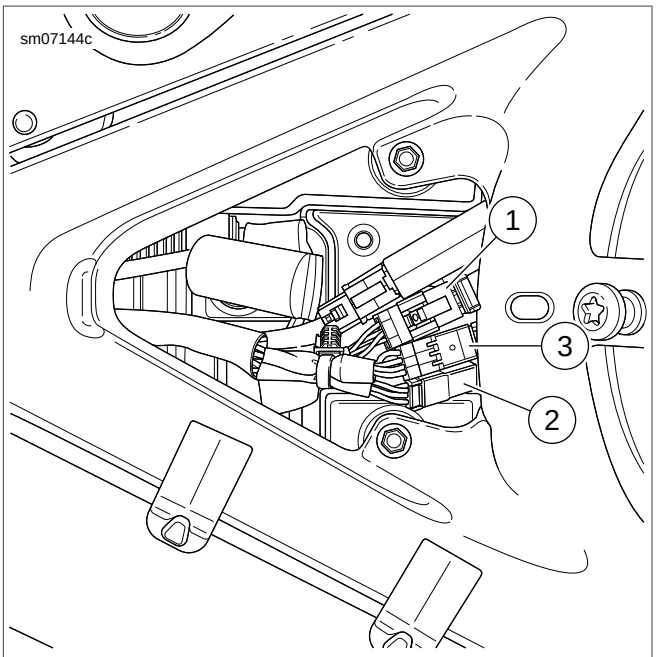
FASTENER	TORQUE VALUE	
Turn signal housing to mount, rear, fastener	96-156 **in-lbs**	10.9-17.6 Nm
Turn signal stalk locknut	120-168 **in-lbs**	13.6-19.0 Nm
Fender, rear, mounting fastener	120-168 **in-lbs**	13.6-19.0 Nm

Removal

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. Remove seat.
3. Raise the rear end of the motorcycle.
4. Remove the lower shock absorber mounting screws and nuts. See 2.20 SHOCK ABSORBERS.
5. Raise the motorcycle to access the underside of the rear fender.
6. See Figure 6-80. Separate the right turn signal [18] (1) and left turn [19] (3) connector housings.
7. Remove the turn signal wire harness from the right and left wire retention brackets.
8. Pull the harness connectors through the feed holes in the fender.
9. Remove screws, washers, nuts and nut plate.
10. Remove rear fender strut covers with attached turn signals.
11. Thread the wire harness through the holes in the fender and fender struts.
12. Unscrew and remove turn signal stalk and fender strut cover from each turn signal assembly.
13. Remove socket terminals from right turn signal [18B] and left turn signal [19B] connector housings.



1. **Right turn [18]**
2. **Stop/tail lamp [40]**
3. **Left turn [19]**

Figure 6-80. Rear Lighting Connectors: XL 1200C/CP/CA/CB

Installation

1. Lay the **new** turn signal housing wires next to removed wires. Cut **new** to length. Trim sheath back 2.5 in (63.5).
2. Crimp **new** terminals onto leads.
3. Assemble the turn signal housing to the mount. Install the fastener. Tighten to 96-156 **in-lbs** (10.9-17.6 Nm).
4. Install wire harness terminals into RH and LH connector housings [18B] and [19B].
5. Thread turn sign wire harness through hole in strut and fender and install strut covers over fender struts.
6. Thread nut onto turn signal stalk from inside the strut. Finger tighten.
7. Secure fender to strut with screws, washers and nuts. Finger tighten.
8. Tighten fasteners:
   a. Turn signal stalks to strut cover to 120-168 **in-lbs** (13.6-19.0 Nm).
   b. Fender strut cover to strut to 120-168 **in-lbs** (13.6-19.0 Nm).
9. Thread turn signal wires through fender and behind the wire retention bracket.
10. Thread the turn signal wires through the fender openings. Connect the housings [18] and [19].
11. Install shock absorber mounting screws and nuts and lower the motorcycle. See 2.20 SHOCK ABSORBERS.
12. Install main fuse.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

⚠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)

13. Install seat.

⚠WARNING

Be sure headlamp, tail and stop lamp and turn signals are operating properly before riding. Poor visibility of rider to other motorists can result in death or serious injury. (00478b)

14. Check operation of all lamps.

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

REAR STOP LAMP SWITCH 6.22

REMOVAL

FASTENER	TORQUE VALUE	
Brake caliper bleeder screw	35-61 **in-lbs**	3.9-6.9 Nm

Stop Lamp Switch

1. Remove left side cover.
2. Remove main fuse.
3. Remove mufflers. See 4.16 EXHAUST SYSTEM, Mufflers.
4. Drain brake fluid:
   a. Remove cap from caliper bleeder screw.
   b. Install a length of 5/16 in (7.9 mm) ID clear plastic tubing over bleeder screw. Place free end in a suitable container.
   c. Open bleeder screw 1/2 turn.
   d. Remove reservoir cover.
   e. Pump brake pedal several times to drain brake fluid.
   f. Close bleeder screw. Tighten to 35-61 **in-lbs** (3.9-6.9 Nm).

NOTE

Do not cut conduit routing wire leads to the stop lamp switch connector [121].

5. Cut shrink tubing covering stop lamp switch and harness.
6. Separate spade connectors [121B-1] and [121B-2] from stop lamp switch.
7. Remove stop lamp switch.

Wire Harness

1. Separate stop lamp connector [121] housings.
2. Remove all terminals from housing.
3. Pull terminals through routing conduit one lead at a time.
4. Remove master cylinder banjo bolt and sealing washers. Discard sealing washers.

INSTALLATION

PART NUMBER	TOOL NAME
HD-25070	HEAT GUN
HD-39969	ULTRA TORCH
HD-41183	HEAT SHIELD ATTACHMENT
HD-48650	DIGITAL TECHNICIAN II

FASTENER	TORQUE VALUE	
Stop lamp switch, rear	12-15 **in-lbs**	1.4-1.6 Nm

Wire Harness

1. Thread terminals and wire leads through routing conduit in front of the connector [121].
2. See Figure 6-81. Route wire harness:
   a. Along brake line.
   b. Under master cylinder.
   c. Along brake line to stop lamp switch.
3. Push terminals into connector housing until they click in place.
4. Connect stop lamp switch connector [121] housings.

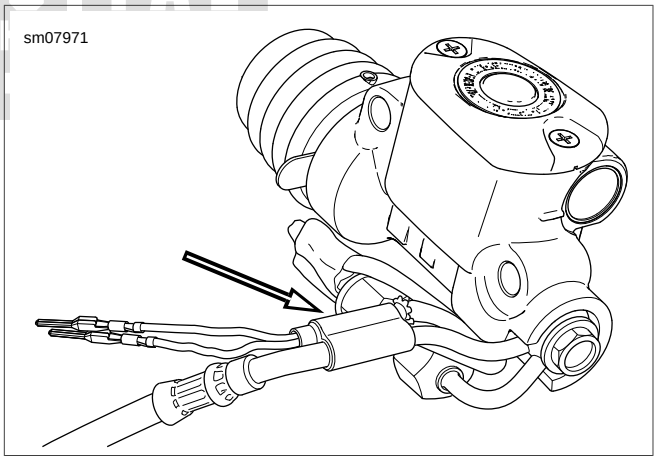


Figure 6-81. Switch Wire Routing Conduit

Stop Lamp Switch

1. Install stop lamp switch. Tighten to 12-15 **in-lbs** (1.4-1.6 Nm).
2. See Figure 6-82. Install spade connectors [121B-1] and [121B-2.
3. Fit wire leads along stop lamp switch and to brake line.
4. Install heat shrink tubing over switch and harness.

⚠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.

5. Use an ULTRA TORCH (Part No. HD-39969) or HEAT GUN (Part No. HD-25070) with HEAT SHIELD ATTACHMENT (Part No. HD-41183) to shrink tubing.
6. Install mufflers. See 4.16 EXHAUST SYSTEM, Mufflers.

⚠WARNING

When any hydraulic brake component, line or connection is loosened or replaced on an ABS motorcycle, Digital Technician II must be used during the brake bleeding procedure to verify all air is removed from the system. Failure to properly bleed the brake system could adversely affect braking, which could result in death or serious injury. (00585c)

7. Bleed brake system. See 2.14 BLEEDING BRAKES.
8. **ABS models:** Use DIGITAL TECHNICIAN II (Part No. HD-48650) to verify that system is bled.
9. Install main fuse.
10. Install side cover.

⚠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)

11. Test operation of rear brake.

⚠WARNING

Be sure headlamp, tail and stop lamp and turn signals are operating properly before riding. Poor visibility of rider to other motorists can result in death or serious injury. (00478b)

12. Check operation of all lamps.

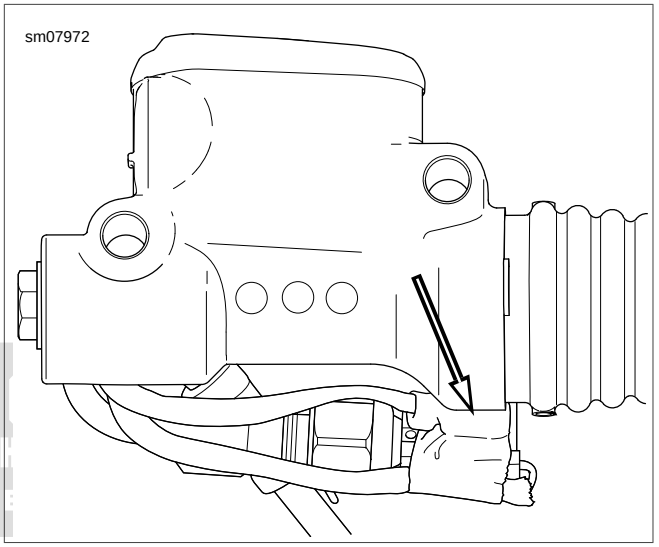


Figure 6-82. Stop Lamp Switch Spade Connectors [121-1] [121-2]

CRANK POSITION SENSOR (CKP) 6.23

GENERAL

The CKP sensor is a variable reluctance (VR) sensor. It generates an AC signal by sensing the passing of 30 teeth cast into the left side flywheel. Two consecutive teeth are missing in the flywheel to establish a reference point. The CKP sensor sends a signal to the ECM. This signal is used to reference engine position (TDC) and engine speed. The CKP sensor is located near the lower front left corner of the engine crankcase.

NOTE

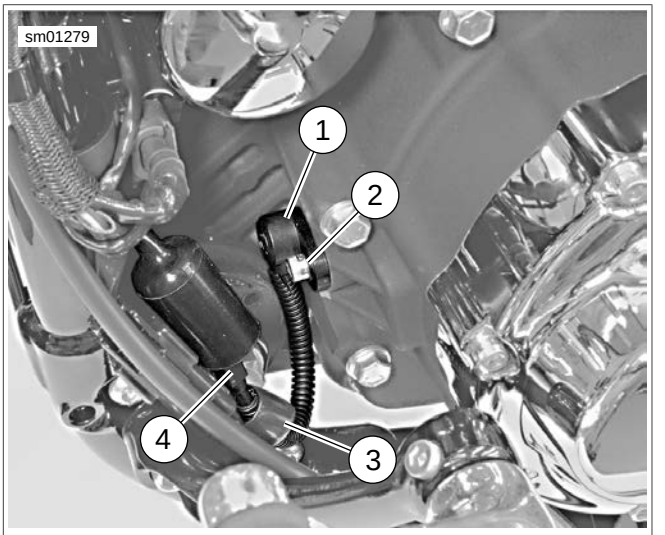
This part cannot be repaired. Replace upon failure.

REMOVAL

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. See Figure 6-83. Disconnect CKP sensor harness connector [79A] from wiring harness connector [79B] (4), located along left frame downtube.
3. Remove CKP wire harness from j-clip (3).
4. Remove screw (2). Carefully remove CKP sensor (1) and O-ring from engine crankcase.



1. **CKP sensor**
2. **Screw**
3. **Wire harness j-clip**
4. **CKP sensor harness connector [79]**

Figure 6-83. CKP Sensor

INSTALLATION

FASTENER	TORQUE VALUE	
CKP screw	90-120 **in-lbs**	10.3-13.6 Nm

NOTE

The CKP sensor O-ring has a blue Teflon coating that provides lubrication during installation. No other lubrication is needed.

1. See Figure 6-83. Carefully install CKP sensor (1) and O-ring into engine crankcase with screw (2). Tighten to 90-120 **in-lbs** (10.3-13.6 Nm).
2. Route CKP sensor wiring harness through J-clip (3).
3. Attach CKP sensor harness connector [79A] to wiring harness connector [79B] (4).
4. Install main fuse.
5. Start engine to verify operation.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

VOLTAGE REGULATOR 6.24

REMOVAL

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

NOTE

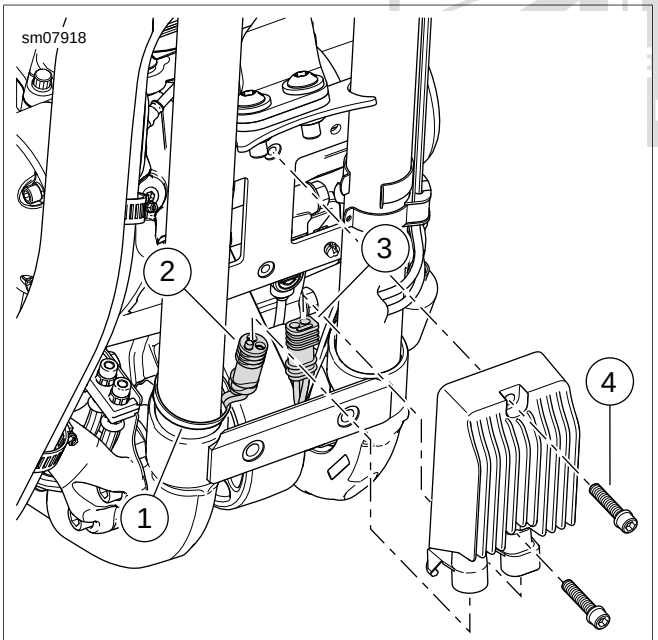
This part is not serviceable. Replace assembly upon failure.

1. Remove side cover.
2. Remove main fuse.

NOTE

Do not pull on wiring when removing stator connector [47].

3. See Figure 6-84. Cut cable strap (1) around frame and stator connector [47] (2) wire harness.
4. Lift external latch on stator connector [47] pin housing. Separate the socket housing.
5. Lift external latch on DC output connector [77] (3) pin housing. Separate the socket housing.
6. Remove screws (4) from voltage regulator.
7. Remove regulator.



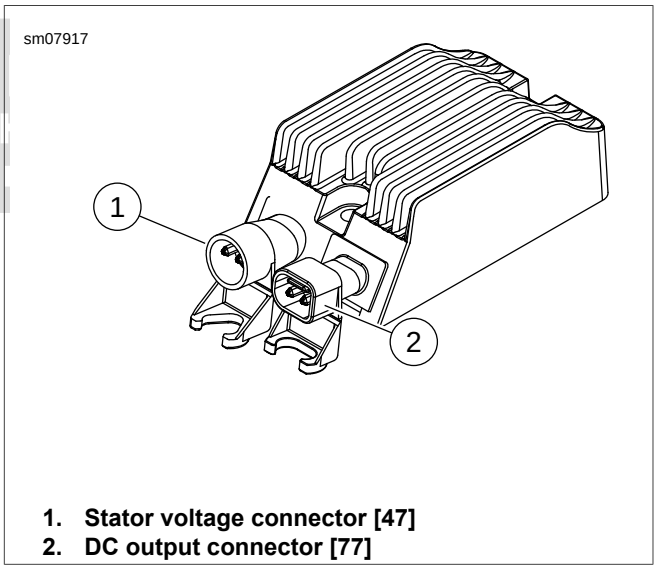
1. **Cable strap**
2. **Stator connector [47]**
3. **DC output connector [77]**
4. **Screws (2)**

Figure 6-84. Voltage Regulator

INSTALLATION

FASTENER	TORQUE VALUE	
Voltage regulator mounting screw	30-60 **in-lbs**	3.4-6.8 Nm

1. Install voltage regulator on downtube mounting bracket with mounting screws. Tighten to 30-60 **in-lbs** (3.4-6.8 Nm).
2. See Figure 6-85. Plug socket connector [47] into regulator pin connector (1). Lock in place with external locking latch.
3. Plug socket connector into regulator DC output connector (2). Lock in place with external locking latch.
4. Verify latch connection to prevent connector separation.
5. Install cable strap around frame and stator connector wire lead.
6. Install main fuse.
7. Close side cover.
8. Test charging system. See the electrical diagnostic manual.



1. **Stator voltage connector [47]**
2. **DC output connector [77]**

Figure 6-85. Regulator Connectors

ALTERNATOR 6.25

REMOVAL AND DISASSEMBLY

⚠WARNING

Prevent accidental vehicle start-up, which could cause death or serious injury. First disconnect negative (-) battery cable at engine and then positive (+) cable from battery. (00280b)

1. Disconnect battery. See 1.20 BATTERY MAINTENANCE.
2. Remove primary cover. See 5.3 PRIMARY COVER.
3. Remove clutch assembly, primary chain and engine sprocket/rotor assembly as a unit. See 5.4 PRIMARY DRIVE AND CLUTCH.

Stator

1. Open external latch and unplug stator harness connector [47] from voltage regulator. See 6.24 VOLTAGE REGULATOR.

NOTE

Note cable strap locations.

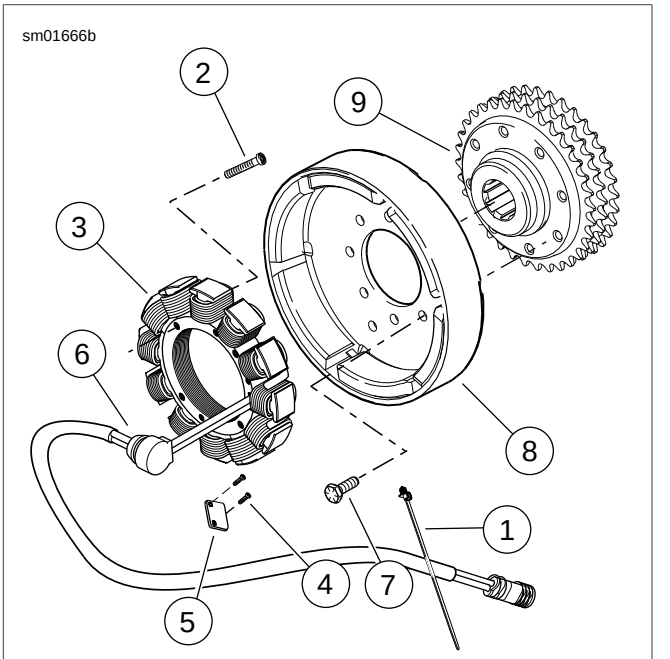
2. See Figure 6-86. Remove cable straps (1) from stator harness.
3. Withdraw stator harness from opening between right crankcase half and gearcase cover.
4. Remove and discard screws (2) securing stator (3) to left crankcase half.
5. Remove two screws (4) and harness retainer plate (5).
6. Remove stator harness grommet (6) from left crankcase half.
7. Withdraw stator harness from grommet hole in left crankcase half. Remove stator.

Rotor

1. See Figure 6-86. Remove bolts (7) securing alternator rotor (8) to engine sprocket (9).
2. See Figure 6-87. Position blocks (2) under rotor (1). Press sprocket (3) free of rotor.

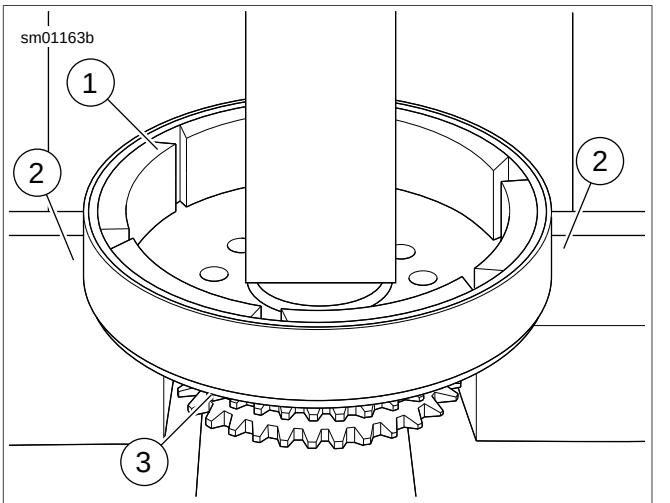
NOTE

Resistance to sprocket/rotor disassembly is due in part to magnetic force of permanent rotor magnets.



1. **Cable strap (3)**
2. **Screw (4)**
3. **Stator**
4. **Screw (2)**
5. **Retainer plate**
6. **Grommet**
7. **Bolts (8)**
8. **Rotor**
9. **Sprocket**

Figure 6-86. Alternator Components



1. **Rotor**
2. **Blocks**
3. **Sprocket**

Figure 6-87. Removing Rotor from Sprocket

CLEANING AND INSPECTION

1. Remove debris from rotor magnets. Clean rotor by wiping thoroughly with a clean cloth.
2. Check rotor for:
   a. Loose or cracked magnets.
   b. Stator bolt contact with rotor.
   c. Spline damage to rotor center mounting bolt hole.
3. Clean stator, stator leads and grommet thoroughly with a clean cloth.
4. Check stator for:
   a. Contact with rotor.
   b. Damaged or cracked insulation.
   c. Electrical failures. See the electrical diagnostic manual.

ASSEMBLY AND INSTALLATION

FASTENER	TORQUE VALUE	
Alternator stator mounting screw	30-40 **in-lbs**	3.4-4.5 Nm
Stator harness retainer screw	56 **in-lbs**	6.3 Nm
Alternator rotor to sprocket screw	120-140 **in-lbs**	13.6-15.8 Nm

Stator

1. Feed stator wiring harness with attached grommet into open grommet hole in left crankcase half.
2. Apply a light coating of clean engine oil to grommet. Press grommet into hole in left crankcase half.
3. Position stator on left crankcase half. Secure stator using **new** screws. Tighten to 30-40 **in-lbs** (3.4-4.5 Nm).

NOTE

Do not exceed maximum torque.

4. Install harness retainer.
   a. Position stator harness retainer over harness and onto engine crankcase with mounting holes facing aft.
   b. Secure with two screws.
   c. Verify that harness is not pinched.
   d. Tighten to 56 **in-lbs** (6.3 Nm).
   e. Verify that the screws are flush with plate.
5. Route stator wire harness:
   a. Across top of crankcase halves to right side of engine.
   b. Downward through opening between right crankcase half and gearcase cover.
   c. Forward and upward along inboard side of right frame downtube.
6. Connect stator harness to voltage regulator harness at connector [46]. Lock external latch in place. See 6.24 VOLTAGE REGULATOR.
7. See Figure 6-88. Secure stator harness and neutral switch wire lead with cable straps.

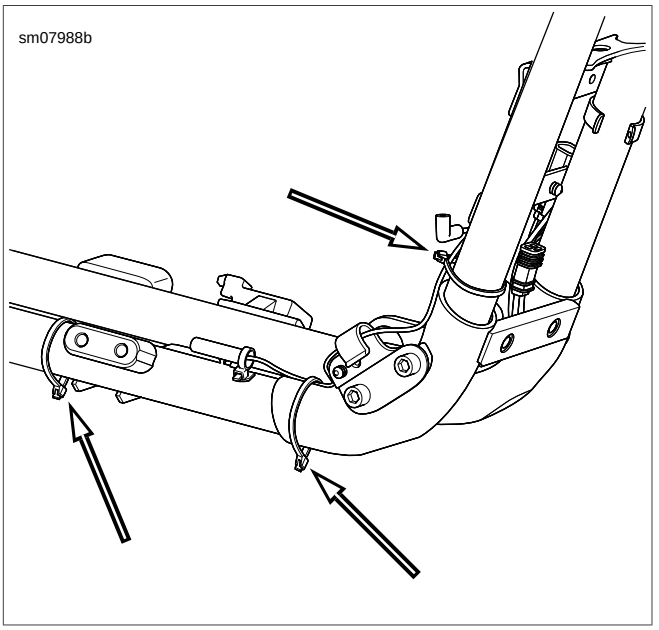


Figure 6-88. Cable Strap Locations

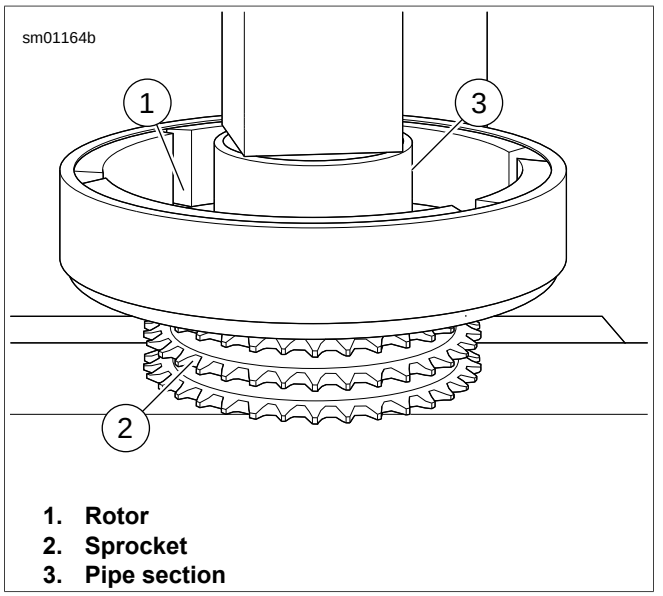
Rotor

1. See Figure 6-89. Position rotor (1) on sprocket (2). Align holes in sprocket with holes in rotor.
2. Apply LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue). Insert mounting bolts through rotor. Start bolts into tapped holes in sprocket.
3. Position a section of pipe (3) with an inside diameter larger than the sprocket mounting hub over center of rotor.
4. Press rotor onto sprocket. Tighten to 120-140 **in-lbs** (13.6-15.8 Nm).

Final Assembly

1. Install clutch assembly, primary chain and engine sprocket/rotor assembly as a unit. See 5.4 PRIMARY DRIVE AND CLUTCH.
2. Install primary cover, left footrest assembly and gear shift lever. See 5.3 PRIMARY COVER.
3. Connect battery. See 1.20 BATTERY MAINTENANCE.
4. Test charging system. See electrical diagnostic manual.

DIGITAL TECHNICIAN HARLEY-DAVIDSON



1. **Rotor**
2. **Sprocket**
3. **Pipe section**

Figure 6-89. Pressing Rotor onto Sprocket

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

VEHICLE SPEED SENSOR (VSS) 6.26

REMOVAL

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. See Figure 6-90. Disconnect VSS harness connector [65A] (1) from VSS (3).
3. Remove screw (2). Carefully remove VSS and O-ring.

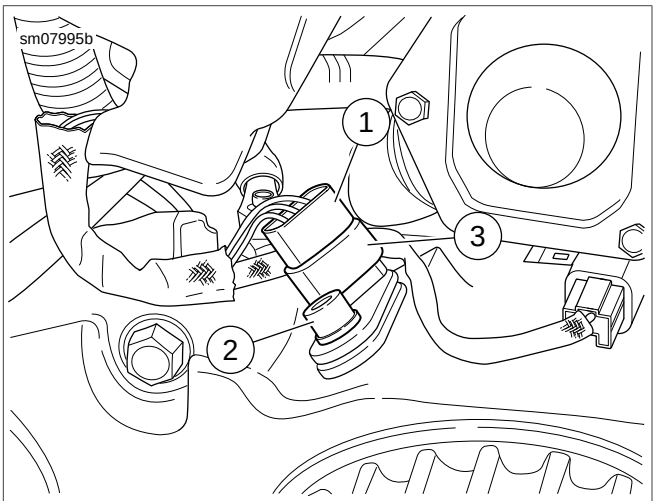
INSTALLATION

FASTENER	TORQUE VALUE	
VSS screw	90-120 **in-lbs**	10.2-13.6 Nm

NOTE

*The **new** VSS O-ring has a Teflon coating that provides lubrication during installation. No other lubrication is needed.*

1. See Figure 6-90. Carefully install VSS (3) and **new** O-ring into engine crankcase with screw (2). Tighten to 90-120 **in-lbs** (10.2-13.6 Nm).
2. Attach VSS harness connector [65A] (1) to VSS.
3. Install main fuse.
4. Test ride motorcycle.



1. **VSS connector [65]**
2. **Screw**
3. **VSS**

Figure 6-90. Vehicle Speed Sensor (VSS)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

WHEEL SPEED SENSOR (WSS) 6.27

FRONT WSS

FASTENER	TORQUE VALUE	
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm

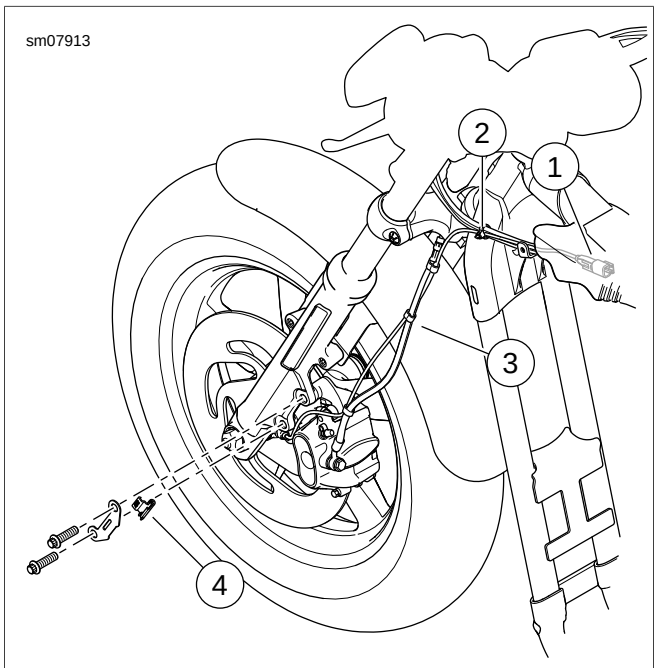
Removal

1. Remove fuel tank. See 4.4 FUEL TANK, Removing Fuel Tank.

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, mounting brackets, components or housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586d)

2. Raise motorcycle to permit wheel removal.
3. Remove fastener to open caddy halves.
4. See Figure 6-91. Remove WSS wire harness.
   a. Separate WSS connector [168] (1) housings.
   b. Cut cable strap (2).
   c. Remove lead clips (3) around brake line.
   d. Remove WSS mounting clip (4).
5. Retract axle to free WSS. See 2.5 WHEELS, Front Wheel.
6. Remove WSS.



1. **Connector [168]**
2. **Cable strap**
3. **Clips (3)**
4. **Bracket clip**

Figure 6-91. WSS Wire Harness

Installation

NOTES

- *Keep WSS away from magnetic fields (magnetic parts trays, magnetic base dial indicators, alternator rotors, etc.).*
- *Do not pull on WSS lead.*

1. See Figure 6-92. Position WSS with index pin to outboard side.
2. Push axle through WSS into fork.
3. Rotate WSS index pin to fit notch in front fork.
4. Install front wheel. See 2.5 WHEELS, Front Wheel.
5. Install WSS clip mounting bracket with caliper.
6. Install WSS wire lead.
   a. Install WSS clip and wire lead.
   b. Route wire lead through coil bracket.
   c. Connect WSS connector [167] housings.
   d. Install cable strap
   e. Clip wire lead to brake line at flagged locations.
7. Connect caddy halves. Install fastener. Tighten to 15-25 **in-lbs** (1.7-2.8 Nm).
8. Install fuel tank. See 4.4 FUEL TANK, Removing Fuel Tank.

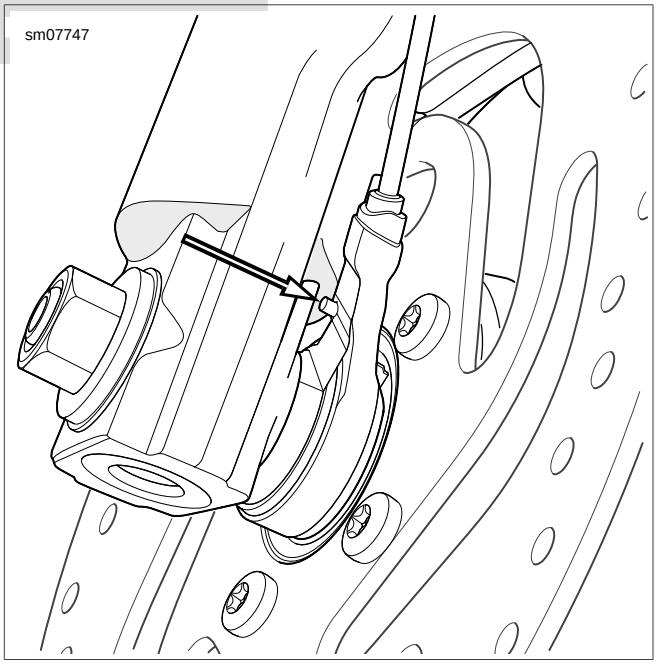


Figure 6-92. WSS Index Pin

REAR WSS

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, mounting brackets, components or housings. Failure to comply can cause serious damage resulting in the need to perform major repair work. (00586d)

1. Raise motorcycle to permit wheel removal.
2. Remove side cover.
3. Remove fuse.
4. See Figure 6-93. Remove wire harness.
   a. Remove wire lead clips (1) from brake line.
   b. Remove cable strap extension (2) from rear brake caliper.
   c. Remove cable strap (3).
   d. Separate rear WSS connector [167] (4).

NOTE

The WSS works with ABS encoder bearing installed in wheel hub. See 2.5 WHEELS, Sealed Wheel Bearings.

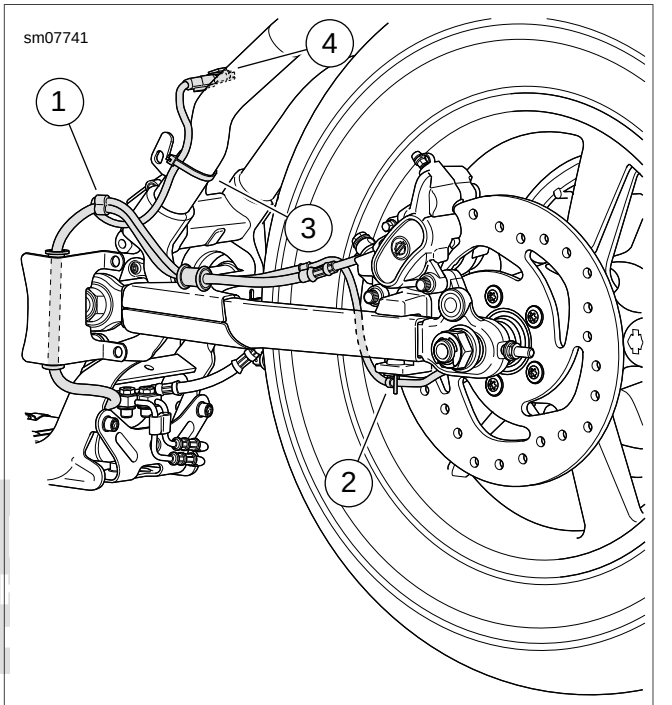
5. Remove axle to free WSS. See 2.5 WHEELS, Rear Wheel.
6. Remove WSS.

Installation

NOTES

- *Keep WSS away from magnetic fields (magnetic parts trays, magnetic base dial indicators, alternator rotors, etc.).*
- *Do not pull WSS lead.*
- *Orient WSS index pin outboard and below caliper bracket.*

1. Install axle through **new** WSS and caliper bracket.
2. Install rear wheel. See 2.5 WHEELS, Rear Wheel.
3. Route wire harness.
   a. Rotate up WSS index pin against caliper bracket.
   b. Install cable strap extension into brake caliper bracket.
   c. Clip wire lead to brake line at flagged locations.
   d. Install cable strap.
   e. Connect WSS connector [167] housings.
4. Install main fuse.
5. Install side cover.



1. **Clip (2)**
2. **Extension clip**
3. **Cable strap**
4. **Connector**

Figure 6-93. Wheel Speed Sensor (WSS)

NEUTRAL INDICATOR SWITCH 6.28

GENERAL

See Figure 6-94. The neutral indicator switch (1) is threaded into the right crankcase half immediately forward of the main drive gear. A short jumper wire connects the switch to the harness connector [136] (2) under the engine crankcase.

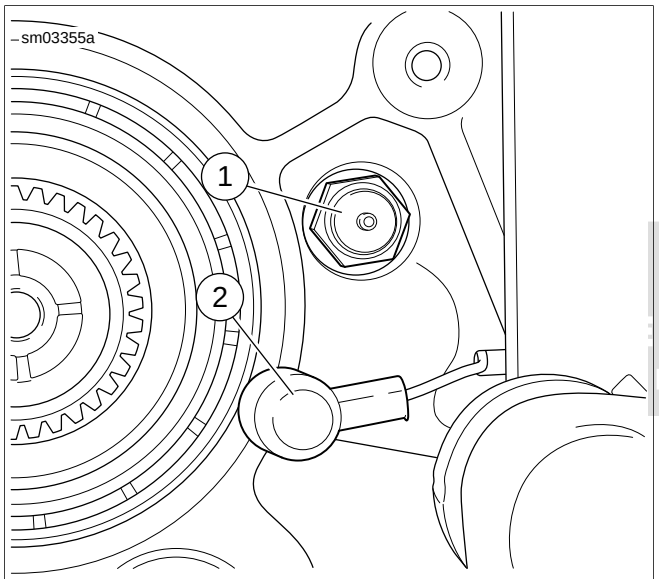
A pin on the shifter drum contacts the neutral indicator switch plunger, completing the neutral indicator circuit.

A motorcycle whose neutral indicator lamp does not light can be tested to determine the problem:

- In a burned out indicator lamp, the wire harness to the instruments or in the main wire harness.
- In the neutral indicator switch and its jumper wire.

NOTE

Replace assembly upon failure.



1. **Neutral indicator switch**
2. **Connector [136]**

Figure 6-94. Neutral Indicator Switch

REPLACEMENT

FASTENER	TORQUE VALUE	
Neutral indicator switch	120-180 **in-lbs**	13.6-20.3 Nm

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. Remove exhaust system. See 4.16 EXHAUST SYSTEM.
3. Remove rider control assembly. See 2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal Assembly or 2.39 RIDER FOOT CONTROLS: MID-MOUNT, Right Footrest and Rear Brake Pedal Assembly.
   a. Remove brake rod C-clip and pin.
   b. Pull rod out of master cylinder.
4. Remove sprocket cover and rear drive belt from transmission sprocket. See 5.5 DRIVE BELT.
5. Remove transmission sprocket. See 5.14 TRANSMISSION SPROCKET.
6. Unplug jumper wire connector from neutral indicator switch. Remove switch with washer from right crankcase half.
7. Note routing of neutral switch jumper wire down between crankcase and rear of gearcase cover.
8. To remove neutral switch jumper wire from neutral switch harness connector [136], cut cable strap securing switch harness to bottom right frame tube.
9. Install **new** neutral indicator switch with washer. Tighten to 120-180 **in-lbs** (13.6-20.3 Nm).
10. Plug **new** neutral switch jumper wire into neutral indicator switch [131]. Route jumper wire in same way that old jumper was routed.
11. Plug jumper wire connector [136A] into harness socket connector [136B]. Secure neutral switch harness and stator harness with cable strap to bottom right frame tube under oil pump.
12. Install transmission sprocket. See 5.14 TRANSMISSION SPROCKET.
13. Install secondary drive belt and sprocket cover. See 5.5 DRIVE BELT.
14. Adjust drive belt deflection. See 1.12 DRIVE BELT AND SPROCKETS.
15. See 4.16 EXHAUST SYSTEM. Install rear muffler and exhaust pipe.
16. Install main fuse.
17. Check operation of neutral indicator lamp.

MAIN WIRING HARNESS AND ELECTRICAL CADDIES 6.29

REMOVAL

1. Remove seat.
2. Remove left and right side covers.
3. Remove the caddy cover.

⚠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)

4. Purge the fuel supply line. See 4.4 FUEL TANK, Purging and Disconnecting Fuel Supply Line.
5. Remove main fuse.

⚠WARNING

Prevent accidental vehicle start-up, which could cause death or serious injury. First disconnect negative (-) battery cable at engine and then positive (+) cable from battery. (00280b)

6. Remove battery. See 1.20 BATTERY MAINTENANCE, Disconnection and Removal.
7. Remove the fuel tank. See 4.4 FUEL TANK.
8. Separate the harness at the left front:
   a. Remove clips securing harness and clutch cable to frame downtube.
   b. Separate oil pressure switch [120] connector.
   c. Separate neutral switch [136] connector.
   d. Separate voltage DC [47] regulator connector.
   e. Remove CKP sensor[79].
   f. Separate JSS [133] connector.
   g. Separate the front HO2 sensor [138].
9. Separate the horn connectors [122].
10. Separate the harness on the right side:
    a. Remove spark plug wires from ignition coil.
    b. Remove cable strap securing ET sensor lead to oil tank bracket.
    c. Disconnect ET sensor [90].
    d. Remove cable strap securing EVAP hose and engine harness to caddy.
11. Remove BCM. See 6.6 BODY CONTROL MODULE (BCM).
12. Remove ECM. See 6.5 ELECTRONIC CONTROL MODULE (ECM).
13. Remove negative battery cable from notch at bottom of electrical caddy.
14. **ABS models:** Remove EHCU bracket bolts and lower the EHCU. See 2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Removal.
    a. Remove the ABS connector [166].
    b. Remove harness from retainer clip.
15. Separate the rear stop lamp switch [121] housings.
16. Disconnect wire harness from engine:
    a. VSS [65].
    b. Solenoid connector [128].
    c. Main harness ground [GND1].
17. Pull the data link. Separate rear WSS connector [168]. Remove cable strap securing connector to battery tray.
18. Remove battery tray. See 6.11 BATTERY TRAY.
19. Separate engine harness.
    a. Loosen latch clip.
    b. Remove retainer.
    c. Separate connector [145] housings.
20. Remove rear spark plug wire from engine.
21. Remove vapor valve from caddy.
22. Separate turn signal [18], [19] and tail lamp [45] connectors.
23. Separate front caddy housings:
    a. Remove two push clips securing coil bracket to caddy.
    b. Cut cable straps securing throttle cables.
    c. Remove caddy housing fastener.
24. Separate coil connector [83].
25. Separate the front connectors:
    a. Headlamp connector [38]
    b. LH controls [24]
    c. RH controls [22-1] [22-2]
    d. Turn signal [31]
    e. Speedometer [20]
26. **ABS models:** Separate the front WSS [167].
27. **Keyed ignition:** Separate the ignition switch connector [33].
28. Remove oil tank fasteners.

29. Remove fastener securing caddy to oil tank bracket.
    a. Pull harness away from rear frame downtube.
    b. Cut cable strap securing positive battery cable to caddy.
    c. Slide wire harness caddy from right to left between rear cylinder and frame.

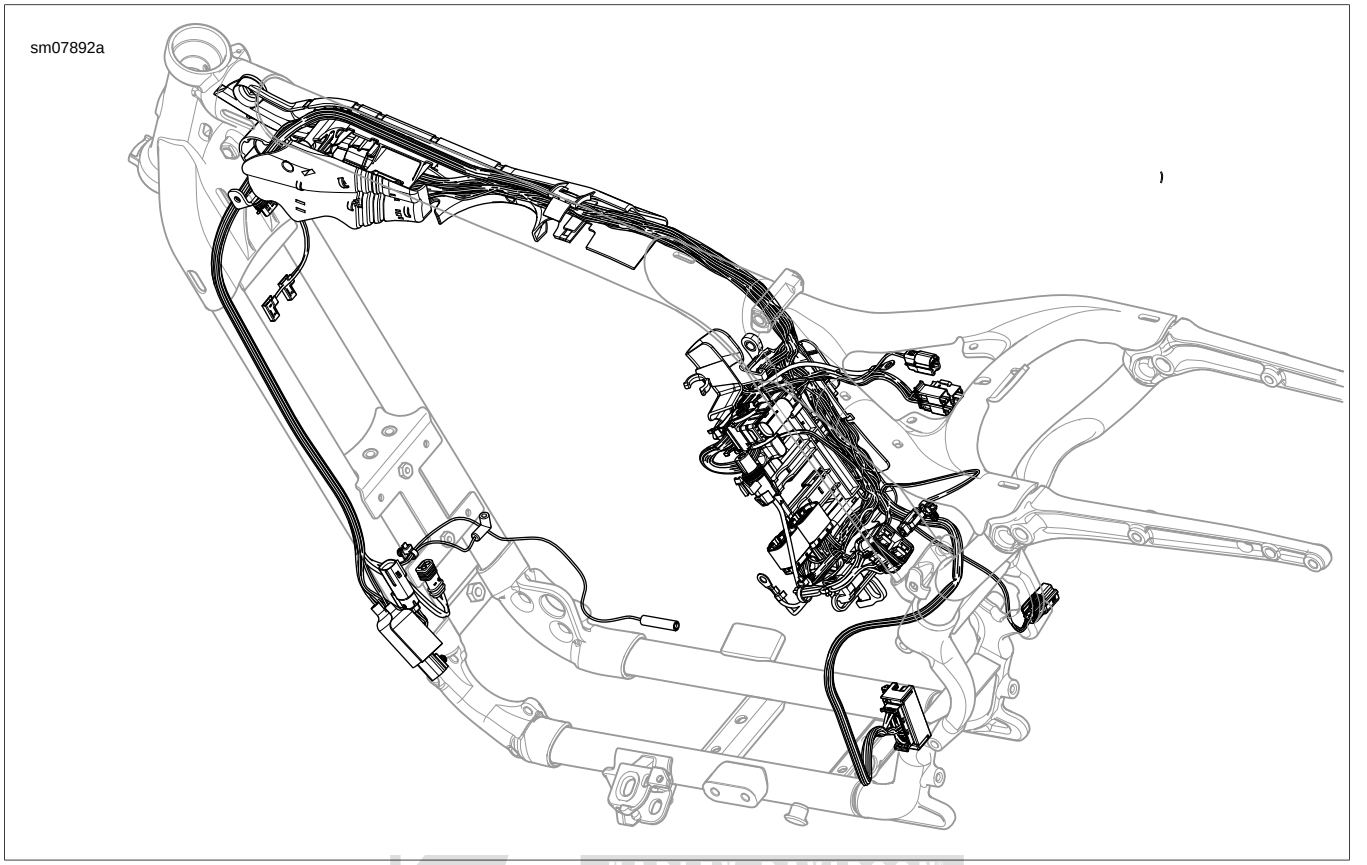


Figure 6-95. Main Wire Harness

BACKBONE ELECTRICAL CADDIES

FASTENER	TORQUE VALUE	
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm

Preparation

1. Remove seat.

⚠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)

2. Purge and disconnect fuel supply line. See 4.4 FUEL TANK, Purging and Disconnecting Fuel Supply Line.
3. Remove fuel tank. See 4.4 FUEL TANK.
4. Separate backbone electrical caddy housings:
    a. Remove two push clips securing coil bracket to caddy.
    b. Cut cable straps securing throttle cables.
    c. Remove caddy housing fastener.

Small Backbone Electrical Caddy

1. See Figure 6-96. Cut, remove and discard all cable straps securing wiring harness bundles to small backbone electrical caddy.
2. Separate caddy from wiring harness.
3. Position wiring harness bundles on small backbone electrical caddy as shown in figure.
4. Install cable straps as shown.

Large Backbone Electrical Caddy

1. See Figure 6-97. Remove all cable straps securing wiring harness bundles to large backbone electrical caddy.
2. Separate caddy from wiring harness and connector sockets.
3. Position wiring harness bundles and connector sockets on large backbone electrical caddy as shown in figure.
4. Install cable straps as shown.

Reassembly

1. Position throttle cables against caddy. Secure with cable straps.

2. Fit caddy halves together. Fasten with single screw. Tighten to 15-25 **in-lbs** (1.7-2.8 Nm).
3. Install push clips securing coil bracket to caddy.
4. Install fuel tank. See 4.4 FUEL TANK.

⚠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 seat.

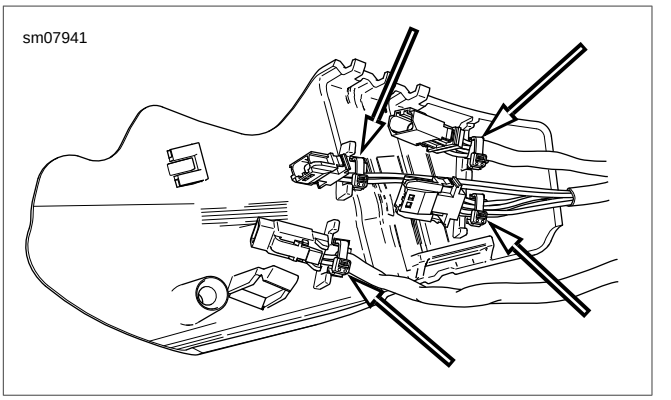


Figure 6-96. Small Backbone Electrical Caddy Cable Straps

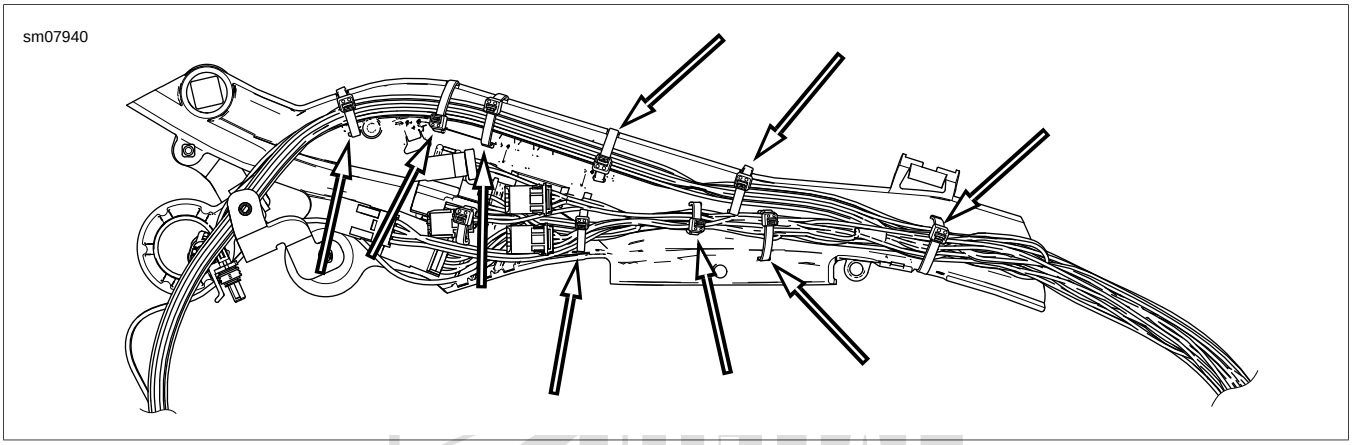


Figure 6-97. Large Backbone Electrical Caddy Cable Straps

REPLACING ECM ELECTRICAL CADDY

Removal

1. Remove main wiring harness. See 6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Removal.
2. See Figure 6-98. Remove all cable straps securing wiring harness bundles to ECM electrical caddy.
3. Separate caddy from wiring harness.

Installation

1. See Figure 6-98. Position wiring harness bundles and connector sockets on ECM electrical caddy.
2. Install cable straps as shown.
3. Install wiring harness onto motorcycle. See 6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Installation.

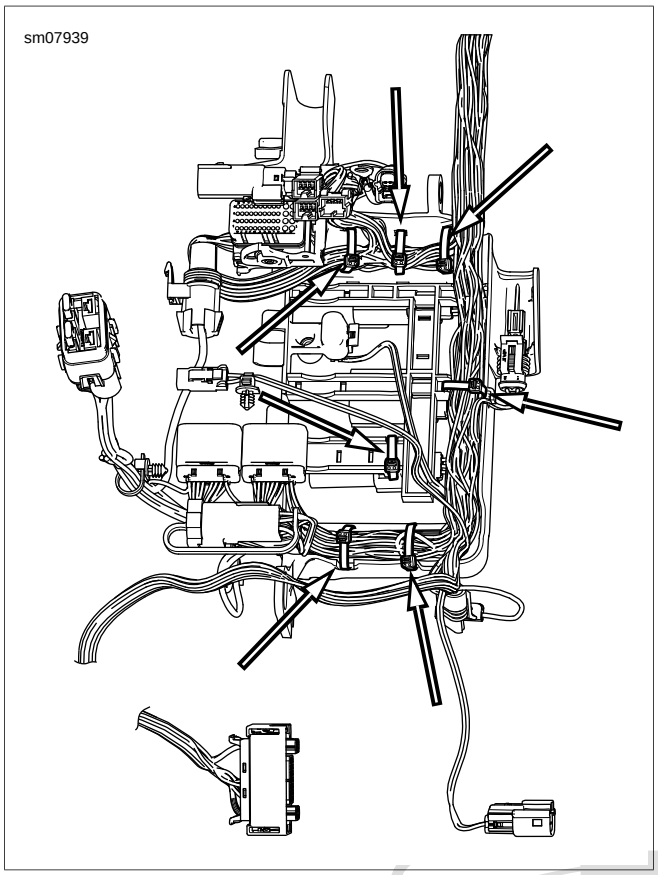


Figure 6-98. ECM Electrical Caddy Cable Straps

INSTALLATION

FASTENER	TORQUE VALUE	
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm
Electrical caddy fastener	50-60 **in-lbs**	5.6-6.8 Nm
Battery tray fastener	96-156 **in-lbs**	10.8-17.6 Nm
Oil tank mounting screws	72-96 **in-lbs**	8.1-10.8 Nm
Main harness ground wire	55-75 **in-lbs**	6.2-8.5 Nm
Electrical caddy cover	50-60 **in-lbs**	5.6-6.8 Nm

1. Prepare harness for installation and routing:
   a. Install **new** cable strap in caddy for positive battery cable.
   b. **Security models without siren:** Connect siren connector [142] to empty housing in electrical caddy.
   c. Orient connectors and wire leads before routing.
2. Thread harness left to right between rear cylinder and frame downtube.
   a. Route harness underneath right side EVAP house.
   b. Route ET sensor down and to rear.
   c. Route tail lamp and turn signals connectors around right side of downtube.
   d. Route stop lamp switch connectors around right side of downtube and down toward switch.
   e. Route starter solenoid connector and VSS connector toward front.
   f. Route EHCU connector through frame and around in front of brake line bracket.
3. Hang front caddy on left side of throttle cables.
4. Route horn wire to horn.
5. See Figure 6-99. Cable strap positive battery cable to electrical caddy.

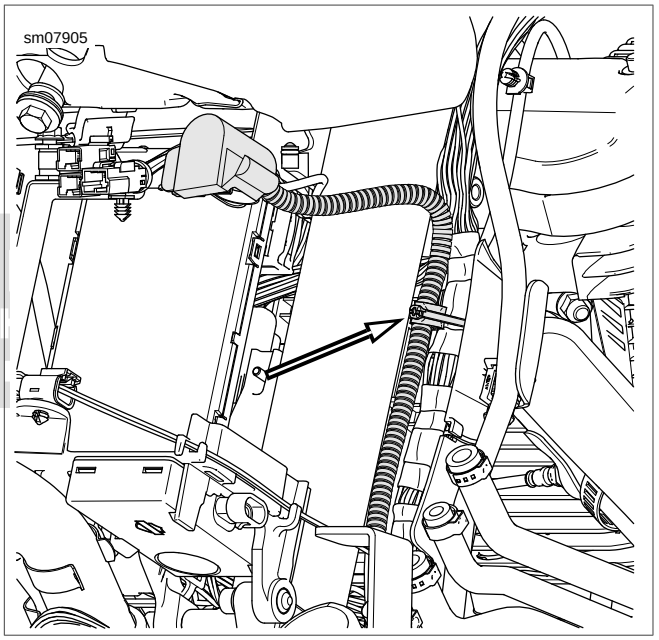
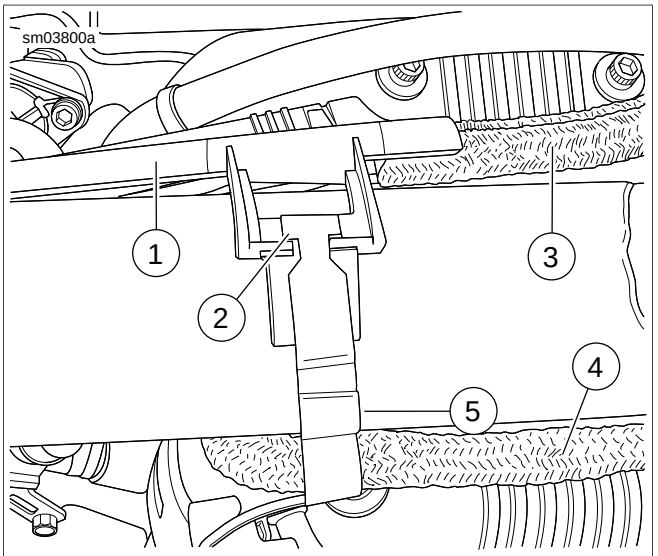


Figure 6-99. Cable Strap around Positive Battery Cable

6. Fit cable straps through front caddy around throttle cables. Cut off ends.
7. See Figure 6-100. Install latch clip.
   a. Orient plug wire on latch clip to coil and spark plug.
   b. Fit engine harness.



1. **Right wire harness caddy**
2. **Wire harness caddy latch clip**
3. **Main harness**
4. **Engine sub-harness**
5. **Fuel pump harness clip**

Figure 6-100. Right Wire Harness Caddy Latch Clip

8. Connect upper front connectors:
   a. Speedometer connector [20]
   b. Right hand controls [22-1] [22-2]
   c. Left hand controls [24]
   d. Turn signals [31]
   e. Headlamp [38]
9. **ABS models:** Connect front WSS [167].
10. **Keyed ignition:** Connect ignition switch [33]. See 6.13 IGNITION SWITCH.
11. Route rear spark plug wire to coil inside caddy.
12. Connect front and rear spark plug wires to coil. Connect coil [83].
13. Fit coil bracket to frame and front caddy.
14. See Figure 6-101. Fit caddy halves together. Fasten with single screw. Tighten to 15-25 **in-lbs** (1.7-2.8 Nm).
15. Install push clips securing coil bracket to caddy.
16. Secure with strap front wire bundle.

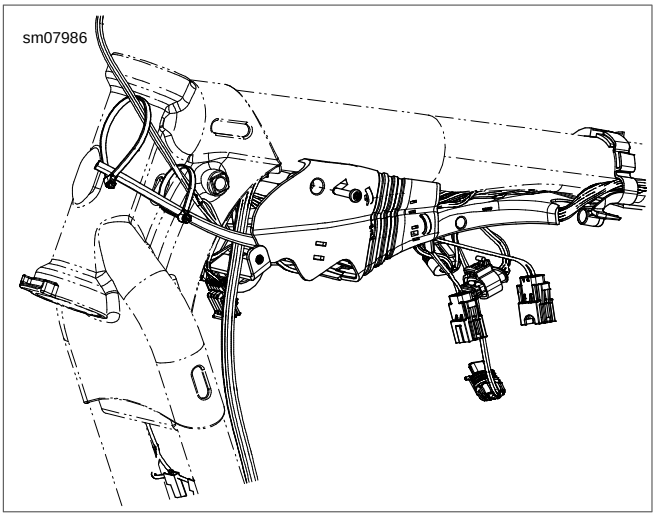


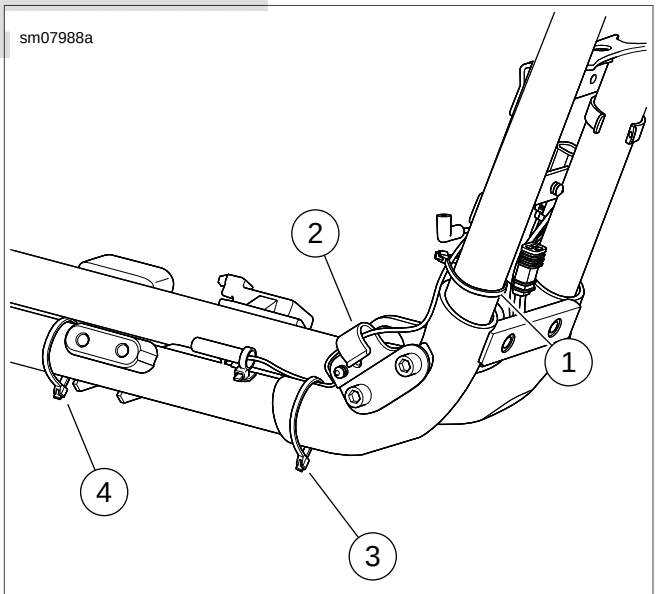
Figure 6-101. Electrical Caddy Cable Straps

17. Route front wire bundles down left side of downtube.

NOTE

Non-ABS models: *See Figure 6-102. Neutral lead is routed in J-clip.*

18. Route neutral switch along lower frame rail. Secure front wire bundle with cable strap.
19. Connect oil pressure switch connector [120].
20. Install cable strap in back of cross bar for neutral and oil pressure switch leads.
21. Install regulator connector [47].



1. **Neutral switch and stator leads**
2. **Non-ABS J-clip**
3. **Neutral switch and stator leads**
4. **Neutral switch and stator leads**

Figure 6-102. Lower Right Frame Tube Cable Straps

22. See Figure 6-103. Connect lower front connectors:
    a. JSS [133]
    b. CKP [79]
    c. Front HO2S [138]
23. Clip harness, front HO2S [138] and clutch cable to frame downtube.
24. Connect horn connector [122].

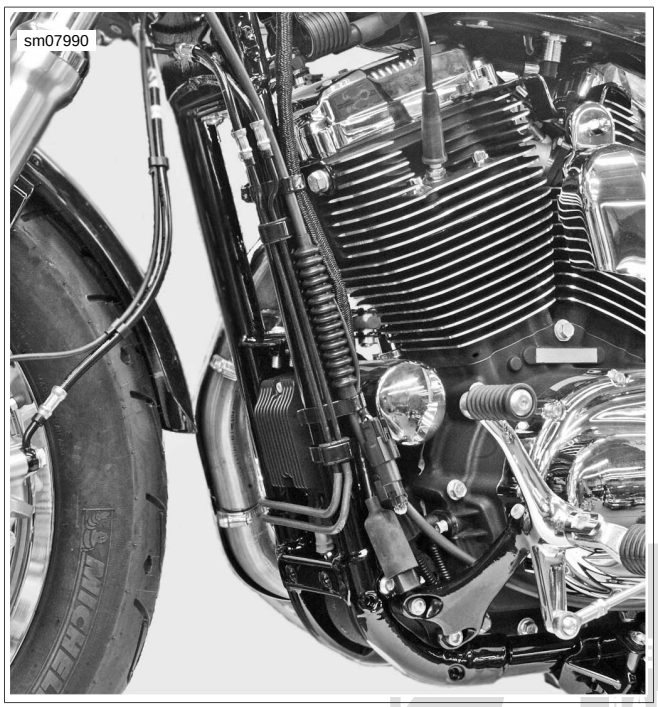


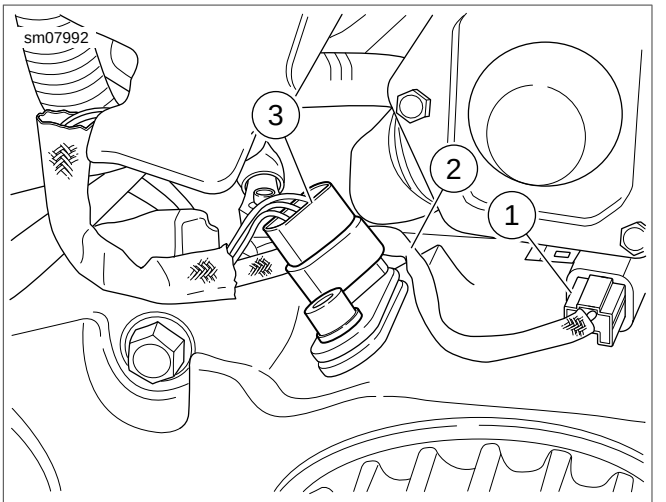
Figure 6-103. Left Down Tube Wire Routing

25. Loosely install oil tank fasteners.
26. Install electrical caddy and fastener. Tighten to 50-60 **in-lbs** (5.6-6.8 Nm).
27. Fit rear WSS lead to hooks on battery tray.
28. Loosely install the tray.
29. Install battery tray mounting screws. Tighten to 96-156 **in-lbs** (10.8-17.6 Nm).
30. Tighten oil tank fasteners to 72-96 **in-lbs** (8.1-10.8 Nm).
31. Install battery ground through hook in battery tray.
32. Connect rear lighting connectors:
    a. Left hand turn signal [19]
    b. Stop lamp [45]
    c. Right turn signal [18]

NOTE

See Figure 6-104. Route starter solenoid connector [128] (1) wire harness (2) behind VSS connector [128] (3) to prevent damage by drive belt.

33. Connect right rear connectors:
    a. VSS [65]
    b. Starter solenoid [128]
    c. ET sensor [90] and retainer



1. **Stater solenoid connector [128]**
2. **Wire lead**
3. **VSS [65]**

Figure 6-104. VSS [65] and Starter Solenoid [128] Wire Leads

34. Route engine harness down through trough to connector on front of electrical caddy. Connect engine harness connector [145].
35. Attach EVAP hose and engine harness to electrical caddy.
36. Install ECM. See 6.5 ELECTRONIC CONTROL MODULE (ECM).
37. Install main harness ground. Tighten to 55-75 **in-lbs** (6.2-8.5 Nm).
38. Install BCM. See 6.6 BODY CONTROL MODULE (BCM).
39. See Figure 6-105. Fit rear HO2S connector [137] clip to top of battery tray.
40. Snap vapor valve into place.
41. Fit data link to battery tray.
42. Route rear HO2S wire lead over and through caddy clip. Connect HO2S [137] housings.
43. Connect rear WSS [168].

Figure 6-105. Under Seat Routing

44. **ABS models:** Connect harness to EHCU. Remove EHCU bracket bolts and lower EHCU.
    a. Route EHCU harness through retainer clip.
    b. Connect ABS connector [166] to EHCU.
    c. Position EHCU. Install bracket. See 2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Installation.
45. Connect rear stop lamp switch connector [121].

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)

46. Install battery. See 1.20 BATTERY MAINTENANCE, Installation and Connection.
47. Install fuel tank. See 4.4 FUEL TANK, Installing Fuel Tank.
    a. Clip pump harness to caddy latch clip.
    b. Connect fuel pump connector [141].
48. Install caddy cover. Tighten to 50-60 **in-lbs** (5.6-6.8 Nm).
49. Install main fuse.
50. Install side covers.

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)

51. Install 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)

52. Test all switches and lights for proper operation.

J-CLIPS: MID-MOUNT MODELS

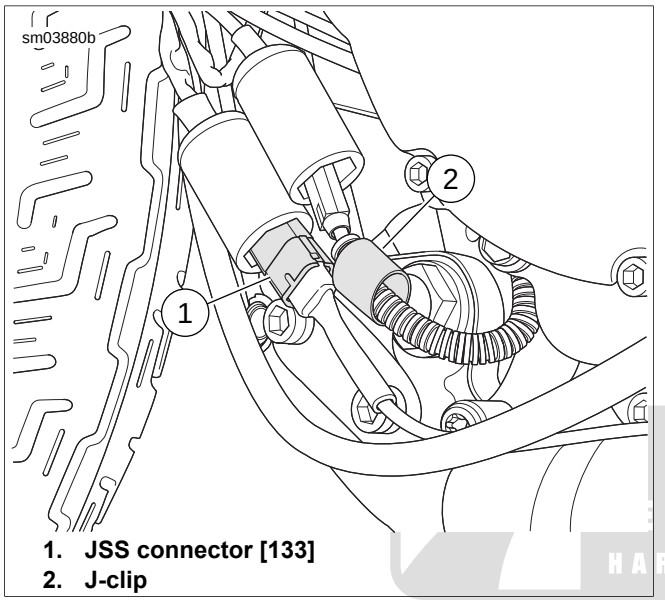
FASTENER	TORQUE VALUE	
J-clip fastener	45-50 ft-lbs	61.0-67.8 Nm

Remove and install J-clips from frame as necessary. Tighten to 45-50 ft-lbs (61.0-67.8 Nm).

JIFFY STAND SENSOR (JSS): INTERNATIONAL MODELS 6.30

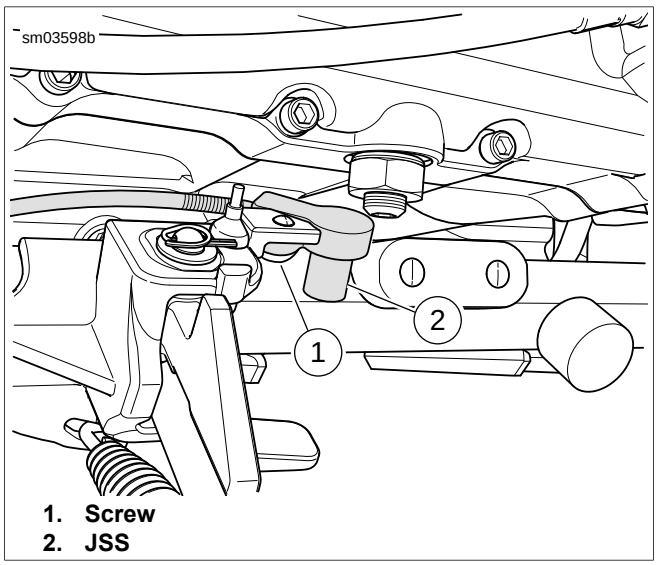
REMOVAL

1. Position motorcycle upright on a suitable lift.
2. See Figure 6-106. Unplug JSS harness connector [133] (1).
3. Cut cable strap securing JSS harness to frame.
4. See Figure 6-107. Remove screw (1). Remove JSS (2) and harness.



1. **JSS connector [133]**
2. **J-clip**

Figure 6-106. JSS Connector



1. **Screw**
2. **JSS**

Figure 6-107. JSS

INSTALLATION

FASTENER	TORQUE VALUE	
JSS screw	96-120 **in-lbs**	10.9-13.6 Nm

1. Install JSS. Finger tighten screw.

NOTE

See Figure 6-108. Align JSS (1) with mounting tab (2) on jiffy stand yoke (3). Improper alignment will damage sensor or tab.

2. See Figure 6-109. With JSS (1) aligned with mounting tab on jiffy stand bracket, tighten screw (2) to 96-120 **in-lbs** (10.9-13.6 Nm).

NOTE

Do not route JSS harness through J-clip. Harness can chafe against J-clip.

3. Route JSS harness forward along frame under left side of engine.
4. Secure harness to outboard side of frame with **new** cable strap (3).
5. If necessary, replace plug (4).
6. Connect JSS harness connector housing [133A] to main harness connector housing [133B].

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)

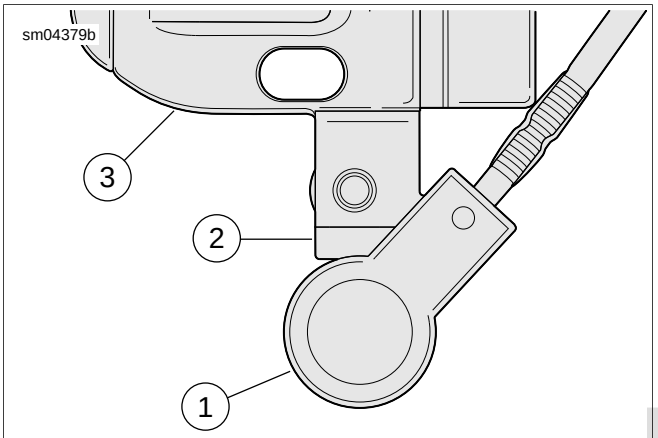
WARNING

Always park motorcycle on a level, firm surface. An unbalanced motorcycle can fall over, which could result in death or serious injury. (00039a)

WARNING

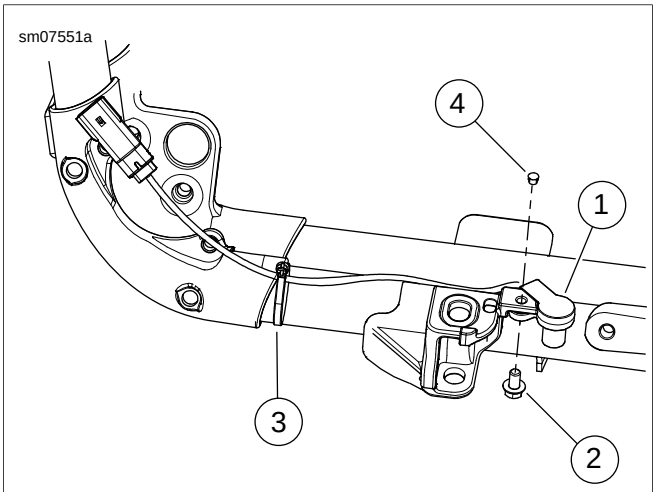
Be sure jiffy stand is fully retracted before riding. If jiffy stand is not fully retracted, it can contact the road surface causing a loss of vehicle control, which could result in death or serious injury. (00007a)

7. Test JSS with jiffy stand down and up:
   a. Turn ignition on.
   b. Shift transmission into gear.
   c. Switch OFF/RUN switch to RUN.
   d. Disengage clutch.
   e. **Jiffy stand down:** Press the START button. Engine does not start. "SidE StAnd" scrolls across the odometer display.
   f. **Jiffy stand up:** Press the START button. Engine can start and run. "SidE StAnd" clears from the odometer display.



1. **JSS**
2. **Mounting tab**
3. **Yoke**

Figure 6-108. JSS Mounting (top view)



1. **JSS**
2. **Screw**
3. **Cable strap**
4. **Plug**

Figure 6-109. JSS Harness Routing

OPERATION

Jiffy Stand Down: Engine Non-Start

See Figure 6-110. The engine does not start if the rider presses the starter button with the transmission in gear and the jiffy stand down. The message "SidE StAnd" (1) scrolls across the odometer display.

Raising the jiffy stand (or putting the transmission in neutral) permits the engine to run and clear the message.

Jiffy Stand Down: Engine Starts and Stalls

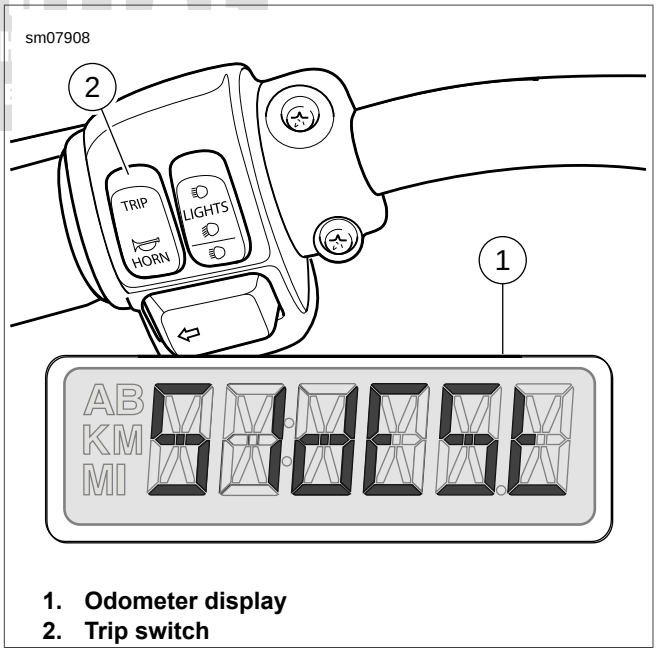
With the jiffy stand down, if the ECM receives a signal indicating the transmission is in neutral or indicating the clutch is engaged, the engine starts and runs. The engine will continue to run after disengaging the clutch and shifting into gear. However with the jiffy stand still down, the engine stalls as the clutch is engaged.

Jiffy Stand Drops

If the jiffy stand drops out of the retracted position at speeds greater than 10 mph (15 km/h):

- The engine continues to run.
- The warning indicator flashes twice.
- "SidE StAnd" scrolls across the odometer display.
- The message remains until the jiffy stand is retracted.

Press the trip switch (2) once while the engine is running to clear the "SidE StAnd" message.



1. **Odometer display**
2. **Trip switch**

Figure 6-110. SidE StAnd Display

OIL PRESSURE SWITCH 6.31

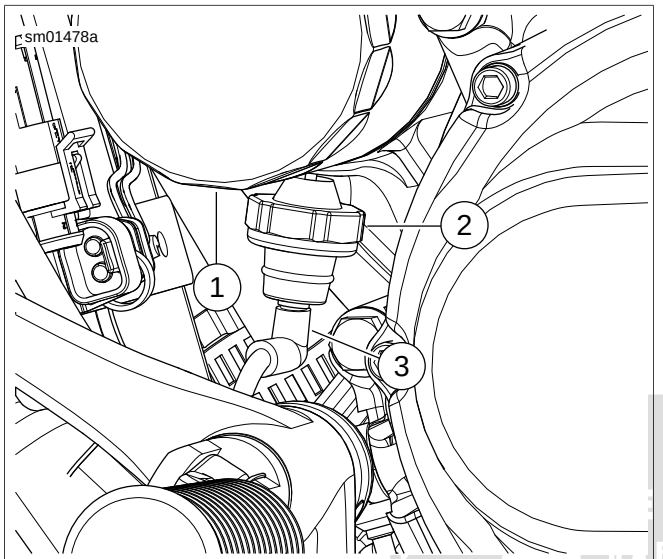
GENERAL

The oil pressure signal lamp switch is a pressure-actuated diaphragm-type switch. When oil pressure is low, spring tension holds the switch contacts closed completing the signal lamp circuit. The complete circuit causes the indicator lamp to illuminate.

See Figure 6-111. The oil pressure switch is located under the oil filter mount at the front of the engine crankcase.

NOTE

Replace assembly upon failure.



1. **Oil filter**
2. **Oil pressure switch**
3. **Oil pressure switch connector [120]**

Figure 6-111. Oil Pressure Indicator Lamp Switch

REMOVAL

WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. See Figure 6-111. Remove wiring harness connector [120] (3) by pulling elbow connector straight down from stud on oil pressure switch (2).
3. Place a drain pan under motorcycle.
4. Remove the oil pressure switch.

INSTALLATION

FASTENER	TORQUE VALUE	
Oil pressure switch	60-90 **in-lbs**	6.8-10.2 Nm

NOTE

***New** switches have a sealant contact patch on the mounting threads.*

1. If installing original sensor, coat threads of oil pressure switch with LOCTITE 565 HIGH PERFORMANCE THREAD SEALANT.
2. See Figure 6-111. Install oil pressure switch (2). Tighten to 60-90 **in-lbs** (6.8-10.2 Nm).

NOTE

Point connector elbow away engine.

3. Attach wiring harness connector [120] to oil pressure switch.
4. Install main fuse.

NOTE

Replace oil if significant loss.

5. Check engine oil level. Add oil if necessary. See 1.6 ENGINE OIL AND FILTER.
6. Start engine. Test oil pressure switch for proper operation. Check oil pressure switch for leaks.

HORN 6.32

FRONT MOUNT: XL 883L/N/R, XL 1200X

FASTENER	TORQUE VALUE	
Stabilizer link, upper front, frame bracket mounting screw: XL 883L/N/R, XL 1200X	25-35 ft-lbs	33.9-47.5 Nm
Horn fastener: XL 883L/N/R, XL 1200X	36-48 **in-lbs**	4.1-5.4 Nm

Removal

1. See Figure 6-112. Remove terminals from the right (1) and left (2) spade connectors.
2. Remove fasteners (3) from horn bracket.
3. Remove horn (4).

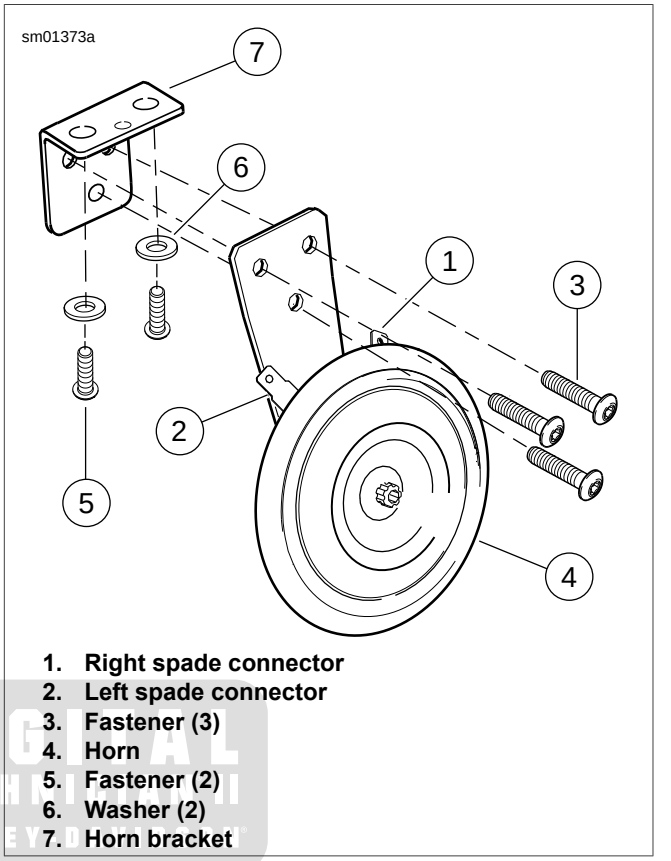
NOTE

The horn bracket is the upper front stabilizer link bracket.

4. If necessary, remove fasteners (5), washers (6) and bracket (7).

Installation

1. Install bracket, washers and fasteners. Tighten to 25-35 ft-lbs (33.9-47.5 Nm).
2. Install horn with screws. Tighten to 36-48 **in-lbs** (4.1-5.4 Nm).
3. Connect the red wire with violet tracer terminal to the left spade connector.
4. Connect the black wire terminal to the right spade connector.



1. **Right spade connector**
2. **Left spade connector**
3. **Fastener (3)**
4. **Horn**
5. **Fastener (2)**
6. **Washer (2)**
7. **Horn bracket**

Figure 6-112. Front Mount Horn: XL 883L/N/R, XL 1200X

SIDE MOUNT: XL 1200C/CP/CA/CB, XL 1200T/V

FASTENER	TORQUE VALUE	
Horn bracket rubber stud: XL 1200C/CP/CA/CB XL 1200T/V	96-192 **in-lbs**	10.8-21.7 Nm
Horn bracket to center engine mount bracket: XL 1200C/CP/CA/CB XL 1200T/V	35-45 **in-lbs**	4.0-5.1 Nm
Horn flange nut: XL 1200C/CP/CA/CB XL 1200T/V	80-100 **in-lbs**	9.0-11.3 Nm
Support bracket to horn cover: XL 1200C/CP/CA/CB, XL 1200T/V	36-60 **in-lbs**	4.1-6.8 Nm
Horn acorn nut: XL 1200C/CP/CA/CB XL 1200T/V	60-180 **in-lbs**	6.8-20.4 Nm

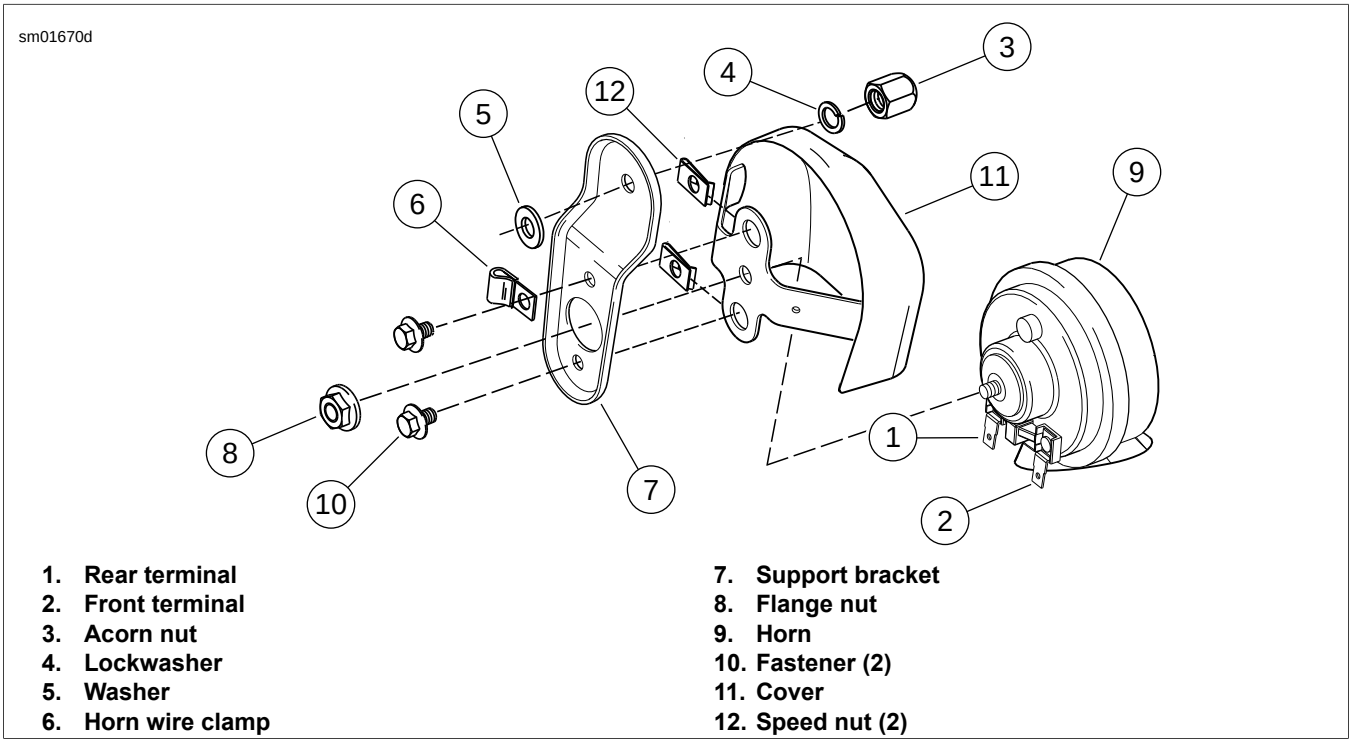
Removal

1. See Figure 6-113. Remove spade connectors from rear (1) and front (2) terminals.
2. Remove acorn nut (3), lockwasher (4) and washer (5) to free horn assembly from rubber mount.
3. Remove wire conduit from horn wire clamp (6) at back of support bracket (7).
4. If necessary, disassemble horn.
   a. Remove flange nut (8) and horn (9).
   b. Remove two fasteners (10) to separate bracket from cover (11).
   c. Remove speed nuts (12) from cover.
5. See Figure 6-114. If necessary, disassemble horn rubber mount and bracket.
   a. Remove fasteners (1) and horn bracket (2) from center engine mount bracket (3).
   b. Loosen nut (4) and slide rubber stud out of horn bracket.

Installation

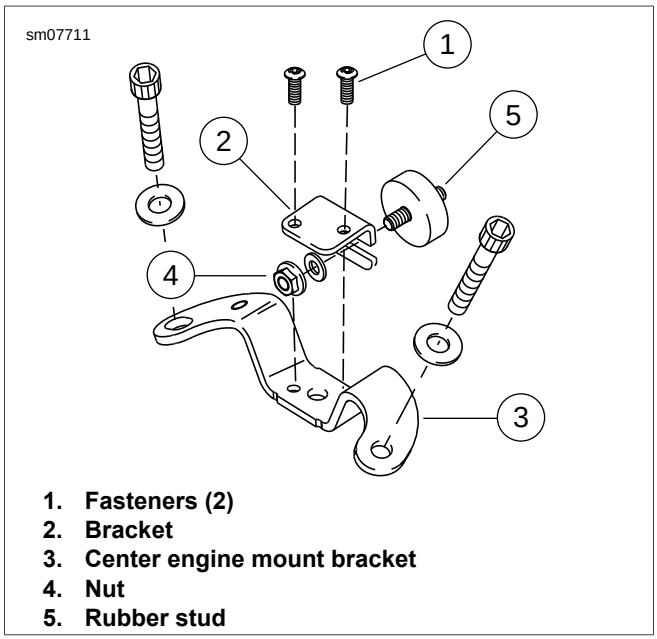
1. Install horn bracket and rubber stud.
   a. Install rubber stud into horn bracket. Tighten to 96-192 **in-lbs** (10.8-21.7 Nm).
   b. Install horn bracket to center engine mount bracket. Tighten to 35-45 **in-lbs** (4.0-5.1 Nm).
2. Install horn with chrome cover and bracket through hole in horn support bracket.
   a. Apply two drops of LOCTITE 262 HIGH STRENGTH THREADLOCKER AND SEALANT (red) flange nut.
   b. Tighten to 80-100 **in-lbs** (9.0-11.3 Nm).
   c. Install fasteners into speed nuts clipped to horn cover. Tighten to 36-60 **in-lbs** (4.1-6.8 Nm).
3. Push wire conduit into horn wire clamp.
4. Install support bracket on rubber mount stud with washer, lockwasher and acorn nut. Tighten to 60-180 **in-lbs** (6.8-20.4 Nm).
5. Connect the red wire with violet tracer to the front terminal.
6. Connect the black lead to the rear terminal.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Rear terminal**
2. **Front terminal**
3. **Acorn nut**
4. **Lockwasher**
5. **Washer**
6. **Horn wire clamp**
7. **Support bracket**
8. **Flange nut**
9. **Horn**
10. **Fastener (2)**
11. **Cover**
12. **Speed nut (2)**

Figure 6-113. Side Mount Horn: XL 1200C/CP/CA/CB, XL 1200T/V



1. **Fasteners (2)**
2. **Bracket**
3. **Center engine mount bracket**
4. **Nut**
5. **Rubber stud**

Figure 6-114. Horn Bracket: XL 1200C/CP/CA/CB, XL 1200T/V

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

RIGHT HANDLEBAR CONTROL MODULE 6.33

REMOVAL

⚠WARNING

To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. Remove fuel tank. See 4.4 FUEL TANK.
3. See Figure 6-115. Remove LH harness caddy fastener.
4. See Figure 6-116. Separate RH control module connector housings [22B-1] (1) and engine OFF/RUN switch connector [22B-2] (2) housings.
5. Remove upper and lower handlebar clamp fasteners. Secure master cylinder/reservoir.
6. Remove switch housing screws.
7. Shorten cable adjusters. See 1.13 THROTTLE CONTROL.
8. See Figure 6-117. Remove brass ferrules from control grip notches. Remove ferrules from cable end fittings.

NOTE

If lower switch housing is tipped, throttle adjuster friction spring can fall out.

9. Remove friction spring.
10. If necessary, remove throttle and idle cables. See 2.24 THROTTLE CABLES, Removal.
11. See Figure 6-118. Remove screws (5) and retainer (6).

NOTE

Note wire routing.

12. Carefully remove switch control module and brake switch (7) from lower housing (4).

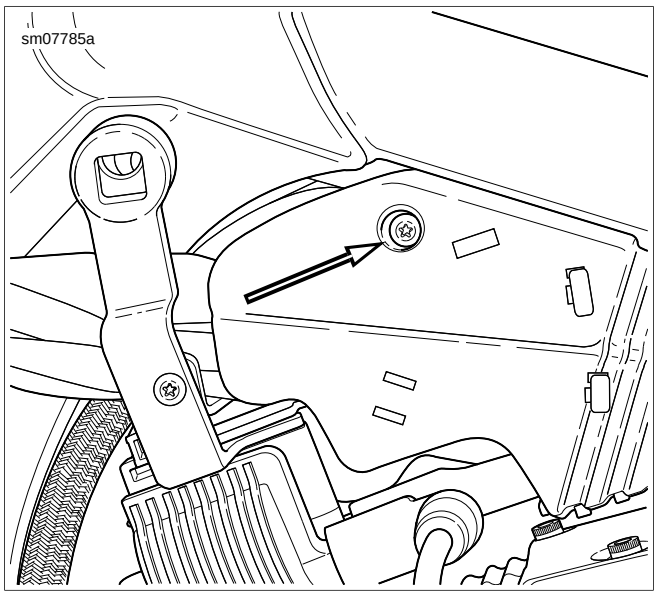
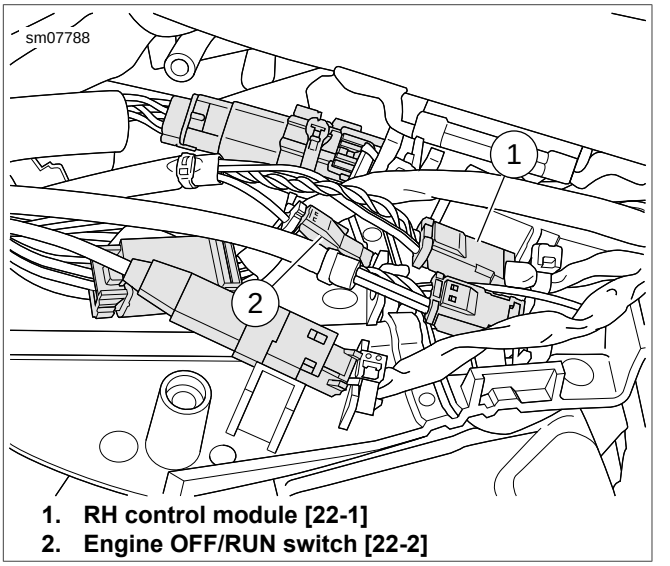


Figure 6-115. Caddy Fastener



1. RH control module [22-1]
2. Engine OFF/RUN switch [22-2]

Figure 6-116. RH Switch Connectors [22-1] [22-2]

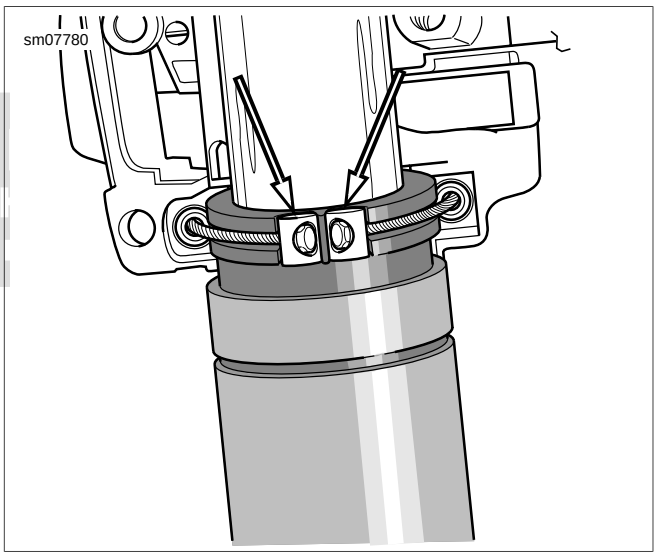
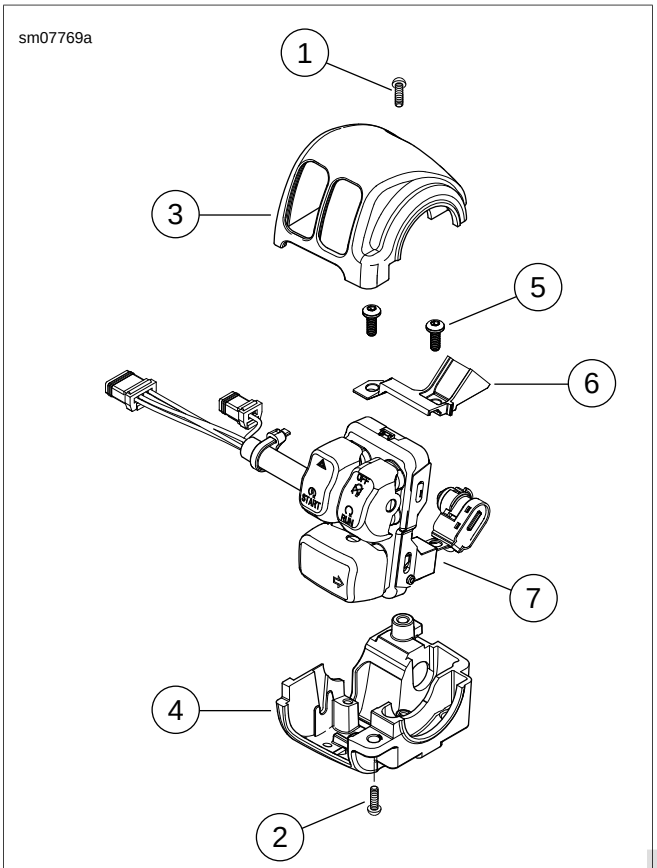


Figure 6-117. Throttle Cable Ferrules



1. **Fastener**
2. **Fastener**
3. **Upper housing**
4. **Lower housing**
5. **Screw (2)**
6. **Retainer**
7. **Control module**

Figure 6-118. RH Switch Assembly

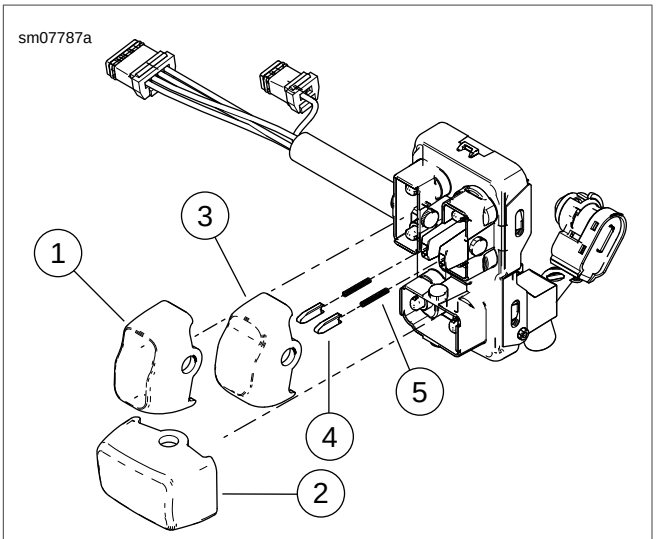
KEY CAPS

Hazard and Turn Signal

See Figure 6-119. Replace the hazard key cap (1) and turn signal key cap (2).

OFF/RUN

1. Remove the OFF/RUN key cap (3).
2. Remove springs (5) and pins (4).
3. Install springs.
4. Install pins.
5. Install OFF/RUN key cap.



1. **START/Hazard key cap**
2. **Turn signal key cap**
3. **OFF/RUN key cap**
4. **Pins (2)**
5. **Springs (2)**

Figure 6-119. Key Caps

FRONT STOP LAMP SWITCH

NOTE

*If **new** stop lamp switch wires have terminals installed, cut wires at terminal end.*

1. See Figure 6-120. Cut wires flush at inoperative stop lamp switch.
2. Remove 0.25-0.3125 in (6.4-7.9 mm) of insulation from each wire end.
3. Cut two pieces of dual wall heat shrink tubing to a length of 0.5 in (12.7 mm).
4. Solder wires together.
5. Heat shrink tubing.

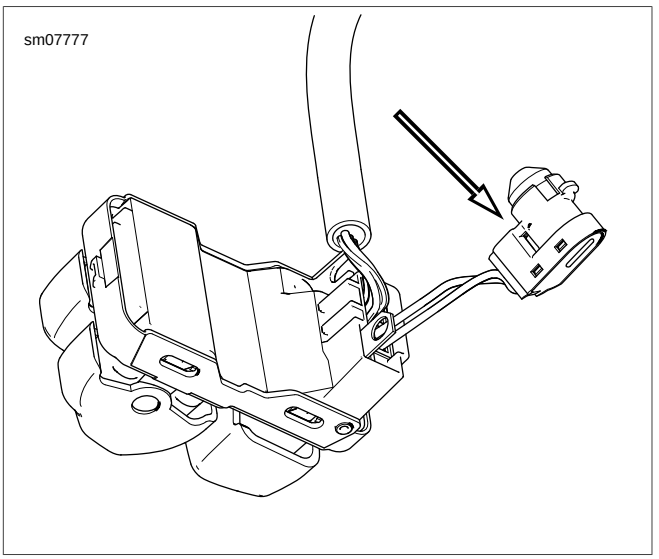


Figure 6-120. RH Control Module/Brake Lamp Switch

INSTALLATION

FASTENER	TORQUE VALUE	
Switch assembly retainer screws	8-10 **in-lbs**	0.9-1.1 Nm
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm

1. Place control module into position in module housing.
2. Position brake switch.
3. Install retainer with screws. Tighten to 8-10 **in-lbs** (0.9-1.1 Nm).
4. If necessary, install throttle and idle cables. See 2.24 THROTTLE CABLES, Installation.
5. See Figure 6-121. Connect cables:
   a. With ferrule grip notches at top, slide throttle control grip over end of right handlebar. Bottom control grip against the closed end. Pull grip back about 1/8 in (3.2 mm) to prevent binding.
   b. Install friction screw spring in lower housing.
   c. Engage housing into throttle control grip.
   d. Fit ferrules over cable ball ends.
   e. Seat ferrules in opposite grip notches.
6. Position upper housing over handlebar and module housing.
7. Start upper and lower module housing screws, but do not tighten.
8. See Figure 6-122. Position brake lever/master cylinder assembly inboard of module housing assembly. Engage tab (2) on lower module housing in the groove (3) at top of brake lever bracket.
9. Install lower handlebar clamp to master cylinder housing screw (with flat washer). Position for rider comfort. Beginning with top screw, tighten to 108-132 **in-lbs** (12.2-14.9 Nm).

NOTE

Tighten lower housing fastener first. Any gap between upper and lower housings is at front of housing.

10. Tighten lower and upper control module housing screws to 35-45 **in-lbs** (4.0-5.1 Nm).
11. Adjust throttle cables. See 1.13 THROTTLE CONTROL.
12. Connect right side switch [22b-1] and OFF/RUN switch [22b-2] connectors.
13. Secure harness with clamps and cable strap as noted during removal.
14. Install caddy fastener. Tighten to 15-25 **in-lbs** (1.7-2.8 Nm).
15. Install fuel tank. See 4.4 FUEL TANK.
16. Install main fuse. See 6.3 FUSES.

⚠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)

17. Test switches.

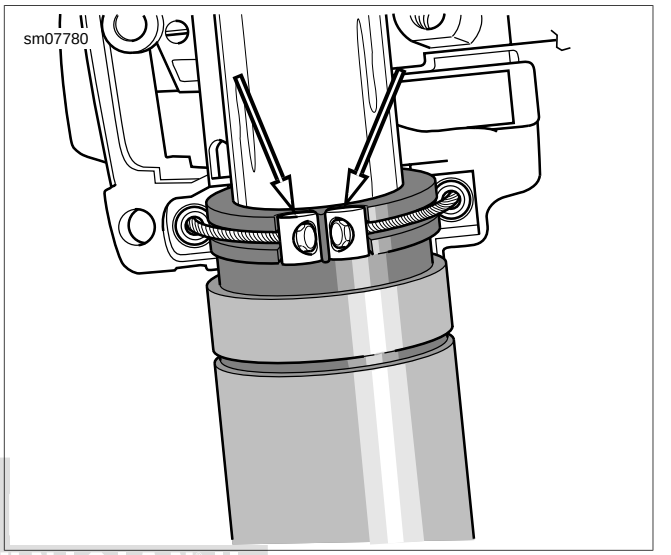
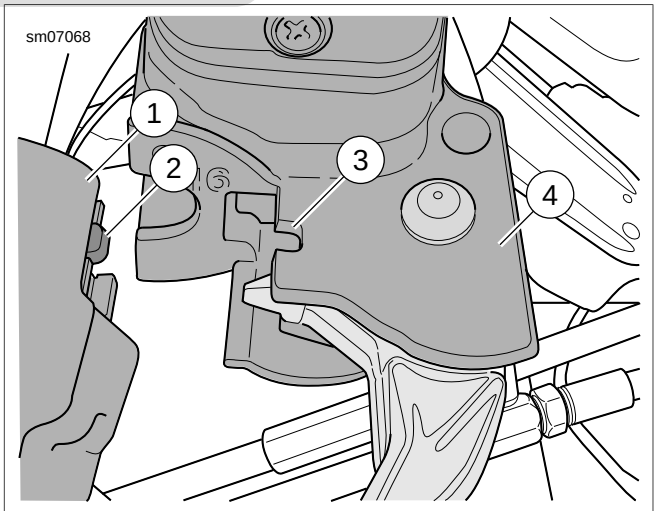


Figure 6-121. Throttle Cable Ferrules



1. **Module housing assembly**
2. **Tab**
3. **Groove**
4. **Brake lever bracket**

Figure 6-122. Module Housing Alignment

LEFT HANDLEBAR CONTROL MODULE 6.34

REMOVAL

WARNING

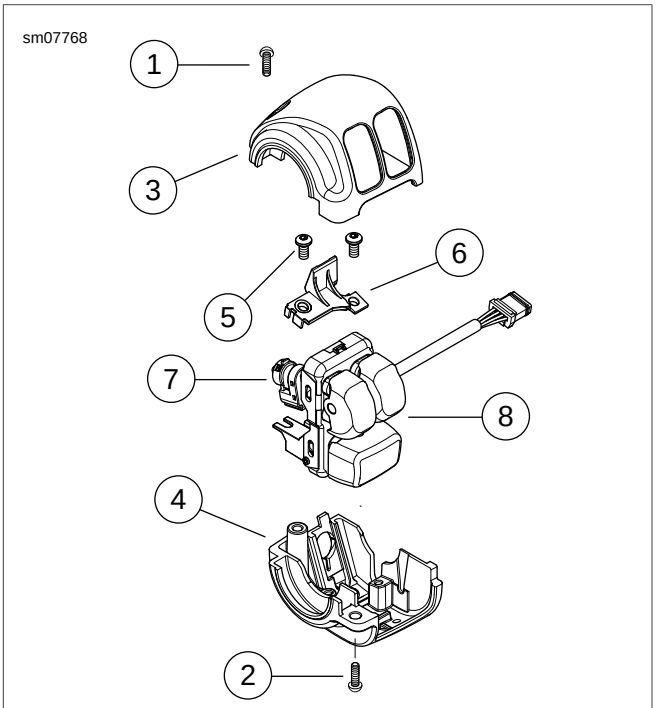
To prevent accidental vehicle start-up, which could cause death or serious injury, remove main fuse before proceeding. (00251b)

1. Remove main fuse.
2. Remove fuel tank. See 4.4 FUEL TANK.
3. Remove left hand harness caddy fastener.
4. Loosen upper handlebar clamp-to-clutch lever screws.
5. See Figure 6-123. Remove upper (1) and lower (2) housing screws. Remove upper housing (3).
6. Remove two fasteners (5) and retaining plate (6).
7. Remove clutch switch (7).
8. Remove control module (8).
9. Remove left hand wire harness shield fastener.
10. See Figure 6-124. Separate left hand control module connector [24] housings.

NOTES

- *Record wire routing and cable strap locations before removal.*
- *Remove connector housing as necessary.*

11. Remove cable straps. Thread wire leads through cable anchors.



1. **Upper fastener**
2. **Lower fastener**
3. **Upper housing**
4. **Lower housing**
5. **Fastener (2)**
6. **Retainer**
7. **Clutch switch**
8. **Hand control module**

Figure 6-123. LH Switch Assembly

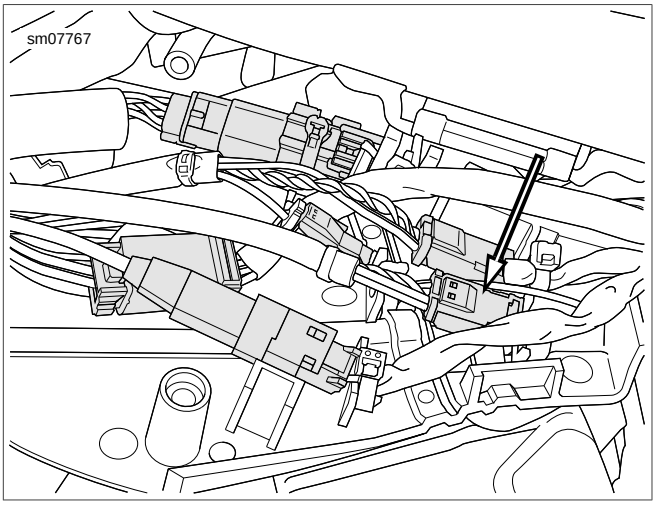


Figure 6-124. LH Control Module Connector [24]

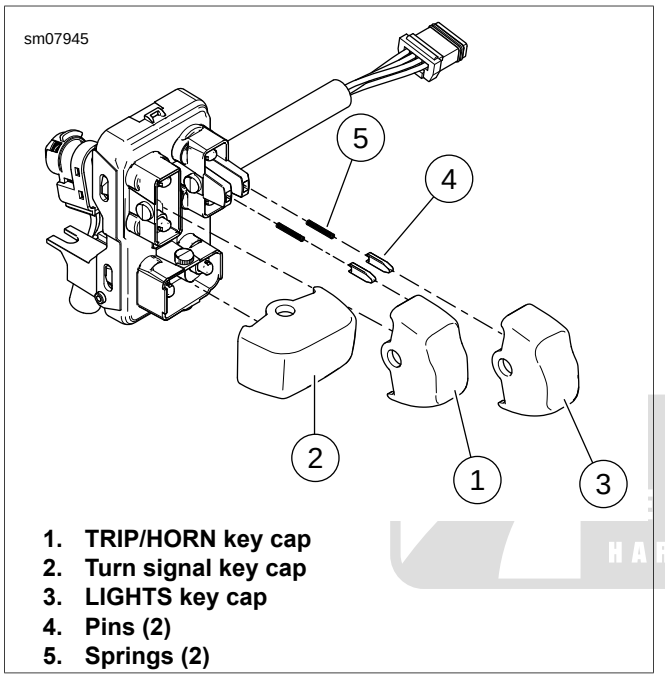
KEY CAPS

TRIP/HORN and Turn Signal

See Figure 6-125. Replace TRIP/HORN (1) and turn signal key cap (2).

LIGHTS

1. Remove the LIGHTS key cap (3).
2. Remove springs (5) and pins (4).
3. Install springs.
4. Install pins.
5. Install LIGHTS key cap.



1. **TRIP/HORN key cap**
2. **Turn signal key cap**
3. **LIGHTS key cap**
4. **Pins (2)**
5. **Springs (2)**

Figure 6-125. Key Caps

CLUTCH SWITCH REPLACEMENT

FASTENER	TORQUE VALUE	
Switch assembly retainer screws	8-10 **in-lbs**	0.9-1.1 Nm

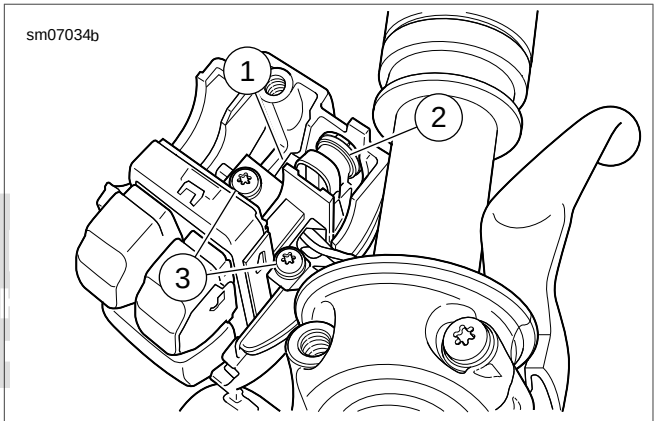
1. See Figure 6-126. Remove screws (3) and retainer (1). Remove clutch switch (2) from housing.
2. Cut wires flush at inoperative clutch switch.
3. If **new** clutch switch wires have terminals installed, cut wires at terminal end.
4. Remove 0.25-0.3125 in (6.4-7.9 mm) of insulation from each wire end.
5. Cut two pieces of dual wall heat shrink tubing to a length of 0.5 in (12.7 mm).
6. Slip heat shrink over wires.
7. Solder wires together.

⚠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.

8. Heat heat shrink.
9. Install clutch switch into housing. Install retainer and screws.
10. Tighten screws to 8-10 **in-lbs** (0.9-1.1 Nm).



1. **Retainer**
2. **Clutch switch**
3. **Screw (2)**

Figure 6-126. LH Clutch Switch and Retainer

INSTALLATION

FASTENER	TORQUE VALUE	
Switch assembly retainer screws	8-10 **in-lbs**	0.9-1.1 Nm
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm

NOTE

Verify placement of rubber grommet on wire harness.

1. Place control module into position in lower housing.
2. Position clutch switch.
3. Install retainer with screws. Tighten to 8-10 **in-lbs** (0.9-1.1 Nm).
4. Position upper and lower housings around handlebar.

5. Start upper and lower housing fasteners. Do not tighten.
6. See Figure 6-127. Position clutch hand lever assembly inboard of switch assembly. Engage tab (3) on lower module housing in groove (2) at the bottom of clutch lever bracket.
7. Fit clutch bracket clamp. Start two screws. Position for rider comfort.
8. Beginning with top screw, tighten to 108-132 **in-lbs** (12.2-14.9 Nm).

NOTE

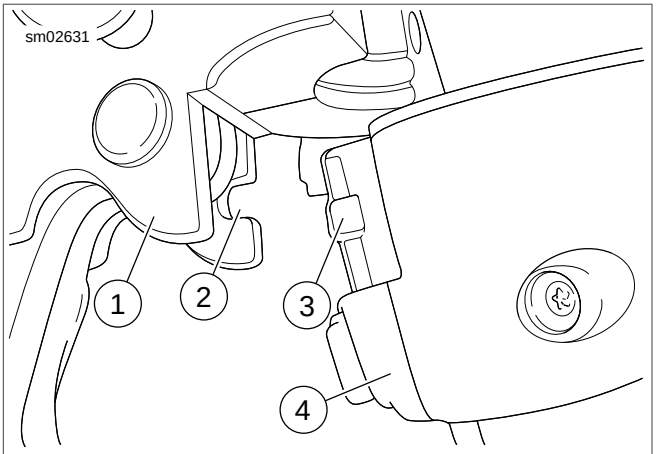
Tighten lower housing fastener first. Any gap between upper and lower housings is at front of housing.

9. Tighten housing fastener to 35-45 **in-lbs** (4.0-5.1 Nm).
10. Secure harness with cable anchors and cable strap as noted.
11. Connect LH switch assembly connector.
12. Install caddy fastener. Tighten to 15-25 **in-lbs** (1.7-2.8 Nm).
13. Install fuel tank. See 4.4 FUEL TANK.
14. Install main fuse. See 6.3 FUSES.

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. Test switch operation.



1. **Clutch lever bracket**
2. **Groove**
3. **Tab**
4. **Switch housing assembly**

Figure 6-127. Clutch Lever Bracket

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

NOTES

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NOTES

AUTOFUSE UNSEALED ELECTRICAL CONNECTOR 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. See Figure A-1 or Figure A-2. Insert smallest pair of pins on the SNAP-ON TERMINAL PICK (Part No. GA500A) into chamber on mating end of socket housing to press tangs on each side of terminal simultaneously.
2. Gently pull on wire to remove terminal from wire end of socket housing.
3. If necessary, crimp **new** terminals on wires.

Assembly

1. Carefully bend tang on each side of terminal outward away from terminal body. Use the thin flat blade from a hobby knife.
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.

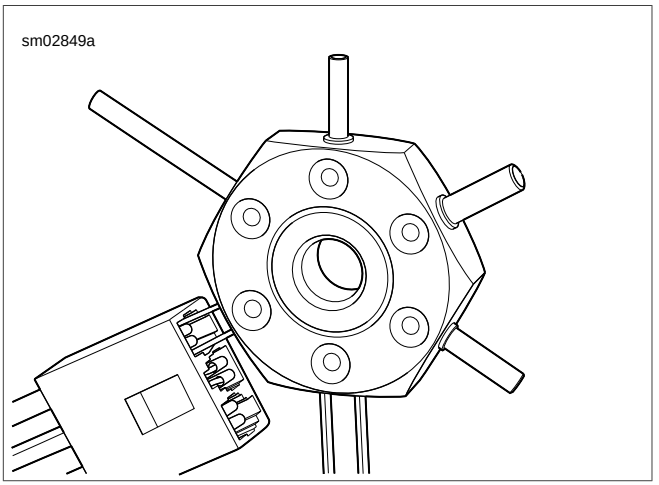


Figure A-1. Removing Autofuse Unsealed Terminal from Ignition Switch

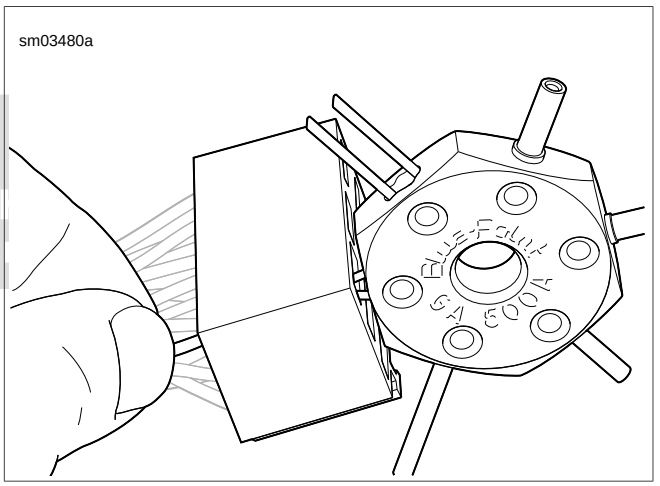


Figure A-2. Removing Autofuse Unsealed Terminal from Fuse Block

BOSCH COMPACT 1.1M CONNECTOR A.2

BOSCH COMPACT 1.1M CONNECTOR

PART NUMBER	TOOL NAME
GA500A	SNAP-ON TERMINAL PICK

General

See Figure A-3. The Bosch Compact 1.1M connector is found on MAP and TMAP sensors.

Housings

Separate: Snap back the secondary lock. Press on the latch while pulling the socket connector from the sensor.

Join: Align the sockets and press the housings together until the latch snaps. Snap in the secondary lock.

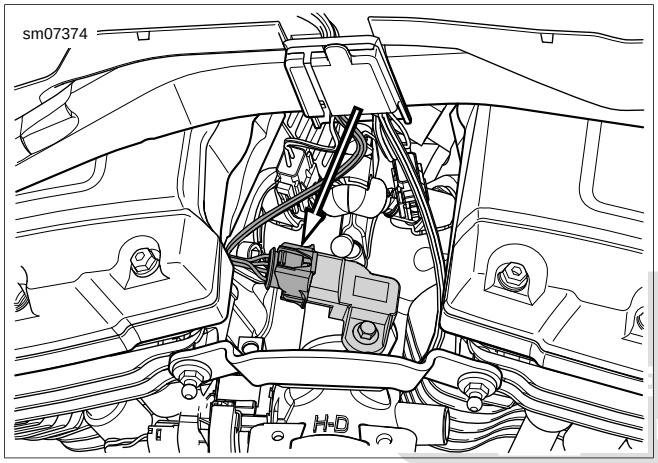


Figure A-3. Bosch Compact 1.1M Connector

Removing Socket Terminal

1. See Figure A-4. Slide the locking bar off the terminal housing.
2. Insert the smallest pins of the SNAP-ON TERMINAL PICK (Part No. GA500A) into the gaps on each side of the socket to compress the tangs on each side of the terminal.
3. Gently pull on the wire to remove the terminal.

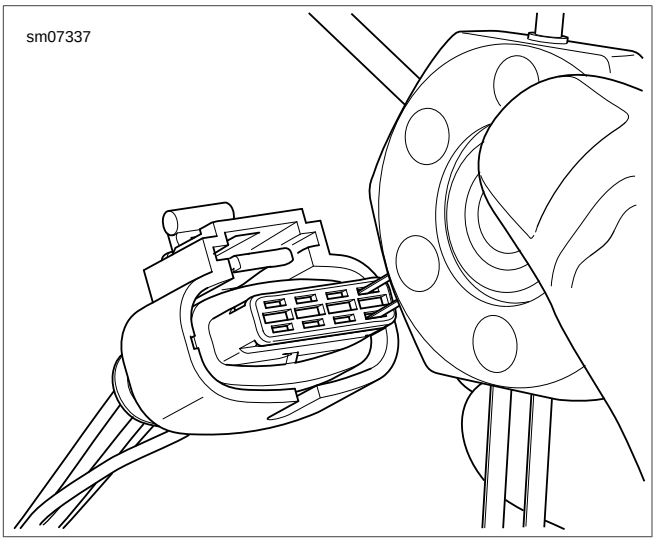


Figure A-4. Terminal Removal: Bosch Compact 1.1M Connector

Installing Socket Terminal

1. See Figure A-5. Use a hobby knife to bend the tangs on each side of the terminal outward.
2. Align terminal to socket housing. Press terminal into housing until it snaps.

NOTE

The teeth on the locking bar face down.

3. Slide the locking bar onto the connector.

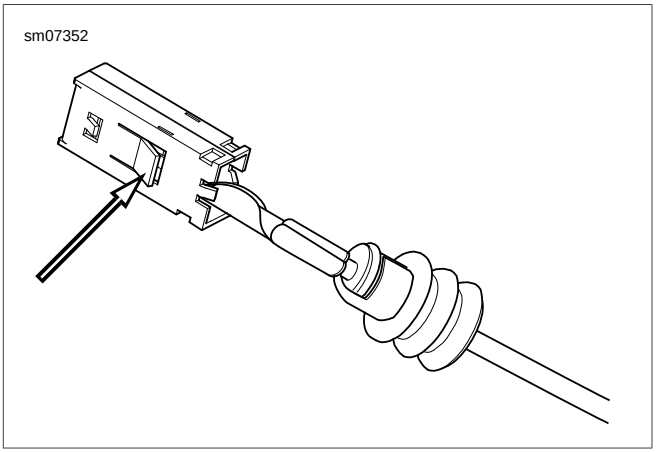


Figure A-5. Tangs: Bosch Compact 1.1M Socket Terminal

BOSCH BTC SEALED CONNECTOR A.3

BOSCH BTC SEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
B-50085	TERMINAL EXTRACTOR
HD-50120-A	BOSCH TERMINAL REPAIR KIT

The Bosch BTC sealed connector is used to connect the ABS module to the wire harness on Touring models.

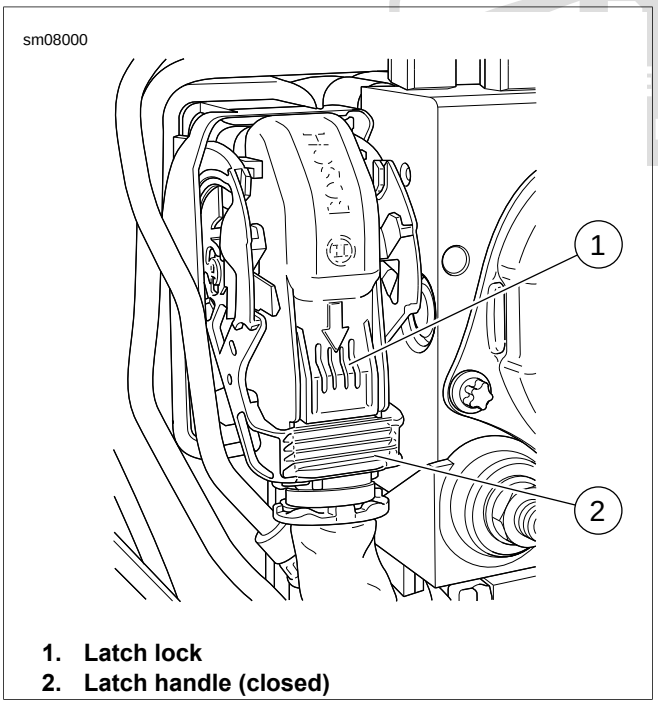
Plugging and Unplugging Connector

1. See Figure A-6. To unplug connector:
   a. While pressing latch lock (1), lift latch handle (2).
   b. See Figure A-7. Raise latch handle into the full upward (open) position (1).
   c. Pull connector straight out of socket.

NOTE

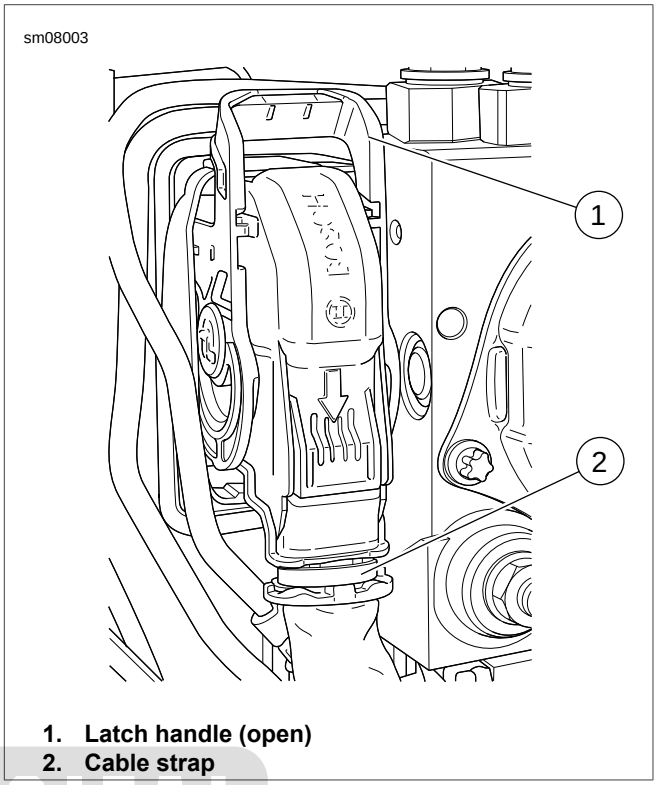
Do not attempt to close latch handle while connector is out of socket. Damage to latch mechanism could result.

2. To plug in connector:
   a. Insert connector. Press gently into socket.
   b. Pull latch handle down (closed) until it clicks.



1. **Latch lock**
2. **Latch handle (closed)**

Figure A-6. Bosch BTC Sealed Connector (Latched)



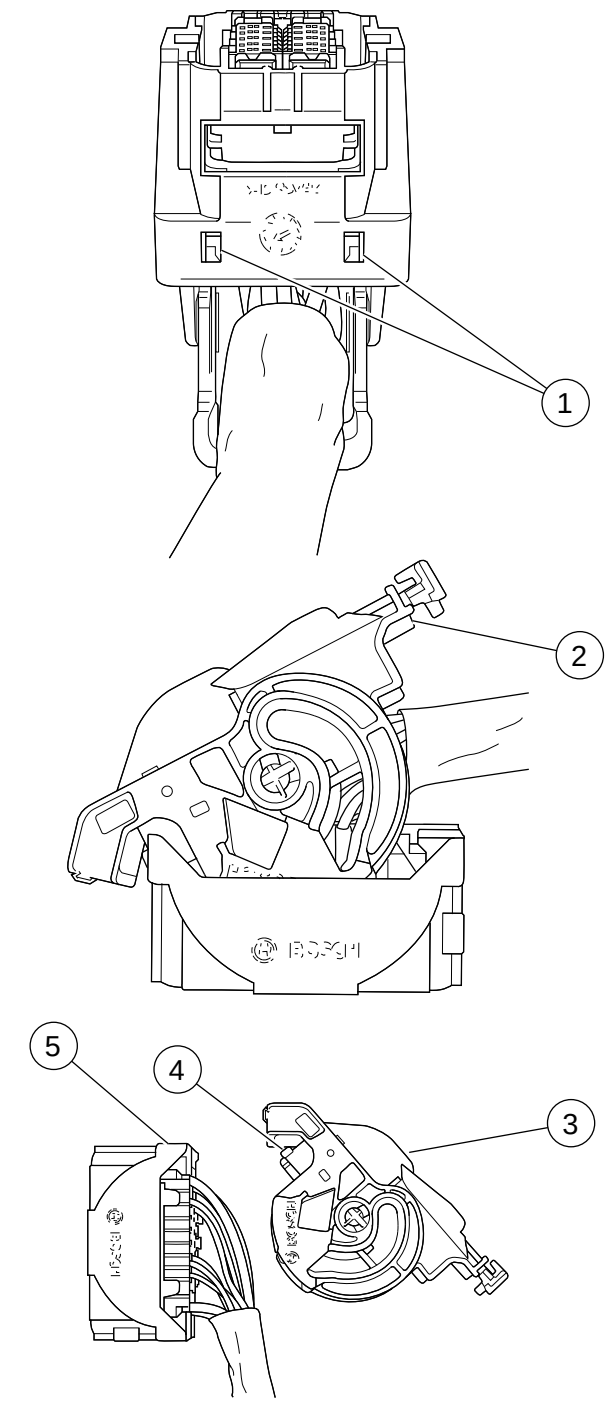
1. **Latch handle (open)**
2. **Cable strap**

Figure A-7. Bosch BTC Sealed Connector (Unlatched)

Removing and Installing Connector Cover

1. To remove connector cover:
   a. See Figure A-7. Remove and discard cable strap (2).
   b. See Figure A-8. Insert the blade of a small screwdriver into cover release latch (1) slot.
   c. Gently pry the cover away from the tab on the body of the connector. Repeat for other release latch slot.
   d. Grasp cover and pivot up (2) and away from connector.

2. To install connector cover:
   a. See Figure A-8. Start cover into connector body at an angle. Engage tabs (4) in slots (5).
   b. Rotate cover down onto body until an audible click is heard, indicating that cover is locked in place.
   c. See Figure A-7. Install **new** cable strap (2).



1. **Cover release latch slot (2)**
2. **Cover pivoted up**
3. **Cover removed**
4. **Tab**
5. **Slot**

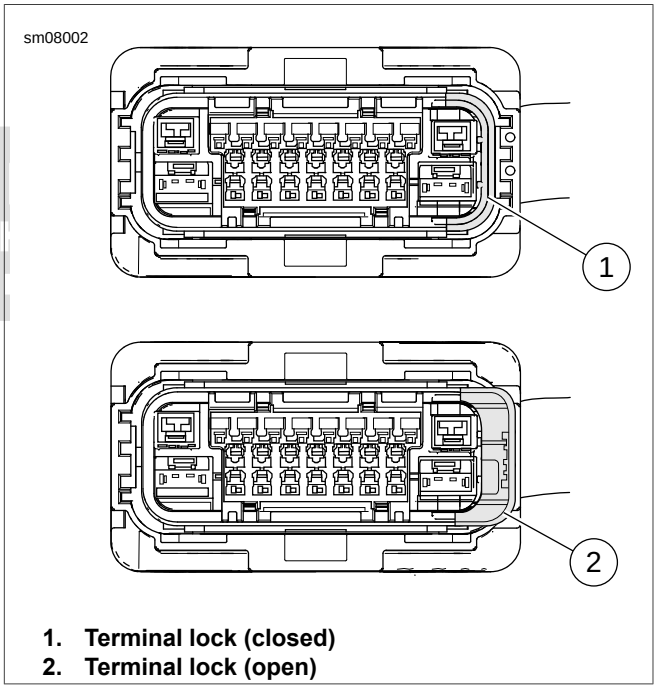
Figure A-8. Removing Bosch BTC Sealed Connector Cover

Removing and Installing Wire Terminals

NOTE

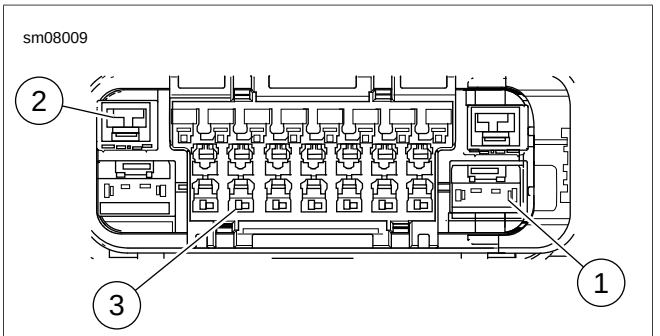
See Figure A-10. The Bosch BTC Sealed connector has three sizes of terminals: 12 gauge, 14 gauge and 20 gauge.

1. To remove terminals from connector:
   a. See Figure A-9. With the blade of a small screwdriver, gently pry the terminal lock (1) open (2).
   b. See Figure A-10. Insert TERMINAL EXTRACTOR (Part No. B-50085) into cavity next to terminal being removed. Carefully pry terminal latch back. Grasp wire and gently pull terminal from terminal cavity.
2. To install terminals in connector:
   a. Carefully insert terminal with wire lead into appropriate terminal cavity.
   b. Gently push terminal into cavity until it clicks, indicating that it is locked in place.
   c. When all terminals are in place, use the blade of a small flat screwdriver to pry the terminal lock closed (1).



1. **Terminal lock (closed)**
2. **Terminal lock (open)**

Figure A-9. Bosch BTC Sealed Connector Terminal Lock



1. 12 ga terminal cavity (2)
2. 14 ga terminal cavity (2)
3. 20 ga terminal cavity (22)

Figure A-10. Bosch BTC Sealed Connector Terminals

Crimping Terminals to Leads

The BOSCH TERMINAL REPAIR KIT (Part No. HD-50120-A) contains the crimper tool, dies and all terminals necessary to repair the Bosch BTC sealed connector. For the correct terminal crimping procedure, refer to the instruction sheet provided with the tool or available through h-dnet.com.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DELPHI 100W MICRO-PACK SEALED CONNECTOR A.4

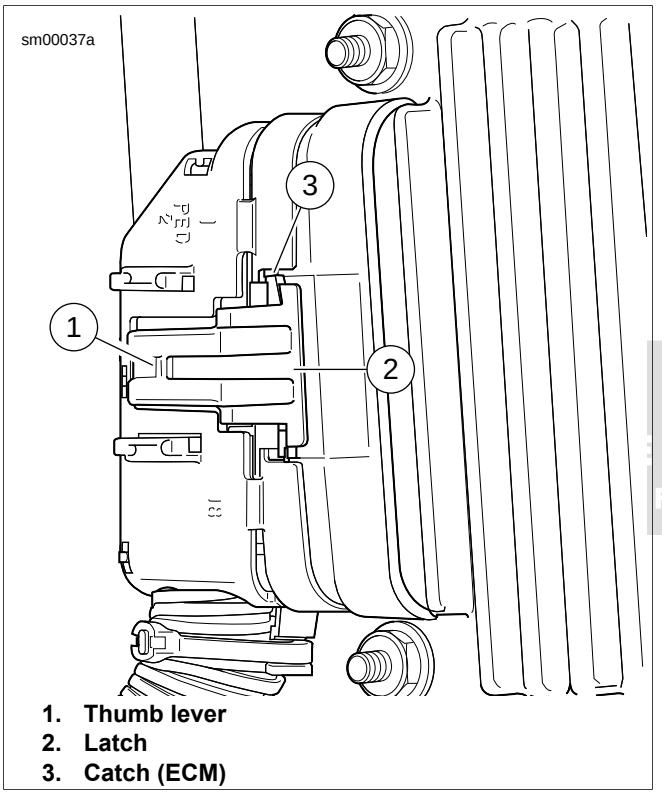
DELPHI 100W MICRO-PACK SEALED CONNECTOR REPAIR

General

A Delphi 100W Micro-Pack Sealed connector connects the electronic control module (ECM) to the main harness.

Separating Socket Housing From ECM

See Figure A-11. 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.

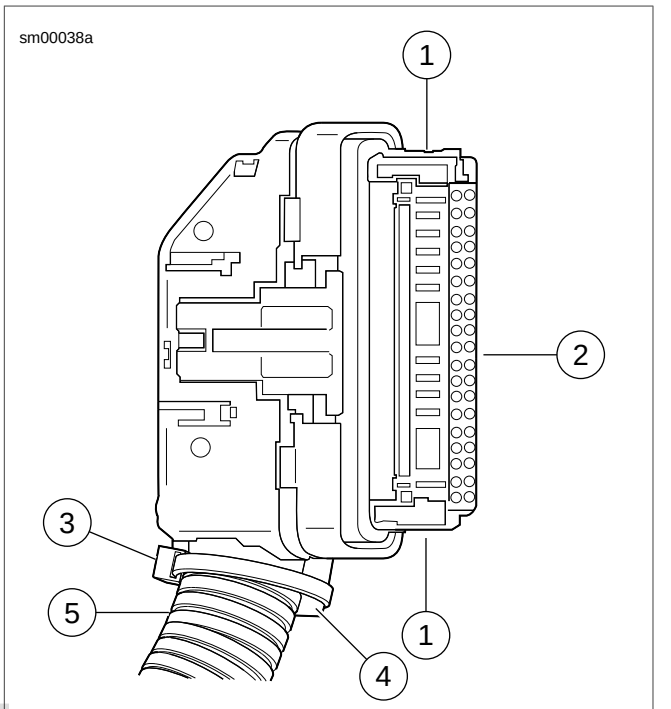


1. Thumb lever
2. Latch
3. Catch (ECM)

Figure A-11. Delphi 100W Micro-Pack Sealed Connector to ECM

Mating Socket Housing To ECM

Push the connector into the ECM until the latch is captured by the catch on the ECM.



1. Latch
2. Secondary lock
3. Cable strap
4. Strain relief collar
5. Conduit

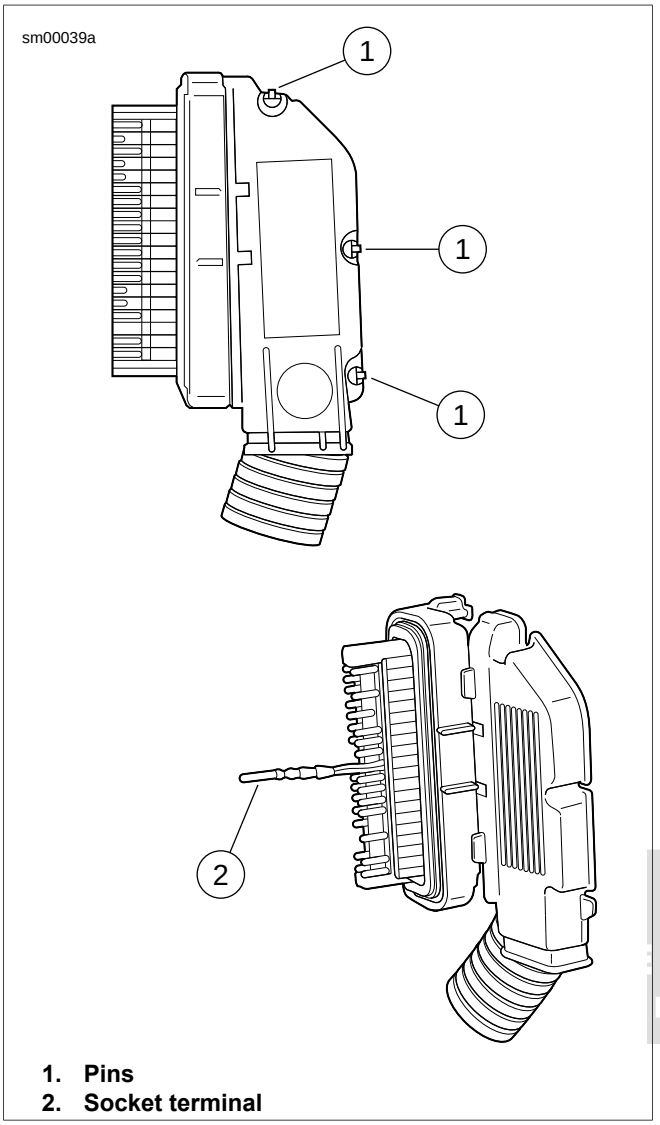
Figure A-12. Delphi 100W Micro-Pack Sealed Connector

Removing Socket Terminal

1. See Figure A-12. To remove, gently press latch (1) on each side of the clear plastic secondary lock (2). 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-13. 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.



1. **Pins**
2. **Socket terminal**

Figure A-13. Delphi 100W Micro-Pack Sealed Connector: Separate Halves of Socket Housing

CRIMPING TERMINALS

PART NUMBER	TOOL NAME
HD-50120	UNIVERSAL CRIMPER SET
HD-50120-2	HAND CRIMP FRAME
HD-50120-7	TYCO AND DELPHI TERMINAL CRIMP DIE

1. Strip the wire insulation to specification. Refer to Table A-1.
2. Install the TYCO AND DELPHI TERMINAL CRIMP DIE (Part No. HD-50120-7) in the handle of the HAND CRIMP FRAME (Part No. HD-50120-2) of the UNIVERSAL CRIMPER SET (Part No. HD-50120).
3. Place the **new** terminal in the specified nest.
4. Insert the wire to the wire stop. Crimp the terminal.
5. Inspect the crimped terminal.

Table A-1. Delphi 100W Micro-Pack Crimper Die (Part No. HD-50120-7)

TERMINAL	PART NO.	STRIP LENGTH		NEST
		in	mm	
Socket: 18 AWG	72076-00	0.200	5.1	B
Socket: 20-22 AWG	72568-08	0.200	5.1	C

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DELPHI 150 METRI-PACK SEALED CONNECTOR A.5

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. Push the pin and socket halves of the connector together.

Removing Socket Terminal

1. See Figure A-14 for pull-to-seat connector or Figure A-15 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. The tangs are on the same side as the external latch.

3. Gently insert a small diameter straight 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. This indicates the tang is pressed in.

NOTE

After repeated terminal extractions, the click may not be heard, but pivot the pin as if the click was heard at least three 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.

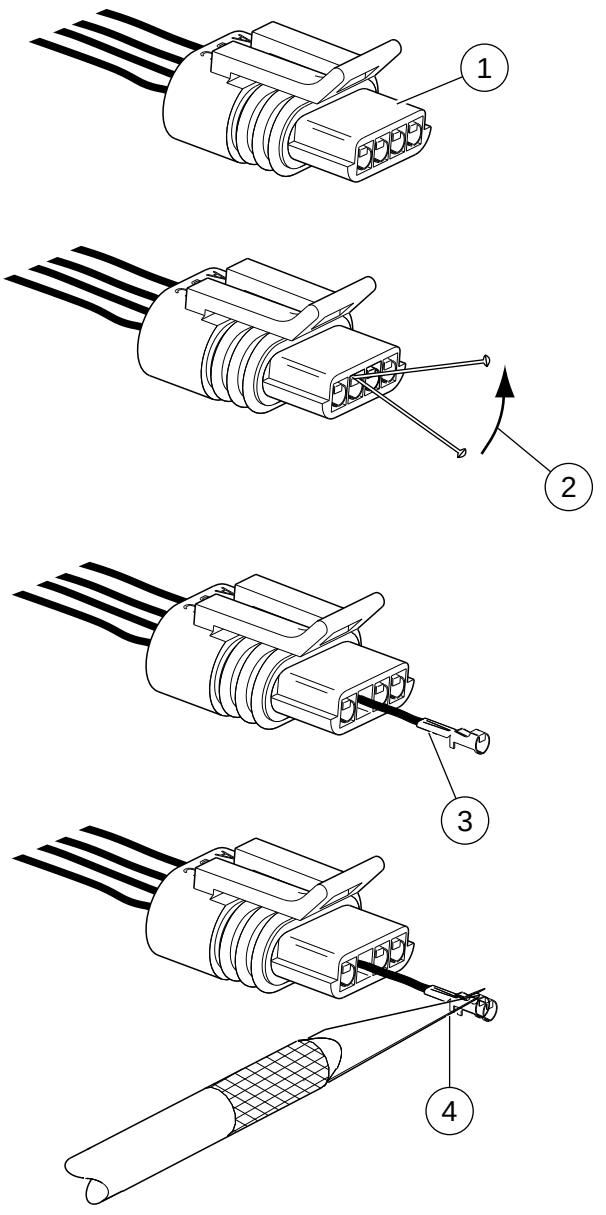
1. See Figure A-14 for pull-to-seat connector or Figure A-15 for push to seat connector. Carefully bend tang on each side of terminal outward away from terminal body. Use the thin flat blade from a hobby knife.
2. Gently pull or push on the lead to install the terminal back into the chamber. A click 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.

NOTE

For push-to-seat: *See Figure A-15. 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.*

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

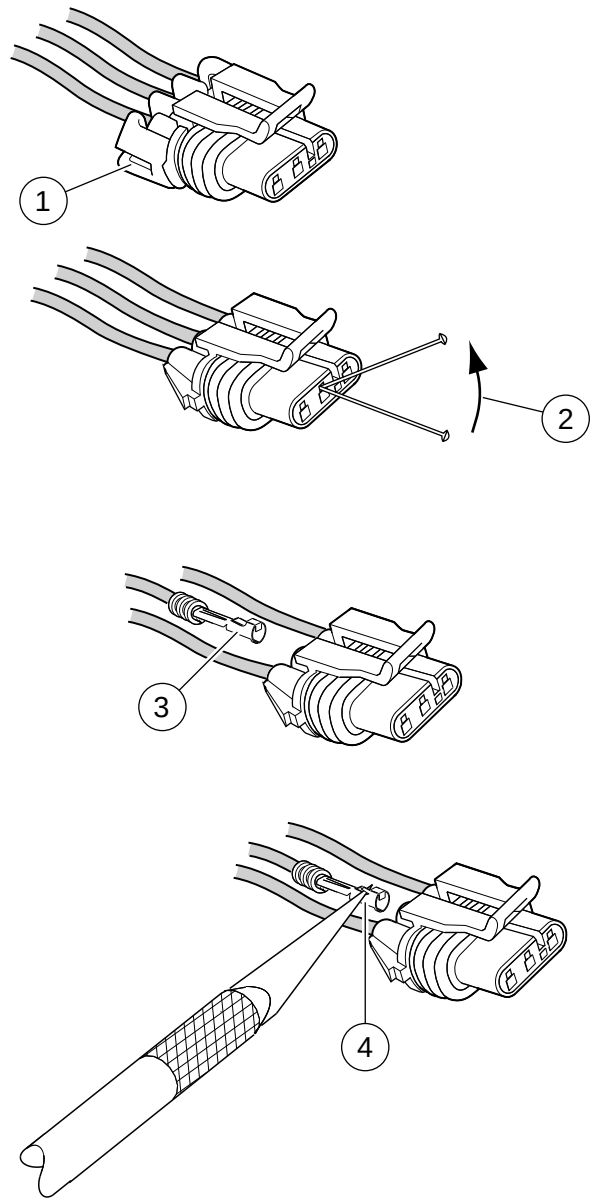
sm00027a



1. Locate tang in chamber
2. Pivot pin to release tang
3. Push to remove
4. Raise tang to install

Figure A-14. Delphi 150 Metri-Pack Sealed Connector: Pull-to-Seat

sm00028a



1. Remove wire lock
2. Pivot pin to release tang
3. Pull to remove
4. Raise tang to install

Figure A-15. Delphi 150 Metri-Pack Sealed Connector: Push-to-Seat

DELPHI 280 METRI-PACK UNSEALED CONNECTOR A.6

FUSE BLOCK REPAIR

Removing Socket Terminals

1. See Figure A-16. 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. Use the thin flat blade from a hobby knife. Gently push tang away from terminal and 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-17. Alpha (1) and numeric (2) coordinates identify the main fuse block terminal cavity. Refer to the main harness wiring diagram.*

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 wire ends to verify that all terminals are locked.
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. Push down until it bottoms.

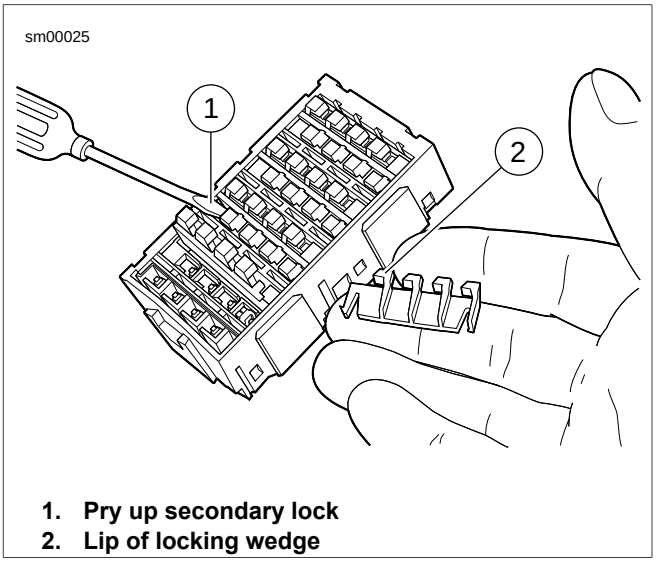
Crimping Terminals

Terminals are crimped twice: once over the wire core and a second time over the insulation/seal.

A correctly crimped terminal can require different crimping dies found on separate crimpers.

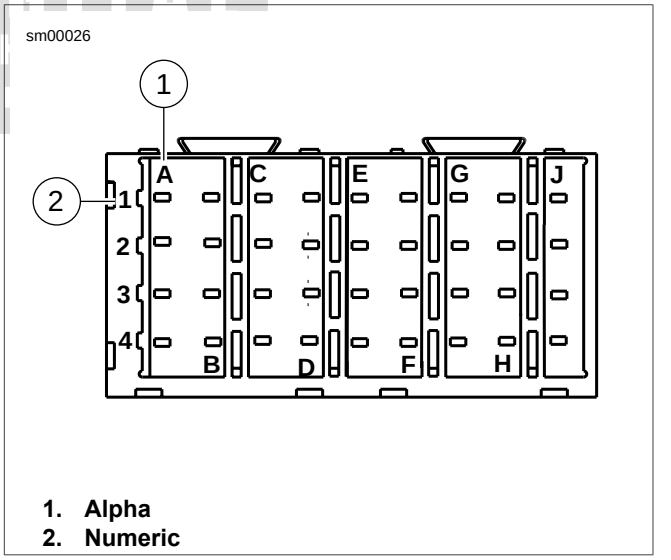
NOTE

The wiring diagram indicates when one socket terminal is being crimped to two wire leads.



1. **Pry up secondary lock**
2. **Lip of locking wedge**

Figure A-16. Fuse Block: Remove Secondary Locks



1. **Alpha**
2. **Numeric**

Figure A-17. Fuse Block: Coordinates (typical)

DELPHI 480 METRI-PACK UNSEALED CONNECTORS A.7

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-18. 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

NOTES

- *Record position of cable straps anchoring wire conduits of the pin and socket housing before removing them.*
- *Cut any cable strap anchoring the wire conduits of the pin (accessory connector housing) and the socket (B+) housing.*

See Figure A-18. 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

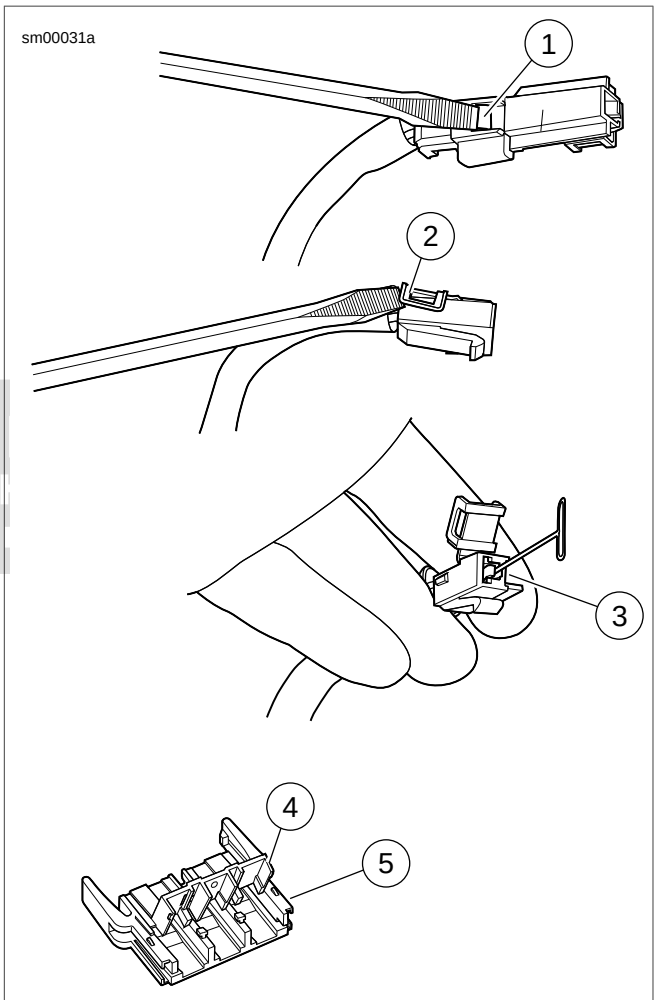
1. See Figure A-18. Bend back the latch (2) slightly and free one side of secondary lock, then repeat to release the opposite side. Rotate the secondary lock outward on hinge to access terminal in chamber of connector housing.
2. On the mating end of the connector, note the tang in the square shaped 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.10 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 original equipment 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-18. Delphi 480 Metri-Pack Unsealed Connector: Remove Socket Terminal

DELPHI 630 METRI-PACK UNSEALED CONNECTOR A.8

DELPHI 630 METRI-PACK UNSEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
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. 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. It engages a rib in the chamber wall to lock the terminal in place.
3. Moving to the mating end of the connector, find the small opening on the chamber wall side of each terminal.
4. Insert SNAP-ON PICK (Part No. 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. See A.10 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. Carefully bend tang on each side of terminal outward away from terminal body. Use the thin flat blade from a hobby knife.
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 wire ends to verify that all terminals are locked.
4. Rotate the hinged secondary lock inward until tabs fully engage latches on both sides of connector.

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DELPHI 800 METRI-PACK SEALED MAIN FUSE HOUSING A.9

DELPHI 800 METRI-PACK SEALED MAIN FUSE HOUSING REPAIR

Removing Socket Terminals

⚠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.
2. See Figure A-19. 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. Replace both as an assembly if either requires replacement.

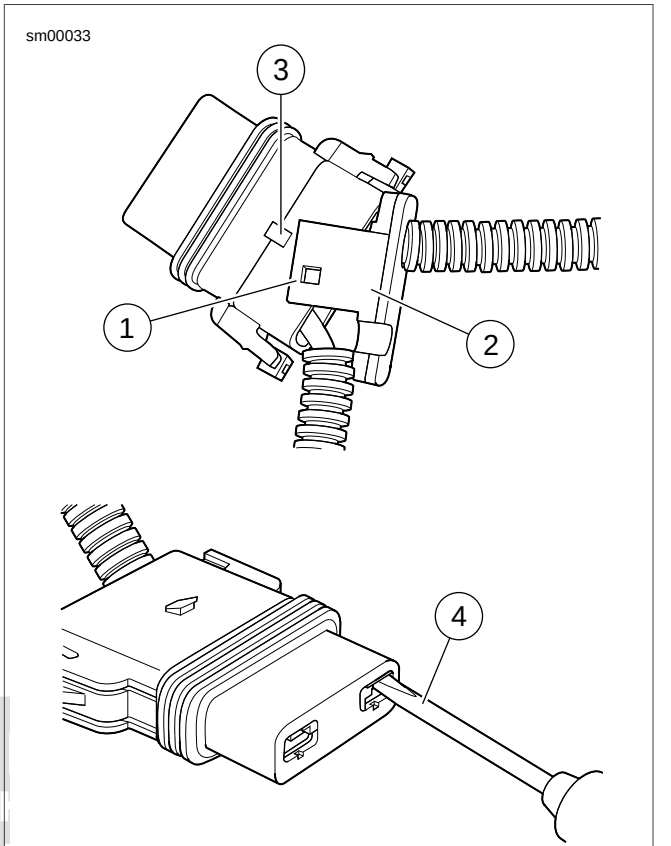
Installing Socket Terminals

1. See Figure A-20. Carefully bend tang outward away from the terminal body.
2. Properly orient terminal to the cavity in the housing. 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. Verify slots engage tabs on sides of connector housing.

⚠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)

6. Connect battery cables.



1. **Secondary lock slot**
2. **Secondary lock**
3. **Tab**
4. **Insert flat blade into opening**

Figure A-19. Delphi 800 Metri-Pack Sealed Main Fuse Housing: Remove Socket Terminals

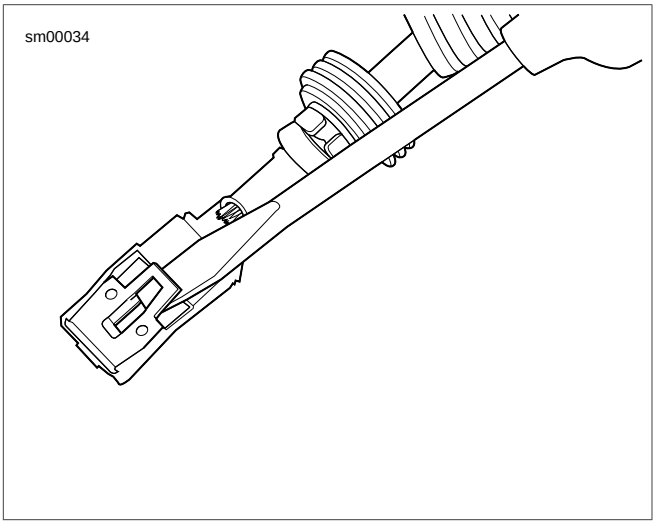


Figure A-20. Delphi 800 Metri-Pack Sealed Main Fuse Housing: Bend Tang

DELPHI METRI-PACK TERMINAL REPAIR A.10

METRI-PACK TERMINAL CRIMPS

PART NUMBER	TOOL NAME
HD-38125-6	PACKARD TERMINAL CRIMPER
HD-38125-7	PACKARD TERMINAL CRIMPER
HD-38125-8	PACKARD TERMINAL CRIMPER

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-21. A crimp can require two crimping dies. The dies are found on the PACKARD TERMINAL CRIMPER (Part No. HD-38125-6) and the PACKARD TERMINAL CRIMPER (Part No. HD-38125-7). The terminal and the wire gauge determine the core crimp die and the insulator/seal die.

NOTE

The PACKARD TERMINAL CRIMPER (Part No. HD-38125-8) also crimps sealed splice connectors in wire gauge sizes 18-20, 14-16 and 10-12.

Preparing Wire Lead

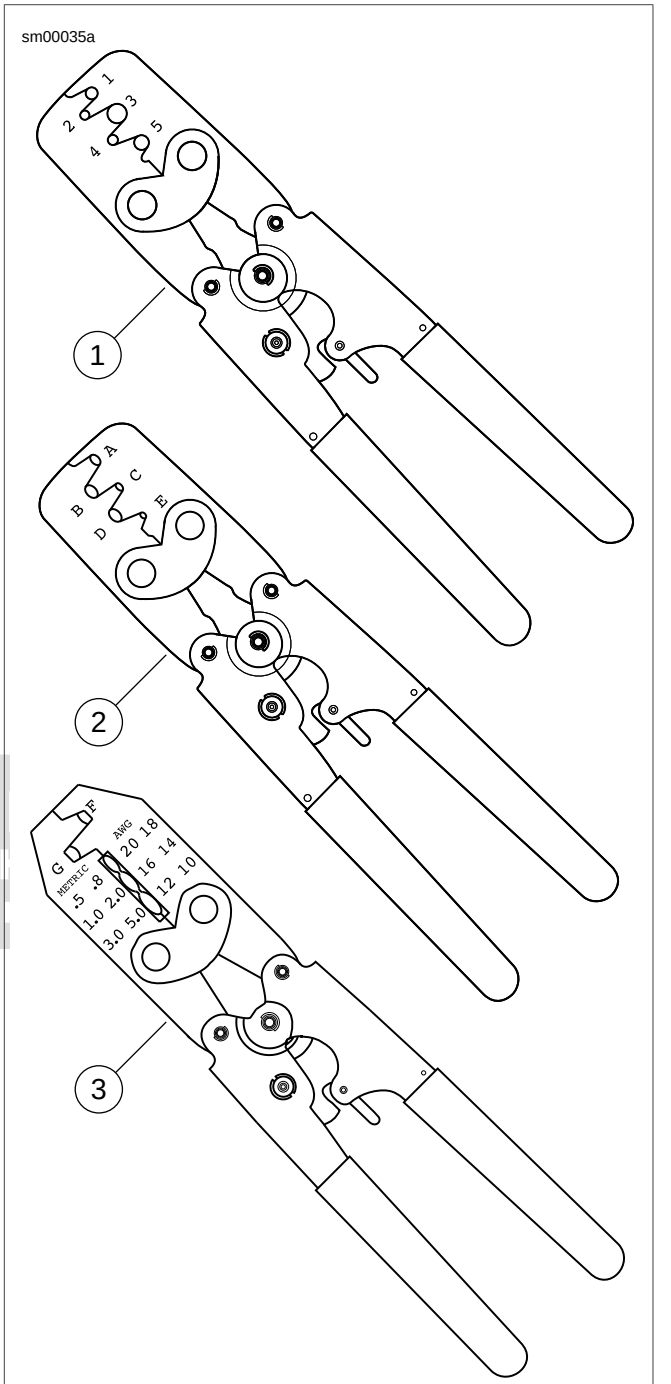
Strip 5/32 in (4.0 mm) of insulation from the wire lead.

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. Make sure that the core crimp tails are facing the forming jaws.
4. Gently squeeze the handles only until crimpers secure the core crimp tails.
5. Insert stripped wire between crimp tails. Verify that wire is positioned so that short pair of crimp tails squeezes core wire strands, while long pair is positioned over the insulation or seal material.
6. Squeeze handles tightly closed. Release grip and the tool automatically opens.



1. **HD-38125-6 sealed terminals**
2. **HD-38125-7 non-sealed terminals**
3. **HD-38125-8 non-sealed terminals**

Figure A-21. Metri-Pack Terminal Crimp Tools

Crimping Insulation/Seal

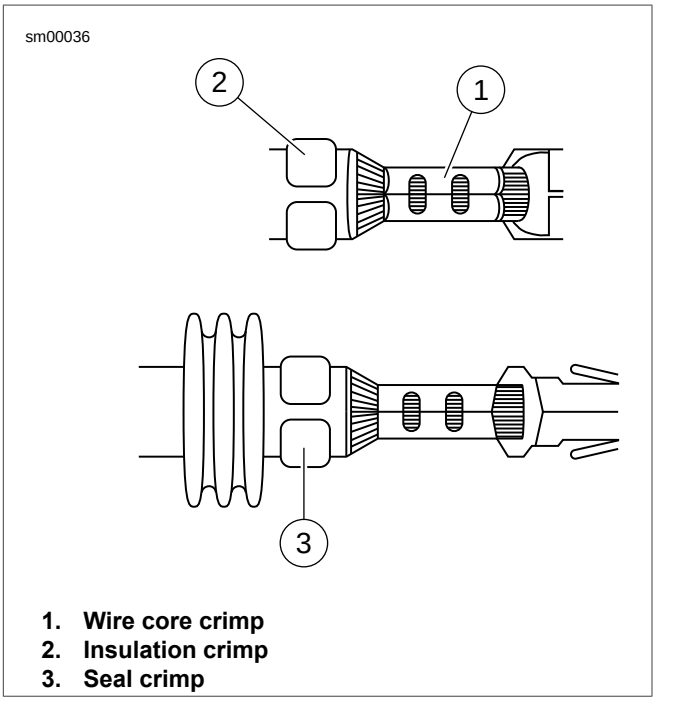
NOTE

Always perform ***Crimping Wire Core*** *before* ***Crimping Insulation/Seal****.*

1. See Figure A-22. Identify the correct die for the insulation/seal crimp (2).
2. Position the insulation/seal crimp in the nest. Make sure that the core 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-22. Inspect the wire core crimp (1). Make sure that the tails are folded in on the wire core without any distortion or excess wire strands.
2. Inspect the insulation (2) or seal (3) crimp. Make sure that the tails of the terminal are wrapped around the insulation without distortion.



1. **Wire core crimp**
2. **Insulation crimp**
3. **Seal crimp**

Figure A-22. Metri-Pack Connector: Inspect Core and Insulation/Seal Crimps

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

DELPHI MICRO 64 SEALED CONNECTOR A.11

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

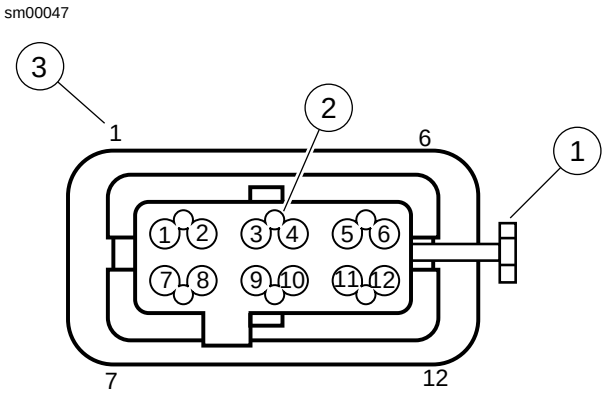
Bend back the external latches slightly and separate the pin and socket housings.

Mating Pin and Socket Housings

Orient the wire lead colors. Align pin and socket housings. Push the pin and socket housings of the connector together until the latches click.

Removing Terminal

1. See Figure A-23. 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-23. Delphi Micro-64 Sealed Connector: Housing

4. See Figure A-24. Obtain the TERMINAL REMOVER (Part No. HD-45928).
5. See Figure A-25. 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-24. Terminal Remover (HD-45928)

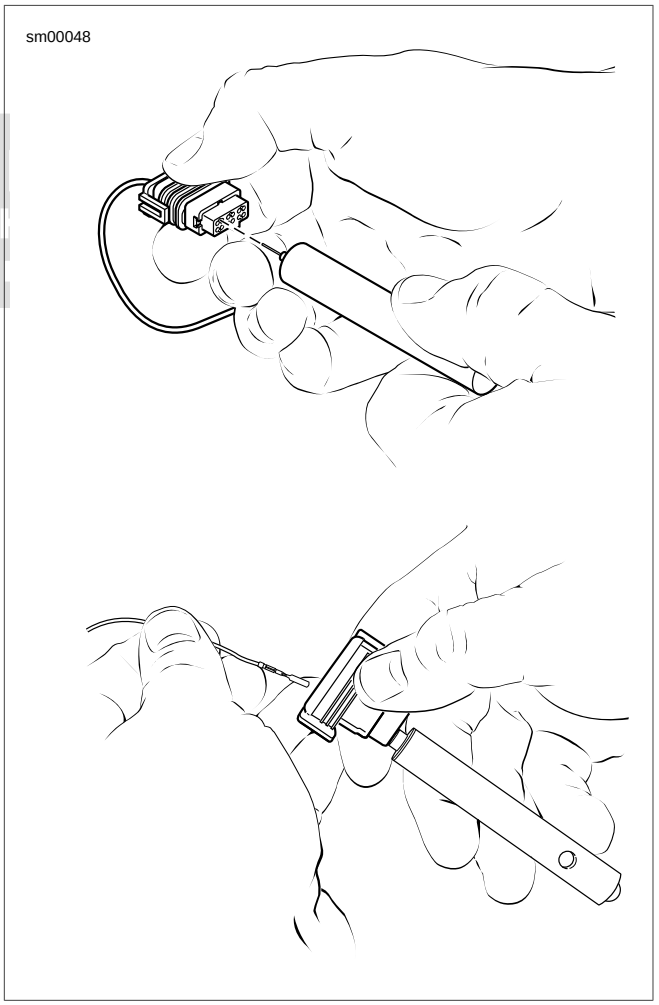


Figure A-25. Delphi Micro-64 Sealed Connector: Insert Tool and Remove Terminal

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-23. 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 removed, the terminal 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 1/8 in (3.0 mm) of insulation from the wire lead.

Crimping Terminals

1. Inspect **new** socket terminal for bent or deformed contact and crimp tails. Replace as necessary.

2. See Figure A-27. 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. Position wire that the 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.

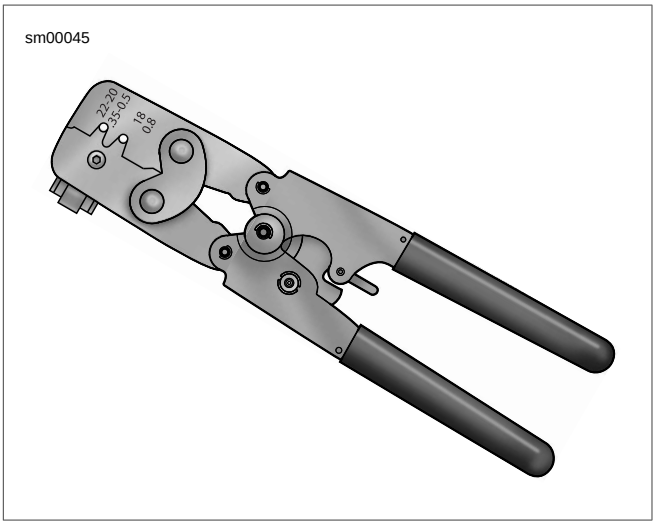
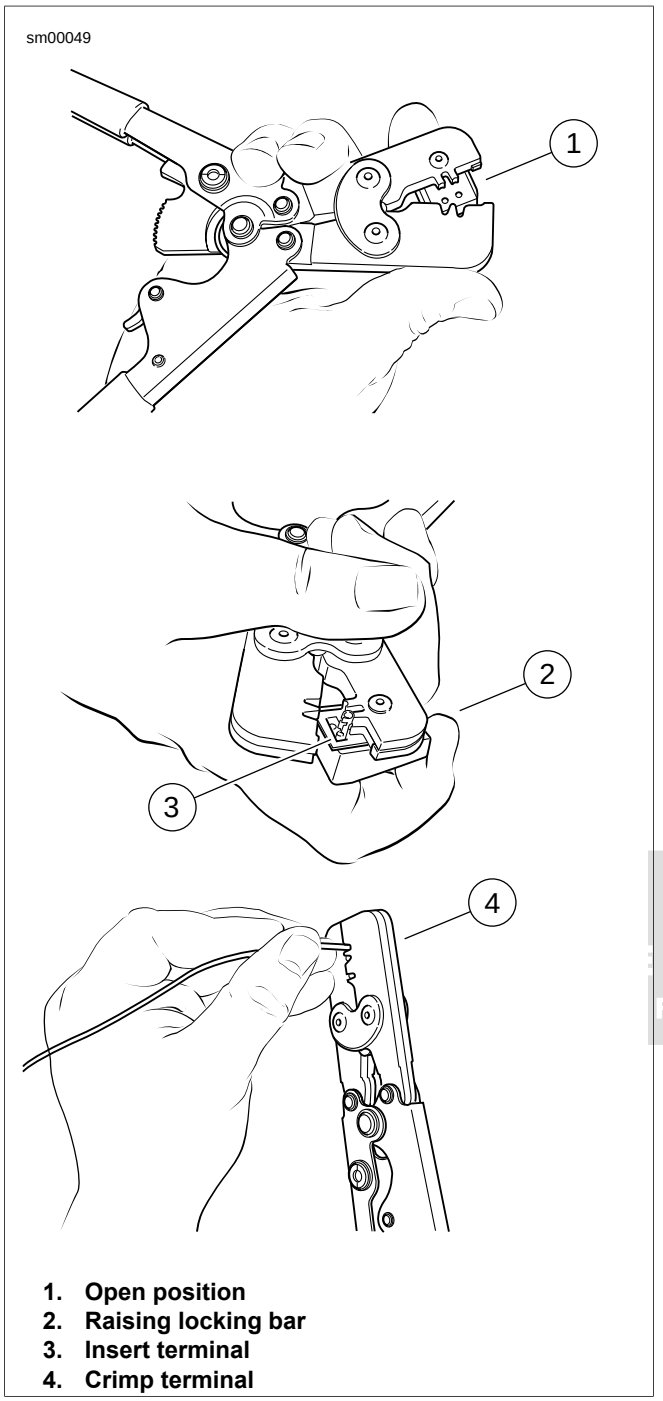


Figure A-26. Terminal Crimper (HD-45929)

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. Open position
2. Raising locking bar
3. Insert terminal
4. Crimp terminal

Figure A-27. Delphi Micro-64 Sealed Connector: Terminal in Crimper

IGITAL
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DELPHI GT 150 SEALED CONNECTOR A.12

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-28. Bend back the external latch(es) slightly and separate pin and socket halves of the 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, these instructions are universal.

1. See Figure A-29. If present, free one side of wire lock (1) from ear on wire end of socket housing. Release the other side if necessary. Release wires from channels in wire lock. Remove appropriate terminals from housing.
2. Use a fingernail to pry colored terminal lock (2) loose. Remove from mating end of socket housing.
3. Use the thin flat blade from a hobby knife. Gently pry tang (3) outward away from terminal. 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, preventing it from backing 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.

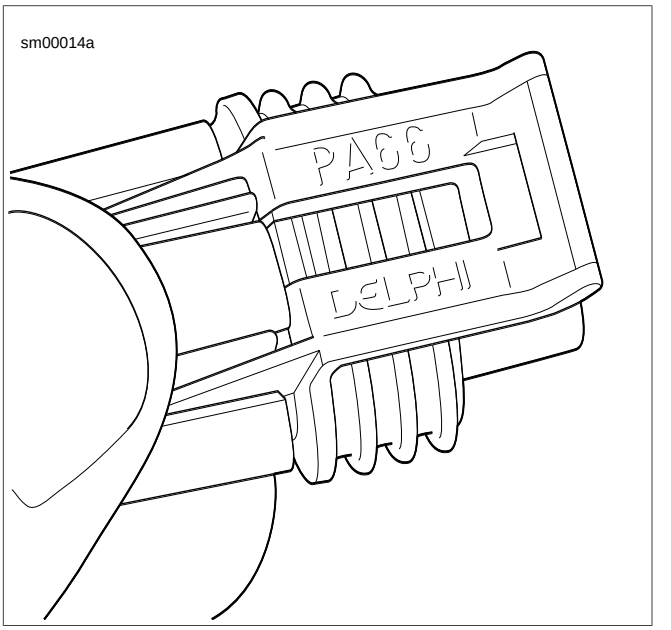
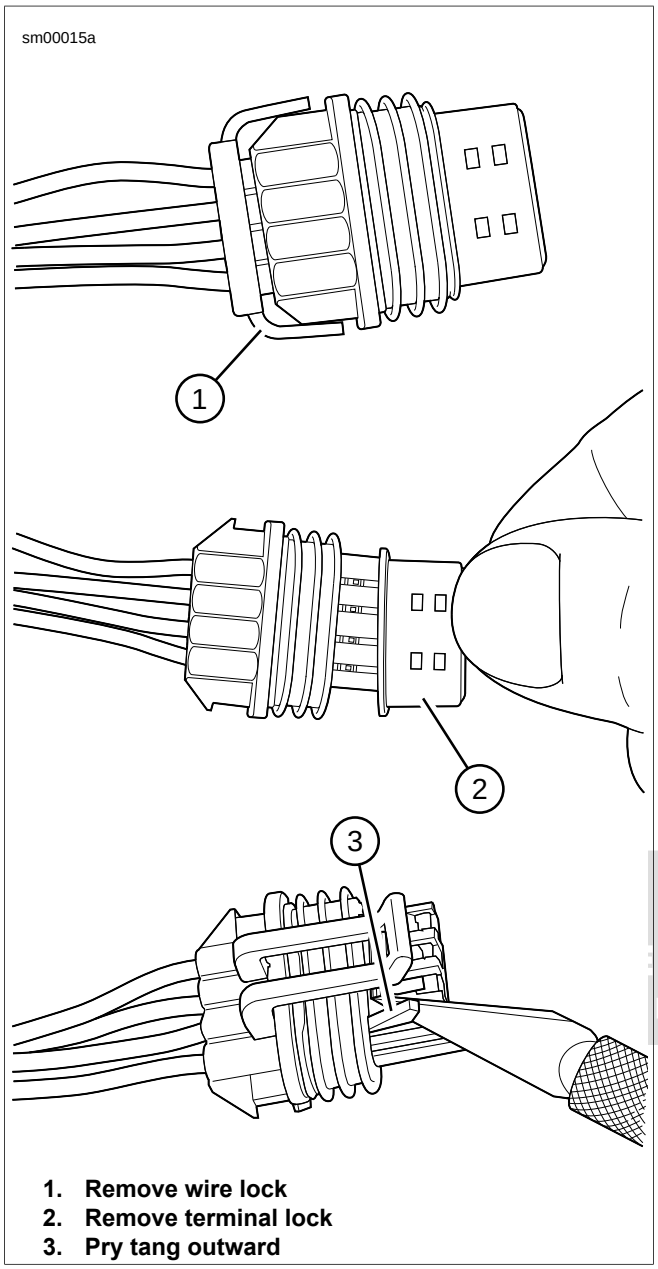


Figure A-28. Delphi GT 150 Sealed Connector: Socket Housing Latch

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Remove wire lock**
2. **Remove terminal lock**
3. **Pry tang outward**

Figure A-29. Delphi GT 150 Sealed Connector: Removing Socket Terminals

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ECHNICIAN® II
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DEUTSCH DT SEALED CONNECTOR A.13

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. DT connectors associated with **left** side accessories, such as the front and rear **left** turn signals, are **gray**. All other DT connectors are **black**.

NOTES

- *A DEUTSCH TERMINAL REPAIR KIT (Part No. HD-41475) contains a selection of seals and seal plugs, locking wedges, attachment clips and terminals.*
- *Also included is a FLAT BLADE L-HOOK (Part No. HD-41475-100) used to remove locking wedges, compartmented storage box and carrying case.*

Separating Pin and Socket Housings

See Figure A-30. 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 attached to the wiring harness.*
- *Six-place and smaller 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.*

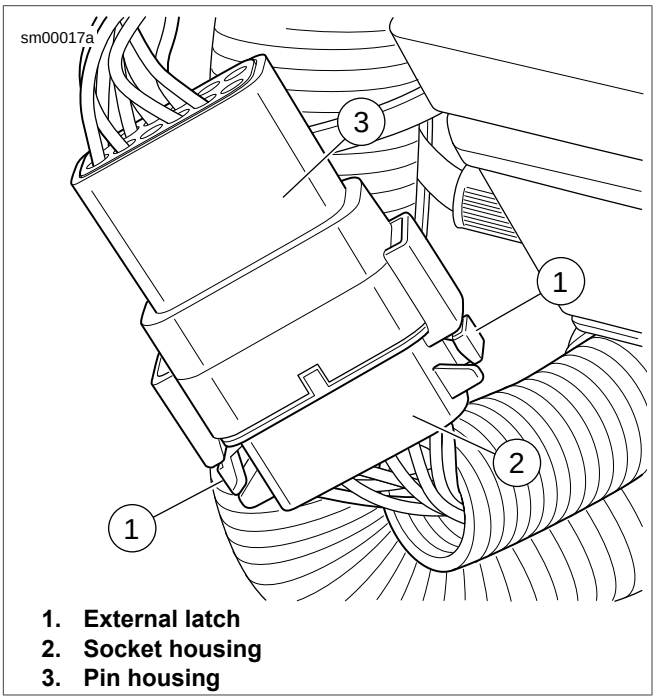
Mating Pin and Socket Housings

1. Align the connectors to match the wire lead colors.
   a. **For One External Latch:** Six-place and smaller Deutsch connectors have one external latch on the socket housing. To join the housings, align the latch on the socket side with the latch cover on the pin side.
   b. **For Two External Latches:** 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.

NOTE

For Two External Latches: *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-30. Deutsch DT Sealed Connector

Removing Socket Terminals

1. See Figure A-31. 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-34. 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-33. 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

Install seal plugs (6) into 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-32. While rectangular wedges do not require a special orientation, align arrow (1) on conical secondary locking wedge towards external latch for three-place connectors.*
- *If the secondary locking wedge does not slide into position easily, check the installation of all the terminals. Unseated terminals prevent the locking wedge from proper installation.*

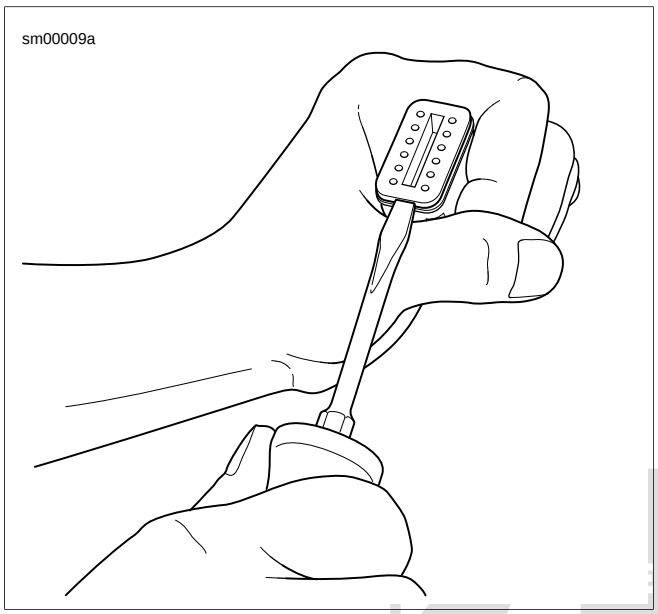
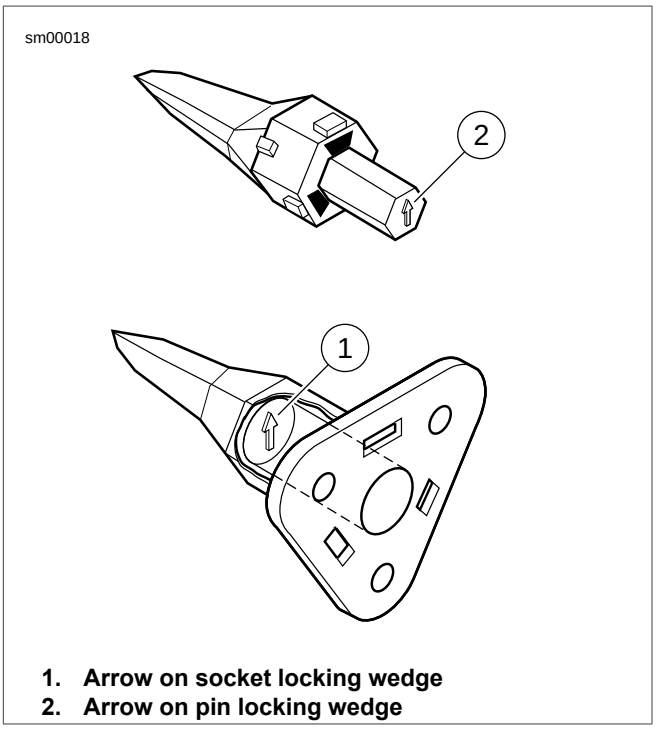


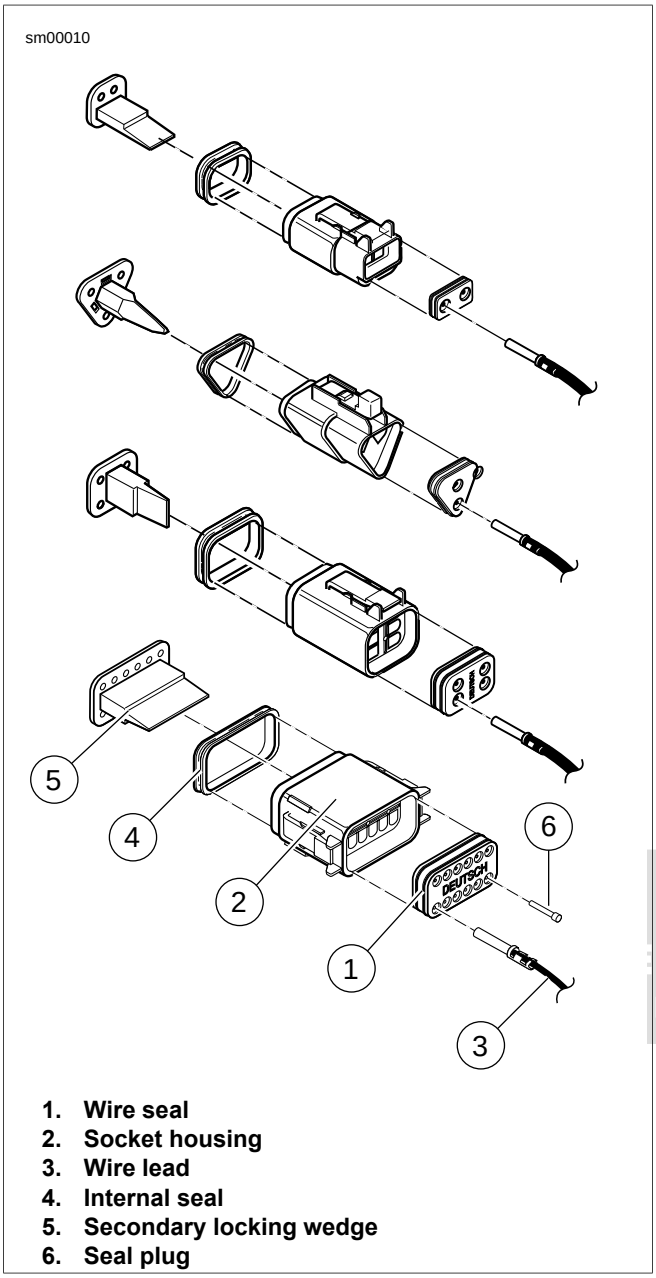
Figure A-31. Deutsch DT Sealed Connector: Remove Secondary Locking Wedge



1. **Arrow on socket locking wedge**
2. **Arrow on pin locking wedge**

Figure A-32. Deutsch DT Sealed Connector: 3-Place Locking Wedges

DIGITAL TECHNICIAN II HARLEY-DAVIDSON



1. **Wire seal**
2. **Socket housing**
3. **Wire lead**
4. **Internal seal**
5. **Secondary locking wedge**
6. **Seal plug**

Figure A-33. 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.*
- *The 8-place and 12-place gray and black connectors are not interchangeable. If replacing both the socket and pin housings, the black may be substituted for the gray.*
- *The socket and pin housings of all other connectors are interchangeable. Black may be mated with the gray since the alignment tabs are absent and the orientation of the external latch is the same.*

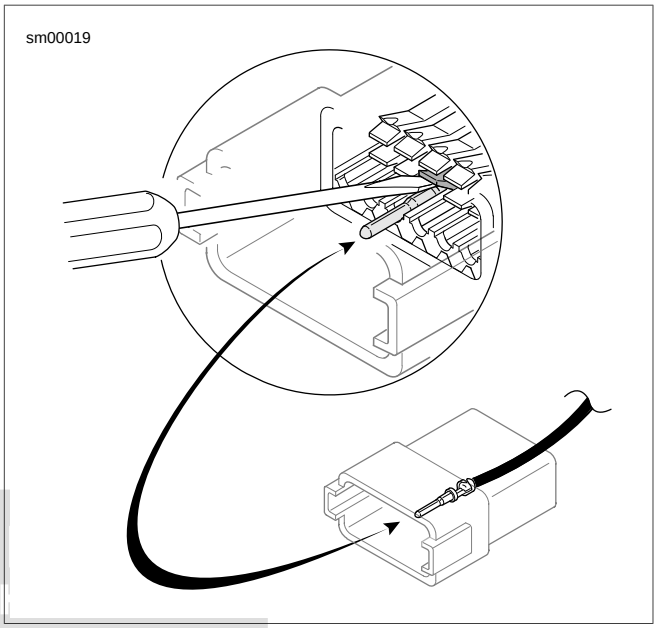


Figure A-34. Deutsch DT Sealed Connector: Press Terminal Latch and Back Out Pin

Installing Pin Terminals

1. See Figure A-35. 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.

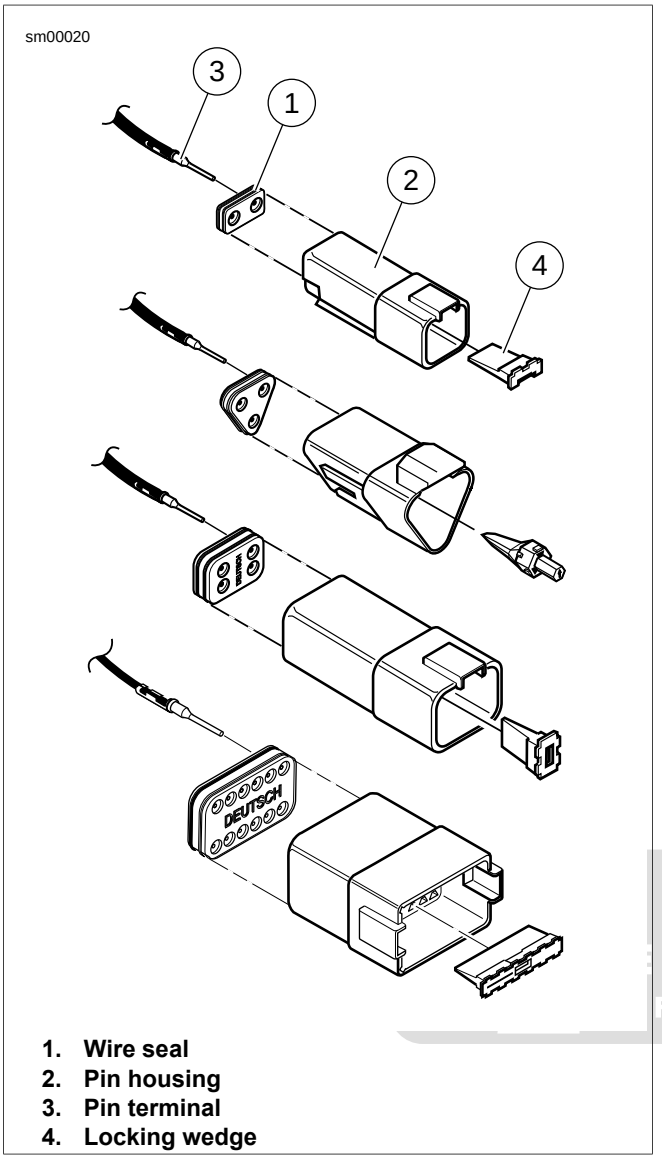
NOTE

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. 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-32. While rectangular wedges do not require a special orientation, align arrow (1) on conical secondary locking wedge towards external latch for three-place connectors.*
- *If the secondary locking wedge does not slide into position easily, check the installation of all the terminals. Unseated terminals prevent the locking wedge from proper installation.*



1. **Wire seal**
2. **Pin housing**
3. **Pin terminal**
4. **Locking wedge**

Figure A-35. 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. Follow the corresponding crimping instructions. Refer to Table A-2.

Table A-2. Deutsch Connector: Terminal Crimping Instructions

TYPE	CRIMPING INSTRUCTIONS
DT Sealed (with crimp tails)	A.14 DEUTSCH DT SEALED TERMINAL REPAIR
DTM Mini Sealed Terminal (solid barrel)	A.16 DEUTSCH DTM SEALED SOLID BARREL MINI TERMINAL REPAIR
DTM Mini Sealed Terminal (with crimp tails)	A.15 DEUTSCH DTM SEALED MINI TERMINAL REPAIR

DEUTSCH DT SEALED TERMINAL REPAIR A.14

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

Crimping Terminal to Lead

1. See Figure A-36. 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. Match the wire gauge to the crimp tool die. Refer to Table A-3.

NOTE

Rest the rounded side of the contact barrel in the nest (concave split level area) with the crimp tails facing up.

3. Insert (2) terminal (socket/pin) through hole of the locking bar.
4. Release locking bar to lock terminal in die.

NOTE

If the crimp tails are slightly out of alignment, the crimp tool rotates the terminal to face the tails upward. When positioned, the locking bar fits snugly in the space between the contact band and the core crimp tails.

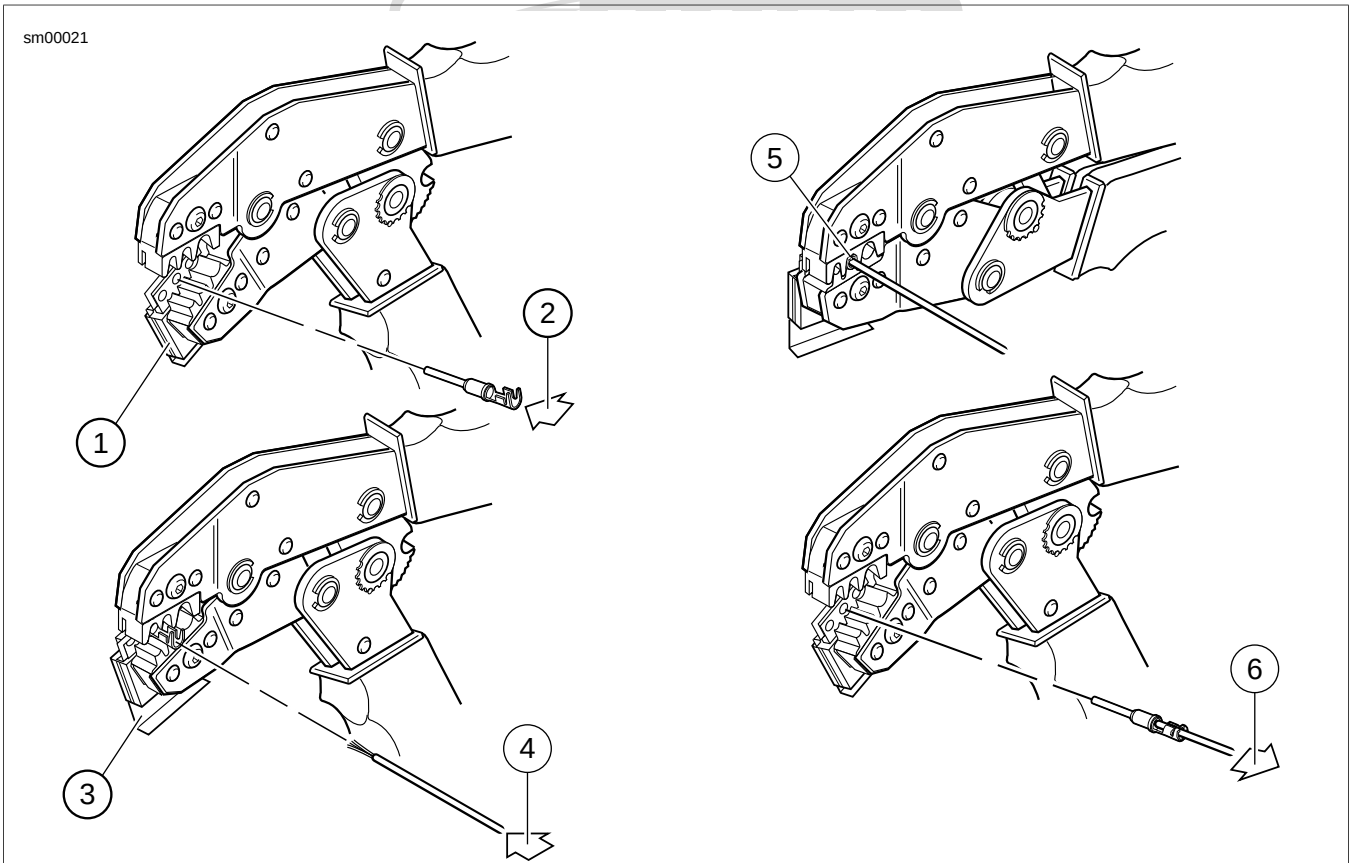
5. Insert stripped wire core between crimp tails until ends make contact with locking bar. Position wire that the wide pair of crimp tails squeeze bare wire strands, while the narrow pair folds over the insulation material.
6. Squeeze handle of crimp tool until tightly closed. Tool automatically opens after the terminal is crimped.
7. Raise locking bar up to remove wire lead and terminal.

Inspecting Crimps

Inspect the wire core and insulation crimps. Distortion should be minimal.

Table A-3. 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 to remove terminal**

Figure A-36. Crimping a Deutsch DT Sealed Terminal

DEUTSCH DTM SEALED MINI TERMINAL REPAIR A.15

DEUTSCH DTM SEALED MINI TERMINAL CRIMPS

PART NUMBER	TOOL NAME
HD-38125-7	PACKARD TERMINAL CRIMPER

Preparing Wire Leads for Crimping

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

Crimping a Mini Terminal to Wire Lead

1. See Figure A-37. 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. Verify 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 that the 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.

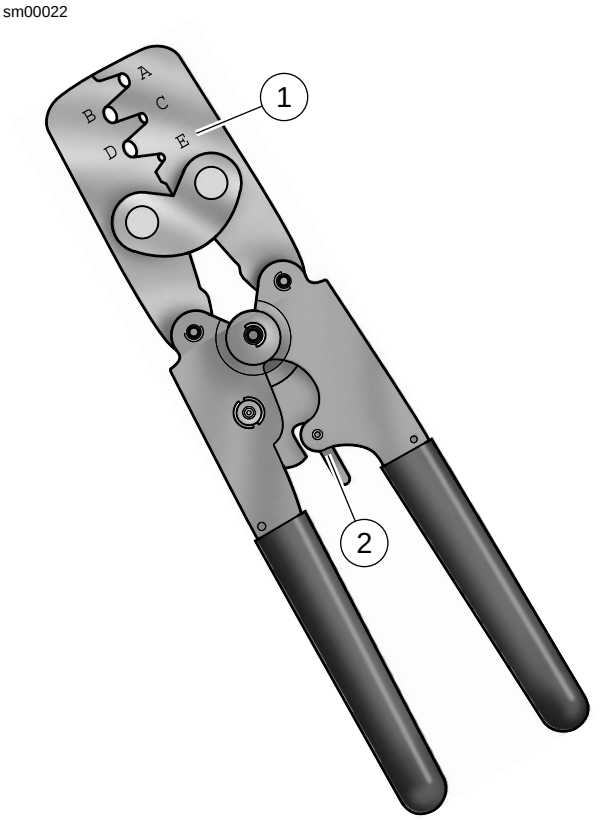
NOTE

If the crimper does not open, squeeze the ratchet trigger (2).

6. Position the insulation crimp on nest C of the crimper. Verify 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-37. Packard Terminal Crimper (HD-38125-7)

DEUTSCH DTM SEALED SOLID BARREL MINI TERMINAL REPAIR A.16

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 1/4 in (6.4 mm) of insulation from the wire lead.

Adjusting Crimper Tool

1. See Figure A-38. 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. Rotate knob 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-39. 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 recess in indentor cover. Tighten knurled locknut.
3. Slowly squeeze handles of crimp tool until contact centers 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.

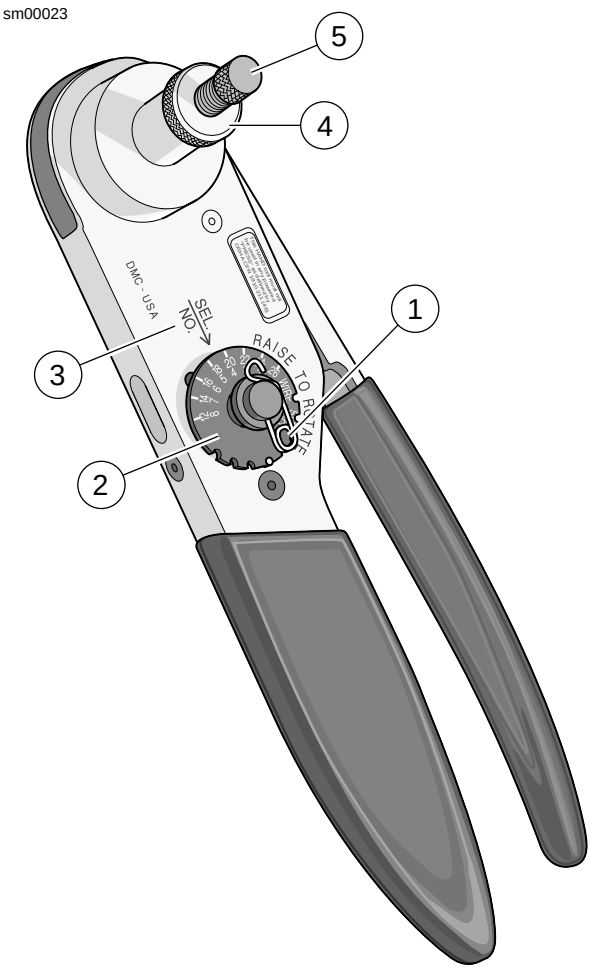
NOTE

Adjust the crimper tool for each contact/wire size.

6. Install pin to lock selector knob.

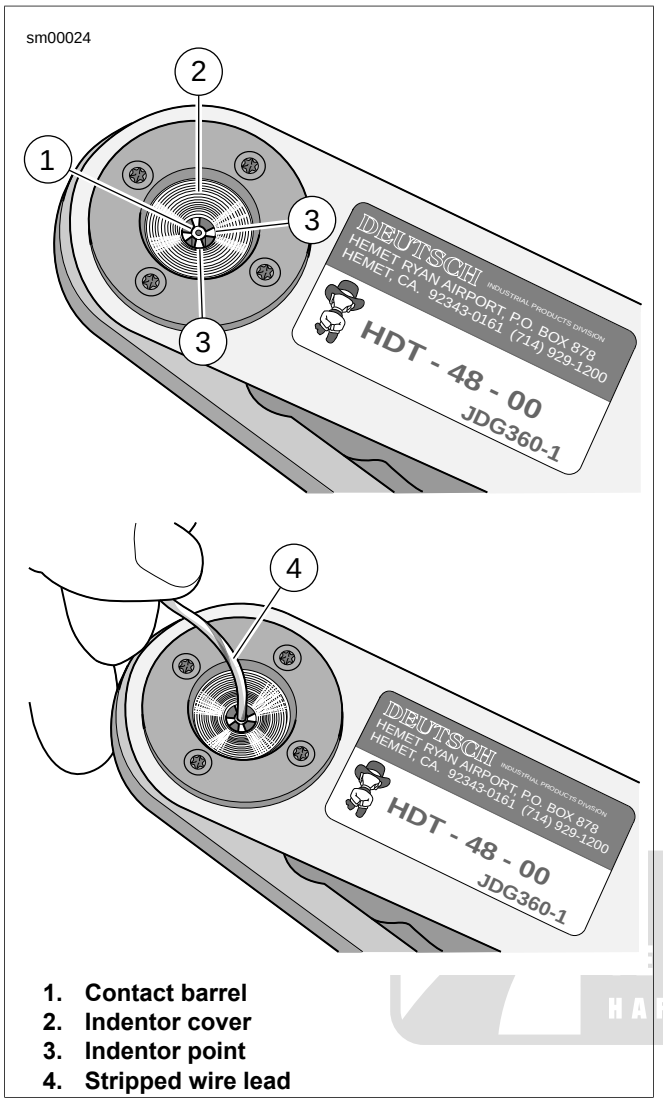
Inspecting Crimps

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-38. Electrical Crimper Tool (HD-42879)



1. **Contact barrel**
2. **Indentor cover**
3. **Indentor point**
4. **Stripped wire lead**

Figure A-39. Deutsch Solid Barrel

IGITAL
ECHNICIAN® II
HARLEY-DAVIDSON®

JAE MX19 SEALED CONNECTOR A.17

JAE MX19 SEALED CONNECTORS

PART NUMBER	TOOL NAME
B-50085	TERMINAL EXTRACTOR

Connector Housings

Separate Housings: See Figure A-40. Press the two release buttons on each side of the housing to separate the connector.

Connect Housings: Align housings. Press together until the locking tabs click.

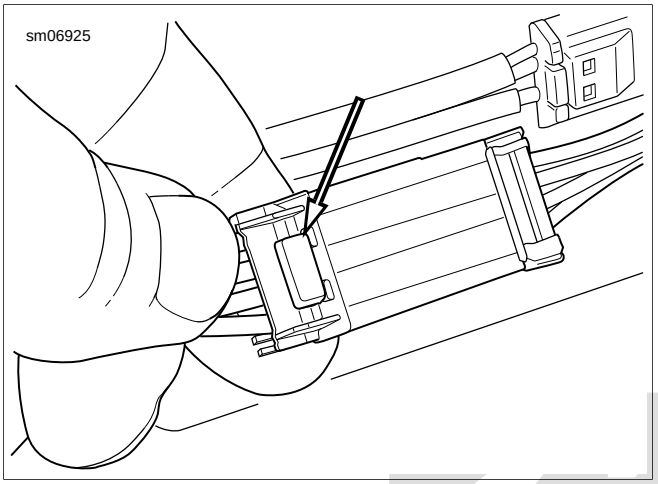


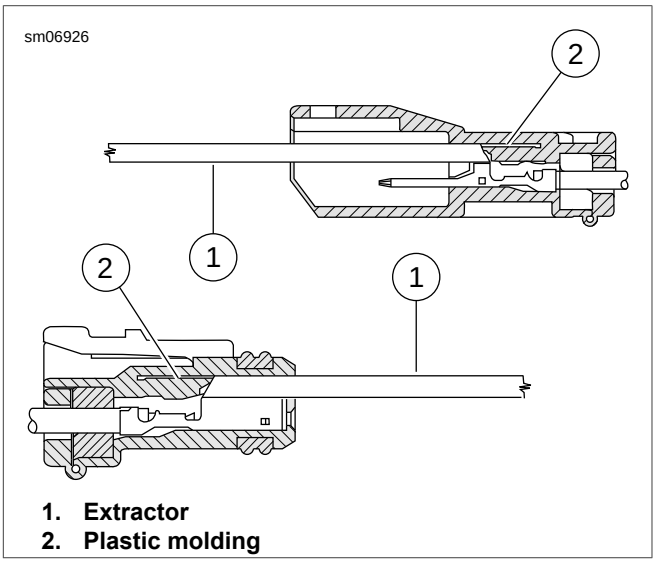
Figure A-40. Release Buttons: JAE MX19 Sealed Connector

Removing Terminals

1. Modify a TERMINAL EXTRACTOR (Part No. B-50085) by filing the front edge to 45 degrees.
2. See Figure A-41. 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. Push terminal into housing until it clicks into place.



1. **Extractor**
2. **Plastic molding**

Figure A-41. JAE MX19 Terminal Removal

CRIMPING TERMINALS

PART NUMBER	TOOL NAME
HD-50120	UNIVERSAL CRIMPER SET
HD-50120-2	HAND CRIMP FRAME
HD-50120-6	JAE DIE

1. Strip the wire insulation to specification. Refer to Table A-4.
2. Install the JAE DIE (Part No. HD-50120-6) in the handle of the HAND CRIMP FRAME (Part No. HD-50120-2) of the UNIVERSAL CRIMPER SET (Part No. HD-50120).
3. Place the **new** terminal in the specified nest.
4. Insert the wire to the wire stop. Crimp the terminal.
5. Inspect the crimped terminal.

Table A-4. JAE MX19 Crimper Die (Part No. HD-50120-6)

TERMINAL	PART NO.	STRIP LENGTH		NEST
		in	mm	
Socket	72910-11	0.051-0.098	2.0-2.5	B
Pin	72909-11	0.051-0.098	2.0-2.5	A

MOLEX CMC SEALED CONNECTOR A.18

MOLEX CMC SEALED CONNECTORS

PART NUMBER	TOOL NAME
HD-50423	0.6 MM TERMINAL EXTRACTOR TOOL
HD-50424	1.5 MM TERMINAL EXTRACTOR TOOL

Separating the Connector

Release: See Figure A-42. 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.

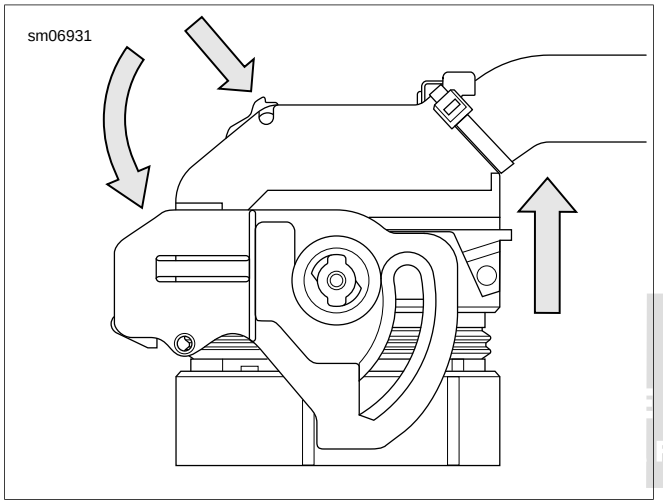


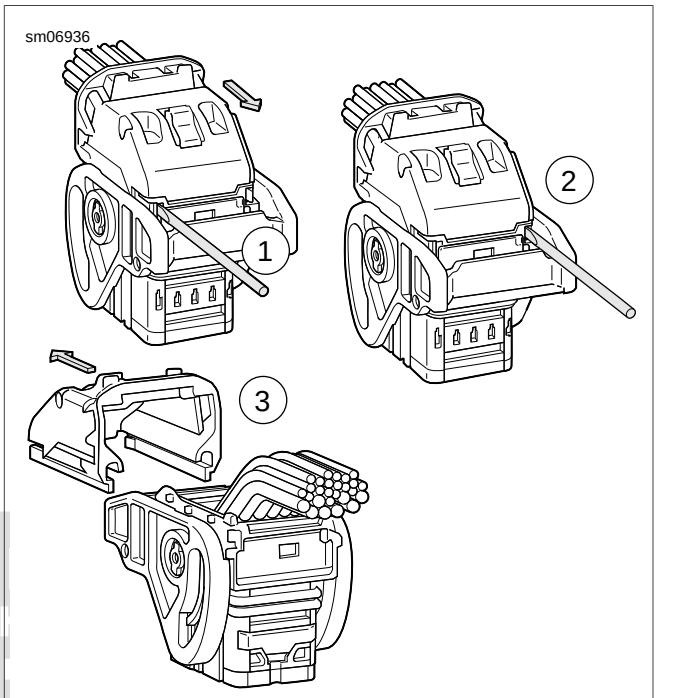
Figure A-42. Release

Removing Terminals

1. With the lever arm open, cut the cable strap around the wire bundle.
2. See Figure A-43. Open a wire cap latch (1) with a small screwdriver.
3. Maintain pressure on the cap and open the opposite latch (2) with the screwdriver.
4. Slide the cap off (3).
5. See Figure A-44. Use the screwdriver to open the secondary lock. Pull the locking bar all the way out.
6. See Figure A-45. Locate the wire lead cavity by the alpha-numeric coordinates.
7. Identify the size of the terminal and select either the CMC extractor 0.6 MM TERMINAL EXTRACTOR TOOL (Part No. HD-50423) or the 1.5 MM TERMINAL EXTRACTOR TOOL (Part No. HD-50424).
8. See Figure A-46. 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. Snap the terminal in place.
2. Slide the cap over the lead bundle. Snap the cap in place.
3. Install a cable strap through the guide and around the lead bundle.



1. **Press latch**
2. **Press cap and latch**
3. **Remove cap**

Figure A-43. Remove the Wire Lead Cap

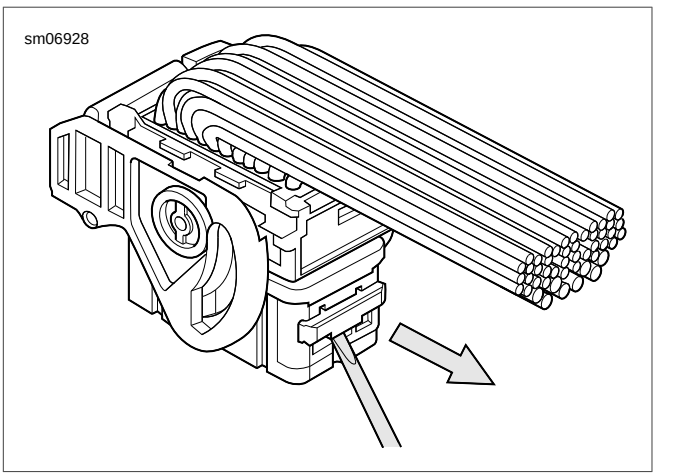
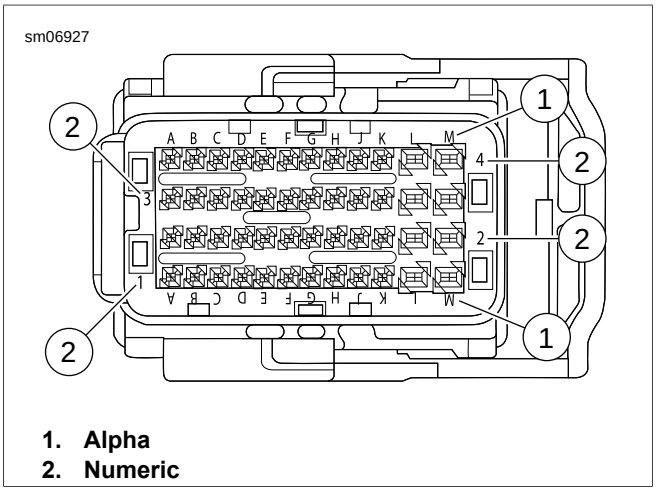
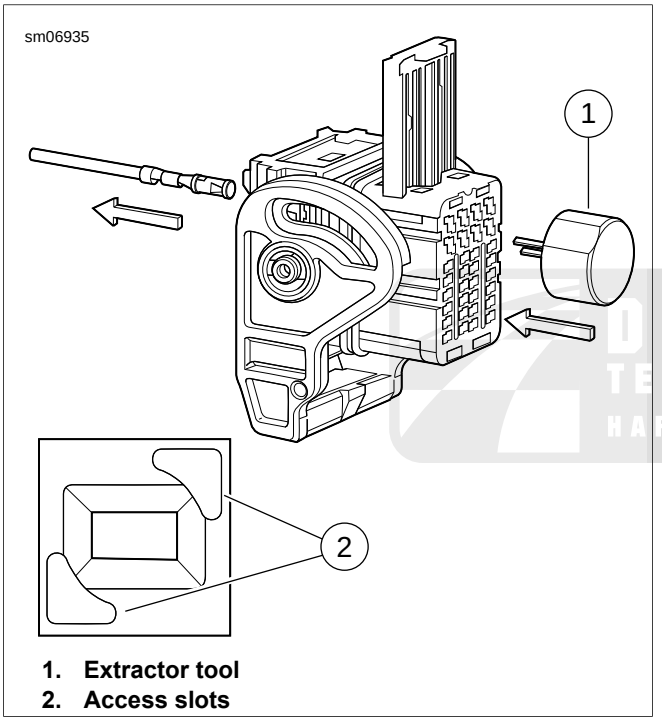


Figure A-44. Molex CMC Sealed Connector Secondary Lock



1. **Alpha**
2. **Numeric**

Figure A-45. Alpha-Numeric Coordinates



1. **Extractor tool**
2. **Access slots**

Figure A-46. Terminal Removal

CRIMPING TERMINALS

PART NUMBER	TOOL NAME
HD-50120	UNIVERSAL CRIMPER SET
HD-50120-2	HAND CRIMP FRAME
HD-50120-3	JAE DIE
HD-50120-4	JAE DIE

1. Select the crimper die according to the terminal part number from the UNIVERSAL CRIMPER SET (Part No. HD-50120).
2. Strip the wire insulation to specification. Refer to Table A-5 or Table A-6.
3. Install the JAE DIE (Part No. HD-50120-3) or JAE DIE (Part No. HD-50120-4) in the handle of the HAND CRIMP FRAME (Part No. HD-50120-2).
4. Place the **new** terminal in the specified nest.
5. Insert the wire to the wire stop. Crimp the terminal.
6. Inspect the crimped terminal.

Table A-5. Molex CMC Sealed Crimper Die (Part No. HD-50120-3)

PART NO.	TERMINAL: WIRE GAUGE	STRIP LENGTH		NEST
		in	mm	
72226-11	Socket: 16 AWG	0.177	4.5	B
72227-11	Socket: 18 AWG	0.177	4.5	A

Table A-6. Molex CMC Sealed Crimper Die (Part No. HD-50120-4)

PART NO.	TERMINAL: WIRE GAUGE	STRIP LENGTH		NEST
		in	mm	
72222-11	Socket: 18 AWG	0.138	3.5	B
72222-11	Socket: 20 AWG	0.138	3.5	A

MOLEX MX 150 SEALED CONNECTOR A.19

MOLEX MX 150 SEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-48114	TERMINAL REMOVER

Separating Pin and Socket Housings

See Figure A-47. 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-48. 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-49. 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-50. 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-51. 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. Determine the cavity number by counting the cavities up or down along the row from each stamped number.

2. Orient the terminal 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.

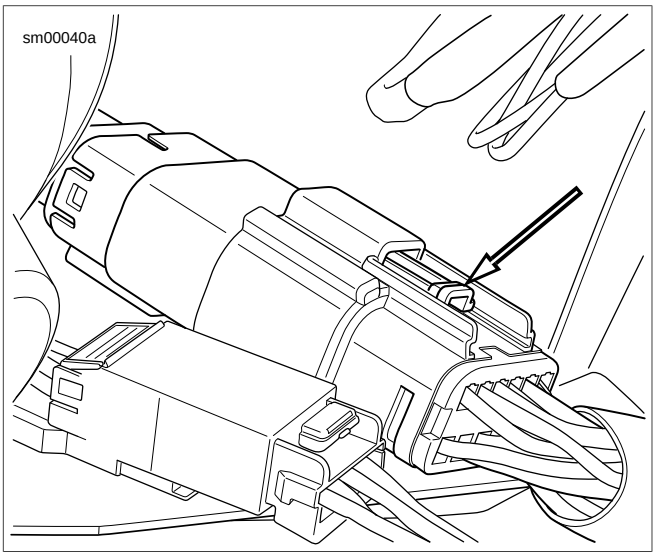


Figure A-47. Molex MX 150 Sealed Connector: Latch

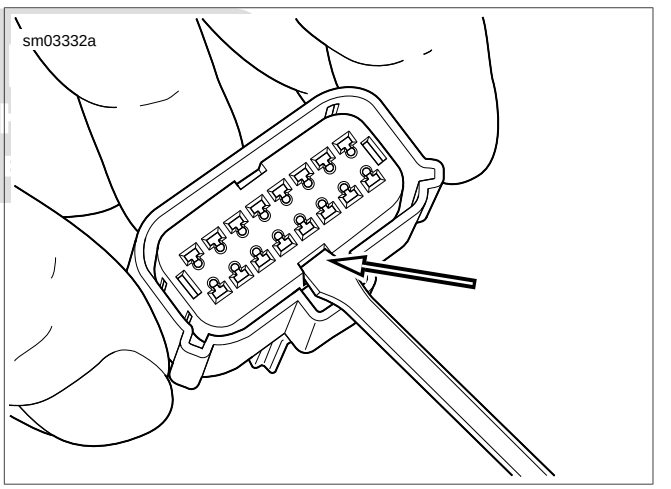


Figure A-48. Secondary Lock Pry Slot (Socket Housing)

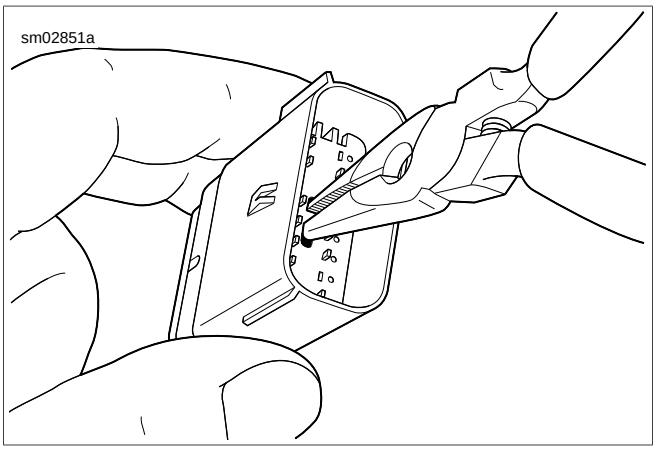


Figure A-49. Pull Up Secondary Lock

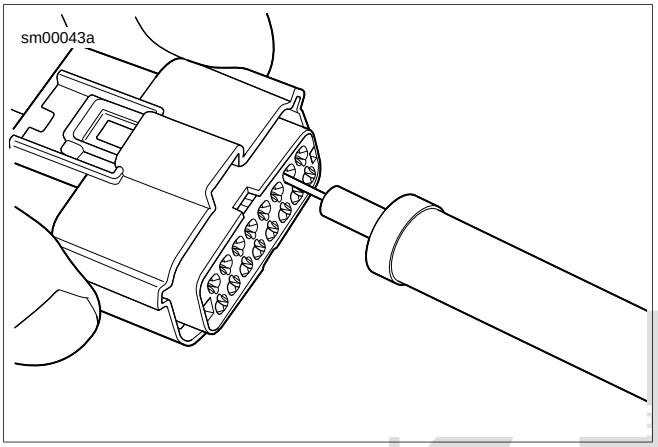
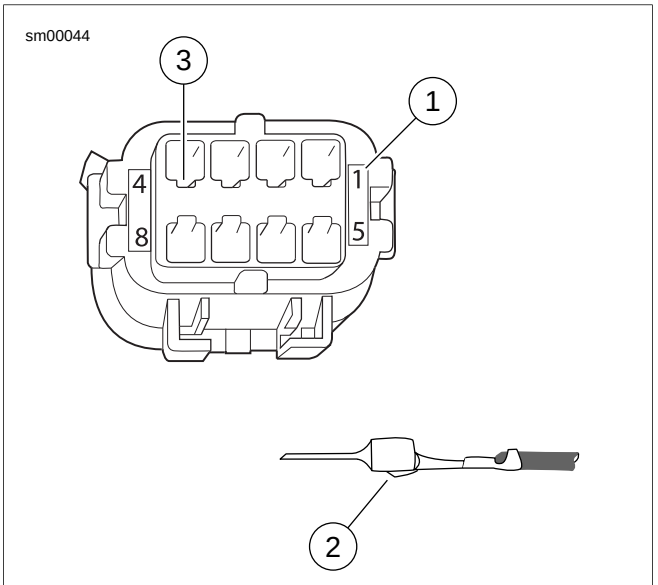


Figure A-50. Molex MX 150 Sealed Connector: Terminal Remover (HD-48114)



1. **Cavity number**
2. **Tang**
3. **Cavity slot**

Figure A-51. 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 wire lead removing 3/16 in (4.70-5.60 mm) of insulation.

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-7.
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-52. 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-7. 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.	

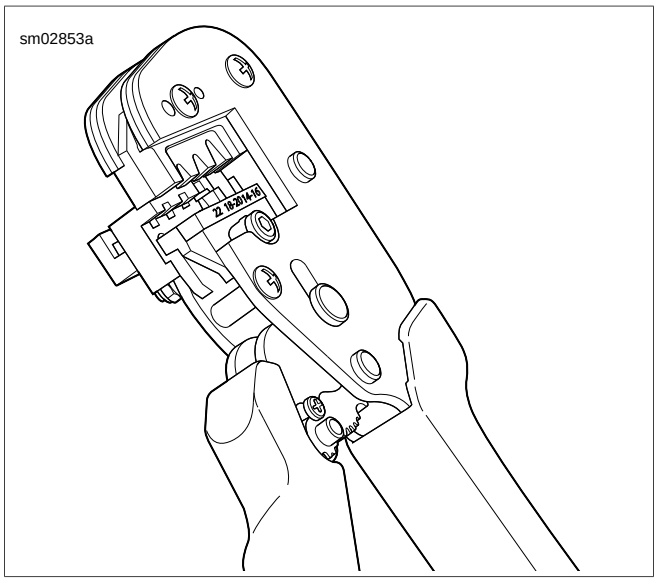
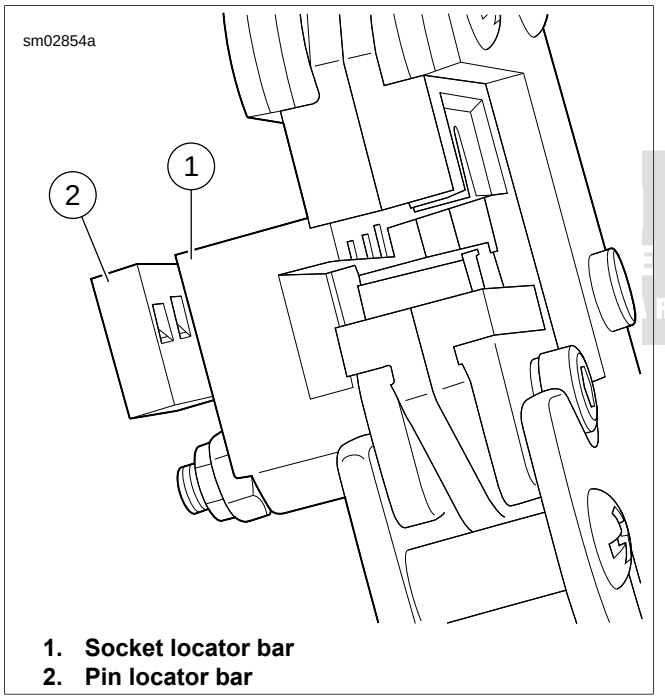


Figure A-52. Open Terminal Crimper (HD-48119) at 45 Degrees



1. **Socket locator bar**
2. **Pin locator bar**

Figure A-53. Terminal Locator Bars

Position Terminal in the Punch/Die

1. See Figure A-54. 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-53. A socket terminal stops against the back face of the socket locator bar (1).
   b. **Pin Terminal:** See Figure A-55. 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-56. Ratchet the handles together until the crimp tails are held in vertical alignment between the punch and the die.

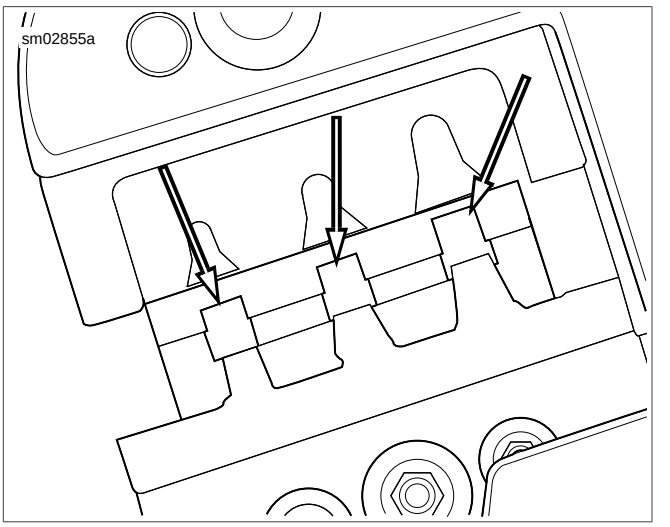


Figure A-54. Square Openings in Socket Locator Bar

Insert Stripped Lead

See Figure A-57. 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.*

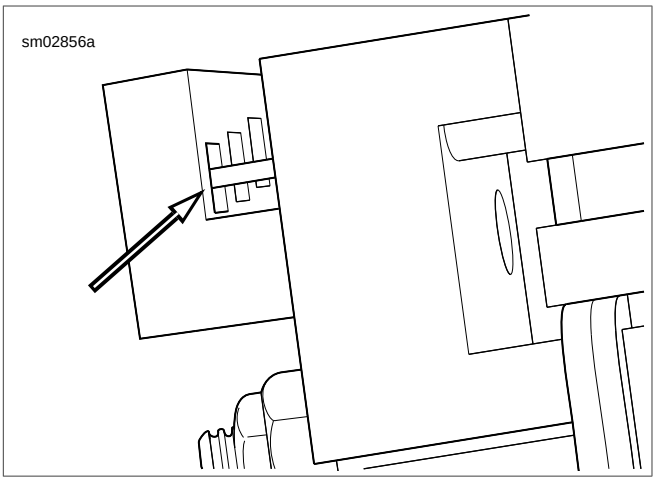


Figure A-55. Pin Terminal against Pin Locator Bar

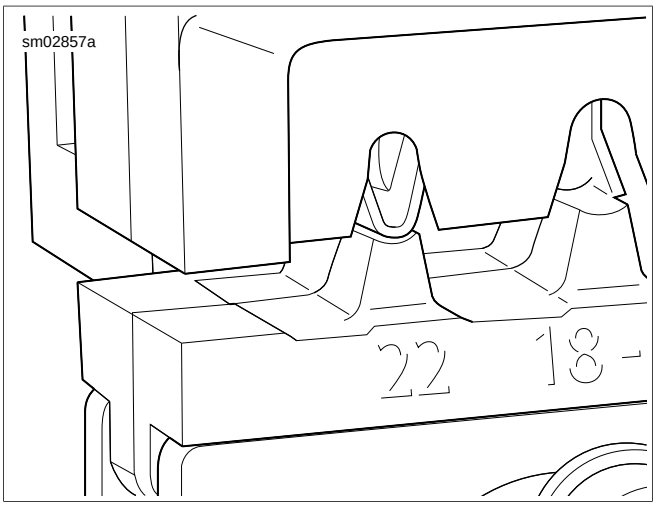


Figure A-56. Crimp Tails in Vertical Alignment between Punch and Die

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

*Open a stuck or jammed tool by pressing the ratchet release lever found between the handles. Do **not** force the handles open or closed.*

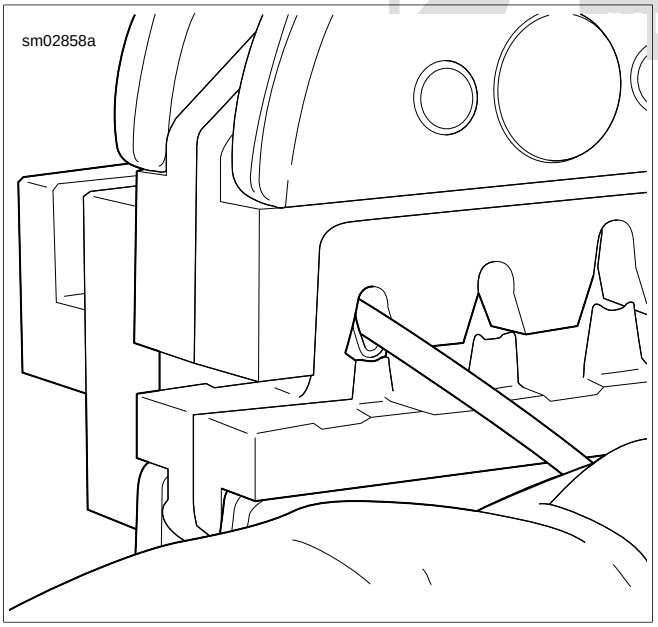
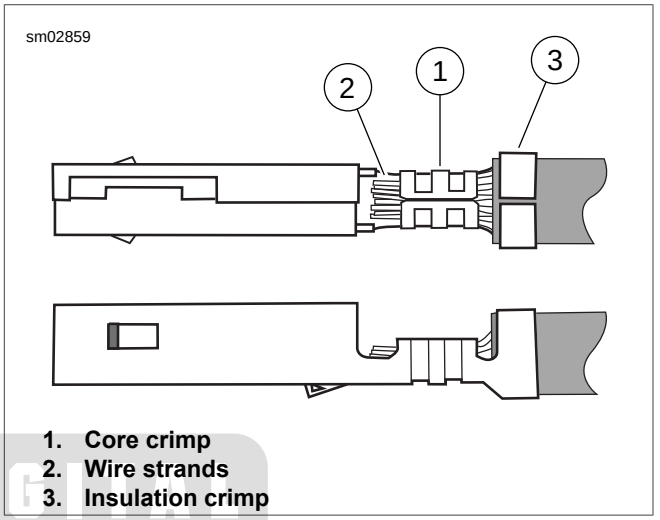


Figure A-57. Stripped Lead at Up Angle

Inspect Crimp

1. **Inspect Crimp:** Inspect the core and insulation crimp.
   a. See Figure A-58. 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. Pull the lead.



1. **Core crimp**
2. **Wire strands**
3. **Insulation crimp**

Figure A-58. Terminal Crimp

TECHNICIAN
HARLEY-DAVIDSON

TYCO 040 MULTILOCK UNSEALED CONNECTOR A.20

TYCO 040 MULTILOCK UNSEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
B-50085	TERMINAL EXTRACTOR
HD-44695-A	MULTI-LOCK CRIMPER

General

Tyco 040 Multilock Unsealed connectors are found between wire harnesses and component wiring.

See Figure A-59. To maintain serviceability, always return connectors to OE locations after service.

Obtain the necessary tools to repair the connector and terminals.

NOTE

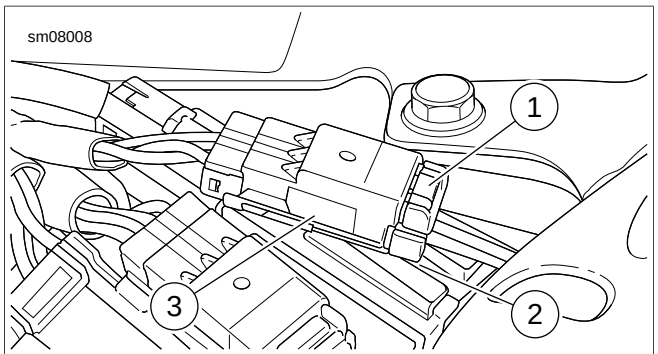
Use the MULTI-LOCK CRIMPER (Part No. HD-44695-A) for terminal crimping.

Separating Pin and Socket Housings

1. See Figure A-59. Press the release button (1) on the socket terminal side of the connector.
2. Pull the socket housing (2) out of the pin housing (3).

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 clicks in place.



1. Release button
2. Socket housing
3. Pin housing

Figure A-59. Tyco 040 Multilock Unsealed Connector

Removing Terminals from Housing

1. See Figure A-60. 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. Using TERMINAL EXTRACTOR (Part No. B-50085), 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

If the tang is released, a click is heard.

4. Gently tug on wire to pull wire and terminal from cavity.

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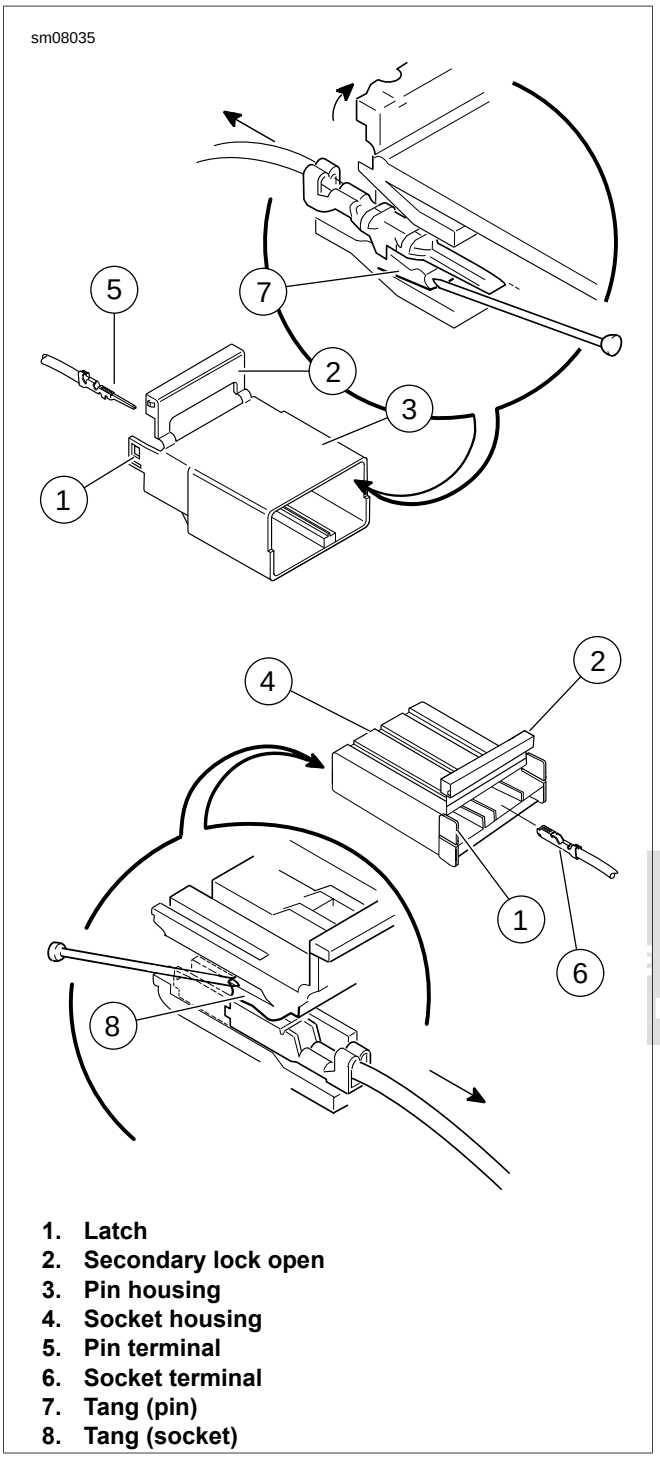


1. **Latch**
2. **Secondary lock open**
3. **Pin housing**
4. **Socket housing**
5. **Pin terminal**
6. **Socket terminal**
7. **Tang (pin)**
8. **Tang (socket)**

Figure A-60. Tyco 040 Multilock Unsealed Connector: Socket and Pin Housings

Inserting Terminals into Housing

NOTE

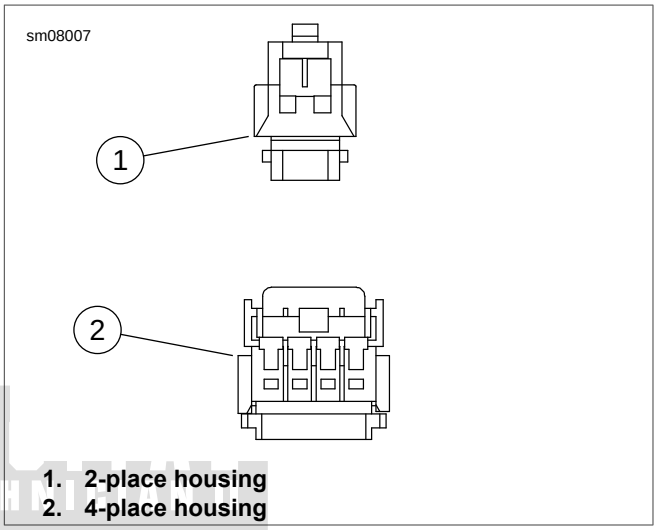
See Figure A-61. Match the wire color to the cavity number found on the wiring diagram.

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

NOTES

- *The release button is always on the top of the connector.*
- *On the pin side of the connector, tangs are positioned at the bottom of each cavity. Therefore, 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. Therefore, the socket terminal slot (on the same side as the crimp tails) must face upward.*

2. Gently tug on wire ends to verify that all terminals are locked.
3. Rotate the hinged secondary lock inward until tabs fully engage latches on both sides of connector.



1. **2-place housing**
2. **4-place housing**

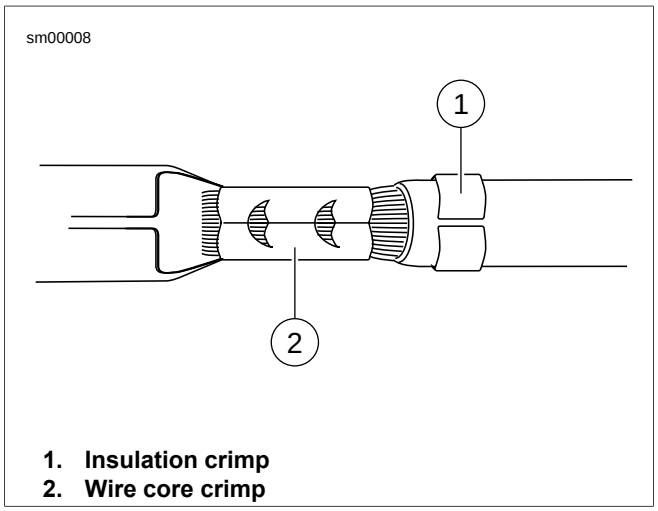
Figure A-61. Tyco 040 Multilock Unsealed Connector (socket housings shown)

Crimping Terminals to Leads

Terminals are crimped twice: once over the wire core and a second time over the insulation tails. For the correct terminal crimping procedure, refer to the instruction sheet provided with the MULTI-LOCK CRIMPER (Part No. HD-44695-A) or available through h-dnet.com.

Inspecting Crimped Terminals

See Figure A-62. Inspect the wire core crimp (2) and insulation crimp (1). Distortion should be minimal.



1. **Insulation crimp**
2. **Wire core crimp**

Figure A-62. Tyco 040 Multilock Unsealed Connector: Terminal Crimp

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TYCO 070 MULTILOCK UNSEALED CONNECTOR A.21

TYCO 070 MULTILOCK UNSEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
B-50085	TERMINAL EXTRACTOR
HD-41609	AMP MULTI-LOCK CRIMPER

General

Tyco 070 Multilock Unsealed connectors are found between wire harnesses and component wiring. They are either floating or anchored to the frame with attachment clips.

See Figure A-63. Attachment clips (1) on the pin housings are fitted to T-studs on 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

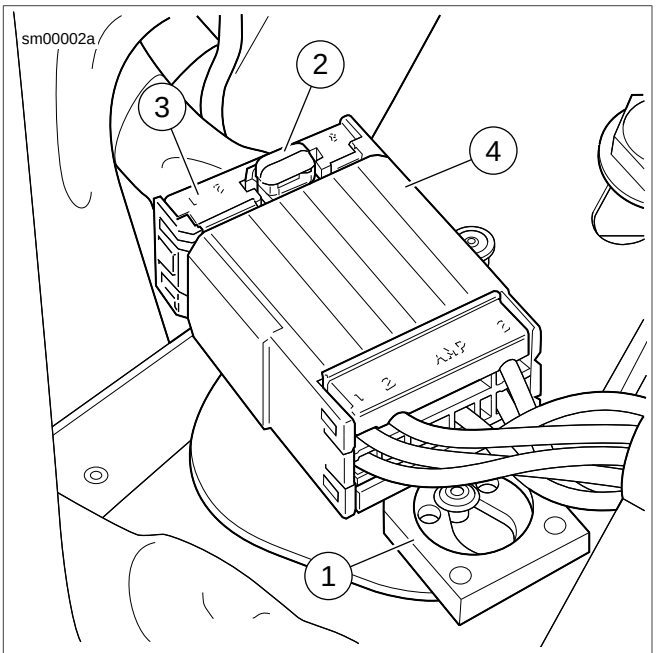
Use the AMP MULTI-LOCK CRIMPER (Part No. HD-41609) for terminal crimping.

Separating Pin and Socket Housings

1. If necessary, slide connector attachment clip so T-stud is in the large end of the clip opening. Remove connector from T-stud.
2. See Figure A-63. Press the release button (2) on the socket terminal side of the connector.
3. 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 clicks in place.
3. If OE location is a T-stud, fit large opening end of attachment clip over T-stud. Slide connector to engage T-stud to small end of opening in clip.



1. **Attachment clip**
2. **Release button**
3. **Socket housing**
4. **Pin housing**

Figure A-63. Tyco 070 Multilock Unsealed Connector

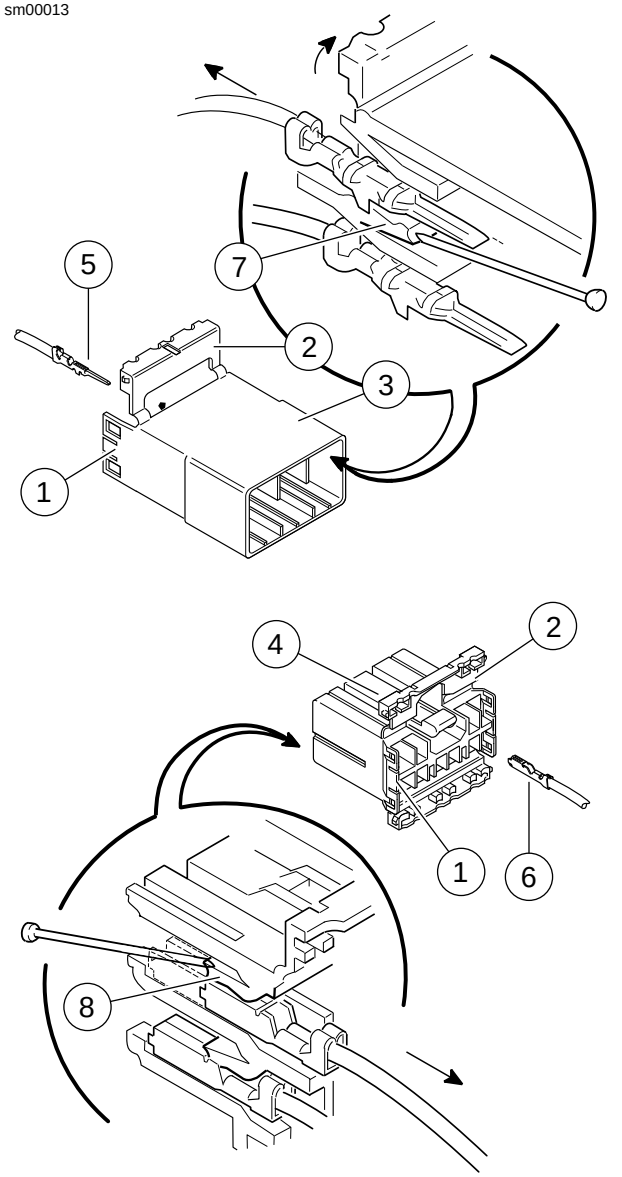
Removing Terminals from Housing

1. See Figure A-64. 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. Using TERMINAL EXTRACTOR (Part No. B-50085), 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

If the tang is released, a click is heard.

4. Gently tug on wire to pull wire and terminal from cavity.



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-64. Tyco 070 Multilock Unsealed Connector: Socket and Pin Housings

Inserting Terminals into Housing

NOTE

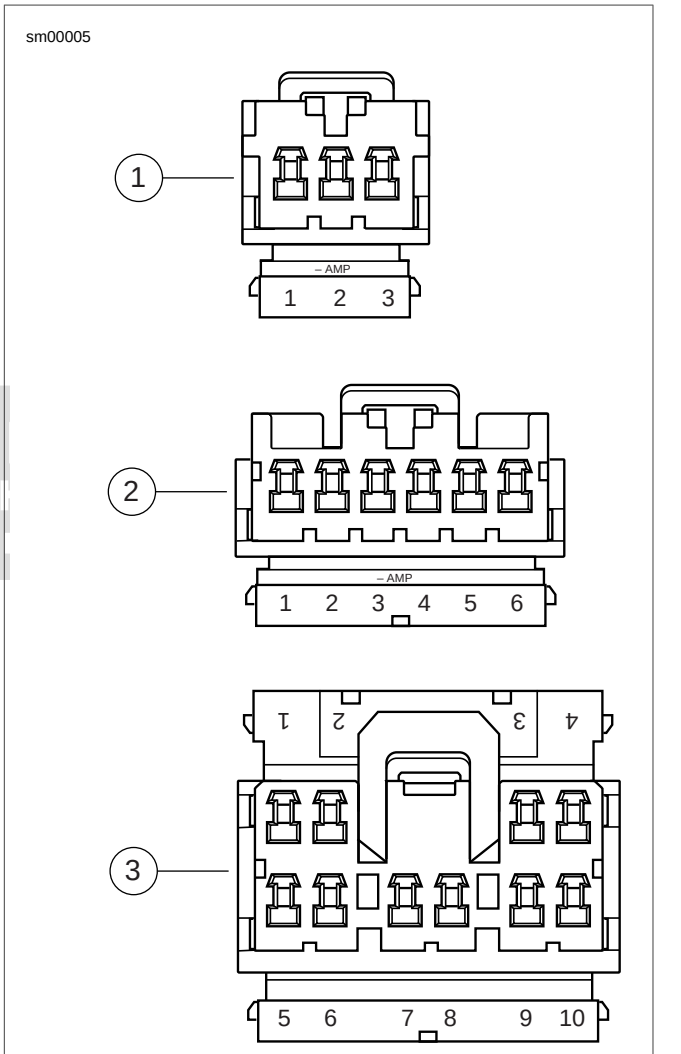
See Figure A-65. Cavity numbers are stamped into the secondary locks of both the socket and pin housings. Match the wire color to the cavity number found on the wiring diagram.

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

- *The release button is always on the top of the connector.*
- *On the pin side of the connector, tangs are positioned at the bottom of each cavity. Therefore, 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. Therefore, the socket terminal slot (on the same side as the crimp tails) must face upward.*

2. Gently tug on wire ends to verify that all terminals are locked.
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-65. Tyco 070 Multilock Unsealed Connector: Cavity Numbers on Secondary Locks (socket housings shown)

Crimping Terminals to Leads

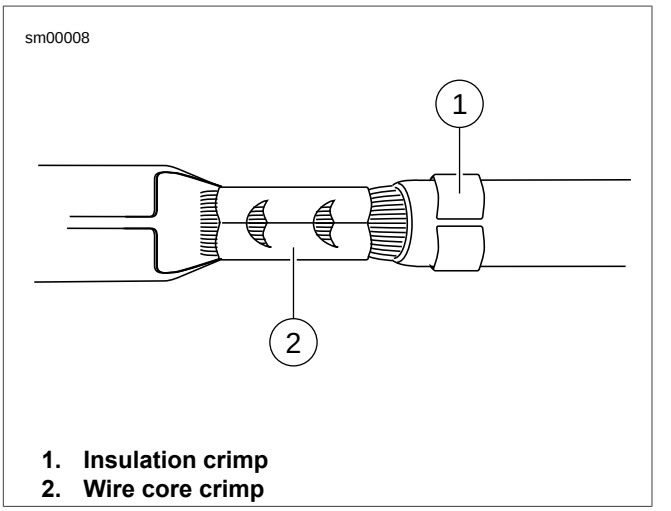
NOTE

Crimping with the AMP Multi-lock Crimper is a one-step operation. One squeeze crimps both the wire core and the insulation tails.

For the correct terminal crimping procedure, refer to the instruction sheet provided with the AMP MULTI-LOCK CRIMPER (Part No. HD-41609) or available through h-dnet.com.

Inspecting Crimped Terminals

See Figure A-66. Inspect the wire core crimp (2) and insulation crimp (1). Distortion should be minimal.



1. **Insulation crimp**
2. **Wire core crimp**

Figure A-66. Tyco 070 Multilock Unsealed Connector: Terminal Crimp

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

TYCO GET 64 SEALED CONNECTOR A.22

TYCO GET 64 SEALED CONNECTOR REPAIR

PART NUMBER	TOOL NAME
B-50085	TERMINAL EXTRACTOR

General

See Figure A-67. The Tyco GET 64 Sealed connector is found on the ECM of most models.

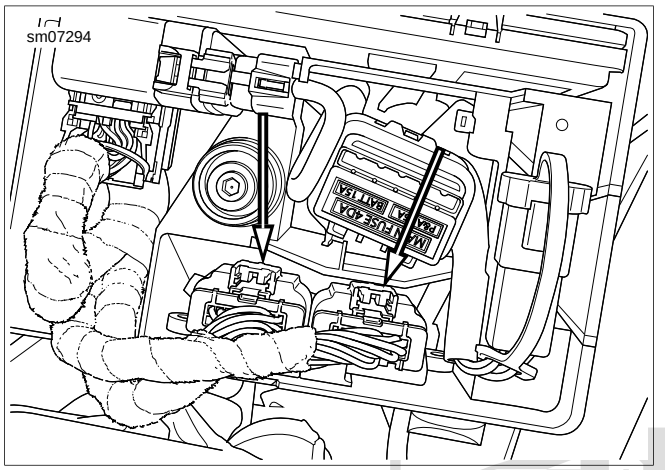
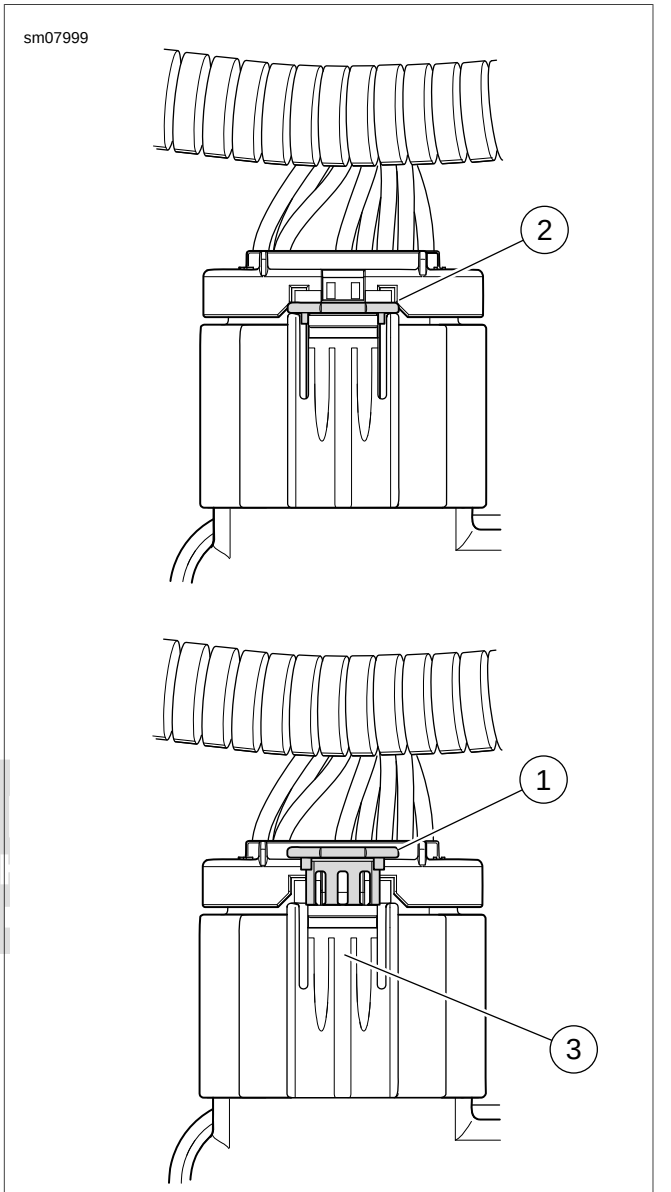


Figure A-67. Tyco GET 64 Sealed Connector Latch

Housings

See Figure A-68. **Separate:** Lift the latch lock to open (1). Press the latch (3). Pull the socket housing off the ECM.

Join: Align the socket housing latch with the catch on the ECM. Press housing onto ECM. Press down the latch lock to close (2).



1. **Latch lock (open)**
2. **Latch lock (closed)**
3. **Connector latch**

Figure A-68. Tyco GET 64 Sealed Connector Latch and Lock

Removing Socket Terminals

1. Remove the black wrap to access the back of the connector.
2. See Figure A-69. Use needle nose pliers to pull the secondary lock out of the housing.
3. See Figure A-70. Orient the bevel of the TERMINAL EXTRACTOR (Part No. B-50085) (1) to the upper or lower terminal row. Insert the extractor into the slot next to the terminal.

4. Rotate the extractor to release the retention beam and simultaneously pull on the wire lead to remove the terminal.

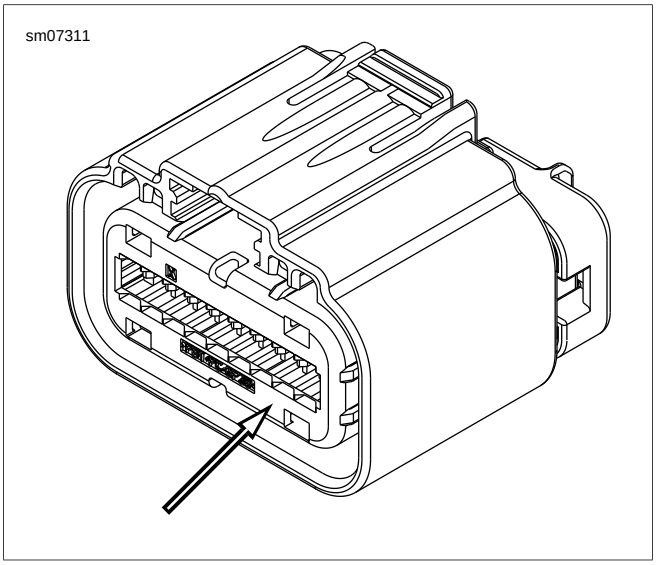
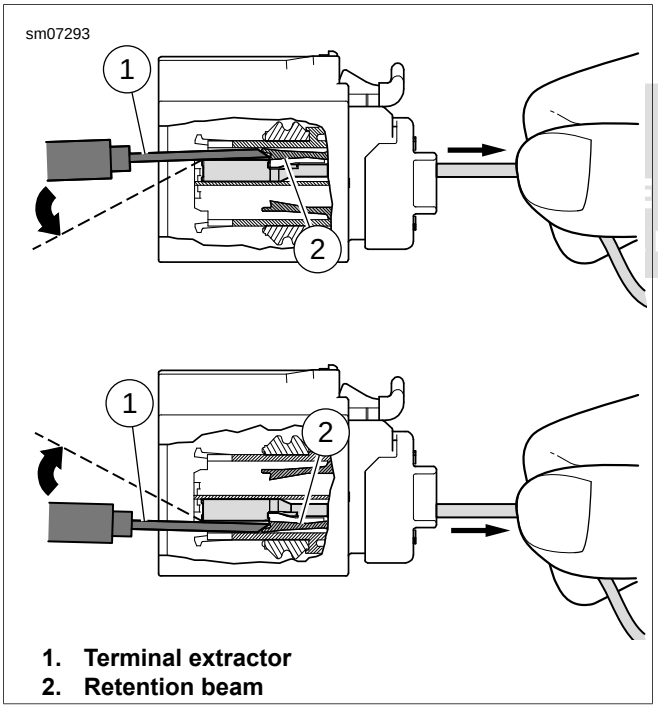


Figure A-69. Tyco GET 64 Secondary Lock



1. **Terminal extractor**
2. **Retention beam**

Figure A-70. Removing Terminals: Tyco GET 64 Sealed Connector

Installing Socket Terminals

1. See Figure A-71. Locate the wire lead cavity by number.
2. See Figure A-72. Orient the open side of the crimp to the lower or the upper terminal row.
3. Press the terminal in through the rear cover and the seal until it clicks.
4. Press the secondary lock into the locked position.
5. Black wrap the wire lead bundle.

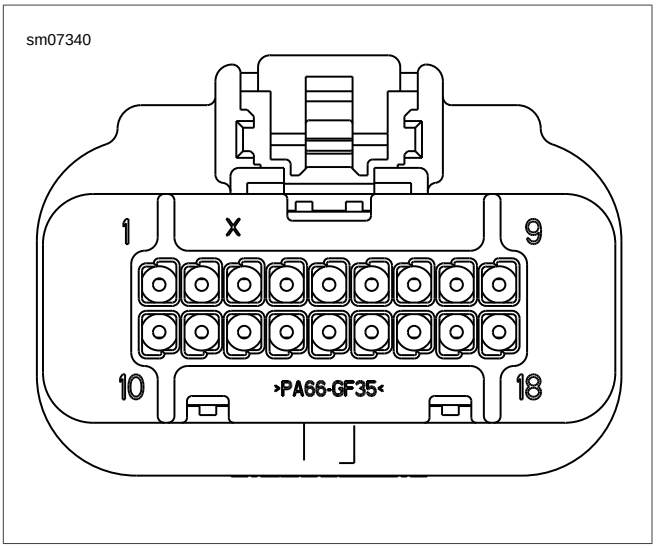


Figure A-71. Cavity Numbers

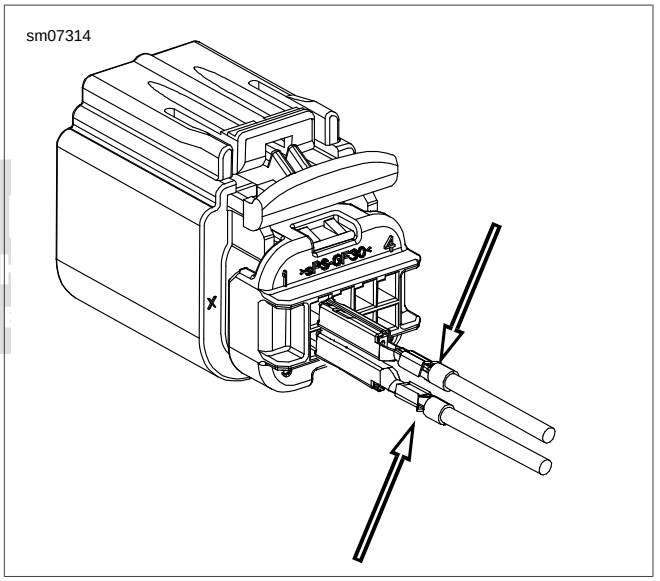


Figure A-72. Socket Terminal Orientation: Crimp Open Side

CRIMPING TERMINALS

PART NUMBER	TOOL NAME
HD-50120	UNIVERSAL CRIMPER SET
HD-50120-2	HAND CRIMP FRAME
HD-50120-7	TYCO AND DELPHI TERMINAL CRIMP DIE

Crimping Tyco GET 64 terminals requires the use of the TYCO AND DELPHI TERMINAL CRIMP DIE (Part No. HD-50120-7) in the HAND CRIMP FRAME (Part No. HD-50120-2). These items are included in the UNIVERSAL CRIMPER SET (Part No. HD-50120).

For the correct terminal crimping procedure, refer to the instruction sheet provided with the tool or available on h-dnet.com.

TYCO MCP SEALED CONNECTOR A.23

TYCO MCP SEALED CONNECTOR

PART NUMBER	TOOL NAME
B-50085	TERMINAL EXTRACTOR
GA500A	SNAP-ON TERMINAL PICK

General

The Tyco MCP sealed connector is used on certain ABS modules.

Housing

Separate: See Figure A-73. Press and hold the lock tab. Pulling on both ends of the lever, open the lever.

Join: Gently mate the pins to the socket. Press and hold the lock tab. Pressing on both ends of the lever, close the lever.

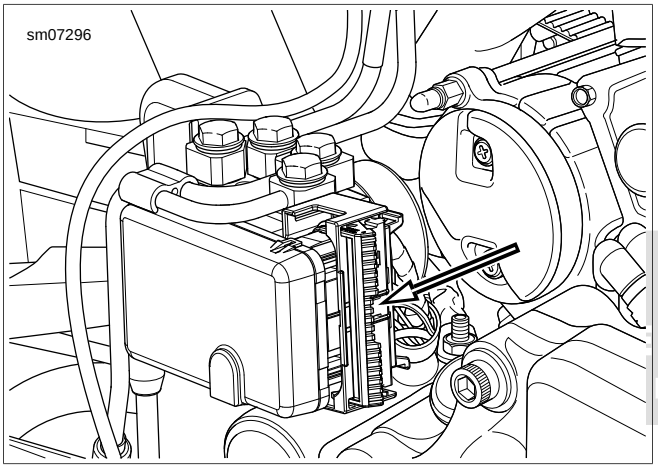


Figure A-73. Tyco MCP Connector Release Bar

Removing the Large Terminals

1. Snap the wire harness cover off of the back of the connector

NOTE

Insert a thin flat bladed screwdriver all the way to the bottom behind the tab of the secondary lock.

2. See Figure A-74. Gently slide the secondary lock out of the connector with a screwdriver.
3. See Figure A-75. Insert the smallest pins of the SNAP-ON TERMINAL PICK (Part No. GA500A) into the gaps on each side of the socket to compress the tangs on each side of the terminal.
4. Gently pull on the wire to remove the terminal.

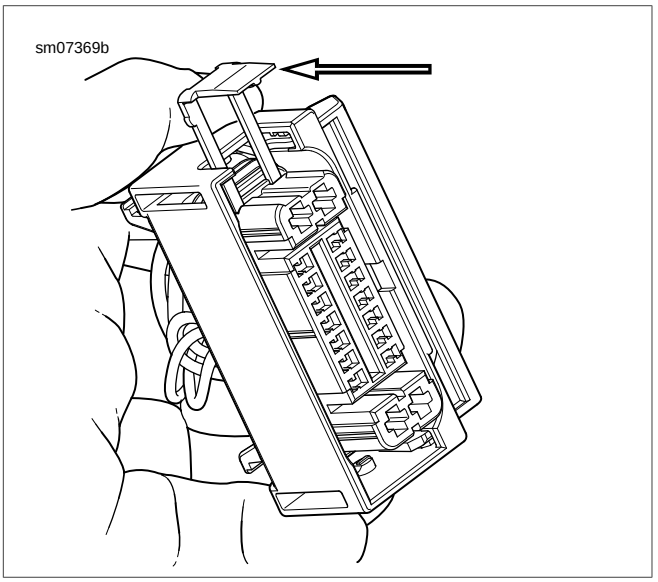


Figure A-74. Tyco MCP Connector Secondary Lock

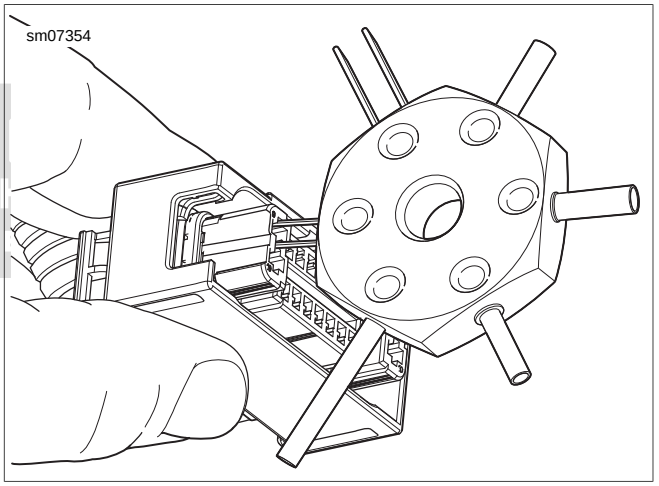


Figure A-75. Removing Large Socket Terminals: Tyco MCP Connector

Removing the Small Terminals

1. Snap the wire harness cover off of the back of the connector

NOTE

Insert a thin flat bladed screwdriver all the way to the bottom behind the tab of the secondary lock.

2. See Figure A-74. Gently slide the secondary lock out of the connector with a screwdriver.
3. See Figure A-76. Insert the TERMINAL EXTRACTOR (Part No. B-50085) into the cavity on the outside of the terminal.
4. Tilt the extractor to lift the molding latch and release the terminal.
5. Gently pull on the wire to remove the terminal.

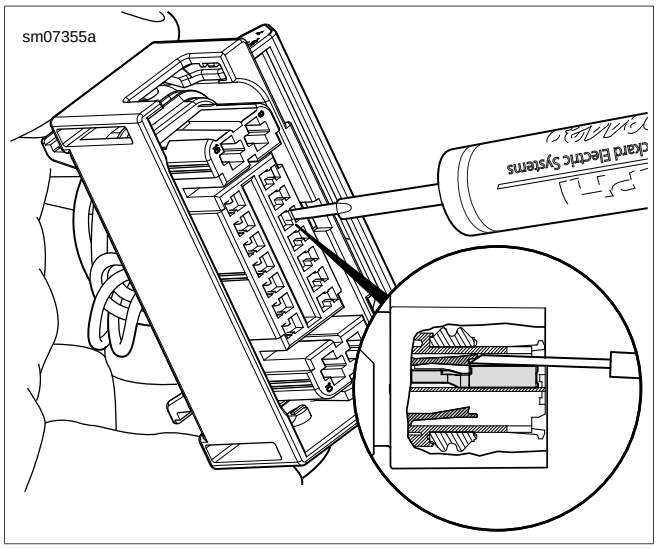


Figure A-76. Removing Small Socket Terminal: Tyco MCP Connector

Installing Terminals

1. See Figure A-77. Locate the wire lead cavity by number.
2. Use a hobby knife to bend the tangs on each side of the terminal outward.
3. Align the socket.
4. Push the socket in until it clicks.
5. Press the secondary lock back into the connector.
6. Snap the wire cover in place.

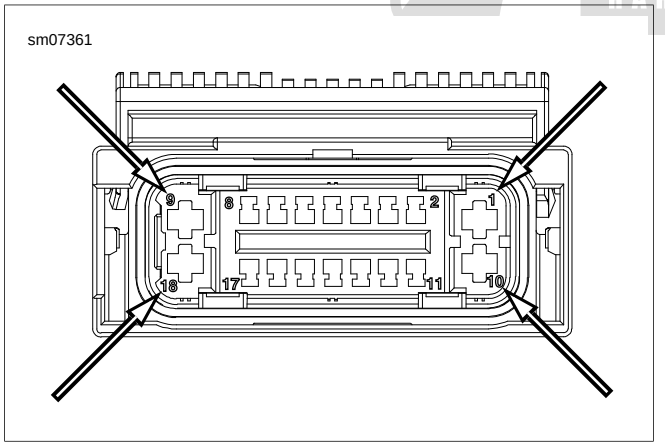


Figure A-77. Tyco MCP Sealed Connector Cavity Numbers

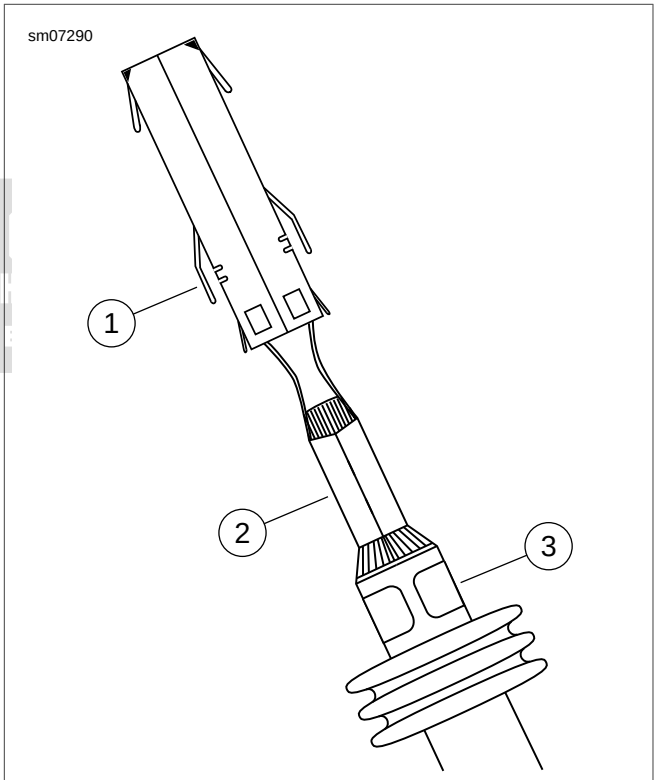
CRIMPING TERMINALS

PART NUMBER	TOOL NAME
HD-50120	UNIVERSAL CRIMPER SET
HD-50120-8	TYCO MCP DIE

1. Strip the wire insulation to specification. Refer to Table A-8.
2. Install the TYCO MCP DIE (Part No. HD-50120-8) in the handle of the UNIVERSAL CRIMPER SET (Part No. HD-50120).
3. Place the **new** terminal in the specified nest.
4. Insert the wire to the wire stop.
5. Crimp the terminal.
6. Inspect the crimped terminal.

Table A-8. Tyco MCP Crimper Die (Part No. HD-50120-8)

TERMINAL	PART NO.	STRIP LENGTH		NEST
		in	mm	
Large socket: 14 AWG	72579-12	0.165-0.189	4.2-4.8	A
Large socket: 16 AWG	72579-12	0.165-0.189	4.2-4.8	B
Small socket: 20 AWG	72580-12	0.130-0.153	3.3-3.9	C



1. **Locking tang**
2. **Lead crimp**
3. **Seal crimp**

Figure A-78. Tyco MCP Socket Terminal Crimp

SEALED SPLICE CONNECTOR A.24

SEALED SPLICE CONNECTOR REPAIR

PART NUMBER	TOOL NAME
HD-25070	ROBINAIR HEAT GUN
HD-38125-8	PACKARD TERMINAL CRIMPER
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

When splicing adjacent wires, stagger the splices that the sealed splice connectors will not touch each other.

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-9.
3. Strip insulation off the wire lead. Refer to Table A-9.

Table A-9. Sealed Splice Connectors

WIRE GAUGE	COLOR	PART NO.	STRIP LENGTH	
			in	mm
18-20 (0.5-0.8 mm)	Red	70585-93	3/8	9.5
14-16 (1.0-2.0 mm)	Blue	70586-93	3/8	9.5
10-12 (3.0-5.0 mm)	Yellow	70587-93	3/8	9.5

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-80. The connector is crimped on one side and then the other.

1. See Figure A-79. Open the PACKARD TERMINAL CRIMPER (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. Insert one end of the sealed connector.
3. Gently squeeze the handles until the connector is held in the jaws.
4. See Figure A-80. 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. 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 electrical system component that is not being serviced.
- Always keep hands away from tool tip area and heat shrink attachment.

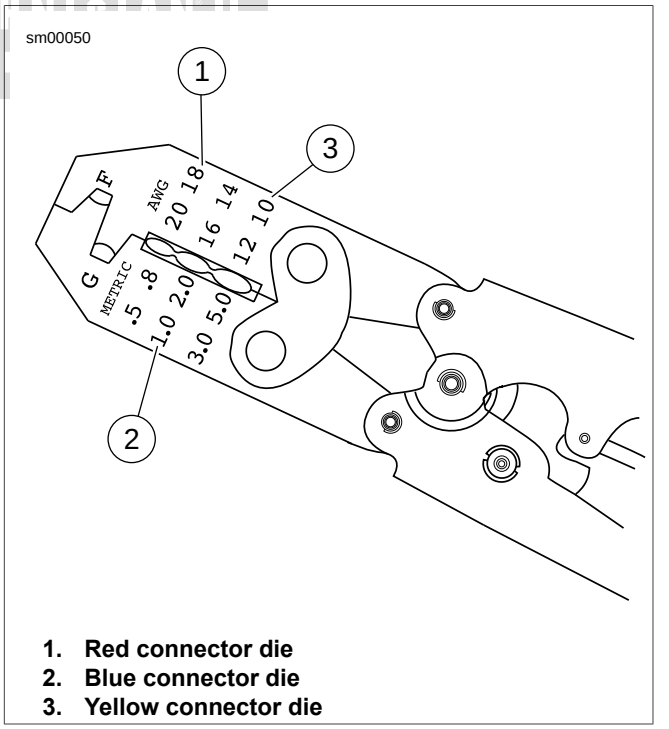
7. Use an ULTRA TORCH (Part No. HD-39969), or a ROBINAIR HEAT GUN (Part No. HD-25070) with a HEAT SHIELD ATTACHMENT (Part No. HD-41183), to heat the connector from the center of the crimp (3) out to each end.

NOTE

It is acceptable for the splice to rest against the heat shrink tool attachment.

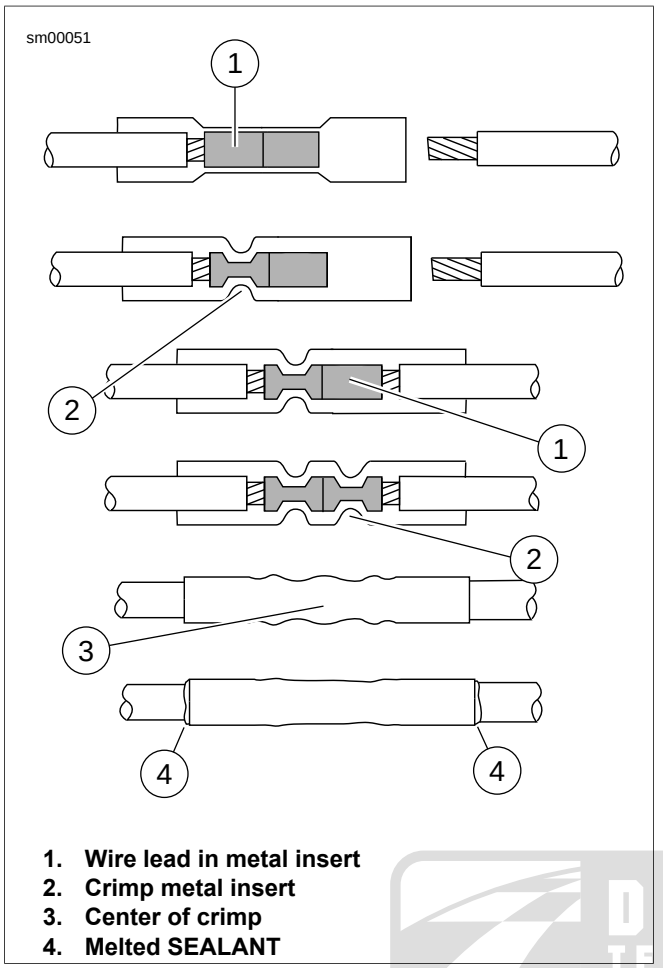
Inspecting Seals

See Figure A-80. 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-79. 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-80. Sealed Splice Connector

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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B.2 WIRING DIAGRAMS.....B-4

DIGITAL TECHNICIAN® II
HARLEY-DAVIDSON®

NOTES

CONNECTORS B.1

CONNECTOR LOCATIONS

Function/Location

All vehicle connectors are identified by their 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 Appendix A are by connector type. Refer to Table B-1.

Table B-1. Sportster Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[18]	Right rear turn signal	4-place Tyco 040 Multilock Unsealed (BK)	Light blue	Under seat (brown tape) (LED and dual stop lamp)
[18-1]	Right rear turn signal	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly (single stop lamp)
[19]	Left rear turn signal	4-place Tyco 040 Multilock Unsealed (BK)	Light blue	Under seat (LED and dual stop lamp)
[19-1]	Left rear turn signal	2-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly (single stop lamp)
[20]	Instruments	6-place Molex MX 150 Sealed (BK)	Gray	Under fuel tank right side
[22-1]	Right hand controls	4-place JAE MX19 Sealed (BK)	Yellow	Under fuel tank left side
[22-2]	Right hand controls	2-place JAE MX19 Sealed (BK)	Yellow	Under fuel tank left side
[24]	Left hand controls	4-place JAE MX19 Sealed (BK)	Yellow	Under fuel tank left side
[29]	Position lamp (HDI)	Spade terminals	Red	Behind headlamp
[31]	Front turn signal and DOM running lamps	6-place Tyco 070 Multilock Unsealed (BK)	Gray	Under fuel tank right side
[33]	Ignition switch (if equipped)	2-place Delphi GT 150 Sealed (GY)	Gray	Under the fuel tank
[38]	Headlamp	4-place Tyco 070 Multilock Unsealed (BK)	Gray	Under fuel tank left side
[38-2]	Headlamp	4-place Tyco 070 Multilock Unsealed (BK)	Gray	Back of headlamp
[39]	Speedometer	12-place Delphi Micro 64 Sealed (GY)	Breakout Box	Back of speedometer
[40]	LP	3-place Tyco 070 Multilock	Gray	Under seat
[47]	Voltage regulator to stator	2-place Dekko (BK)	Green	Bottom of voltage regulator
[64]	Fuse block	Delphi 280 Metri-pack Sealed Delphi 800 Metri-pack Sealed (main fuse)	Purple/Red	Under left side cover
[65]	VSS	3-place Delphi GT 150 Sealed (BK)	Gray	Top of transmission case
[77]	Voltage regulator	2-place Dekko (BK)	Green	Bottom of voltage regulator
[78-1]	ECM	18-place Tyco GET 64 Sealed (BK)	Breakout Box	Under left side cover
[78-2]	ECM	18-place Tyco GET 64 Sealed (GY)	Breakout Box	Under left side cover

Table B-1. Sportster Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[79]	CKP sensor	2-place Deutsch DTM Sealed (BK)	Brown	Lower left front of engine
[80]	TMAP sensor	4-place Bosch 1.1M Sealed (BK)	Gray	Between cylinders right side
[83]	Ignition coil	4-place Delphi GT 150 Sealed (BK)	Gray	Under fuel tank
[84]	Front fuel injector	2-place Ford Sealed (TN)	Gray	Between cylinders
[85]	Rear fuel injector	2-place Ford Sealed (TN)	Gray	Between cylinders
[87]	IAC	4-place Delphi GT 150 Sealed (BK)	Gray	Between cylinders right side
[88]	TPS	3-place Delphi GT 150 Sealed (BK)	Gray	Between cylinders right side
[90]	ET sensor	2-place Delphi GT 150 Sealed (BK)	Gray	Right side ECM caddy
[91]	DLC	6-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 (single non-LED stop lamp)
[94]	Rear fender light harness in circuit board	6-place Tyco 070 Multilock Unsealed (BK)	Gray	Circuit board under tail lamp assembly (single non-LED stop lamp)
[120]	Oil pressure switch	Right angle push on molded terminal (BK)		Under oil filter mount
[121]	Rear brake switch jumper	2-place Molex MX 150 Sealed (BK)	Gray	Below rear fork pivot
[121-1]	Rear brake switch	Spade terminals (BK)	Red	Under rear brake master cylinder
[121-2]	Rear brake switch	Spade terminals (BK)	Red	Under rear brake master cylinder
[122-1]	Horn	Spade terminals (BK)	Red	Front mount - Between front frame tubes Side mount - Left side of engine
[122-2]	Horn	Spade terminals (BK)	Red	Front mount - Between front frame tubes Side mount - Left side of engine
[128]	Starter solenoid	Spade terminal (W)	Red	Right side behind starter
[131]	Neutral switch	Push on molded terminal (BK)		Right side under sprocket cover behind transmission sprocket
[133]	JSS	3-place Molex MX 150 Sealed (BK)	Gray	Left side frame down tube
[136]	Neutral switch jumper	1-place bullet (BK)		Right side frame, below gearcase cover
[137]	Rear HO2S	4-place Molex MX 150 Sealed (BK)	Gray	Under left side cover
[138]	Front HO2S	4-place Molex MX 150 Sealed (BK)	Gray	Left side frame down tube
[141]	Fuel pump and sender	4-place Molex MX 150 Sealed (BK)	Gray	Under left side cover behind ECM caddy cover
[142]	Security siren (if equipped)	3-place Delphi GT 150 Sealed (BK)	Gray	Under left side cover, behind ECM caddy cover
[145]	Engine harness	12-place Molex MX 150 Sealed (BK)	Gray	Under left side cover, behind ECM caddy cover

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

Table B-1. Sportster Connector Locations

NO.	DESCRIPTION	TYPE	TERMINAL PROBE COLOR	LOCATION
[166]	ABS ECU (if equipped)	18-place Tyco MCP Sealed (BK)	Breakout Box	Under transmission
[167]	Front WSS (if equipped)	2-place Deutsch DTM Sealed (BK)	Brown	Under fuel tank
[168]	Rear WSS (if equipped)	2-place Deutsch DTM Sealed	Brown	Under left side cover behind fuse block
[200]	Resistor pack	3-place Molex MX 150 Sealed (BK)	Gray	Under left side cover, behind ECM caddy cover
[209]	Security antenna	2-place Molex MX 64 Unsealed (BK)	Light Blue	Under seat
[242]	BCM	48-place Molex CMC Sealed (BK)	Breakout Box	Under left side cover
[259]	BCM battery power	1-place Delphi 800 Metri-Pack Sealed (BK)	Red	Under left side cover
[GND1]	Harness ground	Ring terminal		Left side behind starter on transmission case
[GND2]	Battery ground	Ring terminal		Right side behind starter on transmission case

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 indicates 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 indication of a splice only indicates that wires are spliced to that circuit. It is not the true location of the splice in the wiring harness.

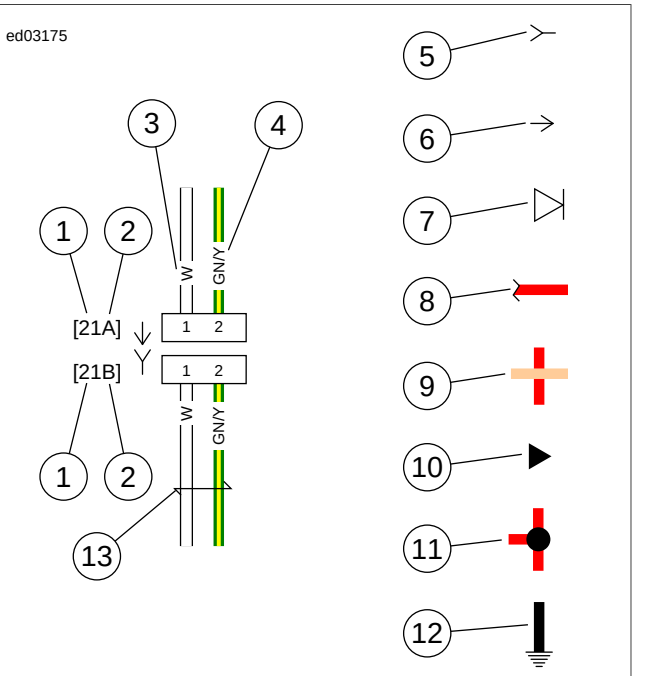
Ground: Grounds can be classified as either clean or dirty grounds. Clean grounds are identified by a (BK/GN) wire and are normally used for sensors or modules.

NOTE

Clean grounds usually do not have electric motors, coils or anything that may cause electrical interference on the ground circuit.

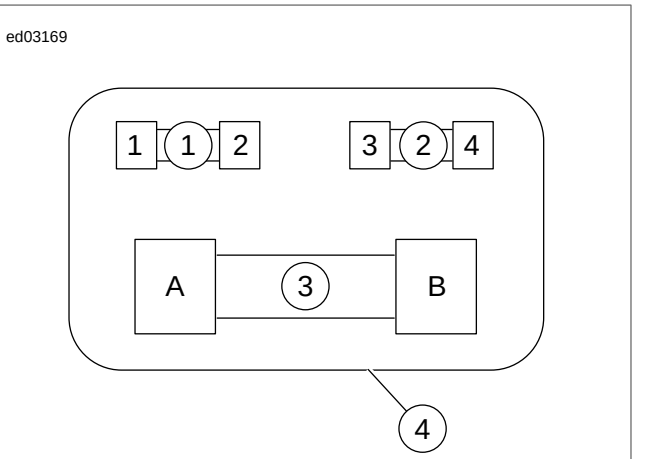
Dirty grounds are identified by a (BK) wire and are used for components that are not as sensitive to electrical interference.

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. **Battery**
2. **P&A**
3. **Main**
4. **Fuse block [64]**

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	Gray
LBE	Light Blue
LGN	Light Green
O	Orange
PK	Pink
R	Red
TN	Tan
V	Violet
W	White
Y	Yellow

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

2015 SPORTSTER WIRING DIAGRAMS

Refer to the table below for wiring diagram information.

Wiring Diagram List

DIAGRAM	LOCATION
Battery Power Distribution	Figure B-3
Ignition and Accessory Power Distribution	Figure B-4
Sensor Grounds	Figure B-5
Ground Circuit: 1 of 2	Figure B-6
Ground Circuit: 2 of 2	Figure B-7
Front Lighting and Hand Controls: 2015 Sportster	Figure B-8
Main Harness 1 of 2: 2015 Sportster	Figure B-9
Main Harness 2 of 2: 2015 Sportster	Figure B-10
Rear Lighting: 2015 Sportster	Figure B-11

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

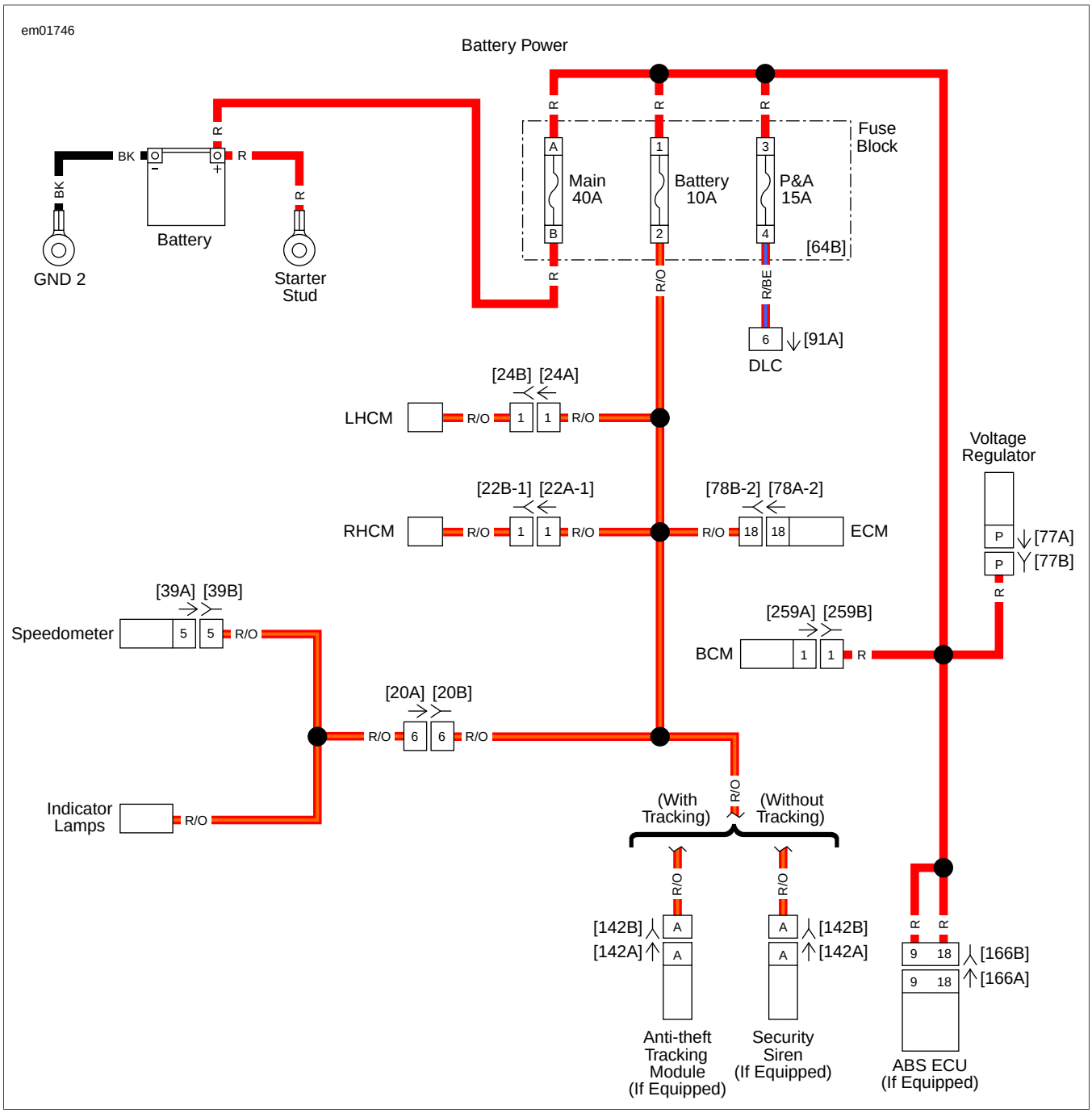


Figure B-3. Battery Power Distribution

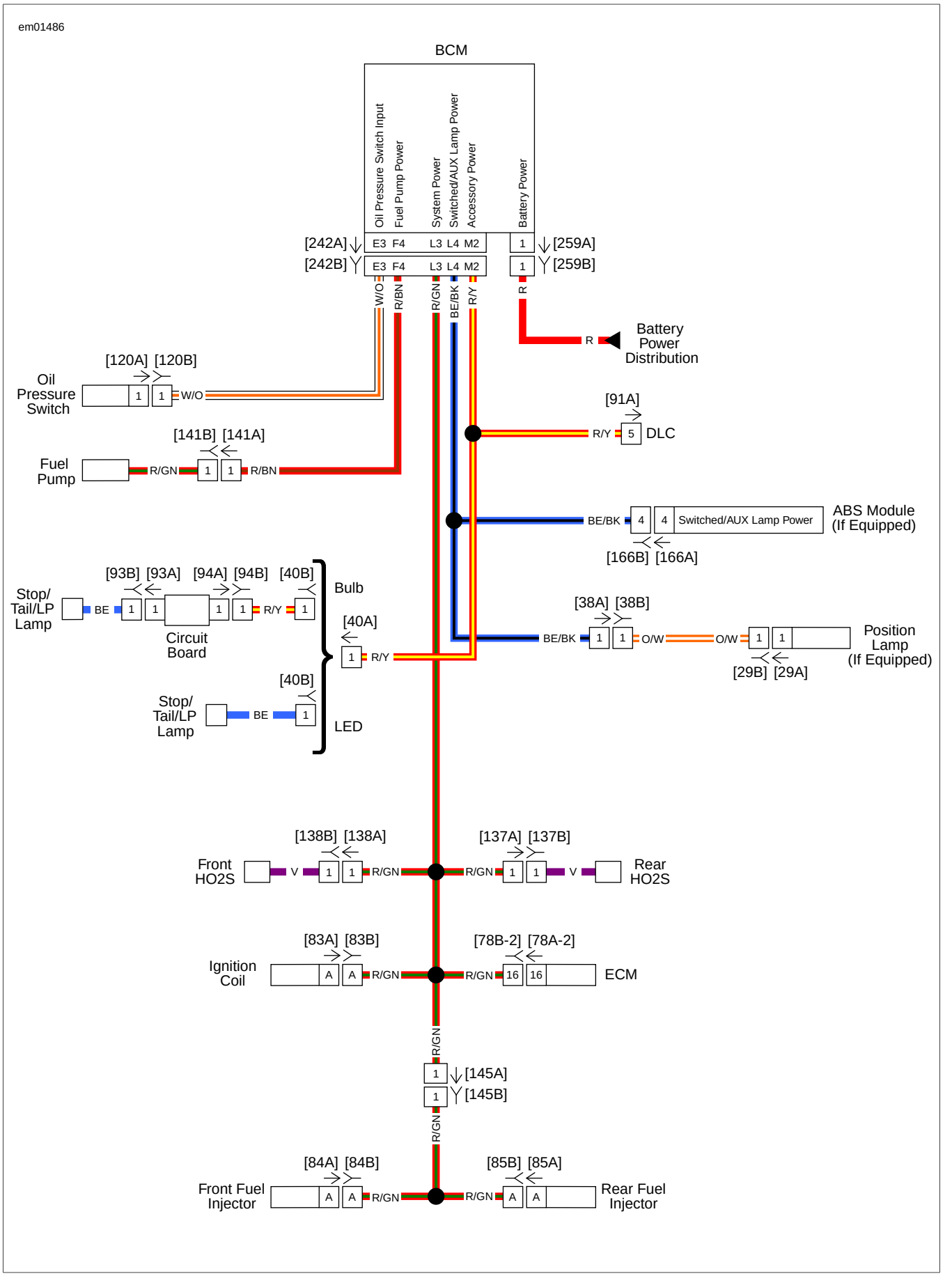


Figure B-4. Ignition and Accessory Power Distribution

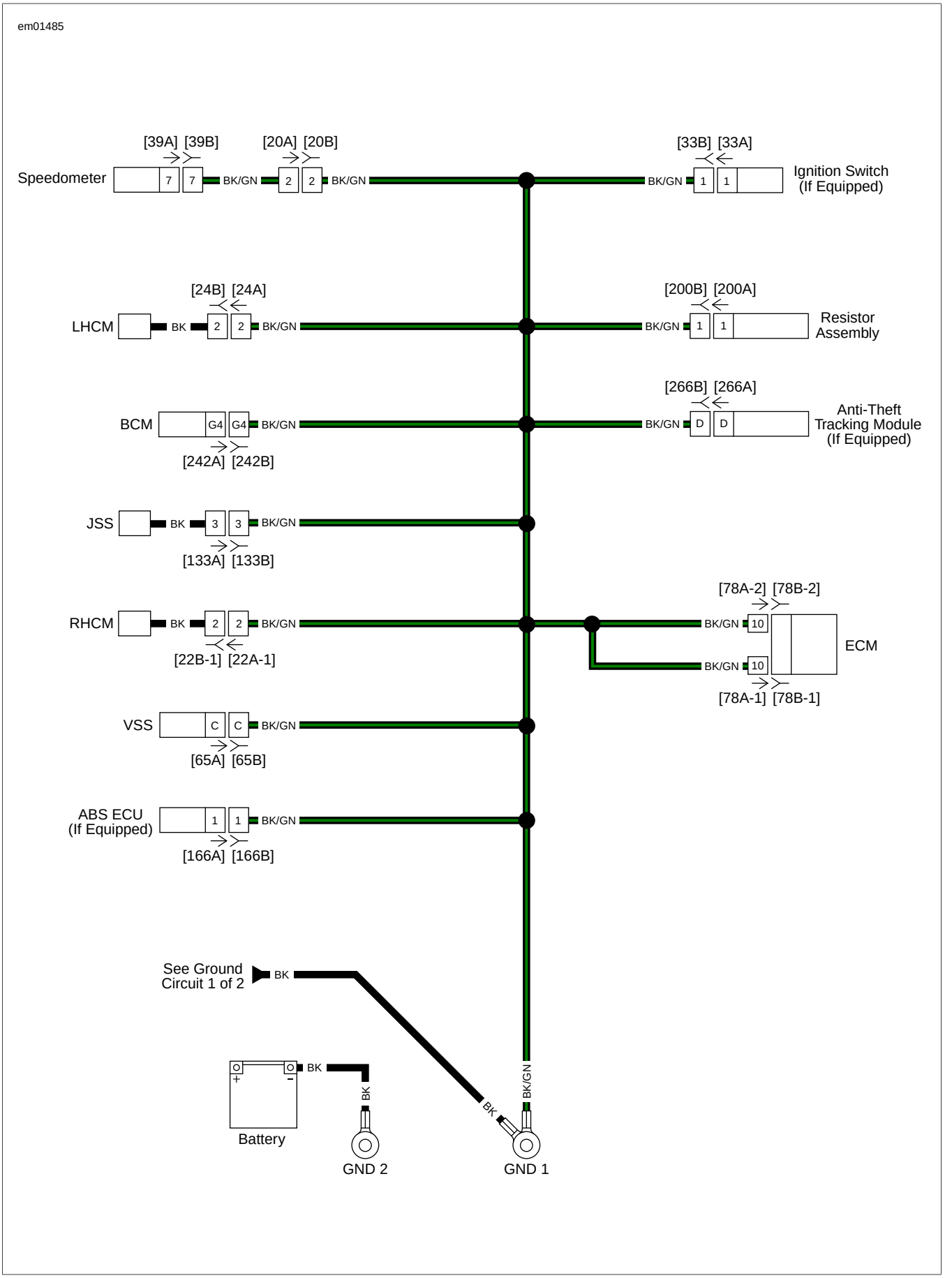


Figure B-5. Sensor Grounds

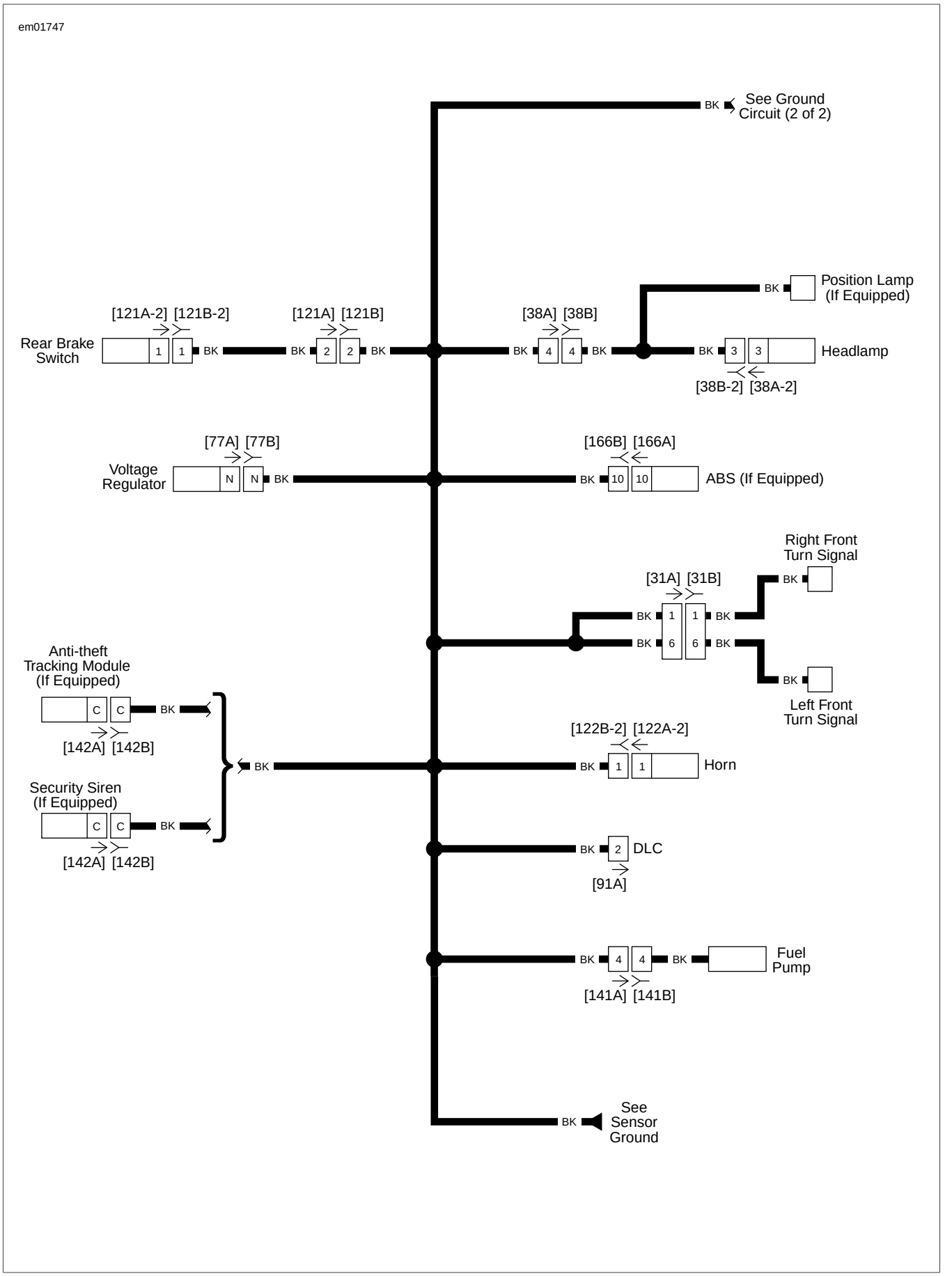


Figure B-6. Ground Circuit: 1 of 2

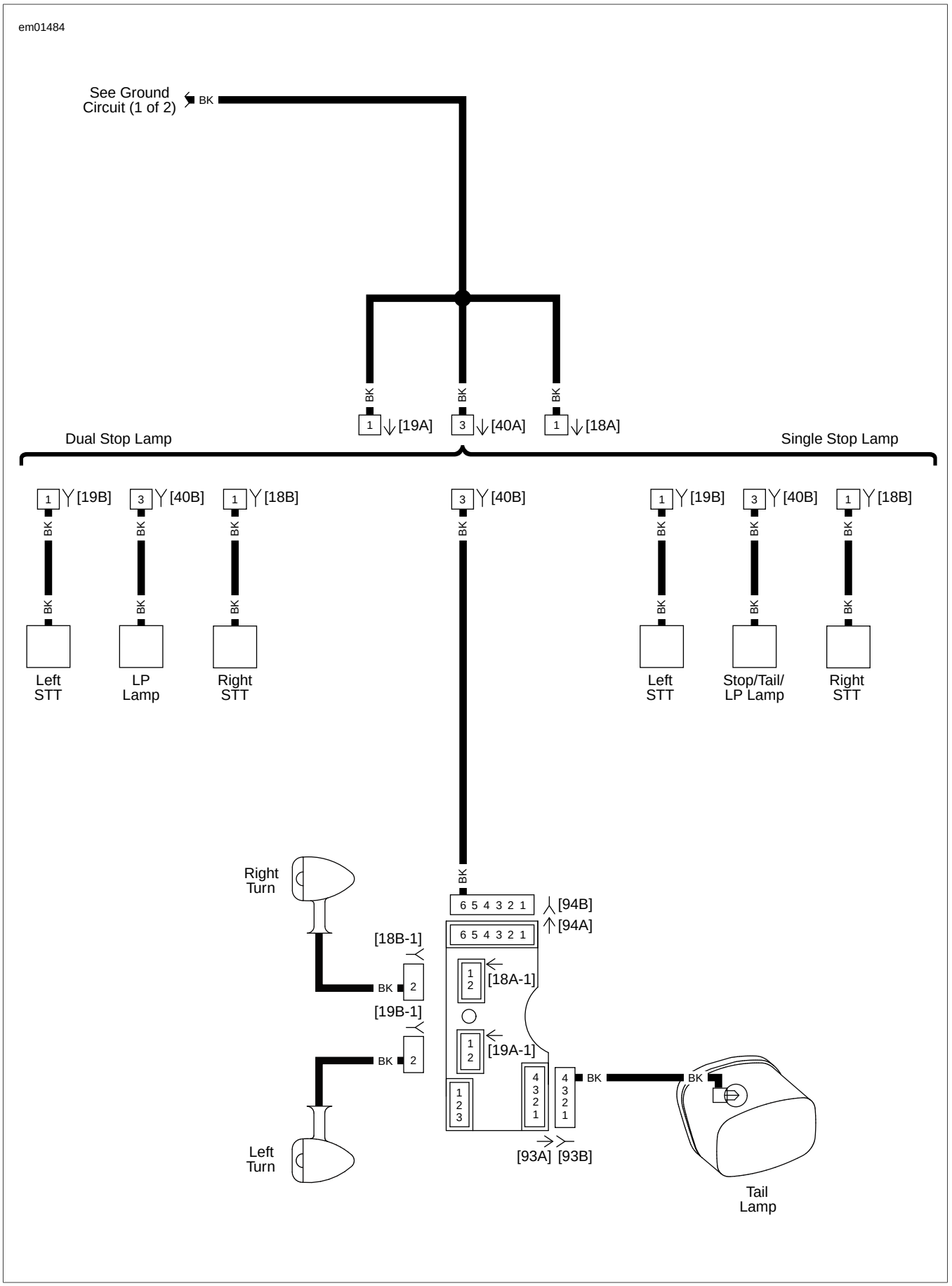


Figure B-7. Ground Circuit: 2 of 2

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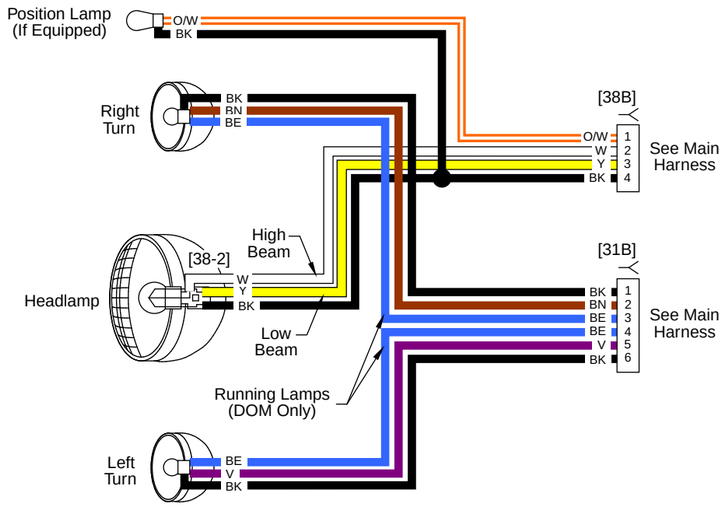

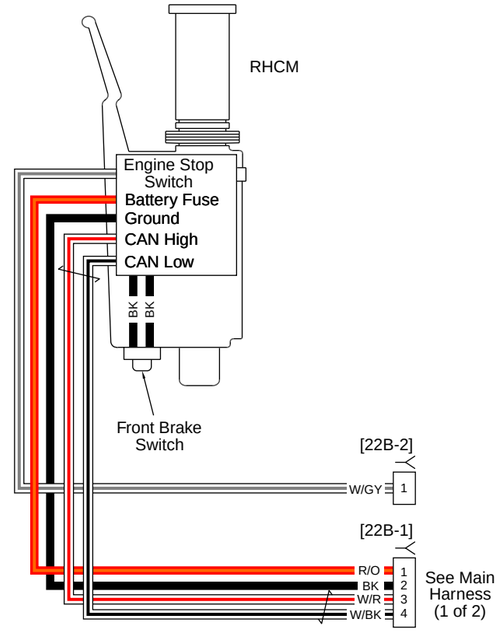

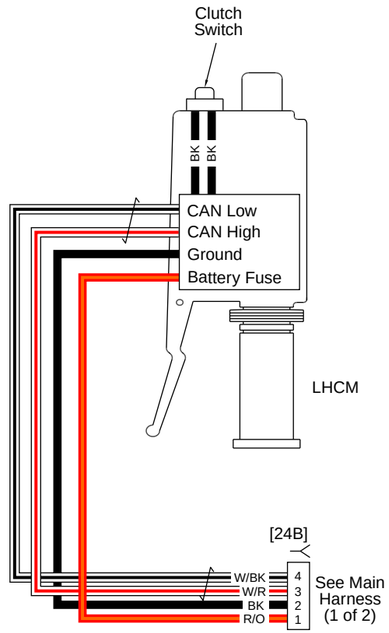

Figure B-8. Front Lighting and Hand Controls: 2015 Sportster

Figure B-8.
Front Lighting and Hand Controls: 2015 Sportster

Figure B-8.
Front Lighting and Hand Controls: 2015 Sportster

et00678

Speedometer
CAN Low 8 W/BK
CAN High 2 W/R
High Beam Indicator 4 BE/W
Battery Fuse 5 R/O
Neutral Indicator 6 W
Sensor Ground 7 BK/GN
Oil Pressure Indicator 1 W/O
Fuel Level 9 W/Y
Left Turn Indicator 10 BE/PK
Right Turn Indicator 12 BE/O

Indicator Lamps
Right Turn Indicator BE/O
Left Turn Indicator BE/PK
High Beam Indicator BE/W
Oil Pressure Indicator W/O
Neutral Indicator W
Battery Fuse R/O

[39A] [39B]
[20A] [20B]
W/Y R/O BK/GN W/R W/BK

See Front Lighting And Hand Controls
[31A] 1 2 3 4 5 6 BK BE/O BE BE BE/PK BK
[22A-1] 1 2 3 4 R/O BK/GN W/R W/BK
[22A-2] 1 W/GY

IAC
IAC A Low
IAC B High
IAC B Low
IAC A High
A B C D [87A]
A B C D [87B]
GY/O GN/W GY/W GN/O

TMAP Sensor
5V Sensor Ground
IAT
5V Sensor Power
Map Intput
1 2 3 4 [80A]
1 2 3 4 [80B]
BK/W GN/GY R/W GY

TPS
5V Sensor Ground
5V Sensor Power
TPS
A B C [88A]
A B C [88B]
BK/W R/W GN/V

Rear Fuel Injector
System Power
Rear Fuel injector
A B [85A]
A B [85B]
R/GN GY/Y

Front Fuel Injector
System Power
Front Fuel injector
A B [84A]
A B [84B]
R/GN GN/Y

[145B] 12 11 10 9 8 7 6 5 4 3 2 1
[145A] 12 11 10 9 8 7 6 5 4 3 2 1
GN/O GY/W GN/W GY/O R/W GY BK/W GN/V GN/GY GY/Y GN/Y R/GN

Fuel Pump
Fuel Pump Power R/BN
Fuel Level Sender W/Y
Sender Ground W/BN
Pump Ground BK
[141B] [141A]
1 R/BN
2 W/Y
3 W/BN
4 BK

[24A]
See Front Lighting And Hand Controls
1 R/O
2 BK/GN
3 W/R
4 W/BK

[167A] [167B]
Front WSS (If Equipped)
Front WSS High R
Front WSS Low BK
1 O/BE
2 O/BK

[38A]
See Front Lighting And Hand Controls
4 BK
3 BE/Y
2 BE/W
1 BE/BK

GND 1
BK
BK/GN

[90B] [90A]
GN BK/W
TN TN
ET Sensor
5V Sensor Ground
ET Sensor

[33B] [33A]
BK/GN W/BE
200Ω 800Ω
Ignition Switch (If Equipped)

[83B] [83A]
R/GN LGN/BN GY/BE GN/BE
System Power
ION Sense
Rear Ignition Coil
Front Ignition Coil
Ignition Coil

R/BE R/O R
P&A 15A
Battery 15A
Main 40A
[64B]
Fuse Block

[200B] [200A]
BK/GN W/BN W/Y
2KΩ 8KΩ
Resistor Assembly

W/R BK W/BK BE/R R/Y R/BE
[91A]
DLC

[78B-1] [78A-1]
GY/BE GN/BE BK/O LGN/Y GN/Y GY/Y GY LGN/GY LGN/BN BK/GN W/BK W/R BK/PK R GN/BN BK
Rear Ignition Coil
Front Ignition Coil
Front HO2S Heater Ground
VSS Input
Front Fuel Injector
Rear Fuel Injector
MAP Input
JSS Signal
ION Sense
Sensor Ground
CAN Low
CAN High
Rear HO2S Heater Ground
CKP Sensor High
Front HO2S
CKP Sensor Low
[78B-2] [78A-2]
GN/O
IAC A High
GN/GY BK/W GN R/W BK/GN GY/O GN/W GY/W GN/V R/GN GY/BN R/O
IAT
5V Sensor Ground
ET Sensor
5V Sensor Power
Sensor Ground
IAC A Low
IAC B High
IAC B Low
TPS
System Power
Rear HO2S
Battery Fuse
ECM

BK W/GY R/O BK/GN BK/W BE/O BE/PK R/BN W/BE O/BE O/BK W/R W/BK BK/PK BE/R R/Y BE/Y BE/W BE/BK BE BK/O R R GN/BN R/GN LGN/GY BK R/W GY/BN R LGN/Y
See Main Harness (2 of 2)

Figure B-9. Main Harness 1 of 2: 2015 Sportster

Figure B-9.
Main Harness 1 of 2: 2015 Sportster

Figure B-9.
Main Harness 1 of 2: 2015 Sportster

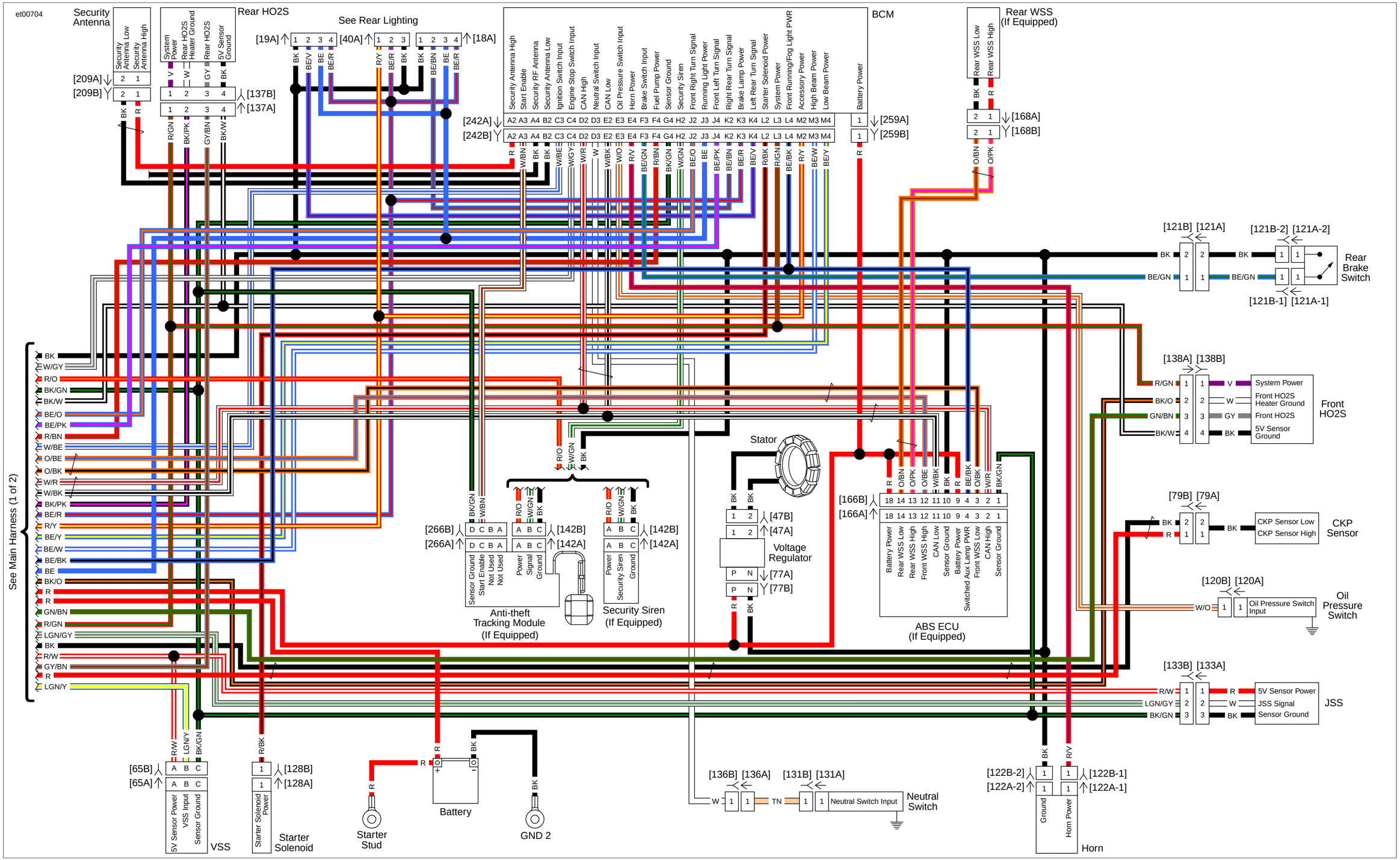

Figure B-10. Main Harness 2 of 2: 2015 Sportster

Figure B-10.
Main Harness 2 of 2: 2015 Sportster

Figure B-10.
Main Harness 2 of 2: 2015 Sportster

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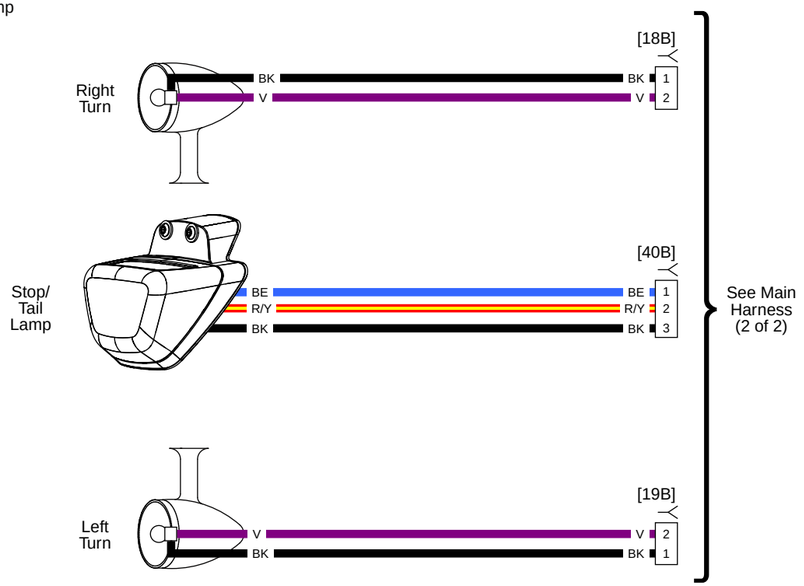
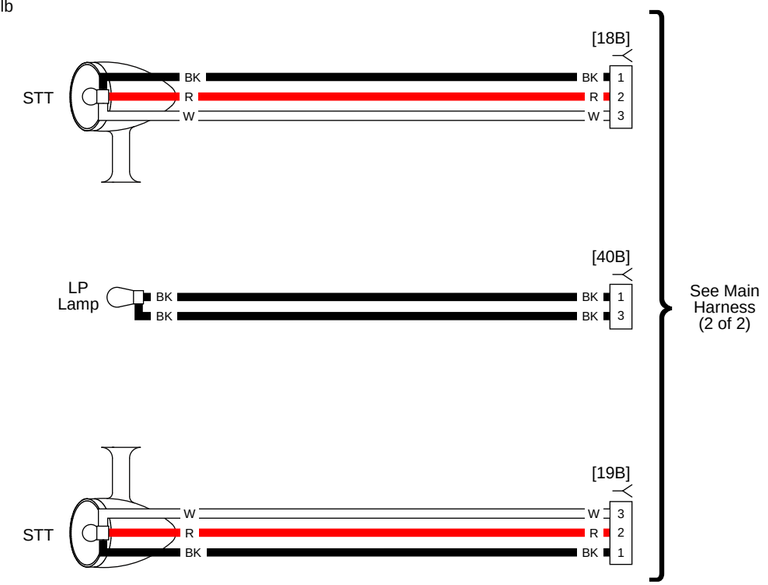
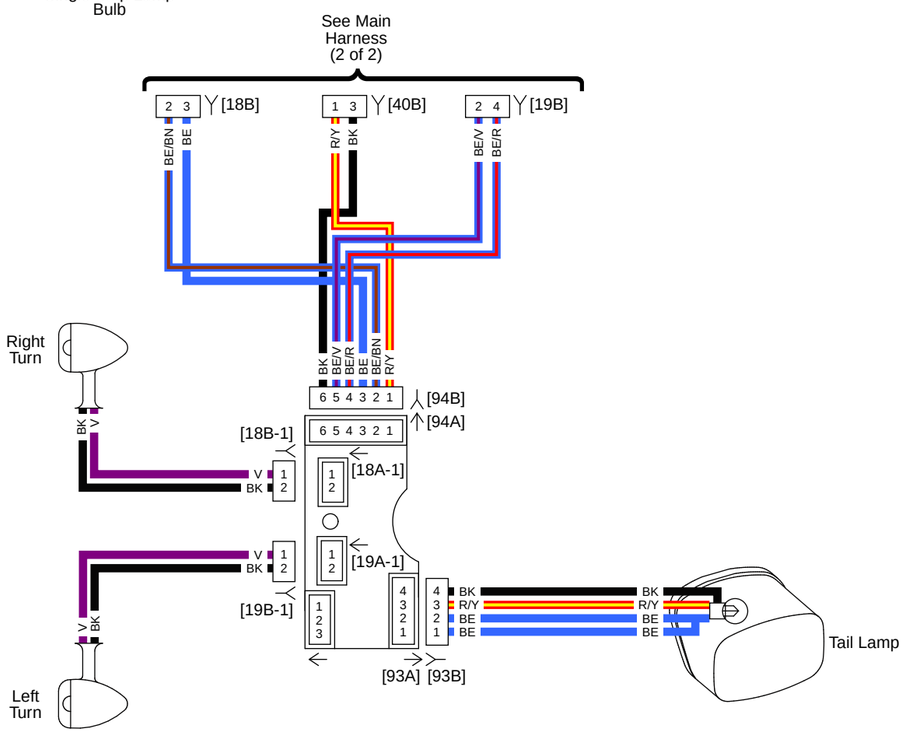
Single Stop Lamp
LED



Dual Stop Lamp Bulb
w/LED LP Lamp



Single Stop Lamp
Bulb



Dual Stop Lamp
LED

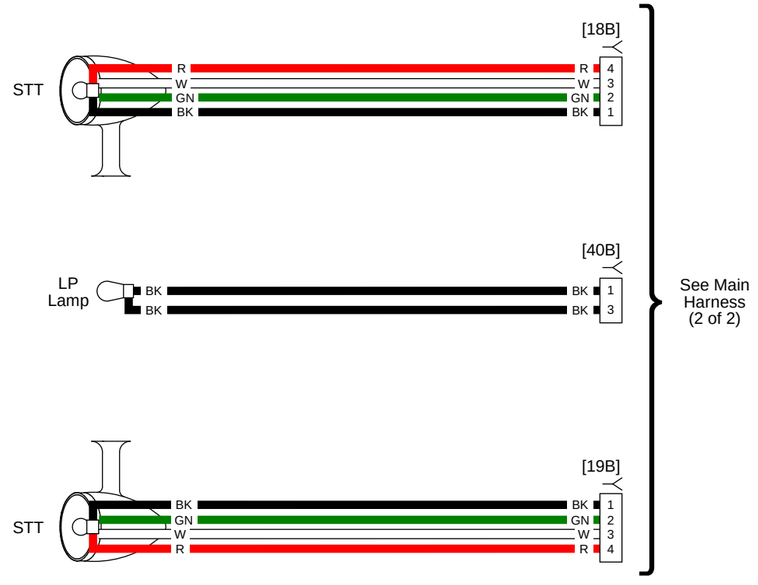


Figure B-11. Rear Lighting: 2015 Sportster

Figure B-11.
Rear Lighting: 2015 Sportster

Figure B-11.
Rear Lighting: 2015 Sportster

TABLE OF CONTENTS

SUBJECT **PAGE NO.**
C.1 FASTENER TORQUE VALUES....C-1
C.2 COMPENSATING SPROCKET....C-2

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
Sprocket compensator bowl bolt, final torque	80 ft-lbs	108.5 Nm	C.2 COMPENSATING SPROCKET, Assembly and Installation/Tighten in a star pattern
Sprocket compensator bowl bolt, first torque	60 ft-lbs	81.3 Nm	C.2 COMPENSATING SPROCKET, Assembly and Installation/Tighten in a star pattern

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

COMPENSATING SPROCKET C.2

GENERAL

Sportster models sold in certain markets have a rear wheel compensating sprocket.

Inspect the compensator components every time the rear wheel is removed.

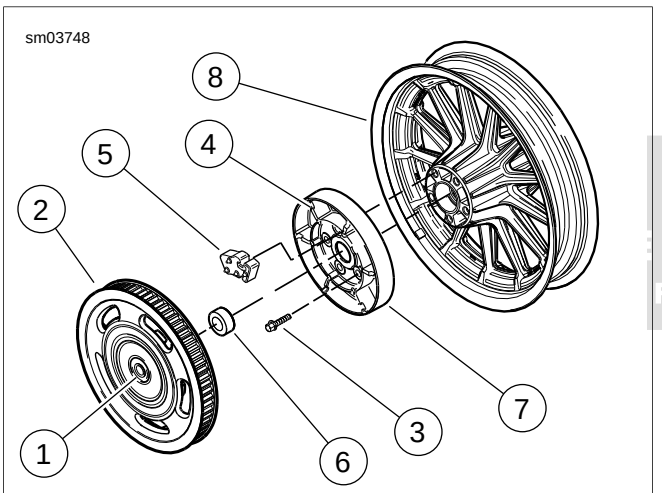
REMOVAL AND DISASSEMBLY

1. Remove rear wheel. See 2.5 WHEELS.
2. See Figure C-1. Remove final drive sprocket assembly (2) and spacer (6).
3. Pull sprocket isolators (5) from compensator bowl (7).

NOTE

*Only remove compensator bowl (7) from rear wheel (8) if necessary. Bolts (3) are one-time usage only. If removed, they must be discarded and replaced with **new** bolts.*

4. If necessary, remove bolts with captive washers (3) and compensator bowl from rear wheel (8). Discard bolts.



1. **Sprocket bearing (part of final drive sprocket assembly)**
2. **Final drive sprocket assembly**
3. **Bolt with captive washer (5)**
4. **Compensator bowl casting lip**
5. **Sprocket isolator (5)**
6. **Spacer**
7. **Compensator bowl**
8. **Rear wheel**

Figure C-1. Compensating Sprocket

CLEANING, INSPECTION AND REPAIR

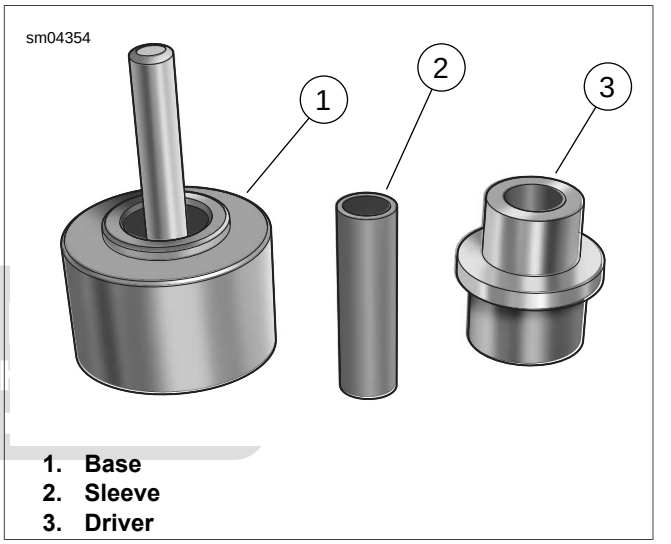
1. See Figure C-1. Wipe inside of compensator bowl (7) and final drive sprocket (2) with a clean, damp cloth.
2. Inspect sprocket bearing (1). If bearing surface is rough or if bearing was leaking grease, replace bearing. See C.2 COMPENSATING SPROCKET, Sprocket Bearing.
3. Inspect sprocket isolators (5) for damage, deterioration, missing chunks or excessive debris beyond normal wear marks. Replace if necessary.

SPROCKET BEARING

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

Removal

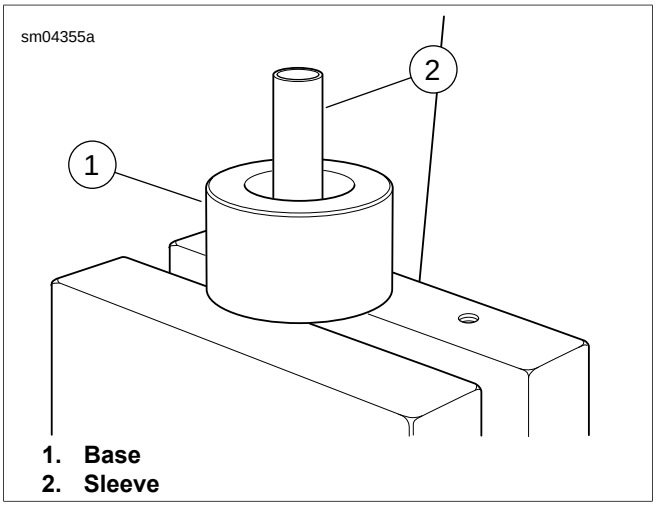
1. See Figure C-2. Pull sprocket from bowl with the REAR WHEEL COMPENSATOR SPROCKET BEARING REMOVER/INSTALLER (Part No. HD-48921).



1. **Base**
2. **Sleeve**
3. **Driver**

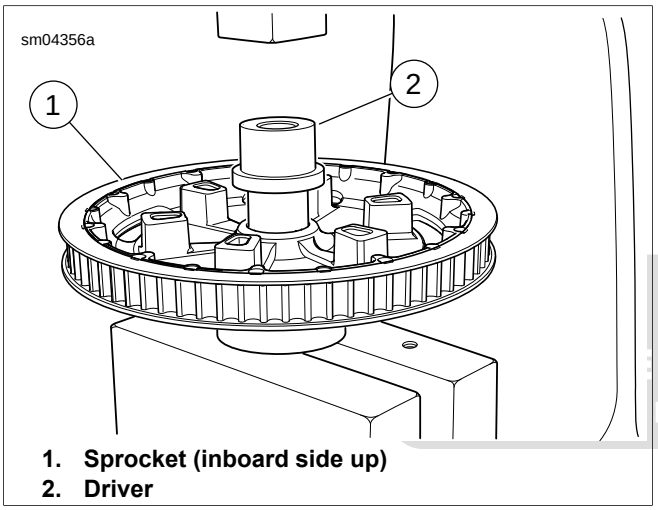
Figure C-2. Rear Wheel Compensator Sprocket Bearing Remover/Installer (Part No. HD-48921)

2. See Figure C-3. Place parallel press blocks on deck of arbor press. Leave gap between press blocks to accommodate base pin in next step.
3. Position base (1) on press blocks with the large OD topside.
4. Slide sleeve (2) over base pin.
5. See Figure C-4. With the inboard side facing up, slide sprocket (1) over sleeve until it rests on base.
6. Slide small OD of driver (2) over sleeve until contact is made with inner race of bearing.
7. Center driver under ram and apply pressure until bearing drops into base. Disassemble tool and discard bearing.



1. Base
2. Sleeve

Figure C-3. Position Tool for Bearing Removal

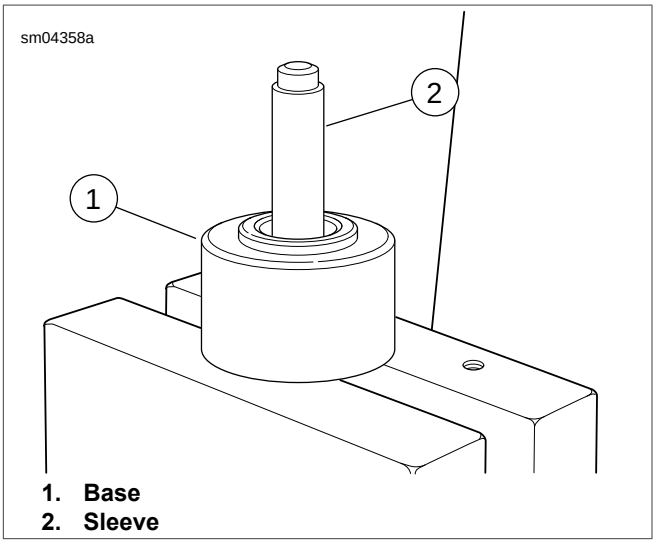


1. Sprocket (inboard side up)
2. Driver

Figure C-4. Remove Compensator Sprocket Bearing

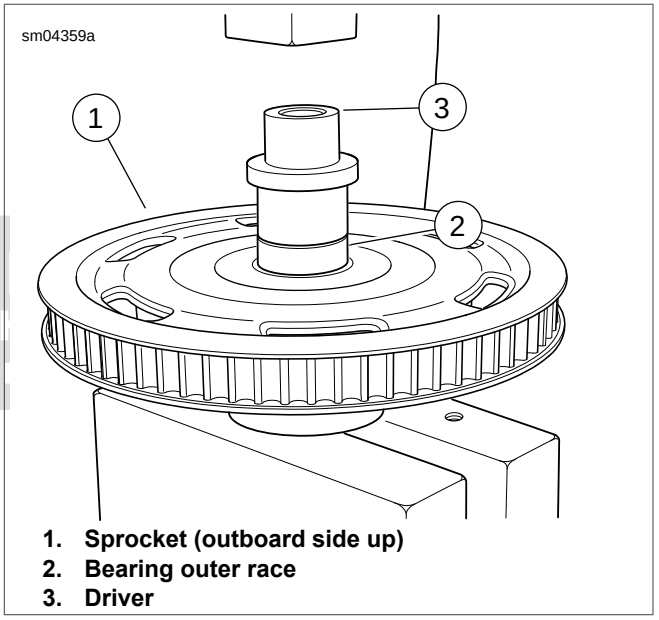
Installation

1. See Figure C-2. Obtain the REAR WHEEL COMPENSATOR SPROCKET BEARING REMOVER/INSTALLER (Part No. HD-48921).
2. See Figure C-5. Position base (1) on deck of arbor press with the small OD topside.
3. Slide sleeve (2) over base pin.
4. Verify that sprocket bearing bore is clean and dry.
5. See Figure C-6. With the outboard side facing up, slide sprocket (1) over sleeve until it rests on base.
6. Slide bearing (2) over sleeve.
7. Slide large OD of driver (3) over sleeve until contact is made with outer race of bearing.
8. Center driver under ram and apply pressure until bearing makes firm contact with counterbore in sprocket.
9. Turn sprocket over. Verify that bearing is fully seated.



1. Base
2. Sleeve

Figure C-5. Position Tool for Bearing Installation



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

Figure C-6. Install Compensator Sprocket Bearing

ASSEMBLY AND INSTALLATION

FASTENER	TORQUE VALUE	
Sprocket compensator bowl bolt, first torque	60 ft-lbs	81.3 Nm
Sprocket compensator bowl bolt, final torque	80 ft-lbs	108.5 Nm

NOTES

- *See Figure C-1. Only remove compensator bowl (7) from rear wheel (8) if necessary. Bolts (3) are one-time usage only. If removed, they must be discarded and replaced with **new** bolts.*
- ***New** compensator bowl bolts have a lock patch on the threads. Do not apply any additional LOCTITE.*

1. See Figure C-1. If compensator bowl (7) was removed, install bowl onto rear wheel with **new** bolts with captive washers (3). Tighten bolts:
   a. Tighten bolts in a star pattern (every other bolt) to 60 ft-lbs (81.3 Nm).
   b. Loosen screws 1/2 turn.
   c. Retighten all five screws in the same star pattern to 80 ft-lbs (108.5 Nm).

NOTE

Do not lubricate inside of compensator bowl (7), sprocket (2) or sprocket isolators (5) with any type of oil-based lubricant. Use ONLY soapy water or window cleaner on isolators to allow their installation. Do not install isolators dry.

2. See Figure C-7. Lubricate isolators (1) with soapy water or window cleaner. Install isolators (1) into compensator bowl (2).

NOTE

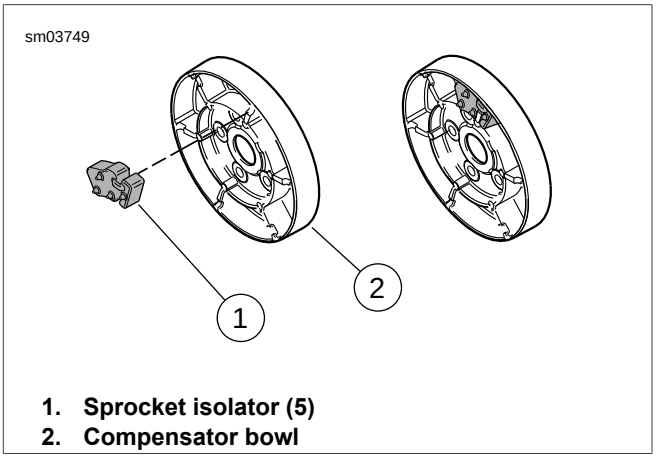
A radial groove machined into its surface identifies the inner spacer. Inner spacer is also thicker than outer spacer. Always install the correct spacer between compensator bowl and sprocket.

3. See Figure C-1. Install spacer (6) by placing on bowl casting lip (4).

NOTE

Use extreme caution to make sure that spacer does not fall out when assembling sprocket onto compensator bowl. If spacer is not present when rear axle is tightened, compensator sprocket and bearing are damaged .

4. Install sprocket (2) onto compensator bowl (7).
5. Install rear wheel. See 2.5 WHEELS.



1. Sprocket isolator (5)
2. Compensator bowl

Figure C-7. Installing Sprocket Isolators

DIGITAL TECHNICIAN II HARLEY-DAVIDSON

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DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

NOTES

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 CONVERSION D.2

UNITED STATES SYSTEM

Unless otherwise specified, all fluid volume measurements in this 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 manual include the metric system equivalents. In the metric system, 1 liter (L) = 1,000 milliliters (mL). 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 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. 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 CONVERSION D.3

UNITED STATES SYSTEM

The U.S. units of torque, foot pounds and inch pounds, are used in this 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 D.4

ACRONYMS AND ABBREVIATIONS

Table D-2. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
A	Amperes
AAT	Ambient air temperature
ABS	Anti-lock braking system
AC	Alternating current
ACC	Accessory position on ignition switch
ACR	Automatic compression release
AGM	Absorbed glass mat (battery)
Ah	Ampere-hour
AIS	Active Intake Solenoid
AWG	American wire gauge
B+	Battery voltage
bar	Bar
BAS	Bank angle sensor
BCM	Body control module
BOB	Breakout box
BTDC	Before top dead center
°C	Celsius (Centigrade)
CA	California
CAL	Calibration
CAN	Controller area network
CB Tx	CB send transmission
CB Rx	CB receive transmission
cc	Cubic centimeters
CCA	Cold cranking amps
CCW	Counterclockwise
CKP	Crankshaft position
cm	Centimeters
cm^3	Cubic centimeters
CW	Clockwise
DC	Direct current
DLC	Data link connector
DOM	Domestic
DOT	Department of Transportation
DTC	Diagnostic trouble code
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

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Table D-2. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
EHCU	Electro Hydraulic Control Unit
ET	Engine temperature
ETC	Electronic throttle control
EVAP	Evaporative emissions control system
°F	Fahrenheit
fl oz	Fluid ounce
FPS	Fuel pressure sensor
ft	Feet
ft-lbs	Foot pounds
FTP	Flash to pass
g	Gram
gal	Gallon
GAWR	Gross axle weight rating
GND	Ground (electrical)
GPS	Global positioning system
GVWR	Gross vehicle weight rating
HCU	Hydraulic control unit
HDI	Harley-Davidson International
HD-Link	Networking system
H-DSSS	Harley-Davidson smart security system
HFM	Hands-free mode
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
INTCM	Intercom
in-lbs	Inch pounds
JSS	Jiffy stand sensor
kg	Kilogram
km	Kilometer
km/h	Kilometers per hour
kPa	Kilopascal
kW	Kilowatt
L	Liter

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Table D-2. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
lb	Pounds
LCD	Liquid crystal display
LED	Light emitting diode
LH	Left hand
LHCM	Left hand control module
LP	License plate
LT	Left
mA	Milliampere
MAP	Manifold absolute pressure
max	Maximum
mi	Mile
min	Minimum
mL	Milliliter
mm	Millimeter
mph	Miles per hour
ms	Millisecond
Nm	Newton-meter
NIM	Navigation interface module
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
PND	Personal navigation device
psi	Pounds per square inch
PWM signal	Pulse width modulated signal
qt	Quart
RAD	Radio
RCM	Reverse control module
RDS	Radio data system
RES	Reserve mark on fuel supply valve
RH	Right hand
RHCM	Right hand control module
rpm	Revolutions per minute
RT	Right
s	Seconds
SCFH	Cubic feet per hour at standard conditions
SDARS	Satellite digital audio radio service
SPDO	Speedometer

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Table D-2. Acronyms and Abbreviations

ACRONYM OR ABBREVIATION	DESCRIPTION
SPKR	Speaker
STT	Stop/tail/turn
TA	Traffic announcement
TCA	Throttle control actuator
TDC	Top dead center
TGS	Twist grip sensor
TPS	Throttle position sensor
TSM	Turn signal module
TSSM	Turn signal/security module
USB	Universal serial bus
V	Volt
VAC	Volts of alternating current
VDC	Volts of direct current
VIN	Vehicle identification number
VR	Voice recognition
VSS	Vehicle speed sensor
W	Watt
WA	Weather alert
WSS	Wheel speed sensor

DIGITAL TECHNICIAN® II HARLEY-DAVIDSON®

NOTES

Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
94448-82B	SHOCK ADJUSTMENT SPANNER	1.22 SUSPENSION ADJUSTMENTS, Shock Absorber Preload: All except XL 1200T
A157-8	SNAP-ON 1/2 IN ADAPTER	5.11 TRANSMISSION RIGHT CASE BEARINGS, Installation
A-157C	SNAP-ON BUSHING DRIVER SET	5.11 TRANSMISSION RIGHT CASE BEARINGS, Installation
B-35758-52A	CUTTER PILOT	3.13 CYLINDER HEAD, Refacing Valve Seats
B-43895-1	REMOVER	5.8 TRANSMISSION REMOVAL AND DISASSEMBLY, Transmission Removal From Left Crankcase
B-43985	TRANSMISSION REMOVAL AND INSTALLATION TOOL	5.8 TRANSMISSION REMOVAL AND DISASSEMBLY, Transmission Removal From Left Crankcase
B-43985	TRANSMISSION REMOVAL AND INSTALLATION TOOL	5.13 TRANSMISSION INSTALLATION, Installation
B-43985-3	INSTALLER	5.13 TRANSMISSION INSTALLATION, Installation
B-43985-4	GUIDE	5.13 TRANSMISSION INSTALLATION, Installation
B-45520	GEAR DETENT ASSEMBLY AID	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
B-45520	GEAR DETENT ASSEMBLY AID	5.13 TRANSMISSION INSTALLATION, Assembling Crankcases
B-45523	VALVE GUIDE REAMER	3.13 CYLINDER HEAD, Replacing Valve Guides
B-45524	VALVE GUIDE REMOVER/INSTALLER	3.13 CYLINDER HEAD, Replacing Valve Guides
B-45525	VALVE GUIDE HONE	3.13 CYLINDER HEAD, Cleaning and Inspection
B-45525	VALVE GUIDE HONE	3.13 CYLINDER HEAD, Replacing Valve Guides
B-45655	CRANKCASE BEARING REMOVER/INSTALLER	3.18 CRANKCASE, Disassembly
B-45655	CRANKCASE BEARING REMOVER/INSTALLER	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
B-45676-A	SPROCKET SHAFT SEAL/SPACER INSTALLER	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
B-45847	CROSS PLATE	5.10 MAIN DRIVE GEAR AND BEARING, Removal
B-45847	CROSS PLATE	5.10 MAIN DRIVE GEAR AND BEARING, Installation
B-50085	TERMINAL EXTRACTOR	A.3 BOSCH BTC SEALED CONNECTOR, Bosch BTC Sealed Connector Repair
B-50085	TERMINAL EXTRACTOR	A.17 JAE MX19 SEALED CONNECTOR, JAE MX19 Sealed Connectors
B-50085	TERMINAL EXTRACTOR	A.20 TYCO 040 MULTILOCK UNSEALED CONNECTOR, Tyco 040 Multilock Unsealed Connector Repair
B-50085	TERMINAL EXTRACTOR	A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR, Tyco 070 Multilock Unsealed Connector Repair
B-50085	TERMINAL EXTRACTOR	A.22 TYCO GET 64 SEALED CONNECTOR, Tyco GET 64 Sealed Connector Repair
B-50085	TERMINAL EXTRACTOR	A.23 TYCO MCP SEALED CONNECTOR, Tyco MCP Sealed Connector
BB200A	SNAP-ON BASIC VACUUM BRAKE BLEEDER	2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Removal
BB200A	SNAP-ON BASIC VACUUM BRAKE BLEEDER	2.14 BLEEDING BRAKES, Procedure
CJ 114	SNAP-ON BODY DENT PULLER	3.18 CRANKCASE, Disassembly
CJ950	SNAP-ON BEARING SEPARATOR	3.18 CRANKCASE, Fitting Pinion Bearings
CJ950	SNAP-ON BEARING SEPARATOR	3.18 CRANKCASE, Fitting Pinion Bearings
FRX 181	SNAP-ON FLARE NUT SOCKET	6.20 FRONT TURN SIGNALS, XL 1200T

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Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
GA500A	SNAP-ON TERMINAL PICK	A.1 AUTOFUSE UNSEALED ELECTRICAL CONNECTOR, Autofuse Unsealed Connector Repair
GA500A	SNAP-ON TERMINAL PICK	A.23 TYCO MCP SEALED CONNECTOR, Tyco MCP Sealed Connector
HD-25070	HEAT GUN	2.34 WINDSHIELD: XL 1200T, Window
HD-25070	HEAT GUN	4.7 INDUCTION MODULE, Disassembly
HD-25070	HEAT GUN	6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Rear Lighting Harness
HD-25070	HEAT GUN	6.22 REAR STOP LAMP SWITCH, Installation
HD-25070	ROBINAIR HEAT GUN	A.24 SEALED SPLICE CONNECTOR, Sealed Splice Connector Repair
HD-33223-1	CYLINDER COMPRESSION GAUGE	3.5 TROUBLESHOOTING, Compression Test
HD-33416	UNIVERSAL DRIVER HANDLE	2.17 FORK STEM AND BRACKET ASSEMBLY, Cleaning, Inspection and Repair
HD-33446-86	TORQUE PLATE BOLTS	3.14 CYLINDER AND PISTON, Cleaning, Inspection and Repair
HD-33446-B	CYLINDER TORQUE PLATES	3.14 CYLINDER AND PISTON, Cleaning, Inspection and Repair
HD-34623-C	PISTON PIN LOCK RING REMOVER/INSTALLER	3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder and Piston
HD-34623-C	PISTON PIN LOCK RING REMOVER/INSTALLER	3.15 TOP END OVERHAUL: ASSEMBLY, Piston and Cylinder
HD-34736-B	VALVE SPRING COMPRESSOR	3.13 CYLINDER HEAD, Disassembly
HD-34736-B	VALVE SPRING COMPRESSOR	3.13 CYLINDER HEAD, Assembly
HD-34751	VALVE GUIDE CLEANING BRUSH	3.13 CYLINDER HEAD, Cleaning and Inspection
HD-34751	VALVE GUIDE CLEANING BRUSH	3.13 CYLINDER HEAD, Replacing Valve Guides
HD-34751	VALVE GUIDE CLEANING BRUSH	3.13 CYLINDER HEAD, Refacing Valve Seats
HD-34902-7	END CAP	3.18 CRANKCASE, Fitting Pinion Bearings
HD-34902-7	END CAP	3.18 CRANKCASE, Fitting Pinion Bearings
HD-35102	WRIST PIN BUSHING HONE	3.14 CYLINDER AND PISTON, Connecting Rod Bushings
HD-35316-11	RECEIVER CUP	5.10 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-12	INSTALLER CUP	5.10 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-4A	8 INCH BOLT	5.10 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-4A	8 INCH BOLT	5.10 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-4A	8 INCH BOLT	5.10 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-4A	8 INCH BOLT	5.10 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-7	WASHER	5.10 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-7	WASHER	5.10 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-8	BEARING DRIVER	5.10 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-9	BEARING DRIVER	5.10 MAIN DRIVE GEAR AND BEARING, Removal
HD-35316-C	MAIN DRIVE GEAR REMOVER AND INSTALLER SET	5.10 MAIN DRIVE GEAR AND BEARING, Installation
HD-35316-D	MAIN DRIVE GEAR REMOVER AND INSTALLER SET	5.10 MAIN DRIVE GEAR AND BEARING, Removal

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Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-35381-A	BELT TENSION GAUGE	1.12 DRIVE BELT AND SPROCKETS, Checking Drive Belt Deflection
HD-35457	BLACK LIGHT LEAK DETECTOR	1.25 TROUBLESHOOTING, Lubrication System
HD-35667-A	CYLINDER LEAKDOWN TESTER	3.5 TROUBLESHOOTING, Cylinder Leakage Test
HD-35758-C	NEWAY VALVE SEAT CUTTER SET	3.13 CYLINDER HEAD, Refacing Valve Seats
HD-36583	FORK SEAL AND BUSHING INSTALLATION TOOL	2.16 FRONT FORK, Assembly
HD-38125-6	PACKARD TERMINAL CRIMPER	A.10 DELPHI METRI-PACK TERMINAL REPAIR, Metri-Pack Terminal Crimps
HD-38125-7	PACKARD TERMINAL CRIMPER	A.10 DELPHI METRI-PACK TERMINAL REPAIR, Metri-Pack Terminal Crimps
HD-38125-7	PACKARD TERMINAL CRIMPER	A.15 DEUTSCH DTM SEALED MINI TERMINAL REPAIR, Deutsch DTM Sealed Mini Terminal Crimps
HD-38125-8	PACKARD TERMINAL CRIMPER	A.10 DELPHI METRI-PACK TERMINAL REPAIR, Metri-Pack Terminal Crimps
HD-38125-8	PACKARD TERMINAL CRIMPER	A.24 SEALED SPLICE CONNECTOR, Sealed Splice Connector Repair
HD-38362	SPORTSTER 5-SPEED SPROCKET LOCKING LINK	5.4 PRIMARY DRIVE AND CLUTCH, Removal
HD-38362	SPORTSTER 5-SPEED SPROCKET LOCKING LINK	5.4 PRIMARY DRIVE AND CLUTCH, Installation
HD-38515-91	CLUTCH SPRING FORCING SCREW	5.4 PRIMARY DRIVE AND CLUTCH, Disassembly
HD-38515-91	CLUTCH SPRING FORCING SCREW	5.4 PRIMARY DRIVE AND CLUTCH, Assembly
HD-38515-A	SPRING COMPRESSING TOOL	5.4 PRIMARY DRIVE AND CLUTCH, Disassembly
HD-38515-A	SPRING COMPRESSING TOOL	5.4 PRIMARY DRIVE AND CLUTCH, Assembly
HD-38871	CRANKSHAFT BUSHING PLATE PILOT	3.17 GEARCASE, Bushing Reaming
HD-39301-A	STEERING HEAD BEARING RACE REMOVAL TOOL	2.17 FORK STEM AND BRACKET ASSEMBLY, Cleaning, Inspection and Repair
HD-39302	STEERING HEAD BEARING RACE INSTALLATION TOOL	2.17 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
HD-39782-A	CYLINDER HEAD SUPPORT STAND	3.13 CYLINDER HEAD, Replacing Valve Guides
HD-39786	CYLINDER HEAD HOLDING FIXTURE	3.13 CYLINDER HEAD, Replacing Valve Guides
HD-39786	CYLINDER HEAD HOLDING FIXTURE	3.13 CYLINDER HEAD, Refacing Valve Seats
HD-39847	REAMER T-HANDLE	3.13 CYLINDER HEAD, Replacing Valve Guides
HD-39964	REAMER LUBRICANT	3.13 CYLINDER HEAD, Replacing Valve Guides
HD-39964	REAMER LUBRICANT	3.14 CYLINDER AND PISTON, Connecting Rod Bushings
HD-39965-A	DEUTSCH TERMINAL CRIMP TOOL	A.14 DEUTSCH DT SEALED TERMINAL REPAIR, Deutsch DT Sealed Terminal Crimps
HD-39969	ULTRA TORCH	6.22 REAR STOP LAMP SWITCH, Installation
HD-39969	ULTRA TORCH	A.24 SEALED SPLICE CONNECTOR, Sealed Splice Connector Repair
HD-41137	HOSE CLAMP PLIERS	3.22 OIL TANK, Crimp Clamps
HD-41142	FUEL PRESSURE GAUGE	4.14 FUEL PRESSURE TEST, Testing
HD-41183	HEAT SHIELD ATTACHMENT	6.22 REAR STOP LAMP SWITCH, Installation

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Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-41183	HEAT SHIELD ATTACHMENT	A.24 SEALED SPLICE CONNECTOR, Sealed Splice Connector Repair
HD-41417	PROPANE ENRICHMENT KIT	4.15 INTAKE LEAK TEST, Leak Tester
HD-41475	DEUTSCH TERMINAL REPAIR KIT	A.13 DEUTSCH DT SEALED CONNECTOR, Deutsch DT Sealed Connector Repair
HD-41475-100	FLAT BLADE L-HOOK	A.13 DEUTSCH DT SEALED CONNECTOR, Deutsch DT Sealed Connector Repair
HD-41609	AMP MULTI-LOCK CRIMPER	A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR, Tyco 070 Multilock Unsealed Connector Repair
HD-41609	AMP MULTI-LOCK CRIMPER	A.21 TYCO 070 MULTILOCK UNSEALED CONNECTOR, Tyco 070 Multilock Unsealed Connector Repair
HD-41675	OIL PRESSURE SENDING UNIT WRENCH	3.3 OIL PRESSURE, Checking Oil Pressure
HD-42310-45	ENGINE SUPPORT CRADLE	5.7 CASE DISASSEMBLY FOR TRANSMISSION REMOVAL, Engine Removal and Disassembly
HD-42311	HARLEY-DAVIDSON OIL FILTER WRENCH	1.6 ENGINE OIL AND FILTER, Changing Oil and Filter
HD-42320-A	PISTON PIN REMOVER	3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder and Piston
HD-42322	PISTON SUPPORT PLATE	3.12 TOP END OVERHAUL: DISASSEMBLY, Cylinder and Piston
HD-42322	PISTON SUPPORT PLATE	3.15 TOP END OVERHAUL: ASSEMBLY, Piston and Cylinder
HD-42326-A	CRANKSHAFT GUIDE TOOL	5.13 TRANSMISSION INSTALLATION, Assembling Crankcases
HD-42326-B	CRANKSHAFT GUIDE TOOL	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
HD-42579-A	SPROCKET SHAFT BEARING/SEAL INSTALLATION TOOL	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
HD-42720-2	CRANKCASE BEARING REMOVER/INSTALLER BASE	3.18 CRANKCASE, Disassembly
HD-42720-2	CRANKCASE BEARING REMOVER/INSTALLER BASE	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
HD-42879	ELECTRICAL CRIMPER TOOL	A.16 DEUTSCH DTM SEALED SOLID BARREL MINI TERMINAL REPAIR, Deutsch DTM Sealed Solid Barrel Terminal Crimps
HD-43984	CRANKSHAFT LOCKING TOOL	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover
HD-44060-C	WHEEL BEARING INSTALLER/REMOVER	2.5 WHEELS, Sealed Wheel Bearings
HD-44061	FUEL PRESSURE GAUGE ADAPTER	4.14 FUEL PRESSURE TEST, Testing
HD-44067-A	HARLEY-DAVIDSON OIL FILTER WRENCH	1.6 ENGINE OIL AND FILTER, Changing Oil and Filter
HD-44695-A	MULTI-LOCK CRIMPER	A.20 TYCO 040 MULTILOCK UNSEALED CONNECTOR, Tyco 040 Multilock Unsealed Connector Repair
HD-44695-A	MULTI-LOCK CRIMPER	A.20 TYCO 040 MULTILOCK UNSEALED CONNECTOR, Tyco 040 Multilock Unsealed Connector Repair
HD-45928	TERMINAL REMOVER	A.11 DELPHI MICRO 64 SEALED CONNECTOR, Delphi Micro 64 Sealed Connector Repair
HD-45929	TERMINAL CRIMPER	A.11 DELPHI MICRO 64 SEALED CONNECTOR, Delphi Micro 64 Sealed Connector Repair
HD-45967	SHOP DOLLY	2.23 REAR ENGINE MOUNT/ISOLATOR, Removal

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Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-45968	FAT JACK	2.22 FRONT ENGINE MOUNT/ISOLATOR, Removal
HD-45968	FAT JACK	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
HD-45968	FAT JACK	3.10 REMOVING ENGINE FROM CHASSIS, Procedure
HD-45968	FAT JACK	6.19 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Removal: DOM Only
HD-46281	BEARING REMOVER/INSTALLER TOOL	2.19 REAR FORK, Pivot Bearings
HD-46282-1A	REACTION ADAPTER	5.14 TRANSMISSION SPROCKET, Removal
HD-46282-1A	REACTION ADAPTER	5.14 TRANSMISSION SPROCKET, Installation
HD-46282-1A	REACTION ADAPTER	5.14 TRANSMISSION SPROCKET, Installation
HD-46282-A	FINAL DRIVE SPROCKET LOCKING TOOL	5.14 TRANSMISSION SPROCKET, Removal
HD-46282-A	FINAL DRIVE SPROCKET LOCKING TOOL	5.14 TRANSMISSION SPROCKET, Installation
HD-46283	PRIMARY DRIVE LOCKING TOOL	5.4 PRIMARY DRIVE AND CLUTCH, Removal
HD-46283	PRIMARY DRIVE LOCKING TOOL	5.4 PRIMARY DRIVE AND CLUTCH, Installation
HD-46284	ENGINE HOOK	3.10 REMOVING ENGINE FROM CHASSIS, Procedure
HD-46285-2	CASE HOLDING FIXTURE	5.13 TRANSMISSION INSTALLATION, Installation
HD-46287	LAPPING TOOL ADAPTER	3.18 CRANKCASE, Lapping Pinion Bearing Outer Race
HD-46288	MAINSHAFT LOCKNUT WRENCH	5.14 TRANSMISSION SPROCKET, Removal
HD-46288	MAINSHAFT LOCKNUT WRENCH	5.14 TRANSMISSION SPROCKET, Installation
HD-46663	CRANKCASE BEARING REMOVER ADAPTER	3.18 CRANKCASE, Disassembly
HD-47855	INNER/OUTER MAIN DRIVE GEAR NEEDLE BEARING INSTALLATION TOOL: XL MODELS	5.10 MAIN DRIVE GEAR AND BEARING, Assembly
HD-47856	MAIN DRIVE GEAR SEAL INSTALLER KIT	5.10 MAIN DRIVE GEAR AND BEARING, Installation
HD-47856-1	INSTALLER	5.10 MAIN DRIVE GEAR AND BEARING, Installation
HD-47856-2	PILOT	5.10 MAIN DRIVE GEAR AND BEARING, Installation
HD-47856-4	ADAPTER	5.10 MAIN DRIVE GEAR AND BEARING, Installation
HD-47856-5	LARGE NUT	5.10 MAIN DRIVE GEAR AND BEARING, Installation
HD-48114	TERMINAL REMOVER	A.19 MOLEX MX 150 SEALED CONNECTOR, Molex MX 150 Sealed Connector Repair
HD-48116-A	TEMPERATURE SENSOR SOCKET	4.6 ENGINE TEMPERATURE (ET) SENSOR, Removal
HD-48119	TERMINAL CRIMPER	A.19 MOLEX MX 150 SEALED CONNECTOR, Crimp Terminal to Lead
HD-48650	DIGITAL TECHNICIAN II	2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR, Installation
HD-48650	DIGITAL TECHNICIAN II	2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Installation
HD-48650	DIGITAL TECHNICIAN II	4.14 FUEL PRESSURE TEST, General
HD-48650	DIGITAL TECHNICIAN II	6.5 ELECTRONIC CONTROL MODULE (ECM), Installation
HD-48650	DIGITAL TECHNICIAN II	6.22 REAR STOP LAMP SWITCH, Installation
HD-48856-A	AXLE ALIGNMENT PLUGS	1.21 WHEEL ALIGNMENT, Wheel Alignment
HD-48921	REAR WHEEL COMPENSATOR SPROCKET BEARING REMOVER/INSTALLER	C.2 COMPENSATING SPROCKET, Sprocket Bearing

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Tools Used in This Manual

PART NUMBER	TOOL NAME	NOTES
HD-48985	SPOKE TORQUE WRENCH	1.8 TIRES AND WHEELS, Wheel Spokes
HD-48985	SPOKE TORQUE WRENCH	2.7 CHECKING AND TRUING WHEELS, Truing Laced Wheels
HD-50017	OXYGEN SENSOR SOCKET	4.10 HEATED OXYGEN SENSOR (HO2S), Removal
HD-50120	UNIVERSAL CRIMPER SET	A.4 DELPHI 100W MICRO-PACK SEALED CONNECTOR, Crimping Terminals
HD-50120	UNIVERSAL CRIMPER SET	A.17 JAE MX19 SEALED CONNECTOR, Crimping Terminals
HD-50120	UNIVERSAL CRIMPER SET	A.18 MOLEX CMC SEALED CONNECTOR, Crimping Terminals
HD-50120	UNIVERSAL CRIMPER SET	A.22 TYCO GET 64 SEALED CONNECTOR, Crimping Terminals
HD-50120	UNIVERSAL CRIMPER SET	A.23 TYCO MCP SEALED CONNECTOR, Crimping Terminals
HD-50120-2	HAND CRIMP FRAME	A.4 DELPHI 100W MICRO-PACK SEALED CONNECTOR, Crimping Terminals
HD-50120-2	HAND CRIMP FRAME	A.17 JAE MX19 SEALED CONNECTOR, Crimping Terminals
HD-50120-2	HAND CRIMP FRAME	A.18 MOLEX CMC SEALED CONNECTOR, Crimping Terminals
HD-50120-2	HAND CRIMP FRAME	A.22 TYCO GET 64 SEALED CONNECTOR, Crimping Terminals
HD-50120-3	JAE DIE	A.18 MOLEX CMC SEALED CONNECTOR, Crimping Terminals
HD-50120-4	JAE DIE	A.18 MOLEX CMC SEALED CONNECTOR, Crimping Terminals
HD-50120-6	JAE DIE	A.17 JAE MX19 SEALED CONNECTOR, Crimping Terminals
HD-50120-7	TYCO AND DELPHI TERMINAL CRIMP DIE	A.4 DELPHI 100W MICRO-PACK SEALED CONNECTOR, Crimping Terminals
HD-50120-7	TYCO AND DELPHI TERMINAL CRIMP DIE	A.22 TYCO GET 64 SEALED CONNECTOR, Crimping Terminals
HD-50120-8	TYCO MCP DIE	A.23 TYCO MCP SEALED CONNECTOR, Crimping Terminals
HD-50120-A	BOSCH TERMINAL REPAIR KIT	A.3 BOSCH BTC SEALED CONNECTOR, Bosch BTC Sealed Connector Repair
HD-50423	0.6 MM TERMINAL EXTRACTOR TOOL	A.18 MOLEX CMC SEALED CONNECTOR, Molex CMC Sealed Connectors
HD-50424	1.5 MM TERMINAL EXTRACTOR TOOL	A.18 MOLEX CMC SEALED CONNECTOR, Molex CMC Sealed Connectors
HD-59000-B	OIL LEVEL GAUGE	2.16 FRONT FORK, Fill with Fork Oil
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 NIPPLE WRENCH	2.7 CHECKING AND TRUING WHEELS, Laced Wheel Rim Offset
HD-94681-80	SPOKE NIPPLE WRENCH	2.7 CHECKING AND TRUING WHEELS, Truing Laced Wheels

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PART NUMBER	TOOL NAME	NOTES
HD-94800-26A	CONNECTING ROD BUSHING REAMER	3.14 CYLINDER AND PISTON, Connecting Rod Bushings
HD-94803-67	REAR INTAKE CAM GEAR BUSHING REAMER	3.17 GEARCASE, Bushing Reaming
HD-94804-57	ROCKER ARM BUSHING REAMER	3.13 CYLINDER HEAD, Replacing Rocker Arm Bushings
HD-94812-1	REAMER	3.17 GEARCASE, Bushing Reaming
HD-94812-87	PILOT	3.17 GEARCASE, Bushing Reaming
HD-95637-46B	BEARING RACE PULLER	5.10 MAIN DRIVE GEAR AND BEARING, Disassembly
HD-95760-69A	BUSHING AND BEARING PULLER	3.17 GEARCASE, Bushing Inspection and Removal
HD-95760-69A	BUSHING AND BEARING PULLER	5.11 TRANSMISSION RIGHT CASE BEARINGS, Removal
HD-95765-69A	1/2 INCH COLLET	5.11 TRANSMISSION RIGHT CASE BEARINGS, Removal
HD-95952-33C	CONNECTING ROD CLAMPING TOOL	3.14 CYLINDER AND PISTON, Connecting Rod Bushings
HD-95970-32D	CONNECTING ROD BUSHING REMOVER/INSTALLER	3.14 CYLINDER AND PISTON, Connecting Rod Bushings
HD-96333-51E	PISTON RING COMPRESSOR	3.15 TOP END OVERHAUL: ASSEMBLY, Piston and Cylinder
HD-96710-40C	CRANKCASE MAIN BEARING LAPPING TOOL	3.18 CRANKCASE, Lapping Pinion Bearing Outer Race
HD-96712-87A	CRANKCASE MAIN BEARING LAP	3.18 CRANKCASE, Lapping Pinion Bearing Outer Race
HD-96796-47	VALVE SPRING TESTER	3.13 CYLINDER HEAD, Cleaning and Inspection
HD-96921-52D	OIL PRESSURE TEST GAUGE KIT	3.3 OIL PRESSURE, Checking Oil Pressure
HD-96925-58	OIL PRESSURE GAUGE ADAPTER	3.3 OIL PRESSURE, Checking Oil Pressure
HD-99500-80	WHEEL TRUING AND BALANCING STAND	2.7 CHECKING AND TRUING WHEELS, Cast Wheel Runout
HD-99500-80	WHEEL TRUING AND BALANCING STAND	2.7 CHECKING AND TRUING WHEELS, Truing Laced Wheels
HD-99500-80	WHEEL TRUING AND BALANCING STAND	2.7 CHECKING AND TRUING WHEELS, Truing Laced Wheels
J-21686-12	FORCING SCREW	3.18 CRANKCASE, Fitting Pinion Bearings
J-21686-12	FORCING SCREW	3.18 CRANKCASE, Fitting Pinion Bearings
J-5586-A	TRANSMISSION SHAFT RETAINING RING PLIERS	3.18 CRANKCASE, Disassembly
J-5586-A	TRANSMISSION SHAFT RETAINING RING PLIERS	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
J-5586-A	TRANSMISSION SHAFT RETAINING RING PLIERS	5.8 TRANSMISSION REMOVAL AND DISASSEMBLY, Mainshaft Disassembly
J-7830-5	BRIDGE	3.18 CRANKCASE, Fitting Pinion Bearings
J-7830-5	BRIDGE	3.18 CRANKCASE, Fitting Pinion Bearings
PFSX916	SNAP-ON SWIVEL BALL SOCKET EXTENSION	4.16 EXHAUST SYSTEM, Exhaust Pipes
PR-36	SNAP-ON SNAP RING PLIERS	5.12 TRANSMISSION LEFT CASE BEARINGS, Removal
TT600-3	SNAP-ON PICK	A.8 DELPHI 630 METRI-PACK UNSEALED CONNECTOR, Delphi 630 Metri-Pack Unsealed Connector Repair

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NOTES

FASTENER	TORQUE VALUE		NOTES
Air cleaner breather screw	84-120 **in-lbs**	9.5-13.6 Nm	4.3 AIR CLEANER ASSEMBLY, All Models
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	1.7 AIR CLEANER AND EXHAUST SYSTEM, Air Cleaner
Air cleaner cover screw	36-60 **in-lbs**	4.1-6.8 Nm	4.3 AIR CLEANER ASSEMBLY, All Models
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm	1.7 AIR CLEANER AND EXHAUST SYSTEM, Air Cleaner
Air filter screw	40-60 **in-lbs**	4.5-6.8 Nm	4.3 AIR CLEANER ASSEMBLY, All Models
Alternator rotor to sprocket screw	120-140 **in-lbs**	13.6-15.8 Nm	6.25 ALTERNATOR, Assembly and Installation
Alternator stator mounting screw	30-40 **in-lbs**	3.4-4.5 Nm	6.25 ALTERNATOR, Assembly and Installation
Axle, front, nut	60-65 ft-lbs	81-88 Nm	2.5 WHEELS, General
Axle, front, nut	60-65 ft-lbs	81-88 Nm	2.5 WHEELS, Front Wheel
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	1.12 DRIVE BELT AND SPROCKETS, Adjustment
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	1.21 WHEEL ALIGNMENT, Wheel Alignment
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	2.5 WHEELS, General
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	2.5 WHEELS, Rear Wheel
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure
Axle, rear, nut	95-105 ft-lbs	129-142 Nm	5.5 DRIVE BELT, Drive Belt
Battery negative cable to crankcase stud	55-75 **in-lbs**	6.2-8.5 Nm	6.10 BATTERY CABLES, Negative Battery Cable
Battery strap fastener	72-96 **in-lbs**	8.1-10.8 Nm	1.20 BATTERY MAINTENANCE, Installation and Connection
Battery strap fastener	72-96 **in-lbs**	8.1-10.8 Nm	6.10 BATTERY CABLES, Positive Battery Cable
Battery terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	1.20 BATTERY MAINTENANCE, Installation and Connection
Battery terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	1.20 BATTERY MAINTENANCE, Installation and Connection
Battery terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	6.10 BATTERY CABLES, Negative Battery Cable
Battery terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	6.10 BATTERY CABLES, Positive Battery Cable
Battery terminal screw	60-70 **in-lbs**	6.8-7.9 Nm	6.10 BATTERY CABLES, Positive Battery Cable
Battery tray fastener	96-156 **in-lbs**	10.8-17.6 Nm	6.11 BATTERY TRAY, Installation
Battery tray fastener	96-156 **in-lbs**	10.8-17.6 Nm	6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Installation
Belt guard screw	120-180 **in-lbs**	13.6-20.4 Nm	2.18 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard
Brake caliper, front, mounting bolt	28-38 ft-lbs	38.0-51.5 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Front
Brake caliper, front, mounting bolt	28-38 ft-lbs	38.0-51.6 Nm	2.9 FRONT BRAKE CALIPERS, Installation
Brake caliper, rear, mounting bolt	28-38 ft-lbs	38.0-51.5 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Rear
Brake caliper bleeder screw	35-61 **in-lbs**	3.9-6.9 Nm	2.9 FRONT BRAKE CALIPERS, Assembly
Brake caliper bleeder screw	35-61 **in-lbs**	3.9-6.9 Nm	2.11 REAR BRAKE CALIPER, Assembly
Brake caliper bleeder screw	35-61 **in-lbs**	3.9-6.9 Nm	2.12 BRAKE LINES, Front Brake Line (Non-ABS)
Brake caliper bleeder screw	35-61 **in-lbs**	3.9-6.9 Nm	2.12 BRAKE LINES, Rear Brake Line (Non-ABS)
Brake caliper bleeder screw	35-61 **in-lbs**	3.9-6.9 Nm	6.22 REAR STOP LAMP SWITCH, Removal
Brake caliper bleeder valve	35-61 **in-lbs**	3.9-6.9 Nm	2.14 BLEEDING BRAKES, Procedure
Brake caliper pad pin	131-173 **in-lbs**	14.8-19.5 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Front

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FASTENER	TORQUE VALUE		NOTES
Brake caliper pad pin	131-173 **in-lbs**	14.8-19.5 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Rear
Brake disc, front, screw	16-24 ft-lbs	21.7-32.6 Nm	2.5 WHEELS, Front Wheel/Cast front wheel
Brake disc, front, screw	16-24 ft-lbs	21.7-32.6 Nm	2.5 WHEELS, Front Wheel
Brake disc, front, screw	16-24 ft-lbs	21.7-32.6 Nm	2.5 WHEELS, Front Wheel/Laced front wheel
Brake disc, rear, screw	30-45 ft-lbs	40.7-61.1 Nm	2.5 WHEELS, Rear Wheel
Brake hose clamp to rear fork screw	30-40 **in-lbs**	3.4-4.5 Nm	1.12 DRIVE BELT AND SPROCKETS, Adjustment
Brake lever pivot pin	5-13 **in-lbs**	0.5-1.5 Nm	2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR, Brake Lever
Brake lever pivot pin nut	44-61 **in-lbs**	4.9-6.9 Nm	2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR, Brake Lever
Brake line, front, manifold bolt	36-48 **in-lbs**	4.1-5.4 Nm	1.18 STEERING HEAD BEARINGS, Fall-Away
Brake line, front, manifold bolt	36-48 **in-lbs**	4.1-5.4 Nm	2.12 BRAKE LINES, Front Master Cylinder to Manifold to Caliper (ABS)
Brake line, front, manifold bolt	36-48 **in-lbs**	4.1-5.4 Nm	2.12 BRAKE LINES, Front Manifold to EHCU (ABS)
Brake line, rear, bracket fasteners	120-180 **in-lbs**	13.6-20.3 Nm	2.19 REAR FORK, Installation
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR, Installation
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.9 FRONT BRAKE CALIPERS, Installation
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR, Installation
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.11 REAR BRAKE CALIPER, Installation
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Front Brake Line (Non-ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Front Brake Line (Non-ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Rear Brake Line (Non-ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Rear Brake Line (Non-ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Front Master Cylinder to Manifold to Caliper (ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Front Master Cylinder to Manifold to Caliper (ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Front Manifold to EHCU (ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Rear Master Cylinder to EHCU (ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Rear Master Cylinder to EHCU (ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Rear EHCU to Caliper (ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.12 BRAKE LINES, Rear EHCU to Caliper (ABS)
Brake line banjo bolt	14-18 ft-lbs	19.0-24.4 Nm	2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Installation
Brake line bracket clamp fastener	20-30 **in-lbs**	2.3-3.4 Nm	2.12 BRAKE LINES, Front Manifold to EHCU (ABS)
Brake line bracket fasteners	120-180 **in-lbs**	13.6-20.3 Nm	2.41 PASSENGER FOOTRESTS, Left
Brake line clamp screw, fork bracket	45-65 **in-lbs**	5.1-7.4 Nm	2.12 BRAKE LINES, Front Brake Line (Non-ABS)
Brake line clamp screw, fork bracket	45-65 **in-lbs**	5.1-7.4 Nm	2.12 BRAKE LINES, Front Master Cylinder to Manifold to Caliper (ABS)

FASTENER	TORQUE VALUE		NOTES
Brake line clamp screw, steering stem	120-168 **in-lbs**	13.6-19.0 Nm	2.12 BRAKE LINES, Front Brake Line (Non-ABS)
Brake line fastener	120-180 **in-lbs**	13.6-20.3 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure
Brake line P-clamp, rear, screw	30-40 **in-lbs**	3.4-4.5 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Rear
Brake line P-clamp, rear, screw	30-40 **in-lbs**	3.4-4.5 Nm	2.12 BRAKE LINES, Rear Brake Line (Non-ABS)
Brake line P-clamp, rear, screw	30-40 **in-lbs**	3.4-4.5 Nm	2.12 BRAKE LINES, Rear EHCU to Caliper (ABS)
Brake line P-clamp, rear, screw	30-40 **in-lbs**	3.4-4.5 Nm	2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Installation
Brake line tube nuts	128-173 **in-lbs**	14.5-19.5 Nm	2.12 BRAKE LINES, Front Master Cylinder to Manifold to Caliper (ABS)
Brake line tube nuts	128-173 **in-lbs**	14.5-19.5 Nm	2.12 BRAKE LINES, Front Manifold to EHCU (ABS)
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Front
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR, Reservoir Cover
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	1.15 BRAKES, Fluid Level
Brake master cylinder, front, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	2.14 BLEEDING BRAKES, Procedure
Brake master cylinder, rear, mounting bracket screw	45-50 ft-lbs	61-68 Nm	2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR, Master Cylinder Mounting Bracket
Brake master cylinder, rear, mounting screw	18-22 ft-lbs	24.4-29.9 Nm	2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR, Installation
Brake master cylinder, rear, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	1.16 BRAKE PADS AND DISCS, Brake Pad Replacement: Rear
Brake master cylinder, rear, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR, Cover
Brake master cylinder, rear, reservoir cover screws	9-17 **in-lbs**	1.0-2.0 Nm	2.14 BLEEDING BRAKES, Procedure
Brake master cylinder/reservoir, rear, pushrod collar	130-173 **in-lbs**	14.7-19.6 Nm	2.10 REAR BRAKE MASTER CYLINDER/RESERVOIR, Master Cylinder Rebuild Kit
Brake master cylinder clamp, front, screw	108-132 **in-lbs**	12.2-14.9 Nm	2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR, Installation
Brake pad pin	131-173 **in-lbs**	14.8-19.5 Nm	2.9 FRONT BRAKE CALIPERS, Assembly
Brake pad pin	131-173 **in-lbs**	14.8-19.5 Nm	2.11 REAR BRAKE CALIPER, Assembly
Brake pedal clevis screw	13-17 ft-lbs	17.6-23.0 Nm	2.39 RIDER FOOT CONTROLS: MID-MOUNT, Right Footrest and Rear Brake Pedal Assembly
Brake pedal clevis screw	13-17 ft-lbs	17.6-23.0 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal Assembly
Brake rod ball stud	120-180 **in-lbs**	13.6-20.4 Nm	2.39 RIDER FOOT CONTROLS: MID-MOUNT, Right Footrest and Rear Brake Pedal Assembly
Brake rod ball stud	120-180 **in-lbs**	13.6-20.4 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal Assembly

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FASTENER	TORQUE VALUE		NOTES
Breather screw	35-55 **in-lbs**	4.0-6.2 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm	2.24 THROTTLE CABLES, Installation
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm	6.17 INDICATOR LAMP MODULE, Assembly
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm	6.27 WHEEL SPEED SENSOR (WSS), Front WSS
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm	6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Backbone Electrical Caddies
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm	6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Installation
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm	6.33 RIGHT HANDLEBAR CONTROL MODULE, Installation
Caddy fastener, front	15-25 **in-lbs**	1.7-2.8 Nm	6.34 LEFT HANDLEBAR CONTROL MODULE, Installation
Caliper to mounting bracket, rear	28-38 ft-lbs	38.0-51.5 Nm	2.11 REAR BRAKE CALIPER, Installation
CKP screw	90-120 **in-lbs**	10.3-13.6 Nm	6.23 CRANK POSITION SENSOR (CKP), Installation
Clutch cable adjuster jamnut	120 **in-lbs**	13.6 Nm	1.11 CLUTCH, Adjustment
Clutch cable fitting	36-108 **in-lbs**	4.1-12.2 Nm	2.25 CLUTCH CONTROL, Assembly and Installation
Clutch cable fitting	36-108 **in-lbs**	4.1-12.2 Nm	5.3 PRIMARY COVER, Installation
Clutch cable guide: XL 1200C/CP/CA/CB	45-65 **in-lbs**	5.0-7.3 Nm	6.16 HEADLAMP, Headlamp Mounts
Clutch cable wireform screw	9-11 **in-lbs**	1.1-1.2 Nm	2.17 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Clutch inspection cover screws	90-120 **in-lbs**	10.3-13.6 Nm	1.10 TRANSMISSION LUBRICANT, Transmission Lubrication
Clutch inspection cover screws	90-120 **in-lbs**	10.3-13.6 Nm	1.10 TRANSMISSION LUBRICANT, Transmission Lubrication
Clutch inspection cover screws	90-120 **in-lbs**	10.2-13.6 Nm	1.11 CLUTCH, Adjustment
Clutch inspection cover screws	90-120 **in-lbs**	10.2-13.6 Nm	2.25 CLUTCH CONTROL, Assembly and Installation
Clutch inspection cover screws	90-120 **in-lbs**	10.3-13.6 Nm	5.3 PRIMARY COVER, Installation
Clutch lever anti-rattle spring screw	8-13 **in-lbs**	0.9-1.5 Nm	2.25 CLUTCH CONTROL, Assembly and Installation
Coil mounting bracket screw	35-45 **in-lbs**	4.0-5.1 Nm	6.15 IGNITION COIL, Installation
Coil mounting screw	24-72 **in-lbs**	2.7-8.1 Nm	6.15 IGNITION COIL, Installation
Countershaft retaining screw	33-37 ft-lbs	44.8-50.2 Nm	5.13 TRANSMISSION INSTALLATION, Shifter Shaft Installation
Crankcase fastener	15-19 ft-lbs	20.3-25.8 Nm	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
Crankcase fastener	15-19 ft-lbs	20.3-25.8 Nm	5.13 TRANSMISSION INSTALLATION, Assembling Crankcases
Cylinder screws, 1st torque	96-120 **in-lbs**	11-14 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/See procedure
Cylinder screws, 1st torque	96-120 **in-lbs**	11-14 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/See procedure

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FASTENER	TORQUE VALUE		NOTES
Cylinder screws, final torque	13-15 ft-lbs	18-20 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/Plus 90 degrees. See procedure
Cylinder screws, final torque	13-15 ft-lbs	18-20 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Cylinder Head/Plus 90 degrees. See procedure
Cylinder stud	120-240 **in-lbs**	13.6-27.1 Nm	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
Debris deflector screw	36-60 **in-lbs**	4.1-6.8 Nm	2.18 BELT GUARD AND DEBRIS DEFLECTOR, Debris Deflector
ECM caddy fastener	72-96 **in-lbs**	8.1-10.8 Nm	6.11 BATTERY TRAY, Installation
ECM fastener	19-24 **in-lbs**	2.1-2.7 Nm	6.5 ELECTRONIC CONTROL MODULE (ECM), Installation
EHCU mounting bracket fasteners	15-18 ft-lbs	20.3-24.4 Nm	2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Installation
EHCU to mounting bracket fastener	50-70 **in-lbs**	5.8-7.8 Nm	2.13 ELECTRO HYDRAULIC CONTROL UNIT (EHCU), Installation
Electrical caddy cover	50-60 **in-lbs**	5.6-6.8 Nm	6.10 BATTERY CABLES, Positive Battery Cable
Electrical caddy cover	50-60 **in-lbs**	5.6-6.8 Nm	6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Installation
Electrical caddy fastener	50-60 **in-lbs**	5.6-6.8 Nm	6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Installation
Electrical caddy fasteners	50-60 **in-lbs**	5.6-6.8 Nm	4.4 FUEL TANK, Installing Fuel Tank
Electrical caddy fasteners	50-60 **in-lbs**	5.6-6.8 Nm	4.12 FUEL PUMP, Installation
Engine mount, front, bolt	95-105 ft-lbs	129-142 Nm	2.22 FRONT ENGINE MOUNT/ISOLATOR, Installation
Engine mount, front, bolt	95-105 ft-lbs	129-142 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure
Engine sprocket nut	240-260 ft-lbs	326-353 Nm	5.4 PRIMARY DRIVE AND CLUTCH, Installation
ET sensor	120-168 **in-lbs**	13.6-19.0 Nm	4.6 ENGINE TEMPERATURE (ET) SENSOR, Installation
EVAP canister mounting bracket screw	15-18 ft-lbs	20.3-24.4 Nm	4.17 EVAPORATIVE (EVAP) EMISSIONS CONTROL, Charcoal Canister
Exhaust mounting bracket fastener	30-33 ft-lbs	40.7-44.7 Nm	4.16 EXHAUST SYSTEM, Mounting Bracket
Exhaust pipe bracket acorn nut	20-30 ft-lbs	27.1-40.7 Nm	4.16 EXHAUST SYSTEM, Exhaust Pipes
Exhaust pipe clamp bracket fastener	30-33 ft-lbs	40.7-44.7 Nm	4.16 EXHAUST SYSTEM, Exhaust Pipe Bracket
Exhaust pipe clamp bracket screw	30-33 ft-lbs	40.7-44.7 Nm	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
Exhaust pipe clamp bracket screw	30-33 ft-lbs	40.7-44.7 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure
Exhaust pipe clamp bracket screw	30-33 ft-lbs	40.7-44.7 Nm	5.5 DRIVE BELT, Drive Belt
Exhaust pipe clamp bracket screw	30-33 ft-lbs	40.7-44.8 Nm	5.14 TRANSMISSION SPROCKET, Installation
Exhaust pipe flange nut	96-120 **in-lbs**	10.8-13.6 Nm	4.16 EXHAUST SYSTEM, Exhaust Pipes
Exhaust shield worm drive clamps	20-40 **in-lbs**	2.3-4.5 Nm	4.16 EXHAUST SYSTEM, Exhaust Shields
Exhaust shield worm drive clamps	20-40 **in-lbs**	2.3-4.5 Nm	4.16 EXHAUST SYSTEM, Muffler Shields
Fender, rear, mounting fastener	120-168 **in-lbs**	13.6-19.0 Nm	6.21 REAR TURN SIGNALS, XL 883L/R

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Fender, rear, mounting fastener	120-168 **in-lbs**	13.6-19.0 Nm	6.21 REAR TURN SIGNALS, XL 883N and XL 1200X/V
Fender, rear, mounting fastener	120-168 **in-lbs**	13.6-19.0 Nm	6.21 REAR TURN SIGNALS, XL 1200C/CP/CA/CB
Fender, rear, mounting fastener: XL 1200C/CP/CA/CB	120-168 **in-lbs**	13.6-19.0 Nm	2.31 REAR FENDER: XL 1200C/CP/CA/CB, Replacement
Fender, rear, mounting fastener: XL 883N, XL 1200X/V	120-168 **in-lbs**	13.6-19.0 Nm	2.33 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V, Assembly and Installation
Fender, rear, mounting fastener: XL 883R/L, CAN XL 883N, XL 1200VX	120-168 **in-lbs**	13.6-19.0 Nm	2.30 REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X, Installation
Fender, rear, saddlebag support bolts: XL 1200T	24-27 ft-lbs	32.6-36.6 Nm	2.32 REAR FENDER: XL 1200T, Installation/Same fastener as the saddlebag support bolt.
Fender brace, rear, screw	20-25 **in-lbs**	2.3-2.8 Nm	2.33 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V, Assembly and Installation
Fender brace, rear, screw: XL 883N, XL 1200X/V	20-25 **in-lbs**	2.3-2.8 Nm	6.19 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: HDI
Fender support, rear, screw: XL 883N, XL 1200X/V	132-216 **in-lbs**	14.9-24.4 Nm	6.19 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: HDI
Fender to fork brace, front: XL 1200X	30-42 **in-lbs**	3.4-4.7 Nm	2.27 FRONT FENDER, All Models/Tighten in cross pattern.
Fender to forks, front: XL except XL 1200X	96-156 **in-lbs**	10.9-17.6 Nm	2.27 FRONT FENDER, All Models
Footrest support bracket	45-50 ft-lbs	61-68 Nm	2.19 REAR FORK, Installation
Footrest support bracket	45-50 ft-lbs	61-68 Nm	2.25 CLUTCH CONTROL, Assembly and Installation
Footrest support bracket	45-50 ft-lbs	61-68 Nm	2.39 RIDER FOOT CONTROLS: MID-MOUNT, Right Footrest and Rear Brake Pedal Assembly
Footrest support bracket	45-50 ft-lbs	61-68 Nm	2.39 RIDER FOOT CONTROLS: MID-MOUNT, Left Footrest and Shift Lever Assembly
Footrest support bracket	45-50 ft-lbs	61-68 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal Assembly
Footrest support bracket	45-50 ft-lbs	61-68 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Left Footrest and Shift Lever Assembly
Footrest wear peg	72-108 **in-lbs**	8.1- 12.2 Nm	2.39 RIDER FOOT CONTROLS: MID-MOUNT, Right Footrest and Rear Brake Pedal Assembly
Footrest wear peg	72-108 **in-lbs**	8.1- 12.2 Nm	2.39 RIDER FOOT CONTROLS: MID-MOUNT, Left Footrest and Shift Lever Assembly
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Right Footrest and Rear Brake Pedal Assembly
Footrest wear peg	72-108 **in-lbs**	8.1-12.2 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Left Footrest and Shift Lever Assembly
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	2.16 FRONT FORK, Installation
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	2.16 FRONT FORK, Installation
Fork, front, bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	6.20 FRONT TURN SIGNALS, XL 1200X

FASTENER	TORQUE VALUE		NOTES
Fork, front, chrome cover	120-192 **in-lbs**	13.5-21.6 Nm	2.17 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Fork, front, pinch bolt	21-27 ft-lbs	28.5-36.6 Nm	2.5 WHEELS, Front Wheel
Fork, front, stem bolt, final torque	72-96 **in-lbs**	8.1-10.9 Nm	2.17 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Fork, front, stem bolt, first torque	23-27 ft-lbs	31.2-36.6 Nm	2.17 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Fork, rear, pivot bolt nut	120-130 ft-lbs	162.7-176.3 Nm	2.19 REAR FORK, Installation
Fork, rear, pivot bolt nut	120-130 ft-lbs	162.7-176.3 Nm	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
Fork brace to forks: XL 1200X	18-22 ft-lbs	24.4-29.8 Nm	2.27 FRONT FENDER, All Models
Fork bracket pinch screw	30-35 ft-lbs	40.7-47.5 Nm	1.18 STEERING HEAD BEARINGS, Fall-Away
Fork slider tube cap	22-58 ft-lbs	29.9-78.7 Nm	2.16 FRONT FORK, Installation
Fork slider tube fastener	132-216 **in-lbs**	14.9-24.4 Nm	2.16 FRONT FORK, Assembly
Fork stem pinch bolt	30-35 ft-lbs	40.7-47.5 Nm	1.18 STEERING HEAD BEARINGS, Fall-Away
Fork stem pinch bolt	30-35 ft-lbs	40.7-47.5 Nm	2.17 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Fork stem pinch bolt	30-35 ft-lbs	40.7-47.5 Nm	2.17 FORK STEM AND BRACKET ASSEMBLY, Assembly and Installation
Fuel hose retaining bracket screw	60 **in-lbs**	6.8 Nm	4.11 FUEL INJECTORS, Installation
Fuel pump bracket mounting screw	19-36 **in-lbs**	2.1-4.1 Nm	4.12 FUEL PUMP, Assembly
Fuel pump module mounting screw	40-45 **in-lbs**	4.5-5.1 Nm	4.12 FUEL PUMP, Installation
Fuel pump module mounting screw	40-45 **in-lbs**	4.5-5.1 Nm	4.13 FUEL FILTER ELEMENT, Installation
Fuel tank fasteners	15-20 ft-lbs	20.3-27.1 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair
Fuel tank fasteners	15-20 ft-lbs	20.3-27.1 Nm	4.4 FUEL TANK, Installing Fuel Tank
Fuel tank fasteners	15-20 ft-lbs	20.3-27.1 Nm	4.7 INDUCTION MODULE, Installation
Fuel tank fasteners	15-20 ft-lbs	20.3-27.1 Nm	4.11 FUEL INJECTORS, Installation
Gearcase cover fasteners	120-140 **in-lbs**	13.6-15.8 Nm	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover
Gear detent assembly screw	90-110 **in-lbs**	10.2-12.4 Nm	5.13 TRANSMISSION INSTALLATION, Installation
Gear shift lever pinch screw	16-20 ft-lbs	21.7-27.1 Nm	2.39 RIDER FOOT CONTROLS: MID-MOUNT, Left Footrest and Shift Lever Assembly
Gear shift lever pinch screw	16-20 ft-lbs	21.7-27.1 Nm	5.3 PRIMARY COVER, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.26 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.26 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.26 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	2.26 HANDLEBAR, Installation
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	6.17 INDICATOR LAMP MODULE, Replacement: XL 883R/L/N, XL 1200CP/CB with Mini-Ape Handlebar, XL 1200T/X/V/XL883N - Tighten rear first, front second.

FASTENER	TORQUE VALUE		NOTES
Handlebar clamp screw	12-18 ft-lbs	16.3-24.4 Nm	6.17 INDICATOR LAMP MODULE, Replacement: XL 883R/L/N, XL 1200CP/CB with Mini-Ape Handlebar, XL 1200T/X/V/Tighten rear first, front second: XL883N.
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm	2.25 CLUTCH CONTROL, Assembly and Installation
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm	2.26 HANDLEBAR, Installation
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm	6.33 RIGHT HANDLEBAR CONTROL MODULE, Installation
Handlebar control lever clamp screw	108-132 **in-lbs**	12.2-14.9 Nm	6.34 LEFT HANDLEBAR CONTROL MODULE, Installation
Handlebar riser bolt, lower	30-40 ft-lbs	40.7-54.3 Nm	2.26 HANDLEBAR, Installation
Handlebar riser bolt, lower	30-40 ft-lbs	40.7-54.3 Nm	2.26 HANDLEBAR, Installation
Handlebar riser clamp screw: XL 1200C/CP/CA except with mini-ape handlebar	12-18 ft-lbs	16.3 -24.4 Nm	6.17 INDICATOR LAMP MODULE, Replacement: XL 1200C/CP/CA except with Mini-Ape Handlebar/XL1200C
Handlebar riser clamp screw: XL 1200C/CP/CA except with mini-ape handlebar	12-18 ft-lbs	16.3 -24.4 Nm	6.17 INDICATOR LAMP MODULE, Replacement: XL 1200C/CP/CA except with Mini-Ape Handlebar/XL1200C
Handlebar riser cover screw	8-12 **in-lbs**	0.9-1.4 Nm	2.26 HANDLEBAR, Installation
Handlebar riser cover screw: XL 1200C/CP/CA except with mini-ape handlebar	8-12 **in-lbs**	0.9-1.4 Nm	6.17 INDICATOR LAMP MODULE, Replacement: XL 1200C/CP/CA except with Mini-Ape Handlebar/XL1200C
Headlamp assembly: XL 1200V/C/CP/CA/CB	30-35 ft-lbs	41-47 Nm	6.16 HEADLAMP, Headlamp Mounts
Headlamp assembly: XL 1200X	30-35 ft-lbs	41-47 Nm	6.16 HEADLAMP, Headlamp Mounts
Headlamp clamp nut: XL 883L/N/R, XL 1200T	120-240 **in-lbs**	13.6-27.1 Nm	1.23 HEADLAMP ALIGNMENT, Headlamp Adjustment
Headlamp clamp nut: XL 883L/N/R, XL 1200T	120-240 **in-lbs**	13.6-27.1 Nm	6.16 HEADLAMP, Headlamp Mounts
Headlamp horizontal adjustment: XL 1200C/CP/CA/CB/V/X	30-35 ft-lbs	40.7-47.5 Nm	1.23 HEADLAMP ALIGNMENT, Headlamp Adjustment
Headlamp mount: XL 1200V/C/CP/CA/CB	30-35 ft-lbs	41-47 Nm	6.16 HEADLAMP, Headlamp Mounts
Headlamp mount: XL 1200X	30-35 ft-lbs	41-47 Nm	6.16 HEADLAMP, Headlamp Mounts
Headlamp upper bracket fasteners: XL 883L/R/N, XL 1200T	120-192 **in-lbs**	14-22 Nm	6.16 HEADLAMP, Headlamp Mounts
Headlamp vertical adjustment: XL 1200C/CP/CA/CB/V/X	30-35 ft-lbs	40.7-47.5 Nm	1.23 HEADLAMP ALIGNMENT, Headlamp Adjustment
Headlamp visor: XL 1200C/CP/CA/CB	120-192 **in-lbs**	14-22 Nm	6.16 HEADLAMP, Headlamp Mounts
HO2S	12.2-14.2 ft-lbs	16.5-19.3 Nm	4.10 HEATED OXYGEN SENSOR (HO2S), Installation
Horn acorn nut: XL 1200C/CP/CA/CB XL 1200T/V	60-180 **in-lbs**	6.8-20.4 Nm	6.32 HORN, Side Mount: XL 1200C/CP/CA/CB, XL 1200T/V
Horn bracket rubber stud: XL 1200C/CP/CA/CB XL 1200T/V	96-192 **in-lbs**	10.8-21.7 Nm	6.32 HORN, Side Mount: XL 1200C/CP/CA/CB, XL 1200T/V

FASTENER	TORQUE VALUE		NOTES
Horn bracket to center engine mount bracket: XL 1200C/CP/CA/CB XL 1200T/V	35-45 **in-lbs**	4.0-5.1 Nm	6.32 HORN, Side Mount: XL 1200C/CP/CA/CB, XL 1200T/V
Horn fastener: XL 883L/N/R, XL 1200X	36-48 **in-lbs**	4.1-5.4 Nm	6.32 HORN, Front Mount: XL 883L/N/R, XL 1200X
Horn flange nut: XL 1200C/CP/CA/CB XL 1200T/V	80-100 **in-lbs**	9.0-11.3 Nm	6.32 HORN, Side Mount: XL 1200C/CP/CA/CB, XL 1200T/V
Hub plate mounting screw	16-24 ft-lbs	21.7-32.6 Nm	2.5 WHEELS, Front Wheel/XL 883N
IAC mounting screw	60 **in-lbs**	6.8 Nm	4.7 INDUCTION MODULE, Assembly
IAC mounting screw	60 **in-lbs**	6.8 Nm	4.8 IDLE AIR CONTROL (IAC), Installation
Ignition switch face nut	72-96 **in-lbs**	8.1-10.8 Nm	6.13 IGNITION SWITCH, Installation
Ignition switch mounting screw	35-45 **in-lbs**	4.0-5.1 Nm	6.13 IGNITION SWITCH, Installation
Induction module cable bracket screw	60 **in-lbs**	6.8 Nm	4.7 INDUCTION MODULE, Assembly
Induction module mounting bracket screw	90-120 **in-lbs**	10.2-13.6 Nm	4.7 INDUCTION MODULE, Installation
Induction module screw	35 **in-lbs**	4.0 Nm	4.7 INDUCTION MODULE, Assembly
Induction module screw	35 **in-lbs**	4.0 Nm	4.9 TEMPERATURE MANIFOLD ABSOLUTE PRESSURE (TMAP) SENSOR, Installation
Intake manifold mounting screw	96-120 **in-lbs**	10.9-13.6 Nm	4.7 INDUCTION MODULE, Installation
Isolator, front, mounting bracket screw	25-35 ft-lbs	33.9-47.5 Nm	2.22 FRONT ENGINE MOUNT/ISOLATOR, Installation
Isolator, front, mounting bracket screw	25-35 ft-lbs	33.9-47.5 Nm	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
Isolator mount, front, screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure
Isolator mount, rear, screw	25-35 ft-lbs	33.9-47.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure
J-clip fastener	45-50 ft-lbs	61.0-67.8 Nm	6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, J-Clips: Mid-Mount Models
JSS screw	96-120 **in-lbs**	10.9-13.6 Nm	6.30 JIFFY STAND SENSOR (JSS): INTERNATIONAL MODELS, Installation
License plate, front, fastener: XL 1200X/C (India)	10-15 **in-lbs**	1.1-1.7 Nm	2.28 FRONT LICENSE PLATE: INDIA MODELS, Front License Plate (India)
License plate, front, fastener: XL 883L/N/R (India)	10-15 **in-lbs**	1.1-1.7 Nm	2.28 FRONT LICENSE PLATE: INDIA MODELS, Front License Plate (India)
License plate clamp nut	20-25 **in-lbs**	2.3-2.8 Nm	6.21 REAR TURN SIGNALS, XL 1200T
License plate clamp nut: XL 1200C/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm	2.31 REAR FENDER: XL 1200C/CP/CA/CB, License Plate Bracket: XL 1200C/CP/CA/CB
License plate clamp nut: XL 1200T	20-25 **in-lbs**	2.3-2.8 Nm	2.32 REAR FENDER: XL 1200T, License Plate Bracket: XL 1200T
License plate clamp nut: XL 883R/L, CAN XL 883N, XL 1200V/X	20-25 **in-lbs**	2.3-2.8 Nm	2.30 REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X, License Plate Bracket: XL 883R/L, CAN XL 883N, XL 1200V/X
License plate lamp housing screw: XL 883N	14-16 **in-lbs**	1.6-1.8 Nm	6.19 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: HDI

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FASTENER	TORQUE VALUE		NOTES
License plate reflector bracket Keps nut: XL 883N, XL 1200X/V (HDI)	10-15 **in-lbs**	1.1-1.7 Nm	6.19 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Reflector Brackets: XL 883N, XL 1200X/V (HDI)
License plate screw: XL 883L/R (India)	10-15 **in-lbs**	1.1-1.7 Nm	2.36 REAR LICENSE PLATE: INDIA MODELS, Rear License Plate (India)
License plate screw: XL 883N, XL 1200X (India)	10-15 **in-lbs**	1.1-1.7 Nm	2.36 REAR LICENSE PLATE: INDIA MODELS, Rear License Plate (India)
License plate support bracket screws: XL 1200C/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm	2.31 REAR FENDER: XL 1200C/CP/CA/CB, License Plate Bracket: XL 1200C/CP/CA/CB
License plate support bracket screws: XL 883R/L, CAN XL 883N, XL 1200V/X	20-25 **in-lbs**	2.3-2.8 Nm	2.30 REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X, License Plate Bracket: XL 883R/L, CAN XL 883N, XL 1200V/X
Main harness ground wire	55-75 **in-lbs**	6.2-8.5 Nm	6.10 BATTERY CABLES, Positive Battery Cable
Main harness ground wire	55-75 **in-lbs**	6.2-8.5 Nm	6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Installation
Mirror stem locknut	96-144 **in-lbs**	10.9-16.3 Nm	2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR, Installation
Mirror stem locknut	96-144 **in-lbs**	10.9-16.3 Nm	2.25 CLUTCH CONTROL, Assembly and Installation
Muffler clamp	38-43 ft-lbs	51.5-58.3 Nm	4.16 EXHAUST SYSTEM, Mufflers
Muffler mounting bracket fastener	17-20 ft-lbs	23.0-27.1 Nm	4.16 EXHAUST SYSTEM, Mufflers
Muffler mounting bracket screw	30-33 ft-lbs	40.7-44.7 Nm	5.14 TRANSMISSION SPROCKET, Installation
Muffler to bracket screw	17-20 ft-lbs	23.0-27.1 Nm	4.16 EXHAUST SYSTEM, Mufflers
Neutral indicator switch	120-180 **in-lbs**	13.6-20.3 Nm	5.13 TRANSMISSION INSTALLATION, Assembling Crankcases
Neutral indicator switch	120-180 **in-lbs**	13.6-20.3 Nm	6.28 NEUTRAL INDICATOR SWITCH, Replacement
Oil drain hose worm clamp	6-10 **in-lbs**	0.7-1.1 Nm	1.6 ENGINE OIL AND FILTER, Changing Oil and Filter
Oil drain hose worm clamp	6-10 **in-lb**	0.7-1.1 Nm	5.3 PRIMARY COVER, Installation
Oil filter adapter	18-22 ft-lbs	24.4-29.8 Nm	3.21 OIL FILTER MOUNT, Assembly
Oil pressure switch	60-90 **in-lbs**	6.8-10.2 Nm	6.31 OIL PRESSURE SWITCH, Installation
Oil pump cover screws	70-80 **in-lbs**	7.9-9.0 Nm	3.19 OIL PUMP, Assembly
Oil pump feed fitting	100-120 **in-lbs**	11.3-13.6 Nm	3.19 OIL PUMP, Installation
Oil pump high-pressure feed hose fitting nut	85-105 **in-lbs**	9.6-11.8 Nm	3.19 OIL PUMP, Installation
Oil pump high-pressure feed hose to crankcase fitting	60-90 **in-lbs**	6.8-10.2 Nm	3.19 OIL PUMP, Installation
Oil pump to crankcase screw	125-150 **in-lbs**	14.1-16.9 Nm	3.19 OIL PUMP, Installation
Oil tank bracket fastener	72-96 **in-lbs**	8.1-10.8 Nm	3.22 OIL TANK, Oil Tank Bracket
Oil tank mounting screws	72-96 **in-lbs**	8.1-10.8 Nm	3.22 OIL TANK, Installation
Oil tank mounting screws	72-96 **in-lbs**	8.1-10.8 Nm	6.10 BATTERY CABLES, Positive Battery Cable
Oil tank mounting screws	72-96 **in-lbs**	8.1-10.8 Nm	6.10 BATTERY CABLES, Positive Battery Cable
Oil tank mounting screws	72-96 **in-lbs**	8.1-10.8 Nm	6.29 MAIN WIRING HARNESS AND ELECTRICAL CADDIES, Installation

FASTENER	TORQUE VALUE		NOTES
Passenger footrest support bracket, left-front, fastener: XL 883R, XL 1200C saree guard	16-20 ft-lbs	21.7-27.1 Nm	2.35 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C (India)
Passenger footrest support bracket fastener	45-50 ft-lbs	61-68 Nm	2.41 PASSENGER FOOTRESTS, Left
Passenger footrest support bracket fastener	45-50 ft-lbs	61-68 Nm	2.41 PASSENGER FOOTRESTS, Right
Pinion shaft locking nut	19-21 ft-lbs	26-29 Nm	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Cam Gears and Gearcase Cover/ plus 15-19 degrees of rotation
Piston oil jet screw	25-35 **in-lbs**	2.8-3.9 Nm	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Crankcase
Preload knob screw: XL 1200T	25-43 **in-lbs**	2.8-4.8 Nm	2.20 SHOCK ABSORBERS, Preload Shock Repair: XL 1200T
Primary chain adjuster locknut	20-25 ft-lbs	27.1-33.9 Nm	1.9 PRIMARY CHAIN, Free Play Adjustment
Primary chain adjuster locknut	20-25 ft-lbs	27.1-33.9 Nm	5.3 PRIMARY COVER, Installation
Primary chaincase drain plug	14-30 ft-lbs	19.0-40.7 Nm	1.10 TRANSMISSION LUBRICANT, Transmission Lubrication/Apply LOCTITE 565 THREAD SEALANT
Primary chaincase drain plug	14-30 ft-lbs	19.0-40.7 Nm	5.3 PRIMARY COVER, Installation
Primary chain cover screws	120-140 **in-lbs**	13.6-15.8 Nm	5.3 PRIMARY COVER, Installation
Primary chain inspection cover	90-120 **in-lbs**	10.2-13.6 Nm	1.9 PRIMARY CHAIN, Free Play Adjustment
Rocker cover, inner, large bolt	18-22 ft-lbs	24.4-29.8 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Rocker cover, inner, screw	135-155 **in-lbs**	15.3-17.5 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Rocker cover, inner, small bolt	135-155 **in-lbs**	15.3-17.5 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Rocker cover, outer, screw	120-168 **in-lbs**	13.6-19.0 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Rocker Covers
Saddlebag locknut: XL 1200T	24-27 ft-lbs	32.6-36.6 Nm	2.29 SADDLEBAGS: XL 1200T, Installation
Seat mounting screw	20-40 **in-lbs**	2.3-4.5 Nm	2.38 SEAT, Installation
Seat post bolt	120-168 **in-lbs**	13.6-19.0 Nm	2.30 REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X, Installation
Seat post bolt	120-168 **in-lbs**	13.6-19.0 Nm	2.31 REAR FENDER: XL 1200C/CP/CA/CB, Replacement
Seat post bolt	120-168 **in-lbs**	13.6-19.0 Nm	2.32 REAR FENDER: XL 1200T, Installation
Seat post bolt	120-168 **in-lbs**	13.6-19.0 Nm	2.33 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V, Assembly and Installation
Shifter peg screw	96-144 **in-lbs**	10.9-16.3 Nm	2.39 RIDER FOOT CONTROLS: MID-MOUNT, Left Footrest and Shift Lever Assembly
Shifter peg screw	96-144 **in-lbs**	10.9-16.3 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Left Footrest and Shift Lever Assembly
Shifter rod to shift lever screw	120-180 **in-lbs**	13.6-20.4 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Left Footrest and Shift Lever Assembly

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FASTENER	TORQUE VALUE		NOTES
Shifter rod to shift lever screw	120-180 **in-lbs**	13.6-20.4 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Left Footrest and Shift Lever Assembly
Shift lever pinch screw	16-20 ft-lbs	21.7-27.1 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Left Footrest and Shift Lever Assembly
Shift pedal clevis screw	13-17 ft-lbs	17.6-23.0 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Left Footrest and Shift Lever Assembly
Shift rod jamnuts	84-132 **in-lbs**	9.5-14.9 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Adjusting Shift Pedal
Shift rod screw	120-180 **in-lbs**	13.6-20.4 Nm	2.40 RIDER FOOT CONTROLS: FORWARD, Adjusting Shift Pedal
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.5 WHEELS, Rear Wheel
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.18 BELT GUARD AND DEBRIS DEFLECTOR, Belt Guard
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.20 SHOCK ABSORBERS, Installation/Apply 2-3 drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads.
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.20 SHOCK ABSORBERS, Installation
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	2.35 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C (India)/Saree Guards: Apply 2-3 drops of LOCTITE 243 MEDIUM STRENGTH THREADLOCKER AND SEALANT (blue) to threads.
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	6.19 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: DOM Only
Shock absorber mounting bolt	45-50 ft-lbs	61-68 Nm	6.19 LICENSE PLATE LAMP MODULE: XL 883N, XL 1200X/V, Installation: HDI
Single disc cast front wheel hub plate screw	16-24 ft-lbs	21.7-32.6 Nm	2.5 WHEELS, Sealed Wheel Bearings
Solenoid contact post jamnut	65-80 **in-lbs**	7.3-9.0 Nm	6.12 STARTER, Solenoid
Spark plug	12-18 ft-lbs	16.3-24.4 Nm	1.17 SPARK PLUGS, Installation
Speedometer screws	12-17 **in-lbs**	1.4-1.9 Nm	6.4 SPEEDOMETER, Installation
Speedometer screws	12-17 **in-lbs**	1.4-1.9 Nm	6.4 SPEEDOMETER, Installation
Speedometer screws	12-17 **in-lbs**	1.4-1.9 Nm	6.4 SPEEDOMETER, Installation
Spoke nipple	55 **in-lbs**	6.2 Nm	1.8 TIRES AND WHEELS, Wheel Spokes
Spoke nipple	55 **in-lbs**	6.2 Nm	2.7 CHECKING AND TRUING WHEELS, Truing Laced Wheels
Sprocket compensator bowl bolt, final torque	80 ft-lbs	108.5 Nm	C.2 COMPENSATING SPROCKET, Assembly and Installation/Tighten in a star pattern
Sprocket compensator bowl bolt, first torque	60 ft-lbs	81.3 Nm	C.2 COMPENSATING SPROCKET, Assembly and Installation/Tighten in a star pattern
Sprocket cover, forward and lower screw	80-120 **in-lbs**	9.0-13.6 Nm	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure

FASTENER	TORQUE VALUE		NOTES
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	5.5 DRIVE BELT, Drive Belt
Sprocket cover, forward and lower screws	80-120 **in-lbs**	9.0-13.6 Nm	5.14 TRANSMISSION SPROCKET, Installation
Sprocket cover screws	80-120 **in-lbs**	9.0-13.6 Nm	4.16 EXHAUST SYSTEM, Mounting Bracket
Sprocket mounting screw, final torque	80 ft-lbs	108.0 Nm	2.5 WHEELS, Rear Wheel
Sprocket mounting screw, first torque	60 ft-lbs	81.3 Nm	2.5 WHEELS, Rear Wheel
Stabilizer link, lower front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link, lower front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.21 STABILIZER LINKS, Lower Front Stabilizer Link
Stabilizer link, lower front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair
Stabilizer link, upper front, engine bracket mounting screw	55-65 ft-lbs	74.6-88.2 Nm	2.21 STABILIZER LINKS, Upper Front Stabilizer Link
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.22 FRONT ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	2.21 STABILIZER LINKS, Upper Front Stabilizer Link
Stabilizer link, upper front, frame bracket mounting screw	25-35 ft-lbs	33.9-47.5 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Assembling Motorcycle After Top End Repair
Stabilizer link, upper front, frame bracket mounting screw: XL 883L/N/R, XL 1200X	25-35 ft-lbs	33.9-47.5 Nm	6.32 HORN, Front Mount: XL 883L/N/R, XL 1200X
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.21 STABILIZER LINKS, Upper Front Stabilizer Link
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.21 STABILIZER LINKS, Lower Front Stabilizer Link
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.21 STABILIZER LINKS, Lower Front Stabilizer Link
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.21 STABILIZER LINKS, Rear Stabilizer Link
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.22 FRONT ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.22 FRONT ENGINE MOUNT/ISOLATOR, Installation
Stabilizer link screw	25-35 ft-lbs	33.9-47.5 Nm	2.23 REAR ENGINE MOUNT/ISOLATOR, Installation
Starter motor oil line clamp fastener	16-21 **in-lbs**	1.8-2.4 Nm	6.12 STARTER, Installation
Starter mounting bolt	13-20 ft-lbs	17.6-27.1 Nm	6.12 STARTER, Installation
Starter positive ring terminal	60-80 **in-lbs**	6.8-9.0 Nm	6.12 STARTER, Installation
Starter ring terminal hex nut	60-80 **in-lbs**	6.8-9.0 Nm	6.10 BATTERY CABLES, Positive Battery Cable
Starter ring terminal hex nut	60-80 **in-lbs**	6.8-9.0 Nm	6.12 STARTER, Solenoid

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FASTENER	TORQUE VALUE		NOTES
Stator harness retainer screw	56 **in-lbs**	6.3 Nm	6.25 ALTERNATOR, Assembly and Installation/Screw must be flush with plate. Do not exceed torque specification.
Stop lamp switch, rear	12-15 **in-lbs**	1.4-1.6 Nm	2.12 BRAKE LINES, Rear Master Cylinder to EHCU (ABS)
Stop lamp switch, rear	12-15 **in-lbs**	1.4-1.6 Nm	6.22 REAR STOP LAMP SWITCH, Installation
Strut cover fastener, front: XL 883R, XL 1200C (India)	120-168 **in-lbs**	13.6-19.0 Nm	2.35 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C (India)
Strut cover fastener, rear: XL 883R, XL 1200C (India)	120-168 **in-lbs**	13.6-19.0 Nm	2.35 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C (India)
Support bracket to horn cover: XL 1200C/CP/CA/CB, XL 1200T/V	36-60 **in-lbs**	4.1-6.8 Nm	6.32 HORN, Side Mount: XL 1200C/CP/CA/CB, XL 1200T/V
Switch assembly retainer screws	8-10 **in-lbs**	0.9-1.1 Nm	6.33 RIGHT HANDLEBAR CONTROL MODULE, Installation
Switch assembly retainer screws	8-10 **in-lbs**	0.9-1.1 Nm	6.34 LEFT HANDLEBAR CONTROL MODULE, Clutch Switch Replacement
Switch assembly retainer screws	8-10 **in-lbs**	0.9-1.1 Nm	6.34 LEFT HANDLEBAR CONTROL MODULE, Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	1.13 THROTTLE CONTROL, Cable Inspection and Lubrication
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	2.24 THROTTLE CABLES, Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	2.25 CLUTCH CONTROL, Assembly and Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	2.26 HANDLEBAR, Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	2.26 HANDLEBAR, Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	6.33 RIGHT HANDLEBAR CONTROL MODULE, Installation
Switch housing screw	35-45 **in-lbs**	4.0-5.1 Nm	6.34 LEFT HANDLEBAR CONTROL MODULE, Installation
Tail lamp base mounting screw: XL 883R/L, XL 1200T	45-48 **in-lbs**	5.1-5.4 Nm	6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L, XL 1200T
Tail lamp LED base fasteners: XL 1200C/CP/CA/CB	40-50 **in-lbs**	4.5-5.6 Nm	6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, LED Tail Lamp: XL 1200C/CP/CA/CB
Tail lamp LED screws: XL 1200C/CP/CA/CB	20-25 **in-lbs**	2.3-2.8 Nm	6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, LED Tail Lamp: XL 1200C/CP/CA/CB
Tail lamp lens screw: XL 883R/L, XL 1200T	20-24 **in-lbs**	2.3-2.7 Nm	6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Bulb Replacement: XL 883R/L, XL 1200T
Tail lamp lens screw: XL 883R/L, XL 1200T	20-24 **in-lbs**	2.3-2.7 Nm	6.18 TAIL LAMP: ALL MODELS EXCEPT XL 883N/XL 1200X/V, Base Replacement: XL 883R/L, XL 1200T
Tail lamp lens screw: XL 883R/L, XL 1200T	20-24 **in-lbs**	2.3-2.7 Nm	6.21 REAR TURN SIGNALS, XL 1200T
Tappet cover, anti-rotation mounting screw	90-120 **in-lbs**	10.2-13.6 Nm	3.20 BOTTOM END OVERHAUL: ASSEMBLY, Tappets

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FASTENER	TORQUE VALUE		NOTES
Tappet cover fastener	90-120 **in-lbs**	10.2-13.6 Nm	3.15 TOP END OVERHAUL: ASSEMBLY, Tappet Covers, Pushrod Covers and Pushrods
TPS screw	35 **in-lbs**	4.0 Nm	4.5 THROTTLE POSITION SENSOR (TPS), Installation
Transmission mainshaft nut	50-60 ft-lbs	67.8-81.3 Nm	5.4 PRIMARY DRIVE AND CLUTCH, Installation
Transmission sprocket lockplate screw	90-120 **in-lbs**	10.3-13.6 Nm	5.14 TRANSMISSION SPROCKET, Installation
Transmission sprocket nut	50 ft-lbs	67.8 Nm	5.14 TRANSMISSION SPROCKET, Installation/Initial torque plus 30-40 degrees.
Turn signal, front, ball head studs: all except XL 1200X, XL 1200T	96-144 **in-lbs**	10.8-16.3 Nm	6.20 FRONT TURN SIGNALS, All Except XL 1200X, XL 1200T
Turn signal, front, ball stud set screw: all except XL 1200X, XL 1200T	96-120 **in-lbs**	10.8-13.6 Nm	6.20 FRONT TURN SIGNALS, All Except XL 1200X, XL 1200T
Turn signal, front, set screw	96-120 **in-lbs**	10.9-13.6 Nm	2.8 FRONT BRAKE MASTER CYLINDER/RESERVOIR, Installation
Turn signal, front, set screw	96-120 **in-lbs**	10.9-13.6 Nm	2.25 CLUTCH CONTROL, Assembly and Installation
Turn signal/license bracket, rear, nut: XL 1200T	20-25 **in-lbs**	2.3-2.8 Nm	6.21 REAR TURN SIGNALS, XL 1200T
Turn signal bracket pinch screw: XL 1200T	36-54 **in-lbs**	4.1-6.1 Nm	6.20 FRONT TURN SIGNALS, XL 1200T
Turn signal housing, front, nut: XL 1200T	12-16 ft-lbs	16.3-21.7 Nm	6.20 FRONT TURN SIGNALS, XL 1200T
Turn signal housing, rear, locking nut: XL 1200T	64-75 **in-lbs**	7.2-8.4 Nm	6.21 REAR TURN SIGNALS, XL 1200T
Turn signal housing to mount, rear, fastener	96-156 **in-lbs**	10.9-17.6 Nm	6.21 REAR TURN SIGNALS, XL 883L/R
Turn signal housing to mount, rear, fastener	96-156 **in-lbs**	10.9-17.6 Nm	6.21 REAR TURN SIGNALS, XL 883N and XL 1200X/V
Turn signal housing to mount, rear, fastener	96-156 **in-lbs**	10.9-17.6 Nm	6.21 REAR TURN SIGNALS, XL 1200C/CP/CA/CB
Turn signal mount, front, nut: XL 1200X	12-16 ft-lbs	16.3-21.7 Nm	6.20 FRONT TURN SIGNALS, XL 1200X
Turn signal stalk locknut	120-168 **in-lbs**	13.6-19.0 Nm	6.21 REAR TURN SIGNALS, XL 883L/R
Turn signal stalk locknut	120-168 **in-lbs**	13.6-19.0 Nm	6.21 REAR TURN SIGNALS, XL 883N and XL 1200X/V
Turn signal stalk locknut	120-168 **in-lbs**	13.6-19.0 Nm	6.21 REAR TURN SIGNALS, XL 1200C/CP/CA/CB
Turn signal stalk locknut: XL 1200C/CP/CA/CB	120-168 **in-lbs**	13.6-19.0 Nm	2.31 REAR FENDER: XL 1200C/CP/CA/CB, Replacement
Turn signal stalk locknut: XL 883N, XL 1200X/V	120-168 **in-lbs**	13.6-19.0 Nm	2.33 REAR FENDER AND LICENSE PLATE BRACKET: XL 883N, XL 1200X/V, Assembly and Installation
Turn signal stalk locknut: XL 883R, XL 1200C (India)	96-156 **in-lbs**	10.9-17.6 Nm	2.35 SAREE GUARD: INDIA MODELS, Saree Guard: XL 883R, XL 1200C (India)
Turn signal stalk locknut: XL 883R/L, CAN XL 883N, XL 1200V/X	120-168 **in-lbs**	13.6-19.0 Nm	2.30 REAR FENDER: XL 883R/L, CAN XL 883N, XL 1200V/X, Installation
Valve stem, tubeless type, nut	12-15 **in-lbs**	1.4-1.7 Nm	2.4 TIRES, Installation
Valve stem, tube type, nut	3-7 **in-lbs**	0.3-0.8 Nm	2.4 TIRES, Installation
Voltage regulator mounting screw	30-60 **in-lbs**	3.4-6.8 Nm	6.24 VOLTAGE REGULATOR, Installation

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VSS screw	90-120 **in-lbs**	10.2-13.6 Nm	6.26 VEHICLE SPEED SENSOR (VSS), Installation
Windshield assembly screws: XL 1200T	23-27 **in-lbs**	2.6-3.1 Nm	2.34 WINDSHIELD: XL 1200T, Window
Windshield clamp shoulder bolt: XL 1200T	48-72 **in-lbs**	5.4-8.1 Nm	2.34 WINDSHIELD: XL 1200T, Windshield: XL 1200T
Windshield clamp shoulder bolt: XL 1200T	48-72 **in-lbs**	5.4-8.1 Nm	2.34 WINDSHIELD: XL 1200T, Mounting Clamps
Wire harness ground wire	55-75 **in-lbs**	6.2-8.5 Nm	3.11 INSTALLING ENGINE IN CHASSIS, Procedure

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